State Route 89A

State Route 89 to Robert Road Transportation Study

Final Report

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CYMPO
Central Yavapai Metropolitan Planning Organization

ADOT

AECOM

Task Assignment: MPD0047-17

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ASM	Arizona State Museum
AADT	Average Annual Daily Traffic
ADT	Average Daily Traffic
ADA	Americans with Disabilities Act
ADOT	Arizona Department of Transportation
AGFD	Arizona Game and Fish Department
ALISS	Accident Location Identification Surveillance System
Appr.	Approach
ASLD	Arizona State Land Department
ADTDM	Arizona Travel Demand Model
BLM	Bureau of Land Management
CYMPO	Central Yavapai Metropolitan Planning Organization
DDI	Diverging Diamond Interchange
Dr	Drive
EB	Eastbound
FHWA	Federal Highway Administration
HCM	Highway Capacity Manual
HSIP	Highway Safety Improvement Program
LOS	Level of Service
MPD	Multimodal Planning Division
mph	Miles per hour
MTIP	Metropolitan Transportation Improvement Program
NB	Northbound
NEPA	National Environmental Policy Act
NRHP	National Register of Historic Places
NRCS	Natural Resources Conservation Service
Pkwy	Parkway
PL	Planning Funds
Rd	Road
RSA	Roadway Safety Assessment
ROW	Right-of-Way
RTP	Regional Transportation Plan
SB	Southbound
sec	Seconds
SHPO	State Historic Preservation Office
SR	State Route
STBG	Surface Transportation Block Grant Program
TAZ	Traffic Analysis Zone
TI	Traffic Interchange
US	United States
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
vpd	Vehicles per day
WB	Westbound
FY	Fiscal Year

1.0 EXECUTIVE SUMMARY

The Arizona Department of Transportation (ADOT), Central Yavapai Metropolitan Planning Organization (CYMPO), and Yavapai County contributed funding towards the State Route 89A – State Route 89 to Robert Road Transportation Study. The City of Prescott and Towns of Prescott Valley, Dewey-Humboldt, and Chino Valley are experiencing increased traffic volumes due to general growth, commuter, commercial, and recreational traffic. In an effort to plan for both current and future traffic impacts in the area, a planning study is beneficial in addressing capacity, access, safety, and operational efficiency on State Route (SR) 89A from the SR 89 Traffic Interchange (TI) to east of Robert Road.

1.1 Study Area

The study area for the SR 89A Transportation Study encompasses SR 89A from the SR 89 traffic interchange at milepost 317.3 to east of the Robert Road intersection at milepost 325 on Fain Road. The study area is shown in **Figure ES-1**.

The corridor limits include one (1) signalized intersection at Robert Road, where SR 89A continues northeast to Jerome (not included in the study limits) and Fain Road begins east of the intersection, connecting SR 89A to SR 69. Additionally, the study corridor includes five grade separated traffic interchanges (at Viewpoint Drive, Glassford Hill Road, Granite Dells Parkway, Larry Caldwell Drive, and SR 89) and one (1) un-signalized roadway connection approximately 1.25 miles west of Glassford Hill Road. The entire length of the study corridor is a four-lane divided freeway facility.

1.2 Purpose and Needs

New housing developments are underway at the Granite Dells Parkway TI, west of Glassford Hill Road (south of SR 89A), and other areas to the west of the study limits have been rezoned for commercial use. Additionally, the City of Prescott has approved the final plat for the Walden Ranch development (Phases 1A, 1B, and 2) at Larry Caldwell Drive. These factors are anticipated to escalate the congestion concerns and may contribute towards the increase in safety needs along the study corridor.

The Average Annual Daily Traffic (AADT) within the corridor is approximately 26,000 (2014), which (prior to the aforementioned developments) has experienced an 8% per year increase in traffic volumes in recent years. Additional regional capacity needs have been identified in the CYMPO 2040 Regional Transportation Plan (RTP) Update, within ADOT's 2013 Corridor Location Study and Environmental Overview: I-17 to Fain Road Connector (ADOT Project # H8162), and Yavapai County's Great Western Feasibility Study.

224 total crashes have occurred in the past 5 years, between 2011 and 2015, throughout the study corridor. Seven (7) of these crashes were incapacitating and three (3) were fatal incidents. All three of the fatal incidents occurred at the Robert Road intersection on the eastern terminus of the study corridor. In 2015, ADOT performed a Roadway Safety Assessment (RSA) at this location.

1.3 Study Goals & Objectives

The primary objectives of the study are to: 1) identify the expansion needs for the corridor; 2) prioritize the needs for the short (5-year), mid (10-year), and long-term (20-year) planning horizons; and 3) scope out and prepare 15% design plans for the recommended solutions.

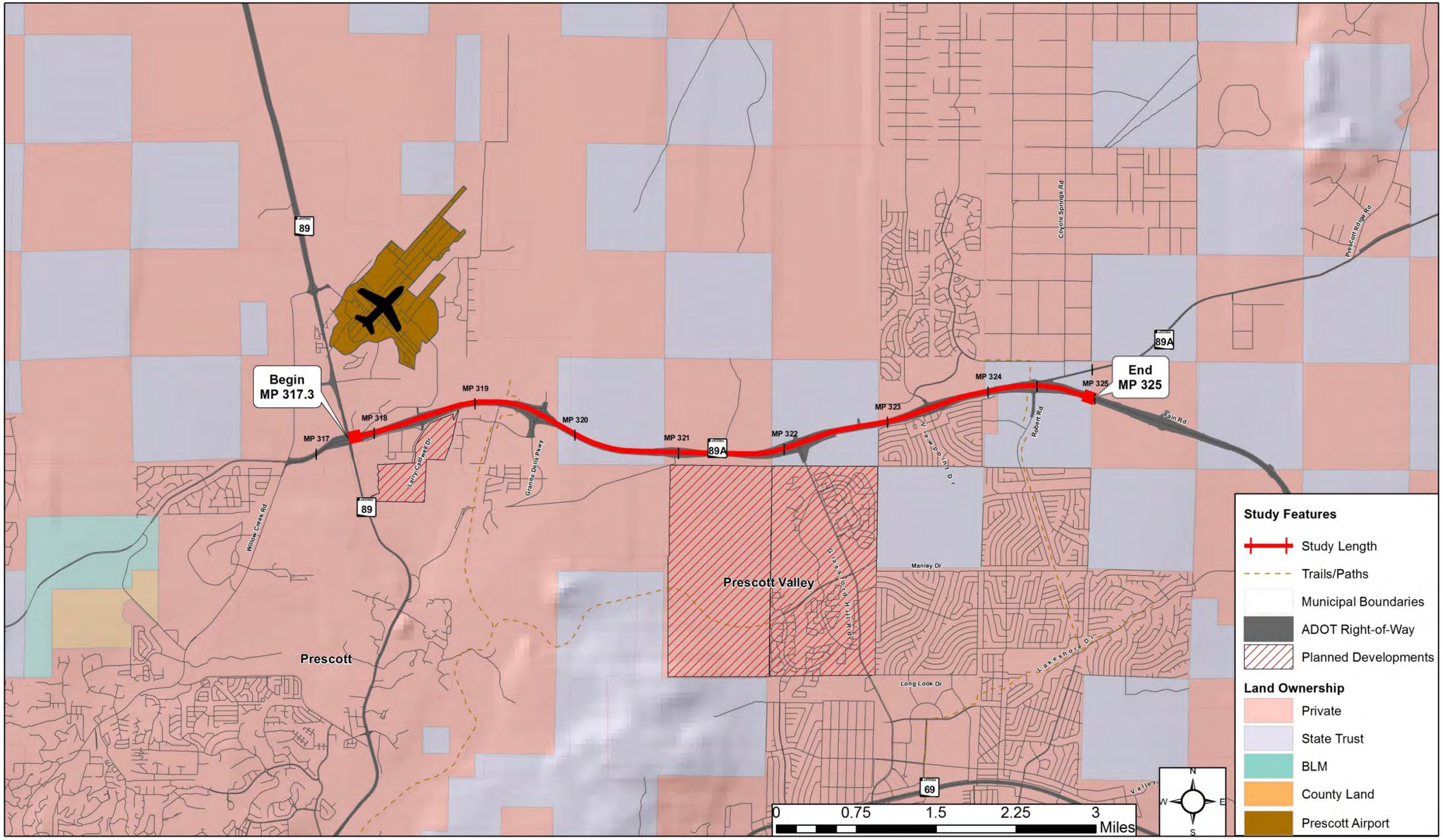
1.4 Study Process

This study was conducted within a 12 month timeframe. A Core Study Team was established, representing ADOT Multi-modal Planning Division (MPD), ADOT Northwest District, CYMPO, Yavapai County, City of Prescott, and Town of Prescott Valley officials to closely coordinate throughout the development of the study deliverables.

Additionally a Stakeholder Team was established including the Study Team agencies as well as representatives from the Town of Chino Valley, Town of Dewey Humboldt, Fish and Wildlife Services, The Nature Conservatory, Arizona Game and Fish Department, Arizona Department of Public Safety, Federal Highway Administration, Arizona State Land Department, and Central Arizona Fire & Medical Authority.

The study addresses current and future conditions and drafts a plan of improvement to the study area. A public involvement meeting was hosted and summarized. The study concludes with the development and refinement of conceptual engineering plans for study area improvements.

Figure ES- 1: Study Area



1.5 Current Conditions

The SR 89A Study Area current conditions were assessed accounting for both physical attributes of the study route and features and attributes that characterize the immediate geography surrounding the study area as well as greater regional attributes for Yavapai County, City of Prescott, and Town of Prescott Valley.

1.5.1 Land Use, Socioeconomic, and Corridor Features

Land use, socioeconomic, and corridor features were each assessed. The current land ownership of the immediate corridor is primarily private ownership or part of the Arizona State Land Department State Land Trust. Additionally, a portion of adjacent land uses and zoning along the SR 89A corridor correspond to residential properties. Recent population figures indicate an increase in the regional population throughout the past five years of collected data, corresponding to continued residential development growth.

1.5.2 Roadway Features

The SR 89A is a controlled access facility with five grade separated traffic interchanges. There is a singular at-grade signalized intersection at the eastern terminus where the route intersects Robert Road and Fain Road as well as branches northbound. The typical through speed limit for the SR 89A is 65 mph. However, the speed limit is reduced to 55 mph inbound and outbound at the Robert Road intersection, including the western portion of Fain Road.

An initial quantitative assessment was completed for the corridors infrastructure condition, specifically identifying pavement ratings, bridge ratings, and vertical clearance and freight vehicle accessibility along corridor interchanges. The mainline pavement data indicates a low level of pavement distresses and/or failures and smooth pavement. Across the corridor, there are 9 bridges, including interchange bridges. Due to the more recent construction of all bridges along the study corridor, none built over 16 years prior, there are currently no bridge deficiencies present throughout the corridor length. **Figure ES-2** displays the corridor's roadway features, including turning movements, interchange control infrastructure, lane counts, and speed limits.

1.5.3 Safety Conditions

Records of traffic crashes in the study area along SR 89A were assembled from ADOT's Accident Location Identification Surveillance System (ALISS) database. Crashes were reviewed for the 5-year period from 2011 through 2015, the most recent 5-year period for which complete crash data is available. The corridor experienced 224 crashes during this period, including crashes on the mainline, ramps, and crossroads in the vicinity of the study-area interchanges.

Of the 224 crashes, three (1.3 percent) were fatal. All three fatal crashes occurred at the signalized intersection of SR 89A and Robert Road, the only at-grade signal in the study area that mainline traffic must pass through. All the fatal crashes occurred during daylight hours and in clear weather. Following are the circumstances of the three fatal crashes:

- On Tuesday, January 22, 2013, at 3:02 p.m., a 49-year-old male motorist on eastbound SR 89A failed to stop and rear-ended a vehicle at the traffic signal. In the leading vehicle, the driver and back seat passenger were injured and the front-seat passenger, a 19-year-old female, was killed.
- On Thursday, September 18, 2014, at 1:19 p.m., a 73-year-old male motorist on westbound SR 89A failed to stop and rear-ended a vehicle stopped at the traffic signal. Both occupants of the leading vehicle, a 78-year-old female and an 89-year-old male, were killed.
- On Saturday, November 14, 2015, at 4:44 p.m., a 54-year-old male motorcyclist was traveling westbound on SR 89A and failed to negotiate a slight curve, ran off the roadway to the right, and overturned, killing the rider. The motorist had a blood-alcohol content of 0.086, exceeding the legal limit.

Statewide, an average of about 0.7% of crashes involve a fatality. The SR 89A corridor has a fatal rate about twice the statewide average; this rate is likely elevated because the speeds along SR 89A are considerably higher than the average of all roadways in the state.

1.5.4 Traffic Volume Collection

Volumes were collected along the SR 89A freeway, crossroads, ramps and turning movement counts were collected at the five major TI's and one at-grade intersection in the study area – SR 89, Larry Caldwell Road, Granite Dells Parkway, Glassford Hill Road, Viewpoint Drive, and Robert Road/Fain Road – during both AM and PM peak hours. All traffic volumes used were balanced volumes which take in to account the method of data collect, and eliminate the traffic dissipated from the network between intersections, representing balance traffic conditions.

The average daily traffic (ADT) on SR 89A ranges from above 40,000 vehicles per day (vpd) per direction between Granite Dells Parkway and Glassford Hill Road to approximately 21,000 vpd per direction between Viewpoint Drive and Robert Road. Glassford Hill Road south of SR 89A has the highest cross street volume at approximately 25,000 vpd. Specific traffic volumes throughout the corridor are displayed in **Figure ES-3**.

Figure ES- 2: Roadway Features

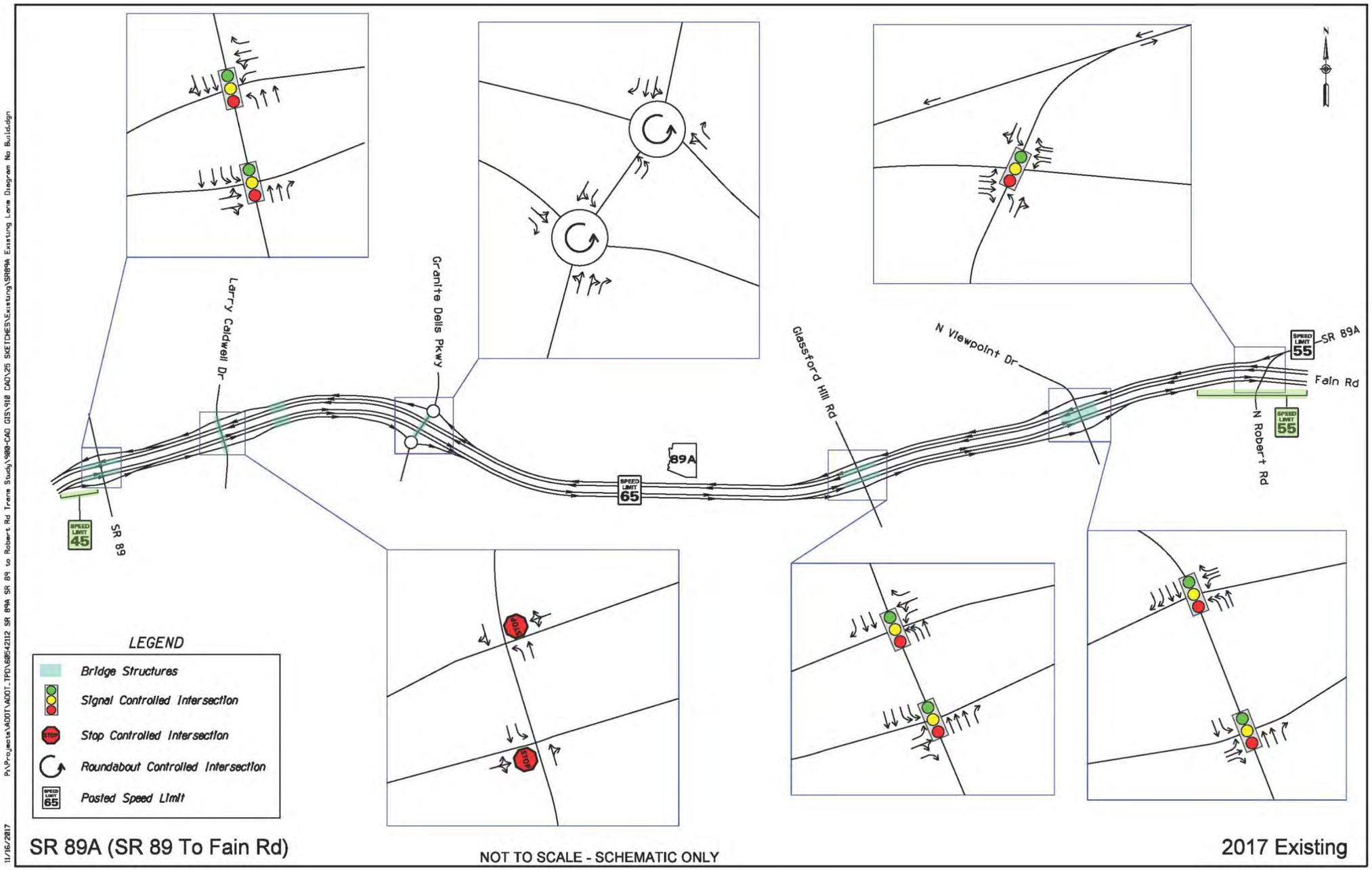
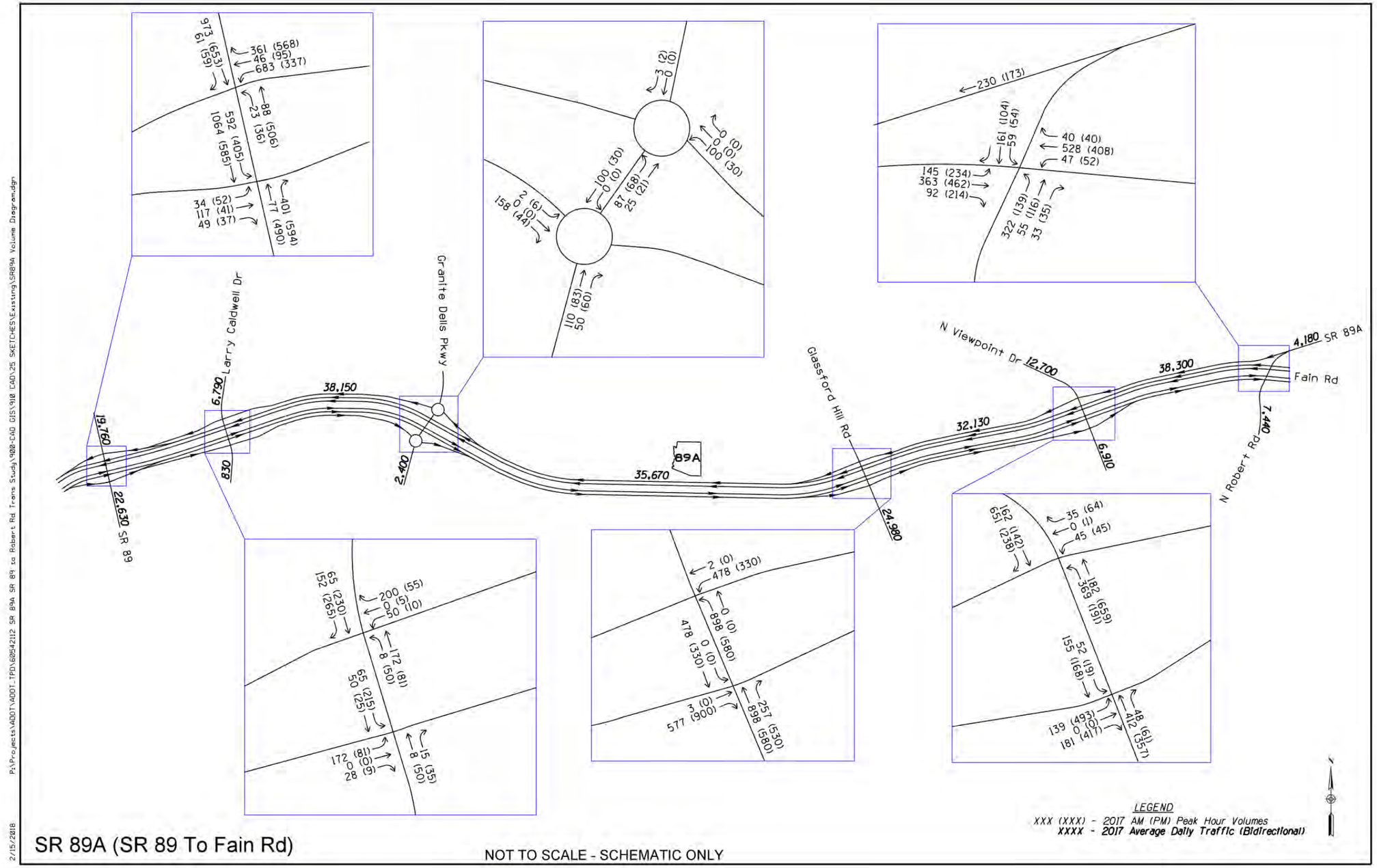


Figure ES- 3: Intersection Turning Movement Volumes



1.5.5 Environmental Overview

An environmental overview of the project area and surrounding area was conducted along SR 89A. The objective of the environmental overview is to describe the social, economic, and environmental character of the study area; to identify potential "fatal flaws", obstacles, issues associated with the study area; and to evaluate the study area alternatives.

Improvements along SR 89A would occur primarily within the existing ROW; however, some additional new ROW and/or TCEs may be required. Because the improvements would be within an existing corridor and primarily within the existing ROW, there would be minimal impact to vegetation, wildlife, or wildlife movement. Coordination with AGFD on impacts to pronghorn habitat and populations will be a likely requirement.

Road improvements that would impact Granite Creek would likely require permitting and water quality certification under Sections 404 and 401 of the Clean Water Act.

A noise impact assessment will be required for road improvements occurring in proximity to noise sensitive receptors such as residences or parks.

A Section 4(f) evaluation will be required for any road improvements that impact the recreational trails that cross SR 89A (e.g., the Peavine Trail in Prescott and the proposed trail at Robert Road), or the three cultural resources sites eligible under for listing on the NRHP under criterion A (the two irrigation canals and the Peavine Railroad alignment). Improvements affecting the Peavine Trail or the proposed trail at Robert Road, if it is constructed prior to road improvements, may require a temporary occupancy agreement with the managing jurisdiction.

Improvements could impact cultural resources requiring mitigation. This could entail conducting additional field investigations and data recovery prior to construction.

Road improvements could result in potential noise impacts to existing residential communities or any new developments that are constructed prior to road improvements. These would require a noise impact assessment and possible mitigation.

A utility survey will be conducted during final design. Utility relocations would require environmental clearance prior to relocation.

1.6 Future Conditions

1.6.1 Future Population & Development

The population of the study area's surrounding regions is expected to significantly increase in the next two decades. The Arizona State Demographer's Office projects the most significant increase in population within Yavapai County to occur in the Town of Prescott Valley, with a projected 55% increase in population between the 2010 Census and 2040.The City of Prescott is expected to experience a more modest, yet notable population increase of 13% across this time span as well.

Various housing developments and master planned communities are under development or are projecting development along the study corridor and adjacent routes within the Town of Prescott Valley and City of Prescott.

1.6.2 Future Population & Development

The following roadway improvements are identified in the most recent ADOT 5-Year Construction Program and the CYMPO MTIP

<u>ADOT 5-Year Construction Program (FY 2018-2022)</u>

There are currently no projects programmed for the SR 89A within the study limits. The SR 89, Junction SR 89A to Deep Well Ranch Road construction project was identified in the FY 2017-2021 5-Year Construction Program.

<u>CYMPO MTIP</u>

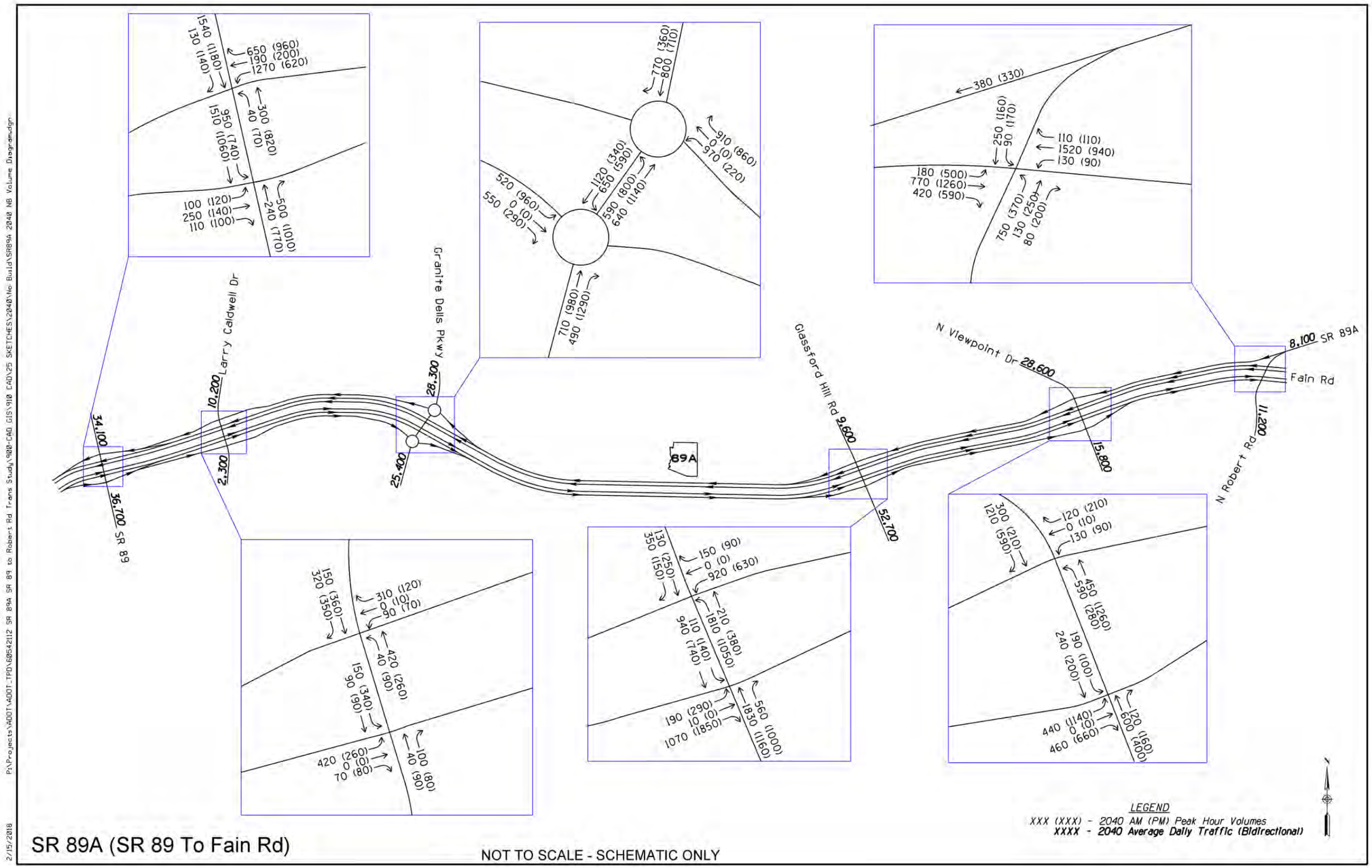
- SR 89 – Jct SR 89A to Deep Well Ranch Road – Construct 2 new lanes on SR 89 (construction funding FY 17/18)
- SR 89A / Robert Road Traffic Interchange – Construct Traffic Interchange (Design funding FY 21)

The SR 89, Junction SR 89A to Deep Well Ranch Road construction project includes an adjustment on the lane configuration at the SR 89 and SR 89A TI within the SR 89A study area.

1.6.3 Future Traffic Volumes

The traffic volume projections were received from the AZTDM were post-processed in accordance with accepted procedures. Growth rates between the existing and future AZTDM model were calculated for each roadway and applied to the 2017 existing volumes. Existing turning movement percentages, peak hour to ADT ratios (k-values) and directional distributions (D-values) were calculated from the existing traffic counts and the average percentages and k values were applied to the future projected post processed ADT volumes. **Figure 22** displays the redistributed, projected, and balanced 2040 No-Build AM peak hour, PM peak hour volumes and turning movements.

Figure ES- 4: 2040 No-Build Intersection Turning Movement Volumes



1.7 Level of Service

Mainline and intersection projected volumes for Year 2025, 2030 and 2035 were developed by using a linear growth rate between the 2017 existing and post-processed Year 2040 volumes. Balanced volumes were developed for each year within the corridor by following a similar methodology that was used to develop AM and PM peak hour 2040 volumes. It was assumed that the fourth leg of Glassford Hill Road traffic interchange would be expanded and utilized by additional development to the north by the Year 2030.

An operational analysis was performed for the mainline including the general-purpose lanes, ramp junctions, and weave sections for the existing and no-build conditions for each of the horizon years. Intersection analysis was also performed for the study intersections including the five TI's and one at-grade signalized intersection. **Table ES-1** and **Table ES-2** include the anticipated No-Build Year 2025, 2030, and 2035 LOS results during the AM and PM Peak Hours for the intersections, respectively. **Table ES-3** include the anticipated No-Build Year 2025, 2030, and 2035 LOS results during the AM and PM Peak Hours for the mainline.

The following summarizes the results of each facility over time:

SR 89A Eastbound Mainline – In the AM peak hour, the eastbound mainline continues to function at LOS D or better until 2040. By 2040, congestion at the Granite Dells intersection causes the mainline to operate at LOS F between SR 89 and Granite Dells. In the PM peak hour, congestion at the Viewpoint Drive intersection causes the mainline between Glassford Hill Road and Viewpoint Drive to operate at LOS F by Year 2030. By Year 2040, this congestion is compounded by congestion at the Glassford Hill Road and Granite Dells interchanges, causing the eastbound mainline to operate at LOS E or F between Viewpoint Drive and Granite Dells, and between Granite Dells and SR 89.

SR 89A Westbound Mainline – In the AM peak hour, congestion at SR 89 causes the westbound mainline to operate at LOS F between SR 89 and Larry Caldwell Drive by Year 2025. This congestion continues to worsen until by Year 2035 the mainline is operating at LOS F between SR 89 and Glassford Hill Road. In the PM peak hour, the westbound mainline continues to operate at LOS D or better through Year 2040.

SR 89 Traffic Interchange – The signalized intersection of SR 89A Ramps and SR 89 begins to degrade in the AM peak hour by Year 2035. By Year 2035 one approach is operating at LOS E and by Year 2040, two approaches. In the PM peak hour, one approach of this interchange begins to operate at LOS E by Year 2025. By Year 2030, the overall intersection operates at LOS E, and by Year 2040 at LOS F.

Larry Caldwell Drive Traffic Interchange – The stop-controlled intersection of SR 89A Ramps and Larry Caldwell Drive operates at LOS B or better, with every approach operating at LOS D or better through Year 2040 in both the AM and PM peak hours.

Granite Dells Parkway Traffic Interchange –The roundabout intersections of SR 89A Ramps and Granite Dells Parkway in the AM peak hour degrades to LOS 'F' on three approaches and LOS 'F' overall by Year 2040. In the PM peak hour, the eastbound approach degrades to LOS 'F' and the northbound approach to LOS 'E' by Year 2040.

Glassford Hill Road Traffic Interchange – The signalized intersection of SR 89A Ramps and Glassford Hill Road operates in the AM peak hour at LOS E by Year 2025, and degrades to LOS F by Year 2030. The same is true in the PM peak hour, with the overall intersection operating at LOS E by Year 2025 and LOS F by Year 2030.

Viewpoint Drive Traffic Interchange – In the AM peak hour, the signalized intersection of SR 89A and Viewpoint Drive operates at LOS D or better at every approach and overall through Year 2040. In the PM peak hour, the overall intersection maintains LOS D or better through Year 2040, but the eastbound approach operates at LOS E by Year 2030 and LOS F by Year 2035.

Robert Road/Fain Road Intersection – The signalized intersection of SR 89A, Fain Road, and Robert Road is the only at-grade intersection with the SR 89A mainline in the corridor. In the AM peak hour, the northbound approach to this intersection operates at LOS E by Year 2025 and LOS F by Year 2030. The overall intersection operates at LOS E by Year 2035 and LOS F by Year 2040. In the PM peak hour, the northbound approach operates at LOS F by Year 2030. The overall intersection operates at LOS E by Year 2040.

1.8 Corridor Needs

Based upon the current pavement and bridge conditions, historical safety incidents, and current and future mobility and freight levels of service and accommodations, the following corridor needs were identified:

- There are no pavement needs identified throughout the corridor
- There are no bridge needs identified along any bridge structure within the corridor
- There is a safety need identified along the entire corridor
    - The SR 89A corridor has an above average total crash rate
    - The Robert Road intersection has experienced multiple fatality resulting incidents
- Increasing future traffic volumes due to continued development of the corridor area has led to emerging mobility concerns along the corridor.
    - Additions to roadway capacity will need to be considered in future roadway improvements
    - Future roadway improvements should take freight and oversized load freight into consideration in the development of future roadway geometries.

Table ES- 1: AM Peak Hour No-Build Comparison Intersection LOS Results

Intersection Location	Intersection Approach	2017 AM Existing		2025 AM No-Build		2030 AM No-Build		2035 AM No-Build		2040 AM No-Build	
		Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay
SR 89A and SR 89 TI (signalized)	EB SR 89A Off Ramp	D (39)	C (31.7)	D (53)	D (43.2)	D (53)	D (42.3)	**E (55)**	D (46.4)	**E (75)**	D (54.5)
	WB SR 89A Off Ramp	C (32)		D (44)		D (37)		D (40)		D (40)	
	NB SR 89	C (25)		D (37)		D (37)		D (40)		D (51)	
	SB SR 89	C (33)		D (43)		D (47)		D (53)		**E (64)**	
SR 89A and Larry Caldwell Dr. TI (unsignalized)	EB SR 89A Frontage Road	B (14)	A (8)	B (18)	A (9.2)	C (21)	B (11.5)	C (25)	B (13.1)	D (38)	B (17.4)
	WB SR 89A Off Ramp	A (9)		B (11)		B (17)		C (21)		C (22)	
	NB Larry Caldwell Dr	A (1)		A (1)		A (2)		A (2)		A (2)	
	SB Larry Caldwell Dr	A (0)		A (1)		A (1)		A (1)		A (1)	
SR 89A and Granite Dells Pkwy TI (roundabout)	EB SR 89A Off Ramp	A (0)	A (0.6)	A (7)	A (4.9)	A (7)	A (6.1)	B (11)	D (49.3)	**F (101)**	**F (297.6)**
	WB SR 89A Off Ramp	A (1)		A (5)		A (7)		B (13)		**F (164)**	
	NB Granite Dells Pkwy	A (0)		A (3)		A (3)		A (4)		A (6)	
	SB Granite Dells Pkwy	A (1)		A (5)		A (7)		**F (148)**		**F (815)**	
SR 89A and Glassford Hill Rd. TI (signalized)	EB SR 89A Off Ramp	B (17)	C (27)	C (29)	**E (57.5)**	C (31)	**F (141.0)**	C (33)	**F (144.0)**	C (34)	**F (179.4)**
	WB SR 89A Off Ramp	D (45)		**E (55)**		**E (58)**		**E (67)**		**F (85)**	
	NB Glassford Hill Rd	C (24)		**E (73)**		**F (277)**		**F (303)**		**F (363)**	
	SB Glassford Hill Rd	N/A		N/A		D (38)		D (42)		**F (167)**	
SR 89A and Viewpoint Dr. TI (signalized)	EB SR 89A Off Ramp	B (12)	B (13)	B (17)	B (19.2)	C (21)	C (24.0)	C (26)	C (33.4)	C (23)	C (34.6)
	WB SR 89A Off Ramp	C (24)		C (31)		D (36)		D (41)		D (38)	
	NB Viewpoint Dr	B (20)		C (31)		D (37)		D (46)		D (43)	
	SB Viewpoint Dr	A (8)		B (13)		B (18)		C (30)		D (35)	
SR 89A and Robert Road (signalized)	EB SR 89A	C (22)	C (23.5)	C (28)	D (35.5)	C (28)	D (50.3)	C (28)	**E (59.2)**	C (28)	**F (90.9)**
	WB Fain Rd	C (27)		D (36)		D (38)		**E (61)**		**F (143)**	
	NB Robert Rd	C (26)		**E (61)**		**F (135)**		**F (145)**		**F (142)**	
	SB SR 89A	B (18)		B (20)		C (22)		C (27)		C (28)	

Table ES- 2: PM Peak Hour No-Build Comparison Intersection LOS Results

Intersection Location	Intersection Approach	2017 PM Existing		2025 PM No-Build		2030 PM No-Build		2035 PM No-Build		2040 PM No-Build	
		Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay
SR 89A and SR 89 TI (signalized)	EB SR 89A Off Ramp	D (42)	C (25.4)	**E (74)**	D (47.9)	**E (64)**	**E (61.7)**	**F (87)**	**E (71.7)**	**F (155)**	**F (81.0)**
	WB SR 89A Off Ramp	C (27)		D (45)		**F (80)**		**F (82)**		**F (82)**	
	NB SR 89	C (22)		D (52)		**E (64)**		**F (87)**		**F (99)**	
	SB SR 89	C (25)		D (38)		C (34)		D (35)		D (43)	
SR 89A and Larry Caldwell Dr. TI (unsignalized)	EB SR 89A Frontage Road	A (9)	A (2.5)	B (11)	A (3.8)	B (12)	A (4.7)	B (14)	A (5.3)	A (14)	A (5.1)
	WB SR 89A Off Ramp	A (7)		A (7)		A (8)		A (8)		A (8)	
	NB Larry Caldwell Dr	A (1)		A (2)		A (2)		A (2)		A (3)	
	SB Larry Caldwell Dr	A (1)		A (1)		A (1)		A (1)		A (2)	
SR 89A and Granite Dells Pkwy TI (roundabout)	EB SR 89A Off Ramp	A (0)	A (0.4)	A (5)	A (4.2)	A (7)	A (5.6)	B (18)	A (9.5)	**F (89)**	D (46.0)
	WB SR 89A Off Ramp	A (1)		A (4)		A (5)		A (7)		A (7)	
	NB Granite Dells Pkwy	A (0)		A (3)		A (4)		A (6)		**E (58)**	
	SB Granite Dells Pkwy	A (0)		A (5)		A (7)		A (8)		A (9)	
SR 89A and Glassford Hill Rd. TI (signalized)	EB SR 89A Off Ramp	C (22)	C (25.4)	**F (119)**	**E (62.3)**	D (48)	**F (80.5)**	**E (69)**	**F (191.5)**	D (48)	**F (150.9)**
	WB SR 89A Off Ramp	D (53)		**E (57)**		**E (73)**		**E (76)**		**E (66)**	
	NB Glassford Hill Rd	B (20)		C (26)		**F (117)**		**F (274)**		**F (337)**	
	SB Glassford Hill Rd	N/A		N/A		**E (58)**		**E (64)**		**E (61)**	
SR 89A and Viewpoint Dr. TI (signalized)	EB SR 89A Off Ramp	B (15)	B (17.1)	D (46)	D (35.9)	**E (75)**	D (47.9)	**F (84)**	D (49.7)	**F (82)**	D (48.2)
	WB SR 89A Off Ramp	C (32)		D (39)		D (38)		D (40)		D (37)	
	NB Viewpoint Dr	C (22)		C (31)		C (34)		D (36)		D (35)	
	SB Viewpoint Dr	B (12)		B (16)		B (17)		B (18)		B (17)	
SR 89A and Robert Road (signalized)	EB SR 89A	C (21)	C (23.1)	C (27)	C (29.1)	C (32)	D (39.6)	C (32)	D (54.2)	D (39)	**E (56.5)**
	WB Fain Rd	C (27)		C (33)		C (33)		C (33)		D (38)	
	NB Robert Rd	C (29)		D (42)		**F (83)**		**F (164)**		**F (171)**	
	SB SR 89A	B (18)		B (17)		B (19)		C (20)		C (21)	

Table ES- 3: AM & PM Peak Hour No-Build Comparison SR 89A Mainline LOS Results

Segment Description	AM Peak Hour										PM Peak Hour									
	2017 Existing		2025 No-Build		2030 No-Build		2035 No-Build		2040 No-Build		2017 Existing		2025 No-Build		2030 No-Build		2035 No-Build		2040 No-Build	
	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS
Eastbound/Northbound SR 89A																				
Project Limit to SR 89 EB Exit Ramp	8	A	9	A	12	B	13	B	16	B	12	B	18	C	23	C	26	D	42	D
SR 89 EB Exit Ramp to SR 89 EB Entr Ramp	5	A	5	A	7	A	8	A	11	A	9	A	13	B	18	C	19	C	21	C
SR 89 EB Entrance Ramp to Larry Caldwell EB Entr Ramp	9	A	11	B	13	B	14	B	**72**	**F**	14	B	19	C	24	C	26	C	**40**	**E**
Larry Caldwell EB Entr Ramp to Granite Dells EB Exit Ramp	6	A	8	A	10	A	11	B	**108**	**F**	11	B	15	B	20	C	26	C	**57**	**F**
Granite Dells EB Exit Ramp to Granite Dells EB Entr Ramp	8	A	9	A	9	A	10	A	9	A	16	B	18	B	20	C	20	C	24	C
Granite Dells EB Entr Ramp to Glassford Hill EB Exit Ramp	9	A	13	B	15	B	17	B	16	B	16	B	22	C	26	D	34	D	**44**	**E**
Glassford Hill EB Exit Ramp to Glassford Hill EB Entr Ramp	4	A	7	A	8	A	9	A	8	A	9	A	13	B	**48**	**F**	**65**	**F**	**104**	**F**
Glassford Hill EB Entr Ramp to Viewpoint Dr EB Exit Ramp	4	A	7	A	7	A	8	A	7	A	9	A	15	B	**127**	**F**	**138**	**F**	**150**	**F**
Viewpoint Dr EB Exit Ramp to Viewpoint Dr EB Entr Ramp	4	A	5	A	5	A	6	A	6	A	6	A	9	A	8	A	8	A	10	A
Viewpoint Dr EB Entr Ramp to Robert Road Intersection	4	A	6	A	7	A	8	A	8	A	7	A	10	A	9	A	10	A	11	B
Westbound/Southbound SR 89A																				
Robert Road Intersection to Viewpoint Dr WB Exit Ramp	6	A	9	A	10	A	12	B	13	B	4	A	5	A	6	A	7	A	8	A
Viewpoint Dr WB Exit Ramp to Viewpoint Dr WB Entr Ramp	8	A	12	B	13	B	15	B	16	B	5	A	6	A	8	A	8	A	10	A
Viewpoint Dr WB Entr Ramp to Glassford Hill WB Exit Ramp	11	A	16	B	20	C	25	C	30	D	5	A	8	A	9	A	10	A	12	B
Glassford Hill WB Exit Ramp to Glassford Hill WB Entr Ramp	12	B	17	B	19	C	23	C	24	C	5	A	7	A	9	A	9	A	11	B
Glassford Hill WB Entr Ramp to Granite Dells WB Exit Ramp	19	C	26	D	31	D	**55**	**F**	**56**	**F**	10	A	14	B	16	B	17	B	18	B
Granite Dells WB Exit Ramp to Granite Dells WB Entr Ramp	18	C	22	C	**51**	**F**	**96**	**F**	**53**	**F**	10	A	11	A	11	A	10	A	11	A
Granite Dells WB Entr Ramp to Larry Caldwell WB Exit Ramp	13	B	18	C	**87**	**F**	**112**	**F**	**101**	**F**	7	A	10	A	14	B	12	B	10	A
Larry Caldwell WB Exit Ramp to SR 89 WB Exit Ramp	21	C	**56**	**F**	**111**	**F**	**114**	**F**	**111**	**F**	10	A	15	B	33	D	34	D	33	D
SR 89 WB Exit Ramp to SR 89 WB Entr Ramp	11	A	16	B	18	C	19	C	23	C	5	A	7	A	8	A	8	A	7	A
SR 89 WB Entr Ramp to Project Limit	15	B	23	C	26	D	27	D	27	D	8	A	11	B	13	B	14	B	14	B

1.9 Evaluation Criteria

1.9.1 Recommended Criteria

Evaluation criteria were developed to assess improvement alternatives for the 2040 build scenario. The evaluation process was performed at all locations that presented multiple ultimate solution alternatives. Given the different needs between the mainline corridor and the corridor interchanges, separate criteria were developed for each independently. The evaluation criteria was grouped into five major categories; mobility and constructability, safety, regional preference, utility impact, and costs. Given the singular solution identified for the corridor mainline, only interchange/intersection specific criteria were established. Furthermore, all near-term and intermediate-term solutions were excluded from the alternatives evaluation. These solutions' implementation timing was determined based upon future level-of-service analysis and immediate safety needs.

In order to establish a comprehensive and regionally appropriate evaluation, the technical advisory committee project team was requested to provide feedback upon all preliminary evaluation criteria. This was successfully accomplished by conducting a survey in order to determine both a set of critically important criteria as well as any non-applicable or non-desirable criteria. The preliminary evaluation criteria were further refined to formulate appropriate criteria for intersection alternative. The following is a list and description of the finalized intersection design criteria.

Mobility and Constructability

Level of service – quantitative measurement of both AM and PM Peak Level of Service measurements

Constructability / Maintenance of Traffic – qualitative measure of the ease or complexity of traffic control and traffic impacts during construction periods

Safety

Conflict points – quantitative measure of both vehicular and pedestrian conflict points present

Predictive safety analysis – quantitative measure analyzing the predicted reduction in total and serious injury crashes

Regional Preferences

Consistency with plans – qualitative measure of a suggested improvement's alignment with previous recommendations derived from completed studies

Agency and Public Acceptance – qualitative measure of stakeholder and the general public's acceptance of suggested improvement

ROW Acquisition Displacements – quantitative measure of expected residential, commercial, or institutional displacements required to implement suggested improvement

Protected Population Impact – qualitative measure of expected impact to protected population groups as outlined by Title VI Civil Rights in implementing suggested improvements

Utility Impact – qualitative measure of expected impacts to existing utility infrastructure to implement suggested improvements

Project Costs

Construction Cost – quantitative measurement of the total cost of construction, including contingency to implement suggested improvements (does not include design, right-of-way, or additional expenses). Planning level construction cost estimates were prepared for all proposed improvements

Operations and Maintenance – qualitative measure of expected maintenance and operation costs of suggested improvement implementation

New Right-of-way required – quantitative measure of expected acres of additional right-of-way acquisition required to implement suggested improvements

1.9.2 Criteria Weighting

Using the distribution of favorable and non-favorable survey responses as the primary guiding determination, the criteria were grouped into weighted tiers. Four tiers were established; the top tier received a weight of 4.0, corresponding to the criteria receiving the highest amount of favorable response; the middle tiers received a weight of 3.0 and 2.0 respectively; and the bottom tier received a weight of 1.0, corresponding to the criteria receiving the lowest amount of favorable response. Criteria that received significant unfavorable response and/or were determined to be non-implementable for the study areas were eliminated from further consideration. The final evaluation criteria tier categorization is as follows:

Tier 1
Weighting Factor – 4.0

Criteria: Level of Service, Construction Cost, and Agency & Public Acceptance

Tier 2
Weighting Factor – 3.0

Criteria: Construction Cost and Agency & Public Acceptance

Tier 3
Weighting Factor – 2.0

Criteria: Conflict Points, Predictive Safety Analysis, Consistency with Plans

Tier 4
Weighting Factor – 1.0

Criteria: Constructability (Maintenance of Traffic), Utility Impact, Protected Population Impact, Right-of-Way Acquisition Displacements, Operation and Maintenance Costs, and New Right-of-Way Required

1.9.3 Alternative Analysis Recommendations

Based upon the analysis as described in the following tables, the preferred 2040 Alternative at Granite Dells Parkway is to keep the existing roundabout with minimal lane configuration adjustments as well as implement the Great Western Drive TI. The preferred 2040 Alternative at Glassford Hill Road TI is to also implement the Great Western Drive TI west of Glassford Hill Road as well as convert the existing signalized intersections into roundabouts. The preferred 2040 Alternative at the Robert Road intersection is to implement the Robert Road Traffic Interchange, configured east of the existing Robert Road intersection.

1.10 Prioritized Recommendations

Following project development and implementation identification, a prioritized list of corridor recommendations was developed. This list provides a ranking of developed projects based upon the level of service analysis and public/stakeholder feedback received during the December 12, 2017 Public Meeting. The resulting Level-of-Service is displayed in **Table ES-4**, **Table ES-5**, and **Table ES-6**. Two tables have been included that show specifically the comparison between SR 89A Level-Of-Service in the No-Build and Build. Table ES-7 shows the comparison for the AM peak hour, while Table ES-8 shows the comparison for the PM peak hour. The Prioritized Recommendations are located in **Table ES-9**. The resulting roadway features are displayed in **Figure ES-5**.

Table ES- 4: AM Peak Hour Build Comparison Intersection LOS Results

Intersection Location	Intersection Approach	2017 AM Existing		2025 AM Build		2030 AM Build		2035 AM Build		2040 AM Build	
		Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay
SR 89A and SR 89 TI	EB SR 89A Off Ramp	D (39)	C (31.7)	D (36)	C (29.8)	D (41)	D (35.4)	D (45)	D (43.8)	D (54)	**E (65.0)**
	WB SR 89A Off Ramp	C (32)		C (26)		C (30)		D (37)		**E (76)**	
	NB SR 89	C (25)		C (29)		C (34)		D (36)		D (44)	
	SB SR 89	C (33)		C (32)		D (40)		**E (55)**		**E (67)**	
SR 89A and Larry Caldwell Dr. TI	EB SR 89A Frontage Road	B (14)	A (8)	B (14)	A (8.3)	B (18)	A (9.5)	C (22)	B (11.3)	C (33)	B (16.8)
	WB SR 89A Off Ramp	A (9)		B (12)		B (13)		B (15)		C (23)	
	NB Larry Caldwell Dr	A (1)		A (1)		A (2)		A (3)		A (2)	
	SB Larry Caldwell Dr	A (0)		A (1)		A (1)		A (1)		A (1)	
SR 89A and Granite Dells Pkwy TI	EB SR 89A Off Ramp	A (0)	A (0.6)	A (7)	A (4.9)	A (7)	A (6.1)	A (5)	A (5.5)	A (7)	A (5.9)
	WB SR 89A Off Ramp	A (1)		A (5)		A (7)		A (6)		A (9)	
	NB Granite Dells Pkwy	A (0)		A (3)		A (3)		A (3)		A (4)	
	SB Granite Dells Pkwy	A (1)		A (5)		A (7)		A (7)		A (4)	
SR 89A and Great Western TI	EB SR 89A Off Ramp	N/A	N/A	N/A	N/A	N/A	N/A	B (14)	C (24.1)	B (15)	C (27.2)
	WB SR 89A Off Ramp	N/A		N/A		N/A		C (27)		C (32)	
	NB Great Western Dr	N/A		N/A		N/A		C (33)		D (35)	
	SB Great Western Dr	N/A		N/A		N/A		B (18)		C (22)	
SR 89A and Glassford Hill Rd. TI	EB SR 89A Off Ramp	B (17)	C (27)	A (1)	C (20.7)	A (1)	A (7.5)	A (1)	A (4.2)	A (2)	A (7.1)
	WB SR 89A Off Ramp	D (45)		C (33)		B (13)		A (7)		B (12)	
	NB Glassford Hill Rd	C (24)		C (25)		A (7)		A (4)		A (6)	
	SB Glassford Hill Rd	N/A		N/A		C (20)		A (7)		B (16)	
SR 89A and Viewpoint Dr. TI	EB SR 89A Off Ramp	B (12)	B (13)	B (15)	B (16.0)	B (17)	B (18.1)	C (20)	C (22.1)	B (19)	C (24.4)
	WB SR 89A Off Ramp	C (24)		B (17)		B (19)		C (21)		C (22)	
	NB Viewpoint Dr	B (20)		C (28)		C (28)		C (32)		C (32)	
	SB Viewpoint Dr	A (8)		B (11)		B (14)		B (19)		C (25)	
SR 89A and Robert Road	EB SR 89A	C (22)	C (23.5)	(C) 26	(C) 31.1	C (29)	C (33.6)	B (15)	C (26.9)	B (14)	C (28.1)
	WB Fain Rd	C (27)		(C) 34		D (36)		C (22)		C (22)	
	NB Robert Rd	C (26)		(D) 42		D (45)		D (42)		D (45)	
	SB SR 89A	B (18)		(C) 21		C (23)		B (19)		C (20)	

Table ES- 5: PM Peak Hour Build Comparison Intersection LOS Results

Intersection Location	Intersection Approach	2017 PM Existing		2025 PM Build		2030 PM Build		2035 PM Build		2040 PM Build	
		Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay
SR 89A and SR 89 TI	EB SR 89A Off Ramp	D (42)	C (25.4)	D (48)	C (32.6)	**F (81)**	D (55.0)	**E (61)**	D (52.7)	**E (58)**	**E (56.4)**
	WB SR 89A Off Ramp	C (27)		C (21)		C (29)		C (30)		C (27)	
	NB SR 89	C (22)		D (44)		**F (84)**		**F (85)**		**F (98)**	
	SB SR 89	C (25)		C (31)		D (47)		D (40)		D (54)	
SR 89A and Larry Caldwell Dr. TI	EB SR 89A Frontage Road	A (9)	A (2.5)	B (11)	A (3.9)	B (13)	A (4.8)	B (14)	A (5.5)	B (15)	A (5.8)
	WB SR 89A Off Ramp	A (7)		A (8)		A (8)		A (9)		A (10)	
	NB Larry Caldwell Dr	A (1)		A (2)		A (2)		A (2)		A (3)	
	SB Larry Caldwell Dr	A (1)		A (1)		A (1)		A (1)		A (2)	
SR 89A and Granite Dells Pkwy TI	EB SR 89A Off Ramp	A (0)	A (0.4)	A (5)	A (4.2)	A (7)	A (5.6)	A (9)	A (4.5)	B (12)	A (5.4)
	WB SR 89A Off Ramp	A (1)		A (4)		A (5)		A (2)		A (3)	
	NB Granite Dells Pkwy	A (0)		A (3)		A (4)		A (3)		A (4)	
	SB Granite Dells Pkwy	A (0)		A (5)		A (7)		A (5)		A (3)	
SR 89A and Great Western TI	EB SR 89A Off Ramp	N/A	N/A	N/A	N/A	N/A	N/A	B (13)	B (18.0)	A (9)	B (16.4)
	WB SR 89A Off Ramp	N/A		N/A		N/A		C (22)		B (16)	
	NB Great Western Dr	N/A		N/A		N/A		C (21)		B (20)	
	SB Great Western Dr	N/A		N/A		N/A		B (19)		C (21)	
SR 89A and Glassford Hill Rd. TI	EB SR 89A Off Ramp	C (22)	C (25.4)	A (1)	B (12.4)	D (36)	B (15.5)	A (1)	A (2.6)	B (19)	A (9.4)
	WB SR 89A Off Ramp	D (53)		C (25)		A (6)		A (5)		A (6)	
	NB Glassford Hill Rd	B (20)		B (17)		A (3)		A (3)		A (3)	
	SB Glassford Hill Rd	N/A		N/A		A (6)		A (5)		A (6)	
SR 89A and Viewpoint Dr. TI	EB SR 89A Off Ramp	B (15)	B (17.1)	C (24)	C (22.4)	C (32)	C (27.7)	**E (60)**	D (45.7)	D (51)	D (39.9)
	WB SR 89A Off Ramp	C (32)		B (18)		C (21)		C (28)		C (26)	
	NB Viewpoint Dr	C (22)		C (28)		C (33)		D (47)		D (42)	
	SB Viewpoint Dr	B (12)		B (14)		B (16)		C (22)		B (20)	
SR 89A and Robert Road	EB SR 89A	C (21)	C (23.1)	C (24)	C (28.6)	C (30)	C (34.1)	B (17)	B (18.9)	C (20)	C (22.4)
	WB Fain Rd	C (27)		C (35)		D (39)		B (16)		B (18)	
	NB Robert Rd	C (29)		D (42)		D (49)		C (24)		C (28)	
	SB SR 89A	B (18)		B (19)		C (22)		B (17)		B (20)	

