Pima Freeway (SR 101L): Princess Drive to Shea Boulevard

General Purpose Lanes

ADOT

Project 101 MA 036 F0123 01D | Federal Project No.: 101-B(210)T

Prepared for ADOT Infrastructure Delivery and Operations Division Project Management Group

Prepared by:

Kimley»Horn

February 2021

ADOT Intermodal Transportation

PROJECT DETERMINATION FORM

Project Number and Federal ID	County and ADOT District	Project Name and Highway	Final Design Concept Report Update Date
101 MA 036 F0123 01D	Maricopa	SR 101L, PRINCESS DRIVE TO SHEA BOULEVARD	February 2021
101-B(210)T	Central	PIMA FREEWAY (SR 101L)	

Project Description:	Add GPL in both directions on SR 101L; Improve Frank Lloyd Wright Blvd, Raintree Dr, Princess Dr and Shea Blvd TIs

Existing Program	
Yes	No
X	

Program Year	Programmed Budget
2023	$81,154,243
	DCR Construction Cost Estimate
	$114,935,000

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:

	Requires a significant amount of new right-of-way:
	Substantially changes the layout or function of connecting roadway or the facility being improved;
	Has a significant adverse impact on abutting real property;
	Otherwise has a significant social, economic, environmental or other effect
	Is controversial on environmental grounds;
	Or has significant floodplain encroachment
X	None of the above conditions apply

Recommends:

Yes:	No:		Environmental Category		
	X	Public Forum	Class 1	Class II	Class III
	X	Offer a combined Location / Design Hearing		X	
	X	Offer Separate Location/Design Hearing			
	X	Hold a Design Public Hearing			

Concur:

DocuSigned by: Tafwachi Katapa 160B0D78745E426... 2/16/2021
Tafwachi Katapa — Project Manager, Project Management Group 614E — Date

DocuSigned by: Paul O'Brien 69D3A817999345F... 2/16/2021
Paul O'Brien — Manager, Environmental Planning Group EM02 — Date

DocuSigned by: Reed Henry 13677DAC22F445B... 2/17/2021
Reed Henry — Manager, Roadway Predesign Section 605E — Date

DocuSigned by: Randy Everett 465E125CB703429... 2/16/2021
Randy Everett — Central District Engineer — Date

Approved:

DocuSigned by: Michael DenBleyker 8F51D09EA7284F0... 2/19/2021
Michael DenBleyker — Roadway Engineering Group Manager, Roadway Engineering Group 605E — Date

DocuSigned by: David Eberhart 0982C40D1CF54F5... 2/16/2021
David Eberhart — State Bridge Engineer, Bridge Group 613E — Date

Comments:

Subsequent to the Final DCR Update being issued in February 2021, it was determined that diamond grinding of the PCCP will no longer be considered and AR-ACFC finish course will be used on this project.

FINAL DESIGN CONCEPT REPORT UPDATE

PIMA FREEWAY (SR 101L)
PRINCESS DRIVE TO SHEA BOULEVARD
GENERAL PURPOSE LANES

ADOT CENTRAL DISTRICT/MARICOPA COUNTY

ADOT CONTRACT NO. 2018-006.11
ADOT PROJECT NO. 101 MA 036 F0123 01D
FEDERAL AID NO. 101-B(210)T

Prepared For:

ADOT

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
PROJECT MANAGEMENT GROUP

Prepared By:

Kimley»Horn

February 2021

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EXECUTIVE SUMMARY

This Design Concept Report (DCR) Update describes the development, evaluation, and recommendation for reconfigurations of four existing Traffic Interchanges (TIs) along SR 101L from Pima Road to Shea Boulevard (MP 36.54 to MP 41.08), of the original DCR PIMA FREEWAY (SR 101L) PRINCESS DRIVE TO RED MOUNTAIN FREEWAY (SR 202L) GENERAL PURPOSE LANES (GPL), Project No. 101L MA 36.5 H687401L (completed in 2010). The ADOT 2010 DCR provides additional GPL on the Pima Freeway from Princess Drive (Milepost 36.54) to the Red Mountain Freeway (Milepost 51.75). This project is located within the Arizona Department of Transportation's (ADOT's) Central District within Maricopa County in central Arizona.

Growing traffic demand has caused the SR 101L corridor to become increasingly congested during the morning and evening peak travel periods, and growth projections indicate the congestion will worsen in the future. Additional GPL would increase the freeway capacity and help alleviate increased levels of traffic congestion in the future.

The Arizona State Transportation Board has approved funding in the Five-Year Transportation Facilities Construction Program. The current approved Regional Transportation Plan Freeway Program (RTPFP) for fiscal years 2020-2024 Life Cycle Construction Program includes funding for the following phases of this project:

Milepost	Location	Type of Work	Funds Source	Funding Amount	Fiscal Year
36.49	SR 101L Pima - Princess to Shea	Right-of-Way and Utilities	Regional Area Road Fund (RARF)	$525,050	2021
		Construct General-Purpose Lane	National Highway Performance Program (NHPP) and RARF Match	$81,154,243	2023

The Maricopa Association of Governments (MAG), Regional Public Transportation Authority (RPTA), and ADOT have collaborated to develop a comprehensive plan for the Regional Freeway System that is included in the Regional Transportation Plan 2040 (RTP) updated February 2020. This project is included in the MAG 2040 RTP Plan Group 1.

The voters of Maricopa County passed Proposition 400 in November 2004, which authorized the continuation of the existing half-cent sales tax for 20 years (2006-2026) to be used for implementing the MAG RTP. A portion of the revenues collected from the half-cent sales tax extension are deposited into the RARF to fund the RTPFP Life Cycle Construction Program projects.

The purpose of this project is to reduce congestion, enhance regional mobility, improve movement of goods and services, and improve access to residential and commercial developments by increasing the capacity of SR 101L by providing an additional GPL in each direction as identified in the RTPFP. The project will also include reconstruction of two existing TIs at Frank Lloyd Wright Boulevard and Raintree Drive to increase capacity and improve traffic operations. Minor improvements are recommended within this report for Princess Drive and Shea Boulevard.

The alternatives analysis includes the evaluation of the following improvements:

- Frank Lloyd Wright Boulevard Improved Single-Point Urban Interchange (SPUI)
- Frank Lloyd Wright Boulevard Tight Diamond Interchange (TDI)
- Raintree Drive Improved SPUI
- Raintree Drive TDI
- Raintree Drive Dual Roundabouts Interchange (DRI)
- Princess Drive TDI: convert to triple lefts and extend storage
- Shea Boulevard SPUI: extend right-turn lane

The No-Build and build alternatives were evaluated and the Recommended Alternative is presented in **Appendix C**. The Recommended Alternative is based on an evaluation of the conformance with the RTP, benefits to traffic operations, geometric design criteria, right-of-way acquisition requirements, utility impacts, environmental considerations, construction costs, and public agency input.

The Recommended Alternative includes updates to the 2010 DCR with an addition of a GPL in both the northbound and southbound directions through widening outside as well as reconstruction of the Frank Lloyd Wright Boulevard TI to a TDI, improvements to the Raintree Drive SPUI, and lane improvements along Shea Boulevard and Princess Drive. The study also evaluated interchange reconfigurations at the Frank Lloyd Wright TI and Raintree Drive TI. Evaluated alternatives included a TDI and an improved SPUI at each location, and a roundabout alternative at Raintree Drive TI.

The acquisition of new right-of-way is anticipated for the Recommended Alternative at several locations. Temporary Construction Easements (TCEs) will be required and the locations and limits will be finalized during final design.

Continuing coordination for this project will be required with the following public agencies: ADOT, MAG, Federal Highway Administration (FHWA), Maricopa County Department of Transportation (MCDOT), and the City of Scottsdale.

Coordination with concurrent construction projects may be required for this project. Coordination will also be required with several utility companies, and Central Arizona Project (CAP).

Mitigation measures for the Recommended Alternative are identified in the ADOT 2010 DCR. The Categorical Exclusion (CE) will include all final mitigation and coordination requirements for the Build Alternative.

Additional reports prepared as part of this DCR include an Initial Traffic Report, and a Draft Americans with Disabilities Act (ADA) Compliance and Feasibility Report. Additional reports prepared as part of the 2010 DCR include an American Association of State Highway and Transportation Officials (AASHTO) Controlling Design Criteria Report, Initial Traffic Report, Initial Onsite Drainage Concept Report, Air Quality Analysis Technical Report, Mobile Source Air Toxics (MSAT) Report, Noise Analysis Technical Report, Hazardous Materials Inventory, Biology Evaluation, and CE.

The total estimated cost for the Recommended Alternative is $121,435,000, which includes $114,285,000 for construction, $650,000 for right-of-way acquisitions, and $6,500,000 for design. The current programmed amount for SR 101L construction from Princess Drive to Shea Boulevard is $88,179,293, which is $81,154,243 for construction, $525,050 for right-of-way acquisitions and utility relocations, and $6,500,000 for design, which come from the RARF and NHPP funding sources. The detailed cost estimates are provided in **Section 6** of this report.

ENVIRONMENTAL COMMITMENTS

LIST OF MITIGATION MEASURES

See ADOT 2010 DCR. Updates to this were not included for analysis or review within the scope of this document. Therefore, no additional measures are included with the preferred alternatives.

1. INTRODUCTION

1.1. FOREWARD

This Design Concept Report (DCR) Update describes the development, evaluation, and recommendation for reconfigurations of four existing Traffic Interchanges (TIs) along SR 101L from Pima Road to Shea Boulevard (MP 36.54 to MP 41.08), of the original DCR PIMA FREEWAY (SR 101L) PRINCESS DRIVE TO RED MOUNTAIN FREEWAY (SR 202L) GENERAL PURPOSE LANES (GPL), Project No. 101L MA 36.5 H687401L (completed in 2010). The ADOT 2010 DCR provides additional GPL on the Pima Freeway from Princess Drive (Milepost 36.54) to the Red Mountain Freeway (Milepost 51.75). This project is located within ADOT's Central District within Maricopa County in central Arizona. The project location and project vicinity map are shown in **Figure 1.1** and **Figure 1.2.**

SR 101L is classified as limited-access Urban Principal Freeway/Expressway and is on the National Highway System (NHS). The posted speed on this section of SR 101L is 65 miles per hour (mph).

The purpose of this report is to update any required information of the ADOT 2010 DCR which evaluated the safety and operation characteristics of the existing SR 101L freeway and provided additional GPL as identified in the RTPFP. The report update will also include recommendations for the reconstruction or modifications of four existing TIs at Princess Drive, Frank Lloyd Wright Boulevard, Raintree Drive and Shea Boulevard to increase capacity and improve traffic operations. Only minor lane improvements are suggested within this report for Princess Drive and Shea Boulevard.

The alternatives analysis includes the evaluation of the following improvements:

- Frank Lloyd Wright Boulevard Improved SPUI
- Frank Lloyd Wright Boulevard TDI
- Raintree Drive Improved SPUI
- Raintree Drive TDI
- Raintree Drive DRI
- Princess Drive TDI: convert to triple lefts and extend storage
- Shea Boulevard SPUI: extend right-turn lane

An Environmental Overview (EO) is provided in the ADOT 2010 DCR. Individual CE and related technical reports for the Build Alternative will be developed during the final design phase of the project.

1.2. NEED FOR THE PROJECT

The Pima Freeway (SR 101L) is a major element of the MAG-adopted RTPFP. This segment of SR 101L accommodates traffic from the Red Mountain Freeway (SR 202L), Price Freeway (SR 101L), State Route 51 (SR 51), and Interstate 17 (I-17). The project is located within the City of Scottsdale and is adjacent to Scottsdale Airport and Scottsdale Community College.

Maricopa County has been one of the fastest growing regions in the United States. In 2017, more people moved to Maricopa County than any other county in the country, according to the U.S. Census Bureau population estimates, released in March 2018. Maricopa County's population jumped by nearly 74,000 people – a 1.7 percent increase. Maricopa County is the fourth most populous county in the country, with over 4.3 million residents.

The growing traffic demand has caused the SR 101L corridor to become increasingly congested during the morning and evening peak travel periods, and growth projections indicate the congestion will worsen in the future. Additional GPL would increase the freeway capacity and help alleviate increased levels of traffic congestion in the future.

At the Princess/Pima TI, MAG evaluated a diverging diamond interchange (DDI) TI alternative in 2013 and also performed a study that included Texas U-turns and flyover directional ramps for northbound (NB) off-ramps and southbound (SB) on-ramp movements and minor capacity and safety improvements in 2017. At the Frank Lloyd Wright TI, the 2017 MAG Traffic Alternatives Study recommended a TDI and a 2019 City of Scottsdale Arterial Life Cycle Program (ALCP) Report recommended minor capacity and safety improvements. Previous studies were performed at the Raintree Drive TI also. A TDI was recommended in the 2014 City of Scottsdale Raintree DCR, 2017 MAG Traffic Alternatives, and in the 2019 City of Scottsdale ALCP Report. At the Shea Boulevard TI, a 2019 City of Scottsdale ALCP Report recommended minor capacity and safety improvements.

The MAG, RPTA, and ADOT have collaborated to develop a comprehensive plan for the Regional Freeway System which is included in the 2040 RTP that was adopted by the MAG Regional Council in February 2020.

The voters of Maricopa County passed Proposition 400 in November 2004, which authorized the continuation of the existing half-cent sales tax for 20 years (2006-2026) to be used for implementing the MAG RTP. A portion of the revenues collected from the half-cent sales tax extension are deposited into the RARF to fund the RTPFP Life Cycle Construction Program projects. This project is included in the MAG 2040 RTP Plan Group 1.

1.3. CHARACTERISTICS OF THE CORRIDOR

See ADOT 2010 DCR Section 1.3.

1.3.1. Roadway Characteristics

See ADOT 2010 DCR Section 1.3.1.

1.3.2. Transit Facilities and Routes

See ADOT 2010 DCR Section 1.3.2.

1.3.3. Land Use and Ownership

1.3.3.1. General Land Use and Ownership

Adjacent land uses along Frank Lloyd Wright and Raintree are entirely commercial and industrial. See also ADOT 2010 DCR Section 1.3.3.

1.3.4. Right-Of-Way

See ADOT 2010 DCR Section 1.3.4.Utilities

See ADOT 2010 DCR Section 1.3.5.

1.3.5. Drainage

See ADOT 2010 DCR Section 1.3.6

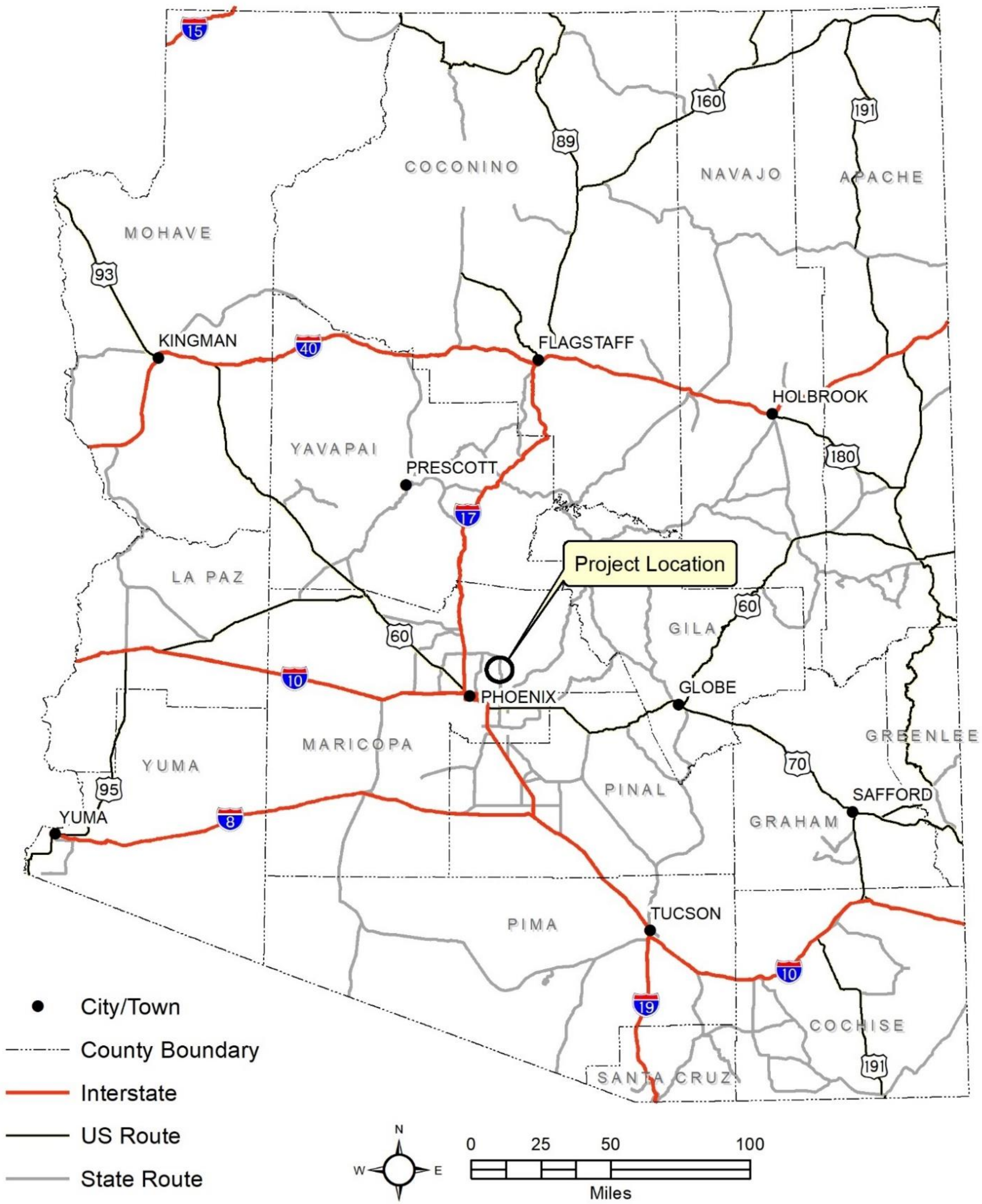


Figure 1.1 – Project Location Map

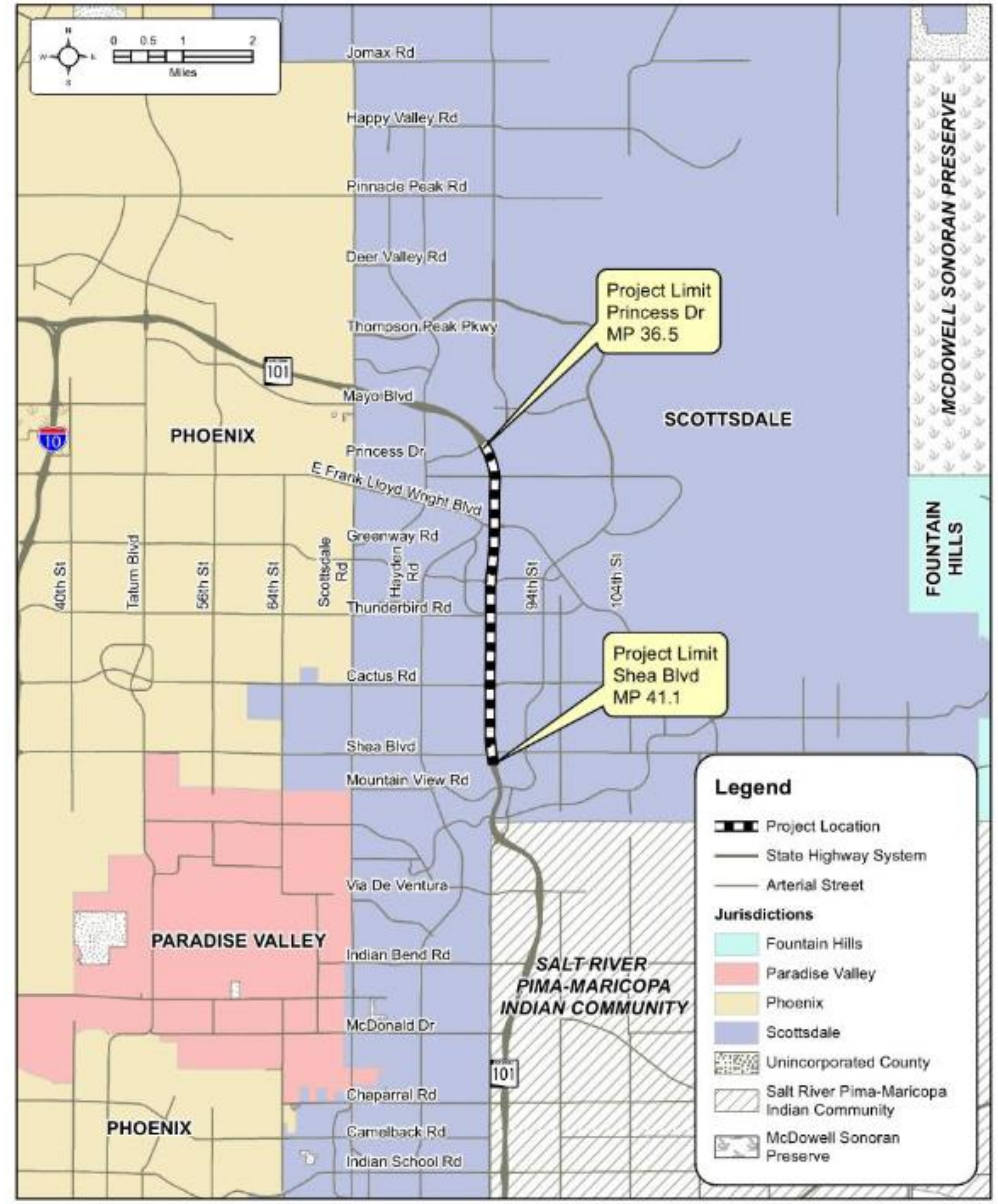


Figure 1.2 – Vicinity Map

1.3.5.1. Off-Site Drainage Systems

ADOT has completed the construction of storage capacity Improvements to the outlet basins of three box culverts located immediately northwest of the project limits. The structural enhancements provide added stability to the outlet basins that are designed to spread out the flows that are concentrated on the upstream side by inlet forebays. These enhancements did not affect any roadway facilities. See also ADOT 2010 DCR Section 1.3.6.1

1.3.6. Structures

See ADOT 2010 DCR Section 1.3.7.

1.3.7. Signing and Lighting

See ADOT 2010 DCR Section 1.3.8.

1.3.8. Freeway Management System

See ADOT 2010 DCR Section 1.3.9.

1.3.9. Speed Monitoring System

See ADOT 2010 DCR Section 1.3.10.

1.3.10. Geotechnical Conditions

The generalized subsurface conditions for this segment of SR 101L were determined based on review of previous geotechnical studies performed for various design segments completed for SR 101L.

The project site is situated within the southern Basin and Range physiographic province characterized by broad intermountain alluvial valleys and intervening fault-bounded and uplifted mountain ranges, often with well-developed pediments and alluvial fans. Generally, the mountain ranges and valleys trend in a north-south to northwest-southeast direction. The typical modern Basin and Range landscape was formed by late Tertiary (Miocene-Pliocene) extensional tectonics and high-angle normal faulting, followed by subsequent erosion of the uplifted mountains and deposition of the sediments in the newly formed basins.

The generalized site geology consists of relatively flat-lying surficial Holocene alluvial plain sediments in the Paradise Valley basin of central Arizona between the McDowell and Phoenix Mountains to the northeast and southwest, respectively and alluvial soils which vary from fine to coarse depending mainly upon the proximity to the sand, gravel and cobble laden Salt River stream bed south of the project terminus. The bedrock in the McDowell and Phoenix mountain ranges consists predominately of late-Proterozoic metasedimentary and metavolcanic rocks. Paradise Valley basin bedrock occurs in unconformable contact beneath the unconsolidated clastic sediments at depths of up to approximately 4,800 feet below the current ground surface.

From an engineering standpoint, the subgrade conditions can be grouped into one general description. The soils consist predominantly of firm to hard, finer grained, low to medium plasticity silty to clayey sands and sandy clays. Typically, these soils are firm in the upper 5' to 20', becoming hard (refusal blow count N-values) and more cemented with depth. Isolated pockets of relatively clean, dense, sand and gravel layers were encountered at depth within some of the borings.

Groundwater was not encountered within previous test borings advanced throughout the project corridor (maximum depth of 90 feet). Groundwater is not anticipated to affect construction of this project.

1.3.10.1. Land Subsidence and Earth Fissures

Depletion of groundwater resources in deep alluvial basin aquifers in the western United States is causing land subsidence. Land subsidence can severely and adversely impact infrastructure by changing the ground elevation, ground slope (grade) and through the development of ground cracks, known as earth fissures, which can erode into large gullies. Earth fissures have the potential to compromise the foundations of roadways, levees and other infrastructure, which may cause failure. The project area has historically experienced less than 50 to 100 feet of groundwater withdrawal (Schumann and Genauldi 1986). While it is possible that some ground subsidence has resulted from that groundwater depletion, significant ground subsidence in the project area has not been reported in scientific or professional literature (Galloway et al 1999).

Interferometric Synthetic Aperture Radar (InSAR) is a satellite-based technology that can detect ground subsidence in the range of 0.2 inches. The Arizona Department of Water Resources (ADWR) has a program that monitors land subsidence in Arizona utilizing InSAR. InSAR data from 2017 to 2019 (ADWR 2020) indicates that the project site has experienced land subsidence ranging from 0.0 to 0.4 inches.

There are no reported earth fissures within the project corridor. The nearest reported earth fissures to the project site is located 4 miles to the southeast near the McDowell Mountains (AZGS 2019).

1.3.11. Pavement Structural Sections

Record drawings for the SR 101L, from Scottsdale Road to McDonald Drive were reviewed to determine the existing mainline, and inside and outside shoulder pavement sections. For the SR 101L mainline, Portland cement concrete pavement (PCCP) with thicknesses ranging from 10.75" to 12" over 4" of Class 2 Aggregate Base (AB) were utilized. Asphalt Concrete Base (ACB) was used in place of AB within depressed freeway areas. Table 1.1 presents a summary of the existing pavement sections within the various constructed roadway segments.

Table 1.1 – Existing Pavement Structural Sections

Project Segment & TRACS	Item	AR-ACFC (inches)	Plain PCCP (inches)	AB (Class 2) (inches)	ACB (inches)	Total Thickness (in)
Pima Road To Shea Boulevard* H4083 01C	Mainline Elevated & Outside Shoulder	1.0	10.75	4.0	-	15.75
	Mainline & Outside Shoulder	1.0	10.75	-	4.0	15.75
	Ramps & Gores	1.0	9.75	4.0	-	14.75
Princess Drive to Shea Boulevard H6936 01C	HOV Elevated & Inside Shoulder	1.0	12.0	4.0	-	17.0
	HOV Depressed & Inside Shoulder	1.0	12.0	-	4.0	17.0

1.3.11.1. Previous Projects

Based on the ADOT Milepost Strip Map, the following projects have been completed within the study area:

Table 1.2 – Previous Projects

Project Number and/or TRACS Number	Begin Milepost	As-Built Date	Description
101-B-NFA H7699-01C	29.8	2010	Freeway Management System SR 51-Princess Drive
101-MA-031 H7208-01C	31.3	2009	Construct High-Occupancy Vehicle (HOV) Lanes Tatum Boulevard-Princess Drive
RAM-600-1-564 101-MA-034 H3230-02C	34.5	2003	Construct Roadway Scottsdale Road-Pima Road
RAM-101-B-501 101-MA-034 H5543-01C	34.5	2001	Construct Roadway Scottsdale Road-Pima Road
101-B H6802-01C	35.5	-	Construct Roadway Auxiliary Lanes
101-MA-036 H6939-01C	36.6	2010	Construct HOV Lanes Princess Drive-Red Mountain TI
RAM-600-1-544 101-MA-036 H4083-01C	36.6	2002	Construct Roadway Pima Road-Shea Boulevard
RAM-600-1-544 101-MA-036 H4083-01C	36.6	2002	Construct Roadway Pima Road-Shea Boulevard
101-MA-040 H6874-01C	40.6	2017	Construct Outside GPL Shea Boulevard-Red Mountain TI
101-MA-041 H5823-01C	41.0	2002	Highway Lighting Shea Boulevard-Thomas Road
RAM-600-1-542 101-MA-041 H4060-01C	41.5	2002	Construct Roadway Shea Boulevard-McDonald, Part A
RAM-600-1-542 101-MA-041 H4060-01C	41.5	2002	Construct Roadway Shea Boulevard-McDonald, Part B

2. TRAFFIC AND CRASH DATA

This section summarizes the initial traffic report update. The full initial traffic report update can be found in **Appendix E**.

2.1. CRASH ANALYSIS

Historical crash data was obtained from the ADOT crash database for the segment of the SR 101L corridor from Princess Drive to south of Shea Boulevard and the SR 101L TIs of Frank Lloyd Wright Boulevard, Raintree Drive, and Shea Boulevard. The analysis evaluated reported crashes between January 1, 2015 and December 31, 2019.

2.1.1. Mainline Crash Analysis

The mainline analysis evaluated the SR 101L corridor within the project limits. A total of 928 crashes was reported between January 1, 2015 and December 31, 2019. The following is a summary of the mainline crash characteristics:

- Of the 928 crashes reported, 42% (390 crashes) occurred in the NB direction and 58% (538 crashes) occurred in the SB direction
- 675 crashes resulted in property damage only (73%), 250 resulted in injuries (27%) and 3 resulted in a fatality (<1%)
- Fifty-six percent (522 crashes) were rear-end crashes, 21% (198 crashes) were sideswipe crashes, and 17% (154 crashes) were single-vehicle/fixed object crashes. The remaining 6% of crashes involved less common manners of collision (e.g., angle, head-on, rear-to-side, other/unknown)
- Seventy-five percent of the crashes occurred during daylight hours, 3% occurred at dusk or dawn, and the remaining 22% occurred during hours of darkness

Historical traffic count data was referenced to calculate crash rates, which are summarized for each segment in **Table 2.1**. The crash rates are depicted by year and by segment in **Figure 2.1** and **Figure 2.2**. The crash rates are expressed in million vehicle miles (MVM).

Table 2.1 – SR 101L Mainline Crash Summary, 2015-2019

Freeway Segment	Segment Length (mi.)	Northbound SR 101L		Southbound SR 101L	
		No. of Crashes (Jan 2015 - Dec 2019)	*Crash Rate (Crashes/MVM)*	*No. of Crashes (Jan 2015 - Dec 2019)*	*Crash Rate (Crashes/MVM)*
Princess Drive/Pima Road to Frank Lloyd Wright Blvd	1.26	98	0.65	72	0.47
Frank Lloyd Wright Blvd to Raintree Drive	0.80	37	0.39	81	0.76
Raintree Drive to Cactus Road	1.40	105	0.57	229	1.04
Cactus Road to Shea Boulevard	1.08	150	0.89	156	0.85

The 2010 SR 101L Design Concept Report analyzed crash data from 2002 to 2006. The comparison of crash rates from the previous analysis is summarized in **Table 2.2**.

Table 2.2 – SR 101L Mainline Crash Rate Comparison to 2010 SR 101L Design Concept Report

Freeway Segment	Segment Length (mi.)	Northbound SR 101L Crash Rate (Crashes/MVM)		Southbound SR 101L Crash Rate (Crashes/MVM)	
		2002 - 2006	*2015 - 2019*	*2002 - 2006*	*2015 - 2019*
Princess Drive/Pima Road to Frank Lloyd Wright Blvd	1.26	0.51	0.65	0.54	0.47
Frank Lloyd Wright Blvd to Raintree Drive	0.80	0.44	0.39	0.72	0.76
Raintree Drive to Cactus Road	1.40	0.54	0.57	1.22	1.04
Cactus Road to Shea Boulevard	1.08	0.78	0.89	1.38	0.85
Weighted Average		**0.57**	**0.64**	**0.98**	**0.79**

Historical crash rates in Arizona were reviewed to compare to the values calculated in this analysis. Crash rate data was identified in the Arizona Motor Vehicle Crash Facts Report (published annually), the 2035 MAG RTP (2014), and in local crash rate reporting.

- The Arizona Motor Vehicle Crash Facts Reports (2014 to 2018) indicates a statewide crash rate based on the total number of crashes and the estimated number of vehicle miles traveled each year. This data includes crashes from all roadway types, from local roadways to interstate freeways. This data source provided an average crash rate of 1.88 crashes per MVM based on the five-year period of data from 2014 to 2018.
- In 2010, citywide crash rate reports were prepared by the City of Scottsdale and the City of Phoenix. Scottsdale and Phoenix reported average segment crash rates of 1.63 crashes per MVM (2000 to 2008) and 2.24 crashes per MVM (2006 to 2010), respectively. This data represents arterial and collector roadways and does not include freeway segments. It is noted that freeway segments typically have lower crash rates than arterial segments, due to the nature of uninterrupted flow on freeways.
- The 2035 MAG RTP identified segment crash rates on various freeway corridors within the MAG region. The analysis evaluated crash data from 1999 to 2011 on the following freeway corridors: I-10, I-17, SR 51, SR 101L, SR 202L, and US 60. The average freeway segment crash rate ranged from 1.30 to 2.10 crashes per MVM. From 1999 to 2011, SR 101L had an average crash rate of approximately 1.36 crashes per MVM.

The 2015 to 2019 SR 101L crash rates from Princess Drive to Shea Boulevard are generally lower than the other regional crash rates reviewed.

A spatial heat map of the SR 101L mainline crashes, based on crash frequency, is shown in **Figure 2.3**. During the 2015 to 2019 analysis period, the location of greatest crash frequency occurred on SR 101L between Thunderbird Road and Shea Boulevard. The crash trends observed on the spatial heat map are consistent with the crash summaries provided in **Table 2.1**. Spatial maps of injury crashes along the SR 101L project limits are shown in **Figure 2.4** and **Figure 2.5**. Crashes that resulted in property damage only (no injury) are omitted from **Figure 2.4** and **Figure 2.5** to display patterns of more critical crashes. Further characteristics of the SR 101L mainline crash analysis are summarized in **Figure 2.6**.

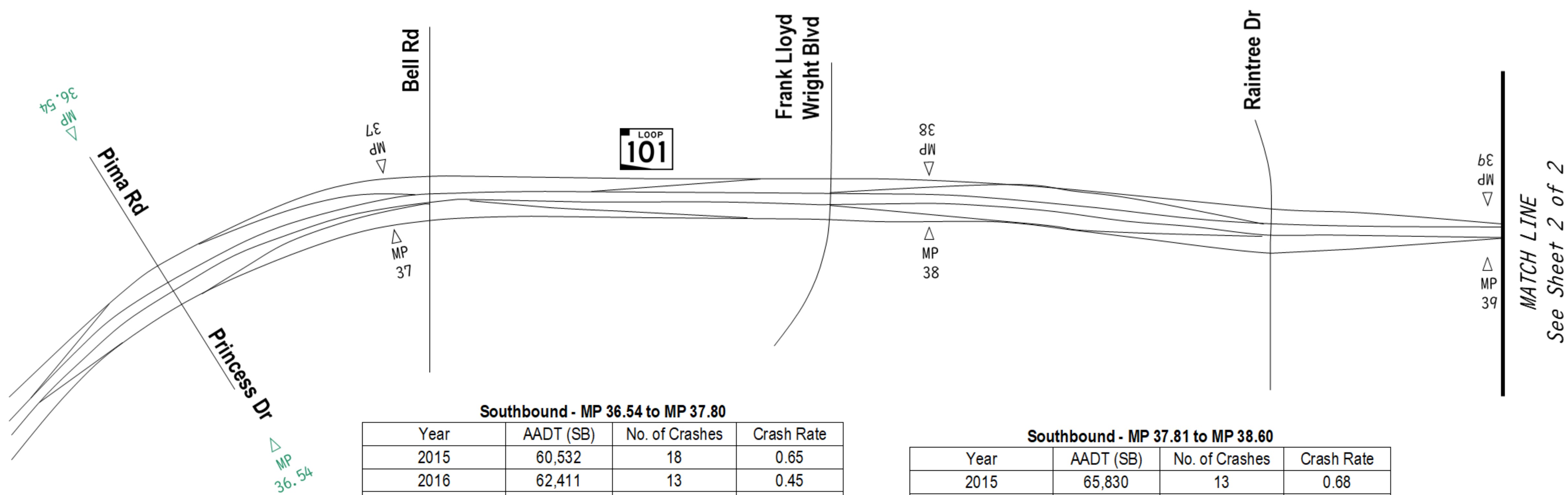
Widening SR 101L to four GPLs is expected to reduce crashes related to congestion, particularly on SR 101L NB south of Shea Boulevard where the segment currently tapers from four GPLs to three GPLs.

Northbound - MP 36.54 to MP 37.80

Year	AADT (NB)	No. of Crashes	Crash Rate
2015	58,378	10	0.37
2016	60,395	20	0.72
2017	66,141	27	0.89
2018	68,919	21	0.66
2019	70,751	20	0.61
Average	**64,917**	**19.6**	**0.65**

Northbound - MP 37.81 to MP 38.60

Year	AADT (NB)	No. of Crashes	Crash Rate
2015	58,776	8	0.47
2016	60,822	7	0.39
2017	66,935	9	0.46
2018	68,139	7	0.35
2019	69,854	6	0.29
Average	**64,905**	**7.4**	**0.39**



Southbound - MP 36.54 to MP 37.80

Year	AADT (SB)	No. of Crashes	Crash Rate
2015	60,532	18	0.65
2016	62,411	13	0.45
2017	68,908	16	0.50
2018	71,801	11	0.33
2019	73,488	14	0.41
Average	**67,428**	**14.4**	**0.47**

Southbound - MP 37.81 to MP 38.60

Year	AADT (SB)	No. of Crashes	Crash Rate
2015	65,830	13	0.68
2016	67,618	8	0.41
2017	74,358	17	0.78
2018	75,942	22	0.99
2019	77,830	21	0.92
Average	**72,316**	**16.2**	**0.76**

SR 101L
PRINCESS DRIVE TO SHEA BOULEVARD

NOT TO SCALE
SCHEMATIC ONLY

NOTES:
1. Crash data includes reported crashes on the SR 101L mainline from January 1 to December 31 of each year. Ramp crashes are not included.
2. The crash rate is calculated per million vehicle miles.

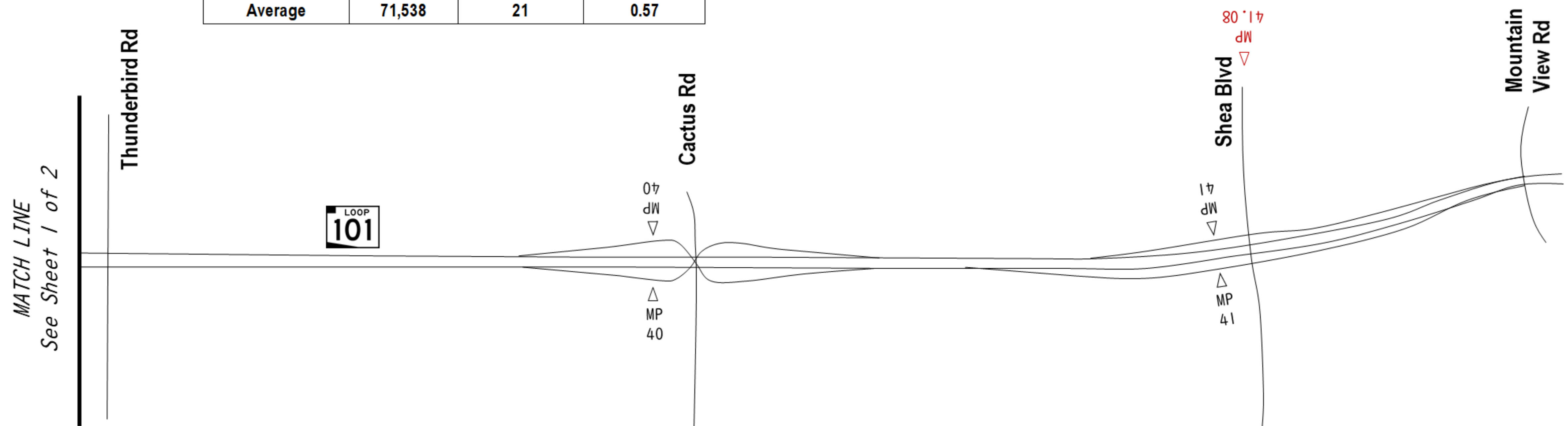
Figure 2.1 – SR 101L Mainline Crash Rate by Year, Princess Drive to Thunderbird Road, 2015-2019

Northbound - MP 38.61 to MP 40.00

Year	AADT (NB)	No. of Crashes	Crash Rate
2015	64,903	20	0.60
2016	66,782	18	0.53
2017	73,745	26	0.69
2018	75,588	22	0.57
2019	76,672	19	0.48
Average	**71,538**	**21**	**0.57**

Northbound - MP 40.01 to MP 41.08

Year	AADT (NB)	No. of Crashes	Crash Rate
2015	71,984	23	0.81
2016	74,287	33	1.13
2017	93,990	29	0.78
2018	97,042	36	0.94
2019	94,001	29	0.78
Average	**86,261**	**30**	**0.89**



Southbound - MP 38.61 to MP 40.00

Year	AADT (SB)	No. of Crashes	Crash Rate
2015	79,616	34	0.84
2016	81,532	49	1.18
2017	87,506	58	1.30
2018	89,124	43	0.94
2019	92,157	45	0.96
Average	**85,987**	**45.8**	**1.04**

Southbound - MP 40.01 to MP 41.08

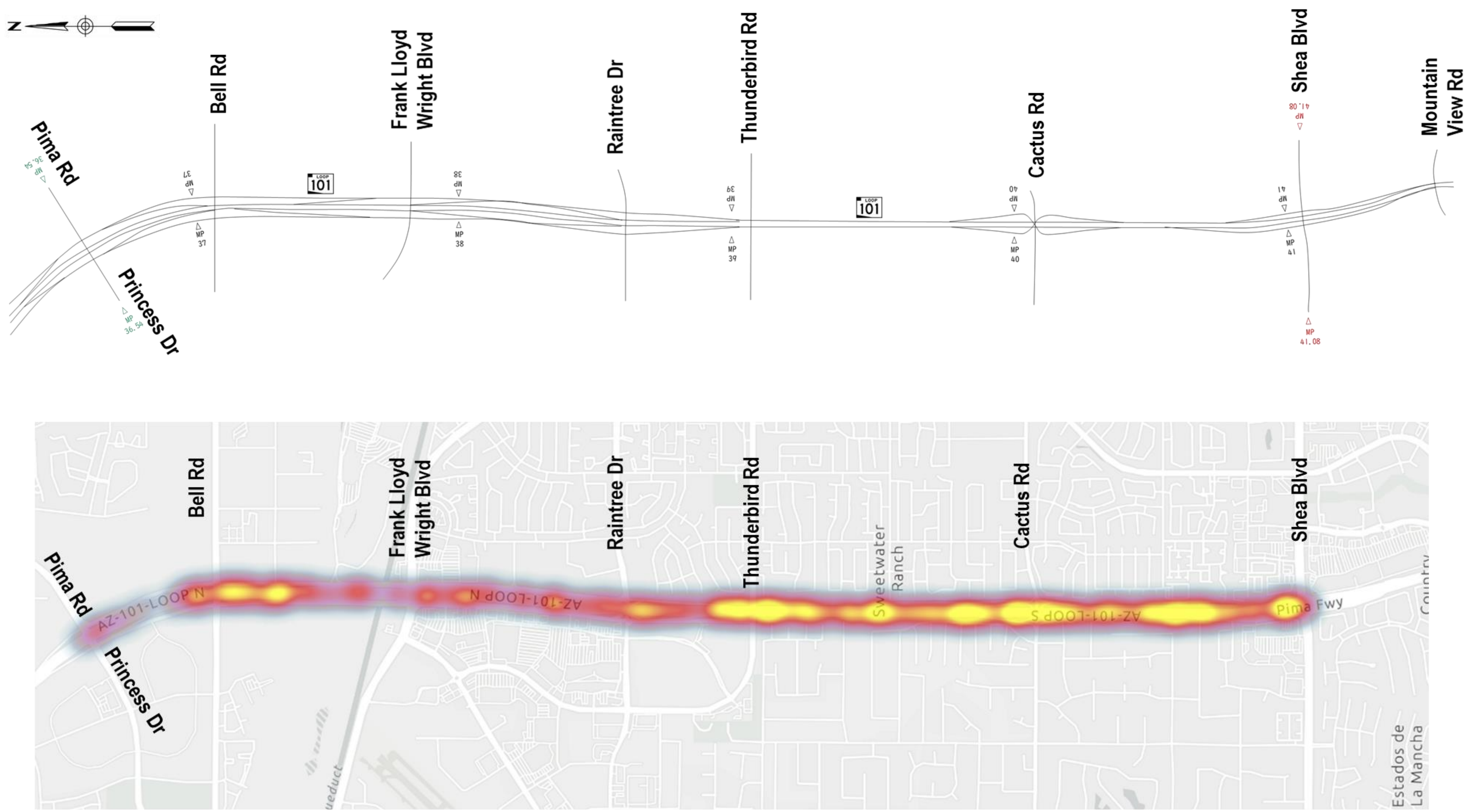
Year	AADT (SB)	No. of Crashes	Crash Rate
2015	87,745	41	1.19
2016	90,553	24	0.67
2017	94,131	26	0.70
2018	94,403	31	0.83
2019	102,230	34	0.84
Average	**93,812**	**31.2**	**0.85**

SR 101L
PRINCESS DRIVE TO SHEA BOULEVARD

NOT TO SCALE
SCHEMATIC ONLY

NOTES:
1. Crash data includes reported crashes on the SR 101L mainline from January 1 to December 31 of each year. Ramp crashes are not included.
2. The crash rate is calculated per million vehicle miles.

Figure 2.2 – SR 101L Mainline Crash Rate by Year, Thunderbird Road to Shea Boulevard, 2015-2019



SR 101L
PRINCESS DRIVE TO SHEA BOULEVARD

NOT TO SCALE
SCHEMATIC ONLY

NOTES:
1. Crash data includes reported crashes on the SR 101L mainline from January 1 to December 31 of each year. Ramp crashes are not included.

Figure 2.3 – SR 101L Mainline Crash Heat Map, 2015-2019

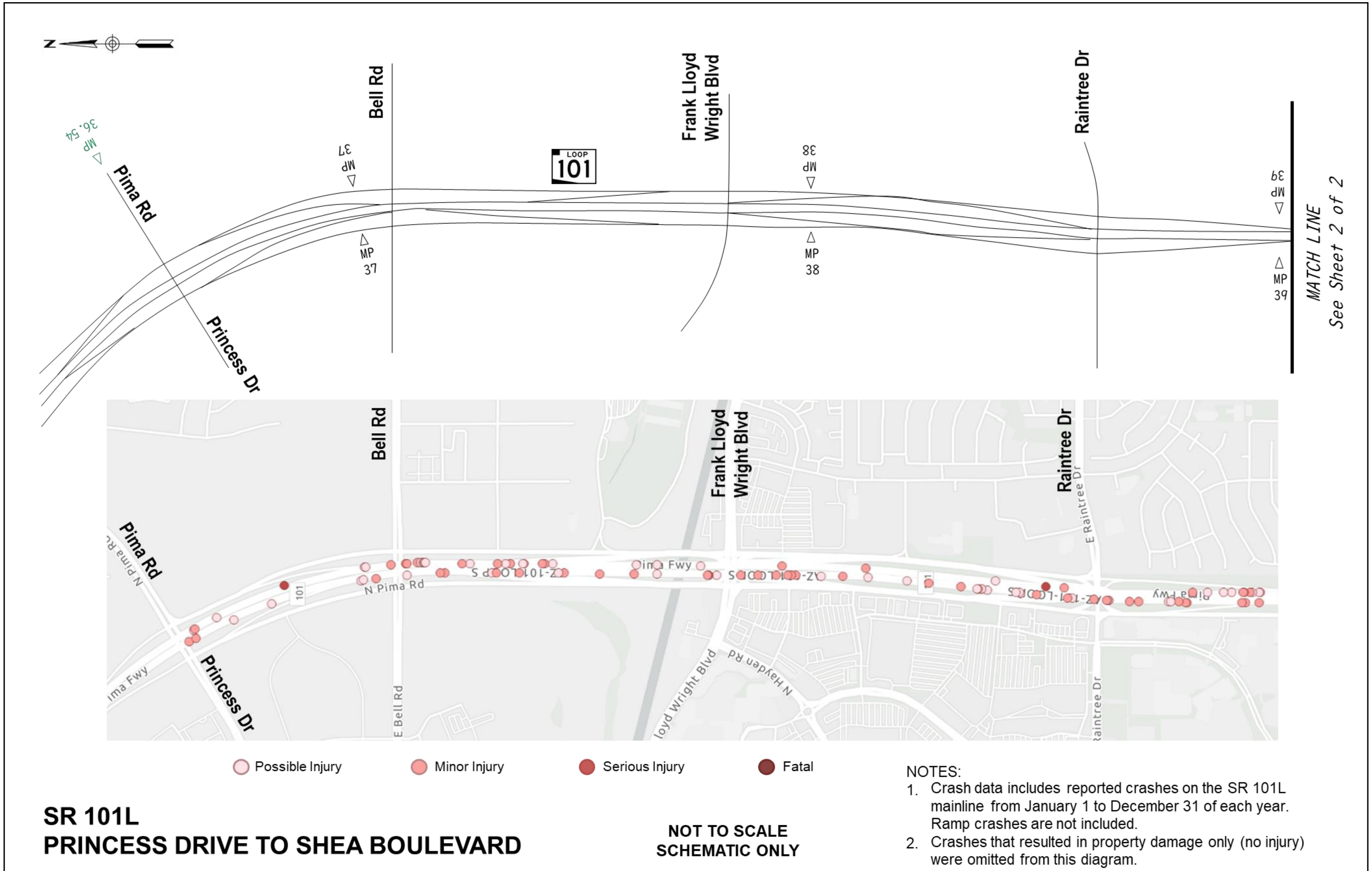


Figure 2.4 – SR 101L Mainline Crash Severity, Princess Drive to Thunderbird Road, 2015-2019

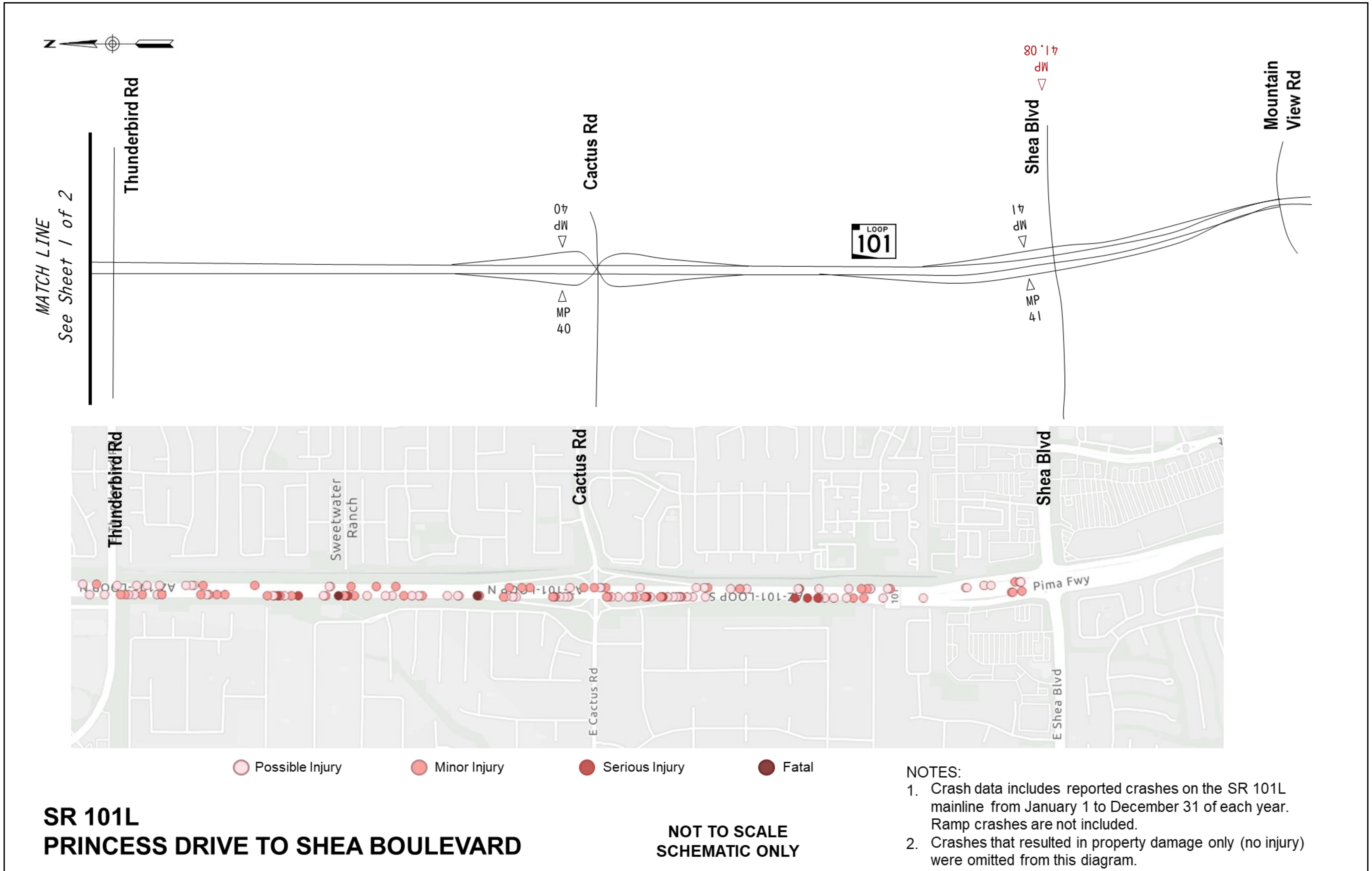


Figure 2.5 – SR 101L Mainline Crash Severity, Thunderbird Road to Shea Boulevard, 2015-2019

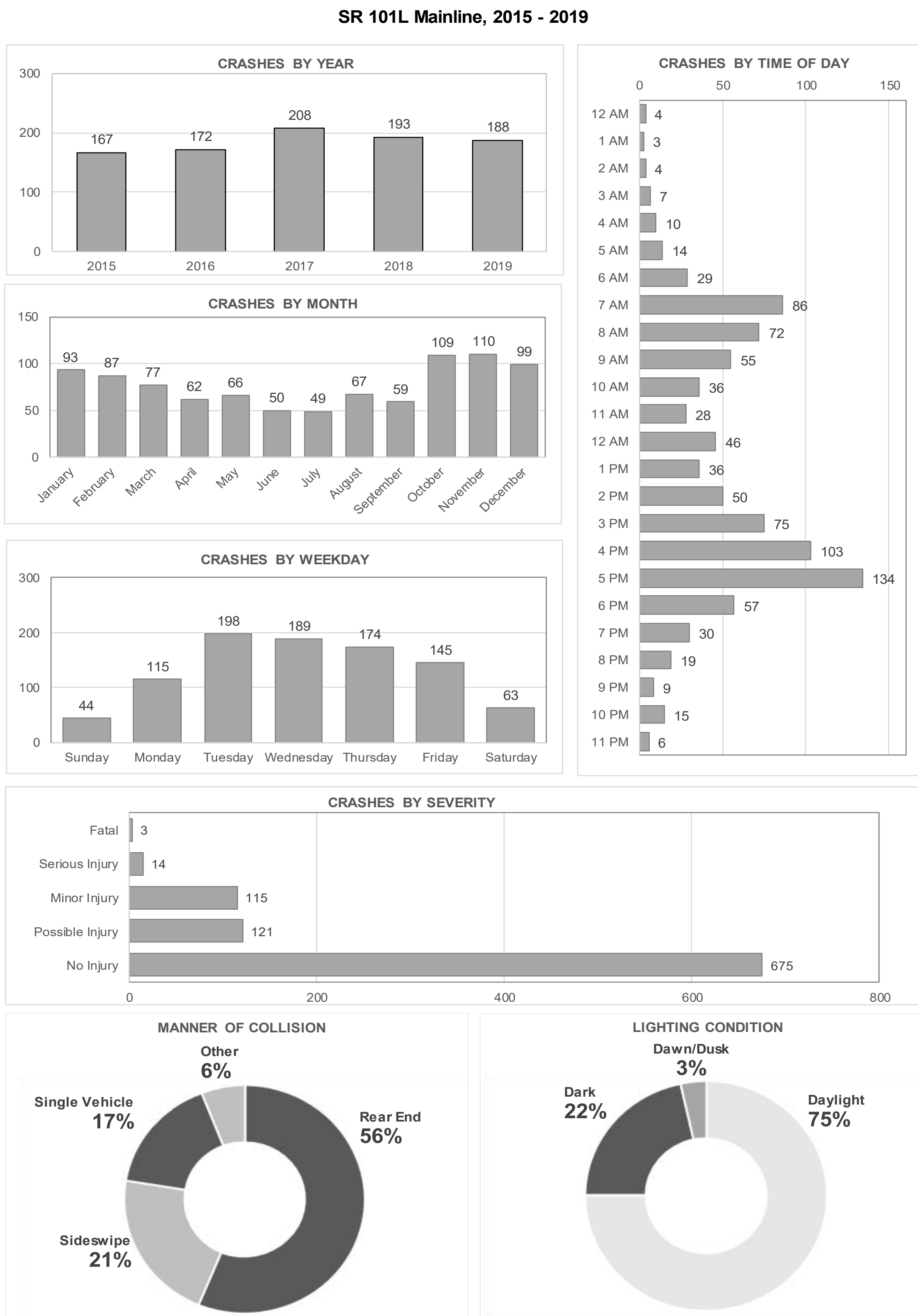


Figure 2.6 – SR 101L Mainline Crash Summary, 2015-2019

2.1.2. Traffic Interchange Crash Analysis

Historical crash data was evaluated at the Frank Lloyd Wright Boulevard, Raintree Drive, and Shea Boulevard TIs. For each interchange, the crash analysis area included a 300-foot section in each direction on the east-west legs of the arterials and the north-south ramps. All offset measurements were taken from the centerline of roadway intersections. During the five-year crash analysis period, a total of 774 crashes occurred at the three TIs. Historical traffic count data from ADOT and the City of Scottsdale was referenced to calculate crash rates, which are summarized in **Table 2.3**. The crash rates of each TI are shown by year in **Figure 2.7** and are expressed in terms of Million Entering Vehicles (MEV).

Table 2.3 – SR 101L Traffic Interchange Crash Rates, 2015-2019

Traffic Interchange	Daily Entering Volume (Average, 2015-2019)	No. of Crashes (2015 - 2019)	Intersection Crash Rate (Crashes/MEV)
SR 101L / Frank Lloyd Wright Blvd	78,205	338	2.43
SR 101L / Raintree Drive	67,431	161	1.36
SR 101L / Shea Blvd	87,760	275	1.74

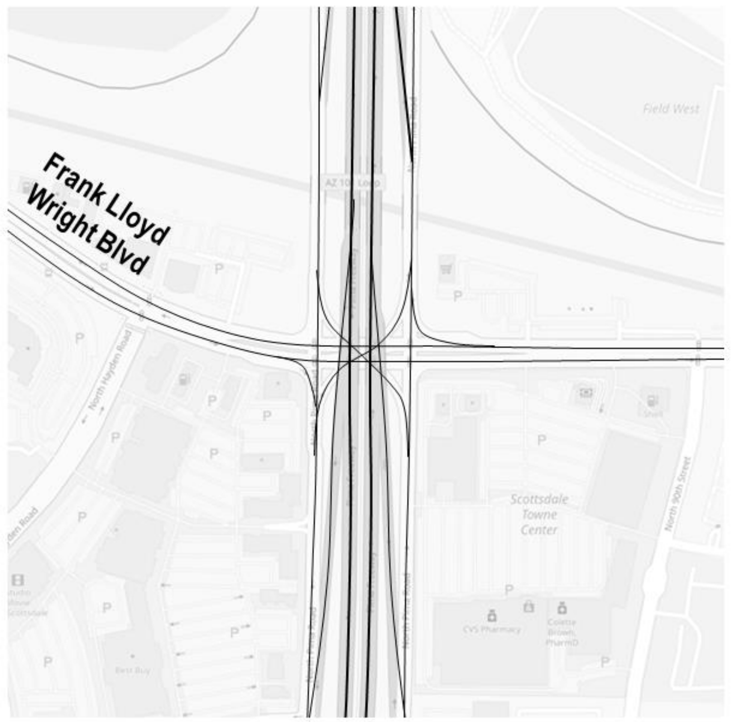
A spatial diagram of the crashes by collision manner is provided in **Figure 2.8**. at the Frank Lloyd Wright Boulevard, Raintree Drive, and Shea Boulevard TIs. Crash characteristics are summarized for these three TIs in **Figure 2.9**, **Figure 2.10**, and **Figure 2.11**, respectively, with aggregated results for all three TIs summarized below:

- Of the 774 crashes reported at the three TIs, 603 resulted in property damage only (78%), 168 resulted in injuries (22%), and 3 resulted in a fatality (<1%).
- Sixty-four percent (496 crashes) were rear-end crashes, 15% (117 crashes) were sideswipe crashes, 11% (86 crashes) were angle crashes, 5% (35 crashes) were single-vehicle/fixed object crashes, and 3% (23 crashes) were left-turn crashes. The remaining 2% of crashes involved less common manners of collision (e.g., head-on, rear-to-side, other/unknown).
- Eighty-four percent of the crashes occurred during daylight hours, 3% occurred at dusk or dawn, and the remaining 13% occurred during hours of darkness.

Expected safety characteristics of the TI configuration alternatives (No-Build and Improved SPUI, TDI, DRI) include the following:

- No-Build SPUI: contains 28 potential conflict points, including 12 crossing points, and prohibits wrong-way travel by signage
- Improved SPUI: contains 28 potential conflict points, including 12 crossing points, and prohibits wrong-way travel by signage; a slight reduction in the overall crash rate is expected due to a reduction in congestion from operational improvements
- TDI: contains 26 potential conflict points, including 10 crossing points, and prohibits wrong-way travel by signage; a slight reduction in the overall crash rate is expected due to a reduction in congestion from operational improvements; a moderate reduction in the severe crash rate is expected due to the reduced number of crossing points
- DRI: contains 38 potential conflict points, including 10 crossing points, and prohibits wrong-way travel by raised concrete islands; a moderate reduction in the overall crash rate is expected due to a significant reduction in congestion from operational improvements; a significant reduction in the severe crash rate is expected due to the reduced number of crossing points and lower operating speeds

SR 101L / Frank Lloyd Wright Boulevard



SR 101L / Frank Lloyd Wright Boulevard			
Year	Daily Entering Volume	No. of Crashes	Crash Rate
2015	83,835	60	1.96
2016	80,240	66	2.25
2017	74,986	60	2.19
2018	75,773	66	2.39
2019	76,192	86	3.09
5-Year Weighted Average	**78,205**	**68**	**2.43**

SR 101L / Raintree Drive

SR 101L / Raintree Drive			
Year	Daily Entering Volume	No. of Crashes	Crash Rate
2015	72,646	31	1.17
2016	73,948	31	1.15
2017	62,278	24	1.06
2018	63,794	42	1.80
2019	64,489	33	1.40
5-Year Weighted Average	**67,431**	**32**	**1.36**

SR 101L / Shea Boulevard

SR 101L / Shea Boulevard			
Year	Daily Entering Volume	No. of Crashes	Crash Rate
2015	85,221	62	1.99
2016	87,936	46	1.43
2017	86,416	55	1.74
2018	89,027	52	1.60
2019	90,200	60	1.82
5-Year Weighted Average	**87,760**	**55**	**1.74**

N

NOTES:
1. The crashes shown include all reported crashes on the freeway ramps and intersecting roadways within 300 feet of the ramp intersections.
2. The crash analysis includes crashes that occurred between January 1 to December 31 of each year.
3. The crash rate is calculated by million entering vehicles (MEV).

SR 101L TRAFFIC INTERCHANGES
FRANK LLOYD WRIGHT BLVD, RAINTREE DRIVE, AND SHEA BLVD

NOT TO SCALE
SCHEMATIC ONLY

Figure 2.7 – SR 101L Traffic Interchange Crash Rates, 2015-2019

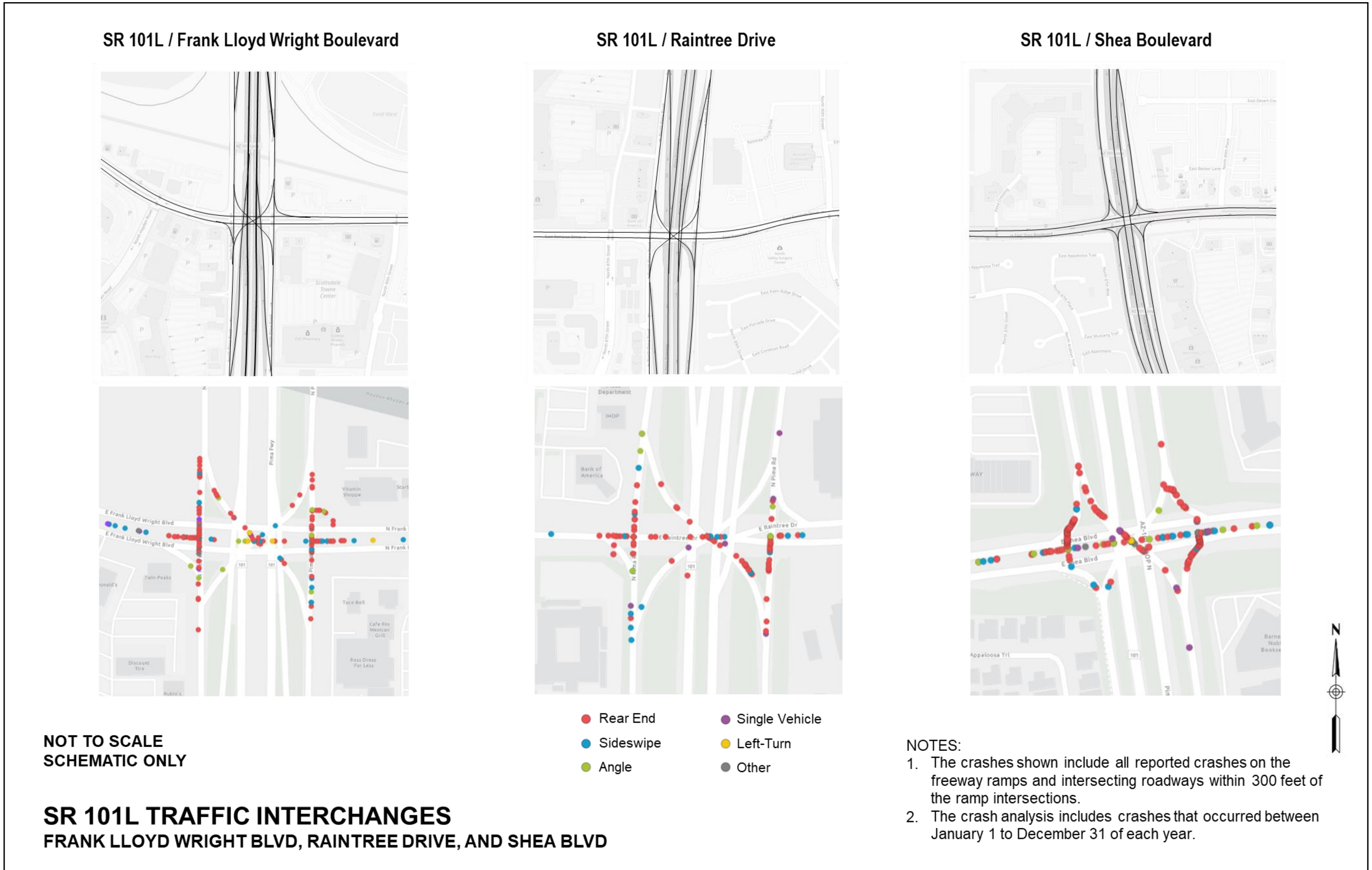
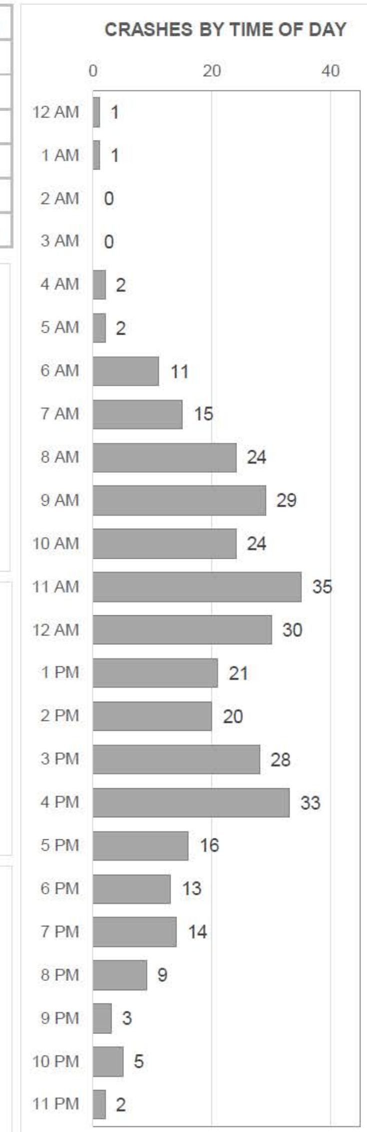
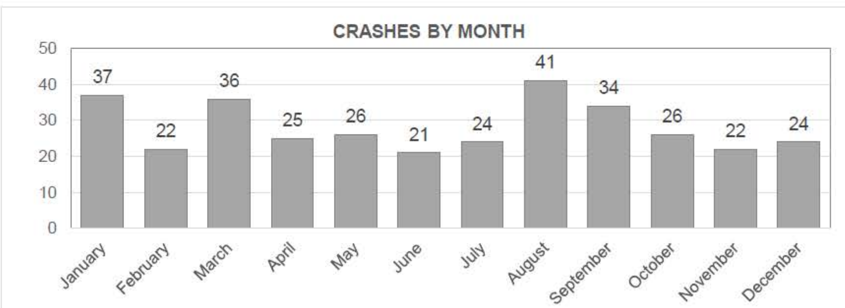


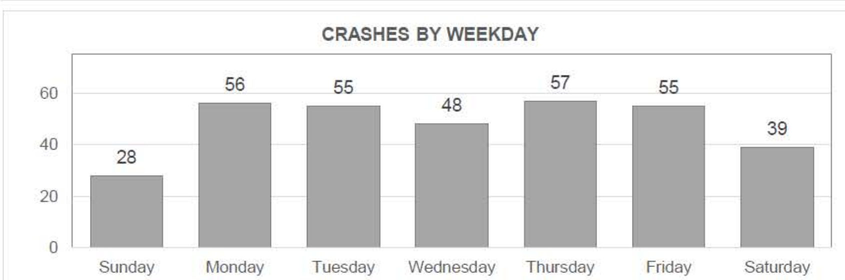
Figure 2.8 – SR 101L Traffic Interchange Collision Manner Diagrams, 2015-2019

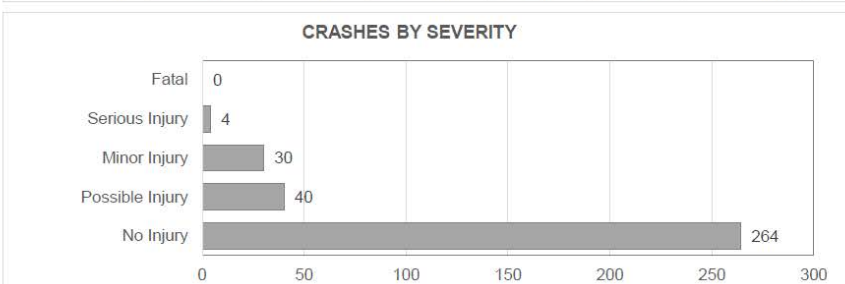
SR 101L / Frank Lloyd Wright Boulevard, 2015 - 2019

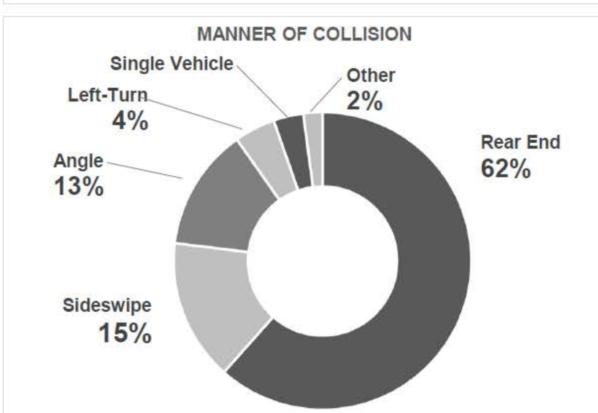
Injury Severity	Rear End	Sideswipe	Angle	Left-Turn	Single Vehicle	Other	Total
Fatal							0
Serious Injury	2		1		1		4
Minor Injury	14	3	8	5			30
Possible Injury	26	4	6	3	1		40
No Injury	166	45	30	7	9	7	264
Total	**208**	**52**	**45**	**15**	**11**	**7**	**338**











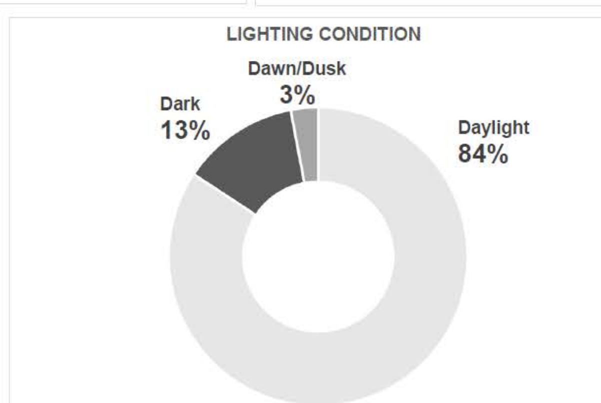
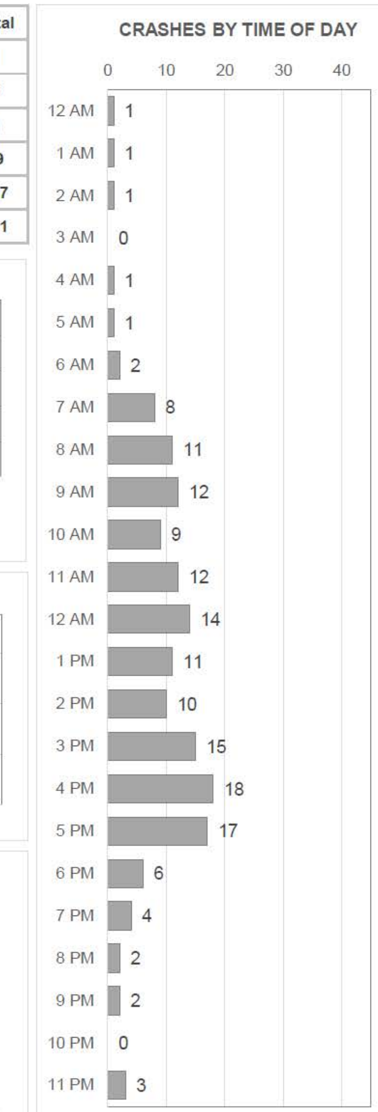
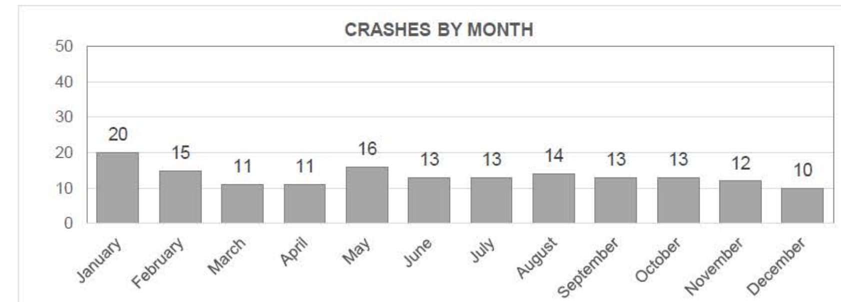


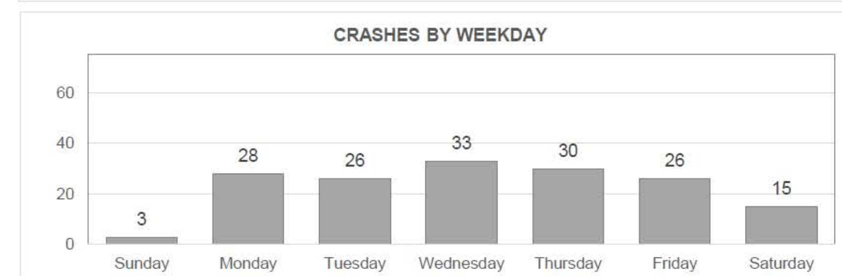
Figure 2.9 – Frank Lloyd Wright Blvd TI Crash Summary, 2015-2019

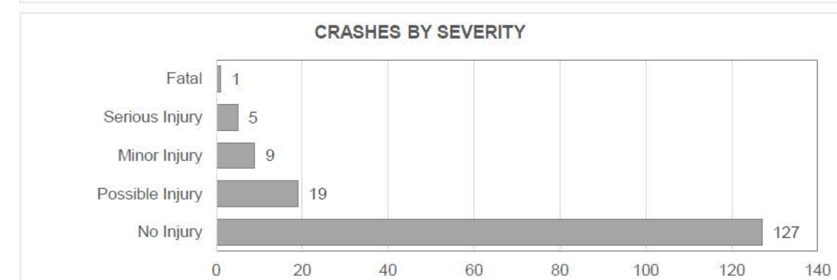
SR 101L / Raintree Drive, 2015 - 2019

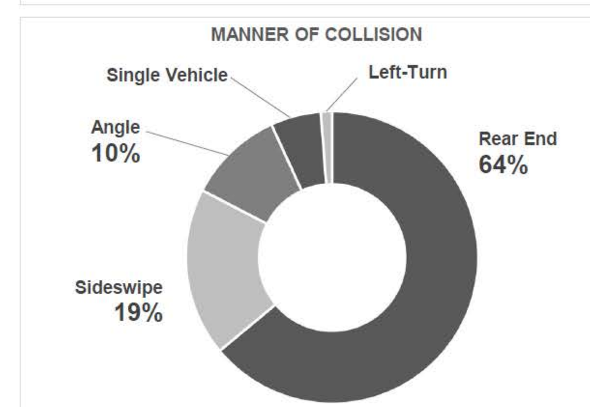
Injury Severity	Rear End	Sideswipe	Angle	Left-Turn	Single Vehicle	Other	Total
Fatal					1		1
Serious Injury		1	2		2		5
Minor Injury	7	1	1				9
Possible Injury	12	1	4	1	1		19
No Injury	84	27	10	1	5		127
Total	**103**	**30**	**17**	**2**	**9**	**0**	**161**











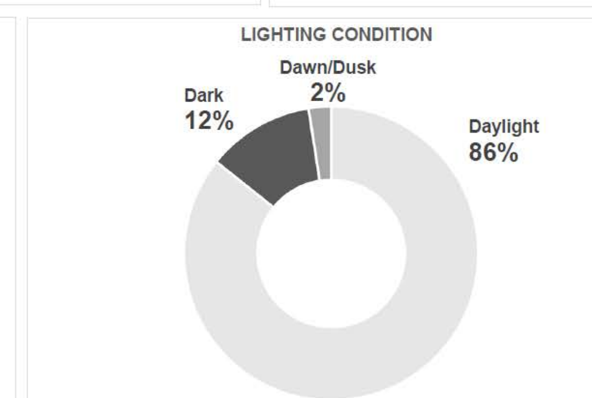
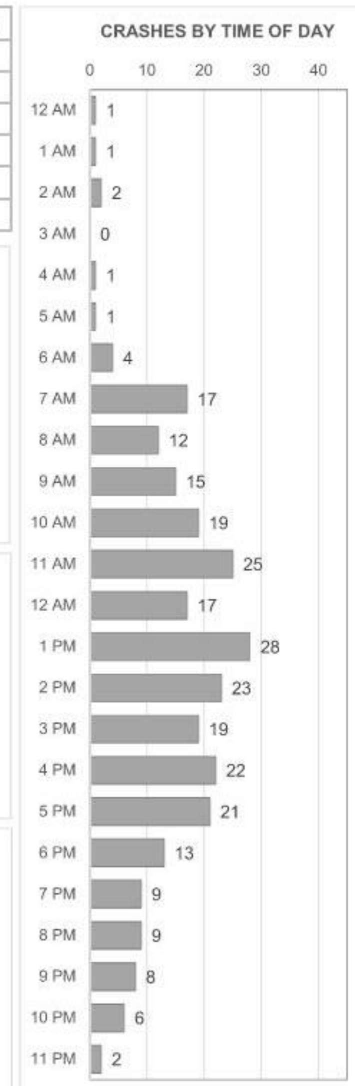


Figure 2.10 – Raintree Drive TI Crash Summary, 2015-2019

SR 101L / Shea Boulevard, 2015 - 2019

Injury Severity	Rear End	Sideswipe	Angle	Left-Turn	Single Vehicle	Other	Total
Fatal					1	1	**2**
Serious Injury	1		3	1	1		**6**
Minor Injury	14	1	5	3	3	3	**29**
Possible Injury	20	1	2		1	2	**26**
No Injury	150	33	14	2	9	4	**212**
Total	**185**	**35**	**24**	**6**	**15**	**10**	**275**



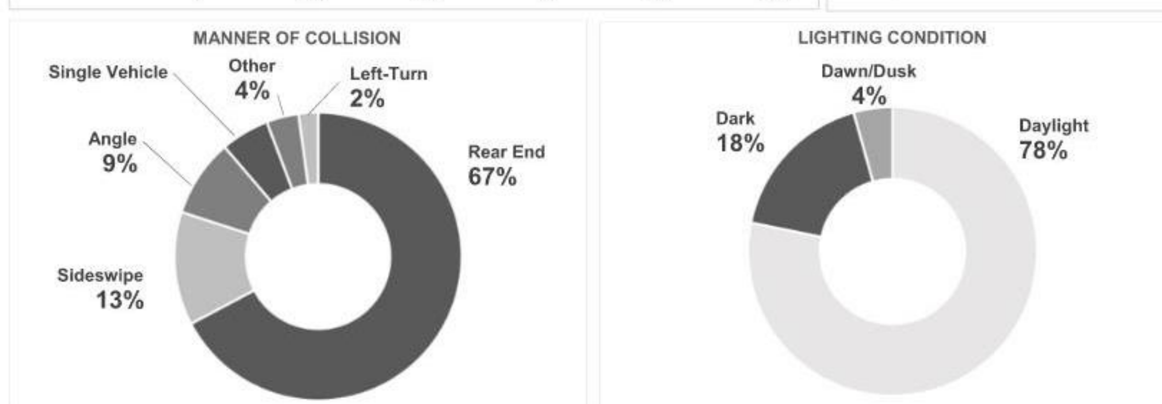


Figure 2.11 – Shea Boulevard TI Crash Summary, 2015-2019

2.1.3. Review of Previous Studies

The following studies conducted in the project limits were reviewed to summarize key safety findings and recommendations:

- SR 101L/Frank Lloyd Wright Blvd and SR 101L/Raintree Drive Road Safety Assessment (RSA) (May 2011)
- Raintree Drive Extension Design Concept Report: Scottsdale Road to SR 101L (June 2014)
- Traffic Alternatives Study: State Route 101L from Princess Drive to Raintree Drive (May 2017)
- No prior relevant studies were identified that included safety findings and recommendations for the Shea Boulevard TI.

2.1.3.1. Frank Lloyd Wright Boulevard TI

The 2011 RSA recommended several minor improvements related to yield-compliance and bicycle/pedestrian safety, along with separating out the shared NB and SB left-turn/through lanes.

The 2017 Traffic Alternatives Study recommended that the Frank Lloyd Wright Boulevard TI be converted to a TDI. The 2011 RSA indicated that converting the Frank Lloyd Wright Boulevard TI to a TDI should be given consideration. The conversion from a SPUI to a TDI is anticipated to address or improve the following safety issues identified in the RSA:

- High-speed eastbound (EB) and westbound (WB) right-turns onto the frontage road/Pima Road due to roadway geometry
- High-speed merging section of multiple movements at the entrance to the SR 101 NB and SB on-ramps
- Driver yielding and pedestrian conflicts in the crosswalks spanning the channelized EB and WB right-turn lanes
- The need for additional EB and WB left-turn lane storage length/capacity
- U-turns from the outer lane of the NB and SB dual left-turn lanes due to driver confusion
- Skewed north-south crosswalks
- Narrow pedestrian refuge area within the north-south crosswalks

2.1.3.2. Raintree Drive TI

Recommendations provided for the Raintree Drive TI included:

- The 2017 Traffic Alternatives Study recommended the addition of a WB right-turn lane.
- The 2017 Traffic Alternatives Study recommended improved NB on-ramp pavement markings at the Raintree Drive TI. The recommendation to improve the NB on-ramp pavement markings was also discussed in the 2011 RSA. As the dual EB left-turn lanes transition to the NB frontage road/Pima Road, a lane drop creates a merge section approximately 100 feet north of the intersection. The left-side lane drop causes the inside left-turn lane to merge with the outside left-turn lane. In addition to the immediate merge of EB left-turning vehicles, a potential conflict exists as WB right-turning vehicles enter the merge section, and often merge into the left lane in anticipation of entering the freeway on-ramp farther north. Based on the roadway geometry and multiple merge conditions, the 2011 RSA recommended pavement marking and/or geometric improvements to this area.
- The 2011 RSA recommended several minor improvements related to yield-compliance and bicycle/pedestrian safety, including widening the pedestrian refuge area within the north-south crosswalks.
- The 2011 RSA recommended consideration of strategies to reduce driver confusion of stopping locations at the SPUI. Vehicles occasionally enter the intersection before realizing they need to stop due to a red signal indication. The 2011 RSA recommended evaluating the existing pavement markings within the intersection to give more visual cues of the intersection and the appropriate stopping positions on the interchange approaches.

2.2. EXISTING TRAFFIC CONDITIONS

2.2.1. Existing Traffic Volumes

Recent daily and peak-hour roadway traffic volume data for the SR 101L mainline and ramps at Princess Drive, Frank Lloyd Wright Boulevard, Raintree Drive, Cactus Road, and Shea Boulevard was obtained from the ADOT Multimodal Planning Division (MPD) Transportation Data Management System (TDMS) for 2018 (mainline volumes) and 2017 (ramp volumes). Mainline 2018 volumes were grown annually by 2.5% to represent 2020 existing mainline volumes. The 2.5% rate was based on the average growth rate between 2017 and 2018 for mainline segments on SR 101L. Ramp 2017 volumes were grown annually by 1.0% to represent 2020 existing ramp volumes. The 1.0% rate was based on the composite growth rate of ramps, TIs, and arterials within the study area.

In addition, historical AM and PM peak-hour turning movement count (TMC) data was provided by the City of Scottsdale at:

- Frank Lloyd Wright Boulevard TI in 2016
- Raintree Drive TI in 2018
- Raintree Drive and 87th Street intersection in 2018
- Shea Boulevard TI in 2016

TMCs were collected on a Tuesday, Wednesday, or Thursday between 7:00 AM and 9:00 AM and between 4:00 PM and 6:00 PM. Newer TMCs were not collected as part of the project effort due to recent drastic changes in travel patterns as a result of COVID-19. The provided TMCs were grown annually by 1.0% to represent 2020 existing TMCs.

Heavy vehicle percentages were assumed to be 7% (4% medium and 3% heavy vehicles) on the freeway mainline and 4% (3% medium and 1% heavy vehicles) on the ramps and TIs based on available ADOT Transportation Data Management System (TDMS) data.

Because of the use of count data from various times and sources, efforts were made to balance volumes between TMCs at TIs and the collected ramp volumes. In most cases, there were driveways or frontage road access between the TMC and ramp count location. Any volume imbalance in those situations was attributed to the driveways or frontage road. For the few locations (Shea Boulevard ramps and the Raintree Drive NB off-ramp) where there was a direct relation between the TMC and ramp volume, the volumes were balanced by adjusting the ramp volume. The mainline and ramp peak-hour volumes were balanced with the goal of minimizing volume adjustments and generally remaining conservative in the overall adjustment.

Additionally, a review of the mainline and ramp volume balancing revealed that the TDMS traffic count station between Cactus Road and Shea Boulevard is believed to be over-counting traffic volumes. The mainline annual average daily traffic (AADT) count of 191,445 was adjusted to 162,000 to minimize the difference between the upstream and downstream count stations.

The 2020 existing daily and peak-hour link volumes for the freeway mainline and ramp volumes are shown in the previously referenced **Figure 2.12**. The 2020 existing SR 101L mainline GPL daily volumes within the project limits range from approximately 61,000 vehicles per day (vpd) to approximately 83,000 vpd. The 2020 existing ramp volumes at the TIs range from approximately 6,000 vpd to approximately 21,000 vpd.

The 2020 existing peak-hour TMC volumes at the Frank Lloyd Wright Boulevard, Raintree Drive, and Shea Boulevard TIs, along with at the Raintree Drive and 87th Street intersection, are shown in **Figure 2.13**.

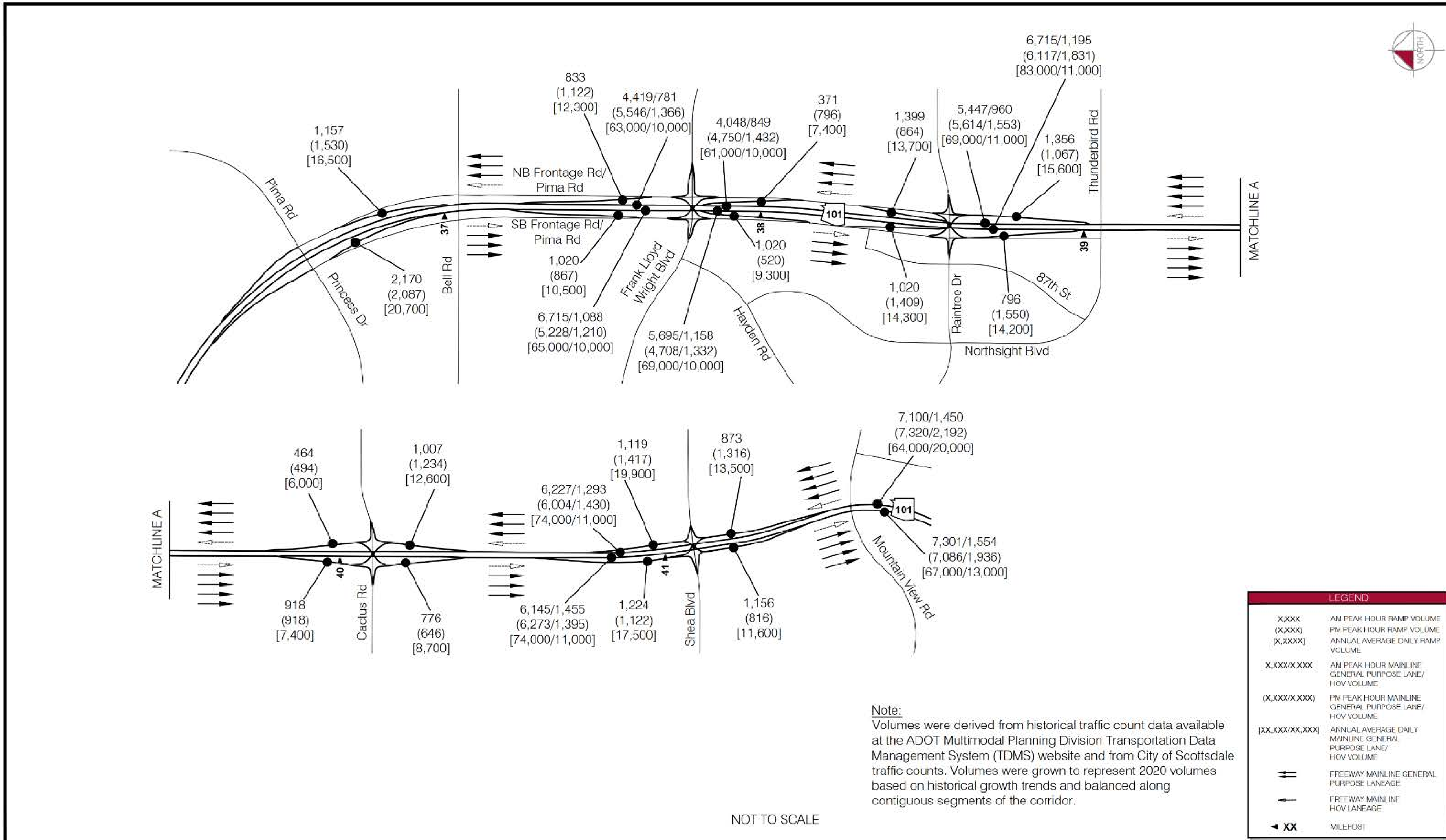


Figure 2.12 – Existing Freeway Lane Geometry and Traffic Volumes

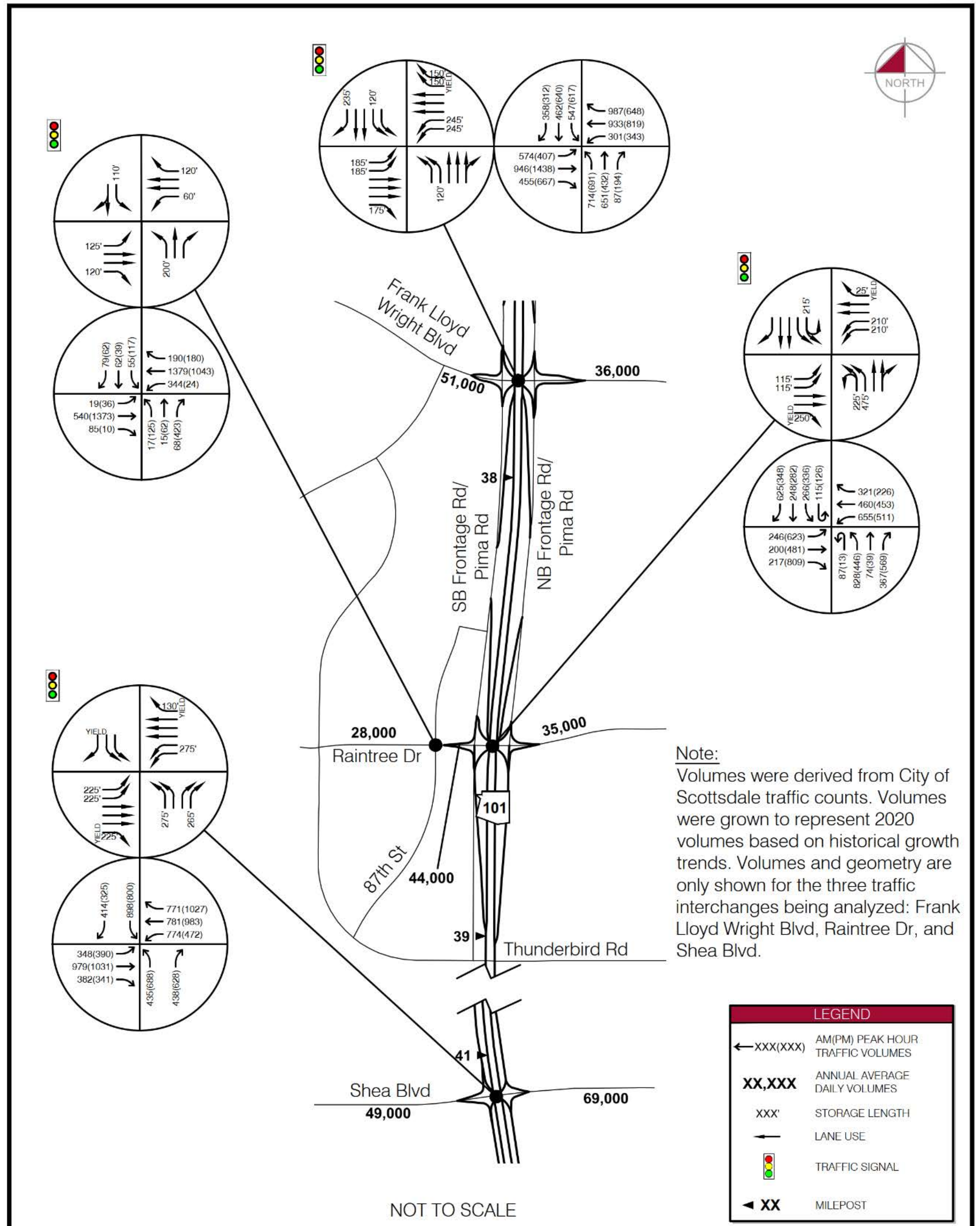


Figure 2.13 – Existing TI Lane Geometry and Traffic Volumes

2.3. FUTURE TRAFFIC CONDITIONS

2.3.1. Description of Alternatives

For the SR 101L mainline, two alternatives were analyzed as part of the 2040 traffic analysis:

- No-Build alternative – where SR 101L remains as it currently exists
- Build alternative – where SR 101L is widened by adding one GPL in each direction throughout the project limits
- For the TIs, four alternatives were analyzed as part of the 2040 traffic analysis:
- No-Build alternative – where the TIs remain as existing SPUIs with no improvements
- Improved SPUI alternative – where the existing SPUIs are improved/expanded at the Frank Lloyd Wright Boulevard, Raintree Drive, and Shea Boulevard TIs
- TDI alternative – where the existing SPUIS are converted to TDIs at the Frank Lloyd Wright Boulevard and Raintree Drive TIs only
- DRI alternative – where the existing SPUI is converted to a double-roundabout interchange at the Raintree Drive TI only

2.3.2. Traffic Volume Projections

2.3.2.1. 2040 Baseline/No-Build Traffic Volumes and Geometry

Future 2040 traffic volumes developed for analysis were based on the 2040 regional travel demand model developed by MAG to evaluate the Phoenix metropolitan area's transportation system. The MAG regional travel demand model is based on projected socioeconomic, population, employment, origin-destination, and other regionally based data.

The following network model outputs were provided by MAG as part of this analysis:

- Baseline (also known as No-Build) – Existing roadway network plus near-term programmed improvements
- Improved (also known as Build) – Existing roadway network plus long-term anticipated improvements by 2040

The 2040 Baseline/No-Build MAG model assumes only minor improvements to the existing roadway network in the vicinity of the project limits, with the SR 101L mainline remaining unchanged between Princess Drive and Shea Boulevard. A 1.0% average annual growth rate was determined for the mainline in the project limits by comparing MAG model estimated daily volumes for the 2020 No-Build scenario and the 2040 No-Build scenario. A 0.5% average annual growth rate was determined to be the composite average growth rate of ramps, TIs, and arterials within the project limits between the 2020 No-Build scenario and the 2040 No-Build scenario. These growth rates were applied to the 2020 existing volumes to develop 2040 No-Build volumes. 2040 No-Build heavy vehicle percentages were assumed to be 7% on the freeway mainline and 4% on the ramps and TIs, similar to existing heavy vehicle percentages.

The 2040 No-Build daily, AM peak-hour, and PM peak-hour link volumes and geometry for the freeway mainline and ramps are shown in **Figure 2.14**. The 2040 No-Build SR 101L mainline GPL daily volumes within the project limits range from approximately 74,000 vpd to approximately 101,000 vpd. The 2040 No-Build ramp volumes at the TIs range from approximately 7,000 vpd to approximately 23,000 vpd. The 2040 No-Build AM and PM peak-hour volumes and No-Build intersection geometry are shown in **Figure 2.15.**

2.3.2.2. 2040 Improved/Build Traffic Volumes and Geometry

The 2040 Improved/Build MAG model assumes the SR 101L mainline is widened by one lane in each direction between Princess Drive and Shea Boulevard. A 1.2% annual growth was determined to be the average annual growth rate for the mainline in the project limits by comparing MAG model estimated daily volumes for the 2020 Build scenario and the 2040 Build scenario. A 0.5% average annual growth rate was determined to be the composite average growth rate of ramps, TIs, and arterials within the project limits between the 2020 Build scenario and the 2040 Build scenario. These growth rates were applied to the 2020 existing volumes to develop 2040 Build volumes. 2040 Build heavy vehicle percentages were assumed to be 7% on the freeway mainline and 4% on the ramps and TIs, similar to existing heavy vehicle percentages.

The 2040 Build daily, AM peak-hour, and PM peak-hour link volumes and geometry for the freeway mainline and ramps are shown in **Figure 2.16**. The 2040 Build SR 101L mainline GPL daily volumes within the project limits range from approximately 77,000 vpd to approximately 105,000 vpd. The 2040 Build ramp volumes at the TIs range from approximately 7,000 vpd to approximately 23,000 vpd.

The 2040 Build AM and PM peak-hour volumes at the Frank Lloyd Wright Boulevard, Raintree Drive, and Shea Boulevard TIs, along with at the Raintree Drive and 87th Street intersection, are shown in **Figure 2.17**, **Figure 2.18**, and **Figure 2.19**, respectively.

Figure 2.17, **Figure 2.18**, and **Figure 2.19** also show the various recommended 2040 TI configurations for the Build alternatives, which includes the number of lanes, type of lanes, traffic control, and recommended storage lengths of those lanes. The geometry and traffic control of the Build alternatives was developed through an iterative process based on trying to promote safety and provide appropriate geometry to address level of service, delay, and queuing issues identified through an operational analysis of the 2040 alternatives. The 2040 operational analysis results (i.e., level of service, delay, and 95th percentile queues) using this assumed Build geometry are discussed in Section 2.4.2.4 of this document.

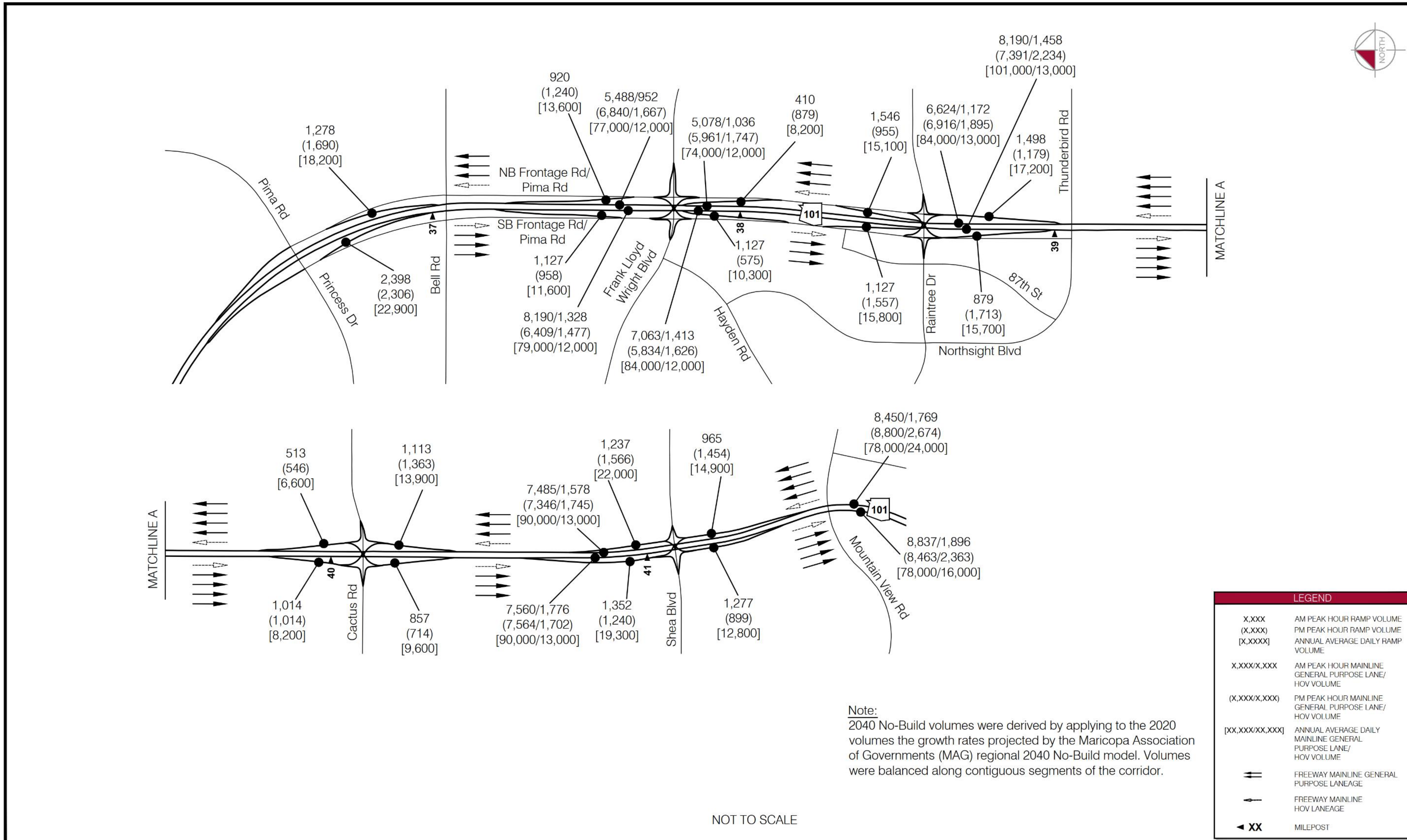


Figure 2.14 – 2040 No-Build Freeway Lane Geometry and Traffic Volumes

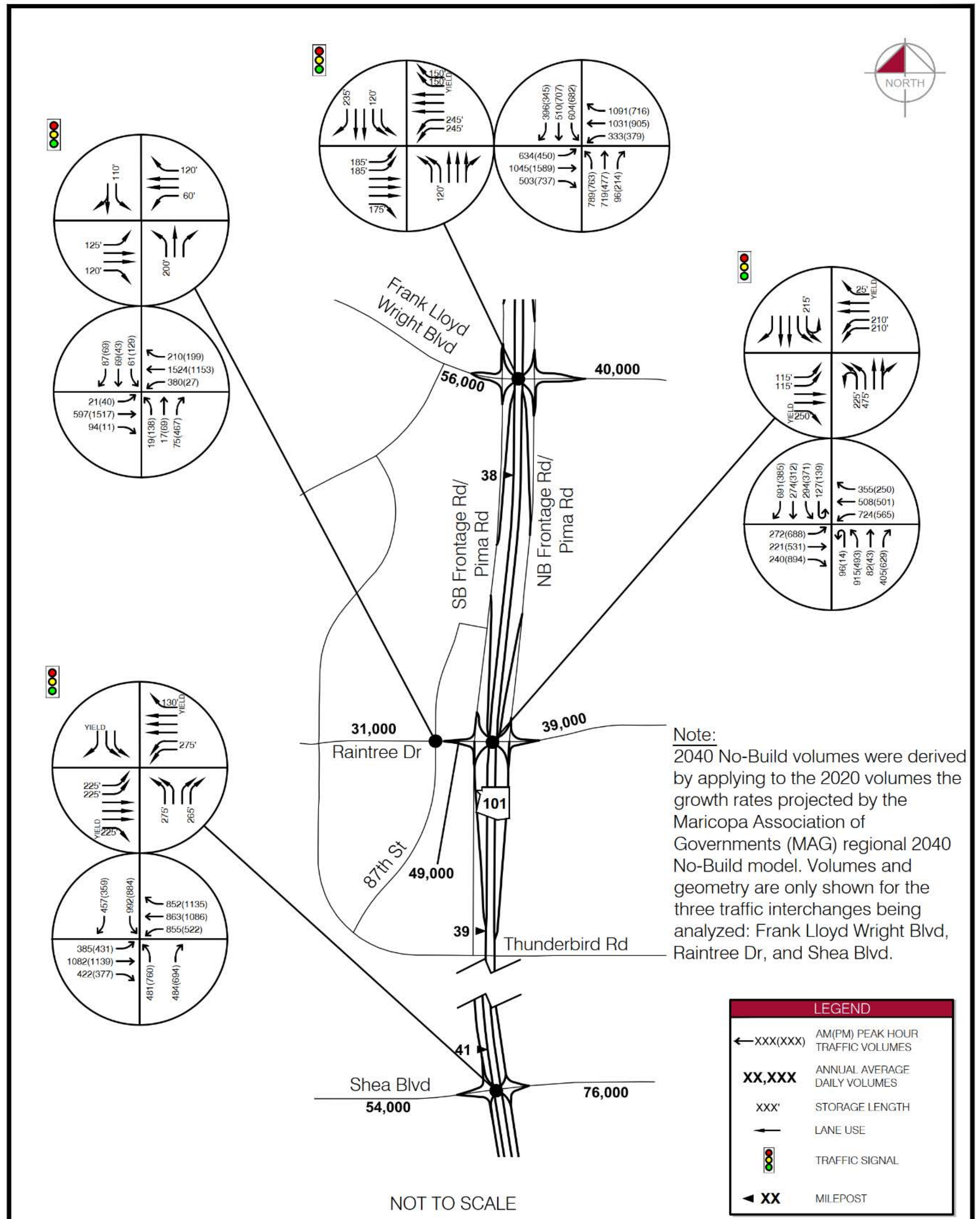


Figure 2.15 – 2040 No-Build TI Lane Geometry and Traffic Volumes

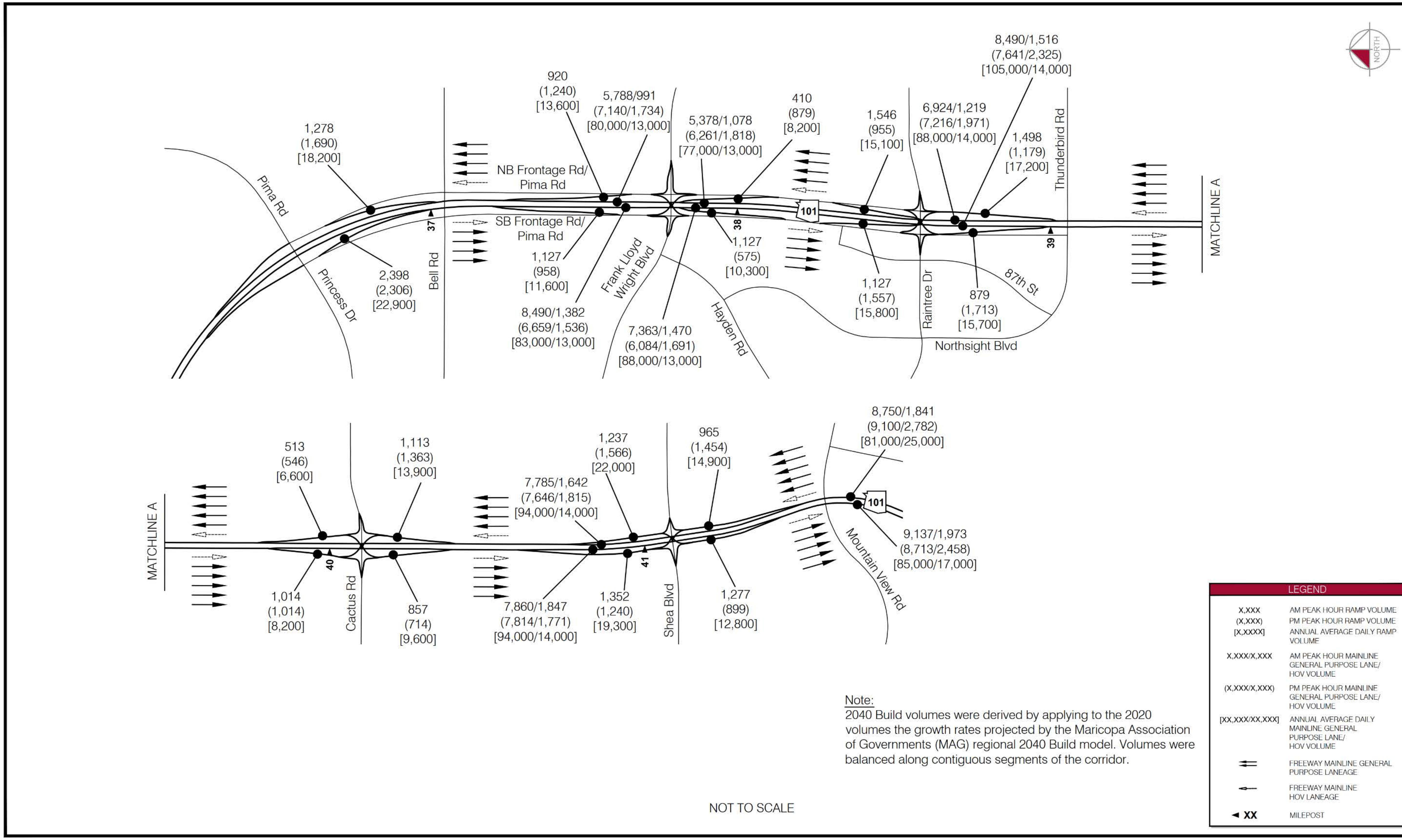


Figure 2.16 – 2040 Build Freeway Lane Geometry and Traffic Volumes

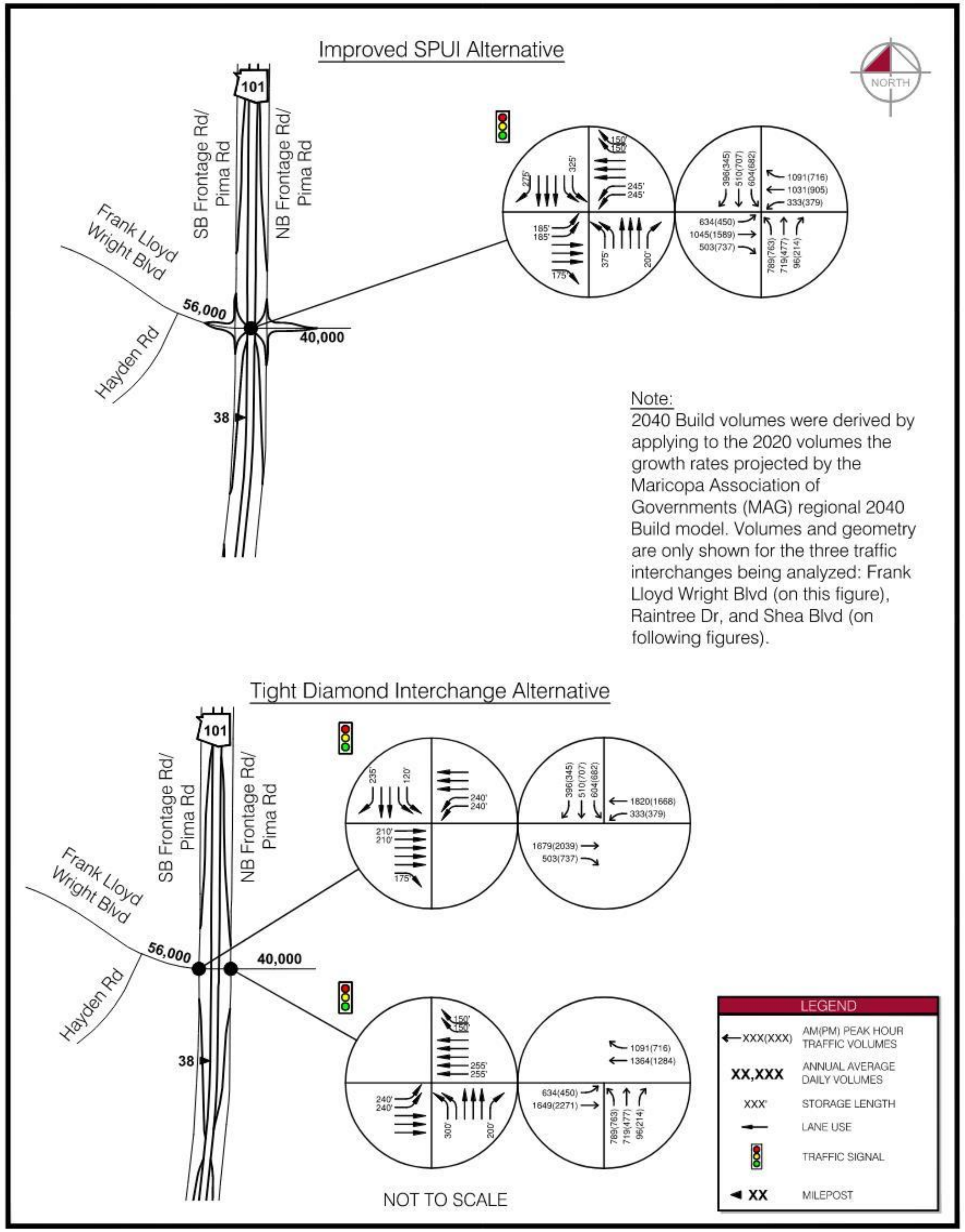


Figure 2.17 – 2040 Build Frank Lloyd Wright Boulevard TI Lane Geometry and Traffic Volumes

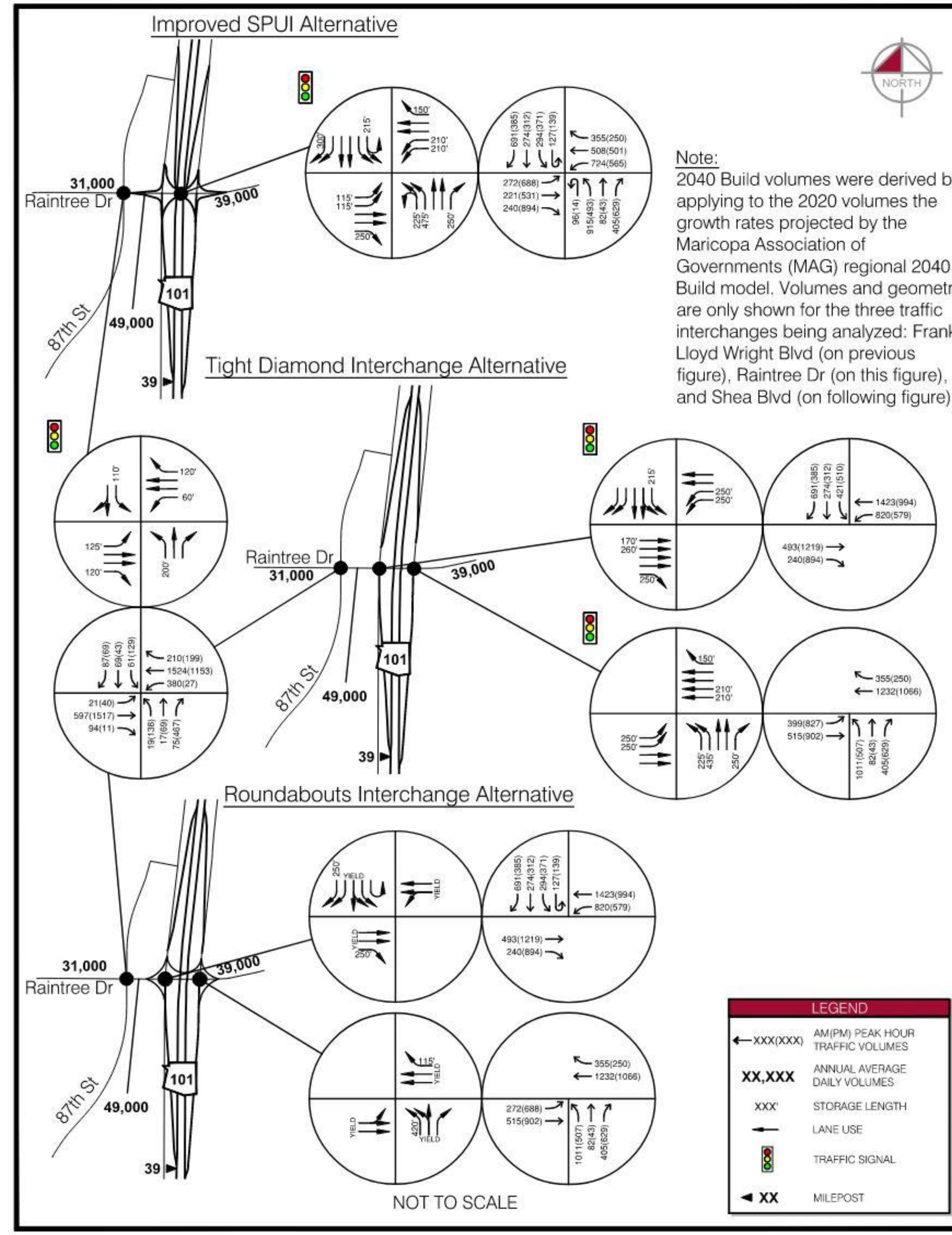


Figure 2.18 – 2040 Build Raintree Drive TI Lane Geometry and Traffic Volumes

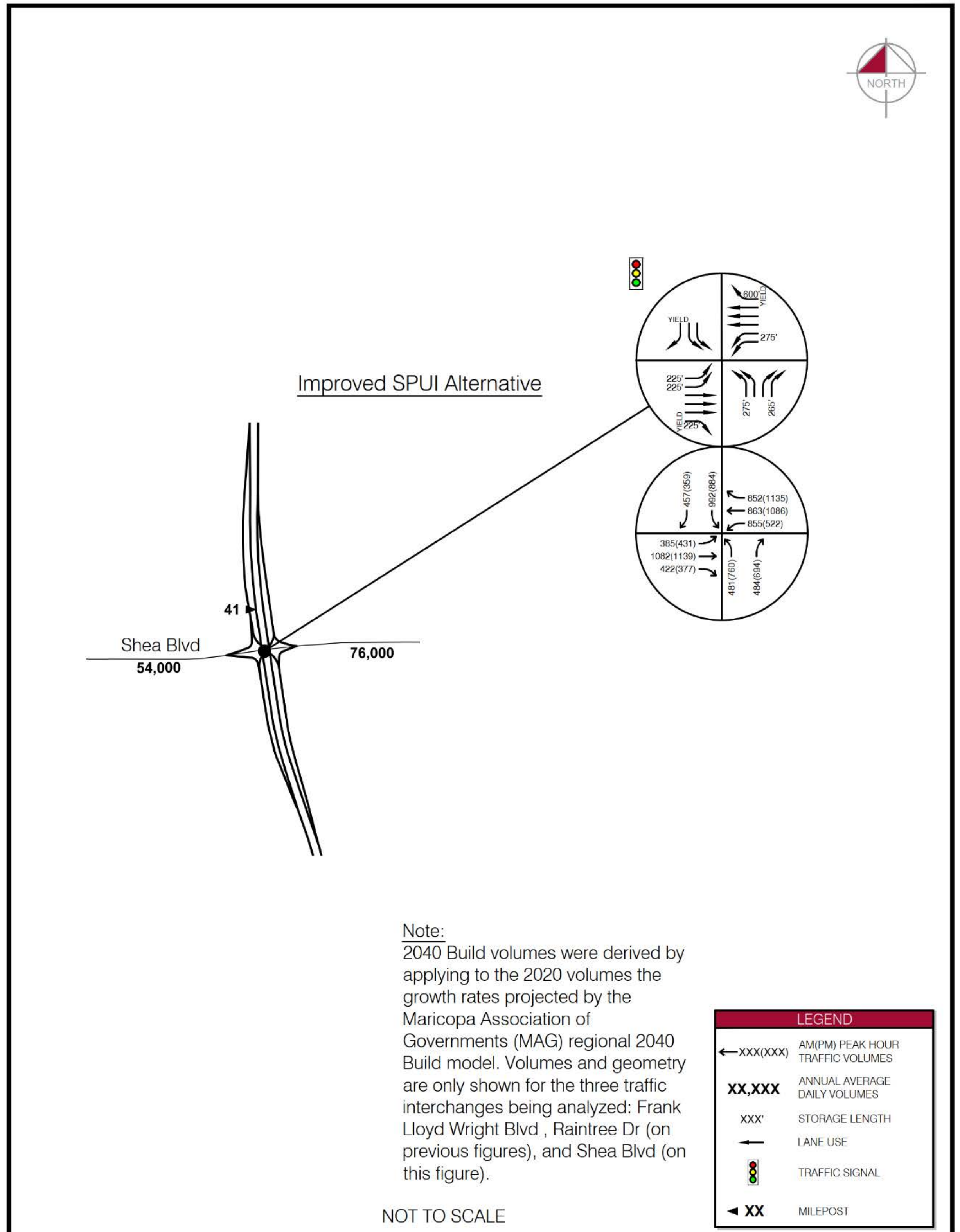


Figure 2.19 – 2040 Build Shea Boulevard TI Lane Geometry and Traffic Volumes

2.4. OPERATIONAL ANALYSIS

2.4.1. Freeway Operational Analysis

2.4.1.1. Analysis Methodology

An operational analysis was performed for the GPLs and ramp merge/diverge areas of SR 101L within the project limits. HOV lanes were excluded to simplify the analysis, although a preliminary review indicated they should operate below capacity through 2040. The operational analysis was conducted for the 2020 Existing, 2040 Baseline/No-Build, and 2040 Improved/Build scenarios.

The VISSIM microscopic traffic simulation software was used to provide a simulation of traffic conditions on the freeway within the project limits. VISSIM can provide measures of effectiveness for each link within the network. Average vehicle density results from VISSIM were used as the measure of effectiveness to come up with a level of service (LOS) for each analysis segment. Average vehicle speed results from VISSIM were also noted. VISSIM uses random seeds to better match how traffic congestion levels change slightly every day, so 10 model runs were conducted and then averaged together to provide the VISSIM model results.

The concept of LOS uses qualitative measures that characterize operational conditions for roadway segments. They are given letter designations from LOS A to LOS F, with LOS A representing uncongested free-flow conditions and LOS F representing an overcapacity condition with a high degree of congestion and vehicle delay. Each LOS grade represents a range of operational conditions. **Table 2.4** shows the average freeway vehicle density ranges that correspond with each segment LOS letter grade for urban conditions. ADOT considers LOS D or better "acceptable" LOS for freeway operations in urban conditions.

Table 2.4 – Freeway Segment Vehicle Density Ranges and Level of Service

Level of Service	Urban Density Range (vehicles/mile/lane)
A	≤ 11
B	> 11 and ≤ 18
C	> 18 and ≤ 26
D	> 26 and ≤ 35
E	> 35 and ≤ 45
F	> 45 (or v/c ratio > 1.0)

Definitions provided from the Highway Capacity Manual (HCM), Exhibit 12-15, Transportation Research Board (TRB), 2016.

2.4.1.2. 2020 Existing Freeway Traffic Conditions

The 2020 Existing freeway mainline operational analysis was based on the existing lane geometries and configurations of the existing freeway as described in Section 2.2 of this document. The VISSIM-modeled average vehicle speed, vehicle density, and corresponding LOS for each segment and peak hour for the 2020 Existing scenario are presented in **Table 2.5**.

Per the 2020 Existing freeway mainline LOS analysis, all freeway segments within the project limits operate at LOS D or better during the 2020 AM and PM peak hours except for the NB segment between Shea Boulevard and the Shea Boulevard NB on-ramp (LOS E in AM), the NB Shea Boulevard on-ramp merge segment (LOS E in AM and PM), and the NB Frank Lloyd Wright Boulevard on-ramp merge segment (LOS F in PM). The highest density in the project limits is 50 vehicles per mile per lane (vpmpl), which occurs at the NB Frank Lloyd Wright Boulevard on-ramp merge segment in the PM peak hour. These results indicate most of the freeway segments in the project limits currently provide acceptable freeway traffic operations but there are a few locations with significant congestion.

Table 2.5 – 2020 Existing Freeway Mainline Level of Service by Segment

Mainline Segment	2020 Existing					
	AM Peak Hour			PM Peak Hour		
	Speed (mph)	Density (vpmpl)	LOS	Speed (mph)	Density (vpmpl)	LOS
Loop 101 Southbound						
West of Hayden EB On-Ramp	59	35	LOS D	62	24	LOS C
Hayden On-Ramp Merge	64	25	LOS C	66	18	LOS C
Between Hayden On-Ramp & Princess On-Ramp	65	28	LOS D	66	20	LOS C
Princess Drive On-Ramp Merge	59	30	LOS D	59	23	LOS C
Between Princess Dr On-Ramp & FLW Off-Ramp	60	30	LOS D	63	22	LOS C
Between FLW Off-Ramp & Raintree Off-Ramp	60	26	LOS C	66	18	LOS B
Between Raintree Off-Ramp & FLW On-Ramp	65	27	LOS D	66	22	LOS C
FLW On-Ramp Merge	61	23	LOS C	61	21	LOS C
Between FLW On-Ramp & Raintree On-Ramp	65	24	LOS C	66	22	LOS C
Raintree On-Ramp Merge	60	29	LOS D	48	32	LOS D
Between Raintree On-Ramp & Cactus Road On-Ramp	65	31	LOS D	56	33	LOS D
Cactus Road On-Ramp Merge	65	27	LOS D	64	27	LOS D
Between Cactus Road On-Ramp and Shea Blvd On-Ramp	66	21	LOS C	66	23	LOS C
Shea Blvd On-Ramp Merge	61	30	LOS D	64	27	LOS D
Loop 101 Northbound						
Between Shea Blvd & Shea Blvd On-Ramp	50	36	LOS E	55	35	LOS D
Shea Blvd On-Ramp Merge	49	39	LOS E	48	39	LOS E
Between Cactus Rd Off-Ramp & On-Ramp	61	34	LOS D	61	33	LOS D
Cactus Road On-Ramp Merge	60	22	LOS C	61	20	LOS C
Between Cactus Road On-Ramp & Raintree On-Ramp	60	22	LOS C	63	24	LOS C
Raintree On-Ramp Merge	65	21	LOS C	62	21	LOS C
Between Raintree On-Ramp and FLW On-Ramp	66	17	LOS B	65	21	LOS C
FLW On-Ramp Merge	62	19	LOS C	46	50	LOS F
Between FLW On-Ramp and Princess Drive On-Ramp	66	21	LOS C	65	25	LOS C
Princess Drive On-Ramp Merge	65	18	LOS B	63	23	LOS C
West of Princess Drive	66	21	LOS C	65	26	LOS C

2.4.1.3. 2040 Baseline/No-Build Freeway Traffic Conditions

An analysis was completed using the 2040 Baseline/No-Build freeway mainline volumes and geometry, as described in Section 2.3.2.1 of this document. The VISSIM-modeled average vehicle speed, vehicle density, and corresponding LOS for each segment and peak hour for the 2040 Baseline/No-Build scenario are presented in **Table 2.6**

Per the 2040 Baseline/No-Build freeway mainline LOS analysis, only about half of the freeway segments within the project limits are expected to operate at LOS D or better in the 2040 AM and PM peak hours. The highest density in the project limits is 116 vpmpl, which occurs at the SB Frank Lloyd Wright Boulevard on-ramp merge segment in the PM peak hour. These results indicate many of the segments in the project limits will likely experience significant congestion by 2040 if no additional GPLs are provided.

Table 2.6 – 2040 Baseline/No-Build Freeway Mainline Level of Service by Segment

Mainline Segment	2040 No-Build					
	AM Peak Hour			PM Peak Hour		
	Speed (mph)	Density (vpmpl)	LOS	Speed (mph)	Density (vpmpl)	LOS
Loop 101 Southbound						
West of Hayden EB On-Ramp	27	81	LOS F	60	31	LOS D
Hayden On-Ramp Merge	52	34	LOS D	65	22	LOS C
Between Hayden On-Ramp & Princess On-Ramp	60	34	LOS D	60	24	LOS C
Princess Drive On-Ramp Merge	53	37	LOS E	40	41	LOS E
Between Princess Dr On-Ramp & FLW Off-Ramp	49	41	LOS E	33	50	LOS F
Between FLW Off-Ramp & Raintree Off-Ramp	37	50	LOS F	20	69	LOS F
Between Raintree Off-Ramp & FLW On-Ramp	25	78	LOS F	15	102	LOS F
FLW On-Ramp Merge	18	86	LOS F	11	116	LOS F
Between FLW On-Ramp & Raintree On-Ramp	20	81	LOS F	13	111	LOS F
Raintree On-Ramp Merge	27	61	LOS F	22	74	LOS F
Between Raintree On-Ramp & Cactus Road On-Ramp	64	34	LOS D	52	35	LOS D
Cactus Road On-Ramp Merge	60	31	LOS D	64	27	LOS D
Between Cactus Road On-Ramp and Shea Blvd On-Ramp	65	26	LOS C	66	23	LOS C
Shea Blvd On-Ramp Merge	53	39	LOS E	64	27	LOS D
Loop 101 Northbound						
Between Shea Blvd & Shea Blvd On-Ramp	14	112	LOS F	24	89	LOS F
Shea Blvd On-Ramp Merge	35	58	LOS F	38	57	LOS F
Between Cactus Rd Off-Ramp & On-Ramp	59	37	LOS E	59	37	LOS E
Cactus Road On-Ramp Merge	59	26	LOS C	60	25	LOS C
Between Cactus Road On-Ramp & Raintree On-Ramp	59	24	LOS C	60	29	LOS D
Raintree On-Ramp Merge	63	21	LOS C	58	28	LOS D
Between Raintree On-Ramp and FLW On-Ramp	66	19	LOS C	59	29	LOS D
FLW On-Ramp Merge	59	23	LOS C	46	51	LOS F
Between FLW On-Ramp and Princess Drive On-Ramp	65	24	LOS C	64	29	LOS D
Princess Drive On-Ramp Merge	64	20	LOS C	61	27	LOS D
West of Princess Drive	65	25	LOS C	63	31	LOS D

Table 2.7 – 2040 Improved/Build Freeway Mainline Level of Service by Segment

Mainline Segment	2040 Improved/Build					
	AM Peak Hour			PM Peak Hour		
	Speed (mph)	Density (vpmpl)	LOS	Speed (mph)	Density (vpmpl)	LOS
Loop 101 Southbound						
West of Hayden EB On-Ramp	60	33	LOS D	62	24	LOS C
Hayden On-Ramp Merge	64	26	LOS C	66	19	LOS C
Between Hayden On-Ramp & Princess On-Ramp	65	27	LOS D	67	20	LOS C
Princess Drive On-Ramp Merge	60	29	LOS D	62	22	LOS C
Between Princess Dr On-Ramp & FLW Off-Ramp	58	31	LOS D	62	22	LOS C
Between FLW Off-Ramp & Raintree Off-Ramp	58	28	LOS D	65	18	LOS B
Between Raintree Off-Ramp & FLW On-Ramp	65	26	LOS C	67	21	LOS C
FLW On-Ramp Merge	62	23	LOS C	62	22	LOS C
Between FLW On-Ramp & Raintree On-Ramp	65	24	LOS C	65	22	LOS C
Raintree On-Ramp Merge	59	29	LOS D	56	25	LOS C
Between Raintree On-Ramp & Cactus Road On-Ramp	65	30	LOS D	65	30	LOS D
Cactus Road On-Ramp Merge	63	28	LOS D	64	26	LOS C
Between Cactus Road On-Ramp and Shea Blvd On-Ramp	66	22	LOS C	67	22	LOS C
Shea Blvd On-Ramp Merge	60	30	LOS D	65	25	LOS C
Loop 101 Northbound						
Between Shea Blvd & Shea Blvd On-Ramp	60	31	LOS D	52	34	LOS D
Shea Blvd On-Ramp Merge	61	37	LOS E	51	38	LOS E
Between Cactus Rd Off-Ramp & On-Ramp	62	33	LOS D	62	33	LOS D
Cactus Road On-Ramp Merge	53	28	LOS D	57	25	LOS C
Between Cactus Road On-Ramp & Raintree On-Ramp	56	25	LOS C	63	25	LOS C
Raintree On-Ramp Merge	64	18	LOS B	63	23	LOS C
Between Raintree On-Ramp and FLW On-Ramp	66	18	LOS B	65	22	LOS C
FLW On-Ramp Merge	62	21	LOS C	60	26	LOS C
Between FLW On-Ramp and Princess Drive On-Ramp	66	21	LOS C	65	24	LOS C
Princess Drive On-Ramp Merge	65	19	LOS C	63	23	LOS C
West of Princess Drive	66	21	LOS C	65	26	LOS C

2.4.1.4. 2040 Improved/Build Freeway Traffic Conditions

An analysis was completed using the 2040 Improved/Build freeway mainline volumes and geometry, as described in Section 2.3.2.2 of this document. The VISSIM-modeled average vehicle speed, vehicle density, and corresponding LOS for each segment and peak hour for the 2040 Improved/Build scenario are presented in **Table 2.7**.

Per the 2040 Improved/Build freeway mainline LOS analysis, all freeway segments within the project limits are expected to operate at LOS D or better in the 2040 AM and PM peak hours except for the NB Shea Boulevard on-ramp merge segment (LOS E in AM and PM). The highest density in the project limits is 38 vpmpl, which occurs at the NB Shea Boulevard on-ramp merge segment in the PM peak hour. These results indicate that the addition of one GPL lane in each direction will generally provide acceptable freeway traffic operations through 2040, with some congestion present at the NB Shea Boulevard on-ramp merge segment in the PM peak hour. If LOS D or better is desired for all mainline segments in 2040 during all time periods, additional improvements would be required at the NB Shea Boulevard on-ramp merge segment.

2.4.2. Traffic Interchange Operational Analysis

2.4.2.1. Analysis Methodology

An operational analysis was performed for all freeway ramp/arterial roadway intersections at the Frank Lloyd Wright, Raintree Drive, and Shea Boulevard TIs, as well as at the Raintree Drive and 87th Street intersection. The operational analysis was conducted for the 2020 Existing, 2040 Baseline/No-Build, and 2040 Improved/Build scenarios.

The VISSIM microscopic traffic simulation software was used to provide a simulation of traffic conditions at the TIs. Ten model runs were conducted and then averaged together to provide the VISSIM model results. Intersections were analyzed in VISSIM using the 2016 HCM methodology. For the DRI alternative at the Raintree Drive TI, the RODEL analysis software was used to model the LOS, delay, and queues.

Similar to roadway segment LOS, each intersection, approach, or movement is given a letter designation from LOS A to LOS F, with LOS A representing uncongested free-flow conditions and LOS F representing an overcapacity condition with a high degree of congestion and vehicle delay. Each LOS grade represents a range of operational conditions.

Table 2.8 shows the average vehicle delay ranges for both signalized and unsignalized intersections that correspond with each LOS letter grade, along with average vehicle delay ranges and corresponding LOS letter grades for diamond TIs (for the TDI alternative), which are effectively two closely-spaced intersections that act as one. ADOT considers LOS D or better "acceptable" LOS for overall TI and intersection operations in urban conditions. Average vehicle queues in VISSIM that do not exceed available storage or do not block upstream driveways/intersections are generally considered to have acceptable queue lengths.

Table 2.8 – Average Vehicle Delay Ranges and Corresponding Level of Service

Level of Service	Average Delay Range (seconds/vehicle) Diamond Interchanges	Signalized Intersections	Unsignalized Intersections
A	≤ 15	≤ 10	≤ 10
B	> 15 and ≤ 30	> 10 and ≤ 20	> 10 and ≤ 15
C	> 30 and ≤ 55	> 20 and ≤ 35	> 15 and ≤ 25
D	> 55 and ≤ 85	> 35 and ≤ 55	> 25 and ≤ 35
E	> 85 and ≤ 120	> 55 and ≤ 80	> 35 and ≤ 50
F	> 120	> 80	> 50

1. Definitions for diamond interchanges provided from the HCM, Exhibit 23-10, TRB, 2016.
2. Definitions for signalized intersections provided from the HCM, Exhibit 19-8, TRB, 2016.
3. Definitions for unsignalized intersections provided from the HCM, Exhibit 20-2, TRB, 2016.

2.4.2.2. 2020 Existing TI/Intersection Traffic Conditions

The 2020 Existing TI/intersection operational analysis was based on the existing lane geometries and configurations of the existing TIs/intersections as described in Section 2.2 of this document. Current signal timings were provided by the City of Scottsdale, which include a 120-second cycle length for all analyzed intersections. The VISSIM-modeled delay, corresponding LOS, and queues at the project TIs/intersections for the 2020 Existing scenario are presented in **Table 2.9** for the AM peak hour and in **Table 2.10** for the PM peak hour.

Table 2.9 – 2020 Existing TI/Intersection Analysis Results: AM Peak Hour

	NB Approach				SB Approach				EB Approach			WB Approach			
Intersection	L	T	R	U	L	T	R	U	L	T	R	L	T	R	Total
Frank Lloyd Wright & Loop 101															
LOS	E	D	C	-	D	F	B	-	F	D	B	E	D	B	D
Delay (sec)	65	50	33	-	52	93	15	-	125	38	13	66	45	14	51
Avg. Queue (ft)	164	89	86	-	94	144	143	-	493	137	46	65	89	53	-
Raintree Drive & Loop 101															
LOS	F	C	C	F	E	F	F	E	D	D	A	E	D	C	F
Delay (sec)	150	32	21	152	60	117	286	64	52	53	7	63	40	22	92
Avg. Queue (ft)	889	801	683	889	250	1208	1208	250	43	36	11	168	85	36	-
Raintree Drive & 87th Street															
LOS	D	D	A	-	D	D	C	-	B	A	A	A	A	A	A
Delay (sec)	52	50	7	-	51	54	27	-	11	5	2	6	2	1	7
Avg. Queue (ft)	4	4	3	-	13	29	45	-	166	166	166	190	217	67	-
Shea Boulevard & Loop 101															
LOS	D	-	A	-	D	-	B	-	D	C	B	F	C	B	C
Delay (sec)	36	-	4	-	46	-	13	-	43	29	14	86	29	20	35
Avg. Queue (ft)	51	-	3	-	131	-	4	-	48	62	35	465	47	285	-

The Frank Lloyd Wright Boulevard TI currently operates at LOS D overall in the AM peak hour. The EB left-turn (EBL) queue of 493' exceeds the 185' of available storage, impacting EB through (EBT) operations.

The Raintree Drive TI currently operates at LOS F overall in the AM peak hour. The NB left-turn (NBL) and U-turn (NBU) queue of 889' exceeds the 475' of available storage, impacting NB through (NBT) operations. The SB through (SBT) and right-turn (SBR) queue of 1,208' blocks upstream driveways and intersections, impacting upstream operations. The WB right-turn (WBR) queue of 36' exceeds the 25' of available storage, impacting WB through (WBT) operations.

The Raintree Drive and 87th Street intersection currently operates at LOS A overall in the AM peak hour. The EBL and EB right-turn (EBR) queues of 166' exceed the 125' and 120' of available storage, respectively, impacting EBT operations. The WB left-turn (WBL) queue of 190' exceeds the 60' of available storage, impacting WBT operations.

The Shea Boulevard TI currently operates at LOS C overall in the AM peak hour. The WBL queue of 465' exceeds the 275' of available storage, impacting WBT operations. The WBR queue of 285' exceeds the 130' of available storage, impacting WBT operations.

These results indicate the Raintree Drive TI does not provide acceptable overall LOS in the 2020 Existing AM peak hour. The other project TIs/intersections provide acceptable overall LOS in the 2020 Existing AM peak hour. There are a few locations/movements that have congestion and queuing issues.

Table 2.10 – 2020 Existing TI/Intersection Analysis Results: PM Peak Hour

	NB Approach				SB Approach				EB Approach			WB Approach			
Intersection	L	T	R	U	L	T	R	U	L	T	R	L	T	R	Total
Frank Lloyd Wright & Loop 101															
LOS	F	D	C	-	D	F	B	-	E	E	D	F	E	B	E
Delay (sec)	99	45	27	-	44	85	16	-	59	60	51	377	57	14	68
Avg. Queue (ft)	244	80	76	-	93	197	194	-	74	349	344	715	311	32	-
Raintree Drive & Loop 101															
LOS	D	D	D	D	D	D	B	D	E	E	D	F	E	D	E
Delay (sec)	42	53	40	43	43	40	15	42	60	57	43	156	74	51	60
Avg. Queue (ft)	65	108	140	65	34	42	35	34	103	105	354	574	372	253	-
Raintree Drive & 87th Street															
LOS	F	F	F	-	F	E	D	-	D	F	E	B	A	A	F
Delay (sec)	214	224	699	-	157	74	45	-	46	102	80	16	2	1	87
Avg. Queue (ft)	7	4	1638	-	104	18	28	-	6	942	942	0	6	0	-
Shea Boulevard & Loop 101															
LOS	D	-	A	-	D	-	B	-	D	C	A	E	C	E	C
Delay (sec)	44	-	5	-	44	-	11	-	47	24	9	57	29	62	35
Avg. Queue (ft)	97	-	5	-	111	-	0	-	58	52	21	366	311	1083	-

The Frank Lloyd Wright Boulevard TI currently operates at LOS E overall in the PM peak hour. The EBR queue of 344 exceeds the 175' of available storage, impacting EBT operations. The WBL queue of 715' exceeds the 245' of available storage, impacting WBT operations.

