ARIZONA 347

Riggs Road Traffic Interchange at State Route 347

Final Design Concept Report

November 2024

ADOT

FINAL DESIGN CONCEPT REPORT

RIGGS ROAD TRAFFIC INTERCHANGE (TI) AT STATE ROUTE (SR) 347
ADOT CENTRAL DISTRICT/MARICOPA COUNTY
CONSTRUCT TRAFFIC INTERCHANGE

ADOT CONTRACT NO. 2022-004
ADOT PROJECT NO. 347 MA 184 F0476 01L
FEDERAL AID NO. NFA

Prepared For:

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

Prepared By:

Kimley»Horn

November 2024

TABLE OF CONTENTS

List of Figures

List of Tables

List of Appendices

List of Acronyms

ADT	Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
AB	Aggregate Base
AC	Asphaltic Concrete
ADMP	Area Drainage Master Plan
ADOSH	Arizona Division of Occupational Safety and Health
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
AJD	Approved Jurisdictional Determination
APE	Area of Potential Effects
APS	Arizona Public Service
ARS	Arizona Revised Statute
ASM	Arizona State Museum
ASTM	American Society for Testing and Materials
AZGS	Arizona Geological Survey
BE	Biological Evaluation
BESF	Biological Evaluation Short Form
BFE	Base Flood Elevations
BIA	Bureau of Indian Affairs
BMP	Best Management Practices
BSR	Bridge Selection Report
CAA	Clean Air Act
CATV	Cable Television
CCA	Candidate Conservation Agreement
CCT	Correlated Color Temperature
CCTV	Closed Circuit Television
CDI	Compact Diamond Interchange
CE	Categorical Exclusion
CIP	Cast in Place
CMAQ	Congestion Mitigation and Air Quality
CRMP	Cultural Resources Management Program
CY	Cubic Yards
dBA	Decibel
DCR	Design Concept Report
DDI	Diverging Diamond Interchange
DE	Drainage Easement
DEQ	Department of Environmental Quality
DMS	Dynamic Message Sign
DRI	Double Roundabout Interchange
EA	Environmental Assessment
EB	Eastbound
EO	Environmental Overview
EP	Environmental Planning
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAS	Federal Aid Secondary
FCDMC	Flood Control District of Maricopa County
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FMS	Freeway Management System
F.O.	Fiber Optic
FRS	Flood Retaining Structure
GPL	General Purpose Lane
GRIC	Gila River Indian Community
GRICPW	GRIC Department of Public Works
GRTI	Gila River Telecommunications, Inc
GRICUA	GRIC Utility Authority
HCM 6	Highway Capacity Manual, 6th Edition
HCS	Highway Capacity Software
HOA	Homeowners Association
HPTP	Historic Properties Treatment Plan
I-8	Interstate 8
I-10	Interstate 10
IBSR	Initial Bridge Selection Report
IGA	Intergovernmental Agreement
IPaC	Information for Planning and Consultation
ITS	Intelligent Transportation Systems
kV	kilovolt
LEP	Limited English Proficiency
LLF	Light Loss Factor
LOS	Level of Service
LUPZ	Land Use Planning & Zoning
MAG	Maricopa Association of Governments
MBTA	Migratory Bird Treaty Act
MCDOT	Maricopa Department of Transportation
MOA	Memorandum of Agreement
MP	Milepost
MPD	Multimodal Planning Division
mph	Miles Per Hour
MSAT	Mobile Source Air Toxics
MS4	Municipal Separate Storm Sewer System
MSE	Mechanically Stabilized Earth
MUTCD	Manual on Uniform Traffic Control Devices
NAAQS	National Ambient Air Quality Standards

NAR	Noise Abatement Requirements
NB	Northbound
NEPA	National Environmental Policy Act
NESHAP	National Standards for Hazardous Air Pollutants
NFP	National Freight Program
NHPP	National Highway Performance Program
NO2	Nitrogen Dioxide
NPDES	National Pollutant Discharge Elimination Systems
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
O3	Ozone
OP	Overpass
OSHA	Occupational Safety and Health Administration
P&R	Park and Ride
PCCP	Portland Cement Concrete Pavement
pc/mi/ln	Passenger Cars per Mile per Lane
PHF	Peak-Hour Factors
PI	Public Involvement
PISA	Preliminary Initial Site Assessment
PLZ	Potential Linkage Zone
PM10	Particulate Matter
ppm	Parts per Million
PROWAG	Public Right-of-Way Accessibility Guidelines
RARF	Regional Area Road Fund
RBA	Recommended Build Alternative
RCBC	Reinforced Concrete Box Culvert
RDG	Roadway Design Guidelines
RIRO	Right-in/Right-Out
R/W	Right-of-Way
RPTA	Regional Public Transportation Authority
RTP	Regional Transportation Plan
RTPFP	Regional Transportation Plan Freeway Program
R/W	Right-of-Way
SB	Southbound
SCIP	San Carlos Irrigation Project
SDI	Spread Diamond Interchange
SDDI	Spread Diverging Diamond Interchange
SFHA	Special Flood Hazard Areas
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SF	Square Feet
SN	Structural Number
SPUI	Single Point Urban Interchange
SR	State Route
STDI	Shifted Tight Diamond Interchange
SWPPP	Stormwater Pollution Prevention Plan
TCB	Temporary Concrete Barrier
TCE	Temporary Construction Easement
TDI	Tight Diamond Interchange
TGP	Traffic Guidelines and Processes
THPO	Tribal Historic Preservation Office
TI	Traffic Interchange
TIP	Transportation Improvement Program
TMC	Turning Movement Count
TOC	Traffic Operations Center
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
v/c	Volume to Capacity Ratio
VPD	Vehicles Per Day
VPH	Vehicles Per Hour
VPMPL	Vehicles Per Mile Per Lane
W	Watt
WAPA	Western Area Power Authority
WB	Westbound
WOTUS	Waters of the United States

Executive Summary

This Design Concept Report (DCR) describes the development, evaluation, and recommendation to provide a grade-separated traffic interchange (TI) on State Route 347 (SR 347) at Riggs Road near Milepost (MP) 185.29. This project is located within the Arizona Department of Transportation's (ADOT) Central District, on Gila River Indian Community (GRIC) lands in Maricopa County in southcentral Arizona.

Growing traffic demand has caused the SR 347 corridor to become increasingly congested during the morning and evening peak travel periods, with collisions above the statewide average occurring at the SR 347/Riggs Road intersection. Growth projections suggest the congestion and safety concerns will worsen in the future if no roadway improvements are made. A grade-separated TI will significantly increase capacity which would reduce the crash potential, alleviate traffic congestion along the SR 347 corridor, and mitigate safety issues and concerns at the existing SR 347/Riggs Road intersection.

The goals of this project are to reduce travel time, enhance regional mobility, and promote roadway and corridor safety by providing free-flow mainline movements along SR 347 through the reconstruction of the existing at-grade signalized intersection at SR 347/Riggs Road to a grade-separated TI, as recommended within the Maricopa Association of Governments (MAG) *Corridor Improvement Plan – SR 347: Interstate 10 to Peters & Nall Road Scoping Study and PEL* (2022). The primary purpose of this DCR is to develop a Recommended Alternative for the TI at this intersection.

An alternatives analysis evaluated the following TI configurations:

- Diamond Interchange (with three configuration variations including, Tight Diamond Interchange [TDI], Spread Diamond Interchange [SDI], and Shifted Tight Diamond Interchange [STDI])
- Single-Point Urban Interchange (SPUI)
- Diverging Diamond Interchange (DDI) (with a Spread DDI (SDDI) configuration variation)
- Double Roundabout Interchange (DRI)

The No-Build and Build alternatives are included in this DCR. The No-Build retains the current intersection type/configuration through the design year. Seven potential "build" alternatives were developed from these TI configurations and evaluated to determine how well each alternative improves traffic operational performance, complies with engineering design standards, minimizes right-of-way (R/W) acquisition, utility impacts, environmental impacts, and project costs while also having local agency, GRIC, and public support.

The seven build alternatives were narrowed down to two and were refined to avoid allottee impacts. The Recommended Build Alternative B1 is further analyzed in section 4 of this DCR.

Public agencies, governments, and tribes that have been involved in the alternative development and evaluation process include ADOT, GRIC, MAG, Ak-Chin Indian Community, Maricopa County Department of Transportation (MCDOT), Flood Control District of Maricopa County (FCDMC), City of Maricopa, Pinal County, GRIC Utility Authority (GRICUA), Gila River Telecommunications, Inc. (GRTI), Bureau of Indian Affairs (BIA), and Federal Highway Administration (FHWA). Continuing coordination for this project will be required with these public agencies, governments, and tribes.

This project's funding source is through 2021 State Legislative Appropriation which included $2.5M for scoping, $7.5M for design and R/W acquisitions, and $25M for construction. An additional $24M in funds for construction was added with a 2023 State appropriation, and $1.5M for design and R/W in 2024 state appropriation. Recently, construction funding of $49M was deferred to FY 2028 by the state legislature. The breakdowns of funding are shown in the table below:

Milepost	Location	Type of Work	Funds Source	Funding Amount	Fiscal Year (FY)
185	Riggs Road TI at SR 347	Scoping	Legislative Appropriation 2021 SB1820	$2,500,000	2021
		Design and R/W		$7,500,000	2021
		Construction		$25,000,000	2021 (deferred to FY 2028)
		Construction	Legislative Appropriation 2023 SB1722	$24,000,000	2023 (deferred to FY 2028)
		Design and R/W	Legislative Appropriation 2024 HB2899	$1,500,000	2024

New acquisition of R/W is anticipated. Temporary Construction Easements (TCEs) may also be required, and their locations and limits will be finalized during final design of the recommended alternative.

Coordination with adjacent construction projects may be required for this project. A project currently is under development by ADOT to widen SR 347 to three lanes in each direction from the City of Maricopa limits to Interstate 10 (I-10). Construction is not funded yet and the construction schedule is not determined and will be scheduled based on available funding.

There is also a project under development by ADOT to widen I-10 to three lanes in each direction from SR 202L (Loop 202) to SR 387. It is anticipated that a portion of this I-10 widening project will begin construction in summer 2025. I-10 and SR 347 serve as alternate routes for each other through this part of the GRIC lands, with traffic diverting from one to the other when there is a closure due to incidents or construction.

The environmental document will include all final mitigation and coordination requirements for the Recommended Alternative.

Additional reports prepared as part of this DCR include an American Association of State Highway and Transportation Officials (AASHTO) Controlling Design Criteria Report, Initial Traffic Report, Alternatives Analysis, Initial Drainage Memo, Initial Bridge Selection Report (BSR), Preliminary initial Site Assessment (PISA) and Asbestos and Lead-Based Paint Sampling and Analysis Biological Evaluation (BE), Approved Jurisdictional Determination (AJD), Cultural Class III Report, and State-level environmental clearance.

The total estimated cost for the Recommended Alternative is $74,943,969, which includes $58,084,106 for construction, $6,806,550 for R/W acquisitions, utility relocations and environmental mitigation, $4,566,220 for consultant design and post design services, and $5,487,093 for FHWA Indirect Coat Allocation Plan (ICAP). The detailed cost estimates are provided in **Section 5** of this report.

1. Introduction

1.1. Foreword

This DCR describes the development, evaluation, and recommendation to provide a grade-separated TI on SR 347 at Riggs Road near MP 185.29. The project is located within the ADOT Central District on GRIC lands in Maricopa County in southcentral Arizona. The project location and project vicinity map are shown in **Figure 1.2** and **Figure 1.3** respectively.

SR 347 is classified as a principal arterial highway with partial control of access. The posted speed on SR 347 is generally 65 miles per hour (mph) but is reduced to 55 mph at the intersection with Riggs Road. SR 347 is a major highway corridor in southcentral Arizona that connects GRIC lands and the City of Maricopa to the Phoenix metropolitan area.

The SR 347 and Riggs Road intersection existing conditions are shown in a drone photo taken in December 2022 in **Figure 1.1**.

1.2. Purpose and Need for the Project

Maricopa County has been one of the fastest growing regions in the United States. According to the U.S. Census Bureau population estimates, in 2022 more people moved to Maricopa County than any other county in the entire country. Growth continued in 2023 with a gain of over 30,000 residents. Maricopa County is the fourth most populous county in the country, with 4,585,871 residents according to July 2023 estimates.

The Arizona Department of Administration, Office of Employment and Population Statistics projects the population of Maricopa County to increase to more than six million by 2050. The City of Maricopa is near the project area and is projected to grow in population from 45,000 (2022) to 144,500 by 2040.

Growing traffic demand has caused the SR 347 corridor to become increasingly congested during the morning and evening peak travel periods, with collisions above the statewide average occurring at the SR 347/Riggs Road intersection. Growth projections suggest the congestion and safety concerns will worsen in the future if no road improvements are made. A grade-separated TI will significantly increase capacity which would reduce the crash potential, alleviating traffic congestion along the SR 347 corridor, and mitigate safety issues and concerns at the SR 347/Riggs Road intersection.

SR 347 provides a vital transportation corridor for the City of Maricopa and East Valley commuters within the Phoenix metropolitan area, as well as intrastate trucking. Many heavy vehicles pass through the SR 347/Riggs Road intersection daily. Per traffic counts collected in May 2022, heavy vehicle percentages at the intersection range from 5% to 11%.

Due to development growth in Maricopa County and in the City of Maricopa, MAG prepared the *SR 347 Scoping Study & PEL – Interstate 10 to Peters & Nall Road 2022 Study* in June 2022 to evaluate transportation deficiencies along SR 347 in southern Maricopa County. The study included analyses of SR 347 from I-10 to Peters & Nall Road, including the major intersections at I-10, Maricopa Road, Riggs Road, Mammoth Way (Cement Plant Access), and Casa Blanca Road. Without improvements, the projected 2040 peak-hour traffic volumes will exceed the available roadway capacity and result in unacceptable traffic congestion on SR 347 from I-10 to SR 238.

Figure 1.1 – Existing SR 347 and Riggs Road Intersection

MAG, the Regional Public Transportation Authority (RPTA), and ADOT have all worked together to develop a comprehensive plan for the Regional Freeway System which is included in the Regional Transportation Plan (RTP) adopted by the MAG Regional Council in November 2003.

This TI project is designated to be designed and constructed with State Legislative Appropriation Funds.

The goals of this project are to reduce travel time, enhance regional mobility, and promote safety while reducing crashes by providing free-flow mainline movements along SR 347 by reconstructing the existing intersection at SR 347/Riggs Road as a grade-separated TI, as recommended within the MAG *Corridor Improvement Plan – SR 347: Interstate 10 to Peters & Nall Road Scoping Study and PEL* (2022). The purpose of this DCR is to develop a Recommended Alternative for the TI at the existing intersection.

The proposed project on SR 347 at Riggs Road (MP 185.29) is programmed to replace the current at-grade signalized intersection with a grade-separated TI.

Access control along Riggs Road will be provided in accordance with the ADOT Roadway Design Guidelines (RDG).

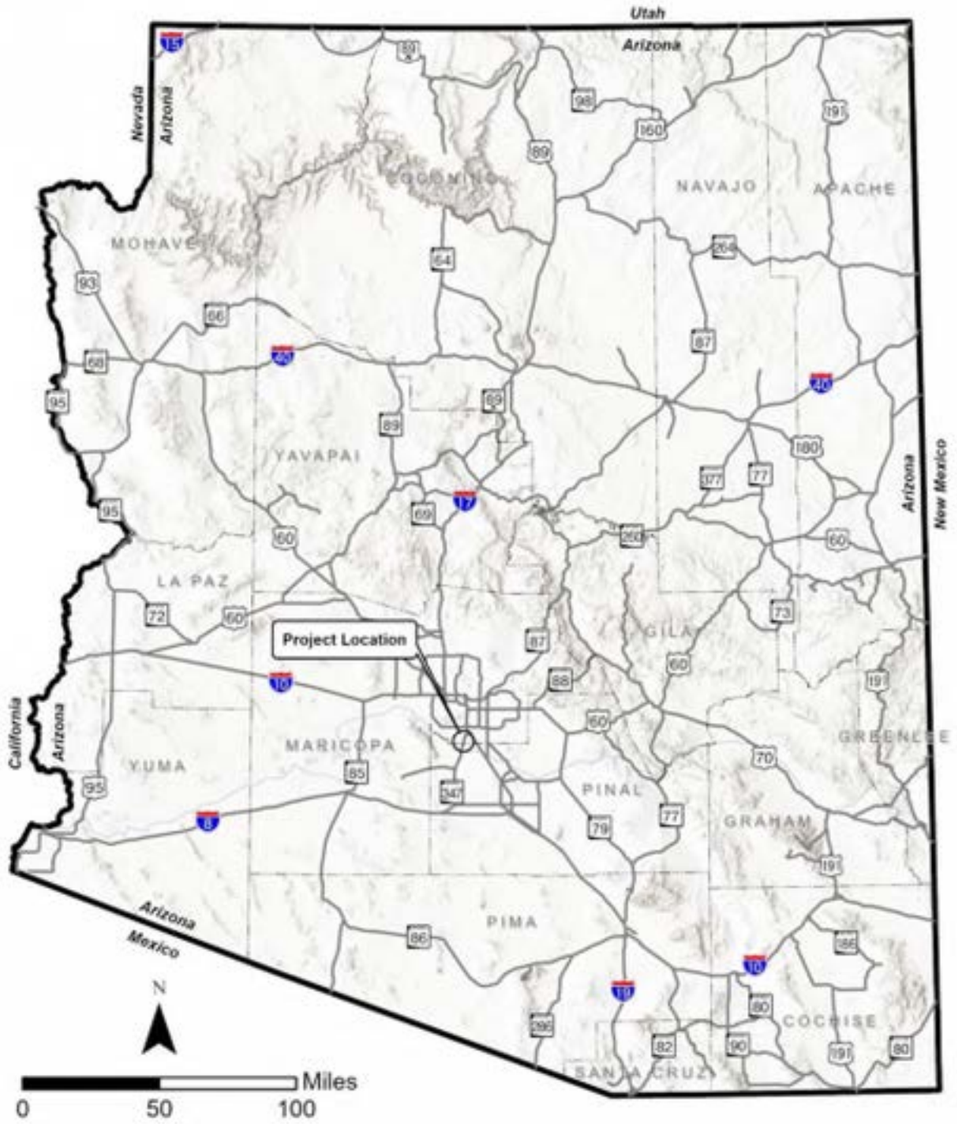


Figure 1.2 – Project Location

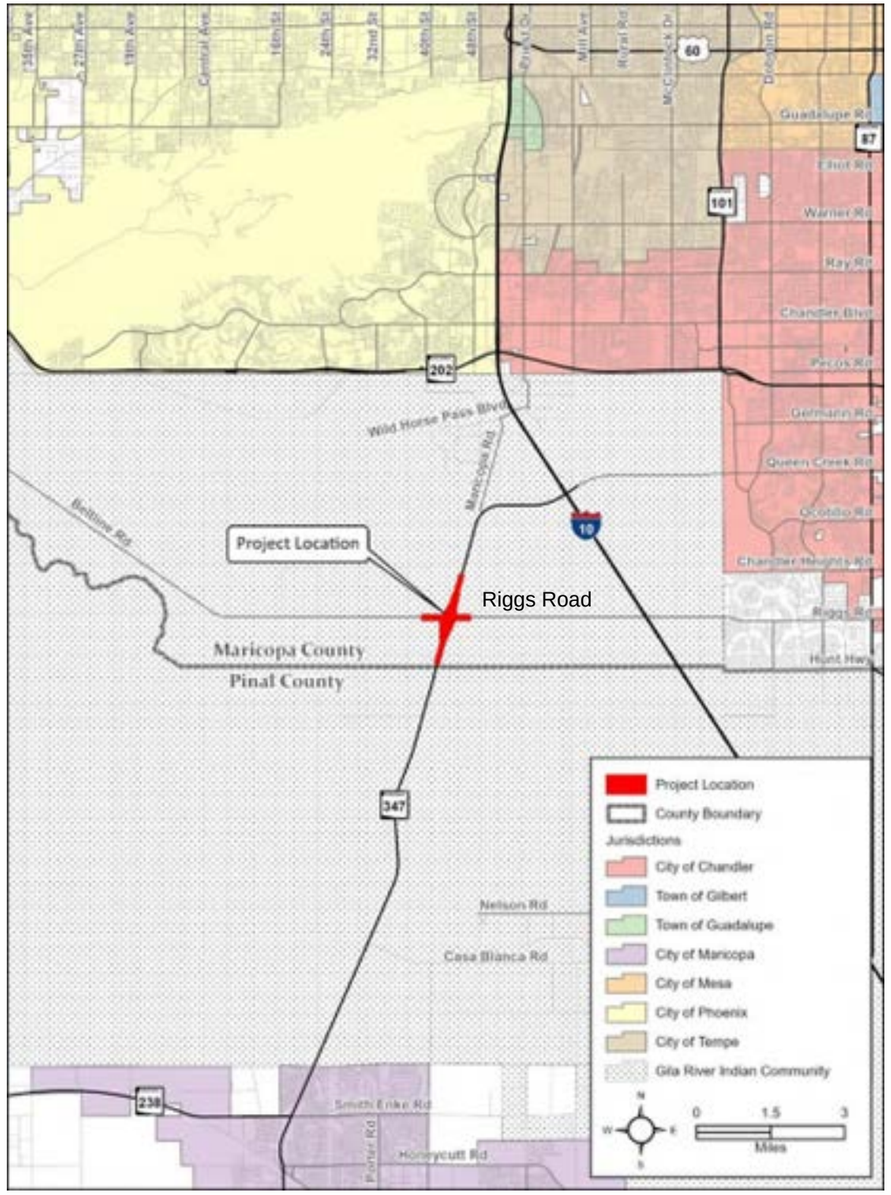


Figure 1.3 – Project Vicinity Map

The primary objective of this study is to identify a preferred alternative at SR 347 at Riggs Road by replacing the current signalized at-grade intersection with a grade-separated TI to accommodate future projected traffic volumes, reduce congestion, promote safety while reducing crashes, and improve traffic operations.

To accomplish this objective, originally Seven TI alternative improvements were analyzed for the proposed TI. These alternatives were variations of four TI configuration concepts and are detailed in Section 2 and 3. The three most favorable alternatives are a shifted diamond interchange, a shifted diamond with signalization, and a shifted DRI. These alternatives are detailed and evaluated in Sections 3 and 5 and all three include additional turn lanes, increased storage, and upgrading the existing at-grade signalized intersection configuration. SPUI, DDI, and tight diamond alternatives were also evaluated, but were collectively eliminated by the project team due to major utility conflicts and because they do not provide any additional traffic operational benefits. Findings from this early evaluation analysis are included in **Appendix G**.

All alternatives analyzed the median areas and findings show that the median along SR 347 will either remain open, or barriers may be needed to protect bridge piers if required.

A detailed description of the items of work and evaluation of the alternatives for this project are included in Sections 3 and 4 of this report with cost estimates included in section 5.

1.3. Description of the Project

Roadway

SR 347

SR 347 travels from I-10 south to SR 84 through Maricopa County, Arizona and is approximately 29 miles long. Providing a quick route to the City of Maricopa, through GRIC and the Ak-Chin Indian Community lands, SR 347 is also a shortcut to San Diego and Interstate 8 (I-8) for metro Phoenix's East Valley residents.

SR 347 was added to the state highway system in 1988. However, like most roads added to the system in the 1980s, the road itself is much older, dating back to the 1930s. The road was reconstructed as part of its conversion from a state highway into a four-lane expressway in the 1990s and has had several upgrades and additions in the years since. The As-built record drawings of previous projects that were used to develop the alternatives and options are summarized in **Table 1.1**.

SR 347 was planned to be called the John Wayne Expressway at one point, but that name was dropped due to controversy. The route number is derived from the original Federal Aid Secondary (FAS) route number – FAS 347.

ADOT now classifies SR 347 as a principal arterial. The existing posted speed limit on SR 347 within the project limits is 55 mph at the Riggs Road intersection and 65 mph outside the Riggs Road intersection.

The SR 347 northbound (NB) and southbound (SB) roadway sections include two general purpose lanes (GPLs) in each direction that are each 12 feet wide. Approaching the Riggs Road intersection, the SR 347 NB and SB roadway sections both include one left-turn lane and one right-turn lane in each direction that are each 12 feet wide.

The SR 347 NB and SB lanes are separated by an unpaved median that is 38 feet wide. Inside paved shoulders are 4 feet wide or less for both NB and SB travel lanes. Outside paved shoulders are 10 feet wide in both directions as well.

Along SR 347, standard 2% cross slopes are consistently maintained. The horizontal alignment of SR 347 is tangential throughout the project limits. The terrain throughout the corridor is level, with maximum grades along the SR 347 mainline at 0.7%.

Table 1.1 provides a list of previous projects constructed within the study area.

Table 1.1 – Previous Projects within the Study Area

Project No.	Begin MP	End MP	Completion Date	Description
STP-347-A(002)A	174.00	184.23	2008	MARICOPA – COUNTY LINE – MILL AND REPLACE
347-A-NFA	184.25	189.38	2008	COUNTY LINE – QUEEN CREEK TI – MILL AND REPLACE
RS-347(14)P	175.60	184.20	1993	COUNTY LINE – SR 238 – RECONSTRUCTION
RS-347(13)	184.00	188.90	1992	QUEEN CREEK TI – COUNTY LINE – GRADE, DRAINAGE, AND PAVING

The highway traverses primarily undisturbed desert landscape through this segment of the roadway corridor. SR 347 south of Riggs Road can also be described as undeveloped desert land but strongly influenced by periodic water flows (sometimes heavy) from the Gila River, Santa Cruz River, and associated tributary washes. SR 347 continues south of Riggs Road to the City of Maricopa and beyond. The Maricopa-Pinal County line crosses SR 347 approximately one mile south of Riggs Road.

Riggs Road Intersection

The SR 347/Riggs Road intersection is located along SR 347 at approximately MP 185.29 and consists of a signalized intersection with auxiliary turn lanes. ADOT classifies Riggs Road as a principal arterial roadway with a two-lane roadway section.

The SR 347/Riggs Road intersection provides a secondary access route between the SR 347 corridor and I-10 approximately four miles to the east, providing access to and from GRIC. Approximately 2.25 miles north of the project, Maricopa Road provides direct access to the Huhugam Heritage Center and southern access to the Wild Horse Pass Casino and other nearby GRIC facilities. To the west of the project area, Riggs Road becomes Beltline Road until it turns directly north to 51st Avenue, providing connectivity to the community of Laveen in Maricopa County.

Riggs Road eastbound (EB) and westbound (WB) roadway sections include one GPL in each direction that are each 12 feet wide. Approaching the SR 347 intersection, the Riggs Road EB and WB roadway sections include one left-turn lane in each direction that are each 12 feet wide.

Riggs Road is undivided and does not have a median, and the outside paved shoulders are 6 feet wide generally for both EB and WB directions. The terrain throughout the intersection and neighboring areas is level, with grades meeting current standards, and the curves meeting vertical stopping sight distance criteria. Superelevation is not used along Riggs Road in this area.

Revolution Industrial, a manufacturing development, is located on the northside of Riggs Road approximately 1,500 feet west of SR 347. There is a potential future commercial/retail development for a service station/convenience store being planned at the northwest corner of SR 347 and Riggs. The other corners of the intersection are undeveloped GRIC lands.

Riggs Road through the project limits is under MCDOT's jurisdiction, which just recently completed a roadway and shoulder rehabilitation project on both the east and west ends of the project limits (MCDOT: TT157, ADOT TRACS: S347 A 501, HX 173 01C).

Existing Right-of-Way

Existing R/W along SR 347 is generally offset 90 feet from the SR 347 Median Construction Centerline. Just south of the project, the R/W on the east side of the road increases to 95 feet from the centerline. Just north of the project the R/W decreases to 85 feet on the west side and 70 feet on the east side of the centerline. The R/W on the east side of SR 347 increases to 100 feet at the Riggs Road interchange. The overall R/W width varies from a minimum of 155 feet north of the Riggs Road interchange to a maximum of 190 feet at the Riggs Road interchange. Existing R/W along Riggs Road is offset 50 feet from the Riggs Road Construction Centerline. All of SR 347 and most of Riggs Road are within existing GRIC land easements in the study area. A portion of Riggs Road east of SR 347 is within Allotted Land easement in the vicinity of the SR 347/Riggs Road intersection.

Transit Facilities and Routes

There are no bus routes throughout the project limits, nor are there any Park-and-Ride (P&R) lots in operation near the study area.

Land Use

The land on which the SR 347 R/W is located is GRIC trust land. ADOT holds an easement reserved for transportation use over such lands. MCDOT has an easement along Riggs Road. Adjacent land outside of the R/W is either GRIC or GRIC allottee lands.

Utilities

Within the study area, there are several utility owners with facilities crossing or adjacent to SR 347 including:

ADOT, GRTI, GRICUA, GRIC Department of Public Works (GRICPW), and San Carlos Irrigation Project (SCIP). A GRICUA power substation, a major utility facility, is located at the northwest corner of the intersection as shown in **Figure 1.4**.

A utility inventory was developed using information collected from field observations, Arizona811 Blue Stake ticket requests, ADOT permits, record drawings, and quarter-section maps. ADOT Utilities and Railroad Group contracted with T2 Utility Engineers who performed horizontal utility designation for the project. This information is summarized in **Table 1.2** below.

Figure 1.4 – GRICUA Power Substation

Utility Type	Ownership	Begin Station	Begin Offset	End Station	End Offset	Begin Milepost	End Milepost	ADOT Permit No.	Record Drawing No.	Inside ADOT Right of Way	Crossing SR 347	ADOT Constructed	Notes
Storm Drain	ADOT	2619+84.02	83.32' Rt	2630+54.41	88.29 Rt	185.11	185.32	-	SS241 01C	Yes	Yes	Yes	Begin/End Station are based on the limits for multiple culverts
Signal Electric	ADOT	-	-	-	-	-	-	-	SS241 01C	Yes	Yes	Yes	
Electric	GRICUA	2618+36.29	1904.59' Lt	2674+98	80.27 Lt	185.08	186.16	-	-	Yes	Yes	No	
Fiber	GRTI	2629+32.95	82.52' Lt	2674+98	77.52' Lt	185.29	186.16	-	-	Yes	No	No	
Cable	GRTI	2575+41.37	82.15' Lt	2674+98	80.27' Lt	185.29	186.16	-	-	Yes	No	No	
Water	GRICPW	2629+31.59	179.31' Lt	2674+98	112.96' Lt	185.29	186.16	-	-	No	No	No	Outside existing ROW

Table 1.2 – Existing Utilities

GRTI has two network fiber backbones (cabling) that cross Riggs Road north to south, and a copper/fiber line run that deviate to Komatke west along the north side of Riggs Road. Both provide critical infrastructure for the GRIC, as well as for GRTI's subsidiary provider, Alluvion. There are no other connections to communication facilities that reroute services, so minimizing relocations and impacts to these facilities is important.

GRICUA has existing overhead powerline located on the west side of the southbound SR 347 roadway coming from north along SR 347 that ties into the existing substation. Another overhead powerline comes from the northwest towards the southeast and ties into the substation. A 69-kilovolt (kV) overhead powerline coming out of substation crosses Riggs Road approximately 200 feet west of SR 347, runs east parallel and south of Riggs Road crossing SR 347, and then departs southeast of the intersection. Due to the proposed grade separation and required new bridge for the project, all potential build alternatives will require GRICUA relocations. The electrical substation and all powerlines are owned by SCIP within GRIC within this project limits and are operated and maintained by GRICUA through a 638 contract with the BIA.

GRICPW has an existing waterline along southbound SR 347 coming from the north, traverses northwest of the substation, and continues west along north side of Riggs Road. GRICPW has confirmed that the water from the hydrant at the northwest corner can be used for construction with continued coordination and approval from GRIC during final design.

Drainage

The land adjacent to SR 347 and Riggs Road is undeveloped and slopes from southeast to northwest towards the Gila River. Neither SR 347 nor Riggs Road has curb and gutter throughout the project limits, and therefore pavement runoff sheet flows off the existing pavement and into roadside ditches.

SR 347 has a Class III drainage classification according to the ADOT RDG which requires that the 25-year regulatory storm event pass with no overtopping. ADOT has indicated that SR 347 is anticipated to be upgraded to Class II drainage classification in the near future so the proposed culverts have been designed such that the 50-year storm event will not overtop the roadway.

Offsite Hydrology

An offsite hydrology model was prepared using FLO-2D where 15-foot by15-foot grids were established for the watershed. United States Geological Society (USGS) 2022 mapping was used to develop a terrain, and Green and Ampt parameters were assigned using Natural Resources Conservation Service (NRCS) soils and existing land uses. The watershed impacting the project location extends east of I-10 and downstream of SR 347 for approximately one mile, and the existing culverts under SR 347 and I-10 were included as hydraulic structures.

The 50- and 100-year, 6-hour storm event was modeled, and it was found that the 6-hour storm duration controls design. Neither of the storm events showed overtopping along SR 347; however, the runoff ponds along SR 347 before discharging through the intersection. See **Figure 1.5**.

The 50-year, 6-hour flow depths near the intersection and for the entire watershed from I-10 through the project limits to the east are included in the Drainage Memo in **Appendix F**.

Existing Structures

Box Culverts

There are two existing reinforced concrete box culverts (RCBC) near the Riggs Road TI. There is a triple 6-foot by 3-foot RCBC that crosses SR 347 located approximately 915 feet south of Riggs Road. See **Figure 1.6**. There is also a single 8-foot by 3-foot foot RCBC that crosses SR 347 located approximately 80 feet north of Riggs Road. ADOT Record Drawings indicate that the structures were constructed in place in 1993. During a site visit on December 22, 2022, the concrete box culverts looked to be in very good condition with no areas of concern. Discussions with the District maintenance staff indicated that there have been no known incidents of damage from flooding or storm events.

The west headwall of the box culvert north of Riggs Road crossing SR 347 is currently outside the existing clear zone (30 feet from traveled way) and SR 347 R/W. The east headwall is 32 feet from the edge of traveled way and ties into the R/W fencing and is marked by delineators. The headwalls of the box culvert south of the intersection are also outside of the existing clear zone and inside the existing SR 347 R/W. The west headwall is 36 feet from the traveled way, and the east headwall is 30 feet from the traveled way. Neither are marked by delineators. The fencing for both sides of the roadway is along the R/W and does not tie to the headwalls. It is anticipated that drainage structures will require removal due to the major reconfiguration of the intersection to a grade-separated TI.

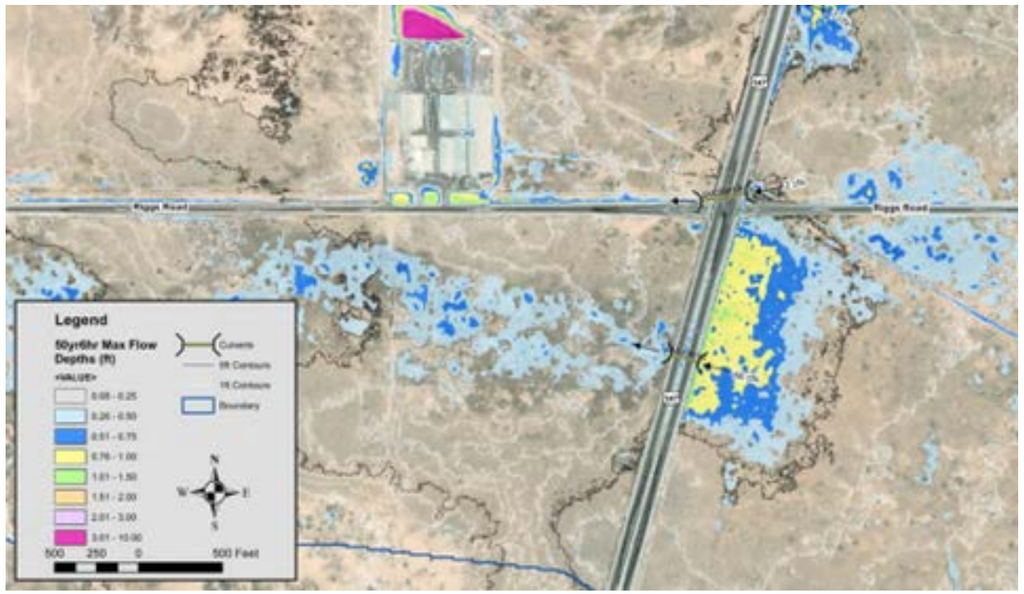


Figure 1.5 – Intersection 50-Year, 6-Hour Flow Depth Results

Figure 1.6 – 6-Foot by 3-Foot Box Culvert (Looking West)

Cattleguards

There are two existing cattleguards with a concrete structure underneath which help convey drainage through the intersection. The first is a six-unit cattleguard that crosses Riggs Road 90 feet to the west of the SR 347 centerline. The second crosses Riggs Road 90 feet to the east of the SR 347 centerline. These cattleguards will require removal and reconstruction due to the major reconfiguration of the intersection to a grade-separated TI.

Existing Signing, Lighting, Traffic Signals, Intelligent Transportation System (ITS)

Signing

The existing intersection of SR 347 and Riggs Road is signed as a rural at-grade intersection. All approaches contain “traffic signal ahead” warning signs on the right shoulder of the roadway approaching the intersection. The NB and SB SR 347 approaches contain ground-mounted lane-use signing, and “wrong way” signing in both the median and the right shoulder. Interstate shield guide signs on the right shoulder provide motorist guidance to I-10. The EB and WB Riggs Road approaches contain two-post ground-mounted destination guide signs.

A two-post guide sign “Interstate 10, 4 miles” is located on the NB departure side of the intersection.

All existing signing will conflict with the proposed improvements and will be removed during construction.

An existing Gila River display board, located along the southbound travel lanes south of the intersection, may require relocation with the project.

Figure 1.7 – GRIC Display Board (Looking South along SR 347)

Lighting

The intersection is currently illuminated with luminaires mounted onto existing traffic signal poles. These poles and luminaires will be removed with the proposed improvements and replaced with new interchange lighting systems. Additional lighting will be installed at the gore points of the entrance and exit ramps along SR 347.

Traffic Signals

The intersection is currently controlled with a traffic signal. The existing traffic signal will be completely removed during construction. ADOT may choose to salvage the existing thermo detection and video detection cameras. The existing traffic signal may temporarily remain in operation to provide traffic control during the initial phases of construction, and phasing will dictate when the traffic signal will be fully removed.

Existing wireless radio equipment will be relocated to the new signal infrastructure. Connection to adjacent signals will be reestablished when the new signal is operational.

ITS

There is no ITS system nor Freeway Management System (FMS) deployments within the proposed project limits.

Existing Pavement Markings

The existing pavement markings follow ADOT standards for a rural, at-grade signalized intersection. Yellow dotted-line-through-intersection markings are present to guide left-turning vehicles on all approaches. All pavement markings near the intersection will conflict with the proposed improvements and will be completely removed via sawcut and replaced during future construction of the grade-separated interchange.

Geotechnical and Existing Pavement Conditions

Site and Geotechnical Conditions

Riggs Road is a two-lane asphaltic concrete (AC) paved road with shoulders. Left-turn lanes are present at the intersection in both directions. SR 347 is a four-lane road with both left- and right-turn lanes at the intersection. The SR 347 and Riggs Road roadways in both directions are elevated approximately 4 to 6 feet above surrounding site grades. A GRICUA electrical substation is located within a fenced yard at the northwest corner of the intersection. Overhead power lines extend north and east from the substation. No other development exists near the intersection. Vegetation beyond the roadway embankment limits consists of typical scattered desert shrubs and bushes.

Generalized subsurface conditions for this location were determined based on review of record drawings completed for the I-10 Riggs Road TI (1962) and the I-10 Queen Creek Road TI (1989) bridges constructed in the general vicinity, as well as our understanding of the general geologic conditions throughout this area. The project site is in the Basin and Range Province of the southwestern United States, which is characterized by a modern landscape consisting of broad alluvial valleys interspersed with and bounded by uplifted and fault-block mountain ranges, often with well-developed pediments and alluvial fans. Generally, these mountain ranges and valleys trend in a north-south to northwest-southeast direction. The modern landscape was formed by late Tertiary (Miocene-Pliocene) extensional tectonism and high-angle normal faulting, followed by subsequent erosion of the uplifted mountains and deposition of the sediments in the newly formed basins.

Published geologic mapping indicates that surficial geologic units at the project site consist of late and middle Pleistocene-age surficial deposits consisting of unconsolidated to weakly consolidated deposits associated with older fluvial systems. This geological unit consists primarily of poorly graded sediment on alluvial plains, but also includes gravelly channel, terrace, and alluvial fan deposits on middle and upper piedmonts (*Richard et al 2000*).

Based on review of the logs from the other bridge sites and observations at the site, the subgrade conditions can be grouped into three general descriptions: fill, near-surface native soils, and deeper native soils. It is assumed the existing embankment fill materials are of similar composition as that of the near-surface soils.

The As-built plans indicate typically firm to very firm, non-plastic to low plasticity silty sand (SM), and medium plasticity clayey sand and sandy clay (SC/CL) in the upper 4 to 6 feet. These soils are typically weakly cemented with calcium carbonate (lime). Similar soils of similar firmness are anticipated to be found within the embankments. The underlying native soils appear to consist of hard/dense to very dense, non-plastic sand (SP/SW), SM with underlying finer grained layers of low plasticity clayey silt (ML), and minor silty clay (CL/CH) layers. Cementation within these underlying hard soils varies from none to moderate.

Groundwater was not encountered within the test borings that were advanced for the I-10 Riggs Road TI and I-10 Queen Creek Road TI locations (maximum depth of 71 feet). Groundwater is not anticipated to affect construction of this project. Local storm runoff could impact construction following storm events. A Stormwater Pollution Prevention Plan (SWPPP) will be developed to mitigate stormwater runoff during construction.

Existing Pavement

The existing pavement appears to be in fair condition along the SR 347 approaches to the intersection. Even though cracking is evident across all travel lanes and within the shoulders, the condition is still considered fair. Moderate to widely spaced (5- to 20-foot) transverse and longitudinal cracks are evident. Most cracks appear to have been recently sealed.

The pavement along Riggs Road appears to be in somewhat better condition with similar spaced cracks. However, little if any crack sealing has been performed along Riggs Road. Open cracks of up to ½-inch wide were apparent west of the intersection at the time of the site visit in 2022. Alligator cracking, indicative of poor subgrade or excess moisture, was observed adjacent to the cattle crossing to the immediate west of the intersection and tighter (1- to 3-foot) spaced cracks were observed in the right wheel path of EB Riggs Road. The existing pavement structural sections that were constructed with the previous projects are provided in **Table 1.3**. **Table 1.4** provides a history of the existing pavement based on our review of As-built plans.

The existing pavement in the intersection appears to be in fair condition.

Table 1.3 – Summary of Record Drawing Plans for Existing Roadway

ADOT/MCDOT Project No.	Mile Post Limits	Date of Plans	Description of Construction	AR-ACFC (in)	PCCP (in)	AC (in)	AB (in)
RS-347(13)	184-188.9	4/1/1993	SR 347 Construction Queen Creek TI to County Line – Mainline Lanes	0.5 (ACFC)	-	4.0	10.0
RS-347(13)	184-188.9	4/1/1993	SR 347 Construction Queen Creek TI to County Line – Mainline Shoulders	-	-	4.0	10.0
RS-347(13)	184-188.9	4/1/1993	SR 347 Construction Queen Creek TI to County Line – Riggs Road	0.5	-	4.0	10.0
347-A-NFA	184.25-189.38	12/16/2008	SR 347 Mill and Replace County Line to Queen Creek TI – Mainline Travel Lanes	0.5	-	4.0	-
347-A-NFA	184.25-189.38	12/16/2008	SR 347 Mill and Replace County Line to Queen Creek TI – Mainline Passing Lanes	0.5	-	2.0	-
347-A-NFA	184.25-189.38	12/16/2008	SR 347 Mill and Replace County Line to Queen Creek TI – Mainline Shoulders	-	-	2.0	-

ADOT/MCDOT Project No.	Mile Post Limits	Date of Plans	Description of Construction	AR-ACFC (in)	PCCP (in)	AC (in)	AB (in)
TT157	-	9/15/2005	Riggs Road at SR 347 Intersection Improvements – Riggs Road Shoulders	-	-	5.5	6.0
TTTMP081	-	8/14/2012	Riggs Road Construction at Maricopa Road – Riggs Road	-	-	6.0	4.0

Table 1.4 – Summary of Existing Pavement Structural Sections

Location	AR-ACFC (in)	PCCP (in)	AC-EP (3/4) Spec. (in)	AC (1/2) Spec. (in)	AB (Class 2) (in)	Total Thickness (in)
SR 347 Lanes	0.5	-	6.0	-	10.0	16.5
SR 347 Shoulders	-	-	6.0	-	10.0	16.0
Riggs Road Travel Lanes	-	-	3.5	2.5	4.0	10.0
Riggs Road Shoulders	-	-	3.5	2.5	4.0	10.0

2. Traffic and Crash Data

2.1. Crash Summary

Analysis was conducted on crashes occurring along SR 347 within approximately 0.5 miles north and south of Riggs Road, and along Riggs Road within approximately 0.125 miles east and west of SR 347 to identify any crash patterns or trends that may be present within the project limits.

Crash data was obtained from ADOT for the dates between January 1, 2017, and December 31, 2021, which was the 5-year timeframe for which the most current data was available at the time the analysis was conducted.

A total of 306 crashes were reported in the vicinity of SR 347/Riggs Road. Of the 306 total crashes, 183 crashes resulted in no injuries (60%) and five crashes resulted in one or more fatalities (2%). The three most common crash types were rear-end crashes (212 crashes/69%), left-turn crashes (30 crashes/10%), and same-direction sideswipe crashes (24 crashes/8%). Summaries of the total crashes by year, crash severity, and crash type as a percentage of crash severity can be found in **Figure 2.1**, **Figure 2.2**, and **Figure 2.3**, respectively. The "Other" category in these figures includes all other crashes (e.g., single vehicle, head-on, opposite-direction sideswipe, and rear-to-side). **Figure 2.4** shows the locations of all crashes within the study period. **Figure 2.5** shows the locations of suspected serious injury and fatal crashes within the data period.

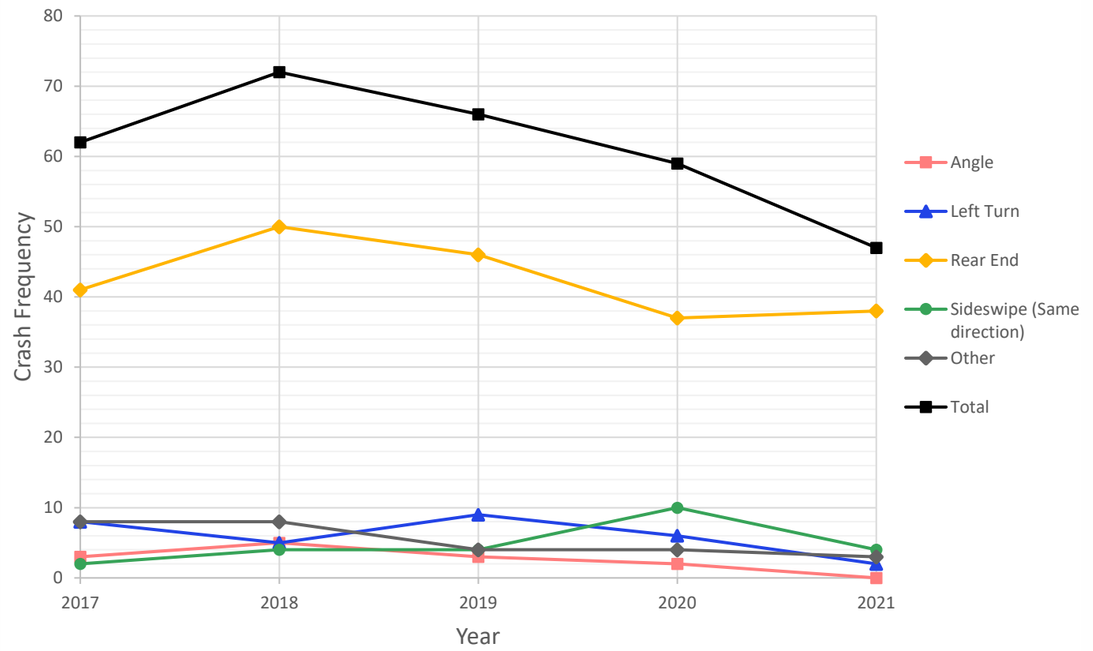


Figure 2.1 – Crash Type by Year

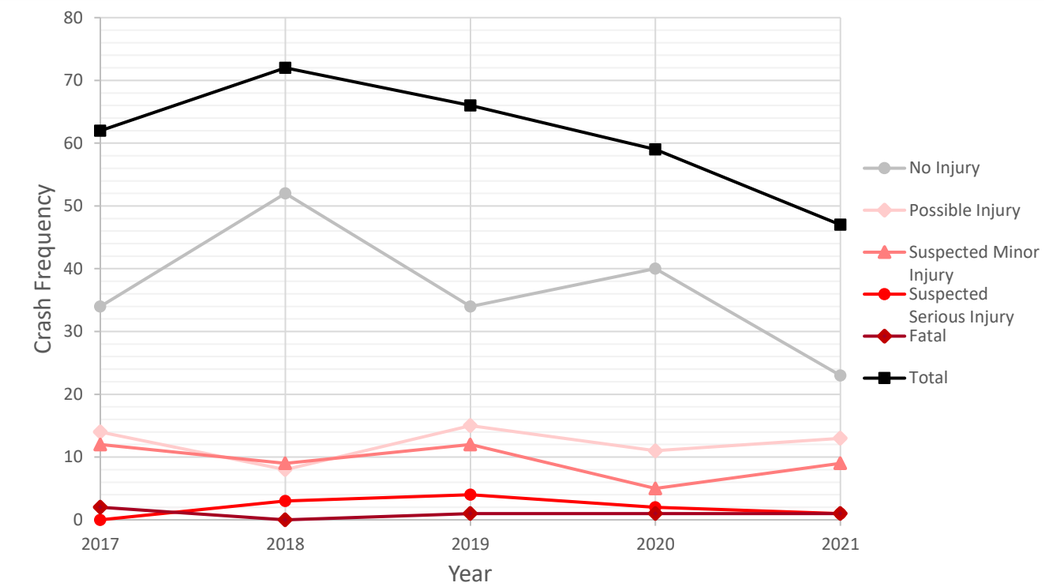


Figure 2.2 – Crash Severity by Year

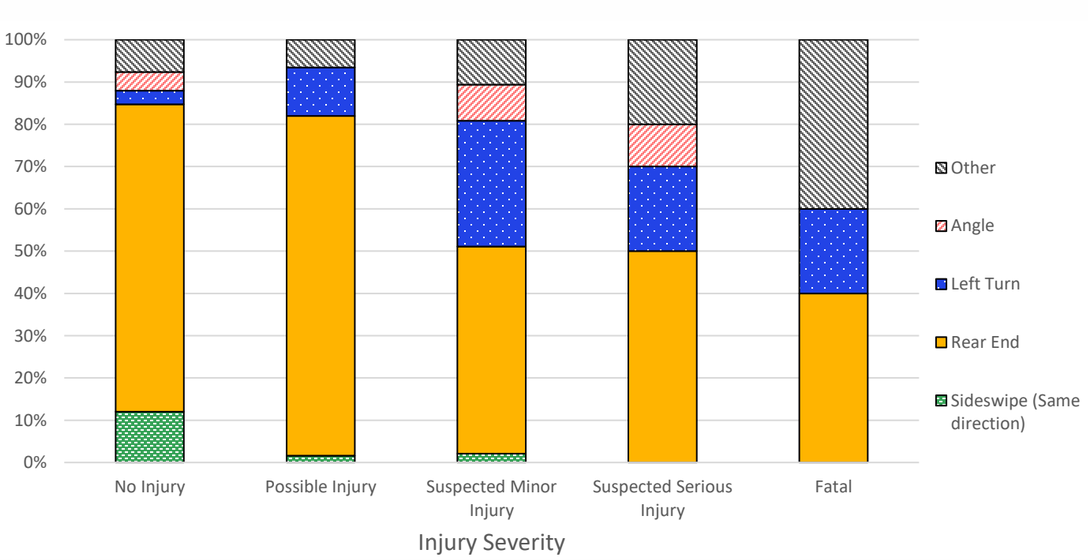


Figure 2.3 – Crash Type as a Percentage of Crash Severity

Figure 2.4 – Crash Map – All Crashes

Figure 2.5 – Crash Map – Suspected Serious Injury and Fatal Crashes

The crash data shows that nearly 70% of crashes were rear-end crashes, most of which occurred on the SR 347 mainline. The high frequency of rear-end crashes on SR 347 at Riggs Road is anticipated to decrease greatly with the addition of a grade-separated TI, as SR 347 mainline through traffic will no longer need to stop. The moderate frequency of left-turn crashes (about 10%) may be mitigated by the signal timing and/or geometric changes associated with the addition of an improved TI. The moderate frequency of sideswipe crashes (about 8%) may also be mitigated by the installation of a future TI upgrade since drivers may currently switch lanes more frequently and unsafely in response to the long queues at the current at-grade intersection.