Table ES- 6: AM & PM Peak Hour Build Comparison SR 89A Mainline LOS Results

Segment Description	AM Peak Hour										PM Peak Hour									
	2017 Existing		2025 Build		2030 Build		2035 Build		2040 Build		2017 Existing		2025 Build		2030 Build		2035 Build		2040 Build	
	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS
Eastbound/Northbound SR 89A																				
Project Limit to SR 89 EB Exit Ramp	8	A	9	A	12	B	13	B	16	B	12	B	18	C	23	C	26	C	30	D
SR 89 EB Exit Ramp to SR 89 EB Entr Ramp	5	A	5	A	7	A	7	A	9	A	9	A	13	B	17	B	18	C	21	C
SR 89 EB Entrance Ramp to Larry Caldwell EB Entr Ramp	9	A	11	B	9	A	9	A	10	A	14	B	19	C	15	B	16	B	18	C
Larry Caldwell EB Entr Ramp to Granite Dells EB Exit Ramp	6	A	8	A	7	A	8	A	9	A	11	B	14	B	12	B	14	B	16	B
Granite Dells EB Exit Ramp to Granite Dells EB Entr Ramp	8	A	9	A	6	A	7	A	8	A	16	B	18	B	13	B	15	B	16	B
Granite Dells EB Entr Ramp to Glassford Hill EB Exit Ramp (or Great Western EB Exit Ramp)	9	A	13	B	10	A	9	A	10	A	16	B	22	C	17	B	17	B	20	C
Great Western EB Exit Ramp to Great Western EB Entr Ramp	n/a	n/a	n/a	n/a	n/a	n/a	8	A	9	A	n/a	n/a	n/a	n/a	n/a	n/a	15	B	17	B
Great Western EB Entr Ramp to Glassford Hill EB Exit Ramp	n/a	n/a	n/a	n/a	n/a	n/a	8	A	9	A	n/a	n/a	n/a	n/a	n/a	n/a	23	C	20	C
Glassford Hill EB Exit Ramp to Glassford Hill EB Entr Ramp	4	A	7	A	8	A	10	A	7	A	9	A	13	B	15	B	18	B	14	B
Glassford Hill EB Entr Ramp to Viewpoint Dr EB Exit Ramp	4	A	7	A	9	A	9	A	7	A	9	A	14	B	20	C	23	C	35	D
Viewpoint Dr EB Exit Ramp to Viewpoint Dr EB Entr Ramp	4	A	5	A	7	A	7	A	5	A	6	A	9	A	11	B	12	B	11	A
Viewpoint Dr EB Entr Ramp to Robert Road Intersection (or Robert Road EB Exit Ramp)	4	A	7	A	8	A	6	A	5	A	7	A	10	A	13	B	9	A	8	A
Robert Road EB Exit Ramp to Robert Road EB Entr Ramp	n/a	n/a	n/a	n/a	n/a	n/a	6	A	4	A	n/a	n/a	n/a	n/a	n/a	n/a	8	A	7	A
Robert Road EB Entr Ramp to Project Limit	n/a	n/a	n/a	n/a	n/a	n/a	7	A	6	A	n/a	n/a	n/a	n/a	n/a	n/a	11	A	9	A
Westbound/Southbound SR 89A																				
Project Limit to Robert Road WB Exit Ramp	n/a	n/a	n/a	n/a	n/a	n/a	12	B	9	A	n/a	n/a	n/a	n/a	n/a	n/a	7	A	6	A
Robert Road WB Exit Ramp to Robert Road WB Entr Ramp	n/a	n/a	n/a	n/a	n/a	n/a	10	A	8	A	n/a	n/a	n/a	n/a	n/a	n/a	6	A	5	A
Robert Road Intersection (or Robert Road WB Entr Ramp) to Viewpoint Dr WB Exit Ramp	6	A	9	A	11	A	12	B	10	A	4	A	5	A	6	A	7	A	6	A
Viewpoint Dr WB Exit Ramp to Viewpoint Dr WB Entr Ramp	8	A	12	B	14	B	16	B	12	B	5	A	6	A	8	A	8	A	7	A
Viewpoint Dr WB Entr Ramp to Glassford Hill WB Exit Ramp	11	A	17	B	21	C	25	C	20	C	5	A	8	A	9	A	10	A	9	A
Glassford Hill WB Exit Ramp to Glassford Hill WB Entr Ramp	12	B	17	B	19	C	26	D	18	C	5	A	7	A	9	A	10	A	8	A
Glassford Hill WB Entr Ramp to Granite Dells WB Exit Ramp (or Great Western WB Exit Ramp)	19	C	27	D	21	C	17	B	20	C	10	A	14	B	11	A	9	A	10	A
Great Western WB Exit Ramp to Great Western WB Entr Ramp	n/a	n/a	n/a	n/a	n/a	n/a	19	C	22	C	n/a	n/a	n/a	n/a	n/a	n/a	9	A	10	A
Great Western WB Entr Ramp to Granite Dells WB Exit Ramp	n/a	n/a	n/a	n/a	n/a	n/a	18	B	20	C	n/a	n/a	n/a	n/a	n/a	n/a	9	A	11	A
Granite Dells WB Exit Ramp to Granite Dells WB Entr Ramp	18	C	22	C	16	B	20	C	20	C	10	A	11	A	7	A	9	A	10	A
Granite Dells WB Entr Ramp to Larry Caldwell WB Exit Ramp	13	B	18	C	16	B	19	C	23	C	7	A	10	A	9	A	10	A	11	B
Larry Caldwell WB Exit Ramp to SR 89 WB Exit Ramp	21	C	24	C	18	C	21	C	23	C	10	A	14	B	10	A	12	B	12	B
SR 89 WB Exit Ramp to SR 89 WB Entr Ramp	11	A	15	B	12	B	14	B	16	B	5	A	6	A	5	A	6	A	6	A
SR 89 WB Entr Ramp to Project Limit	15	B	24	C	18	B	20	C	23	C	8	A	11	B	8	A	9	A	10	A

Table ES- 7: AM Peak Hour No-Build versus Build Comparison SR 89A Mainline LOS Results

Segment Description	2017 Existing		2025 No-Build		2025 Build		2030 No-Build		2030 Build		2035 No-Build		2035 Build		2040 No-Build		2040 Build	
	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS
Eastbound/Northbound SR 89A																		
Project Limit to SR 89 EB Exit Ramp	8	A	9	A	9	A	12	B	12	B	13	B	13	B	16	B	16	B
SR 89 EB Exit Ramp to SR 89 EB Entr Ramp	5	A	5	A	5	A	7	A	7	A	8	A	7	A	11	A	9	A
SR 89 EB Entrance Ramp to Larry Caldwell EB Entr Ramp	9	A	11	B	11	B	13	B	9	A	14	B	9	A	**72**	**F**	10	A
Larry Caldwell EB Entr Ramp to Granite Dells EB Exit Ramp	6	A	8	A	8	A	10	A	7	A	11	B	8	A	**108**	**F**	9	A
Granite Dells EB Exit Ramp to Granite Dells EB Entr Ramp	8	A	9	A	9	A	9	A	6	A	10	A	7	A	9	A	8	A
Granite Dells EB Entr Ramp to Glassford Hill EB Exit Ramp (or Great Western EB Exit Ramp)	9	A	13	B	13	B	15	B	10	A	17	B	9	A	16	B	10	A
Great Western EB Exit Ramp to Great Western EB Entr Ramp	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8	A	n/a	n/a	9	A
Great Western EB Entr Ramp to Glassford Hill EB Exit Ramp	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8	A	n/a	n/a	9	A
Glassford Hill EB Exit Ramp to Glassford Hill EB Entr Ramp	4	A	7	A	7	A	8	A	8	A	9	A	10	A	8	A	7	A
Glassford Hill EB Entr Ramp to Viewpoint Dr EB Exit Ramp	4	A	7	A	7	A	7	A	9	A	8	A	9	A	7	A	7	A
Viewpoint Dr EB Exit Ramp to Viewpoint Dr EB Entr Ramp	4	A	5	A	5	A	5	A	7	A	6	A	7	A	6	A	5	A
Viewpoint Dr EB Entr Ramp to Robert Road Intersection (or Robert Road EB Exit Ramp)	4	A	6	A	7	A	7	A	8	A	8	A	6	A	8	A	5	A
Robert Road EB Exit Ramp to Robert Road EB Entr Ramp	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6	A	n/a	n/a	4	A
Robert Road EB Entr Ramp to Project Limit	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7	A	n/a	n/a	6	A
Westbound/Southbound SR 89A																		
Project Limit to Robert Road WB Exit Ramp	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	12	B	n/a	n/a	9	A
Robert Road WB Exit Ramp to Robert Road WB Entr Ramp	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	10	A	n/a	n/a	8	A
Robert Road Intersection (or Robert Road WB Entr Ramp) to Viewpoint Dr WB Exit Ramp	6	A	9	A	9	A	10	A	11	A	12	B	12	B	13	B	10	A
Viewpoint Dr WB Exit Ramp to Viewpoint Dr WB Entr Ramp	8	A	12	B	12	B	13	B	14	B	15	B	16	B	16	B	12	B
Viewpoint Dr WB Entr Ramp to Glassford Hill WB Exit Ramp	11	A	16	B	17	B	20	C	21	C	25	C	25	C	30	D	20	C
Glassford Hill WB Exit Ramp to Glassford Hill WB Entr Ramp	12	B	17	B	17	B	19	C	19	C	23	C	26	D	24	C	18	C
Glassford Hill WB Entr Ramp to Granite Dells WB Exit Ramp (or Great Western WB Exit Ramp)	19	C	26	D	27	D	31	D	21	C	**55**	**F**	17	B	**56**	**F**	20	C
Great Western WB Exit Ramp to Great Western WB Entr Ramp	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	19	C	n/a	n/a	22	C
Great Western WB Entr Ramp to Granite Dells WB Exit Ramp	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	18	B	n/a	n/a	20	C
Granite Dells WB Exit Ramp to Granite Dells WB Entr Ramp	18	C	22	C	22	C	**51**	**F**	16	B	**96**	**F**	20	C	**53**	**F**	20	C
Granite Dells WB Entr Ramp to Larry Caldwell WB Exit Ramp	13	B	18	C	18	C	**87**	**F**	16	B	**112**	**F**	19	C	**101**	**F**	23	C
Larry Caldwell WB Exit Ramp to SR 89 WB Exit Ramp	21	C	**56**	**F**	24	C	**111**	**F**	18	C	**114**	**F**	21	C	**111**	**F**	23	C
SR 89 WB Exit Ramp to SR 89 WB Entr Ramp	11	A	16	B	15	B	18	C	12	B	19	C	14	B	23	C	16	B
SR 89 WB Entr Ramp to Project Limit	15	B	23	C	24	C	26	D	18	B	27	D	20	C	27	D	23	C

Table ES- 8: PM Peak Hour No-Build versus Build Comparison SR 89A Mainline LOS Results

Segment Description	2017 Existing		2025 No-Build		2025 Build		2030 No-Build		2030 Build		2035 No-Build		2035 Build		2040 No-Build		2040 Build	
	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS
Eastbound/Northbound SR 89A																		
Project Limit to SR 89 EB Exit Ramp	12	B	18	C	18	C	23	C	23	C	26	D	26	C	42	D	30	D
SR 89 EB Exit Ramp to SR 89 EB Entr Ramp	9	A	13	B	13	B	18	C	17	B	19	C	18	C	21	C	21	C
SR 89 EB Entrance Ramp to Larry Caldwell EB Entr Ramp	14	B	19	C	19	C	24	C	15	B	26	C	16	B	40	E	18	C
Larry Caldwell EB Entr Ramp to Granite Dells EB Exit Ramp	11	B	15	B	14	B	20	C	12	B	26	C	14	B	57	F	16	B
Granite Dells EB Exit Ramp to Granite Dells EB Entr Ramp	16	B	18	B	18	B	20	C	13	B	20	C	15	B	24	C	16	B
Granite Dells EB Entr Ramp to Glassford Hill EB Exit Ramp (or Great Western EB Exit Ramp)	16	B	22	C	22	C	26	D	17	B	34	D	17	B	44	E	20	C
Great Western EB Exit Ramp to Great Western EB Entr Ramp	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	15	B	n/a	n/a	17	B
Great Western EB Entr Ramp to Glassford Hill EB Exit Ramp	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	23	C	n/a	n/a	20	C
Glassford Hill EB Exit Ramp to Glassford Hill EB Entr Ramp	9	A	13	B	13	B	48	F	15	B	65	F	18	B	104	F	14	B
Glassford Hill EB Entr Ramp to Viewpoint Dr EB Exit Ramp	9	A	15	B	14	B	127	F	20	C	138	F	23	C	150	F	35	D
Viewpoint Dr EB Exit Ramp to Viewpoint Dr EB Entr Ramp	6	A	9	A	9	A	8	A	11	B	8	A	12	B	10	A	11	A
Viewpoint Dr EB Entr Ramp to Robert Road Intersection (or Robert Road EB Exit Ramp)	7	A	10	A	10	A	9	A	13	B	10	A	9	A	11	B	8	A
Robert Road EB Exit Ramp to Robert Road EB Entr Ramp	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8	A	n/a	n/a	7	A
Robert Road EB Entr Ramp to Project Limit	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	11	A	n/a	n/a	9	A
Westbound/Southbound SR 89A																		
Project Limit to Robert Road WB Exit Ramp	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7	A	n/a	n/a	6	A
Robert Road WB Exit Ramp to Robert Road WB Entr Ramp	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6	A	n/a	n/a	5	A
Robert Road Intersection (or Robert Road WB Entr Ramp) to Viewpoint Dr WB Exit Ramp	4	A	5	A	5	A	6	A	6	A	7	A	7	A	8	A	6	A
Viewpoint Dr WB Exit Ramp to Viewpoint Dr WB Entr Ramp	5	A	6	A	6	A	8	A	8	A	8	A	8	A	10	A	7	A
Viewpoint Dr WB Entr Ramp to Glassford Hill WB Exit Ramp	5	A	8	A	8	A	9	A	9	A	10	A	10	A	12	B	9	A
Glassford Hill WB Exit Ramp to Glassford Hill WB Entr Ramp	5	A	7	A	7	A	9	A	9	A	9	A	10	A	11	B	8	A
Glassford Hill WB Entr Ramp to Granite Dells WB Exit Ramp (or Great Western WB Exit Ramp)	10	A	14	B	14	B	16	B	11	A	17	B	9	A	18	B	10	A
Great Western WB Exit Ramp to Great Western WB Entr Ramp	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	9	A	n/a	n/a	10	A
Great Western WB Entr Ramp to Granite Dells WB Exit Ramp	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	9	A	n/a	n/a	11	A
Granite Dells WB Exit Ramp to Granite Dells WB Entr Ramp	10	A	11	A	11	A	11	A	7	A	10	A	9	A	11	A	10	A
Granite Dells WB Entr Ramp to Larry Caldwell WB Exit Ramp	7	A	10	A	10	A	14	B	9	A	12	B	10	A	10	A	11	B
Larry Caldwell WB Exit Ramp to SR 89 WB Exit Ramp	10	A	15	B	14	B	33	D	10	A	34	D	12	B	33	D	12	B
SR 89 WB Exit Ramp to SR 89 WB Entr Ramp	5	A	7	A	6	A	8	A	5	A	8	A	6	A	7	A	6	A
SR 89 WB Entr Ramp to Project Limit	8	A	11	B	11	B	13	B	8	A	14	B	9	A	14	B	10	A

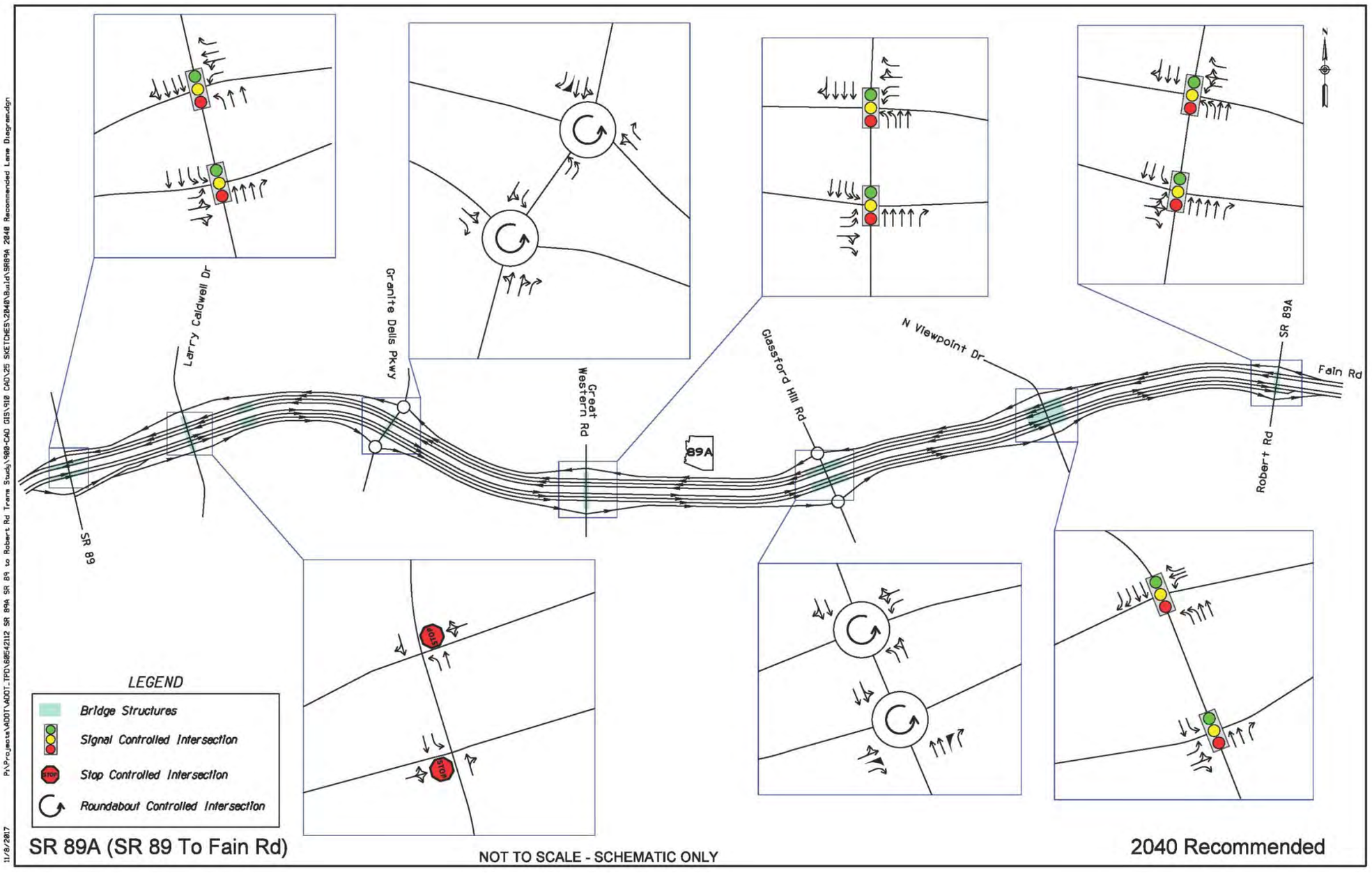
Table ES- 9: Prioritized Recommendations

Priority Ranking	Solution Name	Solution Scope	Total Estimated Cost	Implementation Term
1	Robert Road Intersection Improvements	• Addition of a northbound left-turn lane • New mast arms, reflective signal heads on all poles • Westbound and Eastbound advanced warning beacons	$180,000	Short-term
2	SR 89 TI Eastbound Dual Lane Entrance Ramp	• Addition of a second lane on the eastbound on-ramp	$2,300,000	Short-term
3	Great Western Drive At-Grade Intersection Closure	• Close existing at-grade intersection	Implementation completed by developer	
4	Viewpoint Drive TI Eastbound Dual Left-Turn	• Restripe eastbound dual left-turn lane • Widen Viewpoint Drive northbound receiving lane north of TI (Town of Prescott Valley)	40,000 (ADOT) 130,000 (PV)* 170,000 (Total)*	Short-term
5	Viewpoint Drive TI Westbound Entrance Ramp Extension	• Restripe second lane on westbound on-ramp	$20,000	Short-term
6	Glassford Hill Road TI Eastbound Free Right	• Addition of an eastbound free-right at the TI	$350,000	Short-term
7	Glassford Hill Road TI Westbound Parallel Entrance Ramp Extension	• Extend the westbound parallel entrance ramp	$250,000	Short-term
8	SR 89 TI Eastbound Dual Left-Turn	• Addition of an eastbound left-turn lane at the TI	$120,000	Short-term
9	SR 89A Widening, SR 89 to Glassford Hill Road	• Addition of one general purpose lane in each direction of travel	$20,500,000	Mid-term
10	Great Western Drive TI	• New interchange construction	$24,100,000*	Mid-term
11	Glassford Hill Road TI Roundabouts	• Convert TI interchange to roundabout control	7,000,000**	Mid-term
12	Robert Road TI	• New interchange construction • Realignment of Robert Road & SR 89A to new interchange • Closure of existing at-grade intersection at existing Robert Road	30,400,000*/**	Mid-term
13	SR 89A Widening, Glassford Hill Road to Robert Road TI	• Addition of one general purpose lane in each direction of travel	12,100,000**	Long-term
14	Granite Dells Parkway Roundabout Modifications	• Configuration modifications	300,000**	Long-term

**Costs do not include right-of-way which may be needed.*

***Planning level cost estimate*

Figure ES- 5: 2040 Build Recommended Roadway Features



2.0 INTRODUCTION

The Arizona Department of Transportation (ADOT), Central Yavapai Metropolitan Planning Organization (CYMPO), and Yavapai County contributed funding towards the State Route 89A – State Route 89 to Robert Road Transportation Study. The City of Prescott and Towns of Prescott Valley, Dewey-Humboldt, and Chino Valley are experiencing increased traffic volumes due to general growth, commuter, commercial, and recreational traffic. In an effort to plan for both current and future traffic impacts in the area, a planning study is beneficial in addressing capacity, access, safety, and operational efficiency on State Route (SR) 89A from the SR 89 Traffic Interchange (TI) to east of Robert Road.

2.1 Study Area

The study area for the SR 89A Transportation Study encompasses SR 89A from the SR 89 traffic interchange at milepost 317.3 to east of the Robert Road intersection at milepost 325 on Fain Road. The study area is shown in **Figure 1**

The corridor limits include one (1) signalized intersection at Robert Road, where SR 89A continues northeast to Jerome (not included in the study limits) and Fain Road begins east of the intersection, connecting SR 89A to SR 69. Additionally, the study corridor includes five grade separated traffic interchanges (at Viewpoint Drive, Glassford Hill Road, Granite Dells Parkway, Larry Caldwell Drive, and SR 89) and one (1) un-signalized roadway connection approximately 1.25 miles west of Glassford Hill Road. The entire length of the study corridor is a four-lane divided freeway facility.

2.2 Purpose and Needs

New housing developments are underway at the Granite Dells Parkway TI, west of Glassford Hill Road (south of SR 89A), and other areas to the west of the study limits have been rezoned for commercial use. Additionally, the City of Prescott has approved the final plat for the Walden Ranch development (Phases 1A, 1B, and 2) at Larry Caldwell Drive. These factors are anticipated to escalate the congestion concerns and may contribute towards the increase in safety needs along the study corridor.

The Average Annual Daily Traffic (AADT) within the corridor is approximately 26,000 (2014), which (prior to the aforementioned developments) has experienced an 8% per year increase in traffic volumes in recent years. Additional regional capacity needs have been identified in the CYMPO 2040 Regional Transportation Plan (RTP) Update, within ADOT's 2013 Corridor Location Study and Environmental Overview: I-17 to Fain Road Connector (ADOT Project # H8162), and Yavapai County's Great Western Feasibility Study.

224 total crashes have occurred in the past 5 years, between 2011 and 2015, throughout the study corridor. Seven (7) of these crashes were incapacitating and three (3) were fatal incidents. All three of the fatal incidents occurred at the Robert Road intersection on the eastern terminus of the study corridor. In 2015, ADOT performed a Roadway Safety Assessment (RSA) at this location.

2.3 Study Goals & Objectives

The primary objectives of the study are to: 1) identify the expansion needs for the corridor; 2) prioritize the needs for the short (5-year), mid (10-year), and long-term (20-year) planning horizons; and 3) scope out and prepare 15% design plans for the recommended solutions.

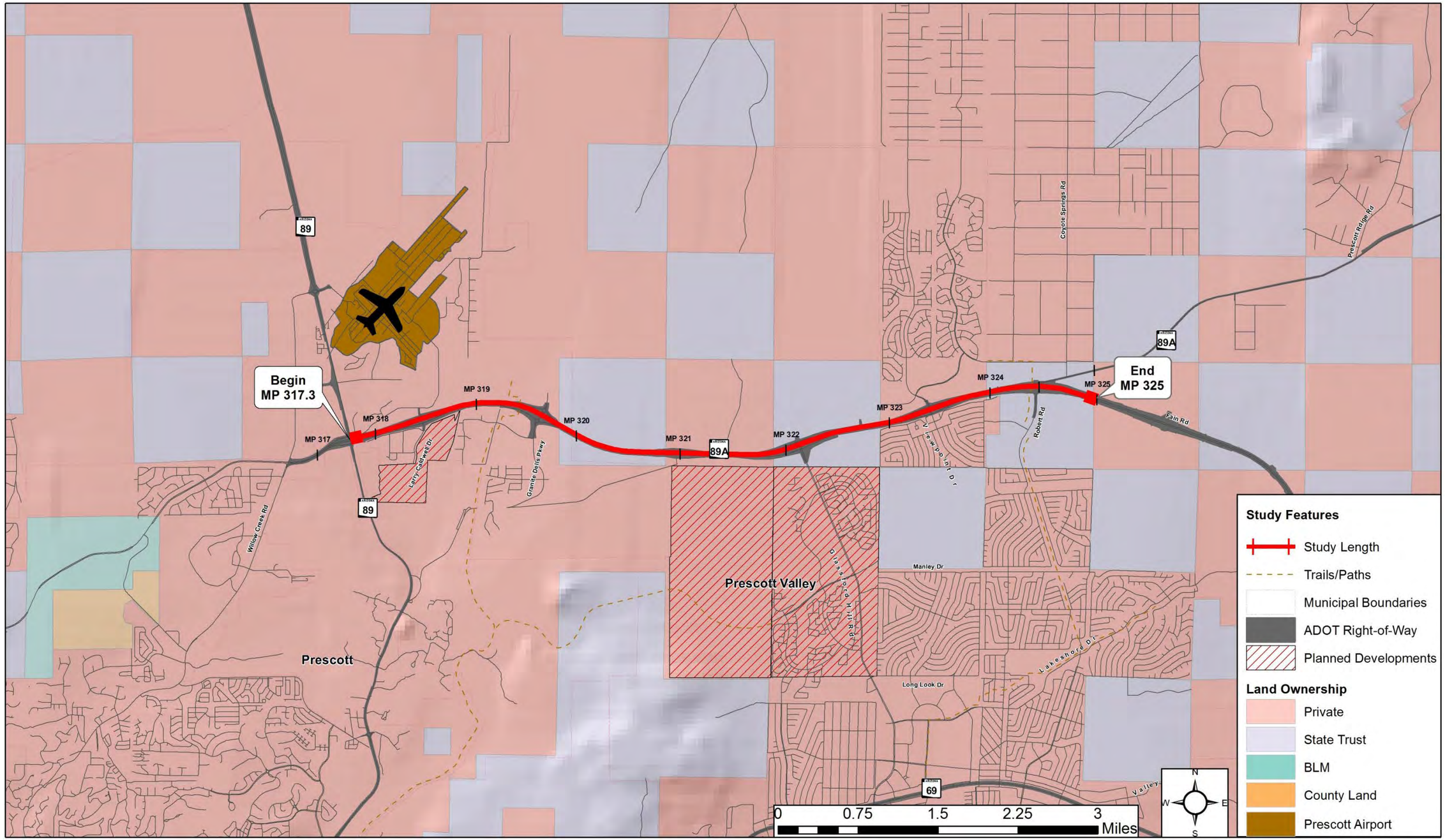
2.4 Study Process

This study was conducted within a 12 month timeframe. A Core Study Team was established, representing ADOT Multi-modal Planning Division (MPD), ADOT Northwest District, CYMPO, Yavapai County, City of Prescott, and Town of Prescott Valley officials to closely coordinate throughout the development of the study deliverables.

Additionally a Stakeholder Team was established including the Study Team agencies as well as representatives from the Town of Chino Valley, Town of Dewey Humboldt, Fish and Wildlife Services, The Nature Conservatory, Arizona Game and Fish Department, Arizona Department of Public Safety, Federal Highway Administration, Arizona State Land Department, and Central Arizona Fire & Medical Authority.

The study addresses current and future conditions and drafts a plan of improvement to the study area. A public involvement meeting was hosted and summarized. The study concludes with the development and refinement of conceptual engineering plans for study area improvements.

Figure 1: Study Area



2.5 Summary of Relevant Plans and Studies

The following sections summarize relevant plans, studies, and design/engineering efforts that have been completed or are currently underway by various agencies. The findings from these studies could impact study recommendations and therefore should be considered in alternatives development and analysis.

2.5.1 On-going Study

SR 69/Fain Road/SR 89A/SR 89 Corridor Profile Study

Projected Completion Date: 2018 (on-going)
Sponsoring Agency: ADOT

Summary of Project: The purpose of this Corridor Profile Study is intended to measure corridor performance on the multi-route corridor between the Cordes Junction interchange with I-17 and the Ash Fork interchange with I-40 (including the segment of SR 89A between Robert Road/Fain Road and the SR 89 Junction) in order to identify a recommended set of prioritized recommended solutions. These solutions are intended for consideration in future construction programs, derived from a transparent, defensible, logical, and replicable process.

Status Update: The study has identified corridor performance, needs, and strategic recommended solutions. Based on existing conditions, no corridor needs were identified on the SR 89A portion of the corridor beyond the Robert Road intersection. Fatalities located at the Robert Road intersection, identified in section 3.3.1, were a contributing factor to a high safety need identified for the respective segment. Based upon the project evaluation process, an intersection signal improvement project was advanced to final recommendation and prioritization.

2.5.2 Previously Completed Studies & Plans

Airport Master Plan Update

Completion Date: 2010
Sponsoring Agency: City of Prescott

Summary of Project: The purpose of the *Airport Master Plan Update* is to understand the future direction of the Prescott Municipal Airport and direct implementation of capital improvement projects for the short-term and long-term planning period. This report also determined the ability of the Airport to meet FAA design standards.

Summary of Findings: The Plan Update determined that approximately $146 million in expansion and improvement projects are needed in order to meet FAA standards and future demand. The City of Prescott will consistently monitor the progress of the airport's enplanements, total aircraft operation, total based aircraft, and overall aviation activity. This monitoring is critical to provide the data necessary to development a schedule of new airport facilities.

Chino Valley Extension Study

Completion Date: 2009
Sponsoring Agency: CYMPO

Summary of Project: This study was initiated by the *Regional Transportation Study (2030 Plan)* that established a base socio-economic data set for the year 2030 to identify transportation needs for the movement of goods, services and people in the region and to develop an alternative route to SR 89 between SR 89A and Paulden. The purpose of the study was to develop alternative corridors and identify desirable corridor termini at SR 89 and Road 5 South/Great Western corridor. Local, state, and federal agency input and traffic forecast modeling were used to identify corridors that are the most advantageous and feasible, while also the least damaging.

Summary of Findings: The final report developed a proposed corridor along SR 89 from Paulden to Road 5 South in Chino Valley, extending through unincorporated areas of Yavapai County, as shown in **Appendix 1**. The final report recommended three alternatives for the Chino Valley Extension label Corridor CV1, CV2, and CV8, which provided the best options for local access and regional connectivity. Corridor CV8 was selected as the preferred corridor for the proposed 18.5 mile controlled access highway. This selection does not require right-of-way acquisition from the Prescott National Forest or conservation easement lands. The CYMPO Technical Advisory Committee approved the study recommendations.

Additional planning level studies will be necessary to determine impacts to the existing SR 89 both north and south of the connection, as well as future western corridor locations to Williamson Valley Road. Additionally, a multi-modal plan was not included in this study, but should be considered as an attractive asset to include in a multi-modal element in the General Plans of the affected communities.

CYMPO Transit Implementation Plan

Completion Date: 2009
Sponsoring Agency: CYMPO

Summary of Project: The purpose of the *Transit Implementation Plan* is to develop a preferred alternative service plan and identify steps for implementing the service for participating communities. The plan developed alternatives to best provide smooth connections for travelers, utilize community resources, and optimize expected ridership. Resources, ridership, costs, and revenues were assessed to best balance the services provided with the costs of services and reflection of community values.

Summary of Findings: The final proposed service plan would include fixed and flexible route services with hourly headways, complementary Americans with Disabilities Act (ADA) accommodating paratransit services, a continuation of voucher programs for non-serviceable users, and a mileage reimbursement program for volunteer drivers. Initial fixed and flexible service would join Prescott and Prescott Valley via SR 69 and the expanded service would include Willow Creek in north Prescott. The full implementation of the service plan will come in three phases: General public voucher programs and development of governance and financing, implementation of fixed and flexible route services with hourly headways and paratransit components, and implementation of expanded route services.

CYMPO Regional Transportation Plan (RTP)

Completion Date: 2015
Sponsoring Agency: CYMPO

Summary of Project: The purpose of this RTP Update was to address changes occurring since the agency's 2011 RTP and to reprioritize transportation investments for the metropolitan area with a 2040 target buildout. The plan focuses on short-, medium-, and long-term transportation investments in the greater City of Prescott, Town of Prescott Valley, Town of Chino Valley, and Town of Dewey-Humboldt urbanized areas within Yavapai County.

Summary of Findings: The RTP identifies the SR 89 and SR 89A Traffic Interchange and to address congestion and improve traffic conditions. Additional projects recommended along SR 89A include; conduct traffic study for mainline and interchanges between SR 89 and Fain Road, construct Robert Road traffic interchange, widen to 6 lanes between SR 89 and Fain Road, further study for widening to 4-lanes between Fain Road and MP 329, construct new TI's for the Great Western Corridor and construct the Side Road Connector south of SR 89A between SR 89 and Glassford Hill Road.

Great Western Corridor Feasibility Study

Completion Date: 2010
Sponsoring Agency: Yavapai County

Summary of Project: The goal of the *Great Western Corridor Feasibility Study* was to identify the corridor alignment, right of way, and traffic interchange location for a new high capacity roadway facility. This report describes the development and evaluation of alternative concepts for the Great Western Corridor. Additionally, a separate traffic study, drainage report, and technical drainage memorandum were prepared. Furthermore, an Environmental Overview (EO) was developed in support of this study with planning level construction cost estimates to allow for future programming of design and construction. No construction funding has been programmed or identified for this corridor.

Summary of Findings: The Great Western Corridor alignment is recommended to begin at SR 89A at Great Western Road and follows the section line north, turning west at the Road 5 South section line and terminating at SR 89. This proposed alignment is 9.2 miles in total length and runs parallel to Granite Creek in the north-south direction, as shown in **Appendix 1**. The proximity to Granite Creek maintains large open spaces for pronghorn and other wildlife and maximizes the distance of the new roadway facility from the existing residential land uses near Viewpoint Drive.

City of Prescott General Plan

Completion Date: 2015
Sponsoring Agency: City of Prescott

Summary of Project: The *City of Prescott General Plan* identifies long-term goals and strategies for the City to reach a preferred future development pattern. The overall goal of the *Circulation Element* of the General Plan was to provide connectivity and enable efficient mobility across a multimodal transportation system. The General Plan outlines specific goals and achievement strategies for the *Roadway Network*, *Pedestrian and Bicycle Circulation*, *Transit Network*, *Airport*, *Traffic Safety*, *and Transportation System Management.*

Summary of Findings: The Arterials Goal is to maintain a level-of-service "C" or better during peak hours of travel, in order to meet AASHTO guidelines, and support alternative "non-motorized" transportation methods along contextually appropriate roadways. The Collector Goals identified include providing safe and attractive collector streets to facilitate local transportation and provide adequate access and interconnectivity for motorized and non-motorized users. The goal for Local Streets is to design safe roadways for vehicles, pedestrians, and bicyclists, while accommodating residential, commercial, and emergency vehicle traffic. Specific Bicycle and Pedestrian Goals include increasing the connectivity to enabling facilities and to accommodate multi-modal transportation options in new land developments. The Transit Goal is to support and participate in regional transit systems.

The airport goal is to improve the regional outreach of air travel. The Traffic Safety Goal is to utilize engineering, education, and enforcement to improve traffic safety. Lastly the traffic management goals are to improve efficiency through improving capacity and safety as well as protect public investment in the transportation system.

City of Prescott Bicycle and Pedestrian Master Plan Update - 2009

Completion Date: 2009
Sponsoring Agency: City of Prescott

Summary of Project: This plan updates the 2003 document accounting for improvements and previously missed opportunities. The plan addresses three subjects: bicycle facilities, pedestrian facilities, and education, including bicycle lanes, sidewalks, trails, paths, signs, and education and safety programs.

Summary of Findings: Goals and objectives are established for each subject focus. The bicycle facilities goals include; developing city-wide on-street bicycle facilities, increase the percentage of bicycle trips taken, designing/constructing roadways with consideration for alternative modes, and improve bicycle safety. Pedestrian facilities goals include; increasing the percentage of walking trips taken, improve safety, and design/construct facilities that accommodate all users including children, elderly, and disabled individuals).

City of Prescott Parks and Recreation Master Plan

Completion Date: 2007
Sponsoring Agency: City of Prescott

Summary of Project: The Parks and Recreation Master Plan is the update to the 1987 iteration of the plan, with the intention of addressing the city's need for dedicated parks and recreation land and facilities in alignment with the City's General Plan.

Summary of Findings: The plan identifies existing and planned trails and paths within and in close proximity to the City of Prescott limits. The Prescott Peavine Trail and Iron King Trail are identified as existing facilities that are in close proximity to the SR 89A corridor. The study identifies proposed Planned Regional Bicycle and Pedestrian Trail and/or Shared Use Path extending from the terminus of the Iron King trail and crossing SR 89A at Viewpoint Drive. Additionally, a Planned Regional Bicycle and Pedestrian Trail is proposed that runs parallel to SR 89A on the north side of the roadway.

I-17 to Fain Road Connector Corridor Location Study and Environmental Overview

Completion Date: 2012
Sponsoring Agency: ADOT

Summary of Project: The I-17 to Fain Road Connector Corridor Location Study is a planning level study to evaluate a prospective future corridor connecting I-17 to SR 89A near Robert Rd in the Town of Prescott Valley. The potential corridor area was split into a north study area adjacent to SR 89A and Fain Rd and a South Corridor between I-17, SR 69, and SR 169.

Summary of Findings: The study presented one no-build alternative as well as 7 build alternatives for corridor alignments in the south study area and 6 build alternatives for the north study area. The Town of Prescott Valley Council indicated that Alternative N-1 and N-1A were the town's preferred alternative. These alternatives recommend a system interchange located approximately .5 miles north of Lakeshore Dr. and east of the SR 89A/Robert Rd/Fain Rd intersection. This study does not formally select a preferred alternative and recommends a design concept report and NEPA review be completed prior to a formal selection.

Town of Prescott Valley General Plan 2025

Completion Date: 2013
Sponsoring Agency: Town of Prescott Valley

Summary of Project: The *Town of Prescott Valley General Plan* identifies long-term goals and strategies for the town's future development. The *Circulation Element* of the plan focuses on all forms of motorized/non-motorized transportation throughout the town's limits. This plan establishes goals and policies to guide the future transportation network.

Summary of Findings: The General Plan addresses the need for improving transportation, due to expected growth, both within and outside of the town, expected to impact transportation efficiency. Additionally the plan identifies the importance of the "Rails-to-Trails" program and other efforts essential to maintaining and improving non-motorized transportation opportunities throughout the city.

Furthermore, this document identifies a series of goals and associated implementation policies to guide future transportation considerations. The identified goals include encouraging public transit and alternative transportation uses to reduce congestion, maintain air quality, and mindfully conserves energy; provide a comprehensive trails system to improve road to park connectivity; develop a street improvement plan supporting development and growth actions; and improve access to Ernest A. Love Field.

SR 89, Chino Valley to Forest Boundary Transportation Study

Completion Date: 2017
Sponsoring Agency: ADOT

Summary of Project: This study was conducted to determine strategic solutions for the SR 89 between Chino Valley through north of Paulden. This portion of the SR 89 is a high speed roadway with poor access management, which has led to a high number of turning-movement crashes. Additionally, with this segment projected to experience increased traffic volumes in the future, access strategies are important to address.

Summary of Findings: A set of near-term (5-year), mid-term (10-year), and long-term (20-year) projects were identified to improve access management, reduce the frequency of rear-end, run-off the road, and fixed object crashes, and reduce wildlife-related crashes with improved fencing and signage. Proposed projects were selected based upon engineering features, property impacts, environmental compatibility, public input, safety impacts, and access management impacts. Future proposed extensions (Great Western Corridor and Chino Valley Extension) could create a direct route between this study area and the SR 89A Corridor.

SR 89, SR89A to S Chino Limits Project Assessment

Completion Date: 2007
Sponsoring Agency: ADOT

Summary of Project: This project assessment was completed for SR 89 between milepost 319.35 (SR 89A Junction) to milepost 324.59 (Future Road 5 South intersection) to address roadway improvements for this corridor segment.

Summary of Findings: Full roadway widening to a 6-lane divided facility is proposed for SR 89 between SR 89A and Chino Valley. An additional 6 feet of width is included at the SR 89A Junction to accommodate the addition of a second left-turn lane from SB SR 89 to EB SR 89A. The improvements between the ramp intersections are not included within the project assessment. No additional impacts to the SR 89A study corridor were identified.

SR 89A at Robert Road Safety Assessment

Completion Date: 2015
Sponsoring Agency: Town of Prescott Valley

Summary of Project: The SR 89A at Robert Road RSA was completed for the Town of Prescott Valley in direct coordination with ADOT to address the safety concerns of the SR 89A and Robert Road at-grade signalized intersection. This intersection has a Y-shaped configuration of high-speed ADOT facilities, with the split of SR 89A and Fain the beginning of Fain Road.

Summary of Findings: A two-day field review was conducted, inventorying existing safety enhancing features of the study area as well as observing driver behavior and identifying safety improvements suggestions. Safety enhancement features present in the study area include but are not limited to rumble strips, delineators, adequate sight distances, nighttime lighting, safety edge, and advanced signal warning sign with flashers. A multitude of safety limitations were identified, including but not limited to partially blocked road advisory and warning signs, poor signing placement, misaligned signal heads, and excessive travel speeds. The study produced a potential safety countermeasure implementation matrix, which addresses the intersection's limitations with proposed projects and suggestions for increased education & enforcement. **Appendix 2** catalogs all recommended improvements identified in the Robert Road RSA.

SR 169 to Fain Road Corridor Location Study

Completion Date: 2009
Sponsoring Agency: CYMPO

Summary of Project: The SR 169 to Fain Road Connector Study looked at a proposed expansion corridor spanning between SR 169 (6 miles north of SR 69) and Fain Road (between Lakeshore Drive and SR 89A Junction). The study goals were to develop a comprehensive range of alternative corridors, gather public feedback on the proposed route, forecast traffic operations, and identify feasible and desirable route and termini locations.

Summary of Findings: The Refined Corridor Alternatives narrowed the options to 3 Proposed Corridors, as shown in **Appendix 1**. The Preferred Alternative PV2Mod was selected as the recommended alternative, as it provides the most direct southeast to northwest route while minimizing the impact on planned employment area development for the Town of Prescott Valley. This preferred alternative will be proposed to ADOT to adopt into the state highway system in the future. The connection to Fain Road included plans for a new traffic interchange with a realigned Robert Road.

Yavapai County Comprehensive Plan

Completion Date: 2011
Sponsoring Agency: Yavapai County

Summary of Project: The *Yavapai County Comprehensive Plan* is a long-term document established to guide decision-making to address the future needs of the county. Specifically, the plan's *Transportation Element* develops a strategic approach for transportation development in conjunction with economic growth and increasing mobility and improving quality of life.

Summary of Findings: This plan summarizes both the current and future transportation conditions including completed and short and long-range projected planned improvements. The goals established for the Transportation Element include, coordination and consistency between transportation planning, land use planning, local/regional stakeholders, and continued encouragement for the use of multi-modal transportation opportunities.

Yavapai County Regional Mobility Management Implementation Plan – 2017

Completion Date: 2017
Sponsoring Agency: CYMPO

Summary of Project: The Regional Mobility Management Implementation Plan was developed for CYMPO and completed in February 2017 in order to identify mobility improvement options for transit and to develop a *Public Transit-Human Service Transportation coordination Plan*.

Summary of Findings: Low levels of service availability were identified for the City of Prescott, Town of Prescott Valley, and Town of Chino Valley. However, service needs for these urbanized areas were identified as "high" due to an aging population. Transit financing is identified as problematic throughout most of Yavapai County. This study identifies a significant potential economic benefit with further implementation of local/regional transit services. The implementation strategies identified include accessing the FTA urban area funding for transit services, designating CYMPO as the lead agency, and establish vanpool service with uniform operation and performance measures in order to best improve the county's available transit services.

2.5.3 Current Transportation Improvement Program

CYMPO Metropolitan Transportation Improvement Program (MTIP)

Program Effective Date: 2016-2025
Sponsoring Agency: CYMPO

Summary of Project: The CYMPO MTIP is a regularly updated fiscally constrained transportation programming document. The MTIP tracks CYMPO's use of Federal funds allocated by the Arizona Department of Transportation on an annual basis. CYMPO is a recipient of Statewide Planning and Research (SPR), Metropolitan Planning (PL), Surface Transportation Block Grant Program (STBG), Highway Safety Improvement Program (HSIP), and Federal Transit Administration Funding (Section 5303) funds.

Summary of Findings: Current projects listed in the MTIP pertaining to the SR 89A study area include the following:

SR 89 - Jct SR 89A to Deep Well Ranch Road – FY 17/18 - *construction*
SR 89A/Robert Road Traffic Interchange – FY 21 - *design*
SR 89A Shoulder Widening – FY 16 - *construction*
Lakeshore Drive - SR 89A, Prescott Valley – Multi-use Path – FY 16 - *construction*

ADOT Five-Year Transportation Facilities Construction Program

Program Effective Date: 2018-2022
Sponsoring Agency: ADOT

Summary of Project: The ADOT Five-Year Transportation Facilities Construction Program is a regularly updated fiscally constrained transportation programming document. This document tracks the programming of Federal funds distributed on an annual basis.
Summary of Findings: There are currently no projects listed in the program pertaining to the SR 89A study area.

3.0 CURRENT CONDITIONS

3.1 Land Use, Socioeconomic, and Corridor Features

3.1.1 Land Ownership

The entirety of the land ownership intersected by the study corridor consists of privately owned land and the Arizona State Land Department State Land Trust lands. Broadening the scope of land ownership, the greater land ownership profile of the region, included within a three mile Euclidean radius of the study corridor, incorporates primarily privately owned lands and Arizona State Land Department State Land Trust lands, but incorporates small portions of land Bureau of Land Management (BLM) and County owned lands, as shown in **Figure 2.** Additionally, as an ADOT owned and operated freeway facility, the entire SR 89A corridor is located within ADOT Right-of-Way. **Table 1** shows the breakdown of the corridor study area's land ownership.

Table 1: Land Ownership

Owner	Area (Acres)
Private	33,106
AZ State Land Trust	12,137
BLM	413
County	206
Total Corridor Area	**45,862**

3.1.2 Land Use

The SR 89A Study Area captures a variety of different land uses across the City of Prescott, Town of Prescott Valley and Yavapai County. The Town of Prescott Valley's land use shows a large amount of future development opportunities with large quantities of Planned Area Development and Village Planned Area Development land use distinctions. Otherwise, the corridor is primarily surrounded by low to medium density residential land uses with small areas of commercial use, as shown in **Figure 3**.

3.1.3 Zoning

The dominating Yavapai County zoning district within the SR 89A study area is represented as Residential; Rural. The portion of county land stretching across SR 89A between Granite Dells Parkway and Glassford Hill Road exclusively has the Residential; Rural zoning distinction.

Yavapai County Zoning Districts include the following:

C1	Commercial; Neighborhood Sales and Services
C2	Commercial; General Sales and Services
M1	Industrial; General Limited
M2	Industrial; Heavy
OS	Open Space Resource Conservation Zone
P1	Parking
PAD	Planned Area Development
PM	Performance Industrial
PUD	Planned Unit Development
R1	Residential; Single Family
R1L	Residential; Single Family Limited
R2	Residential; Multi-Family
RCD	Residential Camping District
RCU	Residential; Rural
RMM	Residential; Multi-Sectional Manufactured Homes
RS	Residential and Services

Similar to Yavapai County, the Town of Prescott Valley zoning districts that directly intersect the SR 89A Corridor are zoned as Residential; Single Family, Rural. However, further housing developments along the SR 89A primarily between Glassford Hill Road and Robert Road have led to zoning differentiations including variations of residential zoning comprising; Mobile and Manufactured Homes, Multiple Dwelling Units, Single Family Limited, and Residential and Services, as well as small portions of commercial, agriculture, public, and industrial zoned land area.

Town of Prescott Valley Zoning Districts include the following:

AG	Agriculture
C1	Commercial; Neighborhood Sales and Services
C2	Commercial; General Sales and Services
C3	Commercial; Minor Industrial
M1	Industrial; General Limited
M2	Industrial; Heavy
P1	Parking
PL	Public Lands
PM	Performance Manufacturing
R1L	Residential; Single Family Limited
R1MH	Residential; Single Family Mobile/Manufactured Homes
R2	Residential; Multiple Dwelling Units
RCU	Residential; Single Family, Rural
RS	Residential and Services

The City of Prescott boundary encompasses the western portion of the SR 89A study corridor. This area has a variety of different zoning districts, thus enabling a variety of development opportunities along the SR 89A in the future. A block of land between milepost 319 and 320 is zoned as Business Regional A majority of the land directly north of SR 89A and south of the Prescott Airport is zoned as Single-family residential. South of the SR 89A includes multiple different zoning districts including Light Industrial, a large section of different single-family residential corresponding with the future Walden Ranch development.

City of Prescott Zoning Districts include the following:

BG	Business General
BR	Business Regional
DTB	Downtown Business District
IG	Industrial General
IL	Industrial Light
IT	Industrial Transition
MF-H	Multi Family – High
MF-M	Multi Family – Medium
MFH	Manufactured Home
MU	Mixed Use
NOB	Neighborhood Oriented Business
NOS	Natural Open Space
RO	Residential Office
RS	Recreation Space
SF-09, SF-12, SR-18, SF-35	Single-Family
SF 12-MH, SF6-MH	Single-family Manufactured Home
RE-2 Acre	Rural Estate

Each jurisdiction's zoning districts are shown in **Figure 4**.

3.1.4 Socioeconomic Conditions

The study corridor extends through unincorporated Yavapai County, the Town of Prescott Valley, and the City of Prescott, providing a travel route used for local, regional, and inter-regional travel. The third component of the *Tri-City Region*, Chino Valley, is a significant population center, which the SR 89A route connects regional traffic along. According to the Arizona State Demographer's Office, the 2015 estimated Yavapai County population is greater than 220,000 people, with the City of Prescott and Town of Prescott Valley being some of the largest population contributors. Additionally, these municipalities have experienced modest population growths between 2010 and 2015 most notably in the Town of Prescott Valley. **Table 2** shows the full population counts, estimates, and projections, between 2010 and 2015.

Table 2: Current Population

Area	2010 Population	2015 Population	% Change 2010 - 2015	Total Growth
Yavapai County	**211,033**	**220,189**	**4%**	**9,156**
Chino Valley	10,817	10,895	1%	78
Dewey-Humboldt	3,894	3,923	1%	29
Prescott	39,843	40,989	3%	1,146
Prescott Valley	38,822	41,415	7%	2,593
Unincorporated	83,782	86,141	3%	2,359

Source: U.S. Census, Arizona Office of Economic Opportunity

The 2010 population distribution throughout this area is displayed in **Figure 5** divided by census tracts. Additionally, a 3-mile study analysis area was created in order to identify the most immediately impacted populations nearest to the study corridor. A three mile radius buffer (approximately 63,487 acres) was created surrounding the study corridor, including all census tracts fully within or intersected. The population distribution within this study analysis area is shown in **Table 3**.

Table 3: Corridor Study Area Population (2010)

Area	Population
City of Prescott	5,697
Town of Prescott Valley	9,444
Yavapai County	1,143
Total Corridor Population	**16,284**

Source: 2010 U.S. Census

Figure 2: Land Ownership

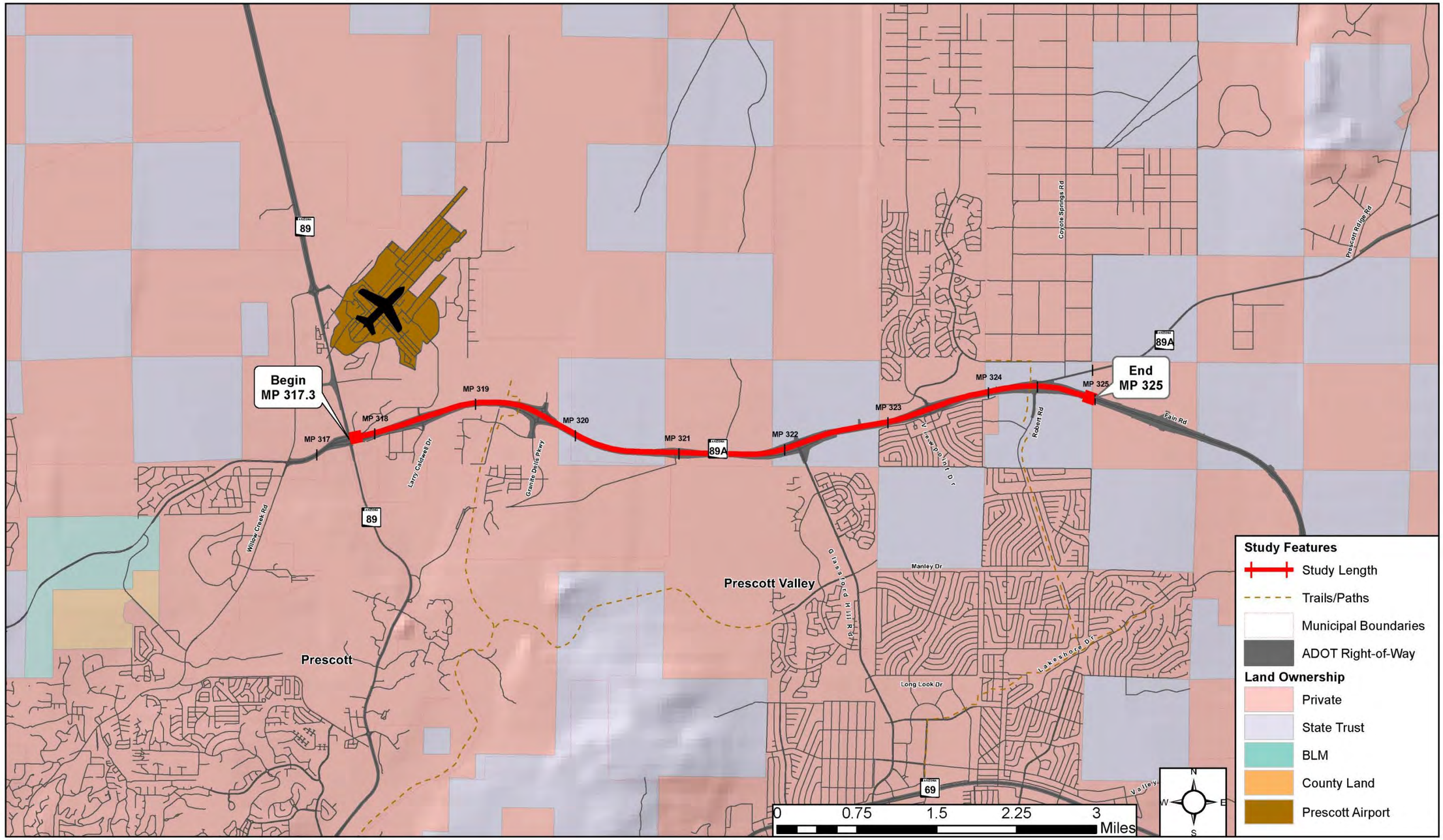
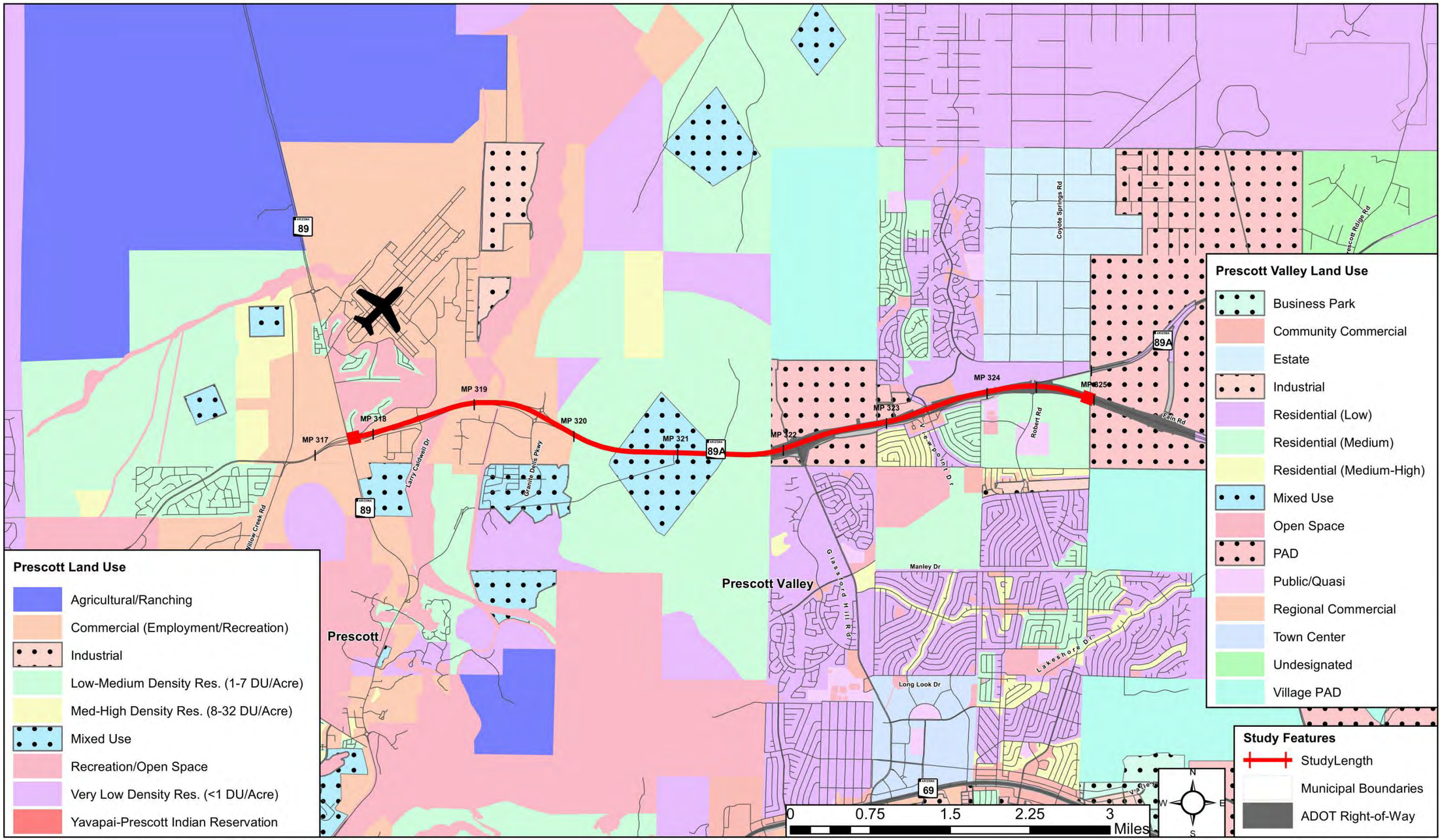


Figure 3: Land Use



*due to data limitations, land use information was interpolated for portions of Yavapai County

Figure 4: Zoning

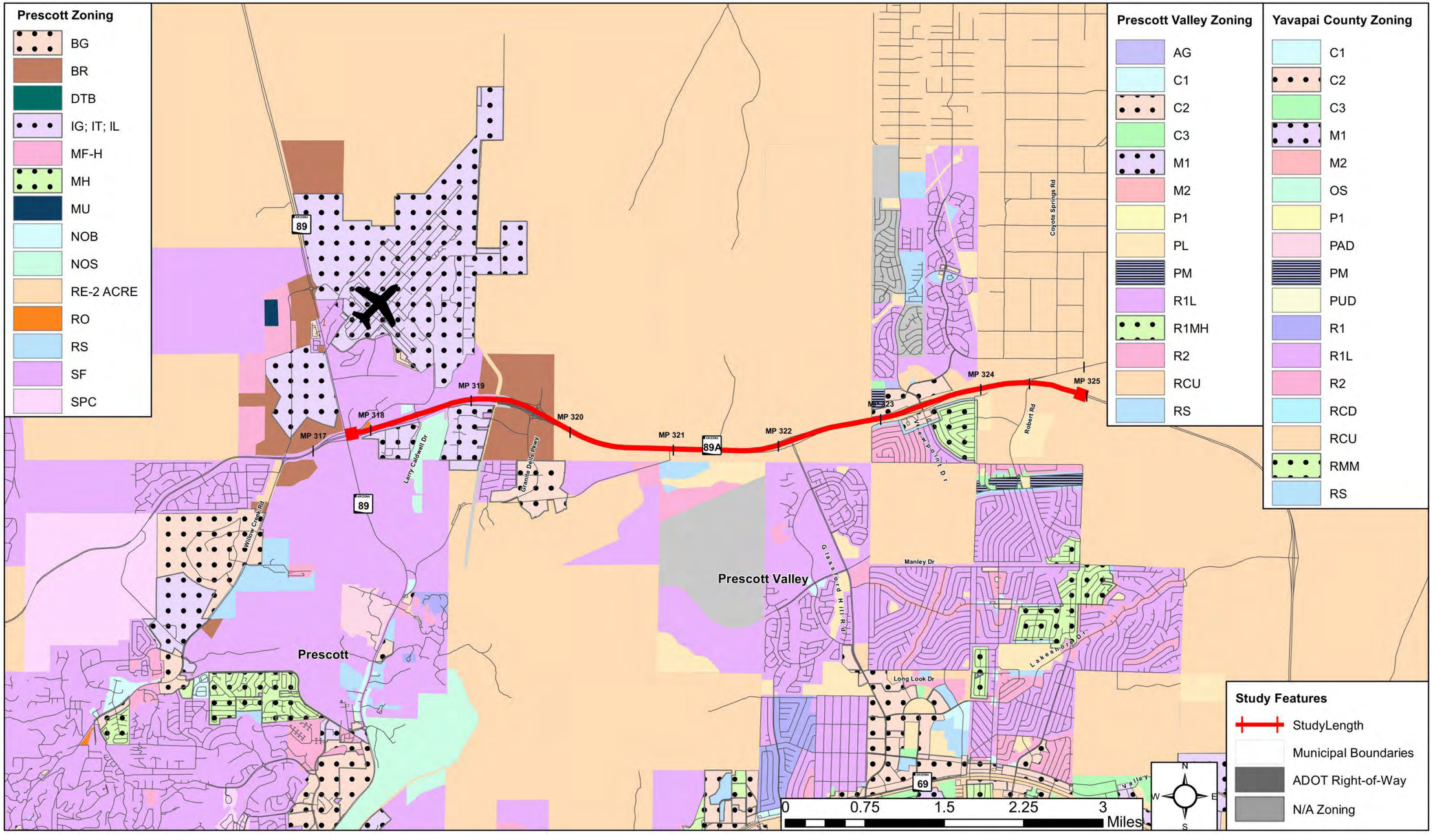
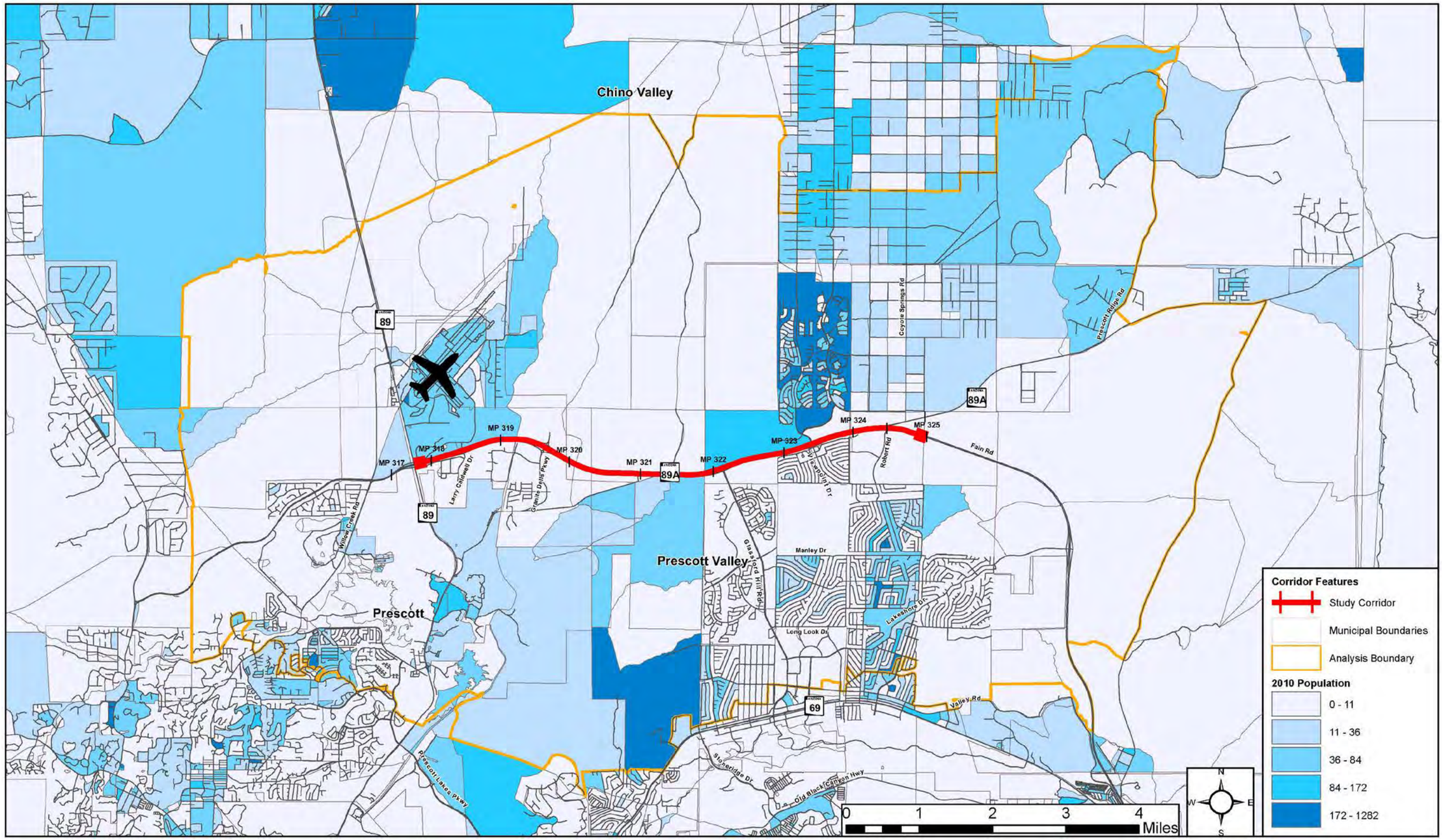


Figure 5: 2010 Population



3.2 Roadway Characteristics

The SR 89A between SR 89 and Robert Road is a controlled access 4-lane divided freeway until the intersection with Robert Road. There are five grade separated traffic interchanges and one at grade signalized intersection throughout the corridor. Additionally, there is access to the Old Highway 89A alignment near milepost 321 west of Glassford Hill Road, which is accessible from both eastbound and westbound dedicated turn lanes.