The Raintree Drive TI currently operates at LOS E overall in the PM peak hour. The EBR queue of 354' exceeds the 250' of available storage, impacting EBT operations. The WBL queue of 574' exceeds the 210' of available storage, impacting WBT operations. The WBR queue of 253' exceeds the 25' of available storage, impacting WBT operations.

The Raintree Drive and 87th Street intersection currently operates at LOS F overall in the PM peak hour. The NB right-turn (NBR) queue of 1,638' blocks upstream driveways and intersections, impacting upstream operations. The EBT and EBR queue of 942' blocks an upstream intersection, impacting upstream operations.

The Shea Boulevard TI currently operates at LOS C overall in the PM peak hour. The WBL queue of 366' exceeds the 275' of available storage, impacting WBT operations. The WBR queue of 1,083' exceeds the 130' of available storage, impacting WBT operations.

These results indicate the Frank Lloyd Wright Boulevard TI, Raintree Drive TI, and Raintree Drive and 87th Street intersection do not provide acceptable overall LOS in the 2020 Existing PM peak hour. The Shea Boulevard TI provides acceptable overall LOS in the 2020 Existing PM peak hour. There are a few locations/movements that have congestion and queuing issues.

2.4.2.3. 2040 Baseline/No-Build TI/Intersection Traffic Conditions

An analysis was completed of the project TIs/intersections using the 2040 Baseline/No-Build volumes and geometry as described in Section 2.3.2.1 of this document. The VISSIM-modeled delay, corresponding LOS, and queues at the project TIs/intersections for the 2040 Baseline/No-Build scenario are presented in **Table 2.11** for the AM peak hour and in **Table 2.12** for the PM peak hour.

Table 2.11 – 2040 Baseline/No-Build TI/Intersection Analysis Results: AM Peak Hour

	NB Approach				SB Approach				EB Approach			WB Approach			
Intersection	L	T	R	U	L	T	R	U	L	T	R	L	T	R	Total
Frank Lloyd Wright & Loop 101															
LOS	F	E	D	-	E	F	D	-	F	D	C	E	D	B	E
Delay (sec)	115	60	44	-	59	147	41	-	167	47	23	66	48	17	68
Avg. Queue (ft)	330	196	195	-	203	312	319	-	1050	913	609	65	110	67	-
Raintree Drive & Loop 101															
LOS	F	C	C	F	F	F	F	F	D	D	A	F	D	C	F
Delay (sec)	151	35	22	153	93	244	341	100	54	55	8	88	47	29	110
Avg. Queue (ft)	886	751	614	886	739	1315	1315	739	51	40	15	454	252	156	-
Raintree Drive & 87th Street															
LOS	D	D	A	-	D	D	C	-	B	A	A	A	A	A	A
Delay (sec)	55	50	8	-	54	54	30	-	12	5	2	8	3	1	8
Avg. Queue (ft)	4	3	3	-	16	35	52	-	8	8	8	10	8	0	-
Shea Boulevard & Loop 101															
LOS	D	-	A	-	D	-	B	-	D	C	B	F	D	C	D
Delay (sec)	37	-	4	-	46	-	13	-	45	30	20	125	46	32	44
Avg. Queue (ft)	42	-	3	-	123	-	2	-	54	69	56	1259	620	1211	-

The Frank Lloyd Wright Boulevard TI is expected to operate at LOS E overall in the 2040 Baseline/No-Build AM peak hour. The SBR queue of 319' exceeds the 235' of available storage, impacting SBT operations. The EBL queue of 1,050' exceeds the 185' of available storage and blocks the upstream driveway and intersection, impacting EBT and upstream operations. The EBT queue of 913' blocks the upstream driveway and intersection, impacting upstream operations. The EBR queue of 609' exceeds the 175' of available storage and blocks the upstream driveway, impacting EBT and upstream operations.

The Raintree Drive TI is expected to operate at LOS F overall in the 2040 Baseline/No-Build AM peak hour. The NBL and NBU queue of 886' exceeds the 475' of available storage, impacting NBT operations. The SBT and SBR queue of 1,315' blocks upstream driveways and intersections, impacting upstream operations. The WBL queue of 454' exceeds the 210' of available storage and blocks an upstream driveway, impacting WBT and upstream operations. The WBR queue of 156' exceeds the 25' of available storage, impacting WBT operations.

The Raintree Drive and 87th Street intersection is expected to operate at LOS A overall in the 2040 Baseline/No-Build AM peak hour with no queuing issues. It should be noted that the 2020 Existing results showed slight queuing issues at this intersection while the 2040 Baseline/No-Build results do not show any queuing issues – this is likely due to the WBL queuing issues at the Raintree Drive TI blocking WBT vehicles from reaching the Raintree Drive and 87th Street intersection.

The Shea Boulevard TI is expected to operate at LOS D overall in the 2040 Baseline/No-Build AM peak hour. The WBL queue of 1,259' exceeds the 275' of available storage and blocks upstream driveways, impacting WBT and upstream operations. The WBT queue of 620' blocks upstream driveways, impacting upstream operations. The WBR queue of 1,211' exceeds the 130' of available storage and blocks upstream driveways, impacting WBT and upstream operations.

These results indicate the Frank Lloyd Wright Boulevard TI and the Raintree Drive TI are not expected to provide acceptable overall LOS in the 2040 Baseline/No-Build AM peak hour. The Raintree Drive and 87th Street intersection and Shea Boulevard TI are expected to provide acceptable overall LOS in the PM peak hour. Several locations/movements are expected to have congestion and queuing issues.

Table 2.12 – 2040 Baseline/No-Build TI/Intersection Analysis Results: PM Peak Hour

Intersection	NB Approach				SB Approach				EB Approach			WB Approach			Total
	L	T	R	U	L	T	R	U	L	T	R	L	T	R	
Frank Lloyd Wright & Loop 101															
LOS	F	D	D	-	D	F	D	-	E	F	E	F	E	B	F
Delay (sec)	178	54	38	-	49	129	43	-	78	86	74	443	67	20	94
Avg. Queue (ft)	525	311	310	-	241	432	438	-	544	1225	1246	1036	876	34	-
Raintree Drive & Loop 101															
LOS	D	F	F	D	D	D	B	D	E	E	D	F	F	E	E
Delay (sec)	41	135	116	42	44	40	17	42	58	59	43	184	97	72	76
Avg. Queue (ft)	282	429	472	282	70	50	45	70	99	12	353	1007	965	915	-
Raintree Drive & 87th Street															
LOS	F	F	F	-	F	F	E	-	D	F	F	C	A	A	F
Delay (sec)	249	232	741	-	181	97	64	-	52	105	82	21	3	1	158
Avg. Queue (ft)	69	3	1650	-	154	54	68	-	980	980	980	1	8	1	-
Shea Boulevard & Loop 101															
LOS	D	-	A	-	D	-	B	-	D	C	A	E	D	E	D
Delay (sec)	43	-	5	-	44	-	11	-	50	23	10	63	38	80	38
Avg. Queue (ft)	110	-	5	-	125	-	0	-	66	55	25	1120	975	1555	-

The Frank Lloyd Wright Boulevard TI is expected to operate at LOS F overall in the 2040 Baseline/No-Build PM peak hour. The SBR queue of 438' exceeds the 235' of available storage, impacting SBT operations. The EBL queue of 544' exceeds the 185' of available storage and blocks the upstream driveway, impacting EBT and upstream operations. The EBT queue of 1,225' blocks the upstream driveway and intersection, impacting upstream operations. The EBR queue of 1,246' exceeds the 175' of available storage and blocks the upstream intersection and driveway, impacting EBT and upstream operations. The WBL queue of 1,036' exceeds the 245' of available storage and blocks the upstream intersection and driveways, impacting WBT operations.

The Raintree Drive TI is expected to operate at LOS E overall in the 2040 Baseline/No-Build PM peak hour. The NBU queue of 282' exceeds the 225' of available storage, impacting NBL operations. The EBR queue of 353' exceeds the 250' of available storage, impacting EBT operations. The WBL queue of 1,007' exceeds the 210' of available storage and blocks the upstream driveway, impacting WBT and upstream operations. The WBT queue of 965' blocks the upstream driveway, impacting upstream operations. The WBR queue of 915' exceeds the 25' of available storage and blocks the upstream driveway, impacting WBT and upstream operations.

- The Raintree Drive and 87th Street intersection is expected to operate at LOS F overall in the 2040 Baseline/No-Build PM peak hour. The NBR queue of 1,650' blocks upstream driveways and intersections, impacting upstream operations. The SBR queue of 154' exceeds the 110' of available storage, impacting SBT and SBR operations. The EBL queue of 980' exceeds the 125' of available storage and blocks an upstream intersection, impacting EBT and upstream operations. The EBT queue of 980' blocks an upstream intersection, impacting upstream operations. The EBR queue of 980' exceeds the 120' of available storage and blocks an upstream intersection, impacting upstream operations.

The Shea Boulevard TI is expected to operate at LOS D overall in the 2040 Baseline/No-Build PM peak hour. The WBL queue of 1,120' exceeds the 275' of available storage and blocks upstream driveways, impacting WBT and upstream operations. The WBT queue of 975' blocks upstream driveways, impacting upstream operations. The WBR queue of 1,555' exceeds the 130' of available storage and blocks the upstream intersection and driveways, impacting WBT and upstream operations.

These results indicate the Frank Lloyd Wright Boulevard TI, Raintree Drive TI, and Raintree Drive and 87th Street intersection are not expected to provide acceptable overall LOS in the 2040 Baseline/No-Build PM peak hour. The Shea Boulevard TI provides acceptable overall LOS in the 2040 Baseline/No-Build. Several locations/movements are expected to have congestion and queuing issues.

2.4.2.4. 2040 Improved/Build-TI/Intersection Conditions

An analysis was completed of the project TIs/intersections using the 2040 Improved/Build volumes and geometry as described in Section 2.3.2.2 of this document. As was mentioned previously, the three Improved/Build alternatives analyzed were:

- Improved SPUI alternative – where the existing SPUIs are improved/expanded at the Frank Lloyd Wright Boulevard, Raintree Drive, and Shea Boulevard TIs
- TDI alternative – where the existing SPUIs are converted to TDIs at the Frank Lloyd Wright Boulevard and Raintree Drive TIs only
- DRI alternative – where the existing SPUI is converted to a DRI at the Raintree Drive TI only

Improved SPUI Analysis

Improvements included in the 2040 Improved/Build SPUI alternative consisted of the following:

- At the Frank Lloyd Wright Boulevard TI, the assumed SPUI configuration improvements included exclusive dual NBL and SBL lanes (as opposed to a shared left-turn/through lane), adding a SBT lane, adding a NBR lane, signal control for all right-turn movements, and associated signal timing adjustments
- At the Raintree Drive TI, the assumed SPUI configuration improvements included adding a NBR lane and SBR lane, additional WBR storage capacity, signal control for all right-turn movements, and associated signal timing adjustments
- At the Raintree Drive and 87th Street intersection, the only assumed improvements were signal timing adjustments, where the EBL and WBL phasing was changed to permitted/protected and NBR overlap phasing was added
- At the Shea Boulevard TI, the assumed SPUI configuration improvements included extending the WBR storage to be 600' and associated signal timing adjustments; geometric constraints restricted the ability to improve the WBL movement

The VISSIM-modeled delay, corresponding LOS, and queues at the project TIs/intersections for the 2040 Improved/Build SPUI alternative are presented in **Table 2.13** for the AM peak hour and in **Table 2.14** for the PM peak hour.

Table 2.13 – 2040 Improved/Build SPUI Alternative TI/Intersection Analysis Results: AM Peak Hour

	NB Approach				SB Approach				EB Approach			WB Approach			
Intersection	L	T	R	U	L	T	R	U	L	T	R	L	T	R	Total
Frank Lloyd Wright & Loop 101															
LOS	D	D	B	-	D	D	C	-	F	D	B	F	E	D	D
Delay (sec)	51	53	10	-	37	51	21	-	95	53	16	82	74	51	54
Avg. Queue (ft)	126	92	10	-	70	62	44	-	299	194	69	78	505	387	-
Raintree Drive & Loop 101															
LOS	F	C	B	F	D	D	D	E	D	E	B	E	D	B	D
Delay (sec)	117	28	13	117	53	57	41	57	44	76	14	74	42	12	55
Avg. Queue (ft)	896	6	15	896	74	58	87	74	39	53	27	260	99	127	-
Raintree Drive & 87th Street															
LOS	D	D	B	-	D	D	C	-	B	C	A	B	A	A	B
Delay (sec)	42	40	13	-	47	45	25	-	22	35	8	11	10	2	17
Avg. Queue (ft)	3	3	4	-	14	27	43	-	71	71	71	73	149	3	-
Shea Boulevard & Loop 101															
LOS	C	-	A	-	D	-	B	-	E	D	C	E	C	C	C
Delay (sec)	32	-	4	-	41	-	13	-	58	41	20	64	27	23	34
Avg. Queue (ft)	45	-	4	-	129	-	5	-	69	97	57	340	53	167	-

The Frank Lloyd Wright Boulevard TI is expected to operate at LOS D overall in the 2040 Improved/Build SPUI alternative AM peak hour. The EBL queue of 299’ exceeds the 185’ of available storage and blocks the upstream driveway and intersection, impacting EBT and upstream operations. The WBT queue of 505’ blocks the upstream driveway, impacting upstream operations. The WBR queue of 387’ exceeds the 150’ of available storage, impacting WBT operations.

The Raintree Drive TI is expected to operate at LOS D overall in the 2040 Improved/Build SPUI alternative AM peak hour. The NBL and NBU queue of 896’ exceeds the 475’ of available storage, impacting NBT operations. The WBL queue of 260’ exceeds the 210’ of available storage, impacting WBT operations.

The Raintree Drive and 87th Street intersection is expected to operate at LOS B overall in the 2040 Improved/Build SPUI alternative AM peak hour with no queuing issues.

The Shea Boulevard TI is expected to operate at LOS C overall in the 2040 Improved/Build SPUI alternative AM peak hour. The WBL queue of 340’ exceeds the 275’ of available storage, impacting WBT operations.

These results indicate all project TIs/intersections are expected to provide acceptable overall LOS in the 2040 Improved/Build SPUI alternative AM peak hour. Only a few locations/movements are expected to have congestion and queuing issues.

Table 2.14 – 2040 Improved/Build SPUI Alternative TI/Intersection Analysis Results: PM Peak Hour

	NB Approach				SB Approach				EB Approach			WB Approach			
Intersection	L	T	R	U	L	T	R	U	L	T	R	L	T	R	Total
Frank Lloyd Wright & Loop 101															
LOS	F	D	C	-	E	E	B	-	E	D	C	E	D	B	D
Delay (sec)	94	47	30	-	68	67	20	-	69	38	23	75	40	11	48
Avg. Queue (ft)	241	58	47	-	163	157	31	-	101	163	144	88	74	29	-
Raintree Drive & Loop 101															
LOS	D	D	C	D	D	D	B	D	D	D	B	D	D	B	D
Delay (sec)	50	41	26	46	45	41	18	47	53	46	21	51	51	10	38
Avg. Queue (ft)	76	7	118	76	73	40	14	73	106	89	202	92	79	80	-
Raintree Drive & 87th Street															
LOS	F	E	F	-	F	D	B	-	E	E	D	C	B	A	D
Delay (sec)	83	65	159	-	93	47	19	-	77	65	52	24	12	3	55
Avg. Queue (ft)	155	18	1023	-	75	30	44	-	956	956	956	1	61	5	-
Shea Boulevard & Loop 101															
LOS	C	-	A	-	C	-	A	-	D	D	B	E	E	E	D
Delay (sec)	32	-	5	-	35	-	10	-	48	36	11	62	57	58	40
Avg. Queue (ft)	66	-	7	-	94	-	1	-	63	90	30	450	1515	1624	-

The Frank Lloyd Wright Boulevard TI is expected to operate at LOS D overall in the 2040 Improved/Build SPUI alternative PM peak hour with no queuing issues.

The Raintree Drive TI is expected to operate at LOS D overall in the 2040 Improved/Build SPUI alternative PM peak hour with no queueing issues.

The Raintree Drive and 87th Street intersection is expected to operate at LOS D overall in the 2040 Improved/Build SPUI alternative PM peak hour. The NBR queue of 1,023’ blocks upstream driveways, impacting upstream operations. The EBL queue of 956’ exceeds the 125’ of available storage and blocks an upstream intersection, impacting EBT and upstream operations. The EBT queue of 956’ blocks an upstream intersection, impacting upstream operations. The EBR queue of 956’ exceeds the 120’ of available storage and blocks an upstream intersection, impacting EBT and upstream operations.

The Shea Boulevard TI is expected to operate at LOS D overall in the 2040 Improved/Build SPUI alternative PM peak hour. The WBL queue of 450’ exceeds the 275’ of available storage and blocks the upstream driveway, impacting WBT and upstream operations. The WBT queue of 1,515’ blocks the upstream intersection and driveways, impacting upstream operations. The WBR queue of 1,624’ exceeds the 600’ of available storage and blocks the upstream intersection and driveways, impacting WBT and upstream operations.

These results indicate all project TIs/intersections are expected to provide acceptable overall LOS in the 2040 Improved/Build SPUI alternative PM peak hour. Only a few locations/movements are expected to have congestion and queuing issues.

TDI Analysis

Improvements included in the 2040 Improved/Build TDI alternative consisted of the following:

- At the Frank Lloyd Wright Boulevard TI, the assumed TDI configuration improvements included the same number of approach lanes for each movement as the existing SPUI configuration along with adding a NBR lane, signal control for all right-turn movements, and associated signal timing adjustments
- At the Raintree Drive TI, the assumed TDI configuration improvements included the same number of approach lanes for each movement as the existing SPUI configuration along with adding a NBR lane and SBR lane, additional WBR storage capacity, signal control for all right-turn movements, and associated signal timing adjustments
- At the Raintree Drive and 87th Street intersection, the only assumed improvements were signal timing adjustments, where the EBL and WBL phasing was changed to permitted/protected and NBR overlap phasing was added

The VISSIM-modeled delay, corresponding LOS, and queues at the project TIs/intersections for the 2040 Improved/Build TDI alternative are presented in **Table 2.15** for the AM peak hour and in **Table 2.16** for the PM peak hour.

Table 2.15 – 2040 Improved/Build TDI Alternative TI/Intersection Analysis Results: AM Peak Hour

Intersection	NB Approach				SB Approach				EB Approach			WB Approach			Total
	L	T	R	U	L	T	R	U	L	T	R	L	T	R	
Frank Lloyd Wright & Loop 101															
LOS	D	B	A	-	D	C	A	-	E	C	A	E	C	B	C
Delay (sec)	64	30	7	-	63	43	9	-	116	39	15	116	45	20	47
Avg. Queue (ft)	76	51	13	-	66	83	43	-	105	105	56	110	110	71	-
Raintree Drive & Loop 101															
LOS	F	C	B	-	D	B	B	-	D	C	B	D	D	B	D
Delay (sec)	130	37	19	-	69	30	30	-	81	40	17	53	64	16	56
Avg. Queue (ft)	845	9	30	-	50	53	63	-	42	42	21	117	117	25	-
Raintree Drive & 87th Street															
LOS	D	D	B	-	D	D	C	-	B	D	A	B	B	A	B
Delay (sec)	41	39	16	-	47	45	25	-	17	35	6	11	11	3	18
Avg. Queue (ft)	3	3	16	-	14	27	43	-	67	67	67	100	176	5	-

The Frank Lloyd Wright Boulevard TI is expected to operate at LOS C overall in the 2040 Improved/Build TDI alternative AM peak hour with no queuing issues.

The Raintree Drive TI is expected to operate at LOS D overall in the 2040 Improved/Build TDI alternative AM peak hour. The NBL queue of 845' exceeds the 475' of available storage, impacting NBT operations.

The Raintree Drive and 87th Street intersection is expected to operate at LOS B overall in the 2040 Improved/Build TDI alternative AM peak hour. The WBL queue of 100' exceeds the 60' of available storage, impacting WBT operations.

These results indicate all project TIs/intersections are expected to provide acceptable overall LOS in the 2040 Improved/Build TDI alternative AM peak hour. Only a few locations/movements are expected to have congestion and queuing issues.

Table 2.16 – 2040 Improved/Build TDI Alternative TI/Intersection Analysis Results: PM Peak Hour

Intersection	NB Approach				SB Approach				EB Approach			WB Approach			Total
	L	T	R	U	L	T	R	U	L	T	R	L	T	R	
Frank Lloyd Wright & Loop 101															
LOS	D	C	B	-	D	C	A	-	D	D	C	D	C	A	C
Delay (sec)	64	32	17	-	62	39	9	-	79	68	53	70	38	11	49
Avg. Queue (ft)	86	38	22	-	79	77	85	-	751	751	988	76	76	26	-
Raintree Drive & Loop 101															
LOS	D	B	B	-	D	C	B	-	D	C	B	D	D	A	C
Delay (sec)	63	30	27	-	61	34	16	-	66	41	22	74	61	15	44
Avg. Queue (ft)	60	5	112	-	68	64	15	-	134	134	210	106	106	33	-
Raintree Drive & 87th Street															
LOS	E	D	D	-	E	D	B	-	D	F	E	C	A	A	D
Delay (sec)	62	41	37	-	117	67	19	-	51	104	75	24	9	2	50
Avg. Queue (ft)	48	15	97	-	217	82	97	-	970	970	970	1	53	3	-

The Frank Lloyd Wright Boulevard TI is expected to operate at LOS C overall in the 2040 Improved/Build TDI alternative PM peak hour. The EBL queue of 751' exceeds the 240' of available storage and blocks the upstream driveway and intersection, impacting EBT and upstream operations. The EBT queue of 751' blocks the upstream driveway, impacting upstream operations. The EBR queue of 988' exceeds the 175' of available storage and blocks the upstream driveway, impacting EBT and upstream operations.

The Raintree Drive TI is expected to operate at LOS C overall in the 2040 Improved/Build TDI alternative PM peak hour with no queueing issues.

The Raintree Drive and 87th Street intersection is expected to operate at LOS D overall in the 2040 Improved/Build TDI alternative PM peak hour. The SBL queue of 217' exceeds the 110' of available storage, impacting SBT and SBR operations. The EBL queue of 970' exceeds the 125' of available storage and blocks an upstream intersection, impacting EBT and upstream operations. The EBT queue of 970' blocks an upstream intersection, impacting upstream operations. The EBR queue of 970' exceeds the 120' of available storage and blocks an upstream intersection, impacting EBT and upstream operations.

These results indicate all project TIs/intersections are expected to provide acceptable overall LOS in the 2040 Improved/Build TDI alternative PM peak hour. Only a few locations/movements are expected to have congestion and queuing issues.

Double-Roundabout Interchange (DRI) Analysis

Improvements included in the 2040 Improved/Build DRI alternative consisted of the following three scenarios for the SB Ramps roundabout:

- Scenario A: one SBR bypass lane and one SBU bypass lane
- Scenario B: two SBR bypass lanes
- Scenario C: two SBR bypass lanes and one SBU bypass lane

The RODEL-modeled delay, corresponding LOS, and queues at the project TIs/intersections for the 2040 Improved/Build DRI alternative are presented in **Table 2.17** for the AM peak hour and in **Table 2.18** for the PM peak hour.

Table 2.17 – 2040 Improved/Build DRI Alternative TI Analysis Results: AM Peak Hour

Leg Name	Number of Lanes		Average Delay (sec)			95% Queue (ft) Per Lane		Level of Service			Total Level of Service					
	Entry	Bypass	Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg	Entries		Bypasses		Total	
L101 SB & Raintree (A: 1 SB Rt Bypass, 1 SB U-Turn Bypass)																
L101 SB SB	2	1	32	365	215	275	5,400	D	F	F	19	C	271	F	73	F
Raintree EB	2	1	4	0	2	25	0	A	A	A						
L101 SB NB			-	-	-	-	-	-	-	-						
Raintree WB	2		17	-	17	525	-	C	-	C						
L101 SB & Raintree (B: 2 SB Rt Bypass)																
L101 SB SB	2	2	59	5	32	675	50	F	A	F	28	D	4	A	19	C
Raintree EB	2	1	3	0	2	25	0	A	A	A						
L101 SB NB			-	-	-	-	-	-	-	-						
Raintree WB	2		17	-	17	525	-	C	-	C						
L101 SB & Raintree (C: 2 SB Rt Bypass, 1 SB U-Turn Bypass)																
L101 SB SB	2	2	32	5	17	275	50	D	A	C	19	C	4	A	14	B
Raintree EB	2	1	3	0	2	25	0	A	A	A						
L101 SB NB			-	-	-	-	-	-	-	-						
Raintree WB	2		17	-	17	525	-	C	-	C						
L101 NB & Raintree (A: 1 SB Rt Bypass, 1 SB U-Turn Bypass)																
L101 NB SB			-	-	-	-	-	-	-	-	8	A	3	A	7	A
Raintree EB	2		3	-	3	25	-	A	-	A						
L101 NB NB	2	1	5	5	5	50	25	A	A	A						
Raintree WB	2	1	14	0	11	275	0	B	A	B						
L101 NB & Raintree (B: 2 SB Rt Bypass)																
L101 NB SB			-	-	-	-	-	-	-	-	14	B	3	A	11	B
Raintree EB	2		4	-	4	50	-	A	-	A						
L101 NB NB	2	1	5	5	5	75	25	A	A	A						
Raintree WB	2	1	27	0	21	600	0	D	A	C						
L101 NB & Raintree (C: 2 SB Rt Bypass, 1 SB U-Turn Bypass)																
L101 NB SB			-	-	-	-	-	-	-	-	8	A	3	A	7	A
Raintree EB	2		3	-	3	25	-	A	-	A						
L101 NB NB	2	1	5	5	5	50	25	A	A	A						
Raintree WB	2	1	14	0	11	275	0	B	A	B						

1. L101 SB & Raintree SB Bypass results were analyzed with separate models to accurately capture the opposing flow volumes.
2. L101 SB & Raintree SB Approach results were analyzed with separate models due to RODEL coding limitations. The SB Approach capacity in RODEL was impacted by the SB Bypass configuration. The separate SB Approach models provided consistent capacity for the three alternatives.
3. L101 NB & Raintree (1 SB Rt Bypass, 1 SB U-Turn Bypass) and (2 SB Rt Bypass, 1 SB U-Turn Bypass) alternative models and results are the same.

The Raintree Drive TI NB Ramps roundabout is expected to operate overall at LOS A for Scenario A, LOS B for Scenario B, and LOS A for Scenario C during the 2040 Improved/Build DRI alternative AM peak hour. The only queuing issue is that in Scenario B the WBT queue of 600' blocks an upstream driveway, impacting upstream operations.

The Raintree Drive TI SB Ramps roundabout is expected to operate overall at LOS F for Scenario A, LOS C for Scenario B, and LOS B for Scenario C during the 2040 Improved/Build DRI alternative PM peak hour. In Scenario A, the SBR bypass queue of 5,400' blocks the upstream intersections, driveways, and ramp junction, significantly impacting upstream operations – this is a potential fatal flaw due to the magnitude of the impact. In Scenario B, the SBT queue of 675' blocks an upstream driveway, impacting upstream operations. In Scenarios A, B, and C, the WBT queue of 525' blocks the adjacent NB Ramps roundabout, significantly impacting operations within the NB Ramps roundabout – this is a potential fatal flaw due to the magnitude of the impact as it could gridlock the TI.

Table 2.18 – 2040 Improved/Build DRI Alternative TI Analysis Results: PM Peak Hour

Leg Name	Number of Lanes		Average Delay (sec)			95% Queue (ft) Per Lane		Level of Service			Total Level of Service					
	Entry	Bypass	Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg	Entries		Bypasses		Total	
L101 SB & Raintree (A: 1 SB Rt Bypass, 1 SB U-Turn Bypass)																
L101 SB SB	2	1	11	8	10	100	75	B	A	B	10	A	2	A	7	A
Raintree EB	2	1	12	0	7	250	0	B	A	A						
L101 SB NB			-	-	-	-	-	-	-	-						
Raintree WB	2		6	-	6	100	-	A	-	A						
L101 SB & Raintree (B: 2 SB Rt Bypass)																
L101 SB SB	2	2	13	3	10	150	25	B	A	B	13	B	1	A	9	A
Raintree EB	2	1	18	0	11	450	0	C	A	B						
L101 SB NB			-	-	-	-	-	-	-	-						
Raintree WB	2		6	-	6	100	-	A	-	A						
L101 SB & Raintree (C: 2 SB Rt Bypass, 1 SB U-Turn Bypass)																
L101 SB SB	2	2	11	3	8	100	25	B	A	A	10	A	1	A	7	A
Raintree EB	2	1	12	0	7	250	0	B	A	A						
L101 SB NB			-	-	-	-	-	-	-	-						
Raintree WB	2		6	-	6	100	-	A	-	A						
L101 NB & Raintree (A: 1 SB Rt Bypass, 1 SB U-Turn Bypass)																
L101 NB SB			-	-	-	-	-	-	-	-	7	A	9	A	7	A
Raintree EB	2		7	-	7	125	-	A	-	A						
L101 NB NB	2	1	6	12	9	50	175	A	B	A						
Raintree WB	2	1	7	0	6	100	0	A	A	A						
L101 NB & Raintree (B: 2 SB Rt Bypass)																
L101 NB SB			-	-	-	-	-	-	-	-	8	A	9	A	8	A
Raintree EB	2		8	-	8	175	-	A	-	A						
L101 NB NB	2	1	7	12	9	50	175	A	B	A						
Raintree WB	2	1	9	0	7	150	0	A	A	A						
L101 NB & Raintree (C: 2 SB Rt Bypass, 1 SB U-Turn Bypass)																
L101 NB SB			-	-	-	-	-	-	-	-	7	A	9	A	7	A
Raintree EB	2		7	-	7	125	-	A	-	A						
L101 NB NB	2	1	6	12	9	50	175	A	B	A						
Raintree WB	2	1	7	0	6	100	0	A	A	A						

1. L101 SB & Raintree SB Bypass results were analyzed with separate models to accurately capture the opposing flow volumes.
2. L101 SB & Raintree SB Approach results were analyzed with separate models due to RODEL coding limitations. The SB Approach capacity in RODEL was impacted by the SB Bypass configuration. The separate SB Approach models provided consistent capacity for the three alternatives.
3. L101 NB & Raintree (1 SB Rt Bypass, 1 SB U-Turn Bypass) and (2 SB Rt Bypass, 1 SB U-Turn Bypass) alternative models and results are the same.

The Raintree Drive TI NB Ramps roundabout is expected to operate overall at LOS A for Scenarios A, B, and C during the 2040 Improved/Build DRI alternative PM peak hour with no queuing issues.

The Raintree Drive TI SB Ramps roundabout is expected to operate overall at LOS A for Scenarios A,B, and C during the 2040 Improved/Build DRI alternative PM peak hour. The only queuing issues is that in Scenario B, the EBT queue of 450' blocks the upstream Raintree Drive and 87th Street intersection, impacting operations at that intersection.

2.5. PRINCESS TI ALTERNATIVE

See ADOT 2010 DCR Section 2.5.

2.6. SUMMARY OF OPERATIONAL ANALYSIS

2.6.1. SR 101L Widening Build Alternative

The following is a summary of the principal findings of the traffic analysis.

SR 101L Mainline

- The only identified mainline crash issue was the concentration of NB crashes south of Shea Boulevard where the mainline currently tapers from four GPLs to three GPLs
- 2040 traffic volumes are projected to be approximately 25% higher than 2020 existing traffic volumes
- There will be significant mainline and ramp junction congestion by 2040 if additional GPLs are not provided on SR 101L
- Widening SR 101L to four GPLs is expected to reduce crashes related to congestion, particularly on SR 101L NB south of Shea Boulevard where the segment currently tapers from four GPLs to three GPLs
- By adding a GPL in each direction, SR 101L is expected to provide LOS D or better through 2040 throughout the project limits except at the Shea Boulevard NB on-ramp merge segment (which provides LOS E)

Frank Lloyd Wright Boulevard TI

- This TI had the highest crash rate of the TIs assessed within the project limits
- An improved SPUI is expected to provide a slight reduction in the overall crash rate due to a reduction in congestion from operational improvements
- A TDI is expected to provide a slight reduction in the overall crash rate due to a reduction in congestion from operational improvements and a moderate reduction in the severe crash rate due to the reduced number of crossing points
- Traffic LOS with the existing SPUI configuration is poor now (LOS E) during peak times and will get worse (LOS F) in the future if no improvements are made
- An improved SPUI is expected to provide LOS D through 2040 if exclusive dual NBL and SBL lanes, an additional SBT lane, an additional NBR lane, signal control for all right-turn movements, and associated signal timing adjustments are provided, although there will still be long EB and WB queues
- A TDI with the same approach lanes as the existing SPUI along with adding a NBR lane and signal control for all right-turn movements is expected to provide LOS C through 2040, although there will still be long EB queues
- The improved SPUI and TDI are relatively similar in terms of anticipated traffic performance and both are considered viable improvements from a traffic standpoint

Raintree Drive TI

- An improved SPUI is expected to provide a slight reduction in the overall crash rate due to a reduction in congestion from operational improvements
- A TDI is expected to provide a slight reduction in the overall crash rate due to a reduction in congestion from operational improvements and a moderate reduction in the severe crash rate due to the reduced number of crossing points
- A DRI is expected to provide a moderate reduction in the overall crash rate due to a significant reduction in congestion from operational improvements and a significant reduction in the severe crash rate due to the reduced number of crossing points and lower operating speeds
- Traffic LOS with the existing SPUI configuration is poor now (LOS F) during peak times and will get worse (LOS F with higher delays) in the future if no improvements are made
- An improved SPUI is expected to provide LOS D through 2040 if adding a NBR lane and SBR lane, additional WBR storage capacity, signal control for all right-turn movements, and associated signal timing adjustments are provided, although there will still be long NB queues
- A TDI with the same approach lanes as the existing SPUI except with adding a NBR lane and SBR lane, additional WBR storage capacity, signal control for all right-turn movements, and associated signal timing adjustments is expected to provide LOS D through 2040, although there will still be some long NB queues
- A DRI is expected to provide LOS C or better through 2040 but the projected long WB queue at the SB Ramps roundabout will extend through the adjacent NB Ramps roundabout, significantly impacting operations – this is a potential fatal flaw due to the magnitude of the impact
- The improved SPUI and TDI are relatively similar in terms of anticipated traffic performance and both are considered viable improvements from a traffic standpoint
- Even though the DRI theoretically provides acceptable overall LOS, it is not considered a viable improvement due to the WB queuing issue that could potentially gridlock the TI

Raintree Drive and 87th Street

- Traffic LOS is poor now (LOS F) during peak times and will get worse (LOS F with higher delays) in the future if no improvements are made
- Recommended improvements are limited to signal timing/phasing adjustments, namely EBL/WBL permitted/protected phasing and NBR overlap phasing
- With these signal timing/phasing improvements, the intersection is expected to provide LOS D through 2040, although there will still be long EB queues

Shea Boulevard TI

- An improved SPUI is expected to provide a slight reduction in the overall crash rate due to a reduction in congestion from operational improvements
- Traffic LOS with the existing SPUI configuration is acceptable now (LOS C) during peak times and is still expected to be acceptable (LOS D) in the future if no improvements are made, but there are long WB queues
- Extending the WBR storage length to 600' and signal timing adjustments will maintain LOS D in the future and will help reduce, but not eliminate, the WB queues
- Other WB improvements are not considered feasible due to geometric constraints at the TI

2.6.2. Princess Drive TI

See ADOT 2010 DCR Section 2.6.2.

3. DESIGN CONCEPT ALTERNATIVES

3.1. INTRODUCTION

In addition to the GPL widening as proposed in the 2010 DCR, design concepts and alternatives were developed for the Princess Drive TI, Frank Lloyd Wright Boulevard TI, Raintree Drive TI, and Shea Boulevard TI. The Frank Lloyd Wright TI Alternatives evaluate an Improved SPUI and a TDI. The Raintree TI considered alternatives also included these TI types, as well as a dual roundabout alternative. Shea Boulevard and Princess Drive TI were not evaluated for the TI type, but were evaluated for spot improvements to provide added capacity. Build and No-Build for Shea Boulevard are included within the Evaluation Criteria Matrix (See Section 3.2) for informational purposes, fatal flaw considerations, and to list benefits of the TI's capacity and other features. See also ADOT 2010 DCR Section 3.1.

3.2. EVALUATION CRITERIA

Five screening criteria were developed to evaluate the SPUI, TDI, and DRI Alternatives. Each evaluation criterion is described below.

- **Traffic Performance:** This criterion evaluated the alternatives for operational safety including conflict points, crash frequency and severity, and wrong way prevention. Also evaluated are potential benefits to the operational performance for the design year of 2040 including improved LOS, queues, storage lengths, through lanes needed, and cross street impacts. Safety, crossing type and time, connectivity, and overall access and accommodations for pedestrians and bicyclists were also considered.
- **Ability to meet design criteria and standards:** The alternatives were evaluated for the use of applicable geometric design criteria and standards as influenced by design speeds, skew angles, and sight distance and in providing required lane widths, ramp tapers, and turning radius. Structural and drainage impacts to existing infrastructure and replacement are also noted within this section.
- **Environmental:** This criterion evaluated the alternatives for its social and economic considerations, amount of disturbance to developed areas and vegetation, potential noise and air quality impacts, potential changes in the visual character and quality, potential impacts to cultural and biological resources, and hazardous materials issues. Also included was their Environmental Requirements such as documents required and timeframe for clearance if an alternative is implemented.
- **Right-of-Way Requirements and Utility Impacts:** The alternatives were evaluated based upon the amount of right-of-way and TCEs, acquisition requirements, relative cost, existing improvement and building impacts, and potential conflicts with existing public utilities and whether those impacts require relocations, extensive coordination, and the relative cost for utilities.
- **Cost:** This criterion evaluated the construction cost of the alternative which includes initial construction cost, ongoing maintenance costs, relative traffic control, right-of-way, and utility relocation costs.

See also ADOT 2010 DCR Section 3.3.

Public agencies that have been involved with this study update concerning the alternative development and evaluation process include ADOT, City of Scottsdale, MAG, and FHWA.

3.3. DESIGN CONCEPT ALTERNATIVES CONSIDERED

3.3.1. SR 101L Widening Build Alternative

See ADOT 2010 DCR Section 3.3.1. The last paragraph is revised to read: The order of magnitude cost for this alternative is updated to $116,970,000 for the mainline widening which is presented in **Table 6.2**.

3.3.2. Princess Drive TI Alternative

ADOT 2010 DCR Section 3.3.2 was determined to no longer be applicable to this project.

3.3.3. No-Build Alternative

See ADOT 2010 DCR Section 3.3.3.

3.3.4. Evaluation of the SR 101L Mainline Widening Alternatives

3.3.4.1. SR 101L Widening Build Alternative

See ADOT 2010 DCR Section 3.3.4.1

3.3.4.2. Princess Drive TI Alternative

Not Applicable.

3.3.4.3. Recommendations

The SR 101L Widening Build Alternative is recommended as the Preferred Alternative for the SR 101L mainline. In making this recommendation, the design team completed a multidiscipline screening process that included agency and public agency input.

3.4. SERVICE INTERCHANGES

3.4.1. Introduction

MAG published a Traffic Alternatives Study in May 2017 and the City of Scottsdale separately prepared a Raintree DCR in 2014, both of which suggested the 2010 ADOT DCR TI configurations may not meet future capacity needs at the Princess Drive, Frank Lloyd Wright Boulevard, Raintree Drive, and Shea Boulevard interchanges. Therefore, interchange modification options for these four TIs were developed in order to optimize the geometric design elements of the ramps, frontage roads, and intersecting roadways, while minimizing environmental impacts, maintaining the improvements within the existing right-of-way, minimizing construction costs, and minimizing impacts to local traffic during construction.

3.4.2. Frank Lloyd Wright TI

The alternatives considered for development within this section of the report are for the Frank Lloyd Wright Boulevard Traffic Interchange.

3.4.2.1. Frank Lloyd Wright Boulevard Improved Single-Point Urban Interchange

The widening of the Frank Lloyd Wright Boulevard TI Overpass (Structure No. 2505, MP 37.78) and bridge abutments would impact the existing Frank Lloyd Wright Boulevard TI. This option for the reconfiguration of this interchange is shown on Figure 3.1.

The Frank Lloyd Wright Boulevard horizontal and vertical alignments and approach lanes would be retained in their current configuration. This option widens the existing single-span bridge by widening the existing abutment and superstructure. The widened abutment would be placed in-line with the existing abutment. This bridge configuration would require all four of the existing ramps to be realigned to avoid the new piers/abutment as depicted on Figure 3.1.

Left turning movements in the SPUI would be consistent with current recommendations of the ADOT Roadway Design Guidelines (RDG) since they must all be reconstructed due to realignment. All right turning movements would be modified to accommodate the WB-67 design vehicle. Left turning movements from SB & NB SR 101L to Frank Lloyd Wright will be converted to dual lefts which, when implemented, require widening at the connection to the ramps as well as extending reconstruction/realignment down the ramps further than anticipated in the 2010 DCR configuration.

In accordance with the modified interchange design, medians, pedestrian facilities, and drainage connections will be reconstructed and the existing traffic signals would be relocated. The order of magnitude construction cost for this option is approximately $2,153,000.

3.4.2.2. Frank Lloyd Wright Boulevard Tight Diamond Interchange

The widening of the Frank Lloyd Wright Boulevard TI Overpass (Structure No. 2505, MP 37.78) and bridge abutments would impact the existing Frank Lloyd Wright Boulevard SPUI. This diamond interchange option for the reconfiguration of this interchange avoids the widening and is shown on Figure 3.2A & B.

The Frank Lloyd Wright Boulevard horizontal and vertical alignments would be retained in their current configuration. Existing pavement will be used and new pavement added to achieve the SPUI to TDI conversion. The left-turn lane extended storage and the tie-ins to the existing condition would require reconstruction and right-of-way near neighboring development as depicted in **Appendix C**.

In accordance with the modified interchange design, medians, pedestrian facilities, and drainage connections will be reconstructed, SPUI ramps sections removed, and the existing traffic signals would be relocated. The order of magnitude construction cost for this option is approximately $3,397,000.

3.4.2.3. Frank Lloyd Wright TI – Evaluation of Alternatives

The evaluation of Alternatives is summarized in **Table 3.1**

Table 3.1 – Frank Lloyd Wright TI Alternatives Selection Matrix

Evaluation Criteria		No-Build Alternative Single-Point Urban Interchange (SPUI)	Alternative A Improved Single-Point Urban Interchange (SPUI)	Alternative B Tight Diamond Interchange (TDI)
Traffic Performance	Operational Safety	- 28 conflict points, including 12 crossing points - Intersection crash rate of 2.43 crashes per million entering vehicles - Severe crashes: angle (13%), left-turn (4%) - Wrong-way travel prevented by signage	○ 28 conflict points, including 12 crossing points ◐ Slight reduction anticipated in crash rate due to reduced congestion ○ No change anticipated in percentage of severe crashes ○ Wrong-way travel prevented by signage	◐ 26 conflict points, including 10 crossing points ◐ Slight reduction anticipated in crash rate due to reduced congestion ○ Slight reduction anticipated in percentage of severe crashes due to reduced number of crossing points ○ Wrong-way travel prevented by signage
	Traffic Operations (Design Year 2040)	- 2040 overall level of service (LOS) of E in the AM and F in the PM - Queues exceed available storage or block upstream driveways/intersections for the SB right-turn (SBR), eastbound left-turn (EBL), EB right-turn (EBR), and westbound left-turn (WBL) movements	◐ 2040 overall LOS of D in the AM and D in the PM ◐ Queues reduced but still exceed available storage or block upstream driveways/intersections for the EBL, EBT, and EBR movements	◐ 2040 overall LOS of C in the AM and C in the PM ◐ Queues reduced but still exceed available storage or block upstream driveways/ intersections for the EBL, EBT, and EBR movements ◑ SB-NB and NB-SB U-turns require two step movement
	Pedestrian Accommodations	- Pedestrian crossings all have signal-controlled pedestrian phasing except for across the two-lane WBR movement, which is yield-controlled - Can take up to five signal cycles for pedestrians to cross the TI	○ Pedestrian crossings all have signal-controlled pedestrian phasing except for across the two-lane WBR movement, which is yield-controlled ○ Can take up to five signal cycles for pedestrians to cross the TI	○ Pedestrian crossings all have signal-controlled pedestrian phasing except for across the two-lane WBR movement, which is yield-controlled ◐ Can take up to three signal cycles for pedestrians to cross the TI
	Bicyclist Accommodations	- Bicycle lanes not provided on Frank Lloyd Wright Blvd through TI; bicyclists must either use vehicle lanes or the sidewalk	◐ Bicycle lanes could be accommodated in the future	◐ Bicycle lanes could be accommodated in the future
	Access	- Hayden Rd signalized intersection and three driveways do not meet current RDG standards for access spacing near interchanges	○ No change anticipated in access	○ No change anticipated in access
Ability to Meet Design Criteria and Standards	Roadway Geometry	- Meets current AASHTO but not RDG standards	◐ Meets current AASHTO and RDG standards	◐ Meets current AASHTO and RDG standards
	Structures	- No impact	◐ No additional walls required ◑ Bridge on mainline needs to be widened	◐ No additional walls required ◑ Bridge on mainline needs to be widened
	Drainage/Floodplains	- No impact	◑ Impacts to portions of existing drainage system due to expansion of NB and SB approaches that are shifted due to future abutment widening	● Moderate impacts to portions of existing drainage system due to conversion from SPUI to TDI
	Earthwork	- No impact	◑ Minimal amount of earthwork required	◑ Major roadway reconfiguration and recompaction due to conversion from SPUI to TDI
	Constructability	- No impact	◑ Moderate construction restrictions for entire TI for moderate duration, with short closures anticipated for lane shifts and restriping	● Major construction restrictions for entire TI for moderate duration, with short closures anticipated for lane shifts and restriping
Environmental	Environmental Requirements	- No impact	○ CE Re-evaluation required	○ CE Re-evaluation required
	Environmental Impacts	- No impact	○ No fatal flaws anticipated	○ No fatal flaws anticipated
Right-of-Way Requirements and Utility Impacts	Right-of-Way Requirements	- No impact	◑ Minimal ROW impacts on NW corner	● ROW impacts on north side along FLW, both sides of the TI, very close to development
	Utility Impacts	- No impact	◑ Conflict with ADOT FMS and power along ramps, two additional sewer lines will be under the SB entrance ramp and SB exit ramp concrete pavement, as well as typical lighting, drainage, irrigation, signal and push button relocation due to widening	◑ Conflict with ADOT FMS and power along ramps, as well as typical lighting, drainage, irrigation, signal and push button relocation due to widening
Cost	Cost	- No impact	◐ Low construction cost since re-using existing configuration, approximately $2,153,000.	◑ Moderate construction cost due to TI reconfiguration, approximately $3,397,000.

Net Effect Legend
● Strong Advantage ◐ Advantage ○ Neutral ◑ Disadvantage ● Strong Disadvantage * ***Fatal Flaw***

3.4.2.4. Frank Lloyd Wright TI – Recommendations

Retaining the SPUI configuration of the existing TI and adding additional turn lanes provides similar capacity to the TDI alternative. Yet, the TDI provides the potential for better signal coordination with the frontage roads, combined with an improved environment for pedestrian and bike crossings. The project team therefore recommends the TDI as the Recommended Alternative for reconstruction of the Frank Lloyd Wright TI. The Recommended Alternative would achieve the traffic operational goals and engineering standard requirements established for this project.

The order-of-magnitude total project cost estimate for the Recommended Alternative for the Frank Lloyd Wright TI is approximately $3,397,000. Additional information regarding the cost estimate is shown in Section 6.3.

3.4.3. 90th Street Single-Point Urban Interchange

This Subsection is not applicable to this project.

3.4.4. Raintree Drive TI

The alternatives considered for development within this section of the report are for the Raintree Drive Traffic Interchange.

3.4.4.1. Raintree Drive Improved Single-Point Urban Interchange

Adjustments to the Raintree Drive TI are not required due to SR 101L GPL widening. This option for the reconfiguration of this interchange based on arterial capacity improvements is shown on Figure 3.3.

The Raintree Drive horizontal and vertical alignments and approach lanes would be retained in their current configuration with one additional lane, a WB to NB right-turn lane for added capacity for NB SR 101L traffic. Since Raintree Drive passes over SR 101L, this option would not affect the existing bridge or abutments.

Implementing Performance Based Practical Design solution (PBPD), the left turning movements and lane widths in the SPUI would remain in their current configuration since they satisfy AASHTO criteria. All right turning movements would be modified to accommodate the WB-67 design vehicle. Exclusive right-turn lanes would be added at the NB and SB exit ramps as depicted on Figure 3.3.

In accordance with the modified interchange design, medians, pedestrian facilities, and drainage connections would be reconstructed for right-turn lane widening only and the existing traffic signals would be relocated. The order of magnitude construction cost for this option is approximately $583,000.

3.4.4.2. Raintree Drive Tight Diamond Interchange

Adjustments to the Raintree Drive TI are not required due to SR 101L GPL widening. This option for the reconfiguration of this interchange based on arterial capacity improvements is shown on Figure 3.4A & B.

The Raintree Drive horizontal and vertical alignments would be retained in their current configuration yet with the left-turn lanes for the diamond configuration added, the through lanes would be widened out at the TI slightly. Tapering the intersection east and west to tie to the existing condition just a few hundred feet past the Freeway ramps. These impacts are shown on Figure 3.4A & B.

In accordance with the modified interchange design, medians, pedestrian facilities, and drainage connections will be reconstructed, SPUI ramps sections removed, and the existing traffic signals would be relocated. The order of magnitude construction cost for this option is approximately $1,930,000. The detailed estimate is contained in Appendix D.

3.4.4.3. Raintree Drive Dual Roundabouts Interchange

Dual roundabouts were considered as an alternative at Raintree Drive TI for potential traffic calming, improved operational performance, reduced crash rates, and lower maintenance costs (signals). The roundabouts were designed to a Case 3 design, where WB-67s can traverse within the inside lane without tracking into the outside lane. A WB-50 was used for the outside lane. The layout is shown on Figure 3.5A & B.

The Raintree Drive horizontal and vertical alignments would be realigned, and typical roundabout grading would need to be modified to closely match the 2% normal crown or the existing roadway to ensure the bridge does not take on additional loading (overlay). Approach lanes would be reconfigured through the roundabouts. This option does not require the widening of the bridge.

This alternative removes the sidewalk on the north side of the TI so that pedestrians must travel to the south side to cross the TI. Also, a U-Turn movement for SB to NB SR 101L traffic is added.

In accordance with the modified interchange design, medians, pedestrian facilities, and drainage connections would be reconstructed for the entire TI and the existing traffic signals would be removed. The order of magnitude construction cost for this option is approximately $2,283,000. The detailed estimate is contained in Appendix D.

3.4.4.4. Raintree Drive TI – Evaluation of Alternatives

The evaluation of Alternatives is summarized in **Table 3.2**

Table 3.2 – Raintree Drive TI Alternatives Selection Matrix

Evaluation Criteria		No-Build Alternative Single-Point Urban Interchange (SPUI)	Alternative A Improved Single-Point Urban Interchange (SPUI)	Alternative B Tight Diamond Interchange (TDI)	Alternative C Double-Roundabout Interchange (DRI)
Traffic Performance	Operational Safety	- 28 conflict points, including 12 crossing points - Intersection crash rate of 1.36 crashes per million entering vehicles - Severe crashes: angle (10%), left-turn (1%) - Wrong-way travel prohibited by signage	○ 28 conflict points, including 12 crossing points ◐ Slight reduction anticipated in crash rate due to reduced congestion ○ No change anticipated in percentage of severe crashes ○ Wrong-way travel prohibited by signage	◐ 26 conflict points, including 10 crossing points ◐ Slight reduction anticipated in crash rate due to reduced congestion ◐ Moderate reduction anticipated in percentage of severe crashes due to reduced number of crossing points ○ Wrong-way travel prohibited by signage	○ 38 conflict points, including 10 crossing points ● Moderate reduction anticipated in crash rate due to significantly reduced congestion ● Significant reduction anticipated in percentage of severe crashes due to reduced number of crossing points and lower speeds ● Wrong-way travel prohibited by raised concrete islands
	Traffic Operations (Design Year 2040)	- 2040 overall LOS of F in the AM and E in the PM - Queues exceed available storage or block upstream driveways/intersections for the nb left-turn (NBL), NB right-turn (NBR), NB U-turn (NBU), SB left-turn (SBL), SB through (SBT), SBR, SB U-turn (SBU), EBR, WBL, WB through (WBT), and WB right-turn (WBR) movements - Nearby Raintree Dr/87th St intersection has 2040 overall LOS of A in the AM and F in the PM with queues that exceed available storage or block upstream driveways/intersections for the NBR, SBL, EBL, EB through (EBT), and EBR movements	◐ 2040 overall LOS of D in the AM and D in the PM ◐ Queues reduced but still exceed available storage or block upstream driveways/intersections for the NBL, NBU, and WBL movements ◐ Nearby Raintree Dr/87th St intersection has 2040 overall LOS of B in the AM and D in the PM with queues that are reduced but still exceed available storage or block upstream driveways/intersections for the NBR, EBL, EBT, and EBR movements	◐ 2040 overall LOS of D in the AM and C in the PM ◐ Queues reduced but still exceed available storage or block upstream driveways/intersections for the NBL movement ◐ Nearby Raintree Dr/87th St intersection has 2040 overall LOS of B in the AM and D in the PM with queues that are reduced but still exceed available storage or block upstream driveways/intersections for the SBL, EBL, EBT, and EBR movements ◑ SB-NB and NB-SB U-turns require two step movement	● 2040 overall LOS of B in the AM and A in the PM at the SB Ramps roundabout 2040 overall LOS of A in the AM and A in the PM at the NB Ramps roundabout * **WB approach queues at the SB Ramps roundabout exceed available storage between the two roundabouts, blocking up the NB Ramps roundabout; to address this issue, three WB lanes would be needed at the SB Ramps roundabout**
	Pedestrian Accommodations	- Pedestrian crossings all have signal-controlled pedestrian phasing except for across the one-lane WBR and EBR movements, which are yield-controlled - Can take up to four signal cycles for pedestrians to cross the TI	○ Pedestrian crossings all have signal-controlled pedestrian phasing except for across the one-lane WBR and EBR movements, which are yield-controlled ○ Can take up to four signal cycles for pedestrians to cross the TI	○ Pedestrian crossings all have signal-controlled pedestrian phasing except for across the one-lane WBR and EBR movements, which are yield-controlled ● Can take up to two signal cycles for pedestrians to cross the TI	◑ Pedestrian crossings are all yield-controlled one-lane or two-lane crossings, making it more challenging for those with disabilities to cross, although this is offset to some degree by the lower speed of vehicles at the crossings. Addressing this issue would require pedestrian crossings with pedestrian-actuated signals or pedestrian hybrid beacons, which will impede the traffic movement ● Pedestrian crossings not provided on north side of TI due to the anticipated high speed of U-turn vehicles at potential crossing locations, requiring pedestrians that desire to go between the southeast and northwest quadrants of the TI to cross at the Raintree Dr/87th St intersection
	Bicyclist Accommodations	- Bicycle lanes provided on Raintree Dr through TI; bicyclists can also either use vehicle lanes or the sidewalk	○ Bicycle lanes provided on Raintree Dr through TI; bicyclists can also either use vehicle lanes or the sidewalk	○ Bicycle lanes provided on Raintree Dr through TI; bicyclists can also either use vehicle lanes or the sidewalk	◑ Bicycle lanes not provided on Raintree Dr through TI; bicyclists must either use vehicle lanes or the sidewalk
	Access	- 87th St signalized intersection and one driveway do not meet current RDG standards for access spacing near interchanges	○ No change anticipated in access	○ No change anticipated in access	○ No change anticipated in access

Ability to Meet Design Criteria and Standards	Roadway Geometry	- Meets current AASHTO but not RDG standards	○ Meets current AASHTO standards	◐ Meets current AASHTO and RDG standards	◐ Meets current AASHTO and RDG standards
	Structures	- No impact	○ No walls or bridges impacted	○ No walls or bridges impacted	○ No walls or bridges impacted
	Drainage/Floodplains	- No impact	◑ Minor impacts to portion of existing drainage system due to addition of SBR, NBR, and WBR lanes	🔴 Major impacts to portions of existing drainage system due to conversion from SPUI to TDI	🔴 Full reconstruction of existing drainage system due to conversion from SPUI to DRI ◑ Drainage needs to be designed considering the existing cross slope of the bridge deck
	Earthwork	- No impact	○ Minimal amount of earthwork required	◑ Major roadway reconfiguration and recompaction due to conversion from SPUI to TDI	🔴 Full roadway and ramps reconfiguration, regrading, and recompaction due to conversion from SPUI to DRI
	Constructability	- No impact	◑ Construction restriction on existing SBR, NBT/R, and WBT/R lanes for short duration	🔴 Construction restrictions for entire TI for moderate duration, with short closures anticipated for lane shifts and restriping	🔴 Construction restrictions for entire TI for extended duration, with short closures anticipated for lane shifts and restriping
Environmental	Environmental Requirements	- No impact	○ CE Re-evaluation required	○ CE Re-evaluation required	○ CE Re-evaluation required
	Environmental Impacts	- No impact	○ No fatal flaws anticipated	○ No fatal flaws anticipated	○ No fatal flaws anticipated
Right-of-Way Requirements and Utility Impacts	Right-of-Way Requirements	- No impact	◑ ROW impacts on NE corner and potential TCE need at the NW corner	◑ ROW impacts on NE corner and potential TCE need at the NW corner	◑ ROW impacts on NE and SE corners
	Utility Impacts	- No impact	◑ Minor lighting, drainage, irrigation, signal and push button relocation due to widening	◑ Conflict with utility cabinets/pedestals/boxes at SE corner widening ◑ Conflict with utility pedestals/pull boxes, storm drain, light poles, and fire hydrant at SE corner of 87th St and Raintree Dr ◑ Conflict with utility pedestals/pull boxes/cabinets and storm drain at SW corner of 87th St and Raintree Dr	◑ Conflict with utility cabinets/pedestals/boxes and storm drain at SE corner widening 🔴 Conflict with major overhead power pole and COS sewer manhole at SE corner widening 🔴 Conflict with Scottsdale sewer manhole, storm drain, and light pole at NE corner RTL widening ◑ Conflict with light pole at SW corner widening ◑ Conflict with storm drain at SW corner island
Cost	Cost	- No impact	●Minimal reconstruction; low construction cost alternative, approximately $583,000. ◑ Long-term signal maintenance and associated costs ◑ Higher societal costs in terms of emissions and severe crashes compared to roundabouts	◐ Moderate construction cost due to TI reconfiguration, approximately $1,930,000. ◑ Long-term signal maintenance and associated costs ◑ Higher societal costs in terms of emissions and severe crashes compared to roundabouts	🔴 Highest construction cost due to traffic control, roadway, drainage, walls and ROW, approximately $2,283,000. ◐ No long-term signal maintenance and associated costs. ◐ Reduced societal costs in terms of reduced emissions and severe crashes

Net Effect Legend
●Strong Advantage ◐ Advantage ○ Neutral ◑ Disadvantage 🔴 Strong Disadvantage * ***Fatal Flaw***

3.4.4.5. Raintree Drive TI – Recommendations

Retaining the SPUI configuration of the existing TI and adding right-turn lanes provides similar capacity to the TDI alternative but has a distinct cost benefit over a TDI by reducing extensive intersection reconstruction required for the WB and EB traffic. The project team therefore recommends the Improved SPUI as the Recommended Alternative for reconstruction of the Raintree Drive TI. The Recommended Alternative would achieve the traffic operational goals and engineering standard requirements established for this project.

The order-of-magnitude total project cost estimate for the Recommended Alternative for the Raintree Drive TI is approximately $583,000. Additional information regarding the cost estimate is shown in Section 6.3.

3.4.5. Princess Drive Tight Diamond Interchange

Adjustments of the Princess Drive TI are not required due to SR 101L GPL widening. This option for the reconfiguration of this interchange based on arterial capacity improvements is shown in the preliminary plans in Appendix C.

The Princess Drive horizontal and vertical alignments and approach lanes would be retained in their current diamond configuration and a third WB to SB left-turn lane for SB SR 101L traffic would be proposed for added capacity. The existing roadway width already accounts for this third lane and is currently not in use. With this configuration the median west of the TI requires minor modification, and the median east is reconstructed to add additional storage for all three left-turn lanes and restriping as required to tie to existing conditions.

Since Princess Drive passes under SR 101L and the existing edge of roadway would not require widening, this option would not affect the existing bridge or abutments.

After reviewing the capacity improvement and cost of the triple left lane alternative, the project team therefore recommends modifying the existing Diamond Interchange with triple lefts as the Recommended Alternative for reconstruction of the Princess Drive TI. The order of magnitude construction cost for this option is approximately $297,000. Additional information regarding the cost estimate is shown in Section 6.3.

3.4.6. Shea Boulevard Single-Point Urban Interchange

Adjustments of the Shea Boulevard TI are not required due to SR 101L GPL widening. This option for the reconfiguration of this interchange based on arterial capacity improvements is shown in the preliminary plans in Appendix C.

The Shea Boulevard horizontal and vertical alignments and approach lanes would be retained in their current configuration with the WB to NB right-turn lane extended for added capacity for NB SR 101L traffic. Since Shea Boulevard passes over SR 101L, this option would not affect the existing bridge or abutments.

Implementing PBPD, the left turning movements and lane widths would remain in their current configuration. The WB to NB right turning movement would be extended to provide additional storage for turning vehicles.

3.4.6.1. Shea Boulevard TI – Evaluation of Alternatives

The evaluation of Alternatives is summarized in **Table 3.3**

Table 3.3 – Shea Boulevard TI Alternative Review Matrix

Evaluation Criteria		No-Build Alternative Single-Point Urban Interchange (SPUI)	Alternative A Improved Single-Point Urban Interchange (SPUI)
Traffic Performance	Operational Safety	- 20 conflict points, including 8 crossing points - Intersection crash rate of 1.74 crashes per million entering vehicles - Severe crashes: angle (9%), left-turn (2%) - Wrong-way travel prevented by signage	○ 20 conflict points, including 8 crossing points ○ No net change anticipated in crash rate (reduced crashes due to reduced congestion offset by increased crashes due to driveway in middle of WBR lane) ○ No change anticipated in percentage of severe crashes ○ Wrong-way travel prevented by signage
	Traffic Operations (Design Year 2040)	- 2040 overall LOS of D in the AM and D in the PM - Queues exceed available storage or block upstream driveways/intersections for the WBL, WBT, and WBR movements	◐ 2040 overall LOS of C in the AM and D in the PM ◐ Queues reduced but still exceed available storage or block upstream driveways/intersections for the WBL, WBT, and WBR movements
	Pedestrian Accommodations	- Pedestrian crossings all have signal-controlled pedestrian phasing except for across the one-lane WBR, EBR, and SBR movements, which are yield-controlled - Can take up to three signal cycles for pedestrians to cross the TI	○ Pedestrian crossings all have signal-controlled pedestrian phasing except for across the one-lane WBR, EBR, and SBR movements, which are yield-controlled ○ Can take up to three signal cycles for pedestrians to cross the TI
	Bicyclist Accommodations	- Bicycle lanes not provided on Shea Blvd through TI; bicyclists must either use vehicle lanes or the sidewalk	○ Bicycle lanes not provided on Shea Blvd through TI; bicyclists must either use vehicle lanes or the sidewalk
	Access	- Two driveways do not meet current RDG standards for access spacing near interchanges	◑ No change anticipated in access, but one driveway is located along extended WBR lane
Ability to Meet Design Criteria and Standards	Roadway Geometry	- Meets current AASHTO but not RDG standards	○ Meets current AASHTO standards
	Structures	- No impact	○ No walls or bridges impacted
	Drainage/Floodplains	- No impact	◑ Minor impacts to portion of existing drainage system due to extension of storage for WBR lane
	Earthwork	- No impact	◑ Minimal amount of earthwork required
	Constructability	- No impact	◑ Construction restriction on existing WBT and WBR lanes and affected driveway for short duration, with closures only anticipated for restriping
Environmental	Environmental Requirements	- No impact	○ CE Re-evaluation required
	Environmental Impacts	- No impact	○ No fatal flaws anticipated

Evaluation Criteria		No-Build Alternative Single-Point Urban Interchange (SPUI)	Alternative A Improved Single-Point Urban Interchange (SPUI)
Right-of-Way Requirements and Utility Impacts	Right-of-Way Requirements	- No impact	○ New TCE required for one driveway
	Utility Impacts	- No impact	○ Very minor impacts to lighting pullbox and possibly irrigation
Cost	Cost	- No impact	◐ Minimal reconstruction; low construction cost alternative, approximately $189,000.

Net Effect Legend
● Strong Advantage ◐ Advantage ○ Neutral ◑ Disadvantage ● Strong Disadvantage ✱ ***Fatal Flaw***

3.4.6.2. Shea Boulevard TI – Recommendations

After reviewing the capacity improvement and cost of the extended right-turn lane alternative, the project team therefore recommends modifying the existing SPUI with an extended WB to NB right-turn lane as the Recommended Alternative for reconstruction of the Shea Boulevard TI. The order of magnitude construction cost for this option is approximately $189,000. Additional information regarding the cost estimate is shown in Section 6.3.

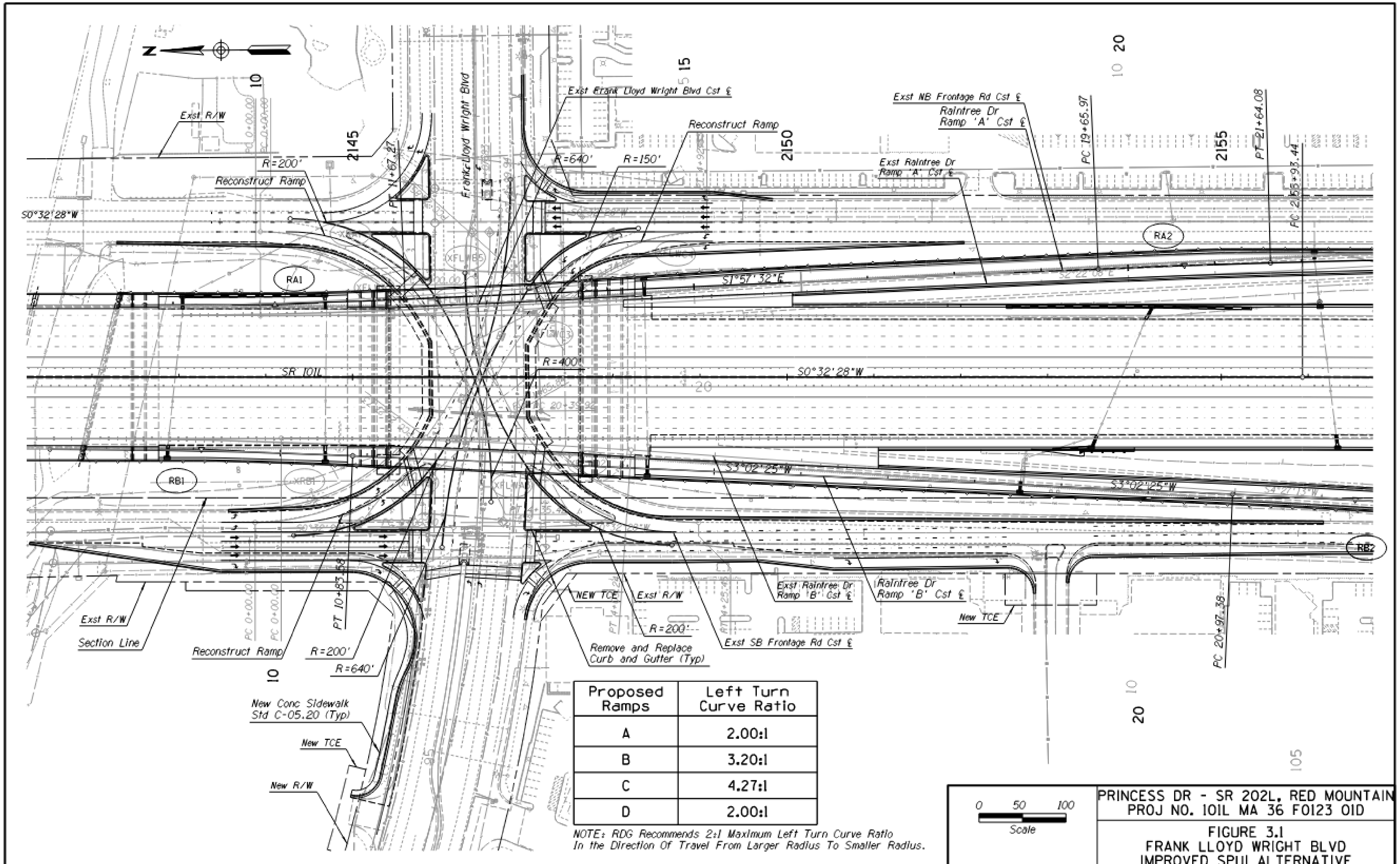


Figure 3.1 – Frank Lloyd Wright Boulevard Improved Single-Point Urban Interchange

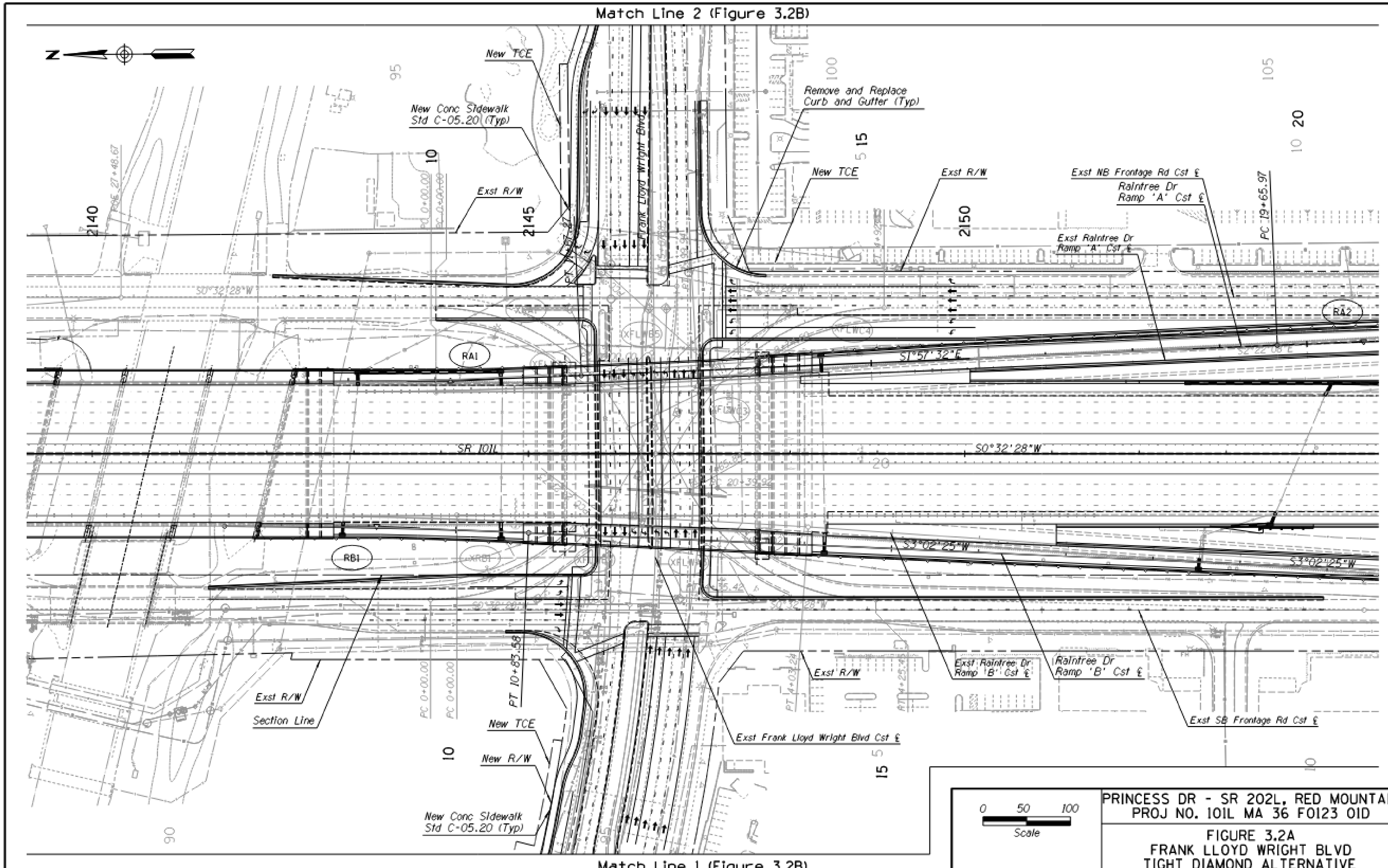


Figure 3.2A – Frank Lloyd Wright Boulevard Tight Diamond Interchange

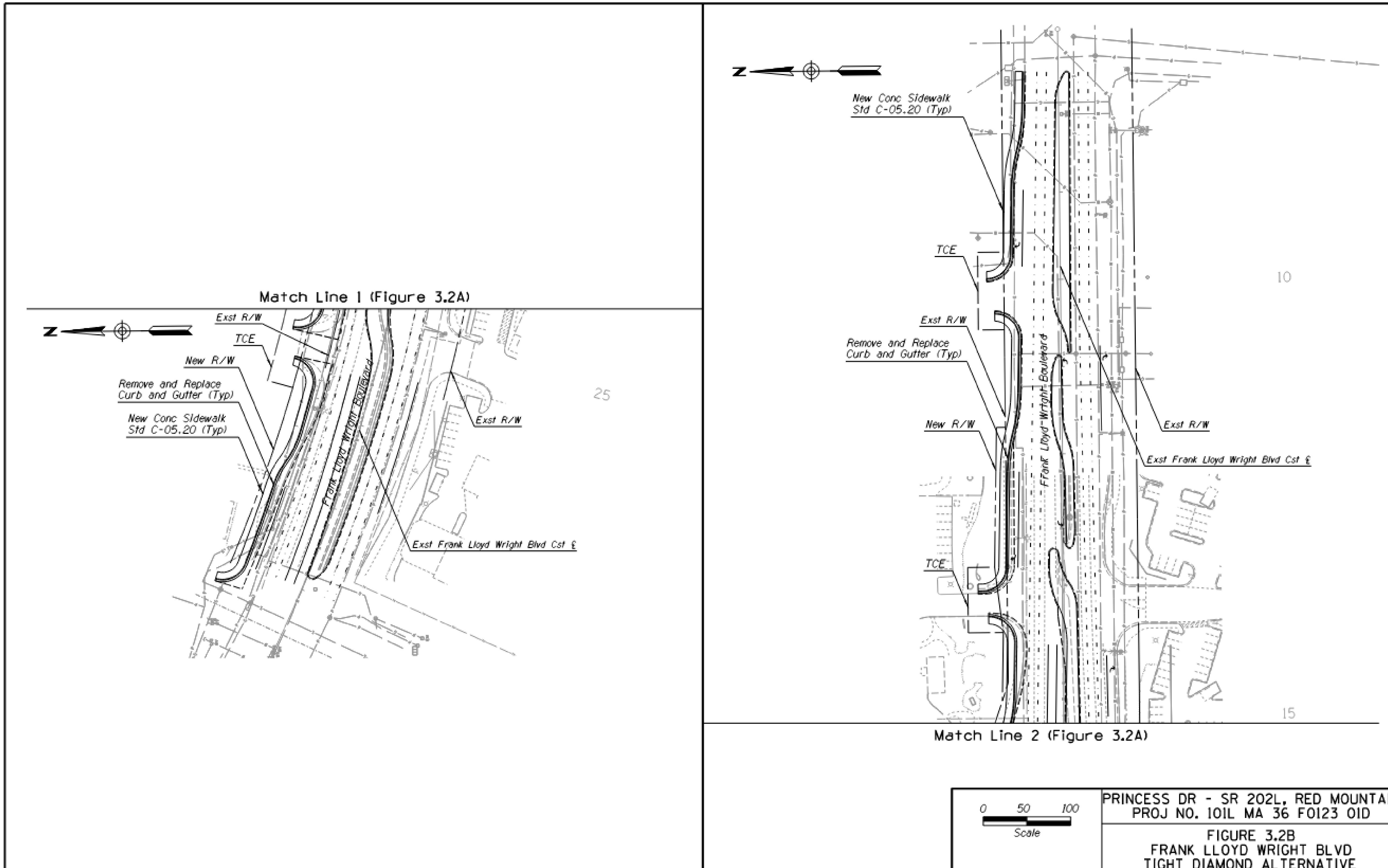


Figure 3.2B – Frank Lloyd Wright Boulevard Tight Diamond Interchange

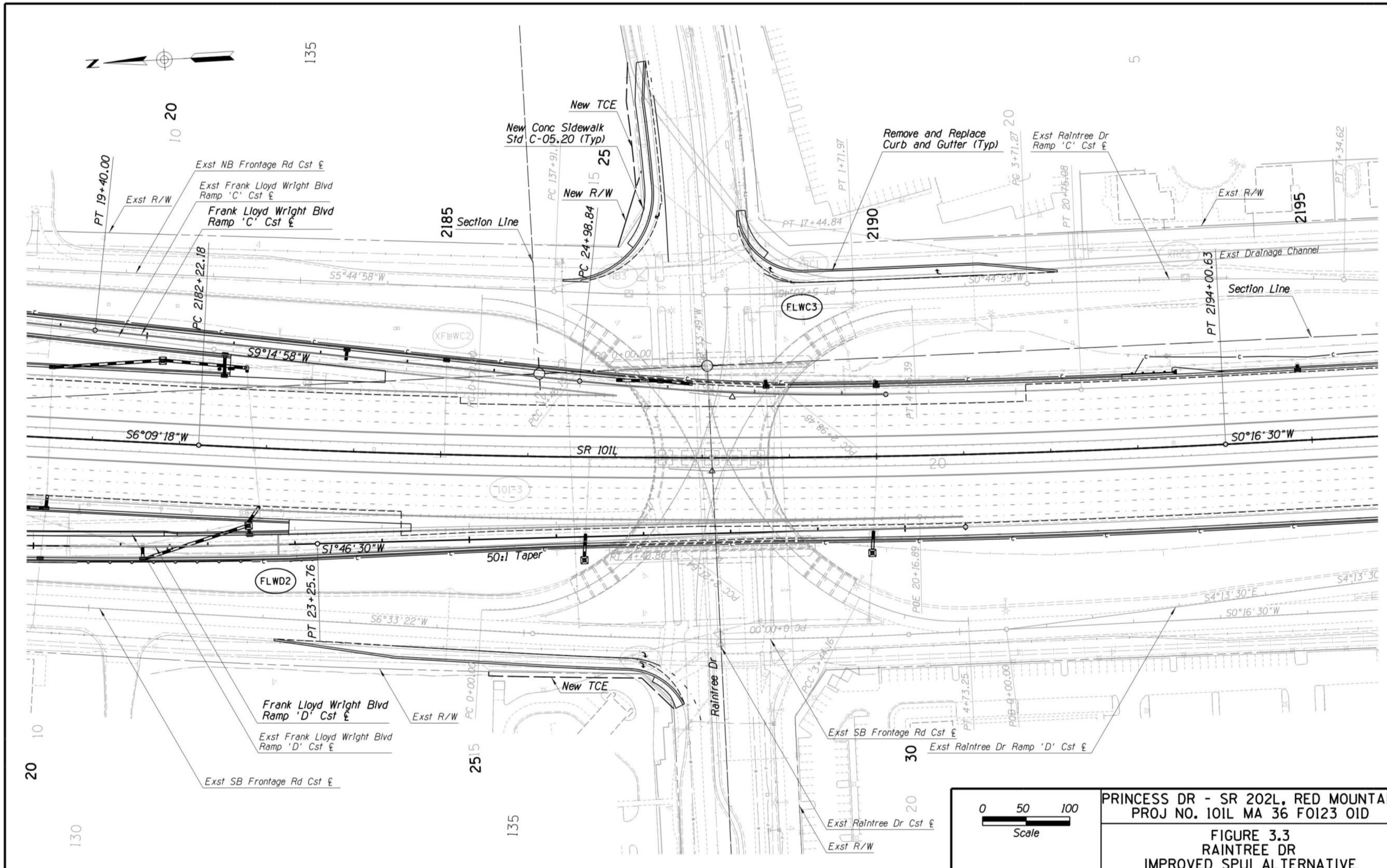


Figure 3.3 – Raintree Drive Improved Single-Point Urban Interchange

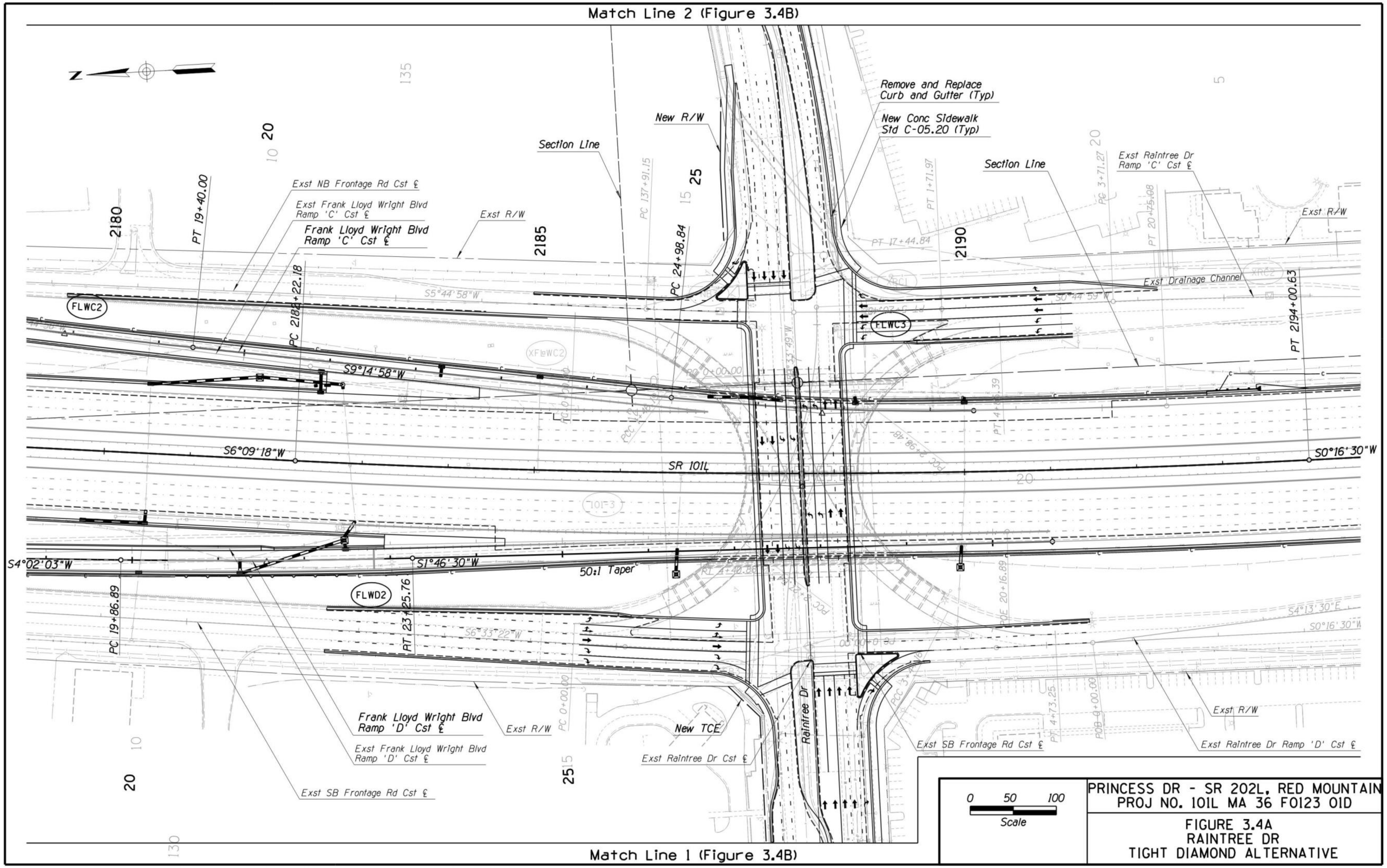


Figure 3.4A – Raintree Drive Tight Diamond Interchange

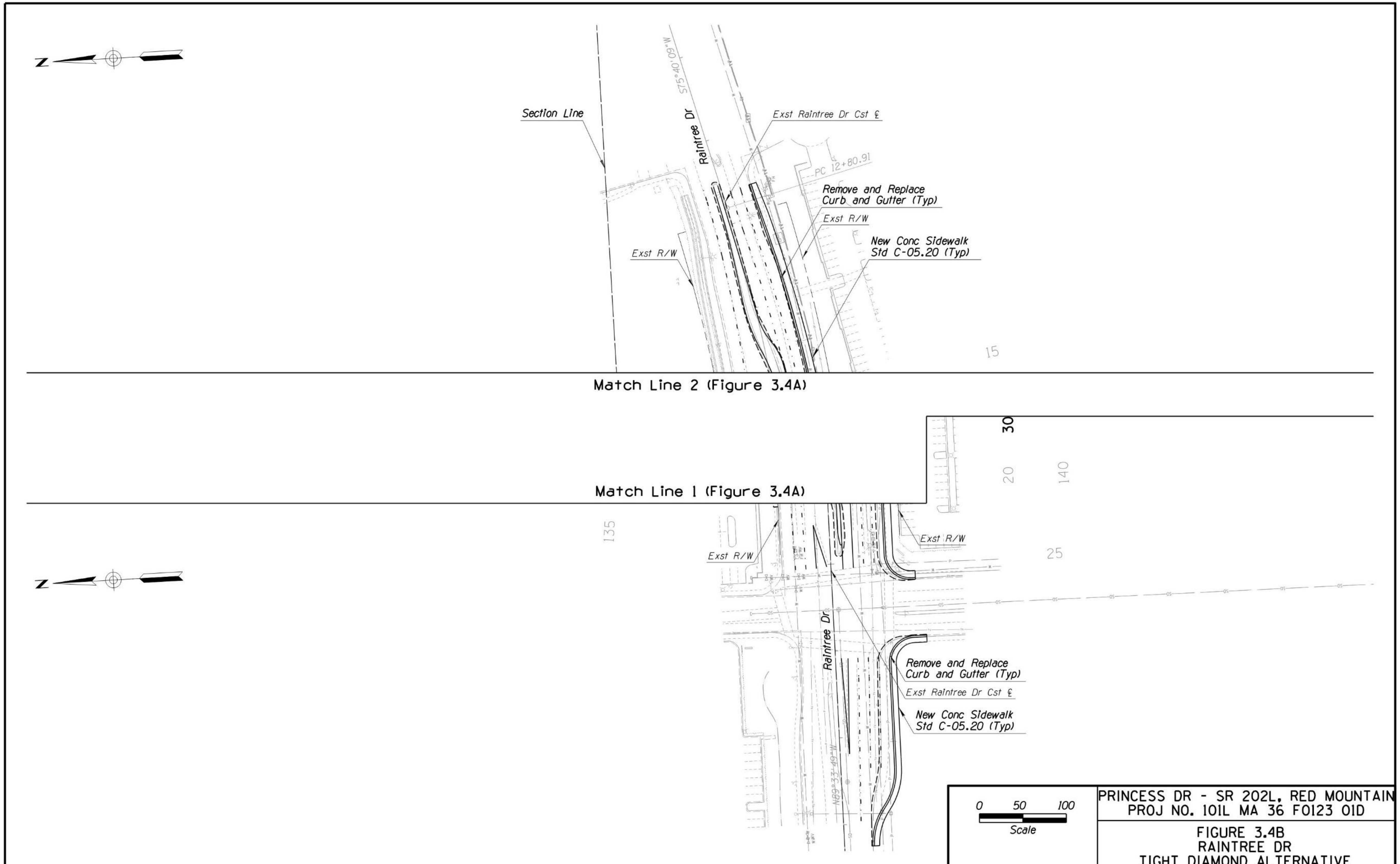


Figure 3.4B – Raintree Drive Tight Diamond Interchange

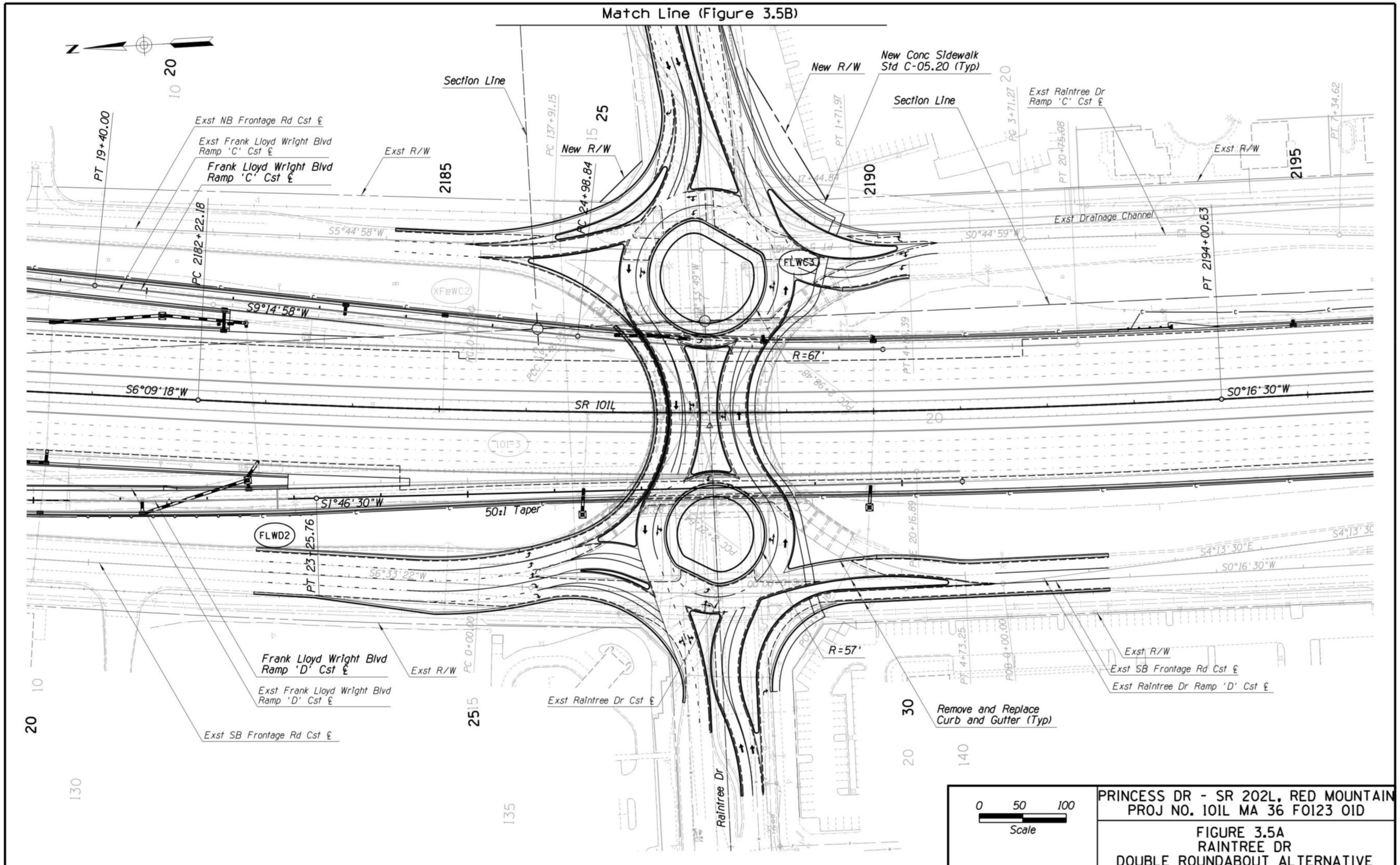


Figure 3.5A – Raintree Drive DRI

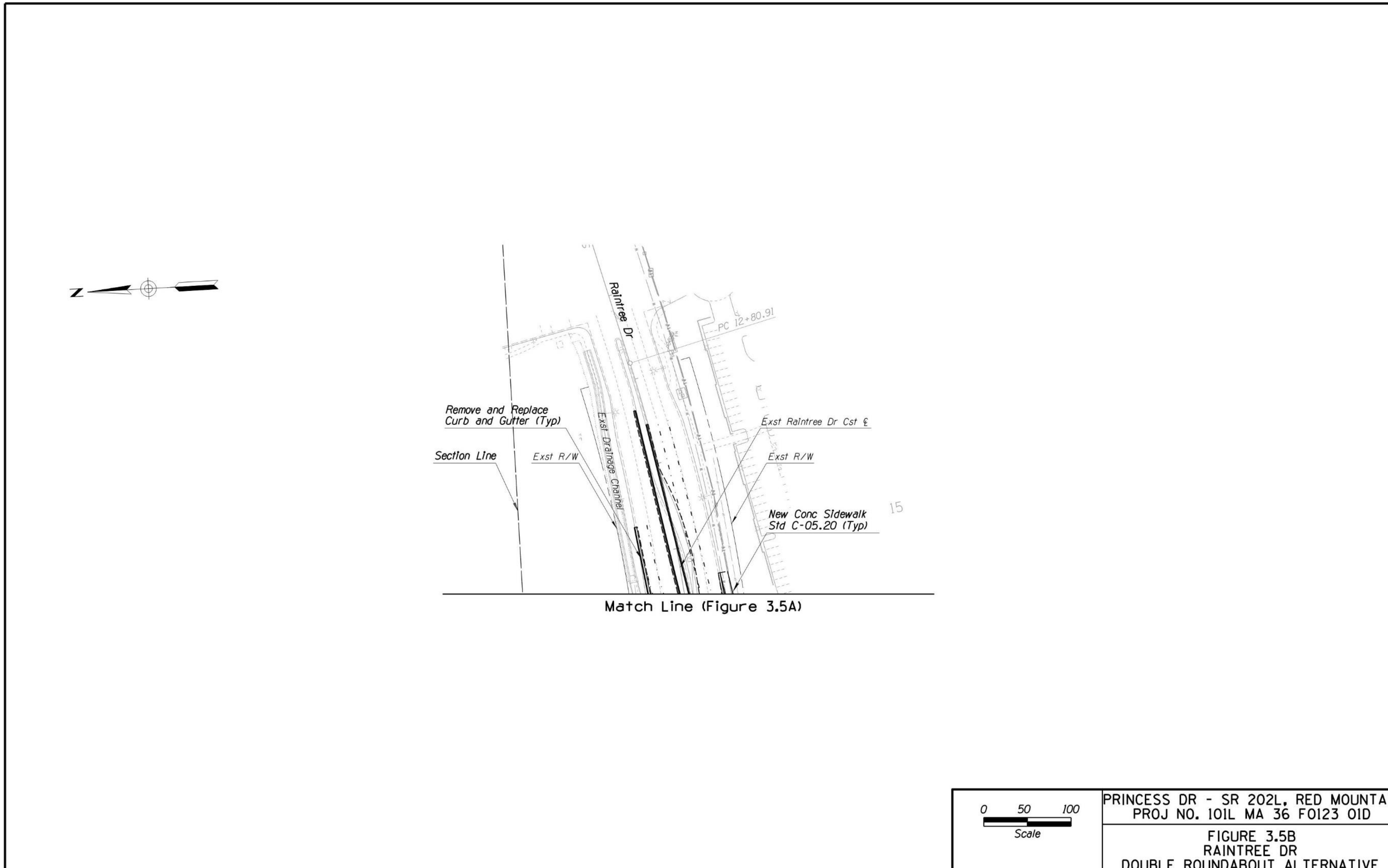


Figure 3.5B – Raintree Drive DRI

4. MAJOR DESIGN FEATURES OF THE RECOMMENDED ALTERNATIVE (GENERAL PURPOSE LANE WIDENING)

4.1. DESIGN CONTROLS

See ADOT 2010 DCR Section 4.1, except that the design year has been updated to 2040.

4.2. SR 101L WIDENING ROADWAY CONFIGURATION

SB SR 101L Mainline

A design concept was developed to construct one additional GPL on SR 101L from Princess Drive to SR 101L/SR202L TI as is presented in the 2010 ADOT DCR, Appendix G. Preliminary plans for the auxiliary lane at Shea Boulevard Ramp B on SB SR 101L are presented in **Appendix C**.

The Shea Boulevard existing SB exit ramp would be designed with a tapered exit configuration from the outside GPL. Four GPL and one HOV lane would continue to the south. Due to constraints caused by existing combination/specialty wall at the Shea Boulevard Ramp B on the outside of the ramp, the SB roadway section would be transitioned to provide a 10’ median shoulder, 12’ HOV and GPL, a 12’ to 1’ outside shoulder transition just north of Ramp B, and then returning to 10’ between the Shea Boulevard TI exit and entrance ramps. See also ADOT 2010 DCR Section 4.2.

4.3. HORIZONTAL AND VERTICAL ALIGNMENTS

The preliminary plan and profile sheets for the updated Shea Boulevard Ramp B is provided in **Appendix C**. See also ADOT 2010 DCR Section 4.3.

4.4. ACCESS CONTROL

See ADOT 2010 DCR Section 4.4.

4.5. RIGHT-OF-WAY

The corridor has additional right-of-way acquired as part of previous projects which would be turned back to the City of Scottsdale near Frank Lloyd Wright and Bell Road.

See also ADOT 2010 DCR Section 4.5.

4.6. STRUCTURES

4.6.1. Introduction

Four mainline overpasses will be widened to accommodate the additional new GPLs and auxiliary lanes associated with the Build Alternative. The overpasses that would be widening include the following structures:

- Pima Road TI Overpass (Structure No.1459 & 2656, MP 36.59)
- Bell Road TI Overpass (Structure No. 2510 & 2511, MP 37.06)
- CAP Canal Bridge (Structure No. 2506 & 2507, MP 37.66)
- Frank Lloyd Wright TI Overpass (Structure No. 2505 & 2512, MP. 37.78)

The existing underpasses shown below would not be modified as a result of the proposed improvements. There are five underpass structures with two structures founded on stub abutments with slope paving, and the other three structures founded on full-height abutments. Retaining walls may be necessary adjacent to the abutments of the underpasses to accommodate the additional freeway lane. Although the Shea Boulevard underpass structure has full-height abutments like Frank Lloyd Wright Boulevard TI and Cactus Road TI, they still may limit the amount of roadway widening at this location.

- Raintree Drive TI Underpass (Structure No. 2501, MP 38.59)
- Thunderbird Road Underpass (Structure No. 2504, MP 39.05)
- Sweetwater Ave. Equestrian Underpass (Structure No. 2503, MP 39.55)
- Cactus Road TI Underpass (Structure No. 2502, MP 40.09)
- Shea Boulevard TI Underpass (Structure No. 2480, MP 41.10)

See also ADOT 2010 DCR Section 4.6.1.

4.6.2. Possible Bridge Widening Alternatives

See ADOT 2010 DCR Section 4.6.2.

4.6.3. Design and Constructability Requirements

Bridge Barriers

All of the SR 101L mainline bridges within the project limits would use a 38” Single Slope Bridge Concrete Barrier at the edge of the bridge deck per ADOT Standard Detail SD 1.10. These bridges do not warrant a 42” Single Slope Concrete Barrier as they do not pass over another freeway.

Concrete Strength

Normal weight precast, prestressed concrete members shall have a maximum 28-day compressive strength (f`c) of 9,000 psi. Normal weight cast-in-place post-tensioned box girder bridges shall have a maximum 28-day compressive strength (f`ci) of 6,000 psi.

Design Code

All of the widened bridges will be designed following *ADOT Bridge Practice Guidelines* and *AASHTO Load and Resistance Factor* Design *(LRFD) Bridge Design Specifications, 8*th *Edition with interims*.

Design Loads

The widened structures shall be designed with following HL-93 loading with provisions for an additional 25 pounds per square foot of deck area for a future wearing surface.

See also ADOT 2010 DCR Section 4.6.3.

4.6.4. Evaluation of Existing Structure Widening Alternatives

See ADOT 2010 DCR Section 4.6.4.

4.7. RETAINING WALLS, NOISE WALLS, AND BOX CULVERTS

See ADOT 2010 DCR Section 4.7.

4.7.1. Retaining Walls

Shea Boulevard Ramp B Wall

The existing Shea Blvd Ramp B wall (Wall No. SH-W1) is a combination/specialty wall located along the western edge of Ramp B. This wall has extensive and unique rustication patterns and colors. During final design this wall will remain intact. Delete Shea Ramp B, Wall R17, from Table 27 in the ADOT 2010 DCR. See also ADOT 2010 DCR Section 4.7.1 for other walls applicable to this project

4.7.2. Noise Walls

Shea Boulevard Ramp B Wall

The existing Shea Blvd Ramp B wall (Wall No. SH-W1) is a combination/specialty wall located along the western edge of Ramp B. This wall has extensive and unique rustication patterns and colors. During final design this wall will remain intact. Delete Shea Ramp B, Wall N2, from Table 28 in the ADOT 2010 DCR. See also ADOT 2010 DCR Section 4.7.2 for other noise walls applicable to this project.

4.7.3. Box Culverts

See ADOT 2010 DCR Section 4.7.3.

4.8. DRAINAGE

See ADOT 2010 DCR Section 4.8.

4.9. EARTHWORK

The earthwork required for the project mainline widening and ramps would include approximately 89,006 cubic yards of excavation and 150,620 cubic yards of embankment. Applying a 15% shrink factor, the project therefore requires import of approximately 74,965 cubic yards.

4.10. TRAFFIC DESIGN

4.10.1. Signing and Pavement Marking

See ADOT 2010 DCR Section 4.10.1.

4.10.2. Traffic Signals

See ADOT 2010 DCR Section 4.10.2.

4.10.3. Lighting

The existing continuous freeway lighting utilizes high pressure sodium (HPS) fixtures throughout the project limits. These fixtures will be removed and replaced with 3000K correlated color temperature (CCT) light-emitting diode (LED) fixtures. The existing median poles with dual high-mast LED fixtures will be sufficient to illuminate the widened roadway. Where existing ramp light poles conflict with the proposed alternative, new aluminum type H and type T poles will be installed with 3000K CCT LED fixtures.

The lighting levels for this project are based on the American National Standard Practices for Roadway Lighting ANSI/IES RP-8-00 (2000). This publication identifies nationally recognized design criteria for roadway lighting and has been adopted by ADOT. Listed in AASHTO (1984) An Information Guide for Roadway Lighting, is the following criteria that was utilized for lighting analysis:

- Average maintained horizontal illuminance: 0.6 to 0.8 foot-candles (fc)
- Minimum illuminance: 0.2 foot-candles
- Average to minimum uniformity ratio: 3:1 to 4:1
- Light loss factor (LLF): 0.80

The existing Type-IV lighting load centers are unmetered and new electrical meters will be added to convert them to metered services. See also ADOT 2010 DCR Section 4.10.3.

4.10.4. Freeway Management System

The existing Freeway Management System (FMS) includes an integrated system of Dynamic Message Signs (DMS), pull boxes, mainline detectors, closed-circuit television (CCTV) cameras, and ramp meters placed throughout this segment of the SR 101L corridor. These FMS features are connected to the ADOT Traffic Operation Center (TOC) by fiber optic cable using 3-3" conduits that are located along the NB side of the SR 101L freeway. These FMS devices and pathways will be required to be relocated within the limits of the freeway widening. The existing ramp meter detection for FLW NB on-Ramp consists of in-pavement detection pucks with wireless. This detection system will be replaced with the ADOT standard sawcut detection loops communications to the ramp meter cabinet.

The current FMS Design Guidelines will require the removal, replacement, and addition of the following FMS devices and pathways along this segment of the SR 101L corridor:

- Remove and replace existing CCTV cameras to provide full 100% coverage of SR 101L, TI crossroads, and DMS within project limits
- Remove the existing Tubular Frame DMS Structures and install new DMS Butterfly Structures at the following locations: Raintree Drive TI, Cactus Road TI, and Shea Boulevard
- Remove and replace the existing ramp meters detection at every on-ramp location with new sawcut pavement loops
- Replace existing ramp meter controllers with adaptive ramp meter controllers
- Addition of wrong-way detection at every off-ramp location with cabinet and illuminated wrong way sign
- Remove and replace existing FMS conduit pathways and trunkline fiber optic cabling along the NB side of the SR 101L
- Remove and replace the existing Scottsdale fiber optic cabling and branch cables connected to each TO traffic signal

The existing FMS system must always remain operational during the construction of this project and will be removed once the new FMS system is tested and accepted by ADOT. A temporary ITS system should be designed to maintain the FMS backbone cable, critical networks, and communications to existing DMS, CCTV cameras, and City of Scottsdale traffic signal cabinets.

4.11. CONSTRUCTON PHASING AND TRAFFIC CONTROL

See ADOT 2010 DCR Section 4.11.

Smart Work Zone

A queue warning smart work zone would be beneficial during full closures where queues on mainline SR 101L may occur outside of typical times and may catch drivers unaware. Queue warning systems comprise portable, trailer-mounted radar sensors connected wirelessly to one or more changeable message boards. When traffic speeds slow, the system will illuminate the changeable message board with a message warning incoming drivers of slow traffic ahead. This system should conform to the Manual on Uniform Traffic Control Devices (MUTCD) with Arizona Supplement, the ADOT Traffic Control Design Guidelines, and Section 710 of the ADOT Standard Specifications.

It is anticipated that this construction will be considered a significant project and that a Transportation Management Plan (TMP) will be needed. The TMP will include a temporary traffic control plan that is compliant with the 2009 MUTCD and the Arizona Supplement to the MUTCD, a traffic operations component that identifies strategies to mitigate impacts of the work zone on the operation and management of the transportation system, and a public information component that includes strategies to inform affected road users, the general public, area residences and businesses, and appropriate public entities about the project, the expected work zone impacts, and the changing conditions of the project. The selected communications method(s) should include project characteristics, expected impacts, closure details, and commuter alternatives.

4.12. UTILITY COORDINATION

The mainline utility conflicts are summarized in the original 2010 DCR. Utility relocations and adjustments will be required to accommodate the proposed improvements. No new manholes shall be located within the PCCP areas unless approved by ADOT. See also ADOT 2010 DCR Section 4.12.

4.13. GEOTECHNICAL AND PAVEMENT DESIGN

4.13.1. Modification of Bridge Structures

With respect to the widening of bridge structures, the site soils are generally considered to be well suited for the use of either shallow spread foundations or drilled shaft foundations. Spread footings should provide adequate support for widened structure elements which are currently supported on shallow foundations, and which would not be subjected to scour. Allowable bearing pressures of 3 to 6 ksf would be anticipated for shallow spread foundations supported on the finer grained surficial soils. Drilled shaft foundations would derive significant support (both in shear and end bearing) from the very firm to hard, fine grained soils present at depth.

Table 4.1 provides a listing of the structures to be widened, the existing foundation conditions and expectations for foundations required for the widened structures.

4.13.2. Retaining Wall Structures

Numerous retaining or noise barrier walls exist along the subject project alignment. The majority of walls are supported on spread footings founded within the firm to very firm alluvial soils present along the project alignment. Retaining walls, either supported by drilled shaft foundations or constructed as soil-nail walls exist at or near the Shea Boulevard TIUP.

The majority of new walls can likely be constructed as standard walls with spread footings at relatively low to moderate allowable soil bearing pressures. Variations of the actual wall types selected will likely be based more upon constructability versus soil conditions. Standard wall footings should be constructible provided the new walls are located a sufficient distance from existing walls (laterally and vertically). In areas of deep cut and/or limited right of way, such as near Shea Boulevard, other types of walls, including soil-nail and drilled shaft (with or without tie- backs) should work based on the soil conditions and previous history of those types of walls being constructed in that area. Other spread-footing types, such as L-footings may be used in areas where excavations behind the walls need to be limited, but that otherwise favorable soil support conditions exist. The use of drilled shafts may be preferred in some locations depending on proximity to existing structures and in isolated areas as dictated by poor subgrade conditions. Other special design walls, such as L-shaped footing walls, may be needed due to the proximity of new walls to existing structures.

Table 4.1 – Summary of Existing and Preliminary Recommended Foundation Types for Widened SR 101L Bridges

Bridge	Existing Foundations	Recommended Foundation for Widening	Comments
Pima Road TI OP	Abutments on Drilled Shafts, Piers on Spread Footings	Abutments on Drilled Shafts, Piers on Spread Footings	Shafts and Footings to be founded in firm to hard soils below 10'
Bell Road OP	Abutments on Drilled Shafts, Piers on Spread Footings	Abutments on Drilled Shafts, Piers on Spread Footings	Shafts and Footings to be founded in firm to hard soils below 10'
CAP Canal Bridge	Abutments and Piers On Drilled Shafts	Abutments and Piers on Drilled Shafts	Shafts to be founded in firm to hard soils below 5' to 10' at abutments, below 10' to 30' at the piers
Frank Lloyd Wright Boulevard TI OP	Abutments on Spread Footings	Abutments on Drilled Shafts	Shafts to be founded in firm to hard soils below 12'

From a preliminary basis and with concurrence from ADOT Roadway, it is recommended that the widening of the SR 101L mainline pavements match the adjacent existing HOV structural pavement section for mainline and existing ramp & gore sections. ADOT is exploring an option for smoothing the ride along freeways where the asphalt rubber – asphaltic concrete friction course (AR-ACFC) has deteriorated. Diamond grinding is a pavement smoothing technique for preserving and rehabilitating the PCCP pavement surface and is anticipated on this project in lieu of AR-ACFC. Table 4.2 provides the recommended pavement structural sections.

Table 4.2 – Preliminary Recommended Pavement Structural Sections by Location

Location	AB (Class 2) (inches)	ACB (inches)	Plain PCCP (inches)	TOTAL (inches)
Mainline SR 101L (Elevated)	4	-	12.0*	16.0*
Mainline SR 101L (Depressed)	-	4	12.0*	16.0*
Ramps	4	-	10.0*	14.0*
Gores	4	-	10.0	14.0

*PCCP will be diamond grinded

4.14. SCOTTSDALE AIRPORT COORDINATION

See ADOT 2010 DCR Section 4.14.

4.15. FUTURE HOV CONNECTOR RAMPS

This section does not apply to this project.

4.16. LANDSCAPE ARCHITECTURAL DESIGN, CONSTRUCTION, AND MAINTENANCE

New landscape, irrigation components, landform graphics, and aesthetic treatments will be required to restore the landscape area after roadway construction and to create a context-sensitive, integrated, and cohesive visual experience through the corridor. The goal for landscape and aesthetics is to preserve and restore to the original design intent, adapt to meet the new available spaces, and maintain the level of quality and density as documented in the original design for all landscape areas.

Planting Materials

Within the project limits, all salvageable Saguaro, Barrel Cacti, Ocotillos, and specimen native tree species with a caliper of 4 inches or greater, measured 6 inches above existing ground, that will be impacted by construction activities shall be identified, salvaged, and incorporated back into the final planting design. During the final design stage, the Consultant may coordinate with the ADOT Project Manager, in cooperation with ADOT Roadside Development, on the salvageability of existing trees. Should ADOT determine that salvageability of existing trees is not required, minimum 15-gallon nursery grown trees shall be proposed.

The overall plant palette developed for this project shall be comprised of plant species that match the types, size, and quality of the plant materials included in the original project record drawings. Trees shall be used in mass plantings and groups, where possible, to provide vertical structure and relief, vegetative texture and accent, and seasonal interest, while breaking up the monotony of the horizontal plane. Tree plantings (deciduous and evergreen) shall be used to focus desirable views while screening undesirable ones. Shrubs (deciduous and evergreen) shall be planted in masses of like variety and shall be used to provide a year-round layer of texture and color that shall serve to articulate the ground plane and provide intermediate vertical relief. Flowering shrubs and accent plantings shall be used to accentuate notable features and to highlight major intersections or changes in movement. When limited right-of-way is available, mass plantings of shrubs/accents shall be provided.

Topsoil

The top 2 feet, at a minimum, of existing topsoil shall be removed from the landscape areas and stockpiled for future reuse within the project limits. The existing topsoil will need to be tested and amended, as required, to comply with Section 806-2.05 of the ADOT Standard Specifications. Should an alternative material, such as asphalt millings, be used as part of the embankment material, topsoil plating shall be installed to a depth of 4 feet to provide enough appropriate medium for plant growth.

Decomposed Granite and Granite Mulch

All landscape areas shall be plated with inert materials (decomposed granite, granite mulch, and rock mulch). Granite mulch shall be placed in ADOT-maintained portions of the project; decomposed granite shall be placed in the portions maintained by the City of Scottsdale. All inert material type shall be new and from a single source to ensure uniformity of color. Within ADOT maintained landscape areas, the acceptable selection of granite mulch shall be Cheyenne, 1-1/4" minus, from Pioneer Landscape Materials, as established in the Certification Letter for single source granite mulch (Appendix H). Within the City of Scottsdale maintained areas along the cross streets, the acceptable colors for consideration shall be Coral. Where existing granite mulch and decomposed granite is not disturbed by construction activities, these areas shall be top dressed with new granite mulch and decomposed granite to a minimum depth of one inch for consistency of material within the landscape areas. Top dressed and newly plated granite mulch and decomposed granite areas shall be blended together to create a uniform appearance.

Maintaining Existing Landscape and Irrigation During Construction

Continuous maintenance of existing landscape plantings and existing landscape irrigation systems will be required during both the Construction Phase and the Landscape Establishment Phase of the project. Areas to be maintained shall extend from the project beginning limits to the project end limits, from right-of-way to right-of-way. Landscape shall be routinely maintained on a monthly or bi-monthly basis, maintained to preconstruction conditions. The care for all existing planting stock shall be in accordance with acceptable horticultural practices; replacing any dead or damaged plant material; keeping areas free of weeds, grasses, and construction related debris; repairing erosion issues; applying all irrigation water; repairing public or weather related damage; furnishing and applying sprays, dust, and/or cages to combat vandalism, disease, insects and other pests; and the testing, adjusting, repairing, and operating of irrigation systems.

The control of weeds shall be accomplished either with herbicides or by manual methods. The types of herbicide to be used and the methods of application shall conform to Environmental Protection Agency (EPA) requirements and labeling instructions.

Landform Graphics

New landform graphics will be required to replace the existing landform graphics located on the west side of SR 101L, between Shea Boulevard and Cactus Road. Existing landform graphics shall be documented for size, location, dimensions, configuration, position, material type, and colors. New landform graphics shall match the original replacement in material types, color, form, shape, and configuration, but may be proportionally adjusted in size, location, and dimensions on the slope to work within the available area and to maximize the visual appearance after roadway construction. Some adjustments in orientation and shape may be required to fit within the available space.

Aesthetics

Rustication is considered an aesthetics treatment. Rustication is defined as any change in the pattern or texture of a built structure as compared with a standard smooth finish. All new structures within the project limits shall receive rustication as an aesthetics treatment. Existing rustication shall be documented for dimension, shape, orientation, texture, depth, and color. New rustication treatments shall match the original treatment in material, color, form, shape, and configuration, but may be proportionally adjusted in size, location, and dimension to work within the available canvas area of the new structure to maximize the visual appearance after construction.

Rustication patterns shall be constructed in a manner so that no joints or seams are visible within the pattern at any locations other than the required construction joints as provided in the final construction details. The rustication patterns shall be constructed through the use of full-size form liners (as well as any mockups) and shall be constructed using a type of construction that matches the original project. The final rustication pattern shall be uniform, smooth, free of any secondary vertical and horizontal seams, and shall be one unit from top of wall to bottom of wall for the full length of one full-size panel (approximately 28-ft – 30-ft). No 8-ft x 10-ft, 4-ft x 8-ft, etc. or similarly sized non-full wall height form liner panels will be acceptable. Masking with paint or other filler material will not be acceptable.

Paint colors shall match the control set as provided by ADOT Roadside Development. This is an updated control set from the original project, based on color selections from the SR 101L, Shea Blvd – SR 202L, Red Mountain project (Project No. 101 MA H6874 01C). Paint color brand may be Sherwin Williams, Dunn Edwards, PPG, or approved equal, so long as the paint colors demonstrate equivalent color effects with the control set.

Irrigation

Landscape areas shall be irrigated by means of an automatic non-pressure compensating drip emitter system for ADOT landscaping. The irrigation design shall distribute water to all existing protected in place plants, salvaged and replanted plants, and new nursery stock plants installed throughout the Project Limits.

Irrigation system components shall be replaced, upgraded, or repaired at each of the existing irrigation points of connection, at multiple locations as shown in Appendix G.

Maintenance Responsibilities

The City of Scottsdale shall maintain all landscape, equestrian trail, and aesthetic features, as identified and in accordance with the current IGA/JPA 00-207. Any improvements and additions to the freeway aesthetics requested by the City of Scottsdale shall be paid for by the City of Scottsdale at the time of construction. Maintenance of aesthetic improvements and additions requested by the City of Scottsdale shall be maintained by the City of Scottsdale.

5. MAJOR DESIGN FEATURES OF THE RECOMMENDED ALTERNATIVES (TRAFFIC INTERCHANGES)

The design alternative presented in Section 5 and Appendix H of the ADOT 2010 DCR is no longer being considered for this project. The section is modified in its entirety for the preferred TI alternatives outlined within this DCR Update.

5.1. MAJOR DESIGN FEATURES OF THE PRINCESS DRIVE RECOMMENDED ALTERNATIVE

5.1.1. Design Controls

See ADOT 2010 DCR Section 4.1, except that the design year has been updated to 2040.

5.1.2. Roadway Configuration

Improvements at the Princess Drive TDI include triple left-turn lanes extended approximately 500' feet to the east along Princess Drive to add additional storage/capacity. This alternative will require the existing center median island to be reduced on the east side of SR 101L and widened on the west side of SR 101L as presented in **Appendix C**. The existing roadway width already accounts for this third lane and is currently not in use. With this configuration the median west of the TI requires minor modification, and the median east is reconstructed to add additional storage for all three left turn lanes and restriping as required to tie to existing conditions.

5.1.3. Horizontal and Vertical Alignments

The Princess Drive horizontal and vertical alignments and approach lanes would be retained in their current diamond configuration.

5.1.4. Access Control

Commercial development surrounds the Princess Drive TI. Full access control is provided east of SR 101L and west of the Princess Drive SB entrance ramp. Driveways are located 520' west of Princess Drive SB exit ramp, which does not meet current access control guidelines. Existing access control will be maintained in accordance with ADOT and FHWA Access Control Policy requirements along Princess Drive.

5.1.5. Right -Of-Way

No new right-of-way is anticipated with the implementation of this alternative.

5.1.6. Structures

The widening of the Princess Drive TI Overpass does not impact this TI alternative. No additional structures are anticipated with this alternative.

5.1.7. Retaining Walls, Noise Walls, and Box Culverts

No additional walls, noise walls, or box culverts are anticipated to be impacted with this alternative.

5.1.8. Drainage

No drainage facilities are impacted by this alternative.

5.1.9. Traffic Design

5.1.9.1. Signing and Pavement Marking

See ADOT 2010 DCR Section 4.10.1.

5.1.9.2. Traffic Signals

Traffic signal heads may require modification of location or additional heads added for the triple left-turn lanes and shifted through lanes. This may be needed on both sides of SR 101L.

5.1.9.3. Lighting

No changes to the existing lighting layout are anticipated with the proposed changes.

5.1.10. Utility Coordination

The extension of the WB left turn bay may require median reconstruction under the adjacent SRP overhead power lines from Station 23+00 to Station 26+00. During final design the plans should be submitted to SRP to verify overhead clearances are maintained and a Consent To Use Agreement issued prior to construction.

At Station 30+66.62, there is a City of Scottsdale sewer manhole within the existing median on the right. The proposed improvements will reduce the median width at this location and result in the manhole being located at the stripe line. The manhole rim and lid will need to be lowered to grade.

5.2. MAJOR DESIGN FEATURES OF THE FRANK LLOYD WRIGHT BOULEVARD TI RECOMMENDED ALTERNATIVE

5.2.1. Design Controls

See ADOT 2010 DCR Section 4.1

5.2.2. Roadway Configuration

The existing TI at Frank Lloyd Wright Boulevard would be reconstructed to a TDI while meeting current AASHTO and Roadway Design Guidelines and standards.

5.2.3. Horizontal and Vertical Alignments

The Frank Lloyd Wright Boulevard horizontal and vertical alignments would be retained in their current configuration. Existing pavement will be used, and new pavement added to achieve the SPUI to TDI conversion. The left-turn lane extended storage and the tie-ins to the existing condition would require reconstruction and right-of-way near neighboring development as depicted on Figure 3.2A and B.

Preliminary plans are provided in **Appendix C** for the recommended alternative which include the horizontal geometry for the existing Frank Lloyd Wright Boulevard and interchange ramps.

5.2.4. Access Control

Commercial development surrounds the Frank Lloyd Wright Boulevard TI. Driveways are located 185' west and 280' east of SR 101L, which does not meet current access control guidelines. Existing access control will be maintained in accordance with ADOT and FHWA Access Control Policy requirements along Frank Lloyd Wright Boulevard.

5.2.5. Right-of-Way

The locations and areas of anticipated right-of-way and TCE acquisition are shown in **Table 5.1**

Table 5.1 – Anticipated Frank Lloyd Wright TI R/W and TCEs

Parcel	Ownership	Parcel Total Area (Ac)	Acquisition Area (Ac)	TCE Area (Ac)
215-51-001R	Vans Golf Properties LLC	1.18	0.080	0.000
215-51-022	FLW and Pima Plaza LLC	3.10	0.290	0.097
217-13-037H	FLW 101 LLC	4.26	0.071	0.157

5.2.6. Structures

The widening of the Frank Lloyd Wright Boulevard TI Overpass (Structure No's. 2505 and 2512) will not conflict with the TDI as shown on Figure 3.1.

5.2.7. Retaining Walls, Noise Walls, and Box Culverts

To reduce the impacts to neighboring development, the NB off-ramp is shifted to the west near the existing retaining wall. An additional wall or barrier would be needed to retain the impacted existing fill slope between the mainline and ramp. No additional walls, noise walls, or box culverts would be anticipated with this alternative.

5.2.8. Drainage

5.2.8.1. Off-Site Systems

This alternative does not include any off-site drainage analysis or modifications to existing drainage patterns.

5.2.8.2. On-Site Systems

Frank Lloyd Wright Boulevard will retain the existing longitudinal slope and cross slope. The reconfiguration would have major impacts to existing drainage systems due to the conversion to a TDI. Catch basins within the median islands would need to be relocated or removed. Impacts to storm drain are also along the north side of the roadway as the roadway would be widened. Reconnection of these storm drain systems is required.

5.2.9. Traffic Design

5.2.9.1. Signing and Pavement Marking

See ADOT 2010 DCR Section 4.10.1

5.2.9.2. Traffic Signals

Widening of the bridge on SR 101L over Frank Lloyd Wright Boulevard and the realignment of the off-ramps and porkchop islands would necessitate new traffic signal poles for the NB and SB off-ramps along with new signal heads mounted on the bridge fascia. The existing controller and meter pedestal can be reused with new conduit, pull boxes, and conductors.

5.2.9.3. Lighting

Existing jurisdictional lighting would be relocated for the arterial conversion to a TDI.

5.2.10. Construction Phasing and Traffic Control

Construction of the bridge widening on SR 101L at Frank Lloyd Wright Boulevard will impact the traffic signal heads mounted to the existing bridge fascia. Temporary traffic signals will be necessary for the east and west cross street approaches, along with the NB and SB SR 101L off-ramp approaches. Temporary signal poles can be placed in the portion of the porkchop medians that separate the through and left-turn movements at the frontage road intersections with Frank Lloyd Wright Boulevard.

It is anticipated that this construction will be considered a significant project and that a TMP will need to be developed. The TMP will include a temporary traffic control plan that is compliant with the 2009 MUTCD and the Arizona Supplement to the MUTCD, a traffic operations component that identifies strategies to mitigate impacts of the work zone on the operation and management of the transportation system, and a public information component that includes strategies to inform affected road users, the general public, area residences and businesses, and appropriate public entities about the project, the expected work zone impacts, and the changing conditions of the project. The selected communications method(s) should include project characteristics, expected impacts, closure details, and commuter alternatives. See also ADOT 2010 DCR Section 4.11.

5.2.11. Utility coordination

The proposed Tight Diamond TI improvements at Frank Lloyd Wright will require utility relocations and adjustments as described in the table below.

Table 5.2 – Anticipated Frank Lloyd Wright Utility Conflicts

Owner	Description	Quadrant/Location	Sta/Offset	Conflict/Mitigation
ADOT	Storm Drain Manhole	NW in existing median porkchop	21+19.58/ 75.97' Rt	In conflict with future sidewalk. Adjust to grade.
City of Scottsdale	Water Manhole and air release pipe.	NW Behind Sidewalk	23+04.65/ 67.48' Rt	In conflict with future curb and gutter. Relocate.
City of Scottsdale	Fire Hydrant	NW – Behind Curb Ramp	22+42.33/ 93.00' Rt	In conflict with future curb ramp. Relocate.
APS & CenturyLink	APS Transformer & CenturyLink	NW – Near Van's Golf Shops	27+50.00/ 75.00' Rt	In conflict with future sidewalk. Relocate.

Owner	Description	Quadrant/Location	Sta/Offset	Conflict/Mitigation
City of Scottsdale	Sewer Manhole	NW – Behind curb ramp at FLW/Hayden NE Corner	28+08.21/ 97.74' Rt; 28+37.97/ 85.03' Rt	In conflict with future pavement. Adjust to grade.
City of Scottsdale	Water Valve & Fire Hydrant	NW - In sidewalk ramp.	22+35.31/ 89.59' Rt	In conflict with future pavement. Adjust to grade/relocate.
City of Scottsdale	Water Valves	NW - East of DW No. 1	24+82.28/ 78.08' Rt	In conflict with future pavement.
City of Scottsdale	Water Valves	SE – In sidewalk	16+06.77 59.15' Lt; 16+07.00 52.54' Lt	In conflict with future sidewalk. Adjust to grade.
City of Scottsdale	Water Vault	SE – In sidewalk	16+26.95/ 55.87' Lt; 16+31.88/ 56.96' Lt	In conflict with future sidewalk. Adjust to grade.
APS	Electrical Manhole	SE In sidewalk	16+93.81/ 58.36' Lt	In conflict with future sidewalk. Adjust to grade.
City of Scottsdale/ APS/Zayo	Various cabinets /pedestals/boxes	SE Behind sidewalk ramp	17+50.00/ 80' Lt	Conflict with future sidewalk and grading.
City of Scottsdale	Sewer Manhole	NE West of DW No. 2 behind sidewalk	10+84.43/ 60.67' Rt	Conflict with sidewalk removal/grading. Adjust to grade.
City of Scottsdale	Backflow Preventors	NE Adjacent to overhead sign pole.	16+02.12 100.49' Rt	Conflict with future sidewalk and grading. Relocate/Adjust to grade.
Southwest Gas	Valves	NE Adjacent to driveways.	11+92.89/ 44.59' Rt; 11+92.87/ 52.94' Rt	In conflict with future pavement.
City of Scottsdale	Water Manhole	Located at existing bridge abutment	20+77.66/ 98.98' Lt	Potential conflict with future bridge widening.

5.2.12. Scottsdale Airport Coordination

See ADOT 2010 DCR Section 4.14

5.3. MAJOR DESIGN FEATURES OF THE RAINTREE DRIVE TI RECOMMENDED ALTERNATIVE

5.3.1. Design Controls

See ADOT 2010 DCR Section 4.1

5.3.2. Roadway Configuration

The updated capacity analysis within Section 2 of this report confirmed minor improvements are required in to increase the capacity at the Raintree Drive SPUI.

The alternative recommends the addition of three right-turn lanes:

- SB to WB on the SB exit ramp
- NB to EB on the NB exit ramp
- WB to NB on Raintree Drive

These are shown on the preliminary plans in **Appendix C**.

5.3.3. Horizontal and Vertical Alignments

The Raintree Drive horizontal and vertical alignments would be retained in their current configuration. Preliminary plans are provided in **Appendix C** for the recommended alternative, which includes the horizontal geometry for the existing Raintree Drive and interchange ramps.

5.3.4. Access Control

Commercial development surrounds the Raintree Drive TI. The full access control requirement is provided east of the Raintree Drive NB entrance ramp. Driveways are located 475' east of Raintree Drive NB exit ramp and 200' west of SR 101L, which does not meet current access control guidelines. Existing access control will be maintained in accordance with ADOT and FHWA Access Control Policy requirements along Raintree Drive.

5.3.5. Right-of-Way

The addition of a right turn lane would require new TCE. The locations and area of the anticipated TCE acquisition is shown in **Table 5.2**

Table 5.3 – Raintree Drive TI Anticipated TCEs

Parcel	Ownership	Parcel Total Area (Ac)	Acquisition Area (Ac)	TCE Area (Ac)
215-53-039C	Bank of America NA	1.54	0.000	0.026

5.3.6. Structures

The widening of the Freeway and improvements along Raintree Drive will not impact the existing Raintree Drive TI Underpass structure. No additional structures are anticipated with this alternative.

5.3.7. Retaining Walls, Noise Walls, and Box Culverts

No additional walls, noise walls, or box culverts would be anticipated with this alternative.

5.3.8. Drainage

5.3.8.1. Off-Site Systems

This alternative does not include any off-site drainage analysis or modifications to existing drainage patterns.

5.3.8.2. On-Site Systems

Raintree Drive will retain the existing longitudinal slope and cross slope. The addition of the right-turn lanes impacts catch basins within the median islands that would require relocation. Catch basins within the right-turn lane widening will also be reconfigured and reconnection of these storm drain systems is required.

5.3.9. Traffic Design

5.3.9.1. Traffic Signals

The improvements at Raintree Drive will require that the pedestrian signal in the southeast corner of the NB off-ramp be relocated. Work in this area will need to be performed to avoid impacting the traffic signal controller or meter pedestal.

5.3.9.2. Lighting

Existing jurisdictional lighting will be relocated for the arterial widening on the preferred TI alternatives.

5.3.10. Construction Phasing and Traffic Control

Traffic will be managed by detailed traffic control plans and by procedures and guidelines specified in Part VI of the current version of the MUTCD and by the Arizona Supplement to the MUTCD.

Construction of the ramp modifications at Raintree Drive can be accomplished utilizing single-lane closures with the exception of the widening of the channelized right-turn for WB traffic entering the NB on-ramp. This channelized right will need to be closed during construction. Temporary concrete barrier will be placed along the saw-cut lines on the ramps and traffic will utilize the existing striping where feasible. Some modification to pavement marking symbols and overhead lane use signing will be required while ramp lanes are closed.

It is anticipated that this construction will be considered a significant project and that a TMP will need to be developed. The TMP will include a temporary traffic control plan that is compliant with the 2009 MUTCD and the Arizona Supplement to the MUTCD, a traffic operations component that identifies strategies to mitigate impacts of the work zone on the operation and management of the transportation system, and a public information component that includes strategies to inform affected road users, the general public, area residences and businesses, and appropriate public entities about the project, the expected work zone impacts, and the changing conditions of the project. The selected communications method(s) should include project characteristics, expected impacts, closure details, and commuter alternatives.

5.3.11. Utility Coordination

At the northwest quadrant, the modifications to the SB exit ramp will result in two sewer lines, owned by City of Scottsdale, to be under the ramp concrete pavement for approximately 300-feet approaching the intersection. These sewer lines are already under the intersection concrete pavement. Survey of the existing sewer inverts and storm drain profiles will be needed during final design to determine if there are any conflicts with storm drain extensions and the existing sewer lines.

Century Link has an existing duct that run parallel in close proximity to the new curb line for the ramp. Utility designation to a quality level B and potholes will be required during final design to determine conflicts.

At the northeast quadrant, for the westbound right turn lane onto the NB SR 101L, the existing APS underground conduit may have to be relocated during construction. Utility designation to a quality level B and potholes will be required during final design to confirm conflicts.

There are existing communication lines along the existing curb return on the southeast quadrant of the intersection. These lines will need to be potholed during final design to determine if the construction of the widening will impact the lines.

Utility adjustments for the Raintree Modified SPUI are summarized in the table below:

Table 5.4 – Anticipated Raintree Drive Utility Conflicts

Owner	Description	Quadrant/Location	Sta/Offset	Conflict/Mitigation
City of Scottdale	Sewer Manhole	NW - West side of SR 101 SB offramp	134+61.37/ 34.02’ Rt	In conflict with proposed right turn lane. Adjust to grade.
City of Scottsdale/APS	Various Cabinets/Pedestals/ Boxes	SE - Behind sidewalk ramp	17+50/ 65.00’ Lt	In conflict with proposed sidewalk and grading. Relocate.

5.4. MAJOR DESIGN FEATURES OF THE SHEA BOULEVARD TI RECOMMENDED ALTERNATIVE

5.4.1. Design Controls

See ADOT 2010 DCR Section 4.1

5.4.2. SR 101L Widening Roadway Configuration

The updated capacity analysis within Section 2 of this report confirmed minor improvements are required in to increase the capacity at the existing Shea Boulevard SPUI.

The alternative recommends the addition a right-turn lane for WB to NB traffic that heads north on SR 101L.

5.4.3. Horizontal and Vertical Alignments

The Shea Boulevard horizontal and vertical alignments would be retained in their current configuration. Preliminary plans are provided in **Appendix C** for the recommended alternative which includes the horizontal geometry for the existing Shea Boulevard and interchange ramps.

5.4.4. Access Control

Commercial development surrounds the Shea Boulevard TI. The full access control requirement is provided west of the Shea Boulevard SB entrance ramp. Driveways are located 300’ west of Shea Boulevard SB exit ramp and 130’ east of SR 101L, which does not meet current access control guidelines. Existing access control will be maintained in accordance with ADOT and FHWA Access Control Policy requirements along Shea Boulevard.

5.4.5. Right-of-Way

The right-turn lane extended storage would require new TCEs. The locations and areas of anticipated right-of-way and TCE acquisition are shown in **Table 5.3**

Table 5.5 – Shea Boulevard Anticipated TCEs

Parcel	Ownership	Parcel Total Area (Ac)	Acquisition Area (Ac)	TCE Area (Ac)
217-25-989D	Wildwood Mobile Villa INC	1.20	0.000	0.013
217-25-989E	BRE LQ Properties LLC	3.38	0.000	0.018

5.4.6. Structures

No additional structures are anticipated with this alternative.

5.4.7. Retaining Walls, Noise Walls, and Box Culverts

No additional walls, noise walls, or box culverts would be anticipated with this alternative.

5.4.8. Drainage

No drainage facilities are impacted by this alternative.

5.4.9. Traffic Design

5.4.9.1. Signing and Pavement Marking

See ADOT 2010 DCR Section 4.10.1

5.4.9.2. Traffic Signals

The improvements at Shea Boulevard would not require changes to the existing traffic signal, signal controller, or meter pedestal.

5.4.9.3. Lighting

The preferred alternative would require existing jurisdictional lighting to be relocated for the arterial right-turn lane extension.

5.4.10. Construction Phasing and Traffic Control

Traffic will be managed by detailed traffic control plans and by procedures and guidelines specified in Part VI of the current version of the MUTCD and by the Arizona Supplement to the MUTCD.

Construction of the ramp modifications at Shea Boulevard can be accomplished utilizing single-lane closures with the exception of the widening of the channelized right turn for WB traffic entering the NB on-ramp. This channelized right will need to be closed during construction. Temporary concrete barrier will be placed along the saw-cut lines on the ramps and traffic will utilize the existing striping where feasible. Some modification to pavement marking symbols and overhead lane use signing will be required while ramp lanes are closed.

5.4.11. Utility Coordination

There are existing underground fiber and communications utilities that run parallel to the right turn lane and a Cox Communication fiber line that crosses perpendicular to the turn lane. No conflicts are anticipated, but utility designation to a quality level B and potholes will be required during final design to confirm.

Water valves, manholes and communication pedestals will have to be adjusted to grade to accommodate the roadway widening and realigned sidewalk.

Utility adjustments for Shea Boulevard are summarized in the table below:

Table 5.6 – Anticipated Shea Boulevard Utility Conflicts

Owner	Description	Quadrant/Location	Sta/Offset	Conflict/Mitigation
CenturyLink	Communications pedestal	West of DW No. 1 behind sidewalk	16+12.15/58.44’ Rt	Future pavement. Relocate.
CenturyLink	Communications pedestal	West of DW No. 1 behind sidewalk	15+82.27/57.97’ Rt	Pedestal appears to be damaged. In conflict w/future pavement. Relocate.
AT&T	Communication Manhole	In sidewalk	12+69.17/52.00’ Rt	In conflict w/future pavement. and future right turn bay pavement (at taper). Adjust to grade.
City of Scottsdale	Water Valve	West of DW No. 2 behind sidewalk	11+95.21/63.02’ Rt	Re-align new sidewalk to avoid valve in sidewalk. Adjust to grade.

6. ITEMIZED ESTIMATE OF PROBABLE COSTS

6.1. Cost Estimate of Recommended Alternative

The total estimated cost for the Recommended Alternative is $121,435,000 which includes $114,285,000 for construction, $650,000 for right-of-way acquisitions, and $6,500,000 for design as shown in Table 6.1. The current programmed amount for SR 101L construction from Princess to Shea Boulevard is $88,179,293, which is $81,154,243 for construction, $525,050 for right-of-way acquisitions and utility relocations, and $6,500,000 for design.

The estimated unit costs are based on the unit prices obtained from recent ADOT bid results.

The following is a list of assumptions that are reflected in the cost estimates for the Recommended Alternative:

1. Costs for landscaping includes the restoration of disturbed areas as well as the cost to maintain existing landscape features.
2. FMS, lighting, and drainage improvements are included in the cost estimates.
3. Pavement structural sections were assumed based on similar projects and will require evaluation during final design process.
4. The earthwork factor applied to the project excavation is estimated to be 15% shrink. No additional earthwork quantities were included in anticipation of hazardous materials or unsuitable material sites.
5. Environmental mitigation costs are not included in this cost estimate.