Most crashes occurred on the SR 347 mainline approaching the intersection. All suspected serious injury and fatal crashes occurred either at the intersection or on the SR 347 mainline approaching the intersection. Crash data provided in the ADOT SR 347/SR 84 Corridor Profile Study (2018), and MAG Corridor Improvement Plan (2021) both show that this section of SR 347 has below-average safety performance compared to applicable state averages, suggesting safety issues exist on SR 347 at Riggs Road.

2.2. Traffic Analysis

AM and PM peak-period turning movement counts (TMCs) were collected at the SR 347/Riggs Road intersection on Thursday, May 19, 2022, between 6:00 AM and 9:00 AM and again between 3:00 PM and 6:00 PM. Because SR 347 is a significant truck route, separate TMCs were collected for passenger cars and heavy vehicles. Bi-directional daily vehicle classification counts were also collected on all four legs of the intersection to determine the distribution of vehicle types on each leg. The existing TMCs and bi-directional average daily traffic (ADT) volumes for the intersection legs are shown in **Figure 2.6**.

The EB and WB approach volumes on Riggs Road are similar during both the AM and PM peak hours, with WB traffic volumes being slightly higher on average. However, on SR 347 volumes are heavily directionally skewed. The NB approach volumes are nearly three times greater than the SB approach volumes in the AM peak hour, and the SB approach volumes are nearly 1.5 times greater than the NB approach volumes in the PM peak hour.

Many heavy vehicles pass through the SR 347/Riggs Road intersection daily. Heavy vehicle percentages were calculated for each intersection leg using the collected daily vehicle classification counts. The existing SR 347/Riggs Road heavy vehicle percentages are shown in **Figure 2.6**.

Table 2.1 summarizes the existing ADT, K-factors (design peak-hour percentage of daily volume), D-factors (directional split), and T-factors (heavy vehicle/truck percentage) for each leg of the intersection. For the purposes of this analysis, heavy vehicles were defined as vehicles in the FHWA Classes 6-13. More information on existing traffic counts can be found in **Appendix G**.

Table 2.1 – SR 347/Riggs Road Intersection Existing Traffic Summary

Input	Intersection Leg			
	North Leg	South Leg	East Leg	West Leg
ADT	47,629	53,343	4,476	3,777
K-Factor	7%	7%	10%	10%
D-Factor	73%	63%	64%	61%
T-Factor	5%	5%	6%	11%

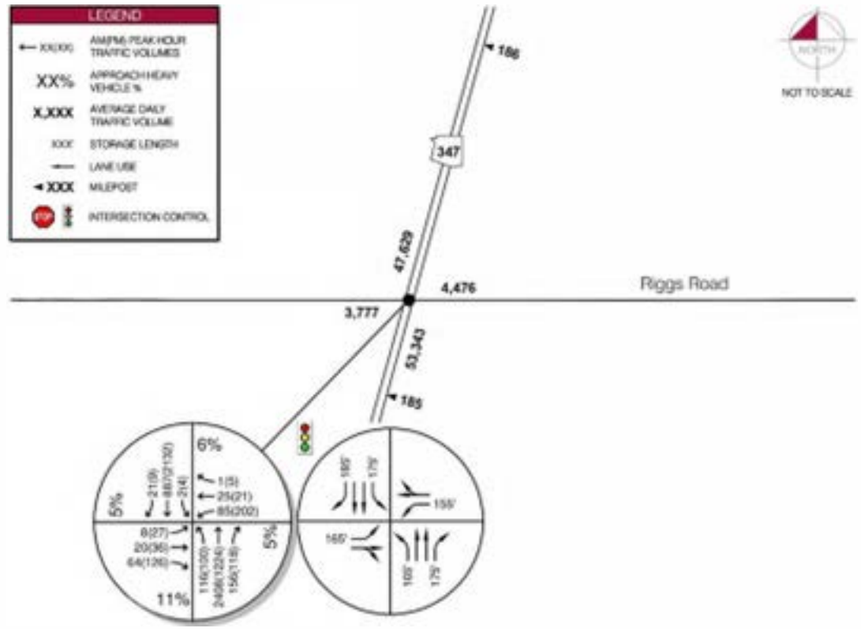


Figure 2.6 – Existing Conditions

2.3. 2050 MAG Traffic Models

The future traffic volumes used for the analysis are based on the 2050 travel demand model developed by MAG to evaluate the Phoenix area's transportation system. The MAG regional travel demand model is based on projected socioeconomic, population, employment, origin-destination, and other regionally based data.

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

- *2020 Existing* – Existing roadway network with estimated 2020 model volumes
- *2050 No-Build* – Existing roadway network with projected 2050 model volumes
- *2050 Build* – Existing roadway network plus programmed improvements with projected 2050 model volumes

The 2050 Build MAG model assumes SR 347 is widened to three lanes in each direction throughout the project limits. It also assumes that a grade-separated TI is constructed at SR 347/Riggs Road. The MAG model volumes are shown in **Appendix G**.

2.4. 2050 TI Build Analysis Scenarios

The following TI configurations were analyzed at the study intersection under the 2050 Build conditions:

- Diamond Interchange with three configuration variations of:
  - Tight Diamond Interchange (TDI)
  - Spread Diamond Interchange (SDI), and
  - Shifted Tight Diamond Interchange (STDI)
- SPUI
- DDI (with a Spread DDI configuration variation)
- DRI

Figure 2.7 shows the illustrations of the various interchange configurations.

All three Diamond Interchange variations utilize two signalized intersections. Each signalized intersection controls off-ramp and on-ramp traffic in one direction of SR 347 traffic (either NB or SB traffic). A TDI has closely-spaced ramp intersections while an SDI has ramp intersections spread farther apart. If a TDI or SDI along with the mainline lanes are shifted away from the current alignment, that is known as an STDI. For purposes of this traffic analysis and to simplify the display of traffic analysis results, the SDI configuration represents the SDI, TDI, and STDI configurations as all three have similar traffic analysis results.

The SPUI configuration utilizes one signalized intersection. All through and left-turning traffic is controlled by the traffic signal, while right-turning traffic is channelized with yield or signal control.

In the DDI configuration, EB and WB traffic on Riggs Road cross each other onto opposite sides of the roadway. This configuration eliminates all left-turn crossing conflicts, with left-turning traffic driving on the left side of the crossroad. This eliminates the need for left-turn signal phasing on the crossroad. The two crossover points are signalized. The points where SR 347 ramp traffic merges with Riggs Road traffic would typically have signal or yield control.

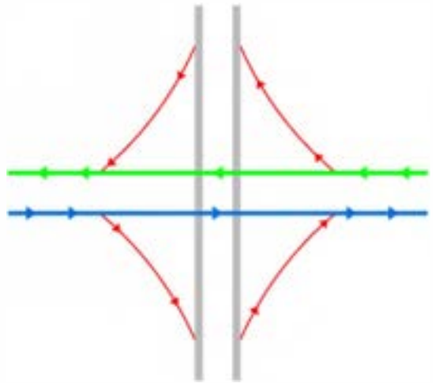
The DRI configuration is similar to the SDI but replaces the signalized intersections with roundabouts. The DRI evaluated for this project is known as a “teardrop” or “dogbone” configuration style.

2.5. 2050 Freeway Mainline Analysis

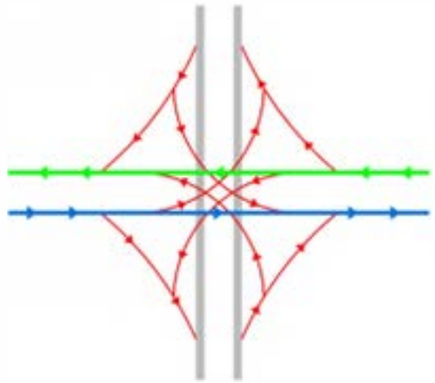
For the 2050 Build condition, SR 347 is assumed to be widened to three GPLs in each direction with grade-separation at Riggs Road. This grade-separation with TI ramps effectively results in SR 347 functioning like a freeway in the vicinity of Riggs Road. As such, a freeway mainline and ramp analysis was conducted for SR 347 in the 2050 Build condition.

2.6. 2050 Traffic Volumes

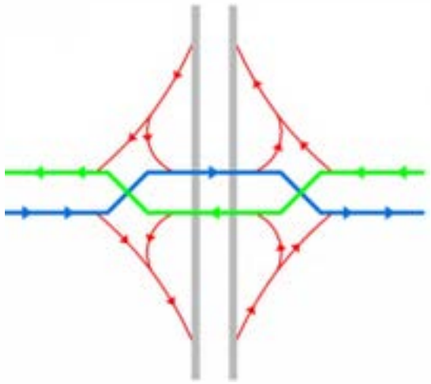
The daily traffic volumes from the MAG 2020 Existing model were compared to the 2050 No-Build and Build model volumes to calculate average annual growth rates for both SR 347 and Riggs Road. This was done for both the 2050 No-Build and 2050 Build conditions. These growth rates were then applied to the 2022 turning movement counts to determine the 2050 No-Build and 2050 Build peak-hour traffic volumes. The annual growth rates that were used in the analyses are shown in **Table 2.2**. The 2050 traffic volumes account for known planned development in the area per information provided by GRIC and in the GRIC *Wild Horse Pass Master Plan* prepared in 2019.



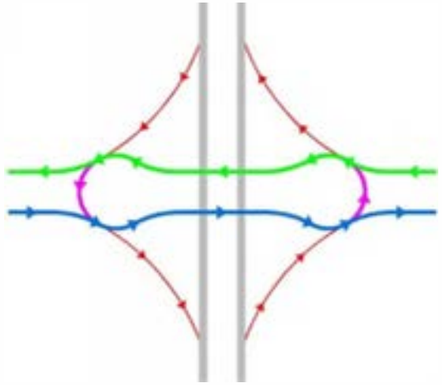
Diamond Interchange Configuration



Single-Point Urban Interchange Configuration



Diverging Diamond Interchange Configuration



Double Roundabout Interchange Configuration

Figure 2.7 – TI Configurations Analyzed

Table 2.2 – Assumed 2022-250 Average Annual Growth Rates

Roadway	No-Build Growth Rate	Build Growth Rate
SR 347	1.2%	1.6%
Riggs Road	3.5%	3.0%

A 2050 “Baseline” Build scenario was also developed that uses the 2050 Build volumes and existing geometry, with the exception that a third through lane is added in each direction on SR 347. The 2050 Baseline Build scenario allows for determining if widening SR 347 alone is sufficient to meet this project’s objectives, or if additional improvements such as grade separating Riggs Road are needed.

The resultant 2050 traffic volumes and lane configurations for the No-Build, Baseline Build, and the different TI configurations are presented in the following figures:

- 2050 No-Build – **Figure 2.8**
- 2050 Baseline Build – **Figure 2.9** and as defined in Section 2.7.4
- 2050 SDI – **Figure 2.10**
- 2050 SPUI – **Figure 2.11**
- 2050 DDI – Lane configuration in **Figure 2.12**, traffic volumes in **Figure 2.13**
- 2050 DRI – **Figure 2.14**

Table 2.3 summarizes the 2050 Build and No-Build ADT, K-factors (design peak-hour percentage of daily volume), D-factors (directional split), and T-factors (heavy vehicle/truck percentage) for each leg of the intersection.

Table 2.3 – SR 347/Riggs Road Intersection 2050 Traffic Summary

Input	Intersection Leg			
	North Leg	South Leg	East Leg	West Leg
Build ADT	74,285	83,196	10,241	8,642
No-Build ADT	66,516	74,496	11,728	9,897
K-Factor	7%	7%	10%	10%
D-Factor	73%	63%	64%	61%
T-Factor	5%	5%	6%	11%

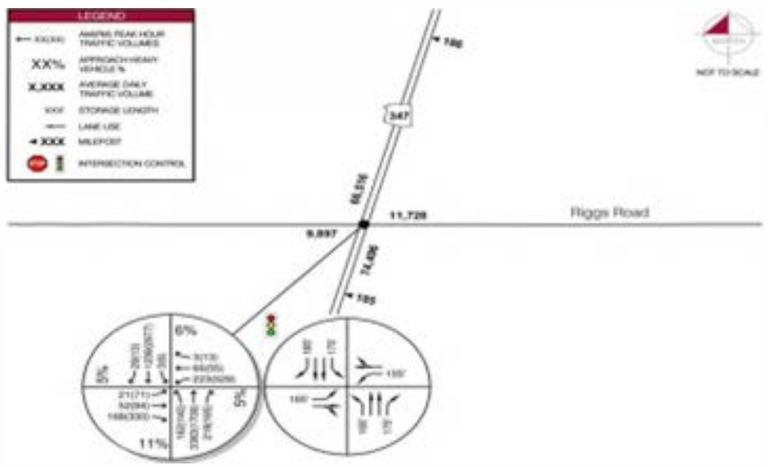


Figure 2.8 – 2050 No-Build Traffic Volumes and Lane Configuration

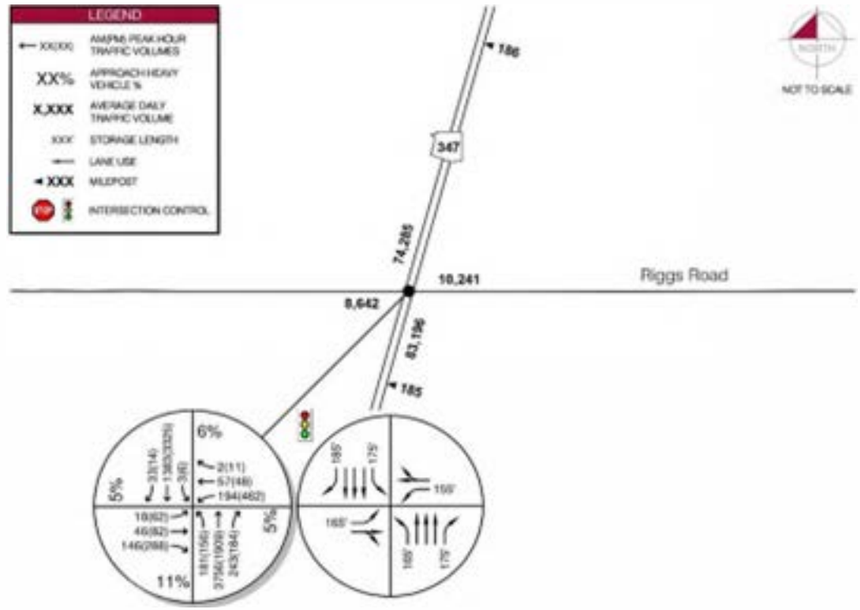


Figure 2.9 – 2050 Baseline Build Traffic Volumes and Lane Configuration

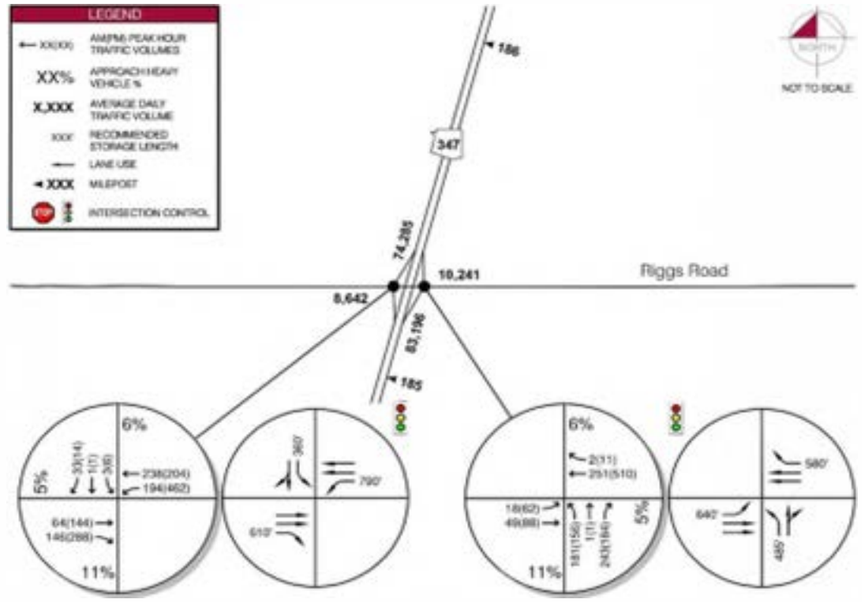


Figure 2.10 – 2050 Build SDI Traffic Volumes and Lane Configuration

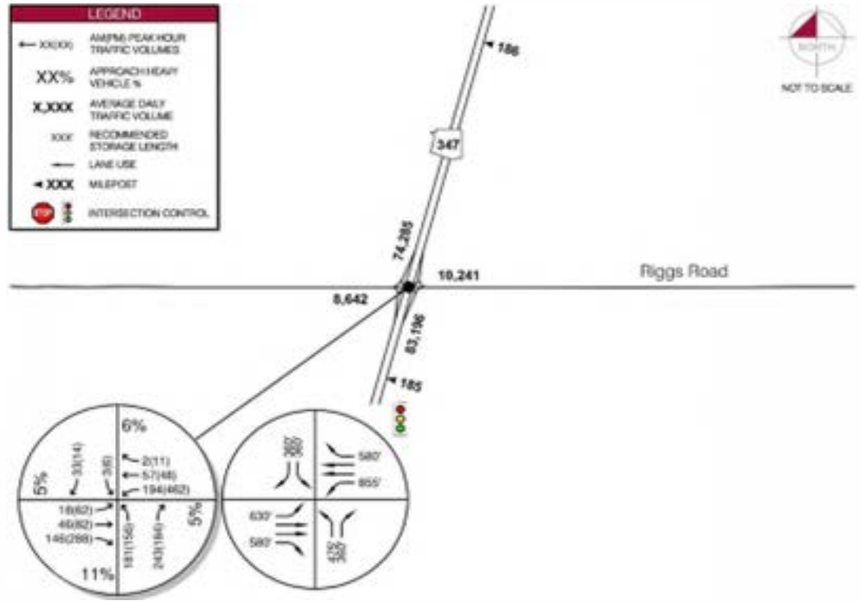


Figure 2.11 – 2050 Build SPUI Traffic Volumes and Lane Configuration

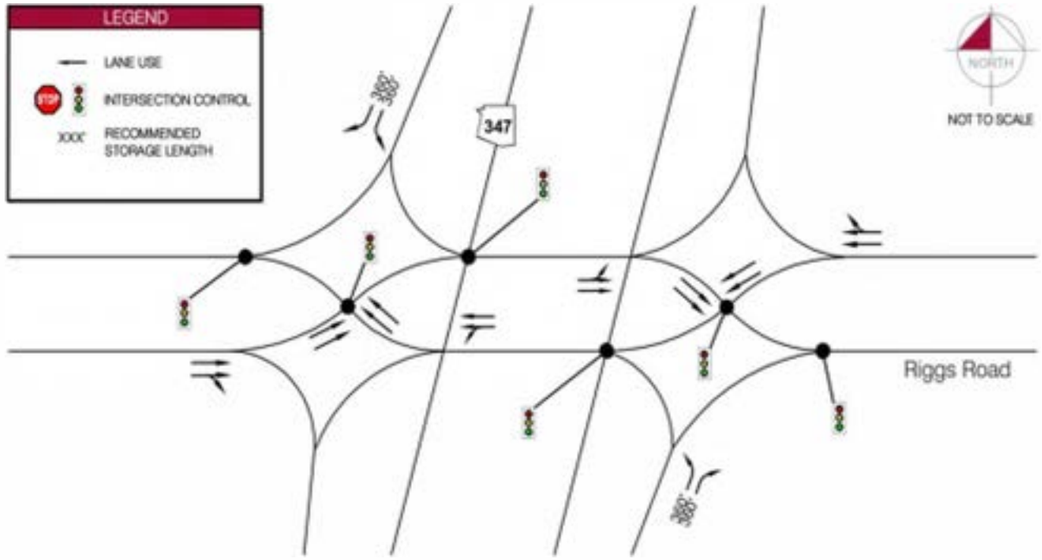


Figure 2.12 – 2050 Build DDI Lane Configuration

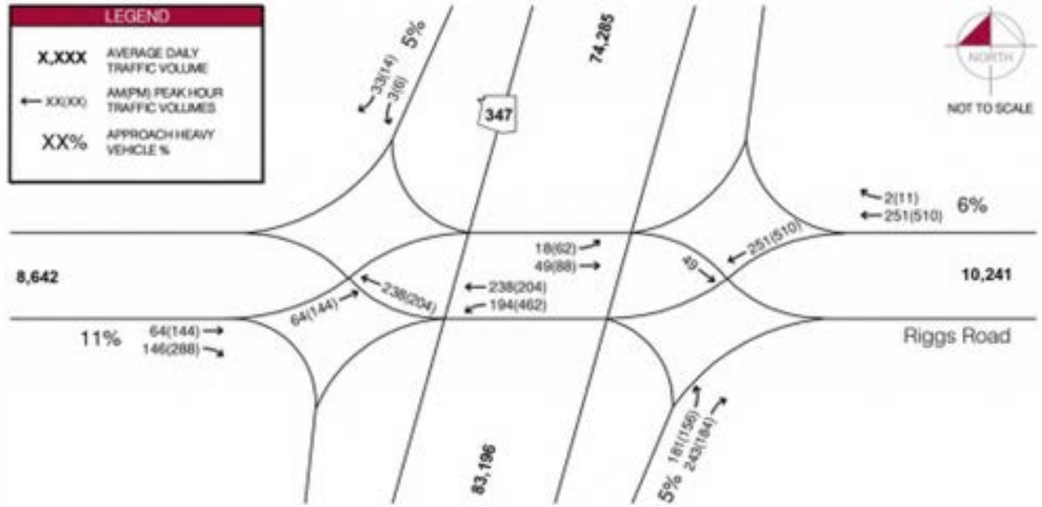


Figure 2.13 – 2050 Build DDI Traffic Volumes

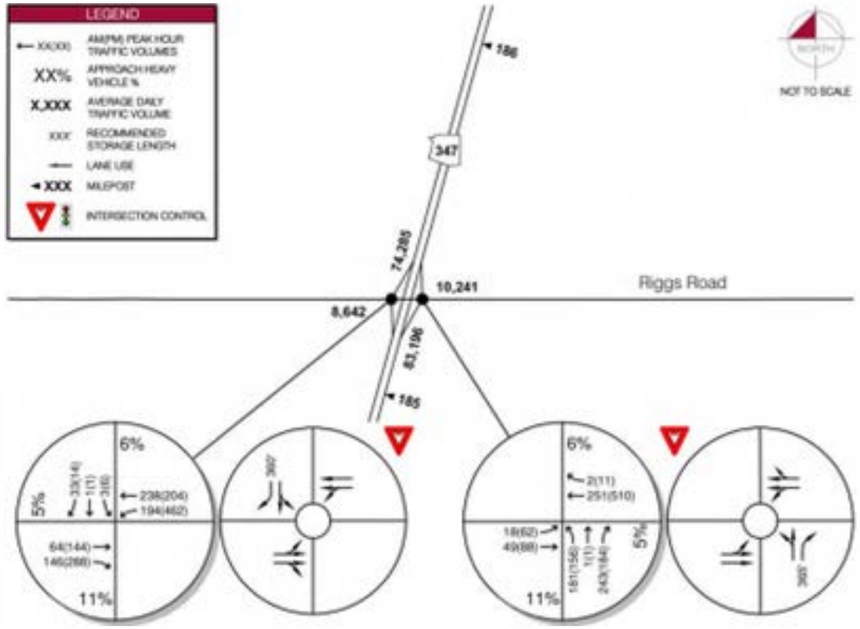


Figure 2.14 – 2050 Build DRI Traffic Volumes and Lane Configuration

The recommended storage lengths shown in **Figures 2.10**, **2.11**, **2.12**, and **2.14** were determined using the methodology outlined in ADOT Traffic Guidelines and Processes (TGP) Section 430. Tables 430-1 and 430-2 from the TGP were used to select the appropriate gap and desirable braking distance, respectively. The 95th percentile queue from the different operational analyses were used as the queue portion of the storage described in TGP 430.

An exclusive WB right-turn lane is not warranted based on the projected 2050 typical peak-hour turning movement volumes. However, when there is a closure or restriction on I-10 through the GRIC, SR 347 often serves as an alternate route for diverting traffic from I-10 via Riggs Road as there is no developed arterial network nearby. In the event of a WB I-10 closure/restriction for the SDI and SPUI configurations, it is anticipated that an exclusive WB right-turn lane will help alleviate the additional right-turn delay at the new interchange that might be caused by the closure.

An exclusive EB right-turn lane is warranted based on projected 2050 typical peak-hour turning movement volumes. Additionally, as in the case of the WB right-turn lane, the EB right-turn lane will help alleviate any additional delay at the new interchange that might be caused by a closure or restriction on SR 202L (Loop 202).

In the DRI configuration, EB and WB right-turn bypass lanes may also be incorporated into the design for the same reasons. However, the lane configuration shown in **Figure 2.14** and the operational results presented in this report for the DRI do not incorporate right-turn bypass lanes.

The 2050 Build geometries for the different TI configurations shown in **Figures 2.10**, **2.11**, **2.12**, and **2.14** show only two-lane off-ramp approaches. With these configurations, the ramps for all the different TI configurations operate at an acceptable level of service (LOS). However, interchange geometry and traffic control at SR 347/Riggs Road should have the flexibility to accommodate significant diversions of traffic periodically due to incident and construction closures or restrictions, including routing mainline SR 347 traffic to use interchange ramps to bypass the closures or restrictions. ADOT has recently implemented the practice of providing a two-lane off-ramp and a four-lane ramp approach at TI ramp/crossroad intersections, where feasible and justified by traffic volumes, to provide flexibility in how traffic can be redirected. This practice includes providing the ability for traffic to cross straight through the ramp/crossroad intersections and use the on-ramp to reenter the mainline. The traffic analysis does not identify a need for these additional lanes to provide acceptable traffic operations during typical traffic conditions, but ADOT may decide during final design to provide additional lanes on the ramps to help improve traffic operations further during temporary construction-related or incident-related traffic diversions along the ramps.

The SDI and DRI configurations can allow mainline traffic to use ramps to bypass closures. However, the SPUI and DDI do not typically allow for exiting mainline traffic to cross straight through the ramp/crossroad intersection and immediately return to the mainline.

2.7. Intersection Operational Analysis

Analysis Methodology

An intersection operational analysis was performed at SR 347/Riggs Road for the Existing, 2050 No-Build, and 2050 Build conditions (including the previously mentioned potential TI configuration scenarios). The analysis of the scenarios with signalized intersections was completed using Synchro 11 analysis software. For signalized intersections, intersection LOS and queue length are typically analyzed using the Highway Capacity Manual, 6th Edition (HCM 6) methodology; however, HCM 6 methodology does not support the analysis of clustered intersections, which are present in the SDI and DDI configuration scenarios. Therefore, the Synchro 11 methodology was used to calculate the LOS and queue length for all signalized interchange scenarios, which is generally accepted in the industry as a satisfactory substitute for the HCM 6 method because the methodologies are similar.

The analysis of the DRI teardrop-style configuration was completed using Rodel 1.96 analysis software. Rodel uses the HCM 6 methodology for roundabouts to calculate the LOS and queue lengths.

Each intersection, approach, or movement is given a letter designation from LOS A to LOS F. LOS A represents operational conditions with minimal delay and traffic volumes significantly less than available capacity (volume-to-capacity ratio (v/c) < 1). LOS F represents poor operational conditions with a high degree of delay and/or traffic volumes greater than the available capacity (v/c >1). Each LOS grade represents a range of operational conditions. **Table 2.4** shows the average vehicle delay ranges for signalized intersections and unsignalized intersections (including roundabouts) that correspond with each LOS letter grade. Per the ADOT RDG Table 103.2A, urban roadways should be designed to ideally achieve LOS C/LOS D or better.

The existing peak-hour factors (PHF) were adjusted in all future analysis scenarios based on the projected traffic demand and proposed lane geometry in accordance with the following guidelines from the ADOT TGP Section 240 for future PHF assumptions:

- PHF = 0.80 for < 75 vehicles per hour (vph) per lane
- PHF = 0.85 for 75 - 300 vph per lane
- PHF = 0.90 for > 300 vph per lane

Table 2.4 – Level of Service Thresholds for Signalized and Unsignalized Intersections

LOS	Control Delay (s/veh)	
	Signalized Intersections	Unsignalized Intersections
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80 or v/c > 1.0*	> 50 or v/c > 1.0*

*v/c = volume-to-capacity ratio
Source: HCM 6th Edition

2022 Existing Intersection Conditions

The existing LOS, delay, and 95th percentile queues at SR 347/Riggs Road were evaluated using the existing conditions traffic volumes and lane geometry described previously in this report. The intersection was analyzed using current signal timings provided by ADOT, which can be found in **Appendix G**. The results of the 2022 Existing AM and 2022 Existing PM intersection capacity analyses are shown in **Table 2.5** and **Table 2.6**, respectively. Synchro 11 output reports for the 2022 Existing analysis scenarios are provided in **Appendix G**.

Table 2.5 – 2022 Existing Intersection Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347/Riggs Road													
LOS	E	F	A	E	C	A	E	D		E	D		E
Average Delay (s)	62	97	6	60	25	0	62	37		62	39		71
95th Percentile Queue (ft)	170	*1,714*	70	12	427	0	26	82		130	47		-

Italics = Queue may be longer; queue shown is maximum after two cycles.

SR 347/Riggs Road currently operates at an overall LOS E in the AM peak hour, with all left-turn movements operating at LOS E, and the NB through movement operating at LOS F. The NB through movement experiences a 95th percentile queue length of at least 1,714 feet. The NB left-turn movement experiences a 95th percentile queue length of 170 feet, which slightly exceeds the existing storage length.

Table 2.6 – 2022 Existing Intersection Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347/Riggs Road													
LOS	F	C	A	F	F	A	E	E		F	D		F
Average Delay (s)	91	26	7	83	198	0	78	65		82	44		123
95th Percentile Queue (ft)	195	774	64	20	*2,115*	0	73	207		350	49		-

Italics = Queue may be longer; queue shown is maximum after two cycles.

SR 347/Riggs Road currently operates at an overall LOS F in the PM peak hour, with the EB left-turn and through/right-turn movements operating at LOS E and the NB left-turn, SB left-turn and through, and WB left-turn movements operating at LOS F. The SB through movement experiences a 95th percentile queue length of at least 2,115 feet. The NB and WB left-turn movements experience 95th percentile queue lengths of 195 feet and 350 feet, respectively, which exceed the existing storage lengths.

2050 No-Build Intersection Analysis

The 2050 No-Build LOS, delay, and 95th percentile queues at SR 347/Riggs Road were evaluated using the 2050 No-Build volumes and existing geometry. The results of the 2050 No-Build AM and 2050 No-Build PM intersection capacity analyses are shown in **Table 2.7** and **Table 2.8**, respectively. Synchro 11 output reports for the 2050 No-Build analysis scenarios are provided in **Appendix G**.

Table 2.7 – 2050 No-Build Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347/Riggs Road													
LOS	F	F	B	F	D	A	F	F		F	E		F
Average Delay (s)	124	330	11	107	45	0	123	93		377	67		234
95th Percentile Queue (ft)	*448*	*4,490*	168	20	1,015	0	75	369		*757*	146		-

Italics = Queue may be longer; queue shown is maximum after two cycles.

SR 347/Riggs Road is anticipated to operate at an overall LOS F in the AM peak hour in 2050 No-Build traffic conditions. The WB through/right-turn movement is anticipated to operate at LOS E, and all left-turn movements and the NB and EB through movements are anticipated to operate at LOS F. The NB and SB through movements experience 95th percentile queue lengths of at least 4,490 feet and 1,015 feet, respectively. The NB and WB left-turn movements experience 95th percentile queue lengths of at least 448 feet and 757 feet, respectively, which exceed the existing storage lengths.

Table 2.8 – 2050 No-Build Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347/Riggs Road													
LOS	F	F	B	F	F	A	F	F		F	D		F
Average Delay (s)	431	98	17	116	525	0	140	196		650	54		367
95th Percentile Queue (ft)	*531*	*1,888*	141	34	*4,191*	0	188	*1,041*		*1,682*	129		-

Italics = Queue may be longer; queue shown is maximum after two cycles.

SR 347/Riggs Road is anticipated to operate at an overall LOS F in the PM peak hour in 2050 No-Build traffic conditions, with all left-turn movements, the NB and SB through movements, and the EB through/right-turn movement operating at LOS F. The NB and SB through movements experience 95th percentile queue lengths of at least 1,888 feet and at least 4,191 feet, respectively. The EB through/right-turn movement experiences a 95th percentile queue length of at least 1,041 feet. The NB and WB left-turn movements experience 95th percentile queue lengths of at least 531 feet and at least 1,682 feet, respectively, which exceed the existing storage lengths.

2050 Baseline Build Intersection Analysis

The 2050 “Baseline” Build LOS, delay, and 95th percentile queues at SR 347/Riggs Road were evaluated using the 2050 Build volumes and existing geometry, with the exception that a third through lane is added in each direction on SR 347. The 2050 “Baseline” Build scenario was analyzed to determine if widening SR 347 alone is sufficient to provide acceptable LOS or if additional improvements such as grade-separating Riggs Road are also needed. The results of the 2050 Baseline Build AM and 2050 Baseline Build PM intersection capacity analyses are shown in **Table 2.9** and **Table 2.10**, respectively. Synchro output reports for the 2050 Baseline Build analysis scenarios are provided in **Appendix G**.

Table 2.9 – 2050 Baseline Build Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347/Riggs Road													
LOS	F	F	B	F	D	A	F	F		F	E		F
Average Delay (s)	115	181	12	103	43	0	114	91		159	61		133
95th Percentile Queue (ft)	393	*3,038*	197	21	723	0	64	315		*555*	122		-

Italics = Queue may be longer; queue shown is maximum after two cycles.

SR 347/Riggs Road is anticipated to operate at an overall LOS F in the AM peak hour in 2050 Baseline Build traffic conditions. The EB through/right-turn movement is anticipated to operate at LOS E, and all left-turn movements and the NB through movement are anticipated to operate at LOS F. The NB through movement experiences a 95th percentile queue length of at least 3,038 feet. The NB left-turn, NB right-turn, and WB left-turn movements experience 95th percentile queue lengths of 393 feet, 197 feet, and at least 555 feet, respectively, which exceed the existing storage lengths.

Table 2.10 – 2050 Baseline Build Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347/Riggs Road													
LOS	F	E	C	F	F	A	F	F		F	D		F
Average Delay (s)	447	64	22	116	406	0	137	127		352	46		270
95th Percentile Queue (ft)	*579*	*1,247*	180	34	*3,077*	0	166	*799*		*1,341*	106		-

Italics = Queue may be longer; queue shown is maximum after two cycles.

SR 347/Riggs Road is anticipated to operate at an overall LOS F in the PM peak hour in 2050 Baseline Build traffic conditions. The NB through movement is anticipated to operate at LOS E, and all left-turn movements, the SB through movement, and the EB through/right-turn movement are anticipated to operate at LOS F. The NB and SB through movements experience 95th percentile queue lengths of at least 1,247 feet and at least 3,077 feet, respectively. The EB through/right-turn movement experiences a 95th percentile queue length of at least 799 feet. The NB left-turn, NB right-turn, and WB left-turn movements experience 95th percentile queue lengths of at least 579 feet, 180 feet, and at least 1,341 feet, respectively, which exceed the existing storage lengths.

2050 Build Intersection Analysis

The 2050 Build LOS, delay, and 95th percentile queues at SR 347/Riggs Road were evaluated using the 2050 Build volumes and the SDI, SPUI, DDI, and DRI interchange scenarios as described previously in this report.

All configurations assume that Riggs Road will be widened to two travel lanes in each direction within the project limits, where feasible, in accordance with the MCDOT vision for Riggs Road to ultimately become a four-lane facility, although it should be noted Riggs Road is projected to be able to provide acceptable traffic operations through 2050 as a two-lane facility if for some reason a four-lane facility is not constructed.

Spread Diamond Interchange Capacity Analysis Results

An intersection diagram extracted from Synchro showing the SDI lane geometry is presented in **Figure 2.15**. The results of the 2050 Build AM and 2050 Build PM intersection capacity analyses with the SDI configuration are shown in **Table 2.11** and **Table 2.12**, respectively. The Synchro 11 output reports for the SDI configuration are provided in **Appendix G**.

The configuration shown in **Figure 2.15** shows back-to-back EB and WB left-turn lanes between the NB and SB ramp intersections. The ability to provide back-to-back left-turn lanes with the appropriate storage lengths and tapers is dependent on the spacing of the NB and SB ramp intersections. If the intersections are spaced so close together that back-to-back left-turn lanes cannot provide adequate storage, the crossroad may need to be constructed wide enough to fit side-by-side dual left-turn lanes to provide adequate left-turn storage.

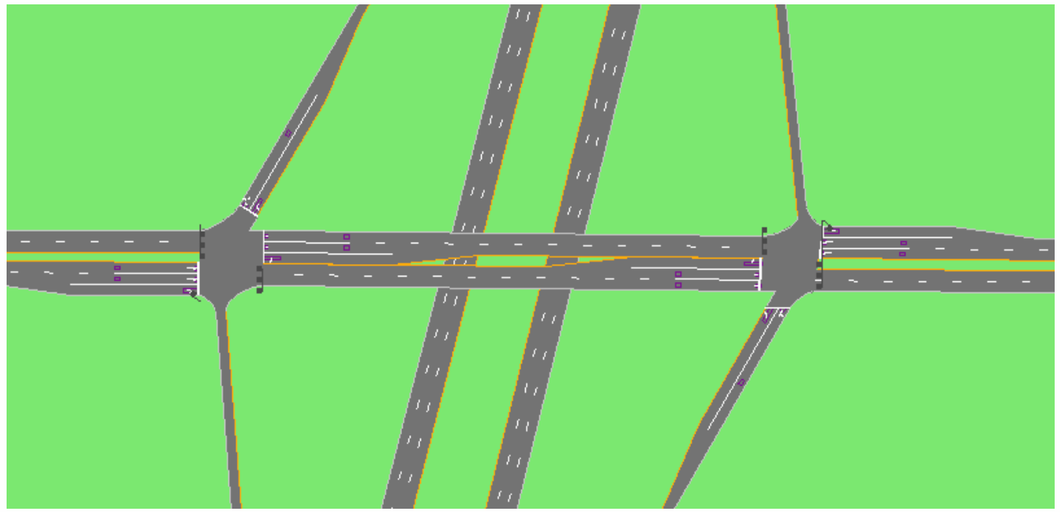


Figure 2.15 – SDI Intersection Diagram

Table 2.11 – 2050 Build with SDI Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347 SB Ramps/Riggs Road													
LOS				B	A			B	A	B	A		B
Average Delay (s)				11	5			16	7	19	8		12
95th Percentile Queue (ft)				5	13			21	33	128	53		-
SR 347 NB Ramps/Riggs Road													
LOS	B	A					C	C			A	A	B
Average Delay (s)	16	5					20	30			9	0	11
95th Percentile Queue (ft)	85	34					24	20			57	0	-

Both SR 347/Riggs Road TI ramp intersections are anticipated to operate at an overall LOS B or better in the 2050 Build with SDI scenario during the AM peak hour. All movements are anticipated to operate at LOS C or better, with 95th percentile queues no greater than 128 feet long.

Table 2.12 – 2050 Build with SDI Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347 SB Ramps/Riggs Road													
LOS				C	B			C	A	C	A		B
Average Delay (s)				24	13			25	10	27	7		19
95th Percentile Queue (ft)				13	16			63	54	235	35		-
SR 347 NB Ramps/Riggs Road													
LOS	C	A					C	C			B	A	B
Average Delay (s)	31	8					27	31			10	0	16
95th Percentile Queue (ft)	147	48					82	8			112	0	-

Both SR 347/Riggs Road TI ramp intersections are anticipated to operate at an overall LOS B or better in the 2050 Build with SDI scenario during the PM peak hour. All movements are anticipated to operate at LOS C or better, with 95th percentile queues no greater than 235 feet long.

Single-Point Urban Interchange Capacity Analysis Results

An intersection diagram extracted from Synchro showing the SPUI lane geometry is presented in **Figure 2.16**. The results of the 2050 Build AM and 2050 Build PM intersection capacity analyses with the SPUI configuration are shown in **Table 2.13** and **Table 2.14**, respectively. The Synchro 11 output reports for the SPUI configuration are provided in **Appendix G**.

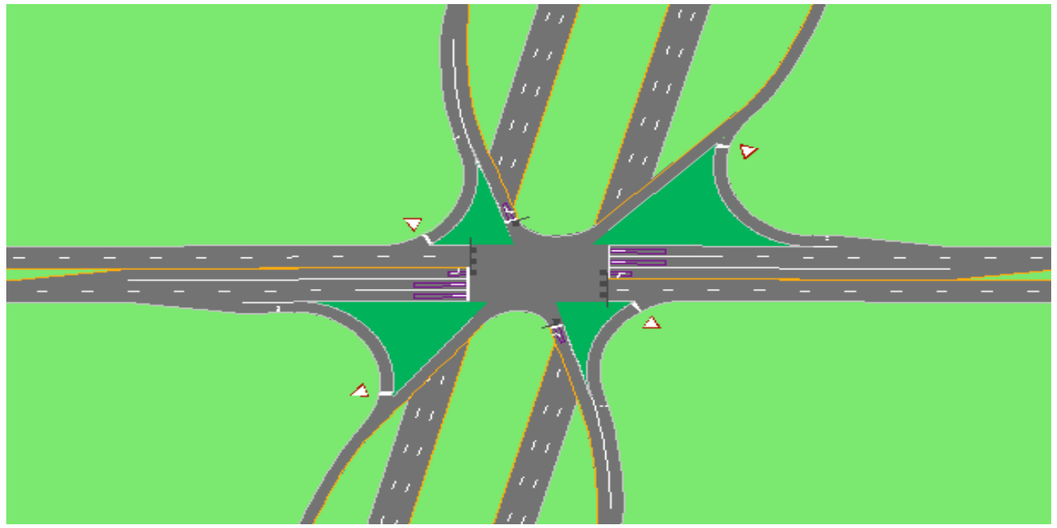


Figure 2.16 – SPUI Intersection Diagram

Table 2.13 – 2050 Build with SPUI Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347/Riggs Road SPUI													
LOS	B		A	B		A	C	C	A	B	B	A	A
Average Delay (s)	18		0	17		0	22	21	0	17	11	0	9
95th Percentile Queue (ft)	108		0	6		0	23	22	0	114	20	0	-

The SR 347/Riggs Road TI is anticipated to operate at an overall LOS A in the 2050 Build with SPUI scenario during the AM peak hour. All movements are anticipated to operate at LOS C or better, with 95th percentile queues no greater than 114 feet long.

Table 2.14 – 2050 Build with SPUI Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347/Riggs Road SPUI													
LOS	C		A	C		A	C	C	A	C	B	A	B
Average Delay (s)	29		0	28		0	26	30	0	21	15	0	15
95th Percentile Queue (ft)	141		0	13		0	72	45	0	298	17	0	-

The SR 347/Riggs Road TI is anticipated to operate at an overall LOS B in the 2050 Build with SPUI scenario during the PM peak hour. All movements are anticipated to operate at LOS C or better, with 95th percentile queues no greater than 298 feet long.

Diverging Diamond Interchange Capacity Analysis Results

An intersection diagram extracted from Synchro 11 showing the DDI lane geometry and intersection numbering is presented in **Figure 2.17**. Intersection numbers are provided for reference in reviewing the DDI analysis results. The results of the 2050 Build AM and 2050 Build PM intersection capacity analyses with the DDI configuration are shown in **Table 2.15** and **Table 2.16**, respectively. The Synchro 11 output reports for the DDI configuration are provided in **Appendix G**.

Figure 2.17 – DDI Intersection Diagram

Table 2.15 – 2050 Build with DDI Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
Riggs Road EB/Riggs Road WB [Int. ID 403]													
LOS								A			A		A
Average Delay (s)								6			5		5
95th Percentile Queue (ft)								8			16		-
Riggs Road EB/SR 347 SBL Off-ramp [Int. ID 404]													
LOS				A				A					A
Average Delay (s)				0				3					3
95th Percentile Queue (ft)				0				3					-
Riggs Road WB/Riggs Road EB [Int. ID 406]													
LOS								A			A		A
Average Delay (s)								10			8		8
95th Percentile Queue (ft)								10			29		-
SR 347 NBR Off-ramp/Riggs Road EB [Int. ID 407]													
LOS			A					A					A
Average Delay (s)			1					3					1
95th Percentile Queue (ft)			0					2					-
SR 347 NBL Off-ramp/Riggs Road WB [Int. ID 410]													
LOS	A										A		A
Average Delay (s)	1										3		2
95th Percentile Queue (ft)	0										7		-
Riggs Road WB/SR 347 SBR Off-ramp [Int. ID 412]													
LOS					A						A		A
Average Delay (s)					0						2		2
95th Percentile Queue (ft)					0						7		-

All SR 347/Riggs Road TI intersections are anticipated to operate at an overall LOS A in the 2050 Build with DDI scenario during the AM peak hour. All movements are anticipated to operate at LOS A, with 95th percentile queues no greater than 29 feet long.

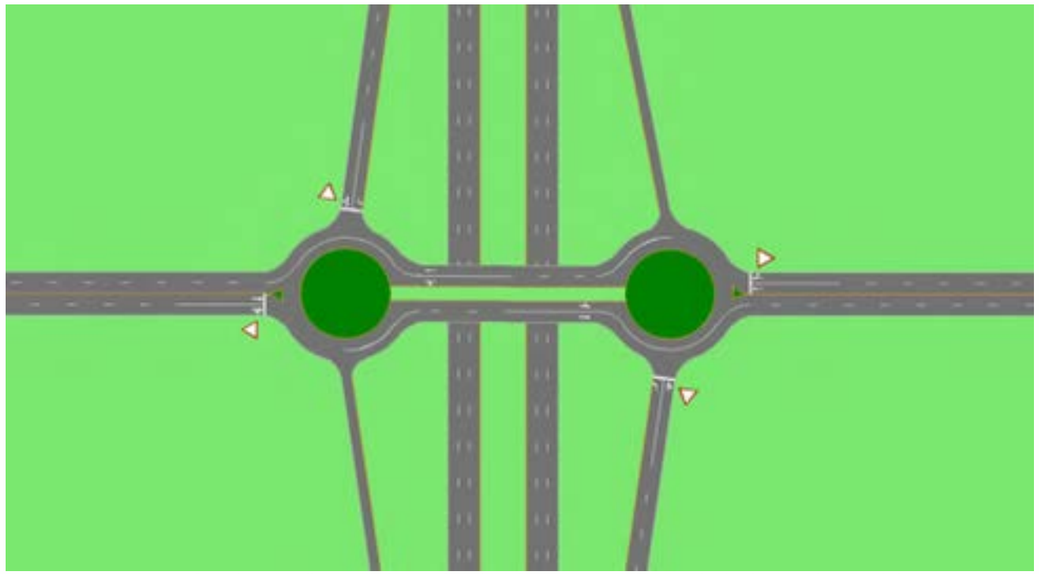
Table 2.16 – 2050 Build with DDI Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
Riggs Road EB/Riggs Road WB [Int. ID 403]													
LOS								A			A		A
Average Delay (s)								6			6		6
95th Percentile Queue (ft)								14			15		-
Riggs Road EB/SR 347 SBL Off-ramp [Int. ID 404]													
LOS				A				A					A
Average Delay (s)				0				3					3
95th Percentile Queue (ft)				0				5					-
Riggs Road WB/Riggs Road EB [Int. ID 406]													
LOS								B			A		A
Average Delay (s)								13			7		8
95th Percentile Queue (ft)								22			65		-
SR 347 NBR Off-ramp/Riggs Road EB [Int. ID 407]													
LOS		A						A					A
Average Delay (s)		0						4					1
95th Percentile Queue (ft)		0						3					-
SR 347 NBL Off-ramp/Riggs Road WB [Int. ID 410]													
LOS	A										A		A
Average Delay (s)	1										2		2
95th Percentile Queue (ft)	4										12		-
Riggs Road WB/SR 347 SBR Off-ramp [Int. ID 412]													
LOS					A						A		A
Average Delay (s)					0						3		3
95th Percentile Queue (ft)					0						6		-

All SR 347/Riggs Road TI intersections are anticipated to operate at an overall LOS A in the 2050 Build with DDI scenario during the PM peak hour. All movements are anticipated to operate at LOS B or better, with 95th percentile queues no greater than 65 feet long.

Double Roundabout Interchange Capacity Analysis Results

An intersection diagram showing the preliminary layout for the DRI with lane geometry is presented in **Figure 2.18**. The results of the 2050 Build AM and 2050 Build PM intersection capacity analyses with the DRI configuration are shown in **Table 2.17** and **Table 2.18**, respectively. The analysis results are provided by approach and for the total intersection. The Rodel output reports for the DRI teardrop-style configuration are provided in **Appendix G**.



Note: Synchro 11 diagram shown for visual purposes only. Analysis done using Rodel.