3.2.1 Right-of-Way (ROW)

There is variation in ADOT Right-of-Way throughout the SR 89A Study Corridor. ROW estimations are identified for each crossroad and the typical through-section of SR 89A Corridor, as shown in **Table 4**.

Table 4: Right-of-Way Estimates

Location	Right-of-Way Width
Typical Through Section	
SR 89A	300 feet
Cross Road	
Fain Rd	300 ft – 375 ft
Robert Rd	150 ft
Viewpoint Dr	100 ft
Glassford Hill Rd	100 ft
Granite Dells Pkwy	120 ft (N) – 310 ft (S)
Larry Caldwell Dr.	120 ft (N) – 200 ft (S)
Pioneer Pkwy	150 ft – 250 ft
SR 89 (South of SR 89A)	100 ft
SR 89 (North of SR 89A)	100ft – 150 ft
SR 89A (East of Robert Rd)	100 ft

Source: ADOT Multimodal Planning Division

3.2.2 Functional Classification

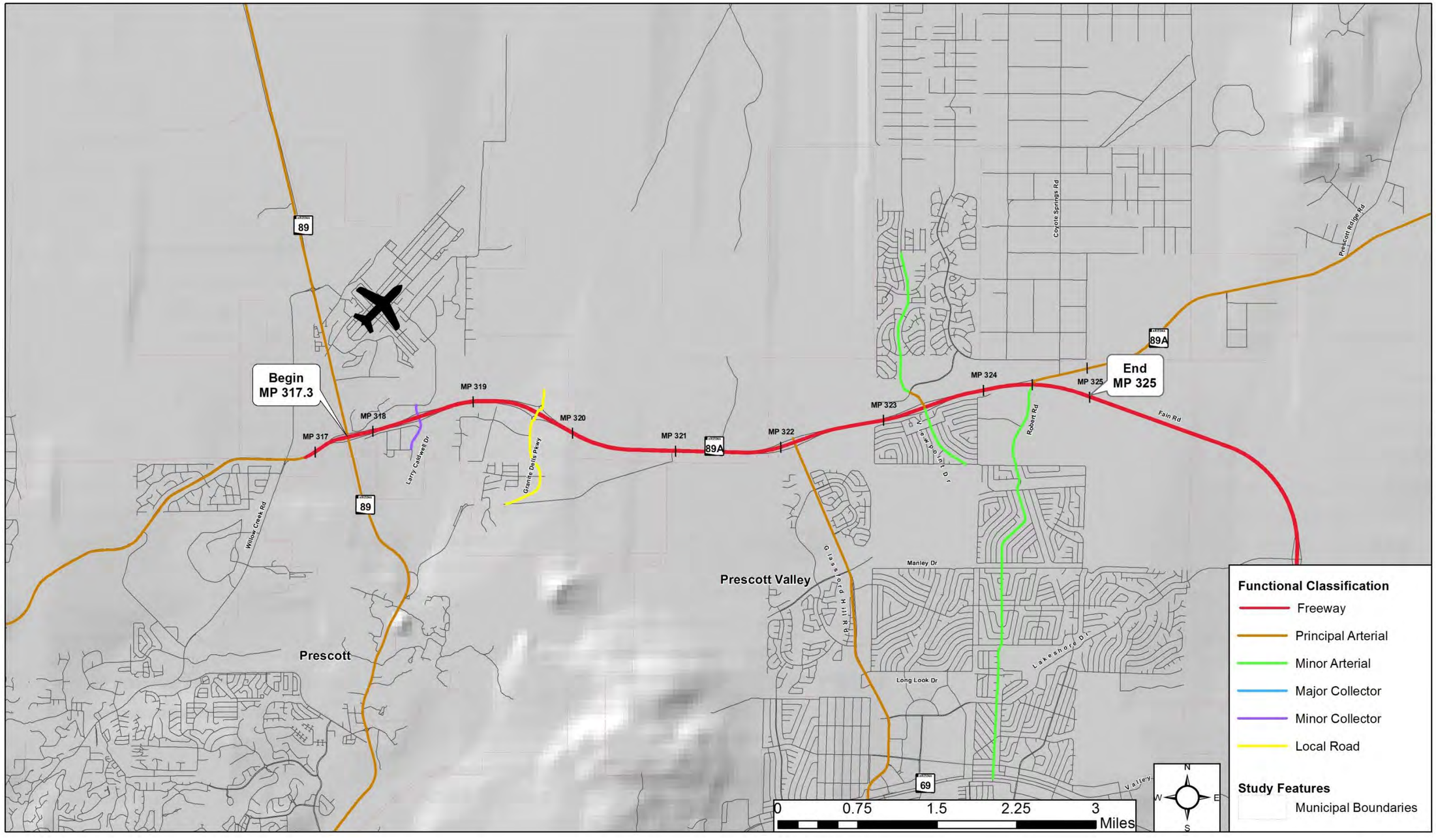
Although the mainline study area is exclusively classified as a freeway facility, there are multiple facility classifications directly interacting with the corridor. **Table 5** and **Figure 6** display the functional classification distinctions for the SR 89A corridor and all relevant cross roads.

Table 5: Functional Classification

Location	Functional Classification
SR 89A (West of Robert Rd)	Freeway
SR 89A (East of Robert Rd)	Principal Arterial
SR 89 (North of SR 89A)	Principal Arterial
SR 89 (South of SR 89A)	Minor / Principal Arterial
Fain Rd	Freeway
Robert Rd	Minor Arterial
Viewpoint Dr	Major/Minor Arterial
Glassford Hill Rd	Principal Arterial
Larry Caldwell Dr.	Minor Collector
Pioneer Parkway	Principal Arterial
Granite Dells Pkwy	Local Road

Source: ADOT, Prescott Valley General Plan

Figure 6: Functional Classification



3.2.3 Roadway Features

The SR 89A is a controlled access facility with five grade separated traffic interchanges. There is a singular at-grade signalized intersection at the eastern terminus where the route intersects Robert Road and Fain Road as well as branches northbound. The Granite Dells Parkway TI is controlled with two roundabouts (EB/WB). The Larry Caldwell Road TI is stop controlled on the ramp legs of the intersections (EB/WB). Viewpoint Drive, Glassford Hill Road, and the SR 89 TI's all contain signal controls (EB/WB).

The typical through speed limit for the SR 89A is 65 mph. However, the speed limit is reduced to 55 mph inbound and outbound at the Robert Road intersection, including the western portion of Fain Road. The remainder of Fain Road is a 65 mph facility outside the study boundaries. Pioneer Parkway is 45 mph as you continue directly through both the western terminus of the study corridor. All corridor characteristics are shown in **Figure 7**.

3.2.4 Pavement

ADOT cyclically inspects their pavement assets throughout the state on a mile-per-mile basis, collecting both the percent area of pavement fissures, displayed as the cracking data, and road smoothness, displayed with the International Roughness Index (IRI) metric. IRI values score as good (<93), fair (93-142), or poor (>142) and cracking values score as good (<8), fair (8-15), and poor (>15).

The cracking data was collected for both northbound and southbound directions of the study area as well as the northbound IRI was collected in March 2015. However, the Southbound IRI data was collected in September 2015.

The SR 89A corridor is a fairly new corridor and the 2015 pavement data indicates a low level of pavement distresses and/or failures and smooth pavement. **Table 6** shows the most recent pavement data collected for the SR 89A study corridor.

Table 6: Pavement Condition

MP Range	Northbound				Southbound			
	Cracking	Date Tested	Average IRI	Date Tested	Cracking	Date Tested	Average IRI	Date Tested
317-318	3	3/18/2015	N/A	N/A	0	3/18/2015	N/A	N/A
318-319	5	3/18/2015	60.590312	3/4/2015	1	3/18/2015	69.678333	9/29/2015
319-320	6	3/18/2015	58.7965	3/4/2015	5	3/18/2015	66.592	9/29/2015
320-321	7	3/18/2015	55.425	3/4/2015	3	3/18/2015	54.552	9/29/2015
321-322	0	3/18/2015	49.9005	3/4/2015	3	3/18/2015	52.5945	9/29/2015
322-323	5	3/18/2015	51.175	3/4/2015	4	3/18/2015	54.98	9/29/2015
323-324	3	3/18/2015	40.1585	3/4/2015	1	3/18/2015	47.2585	9/29/2015
324-325	4	3/18/2015	90.6615	3/4/2015	4	3/18/2015	81.1525	9/29/2015

3.2.5 Bridge

This segment of SR 89A contains nine (9) bridges, seven (7) of which are mainline traffic interchanges. Of these 7 bridges, only two (2) structures create an underpass for the SR 89A mainline.

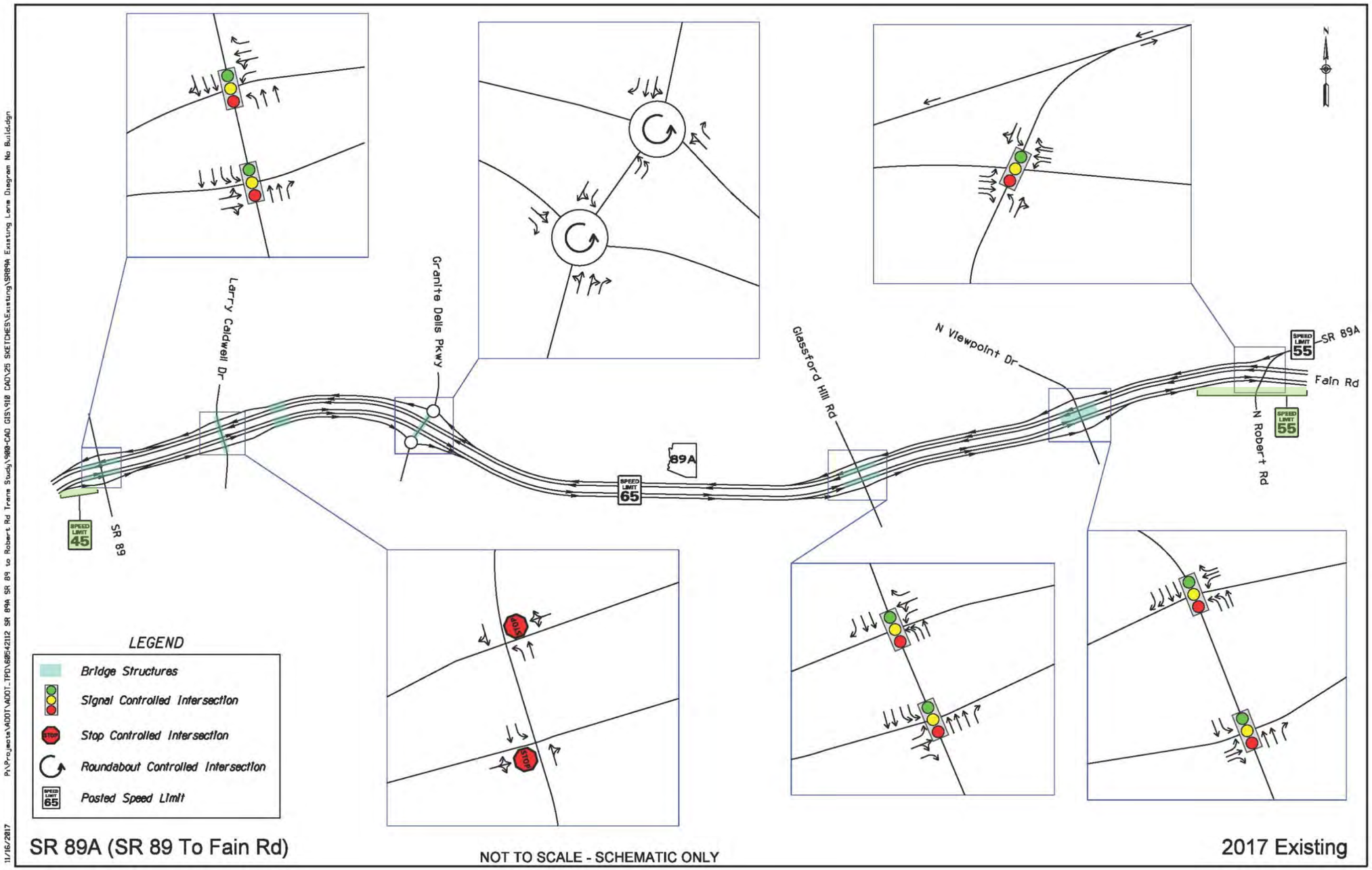
The latest bridge inspection conducted in this region was completed in August 2016, covering each bridge within the study area. These inspections are conducted cyclically throughout the state by ADOT officials, noting the conditions of individual bridge components; including of the deck, sub-structure, and super-structure and determine a cumulative sufficiency rating. Each structural component is rated on a scale from 0-9 (failed condition – excellent condition) with a higher score associating with a better condition. The sufficiency rating is expressed as a percentage, with a greater percentage indicating a higher sufficiency.

Due to the more recent construction of each bridge along the study corridor, none built over 16 years prior, the sufficiency rating and individual ratings score positively. Each bridge has a sufficiency rating greater than 98%. Therefore, there are current no bridge deficiencies present throughout the corridor length. **Table 7** shows the bridge rating information from the August 24, 2016 inspections.

Table 7: Bridge Ratings

Structure Name	MP	Year Built	Deck Area	Bridge Sufficiency Rating	Deck Rating	Sub-structure Rating	Super-structure Rating	Structure Evaluation	Functionally Obsolete	Inspection Date
SR 89A TI OP EB (#1862)	317.76	2008	1170	100.00	7.00	8.00	7.00	7.00	N/A	8/24/2016
SR 89A TI OP WB (#1863)	317.76	2008	1170	100.00	7.00	8.00	8.00	8.00	N/A	8/24/2016
Larry Caldwell Drive TI UP (#1891)	318.46	2001	1062	98.20	7.00	7.00	7.00	7.00	N/A	8/24/2016
Granite Creek Bridge NB (#2015)	318.70	2001	2951	98.90	6.00	8.00	7.00	7.00	N/A	8/24/2016
Granite Creek Bridge SB (#2559)	318.80	2001	1973	98.90	6.00	8.00	7.00	7.00	N/A	8/24/2016
Granite Dells Pkwy TI UP (#2807)	319.61	2010	1256	100.00	8.00	8.00	8.00	8.00	N/A	8/24/2016
Glassford Hill Rd TI OP NB (#2666)	322.04	2005	1041	98.90	7.00	7.00	7.00	7.00	N/A	8/24/2016
Glassford Hill Rd TI OP SB (#2667)	322.04	2003	1041	98.90	7.00	7.00	7.00	7.00	N/A	8/24/2016
Viewpoint Drive TI OP (#2959)	323.39	2011	2650	100.00	8.00	8.00	8.00	8.00	N/A	8/24/2016

Figure 7: Roadway Features



3.2.6 Freight

3.2.6.1 *Bridge Vertical Clearance*

Regular freight traffic and oversize loads require a minimum of 16.25 feet of vertical clearance to safely pass beneath bridge underpasses. Alternatively, the oversize loads could utilize the on/off-ramps to divert around the underpass as an alternative bypass option dependent on load height, while avoiding significant detouring.

The SR 89A mainline has bridge underpasses at the Larry Caldwell Drive and Granite Dells Parkway Traffic Interchanges. There are no vertical clearance limitations along the SR 89A mainline with 17.75 and 18.65 feet of clearance respectively. Furthermore, oversized loads that require additional height clearance have the option on both bridges to use the on/off-ramps in order to bypass the underpass without necessitating significant detouring and/or delay.

The SR 89A TI OP EB (SR 89 TI) bridge presents a vertical clearance limitation, with a non-mainline vertical clearance of only 16.2 feet.

A full record of bridge clearances is shown in **Table 8**.

Table 8: Bridge Vertical Clearance

Structure Name	MP	Mainline Vertical Clearance	Non-Mainline Vertical Clearance
SR 89A TI OP EB (#1862)	317.76	-	16.20
SR 89A TI OP WB (#1863)	317.76	-	17.52
Larry Caldwell Drive TI UP (#1891)	318.46	17.75	-
Granite Creek Bridge NB (#2015)	318.70	-	-
Granite Creek Bridge SB (#2559)	318.80	-	-
Granite Dells Pkwy TI UP (#2807)	319.61	18.65	-
Glassford Hill Rd TI OP NB (#2666)	322.04	-	19.22
Glassford Hill Rd TI OP SB (#2667)	322.04	-	18.25
Viewpoint Dr TI OP (#2959)	323.39	-	20.43

3.2.6.2 *Oversized/Overweight Load Permits*

Due to a newly adopted data storage system, ADOT is only able to provide 2.5 years of permitting information. Class A and C permitting counts are identified for this specified timeframe.

3.2.6.3 *Issued Permits*

Class A permits are issued for non-reducible oversized and/or overweight loads that measure no greater than a 14 foot width, 16 foot height, 120 foot length, and 250,000 pound weight.

Class C permits are issued for oversized and/or overweight loads that measure in excess of 14 foot width, 16 foot height, 120 foot length, and 250,000 pound weight. Additionally permitting fees are incurred for loads exceeding 18 feet in height or width and/or 80,000 pounds.

Table 9 summarizes the total number of Class A and Class C permits issued for routing within the study area for the prior 2.5 years.

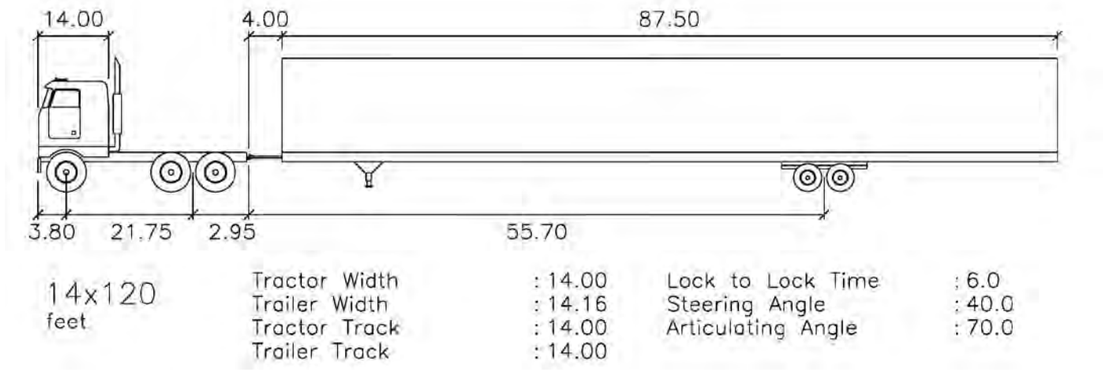
Table 9: Oversized Permits Issued

Type of Permit	Size	Total # of Permits Issued
Class A OS Permits	8’ W x 16’ H x 120’ L x 80,000 lbs.	100
Class A OS/OW Permits	8’ W x 16’ H x 120’ L x 250,000 lbs.	49
Class A Mobile Homes	8’ W x 16’ H x 120’ L x #80,000 lbs.	306
Class C OS Permits	> 14’ W x 16’ H x 120’ L x 80,000 lbs.	7
Class C OS/OW Permits	> 14’ W x 16’ H x 120’ L x 250,000 lbs.	8
Class C Easy Mobile Homes	> 14’ W x 16’ H x 120’ L x 80,000 lbs.	153
Class C Mobile Homes	> 14’ W x 16’ H x 120’ L x 80,000 lbs.	2

3.2.6.4 *Class C Roadway Geometry*

Turning movements were modeled in Transoft AutoTURN software utilizing an aerial view of the corridor at each intersection in order to determine roadway geometry compliance for oversized loads. A 14’ W x 16’ H x 120’ L vehicle was utilized in the model to represent the lowest size limit warranting a Class C permit, as shown in **Figure 8**. It is assumed that trucks will have the ability to utilize the full extent of all lanes to complete the turning movement.

Figure 8: Class C Load Model



The SR 89A mainline does not have any oversized load limitations, with all mainline bridge clearances accommodating a 16 foot tall load. However, the vehicle would need to utilize both through lanes to accommodate the 14 foot load width.

The intersection geometry for the SR 89 TI, Glassford Hill Road TI, and Robert Road intersection all accommodate oversize loads without any issues.

Granite Dells Parkway TI eastbound and westbound exit ramps experience significant curb encroachment/overlap on the approach to each of the respective roundabouts. Furthermore, there is also encroachment inside of the truck apron on the left turns from these exits. All movements from the Granite Dells Parkway to the on-ramps have no issues.

Larry Caldwell Drive experiences issues on all turning movements required to enter or exit the SR 89A ramps. The load's trailer requires a greater overpass bridge width. Additionally right-hand turns from both eastbound and westbound off ramps requires greater inside curb clearance.

Viewpoint Drive can accommodate some oversized turning movements. The westbound to northbound, northbound to eastbound, eastbound to northbound, and eastbound to southbound turns would currently result in minor inside curb encroachment by the trailer. Additionally the northbound to westbound turn requires the cab to maneuver outside of the current roadway striping to clear the trailer.

Refer to **Appendix 3** to view each interchange and intersection truck template diagram. The Class C roadway geometry areas of concern are summarized in **Table 11.**

Table 10: Class C Roadway Geometry Summary

Interchange	Area of Concern
SR 89	No issues
Larry Caldwell Drive	All turning movements entering or existing the ramps experience issues • Overpass bridge width does not accommodate trailer size • Both exit ramp right-turns require greater inside clearance
Granite Dells Parkway	Traffic exiting the ramps experiences issues • Curb encroachment/overlap on approaches to eastbound and westbound exit roundabouts • Both exit ramp left-turns experience encroachment inside the truck apron
Glassford Hill Road	No issues
Viewpoint Drive	Several turning movements experience minor inside curb encroachment • Northbound and westbound right-turns require inside curb encroachment • Eastbound left- and right-turns require inside curb encroachment • Northbound left-turn requires maneuver outside current striping
Robert Road	No issues

3.2.7 Non-motorized Transportation

The study corridor is an access-controlled freeway facility. The roadway corridor does not specifically include non-motorized transportation user facilities, such as sidewalks and bicycle lanes. However, the corridor does permit bicyclists to utilize the shoulders of the facility. 96% of the corridor length accommodates bicyclists, including a minimum of 6 feet of paved shoulder width.

Additional non-motorized consideration was given to the intersecting local/regional roads connecting to the SR 89A mainline. The only roads to provide pedestrian accommodations beginning at the respective SR 89A TI's were Larry Caldwell Drive (south of SR 89A) and Viewpoint Drive (south of SR 89A).

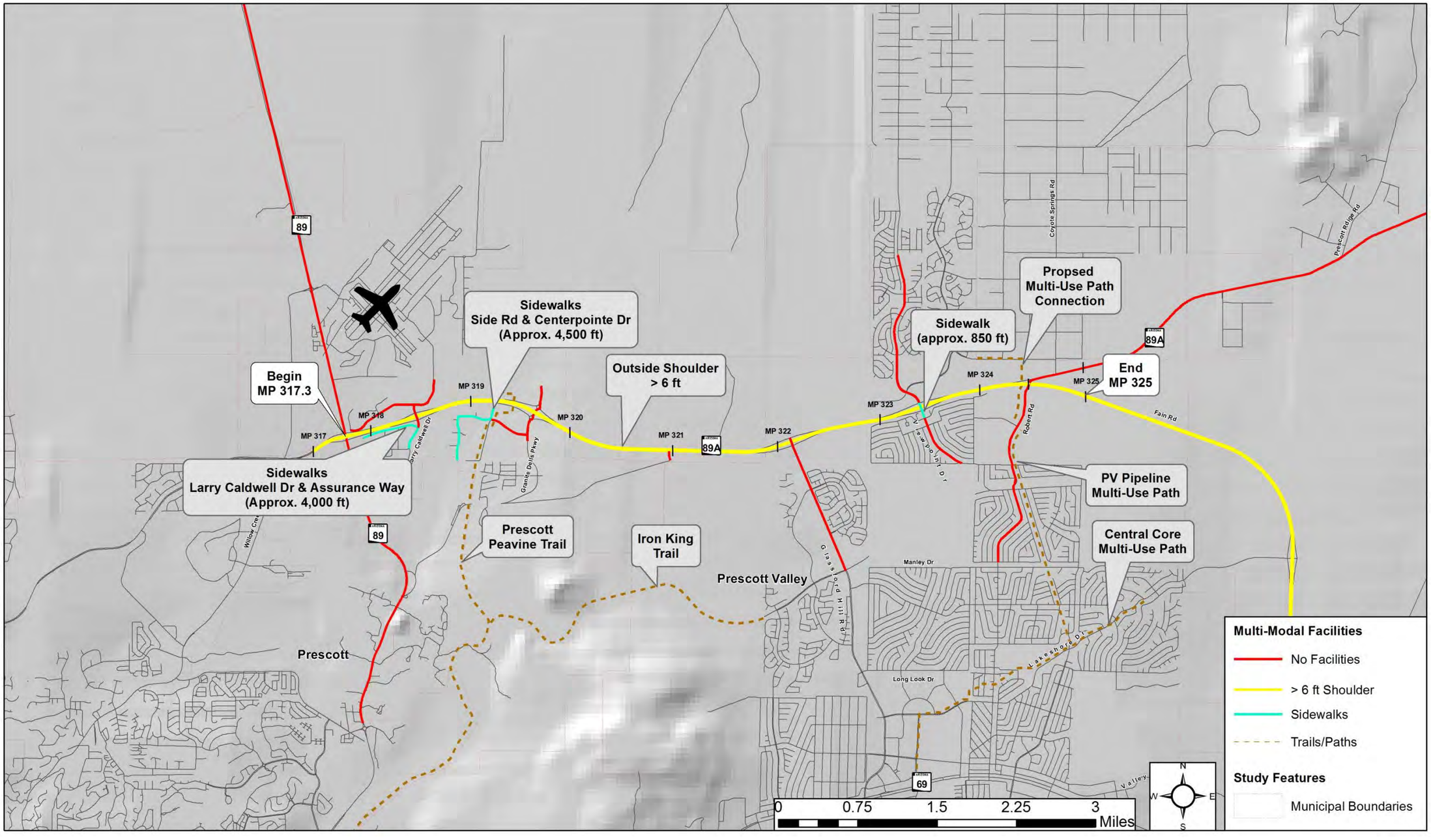
No intersecting local/regional roadways include dedicated bicycle lanes beginning at any respective SR 89A TI.

Additional non-motorized facilities in close proximity to the SR 89A corridor include multi-use trails/paths. The City of Prescott and Town of Prescott Valley house an extensive network of non-motorized recreation trails throughout their respective municipalities. While no direct intersection occurs with SR 89A, the Peavine Trail (City of Prescott) is accessible via Granite Dells Parkway and passes underneath SR 89A through a box culvert. The Iron King Trail (City of Prescott – Town of Prescott Valley) begins as a spur of the Peavine Trail further south of SR 89A. Furthermore, a new trail is proposed, beginning near the intersection of SR 89A and Robert Road. All non-motorized facilities are summarized in **Table 11** and shown in **Figure 9**.

Table 11: Non-Motorized Facilities

Roadways	Non-Motorized Facilities
SR 89A	Bicycle Accommodating Shoulder Width
SR 89	Bicycle Accommodating Shoulder Width
Fain Rd	Bicycle Accommodating Shoulder Width
Robert Rd	N/A
Viewpoint Dr	Limited Sidewalks (South of SR 89A)
Granite Dells Pwky	N/A
Glassford Hill Rd	N/A
Larry Caldwell Dr	Limited Sidewalks (South of SR 89A)
Trails	**Non-Motorized Facilities**
Peavine Trail	Non-motorized Recreational Trail
Iron King Trail	Non-motorized Recreational Trail

Figure 9: Non-Motorized Facilities



3.3 Traffic Conditions

3.3.1 Safety

Records of traffic crashes in the study area along SR 89A were assembled from ADOT's Accident Location Identification Surveillance System (ALISS) database. Crashes were reviewed for the 5-year period from 2011 through 2015, the most recent 5-year period for which complete crash data is available. The corridor experienced 224 crashes during this period, including crashes on the mainline, ramps, and crossroads in the vicinity of the study-area interchanges.

Table 12 shows the distribution of crashes by year. Crashes were slightly higher in 2015 than in any other year of the study period, but the number of crashes has been fairly consistent over time. The average number of crashes is about 45 per year, which corresponds to nearly one crash per week somewhere in the study area.

Table 12: Distribution of Crashes by Year

Year	2011	2012	2013	2014	2015	Total
No. of crashes	49	44	38	43	50	224

A safety predictive analysis for the alternatives considered in this study is provided in **Appendix 4** describes the crash modification research associated with each proposed alternative. Lighting conditions along the corridor were examined and were not found to be a contributing factor in collisions during the time period described.

3.3.1.1 *Severity*

Table 13 shows the severity of the study-area crashes. Of the 224 crashes, three (1.3 percent) were fatal. All three fatal crashes occurred at the signalized intersection of SR 89A and Robert Road, the only at-grade signal in the study area that mainline traffic must pass through. All the fatal crashes occurred during daylight hours and in clear weather. Following are the circumstances of the three fatal crashes:

- On Tuesday, January 22, 2013, at 3:02 p.m., a 49-year-old male motorist on eastbound SR 89A failed to stop and rear-ended a vehicle at the traffic signal. In the leading vehicle, the driver and back seat passenger were injured and the front-seat passenger, a 19-year-old female, was killed.
- On Thursday, September 18, 2014, at 1:19 p.m., a 73-year-old male motorist on westbound SR 89A failed to stop and rear-ended a vehicle stopped at the traffic signal. Both occupants of the leading vehicle, a 78-year-old female and an 89-year-old male, were killed.
- On Saturday, November 14, 2015, at 4:44 p.m., a 54-year-old male motorcyclist was traveling westbound on SR 89A and failed to negotiate a slight curve, ran off the roadway to the right, and overturned, killing the rider. The motorist had a blood-alcohol content of 0.086, exceeding the legal limit.

Statewide, an average of about 0.7% of crashes involve a fatality. The SR 89A corridor has a fatal rate about twice the statewide average; this rate is likely elevated because the speeds along SR 89A are considerably higher than the average of all roadways in the state.

Table 13: Crash Severity

Severity	2011	2012	2013	2014	2015	Total
No Injury (1)	38	28	27	30	28	151
Possible Injury (2)	6	8	4	2	9	29
Non-incapacitating Injury (3)	5	7	4	8	10	34
Incapacitating Injury (4)		1	2	2	2	7
Fatal (5)			1	1	1	3
Total	49	44	38	43	50	224

About 31 percent of the corridor's crashes involved at least one injury, and the remaining 68 percent of crashes involved property damage only (PDO). Both the injury and PDO rates are within one percentage point of the statewide averages.

As discussed earlier, the corridor experienced three fatal crashes accounting for a total of four fatalities. Likewise, a total of 99 people were injured in 70 injury crashes. Nearly 80% of injury crashes involved injury to just one person, while about 18 percent involved two injuries. The most injuries in a single crash was seven. This crash occurred in 2014 at the north intersection of the SR 89/SR 89A TI and involved four vehicles. The number of injuries per crash and total number of injuries in the study area is presented in **Table 14**.

Table 14: Number of Injuries per Crash

Number of Injuries per crash	2011	2012	2013	2014	2015	Total
0	38	28	27	30	29	152
1	7	14	8	10	16	55
2	3	2	2	2	4	13
3			1		1	2
5	1					1
7				1		1
Total	49	44	38	43	50	224

3.3.1.2 *Location of Crashes*

Figure 10 displays a heatmap with a distribution of crashes by location. The heatmap shows a clear concentration of crashes at four locations along the corridor, with relatively fewer crashes in other areas. The four locations are the TI's at SR 89, Glassford Hill Road, and Viewpoint Drive, along with the signalized intersection at Robert Road. At the three high-crash TI's, the vast majority of crashes occur at the intersections of the crossroad and the ramps to and from SR 89A. Each of the 4 identified high-crash locations have been further broken down to show crashes by severity at specific locations. These crash diagrams are provided in **Figure 11.**

Table 15 shows the relationship of crashes in the corridor to intersections and interchanges. About 39 percent of crashes were not associated with an intersection or interchange, but the remaining 61 percent had some intersection relationship. A total of 27 percent of crashes were coded as occurring at or near intersections at non-interchange locations, and an additional 14 percent were coded at or near intersections at interchanges.

Table 16 shows the severity of crashes according to their junction relationship. As noted earlier, all three fatal crashes occurred at or near an intersection not associated with an interchange (Robert Road). However, most of the incapacitating-injury crashes were not associated with intersections.

Table 15: Junction Relationship by Year

Junction Relationship	2011	2012	2013	2014	2015	Total
Not Junction Related	17	15	15	22	19	88
Intersection, Non-Interchange	12	7	1	3	6	29
Intersection Related, Non-Interchange	8	7	4	5	7	31
Entrance/Exit Ramp, Non-Interchange	1		1	1	2	5
Railway Grade Crossing	1					1
Thru Roadway			2			2
Intersection, Interchange		2	3	4	7	16
Intersection-Related, Interchange	3	3	5	4	1	16
Entrance/Exit Ramp, Interchange	7	10	7	3	8	35
Unknown				1		1
Total	49	44	38	43	50	224

Table 16: Junction Relationship by Injury Severity

Junction Relationship	Injury Severity					Total
	No Inj.	Possible Inj.	Non-Inc. Inj.	Inc. Inj.	Fatal	
Not Junction Related	59	9	14	6		88
Intersection, Non-Interchange	18	4	6		1	29
Intersection Related, Non-Interchange	18	8	2	1	2	31
Entrance/Exit Ramp, Non-Interchange	2		3			5
Railway Grade Crossing	1					1
Thru Roadway	2					2
Intersection, Interchange	9	2	5			16
Intersection-Related, Interchange	14	1	1			16
Entrance/Exit Ramp, Interchange	27	5	3			35
Unknown	1					1
Total	151	29	34	7	3	224

3.3.1.3 *Time of Crashes*

Table 17 shows crashes by month along the corridor. The most crashes occurred in September and October and the fewest occurred in February. The summer months did not experience a higher than average crash rate despite the perception that the corridor carries more traffic at that time of year. Other than September and October, only January and November experienced crashes at a rate slightly higher than average.

Figure 10: Crash Heatmap

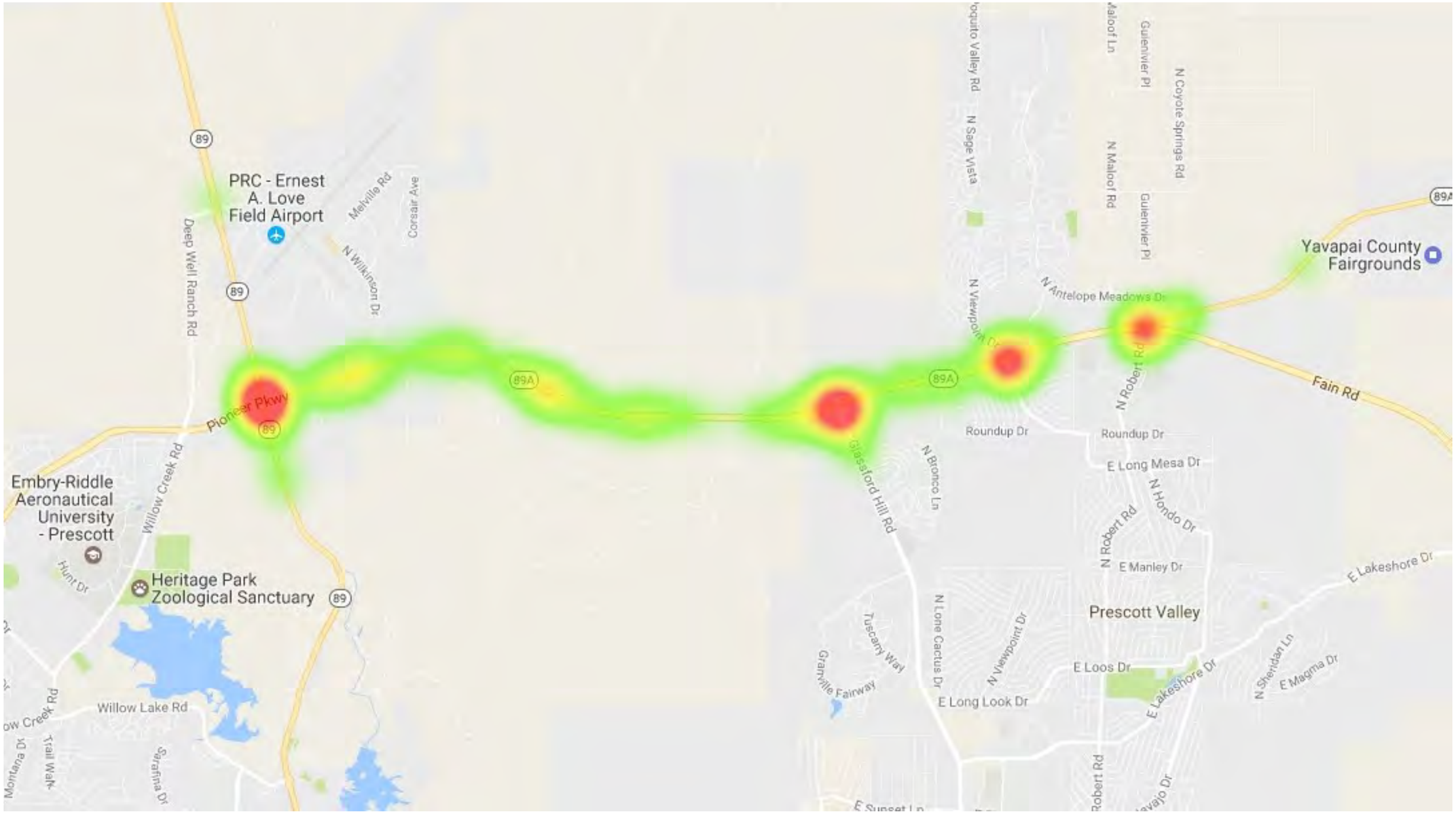


Figure 11: Crash Diagrams by Severity for High-Crash Locations

Table 17: Crashes by Month

Month	2011	2012	2013	2014	2015	Total
January	3	3	4	4	7	21
February	3	2	1	1	2	9
March	6	1	2	6	4	19
April	6	2	2	4	4	18
May	3	4	2	5	4	18
June	3	5	3	1	5	17
July	2	5	1	2	6	16
August	6	2	2	5	1	16
September	5	5	6	5	4	25
October	3	6	8	3	7	27
November	5	3	4	4	4	20
December	4	6	3	3	2	18
Total	49	44	38	43	50	224

Table 18 shows crashes by day of the week. Far fewer crashes occur on weekends than other days of the week—less than half on average. Each weekday has similar crash occurrence, with the most crashes on Thursdays, followed by Tuesdays. In many parts of the state, Friday is an above-average crash date, but on SR 89A, Friday experienced no more crashes than any other weekday.

Table 18: Crashes by Day of Week

Day of Week	2011	2012	2013	2014	2015	Total
Sunday	2	7	3	3	2	17
Monday	7	8	2	10	8	35
Tuesday	9	9	7	5	10	40
Wednesday	9	4	7	8	7	35
Thursday	10	8	8	6	14	46
Friday	9	6	6	9	5	35
Saturday	3	2	5	2	4	16
Total	49	44	38	43	50	224

Table 19 shows crashes by time of day. The data shows a clear spike in crashes during morning and afternoon peak traffic periods, 7:00 to 8:00 a.m. and 3:00 to 5:00 p.m. During the midday, roughly 8:00 a.m. to 3:00 p.m., there are less than half as many crashes as during peak hours. Crashes drop to very low levels overnight. The diurnal distribution of crashes is similar to traffic volume.

Table 19: Crashes by Time of Day

Hour of Day	2011	2012	2013	2014	2015	Total
12:00 a.m.	1	2				3
1:00 a.m.	2					2
2:00 a.m.		1		1	1	3
3:00 a.m.			1	1		2
4:00 a.m.						0
5:00 a.m.	1		1		1	3
6:00 a.m.	4	4			3	11
7:00 a.m.	7	1	1	7	7	23
8:00 a.m.	4	4	1	2	2	13
9:00 a.m.	5	4		2		11
10:00 a.m.	5		1		4	10
11:00 a.m.		1		4	1	6
12:00 p.m.	1	3	2	2	2	10
1:00 p.m.	2	1	3	4	1	11
2:00 p.m.	5	5	1	3	2	16
3:00 p.m.	3	2	9	4	6	24
4:00 p.m.	5	5	5	2	5	22
5:00 p.m.	1	6	4	1	4	16
6:00 p.m.	2	1	2	6	4	15
7:00 p.m.		2	4		3	9
8:00 p.m.	1	1	1			3
9:00 p.m.		1	1	2	2	6
10:00 p.m.			1	1		2
11:00 p.m.				1	2	3
Total	49	44	38	43	50	224

3.3.1.4 *Involvement in Crashes*

Pedestrians are prohibited on portions of SR 89A, but bicyclists are permitted, and all types of non-motorized users can legally use the crossroads in the study area. However, the volume of these users is exceptionally low, and this low level of usage is also reflected in the crash data. During the five-year study period only one of the 224 crashes involved a non-motorist. This crash

occurred on eastbound SR 89A on September 28, 2012, at about 7:00 p.m. A motorist approaching the Glassford Hill Road TI in a half-ton pickup struck and injured a bicyclist. Fault in the crash was assigned to the motorist.

Table 20 shows the number of units involved in each crash. Usually a "unit" refers to a vehicle, but it can also refer, for instance, to a pedestrian or cyclist if a crash involves a non-motorized traveler. Most crashes involve one or two units, but about 7 percent of crashes involved three or more.

Table 20: Number of Units Involved in Crashes

Number of Units Involved	2011	2012	2013	2014	2015	Total
1	14	12	13	15	18	72
2	32	29	22	25	28	136
3	3	2	3	2	4	14
4		1		1		2
Total	49	44	38	43	50	224

Table 21 presents work-zone crash data by year. Eight crashes in the study area, representing nearly 4% of total crashes, occurred in a designated work zone. The remaining 96% of crashes occurred outside a work zone. Half of the work-zone crashes occurred in 2011, and they tapered off through the rest of the data analysis period.

Table 21: Work-Zone Crashes

	2011	2012	2013	2014	2015	Total
Not work-zone related	45	42	37	43	49	216
Work-zone related	4	2	1		1	8
Total	49	44	38	43	50	224

About 7 percent of crashes involve hit-and-run drivers, a rate that has not changed considerably over the years. **Table 22** presents the hit-and-run crashes recorded.

Table 22: Hit-and-Run Crashes

	2011	2012	2013	2014	2015	Total
No hit-and-run drivers	46	42	36	40	45	209
Hit-and-run driver	3	2	2	3	5	15
Total	49	44	38	43	50	224

3.3.1.5 *Crash Conditions*

Table 23 presents the weather conditions during the corridor's crashes. About 76 percent of crashes occurred at a time when the weather was clear, the most predominant weather condition. Only about 5 percent of crashes occurred during rainy weather and less than 1 percent occurred in snow. However, it should be noted that the presence of inclement weather is not necessarily the cause of crashes that occur during that condition.

Table 23: Crashes by Weather Condition

Weather Condition	2011	2012	2013	2014	2015	Total
Clear	35	33	29	31	42	170
Cloudy	8	9	6	7	5	35
Rain	1	2	1	4	3	11
Snow	1			1		2
Severe Crosswinds	1					1
Fog, Smog, Smoke	2					2
Unknown	1		2			3
Total	49	44	38	43	50	224

Table 24 shows the lighting conditions in place at the time of each corridor crash. About 75 percent of crashes occurred during daylight hours, suggesting that crashes are not concentrated during hours of darkness. An additional 5 percent of crashes occurred at dawn or dusk when some light was available but not full daylight. The remaining 20 percent of crashes occurred during hours of darkness. Of the crashes during dark hours, officers reported that 57 percent occurred on roadways with street lighting and 39 percent occurred where no street lighting is present. On SR 89A, the mainline merge and diverge areas are illuminated, but some sections of the mainline are also unlit, which is not uncommon on rural state highways. Ramps themselves are generally not fully lit, but the ramp termini intersections are illuminated at every interchange.

Table 24: Crashes by Lighting Condition

Lighting Condition	2011	2012	2013	2014	2015	Total
Daylight	39	32	27	33	37	168
Dawn	3	1	1			5
Dusk	2	2	1	1	1	7
Dark-lighted	4	5	4	5	7	25
Dark-not lighted		4	4	4	5	17
Dark-unknown lighting	1		1			2
Total	49	44	38	43	50	224

3.3.1.6 *Crash Types*

The manner of collision, as presented on Arizona's crash reporting forms, refers to the type of crash that occurred first in an incident, if multiple types were ultimately involved. For instance, if two vehicles are involved in a sideswipe crash that later causes one vehicle to run off the roadway, the manner of collision for that crash is considered a sideswipe.

Table 25 presents the manner of collision for the study area crashes. Statewide, rear-end crashes are the most common type, averaging nearly half of all crashes. On congested signalized corridors, this ratio often well exceeds half. On the SR 89A corridor, rear-ends are the most common crash type, but they reflect about 36 percent of all crashes. Most rear-end crashes occur on the ramps or crossroads at the TI's, but some occur on the mainline. (As noted earlier, two of the three fatal crashes were rear-ends.)

The next most common crash type, representing about 32 percent of crashes, is single-vehicle crashes. Normally such crashes involve vehicles that run off the road and strike a fixed object or otherwise become incapacitated. Run-off-road crashes are often the most common crash type for rural highways. SR 89A does have some characteristics in common with rural roadways, including some long-distance travelers.

Of the less frequent crash types, same-direction sideswipe crashes accounted for about 11 percent of the corridor's collisions, while intersection crashes including angle and left-turn crashes accounted for a total of 14 percent. No other crash type accounted for more than 3 percent of crashes.

Table 25: Crash Manner of Collision by Year

Manner of Collision	2011	2012	2013	2014	2015	Total
Single vehicle	14	12	13	15	18	72
Angle	2	5	3	4	5	19
Left-Turn	5	4			4	13
Rear-End	19	16	17	16	12	80
Head-On	1	1			4	6
Sideswipe, same direction	5	2	4	6	7	24
Sideswipe, opposite direction		2		1		3
Other	1	1	1	1		4
Unknown	2	1				3
Total	49	44	38	43	50	224

Table 26 shows the injury severity of crashes according to manner of collision. Head-on crashes and opposite-direction sideswipes are most likely to involve injury—two-thirds of these crash types involved at least one injury. Single vehicle crashes were about half as likely to involve injury; injuries occurred in about 35 percent of single-vehicle crashes. Rear-end crashes are often cited as low in severity, but on the SR 89A corridor 31 percent of rear-end crashes involved injury. Two of the corridor's three fatal crashes were also of the rear-end type. The type of collision with the lowest injury occurrence was same-direction sideswipe crashes, of which about 8 percent involved injury. In general, reducing crashes that tend to have a high severity is most likely to achieve a public benefit.

Table 26: Manner of Collision by Injury Severity

Manner of Collision	Injury Severity					Total
	No Inj.	Possible Inj.	Non-Inc. Inj.	Inc. Inj.	Fatal	
Single vehicle	47	8	13	3	1	72
Angle	11	3	5			19
Left-Turn	6	1	6			13
Rear-End	55	16	5	2	2	80
Head-On	2	1	2	1		6
Sideswipe, same direction	22		1	1		24
Sideswipe, opposite direction	1		2			3
Other	4					4
Unknown	3					3
Total	151	29	34	7	3	224

3.3.1.7 *Driver Impairment Status by Location*

Table 27 below shows crash totals by location and level of impairment. "Locations" are designated as either interchanges or segments between interchanges. In much of the corridor the interchanges are so close together that there were no crashes in the short segments between.

Not all drivers are tested for alcohol or drug impairment at the time of a crash, so the actual number of impaired drivers is likely greater than shown in the table. A crash is designated in the table to involve impairment if any driver in the crash was indicated in the database as impaired. The table shows a total of 7 impaired crashes, about 3 percent of total crashes. While this is small, it is actually slightly higher than the statewide percentage of impaired crashes, which is about 2 percent. One can see that the greatest number of crashes occurred at the SR 89 interchange and the Glassford Hill Road interchange, two of the most heavily trafficked intersections on the corridor. The SR 89 interchange and Granite Dells Parkway interchange are the only two locations that do not include at least one drug or alcohol related crash.

Table 27: Location of Collision by Impairment Status

Location*	Impairment**			Total
	None	Alcohol	Drugs	
US-89 interchange	52			52
Larry Caldwell interchange	14		1	15
Granite Dells interchange	23			23
Between Granite Dells & Glassford Hill	13		1	14
Glassford Hill interchange	55	1		56
Viewpoint interchange	34	1	2	37
Robert Road intersection	26	1		27
Total	217	3	4	224

* Interchange locations include crashes that occur on the ramps, at ramp termini, at ramp merge/diverge areas, or on the mainline between exit and entrance ramps.
** Crashes coded with impaired drivers reflect only cases where the impairment was reported on the crash report.

3.3.2 Existing Traffic Data Collection

3.3.2.1 *Volume Data Collection*

Volumes were collected along the SR 89A freeway, crossroads, and ramps. Turning movement counts were collected at the five major TI's and one at-grade intersection in the study area – SR 89, Larry Caldwell Road, Granite Dells Parkway, Glassford Hill Road, Viewpoint Drive, and Robert Road/Fain Road – during both AM and PM peak hours. Raw data counts as well as calculated volume factors are provided in **Appendix 5**. **Figure 12** displays lane configurations and volumes along the SR 89A mainline and access ramps. **Figure 13** shows the turning movement volumes at the intersection and TI's.

The traffic volumes displayed in **Figure 12** and **Figure 13** are balanced volumes which take into account the method of data collection, and eliminate the traffic dissipated from the network between intersections. In other words, these volumes represent "balanced" conditions. The average daily traffic (ADT) on SR 89A ranges from above 40,000 vehicles per day (vpd) per direction between Granite Dells Parkway and Glassford Hill Road to approximately 21,000 vpd per direction between Viewpoint Drive and Robert Road. Glassford Hill Road south of SR 89A has the highest cross street volume at approximately 25,000 vpd.

A comparison of weekday versus weekend volumes on various freeway ramps was completed to ensure that weekend traffic was not drastically higher in the area. Volumes during the average weekday were higher than volumes on Friday, Saturday, and Sunday at each of the three locations examined. A comparison of weekday to weekend volumes is provided in **Figure 14**.