Table 6.1 – Order of Magnitude Construction Cost Estimate

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	74,437	$5.00	$372,185
2020027	REMOVAL OF CONCRETE BARRIER	L.FT.	13,101	$20.00	$262,020
2020029	REMOVAL OF ASPHALTIC CONCRETE PAVEMENT	SQ.YD.	187	$5.00	$935
2020031	REMOVAL OF PORTLAND CEMENT CONCRETE PAVEMENT	SQ.YD.	62,031	$25.00	$1,550,775
2020033	REMOVE (STRUCTURAL CONCRETE)	SQ.YD.	35,445	$40.00	$1,417,800
2020041	REMOVAL OF PIPE	L.FT.	8,464	$30.00	$253,920
2020047	REMOVAL OF SIGNS	EACH	2	$250.00	$500
2020053	REMOVE (CATCH BASINS)	EACH	165	$1,000.00	$165,000
2020054	REMOVE (MANHOLES)	EACH	28	$2,500.00	$70,000
2020071	REMOVE GUARD RAIL	L.FT.	439	$6.00	$2,634
2020081	REMOVE BITUMINOUS PAVEMENT (MILLING) (1")	SQ.YD.	392,866	$2.00	$785,732
2020115	REMOVE (SIGN BRIDGES)	EACH	5	$10,000.00	$50,000
2020116	REMOVE (SCUPPER)	EACH	5	$1,000.00	$5,000
2020155	REMOVE (PULL BOX)	EACH	50	$300.00	$15,000
2020162	REMOVE (CONCRETE)	SQ.YD.	5,539	$4.00	$22,156
2020173	REMOVE (ATTENUATORS)	EACH	2	$1,500.00	$3,000
2020175	REMOVAL OF LIGHT POLES AND BASES	EACH	50	$900.00	$45,000
2030301	ROADWAY EXCAVATION	CU.YD.	89,006	$10.00	$890,060
2030900	BORROW (IN PLACE)	CU.YD.	77,720	$12.00	$932,640
3030022	AGGREGATE BASE, CLASS 2	CU.YD.	89	$50.00	$4,450
4010016	PORTLAND CEMENT CONCRETE PAVEMENT (13" PCCP OVER 4" AB)	SQ.YD.	17,367	$66.00	$1,146,222
4010019	PORTLAND CEMENT CONCRETE PAVEMENT (13" PCCP OVER 4" AC)	SQ.YD.	55,106	$81.00	$4,463,586
4010020	PORTLAND CEMENT CONCRETE PAVEMENT (11" PCCP OVER 4" AB)	SQ.YD.	42,940	$60.00	$2,576,400
4060009	ASPHALTIC CONCRETE (MISCELLANEOUS PAVING)	TON	26	$500.00	$13,000
5012524	STORM DRAIN PIPE, 24"	L.FT.	9,358	$100.00	$935,800
5012530	STORM DRAIN PIPE, 30"	L.FT.	16	$150.00	$2,400
5012536	STORM DRAIN PIPE, 36"	L.FT.	239	$155.00	$37,045
5012548	STORM DRAIN PIPE, 48"	L.FT.	99	$185.00	$18,315
5012554	STORM DRAIN PIPE, 54"	L.FT.	160	$200.00	$32,000
5012566	STORM DRAIN PIPE, 66"	L.FT.	175	$350.00	$61,250
5012572	STORM DRAIN PIPE, 72"	L.FT.	336	$550.00	$184,800
5030142	CONCRETE CATCH BASIN (MEDIAN) (C-15.80)	EACH	7	$5,000.00	$35,000
5030604	CONCRETE CATCH BASIN (C-15.91)	EACH	126	$5,000.00	$630,000
5030605	CONCRETE CATCH BASIN (C-15.92)	EACH	18	$6,000.00	$108,000
5030606	CONCRETE CATCH BASIN (DETAIL)	EACH	36	$6,000.00	$216,000
5050013	MANHOLE (C 18.10) (NEW)	EACH	6	$6,000.00	$36,000
6060073	BRIDGE SIGN STRUCTURE (TAPERED TUBE, SINGLE BEAM)	EACH	2	$45,000.00	$90,000
6060074	FOUNDATION FOR BRIDGE SIGN STRUCTURE (TAPERED TUBE)	EACH	6	$6,000.00	$36,000
6060079	FOUNDATION FOR BRIDGE SIGN STRUCTURE (SD9.20, TYPE 4F)	EACH	4	$14,000.00	$56,000
6060133	CANTILEVER SIGN STRUCTURE (SD9.10, TYPE 3C)	EACH	22	$45,000.00	$990,000
6060151	SIGN STRUCTURE (DMS BUTTERFLY STRUCTURE)	EACH	3	$60,000.00	$180,000
6060152	SIGN STRUCTURE (FOUNDATION FOR DMS BUTTERFLY STRUCTURE)	EACH	3	$12,000.00	$36,000
6060256	FOUNDATION FOR CANTILEVER SIGN STRUCTURE (SD9.10, TYPE 3C)	EACH	22	$12,000.00	$264,000
6070002	BREAKAWAY SIGN POST S4X7.7	L.FT.	440	$35.00	$15,400
6070022	FOUNDATION FOR BREAKAWAY SIGN POST S4X7.7	EACH	43	$600.00	$25,800
6070038	SLIP BASE (2 1/2S)	EACH	75	$250.00	$18,750
6070055	SIGN POST (PERFORATED) (2 1/2 S)	L.FT.	576	$15.00	$8,640
6070060	FOUNDATION FOR SIGN POST (CONCRETE)	EACH	56	$300.00	$16,800
6080005	REGULATORY, WARNING, OR MARKER SIGN PANEL	SQ.FT.	1,293	$20.00	$25,860
6080018	EXTRUDED ALUMINUM SIGN PANEL WITH TYPE VII/IX/X SHEET	SQ.FT.	5,047	$25.00	$126,175
6110201	METAL HANDRAIL	L.FT.	2,300	$65.00	$149,500
7020007	IMPACT ATTENUATION DEVICE (CRASH CUSHION)	EACH	3	$20,000.00	$60,000
7030095	MILEPOST MARKER (S-10)	EACH	8	$400.00	$3,200
7040005	PAVEMENT MARKING (WHITE EXTRUDED THERMOPLASTIC) (0.090")	L.FT.	313,732	$0.60	$188,239
7040006	PAVEMENT MARKING (YELLOW EXTRUDED THERMOPLASTIC) (0.090")	L.FT.	100,620	$0.60	$60,372
7040072	PAVEMENT MARKING (TRANSVERSE) (THERMOPLASTIC) (ALKYD) (0.090")	L.FT.	1,455	$0.75	$1,091
7040074	PAVEMENT SYMBOL (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	87	$125.00	$10,875
7060013	PAVEMENT MARKER, RAISED, TYPE C	EACH	7,266	$5.00	$36,330
7060017	PAVEMENT MARKER, RAISED, TYPE E	EACH	1,206	$3.00	$3,618
7080201	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED) (WHITE)	L.FT.	315,187	$0.10	$31,519
7080202	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED) (YELLOW)	L.FT.	95,260	$0.10	$9,526
7080204	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED SYMBOL)	EACH	87	$100.00	$8,700
7310010	POLE (TYPE A)	EACH	5	$1,500.00	$7,500
7310092	POLE (TYPE H) (BREAKAWAY)	EACH	26	$2,000.00	$52,000
7310140	POLE (TYPE R)	EACH	4	$9,000.00	$36,000
7310162	POLE (TYPE T) (50 FT.)	EACH	24	$3,000.00	$72,000
7310191	POLE (54 FT CCTV POLE W/ LOWERING DEVICE)	EACH	6	$18,000.00	$108,000
7310195	POST (PEDESTRIAN PUSH BUTTON)	EACH	47	$700.00	$32,900
7310197	BREAKAWAY BASE FOR LIGHTING POLE OR SIGNAL FLASHER	EACH	50	$600.00	$30,000
7310200	POLE FOUNDATION (TYPE A)	EACH	9	$1,200.00	$10,800
7310276	POLE FOUNDATION (TYPE H) (BREAKAWAY)	EACH	26	$800.00	$20,800
7310320	POLE FOUNDATION (TYPE R)	EACH	8	$4,000.00	$32,000
7310341	POLE FOUNDATION (TYPE T) (40 FT. THRU 55 FT.)	EACH	24	$1,500.00	$36,000
7310372	POLE FOUNDATION (54 FT CCTV POLE W/ LOWERING DEVICE)	EACH	6	$6,000.00	$36,000
7310551	MAST ARM (20 FT.) (TAPERED)	EACH	6	$1,300.00	$7,800
7310554	MAST ARM (20 FT.) (SPECIAL)	EACH	26	$2,000.00	$52,000
7320040	ELECTRICAL CONDUIT (1 1/2") (PVC)	L.FT.	6,836	$12.00	$82,032
7320050	ELECTRICAL CONDUIT (2") (PVC)	L.FT.	22,500	$10.00	$225,000
7320072	ELECTRICAL CONDUIT (3 - 3") (PVC)	L.FT.	41,450	$20.00	$829,000
7320270	ELECTRICAL CONDUIT (3")	L.FT.	560	$15.00	$8,400
7320410	PULL BOX (NO. 5)	EACH	20	$500.00	$10,000
7320421	PULL BOX (NO. 7) (WITH EXTENSION)	EACH	108	$1,000.00	$108,000
7320450	PULL BOX (NO. 7) (FM-2.06)	EACH	98	$1,000.00	$98,000
7320455	PULL BOX (NO. 9)	EACH	30	$5,000.00	$150,000
7320456	PULL BOX (4B)	EACH	50	$1,000.00	$50,000
7320461	PULL BOX (6B)	EACH	4	$2,000.00	$8,000
7320500	CONDUCTOR (NO. 12)	L.FT.	7,500	$0.80	$6,000
7320520	CONDUCTOR (NO. 8)	L.FT.	98,000	$0.95	$93,100

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
7320585	CONDUCTOR (INSULATED BOND) (NO. 12)	L.FT.	7,750	$1.00	$7,750
7320595	CONDUCTOR (INSULATED BOND) (NO. 8)	L.FT.	22,500	$2.00	$45,000
7320654	CONDUCTORS (NO. 8)	L.FT.	28,378	$1.00	$28,378
7320740	REMOVAL OF EXISTING CONDUCTORS	L.FT.	110,728	$0.50	$55,364
7320787	SINGLE MODE FIBER OPTIC CABLE (144 FIBERS)(ADOT)	L.FT.	60,850	$3.00	$182,550
7320788	SINGLE MODE FIBER OPTIC CABLE (144 FIBERS)(SCOTTSDALE)	L.FT.	60,850	$3.00	$182,550
7320789	SINGLE MODE FIBER OPTIC CABLE (12 FIBERS)	L.FT.	5,750	$2.00	$11,500
7320794	FIBER OPTIC SPLICE CLOSURE (FMS)	EACH	24	$1,500.00	$36,000
7320809	CABLE INNERDUCT (1")	L.FT.	41,300	$1.25	$51,625
7330060	TRAFFIC SIGNAL FACE (TYPE F)	EACH	23	$500.00	$11,500
7330620	RELOCATE TRAFFIC SIGNALS	L.SUM	1	$15,000.00	$15,000
7340103	CONTROL CABINET (CCTV POLE)	EACH	6	$5,000.00	$30,000
7340105	CONTROL CABINET FOUNDATION	EACH	13	$1,200.00	$15,600
7340120	METER PEDESTAL CABINET	EACH	4	$4,000.00	$16,000
7340252	CONTROLLER (INTELIGHT 2070LC)	EACH	10	$7,500.00	$75,000
7340306	METER PEDESTAL FOUNDATION	EACH	4	$1,200.00	$4,800
7350030	LOOP DETECTOR FOR TRAFFIC SURVEILLANCE (6'X6')	EACH	122	$1,000.00	$122,000
7350051	DETECTOR CARD	EACH	58	$200.00	$11,600
7350165	LOOP DETECTOR LEAD-IN CABLE	L.FT.	50,000	$1.00	$50,000
7360030	LUMINAIRE (HORIZONTAL MOUNT) (HPS 250 WATT)	EACH	6	$600.00	$3,600
7360070	LUMINAIRE (VERTICAL MOUNT) (400 WATT)	EACH	14	$650.00	$9,100
7360080	LUMINAIRE (HIGH MAST) (HPS 400 WATT)	EACH	198	$750.00	$148,500
7360104	LUMINAIRE (TRIPLE LUMINAIRE BRACKET)	EACH	66	$800.00	$52,800
7360111	LUMINAIRE (LED) (HORIZONTAL MOUNT) (TYPE 40L)	EACH	69	$900.00	$62,100
7360112	LUMINAIRE (LED) (HIGH MAST) (TYPE 40L)	EACH	112	$1,000.00	$112,000
7360113	LUMINAIRE (LED) (UNDERDECK 15L)	EACH	24	$1,000.00	$24,000
7360114	LUMINAIRE (LED) (VERTICAL MOUNT) (TYPE 40L)	EACH	49	$900.00	$44,100
7360160	POWER SUPPLY (BATTERY BACKUP)	EACH	1	$5,000.00	$5,000
7360420	REMOVE AND SALVAGE EXISTING SIGN LIGHTING	L.SUM	1	$15,000.00	$15,000
7370450	MISCELLANEOUS ELECTRICAL (FURNISH AND INSTALL DMS)	L.SUM	1	$360,000.00	$360,000
7370452	MISCELLANEOUS ELECTRICAL (RELOCATE CCTV)	L.SUM	1	$19,200.00	$19,200
7370455	MISCELLANEOUS ELECTRICAL (RELOCATE DMS)	L.SUM	1	$48,000.00	$48,000
7370654	FIBER OPTIC EQUIPMENT (FIBER TERMINATION PANEL)	EACH	24	$750.00	$18,000
7370705	CCTV FIELD EQUIPMENT	EACH	6	$9,000.00	$54,000
8080043	BACKFLOW PREVENTION ASSEMBLLY RELOCATION	EACH	2	$6,000.00	$12,000
8080551	PIPE (DUCTILE IRON, 8”, CLASS 53)	L.FT.	320	$200.00	$64,000
8080646	RESET FRAME AND COVER FOR VALVE BOX	EACH	6	$700.00	$4,200
8080655	RELOCATE FIRE HYDRANT	EACH	4	$5,000.00	$20,000
8080695	CONCRETE PIPE PLUG	EACH	1	$1,000.00	$1,000
8082845	MANHOLE (RESET FRAME AND COVER)	EACH	10	$1,500.00	$15,000
9050025	GUARD RAIL TERMINAL (MASH)	EACH	16	$5,000.00	$80,000
9050401	GUARD RAIL TRANSITION, W-BEAM TO CONCRETE BARRIER	EACH	16	$3,000.00	$48,000
9080084	CONCRETE CURB AND GUTTER (ALL TYPES)	L.FT.	25,697	$20.00	$513,940
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	23,925	$6.00	$143,550
9080296	CONCRETE SIDEWALK RAMP (ALL TYPES)	EACH	54	$2,500.00	$135,000
9080303	CONCRETE DRIVEWAY	SQ.FT.	400	$20.00	$8,000
9080511	SCUPPER (MAG DET. 203)	EACH	5	$5,000.00	$25,000
9100000	CONCRETE BARRIER (SINGLE FACE WITH GUTTER)	L.FT.	16,032	$80.00	$1,282,560
9100008	CONCRETE BARRIER (SPECIAL HALF) (32")	L.FT.	6,381	$120.00	$765,720
9100009	CONCRETE BARRIER (ADJACENT TO RETAINING WALL)	L.FT.	10,957	$140.00	$1,533,980
9100012	CONCRETE BARRIER (SPECIAL HALF) (42")	L.FT.	14,239	$180.00	$2,563,020
9140153	RETAINING WALL (REGULAR)	SQ.FT.	46,131	$70.00	$3,229,170
9140155	RETAINING WALL (SPECIALTY)	SQ.FT.	57,565	$175.00	$10,073,875
9210021	MEDIAN PAVING (CONCRETE PAVERS)	SQ.YD.	3,849	$60.00	$230,940
9240051	MISCELLANEOUS WORK (SWALLOW MITIGATION)	L.SUM	1	$40,000.00	$40,000
9240052	MISCELLANEOUS WORK (LANDSCAPE & EROSION CONTROL)	L.SUM	1	$2,646,500.00	$2,646,500
9240055	MISCELLANEOUS WORK (STRUCTURES)	L.SUM	1	$15,000.00	$15,000
9240056	MISCELLANEOUS WORK (THERMAL CAMERA DETECTION SYSTEM PRINCESS)	L.SUM	1	$30,000.00	$30,000
9240057	MISCELLANEOUS WORK (THERMAL CAMERA DETECTION SYSTEM FRANK LLOYD WRIGHT)	L.SUM	1	$30,000.00	$30,000
9240058	MISCELLANEOUS WORK (THERMAL CAMERA DETECTION SYSTEM RAINTREE)	L.SUM	1	$30,000.00	$30,000
9240059	MISCELLANEOUS WORK (THERMAL CAMERA DETECTION SYSTEM CACTUS)	L.SUM	1	$30,000.00	$30,000
9240060	MISCELLANEOUS WORK (THERMAL CAMERA DETECTION SYSTEM SHEA)	L.SUM	1	$30,000.00	$30,000
9240061	MISCELLANEOUS WORK (TEMPORARY ITS CABLE AND CONNECTIONS)	L.SUM	1	$125,000.00	$125,000
9240062	MISCELLANEOUS WORK (REMOVE AND REPLACE COS ITS INFRASTRUCTURE)	L.SUM	1	$100,000.00	$100,000
9240102	MISCELLANEOUS WORK (ELECTRICAL RECORD DRAWINGS)	L.SUM	1	$8,000.00	$8,000
9240111	MISCELLANEOUS WORK (69kV POWER LINE RELOCATION)	L.FT.	1,000	$500.00	$500,000
9240112	MISCELLANEOUS WORK (CONTRAST PAVEMENT MARKINGS)	L.FT.	38,660	$1.00	$38,660
9240119	MISCELLANEOUS WORK (RELOCATE RAMP METER)	EACH	8	$6,000.00	$48,000
9240120	MISCELLANEOUS WORK (RELOCATED COMMUNICATIONS PEDESTAL)	EACH	4	$1,000.00	$4,000
9240126	MISCELLANEOUS WORK (PROTECTION AND RESTORATION OF EXISTING FACILITIES)	L.SUM	1	$25,000.00	$25,000
9240129	MISCELLANEOUS WORK (DIAMOND GRINDING)	SQ.YD.	393,502	$6.00	$2,361,012
9240131	MISCELLANEOUS WORK (GigE SWITCH)	EACH	28	$2,500.00	$70,000
9999910	LUMP SUM (PRINCESSS DRIVE OVERPASS SB)	L.SUM	1	$759,500.00	$835,450
9999910	LUMP SUM (PRINCESSS DRIVE OVERPASS NB)	L.SUM	1	$759,500.00	$835,450
9999910	LUMP SUM (BELL ROAD OVERPASS NB)	L.SUM	1	$911,000.00	$1,002,100
9999910	LUMP SUM (BELL ROAD OVERPASS SB)	L.SUM	1	$911,750.00	$1,002,925
9999910	LUMP SUM (CAP CANAL OVERPASS NB)	L.SUM	1	$1,036,750.00	$1,140,425
9999910	LUMP SUM (CAP CANAL OVERPASS SB)	L.SUM	1	$1,036,750.00	$1,140,425
9999910	LUMP SUM (FRANK LLOYD WRIGHT BOULEVARD OVERPASS NB)	L.SUM	1	$1,498,000.00	$1,498,000
9999910	LUMP SUM (FRANK LLOYD WRIGHT BOULEVARD OVERPASS SB)	L.SUM	1	$1,825,950.00	$1,825,950
				ITEM TOTAL	**$60,086,821**

PROJECT WIDE			
Mobilization (10%)	COST		$6,008,683
Dust and Water Palliative (1%)	COST		$600,869
Quality Control (2%)	COST		$1,201,737
Construction Surveying (2%)	COST		$1,201,737
Maintenance and Protection of Traffic (10%)	COST		$6,008,682
		PROJECT WIDE SUBTOTAL	**$15,021,708**
Unidentified Item Allowance (20%)	COST		$15,021,706
		PROJECT WIDE TOTAL	**$30,043,414**
OTHER COST			
Construction Engineering (9%)	COST		$8,111,722
Construction Contingencies (5%)	COST		$4,506,512
Consultant Services (1%)	COST		$901,303
PCCP Materials Quality Incentive ($2 per Sq Yd)	SQ.YD	115,413	$230,826
PCCP Smoothness Incentive ($3,500 per Lane-Mile)	LANE-MILE	16	$57,379
Right-Of-Way ($30 per Sq Ft)	SQ. FT.	20,005	$600,137
Temporary Construction Easement ($3,270 per Month)	MONTH	12	$43,334
		OTHER COST TOTAL	**$14,451,223**

SUMMARY	
ITEM TOTAL	$60,086,821
PROJECT WIDE	$30,043,414
OTHER COST TOTAL	$14,451,223
SUBTOTAL PROJECT COST	$104,581,458
INDIRECT COST ALLOCATION (9.90%)	$10,353,564
DESIGN	$6,500,000
TOTAL PROJECT COST	$121,435,023

PROGRAMMED AMOUNT	
CONSTRUCTION	$81,154,243
R/W AND UTILITIES	$525,050
DESIGN	$6,500,000
TOTAL PROGRAMMED AMOUNT	$88,179,293

6.1.1. Detailed Cost Estimates of Preferred Alternatives

The estimates for the preferred alternatives are provided in this section. These estimates are incorporated within the overall preferred alternative estimate as contained in section 6.1.

- SR 101L Mainline Widening Alternatives, Table 6.2
- Princess Drive TDI: convert to dual lefts and extend storage. Table 6.3
- Frank Lloyd Wright Boulevard TDI, Table 6.4
- Raintree Drive Improved SPUI, Table 6.5
- Shea Boulevard SPUI: extend right-turn lane, Table 6.6

Table 6.2 – SR 101L Mainline Widening

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	61,685	$5.00	$308,425
2020033	REMOVE (STRUCTURAL CONCRETE)	SQ.YD.	35,445	$40.00	$1,417,800
2020027	REMOVAL OF CONCRETE BARRIER	L.FT.	13,101	$20.00	$262,020
2020031	REMOVAL OF PORTLAND CEMENT CONCRETE PAVEMENT	SQ.YD.	57,563	$25.00	$1,439,075
2020041	REMOVAL OF PIPE	L.FT.	8,464	$30.00	$253,920
2020047	REMOVAL OF SIGNS	EACH	2	$250.00	$500
2020053	REMOVE (CATCH BASINS)	EACH	155	$1,000.00	$155,000
2020054	REMOVE (MANHOLES)	EACH	28	$2,500.00	$70,000
2020071	REMOVE GUARD RAIL	L.FT.	439	$6.00	$2,634
2020081	REMOVE BITUMINOUS PAVEMENT (MILLING) (1")	SQ.YD.	392,866	$2.00	$785,732
2020115	REMOVE (SIGN BRIDGES)	EACH	5	$10,000.00	$50,000
2020155	REMOVE (PULL BOX)	EACH	46	$300.00	$13,800
2020173	REMOVE (ATTENUATORS)	EACH	1	$1,500.00	$1,500
2020175	REMOVAL OF LIGHT POLES AND BASES	EACH	46	$900.00	$41,400
2030301	ROADWAY EXCAVATION	CU.YD.	85,764	$10.00	$857,640
2030900	BORROW (IN PLACE)	CU.YD.	77,720	$12.00	$932,640
4010016	PORTLAND CEMENT CONCRETE PAVEMENT (13" PCCP OVER 4" AB)	SQ.YD.	17,367	$66.00	$1,146,222
4010019	PORTLAND CEMENT CONCRETE PAVEMENT (13" PCCP OVER 4" AC)	SQ.YD.	55,106	$81.00	$4,463,586
4010020	PORTLAND CEMENT CONCRETE PAVEMENT (11" PCCP OVER 4" AB)	SQ.YD.	37,893	$60.00	$2,273,580
5012524	STORM DRAIN PIPE, 24"	L.FT.	9,143	$100.00	$914,300
5012530	STORM DRAIN PIPE, 30"	L.FT.	16	$150.00	$2,400
5012536	STORM DRAIN PIPE, 36"	L.FT.	239	$155.00	$37,045
5012548	STORM DRAIN PIPE, 48"	L.FT.	99	$185.00	$18,315
5012554	STORM DRAIN PIPE, 54"	L.FT.	160	$200.00	$32,000
5012566	STORM DRAIN PIPE, 66"	L.FT.	175	$350.00	$61,250
5012572	STORM DRAIN PIPE, 72"	L.FT.	336	$550.00	$184,800
5030142	CONCRETE CATCH BASIN (MEDIAN) (C-15.80)	EACH	6	$5,000.00	$30,000
5030604	CONCRETE CATCH BASIN (C-15.91)	EACH	117	$5,000.00	$585,000
5030605	CONCRETE CATCH BASIN (C-15.92)	EACH	18	$6,000.00	$108,000
5030606	CONCRETE CATCH BASIN (DETAIL)	EACH	36	$6,000.00	$216,000
5050013	MANHOLE (C 18.10) (NEW)	EACH	6	$6,000.00	$36,000
6060073	BRIDGE SIGN STRUCTURE (TAPERED TUBE, SINGLE BEAM)	EACH	2	$45,000.00	$90,000
6060074	FOUNDATION FOR BRIDGE SIGN STRUCTURE (TAPERED TUBE)	EACH	6	$6,000.00	$36,000
6060079	FOUNDATION FOR BRIDGE SIGN STRUCTURE (SD9.20, TYPE 4F)	EACH	4	$14,000.00	$56,000
6060133	CANTILEVER SIGN STRUCTURE (SD9.10, TYPE 3C)	EACH	22	$45,000.00	$990,000
6060151	SIGN STRUCTURE (DMS BUTTERFLY STRUCTURE)	EACH	3	$60,000.00	$180,000
6060152	SIGN STRUCTURE (FOUNDATION FOR DMS BUTTERFLY STRUCTURE)	EACH	3	$12,000.00	$36,000
6060256	FOUNDATION FOR CANTILEVER SIGN STRUCTURE (SD9.10, TYPE 3C)	EACH	22	$12,000.00	$264,000
6070002	BREAKAWAY SIGN POST S4X7.7	L.FT.	224	$35.00	$7,840
6070022	FOUNDATION FOR BREAKAWAY SIGN POST S4X7.7	EACH	16	$600.00	$9,600
6070038	SLIP BASE (2 1/2S)	EACH	48	$250.00	$12,000
6070055	SIGN POST (PERFORATED) (2 1/2 S)	L.FT.	576	$15.00	$8,640
6070060	FOUNDATION FOR SIGN POST (CONCRETE)	EACH	56	$300.00	$16,800
6080005	REGULATORY, WARNING, OR MARKER SIGN PANEL	SQ.FT.	977	$20.00	$19,540
6080018	EXTRUDED ALUMINUM SIGN PANEL WITH TYPE VII/IX/X SHEET	SQ.FT.	5,047	$25.00	$126,175
6110201	METAL HANDRAIL	L.FT.	2,300	$65.00	$149,500
7020007	IMPACT ATTENUATION DEVICE (CRASH CUSHION)	EACH	3	$20,000.00	$60,000
7030095	MILEPOST MARKER (S-10)	EACH	8	$400.00	$3,200
7040005	PAVEMENT MARKING (WHITE EXTRUDED THERMOPLASTIC) (0.090")	L.FT.	298,305	$0.60	$178,983
7040006	PAVEMENT MARKING (YELLOW EXTRUDED THERMOPLASTIC) (0.090")	L.FT.	99,600	$0.60	$59,760
7040072	PAVEMENT MARKING (TRANSVERSE) (THERMOPLASTIC) (ALKYD) (0.090")	L.FT.	630	$0.75	$473
7040074	PAVEMENT SYMBOL (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	53	$125.00	$6,625
7060013	PAVEMENT MARKER, RAISED, TYPE C	EACH	6,880	$5.00	$34,400
7060017	PAVEMENT MARKER, RAISED, TYPE E	EACH	1,180	$3.00	$3,540
7080201	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED) (WHITE)	L.FT.	298,935	$0.10	$29,894
7080202	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED) (YELLOW)	L.FT.	94,240	$0.10	$9,424
7080204	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED SYMBOL)	EACH	53	$100.00	$5,300
7310092	POLE (TYPE H) (BREAKAWAY)	EACH	22	$2,000.00	$44,000
7310162	POLE (TYPE T) (50 FT.)	EACH	24	$3,000.00	$72,000
7310191	POLE (54 FT CCTV POLE W/ LOWERING DEVICE)	EACH	6	$18,000.00	$108,000
7310195	POST (PEDESTRIAN PUSH BUTTON)	EACH	47	$700.00	$32,900
7310197	BREAKAWAY BASE FOR LIGHTING POLE OR SIGNAL FLASHER	EACH	46	$600.00	$27,600
7310200	POLE FOUNDATION (TYPE A)	EACH	4	$1,200.00	$4,800
7310276	POLE FOUNDATION (TYPE H) (BREAKAWAY)	EACH	22	$800.00	$17,600
7310320	POLE FOUNDATION (TYPE R)	EACH	4	$4,000.00	$16,000
7310341	POLE FOUNDATION (TYPE T) (40 FT. THRU 55 FT.)	EACH	24	$1,500.00	$36,000
7310372	POLE FOUNDATION (54 FT CCTV POLE W/ LOWERING DEVICE)	EACH	6	$6,000.00	$36,000
7310551	MAST ARM (20 FT.) (TAPERED)	EACH	6	$1,300.00	$7,800
7310554	MAST ARM (20 FT.) (SPECIAL)	EACH	22	$2,000.00	$44,000
7320040	ELECTRICAL CONDUIT (1 1/2") (PVC)	L.FT.	4,000	$12.00	$48,000
7320050	ELECTRICAL CONDUIT (2") (PVC)	L.FT.	20,500	$10.00	$205,000
7320072	ELECTRICAL CONDUIT (3 - 3") (PVC)	L.FT.	38,950	$20.00	$779,000
7320270	ELECTRICAL CONDUIT (3")	L.FT.	560	$15.00	$8,400
7320410	PULL BOX (NO. 5)	EACH	20	$500.00	$10,000
7320421	PULL BOX (NO. 7) (WITH EXTENSION)	EACH	94	$1,000.00	$94,000
7320450	PULL BOX (NO. 7) (FM-2.06)	EACH	94	$1,000.00	$94,000
7320455	PULL BOX (NO. 9)	EACH	26	$5,000.00	$130,000
7320456	PULL BOX (4B)	EACH	46	$1,000.00	$46,000
7320461	PULL BOX (6B)	EACH	1	$2,000.00	$2,000
7320500	CONDUCTOR (NO. 12)	L.FT.	6,900	$0.80	$5,520

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
7320520	CONDUCTOR (NO. 8)	L.FT.	90,000	$0.95	$85,500
7320585	CONDUCTOR (INSULATED BOND) (NO. 12)	L.FT.	7,450	$1.00	$7,450
7320595	CONDUCTOR (INSULATED BOND) (NO. 8)	L.FT.	20,500	$2.00	$41,000
7320654	CONDUCTORS (NO. 8)	L.FT.	19,370	$1.00	$19,370
7320740	REMOVAL OF EXISTING CONDUCTORS	L.FT.	98,220	$0.50	$49,110
7320787	SINGLE MODE FIBER OPTIC CABLE (144 FIBERS)(ADOT)	L.FT.	58,350	$3.00	$175,050
7320788	SINGLE MODE FIBER OPTIC CABLE (144 FIBERS)(SCOTTSDALE)	L.FT.	58,350	$3.00	$175,050
7320789	SINGLE MODE FIBER OPTIC CABLE (12 FIBERS)	L.FT.	4,750	$2.00	$9,500
7320794	FIBER OPTIC SPLICE CLOSURE (FMS)	EACH	20	$1,500.00	$30,000
7320809	CABLE INNERDUCT (1")	L.FT.	38,800	$1.25	$48,500
7330620	RELOCATE TRAFFIC SIGNALS	L.SUM	1	$15,000.00	$15,000
7340103	CONTROL CABINET (CCTV POLE)	EACH	6	$5,000.00	$30,000
7340105	CONTROL CABINET FOUNDATION	EACH	13	$1,200.00	$15,600
7340120	METER PEDESTAL CABINET	EACH	1	$4,000.00	$4,000
7340252	CONTROLLER (2070)	EACH	10	$7,500.00	$75,000
7340306	METER PEDESTAL FOUNDATION	EACH	1	$1,200.00	$1,200
7350030	LOOP DETECTOR FOR TRAFFIC SURVEILLANCE (6'X6')	EACH	116	$1,000.00	$116,000
7350051	DETECTOR CARD	EACH	58	$200.00	$11,600
7350165	LOOP DETECTOR LEAD-IN CABLE	L.FT.	50,000	$1.00	$50,000
7360030	LUMINAIRE (HORIZONTAL MOUNT) (HPS 250 WATT)	EACH	6	$600.00	$3,600
7360070	LUMINAIRE (VERTICAL MOUNT) (400 WATT)	EACH	14	$650.00	$9,100
7360080	LUMINAIRE (HIGH MAST) (HPS 400 WATT)	EACH	198	$750.00	$148,500
7360104	LUMINAIRE (TRIPLE LUMINAIRE BRACKET)	EACH	66	$800.00	$52,800
7360111	LUMINAIRE (LED) (HORIZONTAL MOUNT) (TYPE 40L)	EACH	65	$900.00	$58,500
7360112	LUMINAIRE (LED) (HIGH MAST) (TYPE 40L)	EACH	112	$1,000.00	$112,000
7360113	LUMINAIRE (LED) (UNDERDECK 15L)	EACH	6	$1,000.00	$6,000
7360114	LUMINAIRE (LED) (VERTICAL MOUNT) (TYPE 40L)	EACH	49	$900.00	$44,100
7360160	POWER SUPPLY (BATTERY BACKUP)	EACH	1	$5,000.00	$5,000
7360420	REMOVE AND SALVAGE EXISTING SIGN LIGHTING	L.SUM	1	$15,000.00	$15,000
7370450	MISCELLANEOUS ELECTRICAL (FURNISH AND INSTALL DMS)	L.SUM	1	$360,000.00	$360,000
7370452	MISCELLANEOUS ELECTRICAL (RELOCATE CCTV)	L.SUM	1	$19,200.00	$19,200
7370455	MISCELLANEOUS ELECTRICAL (RELOCATE DMS)	L.SUM	1	$48,000.00	$48,000
7370654	FIBER OPTIC EQUIPMENT (FIBER TERMINATION PANEL)	EACH	24	$750.00	$18,000
7370705	CCTV FIELD EQUIPMENT	EACH	6	$9,000.00	$54,000
8080043	BACKFLOW PREVENTION ASSEMBLY RELOCATION	EACH	1	$6,000.00	$6,000
8080646	RESET FRAME AND COVER FOR VALVE BOX	EACH	3	$700.00	$2,100
8080655	RELOCATE FIRE HYDRANT	EACH	2	$5,000.00	$10,000
8082845	MANHOLE (RESET FRAME AND COVER)	EACH	5	$1,500.00	$7,500
8080695	CONCRETE PIPE PLUG	EACH	1	$1,000.00	$1,000
8080551	PIPE (DUCTILE IRON, 8", CLASS 53)	L.FT.	320	$200.00	$64,000
9050025	GUARD RAIL TERMINAL (MASH)	EACH	16	$5,000.00	$80,000
9050401	GUARD RAIL TRANSITION, W-BEAM TO CONCRETE BARRIER	EACH	16	$3,000.00	$48,000
9080084	CONCRETE CURB AND GUTTER (ALL TYPES)	L.FT.	15,607	$20.00	$312,140
9080296	CONCRETE SIDEWALK RAMP (ALL TYPES)	EACH	26	$2,500.00	$65,000
9080303	CONCRETE DRIVEWAY	SQ.FT.	400	$20.00	$8,000
9100000	CONCRETE BARRIER (SINGLE FACE WITH GUTTER)	L.FT.	16,032	$80.00	$1,282,560
9100008	CONCRETE BARRIER (SPECIAL HALF) (32")	L.FT.	6,381	$120.00	$765,720
9100009	CONCRETE BARRIER (ADJACENT TO RETAINING WALL)	L.FT.	10,957	$140.00	$1,533,980
9100012	CONCRETE BARRIER (SPECIAL HALF) (42")	L.FT.	14,239	$180.00	$2,563,020
9140153	RETAINING WALL (REGULAR)	SQ.FT.	46,131	$70.00	$3,229,170
9140155	RETAINING WALL (SPECIALTY)	SQ.FT.	57,565	$175.00	$10,073,875
9240051	MISCELLANEOUS WORK (SWALLOW MITIGATION)	L.SUM	1	$40,000.00	$40,000
9240052	MISCELLANEOUS WORK (LANDSCAPE & EROSION CONTROL)	L.SUM	1	$2,530,500.00	$2,530,500
9240055	MISCELLANEOUS WORK (STRUCTURES)	L.SUM	1	$15,000.00	$15,000
9240056	MISCELLANEOUS WORK (THERMAL CAMERA DETECTION SYSTEM PRINCESS)	L.SUM	1	$30,000.00	$30,000
9240057	MISCELLANEOUS WORK (THERMAL CAMERA DETECTION SYSTEM FRANK LLOYD WRIGHT)	L.SUM	1	$30,000.00	$30,000
9240058	MISCELLANEOUS WORK (THERMAL CAMERA DETECTION SYSTEM RAINTREE)	L.SUM	1	$30,000.00	$30,000
9240059	MISCELLANEOUS WORK (THERMAL CAMERA DETECTION SYSTEM CACTUS)	L.SUM	1	$30,000.00	$30,000

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
9240060	MISCELLANEOUS WORK (THERMAL CAMERA DETECTION SYSTEM SHEA)	L.SUM	1	$30,000.00	$30,000
9240061	MISCELLANEOUS WORK (TEMPORARY ITS CABLE AND CONNECTIONS)	L.SUM	1	$125,000.00	$125,000
9240102	MISCELLANEOUS WORK (ELECTRICAL RECORD DRAWINGS)	L.SUM	1	$8,000.00	$8,000
9240111	MISCELLANEOUS WORK (69kV POWER LINE RELOCATION)	L.FT.	1,000	$500.00	$500,000
9240112	MISCELLANEOUS WORK (CONTRAST PAVEMENT MARKINGS)	L.FT.	38,660	$1.00	$38,660
9240119	MISCELLANEOUS WORK (RELOCATE RAMP METER)	EACH	8	$6,000.00	$48,000
9240120	MISCELLANEOUS WORK (RELOCATED COMMUNICATIONS PEDESTAL)	EACH	2	$1,000.00	$2,000
9240126	MISCELLANEOUS WORK (PROTECTION AND RESTORATION OF EXISTING FACILITIES)	L.SUM	1	$25,000.00	$25,000
9240129	MISCELLANEOUS WORK (DIAMOND GRINDING)	SQ.YD.	393,502	$6.00	$2,361,012
9240131	MISCELLANEOUS WORK (GigE SWITCH)	EACH	24	$2,500.00	$60,000
9999910	LUMP SUM (PRINCESSS DRIVE OVERPASS SB)	L.SUM	1	$759,500.00	$835,450
9999910	LUMP SUM (PRINCESSS DRIVE OVERPASS NB)	L.SUM	1	$759,500.00	$835,450
9999910	LUMP SUM (BELL ROAD OVERPASS NB)	L.SUM	1	$911,000.00	$1,002,100
9999910	LUMP SUM (BELL ROAD OVERPASS SB)	L.SUM	1	$911,750.00	$1,002,100
9999910	LUMP SUM (CAP CANAL OVERPASS NB)	L.SUM	1	$1,036,750.00	$1,140,425
9999910	LUMP SUM (CAP CANAL OVERPASS SB)	L.SUM	1	$1,036,750.00	$1,140,425
9999910	LUMP SUM (FRANK LLOYD WRIGHT BOULEVARD OVERPASS NB)	L.SUM	1	$1,498,000.00	$1,498,000
9999910	LUMP SUM (FRANK LLOYD WRIGHT BOULEVARD OVERPASS SB)	L.SUM	1	$1,825,950.00	$1,825,950
				ITEM TOTAL	$58,111,589

PROJECT WIDE			
Mobilization (10%)	COST		$5,811,159
Dust and Water Palliative (1%)	COST		$581,116
Quality Control (2%)	COST		$1,162,232
Construction Surveying (2%)	COST		$1,162,232
Maintenance and Protection of Traffic (10%)	COST		$5,811,159
		PROJECT WIDE SUBTOTAL	$14,527,898
Unidentified Item Allowance (20%)	COST		$14,527,898
		PROJECT WIDE TOTAL	$29,055,796
OTHER COST			
Construction Engineering (9%)	COST		$7,845,065
Construction Contingencies (5%)	COST		$4,358,370
Consultant Services (1%)	COST		$871,674
PCCP Materials Quality Incentive ($2 per Sq Yd)	SQ.YD	110,366	$220,732
PCCP Smoothness Incentive ($3,500 per Lane-Mile)	LANE-MILE	16	$54,869
		OTHER COST TOTAL	$13,350,710

SUMMARY	
ITEM TOTAL	$58,111,589
PROJECT WIDE	$29,055,796
OTHER COST TOTAL	$13,350,710
SUBTOTAL PROJECT COST	$100,518,095
INDIRECT COST ALLOCATION (9.90%)	$9,951,291
DESIGN	$6,500,000
TOTAL PROJECT COST	$116,969,387

Table 6.3 – Princess Drive Tight Diamond Interchange

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	1,565	$5.00	$7,825
2020031	REMOVAL OF PORTLAND CEMENT CONCRETE PAVEMENT	SQ.YD.	1,167	$25.00	$29,175
2020162	REMOVE (CONCRETE)	SQ.YD.	323	$4.00	$1,292
4010020	PORTLAND CEMENT CONCRETE PAVEMENT (11" PCCP OVER 4" AB)	SQ.YD.	1,167	$60.00	$70,020
9080296	CONCRETE SIDEWALK RAMP (ALL TYPES)	EACH	8	$2,500.00	$20,000
9210021	MEDIAN PAVING (RELOCATED COMMUNICATIONS PEDESTAL)	SQ.YD.	447	$60.00	$26,820
				ITEM TOTAL	$155,132

PROJECT WIDE				
Mobilization (10%)	COST			$15,514
Dust and Water Palliative (1%)	COST			$1,552
Quality Control (2%)	COST			$3,103
Construction Surveying (2%)	COST			$3,103
Maintenance and Protection of Traffic (10%)	COST			$15,514
			PROJECT WIDE SUBTOTAL	$38,786
Unidentified Item Allowance (20%)	COST			$38,784
			PROJECT WIDE TOTAL	$77,570
OTHER COST				
Construction Engineering (9%)	COST			$20,944
Construction Contingencies (5%)	COST			$11,636
Consultant Services (1%)	COST			$2,328
PCCP Materials Quality Incentive ($2 per Sq Yd)	SQ.YD	1,167		$2,334
PCCP Smoothness Incentive ($3,500 per Lane-Mile)	LANE-MILE	0.2		$580
			OTHER COST TOTAL	$37,822

SUMMARY	
ITEM TOTAL	$155,132
PROJECT WIDE	$77,570
OTHER COST TOTAL	$37,822
SUBTOTAL PROJECT COST	$270,524
INDIRECT COST ALLOCATION (9.90%)	$26,782
TOTAL PROJECT COST	$297,306

Table 6.4 – Frank Lloyd Wright Boulevard Tight Diamond Interchange

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	9,483	$5.00	$47,415
2020029	REMOVAL OF ASPHALTIC CONCRETE PAVEMENT	SQ.YD.	187	$5.00	$935
2020031	REMOVAL OF PORTLAND CEMENT CONCRETE PAVEMENT	SQ.YD.	3,301	$25.00	$82,525
2020053	REMOVE (CATCH BASINS)	EACH	7	$1,000.00	$7,000
2020116	REMOVE (SCUPPER)	EACH	5	$1,000.00	$5,000
2020155	REMOVE (PULL BOX)	EACH	1	$300.00	$300
2020162	REMOVE (CONCRETE)	SQ.YD.	4,558	$4.00	$18,232
2020173	REMOVE (ATTENUATORS)	EACH	1	$1,500.00	$1,500
2020175	REMOVAL OF LIGHT POLES AND BASES	EACH	1	$900.00	$900
2030301	ROADWAY EXCAVATION	CU.YD.	2,005	$10.00	$20,050
3030022	AGGREGATE BASE, CLASS 2	CU.YD.	89	$50.00	$4,450
4010020	PORTLAND CEMENT CONCRETE PAVEMENT (11" PCCP OVER 4" AB)	SQ.YD.	2,773	$60.00	$166,380
4060009	ASPHALTIC CONCRETE (MISCELLANEOUS PAVING)	TON	15	$500.00	$7,500
5012524	STORM DRAIN PIPE, 24"	L.FT.	188	$100.00	$18,800
5030142	CONCRETE CATCH BASIN (MEDIAN) (15.80)	EACH	1	$5,000.00	$5,000
5030604	CONCRETE CATCH BASIN (15.19)	EACH	6	$5,000.00	$30,000
6070002	BREAKAWAY SIGN POST S4X7.7	L.FT.	192	$35.00	$6,720
6070022	FOUNDATION FOR BREAKAWAY SIGN POST S4X7.7	EACH	24	$600.00	$14,400
6070038	SLIP BASE	EACH	24	$250.00	$6,000
6080005	REGULATORY, WARNING, OR MARKER SIGN PANEL	SQ.FT.	216	$20.00	$4,320
7040005	PAVEMENT MARKING (WHITE EXTRUDED THERMOPLASTIC) (0.090")	L.FT.	14,189	$0.60	$8,513
7040006	PAVEMENT MARKING (YELLOW EXTRUDED THERMOPLASTIC) (0.090")	L.FT.	1,020	$0.60	$612
7040072	PAVEMENT MARKING (TRANSVERSE) (THERMOPLASTIC) (ALKYD) (0.090")	L.FT.	825	$0.75	$619
7040074	PAVEMENT SYMBOL (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	29	$125.00	$3,625
7060013	PAVEMENT MARKER, RAISED, TYPE C	EACH	355	$5.00	$1,775
7060017	PAVEMENT MARKER, RAISED, TYPE E	EACH	26	$3.00	$78
7080201	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED) (WHITE)	L.FT.	15,014	$0.10	$1,501
7080202	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED) (YELLOW)	L.FT.	1,020	$0.10	$102
7080204	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED SYMBOL)	EACH	29	$100.00	$2,900
7310010	POLE (TYPE A)	EACH	4	$1,500.00	$6,000
7310092	POLE (TYPE H) (BREAKAWAY)	EACH	1	$2,000.00	$2,000
7310140	POLE (TYPE R)	EACH	4	$9,000.00	$36,000
7310197	BREAKAWAY BASE FOR LIGHTING POLE OR SIGNAL FLASHER	EACH	1	$600.00	$600
7310200	POLE FOUNDATION (TYPE A)	EACH	4	$1,200.00	$4,800
7310276	POLE FOUNDATION (TYPE H) (BREAKAWAY)	EACH	1	$800.00	$800
7310320	POLE FOUNDATION (TYPE R)	EACH	4	$4,000.00	$16,000
7310554	MAST ARM (20 FT.) (SPECIAL)	EACH	1	$2,000.00	$2,000
7320040	ELECTRICAL CONDUIT (1 1/2") (PVC)	L.FT.	2,336	$12.00	$28,032
7320050	ELECTRICAL CONDUIT (2") (PVC)	L.FT.	500	$10.00	$5,000
7320072	ELECTRICAL CONDUIT (3 - 3") (PVC)	L.FT.	1,000	$20.00	$20,000
7320421	PULL BOX (NO. 7) (WITH EXTENSION)	EACH	14	$1,000.00	$14,000
7320450	PULL BOX (NO. 7) (FM-2.06)	EACH	2	$1,000.00	$2,000
7320455	PULL BOX (NO. 9)	EACH	2	$5,000.00	$10,000
7320456	PULL BOX (4B)	EACH	1	$1,000.00	$1,000
7320461	PULL BOX (6B)	EACH	1	$2,000.00	$2,000
7320500	CONDUCTOR (NO. 12)	L.FT.	150	$0.80	$120
7320520	CONDUCTOR (NO. 8)	L.FT.	2,000	$0.95	$1,900
7320585	CONDUCTOR (INSULATED BOND) (NO. 12)	L.FT.	75	$1.00	$75
7320595	CONDUCTOR (INSULATED BOND) (NO. 8)	L.FT.	500	$2.00	$1,000
7320654	CONDUCTORS (NO. 8)	L.FT.	7,508	$1.00	$7,508
7320740	REMOVAL OF EXISTING CONDUCTORS	L.FT.	9,008	$0.50	$4,504
7320787	SINGLE MODE FIBER OPTIC CABLE (144 FIBERS)(ADOT)	L.FT.	1,000	$3.00	$3,000
7320788	SINGLE MODE FIBER OPTIC CABLE (144 FIBERS)(SCOTTSDALE)	L.FT.	1,000	$3.00	$3,000
7320789	SINGLE MODE FIBER OPTIC CABLE (12 FIBERS)	L.FT.	500	$2.00	$1,000
7320794	FIBER OPTIC SPLICE CLOSURE (ITS)	EACH	2	$1,500.00	$3,000
7320809	CABLE INNERDUCT (1")	L.FT.	1,000	$1.25	$1,250
7330060	TRAFFIC SIGNAL FACE (TYPE F)	EACH	23	$500.00	$11,500
7340120	METER PEDESTAL CABINET	EACH	1	$4,000.00	$4,000
7340306	METER PEDESTAL FOUNDATION	EACH	1	$1,200.00	$1,200
7350030	LOOP DETECTOR FOR TRAFFIC SURVEILLANCE (6'X6')	EACH	6	$1,000.00	$6,000
7360111	LUMINAIRE (LED) (HORIZONTAL MOUNT) (TYPE 40L)	EACH	1	$900.00	$900
7360113	LUMINAIRE (LED) (UNDERDECK 15L)	EACH	6	$1,000.00	$6,000
8080043	BACKFLOW PREVENTION ASSEMBLY RELOCATION	EACH	1	$6,000.00	$6,000
8082845	MANHOLE (RESET FRAME AND COVER)	EACH	3	$1,500.00	$4,500
8080646	RESET FRAME AND COVER FOR VALVE BOX	EACH	1	$700.00	$700
8080655	RELOCATE FIRE HYDRANT	EACH	2	$5,000.00	$10,000
9080084	CONCRETE CURB AND GUTTER (ALL TYPES)	L.FT.	8,435	$20.00	$168,700
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	18,909	$6.00	$113,454

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
9080296	CONCRETE SIDEWALK RAMP (ALL TYPES)	EACH	8	$2,500.00	$20,000
9080511	SCUPPER (MAG DET. 203)	EACH	5	$5,000.00	$25,000
9210021	MEDIAN PAVING (CONCRETE PAVERS)	SQ.YD.	3,402	$60.00	$204,120
9240052	MISCELLANEOUS WORK (LANDSCAPE & EROSION CONTROL)	L.SUM	1	$104,000.00	$104,000
9240062	MISCELLANEOUS WORK (REMOVE AND REPLACE COS ITS INFRASTRUCTURE)	L.SUM	1	$100,000.00	$100,000
9240131	MISCELLANEOUS WORK (GigE SWITCH)	EACH	2	$2,500.00	$5,000
				ITEM TOTAL	$1,434,816

PROJECT WIDE			
Mobilization (10%)	COST		$143,482
Dust and Water Palliative (1%)	COST		$14,349
Quality Control (2%)	COST		$28,697
Construction Surveying (2%)	COST		$28,697
Maintenance and Protection of Traffic (10%)	COST		$143,482
		PROJECT WIDE SUBTOTAL	$358,707
Unidentified Item Allowance (20%)	COST		$358,705
		PROJECT WIDE TOTAL	$717,412
OTHER COST			
Construction Engineering (9%)	COST		$193,701
Construction Contingencies (5%)	COST		$107,612
Consultant Services (1%)	COST		$21,523
PCCP Materials Quality Incentive ($2 per Sq Yd)	SQ.YD	2,773	$5,546
PCCP Smoothness Incentive ($3,500 per Lane-Mile)	LANE-MILE	0.4	$1,379
Right-Of-Way ($30 per Sq Ft)	SQ. FT.	19,195	$575,851
Temporary Construction Easement ($2,767 per Month)	MONTH	12	$33,205
		OTHER COST TOTAL	$938,816

SUMMARY	
ITEM TOTAL	$1,434,816
PROJECT WIDE	$717,412
OTHER COST TOTAL	$938,816
SUBTOTAL PROJECT COST	$3,091,044
INDIRECT COST ALLOCATION (9.90%)	$306,013
TOTAL PROJECT COST	$3,397,057

Table 6.5 – Raintree Drive Improved Single-Point Urban Interchange

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	1,234	$5.00	$6,170
2020053	REMOVE (CATCH BASINS)	EACH	3	$1,000.00	$3,000
2020155	REMOVE (PULL BOX)	EACH	1	$300.00	$300
2020162	REMOVE (CONCRETE)	SQ.YD.	316	$4.00	$1,264
2020175	REMOVAL OF LIGHT POLES AND BASES	EACH	1	$900.00	$900
2030301	ROADWAY EXCAVATION	CU.YD.	906	$10.00	$9,060
4010020	PORTLAND CEMENT CONCRETE PAVEMENT (11" PCCP OVER 4" AB)	SQ.YD.	1,107	$60.00	$66,420
5012524	STORM DRAIN PIPE, 24"	L.FT.	27	$100.00	$2,700
5030604	CONCRETE CATCH BASIN (C-15.91)	EACH	3	$5,000.00	$15,000
6070002	BREAKAWAY SIGN POST S4X7.7	L.FT.	24	$35.00	$840
6070022	FOUNDATION FOR BREAKAWAY SIGN POST S4X7.7	EACH	3	$600.00	$1,800
6070038	SLIP BASE (2 1/2S)	EACH	3	$250.00	$750
6080005	REGULATORY, WARNING, OR MARKER SIGN PANEL	SQ.FT.	100	$20.00	$2,000
7040005	PAVEMENT MARKING (WHITE EXTRUDED THERMOPLASTIC) (0.090")	L.FT.	1,238	$0.60	$743
7040074	PAVEMENT SYMBOL (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	5	$125.00	$625
7060013	PAVEMENT MARKER, RAISED, TYPE C	EACH	31	$5.00	$155
7080201	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED) (WHITE)	L.FT.	1,238	$0.10	$124
7080204	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED SYMBOL)	EACH	5	$100.00	$500
7310010	POLE (TYPE A)	EACH	1	$1,500.00	$1,500
7310092	POLE (TYPE H) (BREAKAWAY)	EACH	1	$2,000.00	$2,000
7310197	BREAKAWAY BASE FOR LIGHTING POLE OR SIGNAL FLASHER	EACH	1	$600.00	$600
7310200	POLE FOUNDATION (TYPE A)	EACH	1	$1,200.00	$1,200
7310276	POLE FOUNDATION (TYPE H) (BREAKAWAY)	EACH	1	$800.00	$800
7310554	MAST ARM (20 FT.) (SPECIAL)	EACH	1	$2,000.00	$2,000
7320040	ELECTRICAL CONDUIT (1 1/2") (PVC)	L.FT.	500	$12.00	$6,000
7320050	ELECTRICAL CONDUIT (2") (PVC)	L.FT.	500	$10.00	$5,000
7320072	ELECTRICAL CONDUIT (3 - 3") (PVC)	L.FT.	1,500	$20.00	$30,000
7320450	PULL BOX (NO. 7) (FM-2.06)	EACH	2	$1,000.00	$2,000
7320455	PULL BOX (NO. 9)	EACH	2	$5,000.00	$10,000
7320456	PULL BOX (4B)	EACH	1	$1,000.00	$1,000
7320461	PULL BOX (6B)	EACH	1	$2,000.00	$2,000
7320500	CONDUCTOR (NO. 12)	L.FT.	150	$0.80	$120
7320520	CONDUCTOR (NO. 8)	L.FT.	2,000	$0.95	$1,900
7320585	CONDUCTOR (INSULATED BOND) (NO. 12)	L.FT.	75	$1.00	$75
7320595	CONDUCTOR (INSULATED BOND) (NO. 8)	L.FT.	500	$2.00	$1,000
7320654	CONDUCTORS (NO. 8)	L.FT.	1,500	$1.00	$1,500
7320740	REMOVAL OF EXISTING CONDUCTORS	L.FT.	2,500	$0.50	$1,250
7320787	SINGLE MODE FIBER OPTIC CABLE (144 FIBERS)(ADOT)	L.FT.	1,500	$3.00	$4,500
7320788	SINGLE MODE FIBER OPTIC CABLE (144 FIBERS)(SCOTTSDALE)	L.FT.	1,500	$3.00	$4,500
7320789	SINGLE MODE FIBER OPTIC CABLE (12 FIBERS)	L.FT.	500	$2.00	$1,000
7320794	FIBER OPTIC SPLICE CLOSURE (ITS)	EACH	2	$1,500.00	$3,000
7320809	CABLE INNERDUCT (1")	L.FT.	1,500	$1.25	$1,875
7340120	METER PEDESTAL CABINET	EACH	1	$4,000.00	$4,000
7340306	METER PEDESTAL FOUNDATION	EACH	1	$1,200.00	$1,200
7360111	LUMINAIRE (LED) (HORIZONTAL MOUNT) (TYPE 40L)	EACH	1	$900.00	$900
7360113	LUMINAIRE (LED) (UNDERDECK 15L)	EACH	8	$1,000.00	$8,000
8082845	MANHOLE (RESET FRAME AND COVER)	EACH	1	$1,500.00	$1,500
9080084	CONCRETE CURB AND GUTTER (ALL TYPES)	L.FT.	1,201	$20.00	$24,020
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	2,387	$6.00	$14,322
9080296	CONCRETE SIDEWALK RAMP (ALL TYPES)	EACH	8	$2,500.00	$20,000
9240052	MISCELLANEOUS WORK (LANDSCAPE & EROSION CONTROL)	L.SUM	1	$12,000.00	$12,000
9240131	MISCELLANEOUS WORK (GigE SWITCH)	EACH	2	$2,500.00	$5,000
				ITEM TOTAL	$288,113

PROJECT WIDE			
Mobilization (10%)	COST		$28,812
Dust and Water Palliative (1%)	COST		$2,882
Quality Control (2%)	COST		$5,763
Construction Surveying (2%)	COST		$5,763
Maintenance and Protection of Traffic (10%)	COST		$28,812
		PROJECT WIDE SUBTOTAL	$72,032
Unidentified Item Allowance (20%)	COST		$72,029
		PROJECT WIDE TOTAL	$144,061
OTHER COST			
Construction Engineering (9%)	COST		$38,896

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	Construction Contingencies (5%)	COST			$21,609
	Consultant Services (1%)	COST			$4,322
	PCCP Materials Quality Incentive ($2 per Sq Yd)	SQ.YD	1,107		$2,214
	PCCP Smoothness Incentive ($3,500 per Lane-Mile)	LANE-MILE	0.2		$550
	Right-Of-Way ($30 per Sq Ft)	SQ. FT.	810		$24,286
	Temporary Construction Easement ($503 per Month)	MONTH	12		$6,039
				OTHER COST TOTAL	**$97,916**

SUMMARY	
ITEM TOTAL	**$288,113**
PROJECT WIDE	**$144,061**
OTHER COST TOTAL	**$97,916**
SUBTOTAL PROJECT COST	**$530,090**
INDIRECT COST ALLOCATION (9.90%)	**$52,479**
TOTAL PROJECT COST	**$582,569**

Table 6.6 – Shea Boulevard Single-Point Urban Interchange: Extend Right Turn Lane

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	470	$5.00	$2,350
2020155	REMOVE (PULL BOX)	EACH	2	$300.00	$600
2020162	REMOVE (CONCRETE)	SQ.YD.	342	$4.00	$1,368
2020175	REMOVAL OF LIGHT POLES AND BASES	EACH	2	$900.00	$1,800
2030301	ROADWAY EXCAVATION	CU.YD.	331	$10.00	$3,310
4060009	ASPHALTIC CONCRETE (MISCELLANEOUS PAVING)	TON	11	$500.00	$5,500
7310092	POLE (TYPE H) (BREAKAWAY)	EACH	2	$2,000.00	$4,000
7310197	BREAKAWAY BASE FOR LIGHTING POLE OR SIGNAL FLASHER	EACH	2	$600.00	$1,200
7310276	POLE FOUNDATION (TYPE H) (BREAKAWAY)	EACH	2	$800.00	$1,600
7310554	MAST ARM (20 FT.) (SPECIAL)	EACH	2	$2,000.00	$4,000
7320050	ELECTRICAL CONDUIT (2") (PVC)	L.FT.	1,000	$10.00	$10,000
7320456	PULL BOX (4B)	EACH	2	$1,000.00	$2,000
7320461	PULL BOX (6B)	EACH	1	$2,000.00	$2,000
7320500	CONDUCTOR (NO. 12)	L.FT.	300	$0.80	$240
7320520	CONDUCTOR (NO. 8)	L.FT.	4,000	$0.95	$3,800
7320585	CONDUCTOR (INSULATED BOND) (NO. 12)	L.FT.	150	$1.00	$150
7320595	CONDUCTOR (INSULATED BOND) (NO. 8)	L.FT.	1,000	$2.00	$2,000
7320740	REMOVAL OF EXISTING CONDUCTORS	L.FT.	1,000	$0.50	$500
7340120	METER PEDESTAL CABINET	EACH	1	$4,000.00	$4,000
7340306	METER PEDESTAL FOUNDATION	EACH	1	$1,200.00	$1,200
7360111	LUMINAIRE (LED) (HORIZONTAL MOUNT) (TYPE 40L)	EACH	2	$900.00	$1,800
7360113	LUMINAIRE (LED) (UNDERDECK 15L)	EACH	4	$1,000.00	$4,000
8080646	RESET FRAME AND COVER FOR VALVE BOX	EACH	2	$700.00	$1,400
8082845	MANHOLE (RESET FRAME AND COVER)	EACH	1	$1,500.00	$1,500
9080084	CONCRETE CURB AND GUTTER (ALL TYPES)	L.FT.	454	$20.00	$9,080
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	2,629	$6.00	$15,774
9080296	CONCRETE SIDEWALK RAMP (ALL TYPES)	EACH	4	$2,500.00	$10,000
9240120	MISCELLANEOUS WORK (RELOCATED COMMUNICATIONS PEDESTAL)	EACH	2	$1,000.00	$2,000
				ITEM TOTAL	**$97,172**
	PROJECT WIDE				
	Mobilization (10%)	COST			$9,718
	Dust and Water Palliative (1%)	COST			$972
	Quality Control (2%)	COST			$1,932
	Construction Surveying (2%)	COST			$1,944
	Maintenance and Protection of Traffic (10%)	COST			$9,718
				PROJECT WIDE SUBTOTAL	**$24,284**
	Unidentified Item Allowance (20%)	COST			$24,292
				PROJECT WIDE TOTAL	**$48,576**
	OTHER COST				
	Construction Engineering (9%)	COST			$13,118
	Construction Contingencies (5%)	COST			$7,281
	Consultant Services (1%)	COST			$1,458
	Temporary Construction Easement ($342 per Month)	MONTH	12		$4,101
				OTHER COST TOTAL	**$25,958**

SUMMARY	
ITEM TOTAL	**$97,172**
PROJECT WIDE	**$48,576**
OTHER COST TOTAL	**$25,958**
SUBTOTAL PROJECT COST	**$171,705**
INDIRECT COST ALLOCATION (9.90%)	**$16,999**
TOTAL PROJECT COST	**$188,704**

6.2. Estimate of Future Maintenance Costs

An estimate of the additional future maintenance costs that would be the result of the additional roadway lane miles added to the freeway system was evaluated for the SR 101L Widening Preferred alternative. The additional maintenance costs are estimated to be approximately $283,795 as shown in Table 6.7 below.

Table 6.7 – Estimate of Future Maintenance Costs

Annual Maintenance Cost Per Lane Mile Using Latest FY Data[1]	
MCL=Maintenance Cost per Lane Mile	**$22,300**
Annual Maintenance Cost of Project at PD/DCR Phase	**Metropolitan Phoenix[6]**
PW = Total Pavement Width	12
NL = Number of Lane Miles	1
LP = Length of Project in Miles	9.6
PMC = Current Project Maintenance Costs	$214,080,
Annual Maintenance Cost of Project a Beginning of Maintenance Phase	**Metropolitan Phoenix[6]**
IF = Inflation Factor	1.058
N = Number of Years to Maintenance Phase	**5**
PMCI = Project Maintenance cost Including Inflation	$283,795

1. MAG Study - Estimated Maintenance Costs (5-year estimates in 2019 dollars) for ADOT assets in Maricopa County.
2. Miscellaneous maintenance include building and yard maintenance, work for other decisions, training, material handling, vegetation control and contract administration for categories not considered in the maintenance costs breakdown.
3. For Other Specialty Items, contact Central Maintenance

4. Total pavement width includes the main line, ramps, and shoulders.
5. Based on increase in maintenance costs of 76% over the last 10 years
6. Numbers for maintenance costs at PCA/DCR Phase and Beginning of Maintenance Phase represent an Example Project, 24 feet wide, 2 miles long, going into the maintenance phase 3 years later.

NL=PW / 12
PMC – MCL x NL x LP
PMCI = PMC x (IF^N)

6.3. Detailed Cost Estimates of Other Alternatives Considered

Refer to **Appendix D** for detailed cost estimates of the following other alternatives considered:

- Frank Lloyd Wright Improved SPUI
- Raintree Drive TDI
- Raintree DRI

7. IMPLEMENTATION PLAN

The current approved RTPFP programmed amount for SR 101L construction from Princess to Shea Boulevard is $88,179,293, which is $81,154,243 for construction, $525,050 for right-of-way acquisitions and utility relocations, and $6,500,000 for design.

The total estimated cost for the Recommended Alternative is $121,435,000 which includes $114,285,000 for construction, $650,000 for right-of-way acquisitions, and $6,500,000 for design.

8. AASHTO Controlling Design Criteria

American Association of State Highway and Transportation Officials (AASHTO) Controlling Design Criteria have been reviewed for the existing roadways that will remain as a part of the proposed improvements. Existing and proposed features for each of the alternatives that do not meet current AASHTO (2018 Green Book) recommended guidelines are indicated below.

The Arizona Department of Transportation (ADOT) Design Criteria has also been reviewed for the existing roadways which will remain as a part of the proposed improvements. Existing and proposed features for each alternative that do not meet current *ADOT Roadway Design Guidelines* are also indicated below.

A complete listing of the existing SR 101L features and evaluation results are presented within the *Initial AASHTO Controlling Criteria Report*, dated December 2020. This report is included in Appendix A.

8.1. AASHTO Non-Conforming Geometric Design Elements

Non-conforming AASHTO design elements that would not be upgraded as part of this project include the following:

SR 101L Mainline (NB and SB):

The existing median shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Princess Drive TI OP Bridge Pier (MP 36.53 to MP 36.64): 2.0' less than recommended
b. Bell Road OP Bridge Pier (MP 37.03 to MP 37.17): 2.1' less than recommended
c. SR 101L Southbound Overhead Sign Support (MP 37.26 to MP 37.27): 2.0' less than recommended
d. CAP Canal OP Bridge Pier (MP 37.65 to MP 37.71): 0.3' less than recommended
e. Frank Lloyd Wright Boulevard TI OP Bridge Pier (MP 37.76 to MP 37.81): 0.3' less than recommended
f. SR 101L Southbound Overhead Sign Support (MP 38.27 to MP 38.28): 2.0' less than recommended
g. Raintree Drive TI UP Bridge Pier (MP 38.56 to MP 38.59): 1.9' less than recommended
h. SR 101L Northbound Overhead Sign Support (MP 38.98 to MP 38.99): 2.0' less than recommended
i. Thunderbird Road UP Bridge Pier (MP 39.03 to MP 39.05): 1.9' less than recommended
j. Sweetwater Avenue Pedestrian UP Bridge Pier (MP 39.54 to MP 39.55): 1.9' less than recommended
k. Cactus Road TI UP Bridge Pier (MP 40.06 to MP 40.09): 1.9' less than recommended
l. SR 101L Northbound Overhead Sign Support (MP 40.12 to MP 40.14): 2.0' less than recommended
m. SR 101L Southbound Overhead Sign Support (MP 40.93 to MP 40.94): 2.0' less than recommended
n. Shea Boulevard TI UP Bridge Pier (MP 41.04 to MP 41.08): 1.9' less than recommended

The proposed outside shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. MP 40.57 to MP 40.65 (SR 101L SB): 0.0' to 9.0' less than recommended**

The existing superelevation is less than the AASHTO recommended at the following locations:

a. MP 36.54 to MP 37.21 (SR 101L SB): 0.001 ft/ft less than 0.030 ft/ft**
b. MP 36.54 to MP 37.04 (SR 101L NB): 0.001 ft/ft less than 0.030 ft/ft**
c. MP 37.04 to MP 37.16 (SR 101L NB): 0.001 ft/ft less than 0.036 ft/ft**

Princess Drive ramp C:

The existing ramp traveled way width is less than the AASHTO recommended 27' minimum at the following locations:

a. Station 2+48 to Station 6+85: 3' less than recommended**

The proposed ramp traveled way width is less than the AASHTO recommended 27' minimum at the following locations:

a. Station 16+85 to Station 29+17: 3' less than recommended**

The existing combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 2+48 to Station 6+85: 6' less than recommended**

The proposed combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 16+85 to Station 24+32: 5' less than recommended**

Princess Drive ramp D:

The existing ramp traveled way width is less than the AASHTO recommended 25' minimum at the following locations:

a. Station 0+00 to Station 4+25: 1' less than recommended**

The proposed ramp traveled way width is less than the AASHTO recommended 25' minimum at the following locations:

a. Station 14+25 to Station 31+33: 1' less than recommended**

The existing outside ramp shoulder width is less than the AASHTO recommended 6' minimum at the following locations:

a. Station 0+00 to Station 4+25: 4' less than recommended**

The proposed outside ramp shoulder width is less than the AASHTO recommended 6' minimum at the following locations:

a. Station 14+25 to Station 31+33: 2' less than recommended**

The existing combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 3+53 to Station 4+25: 2' less than recommended**

The proposed combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 14+25 to Station 24+89: 4' less than recommended**

Frank Lloyd Wright Boulevard Ramp A:

The existing ramp traveled way width is less than the AASHTO recommended 26' minimum at the following locations:

a. Station 23+00 to Station 27+49: 2' less than recommended**

The proposed ramp traveled way width is less than the AASHTO recommended 26' minimum at the following locations:

a. Station 20+17 to Station 33+00: 2' less than recommended**

The existing outside ramp shoulder width is less than the AASHTO recommended 6' minimum at the following locations:

a. Station 23+00 to Station 27+49: 4' less than recommended**

The proposed outside ramp shoulder width is less than the AASHTO recommended 6' minimum at the following locations:

a. Station 20+17 to Station 33+00: 4' less than recommended**

The existing combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 23+00 to Station 23+48: 6' less than recommended**

The proposed combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 25+68 to Station 33+00: 6' less than recommended**

Frank Lloyd Wright Boulevard Ramp B:

The proposed ramp traveled way width is less than the AASHTO recommended 18' minimum at the following locations:

a. Station 9+35 to Station 27+09: 6' less than recommended**

The existing combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 17+09 to Station 17+98: 1' less than recommended**

The proposed combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 14+32 to Station 27+09: 2' less than recommended**

Frank Lloyd Wright Boulevard Ramp D:

The existing ramp traveled way width is less than the AASHTO recommended 26' minimum at the following locations:

a. Station 0+00 to Station 4+59: 2' less than recommended**

The proposed ramp traveled way width is less than the AASHTO recommended 28' minimum at the following locations:

a. Station 14+59 to Station 30+70: 4' less than recommended**

The existing outside ramp shoulder width is less than the AASHTO recommended 6' minimum at the following locations:

a. Station 0+00 to Station 4+59: 4' less than recommended**

The proposed outside ramp shoulder width is less than the AASHTO recommended 6' minimum at the following locations:

a. Station 14+59 to Station 30+70: 2' less than recommended**

The proposed combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 14+59 to Station 24+33: 6' less than recommended**

Raintree Drive Ramp A-1:

The existing ramp traveled way width is less than the AASHTO recommended 32' minimum at the following locations:

a. Station 0+95 to Station 2+05: 2' less than recommended**

The existing inside ramp shoulder width is less than the AASHTO recommended 2' minimum at the following locations:

a. Station 0+00 to Station 2+56: 2' less than recommended**

The existing outside ramp shoulder width is less than the AASHTO recommended 2' minimum at the following locations:

a. Station 0+95 to Station 2+05: 2' less than recommended**

Raintree Drive Ramp B-1:

The existing ramp traveled way width is less than the AASHTO recommended 32' minimum at the following locations:

a. Station 0+64 to Station 2+04: 2' less than recommended**

The existing inside ramp shoulder width is less than the AASHTO recommended 2' minimum at the following locations:

a. Station 0+00 to Station 2+61: 2' less than recommended**

The existing outside ramp shoulder width is less than the AASHTO recommended 2' minimum at the following locations:

a. Station 0+64 to Station 2+04: 2' less than recommended**

Raintree Drive Ramp C-1:

The existing ramp traveled way width is less than the AASHTO recommended 32' minimum at the following locations:

a. Station 3+14 to Station 4+28: 6' less than recommended**

The existing outside ramp shoulder width is less than the AASHTO recommended 2' minimum at the following locations:

a. Station 3+14 to Station 4+28: 2' less than recommended**

Raintree Drive Ramp D-1:

The existing ramp traveled way width is less than the AASHTO recommended 32' minimum at the following locations:

a. Station 2+35 to Station 3+75: 2' less than recommended**

The existing inside ramp shoulder width is less than the AASHTO recommended 2' minimum at the following locations:

a. Station 1+82 to Station 4+73: 2' less than recommended**

The existing outside ramp shoulder width is less than the AASHTO recommended 2' minimum at the following locations:

a. Station 2+35 to Station 3+75: 2' less than recommended**

Raintree Drive Ramp A:

The existing ramp traveled way width is less than the AASHTO recommended 27' minimum at the following locations:

a. Station 16+30 to Station 18+59: 3' less than recommended**

The proposed ramp traveled way width is less than the AASHTO recommended 25' minimum at the following locations:

a. Station 8+67 to Station 26+30: 1' less than recommended**

The existing outside ramp shoulder width is less than the AASHTO recommended 6' minimum at the following locations:

a. Station 16+30 to Station 18+59: 4' less than recommended**

The proposed outside ramp shoulder width is less than the AASHTO recommended 6' minimum at the following locations:

a. Station 8+67 to Station 26+30: 2' less than recommended**

The proposed combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 14+18 to Station 26+30: 4' less than recommended**

Raintree Drive Ramp D:

The existing ramp traveled way width is less than the AASHTO recommended 26' minimum at the following locations:

a. Station 0+00 to Station 5+67: 2' less than recommended**

The proposed ramp traveled way width is less than the AASHTO recommended 26' minimum at the following locations:

a. Station 15+67 to Station 32+30: 2' less than recommended**

The existing outside ramp shoulder width is less than the AASHTO recommended 6' minimum at the following locations:

a. Station 0+00 to Station 5+67: 4' less than recommended**

The proposed outside ramp shoulder width is less than the AASHTO recommended 6' minimum at the following locations:

a. Station 15+67 to Station 32+30: 2' less than recommended**

The existing combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 4+01 to Station 5+67: 6' less than recommended**

The proposed combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 15+67 to Station 25+79: 6' less than recommended**

Cactus Road SPUI Ramp A:

The existing ramp traveled way width is less than the AASHTO recommended 32' minimum at the following locations:

a. Station 14+87 to Station 16+14: 6' less than recommended**

The existing inside ramp shoulder width is less than the AASHTO recommended 2' minimum at the following locations:

a. Station 13+79 to Station 16+70: 2' less than recommended**

Cactus Road SPUI Ramp B:

The existing ramp traveled way width is less than the AASHTO recommended 32' minimum at the following locations:

a. Station 14+51 to Station 16+21: 8' less than recommended**

Cactus Road SPUI Ramp C:

The existing ramp traveled way width is less than the AASHTO recommended 32' minimum at the following locations:

a. Station 3+15 to Station 4+84: 6' less than recommended**

Cactus Road SPUI Ramp D:

The existing ramp traveled way width is less than the AASHTO recommended 32' minimum at the following locations:

a. Station 2+38 to Station 3+70: 6' less than recommended**

The existing inside ramp shoulder width is less than the AASHTO recommended 2' minimum at the following locations:

a. Station 1+84 to Station 4+76: 2' less than recommended**

Cactus Road Ramp A:

The proposed ramp traveled way width is less than the AASHTO recommended 26' minimum at the following locations:

a. Station 9+30 to Station 20+70: 2' less than recommended**

The existing outside ramp shoulder width is less than the AASHTO recommended 6' minimum at the following locations:

a. Station 10+70 to Station 13+79: 4' less than recommended**

The proposed outside ramp shoulder width is less than the AASHTO recommended 6' minimum at the following locations:

a. Station 9+30 to Station 20+70: 4' less than recommended**

The existing combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 10+70 to Station 13+79: 6' less than recommended**

The proposed combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 14+20 to Station 20+70: 6' less than recommended**

Cactus Road Ramp C:

The proposed combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 17+67 to Station 25+04: 2' less than recommended**

Cactus Road Ramp D:

The existing ramp traveled way width is less than the AASHTO recommended 26' minimum at the following locations:

a. Station 4+75 to Station 7+82: 2' less than recommended**

The proposed ramp traveled way width is less than the AASHTO recommended 26' minimum at the following locations:

a. Station 17+81 to Station 29+25: 2' less than recommended**

The existing outside ramp shoulder width is less than the AASHTO recommended 6' minimum at the following locations:

a. Station 4+75 to Station 7+82: 4' less than recommended**

The proposed outside ramp shoulder width is less than the AASHTO recommended 6' minimum at the following locations:

a. Station 17+82 to Station 29+25: 2' less than recommended**

The existing combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 4+75 to Station 7+82: 6' less than recommended**

The proposed combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 17+81 to Station 24+35: 4' less than recommended**

Shea Boulevard Ramp A-1:

The existing ramp traveled way width is less than the AASHTO recommended 32' minimum at the following locations:

a. Station 0+67 to Station 1+35: 7' less than recommended**

Shea Boulevard Ramp B-1:

The existing ramp traveled way width is less than the AASHTO recommended 32' minimum at the following locations:

a. Station 0+56 to Station 1+61: 8' less than recommended**

Shea Boulevard Ramp A:

The existing ramp traveled way width is less than the AASHTO recommended 27' minimum at the following locations:

a. Station 10+80 to Station 14+35: 2' less than recommended**

The proposed ramp traveled way width is less than the AASHTO recommended 26' minimum at the following locations:

a. Station 8+76 to Station 20+80: 2' less than recommended**

The existing outside ramp shoulder width is less than the AASHTO recommended 6' minimum at the following locations:

a. Station 10+80 to Station 14+35: 4' less than recommended**

The proposed outside ramp shoulder width is less than the AASHTO recommended 6' minimum at the following locations:

a. Station 8+76 to Station 20+80: 2' less than recommended**

The existing combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 10+80 to Station 14+35: 6' less than recommended**

The proposed combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 14+41 to Station 20+80: 4' less than recommended**

Shea Boulevard Ramp B:

The existing ramp traveled way width is less than the AASHTO recommended 28' minimum at the following locations:

a. Station 17+43 to Station 17+44: 4' less than recommended**

The proposed ramp traveled way width is less than the AASHTO recommended 26' minimum at the following locations:

a. Station 10+00 to Station 22+85: 2' less than recommended**

The existing combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 17+43 to Station 17+44: 6' less than recommended**

The proposed combined ramp shoulder width is less than the AASHTO recommended 10' minimum at the following locations:

a. Station 14+65 to Station 22+85: 5' less than recommended**

8.2. Request for AASHTO Design Exceptions

ADOT 2010 DCR requested design exceptions for the non-conforming design elements listed in Section 8.1 of this report. Design exceptions marked with ** will be requested for the non-conforming design elements.

8.3. ADOT Non-Conforming Geometric Design Elements

Non-conforming ADOT design elements that would not be upgraded as part of this project include the following:

Princess Drive Ramp C:

The existing outside shoulder width is less than the ADOT recommended 8' minimum at the following locations:

a. Station 2+48 to Station 6+85: 6' less than recommended**

The proposed outside shoulder width is less than the ADOT recommended 8' minimum at the following locations:

a. Station 16+85 to Station 29+17: 6' less than recommended**

Frank Lloyd Wright Boulevard Ramp B:

The proposed outside shoulder width is less than the ADOT recommended 8' minimum at the following locations:

a. Station 9+35 to Station 27+09: 6' less than recommended**

Cactus Road Ramp C:

The proposed outside shoulder width is less than the ADOT recommended 8' minimum at the following locations:

a. Station 17+67 to Station 31+16: 4' less than recommended**

Shea Boulevard Ramp B:

The existing outside shoulder width is less than the ADOT recommended 8' minimum at the following locations:

a. Station 17+43 to Station 17+44: 6' less than recommended**

The proposed outside shoulder width is less than the ADOT recommended 8' minimum at the following locations:

a. Station 10+00 to Station 22+85: 7' less than recommended**

8.4. REQUEST FOR ADOT DESIGN DEVIATIONS

Design deviations will be requested for the non-conforming design elements from the ADOT DCR 2010 and marked with ** listed in Section 8.3 of this report.

9. SOCIAL, ECONOMIC AND ENVIRONMENTAL CONCERNS

See ADOT 2010 DCR 2010 Section 9.0. NEPA will be updated during Design.

APPENDIX A: AASHTO Controlling Design Criteria Report

PROJECT 101 MA 036 F0123 01D

101-B(210)T

PIMA FREEWAY (SR 101L)

PRINCESS DRIVE TO SHEA BOULEVARD

GENERAL PURPOSE LANES

AASHTO CONTROLLING DESIGN CRITERIA REPORT

January 2021

Prepared For:

ADOT

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
PROJECT MANAGEMENT GROUP

Prepared By:

Kimley»Horn

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LIST OF EXISTING FEATURES REQUIRING DESIGN EXCEPTIONS

The following is a list of the existing design features requiring design exceptions based upon A Policy on Geometric Design of Highways and Streets 2018 edition.

SR 101L MAINLINE (DIVIDED)

The existing shoulder width is less than the recommended 10' (median) as follows:

1. *MP 36.53 to MP 36.64 (Princess Drive TI OP Bridge Pier) – 2.0' less than recommended.
2. *MP 37.03 to MP 37.17 (Bell Road TI OP Bridge Pier) – 2.1' less than recommended.
3. *MP 37.26 to MP 37.27 (SB Overhead Sign Support) – 2.0' less than recommended.
4. *MP 37.65 to MP 37.71 (CAP Canal OP Bridge Pier) – 0.3' less than recommended.
5. *MP 37.76 to MP 37.81 (Frank Lloyd Wright Boulevard TI OP Bridge Pier) – 0.3' less than recommended.
6. *MP 38.27 to MP 38.28 (SB Overhead Sign Support) – 2.0' less than recommended.
7. *MP 38.56 to MP 38.59 (Raintree Drive TI UP Bridge Pier) – 1.9' less than recommended.
8. *MP 38.98 to MP 38.99 (NB Overhead Sign Support) – 2.0' less than recommended.
9. *MP 39.03 to MP 39.05 (Thunderbird Road TI UP Bridge Pier) – 1.9' less than recommended.
10. *MP 39.54 to MP 39.55 (Sweetwater Avenue Pedestrian UP Bridge Pier) – 1.9' less than recommended.
11. *MP 40.06 to MP 40.09 (Cactus Road TI UP Bridge Pier) – 1.9' less than recommended.
12. *MP 40.12 to MP 40.14 (NB Overhead Sign Support) – 2.0' less than recommended.
13. *MP 40.93 to MP 40.94 (SB Overhead Sign Support) – 2.0' less than recommended.
14. *MP 41.04 to MP 41.08 (Shea Boulevard TI UP Bridge Pier) – 1.9' less than recommended.

*For information only, Design Exceptions were approved from project 101L MA 36 H6874 01L

The superelevation rate is less than the recommended minimum on the following horizontal curves:

1. Beginning MP 36.54 (SR 101L HPI Station 1964+83.90) – 0.001 ft/ft less than the minimum.
2. Beginning MP 36.54 (SR 101L NB HPI Station 1962+46.41) – 0.001 ft/ft less than the minimum.
3. Beginning MP 37.04 (SR 101L NB HPI Station 2110+23.08) – 0.001 ft/ft less than the minimum.

SOUTHBOUND FRONTAGE ROAD

No design exceptions.

NORTHBOUND FRONTAGE ROAD

No design exceptions.

PRINCESS DRIVE TI

The existing traveled way width is less than the recommended minimum as follows:

1. Ramp C - Station 10+07.00 to Station 20+13.10 – 2 ft less than the 15 ft recommended minimum.
2. Ramp C - Station 2+48.93 to Station 10+07.00 – 3 ft less than the 27 ft recommended minimum.
3. Ramp D - Station 0+00.00 to Station 21+71.69 – 1 ft less than the 25’ recommended minimum.

The existing outside shoulder width is less than the recommended 6’ as follows:

1. Ramp C - Station 2+48.93 to Station 10+07.00 – 4 ft less than the minimum.
2. Ramp D - Station 0+00.00 to Station 21+71.69 – 4 ft less than the minimum.

The existing combined shoulder width is less than the recommended 10’ as follows:

1. Ramp C - Station 2+48.93 to Station 10+07.00 – 6 ft less than the minimum.
2. Ramp D - Station 3+53.93 to Station 14+87.13 – 4 ft less than the minimum.

FRANK LLOYD WRIGHT BOULEVARD TI

The existing traveled way width is less than the recommended minimum as follows:

1. Ramp A - Station 0+00.00 to Station 27+48.67 – 2 ft less than the 26 ft recommended minimum.
2. Ramp D - Station 0+00.00 to Station 20+16.89 – 2 ft less than the 26 ft recommended minimum.

The existing outside shoulder width is less than the recommended 6’ as follows:

1. Ramp A - Station 0+00.00 to Station 27+48.67 – 4 ft less than the minimum.
2. Ramp D - Station 0+00.00 to Station 20+16.89 – 4 ft less than the minimum.

The existing combined shoulder width is less than the recommended 10’ as follows:

1. Ramp A - Station 14+71.48 to Station 23+48.28 – 6 ft less than the minimum.
2. Ramp B - Station 4+63.20 to Station 17+98.30 – 1 ft less than the minimum.
3. Ramp D - Station 4+59.17 to Station 14+22.31 – 6 ft less than the minimum.

RAINTREE DRIVE TI

The existing traveled way width is less than the recommended minimum as follows:

1. Ramp A - Station 0+00.00 to Station 18+58.57 – 3 ft less than the 27 ft recommended minimum.
2. Ramp A-1 - Station 0+95.61 to Station 2+04.89 – 2 ft less than the 32 ft recommended minimum.

3. Ramp B-1 - Station 0+64.91 to Station 2+03.66 – 2 ft less than the 32' recommended minimum.
4. Ramp C-1 - Station 3+14.77 to Station 4+27.53 – 6 ft less than the 32 ft recommended minimum.
5. Ramp D - Station 0+00.00 to Station 29+32.44 – 2 ft less than the 26 ft recommended minimum.
6. Ramp D-1 - Station 2+35.53 to Station 3+75.33 – 2 ft less than the 32' recommended minimum.

The existing inside shoulder width is less than the recommended 2' as follows:

1. Ramp A-1 - Station 0+00.00 to Station 2+56.20 – 2 ft less than the minimum.
2. Ramp B-1 - Station 0+00.00 to Station 2+60.82 – 2 ft less than the minimum.
3. Ramp D-1 - Station 1+82.84 to Station 4+73.25 – 2 ft less than the minimum.

The existing outside shoulder width is less than the recommended 6' as follows:

1. Ramp A - Station 0+00.00 to Station 18+58.57 – 4 ft less than the minimum.
2. Ramp D - Station 0+00.00 to Station 29+32.44 – 4 ft less than the minimum.

The existing outside shoulder width is less than the recommended 2' as follows:

1. Ramp A-1 - Station 0+95.61 to Station 2+04.89 – 2 ft less than the minimum.
2. Ramp B-1 - Station 0+64.91 to Station 2+03.66 – 2 ft less than the minimum.
3. Ramp C-1 - Station 3+14.77 to Station 4+27.53 – 2 ft less than the minimum.
4. Ramp D-1 - Station 2+35.53 to Station 3+75.33 – 2 ft less than the minimum.

The existing combined shoulder width is less than the recommended 10' as follows:

1. Ramp A - Station 4+21.26 to Station 12+61.44 – 6 ft less than the minimum.
2. Ramp D - Station 4+01.00 to Station 14+13.39 – 6 ft less than the minimum.

CACTUS ROAD TI

The existing traveled way width is less than the recommended minimum as follows:

1. SPUI Ramp A - Station 14+87.56 to Station 16+14.44 – 6 ft less than the 32 ft recommended minimum.
2. SPUI Ramp B - Station 14+51.26 to Station 16+20.80 – 8 ft less than the 32 ft recommended minimum.
3. SPUI Ramp C - Station 3+15.41 to Station 4+83.42 – 6 ft less than the 32 ft recommended minimum.
4. Ramp D - Station 4+75.46 to Station 18+61.60 – 2 ft less than the 26 ft recommended minimum.
5. SPUI Ramp D - Station 2+38.88 to Station 3+69.38 – 6 ft less than the 32 ft recommended minimum.

The existing inside shoulder width is less than the recommended 2' as follows:

1. SPUI Ramp A - Station 13+79.33 to Station 16+69.87 – 2 ft less than the minimum.
2. SPUI Ramp D - Station 1+84.88 to Station 4+75.46 – 2 ft less than the minimum.

The existing outside shoulder width is less than the recommended 6’ as follows:

1. Ramp A - Station 5+29.26 to Station 13+79.33 – 4 ft less than the minimum.
2. Ramp D - Station 4+75.46 to Station 18+61.60 – 4 ft less than the minimum.

The existing combined shoulder width is less than the recommended 10’ as follows:

1. Ramp A - Station 4+41.85 to Station 13+79.33 – 6 ft less than the minimum.
2. Ramp D - Station 4+75.46 to Station 14+37.20 – 6 ft less than the minimum.

SHEA BOULEVARD TI

The existing traveled way width is less than the recommended minimum as follows:

1. Ramp A - Station 0+00.00 to Station 14+35.26 – 2 ft less than the 27 ft recommended minimum.
2. Ramp A-1 - Station 0+67.04 to Station 1+35.04 – 7 ft less than the 32 ft recommended minimum.
3. Ramp B - Station 0+00.00 to Station 17+44.41 – 4 ft less than the 28’ recommended minimum.
4. Ramp B-1 - Station 0+56.98 to Station 1+60.68 – 8 ft less than the 32 ft recommended minimum.

The existing outside shoulder width is less than the recommended 6’ as follows:

1. Ramp A - Station 0+00.00 to Station 14+35.26 – 4 ft less than the minimum.
2. Ramp B - Station 0+00.00 to Station 17+44.41 – 4 ft less than the minimum.

The existing combined shoulder width is less than the recommended 10’ as follows:

1. Ramp A - Station 4+99.39 to Station 14+35.26 – 6 ft less than the minimum.
2. Ramp B - Station 6+75.36 to Station 17+44.41 – 4 ft less than the minimum.

THUNDERBIRD ROAD

No design exceptions.

PRINCESS DRIVE

No design exceptions.

BELL ROAD

No design exceptions.

FRANK LLOYD WRIGHT BOULEVARD

No design exceptions.

RAINTREE DRIVE

No design exceptions.

CACTUS ROAD

No design exceptions.

SHEA BOULEVARD

No design exceptions.

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
SR 101L MAINLINE SUMMARY (DIVIDED)

PROJECT NUMBER:	101L MA 036 F0123D	**ROUTE:**	SR 101L
PROJECT LOCATION:	Princess Drive to Shea Boulevard	**BEGINNING MP:**	36.54
HIGHWAY SECTION:	Pima Freeway (SR101L)	**ENDING MP:**	41.08
FUNCTIONAL CLASSIFICATION:	Urban Freeway/Expressway - Controlled Access		

TRAFFIC VOLUMES AND FACTORS:

	EXISTING	DESIGN	TRAFFIC FACTORS		
101L SEGMENT	**2019 AADT**	**2040 AADT**	**K=**	**D=**	**T=**
PRINCESS DRIVE - FRANK LLOYD WRIGHT BOULEVARD	148,000	189,000	9%	51%	7%
FRANK LLOYD WRIGHT BOULEVARD - RAINTREE DRIVE	150,000	191,000	8%	53%	7%
RAINTREE DRIVE - CACTUS ROAD	174,000	221,000	9%	54%	7%
CACTUS ROAD - SHEA BOULEVARD	170,000	216,000	9%	50%	7%
SHEA BOULEVARD - MOUNTAIN VIEW ROAD	164,000	208,000	11%	51%	7%

DESIGN SPEED:

THE AASHTO RECOMMENDED MINIMUM DESIGN SPEED OF THE HIGHWAY IS: 65 MPH

AVERAGE ELEVATION IS: 1,505 FT

THE POSTED SPEED LIMIT IS: 65 MPH

TERRAIN IS: LEVEL

LANE WIDTH:

	LANES	
	EXISTING	**AASHTO**
101L SOUTHBOUND	12'	12'
101L NORTHBOUND	12'	12'

SHOULDER WIDTH:

	INSIDE SHOULDER		OUTSIDE SHOULDER	
	EXISTING	**AASHTO**	**EXISTING**	**AASHTO**
101L SOUTHBOUND	*8-10'	10	10-12'	10'
101L NORTHBOUND	*8-10'	10	10-12'	10'

HORIZONTAL CURVE RADIUS:

	MILEPOST			SUPERELEVATION		EXISTING	AASHTO MAX	METHOD 2	POSTED	EXISTING	EXISTING	HORIZONTAL SSD	
			EXISTING	AASHTO MIN	RDG MAX	DEGREE OF	DEGREE OF	SPEED	SPEED	HSO	GRADE	EXISTING	REQUIRED
HPI STATION	BEGIN	END	(FT/FT)	(FT/FT)	(FT/FT)	CURVE	CURVE	(MPH)	(MPH)	(FT)	(%)	(FT)	(FT)

SEE ATTACHMENT #1

REMARKS:

*DESIGN EXCEPTION REQUIRED

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
SR 101L MAINLINE SUMMARY (DIVIDED)
(CONTINUED)

SUPERELEVATION:

SOUTHBOUND & NORTHBOUND EXISTING MAXIMUM RATE IS: 0.042 FT/FT

AASHTO MAXIMUM RATE IS: 0.060 FT/FT
AASHTO MINIMUM RATE IS: SEE ATTACHMENT #1

STOPPING SIGHT DISTANCE:

VPI STATION	MILEPOST BEGIN	MILEPOST END	APPROACH GRADE (%)	DEPARTURE GRADE (%)	LENGTH OF CURVE (FT)	STOPPING SIGHT DISTANCE EXISTING (FT)	STOPPING SIGHT DISTANCE REQUIRED (FT)	EXISTING SPEED (MPH)	POSTED SPEED (MPH)

SEE ATTACHMENT #2

MAXIMUM GRADE:

	ASCENDING	DESCENDING
SOUTHBOUND EXISTING MAXIMUM GRADE IS:	0.9751%	-2.5842%
NORTHBOUND EXISTING MAXIMUM GRADE IS:	2.5842%	-1.1250%

AASHTO MAXIMUM GRADE IS: 3.0000%

CROSS SLOPE:

SOUTHBOUND & NORTHBOUND EXISTING CROSS SLOPE IS: 2.0%

AASHTO ALLOWABLE RANGE IS: 1.5 - 2.0%

VERTICAL CLEARANCE:

STRUCTURE	MILEPOST	VERTICAL CLEARANCE NB / EB	VERTICAL CLEARANCE SB / WB	MINIMUM CLEARANCE

SEE ATTACHMENT #3

DESIGN LOADING STRUCTURAL CAPACITY:

ROUTE NO.	MILEPOST	STR. NO. AND NAME	BRIDGE LENGTH	BRIDGE ROADWAY WIDTH	BRIDGE RAIL/ BARRIER	AC OVERLAY	VERTICAL CLEARANCE (MINIMUM)	BRIDGE LOAD RATING	BRIDGE SUFFICIENCY RATING

SEE ATTACHMENT #3

REMARKS:

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
SOUTHBOUND FRONTAGE ROAD

PROJECT NUMBER: 101L MA 036 F0123D — **ROUTE:** SR 101L
PROJECT LOCATION: Princess Drive to Shea Boulevard
HIGHWAY SECTION: Pima Freeway (SR101L)
FUNCTIONAL CLASSIFICATION: Frontage Road (Urban Collector)

TRAFFIC VOLUMES AND FACTORS:

	EXISTING 2019 AADT	DESIGN 2040 AADT	TRAFFIC FACTORS K=	D=	T=
SOUTHBOUND FRONTAGE ROAD SEGMENT	N/A	N/A			

DESIGN SPEED:

THE AASHTO RECOMMENDED MINIMUM DESIGN SPEED OF THE HIGHWAY IS: 50 MPH
THE POSTED SPEED LIMIT IS: 45 MPH
TERRAIN IS: LEVEL

AVERAGE ELEVATION IS: 1,545 FT

LANE WIDTH:

	WIDTH OF TRAVELED WAY		LANES	
	EXISTING	AASHTO	EXISTING	AASHTO
SOUTHBOUND FRONTAGE ROAD	22' - 46'	22'	11' - 12'	10'

SHOULDER WIDTH:

	INSIDE SHOULDER		OUTSIDE SHOULDER	
	EXISTING	AASHTO	EXISTING	AASHTO
SOUTHBOUND FRONTAGE ROAD	0'	(1) N/A	0'	(1) N/A

HORIZONTAL CURVE RADIUS:

HPI STATION	MILEPOST BEGIN	MILEPOST END	SUPERELEVATION EXISTING (FT/FT)	SUPERELEVATION AASHTO MIN (FT/FT)	SUPERELEVATION RDG MAX (FT/FT)	EXISTING DEGREE OF CURVE	AASHTO MAX DEGREE OF CURVE	METHOD 2 SPEED (MPH)	POSTED SPEED (MPH)	EXISTING HSO (FT)	EXISTING GRADE (%)	HORIZONTAL SSD EXISTING (FT)	HORIZONTAL SSD REQUIRED (FT)

SEE ATTACHMENT #1

REMARKS:

(1) 6.3.2.1 "Where shoulders are provided use Table 6-5"; Shoulders are not provided for this roadway.

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
SOUTHBOUND FRONTAGE ROAD
(CONTINUED)

SUPERELEVATION:

SOUTHBOUND FRONTAGE ROAD EXISTING MAXIMUM RATE IS: 0.020 FT/FT

AASHTO MAXIMUM RATE IS: 0.060 FT/FT
AASHTO MINIMUM RATE IS: SEE ATTACHMENT #1

STOPPING SIGHT DISTANCE:

VPI STATION	MILEPOST BEGIN	MILEPOST END	APPROACH GRADE (%)	DEPARTURE GRADE (%)	LENGTH OF CURVE (FT)	STOPPING SIGHT DISTANCE EXISTING (FT)	STOPPING SIGHT DISTANCE REQUIRED (FT)	EXISTING SPEED (MPH)	POSTED SPEED (MPH)

SEE ATTACHMENT #2

MAXIMUM GRADE:

	ASCENDING	DESCENDING
SOUTHBOUND FRONTAGE ROAD EXISTING MAXIMUM GRADE IS:	0.5423%	-2.0000%

AASHTO MAXIMUM GRADE IS: 7.0000%

CROSS SLOPE:

SOUTHBOUND FRONTAGE ROAD EXISTING CROSS SLOPE IS: 2.0%

AASHTO ALLOWABLE RANGE IS: 1.5 - 3.0%

VERTICAL CLEARANCE:

STRUCTURE	MILEPOST	VERTICAL CLEARANCE NB / EB	VERTICAL CLEARANCE SB / WB	MINIMUM CLEARANCE

NO STRUCTURES

DESIGN LOADING STRUCTURAL CAPACITY:

ROUTE NO.	MILEPOST	STR. NO. AND NAME	BRIDGE LENGTH	BRIDGE ROADWAY WIDTH	BRIDGE RAIL/ BARRIER	AC OVERLAY	VERTICAL CLEARANCE (MINIMUM)	BRIDGE LOAD RATING	BRIDGE SUFFICIENCY RATING

NO STRUCTURES

REMARKS:

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
NORTHBOUND FRONTAGE ROAD

PROJECT NUMBER: 101L MA 036 F0123D **ROUTE:** SR 101L
PROJECT LOCATION: Princess Drive to Shea Boulevard
HIGHWAY SECTION: Pima Freeway (SR101L)
FUNCTIONAL CLASSIFICATION: Frontage Road (Urban Collector)

TRAFFIC VOLUMES AND FACTORS:

	EXISTING 2019 AADT	DESIGN 2040 AADT	TRAFFIC FACTORS K=	D=	T=
NORTHBOUND FRONTAGE ROAD SEGMENT	N/A	N/A			

DESIGN SPEED:

THE AASHTO RECOMMENDED MINIMUM DESIGN SPEED OF THE HIGHWAY IS: 50 MPH
THE POSTED SPEED LIMIT IS: 45 MPH
TERRAIN IS: LEVEL
AVERAGE ELEVATION IS: 1,545 FT

LANE WIDTH:

	WIDTH OF TRAVELED WAY		LANES	
	EXISTING	AASHTO	EXISTING	AASHTO
NORTHBOUND FRONTAGE ROAD	22' - 46'	22'	11' - 12'	10'

SHOULDER WIDTH:

	INSIDE SHOULDER		OUTSIDE SHOULDER	
	EXISTING	AASHTO	EXISTING	AASHTO
NORTHBOUND FRONTAGE ROAD	0'	(1) N/A	0'	(1) N/A

HORIZONTAL CURVE RADIUS:

HPI STATION	MILEPOST BEGIN	MILEPOST END	SUPERELEVATION EXISTING (FT/FT)	SUPERELEVATION AASHTO MIN (FT/FT)	SUPERELEVATION RDG MAX (FT/FT)	EXISTING DEGREE OF CURVE	AASHTO MAX DEGREE OF CURVE	METHOD 2 SPEED (MPH)	POSTED SPEED (MPH)	EXISTING HSO (FT)	EXISTING GRADE (%)	HORIZONTAL SSD EXISTING (FT)	HORIZONTAL SSD REQUIRED (FT)

SEE ATTACHMENT #1

REMARKS:

(1) 6.3.2.1 "Where shoulders are provided use Table 6-5"; Shoulders are not provided for this roadway.

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
NORTHBOUND FRONTAGE ROAD
(CONTINUED)

SUPERELEVATION:

NORTHBOUND FRONTAGE ROAD EXISTING MAXIMUM RATE IS: 0.023 FT/FT

AASHTO MAXIMUM RATE IS: 0.060 FT/FT
AASHTO MINIMUM RATE IS: SEE ATTACHMENT #1

STOPPING SIGHT DISTANCE:

VPI STATION	MILEPOST BEGIN	MILEPOST END	APPROACH GRADE (%)	DEPARTURE GRADE (%)	LENGTH OF CURVE (FT)	STOPPING SIGHT DISTANCE EXISTING (FT)	STOPPING SIGHT DISTANCE REQUIRED (FT)	EXISTING SPEED (MPH)	POSTED SPEED (MPH)

SEE ATTACHMENT #2

MAXIMUM GRADE:

	ASCENDING	DESCENDING	
NORTHBOUND FRONTAGE ROAD EXISTING MAXIMUM GRADE IS:	3.5000%	-1.3063%	AASHTO MAXIMUM GRADE IS: 7.0000%

CROSS SLOPE:

NORTHBOUND FRONTAGE ROAD EXISTING CROSS SLOPE IS: 2.0%

AASHTO ALLOWABLE RANGE IS: 1.5 - 3.0%

VERTICAL CLEARANCE:

STRUCTURE	MILEPOST	VERTICAL CLEARANCE NB / EB	VERTICAL CLEARANCE SB / WB	MINIMUM CLEARANCE

NO STRUCTURES

DESIGN LOADING STRUCTURAL CAPACITY:

ROUTE NO.	MILEPOST	STR. NO. AND NAME	BRIDGE LENGTH	BRIDGE ROADWAY WIDTH	BRIDGE RAIL/ BARRIER	AC OVERLAY	VERTICAL CLEARANCE (MINIMUM)	BRIDGE LOAD RATING	BRIDGE SUFFICIENCY RATING

NO STRUCTURES

REMARKS:

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
PRINCESS DRIVE TI RAMPS

PROJECT NUMBER:	101L MA 036 F0123D	**ROUTE:**	SR 101L
PROJECT LOCATION:	Princess Drive to Shea Boulevard	**BEGINNING MP:**	36.59
HIGHWAY SECTION:	Pima Freeway (SR101L)	**ENDING MP:**	37.07
FUNCTIONAL CLASSIFICATION:	Freeway Ramps		

TRAFFIC VOLUMES AND FACTORS:

	EXISTING	DESIGN	TRAFFIC FACTORS		
PRINCESS DRIVE TI RAMPS	**2019 AADT**	**2040 AADT**	**K=**	**D=**	**T=**
RAMP C (WESTBOUND OFF-RAMP)	16,500	18,200	9%	100%	4%
RAMP D (EASTBOUND ON-RAMP)	20,700	22,900	10%	100%	4%

DESIGN SPEED:

THE AASHTO RECOMMENDED MINIMUM DESIGN SPEED OF THE HIGHWAY IS: RAMP TERMINUS = 35 MPH; RAMP MAIN BODY = 50 MPH; RAMP GORE AREA = 60 MPH (FOR EXIT RAMPS)
RAMP TERMINUS = 35 MPH; RAMP MAIN BODY = 50 MPH; RAMP GORE AREA = 55 MPH (ENTRANCE RAMPS)

THE POSTED SPEED LIMIT IS: N/A **AVERAGE ELEVATION IS:** 1,590 FT **TERRAIN IS:** LEVEL

LANE WIDTH:
(Case, Traffic Condition)

	TRAVELED WAY		LANES	
	EXISTING	**AASHTO**	**EXISTING**	**AASHTO**
RAMP C (Case 2,C):	*13'	15'	13'	12'
RAMP C (Case 3,C):	*24'	27'	12'	12'
RAMP D (Case 3,C):	*24'	25'	12'	12'

REMARKS:

*DESIGN EXCEPTION REQUIRED

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
PRINCESS DRIVE TI RAMPS
(CONTINUED)

SHOULDER WIDTH:

	INSIDE SHOULDER		OUTSIDE SHOULDER		UNIFORM SHOULDER WIDTH	COMBINED SHOULDER WIDTH	
	EXISTING	AASHTO	EXISTING	AASHTO		EXISTING	AASHTO
RAMP C:	2'	2' - 4'	*2' - 10'	6' - 10'	NO	*4' - 12'	10' - 14'
RAMP D:	4'	2' - 4'	*2'	6' - 10'	YES	*6'	10' - 14'

HORIZONTAL CURVE RADIUS:

HPI STATION	MILEPOST BEGIN	MILEPOST END	SUPERELEVATION EXISTING (FT/FT)	SUPERELEVATION AASHTO MIN (FT/FT)	SUPERELEVATION RDG MAX (FT/FT)	EXISTING DEGREE OF CURVE	AASHTO MAX DEGREE OF CURVE	METHOD 2 SPEED (MPH)	POSTED SPEED (MPH)	EXISTING HSO (FT)	EXISTING GRADE (%)	HORIZONTAL SSD EXISTING (FT)	HORIZONTAL SSD REQUIRED (FT)

SEE ATTACHMENT #1

SUPERELEVATION:

RAMP C EXISTING MAXIMUM RATE: 0.027 FT/FT

RAMP D EXISTING MAXIMUM RATE: 0.032 FT/FT

AASHTO MAXIMUM RATE IS: 0.060 FT/FT

AASHTO MINIMUM RATE IS: SEE ATTACHMENT #1

REMARKS:

*DESIGN EXCEPTION REQUIRED

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
PRINCESS DRIVE TI RAMPS
(CONTINUED)

STOPPING SIGHT DISTANCE:

VPI STATION	MILEPOST BEGIN	MILEPOST END	APPROACH GRADE (%)	DEPARTURE GRADE (%)	LENGTH OF CURVE (FT)	STOPPING SIGHT DISTANCE EXISTING (FT)	STOPPING SIGHT DISTANCE REQUIRED (FT)	EXISTING SPEED (MPH)	POSTED SPEED (MPH)

SEE ATTACHMENT #2

MAXIMUM GRADE:

	ASCENDING	DESCENDING			
RAMP C EXISTING MAXIMUM GRADE:	1.5201%	-1.7692%	(50 MPH)	AASHTO MAXIMUM GRADE FOR 35 MPH IS:	6.0000%
RAMP D EXISTING MAXIMUM GRADE:	2.4661%	-1.0739%	(50 MPH)	AASHTO MAXIMUM GRADE FOR 45+ MPH IS:	5.0000%

CROSS SLOPE:

ALL RAMPS EXISTING CROSS SLOPE IS: 2.0% AASHTO ALLOWABLE RANGE IS: 1.5 - 2.0%

VERTICAL CLEARANCE:

STRUCTURE	MILEPOST	VERTICAL CLEARANCE NB / EB	VERTICAL CLEARANCE SB / WB	MINIMUM CLEARANCE

NO STRUCTURES

DESIGN LOADING STRUCTURAL CAPACITY:

ROUTE NO.	MILEPOST	STR. NO. AND NAME	BRIDGE LENGTH	BRIDGE ROADWAY WIDTH	BRIDGE RAIL/ BARRIER	AC OVERLAY	VERTICAL CLEARANCE (MINIMUM)	BRIDGE LOAD RATING	BRIDGE SUFFICIENCY RATING

NO STRUCTURES

REMARKS:

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
FRANK LLOYD WRIGHT BOULEVARD TI RAMPS

PROJECT NUMBER:	101L MA 036 F0123D	**ROUTE:**	SR 101L
PROJECT LOCATION:	Princess Drive to Shea Boulevard	**BEGINNING MP:**	37.21
HIGHWAY SECTION:	Pima Freeway (SR101L)	**ENDING MP:**	38.63
FUNCTIONAL CLASSIFICATION:	Freeway Ramps & Turning Roadways		

TRAFFIC VOLUMES AND FACTORS:

	EXISTING	DESIGN	TRAFFIC FACTORS		
FRANK LLOYD WRIGHT BOULEVARD TI RAMPS	**2019 AADT**	**2040 AADT**	**K=**	**D=**	**T=**
RAMP A (WESTBOUND ON-RAMP)	12,300	13,600	9%	100%	4%
RAMP B (EASTBOUND OFF-RAMP)	10,500	11,600	10%	100%	4%
RAMP C (WESTBOUND OFF-RAMP)	13,700	15,100	10%	100%	4%
RAMP D (EASTBOUND ON-RAMP)	14,300	15,800	10%	100%	4%

DESIGN SPEED:

THE AASHTO RECOMMENDED MINIMUM DESIGN SPEED OF THE HIGHWAY IS: RAMP TERMINUS = 35 MPH; RAMP MAIN BODY = 50 MPH; RAMP GORE AREA = 60 MPH (FOR EXIT RAMPS)
RAMP TERMINUS = 35 MPH; RAMP MAIN BODY = 50 MPH; RAMP GORE AREA = 55 MPH (ENTRANCE RAMPS)

THE POSTED SPEED LIMIT IS: N/A **AVERAGE ELEVATION IS:** 1,510 FT **TERRAIN IS:** LEVEL

LANE WIDTH:
(Case, Traffic Condition)

	TRAVELED WAY		LANES			TRAVELED WAY		LANES	
	EXISTING	**AASHTO**	**EXISTING**	**AASHTO**		**EXISTING**	**AASHTO**	**EXISTING**	**AASHTO**
RAMP A (Case 3,C):	*24'	26'	12'	12'	RAMP C (Case 2,C):	12'	12'	12'	12'
RAMP A-1 (Case 3,C):	(1) **29'	32'	12'-16'	12'	RAMP C-1 (Case 3,C):	(1) **28'	32'	12'-14'	12'
RAMP B (Case 2,C):	14'	12'	14'	12'	RAMP D (Case 3,C):	*24'	26'	12'	12'
RAMP B-1 (Case 3,C):	(1) **30'	32'	12'-14'	12'	RAMP D-1 (Case 3,C):	(1) **30'	32'	12'-14'	12'

REMARKS:

(1) TWO LANE SPUI RAMP
*DESIGN EXCEPTION REQUIRED
**DESIGN EXCEPTION WILL NOT BE REQUESTED SINCE THIS TI WILL BE RECONSTRUCTED AS A TIGHT DIAMOND

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
FRANK LLOYD WRIGHT BOULEVARD TI RAMPS
(CONTINUED)

SHOULDER WIDTH:

	INSIDE SHOULDER		OUTSIDE SHOULDER		UNIFORM SHOULDER WIDTH	COMBINED SHOULDER WIDTH	
	EXISTING	AASHTO	EXISTING	AASHTO		EXISTING	AASHTO
RAMP A:	2'	2' - 4'	*2'	6' - 10'	YES	*4'	10' - 14'
(1)RAMP A-1:	**0'	2' - 4'	2'	2' - 4'	YES	2'	N/A
RAMP B:	2'	2' - 4'	7'	6' - 10'	YES	*9'	10' - 14'
(1)RAMP B-1:	**0'	2' - 4'	**0'	2' - 4'	YES	0'	N/A
RAMP C:	2'	2' - 4'	8'	6' - 10'	YES	10'	10' - 14'
(1)RAMP C-1:	**0'	2' - 4'	2'	2' - 4'	YES	2'	N/A
RAMP D:	2'	2' - 4'	*2'	6' - 10'	YES	*4'	10' - 14'
(1)RAMP D-1:	**0'	2' - 4'	**0'	2' - 4'	YES	0'	N/A

HORIZONTAL CURVE RADIUS:

	MILEPOST		SUPERELEVATION			EXISTING	AASHTO MAX	METHOD 2	POSTED	EXISTING	EXISTING	HORIZONTAL SSD	
			EXISTING	AASHTO MIN	RDG MAX	DEGREE OF	DEGREE OF	SPEED	SPEED	HSO	GRADE	EXISTING	REQUIRED
HPI STATION	BEGIN	END	(FT/FT)	(FT/FT)	(FT/FT)	CURVE	CURVE	(MPH)	(MPH)	(FT)	(%)	(FT)	(FT)

SEE ATTACHMENT #1

SUPERELEVATION:

RAMP A EXISTING MAXIMUM RATE: 0.020 FT/FT
(1)RAMP A-1 EXISTING MAXIMUM RATE: N/A
RAMP B EXISTING MAXIMUM RATE: 0.024 FT/FT
(1)RAMP B-1 EXISTING MAXIMUM RATE: N/A
RAMP C EXISTING MAXIMUM RATE: 0.023 FT/FT
(1)RAMP C-1 EXISTING MAXIMUM RATE: N/A
RAMP D EXISTING MAXIMUM RATE: 0.020 FT/FT
(1)RAMP D-1 EXISTING MAXIMUM RATE: N/A

AASHTO MAXIMUM RATE IS: 0.060 FT/FT
AASHTO MINIMUM RATE IS: SEE ATTACHMENT #1

REMARKS:

(1) TWO LANE SPUI RAMP
*DESIGN EXCEPTION REQUIRED
**DESIGN EXCEPTION WILL NOT BE REQUESTED SINCE THIS TI WILL BE RECONSTRUCTED AS A TIGHT DIAMOND

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
FRANK LLOYD WRIGHT BOULEVARD TI RAMPS
(CONTINUED)

STOPPING SIGHT DISTANCE:

VPI STATION	MILEPOST BEGIN	MILEPOST END	APPROACH GRADE (%)	DEPARTURE GRADE (%)	LENGTH OF CURVE (FT)	STOPPING SIGHT DISTANCE EXISTING (FT)	STOPPING SIGHT DISTANCE REQUIRED (FT)	EXISTING SPEED (MPH)	POSTED SPEED (MPH)
					SEE ATTACHMENT #2				

MAXIMUM GRADE:

	ASCENDING	DESCENDING		
RAMP A EXISTING MAXIMUM GRADE:	3.4637%	N/A	(50 MPH)	AASHTO MAXIMUM GRADE FOR 35 MPH IS: 6.0000%
(1)RAMP A-1 EXISTING MAXIMUM GRADE:	N/A			AASHTO MAXIMUM GRADE FOR 45+ MPH IS: 5.0000%
RAMP B EXISTING MAXIMUM GRADE:	N/A	-3.6088%	(50 MPH)	
(1)RAMP B-1 EXISTING MAXIMUM GRADE:	N/A			
RAMP C EXISTING MAXIMUM GRADE:	4.0000%	N/A	(50 MPH)	
(1)RAMP C-1 EXISTING MAXIMUM GRADE:	N/A			
RAMP D EXISTING MAXIMUM GRADE:	N/A	-4.5821%	(50 MPH)	
(1)RAMP D-1 EXISTING MAXIMUM GRADE:	N/A			

CROSS SLOPE:

ALL RAMPS EXISTING CROSS SLOPE IS: 2.0%

AASHTO ALLOWABLE RANGE IS: 1.5 - 3.0%

VERTICAL CLEARANCE:

STRUCTURE	MILEPOST	VERTICAL CLEARANCE NB / EB	VERTICAL CLEARANCE SB / WB	MINIMUM CLEARANCE
		NO STRUCTURES		

DESIGN LOADING STRUCTURAL CAPACITY:

ROUTE NO.	MILEPOST	STR. NO. AND NAME	BRIDGE LENGTH	BRIDGE ROADWAY WIDTH	BRIDGE RAIL/ BARRIER	AC OVERLAY	VERTICAL CLEARANCE (MINIMUM)	BRIDGE LOAD RATING	BRIDGE SUFFICIENCY RATING
					NO STRUCTURES				

REMARKS:

(1) TWO LANE SPUI RAMP

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
RAINTREE DRIVE TI RAMPS

PROJECT NUMBER:	101L MA 036 F0123D	**ROUTE:**	SR 101L
PROJECT LOCATION:	Princess Drive to Shea Boulevard	**BEGINNING MP:**	37.69
HIGHWAY SECTION:	Pima Freeway (SR101L)	**ENDING MP:**	39.08
FUNCTIONAL CLASSIFICATION:	Freeway Ramps & Turning Roadways		

TRAFFIC VOLUMES AND FACTORS:

	EXISTING	DESIGN	TRAFFIC FACTORS		
RAINTREE DRIVE TI RAMPS	**2019 AADT**	**2040 AADT**	**K=**	**D=**	**T=**
RAMP A (WESTBOUND ON-RAMP)	7,400	8,200	11%	100%	4%
RAMP B (EASTBOUND OFF-RAMP)	9,300	10,300	11%	100%	4%
RAMP C (WESTBOUND OFF-RAMP)	15,600	17,200	9%	100%	4%
RAMP D (EASTBOUND ON-RAMP)	14,200	15,700	11%	100%	4%

DESIGN SPEED:

THE AASHTO RECOMMENDED MINIMUM DESIGN SPEED OF THE HIGHWAY IS: RAMP TERMINUS = 35 MPH; RAMP MAIN BODY = 50 MPH; RAMP GORE AREA = 60 MPH (FOR EXIT RAMPS)
RAMP TERMINUS = 35 MPH; RAMP MAIN BODY = 50 MPH; RAMP GORE AREA = 55 MPH (ENTRANCE RAMPS)

THE POSTED SPEED LIMIT IS: N/A **AVERAGE ELEVATION IS:** 1,450 FT **TERRAIN IS:** LEVEL

LANE WIDTH:
(Case, Traffic Condition)

	TRAVELED WAY		LANES			TRAVELED WAY		LANES	
	EXISTING	**AASHTO**	**EXISTING**	**AASHTO**		**EXISTING**	**AASHTO**	**EXISTING**	**AASHTO**
RAMP A (Case 3,C):	*24'	27'	12'	12'	RAMP C (Case 2,C):	12'-53'	12'	12'	12'
(1)RAMP A-1 (Case 3,C):	*30'	32'	14'-16'	12'	(1)RAMP C-1 (Case 3,C):	*26'	32'	12'-15'	12'
RAMP B (Case 2,C):	12'	12'	12'	12'	RAMP D (Case 3,C):	*24'	26'	12'	12'
(1)RAMP B-1 (Case 3,C):	*30'	32'	14'-16'	12'	(1)RAMP D-1 (Case 3,C):	*30'	32'	14'-16'	12'

REMARKS:

(1) TWO LANE SPUI RAMP

*DESIGN EXCEPTION REQUIRED

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
RAINTREE DRIVE TI RAMPS
(CONTINUED)

SHOULDER WIDTH:

	INSIDE SHOULDER		OUTSIDE SHOULDER		UNIFORM SHOULDER WIDTH	COMBINED SHOULDER WIDTH	
	EXISTING	AASHTO	EXISTING	AASHTO		EXISTING	AASHTO
RAMP A:	2'	2' - 4'	*2'	6' - 10'	YES	*4'	10' - 14'
(1)RAMP A-1:	*0'	2' - 4'	*0'	2' - 4'	YES	0'	N/A
RAMP B:	2'	2' - 4'	8'	6' - 10'	YES	10'	10' - 14'
(1)RAMP B-1:	*0'	2' - 4'	*0'	2' - 4'	YES	0'	N/A
RAMP C:	2'	2' - 4'	8'	6' - 10'	YES	10'	10' - 14'
(1)RAMP C-1:	4'	2' - 4'	*0'	2' - 4'	YES	4'	N/A
RAMP D:	2'	2' - 4'	*2'	6' - 10'	YES	*4'	10' - 14'
(1)RAMP D-1:	*0'	2' - 4'	*0'	2' - 4'	YES	0'	N/A

HORIZONTAL CURVE RADIUS:

HPI STATION	MILEPOST BEGIN	MILEPOST END	SUPERELEVATION EXISTING (FT/FT)	SUPERELEVATION AASHTO MIN (FT/FT)	SUPERELEVATION RDG MAX (FT/FT)	EXISTING DEGREE OF CURVE	AASHTO MAX DEGREE OF CURVE	METHOD 2 SPEED (MPH)	POSTED SPEED (MPH)	EXISTING HSO (FT)	EXISTING GRADE (%)	HORIZONTAL SSD EXISTING (FT)	HORIZONTAL SSD REQUIRED (FT)

SEE ATTACHMENT #1

SUPERELEVATION:

RAMP A EXISTING MAXIMUM RATE: 0.020 FT/FT
(1)RAMP A-1 EXISTING MAXIMUM RATE: N/A
RAMP B EXISTING MAXIMUM RATE: 0.020 FT/FT
(1)RAMP B-1 EXISTING MAXIMUM RATE: N/A
RAMP C EXISTING MAXIMUM RATE: 0.020 FT/FT
(1)RAMP C-1 EXISTING MAXIMUM RATE: N/A
RAMP D EXISTING MAXIMUM RATE: 0.020 FT/FT
(1)RAMP D-1 EXISTING MAXIMUM RATE: N/A

AASHTO MAXIMUM RATE IS: 0.060 FT/FT
AASHTO MINIMUM RATE IS: SEE ATTACHMENT #1

REMARKS:

(1) TWO LANE SPUI RAMP
*DESIGN EXCEPTION REQUIRED

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
RAINTREE DRIVE TI RAMPS
(CONTINUED)

STOPPING SIGHT DISTANCE:

VPI STATION	MILEPOST BEGIN	MILEPOST END	APPROACH GRADE (%)	DEPARTURE GRADE (%)	LENGTH OF CURVE (FT)	STOPPING SIGHT DISTANCE EXISTING (FT)	STOPPING SIGHT DISTANCE REQUIRED (FT)	EXISTING SPEED (MPH)	POSTED SPEED (MPH)

SEE ATTACHMENT #2

MAXIMUM GRADE:

	ASCENDING	DESCENDING	
RAMP A EXISTING MAXIMUM GRADE:	3.8515%	N/A	(50 MPH)
[1]RAMP A-1 EXISTING MAXIMUM GRADE:	N/A		
RAMP B EXISTING MAXIMUM GRADE:	N/A	-4.0653%	(50 MPH)
[1]RAMP B-1 EXISTING MAXIMUM GRADE:	N/A		
RAMP C EXISTING MAXIMUM GRADE:	3.0600%	N/A	(50 MPH)
[1]RAMP C-1 EXISTING MAXIMUM GRADE:	N/A		
RAMP D EXISTING MAXIMUM GRADE:	N/A	-4.0000%	(50 MPH)
[1]RAMP D-1 EXISTING MAXIMUM GRADE:	N/A		

AASHTO MAXIMUM GRADE FOR 35 MPH IS: 6.0000%
AASHTO MAXIMUM GRADE FOR 45+ MPH IS: 5.0000%

CROSS SLOPE:

ALL RAMPS EXISTING CROSS SLOPE IS: 2.0%

AASHTO ALLOWABLE RANGE IS: 1.5 - 3.0%

VERTICAL CLEARANCE:

STRUCTURE	MILEPOST	VERTICAL CLEARANCE NB / EB	VERTICAL CLEARANCE SB / WB	MINIMUM CLEARANCE

NO STRUCTURES

DESIGN LOADING STRUCTURAL CAPACITY:

ROUTE NO.	MILEPOST	STR. NO. AND NAME	BRIDGE LENGTH	BRIDGE ROADWAY WIDTH	BRIDGE RAIL/ BARRIER	AC OVERLAY	VERTICAL CLEARANCE (MINIMUM)	BRIDGE LOAD RATING	BRIDGE SUFFICIENCY RATING

NO STRUCTURES

REMARKS:

[1] TWO LANE SPUI RAMP

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
CACTUS ROAD TI RAMPS

PROJECT NUMBER:	101L MA 036 F0123D	**ROUTE:**	SR 101L
PROJECT LOCATION:	Princess Drive to Shea Boulevard	**BEGINNING MP:**	39.72
HIGHWAY SECTION:	Pima Freeway (SR101L)	**ENDING MP:**	40.43
FUNCTIONAL CLASSIFICATION:	Freeway Ramps & Turning Roadways		

TRAFFIC VOLUMES AND FACTORS:

	EXISTING	DESIGN	TRAFFIC FACTORS		
CACTUS ROAD TI RAMPS	**2019 AADT**	**2040 AADT**	**K=**	**D=**	**T=**
RAMP A (WESTBOUND ON-RAMP)	6,000	6,600	8%	100%	4%
RAMP B (EASTBOUND OFF-RAMP)	7,400	8,200	12%	100%	4%
RAMP C (WESTBOUND OFF-RAMP)	12,600	13,900	10%	100%	4%
RAMP D (EASTBOUND ON-RAMP)	8,700	9,600	9%	100%	4%

DESIGN SPEED:

THE AASHTO RECOMMENDED MINIMUM DESIGN SPEED OF THE HIGHWAY IS: RAMP TERMINUS = 35 MPH; RAMP MAIN BODY = 50 MPH; RAMP GORE AREA = 60 MPH (FOR EXIT RAMPS)
RAMP TERMINUS = 35 MPH; RAMP MAIN BODY = 50 MPH; RAMP GORE AREA = 55 MPH (ENTRANCE RAMPS)

THE POSTED SPEED LIMIT IS: N/A **AVERAGE ELEVATION IS:** 1,400 FT **TERRAIN IS:** LEVEL

LANE WIDTH:
(Case, Traffic Condition)

	TRAVELED WAY		LANES			TRAVELED WAY		LANES	
	EXISTING	**AASHTO**	**EXISTING**	**AASHTO**		**EXISTING**	**AASHTO**	**EXISTING**	**AASHTO**
RAMP A (Case 3,C):	26'	26'	12'	12'	RAMP C (Case 3,C):	12'	12'	12'	12'
(1)RAMP A (Case 3,C):	*26'	32'	12'-13'	12'	(1)RAMP C (Case 3,C):	*26'	32'	12'-13'	12'
RAMP B (Case 2,C):	12'	12'	12'	12'	RAMP D (Case 3,C):	*24'	26'	12'	12'
(1)RAMP B (Case 3,C):	*24'	32'	12'	12'	(1)RAMP D (Case 3,C):	*26'	32'	12'-14'	12'

REMARKS:

(1) TWO LANE SPUI RAMP

*DESIGN EXCEPTION REQUIRED

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
CACTUS ROAD TI RAMPS
(CONTINUED)

SHOULDER WIDTH:

	INSIDE SHOULDER		OUTSIDE SHOULDER		UNIFORM SHOULDER WIDTH	COMBINED SHOULDER WIDTH	
	EXISTING	AASHTO	EXISTING	AASHTO		EXISTING	AASHTO
RAMP A:	2'	2' - 4'	*2'	6' - 10'	YES	*4'	10' - 14'
(1)RAMP A:	*0'	2' - 4'	4'-6'	2' - 4'	NO	4'-6'	N/A
RAMP B:	2'	2' - 4'	8'	6' - 10'	YES	10'	10' - 14'
(1)RAMP B:	3'	2' - 4'	4'	2' - 4'	YES	7'	N/A
RAMP C:	2'	2' - 4'	8'	6' - 10'	YES	10'	10' - 14'
(1)RAMP C:	4'-6'	2' - 4'	2'	2' - 4'	NO	6'-8'	N/A
RAMP D:	2'	2' - 4'	*2'	6' - 10'	YES	*4'	10' - 14'
(1)RAMP D:	*0'	2' - 4'	3'	2' - 4'	YES	3'	N/A

HORIZONTAL CURVE RADIUS:

HPI STATION	MILEPOST BEGIN	MILEPOST END	SUPERELEVATION EXISTING (FT/FT)	SUPERELEVATION AASHTO MIN (FT/FT)	SUPERELEVATION RDG MAX (FT/FT)	EXISTING DEGREE OF CURVE	AASHTO MAX DEGREE OF CURVE	METHOD 2 SPEED (MPH)	POSTED SPEED (MPH)	EXISTING HSO (FT)	EXISTING GRADE (%)	HORIZONTAL SSD EXISTING (FT)	HORIZONTAL SSD REQUIRED (FT)

SEE ATTACHMENT #1

SUPERELEVATION:

RAMP A EXISTING MAXIMUM RATE: 0.023 FT/FT
RAMP B EXISTING MAXIMUM RATE: 0.023 FT/FT
RAMP C EXISTING MAXIMUM RATE: 0.023 FT/FT
RAMP D EXISTING MAXIMUM RATE: 0.023 FT/FT

AASHTO MAXIMUM RATE IS: 0.060 FT/FT
AASHTO MINIMUM RATE IS: SEE ATTACHMENT #1

REMARKS:

(1) TWO LANE SPUI RAMP
*DESIGN EXCEPTION REQUIRED

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
CACTUS ROAD TI RAMPS
(CONTINUED)

STOPPING SIGHT DISTANCE:

VPI STATION	MILEPOST BEGIN	MILEPOST END	APPROACH GRADE (%)	DEPARTURE GRADE (%)	LENGTH OF CURVE (FT)	STOPPING SIGHT DISTANCE EXISTING (FT)	STOPPING SIGHT DISTANCE REQUIRED (FT)	EXISTING SPEED (MPH)	POSTED SPEED (MPH)

SEE ATTACHMENT #2

MAXIMUM GRADE:

	ASCENDING	DESCENDING	
RAMP A EXISTING MAXIMUM GRADE:	1.2089%	-1.1600%	(50 MPH)
RAMP B EXISTING MAXIMUM GRADE:	1.3401%	-1.4072%	(50 MPH)
RAMP C EXISTING MAXIMUM GRADE:	2.5753%	N/A	(50 MPH)
RAMP D EXISTING MAXIMUM GRADE:	N/A	-2.4528%	(50 MPH)

AASHTO MAXIMUM GRADE FOR 35 MPH IS: 6.0000%
AASHTO MAXIMUM GRADE FOR 45+ MPH IS: 5.0000%

CROSS SLOPE:

ALL RAMPS EXISTING CROSS SLOPE IS: 2.0%

AASHTO ALLOWABLE RANGE IS: 1.5 - 3.0%

VERTICAL CLEARANCE:

STRUCTURE	MILEPOST	VERTICAL CLEARANCE NB / EB	VERTICAL CLEARANCE SB / WB	MINIMUM CLEARANCE

NO STRUCTURES

DESIGN LOADING STRUCTURAL CAPACITY:

ROUTE NO.	MILEPOST	STR. NO. AND NAME	BRIDGE LENGTH	BRIDGE ROADWAY WIDTH	BRIDGE RAIL/ BARRIER	AC OVERLAY	VERTICAL CLEARANCE (MINIMUM)	BRIDGE LOAD RATING	BRIDGE SUFFICIENCY RATING

NO STRUCTURES

REMARKS:

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
SHEA BOULEVARD TI RAMPS

PROJECT NUMBER:	101L MA 036 F0123D	**ROUTE:**	SR 101L
PROJECT LOCATION:	Princess Drive to Shea Boulevard	**BEGINNING MP:**	40.64
HIGHWAY SECTION:	Pima Freeway (SR101L)	**ENDING MP:**	41.49
FUNCTIONAL CLASSIFICATION:	Freeway Ramps & Turning Roadways		

TRAFFIC VOLUMES AND FACTORS:

	EXISTING	DESIGN	TRAFFIC FACTORS		
SHEA BOULEVARD TI RAMPS	**2019 AADT**	**2040 AADT**	**K=**	**D=**	**T=**
RAMP A (WESTBOUND ON-RAMP)	19,900	22,000	7%	100%	4%
RAMP B (EASTBOUND OFF-RAMP)	17,500	19,300	7%	100%	4%

DESIGN SPEED:

THE AASHTO RECOMMENDED MINIMUM DESIGN SPEED OF THE HIGHWAY IS: RAMP TERMINUS = 35 MPH; RAMP MAIN BODY = 50 MPH; RAMP GORE AREA = 60 MPH (FOR EXIT RAMPS)
RAMP TERMINUS = 35 MPH; RAMP MAIN BODY = 50 MPH; RAMP GORE AREA = 55 MPH (ENTRANCE RAMPS)

THE POSTED SPEED LIMIT IS: N/A **AVERAGE ELEVATION IS:** 1,365 FT **TERRAIN IS:** LEVEL

LANE WIDTH:
(Case, Traffic Condition)

	TRAVELED WAY		LANES			TRAVELED WAY		LANES	
	EXISTING	**AASHTO**	**EXISTING**	**AASHTO**		**EXISTING**	**AASHTO**	**EXISTING**	**AASHTO**
RAMP A (Case 3,C):	*25'	27'	12'-13'	12'	RAMP B (Case 3,C):	*24'	28'	12'	12'
(1)RAMP A-1 (Case 3,C):	(1) *25'	32'	12'-13'	12'	(1)RAMP B-1 (Case 3,C):	(1) *24'	32'	12'	12'

REMARKS:

(1) TWO LANE SPUI RAMP

*DESIGN EXCEPTION REQUIRED

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
SHEA BOULEVARD TI RAMPS
(CONTINUED)

SHOULDER WIDTH:

	INSIDE SHOULDER		OUTSIDE SHOULDER		UNIFORM SHOULDER WIDTH	COMBINED SHOULDER WIDTH	
	EXISTING	AASHTO	EXISTING	AASHTO		EXISTING	AASHTO
RAMP A:	2'	2' - 4'	*2'	6' - 10'	YES	*4'	10' - 14'
(1)RAMP A-1:	3'	2' - 4'	3'	2' - 4'	YES	6'	N/A
RAMP B:	4'	2' - 4'	*2'	6' - 10'	YES	*6'	10' - 14'
(1)RAMP B-1:	4'	2' - 4'	4'	2' - 4'	YES	8'	N/A

HORIZONTAL CURVE RADIUS:

HPI STATION	MILEPOST BEGIN	MILEPOST END	SUPERELEVATION EXISTING (FT/FT)	SUPERELEVATION AASHTO MIN (FT/FT)	SUPERELEVATION RDG MAX (FT/FT)	EXISTING DEGREE OF CURVE	AASHTO MAX DEGREE OF CURVE	METHOD 2 SPEED (MPH)	POSTED SPEED (MPH)	EXISTING HSO (FT)	EXISTING GRADE (%)	HORIZONTAL SSD EXISTING (FT)	HORIZONTAL SSD REQUIRED (FT)

SEE ATTACHMENT #1

SUPERELEVATION:

RAMP A EXISTING MAXIMUM RATE: 0.028 FT/FT
(1)RAMP A-1 EXISTING MAXIMUM RATE: 0.020 FT/FT
RAMP B EXISTING MAXIMUM RATE: 0.023 FT/FT
(1)RAMP B-1 EXISTING MAXIMUM RATE: 0.020 FT/FT

AASHTO MAXIMUM RATE IS: 0.060 FT/FT
AASHTO MINIMUM RATE IS: SEE ATTACHMENT #1

REMARKS:

(1) TWO LANE SPUI RAMP
*DESIGN EXCEPTION REQUIRED

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
SHEA BOULEVARD TI RAMPS
(CONTINUED)

STOPPING SIGHT DISTANCE:

VPI STATION	MILEPOST BEGIN	MILEPOST END	APPROACH GRADE (%)	DEPARTURE GRADE (%)	LENGTH OF CURVE (FT)	STOPPING SIGHT DISTANCE EXISTING (FT)	STOPPING SIGHT DISTANCE REQUIRED (FT)	EXISTING SPEED (MPH)	POSTED SPEED (MPH)

SEE ATTACHMENT #2

MAXIMUM GRADE:

	ASCENDING	DESCENDING		
RAMP A EXISTING MAXIMUM GRADE:	1.9999%	-1.4287%	(50 MPH)	
[(1)]RAMP A-1 EXISTING MAXIMUM GRADE:	N/A			
RAMP B EXISTING MAXIMUM GRADE:	2.3420%	-2.2541%	(50 MPH)	
[(1)]RAMP B-1 EXISTING MAXIMUM GRADE:	N/A			

AASHTO MAXIMUM GRADE FOR 35 MPH IS: 6.0000%
AASHTO MAXIMUM GRADE FOR 45+ MPH IS: 5.0000%

CROSS SLOPE:

ALL RAMPS EXISTING CROSS SLOPE IS: 2.0%

AASHTO ALLOWABLE RANGE IS: 1.5 - 3.0%

VERTICAL CLEARANCE:

STRUCTURE	MILEPOST	VERTICAL CLEARANCE NB / EB	VERTICAL CLEARANCE SB / WB	MINIMUM CLEARANCE

NO STRUCTURES

DESIGN LOADING STRUCTURAL CAPACITY:

ROUTE NO.	MILEPOST	STR. NO. AND NAME	BRIDGE LENGTH	BRIDGE ROADWAY WIDTH	BRIDGE RAIL/ BARRIER	AC OVERLAY	VERTICAL CLEARANCE (MINIMUM)	BRIDGE LOAD RATING	BRIDGE SUFFICIENCY RATING

NO STRUCTURES

REMARKS:

[(1)] TWO LANE SPUI RAMP

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
THUNDERBIRD ROAD CROSSROAD

PROJECT NUMBER:	101L MA 036 F0123D	**ROUTE:**	SR 101L
PROJECT LOCATION:	Princess Drive to Shea Boulevard	**THUNDERBIRD RD MP:**	39.05
HIGHWAY SECTION:	Pima Freeway (SR101L)		
FUNCTIONAL CLASSIFICATION:	Major Collector (Urban)		

TRAFFIC VOLUMES AND FACTORS:

	EXISTING 2019 AADT	DESIGN 2040 AADT	TRAFFIC FACTORS K=	D=	T=
THUNDERBIRD RD	N/A	N/A			

DESIGN SPEED:

THE AASHTO RECOMMENDED MINIMUM DESIGN SPEED OF THE HIGHWAY IS: 45 MPH
THE POSTED SPEED LIMIT IS: 45 MPH
AVERAGE ELEVATION IS: 1,440 FT
TERRAIN IS: LEVEL

LANE WIDTH:

	WIDTH OF TRAVELED WAY		LANES	
	EXISTING	**AASHTO**	**EXISTING**	**AASHTO**
THUNDERBIRD RD:	26'	22'	12'-14'	10'

SHOULDER WIDTH:

	INSIDE SHOULDER		OUTSIDE SHOULDER	
	EXISTING	**AASHTO**	**EXISTING**	**AASHTO**
THUNDERBIRD RD:	0'	(1) N/A	(2) 6'	6'

HORIZONTAL CURVE RADIUS:

HPI STATION	MILEPOST BEGIN	MILEPOST END	SUPERELEVATION EXISTING (FT/FT)	SUPERELEVATION AASHTO MIN (FT/FT)	SUPERELEVATION RDG MAX (FT/FT)	EXISTING DEGREE OF CURVE	AASHTO MAX DEGREE OF CURVE	METHOD 2 SPEED (MPH)	POSTED SPEED (MPH)	EXISTING HSO (FT)	EXISTING GRADE (%)	HORIZONTAL SSD EXISTING (FT)	HORIZONTAL SSD REQUIRED (FT)

SEE ATTACHMENT #1

REMARKS:

(1) 6.3.2.1 "Where shoulders are provided use Table 6-5"; Shoulders are not provided for this roadway.
(2) 6' BIKE LANE

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
THUNDERBIRD ROAD CROSSROAD
(CONTINUED)

SUPERELEVATION:

THUNDERBIRD RD EXISTING MAXIMUM RATE: 0.020 FT/FT — AASHTO MAXIMUM RATE IS: 0.060 FT/FT

STOPPING SIGHT DISTANCE:

VPI STATION	MILEPOST BEGIN	MILEPOST END	APPROACH GRADE (%)	DEPARTURE GRADE (%)	LENGTH OF CURVE (FT)	STOPPING SIGHT DISTANCE EXISTING (FT)	STOPPING SIGHT DISTANCE REQUIRED (FT)	EXISTING SPEED (MPH)	POSTED SPEED (MPH)
SEE ATTACHMENT #2									

MAXIMUM GRADE:

THUNDERBIRD RD EXISTING MAXIMUM GRADE: 0.5390% — AASHTO MAXIMUM GRADE IS: 8.0000%

CROSS SLOPE:

THUNDERBIRD RD EXISTING CROSS SLOPE IS: 2.0% — AASHTO ALLOWABLE RANGE IS: 1.5% - 3.0%

VERTICAL CLEARANCE:

STRUCTURE	MILEPOST	VERTICAL CLEARANCE NB / EB	VERTICAL CLEARANCE SB / WB	MINIMUM CLEARANCE
NO STRUCTURES				

DESIGN LOADING STRUCTURAL CAPACITY:

ROUTE NO.	MILEPOST	STR. NO. AND NAME	BRIDGE LENGTH	BRIDGE ROADWAY WIDTH	BRIDGE RAIL/ BARRIER	AC OVERLAY	VERTICAL CLEARANCE (MINIMUM)	BRIDGE LOAD RATING	BRIDGE SUFFICIENCY RATING
NO STRUCTURES									

REMARKS:

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
PRINCESS DR, BELL RD, FRANK LLOYD WRIGHT BLVD, RAINTREE DR, & CACTUS RD CROSSROADS

PROJECT NUMBER:	101L MA 036 F0123D	**ROUTE:**	SR 101L
PROJECT LOCATION:	Princess Drive to Shea Boulevard	**PRINCESS DR MP:**	36.59
HIGHWAY SECTION:	Pima Freeway (SR101L)	**BELL RD MP:**	37.06
FUNCTIONAL CLASSIFICATION:	Minor Arterial (Urban)	**FRANK LLOYD WRIGHT BLVD MP:**	37.78
		RAINTREE DR MP:	38.59
		CACTUS RD MP:	40.09

TRAFFIC VOLUMES AND FACTORS:

	EXISTING 2019 AADT	DESIGN 2040 AADT	TRAFFIC FACTORS K=	D=	T=
PRINCESS DR SEGMENT	N/A	N/A			
BELL RD SEGMENT	N/A	N/A			
FRANK LLOYD WRIGHT BLVD SEGMENT WEST OF SR 101L	51,000	56,000	9%	54%	4%
FRANK LLOYD WRIGHT BLVD SEGMENT EAST OF SR 101L	36,000	40,000	11%	51%	4%
RAINTREE DR SEGMENT WEST OF SR 101L	28,000	31,000	11%	55%	4%
RAINTREE DR SEGMENT EAST OF SR 101L	35,000	39,000	7%	54%	4%
CACTUS RD SEGMENT	0	0	0%	0%	0%

DESIGN SPEED:

THE AASHTO RECOMMENDED MINIMUM DESIGN SPEED OF THE HIGHWAY IS:		THE POSTED SPEED LIMIT IS:
PRINCESS DR:	45 MPH	45 MPH
BELL RD:	45 MPH	45 MPH
FRANK LLOYD WRIGHT BLVD:	45 MPH	45 MPH
RAINTREE DR:	45 MPH	40 MPH
CACTUS RD:	45 MPH	40 MPH
	TERRAIN IS:	LEVEL

LANE WIDTH:

	LANES EXISTING	AASHTO
PRINCESS DR:	10.5' - 12'	10'
BELL RD:	12'	10'
FRANK LLOYD WRIGHT BLVD:	12'	10'
RAINTREE DR:	12'	10'
CACTUS RD:	12'	10'

REMARKS:

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
PRINCESS DR, BELL RD, FRANK LLOYD WRIGHT BLVD, RAINTREE DR, & CACTUS RD CROSSROADS
(CONTINUED)

SHOULDER WIDTH:

	INSIDE SHOULDER		OUTSIDE SHOULDER	
	EXISTING	AASHTO	EXISTING	AASHTO
PRINCESS DR:	0'	N/A	(1) 5'	N/A
BELL RD:	0'	N/A	(2) 6'	N/A
FRANK LLOYD WRIGHT BLVD:	0'	N/A	6'	N/A
RAINTREE DR:	0'	N/A	(2) 6'	N/A
CACTUS RD:	0'	N/A	(2) 6'	N/A

HORIZONTAL CURVE RADIUS:

	MILEPOST		SUPERELEVATION			EXISTING	AASHTO MAX	METHOD 2	POSTED	EXISTING	EXISTING	HORIZONTAL SSD	
HPI STATION	BEGIN	END	EXISTING (FT/FT)	AASHTO MIN (FT/FT)	RDG MAX (FT/FT)	DEGREE OF CURVE	DEGREE OF CURVE	SPEED (MPH)	SPEED (MPH)	HSO (FT)	GRADE (%)	EXISTING (FT)	REQUIRED (FT)

SEE ATTACHMENT #1

SUPERELEVATION:

PRINCESS DR EXISTING MAXIMUM RATE:	0.020 FT/FT	AASHTO MAXIMUM RATE IS:	N/A
BELL RD EXISTING MAXIMUM RATE:	0.020 FT/FT	AASHTO MAXIMUM RATE IS:	N/A
FRANK LLOYD WRIGHT BLVD EXISTING MAXIMUM RATE:	0.020 FT/FT	AASHTO MAXIMUM RATE IS:	N/A
RAINTREE DR EXISTING MAXIMUM RATE:	0.020 FT/FT	AASHTO MAXIMUM RATE IS:	N/A
CACTUS RD EXISTING MAXIMUM RATE:	0.020 FT/FT	AASHTO MAXIMUM RATE IS:	N/A

REMARKS:

(1) 5' BIKE LANE
(2) 6' BIKE LANE

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
PRINCESS DR, BELL RD, FRANK LLOYD WRIGHT BLVD, RAINTREE DR, & CACTUS RD CROSSROADS
(CONTINUED)

STOPPING SIGHT DISTANCE:

VPI STATION	MILEPOST BEGIN	MILEPOST END	APPROACH GRADE (%)	DEPARTURE GRADE (%)	LENGTH OF CURVE (FT)	STOPPING SIGHT DISTANCE EXISTING (FT)	STOPPING SIGHT DISTANCE REQUIRED (FT)	EXISTING SPEED (MPH)	POSTED SPEED (MPH)
SEE ATTACHMENT #2									

MAXIMUM GRADE:

PRINCESS DR EXISTING MAXIMUM GRADE:	1.7576%	AASHTO MAXIMUM GRADE IS:	6.0000%
BELL RD EXISTING MAXIMUM GRADE:	0.4000%	AASHTO MAXIMUM GRADE IS:	6.0000%
FRANK LLOYD WRIGHT BLVD EXISTING MAXIMUM GRADE:	1.2482%	AASHTO MAXIMUM GRADE IS:	6.0000%
RAINTREE DR EXISTING MAXIMUM GRADE:	1.2940%	AASHTO MAXIMUM GRADE IS:	6.0000%
CACTUS RD EXISTING MAXIMUM GRADE:	0.6833%	AASHTO MAXIMUM GRADE IS:	6.0000%

CROSS SLOPE:

PRINCESS DR EXISTING CROSS SLOPE IS:	2.0%	AASHTO ALLOWABLE RANGE IS:	1.5% - 3.0%
BELL RD EXISTING CROSS SLOPE IS:	2.0%	AASHTO ALLOWABLE RANGE IS:	1.5% - 3.0%
FRANK LLOYD WRIGHT BLVD EXISTING CROSS SLOPE IS:	2.0%	AASHTO ALLOWABLE RANGE IS:	1.5% - 3.0%
RAINTREE DR EXISTING CROSS SLOPE IS:	2.0%	AASHTO ALLOWABLE RANGE IS:	1.5% - 3.0%
CACTUS RD EXISTING CROSS SLOPE IS:	2.0%	AASHTO ALLOWABLE RANGE IS:	1.5% - 3.0%

REMARKS:

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
PRINCESS DR, BELL RD, FRANK LLOYD WRIGHT BLVD, RAINTREE DR, & CACTUS RD CROSSROADS
(CONTINUED)

VERTICAL CLEARANCE:

STRUCTURE	MILEPOST	VERTICAL CLEARANCE NB / EB	VERTICAL CLEARANCE SB / WB	MINIMUM CLEARANCE
		NO STRUCTURES		

DESIGN LOADING STRUCTURAL CAPACITY:

ROUTE NO.	MILEPOST	STR. NO. AND NAME	BRIDGE LENGTH	BRIDGE ROADWAY WIDTH	BRIDGE RAIL/ BARRIER	AC OVERLAY	VERTICAL CLEARANCE (MINIMUM)	BRIDGE LOAD RATING	BRIDGE SUFFICIENCY RATING
					NO STRUCTURES				

REMARKS:

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
SHEA BOULEVARD CROSSROAD

PROJECT NUMBER:	101L MA 036 F0123D	**ROUTE:**	SR 101L
PROJECT LOCATION:	Princess Drive to Shea Boulevard	**SHEA BLVD MP:**	41.10
HIGHWAY SECTION:	Pima Freeway (SR101L)		
FUNCTIONAL CLASSIFICATION:	Principal Arterial (Urban)		

TRAFFIC VOLUMES AND FACTORS:

	EXISTING	DESIGN	TRAFFIC FACTORS		
	2019 AADT	2040 AADT	K=	D=	T=
SHEA BLVD SEGMENT WEST OF SR 101L	49,000	54,000	8%	51%	4%
SHEA BLVD SEGMENT EAST OF SR 101L	69,000	76,000	7%	50%	4%

DESIGN SPEED:

THE AASHTO RECOMMENDED MINIMUM DESIGN SPEED OF THE HIGHWAY IS: 45 MPH

THE POSTED SPEED LIMIT IS: 45 MPH

TERRAIN IS: LEVEL

LANE WIDTH:

	LANES	
	EXISTING	AASHTO
SHEA BLVD:	12'-14'	10'

SHOULDER WIDTH:

	INSIDE SHOULDER		OUTSIDE SHOULDER	
	EXISTING	AASHTO	EXISTING	AASHTO
SHEA BLVD:	0	N/A	0	N/A

HORIZONTAL CURVE RADIUS:

	MILEPOST		SUPERELEVATION			EXISTING	AASHTO MAX	METHOD 2	POSTED	EXISTING	EXISTING	HORIZONTAL SSD	
			EXISTING	AASHTO MIN	RDG MAX	DEGREE OF	DEGREE OF	SPEED	SPEED	HSO	GRADE	EXISTING	REQUIRED
HPI STATION	BEGIN	END	(FT/FT)	(FT/FT)	(FT/FT)	CURVE	CURVE	(MPH)	(MPH)	(FT)	(%)	(FT)	(FT)

SEE ATTACHMENT #1

REMARKS:

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
SHEA BOULEVARD CROSSROAD
(CONTINUED)

SUPERELEVATION:

SHEA BLVD EXISTING MAXIMUM RATE: 2.0% AASHTO MAXIMUM RATE IS: N/A

STOPPING SIGHT DISTANCE:

VPI STATION	MILEPOST BEGIN	MILEPOST END	APPROACH GRADE (%)	DEPARTURE GRADE (%)	LENGTH OF CURVE (FT)	STOPPING SIGHT DISTANCE EXISTING (FT)	STOPPING SIGHT DISTANCE REQUIRED (FT)	EXISTING SPEED (MPH)	POSTED SPEED (MPH)

SEE ATTACHMENT #2

MAXIMUM GRADE:

SHEA BLVD EXISTING MAXIMUM GRADE: 0.0083% AASHTO MAXIMUM GRADE IS: 6.0000%

CROSS SLOPE:

SHEA BLVD EXISTING CROSS SLOPE IS: 2.0% AASHTO ALLOWABLE RANGE IS: 1.5% - 3.0%

VERTICAL CLEARANCE:

STRUCTURE	MILEPOST	VERTICAL CLEARANCE NB / EB	VERTICAL CLEARANCE SB / WB	MINIMUM CLEARANCE

NO STRUCTURES

DESIGN LOADING STRUCTURAL CAPACITY:

ROUTE NO.	MILEPOST	STR. NO. AND NAME	BRIDGE LENGTH	BRIDGE ROADWAY WIDTH	BRIDGE RAIL/ BARRIER	AC OVERLAY	VERTICAL CLEARANCE (MINIMUM)	BRIDGE LOAD RATING	BRIDGE SUFFICIENCY RATING

NO STRUCTURES

REMARKS:

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
SR 101L MAINLINE (DIVIDED)

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
1964+83.90	35.71	37.21	*0.029	0.030	0.06	1°-00'-00"	3°-27'	89	65	14.84	-2.0302	825	669
2161+56.43	37.97	38.18	0.020	0.016	0.06	0°-29'-56"	3°-27'	>100	65	16.45	-2.584	1229	676
2188+11.92	38.47	38.69	0.020	0.016	0.06	0°-29'-56"	3°-27'	>100	65	16.86	-2.584	1245	676
2309+75.98	40.77	40.99	0.025	0.024	0.06	0°-45'-33"	3°-27'	94	65	16.11	-1.2604	986	659
2329+69.02	41.19	41.33	0.042	0.040	0.06	1°-27'-19"	3°-27'	83	65	19.26	-1.2604	779	659

Meaning Of Symbols:
* Requires a design exception

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade; if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
SR 101L NORTHBOUND MAINLINE (DIVIDED)

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
1962+46.41	33.68	37.04	*0.029	0.030	0.06	0°-59'-29"	3°-27'	89	65	17	1.1250	887	631
2110+23.08	37.04	37.16	*0.035	0.036	0.06	1°-16'-51"	3°-27'	84	65	14.5	1.125	721	631

Meaning Of Symbols:
* Requires a design exception
Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
SOUTHBOUND FRONTAGE ROAD

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
51+00.71	36.63	37.22	0.020	0.019	0.06	0°-58'-13"	6°-53'	87	50	7.68	-1.4396	602	434
110+59.17	37.94	38.21	0.020	0.015	0.06	0°-26'-12"	6°-53'	>100	50	7.78	-2.0000	904	438
137+26.14	38.54	38.62	(1) 0.020	0.027	0.06	1°-27'-19"	6°-53'	78	50	8.63	-1.0200	521	431

Meaning Of Symbols:

(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.