Figure 2.18 – DRI Intersection Diagram

Table 2.17 – 2050 Build with DRI Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach	SB Approach	EB Approach	WB Approach	Overall
SR 347 SB Ramps/Riggs Road					
LOS		A	A	A	A
Average Delay (s)		2	2	3	3
95th Percentile Queue (ft)		2	12	29	-
SR 347 NB Ramps/Riggs Road					
LOS	A		A	A	A
Average Delay (s)	3		2	2	2
95th Percentile Queue (ft)	27		3	10	-

Both SR 347/Riggs Road TI ramp intersections are anticipated to operate at an overall LOS A in the 2050 Build with DRI scenario during the AM peak hour. All approaches are anticipated to operate at LOS A or better, with 95th percentile queues no greater than 29 feet long.

Table 2.18 – 2050 Build with DRI Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach	SB Approach	EB Approach	WB Approach	Overall
SR 347 SB Ramps/Riggs Road					
LOS		A	A	A	A
Average Delay (s)		2	3	3	3
95th Percentile Queue (ft)		1	32	37	-
SR 347 NB Ramps/Riggs Road					
LOS	A		A	A	A
Average Delay (s)	3		3	2	2
95th Percentile Queue (ft)	23		9	24	-

Both SR 347/Riggs Road TI ramp intersections are anticipated to operate at an overall LOS A in the 2050 Build with DRI scenario during the PM peak hour. All approaches are anticipated to operate at LOS A or better, with 95th percentile queues no greater than 37 feet long.

2.8. Freeway Operational Analysis

Analysis Methodology

An operational analysis was performed for SR 347 within the project limits, including the GPLs, ramp junctions, and merge/diverge sections, for the 2050 Build scenario. Three freeway segment types were analyzed:

- *Basic segments* – Freeway segments not influenced by on-ramp and off-ramp traffic
- *Merging segments* – Freeway segments influenced by on-ramp traffic
- *Diverging segments* – Freeway segments influenced by off-ramp traffic

Highway Capacity Software (HCS) was used to provide measures of effectiveness for each analysis segment. HCS outputs LOS as a function of average vehicle density based on the methodology described in HCM 6. HCS also reports other operational measures such as average vehicle speed.

The concept of LOS uses qualitative measures to characterize operational conditions for roadway segments. Segments are given letter designations from LOS A to LOS F, with LOS A representing uncongested free flow conditions and LOS F representing an overcapacity condition with a high degree of congestion and vehicle delay. Each LOS grade represents a range of operational conditions.

Table 2.19 shows the average vehicle density ranges in passenger cars per mile per lane (pc/mi/ln) that correspond with each segment LOS letter grade for urban conditions. For the 2050 Build LOS analysis, the urban roadway type was used for all roadway segments because SR 347 experiences commuter traffic patterns typical of urban conditions during peak periods and these urban conditions are expected to be present in 2050 as well. Per the ADOT RDG Table 103.2A, urban freeways should be designed to ideally achieve LOS C/LOS D or better.

Table 2.19 – Freeway Segment Vehicle Density Ranges and LOS

LOS	Basic Segment Urban Density Range (pc/mi/ln)	Merge/Diverge Segment Urban Density Range (pc/mi/ln)
A	≤ 11	≤ 10
B	> 11 and ≤ 18	> 10 and ≤ 20
C	> 18 and ≤ 26	> 20 and ≤ 28
D	> 26 and ≤ 35	> 28 and ≤ 35
E	> 35 and ≤ 45	> 35
F	> 45 or v/c > 1.0*	v/c > 1.0*

*v/c = volume-to-capacity ratio
Source: HCM 6th Edition

The 2050 Build analysis utilized the 2050 Build volumes and geometry described in this report (e.g., three lanes in each direction on SR 347). All on-ramps and off-ramps were analyzed assuming 1,300-foot-long acceleration lanes and 600-foot-long deceleration lanes, respectively, including tapers. These values represent the minimum "fringe-urban freeway" ramp lengths outlined in Figures 504.7 and 504.8A of the ADOT RDG and provide a conservative estimate of LOS. All ramps were analyzed as single-lane ramps. A base free-flow speed of 75 mph was assumed on the SR 347 mainline, and a base free-flow speed of 50 mph was assumed on the SR 347 ramps.

2050 Build Freeway Analysis Results

The average vehicle speed, vehicle density, and corresponding LOS for each freeway segment and peak hour for the 2050 Build scenario are presented in **Table 2.20**. The 2050 Build scenario HCS output reports are provided in **Appendix G**.

Table 2.20 – 2050 Build Freeway Level of Service by Segment

Mainline Segment	AM Peak Hour			PM Peak Hour		
	Average Speed (mph)	Average Density (pc/mi/ln)	LOS	Average Speed (mph)	Average Density (pc/mi/ln)	LOS
SR 347 NB						
Basic Segment	72.1	20.3	C	74.1	10.0	A
Merging Segment	67.7	21.7	B	69.6	11.2	A
Diverging Segment	65.3	22.4	C	64.5	11.5	B
SR 347 SB						
Basic Segment	74.1	7.3	A	73.4	17.6	B
Merging Segment	69.4	9.7	A	66.4	24.0	C
Diverging Segment	65.7	8.2	A	66.6	19.4	C

Based on the 2050 Build freeway LOS analysis, all freeway segments within the project area are expected to operate at LOS C or better in the AM and PM peak hours, which meets ADOT's desired LOS threshold for freeway operations. The highest density is 24.0 pc/mi/ln at the SB SR 347 on-ramp merge point in the PM peak hour.

For comparative purposes, the SR 347 mainline was also analyzed as only having two lanes in each direction; however, this results in LOS D and LOS E on several segments. A summary of the delay and LOS of each segment with two travel lanes on SR 347 is shown in the Design Analysis Table sections of the HCS reports in **Appendix G**.

2.9. Other Interchange Considerations

Several other traffic-related considerations besides traffic operations should be evaluated when determining the advantages and disadvantages of various TI configurations. These include motorist safety, interchange familiarity, access, traffic diversion accommodation, pedestrian and bicyclist accommodation and safety, and oversized vehicle accommodation.

Motorist Safety

One measure of motorist safety for interchange configurations is the number of vehicle conflict points, meaning where vehicles may collide if traffic laws are not observed. Of particular concern are vehicle crossing points, where vehicles traveling different directions could potentially collide (such as in an angle or left-turn crash scenario). These types of crashes are more likely to cause severe injury to vehicle occupants than vehicles traveling the same general direction (such as sideswipe crashes). Perpendicular crossing points have a high potential for severe injury to vehicle occupants. The number of conflict points for each interchange configuration is listed below:

- A standard four-legged signalized intersection (the No-Build configuration) has 32 conflict points, including 16 crossing points (four of which are perpendicular).
- The SDI has 26 conflict points, including 10 crossing points (four of which are perpendicular).
- The SPUI has 20 conflict points, including eight crossing points (zero of which are perpendicular).
- The DDI has 14 conflict points, including two crossing points (zero of which are perpendicular).
- The DRI with a teardrop-style configuration has four conflict points, including four crossing points (zero of which are perpendicular).

Head-on/wrong-way crashes have a high potential for severe injury to vehicle occupants. Head-on/wrong-way travel is prohibited only by signage at the No-Build, SDI, and SPUI, whereas raised curbs and the angles of intersecting lanes make it more difficult for head-on/wrong-way travel to occur at the DDI and DRI.

Vehicle speeds at the No-Build, SDI, and SPUI are controlled only by traffic lights and signage, whereas raised curbs and roadway geometry help reduce vehicle speeds at the DDI and DRI. This reduces the likelihood of severe injury to vehicle occupants in the event of a crash.

Interchange Familiarity

Drivers that pass through SR 347/Riggs Road will likely be most familiar with the No-Build's signalized four—way configuration as this is the existing condition.

Drivers that pass through SR 347/Riggs Road will likely be very familiar with how the SDI operates as the majority of freeway TIs in the greater Phoenix area are SDIs (or the related and more compact TDI), including the two existing interchanges closest to SR 347/Riggs Road (I-10/SR 347 and I-10/Riggs Road).

Drivers that pass through SR 347/Riggs Road will likely also be familiar with how the SPUI operates as SPUIs, while not as prevalent as SDIs, have been present in the greater Phoenix area along I-17, SR 51, and SR 101L (Loop 101) for decades.

Drivers that pass through SR 347/Riggs Road will likely not be very familiar with how the DDI operates as DDIs are relatively new to Arizona. To date, there are only four operating DDIs in the greater Phoenix area:

I-17/Happy Valley Road, I-10/Miller Road, SR 202L (Loop 202) South Mountain/Desert Foothills Parkway, and SR 202L (Loop 202) South Mountain/17th Avenue (the latter two of which are half-interchange DDIs). Another DDI is under construction at I-10/Watson Road. GRIC has voiced a preference for DDIs at the nearby I-10/SR 347 and I-10/Wild Horse Pass Boulevard TIs, which are planned to be converted to DDIs in the future.

Most drivers that pass through SR 347/Riggs Road will likely be somewhat familiar with how the DRI operates. More roundabout intersections have been implemented throughout the greater Phoenix metropolitan area over the last 20 years, but there are currently a limited number of DRIs in the greater Phoenix metropolitan area. A teardrop-style DRI was recently constructed at SR 202L (Loop 202) South Mountain/Estrella Drive and a teardrop-style DRI is also being planned at the I-10/Casa Blanca Road TI. GRIC has expressed a willingness to consider roundabouts as a possible solution at the SR 347/Riggs Road TI. MCDOT has also voiced support for a DRI at this location.

Access

As stated in Section 506 of the 2022 ADOT RDG, “adequate access control is essential to the safe and efficient operation of traffic interchanges.” All Build interchange configurations (SDI, SPUI, DDI, and DRI) will likely have the same or similar access control requirements that will affect access options on all four corners of the interchange. The No-Build scenario will not affect existing access conditions.

All Build interchange configurations will require the access at the existing substation on the northwest corner of SR 347/Riggs Road to be relocated farther west along Beltline Road (Riggs Road). Per the ADOT RDG, the closest allowable access is supposed to be a right-in/right-out (RIRO) driveway 660 feet west of the SB ramp radius return of the new interchange, with the closest allowable full access 1,320 feet west of the SB ramp radius return of the new interchange. The ADOT RDG acknowledges that, “in areas with existing development, it may sometimes be difficult to obtain minimum access control distance along the crossroad. R/W acquisition for the access control must be considered and evaluated based upon land ownership and existing access”.

Interchange alternatives that push the interchange farther to the east could limit access to the existing allottee parcels to the east of SR 347.

The DRI provides convenient U-turn opportunities at either roundabout, which can help minimize adverse impacts of access control restrictions on Riggs Road. The SDI, SPUI, and DDI do not typically permit U-turns within the interchange.

Traffic Diversion Accommodation

When there is a closure or restriction on I-10 through the GRIC, SR 347 often serves as an alternate route for diverting traffic from I-10 via Riggs Road as there is no developed arterial network nearby. For the same reason, I-10 serves as an alternate route for diverting traffic from SR 347 via Riggs Road. Riggs Road/Beltline Road also serves as an alternate route for diverting traffic from SR 202L (Loop 202) South Mountain due to a closure or restriction.

Interchange geometry and traffic control at SR 347/Riggs Road should recognize the need for flexibility to accommodate significant diversions of traffic periodically due to incident and construction closures or restrictions, including routing mainline traffic to use interchange ramps to bypass the closures or restrictions. Recognizing this, ADOT has recently implemented the practice of providing a two-lane off-ramp and a four-lane ramp approach at TI ramp/crossroad intersections, where feasible, to provide flexibility in how traffic can be redirected. This practice includes providing the ability for traffic to cross straight through ramp/crossroad intersections and use the on-ramp to reenter the mainline.

The No-Build scenario provides flexibility at the signalized intersection to divert traffic but is capacity-constrained by the existing geometry.

The SDI provides the desired ability to allow traffic to exit the mainline at the TI, continue across the crossroad, and then re-enter the mainline. Traffic signal timing at an SDI can easily be modified to better accommodate diverted traffic volumes at the TI, thus minimizing back-ups onto the mainline.

The SPUI and DDI do not typically allow for exiting mainline traffic to cross straight through the ramp/crossroad intersection and immediately get back on the mainline. Through movements are typically not permitted due to the channelized left-turn and right-turn lanes on the off-ramps and on-ramps. Instead, at a typical SPUI or DDI, exiting traffic would need to make a left- or right-turn at the off-ramp/crossroad intersection, make a U-turn somewhere along the crossroad, return to the TI, and then enter the mainline using the on-ramp.

A SPUI or DDI can be designed to allow for through movements at the ramp/crossroad intersection; however, completing this movement requires making additional turning movements and passing through an additional intersection. The capacity of these through movements is generally lower than the through movement at an SDI or DRI because typically only one lane is provided to make the through movement and it is not as simple of a movement. An example of a DDI that allows for through movements at the ramp/crossroads intersection can be found at the I-17/Happy Valley Road TI. At this location, NB and SB ramp traffic must make a right-turn, cross all EB or WB through lanes, and immediately make a left-turn to continue NB or SB through the TI. The SPUI and DDI configuration scenarios require a massive footprint to achieve this functionality and the construction phasing is very complex.

The DRI provides the desired ability to allow traffic to exit the mainline at the TI, continue across the crossroad by going partway around the roundabout, and then reenter the mainline. Depending on the roundabout configuration, there could be one or two exiting lanes that would allow traffic to go through the interchange and get back onto the mainline. Roundabouts operate using yield control, so the DRI does not have the capability that the signalized SDI does to quickly “flush” a large volume of diverted traffic through the TI unless officer control is implemented at each of the entering approaches of the DRI.

Pedestrian and Bicyclist Accommodation and Safety

The No-Build scenario includes pedestrian crossing indications and shoulders for bicycle travel but does not include any pedestrian facilities like crosswalks, sidewalks, and ramps. Road bikes also have a challenge navigating around the cattle guards. Pedestrians and bicyclists can be accommodated at all four TI configurations being analyzed. The SDI, SPUI, and DDI typically provide separate facilities for pedestrians (sidewalk) and bicyclists (bike lanes). Roundabouts do not typically include bike lanes within the circulating area for safety reasons, so the DRI typically includes ramps for bicyclists to transition from the bike lane to the sidewalk on approach to the TI and then again from the sidewalk to the bike lane when departing the TI.

The No-Build scenario requires pedestrians to cross vehicle paths at least one time to get across the intersection.

The SDI requires pedestrians to cross vehicle paths at least two times to get across the TI and there are typically pedestrian crossing phases within the traffic signal cycle that provide “protected” time for

pedestrians to cross. If right-turn lanes are channelized, the pedestrian crossing is typically not signalized, although it can be. It can take up to two signal cycles for pedestrians to cross the TI.

The SPUI requires pedestrians to cross vehicle paths at least four times to get across the TI and there are typically pedestrian crossing phases within the traffic signal cycle that provide "protected" time for pedestrians to cross the left-turn lanes. The right-turn lanes are channelized, and the pedestrian crossing may or may not be signalized. It can take up to four signal cycles for pedestrians to cross the TI.

The DDI requires pedestrians to cross vehicle paths at least four times to get across the TI and there are typically pedestrian crossing phases within the traffic signal cycle that provide "protected" time for pedestrians to cross the left-turn lanes. The right-turn lanes are channelized, and the pedestrian crossing may or may not be signalized. It can take up to four signal cycles for pedestrians to cross the TI, but the signal cycle lengths for a DDI are usually much shorter than for an SDI or SPUI.

The DRI requires pedestrians to cross vehicle paths at least two times to get across the TI. With the roundabout being yield-controlled, there are typically no signalized crossings for pedestrians, which can make it challenging for those with disabilities to cross. This may be offset to some degree, however, by the lower speed of vehicles at the crossings, as lower vehicle speeds reduce the likelihood of severe injury to pedestrians. Pedestrian-actuated signals or pedestrian hybrid beacons could be added to address this issue but doing so will impede traffic movements entering and exiting the roundabout when the signals/beacons are activated.

Oversized Vehicle Accommodation

SR 347 and Riggs Road are both sometimes used as routes for oversized vehicles. The SR 347/Riggs Road TI should be designed to accommodate oversized vehicles where feasible. This includes providing adequate vertical clearance as well as adequate turning radii.

The No-Build scenario accommodates oversize vehicles well as there are no major horizontal or vertical restrictions (besides the signal poles and mast arms).

The SDI can provide adequate vertical clearance by allowing oversized vehicles on SR 347 to "ramp around" the TI bridge if needed by allowing vehicles to cross straight through the ramp/crossroad intersection and immediately return to the mainline. The SDI typically provides adequate turning radii for oversized vehicles.

The SPUI and DDI do not allow oversized vehicles on SR 347 to "ramp around" the TI bridge because there is typically no through movement on the off-ramp at the SPUI or DDI. As a result, bridge heights over the mainline may need to be higher with a SPUI or DDI in recognition of this constraint. The constrained path of channelized turn lanes at a SPUI or a DDI may be a challenge for some oversize vehicles to navigate without running up on the curbs.

The DRI can provide adequate vertical clearance by allowing oversized vehicles on SR 347 to "ramp around" the TI bridge if needed by allowing vehicles to cross straight through the ramp/crossroad intersection and immediately return to the mainline if the splitter islands and central island have mountable curbs (which is normally the case at a roundabout). The DRI typically provides adequate turning radii for oversized vehicles by providing a truck apron and mountable curbs for the splitter islands and central island. Some low-clearance oversized vehicles, however, may have difficulties navigating roundabouts because of the varying elevation of the intersection from the many curbs and islands present throughout.

Oversized vehicles on Riggs Road will not have the option to "ramp around" the TI bridge if SR 347 crosses over Riggs Road because there are no entrance or exit ramps on Riggs Road in any of the TI configuration scenarios.

Vehicle requirements should be coordinated with the contact below during final design to make sure the proper design vehicle is being used:

Christina Pippin
Statewide Permit Services Supervisor
cpippin@azdot.gov
602-712-8280

2.10. Traffic Analysis Summary

The principal findings of the traffic analysis are summarized below:

SR 347

- With the current roadway geometry of the SR 347 mainline having two GPLs in each direction, SR 347 experiences significant congestion and delays. This situation is anticipated to worsen without improvements.
- The congestion on SR 347 contributes to crashes along SR 347.
- Year 2050 traffic volumes are projected to be approximately 1.4 times current levels without the construction of a TI and 1.6 times current levels with the construction of a TI.
- Widening the SR 347 mainline to three GPLs in each direction improves traffic operations but is not sufficient to provide acceptable LOS in 2050. Additional improvements such as grade separation of SR 347/Riggs Road are warranted.

SR 347/Riggs Road

- The existing condition provides an overall LOS E/F at the at-grade signalized intersection in 2022.
- The No-Build scenario provides an overall LOS F at the at-grade intersection through 2050.
- The Baseline Build scenario provides an overall LOS F at the at-grade intersection through 2050.
- The SDI provides an overall LOS B or better at each TI ramp intersection through 2050.
- The SPUI provides an overall LOS B or better at the TI through 2050.
- The DDI provides an overall LOS A at each TI ramp intersection and crossover point through 2050.
- The DRI provides an overall LOS A at each TI ramp intersection through 2050.
- **Table 2.21** summarizes the worst intersection LOS for each scenario with its accompanying delay in seconds. It should be noted that all four build TI configuration scenarios provide acceptable LOS.

Table 2.21 – Level of Service Summary

SR 347/Riggs Road Scenario	Worst Peak Hour Intersection LOS / Average Delay (s)
2022 No-Build (existing condition)	F / 123
2050 No-Build (no improvements)	F / 367
2050 Baseline Build (widen to three lanes NB/SB on SR 347)	F / 270
2050 Spread Diamond Interchange (Two lanes EB/WB on Riggs Road)	B / 19
2050 Single Point Urban Interchange (Two lanes EB/WB on Riggs Road)	B / 15
2050 Diverging Diamond Interchange (Two lanes EB/WB on Riggs Road)	A / 8
2050 Double Roundabout Interchange (Two lanes EB/WB on Riggs Road)	A / 3

Other Traffic-Related Interchange Considerations

- The DRI provides the most benefit in terms of safety due to the number and type of conflict points, followed in order by the DDI, the SPUI, and the SDI.
- Drivers are most familiar with the SDI, followed in order by the SPUI, the DRI, and the DDI.
- All four analyzed interchange types will likely have similar access requirements, but only the DRI provides U-turn opportunities for EB-WB Riggs Road traffic at the ramp/crossroad intersections to help with access.
- The SDI provides the most benefit in terms of traffic diversion accommodation, followed in order by the DRI and then the SPUI and the DDI, providing a similar level of benefit.
- The SPUI provides the most benefit in terms of bicyclist accommodation (one intersection with green phase), followed by the SDI and DDI (two intersections with green phase), with the DRI providing the least bicyclist accommodation (no bikes allowed).
- The SDI provides the most benefit in terms of pedestrian accommodation (two protected crossings), followed by the DRI (two yield crossings), followed by the SPUI and DDI (two protected and two yield crossings).
- The SDI provides the most benefit in terms of oversized vehicle accommodation, followed in order by the DRI and then the SPUI and the DDI, providing a similar level of benefit.
- Other factors besides traffic considerations (e.g., R/W impacts, cost, etc.) should be considered in determining the preferred TI configuration at SR 347/Riggs Road.

Evaluation Matrix of Interchange Configuration Scenarios

The various configuration scenarios were compared to each other using several different evaluation criteria. Some of the evaluation criteria do not lend themselves to numerical quantification, so the evaluation was performed on a “qualitative” basis using the following descriptors to describe the relative impacts of each of the “Build” scenarios plus the “No-Build” scenario:

- ● Strong Advantage;
- ◐ Advantage;
- ○ Neutral;
- ◑ Disadvantage; and
- ● Strong Disadvantage.

The Strong Advantage and Advantage descriptors apply when implementation of a scenario is anticipated to result in a positive change or improvement compared to existing conditions. The Strong Disadvantage and Disadvantage descriptors apply when implementation of a scenario is anticipated to result in a negative change or worsening compared to current conditions. The Neutral descriptor applies when implementation of a scenario is anticipated to have no impact on current conditions or result in both positive and negative changes that effectively cancel each other out.

Table 2.22 summarizes the relative advantages and disadvantages of the No-Build and Build scenarios analyzed (Baseline Build, SDI, SPUI, DDI, and DRI).

Table 2.22 – Evaluation Matrix of Traffic Configuration Scenarios and Criteria

Evaluation Criteria	No-Build (Signalized Intersection)	Baseline Build (Signalized Intersection, widen to three lanes NB/SB on SR 347)	Spread Diamond Interchange (SDI)	Single-Point Urban Interchange (SPUI)	Diverging Diamond Interchange (DDI)	Double Roundabout Interchange (DRI)
Traffic Operations (2050 AM/PM)	● - LOS F/F - Queues of 4,490'/4,191'	● - LOS F/F - Queues of 3,038'/3,077'	◐ - LOS B/B - Queues of 128'/235'	◐ - LOS A/B - Queues of 114'/298'	● - LOS A/A - Queues of 29'/65'	● - LOS A/A - Queues of 29'/37'
Motorist Safety	● - 32 conflict points, 16 crossing points (4 perpendicular) - Speed and wrong-way control by signals and signs - History of frequent crashes, many of which are severe	● - 32 conflict points, 16 crossing points (4 perpendicular) - Speed and wrong-way control by signals and signs - History of frequent crashes, many of which are severe	◑ - 26 conflict points, 10 crossing points (4 perpendicular) - Speed and wrong-way control by signals and signs	○ - 20 conflict points, 8 crossing points (0 perpendicular) - Speed and wrong-way control by signals and signs	◐ - 14 conflict points, 2 crossing points (0 perpendicular) - Speed and wrong-way control by curbs and roadway geometry	● - 4 conflict points, 4 crossing points (0 perpendicular) - Speed and wrong-way control by curbs and roadway geometry
Driver Familiarity	● - Very common configuration	● - Very common configuration	● - Very common configuration	◐ - Common configuration	◑ - Uncommon configuration	○ - Somewhat common configuration
Access to Adjacent Parcels	○ - No change to existing access conditions	○ - No change to existing access conditions	● - Access restrictions require relocation of substation access and could limit access to tribal allottee parcels east of SR 347	● - Access restrictions require relocation of substation access and could limit access to tribal allottee parcels east of SR 347	● - Access restrictions require relocation of substation access and could limit access to tribal allottee parcels east of SR 347	◑ - Access restrictions require relocation of substation access and could limit access to tribal allottee parcels east of SR 347 - Roundabout provides U-turn opportunity within interchange
Traffic Diversion Accommodation	○ - Flexible but capacity-constrained	○ - Flexible but capacity-constrained	● - Increased capacity with direct through movement at ramps - Can easily modify signal timing to clear queues	◐ - Increased capacity but through movement typically not provided or provided only indirectly at ramps - Can easily modify signal timing to clear queues	◐ - Increased capacity but through movement typically not provided or provided only indirectly at ramps - Can easily modify signal timing to clear queues	◐ - Increased capacity with direct through movement at ramps - Yield control cannot easily be modified to clear queues
Pedestrian and Bicyclist Accommodation and Safety	◑ - 1 crossing required, signalized - Includes pedestrian crossing indications and shoulders but is missing crosswalks, sidewalk, and ramps - High vehicle speeds negatively affect pedestrian and bicyclist safety and comfort	◑ - 1 crossing required, signalized - Includes pedestrian crossing indications and shoulders but is missing crosswalks, sidewalk, and ramps - High vehicle speeds negatively affect pedestrian and bicyclist safety and comfort	○ - 2 crossings required, typically all signalized - Includes standard pedestrian and bicyclist facilities - High vehicle speeds negatively affect pedestrian and bicyclist safety and comfort	○ - 4 crossings required, some or all signalized - Includes standard pedestrian and bicyclist facilities - High vehicle speeds negatively affect pedestrian and bicyclist safety and comfort	◐ - 4 crossings required, some or all signalized - Includes standard pedestrian and bicyclist facilities - Moderate vehicle speeds somewhat affect pedestrian and bicyclist safety and comfort	◐ - 2 crossings required, typically all unsignalized but can be signalized - Includes standard pedestrian and bicyclist facilities - Low vehicle speeds positively affect pedestrian and bicyclist safety and comfort
Oversize Vehicle Accommodation	● - Open geometry with no major horizontal or vertical restrictions	● - Open geometry with no major horizontal or vertical restrictions	◐ - Open geometry with ramp around option	● - Restricted geometry with no ramp around option typically	● - Restricted geometry with no ramp around option typically	◑ - Restricted geometry with ramp around option

Legend

Strong Advantage ● Advantage ◐ Neutral ○ Disadvantage ◑ Strong Disadvantage ●

3. Design Concept Alternatives

3.1. Introduction

Design concepts provide a grade-separated intersection or TI at SR 347 and Riggs Road. Seven alternatives were considered for the TI in addition to the "No-Build" alternative. The seven alternatives included:

- Alternative A1 – Tight Diamond TI (TDI)
- Alternative A2 – Spread Diamond TI (SDI)
- Alternative B1 – Shifted Tight Diamond TI with Signals (STDI)
- Alternative B2 – Shifted Tight Diamond TI with Roundabouts (DRI)
- Alternative C – Single-Point Urban Interchange (SPUI)
- Alternative D1 – Diverging Diamond Interchange (DDI)
- Alternative D2 – Spread DDI (SDDI)

The alternatives were developed to conform to the adopted regional transportation plans, improve traffic operational performance, achieve engineering design standards, minimize R/W acquisition and utility impacts, minimize environmental impacts, minimize project costs, and obtain local agency, governmental (including tribal governments), and public support.

Public agencies and governmental entities that have been involved in the alternative evaluation process include ADOT, MAG, GRIC, AK-Chin Indian Community, MCDOT, Pinal County, City of Maricopa, GRICUA, GRTI, BIA, and the FHWA.

3.2. Evaluation Criteria

Six screening criteria were used to evaluate the Build and No-Build alternatives. Each evaluation criterion is described below:

1. Traffic Operational Performance: This criterion evaluates the alternatives for potential benefits to the operational performance and LOS of the TI Alternative. The SR 347 and Riggs Road TI should provide LOS 'D' or better operational characteristics for the Design Year 2050 traffic volume projections provided by MAG and updated within this report. This section also includes evaluation of Safety, Driver Familiarity with the TI type, Access to Adjacent Parcels, Traffic Diversion Accommodation, Pedestrian and Bicyclist Accommodation, and Oversized Vehicle Accommodation.
2. Ability to Achieve Engineering Standards or Geometric Design: This criterion evaluates the use of applicable geometric design criteria. The alternatives must achieve AASHTO and ADOT geometric design standards to optimize highway safety and operational characteristics and minimize owner liability. AASHTO and ADOT geometric design standards are mandatory, unless a formal AASHTO design exception can be obtained from the FHWA, or an ADOT design variance can be obtained from ADOT's Roadway Group.
3. R/W Requirements and Utility Impacts: This criterion evaluates the impact of the alternatives on R/W acquisition and existing utilities. The alternatives should minimize the need for new R/W and impacts to existing utilities.
4. Environmental Considerations: This criterion evaluates the alternatives based upon amount of disturbance to developed areas and vegetation, potential changes in visual character and quality, potential impacts to cultural/historic and biological resources, and hazardous materials issues. No environmental fatal-flaw issues should be identified that could not be mitigated with the project.
5. Total Estimated Construction Cost: This criterion evaluates the estimated construction cost of the alternatives. The widening alternatives operational and geometric design characteristics must be achieved in the most cost-effective manner (taking legal obligations into account) to obtain the necessary funding for the facility.
6. Agency, Governmental, and Public Acceptance: This criterion evaluates the ability of the alternatives to obtain local agency, governmental, and public acceptance is vital for project implementation which includes design that is compliant with major stakeholder regional and local transportation plans and goals.

3.3. Design Concept Alternatives Considered and Discontinued

Riggs Road TI Alternatives

Alternative A1 – Tight Diamond TI

Alternative A will keep the SR 347 alignment in its current location and construct a TDI at Riggs Road. Riggs Road will be elevated onto a bridge to cross over SR 347. Traffic will be controlled utilizing traffic signals and the configuration will meet the capacity needs with the interchange operating at LOS B in the 2050 AM and PM peak hour. The TI will be designed to meet all AASHTO Controlling Design Criteria. Retaining walls will be required on the approaches to the bridge. Oversized vehicles are easily accommodated by utilizing the ramps to bypass the Riggs Road bridge.

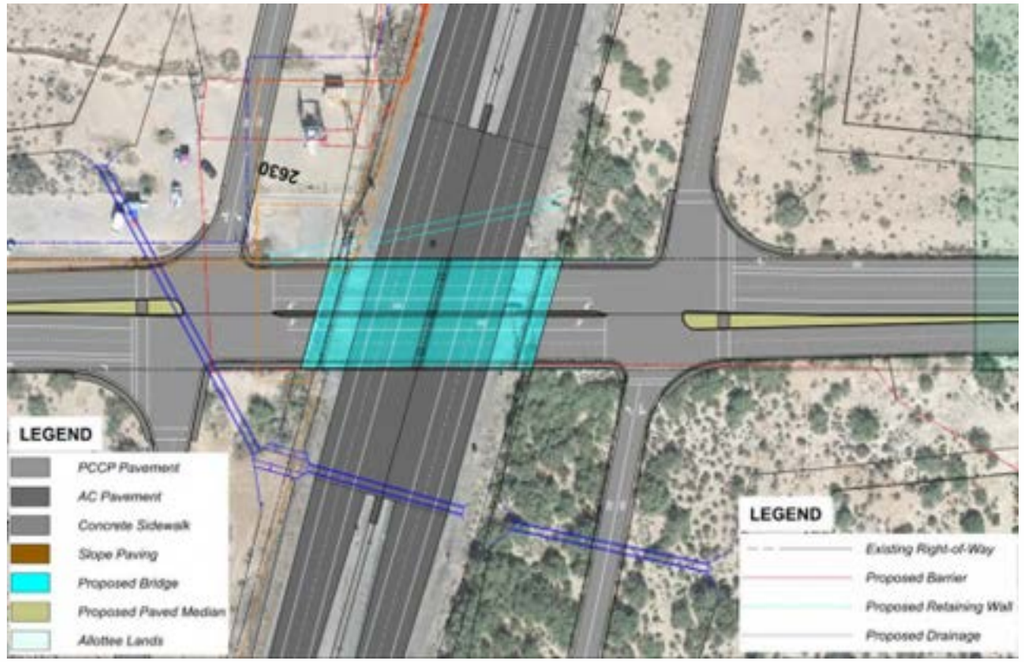


Figure 3.1 – Alternative A1 - Tight Diamond TI Layout

This alternative will require substantial R/W acquisition, including potential impacts to allottee parcels. This alternative will also require the relocation of the existing GRICUA power substation and several power pole relocations, which all together are estimated to cost more than $10 million and will require 3 to 4 years to relocate. Traffic control for Alternative A1 requires a long-tern shoe-fly detour along Riggs Road and typical short-term closures to tie in traffic to the new construction.

Alternative A2 – Spread Diamond TI

Alternative A2 will keep the SR 347 alignment in its current location and construct a SDI at Riggs Road. Riggs Road will be elevated onto a bridge to cross over SR 347. Traffic will be controlled utilizing traffic signals and the configuration will meet the capacity needs with the interchange operating at LOS B in the 2050 AM and PM peak hour. The TI will be designed to meet all AASHTO Controlling Design Criteria. Retaining walls will be required on the approaches to the bridge. Oversized vehicles are easily accommodated by utilizing the ramps to bypass the Riggs Road bridge.

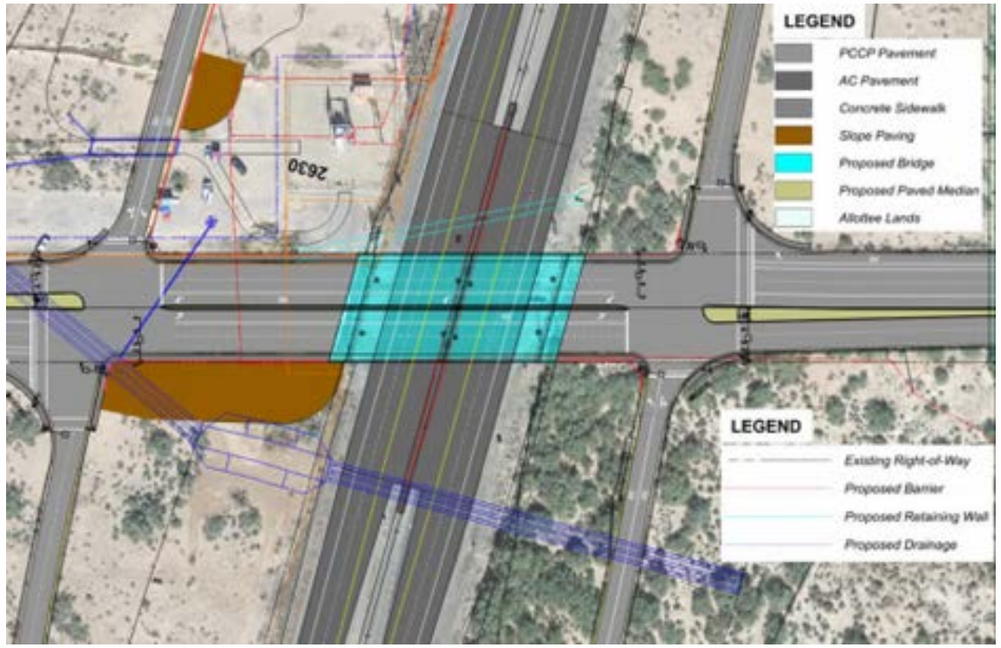


Figure 3.2 – Alternative A2 - Spread Diamond TI Layout

This alternative will require substantial R/W acquisition, including potential impacts to allottee parcels. This alternative will protect-in-place the existing GRICUA power substation. The substation will be located within ADOT R/W in the infield area between the SB Riggs Road off-ramp and SB SR 347. Several power pole relocations will be required at an estimated cost of $1.5 million. If the relocations were decided to be placed underground, the cost would be an estimated $7 million. The power poles will require 1 to 2 years to relocate. Access to the substation will be provided via a driveway on Riggs Road west of SR 347. An equipment underpass will be required under the SB Riggs Road off-ramp to provide access to the substation. Additional retaining walls will be required to avoid fill slope impacts to the substation. Traffic control for Alternative A2 requires a long-tern shoe-fly detour along Riggs Road and typical short-term closures to tie in traffic at new construction.

Alternative B1 – Shifted Tight Diamond TI with Signals

Alternative B1 will shift the SR 347 alignment to the east of its current location utilizing large-radii reverse curves along the SR 347 centerline. This alternative constructs a TDI at Riggs Road. Riggs Road will remain at grade and SR 347 will be elevated onto a bridge to cross over Riggs Road. Traffic will be controlled utilizing traffic signals and the configuration will meet the capacity needs with the interchange operating at LOS B in the 2050 AM and PM peak hour. The TI will be designed to meet all AASHTO Controlling Design Criteria. Some retaining walls will be required. Oversize vehicles are easily accommodated and do not need to be detoured off SR 347.

This alternative will require R/W acquisition, including potential impacts to allottee parcels. This alternative will protect the existing GRICUA power substation in place. The substation will be located outside of ADOT R/W. Existing powerlines will need to be raised over SR 347 at an estimated cost of $1.2 million. If the relocations were decided to be placed underground, the cost would be an estimated $7 million. The powerline relocation will require 1 to 2 years. Access to the substation will be provided via a driveway on Riggs Road west of SR 347. Traffic control for Alternative B1 requires only typical short-term closures to tie in traffic at new construction along SR 347 and Riggs Road. A retaining wall will be required between the NB on ramp and mainline SR 347 for a short distance to reduce the impacts to the allottee lands. A 2-foot-max retaining wall will also be required between the SB off ramp and the GRICUA power substation to avoid fill slope impacts to the substation.

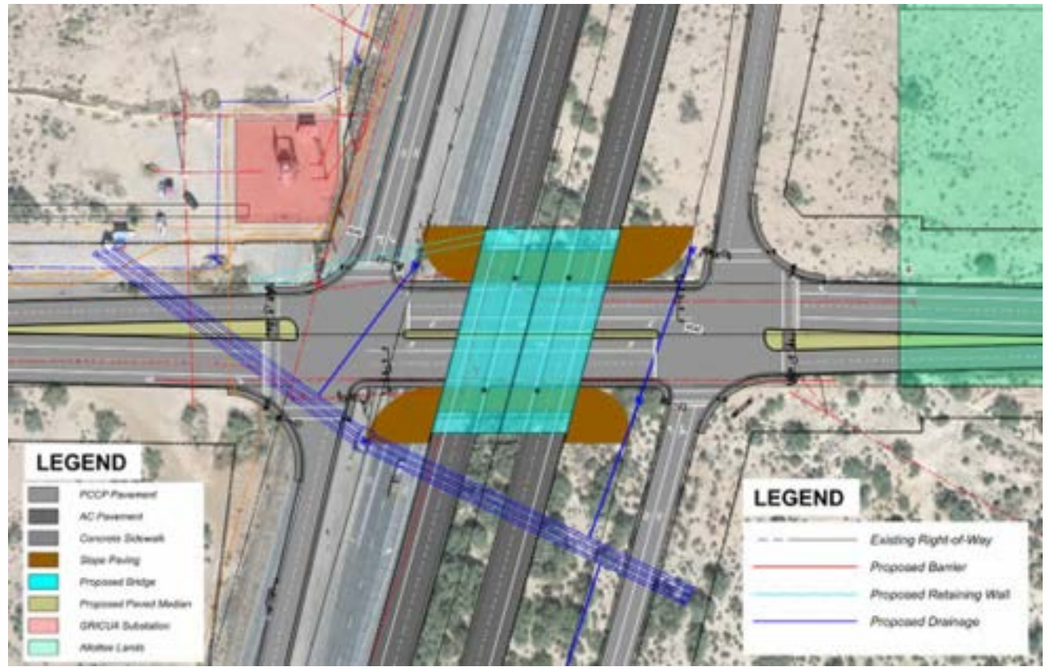


Figure 3.3 – Alternative B1 - Shifted Tight Diamond with Signals TI Layout

Alternative B2 – Shifted Tight Diamond TI with Roundabouts

Alternative B2 will shift the SR 347 alignment to the east of its current location utilizing large-radii reverse curves along the SR 347 centerline. This alternative will construct a diamond interchange with roundabouts at Riggs Road. Riggs Road will remain at grade and SR 347 will be elevated onto a bridge to cross over Riggs Road. This alternative will meet the capacity needs with the interchange operating at LOS A in the 2050 AM and PM peak hour. The TI will be designed to meet all AASHTO Controlling Design Criteria. No retaining walls will be required. This alternative requires the largest bridge. Oversized vehicles can be accommodated but would need to negotiate roundabout geometry.

This alternative will require R/W acquisition, including potential impacts to allottee parcels. This alternative will protect the existing GRICUA power substation in place and will remain located outside of ADOT R/W. Existing powerlines will need to be raised over SR 347 at an estimated cost of $1.2 million. If the relocations were decided to be placed underground, the cost would be an estimated $7 million. The powerline relocation will require 1 to 2 years. Access to the substation will be provided via a driveway on Riggs Road west of SR 347. Traffic control for Alternative B1 requires temporary paving and typical short-term closures to tie in traffic at new construction along SR 347 and Riggs Road.

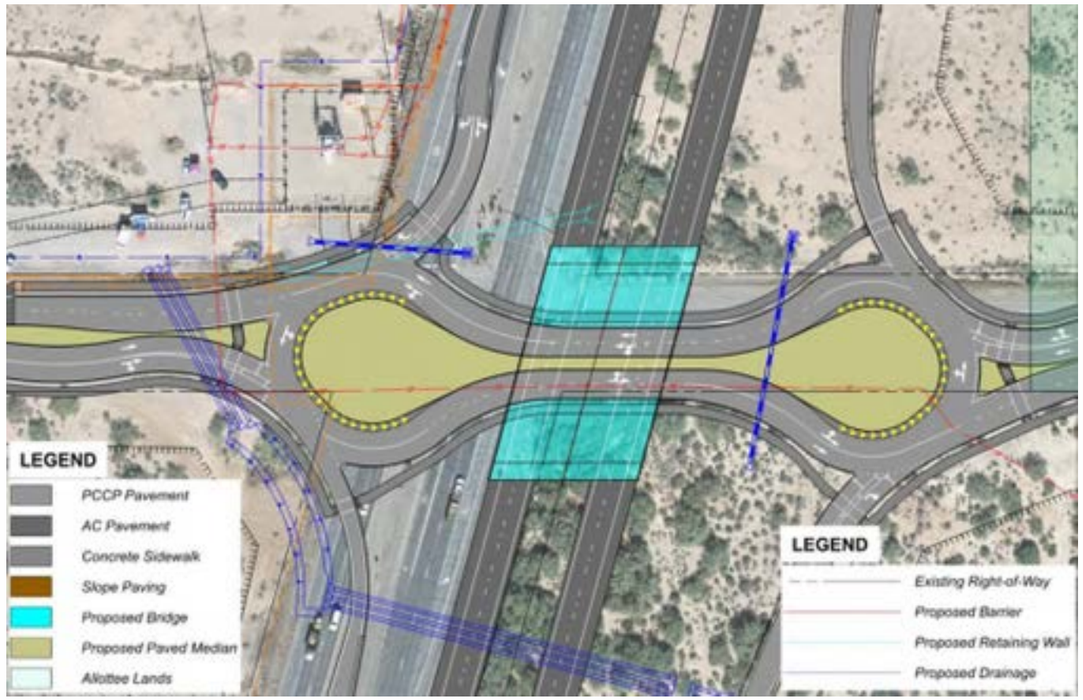


Figure 3.4 – Alternative B2 - Shifted Tight Diamond with Roundabouts TI Layout

Alternative C – Single-Point Urban Interchange (SPUI)

Alternative C will keep the SR 347 alignment in its current location and construct a SPUI at Riggs Road. Riggs Road will be elevated onto a bridge to cross over SR 347. Traffic will be controlled utilizing traffic signals and the configuration will meet the capacity needs with the interchange operating at LOS A in the 2050 AM peak hour and LOS B in the 2050 PM peak hour. The TI will be designed to meet all AASHTO Controlling Design Criteria. A significant number of retaining walls will be required on the approaches to the bridge and along portions of the ramps. This alternative requires the smallest bridge footprint. This alternative does not favorably accommodate oversized vehicles due to the geometry of the SPUI in which through movements from off-ramps to on-ramps are restricted.

This alternative will require the least amount of R/W acquisition but will potentially impact allottee parcels. This alternative will also require the relocation of the existing GRICUA power substation and several power pole relocations which all together are estimated to cost more than $10 million and will require 3 to 4 years to relocate. Traffic control for Alternative C requires a long-term shoe-fly detour along Riggs Road and typical short-term closures to tie in traffic at new construction.

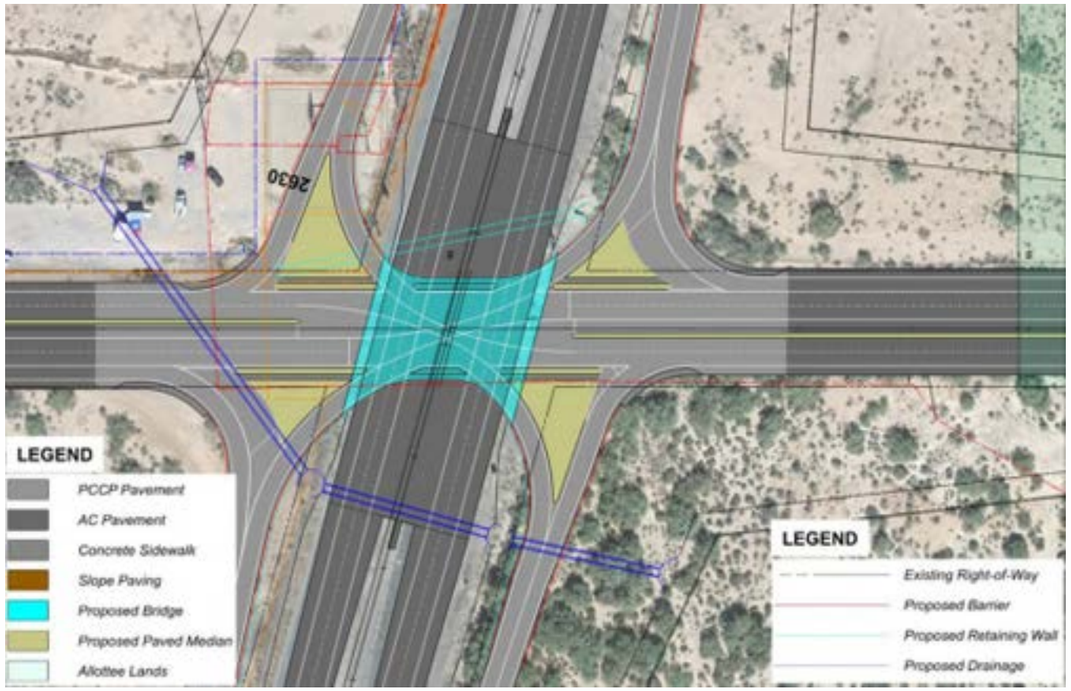


Figure 3.5 – Alternative C - SPUI TI Layout

Alternative D1 – Diverging Diamond Interchange (DDI)

Alternative D1 will keep the SR 347 alignment in its current location and construct a DDI at Riggs Road. Riggs Road will be elevated and both EB and WB traffic will cross SR 347 on independent bridges. Traffic will be controlled utilizing traffic signals and the configuration will meet the capacity needs with the interchange operating at LOS A in the 2050 AM and PM peak hour. The TI will be designed to meet all AASHTO Controlling Design Criteria. Retaining walls will be required on the approaches to the bridge and along portions of the ramps. This alternative does not favorably accommodate oversized vehicles due to the geometry of the DDI in which through movements from off-ramps to on-ramps are restricted.

This alternative will require less R/W acquisition than most and will potentially impact allottee parcels. This alternative will also require the relocation of the existing GRICUA power substation and several power pole relocations which all together are estimated to cost more than $10 million and will require 3 to 4 years to relocate. Traffic control for Alternative D1 requires a long-tern shoe-fly detour along Riggs Road and typical short-term closures to tie in traffic at new construction.

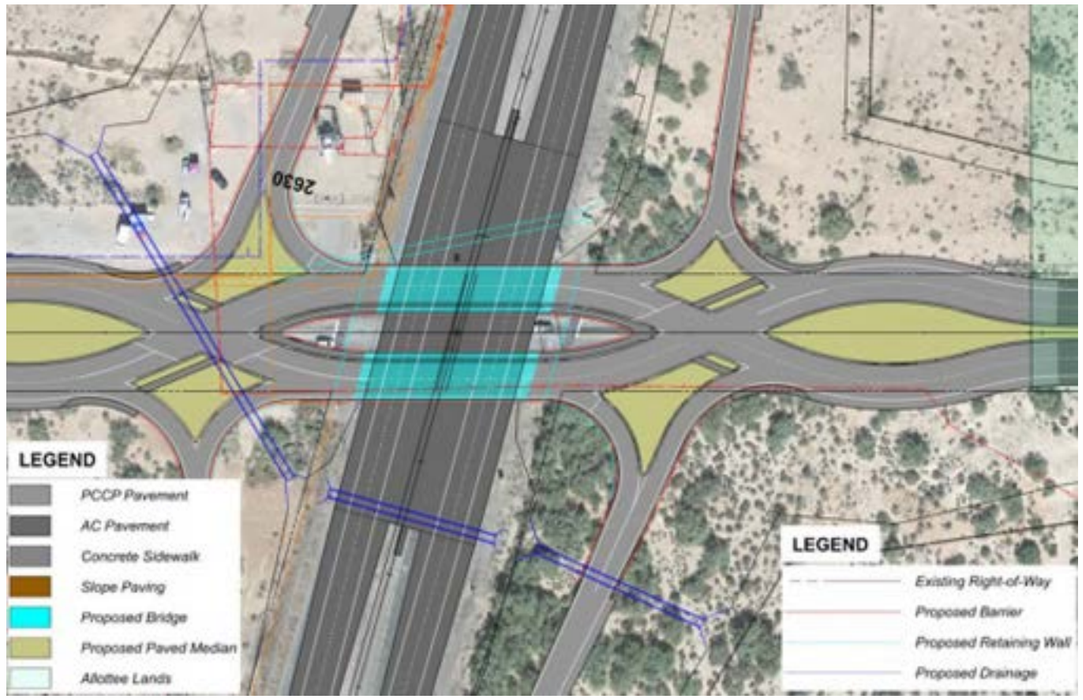


Figure 3.6 – Alternative D1 - DDI TI Layout

Alternative D2 – Spread DDI

Alternative D2 will keep the SR 347 alignment in its current location and construct a DDI at Riggs Road. Riggs Road will be elevated and both EB and WB traffic will cross SR 347 on independent bridges. The western intersection of the DDI is shifted to the west to protect the GRICUA power substation in place. Traffic will be controlled utilizing traffic signals and the configuration will meet the capacity needs with the interchange operating at LOS A in the 2050 AM and PM peak hour. The TI will be designed to meet all AASHTO Controlling Design Criteria. Retaining walls will be required on the approaches to the bridge and along portions of the ramps. This alternative does not favorably accommodate oversized vehicles due to the geometry of the DDI in which through movements from off-ramps to on-ramps are restricted.