3.3.2.2 *Origin-Destination Data Collection*

In addition to the existing volumes, data was collected to better understand the travel patterns on the corridor, specifically in terms of the origin-destination (O-D) pairs. Any point at which traffic is able to enter the corridor could be considered an origin, while any point at which they are able to exist could be considered a destination. For the purpose of O-D pair data collection, Anonymous Re-Identification Devices (ARID's) were deployed in the study area. These devices use the anonymous identification tags gathered from Wi-Fi enabled devices inside vehicles to capture their presence at both an origin and destination point. In other words, the ARID's are able to detect the presence of a vehicle at a corridor entry point and the presence of that same vehicle at a corridor exit point, and aggregate this data for use by the analysis team. **Figure 15** shows the proposed locations of the ARID's on this study corridor, as well as the final locations. Proposed locations were presented to the stakeholder leadership team, which provided feedback resulting the final location selection.

Unfortunately, two ARID devices (on Glassford Hill Road and Larry Caldwell Drive) did not successfully record real-time Wi-Fi data during the study. A second round of ARID data collection was attempted, with the goal of bridging this data gap, but we found that limited cellular signal availability near the ARID device locations was an impediment to data collection in the study area. Therefore, reliable data for the origin-destination results at these two locations was not available. Fortunately, other sources of data, such as the CYMPO model and counts of existing interchange turning movements, can be used to estimate the origin-destination trends in the study area, particularly when combined with the existing ARID data. This complimentary data was used to verify the O-D tables used in the VISSIM modeling effort. Because VISSIM results are provided as an average over space, the effects of not having more detailed information for these particular areas does not have a major impact on the model results.

ARID's captured only data from vehicles which contain a Wi-Fi enabled device. Therefore, the resulting total vehicles captured cannot be directly correlated to the total volume at the location. However, the percentage of vehicles choosing a specific O-D pair can be assumed to be scalable to the overall number of vehicles entering the corridor at a specific location. Therefore, by applying the percentages from vehicles captured to the overall count information, one can achieve a reasonable approximation of the total vehicles choosing a specific O-D pair. **Table 28** provides an overview of the O-D data collected in this study. The table shows that vehicles originating from either direction on SR 89 or from Pioneer Parkway are more often destined to Fain Road than to north on Viewpoint Drive in either peak hour. Vehicles originating from either north on Viewpoint Drive or from Fain Road are more often destined to Pioneer Parkway than to SR 89. Of those originating from Fain Road and destined for SR 89, north on SR 89 is the more common direction.

Table 28: ARID Deployment O-D Results

Origin Location	Time Period	Destination Location: SR 89, North of SR 89A	SR 89A, West of SR 89	SR 89, South of SR 89A	Viewpoint Drive, North of SR 89A	Fain Road, East of SR 89A
SR 89, North of SR 89A	AM Peak		30	162	8	52
	PM Peak		27	109	26	60
SR 89A, West of SR 89	AM Peak	13		19	7	34
	PM Peak	6		4	29	50
SR 89, South of SR 89A	AM Peak	24	6		3	11
	PM Peak	62	13		26	41
Viewpoint Drive, North of SR 89A	AM Peak	5	14	6		5
	PM Peak	7	18	7		6
Fain Road, East of SR 89A	AM Peak	16	32	14	4	
	PM Peak	24	44	18	22	

Figure 12: SR 89A Mainline Lane Configurations and Volumes

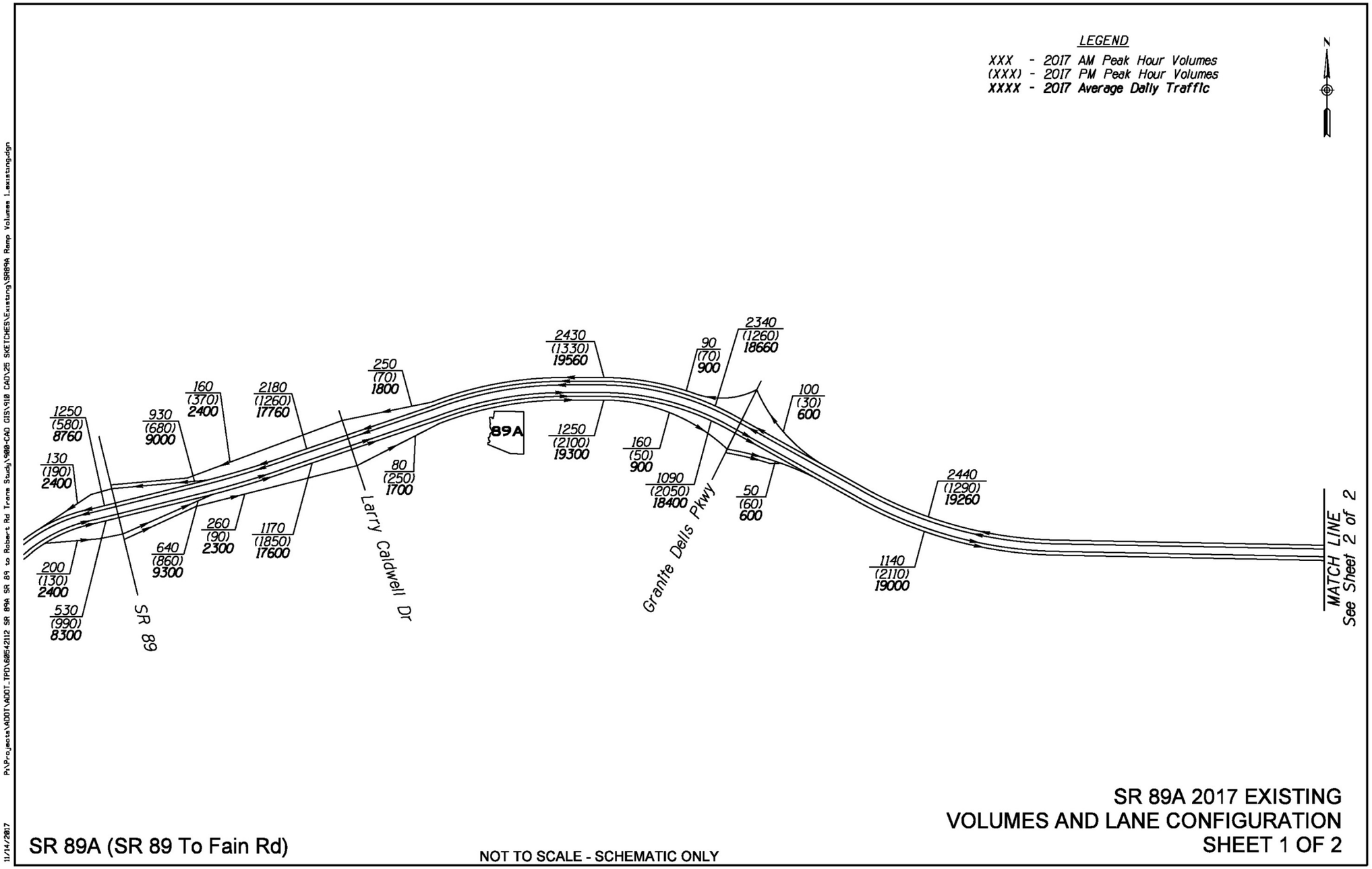


Figure 12 (cont'd): SR 89A Mainline Lane Configurations and Volumes

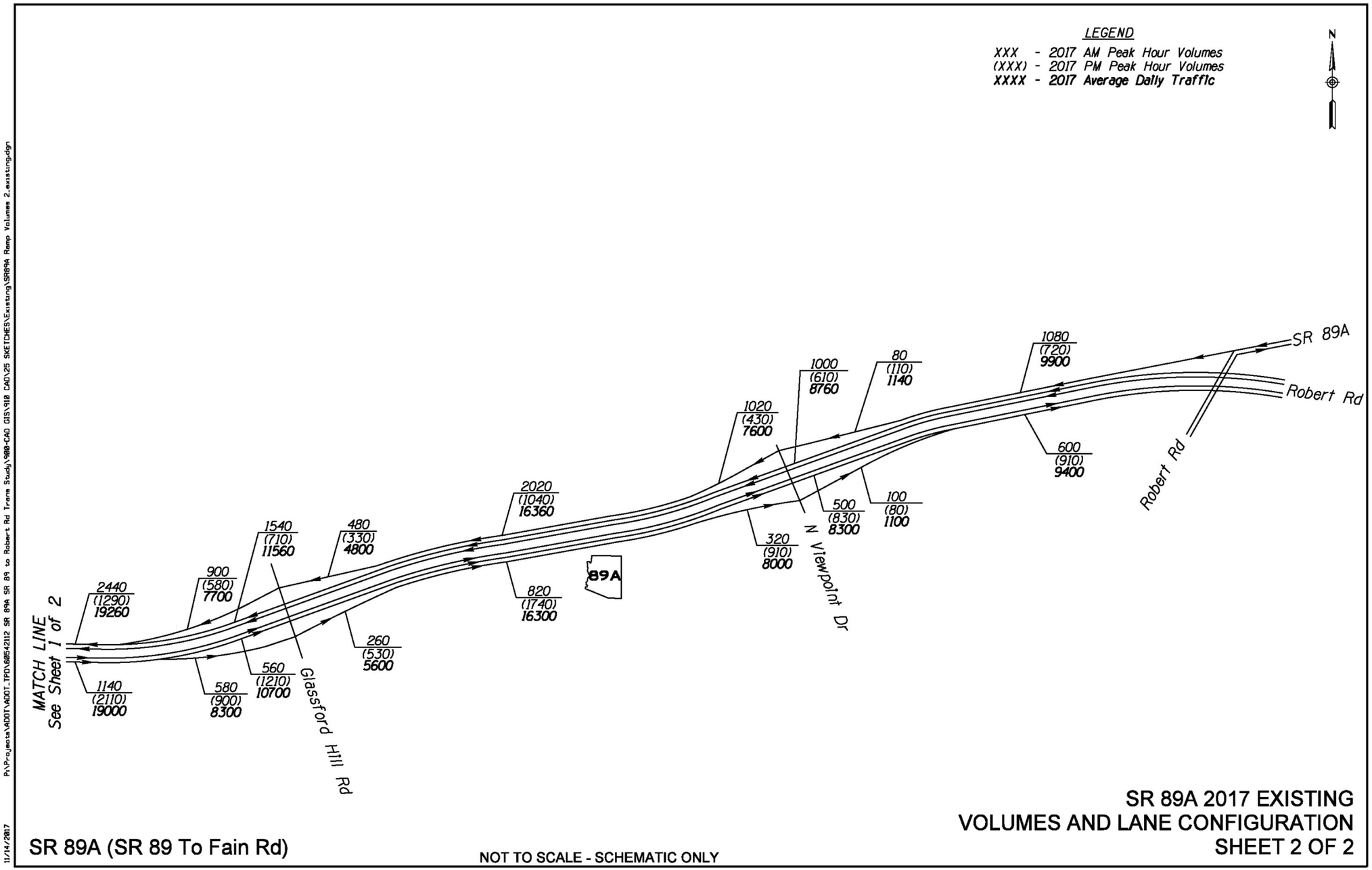


Figure 13: Intersection Turning Movement Volumes

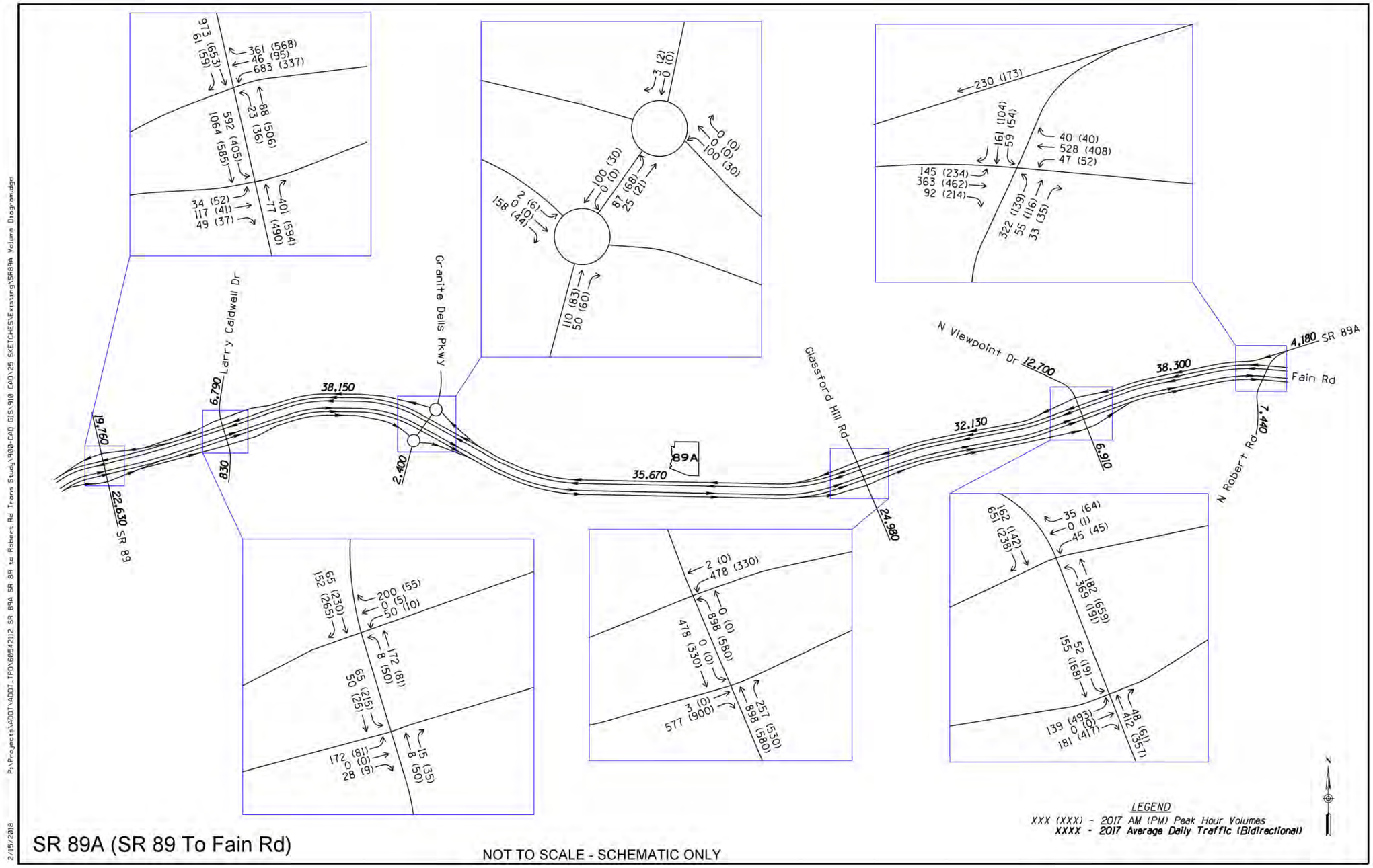


Figure 14: Comparison of Weekday and Weekend Volumes

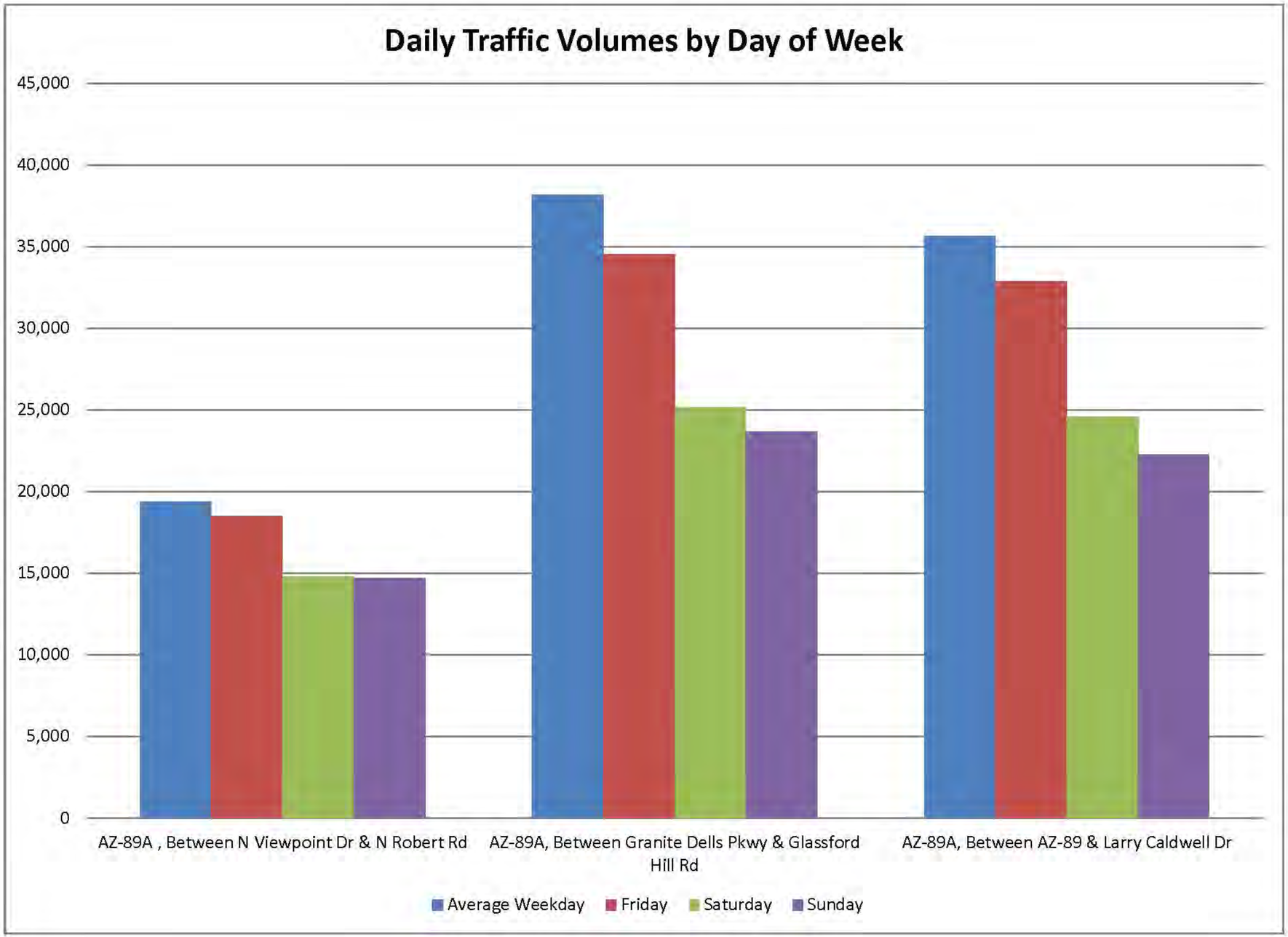
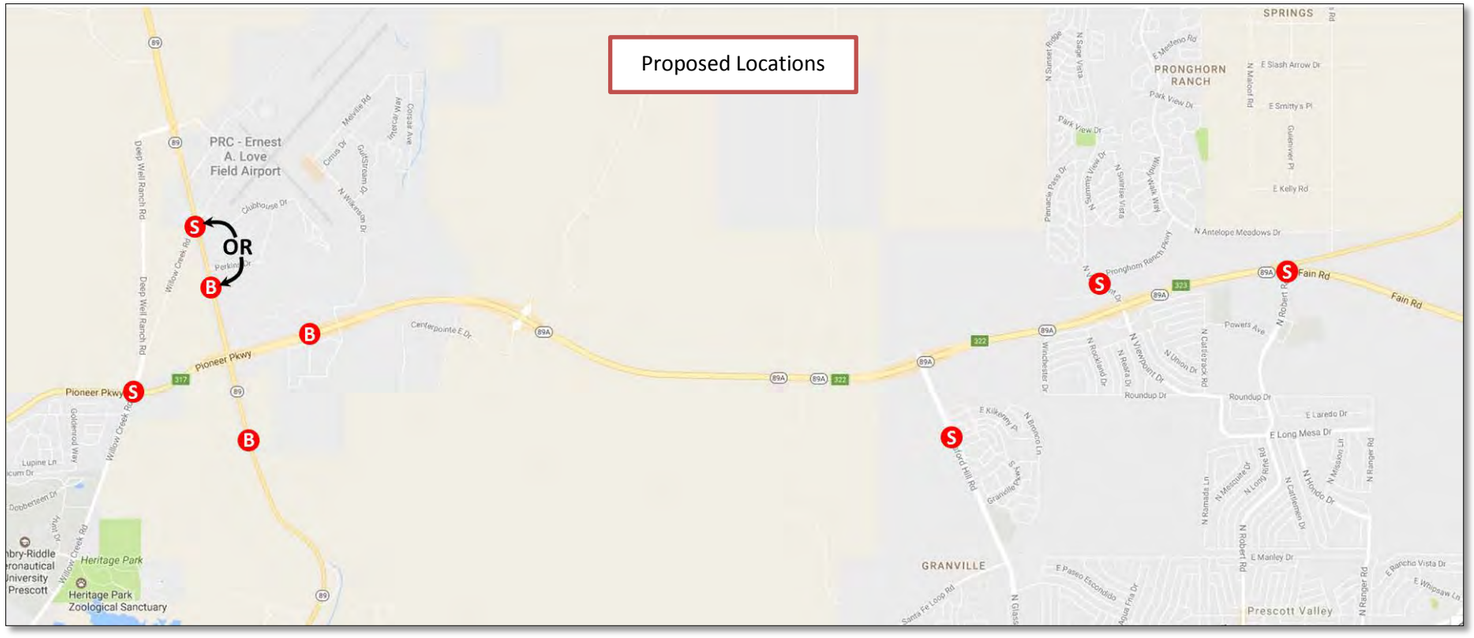


Figure 15: Proposed and Final ARID Locations



★ Denotes location where ARID origin-destination data could not be collected

3.3.3 Operational Analysis Methodology

An operational analysis was performed for the mainline including the general-purpose lanes, ramp junctions, and weave sections and for the existing conditions. Intersection analysis was also performed for the study intersections including the five TI's and one at-grade signalized intersection. The VISSIM computer program was used to provide a simulation of the entire system within the study area. VISSIM is a microscopic traffic simulation program that uses roadway geometry and traffic volume inputs to simulate operations of an entire freeway or arterial network. VISSIM has the ability to provide various measures of effectiveness for each link within the system. The vehicle density and speed outputs from VISSIM were used as the measure of effectiveness to relate to a level-of-service as established by the Highway Capacity Manual (HCM) for the freeway and ramp facilities. The vehicle delay output was used to relate to a level-of-service at the signalized intersections.

The concept of level-of-service (LOS) uses qualitative measures that characterize operational conditions within a stream of traffic. The descriptions of individual levels-of-service characterize these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience. Six levels of service are defined for each type of facility for which the analytical procedures are available. They are given letter designations from 'A' to 'F', with each condition describing a gradually worsening level of congestion, as described below:

- **LOS A:** Best, free flow operations (on uninterrupted flow facilities) and very low delay (on interrupted flow facilities). Freedom to select desired speeds and to maneuver within traffic is extremely high.
- **LOS B:** Flow is stable, but presence of other users is noticeable. Freedom to select desired speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within traffic.
- **LOS C:** Flow is stable, but the operation of users is becoming affected by the presence of other users. Maneuvering within traffic requires substantial vigilance on the part of the user.
- **LOS D:** High density but stable flow. Speed and freedom to maneuver are severely restricted. The driver is experiencing a generally poor level of comfort and convenience.
- **LOS E:** Flow is at or near capacity. All speeds are reduced to a low, but relatively uniform value. Freedom to maneuver within traffic is extremely difficult. Comfort and convenience levels are extremely poor.
- **LOS F:** Worst, facility has failed, or a breakdown has occurred.

Table 29 describes levels-of-service and corresponding vehicle densities (vehicles per mile per lane) for freeway and ramp facilities or vehicle delays (seconds) for intersections as established in the HCM.

Table 29: Vehicle Levels-of-Service and Corresponding Measures of Effectiveness

Level-of-Service	Density Range (pc/mi/ln)	Signal Control Delay (sec)
A	0-11	0-10
B	>11-18	>10-20
C	>18-26	>20-35
D	>26-35	>35-55
E	>35-45	>55-80
F	>45	>80

Source: *Highway Capacity Manual* (2010)

Existing signal timings were collected in 2017 for existing conditions at the signal-controlled intersections, and these same signal timings were applied to 2040 No-Build conditions.

The following VISSIM model input assumptions were used for the operational analysis:

- Free flow speed of 65 mph for the mainline general-purpose lanes
- Free flow speed equal to the posted speed limit for all arterials
- Commercial vehicle percentage was applied independently at each input, based on observations from existing volume counts

In order to replicate the existing peak hour travel conditions, the AM and PM peak hour VISSIM models were calibrated based on measured field data. Existing field measured traffic volumes, speeds, and travel times were utilized as calibration data. Travel times were collected using the same deployment of ARID technology described in *Section 3.3.2.2*. As the ARID's collect the presence of a vehicle as it passes a device, they also capture a time stamp. This time-stamp allows the team to understand the median travel time taken between each O-D pair. Median travel times gathered in this study are provided in **Table 30**. VISSIM models were calibrated based on travel time between the origin-destination pairs available. Following the calibration process, the VISSIM model output closely replicated the existing congestion conditions observed in the study area. The lane changing and driver behavior parameters from the calibration process were then used in the future condition VISSIM models. The models were run at least ten times with varying random number seeds and the model output was averaged to determine the density and delay.

Table 30: Travel Time Results

Origin Location	Time Period	Destination Location: SR 89, North of SR 89A	SR 89A, West of SR 89	SR 89, South of SR 89A	Viewpoint Drive, North of SR 89A	Fain Road, East of SR 89A
SR 89, North of SR 89A	AM Peak				7:48	9:03
	PM Peak				7:26	8:44
SR 89A, West of SR 89	AM Peak				5:56	7:19
	PM Peak				6:06	7:16
SR 89, South of SR 89A	AM Peak				6:09	8:18
	PM Peak				6:28	7:39
Viewpoint Drive, North of SR 89A	AM Peak	6:19	5:57	7:07		1:52
	PM Peak	6:29	5:39	6:38		1:40
Fain Road, East of SR 89A	AM Peak	8:31	7:16	8:58	2:04	
	PM Peak	8:18	7:22	8:10	2:02	

3.3.4 Operational Analysis Results

3.3.4.1 *SR 89A Mainline and Ramp Results*

Figure 16 and **Figure 17** summarize the level-of-service analysis results for the existing conditions AM and PM peak hours, respectively, on the SR 89A Mainline.

In the AM peak Hour, SR 89A operates at level-of-service (LOS) 'A/B' in the eastbound direction, and at LOS 'A/B' or LOS 'C' in the westbound direction. All ramps in the study area operate at LOS 'C' or better, with westbound ramps generally experiencing greater densities. In the PM peak hour, the eastbound and westbound directions of SR 89A both operate at LOS 'A/B' throughout the corridor. All ramps operate at LOS 'C' or better, with eastbound ramps generally experiencing greater densities.

3.3.4.2 *Intersection Results*

Figure 18 and Table 31 includes the operational results for the 2017 Existing Conditions. The resulting seconds of delay on each approach leg of each intersection is displayed in parentheses. In these conditions, each approach to every intersection operates at LOS 'D' or better in both AM and PM peak hours. Each intersection as a total operates at LOS 'C' or better in both AM and PM peak hours.

Table 31: Existing Intersection Level-of-Service Results

Intersection Location	Intersection Approach	2017 AM Existing: Intersection Approach LOS & Delay	2017 AM Existing: Overall Intersection LOS & Delay	2017 PM Existing: Intersection Approach LOS & Delay	2017 PM Existing: Overall Intersection LOS & Delay
SR 89A and SR 89 TI (signalized)	EB SR 89A Off Ramp	D (39)	C (31.7)	D (42)	C (25.4)
	WB SR 89A Off Ramp	C (32)		C (27)	
	NB SR 89	C (25)		C (22)	
	SB SR 89	C (33)		C (25)	
SR 89A and Larry Caldwell Dr. TI (unsignalized)	EB SR 89A Frontage Road	B (14)	A (8)	A (9)	A (2.5)
	WB SR 89A Off Ramp	A (9)		A (7)	
	NB Larry Caldwell Dr	A (1)		A (1)	
	SB Larry Caldwell Dr	A (0)		A (1)	
SR 89A and Granite Dells Pkwy TI (roundabout)	EB SR 89A Off Ramp	A (0)	A (0.6)	A (0)	A (0.4)
	WB SR 89A Off Ramp	A (1)		A (1)	
	NB Granite Dells Pkwy	A (0)		A (0)	
	SB Granite Dells Pkwy	A (1)		A (0)	
SR 89A and Glassford Hill Rd. TI (signalized)	EB SR 89A Off Ramp	B (17)	C (27)	C (22)	C (25.4)
	WB SR 89A Off Ramp	D (45)		D (53)	
	NB Glassford Hill Rd.	C (24)		B (20)	
SR 89A and Viewpoint Dr. TI (signalized)	EB SR 89A Off Ramp	B (12)	B (13)	B (15)	B (17.1)
	WB SR 89A Off Ramp	C (24)		C (32)	
	NB Viewpoint Dr.	B (20)		C (22)	
	SB Viewpoint Dr.	A (8)		B (12)	
SR 89A and Robert Road (signalized)	EB SR 89A	C (22)	C (23.5)	C (21)	C (23.1)
	WB Fain Rd	C (27)		C (27)	
	NB Robert Rd	C (26)		C (29)	
	SB SR 89A	B (18)		B (18)	

Figure 16: Existing Level-of-Service on SR 89A Mainline and Ramps: AM Peak Hour

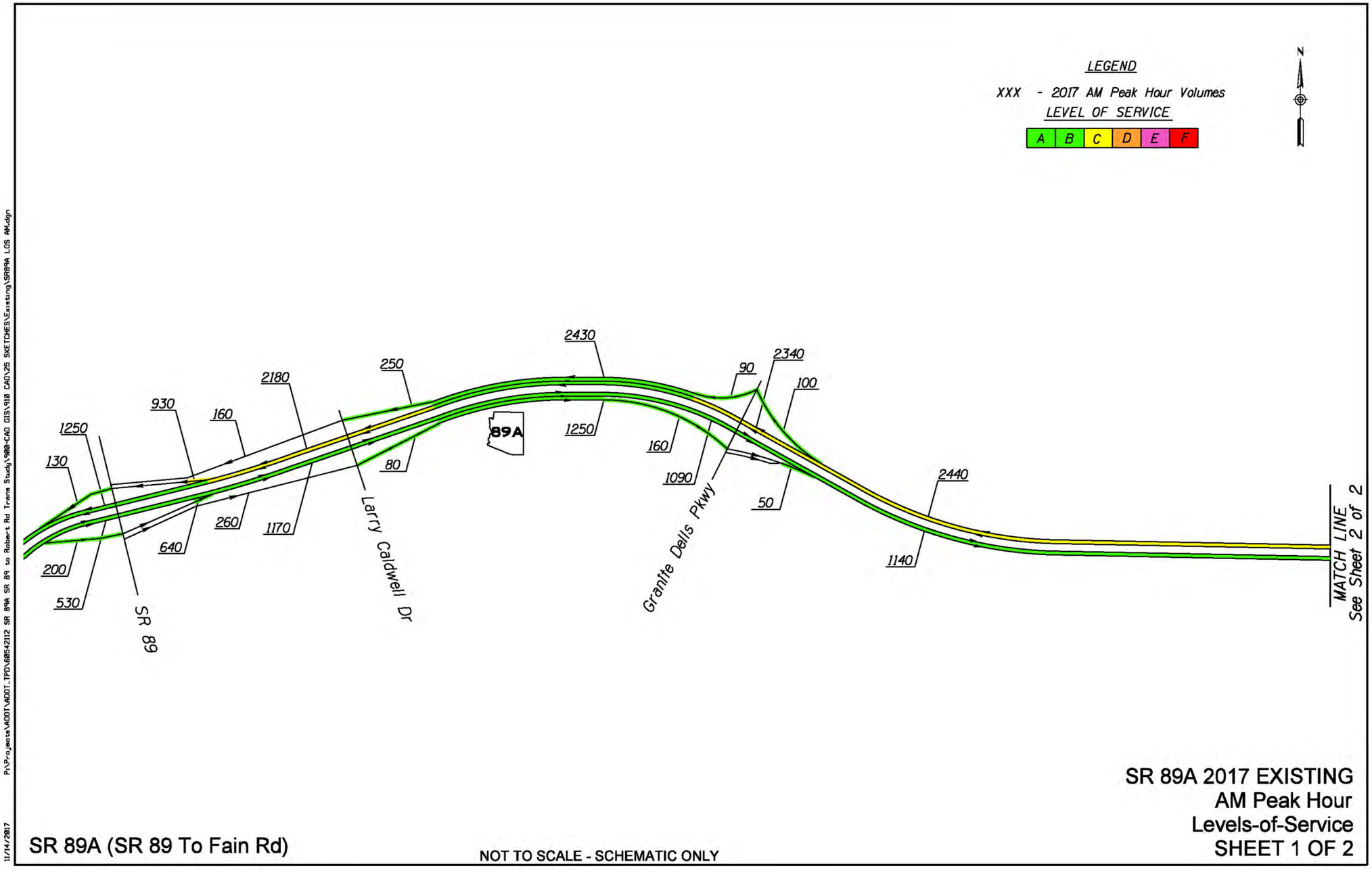


Figure 16 (cont'd): Existing Level-of-Service on SR 89A Mainline and Ramps: AM Peak Hour

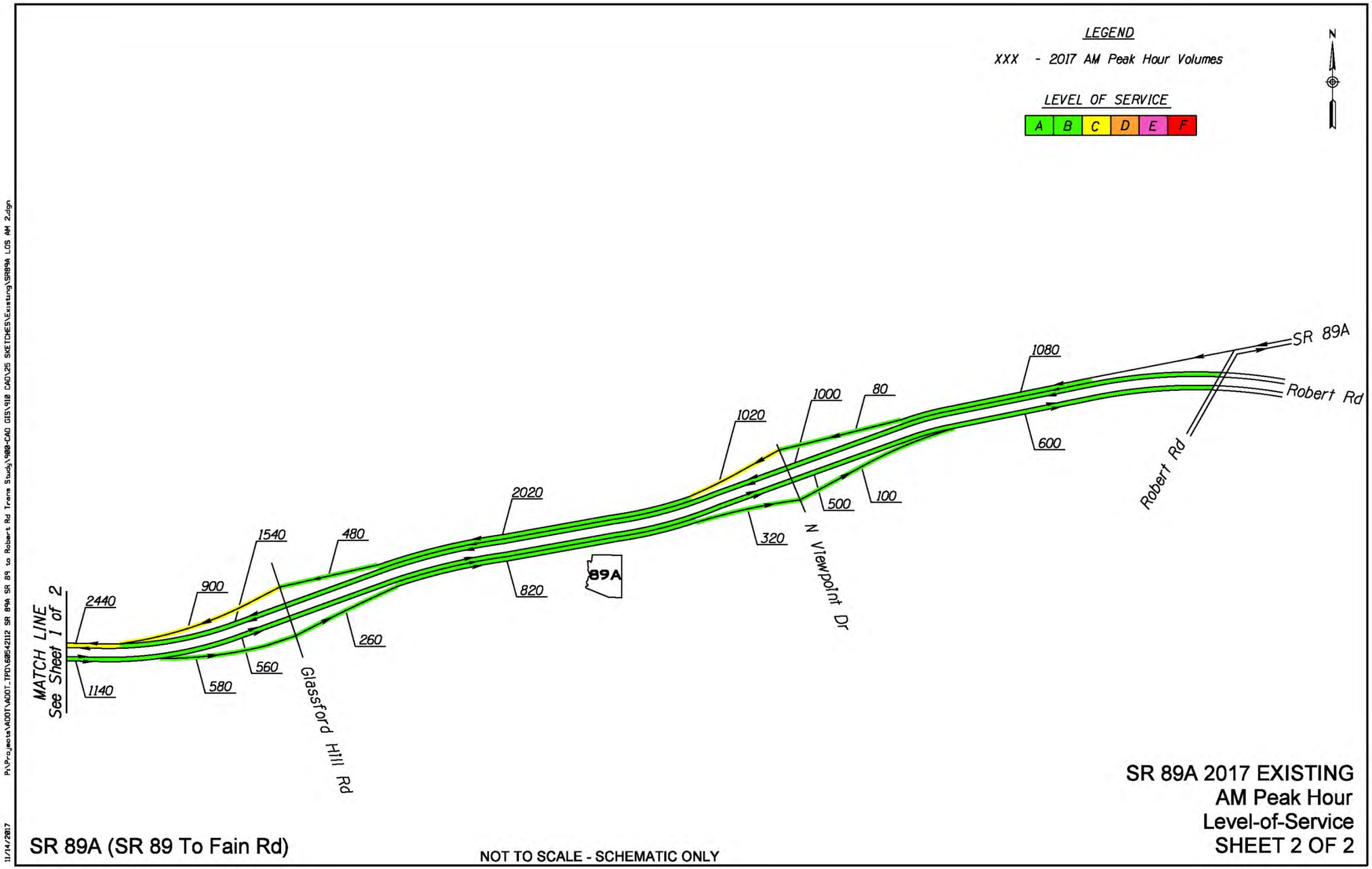


Figure 17: Existing Level-of-Service on SR 89A Mainline and Ramps: PM Peak Hour

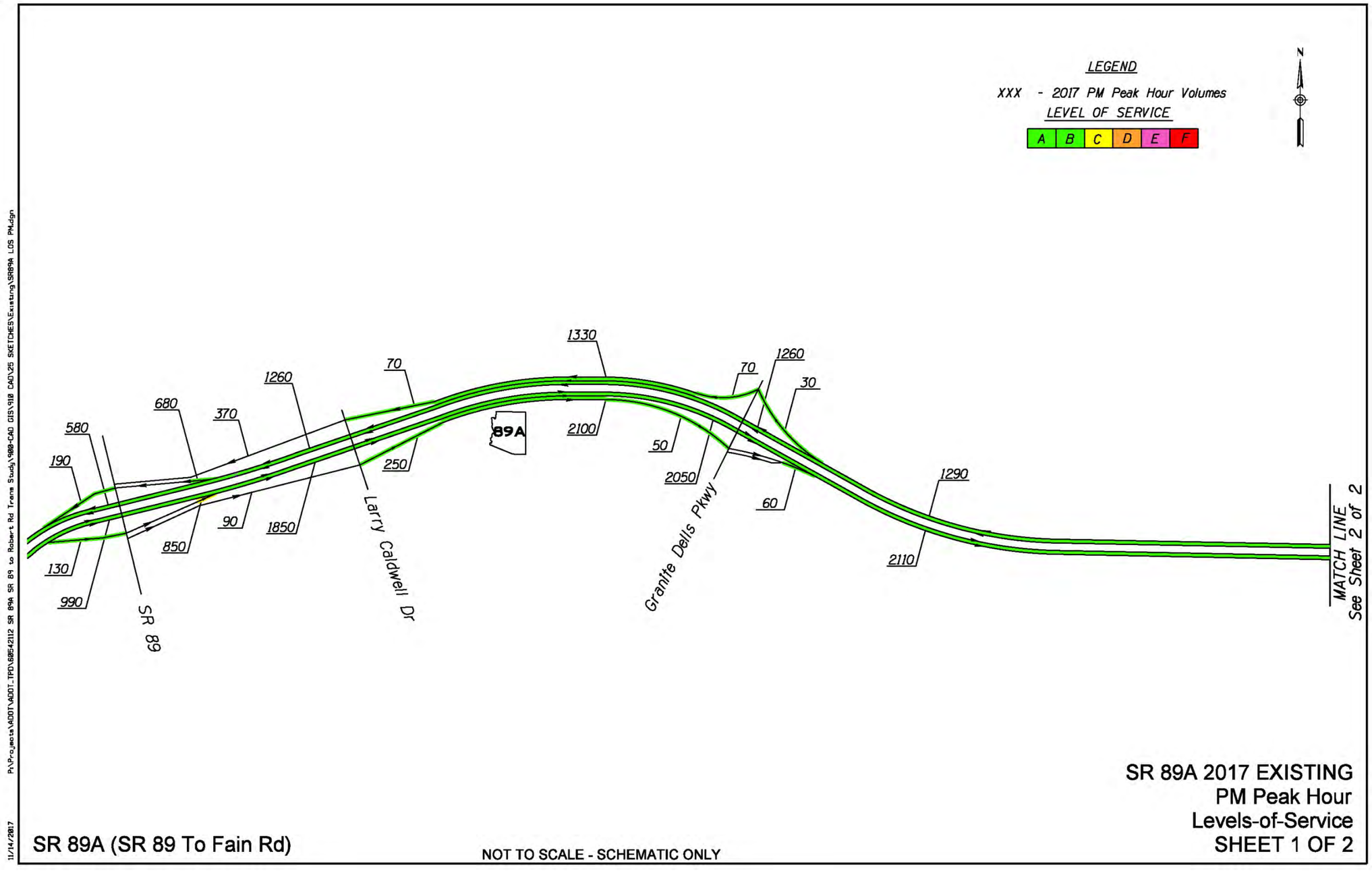


Figure 17 (cont'd): Existing Level-of-Service on SR 89A Mainline and Ramps: PM Peak Hour

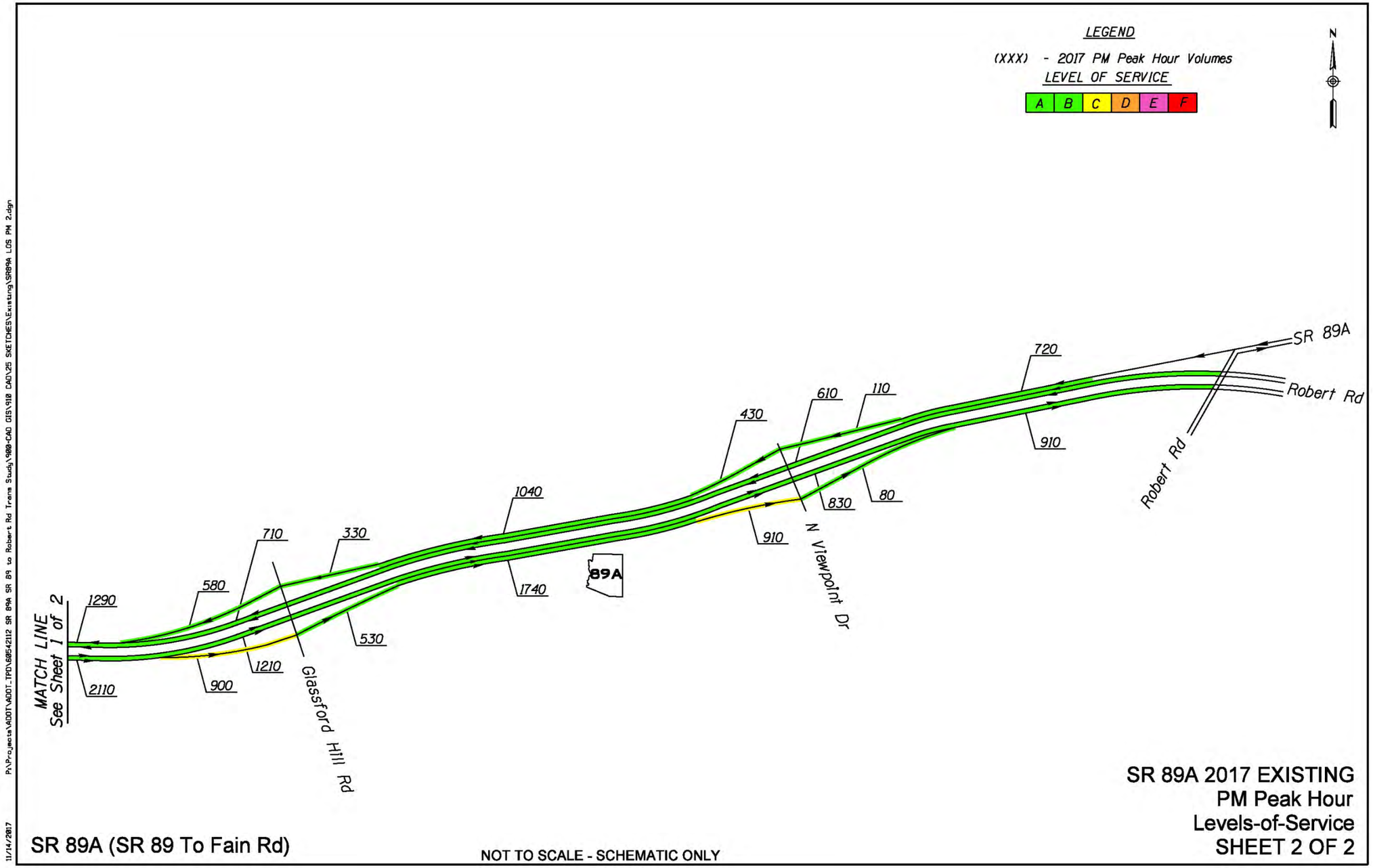
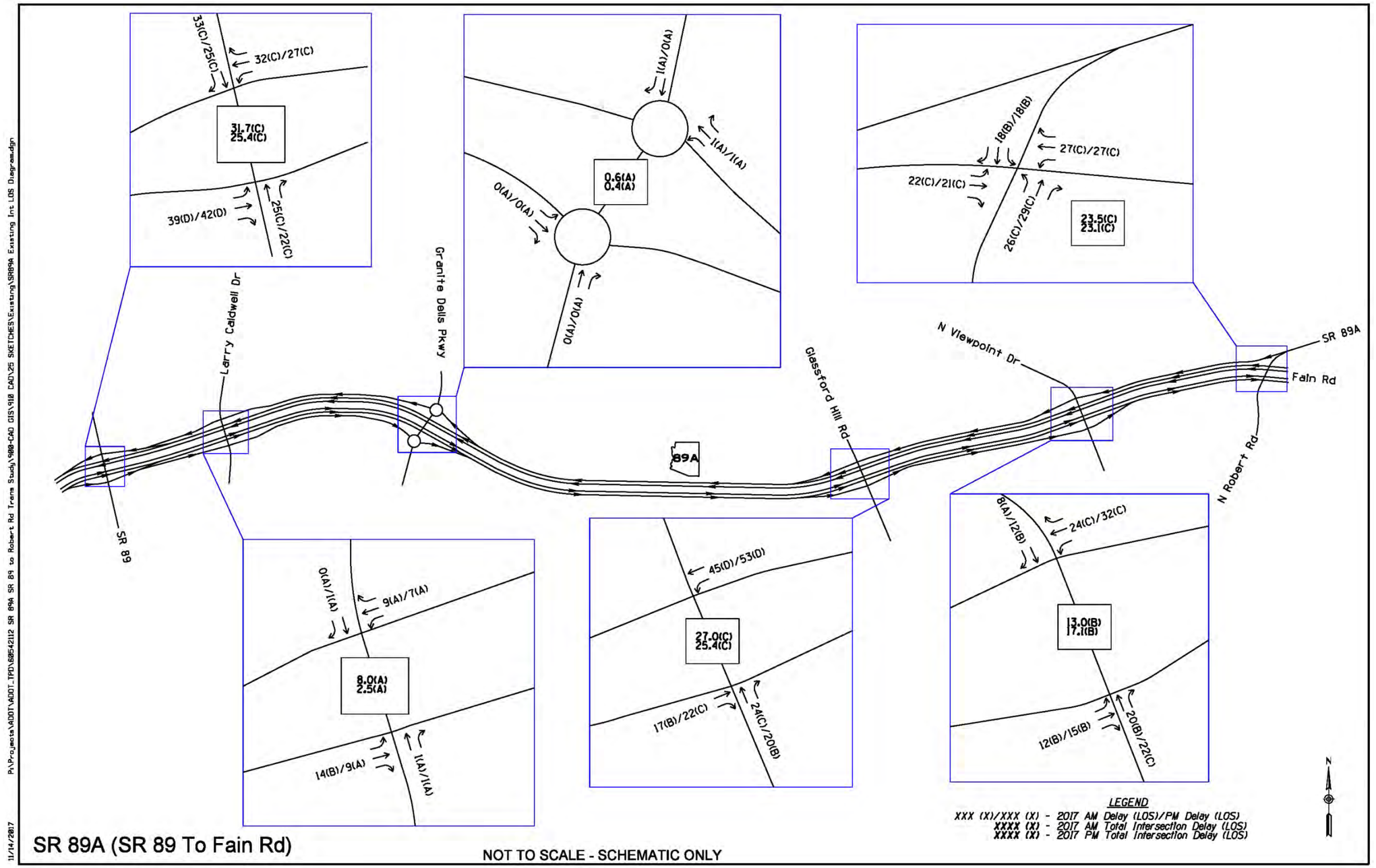


Figure 18: Existing Intersection Levels-of-Service



4.0 ENVIRONMENTAL OVERVIEW

This chapter provides an environmental overview of the project area and surrounding area. The objective of the environmental overview is to describe the social, economic, and environmental character of the study area; to identify potential "fatal flaws", obstacles, issues associated with the study area; and to evaluate the study area alternatives.

4.1 Affected Environment

4.1.1 Physical and Natural Environment

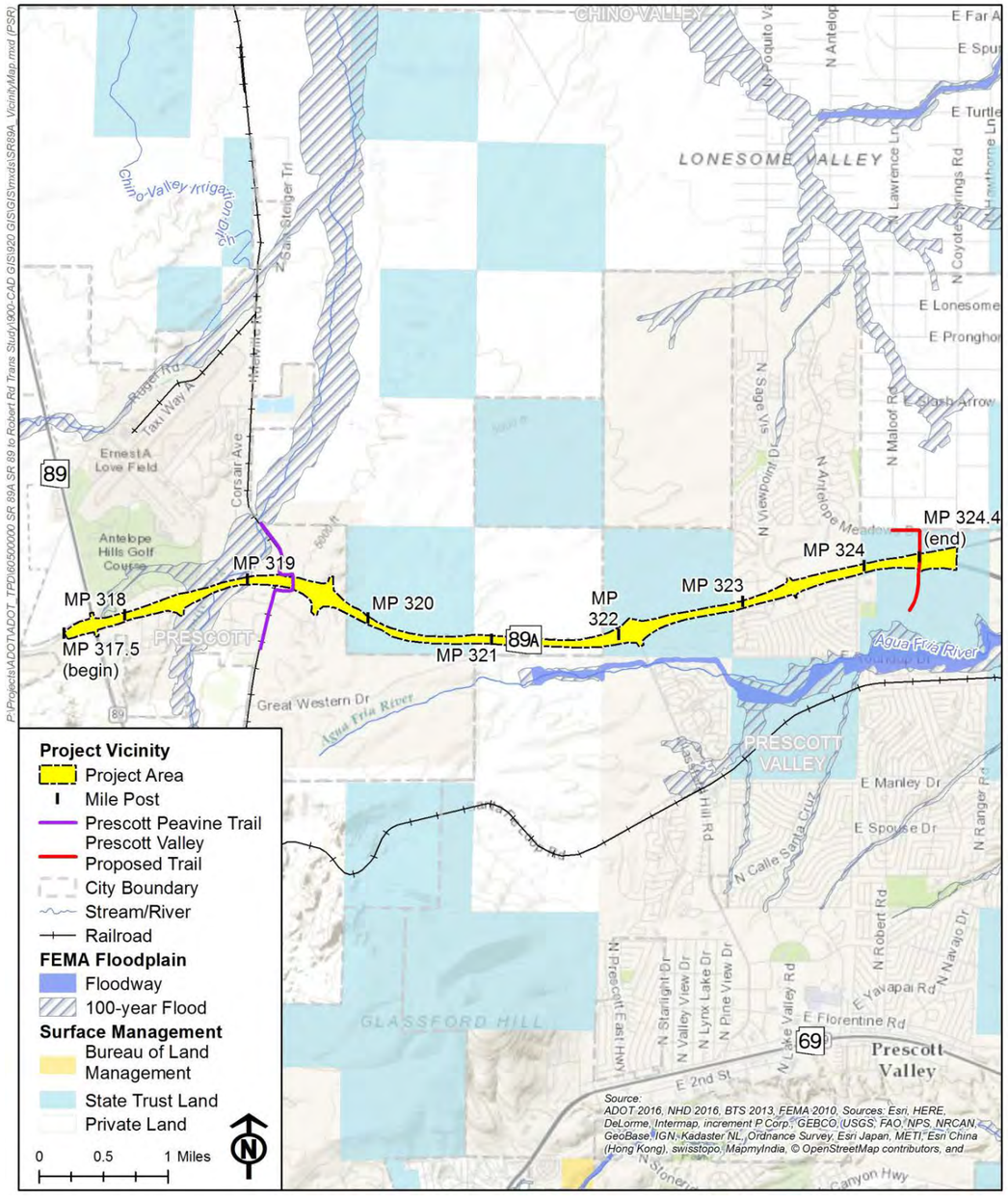
4.1.1.1 *Topography/Physiology*

The project site is located in the Lonesome Valley and crosses primarily undeveloped areas within Yavapai County. The project extends between Prescott, Arizona, on the east and Prescott Valley on the west. Sections of Arizona State Trust Land occur in a checkerboard pattern throughout the area; State Route (SR) 89A crosses three sections of land owned by the Arizona State Land Department (ASLD), as shown in **Figure 19**.

The project is located within Sections 35 and 36, of Township (T) 15 North (N), Range (R) 2 West (W), and Sections 31 through 36 of T15N, R1W, Gila and Salt River Meridian, Arizona. The above legal descriptions are found on the Chino Valley and Prescott Valley South US Geological Survey (USGS) 7.5-minute Topographic Series maps.

Lonesome Valley is a relatively wide and flat-bottomed alluvial basin with some gentle to moderately steep slopes. The Bradshaw Mountains are located southwest of the project area and the Black Hills are on the northeast side of the valley. The soil information for Yavapai County was obtained from the Natural Resources Conservation Service (NRCS 2017). Soils within the project area are predominantly in the Abra, Lonti, Lynx, Springerville, and Wineg series.

Figure 19: Project Vicinity Map



4.1.1.2 *Vegetation*

The project is located within the Plains and Great Basin Grassland biotic community. This biotic community consists mainly of short-grass species and shrubs. Plants observed in the field included blue grama (*Bouteloua gracilis*) and other grama grasses, buffalograss (*Bouteloua dactyloides*), Indian ricegrass (*Achnatherum hymenoides*), sand dropseed (*Sporobolus cryptandrus*) and alkali sacaton (*S. airoides*) and shrubs such as fourwing saltbush (*Atriplex canescens*), sagebrush (*Artemisia* sp.), and snakeweed (*Gutierrezia sarothrae*). (Brown 1994)

4.1.1.3 *Biology*

A query of the Arizona Game and Fish Department's (AGFD) Environmental Online Review Tool (AGFD 2017) and the U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Consultation (IPaC) database (USFWS 2017) was conducted on April 6, 2017. The USFWS' Information for Planning and Consultation (IPaC) site listed four federally protected species potentially occurring within the project vicinity:

- Yellow-billed Cuckoo *(Coccyzus americanus)* – threatened
- Northern Mexican Gartersnake *(Thamnophis eques megalops)* – threatened
- Headwater Chub *(Gila nigra)* – proposed threatened
- Roundtail Chub *(Gila robusta)* – proposed threatened
- Acuna Cactus *(Echinomastus erectocentrus var. acunensis)* – endangered

The AGFD Environmental Online Review Tool identified five species that have been documented occurring within three miles of the project vicinity (a three-mile radius surrounding the project area). These species are:

- Golden Eagle (*Aquila chrysaetos*) – USFWS, Bald and Golden Eagle Protection Act (BGA); Bureau of Land Management (BLM), sensitive (S);
- Maricopa Tiger Beetle (*Cicindela oregona Maricopa*) – USFWS, species of concern (SC)
- Mogollon Fleabane (*Erigeron anchana*) – USFWS, SC; U.S. Forest Service (USFS), S
- Bald Eagle - Winter & Sonoran Desert populations (*Haliaeetus leucocephalus*) – USFWS, SC & BGA; USFS, S; BLM, S
- Arizona Phlox (*Phlox amabilis*) – USFS, S

The project area is located within AGFD's pronghorn management unit 19A (AGFD 2017a). The majority of pronghorn habitat in Unit 19A occurs on six ranches that comprise 172 square miles or 120,320 acres of land. The ranches are the Fletcher, Perkins, Wells, Deep Well, Granite Dells, and Fain (AGFD 2013).The project area crosses through the Granite Dells Ranch and generally borders Fain Ranch at the east end of the project. Granite Dells Ranch is located in approximately the center of Lonesome Valley and extends south across highway 89A to Glassford Hill. It consists of about 18,500 acres of private, and 4,500 acres of State Trust Land. This ranch contains extremely high quality pronghorn habitat, but is slated for development (residential housing). Fain Ranch is located south of Highway 89A and east of Prescott Valley. This ranch consists of approximately 16,600 acres of privately owned and 11,520 acres of State Trust Land. Approximately 750 post-hunt adult pronghorn inhabit Unit 19A in eight distinct sub-populations (AGFD 2013). Geographical features, urban developments, and Highways functionally isolate these subpopulations.

4.1.1.4 *Hydrology/Water Quality*

State Route 89A crosses Granite Creek which has a designated floodplain and floodway within the project area, (Federal Emergency MA floodplain map 04025C1695G, effective date 09/03/2010). Granite Creek is a tributary of the Verde River. While not confirmed, it is assumed that Granite Creek would be designated as Waters of the U.S. and subject to regulations under Sections 401 and 404 of the Clean Water Act.

4.1.1.5 *Noise*

The majority of the land adjacent to the project area is currently undeveloped or commercial. However, there are several noise sensitive developments along SR 89A. There is a residential development in the northeast quadrant of the intersection of SR 89 and SR 89A with the closest homes abutting SR 89. A high school is located south of SR 89A on Side Road, approximately 0.4 mile west of Granite Dells Parkway. Another residential development abuts SR 89A on the south at Viewpoint Drive. There are existing noise walls at this location.

4.1.1.6 *Air Quality*

An air quality analysis was not conducted for this environmental overview. The project is within an area of attainment for all air pollutants.

4.1.1.7 *Hazardous Materials*

A preliminary initial sight assessment (PISA) was not conducted for this environmental overview. No obvious environmental hazards were observed during the site reconnaissance.

4.1.1.8 *Section 4(f) and Section 6(f)*

The Peavine Trail, west of Granite Dells Parkway, is located on an historic railroad corridor which crosses under SR 89A. The Town of Prescott Valley has a proposed recreational trail that would cross underneath SR 89A near the intersection with Robert Road. The tunnel for the trail has already been constructed. There are other existing and proposed trails that cross the project corridor which are located along existing roads. No other publicly-owned recreational facilities or wildlife refuges were identified within one-quarter mile of the project area.