Note:

AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
NORTHBOUND FRONTAGE ROAD

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
52+30.14	36.77	37.09	(1) 0.023	0.027	0.06	1°-27'-19"	6°-53'	79	50	7.83	-2.0063	497	438
113+17.63	38.02	38.12	0.020	0.019	0.06	0°-58'-13"	6°-53'	87	50	20.47	-2.0000	984	438
138+76.96	38.54	38.58	(1) 0.020	0.027	0.06	1°-27'-19"	6°-53'	78	50	8.22	-1.0156	509	431

Meaning Of Symbols:
(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.
Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
PRINCESS DRIVE RAMP C

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
7+29.71	36.70	37.08	0.027	0.027	0.06	1°-27'-19"	6°-53'	80	50	8.23	1.7692	509	412

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
PRINCESS DRIVE RAMP D

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
13+23.17	36.69	37.02	0.027	0.027	0.06	1°-27'-19"	6°-53'	80	50	7.93	2.4661	500	407

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
FRANK LLOYD WRIGHT BOULEVARD RAMP A

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
17+95.95	37.46	37.53	0.020	0.019	0.06	0°-58'-13"	6°-53'	87	50	6.79	-0.4001	566	426

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
FRANK LLOYD WRIGHT BOULEVARD RAMP A-1

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
1+53.58	37.74	37.78	(1) 0.020	0.043	0.06	23°-17'-06"	70°-54'	29	20	9.33	-0.4001	136	112
3+56.66	37.78	37.79	(1) 0.020	0.039	0.06	17°-27'-50"	70°-54'	32	20	19.63	-0.4001	228	112

Meaning Of Symbols:

(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.

Note:

AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade; if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
FRANK LLOYD WRIGHT BOULEVARD RAMP B

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
8+18.95	37.35	37.41	0.024	0.023	0.06	1°-09'-51"	6°-53'	84	50	35.58	-1.9598	1184	438
14+22.23	37.46	37.53	0.020	0.019	0.06	0°-58'-13"	6°-53'	87	50	11.28	-3.6088	730	451
19+95.28	37.57	37.64	0.020	0.019	0.06	0°-58'-13"	6°-53'	87	50	7.36	-0.5001	590	427

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
FRANK LLOYD WRIGHT BOULEVARD RAMP B-1

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
1+22.76	37.74	37.78	(1) 0.020	0.043	0.06	23°-17'-06"	70°-54'	29	20	15.48	-0.4001	175	112
3+73.04	37.78	37.79	(1) 0.020	0.036	0.06	13°-26'-01"	70°-54'	36	20	22.07	-0.4001	276	112

Meaning Of Symbols:
(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.
Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
FRANK LLOYD WRIGHT BOULEVARD RAMP C

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
2+57.84	38.26	39.36	0.020	0.019	0.06	0°-58'-13"	6°-53'	87	50	7.97	-4.0000	614	454
15+77.71	38.47	38.66	0.023	0.019	0.06	0°-58'-13"	6°-53'	88	50	17.04	-4.0000	897	454

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
FRANK LLOYD WRIGHT BOULEVARD RAMP C-1

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
1+48.59	37.78	37.80	(1) 0.020	0.036	0.06	13°-26'-01"	70°-54'	36	20	23.35	6.69	284	106
3+95.65	37.80	37.84	(1) 0.020	0.043	0.06	23°-17'-06"	70°-54'	29	20	13.72	-0.4001	165	112

Meaning Of Symbols:

(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
FRANK LLOYD WRIGHT BOULEVARD RAMP D-1

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
0+84.73	37.79	37.80	(1) 0.020	0.039	0.06	17°-27'-50"	70°-54'	32	20	9.93	-0.4001	162	112
3+09.20	37.80	37.84	(1) 0.020	0.043	0.06	23°-17'-06"	70°-54'	29	20	21.58	-0.4001	208	112

Meaning Of Symbols:
(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.
Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
RAINTREE DRIVE RAMP A

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
1+50.00	37.74	37.80	0.020	0.019	0.06	0°-58'-13"	6°-53'	87	50	13.77	-1.8335	807	437
16+72.17	38.02	38.09	0.020	0.019	0.06	0°-58'-13"	6°-53'	87	50	8.14	-3.8515	620	453

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
RAINTREE DRIVE RAMP A-1

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
0+75.32	38.53	38.55	(1) 0.020	0.043	0.06	23°-17'-06"	70°-54'	29	20	9.54	-0.4202	137	112
3+04.31	38.55	38.58	(1) 0.020	0.039	0.06	17°-27'-50"	70°-54'	32	20	9.67	-0.4202	160	112

Meaning Of Symbols:
(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
RAINTREE DRIVE RAMP B

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
2+01.70	37.75	37.82	0.020	0.019	0.06	0°-58'-13"	6°-53'	87	50	13.88	-4.0653	810	455
19+35.23	38.07	38.16	0.020	0.015	0.06	0°-26'-12"	6°-53'	>100	50	14.18	-1.0851	1220	431

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
RAINTREE DRIVE RAMP B-1

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
1+24.15	38.53	38.57	(1) 0.020	0.045	0.06	24°-56'-54"	70°-54'	28	20	9.71	-0.4202	134	112
3+80.05	38.57	38.58	(1) 0.020	0.036	0.06	13°-26'-01"	70°-54'	36	20	10.16	-0.4202	187	112

Meaning Of Symbols:
(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.
Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade; if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
RAINTREE DRIVE RAMP C

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
0+86.00	38.58	38.61	0.020	0.016	0.06	1°-27'-19"	16°-50'	78	35	19.78	-1.0155	790	250
5+52.41	38.65	38.72	0.020	0.019	0.06	0°-58'-13"	6°-53'	87	50	9.07	-3.0600	655	446

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
RAINTREE DRIVE RAMP C-1

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
1+55.65	38.57	38.59	(1) 0.020	0.036	0.06	13°-26'-01"	70°-54'	36	20	9.74	-0.4202	183	112
3+98.41	38.59	38.62	(1) 0.020	0.046	0.06	26°-52'-02"	70°-54'	27	20	9.74	-0.4202	129	112

Meaning Of Symbols:

(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
RAINTREE DRIVE RAMP D

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
11+96.82	38.83	38.90	0.020	0.019	0.06	0°-58'-13"	6°-53'	87	50	9.71	-4.0000	677	454

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
RAINTREE DRIVE RAMP D-1

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
1+89.82	38.58	38.61	(1) 0.020	0.039	0.06	17°-27'-50"	70°-54'	32	20	9.75	-0.4202	160	112
4+10.23	38.61	38.63	(1) 0.020	0.043	0.06	23°-17'-06"	70°-54'	29	20	10.33	-0.4202	143	112

Meaning Of Symbols:
(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.
Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
CACTUS ROAD RAMP A

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
3+21.94	39.76	39.98	0.023	0.019	0.06	0°-58'-13"	6°-53'	88	50	9.62	-1.2089	674	432
15+02.13	40.02	40.06	(1)0.010	0.043	0.06	23°-17'-06"	70°-54'	28	20	9.41	1.1600	137	111
17+37.17	40.06	40.08	(1)0.010	0.039	0.06	17°-27'-50"	70°-54'	32	20	10.08	1.160	163	111

Meaning Of Symbols:
(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
CACTUS ROAD RAMP B

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
2+96.24	39.76	39.87	0.023	0.019	0.06	0°-58'-13"	6°-53'	88	50	13.71	-1.2089	805	432
15+00.55	40.02	40.06	(1)0.010	0.043	0.06	23°-17'-06"	70°-54'	28	20	9.33	1.3401	136	110
17+76.73	40.06	40.08	(1)0.010	0.036	0.06	13°-26'-01"	70°-54'	35	20	9.88	1.3401	184	110

Meaning Of Symbols:
(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.
Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
CACTUS ROAD RAMP C

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
1+74.11	40.07	40.10	(1) 0.010	0.036	0.06	13°-26'-01"	70°-54'	35	20	9.79	-1.1995	183	113
4+48.71	40.10	40.13	(1) 0.010	0.043	0.06	23°-17'-06"	70°-54'	28	20	9.74	-2.5753	139	115
16+39.87	40.28	40.40	0.023	0.019	0.06	0°-58'-13"	6°-53'	88	50	14.35	-0.2496	824	425

Meaning Of Symbols:
(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade; if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
CACTUS ROAD RAMP D

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
1+30.57	40.08	40.10	(1) 0.010	0.039	0.06	17°-27'-50"	70°-54'	32	20	10.09	-1.2598	163	113
3+70.79	40.10	40.13	(1) 0.010	0.043	0.06	23°-17'-06"	70°-54'	28	20	10.35	-2.4528	143	115
15+42.47	40.27	40.40	0.023	0.019	0.06	0°-58'-13"	6°-53'	88	50	8.98	-0.2501	651	425

Meaning Of Symbols:
(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.
Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
SHEA BOULEVARD RAMP A

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
3+84.17	40.74	40.89	0.028	0.023	0.06	1°-09'-51"	6°-53'	85	50	8.54	1.9999	580	410

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
SHEA BOULEVARD RAMP A-1

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
1+07.74	41.03	41.06	(1) 0.020	0.049	0.06	31°-45'-08"	70°-54'	26	20	8.7	-0.8300	113	113
2+68.81	41.06	41.06	(1) 0.020	0.041	0.06	19°-24'-15"	70°-54'	31	20	10	-0.8300	154	113

Meaning Of Symbols:
(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade; if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
SHEA BOULEVARD RAMP B

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
2+86.42	40.55	40.66	0.020	0.015	0.06	0°-41'-55"	6°-53'	94	50	5.72	-0.6805	613	428
16+43.10	40.74	40.98	0.020	0.020	0.06	0°-59'-53"	6°-53'	87	50	9.82	2.3420	672	408

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
SHEA BOULEVARD RAMP B-1

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
1+03.07	41.02	41.05	(1) 0.020	0.046	0.06	27°-17'-14"	70°-54'	27	20	9.02	-0.8300	124	113
3+12.93	41.05	41.07	(1) 0.020	0.038	0.06	15°-52'-34"	70°-54'	33	20	9.02	-0.8300	162	113

Meaning Of Symbols:

(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.

Note:

AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade; if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
FRANK LLOYD WRIGHT BOULEVARD

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
26+25.44	37.79	37.73	(1) 0.020	0.056	0.06	3°-06'-17"	4°-18'	62	60	28	-1.2482	644	578

Meaning Of Symbols:
(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.
Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
CACTUS ROAD

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
16+04.78	40.07	40.08	(1) 0.020	0.048	0.06	4°-21'-57"	8°-55'	55	45	24.63	-0.4673	509	362

Meaning Of Symbols:
(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
RAINTREE DRIVE

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
15+14.71	38.56	38.58	(1) 0.020	0.051	0.06	3°-10'-59"	5°-24'	61	55	19.84	-0.4202	535	496

Meaning Of Symbols:

(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 1 - HORIZONTAL CURVE INVENTORY
SHEA BOULEVARD

Project Name: SR 101L; Princess Drive to Shea Boulevard
Project No: 101L MA 036 F0123D

HPI Station	Milepost		Superelevation (ft/ft)			Degree Of Curve		Speed (mph)		HSO	Grade	Horizontal SSD (ft)	
(ft)	Begin	End	Existing	AASHTO Min	RDG Max	Existing	AASHTO Max	Method 2	Posted	(ft)	(%)	Existing	Required
14+52.40	41.07	41.06	(1) 0.020	0.023	0.06	1°-00'-00"	5°-24'	86	55	7	-0.8300	566	499
27+26.45	41.06	41.05	(1) 0.020	0.026	0.06	1°-08'-43"	5°-24'	84	55	13.19	-0.0900	727	493

Meaning Of Symbols:
(1) Existing condition meets the requirements within AASHTO 2018 Section 3.3.6.2 and Table 3-13.

Note:
AASHTO Minimum superelevation derived from Method 5 to meet posted speed.
Roadway Engineering Design Guidelines (RDG) Maximum is based on elevation (See RDG Table 202.1A).
Input grade with respect to traffic for inside lane of curve; if both - & + grades within the curve, choose the negative grade;
if all negative grades, choose the largest negative grade; if all positive grades, choose the smallest positive grade.
(See Help file under Help Topics/Approach Grade)
HSO = Horizontal Sightline Offset

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: FREEWAY - URBAN

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
101L Median											
2147+30.97-exst			2	-0.4001	-2.5842	1771.65	Crest	1323	676	97	65
2185+85.96-exst			2	-2.5842	0.3999	787.4	Sag	1114	676	87	65
2198+16.27-exst			2	0.3999	-1.8898	1312.34	Crest	1112	667	88	65
2213+91.08-exst			2	-1.8898	0.6001	787.4	Sag	1595	667	+100	65
2224+40.94-exst			2	0.6001	-1.6520	1312.32	Crest	1121	664	89	65
2237+53.28-exst			2	-1.6520	0.4999	787.4	Sag	2606	664	+100	65
2250+65.62-exst			2	0.4999	-1.7405	1837.27	Crest	1330	665	98	65
2266+73.23-exst			2	-1.7405	0.5709	787.4	Sag	1977	665	+100	65
2280+18.37-exst			2	0.5709	-1.1638	984.25	Crest	1114	658	89	65
2294+61.94-exst			2	-1.1638	-0.3998	787.4	Sag	+9999	658	+100	65
2303+14.96-exst			2	-0.3998	-1.2607	787.4	Crest	1647	659	+100	65
2319+55.38-exst			2	-1.2607	-0.9579	787.4	Sag	+9999	659	+100	65
2341+86.35-exst			2	-0.9579	2.3292	787.4	Sag	972	673	81	65

Notes:

Traffic Direction:
1w = One Way Traffic in Station direction
1a = One Way Traffic against Station direction
2 = Two Way Traffic

Grades are with respect to Station direction.
* Indicates design exception required.
GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: FREEWAY - URBAN

VPI STATION	MILEPOST BEGIN	MILEPOST END	TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE AVAILABLE (ft)	STOPPING SIGHT DISTANCE AASHTO MINIMUM (ft)	SPEED AVAILABLE (mph)	SPEED DESIGN (mph)
SB 101L											
1964+00-exst			1w	0.9747	-1.2288	1000	Crest	990	659	83	65
2108+59.58-exst			1w	-1.2288	-2.0298	1312.34	Crest	2003	669	+100	65
2125+16.40-exst			1w	-2.0298	-0.4001	787.4	Sag	+9999	669	+100	65
NB 101L											
195445.67-exst			1a	-0.5147	1.1254	800	Sag	+9999	657	+100	65
1964+00-exst			1a	1.1254	-1.2546	1100	Crest	999	657	84	65
2109+25.20-exst			1a	-1.2546	-2.0299	984.25	Crest	1884	630	+100	65
2125+16.40-exst			1a	-2.0298	-0.4001	787.4	Sag	+9999	639	+100	65

Notes:

Traffic Direction:
1w = One Way Traffic in Station direction
1a = One Way Traffic against Station direction
2 = Two Way Traffic

Grades are with respect to Station direction.
* Indicates design exception required.
GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: COLLECTOR - URBAN

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
SB Frontage Road											
46+07.94-exst			1w	-1.0601	-1.4396	393.72	Crest	3040	434	+100	50
57+82.05-exst			1w	-1.4396	-1.3500	0	GB	GB	GB	GB	50
79+39.63-exst			1w	-1.3500	-0.5947	393.72	Sag	+9999	433	+100	50
86+77.82-exst			1w	-0.5947	-1.6608	393.72	Crest	1209	435	93	50
94+81.63-exst			1w	-1.6608	-1.0483	0	GB	GB	GB	GB	50
98+28.16-exst			1w	-1.0483	-2.0000	393.72	Crest	1331	438	98	50
127+29.66-exst			1w	-2.0000	0.5423	393.72	Sag	884	438	77	50
131+56.17-exst			1w	0.5423	-1.0200	393.72	Crest	888	431	78	50
142+06.04-exst			1w	-1.0200	-1.7000	393.72	Crest	1784	436	+100	50
147+63.78-exst			1w	-1.7000	-0.5109	393.72	Sag	+9999	436	+100	50
155+18.37-exst			1w	-0.5109	-1.5000	393.72	Crest	1288	434	97	50
159+28.48-exst			1w	-1.5000	0.5000	393.72	Sag	2375	434	+100	50

Notes:

Traffic Direction:
1w = One Way Traffic in Station direction
1a = One Way Traffic against Station direction
2 = Two Way Traffic

Grades are with respect to Station direction.
* Indicates design exception required.
GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: COLLECTOR - URBAN

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
NB Frontage Road											
35+76.12-exst			1a	-1.1204	-0.4000	393.72	Sag	+9999	421	+100	50
45+27.56-exst			1a	-0.4000	-2.0063	393.72	Crest	869	421	78	50
55+61.02-exst			1a	-2.0063	-1.4899	393.72	Sag	+9999	413	+100	50
73+81.89-exst			1a	-1.4899	1.3063	393.72	Sag	717	433	68	50
83+66.14-exst			1a	1.3063	-3.5000	820.25	Crest	607	433	62	50
95+47.24-exst			1a	-3.5000	-1.0095	393.72	Sag	932	417	82	50
102+03.41-exst			1a	-1.0095	0.9487	393.72	Sag	2812	430	+100	50
106+95.54-exst			1a	0.9487	-2.0000	524.96	Crest	628	430	63	50
115+81.36-exst			1a	-2.0000	-1.0000	393.72	Sag	+9999	417	+100	50
119+75.07-exst			1a	-1.0000	-1.8500	393.72	Crest	1466	417	+100	50
130+24.93-exst			1a	-1.8500	1.0000	393.72	Sag	692	430	67	50
134+18.64-exst			1a	1.0000	-1.0156	393.72	Crest	732	430	70	50

Notes:

Traffic Direction:
1w = One Way Traffic in Station direction
1a = One Way Traffic against Station direction
2 = Two Way Traffic

Grades are with respect to Station direction.
* Indicates design exception required.
GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: FREEWAY RAMPS

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
Princess Ramp C											
4+26.51-exst			1a	-0.5499	1.7692	393.7	Sag	1154	436	90	50
10+66.27-exst			1a	1.7692	-1.5201	853	Crest	748	436	70	50

Notes:

Traffic Direction:
1w = One Way Traffic in Station direction
1a = One Way Traffic against Station direction
2 = Two Way Traffic

Grades are with respect to Station direction.
* Indicates design exception required.
GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: FREEWAY RAMPS

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
Princess Ramp D											
5+90.55-exst			1w	-0.6196	2.4661	393.7	Sag	604	428	62	50
11+81.10-exst			1w	2.4661	-1.0739	590.6	Crest	600	431	62	50

Notes:

Traffic Direction:
1w = One Way Traffic in Station direction
1a = One Way Traffic against Station direction
2 = Two Way Traffic

Grades are with respect to Station direction.
* Indicates design exception required.
GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: FREEWAY RAMPS

VPI STATION	MILEPOST BEGIN	MILEPOST END	TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE AVAILABLE (ft)	STOPPING SIGHT DISTANCE AASHTO MINIMUM (ft)	SPEED AVAILABLE (mph)	SPEED DESIGN (mph)
FLW Blvd											
Ramp A											
21+32.55-exst			1a	-0.4001	-3.4637	475.7	Crest	590	421	62	50

Notes:

Traffic Direction:
1w = One Way Traffic in Station direction
1a = One Way Traffic against Station direction
2 = Two Way Traffic

Grades are with respect to Station direction.
* Indicates design exception required.
GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: FREEWAY RAMPS

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
FLW Blvd											
Ramp B											
9+18.64-exst			1w	-1.9598	-3.6088	524.9	Crest	917	451	77	50
13+28.74-exst			1w	-3.6088	-0.5001	393.7	Sag	598	451	60	50

Notes:

Traffic Direction:
1w = One Way Traffic in Station direction
1a = One Way Traffic against Station direction
2 = Two Way Traffic

Grades are with respect to Station direction.
* Indicates design exception required.
GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: FREEWAY RAMPS

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
FLW Blvd											
Ramp C											
5+90.55-exst			1a	-1.9995	-4.0000	524.9	Crest	802	410	76	50
10+99.08-exst			1a	-4.0000	-1.5184	393.7	Sag	941	413	83	50

Notes:

Traffic Direction:
1w = One Way Traffic in Station direction
1a = One Way Traffic against Station direction
2 = Two Way Traffic

Grades are with respect to Station direction.
* Indicates design exception required.
GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: FREEWAY RAMPS

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
FLW Blvd											
Ramp D											
6+56.17-exst			1w	-1.8999	-4.5821	524.9	Crest	665	460	63	50
11+97.51-exst			1w	-4.5821	-1.9997	393.7	Sag	851	460	73	50

Notes:

Traffic Direction:
1w = One Way Traffic in Station direction
1a = One Way Traffic against Station direction
2 = Two Way Traffic

Grades are with respect to Station direction.
* Indicates design exception required.
GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: FREEWAY RAMPS

VPI STATION	MILEPOST BEGIN	MILEPOST END	TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE AVAILABLE (ft)	STOPPING SIGHT DISTANCE AASHTO MINIMUM (ft)	SPEED AVAILABLE (mph)	SPEED DESIGN (mph)
Raintree Dr											
Ramp A											
7+38.19-exst			1a	-1.8335	-3.8515	492.1	Crest	781	411	75	50
13+94.36-exst			1a	-3.8515	-1.8819	393.7	Sag	2676	411	+100	50

Notes:

Traffic Direction:
1w = One Way Traffic in Station direction
1a = One Way Traffic against Station direction
2 = Two Way Traffic

Grades are with respect to Station direction.
* Indicates design exception required.
GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: FREEWAY RAMPS

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
Raintree Dr											
Ramp B											
7+21.78-exst			1w	-1.9004	-4.0653	590.6	Crest	794	455	70	50
14+59.97-exst			1w	-4.0653	-1.0851	393.7	Sag	639	455	62	50

Notes:

Traffic Direction:
1w = One Way Traffic in Station direction
1a = One Way Traffic against Station direction
2 = Two Way Traffic

Grades are with respect to Station direction.
* Indicates design exception required.
GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: FREEWAY RAMPS

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
Raintree Dr											
Ramp C											
7+21.78-exst			1a	-1.0155	-3.0600	393.7	Crest	725	417	71	50
14+59.97-exst			1a	-3.0600	-1.7496	393.7	Sag	+9999	412	+100	50

Notes:

Traffic Direction:
1w = One Way Traffic in Station direction
1a = One Way Traffic against Station direction
2 = Two Way Traffic

Grades are with respect to Station direction.
* Indicates design exception required.
GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: FREEWAY RAMPS

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
Raintree Dr											
Ramp D											
6+56.17-exst			1w	-1.5681	-4.0000	492.1	Crest	690	454	65	50
11+15.49-exst			1w	-4.0000	-1.8202	393.7	Sag	1464	454	+100	50

Notes:

Traffic Direction:
1w = One Way Traffic in Station direction
1a = One Way Traffic against Station direction
2 = Two Way Traffic

Grades are with respect to Station direction.
* Indicates design exception required.
GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: FREEWAY RAMPS

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
Cactus Rd											
Ramp A											
7+21.78-exst			1a	-1.2089	1.1600	393.7	Sag	1077	432	87	50

Notes:

Traffic Direction:
1w = One Way Traffic in Station direction
1a = One Way Traffic against Station direction
2 = Two Way Traffic

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GB indicates grade break. Stopping Sight Distance and Speed not calculated.
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ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: FREEWAY RAMPS

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
Cactus Rd											
Ramp B											
7+71.00-exst			1w	-1.4072	1.3401	393.7	Sag	743	433	70	50

Notes:

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ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: FREEWAY RAMPS

VPI STATION	MILEPOST BEGIN	MILEPOST END	TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE AVAILABLE (ft)	STOPPING SIGHT DISTANCE AASHTO MINIMUM (ft)	SPEED AVAILABLE (mph)	SPEED DESIGN (mph)
Cactus Rd											
Ramp C											
5+90.55-exst			1a	-1.1995	-2.5753	393.7	Crest	981	415	85	50
12+13.91-exst			1a	-2.5753	-0.2496	393.7	Sag	1143	422	92	50

Notes:

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Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: FREEWAY RAMPS

VPI STATION	MILEPOST BEGIN	MILEPOST END	TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE AVAILABLE (ft)	STOPPING SIGHT DISTANCE AASHTO MINIMUM (ft)	SPEED AVAILABLE (mph)	SPEED DESIGN (mph)
Cactus Rd											
Ramp D											
5+24.93-exst			1w	-1.2598	-2.4528	393.7	Crest	1101	442	87	50
11+64.70-exst			1w	-2.4528	-0.2501	393.7	Sag	1400	442	+100	50

Notes:

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GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: FREEWAY RAMPS

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
Shea Blvd											
Ramp A											
8+53.02-exst			1a	-1.4287	1.9999	492.1	Sag	622	438	62	50

Notes:

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Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: FREEWAY RAMPS

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
Shea Blvd											
Ramp B											
10+82.68-exst			1w	-0.6805	2.3420	459.3	Sag	703	428	68	50
17+71.65-exst			1w	2.3420	-2.2541	918.6	Crest	657	440	64	50
24+27.82-exst			1w	-2.2541	2.0000	262.5	Sag	303	254	39	35

Notes:

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ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: COLLECTOR - URBAN

VPI STATION	MILEPOST		TRAFFIC	GRADE	GRADE	CURVE	CURVE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END	DIRECTION (1w, 1a or 2)	IN (%)	OUT (%)	LENGTH (ft)	TYPE	AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
Thunderbird Rd											
29+85.56-exst			2	-0.4000	0.5390	262.5	Sag	+9999	427	+100	50
33+30.05-exst			2	0.5390	-0.3294	360.9	Crest	1423	427	+100	50
36+08.92-exst			2	-0.3294	0.4375	196.9	Sag	+9999	426	+100	50

Notes:

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GB indicates grade break. Stopping Sight Distance and Speed not calculated.
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ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: ARTERIAL - URBAN

VPI STATION	MILEPOST		TRAFFIC	GRADE	GRADE	CURVE	CURVE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END	DIRECTION (1w, 1a or 2)	IN (%)	OUT (%)	LENGTH (ft)	TYPE	AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
Princess Dr											
8+00.00-exst			2	-0.1800	-1.6000	200	Crest	860	435	76	50
14+00.00-exst			2	-1.6000	-1.2000	200	Sag	+9999	435	+100	50
23+30.00-exst			2	-1.2000	-1.7676	200	Crest	2001	436	+100	50
27+00.00-exst			2	-1.7676	-1.5751	200	Sag	+9999	436	+100	50

Notes:

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GB indicates grade break. Stopping Sight Distance and Speed not calculated.
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ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: ARTERIAL - URBAN

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
Raintree Dr											
29+52.76-exst			2	-0.4202	1.2940	197	Sag	+9999	503	+100	55
32+80.84-exst			2	1.2940	-0.4843	197	Crest	705	503	68	55
37+40.16-exst			2	-0.4843	-0.6278	0	GB	GB	GB	GB	55

Notes:

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GB indicates grade break. Stopping Sight Distance and Speed not calculated.
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ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: ARTERIAL - URBAN

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
Frank Lloyed Wright											
Boulevard											
28+70.73-exst			2	-0.4003	-1.2482	262.5	Crest	1404	578	+100	60
31+49.61-exst			2	-1.2482	0.8981	196.9	Sag	1038	578	85	60
34+94.09-exst			2	0.8981	0.3999	196.9	Crest	2264	575	+100	60

Notes:

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GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: ARTERIAL - URBAN

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
Bell Rd											
26+41.08-exst			2	-0.2437	-0.4000	0	GB	GB	GB	GB	55

Notes:

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1w = One Way Traffic in Station direction
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GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: ARTERIAL - URBAN

VPI STATION	MILEPOST BEGIN	MILEPOST END	TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE AVAILABLE (ft)	STOPPING SIGHT DISTANCE AASHTO MINIMUM (ft)	SPEED AVAILABLE (mph)	SPEED DESIGN (mph)
Cactus Rd											
29+52.76-exst			2	-0.4673	0.5000	164	Sag	+9999	362	+100	45
32+80.84-exst			2	0.5000	-0.6833	492.1	Crest	1158	363	92	45
36+74.54-exst			2	-0.6833	-0.4116	164	Sag	+9999	363	+100	45

Notes:

Traffic Direction:
1w = One Way Traffic in Station direction
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* Indicates design exception required.
GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - VERTICAL CURVE INVENTORY

Project Name: Princess Drive to Shea Boulevard (101L)
Project Number: 101L MA 036 F0123D
Roadway Type: ARTERIAL - URBAN

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
Shea Blvd											
14+43.57-exst			2	0.4300	0.7400	196.9	Sag	+9999	498	+100	55
16+73.23-exst			2	0.7400	-0.8300	262.5	Crest	819	499	74	55
19+02.89-exst			2	-0.8300	0.0900	196.9	Sag	+9999	499	+100	55

Notes:

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ROADWAY ENGINEERING GROUP
ROADWAY PREDESIGN SECTION
ATTACHMENT 3 - BRIDGE EVALUATION

DATE: 11/18/2020

TO: **HENRY SUNG**
BRIDGE GROUP
BRIDGE MANAGEMENT SECTION, MD 635E

FEDERAL REFERENCE NO: 101-B(210)T   TRACS NO: F0123 01D
HIGHWAY: SR 101L
LOCATION: Princess Drive to Shea Boulevard
MP LIMITS: 36.54 TO: 41.08
PROJECT DESCRIPTION: Roadway Widening

FROM: **Tafwachi Katapa**
602.712.7614
tkatapa@azdot.gov

SUBJECT: **BRIDGE EVALUATION REQUEST**

Please evaluate the following structures per AASHTO guidelines:

ROUTE NO.	MILEPOST	STR. NO. AND NAME	BRIDGE LENGTH	BRIDGE ROADWAY WIDTH	BRIDGE RAIL / BARRIER					AC OVERLAY			VERTICAL CLEARANCE (MINIMUM)		BRIDGE LOAD RATING	BRIDGE SUFFICIENCY RATING
					TYPE	GEOM. OK	STRUC OK	Railings OK	Transitions OK	THICKNESS (EXISTING)	REMOVE	REPLACE / NEW				
N7*	N11	N8 & A209	N49	N51	A206A	A206B	A206C	N36A	N36B	A201	(MINIMUM)	(MAXIMUM)	NB/EB	SB/WB	N66	SRB
101L	36.59	**01459** Pima Road TI OP EB	217	66	Concrete Barrier	**Yes**	**Yes**	**Yes**	**NA**	**1"**	**1"**	**1"**	**16.4**	**16.34**	**HS 20+**	**99.00**
			Comments:Existing AC overlay on bridge deck should be removed full depth, bare concrete deck top be inspected, repaired if needed .Then be overlaid with 1" thick appropriate asphaltic overlay.													
101L	36.59	**02656** Pima Road TI OP WB	217	66	Concrete Barrier	**Yes**	**Yes**	**Yes**	**NA**	**1"**	**1"**	**1"**	**16.24**	**16.23**	**HS 20**	**99.00**
			Comments:Existing AC overlay on bridge deck should be removed full depth, bare concrete deck top be inspected, repaired if needed .Then be overlaid with 1" thick appropriate asphaltic overlay.													
101L	37.06	**02510** Bell Rd OP NB	244	76.8	Concrete Barrier	**Yes**	**Yes**	**Yes**	**NA**	**1"**	**1"**	**1"**	**16.78**	**16.87**	**HS 20+**	**94.10**
			Comments:Existing AC overlay on bridge deck should be removed full depth, bare concrete deck top be inspected, repaired if needed .Then be overlaid with 1" thick appropriate asphaltic overlay.													
101L	37.06	**02511** Bell Rd OP SB	244	76.8	Concrete Barrier	**Yes**	**Yes**	**Yes**	**NA**	**1"**	**1"**	**1"**	**16.46**	**16.46**	**HS 20+**	**94.00**
			Comments:Existing AC overlay on bridge deck should be removed full depth, bare concrete deck top be inspected, repaired if needed .Then be overlaid with 1" thick appropriate asphaltic overlay.													
101L	37.66	**01937** CAP Canal Bridge	88	35.3	Concrete Barrier	**Yes**	**Yes**	**Yes**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**HS 20+**	**100.00**
			Comments:													
101L	37.66	**02506** CAP Canal Bridge NB	275	78.4	Concrete Barrier	**Yes**	**Yes**	**Yes**	**NA**	**2"**	**2"**	**1"**	**NA**	**NA**	**HS 20+**	**95.00**
			Comments:Existing AC overlay on bridge deck should be removed full depth, bare concrete deck top be inspected, repaired if needed .Then be overlaid with 1" thick appropriate asphaltic overlay.													

ATTACHMENT 3 - BRIDGE EVALUATION (CONTINUED)

ROUTE NO. N7*	MILEPOST N11	STR. NO. AND NAME N8 & A209	BRIDGE LENGTH N49	BRIDGE ROADWAY WIDTH N51	BRIDGE RAIL / BARRIER: TYPE A206A	BRIDGE RAIL / BARRIER: GEOM. OK A206B	BRIDGE RAIL / BARRIER: STRUC OK A206C	BRIDGE RAIL / BARRIER: Railings OK N36A	BRIDGE RAIL / BARRIER: Transitions OK N36B	AC OVERLAY: THICKNESS (EXISTING) A201	AC OVERLAY: REMOVE (MINIMUM)	AC OVERLAY: REPLACE / NEW (MAXIMUM)	VERTICAL CLEARANCE (MINIMUM): NB/EB	VERTICAL CLEARANCE (MINIMUM): SB/WB	BRIDGE LOAD RATING N66	BRIDGE SUFFICIENCY RATING SRB	Comments
101L	37.66	**02507** CAP Canal Bridge SB	275	78.4	Concrete Barrier	**Yes**	**Yes**	**Yes**	**NA**	**2"**	**2"**	**1"**	**NA**	**NA**	**HS 20**	**94.80**	Comments:Existing AC overlay on bridge deck should be removed full depth, bare concrete deck top be inspected, repaired if needed .Then be overlaid with 1" thick appropriate asphaltic overlay.
101L	37.66	**02508** CAP Canal Bridge WFR	100	39.4	Concrete Barrier	**Yes**	**Yes**	**Yes**	**Yes**	**NA**	**NA**	**NA**	**NA**	**NA**	**HS 20+**	**81.20**	Comments:
101L	37.66	**02509** CAP Canal Bridge EFR	100	51.2	Concrete Barrier	**Yes**	**Yes**	**Yes**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**HS 20+**	**80.90**	Comments:
101L	37.78	**02505** Frank Lloyd Wright Blvd TI OP	225	157.2	Concrete Barrier	**Yes**	**Yes**	**Yes**	**NA**	**1"**	**1"**	**1"**	**16.89**	**17.5**	**HS 20+**	**100.00**	Comments:Existing AC overlay on bridge deck should be removed full depth, bare concrete deck top be inspected, repaired if needed .Then be overlaid with 1" thick appropriate asphaltic overlay. Structure #2512 was combined with Structure #2505 as per inspection note.
101L	38.59	**02501** Raintree Drive TI UP	212	109.1	Concrete Barrier	**Yes**	**Yes**	**Yes**	**NA**	**NA**	**NA**	**NA**	**18.53**	**17.51**	**HS 20+**	**97.30**	Comments:
101L	39.05	**02504** Thunderbird Rd UP	294	78.7	H-2-1 on Concrete Parapet	**Yes**	**Yes**	**Yes**	**NA**	**NA**	**NA**	**NA**	**16.67**	**16.81**	**HS 20+**	**94.40**	Comments:
101L	39.55	**02503** Sweetwater Ave Equestrian/Ped UP	283	NA	Concrete Barrier &	**Yes**	**Yes**	**Yes**	**NA**	**NA**	**NA**	**NA**	**18.01**	**18**	**NA**	**NA**	Comments: Pedestrian Structure.
101L	40.09	**02502** Cactus Rd TI UP	183	108.8	Concrete Barrier	**Yes**	**Yes**	**Yes**	**NA**	**NA**	**NA**	**NA**	**17.27**	**16.81**	**HS 20+**	**94.30**	Comments:There are damaged and deteriorated sections of pourable joint sealant at approach joints. There are some missing sections of the joint sealant
101L	41.10	**02480** Shea Blvd TI UP	172	102.4	Concrete Barrier	**Yes**	**Yes**	**Yes**	**NA**	**NA**	**NA**	**NA**	**17.27**	**16.55**	**HS 20+**	**90.90**	Comments:

Evaluation Completed by: Masudur Rahman Date: 10/28/2020

Notes: *N numbers are NBI numbers and A numbers are Arizona Items Number for bridge inventory

For Pima TI OP and Bell Rd OP SB, the soffit mounted lights will be relocated to achieve the required vertical clearance of 16.5'

APPENDIX B: Summary of Comments and Responses

Review Comments

Submittal	DRAFT DCR UPDATE	**Project Name**	Pima Freeway (SR101L): Princess to Shea Blvd GPLs
Return Date	September 22, 2020	**Project Number**	101-B(210)T
Reviewed By	Various	**TRACS Number**	101 MA 036 F0123 01D
Discipline/Office	Various	**Consultant**	Kimley»Horn
Phone Number	(602) 712-7614	**ADOT PM**	Tafwachi Katapa, P.E.

Discipline Legend - 1: Roadway 2: Right of Way, U: Utilities 3: Environmental 4: Drainage 5: Traffic 6: Structures 7: Geotechnical/Materials 8: Landscape 9: Estimates

Discipline	ITEM	DWG/SHT	Comment By	COMMENT	DISPOSITION INITIAL	DISPOSITION FINAL	RESPONSE / COMMENT
1	1		Reed Henry	I assume the Header will be changed to "Final DCR Update" when it's ready for your seal and signature.	A	A	***Agree.***
1	2	50	Reed Henry	Please prepare a Design Exception request for the controlling criteria that will not be met, ASAP. Also please consider as an alternative, where Section 4.2 is considering a 1' outside shoulder, the use of an 8' inside shoulder, 11' lanes and an 8' outside shoulder.	A	A	***Agree - Design Exception submitted.***
1	3	67	Reed Henry	The AASHTO Report will need to be updated as part of the new Design Exception Request to include all exceptions.	D	D	***Section 8 will be updated to include the previous AASHTO Criteria. Appendix A from the previous AASHTO report is still valid and will not be updated as part of the DCR Update since the DCR Update only updates the 3 TIs.***
1	4	Plan Sheet 4 of 15	Reed Henry	Verify Build Alternative Plan Sheet 4 of 15 is being designed to meet the 101, I-17 to Pima DB final design configuration.	A	A	***Will review to ensure the project tie together correctly.***
1	5	Plan Sheet 10 of 15	Reed Henry	Verify Build Alternative Plan Sheet 10 of 15 is correct, it shows a TDI at Raintree.	A	A	***Layout is in error, and will be updated to show the improved SPUI configuration.***
1	6	Page I	Julia Mendoza	Executive Summary, first paragraph: Please include the limits of this new project.	A	A	***Will comply.***
1	7	Page 1	Julia Mendoza	Item 1.1. Second paragraph: Please include "State Route 101L is on the National Highway System (NHS)", as part of this Highway classification.	A	A	***Will comply.***
1	8	Page 25	Julia Mendoza	Page 25, Item 2.4.1.1. Second paragraph, fifth sentence: It should be "speeds" instead of "seeds".	D	D	***"Seeds" is the correct terminology. "Random seeds" refer to numbers randomly generated as initial values in starting the simulation of traffic modeling such that no two model runs are identical. This helps the models reflect actual conditions, where traffic volumes fluctuate daily.***
1	9	Page 27	Julia Mendoza	Why it is used HCM 2010 to measure the Level of Services on TIs (Table 2.8) and HCM 2016 to measure the Level of Service on Mainlines (Table 2.4)?	A	A	***HCM references will be updated to be consistent where applicable.***
1	10	Pages 30 & 31	Julia Mendoza	Tables 2.13, 2.14, 2.15 & 2.16: The delay values are very close for TDI and improved SPUI alternatives on Frank Lloyd Wright TI. Average Queues are similar. Why spend more money, almost a million dollars more plus all the inconvenient to change to a TDI and getting similar results of an improved SPUI?	D	D	***Section 3.4.2.4 on page 37 explains that the TDI provides the potential for better signal coordination with the ramp/frontage roads and provides an improved environment for pedestrian and bike crossings, which is a high priority for some project stakeholders. Update (10-07-20): Dave Meinhard (COS) explained that the Scottsdale council has presented the interchange options to the commission. The commission voted on the approved TDI recommendation. TDI is more user- and pedestrian-friendly.***
1	11	Page 50	Julia Mendoza	Item 4.1. Design Controls. It is referenced to ADOT 2010 DCR. Tables 21, 22 & 23 have the Design Year set as 2030. The 2020 DCR Design Year is 2040. Please clarify.	A	A	***Text will be modified to indicate the 2010 DCR criteria apply except that the design year is 2040 instead of 2030.***
1	12	Page 50	Julia Mendoza	Item 4.6.2. Will the final 2020 DCR define the alternative to be used on bridges widening within the project limits? This will impact the project cost. Now it is considered as a Lump Sum.	D	D	***These will be determined during final design with the bridge selection report***
1	13	Page 50	Julia Mendoza	Item 4.6.2. Will 2020 DCR consider existing bridge deficiencies, based on a new bridge inspection, be fixed as part of this project?	D	D	***We have reviewed the current reports. Current inspection reports only mention minor items at the Bell Rd and FLW bridges. The widening of these bridges will address the items mentioned in the repair reports. Update (10-07-20): Previous bridge inspection reports have been reviewed. It was determined that only minor other deficiences will be fixed as part of this project.***
1	14	Page 56	Julia Mendoza	Item 5.3.2. It is recommended just minor improvements for this Raintree Drive SPUI but Plan C-2.6 (Appendix B) shows a new TDI.	A	A	***Plan sheet C-2.9 will be updated to show a SPUI.***

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Review Comments

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Return Date	September 22, 2020	Project Number	101-B(210)T
Reviewed By	Various	TRACS Number	101 MA 036 F0123 01D
Discipline/Office	Various	Consultant	Kimley»Horn
Phone Number	(602) 712-7614	ADOT PM	Tafwachi Katapa, P.E.

Discipline Legend - 1: Roadway 2: Right of Way, U: Utilities 3: Environmental 4: Drainage 5: Traffic 6: Structures 7: Geotechnical/Materials 8: Landscape 9: Estimates

Discipline	ITEM	DWG/SHT	Comment By	COMMENT	DISPOSITION INITIAL	DISPOSITION FINAL	RESPONSE / COMMENT
1	15	Page 57	Julia Mendoza	Item 5.4.2. Shea Blvd is mentioned as a Diamond TI. It is a SPUI TI.	A	A	***Will update reference to SPUI TI.***
1	16	Page 58	Julia Mendoza	Itemized Cost Estimate: Why it is not so detailed on Structures?	D	D	***SQ FT cost is typical for DCR's. Detailed estimates will be prepared with the bridge selection reports during final design.***
1	17	ADA Report	Julia Mendoza	Does it contain all existing non-compliant features or just those in need of improvements after the TIs reconstruction?	D	D	***This includes all ADA features within the project, including all the TIs.***
1	18	ADA Report	Julia Mendoza	Introduction. First paragraph: “general purpose...lanes not lands”	A	A	***Will update.***
1	19	General	Julia Mendoza	What is the purpose of: “See ADOT 2010 DCR” on certain Items of the 2020 DCR. Is it that the referenced piece of information is part of the 2020 DCR and we have to comment on it? Will them be updated and included in the Final 2020 DCR?	D	D	***THe project scope is to only provide updates to the 2010 DCR focusing on FLW, Raintree and Shea Blvd TIs. The document has the same layout and headings as the 2010 document, to use them side by side. K-H has reviewed the 2010 DCR and found these sections do not require an update yet will still apply for consideration by the final designer/engineer. Thus a note is placed under that section to refer the final designer to the secton of the older report. Comments are not needed for the 2010 DCR since it is already an approved document. The sections reference from the 2010 DCR will not be included with this DCR Update.***
1	20	General	Julia Mendoza	The word “would” is repetitive throughout this 2020 DCR on information copied or referenced to the ADOT 2010 DCR. Shouldn’t this give an idea of no certainty on the proposed solutions and/or recommendations?	D	D	***This is typical DCR language in providing the final design team flexibility as the recommendations are implemented.***
1	21	General	Julia Mendoza	The Design Exceptions Request was not included on this 2020 DCR.	A	A	***The Design Exception Request was sent after the DRAFT DCR was submitted. The approved Design Exceptions Request will be included with the Final DCR Update submittal.***
1	22	General	David Meinhart	Kiran and I are fine with the draft report. You have already included our comments from the various sections that have now been compiled. Based on last Thursday’s Transportation Commission outcome, we are still recommending the TDI concept at Frank Lloyd Wright.	D	D	***Thank you for the City of Scottdale's confirmation.***
8	23	General	Joe Salazar	Leroy Brady will provide a letter of the finding of public interest for single source granite mulch to be Cheyenne, 1-1/4” minus, from Pioneer. This needs to be included in the DCR and final design special provisions. There is a transition to Coral granite mulch at the south end of the project, but the majority of the corridor will be Cheyenne, by Pioneer.	A	A	***This has been sent for signatures.***
8	24	General	Joe Salazar	The cross streets (Princess, Bell, FLW), maintained by the City of Scottsdale, are Coral.	A	A	***Will note city maintained DG color.***
8	25	General	Joe Salazar	Paint colors shall match the control set as provided by ADOT Roadside Development. This is an updated control set from the original project, based on the color selections of the SR 101L GPL Shea to SR 202L project. Sources can be Sherwin Williams, Dunn Edwards, PPG, etc. so long as they match the current control set.	A	A	***Will add note on paint color control requirement.***
1	26	General	Victor Yang	No comments	D	D	

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5	27	Page 51	Central District	As information in the DCR should include that the NB Frank Lloyd Blvd. Ramp Meter is a wireless type.	B/C	A	***Language will be added to the DCR stating that the existing NB FLW ramp meter utilizes a wireless (Sensys) system for detection. All new ramp meter systems for the project will utilize sawcut loop detector technology.***
5	28	59	Central District	Missing an item for ITS Record Drawings	A	A	***Will add item.***
5	29	59,60	Central District	Will this project need Split #9 Pull Boxes to keep the fiber communication functional when this project is being constructed?	A	A	***We don't anticipate the need for Split #9 pull boxes. A bid item was added for "Temporary ITS" which we believe can be installed on the median barrier or as a "Phase Zero" to maintain the critical ADOT FMS networks and CCTV/DMS/TS during construction. KHA will elaborate the temp ITS requirements in the DCR.***
5	30	59	Central District	What are Unidentified Allowances?	D	D	***These are items that are not yet discovered in the DCR phase that once final design commences are found to be required. These is usually set at 20% at this Stage.***
5	31	59	Central District	If the item 7320421 Pull Box (No. 7) (With Extension) are for FMS change them to No 7 pull boxes Standard FM-2.06 Standard.	A	A	***Agree. Will revise Item.***
5	32	61	Central District	For Item 7340252 in the () edit to read Intelight 2070LC	A	A	***Description will be revised per comment.***
5	33	62	Central District	Missing Item for patch and splice modules	A	A	***A fiber optic termination panel bid item will be added. This item was assumed included in the fiber cabling for the submittal.***
5	34	62	Central District	Is this project is going to need closures for fiber splicing new fiber to existing fiber?	A	A	***Its anticipated that no traffic restrictions will be required for splicing of fiber optic cables since the No. 9 pull boxes are located outside of the travel way. KHA will confirm.***
1	35	Plan Sheet No.4, 13	Central District	Plan sheet 4 and 13 are missing freeway beginning and end project limits stations.	A	A	***Will add callouts.***
1	36	Plan Sheet No.6	Central District	The New Conc. Half Barrier Special Detail. Missing the reference Detail	A	D	***Will update reference concerning Special details. Update(10/15/2020): The concrete barrier special details will be developed during final design.***
5	37	Introduction. 1	Central District	Change lands to lanes	A	A	***Will update this within the ADA report introduction.***
5	38	General	Central District	Will the Ramp Meters in this project be functional during construction of this project?	B/C	D	***Lets discuss. The RM will be taken down and offline for construction of on-ramp improvements. At other times during construction the RM can be maintained and operational. Are there specific RM locations ADOT would like maintained during construction? Update (10-07-20): Depending on construction phasing, this will be addressed during final design.***
U	39	pg 52	Central District	4.12 "no MH or CB in freeway pavement areas" should also include crossroads/ramps. No MH or CB in any travel lane within ADOT ROW	B/C	A	***Will discuss. Update (10-07-20): No "new" MH or CB will be located in the pavement. Standard language from Steve O'Brien will help clarify.***

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8	40	pg 52	Central District	4.16 change the subtitle from "Landscape Architectural Design" to "Landscape Architectural Design, Construction and Maintenance"	A	.A	***Will revise.***
8	41	pg 52	Central District	4.16 add that the City of Scottsdale is expected to maintain all landscape, equestrian trail and aesthetic features in accordance with the current IGA/JPA 00-207. All improvements, and additions to the freeway aesthetics requested by the City of Scottsdale shall be paid for by the City of Scottsdale at construction, and the maintenance of all aesthetic improvements and additions requested by the City of Scottsdale shall either be paid for, or maintained by the City of Scottsdale.	A	A	***Will add.***
9	42	pg 58	Central District	note #1 states that the landscape cost estimate is based only on disturbed areas. This is not going to be true. The cost of landscape should also include in the estimate a figure of approximately $31K per mile per year for the construction contractor to maintain the existing landscape features which are still part of the project area but not disturbed. This project has a length of approx. 4.8 miles so that would be about $148K per year. This conflicts with paragraph on page 53 which says undisturbed areas will be maintained.	A	A	***Will clarify and make sure overall landscape cost estimate includes maintenance of existing landscape.***
U	43	52	JR	Section 4.12. Utility Coordination. Please clarify. Are the catch basins being referred to ADOT catch basins, or the City's. Also is it "freeway pavement areas" or "freeway PCCP areas?	B/C	A	***Will discuss.*** ***Update (10-07-20): Will revise statement to take out catch basins. Catch basins are needed for roadway drainage.***
U	44	54	JR	Section 5.1.10. Utility Coordination. Please reference the manhole location by station.	A	A	***Will add stations.***
U	45	55	JR	Section 5.2.11. Utility Coordination. At the NW quadrant I noticed <u>two</u> waterlines and <u>one</u> sewer line being under the ramp concrete pavement. Please provide offset distances from the frontage road centerline to the facilities being called out. At the SW quadrant I don't see the SB frontage road modifications impacting the two referenced sewer lines. Please call out the plan sheet which is being referenced for this sub-section.	A	A	***Will add stations and offsets to help clarify text.***
U	46	5 (C-2.1a)	JR	There is some median reconstruction work being done under some power lines. If the those lines are SRP transmission lines, at minimum, the work could trigger a "Consent to Use Agreement" to be able to work within their easement.	A	A	***Will confirm ownership and existing land rights to confirm if a Consent to Use Agreement is required.***
5	47	Page 16	Beverly Chenausky	"TMCs were collected on a Tuesday, Wednesday, or Thursday between 7:00 AM and 9:00 AM and between 4:00 PM and 6:00PM. Newer TMCs were not collected as part of the project effort due to recent drastic changes in travel patterns as a result of COVID-19. The provided TMCs were grown annually by 1.0% to represent 2020 existing TMCs." - *Are there grown estimates for 2040? Are these assumed to be the same for build and no-build?*	D	D	***Section 2.3.2.1 and Section 2.3.2.2 on page 19 describe the development of the 2040 No-Build and 2040 Build volumes, respectively. 2040 No-Build mainline volumes are slightly different from 2040 Build mainline volumes. 2040 No-Build intersection peak hour volumes (TMCs) are the same as 2040 Build intersection peak hour volumes (TMCs). The 2040 volumes are displayed in Figures 2.14 through 2.19 on pages 20-24.***
5	48	Pages 17-18	Beverly Chenausky	"Heavy vehicle percentages were assumed to be 7% (4% medium and 3% heavy vehicles) on the freeway mainline and 4% (3% medium and 1% heavy vehicles) on the ramps and TIs based on available ADOT Transportation Data Management System (TDMS) data." - *Can you provide some graphic images similar to Figure 2.12 – Existing Freeway Lane Geometry and Traffic Volumes and Figure 2.13 – Existing TI Lane Geometry and Traffic Volumes that show truck volumes (can be combined medium/heavy).*	D	D	***Figures showing heavy vehicle percentages have not historically been included in ADOT DCRs. The heavy vehicle volumes can be calculated from any volume shown in the figures using the percentages referenced of 7% on the mainline and 4% on the ramps and TIs. Creating figures showing heavy vehicle volumes would be a substantial amount of unanticipated effort.***

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5	49	Page 19	Beverly Chenausky	*Similar can these scenarios include information on trucks in Figure 2.14-19 (report notes heavy traffic data available).* "For the SR 101L mainline, two alternatives were analyzed as part of the 2040 traffic analysis: ▪ No-Build alternative – where SR 101L remains as it currently exists ▪ Build alternative – where SR 101L is widened by adding one GPL in each direction throughout the project limits For the TIs, four alternatives were analyzed as part of the 2040 traffic analysis: ▪ No-Build alternative – where the TIs remain as existing SPUIs with no improvements ▪ Improved SPUI alternative – where the existing SPUIs are improved/expanded at the Frank Lloyd Wright Boulevard, Raintree Drive, and Shea Boulevard TIs ▪ TDI alternative – where the existing SPUIS are converted to TDIs at the Frank Lloyd Wright Boulevard and Raintree Drive TIs only ▪ DRI alternative – where the existing SPUI is converted to a double-roundabout interchange at the Raintree Drive TI only"	D	D	***See response to comment no. 48.***
5	50	Page 27	Beverly Chenausky	"ADOT considers LOS D or better "acceptable" LOS for overall TI and intersection operations in urban conditions. Average vehicle queues in VISSIM that do not exceed available storage or do not block upstream driveways/intersections are generally considered to have acceptable queue lengths. -*While LOS D is acceptable be advised that any traffic intersections that impact LOS D or greater or will change intersection LOS D or greater due to traffic volumes attributed to the project are triggers for CO modeling, if the congested intersections "significantly increase truck volumes" then PM10 hot-spot modeling will be needed as well. To "screen" these projects more details are needed on the trucks in the LOS at intersections, for those LOS D greater (congested intersections) some discussions on how the project "improves" congestion or doesn't worsen the condition. From the traffic report it appears most if not all of the intersections improve in the build condition there are a few stragglers, now I am assuming this project won't increase trucks significantly so PM10 modeling likely not needed, may be able to screen out CO modeling based on the overall improvement in congestion/delay but may need some further discussions on this result in Table 2.14.. overall delay is also higher than nobuild? May need a little more explanation on this, can note improvements in AM overall and minimize the impact of the PM increase in overall delay but may not guarantee modeling will not be suggested for CO. The DCR Scope does include an air quality technical report, so keep that in as written, but there is no need for MSAT if this is going to be an ICE clearance.*	D	D	***The SR 101L/Shea Blvd traffic interchange is the only interchange where the 2040 Build PM condition LOS is D and the average delay per vehicle is higher than the 2040 No-Build PM condition (40 seconds vs. 38 seconds). This slight 2-second difference is due to variability in the traffic simulation model and does not indicate congestion would be worse with improvements than without as the only improvement at this location is extending the length of the westbound right-turn lane. The traffic model uses "random seed" numbers to initiate the model runs such that no two model runs are exactly the same, similar to how traffic volumes change slightly every day. The values shown in the analysis results tables are the average values of ten model runs. Truck volumes at the traffic interchanges are projected to only grow 10% between 2020 and 2040 (0.5% for 20 years). Average delay per vehicle values improve significantly more than this percentage between the 2040 No-Build condition and the 2040 Build condition with the recommended improvements, as indicated by several of the interchanges going from LOS F or LOS E to LOS D or better. Overall, emissions in the 2040 Build condition will be significantly lower than in the 2040 No-Build condition. This can be evaluated further during final design when NEPA clearance is being done. The reference to the MSAT in the Executive Summary is just documenting what environmental reports were included in the 2010 DCR.***
5	51	Page 27	Beverly Chenausky	See image 'Table 2.14' for comment reference	D	D	***See response to comment no. 50.***

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1	52	Executive Summary	D. Whitaker	Continuing coordination - 2010 FDCR also lists SRPMIC, Tempe, and Mesa. Please confirm	D	D	***These three were originally listed in connection with the southern segment 1 of the 2010 DCR that is already constructed. These three are intentionally removed from the DCR update. No changes necessary.***
6	53	59, 61	I. Racic	The cost of the noise walls in the DCR is at $25/sqft, which may be a number I would take a look into as the current market figure I believe is above that. 9140133 Noise Barrier Wall (Combination-noise wall portion only) SQ.FT. 25,800 $25.00 $645,000)	A	A	***This item has been removed. It is part of Shea Blvd Ramp B which is to remain in-place and not be constructed or modified***
1	54	Noise Section	I. Racic	There is a reference to Noise Analysis Technical Report, and the one in the file is from 2008. There will be a need for a new Noise Analysis Technical Report/Re-evaluation form to be completed.	D	D	***This will be completed as part of the final design.***
1	55	73/398	E.Chan	Were the design exceptions listed in 8.1 (without ** - no DE request planned) approved by FHWA previously? A DE request would need to be submitted for pre-existing design exceptions that will be perpetuated. Check if commitments were made in previous Design Exception Approval letters for this cooridor to address exceptions in future widening.	A	A	***Yes. Those without ** were approved previously for this project. There were previously approved design exceptions that are still valid for this project since they were approved for this project (same project); the DCR Update project only looked at alternatives for FLW, Raintree and Shea Blvd TIs. The area near Shea Ramp B where the existing combination wall is being avoided will require a new design exception which has been submitted.*** ***Update (10-07-20): FHWA previously approved design exceptions for Princess to Red Mountain (SR 202L) project. KHA to check 2010 previous non-conforming design exceptions.***
1	56	73/398	E.Chan	Superelevation deficiencies. Were they evaluated based on AASHTO Method 2 or Method 5? For reconstruction projects, Method 5 evaluation is required.	A	A	***There were 4 locations where superelevation deficiencies were identified in the 2010 DCR: FLW Ramp A, Raintree Drive Ramps A, B and D. These ramps will have to be reconstructed for the addition of the GPL and hence no design exception for superelevation is anticipated.*** ***Updated (10/16/2020): Mainline locations listed with superelevations less than recommended minimum have been checked.***
1	57	60/398	E.Chan	All TI's: Does existing access control meet RDG minimum? If not, can this be addressed with the TI reconfigurations?	B/C	A	***Access control could not be updated to current standards without full ROW aquistions on many commecial properties and would be cost prohibitive.*** ***Update (10-07-20): Will elaborate the evaluation of access control in the DCR for Princess, FLW, Raintree and Shea.***

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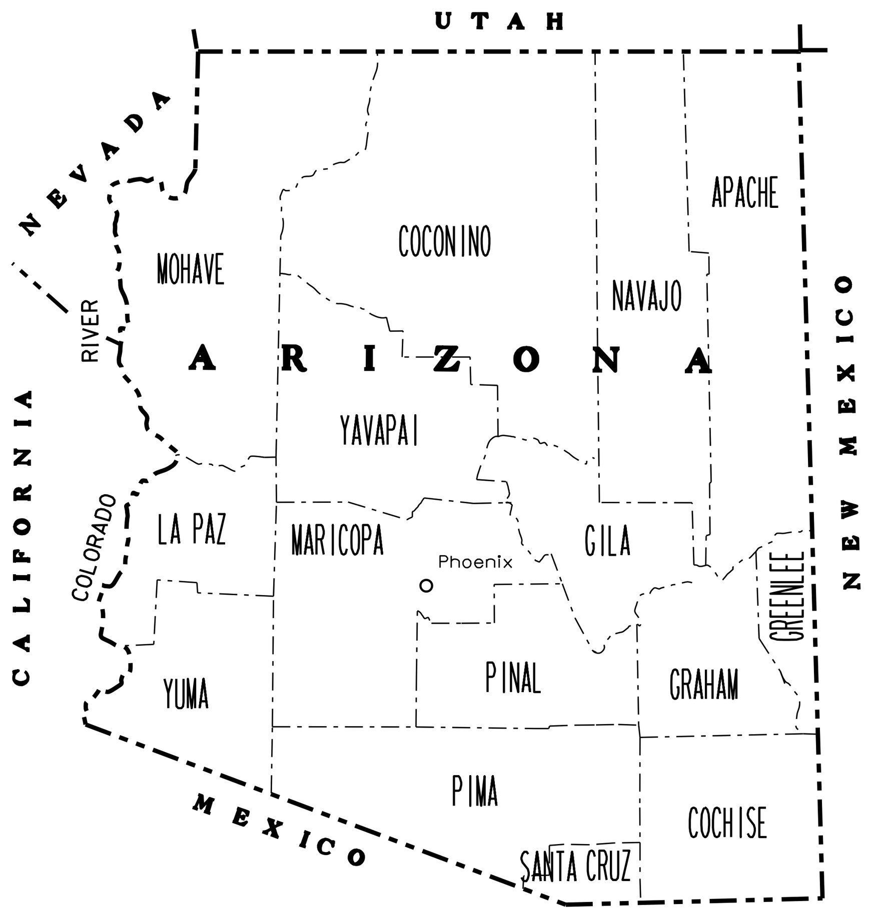
APPENDIX C: Typical Sections and Plans of the Recommended Alternative

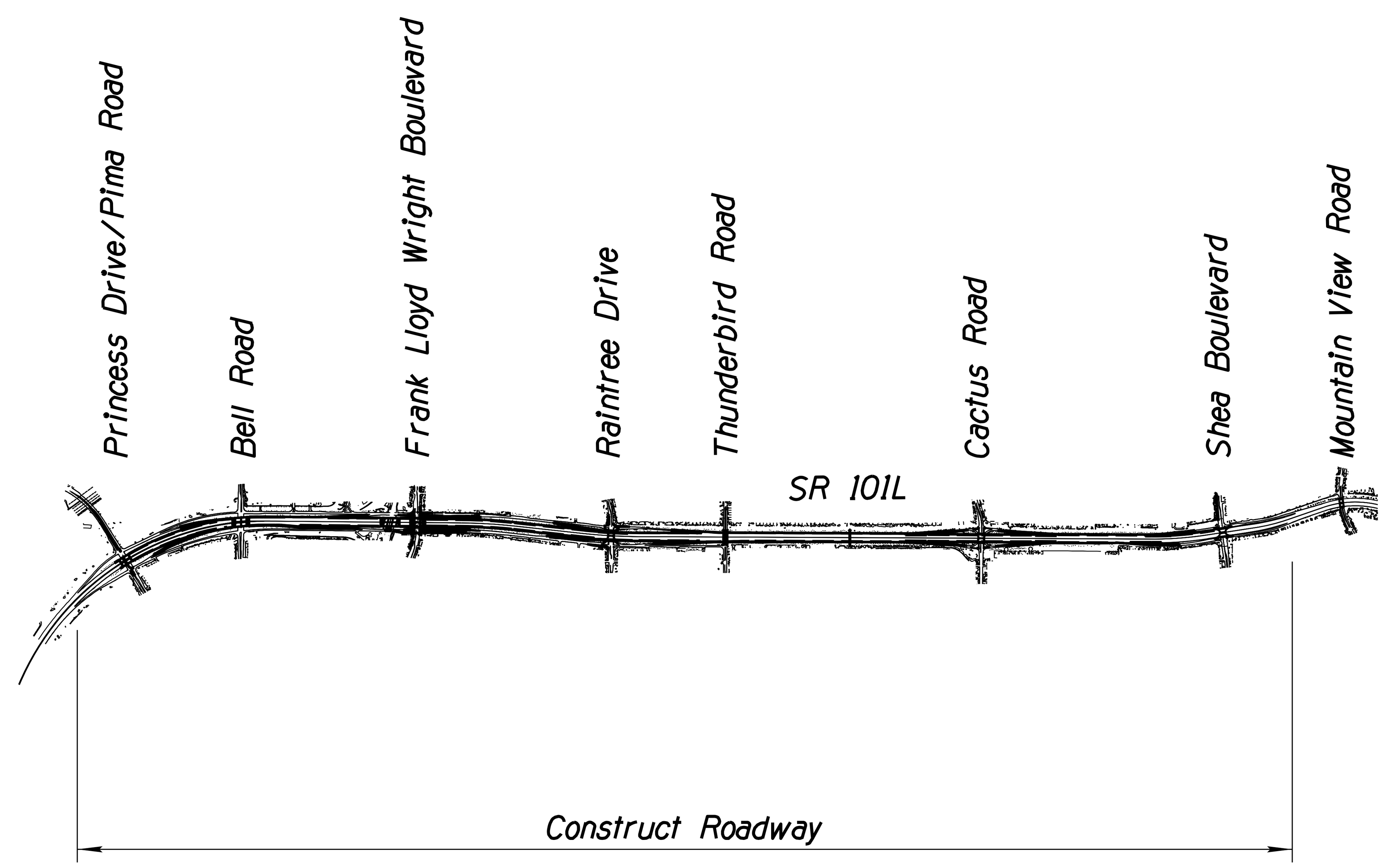


STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION

PROJECT PLANS

ADOT

STATE HIGHWAY
SR 101L



DESIGN CONCEPT REPORT UPDATE
APPENDIX C - SR101L WIDENING ALTERNATIVE
TYPICAL SECTIONS AND PLANS
JANUARY, 2021

PRINCESS DRIVE – SHEA BOULEVARD

PROJECT NO. 101 MA 036 F0123 01D
FEDERAL AID NO. 101–B(210)T

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
APPROVED: FLOYD ROEHRICH
STATE ENGINEER

APPROVED DATE

ASSISTANT STATE ENGINEER

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	101-B(210)T	2	15	

101L MA 36

INDEX OF SHEETS

	NAME	DATE
DESIGN	A. Stake	01/21
DRAWN	T. Baxter	01/21
CHECKED	A. Hathcock	01/21

Kimley»Horn

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DESIGN SHEET

ROUTE SR 101L

LOCATION PRINCESS DRIVE - SHEA BOULEVARD

TRACS NO. F0123 01D

101-B(210)T

PRELIMINARY
DCR UPDATE
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG. NO. G-1.1

____ OF ____

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

11:53:50 AM 1/22/2021 AUSTIN.STAKE K:\PHX_ROADWAY\291244000-PROJ DEV ON-CALL 2018-006.11\291244009-SR101L-PRINCESS-SHEA DCR\CADD\12-SHEETS\ROADWAY\F0123DS01.DGN

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
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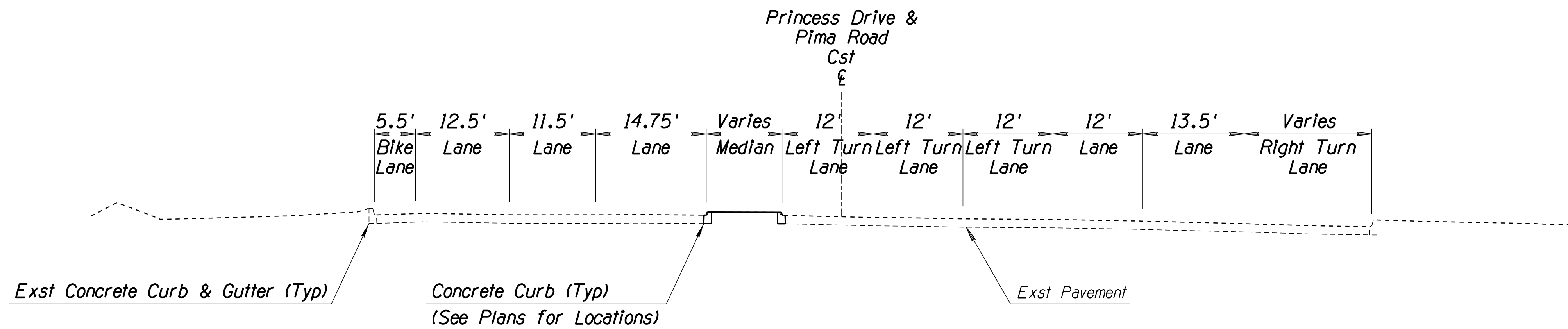
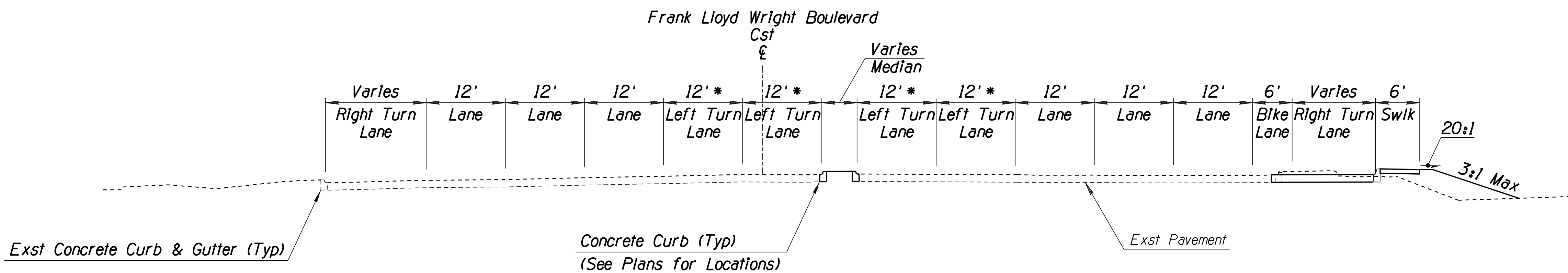
101L MA 36



TYPICAL SECTION
Princess Drive / Pima Road



TYPICAL SECTION
Frank Lloyd Wright Boulevard

*See Plans for Locations of Left Turn Lanes

	NAME	DATE
DESIGN	A. Stake	01/21
DRAWN	T. Baxter	01/21
CHECKED	A. Hathcock	01/21

Kimley»Horn
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ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

DESIGN SHEET
SR 101L
TYPICAL CROSSROAD SECTIONS

PRELIMINARY
DCR UPDATE
Review
NOT FOR CONSTRUCTION OR RECORDING

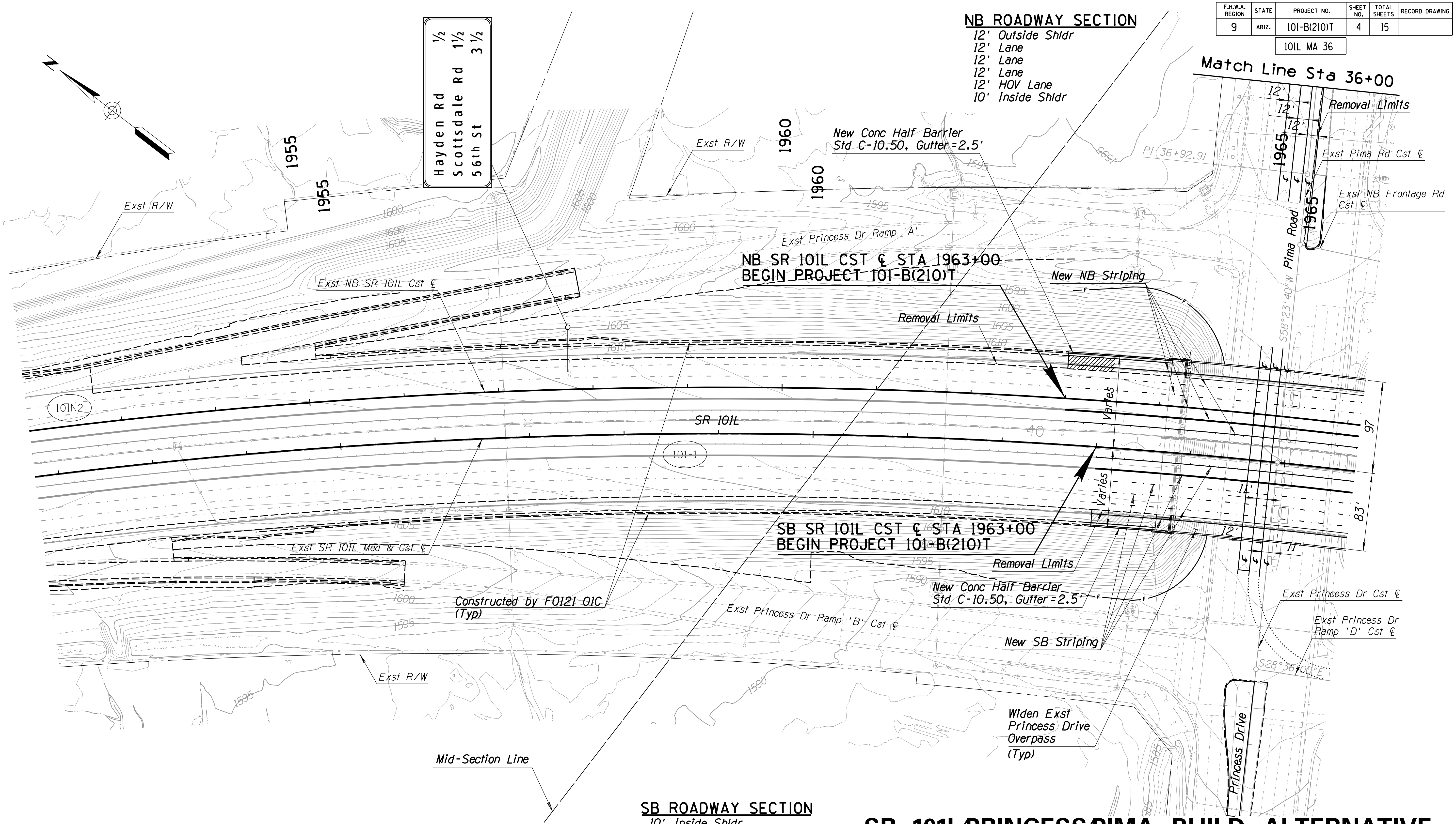
ROUTE SR 101L | LOCATION PRINCESS DRIVE - SHEA BOULEVARD | DWG. NO. G-2.1

TRACS NO. F0123 01D | 101-B(210)T | ___ OF ___

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	101-B(210)T	4	15	

101L MA 36



NB ROADWAY SECTION
12' Outside Shldr
12' Lane
12' Lane
12' Lane
12' HOV Lane
10' Inside Shldr

SB ROADWAY SECTION
10' Inside Shldr
12' HOV Lane
12' Lane
12' Lane
12' Lane
0'-12' Lane
12' Outside Shldr

NOTE: See 2010 Final DCR Plans for additional information.

SR 101L/PRINCESS/PIMA BUILD ALTERNATIVE

	NAME	DATE
DESIGN	A. Stake	01/21
DRAWN	T. Baxter	01/21
CHECKED	A. Hathcock	01/21

Kimley»Horn
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ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

SR 101L MAINLINE
PLAN SHEET
Sta 1952+00 to Sta 1966+00

PRELIMINARY
DCR UPDATE
Review
NOT FOR CONSTRUCTION OR RECORDING

45

ROUTE: SR 101L
LOCATION: PRINCESS DRIVE - SHEA BOULEVARD

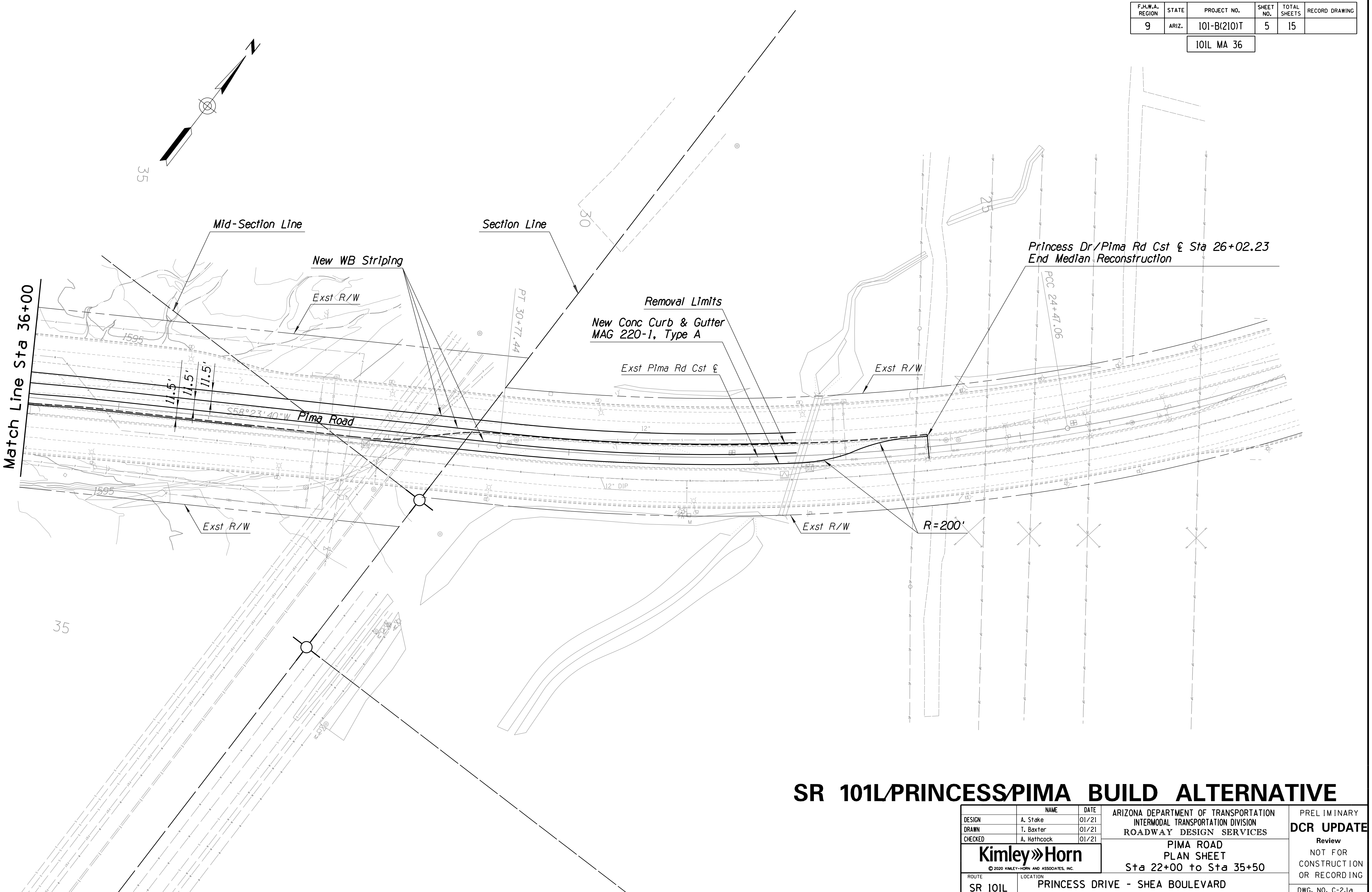
DWG. NO. C-2.1

TRACS NO. F0123 01D | 101-B(210)T | ____ OF ____

2:34:52 PM 1/21/2021 AUSTIN.STAKE K:\PHX_ROADWAY\291244000-PROJ DEV ON-CALL 2018-006.11\291244009-SR101L-PRINCESS-SHEA DCR\CADD\12-SHEETS\ROADWAY\F0123P01.DGN

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	101-B(210)T	5	15	

101L MA 36



SR 101L/PRINCESS/PIMA BUILD ALTERNATIVE

	NAME	DATE
DESIGN	A. Stake	01/21
DRAWN	T. Baxter	01/21
CHECKED	A. Hathcock	01/21

Kimley»Horn

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

PIMA ROAD
PLAN SHEET
Sta 22+00 to Sta 35+50

PRELIMINARY
DCR UPDATE
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE SR 101L

LOCATION PRINCESS DRIVE - SHEA BOULEVARD

DWG. NO. C-2.1a

TRACS NO. F0123 01D

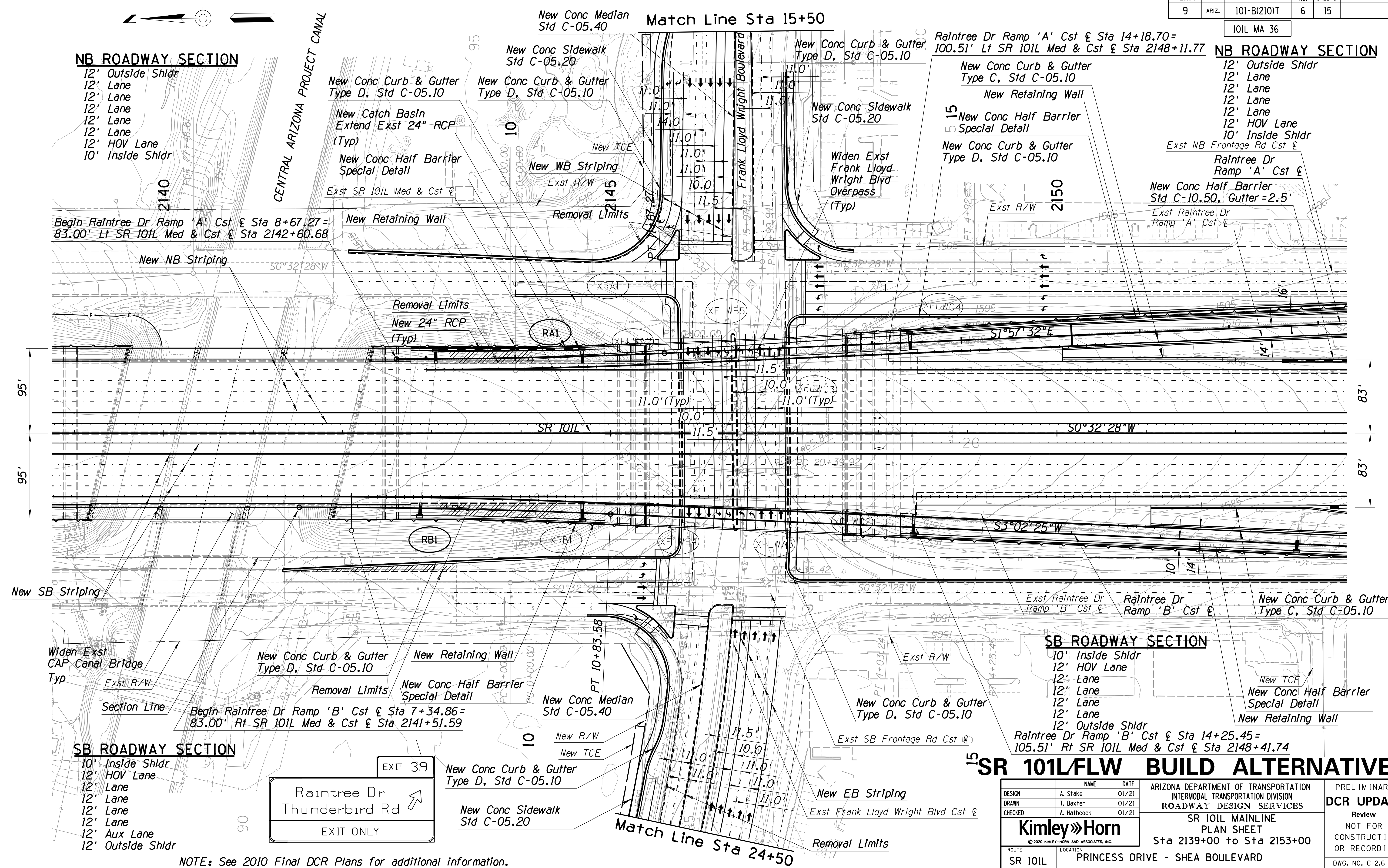
101-B(210)T

____ OF ____

2:35:05 PM 1/21/2021 AUSTIN.STAKE K:\PHX_ROADWAY\291244000-PROJ DEV ON-CALL 2018-006.11\291244009-SR101L-PRINCESS-SHEA DCR\CADD\12-SHEETS\ROADWAY\F0123P01A.DGN

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	101-B(210)T	6	15	

101L MA 36



NOTE: See 2010 Final DCR Plans for additional information.

SR 101L/FLW BUILD ALTERNATIVE

	NAME	DATE
DESIGN	A. Stake	01/21
DRAWN	T. Baxter	01/21
CHECKED	A. Hathcock	01/21

Kimley»Horn

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

SR 101L MAINLINE
PLAN SHEET
Sta 2139+00 to Sta 2153+00

PRELIMINARY
DCR UPDATE
Review
NOT FOR CONSTRUCTION OR RECORDING

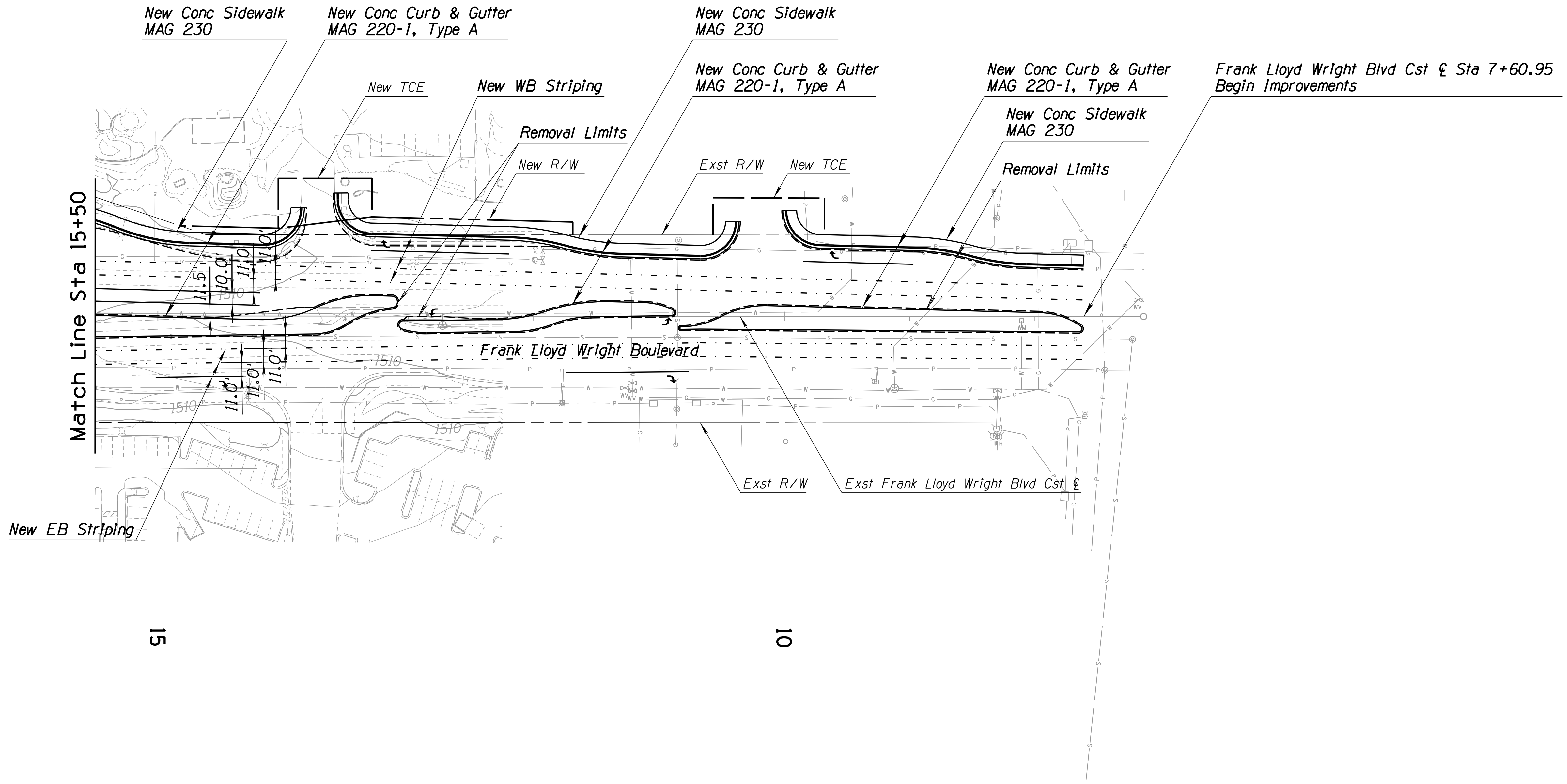
ROUTE SR 101L
LOCATION PRINCESS DRIVE - SHEA BOULEVARD
DWG. NO. C-2.6

TRACS NO. F0123 01D | 101-B(210)T | ____ OF ____

2:35:14 PM 1/21/2021 AUSTIN.STAKE K:\PHX_ROADWAY\291244000-PROJ DEV ON-CALL 2018-006.11\291244009-SR101L-PRINCESS-SHEA DCR\CADD\12-SHEETS\ROADWAY\F0123P06.DGN

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	101-B(210)T	7	15	

101L MA 36



SR 101L/FLW BUILD ALTERNATIVE

	NAME	DATE
DESIGN	A. Stake	01/21
DRAWN	T. Baxter	01/21
CHECKED	A. Hathcock	01/21

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ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

FRANK LLOYD WRIGHT BLVD
PLAN SHEET
Sta 7+13.25 to Sta 15+10.00

PRELIMINARY
DCR UPDATE
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE SR 101L
LOCATION PRINCESS DRIVE - SHEA BOULEVARD
DWG. NO. C-2.6a

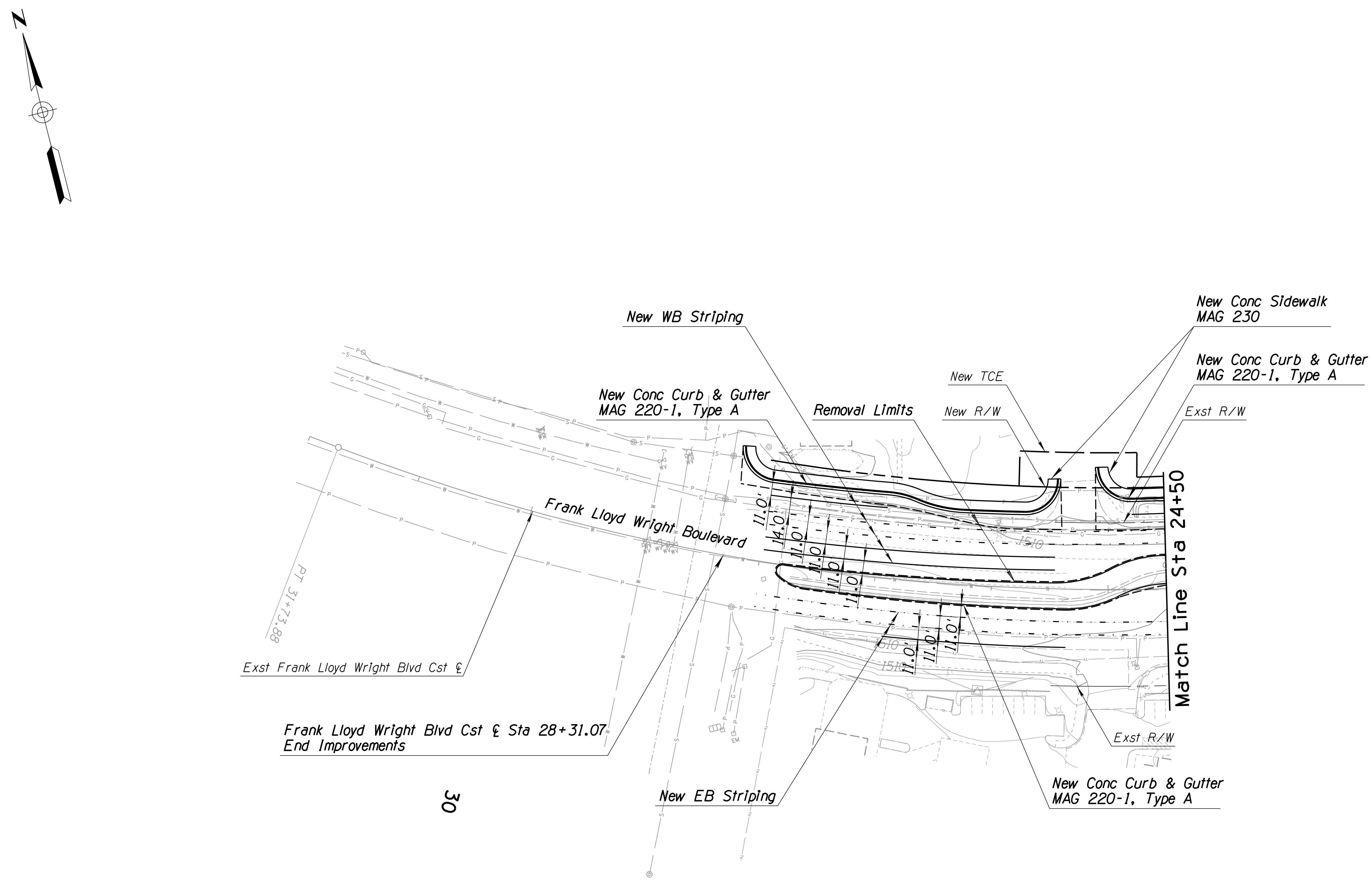
TRACS NO. F0123 01D | 101-B(210)T | ___ OF ___

DATE- LOCATION- REVISIONS- FINISHED PLANS- SURVEY NO.
DATE- LOCATION- REVISIONS- FINISHED PLANS- SURVEY NO.

2:35:22 PM 1/21/2021 AUSTIN.STAKE K:\PHX_ROADWAY\291244000-PROJ DEV ON-CALL 2018-006.11\291244009-SR101L-PRINCESS-SHEA DCR\CADD\12-SHEETS\ROADWAY\F0123P06A.DGN

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	101-B(210)T	8	15	

101L MA 36



SR 101L/FLW BUILD ALTERNATIVE

	NAME	DATE
DESIGN	A. Stake	01/21
DRAWN	T. Baxter	01/21
CHECKED	A. Hathcock	01/21

Kimley»Horn

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ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

FRANK LLOYD WRIGHT BLVD
PLAN SHEET
Sta 24+50 to Sta 32+00

PRELIMINARY
DCR UPDATE
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE SR 101L

LOCATION PRINCESS DRIVE - SHEA BOULEVARD

DWG. NO. C-2.6b

TRACS NO. F0123 01D | 101-B(210)T | ___ OF ___

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

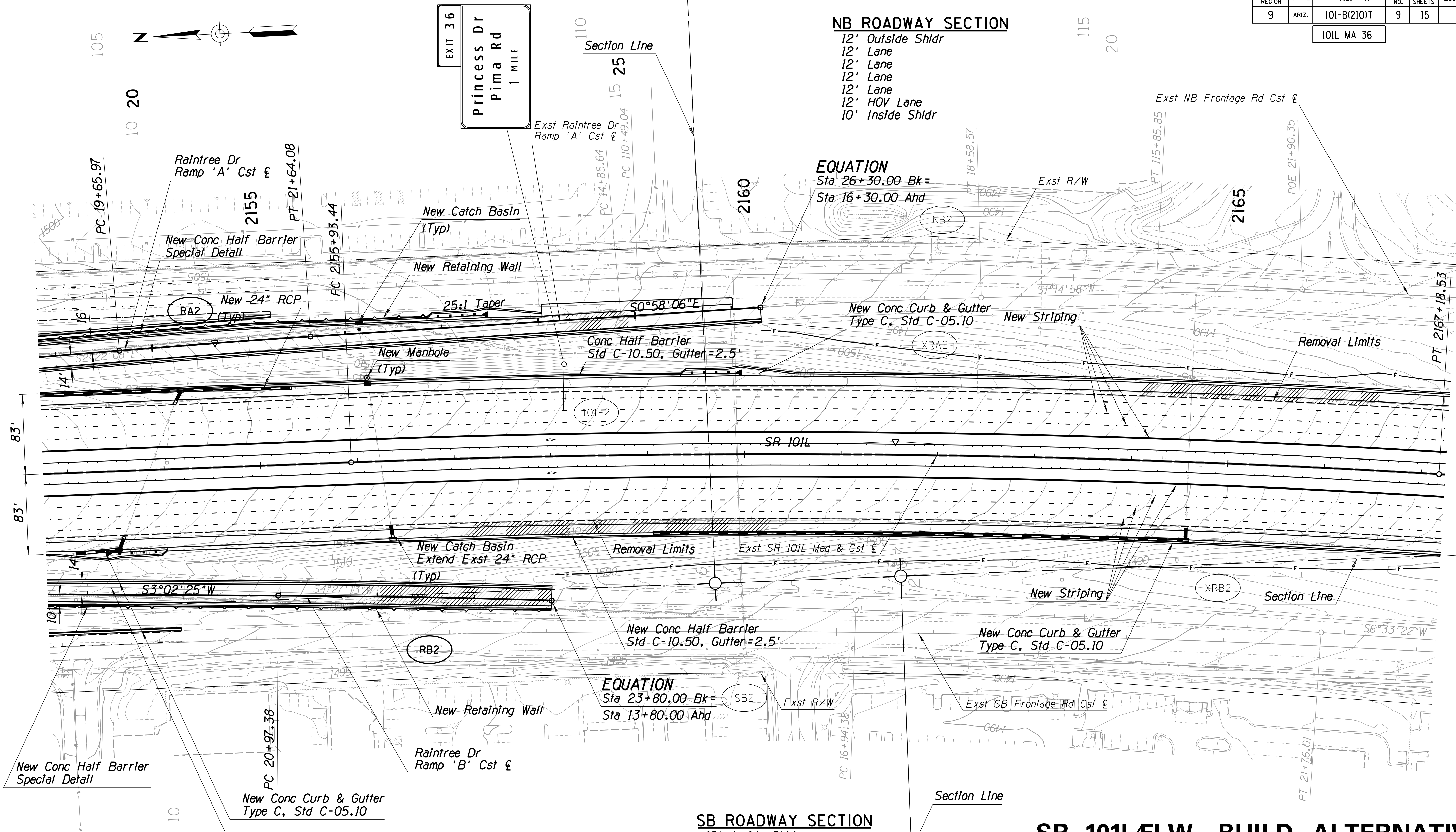
2:35:29 PM 1/21/2021 AUSTIN.STAKE K:\PHX_ROADWAY\291244000-PROJ DEV ON-CALL 2018-006.11\291244009-SR101L-PRINCESS-SHEA DCR\CADD\12-SHEETS\ROADWAY\F0123P06B.DGN

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	101-B(210)T	9	15	

101L MA 36

NB ROADWAY SECTION

12' Outside Shldr
12' Lane
12' Lane
12' Lane
12' Lane
12' HOV Lane
10' Inside Shldr



SB ROADWAY SECTION

10' Inside Shldr
12' HOV Lane
12' Lane
12' Lane
12' Lane
12' Lane
12' Outside Shldr

NOTE: See 2010 Final DCR Plans for additional information.

SR 101L/FLW BUILD ALTERNATIVE

	NAME	DATE
DESIGN	A. Stake	01/21
DRAWN	T. Baxter	01/21
CHECKED	A. Hathcock	01/21

Kimley»Horn

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

SR 101L MAINLINE
PLAN SHEET
Sta 2153+00 to Sta 2167+00

PRELIMINARY
DCR UPDATE
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE: SR 101L
LOCATION: PRINCESS DRIVE - SHEA BOULEVARD

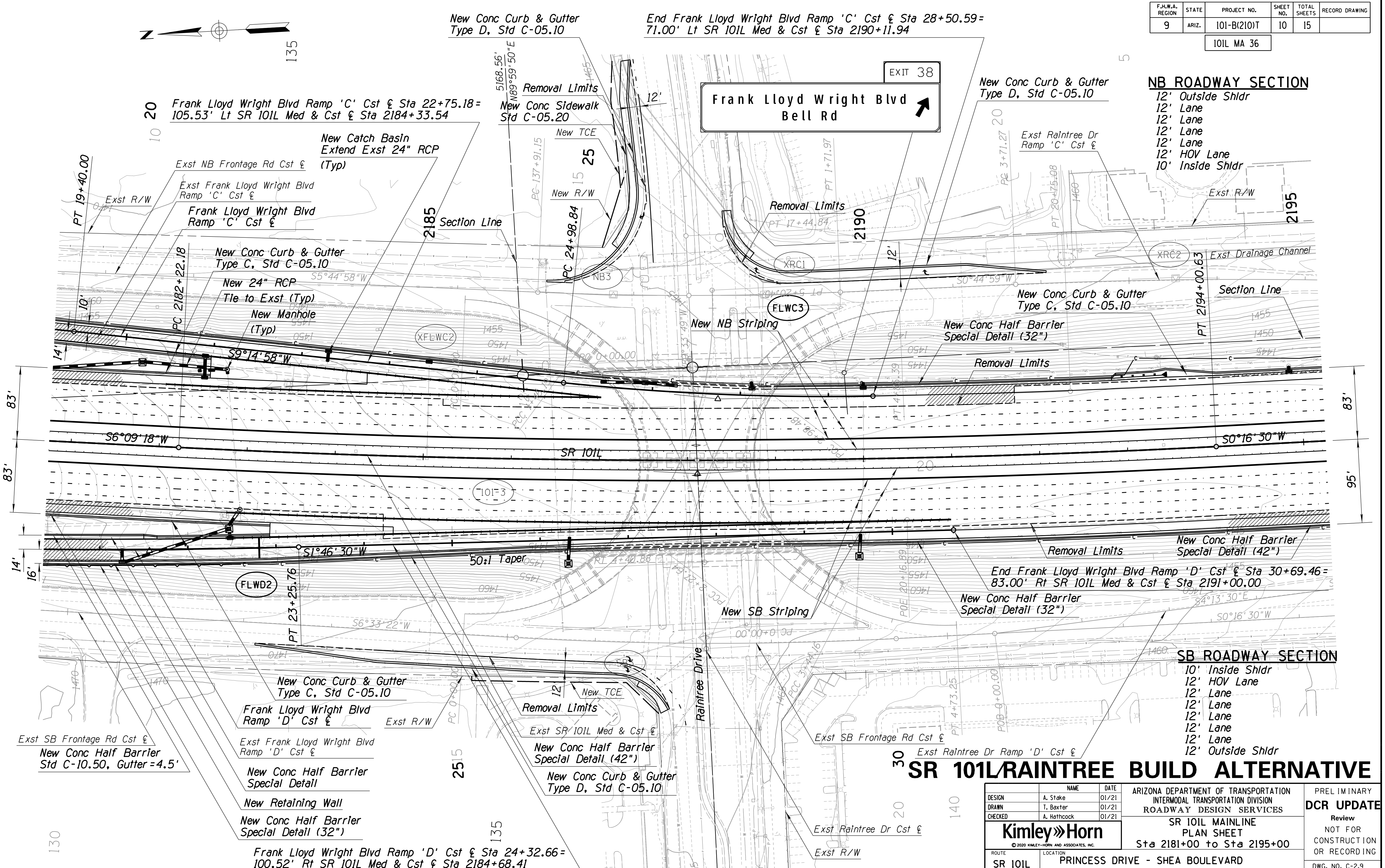
DWG. NO. C-2.7

TRACS NO. F0123 01D | 101-B(210)T | ____ OF ____

2:35:37 PM 1/21/2021 AUSTIN.STAKE K:\PHX_ROADWAY\291244000-PROJ DEV ON-CALL 2018-006.11\291244009-SR101L-PRINCESS-SHEA DCR\CADD\12-SHEETS\ROADWAY\F0123P07.DGN

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	101-B(210)T	10	15	

101L MA 36



SR 101L/RAINTREE BUILD ALTERNATIVE

	NAME	DATE
DESIGN	A. Stake	01/21
DRAWN	T. Baxter	01/21
CHECKED	A. Hathcock	01/21

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ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

SR 101L MAINLINE
PLAN SHEET
Sta 2181+00 to Sta 2195+00

PRELIMINARY
DCR UPDATE
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE: SR 101L
LOCATION: PRINCESS DRIVE - SHEA BOULEVARD

DWG. NO. C-2.9

TRACS NO. F0123 01D | 101-B(210)T | ___ OF ___

NOTE: See 2010 Final DCR Plans for additional information.

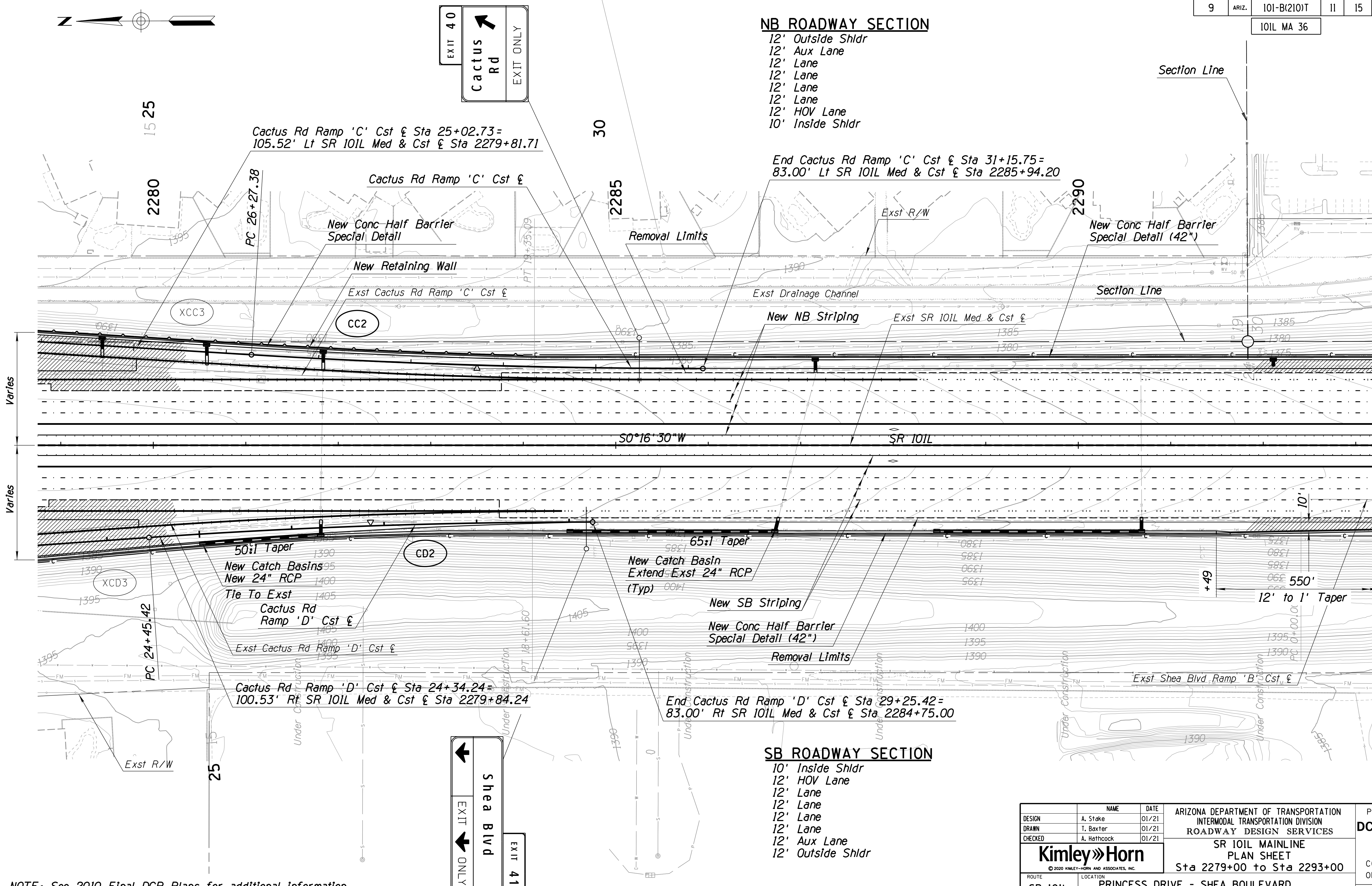
2:35:44 PM 1/21/2021 AUSTIN.STAKE K:\PHX_ROADWAY\291244000-PROJ DEV ON-CALL 2018-006.11\291244009-SR101L-PRINCESS-SHEA DCR\CADD\12-SHEETS\ROADWAY\F0123P09.DGN

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	101-B(210)T	11	15	

101L MA 36

NB ROADWAY SECTION

12' Outside Shldr
12' Aux Lane
12' Lane
12' Lane
12' Lane
12' Lane
12' HOV Lane
10' Inside Shldr



SB ROADWAY SECTION

10' Inside Shldr
12' HOV Lane
12' Lane
12' Lane
12' Lane
12' Lane
12' Aux Lane
12' Outside Shldr

NOTE: See 2010 Final DCR Plans for additional information.

	NAME	DATE
DESIGN	A. Stake	01/21
DRAWN	T. Baxter	01/21
CHECKED	A. Hathcock	01/21

Kimley»Horn

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

SR 101L MAINLINE
PLAN SHEET
Sta 2279+00 to Sta 2293+00

PRELIMINARY
DCR UPDATE
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE: SR 101L
LOCATION: PRINCESS DRIVE - SHEA BOULEVARD

TRACS NO. F0123 01D | 101-B(210)T | ___ OF ___

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

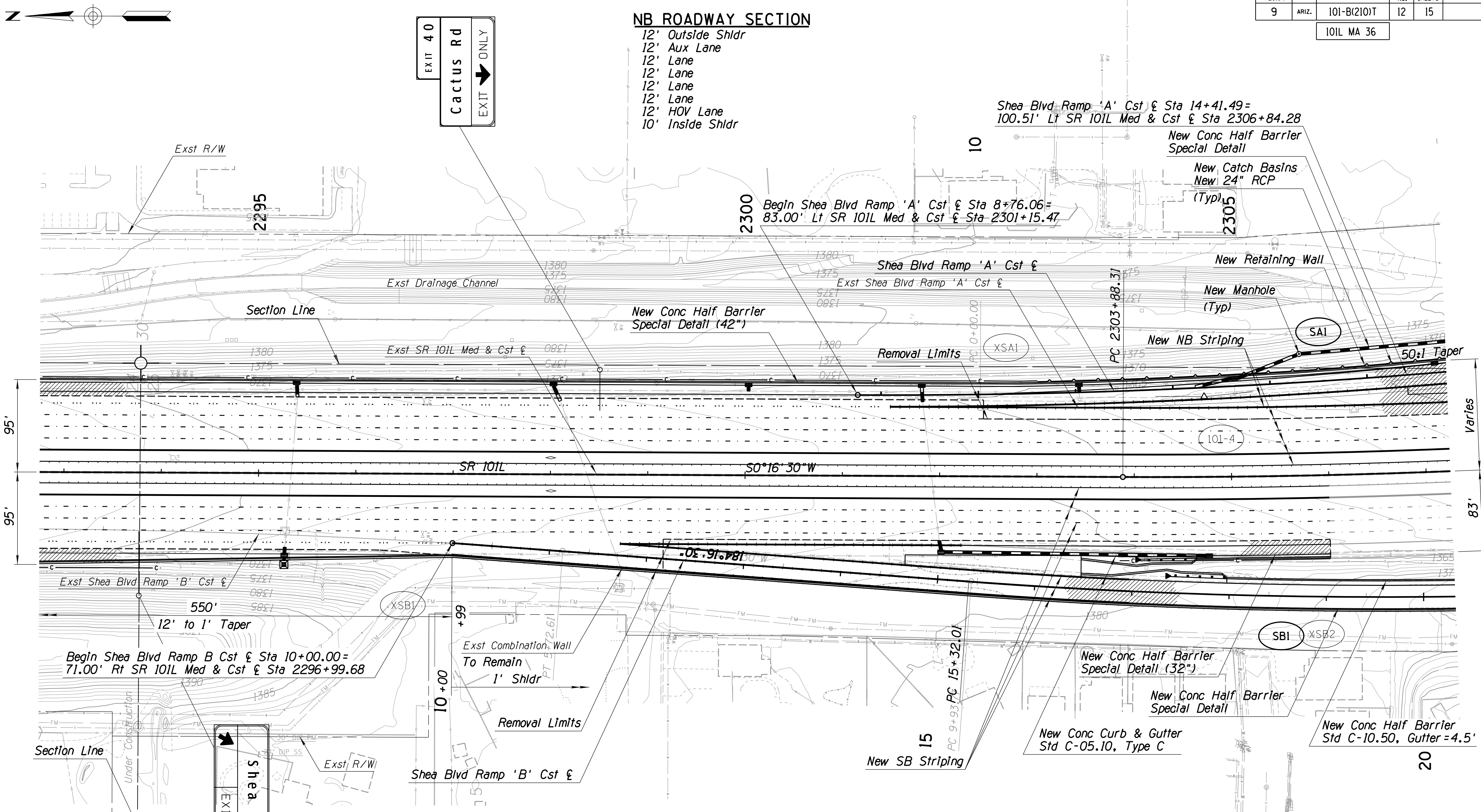
2:35:51 PM 1/21/2021 AUSTIN.STAKE K:\PHX_ROADWAY\291244000-PROJ DEV ON-CALL 2018-006.11\291244009-SR101L-PRINCESS-SHEA DCR\CADD\12-SHEETS\ROADWAY\F0123P16.DGN

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	101-B(210)T	12	15	

101L MA 36

NB ROADWAY SECTION

12' Outside Shldr
12' Aux Lane
12' Lane
12' Lane
12' Lane
12' Lane
12' HOV Lane
10' Inside Shldr



SB ROADWAY SECTION

10' Inside Shldr
12' HOV Lane
12' Lane
12' Lane
12' Lane
12' Lane
12' Aux Lane
12' Outside Shldr

CURVE DATA

Curve	Degree	Delta	Length
SB1	0°59'53"	12°54'17"	1293.15'

SB ROADWAY SECTION

10' Inside Shldr
12' HOV Lane
12' Lane
12' Lane
12' Lane
12' Lane
10' Outside Shldr

NOTE: See 2010 Final DCR Plans for additional information.

SR 101L/SHEA BUILD ALTERNATIVE

	NAME	DATE
DESIGN	A. Stake	01/21
DRAWN	T. Baxter	01/21
CHECKED	A. Hathcock	01/21

Kimley»Horn

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

SR 101L MAINLINE
PLAN SHEET
Sta 2293+00 to Sta 2307+00

PRELIMINARY
DCR UPDATE
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE: SR 101L | LOCATION: PRINCESS DRIVE - SHEA BOULEVARD

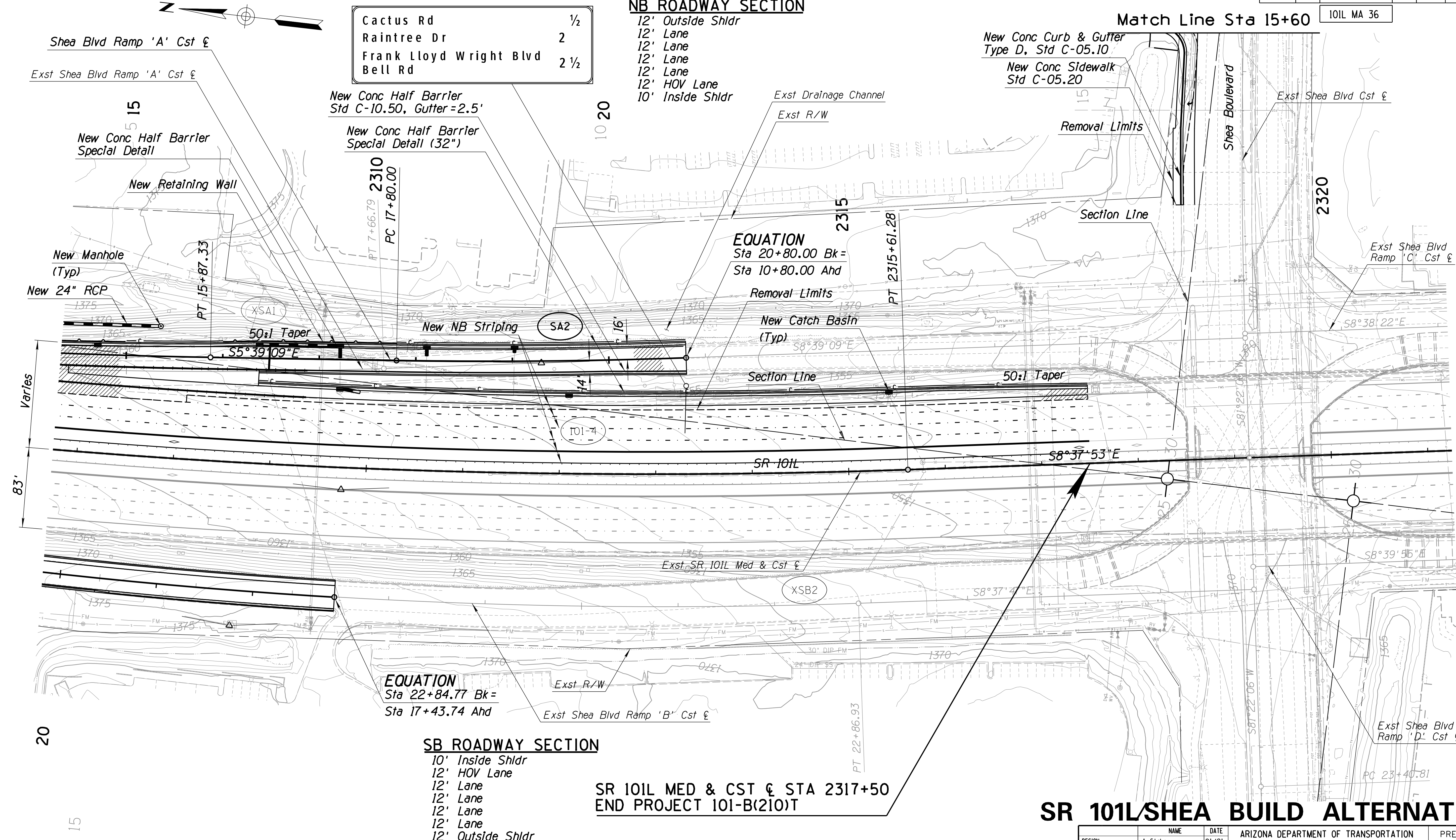
DWG. NO. C-2.17

TRACS NO. F0123 01D | 101-B(210)T | ___ OF ___

2:35:58 PM 1/21/2021 AUSTIN.STAKE K:\PHX_ROADWAY\291244000-PROJ DEV ON-CALL 2018-006.11\291244009-SR101L-PRINCESS-SHEA DCR\CADD\12-SHEETS\ROADWAY\F0123P17.DGN

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	101-B(210)T	13	15	

101L MA 36



SR 101L/SHEA BUILD ALTERNATIVE

	NAME	DATE
DESIGN	A. Stake	01/21
DRAWN	T. Baxter	01/21
CHECKED	A. Hathcock	01/21

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ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

SR 101L MAINLINE
PLAN SHEET
Sta 2307+00 to Sta 2321+00

PRELIMINARY
DCR UPDATE
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE: SR 101L
LOCATION: PRINCESS DRIVE - SHEA BOULEVARD
DWG. NO. C-2.18

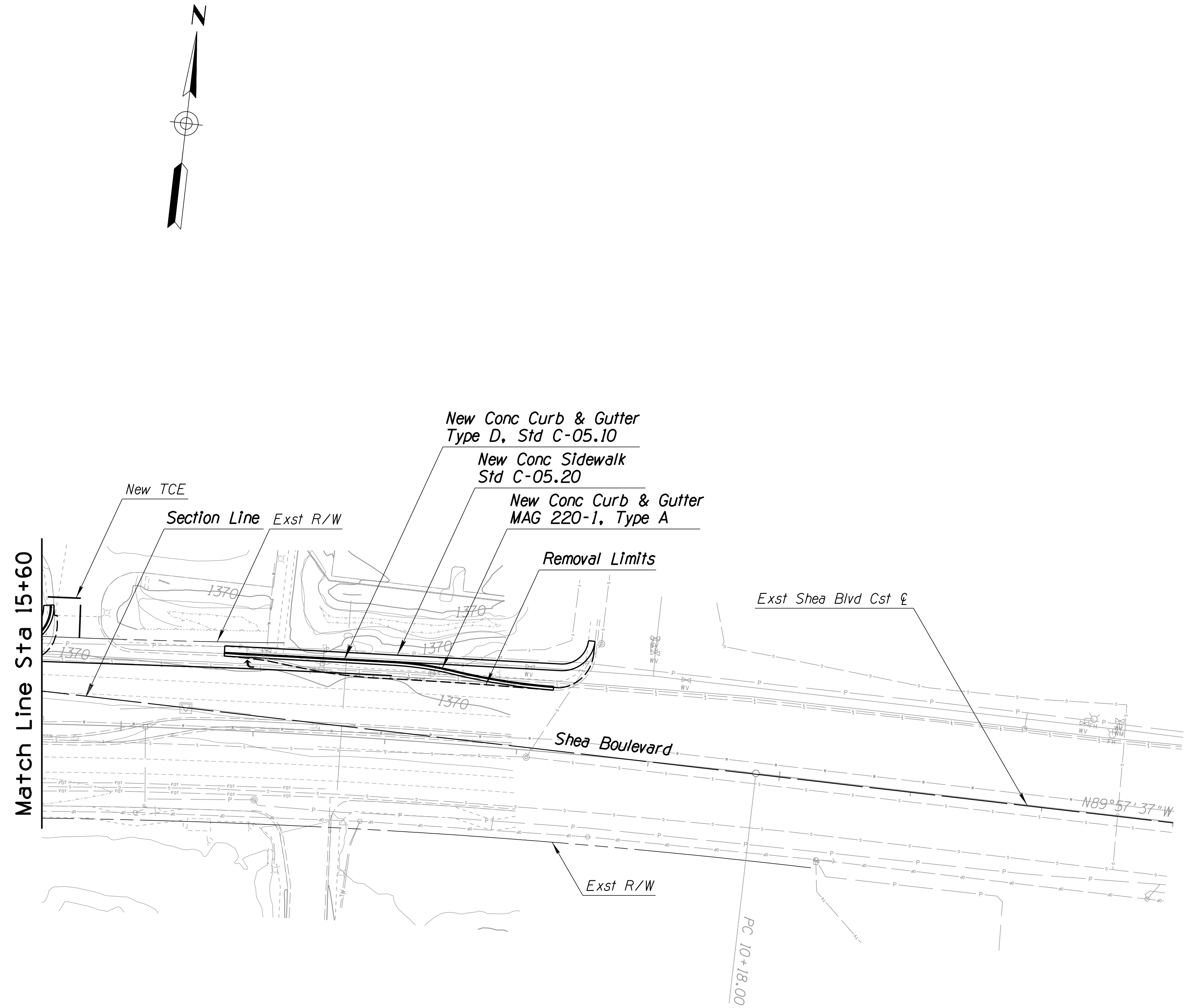
TRACS NO. F0123 01D | 101-B(210)T | ___ OF ___

NOTE: See 2010 Final DCR Plans for additional information.