This alternative will require substantial R/W acquisition, including potential impacts to allottee parcels. This alternative will protect the existing GRICUA power substation in place. The substation will be located within ADOT R/W in the infield area between the SB Riggs Road off-ramp and SB SR 347. Several power pole relocations will be required at an estimated cost of $1.5 million. If the relocations were decided to be placed underground, the cost would be an estimated additional $7 million. The power poles will require 1 to 2 years to relocate. Access to the substation will be provided via a driveway on Riggs Road west of SR 347. An equipment underpass will be required under the SB Riggs Road off-ramp to provide access to the substation. Additional retaining walls will be required to avoid fill slope impacts to the substation. Traffic control for Alternative A1 requires a long-tern shoe-fly detour along Riggs Road (larger than other options) and typical short-term closures to tie in traffic at new construction.

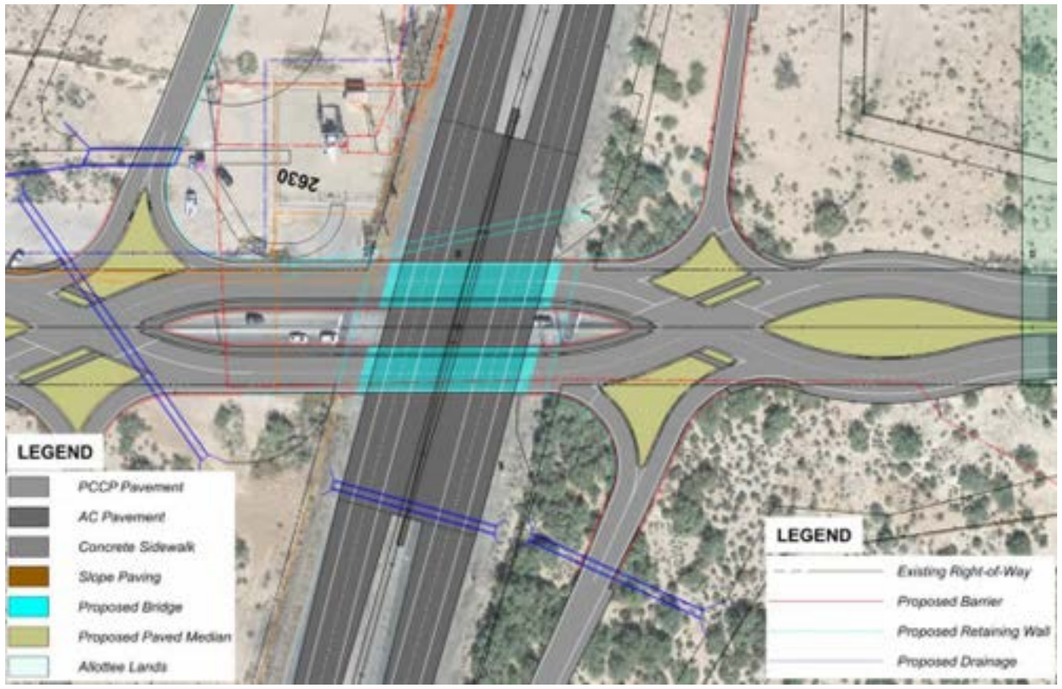


Figure 3.7 – Alternative D2 - Spread DDI TI Layout

3.4. Narrowing Down of Alternatives

Seven potential “Build” alternatives were developed and evaluated to determine how well each improves traffic operational performance, complies with engineering design standards, and minimizes R/W acquisition, utility impacts, environmental impacts, and project costs while also having local agency and public support.

Each of these alternatives were evaluated against the criteria identified in Section 3.2 and a detailed alternatives evaluation matrix is shown in **Table 3.1**.

Table 3.1 – TI Alternatives Evaluation Matrix

Evaluation Criteria		*No-Build*	*Alternative A1 Tight Diamond (TDI)*	*Alternative A2 Spread Diamond (SDI)*	*Alternative B1 Shifted Tight Diamond w/Signals (STDI)*	*Alternative B2 Shifted Tight Diamond w/Roundabouts (DRI)*	*Alternative C Single-Point Urban Interchange (SPUI)*	*Alternative D1 Diverging Diamond (DDI)*	*Alternative D2 Spread Diverging Diamond (SDDI)*
Traffic Performance	**Traffic Operations (2050 AM/PM Level of Service)**	● Doesn't meet capacity needs ●* LOS F/F	● Meets capacity needs ◐ LOS B/B	● Meets capacity needs ◐ LOS B/B	● Meets capacity needs ◐ LOS B/B	● Meets capacity needs ● LOS A/A	● Meets capacity needs ◐ LOS A/B	● Meets capacity needs ● LOS A/A	● Meets capacity needs ● LOS A/A
	Motorist Safety	● 32 conflict points, 16 crossing points ● History of frequent severe crashes	◑ 26 conflict points, 10 crossing points	◑ 26 conflict points, 10 crossing points	◑ 26 conflict points, 10 crossing points	● 4 conflict points, 4 crossing points	○ 20 conflict points, 8 crossing points	◐ 14 conflict points, 2 crossing points	◐ 14 conflict points, 2 crossing points
	Access to Adjacent Parcels	○ No change to existing access conditions	● Access restrictions at substation and potentially at tribal allottee parcels	● Access restrictions at substation and potentially at tribal allottee parcels	● Access restrictions at substation and potentially at tribal allottee parcels	◑ Access restrictions at substation and potentially at tribal allottee parcels but with U-turn option	● Access restrictions at substation and potentially at tribal allottee parcels	● Access restrictions at substation and potentially at tribal allottee parcels	● Access restrictions at substation and potentially at tribal allottee parcels
	Traffic Diversion Accommodation	○ Flexible but capacity-constrained	● Increased capacity; through movement at ramps; signal control	● Increased capacity; through movement at ramps; signal control	● Increased capacity; through movement at ramps; signal control	◐ Increased capacity; through movement at ramps; yield control	◐ Increased capacity; through movement not typically provided at ramps; signal control	◐ Increased capacity; through movement not typically provided at ramps; signal control	◐ Increased capacity; through movement not typically provided at ramps; signal control
	Oversize Vehicle Accommodation	● Open geometry with no major restrictions	◐ Open geometry with ramp around option	◐ Open geometry with ramp around option	◐ Open geometry with ramp around option	◑ Restricted geometry with ramp around option	● Restricted geometry with no ramp around option typically	● Restricted geometry with no ramp around option typically	● Restricted geometry with no ramp around option typically
	Construction Detours and Closures	● No detours or closures required.	● Long-term shoefly detour along Riggs Road and short term along SR 347	● Long-term shoefly detour along Riggs Road and short term along SR 347	◑ Short-term closures for tie-in along SR 347	◑ Short-term closures for tie-in along SR 347, some temporary paving along at roundabouts	● Long-term shoefly detour along Riggs Road and short term along SR 347	● Long-term shoefly detour along Riggs Road and short term along SR 347	● Long-term shoefly detour along Riggs Road and short term along SR 347
	Driver Familiarity	● Very common configuration	● Very common configuration	● Very common configuration	● Very common configuration	○ Somewhat common configuration	◐ Common configuration	◑ Uncommon configuration	◑ Uncommon configuration
	Pedestrian and Bicyclist Accommodation and Safety	◑ 1 crossing required, signalized; no existing sidewalks or crosswalks; high vehicle speeds at crossing	○ 2 crossings required, all signalized; sidewalks and crosswalks; high vehicle speeds at crossings	○ 2 crossings required, all signalized; sidewalks and crosswalks; high vehicle speeds at crossings	○ 2 crossings required, all signalized; sidewalks and crosswalks; high vehicle speeds at crossings	◐ 2 crossings required, typically not signalized; sidewalks and crosswalks; low vehicle speeds at crossings	○ 4 crossings required, some or all signalized; sidewalks and crosswalks; high vehicle speeds at crossings	◐ 4 crossings required, some or all signalized; sidewalks and crosswalks; moderate vehicle speeds at crossings	◐ 4 crossings required, some or all signalized; sidewalks and crosswalks; moderate vehicle speeds at crossings
Engineering Requirements	**SR 347 Roadway Horizontal Geometry**	◐ Tangent ◐ Meets AASHTO design criteria, no design exceptions needed	◐ Tangent ◐ Meets AASHTO design criteria, no design exceptions needed	◐ Tangent ◐ Meets AASHTO design criteria, no design exceptions needed	○ Horizontal reverse curves, bridge tangent ◐ Meets AASHTO design criteria, no design exceptions needed	○ Horizontal reverse curves, bridge tangent ◐ Meets AASHTO design criteria, no design exceptions needed	◐ Tangent ◐ Meets AASHTO design criteria, no design exceptions needed	◐ Tangent ◐ Meets AASHTO design criteria, no design exceptions needed	◐ Tangent ◐ Meets AASHTO design criteria, no design exceptions needed
	SR 347 Roadway Vertical Geometry and Clearance	● No vertical geometry requirements because no bridge	◐ Underpass (Riggs over SR 347) ◐ Meets AASHTO Design Criteria, no design exceptions needed	◐ Underpass (Riggs over SR 347) ◐ Meets AASHTO Design Criteria, no design exceptions needed	○ Overpass (SR 347 over Riggs) ◐ Meets AASHTO Design Criteria, no design exceptions needed	○ Overpass (SR 347 over Riggs) ◐ Meets AASHTO Design Criteria, no design exceptions needed	◐ Underpass (Riggs over SR 347) ◐ Meets AASHTO Design Criteria, no design exceptions needed	◐ Underpass (Riggs over SR 347) ◐ Meets AASHTO Design Criteria, no design exceptions needed	◐ Underpass (Riggs over SR 347) ◐ Meets AASHTO Design Criteria, no design exceptions needed
	Bridge Square Feet	● No bridge required	○ 19,861 SF	○ 19,861 SF	◑ 27,490 SF	◑ 27,490 SF	◐ 15,668 SF	◐ 13,120 SF	◐ 13,120 SF
	Walls	● No walls required	○ 15,344 SF	◑ 22,462 SF	● 9,070 SF	● 9,070 SF	● 36,319 SF	◑ 21,322 SF	● 27,149 SF
	Drainage	● No additional drainage infrastructure is required	● 52 LF CMP, 124 LF RCP, 2016 LF Pipe Culvert, 100 LF RCB	● 86 LF CMP, 148 LF RCP, 3183 LF Pipe culvert, 140 LF RCB, Junction structure	◑ 109 LF CMP, 777 LF RCP, 1944 LF Pipe Culvert, 245 LF RCB, Junction Box	◑ 75 LF CMP, 333 LF RCP, 1602 LF Pipe Culvert, 245 LF RCB	◑ 25 LF CMP, 372 LF RCP, 1573 LF Pipe Culvert, 58 LF RCB, Junction Box	◑ 25 LF CMP, 372 LF RCP, 1746 LF Pipe Culvert, 52 LF RCB	◑ 34 LF CMP, 372 LF RCP, 2585 LF Pipe Culvert, 94 LF RCB, Junction Box

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

Table 3.1 – TI Alternatives Evaluation Matrix (Continued)

Evaluation Criteria		*No-Build*	*Alternative A1 Tight Diamond (TDI)*	*Alternative A2 Spread Diamond (SDI)*	*Alternative B1 Shifted Tight Diamond w/Signals (STDI)*	*Alternative B2 Shifted Tight Diamond w/Roundabouts (DRI)*	*Alternative C Single-Point Urban Interchange (SPUI)*	*Alternative D1 Diverging Diamond (DDI)*	*Alternative D2 Spread Diverging Diamond (SDDI)*
Engineering Requirements (continued)	**Earthwork**	🔵 No earthwork required	○ 197k CY	● 408k CY	◑ 301k CY	◑ 350k CY	○ 197k CY	◑ 223k CY	◑ 265k CY
	Constructability	🔵 No construction required	◑ Shoo-fly detour required	◑ Shoo-fly detour required	◐ Phased offline, minimal temporary pavement and grading	◐ Phased offline, minimal temporary pavement and grading	◑ Shoo-fly detour required	◑ Shoo-fly detour required	◑ Shoo-fly detour required
Right-of-Way Requirements & Utility Impacts	**Right-of Way**	🔵 No new right-of-way required	◑ 1,689,035 SF (38.77 AC)	● 1,916,248 SF (43.99 AC)	○ 1,444,977 SF (33.17 AC)	○ 1,321,248 SF (30.33 AC)	◐ 1,075,344 SF (24.69 AC)	◐ 1,152,553 SF (26.46 AC)	◑ 1,524,730 SF (35.00 AC)
	Allottee Parcel Impacts	🔵 No impacts to existing allottee parcels	◑ 1 parcel potentially impacted, 65,083 SF	🔵 Refined Alternatives have been revised to avoid all impacts	🔵 Refined Alternatives have been revised to avoid all impacts	● 2 parcels potentially impacted, 30,933 SF	◑ 1 parcels potentially impacted, 49,777 SF	◑ 1 parcel potentially impacted, 41,067 SF	◑ 1 parcel potentially impacted, 41,067 SF
	GRICUA Power Utility Impacts	🔵 No impacts	●* $10M+ substation relocation and multiple pole relocations ● Relocation requires 3-4 years to complete	◑ $1.5M pole relocations ◑ Relocation requires 1-2 years to complete	○ $1.2M powerline raised above SR 347 ○ Relocation requires 1-2 years to complete	○ $1.2M powerline raised above SR 347 ○ Relocation requires 1-2 years to complete	●* $10M+ substation relocation and multiple pole relocations ● Relocation requires 3-4 years to complete	●* $10M+ substation relocation and multiple pole relocations ● Relocation requires 3-4 years to complete	◑ $1.5M pole relocations ◑ Relocation requires 1-2 years to complete
	Substation Access	◐ Existing driveway	◑ Driveway relocated	● Equipment crossing structure required and driveway relocated	◐ Driveway maintained	◐ Driveway maintained	◑ Driveway relocated	◑ Driveway relocated	● Equipment crossing structure required and driveway relocated
	GRTI Fiber Optic Relocations	🔵 No impacts	◑ Requires relocations	🔵 No impacts	🔵 No impacts	🔵 No impacts	◑ Requires relocations	◑ Requires relocations	🔵 No impacts
Environmental Considerations	**Section 404/401 and Clean Water Act (Waters of the U.S.)**	🔵 No impacts to Section 404 Waters of the U.S.	○ No impacts to Waters of the U.S. as Waters are not present. Confirmed by Corps of Engineers on 09/01/2023.	○ No impacts to Waters of the U.S. as Waters are not present. Confirmed by Corps of Engineers on 09/01/2023.	○ No impacts to Waters of the U.S. as Waters are not present. Confirmed by Corps of Engineers on 09/01/2023.	○ No impacts to Waters of the U.S. as Waters are not present. Confirmed by Corps of Engineers on 09/01/2023.	○ No impacts to Waters of the U.S. as Waters are not present. Confirmed by Corps of Engineers on 09/01/2023.	○ No impacts to Waters of the U.S. as Waters are not present. Confirmed by Corps of Engineers on 09/01/2023.	○ No impacts to Waters of the U.S. as Waters are not present. Confirmed by Corps of Engineers on 09/01/2023.
	Biological Resources	🔵 No impacts to biological resources.	○ The study area is defined by poor to marginal habitat for all species; therefore, impacts would be different intensities of low. Impacts are based on low-quality habitat removed.	○ The study area is defined by poor to marginal habitat for all species; therefore, impacts would be different intensities of low. Impacts are based on low-quality habitat removed.	○ The study area is defined by poor to marginal habitat for all species; therefore, impacts would be different intensities of low. Impacts are based on low-quality habitat removed.	○ The study area is defined by poor to marginal habitat for all species; therefore, impacts would be different intensities of low. Impacts are based on low-quality habitat removed.	○ The study area is defined by poor to marginal habitat for all species; therefore, impacts would be different intensities of low. Impacts are based on low-quality habitat removed.	○ The study area is defined by poor to marginal habitat for all species; therefore, impacts would be different intensities of low. Impacts are based on low-quality habitat removed.	○ The study area is defined by poor to marginal habitat for all species; therefore, impacts would be different intensities of low. Impacts are based on low-quality habitat removed.
	Hazardous Materials	🔵 No impacts to hazardous materials.	○ No specific sites of concern based on the Preliminary Initial Site Assessment (PISA) approved on 04/10/2023. No documented asbestos/lead (report approved 05/23/2023).	○ No specific sites of concern based on the PISA approved on 04/10/2023. No documented asbestos/lead (report approved 05/23/2023).	○ No specific sites of concern based on the PISA approved on 04/10/2023. No documented asbestos/lead (report approved 05/23/2023).	○ No specific sites of concern based on the PISA approved on 04/10/2023. No documented asbestos/lead (report approved 05/23/2023).	○ No specific sites of concern based on the PISA approved on 04/10/2023. No documented asbestos/lead (report approved 05/23/2023).	○ No specific sites of concern based on the PISA approved on 04/10/2023. No documented asbestos/lead (report approved 05/23/2023).	○ No specific sites of concern based on the PISA approved on 04/10/2023. No documented asbestos/lead (report approved 05/23/2023).
	Cultural Resources	🔵 No impacts to cultural resources.	◑ New access control/ R/W will impact one site (GR-1768/AZ U:13:31 [ASU]). All alternatives will impact at least six roadside memorials per CRMP.	◑ Same R/W impact as TDI to one site (GR-1768/AZ U:13:31 [ASU]). All alternatives will impact at least six roadside memorials per CRMP.	◑ More R/W impact than TDI to one site (GR-1768/AZ U:13:31 [ASU]). All alternatives will impact at least six roadside memorials per CRMP.	◑ More R/W impact than STDI to one site (GR-1768/AZ U:13:31 [ASU]). All alternatives will impact at least six roadside memorials per CRMP.	◑ No new R/W impacts to one site (GR-1768/AZ U:13:31 [ASU]). All alternatives will impact at least six roadside memorials per CRMP.	◑ No new R/W impacts to one site (GR-1768/AZ U:13:31 [ASU]). All alternatives will impact at least six roadside memorials per CRMP.	◑ No new R/W impacts to one site (GR-1768/AZ U:13:31 [ASU]). All alternatives will impact at least six roadside memorials per CRMP.

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

Table 3.1 – TI Alternatives Evaluation Matrix (Continued)

Evaluation Criteria		*No-Build*	*Alternative A1 Tight Diamond (TDI)*	*Alternative A2 Spread Diamond (SDI)*	*Alternative B1 Shifted Tight Diamond w/Signals (STDI)*	*Alternative B2 Shifted Tight Diamond w/Roundabouts (DRI)*	*Alternative C Single-Point Urban Interchange (SPUI)*	*Alternative D1 Diverging Diamond (DDI)*	*Alternative D2 Spread Diverging Diamond (SDDI)*
Environmental Considerations (continued)	**Air Quality**	● No impacts to air quality.	○ A qualitative assessment for air quality will be conducted and methods will be approved by GRIC Department of Environmental Quality (DEQ) if required by BIA.	○ A qualitative assessment for air quality will be conducted and methods will be approved by GRIC DEQ if required by BIA.	◐ An Earth Moving Permit/Dust Control Plan from the GRIC DEQ is anticipated for construction.	○ A qualitative assessment for air quality will be conducted and methods will be approved by GRIC DEQ if required by BIA.	○ A qualitative assessment for air quality will be conducted and methods will be approved by GRIC DEQ if required by BIA.	○ A qualitative assessment for air quality will be conducted and methods will be approved by GRIC DEQ if required by BIA.	○ A qualitative assessment for air quality will be conducted and methods will be approved by GRIC DEQ if required by BIA.
	BIA NEPA	● No impacts to allottee lands.	◑ Approximately 65,083 SF of R/W acquisition anticipated from allottee lands. An Environmental Assessment (EA) will be prepared to analyze potential impacts from R/W acquisition. BIA would be the lead federal agency.	◐ No R/W acquisition is anticipated from allottee lands; therefore, an EA is not required from BIA	◐ No R/W acquisition is anticipated from allottee lands; therefore, an EA is not required from BIA.	◑ Approximately 30,933 SF of R/W acquisition anticipated from allottee lands. An EA will be prepared to analyze potential impacts from R/W acquisition. BIA would be the lead federal agency.	◑ Approximately 49,777 SF of R/W acquisition anticipated from allottee lands. An EA will be prepared to analyze potential impacts from R/W acquisition. BIA would be the lead federal agency.	◑ Approximately 41,067 SF of R/W acquisition anticipated from allottee lands. An EA will be prepared to analyze potential impacts from R/W acquisition. BIA would be the lead federal agency.	◑ Approximately 41,067 SF of R/W acquisition anticipated from allottee lands. An EA will be prepared to analyze potential impacts from R/W acquisition. BIA would be the lead federal agency.
Total Estimated Construction Cost	**Operating and Maintenance Costs**	○ Roadway and signal maintenance	● Roadway, bridge, and signal maintenance	● Roadway, bridge, and signal maintenance	● Roadway, bridge, and signal maintenance	◑ Roadway and bridge maintenance	● Roadway, bridge, and signal maintenance	● Roadway, bridge, and signal maintenance	● Roadway, bridge, and signal maintenance
	Total Project Cost	● $0	● ~$81M	○ ~$69M	◑ ~$75M	○ ~$68M	● ~$88M	● ~$78M	○ ~$69M
Agency and Public Support	**GRIC Leadership**	○	○	◐ one of the two alternatives refined for additional comparison	● Concurred by GRIC Litigation team to continue moving forward	○	○	○	○
	GRIC Members	◑ While most Community members seem to value traffic flow and safety improvements, some dislike the idea of improvements that would increase traffic from outside the reservation	◐ Community members generally prefer diamond interchanges for their familiarity	◐ Community members generally prefer diamond interchanges for their familiarity	◐ Community members generally prefer diamond interchanges for their familiarity	●* Community members generally opposed to roundabouts	○ Some community members expressed support for SPUI	○ Some community members expressed support for DDI	○ Some community members expressed support for DDI
	General Public	● Disliked by public due to many traffic flow and safety concerns	◐ Good support among public due to simplicity, familiarity, and similar design to the I-10/Riggs TI	◐ Good support among public of diamond interchanges	◐ Good support among public of diamond interchanges	◑ Some positive comments but also the most negative comments about roundabouts	○ Some support among public of SPUI	○ Some support among public of DDI	○ Some support among public of DDI
	FHWA	○ No comment	◐ Positive from incident management perspective	◐ Positive from incident management perspective	○ No comment	◐ Positive comments	○ No comment	◑ Negative from incident management perspective	◑ Negative from incident management perspective
	ADOT Technical Groups	○ No comment	○ No comment	○ No comment	● ADOT Roadway Design Team's preferred alternative	◐ Strong support from ADOT TSMO	○ No comment	○ TSMO – fewer conflict points but at high speed	○ TSMO – fewer conflict points but at high speed
	MCDOT	● 2 lanes in each direction along Riggs Rd is preferred	◑ Preference is to avoid raising Riggs Rd	◑ Preference is to avoid raising Riggs Rd	◐ Preference is to have Riggs Rd stay at grade	● Preferred alternative by MCDOT	◑ Preference is to avoid raising Riggs Rd	◑ Preference is to avoid raising Riggs Rd	◑ Preference is to avoid raising Riggs Rd

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

3.5. Alternatives Analysis Summary Findings

The previously mentioned six screening criteria were used to evaluate the Build and No-Build alternatives. The findings from the assessment of each evaluation criterion are described below:

Traffic Performance

- All the Build alternatives provide LOS B or better, which exceeds the ADOT-required minimum of LOS D or better for the design year 2050.
- The No-Build does not meet the ADOT-required minimum of LOS D or better for the design year 2050 because it provides LOS F, which is considered a "fatal flaw" for the No-Build alternative.
- All Build alternatives improve motorist safety compared to the No-Build, with Alternative B2 (DRI) having the fewest conflict points followed by Alternatives D1 (DDI) and D2 (SDDI).
- All Build alternatives restrict access more than the No-Build, but this access restriction promotes safety.
- The signalized diamond alternatives (Alternatives A1 [TDI]), A2 (SDI), and A3 [STDI]) are the most typical layout for TIs within the region and therefore provide the highest driver familiarity.
- If there are crashes or oversized vehicles along SR 347, and traffic must be diverted through the ramps of the TI, Alternatives A1 (TDI), A2 (SDI), and B1 (STDI) provide the highest ability to accommodate diverted traffic from the mainline because they don't slow traffic or require turning movements.
- Pedestrian and bicyclist accommodations and safety are best promoted with Alternatives B2 (DRI), D1 (DDI), and D2 (SDDI).

Engineering Requirements

- Alternatives B1 (STDI) and B2 (DRI) both require horizontal reverse curves and create the potential for over-height vehicles on Riggs Road to not fit under the SR 347 bridge.
- Alternatives B1 (STDI) and B2 (DRI) require the highest bridge square footage but do not require wall construction/future maintenance.
- Alternatives A1 (TDI) and A2 (SDI) have the most drainage impacts.
- Alternative A1 (TDI) and Alternative C (SPUI) require the least earthwork of the Build alternatives.
- Alternatives B1 (STDI) and B2 (DRI) are the easiest to construct because much of the fill earthwork and bridge can be built while the existing roadways remain in service.

R/W Requirements and Utility Impacts

- Alternatives A1 (TDI), C (SPUI), and D1 (DDI) require the relocation of the GRICUA substation at the northwest corner of SR 347 and Riggs Road, which, due to budget and schedule impacts is considered a "fatal flaw" and as such Alternatives A1 (TDI), C (SPUI), and D1 (DDI) should be eliminated from further analysis.
- Alternatives A2 (SDI) and D2 (SDDI) require an equipment crossing structure and driveway relocation to maintain access to the GRICUA substation. Existing access can be maintained with Alternatives B1 (STDI) and B2 (DRI).
- Fiber optic relocations are not required for Alternatives A2 (SDI), B1 (STDI), B2 (DRI), and D2 (SDDI).
- Alternative A2 (SDI) requires the most R/W.
- All Build alternatives could potentially impact allottee parcels, with Alternatives B1 (STDI) and B2 (DRI) anticipated to impact two allottee parcels with the assumed preliminary roadway alignment.
- It is anticipated that with further evaluation, for all alternatives, Riggs Road can be realigned south to avoid impacts to allottee lands.

Environmental Considerations

- All Build alternatives would have no impacts to Waters of the U.S. (not present) and hazardous materials (no hazardous materials cases and no documented asbestos/lead).
- All Build alternatives would have similar minor impacts to biological resources and air quality (construction-related).
- Cultural resources are currently being evaluated by GRIC's Cultural Resources Management Program (CRMP) and Tribal Historic Preservation Office (THPO).

Total Estimated Construction Cost

- The estimated construction cost of the Build alternatives varies from $68M (Alternative B2 (DRI)) to $88M (Alternative C (SPUI)).

Agency and Public Support – Preferences expressed during District Meetings

- Community members' support was strongest for Alternatives A1 (TDI), A2 (SDI), and B1 (STDI).
- Alternative B2 (DRI) was generally opposed by Community members, which is considered a "fatal flaw" and as such Alternative B2 (DRI) should be eliminated from further analysis.
- General public support was strongest for Alternatives A1 (TDI), A2 (SDI), and B1 (STDI).
- FHWA indicated support for Alternatives A1 (TDI), A2 (SDI), and B2 (DRI).
- ADOT Roadway Design indicated they are most supportive of Alternative B1 (STDI) while ADOT TSMO indicated strong support for Alternative B2 (DRI) also.
- MCDOT indicated strong support for Alternative B2 (DRI) and some support for Alternative B1 (STDI).

3.6. Conclusion

Six screening criteria were used to evaluate the Build and No-Build alternatives. Seven potential Build alternatives were developed and evaluated to determine how well each alternative improves traffic performance, complies with engineering design standards, minimizes right-of-way (R/W) acquisition and associated utility impacts, minimizes environmental impacts, and minimizes project costs, while also having local agency, GRIC, and public support.

ADOT performed community outreach in collaboration with Community representatives that included presentations to the GRIC Litigation Team, all seven GRIC Districts, and the GRIC Elders' Concerns Group. Based on all comments and input received during these meetings, and the technical findings from the alternatives analysis, ADOT submitted an Alternatives Analysis Report to the Community on October 18, 2023. ADOT also provided a presentation to GRIC staff on November 1, 2023, to review the Alternatives Analysis Report and to summarize the findings of the alternatives analysis, as well as to provide the recommendation to advance the following two Build alternatives for further analysis:

- Alternative A2 – Spread Diamond TI
- Alternative B1 – Shifted Tight Diamond TI with Signals

These two "build" alternative recommendations were influenced by input received from GRIC Departments and Community members (at district meetings), including:

- Strong support for grade separation – to reduce crashes and congestion
- Strong support for simple and familiar design
- Roundabouts not preferred
- Minimize acquisition of new R/W
- Minimize impacts to allotted parcels
- Limit impacts to utilities and service interruptions
- Avoid GRICUA substation relocation
- Accommodate future development

ADOT further refined the design of these two alternatives by shifting Riggs Road to the south at and near the intersection to avoid acquisition of allotted lands. Roll plots for these alternatives are included in **Appendix C**.

The following is a summary of key features of these two refined alternatives:

Refined Alternative A2 – Spread Diamond TI

- A new grade-separated TI with Riggs Road elevated over SR 347 on a new bridge
- Four new exit and entrance ramps will be constructed, one in each quadrant of the intersection
- SR 347 roadway will remain in the current alignment
- SB ramps will spread out farther west to avoid impacts to the GRICUA electrical substation
- An equipment underpass structure will be required under the SB Riggs Road off-ramp to provide access to the substation
- Riggs Road will be elevated over SR 347 and widened to provide two through lanes and turn lanes in each direction within the TI limits
- Riggs Road will be shifted south to avoid impacts to allottee lands in the northeast quadrant of the intersection
- New traffic signals will be installed at the intersections of Riggs Road and the new TI ramps

Refined Alternative B1 – Shifted Tight Diamond TI with Signals

- A new grade-separated TI with the SR 347 roadway elevated over Riggs Road on a new bridge
- Four new exit and entrance ramps will be constructed, one in each quadrant of the intersection
- SR 347 roadway will be shifted east at and near the intersection to avoid impacts to the existing GRICUA electrical substation
- Riggs Road will be shifted south at and near the intersection to avoid impacts to allottee lands in the northeast quadrant of the intersection
- Riggs Road will remain at-grade and widened to provide two through lanes and turn lanes in each direction within the TI limits
- New traffic signals will be installed at the intersections of Riggs Road and the new TI ramps

Alternatives Evaluation

Each of these two Recommended Build Alternatives, along with the No-Build alternative, were evaluated using the six screening criteria discussed above. A detailed alternatives evaluation matrix is included in Table 3.2 on the following two pages.

Table 3.2 – Refined Alternatives Evaluation Matrix

Evaluation Criteria		No-Build	Refined Alternative A2 Spread Diamond (SDI)	Refined Alternative B1 Shifted Tight Diamond w/ Signals (STDI)
Traffic Performance	**Traffic Operations (2050 AM/PM Level of Service)**	●* Does not meet capacity needs ●* LOS F/F	● Meets capacity needs ◐ LOS B/B	
	Motorist Safety	● 32 conflict points, 16 crossing points ● History of frequent severe crashes	◑ 26 conflict points, 10 crossing points	
	Access to Adjacent Parcels	○ No change to existing access conditions	● Access restrictions at substation and along Riggs Road due to elevated Riggs Road grade	● Riggs Road remains at-grade allowing right-in right-out access per the ADOT Roadway Design Guidelines
	Traffic Diversion Accommodation	○ Flexible but capacity-constrained	● Increased capacity; through movement at ramps; signal control	
	Regional Oversize Vehicle Accommodation along SR 347	◑ Vertically oversized loads limited by existing traffic signals, may require traffic control through intersection	● Vertically oversized loads limited by traffic signals and bridge, which may require use of another route	● No vertical limitations for oversized loads traveling along SR 347
	Construction Detours and Closures	● No detours or closures required	● Long-term shoo-fly detour along Riggs Road and short-term along SR 347	◑ Short-term closures for tie-in along SR 347
	Driver Familiarity	● Very common configuration	● Very common configuration	
	Pedestrian and Bicyclist Accommodation and Safety	◑ 1 crossing required, signalized; no existing sidewalks or crosswalks; high vehicle speeds at crossing	○ Two crossings required, all signalized; sidewalks and crosswalks; high vehicle speeds at crossings	
Engineering Requirements	**Roadway Horizontal Geometry**	◐ Tangent ◐ Meets AASHTO design criteria, no design exceptions needed	○ Horizontal reverse curves for Riggs Road ◐ Meets AASHTO design criteria, no design exceptions needed	○ Horizontal reverse curves for Riggs Road and SR 347 ◐ Meets AASHTO design criteria, no design exceptions needed
	Roadway Vertical Geometry and Clearance	● No vertical geometry requirements because no bridge	◐ Underpass (Riggs over SR 347) ◐ Meets AASHTO design criteria, no design exceptions needed	○ Overpass (SR 347 over Riggs) ◐ Meets AASHTO design criteria, no design exceptions needed
	Bridge Square Feet (SF)	● No bridge required	○ ~19,861 SF	◑ ~27,490 SF
	Walls	● No walls required	◑ 22,462 SF	◐ 9,070 SF
	Drainage	● No additional drainage infrastructure is required	○ Drainage culverts and retention basins are required to retain and bypass drainage flows through the TI	

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

Note: When the differences between the alternatives are nominal or the value is the same for either alternative, the table is merged to identify similar characteristics more easily and those that are different between the two Build Alternatives.

Table 3.2 – Refined Alternatives Evaluation Matrix (Continued)

Evaluation Criteria		*No-Build*	*Refined Alternative A2 Spread Diamond (SDI)*	*Refined Alternative B1 Shifted Tight Diamond w/ Signals (STDI)*
Engineering Requirements (continued)	**Earthwork**	● No earthwork required	● 407,924 cubic yards (CY)	◑ 301,276 CY
	Constructability	● No construction required	◑ Bridge installation requires construction and removal of Riggs Road detour roadway	◐ Phased offline, minimal temporary pavement and grading
R/W Requirements and Utility Impacts	**Right-of Way**	● No new right-of-way required	● ~44 acres	○ ~33 acres
	New Allottee Parcel Impacts	● No impacts to existing allottee parcels	● No impacts	
	GRICUA Power Utility Impacts	● No impacts	◑ $1.5M pole relocations ◑ Relocation requires 2 years to complete	○ $1.2M powerline relocations ○ Relocation requires 1-2 years to complete
	Substation Access	◐ Existing driveway	● Equipment crossing structure required and driveway relocated	◐ Driveway maintained
	GRTI Fiber Optic Relocations	● No impacts	◐ Some impacts are anticipated	
Environmental Considerations	**Section 404/401 and Clean Water Act (Waters of the U.S.)**	● No impacts	● No impacts to Waters of the U.S. as Waters are not present. Confirmed by Corps of Engineers on 09/01/2023.	
	Biological Resources	● No impacts	○ The study area consists of poor to marginal habitat for all species; therefore, impacts would be low as only low-quality habitat will be removed.	
	Hazardous Materials	● No impacts	● No specific sites of concern based on the PISA approved on 04/10/2023. No documented asbestos/lead (report approved 05/23/2023).	
	Cultural Resources	● No impacts	◑ Impact to one site (GR-1768/AZ U:13:31 [ASU]). Also, will impact at least six roadside memorials per Cultural Resource Management Program (CRMP).	

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

Note: When the differences between the alternatives are nominal or the value is the same for either alternative, the table is merged to identify similar characteristics more easily and those that are different between the two Build Alternatives.

No-Build Alternative

The No-Build alternative is included for comparative purposes, but it has a fatal flaw in that it does not meet the purpose and need of the project to provide adequate capacity and an acceptable LOS in the design year 2050. It is not a supported option by the Community, ADOT, MCDOT and other agencies, as it is not grade-separated to provide free-flow movement of SR 347 traffic to address the existing and future traffic issues related to operations and safety. The No-Build alternative is therefore not a viable option. Evaluation between the remaining two Build alternatives, Refined Alternative A2 and Refined Alternative B1, is discussed further below.

Recommended Build Alternative (RBA)

Considering the Community's input provided in the comments received dated November 21, 2023, subsequent discussions through March 2024, and ADOT's technical findings from the alternatives analysis, it appears both the Community and ADOT overall prefer the **Refined Alternative B1 – Shifted Tight Diamond TI with Signals** as the RBA.

The following factors influenced the selection of the Refined Alternative B1 – Shifted Tight Diamond TI with Signals as the preliminary RBA:

- Meets the project purpose and need by satisfying future operational, capacity, and safety requirements and is supported by the Community, ADOT, and MCDOT
- Riggs Road remains at-grade, enabling adjacent parcels access, thereby increasing development opportunity
- Avoids significant impacts to GRICUA substation, avoids locating the substation within the ramp infill area, maintains simple access to GRICUA facilities for utility maintenance service, and doesn't require a maintenance underpass structure as would be required for Refined Alternative A2. GRICUA prefers B1 alternative over A2.
- Requires approximately seven fewer acres of R/W than the Refined Alternative A2, therefore reducing impact to GRIC lands.
- Does not limit vertical height of over-sized loads along SR 347
- Construction phasing for Alternative B1 is much simpler than the Alternative A2 as Riggs Road and all four ramps remain at grade. New NB on-ramp and off-ramp and the bridge over Riggs Road can be constructed offline during the first phase allowing maintenance of traffic on both Riggs Road and SR 347.

3.7. Conclusion Summary

As this alternatives analysis was performed to determine the single RBA, the design team will evaluate and compare the No-Build alternative with the RBA for further environmental and design studies and incorporate them into the environmental documents.

3.8. Other Design Concept Alternatives

TI Bridge Alternatives

The grade separation of SR 347 and Riggs Road will require construction of a new bridge structure. An Initial Bridge Selection Report (IBSR) will be prepared for the preferred TI alternative.

Recommendations

The recommended structure type for each TI alternative is a two-span bridge layout with a precast, prestressed Bulb-Tee girder superstructure. The bridges will either be supported on stub abutments bearing on drilled shafts or on pier style abutments and columns in front of Mechanically Stabilized Earth (MSE) retaining walls and a center pier cap on round columns bearing on drilled shafts. The bridge alternatives for the recommended TI alternative will be developed further in the IBSR. The bridge barriers, columns, and wingwalls will be designed to accommodate aesthetic features as necessary. Bridge aesthetics will be determined during final design.

Retaining Walls

CIP or MSE retaining walls are needed on the Spread Diamond TI Alternative (A2) and the Spread Diverging Diamond TI Alternative (D2) at the bridge and the ramps in order to tighten the space between SR 347 and the ramps on the east side to avoid impacts to R/W and Allottee Lands. They are also needed on the west side of SR-347 to accommodate the drainage channel and avoid conflicts with the substation in the northwest corner of the TI. The retaining walls will wrap around the bridge behind the abutments allowing for pier style abutments on columns. This will shorten the bridge spans to allow shorter girders and reduce the height of fill and retaining walls needed at the bridge. MSE walls are assumed in all estimates as they allow for shorter bridge spans and they are typically more economical for this height of walls at the bridges.

The other TI alternatives can use slopes at the bridge and do not need retaining walls.

Alternatives B1 and B2 can utilize small retaining walls next to the northbound on ramp between the ramp and SR 347 to tighten the ramp geometry and reduce the impacts to the Allottee Lands. These minor retaining walls are assumed to be standard ADOT cast-in-place concrete retaining walls.

Access Control Alternatives

Access control should be provided along crossroads at the TI per the ADOT RDG Section 506 for safe and efficient operations of all traffic **(Appendix G)**. Per RDG, full access control shall extend along the crossroad a minimum of 660 feet beyond the end of exit ramp radius returns and an additional 660 feet for RIRO access when the crossroad has two lanes or less per direction. From entrance ramps, full access control shall extend along the crossroad a minimum of 330 feet beyond the radius return. Between 330 feet and 1,320 feet from the entrance ramp returns, access along the crossroad shall be limited to RIRO only.

Riggs Road, east and west of SR 347 is undeveloped except for one parcel along Riggs Road on the north side of the road about 1,000 feet west of the intersection. This is an industrial site for manufacturing and shipping products, Revolution Industrial. GRIC has been approached with initial plans to add a fueling station in the area; thus future development is being initiated and more will likely follow. Business access driveways exist within the RDG-required access control limits. It would be difficult and not cost-effective to close and/or relocate these business accesses. Currently, streets and driveways along Riggs Road (Revolution Industrial and GRICUA Power Substation) have full access; these will be reduced to RIRO only access by constructing a raised median island.

All the alternatives have similar access control requirements for neighboring land ownership.

Recommendation

Consider relocation of the access to the GRICUA substation and provide RIRO access at the eastern driveway into the Revolution Industrial and full access at the access furthest to the west.

4. Major Design Features (Recommended Alternative)

4.1. Introduction

This chapter describes major design features of the recommended alternative, which includes mainline, ramps, bridges, increased traffic capacity, and offsite drainage conveyance.

4.2. Design Controls

SR 347 is classified as a Rural Principal Arterial and Riggs Road is classified as a Rural Major Collector. A summary of the design controls for the SR 347 mainline is provided in **Table 4.1.** A summary of the design controls for the TI ramps is provided in **Table 4.2**. A summary of the design controls for Riggs Road is provided in **Table 4.3**.

Table 4.1 – Design Controls for SR 347 Mainline

Description of Criteria	Values for Design
Design Year	2050
Design Speed	70 mph
Superelevation	Match existing (0.10 ft/ft maximum)
Cross Slope	2.0%
Lane Width	12 ft.
Shoulder Width:	
Median	10 ft.
Outside	10 ft.
Maximum Horizontal Curvature	2 degrees, 18 minutes
Maximum Gradient	3%
Slope Standards:	
Median	6:1
Outside	Std. C-02.10
Minimum Vertical Clearance	16.5 ft

Table 4.2 – Design Controls for SR 347/ Riggs Road Traffic Interchange Ramps

Description of Criteria	Values for Design
Design Year	2050
Design Speed:	
Nose of gore (exit ramps)	65 mph
Nose of gore (entrance ramps)	60 mph
Ramp Body	50 mph
Superelevation	0.10 ft/ft maximum
Cross Slope	2.0%
Lane Width	12 ft.
Maximum Horizontal Curvature:	
Nose of gore (exit ramps)	2 degrees, 30 minutes
Nose of gore (entrance ramps)	3 degrees, 0 minutes
Ramp Body	4 degrees, 30 minutes
Maximum Gradient	+4%, -5%
Slope Standards:	
Inside	Varies, 3:1 maximum
Outside	Std. C-02.10

Table 4.3 – Design Controls for Riggs Road

Description of Criteria	Values for Design
Design Year	2050
Cross Section	MCDOT Rural Minor Arterial
Design Speed	65 mph
Superelevation	0.10 ft/ft maximum
Cross Slope	2.0%
Lane Width	12 ft
Maximum Horizontal Curvature	2 degrees, 30 minutes
Maximum Gradient	3%
Minimum Gradient	0%
Taper Rate	65:1
Slope Standards	4:1 Max
Minimum Vertical Clearance	16.5 ft.

4.3. Horizontal and Vertical Alignment

Roll plots are provided in **Appendix D & E** for the recommended alternative for the construction of a TI at Riggs Road. The roll plots include the horizontal and vertical geometry for the proposed Riggs Road. Riggs Road will be shifted to the south utilizing large-radii reverse curves. The profile for Riggs Road will be fully reconstructed and will generally be raised to accommodate a normal cross slope of 2% and ensure clearance over the required storm drain infrastructure.

The Riggs Road TI ramps will generally be constructed in a tight diamond configuration. The ramps will be profiled to tie into the newly constructed and wider Riggs Road. The profiles of the proposed ramps will tie into the back of gore.

NB and SB SR 347 will be realigned utilizing large-radii reverse curves yet still parallel offset to one another. The realignment allows for the SB ramps to be constructed on the existing SB lanes, thus avoiding impact to the substation on the Northwest corner of the intersection. The profile of SR 347 will be raised at Riggs Road to accommodate the structural section of the new bridge and maintain a minimum of 16'-6" of vertical clearance over Riggs Road. Inside widening will be provided along NB and SB SR 347 to accommodate the future widening of the corridor to three lanes in each direction.

4.4. Access Control

Access control already exists along SR 347 and will be maintained in accordance with ADOT and FHWA Access Control Policy requirements.

No access control currently exists along Riggs Road. New access control will be obtained along Riggs Road as shown in the exhibit in **Appendix I** in accordance with ADOT and FHWA Access Control Policy requirements.

4.5. Right-of-Way

New R/W will be required along SR 347 and Riggs Road to accommodate the new TI and arterial improvements. All property adjacent to the project is owned by GRIC. The R/W will need be acquired as an easement on GRIC land. There are no new TCEs nor Drainage Easements (DE). The locations and areas of anticipated R/W, DE, and TCE acquisition are shown in Table 4.4. Refer to the roll plots in Appendix E for additional dimensions and details for the anticipated R/W and easement acquisitions.

All R/W acquisitions are anticipated to be partial acquisitions to accommodate new roadway features such as sidewalks, pavement, driveways, etc.

Table 4.4 – Anticipated R/W

Location	Ownership	Total Area (Ac)	Acquisition Area (Ac)	TCE Area (Ac)	DE Area (Ac)
NE Corner	Gila River Indian Community	8.23	8.23	0.00	0.00
SE Corner	Gila River Indian Community	18.71	18.71	0.00	0.00
NW Corner	Gila River Indian Community	3.81	1.85	1.96	0.00
SW Corner	Gila River Indian Community	4.38	4.38	0.00	0.00

4.6. Drainage

Offsite Drainage

The drainage design requirement for the TI improvements is to maintain capacity through the TI and not negatively impact the downstream patterns in the post-project conditions. The existing culvert crossing under SR 347, north of Riggs Road, will be removed with the improvements. The results of the offsite hydrologic modeling were used to size a new culvert across SR 347. The new culvert is a 3-36-inch pipe culvert. A new channel will be constructed at the northwest corner to connect to the existing channel. The other culverts within the project are being extended for the TI improvements.

A large shallow basin on the southeast corner of Riggs and SR 347 is proposed to attenuate flow downstream. In existing conditions, ponding occurs on the east side of SR 347. With this proposed project, fill will be placed in this ponded area. The displaced volume caused by this fill will then be excavated out farther to the east to match the existing stormwater volume.

Onsite Drainage

The TI alternative will require onsite drainage improvements to drain the new infield areas. Area drains with small storm drains at low points in the infield areas will connect to the culverts. The inlets in the infield areas shall be raised 1 foot above the proposed ground to allow for first flush treatment of the roadway runoff. The stormwater impounded below the inlet will infiltrate into the round. In large enough storms, these shallow basins will then overtop into the grated catch basins and discharge to the adjacent culvert. The roadway runoff will flow into these basins from off the edge of pavement or by way of catch basins and storm drains. These basins will meet the pre- versus post-project conditions as well as providing stormwater treatment component as requested by GRIC Flood Control.

4.7. Section 401 and 404 of Clean Water Act

Refer to **Section 7**, Environmental Overview, for additional information on Section 401 and 404 of the Clean Water Act.

4.8. NPDES Permit

Since the project will disturb one or more acres of land area, a National Pollutant Discharge Elimination Systems (NPDES) general permit will be required from the U.S. Environmental Protection Agency (EPA) as directed by Section 402(p) of the Clean Water Act.

4.9. Earthwork

The required earthwork for the recommended alternative is shown in **Table 4.5**. The project is anticipated to be a waste project.

Table 4.5 – Earthwork for the Recommended Alternative

Location	Excavation (CY)
Roadway Excavation	53,553
Structural Excavation	170
Pipe Excavation	2,070
Drainage Basin Excavation	7,726
Shrink	6,266
Embankment	358,529
Borrow	**301,276**

4.10. Construction Phasing and Traffic Control

SR 347

Two lanes of traffic will be maintained in both directions on SR 347 for the majority of the project. Short-duration lane closures on SR 347 will be needed to tie existing SR 347 into the new alignment. Temporary pavement will be needed to maintain intersection traffic while the SR 347 ramps are tied into the new Riggs Road alignment.

Riggs Road

One lane of traffic will be maintained in both directions on Riggs Road for the duration of the project. Short-duration lane closures will be needed to tie existing Riggs Road into the new alignment, and traffic will be maintained with flagging and pilot car operations during these closures. Temporary pavement will be needed to maintain intersection traffic while the SR 347 ramps are tied into the new alignment.

Construction Phasing Concept

The construction phasing of the TI is greatly simplified by shifting the alignment of SR 347 to the east, allowing for construction of the TI in three primary phases. Phase one will construct the NB SR 347 alignment, Ramp A, Ramp C, and the EB Riggs Road pavement while traffic is maintained in existing lanes. Phase two will shift NB SR 347 onto the new NB alignment and shift Riggs Road traffic onto the new EB Riggs Road pavement. Ramps A and C will be open in this phase, and temporary pavement will be needed to allow Riggs Road traffic to use these ramps. Phase two will construct the SB SR 347 alignment and the WB Riggs Rd pavement. Phase three will shift SB SR 347 traffic onto the new SB SR 347 alignment and will use the existing southbound SR 347 alignment as temporary SB on- and off-ramps to Riggs Road. Phase three will construct the new Ramps B and D. Short-duration lane closures of both SR 347 and Riggs Road are anticipated to make the final connections between the new ramps and the new Riggs Road pavement, but detours are not anticipated. Temporary pavement will be needed to maintain two lanes of traffic on SR 347 and maintain connections to Riggs Road while the new ramps are constructed. See **Appendix H** for preliminary construction phasing concepts.

4.11. Traffic Design

Traffic Signal Design

Traffic signal design will conform to the ADOT TGP and will be compliant with the Manual on Uniform Traffic Control Devices (MUTCD), 2009 Edition as well as the Arizona Supplement to the 2009 MUTCD. Traffic signal equipment will follow current ADOT standards.

The shifted diamond alternative can be designed as one signal system, operated under a single traffic signal controller. The signal cabinet is designed to be equipped with a modem, ethernet switch, and antenna for ADOT cellular connection.

Signing and Pavement Marking

The existing signs at the intersection will be removed and replaced to support the proposed roadway improvements. The final sign locations will be determined during the development of the final design plans and must consider the existing and new locations of utilities, structures, drainage features, and other appurtenances. Per discussion with ADOT, new guide signing along SR 347 will be installed in the ultimate configuration accounting for the future widening of SR 347 to three lanes in each direction. Guide signs will be placed on overhead cantilever structures and retroreflective Type XI sheeting will be utilized on all permanent signs.

Pavement marking of the entrance and exit ramps for Riggs Road will conform to ADOT Standard Drawings M-15 and M-16 for parallel exit and entrance ramps. Pavement marking on Riggs Road within the limits of the TI will conform to ADOT standards.

All existing signs, posts, delineators, and foundations impacted by the project within the limits will be removed. All signing and pavement markings for this project will be designed in accordance with the current ADOT Signing and Marking Standard Drawings, Manual of Approved Signs, 2009 MUTCD, and the Arizona Supplement to the MUTCD. In addition, current ADOT SignCAD templates, if applicable, will be utilized to format signs.