Archaeological sites N:3:32(ASM), Santa Fe, Prescott & Phoenix Railway; AZ N:7:212(ASM), the Chino Valley Irrigation Ditch; and AZ N:218(ASM), and the Granite Dell Ranch Irrigation Ditch (old Chino Valley Irrigation Ditch) would qualify as cultural resources that would be protected under Section 4(f).

There were no identified Section 6(f) resources identified within the project area.

4.1.2 Socioeconomic Environment

4.1.2.1 Right-of-Way

The SR 89A right-of-way (ROW) is approximately 250 feet in width, widening out at each of the traffic interchanges. The need for additional new ROW or temporary construction easements (TCE) has not been determined.

4.1.2.2 Land Use

The majority of the land immediately adjacent to SR 89A is undeveloped. A residential development extends approximately one-half mile to the east and west of Viewpoint Drive on the south side of SR 89A. There is additional residential development beginning approximately one-third of a mile north of SR 89A at Viewpoint Road. Another residential area is approximately one-quarter mile south of SR 89A at Glassford Hill Road. New residential development is also being constructed south of SR 89A off of Granite Dells Parkway. West of Granite Dells Parkway there are a number of scattered commercial developments, including churches and a school that abut SR 89A. Antelope Hills Golf Course is located in the northeast quadrant of the intersection of SR 89 and SR 89A. A quarry and cement plant is located within Granite Creek on the north side of SR 89A

4.1.2.3 Socio Economics (including Title VI/Environmental Justice)

No demographic data was collected for this environmental overview. There are a number of residential developments adjacent or within one-half mile of SR 89A.

4.1.2.4 Utilities

A utility survey was not completed for the environmental overview. There are no aboveground electric transmission lines within the corridor.

4.1.3 Cultural Resources

A cultural resource records review was conducted as a component of this environmental overview and prepared in conjunction with planning proposed future potential improvements of approximately 7.7 miles of State Route (SR) 89A between the junction with SR 89, at milepost (MP) 317.3, and MP 325.0, east of Robert Road. That segment of SR 89A, which is locally designated as Pioneer Parkway, crosses land within the city limits of Prescott and Prescott Valley, and unincorporated Yavapai County. The review area was delineated as extending 0.5 mile around that segment of SR 89A. A primary source of information was the AZSITE Cultural Resource Information System. The Portal of the Historic Preservation Team of the Arizona Department of Transportation also was accessed.

The review compiled summary information for 43 prior cultural resource surveys within or overlapping the records review area. Many of the surveys were of limited scope (25 surveys covered 25 or fewer acres), but in the aggregate the surveys covered a considerable percentage of the records review area, particularly in the western part. Importantly, the surveys covered the existing SR 89A ROW. Those surveys include:

- The original survey of the SR 89A right-of–way (Hathaway and Gregory 1991)
- Survey for the SR 89A/Glassford Hill Road interchange (Ziem 1998)
- Surveys for realignment of the approximately the western 4 miles of SR 89A (Ziem and Motsinger 1998; Ziem 1999), and archeological data recovery and historic research to mitigate the project impacts (Archer and Stein 2000)
- Surveys for widening of approximately 4 miles of SR 89A in Prescott Valley (Fox 1999, 2000, Webb 2001a, 2001b)
- Survey for SR 89A improvements east of Roberts Road junction (Dongoske 2004)

The review compiled summary information for 22 recorded cultural resources. Eleven of the sites reflect the prehistoric Prescott culture occupation of the region and vary from artifact scatters without features to artifact scatters with remnants of one or two cobble structures (probable field houses) and other features such as rock piles and a petroglyph. Eight of the sites reflect the historic occupation of the region, and include roads, a railroad, irrigation canals, a plane crash site, and a trash dump. Two sites have both prehistoric and historic components, including a site with two historic lime kilns built in the 1870s. The dating of another site that consists of a collapsed cobble wall around the edge of a hill is undetermined but it probably is of prehistoric origin.

Six of the recorded cultural resources sites are within or overlap the ROW of the reviewed segment of SR 89A:

- Santa Fe, Prescott & Phoenix Railway, AZ N:3:32(ASM), NRHP eligible, Criteria A and D (a segment north of the project area is listed in the NRHP as a component of the Limestone Historic District)
- US/SR 89, AZ I:3:10(ASM), NRHP eligible, Criterion D
- US/SR 89A, AZ N:7:61(ASM), NRHP eligible, Criterion D
- Historic Point of Rocks Lime Kilns and scatter of Prescott Culture potsherds, flaked stone, and ground stone, AZ N:7:216(ASM), NRHP eligible, Criterion D
- Chino Valley Irrigation Ditch , AZ N:7:212(ASM), NRHP eligible, Criteria A and D
- Granite Dells Ranch Irrigation Ditch (old Chino Valley Irrigation Ditch), AZ N:218(ASM), NRHP eligible, Criterion A.

The Federal Highway Administration and Arizona Department of Transportation, in consultation with the State Historic Preservation Office (SHPO), determined that the prior realignment of the west end of SR 89A and widening and improving the segment of SR 89A under review did not affect the historic characteristics that make the Santa Fe, Prescott & Phoenix Railway, US/SR 89, and US/SR89A eligible for the NRHP.

Two additional archaeological sites are located outside the existing ROW at the western end of SR 89A. The AZSITE database indicates that the sites are located within areas disturbed by the SR 89A realignment and widening:

- Site AZ N:7:215(ASM), a scatter of prehistoric Prescott culture potsherds and flaked stone located between SR 89 and Larry Caldwell Drive
- Site AZ N:7:377(ASM), a prehistoric field house with Prescott culture potsherds, flaked stone, and ground stone located near the SR 89A/Granite Dells Parkway interchange

The NRHP eligibility of those two sites has not been formally evaluated but the recorders of both sites recommended they be considered eligible for the NRHP under Criterion D for their potential to yield important information.

Archaeological sites N:3:32(ASM), Santa Fe, Prescott & Phoenix Railway; AZ N:7:212(ASM), the Chino Valley Irrigation Ditch; and AZ N:218(ASM), the Granite Dell Ranch Irrigation Ditch (old Chino Valley Irrigation Ditch) would qualify for protection under Section 4(f).

4.2 Environmental Concerns

4.2.1 Physical and Natural Environment

4.2.1.1 *Topography/Physiology*

There are no concerns related to topography or physiology.

4.2.1.2 *Vegetation*

Coordination with ADOT Roadside Development Section will be required to determine whether Arizona Department of Agriculture notification will be required. Standard mitigation for invasive and noxious species will also be required.

4.2.1.3 *Biology*

A survey for swallows on the bridge over Granite Creek was not conducted. Swallows may nest on that structure and a survey prior to any construction work is recommended.

There is a pronghorn population within the project area. The existing road and development has already impacted the species and its habitat. Coordination with AGFD related to any proposed improvements is recommended. AGFD may have recommendations for mitigation for any future improvements.

4.2.1.4 *Hydrology/Water Quality*

The jurisdictional status of Granite Creek needs to be confirmed; however, since it is a primary tributary to the Verde River, it is assumed to be a jurisdictional, placement of fill or dredge material into the river would be subject to permitting under Section 404 of the Clean Water Act and Water Quality Certification by the Arizona Department of Environmental Quality under Section 401. The project would likely require a Nationwide Permit 14, Linear Transportation Projects or may qualify for a Regional General Permit 96, Routine Transportation Activities. Final determination of the type of permit would be dependent on the extent of permanent impacts.

4.2.1.5 *Noise*

A noise impact assessment will be required for segments of the project area if there will be capacity improvements in the vicinity of noise sensitive receptors.

4.2.1.6 *Air Quality*

Depending on the scope and nature of improvements, a qualitative air quality assessment may be required for this project.

4.2.1.7 *Hazardous Materials*

No obvious hazardous materials concerns were noted during the field reconnaissance. A standard PISA would be required. Under current guidelines any paint obliteration would require testing for lead based paint and asbestos. Any demolition of concrete load-bearing structures would require sampling for asbestos.

4.2.1.8 *Section 4(f) and Section 6(f)*

If any road improvements directly impact the recreational trails that cross SR 89A (e.g., the Peavine Trail in Prescott and the proposed trail at Robert Road) or the three cultural resources sites eligible for listing on the NRHP under criterion A, a Section 4(f) evaluation may be required. Depending on the nature of proposed improvements, there could be a need for a temporary occupancy of the recreational trails.

4.2.2 Socioeconomic Environment

4.2.2.1 *Right-of-Way*

While the need for new ROW and/or TCEs has not been determined, it is likely that one or both may be required for the proposed improvements. If additional ROW is required from the Arizona State Land Department additional environmental studies may be required to meet their requirements.

4.2.2.2 *Land Use*

There would be no substantive permanent impact on land use. Proposed road improvements would be in response to continuing growth in the region. It is not anticipated that there would be substantial secondary induced growth along the corridor.

4.2.2.3 *Socio Economics*

There are no anticipated substantive social or economic impacts anticipated from any proposed road improvements.

4.2.2.4 *Title VI/Environmental Justice*

In accordance with Title VI and Environmental Justice standards, the percentage of individuals categorized as members of protected population groups, including individuals 65 years of age or older, limited English speaking households, households earning below the poverty threshold, and racial and/or ethnic minorities were identified. Using the 3 mile study area radial buffer area, the following percentages were identified.

- 23.12 % of the population are 65 years of age or older
- 2.11% of households have limited English proficiency
- 13.88% of households are below the poverty threshold
- 8.43% of the population are racial minorities
- 15.88% of the population are of Hispanic, Latino/Latina ethnicity

Because road improvements would occur essentially within the existing ROW it is not anticipated that the improvements would have a disproportionate impact on any protected population.

4.2.2.5 *Utilities*

A utility survey will be conducted during final design. Utility relocations would require environmental clearance prior to relocation.

4.2.3 Cultural Resources

Additional surveys and possible mitigation may be required if improvements to SR 89A would result in disturbance of any of the six sites overlap or are located within the SR 89A ROW or the two sites that are immediately adjacent to the ROW.

4.3 Conclusion

Improvements along SR 89A would occur primarily within the existing ROW; however, some additional new ROW and/or TCEs may be required. Because the improvements would be within an existing corridor and primarily within the existing ROW, there would be minimal impact to vegetation, wildlife, or wildlife movement. Coordination with AGFD on impacts to pronghorn habitat and populations will be a likely requirement.

Road improvements that would impact Granite Creek would likely require permitting and water quality certification under Sections 404 and 401 of the Clean Water Act.

A noise impact assessment will be required for road improvements occurring in proximity to noise sensitive receptors such as residences or parks.

A Section 4(f) evaluation will be required for any road improvements that impact the recreational trails that cross SR 89A (e.g., the Peavine Trail in Prescott and the proposed trail at Robert Road), or the three cultural resources sites eligible under for listing on the NRHP under criterion A (the two irrigation canals and the Peavine Railroad alignment). Improvements affecting the Peavine Trail or the proposed trail at Robert Road, if it is constructed prior to road improvements, may require a temporary occupancy agreement with the managing jurisdiction.

Improvements could impact cultural resources requiring mitigation. This could entail conducting additional field investigations and data recovery prior to construction.

Road improvements could result in potential noise impacts to existing residential communities or any new developments that are constructed prior to road improvements. These would require a noise impact assessment and possible mitigation.

A utility survey will be conducted during final design. Utility relocations would require environmental clearance prior to relocation.

5.0 FUTURE CONDITIONS

5.1 Study Corridor

5.1.1 Future Population

The population of study area's surrounding regions is expected to significantly increase in the next two decades. The Arizona State Demographer's Office projects the most significant increase in population within Yavapai County to occur in the Town of Prescott Valley, with a projected 55% increase in population between the 2010 Census and 2040.The City of Prescott is expected to experience a more modest, yet notable population increase of 13% across this time span as well.

Additionally, surrounding municipalities of central Yavapai County, including the cities of Chino Valley and Dewey-Humboldt as well as unincorporated Yavapai County are also expected to experience significant population growth. All population growth expectations are shown in **Table 32**.

Table 32: Future Population Projections

Area	2010 Population	2015 Population	2040 Population	% Change 2010-2040	Total Growth
Yavapai County	**211,033**	**220,189**	**302,815**	**43%**	**91,782**
Chino Valley	10,817	10,895	15,846	46%	5,029
Dewey-Humboldt	3,894	3,923	4,973	28%	1,079
Prescott	39,843	40,989	45,084	13%	5,241
Prescott Valley	38,822	41,415	60,196	55%	21,374
Unincorporated	83,782	86,141	125,768	50%	41,986

Source: U.S. Census, Arizona Office of Economic Opportunity

5.1.2 Future Development

The 227 acre Walden Ranch development has been unanimously approved by the City of Prescott City Council on June 21, 2016. This development located southeast of the SR 89A and SR 89 TI, is approved to become a 215 home community directly along the study corridor. This development will likely contribute towards increased volumes experienced along the western portion of the study corridor and Larry Caldwell Drive. The development is expected to reach completion at the end of 2023.

The 1,259 acre Glassford Height master planned development (recently renamed Jasper) was approved and rezoned accordingly by the Town of Prescott Valley Mayor and Town Council on May 22, 2014. This development is located south of the SR 89A corridor directly west of Glassford Hill Road. This development will likely contribute towards increased volumes experienced along the central portion of the study corridor and Glassford Hill Road.

The 1,268 acre Granville master planned development reached final development plan approval by the Town of Prescott Valley Mayor and Town Council on September 25, 2014. This development is located south of the SR 89A corridor adjacent to Glassford Hill Road. This development will likely contribute towards increased volumes experienced along the central portion of the study corridor and Glassford Hill Road.

Deep Well Ranch is a prospective 1,800 acre master-planned development with the intention of developing more than 10,000 homes over the course of 35 years. This development is located northwest of the study corridor primarily west of SR 89 within the northern limits of the City of Prescott approaching the Town of Chino Valley. The plan is currently under city's Planning and Zoning Commission's review, public hearings and comments.

5.2 Roadway Conditions

5.2.1 Planned Roadway Improvements

The following roadway improvements are identified in the most recent ADOT 5-Year Construction Program and the CYMPO MTIP

ADOT 5-Year Construction Program (FY 2018-2022)

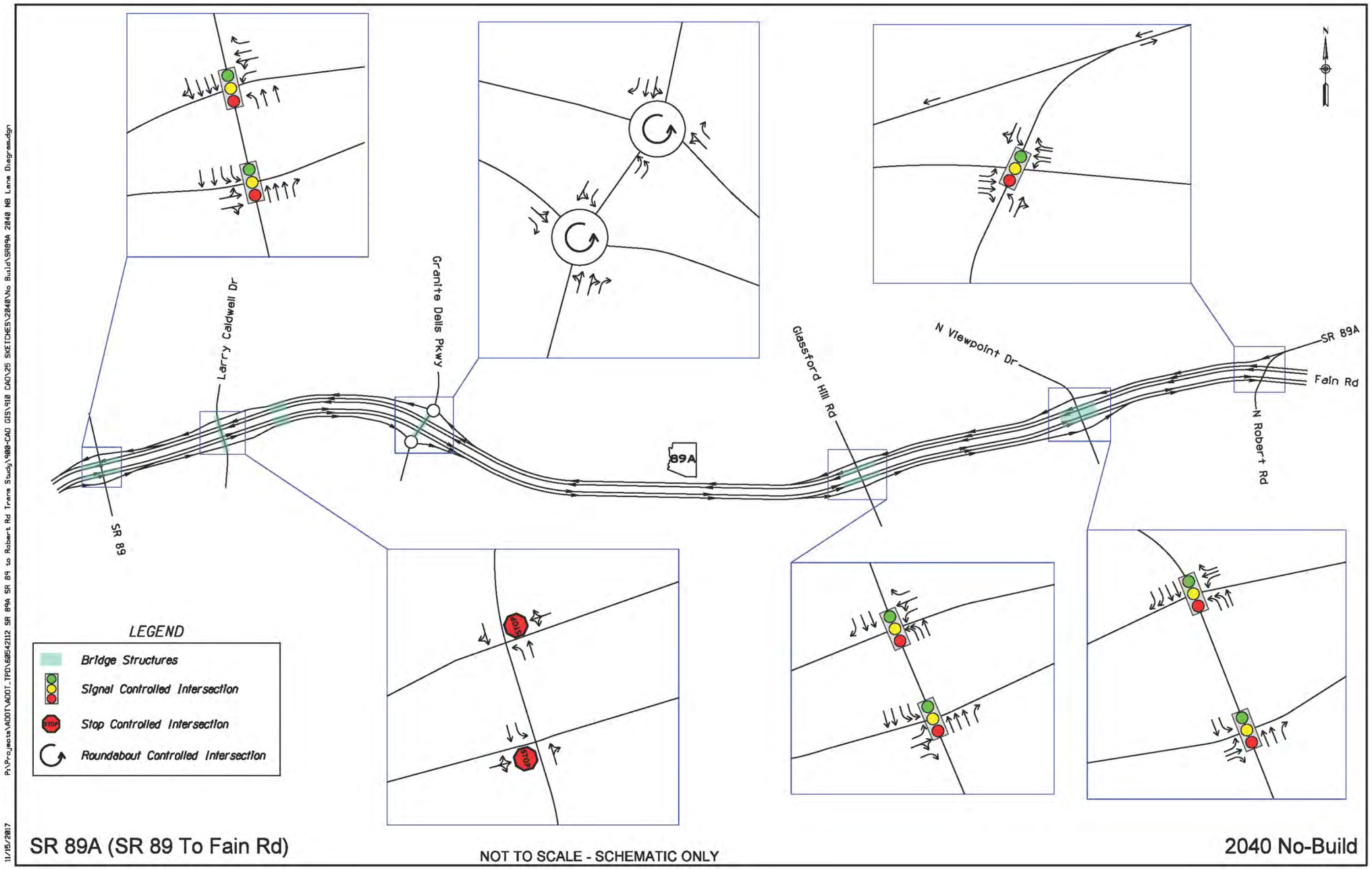
There are currently no projects programmed for the SR 89A within the study limits. The SR 89, Junction SR 89A to Deep Well Ranch Road construction project was identified in the FY 2017-2021 5-Year Construction Program.

CYMPO MTIP

- SR 89 – Jct SR 89A to Deep Well Ranch Road – Construct 2 new lanes on SR 89 (construction funding FY 17/18)
- SR 89A / Robert Road Traffic Interchange – Construct Traffic Interchange (Design funding FY 21)

The SR 89, Junction SR 89A to Deep Well Ranch Road construction project includes an adjustment on the lane configuration at the SR 89 and SR 89A TI within the SR 89A study area, as shown in **Figure 20**. No other adjustments to configuration, traffic control or speed limits are currently programed within the study area.

Figure 20: 2040 No-Build Roadway Features



5.2.2 Planned Non-motorized Improvements

A proposed multi-use path is planned to be built near the Robert Road intersection. This planned trail is suggested to span on both the north and south of the SR 89A within the Town of Prescott Valley.

The following multimodal improvements are identified in the most recent ADOT 5-Year Construction Program and the CYMPO MTIP

ADOT 5-Year Construction Program

There are currently no projects programmed for the SR 89A within the study limits.

CYMPO MTIP

- Lakeshore Drive - SR 89A, Prescott Valley – Multi-use Path – Completed January 2017

5.2.3 Asset Condition

Both the overall bridge condition and pavement condition throughout the entire study corridor is performing in “good” condition, in part due to the newer age of the corridor.

Therefore, it is suggested that ADOT continues with their regular cycle of roadway maintenance activities and scheduled preservation projects to upkeep the roadway’s assets.

5.3 Future Traffic Conditions

5.3.1 Travel Demand Model

The Arizona Department of Transportation maintains a Travel Demand Model (AZTDM). In 2014, a sub-model was developed for the Central Yavapai Metropolitan Planning Organization (CYMPO) to more accurately project the CYMPO travel demand. For purposes of this SR 89A Transportation Study’s future traffic analysis, the CYMPO sub-model was updated based on most recent development and employment projections from summer 2017.

State Law dictates that travel demand models developed are to match population projections developed for each county by the Arizona State Demographer, in order to maintain consistency between state agencies. Each traffic analysis zone within the AZTDM in Yavapai County was updated for this effort to meet the most recent State Demographer’s projections for population. This socio-economic data was used in running a “conforming” iteration of the model. In order to reflect future development on and near the corridor which may not have been captured by these changes, an additional “non-conforming” iteration of the model was run, which used a slightly different version of the socio-economic data.

In order to develop the socio-economic data for the “non-conforming” model run, the project team studied proposed and accepted development plans in the vicinity of the corridor, as well as researched existing employment and housing opportunities in each traffic analysis zone using web-based mapping systems. The resulting socio-economic data included changes to employment and population reflected in the following planned development areas:

- Jasper (Formally Glassford Heights)
- Viewpoint/Pronghorn
- Deep Wells Ranch
- Centerpoint South
- Granville

Since the acceptance of the CYMPO sub-model development, the convergence criteria for the AZTDM has also changed, with criteria being tightened to reduce noise from stochastic processes in the modelling system. As such, the updated AZTDM model used for this project did not fully converge to ADOT’s convergence criteria. The non-converging elements of the model, however, are outside the range of the corridor study area and should not significantly affect the resultant roadway projections.

5.3.2 2040 Projected Volumes

The traffic volume projections that were received from the AZTDM were post-processed in accordance with accepted procedures. Growth rates between the existing and future AZTDM model were calculated for each roadway and applied to the 2017 existing volumes. Existing turning movement percentages, peak hour to ADT ratios (k-values) and directional distributions (D-values) were calculated from the existing traffic counts and the average percentages and k values were applied to the future projected post processed ADT volumes. **Figure 21** and **Figure 22** display the redistributed, projected, and balanced 2040 No-Build AM peak hour, PM peak hour, and ADT volumes for the freeway mainline and turning movements, respectively.

Figure 21: SR 89A 2040 No-Build Mainline Lane Configurations and Volumes

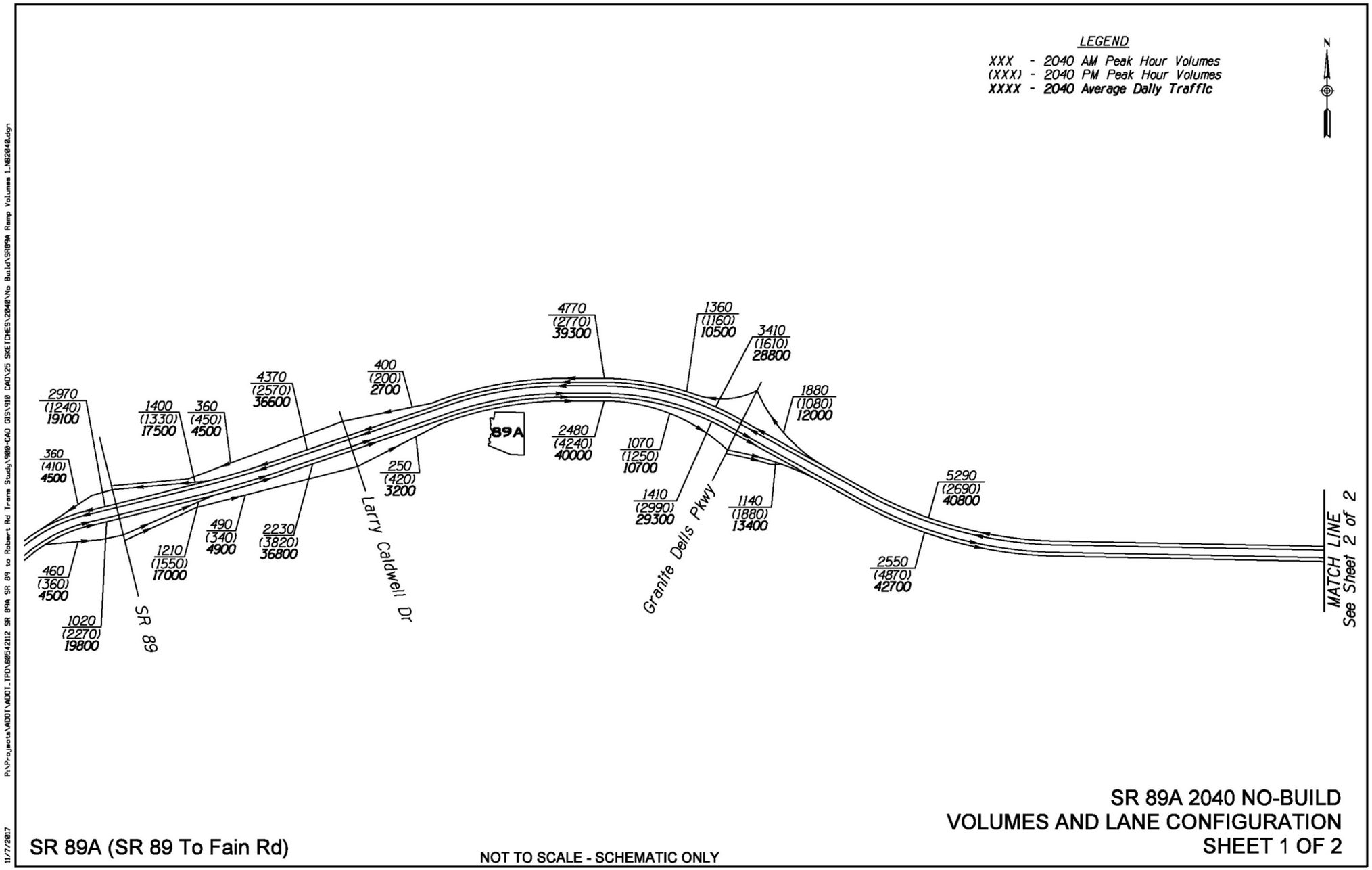


Figure 21 (cont'd): SR 89A 2040 No-Build Mainline Lane Configurations and Volumes

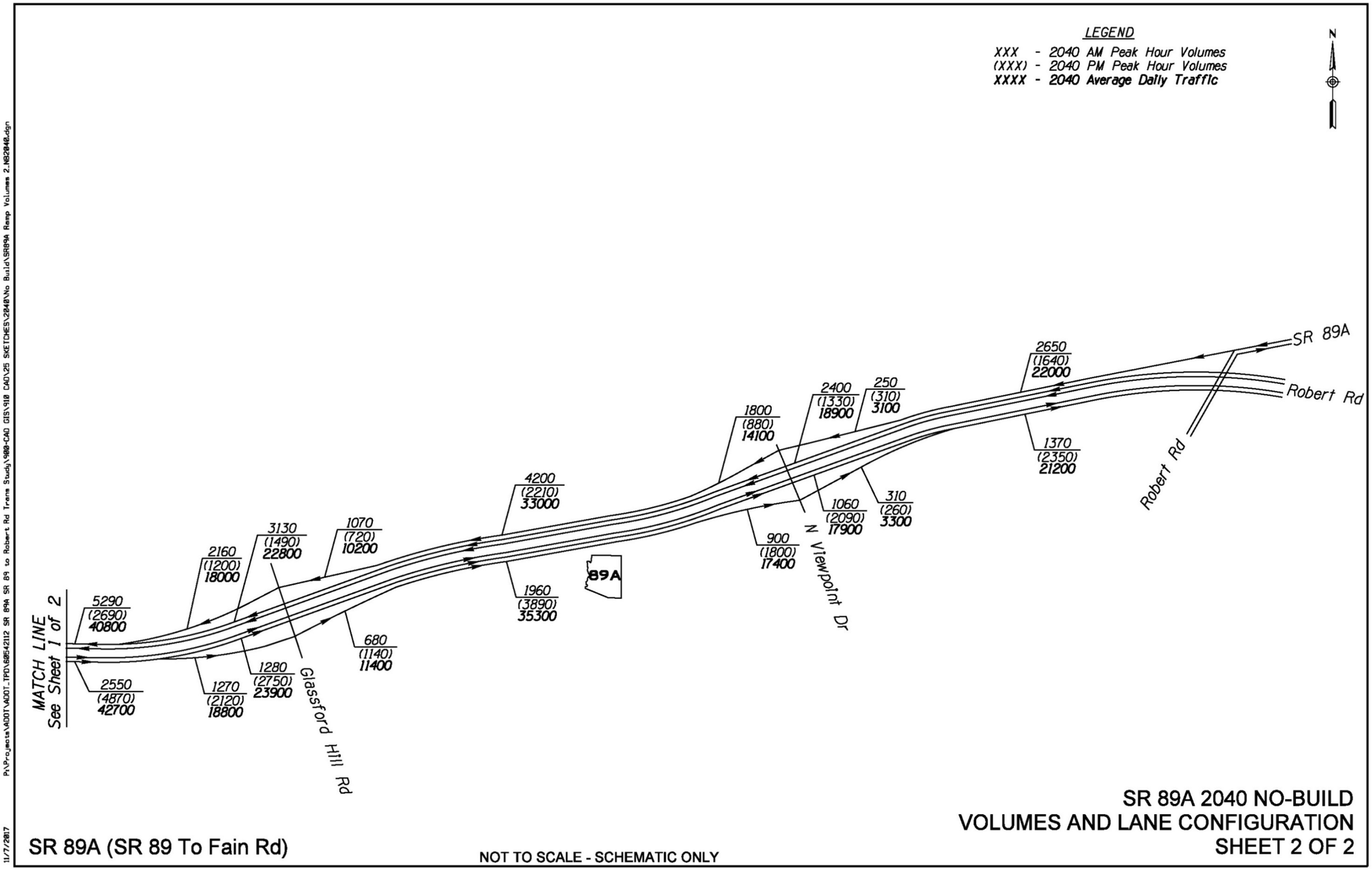
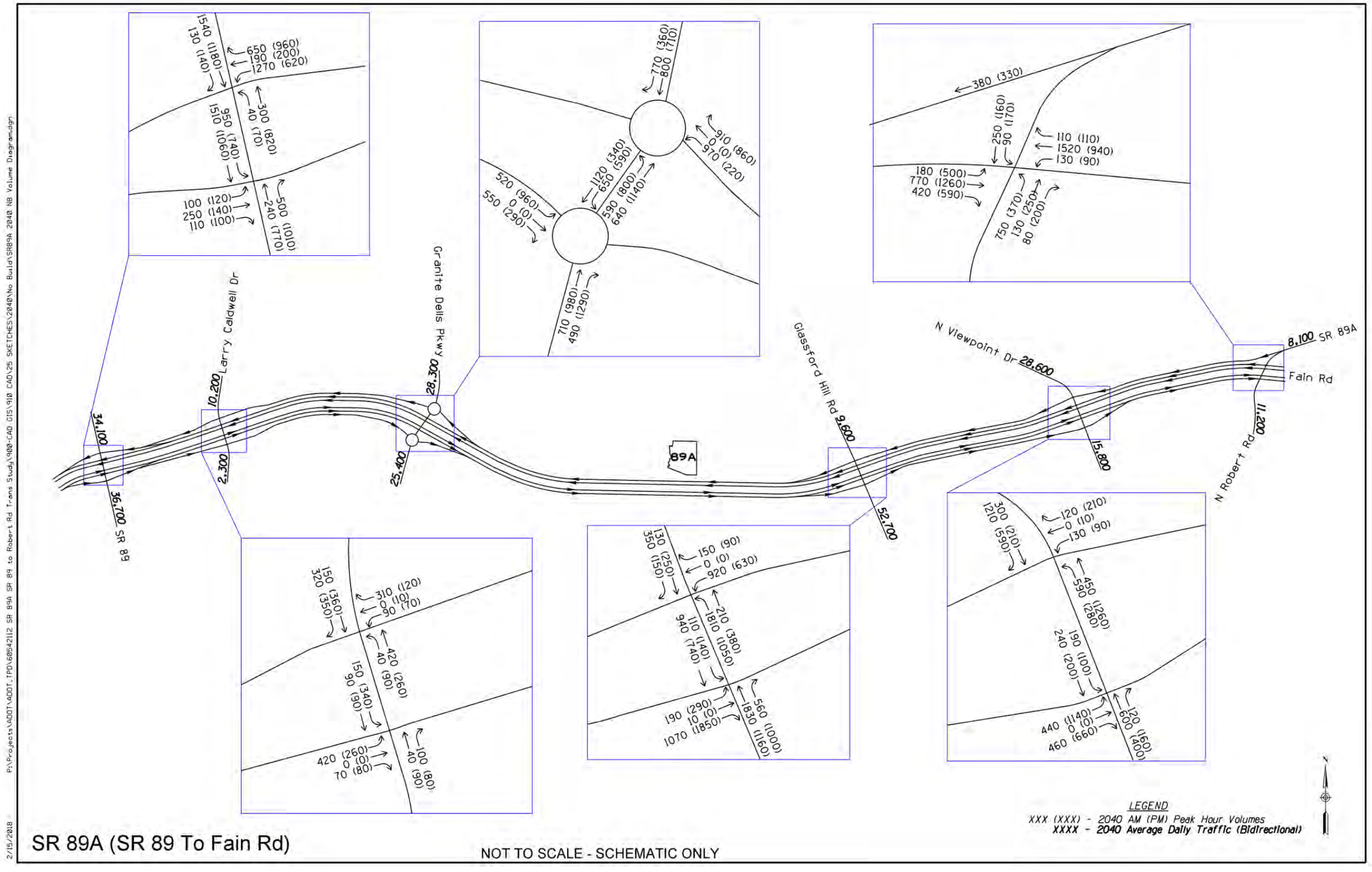


Figure 22: 2040 No-Build Intersection Turning Movement Volumes



5.3.3 2040 No-Build Projected Operational Analysis Results

5.3.3.1 *SR 89A Mainline and Ramp Results*

Figure 23 and **Figure 24** summarize the level-of-service analysis results for the 2040 No-Build conditions during both the AM and PM peak hours, respectively, on the SR 89A mainline.

In the AM peak Hour, SR 89A operates at LOS 'D' or better in the eastbound direction of travel with the exception of the segments between SR 89 to Granite Dells Parkway which operates at a LOS 'F'. The westbound direction of travel degrades to a LOS 'E or F' from the Glassford Hill Road on-ramp until the SR 89 off-ramp. All other segments operate at a LOS 'D' or better.

The following ramps operate with a LOS 'E' or worse:

- Viewpoint Drive westbound on-ramp
- Glassford Hill Road westbound on-ramp
- Granite Dells Parkway westbound off-ramp
- Granite Dells Parkway westbound on-ramp

In the PM peak Hour, SR 89A operates at LOS 'D' or better in the westbound direction of travel for all segments. The eastbound direction of travel degrades to a LOS 'E or F' from the SR 89 off-ramp until the Viewpoint Drive off-ramp. All other segments operate at a LOS 'A/B'.

The following ramps operate with a LOS 'E' or worse:

- SR 89 eastbound on-ramp
- Granite Dells Parkway eastbound off-ramp
- Granite Dells Parkway eastbound on-ramp
- Glassford Hill Road eastbound off-ramp
- Glassford Hill Road eastbound on-ramp
- Viewpoint Drive eastbound off-ramp

5.3.3.2 *Intersection Results*

Figure 25 and Table 33 includes the operational results for the 2040 No-Build Conditions. The resulting seconds of delay on each approach leg of each intersection is displayed in parentheses. In the AM peak hour, the following intersections are anticipated to degrade and operate at a LOS 'E or F':

- SR 89A/SR 89 TI
- SR 89A/Granite Dells Parkway
- SR 89A/Glassford Hill Road
- SR 89A/Robert Road

In the PM peak hour, the following intersections are anticipated to degrade and operate at a LOS 'E or F':

- SR 89A/SR 89 TI
- SR 89A/Granite Dells Parkway
- SR 89A/Glassford Hill Road

In the PM peak hour, the following intersections are anticipated to operate at a LOS 'E or F' on at least one approach but operate at a LOS 'D' or better as a total intersection:

- SR 89A/Viewpoint Road

Table 33: 2040 No-Build Intersection Level-of-Service Results

Intersection Location	Intersection Approach	2040 AM No-Build		2040 PM No-Build	
		Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay
SR 89A and SR 89 TI (signalized)	EB SR 89A Off Ramp	**E (75)**	D (54.5)	**F (155)**	**F (81.0)**
	WB SR 89A Off Ramp	D (40)		**F (82)**	
	NB SR 89	D (51)		**F (99)**	
	SB SR 89	**E (64)**		D (43)	
SR 89A and Larry Caldwell Dr. TI (unsignalized)	EB SR 89A Frontage Road	D (38)	B (17.4)	A (14)	A (5.1)
	WB SR 89A Off Ramp	C (22)		A (8)	
	NB Larry Caldwell Dr	A (2)		A (3)	
	SB Larry Caldwell Dr	A (1)		A (2)	
SR 89A and Granite Dells Pkwy. TI (roundabout)	EB SR 89A Off Ramp	**F (101)**	**F (297.6)**	**F (89)**	D (46.0)
	WB SR 89A Off Ramp	**F (164)**		A (7)	
	NB Granite Dells Pkwy.	A (6)		**E (58)**	
	SB Granite Dells Pkwy.	**F (815)**		A (9)	
SR 89A and Glassford Hill Rd. TI (signalized)	EB SR 89A Off Ramp	C (34)	**F (179.4)**	D (48)	**F (150.9)**
	WB SR 89A Off Ramp	**F (85)**		**E (66)**	
	NB Glassford Hill Rd.	**F (363)**		**F (337)**	
SR 89A and Viewpoint Dr. TI (signalized)	EB SR 89A Off Ramp	**F (167)**	C (34.6)	**E (61)**	D (48.2)
	WB SR 89A Off Ramp	C (23)		**F (82)**	
	NB Viewpoint Dr.	D (38)		D (37)	
	SB Viewpoint Dr.	D (43)		D (35)	
SR 89A and Robert Road (signalized)	EB SR 89A	D (35)	**F (90.9)**	B (17)	**E (56.5)**
	WB Fain Rd	C (28)		D (39)	
	NB Robert Rd	**F (143)**		D (38)	
	SB SR 89A	**F (142)**		**F (171)**	

Figure 23: 2040 No-Build Level-of-Service on SR 89A Mainline and Ramps: AM Peak Hour

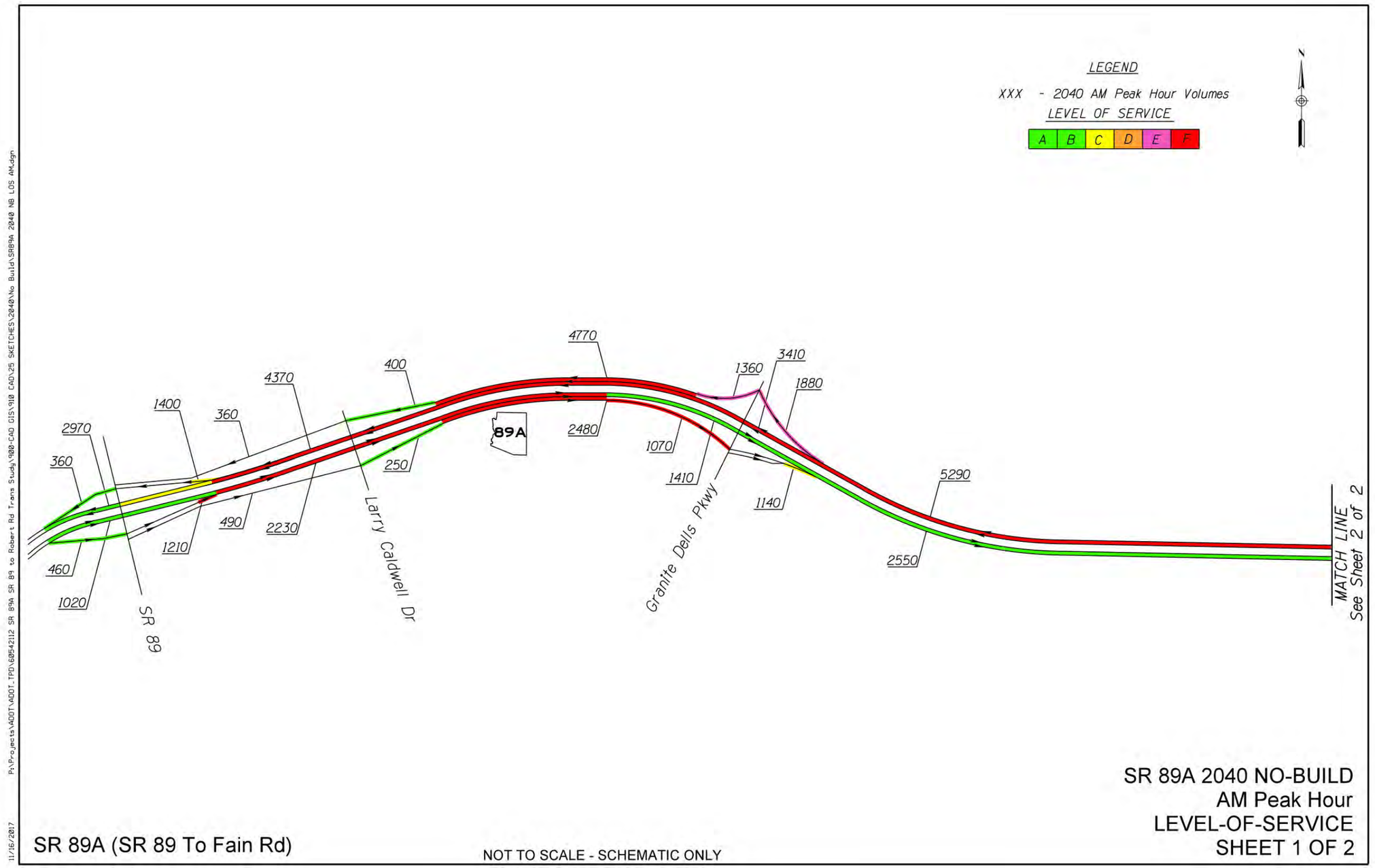


Figure 23 (cont'd): 2040 No-Build Level-of-Service on SR 89A Mainline and Ramps: AM Peak Hour

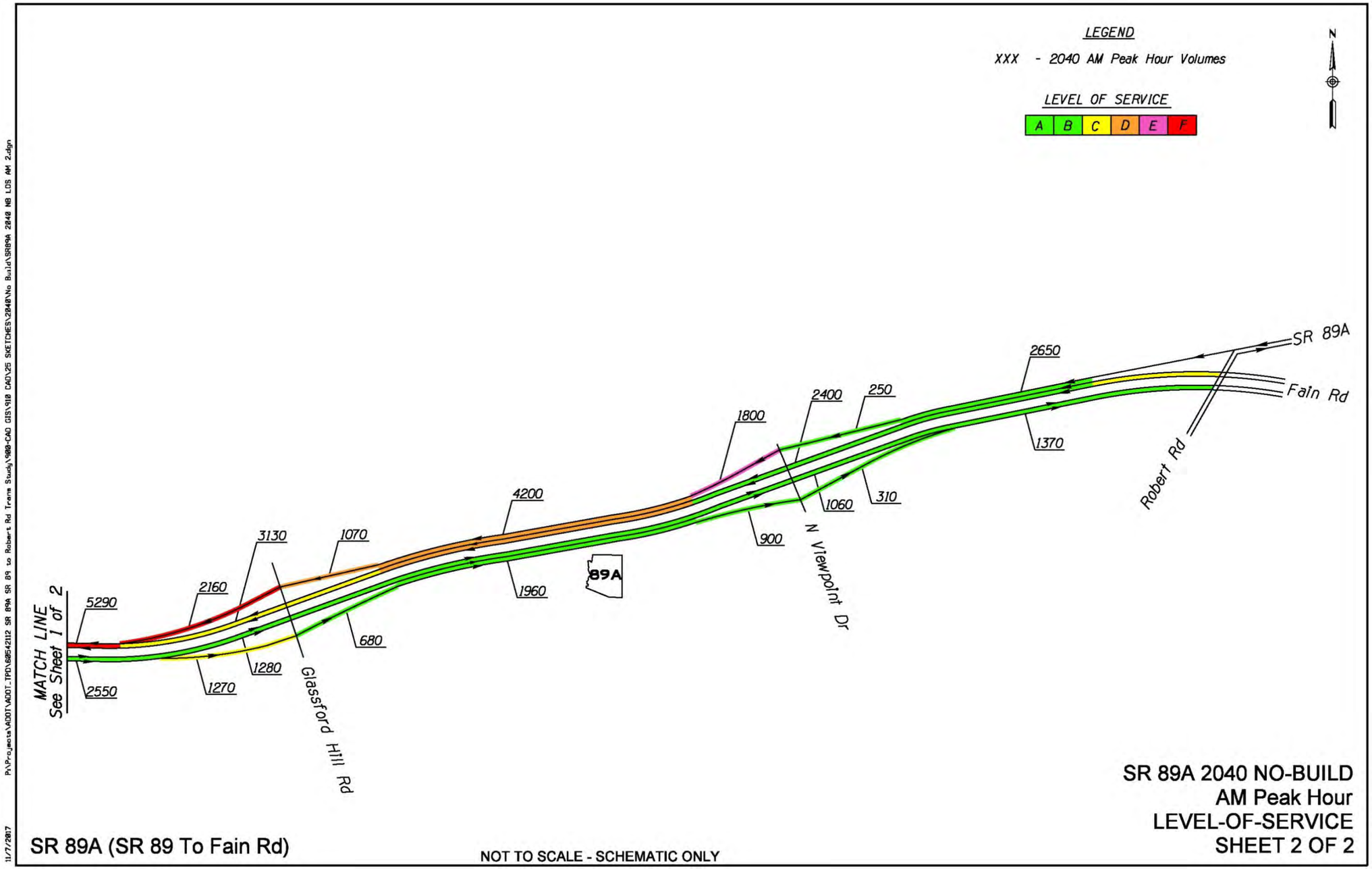


Figure 24: 2040 No-Build Level-of-Service on SR 89A Mainline and Ramps: PM Peak Hour

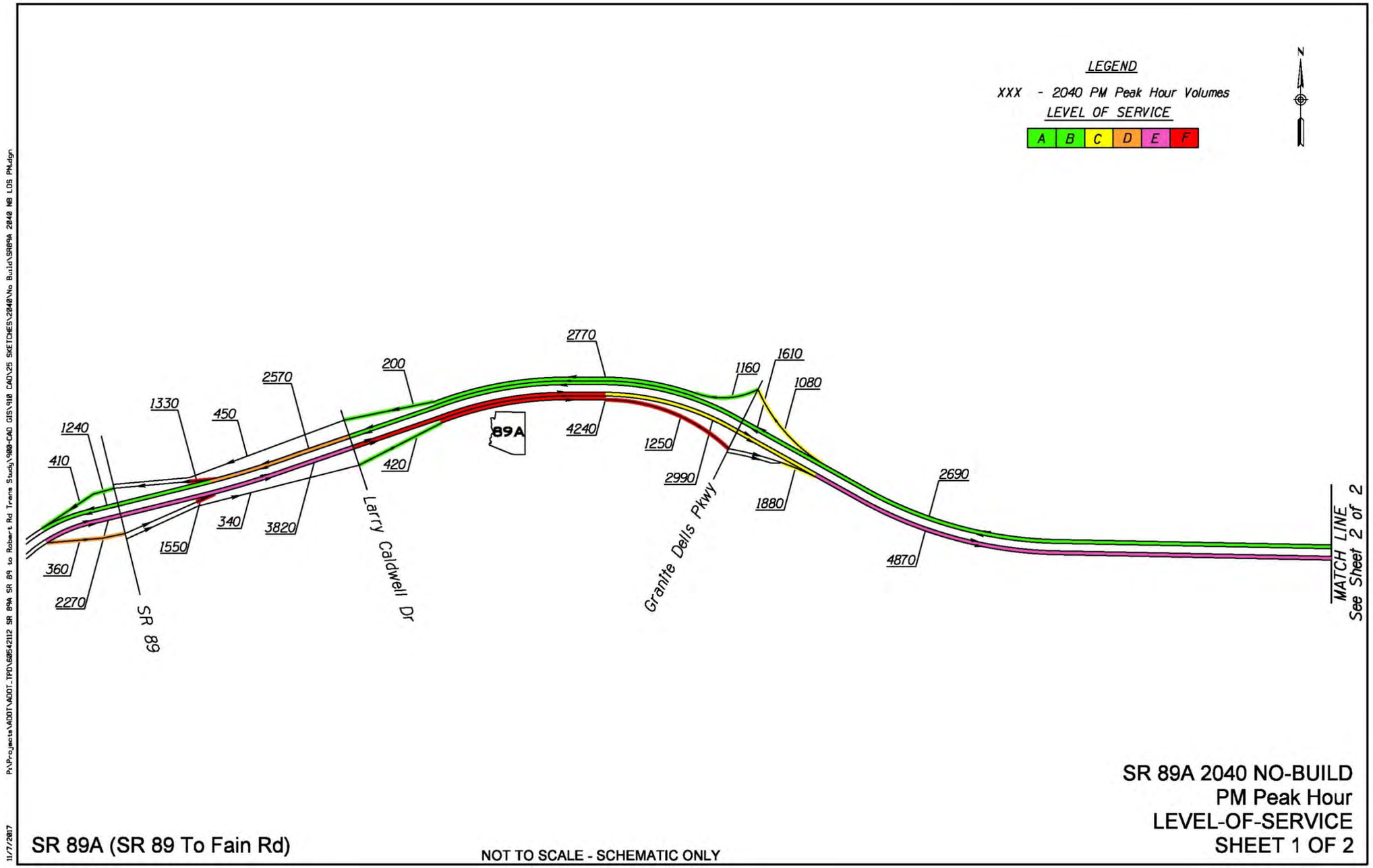


Figure 24 (cont'd): 2040 No-Build Level-of-Service on SR 89A Mainline and Ramps: PM Peak Hour

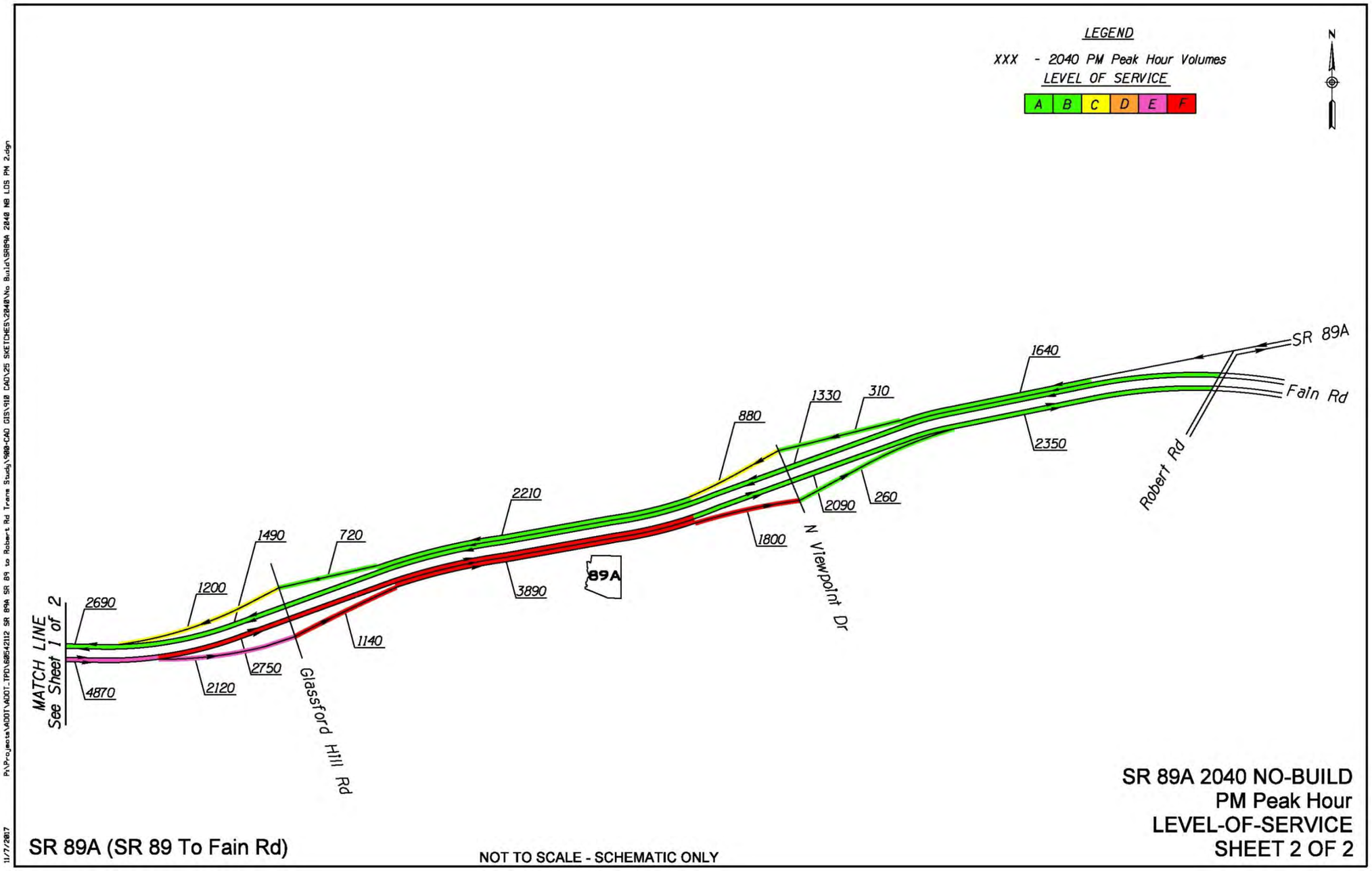
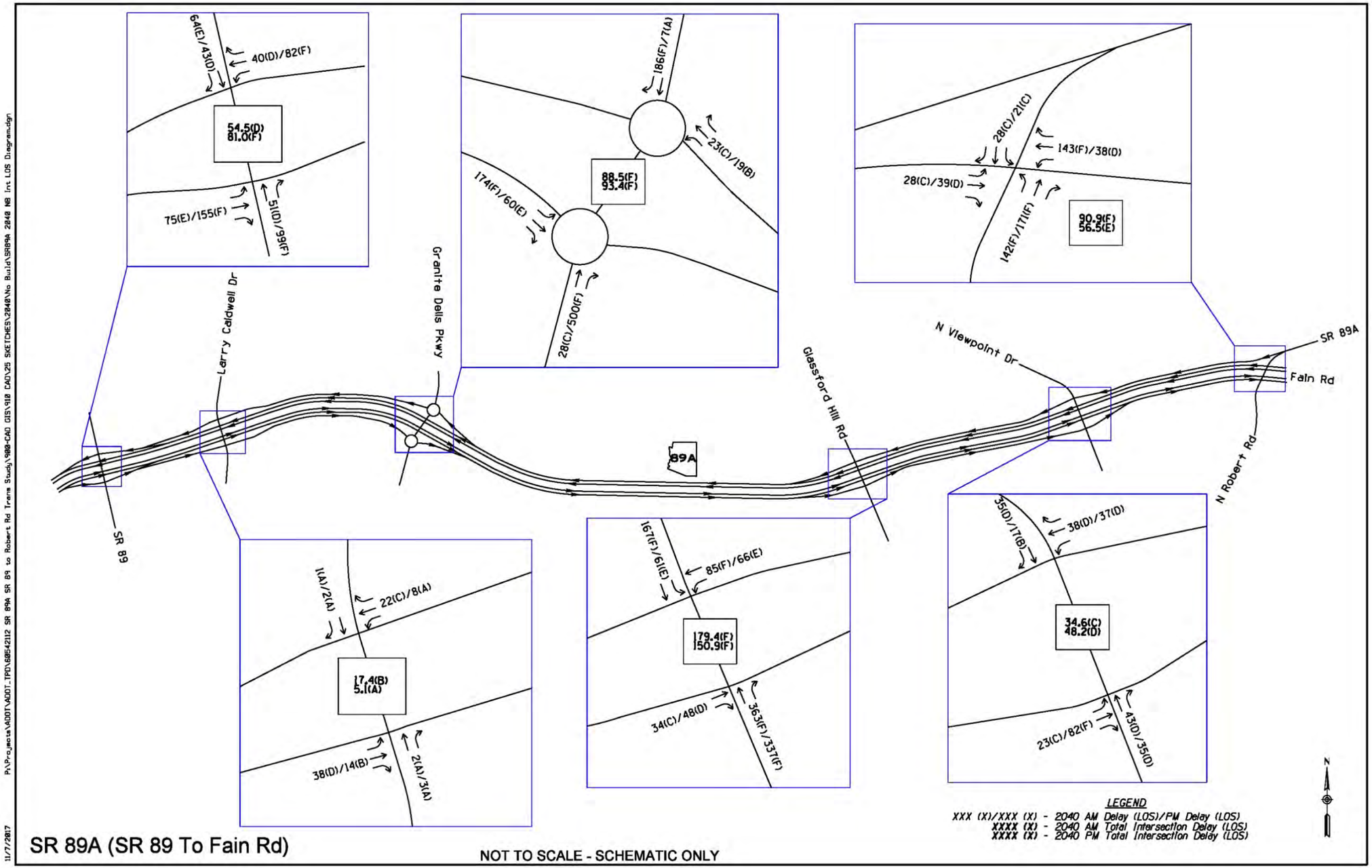


Figure 25: 2040 No-Build Intersection Levels-of-Service



5.4 Summary of Corridor Needs Over Time

Based upon the current pavement and bridge conditions, historical safety incidents, and current and future mobility and freight levels of service and accommodations, the following corridor needs have been identified:

- There are no pavement needs identified throughout the corridor
- There are no bridge needs identified along any bridge structure within the corridor
- There is a safety need identified along the entire corridor
    - The SR 89A corridor has an above average total crash rate
    - The Robert Road intersection has experienced multiple fatality resulting incidents
- Increasing future traffic volumes due to continued development of the corridor area has led to emerging mobility concerns along the corridor.
    - Additions to roadway capacity will need to be considered in future roadway improvements
    - Future roadway improvements should take freight and oversized load freight into consideration in the development of future roadway geometries.

In order to better understand the roadway capacity needs, a multi-year traffic analysis was conducted to identify when capacity concerns would first develop throughout the corridor. Mainline and intersection projected volumes for Year 2025, 2030 and 2035 were developed by using a linear growth rate between the 2017 existing and post-processed Year 2040 volumes. Balanced volumes were developed for each year within the corridor by following a similar methodology that was used to develop AM and PM peak hour 2040 volumes, as explained in Section 3.3.2.1. It was assumed that the fourth leg of Glassford Hill Road traffic interchange would be expanded and utilized by additional development to the north by the Year 2030.