2:36:08 PM 1/21/2021 AUSTIN.STAKE K:\PHX_ROADWAY\291244000-PROJ DEV ON-CALL 2018-006.11\291244009-SR101L-PRINCESS-SHEA DCR\CADD\12-SHEETS\ROADWAY\F0123P18.DGN

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	101-B(210)T	14	15	

101L MA 36



SHEA BUILD ALTERNATIVE

	NAME	DATE
DESIGN	A. Stake	01/21
DRAWN	T. Baxter	01/21
CHECKED	A. Hathcock	01/21

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ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

SR 101L MAINLINE
PLAN SHEET
Sta 7+00 to Sta 15+60

PRELIMINARY
DCR UPDATE
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE SR 101L | LOCATION PRINCESS DRIVE - SHEA BOULEVARD

DWG. NO. C-2.18a

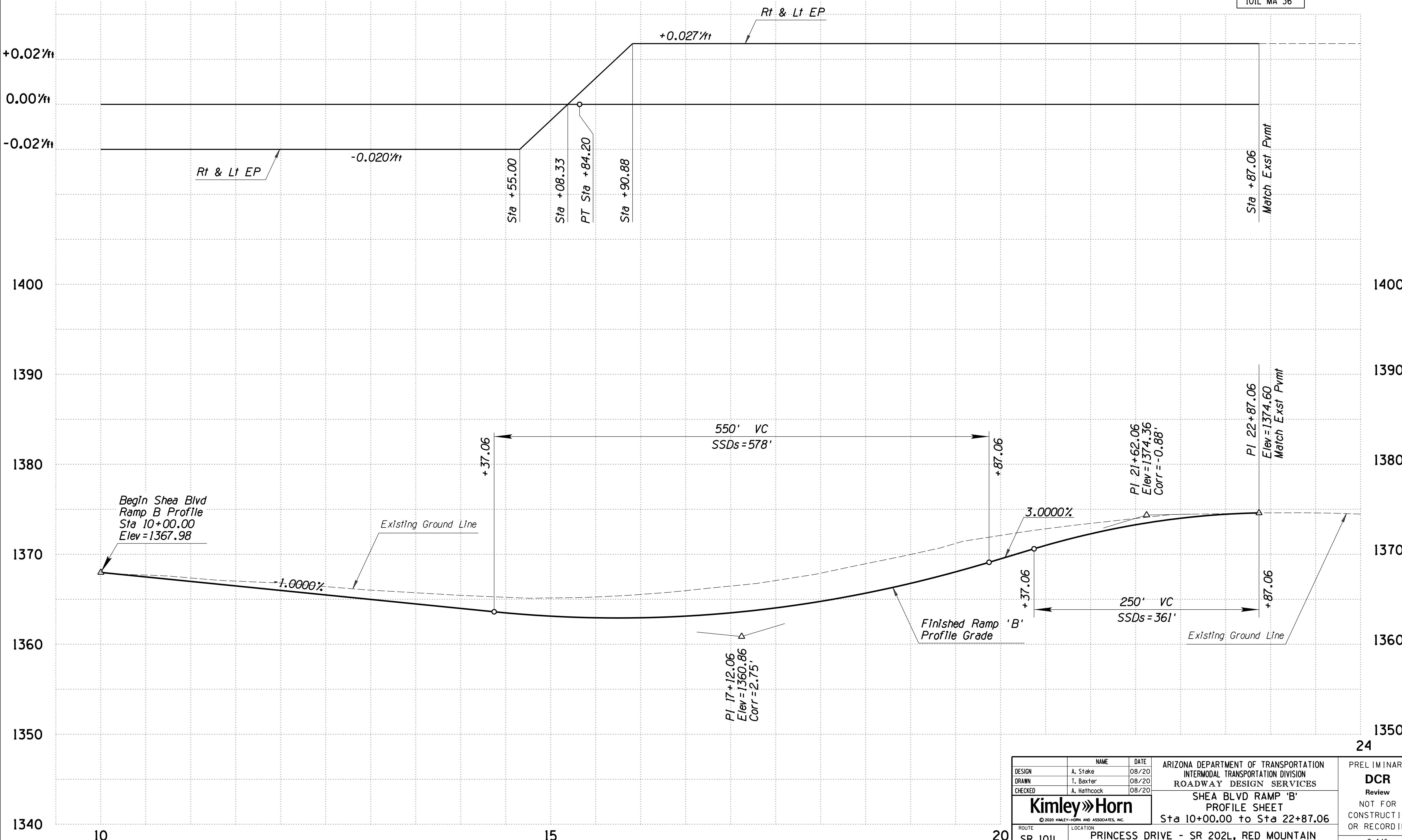
TRACS NO. F0123 01D | 101-B(210)T | ___ OF ___

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

2:36:15 PM 1/21/2021 AUSTIN.STAKE K:\PHX_ROADWAY\291244000-PROJ DEV ON-CALL 2018-006.11\291244009-SR101L-PRINCESS-SHEA DCR\CADD\12-SHEETS\ROADWAY\F0123P18A.DGN

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	101-B(210)T	15	15	

101L MA 36



	NAME	DATE
DESIGN	A. Stake	08/20
DRAWN	T. Baxter	08/20
CHECKED	A. Hathcock	08/20

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ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

SHEA BLVD RAMP 'B'
PROFILE SHEET
Sta 10+00.00 to Sta 22+87.06

PRELIMINARY
DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE: SR 101L
LOCATION: PRINCESS DRIVE - SR 202L, RED MOUNTAIN

C-4.16

TRACS NO. F0123 01D

____ OF ____

APPENDIX D: Detailed Cost Estimates for Other Alternatives

Arizona Department of Transportation

Estimated Engineering Construction Cost

Itemized Estimate

Improved Single-Point Urban Interchange at Frank Lloyd Wright Boulevard

Project Number: 101-B(210)T

Location: SR101L - Princess to Shea DCR

Version: Final Design Concept Report, Stage I (15%)

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	6,423	$5.00	$32,115
2020031	REMOVAL OF PORTLAND CEMENT CONCRETE PAVEMENT	SQ.YD.	1,796	$25.00	$44,900
2020053	REMOVE (CATCH BASINS)	EACH	8	$1,000.00	$8,000
2020116	REMOVE (SCUPPER)	EACH	3	$1,000.00	$3,000
2020155	REMOVE (PULL BOX)	EACH	1	$300.00	$300
2020162	REMOVE (CONCRETE)	SQ.YD.	2,141	$4.00	$8,564
2020173	REMOVE (ATTENUATORS)	EACH	1	$1,500.00	$1,500
2020175	REMOVAL OF LIGHT POLES AND BASES	EACH	1	$900.00	$900
4010020	PORTLAND CEMENT CONCRETE PAVEMENT (11" PCCP OVER 4" AB)	SQ.YD.	3,607	$60.00	$216,420
5012524	STORM DRAIN PIPE, 24"	L.FT.	115	$100.00	$11,500
5030142	CONCRETE CATCH BASIN (MEDIAN) (C-15.80)	EACH	3	$5,000.00	$15,000
5030604	CONCRETE CATCH BASIN (C-15.91)	EACH	7	$5,000.00	$35,000
6070002	BREAKAWAY SIGN POST S4X7.7	L.FT.	192	$35.00	$6,720
6070022	FOUNDATION FOR BREAKAWAY SIGN POST S4X7.7	EACH	24	$600.00	$14,400
6070038	SLIP BASE	EACH	24	$250.00	$6,000
6080005	REGULATORY, WARNING, OR MARKER SIGN PANEL	SQ.FT.	216	$20.00	$4,320
7040005	PAVEMENT MARKING (WHITE EXTRUDED THERMOPLASTIC) (0.090")	L.FT.	14,189	$0.60	$8,513
7040006	PAVEMENT MARKING (YELLOW EXTRUDED THERMOPLASTIC) (0.090")	L.FT.	1,020	$0.60	$612
7040072	PAVEMENT MARKING (TRANSVERSE) (THERMOPLASTIC) (ALKYD) (0.090")	L.FT.	825	$0.75	$619
7040074	PAVEMENT SYMBOL (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	29	$125.00	$3,625
7060013	PAVEMENT MARKER, RAISED, TYPE C	EACH	355	$5.00	$1,775
7060017	PAVEMENT MARKER, RAISED, TYPE E	EACH	26	$3.00	$78
7080201	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED) (WHITE)	L.FT.	15,014	$0.10	$1,501
7080202	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED) (YELLOW)	L.FT.	1,020	$0.10	$102
7080204	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED SYMBOL)	EACH	29	$100.00	$2,900
7310010	POLE (TYPE A)	EACH	4	$1,500.00	$6,000
7310092	POLE (TYPE H) (BREAKAWAY)	EACH	1	$2,000.00	$2,000
7310140	POLE (TYPE R)	EACH	4	$9,000.00	$36,000
7310197	BREAKAWAY BASE FOR LIGHTING POLE OR SIGNAL FLASHER	EACH	1	$600.00	$600
7310200	POLE FOUNDATION (TYPE A)	EACH	4	$1,200.00	$4,800
7310276	POLE FOUNDATION (TYPE H) (BREAKAWAY)	EACH	1	$800.00	$800
7310320	POLE FOUNDATION (TYPE R)	EACH	4	$4,000.00	$16,000
7310554	MAST ARM (20 FT.) (SPECIAL)	EACH	1	$2,000.00	$2,000
7320040	ELECTRICAL CONDUIT (1 1/2") (PVC)	L.FT.	2,336	$12.00	$28,032
7320050	ELECTRICAL CONDUIT (2") (PVC)	L.FT.	500	$10.00	$5,000
7320072	ELECTRICAL CONDUIT (3 - 3") (PVC)	L.FT.	1,000	$20.00	$20,000
7320421	PULL BOX (NO. 7) (WITH EXTENSION)	EACH	14	$1,000.00	$14,000
7320450	PULL BOX (NO. 7) (FM-2.06)	EACH	2	$1,000.00	$2,000
7320455	PULL BOX (NO. 9)	EACH	2	$5,000.00	$10,000
7320456	PULL BOX (4B)	EACH	1	$1,000.00	$1,000
7320461	PULL BOX (6B)	EACH	1	$2,000.00	$2,000
7320500	CONDUCTOR (NO. 12)	L.FT.	150	$0.80	$120
7320520	CONDUCTOR (NO. 8)	L.FT.	2,000	$0.95	$1,900
7320585	CONDUCTOR (INSULATED BOND) (NO. 12)	L.FT.	75	$1.00	$75
7320595	CONDUCTOR (INSULATED BOND) (NO. 8)	L.FT.	500	$2.00	$1,000
7320654	CONDUCTORS (NO. 8)	L.FT.	7,508	$1.00	$7,508
7320740	REMOVAL OF EXISTING CONDUCTORS	L.FT.	9,008	$0.50	$4,504
7320787	SINGLE MODE FIBER OPTIC CABLE (144 FIBERS)	L.FT.	1,000	$3.00	$3,000

Arizona Department of Transportation

Estimated Engineering Construction Cost

Itemized Estimate

Improved Single-Point Urban Interchange at Frank Lloyd Wright Boulevard

Project Number: 101-B(210)T

Location: SR101L - Princess to Shea DCR

Version: Final Design Concept Report, Stage I (15%)

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
7320788	SINGLE MODE FIBER OPTIC CABLE (144 FIBERS) (SCOTTSDALE)	L.FT.	1,000	$3.00	$3,000
7320789	SINGLE MODE FIBER OPTIC CABLE (12 FIBERS)	L.FT.	500	$2.00	$1,000
7320794	FIBER OPTIC SPLICE CLOSURE (ITS)	EACH	2	$1,500.00	$3,000
7320809	CABLE INNERDUCT (1")	L.FT.	1,000	$1.25	$1,250
7330060	TRAFFIC SIGNAL FACE (TYPE F)	EACH	23	$500.00	$11,500
7340120	METER PEDESTAL CABINET	EACH	1	$4,000.00	$4,000
7340306	METER PEDESTAL FOUNDATION	EACH	1	$1,200.00	$1,200
7350030	LOOP DETECTOR FOR TRAFFIC SURVEILLANCE (6'X6')	EACH	6	$1,000.00	$6,000
7360111	LUMINAIRE (LED) (HORIZONTAL MOUNT) (TYPE 40L)	EACH	1	$900.00	$900
7360113	LUMINAIRE (LED) (UNDERDECK 15L)	EACH	6	$1,000.00	$6,000
8080043	BACKFLOW PREVENTION ASSEMBLY RELOCATION	EACH	1	$6,000.00	$6,000
8080646	RESET FRAME AND COVER FOR VALVE BOX	EACH	1	$700.00	$700
8080655	RELOCATE FIRE HYDRANT	EACH	2	$5,000.00	$10,000
8082845	MANHOLE (RESET FRAME AND COVER)	EACH	3	$1,500.00	$4,500
9080084	CONCRETE CURB AND GUTTER (ALL TYPES)	L.FT.	5,809	$20.00	$116,180
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	5,157	$6.00	$30,942
9080296	CONCRETE SIDEWALK RAMP (ALL TYPES)	EACH	8	$2,500.00	$20,000
9080511	SCUPPER (MAG DET. 203)	EACH	1	$5,000.00	$5,000
9210021	MEDIAN PAVING (CONCRETE PAVERS)	SQ.YD.	1,186	$60.00	$71,160
9240052	MISCELLANEOUS WORK (LANDSCAPE & EROSION CONTROL)	L.SUM	1	$104,000.00	$104,000
9240062	MISCELLANEOUS WORK (REMOVE AND REPLACE COS ITS INFRASTRUCTURE)	L.SUM	1	$100,000.00	$100,000
9240131	MISCELLANEOUS WORK (GigE SWITCH)	EACH	2	$2,500.00	$5,000
				ITEM TOTAL	**$1,108,036**

PROJECT WIDE		
Mobilization (10%)		$110,804
Dust and Water Palliative (1%)		$11,081
Quality Control (2%)		$22,161
Construction Surveying (2%)		$22,161
Maintenance And Protection Of Traffic (10%)		$110,804
	PROJECT WIDE SUBTOTAL	**$277,011**
Unidentified Item Allowance (20%)		$277,010
	PROJECT WIDE TOTAL	**$554,021**
OTHER COSTS		
Construction Engineering (9%)		$134,627
Construction Contingencies (5%)		$74,793
Consultant Services (1%)		$14,959
PCCP Materials Quality Incentive ($2 per Sq Yd)	3,607 SQ. YD.	$7,214
Right-of-Way ($30 per Sq Ft)	1,536 SQ. FT.	$46,081
Temporary Conctruction Easement ($1,600 Month)	12 Months	$19,202
	OTHER COSTS TOTAL	**$296,876**

SUMMARY

ITEM TOTAL		**$1,108,036**
PROJECT WIDE		**$554,021**
OTHER COST TOTAL		**$296,876**
SUBTOTAL PROJECT COST		**$1,958,932**
INDIRECT COST ALLOCATION (9.90%)		**$193,934**
	TOTAL PROJECT COST	**$2,152,867**

Arizona Department of Transportation

Estimated Engineering Construction Cost

Itemized Estimate

Tight Diamond Interchange at Raintree Drive

Project Number: 101-B(210)T

Location: SR101L - Princess to Shea DCR

Version: Final Design Concept Report, Stage I (15%)

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	6,517	$5.00	$32,585
2020029	REMOVAL OF ASPHALTIC CONCRETE PAVEMENT	SQ.YD.	565	$5.00	$2,825
2020031	REMOVAL OF PORTLAND CEMENT CONCRETE PAVEMENT	SQ.YD.	2,338	$25.00	$58,450
2020053	REMOVE (CATCH BASINS)	EACH	4	$1,000.00	$4,000
2020116	REMOVE (SCUPPER)	EACH	5	$1,000.00	$5,000
2020155	REMOVE (PULL BOX)	EACH	1	$300.00	$300
2020162	REMOVE (CONCRETE)	SQ.YD.	3,717	$4.00	$14,868
2020175	REMOVAL OF LIGHT POLES AND BASES	EACH	1	$900.00	$900
2030301	ROADWAY EXCAVATION	CU.YD.	1,739	$10.00	$17,390
3030022	AGGREGATE BASE, CLASS 2	CU.YD.	171	$50.00	$8,550
4010020	PORTLAND CEMENT CONCRETE PAVEMENT (11" PCCP OVER 4" AB)	SQ.YD.	2,189	$60.00	$131,340
4060009	ASPHALTIC CONCRETE (MISCELLANEOUS PAVING)	TON	29	$500.00	$14,500
5012524	STORM DRAIN PIPE, 24"	L.FT.	113	$100.00	$11,300
5030142	CONCRETE CATCH BASIN (MEDIAN) (C-15.80)	EACH	1	$5,000.00	$5,000
5030604	CONCRETE CATCH BASIN (C-15.91)	EACH	3	$5,000.00	$15,000
6070002	BREAKAWAY SIGN POST S4X7.7	L.FT.	24	$35.00	$840
6070022	FOUNDATION FOR BREAKAWAY SIGN POST S4X7.7	EACH	3	$600.00	$1,800
6070038	SLIP BASE	EACH	3	$250.00	$750
6080005	REGULATORY, WARNING, OR MARKER SIGN PANEL	SQ.FT.	100	$20.00	$2,000
7040005	PAVEMENT MARKING (WHITE EXTRUDED THERMOPLASTIC) (0.090")	L.FT.	1,238	$0.60	$743
7040074	PAVEMENT SYMBOL (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	5	$125.00	$625
7060013	PAVEMENT MARKER, RAISED, TYPE C	EACH	31	$5.00	$155
7080201	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED) (WHITE)	L.FT.	1,238	$0.10	$124
7080204	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED SYMBOL)	EACH	5	$100.00	$500
7310010	POLE (TYPE A)	EACH	1	$1,500.00	$1,500
7310092	POLE (TYPE H) (BREAKAWAY)	EACH	1	$2,000.00	$2,000
7310197	BREAKAWAY BASE FOR LIGHTING POLE OR SIGNAL FLASHER	EACH	1	$600.00	$600
7310200	POLE FOUNDATION (TYPE A)	EACH	1	$1,200.00	$1,200
7310276	POLE FOUNDATION (TYPE H) (BREAKAWAY)	EACH	1	$800.00	$800
7310554	MAST ARM (20 FT.) (SPECIAL)	EACH	1	$2,000.00	$2,000
7320040	ELECTRICAL CONDUIT (1 1/2") (PVC)	L.FT.	500	$12.00	$6,000
7320050	ELECTRICAL CONDUIT (2") (PVC)	L.FT.	500	$10.00	$5,000
7320072	ELECTRICAL CONDUIT (3 - 3") (PVC)	L.FT.	1,500	$20.00	$30,000
7320450	PULL BOX (NO. 7) (FM-2.06)	EACH	2	$1,000.00	$2,000
7320455	PULL BOX (NO. 9)	EACH	2	$5,000.00	$10,000
7320456	PULL BOX (4B)	EACH	1	$1,000.00	$1,000
7320461	PULL BOX (6B)	EACH	1	$2,000.00	$2,000
7320500	CONDUCTOR (NO. 12)	L.FT.	150	$0.80	$120
7320520	CONDUCTOR (NO. 8)	L.FT.	2,000	$0.95	$1,900
7320585	CONDUCTOR (INSULATED BOND) (NO. 12)	L.FT.	75	$1.00	$75
7320595	CONDUCTOR (INSULATED BOND) (NO. 8)	L.FT.	500	$2.00	$1,000
7320654	CONDUCTORS (NO. 8)	L.FT.	1,500	$1.00	$1,500
7320740	REMOVAL OF EXISTING CONDUCTORS	L.FT.	2,500	$0.50	$1,250
7320787	SINGLE MODE FIBER OPTIC CABLE (144 FIBERS)	L.FT.	1,500	$3.00	$4,500
7320788	SINGLE MODE FIBER OPTIC CABLE (144 FIBERS) (SCOTTSDALE)	L.FT.	1,500	$3.00	$4,500
7320789	SINGLE MODE FIBER OPTIC CABLE (12 FIBERS)	L.FT.	500	$2.00	$1,000
7320794	FIBER OPTIC SPLICE CLOSURE (ITS)	EACH	2	$1,500.00	$3,000
7320809	CABLE INNERDUCT (1")	L.FT.	1,500	$1.25	$1,875

Arizona Department of Transportation

Estimated Engineering Construction Cost

Itemized Estimate

Tight Diamond Interchange at Raintree Drive

Project Number: 101-B(210)T

Location: SR101L - Princess to Shea DCR

Version: Final Design Concept Report, Stage I (15%)

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
7340120	METER PEDESTAL CABINET	EACH	1	$4,000.00	$4,000
7340306	METER PEDESTAL FOUNDATION	EACH	1	$1,200.00	$1,200
7360111	LUMINAIRE (LED) (HORIZONTAL MOUNT) (TYPE 40L)	EACH	1	$900.00	$900
7360113	LUMINAIRE (LED) (UNDERDECK 15L)	EACH	8	$1,000.00	$8,000
8082845	MANHOLE (RESET FRAME AND COVER)	EACH	1	$1,500.00	$1,500
9080084	CONCRETE CURB AND GUTTER (ALL TYPES)	L.FT.	6,453	$20.00	$129,060
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	13,655	$6.00	$81,930
9080296	CONCRETE SIDEWALK RAMP (ALL TYPES)	EACH	8	$2,500.00	$20,000
9080511	SCUPPER (MAG DET. 203)	EACH	5	$5,000.00	$25,000
9100009	CONCRETE BARRIER (ADJACENT TO RETAINING WALL)	L.FT.	1,349	$140.00	$188,860
9210021	MEDIAN PAVING (CONCRETE PAVERS)	SQ.YD.	1,803	$60.00	$108,180
9240052	MISCELLANEOUS WORK (LANDSCAPE & EROSION CONTROL)	L.SUM	1	$12,000.00	$12,000
9240131	MISCELLANEOUS WORK (GigE SWITCH)	EACH	2	$2,500.00	$5,000
				ITEM TOTAL	**$999,995**

PROJECT WIDE		
Mobilization (10%)		$100,000
Dust and Water Palliative (1%)		$10,000
Quality Control (2%)		$20,000
Construction Surveying (2%)		$20,000
Maintenance And Protection Of Traffic (10%)		$100,000
	PROJECT WIDE SUBTOTAL	**$250,000**
Unidentified Item Allowance (20%)		$249,999
	PROJECT WIDE TOTAL	**$499,999**
OTHER COSTS		
Construction Engineering (9%)		$121,500
Construction Contingencies (5%)		$67,500
Consultant Services (1%)		$13,500
PCCP Materials Quality Incentive ($2 per Sq Yd)	2,189 SQ. YD.	$4,378
Right-of-Way ($30 per Sq Ft)	1,555 SQ. YD.	$46,642
Temporary Construction Easement ($252 per Month)	12 Months	$3,023
	OTHER COSTS TOTAL	**$256,543**

SUMMARY

ITEM TOTAL		**$999,995**
PROJECT WIDE		**$499,999**
OTHER COST TOTAL		**$256,543**
SUBTOTAL PROJECT COST		**$1,756,537**
INDIRECT COST ALLOCATION (9.90%)		**$173,897**
	TOTAL PROJECT COST	**$1,930,434**

Arizona Department of Transportation

Estimated Engineering Construction Cost

Itemized Estimate

Double-Roundabout Interchange at Raintree Drive

Project Number: 101-B(210)T

Location: SR101L - Princess to Shea DCR

Version: Final Design Concept Report, Stage I (15%)

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	5,141	$5.00	$25,705
2020027	REMOVAL OF CONCRETE BARRIER	L.FT.	963	$20.00	$19,260
2020029	REMOVAL OF ASPHALTIC CONCRETE PAVEMENT	SQ.YD.	435	$5.00	$2,175
2020031	REMOVAL OF PORTLAND CEMENT CONCRETE PAVEMENT	SQ.YD.	3,946	$25.00	$98,650
2020052	REMOVE (RETAINING WALL)	L.FT.	30	$30.00	$900
2020053	REMOVE (CATCH BASINS)	EACH	4	$1,000.00	$4,000
2020116	REMOVE (SCUPPER)	EACH	3	$1,000.00	$3,000
2020155	REMOVE (PULL BOX)	EACH	1	$300.00	$300
2020162	REMOVE (CONCRETE)	SQ.YD.	3,377	$4.00	$13,508
2020175	REMOVAL OF LIGHT POLES AND BASES	EACH	1	$900.00	$900
2030301	ROADWAY EXCAVATION	CU.YD.	585	$10.00	$5,850
4010020	PORTLAND CEMENT CONCRETE PAVEMENT (11" PCCP OVER 4" AB)	SQ.YD.	3,172	$60.00	$190,320
5012524	STORM DRAIN PIPE, 24"	L.FT.	67	$100.00	$6,700
5030142	CONCRETE CATCH BASIN (MEDIAN) (C-15.80)	EACH	3	$5,000.00	$15,000
5030604	CONCRETE CATCH BASIN (C-15.91)	EACH	1	$5,000.00	$5,000
6070002	BREAKAWAY SIGN POST S4X7.7	L.FT.	24	$35.00	$840
6070022	FOUNDATION FOR BREAKAWAY SIGN POST S4X7.7	EACH	3	$600.00	$1,800
6070038	SLIP BASE	EACH	3	$250.00	$750
6080005	REGULATORY, WARNING, OR MARKER SIGN PANEL	SQ.FT.	100	$20.00	$2,000
7040005	PAVEMENT MARKING (WHITE EXTRUDED THERMOPLASTIC) (0.090")	L.FT.	1,238	$0.60	$743
7040074	PAVEMENT SYMBOL (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	5	$125.00	$625
7060013	PAVEMENT MARKER, RAISED, TYPE C	EACH	31	$5.00	$155
7080201	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED) (WHITE)	L.FT.	1,238	$0.10	$124
7080204	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED SYMBOL)	EACH	5	$100.00	$500
7310010	POLE (TYPE A)	EACH	1	$1,500.00	$1,500
7310200	POLE FOUNDATION (TYPE A)	EACH	1	$1,200.00	$1,200
7310092	POLE (TYPE H) (BREAKAWAY)	EACH	1	$2,000.00	$2,000
7310197	BREAKAWAY BASE FOR LIGHTING POLE OR SIGNAL FLASHER	EACH	1	$600.00	$600
7310276	POLE FOUNDATION (TYPE H) (BREAKAWAY)	EACH	1	$800.00	$800
7310554	MAST ARM (20 FT.) (SPECIAL)	EACH	1	$2,000.00	$2,000
7320040	ELECTRICAL CONDUIT (1 1/2") (PVC)	L.FT.	500	$12.00	$6,000
7320050	ELECTRICAL CONDUIT (2") (PVC)	L.FT.	500	$10.00	$5,000
7320072	ELECTRICAL CONDUIT (3 - 3") (PVC)	L.FT.	1,500	$20.00	$30,000
7320450	PULL BOX (NO. 7) (FM-2.06)	EACH	2	$1,000.00	$2,000
7320455	PULL BOX (NO. 9)	EACH	2	$5,000.00	$10,000
7320456	PULL BOX (4B)	EACH	1	$1,000.00	$1,000
7320461	PULL BOX (6B)	EACH	1	$2,000.00	$2,000
7320500	CONDUCTOR (NO. 12)	L.FT.	150	$0.80	$120
7320520	CONDUCTOR (NO. 8)	L.FT.	2,000	$0.95	$1,900
7320585	CONDUCTOR (INSULATED BOND) (NO. 12)	L.FT.	75	$1.00	$75
7320595	CONDUCTOR (INSULATED BOND) (NO. 8)	L.FT.	500	$2.00	$1,000
7320654	CONDUCTORS (NO. 8)	L.FT.	1,500	$1.00	$1,500
7320740	REMOVAL OF EXISTING CONDUCTORS	L.FT.	2,500	$0.50	$1,250
7320787	SINGLE MODE FIBER OPTIC CABLE (144 FIBERS)	L.FT.	1,500	$3.00	$4,500
7320788	SINGLE MODE FIBER OPTIC CABLE (144 FIBERS) (SCOTTSDALE)	L.FT.	1,500	$3.00	$4,500
7320789	SINGLE MODE FIBER OPTIC CABLE (12 FIBERS)	L.FT.	500	$2.00	$1,000
7320794	FIBER OPTIC SPLICE CLOSURE (ITS)	EACH	2	$1,500.00	$3,000
7320809	CABLE INNERDUCT (1")	L.FT.	1,500	$1.25	$1,875

Arizona Department of Transportation

Estimated Engineering Construction Cost

Itemized Estimate

Double-Roundabout Interchange at Raintree Drive

Project Number: 101-B(210)T

Location: SR101L - Princess to Shea DCR

Version: Final Design Concept Report, Stage I (15%)

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
7340120	METER PEDESTAL CABINET	EACH	1	$4,000.00	$4,000
7340306	METER PEDESTAL FOUNDATION	EACH	1	$1,200.00	$1,200
7360111	LUMINAIRE (LED) (HORIZONTAL MOUNT) (TYPE 40L)	EACH	1	$900.00	$900
7360113	LUMINAIRE (LED) (UNDERDECK 15L)	EACH	8	$1,000.00	$8,000
8082845	MANHOLE (RESET FRAME AND COVER)	EACH	1	$1,500.00	$1,500
9080084	CONCRETE CURB AND GUTTER (ALL TYPES)	L.FT.	8,029	$20.00	$160,580
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	4,382	$6.00	$26,292
9080296	CONCRETE SIDEWALK RAMP (ALL TYPES)	EACH	4	$2,500.00	$10,000
9080511	SCUPPER (MAG DET. 203)	EACH	3	$5,000.00	$15,000
9100009	CONCRETE BARRIER (ADJACENT TO RETAINING WALL)	L.FT.	1,043	$140.00	$146,020
9140153	RETAINING WALL (REGULAR)	SQ.FT.	30	$70.00	$2,100
9210021	MEDIAN PAVING (CONCRETE PAVERS)	SQ.YD.	3,915	$60.00	$234,900
9240052	MISCELLANEOUS WORK (LANDSCAPE & EROSION CONTROL)	L.SUM	1	$12,000.00	$12,000
9240131	MISCELLANEOUS WORK (GigE SWITCH)	EACH	2	$2,500.00	$5,000
				ITEM TOTAL	**$1,111,117**
	PROJECT WIDE				
	Mobilization (10%)				$111,112
	Dust and Water Palliative (1%)				$11,112
	Quality Control (2%)				$22,223
	Construction Surveying (2%)				$22,223
	Maintenance And Protection Of Traffic (10%)				$111,112
				PROJECT WIDE SUBTOTAL	**$277,782**
	Unidentified Item Allowance (20%)				$277,780
				PROJECT WIDE TOTAL	**$555,562**
	OTHER COSTS				
	Construction Engineering (9%)				$135,001
	Construction Contingencies (5%)				$75,001
	Consultant Services (1%)				$15,001
	PCCP Materials Quality Incentive ($2 per Sq Yd)			3,172 SQ. YD.	$6,344
	Right-of-Way ($30 per Sq Ft)			5,974 SQ. YD.	$179,226
				OTHER COSTS TOTAL	**$410,602**

SUMMARY

ITEM TOTAL	**$1,111,117**
PROJECT WIDE	**$555,562**
OTHER COST TOTAL	**$410,602**
SUBTOTAL PROJECT COST	**$2,077,281**
INDIRECT COST ALLOCATION (9.90%)	**$205,651**
TOTAL PROJECT COST	**$2,282,931**

APPENDIX E: Initial Traffic Report

INITIAL TRAFFIC REPORT UPDATE

PIMA FREEWAY (SR101L)
PRINCESS DRIVE TO SHEA BOULEVARD
GENERAL PURPOSE LANES

ADOT CENTRAL DISTRICT/MARICOPA COUNTY

ADOT CONTRACT NO. 2018-006.11
ADOT PROJECT NO. 101 MA 036 F0123 01D
FEDERAL AID NO. 101-B(210)T

Prepared For:

ADOT

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
PROJECT MANAGEMENT GROUP

Prepared By:

Kimley»Horn

January 2021

Registered Professional Engineer (Civil)
CERTIFICATE NO.
43294
MICHAEL L.
GRANDY
DATE SIGNED 01-20-21
ARIZONA U.S.A.
Exp. 09-30-23

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1.0 Introduction

This Initial Traffic Report Update has been developed to support the Design Concept Report (DCR) Update of the 2010 DCR for widening an approximately 4.5-mile-long segment of State Route Loop 101 (SR 101L) from Princess Drive to south of Shea Boulevard. This project is located in the Arizona Department of Transportation (ADOT) Central District and is within the City of Scottsdale in Maricopa County in Arizona (from SR 101L milepost (MP) 36.54 to MP 41.08). The project location and project vicinity map are shown in **Figure 1.1** and **Figure 1.2**, respectively.

The purposes of this report are to:

- Document the existing safety and operational conditions of the SR 101L freeway mainline and all traffic interchanges (TIs) within the project limits except the Cactus Road TI (because no improvements are contemplated there – see the prior 2010 DCR for more information)
- Forecast and evaluate future traffic conditions for the SR 101L freeway mainline and project TIs
- Provide recommendations for improvements that promote safety, reduce congestion, and improve operations, thereby enhancing local and regional mobility

The traffic analysis includes the evaluation of the following improvements:

- Freeway mainline – Addition of a single general-purpose lane on SR 101L in the northbound (NB) and southbound (SB) travel directions from just south of Princess Drive to just south of Shea Boulevard
- Project TIs – Safety and operational improvements at the Frank Lloyd Wright Boulevard, Raintree Drive, and Shea Boulevard TIs and at the intersection of Raintree Drive and 87th Street (because of its proximity to the Raintree Drive TI)

Improvements being contemplated at the TIs include:

- Improving/expanding the existing single-point urban interchange (SPUI) at the Frank Lloyd Wright Boulevard, Raintree Drive and Shea Boulevard TIs
- Converting the existing SPUI to a tight diamond interchange (TDI) at the Frank Lloyd Wright Boulevard and Raintree Drive TIs only
- Converting the existing SPUI to a double-roundabout interchange (DRI) at the Raintree Drive TI only

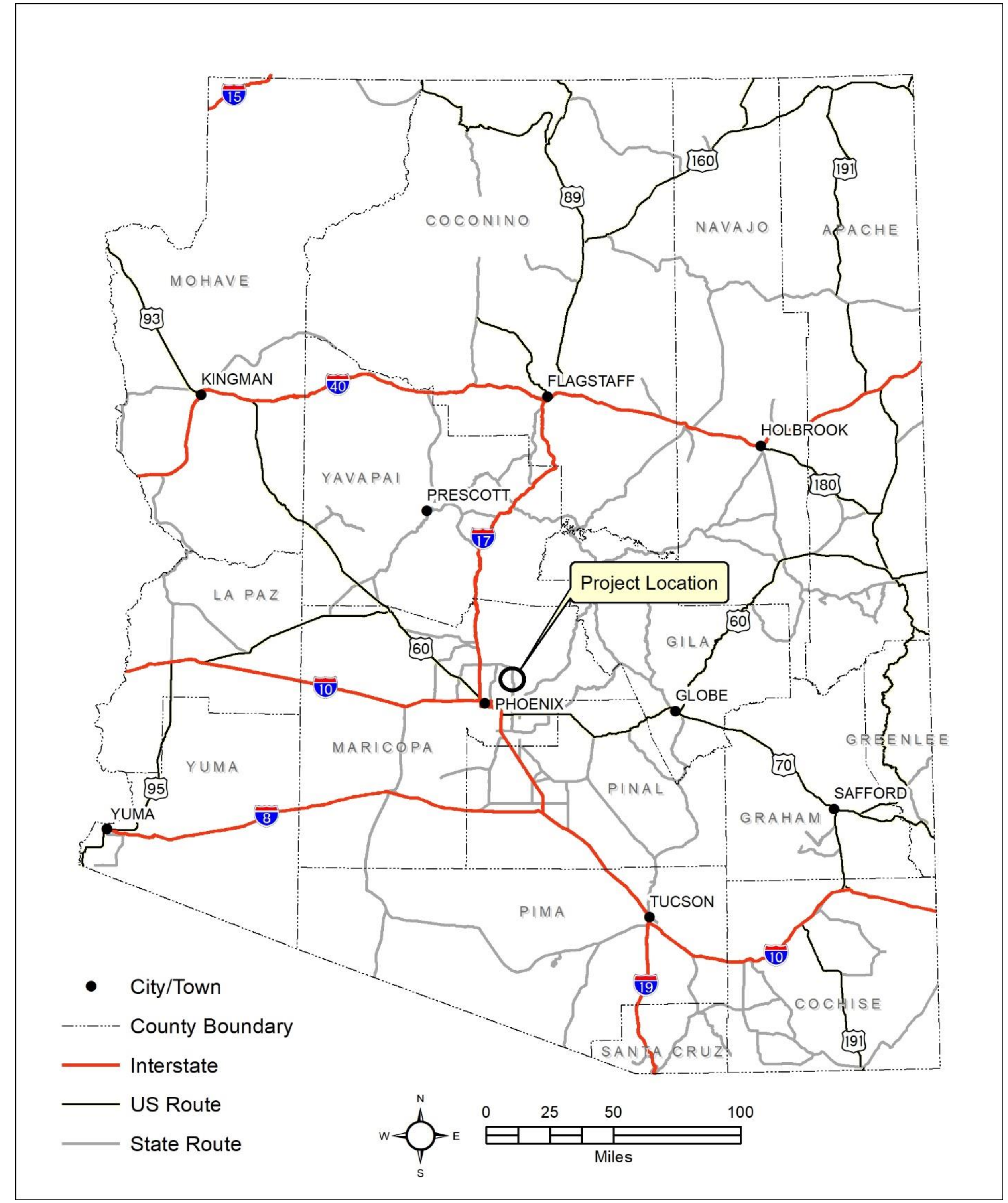


Figure 1.1 – Project Location

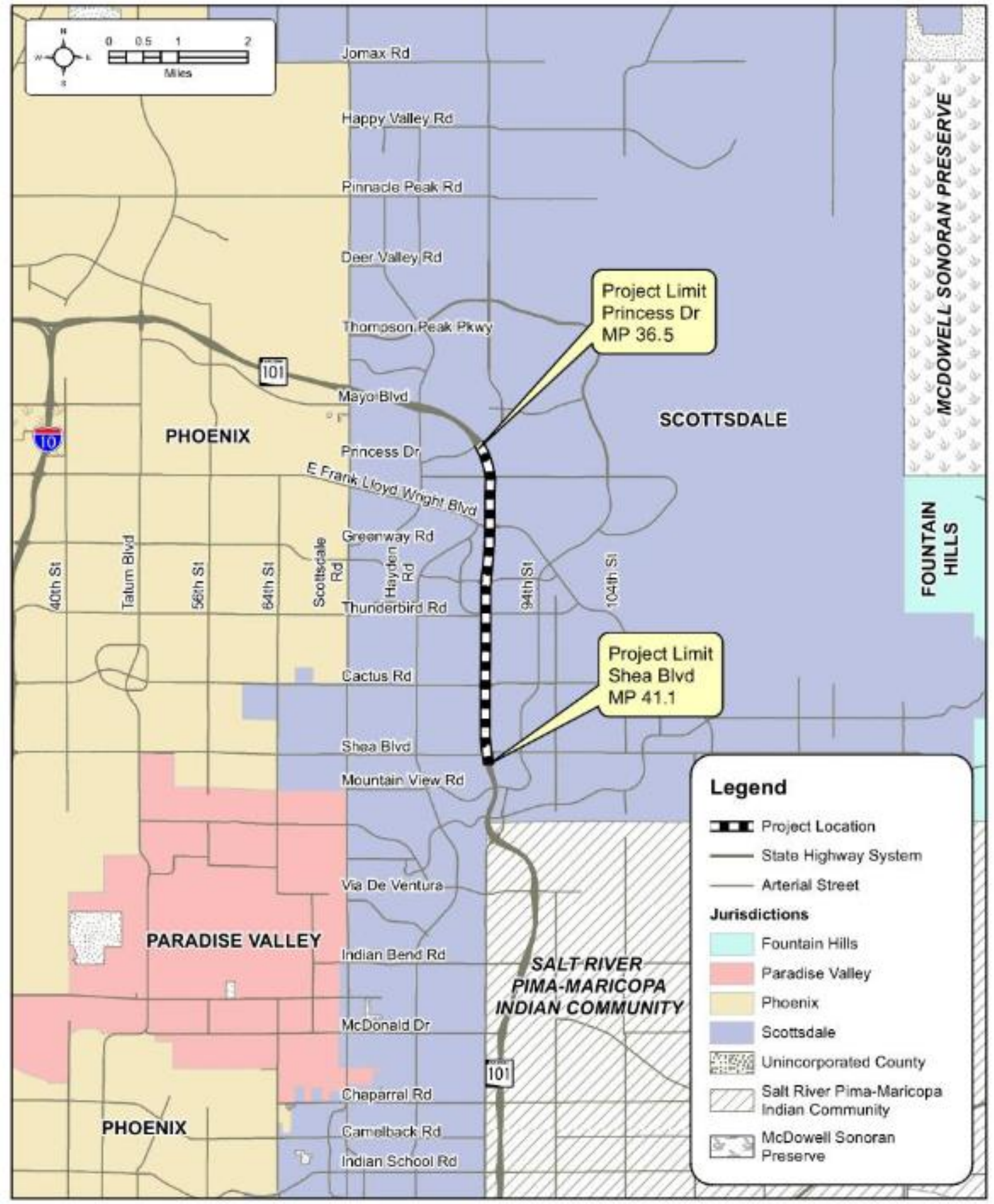


Figure 1.2 – Project Vicinity Map

2.0 Existing Conditions

2.1 Existing Freeway and TI Geometry

2.1.1 SR 101L

SR 101L is a major regional freeway within Maricopa County that is approximately 60 miles long. SR 101L starts at I-10 west of Phoenix heading north, bends east through northern Phoenix, and then goes south through Scottsdale before terminating at the Loop 202 Santan Freeway (south) east of Phoenix.

The posted speed limit on SR 101L within the project limits is 65 miles per hour (mph). Between Princess Drive and Raintree Drive and between Cactus Road and Shea Boulevard, the SR 101L NB and SB roadway sections include three general-purpose lanes (GPLs) and one high-occupancy vehicle (HOV) lane in each direction that are each 12' wide. Between Raintree Drive and Cactus Road and south of Shea Boulevard, the SR 101L NB and SB roadway sections include four GPLs and one HOV lane in each direction. SR 101L north of Princess Drive is currently being widened from three GPLs and one HOV lane to four GPLs and one HOV lane.

NB and SB frontage roads (also known as Pima Road) are located adjacent to SR 101L. The NB frontage road extends between Raintree Drive and Princess Drive. The SB frontage road extends between Princess Drive and Thunderbird Road. ADOT classifies the frontage road as a Minor Collector.

North of Bell Road, the median separating the SR 101L NB and SB travel lanes is a 15' raised concrete median. Inside and outside paved shoulders are approximately 10' wide. South of Bell Road, the median separating the SR 101L NB and SB travel lanes is a 2' raised concrete median. Inside and outside paved shoulders are 10' wide or less.

The existing freeway mainline lane geometry is shown in **Figure 2.1**.

2.1.2 Frank Lloyd Wright Boulevard TI

The Frank Lloyd Wright Boulevard TI is located along SR 101L at approximately MP 37.8 and is a SPUI with NB and SB on-ramps and off-ramps that connect to SR 101L via the frontage road/Pima Road. Frank Lloyd Wright Boulevard currently has three through lanes in each direction. ADOT classifies Frank Lloyd Wright Boulevard as a Minor Arterial adjacent to SR 101L. The City of Scottsdale classifies Frank Lloyd Wright Boulevard as a Major Arterial – Suburban with an ultimate six-lane roadway section.

The SB off-ramp consists of a single exit lane from the freeway mainline that becomes a third through lane on the frontage road/Pima Road. The frontage road/Pima Road adds an auxiliary right-turn lane at Frank Lloyd Wright Boulevard and becomes two left-turn lanes, two through lanes, and a right-turn lane. The Frank Lloyd Wright Boulevard turning movements that contribute to the SB frontage road/Pima Road consist of two SB through lanes, one EB right-turn lane, and two WB left-turn lanes near the TI that merge down to two SB through lanes on the frontage road/Pima Road. Farther south, the frontage road/Pima Road provides one diverging lane that opens to two SB on-ramp lanes.

The NB off-ramp consists of a single exit lane from the freeway mainline that becomes a third through lane on the frontage road/Pima Road. The frontage road/Pima Road adds a fourth lane between the freeway mainline exit and the Frank Lloyd Wright Boulevard intersection. The Frank Lloyd Wright Boulevard NB off-ramp intersection consists of two left-turn lanes, two through lanes, and a shared through/right-turn lane. The Frank Lloyd Wright Boulevard turning movements that contribute to the NB frontage road consist of three NB through lanes, two WB right-turn lanes, and two EB left-turn lanes that merge down to four NB through lanes on the frontage road/Pima Road. Two lanes diverge from the NB frontage road/Pima Road to the NB on-ramp.

The NB and SB ramp intersections at the Frank Lloyd Wright Boulevard TI are signalized as a SPUI, operating as a single intersection. WB right-turn lanes onto the NB frontage road/Pima Road are yield-controlled.

The area north and south of the Frank Lloyd Wright Boulevard TI primarily consists of commercial developments. Directly north of the Frank Lloyd Wright Boulevard TI is the Central Arizona Project (CAP) canal running east-west under SR 101L and the frontage road/Pima Road. North of the CAP canal, the TPC golf course is located west of SR 101L and the Westworld event venue is located east of SR 101L.

The existing Frank Lloyd Wright Boulevard TI lane geometry is shown in **Figure 2.2**.

2.1.3 Raintree Drive TI and Intersection at 87th Street

The Raintree Drive TI is located along SR 101L at approximately MP 38.6 and is a SPUI with NB and SB on-ramps and off-ramps that connect to SR 101L via the frontage road/Pima Road with the exception of the NB off-ramp, which connects directly between SR 101L and Raintree Drive because the NB frontage road/Pima Road does not extend south past Raintree Drive. Raintree Drive currently has two through lanes in each direction. ADOT classifies Raintree Drive as a Minor Arterial adjacent to SR 101L. The City of Scottsdale classifies Raintree Drive as a Major Arterial – Suburban with an ultimate six-lane roadway section west of SR 101L and a Minor Arterial – Suburban with an ultimate four-lane roadway section east of SR 101L.

The SB off-ramp consists of a single exit lane from the freeway mainline, which becomes a fourth through lane on the frontage road/Pima Road. The frontage road/Pima Road adds an auxiliary left-turn lane at Raintree Drive and becomes two left-turn lanes, two through lanes, and a right-turn lane. The Raintree Drive turning movements that contribute to the SB frontage road/Pima Road consist of two SB through lanes, one EB right-turn lane, and two WB left-turn lanes that merge down to three SB through lanes on the frontage road/Pima Road. Two lanes diverge from the SB frontage road/Pima Road to the SB on-ramp.

The NB off-ramp consists of a single exit lane from the freeway mainline, which becomes the NB approach to the off-ramp intersection consisting of two left-turn lanes, one through lane, and a shared through/right-turn lane. The Raintree Drive TI turning movements that contribute to the NB frontage road/Pima Road consist of two NB through lanes, one WB right-turn lane, and two EB left-turn lanes merging down to two NB through lanes on the frontage road/Pima Road. Further north, one lane diverges from the frontage road/Pima Road and opens to two lanes on the NB on-ramp.

The NB and SB ramp intersections at the Raintree Drive TI are signalized as a SPUI, operating as a single intersection. EB and WB right-turn lanes onto the on-ramps are yield-controlled.

Directly west of the Raintree Drive TI is the signalized intersection of Raintree Drive and 87th Street. Raintree Drive includes two through lanes in the east-west direction with one left-turn and one right-turn auxiliary lane on both the east and west legs of the intersection. 87th Street includes two through lanes in each direction south of Raintree Drive and one through lane in each direction north of Raintree Drive. The northbound approach to the intersection consists of one left-turn lane, one through lane, and one right-turn lane. The southbound approach to the intersection consists of one left-turn lane and one shared through/right-turn lane.

The area adjacent to the Raintree Drive TI on the east side of SR 101L primarily consists of office land use. Residential land uses are located further east and southeast of the TI. The area adjacent to Raintree Drive on the west side of SR 101L primarily consists of commercial and office developments with some vacant land on the south side of Raintree Drive between Northsight Boulevard and 87th Street.

The existing Raintree Drive TI and Raintree Drive and 87th Street intersection lane geometry is shown in **Figure 2.2**.

2.1.4 Shea Boulevard TI

The Shea Boulevard TI is located along SR 101L at approximately MP 41.81 and is a SPUI with NB and SB on-ramps and off-ramps that connect to SR 101L. Shea Boulevard currently has three through lanes in each direction. ADOT classifies Shea Boulevard as a Principal Arterial adjacent to SR 101L. The City of Scottsdale classifies Shea Boulevard as a Major Arterial – Suburban with an ultimate six-lane roadway section.

The SB off-ramp consists of two exit lanes from the freeway mainline, adds an additional lane from adjacent parcel access, and becomes two left-turn lanes and one right-turn lane at the Shea Boulevard TI. The Shea Boulevard turning movements that contribute to the SB on-ramp consist of one EB right-turn lane, and two WB left-turn lanes. The EB right-turn lane merges with the outside WB left-turn lane into two SB on-ramp lanes.

The NB off-ramp consists of two exit lanes from the freeway mainline and adds two auxiliary lanes to become two left-turn lanes and two right-turn lanes at the Shea Boulevard TI intersection. The Shea Boulevard turning movements that contribute to the NB on-ramp consist of one WB right-turn lane and two EB left-turn lanes. The WB right-turn lane merges with the outside EB left-turn lane into two NB on ramp lanes.

The NB and SB ramp intersections at the Shea Boulevard TI are signalized as a SPUI, operating as a single intersection. EB and WB right-turn lanes onto the on-ramps and the SB off-ramp right-turn lane are yield-controlled.

The area north and south of the Shea Boulevard TI largely consists of commercial and residential developments. Immediately adjacent to the TI in the southwest corner are residential land uses while the southeast and northwest corners consist of various commercial land uses including restaurants and the northeast corner consists of commercial, hotel and office land uses.

The existing Shea Boulevard TI lane geometry is shown in **Figure 2.2**.

2.2 Existing Traffic Volumes

Recent daily and peak hour roadway traffic volume data for the SR 101L mainline and ramps at Princess Drive, Frank Lloyd Wright Boulevard, Raintree Drive, Cactus Rd, and Shea Boulevard was obtained from the ADOT Multimodal Planning Division (MPD) Transportation Data Management System (TDMS) for 2018 (mainline volumes) and 2017 (ramp volumes). Mainline 2018 volumes were grown annually by 2.5% to represent 2020 existing mainline volumes. The 2.5% rate was based on the average growth rate between 2017 and 2018 for mainline segments on SR 101L. Ramp 2017 volumes were grown annually by 1.0% to represent 2020 existing ramp volumes. The 1.0% rate was based on the composite growth rate of ramps, TIs, and arterials within the study area.

In addition, historical AM and PM peak hour turning movement count (TMC) data was provided by the City of Scottsdale at:

- Frank Lloyd Wright Boulevard TI in 2016
- Raintree Drive TI in 2018
- Raintree Drive and 87th Street intersection in 2018
- Shea Boulevard TI in 2016

TMCs were collected on a Tuesday, Wednesday, or Thursday between 7:00 AM and 9:00 AM and between 4:00 PM and 6:00 PM. Newer TMCs were not collected as part of the project effort due to recent drastic changes in travel patterns as a result of COVID-19. The provided TMCs were grown annually by 1.0% to represent 2020 existing TMCs.

Heavy vehicle percentages were assumed to be 7% (4% medium and 3% heavy vehicles) on the freeway mainline and 4% (3% medium and 1% heavy vehicles) on the ramps and TIs based on available ADOT TDMS data.

Because of the use of count data from various times and sources, efforts were made to balance volumes between TMCs at TIs and the collected ramp volumes. In most cases, there were driveways or frontage road access between the TMC and ramp count location. Any volume imbalance in those situations was attributed to the driveways or frontage road. For the few locations (Shea Boulevard ramps and the Raintree Dr NB off-ramp) where there was a direct relation between the TMC and ramp volume, the volumes were balanced by adjusting the ramp volume. The mainline and ramp peak hour volumes were balanced with the goal of minimizing volume adjustments and generally remaining conservative in the overall adjustment.

Additionally, a review of the mainline and ramp volume balancing revealed that the TDMS traffic count station between Cactus Road and Shea Boulevard is believed to be over-counting traffic volumes. The mainline annual average daily traffic (AADT) count of 191,445 was adjusted to 162,000 to minimize the difference between the upstream and downstream count stations.

The 2020 existing daily and peak hour link volumes for the freeway mainline and ramp volumes are shown in the previously referenced **Figure 2.1**. The 2020 existing SR 101L mainline GPL daily volumes within the project limits range from approximately 61,000 vehicles per day (vpd) to approximately 83,000 vpd. The 2020 existing ramp volumes at the TIs range from approximately 6,000 vpd to approximately 21,000 vpd.

The 2020 existing peak hour TMC volumes at the Frank Lloyd Wright Boulevard, Raintree Drive, and Shea Boulevard TIs, along with at the Raintree Drive and 87th Street intersection, are shown in the previously referenced **Figure 2.2**.

Detailed data on existing traffic volumes can be found in **Appendix 1**.

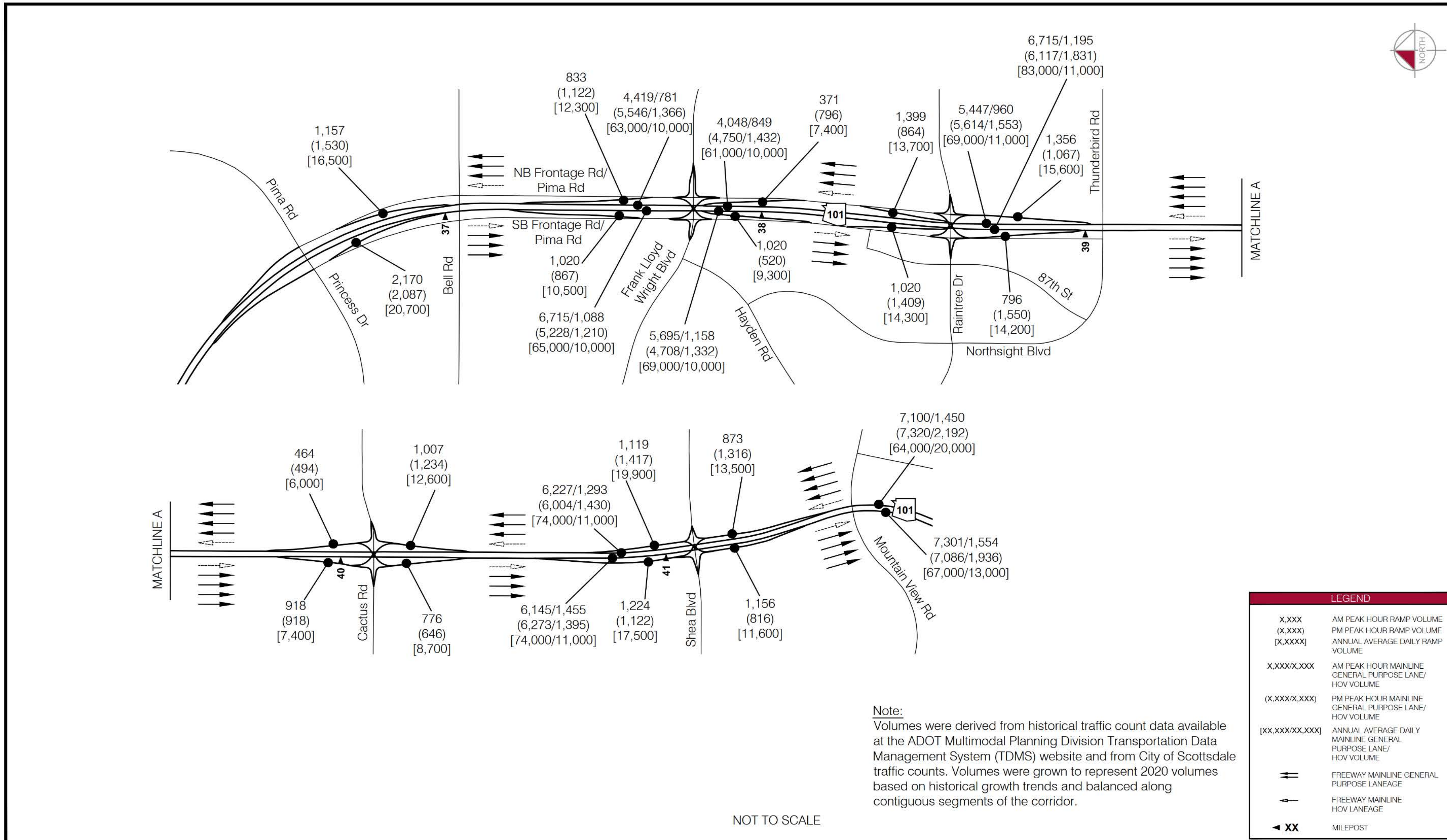


Figure 2.1 – Existing Freeway Lane Geometry and Traffic Volumes

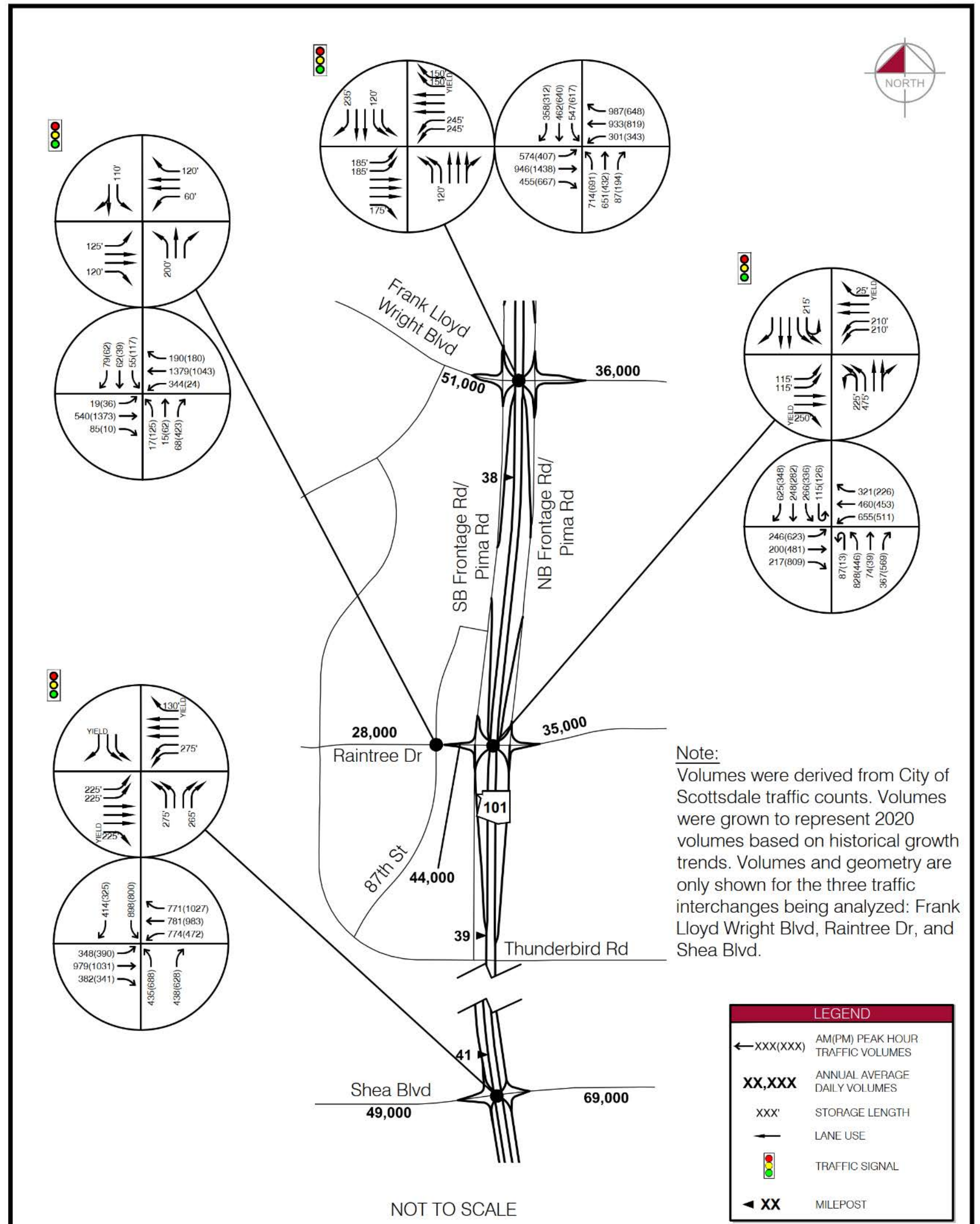


Figure 2.2 – Existing TI Lane Geometry and Traffic Volumes

3.0 Future Traffic Volumes Analysis and Alternatives

3.1 2040 Baseline/No-Build Traffic Volumes and Geometry

Future 2040 traffic volumes developed for analysis were based on the 2040 regional travel demand model developed by the Maricopa Association of Governments (MAG) to evaluate the Phoenix metropolitan area's transportation system. The MAG regional travel demand model is based on projected socioeconomic, population, employment, origin-destination, and other regionally-based data.

The following network model outputs were provided by MAG as part of this analysis:

- Baseline (also known as No-Build) – Existing roadway network plus near-term programmed improvements
- Improved (also known as Build) – Existing roadway network plus long-term anticipated improvements by 2040

The 2040 Baseline/No-Build MAG model assumes only minor improvements to the existing roadway network in the vicinity of the project limits, with the SR 101L mainline remaining unchanged between Princess Drive and Shea Boulevard. A 1.0% average annual growth rate was determined for the mainline in the project limits by comparing MAG model estimated daily volumes for the 2020 No-Build scenario and the 2040 No-Build scenario. A 0.5% average annual growth rate was determined to be the composite average growth rate of ramps, TIs, and arterials within the project limits between the 2020 No-Build scenario and the 2040 No-Build scenario. These growth rates were applied to the 2020 existing volumes to develop 2040 No-Build volumes. 2040 No-Build heavy vehicle percentages were assumed to be 7% on the freeway mainline and 4% on the ramps and TIs, similar to existing heavy vehicle percentages.

The 2040 No-Build daily, AM peak hour, and PM peak hour link volumes and geometry for the freeway mainline and ramps are shown in **Figure 3.1**. The 2040 No-Build SR 101L mainline GPL daily volumes within the project limits range from approximately 74,000 vpd to approximately 101,000 vpd. The 2040 No-Build ramp volumes at the TIs range from approximately 7,000 vpd to approximately 23,000 vpd.

The 2040 No-Build AM and PM peak hour volumes and No-Build intersection geometry are shown in **Figure 3.2.**

3.2 2040 Analysis Alternatives

For the SR 101L mainline, two alternatives were analyzed as part of the 2040 traffic analysis:

- No-Build alternative – where SR 101L remains as it currently exists
- Build alternative – where SR 101L is widened by adding one GPL in each direction throughout the project limits

For the TIs, four alternatives were analyzed as part of the 2040 traffic analysis:

- No-Build alternative – where the TIs remain as existing SPUIs with no improvements
- Improved SPUI alternative – where the existing SPUIs are improved/expanded at the Frank Lloyd Wright Boulevard, Raintree Drive and Shea Boulevard TIs
- TDI alternative – where the existing SPUIS are converted to tight diamond interchanges at the Frank Lloyd Wright Boulevard and Raintree Drive TIs only
- DRI alternative – where the existing SPUI is converted to a double-roundabout interchange at the Raintree Drive TI only

3.3 2040 Improved/Build Traffic Volumes and Geometry

The 2040 Improved/Build MAG model assumes the SR 101L mainline is widened by one lane in each direction between Princess Drive and Shea Boulevard. A 1.2% annual growth was determined to be the average annual growth rate for the mainline in the project limits by comparing MAG model estimated daily volumes for the 2020 Build scenario and the 2040 Build scenario. A 0.5% average annual growth rate was determined to be the composite average growth rate of ramps, TIs, and arterials within the project limits between the 2020 Build scenario and the 2040 Build scenario. These growth rates were applied to the 2020 existing volumes to develop 2040 Build volumes. 2040 Build heavy vehicle percentages were assumed to be 7% on the freeway mainline and 4% on the ramps and TIs, similar to existing heavy vehicle percentages.

The 2040 Build daily, AM peak hour, and PM peak hour link volumes and geometry for the freeway mainline and ramps are shown in **Figure 3.3**. The 2040 Build SR 101L mainline GPL daily volumes within the project limits range from approximately 77,000 vpd to approximately 105,000 vpd. The 2040 Build ramp volumes at the TIs range from approximately 7,000 vpd to approximately 23,000 vpd.

The 2040 Build AM and PM peak hour volumes at the Frank Lloyd Wright Boulevard, Raintree Drive, and Shea Boulevard TIs, along with at the Raintree Drive and 87th Street intersection, are shown in **Figure 3.4**, **Figure 3.5**, and **Figure 3.6**, respectively. Detailed data on the 2040 traffic volumes can be found in **Appendix 2**.

Figure 3.4, **Figure 3.5**, and **Figure 3.6** also show the various recommended 2040 TI configurations for the Build alternatives, which includes the number of lanes, type of lanes, traffic control, and recommended storage lengths of those lanes. The geometry and traffic control of the Build alternatives was developed through an iterative process based on trying to promote safety and provide appropriate geometry to address level of service, delay, and queuing issues identified through an operational analysis of the 2040 alternatives. The 2040 operational analysis results (i.e., level of service, delay, and 95th percentile queues) using this assumed Build geometry are discussed in Section 6.0 of this document.

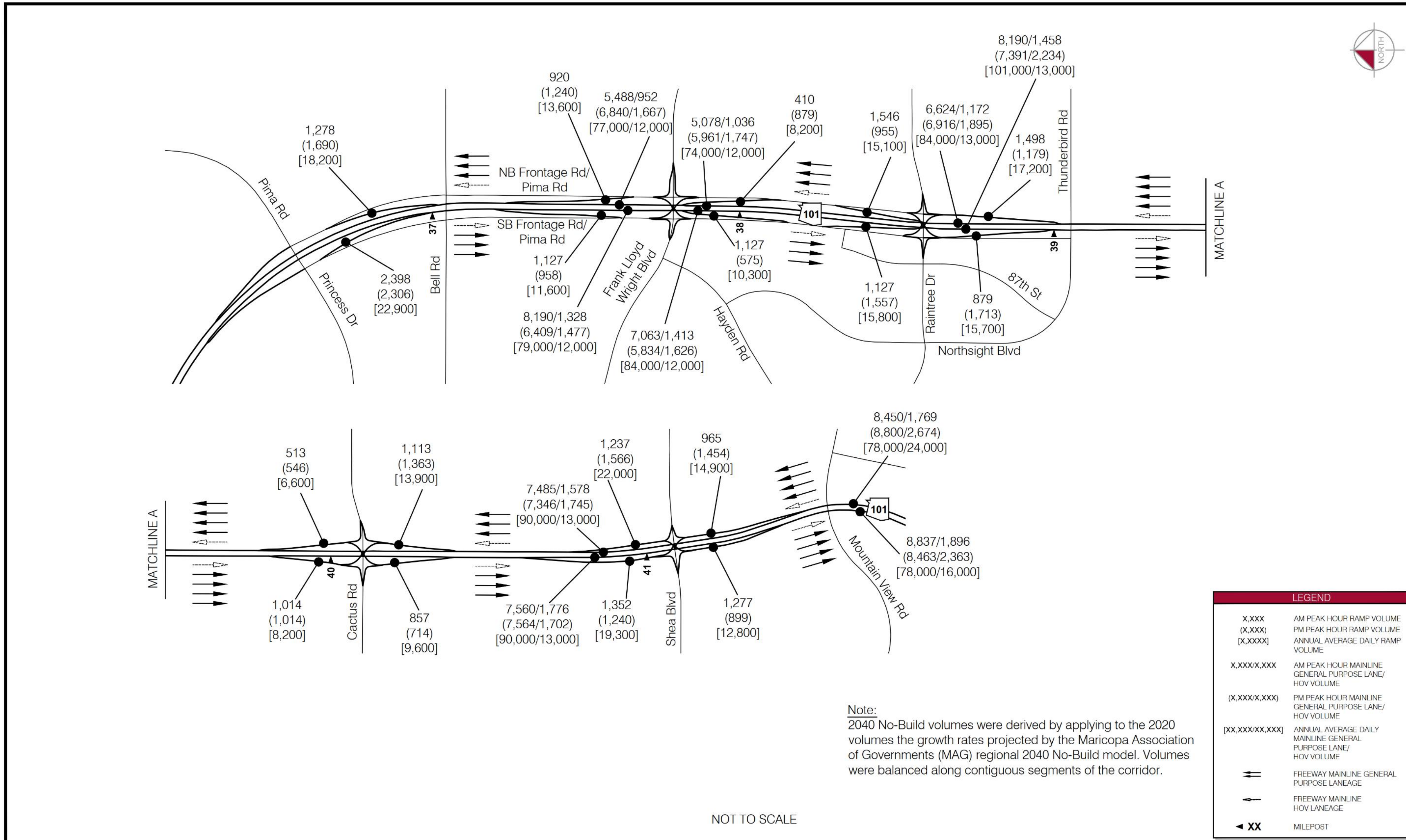


Figure 3.1 – 2040 No-Build Freeway Lane Geometry and Traffic Volumes

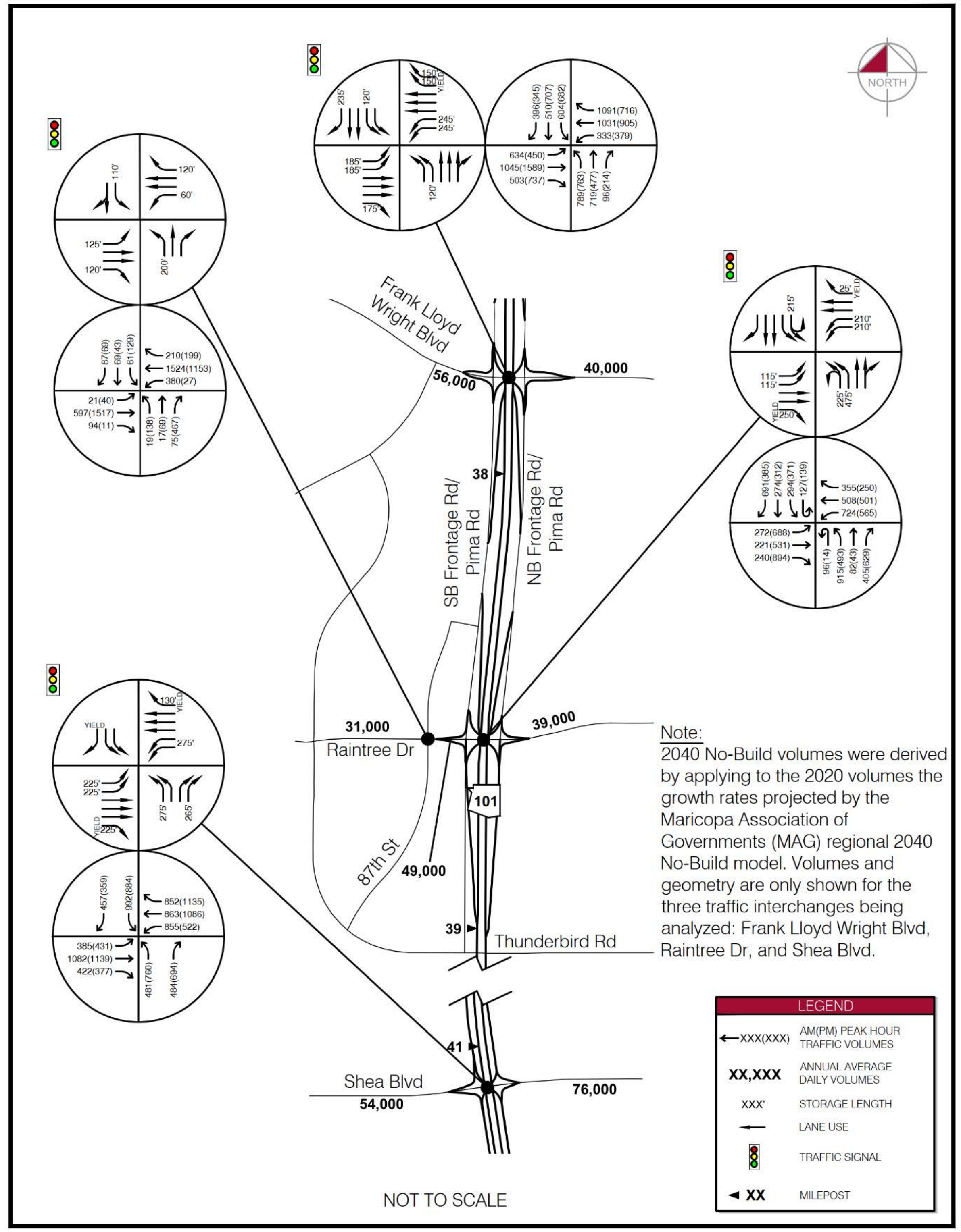


Figure 3.2 – 2040 No-Build TI Lane Geometry and Traffic Volumes

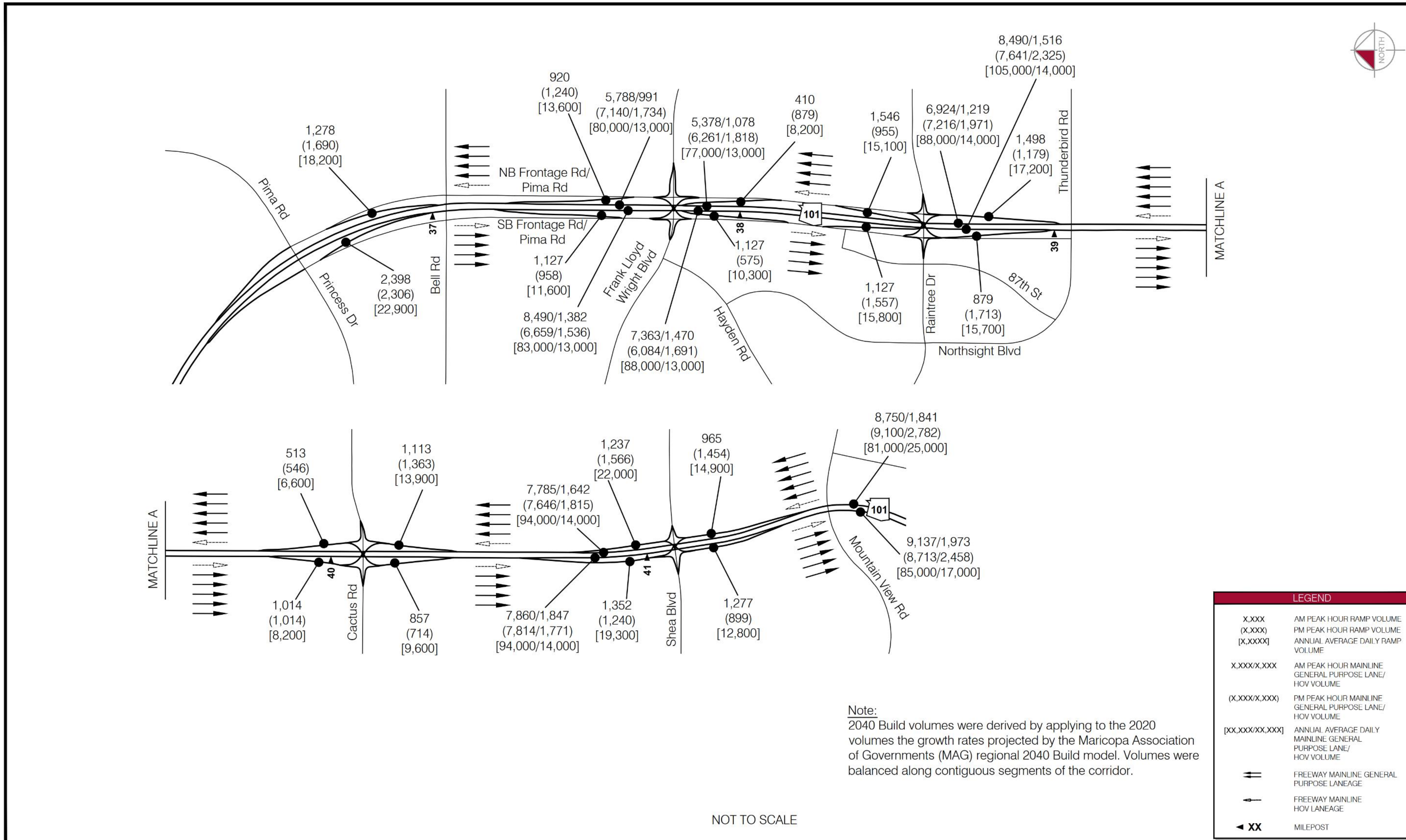


Figure 3.3 – 2040 Build Freeway Lane Geometry and Traffic Volumes

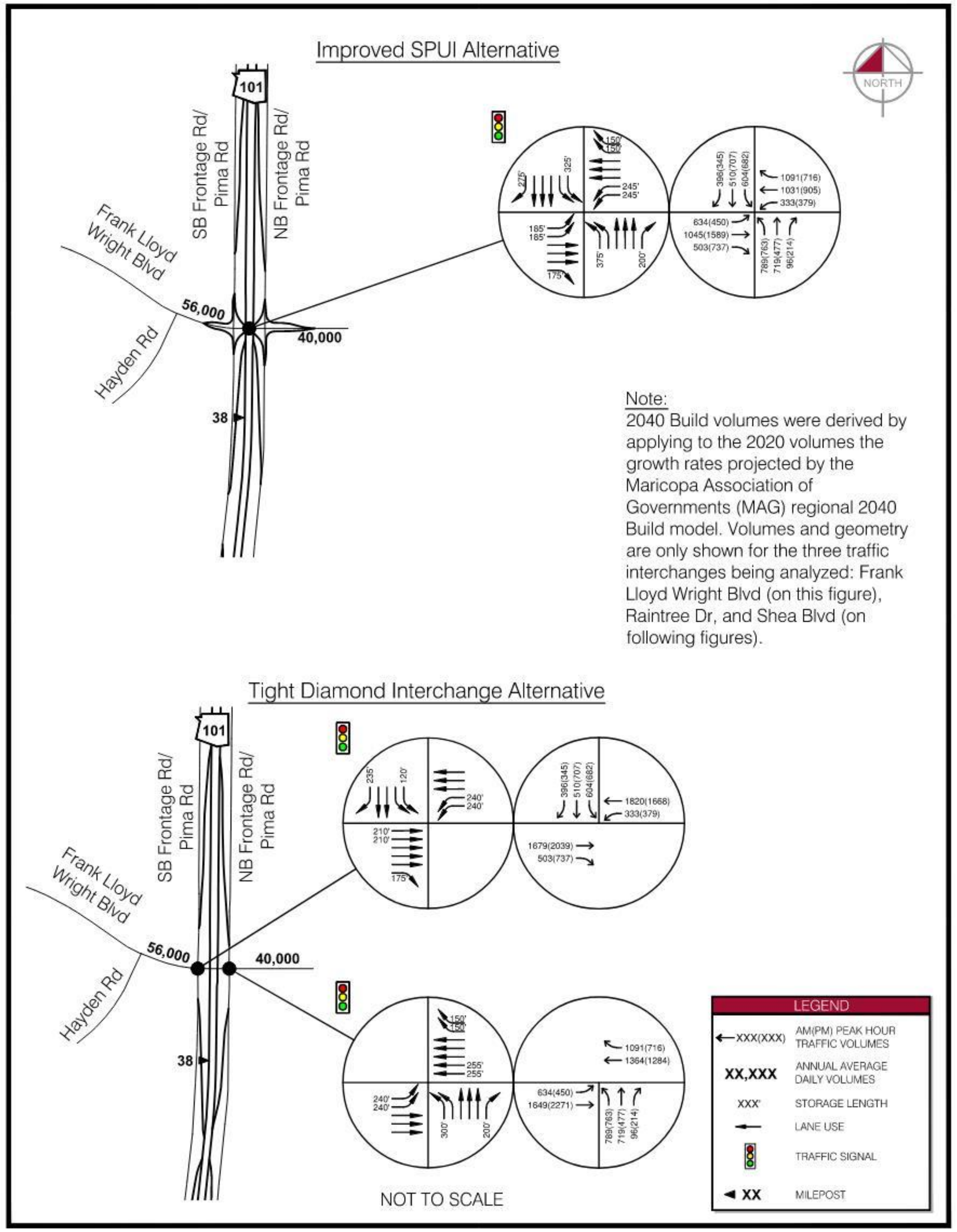


Figure 3.4 – 2040 Build Frank Lloyd Wright Boulevard TI Lane Geometry and Traffic Volumes

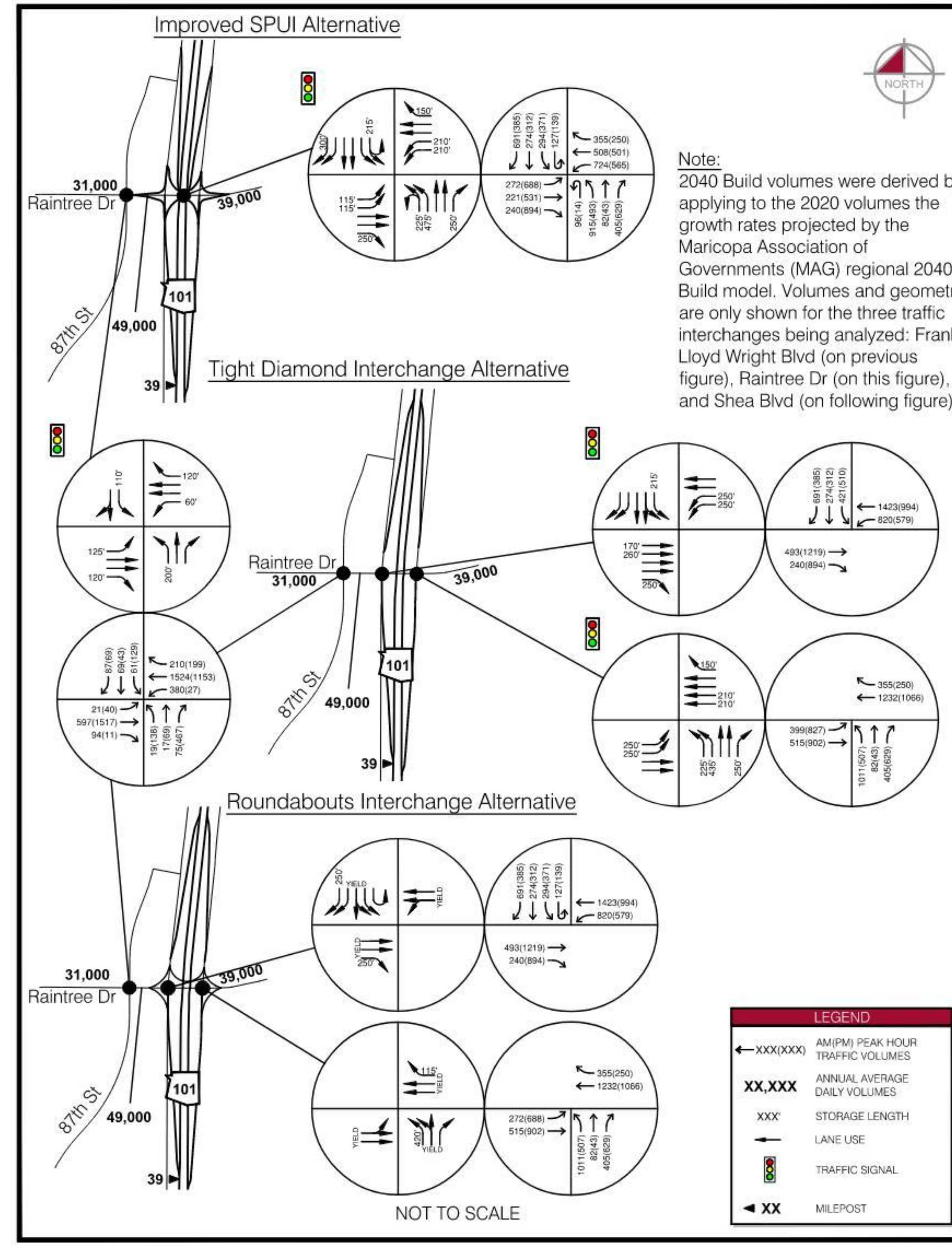


Figure 3.5 – 2040 Build Raintree Drive TI Lane Geometry and Traffic Volumes

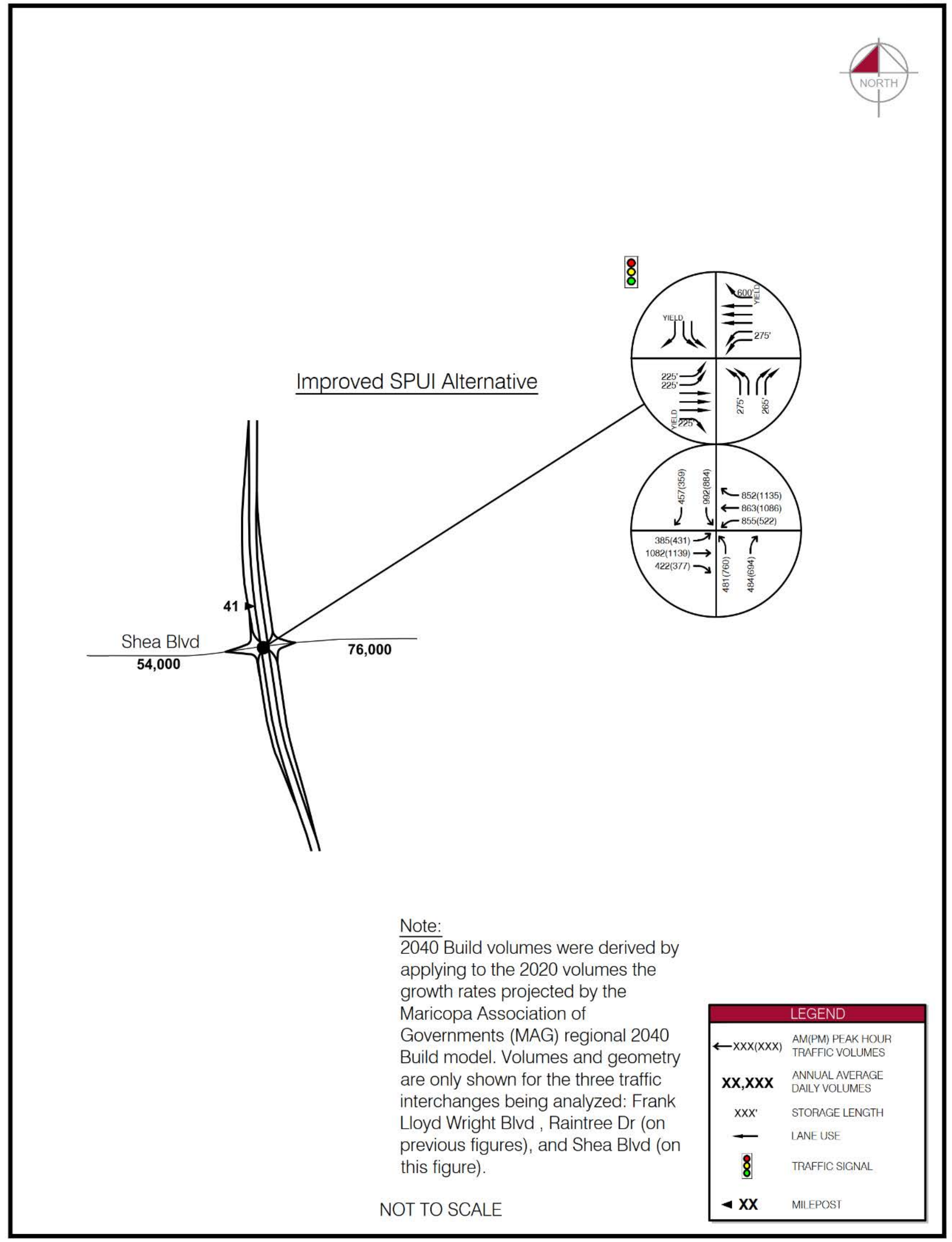


Figure 3.6 – 2040 Build Shea Boulevard TI Lane Geometry and Traffic Volumes

4.0 Crash Analysis

Historical crash data was obtained from the ADOT crash database for the segment of the SR 101L corridor from Princess Drive to south of Shea Boulevard and the SR 101L TIs of Frank Lloyd Wright Boulevard, Raintree Drive, and Shea Boulevard. The analysis evaluated reported crashes between January 1, 2015 and December 31, 2019.

4.1 Mainline Crash Analysis

The mainline analysis evaluated the SR 101L corridor within the project limits . A total of 928 crashes was reported between January 1, 2015 and December 31, 2019. The following is a summary of the mainline crash characteristics:

- Of the 928 crashes reported, 42% (390 crashes) occurred in the NB direction and 58% (538 crashes) occurred in the SB direction
- 675 crashes resulted in property damage only (73%), 250 resulted in injuries (27%) and 3 resulted in a fatality (<1%)
- 56% (522 crashes) were rear-end crashes, 21% (198 crashes) were sideswipe crashes, and 17% (154 crashes) were single vehicle/fixed object crashes. The remaining 6% of crashes involved less common manners of collision (e.g., angle, head-on, rear-to-side, other/unknown)
- 75% of the crashes occurred during daylight hours, 3% occurred at dusk or dawn, and the remaining 22% occurred during hours of darkness

Historical traffic count data was referenced to calculate crash rates, which are summarized for each segment in **Table 4.1**. The crash rates are depicted by year and by segment in **Figure 4.1** and **Figure 4.2**. The crash rates are expressed in terms of million vehicle miles (MVM).

Table 4.1 – SR 101L Mainline Crash Summary, 2015-2019

Freeway Segment	Segment Length (mi.)	Northbound SR 101L		Southbound SR 101L	
		No. of Crashes (Jan 2015 - Dec 2019)	*Crash Rate (Crashes/MVM)*	*No. of Crashes (Jan 2015 - Dec 2019)*	*Crash Rate (Crashes/MVM)*
Princess Drive/Pima Road to Frank Lloyd Wright Blvd	1.26	98	0.65	72	0.47
Frank Lloyd Wright Blvd to Raintree Drive	0.80	37	0.39	81	0.76
Raintree Drive to Cactus Road	1.40	105	0.57	229	1.04
Cactus Road to Shea Boulevard	1.08	150	0.89	156	0.85

The 2010 SR 101L Design Concept Report analyzed crash data from 2002 to 2006. The comparison of crash rates from the previous analysis is summarized in **Table 4.2**.

Table 4.2 – SR 101L Mainline Crash Rate Comparison to 2010 SR 101L Design Concept Report

Freeway Segment	Segment Length (mi.)	Northbound SR 101L Crash Rate (Crashes/MVM)		Southbound SR 101L Crash Rate (Crashes/MVM)	
		2002 - 2006	*2015 - 2019*	*2002 - 2006*	*2015 - 2019*
Princess Drive/Pima Road to Frank Lloyd Wright Blvd	1.26	0.51	0.65	0.54	0.47
Frank Lloyd Wright Blvd to Raintree Drive	0.80	0.44	0.39	0.72	0.76
Raintree Drive to Cactus Road	1.40	0.54	0.57	1.22	1.04
Cactus Road to Shea Boulevard	1.08	0.78	0.89	1.38	0.85
Weighted Average		**0.57**	**0.64**	**0.98**	**0.79**

Historical crash rates in Arizona were reviewed to compare to the values calculated in this analysis. Crash rate data was identified in the Arizona Motor Vehicle Crash Facts Report (published annually), the 2035 Maricopa Association of Governments (MAG) Regional Transportation Plan (2014), and in local crash rate reporting.

- The Arizona Motor Vehicle Crash Facts Reports (2014 to 2018) indicates a statewide crash rate based on the total number of crashes and the estimated number of vehicle miles traveled each year. This data includes crashes from all roadway types, from local roadways to interstate freeways. This data source provided an average crash rate of 1.88 crashes per MVM based on the five-year period of data from 2014 to 2018
- In 2010, citywide crash rate reports were prepared by the City of Scottsdale and the City of Phoenix. Scottsdale and Phoenix reported average segment crash rates of 1.63 crashes per MVM (2000 to 2008) and 2.24 crashes per MVM (2006 to 2010), respectively. This data represents arterial and collector roadways and does not include freeway segments. It is noted that freeway segments typically have lower crash rates than arterial segments, due to the nature of uninterrupted flow on freeways
- The 2035 MAG Regional Transportation Plan identified segment crash rates on various freeway corridors within the MAG region. The analysis evaluated crash data from 1999 to 2011 on the following freeway corridors: I-10, I-17, SR 51, SR 101L, SR 202L, and US 60. The average freeway segment crash rate ranged from 1.30 to 2.10 crashes per MVM. From 1999 to 2011, SR 101L had an average crash rate of approximately 1.36 crashes per MVM

The 2015 to 2019 SR 101L crash rates from Princess Drive to Shea Boulevard are generally lower than the other regional crash rates reviewed.

A spatial heat map of the SR 101L mainline crashes, based on crash frequency, is shown in **Figure 4.3**. During the 2015 to 2019 analysis period, the location of greatest crash frequency occurred on SR 101L between Thunderbird Road and Shea Boulevard. The crash trends observed on the spatial heat map are consistent with the crash summaries provided in **Table 4.1**.

Spatial maps of injury crashes along the SR 101L project limits are shown in **Figure 4.4** and **Figure 4.5**. Crashes that resulted in property damage only (no injury) are omitted from **Figure 4.4** and **Figure 4.5** to display patterns of more critical crashes. Further characteristics of the SR 101L mainline crash analysis are summarized in **Figure 4.6**.

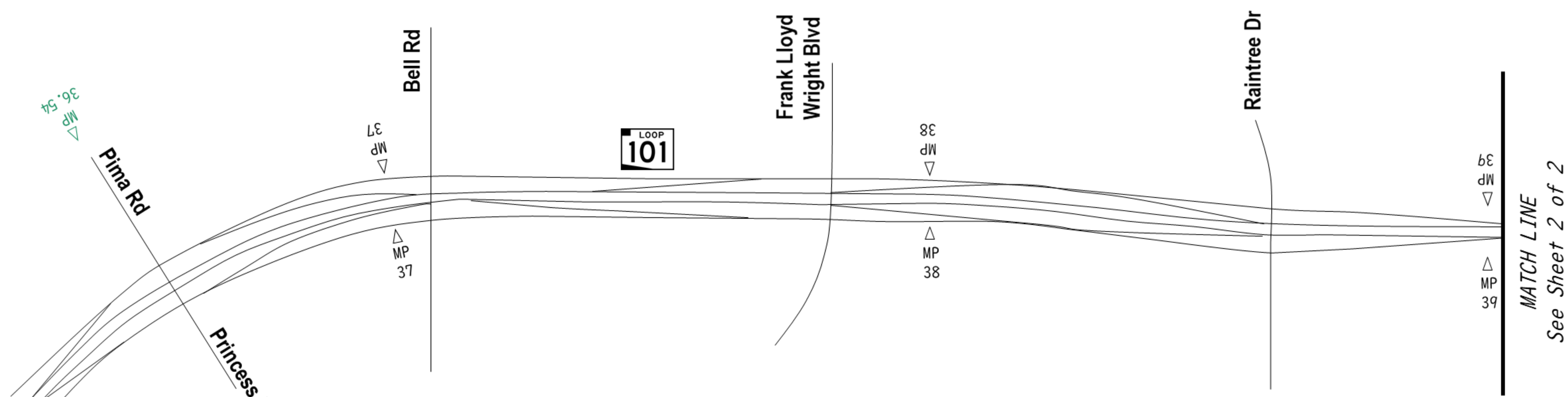
Widening SR 101L to four GPLs is expected to reduce crashes related to congestion, particularly on SR 101L NB south of Shea Boulevard where the segment currently tapers from four GPLs to three GPLs.

Northbound - MP 36.54 to MP 37.80

Year	AADT (NB)	No. of Crashes	Crash Rate
2015	58,378	10	0.37
2016	60,395	20	0.72
2017	66,141	27	0.89
2018	68,919	21	0.66
2019	70,751	20	0.61
Average	**64,917**	**19.6**	**0.65**

Northbound - MP 37.81 to MP 38.60

Year	AADT (NB)	No. of Crashes	Crash Rate
2015	58,776	8	0.47
2016	60,822	7	0.39
2017	66,935	9	0.46
2018	68,139	7	0.35
2019	69,854	6	0.29
Average	**64,905**	**7.4**	**0.39**



Southbound - MP 36.54 to MP 37.80

Year	AADT (SB)	No. of Crashes	Crash Rate
2015	60,532	18	0.65
2016	62,411	13	0.45
2017	68,908	16	0.50
2018	71,801	11	0.33
2019	73,488	14	0.41
Average	**67,428**	**14.4**	**0.47**

Southbound - MP 37.81 to MP 38.60

Year	AADT (SB)	No. of Crashes	Crash Rate
2015	65,830	13	0.68
2016	67,618	8	0.41
2017	74,358	17	0.78
2018	75,942	22	0.99
2019	77,830	21	0.92
Average	**72,316**	**16.2**	**0.76**

SR 101L
PRINCESS DRIVE TO SHEA BOULEVARD

NOT TO SCALE
SCHEMATIC ONLY

NOTES:
1. Crash data includes reported crashes on the SR 101L mainline from January 1 to December 31 of each year. Ramp crashes are not included.
2. The crash rate is calculated per million vehicle miles.

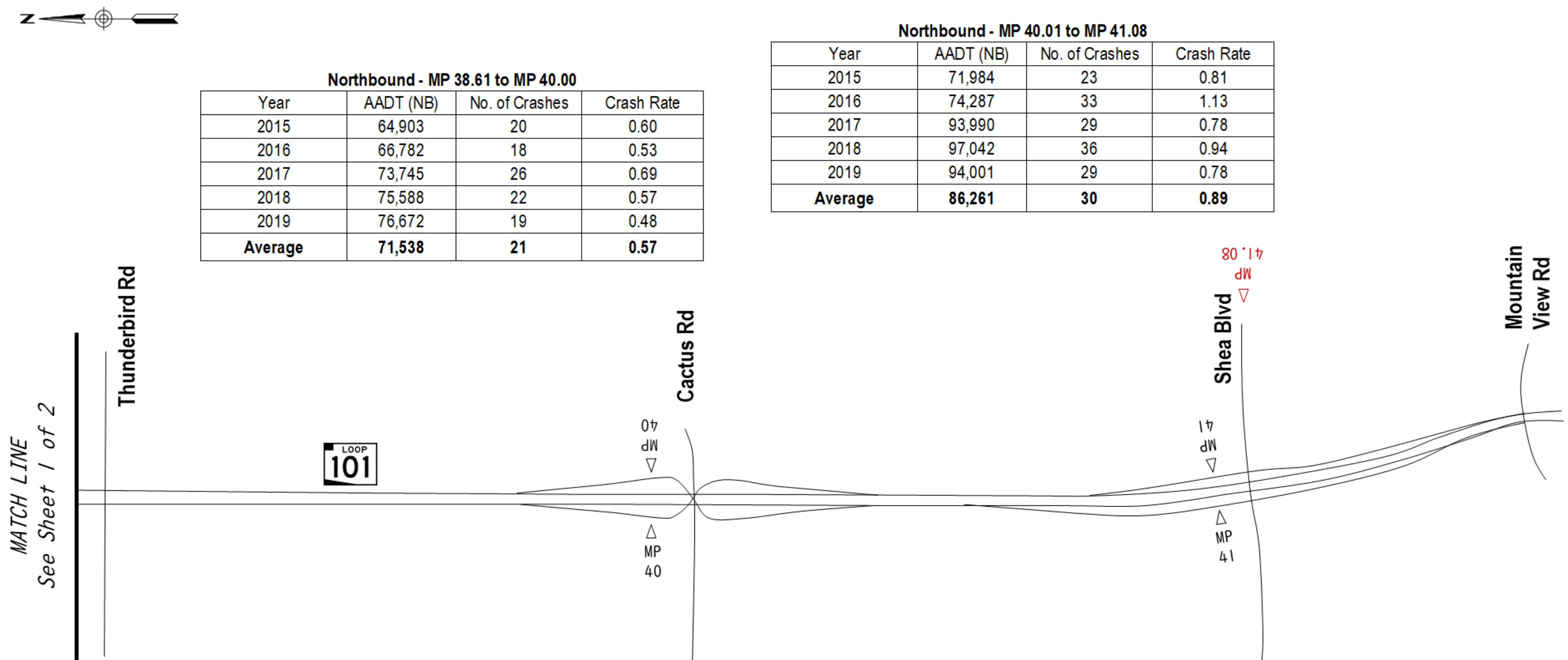
Figure 4.1 – SR 101L Mainline Crash Rate by Year, Princess Drive to Thunderbird Road, 2015-2019

Northbound - MP 38.61 to MP 40.00

Year	AADT (NB)	No. of Crashes	Crash Rate
2015	64,903	20	0.60
2016	66,782	18	0.53
2017	73,745	26	0.69
2018	75,588	22	0.57
2019	76,672	19	0.48
Average	**71,538**	**21**	**0.57**

Northbound - MP 40.01 to MP 41.08

Year	AADT (NB)	No. of Crashes	Crash Rate
2015	71,984	23	0.81
2016	74,287	33	1.13
2017	93,990	29	0.78
2018	97,042	36	0.94
2019	94,001	29	0.78
Average	**86,261**	**30**	**0.89**



Southbound - MP 38.61 to MP 40.00

Year	AADT (SB)	No. of Crashes	Crash Rate
2015	79,616	34	0.84
2016	81,532	49	1.18
2017	87,506	58	1.30
2018	89,124	43	0.94
2019	92,157	45	0.96
Average	**85,987**	**45.8**	**1.04**

Southbound - MP 40.01 to MP 41.08

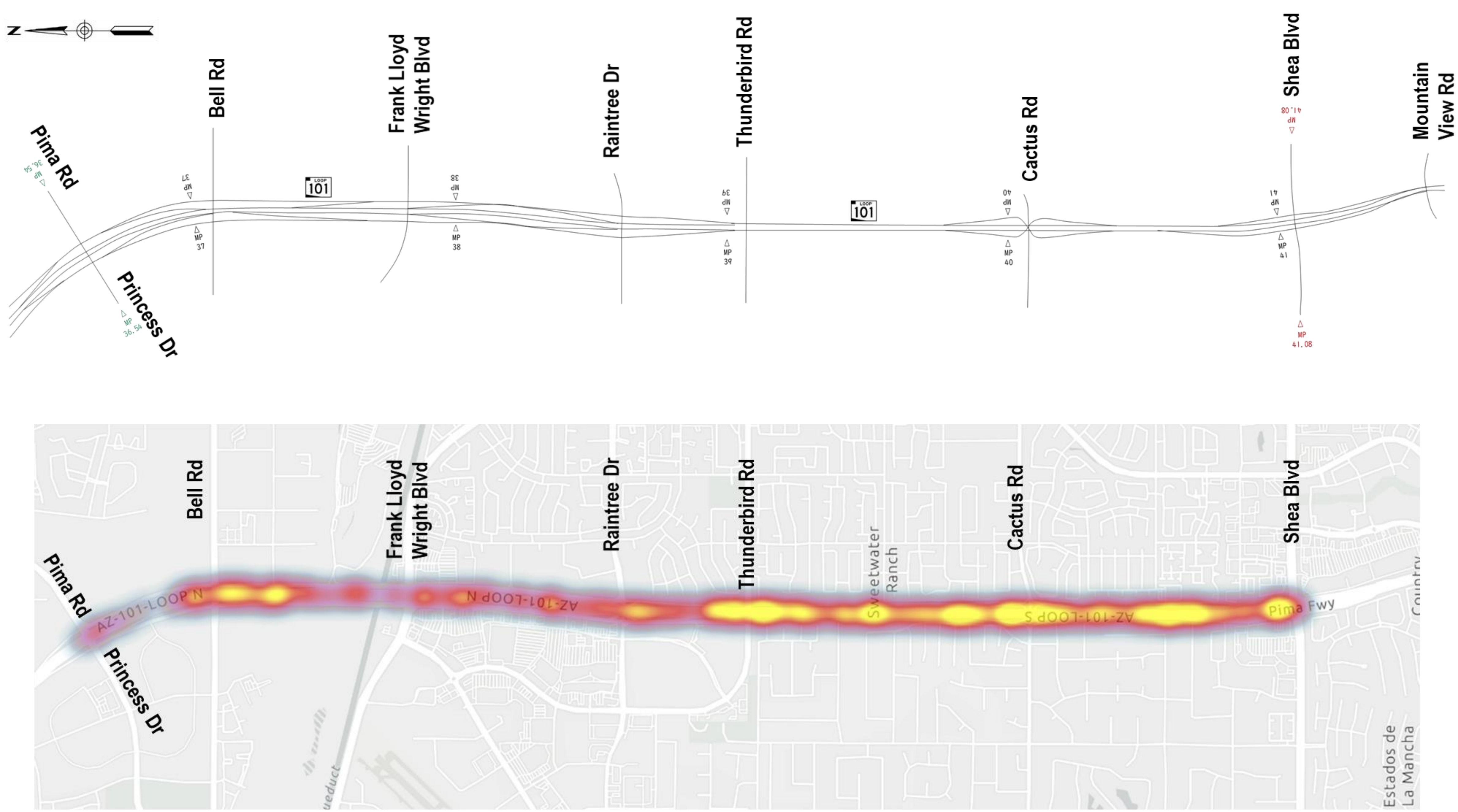
Year	AADT (SB)	No. of Crashes	Crash Rate
2015	87,745	41	1.19
2016	90,553	24	0.67
2017	94,131	26	0.70
2018	94,403	31	0.83
2019	102,230	34	0.84
Average	**93,812**	**31.2**	**0.85**

SR 101L
PRINCESS DRIVE TO SHEA BOULEVARD

NOT TO SCALE
SCHEMATIC ONLY

NOTES:
1. Crash data includes reported crashes on the SR 101L mainline from January 1 to December 31 of each year. Ramp crashes are not included.
2. The crash rate is calculated per million vehicle miles.

Figure 4.2 – SR 101L Mainline Crash Rate by Year, Thunderbird Road to Shea Boulevard, 2015-2019



SR 101L
PRINCESS DRIVE TO SHEA BOULEVARD

NOT TO SCALE
SCHEMATIC ONLY

NOTES:
1. Crash data includes reported crashes on the SR 101L mainline from January 1 to December 31 of each year. Ramp crashes are not included.

Figure 4.3 – SR 101L Mainline Crash Heat Map, 2015-2019

Possible Injury | Minor Injury | Serious Injury | Fatal

SR 101L
PRINCESS DRIVE TO SHEA BOULEVARD

NOT TO SCALE
SCHEMATIC ONLY

NOTES:
1. Crash data includes reported crashes on the SR 101L mainline from January 1 to December 31 of each year. Ramp crashes are not included.
2. Crashes that resulted in property damage only (no injury) were omitted from this diagram.

Figure 4.4 – SR 101L Mainline Crash Severity, Princess Drive to Thunderbird Road, 2015-2019

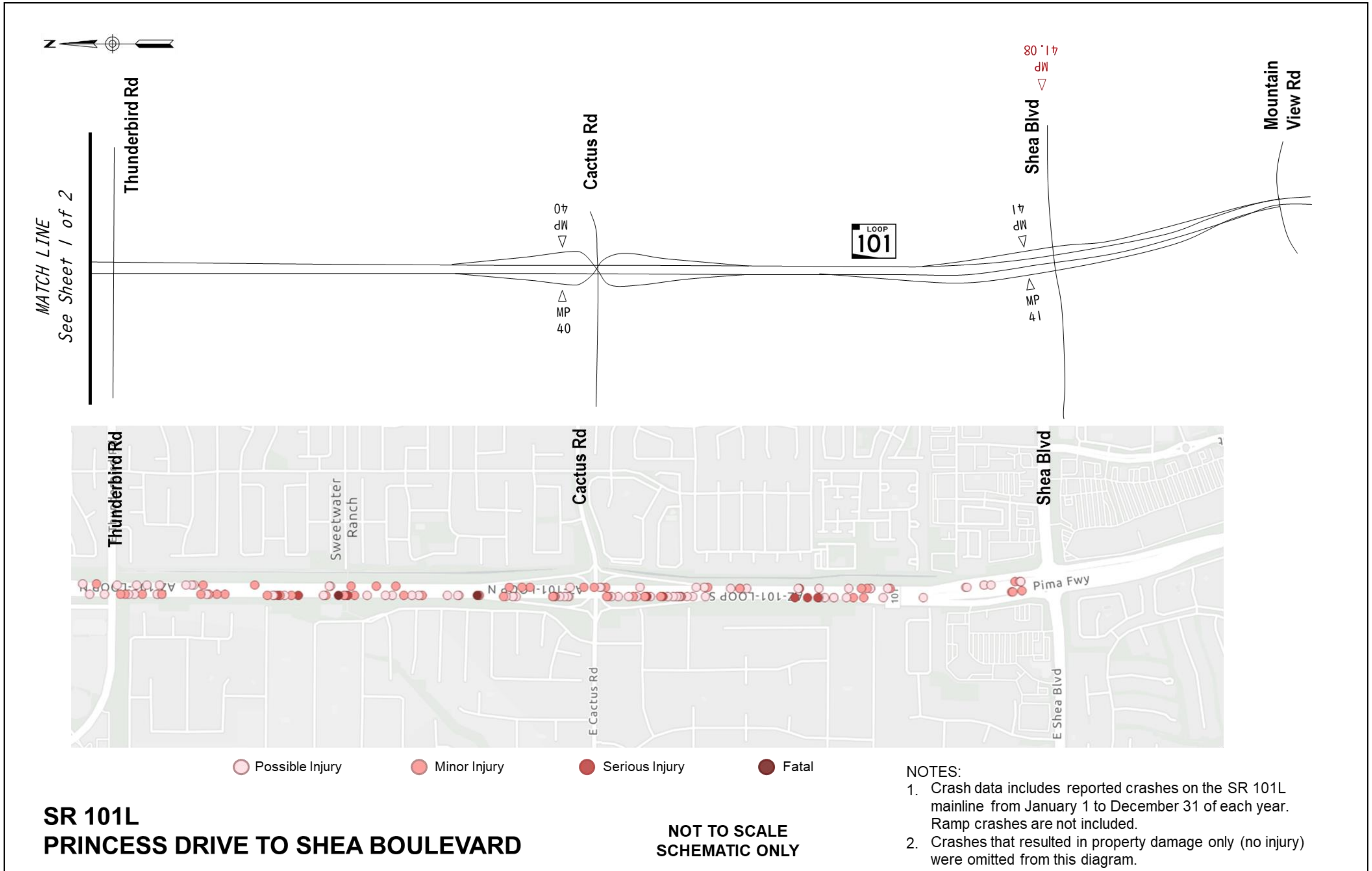


Figure 4.5 – SR 101L Mainline Crash Severity, Thunderbird Road to Shea Boulevard, 2015-2019

Figure 4.6 – SR 101L Mainline Crash Summary, 2015-2019

4.2 Traffic Interchange Crash Analysis

Historical crash data was evaluated at the Frank Lloyd Wright Boulevard, Raintree Drive, and Shea Boulevard TIs. For each interchange, the crash analysis area included the following:

- Frank Lloyd Wright Boulevard, Raintree Drive, and Shea Boulevard TIs: 300 feet west of the SR 101L SB ramps to 300 feet east of the SR 101L NB ramps
- SR 101L Ramps: within 300 feet north and south of the intersecting roadway

All offset measurements were taken from the centerline of roadway intersections. During the five-year crash analysis period, a total of 774 crashes occurred at the three TIs. Historical traffic count data from ADOT and the City of Scottsdale was referenced to calculate crash rates, which are summarized in **Table 4.3**. The crash rates of each TI are shown by year in **Figure 4.7** and are expressed in terms of Million Entering Vehicles (MEV).

Table 4.3 – SR 101L Traffic Interchange Crash Rates, 2015-2019

Traffic Interchange	Daily Entering Volume (Average, 2015-2019)	No. of Crashes (2015 - 2019)	Intersection Crash Rate (Crashes/MEV)
SR 101L / Frank Lloyd Wright Blvd	78,205	338	2.43
SR 101L / Raintree Drive	67,431	161	1.36
SR 101L / Shea Blvd	87,760	275	1.74

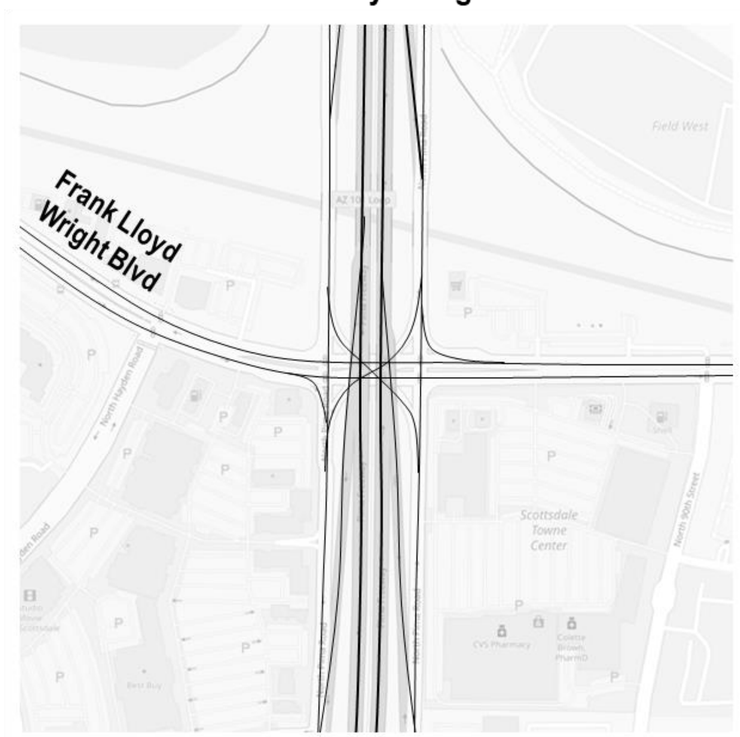
A spatial diagram of the crashes by collision manner is provided in **Figure 4.8**. at the Frank Lloyd Wright Boulevard, Raintree Drive, and Shea Boulevard TIs. Crash characteristics are summarized for these three TIs in **Figure 4.9**, **Figure 4.10**, and **Figure 4.11**, respectively, with aggregated results for all three TIs summarized below:

- Of the 774 crashes reported at the three traffic interchanges, 603 resulted in property damage only (78%), 168 resulted in injuries (22%) and 3 resulted in a fatality (<1%)
- 64% (496 crashes) were rear-end crashes, 15% (117 crashes) were sideswipe crashes, 11% (86 crashes) were angle crashes, 5% (35 crashes) were single vehicle/fixed object crashes, and 3% (23 crashes) were left-turn crashes. The remaining 2% of crashes involved less common manners of collision (e.g., head-on, rear-to-side, other/unknown)
- 84% of the crashes occurred during daylight hours, 3% occurred at dusk or dawn, and the remaining 13% occurred during hours of darkness

Expected safety characteristics of the TI configuration alternatives (No-Build and Improved SPUI, TDI, DRI) include the following:

- No-Build SPUI: contains 28 potential conflict points, including 12 crossing points, and prohibits wrong-way travel by signage
- Improved SPUI: contains 28 potential conflict points, including 12 crossing points, and prohibits wrong-way travel by signage; a slight reduction in the overall crash rate is expected due to a reduction in congestion from operational improvements
- TDI: contains 26 potential conflict points, including 10 crossing points, and prohibits wrong-way travel by signage; a slight reduction in the overall crash rate is expected due to a reduction in congestion from operational improvements; a moderate reduction in the severe crash rate is expected due to the reduced number of crossing points
- DRI: contains 38 potential conflict points, including 10 crossing points, and prohibits wrong-way travel by raised concrete islands; a moderate reduction in the overall crash rate is expected due to a significant reduction in congestion from operational improvements; a significant reduction in the severe crash rate is expected due to the reduced number of crossing points and lower operating speeds

SR 101L / Frank Lloyd Wright Boulevard



SR 101L / Raintree Drive

SR 101L / Shea Boulevard

SR 101L / Frank Lloyd Wright Boulevard			
Year	Daily Entering Volume	No. of Crashes	Crash Rate
2015	83,835	60	1.96
2016	80,240	66	2.25
2017	74,986	60	2.19
2018	75,773	66	2.39
2019	76,192	86	3.09
5-Year Weighted Average	**78,205**	**68**	**2.43**

SR 101L / Raintree Drive			
Year	Daily Entering Volume	No. of Crashes	Crash Rate
2015	72,646	31	1.17
2016	73,948	31	1.15
2017	62,278	24	1.06
2018	63,794	42	1.80
2019	64,489	33	1.40
5-Year Weighted Average	**67,431**	**32**	**1.36**

SR 101L / Shea Boulevard			
Year	Daily Entering Volume	No. of Crashes	Crash Rate
2015	85,221	62	1.99
2016	87,936	46	1.43
2017	86,416	55	1.74
2018	89,027	52	1.60
2019	90,200	60	1.82
5-Year Weighted Average	**87,760**	**55**	**1.74**

N

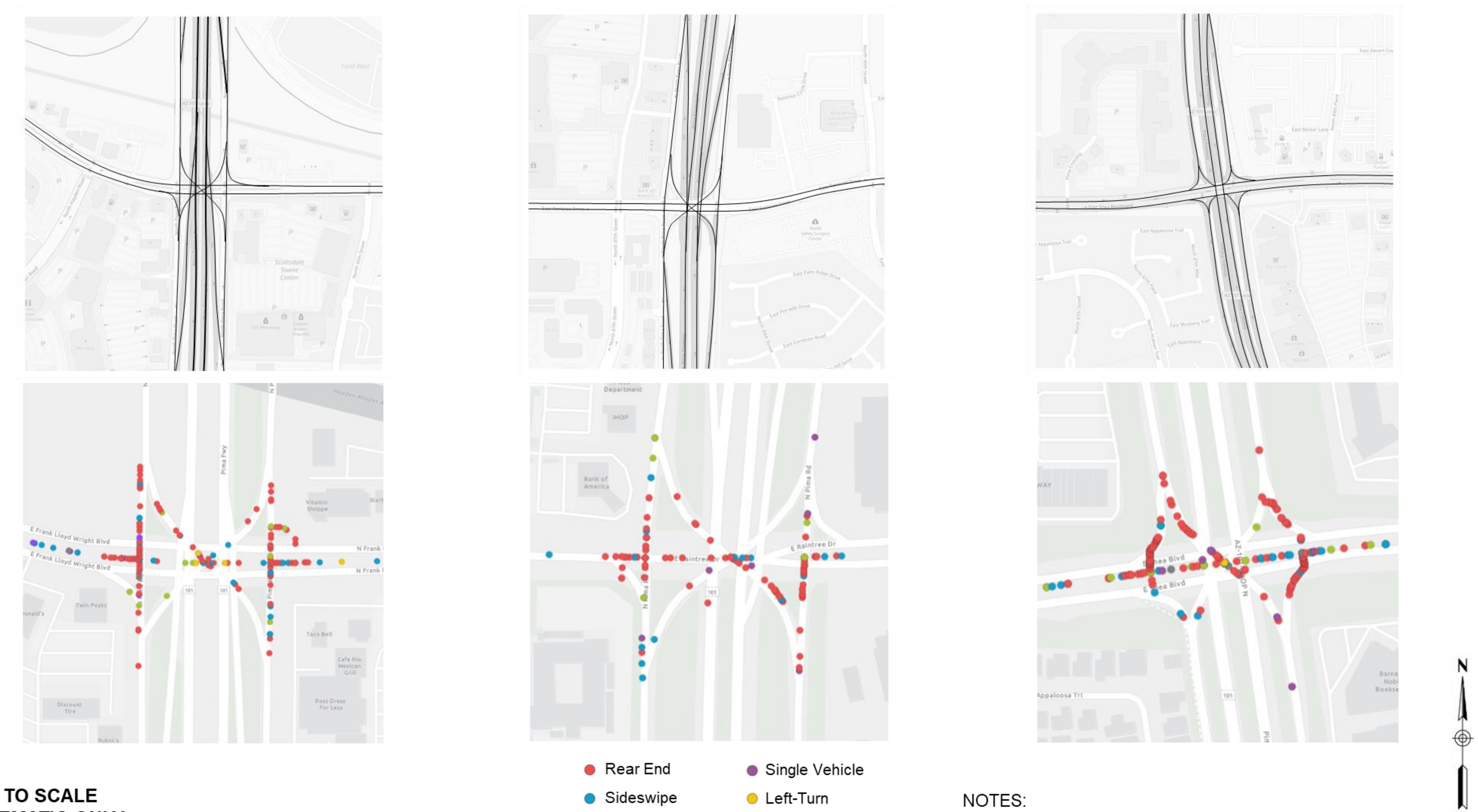
NOTES:
1. The crashes shown include all reported crashes on the freeway ramps and intersecting roadways within 300 feet of the ramp intersections.
2. The crash analysis includes crashes that occurred between January 1 to December 31 of each year.
3. The crash rate is calculated by million entering vehicles (MEV).

SR 101L TRAFFIC INTERCHANGES
FRANK LLOYD WRIGHT BLVD, RAINTREE DRIVE, AND SHEA BLVD

NOT TO SCALE
SCHEMATIC ONLY

Figure 4.7 – SR 101L Traffic Interchange Crash Rates, 2015-2019

SR 101L / Frank Lloyd Wright Boulevard | **SR 101L / Raintree Drive** | **SR 101L / Shea Boulevard**



- Rear End
- Sideswipe
- Angle
- Single Vehicle
- Left-Turn
- Other

NOT TO SCALE
SCHEMATIC ONLY

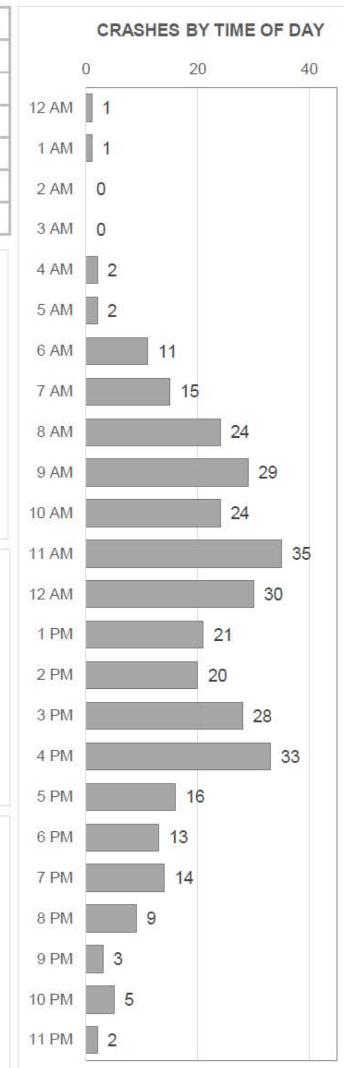
SR 101L TRAFFIC INTERCHANGES
FRANK LLOYD WRIGHT BLVD, RAINTREE DRIVE, AND SHEA BLVD

NOTES:
1. The crashes shown include all reported crashes on the freeway ramps and intersecting roadways within 300 feet of the ramp intersections.
2. The crash analysis includes crashes that occurred between January 1 to December 31 of each year.

Figure 4.8 – SR 101L Traffic Interchange Collision Manner Diagrams, 2015-2019

SR 101L / Frank Lloyd Wright Boulevard, 2015 - 2019

Injury Severity	Rear End	Sideswipe	Angle	Left-Turn	Single Vehicle	Other	Total
Fatal							0
Serious Injury	2		1		1		4
Minor Injury	14	3	8	5			30
Possible Injury	26	4	6	3	1		40
No Injury	166	45	30	7	9	7	264
Total	208	52	45	15	11	7	338



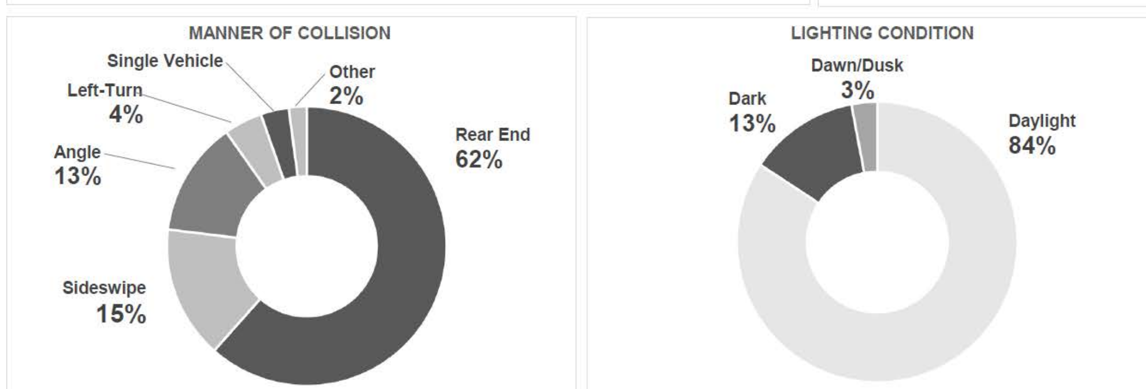
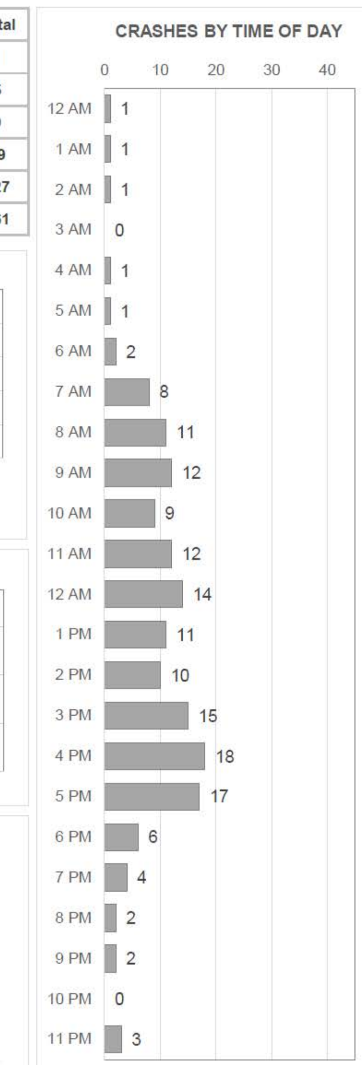
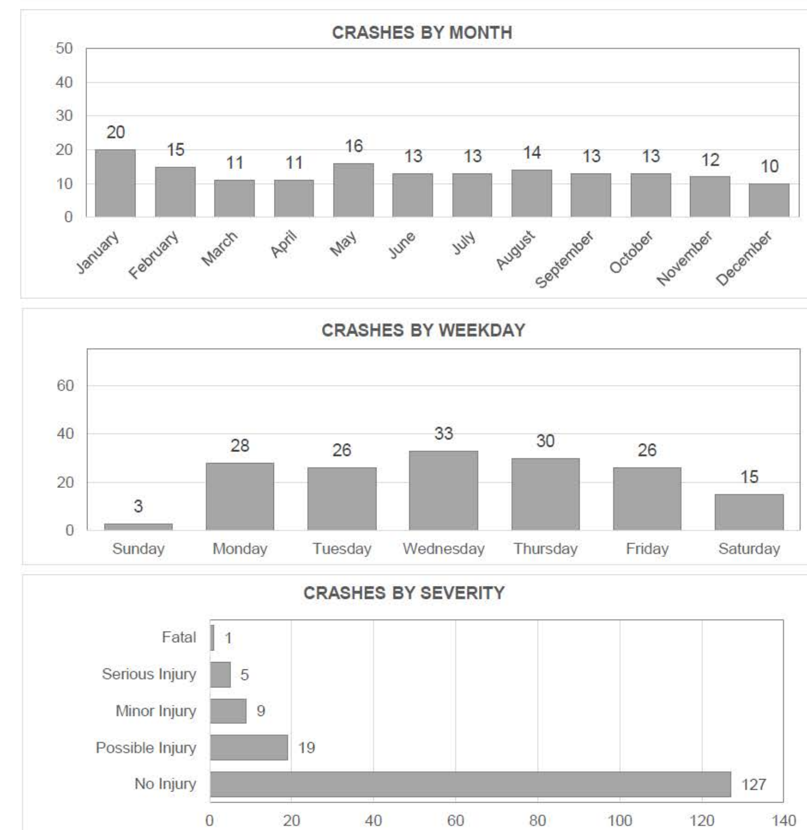


Figure 4.9 – Frank Lloyd Wright Blvd TI Crash Summary, 2015-2019

SR 101L / Raintree Drive, 2015 - 2019

Injury Severity	Rear End	Sideswipe	Angle	Left-Turn	Single Vehicle	Other	Total
Fatal					1		1
Serious Injury		1	2		2		5
Minor Injury	7	1	1				9
Possible Injury	12	1	4	1	1		19
No Injury	84	27	10	1	5		127
Total	103	30	17	2	9	0	161





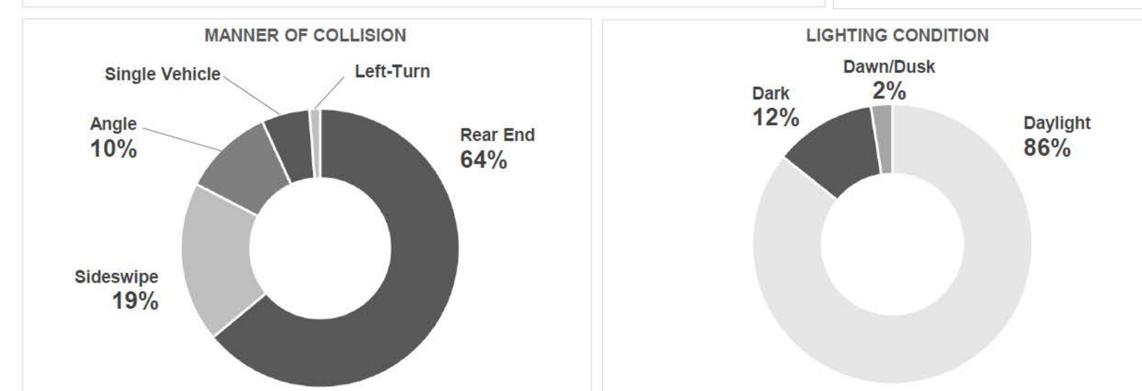
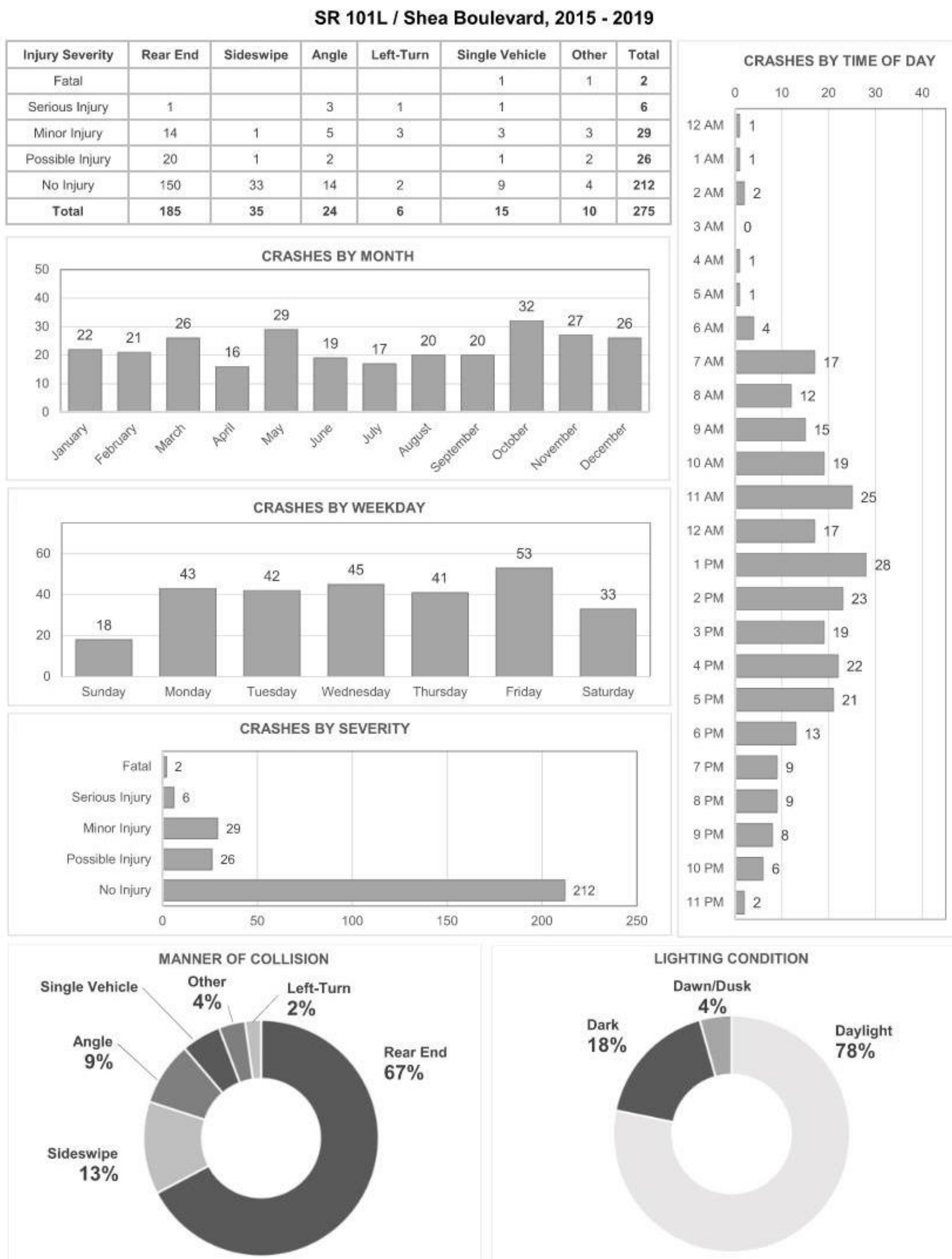


Figure 4.10 – Raintree Drive TI Crash Summary, 2015-2019



SR 101L / Shea Boulevard, 2015 - 2019

Injury Severity	Rear End	Sideswipe	Angle	Left-Turn	Single Vehicle	Other	Total
Fatal					1	1	2
Serious Injury	1		3	1	1		6
Minor Injury	14	1	5	3	3	3	29
Possible Injury	20	1	2		1	2	26
No Injury	150	33	14	2	9	4	212
Total	185	35	24	6	15	10	275

Figure 4.11 – Shea Boulevard TI Crash Summary, 2015-2019

4.3 Review of Previous Studies

The following studies conducted in the project limits were reviewed to summarize key safety findings and recommendations:

- SR 101L/Frank Lloyd Wright Blvd and SR 101L/Raintree Drive Road Safety Assessment (RSA) (May 2011)
- Raintree Drive Extension Design Concept Report: Scottsdale Road to SR 101L (June 2014)
- Traffic Alternatives Study: State Route 101L from Princess Drive to Raintree Drive (May 2017)

No prior relevant studies were identified that included safety findings and recommendations for the Shea Boulevard TI.

4.3.1 Frank Lloyd Wright Boulevard TI

The 2011 RSA recommended several minor improvements related to yield-compliance and bicycle/pedestrian safety, along with separating out the shared NB and SB left-turn/through lanes.

The 2017 Traffic Alternatives Study recommended that the Frank Lloyd Wright Boulevard TI be converted to a TDI. The 2011 RSA indicated that converting the Frank Lloyd Wright Boulevard TI to a TDI should be given consideration. The conversion from a SPUI to a TDI is anticipated to address or improve the following safety issues identified in the Road Safety Assessment:

- High-speed eastbound (EB) and westbound (WB) right-turns onto the frontage road/Pima Road due to roadway geometry
- High-speed merging section of multiple movements at the entrance to the SR 101 NB and SB on-ramps
- Driver yielding and pedestrian conflicts in the crosswalks spanning the channelized EB and WB right-turn lanes
- The need for additional EB and WB left-turn lane storage length/capacity
- U-turns from the outer lane of the NB and SB dual left-turn lanes due to driver confusion
- Skewed north-south crosswalks
- Narrow pedestrian refuge area within the north-south crosswalks

4.3.2 Raintree Drive TI

Recommendations provided for the Raintree Drive TI included:

- The 2017 Traffic Alternatives Study recommended the addition of a WB right-turn lane
- The 2017 Traffic Alternatives Study recommended improved NB on-ramp pavement markings at the Raintree Drive TI. The recommendation to improve the NB on-ramp pavement markings was also discussed in the 2011 Road Safety Assessment. As the dual EB left-turn lanes transition to the NB frontage road/Pima Road, a lane reduction creates a merge section approximately 100 feet north of the intersection. The left-side lane reduction causes the inside left-turn lane to merge with the outside left-turn lane. In addition to the immediate merge of EB left-turning vehicles, a potential conflict exists as WB right-turning vehicles enter the merge section, and often merge into the left lane in anticipation of entering the freeway on-ramp farther north. Based on the roadway geometry and multiple merge conditions, the 2011 Road Safety Assessment recommended pavement marking and/or geometric improvements to this area
- The 2011 RSA recommended several minor improvements related to yield-compliance and bicycle/pedestrian safety, including widening the pedestrian refuge area within the north-south crosswalks
- The 2011 RSA recommended consideration of strategies to reduce driver confusion of stopping locations at the SPUI. Vehicles occasionally enter the intersection before realizing they need to stop due to a red signal indication. The 2011 RSA recommended evaluating the existing pavement markings within the intersection to give more visual cues of the intersection and the appropriate stopping positions on the interchange approaches

5.0 Freeway Operational Analysis

5.1 Analysis Methodology

An operational analysis was performed for the GPLs and ramp merge/diverge areas of SR 101L within the project limits. HOV lanes were excluded to simplify the analysis, although a preliminary review indicated they should operate below capacity through 2040. The operational analysis was conducted for the 2020 Existing, 2040 Baseline/No-Build, and 2040 Improved/Build scenarios.

The VISSIM microscopic traffic simulation software was used to provide a simulation of traffic conditions on the freeway within the project limits. VISSIM can provide measures of effectiveness for each link within the network. Average vehicle density results from VISSIM were used as the measure of effectiveness to come up with a level of service (LOS) for each analysis segment. Average vehicle speed results from VISSIM were also noted. VISSIM uses random seeds to better match how traffic congestion levels change slightly every day, so ten model runs were conducted and then averaged together to provide the VISSIM model results.

The concept of LOS uses qualitative measures that characterize operational conditions for roadway segments. They are given letter designations from LOS A to LOS F, with LOS A representing uncongested free-flow conditions and LOS F representing an overcapacity condition with a high degree of congestion and vehicle delay. Each LOS grade represents a range of operational conditions.

Table 5.1 shows the average freeway vehicle density ranges that correspond with each segment LOS letter grade for urban conditions. ADOT considers LOS D or better “acceptable” LOS for freeway operations in urban conditions.

Table 5.1 – Freeway Segment Vehicle Density Ranges and Level of Service

Level of Service	Urban Density Range (vehicles/mile/lane)
A	≤ 11
B	> 11 and ≤ 18
C	> 18 and ≤ 26
D	> 26 and ≤ 35
E	> 35 and ≤ 45
F	> 45 v/c ratio > 1.0

Definitions provided from the Highway Capacity Manual (HCM), Exhibit 12-15, Transportation Research Board (TRB), 2016.

5.2 2020 Existing Freeway Traffic Conditions

The 2020 Existing freeway mainline operational analysis was based on the existing lane geometries and configurations of the existing freeway as described in Section 2.0 of this document. The VISSIM-modeled average vehicle speed, vehicle density, and corresponding LOS for each segment and peak hour for the 2020 Existing scenario are presented in **Table 5.2**, with the corresponding VISSIM output reports provided in **Appendix 3**.

Per the 2020 Existing freeway mainline LOS analysis, all freeway segments within the project limits operate at LOS D or better during the 2020 AM and PM peak hours except for the NB segment between Shea Boulevard and the Shea Boulevard NB on-ramp (LOS E in AM), the NB Shea Boulevard on-ramp merge segment (LOS E in AM and PM), and the NB Frank Lloyd Wright Boulevard on-ramp merge segment (LOS F in PM). The highest density in the project limits is 50 vehicles per mile per lane (vpmpl), which occurs at the NB Frank Lloyd Wright Boulevard on-ramp merge segment in the PM peak hour. These results indicate most of the freeway segments in the project limits currently provide acceptable freeway traffic operations but there are a few locations with significant congestion.

Table 5.2 – 2020 Existing Freeway Mainline Level of Service by Segment

Mainline Segment	2020 Existing					
	AM Peak Hour			PM Peak Hour		
	Speed (mph)	Density (vpmpl)	LOS	Speed (mph)	Density (vpmpl)	LOS
Loop 101 Southbound						
West of Hayden EB On-Ramp	59	35	LOS D	62	24	LOS C
Hayden On-Ramp Merge	64	25	LOS C	66	18	LOS C
Between Hayden On-Ramp & Princess On-Ramp	65	28	LOS D	66	20	LOS C
Princess Drive On-Ramp Merge	59	30	LOS D	59	23	LOS C
Between Princess Dr On-Ramp & FLW Off-Ramp	60	30	LOS D	63	22	LOS C
Between FLW Off-Ramp & Raintree Off-Ramp	60	26	LOS C	66	18	LOS B
Between Raintree Off-Ramp & FLW On-Ramp	65	27	LOS D	66	22	LOS C
FLW On-Ramp Merge	61	23	LOS C	61	21	LOS C
Between FLW On-Ramp & Raintree On-Ramp	65	24	LOS C	66	22	LOS C
Raintree On-Ramp Merge	60	29	LOS D	48	32	LOS D
Between Raintree On-Ramp & Cactus Road On-Ramp	65	31	LOS D	56	33	LOS D
Cactus Road On-Ramp Merge	65	27	LOS D	64	27	LOS D
Between Cactus Road On-Ramp and Shea Blvd On-Ramp	66	21	LOS C	66	23	LOS C
Shea Blvd On-Ramp Merge	61	30	LOS D	64	27	LOS D
Loop 101 Northbound						
Between Shea Blvd & Shea Blvd On-Ramp	50	36	LOS E	55	35	LOS D
Shea Blvd On-Ramp Merge	49	39	LOS E	48	39	LOS E
Between Cactus Rd Off-Ramp & On-Ramp	61	34	LOS D	61	33	LOS D
Cactus Road On-Ramp Merge	60	22	LOS C	61	20	LOS C
Between Cactus Road On-Ramp & Raintree On-Ramp	60	22	LOS C	63	24	LOS C
Raintree On-Ramp Merge	65	21	LOS C	62	21	LOS C
Between Raintree On-Ramp and FLW On-Ramp	66	17	LOS B	65	21	LOS C
FLW On-Ramp Merge	62	19	LOS C	46	50	LOS F
Between FLW On-Ramp and Princess Drive On-Ramp	66	21	LOS C	65	25	LOS C
Princess Drive On-Ramp Merge	65	18	LOS B	63	23	LOS C
West of Princess Drive	66	21	LOS C	65	26	LOS C

5.3 2040 Baseline/No-Build Freeway Traffic Conditions

An analysis was completed using the 2040 Baseline/No-Build freeway mainline volumes and geometry, as described in Section 3.0 of this document. The VISSIM-modeled average vehicle speed, vehicle density, and corresponding LOS for each segment and peak hour for the 2040 Baseline/No-Build scenario are presented in **Table 5.3**, with the corresponding VISSIM output reports provided in **Appendix 3**.

Per the 2040 Baseline/No-Build freeway mainline LOS analysis, only about half of the freeway segments within the project limits are expected to operate at LOS D or better in the 2040 AM and PM peak hours. The highest density in the project limits is 116 vpmpl, which occurs at the SB Frank Lloyd Wright Boulevard on-ramp merge segment in the PM peak hour. These results indicate many of the segments in the project limits will likely experience significant congestion by 2040 if no additional GPLs are provided.

Table 5.3 – 2040 Baseline/No-Build Freeway Mainline Level of Service by Segment

Mainline Segment	2040 No-Build					
	AM Peak Hour			PM Peak Hour		
	Speed (mph)	Density (vpmpl)	LOS	Speed (mph)	Density (vpmpl)	LOS
Loop 101 Southbound						
West of Hayden EB On-Ramp	27	81	LOS F	60	31	LOS D
Hayden On-Ramp Merge	52	34	LOS D	65	22	LOS C
Between Hayden On-Ramp & Princess On-Ramp	60	34	LOS D	60	24	LOS C
Princess Drive On-Ramp Merge	53	37	LOS E	40	41	LOS E
Between Princess Dr On-Ramp & FLW Off-Ramp	49	41	LOS E	33	50	LOS F
Between FLW Off-Ramp & Raintree Off-Ramp	37	50	LOS F	20	69	LOS F
Between Raintree Off-Ramp & FLW On-Ramp	25	78	LOS F	15	102	LOS F
FLW On-Ramp Merge	18	86	LOS F	11	116	LOS F
Between FLW On-Ramp & Raintree On-Ramp	20	81	LOS F	13	111	LOS F
Raintree On-Ramp Merge	27	61	LOS F	22	74	LOS F
Between Raintree On-Ramp & Cactus Road On-Ramp	64	34	LOS D	52	35	LOS D
Cactus Road On-Ramp Merge	60	31	LOS D	64	27	LOS D
Between Cactus Road On-Ramp and Shea Blvd On-Ramp	65	26	LOS C	66	23	LOS C
Shea Blvd On-Ramp Merge	53	39	LOS E	64	27	LOS D
Loop 101 Northbound						
Between Shea Blvd & Shea Blvd On-Ramp	14	112	LOS F	24	89	LOS F
Shea Blvd On-Ramp Merge	35	58	LOS F	38	57	LOS F
Between Cactus Rd Off-Ramp & On-Ramp	59	37	LOS E	59	37	LOS E
Cactus Road On-Ramp Merge	59	26	LOS C	60	25	LOS C
Between Cactus Road On-Ramp & Raintree On-Ramp	59	24	LOS C	60	29	LOS D
Raintree On-Ramp Merge	63	21	LOS C	58	28	LOS D
Between Raintree On-Ramp and FLW On-Ramp	66	19	LOS C	59	29	LOS D
FLW On-Ramp Merge	59	23	LOS C	46	51	LOS F
Between FLW On-Ramp and Princess Drive On-Ramp	65	24	LOS C	64	29	LOS D
Princess Drive On-Ramp Merge	64	20	LOS C	61	27	LOS D
West of Princess Drive	65	25	LOS C	63	31	LOS D

5.4 2040 Improved/Build Freeway Traffic Conditions

An analysis was completed using the 2040 Improved/Build freeway mainline volumes and geometry, as described in Section 3.0 of this document. The VISSIM-modeled average vehicle speed, vehicle density, and corresponding LOS for each segment and peak hour for the 2040 Improved/Build scenario are presented in **Table 5.4**, with the corresponding VISSIM output reports provided in **Appendix 3**.

Per the 2040 Improved/Build freeway mainline LOS analysis, all freeway segments within the project limits are expected to operate at LOS D or better in the 2040 AM and PM peak hours except for the NB Shea Boulevard on-ramp merge segment (LOS E in AM and PM). The highest density in the project limits is 38 vpmpl, which occurs at the NB Shea Boulevard on-ramp merge segment in the PM peak hour. These results indicate that the addition of one GPL lane in each direction will generally provide acceptable freeway traffic operations through 2040, with some congestion present at the NB Shea Boulevard on-ramp merge segment in the PM peak hour. If LOS D or better is desired for all mainline segments in 2040 during all time periods, additional improvements would be required at the NB Shea Boulevard on-ramp merge segment.

Table 5.4 – 2040 Improved/Build Freeway Mainline Level of Service by Segment

Mainline Segment	2040 Improved/Build					
	AM Peak Hour			PM Peak Hour		
	Speed (mph)	Density (vpmpl)	LOS	Speed (mph)	Density (vpmpl)	LOS
Loop 101 Southbound						
West of Hayden EB On-Ramp	60	33	LOS D	62	24	LOS C
Hayden On-Ramp Merge	64	26	LOS C	66	19	LOS C
Between Hayden On-Ramp & Princess On-Ramp	65	27	LOS D	67	20	LOS C
Princess Drive On-Ramp Merge	60	29	LOS D	62	22	LOS C
Between Princess Dr On-Ramp & FLW Off-Ramp	58	31	LOS D	62	22	LOS C
Between FLW Off-Ramp & Raintree Off-Ramp	58	28	LOS D	65	18	LOS B
Between Raintree Off-Ramp & FLW On-Ramp	65	26	LOS C	67	21	LOS C
FLW On-Ramp Merge	62	23	LOS C	62	22	LOS C
Between FLW On-Ramp & Raintree On-Ramp	65	24	LOS C	65	22	LOS C
Raintree On-Ramp Merge	59	29	LOS D	56	25	LOS C
Between Raintree On-Ramp & Cactus Road On-Ramp	65	30	LOS D	65	30	LOS D
Cactus Road On-Ramp Merge	63	28	LOS D	64	26	LOS C
Between Cactus Road On-Ramp and Shea Blvd On-Ramp	66	22	LOS C	67	22	LOS C
Shea Blvd On-Ramp Merge	60	30	LOS D	65	25	LOS C
Loop 101 Northbound						
Between Shea Blvd & Shea Blvd On-Ramp	60	31	LOS D	52	34	LOS D
Shea Blvd On-Ramp Merge	61	37	LOS E	51	38	LOS E
Between Cactus Rd Off-Ramp & On-Ramp	62	33	LOS D	62	33	LOS D
Cactus Road On-Ramp Merge	53	28	LOS D	57	25	LOS C
Between Cactus Road On-Ramp & Raintree On-Ramp	56	25	LOS C	63	25	LOS C
Raintree On-Ramp Merge	64	18	LOS B	63	23	LOS C
Between Raintree On-Ramp and FLW On-Ramp	66	18	LOS B	65	22	LOS C
FLW On-Ramp Merge	62	21	LOS C	60	26	LOS C
Between FLW On-Ramp and Princess Drive On-Ramp	66	21	LOS C	65	24	LOS C
Princess Drive On-Ramp Merge	65	19	LOS C	63	23	LOS C
West of Princess Drive	66	21	LOS C	65	26	LOS C

6.0 Traffic Interchange Operational Analysis

6.1 Analysis Methodology

An operational analysis was performed for all freeway ramp/arterial roadway intersections at the Frank Lloyd Wright, Raintree Drive, and Shea Boulevard TIs, as well as at the Raintree Drive and 87th Street intersection. The operational analysis was conducted for the 2020 Existing, 2040 Baseline/No-Build, and 2040 Improved/Build scenarios.

The VISSIM microscopic traffic simulation software was used to provide a simulation of traffic conditions at the TIs. Ten model runs were conducted and then averaged together to provide the VISSIM model results. Intersections were analyzed in VISSIM using the 2016 HCM methodology. For the double-roundabouts interchange alternative at the Raintree Drive TI, the RODEL analysis software was used to model the LOS, delay, and queues.

Similar to roadway segment LOS, each intersection, approach, or movement is given a letter designation from LOS A to LOS F, with LOS A representing uncongested free-flow conditions and LOS F representing an overcapacity condition with a high degree of congestion and vehicle delay. Each LOS grade represents a range of operational conditions.

Table 6.1 shows the average vehicle delay ranges for both signalized and unsignalized intersections that correspond with each LOS letter grade, along with average vehicle delay ranges and corresponding LOS letter grades for diamond TIs (for the TDI alternative), which are effectively two closely-spaced intersections that act as one. ADOT considers LOS D or better "acceptable" LOS for overall TI and intersection operations in urban conditions. Average vehicle queues in VISSIM that do not exceed available storage or do not block upstream driveways/intersections are generally considered to have acceptable queue lengths.

Table 6.1 – Average Vehicle Delay Ranges and Corresponding Level of Service

Level of Service	Average Delay Range (seconds/vehicle)		
	Diamond Interchanges	Signalized Intersections	Unsignalized Intersections
A	≤ 15	≤ 10	≤ 10
B	> 15 and ≤ 30	> 10 and ≤ 20	> 10 and ≤ 15
C	> 30 and ≤ 55	> 20 and ≤ 35	> 15 and ≤ 25
D	> 55 and ≤ 85	> 35 and ≤ 55	> 25 and ≤ 35
E	> 85 and ≤ 120	> 55 and ≤ 80	> 35 and ≤ 50
F	> 120	> 80	> 50

1. Definitions for diamond interchanges provided from the HCM, Exhibit 23-10, TRB, 2016.
2. Definitions for signalized intersections provided from the HCM, Exhibit 19-8, TRB, 2016.
3. Definitions for unsignalized intersections provided from the HCM, Exhibit 20-2, TRB, 2016.

6.2 2020 Existing TI/Intersection Traffic Conditions

The 2020 Existing TI/intersection operational analysis was based on the existing lane geometries and configurations of the existing TIs/intersections as described in Section 2.0 of this document. Current signal timings were provided by the City of Scottsdale, which include a 120-second cycle length for all analyzed intersections. The VISSIM-modeled delay, corresponding LOS, and queues at the project TIs/intersections for the 2020 Existing scenario are presented in **Table 6.2** for the AM peak hour and in **Table 6.3** for the PM peak hour, with the corresponding VISSIM output reports provided in **Appendix 4**.

Table 6.2 – 2020 Existing TI/Intersection Analysis Results: AM Peak Hour

Intersection	NB Approach				SB Approach				EB Approach			WB Approach			Total
	L	T	R	U	L	T	R	U	L	T	R	L	T	R	
Frank Lloyd Wright & Loop 101															
LOS	E	D	C	-	D	F	B	-	F	D	B	E	D	B	D
Delay (sec)	65	50	33	-	52	93	15	-	125	38	13	66	45	14	51
Avg. Queue (ft)	164	89	86	-	94	144	143	-	493	137	46	65	89	53	-
Raintree Drive & Loop 101															
LOS	F	C	C	F	E	F	F	E	D	D	A	E	D	C	F
Delay (sec)	150	32	21	152	60	117	286	64	52	53	7	63	40	22	92
Avg. Queue (ft)	889	801	683	889	250	1208	1208	250	43	36	11	168	85	36	-
Raintree Drive & 87th Street															
LOS	D	D	A	-	D	D	C	-	B	A	A	A	A	A	A
Delay (sec)	52	50	7	-	51	54	27	-	11	5	2	6	2	1	7
Avg. Queue (ft)	4	4	3	-	13	29	45	-	166	166	166	190	217	67	-
Shea Boulevard & Loop 101															
LOS	D	-	A	-	D	-	B	-	D	C	B	F	C	B	C
Delay (sec)	36	-	4	-	46	-	13	-	43	29	14	86	29	20	35
Avg. Queue (ft)	51	-	3	-	131	-	4	-	48	62	35	465	47	285	-

The Frank Lloyd Wright Boulevard TI currently operates at LOS D overall in the AM peak hour. The EB left-turn (EBL) queue of 493' exceeds the 185' of available storage, impacting EB through (EBT) operations.

The Raintree Drive TI currently operates at LOS F overall in the AM peak hour. The NB left-turn (NBL) and U-turn (NBU) queue of 889' exceeds the 475' of available storage, impacting NB through (NBT) operations. The SB through (SBT) and right-turn (SBR) queue of 1,208' blocks upstream driveways and intersections, impacting upstream operations. The WB right-turn (WBR) queue of 36' exceeds the 25' of available storage, impacting WB through (WBT) operations.

The Raintree Drive and 87th Street intersection currently operates at LOS A overall in the AM peak hour. The EBL and EB right-turn (EBR) queues of 166' exceed the 125' and 120' of available storage, respectively, impacting EBT operations. The WB left-turn (WBL) queue of 190' exceeds the 60' of available storage, impacting WBT operations.

The Shea Boulevard TI currently operates at LOS C overall in the AM peak hour. The WBL queue of 465' exceeds the 275' of available storage, impacting WBT operations. The WBR queue of 285' exceeds the 130' of available storage, impacting WBT operations.

These results indicate the Raintree Drive TI does not provide acceptable overall LOS in the 2020 Existing AM peak hour. The other project TIs/intersections provide acceptable overall LOS in the 2020 Existing AM peak hour. There are a few locations/movements that have congestion and queuing issues.

Table 6.3 – 2020 Existing TI/Intersection Analysis Results: PM Peak Hour

Intersection	NB Approach				SB Approach				EB Approach			WB Approach			Total
	L	T	R	U	L	T	R	U	L	T	R	L	T	R	
Frank Lloyd Wright & Loop 101															
LOS	F	D	C	-	D	F	B	-	E	E	D	F	E	B	E
Delay (sec)	99	45	27	-	44	85	16	-	59	60	51	377	57	14	68
Avg. Queue (ft)	244	80	76	-	93	197	194	-	74	349	344	715	311	32	-
Raintree Drive & Loop 101															
LOS	D	D	D	D	D	D	B	D	E	E	D	F	E	D	E
Delay (sec)	42	53	40	43	43	40	15	42	60	57	43	156	74	51	60
Avg. Queue (ft)	65	108	140	65	34	42	35	34	103	105	354	574	372	253	-
Raintree Drive & 87th Street															
LOS	F	F	F	-	F	E	D	-	D	F	E	B	A	A	F
Delay (sec)	214	224	699	-	157	74	45	-	46	102	80	16	2	1	87
Avg. Queue (ft)	7	4	1638	-	104	18	28	-	6	942	942	0	6	0	-
Shea Boulevard & Loop 101															
LOS	D	-	A	-	D	-	B	-	D	C	A	E	C	E	C
Delay (sec)	44	-	5	-	44	-	11	-	47	24	9	57	29	62	35
Avg. Queue (ft)	97	-	5	-	111	-	0	-	58	52	21	366	311	1083	-

The Frank Lloyd Wright Boulevard TI currently operates at LOS E overall in the PM peak hour. The EBR queue of 344 exceeds the 175' of available storage, impacting EBT operations. The WBL queue of 715' exceeds the 245' of available storage, impacting WBT operations.

The Raintree Drive TI currently operates at LOS E overall in the PM peak hour. The EBR queue of 354' exceeds the 250' of available storage, impacting EBT operations. The WBL queue of 574' exceeds the 210' of available storage, impacting WBT operations. The WBR queue of 253' exceeds the 25' of available storage, impacting WBT operations.