Roadway Lighting

Lighting within the project will adhere to ADOT's standards including pole and fixture types. Luminaries will utilize a light loss factor (LLF) of 0.8 per ADOT's design guidelines and a correlated color temperature (CCT) for the LEDs of 3000 Kelvin. Luminaires not on traffic signal poles will be powered from a standard ADOT type IV load center which energizes using 480 volts, single-phase power, and is controlled by an on-cabinet photocontrol unit.

Freeway Management System

This project will incorporate advanced traffic management technology that will eventually be incorporated into ADOT's FMS. Proposed improvements will include closed-circuit television (CCTV) cameras located at each ramp terminal in the NB and SB directions of SR 347. These cameras will provide full 100% coverage to monitor traffic operations within the interchange and along Riggs Road. The proposed CCTV cameras will be connected to each other using fiber optic infrastructure, and a cellular modem at one CCTV location will be used to provide communications with the ADOT Traffic Operations Center (TOC). The fiber connection between the CCTV cameras will be either extend underneath the SR 347 mainline or extend across the bridge over SR 347 depending on the final configuration of the interchange. A No. 9 pull box will be placed at the base of each CCTV location and will serve as the ultimate connection point when the FMS fiber backbone is eventually extended to the interchange.

4.12. Utilities and Railroad

The proposed construction activity in the median including subgrade preparation, earth moving and respective heavy equipment, and drilling may necessitate relocation of certain underground utilities prior to construction. There are several utilities that cross underneath or over SR 347 and Riggs Road and may require relocation and/or adjustment prior to construction. These utility companies will be contacted during the design phase to assess the need for relocation.

Using the utility as-built plans for reference, it is anticipated that the following utilities will require relocation and/or adjustment prior to construction:

- GRICUA
  - 69kV overhead power lines along SR 347, crossing Riggs Road west leg and across SR 347 south of the intersection.
  - 12kV overhead powerlines across the west leg of Riggs Road.
- GRTI
  - Underground fiber and cable.
- GRICPW

  - 16” waterline at the west side of SR 347 to the intersection and to the west on the north side of Riggs Road. This will have to be relocated outside the new project R/W as it is in the existing condition. Coordination of the location and easement will be necessary during final design.
- ADOT
  - Box culverts are required to be relocated or extended.
  - Cattleguards that allow drainage to runoff will be removed and reconstructed.
  - Signal poles and electrical removed and reconstructed at the new intersections at the TI.

Utility potholing will be required during final design to accurately locate the existing underground utilities anticipated to be impacted within the project limits. During final design, each utility company will receive the design plans for review and develop plans for any relocations and/or adjustments necessary.

There is no railroad involvement within a half mile of the project limits. There are no irrigation districts and/or facilities within the project limits.

4.13. Geotechnical Recommendations for Structures and Pavement Design

Roadway

The site soils are generally considered to be well suited for use as pavement subgrade. In accordance with the City standards for a major arterial, subgrade preparation should consist of scarification of 12 inches, moisture conditioning to within 2% of the optimum moisture content, and compaction to a minimum of 95% of the maximum American Society for Testing and Materials (ASTM) D698 Standard Proctor density. It appears likely that any on-site soils can be re-used as embankment fill. These assumptions should be verified during final design.

From a preliminary standpoint, embankment fill slopes should be made no steeper than 3.0H:1V.

New Bridge Structure Foundations

Based on data observed from nearby bridges, it appears that foundations for new bridges could be supported by either spread-type foundations at moderate bearing resistance pressures or upon drilled shafts.

Recommended Pavement Structural Sections

From a preliminary basis, it is typically recommended that relatively short sections of reconstructed pavement match that of the adjacent pavement which will remain. However, the existing pavement sections shown in **Table 1.4** are not considered to be acceptable for future traffic volumes. Thus, preliminary pavement sections are estimated based on future volumes. **Table 4.6** provides the recommended pavement structural sections.

Additionally, preliminary earthwork factors in the area, based on our site visit and review of available boring logs, is on the order of 10% shrink. Ground compaction factors, based on the existing vegetation and anticipated fill heights based on guidance in the ADOT Geotechnical Project Development Manual, is 0.25 foot.

Table 4.6 – Preliminary Recommended Pavement Structural Sections by Location

Location	AR-ACFC (in)	AC (in)	Plain PCCP (in)	AB (in)	Total
SR 347 Mainline	0.5	10	---	16	26.5
Riggs Road	---	6	---	10	16
SR 347 and Riggs Road TI Ramps and Crossroads	---	---	10	4	14

4.14. Structures

The new TI improvements at Riggs Road will consist of constructing a new bridge to grade separate SR 347 over Riggs Road and eliminate the stop-controlled intersection. The bridge will be a new two-span precast, prestressed concrete girder bridge with abutments and piers supported on drilled shafts. A bridge selection report will be developed for the recommended TI alternative only to investigate different bridge alternatives for the recommended TI alternative.

The new bridge for the recommended alternative will be shifted off the current SR 347 alignment. This will allow the bridge to be constructed in a single phase to save construction time and money, as well as allow the SB off ramp to be constructed without impacting the electrical substation.

However, the bridge will be close enough to the existing SR 347 alignment that the fill slopes will impact the existing NB travel lanes. Project phasing will be developed to keep the NB lanes open during construction by either constructing the NB ramps first to detour traffic onto the ramps or utilize shoring at the bridge and phase the fill and roadway pavement construction to shift the traffic at appropriate times. SR 347 must remain open at all times during construction.

Riggs Road will be maintained during construction by shifting lanes around as needed to avoid construction activities. Riggs Road will remain open at the bridge construction except for short-term night and weekend closures for activities such as setting bridge girders and pouring the concrete deck.

The new bridge will accommodate the ultimate SR 347 build-out while protecting the electrical substation and keeping traffic open during construction. The new bridge will provide at least a 75-year service life.

4.15. Erosion Control

All disturbed soils during construction shall receive temporary erosion control in accordance with the NPDES construction general permit and the ADOT Erosion and Pollution Control Manual for Highway Design and Construction as well as the Stormwater Monitoring Guidance Manual for Construction Activities. The contractor will utilize the proper best management practices (BMPs) and maintain a SWPPP for the project. All disturbed soils that will not be landscaped or otherwise permanently stabilized by construction will be seeded using species native to the project vicinity.

4.16. Landscape and Aesthetics

The median treatment along Riggs Road will be treated with concrete median pavers. The TI will be treated with native hydroseeding. Additional landscape, irrigation, and aesthetics beyond ADOT standards shall be coordinated with GRIC through the IGA.

4.17. Multimodal Considerations

Riggs Road will be designed to accommodate both pedestrians and bicycles through the interchange. Improvements will include signalized pedestrian crossings of on- and off-ramps, and sidewalks that facilitate pedestrian and bicycle movements through the interchange. Bicycle lanes will be provided along Riggs Road through the TI limits between the ramps. Pedestrian and bicycle accommodation through the TI alternatives is illustrated in **Appendix E**.

4.18. Americans with Disabilities Act (ADA) Features Inventory

An ADA Compliance and Feasibility Report has been completed and is included in **Appendix K**. Existing pedestrian features located within the project limits were evaluated for compliance with the 2010 ADA Standards for Accessible Design (2010 Standards). Existing features within the project limits that were found to be non-compliant will be addressed during the final design and construction of the project. Reconstructed and new pedestrian facilities within the project limits will be designed in accordance with the 2010 Standards and Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way dated July 26, 2011.

ADA/Public Right-of-Way Accessibility Guidelines (PROWAG)-compliant pedestrian access shall be maintained on at least one side of Riggs Road at all times during construction.

4.19. Design Exceptions

There are no design exceptions being requested within the project limits.

5. Itemized Cost Estimate

5.1. Cost Estimate of Recommended Alternative

Total Estimated Construction Cost

The estimated construction cost of the Recommended Build Alternative, Alternative B1 – Shifted Tight Diamond TI with Signals is $75M and detailed in **Table 5.1**.

Table 5.1 – Recommended Alternative B1 Order of Magnitude Construction Cost Estimate

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2010011	CLEARING AND GRUBBING	ACRE	38	$ 2,500.00	$ 95,000.00
2020029	REMOVAL OF ASPHALTIC CONCRETE PAVEMENT	SQ.YD.	83186	$ 2.00	$ 166,372.00
2020041	REMOVAL OF PIPE	L.FT.	320	$ 30.00	$ 9,600.00
2020042	REMOVAL OF PIPE (BOX CULVERT)	L.FT.	262	$ 40.00	$ 10,480.00
2020050	REMOVE (TRAFFIC SIGNAL SYSTEM)	L.SUM	1	$ 40,000.00	$ 40,000.00
2020101	REMOVE FENCE	L.FT.	11750	$ 15.00	$ 176,250.00
2020115	REMOVE (CATTLE GUARD)	EACH	2	$ 1,000.00	$ 2,000.00
2030301	ROADWAY EXCAVATION	CU.YD.	53553	$ 15.00	$ 803,295.00
2030401	DRAINAGE EXCAVATION	CU.YD.	7726	$ 15.00	$ 115,890.00
2030904	BORROW (IN PLACE)	CU.YD.	301276	$ 20.00	$ 6,025,520.00
3030022	AGGREGATE BASE, CLASS 2	CU.YD.	50658	$ 90.00	$ 4,559,220.00
3030026	AGGREGATE SUBBASE, CLASS 6	CU.YD.	1025	$ 45.00	$ 46,125.00
4010010	PORTLAND CEMENT CONCRETE PAVEMENT (10")	SQ.YD.	34615	$ 85.00	$ 2,942,275.00
4040111	BITUMINOUS TACK COAT	TON	57	$ 550.00	$ 31,350.00
4040116	APPLY BITUMINOUS TACK COAT	HOUR	189	$ 275.00	$ 51,975.00
4040282	ASPHALT BINDER (PG 76-16)	TON	2357	$ 900.00	$ 2,121,300.00
4160004	ASPHALTIC CONCRETE (3/4" MIX) (END PRODUCT) (SPECIAL MIX)	TON	47222	$ 75.00	$ 3,541,650.00
4160031	MINERAL ADMIXTURE	TON	444	$ 90.00	$ 39,960.00
5010011	PIPE, CORRUGATED METAL, 24"	L.FT.	76	$ 200.00	$ 15,200.00
5012524	STORM DRAIN PIPE, 24"	L.FT.	595	$ 250.00	$ 148,750.00
5012924	PIPE CULVERT, 24"	L.FT.	40	$ 170.00	$ 6,800.00
5012936	PIPE CULVERT, 36"	L.FT.	636	$ 200.00	$ 127,200.00
5014024	FLARED END SECTION, 24" (C-13.25)	EACH	1	$ 1,500.00	$ 1,500.00
5014124	FLARED END SECTION (24") (C-13.20)	EACH	2	$ 1,500.00	$ 3,000.00
5014136	FLARED END SECTION (36") (C-13.20)	EACH	2	$ 2,000.00	$ 4,000.00
5030143	CONCRETE CATCH BASIN (MEDIAN) (C-15.80)	EACH	5	$ 8,000.00	$ 40,000.00
6011150	SINGLE SLOPE BRIDGE CONCRETE BARRIER AND TRANSITION (38")	L.FT.	1867	$ 150.00	$ 280,050.00
6060058	BRIDGE SIGN STRUCTURE (TAPERED TUBE, SINGLE BEAM, 70' 1" TO 85')	EACH	2	$ 39,000.00	$ 78,000.00
6060074	FOUNDATION FOR BRIDGE SIGN STRUCTURE (TAPERED TUBE)	EACH	2	$ 8,000.00	$ 16,000.00
6060132	CANTILEVER SIGN STRUCTURE (SD9.10, TYPE 2C)	EACH	6	$ 64,000.00	$ 384,000.00
6060255	FOUNDATION FOR CANTILEVER SIGN STRUCTURE (SD9.10, TYPE 2C)	EACH	6	$ 17,000.00	$ 102,000.00
6070002	BREAKAWAY SIGN POST S4X7.7	L.FT.	426	$ 45.00	$ 19,170.00
6070022	FOUNDATION FOR BREAKAWAY SIGN POST S4X7.7	EACH	32	$ 900.00	$ 28,800.00
6070057	SIGN POST (PERFORATED) (2 1/2 T)	L.FT.	266	$ 42.00	$ 11,172.00
6070060	FOUNDATION FOR SIGN POST (CONCRETE)	EACH	20	$ 325.00	$ 6,500.00
6080005	REGULATORY, WARNING, OR MARKER SIGN PANEL	SQ.FT.	425	$ 40.00	$ 17,000.00
6080018	EXTRUDED ALUMINUM SIGN PANEL	SQ.FT.	450	$ 50.00	$ 22,500.00
6080025	FLAT SHEET ALUMINUM SIGN PANEL	SQ.FT.	198	$ 30.00	$ 5,940.00
7020001	IMPACT ATTENUATION DEVICE (ENERGY ABSORBING TERMINAL)	EACH	2	$ 25,000.00	$ 50,000.00
7040005	PAVEMENT MARKING (WHITE EXTRUDED THERMOPLASTIC) (0.090")	L.FT.	62984	$ 0.62	$ 39,050.08
7040006	PAVEMENT MARKING (YELLOW EXTRUDED THERMOPLASTIC) (0.090")	L.FT.	34380	$ 0.62	$ 21,315.60
7040072	PAVEMENT MARKING (TRANSVERSE) (THERMOPLASTIC) (ALKYD) (0.090")	L.FT.	4080	$ 0.90	$ 3,672.00
7040073	PAVEMENT LEGEND (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	8	$ 180.00	$ 1,440.00
7040074	PAVEMENT SYMBOL (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	16	$ 160.00	$ 2,560.00
7050022	PAVEMENT MARKING, PREFORMED, WHITE STRIPE, TYPE I	L.FT.	20280	$ 3.40	$ 68,952.00
7060013	PAVEMENT MARKER, RAISED, TYPE C	EACH	1060	$ 3.50	$ 3,710.00
7060018	PAVEMENT MARKER, RAISED, TYPE G	EACH	530	$ 3.50	$ 1,855.00
7080201	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED) (WHITE)	L.FT.	79444	$ 0.25	$ 19,861.00
7080202	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED) (YELLOW)	L.FT.	34380	$ 0.18	$ 6,188.40
7080206	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED SYMBOL) (ARROW)	EACH	16	$ 75.00	$ 1,200.00
7080208	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED LEGEND) (ONLY)	EACH	8	$ 70.00	$ 560.00
7310011	POLE (TYPE A) (8')	EACH	4	$ 2,000.00	$ 8,000.00
7310012	POLE (TYPE A) (10')	EACH	2	$ 2,200.00	$ 4,400.00
7310070	POLE (TYPE G) (STANDARD BASE)	EACH	2	$ 3,500.00	$ 7,000.00
7310090	POLE (TYPE H) (STANDARD BASE)	EACH	32	$ 1,200.00	$ 38,400.00
7310130	POLE (TYPE Q)	EACH	6	$ 10,000.00	$ 60,000.00
7310197	BREAKAWAY BASE FOR LIGHTING POLE OR SIGNAL FLASHER	EACH	32	$ 600.00	$ 19,200.00
7310200	POLE FOUNDATION (TYPE A)	EACH	6	$ 2,000.00	$ 12,000.00
7310260	POLE FOUNDATION (TYPE G) (STANDARD BASE)	EACH	2	$ 3,000.00	$ 6,000.00
7310276	POLE FOUNDATION (TYPE H) (BREAKAWAY)	EACH	32	$ 800.00	$ 25,600.00
7310310	POLE FOUNDATION (TYPE Q)	EACH	6	$ 6,000.00	$ 36,000.00
7310551	MAST ARM (20 FT.) (TAPERED)	EACH	40	$ 2,500.00	$ 100,000.00
7310590	MAST ARM (40 FT.) (TAPERED)	EACH	4	$ 10,000.00	$ 40,000.00
7320030	ELECTRICAL CONDUIT (1") (PVC)	L.FT.	560	$ 15.00	$ 8,400.00
7320050	ELECTRICAL CONDUIT (2") (PVC)	L.FT.	12802	$ 30.00	$ 384,060.00

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
7320060	ELECTRICAL CONDUIT (2 1/2") (PVC)	L.FT.	150	$ 35.00	$ 5,250.00
7320070	ELECTRICAL CONDUIT (3") (PVC)	L.FT.	200	$ 50.00	$ 10,000.00
7320073	ELECTRICAL CONDUIT (2 - 3") (PVC)	L.FT.	80	$ 80.00	$ 6,400.00
7320291	ELECTRICAL CONDUIT (4 - 3") (PVC)	L.FT.	1750	$ 80.00	$ 140,000.00
7320420	PULL BOX (NO. 7)	EACH	10	$ 1,200.00	$ 12,000.00
7320421	PULL BOX (NO. 7) (WITH EXTENSION)	EACH	11	$ 1,800.00	$ 19,800.00
7320456	PULL BOX (4B)	EACH	40	$ 1,000.00	$ 40,000.00
7320460	PULL BOX (6B)	EACH	1	$ 1,500.00	$ 1,500.00
7320500	CONDUCTOR (NO. 12)	L.FT.	6080	$ 1.00	$ 6,080.00
7320520	CONDUCTOR (NO. 8)	L.FT.	51200	$ 1.20	$ 61,440.00
7320585	CONDUCTOR (INSULATED BOND) (NO. 12)	L.FT.	3040	$ 1.00	$ 3,040.00
7320595	CONDUCTOR (INSULATED BOND) (NO. 8)	L.FT.	12800	$ 1.20	$ 15,360.00
7320651	CONDUCTORS (SR347 & RIGGS RD)	L.SUM	1	$ 50,000.00	$ 50,000.00
7330060	TRAFFIC SIGNAL FACE (TYPE F)	EACH	1	$ 1,200.00	$ 1,200.00
7330070	TRAFFIC SIGNAL FACE (TYPE G)	EACH	20	$ 1,800.00	$ 36,000.00
7330210	TRAFFIC SIGNAL FACE (PEDESTRIAN) (MAN/HAND)	EACH	4	$ 1,200.00	$ 4,800.00
7330220	PEDESTRIAN PUSH BUTTON	EACH	12	$ 700.00	$ 8,400.00
7330310	TRAFFIC SIGNAL MOUNTING ASSEMBLY (TYPE II)	EACH	12	$ 300.00	$ 3,600.00
7330330	TRAFFIC SIGNAL MOUNTING ASSEMBLY (TYPE IV)	EACH	18	$ 1,100.00	$ 19,800.00
7330340	TRAFFIC SIGNAL MOUNTING ASSEMBLY (TYPE V)	EACH	6	$ 1,100.00	$ 6,600.00
7340050	CONTROL CABINET (TYPE V)	EACH	12	$ 50,000.00	$ 600,000.00
7340105	CONTROL CABINET FOUNDATION	EACH	1	$ 2,000.00	$ 2,000.00
7340120	METER PEDESTAL CABINET	EACH	1	$ 5,000.00	$ 5,000.00
7340252	CONTROLLER (COBALT)	EACH	1	$ 7,500.00	$ 7,500.00
7340306	METER PEDESTAL FOUNDATION	EACH	1	$ 2,000.00	$ 2,000.00
7350210	VIDEO DETECTION SYSTEM (6 CAMERA COMPLETE SYSTEM)	EACH	1	$ 90,000.00	$ 90,000.00
7360111	LUMINAIRE (LED) (HORIZONTAL MOUNT) (TYPE 25L)	EACH	33	$ 1,300.00	$ 42,900.00
7360113	LUMINAIRE (LED) (UNDERDECK 15L)	EACH	4	$ 1,200.00	$ 4,800.00
7360160	POWER SUPPLY (BATTERY BACKUP)	EACH	8	$ 12,000.00	$ 96,000.00
7360240	LOAD CENTER CABINET FOUNDATION	EACH	1	$ 1,500.00	$ 1,500.00
7360241	LOAD CENTER CABINET (TYPE IV) (240/480 VOLT)	EACH	1	$ 10,000.00	$ 10,000.00
7370452	MISCELLANEOUS ELECTRICAL (RECORD DRAWINGS & DEVICE NUMBER INSTALLATION)	L.SUM	1	$ 8,000.00	$ 8,000.00
7370705	CCTV FIELD EQUIPMENT	EACH	1	$ 9,000.00	$ 9,000.00
9030013	BARBED WIRE GAME FENCE	L.FT.	16566	$ 8.00	$ 132,528.00
9050003	GUARD RAIL, W-BEAM, SINGLE FACE (MASH)	L.FT.	2163	$ 45.00	$ 97,335.00
9050025	GUARD RAIL TERMINAL (MASH)	EACH	4	$ 11,000.00	$ 44,000.00
9050036	GUARD RAIL, ANCHOR ASSEMBLY	EACH	1	$ 4,500.00	$ 4,500.00
9050419	GUARD RAIL TRANSITION (THRIE BEAM)	EACH	5	$ 6,500.00	$ 32,500.00
9060081	CATTLE GUARD (8 UNIT)	EACH	2	$ 65,000.00	$ 130,000.00
9080001	CONCRETE CURB (C-05.10) (TYPE A)	L.FT.	4177	$ 22.00	$ 91,894.00
9080085	CONCRETE CURB AND GUTTER (C-05.10) (TYPE D)	L.FT.	2938	$ 40.00	$ 117,520.00
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	7372	$ 8.00	$ 58,976.00
9080245	CONCRETE (9" PAD)	SQ.YD.	150	$ 165.00	$ 24,750.00
9080286	CONCRETE SIDEWALK RAMP (C-05.30, TYPE B)	EACH	14	$ 6,500.00	$ 91,000.00
9100008	CONCRETE BARRIER (C-10.50)	L.FT.	1073	$ 90.00	$ 96,570.00
9140178	RETAINING WALL (REINFORCED CONCRETE CANTILEVER)	SQ.FT.	9070	$ 150.00	$ 1,360,500.00
9210011	MEDIAN PAVING	SQ.YD.	1723	$ 150.00	$ 258,450.00
9240015	FORCE ACCOUNT WORK (ESTABLISH ELECTRICAL SERVICE)	L.SUM	1	$ 20,000.00	$ 20,000.00
9240052	MISCELLANEOUS WORK (LANDSCAPE & EROSION CONTROL)	L.SUM	1	$ 690,000.00	$ 690,000.00
9240119	MISCELLANEOUS WORK (CELLULAR SYSTEM)	EACH	2	$ 8,000.00	$ 16,000.00
9240120	MISCELLANEOUS WORK (BATTERY BACKUP FOUNDATION)	EACH	1	$ 1,500.00	$ 1,500.00
2030501A	STRUCTURAL EXCAVATION	CU.YD.	170	$ 100.00	$ 17,000.00
2030506A	STRUCTURE BACKFILL	CU.YD.	846	$ 200.00	$ 169,200.00
6010003A	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,500)	CU.YD.	798	$ 1,200.00	$ 957,600.00
6010005A	STRUCTURAL CONCRETE (CLASS S) (F'C = 4,500)	CU.YD.	934	$ 1,800.00	$ 1,681,200.00
6010835A	BRIDGE DECK TEXTURING (SAWED GROOVES)	SQ.YD.	3310	$ 25.00	$ 82,750.00
6011150A	SINGLE SLOPE BRIDGE CONCRETE BARRIER AND TRANSITION (38")	L.FT.	498	$ 150.00	$ 74,700.00
6011151A	SINGLE SLOPE BRIDGE CONCRETE BARRIER AND TRANSITION (42")	L.FT.	498	$ 250.00	$ 124,500.00
6011343A	DECK JOINT ASSEMBLY (FLANGELESS STRIP SEAL)	L.FT.	252	$ 600.00	$ 151,200.00
6011371A	APPROACH SLAB (SD 2.01)	SQ.FT.	3780	$ 60.00	$ 226,800.00
6014974A	PRECAST, P/S MEMBER (BT58 GIRDER)	L.FT.	3004	$ 650.00	$ 1,952,600.00
6015101A	RESTRAINERS, VERTICAL EARTHQUAKE (FIXED)	EACH	12	$ 600.00	$ 7,200.00
6015102A	RESTRAINERS, VERTICAL EARTHQUAKE (EXPANSION)	EACH	24	$ 800.00	$ 19,200.00
6050002A	REINFORCING STEEL	LB.	410740	$ 2.50	$ 1,026,850.00
6090048B	DRILLED SHAFT FOUNDATION (48")	L.FT.	1500	$ 900.00	$ 1,350,000.00
6090072B	DRILLED SHAFT FOUNDATION (72")	L.FT.	376	$ 1,300.00	$ 488,800.00
9240192B	MISCELLANEOUS WORK (SLOPE PAVING)	SQ.YD.	2870	$ 200.00	$ 574,000.00
2020050C	REMOVE (HEADWALLS, WING WALLS, AND APRON)	L.SUM	1	$ 10,000.00	$ 10,000.00
2030501C	STRUCTURAL EXCAVATION	CU.YD.	231	$ 100.00	$ 23,100.00
2030506C	STRUCTURE BACKFILL	CU.YD.	279	$ 200.00	$ 55,800.00
6010002C	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	429	$ 900.00	$ 386,100.00
6050002C	REINFORCING STEEL	LB.	60392	$ 2.50	$ 150,980.00

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
6050101C	PLACE DOWELS	EACH	24	$ 50.00	$ 1,200.00
6110202C	METAL HANDRAIL (MAG DETAIL 145)	L.FT.	38	$ 60.00	$ 2,280.00
				ITEM TOTAL	**$31,278,933**

PROJECT WIDE

Mobilization	COST	10%	$3,719,632
Dust and Water Pallative	COST	1%	$371,963
Quality Control	COST	2%	$743,926
Construction Surveying	COST	1%	$371,963
Maintenance and Protection of Traffic	COST	10%	$3,719,632
		PROJECT WIDE SUBTOTAL	**$8,927,117**
Unidentified Item Allowance	COST	10%	$4,612,344
		PROJECT WIDE TOTAL	**$13,539,461**

OTHER COST

GRICUA Utility Relocations	L.SUM	1	$1,200,000
GRIC DPW 16" Waterline Relocation	L. FT.	3,341	$835,250
Environmental - Cultural Data Recovery	L.SUM	1	$270,000
Construction Engineering	COST	9%	$4,566,220
Construction Contingencies	COST	5%	$2,536,789
Consultant Design Services	COST	8%	$4,058,863
Post Design Services	COST	1%	$507,358
PCCP Materials Quality Incentive	SQ.YD	34,615	$69,230
PCCP Smoothness Incentive	LANE-MILE	4.9	$34,418
AC Quality Incentive	TON	47,222	$141,666
Right-of-Way	SQ.FT.	1,444,977	$4,373,080
TCE	SQ.FT.	85,480	$128,220
		OTHER COST TOTAL	**$18,721,094**

SUMMARY	
ITEM TOTAL	**$37,196,321**
PROJECT WIDE	**$13,539,461**
OTHER COST TOTAL	**$18,721,094**
SUBTOTAL PROJECT COST	**$69,456,876**
INDIRECT COST ALLOCATION PLAN (ICAP) (7.90%)	**$5,487,093**
TOTAL COST	**$74,943,969**

5.2. Detailed Cost Estimates of Alternatives Considered

Detailed, order of magnitude construction cost estimates of the following other alternative considered:

- Alternative A2 – Spread Diamond TI, **Table 5.2**

Table 5.2 – Alternative A2 Order of Magnitude Construction Cost Estimate

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2010011	CLEARING AND GRUBBING	ACRE	36	$ 2,500.00	$ 90,000.00
2020029	REMOVAL OF ASPHALTIC CONCRETE PAVEMENT	SQ.YD.	34244	$ 2.00	$ 68,488.00
2020041	REMOVAL OF PIPE	L.FT.	4	$ 30.00	$ 120.00
2020042	REMOVAL OF PIPE (BOX CULVERT)	L.FT.	410	$ 40.00	$ 16,400.00
2020050	REMOVE (TRAFFIC SIGNAL SYSTEM)	L.SUM	1	$ 40,000.00	$ 40,000.00
2020101	REMOVE FENCE	L.FT.	10402	$ 15.00	$ 156,030.00
2020115	REMOVE (CATTLE GUARD)	EACH	2	$ 1,000.00	$ 2,000.00
2030301	ROADWAY EXCAVATION	CU.YD.	8712	$ 15.00	$ 130,680.00
2030401	DRAINAGE EXCAVATION	CU.YD.	7488	$ 15.00	$ 112,320.00
2030904	BORROW (IN PLACE)	CU.YD.	407924	$ 20.00	$ 8,158,480.00
3030022	AGGREGATE BASE, CLASS 2	CU.YD.	24982	$ 90.00	$ 2,248,380.00
3030026	AGGREGATE SUBBASE, CLASS 6	CU.YD.	1053	$ 45.00	$ 47,385.00
4010010	PORTLAND CEMENT CONCRETE PAVEMENT (10")	SQ.YD.	34897	$ 85.00	$ 2,966,245.00
4040111	BITUMINOUS TACK COAT	TON	25	$ 550.00	$ 13,750.00
4040116	APPLY BITUMINOUS TACK COAT	HOUR	88	$ 275.00	$ 24,200.00
4040282	ASPHALT BINDER (PG 76-16)	TON	1051	$ 900.00	$ 945,900.00
4160004	ASPHALTIC CONCRETE (3/4" MIX) (END PRODUCT) (SPECIAL MIX)	TON	21008	$ 75.00	$ 1,575,600.00
4160031	MINERAL ADMIXTURE	TON	198	$ 90.00	$ 17,820.00
5010011	PIPE, CORRUGATED METAL, 24"	L.FT.	86	$ 200.00	$ 17,200.00
5012524	STORM DRAIN PIPE, 24"	L.FT.	148	$ 250.00	$ 37,000.00
5012936	PIPE CULVERT, 36"	L.FT.	3183	$ 200.00	$ 636,600.00
5014024	FLARED END SECTION, 24" (C-13.25)	EACH	2	$ 1,500.00	$ 3,000.00
5014136	FLARED END SECTION (36") (C-13.20)	EACH	12	$ 2,000.00	$ 24,000.00
5030143	CONCRETE CATCH BASIN (MEDIAN) (C-15.80)	EACH	1	$ 8,000.00	$ 8,000.00
5030500	JUNCTION BOX	EACH	1	$ 40,000.00	$ 40,000.00
6011143	32" TYPE F ROADWAY BARRIER TRANSITION TO 42" SINGLE SLOPE BRIDGE BARRIER	L.FT.	45	$ 210.00	$ 9,450.00
6011151	SINGLE SLOPE BRIDGE CONCRETE BARRIER AND TRANSITION (42")	L.FT.	555	$ 250.00	$ 138,750.00
6018101	REINFORCED CONCRETE BOX CULVERT (UTILITY ACCESS TUNNEL)	L.FT.	85	$ 6,000.00	$ 510,000.00
6060046	BRIDGE SIGN STRUCTURE (SD9.20, TYPE 2F)	EACH	2	$ 150,000.00	$ 300,000.00
6060058	BRIDGE SIGN STRUCTURE (TAPERED TUBE, SINGLE BEAM, 70' 1" TO 85')	EACH	2	$ 39,000.00	$ 78,000.00
6060076	FOUNDATION FOR BRIDGE SIGN STRUCTURE (SD9.20, TYPE 2F)	EACH	4	$ 20,000.00	$ 80,000.00
6060132	CANTILEVER SIGN STRUCTURE (SD9.10, TYPE 2C)	EACH	3	$ 64,000.00	$ 192,000.00
6060134	CANTILEVER SIGN STRUCTURE (SD9.10, TYPE 4C)	EACH	1	$ 82,000.00	$ 82,000.00
6060255	FOUNDATION FOR CANTILEVER SIGN STRUCTURE (SD9.10, TYPE 2C)	EACH	3	$ 26,000.00	$ 78,000.00
6060257	FOUNDATION FOR CANTILEVER SIGN STRUCTURE (SD9.10, TYPE 4C)	EACH	1	$ 25,000.00	$ 25,000.00
6080018	EXTRUDED ALUMINUM SIGN PANEL	SQ.FT.	677	$ 50.00	$ 33,850.00
7020001	IMPACT ATTENUATION DEVICE (ENERGY ABSORBING TERMINAL)	EACH	2	$ 25,000.00	$ 50,000.00
7040005	PAVEMENT MARKING (WHITE EXTRUDED THERMOPLASTIC) (0.090")	L.FT.	44850	$ 0.62	$ 27,807.00
7040006	PAVEMENT MARKING (YELLOW EXTRUDED THERMOPLASTIC) (0.090")	L.FT.	19530	$ 0.62	$ 12,108.60
7040072	PAVEMENT MARKING (TRANSVERSE) (THERMOPLASTIC) (ALKYD) (0.090")	L.FT.	3735	$ 0.90	$ 3,361.50
7040073	PAVEMENT LEGEND (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	8	$ 180.00	$ 1,440.00
7040074	PAVEMENT SYMBOL (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	22	$ 160.00	$ 3,520.00
7050022	PAVEMENT MARKING, PREFORMED, WHITE STRIPE, TYPE I	L.FT.	16200	$ 3.40	$ 55,080.00

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
7060013	PAVEMENT MARKER, RAISED, TYPE C	EACH	1100	$ 3.50	$ 3,850.00
7060018	PAVEMENT MARKER, RAISED, TYPE G	EACH	200	$ 3.50	$ 700.00
7080201	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED) (WHITE)	L.FT.	61935	$ 0.25	$ 15,483.75
7080202	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED) (YELLOW)	L.FT.	19530	$ 0.18	$ 3,515.40
7080206	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED SYMBOL) (ARROW)	EACH	22	$ 75.00	$ 1,650.00
7080208	WATERBORNE-TYPE I PAVEMENT MARKING (PAINTED LEGEND) (ONLY)	EACH	8	$ 70.00	$ 560.00
7310011	POLE (TYPE A) (8')	EACH	6	$ 2,000.00	$ 12,000.00
7310012	POLE (TYPE A) (10')	EACH	2	$ 2,200.00	$ 4,400.00
7310070	POLE (TYPE G) (STANDARD BASE)	EACH	4	$ 3,500.00	$ 14,000.00
7310090	POLE (TYPE H) (STANDARD BASE)	EACH	31	$ 1,200.00	$ 37,200.00
7310130	POLE (TYPE Q)	EACH	6	$ 10,000.00	$ 60,000.00
7310197	BREAKAWAY BASE FOR LIGHTING POLE OR SIGNAL FLASHER	EACH	31	$ 600.00	$ 18,600.00
7310200	POLE FOUNDATION (TYPE A)	EACH	8	$ 2,000.00	$ 16,000.00
7310260	POLE FOUNDATION (TYPE G) (STANDARD BASE)	EACH	4	$ 3,000.00	$ 12,000.00
7310276	POLE FOUNDATION (TYPE H) (BREAKAWAY)	EACH	31	$ 800.00	$ 24,800.00
7310310	POLE FOUNDATION (TYPE Q)	EACH	6	$ 6,000.00	$ 36,000.00
7310551	MAST ARM (20 FT.) (TAPERED)	EACH	41	$ 2,500.00	$ 102,500.00
7310561	MAST ARM (25 FT.) (TAPERED)	EACH	2	$ 3,000.00	$ 6,000.00
7310590	MAST ARM (40 FT.) (TAPERED)	EACH	4	$ 10,000.00	$ 40,000.00
7320030	ELECTRICAL CONDUIT (1") (PVC)	L.FT.	555	$ 15.00	$ 8,325.00
7320050	ELECTRICAL CONDUIT (2") (PVC)	L.FT.	12910	$ 30.00	$ 387,300.00
7320060	ELECTRICAL CONDUIT (2 1/2") (PVC)	L.FT.	400	$ 35.00	$ 14,000.00
7320070	ELECTRICAL CONDUIT (3") (PVC)	L.FT.	610	$ 50.00	$ 30,500.00
7320073	ELECTRICAL CONDUIT (2 - 3") (PVC)	L.FT.	1030	$ 80.00	$ 82,400.00
7320420	PULL BOX (NO. 7)	EACH	8	$ 1,200.00	$ 9,600.00
7320421	PULL BOX (NO. 7) (WITH EXTENSION)	EACH	4	$ 1,800.00	$ 7,200.00
7320456	PULL BOX (4B)	EACH	39	$ 1,000.00	$ 39,000.00
7320460	PULL BOX (6B)	EACH	1	$ 1,500.00	$ 1,500.00
7320500	CONDUCTOR (NO. 12)	L.FT.	5940	$ 1.00	$ 5,940.00
7320520	CONDUCTOR (NO. 8)	L.FT.	50000	$ 1.20	$ 60,000.00
7320585	CONDUCTOR (INSULATED BOND) (NO. 12)	L.FT.	2970	$ 1.00	$ 2,970.00
7320595	CONDUCTOR (INSULATED BOND) (NO. 8)	L.FT.	12500	$ 1.20	$ 15,000.00
7320651	CONDUCTORS (SR347 SB & Riggs Rd)	L.SUM	1	$ 50,000.00	$ 50,000.00
7320652	CONDUCTORS (SR347 NB & Riggs Rd)	L.SUM	1	$ 50,000.00	$ 50,000.00
7330060	TRAFFIC SIGNAL FACE (TYPE F)	EACH	20	$ 1,200.00	$ 24,000.00
7330070	TRAFFIC SIGNAL FACE (TYPE G)	EACH	4	$ 1,800.00	$ 7,200.00
7330210	TRAFFIC SIGNAL FACE (PEDESTRIAN) (MAN/HAND)	EACH	16	$ 1,200.00	$ 19,200.00
7330220	PEDESTRIAN PUSH BUTTON	EACH	14	$ 700.00	$ 9,800.00
7330310	TRAFFIC SIGNAL MOUNTING ASSEMBLY (TYPE II)	EACH	16	$ 300.00	$ 4,800.00
7330330	TRAFFIC SIGNAL MOUNTING ASSEMBLY (TYPE IV)	EACH	6	$ 1,100.00	$ 6,600.00
7330340	TRAFFIC SIGNAL MOUNTING ASSEMBLY (TYPE V)	EACH	14	$ 1,100.00	$ 15,400.00
7330350	TRAFFIC SIGNAL MOUNTING ASSEMBLY (TYPE VI)	EACH	2	$ 1,200.00	$ 2,400.00
7340050	CONTROL CABINET (TYPE V)	EACH	2	$ 50,000.00	$ 100,000.00
7340105	CONTROL CABINET FOUNDATION	EACH	2	$ 2,000.00	$ 4,000.00
7340120	METER PEDESTAL CABINET	EACH	2	$ 5,000.00	$ 10,000.00
7340252	CONTROLLER (COBALT)	EACH	2	$ 7,500.00	$ 15,000.00
7340306	METER PEDESTAL FOUNDATION	EACH	2	$ 2,000.00	$ 4,000.00
7350210	VIDEO DETECTION SYSTEM (3 CAMERA COMPLETE SYSTEM)	EACH	2	$ 90,000.00	$ 180,000.00
7360111	LUMINAIRE (LED) (HORIZONTAL MOUNT) (TYPE 25L)	EACH	41	$ 1,300.00	$ 53,300.00
7360113	LUMINAIRE (LED) (UNDERDECK 15L)	EACH	8	$ 1,200.00	$ 9,600.00
7360160	POWER SUPPLY (BATTERY BACKUP)	EACH	2	$ 12,000.00	$ 24,000.00
7360240	LOAD CENTER CABINET FOUNDATION	EACH	1	$ 1,500.00	$ 1,500.00
7360241	LOAD CENTER CABINET (TYPE IV) (240/480 VOLT)	EACH	1	$ 10,000.00	$ 10,000.00
7370452	MISCELLANEOUS ELECTRICAL (RECORD DRAWINGS & DEVICE NUMBER INSTALLATION)	L.SUM	1	$ 8,000.00	$ 8,000.00
7370705	CCTV FIELD EQUIPMENT	EACH	2	$ 9,000.00	$ 18,000.00
9030013	BARBED WIRE GAME FENCE	L.FT.	15465	$ 8.00	$ 123,720.00
9050025	GUARD RAIL TERMINAL (MASH)	EACH	2	$ 11,000.00	$ 22,000.00
9050419	GUARD RAIL TRANSITION (C-10.31)	EACH	2	$ 6,500.00	$ 13,000.00
9060081	CATTLE GUARD (8 UNIT)	EACH	2	$ 65,000.00	$ 130,000.00
9080001	CONCRETE CURB (C-05.10) (TYPE A)	L.FT.	3464	$ 22.00	$ 76,208.00
9080085	CONCRETE CURB AND GUTTER (C-05.10) (TYPE D)	L.FT.	1427	$ 40.00	$ 57,080.00
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	8604	$ 8.00	$ 68,832.00
9100007	CONCRETE HALF BARRIER TRANSITION (20-FT)	EACH	2	$ 1,800.00	$ 3,600.00
9100008	CONCRETE BARRIER (C-10.50)	L.FT.	296	$ 90.00	$ 26,640.00
9100114	CONCRETE BARRIER TRANSITION (C-10.77 END TERMINAL)	EACH	2	$ 9,500.00	$ 19,000.00
9100201	CONCRETE MEDIAN BARRIER	L.FT.	343	$ 150.00	$ 51,450.00
9210011	MEDIAN PAVING	SQ.YD.	1528	$ 150.00	$ 229,200.00
9240015	FORCE ACCOUNT WORK (ESTABLISH ELECTRICAL SERVICE)	L.SUM	1	$ 20,000.00	$ 20,000.00
9240052	MISCELLANEOUS WORK (LANDSCAPE & EROSION CONTROL)	L.SUM	1	$ 690,000.00	$ 690,000.00
9240119	MISCELLANEOUS WORK (CELLULAR SYSTEM)	EACH	1	$ 8,000.00	$ 8,000.00
9240120	MISCELLANEOUS WORK (BATTERY BACKUP FOUNDATION)	EACH	2	$ 1,500.00	$ 3,000.00
9240122	MISCELLANEOUS WORK (PIPE CONNECTION PER ADOT DET C-13.70)	EACH	1	$ 1,500.00	$ 1,500.00
9240192	MISCELLANEOUS WORK (SLOPE PAVING)	SQ.YD.	1729	$ 200.00	$ 345,800.00
9290001	MECHANICALLY STABILIZED EARTH RETAINING WALLS	SQ.FT.	22462	$ 200.00	$ 4,492,400.00
2030501E	STRUCTURAL EXCAVATION	CU.YD.	272	$ 100.00	$ 27,200.00
2030506E	STRUCTURE BACKFILL	CU.YD.	240	$ 200.00	$ 48,000.00
6010003E	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,500)	CU.YD.	541	$ 1,200.00	$ 649,200.00
6010005E	STRUCTURAL CONCRETE (CLASS S) (F'C = 4,500)	CU.YD.	620	$ 1,800.00	$ 1,116,000.00

ITEM NO	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
6011132E	COMBINATION PEDESTRIAN-TRAFFIC BRIDGE RAILING	L.FT.	417	$ 280.00	$ 116,726.06
6011343E	DECK JOINT ASSEMBLY (FLANGELESS STRIP SEAL)	L.FT.	201	$ 600.00	$ 120,600.00
6011371E	APPROACH SLAB (SD 2.01)	SQ.FT.	3010	$ 60.00	$ 180,600.00
6014973E	PRECAST, P/S MEMBER (BT42 GIRDER)	L.FT.	2148	$ 650.00	$ 1,396,200.00
6015101E	RESTRAINERS, VERTICAL EARTHQUAKE (FIXED)	EACH	12	$ 600.00	$ 7,200.00
6015102E	RESTRAINERS, VERTICAL EARTHQUAKE (EXPANSION)	EACH	24	$ 800.00	$ 19,200.00
6050002E	REINFORCING STEEL	LB.	231536	$ 2.50	$ 578,839.91
6090048F	DRILLED SHAFT FOUNDATION (48")	L.FT.	700	$ 900.00	$ 630,000.00
6090072F	DRILLED SHAFT FOUNDATION (72")	L.FT.	320	$ 1,300.00	$ 416,000.00
2030501A	STRUCTURAL EXCAVATION	CU.YD.	295	$ 100.00	$ 29,500.00
2030506A	STRUCTURE BACKFILL	CU.YD.	89	$ 200.00	$ 17,800.00
6010002A	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	130	$ 900.00	$ 117,000.00
6050002A	REINFORCING STEEL	LB.	17347	$ 2.50	$ 43,367.50
6110202A	METAL HANDRAIL (MAG DETAIL 145)	L.FT.	56	$ 60.00	$ 3,360.00
2030501B	STRUCTURAL EXCAVATION	CU.YD.	417	$ 100.00	$ 41,700.00
2030506B	STRUCTURE BACKFILL	CU.YD.	99	$ 200.00	$ 19,800.00
6010002B	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,000)	CU.YD.	147	$ 900.00	$ 132,300.00
6050002B	REINFORCING STEEL	LB.	19745	$ 2.50	$ 49,362.50
6110202B	METAL HANDRAIL (MAG DETAIL 145)	L.FT.	56	$ 60.00	$ 3,360.00
			ITEM TOTAL		**$32,904,505**

SUMMARY	
ITEM TOTAL	**$32,904,505**
PROJECT WIDE	**$11,977,240**
OTHER COST TOTAL	**$19,005,885**
SUBTOTAL PROJECT COST	**$63,887,630**
INDIRECT COST ALLOCATION PLAN (ICAP) (7.90%)	**$5,047,123**
TOTAL COST	**$68,934,753**

PROJECT WIDE

Mobilization	COST	10%	$3,290,451
Dust and Water Pallative	COST	1%	$329,045
Quality Control	COST	2%	$658,090
Construction Surveying	COST	1%	$329,045
Maintenance and Protection of Traffic	COST	10%	$3,290,451
		PROJECT WIDE SUBTOTAL	**$7,897,081**
Unidentified Item Allowance	COST	10%	$4,080,159
		PROJECT WIDE TOTAL	**$11,977,240**

OTHER COST

GRICUA Utility Relocations	L.SUM	1	$1,500,000
GRIC DPW 16" Waterline Relocation	L. FT.	3,372	$843,000
Environmental - Cultural Data Recovery	L.SUM	1	$270,000
Construction Engineering	COST	9%	$4,039,357
Construction Contingencies	COST	5%	$2,244,087
Consultant Design Services	COST	8%	$3,590,540
Post Design Services	COST	1%	$448,817
PCCP Materials Quality Incentive	SQ.YD	34,897	$69,794
PCCP Smoothness Incentive	LANE-MILE	5.0	$34,699
AC Quality Incentive	TON	21,008	$63,024
Right-of-Way	SQ.FT.	1,916,248	$5,799,335
TCE	SQ.FT.	68,821	$103,232
		OTHER COST TOTAL	**$19,005,885**

6. AASHTO Controlling Design Criteria and Design Exceptions

The existing roadway elements of this project have been reviewed and analyzed to ensure that they comply with AASHTO requirements. Existing and proposed features for the recommended alternative that do not meet AASHTO design criteria (2018 Green Book) are indicated in the discussion below.

ADOT design criteria have also been reviewed for non-conforming elements which will remain as a part of the proposed improvements. All features are designed to meet current ADOT RDG with exception as noted below.

A complete discussion of the existing SR 347 and Riggs Road features and evaluation results are presented within the Final AASHTO Controlling Design Criteria Report (September 2024), included as **Appendix A** of this report.

6.1. AASHTO Non-Conforming Geometric Design Elements

There are no non-conforming AASHTO geometric design elements within the project limits. All roadway geometry will be reconstructed as part of this project and will comply with AASHTO design criteria upon completion of the proposed improvements.

6.2. Request for AASHTO Design Exceptions

Design exceptions are not being requested for the non-conforming design elements listed in **Section 6.1** of this report. The non-conforming elements listed in **Section 6.1**, except as noted, will be reconstructed as part of this project, and will comply with AASHTO design criteria upon completion of the proposed improvements.

6.3. ADOT RDG Non-Conforming Geometric Design Elements

There are no non-conforming ADOT geometric design elements within the project limits. All roadway geometry will be reconstructed as part of this project and will comply with ADOT design criteria upon completion of the proposed improvements.

6.4. Request for ADOT Design Exceptions

Design deviations will not be required for this project and will not be requested.

7. Environmental Considerations

7.1. Environmental Overview

The environmental Study Area for the project extends along SR 347 from MP 184.30 to MP 186.19 on GRIC lands in Maricopa County, Arizona. This environmental overview (EO) documents environmental conditions within the Study Area to identify opportunities and constraints that have been considered in selecting a preferred alternative.

7.2. Affected Environment/Environmental Concerns

Physical and Natural Environment

1. Topography/Physiology

The Study Area is approximately 1,130 feet to 1,150 feet above mean sea level and drains west. Offsite drainage patterns will be maintained. Drainage structures within the Study Area will be modified; however, the drainage patterns will be maintained. The general topography of the Study Area will be maintained.

2. Vegetation

According to Biotic Communities, Southwestern United States and Northwestern Mexico, the Study Area is within the Lower Colorado River Subdivision of the Sonoran Desertscrub biotic community.[1] The Study Area primarily consists of velvet mesquite (*Prosopis velutina*) and fourwing saltbush (*Atriplex canescens*). Noxious and invasive species observed within the Study Area includes tamarisk (*Tamarix chinensis*), Asian mustard (*Brassica tournefortii*), buffelgrass (*Cenchrus ciliaris*), cheeseweed (*Malva parviflora*), red root pigweed (*Amaranthus retroflexus*), and globe chamomile (*Oncosiphon pilulifer*).

3. Biology

a. Threatened, Endangered and Sensitive Species

The official species list for the Study Area was obtained from the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) system (Project Code: 2023-0055066) on March 13, 2023.[2] The list included four threatened, endangered, or candidate species that should be evaluated for the Study Area. There is no federally designated critical habitat within the project vicinity. A BE is currently being prepared to analyze the preferred alternative. Impacts to Endangered Species Act (ESA) protected species are not anticipated. The Study Area consists of poor to marginal habitat; therefore, impacts to GRIC focal species would be minimal.

b. Migratory Bird Treaty Act

Migratory birds may nest on the ground, on structures, or in trees, shrubs, or other vegetation within the Study Area. The construction footprint and surrounding R/W were investigated on January 23, 2023 by windshield and foot survey for indications that migratory birds may nest in the area. Nests were observed; therefore, environmental commitments will be required to avoid impacts to migratory birds.

c. Invasive Species

Noxious and invasive species observed within the Study Area include tamarisk, Asian mustard, buffelgrass, cheeseweed, red root pigweed, and globe chamomile; therefore, this project will incorporate environmental commitments to prevent the introduction and spread of invasive species.

d. GRIC Protected Native Plants

The Study Area was surveyed for the presence of protected native plants on January 23, 2023. GRIC focal species observed within the Study Area include velvet mesquite, saltbush, brittlebush (*Encelia farinosa*), and saguaro (*Carnegiea gigantea*); therefore, environmental commitments will be required.

4. Water Quality

a. Clean Water Act (Section 404/401)

An AJD was reviewed and approved by GRIC and issued by the U.S. Army Corps of Engineers on September 1, 2023. No potential waters of the U.S. (WOTUS) are present within the Study Area; therefore, Section 404/401 permitting will not be required.

5. Noise

There are no sensitive noise receptors located in the Study Area and this is not a Type I project; therefore, noise analysis is not required.

6. Air Quality

The project will comply with the GRIC Air Quality Management Program Air Quality Ordinance. An Earth Moving Permit/Dust Control Plan from the GRIC DEQ is anticipated for construction.