An operational analysis was performed for the mainline including the general-purpose lanes, ramp junctions, and weave sections for the no-build conditions for each of the horizon years. Intersection analysis was also performed for the study intersections including the five TI's and one at-grade signalized intersection. This levels-of-service (LOS) analysis was conducted following the methodologies described in, Section 3.3.5. **Table 34** and **Table 35** include the anticipated No-Build Year 2025, 2030, and 2035 LOS results during the AM and PM Peak Hours for the intersections, respectively. **Table 36** include the anticipated No-Build Year 2025, 2030, and 2035 LOS results during the AM and PM Peak Hours for the mainline. These tables also include the existing 2017 and anticipated Year 2040 No-Build results for comparison purposes. **Appendix 6** includes visual representation of the volumes and results for the 2025 – 2040 Years.

The following summarizes the results of each facility over time:

SR 89A Eastbound Mainline – In the AM peak hour, the eastbound mainline continues to function at LOS D or better until 2040. By 2040, congestion at the Granite Dells intersection causes the mainline to operate at LOS F between SR 89 and Granite Dells. In the PM peak hour, congestion at the Viewpoint Drive intersection causes the mainline between Glassford Hill Road and Viewpoint Drive to operate at LOS F by Year 2030. By Year 2040, this congestion is compounded by congestion at the Glassford Hill Road and Granite Dells interchanges, causing the eastbound mainline to operate at LOS E or F between Viewpoint Drive and Granite Dells, and between Granite Dells and SR 89.

SR 89A Westbound Mainline – In the AM peak hour, congestion at SR 89 causes the westbound mainline to operate at LOS F between SR 89 and Larry Caldwell Drive by Year 2025. This congestion continues to worsen until by Year 2035 the mainline is operating at LOS F between SR 89 and Glassford Hill Road. In the PM peak hour, the westbound mainline continues to operate at LOS D or better through Year 2040.

SR 89 Traffic Interchange – The signalized intersection of SR 89A Ramps and SR 89 begins to degrade in the AM peak hour by Year 2035. By Year 2035 one approach is operating at LOS E and by Year 2040, two approaches. In the PM peak hour, one approach of this interchange begins to operate at LOS E by Year 2025. By Year 2030, the overall intersection operates at LOS E, and by Year 2040 at LOS F.

Larry Caldwell Drive Traffic Interchange – The stop-controlled intersection of SR 89A Ramps and Larry Caldwell Drive operates at LOS B or better, with every approach operating at LOS D or better through Year 2040 in both the AM and PM peak hours.

Granite Dells Parkway Traffic Interchange –The roundabout intersections of SR 89A Ramps and Granite Dells Parkway in the AM peak hour degrades to LOS 'F' on three approaches and LOS 'F' overall by Year 2040. In the PM peak hour, the eastbound approach degrades to LOS 'F' and the northbound approach to LOS 'E' by Year 2040.

Glassford Hill Road Traffic Interchange – The signalized intersection of SR 89A Ramps and Glassford Hill Road operates in the AM peak hour at LOS E by Year 2025, and degrades to LOS F by Year 2030. The same is true in the PM peak hour, with the overall intersection operating at LOS E by Year 2025 and LOS F by Year 2030.

Viewpoint Drive Traffic Interchange – In the AM peak hour, the signalized intersection of SR 89A and Viewpoint Drive operates at LOS D or better at every approach and overall through Year 2040. In the PM peak hour, the overall intersection maintains LOS D or better through Year 2040, but the eastbound approach operates at LOS E by Year 2030 and LOS F by Year 2035.

Robert Road/Fain Road Intersection – The signalized intersection of SR 89A, Fain Road, and Robert Road is the only at-grade intersection with the SR 89A mainline in the corridor. In the AM peak hour, the northbound approach to this intersection operates at LOS E by Year 2025 and LOS F by Year 2030. The overall intersection operates at LOS E by Year 2035 and LOS F by Year 2040. In the PM peak hour, the northbound approach operates at LOS F by Year 2030. The overall intersection operates at LOS E by Year 2040.

Table 34: AM Peak Hour No-Build Comparison Intersection LOS Results

Intersection Location	Intersection Approach	2017 AM Existing		2025 AM No-Build		2030 AM No-Build		2035 AM No-Build		2040 AM No-Build	
		Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay
SR 89A and SR 89 TI (signalized)	EB SR 89A Off Ramp	D (39)	C (31.7)	D (53)	D (43.2)	D (53)	D (42.3)	**E (55)**	D (46.4)	**E (75)**	D (54.5)
	WB SR 89A Off Ramp	C (32)		D (44)		D (37)		D (40)		D (40)	
	NB SR 89	C (25)		D (37)		D (37)		D (40)		D (51)	
	SB SR 89	C (33)		D (43)		D (47)		D (53)		**E (64)**	
SR 89A and Larry Caldwell Dr. TI (unsignalized)	EB SR 89A Frontage Road	B (14)	A (8)	B (18)	A (9.2)	C (21)	B (11.5)	C (25)	B (13.1)	D (38)	B (17.4)
	WB SR 89A Off Ramp	A (9)		B (11)		B (17)		C (21)		C (22)	
	NB Larry Caldwell Dr	A (1)		A (1)		A (2)		A (2)		A (2)	
	SB Larry Caldwell Dr	A (0)		A (1)		A (1)		A (1)		A (1)	
SR 89A and Granite Dells Pkwy TI (roundabout)	EB SR 89A Off Ramp	A (0)	A (0.6)	A (7)	A (4.9)	A (7)	A (6.1)	B (11)	D (49.3)	**F (101)**	**F (297.6)**
	WB SR 89A Off Ramp	A (1)		A (5)		A (7)		B (13)		**F (164)**	
	NB Granite Dells Pkwy	A (0)		A (3)		A (3)		A (4)		A (6)	
	SB Granite Dells Pkwy	A (1)		A (5)		A (7)		**F (148)**		**F (815)**	
SR 89A and Glassford Hill Rd. TI (signalized)	EB SR 89A Off Ramp	B (17)	C (27)	C (29)	**E (57.5)**	C (31)	**F (141.0)**	C (33)	**F (144.0)**	C (34)	**F (179.4)**
	WB SR 89A Off Ramp	D (45)		**E (55)**		**E (58)**		**E (67)**		**F (85)**	
	NB Glassford Hill Rd	C (24)		**E (73)**		**F (277)**		**F (303)**		**F (363)**	
	SB Glassford Hill Rd	N/A		N/A		D (38)		D (42)		**F (167)**	
SR 89A and Viewpoint Dr. TI (signalized)	EB SR 89A Off Ramp	B (12)	B (13)	B (17)	B (19.2)	C (21)	C (24.0)	C (26)	C (33.4)	C (23)	C (34.6)
	WB SR 89A Off Ramp	C (24)		C (31)		D (36)		D (41)		D (38)	
	NB Viewpoint Dr	B (20)		C (31)		D (37)		D (46)		D (43)	
	SB Viewpoint Dr	A (8)		B (13)		B (18)		C (30)		D (35)	
SR 89A and Robert Road (signalized)	EB SR 89A	C (22)	C (23.5)	C (28)	D (35.5)	C (28)	D (50.3)	C (28)	**E (59.2)**	C (28)	**F (90.9)**
	WB Fain Rd	C (27)		D (36)		D (38)		**E (61)**		**F (143)**	
	NB Robert Rd	C (26)		**E (61)**		**F (135)**		**F (145)**		**F (142)**	
	SB SR 89A	B (18)		B (20)		C (22)		C (27)		C (28)	

Table 35: PM Peak Hour No-Build Comparison Intersection LOS Results

Intersection Location	Intersection Approach	2017 PM Existing		2025 PM No-Build		2030 PM No-Build		2035 PM No-Build		2040 PM No-Build	
		Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay
SR 89A and SR 89 TI (signalized)	EB SR 89A Off Ramp	D (42)	C (25.4)	**E (74)**	D (47.9)	**E (64)**	**E (61.7)**	**F (87)**	**E (71.7)**	**F (155)**	**F (81.0)**
	WB SR 89A Off Ramp	C (27)		D (45)		**F (80)**		**F (82)**		**F (82)**	
	NB SR 89	C (22)		D (52)		**E (64)**		**F (87)**		**F (99)**	
	SB SR 89	C (25)		D (38)		C (34)		D (35)		D (43)	
SR 89A and Larry Caldwell Dr. TI (unsignalized)	EB SR 89A Frontage Road	A (9)	A (2.5)	B (11)	A (3.8)	B (12)	A (4.7)	B (14)	A (5.3)	A (14)	A (5.1)
	WB SR 89A Off Ramp	A (7)		A (7)		A (8)		A (8)		A (8)	
	NB Larry Caldwell Dr	A (1)		A (2)		A (2)		A (2)		A (3)	
	SB Larry Caldwell Dr	A (1)		A (1)		A (1)		A (1)		A (2)	
SR 89A and Granite Dells Pkwy TI (roundabout)	EB SR 89A Off Ramp	A (0)	A (0.4)	A (5)	A (4.2)	A (7)	A (5.6)	B (18)	A (9.5)	**F (89)**	D (46.0)
	WB SR 89A Off Ramp	A (1)		A (4)		A (5)		A (7)		A (7)	
	NB Granite Dells Pkwy	A (0)		A (3)		A (4)		A (6)		**E (58)**	
	SB Granite Dells Pkwy	A (0)		A (5)		A (7)		A (8)		A (9)	
SR 89A and Glassford Hill Rd. TI (signalized)	EB SR 89A Off Ramp	C (22)	C (25.4)	**F (119)**	**E (62.3)**	D (48)	**F (80.5)**	**E (69)**	**F (191.5)**	D (48)	**F (150.9)**
	WB SR 89A Off Ramp	D (53)		**E (57)**		**E (73)**		**E (76)**		**E (66)**	
	NB Glassford Hill Rd	B (20)		C (26)		**F (117)**		**F (274)**		**F (337)**	
	SB Glassford Hill Rd	N/A		N/A		**E (58)**		**E (64)**		**E (61)**	
SR 89A and Viewpoint Dr. TI (signalized)	EB SR 89A Off Ramp	B (15)	B (17.1)	D (46)	D (35.9)	**E (75)**	D (47.9)	**F (84)**	D (49.7)	**F (82)**	D (48.2)
	WB SR 89A Off Ramp	C (32)		D (39)		D (38)		D (40)		D (37)	
	NB Viewpoint Dr	C (22)		C (31)		C (34)		D (36)		D (35)	
	SB Viewpoint Dr	B (12)		B (16)		B (17)		B (18)		B (17)	
SR 89A and Robert Road (signalized)	EB SR 89A	C (21)	C (23.1)	C (27)	C (29.1)	C (32)	D (39.6)	C (32)	D (54.2)	D (39)	**E (56.5)**
	WB Fain Rd	C (27)		C (33)		C (33)		C (33)		D (38)	
	NB Robert Rd	C (29)		D (42)		**F (83)**		**F (164)**		**F (171)**	
	SB SR 89A	B (18)		B (17)		B (19)		C (20)		C (21)	

Table 36: AM & PM Peak Hour No-Build Comparison SR 89A Mainline LOS Results

Segment Description	AM Peak Hour										PM Peak Hour									
	2017 Existing		2025 No-Build		2030 No-Build		2035 No-Build		2040 No-Build		2017 Existing		2025 No-Build		2030 No-Build		2035 No-Build		2040 No-Build	
	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS
Eastbound/Northbound SR 89A																				
Project Limit to SR 89 EB Exit Ramp	8	A	9	A	12	B	13	B	16	B	12	B	18	C	23	C	26	D	42	D
SR 89 EB Exit Ramp to SR 89 EB Entr Ramp	5	A	5	A	7	A	8	A	11	A	9	A	13	B	18	C	19	C	21	C
SR 89 EB Entrance Ramp to Larry Caldwell EB Entr Ramp	9	A	11	B	13	B	14	B	**72**	**F**	14	B	19	C	24	C	26	C	**40**	**E**
Larry Caldwell EB Entr Ramp to Granite Dells EB Exit Ramp	6	A	8	A	10	A	11	B	**108**	**F**	11	B	15	B	20	C	26	C	**57**	**F**
Granite Dells EB Exit Ramp to Granite Dells EB Entr Ramp	8	A	9	A	9	A	10	A	9	A	16	B	18	B	20	C	20	C	24	C
Granite Dells EB Entr Ramp to Glassford Hill EB Exit Ramp	9	A	13	B	15	B	17	B	16	B	16	B	22	C	26	D	34	D	**44**	**E**
Glassford Hill EB Exit Ramp to Glassford Hill EB Entr Ramp	4	A	7	A	8	A	9	A	8	A	9	A	13	B	**48**	**F**	**65**	**F**	**104**	**F**
Glassford Hill EB Entr Ramp to Viewpoint Dr EB Exit Ramp	4	A	7	A	7	A	8	A	7	A	9	A	15	B	**127**	**F**	**138**	**F**	**150**	**F**
Viewpoint Dr EB Exit Ramp to Viewpoint Dr EB Entr Ramp	4	A	5	A	5	A	6	A	6	A	6	A	9	A	8	A	8	A	10	A
Viewpoint Dr EB Entr Ramp to Robert Road Intersection	4	A	6	A	7	A	8	A	8	A	7	A	10	A	9	A	10	A	11	B
Westbound/Southbound SR 89A																				
Robert Road Intersection to Viewpoint Dr WB Exit Ramp	6	A	9	A	10	A	12	B	13	B	4	A	5	A	6	A	7	A	8	A
Viewpoint Dr WB Exit Ramp to Viewpoint Dr WB Entr Ramp	8	A	12	B	13	B	15	B	16	B	5	A	6	A	8	A	8	A	10	A
Viewpoint Dr WB Entr Ramp to Glassford Hill WB Exit Ramp	11	A	16	B	20	C	25	C	30	D	5	A	8	A	9	A	10	A	12	B
Glassford Hill WB Exit Ramp to Glassford Hill WB Entr Ramp	12	B	17	B	19	C	23	C	24	C	5	A	7	A	9	A	9	A	11	B
Glassford Hill WB Entr Ramp to Granite Dells WB Exit Ramp	19	C	26	D	31	D	**55**	**F**	**56**	**F**	10	A	14	B	16	B	17	B	18	B
Granite Dells WB Exit Ramp to Granite Dells WB Entr Ramp	18	C	22	C	**51**	**F**	**96**	**F**	**53**	**F**	10	A	11	A	11	A	10	A	11	A
Granite Dells WB Entr Ramp to Larry Caldwell WB Exit Ramp	13	B	18	C	**87**	**F**	**112**	**F**	**101**	**F**	7	A	10	A	14	B	12	B	10	A
Larry Caldwell WB Exit Ramp to SR 89 WB Exit Ramp	21	C	**56**	**F**	**111**	**F**	**114**	**F**	**111**	**F**	10	A	15	B	33	D	34	D	33	D
SR 89 WB Exit Ramp to SR 89 WB Entr Ramp	11	A	16	B	18	C	19	C	23	C	5	A	7	A	8	A	8	A	7	A
SR 89 WB Entr Ramp to Project Limit	15	B	23	C	26	D	27	D	27	D	8	A	11	B	13	B	14	B	14	B

6.0 EVALUATION CRITERIA, ALTERNATIVES ANALYSIS, AND RECOMMENDED IMPROVEMENTS

6.1 Evaluation Criteria

Evaluation criteria were developed to assess improvement alternatives for the 2040 build scenario. The evaluation process was performed at all locations that presented multiple ultimate solution alternatives. Given the different needs between the mainline corridor and the corridor interchanges, separate criteria were developed for each independently.

6.1.1 Recommended Criteria

The evaluation criteria was grouped into five major categories; mobility and constructability, safety, regional preference, utility impact, and costs. Given the singular solution identified for the corridor mainline, only interchange/intersection specific criteria were established. Furthermore, all near-term and intermediate-term solutions were excluded from the alternatives evaluation. These solutions' implementations were determined based upon future level-of-service analysis and immediate safety needs.

In order to establish a comprehensive and regionally appropriate evaluation, the technical advisory committee project team was requested to provide feedback upon all preliminary evaluation criteria. This was successfully accomplished by conducting a survey in order to determine both a set of critically important criteria as well as any non-applicable or non-desirable criteria.

In total, nine surveys were completed and used to establish the finalized list of evaluation criteria. The survey responses can be seen in **Figure 26**. Using the survey responses as the primary guidance, the preliminary evaluation criteria were refined to formulate appropriate criteria for intersection alternative. The following is a list and description of the finalized intersection design criteria.

Mobility and Constructability

Level of service – quantitative measurement of both AM and PM Peak Level of Service measurements

Constructability / Maintenance of Traffic – qualitative measure of the ease or complexity of traffic control and traffic impacts during construction periods

Safety

Conflict points – quantitative measure of both vehicular and pedestrian conflict points present

Predictive safety analysis – quantitative measure analyzing the predicted reduction in total and serious injury crashes

Regional Preferences

Consistency with plans – qualitative measure of a suggested improvement's alignment with previous recommendations derived from completed studies

Agency and Public Acceptance – qualitative measure of stakeholder and the general public's acceptance of suggested improvement

ROW Acquisition Displacements – quantitative measure of expected residential, commercial, or institutional displacements required to implement suggested improvement

Protected Population Impact – qualitative measure of expected impact to protected population groups as outlined by Title VI Civil Rights in implementing suggested improvements

Utility Impact – qualitative measure of expected impacts to existing utility infrastructure to implement suggested improvements

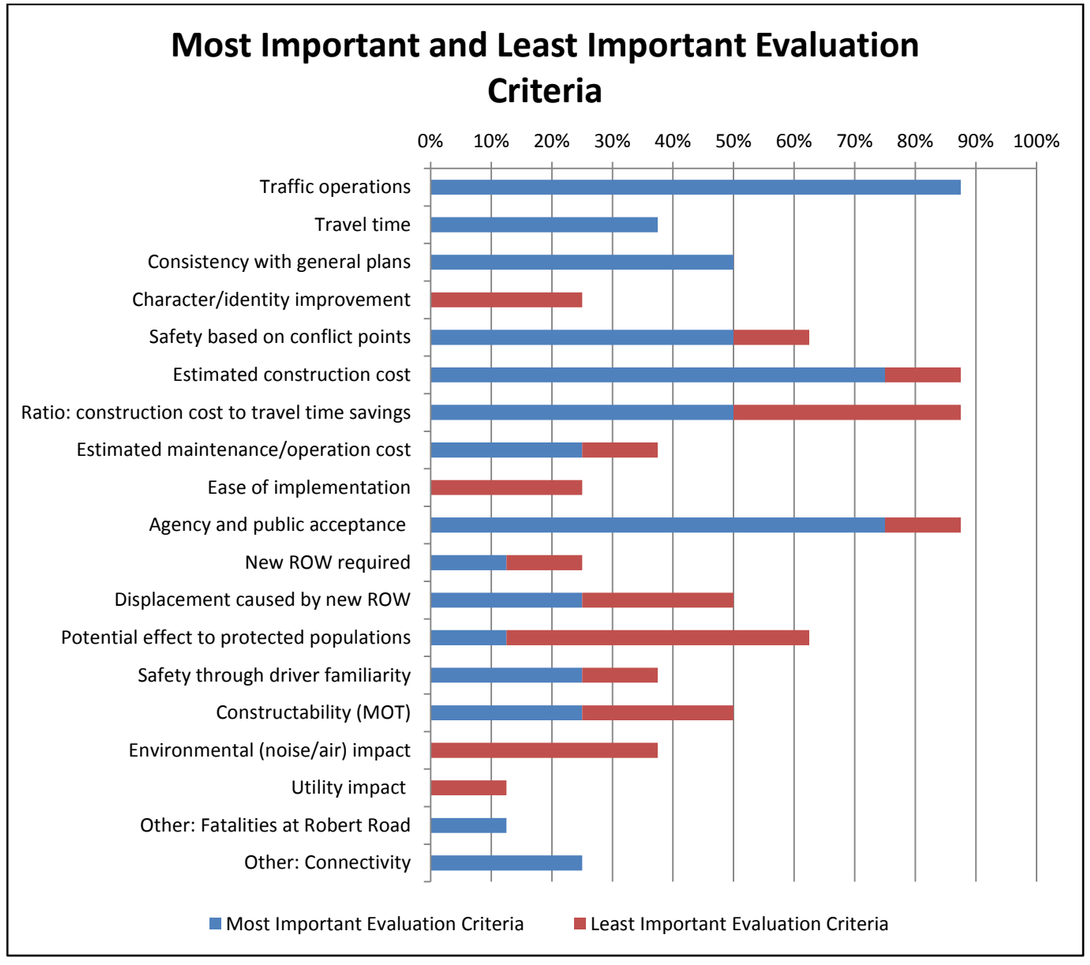
Project Costs

Construction Cost – quantitative measurement of the total cost of construction, including contingency to implement suggested improvements (does not include design, right-of-way, or additional expenses). Planning level construction cost estimates were prepared for all proposed improvements

Operations and Maintenance – qualitative measure of expected maintenance and operation costs of suggested improvement implementation

New Right-of-way required – quantitative measure of expected acres of additional right-of-way acquisition required to implement suggested improvements

Figure 26: Evaluation Criteria TAC Survey



6.1.2 Criteria Weighting

Using the distribution of favorable and non-favorable survey responses as the primary guiding determination, the criteria were grouped into weighted tiers. Four tiers were established; the top tier received a weight of 4.0, corresponding to the criteria receiving the highest amount of favorable response; the middle tiers received a weight of 3.0 and 2.0 respectively; and the bottom tier received a weight of 1.0, corresponding to the criteria receiving the lowest amount of favorable response. Criteria that received significant unfavorable response and/or were determined to be non-implementable for the study areas were eliminated from further consideration. The final evaluation criteria tier categorization is as follows:

Tier 1
Weighting Factor – 4.0

Criteria: Level of Service

Tier 2
Weighting Factor – 3.0

Criteria: Construction Cost and Agency & Public Acceptance

Tier 3
Weighting Factor – 2.0

Criteria: Conflict Points, Predictive Safety Analysis, Consistency with Plans

Tier 4
Weighting Factor – 1.0

Criteria: Constructability (Maintenance of Traffic), Utility Impact, Protected Population Impact, Right-of-Way Acquisition Displacements, Operation and Maintenance Costs, and New Right-of-Way Required

6.2 Potential Corridor Improvements

Potential corridor improvements were developed by investigating the corridor needs for each year as described in Section 5.4 and brainstorming mitigation measures for these needs with the core project team. Additional corridor improvements were developed from direction provided by the TAC regarding corridor needs and safety needs from the detailed safety analysis. The following text describes each of the potential corridor improvements developed by location along the corridor.

6.2.1 SR 89A Mainline (Additional General Purpose Lane)

No-Build Conditions

The existing typical section for SR 89A consists of two 12 foot general purpose lanes with a four foot inside shoulder and ten foot outside shoulder in each direction. The median width is 38 feet, extending between SR 89 to directly west of the Robert Rd intersection. The roadway converges to a flush paved median for approximately 250 feet prior to the at-grade Robert Rd intersection. Additional roadway features include eastbound and westbound auxiliary lanes between Larry Caldwell Drive and Granite Dells Parkway, and between Glassford Hill Road and Viewpoint Drive.

Design Alternative

The design would construct an additional 12 foot lane in the median in both directions, with median barrier. The inside shoulder width would be adjusted to 12 feet, while the outside shoulder would be widened from 10 to 12 feet. This new design would widen the cross-section by a total of eight feet, widening the outside edge of roadway by four feet of the existing edge of pavement in both directions. Bridge structures over Granite Creek and Glassford Hill Road would need to be widened to the median side to accommodate the additional lane and shoulder. A design variance

would be required for the inside shoulder width at the Larry Caldwell Drive and Granite Dells Parkway overpasses due to existing bridge piers located in the center of the alignment of the proposed median. Design variances for the outside shoulder width would also be required at the Glassford Hill Road bridges, unless the outside of the bridge is widened or the inside shoulder is reduced to 10 feet across the bridges. **Figure 27** includes a visual example of this general purpose lane widening on a small segment of the corridor.

6.2.2 SR 89 Traffic Interchange (Additional Eastbound Left-turn Lane)

No-Build Conditions

The existing eastbound exit ramp at SR 89 is a single lane ramp with a two-lane throat. The left lane is used for left-turns and through movements, while the right- lane is used for right-turns only. Additionally, signal timing green time allocation is significantly reduced for the eastbound exit movement to provide greater green time length to the SR 89 southbound movement in the morning or the SR 89A westbound ramp movement in the evening, causing insufficient timing to empty left-turn queues.

Design Alternative

In order to meet demand for left-turns and through movements, this alternative would construct an additional left-turn lane to the left side of the ramp at the throat. The center lane would also be restriped to permit both left-turns and through movements, and the right lane would remain as right-turn only. **Figure 28** includes a visual example of this proposed improvement.

6.2.3 SR 89 Eastbound Entrance Ramp Reconfiguration (Two Lane Entrance Ramp)

No-Build Conditions

The existing eastbound entrance ramp at SR 89 is a two-lane throat that diverges into a single-lane entrance to SR 89A and a single-lane frontage road that continues east to Larry Caldwell Drive. Two left turn lanes exist from southbound SR 89 to the eastbound ramp, but one of these lanes is under-utilized due to the ramp configuration, which forces drivers to proactively choose lanes prior to the turn in order to avoid a quick merge into their intended lane depending on their destination.

A safety issue currently exists, in which eastbound SR 89A mainline traffic is able to cross over the paved gore between the mainline and the entrance ramp and the paved gore between the entrance ramp and the frontage road in order to get to the eastbound frontage road. Drivers traveling eastbound along Pioneer Parkway are attempting this non-permitted maneuver in order to bypass the intended route of exiting at SR 89 and continuing through the intersection to the frontage road. Given there is no direct mainline exit to access Larry Caldwell Drive, this movement is likely intended to bypass the traffic light at the SR 89 intersection.

Design Alternatives

(Option 1): This design alternative would add a two-lane entrance to SR 89A, with the right lane having an option to continue east on the frontage road to Larry Caldwell Drive. The two-lane ramp would drop the right lane with a taper beginning near the entrance gore, in accordance with Figure 504.8B of the ADOT Roadway Design Guidelines. Concrete barriers and realignment of the mainline gore and the frontage road gore locations eliminate the ability to make the dangerous crossover maneuver from the mainline to the frontage road, reducing the safety concerns at this location.

(Option 2): This design alternative would add a two-lane entrance to SR 89A, with the right lane having an option to continue east on the frontage road to Larry Caldwell Drive. East of the bridge over SR 89, the two lanes on the mainline would realign toward the median into the ultimate three-lane configuration, while the two ramp lanes would enter SR 89A together. The outside lane will drop with a taper west of the Larry Caldwell Drive overpass, with three lanes remaining in the eastbound direction. Concrete barriers and realignments of the mainline gore and the frontage road gore locations eliminate the ability to make the dangerous crossover maneuver from the mainline to the frontage road, reducing the safety concerns at this location. Option 1 has the ability to transition post-construction into Option 2 with minimal adjustments to the design of the ramp gores and barriers at such a time that Option 2 will be required.

Figure 29 and **Figure 30** include visual examples of the Option 1 and Option 2 proposed improvements, respectively.

6.2.4 Granite Dells Parkway Traffic Interchange

No-Build Conditions

The existing interchange of Granite Dells Parkway and SR 89A is a diamond interchange with roundabouts at each ramp intersection. Both intersections are configured as double-lane roundabouts. The southbound leg of the northern interchange is currently closed to through traffic with Granite Dells Parkway currently terminating at the intersection. Both eastbound and westbound exit ramps enable a fully protected free-right movement, with the westbound exit's northbound turn options being prohibited with temporary barriers until further extension of Granite Dells Parkway. Furthermore, the northbound approach to the eastbound on-ramp has a fully protected free-right.

Design Alternative – Roundabout modifications

The proposed design alternative modifies the northern roundabout to allow double left-turns from the westbound exit ramp to southbound Granite Dells Parkway. The southern roundabout would also be modified to allow double left-turns from southbound Granite Dells Parkway to the eastbound entrance ramp and double left turns from the eastbound exit ramp to northbound Granite Dells Parkway. These modifications can be made by adding a spiraled lane into the existing center circle, enabling most of the existing approaches and departures to be maintained. **Figure 31** includes a visual example of this proposed improvement.

Design Alternative – Minimal Lane adjustment (southbound free right)
The proposed design alternative adds a free-right turn to the north roundabout for southbound to westbound traffic to accommodate projected future volumes originating from development north of the corridor and completion of roadway access along the northern leg. Additionally, the westbound on-ramp would be widened to the outside to accommodate a third lane, created from the free-right turn for a short length before the outside lane is removed with a taper. **Figure 32** includes a visual example of this proposed improvement.

6.2.5 Great Western Drive

No-Build Conditions
Existing Great Western Drive is a local access road with an at-grade, unsignalized intersection with SR 89A. A median crossover provides access to and from westbound SR 89A with a dedicated left-turn lane and approximately 500 feet of flush paved median. Additionally, there is an eastbound right-turn lane. Currently, Great Western Drive provides access to a water tower adjacent to the SR 89A corridor, but terminates at this exit, prohibiting any further connection to the roadway's former north/south alignment.

Design Alternative – Great Western Drive Closure
This design alternative is proposed for implementation in the interim short-term timeframe. In the interim condition with two lanes in each direction on SR 89A, all access from SR 89A to Great Western Drive would be closed, including the westbound left-turn lane and additional median crossing pavement would be removed in order to eliminate crossing traffic.

Design Alternative – Traffic interchange
As outlined in the CYMPO Regional Transportation Plan and the Yavapai County Great Western Corridor Feasibility Study, a grade separated traffic interchange is proposed for the Great Western Drive corridor. The layout is proposed to be a diamond interchange with an overpass across the SR 89A mainline. On the overpass, two through lanes and two left turn lanes are proposed in each direction. On the mainline, auxiliary lanes will provide access to exit ramps and from entrance ramps in both directions between Granite Dells Parkway and Glassford Hill Road, respectively. **Figure 33** includes a visual example of this proposed improvement.

This layout incorporates the 15% plan alignment which also included a system interchange which will require additional right-of-way. If the traffic interchange is implemented prior to right-of-way acquisition for the system interchange, slightly modified ramp alignments on the northern intersection could reduce the need for right-of-way with this proposed improvement.

Figure 27: General Purpose Lane Widening

Figure 28: SR 89 TI Improvements

Figure 29: SR 89 TI Eastbound Entrance Ramp Option 1

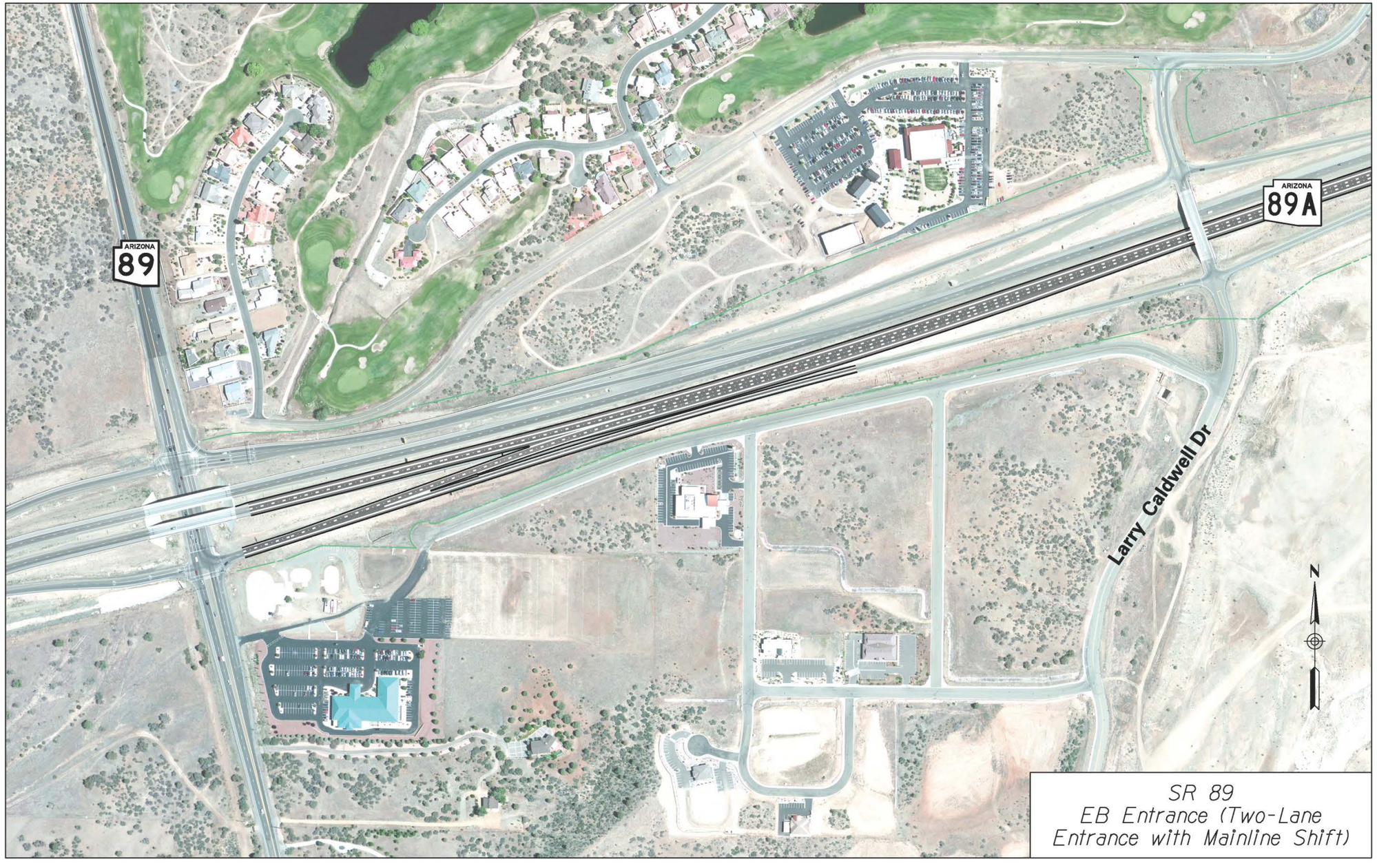


Figure 30: SR 89 TI Eastbound Entrance Ramp Option 2

Figure 31: Granite Dells TI Roundabout Lane Reconfiguration

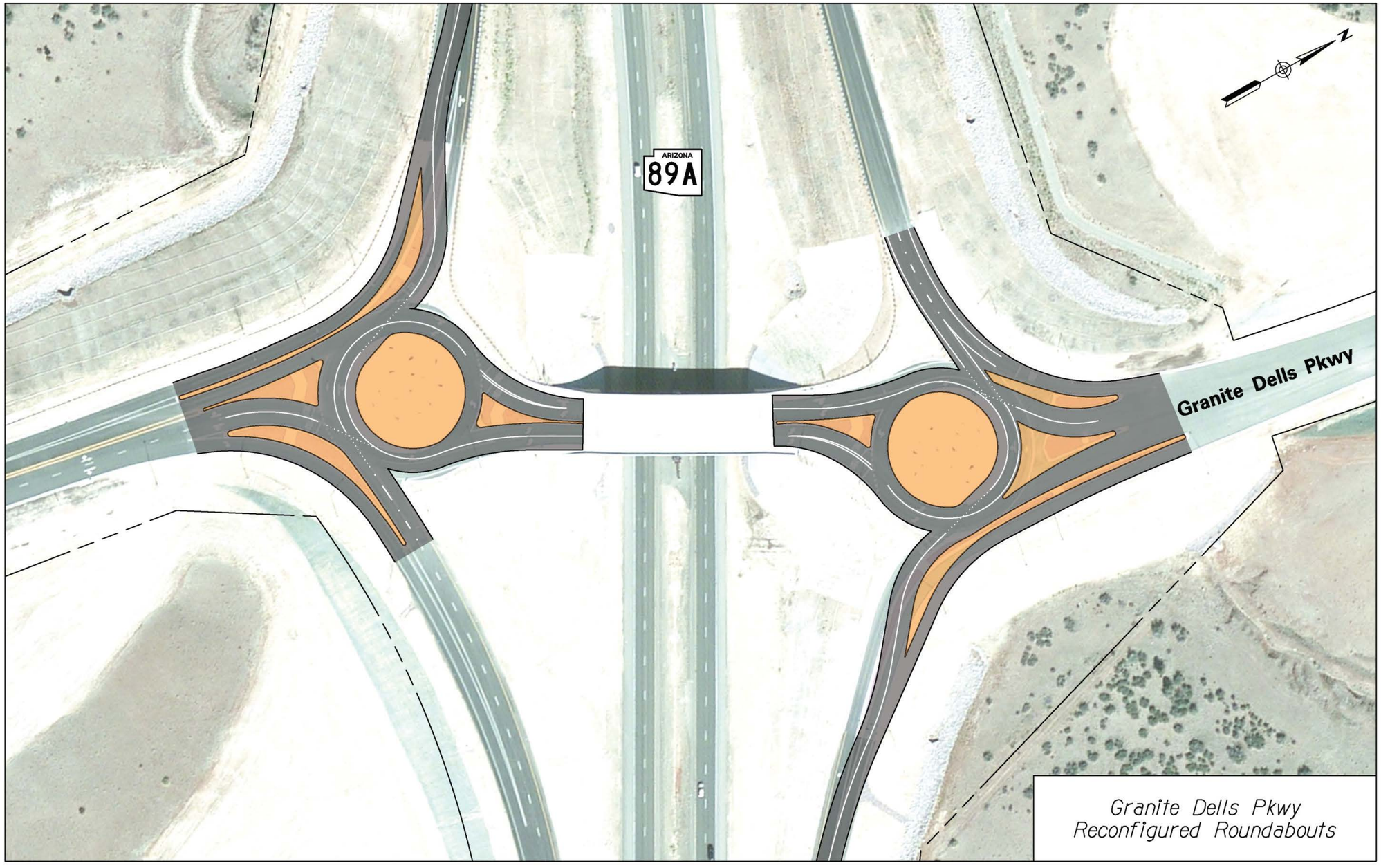


Figure 32: Granite Dells TI Roundabout Minimal Lane Adjustment (Southbound Free Right)

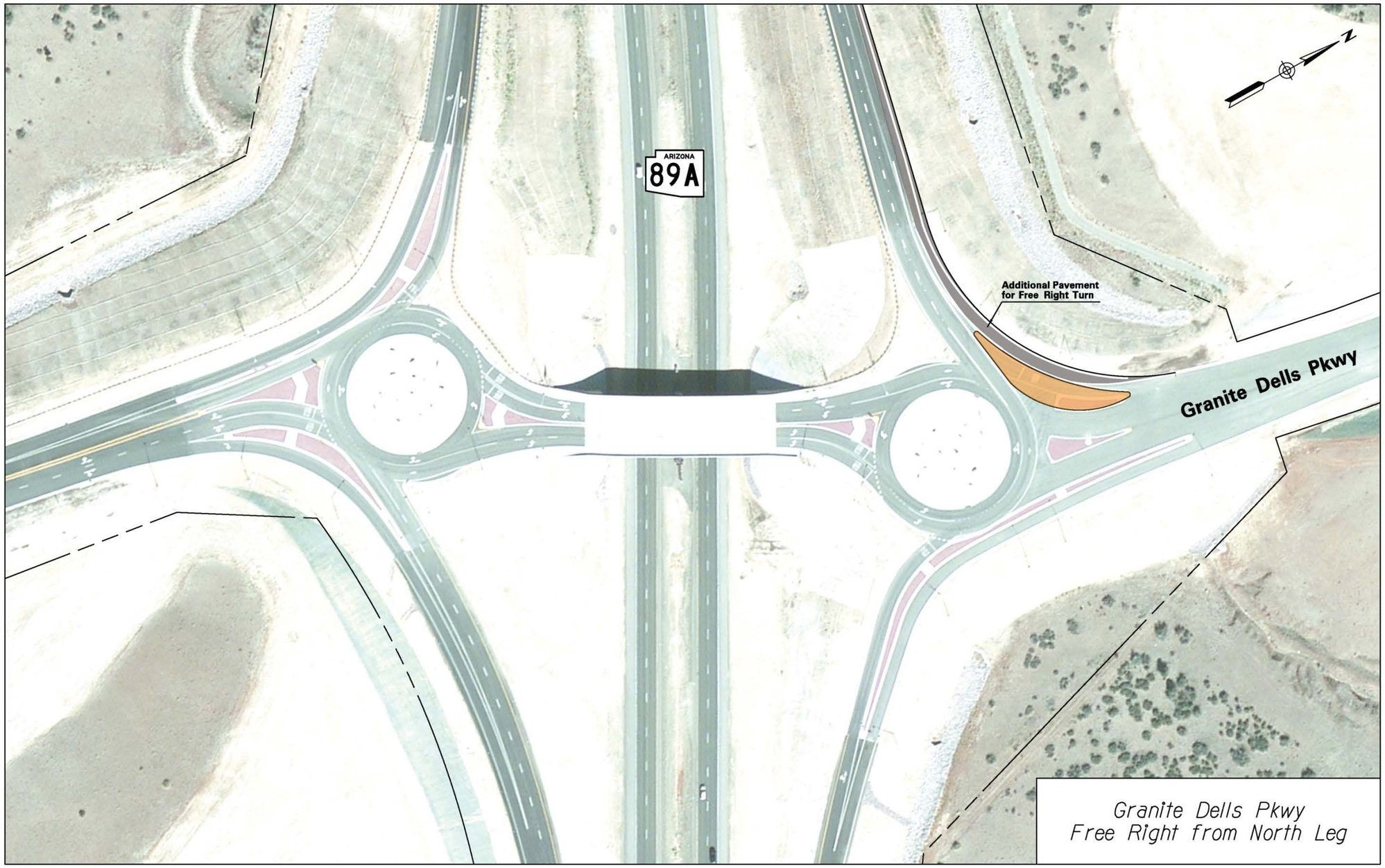
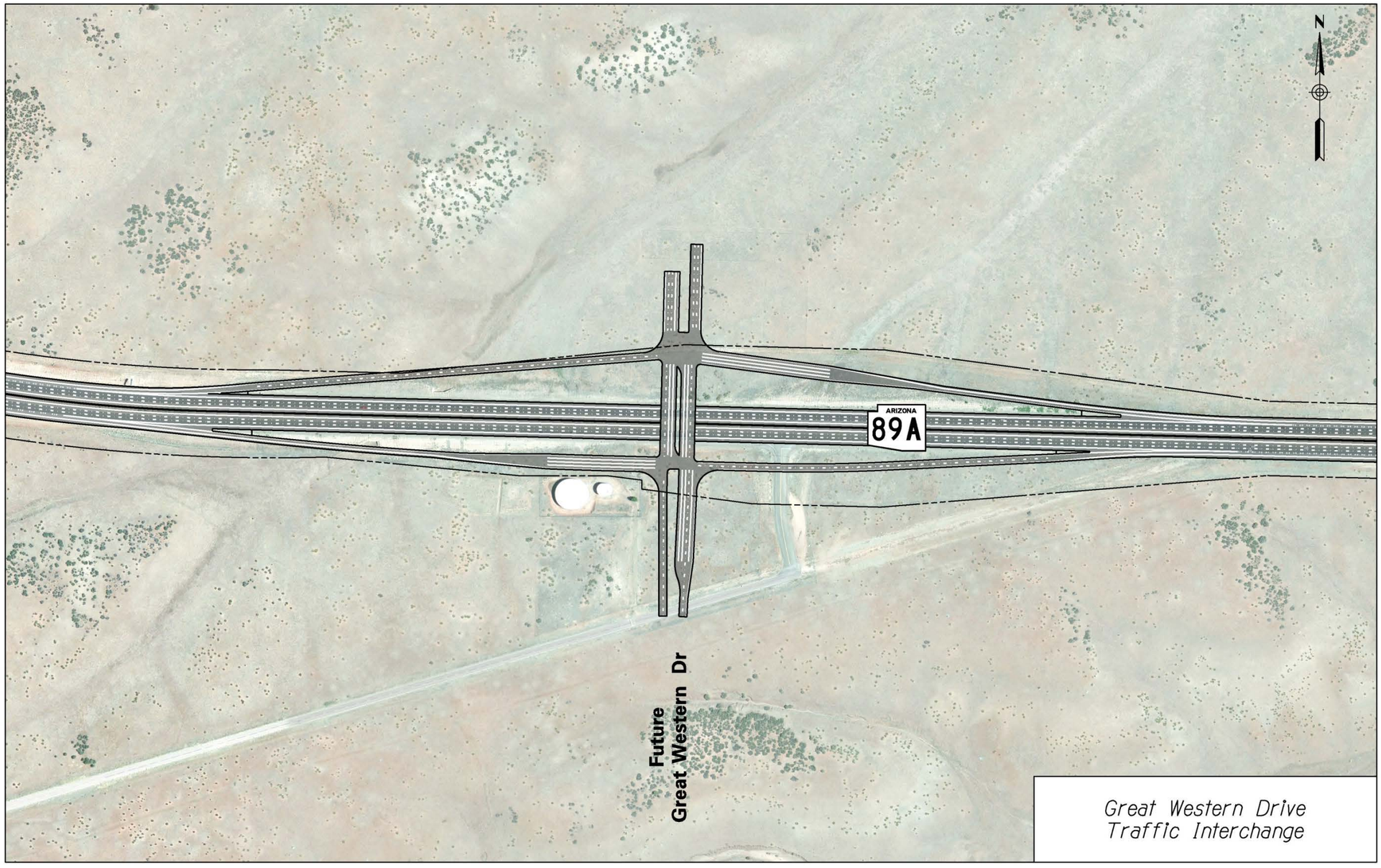


Figure 33: Great Western Drive TI



6.2.6 Glassford Hill Road Traffic Interchange

No-Build Conditions

The existing interchange of Glassford Hill Road and SR 89A is a diamond configuration, with SR 89A mainline passing over Glassford Hill Road. To the south, Glassford Hill Road is a two lane arterial roadway. North of the westbound entrance and exit ramps, the pavement on Glassford Hill Road ends at a locked gate, permitting service access only. Within the interchange, two through lanes and two left-turn lanes exist in the southbound direction. In the northbound direction, two left-turn lanes exist with adequate pavement to accommodate up to two future striped through lanes.

The eastbound exit ramp has a three lane throat, with a single left-turn lane, a through/right middle lane, and a right-turn lane. Glassford Hill Road is currently configured as a divided arterial roadway with two lanes traveling through the interchange and extending south in the southbound direction.

The westbound entrance ramp from Glassford Hill Road to SR 89A currently has a standard parallel entrance with a 700 foot acceleration lane past the striped gore and a 600 foot lane drop taper on the SR 89A mainline.

Design Alternative –Eastbound exit ramp free right-turn lane

This proposed alternative design includes an eastbound free-right turn created with the addition of channelization and a third southbound lane south of the ramp. The left-turn only lane would remain unchanged, while the center lane would be restriped as a through-only lane. **Figure 34** includes a visual example of this proposed improvement.

Design Alternative – Roundabout Interchange

The design alternative proposes double roundabouts to be added to the interchange at the locations of the existing ramp/crossroad intersections. Glassford Hill Road to the south of the interchange woud be increased to three lanes in each direction. Accommodations for a future development of a north leg of Glassford Hill Road would also be provided. The northern roundabout at the westbound entrance and exit ramps would be elliptical in order to enable a double left-turn for both northbound to westbound and westbound to southbound movements. Between the roundabouts, two lanes would be provided in each direction. **Figure 35** includes a visual example of this proposed improvement.

Design Alternative – Diverging diamond interchange (DDI)

The design alternative proposes a DDI at the interchange. A DDI is a unique configuration wherein traffic is temporarily shifted to the opposite side of the road in the crossroad section of the interchange between two intersection traffic signals. This configuration reduces conflict points and enables free left-turn movements to and from the ramps. This proposed design at the Glassford Hill Road interchange requires Glassford Hill Road be widened to three lanes in each direction south of the interchange. Accommodations for a future development of a north leg of Glassford Hill Road would also be provided. Three lanes would be provided in each direction between the ramps and an additional right-turn lane would be added to the eastbound exit ramp. **Figure 36** includes a visual example of this proposed improvement.

Design Alternative – Westbound extended parallel entrance ramp

The proposed design would extend the parallel entrance acceleration lane by approximately 600 feet for a total length of 1,300 feet. The acceleration lane would also extend the length of the lane drop with a 780 foot taper (65:1). **Figure 37** includes a visual example of this proposed improvement.

6.2.7 Viewpoint Drive Traffic Interchange

No-Build Conditions

The existing Viewpoint Drive interchange is a typical diamond configuration. The eastbound exit ramp at Viewpoint Drive has a three lane throat, with one left-turn, one through lane, and one right-turn lane. Between the ramps, there are three lanes in the northbound direction, including two left only lanes and a single through lane. There is adequate pavement width to accommodate an additional through northbound lane, which is currently striped out.

The westbound entrance ramp is a two lane ramp that tapers to one lane approximately 500 feet past the intersection with Viewpoint Drive. The existing pavement width is adequate to accommodate two lanes through the ramp to the SR 89A mainline gore prior to a necessary taper.

Continuing north of the interchange, Viewpoint Drive has one northbound lane separated from southbound traffic by a wide raised center median through to Pronghorn Ranch Parkway.

Design Alternative – Additional northbound lane and eastbound exit ramp dual left-turn

Between the ramps, the striped out pavement would be converted to an additional northbound lane. With this additional lane, the eastbound exit lane configuration can be changed to allow dual left-turns. The ramp lanes would be converted to one left-turn lane, a center left/through lane, and a right-turn lane. North of the interchange, an additional lane will be added along Viewpoint Drive from the interchange to Pronghorn Ranch Parkway. This additional lane will turn into a trap right turn lane at the Pronghorn Ranch Parkway intersection, and Viewpoint Drive will continue as a single northbound lane past the intersection. **Figure 38** includes a visual example of this proposed improvement.

Design Alternative – Westbound entrance ramp extension

The westbound entrance ramp would be restriped to carry two lanes approximately 1,500 feet past the existing taper location. The right lane would drop with a 600 foot taper (50:1) prior to merging with the SR 89A mainline. **Figure 39** includes a visual example of this proposed improvement.

Figure 34: Glassford Hill TI Eastbound Free Right-turn

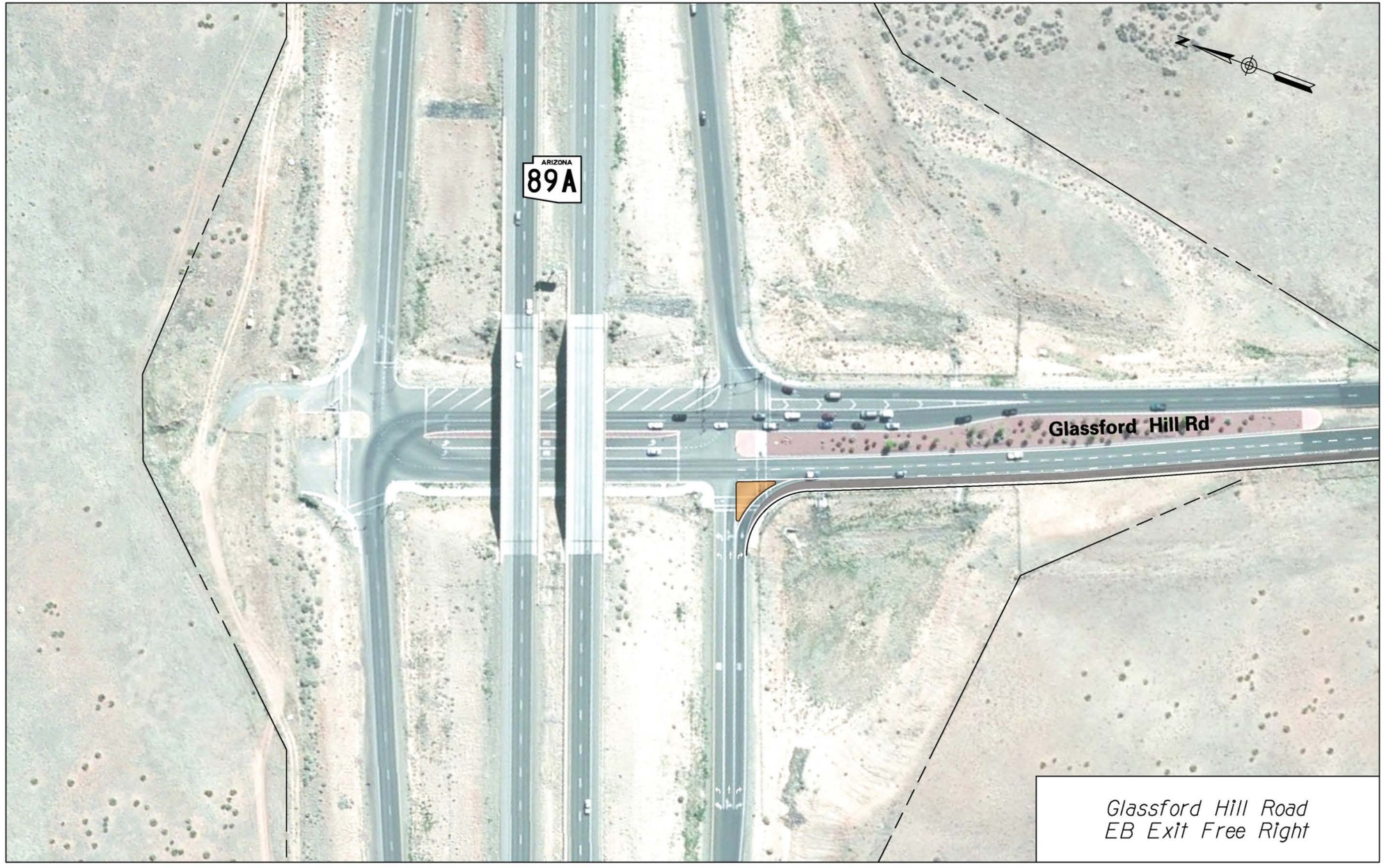


Figure 35: Glassford Hill TI Roundabout

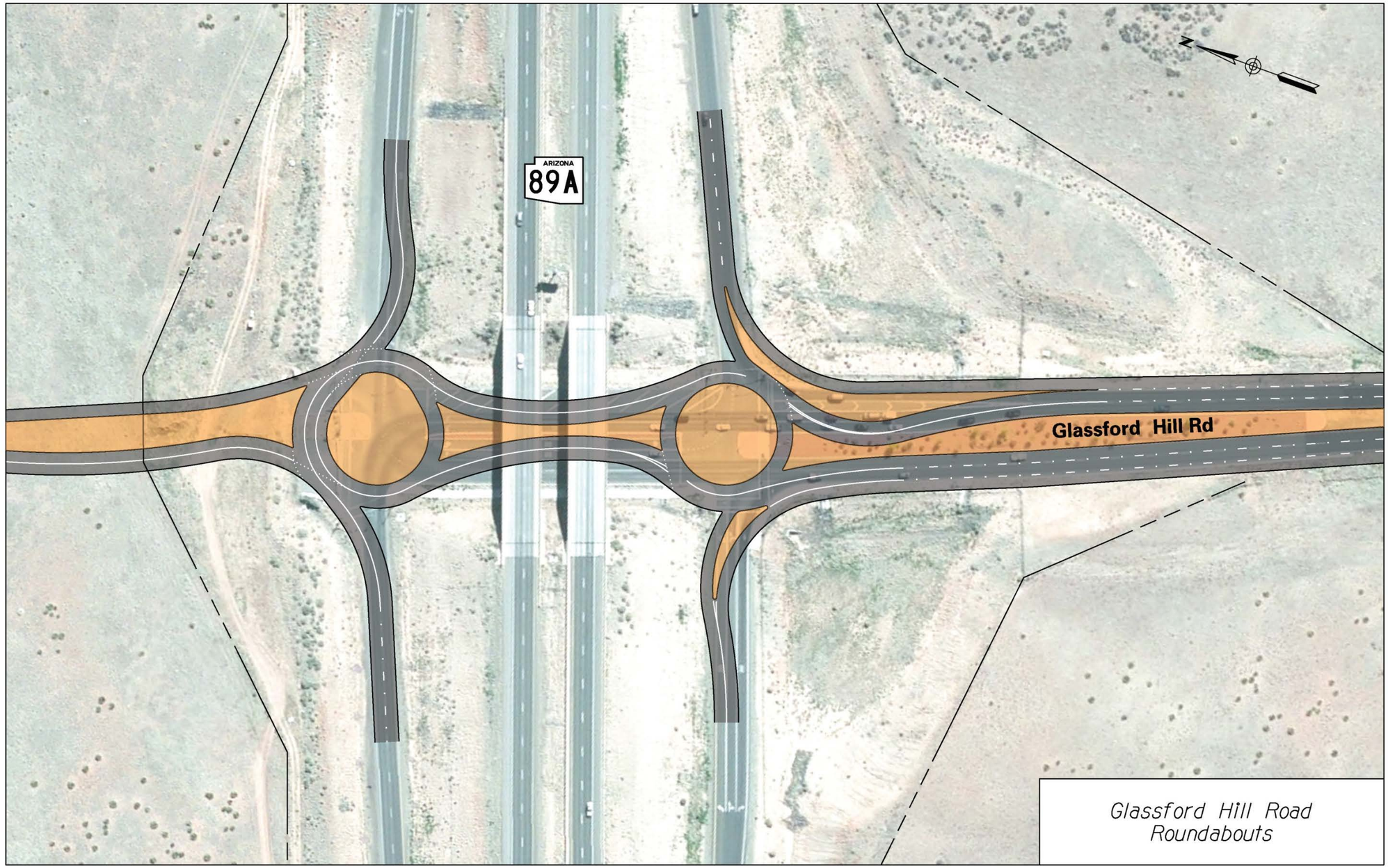


Figure 36: Glassford Hill TI Diverging Diamond Interchange

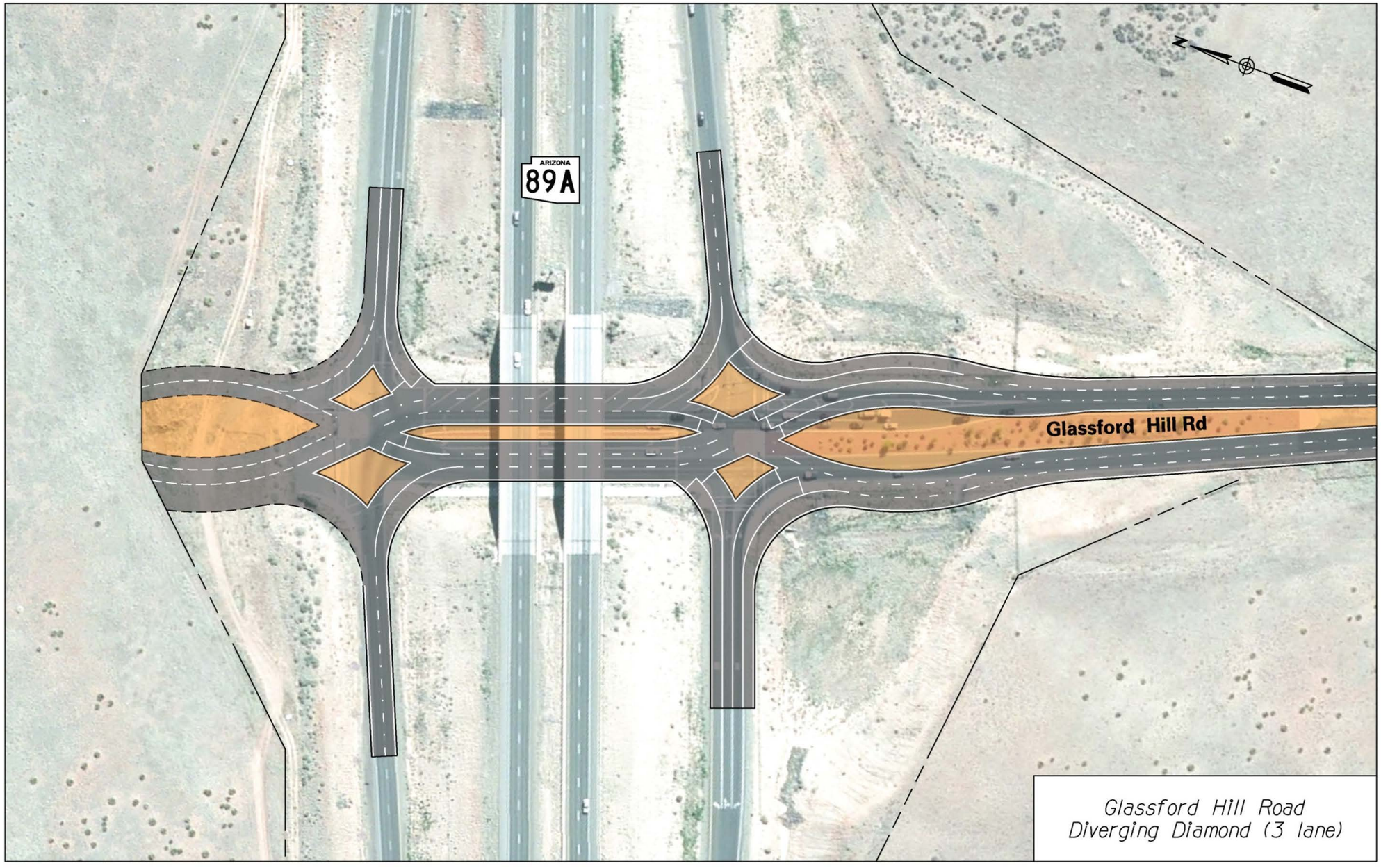


Figure 37: Glassford Hill TI Westbound Extended Parallel Entrance Ramp

Figure 38: Viewpoint Drive TI Additional Northbound Lane and Eastbound Dual Left-Turn

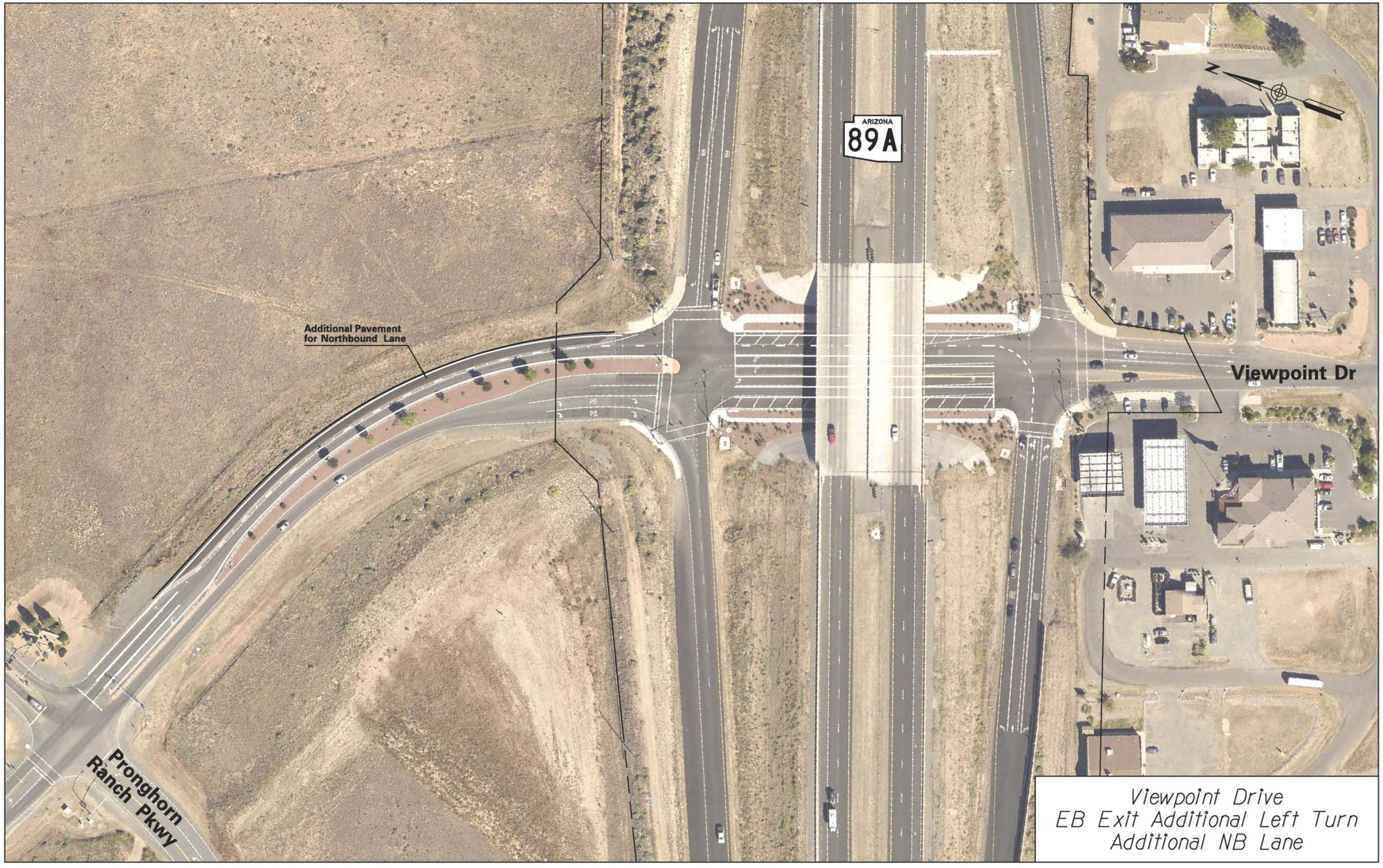


Figure 39: Viewpoint Drive TI Westbound Entrance Ramp Extended Lane

6.2.8 Robert Road/Fain Road Signalized Intersection

No-Build Conditions

Existing Robert Road intersects with SR 89A at an at-grade, signalized intersection. The SR 89A mainline is two lanes in each direction with dedicated left-turn lanes and right-turn lanes existing on the approaches and an open median separating the two directions of traffic. The intersection is designed on an angle with curves on both the north and south legs of Robert Road. South of the intersection, Robert Road includes two northbound lanes on the approach: a left-turn lane and a through/right-turn lane.