The Raintree Drive and 87th Street intersection currently operates at LOS F overall in the PM peak hour. The NB right-turn (NBR) queue of 1,638' blocks upstream driveways and intersections, impacting upstream operations. The EBT and EBR queue of 942' blocks an upstream intersection, impacting upstream operations.

The Shea Boulevard TI currently operates at LOS C overall in the PM peak hour. The WBL queue of 366' exceeds the 275' of available storage, impacting WBT operations. The WBR queue of 1,083' exceeds the 130' of available storage, impacting WBT operations.

These results indicate the Frank Lloyd Wright Boulevard TI, Raintree Drive TI, and Raintree Drive and 87th Street intersection do not provide acceptable overall LOS in the 2020 Existing PM peak hour. The Shea Boulevard TI provides acceptable overall LOS in the 2020 Existing PM peak hour. There are a few locations/movements that have congestion and queuing issues.

6.3 2040 Baseline/No-Build TI/Intersection Traffic Conditions

An analysis was completed of the project TIs/intersections using the 2040 Baseline/No-Build volumes and geometry as described in Section 3.0 of this document. The VISSIM-modeled delay, corresponding LOS, and queues at the project TIs/intersections for the 2040 Baseline/No-Build scenario are presented in **Table 6.4** for the AM peak hour and in **Table 6.5** for the PM peak hour, with the corresponding VISSIM output reports provided in **Appendix 4**.

Table 6.4 – 2040 Baseline/No-Build TI/Intersection Analysis Results: AM Peak Hour

Intersection	NB Approach				SB Approach				EB Approach			WB Approach			Total
	L	T	R	U	L	T	R	U	L	T	R	L	T	R	
Frank Lloyd Wright & Loop 101															
LOS	F	E	D	-	E	F	D	-	F	D	C	E	D	B	E
Delay (sec)	115	60	44	-	59	147	41	-	167	47	23	66	48	17	68
Avg. Queue (ft)	330	196	195	-	203	312	319	-	1050	913	609	65	110	67	-
Raintree Drive & Loop 101															
LOS	F	C	C	F	F	F	F	F	D	D	A	F	D	C	F
Delay (sec)	151	35	22	153	93	244	341	100	54	55	8	88	47	29	110
Avg. Queue (ft)	886	751	614	886	739	1315	1315	739	51	40	15	454	252	156	-
Raintree Drive & 87th Street															
LOS	D	D	A	-	D	D	C	-	B	A	A	A	A	A	A
Delay (sec)	55	50	8	-	54	54	30	-	12	5	2	8	3	1	8
Avg. Queue (ft)	4	3	3	-	16	35	52	-	8	8	8	10	8	0	-
Shea Boulevard & Loop 101															
LOS	D	-	A	-	D	-	B	-	D	C	B	F	D	C	D
Delay (sec)	37	-	4	-	46	-	13	-	45	30	20	125	46	32	44
Avg. Queue (ft)	42	-	3	-	123	-	2	-	54	69	56	1259	620	1211	-

The Frank Lloyd Wright Boulevard TI is expected to operate at LOS E overall in the 2040 Baseline/No-Build AM peak hour. The SBR queue of 319' exceeds the 235' of available storage, impacting SBT operations. The EBL queue of 1,050' exceeds the 185' of available storage and blocks the upstream driveway and intersection, impacting EBT and upstream operations. The EBT queue of 913' blocks the upstream driveway and intersection, impacting upstream operations. The EBR queue of 609' exceeds the 175' of available storage and blocks the upstream driveway, impacting EBT and upstream operations.

The Raintree Drive TI is expected to operate at LOS F overall in the 2040 Baseline/No-Build AM peak hour. The NBL and NBU queue of 886' exceeds the 475' of available storage, impacting NBT operations. The SBT and SBR queue of 1,315' blocks upstream driveways and intersections, impacting upstream operations. The WBL queue of 454' exceeds the 210' of available storage and blocks an upstream driveway, impacting WBT and upstream operations. The WBR queue of 156' exceeds the 25' of available storage, impacting WBT operations.

The Raintree Drive and 87th Street intersection is expected to operate at LOS A overall in the 2040 Baseline/No-Build AM peak hour with no queuing issues. It should be noted that the 2020 Existing results showed slight queuing issues at this intersection while the 2040 Baseline/No-Build results don't show any queuing issues – this is likely due to the WBL queuing issues at the Raintree Drive TI blocking WBT vehicles from reaching the Raintree Drive and 87th Street intersection.

The Shea Boulevard TI is expected to operate at LOS D overall in the 2040 Baseline/No-Build AM peak hour. The WBL queue of 1,259' exceeds the 275' of available storage and blocks upstream driveways, impacting WBT and upstream operations. The WBT queue of 620' blocks upstream driveways, impacting upstream operations. The WBR queue of 1,211' exceeds the 130' of available storage and blocks upstream driveways, impacting WBT and upstream operations.

These results indicate the Frank Lloyd Wright Boulevard TI and the Raintree Drive TI are not expected to provide acceptable overall LOS in the 2040 Baseline/No-Build AM peak hour. The Raintree Drive and 87th Street intersection and Shea Boulevard TI are expected to provide acceptable overall LOS in the PM peak hour. Several locations/movements are expected to have congestion and queuing issues.

Table 6.5 – 2040 Baseline/No-Build TI/Intersection Analysis Results: PM Peak Hour

Intersection	NB Approach				SB Approach				EB Approach			WB Approach			Total
	L	T	R	U	L	T	R	U	L	T	R	L	T	R	
Frank Lloyd Wright & Loop 101															
LOS	F	D	D	-	D	F	D	-	E	F	E	F	E	B	F
Delay (sec)	178	54	38	-	49	129	43	-	78	86	74	443	67	20	94
Avg. Queue (ft)	525	311	310	-	241	432	438	-	544	1225	1246	1036	876	34	-
Raintree Drive & Loop 101															
LOS	D	F	F	D	D	D	B	D	E	E	D	F	F	E	E
Delay (sec)	41	135	116	42	44	40	17	42	58	59	43	184	97	72	76
Avg. Queue (ft)	282	429	472	282	70	50	45	70	99	12	353	1007	965	915	-
Raintree Drive & 87th Street															
LOS	F	F	F	-	F	F	E	-	D	F	F	C	A	A	F
Delay (sec)	249	232	741	-	181	97	64	-	52	105	82	21	3	1	158
Avg. Queue (ft)	69	3	1650	-	154	54	68	-	980	980	980	1	8	1	-
Shea Boulevard & Loop 101															
LOS	D	-	A	-	D	-	B	-	D	C	A	E	D	E	D
Delay (sec)	43	-	5	-	44	-	11	-	50	23	10	63	38	80	38
Avg. Queue (ft)	110	-	5	-	125	-	0	-	66	55	25	1120	975	1555	-

The Frank Lloyd Wright Boulevard TI is expected to operate at LOS F overall in the 2040 Baseline/No-Build PM peak hour. The SBR queue of 438' exceeds the 235' of available storage, impacting SBT operations. The EBL queue of 544' exceeds the 185' of available storage and blocks the upstream driveway, impacting EBT and upstream operations. The EBT queue of 1,225' blocks the upstream driveway and intersection, impacting upstream operations. The EBR queue of 1,246' exceeds the 175' of available storage and blocks the upstream intersection and driveway, impacting EBT and upstream operations. The WBL queue of 1,036' exceeds the 245' of available storage and blocks the upstream intersection and driveways, impacting WBT operations.

The Raintree Drive TI is expected to operate at LOS E overall in the 2040 Baseline/No-Build PM peak hour. The NBU queue of 282' exceeds the 225' of available storage, impacting NBL operations. The EBR queue of 353' exceeds the 250' of available storage, impacting EBT operations. The WBL queue of 1,007' exceeds the 210' of available storage and blocks the upstream driveway, impacting WBT and upstream operations. The WBT queue of 965' blocks the upstream driveway, impacting upstream operations. The WBR queue of 915' exceeds the 25' of available storage and blocks the upstream driveway, impacting WBT and upstream operations.

The Raintree Drive and 87th Street intersection is expected to operate at LOS F overall in the 2040 Baseline/No-Build PM peak hour. The NBR queue of 1,650' blocks upstream driveways and intersections, impacting upstream operations. The SBR queue of 154' exceeds the 110' of available storage, impacting SBT and SBR operations. The EBL queue of 980' exceeds the 125' of available storage and blocks an upstream intersection, impacting EBT and upstream operations. The EBT queue of 980' blocks an upstream intersection, impacting upstream operations. The EBR queue of 980' exceeds the 120' of available storage and blocks an upstream intersection, impacting upstream operations.

The Shea Boulevard TI is expected to operate at LOS D overall in the 2040 Baseline/No-Build PM peak hour. The WBL queue of 1,120' exceeds the 275' of available storage and blocks upstream driveways, impacting WBT and upstream operations. The WBT queue of 975' blocks upstream driveways, impacting upstream operations. The WBR queue of 1,555' exceeds the 130' of available storage and blocks the upstream intersection and driveways, impacting WBT and upstream operations.

These results indicate the Frank Lloyd Wright Boulevard TI, Raintree Drive TI, and Raintree Drive and 87th Street intersection are not expected to provide acceptable overall LOS in the 2040 Baseline/No-Build PM peak hour. The Shea Boulevard TI provides acceptable overall LOS in the 2040 Baseline/No-Build. Several locations/movements are expected to have congestion and queuing issues.

6.4 2040 Improved/Build TI/Intersection Conditions

An analysis was completed of the project TIs/intersections using the 2040 Improved/Build volumes and geometry as described in Section 3.0 of this document. As was mentioned previously, the three Improved/Build alternatives analyzed were:

- Improved SPUI alternative – where the existing SPUIs are improved/expanded at the Frank Lloyd Wright Boulevard, Raintree Drive and Shea Boulevard TIs
- TDI alternative – where the existing SPUIs are converted to tight diamond interchanges at the Frank Lloyd Wright Boulevard and Raintree Drive TIs only
- DRI alternative – where the existing SPUI is converted to a double-roundabout interchange at the Raintree Drive TI only

6.4.1 Improved Single-Point Urban Interchange (SPUI) Analysis

Improvements included in the 2040 Improved/Build SPUI alternative consisted of the following:

- At the Frank Lloyd Wright Boulevard TI, the assumed SPUI configuration improvements included exclusive dual NBL and SBL lanes (as opposed to a shared left-turn/through lane), adding a SBT lane, adding a NBR lane, signal control for all right-turn movements, and associated signal timing adjustments
- At the Raintree Drive TI, the assumed SPUI configuration improvements included adding a NBR lane and SBR lane, additional WBR storage capacity, signal control for all right-turn movements, and associated signal timing adjustments
- At the Raintree Drive and 87th Street intersection, the only assumed improvements were signal timing adjustments, where the EBL and WBL phasing was changed to permitted/protected and NBR overlap phasing was added
- At the Shea Boulevard TI, the assumed SPUI configuration improvements included extending the WBR storage to be 600' and associated signal timing adjustments; geometric constraints restricted the ability to improve the WBL movement

The VISSIM-modeled delay, corresponding LOS, and queues at the project TIs/intersections for the 2040 Improved/Build SPUI alternative are presented in **Table 6.6** for the AM peak hour and in **Table 6.7** for the PM peak hour, with the corresponding VISSIM output reports provided in **Appendix 4**.

Table 6.6 – 2040 Improved/Build SPUI Alternative TI/Intersection Analysis Results: AM Peak Hour

Intersection	NB Approach				SB Approach				EB Approach			WB Approach			Total
	L	T	R	U	L	T	R	U	L	T	R	L	T	R	
Frank Lloyd Wright & Loop 101															
LOS	D	D	B	-	D	D	C	-	F	D	B	F	E	D	D
Delay (sec)	51	53	10	-	37	51	21	-	95	53	16	82	74	51	54
Avg. Queue (ft)	126	92	10	-	70	62	44	-	299	194	69	78	505	387	-
Raintree Drive & Loop 101															
LOS	F	C	B	F	D	D	D	E	D	E	B	E	D	B	D
Delay (sec)	117	28	13	117	53	57	41	57	44	76	14	74	42	12	55
Avg. Queue (ft)	896	6	15	896	74	58	87	74	39	53	27	260	99	127	-
Raintree Drive & 87th Street															
LOS	D	D	B	-	D	D	C	-	B	C	A	B	A	A	B
Delay (sec)	42	40	13	-	47	45	25	-	22	35	8	11	10	2	17
Avg. Queue (ft)	3	3	4	-	14	27	43	-	71	71	71	73	149	3	-
Shea Boulevard & Loop 101															
LOS	C	-	A	-	D	-	B	-	E	D	C	E	C	C	C
Delay (sec)	32	-	4	-	41	-	13	-	58	41	20	64	27	23	34
Avg. Queue (ft)	45	-	4	-	129	-	5	-	69	97	57	340	53	167	-

The Frank Lloyd Wright Boulevard TI is expected to operate at LOS D overall in the 2040 Improved/Build SPUI alternative AM peak hour. The EBL queue of299' exceeds the 185' of available storage and blocks the upstream driveway and intersection, impacting EBT and upstream operations. The WBT queue of505' blocks the upstream driveway, impacting upstream operations. The WBR queue of 387' exceeds the 150' of available storage, impacting WBT operations.

The Raintree Drive TI is expected to operate at LOS D overall in the 2040 Improved/Build SPUI alternative AM peak hour. The NBL and NBU queue of 896' exceeds the 475' of available storage, impacting NBT operations. The WBL queue of 260' exceeds the 210' of available storage, impacting WBT operations.

The Raintree Drive and 87th Street intersection is expected to operate at LOS B overall in the 2040 Improved/Build SPUI alternative AM peak hour with no queuing issues.

The Shea Boulevard TI is expected to operate at LOS C overall in the 2040 Improved/Build SPUI alternative AM peak hour. The WBL queue of 340' exceeds the 275' of available storage, impacting WBT operations.

These results indicate all project TIs/intersections are expected to provide acceptable overall LOS in the 2040 Improved/Build SPUI alternative AM peak hour. Only a few locations/movements are expected to have congestion and queuing issues.

Table 6.7 – 2040 Improved/Build SPUI Alternative TI/Intersection Analysis Results: PM Peak Hour

Intersection	NB Approach				SB Approach				EB Approach			WB Approach			Total
	L	T	R	U	L	T	R	U	L	T	R	L	T	R	
Frank Lloyd Wright & Loop 101															
LOS	F	D	C	-	E	E	B	-	E	D	C	E	D	B	D
Delay (sec)	94	47	30	-	68	67	20	-	69	38	23	75	40	11	48
Avg. Queue (ft)	241	58	47	-	163	157	31	-	101	163	144	88	74	29	-
Raintree Drive & Loop 101															
LOS	D	D	C	D	D	D	B	D	D	D	B	D	D	B	D
Delay (sec)	50	41	26	46	45	41	18	47	53	46	21	51	51	10	38
Avg. Queue (ft)	76	7	118	76	73	40	14	73	106	89	202	92	79	80	-
Raintree Drive & 87th Street															
LOS	F	E	F	-	F	D	B	-	E	E	D	C	B	A	D
Delay (sec)	83	65	159	-	93	47	19	-	77	65	52	24	12	3	55
Avg. Queue (ft)	155	18	1023	-	75	30	44	-	956	956	956	1	61	5	-
Shea Boulevard & Loop 101															
LOS	C	-	A	-	C	-	A	-	D	D	B	E	E	E	D
Delay (sec)	32	-	5	-	35	-	10	-	48	36	11	62	57	58	40
Avg. Queue (ft)	66	-	7	-	94	-	1	-	63	90	30	450	1515	1624	-

The Frank Lloyd Wright Boulevard TI is expected to operate at LOS D overall in the 2040 Improved/Build SPUI alternative PM peak hour with no queuing issues.

The Raintree Drive TI is expected to operate at LOS D overall in the 2040 Improved/Build SPUI alternative PM peak hour with no queueing issues.

The Raintree Drive and 87th Street intersection is expected to operate at LOS D overall in the 2040 Improved/Build SPUI alternative PM peak hour. The NBR queue of 1,023' blocks upstream driveways, impacting upstream operations. The EBL queue of 956' exceeds the 125' of available storage and blocks an upstream intersection, impacting EBT and upstream operations. The EBT queue of 956' blocks an upstream intersection, impacting upstream operations. The EBR queue of 956' exceeds the 120' of available storage and blocks an upstream intersection, impacting EBT and upstream operations.

The Shea Boulevard TI is expected to operate at LOS D overall in the 2040 Improved/Build SPUI alternative PM peak hour. The WBL queue of 450' exceeds the 275' of available storage and blocks the upstream driveway, impacting WBT and upstream operations. The WBT queue of 1,515' blocks the upstream intersection and driveways, impacting upstream operations. The WBR queue of 1,624' exceeds the 600' of available storage and blocks the upstream intersection and driveways, impacting WBT and upstream operations.

These results indicate all project TIs/intersections are expected to provide acceptable overall LOS in the 2040 Improved/Build SPUI alternative PM peak hour. Only a few locations/movements are expected to have congestion and queuing issues.

6.4.2 Tight Diamond Interchange (TDI) Analysis

Improvements included in the 2040 Improved/Build TDI alternative consisted of the following:

- At the Frank Lloyd Wright Boulevard TI, the assumed TDI configuration improvements included the same number of approach lanes for each movement as the existing SPUI configuration along with adding a NBR lane, signal control for all right-turn movements, and associated signal timing adjustments
- At the Raintree Drive TI, the assumed TDI configuration improvements included the same number of approach lanes for each movement as the existing SPUI configuration along with adding a NBR lane and SBR lane, additional WBR storage capacity, signal control for all right-turn movements, and associated signal timing adjustments
- At the Raintree Drive and 87th Street intersection, the only assumed improvements were signal timing adjustments, where the EBL and WBL phasing was changed to permitted/protected and NBR overlap phasing was added

The VISSIM-modeled delay, corresponding LOS, and queues at the project TIs/intersections for the 2040 Improved/Build TDI alternative are presented in **Table 6.8** for the AM peak hour and in **Table 6.9** for the PM peak hour, with the corresponding VISSIM output reports provided in **Appendix 4**.

Table 6.8 – 2040 Improved/Build TDI Alternative TI/Intersection Analysis Results: AM Peak Hour

Intersection	NB Approach				SB Approach				EB Approach			WB Approach			Total
	L	T	R	U	L	T	R	U	L	T	R	L	T	R	
Frank Lloyd Wright & Loop 101															
LOS	D	B	A	-	D	C	A	-	E	C	A	E	C	B	C
Delay (sec)	64	30	7	-	63	43	9	-	116	39	15	116	45	20	47
Avg. Queue (ft)	76	51	13	-	66	83	43	-	105	105	56	110	110	71	-
Raintree Drive & Loop 101															
LOS	F	C	B	-	D	B	B	-	D	C	B	D	D	B	D
Delay (sec)	130	37	19	-	69	30	30	-	81	40	17	53	64	16	56
Avg. Queue (ft)	845	9	30	-	50	53	63	-	42	42	21	117	117	25	-
Raintree Drive & 87th Street															
LOS	D	D	B	-	D	D	C	-	B	D	A	B	B	A	B
Delay (sec)	41	39	16	-	47	45	25	-	17	35	6	11	11	3	18
Avg. Queue (ft)	3	3	16	-	14	27	43	-	67	67	67	100	176	5	-

The Frank Lloyd Wright Boulevard TI is expected to operate at LOS C overall in the 2040 Improved/Build TDI alternative AM peak hour with no queuing issues.

The Raintree Drive TI is expected to operate at LOS D overall in the 2040 Improved/Build TDI alternative AM peak hour. The NBL queue of 845’ exceeds the 475’ of available storage, impacting NBT operations.

The Raintree Drive and 87th Street intersection is expected to operate at LOS B overall in the 2040 Improved/Build TDI alternative AM peak hour. The WBL queue of 100’ exceeds the 60’ of available storage, impacting WBT operations.

These results indicate all project TIs/intersections are expected to provide acceptable overall LOS in the 2040 Improved/Build TDI alternative AM peak hour. Only a few locations/movements are expected to have congestion and queuing issues.

Table 6.9 – 2040 Improved/Build TDI Alternative TI/Intersection Analysis Results: PM Peak Hour

Intersection	NB Approach				SB Approach				EB Approach			WB Approach			Total
	L	T	R	U	L	T	R	U	L	T	R	L	T	R	
Frank Lloyd Wright & Loop 101															
LOS	D	C	B	-	D	C	A	-	D	D	C	D	C	A	C
Delay (sec)	64	32	17	-	62	39	9	-	79	68	53	70	38	11	49
Avg. Queue (ft)	86	38	22	-	79	77	85	-	751	751	988	76	76	26	-
Raintree Drive & Loop 101															
LOS	D	B	B	-	D	C	B	-	D	C	B	D	D	A	C
Delay (sec)	63	30	27	-	61	34	16	-	66	41	22	74	61	15	44
Avg. Queue (ft)	60	5	112	-	68	64	15	-	134	134	210	106	106	33	-
Raintree Drive & 87th Street															
LOS	E	D	D	-	E	D	B	-	D	F	E	C	A	A	D
Delay (sec)	62	41	37	-	117	67	19	-	51	104	75	24	9	2	50
Avg. Queue (ft)	48	15	97	-	217	82	97	-	970	970	970	1	53	3	-

The Frank Lloyd Wright Boulevard TI is expected to operate at LOS C overall in the 2040 Improved/Build TDI alternative PM peak hour. The EBL queue of751’ exceeds the 240’ of available storage and blocks the upstream driveway and intersection, impacting EBT and upstream operations. The EBT queue of751’ blocks the upstream driveway, impacting upstream operations. The EBR queue of 988’ exceeds the 175’ of available storage and blocks the upstream driveway, impacting EBT and upstream operations.

The Raintree Drive TI is expected to operate at LOS C overall in the 2040 Improved/Build TDI alternative PM peak hour with no queueing issues.

The Raintree Drive and 87th Street intersection is expected to operate at LOS D overall in the 2040 Improved/Build TDI alternative PM peak hour. The SBL queue of 217’ exceeds the 110’ of available storage, impacting SBT and SBR operations. The EBL queue of 970’ exceeds the 125’ of available storage and blocks an upstream intersection, impacting EBT and upstream operations. The EBT queue of 970’ blocks an upstream intersection, impacting upstream operations. The EBR queue of 970’ exceeds the 120’ of available storage and blocks an upstream intersection, impacting EBT and upstream operations.

These results indicate all project TIs/intersections are expected to provide acceptable overall LOS in the 2040 Improved/Build TDI alternative PM peak hour. Only a few locations/movements are expected to have congestion and queuing issues.

6.4.3 Double-Roundabout Interchange (DRI) Analysis

Improvements included in the 2040 Improved/Build DRI alternative consisted of the following three scenarios for the SB Ramps roundabout:

- Scenario A: one SBR bypass lane and one SBU bypass lane
- Scenario B: two SBR bypass lanes
- Scenario C: two SBR bypass lanes and one SBU bypass lane

The RODEL-modeled delay, corresponding LOS, and queues at the project TIs/intersections for the 2040 Improved/Build DRI alternative are presented in **Table 6.10** for the AM peak hour and in **Table 6.11** for the PM peak hour, with the corresponding RODEL output reports provided in **Appendix 4**.

Table 6.10 – 2040 Improved/Build DRI Alternative TI Analysis Results: AM Peak Hour

Leg Name	Number of Lanes		Average Delay (sec)			95% Queue (ft) Per Lane		Level of Service			Total Level of Service					
	Entry	Bypass	Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg	Entries		Bypasses		Total	
L101 SB & Raintree (A: 1 SB Rt Bypass, 1 SB U-Turn Bypass)																
L101 SB SB	2	1	32	365	215	275	5,400	D	F	F	19	C	271	F	73	F
Raintree EB	2	1	4	0	2	25	0	A	A	A						
L101 SB NB			-	-	-	-	-	-	-	-						
Raintree WB	2		17	-	17	525	-	C	-	C						
L101 SB & Raintree (B: 2 SB Rt Bypass)																
L101 SB SB	2	2	59	5	32	675	50	F	A	F	28	D	4	A	19	C
Raintree EB	2	1	3	0	2	25	0	A	A	A						
L101 SB NB			-	-	-	-	-	-	-	-						
Raintree WB	2		17	-	17	525	-	C	-	C						
L101 SB & Raintree (C: 2 SB Rt Bypass, 1 SB U-Turn Bypass)																
L101 SB SB	2	2	32	5	17	275	50	D	A	C	19	C	4	A	14	B
Raintree EB	2	1	3	0	2	25	0	A	A	A						
L101 SB NB			-	-	-	-	-	-	-	-						
Raintree WB	2		17	-	17	525	-	C	-	C						
L101 NB & Raintree (A: 1 SB Rt Bypass, 1 SB U-Turn Bypass)																
L101 NB SB			-	-	-	-	-	-	-	-	8	A	3	A	7	A
Raintree EB	2		3	-	3	25	-	A	-	A						
L101 NB NB	2	1	5	5	5	50	25	A	A	A						
Raintree WB	2	1	14	0	11	275	0	B	A	B						
L101 NB & Raintree (B: 2 SB Rt Bypass)																
L101 NB SB			-	-	-	-	-	-	-	-	14	B	3	A	11	B
Raintree EB	2		4	-	4	50	-	A	-	A						
L101 NB NB	2	1	5	5	5	75	25	A	A	A						
Raintree WB	2	1	27	0	21	600	0	D	A	C						
L101 NB & Raintree (C: 2 SB Rt Bypass, 1 SB U-Turn Bypass)																
L101 NB SB			-	-	-	-	-	-	-	-	8	A	3	A	7	A
Raintree EB	2		3	-	3	25	-	A	-	A						
L101 NB NB	2	1	5	5	5	50	25	A	A	A						
Raintree WB	2	1	14	0	11	275	0	B	A	B						

1. L101 SB & Raintree SB Bypass results were analyzed with separate models to accurately capture the opposing flow volumes.
2. L101 SB & Raintree SB Approach results were analyzed with separate models due to RODEL coding limitations. The SB Approach capacity in RODEL was impacted by the SB Bypass configuration. The separate SB Approach models provided consistent capacity for the three alternatives.
3. L101 NB & Raintree (1 SB Rt Bypass, 1 SB U-Turn Bypass) and (2 SB Rt Bypass, 1 SB U-Turn Bypass) alternative models and results are the same.

The Raintree Drive TI NB Ramps roundabout is expected to operate overall at LOS A for Scenario A, LOS B for Scenario B, and LOS A for Scenario C during the 2040 Improved/Build DRI alternative AM peak hour. The only queuing issue is that in Scenario B the WBT queue of 600’ blocks an upstream driveway, impacting upstream operations.

The Raintree Drive TI SB Ramps roundabout is expected to operate overall at LOS F for Scenario A, LOS C for Scenario B, and LOS B for Scenario C during the 2040 Improved/Build DRI alternative PM peak hour. In Scenario A, the SBR bypass queue of 5,400’ blocks the upstream intersections, driveways, and ramp junction, significantly impacting upstream operations – this is a potential fatal flaw due to the magnitude of the impact. In Scenario B, the SBT queue of 675’ blocks an upstream driveway, impacting upstream operations. In Scenarios A, B, and C, the WBT queue of 525’ blocks the adjacent NB Ramps roundabout, significantly impacting operations within the NB Ramps roundabout – this is a potential fatal flaw due to the magnitude of the impact as it could gridlock the TI.

Table 6.11 – 2040 Improved/Build DRI Alternative TI Analysis Results: PM Peak Hour

Leg Name	Number of Lanes		Average Delay (sec)			95% Queue (ft) Per Lane		Level of Service			Total Level of Service					
	Entry	Bypass	Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg	Entries		Bypasses		Total	
L101 SB & Raintree (A: 1 SB Rt Bypass, 1 SB U-Turn Bypass)																
L101 SB SB	2	1	11	8	10	100	75	B	A	B	10	A	2	A	7	A
Raintree EB	2	1	12	0	7	250	0	B	A	A						
L101 SB NB			-	-	-	-	-	-	-	-						
Raintree WB	2		6	-	6	100	-	A	-	A						
L101 SB & Raintree (B: 2 SB Rt Bypass)																
L101 SB SB	2	2	13	3	10	150	25	B	A	B	13	B	1	A	9	A
Raintree EB	2	1	18	0	11	450	0	C	A	B						
L101 SB NB			-	-	-	-	-	-	-	-						
Raintree WB	2		6	-	6	100	-	A	-	A						
L101 SB & Raintree (C: 2 SB Rt Bypass, 1 SB U-Turn Bypass)																
L101 SB SB	2	2	11	3	8	100	25	B	A	A	10	A	1	A	7	A
Raintree EB	2	1	12	0	7	250	0	B	A	A						
L101 SB NB			-	-	-	-	-	-	-	-						
Raintree WB	2		6	-	6	100	-	A	-	A						
L101 NB & Raintree (A: 1 SB Rt Bypass, 1 SB U-Turn Bypass)																
L101 NB SB			-	-	-	-	-	-	-	-	7	A	9	A	7	A
Raintree EB	2		7	-	7	125	-	A	-	A						
L101 NB NB	2	1	6	12	9	50	175	A	B	A						
Raintree WB	2	1	7	0	6	100	0	A	A	A						
L101 NB & Raintree (B: 2 SB Rt Bypass)																
L101 NB SB			-	-	-	-	-	-	-	-	8	A	9	A	8	A
Raintree EB	2		8	-	8	175	-	A	-	A						
L101 NB NB	2	1	7	12	9	50	175	A	B	A						
Raintree WB	2	1	9	0	7	150	0	A	A	A						
L101 NB & Raintree (C: 2 SB Rt Bypass, 1 SB U-Turn Bypass)																
L101 NB SB			-	-	-	-	-	-	-	-	7	A	9	A	7	A
Raintree EB	2		7	-	7	125	-	A	-	A						
L101 NB NB	2	1	6	12	9	50	175	A	B	A						
Raintree WB	2	1	7	0	6	100	0	A	A	A						

1. L101 SB & Raintree SB Bypass results were analyzed with separate models to accurately capture the opposing flow volumes.
2. L101 SB & Raintree SB Approach results were analyzed with separate models due to RODEL coding limitations. The SB Approach capacity in RODEL was impacted by the SB Bypass configuration. The separate SB Approach models provided consistent capacity for the three alternatives.
3. L101 NB & Raintree (1 SB Rt Bypass, 1 SB U-Turn Bypass) and (2 SB Rt Bypass, 1 SB U-Turn Bypass) alternative models and results are the same.

The Raintree Drive TI NB Ramps roundabout is expected to operate overall at LOS A for Scenarios A, B, and C during the 2040 Improved/Build DRI alternative PM peak hour with no queuing issues.

The Raintree Drive TI SB Ramps roundabout is expected to operate overall at LOS A for Scenarios A,B, and C during the 2040 Improved/Build DRI alternative PM peak hour. The only queuing issues is that in Scenario B, the EBT queue of 450' blocks the upstream Raintree Drive and 87th Street intersection, impacting operations at that intersection.

7.0 Summary

The following is a summary of the principal findings of the traffic analysis.

SR 101L Mainline

- The only identified mainline crash issue was the concentration of NB crashes south of Shea Boulevard where the mainline currently tapers from four GPLs to three GPLs
- 2040 traffic volumes are projected to be approximately 25% higher than 2020 existing traffic volumes
- There will be significant mainline and ramp junction congestion by 2040 if additional GPLs are not provided on SR 101L
- Widening SR 101L to four GPLs is expected to reduce crashes related to congestion, particularly on SR 101L NB south of Shea Boulevard where the segment currently tapers from four GPLs to three GPLs
- By adding a GPL in each direction, SR 101L is expected to provide LOS D or better through 2040 throughout the project limits except at the Shea Boulevard NB on-ramp merge segment (which provides LOS E)

Frank Lloyd Wright Boulevard TI

- This TI had the highest crash rate of the TIs assessed within the project limits
- An improved SPUI is expected to provide a slight reduction in the overall crash rate due to a reduction in congestion from operational improvements
- A TDI is expected to provide a slight reduction in the overall crash rate due to a reduction in congestion from operational improvements and a moderate reduction in the severe crash rate due to the reduced number of crossing points
- Traffic LOS with the existing SPUI configuration is poor now (LOS E) during peak times and will get worse (LOS F) in the future if no improvements are made
- An improved SPUI is expected to provide LOS D through 2040 if exclusive dual NBL and SBL lanes, an additional SBT lane, an additional NBR lane, signal control for all right-turn movements, and associated signal timing adjustments are provided, although there will still be long EB and WB queues
- A TDI with the same approach lanes as the existing SPUI along with adding a NBR lane and signal control for all right-turn movements is expected to provide LOS C through 2040, although there will still be long EB queues
- The improved SPUI and TDI are relatively similar in terms of anticipated traffic performance and both are considered viable improvements from a traffic standpoint

Raintree Drive TI

- An improved SPUI is expected to provide a slight reduction in the overall crash rate due to a reduction in congestion from operational improvements
- A TDI is expected to provide a slight reduction in the overall crash rate due to a reduction in congestion from operational improvements and a moderate reduction in the severe crash rate due to the reduced number of crossing points
- A DRI is expected to provide a moderate reduction in the overall crash rate due to a significant reduction in congestion from operational improvements and a significant reduction in the severe crash rate due to the reduced number of crossing points and lower operating speeds
- Traffic LOS with the existing SPUI configuration is poor now (LOS F) during peak times and will get worse (LOS F with higher delays) in the future if no improvements are made
- An improved SPUI is expected to provide LOS D through 2040 if adding a NBR lane and SBR lane, additional WBR storage capacity, signal control for all right-turn movements, and associated signal timing adjustments are provided, although there will still be long NB queues
- A TDI with the same approach lanes as the existing SPUI except with adding a NBR lane and SBR lane, additional WBR storage capacity, signal control for all right-turn movements, and associated signal timing adjustments is expected to provide LOS D through 2040, although there will still be some long NB queues
- A DRI is expected to provide LOS C or better through 2040 but the projected long WB queue at the SB Ramps roundabout will extend through the adjacent NB Ramps roundabout, significantly impacting operations – this is a potential fatal flaw due to the magnitude of the impact
- The improved SPUI and TDI are relatively similar in terms of anticipated traffic performance and both are considered viable improvements from a traffic standpoint
- Even though the DRI theoretically provides acceptable overall LOS, it is not considered a viable improvement due to the WB queuing issue that could potentially gridlock the TI

Raintree Drive and 87th Street

- Traffic LOS is poor now (LOS F) during peak times and will get worse (LOS F with higher delays) in the future if no improvements are made
- Recommended improvements are limited to signal timing/phasing adjustments, namely EBL/WBL permitted/protected phasing and NBR overlap phasing
- With these signal timing/phasing improvements, the intersection is expected to provide LOS D through 2040, although there will still be long EB queues

Shea Boulevard TI

- An improved SPUI is expected to provide a slight reduction in the overall crash rate due to a reduction in congestion from operational improvements
- Traffic LOS with the existing SPUI configuration is acceptable now (LOS C) during peak times and is still expected to be acceptable (LOS D) in the future if no improvements are made, but there are long WB queues
- Extending the WBR storage length to 600’ and signal timing adjustments will maintain LOS D in the future and will help reduce, but not eliminate, the WB queues
- Other WB improvements are not considered feasible due to geometric constraints at the TI

APPENDIX 1 – Existing Traffic Volumes and Signal Timings

Mainline and Ramp Traffic Counts

Location Info

Location ID	101236_SB
Type	LINK
Functional Class	2
Located On	SR 101
Between	Exit 36 Princess Dr - Pima Rd AND Exit 37 Frank Lloyd Wright Blvd
Direction	SB
Community	-
MPO_ID	0
HPMS ID	0
Agency	Arizona Department of Transportation

Count Data Info

Start Date	12/10/2018
End Date	12/11/2018
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	adot
Count Source	101236
File Name	
Weather	
Study	
Owner	adotits

Interval: 15 mins

Time	15 Min 1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	76	68	65	48	257		257	228	198	177		
01:00 - 02:00	47	38	44	36	165		165	149	135	133		
02:00 - 03:00	31	24	42	36	133		133	126	166	211		
03:00 - 04:00	24	64	87	118	293		293	407	569	789		
04:00 - 05:00	138	226	307	345	1016		1016	1290	1653	2194		
05:00 - 06:00	412	589	848	1012	2861		2861	3534	4117	4687		
06:00 - 07:00	1085	1172	1418	1466	5141	18126	5141	5577	6177	6425	6713	37.0%
07:00 - 08:00	1521	1772	1666	1669	6628		6628	6713	6615	6619		
08:00 - 09:00	1606	1674	1670	1407	6357		6357	6181	5818	5425		
09:00 - 10:00	1430	1311	1277	1230	5248	22687	5248	4899	4639	4484	5248	23.1%
10:00 - 11:00	1081	1051	1122	1073	4327		4327	4333	4375	4304		
11:00 - 12:00	1087	1093	1051	1114	4345		4345	4323	4329	4372		
12:00 - 13:00	1065	1099	1094	1086	4344		4344	4298	4333	4377		
13:00 - 14:00	1019	1134	1138	1132	4423		4423	4463	4456	4541		
14:00 - 15:00	1059	1127	1223	1305	4714	21005	4714	4917	5086	5204	5752	27.4%
15:00 - 16:00	1262	1296	1341	1317	5216		5216	5404	5619	5709		
16:00 - 17:00	1450	1511	1431	1360	5752		5752	5717	5648	5429		
17:00 - 18:00	1415	1442	1212	1254	5323		5323	4862	4370	3974		
18:00 - 19:00	954	950	816	726	3446	11280	3446	3127	2697	2402	3446	30.5%
19:00 - 20:00	635	520	521	469	2145		2145	1926	1806	1659		
20:00 - 21:00	416	400	374	284	1474		1474	1364	1298	1170		
21:00 - 22:00	306	334	246	270	1156		1156	1055	918	879		
22:00 - 23:00	205	197	207	143	752		752	692	609	498		
23:00 - 24:00	145	114	96	88	443		443	298	184	88		
TOTAL					75959	75959					6713	8.8%

Location Info

Location ID	101236_NB
Type	LINK
Functional Class	2
Located On	SR 101
Between	Exit 36 Princess Dr - Pima Rd AND Exit 37 Frank Lloyd Wright Blvd
Direction	NB
Community	-
MPO_ID	0
HPMS ID	0
Agency	Arizona Department of Transportation

Count Data Info

Start Date	12/10/2018
End Date	12/11/2018
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	adot
Count Source	101236
File Name	
Weather	
Study	
Owner	adotits

Interval: 15 mins

Time	15 Min 1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	91	103	91	96	381		381	359	318	286		
01:00 - 02:00	69	62	59	48	238		238	209	208	190		
02:00 - 03:00	40	61	41	42	184		184	191	173	171		
03:00 - 04:00	47	43	39	50	179		179	194	246	354		
04:00 - 05:00	62	95	147	173	477		477	602	828	1266		
05:00 - 06:00	187	321	585	610	1703		1703	2087	2638	3036		
06:00 - 07:00	571	872	983	1048	3474	12869	3474	3866	4129	4381	4887	38.0%
07:00 - 08:00	963	1135	1235	1273	4606		4606	4839	4887	4856		
08:00 - 09:00	1196	1183	1204	1206	4789		4789	4678	4582	4422		
09:00 - 10:00	1085	1087	1044	988	4204	19680	4204	3973	3821	3654	4241	21.5%
10:00 - 11:00	854	935	877	910	3576		3576	3605	3634	3670		
11:00 - 12:00	883	964	913	914	3674		3674	3777	3810	3873		
12:00 - 13:00	986	997	976	1026	3985		3985	4032	4094	4220		
13:00 - 14:00	1033	1059	1102	1047	4241		4241	4303	4474	4746		
14:00 - 15:00	1095	1230	1374	1459	5158	23234	5158	5507	5786	5930	6465	27.8%
15:00 - 16:00	1444	1509	1518	1613	6084		6084	6263	6366	6465		
16:00 - 17:00	1623	1612	1617	1546	6398		6398	6280	6225	6012		
17:00 - 18:00	1505	1557	1404	1128	5594		5594	5154	4890	4465		
18:00 - 19:00	1065	1293	979	821	4158	13943	4158	3906	3366	3043	4158	29.8%
19:00 - 20:00	813	753	656	604	2826		2826	2594	2421	2273		
20:00 - 21:00	581	580	508	477	2146		2146	1980	1856	1767		
21:00 - 22:00	415	456	419	359	1649		1649	1571	1440	1240		
22:00 - 23:00	337	325	219	217	1098		1098	954	785	716		
23:00 - 24:00	193	156	150	108	607		607	414	258	108		
TOTAL					71429	71429					6465	9.1%

Location Info	
Location ID	101237_SB
Type	LINK
Functional Class	2
Located On	SR 101
Between	Exit 37 Frank Lloyd Wright Blvd AND Exit 39 Raintree Dr
Direction	SB
Community	-
MPO_ID	0
HPMS ID	0
Agency	Arizona Department of Transportation

Count Data Info	
Start Date	9/11/2018
End Date	9/12/2018
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	adot
Count Source	101237
File Name	
Weather	
Study	
Owner	adotits

Interval: 15 mins

Time	15 Min 1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	48	69	60	46	223		223	238	218	196		
01:00 - 02:00	63	49	38	50	200		200	172	178	184		
02:00 - 03:00	35	55	44	44	178		178	187	182	232		
03:00 - 04:00	44	50	94	103	291		291	421	627	906		
04:00 - 05:00	174	256	373	362	1165		1165	1452	1792	2186		
05:00 - 06:00	461	596	767	838	2662		2662	3126	3583	4153		
06:00 - 07:00	925	1053	1337	1366	4681	17521	4681	5323	5928	6465	6676	38.1%
07:00 - 08:00	1567	1658	1874	1577	6676		6676	6655	6603	6331		
08:00 - 09:00	1546	1606	1602	1410	6164		6164	6081	5944	5561		
09:00 - 10:00	1463	1469	1219	1182	5333	23378	5333	4976	4578	4523	5333	22.8%
10:00 - 11:00	1106	1071	1164	1103	4444		4444	4447	4470	4446		
11:00 - 12:00	1109	1094	1140	1091	4434		4434	4416	4477	4535		
12:00 - 13:00	1091	1155	1198	1094	4538		4538	4558	4538	4518		
13:00 - 14:00	1111	1135	1178	1205	4629		4629	4785	5002	5275		
14:00 - 15:00	1267	1352	1451	1466	5536	22474	5536	5547	5660	5614	5950	26.5%
15:00 - 16:00	1278	1465	1405	1389	5537		5537	5709	5739	5811		
16:00 - 17:00	1450	1495	1477	1434	5856		5856	5916	5950	5783		
17:00 - 18:00	1510	1529	1310	1196	5545		5545	5203	4850	4502		
18:00 - 19:00	1168	1176	962	902	4208	13826	4208	3820	3410	3083	4208	30.4%
19:00 - 20:00	780	766	635	550	2731		2731	2484	2251	2065		
20:00 - 21:00	533	533	449	409	1924		1924	1814	1686	1583		
21:00 - 22:00	423	405	346	307	1481		1481	1354	1198	1056		
22:00 - 23:00	296	249	204	170	919		919	802	679	588		
23:00 - 24:00	179	126	113	88	506		506	327	201	88		
TOTAL					79861	79861					6676	8.4%

Location Info	
Location ID	101237_NB
Type	LINK
Functional Class	2
Located On	SR 101
Between	Exit 37 Frank Lloyd Wright Blvd AND Exit 39 Raintree Dr
Direction	NB
Community	-
MPO_ID	0
HPMS ID	0
Agency	Arizona Department of Transportation

Count Data Info	
Start Date	9/11/2018
End Date	9/12/2018
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	adot
Count Source	101237
File Name	
Weather	
Study	
Owner	adotits

Interval: 15 mins

Time	15 Min 1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	56	95	65	66	282		282	279	231	210		
01:00 - 02:00	53	47	44	25	169		169	152	148	140		
02:00 - 03:00	36	43	36	27	142		142	135	128	119		
03:00 - 04:00	29	36	27	21	113		113	124	144	218		
04:00 - 05:00	40	56	101	80	277		277	297	347	390		
05:00 - 06:00	60	106	144	120	430		430	412	434	411		
06:00 - 07:00	42	128	121	137	428	8953	428	856	1544	2657	4864	54.3%
07:00 - 08:00	470	816	1234	1291	3811		3811	4521	4864	4814		
08:00 - 09:00	1180	1159	1184	1191	4714		4714	4626	4476	4323		
09:00 - 10:00	1092	1009	1031	933	4065	19602	4065	3837	3676	3552	4383	22.4%
10:00 - 11:00	864	848	907	882	3501		3501	3477	3511	3523		
11:00 - 12:00	840	882	919	961	3602		3602	3719	3830	3945		
12:00 - 13:00	957	993	1034	1067	4051		4051	4035	4079	4185		
13:00 - 14:00	941	1037	1140	1265	4383		4383	4663	4995	5314		
14:00 - 15:00	1221	1369	1459	1476	5525	23790	5525	5763	5867	5930	6328	26.6%
15:00 - 16:00	1459	1473	1522	1519	5973		5973	6066	6217	6255		
16:00 - 17:00	1552	1624	1560	1555	6291		6291	6328	6267	6173		
17:00 - 18:00	1589	1563	1466	1383	6001		6001	5809	5431	5071		
18:00 - 19:00	1397	1185	1106	917	4605	14093	4605	4117	3734	3388	4605	32.7%
19:00 - 20:00	909	802	760	689	3160		3160	2826	2598	2364		
20:00 - 21:00	575	574	526	489	2164		2164	2003	1937	1797		
21:00 - 22:00	414	508	386	367	1675		1675	1554	1333	1166		
22:00 - 23:00	293	287	219	173	972		972	846	689	592		
23:00 - 24:00	167	130	122	115	534		534	367	237	115		
TOTAL					66868	66868					6328	9.5%

Location Info

Location ID	101238_SB
Type	LINK
Functional Class	2
Located On	SR 101
Between	Exit 39 Raintree Dr AND Exit 40 Cactus Rd
Direction	SB
Community	-
MPO_ID	0
HPMS ID	0
Agency	Arizona Department of Transportation

Count Data Info

Start Date	8/23/2018
End Date	8/24/2018
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	adot
Count Source	101238
File Name	
Weather	
Study	
Owner	adotits

Interval: 15 mins

Time	15 Min				Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
	1st	2nd	3rd	4th								
00:00 - 01:00	73	75	79	66	293		293	278	256	224		
01:00 - 02:00	58	53	47	37	195		195	176	175	188		
02:00 - 03:00	39	52	60	41	192		192	209	230	279		
03:00 - 04:00	56	73	109	125	363		363	490	707	1030		
04:00 - 05:00	183	290	432	481	1386		1386	1721	2110	2534		
05:00 - 06:00	518	679	856	995	3048		3048	3544	4154	4847		
06:00 - 07:00	1014	1289	1549	1555	5407	15549	5407	6204	6959	7435	7690	49.5%
07:00 - 08:00	1811	2044	2025	1810	7690		7690	7618	6287	4262		
08:00 - 09:00	1739	713	0	0	2452		2452	713	0	1309		
09:00 - 10:00	0	0	1309	1386	2695	25178	2695	3979	5287	5294	5914	23.5%
10:00 - 11:00	1284	1308	1316	1330	5238		5238	5371	5446	5536		
11:00 - 12:00	1417	1383	1406	1427	5633		5633	5605	5671	5733		
12:00 - 13:00	1389	1449	1468	1392	5698		5698	5779	5799	5820		
13:00 - 14:00	1470	1469	1489	1486	5914		5914	6111	6336	6571		
14:00 - 15:00	1667	1694	1724	1703	6788	27917	6788	6816	6801	6868	7505	26.9%
15:00 - 16:00	1695	1679	1791	1682	6847		6847	7056	7232	7228		
16:00 - 17:00	1904	1855	1787	1774	7320		7320	7424	7505	7285		
17:00 - 18:00	2008	1936	1567	1451	6962		6962	6480	5868	5404		
18:00 - 19:00	1526	1324	1103	992	4945	17087	4945	4391	3965	3644	4945	28.9%
19:00 - 20:00	972	898	782	725	3377		3377	3094	2836	2647		
20:00 - 21:00	689	640	593	587	2509		2509	2383	2314	2202		
21:00 - 22:00	563	571	481	387	2002		2002	1739	1476	1271		
22:00 - 23:00	300	308	276	249	1133		1133	1047	935	818		
23:00 - 24:00	214	196	159	123	692		692	478	282	123		
TOTAL					88779	88779					7690	8.7%

Location Info

Location ID	101238_NB
Type	LINK
Functional Class	2
Located On	SR 101
Between	Exit 39 Raintree Dr AND Exit 40 Cactus Rd
Direction	NB
Community	-
MPO_ID	0
HPMS ID	0
Agency	Arizona Department of Transportation

Count Data Info

Start Date	8/23/2018
End Date	8/24/2018
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	adot
Count Source	101238
File Name	
Weather	
Study	
Owner	adotits

Interval: 15 mins

Time	15 Min				Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
	1st	2nd	3rd	4th								
00:00 - 01:00	74	105	89	68	336		336	336	299	264		
01:00 - 02:00	74	68	54	65	261		261	233	211	212		
02:00 - 03:00	46	46	55	39	186		186	170	173	178		
03:00 - 04:00	30	49	60	67	206		206	288	428	659		
04:00 - 05:00	112	189	291	407	999		999	1312	1645	2080		
05:00 - 06:00	425	522	726	844	2517		2517	2895	3308	3746		
06:00 - 07:00	803	935	1164	1315	4217	12180	4217	4752	5342	5751	6125	50.3%
07:00 - 08:00	1338	1525	1573	1577	6013		6013	6125	5100	3527		
08:00 - 09:00	1450	500	0	0	1950		1950	500	0	1108		
09:00 - 10:00	0	0	1108	1170	2278	20277	2278	3279	4332	4304	5051	24.9%
10:00 - 11:00	1001	1053	1080	1052	4186		4186	4230	4200	4169		
11:00 - 12:00	1045	1023	1049	1126	4243		4243	4297	4402	4511		
12:00 - 13:00	1099	1128	1158	1134	4519		4519	4542	4626	4804		
13:00 - 14:00	1122	1212	1336	1381	5051		5051	5279	5595	5856		
14:00 - 15:00	1350	1528	1597	1621	6096	25024	6096	6212	6303	6217	6503	26.0%
15:00 - 16:00	1466	1619	1511	1630	6226		6226	6339	6388	6493		
16:00 - 17:00	1579	1668	1616	1634	6497		6497	6503	6443	6406		
17:00 - 18:00	1585	1608	1579	1433	6205		6205	5899	5443	4952		
18:00 - 19:00	1279	1152	1088	936	4455	15740	4455	4064	3705	3348	4455	28.3%
19:00 - 20:00	888	793	731	653	3065		3065	2899	2790	2641		
20:00 - 21:00	722	684	582	519	2507		2507	2325	2112	1939		
21:00 - 22:00	540	471	409	409	1829		1829	1652	1523	1400		
22:00 - 23:00	363	342	286	254	1245		1245	1083	924	777		
23:00 - 24:00	201	183	139	128	651		651	450	267	128		
TOTAL					75738	75738					6503	8.6%

Location Info	
Location ID	101239_SB
Type	LINK
Functional Class	2
Located On	SR 101
Between	Exit 40 Cactus Rd AND Exit 41 Shea Blvd
Direction	SB
Community	-
MPO_ID	0
HPMS ID	P00005110101
Agency	Arizona Department of Transportation

Count Data Info	
Start Date	8/14/2018
End Date	8/15/2018
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	adot
Count Source	101239
File Name	
Weather	
Study	
Owner	adotits

Interval: 15 mins	15 Min											
Time	1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	40	104	72	57	273		273	291	223	187		
01:00 - 02:00	58	36	36	22	152		152	119	112	108		
02:00 - 03:00	25	29	32	39	125		125	133	136	139		
03:00 - 04:00	33	32	35	39	139		139	176	206	236		
04:00 - 05:00	70	62	65	99	296		296	309	299	267		
05:00 - 06:00	83	52	33	80	248		248	216	211	312		
06:00 - 07:00	51	47	134	252	484	16002	484	1650	3607	5802	8541	53.4%
07:00 - 08:00	1217	2004	2329	2123	7673		7673	8523	8541	8173		
08:00 - 09:00	2067	2022	1961	1795	7845		7845	7545	7196	6919		
09:00 - 10:00	1767	1673	1684	1495	6619	30211	6619	6199	5949	5636	6619	21.9%
10:00 - 11:00	1347	1423	1371	1468	5609		5609	5698	5705	5863		
11:00 - 12:00	1436	1430	1529	1421	5816		5816	5742	5797	5730		
12:00 - 13:00	1362	1485	1462	1479	5788		5788	5981	5996	6213		
13:00 - 14:00	1555	1500	1679	1645	6379		6379	6485	6831	7024		
14:00 - 15:00	1661	1846	1872	1798	7177	29723	7177	7289	7226	7222	7832	26.3%
15:00 - 16:00	1773	1783	1868	1812	7236		7236	7375	7602	7621		
16:00 - 17:00	1912	2010	1887	1983	7792		7792	7832	7753	7809		
17:00 - 18:00	1952	1931	1943	1692	7518		7518	7089	6646	6036		
18:00 - 19:00	1523	1488	1333	1137	5481	11573	5481	5114	4751	4354	5481	47.4%
19:00 - 20:00	1156	1125	936	707	3924		3924	3344	2609	1689		
20:00 - 21:00	576	390	16	56	1038		1038	462	72	56		
21:00 - 22:00	0	0	0	27	27		27	43	104	128		
22:00 - 23:00	16	61	24	14	115		115	99	39	15		
23:00 - 24:00	0	1	0	2	3		3	3	2	2		
TOTAL					87757	87757					8541	9.7%

Location Info	
Location ID	101239_NB
Type	LINK
Functional Class	2
Located On	SR 101
Between	Exit 40 Cactus Rd AND Exit 41 Shea Blvd
Direction	NB
Community	-
MPO_ID	0
HPMS ID	P00005110101
Agency	Arizona Department of Transportation

Count Data Info	
Start Date	8/14/2018
End Date	8/15/2018
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	adot
Count Source	101239
File Name	
Weather	
Study	
Owner	adotits

Interval: 15 mins	15 Min											
Time	1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	89	124	108	103	424		424	412	359	321		
01:00 - 02:00	77	71	70	63	281		281	250	242	227		
02:00 - 03:00	46	63	55	62	226		226	236	226	266		
03:00 - 04:00	56	53	95	115	319		319	399	595	902		
04:00 - 05:00	136	249	402	517	1304		1304	1637	1996	2493		
05:00 - 06:00	469	608	899	1120	3096		3096	3628	4278	4932		
06:00 - 07:00	1001	1258	1553	1795	5607	20535	5607	6337	7020	7456	7575	36.9%
07:00 - 08:00	1731	1941	1989	1875	7536		7536	7575	7480	7390		
08:00 - 09:00	1770	1846	1899	1877	7392		7392	7330	7023	6603		
09:00 - 10:00	1708	1539	1479	1389	6115	28365	6115	5652	5398	5191	6115	21.6%
10:00 - 11:00	1245	1285	1272	1413	5215		5215	5288	5324	5427		
11:00 - 12:00	1318	1321	1375	1458	5472		5472	5452	5499	5612		
12:00 - 13:00	1298	1368	1488	1446	5600		5600	5639	5753	5745		
13:00 - 14:00	1337	1482	1480	1664	5963		5963	6279	6528	7019		
14:00 - 15:00	1653	1731	1971	1957	7312	30840	7312	7533	7723	7684	8004	26.0%
15:00 - 16:00	1874	1921	1932	1926	7653		7653	7730	7868	7927		
16:00 - 17:00	1951	2059	1991	1997	7998		7998	8004	7968	7991		
17:00 - 18:00	1957	2023	2014	1883	7877		7877	7717	7319	6748		
18:00 - 19:00	1797	1625	1443	1218	6083	19848	6083	5388	4825	4206	6083	30.6%
19:00 - 20:00	1102	1062	824	880	3868		3868	3599	3263	3081		
20:00 - 21:00	833	726	642	576	2777		2777	2508	2290	2120		
21:00 - 22:00	564	508	472	439	1983		1983	1868	1740	1563		
22:00 - 23:00	449	380	295	255	1379		1379	1271	1209	1104		
23:00 - 24:00	341	318	190	355	1204		1204	863	545	355		
TOTAL					102684	102684					8004	7.8%

Location Info

Location ID	101240_SB
Type	LINK
Functional Class	2
Located On	SR 101
Between	Exit 41 Shea Blvd AND Exit 42 Pima Rd - 90th St
Direction	SB
Community	-
MPO_ID	0
HPMS ID	0
Agency	Arizona Department of Transportation

Count Data Info

Start Date	8/20/2018
End Date	8/21/2018
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	adot
Count Source	101240
File Name	
Weather	
Study	
Owner	adotits

Interval: 15 mins

Time	15 Min 1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	49	69	67	78	263		263	272	254	225		
01:00 - 02:00	58	51	38	42	189		189	174	156	164		
02:00 - 03:00	43	33	46	43	165		165	177	209	261		
03:00 - 04:00	55	65	98	124	342		342	453	653	930		
04:00 - 05:00	166	265	375	398	1204		1204	1447	1706	2027		
05:00 - 06:00	409	524	696	813	2442		2442	2899	3503	4165		
06:00 - 07:00	866	1128	1358	1474	4826	18385	4826	5550	6244	6767	7290	39.7%
07:00 - 08:00	1590	1822	1881	1836	7129		7129	7290	7037	6821		
08:00 - 09:00	1751	1569	1665	1445	6430		6430	5907	5523	4956		
09:00 - 10:00	1228	1185	1098	1019	4530	21687	4530	4282	4074	4037	4542	20.9%
10:00 - 11:00	980	977	1061	1017	4035		4035	4059	4148	4181		
11:00 - 12:00	1004	1066	1094	1103	4267		4267	4267	4324	4351		
12:00 - 13:00	1004	1123	1121	1065	4313		4313	4416	4437	4429		
13:00 - 14:00	1107	1144	1113	1178	4542		4542	4621	4755	4942		
14:00 - 15:00	1186	1278	1300	1217	4981	22504	4981	5136	5283	5452	6158	27.4%
15:00 - 16:00	1341	1425	1469	1418	5653		5653	5865	6060	6048		
16:00 - 17:00	1553	1620	1457	1528	6158		6158	6143	6079	6043		
17:00 - 18:00	1538	1556	1421	1197	5712		5712	5446	5056	4614		
18:00 - 19:00	1272	1166	979	895	4312	14144	4312	3852	3434	3044	4312	30.5%
19:00 - 20:00	812	748	589	549	2698		2698	2431	2205	2122		
20:00 - 21:00	545	522	506	467	2040		2040	1898	1774	1610		
21:00 - 22:00	403	398	342	305	1448		1448	1330	1205	1083		
22:00 - 23:00	285	273	220	165	943		943	835	695	608		
23:00 - 24:00	177	133	133	97	540		540	363	230	97		
TOTAL					79162	79162					7290	9.2%

Location Info

Location ID	101240_NB
Type	LINK
Functional Class	2
Located On	SR 101
Between	Exit 41 Shea Blvd AND Exit 42 Pima Rd - 90th St
Direction	NB
Community	-
MPO_ID	0
HPMS ID	0
Agency	Arizona Department of Transportation

Count Data Info

Start Date	8/20/2018
End Date	8/21/2018
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	adot
Count Source	101240
File Name	
Weather	
Study	
Owner	adotits

Interval: 15 mins

Time	15 Min 1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	79	127	91	82	379		379	363	285	249		
01:00 - 02:00	63	49	55	53	220		220	208	209	208		
02:00 - 03:00	51	50	54	40	195		195	200	213	238		
03:00 - 04:00	56	63	79	106	304		304	368	530	829		
04:00 - 05:00	120	225	378	413	1136		1136	1450	1737	2117		
05:00 - 06:00	434	512	758	905	2609		2609	3136	3850	4558		
06:00 - 07:00	961	1226	1466	1566	5219	18417	5219	5832	6318	6605	6840	37.1%
07:00 - 08:00	1574	1712	1753	1749	6788		6788	6840	6706	6582		
08:00 - 09:00	1626	1578	1629	1577	6410		6410	6075	5741	5269		
09:00 - 10:00	1291	1244	1157	1134	4826	22250	4826	4546	4378	4252	4826	21.7%
10:00 - 11:00	1011	1076	1031	1063	4181		4181	4159	4110	4145		
11:00 - 12:00	989	1027	1066	1168	4250		4250	4358	4413	4484		
12:00 - 13:00	1097	1082	1137	1091	4407		4407	4387	4460	4490		
13:00 - 14:00	1077	1155	1167	1187	4586		4586	4722	4808	5015		
14:00 - 15:00	1213	1241	1374	1363	5191	24949	5191	5499	5805	6021	6963	27.9%
15:00 - 16:00	1521	1547	1590	1612	6270		6270	6344	6514	6656		
16:00 - 17:00	1595	1717	1732	1695	6739		6739	6938	6963	6902		
17:00 - 18:00	1794	1742	1671	1542	6749		6749	6332	5891	5329		
18:00 - 19:00	1377	1301	1109	1012	4799	15551	4799	4259	3737	3393	4799	30.9%
19:00 - 20:00	837	779	765	640	3021		3021	2763	2509	2235		
20:00 - 21:00	579	525	491	491	2086		2086	1983	1945	1832		
21:00 - 22:00	476	487	378	329	1670		1670	1550	1367	1243		
22:00 - 23:00	356	304	254	190	1104		1104	948	812	707		
23:00 - 24:00	200	168	149	120	637		637	437	269	120		
TOTAL					83776	83776					6963	8.3%

Frank Lloyd Wright Blvd SB On-Ramp

Location Info	
Location ID	7330
Type	I-SECTION
Functional Class	6
Located On	SR-101 Exit 38 G-Ramp
Between	AND
Direction	RAMP
Community	-
MPO_ID	0
HPMS ID	
Agency	Arizona Department of Transportation

Count Data Info	
Start Date	7/11/2017
End Date	7/12/2017
Start Time	12:00 PM
End Time	12:00 PM
Direction	
Notes	
Count Source	
File Name	7330.xlsx
Weather	
Study	
Owner	jasonc

Interval: 15 mins

Time	15 Min 1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	23	19	19	20	81		81	78	78	69		
01:00 - 02:00	20	19	10	10	59		59	48	35	31		
02:00 - 03:00	9	6	6	10	31		31	29	26	27		
03:00 - 04:00	7	3	7	5	22		22	35	50	68		
04:00 - 05:00	20	18	25	28	91		91	109	121	158		
05:00 - 06:00	38	30	62	68	198		198	231	278	344		
06:00 - 07:00	71	77	128	137	413	2087	413	514	643	751	863	41.4%
07:00 - 08:00	172	206	236	210	824		824	856	857	863		
08:00 - 09:00	204	207	242	197	850		850	844	843	787		
09:00 - 10:00	198	206	186	190	780	4532	780	773	740	773	1076	23.7%
10:00 - 11:00	191	173	219	187	770		770	772	838	838		
11:00 - 12:00	193	239	219	254	905		905	935	971	1002		
12:00 - 13:00	223	275	250	262	1010		1010	1044	1040	1076		
13:00 - 14:00	257	271	286	253	1067		1067	1085	1086	1065		
14:00 - 15:00	275	272	265	269	1081	4808	1081	1125	1179	1172	1352	28.1%
15:00 - 16:00	319	326	258	264	1167		1167	1196	1177	1232		
16:00 - 17:00	348	307	313	320	1288		1288	1298	1352	1351		
17:00 - 18:00	358	361	312	241	1272		1272	1218	1136	1047		
18:00 - 19:00	304	279	223	178	984	3401	984	928	831	794	984	28.9%
19:00 - 20:00	248	182	186	163	779		779	694	680	629		
20:00 - 21:00	163	168	135	113	579		579	529	482	420		
21:00 - 22:00	113	121	73	63	370		370	348	287	256		
22:00 - 23:00	91	60	42	59	252		252	202	180	177		
23:00 - 24:00	41	38	39	35	153		153	112	74	35		
TOTAL					15026	15026					1352	9.0%

Frank Lloyd Wright Blvd NB On-Ramp

Location Info	
Location ID	7323
Type	I-SECTION
Functional Class	6
Located On	SR-101 Exit 37 J-Ramp
Between	AND
Direction	RAMP
Community	-
MPO_ID	0
HPMS ID	
Agency	Arizona Department of Transportation

Count Data Info	
Start Date	5/10/2017
End Date	5/11/2017
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	
Count Source	
File Name	7323.xlsx
Weather	
Study	
Owner	jasonc

Interval: 15 mins

Time	15 Min 1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	13	25	7	13	58		58	49	30	29		
01:00 - 02:00	4	6	6	10	26		26	22	19	15		
02:00 - 03:00	0	3	2	3	8		8	15	18	21		
03:00 - 04:00	7	6	5	6	24		24	24	31	44		
04:00 - 05:00	7	13	18	17	55		55	96	130	176		
05:00 - 06:00	48	47	64	73	232		232	284	363	462		
06:00 - 07:00	100	126	163	124	513	2321	513	609	657	773	954	41.1%
07:00 - 08:00	196	174	279	212	861		861	906	954	934		
08:00 - 09:00	241	222	259	225	947		947	892	852	812		
09:00 - 10:00	186	182	219	186	773	4369	773	773	765	762	1009	23.1%
10:00 - 11:00	186	174	216	185	761		761	776	811	827		
11:00 - 12:00	201	209	232	230	872		872	916	944	963		
12:00 - 13:00	245	237	251	221	954		954	957	949	989		
13:00 - 14:00	248	229	291	241	1009		1009	1037	1023	1001		
14:00 - 15:00	276	215	269	279	1039	4113	1039	1040	1095	1125	1125	27.4%
15:00 - 16:00	277	270	299	230	1076		1076	1085	1084	1008		
16:00 - 17:00	286	269	223	251	1029		1029	1008	967	992		
17:00 - 18:00	265	228	248	228	969		969	953	955	907		
18:00 - 19:00	249	230	200	195	874	3065	874	802	739	703	874	28.5%
19:00 - 20:00	177	167	164	147	655		655	654	634	623		
20:00 - 21:00	176	147	153	123	599		599	563	494	436		
21:00 - 22:00	140	78	95	74	387		387	330	319	298		
22:00 - 23:00	83	67	74	47	271		271	227	185	132		
23:00 - 24:00	39	25	21	23	108		108	69	44	23		
TOTAL					14100	14100					1125	8.0%

Frank Lloyd Wright Blvd SB Off-Ramp

Location Info	
Location ID	7320
Type	I-SECTION
Functional Class	6
Located On	SR-101 Exit 37 A-Ramp
Between	AND
Direction	RAMP
Community	-
MPO_ID	0
HPMS ID	
Agency	Arizona Department of Transportation

Count Data Info	
Start Date	5/10/2017
End Date	5/11/2017
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	
Count Source	
File Name	7320.xlsx
Weather	
Study	
Owner	jasonc

Interval: 15 mins

Time	15 Min 1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	11	7	16	14	48		48	42	40	35		
01:00 - 02:00	5	5	11	7	28		28	29	28	26		
02:00 - 03:00	6	4	9	9	28		28	34	40	40		
03:00 - 04:00	12	10	9	29	60		60	72	81	103		
04:00 - 05:00	24	19	31	59	133		133	158	219	311		
05:00 - 06:00	49	80	123	130	382		382	449	544	591		
06:00 - 07:00	116	175	170	214	675	2442	675	788	845	928	954	39.1%
07:00 - 08:00	229	232	253	240	954		954	941	954	868		
08:00 - 09:00	216	245	167	185	813		813	806	775	845		
09:00 - 10:00	209	214	237	209	869	4096	869	865	814	786	869	21.2%
10:00 - 11:00	205	163	209	218	795		795	791	821	803		
11:00 - 12:00	201	193	191	197	782		782	814	831	863		
12:00 - 13:00	233	210	223	188	854		854	833	826	790		
13:00 - 14:00	212	203	187	194	796		796	749	723	720		
14:00 - 15:00	165	177	184	181	707	2895	707	735	727	719	762	26.3%
15:00 - 16:00	193	169	176	180	718		718	698	723	720		
16:00 - 17:00	173	194	173	204	744		744	762	746	738		
17:00 - 18:00	191	178	165	192	726		726	708	699	700		
18:00 - 19:00	173	169	166	156	664	2256	664	626	571	514	664	29.4%
19:00 - 20:00	135	114	109	124	482		482	433	407	378		
20:00 - 21:00	86	88	80	58	312		312	300	291	282		
21:00 - 22:00	74	79	71	62	286		286	259	214	176		
22:00 - 23:00	47	34	33	32	146		146	117	99	85		
23:00 - 24:00	18	16	19	16	69		69	51	35	16		
TOTAL					12071	12071					954	7.9%

Frank Lloyd Wright Blvd NB Off-Ramp

Location Info	
Location ID	7333
Type	I-SECTION
Functional Class	6
Located On	SR-101 Exit 38 C-Ramp
Between	AND
Direction	RAMP
Community	-
MPO_ID	0
HPMS ID	
Agency	Arizona Department of Transportation

Count Data Info	
Start Date	7/12/2017
End Date	7/13/2017
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	
Count Source	
File Name	7333.xlsx
Weather	
Study	
Owner	jasonc

Interval: 15 mins

Time	15 Min 1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	23	15	9	10	57		57	44	39	37		
01:00 - 02:00	10	10	7	11	38		38	33	30	34		
02:00 - 03:00	5	7	11	4	27		27	29	28	28		
03:00 - 04:00	7	6	11	29	53		53	64	93	137		
04:00 - 05:00	18	35	55	72	180		180	218	259	317		
05:00 - 06:00	56	76	113	177	422		422	515	617	750		
06:00 - 07:00	149	178	246	288	861	3667	861	997	1131	1277	1471	40.1%
07:00 - 08:00	285	312	392	384	1373		1373	1438	1471	1433		
08:00 - 09:00	350	345	354	384	1433		1433	1368	1312	1205		
09:00 - 10:00	285	289	247	264	1085	4509	1085	1008	947	890	1085	24.1%
10:00 - 11:00	208	228	190	241	867		867	833	801	848		
11:00 - 12:00	174	196	237	245	852		852	905	932	905		
12:00 - 13:00	227	223	210	246	906		906	888	858	837		
13:00 - 14:00	209	193	189	208	799		799	791	783	813		
14:00 - 15:00	201	185	219	229	834	3447	834	833	845	845	905	26.3%
15:00 - 16:00	200	197	219	251	867		867	869	880	866		
16:00 - 17:00	202	208	205	245	860		860	861	885	905		
17:00 - 18:00	203	232	225	226	886		886	887	805	764		
18:00 - 19:00	204	150	184	168	706	2312	706	627	600	523	706	30.5%
19:00 - 20:00	125	123	107	87	442		442	395	367	329		
20:00 - 21:00	78	95	69	60	302		302	287	255	262		
21:00 - 22:00	63	63	76	59	261		261	248	227	190		
22:00 - 23:00	50	42	39	35	166		166	149	122	101		
23:00 - 24:00	33	15	18	14	80		80	47	32	14		
TOTAL					14357	14357					1471	10.2%

Raintree Drive SB On-Ramp

Location Info	
Location ID	7331
Type	I-SECTION
Functional Class	6
Located On	SR-101 Exit 38 G1-Ramp
Between	AND
Direction	RAMP
Community	-
MPO_ID	0
HPMS ID	
Agency	Arizona Department of Transportation

Count Data Info	
Start Date	7/12/2017
End Date	7/13/2017
Start Time	10:00 AM
End Time	10:00 AM
Direction	
Notes	
Count Source	
File Name	7331.xlsx
Weather	
Study	
Owner	jasonc

Interval: 15 mins

Time	15 Min 1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	17	16	12	13	58		58	49	42	38		
01:00 - 02:00	8	9	8	9	34		34	30	25	28		
02:00 - 03:00	4	4	11	8	27		27	28	29	27		
03:00 - 04:00	5	5	9	10	29		29	39	50	60		
04:00 - 05:00	15	16	19	20	70		70	82	124	167		
05:00 - 06:00	27	58	62	70	217		217	287	350	422		
06:00 - 07:00	97	121	134	131	483	2091	483	566	650	754	831	39.7%
07:00 - 08:00	180	205	238	175	798		798	831	824	796		
08:00 - 09:00	213	198	210	189	810		810	794	783	779		
09:00 - 10:00	197	187	206	179	769	4550	769	760	781	789	1036	22.8%
10:00 - 11:00	188	208	214	216	826		826	861	904	917		
11:00 - 12:00	223	251	227	258	959		959	996	1008	1036		
12:00 - 13:00	260	263	255	221	999		999	993	983	1021		
13:00 - 14:00	254	253	293	197	997		997	1039	1052	1042		
14:00 - 15:00	296	266	283	258	1103	5349	1103	1100	1120	1210	1626	30.4%
15:00 - 16:00	293	286	373	289	1241		1241	1345	1414	1396		
16:00 - 17:00	397	355	355	395	1502		1502	1551	1626	1624		
17:00 - 18:00	446	430	353	274	1503		1503	1395	1190	1048		
18:00 - 19:00	338	225	211	174	948	2764	948	832	775	712	948	34.3%
19:00 - 20:00	222	168	148	122	660		660	551	487	447		
20:00 - 21:00	113	104	108	76	401		401	386	356	315		
21:00 - 22:00	98	74	67	47	286		286	237	211	186		
22:00 - 23:00	49	48	42	33	172		172	147	109	92		
23:00 - 24:00	24	10	25	20	79		79	55	45	20		
TOTAL					14971	14971					1626	10.9%

Raintree Drive NB On-Ramp

Location Info	
Location ID	7322
Type	I-SECTION
Functional Class	6
Located On	SR-101 Exit 38 J-Ramp
Between	AND
Direction	RAMP
Community	-
MPO_ID	0
HPMS ID	
Agency	Arizona Department of Transportation

Count Data Info	
Start Date	5/10/2017
End Date	5/11/2017
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	
Count Source	
File Name	7322.xlsx
Weather	
Study	
Owner	jasonc

Interval: 15 mins

Time	15 Min 1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	19	7	6	5	37		37	28	30	31		
01:00 - 02:00	10	9	7	5	31		31	23	16	14		
02:00 - 03:00	2	2	5	4	13		13	13	12	16		
03:00 - 04:00	2	1	9	2	14		14	18	23	26		
04:00 - 05:00	6	6	12	14	38		38	45	55	65		
05:00 - 06:00	13	16	22	30	81		81	103	138	168		
06:00 - 07:00	35	51	52	84	222	1041	222	284	342	396	425	40.8%
07:00 - 08:00	97	109	106	82	394		394	413	388	395		
08:00 - 09:00	116	84	113	112	425		425	397	432	402		
09:00 - 10:00	88	119	83	77	367	2439	367	374	340	363	617	25.3%
10:00 - 11:00	95	85	106	119	405		405	424	449	475		
11:00 - 12:00	114	110	132	142	498		498	536	555	559		
12:00 - 13:00	152	129	136	135	552		552	546	573	609		
13:00 - 14:00	146	156	172	143	617		617	653	675	680		
14:00 - 15:00	182	178	177	182	719	3196	719	737	741	755	900	28.2%
15:00 - 16:00	200	182	191	192	765		765	798	833	840		
16:00 - 17:00	233	217	198	202	850		850	870	886	900		
17:00 - 18:00	253	233	212	164	862		862	797	727	662		
18:00 - 19:00	188	163	147	131	629	1688	629	573	514	443	629	37.3%
19:00 - 20:00	132	104	76	86	398		398	352	313	286		
20:00 - 21:00	86	65	49	44	244		244	221	181	169		
21:00 - 22:00	63	25	37	25	150		150	110	105	97		
22:00 - 23:00	23	20	29	9	81		81	81	72	53		
23:00 - 24:00	23	11	10	9	53		53	30	19	9		
TOTAL					8445	8445					900	10.7%

Raintree Drive SB Off-Ramp

Location Info	
Location ID	7321
Type	I-SECTION
Functional Class	6
Located On	SR-101 Exit 38 A-Ramp
Between	AND
Direction	RAMP
Community	-
MPO_ID	0
HPMS ID	
Agency	Arizona Department of Transportation

Count Data Info	
Start Date	7/12/2017
End Date	7/13/2017
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	
Count Source	
File Name	7321.xlsx
Weather	
Study	
Owner	jasonc

Interval: 15 mins

Time	15 Min 1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	7	8	6	6	27		27	26	24	23		
01:00 - 02:00	6	6	5	4	21		21	16	10	9		
02:00 - 03:00	1	0	4	2	7		7	9	13	23		
03:00 - 04:00	3	4	14	23	44		44	57	69	88		
04:00 - 05:00	16	16	33	64	129		129	154	190	242		
05:00 - 06:00	41	52	85	137	315		315	386	484	567		
06:00 - 07:00	112	150	168	223	653	2771	653	712	817	905	1166	42.1%
07:00 - 08:00	171	255	256	316	998		998	1105	1150	1166		
08:00 - 09:00	278	300	272	270	1120		1120	1100	997	916		
09:00 - 10:00	258	197	191	225	871	3340	871	777	742	692	871	26.1%
10:00 - 11:00	164	162	141	196	663		663	658	643	634		
11:00 - 12:00	159	147	132	151	589		589	593	605	636		
12:00 - 13:00	163	159	163	160	645		645	618	608	580		
13:00 - 14:00	136	149	135	152	572		572	548	527	519		
14:00 - 15:00	112	128	127	147	514	2045	514	510	520	503	552	27.0%
15:00 - 16:00	108	138	110	129	485		485	491	509	530		
16:00 - 17:00	114	156	131	142	543		543	552	537	542		
17:00 - 18:00	123	141	136	103	503		503	474	431	392		
18:00 - 19:00	94	98	97	76	365	1303	365	340	293	257	365	28.0%
19:00 - 20:00	69	51	61	47	228		228	217	218	204		
20:00 - 21:00	58	52	47	53	210		210	191	171	164		
21:00 - 22:00	39	32	40	32	143		143	126	109	87		
22:00 - 23:00	22	15	18	14	69		69	65	62	61		
23:00 - 24:00	18	12	17	13	60		60	42	30	13		
TOTAL					9774	9774					1166	11.9%

Raintree Drive NB Off-Ramp

Location Info	
Location ID	7332
Type	I-SECTION
Functional Class	2
Located On	SR-101 Exit 38 C1-Ramp
Between	AND
Direction	RAMP
Community	-
MPO_ID	0
HPMS ID	
Agency	Arizona Department of Transportation

Count Data Info	
Start Date	5/10/2017
End Date	5/11/2017
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	
Count Source	
File Name	7332.xlsx
Weather	
Study	
Owner	jasonc

Interval: 15 mins

Time	15 Min 1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	15	20	21	11	67		67	60	46	31		
01:00 - 02:00	8	6	6	9	29		29	28	32	39		
02:00 - 03:00	7	10	13	5	35		35	32	35	35		
03:00 - 04:00	4	13	13	26	56		56	61	73	90		
04:00 - 05:00	9	25	30	62	126		126	157	201	272		
05:00 - 06:00	40	69	101	166	376		376	479	579	714		
06:00 - 07:00	143	169	236	331	879	4154	879	1063	1233	1351	1891	45.5%
07:00 - 08:00	327	339	354	484	1504		1504	1685	1854	1891		
08:00 - 09:00	508	508	391	364	1771		1771	1578	1318	1211		
09:00 - 10:00	315	248	284	396	1243	5560	1243	1194	1173	1140	1243	22.4%
10:00 - 11:00	266	227	251	293	1037		1037	1026	1056	1056		
11:00 - 12:00	255	257	251	259	1022		1022	1046	1049	1067		
12:00 - 13:00	279	260	269	339	1147		1147	1160	1161	1176		
13:00 - 14:00	292	261	284	274	1111		1111	1053	1046	1019		
14:00 - 15:00	234	254	257	260	1005	4171	1005	996	993	985	1156	27.7%
15:00 - 16:00	225	251	249	251	976		976	1020	1008	1062		
16:00 - 17:00	269	239	303	291	1102		1102	1145	1156	1145		
17:00 - 18:00	312	250	292	234	1088		1088	1025	975	875		
18:00 - 19:00	249	200	192	169	810	2752	810	711	672	608	810	29.4%
19:00 - 20:00	150	161	128	128	567		567	560	492	463		
20:00 - 21:00	143	93	99	98	433		433	392	381	341		
21:00 - 22:00	102	82	59	73	316		316	268	239	229		
22:00 - 23:00	54	53	49	41	197		197	179	167	136		
23:00 - 24:00	36	41	18	21	116		116	80	39	21		
TOTAL					17013	17013					1891	11.1%

Shea Boulevard SB On-Ramp

Location Info	
Location ID	7351
Type	I-SECTION
Functional Class	2
Located On	SR-101 Exit 41 G-Ramp
Between	AND
Direction	RAMP
Community	-
MPO_ID	0
HPMS ID	
Agency	Arizona Department of Transportation

Count Data Info	
Start Date	7/12/2017
End Date	7/13/2017
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	
Count Source	
File Name	7351.xlsx
Weather	
Study	
Owner	jasonc

Interval: 15 mins

Time	15 Min 1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	27	25	17	12	81		81	63	45	36		
01:00 - 02:00	9	7	8	5	29		29	23	23	31		
02:00 - 03:00	3	7	16	7	33		33	38	43	41		
03:00 - 04:00	8	12	14	14	48		48	59	71	94		
04:00 - 05:00	19	24	37	39	119		119	144	184	234		
05:00 - 06:00	44	64	87	78	273		273	343	432	493		
06:00 - 07:00	114	153	148	156	571	2187	571	624	676	721	859	39.3%
07:00 - 08:00	167	205	193	244	809		809	835	829	859		
08:00 - 09:00	193	199	223	192	807		807	805	779	760		
09:00 - 10:00	191	173	204	180	748	3813	748	750	755	731	817	21.4%
10:00 - 11:00	193	178	180	188	739		739	749	731	744		
11:00 - 12:00	203	160	193	173	729		729	742	778	778		
12:00 - 13:00	216	196	193	175	780		780	760	777	797		
13:00 - 14:00	196	213	213	195	817		817	836	818	801		
14:00 - 15:00	215	195	196	192	798	2803	798	794	781	760	798	28.5%
15:00 - 16:00	211	182	175	145	713		713	699	683	679		
16:00 - 17:00	197	166	171	147	681		681	666	667	640		
17:00 - 18:00	182	167	144	118	611		611	596	555	558		
18:00 - 19:00	167	126	147	100	540	2281	540	515	488	444	540	23.7%
19:00 - 20:00	142	99	103	84	428		428	393	390	385		
20:00 - 21:00	107	96	98	77	378		378	378	347	312		
21:00 - 22:00	107	65	63	63	298		298	254	236	215		
22:00 - 23:00	63	47	42	44	196		196	163	161	147		
23:00 - 24:00	30	45	28	28	131		131	101	56	28		
TOTAL					11357	11357					859	7.6%

Shea Boulevard NB On-Ramp

Location Info	
Location ID	7353
Type	I-SECTION
Functional Class	2
Located On	SR-101 Exit 41 J-Ramp
Between	AND
Direction	RAMP
Community	-
MPO_ID	0
HPMS ID	
Agency	Arizona Department of Transportation

Count Data Info	
Start Date	7/11/2017
End Date	7/12/2017
Start Time	12:00 PM
End Time	12:00 PM
Direction	
Notes	
Count Source	
File Name	7353.xlsx
Weather	
Study	
Owner	jasonc

Interval: 15 mins

Time	15 Min 1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	38	26	24	17	105		105	76	64	54		
01:00 - 02:00	9	14	14	10	47		47	43	39	33		
02:00 - 03:00	5	10	8	7	30		30	42	42	46		
03:00 - 04:00	17	10	12	11	50		50	55	61	81		
04:00 - 05:00	22	16	32	39	109		109	130	156	189		
05:00 - 06:00	43	42	65	84	234		234	278	362	469		
06:00 - 07:00	87	126	172	175	560	3060	560	650	718	868	1435	46.9%
07:00 - 08:00	177	194	322	390	1083		1083	1232	1391	1435		
08:00 - 09:00	326	353	366	372	1417		1417	1366	1306	1206		
09:00 - 10:00	275	293	266	274	1108	6413	1108	1145	1137	1204	1398	21.8%
10:00 - 11:00	312	285	333	296	1226		1226	1245	1294	1290		
11:00 - 12:00	331	334	329	339	1333		1333	1343	1363	1382		
12:00 - 13:00	341	354	348	345	1388		1388	1398	1382	1387		
13:00 - 14:00	351	338	353	316	1358		1358	1368	1388	1415		
14:00 - 15:00	361	358	380	377	1476	6693	1476	1483	1501	1522	1897	28.3%
15:00 - 16:00	368	376	401	476	1621		1621	1725	1813	1897		
16:00 - 17:00	472	464	485	443	1864		1864	1862	1896	1830		
17:00 - 18:00	470	498	419	345	1732		1732	1601	1439	1259		
18:00 - 19:00	339	336	239	236	1150	3939	1150	1031	927	884	1150	29.2%
19:00 - 20:00	220	232	196	174	822		822	797	728	685		
20:00 - 21:00	195	163	153	134	645		645	588	550	517		
21:00 - 22:00	138	125	120	96	479		479	444	386	334		
22:00 - 23:00	103	67	68	59	297		297	263	251	220		
23:00 - 24:00	69	55	37	44	205		205	136	81	44		
TOTAL					20339	20339					1897	9.3%

Shea Boulevard SB Off-Ramp

Location Info	
Location ID	7350
Type	I-SECTION
Functional Class	2
Located On	SR-101 Exit 41 A-Ramp
Between	AND
Direction	RAMP
Community	-
MPO_ID	0
HPMS ID	
Agency	Arizona Department of Transportation

Count Data Info	
Start Date	7/11/2017
End Date	7/12/2017
Start Time	1:00 PM
End Time	1:00 PM
Direction	
Notes	
Count Source	
File Name	7350.xlsx
Weather	
Study	
Owner	jasonc

Interval: 15 mins

Time	15 Min 1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	23	22	12	15	72		72	60	47	44		
01:00 - 02:00	11	9	9	7	36		36	37	40	48		
02:00 - 03:00	12	12	17	10	51		51	45	38	37		
03:00 - 04:00	6	5	16	25	52		52	65	97	146		
04:00 - 05:00	19	37	65	77	198		198	252	315	384		
05:00 - 06:00	73	100	134	194	501		501	598	698	811		
06:00 - 07:00	170	200	247	316	933	3578	933	1019	1128	1194	1378	38.5%
07:00 - 08:00	256	309	313	389	1267		1267	1330	1360	1372		
08:00 - 09:00	319	339	325	395	1378		1378	1406	1415	1410		
09:00 - 10:00	347	348	320	334	1349	6503	1349	1270	1266	1237	1350	20.8%
10:00 - 11:00	268	344	291	354	1257		1257	1293	1308	1350		
11:00 - 12:00	304	359	333	354	1350		1350	1334	1338	1309		
12:00 - 13:00	288	363	304	318	1273		1273	1291	1227	1254		
13:00 - 14:00	306	299	331	338	1274		1274	1303	1308	1258		
14:00 - 15:00	335	304	281	325	1245	4472	1245	1179	1162	1150	1245	27.8%
15:00 - 16:00	269	287	269	274	1099		1099	1085	1077	1060		
16:00 - 17:00	255	279	252	263	1049		1049	1056	1038	1083		
17:00 - 18:00	262	261	297	259	1079		1079	1089	1049	987		
18:00 - 19:00	272	221	235	205	933	3012	933	822	745	663	933	31.0%
19:00 - 20:00	161	144	153	143	601		601	553	539	508		
20:00 - 21:00	113	130	122	86	451		451	439	399	332		
21:00 - 22:00	101	90	55	63	309		309	264	210	210		
22:00 - 23:00	56	36	55	49	196		196	190	175	147		
23:00 - 24:00	50	21	27	15	113		113	63	42	15		
TOTAL					18066	18066					1415	7.8%

Shea Boulevard NB Off-Ramp

Location Info	
Location ID	7352
Type	I-SECTION
Functional Class	2
Located On	SR-101 Exit 41 C-Ramp
Between	AND
Direction	RAMP
Community	-
MPO_ID	0
HPMS ID	
Agency	Arizona Department of Transportation

Count Data Info	
Start Date	7/12/2017
End Date	7/13/2017
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	
Count Source	
File Name	7352.xlsx
Weather	
Study	
Owner	jasonc

Interval: 15 mins

Time	15 Min 1st	2nd	3rd	4th	Hourly Count	Period Volume	15-Minute Hourly Volume				Peak Hour Volume	Factor
00:00 - 01:00	24	17	11	18	70		70	67	59	57		
01:00 - 02:00	21	9	9	13	52		52	42	47	48		
02:00 - 03:00	11	14	10	10	45		45	41	42	43		
03:00 - 04:00	7	15	11	18	51		51	57	64	94		
04:00 - 05:00	13	22	41	65	141		141	177	214	268		
05:00 - 06:00	49	59	95	127	330		330	394	494	583		
06:00 - 07:00	113	159	184	210	666	2550	666	761	827	848	1026	40.2%
07:00 - 08:00	208	225	205	220	858		858	900	913	992		
08:00 - 09:00	250	238	284	254	1026		1026	1009	970	928		
09:00 - 10:00	233	199	242	230	904	4151	904	856	866	833	904	21.8%
10:00 - 11:00	185	209	209	204	807		807	791	786	780		
11:00 - 12:00	169	204	203	222	798		798	832	851	869		
12:00 - 13:00	203	223	221	184	831		831	815	778	778		
13:00 - 14:00	187	186	221	217	811		811	804	843	849		
14:00 - 15:00	180	225	227	199	831	3655	831	824	795	790	1103	30.2%
15:00 - 16:00	173	196	222	203	794		794	854	883	893		
16:00 - 17:00	233	225	232	237	927		927	927	1053	1099		
17:00 - 18:00	233	351	278	241	1103		1103	1080	944	875		
18:00 - 19:00	210	215	209	174	808	2707	808	733	656	545	808	29.8%
19:00 - 20:00	135	138	98	112	483		483	448	408	418		
20:00 - 21:00	100	98	108	87	393		393	389	377	332		
21:00 - 22:00	96	86	63	91	336		336	295	259	248		
22:00 - 23:00	55	50	52	49	206		206	194	171	148		
23:00 - 24:00	43	27	29	23	122		122	79	52	23		
TOTAL					13393	13393					1103	8.2%

Traffic Interchange and Study Intersection Traffic Counts

Intersection Turning Movement
Prepared by:
Field Data Services of Arizona, Inc.
520.316.6745

Project #: 16-1363-011

TMC SUMMARY OF Loop 101 Ramps & Shea Blvd.

Loop 101 Ramps

Shea Blvd.

Shea Blvd.

N

APPROACH LANES

TOTAL		1107	0	2417
PM		313	0	769
MD		396	0	785
AM		398	0	863

AM	MD	PM	TOTAL
741	1053	987	2781
751	752	945	2448
744	545	454	1743

APPROACH LANES

TOTAL	AM	MD	PM
1064	334	356	374
2979	941	1047	991
988	367	294	327

APPROACH LANES

CONTROL
Signal

PM	661	0	604	
MD	356	0	406	
AM	418	0	421	
TOTAL	1435	0	1431	

APPROACH LANES

Loop 101 Ramps

LOCATION #: **16-1363-011**

TURNING MOVEMENT COUNT

Loop 101 Ramps & Shea Blvd.
(Intersection Name)

THURSDAY — Day
10/06/16 — Date

COUNT PERIODS

AM	700AM	-	930AM
NOON	1145AM	-	145PM
PM	330PM	-	600PM

AM PEAK HOUR 700 AM

NOON PEAK HOUR 1145 AM

PM PEAK HOUR 400 PM

Intersection Turning Movement
Prepared by:
FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745

Project #: 16-1198-008

TMC SUMMARY OF Loop 101 - SB Ramps & Frank Lloyd Wright Blvd.

Loop 101 - SB Rai

APPROACH LANES

N

Southbound approach:

TOTAL	1027	1686	1712
PM	300	615	593
MD	383	627	594
AM	344	444	525

Frank Lloyd Wright Blvd.

Frank Lloyd Wright Blvd.

APPROACH LANES

Eastbound approach:

TOTAL	AM	MD	PM
0	0	0	0
3512	909	1221	1382
1689	437	611	641

CONTROL
Signalized

Westbound approach:

AM	MD	PM	TOTAL
0	0	0	0
1317	1177	1143	3637
289	401	329	1019

APPROACH LANES

Northbound approach:

PM	0	0	0
MD	0	0	0
AM	0	0	0
TOTAL	0	0	0

APPROACH LANES

Loop 101 - SB Ramps

LOCATION #: 16-1198-008

TURNING MOVEMENT COUNT

101 - SB Ramps & Frank Lloyd Wright
(Intersection Name)

THURSDAY — Day
05/19/2016 — Date

COUNT PERIODS

AM	700AM	-	900AM
NOON	1100AM	-	200PM
PM	400PM	-	600PM

AM PEAK HOUR 715 AM
NOON PEAK HOUR 1200 PM
PM PEAK HOUR 430 PM

Intersection Turning Movement
Prepared by:
FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745

Project #: 16-1198-007

TMC SUMMARY OF Loop 101 - NB Ramps & Frank Lloyd Wright Blvd.

Loop 101 - NB Ra

APPROACH LANES

N

Southbound approach:

TOTAL	0	0	0
PM	0	0	0
MD	0	0	0
AM	0	0	0

Frank Lloyd Wright Blvd.

Frank Lloyd Wright Blvd.

APPROACH LANES

Eastbound approach:

TOTAL	AM	MD	PM
1347	552	404	391
4214	1045	1514	1655
0	0	0	0

CONTROL
Signalized

Westbound approach:

AM	MD	PM	TOTAL
949	689	622	2260
897	870	787	2554
0	0	0	0

APPROACH LANES

Northbound approach:

PM	664	415	186
MD	720	458	177
AM	686	625	83
TOTAL	2070	1498	446

APPROACH LANES

Loop 101 - NB Ramps

LOCATION #: 16-1198-007

TURNING MOVEMENT COUNT

101 - NB Ramps & Frank Lloyd Wright
(Intersection Name)

THURSDAY — Day
05/19/2016 — Date

COUNT PERIODS

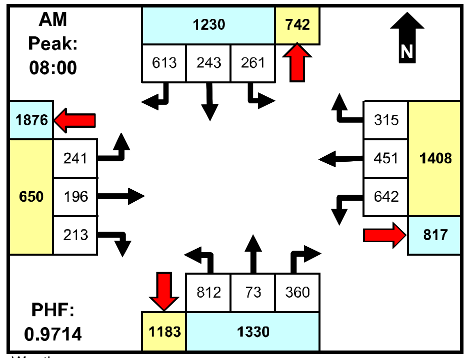
AM	700AM	-	900AM
NOON	1100AM	-	200PM
PM	400PM	-	600PM

AM PEAK HOUR 715 AM
NOON PEAK HOUR 1145 AM
PM PEAK HOUR 445 PM

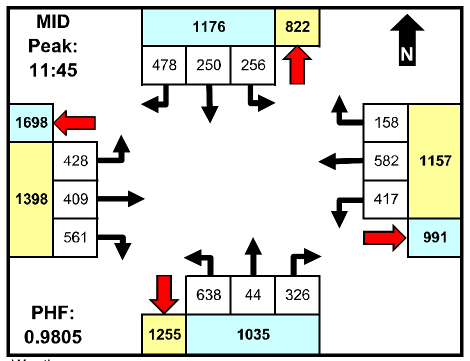
TRAFFIC RESEARCH & ANALYSIS, INC.
Specializing in Traffic Data Collection

Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

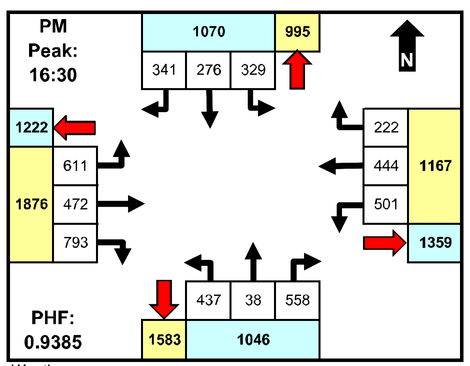
Intersection ID: 1800087
Count Date: 6/2/2018



Weather: approx:



Weather: approx:



Weather: approx:

SR LP 101 PIMA & E RAINTREE DR

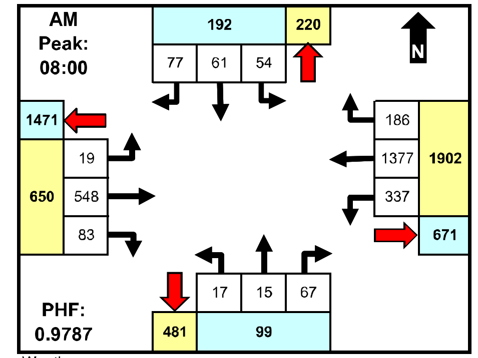
	From North					From East					From South					From West					INTSEC
	SR LP 101 PIMA					E RAINTREE DR					SR LP 101 PIMA					E RAINTREE DR					
Time	LT	Thru	RT	U	CW	LT	Thru	RT	U	CW	LT	Thru	RT	U	CW	LT	Thru	RT	U	CW	TOTAL
																					0
07:00	44	32	106	24	0	142	46	63	0	0	193	18	73	49	0	54	32	25	0	0	901
07:15	49	53	136	35	1	190	72	57	0	1	177	12	72	50	0	35	25	32	0	0	997
07:30	68	68	118	47	0	177	81	85	0	0	202	22	105	25	0	39	47	47	0	0	1131
07:45	70	67	151	25	0	184	127	72	0	0	194	24	98	29	0	45	38	39	0	0	1163
08:00	59	62	143	36	0	132	104	62	0	0	218	20	79	26	0	57	47	44	0	0	1089
08:15	67	55	162	31	0	189	117	86	0	0	197	15	88	18	0	57	52	55	0	0	1189
08:30	83	61	149	27	0	170	90	94	0	0	206	21	97	15	0	68	51	44	0	0	1176
08:45	52	65	159	19	0	151	140	73	0	0	191	17	96	26	2	59	46	70	0	0	1166
																					0
	261	243	613	113	0	642	451	315	0	0	812	73	360	85	2	241	196	213	0	0	4620
				300	0.96				298	0.9				343	0.97				148	0.93	1092.757
				315					392					318					164		1189
				320					354					339					163		1176
				295					364					330					175		1164
																					0
																					0
																					0
																					0
																					0
																					0
																					0
																					0
11:00	44	48	124	33	1	93	116	50	0	0	162	7	74	5	1	82	61	124	0	0	1025
11:15	57	51	125	33	0	103	121	37	0	0	170	8	80	6	1	86	72	119	0	0	1069
11:30	62	51	103	40	1	98	139	52	0	0	152	12	86	3	0	91	78	146	0	0	1114
11:45	69	66	138	37	1	113	150	34	0	0	149	11	78	4	1	105	102	134	0	0	1192
12:00	62	52	127	42	0	90	159	44	0	0	160	15	92	11	0	112	111	139	0	0	1216
12:15	63	64	98	51	0	106	130	42	0	0	160	5	83	5	0	113	111	151	0	0	1182
12:30	62	68	115	62	0	108	143	38	0	1	169	13	73	7	0	98	85	137	0	0	1179
12:45	70	74	127	63	0	87	120	44	0	0	179	12	76	7	0	89	94	134	0	0	1176
																					0
	256	250	478	192	1	417	582	158	0	1	638	44	326	27	1	428	409	561	0	0	4769
				310	0.95				297	0.97				242	0.93				341	0.93	1193.785
				283					293					278					362		1216
				276					278					253					375		1182
				307					289					262					320		1178
																					0
																					0
																					0
																					0
																					0
																					0
																					0
																					0
16:00	66	66	78	24	0	125	96	54	0	0	125	16	113	7	0	171	96	215	0	0	1252
16:15	86	70	94	30	0	145	137	50	0	1	102	13	109	6	3	140	114	184	0	0	1284
16:30	70	66	95	36	0	116	97	35	0	1	109	11	152	5	0	138	112	192	0	0	1235
16:45	80	47	91	25	2	126	118	56	0	0	109	10	119	5	0	158	112	160	0	0	1218
17:00	98	74	73	29	0	125	100	69	0	0	109	10	149	1	0	150	122	266	0	0	1375
17:15	81	89	82	34	0	134	129	62	0	0	110	7	138	2	0	165	126	175	0	0	1334
17:30	76	57	67	23	0	106	109	46	0	0	121	6	161	2	0	132	108	150	0	0	1164
17:45	89	42	75	22	0	121	109	41	0	0	81	7	145	2	0	125	97	140	0	0	1096
18:00																					0
18:15	329	276	341	124	2	501	444	222	0	1	437	38	558	13	0	611	472	793	0	0	5162
18:30				267	0.94				248	0.9				277	0.94				442	0.87	1237.649
18:45				243					300					243					430		1216
19:00				274					294					269					538		1375
19:15				286					325					257					466		1334
																					0
																					0
																					0

Total

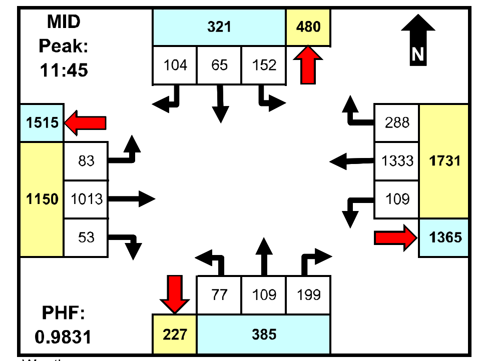
TRAFFIC RESEARCH & ANALYSIS, INC.
Specializing in Traffic Data Collection

Traffic Research & Analysis, Inc.
3844 East Indian School Road
Phoenix, AZ 85018
(602) 840-1500

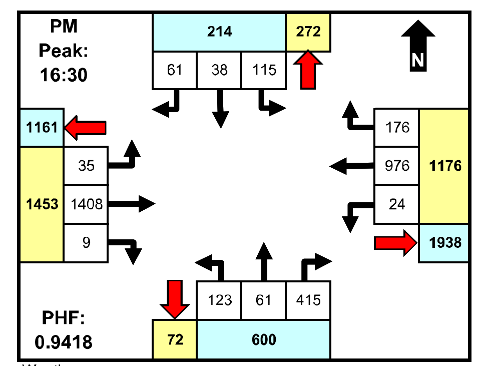
Intersection ID: 1800086
Count Date: 6/2/2018



Weather: approx:



Weather: approx:



Weather: approx:

N 87TH ST & E RAINTREE DR

	From North					From East					From South					From West					INTSEC
	N 87TH ST					E RAINTREE DR					N 87TH ST					E RAINTREE DR					
Time	LT	Thru	RT	U	CW	LT	Thru	RT	U	CW	LT	Thru	RT	U	CW	LT	Thru	RT	U	CW	TOTAL
																					0
07:00	8	8	13	0	0	66	212	38	1	0	3	1	10	0	0	6	82	7	0	0	455
07:15	8	13	18	0	0	95	266	36	0	0	1	2	12	0	1	6	89	17	0	0	564
07:30	8	11	21	0	0	84	281	34	0	0	2	4	12	0	0	2	83	16	0	0	558
07:45	15	15	27	0	2	100	326	49	0	0	3	4	12	0	0	4	92	31	0	0	680
08:00	15	14	19	0	0	96	339	41	1	0	5	6	9	0	0	8	122	21	0	0	696
08:15	8	18	15	0	2	91	346	47	1	1	2	3	14	0	0	5	143	26	0	1	723
08:30	17	16	20	0	0	79	311	52	0	0	5	5	25	0	0	4	147	22	0	0	703
08:45	14	13	23	0	2	71	381	46	0	0	5	1	19	0	0	2	136	14	0	1	728
																					0
	54	61	77	0	4	337	1377	186	2	1	17	15	67	0	0	19	548	83	0	2	2850
				48	0.91				477	0.95				20	0.71				151	0.93	699.5015
				41					485					19					174		719
				53					442					35					173		703
				50					498					25					152		725
																					0
																					0
																					0
																					0
																					0
																					0
																					0
																					0
11:00	29	7	13	0	12	29	301	60	0	2	9	11	37	0	3	17	204	9	0	2	745
11:15	37	11	27	0	0	20	286	88	1	7	18	18	51	0	0	19	216	7	0	3	809
11:30	31	10	32	0	1	15	292	85	1	3	23	25	56	0	0	23	216	6	0	0	819
11:45	44	17	22	0	3	23	356	65	0	2	12	27	55	0	1	27	228	9	0	4	895
12:00	28	14	26	0	2	28	337	86	0	6	29	26	60	0	0	21	247	8	0	0	918
12:15	40	12	31	0	0	32	302	66	1	1	21	29	46	0	1	21	256	20	0	1	880
12:30	40	22	25	0	0	26	338	71	0	2	15	27	38	0	0	14	282	16	1	0	917
12:45	47	22	42	0	2	39	310	74	0	2	8	14	34	0	0	17	247	24	0	1	883
																					0
	152	65	104	0	5	109	1333	288	1	11	77	109	199	0	2	83	1013	53	1	5	3610
				83	0.92				444	0.96				94	0.84				264	0.92	888.6374
				68					451					115					276		910
				83					401					96					297		877
				87					435					80					313		915
																					0
																					0
																					0
																					0
																					0
																					0
																					0
																					0
16:00	32	11	22	0	0	11	243	38	0	0	21	9	106	0	1	7	307	6	0	0	814
16:15	25	8	21	0	1	8	273	61	0	0	27	6	74	0	0	12	285	3	0	1	805
16:30	25	13	21	0	1	9	219	41	0	0	34	11	106	0	0	4	339	5	1	1	830
16:45	30	9	18	0	0	8	266	47	0	0	30	10	105	1	1	14	325	1	0	1	866
17:00	32	7	12	0	0	4	227	36	0	0	38	25	112	0	0	7	413	2	0	0	915
17:15	28	9	10	0	0	3	264	52	0	0	21	15	92	0	0	10	331	1	0	0	836
17:30	31	6	14	0	0	4	235	61	0	0	23	8	88	0	0	10	313	3	0	0	796
17:45	25	5	17	0	0	5	194	56	0	1	16	7	60	0	1	9	269	1	0	1	667
																					0
	115	38	61	0	1	24	976	176	0	0	123	61	415	1	1	35	1408	9	1	2	3447
				59	0.91				269	0.92				151	0.86				349	0.86	831.5406
				57					321					146					340		864
				51					267					175					422		915
				47					319					128					342		836
																					0
																					0
																					0

Total

Traffic Interchange and Study Intersection Signal Timing

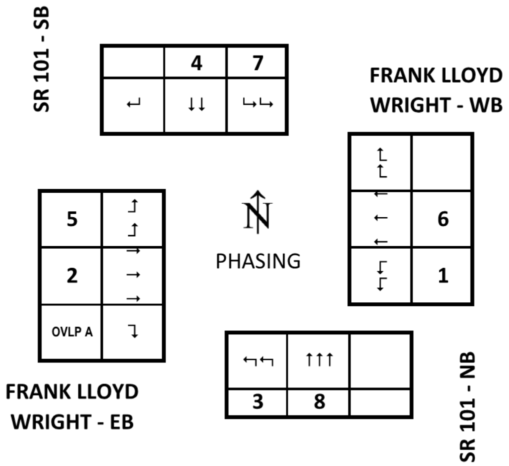
FRANK LLOYD WRIGHT & SR 101			System # 174
BASIC TIMING PLAN 1	Section #	I.P. Address MM1-5-1	Date Designed
	1618	172.27.11.74	12/11/2018

TIMING PLAN - MM-2-1

Phase	1	2	3	4	5	6	7	8
Movement	WBL	EBT	NBL	SBT	EBL	WBT	SBL	NBT
NOTES	PROT	COORD	PROT		PROT	COORD	PROT	
MIN GRN	5	10	5	10	5	10	5	10
BK MGRN								
CS MGRN								
DLY GRN								
WALK		7		4		4		4
WALK2								
WLK MAX								
PED CLR/FDW		20		40		17		38
PD CLR2								
PC MAX								
PED CO								
VEH EXT	2		2		2		2	
VH EXT2								
MAX 1	35	50	35	50	35	50	35	50
MAX 2	45	65	45	65	45	65	45	65
MAX 3								
DYM MAX	45	65	45	65	45	65	45	65
DYM STP	5	5	5	5	5	5	5	5
YELLOW	3.6	4.4	3.6	4.4	3.6	4.4	3.6	4.4
RED CLR	3.5	6.5	1.8	1.8	3.5	6.5	1.8	1.8
RED MAX								
RED RVT	2	2	2	2	2	2	2	2
ACT B4								
SEC/ACT								
MAX INT								
TIME B4								
CARS WT								
STPTDUC								
TTREDUC								
MIN GAP								

RECALLS - MM-2-8

	1	2	3	4	5	6	7	8
LOCK DET								
VEH RECALL	X	X	X	X	X	X	X	X
PED RECALL								
MAX RECALL								
SOFT RECALL								
NO REST								
ADD INIT CAL								



NOTES

Advance detection for phase 2, 4, 6, 8.
EB RT OVLP A = Ph3 + Ph2 with Ped Prot
Timing plan 1 for AM, Midday, and PM.
All phases are in vehicle recall for Timing Plan 1.

PHASING SEQUENCES

TOD: MORNING

R1	2	1	4	3
R2	6	5	8	7
		B		B

Use Timing plan: 1

TOD: MIDDAY

R1	2	1	4	3
R2	6	5	8	7
		B		B

Use Timing plan: 1

TOD: EVENING

R1	2	1	4	3
R2	6	5	8	7
		B		B

Use Timing plan: 1

TOD: NIGHT

R1				
R2				
		B		B

Use Timing plan:

FREE

R1	2	1	4	3
R2	6	5	8	7
		B		B

Use Timing plan: 254

Approved By
Effective Date

FRANK LLOYD WRIGHT & SR 101		System #	174
COORDINATOR	Section #	Date Updated	
	1618	12/11/2018	

PHASE	1	2	3	4	5	6	7	8
FDW		20		40		17		38
YELLOW	3.6	4.4	3.6	4.4	3.6	4.4	3.6	4.4
ALL RED	3.5	6.5	1.8	1.8	3.5	6.5	1.8	1.8
WALK		20		40		17		38

PLAN 1
AM PLAN
OPERATIVE TIMES
6:00

									TIMING PLAN	OFFSET
R1	2	→	1	↲	4	↓	3	↰		
R2	6	←	5	↱	8	↑	7	↳		114
	RING 1				RING 2					
PHASE	1	2	3	4	5	6	7	8		
SPLIT	21	42	33	24	30	33	28	29	Target Cycle Length	
COORD		X				X			120	
RECALLS	V	V	V	V	V	V	V	V	Actual Cycle Length	
GREEN	13.9	31.1	27.6	17.8	22.9	22.1	22.6	22.8	120	

PLAN 2
MIDDAY PLAN
OPERATIVE TIMES
9:00

									TIMING PLAN	OFFSET
R1	2	→	1	↲	4	↓	3	↰		
R2	6	←	5	↱	8	↑	7	↳		103
	RING 1				RING 2					
PHASE	1	2	3	4	5	6	7	8		
SPLIT	19	35	33	33	26	28	36	30	Target Cycle Length	
COORD		X				X			120	
RECALLS	V	V	V	V	V	V	V		Actual Cycle Length	
GREEN	11.9	24.1	27.6	26.8	18.9	17.1	30.6	23.8	120	

PLAN 3
PM PLAN
OPERATIVE TIMES
15:00

									TIMING PLAN	OFFSET
R1	2	→	1	↲	4	↓	3	↰		
R2	6	←	5	↱	8	↑	7	↳		113
	RING 1				RING 2					
PHASE	1	2	3	4	5	6	7	8		
SPLIT	18	38	30	34	30	26	34	30	Target Cycle Length	
COORD		X				X			120	
RECALLS	V	V	V	V	V	V	V	V	Actual Cycle Length	
GREEN	10.9	27.1	24.6	27.8	22.9	15.1	28.6	23.8	120	

Raintree Dr & SR-101 Ramps

BASIC TIMING PLAN	Section #	I.P. Address MM1-5-1	Date Designed
		172.17.11.73	1/10/2019

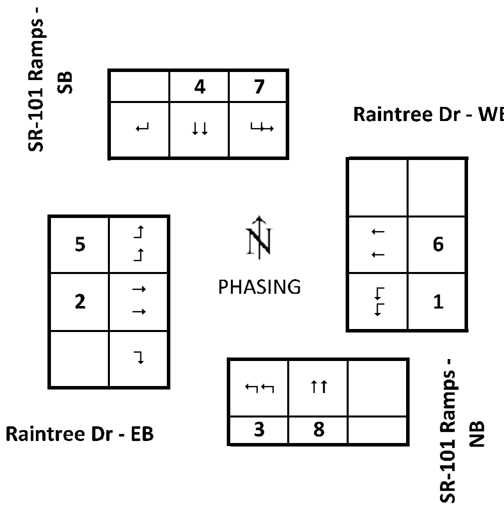
System # 173

TIMING PLAN - MM-2-1

Phase	1	2	3	4	5	6	7	8
Movement	WBL	EBT	NBL	SBT	EBL	WBT	SBL	NBT
NOTES	PROT	COORD	PROT		PROT	COORD	PROT	
MIN GRN	5	10	5	10	5	10	5	10
BK MGRN								
CS MGRN								
DLY GRN								
WALK		4		5		4		5
WALK2								
WLK MAX								
PED CLR/FDW		14		27		17		27
PD CLR2								
PC MAX								
PED CO								
VEH EXT	2	2	2	2	2	2	2	2
VH EXT2								
MAX 1	35	50	35	50	35	50	35	50
MAX 2	45	60	45	60	45	60	45	60
MAX 3								
DYM MAX	45	60	45	60	45	60	45	60
DYM STP	5	5	5	5	5	5	5	5
YELLOW	3.6	4.0	4	4.7	3.3	4.4	4.0	4.7
RED CLR	4.9	3.3	1.4	1.0	5.9	2.8	1.4	1.0
RED MAX								
RED RVT	2	2	2	2	2	2	2	2
ACT B4								
SEC/ACT								
MAX INT								
TIME B4								
CARS WT								
STPTDUC								
TTREDUC								
MIN GAP								

RECALLS - MM-2-8

	1	2	3	4	5	6	7	8
LOCK DET								
VEH RECALL	X	X			X	X		
PED RECALL								
MAX RECALL								
SOFT RECALL								
NO REST								
ADD INIT CAL								



NOTES

PHASING SEQUENCES

TOD: MORNING

R1	2	1	4	3
R2	6	5	8	7
		B		B

Use Timing plan:

TOD: MIDDAY

R1	2	1	4	3
R2	6	5	8	7
		B		B

Use Timing plan:

TOD: EVENING

R1	2	1	4	3
R2	6	5	8	7
		B		B

Use Timing plan:

TOD: NIHGt

R1	2	1	3	4
R2	6	5	8	7
		B		B

Use Timing plan:

FREE

R1	2	1	4	3
R2	6	5	8	7
		B		B

Use Timing plan: 254

Raintree Dr & SR-101 Ramps

System # 173

COORDINATOR	Section #	Date Updated
	101	1/10/2019

PHASE	1	2	3	4	5	6	7	8
FDW		14		27		17		27
YELLOW	3.6	4	4	4.7	3.3	4.4	4	4.7
ALL RED	4.9	3.3	1.4	1	5.9	2.8	1.4	1
WALK		14		27		17		27

PLAN 1 AM PLAN OPERATIVE TIMES

									COORD PATTERN	OFFSET
R1	1 ↲		2 →		4 ↓		3 ↰			
R2	5 ↱		6 ←		8 ↑		7 ↳		Balanced	17
	RING 1				RING 2					
PHASE	1	2	3	4	5	6	7	8		
SPLIT	37	24	39	20	30	31	21	38	Target Cycle Length	
COORD		X				X			120	
RECALLS	V	V	V	V	V	V	V	V	Actual Cycle Length	
GREEN	28.5	16.7	33.6	14.3	20.8	23.8	15.6	32.3	120	

PLAN 4 MIDDAY PLAN OPERATIVE TIMES

									COORD PATTERN	OFFSET
R1	2 →		1 ↲		4 ↓		3 ↰			
R2	6 ←		5 ↱		8 ↑		7 ↳		Balanced	101
	RING 1				RING 2					
PHASE	1	2	3	4	5	6	7	8		
SPLIT	31	38	31	20	35	34	27	24	Target Cycle Length	
COORD		X				X			120	
RECALLS	V	V	V	V	V	V	V	V	Actual Cycle Length	
GREEN	22.5	30.7	25.6	14.3	25.8	26.8	21.6	18.3	120	

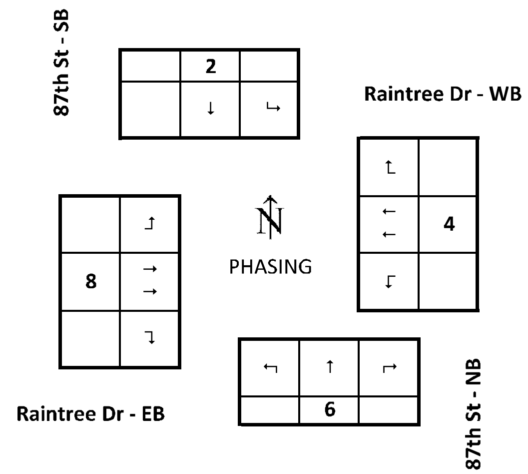
PLAN 7 PM PLAN OPERATIVE TIMES

									COORD PATTERN	OFFSET
R1	2 →		1 ↲		4 ↓		3 ↰			
R2	6 ←		5 ↱		8 ↑		7 ↳		Balanced	19
	RING 1				RING 2					
PHASE	1	2	3	4	5	6	7	8		
SPLIT	36	34	26	24	36	34	28	22	Target Cycle Length	
COORD		X				X			120	
RECALLS	V	V	V	V	V	V	V	V	Actual Cycle Length	
GREEN	27.5	26.7	20.6	18.3	26.8	26.8	22.6	16.3	120	

Raintree Dr & 87th St

Raintree Dr & 87th St			System # 267
BASIC TIMING PLAN	Section #	I.P. Address MM1-5-1	Date Designed
		172.17.12.67	2/20/2018

	Phase		2		4		6		8
TIMING PLAN - MM-2-1	Movement		SBT		WBT		NBT		EBT
	NOTES		COORD				COORD		
	MIN GRN		10		7		10		7
	BK MGRN								
	CS MGRN								
	DLY GRN								
	WALK		4		4		4		4
	WALK2								
	WLK MAX								
	PED CLR/FDW		29		20		29		20
	PD CLR2								
	PC MAX								
	PED CO								
	VEH EXT		2				2		
	VH EXT2								
	MAX 1		40		50		40		50
	MAX 2		50		60		50		60
	MAX 3								
	DYM MAX		50		60		50		60
	DYM STP		5		5		5		5
	YELLOW		4.4		4		4.4		4
	RED CLR		2.0		1.7		2.0		1.7
	RED MAX								
	RED RVT		2		2		2		2
	ACT B4								
	SEC/ACT								
	MAX INT								
	TIME B4								
	CARS WT								
	STPTDUC								
	TTREDUC								
	MIN GAP								
RECALLS - MM-2-8	LOCK DET								
	VEH RECALL				X				X
	PED RECALL								
	MAX RECALL								
	SOFT RECALL								
	NO REST								
	ADD INIT CAL								



PHASING SEQUENCES

TOD: MORNING

R1	2		4	
R2	6		8	
		B		B

Use Timing plan:

TOD: MIDDAY

R1	2		4	
R2	6		8	
		B		B

Use Timing plan:

TOD: EVENING

R1	2		4	
R2	6		8	
		B		B

Use Timing plan:

TOD: WEEKEND

R1	2		4	
R2	6		8	
		B		B

Use Timing plan:

FREE

R1	2		4	
R2	6		8	
		B		B

Use Timing plan: 254

NOTES

Advance detection on phase 4 & 8.

Raintree Dr & 87th St

Raintree Dr & 87th St		System #	267
COORDINATOR	Section #	Date Updated	
	101	2/20/2018	

PHASE	1	2	3	4	5	6	7	8
FDW		29		20		29		20
YELLOW		4.4		4		4.4		4
ALL RED		2		1.7		2		1.7
WALK		29		20		29		20

PLAN 1 AM PLAN OPERATIVE TIMES	R1	2	↓			4	←			COORD PATTERN	OFFSET
	R2	6	↑			8	→			Balanced	100
		RING 1				RING 2					
	PHASE		2		4		6		8		
	SPLIT		35		85		35		85	Target Cycle Length	
	COORD				X				X	120	
	RECALLS				V				V	Actual Cycle Length	
	GREEN		28.6		79.3		28.6		79.3	120	

PLAN 4 MIDDAY PLAN OPERATIVE TIMES	R1	2	↓			4	←			COORD PATTERN	OFFSET
	R2	6	↑			8	→			Balanced	68
		RING 1				RING 2					
	PHASE		2		4		6		8		
	SPLIT		40		80		40		80	Target Cycle Length	
	COORD				X				X	120	
	RECALLS				V				V	Actual Cycle Length	
	GREEN		33.6		74.3		33.6		74.3	120	

PLAN 7 PM PLAN OPERATIVE TIMES	R1	2	↓			4	←			COORD PATTERN	OFFSET
	R2	6	↑			8	→			Balanced	4
		RING 1				RING 2					
	PHASE		2		4		6		8		
	SPLIT		40		80		40		80	Target Cycle Length	
	COORD				X				X	120	
	RECALLS				V				V	Actual Cycle Length	
	GREEN		33.6		74.3		33.6		74.3	120	

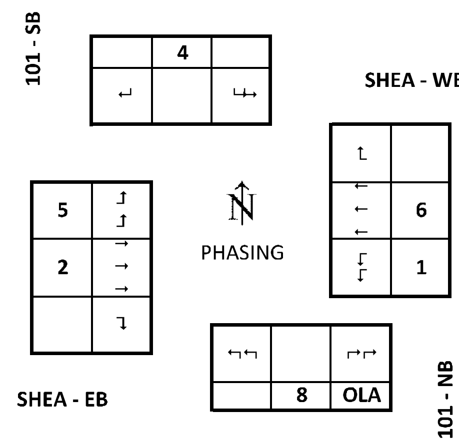
SHEA & 101			System # 113
BASIC TIMING PLAN	Section #	I.P. Address MM1-5-1	Date Designed
		172.27.11.13	3/12/2020

TIMING PLAN - MM-2-1

Phase	1	2		4	5	6		8
Movement	WBL	EBT		SBT	EBL	WBT		NBT
NOTES	L-P	COORD			PROT	COORD		
MIN GRN	5	10		7	5	10		7
BK MGRN								
CS MGRN								
DLY GRN								
WALK		4		0		4		0
WALK2								
WLK MAX								
PED CLR/FDW		13		-		14		-
PD CLR2								
PC MAX								
PED CO								
VEH EXT	2	2		2	2	2		2
VH EXT2								
MAX 1	40	45		50	30	55		50
MAX 2	55	65		65	55	65		65
MAX 3								
DYM MAX	55	65		65	55	65		65
DYM STP	5	5		5	5	5		5
YELLOW	4	4.7		4	4	4.7		4
RED CLR	2	1.9		1.7	2	1.9		1.9
RED MAX								
RED RVT	2	2		2	2	2		2
ACT B4								
SEC/ACT								
MAX INT								
TIME B4								
CARS WT								
STPTDUC								
TTREDUC								
MIN GAP								

RECALLS - MM-2-8

LOCK DET								
VEH RECALL								
PED RECALL								
MAX RECALL		X				X		
SOFT RECALL								
NO REST								
ADD INIT CAL								



PHASING SEQUENCES

TOD: MORNING	R1	1	2	4	
	R2	6	5	8	
			B		B
Use Timing plan:					
TOD: MIDDAY	R1	1	2	4	
	R2	6	5	8	
			B		B
Use Timing plan:					
TOD: EVENING	R1	1	2	4	
	R2	6	5	8	
			B		B
Use Timing plan:					
TOD: NIGHT	R1	1	2	4	
	R2	6	5	8	
			B		B
Use Timing plan:					
FREE	R1	1	2	4	
	R2	6	5	8	
			B		B
Use Timing plan: 254					

NOTES
- NBR overlap is delayed 3 seconds from start of WBL.
- No existing vehicle detection on EBT, WBT.

Approved By

Effective Date

SHEA & 101		System #	113
COORDINATOR	Section #	Date Updated	
	0	3/12/2020	

PHASE	1	2	3	4	5	6	7	8
FDW		13		-		14		-
YELLOW	4	4.7		4	4	4.7		4
ALL RED	2	1.9		1.7	2	1.9		1.9
WALK		13		-		14		-

PLAN 1 AM PLAN OPERATIVE TIMES 6:00										
R1	1	↰	2	→	4	↓			COORD PATTERN	OFFSET
R2	6	←	5	↱	8	↑			Balanced	26
	RING 1				RING 2					
PHASE	1	2		4	5	6		8		
SPLIT	32	46		42	30	48		42	Target Cycle Length	
COORD		X				X			120	
RECALLS		V				V			Actual Cycle Length	
GREEN	26.0	39.4		36.3	24.0	41.4		36.1	120	

PLAN 2 MIDDAY PLAN OPERATIVE TIMES 9:00										
R1	1	↰	2	→	4	↓			COORD PATTERN	OFFSET
R2	6	←	5	↱	8	↑			Balanced	66
	RING 1				RING 2					
PHASE	1	2		4	5	6		8		
SPLIT	25	48		47	22	51		47	Target Cycle Length	
COORD		X				X			120	
RECALLS		V				V			Actual Cycle Length	
GREEN	19.0	41.4		41.3	16.0	44.4		41.1	120	

PLAN 3 PM PLAN OPERATIVE TIMES 15:00										
R1	1	↰	2	→	4	↓			COORD PATTERN	OFFSET
R2	6	←	5	↱	8	↑			Balanced	26
	RING 1				RING 2					
PHASE	1	2		4	5	6		8		
SPLIT	32	46		42	26	52		42	Target Cycle Length	
COORD		X				X			120	
RECALLS		V				V			Actual Cycle Length	
GREEN	26.0	39.4		36.3	20.0	45.4		36.1	120	

PLAN 4 MIDNIGHT PLAN OPERATIVE TIMES 22:00										
R1	1	↰	2	→	4	↓			COORD PATTERN	OFFSET
R2	6	←	5	↱	8	↑			Balanced	23
	RING 1				RING 2					
PHASE	1	2		4	5	6		8		
SPLIT	30	30		30	30	30		30	Target Cycle Length	
COORD		X				X			90	
RECALLS		V				V			Actual Cycle Length	
GREEN	24.0	23.4		24.3	24.0	23.4		24.1	90	

APPENDIX 2 – 2040 Traffic Volumes

Southbound SR 101			2018 Balanced Volumes		2020 Grown Volumes		2040 (No Build) Grown Volumes		2040 (Build) Grown Volumes	
Route	**Start/End or Ramp**		AM	PM	AM	PM	AM	PM	AM	PM
SR 101	Exit 35 Hayden Rd	Exit 36 Princess Dr - Pima Rd	5,700	4,200	6,000	4,450	7,400	5,550	7,700	5,800
SR 101	Hayden Rd EB On-Ramp		523	367	534	374	590	413	590	413
SR 101	Princess Dr/Pima Rd SB Off-Ramp		950	800	969	816	1,071	902	1,071	902
SR 101	Princess Dr/Pima Rd SB On-Ramp		2,127	2,046	2,170	2,087	2,398	2,306	2,398	2,306
SR 101	Frank Lloyd Wright Blvd SB Off-Ramp		1,000	850	1,020	867	1,127	958	1,127	958
SR 101	Exit 36 Princess Dr - Pima Rd	Exit 37 Frank Lloyd Wright Blvd	6,400	4,963	6,715	5,228	8,190	6,409	8,490	6,659
SR 101	Raintree Dr SB Off-Ramp		1,000	510	1,020	520	1,127	575	1,127	575
SR 101	Exit 37 Frank Lloyd Wright Blvd	Exit 39 Raintree Dr	5,400	4,453	5,695	4,708	7,063	5,834	7,363	6,084
SR 101	Frank Lloyd Wright Blvd SB On-Ramp		1,000	1,381	1,020	1,409	1,127	1,557	1,127	1,557
SR 101	Exit 39 Raintree Dr	Exit 40 Cactus Rd	6,400	5,834	6,715	6,117	8,190	7,391	8,490	7,641
SR 101	Raintree Dr SB On-Ramp		780	1,519	796	1,550	879	1,713	879	1,713
SR 101	Cactus Rd SB Off-Ramp		900	900	918	918	1,014	1,014	1,014	1,014
SR 101	Cactus Rd SB On-Ramp		761	633	776	646	857	714	857	714
SR 101	Shea Blvd SB Off-Ramp		1,200	1,100	1,224	1,122	1,352	1,240	1,352	1,240
SR 101	Exit 40 Cactus Rd	Exit 41 Shea Blvd	5,841	5,986	6,145	6,273	7,560	7,564	7,860	7,814
SR 101	Shea Blvd SB On-Ramp		1,133	797	1,156	813	1,277	899	1,277	899
SR 101	Exit 41 Shea Blvd	Exit 42 Pima Rd - 90th St	6,974	6,783	7,301	7,086	8,837	8,463	9,137	8,713

Note: Mainline volumes are non-HOV volumes.

Northbound SR 101			2018 Balanced Volumes		2020 Grown Volumes		2040 (No Build) Grown Volumes		2040 (Build) Grown Volumes	
Route	**Start/End or Ramp**		AM	PM	AM	PM	AM	PM	AM	PM
SR 101	Exit 36 Princess Dr - Pima Rd	Exit 35 Hayden Rd	4,000	5,160	4,242	5,444	5,293	6,728	5,593	7,028
SR 101	Hayden Rd WB Off-Ramp		500	800	510	816	563	902	563	902
SR 101	Princess Dr/Pima Rd NB On-Ramp		644	1,100	657	1,122	726	1,240	726	1,240
SR 101	Princess Dr/Pima Rd NB Off-Ramp		1,134	1,500	1,157	1,530	1,278	1,690	1,278	1,690
SR 101	Frank Lloyd Wright Blvd NB On-Ramp		817	1,100	833	1,122	920	1,240	920	1,240
SR 101	Exit 37 Frank Lloyd Wright Blvd	Exit 36 Princess Dr - Pima Rd	4,173	5,260	4,419	5,546	5,488	6,840	5,788	7,140
SR 101	Raintree Dr NB On-Ramp		364	780	371	796	410	879	410	879
SR 101	Exit 39 Raintree Dr	Exit 37 Frank Lloyd Wright Blvd	3,809	4,480	4,048	4,750	5,078	5,961	5,378	6,261
SR 101	Frank Lloyd Wright Blvd NB Off-Ramp		1,371	847	1,399	864	1,546	955	1,546	955
SR 101	Exit 40 Cactus Rd	Exit 39 Raintree Dr	5,180	5,327	5,447	5,614	6,624	6,916	6,924	7,216
SR 101	Raintree Dr NB Off-Ramp		1,330	1,046	1,356	1,067	1,498	1,179	1,498	1,179
SR 101	Cactus Rd NB On-Ramp		455	484	464	494	513	546	513	546
SR 101	Cactus Rd NB Off-Ramp		987	1,210	1,007	1,234	1,113	1,363	1,113	1,363
SR 101	Shea Blvd NB On-Ramp		1,097	1,389	1,119	1,417	1,237	1,566	1,237	1,566
SR 101	Exit 41 Shea Blvd	Exit 40 Cactus Rd	5,945	5,710	6,227	6,004	7,485	7,346	7,785	7,646
SR 101	Shea Blvd NB Off-Ramp		855	1,290	873	1,316	965	1,454	965	1,454
SR 101	Exit 42 Pima Rd - 90th St	Exit 41 Shea Blvd	6,800	7,000	7,100	7,320	8,450	8,800	8,750	9,100

Note: Mainline volumes are non-HOV volumes.