7. Hazardous Materials

A PISA was reviewed and approved by GRIC and approved by ADOT Environmental Planning (EP) on March 10, 2023. No facilities of concern were documented within or adjacent to the Study Area.

An Asbestos and Lead-Based Paint Sampling and Analysis was reviewed and approved by GRIC and approved by ADOT EP on May 23, 2023. Asbestos at a level greater than 1% and lead at a level greater than 0.5% by weight/5,000 parts per million (ppm) was not detected in any samples collected within the project limits. National Standards for Hazardous Air Pollutants (NESHAP) notification to ADOT and GRIC will be required for the work associated with the Riggs Road TI.

8. Cultural Resources

A Class III Cultural Resources Survey was completed by GRIC CRMP. ADOT, GRIC CRMP, and the Tribal Historic Preservation Office (THPO) are currently evaluating impacts to cultural resources and are working to prepare a Historic Properties Treatment Plan (HPTP) and Memorandum of Agreement (MOA).

[1] https://databasin.org

[2] https://ecos.fws.gov/ipac/

7.3. Agency & Stakeholder Coordination

The project kick-off meeting was held on August 11, 2022, via Microsoft Teams. Participants included representatives from:

- FHWA
- ADOT
- MAG
- GRIC Land Use Planning & Zoning (LUPZ)
- GRIC THPO
- GRIC CRMP
- GRICUA
- GRTI
- Ak-Chin Indian Community
- MCDOT
- Pinal County
- City of Maricopa

The meeting was chaired by the ADOT Project Manager and Kimley-Horn. Agenda items included a project overview, schedule, critical path activities, and discipline reports for traffic, environmental, R/W, roadway, drainage, bridge design, pavement and geotechnical, traffic control, FMS, lighting, survey, utilities, landscaping/erosion control, agency coordination/scoping, maintenance, intergovernmental agreement (IGA), and public involvement (PI). The meeting also focused on soliciting input from the stakeholders. Presentations to the stakeholders provided data and graphics depicting existing conditions, LOS, operational issues, traffic modeling/forecasts, alternatives development, and environmental resource issues.

The Agency Scoping Meeting was held on October 31, 2022, via Microsoft Teams. Participants included representatives from:

- FHWA
- ADOT
- MAG
- GRIC LUPZ
- GRICUA
- GRTI
- MCDOT
- Pinal County
- City of Maricopa

The meeting was chaired by the ADOT Project Manager and Kimley-Horn. Agenda items included the MAG corridor study; the project purpose, need, and goal; potential issues and considerations as alternative options were developed; alternatives considered; and selection criteria. Selection criteria included preliminary LOS, project schedule, critical path activities, and discipline status reports for environmental, R/W, survey, utilities, and PI. Presentations to the stakeholders provided data and graphics depicting the corridor study, existing and proposed conditions, LOS, traffic modeling/forecasts, alternatives development, and construction phasing.

Several stakeholder-focused discussions supplemented the meeting, including:

- GRICUA Coordination Meeting – September 7, 2022
- MCDOT and ADOT Meeting – September 20, 2022
- GRICUA Meeting – October 19, 2022
- Wildhorse Pass Development Authority Board Presentation – November 3, 2022
- Project Progress Meeting – December 8, 2022
- ADOT/GRIC/BIA Meeting – April 17, 2023
- ADOT/GRIC/BIA Meeting – August 24, 2023
- ADOT/GRIC Coordination Meetings – Ongoing Monthly

8. Public Involvement

During the public scoping phase of this project, ADOT performed Community outreach in collaboration with Community representatives that included presentations to the GRIC Litigation Team, all seven GRIC Districts, and the GRIC Elders' Concerns Group. ADOT, in coordination with MAG, also provided a presentation to Wild Horse Pass Development Authority (WHPDA). These presentations included seven build alternatives that were evaluated, along with a No-build alternative, using various criteria, including Traffic Performance, Engineering Requirements, Right-of-Way Requirements, Utility Impacts, Environmental Considerations, Construction Cost, and Community / Tribal Agency / Public Support.

The ADOT Communications Team led all PI efforts for this project with assistance from design consultants. The following were included with the PI effort:

- Project-Specific PI Plan
- Conduct research of the City of Maricopa, GRIC, and surrounding areas to determine:
    - Established communication channels including social media groups, etc.
    - Major stakeholder groups such as homeowners' associations (HOAs), business chambers, community groups, major employers, and faith-based groups
    - Community events
    - Elected officials
    - Previous media stories near the area
- Limited English Proficiency (LEP) research and Four Factor Analysis
- Stakeholder meetings with ADOT, City of Maricopa, MAG, and GRIC to determine existing communication tools and confirm PI tasks
- Project website, hosted by ADOT, to include an overview of the project, visual displays, project documentation, as well as an introductory presentation
- Preparation and distribution of project information to the City of Maricopa, GRIC, and other surrounding communities and stakeholders, to encourage viewing of the project website, solicit feedback and comments related to the interchange modifications, and provide general project information
- Prepare for and conduct a Public Scoping Meeting
- Compile all public comments received throughout project
- Prepare a PI summary
- Two Public Meetings were held – one for GRIC and one for City of Maricopa/public
    - GRIC Community Meeting was held on 8/13/24
    - City of Maricopa Meeting was held on 8/15/24

APPENDIX A: AASHTO Controlling Design Criteria Report

PROJECT 347 MA 184 F0476 01L

NFA

MARICOPA ROAD (SR 347)

RIGGS ROAD TI

ROADWAY CONSTRUCTION

AASHTO CONTROLLING DESIGN CRITERIA REPORT

September 2024

Prepared For:

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

Prepared By:

Kimley»Horn

TABLE OF CONTENTS

LIST OF EXISTING FEATURES REQUIRING DESIGN EXCEPTIONS

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

SR 347 MAINLINE (DIVIDED)

No design exceptions.

RIGGS ROAD

No design exceptions.

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
SR 347 MAINLINE SUMMARY (DIVIDED)

PROJECT NUMBER:	347 MA 184 F0476 01L	**ROUTE:**	SR 347
PROJECT LOCATION:	Riggs Road TI	**BEGINNING MP:**	184.60
HIGHWAY SECTION:	Maricopa Road	**ENDING MP:**	186.08
FUNCTIONAL CLASSIFICATION:	Rural Principal Arterial		

TRAFFIC VOLUMES AND FACTORS:

	EXISTING	DESIGN	TRAFFIC FACTORS		
SR 347 SEGMENT	**2022 AADT**	**2050 AADT**	**K=**	**D=**	**T=**
NORTH OF RIGGS ROAD (NORTH OF MP 185.29)	47,629	66,516	7%	73%	5%
SOUTH OF RIGGS ROAD (SOUTH OF MP 185.29)	53,343	74,496	7%	63%	5%

DESIGN SPEED:

THE AASHTO RECOMMENDED MINIMUM DESIGN SPEED OF THE HIGHWAY IS: 50-75 MPH
THE POSTED SPEED LIMIT IS: 65 MPH
AVERAGE ELEVATION IS: 1,140 FT
TERRAIN IS: LEVEL

LANE WIDTH:

	LANES	
	EXISTING	**AASHTO**
SR 347 NORTHBOUND	12'	12'
SR 347 SOUTHBOUND	12'	12'

SHOULDER WIDTH:

	INSIDE SHOULDER		OUTSIDE SHOULDER	
	EXISTING	**AASHTO**	**EXISTING**	**AASHTO**
SR 347 NORTHBOUND	4'	4'	10'	8'
SR 347 SOUTHBOUND	4'	4'	10'	8'

HORIZONTAL CURVE RADIUS:

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

N/A - NO HORIZONTAL CURVES IN PROJECT LIMITS

REMARKS:

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
SR 347 MAINLINE SUMMARY (DIVIDED)
(CONTINUED)

SUPERELEVATION:

NORTHBOUND & SOUTHBOUND EXISTING MAXIMUM RATE IS: 2.0% AASHTO MAXIMUM RATE IS: 12.0%

STOPPING SIGHT DISTANCE:

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

SEE ATTACHMENT #1

MAXIMUM GRADE:

	ASCENDING	DESCENDING
SR 347 NORTHBOUND EXISTING MAXIMUM GRADE IS:	0.7140%	-0.1000%
SR 347 SOUTHBOUND EXISTING MAXIMUM GRADE IS:	0.1000%	-0.7140%

AASHTO MAXIMUM GRADE IS: 3.0000%

CROSS SLOPE:

NORTHBOUND & SOUTHBOUND EXISTING CROSS SLOPE IS: 2.0% AASHTO ALLOWABLE RANGE IS: 1.5 - 2.0%

VERTICAL CLEARANCE:

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

N/A - NO EXISTING STRUCTURES IN PROJECT LIMITS

DESIGN LOADING STRUCTURAL CAPACITY:

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

N/A - NO EXISTING STRUCTURES IN PROJECT LIMITS

REMARKS:

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
RIGGS ROAD CROSSROAD

PROJECT NUMBER: 347 MA 184 F0476 01L
PROJECT LOCATION: Riggs Road TI
HIGHWAY SECTION: Maricopa Road
FUNCTIONAL CLASSIFICATION: Rural Major Collector

ROUTE: SR 347
INTERSECTION MP: 185.29

TRAFFIC VOLUMES AND FACTORS:

RIGGS ROAD SEGMENT	EXISTING 2022 AADT	DESIGN 2050 AADT	TRAFFIC FACTORS K=	D=	T=
WEST OF SR 347	3,777	9,897	10%	61%	11%
EAST OF SR 347	4,476	11,728	10%	64%	6%

DESIGN SPEED:

THE AASHTO RECOMMENDED MINIMUM DESIGN SPEED OF THE HIGHWAY IS: 60 MPH
THE POSTED SPEED LIMIT IS: 55 MPH
AVERAGE ELEVATION IS: 1,140 FT
TERRAIN IS: LEVEL

LANE WIDTH:

	LANES	
	EXISTING	AASHTO
RIGGS RD	12'	10'

SHOULDER WIDTH:

	INSIDE SHOULDER		OUTSIDE SHOULDER	
	EXISTING	AASHTO	EXISTING	AASHTO
RIGGS RD:	N/A	N/A	12' - 15'	6'

HORIZONTAL CURVE RADIUS:

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

N/A - NO HORIZONTAL CURVES IN PROJECT LIMITS

REMARKS:

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
RIGGS ROAD CROSSROAD
(CONTINUED)

SUPERELEVATION:

RIGGS RD EXISTING MAXIMUM RATE: 2.0%

AASHTO MAXIMUM RATE IS: 12.0%

STOPPING SIGHT DISTANCE:

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

SEE ATTACHMENT #1

MAXIMUM GRADE:

RIGGS RD EXISTING MAXIMUM GRADE: 1.1000%

AASHTO MAXIMUM GRADE IS: 6.0000%

CROSS SLOPE:

RIGGS RD EXISTING CROSS SLOPE IS: 2.0%

AASHTO ALLOWABLE RANGE IS: 1.5% - 2.0%

VERTICAL CLEARANCE:

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

N/A - NO EXISTING STRUCTURES IN PROJECT LIMITS

DESIGN LOADING STRUCTURAL CAPACITY:

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

N/A - NO EXISTING STRUCTURES IN PROJECT LIMITS

REMARKS:

ATTACHMENT 1 - VERTICAL CURVE INVENTORY

Project Name: SR 347/Riggs Road TI
Project Number: 347 MA 184 F0476 01L
Roadway Type: Rural Principal Arterial

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
Exst SR 347 Med											
2578+00.			2	-0.1000	0.0000	0	GB	GB	GB	GB	70
2598+00.			2	0.0000	0.7140	800	Sag	+9999	737	+100	70
2606+00.			2	0.7140	-0.1000	800	Crest	1726	737	+100	70
2616+00.			2	-0.1000	0.0000	0	GB	GB	GB	GB	70
2650+00.			2	0.0000	-0.1000	0	GB	GB	GB	GB	70
2696+00.			2	-0.1000	0.2000	800	Sag	+9999	730	+100	70

Notes:

Traffic Direction:
1w = One Way Traffic in Station direction
1a = One Way Traffic against Station direction
2 = Two Way Traffic

Grades are with respect to Station direction.
* Indicates design exception required.
GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 1 - VERTICAL CURVE INVENTORY

Project Name: SR 347/Riggs Road TI
Project Number: 347 MA 184 F0476 01L
Roadway Type: Rural Major Collector

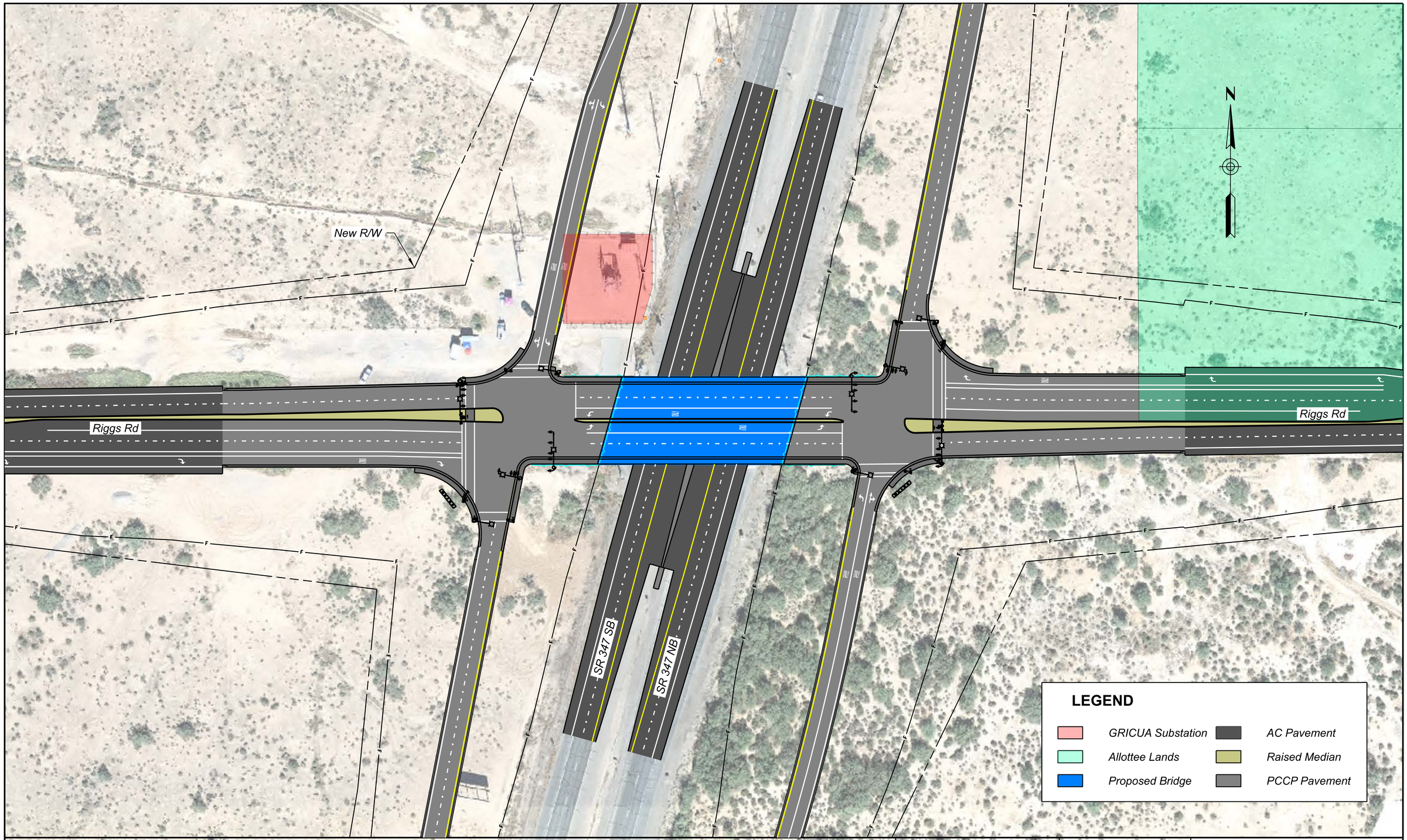
VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
Exst Riggs Rd											
6+50.			2	0.1500	1.1000	200	Sag	+9999	657	+100	65
8+90.			2	1.1000	0.6300	100	Crest	2346	657	+100	65
9+64.43			2	0.6300	2.0000	0	GB	GB	GB	GB	65
SR 347 Intersection			2	2.0000	-2.0000	0	GB	GB	GB	GB	65
11+68.93			2	-2.0000	-0.9300	0	GB	GB	GB	GB	65
13+05.			2	-0.9300	0.1500	150	Sag	+9999	655	+100	65

Notes:

Traffic Direction:
1w = One Way Traffic in Station direction
1a = One Way Traffic against Station direction
2 = Two Way Traffic

Grades are with respect to Station direction.
* Indicates design exception required.
GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

APPENDIX B: Alternatives Considered



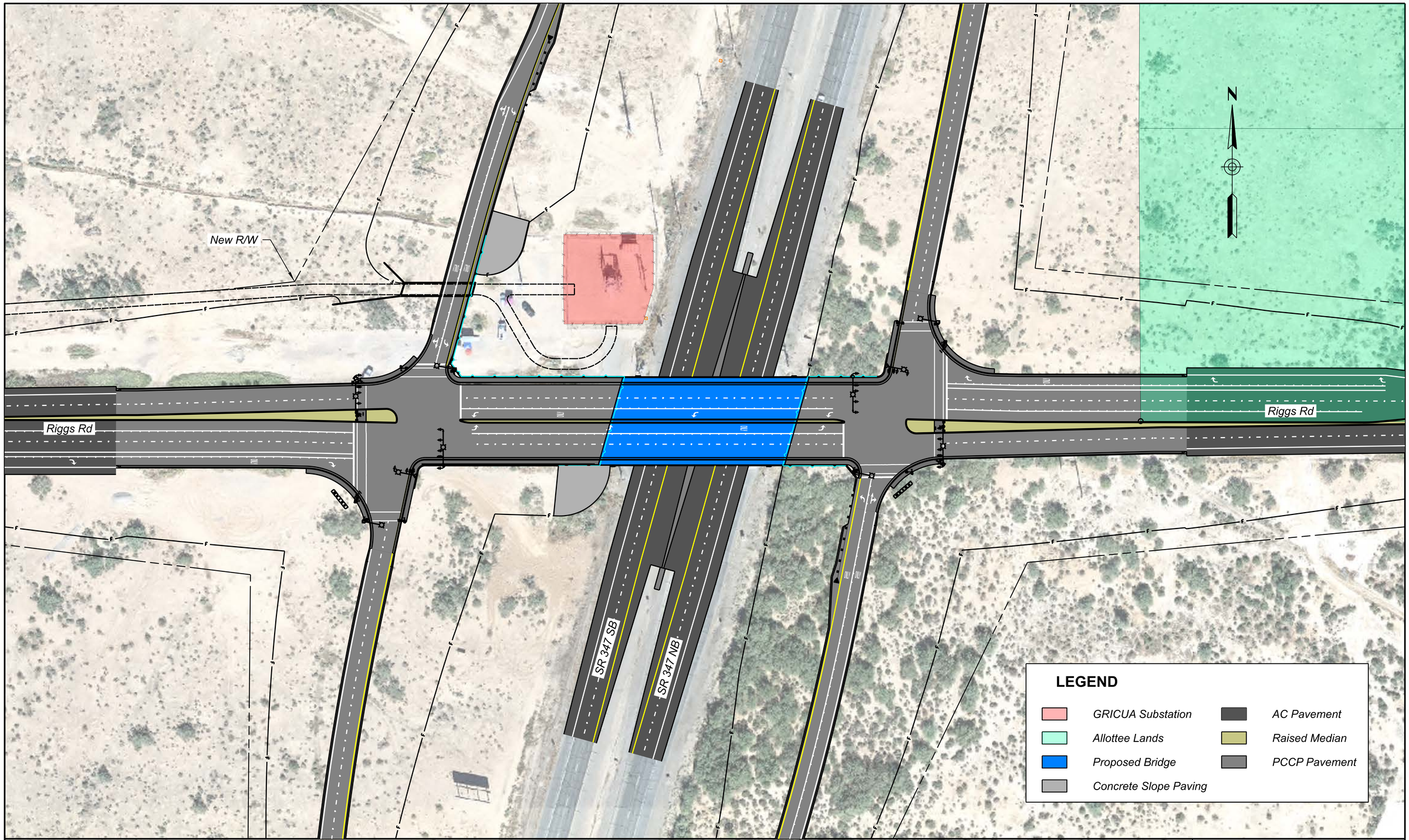
ALTERNATIVE A1
TIGHT DIAMOND

Kimley»Horn AND ASSOCIATES, INC.

APPENDIX B

PROJECT NO.
F0476 01 L
RIGGS ROAD TI AT SR 347
SCALE: 1"=50'

5:11:01 PM 9/27/2023 Thomas.Stafford K:\PHX_Roadway\Worksets\ADOT_CONNECT_PROJECTS_10.10_291749000-F0476-SR_347_Riggs_Rd_TI\dgn\06-Exhibits\2023-09-19_Simplified Exhibits\F0476_exhibit_ddi_ALTA1.dgn



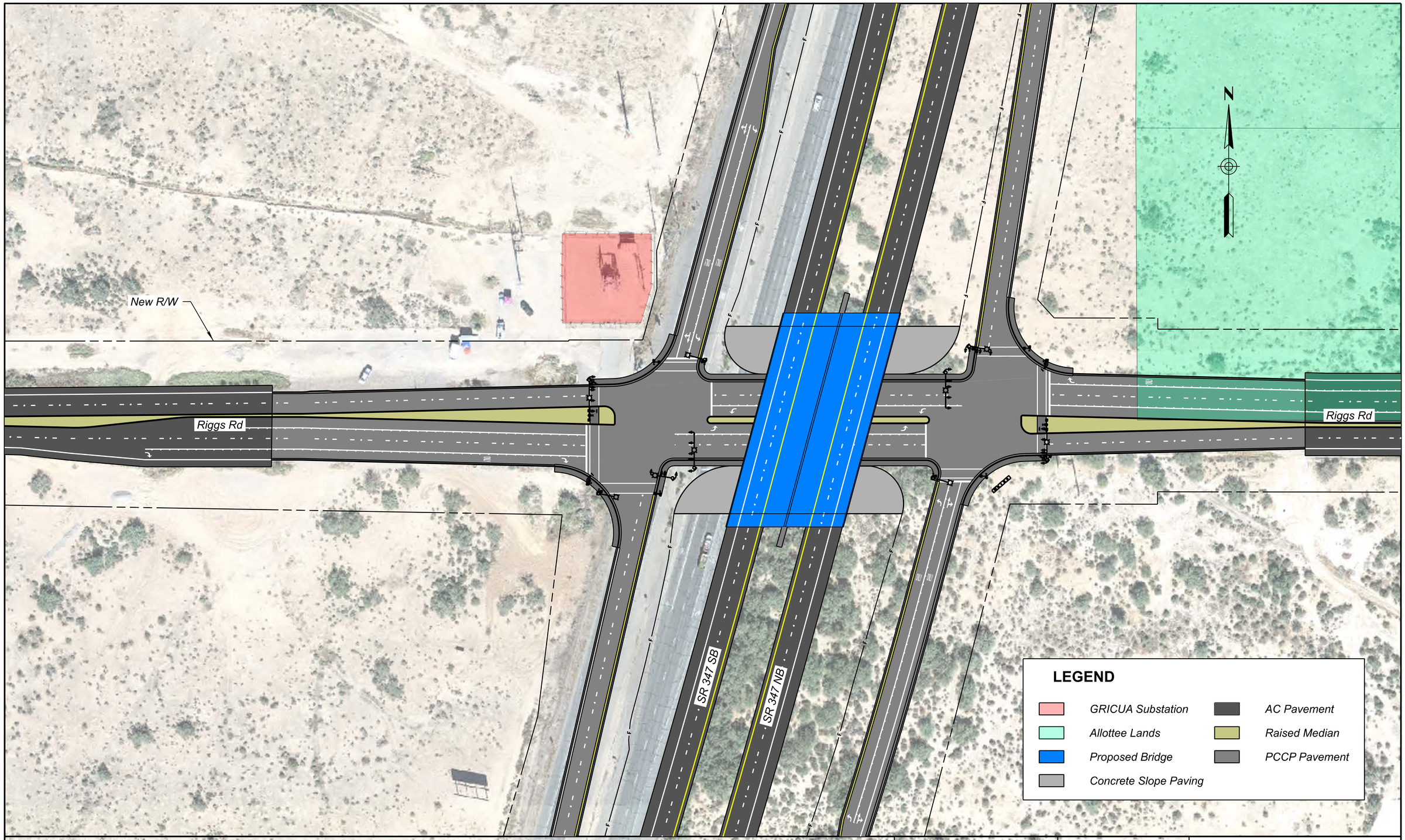
ALTERNATIVE A2
SPREAD DIAMOND

Kimley»Horn AND ASSOCIATES, INC.

APPENDIX B

PROJECT NO.
F0476 01 L
RIGGS ROAD TI AT SR 347
SCALE: 1"=50'

5:11:25 PM 9/27/2023 Thomas.Stafford K:\PHX_Roadway\Worksets\ADOT_CONNECT_PROJECTS_10.10_291749000-F0476-SR_347_Riggs_Rd_TI\dgn\06-Exhibits\2023-09-19_Simplified Exhibits\F0476_exhibit_ddi_ALTA2.dgn



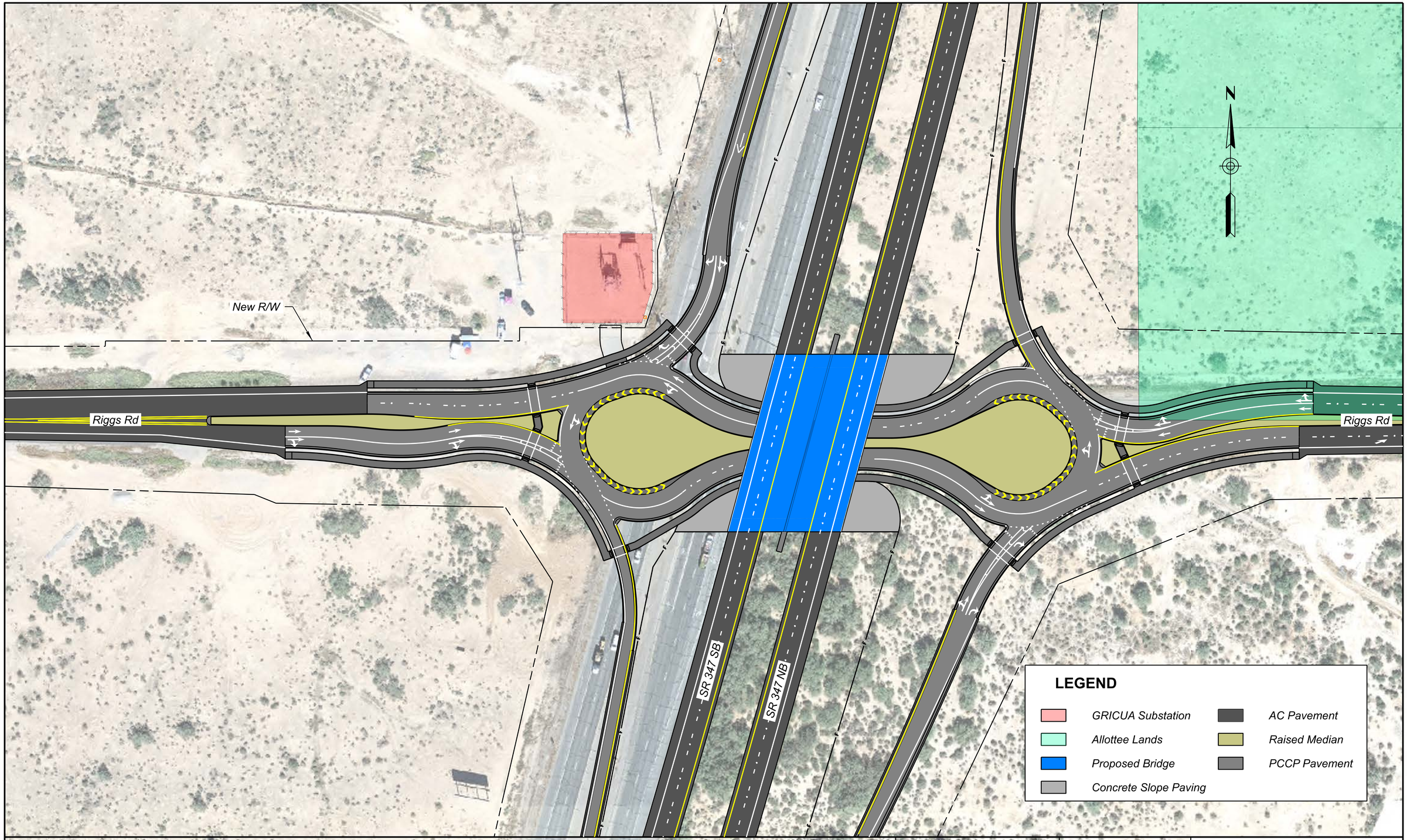
ALTERNATIVE B1
SHIFTED DIAMOND
w/SIGNALS

Kimley»Horn AND ASSOCIATES, INC.

APPENDIX B

PROJECT NO.
F0476 01 L
RIGGS ROAD TI AT SR 347
SCALE: 1"=50'

5:11:49 PM 9/27/2023 Thomas.Stafford K:\PHX_Roadway\Worksets\ADOT_CONNECT_PROJECTS_10.10_291749000-F0476-SR_347_Riggs_Rd_TI\dgn\06-Exhibits\2023-09-19_Simplified Exhibits\F0476_exhibit_ddi_ALTB1.dgn



ALTERNATIVE B2
SHIFTED DIAMOND
w/ROUNDABOUTS

Kimley»Horn AND ASSOCIATES, INC.

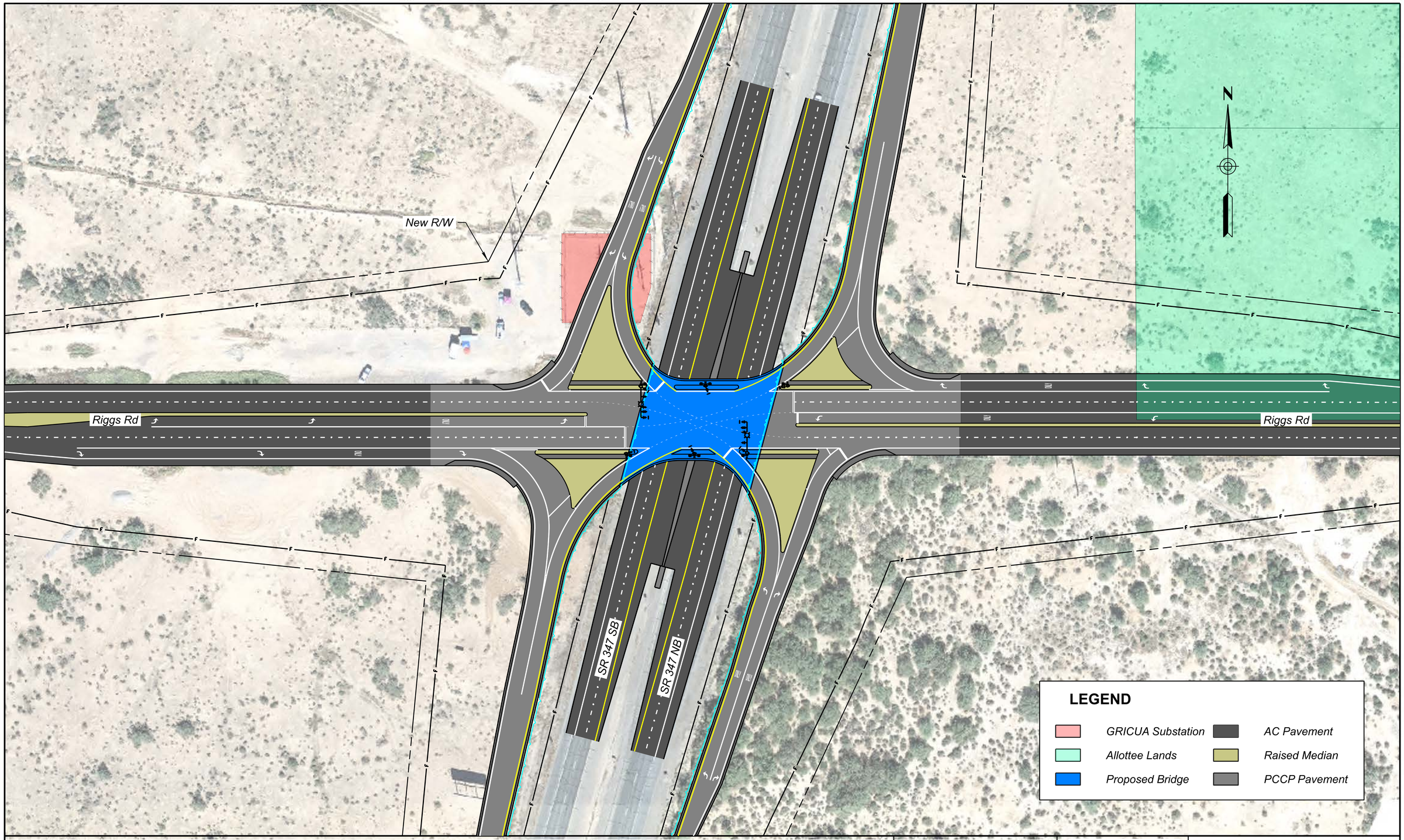
APPENDIX B

PROJECT NO.
F0476 01 L

RIGGS ROAD TI AT SR 347

SCALE: 1"=50'

5:12:12 PM 9/27/2023 Thomas.Stafford K:\PHX_Roadway\Worksets\ADOT_CONNECT_PROJECTS_10.10_291749000-F0476-SR_347_Riggs_Rd_TI\dgn\06-Exhibits\2023-09-19_Simplified Exhibits\F0476_exhibit_ddi_ALTB2.dgn



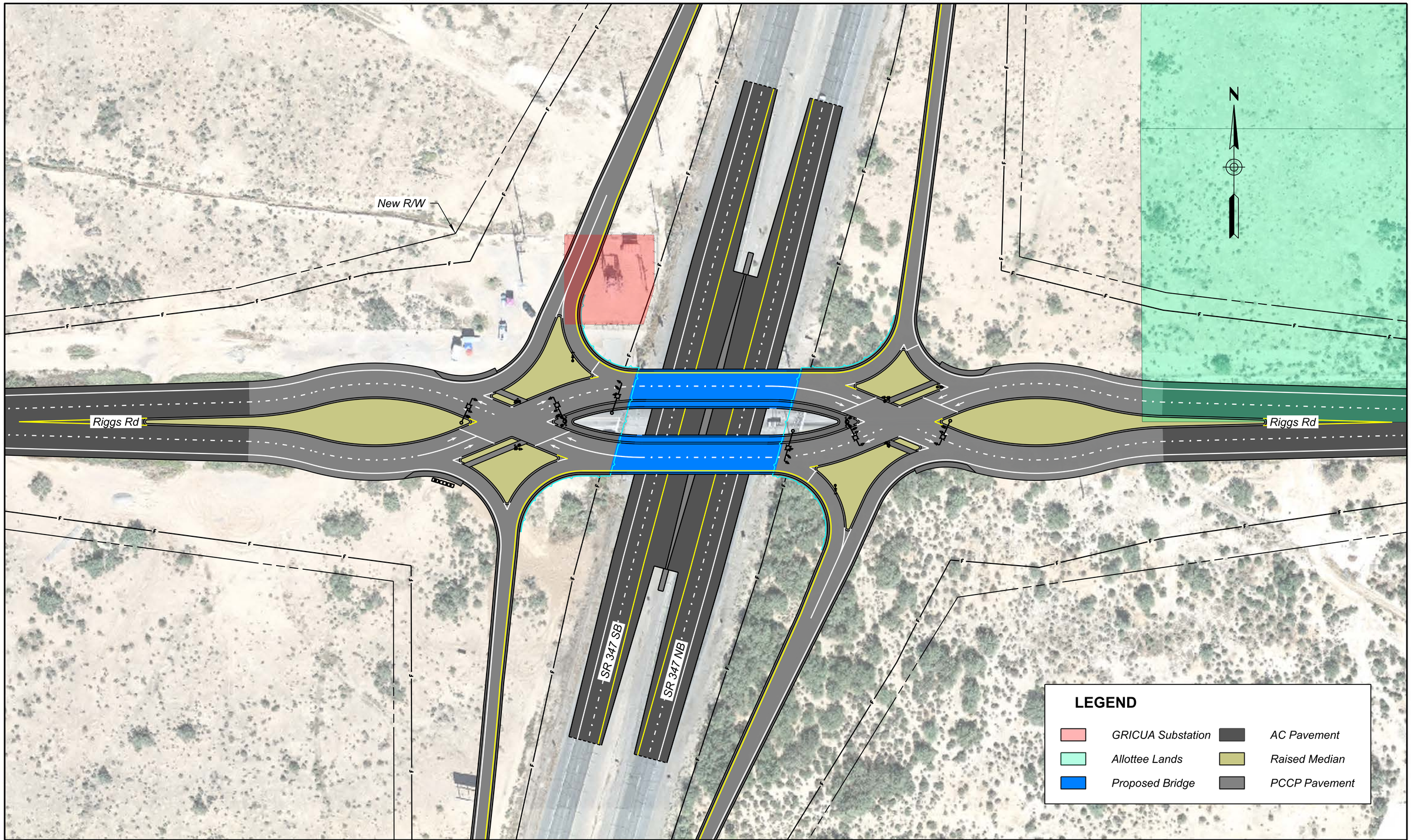
ALTERNATIVE C
SINGLE-POINT URBAN
INTERCHANGE

Kimley»Horn AND ASSOCIATES, INC.

APPENDIX B

PROJECT NO.
F0476 01 L
RIGGS ROAD TI AT SR 347
SCALE: 1"=50'

5:12:32 PM 9/27/2023 Thomas.Stafford K:\PHX_Roadway\Worksets\ADOT_CONNECT_PROJECTS_10.10_291749000-F0476-SR_347_Riggs_Rd_TI\dgn\06-Exhibits\2023-09-19_Simplified Exhibits\F0476_exhibit_ddi_ALTC.dgn



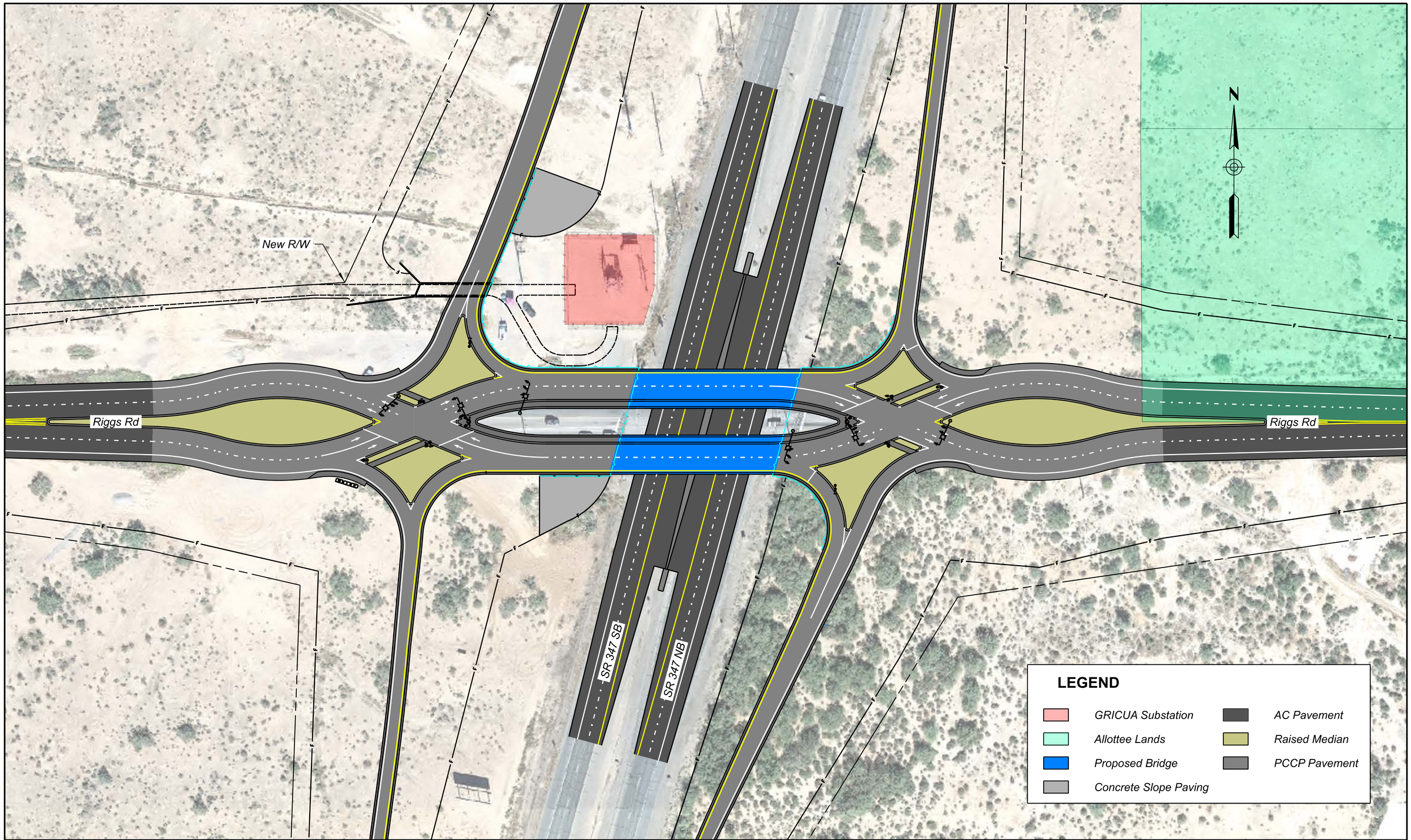
ALTERNATIVE
DIVERGING DIAMOND

Kimley»Horn AND ASSOCIATES, INC.

APPENDIX B

PROJECT NO.
F0476 01 L
RIGGS ROAD TI AT SR 347
SCALE: 1"=50'

5:12:55 PM 9/27/2023 Thomas.Stafford K:\PHX_Roadway\Worksets\ADOT_CONNECT_PROJECTS_10.10_291749000-F0476-SR_347_Riggs_Rd_TI\dgn\06-Exhibits\2023-09-19_Simplified Exhibits\F0476_exhibit_ddi_ALTD.dgn



ALTERNATIVE D2
SPREAD DIVERGING
DIAMOND

Kimley»Horn AND ASSOCIATES, INC.

APPENDIX B

PROJECT NO.
F0476 01 L
RIGGS ROAD TI AT SR 347
SCALE: 1"=50'

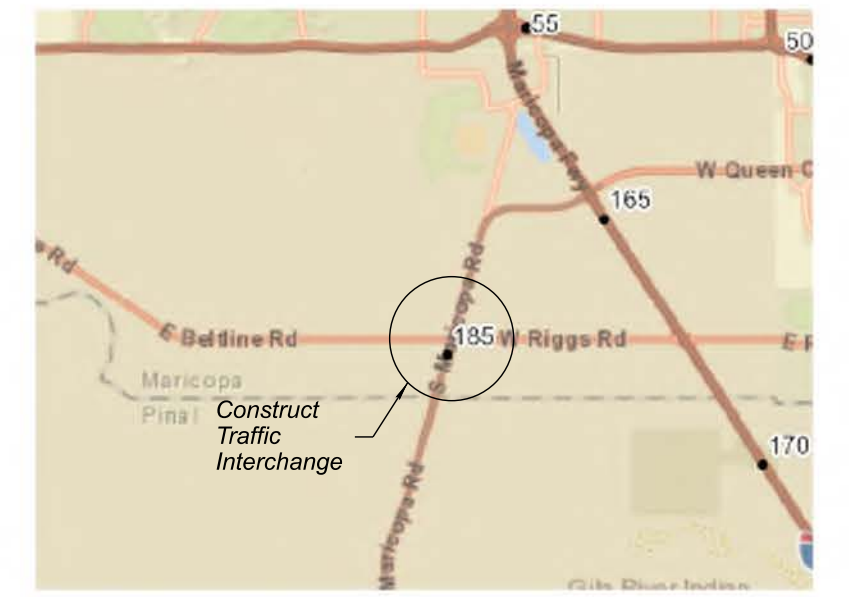
5:13:16 PM 9/27/2023 Thomas.Stafford K:\PHX_Roadway\Worksets\ADOT_CONNECT_PROJECTS_10.10_291749000-F0476-SR_347_Riggs_Rd_TI\dgn\06-Exhibits\2023-09-19_Simplified Exhibits\F0476_exhibit_ddi_ALTD1.dgn

APPENDIX C: Roll Plots of the Refined Alternatives

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION

SCHEMATIC PLAN

STATE HIGHWAY
MARICOPA ROAD
SR 347



KEY MAP
NOT TO SCALE

SR 347
RIGGS ROAD TI
PROJECT NO. 347 MA 184 F0476 01L

LEGEND

PCCP Pavement	Existing Right-of-Way
AC Pavement	New Right-of-Way
Concrete Sidewalk	New Access Control
Concrete Slope Paving	Proposed Retaining Wall
Proposed Bridge	Fill Limits
Raised Median	Cut Limits
GRICUA Substation	TCE
Remove Existing Pavement	

FINAL
DCR
Review
NOT FOR
CONSTRUCTION
OR RECORDING

	NAME	DATE
DESIGN	ARH	09/24
DRAWN	TNS	09/24
CHECKED	RSC	09/24

Kimley»Horn
© 2024 KIMLEY-HORN AND ASSOCIATES, INC.

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

APPENDIX C
SR 347 PLAN

ROUTE
MILEPOST
STRUCTURE NO.

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	347 MA 184	NFA	1	4	

LOCATION SR 347 & RIGGS ROAD TI

TRACS NO. F0476 01L

ADOT

SHEET ___ OF ___

9:52:33 AM 9/10/2024 Edgar.Flores K:\PHX_Roadway\Worksets\ADOT_CONNECT_PROJECTS_10,10_291749000-F0476-SR_347_Riggs_Rd_TI\dgn\Roadway\Roll Plots\Alternatives\F0476_rollplot_diamond_shift_SR347.dgn

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION

SCHEMATIC PLAN

STATE HIGHWAY
MARICOPA ROAD
SR 347

KEY MAP
NOT TO SCALE

RIGGS ROAD TI AT SR 347
PROJECT NO. 347 MA 184 F0476 01L

MIDPOINT OF PROJECT

Central Zone
State Plane Coordinates
X=678,100
Y=807,400

DESIGN DATA

2022 AADT = 53,343
2050 AADT = 77,163

Design Speed

SR 347	*= 70 MPH*
Riggs Rd:	
Outside Project Limits	*= 55 MPH*
Within Project Limits	*= 45 MPH*
Ramps:	
Body	*= 50 MPH*
Entrance at Gore	*= 60 MPH*
Exit at Gore	*= 65 MPH*
Crossroad Terminal	*= 35 MPH*

LENGTH OF PROJECT

SR 347 Cst CL

Sta 2593+00.00	*to Sta 2627+91.23*	*= 3,491.23'*	
Sta 2627+91.23	*to Sta 2630+39.43*	*= 248.20'*	*(Bridge Exception)*
Sta 2630+39.43	*to Sta 2656+51.59 Bk*	*= 2,612.16'*	
Sta 2656+44.75 Ahd	*to Sta 2670+88.86*	*= 1,444.11'*	
	Gross Length	*= 7,795.70' - 1.48 Miles*	
	Net Length	*= 7,547.50' - 1.43 Miles*	
	Mile Post 184.60 to 186.08		

Riggs Rd Cst CL

Sta 33+99.34	*to Sta 66+00.40*	*= 3,201.06'*
	Gross & Net Length	*= 3,201.06' - 0.61 Miles*

LEGEND

PCCP Pavement	*Existing Right-of-Way*
AC Pavement	*New Right-of-Way*
Concrete Sidewalk	*New Access Control*
Concrete Slope Paving	*Proposed Retaining Wall*
Proposed Bridge	*Fill Limits*
Raised Median	*Cut Limits*
GRICUA Substation	*TCE*

FINAL
DCR
Review
NOT FOR
CONSTRUCTION
OR RECORDING

	NAME	DATE
DESIGN	ARH	09/24
DRAWN	TNS	09/24
CHECKED	RSC	09/24

Kimley»Horn
© 2024 KIMLEY-HORN AND ASSOCIATES, INC.

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

APPENDIX C
RIGGS RD PLAN

ROUTE
MILEPOST
STRUCTURE NO.