Design Alternative – Interim Signalized Intersection Improvements

South of the intersection, Robert Road would be restriped to accommodate an additional left-turn lane. The other two lanes will remain as in their existing configuration with a second left-turn lane and a through/right-turn lane. This proposed design would also include upgrading the signal heads and mast arms to address safety concerns at the intersection. **Figure 40** includes a visual example of this proposed improvement.

Design Alternative –Signalized Intersection Improvements

On the mainline, an additional lane would be added in the westbound direction on the median side, beginning approximately 1,500 feet east of the intersection along Fain Road. South of the intersection, Robert Road would be restriped to accommodate an additional left-turn lane. The other two lanes will remain as in their existing configuration with a second left-turn lane and a through/right-turn lane. This proposed design would also include upgrading the signal heads and mast arms to address safety concerns at the intersection. **Figure 41** includes a visual example of this proposed improvement.

Design Alternative - Roundabout

Proposed design alternative includes a two-lane roundabout which would replace the existing signalized intersection. A right-turn bypass lane will be added to the westbound, southbound and eastbound approaches. The roundabout would be designed to accommodate a third eastbound/westbound through lane if needed. **Figure 42** includes a visual example of this proposed improvement.

Design Alternative – Traffic Interchange

Proposed design alternative includes a grade separated traffic interchange for Robert Road, approximately 2,800 feet east of the existing intersection. The layout would be a diamond interchange with an overpass over the Fain Road mainline. On the overpass, two through lanes and two left-turn lanes would be added in the northbound direction and two through lanes and a single left-turn lane in the southbound direction of travel. On the mainline, exit ramps would be tapered, and entrance ramps would enter parallel into an acceleration lane.

North of the interchange, the cross road would continue north and connect with existing SR 89A. South of the interchange, the cross road would i connect to a proposed extension of Santa Fe Loop from the west. **Figure 43** includes a visual example of this proposed improvement.

Figure 40: Robert Road Signalized Intersection Improvements

Figure 41: Robert Road Signalized Intersection Improvements

Figure 42: Robert Road Roundabout

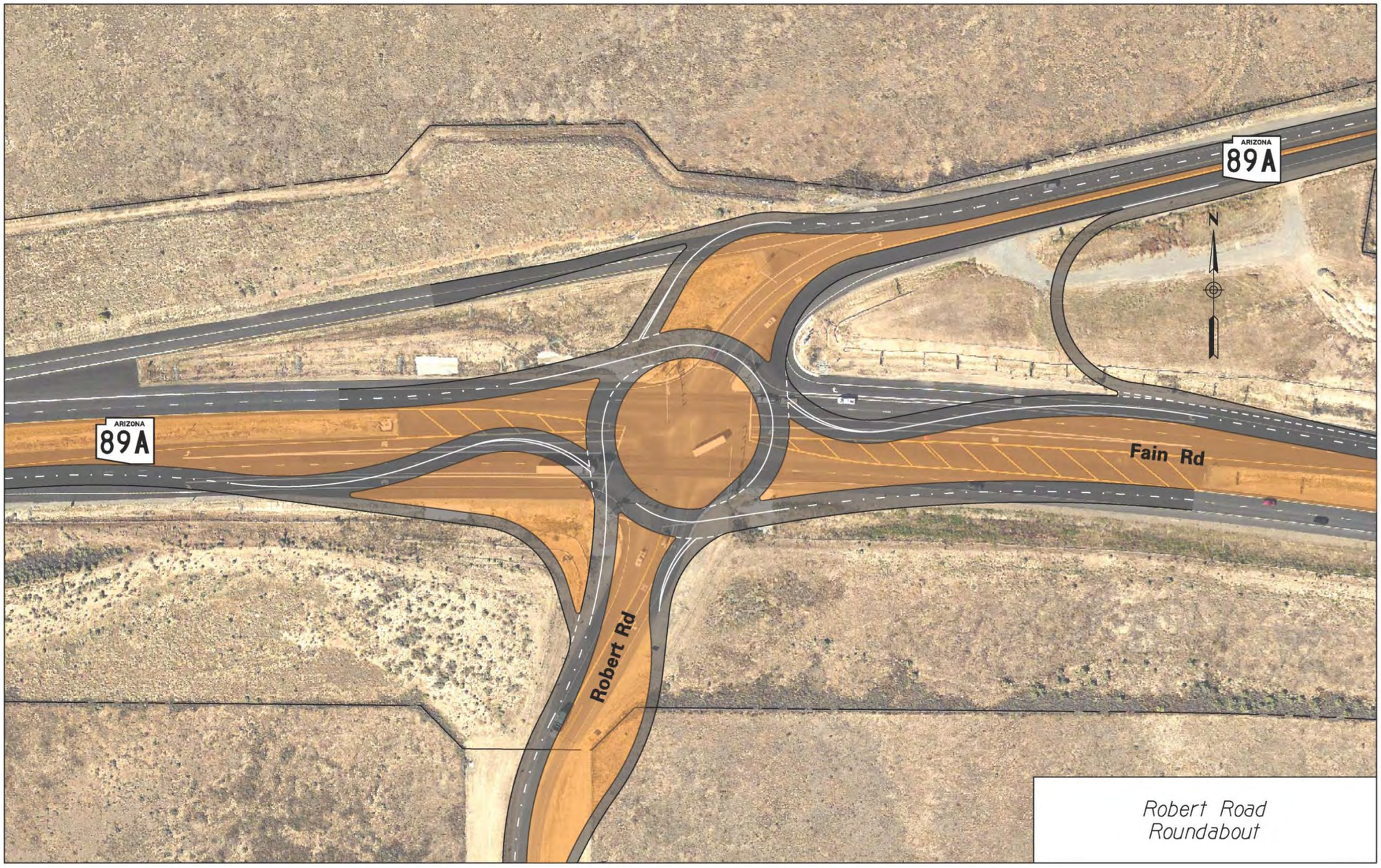


Figure 43: Robert Road Traffic Interchange

6.3 Alternatives Analysis and Recommendations

Three sets of alternatives were evaluated within the study area to determine a recommended ultimate 2040 proposed improvement at each respective traffic interchange location where multiple proposed improvements were discussed. The three locations include the Granite Dells Parkway TI, the Glassford Hill TI, and the Robert Road Intersection. The SR 89A intersection locations and their respective alternatives include the following:

Granite Dells Parkway Traffic Interchange
Alternative 1 – No Build Alternative
Alternative 2 – Roundabout Modifications
Alternative 3 – Great Western Drive TI & with No-Build
Alternative 4 – Great Western Drive TI & Minimal Roundabout Modifications

Glassford Hill Road Traffic Interchange
Alternative 1 – No Build Alternative
Alternative 2– Signal Optimization & Minimal lane adjustment (southbound free right)
Alternative 3 – Diverging Diamond Interchange
Alternative 4 –Roundabout Interchange
Alternative 5 – Great Western Drive TI & Signal Modifications (Alt 2)
Alternative 6 – Great Western Drive TI & Roundabout Interchange (Alt 4)

Robert Road Intersection
Alternative 1 – No Build Alternative
Alternative 2 – Intersection Signal Improvements
Alternative 3 – Two-Lane Roundabout
Alternative 4 – Three-Lane Roundabout
Alternative 5 – Traffic Interchange

For each location the No-Build Alternative includes the existing SR 89A corridor, interchanges, and intersections and any planned improvements that currently have secured construction funding through either state, regional, county, or local funding mechanism.

Traffic operational analyses were conducted for each Alternative following the methodologies described in Section 3.3.5. Rodel traffic software was utilized in the analysis of all roundabouts. Year 2040 build traffic projections were developed based upon the 2040 no-build volumes and manually adjusted to account for redistribution where new access points to the corridor are present in each alternative. A predictive safety detailed analysis was conducted for each alternative; a memorandum describing this analysis is included in **Appendix 4**.

The alternatives analysis includes evaluation of each of the alternatives using the evaluation criteria and weighting factors as described in Section 6.1. The evaluation criteria were utilized for each alternative at all three locations. The alternative receiving the highest score at each respective location is identified as the preferred 2040 alternative. The alternative analysis matrices for the Granite Dells Parkway TI, Glassford Hill Road TI, and Robert Road intersection locations are shown in **Table 37**, **Table 38**, and **Table 39,** respectively.

6.3.1 Alternative Analysis Results

Based upon the analysis as described in the following tables, the preferred 2040 Alternative at Granite Dells Parkway is to keep the existing roundabout with minimal lane configuration adjustments as well as implement the Great Western Drive TI. The preferred 2040 Alternative at Glassford Hill Road TI is to also implement the Great Western Drive TI west of Glassford Hill Road as well as convert the existing signalized intersections into roundabouts. The preferred 2040 Alternative at the Robert Road intersection is to implement the Robert Road Traffic Interchange, configured east of the existing Robert Road intersection. It was determined that the roundabout alternative at Robert Road was not recommended for implementation due to the character of the corridor and the ultimate vision of an access controlled facility. However, it is noted that if future safety issues arise prior to the installation of the traffic interchange, a roundabout may be considered.

Table 37: Granite Dells Parkway TI Alternative Matrix

EVALUATION CRITERIA		NO-BUILD	ROUNDABOUT MODIFICATIONS	GREAT WESTERN DR TI W/ NO-BUILD	GREAT WESTERN DR TI W/ MINIMAL ROUNDABOUT MODIFICATION
Safety	Conflict Points	• 12 vehicular conflicts • 8 pedestrian conflicts *Raw Score: 5* *Weighted Score: 10*	• 12 vehicular conflicts • 8 pedestrian conflicts *Raw Score: 5* *Weighted Score: 10*	• 12 vehicular conflicts • 8 pedestrian conflicts *Raw Score: 5* *Weighted Score: 10*	• 12 vehicular conflicts • 8 pedestrian conflicts *Raw Score: 5* *Weighted Score: 10*
	Predictive Safety Analysis	• No crashes at location *Raw Score: 4* *Weighted Score: 8*	• Qualitative: Increasing through lane, adding reverse curvature to entrance *Raw Score: 4* *Weighted Score: 8*	• New conflict points introduced *Raw Score: 3* *Weighted Score: 6*	• New conflict points introduced *Raw Score: 3* *Weighted Score: 6*
Mobility/ Constructability	Level of Service	• 2040 Intersection – AM LOS F, PM LOS D *Raw Score: 1* *Weighted Score: 4*	• 2040 Intersection – AM LOS A, PM LOS C (Appr) Raw Score: 3 *Weighted Score: 12*	• 2040 Intersection – AM LOS C (Appr), PM LOS A Raw Score: 3 *Weighted Score: 12*	• 2040 Intersection – AM LOS A , PM LOS A *Raw Score: 5* *Weighted Score: 20*
	Constructability/Maintenance of Traffic	• No Issues *Raw Score: 5* *Weighted Score: 5*	• New lane addition *Raw Score: 4* *Weighted Score: 4*	• Traffic Control Complex *Raw Score: 3* *Weighted Score: 3*	• Traffic Control Complex *Raw Score: 3* *Weighted Score: 3*
Regional Acceptance & Impacts	Consistency With Plans	• N/A *Raw Score: 3* *Weighted Score: 6*	• Not include in plans *Raw Score: 3* *Weighted Score: 6*	• Included in multiple plans *Raw Score: 5* *Weighted Score: 10*	• Included in multiple plans *Raw Score: 5* *Weighted Score: 10*
	Agency & Public Acceptance	Raw Score: 0 Weighted Score: 0	Raw Score: 2 Weighted Score: 6	Raw Score: 4 Weighted Score: 12	Raw Score: 5 Weighted Score: 15
	ROW Acquisition Displacements	• None *Raw Score: 3* *Weighted Score: 3*	• None *Raw Score: 3* *Weighted Score: 3*	• None *Raw Score: 3* *Weighted Score: 3*	• None *Raw Score: 3* *Weighted Score: 3*
	Protected Populations	• None *Raw Score: 3* *Weighted Score: 3*	• None *Raw Score: 3* *Weighted Score: 3*	• None *Raw Score: 3* *Weighted Score: 3*	• None *Raw Score: 3* *Weighted Score: 3*
Utility Impacts		• None *Raw Score: 3* *Weighted Score: 3*	• No anticipated impacts *Raw Score: 3* *Weighted Score: 3*	• No anticipated impacts *Raw Score: 3* *Weighted Score: 3*	• No anticipated impacts *Raw Score: 3* *Weighted Score: 3*
Project Costs Construction	Construction	• None *Raw Score: 3* *Weighted Score: 9*	• Lane modifications • $600k *Raw Score: 2* *Weighted Score: 6*	• TI construction • $20 million *Raw Score: 1* *Weighted Score: 3*	• TI construction • Lane Modifications • $20.3 million *Raw Score: 1* *Weighted Score: 3*
	Operations & Maintenance	• Lighting maintenance *Raw Score: 4* *Weighted Score: 4*	• Lighting maintenance *Raw Score: 4* *Weighted Score: 4*	• Lighting maintenance • TI maintenance *Raw Score: 2* *Weighted Score: 2*	• Lighting maintenance • TI maintenance *Raw Score: 2* *Weighted Score: 2*
	Right-of-Way (acres)	• None *Raw Score: 3* *Weighted Score: 3*	• None *Raw Score: 3* *Weighted Score: 3*	• 2 acres *Raw Score: 2* *Weighted Score: 2*	• 2 acres *Raw Score: 2* *Weighted Score: 2*
Criteria Rating 1 – Strong Disadvantage; 2 – Some Disadvantage; 3 – Neutral; 4 – Some Advantage; 5 – Strong Advantage		*Total Weighted Score: 58*	*Total Weighted Score: 68*	*Total Weighted Score: 69*	*Total Weighted Score: 80*

Table 38: Glassford Hill Road TI Alternative Matrix

EVALUATION CRITERIA		NO-BUILD	SIGNAL OPTIMIZATION W/ FREE RIGHT	DIVERGING DIAMOND INTERCHANGE	ROUNDABOUT INTERCHANGE	GREAT WESTERN DR TI W/ SIGNAL OPT	GREAT WESTERN DR TI WROUNDABOUT INTERCHANGE
Safety	Conflict Points	• 26 vehicular conflicts • 20 pedestrian conflicts *Raw Score: 2* Weighted Score: 4	• 26 vehicular conflicts • 20 pedestrian conflicts *Raw Score: 2* Weighted Score: 4	• 14 vehicular conflicts • 12 pedestrian conflicts *Raw Score: 4* Weighted Score: 8	• 12 vehicular conflicts • 8 pedestrian conflicts *Raw Score: 5* Weighted Score: 10	• 26 vehicular conflicts • 20 pedestrian conflicts *Raw Score: 2* Weighted Score: 4	• 12 vehicular conflicts • 8 pedestrian conflicts *Raw Score: 5* Weighted Score: 10
	Predictive Safety Analysis	• none *Raw Score: 2* Weighted Score: 4	• 0.2 total crash reduction • 0.1 injury crash reduction *Raw Score: 3* Weighted Score: 6	• 1.9 total crash reduction • 0.5 injury crash reduction *Raw Score: 5* Weighted Score: 10	• 1.1 total crash reduction • 0.9 injury crash reduction *Raw Score: 5* Weighted Score: 10	• New conflict points introduced *Raw Score: 2* Weighted Score: 4	• New conflict points introduced *Raw Score: 3* Weighted Score: 6
Mobility/ Constructability	Level of Service	• 2040 Intersection – AM LOS F, PM LOS F *Raw Score: 1* Weighted Score: 4	• 2040 Intersection – AM LOS F, PM LOS D (Appr.) *Raw Score: 2* Weighted Score: 8	• 2040 Intersection – AM LOS F, PM LOS B *Raw Score: 3* Weighted Score: 12	• 2040 Intersection – AM LOS F, PM LOS D (appr) *Raw Score: 2* Weighted Score: 8	• 2040 Intersection – AM LOS F, PM LOS C *Raw Score: 2* Weighted Score: 8	• 2040 Intersection – AM LOS A, PM LOS A *Raw Score: 5* Weighted Score: 20
	Constructability/ Maintenance of Traffic	• No Issues *Raw Score: 5* Weighted Score: 5	• Minimal Impacts to Traffic *Raw Score: 4* Weighted Score: 4	• Unfamiliar Traffic Control *Raw Score: 1* Weighted Score: 1	• Complex Traffic Control *Raw Score: 2* Weighted Score: 2	• Additional Traffic Control *Raw Score: 3* Weighted Score: 3	• Complex Traffic Control *Raw Score: 2* Weighted Score: 2
Regional Acceptance & Impacts	Consistency With Plans	• N/A *Raw Score: 3* Weighted Score: 6	• Not include in plans *Raw Score: 3* Weighted Score: 6	• Not included in plans or implemented in district *Raw Score: 2* Weighted Score: 4	• Not include in plans *Raw Score: 3* Weighted Score: 6	• Included in multiple plans *Raw Score: 5* Weighted Score: 10	• Included in multiple plans *Raw Score: 4* Weighted Score: 8
	Agency & Public Acceptance	Raw Score: 0 Weighted Score: 0	Raw Score: 3 Weighted Score: 9	Raw Score: 0 Weighted Score: 0	Raw Score: 3 Weighted Score: 9	Raw Score: 5 Weighted Score: 15	Raw Score: 4 Weighted Score: 12
	ROW Acquisition Displacements	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3
	Protected Populations	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3
Utility Impacts		• None *Raw Score: 3* Weighted Score: 3	• No anticipated impacts *Raw Score: 3* Weighted Score: 3	• Potential impacts *Raw Score: 2* Weighted Score: 2	• Potential impacts *Raw Score: 2* Weighted Score: 2	• No anticipated impacts *Raw Score: 3* Weighted Score: 3	• Potential impacts *Raw Score: 2* Weighted Score: 2
Project Costs Construction	Construction	• None *Raw Score: 3* Weighted Score: 9	• Signal modification, Additional turn lane • $300k *Raw Score: 3* Weighted Score: 9	• DDI construction • $3.3 million *Raw Score: 2* Weighted Score: 6	• Roundabout construction • $5.6 million *Raw Score: 2* Weighted Score: 6	• TI construction, signal modification • $20.3 million *Raw Score: 1* Weighted Score: 3	• TI construction, roundabout construction • $25.6 million *Raw Score: 1* Weighted Score: 3
	Operations & Maintenance	• Signal maintenance *Raw Score: 3* Weighted Score: 3	• Signal maintenance *Raw Score: 3* Weighted Score: 3	• Signal maintenance *Raw Score: 3* Weighted Score: 3	• Roundabout lighting *Raw Score: 4* Weighted Score: 4	• Signal maintenance • TI maintenance *Raw Score: 1* Weighted Score: 1	• Roundabout lighting • TI maintenance *Raw Score: 2* Weighted Score: 2
	Right-of-Way (acres)	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• 2 acres *Raw Score: 2* Weighted Score: 2	• 2 acres *Raw Score: 2* Weighted Score: 2
Criteria Rating 1 – Strong Disadvantage; 2 – Some Disadvantage; 3 - Neutral 4 – Some Advantage; 5 – Strong Advantage		*Total Weighted Score: 47*	*Total Weighted Score: 61*	*Total Weighted Score: 55*	*Total Weighted Score: 66*	*Total Weighted Score: 59*	*Total Weighted Score: 73*

Table 39: Robert Road Intersection Alternative Matrix

EVALUATION CRITERIA		NO-BUILD	INTERSECTION SIGNAL IMPROVEMENTS	2-LANE ROUNDABOUT	3-LANE ROUNDABOUT	TRAFFIC INTERCHANGE
Safety	Conflict Points	• 32 vehicular conflicts • 16 pedestrian conflicts *Raw Score: 2* Weighted Score: 4	• 32 vehicular conflicts • 16 pedestrian conflicts *Raw Score: 2* Weighted Score: 4	• 8 vehicular conflicts • 8 pedestrian conflicts *Raw Score: 5* Weighted Score: 10	• 8 vehicular conflicts • 8 pedestrian conflicts *Raw Score: 5* Weighted Score: 10	• 26 vehicular conflicts • 20 pedestrian conflicts *Raw Score: 3* Weighted Score: 6
	Predictive Safety Analysis	• none *Raw Score: 1* Weighted Score: 2	• 0.6 total crash reduction *Raw Score: 2* Weighted Score: 4	• 0.8 total crash reduction • 1.7 injury crash reduction *Raw Score: 5* Weighted Score: 10	• 0.8 total crash reduction* • 1.7 injury crash reduction *Raw Score: 4* Weighted Score: 8	• 1.2 total crash reduction • 0.7 injury crash reduction *Raw Score: 4* Weighted Score: 8
Mobility/ Constructability	Level of Service	• 2040 Intersection – AM LOS F, PM LOS E *Raw Score: 1* Weighted Score: 4	• 2040 Intersection – AM LOS D (Appr), PM LOS F *Raw Score: 2* Weighted Score: 8	• 2040 Intersection – AM LOS F, PM LOS F *Raw Score: 1* Weighted Score: 4	• 2040 Intersection – AM LOS B, PM LOS D (Appr) *Raw Score: 3* Weighted Score: 12	• 2040 Intersection – AM LOS C (Appr), PM LOS C *Raw Score: 4* Weighted Score: 16
	Constructability/Maintenance of Traffic	• No Issues *Raw Score: 5* Weighted Score: 5	• Minimal Impacts to Traffic *Raw Score: 4* Weighted Score: 4	• Traffic Control more complex *Raw Score: 2* Weighted Score: 2	• Traffic Control more complex *Raw Score: 2* Weighted Score: 2	• Traffic Control Complex *Raw Score: 3* Weighted Score: 3
Regional Acceptance & Impacts	Consistency With Plans	• N/A *Raw Score: 3* Weighted Score: 6	• Partially included in plan *Raw Score: 4* Weighted Score: 8	• Not include in plans *Raw Score: 3* Weighted Score: 6	• Not include in plans *Raw Score: 3* Weighted Score: 6	• Included in multiple plans *Raw Score: 5* Weighted Score: 10
	Agency & Public Acceptance	Raw Score: 0 Weighted Score: 0	Raw Score: 4 Weighted Score: 12	Raw Score: 2 Weighted Score: 6	Raw Score: 1 Weighted Score: 3	Raw Score: 5 Weighted Score: 15
	ROW Acquisition Displacements	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3
	Protected Populations	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3
Utility Impacts		• None *Raw Score: 3* Weighted Score: 3	• No anticipated impacts *Raw Score: 3* Weighted Score: 3	• No anticipated impacts *Raw Score: 3* Weighted Score: 3	• No anticipated impacts *Raw Score: 3* Weighted Score: 3	• Potential impacts (overhead powerline) *Raw Score: 2* Weighted Score: 2
Project Costs Construction	Construction	• None *Raw Score: 3* Weighted Score: 9	• Signal modification, Additional turn lane • $2.97 million *Raw Score: 2* Weighted Score: 6	• Roundabout construction • $4.5 million *Raw Score: 2* Weighted Score: 6	• Roundabout construction • $5.4 million *Raw Score: 2* Weighted Score: 6	• TI construction • $30.4 million *Raw Score: 1* Weighted Score: 3
	Operations & Maintenance	• Signal maintenance *Raw Score: 3* Weighted Score: 3	• Signal maintenance *Raw Score: 3* Weighted Score: 3	• Roundabout lighting *Raw Score: 4* Weighted Score: 4	• Roundabout lighting *Raw Score: 4* Weighted Score: 4	• Multiple signal maintenance *Raw Score: 2* Weighted Score: 2
	Right-of-Way (acres)	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• None *Raw Score: 3* Weighted Score: 3	• 14 acres *Raw Score: 1* Weighted Score: 1
Criteria Rating 1 – Strong Disadvantage 2 – Some Disadvantage 3 - Neutral 4 – Some Advantage 5 – Strong Advantage		*Total Weighted Score: 45*	*Total Weighted Score: 61*	*Total Weighted Score: 60*	*Total Weighted Score: 63*	*Total Weighted Score: 72*

* No crash modification factor available specifically for a 3-lane roundabout (more crashes are expected to occur as compared to a two-lane roundabout)

6.4 Recommendations

Based on the results of the Alternative Evaluation, safety needs, and no-build operational analysis, a list of 2040 Build Recommendations was developed.

6.4.1 2040 Build Recommendations

The 2040 Build Recommendations that are recommended for implementation include the following:

SR 89A Mainline

- Additional general purpose lane

SR 89 TI

- Additional eastbound left-turn lane
- Eastbound entrance ramp reconfiguration (two lane entrance ramp)

Granite Dells Parkway TI

- Minimal roundabout modifications

Great Western Drive

- Traffic Interchange

Glassford Hill Road TI

- Westbound extended parallel entrance ramp
- Roundabout Interchange

Viewpoint Drive TI

- Westbound entrance ramp extension
- Additional northbound lane and eastbound exit ramp dual left-turn

Robert Road Intersection

- Traffic Interchange

Intersection lane configuration, mainline volumes, and intersection volumes for the 2040 Build Recommendations are displayed in **Figure 44**, **Figure 45**, and **Figure 46**, respectively.

6.4.2 2040 Build Recommended Alternative Operational Analysis Results

SR 89A Mainline and Ramp Results

Figure 47 and **Figure 48** summarize the level-of-service analysis results for the 2040 Recommended Build Alternative during both the AM and PM peak hours, respectively, on the SR 89A mainline.

In the AM peak Hour, SR 89A operates at LOS ‘C’ or better in both the eastbound and westbound directions of travel. The following ramp operates with a LOS ‘E’ or worse:

- SR 89 westbound off-ramp

In the PM peak Hour, SR 89A operates at LOS ‘D’ or better in the eastbound direction of travel for all segments with the exception of the segment between Glassford Hill entrance ramp to the Viewpoint Drive exit ramp which operates at a LOS ‘E’. The westbound direction of travel operates at a LOS ‘E or F’ from the Granite Dells Parkway entrance ramp until the SR 89 exit ramp. All other segments operate at a LOS ‘C’ or better.

The following ramps operate with a LOS ‘E’ or worse:

- SR 89 westbound off-ramp
- Viewpoint Drive eastbound off-ramp

Intersection Results

Figure 49 includes the operational results for the 2040 Recommended Build Alternative. In the AM peak hour, the following intersections are anticipated to operate at a LOS ‘E or F’:

- SR 89A/SR 89 TI

In the PM peak hour, the following intersections are anticipated to degrade and operate at a LOS ‘E or F’:

- SR 89A/SR 89 TI

In the PM peak hour, the following intersections are anticipated to operate at a LOS ‘E or F’ on at least one approach but operate at a LOS ‘D’ or better as a total intersection:

- SR 89A/Viewpoint Road

Figure 44: 2040 Build Recommended Roadway Features

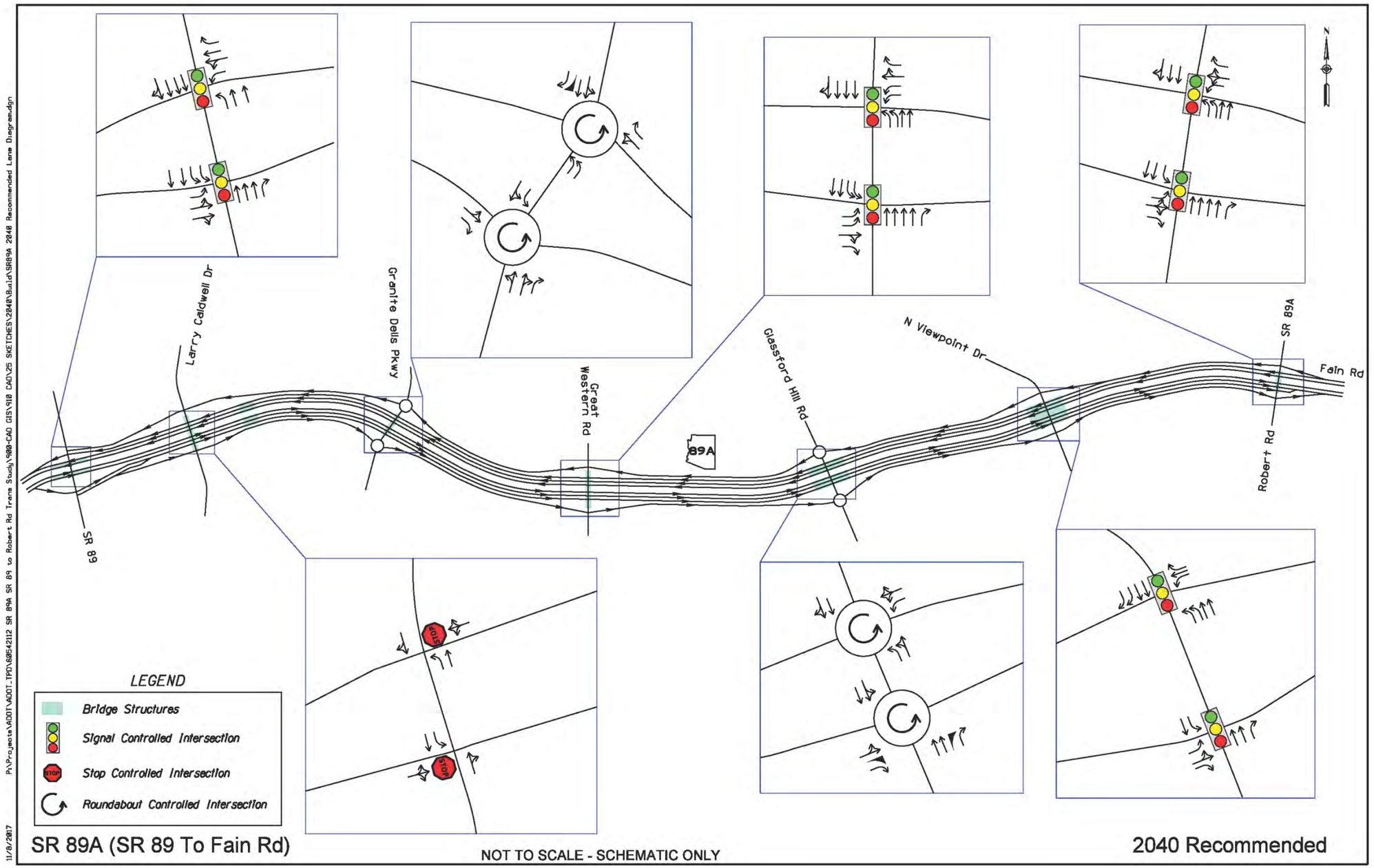


Figure 45: 2040 Build Recommended SR 89A Mainline Lane Configuration and Volumes

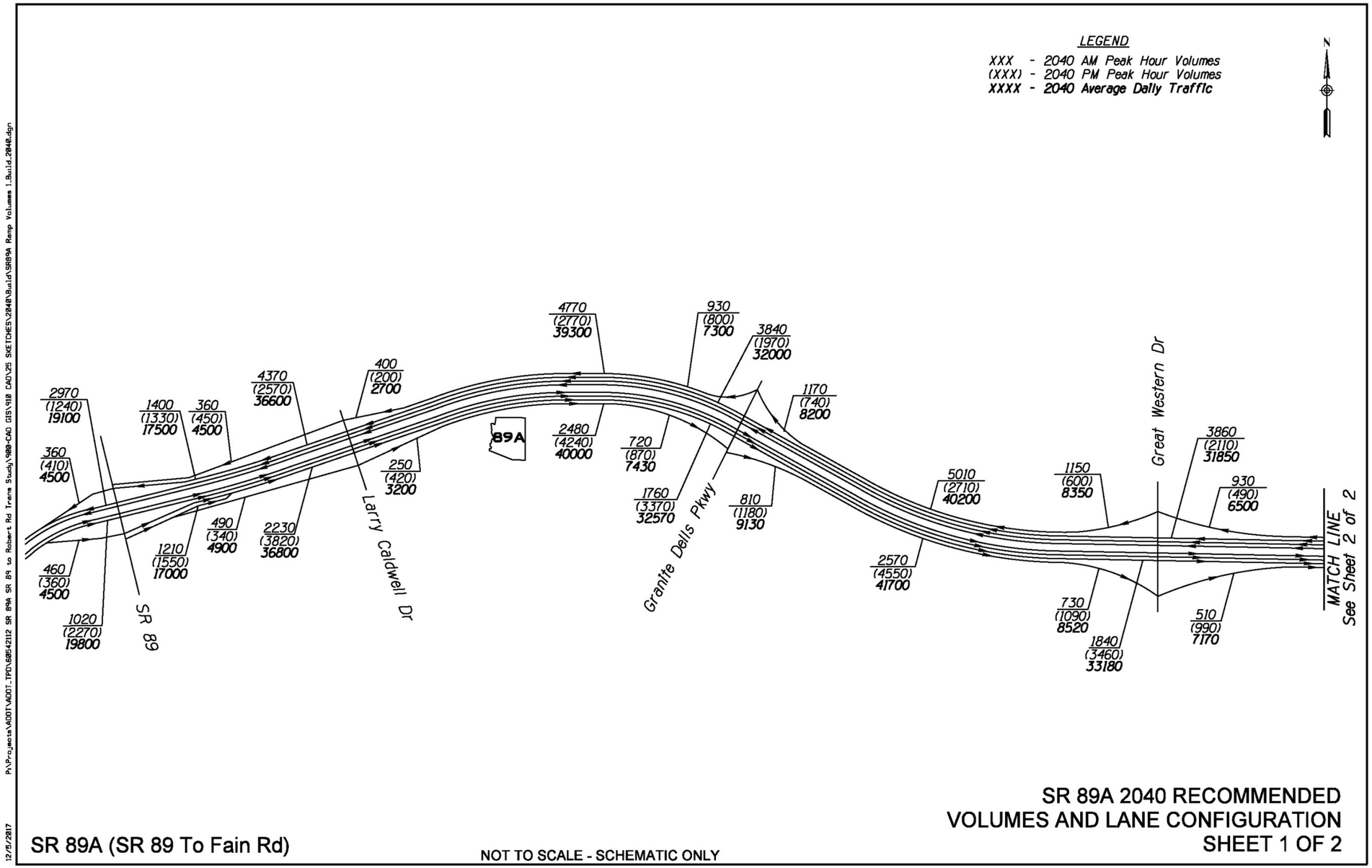


Figure 45 (cont'd): **2040 Build Recommended SR 89A Mainline Lane Configuration and Volumes**

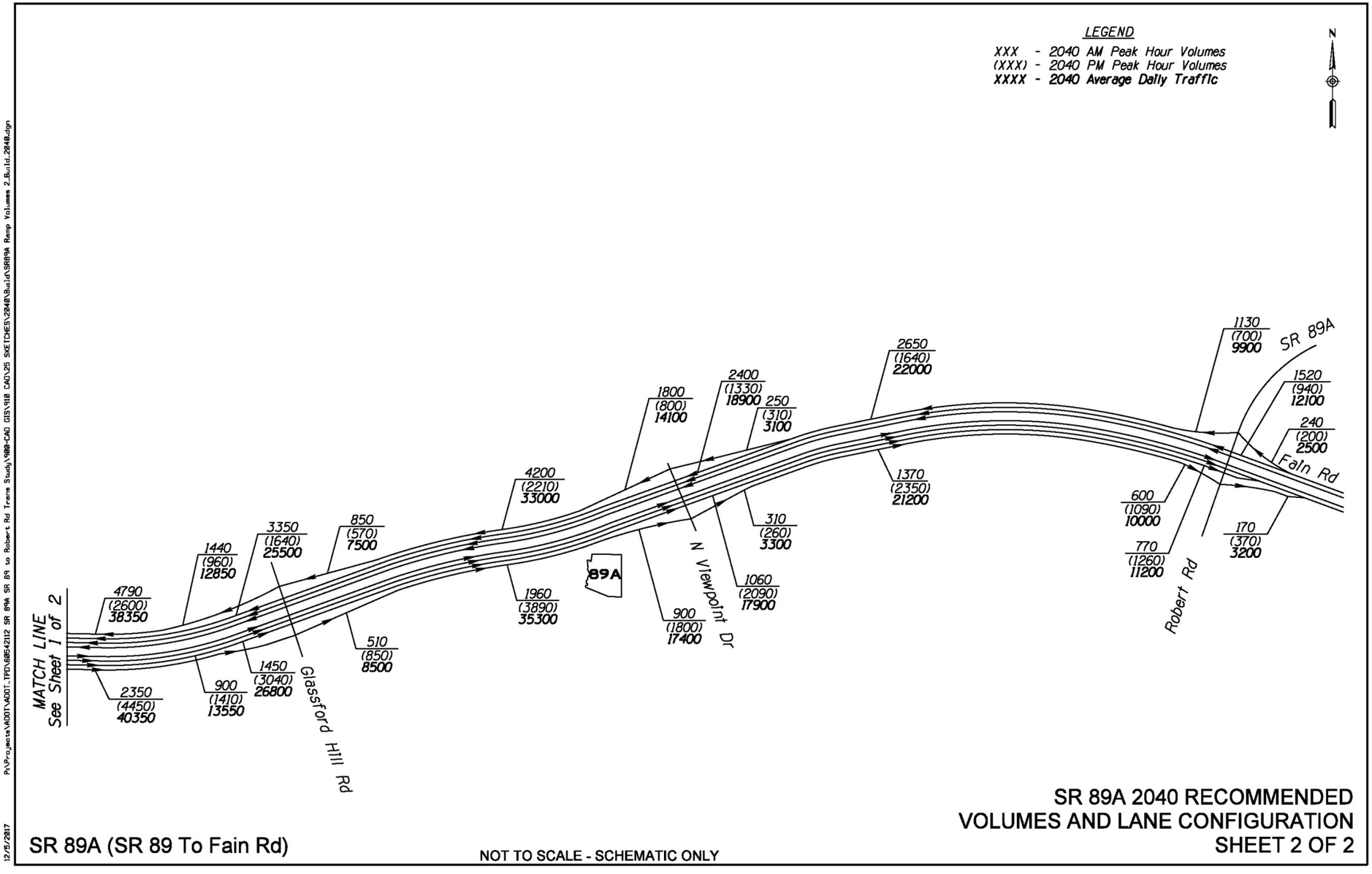


Figure 46: 2040 Build Recommended Intersection Turning Movement Volumes

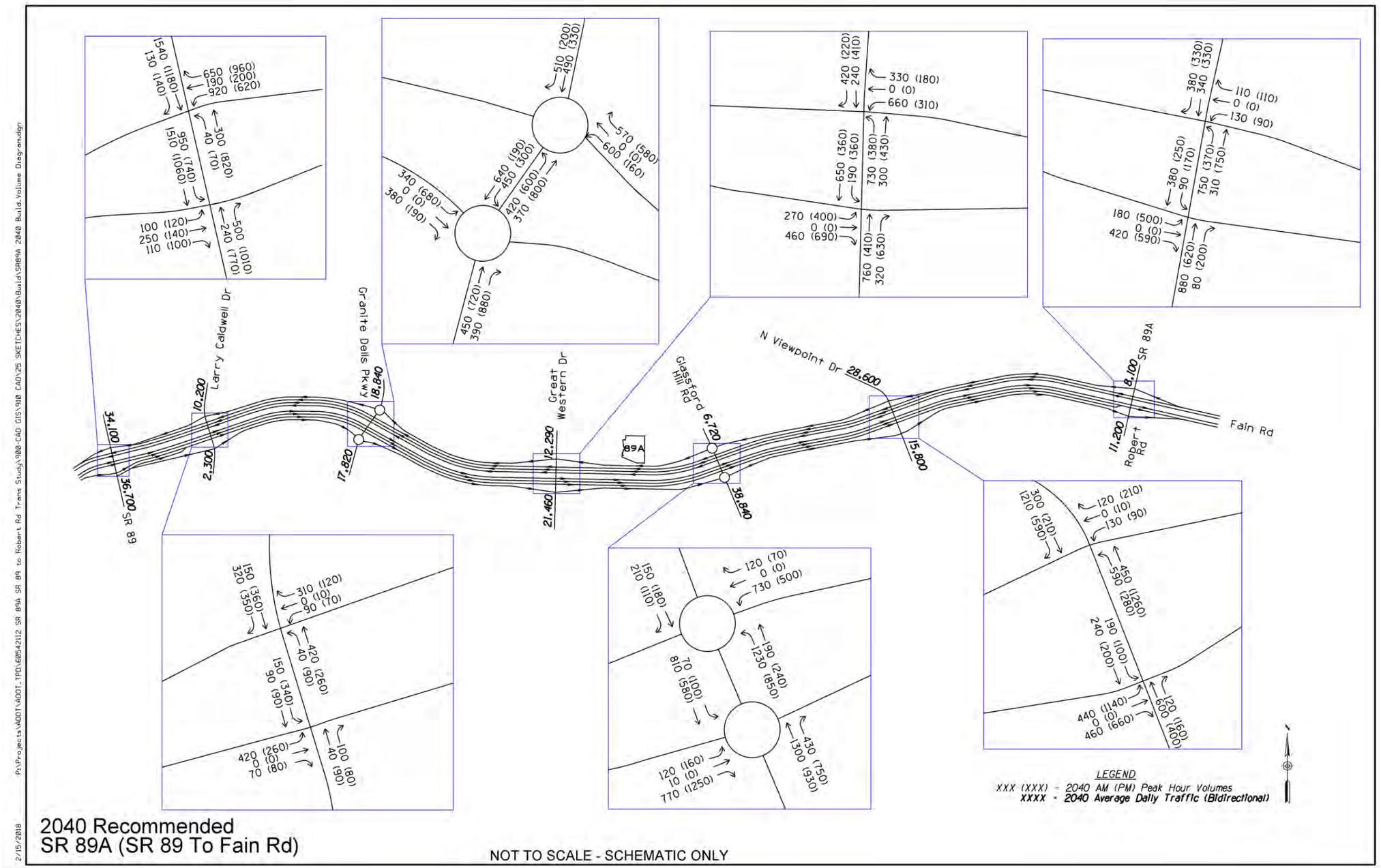


Figure 47: 2040 Build Recommended AM Peak Hour Level-of-Service on SR 89A Mainline and Ramps

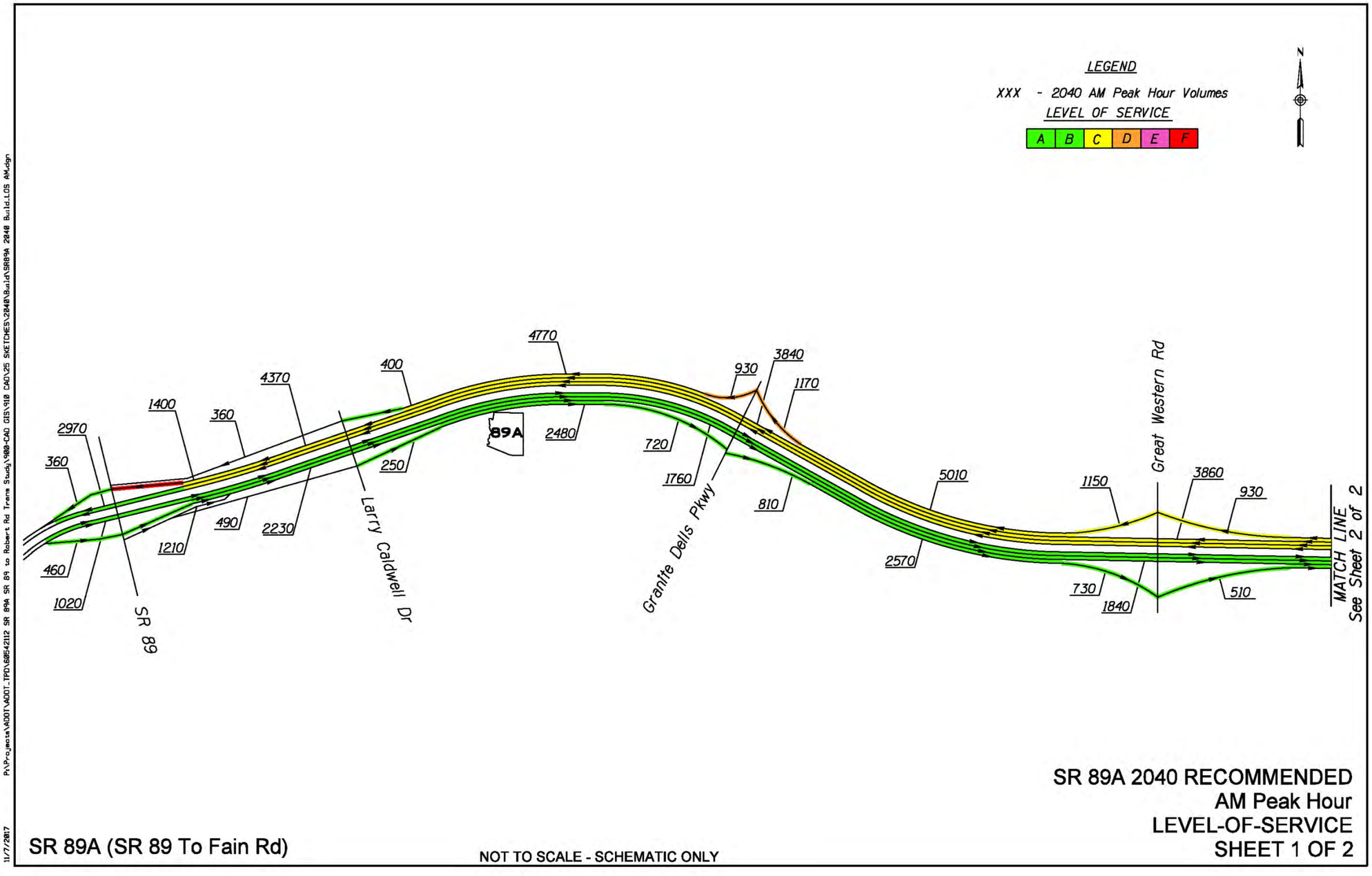


Figure 47 (cont'd): **2040 Build Recommended AM Peak Hour Level-of-Service on SR 89A Mainline and Ramps**

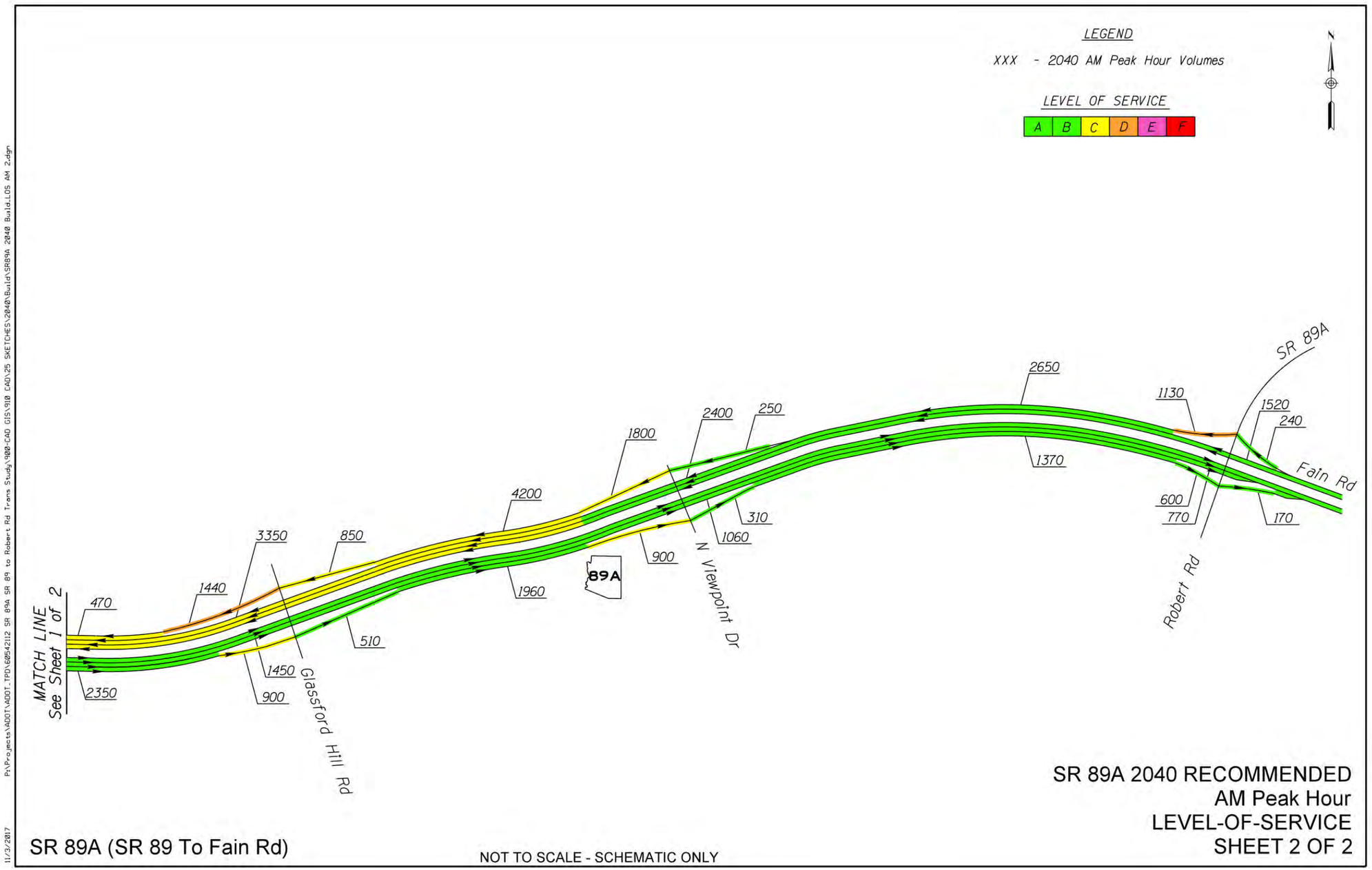


Figure 48: 2040 Build Recommended PM Peak Hour Level-of-Service on SR 89A Mainline and Ramps