2040 Traffic Interchange Turning Movement Volumes

AM	U-N	NL	NT	NR	U-S	SL	ST	SR	U-E	EL	ET	ER	U-W	WL	WT	WR
FLW & Loop 101	0	789	719	96	0	604	510	396	0	634	1045	503	0	333	1031	1091
Raintree & Loop 101	96	915	82	405	127	294	274	691	0	272	221	240	0	724	508	355
Raintree & 87th St	0	19	17	75	0	61	69	87	0	21	597	94	0	380	1524	210
Shea & Loop 101	0	481	0	484	0	992	0	457	0	385	1082	422	0	855	863	852

PM	U-N	NL	NT	NR	U-S	SL	ST	SR	U-E	EL	ET	ER	U-W	WL	WT	WR
FLW & Loop 101	0	763	477	214	0	682	707	345	0	450	1589	737	0	379	905	716
Raintree & Loop 101	14	493	43	629	139	371	312	385	0	688	531	894	0	565	501	250
Raintree & 87th St	0	138	69	467	0	129	43	69	0	40	1517	11	0	27	1153	199
Shea & Loop 101	0	760	0	694	0	884	0	359	0	431	1139	377	0	522	1086	1135

APPENDIX 3 – VISSIM Freeway Output Reports (2020 Existing, 2040 Baseline/No-Build, 2040 Improved/Build)

Mainline and Ramps 2020 AM Existing Peak Hour Results

Link No.	Segment	Volume	Density	Speed	LOS
Loop 101 SB Ramps					
12	Princess Dr. Off-Ramp	971	17	59	B
17	Princess Dr. On-Ramp	2120	43	38	E
19	Frank Lloyd Wright Off-Ramp	1020	18	57	B
23	Raintree Dr. Off-Ramp	925	16	57	B
27	Frank Lloyd Wright On-Ramp	1021	14	61	F
31	Raintree Dr. On-Ramp	780	24	34	C
138	Cactus Rd. Off-Ramp	851	15	58	B
115	Cactus Rd. On-Ramp	741	9	45	A
161	Shea Blvd. Off-Ramp	1131	9	63	A
263	Shea Blvd. On-Ramp	1067	37	23	E
Loop 101 NB Ramps					
251	Shea Blvd. NB Off-Ramp	604	7	59	A
274	Shea Blvd.NB On-Ramp	886	12	45	B
279	Cactus Rd. Off-Ramp	998	18	56	B
176	Cactus Rd. On-Ramp	463	5	45	A
10050	Raintree Drive NB Off-Ramp	1358	26	51	C
42	Frank Lloyd Wright NB Off-Ramp	1369	25	24	C
46	Raintree Drive NB On-Ramp	362	6	50	A
51	Frank Lloyd Wright NB On-Ramp	813	16	35	B
54	Princess Drive Off-Ramp	1159	19	60	C
58	Princess Drive On-Ramp	614	14	47	B
Loop 101 SB Mainline					
2	West of Hayden EB On-Ramp	5990	35	59	D
10	Hayden On-Ramp Merge	4900	25	64	C
11	Between Hayden On-Ramp & Princess On-Ramp	5394	28	65	D
18	Princess Drive On-Ramp Merge	5453	30	59	D
119	Between Princess Dr On-Ramp & FLW Off-Ramp	6207	30	60	D
121	Between FLW Off-Ramp & Raintree Off-Ramp	6116	26	60	C
24	Between Raintree Off-Ramp & FLW On-Ramp	5269	27	65	D
167	FLW On-Ramp Merge	5915	23	61	C
1042	Between FLW On-Ramp & Raintree On-Ramp	6292	24	65	C
33	Raintree On-Ramp Merge	6455	29	60	D
153	Between Raintree On-Ramp & Cactus Road On-Ramp	6230	31	65	D
159	Cactus Road On-Ramp Merge	7052	27	65	D
7	Between Cactus Road On-Ramp and Shea Blvd On-Ramp	5892	21	66	C
248	Shea Blvd On-Ramp Merge	7040	30	61	D
Loop 101 NB Mainline					
56	Between Shea Blvd & Shea Blvd On-Ramp	6283	36	50	E
278	Shea Blvd On-Ramp Merge	6743	39	49	E
35	Between Cactus Rd Off-Ramp & On-Ramp	6371	34	61	D
200	Cactus Road On-Ramp Merge	5989	22	60	C
10051	Between Cactus Road On-Ramp & Raintree On-Ramp	5578	22	60	C
48	Raintree On-Ramp Merge	4394	21	65	C
211	Between Raintree On-Ramp and FLW On-Ramp	4369	17	66	B
223	FLW On-Ramp Merge	4547	19	62	C
53	Between FLW On-Ramp and Princess Drive On-Ramp	4756	21	66	C
60	Princess Drive On-Ramp Merge	4169	18	65	B
61	West of Princess Drive	4268	21	66	C

Mainline and Ramps 2020 PM Existing Peak Hour Results

Link No.	Segment	Volume	Density	Speed	LOS
Loop 101 SB Ramps					
12	Princess Dr. Off-Ramp	814	14	58	B
17	Princess Dr. On-Ramp	1618	43	36	E
19	Frank Lloyd Wright Off-Ramp	867	15	57	B
23	Raintree Dr. Off-Ramp	461	8	59	A
27	Frank Lloyd Wright On-Ramp	1466	105	9	F
31	Raintree Dr. On-Ramp	1639	142	6	F
138	Cactus Rd. Off-Ramp	843	15	57	B
115	Cactus Rd. On-Ramp	634	8	46	A
161	Shea Blvd. Off-Ramp	1060	8	63	A
263	Shea Blvd. On-Ramp	782	19	30	C
Loop 101 NB Ramps					
251	Shea Blvd. NB Off-Ramp	1299	11	60	B
274	Shea Blvd.NB On-Ramp	1347	16	43	B
279	Cactus Rd. Off-Ramp	1226	22	55	C
176	Cactus Rd. On-Ramp	479	5	45	A
10050	Raintree Drive NB Off-Ramp	1068	20	54	C
42	Frank Lloyd Wright NB Off-Ramp	845	15	56	B
46	Raintree Drive NB On-Ramp	771	15	43	B
51	Frank Lloyd Wright NB On-Ramp	1000	160	3	F
54	Princess Drive Off-Ramp	1500	27	55	D
58	Princess Drive On-Ramp	1096	61	16	F
Loop 101 SB Mainline					
2	West of Hayden EB On-Ramp	4451	24	62	C
10	Hayden On-Ramp Merge	4798	18	66	C
11	Between Hayden On-Ramp & Princess On-Ramp	3956	20	66	C
18	Princess Drive On-Ramp Merge	5516	23	59	C
119	Between Princess Dr On-Ramp & FLW Off-Ramp	5649	22	63	C
121	Between FLW Off-Ramp & Raintree Off-Ramp	4772	18	66	B
24	Between Raintree Off-Ramp & FLW On-Ramp	4316	22	66	C
167	FLW On-Ramp Merge	5317	21	61	C
10042	Between FLW On-Ramp & Raintree On-Ramp	5731	22	66	C
33	Raintree On-Ramp Merge	6358	32	48	D
153	Between Raintree On-Ramp & Cactus Road On-Ramp	6406	33	56	D
159	Cactus Road On-Ramp Merge	7014	27	64	D
7	Between Cactus Road On-Ramp and Shea Blvd On-Ramp	5997	23	66	C
248	Shea Blvd On-Ramp Merge	6744	27	64	D
Loop 101 NB Mainline					
56	Between Shea Blvd & Shea Blvd On-Ramp	7284	35	55	D
278	Shea Blvd On-Ramp Merge	7200	39	48	E
35	Between Cactus Rd Off-Ramp & On-Ramp	6106	33	61	D
200	Cactus Road On-Ramp Merge	6541	20	61	C
10051	Between Cactus Road On-Ramp & Raintree On-Ramp	5556	24	63	C
48	Raintree On-Ramp Merge	5473	21	62	C
211	Between Raintree On-Ramp and FLW On-Ramp	5483	21	65	C
223	FLW On-Ramp Merge	5605	50	46	F
53	Between FLW On-Ramp and Princess Drive On-Ramp	4828	25	65	C
60	Princess Drive On-Ramp Merge	5997	23	63	C
61	West of Princess Drive	5184	26	65	C

Mainline and Ramps 2040 AM No-Build Peak Hour Results

Link No.	Segment	Volume	Density	Speed	LOS
Loop 101 SB Ramps					
12	Princess Dr. Off-Ramp	1067	16	58	B
17	Princess Dr. On-Ramp	2300	46	35	F
19	Frank Lloyd Wright Off-Ramp	1114	18	57	B
23	Raintree Dr. Off-Ramp	1117	16	57	B
27	Frank Lloyd Wright On-Ramp	1118	82	11	F
31	Raintree Dr. On-Ramp	877	37	27	E
138	Cactus Rd. Off-Ramp	934	16	57	B
115	Cactus Rd. On-Ramp	845	10	45	A
161	Shea Blvd. Off-Ramp	1260	9	62	A
263	Shea Blvd. On-Ramp	1184	47	21	F
Loop 101 NB Ramps					
251	Shea Blvd. NB Off-Ramp	862	7	55	A
274	Shea Blvd.NB On-Ramp	1192	14	44	B
279	Cactus Rd. Off-Ramp	976	18	48	B
176	Cactus Rd. On-Ramp	508	6	45	A
10050	Raintree Drive NB Off-Ramp	1450	26	52	C
42	Frank Lloyd Wright NB Off-Ramp	1557	26	52	C
46	Raintree Drive NB On-Ramp	401	7	49	A
51	Frank Lloyd Wright NB On-Ramp	917	29	27	D
54	Princess Drive Off-Ramp	1311	19	60	C
58	Princess Drive On-Ramp	712	16	44	B
Loop 101 SB Mainline					
2	West of Hayden EB On-Ramp	7528	81	27	F
10	Hayden On-Ramp Merge	8225	34	52	D
11	Between Hayden On-Ramp & Princess On-Ramp	7149	34	60	D
18	Princess Drive On-Ramp Merge	8666	37	53	E
119	Between Princess Dr On-Ramp & FLW Off-Ramp	8873	41	49	E
121	Between FLW Off-Ramp & Raintree Off-Ramp	7747	50	37	F
24	Between Raintree Off-Ramp & FLW On-Ramp	6753	78	25	F
167	FLW On-Ramp Merge	5740	86	18	F
10042	Between FLW On-Ramp & Raintree On-Ramp	7886	81	20	F
33	Raintree On-Ramp Merge	9809	61	27	F
153	Between Raintree On-Ramp & Cactus Road On-Ramp	7727	34	64	D
159	Cactus Road On-Ramp Merge	8642	31	60	D
7	Between Cactus Road On-Ramp and Shea Blvd On-Ramp	7403	26	65	C
248	Shea Blvd On-Ramp Merge	8627	39	53	E
Loop 101 NB Mainline					
56	Between Shea Blvd & Shea Blvd On-Ramp	8574	112	14	F
278	Shea Blvd On-Ramp Merge	8903	58	35	F
35	Between Cactus Rd Off-Ramp & On-Ramp	8076	37	59	E
200	Cactus Road On-Ramp Merge	7684	26	59	C
10051	Between Cactus Road On-Ramp & Raintree On-Ramp	7058	24	59	C
48	Raintree On-Ramp Merge	5843	21	63	C
211	Between Raintree On-Ramp and FLW On-Ramp	5898	19	66	C
223	FLW On-Ramp Merge	6080	23	59	C
53	Between FLW On-Ramp and Princess Drive On-Ramp	5504	24	65	C
60	Princess Drive On-Ramp Merge	6187	20	64	C
61	West of Princess Drive	5654	25	65	C

Mainline and Ramps 2040 PM No-Build Peak Hour Results

Link No.	Segment	Volume	Density	Speed	LOS
Loop 101 SB Ramps					
12	Princess Dr. Off-Ramp	898	15	57	B
17	Princess Dr. On-Ramp	1614	60	25	F
19	Frank Lloyd Wright Off-Ramp	960	16	56	B
23	Raintree Dr. Off-Ramp	512	8.35	58	A
27	Frank Lloyd Wright On-Ramp	1544	180	3	F
31	Raintree Dr. On-Ramp	1596	147	6	F
138	Cactus Rd. Off-Ramp	916	14	57	B
115	Cactus Rd. On-Ramp	703	8	46	A
161	Shea Blvd. Off-Ramp	1141	8	63	A
263	Shea Blvd. On-Ramp	893	21	30	C
Loop 101 NB Ramps					
251	Shea Blvd. NB Off-Ramp	1246	14	55	B
274	Shea Blvd.NB On-Ramp	1368	16	43	B
279	Cactus Rd. Off-Ramp	1174	20	47	C
176	Cactus Rd. On-Ramp	533	6	45	A
10050	Raintree Drive NB Off-Ramp	1214	20	54	C
42	Frank Lloyd Wright NB Off-Ramp	972	15	56	B
46	Raintree Drive NB On-Ramp	852	17	42	B
51	Frank Lloyd Wright NB On-Ramp	1200	177	3	F
54	Princess Drive Off-Ramp	1723	27	56	D
58	Princess Drive On-Ramp	1253	73	13	F
Loop 101 SB Mainline					
2	West of Hayden EB On-Ramp	5854	31	60	D
10	Hayden On-Ramp Merge	4976	22	65	C
11	Between Hayden On-Ramp & Princess On-Ramp	5246	24	60	C
18	Princess Drive On-Ramp Merge	6790	41	40	E
119	Between Princess Dr On-Ramp & FLW Off-Ramp	6955	50	33	F
121	Between FLW Off-Ramp & Raintree Off-Ramp	5983	69	20	F
24	Between Raintree Off-Ramp & FLW On-Ramp	5474	102	15	F
167	FLW On-Ramp Merge	6543	116	11	F
10042	Between FLW On-Ramp & Raintree On-Ramp	7038	111	13	F
33	Raintree On-Ramp Merge	7400	74	22	F
153	Between Raintree On-Ramp & Cactus Road On-Ramp	7697	35	52	D
159	Cactus Road On-Ramp Merge	8369	27	64	D
7	Between Cactus Road On-Ramp and Shea Blvd On-Ramp	7227	23	66	C
248	Shea Blvd On-Ramp Merge	8052	27	64	D
Loop 101 NB Mainline					
56	Between Shea Blvd & Shea Blvd On-Ramp	9034	89	24	F
278	Shea Blvd On-Ramp Merge	9044	57	38	F
35	Between Cactus Rd Off-Ramp & On-Ramp	8021	37	59	E
200	Cactus Road On-Ramp Merge	8594	25	60	C
10051	Between Cactus Road On-Ramp & Raintree On-Ramp	7369	29	60	D
48	Raintree On-Ramp Merge	7197	28	58	D
211	Between Raintree On-Ramp and FLW On-Ramp	7261	29	59	D
223	FLW On-Ramp Merge	7371	51	46	F
53	Between FLW On-Ramp and Princess Drive On-Ramp	6374	29	64	D
60	Princess Drive On-Ramp Merge	6989	27	61	D
61	West of Princess Drive	7028	31	63	D

Mainline and Ramps 2040 AM Add Lane Peak Hour Results

Link No.	Segment	Volume	Density	Speed	LOS
Loop 101 SB Ramps					
12	Princess Dr. Off-Ramp	1067	18	58	B
17	Princess Dr. On-Ramp	2300	43	37	E
19	Frank Lloyd Wright Off-Ramp	1114	20	56	C
23	Raintree Dr. Off-Ramp	1117	18	57	B
27	Frank Lloyd Wright On-Ramp	1118	78	11	F
31	Raintree Dr. On-Ramp	877	36	27	E
138	Cactus Rd. Off-Ramp	934	16	57	B
115	Cactus Rd. On-Ramp	845	10	45	A
161	Shea Blvd. Off-Ramp	1260	10	61	A
263	Shea Blvd. On-Ramp	1184	40	25	E
Loop 101 NB Ramps					
251	Shea Blvd. NB Off-Ramp	862	7	60	A
274	Shea Blvd.NB On-Ramp	1192	14	44	B
279	Cactus Rd. Off-Ramp	976	20	50	C
176	Cactus Rd. On-Ramp	508	6	45	A
10050	Raintree Drive NB Off-Ramp	1450	33	48	D
42	Frank Lloyd Wright NB Off-Ramp	1557	31	51	D
46	Raintree Drive NB On-Ramp	401	7	48	A
51	Frank Lloyd Wright NB On-Ramp	917	29	27	D
54	Princess Drive Off-Ramp	1311	22	58	C
58	Princess Drive On-Ramp	712	16	44	B
Loop 101 SB Mainline					
2	West of Hayden EB On-Ramp	7528	33	60	D
10	Hayden On-Ramp Merge	8225	26	64	C
11	Between Hayden On-Ramp & Princess On-Ramp	7149	27	65	D
18	Princess Drive On-Ramp Merge	8666	29	60	D
119	Between Princess Dr On-Ramp & FLW Off-Ramp	8873	31	58	D
121	Between FLW Off-Ramp & Raintree Off-Ramp	7747	28	58	D
24	Between Raintree Off-Ramp & FLW On-Ramp	6753	26	65	C
167	FLW On-Ramp Merge	5740	23	62	C
10042	Between FLW On-Ramp & Raintree On-Ramp	7886	24	65	C
33	Raintree On-Ramp Merge	9809	29	59	D
153	Between Raintree On-Ramp & Cactus Road On-Ramp	7727	30	65	D
159	Cactus Road On-Ramp Merge	8642	28	63	D
7	Between Cactus Road On-Ramp and Shea Blvd On-Ramp	7403	22	66	C
248	Shea Blvd On-Ramp Merge	8627	30	60	D
Loop 101 NB Mainline					
56	Between Shea Blvd & Shea Blvd On-Ramp	8574	31	60	D
278	Shea Blvd On-Ramp Merge	8903	37	61	E
35	Between Cactus Rd Off-Ramp & On-Ramp	8076	33	62	D
200	Cactus Road On-Ramp Merge	7684	28	53	D
10051	Between Cactus Road On-Ramp & Raintree On-Ramp	7058	25	56	C
48	Raintree On-Ramp Merge	5843	18	64	B
211	Between Raintree On-Ramp and FLW On-Ramp	5898	18	66	B
223	FLW On-Ramp Merge	6080	21	62	C
53	Between FLW On-Ramp and Princess Drive On-Ramp	5504	21	66	C
60	Princess Drive On-Ramp Merge	6187	19	65	C
61	West of Princess Drive	5654	21	66	C

Mainline and Ramps 2040 PM Add Lane Peak Hour Results

Link No.	Segment	Volume	Density	Speed	LOS
Loop 101 SB Ramps					
12	Princess Dr. Off-Ramp	898	15	58	B
17	Princess Dr. On-Ramp	1614	43	37	E
19	Frank Lloyd Wright Off-Ramp	960	16	57	B
23	Raintree Dr. Off-Ramp	512	9	58	A
27	Frank Lloyd Wright On-Ramp	1544	128	7	F
31	Raintree Dr. On-Ramp	1596	147	6	F
138	Cactus Rd. Off-Ramp	916	16	57	B
115	Cactus Rd. On-Ramp	703	8	46	A
161	Shea Blvd. Off-Ramp	1141	9	62	A
263	Shea Blvd. On-Ramp	893	21	30	C
Loop 101 NB Ramps					
251	Shea Blvd. NB Off-Ramp	1246	11	59	B
274	Shea Blvd.NB On-Ramp	1368	16	43	B
279	Cactus Rd. Off-Ramp	1174	21	51	C
176	Cactus Rd. On-Ramp	533	6	45	A
10050	Raintree Drive NB Off-Ramp	1214	24	50	C
42	Frank Lloyd Wright NB Off-Ramp	972	17	55	B
46	Raintree Drive NB On-Ramp	852	17	42	B
51	Frank Lloyd Wright NB On-Ramp	1200	182	5	F
54	Princess Drive Off-Ramp	1723	35	49	D
58	Princess Drive On-Ramp	1253	73	13	F
Loop 101 SB Mainline					
2	West of Hayden EB On-Ramp	5854	24	62	C
10	Hayden On-Ramp Merge	4976	19	66	C
11	Between Hayden On-Ramp & Princess On-Ramp	5246	20	67	C
18	Princess Drive On-Ramp Merge	6790	22	62	C
119	Between Princess Dr On-Ramp & FLW Off-Ramp	6955	22	62	C
121	Between FLW Off-Ramp & Raintree Off-Ramp	5983	18	65	B
24	Between Raintree Off-Ramp & FLW On-Ramp	5474	21	67	C
167	FLW On-Ramp Merge	6543	22	62	C
10042	Between FLW On-Ramp & Raintree On-Ramp	7038	22	65	C
33	Raintree On-Ramp Merge	7400	25	56	C
153	Between Raintree On-Ramp & Cactus Road On-Ramp	7697	30	65	D
159	Cactus Road On-Ramp Merge	8369	26	64	C
7	Between Cactus Road On-Ramp and Shea Blvd On-Ramp	7227	22	67	C
248	Shea Blvd On-Ramp Merge	8052	25	65	C
Loop 101 NB Mainline					
56	Between Shea Blvd & Shea Blvd On-Ramp	9034	34	52	D
278	Shea Blvd On-Ramp Merge	9044	38	51	E
35	Between Cactus Rd Off-Ramp & On-Ramp	8021	33	62	D
200	Cactus Road On-Ramp Merge	8594	25	57	C
10051	Between Cactus Road On-Ramp & Raintree On-Ramp	7369	25	63	C
48	Raintree On-Ramp Merge	7197	23	63	C
211	Between Raintree On-Ramp and FLW On-Ramp	7261	22	65	C
223	FLW On-Ramp Merge	7371	26	60	C
53	Between FLW On-Ramp and Princess Drive On-Ramp	6374	24	65	C
60	Princess Drive On-Ramp Merge	6989	23	63	C
61	West of Princess Drive	7028	26	65	C

APPENDIX 4 – VISSIM/RODEL TI/Intersection Output Reports (2020 Existing, 2040 Baseline/No-Build, 2040 Improved/Build)

VISSIM Analysis Results

2020 AM Peak Hour Results

Intersection	Approach	Turning Movement	QLEN	QLENMAX	Volume (Vehicles)	Delay (veh/sec)	Approach Volume	Approach Delay (sec/veh)	Approach LOS
		TURNING MOVEMENT	QLEN	QLENMAX	VEHS(ALL)	VEHDELAY(ALL)			
Frank Lloyd Wright & Loop 101	NB	NBL	163.46	482.14	712	65.01	1,453	56.4	E
		NBT	89.18	381.2	654	50.07			
		NBR	85.46	383.29	87	33.35			
	SB	SBL	93.62	387.78	550	51.66	1,377	56.2	E
		SBT	143.92	435.98	467	92.98			
		SBR	142.87	448.88	360	15.25			
	EB	EBL	492.66	1002.94	564	124.52	1,960	57.3	E
		EBT	136.51	868.72	952	37.97			
		EBR	46.01	543.94	444	13.31			
	WB	WBL	65.17	219.44	303	66.47	2,215	34.5	C
		WBT	88.57	398.07	936	45.19			
		WBR	52.83	292.48	976	14.38			
		0	0	0	0	0			
						Overall Intersection	7,005	49.7	D
Raintree and Loop 101	NB	NBL	888.08	1233.05	631	150.25	996	103.4	F
		NBT	801.14	1214.12	60	31.62			
		NBR	682.78	1155.34	305	20.66			
	SB	SBL	249.15	755.73	259	60.01	942	185.5	F
		SBT	1028.7	1346.98	215	117.05			
		SBR	1028.31	1346.63	468	286.33			
	EB	EBL	43.34	193.27	231	51.61	641	36.9	D
		EBT	36.28	131.03	194	52.93			
		EBR	11.18	134.38	216	6.69			
	WB	WBL	168.52	815.58	649	62.62	1,378	46.4	D
		WBT	84.96	552.03	412	40.06			
		WBR	36.04	513.29	317	21.63			
						Overall Intersection	3,957	92.3	F
Raintree and 87th St	NB	NBL	3.94	50.13	16	51.63	93	21.4	C
		NBT	3.46	54.9	14	50.31			
		NBR	2.59	83.04	63	7.32			
	SB	SBL	13.26	118.36	53	50.93	197	42.1	D
		SBT	28.88	254.97	61	54.35			
		SBR	45.85	286.53	83	27.46			
	EB	EBL	6.36	165.53	19	11.16	631	4.3	A
		EBT	6.36	165.53	527	4.5			
		EBR	6.36	165.53	85	1.65			
	WB	WBL	6.14	189.99	303	6.14	1,681	2.9	A
		WBT	6.77	216.57	1207	2.45			
		WBR	0.95	67.11	171	0.51			
						Overall Intersection	2,602	6.9	A
Shea and Loop 101	NB	NBL	51.71	225.42	434	36.45	873	19.9	B
		NBT							
		NBR	2.53	87.15	439	3.52			
	SB	SBL	131.5	461.33	858	45.69	1,249	35.4	D
		SBT							
		SBR	3.67	147.37	391	12.82			
	EB	EBL	47.6	186.23	345	42.73	1,713	28.6	C
		EBT	61.91	264.06	987	29.39			
		EBR	35.39	256.49	381	13.74			
	WB	WBL	464.53	1169.58	771	86.11	2,327	44.8	D
		WBT	46.76	213.62	785	28.8			
		WBR	284.97	1139.74	771	19.75			
						Overall Intersection	6,162	34.9	C

2020 PM Peak Hour Results

Intersection	Approach	Turning Movement	QLEN	QLENMAX	Volume (Vehicles)	Delay (veh/sec)	Approach Volume	Approach Delay (sec/veh)	Approach LOS
		TURNING MOVEMENT	QLEN	QLENMAX	VEHS(ALL)	VEHDELAY(ALL)			
Frank Lloyd Wright & Loop 101	NB	NBL	244.09	567.09	676	99.17	1,302	70.6	E
		NBT	80.23	345.06	433	45.3			
		NBR	76.11	347.15	193	27.09			
	SB	SBL	93.01	485.49	620	43.64	1,571	55.1	E
		SBT	196.96	619.98	637	85.48			
		SBR	193.98	632.89	314	15.91			
	EB	EBL	74.15	397.52	418	58.62	2,511	57.5	E
		EBT	348.66	1031.58	1439	60.18			
		EBR	343.89	1054.48	654	50.75			
	WB	WBL	715.36	1184.37	279	377.02	1,736	92.5	F
		WBT	311.29	839.23	819	56.73			
		WBR	32.17	146.6	638	14.07			
						Overall Intersection	7,120	67.9	E
Raintree and Loop 101	NB	NBL	65.49	281.78	381	41.59	991	41.4	D
		NBT	107.7	474.6	41	53.18			
		NBR	140.18	519.56	569	40.39			
	SB	SBL	63.57	282.28	339	43.47	907	33.0	C
		SBT	42.34	235.97	275	39.74			
		SBR	35.04	235.57	293	14.68			
	EB	EBL	103.16	219.11	428	60.01	1,310	51.8	D
		EBT	104.84	404.56	327	56.56			
		EBR	352.83	428.03	555	42.62			
	WB	WBL	573.67	1118.34	494	155.95	1,098	106.2	F
		WBT	372.16	1030.08	385	74.07			
		WBR	252.55	1003.11	219	50.61			
						Overall Intersection	4,306	59.3	E
Raintree and 87th St	NB	NBL	7.14	118.58	36	213.74	477	644.5	F
		NBT	3.66	85.49	18	224.41			
		NBR	1637.63	1673.87	423	699			
	SB	SBL	103.77	308.81	109	157.43	207	109.3	F
		SBT	17.86	247.34	36	74.3			
		SBR	27.64	278.89	62	44.95			
	EB	EBL	6.36	165.53	19	11.16	1,158	100.3	F
		EBT	941.82	1058.34	1131	101.92			
		EBR	941.82	1058.34	8	80.37			
	WB	WBL	0.27	25.35	25	18.58	1,239	2.4	A
		WBT	6.3	84.46	1034	2.25			
		WBR	0.62	51.31	180	1			
						Overall Intersection	3,081	145.8	F
Shea and Loop 101	NB	NBL	96.83	417.2	683	43.78	1,308	25.0	C
		NBT							
		NBR	4.94	104.25	625	4.52			
	SB	SBL	111.34	401.63	769	44.4	1,075	34.9	C
		SBT							
		SBR	0.68	89.57	306	11.13			
	EB	EBL	57.91	224.13	386	47.19	1,767	26.1	C
		EBT	51.59	271.48	1044	23.82			
		EBR	21.34	192.68	337	9.17			
	WB	WBL	366.16	967.26	463	57.37	2,387	48.1	D
		WBT	311.78	708.13	939	28.76			
		WBR	1082.78	1579.16	985	62.27			
						Overall Intersection	6,537	35.4	D

2040 No-Build AM Peak Hour Results

Intersection	Approach	Turning Movement	QLEN	QLENMAX	Volume (Vehicles)	Delay (veh/sec)	Approach Volume	Approach Delay (sec/veh)	Approach LOS
		TURNING MOVEMENT	QLEN	QLENMAX	VEHS(ALL)	VEHDELAY(ALL)			
Frank Lloyd Wright & Loop 101	NB	NBL	329.88	680.05	778	115.09	1,601	85.9	F
		NBT	196.26	657.29	727	60.23			
		NBR	194.74	659.38	96	44.09			
	SB	SBL	202.99	722.42	611	59.23	1,513	83.7	F
		SBT	311.98	751.43	505	147.25			
		SBR	319.24	764.33	397	40.52			
	EB	EBL	1050.39	1448.13	572	166.95	2,027	75.4	E
		EBT	912.6	1449.13	987	47.26			
		EBR	608.29	1274.92	468	22.64			
	WB	WBL	65.17	219.44	303	66.47	2,419	36.6	D
		WBT	109.82	595.55	1037	48.13			
		WBR	66.59	404.26	1079	17.22			
Overall Intersection							7,560	66.9	E
Raintree and Loop 101	NB	NBL	886.21	1234.62	627	150.81	991	103.9	F
		NBT	751.17	1215.66	60	34.51			
		NBR	614.34	1256.51	304	20.82			
	SB	SBL	738.27	1673.87	251	93.33	918	251.6	F
		SBT	1314.64	1673.87	207	244			
		SBR	1314.37	1673.85	460	341.41			
	EB	EBL	50.95	206.67	256	53.64	713	38.6	D
		EBT	40.42	146.63	217	55.12			
		EBR	14.45	151.56	240	7.7			
	WB	WBL	453.61	1161.76	713	87.6	1,527	61.9	E
		WBT	252.61	1037.54	464	47.27			
		WBR	155.74	1048.99	350	28.78			
Overall Intersection							4,149	109.9	F
Raintree and 87th St	NB	NBL	3.68	55.81	17	55.81	101	22.1	C
		NBT	3.44	50.94	15	50			
		NBR	2.98	82.25	69	7.66			
	SB	SBL	15.68	136.96	60	53.62	219	44.1	D
		SBT	34.45	254.69	70	54.29			
		SBR	52.46	286.25	89	29.63			
	EB	EBL	8.31	176.92	21	11.92	700	5.0	A
		EBT	8.31	176.92	585	5.34			
		EBR	8.31	176.92	94	1.7			
	WB	WBL	9.45	212.55	310	7.79	1,723	3.4	A
		WBT	8.43	258.22	1240	2.68			
		WBR	0.94	67.46	173	0.52			
Overall Intersection							2,743	7.7	A
Shea and Loop 101	NB	NBL	41.86	203.61	481	36.76	965	20.3	C
		NBT							
		NBR	2.68	87.86	484	4.02			
	SB	SBL	123.2	437.15	992	44.32	1,449	34.4	C
		SBT							
		SBR	2.16	123.19	457	12.73			
	EB	EBL	53.65	197.33	384	44.55	1,888	30.6	C
		EBT	68.85	335.7	1082	29.89			
		EBR	56.43	313.42	422	19.59			
	WB	WBL	1258.67	1634.88	855	125.49	2,570	67.8	E
		WBT	619.15	1228.89	863	45.87			
		WBR	1210.87	1648.03	852	32.01			
Overall Intersection							6,872	43.8	D

2040 No-Build PM Peak Hour Results

Intersection	Approach	Turning Movement	QLEN	QLENMAX	Volume (Vehicles)	Delay (veh/sec)	Approach Volume	Approach Delay (sec/veh)	Approach LOS
		TURNING MOVEMENT	QLEN	QLENMAX	VEHS(ALL)	VEHDELAY(ALL)			
Frank Lloyd Wright & Loop 101	NB	NBL	524.74	819.92	703	178.05	1,381	114.9	F
		NBT	310.78	723.79	469	54.35			
		NBR	309.66	725.88	209	38.27			
	SB	SBL	240.51	828.74	685	48.92	1,711	79.5	E
		SBT	431.87	920.02	683	128.73			
		SBR	437.92	932.92	343	42.46			
	EB	EBL	543.76	1175.39	431	78.36	2,585	81.7	F
		EBT	1224.25	1503.1	1480	86.25			
		EBR	1244.89	1525.99	674	73.7			
	WB	WBL	1035.55	1415.87	279	442.61	1,728	110.3	F
		WBT	875.64	1416.37	812	67.21			
		WBR	33.74	146.18	637	19.77			
Overall Intersection							7,405	94.0	F
Raintree and Loop 101	NB	NBL	281.69	890.61	414	41.97	1,072	88.2	F
		NBT	429.33	920.77	44	135.38			
		NBR	471.96	965.73	614	116.04			
	SB	SBL	70.05	289.82	371	43.5	1,004	33.8	C
		SBT	50.19	267.19	307	39.64			
		SBR	44.5	266.8	326	17.27			
	EB	EBL	98.93	224.64	424	58.01	1,297	51.8	D
		EBT	128.2	405.99	321	58.93			
		EBR	353.01	427.45	552	42.83			
	WB	WBL	1006.74	1290.38	505	183.73	1,126	130.7	F
		WBT	964.74	1282.17	394	96.9			
		WBR	915.27	1342.71	227	71.52			
Overall Intersection							4,499	76.2	E
Raintree and 87th St	NB	NBL	68.73	288.39	33	249.01	516	693.7	F
		NBT	3.15	81.7	16	231.72			
		NBR	1647.78	1672.06	467	741			
	SB	SBL	145.24	323.88	122	180.67	229	132.1	F
		SBT	54.02	310.22	40	97.36			
		SBR	67.67	341.78	67	64.25			
	EB	EBL	980.28	1057.42	29	52.29	1,150	103.3	F
		EBT	980.28	1057.42	1113	104.81			
		EBR	980.28	1057.42	8	81.59			
	WB	WBL	0.54	36.7	28	21.21	1,329	2.7	A
		WBT	7.96	98.47	1106	2.63			
		WBR	0.83	70.71	195	0.57			
Overall Intersection							3,224	158.4	F
Shea and Loop 101	NB	NBL	74.79	346.86	760	43.06	1,454	24.7	C
		NBT							
		NBR	4.59	114.71	694	4.62			
	SB	SBL	101.69	369.19	884	44.41	1,243	34.7	C
		SBT							
		SBR	0.39	64.18	359	10.91			
	EB	EBL	66.37	250.05	428	49.29	1,939	26.2	C
		EBT	54.79	338.73	1139	22.86			
		EBR	24.52	230.98	372	9.64			
	WB	WBL	1119.03	1531.33	465	63.37	2,545	55.1	E
		WBT	976.34	1529.82	1086	28.76			
		WBR	1544.71	1673.46	994	79.9			
Overall Intersection							7,181	37.6	D

2040 AM Improved/Build SPUI TI/Intersection Peak Hour Results

Intersection	Approach	Turning Movement	QLEN	QLENMAX	Volume (Vehicles)	Delay (veh/sec)	Approach Volume	Approach Delay (sec/veh)	Approach LOS
		TURNING MOVEMENT	QLEN	QLENMAX	VEHS(ALL)	VEHDELAY(ALL)			
Frank Lloyd Wright & Loop 101	NB	NBL	126.95	437	778	51.05	1,598	49.3	D
		NBT	92.08	371.95	725	52.51			
		NBR	10.12	94.89	95	10.18			
	SB	SBL	69.92	320.18	607	36.94	1,514	37.5	D
		SBT	61.82	256.12	509	51.41			
		SBR	43.36	287.95	398	20.74			
	EB	EBL	299.33	916.31	641	94.81	2,183	56.8	E
		EBT	193.71	895.58	1050	52.68			
		EBR	68.23	558.15	492	16.16			
	WB	WBL	77.55	222.42	334	81.56	2,433	64.8	E
		WBT	505.3	1271.66	1029	74			
		WBR	388.6	1285.08	1070	50.79			
		0	0	0	0	0			
Overall Intersection							7,728	54.0	D
Raintree and Loop 101	NB	NBL	896.61	1232.73	673	116.52	1,149	81.6	F
		NBU	896.61	1232.73	80	116.02			
		NBT	6.06	60.88	66	28.04			
		NBR	15.33	179.12	330	12.61			
	SB	SBL	74.37	291.82	294	52.66	1,308	45.7	D
		SBU	74.37	291.82	128	57.18			
		SBT	58.13	333.8	274	42.93			
		SBR	87.29	332.72	612	41.18			
	EB	EBL	38.53	203.62	257	44.97	713	44.0	D
		EBT	52.65	159	217	75.98			
		EBR	27.34	221.88	239	14.02			
	WB	WBL	259.57	1019.01	722	74.29	1,566	49.5	D
		WBT	99.06	693.72	457	42.18			
		WBR	127.54	224.34	387	12.09			
Overall Intersection							4,736	55.4	D
Raintree and 87th St	NB	NBL	3.26	54.12	18	41.92	102	21.7	C
		NBT	2.75	50.97	15	39.55			
		NBR	3.68	88.24	69	12.56			
	SB	SBL	13.9	126.96	60	47.41	219	37.5	D
		SBT	27.38	216.6	70	45.23			
		SBR	43.47	248.16	89	24.77			
	EB	EBL	70.54	317.1	21	21.96	701	30.8	C
		EBT	70.54	317.1	586	34.88			
		EBR	70.54	317.1	94	7.61			
	WB	WBL	73.24	436.21	335	11.26	1,862	9.5	A
		WBT	149.26	499.9	1335	10.15			
		WBR	3.12	128.31	192	1.82			
Overall Intersection							2,884	17.2	B
Shea and Loop 101	NB	NBL	44.77	211.16	432	31.64	869	17.8	B
		NBT							
		NBR	3.5	84.19	437	4.19			
	SB	SBL	129.22	489.9	939	40.5	1,366	31.9	C
		SBT							
		SBR	4.6	176.82	427	12.86			
	EB	EBL	68.72	230.46	384	57.56	1,887	39.5	D
		EBT	96.69	443	1082	40.77			
		EBR	56.91	320.6	421	19.56			
	WB	WBL	339.4	1035.84	848	63.7	2,562	37.7	D
		WBT	52.87	321.62	865	26.63			
		WBR	167.33	898.27	849	23.06			
Overall Intersection							6,684	34.4	C

2040 PM Improved/Build SPUI TI/Intersection Peak Hour Results

Intersection	Approach	Turning Movement	QLEN	QLENMAX	Volume (Vehicles)	Delay (veh/sec)	Approach Volume	Approach Delay (sec/veh)	Approach LOS
		TURNING MOVEMENT	QLEN	QLENMAX	VEHS(ALL)	VEHDELAY(ALL)			
Frank Lloyd Wright & Loop 101	NB	NBL	240.91	594.16	752	93.58	1,444	68.7	E
		NBT	58.38	321.36	478	46.89			
		NBR	47.16	261.02	214	30.07			
	SB	SBL	162.85	667.31	692	73.04	1,751	60.1	E
		SBT	156.94	624.44	710	67.39			
		SBR	30.59	278.32	349	19.64			
	EB	EBL	101.83	587.6	463	69.02	2,776	38.9	D
		EBT	163.17	707.96	1586	37.58			
		EBR	143.78	806.11	727	22.53			
	WB	WBL	88.46	291.32	379	74.65	2,042	35.7	D
		WBT	74.41	372.84	916	40.01			
		WBR	29.32	168.17	747	10.73			
		0	0	0	0	0			
Overall Intersection							8,013	48.1	D
Raintree and Loop 101	NB	NBL	76.03	282.12	420	49.95	1,109	35.8	D
		NBU	76.03	282.12	15	46.3			
		NBT	7.43	52.73	45	40.91			
		NBR	118.83	474.02	629	25.73			
	SB	SBL	73.8	292.21	371	45.23	1,138	36.6	D
		SBU	73.8	292.21	139	46.83			
		SBT	39.74	184.23	308	40.72			
		SBR	13.89	130.63	320	18.32			
	EB	EBL	105.88	224.17	535	53.14	1,683	37.6	D
		EBT	89.45	392.78	415	46.4			
		EBR	202.74	425.98	733	21.26			
	WB	WBL	92.32	518.73	564	51.02	1,257	42.6	D
		WBT	78.93	379.49	429	51.45			
		WBR	80.42	858.06	264	10.06			
Overall Intersection							5,187	38.2	D
Raintree and 87th St	NB	NBL	155.47	359.96	135	83.31	604	131.4	F
		NBT	17.84	128.19	68	65.17			
		NBR	1023.41	1533.47	401	158.84			
	SB	SBL	74.81	303.51	126	93.25	238	63.1	E
		SBT	30.39	269.06	42	46.72			
		SBR	43.82	300.62	70	18.7			
	EB	EBL	955.7	1056.7	28	76.83	1,158	65.4	E
		EBT	955.7	1056.7	1122	65.18			
		EBR	955.7	1056.7	8	51.74			
	WB	WBL	0.81	44.8	29	24.23	1,370	10.9	B
		WBT	61.02	330.37	1140	12.02			
		WBR	4.56	150.31	201	2.63			
Overall Intersection							3,370	54.9	D
Shea and Loop 101	NB	NBL	66.29	310.46	656	31.82	1,256	19.1	B
		NBT							
		NBR	7.07	136.3	600	5.18			
	SB	SBL	93.35	370.75	825	35.03	1,156	27.8	C
		SBT							
		SBR	0.37	58.61	331	9.84			
	EB	EBL	63	257.5	428	52.45	1,941	34.8	C
		EBT	89.72	424.06	1140	35.99			
		EBR	30.39	227.95	373	10.73			
	WB	WBL	59.04	308.15	410	45.99	2,366	46.8	D
		WBT	59.13	321	816	33.46			
		WBR	1611.14	1673.89	1140	56.72			
Overall Intersection							6,719	34.9	C

2040 AM Improved/Build TDI Alternative TI/Intersection Peak Hour Results

Intersection	Approach	Turning Movement	QLEN	QLENMAX	Volume (Vehicles)	Delay (veh/sec)	Approach Volume	Approach Delay (sec/veh)	Approach LOS
		TURNING MOVEMENT	QLEN	QLENMAX	VEHS(ALL)	VEHDELAY(ALL)			
Frank Lloyd Wright & Loop 101	NB	NBL	76.34	348.52	779	64.33	1,603	45.3	C
		NBT	50.92	289.9	729	29.96			
		NBR	13.49	73.72	95	7.34			
	SB	SBL	66.09	272.64	606	62.96	1,517	41.9	C
		SBT	82.88	267.42	511	42.93			
		SBR	42.91	236.52	400	8.59			
	EB	EBL	105.48	444.68	646	116.24	2,187	56.2	D
		EBT	105.48	444.68	1048	38.74			
		EBR	55.77	304.64	493	14.59			
	WB	WBL	110.64	589.44	337	116.42	2,501	43.1	C
		WBT	110.64	589.44	1037	45.41			
		WBR	71.2	777.18	1127	19.16			
		0	0	0	0	0			
Overall Intersection							7,808	47.0	C
Raintree & Loop 101	NB	NBL	844.92	1222.33	714	129.72	1,135	89.8	E
		NBT	8.28	73.04	70	37.23			
		NBR	29.28	242.38	351	18.92			
	SB	SBL	50.21	282.84	294	68.77	1,188	39.8	C
		SBT	52.61	282.37	273	30.03			
		SBR	62.99	292.52	621	30.37			
	EB	EBL	42.08	210.64	255	81.12	725	46.2	C
		EBT	42.08	210.64	216	39.97			
		EBR	21.1	197	254	16.57			
	WB	WBL	116.65	420.47	722	53.33	1,576	47.2	C
		WBT	116.65	420.47	464	63.66			
		WBR	25.22	279.7	390	16.22			
Overall Intersection							4,624	55.6	D
Raintree and 87th St	NB	NBL	3.21	54.11	18	41.41	102	43.0	D
		NBT	2.76	50.96	15	39.88			
		NBR	16.06	121.6	69	44.15			
	SB	SBL	13.93	126.96	60	47.27	219	37.2	D
		SBT	27.04	216.6	70	44.56			
		SBR	42.94	248.16	89	24.55			
	EB	EBL	67.29	296.43	21	17.33	700	30.6	C
		EBT	67.29	296.43	585	34.95			
		EBR	67.29	296.43	94	6.44			
	WB	WBL	100.32	752.04	361	11.28	1,993	10.3	B
		WBT	175.53	756.69	1434	11.1			
		WBR	4.55	110.99	198	2.54			
Overall Intersection							3,014	18.1	B

2040 PM Improved/Build TDI Alternative TI/Intersection Peak Hour Results

Intersection	Approach	Turning Movement	QLEN	QLENMAX	Volume (Vehicles)	Delay (veh/sec)	Approach Volume	Approach Delay (sec/veh)	Approach LOS
		TURNING MOVEMENT	QLEN	QLENMAX	VEHS(ALL)	VEHDELAY(ALL)			
Frank Lloyd Wright & Loop 101	NB	NBL	86.38	358.17	761	64.17	1,452	46.6	C
		NBT	37.64	173.32	478	31.81			
		NBR	21.6	183.51	213	17.05			
	SB	SBL	79.46	381.44	688	62.04	1,745	42.0	C
		SBT	77.24	359.56	709	38.56			
		SBR	85.48	377.82	348	9.26			
	EB	EBL	750.97	1374.79	454	78.93	2,741	65.9	D
		EBT	750.97	1374.79	1566	68.28			
		EBR	987.99	1438.84	721	52.56			
	WB	WBL	76.09	308.46	380	69.72	2,045	34.1	C
		WBT	76.09	308.46	919	38.29			
		WBR	26.33	138.49	746	10.79			
		0	0	0	0	0			
Overall Intersection							7,983	49.0	C
Raintree & Loop 101	NB	NBL	60.21	272.65	420	62.94	1,094	40.7	C
		NBT	5.38	48.99	45	29.54			
		NBR	111.99	430.4	629	26.65			
	SB	SBL	68.37	350.44	368	60.98	1,002	38.2	C
		SBT	63.84	343.59	314	34.36			
		SBR	14.99	140.23	320	15.65			
	EB	EBL	134.05	408.91	522	65.99	1,633	40.6	C
		EBT	134.05	408.91	404	40.59			
		EBR	210.4	425.96	707	21.79			
	WB	WBL	106.04	404.39	557	73.95	1,253	56.9	D
		WBT	106.04	404.39	430	61.04			
		WBR	33.2	796.69	266	14.68			
Overall Intersection							4,982	44.2	C
Raintree and 87th St	NB	NBL	48.43	212.47	142	61.52	677	42.4	D
		NBT	15.36	126.75	73	41.17			
		NBR	96.76	572.85	462	36.66			
	SB	SBL	217.46	331.83	104	117.07	216	71.5	E
		SBT	82.36	320.82	42	46.72			
		SBR	97.28	352.38	70	18.7			
	EB	EBL	969.55	1057.83	27	50.93	1,081	102.1	F
		EBT	969.55	1057.83	1047	103.61			
		EBR	969.55	1057.83	7	75.01			
	WB	WBL	0.94	50.84	28	23.87	1,367	8.4	A
		WBT	53.37	666.21	1139	9.11			
		WBR	3.21	137.34	200	1.91			
Overall Intersection							3,341	49.7	D

RODEL Analysis Results

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101NB SB	0	0	14.00	1	14.00	1	100.00	120.00	20.00
2	Raintree EB	90	0	28.00	2	28.00	2	102.00	125.00	27.00
3	L101NB NB	180	0	28.00	2	28.00	2	48.00	118.00	33.00
4	Raintree WB	270	0	26.00	2	28.00	2	106.00	135.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101NB SB	185.00	32.00	2	18.00	1	14.00	1
2	Raintree EB	185.00	16.00	1	39.00	2	28.00	2
3	L101NB NB	185.00	32.00	2	14.00	1	14.00	1
4	Raintree WB	185.00	32.00	2	32.00	2	28.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101NB SB	0	1.000	0	1.000	20.00	2091	0	14.00	2091	0
2	Raintree EB	0	1.000	0	1.000	20.00	4182	0	28.00	4182	0
3	L101NB NB	0	1.000	0	1.000	28.00	4182	0	14.00	2091	0
4	Raintree WB	0	1.000	0	1.000	26.00	3883	0	28.00	4182	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
3	L101NB NB	Merge	405	28	2	12	1	28	2
4	Raintree WB	Free	355	26	2	12	1	26	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
3	L101NB NB	12	1	0	100	135.0004 579	30	4	Raintree WB	2	2
4	Raintree WB	12	1	0	150	142.0004 817	30	1	L101NB SB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
3	L101NB NB	0	1.000	0	1.000
4	Raintree WB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101NB SB	0	0	0	0	0	4.0	1.00	0.960
2	Raintree EB	0	272	515	0	0	4.0	1.00	0.930
3	L101NB NB	0	1011	82	0	405	4.0	1.00	0.970
4	Raintree WB	0	0	1232	0	355	4.0	1.00	0.900

2040 AM Peak
50% Confidence Level
Daylight conditions
Alternative A
Project: Raintree-L101 NB
Scheme: 2040
Rodel-Win1 - Full Geometry

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		709	0		0.0000	
2	Raintree EB	None	787		0		2242	2470		0.3186	
3	L101NB NB	Merge	1093	405	787	515	0	1854	1157	0.5897	0.3500
4	Raintree WB	Free	1232	355	1365	0	920	1452	1326	0.8482	0.2678

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	3.06		3.06	1.93		A		A
3	L101NB NB	Merge	4.61	4.75	4.65	4.01	1.48	A	A	A
4	Raintree WB	Free	13.91	0.00	10.80	20.88	0.00	B	A	B

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		688	0		0.0000	
2	Raintree EB	None	846		0		2388	2470		0.3426	
3	L101NB NB	Merge	1127	418	846	554	0	1811	1145	0.6220	0.3686
4	Raintree WB	Free	1369	394	1418	0	971	1414	1326	0.9682	0.2975

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	3.07		3.07	1.93		A		A
3	L101NB NB	Merge	4.85	4.80	4.84	4.01	1.48	A	A	A
4	Raintree WB	Free	19.32	0.00	14.99	20.88	0.00	C	A	B

Global Results

Performance and Accidents

2040 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3112	760	3872
Capacity	veh/hr	5776	2483	8259
Average Delay	sec/veh	7.90	2.53	6.85
L.O.S. (Signal)	A – F	A	A	A
L.O.S. (Unsig)	A – F	A	A	A
Total Delay	veh.hrs	6.83	0.53	7.37

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101NB SB	0	0	14.00	1	14.00	1	100.00	120.00	20.00
2	Raintree EB	90	0	28.00	2	28.00	2	102.00	125.00	27.00
3	L101NB NB	180	0	28.00	2	28.00	2	48.00	118.00	33.00
4	Raintree WB	270	0	26.00	2	28.00	2	106.00	135.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101NB SB	185.00	32.00	2	18.00	1	14.00	1
2	Raintree EB	185.00	16.00	1	39.00	2	28.00	2
3	L101NB NB	185.00	32.00	2	14.00	1	14.00	1
4	Raintree WB	185.00	32.00	2	32.00	2	28.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101NB SB	0	1.000	0	1.000	20.00	2091	0	14.00	2091	0
2	Raintree EB	0	1.000	0	1.000	20.00	4182	0	28.00	4182	0
3	L101NB NB	0	1.000	0	1.000	28.00	4182	0	14.00	2091	0
4	Raintree WB	0	1.000	0	1.000	26.00	3883	0	28.00	4182	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
3	L101NB NB	Merge	405	28	2	12	1	28	2
4	Raintree WB	Free	355	26	2	12	1	26	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
3	L101NB NB	12	1	0	100	135.0004622	30	4	Raintree WB	2	2
4	Raintree WB	12	1	0	150	142.0004862	30	1	L101NB SB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
3	L101NB NB	0	1.000	0	1.000
4	Raintree WB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101NB SB	0	0	0	0	0	4.0	1.00	0.960
2	Raintree EB	0	272	515	0	0	4.0	1.00	0.930
3	L101NB NB	0	1011	82	0	405	4.0	1.00	0.970
4	Raintree WB	0	0	1232	0	355	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		709	0		0.0000	
2	Raintree EB	None	787		0		2195	2279		0.3454	
3	L101NB NB	Merge	1093	405	787	515	0	1662	958	0.6575	0.4227
4	Raintree WB	Free	1232	355	1365	0	920	1202	780	1.0249	0.4553

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	3.45		3.45	2.18		A		A
3	L101NB NB	Merge	6.04	6.44	6.15	5.31	2.02	A	A	A
4	Raintree WB	Free	80.16	0.00	62.23	102.86	0.00	F	A	F

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr) Arrival Flow Entry	Arrival Flow Bypass	Opposing Flow Entry	Opposing Flow Bypass	Exit Flow	Capacity (veh/hr) Capacity Entry	Capacity Bypass	Average VCR Entry	Average VCR Bypass
1	L101NB SB	None	0		0		688	0		0.0000	
2	Raintree EB	None	846		0		2205	2279		0.3714	
3	L101NB NB	Merge	1127	418	846	553	0	1620	946	0.6955	0.4478
4	Raintree WB	Free	1369	394	1418	0	971	1165	780	1.1754	0.5059

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec) Entry	Average Delay Bypass	Average Delay Leg	95% Queue (veh) Entry	95% Queue Bypass	Level of Service Entry	Level of Service Bypass	Level of Service Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	3.46		3.46	2.18		A		A
3	L101NB NB	Merge	6.45	6.55	6.48	5.31	2.02	A	A	A
4	Raintree WB	Free	84.44	0.00	65.55	102.86	0.00	F	A	F

Global Results

Performance and Accidents

2040 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3112	760	3872
Capacity	veh/hr	5143	1738	6881
Average Delay	sec/veh	34.73	3.43	28.59
L.O.S. (Signal)	A – F	C	A	C
L.O.S. (Unsig)	A – F	D	A	D
Total Delay	veh.hrs	30.02	0.73	30.75

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101NB SB	0	0	14.00	1	14.00	1	100.00	120.00	20.00
2	Raintree EB	90	0	28.00	2	28.00	2	102.00	125.00	27.00
3	L101NB NB	180	0	28.00	2	28.00	2	48.00	118.00	33.00
4	Raintree WB	270	0	26.00	2	28.00	2	106.00	135.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101NB SB	185.00	32.00	2	18.00	1	14.00	1
2	Raintree EB	185.00	16.00	1	39.00	2	28.00	2
3	L101NB NB	185.00	32.00	2	14.00	1	14.00	1
4	Raintree WB	185.00	32.00	2	32.00	2	28.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101NB SB	0	1.000	0	1.000	20.00	2091	0	14.00	2091	0
2	Raintree EB	0	1.000	0	1.000	20.00	4182	0	28.00	4182	0
3	L101NB NB	0	1.000	0	1.000	28.00	4182	0	14.00	2091	0
4	Raintree WB	0	1.000	0	1.000	26.00	3883	0	28.00	4182	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
3	L101NB NB	Merge	629	28	2	12	1	28	2
4	Raintree WB	Free	250	26	2	12	1	26	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
3	L101NB NB	12	1	0	100	135.0004 45	30	4	Raintree WB	2	2
4	Raintree WB	12	1	0	150	142.0004 68	30	1	L101NB SB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
3	L101NB NB	0	1.000	0	1.000
4	Raintree WB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101NB SB	0	0	0	0	0	4.0	1.00	0.940
2	Raintree EB	0	688	902	0	0	4.0	1.00	0.870
3	L101NB NB	0	507	43	0	629	4.0	1.00	0.940
4	Raintree WB	0	0	1066	0	250	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		981	0		0.0000	
2	Raintree EB	None	1590		0		1573	2470		0.6437	
3	L101NB NB	Merge	550	629	1590	902	0	1206	931	0.4560	0.6755
4	Raintree WB	Free	1066	250	1238	0	1530	1544	1326	0.6902	0.1886

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	6.50		6.50	9.96		A		A
3	L101NB NB	Merge	5.63	11.80	8.92	3.18	6.93	A	B	A
4	Raintree WB	Free	6.98	0.00	5.66	8.43	0.00	A	A	A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		937	0		0.0000	
2	Raintree EB	None	1828		0		1715	2470		0.7399	
3	L101NB NB	Merge	585	669	1821	1033	0	1045	891	0.5598	0.7713
4	Raintree WB	Free	1184	278	1371	0	1698	1448	1326	0.8180	0.2095

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	7.34		7.34	9.96		A		A
3	L101NB NB	Merge	6.80	13.61	10.43	3.18	6.93	A	B	B
4	Raintree WB	Free	8.96	0.00	7.26	8.43	0.00	A	A	A

2040 PM Peak
50% Confidence Level
Daylight conditions
Project: Raintree-L101 NB
Scheme: 2040
Rodel-Win1 - Full Geometry
Alternative A

Global Results

Performance and Accidents

2040 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3206	879	4085
Capacity	veh/hr	5221	2257	7478
Average Delay	sec/veh	6.51	8.44	6.93
L.O.S. (Signal)	A – F	A	A	A
L.O.S. (Unsig)	A – F	A	A	A
Total Delay	veh.hrs	5.80	2.06	7.86

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101NB SB	0	0	14.00	1	14.00	1	100.00	120.00	20.00
2	Raintree EB	90	0	28.00	2	28.00	2	102.00	125.00	27.00
3	L101NB NB	180	0	28.00	2	28.00	2	48.00	118.00	33.00
4	Raintree WB	270	0	26.00	2	28.00	2	106.00	135.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101NB SB	185.00	32.00	2	18.00	1	14.00	1
2	Raintree EB	185.00	16.00	1	39.00	2	28.00	2
3	L101NB NB	185.00	32.00	2	14.00	1	14.00	1
4	Raintree WB	185.00	32.00	2	32.00	2	28.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101NB SB	0	1.000	0	1.000	20.00	2091	0	14.00	2091	0
2	Raintree EB	0	1.000	0	1.000	20.00	4182	0	28.00	4182	0
3	L101NB NB	0	1.000	0	1.000	28.00	4182	0	14.00	2091	0
4	Raintree WB	0	1.000	0	1.000	26.00	3883	0	28.00	4182	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
3	L101NB NB	Merge	629	28	2	12	1	28	2
4	Raintree WB	Free	250	26	2	12	1	26	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
3	L101NB NB	12	1	0	100	135.0004406	30	4	Raintree WB	2	2
4	Raintree WB	12	1	0	150	142.0004635	30	1	L101NB SB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
3	L101NB NB	0	1.000	0	1.000
4	Raintree WB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101NB SB	0	0	0	0	0	4.0	1.00	0.940
2	Raintree EB	0	688	902	0	0	4.0	1.00	0.870
3	L101NB NB	0	507	43	0	629	4.0	1.00	0.940
4	Raintree WB	0	0	1066	0	250	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		980	0		0.0000	
2	Raintree EB	None	1590		0		1571	2279		0.6978	
3	L101NB NB	Merge	550	629	1589	901	0	916	595	0.6007	1.0577
4	Raintree WB	Free	1066	250	1237	0	1484	1354	1127	0.7875	0.2219

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	8.23		8.23	12.96		A		A
3	L101NB NB	Merge	10.45	187.18	104.73	7.02	99.80	B	F	F
4	Raintree WB	Free	11.91	0.00	9.64	16.74	0.00	B	A	A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		937	0		0.0000	
2	Raintree EB	None	1828		0		1697	2279		0.8021	
3	L101NB NB	Merge	585	669	1817	1031	0	763	558	0.7672	1.5511
4	Raintree WB	Free	1184	278	1365	0	1586	1261	1127	0.9392	0.2465

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	9.61		9.61	12.96		A		A
3	L101NB NB	Merge	14.39	202.24	114.61	7.02	89.64	B	F	F
4	Raintree WB	Free	17.15	0.00	13.89	16.74	0.00	C	A	B

Global Results

Performance and Accidents

2040 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3206	879	4085
Capacity	veh/hr	4548	1721	6269
Average Delay	sec/veh	9.83	133.94	36.54
L.O.S. (Signal)	A – F	A	F	D
L.O.S. (Unsig)	A – F	A	F	E
Total Delay	veh.hrs	8.75	32.70	41.46

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	691	28	2	13.5	1	28	2
2	Raintree EB	Free	240	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	13.5	1	80	160	170.0006 8	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0006	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	294	274	0	691	4.0	1.00	0.960
2	Raintree EB	0	0	493	0	240	4.0	1.00	0.930
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.970
4	Raintree WB	0	820	1423	0	0	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	568	691	2239	2239	0	699	321	0.8124	2.1524
2	Raintree EB	Free	493	240	1384	0	1741	1444	1492	0.3415	0.1609
3	L101SB NB	None	0		0		1331	0		0.0000	
4	Raintree WB	None	2243		0		785	2498		0.8978	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	47.82	2254.73	1259.08	35.35	821.68	E	F	F
2	Raintree EB	Free	3.54	0.00	2.38	1.47	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	16.56		16.56	41.67		C		C

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	592	720	2438	2438	0	568	255	1.0411	9.2781
2	Raintree EB	Free	530	258	1430	0	1802	1410	1492	0.3759	0.1730
3	L101SB NB	None	0		0		1302	0		0.0000	
4	Raintree WB	None	2492		0		808	2498		0.9975	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	67.63	2423.31	1360.54	35.35	569.17	F	F	F
2	Raintree EB	Free	3.62	0.00	2.44	1.47	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	22.38		22.38	41.67		C		C

Global Results

Performance and Accidents

2040 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3304	931	4235
Capacity	veh/hr	4641	1813	6454
Average Delay	sec/veh	19.99	1673.49	383.48
L.O.S. (Signal)	A – F	B	F	F
L.O.S. (Unsig)	A – F	C	F	F
Total Delay	veh.hrs	18.34	432.78	451.13

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	691	28	2	13.5	1	28	2
2	Raintree EB	Free	240	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	13.5	1	80	160	170.0006 854	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0006 048	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	294	274	0	691	4.0	1.00	0.960
2	Raintree EB	0	0	493	0	240	4.0	1.00	0.930
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.970
4	Raintree WB	0	820	1423	0	0	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	568	691	2217	2217	0	522	129	1.0876	5.3422
2	Raintree EB	Free	493	240	1317	0	1536	1301	1292	0.3790	0.1857
3	L101SB NB	None	0		0		1295	0		0.0000	
4	Raintree WB	None	2243		0		755	2307		0.9722	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	200.25	6503.75	3659.92	112.45	1288.50	F	F	F
2	Raintree EB	Free	4.11	0.00	2.76	1.65	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	34.08		34.08	93.76		D		D

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	592	720	2307	2307	0	463	99	1.2777	34.2784
2	Raintree EB	Free	530	258	1306	0	1563	1308	1292	0.4053	0.1997
3	L101SB NB	None	0		0		1295	0		0.0000	
4	Raintree WB	None	2492		0		769	2307		1.0803	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	180.81	6513.98	3656.76	86.37	881.03	F	F	F
2	Raintree EB	Free	4.15	0.00	2.79	1.65	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	45.26		45.26	93.76		E		E

Global Results

Performance and Accidents

2040 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3304	931	4235
Capacity	veh/hr	4130	1422	5552
Average Delay	sec/veh	58.17	4827.17	1106.56
L.O.S. (Signal)	A – F	E	F	F
L.O.S. (Unsig)	A – F	F	F	F
Total Delay	veh.hrs	53.39	1248.36	1301.75

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

2040 PM Peak
50% Confidence Level
Daylight conditions
Alternative A
Project: Raintree-L101 SB
Scheme: 2040
Rodel-Win1 - Full Geometry

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	385	28	2	13.5	1	28	2
2	Raintree EB	Free	894	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	13.5	1	80	160	170.0007018	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0006192	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	371	312	0	385	4.0	1.00	0.940
2	Raintree EB	0	0	1219	0	894	4.0	1.00	0.870
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.940
4	Raintree WB	0	579	994	0	0	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	683	385	1572	1572	0	1227	623	0.5566	0.6182
2	Raintree EB	Free	1219	894	1261	0	1378	1532	1492	0.7956	0.5994
3	L101SB NB	None	0		0		1784	0		0.0000	
4	Raintree WB	None	1573		0		1588	2498		0.6296	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	11.17	15.26	12.64	7.29	6.11	B	C	B
2	Raintree EB	Free	11.54	0.00	6.66	19.91	0.00	B	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	5.51		5.51	7.71		A		A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	727	410	1744	1744	0	1111	562	0.6542	0.7550
2	Raintree EB	Free	1401	1028	1364	0	1507	1458	1492	0.9611	0.6889
3	L101SB NB	None	0		0		1712	0		0.0000	
4	Raintree WB	None	1748		0		1766	2498		0.6995	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	13.14	18.85	15.20	7.29	6.11	B	C	C
2	Raintree EB	Free	17.27	0.00	9.96	19.91	0.00	C	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	5.99		5.99	7.71		A		A

Global Results

Performance and Accidents

2040 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3475	1279	4754
Capacity	veh/hr	5258	2114	7372
Average Delay	sec/veh	8.74	4.59	7.62
L.O.S. (Signal)	A – F	A	A	A
L.O.S. (Unsig)	A – F	A	A	A
Total Delay	veh.hrs	8.44	1.63	10.07

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	385	28	2	13.5	1	28	2
2	Raintree EB	Free	894	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	13.5	1	80	160	170.0007072	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.000624	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	371	312	0	385	4.0	1.00	0.940
2	Raintree EB	0	0	1219	0	894	4.0	1.00	0.870
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.940
4	Raintree WB	0	579	994	0	0	4.0	1.00	0.900

2040 PM Peak
85% Confidence Level
Daylight conditions
Alternative A
Project: Raintree-L101 SB
Scheme: 2040
Rodel-Win1 - Full Geometry

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	683	385	1572	1572	0	976	311	0.6997	1.2395
2	Raintree EB	Free	1219	894	1260	0	1301	1254	1095	0.9721	0.8164
3	L101SB NB	None	0		0		1784	0		0.0000	
4	Raintree WB	None	1573		0		1569	2307		0.6818	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	20.41	494.36	191.26	14.96	160.19	C	F	F
2	Raintree EB	Free	57.43	0.00	33.13	99.05	0.00	F	A	D
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	6.85		6.85	9.73		A		A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	727	410	1742	1742	0	863	256	0.8416	2.6900
2	Raintree EB	Free	1401	1028	1354	0	1356	1188	1095	1.1790	0.9384
3	L101SB NB	None	0		0		1713	0		0.0000	
4	Raintree WB	None	1748		0		1575	2307		0.7576	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	26.53	565.34	220.77	14.96	124.25	D	F	F
2	Raintree EB	Free	73.29	0.00	42.28	99.05	0.00	F	A	E
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	7.61		7.61	9.73		A		A

Global Results

Performance and Accidents

2040 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3475	1279	4754
Capacity	veh/hr	4537	1406	5943
Average Delay	sec/veh	27.26	148.81	59.96
L.O.S. (Signal)	A – F	C	F	E
L.O.S. (Unsig)	A – F	D	F	F
Total Delay	veh.hrs	26.31	52.87	79.18

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	294	274	0	0	4.0	1.00	0.960
2	Raintree EB	0	0	493	0	240	4.0	1.00	0.930
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.970
4	Raintree WB	0	820	1423	0	0	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	568		2239		0	774		0.7336	
2	Raintree EB	Free	493	240	1384	0	1420	1443	1492	0.3416	0.1609
3	L101SB NB	None	0		0		1331	0		0.0000	
4	Raintree WB	None	2243		0		786	2498		0.8978	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	31.60		31.60	22.02		D		D
2	Raintree EB	Free	3.54	0.00	2.38	1.50	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	16.56		16.56	41.67		C		C

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	592		2438		0	639		0.9266	
2	Raintree EB	Free	530	258	1452	0	1547	1394	1492	0.3803	0.1730
3	L101SB NB	None	0		0		1298	0		0.0000	
4	Raintree WB	None	2492		0		820	2498		0.9975	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	43.61		43.61	22.02		E		E
2	Raintree EB	Free	3.67	0.00	2.47	1.50	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	22.38		22.38	41.67		C		C

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	294	274	0	0	4.0	1.00	0.960
2	Raintree EB	0	0	493	0	240	4.0	1.00	0.930
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.970
4	Raintree WB	0	820	1423	0	0	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	568		2217		0	598		0.9501	
2	Raintree EB	Free	493	240	1364	0	1406	1267	1292	0.3892	0.1857
3	L101SB NB	None	0		0		1317	0		0.0000	
4	Raintree WB	None	2243		0		779	2307		0.9722	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	96.72		96.72	51.78		F		F
2	Raintree EB	Free	4.28	0.00	2.88	1.76	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	34.08		34.08	93.76		D		D

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	592		2307		0	536		1.1028	
2	Raintree EB	Free	530	258	1373	0	1464	1260	1292	0.4207	0.1997
3	L101SB NB	None	0		0		1324	0		0.0000	
4	Raintree WB	None	2492		0		804	2307		1.0803	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	98.35		98.35	46.46		F		F
2	Raintree EB	Free	4.36	0.00	2.93	1.76	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	45.26		45.26	93.76		E		E

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	371	312	0	0	4.0	1.00	0.940
2	Raintree EB	0	0	1219	0	894	4.0	1.00	0.870
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.940
4	Raintree WB	0	579	994	0	0	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	683		1572		0	1227		0.5566	
2	Raintree EB	Free	1219	894	1261	0	994	1532	1492	0.7956	0.5994
3	L101SB NB	None	0		0		1784	0		0.0000	
4	Raintree WB	None	1573		0		1588	2498		0.6296	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	11.17		11.17	7.29		B		B
2	Raintree EB	Free	11.54	0.00	6.66	19.91	0.00	B	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	5.51		5.51	7.71		A		A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	727		1744		0	1111		0.6542	
2	Raintree EB	Free	1401	1028	1364	0	1102	1458	1492	0.9611	0.6889
3	L101SB NB	None	0		0		1712	0		0.0000	
4	Raintree WB	None	1748		0		1766	2498		0.6995	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	13.14		13.14	7.29		B		B
2	Raintree EB	Free	17.27	0.00	9.96	19.91	0.00	C	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	5.99		5.99	7.71		A		A

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	371	312	0	0	4.0	1.00	0.940
2	Raintree EB	0	0	1219	0	894	4.0	1.00	0.870
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.940
4	Raintree WB	0	579	994	0	0	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	683		1572		0	1036		0.6593	
2	Raintree EB	Free	1219	894	1261	0	993	1254	1095	0.9722	0.8164
3	L101SB NB	None	0		0		1784	0		0.0000	
4	Raintree WB	None	1573		0		1569	2307		0.6818	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	17.07		17.07	12.09		C		C
2	Raintree EB	Free	57.82	0.00	33.36	100.30	0.00	F	A	D
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	6.85		6.85	9.73		A		A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	727		1742		0	920		0.7894	
2	Raintree EB	Free	1401	1028	1358	0	1101	1186	1095	1.1817	0.9384
3	L101SB NB	None	0		0		1713	0		0.0000	
4	Raintree WB	None	1748		0		1575	2307		0.7576	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	21.56		21.56	12.09		C		C
2	Raintree EB	Free	74.27	0.00	42.85	100.30	0.00	F	A	E
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	7.61		7.61	9.73		A		A

Operational Data

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	691	28	2	13.5	1	28	2
2	Raintree EB	Free	240	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	13.5	1	80	160	170.0007 779	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0006 864	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	294	274	0	691	4.0	1.00	0.960
2	Raintree EB	0	0	493	0	240	4.0	1.00	0.930
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.970
4	Raintree WB	0	0	1423	0	0	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	568	691	1423	1423	0	1234	593	0.4603	1.1659
2	Raintree EB	Free	493	240	568	0	2013	2034	1492	0.2424	0.1609
3	L101SB NB	None	0		0		514	0		0.0000	
4	Raintree WB	None	1423		0		787	2498		0.5696	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	9.64	365.16	204.77	4.78	215.90	A	F	F
2	Raintree EB	Free	2.20	0.00	1.48	0.88	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	3.04		3.04	3.89		A		A

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	592	720	1580	1580	0	1131	540	0.5232	2.0723
2	Raintree EB	Free	530	258	591	0	2120	2018	1492	0.2627	0.1730
3	L101SB NB	None	0		0		504	0		0.0000	
4	Raintree WB	None	1581		0		836	2498		0.6328	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	10.73	393.62	220.88	4.78	163.30	B	F	F
2	Raintree EB	Free	2.21	0.00	1.49	0.88	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	3.25		3.25	3.89		A		A

Operational Data

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	691	28	2	13.5	1	28	2
2	Raintree EB	Free	240	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	13.5	1	80	160	170.0007834	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0006912	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	294	274	0	691	4.0	1.00	0.960
2	Raintree EB	0	0	493	0	240	4.0	1.00	0.930
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.970
4	Raintree WB	0	0	1423	0	0	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	568	691	1423	1423	0	1043	394	0.5447	1.7553
2	Raintree EB	Free	493	240	568	0	1816	1843	1292	0.2675	0.1857
3	L101SB NB	None	0		0		514	0		0.0000	
4	Raintree WB	None	1423		0		787	2307		0.6168	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	13.37	1647.69	910.37	6.92	668.69	B	F	F
2	Raintree EB	Free	2.51	0.00	1.69	1.01	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	3.67		3.67	4.77		A		A

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	592	720	1579	1579	0	940	342	0.6291	6.0978
2	Raintree EB	Free	530	258	588	0	1921	1828	1292	0.2900	0.1997
3	L101SB NB	None	0		0		504	0		0.0000	
4	Raintree WB	None	1581		0		834	2307		0.6853	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	15.47	1753.58	969.43	6.92	470.69	C	F	F
2	Raintree EB	Free	2.52	0.00	1.70	1.01	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	3.98		3.98	4.77		A		A

Operational Data

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	385	28	2	13.5	1	28	2
2	Raintree EB	Free	894	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	13.5	1	80	160	170.0007 997	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0007 056	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

2040 PM Peak
50% Confidence Level
Daylight conditions
Alternative A
Project: Raintree-L101 SB
Scheme: 2040
Rodel-Win1 - Full Geometry

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	371	312	0	385	4.0	1.00	0.940
2	Raintree EB	0	0	1219	0	894	4.0	1.00	0.870
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.940
4	Raintree WB	0	0	994	0	0	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	683	385	994	994	0	1620	828	0.4215	0.4652
2	Raintree EB	Free	1219	894	683	0	1379	1951	1492	0.6249	0.5994
3	L101SB NB	None	0		0		1206	0		0.0000	
4	Raintree WB	None	994		0		1590	2498		0.3978	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	6.54	8.05	7.08	3.78	2.71	A	A	A
2	Raintree EB	Free	4.51	0.00	2.60	5.70	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	2.22		2.22	1.90		A		A

2040 PM Peak
50% Confidence Level
Daylight conditions
Alternative A
Project: Raintree-L101 SB
Scheme: 2040
Rodel-Win1 - Full Geometry

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	727	410	1104	1104	0	1545	789	0.4702	0.5288
2	Raintree EB	Free	1401	1028	726	0	1513	1920	1492	0.7299	0.6889
3	L101SB NB	None	0		0		1155	0		0.0000	
4	Raintree WB	None	1104		0		1793	2498		0.4421	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	6.96	8.69	7.58	3.78	2.71	A	A	A
2	Raintree EB	Free	5.22	0.00	3.01	5.70	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	2.27		2.27	1.90		A		A

Operational Data

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	385	28	2	13.5	1	28	2
2	Raintree EB	Free	894	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	13.5	1	80	160	170.0008 051	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0007 104	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	371	312	0	385	4.0	1.00	0.940
2	Raintree EB	0	0	1219	0	894	4.0	1.00	0.870
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.940
4	Raintree WB	0	0	994	0	0	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	683	385	994	994	0	1429	629	0.4780	0.6126
2	Raintree EB	Free	1219	894	683	0	1378	1730	1234	0.7047	0.7247
3	L101SB NB	None	0		0		1206	0		0.0000	
4	Raintree WB	None	994		0		1589	2307		0.4309	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	8.15	14.62	10.49	4.80	5.32	A	B	B
2	Raintree EB	Free	6.44	0.00	3.72	8.74	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	2.54		2.54	2.19		A		A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	727	410	1104	1104	0	1354	590	0.5365	0.7179
2	Raintree EB	Free	1401	1028	725	0	1510	1700	1234	0.8244	0.8330
3	L101SB NB	None	0		0		1155	0		0.0000	
4	Raintree WB	None	1104		0		1788	2307		0.4787	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	8.83	16.83	11.71	4.80	5.32	A	C	B
2	Raintree EB	Free	7.96	0.00	4.59	8.74	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	2.61		2.61	2.19		A		A

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101NB SB	0	0	14.00	1	14.00	1	100.00	120.00	20.00
2	Raintree EB	90	0	28.00	2	28.00	2	102.00	125.00	27.00
3	L101NB NB	180	0	28.00	2	28.00	2	48.00	118.00	33.00
4	Raintree WB	270	0	26.00	2	28.00	2	106.00	135.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101NB SB	185.00	32.00	2	18.00	1	14.00	1
2	Raintree EB	185.00	16.00	1	39.00	2	28.00	2
3	L101NB NB	185.00	32.00	2	14.00	1	14.00	1
4	Raintree WB	185.00	32.00	2	32.00	2	28.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101NB SB	0	1.000	0	1.000	20.00	2091	0	14.00	2091	0
2	Raintree EB	0	1.000	0	1.000	20.00	4182	0	28.00	4182	0
3	L101NB NB	0	1.000	0	1.000	28.00	4182	0	14.00	2091	0
4	Raintree WB	0	1.000	0	1.000	26.00	3883	0	28.00	4182	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
3	L101NB NB	Merge	405	28	2	12	1	28	2
4	Raintree WB	Free	355	26	2	12	1	26	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
3	L101NB NB	12	1	0	100	135.0003974	30	4	Raintree WB	2	2
4	Raintree WB	12	1	0	150	142.000418	30	1	L101NB SB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
3	L101NB NB	0	1.000	0	1.000
4	Raintree WB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101NB SB	0	0	0	0	0	4.0	1.00	0.960
2	Raintree EB	0	399	515	0	0	4.0	1.00	0.930
3	L101NB NB	0	1011	82	0	405	4.0	1.00	0.970
4	Raintree WB	0	0	1232	0	355	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		836	0		0.0000	
2	Raintree EB	None	914		0		2235	2470		0.3700	
3	L101NB NB	Merge	1093	405	914	515	0	1763	1157	0.6200	0.3500
4	Raintree WB	Free	1232	355	1492	0	920	1325	1109	0.9298	0.3201

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	3.82		3.82	2.80		A		A
3	L101NB NB	Merge	5.20	4.75	5.08	4.58	1.48	A	A	A
4	Raintree WB	Free	27.34	0.00	21.22	48.41	0.00	D	A	C

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr) Arrival Flow Entry	Arrival Flow Bypass	Opposing Flow Entry	Opposing Flow Bypass	Exit Flow	Capacity (veh/hr) Capacity Entry	Capacity Bypass	Average VCR Entry	Average VCR Bypass
1	L101NB SB	None	0		0		812	0		0.0000	
2	Raintree EB	None	983		0		2320	2470		0.3979	
3	L101NB NB	Merge	1127	418	982	553	0	1714	1145	0.6574	0.3685
4	Raintree WB	Free	1369	394	1554	0	971	1280	1109	1.0692	0.3557

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec) Entry	Average Delay Bypass	Average Delay Leg	95% Queue (veh) Entry	95% Queue Bypass	Level of Service Entry	Level of Service Bypass	Level of Service Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	3.85		3.85	2.80		A		A
3	L101NB NB	Merge	5.54	4.80	5.34	4.58	1.48	A	A	A
4	Raintree WB	Free	41.22	0.00	32.00	48.41	0.00	E	A	D

Global Results

Performance and Accidents

2040 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3239	760	3999
Capacity	veh/hr	5558	2266	7824
Average Delay	sec/veh	13.23	2.53	11.20
L.O.S. (Signal)	A – F	B	A	B
L.O.S. (Unsig)	A – F	B	A	B
Total Delay	veh.hrs	11.90	0.53	12.44

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101NB SB	0	0	14.00	1	14.00	1	100.00	120.00	20.00
2	Raintree EB	90	0	28.00	2	28.00	2	102.00	125.00	27.00
3	L101NB NB	180	0	28.00	2	28.00	2	48.00	118.00	33.00
4	Raintree WB	270	0	26.00	2	28.00	2	106.00	135.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101NB SB	185.00	32.00	2	18.00	1	14.00	1
2	Raintree EB	185.00	16.00	1	39.00	2	28.00	2
3	L101NB NB	185.00	32.00	2	14.00	1	14.00	1
4	Raintree WB	185.00	32.00	2	32.00	2	28.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101NB SB	0	1.000	0	1.000	20.00	2091	0	14.00	2091	0
2	Raintree EB	0	1.000	0	1.000	20.00	4182	0	28.00	4182	0
3	L101NB NB	0	1.000	0	1.000	28.00	4182	0	14.00	2091	0
4	Raintree WB	0	1.000	0	1.000	26.00	3883	0	28.00	4182	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
3	L101NB NB	Merge	405	28	2	12	1	28	2
4	Raintree WB	Free	355	26	2	12	1	26	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
3	L101NB NB	12	1	0	100	135.0004018	30	4	Raintree WB	2	2
4	Raintree WB	12	1	0	150	142.0004226	30	1	L101NB SB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
3	L101NB NB	0	1.000	0	1.000
4	Raintree WB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101NB SB	0	0	0	0	0	4.0	1.00	0.960
2	Raintree EB	0	399	515	0	0	4.0	1.00	0.930
3	L101NB NB	0	1011	82	0	405	4.0	1.00	0.970
4	Raintree WB	0	0	1232	0	355	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		836	0		0.0000	
2	Raintree EB	None	914		0		2121	2279		0.4011	
3	L101NB NB	Merge	1093	405	914	515	0	1571	958	0.6955	0.4227
4	Raintree WB	Free	1232	355	1491	0	920	1112	780	1.1077	0.4553

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	4.34		4.34	3.18		A		A
3	L101NB NB	Merge	7.09	6.44	6.91	6.36	2.02	A	A	A
4	Raintree WB	Free	159.93	0.00	124.15	187.57	0.00	F	A	F

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		812	0		0.0000	
2	Raintree EB	None	983		0		2109	2279		0.4313	
3	L101NB NB	Merge	1127	418	982	553	0	1523	946	0.7400	0.4478
4	Raintree WB	Free	1369	394	1553	0	971	1069	780	1.2811	0.5059

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	4.38		4.38	3.18		A		A
3	L101NB NB	Merge	7.72	6.55	7.40	6.36	2.02	A	A	A
4	Raintree WB	Free	148.38	0.00	115.19	173.39	0.00	F	A	F

Global Results

Performance and Accidents

2040 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3239	760	3999
Capacity	veh/hr	4962	1738	6700
Average Delay	sec/veh	64.45	3.43	52.85
L.O.S. (Signal)	A – F	E	A	D
L.O.S. (Unsig)	A – F	F	A	F
Total Delay	veh.hrs	57.99	0.73	58.71

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101NB SB	0	0	14.00	1	14.00	1	100.00	120.00	20.00
2	Raintree EB	90	0	28.00	2	28.00	2	102.00	125.00	27.00
3	L101NB NB	180	0	28.00	2	28.00	2	48.00	118.00	33.00
4	Raintree WB	270	0	26.00	2	28.00	2	106.00	135.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101NB SB	185.00	32.00	2	18.00	1	14.00	1
2	Raintree EB	185.00	16.00	1	39.00	2	28.00	2
3	L101NB NB	185.00	32.00	2	14.00	1	14.00	1
4	Raintree WB	185.00	32.00	2	32.00	2	28.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101NB SB	0	1.000	0	1.000	20.00	2091	0	14.00	2091	0
2	Raintree EB	0	1.000	0	1.000	20.00	4182	0	28.00	4182	0
3	L101NB NB	0	1.000	0	1.000	28.00	4182	0	14.00	2091	0
4	Raintree WB	0	1.000	0	1.000	26.00	3883	0	28.00	4182	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
3	L101NB NB	Merge	629	28	2	12	1	28	2
4	Raintree WB	Free	250	26	2	12	1	26	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
3	L101NB NB	12	1	0	100	135.0004 19	30	4	Raintree WB	2	2
4	Raintree WB	12	1	0	150	142.0004 408	30	1	L101NB SB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
3	L101NB NB	0	1.000	0	1.000
4	Raintree WB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101NB SB	0	0	0	0	0	4.0	1.00	0.940
2	Raintree EB	0	827	902	0	0	4.0	1.00	0.870
3	L101NB NB	0	507	43	0	629	4.0	1.00	0.940
4	Raintree WB	0	0	1066	0	250	4.0	1.00	0.900

2040 PM Peak
50% Confidence Level
Daylight conditions
Alternative B
Project: Raintree-L101 NB
Scheme: 2040
Rodel-Win1 - Full Geometry

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		1119	0		0.0000	
2	Raintree EB	None	1729		0		1572	2470		0.7000	
3	L101NB NB	Merge	550	629	1728	901	0	1110	931	0.4955	0.6754
4	Raintree WB	Free	1066	250	1376	0	1530	1444	1326	0.7380	0.1886

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	8.31		8.31	14.13		A		A
3	L101NB NB	Merge	6.68	11.79	9.41	4.04	6.92	A	B	A
4	Raintree WB	Free	9.08	0.00	7.35	12.14	0.00	A	A	A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		1069	0		0.0000	
2	Raintree EB	None	1987		0		1708	2470		0.8046	
3	L101NB NB	Merge	585	669	1976	1031	0	937	892	0.6242	0.7707
4	Raintree WB	Free	1184	278	1527	0	1696	1335	1326	0.8872	0.2095

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	9.73		9.73	14.13		A		A
3	L101NB NB	Merge	8.47	13.57	11.19	4.04	6.92	A	B	B
4	Raintree WB	Free	12.61	0.00	10.22	12.14	0.00	B	A	B

Global Results

Performance and Accidents

2040 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3345	879	4224
Capacity	veh/hr	5024	2257	7281
Average Delay	sec/veh	8.29	8.44	8.32
L.O.S. (Signal)	A – F	A	A	A
L.O.S. (Unsig)	A – F	A	A	A
Total Delay	veh.hrs	7.70	2.06	9.76

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101NB SB	0	0	14.00	1	14.00	1	100.00	120.00	20.00
2	Raintree EB	90	0	28.00	2	28.00	2	102.00	125.00	27.00
3	L101NB NB	180	0	28.00	2	28.00	2	48.00	118.00	33.00
4	Raintree WB	270	0	26.00	2	28.00	2	106.00	135.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101NB SB	185.00	32.00	2	18.00	1	14.00	1
2	Raintree EB	185.00	16.00	1	39.00	2	28.00	2
3	L101NB NB	185.00	32.00	2	14.00	1	14.00	1
4	Raintree WB	185.00	32.00	2	32.00	2	28.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101NB SB	0	1.000	0	1.000	20.00	2091	0	14.00	2091	0
2	Raintree EB	0	1.000	0	1.000	20.00	4182	0	28.00	4182	0
3	L101NB NB	0	1.000	0	1.000	28.00	4182	0	14.00	2091	0
4	Raintree WB	0	1.000	0	1.000	26.00	3883	0	28.00	4182	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
3	L101NB NB	Merge	629	28	2	12	1	28	2
4	Raintree WB	Free	250	26	2	12	1	26	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
3	L101NB NB	12	1	0	100	135.0004 234	30	4	Raintree WB	2	2
4	Raintree WB	12	1	0	150	142.0004 453	30	1	L101NB SB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
3	L101NB NB	0	1.000	0	1.000
4	Raintree WB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101NB SB	0	0	0	0	0	4.0	1.00	0.940
2	Raintree EB	0	827	902	0	0	4.0	1.00	0.870
3	L101NB NB	0	507	43	0	629	4.0	1.00	0.940
4	Raintree WB	0	0	1066	0	250	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		1119	0		0.0000	
2	Raintree EB	None	1729		0		1569	2279		0.7588	
3	L101NB NB	Merge	550	629	1727	901	0	823	595	0.6683	1.0575
4	Raintree WB	Free	1066	250	1375	0	1484	1240	1028	0.8599	0.2433

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	11.04		11.04	19.57		B		B
3	L101NB NB	Merge	15.08	186.58	106.58	12.01	99.69	C	F	F
4	Raintree WB	Free	20.62	0.00	16.70	34.84	0.00	C	A	C

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr) Arrival Flow Entry	Arrival Flow Bypass	Opposing Flow Entry	Opposing Flow Bypass	Exit Flow	Capacity (veh/hr) Capacity Entry	Capacity Bypass	Average VCR Entry	Average VCR Bypass
1	L101NB SB	None	0		0		1069	0		0.0000	
2	Raintree EB	None	1987		0		1651	2279		0.8722	
3	L101NB NB	Merge	585	669	1968	1027	0	661	559	0.8846	1.5460
4	Raintree WB	Free	1184	278	1512	0	1583	1141	1028	1.0377	0.2703

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec) Entry	Average Delay Bypass	Average Delay Leg	95% Queue (veh) Entry	95% Queue Bypass	Level of Service Entry	Level of Service Bypass	Level of Service Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	13.54		13.54	19.57		B		B
3	L101NB NB	Merge	23.17	200.78	117.93	12.01	89.05	C	F	F
4	Raintree WB	Free	32.93	0.00	26.68	34.84	0.00	D	A	D

Global Results

Performance and Accidents

2040 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3345	879	4224
Capacity	veh/hr	4341	1622	5963
Average Delay	sec/veh	14.76	133.52	39.47
L.O.S. (Signal)	A – F	B	F	D
L.O.S. (Unsig)	A – F	B	F	E
Total Delay	veh.hrs	13.71	32.60	46.31

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	691	28	2	27	2	28	2
2	Raintree EB	Free	240	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	27	2	80	160	170.0008 541	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0007 536	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	421	274	0	691	4.0	1.00	0.960
2	Raintree EB	0	0	493	0	240	4.0	1.00	0.930
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.970
4	Raintree WB	0	820	1423	0	0	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	695	691	2239	2239	0	549	534	1.2663	1.2949
2	Raintree EB	Free	493	240	1365	0	1951	1457	1492	0.3384	0.1609
3	L101SB NB	None	0		0		1274	0		0.0000	
4	Raintree WB	None	2243		0		824	2498		0.8978	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	372.34	529.41	450.65	269.03	321.95	F	F	F
2	Raintree EB	Free	3.48	0.00	2.34	1.35	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	16.56		16.56	41.67		C		C

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	724	720	2438	2438	0	428	408	1.6933	2.9770
2	Raintree EB	Free	530	258	1319	0	1954	1490	1492	0.3557	0.1730
3	L101SB NB	None	0		0		1259	0		0.0000	
4	Raintree WB	None	2492		0		789	2498		0.9975	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	345.93	630.86	487.98	205.59	234.63	F	F	F
2	Raintree EB	Free	3.43	0.00	2.31	1.35	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	22.38		22.38	41.67		C		C

Global Results

Performance and Accidents

2040 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3431	931	4362
Capacity	veh/hr	4504	2025	6529
Average Delay	sec/veh	86.75	392.93	152.10
L.O.S. (Signal)	A – F	F	F	F
L.O.S. (Unsig)	A – F	F	F	F
Total Delay	veh.hrs	82.67	101.62	184.29

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	691	28	2	27	2	28	2
2	Raintree EB	Free	240	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	27	2	80	160	170.0008 595	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0007 584	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	421	274	0	691	4.0	1.00	0.960
2	Raintree EB	0	0	493	0	240	4.0	1.00	0.930
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.970
4	Raintree WB	0	820	1423	0	0	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	695	691	2217	2217	0	371	348	1.8742	1.9829
2	Raintree EB	Free	493	240	1181	0	1755	1399	1292	0.3525	0.1857
3	L101SB NB	None	0		0		1197	0		0.0000	
4	Raintree WB	None	2243		0		718	2307		0.9722	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	878.67	1615.93	1246.23	643.77	712.97	F	F	F
2	Raintree EB	Free	3.71	0.00	2.50	1.46	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	34.08		34.08	93.76		D		D

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	724	720	2307	2307	0	316	292	2.2911	6.7725
2	Raintree EB	Free	530	258	1159	0	1755	1415	1292	0.3748	0.1997
3	L101SB NB	None	0		0		1188	0		0.0000	
4	Raintree WB	None	2492		0		721	2307		1.0803	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	818.72	1902.23	1358.91	417.43	462.36	F	F	F
2	Raintree EB	Free	3.69	0.00	2.48	1.46	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	45.26		45.26	93.76		E		E

Global Results

Performance and Accidents

2040 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3431	931	4362
Capacity	veh/hr	4077	1641	5718
Average Delay	sec/veh	200.80	1199.36	413.92
L.O.S. (Signal)	A – F	F	F	F
L.O.S. (Unsig)	A – F	F	F	F
Total Delay	veh.hrs	191.37	310.17	501.54

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	385	28	2	27	2	28	2
2	Raintree EB	Free	894	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	27	2	80	160	170.0008 813	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0007 776	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	510	312	0	385	4.0	1.00	0.940
2	Raintree EB	0	0	1219	0	894	4.0	1.00	0.870
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.940
4	Raintree WB	0	579	994	0	0	4.0	1.00	0.900

2040 PM Peak
50% Confidence Level
Daylight conditions
Alternative B
Project: Raintree-L101 SB
Scheme: 2040
Rodel-Win1 - Full Geometry

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	822	385	1572	1572	0	1156	1084	0.7114	0.3550
2	Raintree EB	Free	1219	894	1400	0	1378	1429	1485	0.8529	0.6021
3	L101SB NB	None	0		0		1784	0		0.0000	
4	Raintree WB	None	1573		0		1725	2498		0.6296	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	15.65	5.15	12.30	13.58	1.87	C	A	B
2	Raintree EB	Free	18.20	0.00	10.50	36.43	0.00	C	A	B
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	5.51		5.51	7.71		A		A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr) Arrival Flow Entry	Arrival Flow Bypass	Opposing Flow Entry	Opposing Flow Bypass	Exit Flow	Capacity (veh/hr) Capacity Entry	Capacity Bypass	Average VCR Entry	Average VCR Bypass
1	L101SB SB	Yield	874	410	1744	1744	0	1042	970	0.8390	0.4271
2	Raintree EB	Free	1401	1028	1504	0	1511	1354	1485	1.0351	0.6920
3	L101SB NB	None	0		0		1713	0		0.0000	
4	Raintree WB	None	1748		0		1872	2498		0.6995	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec) Entry	Average Delay Bypass	Average Delay Leg	95% Queue (veh) Entry	95% Queue Bypass	Level of Service Entry	Level of Service Bypass	Level of Service Leg
1	L101SB SB	Yield	20.19	5.83	15.61	13.58	1.87	C	A	C
2	Raintree EB	Free	29.52	0.00	17.03	36.43	0.00	D	A	C
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	5.99		5.99	7.71		A		A

Global Results

Performance and Accidents

2040 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3614	1279	4893
Capacity	veh/hr	5083	2569	7652
Average Delay	sec/veh	12.10	1.55	9.34
L.O.S. (Signal)	A – F	B	A	A
L.O.S. (Unsig)	A – F	B	A	A
Total Delay	veh.hrs	12.15	0.55	12.70

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	385	28	2	27	2	28	2
2	Raintree EB	Free	894	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	27	2	80	160	170.0008 867	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0007 824	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	510	312	0	385	4.0	1.00	0.940
2	Raintree EB	0	0	1219	0	894	4.0	1.00	0.870
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.940
4	Raintree WB	0	579	994	0	0	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	822	385	1572	1572	0	861	650	0.9548	0.5921
2	Raintree EB	Free	1219	894	1389	0	1378	1137	1033	1.0718	0.8653
3	L101SB NB	None	0		0		1780	0		0.0000	
4	Raintree WB	None	1573		0		1626	2307		0.6818	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	71.82	14.38	53.50	70.55	6.64	F	B	F
2	Raintree EB	Free	121.41	0.00	70.04	147.94	0.00	F	A	F
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	6.85		6.85	9.73		A		A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	874	410	1742	1742	0	753	548	1.1609	0.7746
2	Raintree EB	Free	1401	1028	1395	0	1504	1133	1033	1.2365	0.9946
3	L101SB NB	None	0		0		1732	0		0.0000	
4	Raintree WB	None	1748		0		1601	2307		0.7576	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	92.86	19.68	69.52	70.55	6.64	F	C	F
2	Raintree EB	Free	107.73	0.00	62.15	136.79	0.00	F	A	F
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	7.61		7.61	9.73		A		A

Global Results

Performance and Accidents

2040 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3614	1279	4893
Capacity	veh/hr	4305	1683	5988
Average Delay	sec/veh	60.27	4.33	45.65
L.O.S. (Signal)	A – F	E	A	D
L.O.S. (Unsig)	A – F	F	A	E
Total Delay	veh.hrs	60.50	1.54	62.04

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	421	274	0	0	4.0	1.00	0.960
2	Raintree EB	0	0	493	0	240	4.0	1.00	0.930
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.970
4	Raintree WB	0	820	1423	0	0	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	695		2217		0	598		1.1625	
2	Raintree EB	Free	493	240	1402	0	1406	1239	1292	0.3979	0.1857
3	L101SB NB	None	0		0		1284	0		0.0000	
4	Raintree WB	None	2243		0		851	2307		0.9722	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	247.70		247.70	183.23		F		F
2	Raintree EB	Free	4.44	0.00	2.99	1.76	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	34.08		34.08	93.76		D		D

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	724		2307		0	536		1.3494	
2	Raintree EB	Free	530	258	1380	0	1464	1255	1292	0.4224	0.1997
3	L101SB NB	None	0		0		1278	0		0.0000	
4	Raintree WB	None	2492		0		855	2307		1.0803	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	220.13		220.13	127.39		F		F
2	Raintree EB	Free	4.47	0.00	3.01	1.76	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	45.26		45.26	93.76		E		E

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	510	312	0	0	4.0	1.00	0.940
2	Raintree EB	0	0	1219	0	894	4.0	1.00	0.870
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.940
4	Raintree WB	0	579	994	0	0	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr) Arrival Flow Entry	Arrival Flow Bypass	Opposing Flow Entry	Opposing Flow Bypass	Exit Flow	Capacity (veh/hr) Capacity Entry	Capacity Bypass	Average VCR Entry	Average VCR Bypass
1	L101SB SB	None	822		1572		0	1036		0.7935	
2	Raintree EB	Free	1219	894	1399	0	993	1130	1033	1.0784	0.8653
3	L101SB NB	None	0		0		1784	0		0.0000	
4	Raintree WB	None	1573		0		1627	2307		0.6818	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec) Entry	Average Delay Bypass	Average Delay Leg	95% Queue (veh) Entry	95% Queue Bypass	Level of Service Entry	Level of Service Bypass	Level of Service Leg
1	L101SB SB	None	24.03		24.03	23.37		C		C
2	Raintree EB	Free	141.76	0.00	81.78	170.49	0.00	F	A	F
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	6.85		6.85	9.73		A		A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr) Arrival Flow Entry	Arrival Flow Bypass	Opposing Flow Entry	Opposing Flow Bypass	Exit Flow	Capacity (veh/hr) Capacity Entry	Capacity Bypass	Average VCR Entry	Average VCR Bypass
1	L101SB SB	None	874		1742		0	920		0.9500	
2	Raintree EB	Free	1401	1028	1488	0	1101	1068	1033	1.3114	0.9946
3	L101SB NB	None	0		0		1713	0		0.0000	
4	Raintree WB	None	1748		0		1594	2307		0.7576	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec) Entry	Average Delay Bypass	Average Delay Leg	95% Queue (veh) Entry	95% Queue Bypass	Level of Service Entry	Level of Service Bypass	Level of Service Leg
1	L101SB SB	None	33.68		33.68	23.37		D		D
2	Raintree EB	Free	128.30	0.00	74.02	169.75	0.00	F	A	F
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	7.61		7.61	9.73		A		A

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

2040 AM Peak
50% Confidence Level
Daylight conditions
Project: Raintree-L101 SB
Scheme: 2040
Rodel-Win1 - Full Geometry
Alternative B

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	421	274	0	0	4.0	1.00	0.960
2	Raintree EB	0	0	493	0	240	4.0	1.00	0.930
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.970
4	Raintree WB	0	820	1423	0	0	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	695		2239		0	774		0.8976	
2	Raintree EB	Free	493	240	1507	0	1420	1354	1492	0.3640	0.1609
3	L101SB NB	None	0		0		1330	0		0.0000	
4	Raintree WB	None	2243		0		910	2498		0.8978	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	59.09		59.09	54.49		F		F
2	Raintree EB	Free	3.89	0.00	2.61	1.58	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	16.56		16.56	41.67		C		C

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	724		2438		0	639		1.1337	
2	Raintree EB	Free	530	258	1522	0	1547	1343	1492	0.3947	0.1730
3	L101SB NB	None	0		0		1311	0		0.0000	
4	Raintree WB	None	2492		0		912	2498		0.9975	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	82.17		82.17	54.49		F		F
2	Raintree EB	Free	3.93	0.00	2.65	1.58	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	22.38		22.38	41.67		C		C

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	510	312	0	0	4.0	1.00	0.940
2	Raintree EB	0	0	1219	0	894	4.0	1.00	0.870
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.940
4	Raintree WB	0	579	994	0	0	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	822		1572		0	1227		0.6698	
2	Raintree EB	Free	1219	894	1400	0	994	1429	1485	0.8530	0.6021
3	L101SB NB	None	0		0		1784	0		0.0000	
4	Raintree WB	None	1573		0		1725	2498		0.6296	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	12.98		12.98	10.88		B		B
2	Raintree EB	Free	18.37	0.00	10.60	36.94	0.00	C	A	B
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	5.51		5.51	7.71		A		A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	874		1744		0	1111		0.7873	
2	Raintree EB	Free	1401	1028	1508	0	1102	1351	1485	1.0371	0.6920
3	L101SB NB	None	0		0		1713	0		0.0000	
4	Raintree WB	None	1748		0		1873	2498		0.6995	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	16.24		16.24	10.88		C		C
2	Raintree EB	Free	30.00	0.00	17.31	36.94	0.00	D	A	C
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	5.99		5.99	7.71		A		A

Operational Data

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	691	28	2	27	2	28	2
2	Raintree EB	Free	240	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	27	2	80	160	170.0009139	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0008064	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	421	274	0	691	4.0	1.00	0.960
2	Raintree EB	0	0	493	0	240	4.0	1.00	0.930
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.970
4	Raintree WB	0	0	1423	0	0	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	695	691	1423	1423	0	1329	1353	0.5230	0.5105
2	Raintree EB	Free	493	240	695	0	2114	1942	1492	0.2538	0.1609
3	L101SB NB	None	0		0		514	0		0.0000	
4	Raintree WB	None	1423		0		914	2498		0.5696	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	8.59	5.43	7.01	5.29	3.44	A	A	A
2	Raintree EB	Free	2.34	0.00	1.57	0.94	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	3.04		3.04	3.89		A		A

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	724	720	1580	1580	0	1222	1242	0.5925	0.5869
2	Raintree EB	Free	530	258	723	0	2298	1922	1492	0.2758	0.1730
3	L101SB NB	None	0		0		504	0		0.0000	
4	Raintree WB	None	1581		0		968	2498		0.6328	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	9.71	6.23	7.98	5.29	3.44	A	A	A
2	Raintree EB	Free	2.36	0.00	1.58	0.94	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	3.25		3.25	3.89		A		A

Operational Data

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	691	28	2	27	2	28	2
2	Raintree EB	Free	240	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	27	2	80	160	170.0009 52	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0008 4	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	421	274	0	691	4.0	1.00	0.960
2	Raintree EB	0	0	493	0	240	4.0	1.00	0.930
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.970
4	Raintree WB	0	0	1423	0	0	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	695	691	1423	1423	0	1002	1009	0.6935	0.6846
2	Raintree EB	Free	493	240	694	0	2113	1751	1292	0.2815	0.1857
3	L101SB NB	None	0		0		514	0		0.0000	
4	Raintree WB	None	1423		0		913	2307		0.6168	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	17.14	11.61	14.38	11.68	8.57	C	B	B
2	Raintree EB	Free	2.69	0.00	1.81	1.09	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	3.67		3.67	4.77		A		A

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	724	720	1579	1579	0	901	904	0.8032	0.8187
2	Raintree EB	Free	530	258	716	0	2292	1736	1292	0.3054	0.1997
3	L101SB NB	None	0		0		504	0		0.0000	
4	Raintree WB	None	1581		0		963	2307		0.6853	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	21.24	15.19	18.23	11.68	8.57	C	C	C
2	Raintree EB	Free	2.71	0.00	1.82	1.09	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	3.98		3.98	4.77		A		A

Operational Data

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	385	28	2	27	2	28	2
2	Raintree EB	Free	894	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	27	2	80	160	170.0009 738	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0008 592	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	510	312	0	385	4.0	1.00	0.940
2	Raintree EB	0	0	1219	0	894	4.0	1.00	0.870
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.940
4	Raintree WB	0	0	994	0	0	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	822	385	994	994	0	1620	1657	0.5073	0.2323
2	Raintree EB	Free	1219	894	822	0	1379	1850	1492	0.6588	0.5994
3	L101SB NB	None	0		0		1206	0		0.0000	
4	Raintree WB	None	994		0		1728	2498		0.3978	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	6.66	2.81	5.43	4.73	0.91	A	A	A
2	Raintree EB	Free	5.23	0.00	3.02	6.86	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	2.22		2.22	1.90		A		A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	874	410	1104	1104	0	1546	1580	0.5658	0.2609
2	Raintree EB	Free	1401	1028	873	0	1513	1813	1492	0.7726	0.6889
3	L101SB NB	None	0		0		1155	0		0.0000	
4	Raintree WB	None	1104		0		1937	2498		0.4421	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	7.23	2.92	5.85	4.73	0.91	A	A	A
2	Raintree EB	Free	6.25	0.00	3.61	6.86	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	2.27		2.27	1.90		A		A

Operational Data

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	385	28	2	27	2	28	2
2	Raintree EB	Free	894	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	27	2	80	160	170.0009792	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.000864	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	510	312	0	385	4.0	1.00	0.940
2	Raintree EB	0	0	1219	0	894	4.0	1.00	0.870
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.940
4	Raintree WB	0	0	994	0	0	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr) Arrival Flow Entry	Arrival Flow Bypass	Opposing Flow Entry	Opposing Flow Bypass	Exit Flow	Capacity (veh/hr) Capacity Entry	Capacity Bypass	Average VCR Entry	Average VCR Bypass
1	L101SB SB	Yield	822	385	994	994	0	1429	1458	0.5752	0.2640
2	Raintree EB	Free	1219	894	822	0	1379	1630	1234	0.7478	0.7247
3	L101SB NB	None	0		0		1206	0		0.0000	
4	Raintree WB	None	994		0		1728	2307		0.4309	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec) Entry	Average Delay Bypass	Average Delay Leg	95% Queue (veh) Entry	95% Queue Bypass	Level of Service Entry	Level of Service Bypass	Level of Service Leg
1	L101SB SB	Yield	8.66	3.33	6.96	6.30	1.10	A	A	A
2	Raintree EB	Free	8.07	0.00	4.66	11.66	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	2.54		2.54	2.19		A		A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr) Arrival Flow Entry	Arrival Flow Bypass	Opposing Flow Entry	Opposing Flow Bypass	Exit Flow	Capacity (veh/hr) Capacity Entry	Capacity Bypass	Average VCR Entry	Average VCR Bypass
1	L101SB SB	Yield	874	410	1104	1104	0	1354	1381	0.6457	0.2989
2	Raintree EB	Free	1401	1028	872	0	1513	1594	1234	0.8789	0.8330
3	L101SB NB	None	0		0		1155	0		0.0000	
4	Raintree WB	None	1104		0		1931	2307		0.4787	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec) Entry	Average Delay Bypass	Average Delay Leg	95% Queue (veh) Entry	95% Queue Bypass	Level of Service Entry	Level of Service Bypass	Level of Service Leg
1	L101SB SB	Yield	9.64	3.50	7.69	6.30	1.10	A	A	A
2	Raintree EB	Free	10.53	0.00	6.07	11.66	0.00	B	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	2.61		2.61	2.19		A		A

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101NB SB	0	0	14.00	1	14.00	1	100.00	120.00	20.00
2	Raintree EB	90	0	28.00	2	28.00	2	102.00	125.00	27.00
3	L101NB NB	180	0	28.00	2	28.00	2	48.00	118.00	33.00
4	Raintree WB	270	0	26.00	2	28.00	2	106.00	135.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101NB SB	185.00	32.00	2	18.00	1	14.00	1
2	Raintree EB	185.00	16.00	1	39.00	2	28.00	2
3	L101NB NB	185.00	32.00	2	14.00	1	14.00	1
4	Raintree WB	185.00	32.00	2	32.00	2	28.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101NB SB	0	1.000	0	1.000	20.00	2091	0	14.00	2091	0
2	Raintree EB	0	1.000	0	1.000	20.00	4182	0	28.00	4182	0
3	L101NB NB	0	1.000	0	1.000	28.00	4182	0	14.00	2091	0
4	Raintree WB	0	1.000	0	1.000	26.00	3883	0	28.00	4182	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
3	L101NB NB	Merge	405	28	2	12	1	28	2
4	Raintree WB	Free	355	26	2	12	1	26	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
3	L101NB NB	12	1	0	100	135.0004579	30	4	Raintree WB	2	2
4	Raintree WB	12	1	0	150	142.0004817	30	1	L101NB SB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
3	L101NB NB	0	1.000	0	1.000
4	Raintree WB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101NB SB	0	0	0	0	0	4.0	1.00	0.960
2	Raintree EB	0	272	515	0	0	4.0	1.00	0.930
3	L101NB NB	0	1011	82	0	405	4.0	1.00	0.970
4	Raintree WB	0	0	1232	0	355	4.0	1.00	0.900

2040 AM Peak
50% Confidence Level
Daylight conditions
Project: Raintree-L101 NB
Scheme: 2040
Rodel-Win1 - Full Geometry
Alternative C

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		709	0		0.0000	
2	Raintree EB	None	787		0		2242	2470		0.3186	
3	L101NB NB	Merge	1093	405	787	515	0	1854	1157	0.5897	0.3500
4	Raintree WB	Free	1232	355	1365	0	920	1452	1326	0.8482	0.2678

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	3.06		3.06	1.93		A		A
3	L101NB NB	Merge	4.61	4.75	4.65	4.01	1.48	A	A	A
4	Raintree WB	Free	13.91	0.00	10.80	20.88	0.00	B	A	B

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		688	0		0.0000	
2	Raintree EB	None	846		0		2388	2470		0.3426	
3	L101NB NB	Merge	1127	418	846	554	0	1811	1145	0.6220	0.3686
4	Raintree WB	Free	1369	394	1418	0	971	1414	1326	0.9682	0.2975

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	3.07		3.07	1.93		A		A
3	L101NB NB	Merge	4.85	4.80	4.84	4.01	1.48	A	A	A
4	Raintree WB	Free	19.32	0.00	14.99	20.88	0.00	C	A	B

Global Results

Performance and Accidents

2040 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3112	760	3872
Capacity	veh/hr	5776	2483	8259
Average Delay	sec/veh	7.90	2.53	6.85
L.O.S. (Signal)	A – F	A	A	A
L.O.S. (Unsig)	A – F	A	A	A
Total Delay	veh.hrs	6.83	0.53	7.37

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101NB SB	0	0	14.00	1	14.00	1	100.00	120.00	20.00
2	Raintree EB	90	0	28.00	2	28.00	2	102.00	125.00	27.00
3	L101NB NB	180	0	28.00	2	28.00	2	48.00	118.00	33.00
4	Raintree WB	270	0	26.00	2	28.00	2	106.00	135.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101NB SB	185.00	32.00	2	18.00	1	14.00	1
2	Raintree EB	185.00	16.00	1	39.00	2	28.00	2
3	L101NB NB	185.00	32.00	2	14.00	1	14.00	1
4	Raintree WB	185.00	32.00	2	32.00	2	28.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101NB SB	0	1.000	0	1.000	20.00	2091	0	14.00	2091	0
2	Raintree EB	0	1.000	0	1.000	20.00	4182	0	28.00	4182	0
3	L101NB NB	0	1.000	0	1.000	28.00	4182	0	14.00	2091	0
4	Raintree WB	0	1.000	0	1.000	26.00	3883	0	28.00	4182	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
3	L101NB NB	Merge	405	28	2	12	1	28	2
4	Raintree WB	Free	355	26	2	12	1	26	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
3	L101NB NB	12	1	0	100	135.0004622	30	4	Raintree WB	2	2
4	Raintree WB	12	1	0	150	142.0004862	30	1	L101NB SB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
3	L101NB NB	0	1.000	0	1.000
4	Raintree WB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101NB SB	0	0	0	0	0	4.0	1.00	0.960
2	Raintree EB	0	272	515	0	0	4.0	1.00	0.930
3	L101NB NB	0	1011	82	0	405	4.0	1.00	0.970
4	Raintree WB	0	0	1232	0	355	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		709	0		0.0000	
2	Raintree EB	None	787		0		2195	2279		0.3454	
3	L101NB NB	Merge	1093	405	787	515	0	1662	958	0.6575	0.4227
4	Raintree WB	Free	1232	355	1365	0	920	1202	780	1.0249	0.4553

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	3.45		3.45	2.18		A		A
3	L101NB NB	Merge	6.04	6.44	6.15	5.31	2.02	A	A	A
4	Raintree WB	Free	80.16	0.00	62.23	102.86	0.00	F	A	F

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		688	0		0.0000	
2	Raintree EB	None	846		0		2205	2279		0.3714	
3	L101NB NB	Merge	1127	418	846	553	0	1620	946	0.6955	0.4478
4	Raintree WB	Free	1369	394	1418	0	971	1165	780	1.1754	0.5059

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	3.46		3.46	2.18		A		A
3	L101NB NB	Merge	6.45	6.55	6.48	5.31	2.02	A	A	A
4	Raintree WB	Free	84.44	0.00	65.55	102.86	0.00	F	A	F

Global Results

Performance and Accidents

2040 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3112	760	3872
Capacity	veh/hr	5143	1738	6881
Average Delay	sec/veh	34.73	3.43	28.59
L.O.S. (Signal)	A – F	C	A	C
L.O.S. (Unsig)	A – F	D	A	D
Total Delay	veh.hrs	30.02	0.73	30.75

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101NB SB	0	0	14.00	1	14.00	1	100.00	120.00	20.00
2	Raintree EB	90	0	28.00	2	28.00	2	102.00	125.00	27.00
3	L101NB NB	180	0	28.00	2	28.00	2	48.00	118.00	33.00
4	Raintree WB	270	0	26.00	2	28.00	2	106.00	135.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101NB SB	185.00	32.00	2	18.00	1	14.00	1
2	Raintree EB	185.00	16.00	1	39.00	2	28.00	2
3	L101NB NB	185.00	32.00	2	14.00	1	14.00	1
4	Raintree WB	185.00	32.00	2	32.00	2	28.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101NB SB	0	1.000	0	1.000	20.00	2091	0	14.00	2091	0
2	Raintree EB	0	1.000	0	1.000	20.00	4182	0	28.00	4182	0
3	L101NB NB	0	1.000	0	1.000	28.00	4182	0	14.00	2091	0
4	Raintree WB	0	1.000	0	1.000	26.00	3883	0	28.00	4182	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
3	L101NB NB	Merge	629	28	2	12	1	28	2
4	Raintree WB	Free	250	26	2	12	1	26	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
3	L101NB NB	12	1	0	100	135.0004 45	30	4	Raintree WB	2	2
4	Raintree WB	12	1	0	150	142.0004 68	30	1	L101NB SB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
3	L101NB NB	0	1.000	0	1.000
4	Raintree WB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101NB SB	0	0	0	0	0	4.0	1.00	0.940
2	Raintree EB	0	688	902	0	0	4.0	1.00	0.870
3	L101NB NB	0	507	43	0	629	4.0	1.00	0.940
4	Raintree WB	0	0	1066	0	250	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		981	0		0.0000	
2	Raintree EB	None	1590		0		1573	2470		0.6437	
3	L101NB NB	Merge	550	629	1590	902	0	1206	931	0.4560	0.6755
4	Raintree WB	Free	1066	250	1238	0	1530	1544	1326	0.6902	0.1886

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	6.50		6.50	9.96		A		A
3	L101NB NB	Merge	5.63	11.80	8.92	3.18	6.93	A	B	A
4	Raintree WB	Free	6.98	0.00	5.66	8.43	0.00	A	A	A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		937	0		0.0000	
2	Raintree EB	None	1828		0		1715	2470		0.7399	
3	L101NB NB	Merge	585	669	1821	1033	0	1045	891	0.5598	0.7713
4	Raintree WB	Free	1184	278	1371	0	1698	1448	1326	0.8180	0.2095

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	7.34		7.34	9.96		A		A
3	L101NB NB	Merge	6.80	13.61	10.43	3.18	6.93	A	B	B
4	Raintree WB	Free	8.96	0.00	7.26	8.43	0.00	A	A	A

2040 PM Peak
50% Confidence Level
Daylight conditions
Alternative C
Project: Raintree-L101 NB
Scheme: 2040
Rodel-Win1 - Full Geometry

Global Results

Performance and Accidents

2040 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3206	879	4085
Capacity	veh/hr	5221	2257	7478
Average Delay	sec/veh	6.51	8.44	6.93
L.O.S. (Signal)	A – F	A	A	A
L.O.S. (Unsig)	A – F	A	A	A
Total Delay	veh.hrs	5.80	2.06	7.86

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101NB SB	0	0	14.00	1	14.00	1	100.00	120.00	20.00
2	Raintree EB	90	0	28.00	2	28.00	2	102.00	125.00	27.00
3	L101NB NB	180	0	28.00	2	28.00	2	48.00	118.00	33.00
4	Raintree WB	270	0	26.00	2	28.00	2	106.00	135.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101NB SB	185.00	32.00	2	18.00	1	14.00	1
2	Raintree EB	185.00	16.00	1	39.00	2	28.00	2
3	L101NB NB	185.00	32.00	2	14.00	1	14.00	1
4	Raintree WB	185.00	32.00	2	32.00	2	28.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101NB SB	0	1.000	0	1.000	20.00	2091	0	14.00	2091	0
2	Raintree EB	0	1.000	0	1.000	20.00	4182	0	28.00	4182	0
3	L101NB NB	0	1.000	0	1.000	28.00	4182	0	14.00	2091	0
4	Raintree WB	0	1.000	0	1.000	26.00	3883	0	28.00	4182	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
3	L101NB NB	Merge	629	28	2	12	1	28	2
4	Raintree WB	Free	250	26	2	12	1	26	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
3	L101NB NB	12	1	0	100	135.0004406	30	4	Raintree WB	2	2
4	Raintree WB	12	1	0	150	142.0004635	30	1	L101NB SB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
3	L101NB NB	0	1.000	0	1.000
4	Raintree WB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101NB SB	0	0	0	0	0	4.0	1.00	0.940
2	Raintree EB	0	688	902	0	0	4.0	1.00	0.870
3	L101NB NB	0	507	43	0	629	4.0	1.00	0.940
4	Raintree WB	0	0	1066	0	250	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101NB SB	None	0		0		980	0		0.0000	
2	Raintree EB	None	1590		0		1571	2279		0.6978	
3	L101NB NB	Merge	550	629	1589	901	0	916	595	0.6007	1.0577
4	Raintree WB	Free	1066	250	1237	0	1484	1354	1127	0.7875	0.2219

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	8.23		8.23	12.96		A		A
3	L101NB NB	Merge	10.45	187.18	104.73	7.02	99.80	B	F	F
4	Raintree WB	Free	11.91	0.00	9.64	16.74	0.00	B	A	A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr) Arrival Flow Entry	Arrival Flow Bypass	Opposing Flow Entry	Opposing Flow Bypass	Exit Flow	Capacity (veh/hr) Capacity Entry	Capacity Bypass	Average VCR Entry	Average VCR Bypass
1	L101NB SB	None	0		0		937	0		0.0000	
2	Raintree EB	None	1828		0		1697	2279		0.8021	
3	L101NB NB	Merge	585	669	1817	1031	0	763	558	0.7672	1.5511
4	Raintree WB	Free	1184	278	1365	0	1586	1261	1127	0.9392	0.2465

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec) Entry	Average Delay Bypass	Average Delay Leg	95% Queue (veh) Entry	95% Queue Bypass	Level of Service Entry	Level of Service Bypass	Level of Service Leg
1	L101NB SB	None	0.00		0.00	0.00		A		A
2	Raintree EB	None	9.61		9.61	12.96		A		A
3	L101NB NB	Merge	14.39	202.24	114.61	7.02	89.64	B	F	F
4	Raintree WB	Free	17.15	0.00	13.89	16.74	0.00	C	A	B

2040 PM Peak
85% Confidence Level
Daylight conditions
Project: Raintree-L101 NB
Scheme: 2040
Rodel-Win1 - Full Geometry
Alternative C

Global Results

Performance and Accidents

2040 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3206	879	4085
Capacity	veh/hr	4548	1721	6269
Average Delay	sec/veh	9.83	133.94	36.54
L.O.S. (Signal)	A – F	A	F	D
L.O.S. (Unsig)	A – F	A	F	E
Total Delay	veh.hrs	8.75	32.70	41.46

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	691	28	2	27	2	28	2
2	Raintree EB	Free	240	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	27	2	80	160	170.0009 194	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0008 112	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	294	274	0	691	4.0	1.00	0.960
2	Raintree EB	0	0	493	0	240	4.0	1.00	0.930
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.970
4	Raintree WB	0	820	1423	0	0	4.0	1.00	0.900

2040 AM Peak
50% Confidence Level
Daylight conditions
Project: Raintree-L101 SB
Scheme: 2040
Rodel-Win1 - Full Geometry
Alternative C

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	568	691	2239	2239	0	526	558	1.0796	1.2386
2	Raintree EB	Free	493	240	1327	0	1973	1484	1492	0.3321	0.1609
3	L101SB NB	None	0		0		1304	0		0.0000	
4	Raintree WB	None	2243		0		756	2498		0.8978	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	212.58	442.79	338.93	118.39	276.61	F	F	F
2	Raintree EB	Free	3.37	0.00	2.27	1.33	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	16.56		16.56	41.67		C		C

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	592	720	2438	2438	0	406	430	1.4564	2.6352
2	Raintree EB	Free	530	258	1298	0	1977	1506	1492	0.3520	0.1730
3	L101SB NB	None	0		0		1300	0		0.0000	
4	Raintree WB	None	2492		0		740	2498		0.9975	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	211.26	523.96	382.88	111.48	207.21	F	F	F
2	Raintree EB	Free	3.36	0.00	2.26	1.33	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	22.38		22.38	41.67		C		C

2040 AM Peak
50% Confidence Level
Daylight conditions
Project: Raintree-L101 SB
Scheme: 2040
Rodel-Win1 - Full Geometry
Alternative C

Global Results

Performance and Accidents

2040 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3304	931	4235
Capacity	veh/hr	4509	2049	6558
Average Delay	sec/veh	48.29	328.65	109.92
L.O.S. (Signal)	A – F	D	F	F
L.O.S. (Unsig)	A – F	E	F	F
Total Delay	veh.hrs	44.32	84.99	129.31

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	691	28	2	27	2	28	2
2	Raintree EB	Free	240	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	27	2	80	160	170.0009248	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0008016	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	294	274	0	691	4.0	1.00	0.960
2	Raintree EB	0	0	493	0	240	4.0	1.00	0.930
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.970
4	Raintree WB	0	820	1423	0	0	4.0	1.00	0.900

2040 AM Peak
85% Confidence Level
Daylight conditions
Project: Raintree-L101 SB
Scheme: 2040
Rodel-Win1 - Full Geometry
Alternative C

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	568	691	2217	2217	0	348	373	1.6326	1.8531
2	Raintree EB	Free	493	240	1158	0	1779	1415	1292	0.3483	0.1857
3	L101SB NB	None	0		0		1218	0		0.0000	
4	Raintree WB	None	2243		0		673	2307		0.9722	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	691.24	1407.99	1084.63	425.30	656.17	F	F	F
2	Raintree EB	Free	3.64	0.00	2.45	1.43	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	34.08		34.08	93.76		D		D

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	592	720	2307	2307	0	294	315	2.0142	5.8677
2	Raintree EB	Free	530	258	1137	0	1779	1431	1292	0.3705	0.1997
3	L101SB NB	None	0		0		1211	0		0.0000	
4	Raintree WB	None	2492		0		682	2307		1.0803	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	634.53	1672.78	1204.37	273.16	423.32	F	F	F
2	Raintree EB	Free	3.63	0.00	2.44	1.43	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	45.26		45.26	93.76		E		E

2040 AM Peak
85% Confidence Level
Daylight conditions
Project: Raintree-L101 SB
Scheme: 2040
Rodel-Win1 - Full Geometry
Alternative C

Global Results

Performance and Accidents

2040 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3304	931	4235
Capacity	veh/hr	4070	1665	5735
Average Delay	sec/veh	142.51	1045.03	340.91
L.O.S. (Signal)	A – F	F	F	F
L.O.S. (Unsig)	A – F	F	F	F
Total Delay	veh.hrs	130.79	270.26	401.05

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	385	28	2	27	2	28	2
2	Raintree EB	Free	894	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	27	2	80	160	170.0009 411	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0008 304	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	371	312	0	385	4.0	1.00	0.940
2	Raintree EB	0	0	1219	0	894	4.0	1.00	0.870
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.940
4	Raintree WB	0	579	994	0	0	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	683	385	1572	1572	0	1227	1248	0.5566	0.3086
2	Raintree EB	Free	1219	894	1261	0	1379	1532	1492	0.7956	0.5994
3	L101SB NB	None	0		0		1784	0		0.0000	
4	Raintree WB	None	1573		0		1588	2498		0.6296	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	11.17	4.16	8.64	7.29	1.48	B	A	A
2	Raintree EB	Free	11.54	0.00	6.66	19.91	0.00	B	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	5.51		5.51	7.71		A		A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr) Arrival Flow Entry	Arrival Flow Bypass	Opposing Flow Entry	Opposing Flow Bypass	Exit Flow	Capacity (veh/hr) Capacity Entry	Capacity Bypass	Average VCR Entry	Average VCR Bypass
1	L101SB SB	Yield	727	410	1744	1744	0	1111	1126	0.6542	0.3672
2	Raintree EB	Free	1401	1028	1364	0	1511	1458	1492	0.9611	0.6889
3	L101SB NB	None	0		0		1712	0		0.0000	
4	Raintree WB	None	1748		0		1766	2498		0.6995	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec) Entry	Average Delay Bypass	Average Delay Leg	95% Queue (veh) Entry	95% Queue Bypass	Level of Service Entry	Level of Service Bypass	Level of Service Leg
1	L101SB SB	Yield	13.14	4.62	10.07	7.29	1.48	B	A	B
2	Raintree EB	Free	17.27	0.00	9.96	19.91	0.00	C	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	5.99		5.99	7.71		A		A

Global Results

Performance and Accidents

2040 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3475	1279	4754
Capacity	veh/hr	5258	2739	7997
Average Delay	sec/veh	8.74	1.25	6.72
L.O.S. (Signal)	A – F	A	A	A
L.O.S. (Unsig)	A – F	A	A	A
Total Delay	veh.hrs	8.44	0.45	8.88

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	385	28	2	27	2	28	2
2	Raintree EB	Free	894	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	27	2	80	160	170.0009466	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0008352	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	371	312	0	385	4.0	1.00	0.940
2	Raintree EB	0	0	1219	0	894	4.0	1.00	0.870
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.940
4	Raintree WB	0	579	994	0	0	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	683	385	1572	1572	0	913	817	0.7478	0.4714
2	Raintree EB	Free	1219	894	1260	0	1378	1254	1095	0.9718	0.8164
3	L101SB NB	None	0		0		1784	0		0.0000	
4	Raintree WB	None	1573		0		1569	2307		0.6818	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	25.64	8.48	19.45	19.67	3.42	D	A	C
2	Raintree EB	Free	56.74	0.00	32.73	96.77	0.00	F	A	D
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	6.85		6.85	9.73		A		A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	727	410	1742	1742	0	803	707	0.9044	0.5913
2	Raintree EB	Free	1401	1028	1346	0	1508	1194	1095	1.1739	0.9384
3	L101SB NB	None	0		0		1713	0		0.0000	
4	Raintree WB	None	1748		0		1577	2307		0.7576	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	34.52	10.40	25.82	19.67	3.42	D	B	D
2	Raintree EB	Free	71.62	0.00	41.32	96.77	0.00	F	A	E
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	7.61		7.61	9.73		A		A

Global Results

Performance and Accidents

2040 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3475	1279	4754
Capacity	veh/hr	4475	1912	6387
Average Delay	sec/veh	28.05	2.55	21.19
L.O.S. (Signal)	A – F	C	A	C
L.O.S. (Unsig)	A – F	D	A	C
Total Delay	veh.hrs	27.07	0.91	27.98

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

2040 AM Peak
50% Confidence Level
Daylight conditions
Project: Raintree-L101 SB
Scheme: 2040
Rodel-Win1 - Full Geometry
Alternative C

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	294	274	0	0	4.0	1.00	0.960
2	Raintree EB	0	0	493	0	240	4.0	1.00	0.930
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.970
4	Raintree WB	0	820	1423	0	0	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	568		2239		0	774		0.7336	
2	Raintree EB	Free	493	240	1384	0	1420	1443	1492	0.3416	0.1609
3	L101SB NB	None	0		0		1331	0		0.0000	
4	Raintree WB	None	2243		0		786	2498		0.8978	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	31.60		31.60	22.02		D		D
2	Raintree EB	Free	3.54	0.00	2.38	1.50	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	16.56		16.56	41.67		C		C

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	592		2438		0	639		0.9266	
2	Raintree EB	Free	530	258	1452	0	1547	1394	1492	0.3803	0.1730
3	L101SB NB	None	0		0		1298	0		0.0000	
4	Raintree WB	None	2492		0		820	2498		0.9975	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	43.61		43.61	22.02		E		E
2	Raintree EB	Free	3.67	0.00	2.47	1.50	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	22.38		22.38	41.67		C		C

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	294	274	0	0	4.0	1.00	0.960
2	Raintree EB	0	0	493	0	240	4.0	1.00	0.930
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.970
4	Raintree WB	0	820	1423	0	0	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	568		2217		0	598		0.9501	
2	Raintree EB	Free	493	240	1364	0	1406	1267	1292	0.3892	0.1857
3	L101SB NB	None	0		0		1317	0		0.0000	
4	Raintree WB	None	2243		0		779	2307		0.9722	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	96.72		96.72	51.78		F		F
2	Raintree EB	Free	4.28	0.00	2.88	1.76	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	34.08		34.08	93.76		D		D

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	592		2307		0	536		1.1028	
2	Raintree EB	Free	530	258	1373	0	1464	1260	1292	0.4207	0.1997
3	L101SB NB	None	0		0		1324	0		0.0000	
4	Raintree WB	None	2492		0		804	2307		1.0803	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	98.35		98.35	46.46		F		F
2	Raintree EB	Free	4.36	0.00	2.93	1.76	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	45.26		45.26	93.76		E		E

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	371	312	0	0	4.0	1.00	0.940
2	Raintree EB	0	0	1219	0	894	4.0	1.00	0.870
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.940
4	Raintree WB	0	579	994	0	0	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	683		1572		0	1227		0.5566	
2	Raintree EB	Free	1219	894	1261	0	994	1532	1492	0.7956	0.5994
3	L101SB NB	None	0		0		1784	0		0.0000	
4	Raintree WB	None	1573		0		1588	2498		0.6296	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	11.17		11.17	7.29		B		B
2	Raintree EB	Free	11.54	0.00	6.66	19.91	0.00	B	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	5.51		5.51	7.71		A		A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	727		1744		0	1111		0.6542	
2	Raintree EB	Free	1401	1028	1364	0	1102	1458	1492	0.9611	0.6889
3	L101SB NB	None	0		0		1712	0		0.0000	
4	Raintree WB	None	1748		0		1766	2498		0.6995	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	13.14		13.14	7.29		B		B
2	Raintree EB	Free	17.27	0.00	9.96	19.91	0.00	C	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	5.99		5.99	7.71		A		A

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	L101SB SB	0	0	28.00	2	28.00	2	55.00	125.00	48.00
2	Raintree EB	90	0	28.00	2	28.00	2	100.00	125.00	30.00
3	L101SB NB	180	0	14.00	1	14.00	1	0.00	100.00	20.00
4	Raintree WB	270	0	28.00	2	28.00	2	0.00	155.00	25.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	L101SB SB	185.00	32.00	2	18.00	1	18.00	1
2	Raintree EB	185.00	32.00	2	32.00	2	32.00	2
3	L101SB NB	185.00	32.00	2	18.00	1	18.00	1
4	Raintree WB	185.00	16.00	1	32.00	2	32.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	L101SB SB	0	1.000	0	1.000	28.00	4182	0	18.00	2688	0
2	Raintree EB	0	1.000	0	1.000	28.00	4182	0	32.00	4779	0
3	L101SB NB	0	1.000	0	1.000	20.00	2091	0	18.00	2688	0
4	Raintree WB	0	1.000	0	1.000	20.00	4182	0	32.00	4779	0

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	371	312	0	0	4.0	1.00	0.940
2	Raintree EB	0	0	1219	0	894	4.0	1.00	0.870
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.940
4	Raintree WB	0	579	994	0	0	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	683		1572		0	1036		0.6593	
2	Raintree EB	Free	1219	894	1261	0	993	1254	1095	0.9722	0.8164
3	L101SB NB	None	0		0		1784	0		0.0000	
4	Raintree WB	None	1573		0		1569	2307		0.6818	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	17.07		17.07	12.09		C		C
2	Raintree EB	Free	57.82	0.00	33.36	100.30	0.00	F	A	D
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	6.85		6.85	9.73		A		A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	None	727		1742		0	920		0.7894	
2	Raintree EB	Free	1401	1028	1358	0	1101	1186	1095	1.1817	0.9384
3	L101SB NB	None	0		0		1713	0		0.0000	
4	Raintree WB	None	1748		0		1575	2307		0.7576	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	None	21.56		21.56	12.09		C		C
2	Raintree EB	Free	74.27	0.00	42.85	100.30	0.00	F	A	E
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	7.61		7.61	9.73		A		A

Operational Data

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	691	28	2	27	2	28	2
2	Raintree EB	Free	240	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	27	2	80	160	170.0009 846	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0008 688	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	294	274	0	691	4.0	1.00	0.960
2	Raintree EB	0	0	493	0	240	4.0	1.00	0.930
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.970
4	Raintree WB	0	0	1423	0	0	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	568	691	1423	1423	0	1329	1353	0.4274	0.5105
2	Raintree EB	Free	493	240	568	0	2114	2034	1492	0.2424	0.1609
3	L101SB NB	None	0		0		514	0		0.0000	
4	Raintree WB	None	1423		0		787	2498		0.5696	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	8.47	5.43	6.80	4.16	3.44	A	A	A
2	Raintree EB	Free	2.20	0.00	1.48	0.88	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	3.04		3.04	3.89		A		A

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	592	720	1580	1580	0	1222	1242	0.4842	0.5869
2	Raintree EB	Free	530	258	591	0	2298	2017	1492	0.2628	0.1730
3	L101SB NB	None	0		0		504	0		0.0000	
4	Raintree WB	None	1581		0		836	2498		0.6328	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	9.34	6.23	7.63	4.16	3.44	A	A	A
2	Raintree EB	Free	2.21	0.00	1.49	0.88	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	3.25		3.25	3.89		A		A

Operational Data

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	691	28	2	27	2	28	2
2	Raintree EB	Free	240	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	27	2	80	160	170.0009 901	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0008 736	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	294	274	0	691	4.0	1.00	0.960
2	Raintree EB	0	0	493	0	240	4.0	1.00	0.930
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.970
4	Raintree WB	0	0	1423	0	0	4.0	1.00	0.900

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	568	691	1423	1423	0	988	1024	0.5747	0.6750
2	Raintree EB	Free	493	240	568	0	2113	1843	1292	0.2675	0.1857
3	L101SB NB	None	0		0		514	0		0.0000	
4	Raintree WB	None	1423		0		787	2307		0.6168	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	15.03	11.08	12.86	7.87	8.09	C	B	B
2	Raintree EB	Free	2.51	0.00	1.69	1.01	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	3.67		3.67	4.77		A		A

2040 AM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	592	720	1579	1579	0	888	918	0.6661	0.8051
2	Raintree EB	Free	530	258	587	0	2292	1829	1292	0.2899	0.1997
3	L101SB NB	None	0		0		504	0		0.0000	
4	Raintree WB	None	1581		0		834	2307		0.6853	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	17.60	14.35	15.82	7.87	8.09	C	B	C
2	Raintree EB	Free	2.52	0.00	1.70	1.01	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	3.98		3.98	4.77		A		A

Operational Data

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	385	28	2	27	2	28	2
2	Raintree EB	Free	894	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	27	2	80	160	170.0010227	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0009024	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	371	312	0	385	4.0	1.00	0.940
2	Raintree EB	0	0	1219	0	894	4.0	1.00	0.870
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.940
4	Raintree WB	0	0	994	0	0	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr) Arrival Flow Entry	Arrival Flow Bypass	Opposing Flow Entry	Opposing Flow Bypass	Exit Flow	Capacity (veh/hr) Capacity Entry	Capacity Bypass	Average VCR Entry	Average VCR Bypass
1	L101SB SB	Yield	683	385	994	994	0	1620	1657	0.4215	0.2323
2	Raintree EB	Free	1219	894	683	0	1379	1951	1492	0.6249	0.5994
3	L101SB NB	None	0		0		1206	0		0.0000	
4	Raintree WB	None	994		0		1590	2498		0.3978	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec) Entry	Average Delay Bypass	Average Delay Leg	95% Queue (veh) Entry	95% Queue Bypass	Level of Service Entry	Level of Service Bypass	Level of Service Leg
1	L101SB SB	Yield	6.54	2.81	5.19	3.78	0.91	A	A	A
2	Raintree EB	Free	4.51	0.00	2.60	5.70	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	2.22		2.22	1.90		A		A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr) Arrival Flow Entry	Arrival Flow Bypass	Opposing Flow Entry	Opposing Flow Bypass	Exit Flow	Capacity (veh/hr) Capacity Entry	Capacity Bypass	Average VCR Entry	Average VCR Bypass
1	L101SB SB	Yield	727	410	1104	1104	0	1545	1579	0.4702	0.2609
2	Raintree EB	Free	1401	1028	726	0	1513	1920	1492	0.7299	0.6889
3	L101SB NB	None	0		0		1155	0		0.0000	
4	Raintree WB	None	1104		0		1793	2498		0.4421	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec) Entry	Average Delay Bypass	Average Delay Leg	95% Queue (veh) Entry	95% Queue Bypass	Level of Service Entry	Level of Service Bypass	Level of Service Leg
1	L101SB SB	Yield	6.96	2.93	5.50	3.78	0.91	A	A	A
2	Raintree EB	Free	5.22	0.00	3.01	5.70	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	2.27		2.27	1.90		A		A

Operational Data

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	L101SB SB	Yield	385	28	2	27	2	28	2
2	Raintree EB	Free	894	28	2	13.5	1	28	2

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	L101SB SB	27	2	80	160	170.0010 173	43	2	Raintree EB	2	2
2	Raintree EB	13.5	1	0	100	150.0008 976	30	3	L101SB NB	1	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	L101SB SB	0	1.000	0	1.000
2	Raintree EB	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	L101SB SB	0	371	312	0	385	4.0	1.00	0.940
2	Raintree EB	0	0	1219	0	894	4.0	1.00	0.870
3	L101SB NB	0	0	0	0	0	4.0	1.00	0.940
4	Raintree WB	0	0	994	0	0	4.0	1.00	0.900

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	683	385	994	994	0	1429	1458	0.4780	0.2640
2	Raintree EB	Free	1219	894	683	0	1379	1730	1234	0.7047	0.7247
3	L101SB NB	None	0		0		1206	0		0.0000	
4	Raintree WB	None	994		0		1589	2307		0.4309	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	8.15	3.33	6.41	4.80	1.10	A	A	A
2	Raintree EB	Free	6.44	0.00	3.72	8.74	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	2.54		2.54	2.19		A		A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	L101SB SB	Yield	727	410	1104	1104	0	1354	1381	0.5365	0.2989
2	Raintree EB	Free	1401	1028	725	0	1513	1700	1234	0.8244	0.8330
3	L101SB NB	None	0		0		1155	0		0.0000	
4	Raintree WB	None	1104		0		1788	2307		0.4787	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	L101SB SB	Yield	8.83	3.50	6.91	4.80	1.10	A	A	A
2	Raintree EB	Free	7.96	0.00	4.59	8.74	0.00	A	A	A
3	L101SB NB	None	0.00		0.00	0.00		A		A
4	Raintree WB	None	2.61		2.61	2.19		A		A

APPENDIX F: Draft Americans with Disabilities Act Compliance and Feasibility Report

PROJECT 101 MA 036 F0123 01D
101-B(210)T
PIMA FREEWAY
PIMA FREEWAY (SR 101L): PRINCESS DRIVE TO SHEA BOULEVARD
GENERAL PURPOSE LANES
DCR UPDATE

ADA COMPLIANCE AND FEASIBILITY REPORT

AUGUST 04, 2020

PREPARED BY

Kimley»Horn

PREPARED FOR

ADOT
Infrastructure Delivery and Operations

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INTRODUCTION

Project No. F0123 01D Pima Freeway (SR 101L): Princess Drive to Shea Blvd, is a Design Concept Report which is described as the development, evaluation and recommendation to provide additional general-purpose lanes on the Pima Freeway (SR 101L). It is located on SR 101L in Maricopa County, in the ADOT Central District. The proposed project limits begin at milepost (MP) 36.5, and end at MP 41.2.

The ADOT Feature Inventory System (FIS) indicates that there are 296 ADA features within the project limits. Of those features, 200 are not in compliance with current ADA standards. A summary of the non-compliant locations and locations which need to be evaluated for compliance is included in this listing. The table below provides a summary of all the ADA features listed within the *ADA Transition Plan for Public Rights of Way*.

Table 1: FIS List of Total ADA Features

Feature Type	Compliant	Non-Compliant	Total in FIS	Not in FIS	No Longer Existent	Existing ADA Total	Total Proposed Improvements
Sidewalk	31	6	37	0	0	37	6
Curb Ramps (& Curb Ramp Needs)	2	48	50	0	0	50	48
Driveways	0	2	2	0	0	2	2
Accessible Pedestrian Signals (APS)	0	72	50	22	0	72	72
Railing	23	4	24	3	0	27	1
Pedestrian Island Crossings	0	35	28	7	0	35	35
Pedestrian Overpass/Underpass	1	0	1	0	0	1	0
Obstructions & ADA Features Needed	5	33	17	21	0	38	33
Crosswalks*	34	0	0	34	0	34	0
Total	**96**	**200**	**209**	**85**	**0**	**296**	**197**

*Crosswalks are not recorded as assets in FIS.

In conjunction with any work done on existing ADA features, work zone traffic control plans should follow ADA requirements, where applicable.

Table 2: Summary All Proposed Action Items

Proposed Action Item- Sidewalk	
Reconstruct Sidewalk to Repair Cross Slope, Update FIS	6
Compliant (No Action)	31
Proposed Action Item- Curb Ramps	
Reconstruct Curb Ramp with this Project, Update FIS	44
Add Truncated Domes, Update FIS	4
Compliant (No Action)	2
Proposed Action Item- Driveways	
Driveway will be reconstructed with this Project, Update FIS	2
Proposed Action Item- Accessible Pedestrian Signals	
Reconstructing Curb Ramp with this Project to Provide Push Button Access	24
Pedestrian Activated Signal Removed Prior to this Project, Update FIS Status to Removed	1
Constructing New PB-Pole, Update FIS	47
Proposed Action Item- Railing	
Evaluate as Safety Rail	21
Duplicate FIS Entry OR Feature No Longer Exists, Update FIS (No Action)	3
Replace Railing	1
To Remain (No Action)	2
Proposed Action Item- Pedestrian Island Crossings	
Add Truncated Domes, Update FIS	21
Pedestrian Island Cross will be reconstructed with this project, Update FIS	14
Proposed Action Item- Pedestrian Overpass/Underpass	
To Remain, No Action	1
Proposed Action Item- Obstructions & ADA Features Needed	
Repair Cracked/Uneven Concrete	12
Adjust Utility Box to be Flush with Sidewalk & Repair Sidewalk	5

Reconstruct Curb Ramp, Update FIS	16
To Remain (No Action)	5
Proposed Action Item- Crosswalks	
To Remain, Add to FIS	34
Subtotal Proposed Improvements	**197**
Subtotal (No Action)	**99**
Total	**296**

1. SIDEWALK

A total of 37 **sidewalk** locations with an overall length of 4,973 feet of sidewalk are located throughout the project limits. ADOT FIS listed 37 locations, and all were included in ADOT FIS. There are 6 locations with non-compliant sidewalks totaling 782 feet. The remaining 31 locations include 4,191 feet of ADA compliant sidewalk. The following table summarizes the proposed action items for sidewalk.

Table 3: Summary of Proposed Sidewalk Action Items

Proposed Action Item- Sidewalk	Princess Drive	Bell Road	FLW Blvd	Raintree Drive	Thunderbird Road	Pedestrian Bridge	Cactus Road	Shea Blvd	Total
Reconstruct Sidewalk to Repair Cross Slope	2	2	0	0	2	0	0	0	6
Total	**2**	**2**	**0**	**0**	**2**	**0**	**0**	**0**	**6**

The following tables summarize **sidewalk** locations throughout the project limits. The first table lists ADA non-compliant sidewalk.

Table 4: ADA Non-Compliant Sidewalk

Asset ID	Location	Beginning MP	Approx. Length (Ft)	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
Princess Drive							
1025220	NW Princess Drive	36.57 (Rt)	144’	-Cross Slope > 2.0% -Exst = ~2.4%	Reconstruct Sidewalk to Repair Cross Slope		

Asset ID	Location	Beginning MP	Approx. Length (Ft)	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
1025208	SW Princess Drive	36.60 (Rt)	146’	-Cross Slope > 2.0% -Exst = ~3.1%	Reconstruct Sidewalk to Repair Cross Slope		
Bell Road							
1025232	NW Bell Road	37.06 (Rt)	111’	-Cross Slope > 2.0% -Exst = ~2.8%	Reconstruct Sidewalk to Repair Cross Slope		
1025224	South Bell Road	37.09 (Rt)	341’	-Cross Slope > 2.0% -Exst = ~2.3%	Reconstruct Sidewalk to Repair Cross Slope		
Thunderbird Road							
1025310	North Thunderbird Road	39.05 (Rt)	20’	-Cross Slope > 2.0% -Exst = ~2.5%	Reconstruct Sidewalk to Repair Cross Slope		
1025303	South Thunderbird Road	39.06 (Rt)	20’	-Cross Slope > 2.0% -Exst = ~2.5%	Reconstruct Sidewalk to Repair Cross Slope		
		Total:	782’				

The table below contains a listing of all ADA compliant **sidewalk**.

Table 5: ADA Compliant Sidewalk

Asset ID	Location	Direction	Beginning MP	Approx. Length (Ft)
Princess Drive				
1025217	North Princess Drive	East/West	36.57 (Rt)	386’
1025215	NE Princess Drive	East/West	36.57 (Rt)	30’
1025212	SE Princess Drive	East/West	36.59 (Rt)	35’
1025210	South Princess Drive	East/West	36.59 (Rt)	120’
1026220	SW Princess Drive	East/West	36.63 (Rt)	146’
1026222	SW Princess Drive	East/West	36.72 (Rt)	30’

Asset ID	Location	Direction	Beginning MP	Approx. Length (Ft)
Bell Road				
1025230	North Bell Road	East/West	37.08 (Rt)	353’
1025228	NE Bell Road	East/West	37.08 (Rt)	144’
1025226	SE Bell Road	East/West	37.11 (Rt)	126’
1025222	SW Bell Road	East/West	37.09 (Rt)	168’
Frank Lloyd Wright Boulevard				
1025238	NW Frank Lloyd Wright Blvd	East/West	37.38 (Rt)	144’
1390793	North Frank Lloyd Wright Blvd	East/West	37.79 (Rt)	143’
1025236	NE Frank Lloyd Wright Blvd	East/West	37.78 (Rt)	120’
1025240	SE Frank Lloyd Wright Blvd	East/West	37.81 (Rt)	152’
1390778	South Frank Lloyd Wright Blvd	East/West	37.81 (Rt)	142’
1025234	SW Frank Lloyd Wright Blvd	East/West	37.81 (Rt)	163’
Raintree Drive				
1025242	NW Raintree Drive	East/West	38.58 (Rt)	177’
1025312	NE Raintree Drive	East/West	38.58 (Rt)	129’
1025314	SE Raintree Drive	East/West	38.60 (Rt)	158’
1025244	SW Raintree Drive	East/West	38.61 (Rt)	154’
Thunderbird Road				
1025307	NE Thunderbird Road	East/West	39.05 (Rt)	107’
1025305	SE Thunderbird Road	East/West	39.06 (Rt)	110’
Cactus Road				
1025273	NW Cactus Road	East/West	40.08 (Rt)	128’
1025271	NE Cactus Road	East/West	40.08 (Rt)	53’
1025277	SE Cactus Road	East/West	40.10 (Rt)	124’
1025275	SW Cactus Road	East/West	40.10 (Rt)	151’
Shea Boulevard				
1025285	NW Shea Road	East/West	41.05 (Rt)	103’
1025283	NE Shea Road	East/West	41.05 (Rt)	110’
1025281	SE Shea Road	East/West	41.08 (Rt)	90’
1394667	SW Shea Road	North/South	41.08 (Rt)	77’
1025279	SW Shea Road	East/West	41.08 (Rt)	118’
			Total:	4,191’

2. CURB RAMPS

There are a total of 50 **curb ramp** locations throughout the project limits. ADOT FIS listed 50 locations, and no new locations were identified. Two of the curb ramps meet current ADA standards. The remaining 48 locations do not comply with ADA standards. The following table summarizes the recommended action for each feature to become compliant. Detailed survey will be necessary at all locations where a new curb ramp will be required.

Table 6: Summary of Proposed Curb Ramp Action Items

Proposed Action Item- Curb Ramps	Princess Drive	Bell Road	FLW Blvd	Raintree Drive	Thunderbird Road	Pedestrian Bridge	Cactus Road	Shea Blvd	Total
Reconstruct Curb Ramp	8	8	7	8	3	0	7	3	44
Add Truncated Domes	0	0	1	0	1	0	1	1	4
Add Truncated Domes & Stripe/Re-Stripe Crosswalk	0	0	0	0	0	0	0	0	0
Reconstruct Gutter	0	0	0	0	0	0	0	0	0
Compliant (No Action)	2	0	0	0	0	0	0	0	2
Total	**10**	**8**	**8**	**8**	**4**	**0**	**8**	**4**	**50**

The following table gives a detailed summary of the non-compliant **curb ramp** locations:

Table 7: ADA Non-Compliant Curb Ramps

Asset ID	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
Princess Drive						
1390753	NW Princess Dr-West of SB off ramp	36.57 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		

Asset ID	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
1390751	NW Princess Dr-East of SB off ramp	36.57 (Rt)	-No Detectable Warning -Cross Slope is > 2%	Reconstruct curb ramp		
1390749	NE Princess Dr-West of NB on ramp	36.57 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
1390748	NE Princess Dr-East of NB on ramp.	36.57 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
1390745	SE Princess Dr-East of NB off ramp.	36.60 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
1390744	SE Princess Dr-West of NB off ramp	36.60 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
1390738	SW Princess Dr-East of SB on ramp	36.60 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
1390736	SW Princess Dr-West of SB on ramp	36.60 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
Bell Road						
1390768	NW Bell Rd-West of SB off ramp	37.06 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
1390767	NW Bell Rd-East of SB off ramp	37.07 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
1390764	NE Bell Rd-West of NB on ramp	37.08 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
1390763	NE Bell Rd-East of NB on ramp	37.08 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
1390760	SE Bell Rd-East of NB off ramp	37.10 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
1390758	SE Bell Rd-West of NB off ramp	37.10 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
1390757	SW Bell Rd-East of SB on ramp	37.08 (Rt)	-No Detectable Warning -Cross Slope is > 2%	Reconstruct curb ramp		
1390756	SW Bell Rd-West of SB on ramp	37.08 (Rt)	-No Detectable Warning -No Turning Space -Gutter Slope is > 5%	Reconstruct curb ramp		

Asset ID	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
Frank Lloyd Wright Boulevard						
1390798	NW FLW-West of SB off ramp	37.78 (Rt)	-No Detectable Warning	Install detectable warning surface		
1390794	NW FLW-East of SB on ramp	37.78 (Rt)	-No Detectable Warning -Gutter Slope is > 5%	Reconstruct curb ramp		
1390792	NE FLW-West of NB on ramp	37.78 (Rt)	-No Detectable Warning	Install detectable warning surface		
1390785	NE FLW-East of NB on ramp	37.78 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
1390783	SE FLW-East of NB off ramp	37.81 (Rt)	-No Turning Space	Reconstruct curb ramp		
1390779	SE FLW-West of NB off ramp	37.81 (Rt)	-Gutter Slope is > 5%	Reconstruct curb ramp		
1390777	SW FLW-East of SB on ramp	37.81 (Rt)	-Gutter Slope is > 5%	Reconstruct curb ramp		
1390772	SW FLW-West of SB on ramp	37.81 (Rt)	-Gutter Slope is > 5%	Reconstruct curb ramp		
Raintree Drive						
1390831	NW Raintree-West of SB off ramp	38.58 (Rt)	-No Detectable Warning -Turning Space Running Slope is > 2%	Reconstruct curb ramp		
1390827	NW Raintree-East of SB off ramp	38.58 (Rt)	-No Detectable Warning -No Turning Space -Cross Slope > 2%	Reconstruct curb ramp		
1390825	NE Raintree-West of NB on ramp	38.58 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
1390819	NE Raintree-East of NB on ramp	38.58 (Rt)	-No Detectable Warning -Gutter Slope > 5%	Reconstruct curb ramp		

Asset ID	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
1390816	SE Raintree-East of NB off ramp	38.60 (Rt)	-No Detectable Warning -Turning Space Running Slope > 2% -Gutter Slope > 5%	Reconstruct curb ramp		
1390810	SE Raintree-West of NB off ramp	38.61 (Rt)	-No Detectable Warning -No Turning Space -Cross Slope > 2%	Reconstruct curb ramp		
1390809	SW Raintree-East of SB on ramp	38.61 (Rt)	-No Detectable Warning -No Turning Space -Cross Slope >2%	Reconstruct curb ramp		
1390802	SW Raintree-West of SB on ramp	38.61 (Rt)	-No Detectable Warning -Gutter Slope > 5%	Reconstruct curb ramp		
Thunderbird Road						
1390836	NW Thunderbird-West of SB frontage	39.04 (Rt)	-No Detectable Warning -No Turning Space -Gutter Slope > 5%	Reconstruct curb ramp		
1390835	NW Thunderbird-East of SB frontage rd	39.05 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
1390834	NE Thunderbird-East of bridge	39.05 (Rt)	-No Detectable Warning -Gutter Slope > 5%	Reconstruct curb ramp		
1390832	SE Thunderbird-East of Bridge	39.06 (Rt)	-No Detectable Warning	Install detectable warning surface		
Cactus Road						
1394664	NW Cactus Rd-West of SB off ramp	40.08 (Rt)	-No Detectable Warning	Install detectable warning surface		
1394661	NW Cactus Rd-East of SB off ramp	40.08 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
1394658	NE Cactus Rd-West of NB on ramp	40.08 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
1394655	NE Cactus Rd-East of NB on ramp	40.08 (Rt)	-No Detectable Warning -No 4’x4’ Turning Space	Reconstruct curb ramp		

Asset ID	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
1394652	SE Cactus Rd-East of NB off ramp	40.11 (Rt)	-No Detectable Warning -No 4'x4' Turning Space	Reconstruct curb ramp		
1394648	SE Cactus Rd-West of NB off ramp	40.10 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
1394646	SW Cactus Rd-West of SB on ramp	40.10 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
1394642	SW Cactus Rd-West of SB on ramp	40.10 (Rt)	-No Detectable Warning -Gutter Slope > 5%	Reconstruct curb ramp		
Shea Boulevard						
1394685	NW Shea Blvd-West of SB off ramp	41.05 (Rt)	-No Detectable Warning	Install detectable warning surface		
1394678	NE Shea Blvd-East of NB on ramp	41.05 (Rt)	-No Detectable Warning -Obstructions in the ramp path.	Reconstruct curb ramp		
1394675	SE Shea Blvd-East on NB off ramp	41.08 (Rt)	-No Detectable Warning -No Turning Space	Reconstruct curb ramp		
1394666	SW Shea Blvd-West of SB on ramp	41.08 (Rt)	-No Detectable Warning -No Turning Space -Cross Slope > 2%	Reconstruct curb ramp		

The following are locations with **curb ramps** which are compliant with ADA Standards.