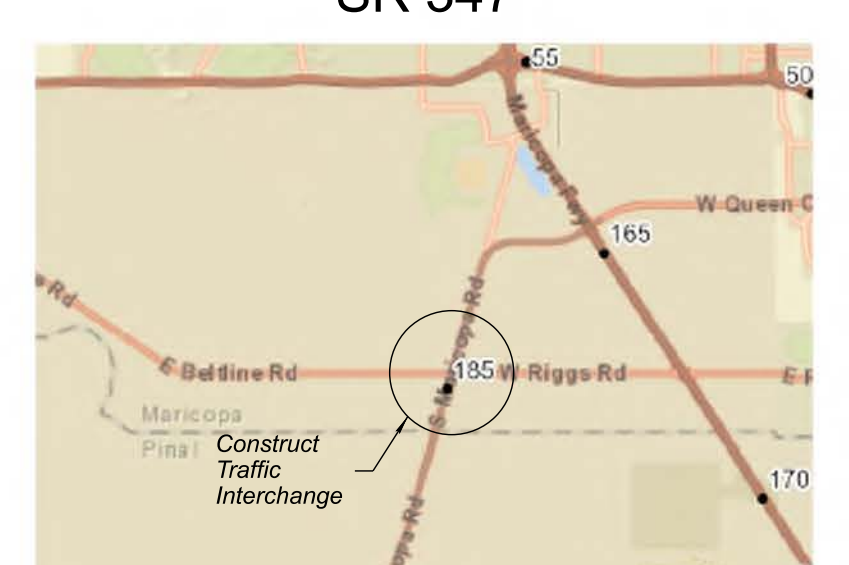
F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	347 MA 184	NFA	2	4	

LOCATION RIGGS ROAD TI AT SR 347
TRACS NO. F0476 01L
ADOT
SHEET ___ OF ___

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION

SCHEMATIC PLAN

STATE HIGHWAY
MARICOPA ROAD
SR 347



KEY MAP
NOT TO SCALE

T2S R4E

SR 347
RIGGS ROAD TI
PROJECT NO. 347 MA 184 F0476 01L

LEGEND

PCCP Pavement	Existing Right-of-Way
AC Pavement	New Right-of-Way
Concrete Sidewalk	New Access Control
Concrete Slope Paving	Proposed Retaining Wall
Proposed Bridge	Fill Limits
Raised Median	Cut Limits
GRICUA Substation	TCE
Remove Existing Pavement	

FINAL
DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

	NAME	DATE
DESIGN	ARH	09/24
DRAWN	TNS	09/24
CHECKED	RSC	09/24

Kimley»Horn

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

APPENDIX C
SPREAD DIAMOND INTERCHANGE
SR 347 PLAN

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	347 MA 184	NFA	3	4	

LOCATION SR 347 & RIGGS ROAD TI

TRACS NO. F0476 01L

ADOT

SHEET ___ OF ___

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION

SCHEMATIC PLAN

STATE HIGHWAY
MARICOPA ROAD
SR 347

KEY MAP
NOT TO SCALE

RIGGS ROAD TI AT SR 347
PROJECT NO. 347 MA 184 F0476 01L

MIDPOINT OF PROJECT

Central Zone
State Plane Coordinates
Y=673,100
X=857,400

DESIGN DATA

2022 AADT = 53,343
2050 AADT = 77,163

Design Speed

SR 347:
Riggs Rd:
Outside Project Limits = 55 MPH
Within Project Limits = 45 MPH
Ramps:
Body = 50 MPH
Entrance at Gore = 60 MPH
Exit at Gore = 55 MPH
Crossroad Terminal = 35 MPH

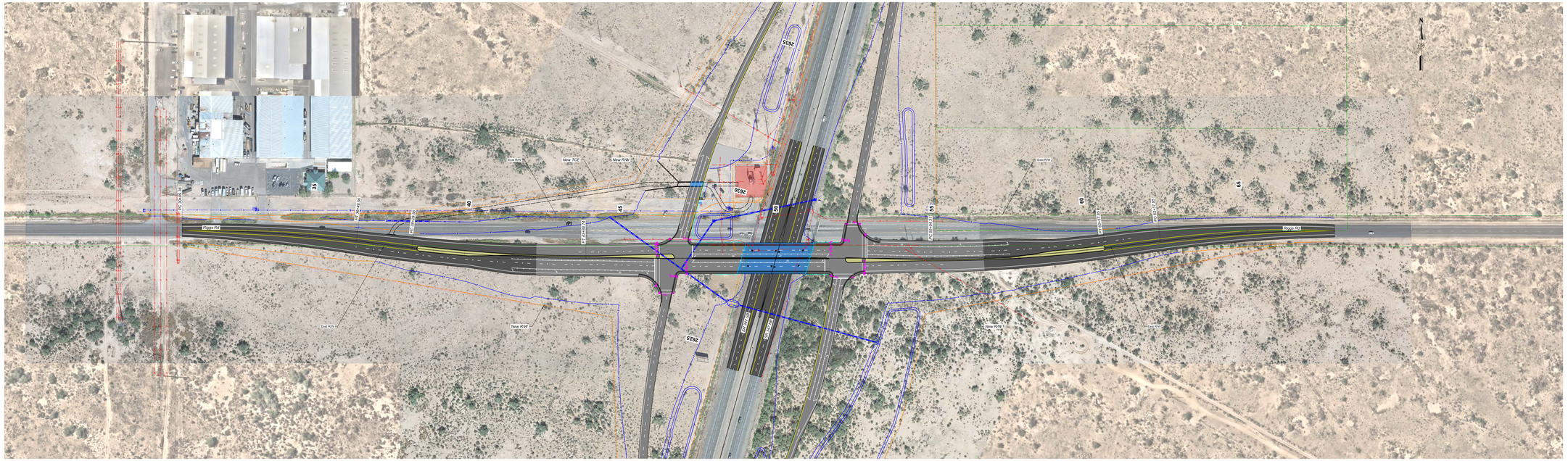
LENGTH OF PROJECT

SR 347 Cal CL
Sta 2593+00.00 to Sta 2627+91.23 = 3,491.23'
Sta 2627+91.23 to Sta 2630+30.40 = 238.17' (Bridge Exception)
Sta 2630+30.40 to Sta 2656+51.59 Ahd = 2,612.16'
Sta 2656+44.75 Ahd to Sta 2670+88.86 = 1,444.11'
Gross Length = 7,795.70' - 1.48 Miles
Net Length = 7,547.50' - 1.43 Miles
Mile Post 184.60 to 186.08

Riggs Rd Cal CL
Sta 93+99.34 to Sta 66+00.40 = 3,201.06'
Gross & Net Length = 3,201.06' - 0.61 Miles

LEGEND

- PCCP Pavement
- AC Pavement
- Concrete Sidewalk
- Concrete Slope Paving
- Proposed Bridge
- Raised Median
- GPC/UA Substation
- Existing Right-of-Way
- New Right-of-Way
- New Access Control
- Proposed Retaining Wall
- Fill Limits
- Cut Limits
- TCE



PWL
DCR
Review
NOT FOR CONSTRUCTION
OR RECORDING

DESIGN		DATE
DRAWN		DATE
CHECKED		DATE

Kimley»Horn
© 2024 KIMLEY-HORN AND ASSOCIATES, INC.

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

APPENDIX C
SPREAD DIAMOND INTERCHANGE
RIGGS RD PLAN

DATE
APPROVED
DATE

F.H.W.A., Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ	347 MA 184	MA	4	6	

LOCATION: RIGGS ROAD TI AT SR 347

TRACS NO. F0476 01L

ADOT

SHEET OF

9:53:26 AM 9/10/2024 Edgar Flores V:\PHX_Roadway\Workstation\DOT_CONNECT_PROJECTS_12-10_DIY\0000-PW%5R_347_Riggs_Rd_TI\dgn\Roadway\Plots\Alternative\PWTR_riddell_diamond_spread_Riggs.dgn

APPENDIX D: Typical Sections of the Recommended Alternative

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION

SCHEMATIC PLAN

STATE HIGHWAY
MARICOPA ROAD
SR 347

KEY MAP
NOT TO SCALE

RIGGS ROAD TI AT SR 347
PROJECT NO. 347 MA 184 F0476 01L

MIDPOINT OF PROJECT

Central Zone
State Plane Coordinates
Y=853,100
X=657,400

DESIGN DATA

2022 AADT = 53,343
2050 AADT = 77,163

Design Speed

SR 347:
Riggs Rd:
Outside Project Limits = 55 MPH
Within Project Limits = 45 MPH
Ramps:
Body = 50 MPH
Entrance at Gore = 60 MPH
Exit at Gore = 55 MPH
Crossroad Terminal = 35 MPH

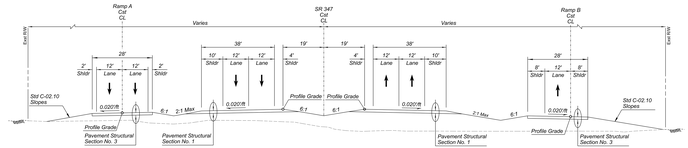
LENGTH OF PROJECT

SR 347 Cnt CL
Sta 2593+00.00 *to Sta 2627+91.23* = *3,491.23'*
Sta 2627+91.23 *to Sta 2630+39.43* = *247.20'* *(Bridge Exception)*
Sta 2630+39.43 *to Sta 2656+51.59 Bk* = *2,612.16'*
Sta 2656+44.75 Ahd *to Sta 2670+88.86* = *1,444.11'*
Gross Length = *7,795.70' - 1.48 Miles*
Net Length = *7,547.50' - 1.43 Miles*
Mile Post 184.60 to 186.09

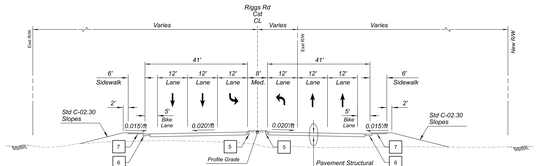
Riggs Rd Cnt CL
Sta 53+99.34 *to Sta 66+00.40* = *3,201.06'*
Gross & Net Length = *3,201.06' - 0.61 Miles*

LEGEND

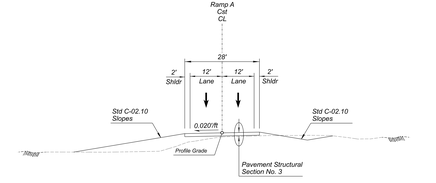
1	*Conc Median Barrier ADOT Std C-10.41*	5	*Conc Single Curb ADOT Std C-05.10, Type A*
2	*Conc Half Barrier ADOT SD 1.10*	6	*Conc Curb and Gutter ADOT Std C-05.10, Type D*
3	*Conc Retaining Wall ADOT SD 7.01*	7	*Conc Sidewalk ADOT Std C-05.20*
4	*Conc Half Barrier ADOT Std C-10.50*		



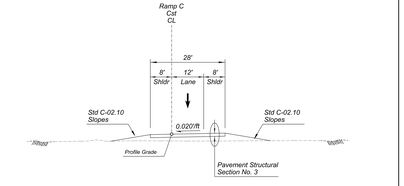
TYPICAL SECTION
SR 347 Cnt CL
Sta 2593+00.00 to Sta 2627+91.23
Sta 2627+91.23 to 2630+39.43 (Bridge Exception)



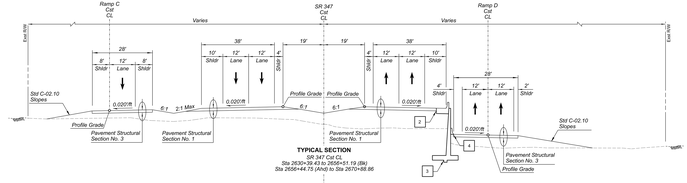
TYPICAL SECTION
Riggs Rd Cnt CL
Sta 43+60.91 to Sta 56+24.84



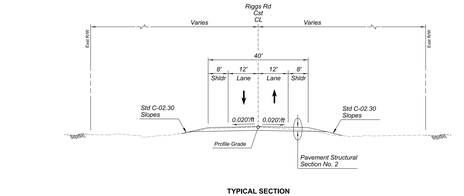
TYPICAL SECTION
Ramp A Cnt CL
Sta 15+12.13 to Sta 28+91.13



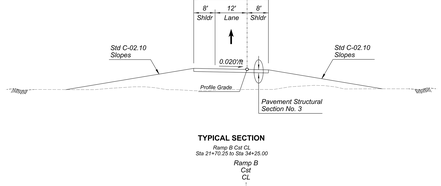
TYPICAL SECTION
Ramp C Cnt CL
Sta 14+90.00 to Sta 24+56.52



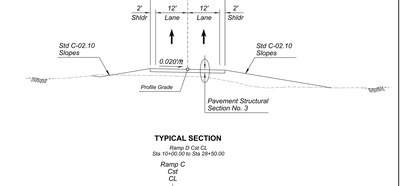
TYPICAL SECTION
SR 347 Cnt CL
Sta 2630+39.43 to 2656+51.19 (Bk)
Sta 2656+44.75 (Ahd to Sta 2670+88.86



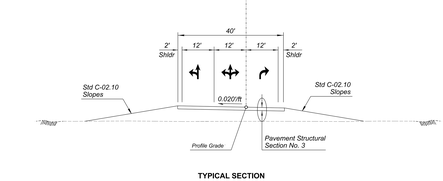
TYPICAL SECTION
Riggs Rd Cnt CL
Sta 33+99.41 to Sta 43+60.91
Sta 56+24.84 to Sta 66+00.40



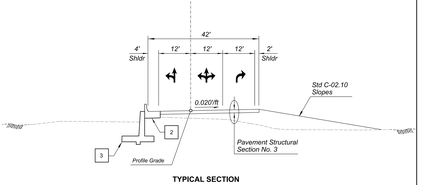
TYPICAL SECTION
Ramp B Cnt CL
Sta 21+70.25 to Sta 34+25.00



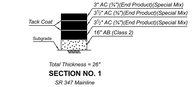
TYPICAL SECTION
Ramp D Cnt CL
Sta 10+00.00 to Sta 28+50.00



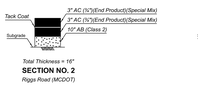
TYPICAL SECTION
Ramp B Cnt CL
Sta 34+25.00 to Sta 39+43.04



TYPICAL SECTION
Ramp C Cnt CL
Sta 10+00.00 to Sta 14+90.00



Total Thickness = 36"
SECTION NO. 1
SR 347 Mainline



Total Thickness = 16"
SECTION NO. 2
Riggs Road (MCDOT)

Total Thickness = 14"
SECTION NO. 3
Riggs Road (ADOT)
Riggs Road Ramps
Concrete Gores

FINAL
DCR Review
NOT FOR CONSTRUCTION OR RECORDING

DESIGN		DATE
DRAWN		
CHECKED		

Kimley»Horn
© 2024 Kimley-Horn and Associates, Inc.

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

APPENDIX D
TYPICAL SECTIONS
RECOMMENDED ALTERNATIVE

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ	347 MA 184	MA	1		

RIGGS ROAD TI AT SR 347

TRACS NO. F0476 01L

ADOT

SHEET OF

9:48:13 AM 9/10/2024 Edgar Flores V:\PHX_Roadway\Workstation\DOT_CONNECT_PROJECTS_10.10_2019\0005-PW\R\DR_let_Riggs_RL_Thing\Roadway\Plots\PWDR\PS_Alliant_Isabelle.dgn

APPENDIX E: Roll Plots of Recommended Alternative

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION

SCHEMATIC PLAN

STATE HIGHWAY
MARICOPA ROAD
SR 347

KEY MAP
NOT TO SCALE

RIGGS ROAD TI AT SR 347

PROJECT NO. 347 MA 184 F0476 01L

MIDPOINT OF PROJECT

Section 36, T5S, R4E
State Plane Coordinates
Y=693,000
X=827,100

DESIGN DATA

2022 AADT = 31,640
2050 AADT = 77,162

Design Speed

SR 347
Rigg Rd
Outside Project Limits = 55 MPH
Within Project Limits = 45 MPH

Ramps
Exit = 50 MPH
Entrance at Grade = 50 MPH
Entrance Flying = 50 MPH
Crossroad Terminal = 25 MPH

LENGTH OF PROJECT

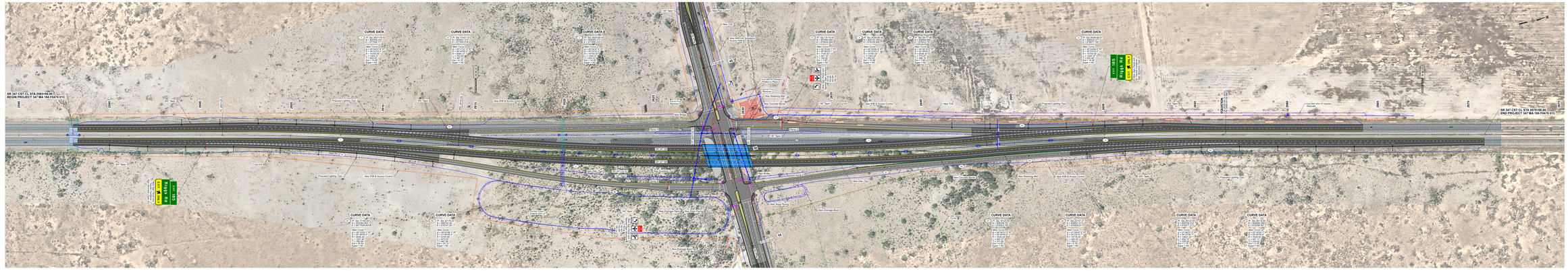
SR 347 Cst CL
Sta 2557+57.23 to Sta 2570+51.23 = 1,441.23'
Sta 2570+51.23 to Sta 2574+91.83 = 1,040.60' (Bridge Exception)
Sta 2574+91.83 to Sta 2593+33.88 = 1,813.31'
Sta 2557+57.23 to Sta 2593+33.88 = 4,295.14' = 81 Miles
Grand Length = 1,295.14' = 1.45 Miles
Mile Post 184.80 to 186.26

Riggs Rd CsI CL
Sta 5416.34 to Sta 5510.40 = 4,320.06'
Gross & Net Length = 3,231.06' = 0.61 Miles

LEGEND

PCCP Pavement	Existing Right-of-Way
AC Pavement	New Right-of-Way
Concrete Sidewalk	New Access Control
Concrete Slope Paving	Proposed Retaining Wall
Proposed Bridge	PE Limits
Raised Median	CsI Limits
DRCVK Subsidiary	TCE
Remove Existing Pavement	

DCR
Verify
scope before
you excavate



DCR
Verify
scope before
you excavate

DESIGN	DRAWN	CHECKED	QA/QC
[redacted]	[redacted]	[redacted]	[redacted]

Kimley»Horn

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS
PROJECT MANAGEMENT GROUP

RIGGS ROAD TI AT SR 347
RECOMMENDED ALTERNATIVE
SCHEMATIC PLAN

DESIGNED	[redacted]	DRAWN	[redacted]	CHECKED	[redacted]	QA/QC	[redacted]
PROJECT MANAGER	[redacted]						

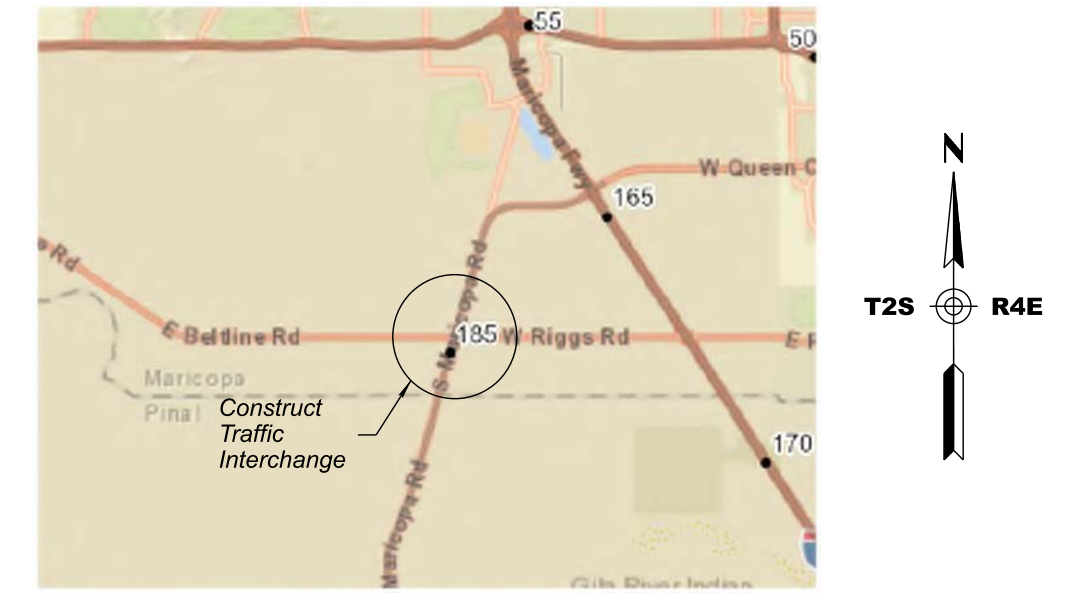
F.H.W.A. Identification		STATE	PROJECT	SHEET NO.	TOTAL SHEETS		
		ARIZ	347 MA 184 F0476 01L				
		TRACS NO.	F0476 01L				

ADOT

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION

SCHEMATIC PLAN

STATE HIGHWAY
MARICOPA ROAD
SR 347



KEY MAP
NOT TO SCALE

RIGGS ROAD TI AT SR 347
PROJECT NO. 347 MA 184 F0476 01L

MIDPOINT OF PROJECT

Central Zone
State Plane Coordinates
X=678,100
Y=807,400

DESIGN DATA

2022 AADT = 53,343
2050 AADT = 77,163

Design Speed

SR 347	= 70 MPH
Riggs Rd:	
Outside Project Limits	= 55 MPH
Within Project Limits	= 45 MPH
Ramps:	
Body	= 50 MPH
Entrance at Gore	= 60 MPH
Exit at Gore	= 65 MPH
Crossroad Terminal	= 35 MPH

LENGTH OF PROJECT

SR 347 Cst CL

Sta 2593+00.00	to Sta 2627+91.23	= 3,491.23'	
Sta 2627+91.23	to Sta 2630+39.43	= 248.20'	(Bridge Exception)
Sta 2630+39.43	to Sta 2656+51.59 Bk	= 2,612.16'	
Sta 2656+44.75 Ahd	to Sta 2670+88.86	= 1,444.11'	
	Gross Length	= 7,795.70' - 1.48 Miles	
	Net Length	= 7,547.50' - 1.43 Miles	
	Mile Post 184.60 to 186.08		

Riggs Rd Cst CL

Sta 33+99.34	to Sta 66+00.40	= 3,201.06'
	Gross & Net Length	= 3,201.06' - 0.61 Miles

FINAL
DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

9:49:54 AM 9/10/2024 Edgar.Flores K:\PHX_Roadway\Workset\ADOT_CONNECT_PROJECTS_10_10_291749000\F0476\SR_347_Riggs_Rd_TI\dgn\Roadway\Rd Plots\F0476_cdplot_profiles.dgn

	NAME	DATE
DESIGN	ARH	09/24
DRAWN	TNS	09/24
CHECKED	RSC	09/24

Kimley»Horn

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
PROJECT MANAGEMENT GROUP
APPENDIX E
RECOMMENDED ALTERNATIVE
SR 347 & RAMPS
PROFILES

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL AID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	347 MA 184	NFA	2	3	

LOCATION: RIGGS ROAD TI AT SR 347

TRACS NO. F0476 01L

ADOT

SHEET ___ OF ___

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION

SCHEMATIC PLAN

STATE HIGHWAY
MARICOPA ROAD
SR 347

KEY MAP
NOT TO SCALE

RIGGS ROAD TI AT SR 347
PROJECT NO. 347 MA 184 F0476 01L

MIDPOINT OF PROJECT

Central Zone
State Plane Coordinates
X=678,100
Y=807,400

DESIGN DATA

2022 AADT = 53,343
2050 AADT = 77,163

Design Speed

SR 347	= 70 MPH
Riggs Rd:	
Outside Project Limits	= 55 MPH
Within Project Limits	= 45 MPH
Ramps:	
Body	= 50 MPH
Entrance at Gore	= 60 MPH
Exit at Gore	= 65 MPH
Crossroad Terminal	= 35 MPH

LENGTH OF PROJECT

SR 347 Cst CL

Sta 2593+00.00	to Sta 2627+91.23	= 3,491.23'	
Sta 2627+91.23	to Sta 2630+39.43	= 248.20'	(Bridge Exception)
Sta 2630+39.43	to Sta 2656+51.59 Bk	= 2,612.16'	
Sta 2656+44.75 Ahd	to Sta 2670+88.86	= 1,444.11'	
	Gross Length	= 7,795.70' - 1.48 Miles	
	Net Length	= 7,547.50' - 1.43 Miles	
	Mile Post 184.60 to 186.08		

Riggs Rd Cst CL

Sta 33+99.34	to Sta 66+00.40	= 3,201.06'
	Gross & Net Length	= 3,201.06' - 0.61 Miles

LEGEND

PCCP Pavement	Existing Right-of-Way
AC Pavement	New Right-of-Way
Concrete Sidewalk	New Access Control
Concrete Slope Paving	Proposed Retaining Wall
Proposed Bridge	Fill Limits
Raised Median	Cut Limits
GRICUA Substation	TCE
Remove Existing Pavement	

FINAL DCR Review NOT FOR CONSTRUCTION OR RECORDING		NAME	DATE
	DESIGN	ARH	09/24
	DRAWN	TNS	09/24
	CHECKED	RSC	09/24

Kimley»Horn

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

APPENDIX E
SHIFTED DIAMOND INTERCHANGE
RIGGS RD PLAN AND PROFILE

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	347 MA 184	NFA	3	3	

LOCATION: RIGGS ROAD TI AT SR 347

TRACS NO. F0476 01L

ADOT

SHEET ___ OF ___

APPENDIX F: Drainage Memorandum

DRAINAGE MEMORANDUM

Maricopa Road (State Route 347): Riggs Road Traffic Interchange

Prepared for:

Arizona Department of Transportation
Infrastructure Delivery and Operations Division

Prepared by:

Kimley-Horn
1661 E. Camelback Road
Suite 400
Phoenix, AZ 85016

291749000
November 2024

DRAINAGE MEMORANDUM

MARICOPA ROAD (STATE ROUTE 347): RIGGS ROAD TRAFFIC INTERCHANGE

NOVEMBER 2024

Prepared By:

Kimley»Horn

Contents

Figures

Tables

Appendices

Appendix A – FLO-2D Results

Appendix B - Hydrology Exhibits

1.0 **NO TABLE OF FIGURES ENTRIES FOUND.**INTRODUCTION

1.1. PROJECT LOCATION

The project improvements consist of providing a grade separated interchange on Maricopa Road/State Route (SR 347) at Riggs Road near milepost 185.29. The project is located within the Arizona Department of Transportation (ADOT) Central District within Maricopa County in south-central Arizona.

1.2. BACKGROUND

SR 347 is classified as a principal arterial highway with partial control of access. It is a major highway corridor in central Arizona, connecting the City of Maricopa to the Phoenix metropolitan area. The growing traffic demand has caused the SR 347 corridor to become increasingly congested during the morning and evening peak travel periods, and growth projections indicate congestion will worsen in the future. The increase in congestion and high speeds along the corridor contribute to higher rates for rear end collisions due to the signal and unexpected lengths of queuing. Improvements are needed that address the congestion and safety concerns. The purpose of this project is to evaluate the alternatives to reduce travel time, enhance regional mobility, improve safety by providing free-flow mainline movements along SR 347 by reconstructing the existing intersection at SR 347 and Riggs Road to a grade separated interchange. The primary goal of the project is to recommend a preferred alternative for constructing a TI at the intersection. A Design Concept Report (DCR) is being prepared to evaluate the proposed improvements and possible alternatives.

1.3. PURPOSE

The purpose of this report is to document the existing conditions and proposed drainage improvements within the project limits.

2.0 CONCEPT PLAN DEVELOPMENT

2.1. LOCAL WATERSHED

The existing topography through the project limits and surrounding area is undeveloped and slopes from southeast to northwest towards the Gila River. The surrounding undeveloped areas are located within the Gila River Indian Community (GRIC)

2.2. FLOODPLAIN LOCATIONS

The project is in Flood Insurance Rate Maps (FIRM) for Maricopa County, Arizona and incorporated areas, Panel Number 04013C3100L which was not printed. Therefore, there are no floodplains within the project limits.

2.3. PREVIOUS DRAINAGE STUDIES

At the time of this report, no drainage reports were located or reviewed for the project limits.

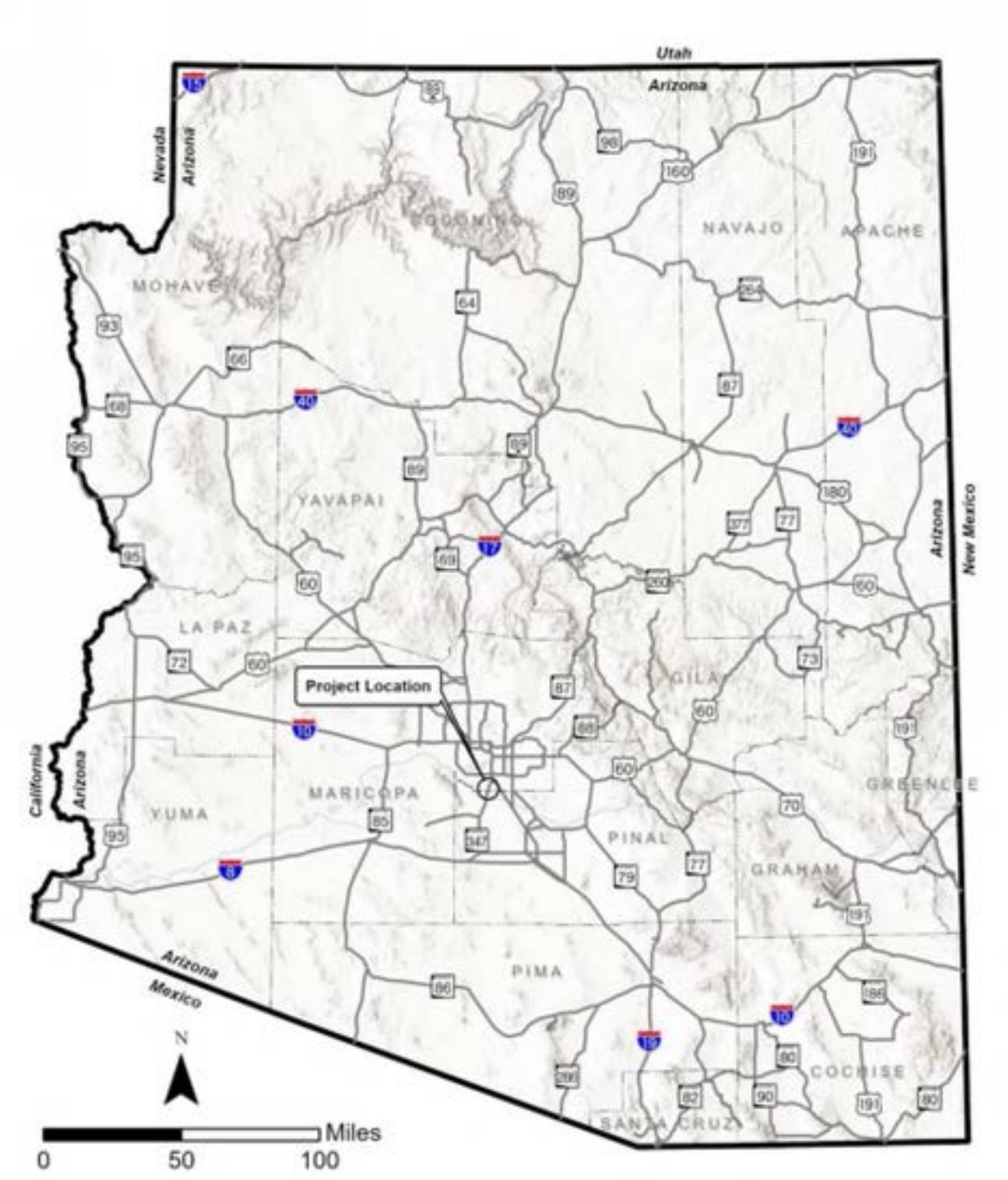


Figure 1. Location Map

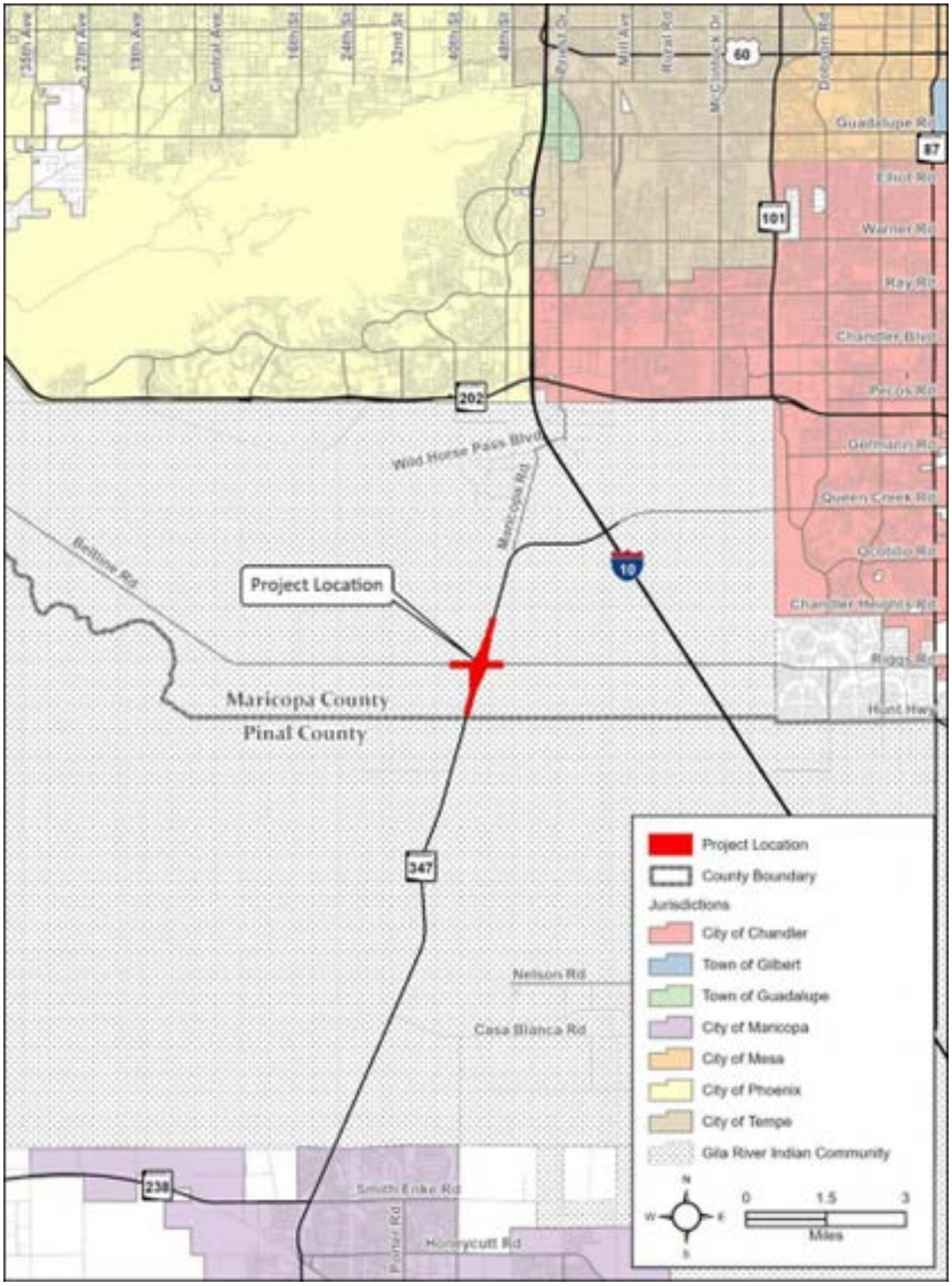


Figure 2. Vicinity Map

3.0 ON-SITE DRAINAGE

3.1. EXISTING ON-SITE DRAINAGE FEATURES

The mainline of SR-347 is a divided highway without curb and gutter throughout the limits of the project. The depressed median areas do not have any method of conveying runoff from the median. Riggs Road does not have any curb and gutter throughout the project limits. Pavement runoff sheet flows off the existing pavement into roadside areas. There is no on-site drainage infrastructure within the project limits.

3.2. DESIGN CRITERIA

The Rational Method will be used to calculate on-site peak discharges. A minimum time of concentration of 10-minutes will be used. The ADOT Roadway Design Guidelines (RDG) classifies SR-347 as a Class 3 highway. SR347 could be upgraded to Class 2 based on recent discussions with ADOT. Class 2 highways are required to convey the 50-year storm event for cross-culverts and offsite flows.

3.3. PROPOSED ON-SITE DRAINAGE FEATURES

No curb and gutter are being included with the improvements. Multiple alternatives are being evaluated for the grade separated interchange. Each of the alternatives will require onsite drainage improvements to drain the new infield areas. Area drains with small storm drains at low points in the infield areas will connect to the culverts. On-site improvements will be similar for all alternatives, and therefore ultimately the preferred alternative. Additional refinements or updates once the preferred alternative is selected shall be included in the Final Draft of this memorandum.

3.4. FIRST FLUSH REQUIREMENTS

Based on communications with GRIC Flood Control, first flush treatment basins are required with the preferred alternative. The basins will be designed to collect the adjacent sheet flow runoff from the roadway. The basins will be dissipated in 36-hours and infiltration testing will be completed. The basins will ultimately discharge to the storm drain system that will connect to the adjacent offsite culverts.

4.0 OFF-SITE DRAINAGE

4.1. EXISTING OFF-SITE DRAINAGE FEATURES

The land adjacent to SR-347 and Riggs Road is undeveloped and slopes from southeast to northwest towards the Gila River. Two concrete box culverts exist near the Riggs Rd TI. A three (3) barrel 6’x3’ culvert is located approximately 80 feet north of Riggs Rd Centerline. A cattleguard passes runoff from the southeast corner of the intersection to the northeast corner where the existing culvert discharges into a channel along the north side of Riggs Road. A single barrel 8’x3’ culvert is located approximately 915 feet south of Riggs Rd TI. The runoff continues west before ultimately reaching the Gila River. During a site visit on December 22, 2022, the concrete box culverts looked to be in very good condition with no areas of concern. Discussions with the District maintenance staff indicated that there have been no known incidents of flooding or damage from storm events in the past.

4.2. PROPOSED OFF-SITE DRAINAGE FEATURES

The drainage design approach for the TI improvements is to maintain capacity through the TI and not negatively impact the downstream patterns in the post-project conditions. SR-347 has a Class 3 drainage classification according to the ADOT roadway design guidelines. Class 3 roadways are required to pass the 25-year storm event with no overtopping. SR 347 could be upgraded to Class 2 in the near future based on recent discussions with ADOT. Class 2 highways are required to convey the 50-year storm event for cross-culverts and offsite flows. The existing culvert crossing under SR-347, north of Riggs Road, will be removed with the improvements. The results of the offsite hydrologic modeling were used to size a new culvert across SR-347. The new culvert is a 1-36-inch pipe culvert. A new channel will be constructed at the northwest corner to connect to the existing channel. The other culverts within the project are being extended for the TI improvements.

4.3. OFFSITE HYDROLOGY MODEL

An offsite hydrology model was prepared using FLO-2D. The watershed extended east of I-10 and downstream of SR-347 for approximately one (1) mile. The FLO-2D model used 15'x15' grid cells. The existing conditions was modelled for both the 50- and 100-year storm event. Each of the alternatives was also modelled for the 50- and 100-year storm events. Refer to **Appendix A** for model results. The following tables summarize the 50- and 100-year flows through the existing culverts.

Table 1: 50-year Culvert Flow Summary

Culvert Name	Culvert Location	50-year Peak Discharge (cfs)
Culv347-N2	Culvert north of Riggs Road under SR347	3
Culv347-N	Culvert at the Riggs Road Intersection under SR347	7
Culv347-S	Culvert south of Riggs Road Intersection under SR347	66

Table 2: 100-year Culvert Flow Summary

Culvert Name	Culvert Location	100-year Peak Discharge (cfs)
Culv347-N2	Culvert north of Riggs Road under SR347	3
Culv347-N	Culvert at the Riggs Road Intersection under SR347	12
Culv347-S	Culvert south of Riggs Road Intersection under SR347	98

4.4. USGS MAPPING

United States Geological Society (USGS) 2022 mapping was used to develop a terrain. A gridded 2'x2' DEM was generated for the entire watershed.

4.5. RAINFALL

The 50- and 100-year 6-hour rainfall depths were obtained from National Oceanic and Atmospheric Administration Atlas 14 (NOAA 14). The 50- and 100-year rainfall depths are 2.28 and 2.55 inches respectively. The 6 and 24-hour storm durations were evaluated, and the 6-hour storm duration generates the highest peak flow.

4.6. HYDRAULIC STRUCTURES

The upstream watershed extends east of Interstate 10 (I-10). The existing culverts under SR-347 were included as general culvert equations in FLO-2D.

Green and Ampt Parameters

Green and Ampt parameters were assigned for the watershed using NRCS soils and existing land uses. The soil data was downloaded from the ADOT Soil Data with predefined Green and Ampt predefined hydrology parameters for the Gila River Indian Reservation, AZ and Parts of Maricopa and Pinal County Soil Survey (NRCS Soil Survey AZ658). The watershed land use consists of mostly undeveloped desert range land. There is an industrial site west of SR347 and north of Riggs that was also included in the land use. The land use parameters were assigned based on the Flood Control District of Maricopa County (FCDMC) Hydrology Manual. The soil and land use Green and Ampt parameters are shown in the following tables. For the soils, XKSAT is the hydraulic conductivity, PSIF is the Suction, DTHETA is the initial soil moisture deficit. Per the land use, the initial soil moisture is dry for all land uses found within the watershed. The soils and land use exhibits are provided in **Appendix B**.

Table 3: Soil Green and Ampt Parameters

NRCS Soil Survey	MUSYM	MUKEY	Soil Name	XKSAT (in/hr)	PSIF (in)	Rock Outcrop (%)	DETHETA (Dry) Unitless	Limiting Infiltration Depth (ft)
AZ658	20	54279	Kamato complex, 0 to 5 percent slopes	0.22	8.68	0	0.28	0.25
AZ659	21	54281	Kamato loam, 0 to 2 percent slopes	0.1	18.31	0	0.26	0.25
AZ660	32	54305	Shontik-Redun complex, 0 to 3 percent slopes	0.79	4.3	0	0.33	0.25
AZ661	33	54307	Tatai silt loam, 0 to 2 percent slopes	0.18	23.94	0	0.3	0.25
AZ662	34	54309	Trix loam, saline-sodic, 0 to 1 percent slopes	0.38	11.75	0	0.33	0.25
AZ663	7	54334	Casa Grande complex, 0 to 5 percent slopes	0.17	8.84	0	0.28	0.25
AZ664	8	54336	Casa Grande fine sandy loam, 0 to 3 percent slopes	0.75	3.47	0	0.33	0.25

The Surface Detention Parameter (TOLGLOBAL = 0.004ft = 0.05inches) was subtracted from the initial abstraction to not double count the initial loss parameter in FLO-2D. The TOLGLOBAL value prescribes the flow depth for a floodplain or channel grid element below which no flood routing will be performed. TOLGLOBAL is analogous to the initial rainfall abstraction.

Table 4: Land Use Green and Ampt Parameters

Land Use	Initial Abstraction (in)	Percent Impervious (%)	Initial Saturation Condition	Manning's n-Value
Desert Rangeland	0.35	0	Dry	0.040
Industrial	0.15	55	Dry	0.035

5.0 RESULTS

The results of the model showed no overtopping along SR-347. Runoff ponds along SR-347 before discharging through the intersection from the existing culverts. There is an existing cattle guard east of SR347 that bleeds flow from the southeast corner to the northeast corner of the intersection and flow is routed to the existing culvert that crosses SR347 immediately north of Riggs Road. This culvert discharges to an existing roadside swale and flows to the west adjacent to the existing industrial site to the north of Riggs Road.

6.0 REFERENCES

Arizona Department of Transportation, *Highway Drainage Design Manual, Volume 2 - Hydrology* revised 2014

Arizona Department of Transportation, Roadway Engineering Group, *Roadway Design Guidelines,* May 2012

Arizona Department of Transportation, *Post-Construction Best Management Practices Manual for Water Quality,* January 2016

Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County, Arizona – Hydrology,* revised 2013.

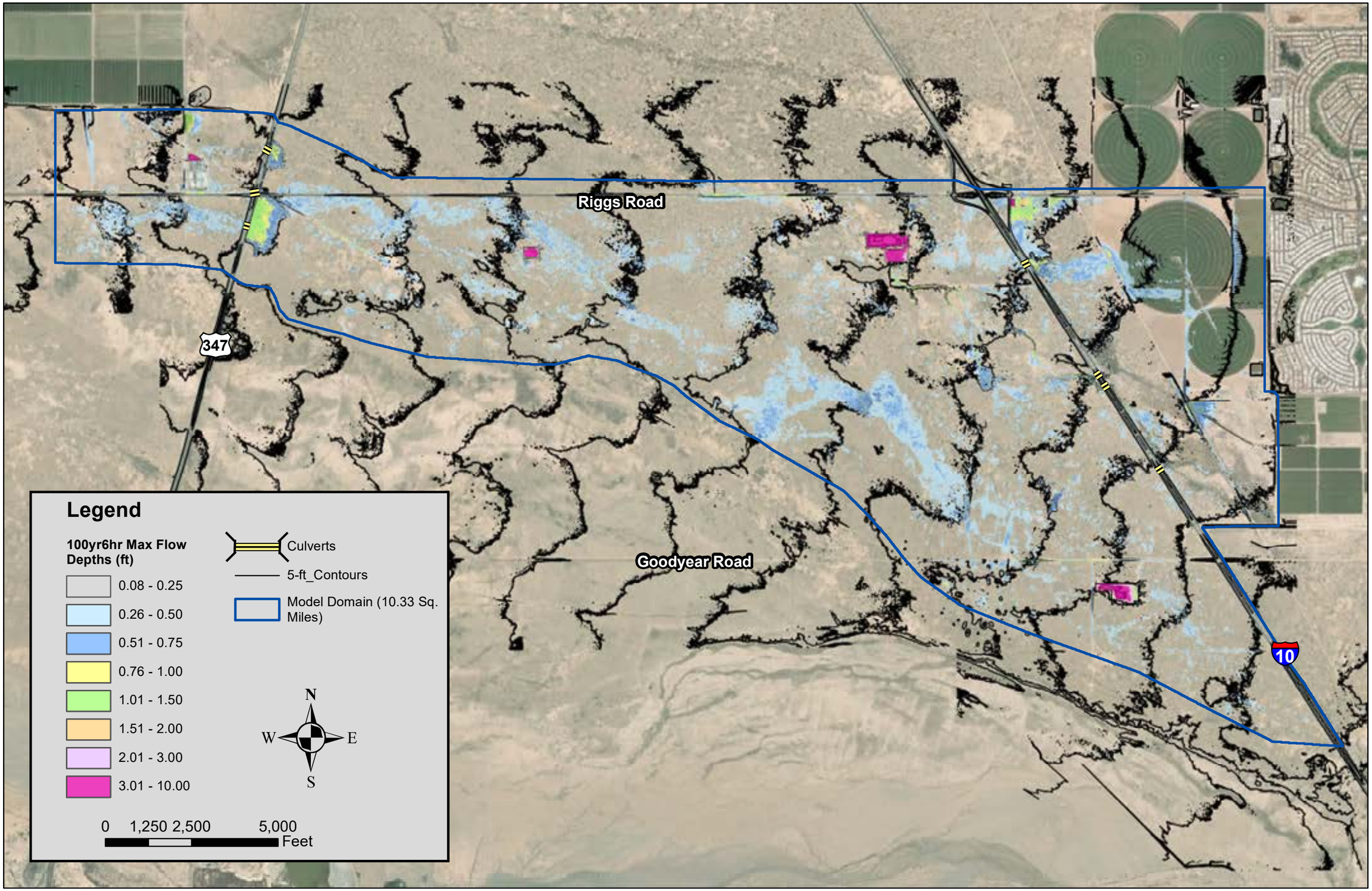
Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County, Arizona – Hydraulics,* revised 2013.

Flood Control District of Maricopa County, *Drainage Policies and Standards for Maricopa County, Arizona*, revised 2016.

Federal Highway Administration, *Hydraulic Engineering Circular No. 22, Urban Drainage Design Manual – Third Edition*, September 2009

National Oceanic and Atmospheric Administration, NOAA Atlas 14, Precipitation-Frequency Atlas of the United States, 2011

Appendix A – FLO-2D Results



NO.	REVISION	BY	DATE	APPR.

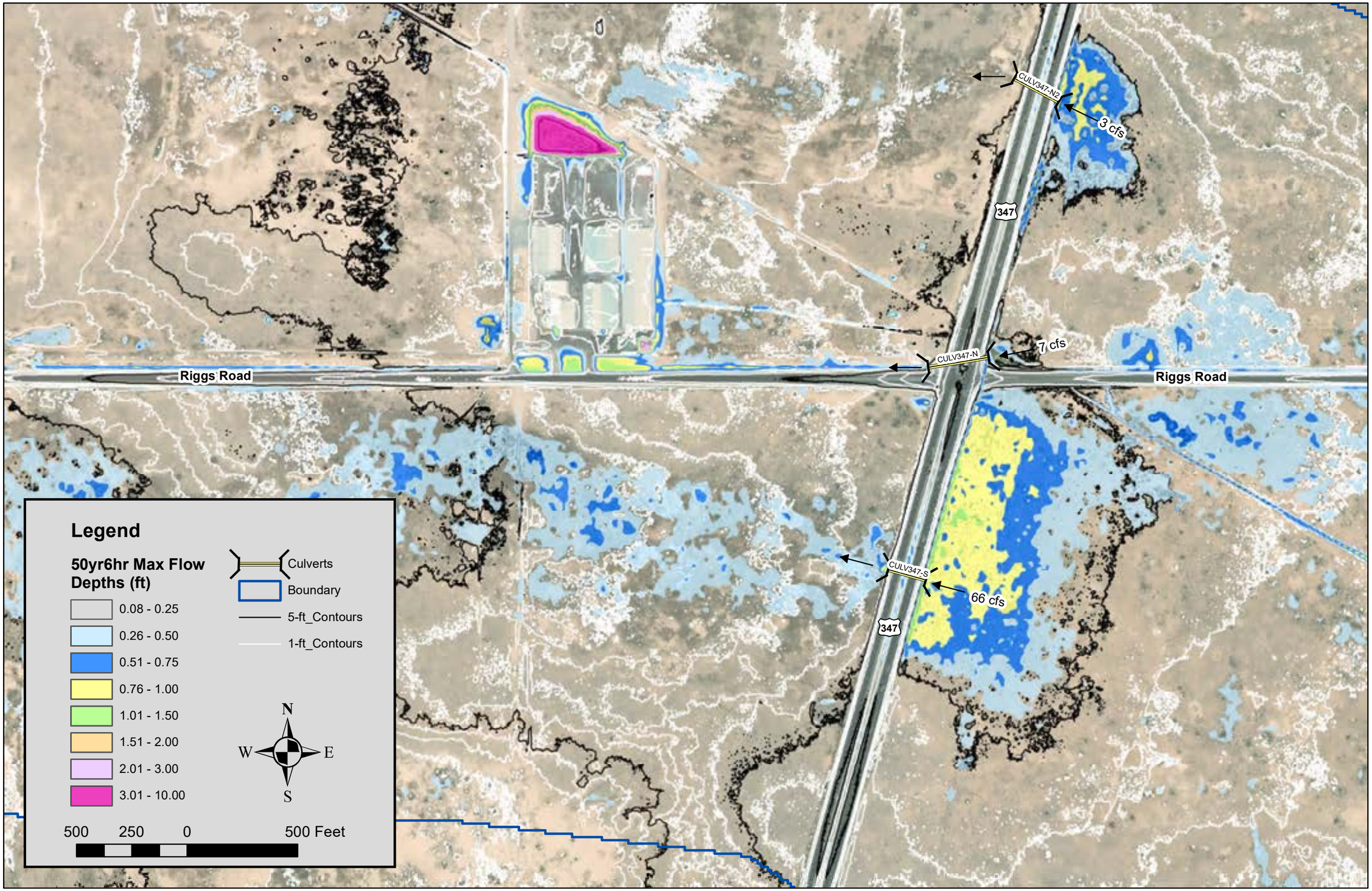
Kimley»Horn
2022 KIMLEY-HORN AND ASSOCIATES, INC.
Engineering, Planning and Environmental Consultants
7740 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

SCALE(H):1"=32.00'FT
SCALE(V): N/A
DESIGNED BY:ATC
DRAWN BY:ATC
CHECKED BY:ZRS
DATE:10/7/2022

Existing Riggs TI 100yr-6hr Flow Depths Overall Map

PROJECT NO.
29174900

DRAWING NAME
EX1



NO.	REVISION	BY	DATE	APPR.