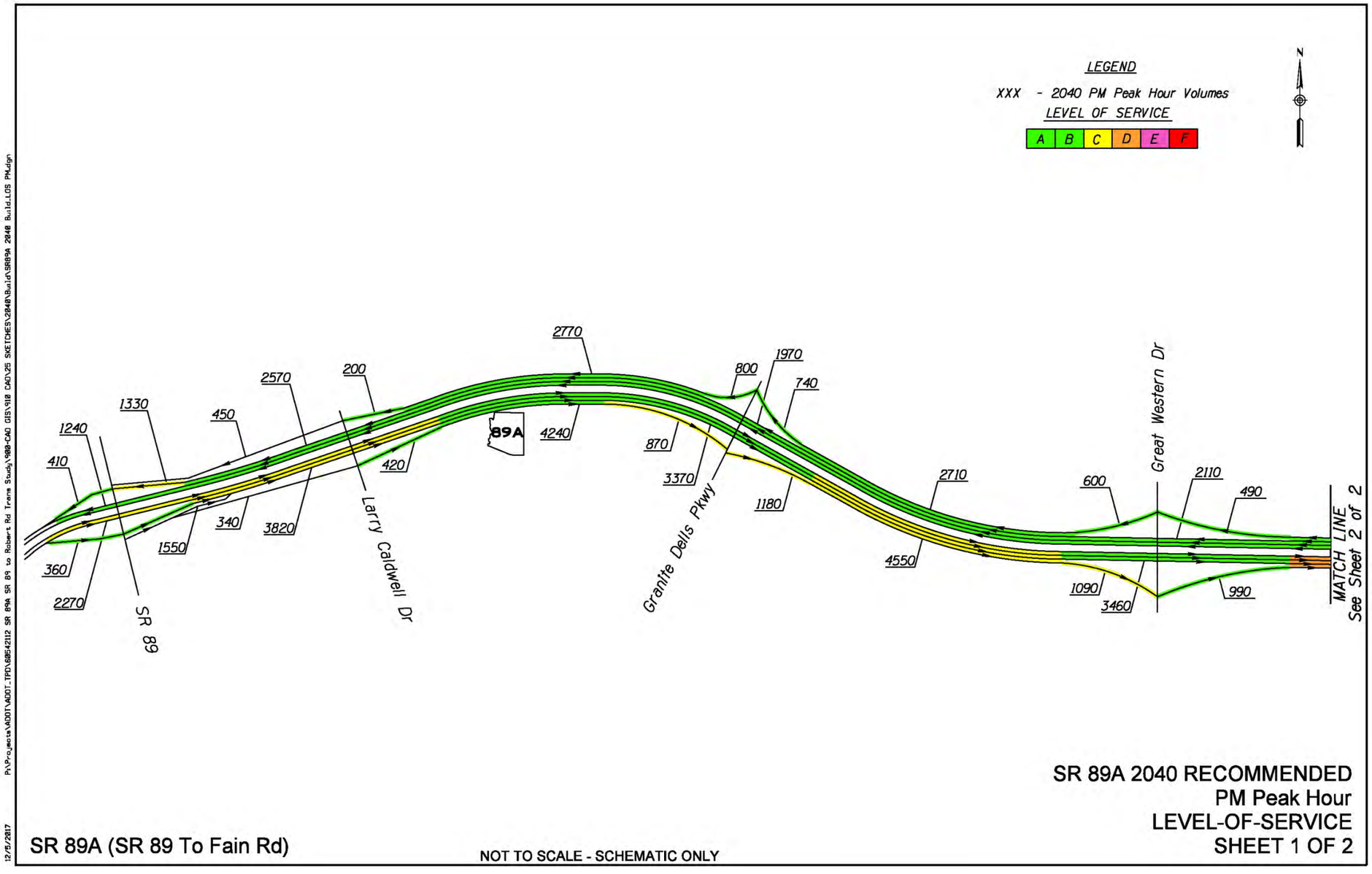


Figure 48 (cont'd): **2040 Build Recommended PM Peak Hour Level-of-Service on SR 89A Mainline and Ramps**

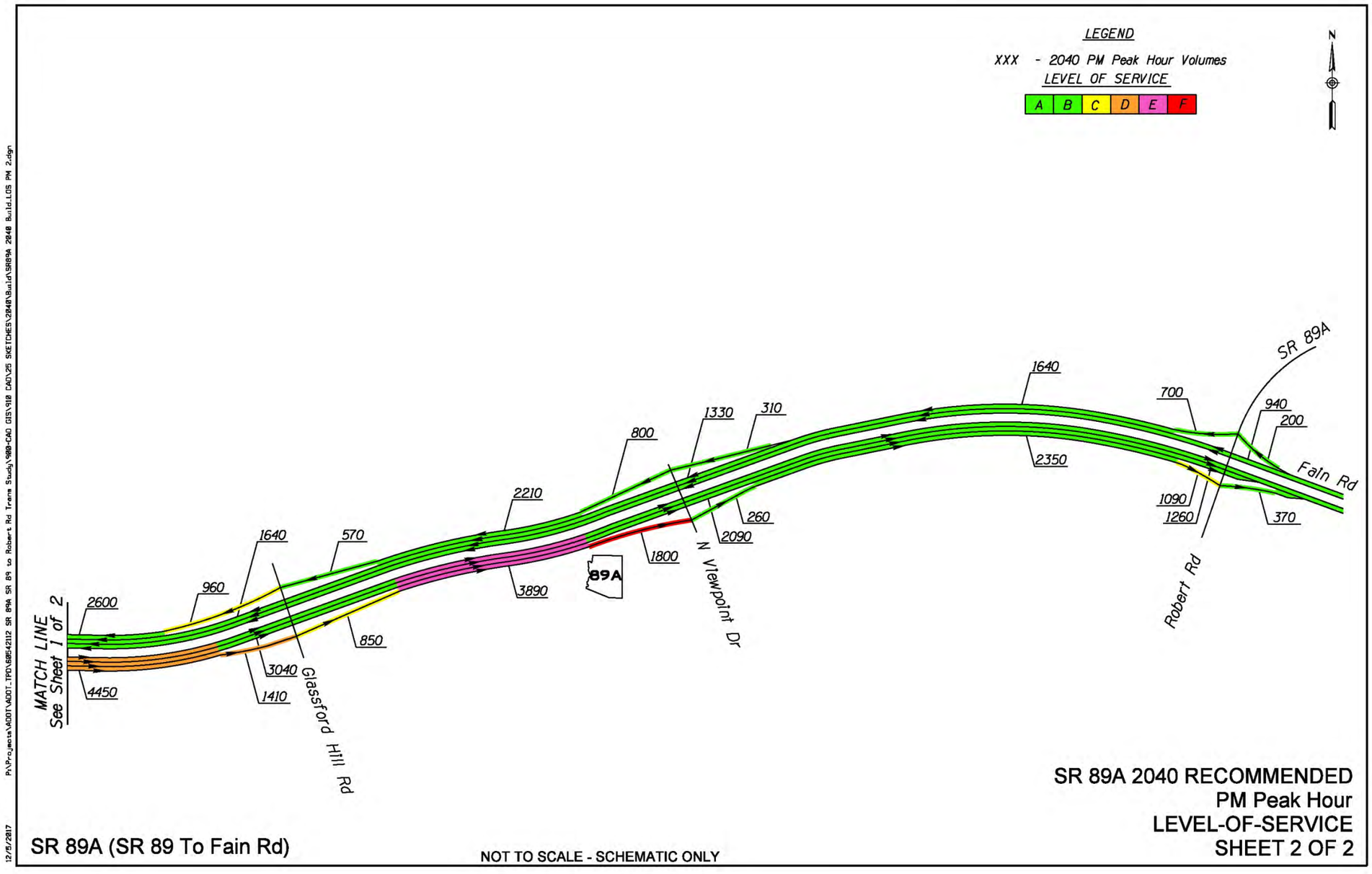
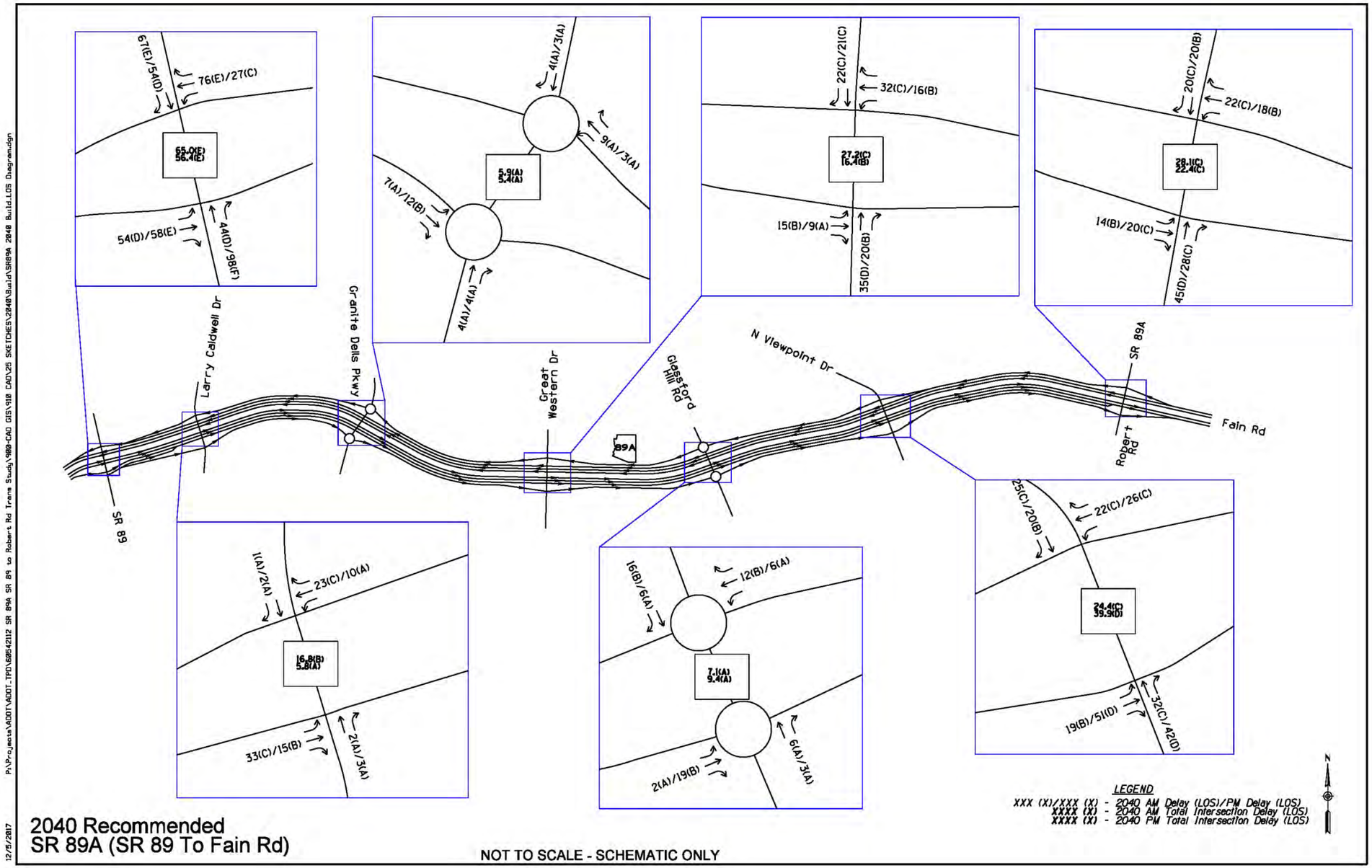


Figure 49: 2040 Build Recommended Intersection Level-of-Service



6.5 Plan of Implementation

Based upon the incremental needs analysis for the no-build conditions, safety analysis, core team input, and the 2040 Build Recommended Alternative, an implementation plan of short-term, mid-term, and long-term projects were developed. These short-term, mid-term, and long-term solutions were correlated to the years 2025, 2030-2035, and 2040 respectively. The implementation period of the projects was determined through the combination of a traffic operational analysis and safety analysis. The safety analysis was performed at locations of safety concern which were determined during the current condition assessment of the study corridor. A predictive safety analysis was performed, enabling the development of crash reduction factors for specific geometric improvements that provide a safety benefit to roadway users. This predictive safety analysis is described in **Appendix 4**. Additionally, utilizing traffic modeling to assess future traffic conditions at each implementation period, the level-of-service failures were identified and further assessed following the implementation of roadway improvements.

The project implementation includes the ultimate corridor improvements as identified in the 2040 Build Recommended Improvements included in Section 6.4, safety improvements, as well as interim solutions.

6.5.1 Short-term Implementation (2025)

The short-term 2025 Build Recommendations that are recommended for implementation include the following:

SR 89 TI

- Additional eastbound left-turn lane
- Eastbound entrance ramp reconfiguration (two lane entrance ramp)

Great Western Drive

- Interim access closure

Glassford Hill Road TI

- Westbound extended parallel entrance ramp
- Eastbound exit ramp free right-turn lane

Viewpoint Drive TI

- Westbound entrance ramp extension
  - Additional northbound lane and eastbound exit ramp dual left-turn

Robert Road Intersection

- Interim signalized intersection improvements

Intersection lane configurations for the 2025 Build Recommendations are displayed in **Figure 50**.

6.5.2 Mid-Term Implementation (2030)

The mid-term 2030 Build Recommendations that are recommended for implementation include the following:

SR 89A Mainline

- Additional general purpose lane in both the eastbound and westbound direction of travel between the SR 89 TI and Glassford Hill Road TI

Intersection lane configurations for the 2030 Build Recommendations are displayed in **Figure 51**.

Glassford Hill Road TI

- Roundabout Interchange

6.5.3 Mid-Term Implementation (2035)

The mid-term 2035 Build Recommendations that are recommended for implementation include the following:

Great Western Drive TI

- Traffic Interchange

Robert Road Intersection

- Traffic Interchange
- Construct all critical connecting accesses to the new alignment of Robert Road

Intersection lane configurations for the 2035 Build Recommendations are displayed in **Figure 52**.

6.5.4 Long-Term Implementation (2040)

The remaining long-term 2040 Build Recommendations that are recommended for implementation include the following:

SR 89A Mainline

- Additional general purpose lane in both the eastbound and westbound direction between the Glassford Hill Road TI and Robert Road TI

Granite Dells Parkway TI

- Minimal roundabout modifications

Figure 50: 2025 Build Recommended Roadway Features

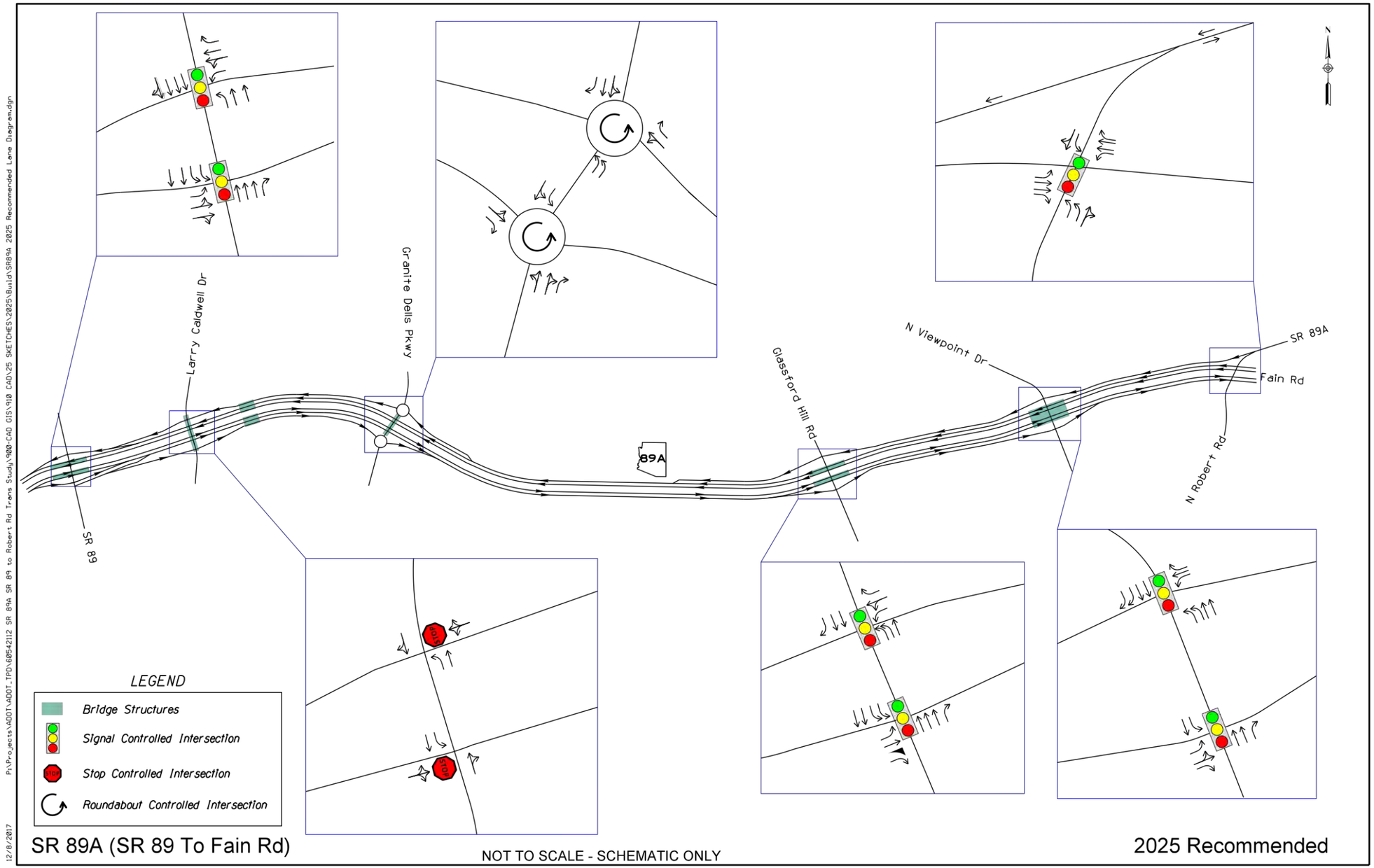


Figure 51: 2030 Build Recommended Roadway Features

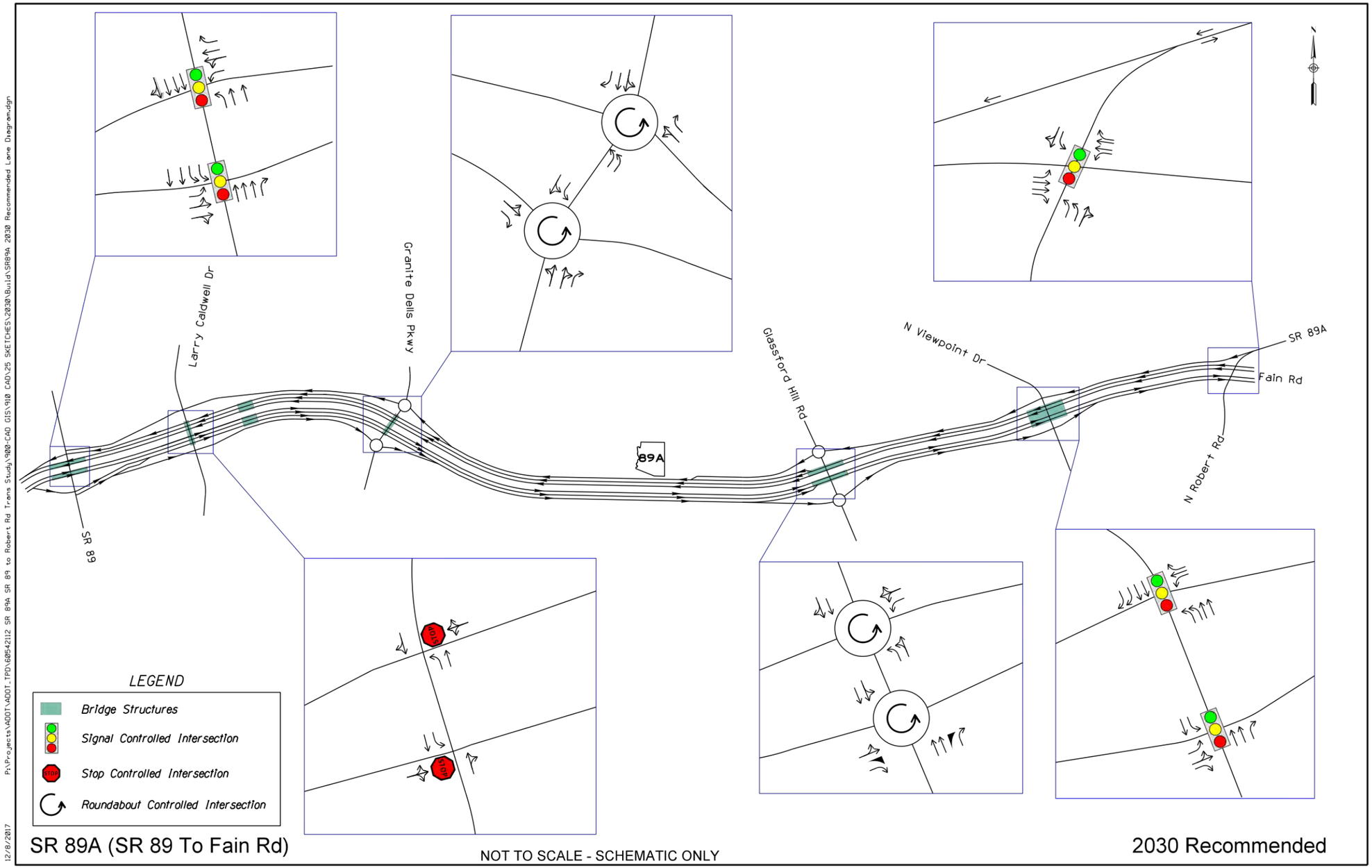
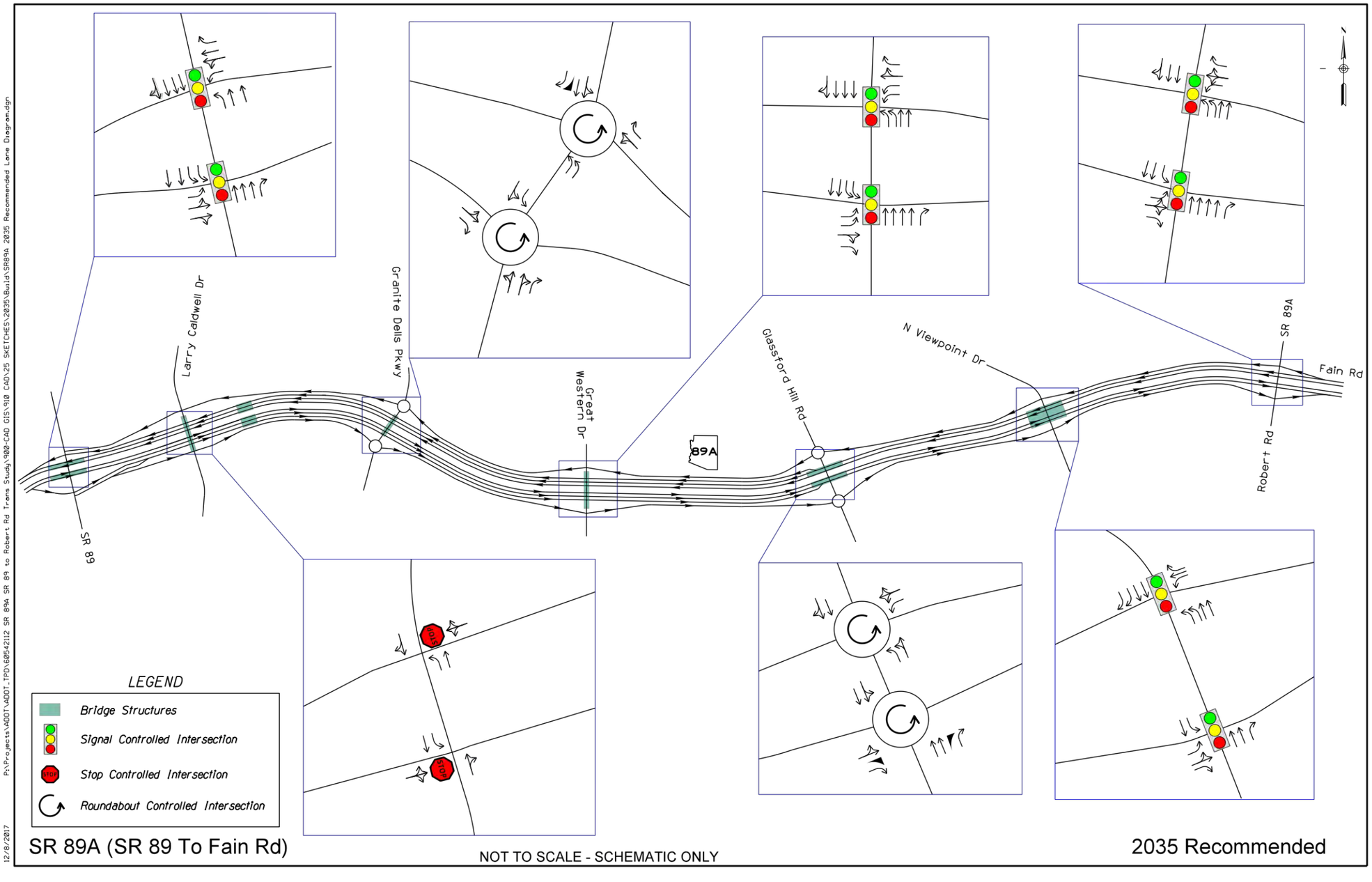


Figure 52: 2035 Build Recommended Roadway Features



6.6 Implementation Operational Analysis Results

An operational analysis was performed for the mainline including the general-purpose lanes, ramp junctions, and weave sections and for the build conditions for each of the horizon years. Intersection analysis was also performed for the study intersections including the five TI's and one at-grade signalized intersection. This levels-of-service (LOS) analysis was conducted following the methodologies described in Section 3.3.5. **Table 40** and **Table 41** include the anticipated Build Recommended Alternatives Year 2025, 2030, and 2035 LOS results during the AM and PM Peak Hours for the intersections, respectively. **Table 42** includes the anticipated Build Recommended Alternatives Year 2025, 2030, and 2035 LOS results during the AM and PM Peak hours for the mainline. These tables also include the existing 2017 and 2040 Build Recommended results for comparison purposes. **Appendix 7** includes visual representation of the volumes and results for the 2025 – 2035 Years Recommendations.

The following summarizes the results of each facility over time for the recommended build conditions:

SR 89A Eastbound Mainline – With the implementation of recommendations, the eastbound SR 89A mainline operates at LOS C or better through 2040 in the AM peak hour. In the PM peak hour, the eastbound mainline operates at LOS E by Year 2040 between the Glassford Hill entrance ramp and the Viewpoint Drive exit ramp, and at LOS D or better in all other segments.

SR 89A Westbound Mainline – With the implementation of recommendations, the eastbound SR 89A mainline operates at LOS C or better through 2040 in the AM peak hour. In the PM peak hour, the westbound mainline operates at LOS F by Year 2040 between the Granite Dells entrance ramp and the SR 89 exit ramp and at LOS A in all other segments.

SR 89 Traffic Interchange – The signalized intersection of SR 89A Ramps and SR 89 begins to degrade in the AM peak hour by Year 2040, by which time the intersection overall operates at LOS E. In the PM peak hour, one approach of this interchange begins to operate at LOS E by Year 2025. By Year 2030, the overall intersection operates at LOS E, and by Year 2035 at LOS F.

Larry Caldwell Drive Traffic Interchange – The stop-controlled intersection of SR 89A Ramps and Larry Caldwell Drive operates at LOS B or better, with every approach operating at LOS D or better through Year 2040 in both the AM and PM peak hours.

Granite Dells Parkway Traffic Interchange – The roundabout intersections at SR 89A Ramps and Granite Dells Parkway operate at LOS A, with every approach operating at LOS D or better through Year 2040 in both the AM and PM peak hours.

Great Western Drive Traffic Interchange – The recommendations include construction of the Great Western Drive Traffic Interchange between Granite Dells Parkway and Glassford Hill Road by 2035. The signal-controlled intersection of SR 89A Ramps and Great Western Drive operates at LOS C or better, with every approach operating at LOS D or better through Year 2040 in both the AM and PM peak hours.

Glassford Hill Road Traffic Interchange – The recommendations include providing roundabout intersections at SR 89A Ramps and Glassford Hill Road by Year 2030. With this recommendation, the intersection operates at LOS C or better, with every approach operating at LOS D or better through Year 2040 in both the AM and PM peak hours.

Viewpoint Drive Traffic Interchange – The signalized intersection of SR 89A Ramps and Viewpoint Drive operates at LOS D or better, with every approach operating at LOS D or better through Year 2040 in both the AM and PM peak hours. In the PM peak hour, the eastbound approach to the intersection degrades to LOS E by Year 2040.

Robert Road/Fain Road Intersection – The recommendations at SR 89A, Robert Road, and Fain Road include converting the intersection to a traffic interchange by Year 2035. With these recommendations, the intersection operates at LOS C or better, with every approach operating at LOS C or better through Year 2040 in both the AM and PM peak hours.

Table 40: AM Peak Hour Build Comparison Intersection LOS Results

Intersection Location	Intersection Approach	2017 AM Existing		2025 AM Build		2030 AM Build		2035 AM Build		2040 AM Build	
		Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay
SR 89A and SR 89 TI	EB SR 89A Off Ramp	D (39)	C (31.7)	D (36)	C (29.8)	D (41)	D (35.4)	D (45)	D (43.8)	D (54)	**E (65.0)**
	WB SR 89A Off Ramp	C (32)		C (26)		C (30)		D (37)		**E (76)**	
	NB SR 89	C (25)		C (29)		C (34)		D (36)		D (44)	
	SB SR 89	C (33)		C (32)		D (40)		**E (55)**		**E (67)**	
SR 89A and Larry Caldwell Dr. TI	EB SR 89A Frontage Road	B (14)	A (8)	B (14)	A (8.3)	B (18)	A (9.5)	C (22)	B (11.3)	C (33)	B (16.8)
	WB SR 89A Off Ramp	A (9)		B (12)		B (13)		B (15)		C (23)	
	NB Larry Caldwell Dr	A (1)		A (1)		A (2)		A (3)		A (2)	
	SB Larry Caldwell Dr	A (0)		A (1)		A (1)		A (1)		A (1)	
SR 89A and Granite Dells Pkwy TI	EB SR 89A Off Ramp	A (0)	A (0.6)	A (7)	A (4.9)	A (7)	A (6.1)	A (5)	A (5.5)	A (7)	A (5.9)
	WB SR 89A Off Ramp	A (1)		A (5)		A (7)		A (6)		A (9)	
	NB Granite Dells Pkwy	A (0)		A (3)		A (3)		A (3)		A (4)	
	SB Granite Dells Pkwy	A (1)		A (5)		A (7)		A (7)		A (4)	
SR 89A and Great Western TI	EB SR 89A Off Ramp	N/A	N/A	N/A	N/A	N/A	N/A	B (14)	C (24.1)	B (15)	C (27.2)
	WB SR 89A Off Ramp	N/A		N/A		N/A		C (27)		C (32)	
	NB Great Western Dr	N/A		N/A		N/A		C (33)		D (35)	
	SB Great Western Dr	N/A		N/A		N/A		B (18)		C (22)	
SR 89A and Glassford Hill Rd. TI	EB SR 89A Off Ramp	B (17)	C (27)	A (1)	C (20.7)	A (1)	A (7.5)	A (1)	A (4.2)	A (2)	A (7.1)
	WB SR 89A Off Ramp	D (45)		C (33)		B (13)		A (7)		B (12)	
	NB Glassford Hill Rd	C (24)		C (25)		A (7)		A (4)		A (6)	
	SB Glassford Hill Rd	N/A		N/A		C (20)		A (7)		B (16)	
SR 89A and Viewpoint Dr. TI	EB SR 89A Off Ramp	B (12)	B (13)	B (15)	B (16.0)	B (17)	B (18.1)	C (20)	C (22.1)	B (19)	C (24.4)
	WB SR 89A Off Ramp	C (24)		B (17)		B (19)		C (21)		C (22)	
	NB Viewpoint Dr	B (20)		C (28)		C (28)		C (32)		C (32)	
	SB Viewpoint Dr	A (8)		B (11)		B (14)		B (19)		C (25)	
SR 89A and Robert Road	EB SR 89A	C (22)	C (23.5)	(C) 26	(C) 31.1	C (29)	C (33.6)	B (15)	C (26.9)	B (14)	C (28.1)
	WB Fain Rd	C (27)		(C) 34		D (36)		C (22)		C (22)	
	NB Robert Rd	C (26)		(D) 42		D (45)		D (42)		D (45)	
	SB SR 89A	B (18)		(C) 21		C (23)		B (19)		C (20)	

Table 41: PM Peak Hour Build Comparison Intersection LOS Results

Intersection Location	Intersection Approach	2017 PM Existing		2025 PM Build		2030 PM Build		2035 PM Build		2040 PM Build	
		Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay	Intersection Approach LOS & Delay	Overall Intersection LOS & Delay
SR 89A and SR 89 TI	EB SR 89A Off Ramp	D (42)	C (25.4)	D (48)	C (32.6)	**F (81)**	D (55.0)	**E (61)**	D (52.7)	**E (58)**	**E (56.4)**
	WB SR 89A Off Ramp	C (27)		C (21)		C (29)		C (30)		C (27)	
	NB SR 89	C (22)		D (44)		**F (84)**		**F (85)**		**F (98)**	
	SB SR 89	C (25)		C (31)		D (47)		D (40)		D (54)	
SR 89A and Larry Caldwell Dr. TI	EB SR 89A Frontage Road	A (9)	A (2.5)	B (11)	A (3.9)	B (13)	A (4.8)	B (14)	A (5.5)	B (15)	A (5.8)
	WB SR 89A Off Ramp	A (7)		A (8)		A (8)		A (9)		A (10)	
	NB Larry Caldwell Dr	A (1)		A (2)		A (2)		A (2)		A (3)	
	SB Larry Caldwell Dr	A (1)		A (1)		A (1)		A (1)		A (2)	
SR 89A and Granite Dells Pkwy TI	EB SR 89A Off Ramp	A (0)	A (0.4)	A (5)	A (4.2)	A (7)	A (5.6)	A (9)	A (4.5)	B (12)	A (5.4)
	WB SR 89A Off Ramp	A (1)		A (4)		A (5)		A (2)		A (3)	
	NB Granite Dells Pkwy	A (0)		A (3)		A (4)		A (3)		A (4)	
	SB Granite Dells Pkwy	A (0)		A (5)		A (7)		A (5)		A (3)	
SR 89A and Great Western TI	EB SR 89A Off Ramp	N/A	N/A	N/A	N/A	N/A	N/A	B (13)	B (18.0)	A (9)	B (16.4)
	WB SR 89A Off Ramp	N/A		N/A		N/A		C (22)		B (16)	
	NB Great Western Dr	N/A		N/A		N/A		C (21)		B (20)	
	SB Great Western Dr	N/A		N/A		N/A		B (19)		C (21)	
SR 89A and Glassford Hill Rd. TI	EB SR 89A Off Ramp	C (22)	C (25.4)	A (1)	B (12.4)	D (36)	B (15.5)	A (1)	A (2.6)	B (19)	A (9.4)
	WB SR 89A Off Ramp	D (53)		C (25)		A (6)		A (5)		A (6)	
	NB Glassford Hill Rd	B (20)		B (17)		A (3)		A (3)		A (3)	
	SB Glassford Hill Rd	N/A		N/A		A (6)		A (5)		A (6)	
SR 89A and Viewpoint Dr. TI	EB SR 89A Off Ramp	B (15)	B (17.1)	C (24)	C (22.4)	C (32)	C (27.7)	**E (60)**	D (45.7)	D (51)	D (39.9)
	WB SR 89A Off Ramp	C (32)		B (18)		C (21)		C (28)		C (26)	
	NB Viewpoint Dr	C (22)		C (28)		C (33)		D (47)		D (42)	
	SB Viewpoint Dr	B (12)		B (14)		B (16)		C (22)		B (20)	
SR 89A and Robert Road	EB SR 89A	C (21)	C (23.1)	C (24)	C (28.6)	C (30)	C (34.1)	B (17)	B (18.9)	C (20)	C (22.4)
	WB Fain Rd	C (27)		C (35)		D (39)		B (16)		B (18)	
	NB Robert Rd	C (29)		D (42)		D (49)		C (24)		C (28)	
	SB SR 89A	B (18)		B (19)		C (22)		B (17)		B (20)	

Table 42: AM & PM Peak Hour Build Comparison SR 89A Mainline LOS Results

Segment Description	AM Peak Hour										PM Peak Hour									
	2017 Existing		2025 Build		2030 Build		2035 Build		2040 Build		2017 Existing		2025 Build		2030 Build		2035 Build		2040 Build	
	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS
Eastbound/Northbound SR 89A																				
Project Limit to SR 89 EB Exit Ramp	8	A	9	A	12	B	13	B	16	B	12	B	18	C	23	C	26	C	30	D
SR 89 EB Exit Ramp to SR 89 EB Entr Ramp	5	A	5	A	7	A	7	A	9	A	9	A	13	B	17	B	18	C	21	C
SR 89 EB Entrance Ramp to Larry Caldwell EB Entr Ramp	9	A	11	B	9	A	9	A	10	A	14	B	19	C	15	B	16	B	18	C
Larry Caldwell EB Entr Ramp to Granite Dells EB Exit Ramp	6	A	8	A	7	A	8	A	9	A	11	B	14	B	12	B	14	B	16	B
Granite Dells EB Exit Ramp to Granite Dells EB Entr Ramp	8	A	9	A	6	A	7	A	8	A	16	B	18	B	13	B	15	B	16	B
Granite Dells EB Entr Ramp to Glassford Hill EB Exit Ramp (or Great Western EB Exit Ramp)	9	A	13	B	10	A	9	A	10	A	16	B	22	C	17	B	17	B	20	C
Great Western EB Exit Ramp to Great Western EB Entr Ramp	n/a	n/a	n/a	n/a	n/a	n/a	8	A	9	A	n/a	n/a	n/a	n/a	n/a	n/a	15	B	17	B
Great Western EB Entr Ramp to Glassford Hill EB Exit Ramp	n/a	n/a	n/a	n/a	n/a	n/a	8	A	9	A	n/a	n/a	n/a	n/a	n/a	n/a	23	C	20	C
Glassford Hill EB Exit Ramp to Glassford Hill EB Entr Ramp	4	A	7	A	8	A	10	A	7	A	9	A	13	B	15	B	18	B	14	B
Glassford Hill EB Entr Ramp to Viewpoint Dr EB Exit Ramp	4	A	7	A	9	A	9	A	7	A	9	A	14	B	20	C	23	C	35	D
Viewpoint Dr EB Exit Ramp to Viewpoint Dr EB Entr Ramp	4	A	5	A	7	A	7	A	5	A	6	A	9	A	11	B	12	B	11	A
Viewpoint Dr EB Entr Ramp to Robert Road Intersection (or Robert Road EB Exit Ramp)	4	A	7	A	8	A	6	A	5	A	7	A	10	A	13	B	9	A	8	A
Robert Road EB Exit Ramp to Robert Road EB Entr Ramp	n/a	n/a	n/a	n/a	n/a	n/a	6	A	4	A	n/a	n/a	n/a	n/a	n/a	n/a	8	A	7	A
Robert Road EB Entr Ramp to Project Limit	n/a	n/a	n/a	n/a	n/a	n/a	7	A	6	A	n/a	n/a	n/a	n/a	n/a	n/a	11	A	9	A
Westbound/Southbound SR 89A																				
Project Limit to Robert Road WB Exit Ramp	n/a	n/a	n/a	n/a	n/a	n/a	12	B	9	A	n/a	n/a	n/a	n/a	n/a	n/a	7	A	6	A
Robert Road WB Exit Ramp to Robert Road WB Entr Ramp	n/a	n/a	n/a	n/a	n/a	n/a	10	A	8	A	n/a	n/a	n/a	n/a	n/a	n/a	6	A	5	A
Robert Road Intersection (or Robert Road WB Entr Ramp) to Viewpoint Dr WB Exit Ramp	6	A	9	A	11	A	12	B	10	A	4	A	5	A	6	A	7	A	6	A
Viewpoint Dr WB Exit Ramp to Viewpoint Dr WB Entr Ramp	8	A	12	B	14	B	16	B	12	B	5	A	6	A	8	A	8	A	7	A
Viewpoint Dr WB Entr Ramp to Glassford Hill WB Exit Ramp	11	A	17	B	21	C	25	C	20	C	5	A	8	A	9	A	10	A	9	A
Glassford Hill WB Exit Ramp to Glassford Hill WB Entr Ramp	12	B	17	B	19	C	26	D	18	C	5	A	7	A	9	A	10	A	8	A
Glassford Hill WB Entr Ramp to Granite Dells WB Exit Ramp (or Great Western WB Exit Ramp)	19	C	27	D	21	C	17	B	20	C	10	A	14	B	11	A	9	A	10	A
Great Western WB Exit Ramp to Great Western WB Entr Ramp	n/a	n/a	n/a	n/a	n/a	n/a	19	C	22	C	n/a	n/a	n/a	n/a	n/a	n/a	9	A	10	A
Great Western WB Entr Ramp to Granite Dells WB Exit Ramp	n/a	n/a	n/a	n/a	n/a	n/a	18	B	20	C	n/a	n/a	n/a	n/a	n/a	n/a	9	A	11	A
Granite Dells WB Exit Ramp to Granite Dells WB Entr Ramp	18	C	22	C	16	B	20	C	20	C	10	A	11	A	7	A	9	A	10	A
Granite Dells WB Entr Ramp to Larry Caldwell WB Exit Ramp	13	B	18	C	16	B	19	C	23	C	7	A	10	A	9	A	1510	A	11	B
Larry Caldwell WB Exit Ramp to SR 89 WB Exit Ramp	21	C	24	C	18	C	21	C	23	C	10	A	14	B	10	A	12	B	12	B
SR 89 WB Exit Ramp to SR 89 WB Entr Ramp	11	A	15	B	12	B	14	B	16	B	5	A	6	A	5	A	6	A	6	A
SR 89 WB Entr Ramp to Project Limit	15	B	24	C	18	B	20	C	23	C	8	A	11	B	8	A	9	A	10	A

7.0 PUBLIC INVOLVEMENT SUMMARY REPORT

7.1 Public Meeting

ADOT held a public information meeting for the study on December 12, 2017 from 6 – 7:30 p.m. at the Town of Prescott Valley Public Library located at 7401 E. Civic Circle, Prescott Valley, AZ, 86314. The purpose of the meeting was to show potential transportation improvements along the study corridor. A brief presentation was held at 6:15 p.m. A total of 69 people signed in and attended the meeting.

Various types of public meeting notifications were used. The types of notifications are identified below.

7.1.1 Media Relations

A news release announcing the public meeting was distributed via ADOT's Gov.Delivery system on November 30, 2017. The distribution included nearly 5,000 State Route 89A stakeholders and media outlets. The news release included information on the need for the study, public meeting information, project website address and avenues to submit comment. A copy of the news release is included in **Appendix 8-A**.

7.1.2 Memo to ADOT Department Heads

A memo announcing the public meeting was posted on December 4, 2017 to ADOT department heads on the bulletin board located in the ADOT Administrative Building, 206 South 17th Avenue, Phoenix, AZ 85007.

7.1.3 Newspaper Advertisements

A newspaper display advertisement ran in the Prescott Daily Courier on December 4, 2017.The advertisement included the study corridor map, need for the study, public meeting information, project website address and avenues to submit comment. A copy of the advertisement is included in **Appendix 8-B**.

7.1.4 Flyer

Project flyers that included the study corridor map, need for the study, public meeting information, project website address and avenues to submit comment were left for public consumption at Prescott Valley Town Hall, Prescott City Hall, Prescott Valley Public Library and the Antelope Hills Golf Course pro-shop and clubhouse bulletin board. A copy of the flyer is included in **Appendix 8-C**.

7.1.5 Postcards

A postcard announcing the public meeting, the need for the study and the project website address was mailed on November 21, 2017. A total of 6,420 postcards were sent to properties within a one-mile radius of the study corridor (Figure 1). A copy of the postcard can be found in **Appendix 8-D**.

7.1.6 Social Media

On behalf of ADOT, the City of Prescott copied the news release onto their Facebook page on December 12, 2017. A copy of the post can be found in **Appendix 8-E**.

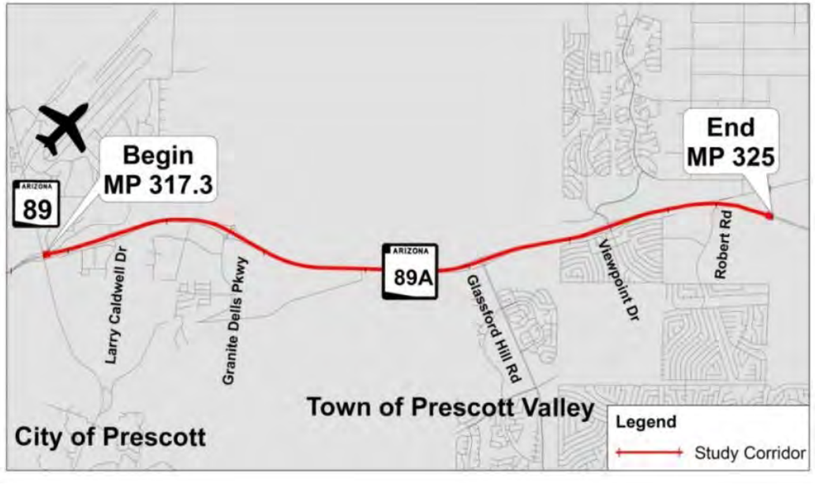
7.1.7 Website

The project website, www.azdot.gov/SR89RobertRoadStudy was updated to include all informational materials, public meeting information and project details.

7.1.8 Other Publicity

The December 8, 2017, Town of Prescott Valley Weekly Team Update that is distributed via email weekly list serve to the media and subscribing Prescott Valley residents also announced the public meeting and provided the project flyer. The December 20, 2017 edition of the Prescott Valley Tribune featured an article about the study and public meeting. Copies can be found in **Appendix 8-F**.

Figure 53: Study Area Map



7.2 Public Meeting Content

As attendees joined the public meeting, they were asked to sign-in and were provided a project fact sheet and comment form. Attendees were also given an explanation of the style of the meeting – a presentation at 6:15 p.m. followed by an open house with an opportunity to ask questions to subject matter experts. Copies of ADOT's Title VI brochures and voluntary Title VI

Self Identification survey cards were also available. A copy of the project fact sheet and comment form can be found in **Appendix 8-G**.

7.2.1 Presentation

A formal presentation was provided by the ADOT's Northwest District Engineer. The presentation reviewed the study area and goals, corridor needs, and the proposed improvements and corresponding planning horizons. A copy of the presentation can be found in **Appendix 8-G**.

After the presentation, some attendees raised their hands and asked questions related to the study and the area in general. All attendees were then invited to visit the roll plot map station, view the display board stations and dialogue with subject matter experts from the Project Team and AECOM regarding the study.

7.2.2 Display Boards

Ten display boards were available for attendees to review. The boards provided information on study goals, corridor needs, existing conditions and conceptual improvements along the study corridor. A copy of the display boards shown at the meeting can be found in **Appendix 8-G**.

7.2.3 Roll Plot Map

A large scale roll plot map was created to more clearly illustrate the entire study corridor. Attendees were asked to draw and write comments directly on the roll plot map. A copy of the roll plot map shown at the meeting can be found in **Appendix 8-G**.

7.3 Public Comment Summary

The comment period for the study was from November 30 to December 31, 2017. Comments could be submitted via telephone, email, mail and/or comment form.

7.3.1 Public Meeting Presentation Questions

Questions were asked of the Northwest District Engineer following the presentation. The questions and responses are as follows:

- What is happening with the development at Pronghorn?
  That is an inquiry to be directed to the Town of Prescott Valley.
- What is the cost?
  The next part of the scope is working on cost. The following step is to apply for funding.
- Will improvements require acquisition of public property?
  Some of them do, and some don't. One example is the Robert Road intersection. Right of Way agents offer full market value.
- What is planned at Glassford north?
  We don't know of anything yet, but we will in the future.
- Can you point out on the map where new development is going?
  All of the bubbles show development. There's development all over the place.
- Why push Robert Road so far east?
  Provide space from the interchange at Viewpoint.

7.3.2 Public Meeting Form Comments

A total of eight public comments were received at the public meeting via the comment form:

- I liked most of the plans with the exception of moving the Robert Road/89A interchange farther east. Why would I use Robert Road when I almost always drive westbound on 89A? A traffic study would reveal that most of the traffic on Robert Road goes westbound. Therefore, it would increase congestion on Viewpoint in order to avoid doubling back from Robert Road.
- Consider widening to three lanes all the way to Willow Creek Road Interchange? Roundabouts need to be wide enough for large trucks and RVs. Continue coordination with City of Prescott and Prescott Valley to look at other traffic corridors and widening for flow of traffic from Glassford Road/Viewpoint/Robert Road in Prescott Valley to Larry Caldwell Road/89/Willow Creek Road in Prescott. What happened to the Highway 89A shoulder widening project?
- The exit ramp from 89A to Glassford Hill Road (just after you get on 89A from Viewpoint entrance) headed west is in horrible shape. It's bumpy, choppy, worsening weekly.
- Are you going to build walls near communities? I live on Pronghorn and the noises form air breaks and Harleys are really noisy! Thank you for your plans to improve Robert Road exchange.
- Would like to see an alternative road into Chino Valley – lots.
- Is there any plan to reduce the speed limit on Glassford Hill Road between Lakeshore Drive to 89A? Now its 45 miles hour. I live close in Granville to Glassford Hill Road, it seems that a significant number of vehicles drive much faster than the posted speed limit. Is there a plan to use rubberized asphalt on Glassford Hill Road to minimize road noise?
- If third lane is proposed westbound 89A from Robert Road to 89, plan needs to include westbound third lane all the way to Willow Creek Road. Commute traffic congested currently to two left-turn lanes onto southbound Willow Creek Road. To narrow to two lanes at 89/89A overpass within .2 mile of LG Intersection (Willow Creek Road) will cause bottleneck as is currently occurring. Efficient to plan/implement extra .2 miles of additional third lane flow to two left turn lanes. Discussions should be held with the town to connect existing Robert Road to the Antelope Drive Pronghorn Ranch.
- Glassford Hill Road TI – favor divergent diamond. Do not favor the use of a double roundabout as a mid-term improvement. 3rd lane westbound between Viewpoint and Glassford Hill should be a priority. Support 2nd left turn on eastbound off at Viewpoint. Robert Road interchange – discussions should be held with the town to connect existing Robert Road to the Antelope Drive Pronghorn Ranch.

7.3.3 Public Meeting Roll Plot Comments

The following comments were made directly on the roll plot during the public meeting:

Robert Road

- The "2nd left-turn lane [is needed] ASAP" at the existing Robert Road interchange in the northbound to westbound turning movement
- Alternative connections for the Robert Road Traffic Interchange proposal (**See graphic at right**).
  - An alternative eastbound entrance ramp is suggested to begin at the northernmost entrance of the pre-school looping in a parabolic manner to the Fain Road mainline connecting in the same location as the recommended TI location.
  - Alternative northern and southern connections are proposed along the recommended connection roadway between the recommended TI location and Robert Road south of the pre-school. The connection road would fork and connect at the existing Robert Road/Powers Ave and Robert Road/Roundup Dr intersections.
- The TI connector road intersection with Robert Road was commented as a "bad intersection, [that] needs [a] light" as well as also questioned as to "what kind of traffic control" will be constructed at this location.
- The area south of Fain Road and east of Robert Road is commented to be a flood plain.
- A comment indicates that there are "mailboxes" located along the east side Coyote Springs Rd located northeast of the Robert Road intersection accessible from the SR 89A route diverging east by northeast from the Robert Road intersection.

Viewpoint Drive

- A residential sound wall is needed extending from the existing westbound on-ramp at Robert Rd to approximately 500 feet west of the Viewpoint Drive interchange ended on the east end of the LDS Church property along the northern boundary of the existing mainline. This comment is focused on potential noise impacts on the developments north of SR 89A centered around Viewpoint Drive.
- The "left turn signal timing [needs to be] retimed, [currently it takes] too long before [the signal] turns green and then [the green time] does not last long enough" at the northern leg of the Viewpoint Drive interchange.

Glassford Hill Road

- The westbound off-ramp and auxiliary lane on the approach to the off-ramp has "rough pavement [that] needs re-pavement"
- "Instead of a roundabout, eliminate the [southernmost] northbound traffic light on Glassford Hill Road. All northbound Glassford Hill traffic [will] move straight through under the SR 89A to the [northernmost] traffic signal. The westbound SR 89A off-ramp retains traffic signal. Stopping twice within 100 feet a two traffic signals causes congestions. [Additionally], the lights are poorly timed".

SR 89 Intersection

- Addition of eastbound on-ramp needs to be done – "Do this 1st"!
- The existing eastbound on-ramp is "rough pavement" and "needs [to be] resurfaced"

SR 89A Mainline

- "Include wildlife over-passes north-south along the entire analysis route"
- There is a need to "[continue] analysis area for 3rd westbound lane all the way to Willow Creek Road."

7.3.4 Comments Submitted After Public Meeting

The following two additional comments were received after the public meeting:

- Sorry I had to miss the public meeting. I am concerned that the study may be skewed by its scope being too narrow.

The study counted the number of vehicles travelling thru the intersections per year and concluded that more lanes would be needed at Glassford Hill and Viewpoint intersections. Viewing the traffic in that area reveals a characteristic that casts doubt on your conclusions. A big part of the traffic only travels Hwy 89A between these two intersections. This is the only convenient route between Viewpoint subdivision (and several other nearby communities) and the Prescott Valley business district. There are no grocery stores, drug stores, hardware stores, etc in the communities north of Hwy 89A accessed by the Viewpoint interchange. The usual route for any shopping uses 89A between Viewpoint and Glassford Hill. That is a lot of traffic per year through those intersections.

Now, consider that Viewpoint Drive is laid out on the city plan to run from the Prescott Valley town center across Hwy 89A to Viewpoint. However, it is not completed. The unconstructed section would be entirely through undeveloped land, and the right-of-way may already be in public ownership. I propose that the study consider the alternative of completing Viewpoint drive to divert a lot of traffic from Hwy 98A. I expect that a good survey would confirm the likely traffic diversion, and that the relatively low construction cost, minus the foregone cost of "improvements" to the two Hwy 89 intersections would be a favorable factor. In addition, traffic diversion would be a significant safety improvement.

Please let me know if you have already considered these ideas or if you are open to including this alternative in your planning. I would that to think that our highway plans were based on the narrow method of adding lanes where traffic estimates exceed an arbitrary threshold number.

- Thank you for the 89A public meeting from 12/12/17. Budgetary plans are at least 10 years out unless a windfall for funds (taxes) happens sooner. I have 3 observations:
  - Why aren't the developers paying part of the planned interchange at Great Western on 89A?
  - I would like to see total maintenance for now from Fain Road to Highway 89. This would be from the lanes of 89A + on-ramps + off-ramps. This would be planning the highway + ramp + lay down new asphalt.
  - We were planning on a new auto, but the roads and streets are so bad in the Prescott Valley and Prescott area, we declined.

In addition, the Town of Prescott Valley submitted a letter dated October 26, 2018 prior to the public meeting:

PRESCOTT VALLEY

Town of Prescott Valley
Office of the Mayor
7501 E. Civic Circle
Prescott Valley
Arizona 86314

October 26, 2017

Chris Bridges, Administrator
Central Yavapai Metropolitan Planning Organization
1971 Commerce Center Circle, Suite E
Prescott, AZ 86301

Re: SR 89A Transportation Study
SR 89A/Robert Road- Traffic Interchange

The Town of Prescott Valley congratulates the efforts of CYMPO to lead the planning effort for the current State Route 89A Transportation Study that will address future needs for capacity, access, safety, and operational efficiency on SR 89A between the interchange with State Route 89 in Prescott and the interchange with Robert Road in Prescott Valley.

As you know, there has been a long-standing regional goal to build out the high-speed "freeway" design standard for SR 89A connections as part of ADOT's existing and planned freeway expansions in the quad-city area. That is why the Town is very concerned that the current SR 89A Transportation Study recommends construction of an interim roundabout at the Robert Road intersection. Such an interim project will only delay construction of the 'grade separated' traffic interchange at Robert Road desperately needed to reach the regional goal of a freeway design standard. Rather than pause and apply significant public funds in a way that delays the progress we've all been hoping for, we encourage CYMPO to continue moving toward the grade separated interchange at Robert Road.

Sincerely,

Harvey Skoog, Mayor
Town of Prescott Valley

8.0 PRIORITIZED RECOMMENDATIONS AND CONCLUSIONS

8.1 Prioritized recommendations

Following project development and implementation identification, a prioritized list of corridor recommendations was developed. This list provides a ranking of developed projects based upon the level of service analysis and public/stakeholder feedback received during the December 12, 2017 Public Meeting. The Prioritized Recommendations are listed in **Table 43**.

8.2 Funding

The proposed recommendations discussed throughout this document do not have secured funding nor are programmed in any state, regional, or local jurisdictional programming document to date.

Select recommendations developed into 15% design plans are located in **Appendix 9**. Detailed and planning-level cost estimates for recommended projects are provided in **Appendix 10**.

Based on the scope of work and benefit towards the system's mobility and/or safety, certain projects may be eligible for additional funding sources, such as Highway Safety Improvement Program funds, in addition to federal, state, and local funding sources with traditional allocations.

Table 43: Prioritized Recommendations

Priority Ranking	Solution Name	Solution Scope	Total Estimated Cost	Implementation Term
1	Robert Road Intersection Improvements	• Addition of a northbound left-turn lane • New mast arms, reflective signal heads on all poles • Westbound and Eastbound advanced warning beacons	$180,000	Short-term
2	SR 89 TI Eastbound Dual Lane Entrance Ramp	• Addition of a second lane on the eastbound on-ramp	$2,300,000	Short-term
3	Great Western Drive At-Grade Intersection Closure	• Close existing at-grade intersection	Implementation completed by developer	
4	Viewpoint Drive TI Eastbound Dual Left-Turn	• Restripe eastbound dual left-turn lane • Widen Viewpoint Drive northbound receiving lane north of TI (Town of Prescott Valley)	40,000 (ADOT) 130,000 (PV)* 170,000 (Total)*	Short-term
5	Viewpoint Drive TI Westbound Entrance Ramp Extension	• Restripe second lane on westbound on-ramp	$20,000	Short-term
6	Glassford Hill Road TI Eastbound Free Right	• Addition of an eastbound free-right at the TI	$350,000	Short-term
7	Glassford Hill Road TI Westbound Parallel Entrance Ramp Extension	• Extend the westbound parallel entrance ramp	$250,000	Short-term
8	SR 89 TI Eastbound Dual Left-Turn	• Addition of an eastbound left-turn lane at the TI	$120,000	Short-term
9	SR 89A Widening, SR 89 to Glassford Hill Road	• Addition of one general purpose lane in each direction of travel	$20,500,000	Mid-term
10	Great Western Drive TI	• New interchange construction	$24,100,000*	Mid-term
11	Glassford Hill Road TI Roundabouts	• Convert TI interchange to roundabout control	7,000,000**	Mid-term
12	Robert Road TI	• New interchange construction • Realignment of Robert Road & SR 89A to new interchange • Closure of existing at-grade intersection at existing Robert Road	30,400,000*/**	Mid-term
13	SR 89A Widening, Glassford Hill Road to Robert Road TI	• Addition of one general purpose lane in each direction of travel	12,100,000**	Long-term
14	Granite Dells Parkway Roundabout Modifications	• Configuration modifications	300,000**	Long-term

**Costs do not include right-of-way which may be needed.*

***Planning level cost estimate*