Table 8: ADA Compliant Curb Ramps

Asset ID	Location	Beginning MP
Princess Drive		
1396375	SW Princess Drive. SB on ramp.	36.71 (Rt)
1396376	SW Princess Drive. SB on ramp.	36.72 (Rt)

3. DRIVEWAYS

A total of 2 **driveway** locations are located within the project limits. ADOT FIS listed 2 locations, and 0 locations were not included in ADOT FIS. Of these locations, 2 driveway locations (2 Single, 0 Multiple) are not compliant with ADA standards. A table summarizing the proposed action items for these ADA features is listed below:

Table 9: Summary of Proposed Driveway Action Items

Proposed Action Item- Driveways	Princess Drive	Bell Road	FLW Blvd	Raintree Drive	Thunderbird Road	Pedestrian Bridge	Cactus Road	Shea Blvd	Total
Reconstruct Driveway	0	0	0	0	0	0	2	0	2
Total	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**2**

The following are detailed descriptions of the **driveway** locations which need to be addressed for compliance with ADA Standards:

Table 10: ADA Non-Compliant Driveways

Asset ID	Location	Beginning MP	Single or Multiple (#)	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
Cactus Road							
1394653	SE Cactus Road- East of NB off ramp	40.10 (Rt)	Single	-Cross Slope > 2%	Reconstruct Driveway		
1394654	NE Cactus Road- East of NB on ramp	40.08 (Rt)	Single	-Cross Slope > 2%	Reconstruct Driveway		

As mentioned above, there are no ADA compliant **driveways** within the project limits.

4. ACCESSIBLE PEDESTRIAN SIGNALS

There are a total of 72 locations with **accessible pedestrian signals** within the project limits. Of these locations, All 72 APS locations are not compliant with ADA standards. ADOT FIS did not include 22 locations. These locations have been evaluated for compliance. A table summarizing the proposed action items for these ADA features is listed below:

Table 11: Summary of Proposed APS Action Items

Proposed Action Item- Accessible Pedestrian Signals	Princess Drive	Bell Road	FLW Blvd	Raintree Drive	Thunderbird Road	Pedestrian Bridge	Cactus Road	Shea Blvd	Total
Reconstructing Curb Ramp with this Project to Provide Push Button Access	4	7	2	5	0	0	4	2	24
Pedestrian Activated signal Removed Prior to this Project, Update FIS Status to Removed	0	0	0	1	0	0	0	0	1
Constructing New PB-Pole, Update FIS	5	3	16	11	0	0	4	8	47
Total	**9**	**10**	**18**	**17**	**0**	**0**	**8**	**10**	**72**

The following are existing **APS** locations which do not comply with ADA standards:

Table 12: ADA Non-Compliant APS Locations

Asset ID	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
Princess Drive						
1390754	NW Princess Drive-West of SB off ramp	36.57 (Rt)	-Reach > 10”	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
XXPB01	NW Princess Drive-East of SB off ramp	36.57 (Rt)	-Located > 5’ from Crosswalk	Constructing New PB-Pole, Update FIS		
XXPB02	NE Princess Drive-West of NB on ramp	36.57 (Rt)	-Located > 5’ from Crosswalk	Constructing New PB-Pole, Update FIS		

Asset ID	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
XXPB03	NE Princess Drive- East of NB on ramp	36.57 (Rt)	-Reach > 10”	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
1390746	SE Princess Drive- East of NB off ramp	36.60 (Rt)	-Reach > 10”	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
1390743	SE Princess Drive- West of NB off ramp	36.60 (Rt)	-Reach > 10”	Constructing New PB-Pole, Update FIS		
1390741	SW Princess Drive- West of SB on ramp	36.60 (Rt)	-Reach > 10”	Constructing New PB-Pole, Update FIS		
1390737	SW Princess Drive- West of SB on ramp	36.60 (Rt)	-Reach > 10”	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
XXPB04	West Princess Drive- Pedestrian Island	36.60 (Med)	-Located > 5’ from Crosswalk	Constructing New PB-Pole, Update FIS		
			Bell Road			
1390769	NW Bell Road- West of SB off ramp	37.06 (Rt)	-Reach > 10”	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
XXPB05	NW Bell Road- East of SB off ramp	37.06 (Rt)	-Reach > 10”	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
1390765	NE Bell Road- West of NB on ramp	37.06 (Rt)	-Reach > 10”	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
XXPB06	NE Bell Road- East of NB on ramp	37.06 (Rt)	-Reach > 10”	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
XXPB07	East Bell Road	37.08 (Med)	-Reach > 10”	Constructing New PB-Pole, Update FIS		
1390761	SE Bell Road- East of NB off ramp	37.10 (Rt)	-Reach > 10”	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
1390759	SE Bell Road- West of NB off ramp	37.10 (Rt)	-Reach > 10”	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
XXPB08	SW Bell Road- East of SB on ramp	37.10 (Rt)	-Located > 5’ from Crosswalk	Constructing New PB-Pole, Update FIS		
XXPB09	SW Bell Road- West of SB on ramp	37.10 (Rt)	-Reach > 10”	Reconstructing Curb Ramp with this Project to Provide Push Button Access		

Asset ID	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
1390771	West Bell Road-Pedestrian Island	37.08 (Med)	-Reach > 10”	Constructing New PB-Pole, Update FIS		
Frank Lloyd Wright Boulevard						
XXPB10	NW FLW- West of SB off ramp	37.79 (Rt)	-Reach > 10”	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
1390797	NW FLW- West side of Pedestrian Island	37.79 (Rt)	-Reach > 10”	Constructing New PB-Pole, Update FIS		
1390796	NW FLW- East side of Pedestrian Island	37.79 (Rt)	-Reach > 10”	Constructing New PB-Pole, Update FIS		
XXPB11	NW FLW- East of SB off ramp	37.79 (Rt)	-Located > 5’ from Crosswalk	Constructing New PB-Pole, Update FIS		
XXPB12	NE FLW- West of NB on ramp	37.79 (Rt)	-Located > 5’ from Crosswalk	Constructing New PB-Pole, Update FIS		
1390791	NE FLW- West side of Pedestrian Island	37.79 (Rt)	-Reach > 10”	Constructing New PB-Pole, Update FIS		
1390790	NE FLW- East side of Pedestrian Island	37.79 (Rt)	-Reach > 10”	Constructing New PB-Pole, Update FIS		
1390787	NE FLW- West side of smaller Pedestrian Island	37.79 (Rt)	-Reach > 10”	Constructing New PB-Pole, Update FIS		
XXPB13	NE FLW- West side of smaller Pedestrian Island. Crossing to the South	37.79 (Rt)	-Reach > 10”	Constructing New PB-Pole, Update FIS		
XXPB14	SE FLW- East of NB off ramp	37.81 (Rt)	-Reach > 10”	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
1390782	SE FLW- East side of Pedestrian Island	37.81 (Rt)	-Reach > 10”	Constructing New PB-Pole, Update FIS		
1390781	SE FLW- West side of Pedestrian Island	37.81 (Rt)	-Reach > 10”	Constructing New PB-Pole, Update FIS		

Asset ID	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
XXPB15	SE FLW- West of NB off ramp	37.81 (Rt)	-Located > 5' from Crosswalk	Constructing New PB-Pole, Update FIS		
XXPB16	SW FLW- East of SB on ramp	37.81 (Rt)	-Reach > 10"	Constructing New PB-Pole, Update FIS		
1390776	SW FLW- East side of Pedestrian Island	37.81 (Rt)	-Reach > 10"	Constructing New PB-Pole, Update FIS		
1390744	SW FLW- West side of Pedestrian Island	37.81 (Rt)	-Reach > 10"	Constructing New PB-Pole, Update FIS		
XXPB17	SW FLW- West Pedestrian Island	37.81 (Rt)	-Reach > 10"	Constructing New PB-Pole, Update FIS		
XXPB18	SW FLW- West of SB on ramp	37.81 (Rt)	-Reach > 10"	Constructing New PB-Pole, Update FIS		
Raintree Drive						
XXPB19	NW Raintree- West of SB off ramp	38.59 (Rt)	-Reach > 10"	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
1390830	West Raintree- Pedestrian Island	38.59 (Med)	-No pushbutton	Pedestrian Activated signal Removed Prior to this Project, Update FIS Status to Removed		
XXPB20	NW Raintree- West side of Pedestrian Island	38.59 (Rt)	-Reach > 10"	Constructing New PB-Pole, Update FIS		
1390829	NW Raintree- East side of Pedestrian Island	38.59 (Rt)	-Reach > 10"	Constructing New PB-Pole, Update FIS		
XXPB21	NW Raintree- East of SB off ramp	38.59 (Rt)	-Located > 5' from Crosswalk	Constructing New PB-Pole, Update FIS		
1390824	NE Raintree- West side of Pedestrian Island	38.59 (Rt)	-Reach > 10"	Constructing New PB-Pole, Update FIS		
1390823	NE Raintree- East side of Pedestrian Island	38.59 (Rt)	-Reach > 10"	Constructing New PB-Pole, Update FIS		
1390826	NE Raintree- West of NB on ramp	38.59 (Rt)	-Reach > 10"	Reconstructing Curb Ramp with this Project to Provide Push Button Access		

Asset ID	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
1390821	NE Raintree- Pedestrian Island	38.59 (Rt)	-Reach > 10”	Constructing New PB-Pole, Update FIS		
XXPB22	SE Raintree- East of NB off ramp	38.60 (Rt)	-Reach > 10”	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
1390815	SE Raintree- East side of Pedestrian Island	38.60 (Rt)	-Reach > 10”	Constructing New PB-Pole, Update FIS		
1390814	SE Raintree- West side of Pedestrian Island	38.60 (Rt)	-Reach > 10”	Constructing New PB-Pole, Update FIS		
1390811	SE Raintree- West of NB off ramp	38.61 (Rt)	-Reach > 10”	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
1390812	SW Raintree- East of SB on ramp	38.61 (Rt)	-Reach > 10”	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
1390808	SW Raintree- East side of Pedestrian Island	38.60 (Rt)	-Reach > 10”	Constructing New PB-Pole, Update FIS		
1390807	SW Raintree- West side of Pedestrian Island	38.60 (Rt)	-Reach > 10”	Constructing New PB-Pole, Update FIS		
1390805	SW Raintree- Western Pedestrian Island	38.60 (Rt)	-Reach > 10”	Constructing New PB-Pole, Update FIS		
Cactus Road						
1394663	NW Cactus- East side of Pedestrian Island	40.08 (Rt)	-Reach > 10”	Constructing New PB-Pole, Update FIS		
1394660	NW Cactus- East of SB off ramp	40.08 (Rt)	-Reach > 10”	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
1394659	NE Cactus- West of NB on ramp	40.08 (Rt)	-Reach > 10”	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
1394657	NE Cactus- West side of Pedestrian Island	40.08 (Rt)	-Reach > 10”	Constructing New PB-Pole, Update FIS		
1394651	SE Cactus- West side of Pedestrian Island	40.10 (Rt)	-Reach > 10”	Constructing New PB-Pole, Update FIS		

Asset ID	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
1394649	SE Cactus- West of NB off ramp	40.10 (Rt)	-Reach > 10"	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
1394647	SW Cactus- East of SB on ramp	40.10 (Rt)	-Reach > 10"	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
1394644	SW Cactus- East side of Pedestrian Island	40.10 (Rt)	-Reach > 10"	Constructing New PB-Pole, Update FIS		
Shea Boulevard						
1394683	NW Shea- East side of Pedestrian Island	41.05 (Rt)	-Reach > 10"	Constructing New PB-Pole, Update FIS		
1394682	NW Shea- East of SB off ramp	41.05 (Rt)	-Reach > 10"	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
1394681	NE Shea- West of NB on ramp	41.06 (Rt)	-Reach > 10"	Constructing New PB-Pole, Update FIS		
1394680	NE Shea- West side of Pedestrian Island	41.06 (Rt)	-Reach > 10"	Constructing New PB-Pole, Update FIS		
1394676	SE Shea- East of NHB off ramp	41.08 (Rt)	-Reach > 10"	Reconstructing Curb Ramp with this Project to Provide Push Button Access		
1394674	SE Shea- East side of Pedestrian Island	41.08 (Rt)	-Reach > 10"	Constructing New PB-Pole, Update FIS		
1394673	SE Shea- West side of Pedestrian Island	41.08 (Rt)	-Reach > 10"	Constructing New PB-Pole, Update FIS		
1394671	SE Shea- West of NB off ramp	41.07 (Rt)	-Reach > 10"	Constructing New PB-Pole, Update FIS		
1394670	SW Shea- East of SB on ramp	41.08 (Rt)	-Reach > 10"	Constructing New PB-Pole, Update FIS		
1394669	SW Shea- East side of Pedestrian Island	41.08 (Rt)	-Reach > 10"	Constructing New PB-Pole, Update FIS		

APS locations which are compliant with ADA standards are typically not included in the ADOT FIS system. A summary of existing **APS** locations which are not currently listed in the ADOT FIS system are as follows:

Table 13: Existing APS locations not currently listed in ADOT FIS

Asset ID	Location	Beginning MP	Pole No.	Notes
Princess Drive				
XXPB01	NW Princess Drive - East of SB off ramp	36.57 (Rt)		
XXPB02	NE Princess Drive - West of NB on ramp	36.57 (Rt)		
XXPB03	NE Princess Drive - East of NB on ramp	36.57 (Rt)		
XXPB04	West Princess Drive - Pedestrian Island	36.60 (Med)		
Bell Road				
XXPB05	NW Bell Road - East of SB off ramp	37.06 (Rt)		
XXPB06	NE Bell Road - East of NB on ramp	37.06 (Rt)		
XXPB07	East Bell Road	37.08 (Med)		
XXPB08	SW Bell Road - East of SB on ramp	37.10 (Rt)		
XXPB09	SW Bell Road - West of SB on ramp	37.10 (Rt)		
Frank Lloyd Wright Boulevard				
XXPB10	NW FLW - West of SB off ramp	37.79 (Rt)		
XXPB11	NW FLW - East of SB off ramp	37.79 (Rt)		
XXPB12	NE FLW - West of NB on ramp	37.79 (Rt)		
XXPB13	NE FLW - West side of smaller Pedestrian Island, Crossing to the South	37.79 (Rt)		
XXPB14	SE FLW - East of NB off ramp	37.81 (Rt)		
XXPB15	SE FLW - West of NB off ramp	37.81 (Rt)		
XXPB16	SW FLW - East of SB on ramp	37.81 (Rt)		
XXPB17	SW FLW - West Pedestrian Island	37.81 (Rt)		
XXPB18	SW FLW - West of SB on ramp	37.81 (Rt)		
Raintree Drive				
XXPB18	SW FLW - West of SB on ramp	37.81 (Rt)		
XXPB19	NW Raintree - West of SB off ramp	38.59 (Rt)		
XXPB20	NW Raintree - West side of Pedestrian Island	38.59 (Rt)		
XXPB21	NW Raintree - East of SB off ramp	38.59 (Rt)		
XXPB22	SE Raintree - East of NB off ramp	38.60 (Rt)		

5. RAILING

The ADOT FIS lists a total of 25 locations with **railing**. Of these locations, 2 are handrail locations, 25 are safety rail locations (not part of a continuous pedestrian pathway) and 0 are detectable rail locations (beside a sidewalk, not used as a gripping surface). Railing is evaluated according to applicable ADA requirements (PROWAG & ADAAG) and/or OSHA requirements depending on the function of the railing. A table summarizing the proposed action items for these ADA features is listed below:

Table 14: Summary of Proposed Railing Action Items

Proposed Action Item- Railing	Princess Drive	Bell Road	FLW Blvd	Raintree Drive	Thunderbird Road	Pedestrian Bridge	Cactus Road	Shea Blvd	Total
Evaluate as Safety Rail	2	2	0	2	4	2	6	3	21
Duplicate FIS Entry OR Feature No Longer Exists Update FIS (No Action)	0	1	0	0	0	0	1	1	3
Replace Railing	0	0	0	0	0	0	1	0	1
To Remain (No Action)	0	0	0	0	0	2	0	0	2
Total	**2**	**3**	**0**	**2**	**4**	**4**	**8**	**4**	**27**

The following are detailed descriptions of the **railing** locations which need to be addressed for compliance with applicable standards:

Table 15: ADA Non-Compliant Railing

Asset ID	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
Bell Road						
2010935	NE Bell Rd	37.07 (Rt)	-Duplicate	Duplicate FIS Entry OR Feature No Longer Exists, Update FIS (No Action)		
Cactus Road						
1024684	West Cactus Rd NB on ramp	38.87 (Rt)	-Duplicate	Duplicate FIS Entry OR Feature No Longer Exists, Update FIS (No Action)		

Asset ID	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
1024889	NW Cactus Rd- In front of Sidewalk	40.08 (Rt)	-Damaged by collision.	Replace safety rail.		
Shea Boulevard						
1024678	East of Shea Blvd NB on ramp	41.00 (Rt)	-Duplicate	Duplicate FIS Entry OR Feature No Longer Exists, Update FIS (No Action)		

The following table describes **railing** which is compliant with respective standards:

Table 16: ADA Compliant Railing Locations

Asset ID	Direction	Beginning MP	Location
Princess Drive			
1024825	North/South	36.57 (Med)	North Princess Drive - Top of slope paving
1025679	North/South	36.59 (Med)	South Princess Drive - Top of slope paving
Bell Road			
1024829	East/West	37.08 (Rt)	NE Bell Road - Behind sidewalk
2011274	East/West	37.11 (Rt)	SE Bell Road - Behind sidewalk
Raintree Drive			
2017832	North/South	38.75 (Rt)	East of NB SR 101L - Between Raintree Drive and Thunderbird Road TI's
2017760	North/South	38.76 (Rt)	East of NB SR 101L - Between Raintree Drive and Thunderbird Road TI's
Thunderbird Road			
2017829	North/South	39.04 (Rt)	NE Thunderbird Road - Behind sidewalk
2017828	North/South	39.04 (Rt)	NE Thunderbird Road - Behind sidewalk
XXHR01	North/South	39.06 (Rt)	SE Thunderbird Road - Behind sidewalk and fence
1022554	North/South	39.06 (Rt)	SW Thunderbird Road - On top of wall
Pedestrian Bridge			
2017821	North/South	39.55 (Rt)	NE Pedestrian Bridge - Around Culvert Headwall
2017818	North/South	39.06 (Rt)	SE Pedestrian Bridge - Around Culvert Headwall
XXHR02	East/West	39.55 (Rt)	North Pedestrian Bridge
XXHR03	East/West	39.57 (Rt)	South Pedestrian Bridge
Cactus Road			
2017646	North/South	40.01 (Rt)	East Cactus Road - NB on ramp

Asset ID	Direction	Beginning MP	Location
2017816	North/South	40.01 (Rt)	East Cactus Road - NB on ramp
2017647	North/South	40.01 (Rt)	East Cactus Road - NB on ramp
1022564	North/South	38.87 (Rt)	West Cactus Road - SB on ramp
2017644	North/South	40.11 (Rt)	SE Cactus Road - Behind sidewalk
2017645	North/South	40.13 (Rt)	East of Cactus Road - NB on ramp
Shea Boulevard			
2017814	North/South	40.63 (Rt)	East of NB SR 101L between Cactus Road and Shea Blvd TI's
2017811	North/South	40.81 (Rt)	East of NB SR 101L between Cactus Road and Shea Blvd TI's
2013362	North/South	41.00 (Rt)	East of Shea Boulevard NB on ramp

6. PEDESTRIAN ISLAND CROSSING

There are 35 locations throughout the project limits which have **pedestrian crossing at islands**. All 35 are ADA non-compliant locations. The following table summarizes the recommended action for each feature to become compliant.

Table 17: Summary of Proposed Pedestrian Island Crossing Action Items

Proposed Action Item- Pedestrian Island Crossing	Princess Drive	Bell Road	FLW Blvd	Raintree Drive	Thunderbird Road	Pedestrian Bridge	Cactus Road	Shea Blvd	Total
Add Truncated Domes	1	2	0	6	1	0	6	5	21
Reconstruct Pedestrian Island Crossing	1	0	8	4	0	0	0	1	14
Total	**2**	**2**	**8**	**10**	**1**	**0**	**6**	**6**	**35**

A detailed description of each of the ADA non-compliant **pedestrian crossings at islands** are as follows:

Table 18: ADA Non-Compliant Pedestrian Island Crossings

Asset ID	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
Princess Drive						
1390747	East Princess Dr	36.58 (Med)	-Not accessible. No crossing sign posted.	Pedestrian Island Crossing will be removed with this project, update FIS Status to Removed		
1390755	West Princess Dr	36.58 (Med)	-No truncated domes	Add truncated domes		
Bell Road						
1390762	East Bell Rd	37.09 (Med)	-No truncated domes	Add truncated domes		
1390770	West Bell Rd	37.08 (Med)	-No truncated domes	Add truncated domes		
Frank Lloyd Wright Boulevard						
1390795	NW FLW Blvd	37.79 (Rt)	-Textured Surface/Pavers	Reconstruct Pedestrian Island Crossing		
1390789	NE FLW Blvd	37.79 (Rt)	-Textured Surface/Pavers	Reconstruct Pedestrian Island Crossing		
1390786	NE FLW Blvd	37.79 (Rt)	-Textured Surface/Pavers	Reconstruct Pedestrian Island Crossing		
1390788	East FLW Blvd	37.80 (Med)	-Length < 6’	Reconstruct Pedestrian Island Crossing		
1390780	SE FLW Blvd	37.81 (Lt)	-Textured Surface/Pavers	Reconstruct Pedestrian Island Crossing		
1390775	SW FLW Blvd	37.81 (Rt)	-Textured Surface/Pavers	Reconstruct Pedestrian Island Crossing		
1390773	SW FLW Blvd	37.81 (Rt)	-Textured Surface/Pavers	Reconstruct Pedestrian Island Crossing		
1390799	West FLW Blvd	37.80 (Med)	-Length < 6’	Reconstruct Pedestrian Island Crossing		
Raintree Drive						
1390801	West Raintree Dr	38.59 (Med)	-Length < 6’	Reconstruct Pedestrian Island Crossing		
1390828	NW Raintree Dr	38.58 (Rt)	-No truncated domes	Add truncated domes.		
1390822	NE Raintree Dr	38.58 (Lt)	-Cross Slope > 2%	Reconstruct Pedestrian Island Crossing		
1390820	NE Raintree Dr	38.58 (Lt)	-Not 4’ wide	Reconstruct Pedestrian Island Crossing		
1390818	East Raintree Dr	38.60 (Lt)	-Length < 6’	Reconstruct Pedestrian Island Crossing		
1390813	SE Raintree Dr	38.60 (Rt)	-No truncated domes	Add truncated domes		
1390806	SW Raintree Dr	38.61 (Rt)	-No truncated domes	Add truncated domes		
1390804	SW Raintree Dr	38.60 (Rt)	-No truncated domes	Add truncated domes		
XXPED01	N Raintree Dr	38.58 (Rt)	-No truncated domes	Add truncated domes		
XXPED02	S Raintree Dr	38.60 (Rt)	-No truncated domes	Add truncated domes		
Thunderbird Road						
1390833	E Thunderbird Rd	39.05 (Med)	-No truncated domes	Add truncated domes		

Asset ID	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
			Cactus Road			
1394662	NW Cactus Rd	40.08 (Rt)	-No truncated domes	Add truncated domes		
XXPED03	NE Cactus Rd	40.08 (Rt)	-No truncated domes	Add truncated domes		
XXPED04	N Cactus Rd	40.08 (Rt)	-No truncated domes	Add truncated domes		
XXPED05	S Cactus Rd	40.10 (Rt)	-No truncated domes	Add truncated domes		
1394650	SE Cactus Rd	40.10 (Rt)	-No truncated domes	Add truncated domes		
1394643	SW Cactus Rd	40.10 (Rt)	-No truncated domes	Add truncated domes		
			Shea Boulevard			
1394684	NW Shea Blvd	41.05 (Rt)	-No truncated domes	Add truncated domes		
1394679	NE Shea Blvd	41.05 (Rt)	-No truncated domes	Add truncated domes		
1394672	SE Shea Blvd	41.08 (Rt)	-No truncated domes	Add truncated domes		
1394668	SW Shea Blvd	41.08 (Rt)	-No truncated domes -Cross Slope > 2%	Reconstruct Pedestrian Island Crossing		
XXPED06	North Shea Blvd	41.05 (Rt)	-No truncated domes	Add truncated domes		
XXPED07	South Shea Blvd	41.08 (Rt)	-No truncated domes	Add truncated domes		

As mentioned above, there are no ADA compliant **pedestrian island crossings** within the project limits.

7. PEDESTRIAN OVERPASS/UNDERPASS CROSSING

There is 1 location throughout the project limits which has a **pedestrian overpass or underpass,** which is an overpass and is found to be ADA compliant.

The following table describes compliant **pedestrian overpass and underpass** locations:

Table 19: ADA Compliant Pedestrian Overpass/Underpass

Asset ID	Direction	Beginning MP	Overpass or Underpass	Location
		Pedestrian Bridge		
1434217	East/West	39.56	Overpass	Pedestrian Bridge is located over the SR 101L between Thunderbird Road and Cactus Road

8. OBSTRUCTIONS & ADA FEATURES NEEDED

There are 38 areas containing **obstructions** and 16 locations which require new ADA features for the area to become compliant. The proposed action items for these areas are summarized in the table below:

Table 20: Summary of Obstructions Action Items

Proposed Action Item- Obstructions	Princess Drive	Bell Road	FLW Blvd	Raintree Drive	Thunderbird Road	Pedestrian Bridge	Cactus Road	Shea Blvd	Total
Repair Cracked/Uneven Concrete	1	0	2	1	0	0	4	4	12
Adjust Utility Box to be Flush with Sidewalk & Repair Sidewalk	1	0	1	0	0	0	2	1	5
Reconstruct Curb Ramp, Update FIS	6	3	2	1	1	0	2	1	16
To Remain, Update FIS Status to Compliant	0	1	2	0	0	0	2	0	5
Total	**8**	**4**	**7**	**2**	**1**	**0**	**10**	**6**	**38**

A listing of all locations containing **obstructions** is detailed in the table below:

Table 21: Locations with ADA Obstructions & ADA Features Needed

Asset ID	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
Princess Drive						
1390752	NW Princess Dr- East of SB off ramp	36.57 (Rt)	-Cracked concrete in ADA path	Reconstruct Curb Ramp, Update FIS		
1390750	NE Princess Dr-West of NB on ramp	36.57 (Rt)	-Cracked concrete in ADA path	Reconstruct Curb Ramp, Update FIS		
1390742	SE Princess Dr- West of NB off ramp	36.60 (Rt)	-Cracked concrete in ADA path	Reconstruct Curb Ramp, Update FIS		

Asset ID	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
1390839	SE Princess Dr- West of NB off ramp	36.60 (Rt)	-Broken curb at curb ramp	Reconstruct Curb Ramp, Update FIS		
1390739	SW Princess Dr-East of SB on ramp	36.60 (Rt)	-Cracked Concrete in ADA path	Reconstruct Curb Ramp, Update FIS		
1390740	SW Princess Dr-East of SB on ramp	36.60 (Rt)	-Sunken Concrete Panel	Repair Cracked/Uneven Concrete		
1390734	SW Princess Dr-West of SB on ramp	36.60 (Rt)	-Sunken Traffic Signal Box	Adjust Utility Box to be Flush with Sidewalk & Repair Sidewalk		
1390735	SW Princess Dr- West of SB on ramp	36.60 (Rt)	-Cracked Concrete in ADA Crosswalk path	Reconstruct Curb Ramp, Update FIS		
Bell Road						
1390766	North Bell Rd Sidewalk-Eastern side	37.08 (Rt)	-Separated Concrete panels	To Remain, Update FIS Status to Compliant		
XXOB01	NE Bell Rd-Curb Ramp West of NB on ramp	37.08 (Rt)	-Cracked Concrete in ADA Crosswalk path	Reconstruct Curb Ramp, Update FIS		
XXOB02	NE Bell Rd-Curb Ramp East of NB on ramp	37.08 (Rt)	-Sunken Utility box in Curb Ramp	Reconstruct Curb Ramp, Update FIS		
XXOB03	SW Bell Rd-Sidewalk	37.09 (Rt)	-Cracked Concrete in ADA path	Reconstruct Curb Ramp, Update FIS		
Frank Lloyd Wright Boulevard						
XXOB04	NW FLW Blvd-Curb Ramp West of SB off ramp	37.79 (Rt)	-Cracked Concrete Panel	Reconstruct Curb Ramp, Update FIS		
1390842	NE FLW Blvd-Eastern Island	37.79 (Rt)	-Sediment build up in ADA path	To Remain, Update FIS Status to Compliant		
1390800	NE FLW Blvd-Eastern Island	37.79 (Rt)	-Sunken Utility box in ADA path	Adjust Utility Box to be Flush with Sidewalk & Repair Sidewalk		
XXOB05	NE FLW Blvd-Curb Ramp East of NB on ramp	37.79 (Rt)	-Sunken Concrete Panel	Reconstruct Curb Ramp, Update FIS		
1390784	NE FLW Blvd- Sidewalk in front of overhead sign structure	37.79 (Rt)	-Cracked Concrete panel	To Remain, Update FIS Status to Compliant		

Asset ID	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
XXOB06	SE FLW Blvd Sidewalk	37.81 (Rt)	-Cracked concrete panels	Repair Cracked/Uneven Concrete		
XXOB07	SW FLW Blvd Sidewalk	37.81 (Rt)	-Cracked concrete panel	Repair Cracked/Uneven Concrete		
Raintree Drive						
1390817	SE Raintree Dr- Curb Ramp East of NB off ramp	38.60 (Rt)	-Cracked Concrete panel	Reconstruct Curb Ramp, Update FIS		
XXOB08	SE Raintree Dr- Cross walk in front of East Curb Ramp	38.60 (Rt)	-Cracked concrete in Crosswalk path	Reconstruct Crosswalk with this Project, Update FIS		
Thunderbird Road						
XXOB09	NW Thunderbird Rd-Curb Ramp West of SB off ramp	39.04 (Rt)	-Extruded Utility box in ADA path	Reconstruct Curb Ramp, Update FIS		
Cactus Road						
XXOB10	NW Cactus Rd- Curb Ramp West of SB off ramp	40.08 (Rt)	-Cracked Concrete panel	Reconstruct Curb Ramp, Update FIS		
XXOB11	NW Cactus Rd Pedestrian Island	40.08 (Rt)	-Cracked Concrete panel	Repair Cracked/Uneven Concrete		
XXOB12	NW Cactus Rd Pedestrian Island	40.08 (Rt)	-Cracked Concrete panel	Repair Cracked/Uneven Concrete		
XXOB13	NE Cactus Rd Pedestrian Island	40.08 (Rt)	-Cracked Concrete panel	Repair Cracked/Uneven Concrete		
XXOB14	SE Cactus Rd- Sidewalk	40.10 (Rt)	-Sunken Utility cap in ADA path	Adjust Utility Box to be Flush with Sidewalk & Repair Sidewalk		
XXOB15	SE Cactus Road- Curb Ramp East of NB off ramp	40.10 (Rt)	-Cracked Concrete panel	Reconstruct Curb Ramp, Update FIS		
XXOB16	SE Cactus Rd- Pedestrian Island	40.10 (Rt)	-Cracked Concrete panel	Repair Cracked/Uneven Concrete		
1394645	South Cactus Rd Pedestrian Island	40.10 (Rt)	-Sunken Concrete panel	To Remain, Update FIS Status to Compliant		
1395167	South Cactus Rd- Pedestrian Island	40.10 (Rt)	-Cracked Concrete panel	To Remain, Update FIS Status to Compliant		

Asset ID	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
XXOB17	SW Cactus Rd-Sidewalk	40.10 (Rt)	-Sunken Utility cap in ADA path	Adjust Utility Box to be Flush with Sidewalk & Repair Sidewalk		
Shea Boulevard						
1394677	NE Shea Blvd-Curb Ramp East of NB on ramp	41.05 (Rt)	-Utility cap in the ADA path	Reconstruct Curb Ramp, Update FIS		
XXOB18	NE Shea Blvd -Sidewalk	41.05 (Rt)	-Cracked Concrete panel	Repair Cracked/Uneven Concrete		
XXOB19	SE Shea Blvd Pedestrian Island	41.08 (Rt)	-Cracked Concrete panel	Repair Cracked/Uneven Concrete		
XXOB20	SE Shea Blvd Pedestrian Island	41.08 (Rt)	-Sunken Concrete panels	Repair Cracked/Uneven Concrete		
XXOB21	SW Shea Blvd Pedestrian Island	41.08 (Rt)	-Cracked Concrete panel	Repair Cracked/Uneven Concrete		
1394665	SW Shea Blvd-Sidewalk	41.08 (Rt)	-Utility cap in the ADA path	Adjust Utility Box to be Flush with Sidewalk & Repair Sidewalk		

9. CROSSWALKS

There are 34 **crosswalks** located within the project limits. These were evaluated for a maximum cross slope of 2.0% for a continuous pedestrian pathway in a stop controlled or yield situation, and a maximum cross slope of 5.0% in a non-yield situation. Mid-block crossings are permitted to equal the street or highway grade. (Refer to PROWAG R302.6 Cross Slope).

The type of crosswalk (Yield, Non-Yield, Mid-Block) is indicated in the table below along with the cross slope of each crosswalk and the two curb ramps (Asset ID) which are connected by the crosswalk. The crosswalk cross slope shall be measured at various points in the crosswalk (wherever it appears there may be a grade change), and the crosswalk's compliancy determined. Any proposed action items for non-compliant crosswalks are summarized in the table below:

Table 22: Summary of Crosswalk Action Items

Proposed Action Item- Crosswalks	Princess Drive	Bell Road	FLW Blvd	Raintree Drive	Thunderbird Road	Pedestrian Bridge	Cactus Road	Shea Blvd	Total
To Remain, Add to FIS	6	6	6	6	2	0	4	4	34
Total	**6**	**6**	**6**	**6**	**2**	**0**	**4**	**4**	**34**

Field data for locations containing **crosswalks** was gathered and is detailed in the table below:

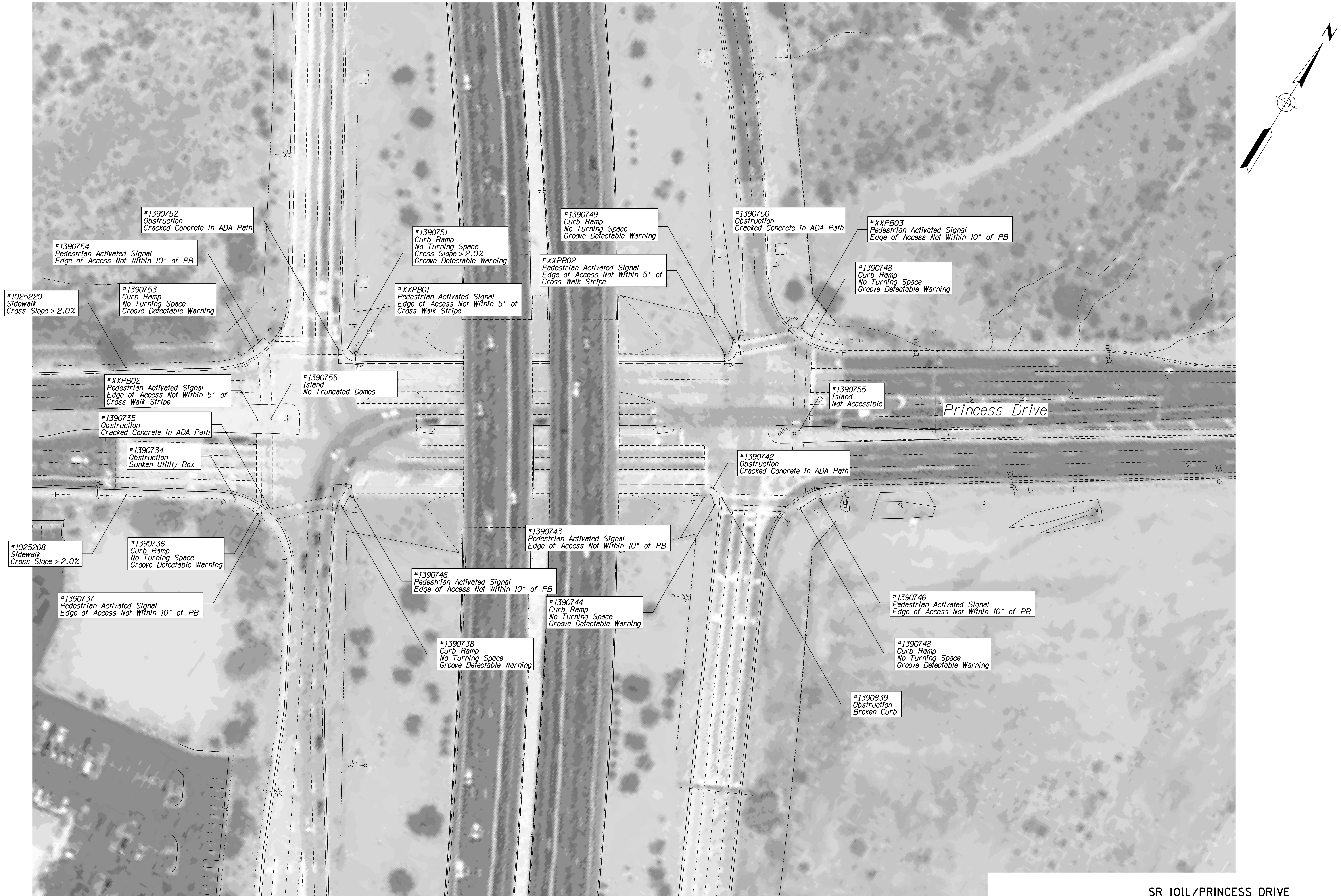
Table 23: Locations with Crosswalks

Connecting Curb Ramps	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
Princess Drive						
1390753 1390751	NW Princess Dr	36.57 (Rt)		To Remain, Add to FIS		
1390749 1390748	NE Princess Dr	36.57 (Rt)		To Remain, Add to FIS		
1390736 1390753	East Princess Dr	36.58 (Med)		To Remain, Add to FIS		
1390748 1390745	West Princess Dr	36.58 (Med)		To Remain, Add to FIS		
1390745 1390744	SE Princess Dr	36.59 (Rt)		To Remain, Add to FIS		
1390736 1390738	SW Princess Dr	36.59 (Rt)		To Remain, Add to FIS		
Bell Road						
1390768 1390767	NW Bell Rd	37.06 (Rt)		To Remain, Add to FIS		

Connecting Curb Ramps	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
1390764 1390763	NE Bell Rd	37.08 (Rt)		To Remain, Add to FIS		
1390763 1390760	East Bell Rd	37.08 (Rt)		To Remain, Add to FIS		
1390758 1390760	SE Bell Rd	37.11 (Rt)		To Remain, Add to FIS		
1390757 1390756	SW Bell Rd	37.10 (Rt)		To Remain, Add to FIS		
1390768 1390756	West Bell Rd	37.08 (Rt)		To Remain, Add to FIS		
Frank Lloyd Wright Boulevard						
1390798 1390794	NW FLW Blvd	37.79 (Rt)		To Remain, Add to FIS		
1390792 1390785	NE FLW Blvd	37.79 (Rt)		To Remain, Add to FIS		
1390785 1390783	East FLW Blvd	37.80 (Rt)		To Remain, Add to FIS		
1390783 1390779	SE FLW Blvd	37.81 (Rt)		To Remain, Add to FIS		
1390777 1390772	SW FLW Blvd	37.81 (Rt)		To Remain, Add to FIS		
1390798 1390772	West FLW Blvd	37.80 (Rt)		To Remain, Add to FIS		
Raintree Drive						
1390831 1390827	NW Raintree Dr	38.59 (Rt)		To Remain, Add to FIS		
1390825 1390819	NE Raintree Dr	38.59 (Rt)		To Remain, Add to FIS		
1390819 1390816	East Raintree Dr	38.59 (Rt)		To Remain, Add to FIS		

Connecting Curb Ramps	Location	Beginning MP	Reason for Non-Compliance	Proposed Action	Final Design	Constructed
1390810 1390816	SE Raintree Dr	38.60 (Rt)		To Remain, Add to FIS		
1390802 1390809	SW Raintree Dr	38.60 (Rt)		To Remain, Add to FIS		
1390831 1390802	West Raintree Dr	38.59 (Rt)		To Remain, Add to FIS		
Thunderbird Road						
1390836 1390835	NW Thunderbird Rd	39.04 (Rt)		To Remain, Add to FIS		
1390834 1390832	East Thunderbird Rd	39.05 (Rt)		To Remain, Add to FIS		
Cactus Road						
1394664 1394661	NW Cactus Rd	40.08 (Rt)		To Remain, Add to FIS		
1394658 1394655	NE Cactus Rd	40.08 (Rt)		To Remain, Add to FIS		
1394648 1394652	SE Cactus Rd	40.10 (Rt)		To Remain, Add to FIS		
1394642 1394646	SW Cactus Rd	40.10 (Rt)		To Remain, Add to FIS		
Shea Boulevard						
1394685 XXPED06	NW Shea Blvd	41.05 (Rt)		To Remain, Add to FIS		
XXPED06 1394678	NE Shea Blvd	41.05 (Rt)		To Remain, Add to FIS		
1394675 XXPED07	SE Shea Blvd	41.08 (Rt)		To Remain, Add to FIS		
XXPED07 1394666	SW Shea Blvd	41.08 (Rt)		To Remain, Add to FIS		

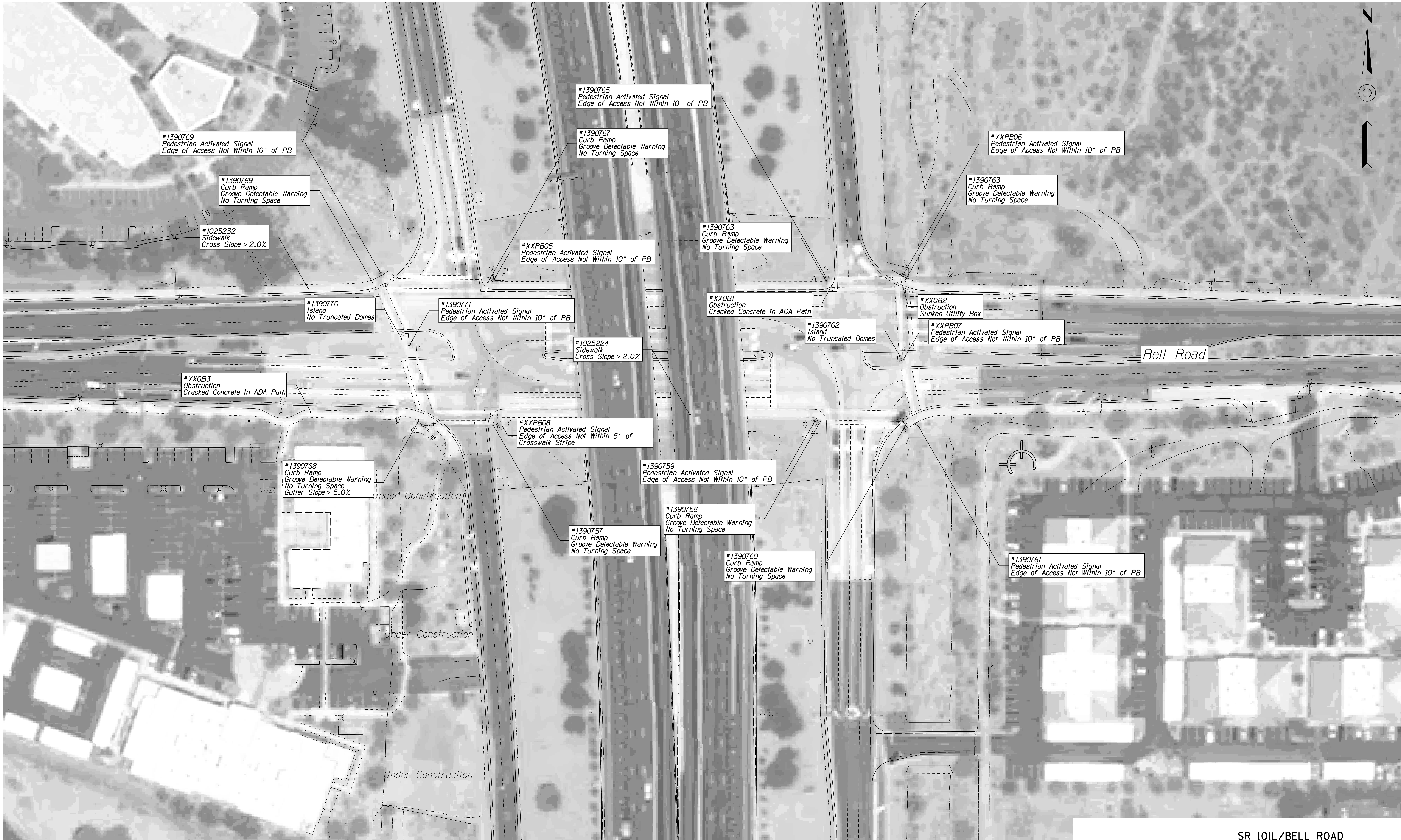
APPENDIX



SR 101L/PRINCESS DRIVE
PLAN SHEET

ADA Features Map

Kimley»Horn



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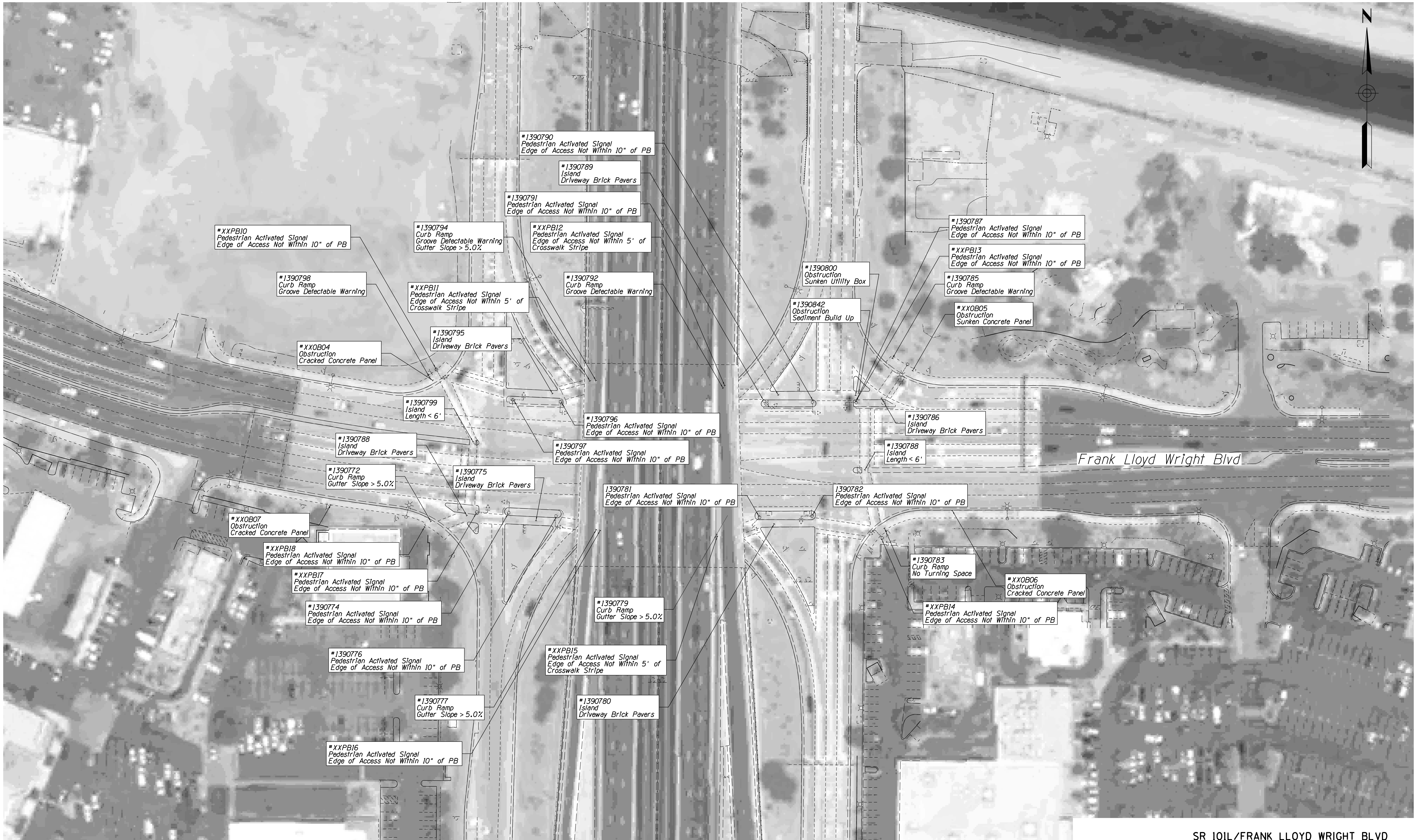

SR 101L/FRANK LLOYD WRIGHT BLVD
PLAN SHEET

ADA Features Map

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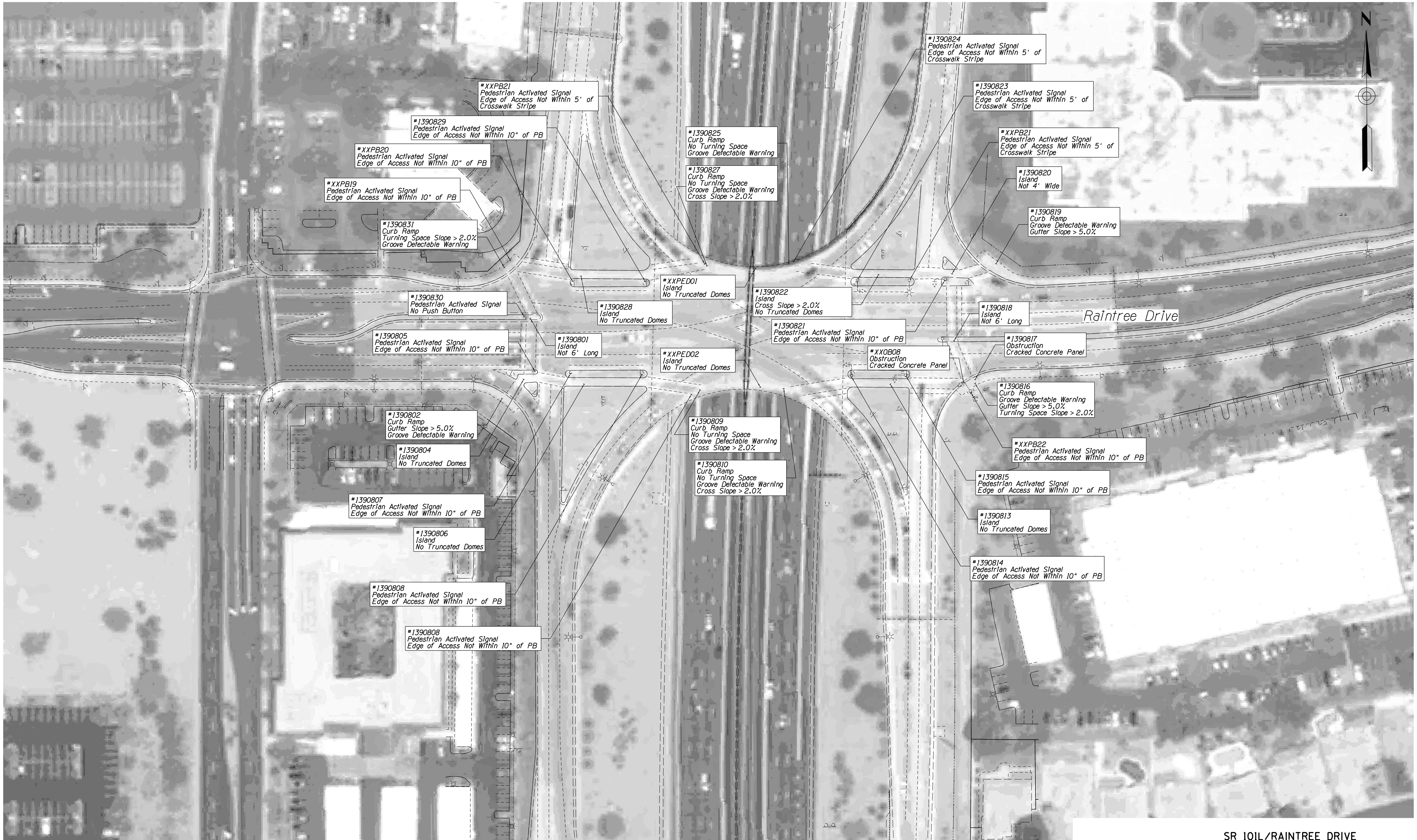

SR 101L/RAINTREE DRIVE
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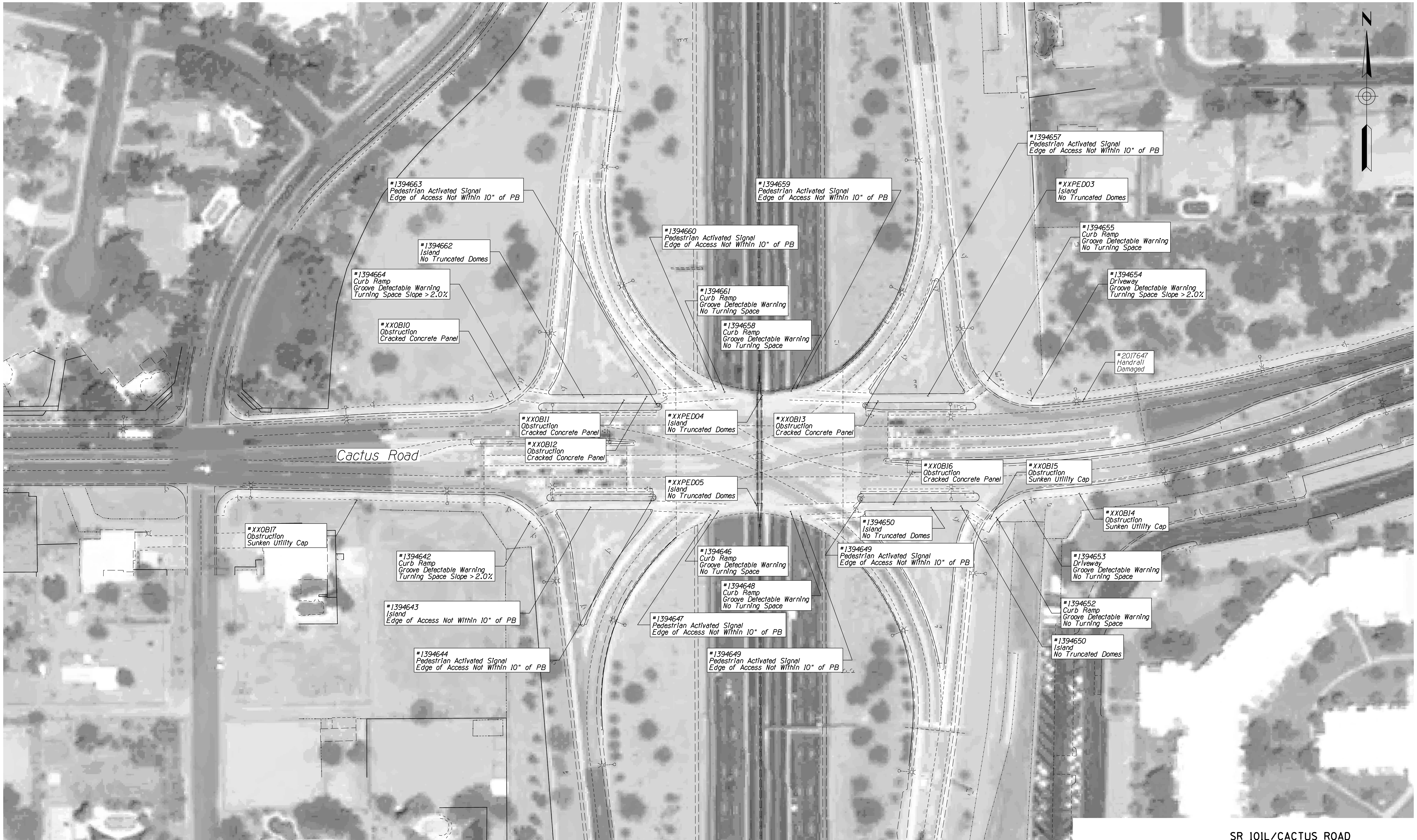
SR 101L/THUNDERBIRD ROAD
PLAN SHEET

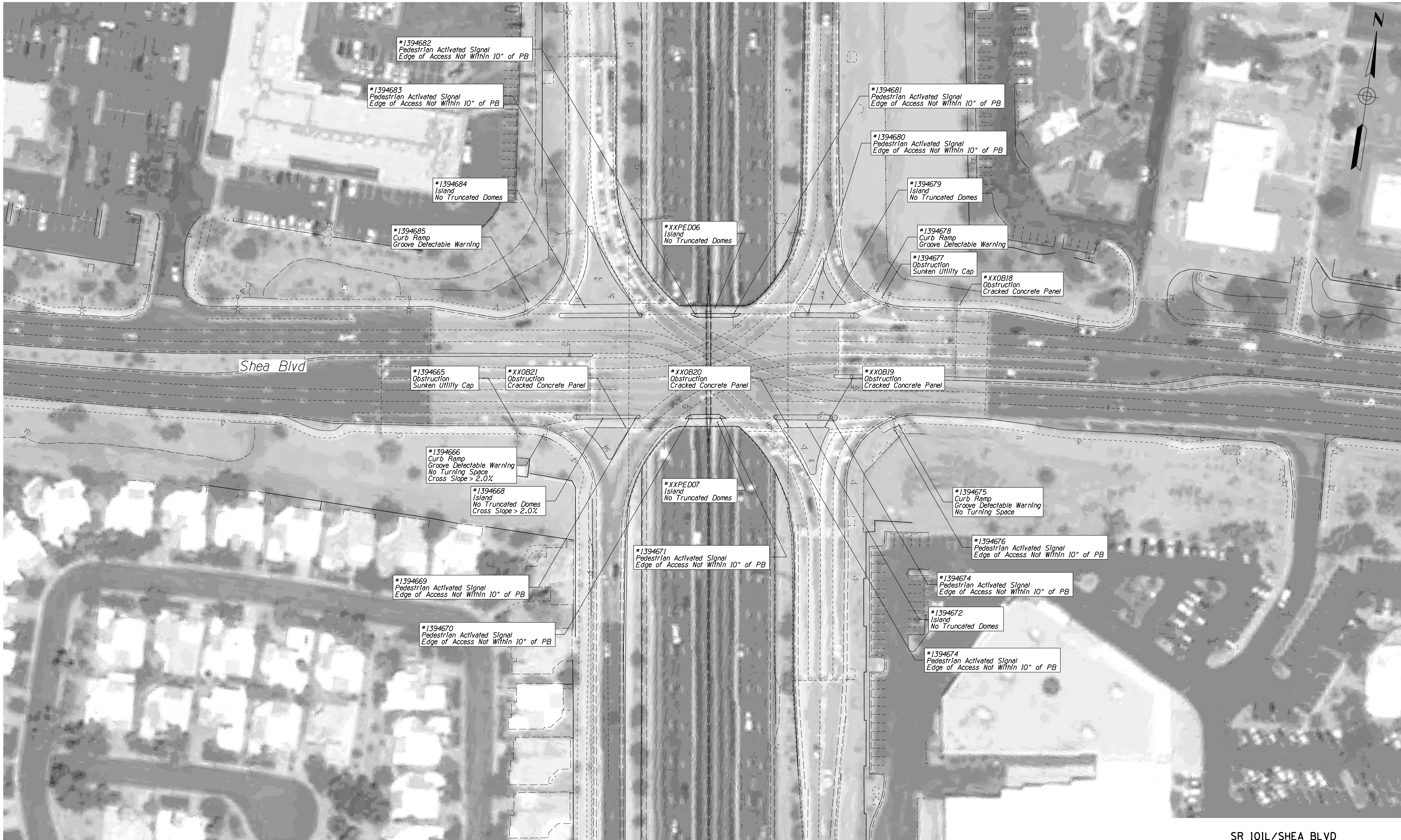
PROJECT 101 MA 036 F0123 01D



SR 101L/CACTUS ROAD
PLAN SHEET

ADA Features Map

Kimley»Horn



SR 101L/SHEA BLVD
PLAN SHEET

Sidewalk

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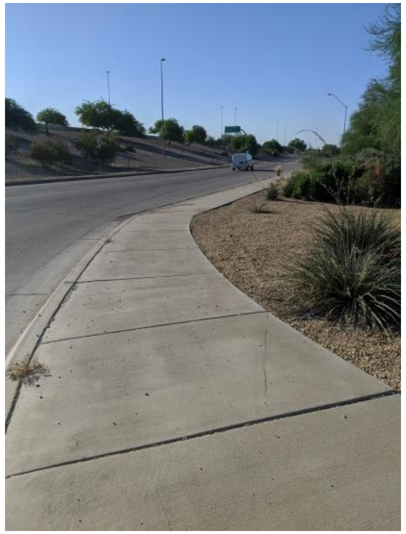

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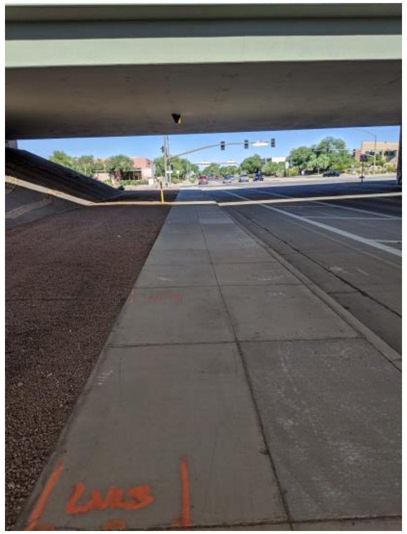

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Sidewalk

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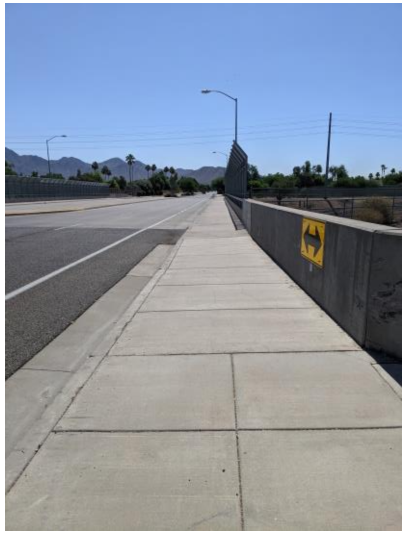

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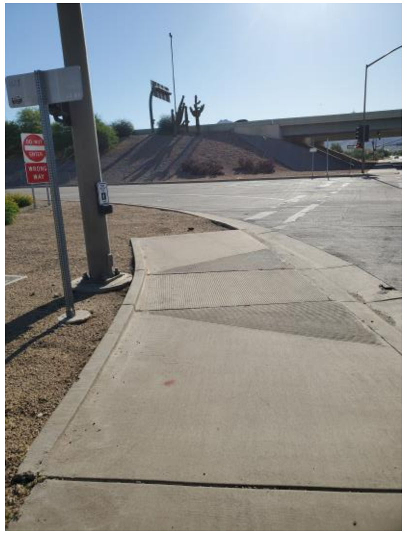

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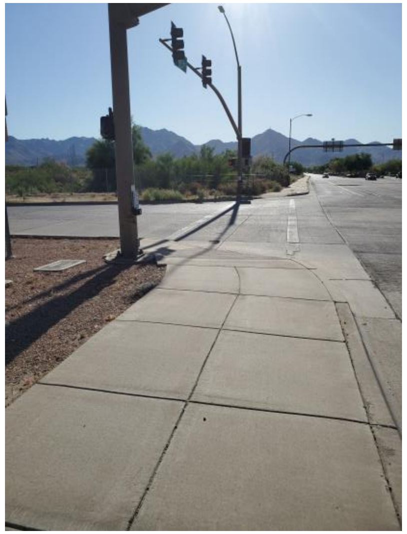

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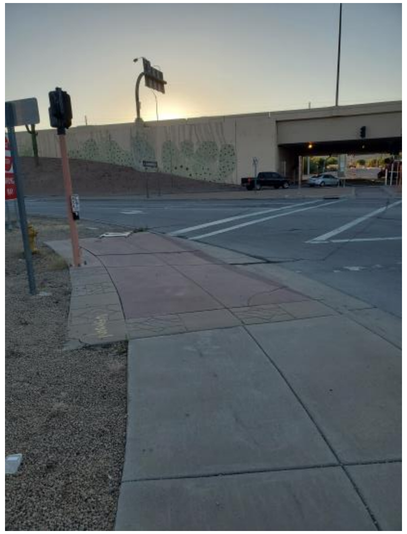
Curb Ramps

1390757

1390756



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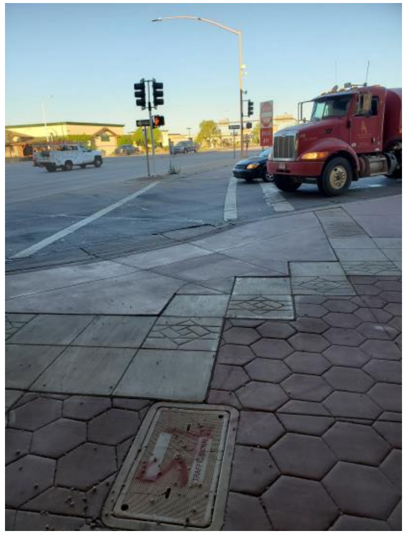

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Curb Ramps

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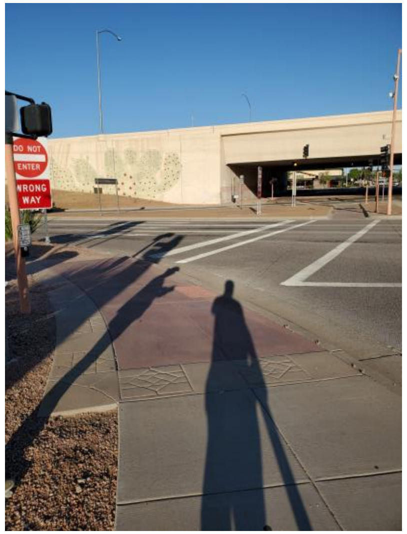

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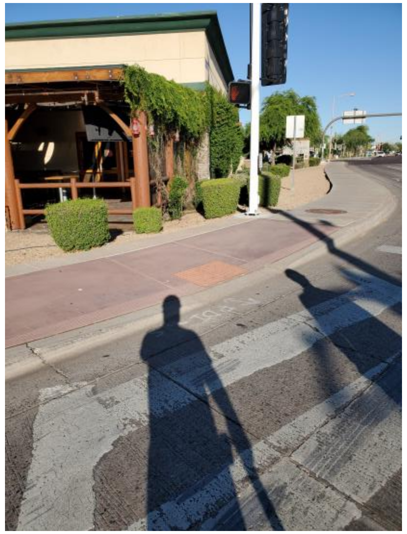
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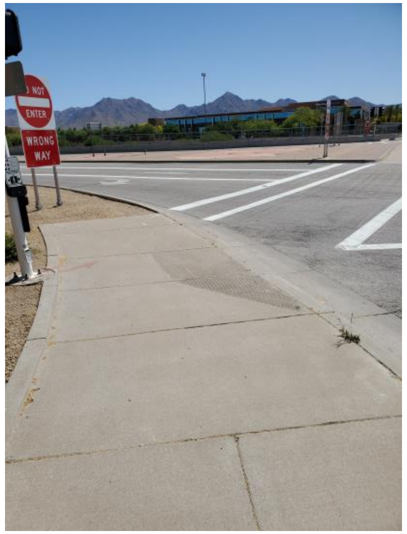

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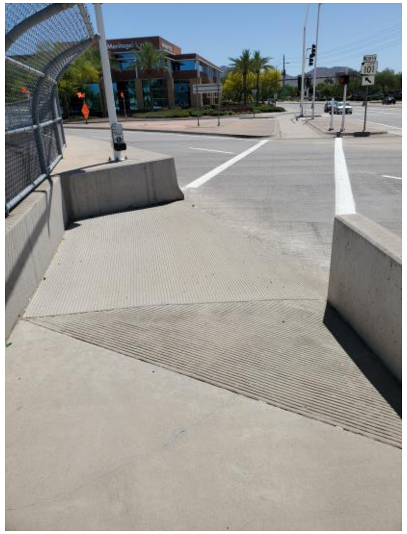

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Curb Ramps

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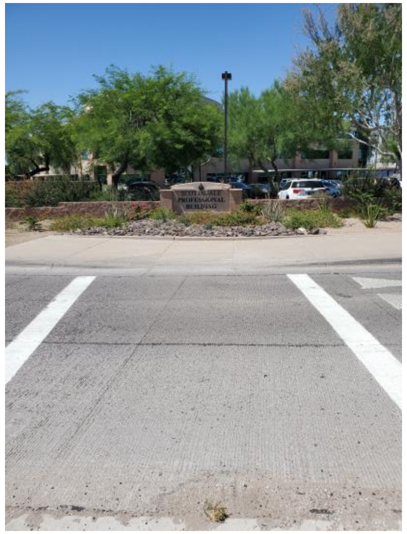

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Curb Ramps

f0123 - Diamond Alternatives.dgn

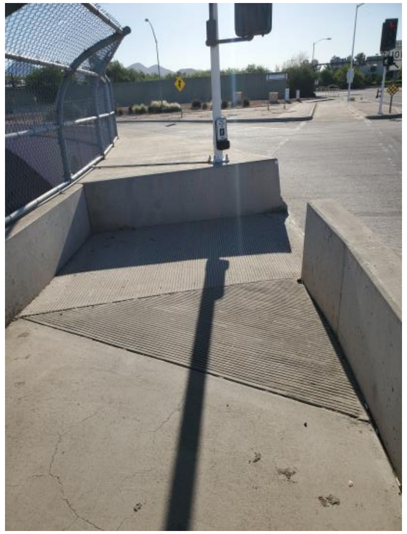
1390834

1390832

1394664

1394661

Curb Ramps



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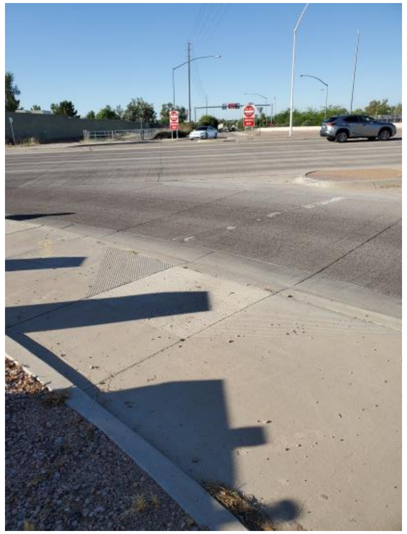

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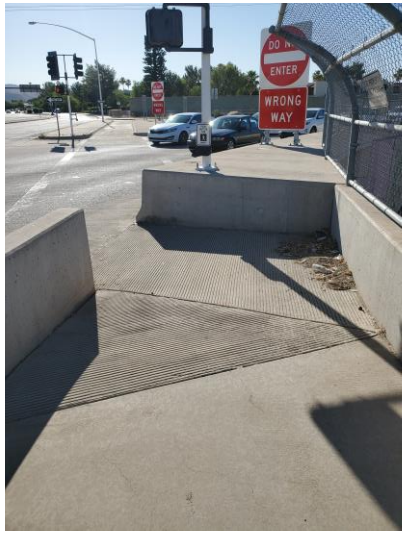

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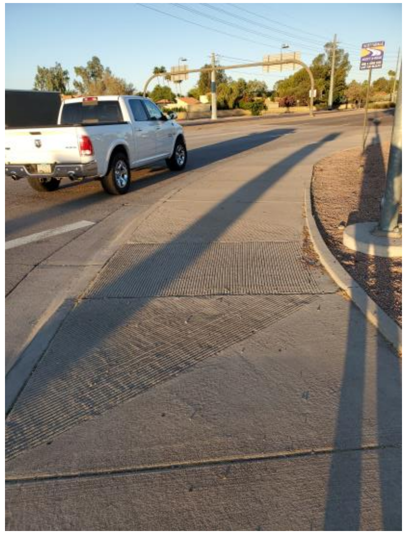

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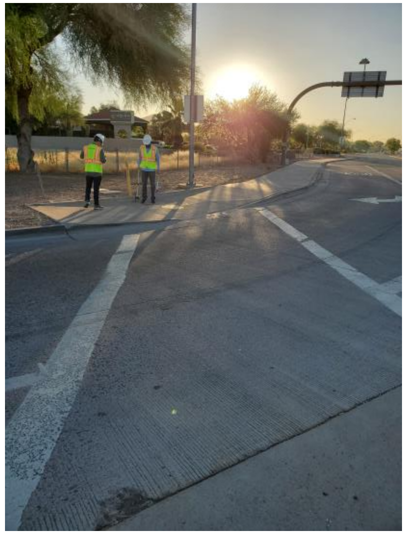

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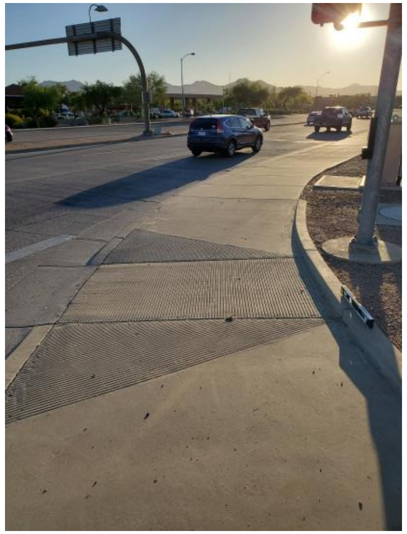
Curb Ramps



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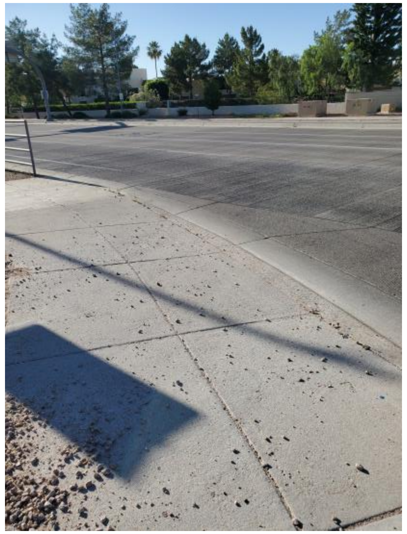

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1390754

XXPB01

XXPB02

XXPB03

Accessible Pedestrian Signals

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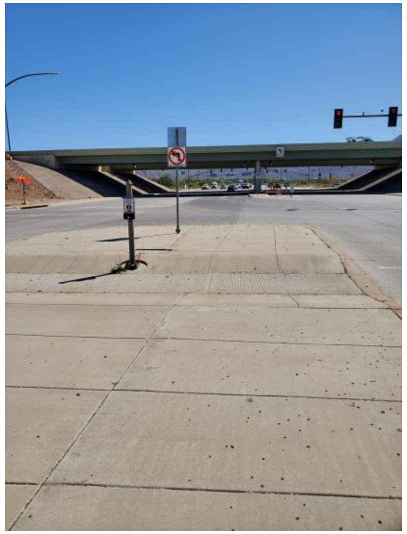
1390743

1390741

1390737



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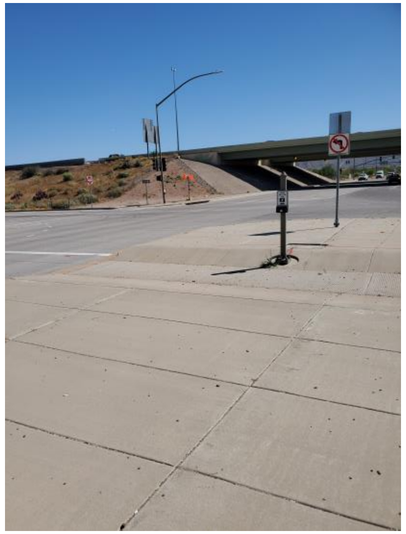

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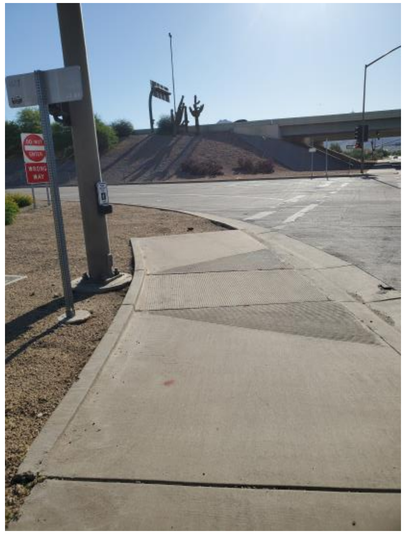

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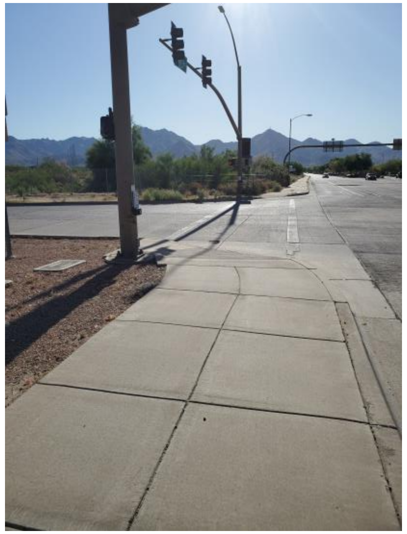

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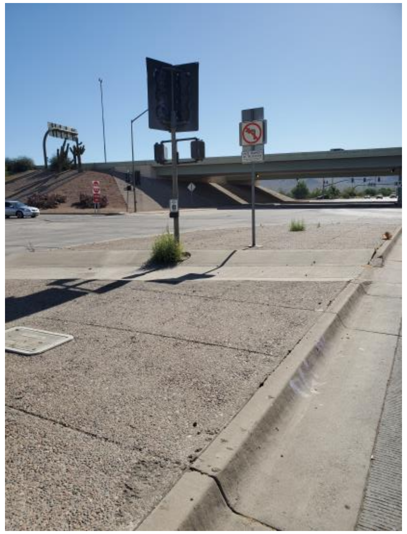

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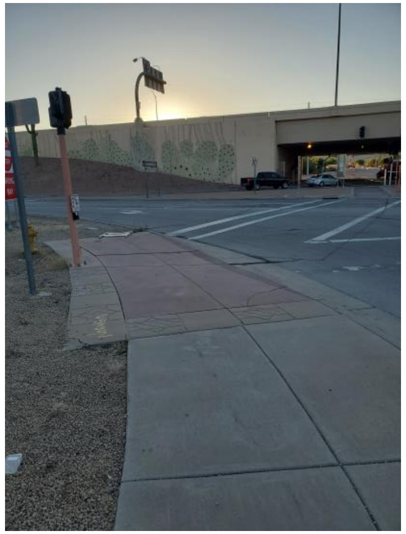

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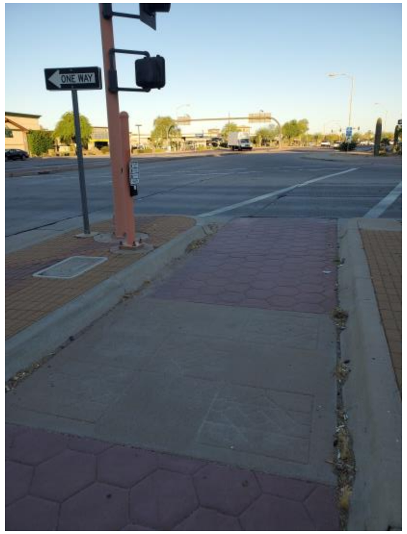

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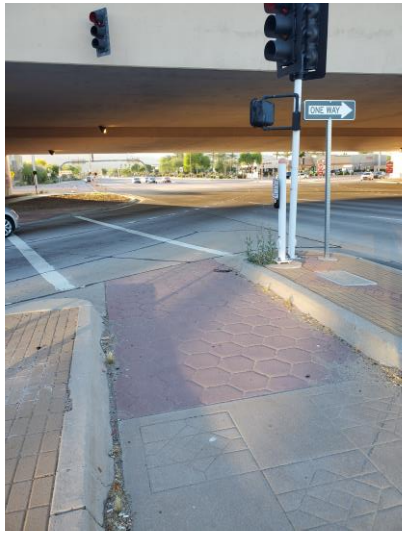

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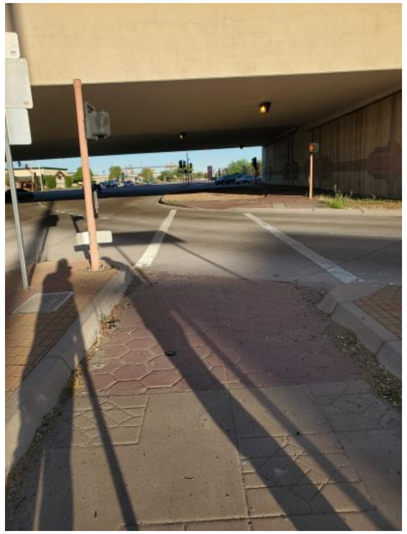

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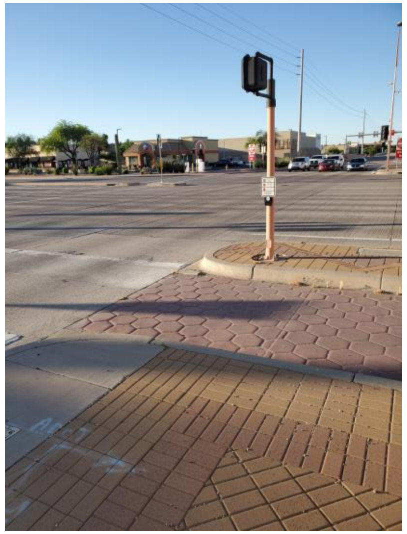

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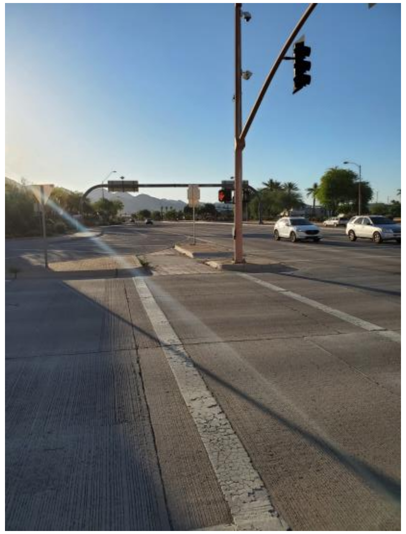

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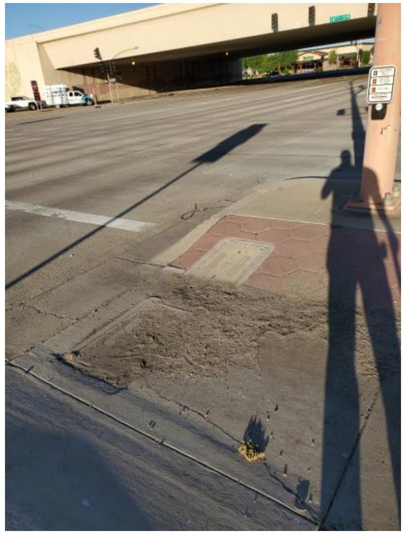

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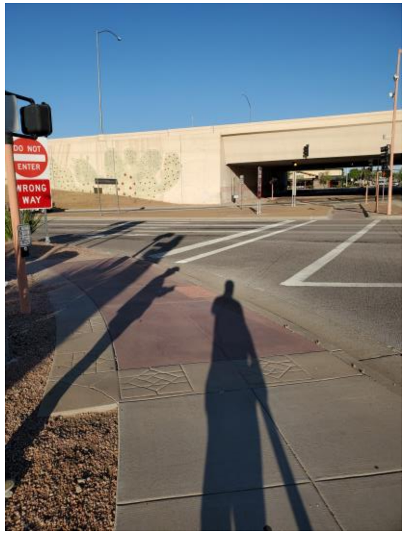

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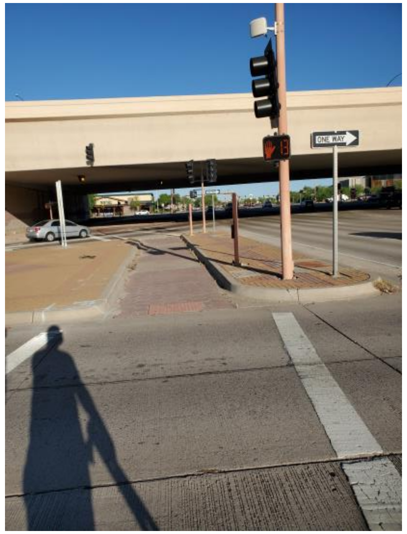

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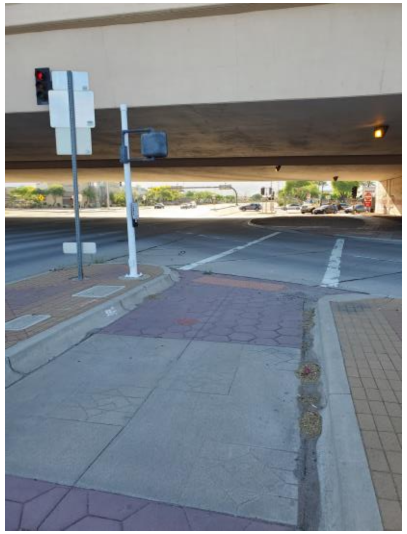
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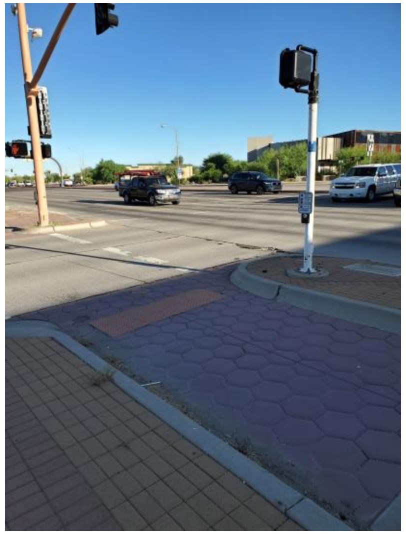
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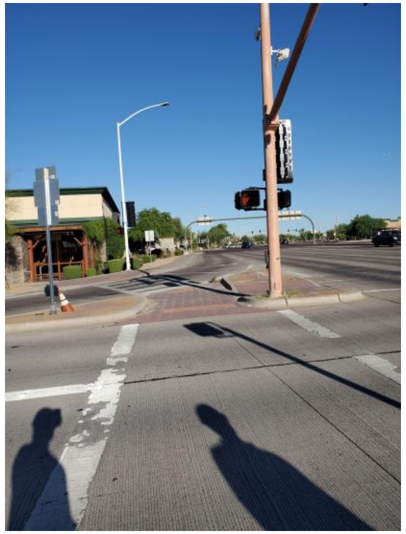
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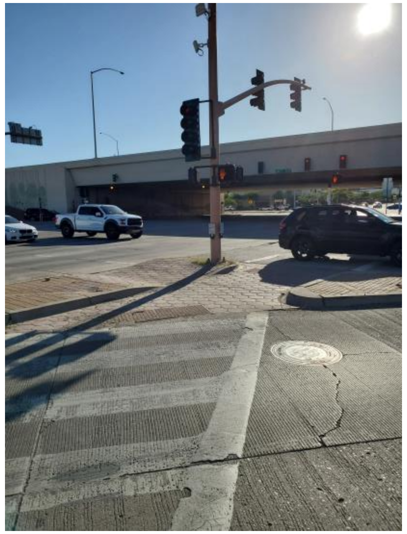
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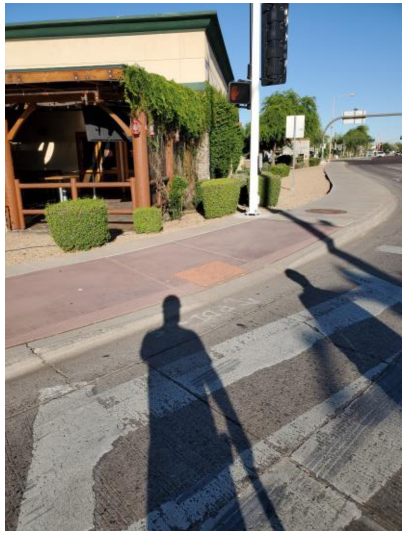

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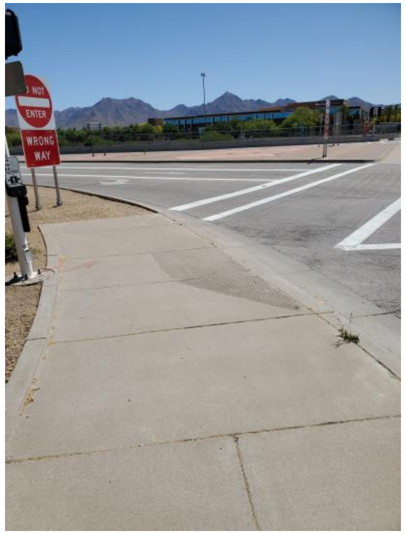

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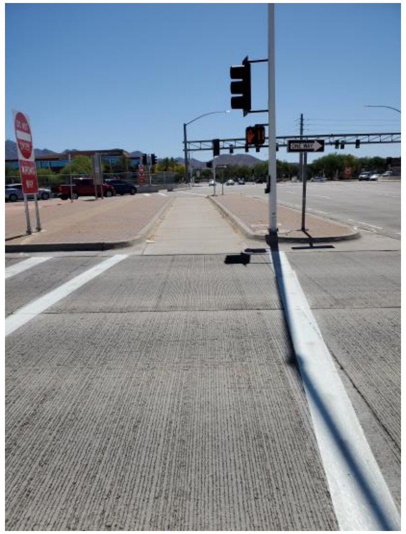

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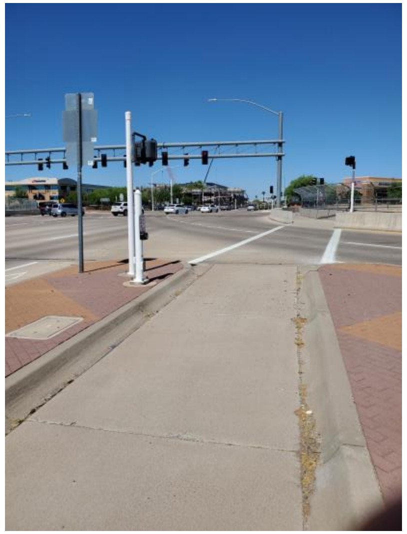
Accessible Pedestrian Signals



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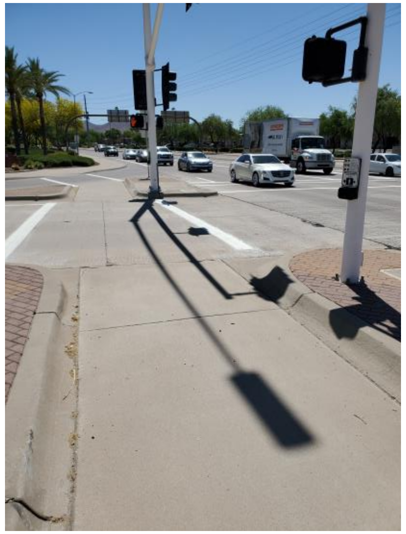

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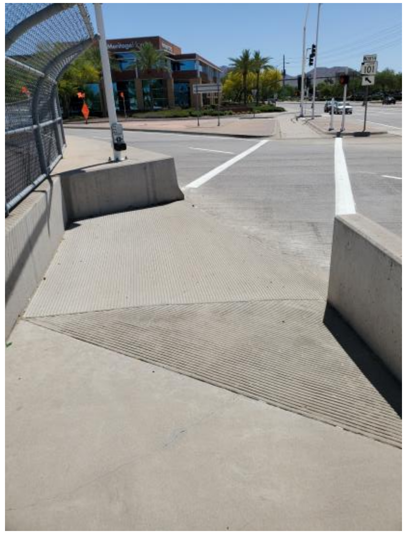

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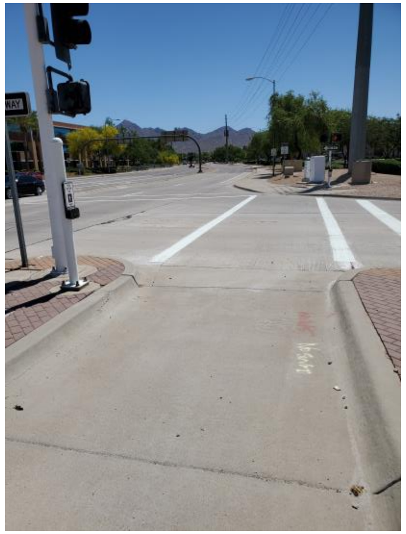

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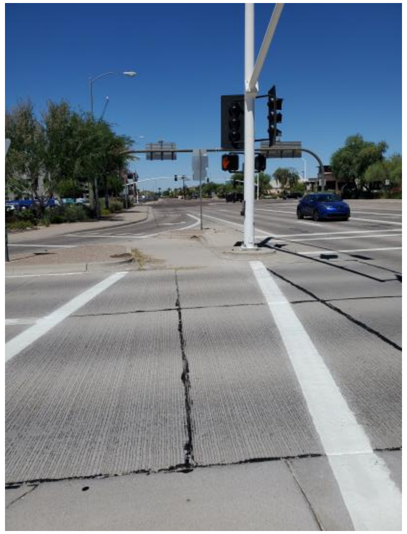

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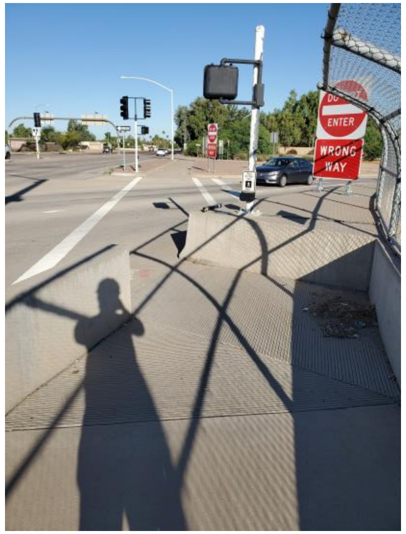

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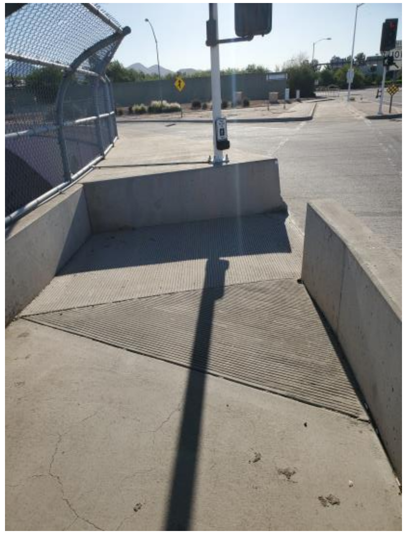

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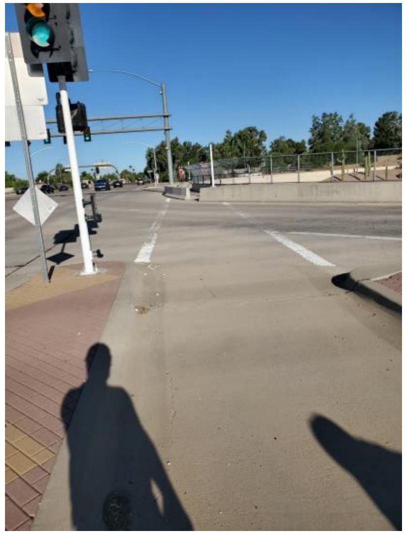

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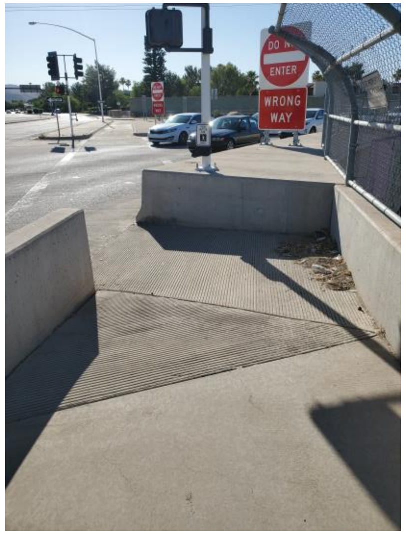

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Accessible Pedestrian Signals

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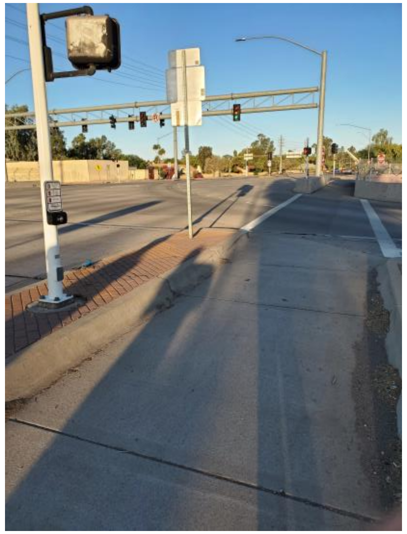

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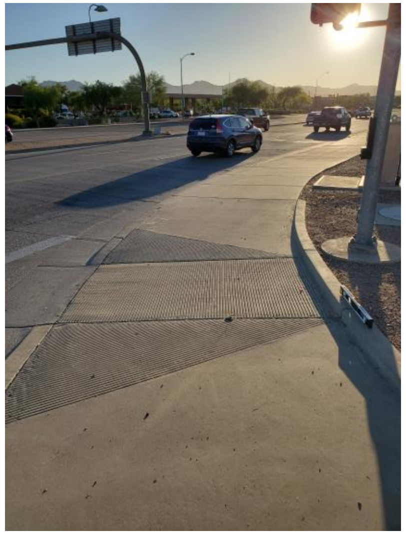

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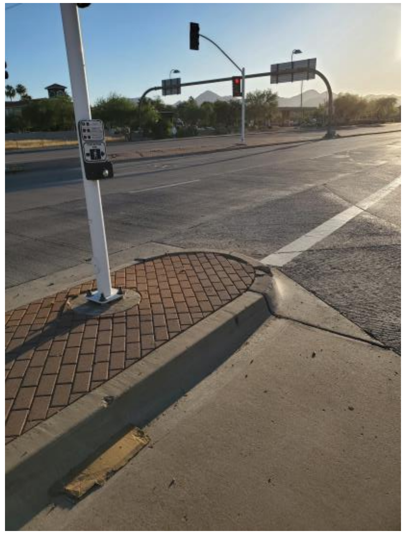

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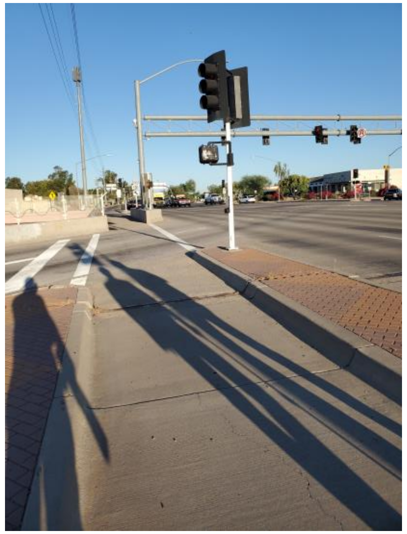

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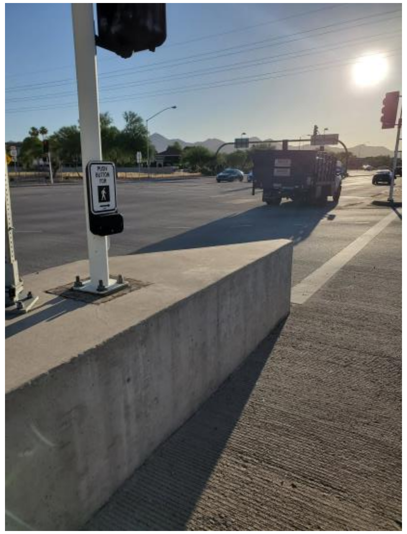

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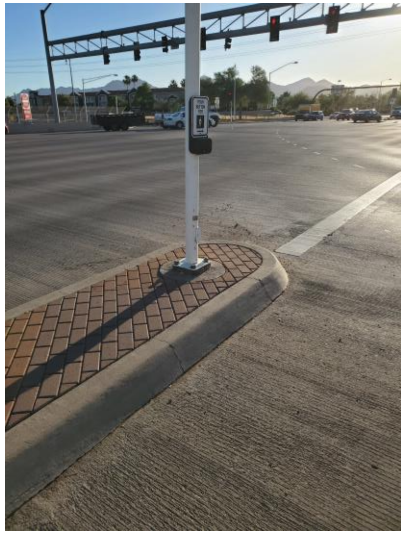

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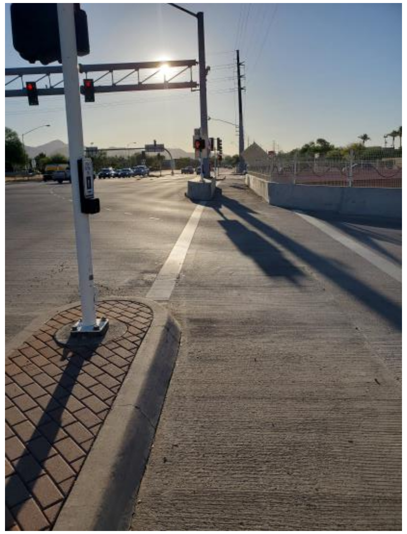

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Railing

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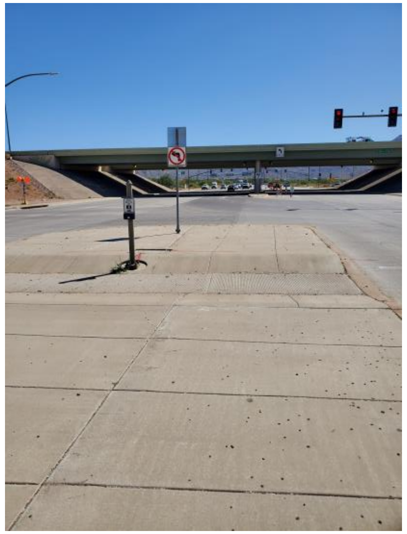

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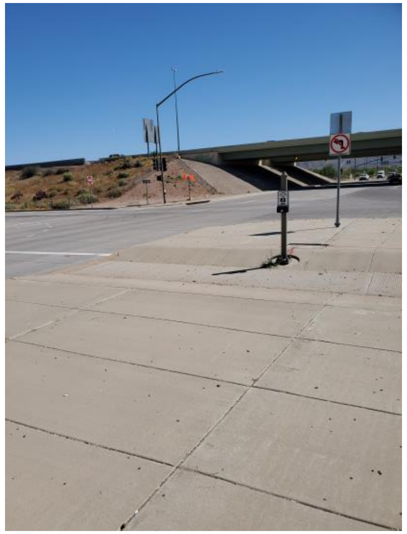

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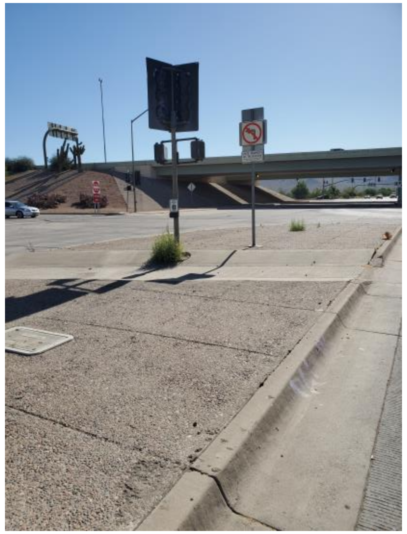

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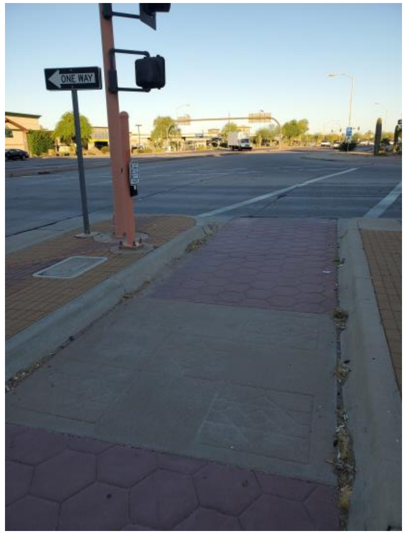

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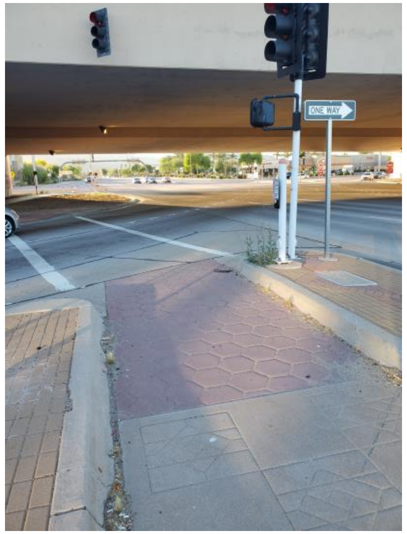

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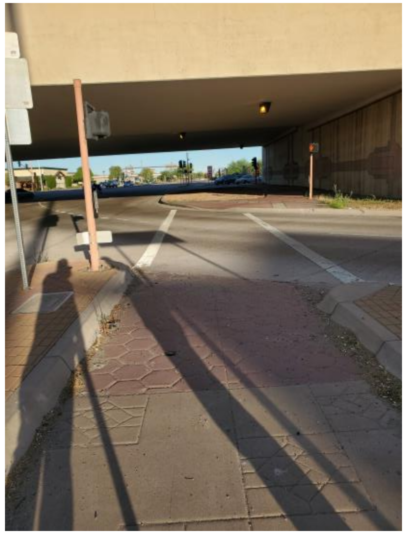

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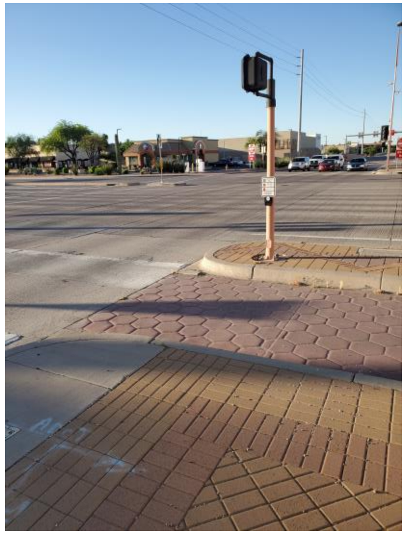

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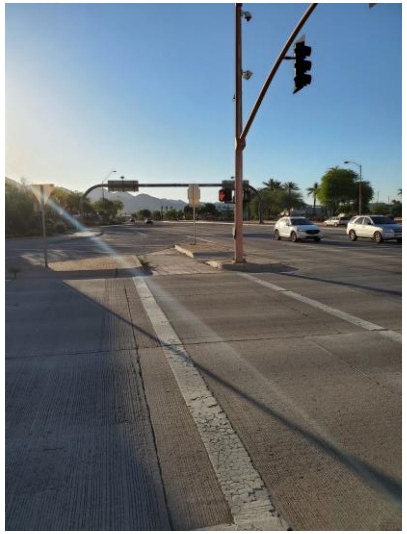

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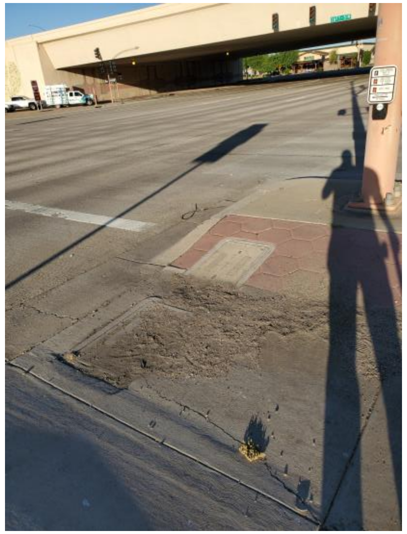

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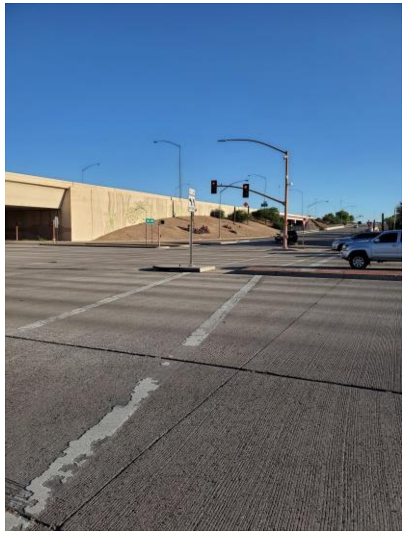

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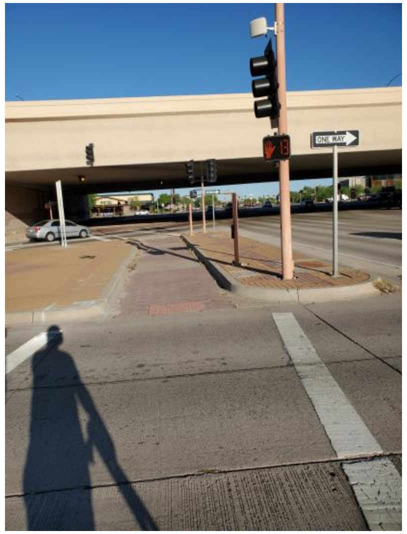

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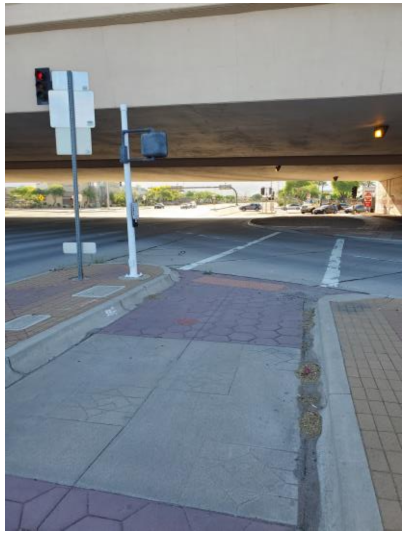

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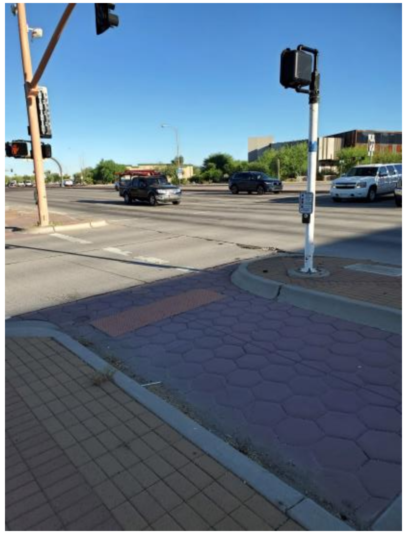

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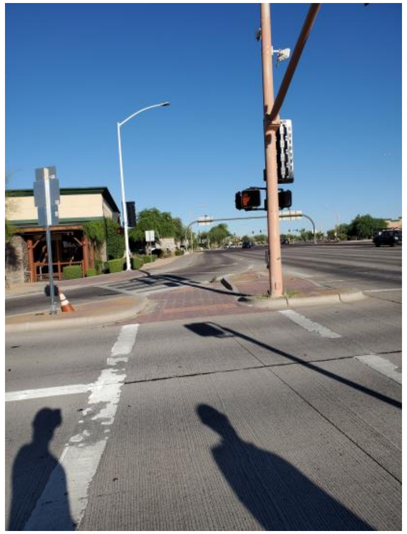
Pedestrian Island Crossings



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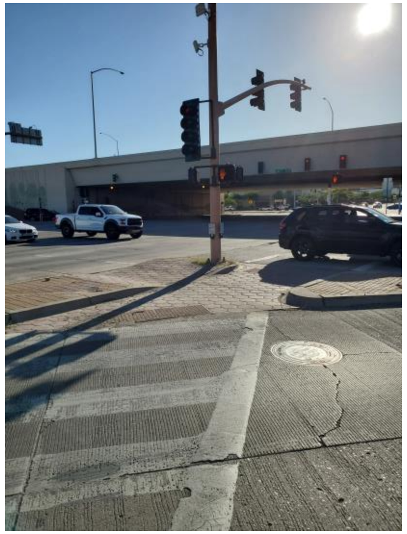

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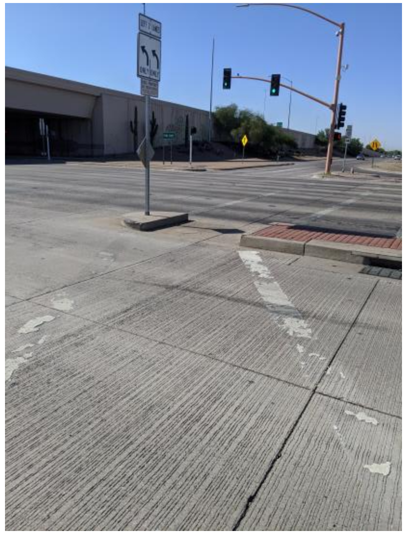

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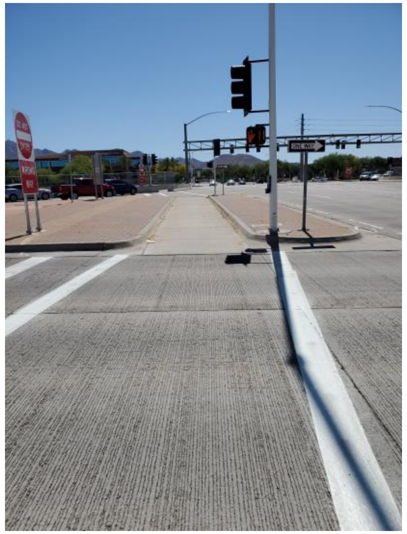

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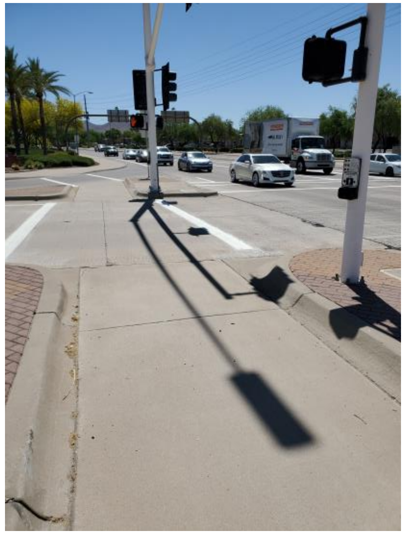

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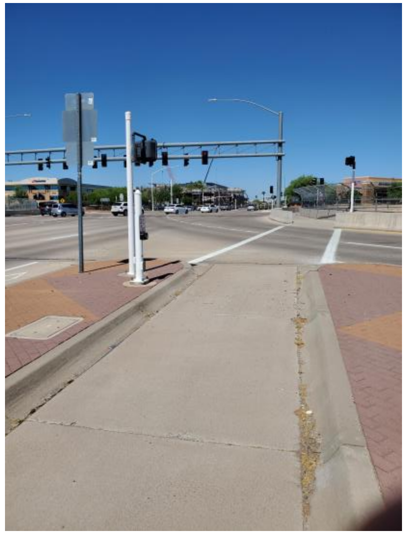

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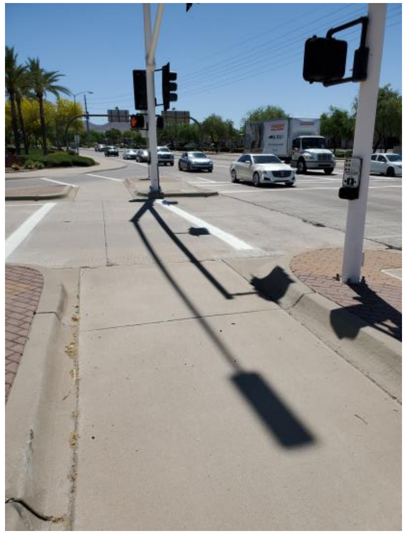

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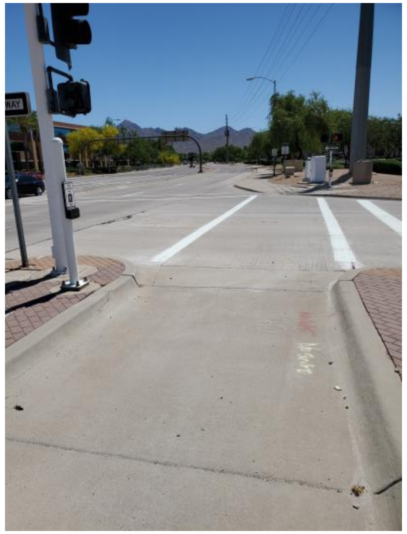

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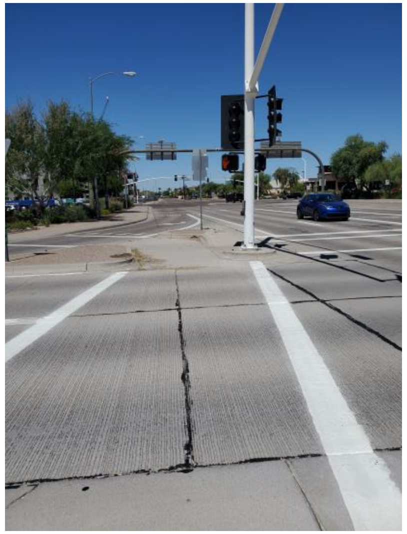

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Pedestrian Island Crossings

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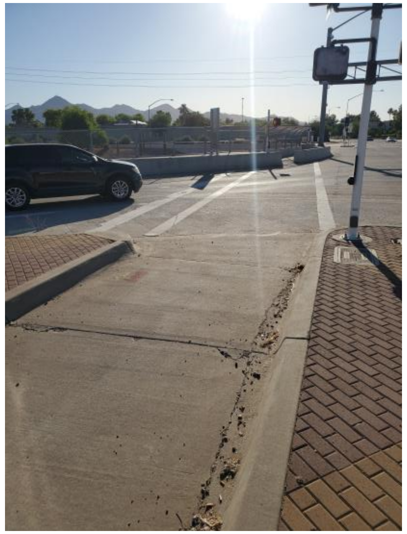

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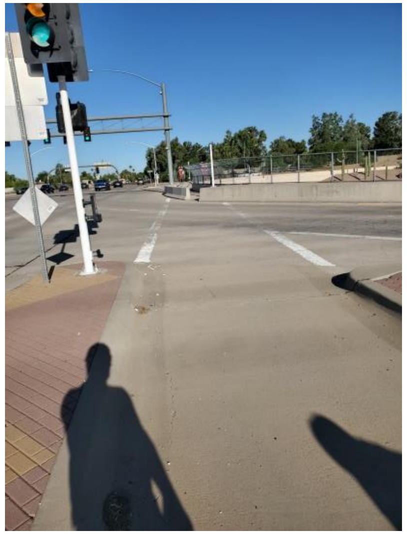

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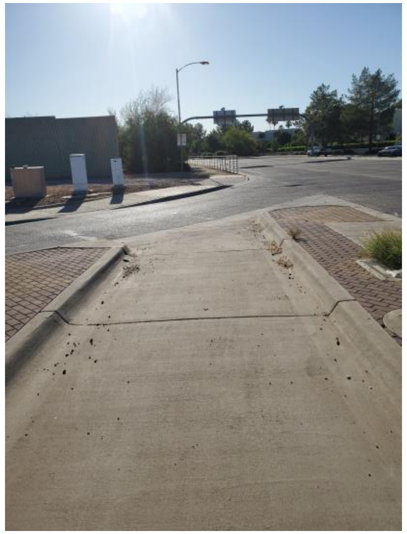

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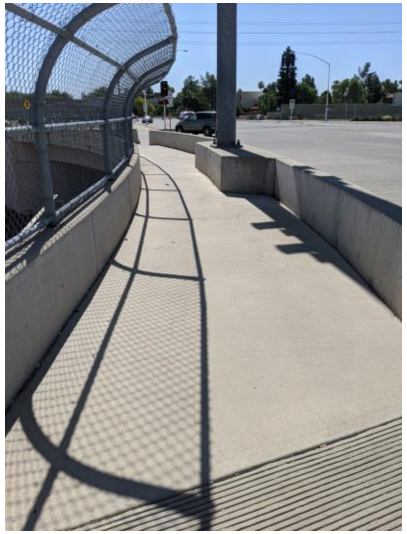

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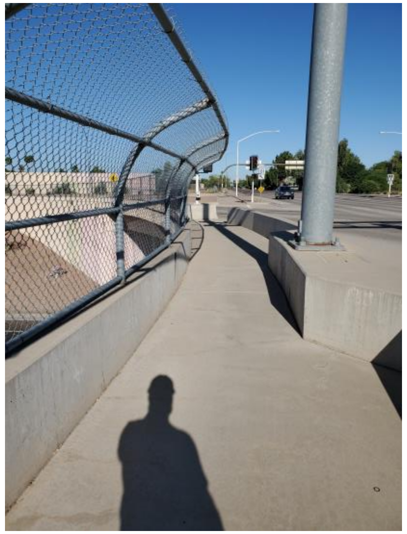

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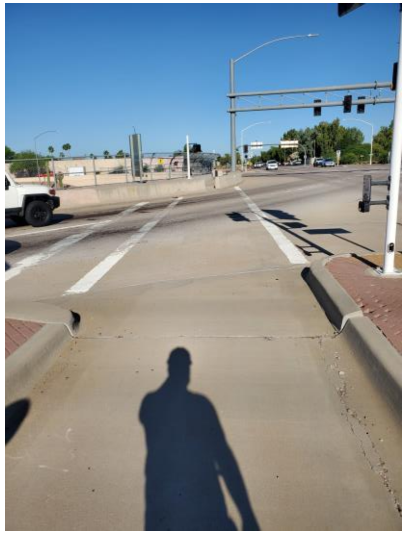

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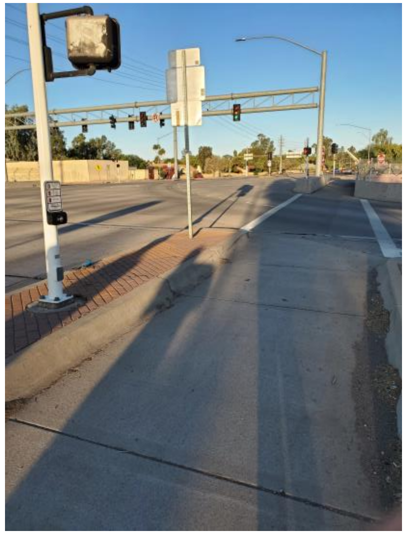

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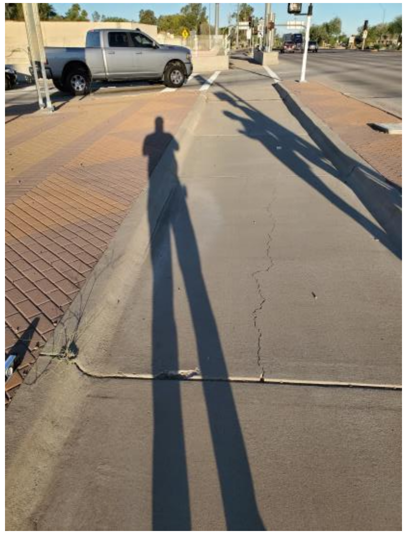

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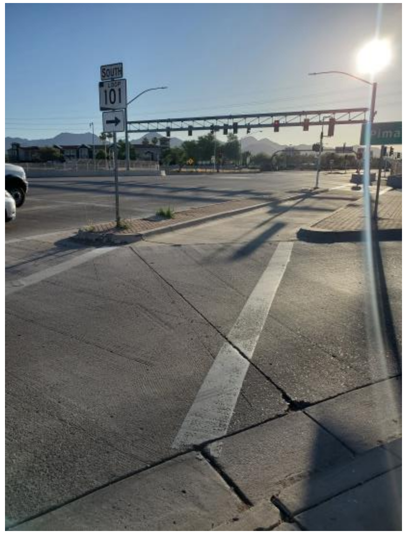

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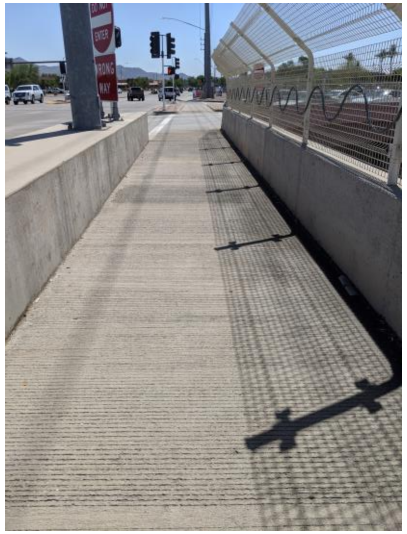

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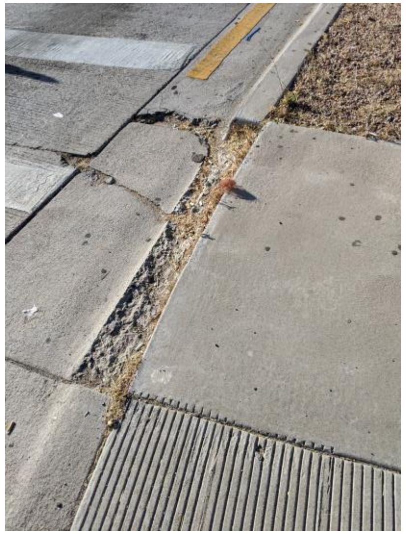


1390839

Obstructions


1390739


1390740


1390734

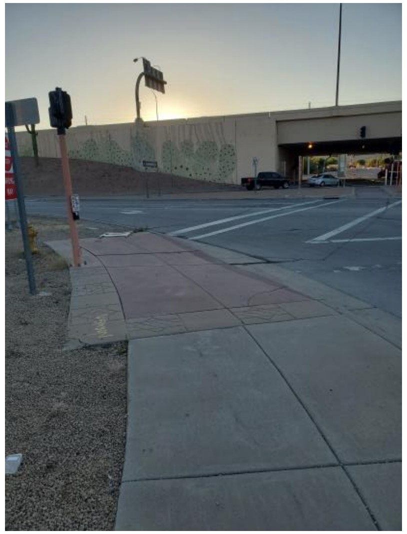

1390735

Obstructions

XXOB01

XXOB02

XXOB03



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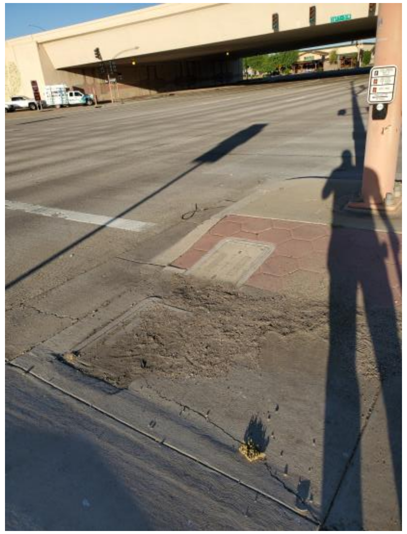

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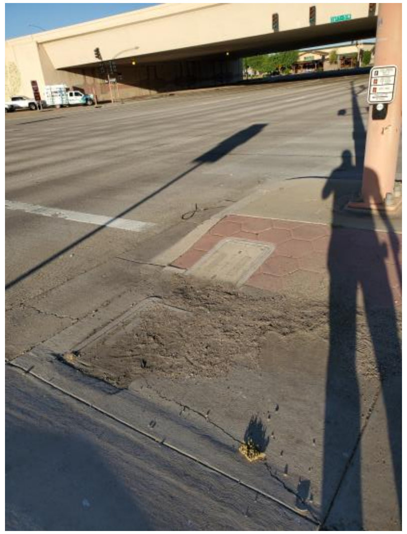

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XXOB05

XXOB06

Obstructions

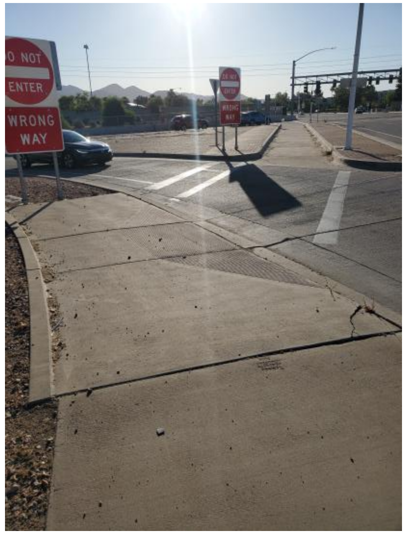
XXOB07

1390817

XXOB08

XXOB09-1

XXOB09-2



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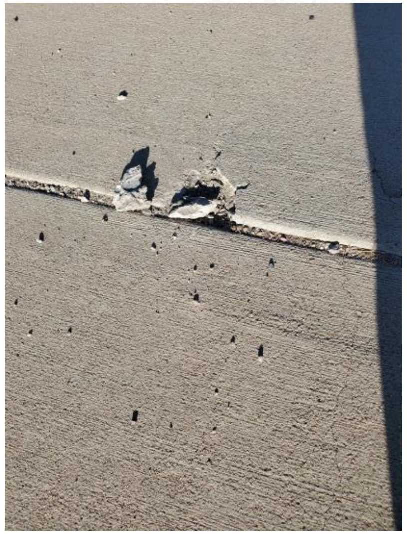

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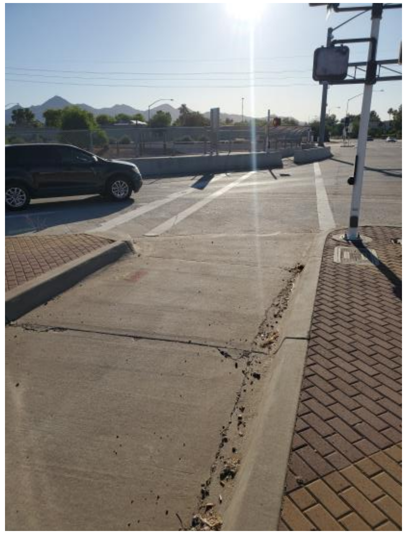

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Obstructions

XXOB13

XXOB14

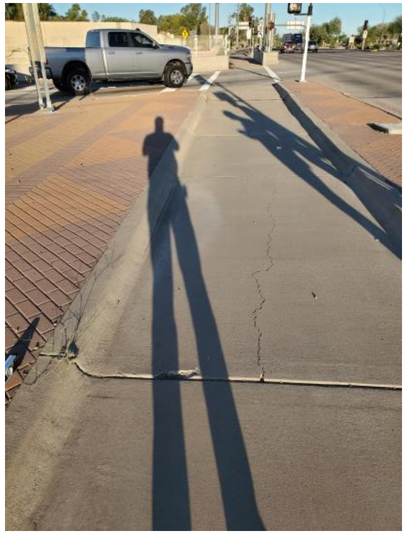
XXOB15

XXOB16

XXOB17

1394677

XXOB18



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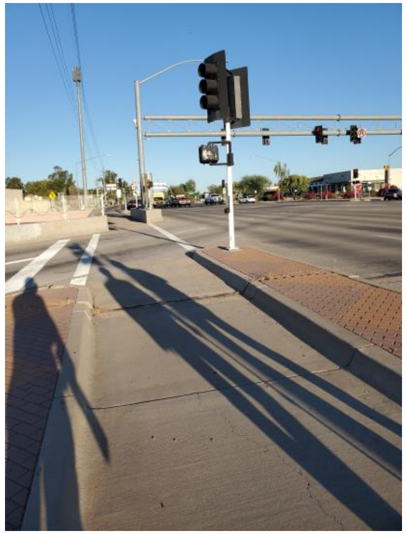

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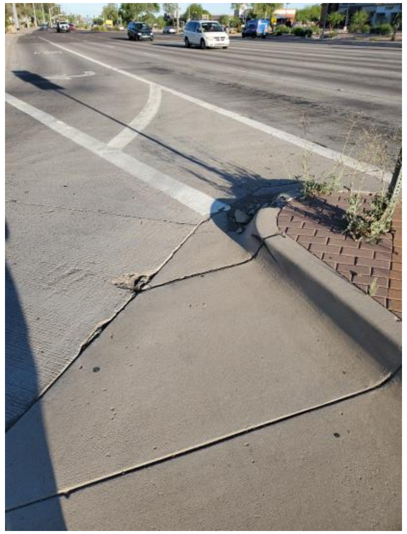

XXOB21

1394665

APPENDIX G: Irrigation System Component Replacements

CONTROLLER DESCRIPTION	ADOT A1
LOCATION	SW Corner of SR 101L/Bell Road
WATER METER	8749 E. Bell Rd.
POWER METER	16700 N. Pima Rd.
SALVAGE EXISTING AND REPLACE WITH NEW OF THE FOLLOWING:	IRRInet ACE3600, 32-Station Controller Unit
	Controller Cabinet
	Data Industrial 250 In-Line Flow Sensor with 1-1/2" Brass Tee
	Data Industrial Series 5000 Flow Monitor
	Morrill Industries 2” Stainless Steel Screen Filter with Flush Valve
	Pressure Transducer
	ACR Antenna 800 MHz YAGI
ADDITIONAL WORK ITEMS	2" Full Port Brass Ball Valve before Master Valve
	Provide fiber connection from the ADOT FMS trunk line to irrigation controller cabinet. This work will include a new 2” conduit, which will run from the ADOT FMS trunk to a No. 7 pull box directly adjacent to the enclosure. All work will be completed per ADOT ITS standards for fiber optic cable installations.
	Add shade fabric on all sides of enclosure (excluding gate side/wall side) from top rail to 30” above concrete slab
	Repaint fence enclosure ADOT Tan
NOTES	Protect existing hose bib in place
	No replacement needed for roof fabric

CONTROLLER DESCRIPTION	ADOT A2
LOCATION	SW Corner of SR 101L/Frank Lloyd Wright
WATER METER	15648 N. Pima Rd.
POWER METER	15658 N. Pima Rd.
SALVAGE EXISTING AND REPLACE WITH NEW OF THE FOLLOWING:	IRRInet ACE3600, 32-Station Controller Unit
	Controller Cabinet
	Data Industrial 250 In-Line Flow Sensor with 1-1/2" Brass Tee
	Data Industrial Series 5000 Flow Monitor
	Morrill Industries 2” Stainless Steel Screen Filter with Flush Valve
	Pressure Transducer
	ACR Antenna 800 MHz YAGI
ADDITIONAL WORK ITEMS	2" Full Port Brass Ball Valve before Master Valve
	Provide fiber connection from the ADOT FMS trunk line to irrigation controller cabinet. This work will include a new 2” conduit, which will run from the ADOT FMS trunk to a No. 7 pull box directly adjacent to the enclosure. All work will be completed per ADOT ITS standards for fiber optic cable installations.
	Add shade fabric on all sides of enclosure (excluding gate side/wall side) from top rail to 30” above concrete slab
	Repaint fence enclosure brown to match existing Repaint half block wall ADOT Tan
NOTES	Protect existing hose bib in place
	No replacement needed for roof fabric

CONTROLLER DESCRIPTION	ADOT A3
LOCATION	NE Corner of SR 101L/Thunderbird Rd.
WATER METER	8802 E. Thunderbird Rd.
POWER METER	8808 E. Thunderbird Rd.
SALVAGE EXISTING AND REPLACE WITH NEW OF THE FOLLOWING:	IRRInet ACE3600, 32-Station Controller Unit
	Controller Cabinet
	Data Industrial 250 In-Line Flow Sensor with 1-1/2" Brass Tee
	Data Industrial Series 5000 Flow Monitor
	Morrill Industries 2” Stainless Steel Screen Filter with Flush Valve
	Pressure Transducer
	ACR Antenna 800 MHz YAGI
ADDITIONAL WORK ITEMS	2" Full Port Brass Ball Valve before Master Valve
	Provide fiber connection from the ADOT FMS trunk line to irrigation controller cabinet. This work will include a new 2” conduit, which will run from the ADOT FMS trunk to a No. 7 pull box directly adjacent to the enclosure. All work will be completed per ADOT ITS standards for fiber optic cable installations.
	Replace existing roof fabric and cable
	Add shade fabric on all sides of enclosure (excluding gate side/wall side) from top rail to 30” above concrete slab
	Repaint fence enclosure ADOT Tan
NOTES	Protect existing hose bib in place

CONTROLLER DESCRIPTION	ADOT A4
LOCATION	NE Corner of SR 101L/Cactus Rd.
WATER METER	8808 E. Cactus Rd.
POWER METER	12235 N. Pima Rd.
SALVAGE EXISTING AND	IRRInet ACE3600, 32-Station Controller Unit
	Controller Cabinet
	Data Industrial 250 In-Line Flow Sensor with 1-1/2" Brass Tee
	Morrill Industries 2” Stainless Steel Screen Filter with Flush Valve
	Pressure Transducer
	ACR Antenna 800 MHz YAGI
ADDITIONAL WORK ITEMS	2" Full Port Brass Ball Valve before Master Valve
	Provide fiber connection from the ADOT FMS trunk line to irrigation controller cabinet. This work will include a new 2” conduit, which will run from the ADOT FMS trunk to a No. 7 pull box directly adjacent to the enclosure. All work will be completed per ADOT ITS standards for fiber optic cable installations.
	Shade fabric on all sides of enclosure (excluding gate side/wall side) from top rail to 30” above concrete slab
	Repaint fence enclosure ADOT Tan
NOTES	Protect existing hose bib in place
	No replacement needed for roof fabric

CONTROLLER DESCRIPTION	ADOT A5
LOCATION	NW Corner of SR 101L/Shea Blvd.
WATER METER	8790 E. Shea Blvd.
POWER METER	8782 E. Shea Blvd.
SALVAGE EXISTING AND	IRRInet-M, 16-Station Controller Unit
	Controller Cabinet
	Data Industrial 250 In-Line Flow Sensor with 1-1/2" Brass Tee
	Morrill Industries 2” Stainless Steel Screen Filter with Flush Valve
	Pressure Transducer
	SR Antenna 400 MHz YAGI with 18”-36” mast
ADDITIONAL WORK ITEMS	2" Full Port Brass Ball Valve before Master Valve
	Provide fiber connection from the ADOT FMS trunk line to irrigation controller cabinet. This work will include a new 2” conduit, which will run from the ADOT FMS trunk to a No. 7 pull box directly adjacent to the enclosure. All work will be completed per ADOT ITS standards for fiber optic cable installations.
	Replace existing roof fabric and cable
	Add shade fabric on all sides of enclosure (excluding gate side/wall side) from top rail to 30” above concrete slab
	Repaint fence enclosure ADOT Tan
NOTES	Protect existing hose bib in place

APPENDIX H: Certification Letter for Granite Mulch

CERTIFICATION FOR PROPRIETARY-MATERIAL USE, ESSENTIAL FOR SYNCHRONIZATION

TO: Mr. Michael DenBleyker, PE, Assistant State Engineer

FROM: Mr. E. Leroy Brady, PLA, FASLA, Manager and Chief Landscape Architect elb 9-29-2020

CC: Tafwachi Katapa, Project Manager

DATE: September 25, 2020

Project No.: 101 MA 036 F0123 01D
Federail Aid No.: 101-B(210)T
Pima Freeway (SR 101L): Princess Drive to Shea Boulevard
General Purpose Lanes

PROJECT DESCRIPTION: This project is located in ADOT's Central District within the City of Scottsdale, in Maricopa County, Arizona. The work will consist of adding one general-purpose lane in both the northbound and southbound directions through outside widening on the SR 101L Pima Freeway from Princess Drive (Milepost 36.50) to the Shea Boulevard (Milepost 41.20). Additional construction would include:

- Widening the Pima Road TI Overpass (Structure No.1459 & 2656, MP 36.59);
- Widening the Bell Road TI Overpass (Structure No. 2510 & 2511, MP 37.06);
- Widening the CAP Canal Bridge (Structure No. 2506 & 2507, MP 37.66);
- Widening the Frank Lloyd Wright TI Overpass (Structure No. 2505 & 2512, MP. 37.78);
- Reconstructing the existing TI at Frank Lloyd Wright Boulevard to a Tight Diamond Interchange;
- Constructing right turns lanes at the Raintree Drive TI;
- Extending the right turn lane at Shea Blvd for the WB to NB traffic movement;
- Installing retaining walls;
- Expanding the existing storm drain pipe and inlet system;
- Removing and replacing existing guardrail, barrier, and chain link fence, as needed;
- Installing and/or upgrading Freeway Management System (FMS) facilities within the project limits, including dynamic message signs (DMS) and structures;
- Converting existing high pressure sodium (HPS) fixtures with new light-emitting diode (LED) fixtures in the SR 101L median and relocating existing light poles, as needed;
- Removing and replacing existing traffic signals throughout the project limits, as needed;
- Removing and replacing existing signs, object markers, and milepost markers;

- Painting existing infrastructure as needed and applying aesthetic treatments to new infrastructure to complement existing;
- Relocating utilities;
- Clearing and grubbing vegetation within the existing right-of-way;
- Landscaping areas disturbed by construction and controlling noxious weeds within the project limits, as needed.

FHWA OVERSIGHT: ☐ YES ☒ NO

PROPRIETARY MATERIAL:

As specified in the H4083 01C, SR 101L, Pima Rd. to Shea Blvd. project plans, completed in 2001, the original granite mulch specified for the project corridor was San Tan, 1-1/4" minus. This granite mulch material is no longer available. Alternative granite mulch materials samples have been evaluated and it is determined that Cheyenne, 1-1/4" minus, by Pioneer Landscape Centers, is the best match for use in replacing/installing granite mulch as a part of the scope of work described above.

Approval is requested for the use of this proprietary item in order to create uniformity and consistency in the ground plane of the landscape areas throughout the corridor. Additionally, a uniform and consistent granite mulch palette will be easier to maintain.

Approved: ______________________ Date: 9/30/20
Assistant State Engineer

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