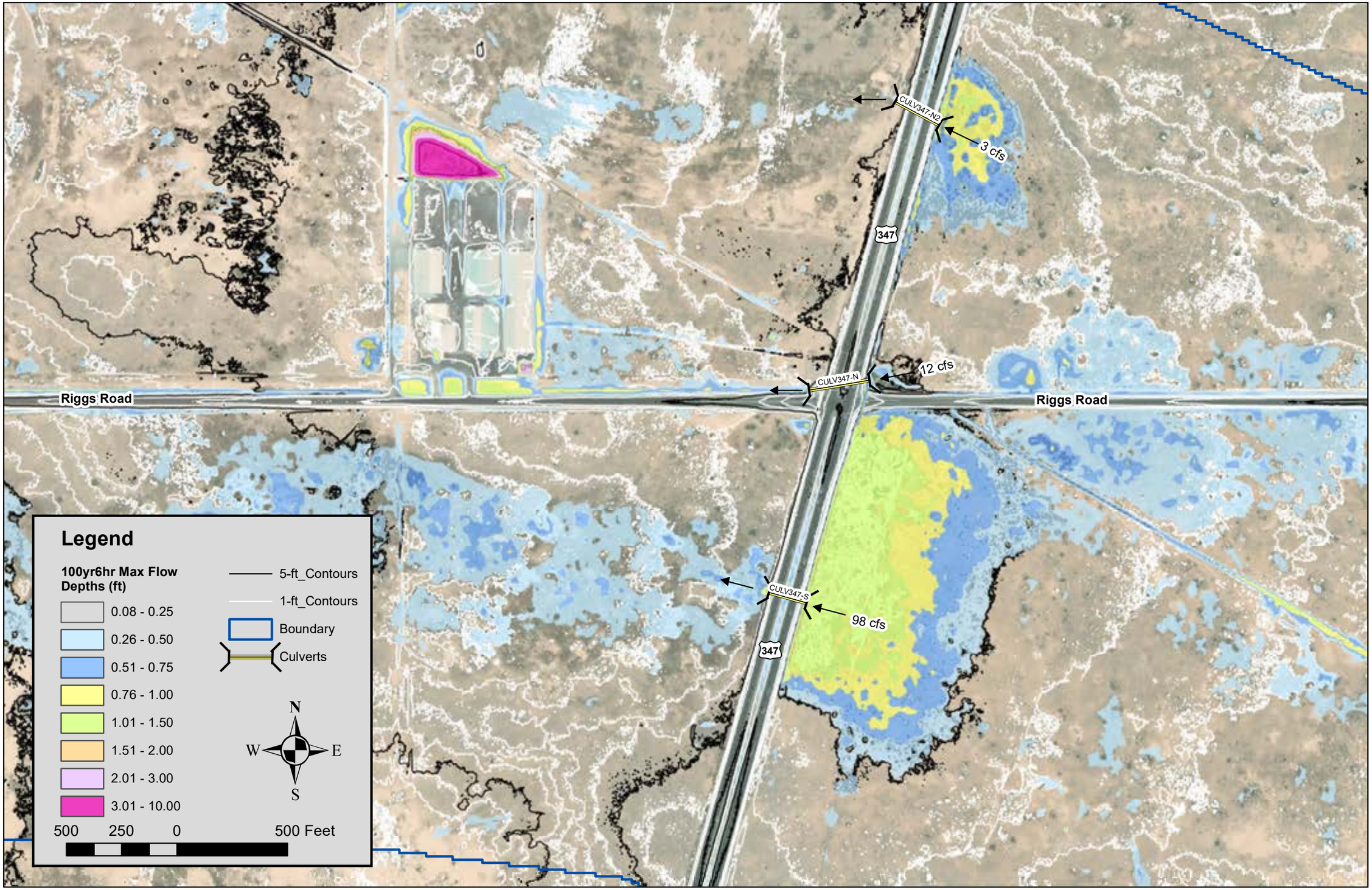
Kimley»Horn
2023 KIMLEY-HORN AND ASSOCIATES, INC.
Engineering, Planning and Environmental Consultants
7740 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

SCALE(H):1"=5,000FT
SCALE(V): NA
DESIGNED BY:ATC
DRAWN BY:ATC
CHECKED BY:ZRS
DATE:01/09/2023

Existing Riggs TI
50yr-6hr Flow Depths

PROJECT NO.
291749000

DRAWING NAME
EX-3



NO.	REVISION	BY	DATE	APPR.

Kimley»Horn
2023 KIMLEY-HORN AND ASSOCIATES, INC.
Engineering, Planning and Environmental Consultants
7740 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

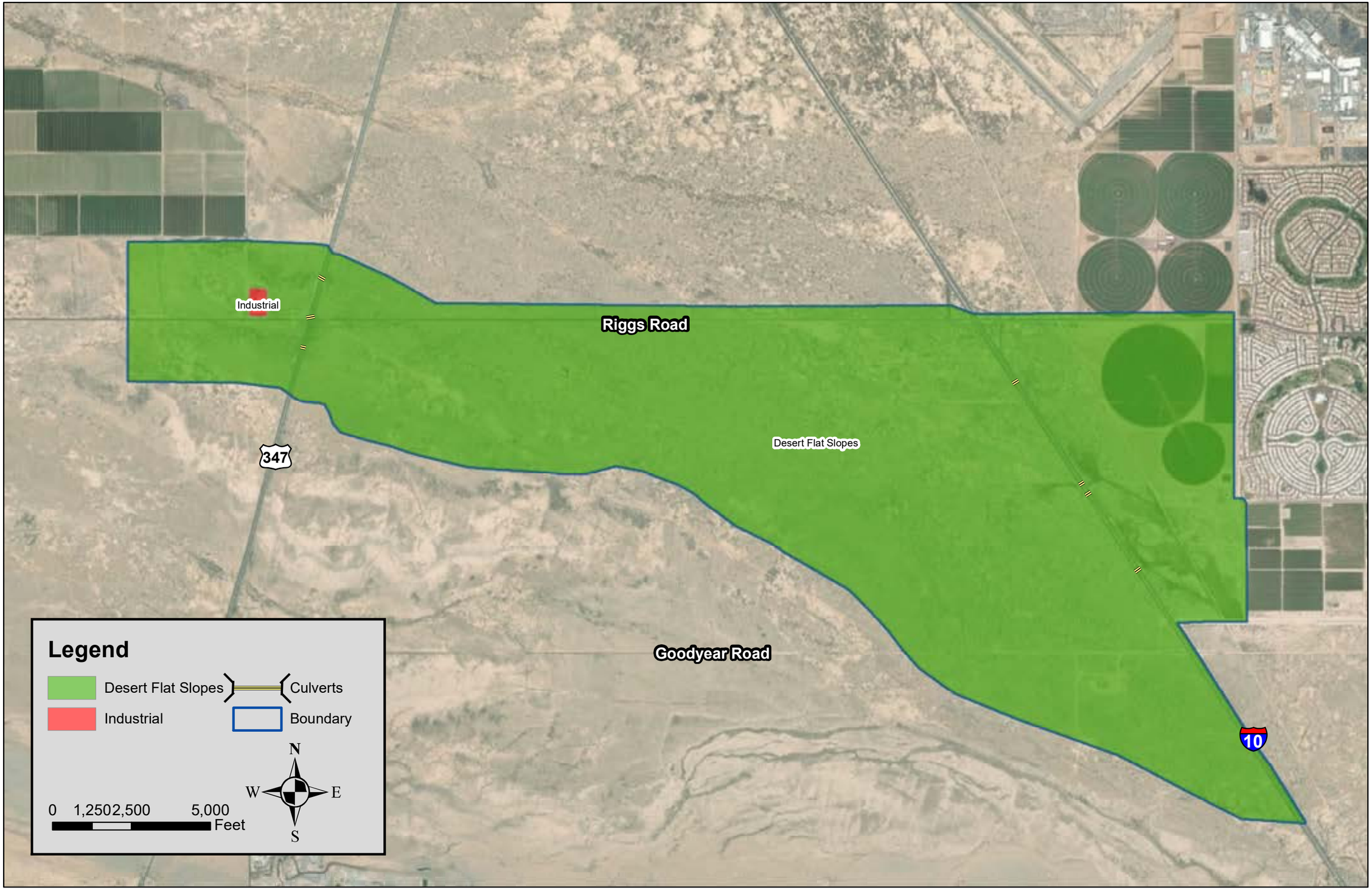
SCALE(H): 1"=5,000FT
SCALE(V): N/A
DESIGNED BY:ATC
DRAWN BY:ATC
CHECKED BY:ZRS
DATE:01/09/2023

Existing Riggs TI
100yr-6hr Flow Depths

PROJECT NO.
29174900

DRAWING NAME
EX-2

Appendix B – Hydrology Exhibits



NO.	REVISION	BY	DATE	APPR.

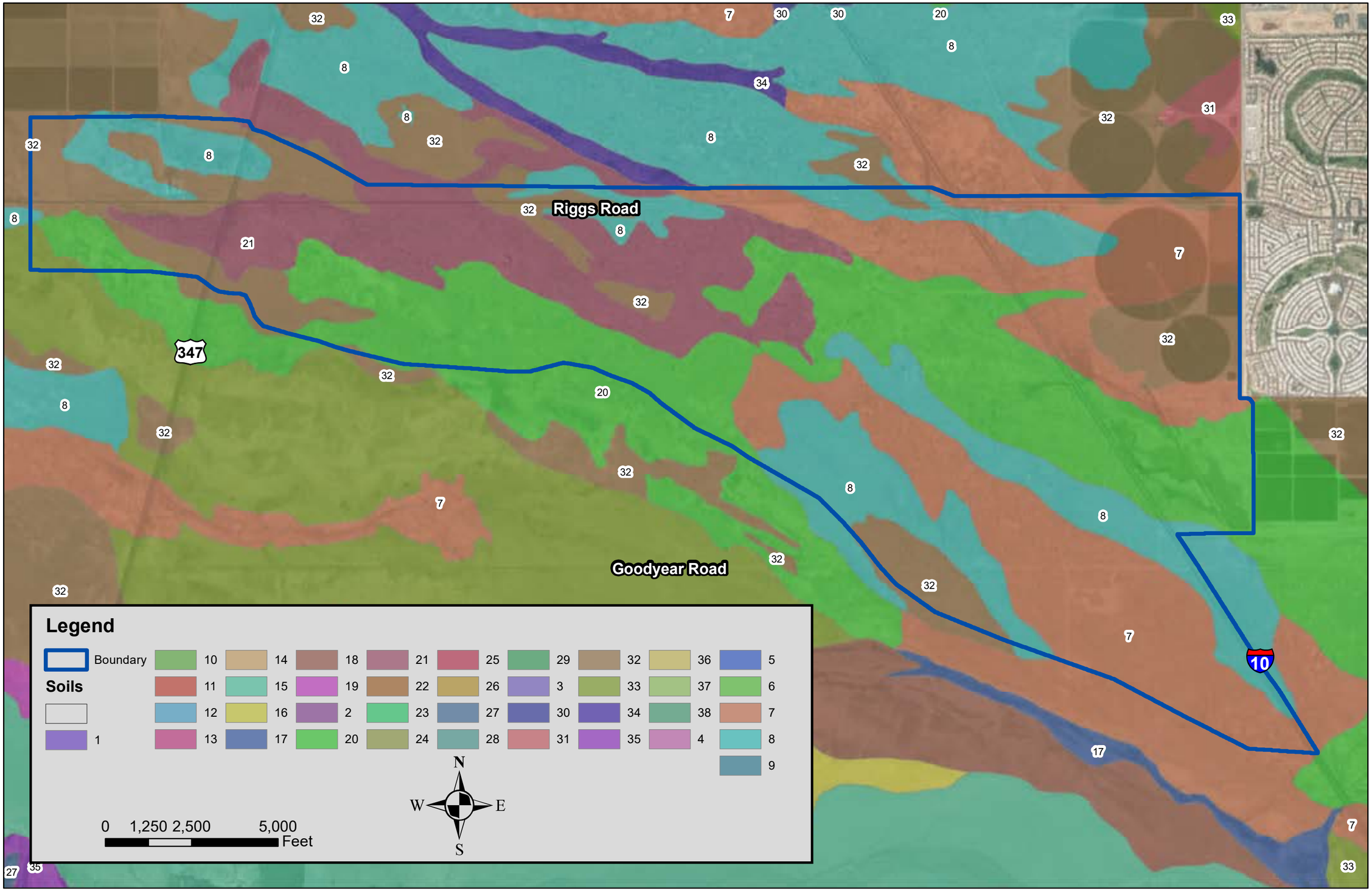
Kimley»Horn
2023 KIMLEY-HORN AND ASSOCIATES, INC.
Engineering, Planning and Environmental Consultants
7740 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

SCALE(H):1"=32,000FT
SCALE(V): N/A
DESIGNED BY:ATC
DRAWN BY:ATC
CHECKED BY:ZRS
DATE:01/30/2023

SR347 & Riggs TI Land Use Map

PROJECT NO.
291749000

DRAWING NAME
LU



NO.	REVISION	BY	DATE	APPR.

Kimley»Horn
© 2023 KIMLEY-HORN AND ASSOCIATES, INC.
Engineering, Planning and Environmental Consultants
7740 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

SCALE(H): 1"=32,00'/FT
SCALE(V): N/A
DESIGNED BY:ATC
DRAWN BY:ATC
CHECKED BY:ZRS
DATE:01/12/2023

SR347 & Riggs TI Soils Map

PROJECT NO.
29174900

DRAWING NAME
EX1

APPENDIX G: Final Traffic Report

FINAL TRAFFIC REPORT

MARICOPA ROAD (STATE ROUTE 347): RIGGS ROAD TRAFFIC INTERCHANGE
ADOT CENTRAL DISTRICT/MARICOPA COUNTY
CONSTRUCT TRAFFIC INTERCHANGE

ADOT CONTRACT NO. 2022-004
ADOT PROJECT NO. 347 MA 184 F0476 01L
FEDERAL AID NO. NFA

Prepared For:

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

Prepared By:

Kimley»Horn

NOVEMBER 2024

Table of Contents

List of Figures

List of Tables

List of Appendices

1. INTRODUCTION

This Final Traffic Report has been developed to support the Design Concept Report (DCR) for a grade-separated traffic interchange (TI) at the currently at-grade signalized intersection of Arizona State Route 347 (SR 347) and Riggs Road. The project is located in the Arizona Department of Transportation (ADOT) Central District and the Gila River Indian Community in Maricopa County, Arizona. The project location and vicinity maps are shown in **Figure 1.1** and **Figure 1.2**, respectively.

The purposes of this report are to document the existing safety and operational characteristics of the intersection of SR 347/Riggs Road, analyze TI design scenarios, evaluate future freeway mainline and TI operations, and provide recommendations for improvements within the project limits. The recommended improvements are designed to reduce congestion, promote safety, improve traffic operations, and enhance regional mobility.

The traffic analysis includes the evaluation of the following TI types:

- Spread Diamond Interchange (SDI)
- Single-Point Urban Interchange (SPUI)
- Diverging Diamond Interchange (DDI)
- Double Roundabout Interchange (DRI)

Additionally, SR 347 at Riggs Road is programmed to be widened to provide one additional general-purpose lane (GPL) in each direction. These additional lanes were considered in the TI evaluation.

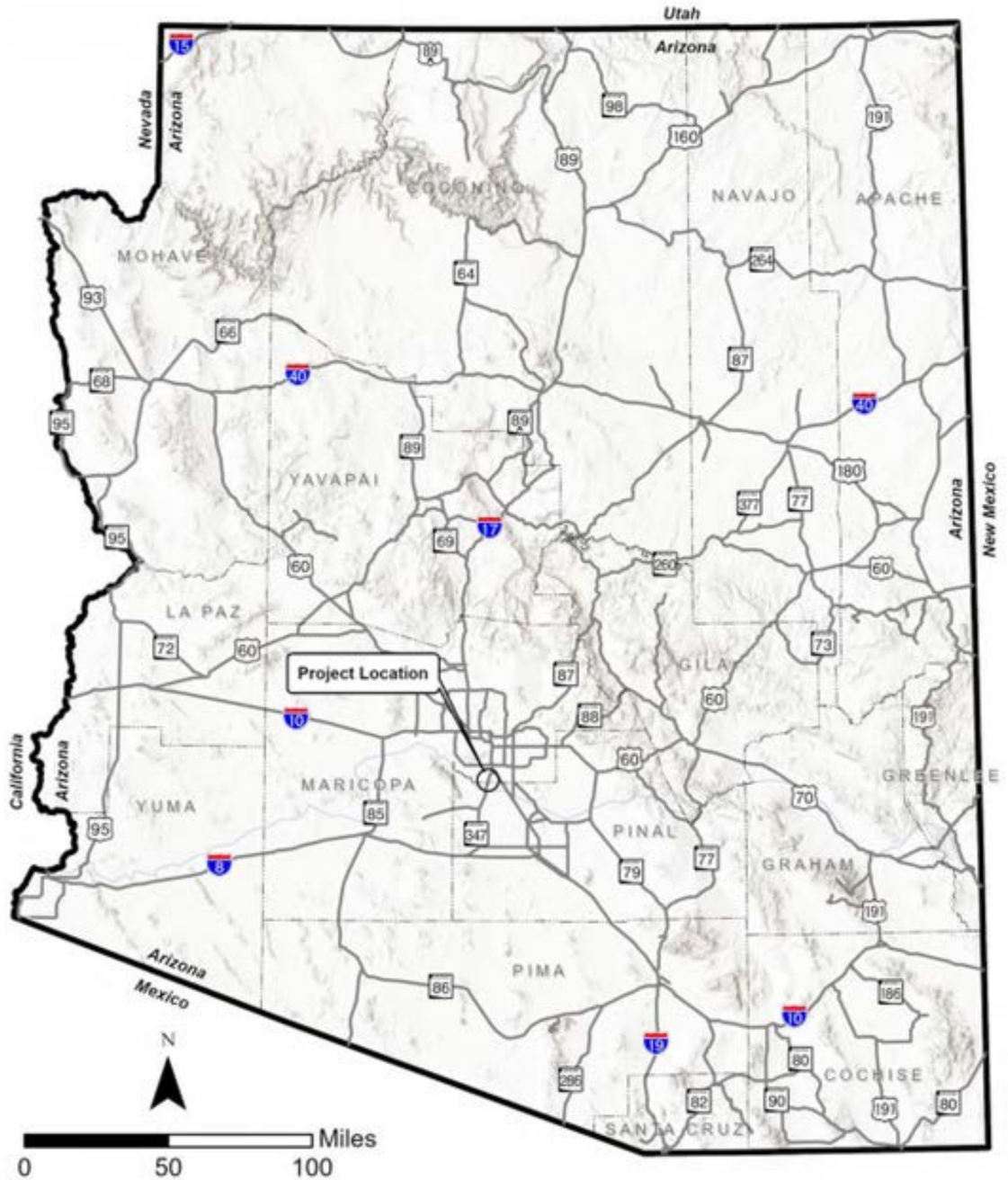


Figure 1.1 – Project Location Map

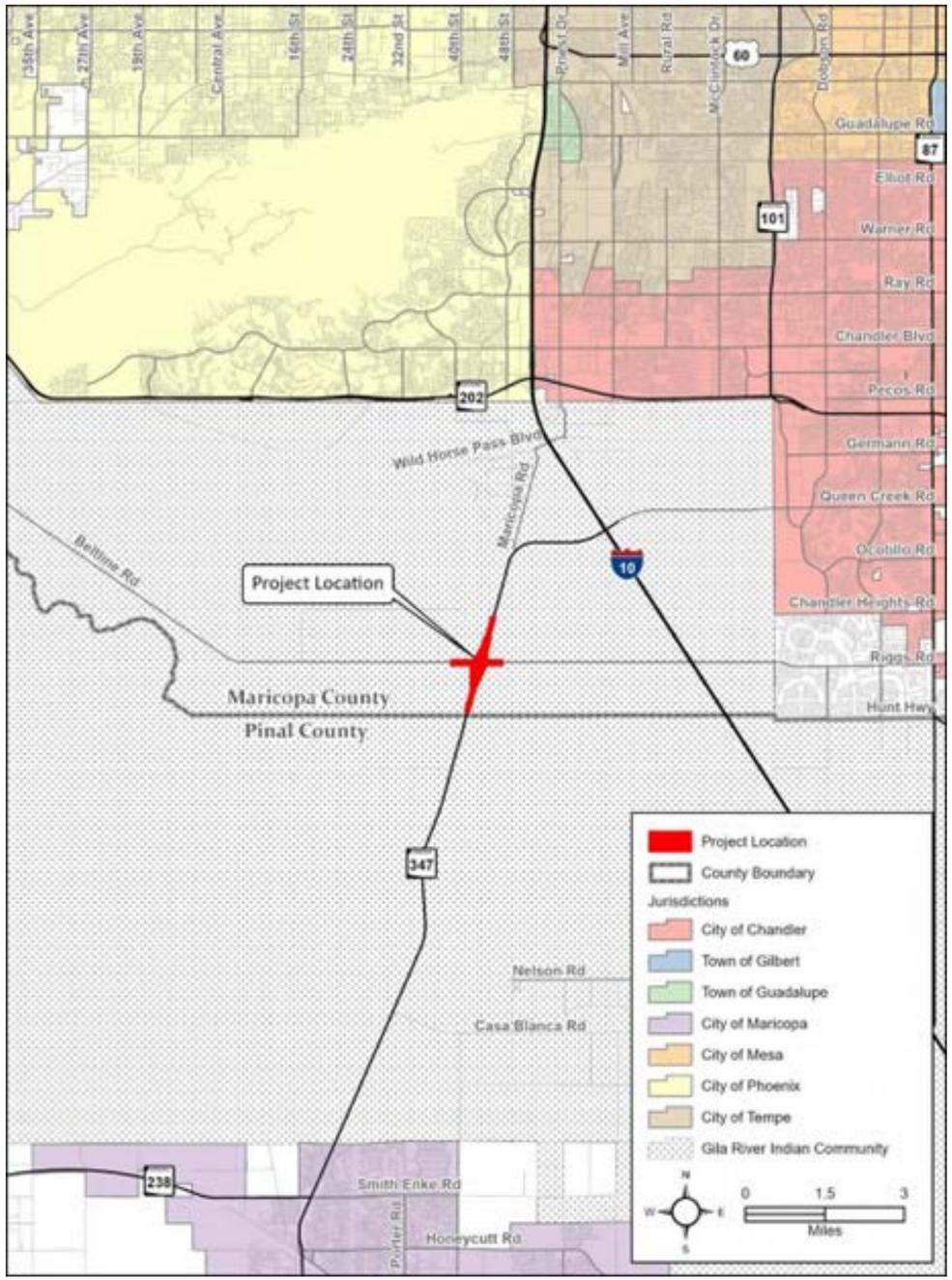


Figure 1.2 – Project Vicinity Map

2. EXISTING CONDITIONS

2.1 Existing Geometry

2.1.1 Road Segment Geometry

SR 347 (also referred to as ***Maricopa Road***, ***John Wayne Parkway***, and ***American Indian Memorial Highway*** in the vicinity of the project) runs generally north-south between SR 84 and Interstate 10 (I-10) and is approximately 29 miles long. SR 347 terminates at SR 84 to the south and I-10 to the north. SR 347 is owned, operated, and maintained by ADOT. ADOT classifies SR 347 as a "principal other arterial" roadway per the 2020 ADOT Map Book. The posted speed limit on SR 347 is 55 miles per hour (mph) within the project limits.

The existing SR 347 northbound (NB) and southbound (SB) roadway sections include two GPLs in each direction that are each 12 feet wide. An approximately 36-foot-wide unpaved median separates the NB and SB travel lanes. Inside paved shoulders are approximately 5 feet wide or less and outside paved shoulders are approximately 10 feet wide.

Riggs Road runs generally east-west in the vicinity of the site. Riggs Road connects to I-10 approximately four miles east of SR 347 and becomes Beltline Road west of SR 347. Riggs Road is owned, operated, and maintained by the Maricopa County Department of Transportation (MCDOT). MCDOT classifies Riggs Road as a "principal arterial" roadway per the MCDOT Major Streets and Routes Plan. The posted speed limit on Riggs Road is 55 mph within the project limits.

2.1.2 Intersection Geometry and Signal Phasing

The signalized intersection of SR 347/Riggs Road is approximately located at milepost (MP) 185.3 along SR 347. The NB and SB approaches to the intersection each have two through lanes, a right-turn lane, and a left-turn lane. The EB and WB approaches each have a shared through/right-turn lane and a left-turn lane. All left turns at the intersection operate with protected/permitted signal phasing. Existing signal timing sheets are included in **Appendix 1**.

The area surrounding the SR 347/Riggs Road intersection is largely undeveloped. An electrical substation is located on the northwest corner of the intersection. Revolution Industrial is located on the north side of Riggs Road approximately 1,660 feet west of SR 347 and is the only other developed area within the vicinity of the intersection.

The existing SR 347/Riggs Road intersection lane geometry is shown in **Figure 2.1**.

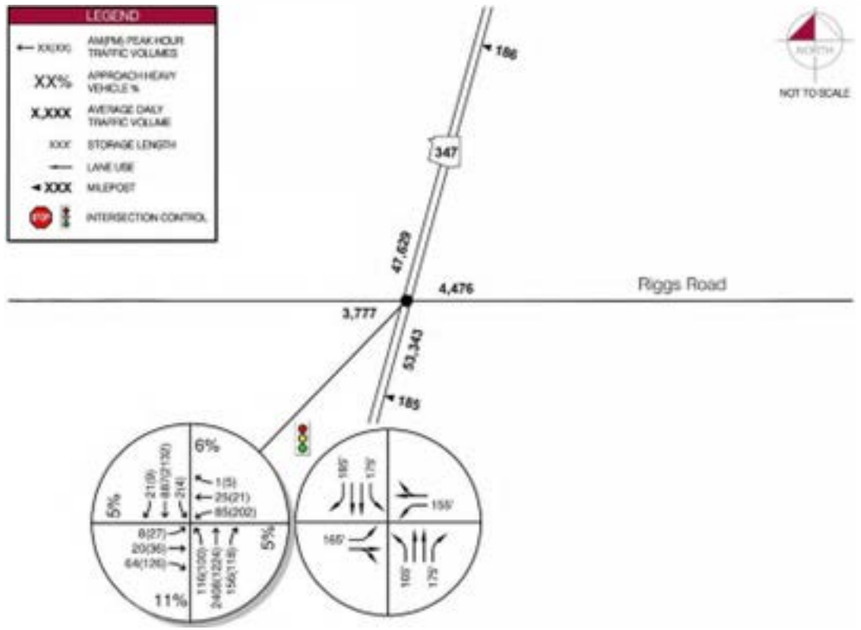


Figure 2.1 – Existing Conditions

2.2 Existing Traffic Volumes

AM and PM peak period turning movement counts (TMCs) were collected at the SR 347/Riggs Road intersection on Thursday, May 19, 2022 between 6:00 AM and 9:00 AM and between 3:00 PM and 6:00 PM. Because SR 347 is a significant truck route, separate TMCs were collected for passenger cars and heavy vehicles. Bi-directional daily vehicle classification counts were also collected on all four legs of the intersection to determine the distribution of vehicle types on each leg. The existing TMCs and bi-directional average daily traffic (ADT) volumes for the intersection legs are shown in the previously referenced **Figure 2.1**.

The EB and WB approach volumes on Riggs Road are similar during both the AM and PM peak hours, with WB traffic volumes being slightly higher on average. On SR 347, however, volumes are heavily directional. The NB approach volumes are nearly three times greater than the SB approach volumes in the AM peak hour, and the SB approach volumes are nearly 1.5 times greater than the NB approach volumes in the PM peak hour.

Many heavy vehicles pass through the SR 347/Riggs Road intersection daily. Heavy vehicle percentages were calculated for each intersection leg using the collected daily vehicle classification counts. The existing SR 347/Riggs Road heavy vehicle percentages are shown in the previously referenced **Figure 2.1**.

Table 2.1 summarizes the existing ADT, K-factors (design peak hour percentage of daily volume), D-factors (directional split), and T-factors (heavy vehicle/truck percentage) for each leg of the intersection. For the purposes of this analysis, heavy vehicles were defined as vehicles in the Federal Highway Administration (FHWA) Classes 6-13.

Table 2.1 – SR 347/Riggs Road Intersection Existing Traffic Summary

Input	Intersection Leg			
	North Leg	South Leg	East Leg	West Leg
ADT	47,629	53,343	4,476	3,777
K-Factor	7%	7%	10%	10%
D-Factor	73%	63%	64%	61%
T-Factor	5%	5%	6%	11%

More information on existing traffic counts can be found in **Appendix 1**.

3. FUTURE TRAFFIC VOLUMES ANALYSIS AND SCENARIOS

3.1 2050 MAG Model

The future traffic volumes used for the analysis are based on the 2050 travel demand model developed by the Maricopa Association of Governments (MAG) to evaluate the Phoenix area's transportation system. The MAG regional travel demand model is based on projected socioeconomic, population, employment, origin-destination, and other regionally-based data.

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

- *2020 Existing* – Existing roadway network with estimated 2020 model volumes
- *2050 No-Build* – Existing roadway network with projected 2050 model volumes
- *2050 Build* – Existing roadway network plus programmed improvements with projected 2050 model volumes

The 2050 Build MAG model assumes SR 347 is widened to three lanes in each direction in the project limits. It also assumes that a grade-separated TI is constructed at SR 347/Riggs Road. The MAG model volumes are shown in **Appendix 2**.

3.2 2050 TI Build Analysis Scenarios

The following TI configurations were analyzed at the study intersection under the 2050 Build conditions (see illustrations of the interchange configurations shown in **Figure 3.1**):

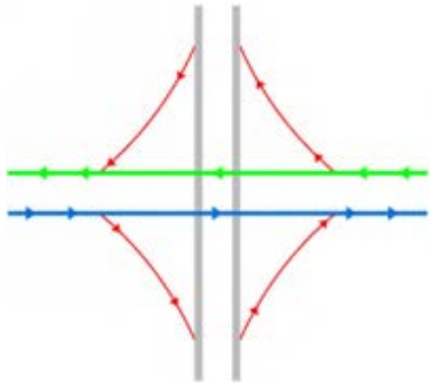
- Tight Diamond Interchange/Shifted Diamond Interchange/Spread Diamond Interchange (SDI)
- Single-Point Urban Interchange (SPUI)
- Diverging Diamond Interchange /Spread Diverging Diamond Interchange (DDI)
- Double Roundabout Interchange (DRI)

The SDI configuration utilizes two signalized intersections. Each signalized intersection controls off-ramp and on-ramp traffic in one of the directions of SR 347 traffic (NB or SB traffic). A Tight Diamond Interchange (TDI) functions similarly to an SDI but spaces the ramp intersections more closely. If an SDI or TDI along with the mainline lanes is shifted away from the current alignment, that is known as a shifted diamond interchange. For purposes of this traffic analysis and to simplify the display of traffic analysis results, the SDI configuration represents the SDI, TDI, and shifted diamond scenarios as all three have similar traffic analysis results.

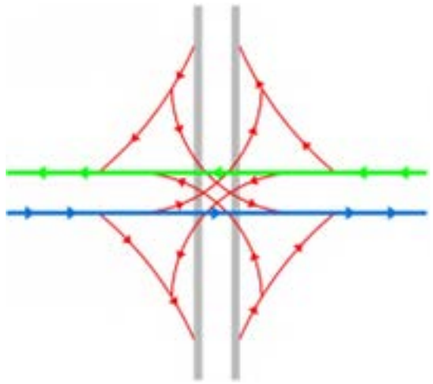
The SPUI configuration utilizes one signalized intersection. All through and left-turning traffic is controlled by the traffic signal, while right turns are channelized with yield or signal control.

In the DDI configuration, EB and WB traffic on Riggs Road cross each other onto opposite sides of the roadway. This configuration eliminates all left-turn crossing conflicts, with left-turning traffic driving on the left side of the crossroad. This eliminates the need for left-turn signal phasing on the crossroad. The two crossover points are signalized. The points where SR 347 ramp traffic merges with Riggs Road traffic would typically have signal or yield control.

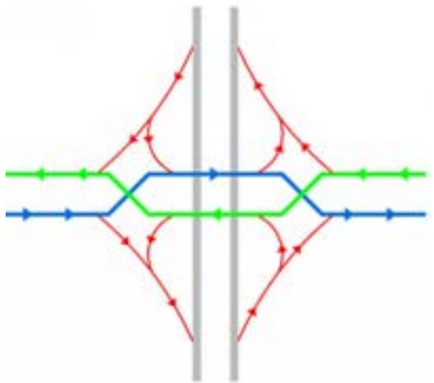
The DRI configuration is similar to the SDI but replaces the signalized intersections with roundabouts. The DRI evaluated for this project is a configuration known as a "teardrop" or "dog bone" style.



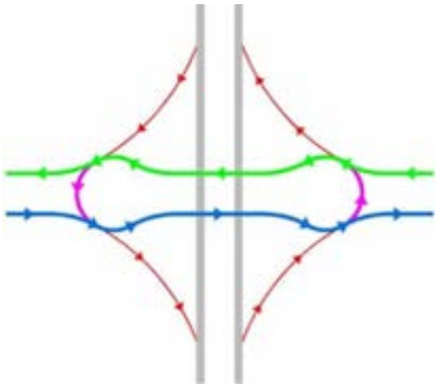
Tight/Shifted/Spread Diamond Interchange Configuration



Single Point Urban Interchange Configuration



Diverging Diamond Interchange Configuration



Double Roundabout Interchange Configuration

Figure 3.1 – TI Configurations Analyzed

3.3 2050 Freeway Mainline Analysis

For the 2050 Build condition, SR 347 is assumed to be widened to three GPLs in each direction with grade separation at Riggs Road. This grade separation with TI ramps effectively results in SR 347 functioning like a freeway in the vicinity of Riggs Road. As such, a freeway mainline and ramp analysis was conducted for SR 347 in the 2050 Build condition.

3.4 2050 Traffic Volumes

The daily traffic volumes from the MAG 2020 Existing model were compared to the 2050 No-Build and Build model volumes to calculate average annual growth rates for SR 347 and Riggs Road separately in both the 2050 No-Build and 2050 Build conditions. These growth rates were then applied to the 2022 turning movement counts to determine the 2050 No-Build and 2050 Build peak hour traffic volumes. The annual growth rates that were used in the analyses are shown in **Table 3.1**. The 2050 traffic volumes account for known planned development in the area per information provided by GRIC and in the GRIC *Wild Horse Pass Master Plan* prepared in 2019.

Table 3.1 – Assumed 2022-2050 Average Annual Growth Rates

Roadway	No-Build Growth Rate	Build Growth Rate
SR 347	1.2%	1.6%
Riggs Road	3.5%	3.0%

A 2050 Baseline Build scenario was also developed that uses the 2050 Build volumes and existing geometry, with the exception that a third through lane is added in each direction on SR 347. The 2050 “Baseline” Build scenario allows for the determination of if widening SR 347 alone is sufficient or if additional improvements such as grade-separating Riggs Road are also needed.

The resultant 2050 traffic volumes and lane configurations for the No-Build, Baseline Build, and the different TI configurations are presented in the following figures:

- 2050 No-Build – **Figure 3.2**
- 2050 Baseline Build – **Figure 3.3** and as defined in **Section 5.4**
- 2050 SDI – **Figure 3.4**
- 2050 SPUI – **Figure 3.5**
- 2050 DDI – Lane configuration in Figure 3.6, traffic volumes in **Figure 3.7**
- 2050 DRI – **Figure 3.8**

Table 3.2 summarizes the 2050 Build and No-Build ADT, K-factors (design peak hour percentage of daily volume), D-factors (directional split), and T-factors (heavy vehicle/truck percentage) for each leg of the intersection.

Table 3.2 – SR 347/Riggs Road Intersection 2050 Traffic Summary

Input	Intersection Leg			
	North Leg	South Leg	East Leg	West Leg
Build ADT	74,285	83,196	10,241	8,642
No-Build ADT	66,516	74,496	11,728	9,897
K-Factor	7%	7%	10%	10%
D-Factor	73%	63%	64%	61%
T-Factor	5%	5%	6%	11%

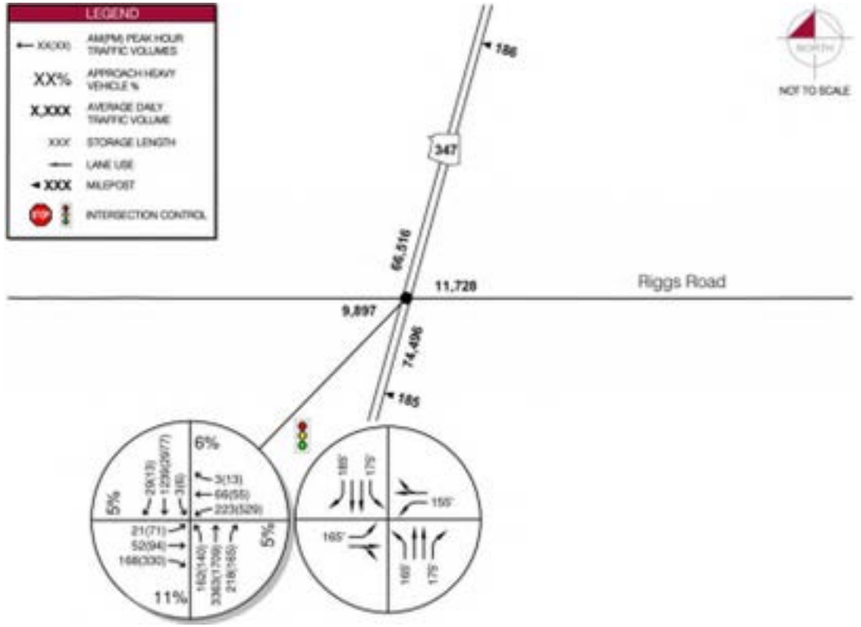


Figure 3.2 – 2050 No-Build Traffic Volumes and Lane Configuration

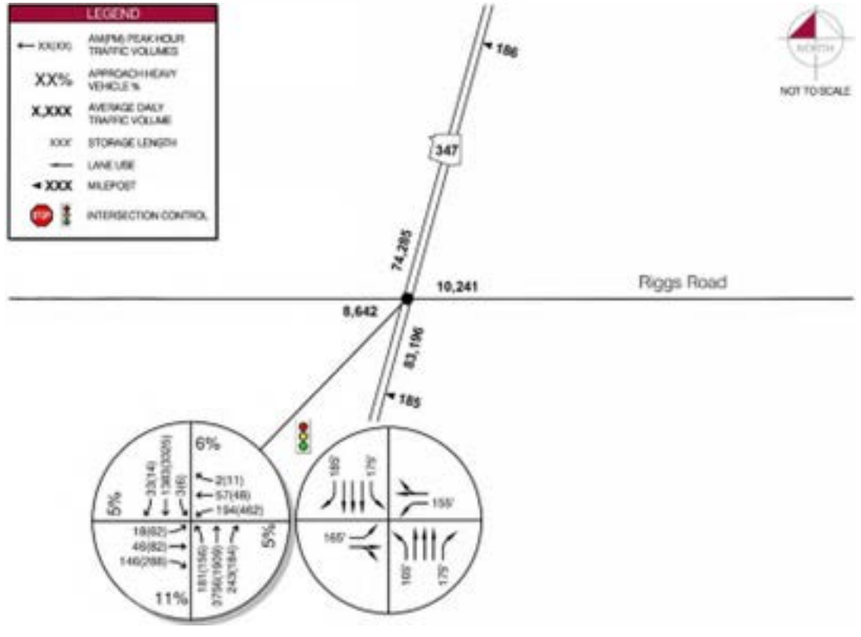


Figure 3.3 – 2050 Baseline Build Traffic Volumes and Lane Configuration

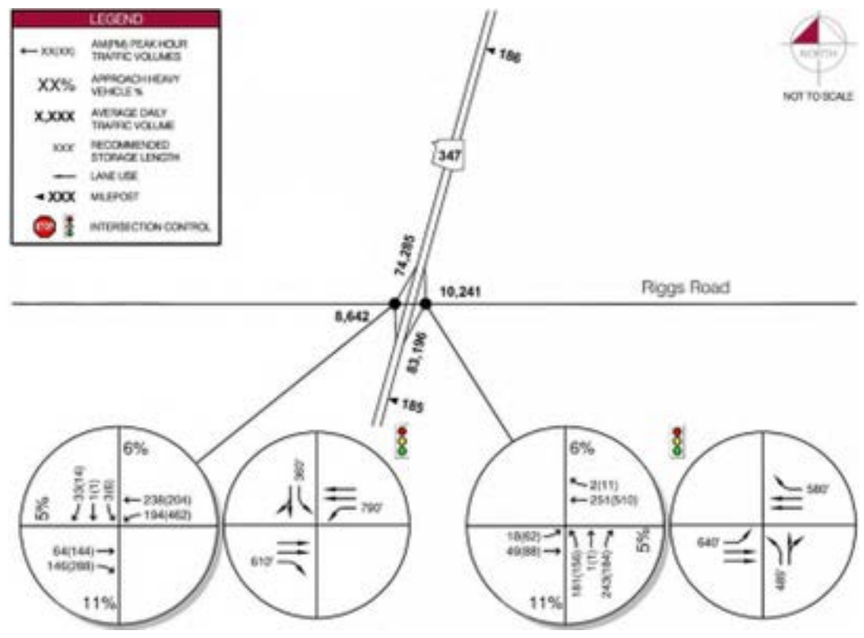


Figure 3.4 – 2050 Build SDI Traffic Volumes and Lane Configuration

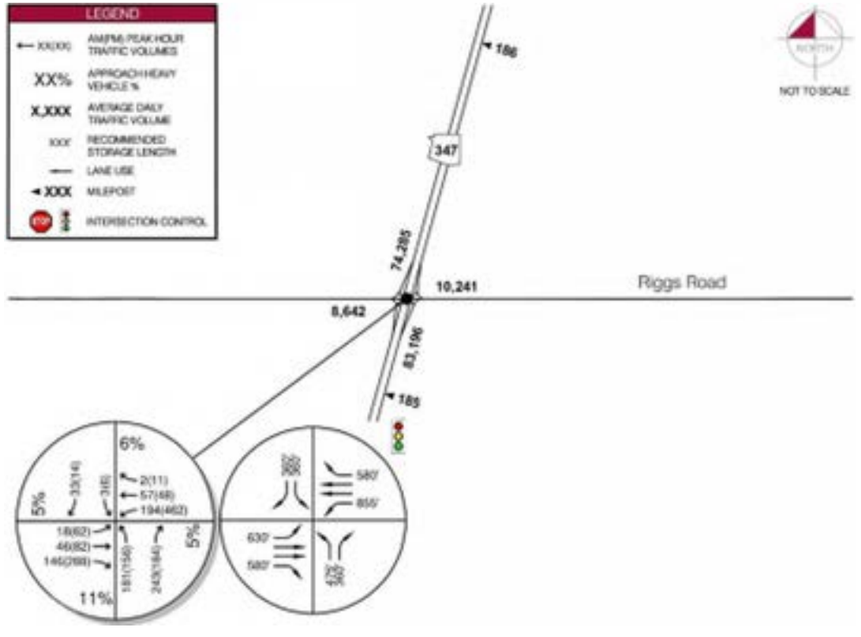


Figure 3.5 – 2050 Build SPUI Traffic Volumes and Lane Configuration

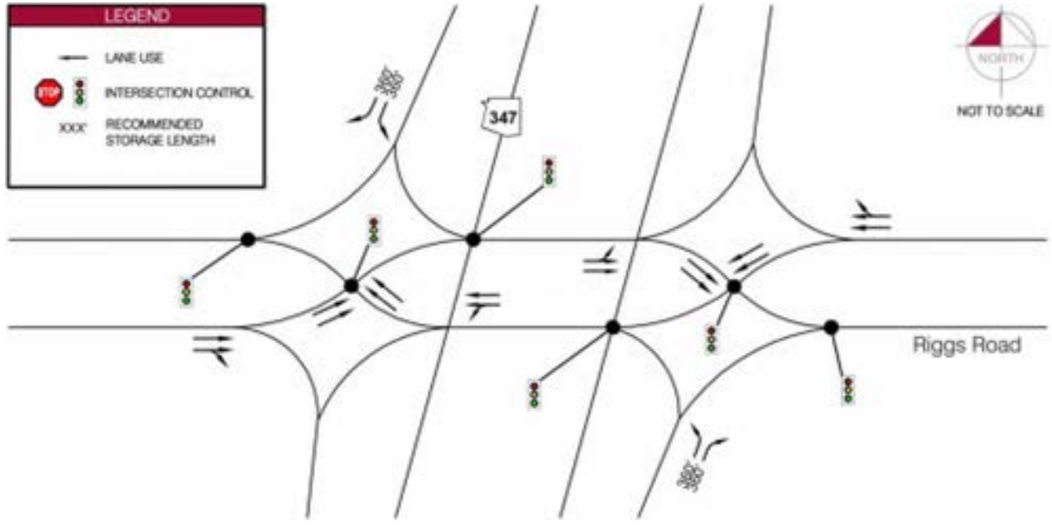


Figure 3.6 – 2050 Build DDI Lane Configuration

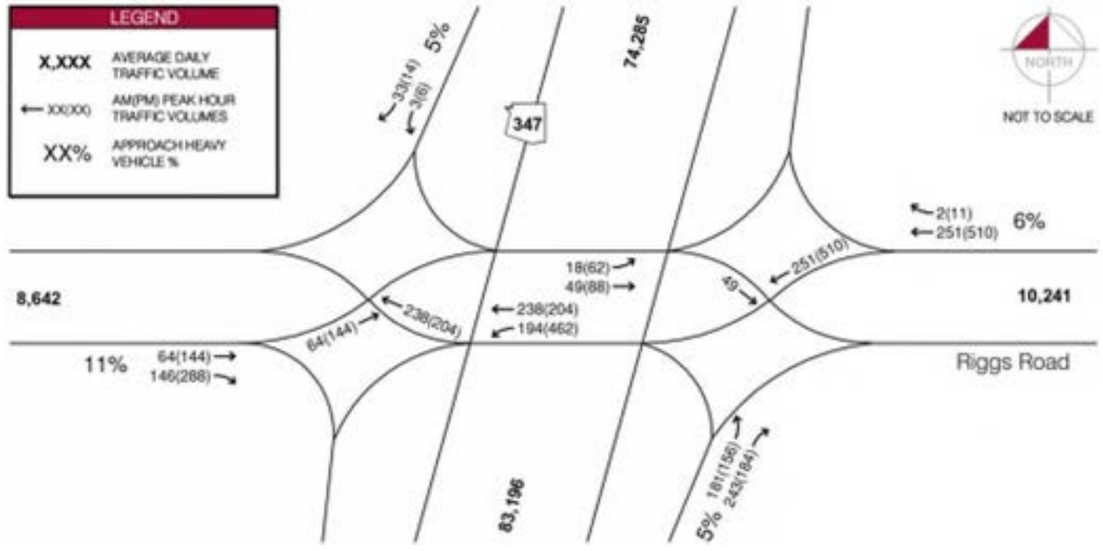


Figure 3.7 – 2050 Build DDI Traffic Volumes

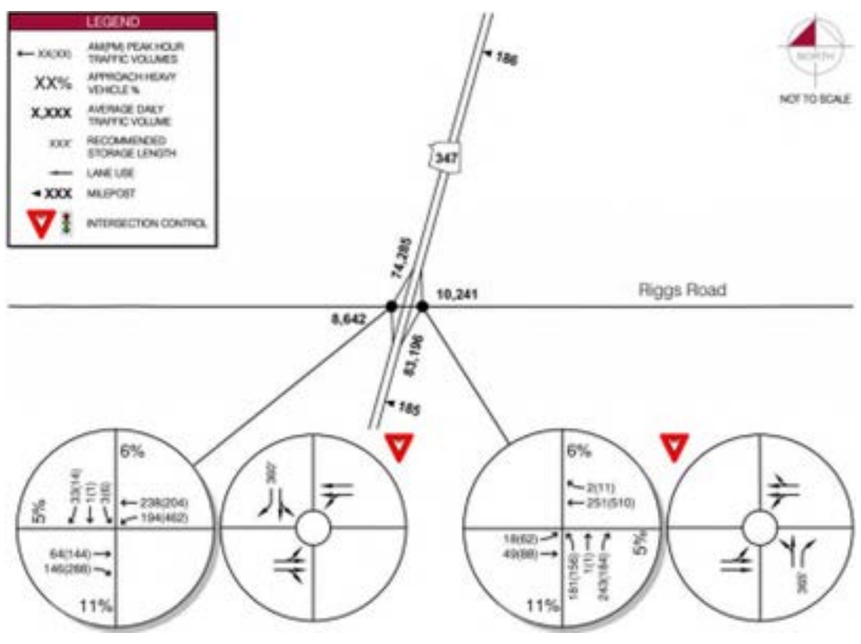


Figure 3.8 – 2050 Build DRI Traffic Volumes and Lane Configuration

The recommended storage lengths shown in **Figures Figure** 3.4, **Figure** 3.5, **Figure** 3.6, and **Figure** 3.8 were determined using the methodology outlined in ADOT Traffic Guidelines and Processes (TGP) Section 430. Tables 430-1 and 430-2 from the TGP were used to select the appropriate gap and desirable braking distance, respectively. The 95th percentile queues from the different operational analyses presented in **Section 5.5** of this report were used as the queue portion of the storage described in TGP 430.

An exclusive westbound (WB) right turn lane is not warranted based on projected 2050 typical peak hour turning movement volumes. However, when there is a closure or restriction on I-10 through the Gila River Indian Community (GRIC), SR 347 often serves as an alternate route for diverting traffic from I-10 via Riggs Road as there is no developed arterial network nearby. In the event of a WB I-10 closure/restriction for the SDI and SPUI configurations, it is anticipated that an exclusive WB right turn lane will help alleviate the additional right turn delay at the new interchanged that might be caused by the closure.

An exclusive eastbound (EB) right-turn lane is warranted based on projected 2050 typical peak hour turning movement volumes. Additionally, as in the case of the WB right-turn lane, the EB right-turn lane will help alleviate any additional delay at the new interchange that might be caused by a closure or restriction on SR 202L (Loop 202).

In the DRI configuration, an EB and WB right-turn bypass lane may also be incorporated into the design for the same reasons. However, the lane configuration shown in **Figure 3.8** and the operational results presented in **Section 5.5.4** for the DRI do not incorporate right-turn bypass lanes.

The 2050 build geometries for the different TI configurations shown in **Figures Figure** 3.4, **Figure** 3.5, **Figure** 3.6, and **Figure** 3.8 show only two-lane off-ramp approaches. With these configurations, the ramps for all the different TI configurations operate at acceptable LOS. However, interchange geometry and traffic control at SR 347/Riggs Road should recognize the need for flexibility to accommodate significant diversions of traffic periodically due to incident and construction closures or restrictions, including routing mainline SR 347 traffic to use interchange ramps to bypass the closures or restrictions. Recognizing this, ADOT has recently implemented the practice of providing a two-lane off-ramp and a four-lane ramp approach at TI ramp/crossroad intersections, where feasible, to provide flexibility in how traffic can be redirected. This practice includes providing the ability for traffic to cross straight through ramp/crossroad intersections and use the on-ramp to reenter the mainline. As traffic analysis doesn't require these additional lanes to provide acceptable LOS, the corresponding increase in budget will need to be reviewed and the additional lanes added to the project during final design if desired.

The SDI and DRI configurations can allow mainline traffic to use ramps to bypass closures. However, the SPUI and DDI do not typically allow for exiting mainline traffic to cross straight through the ramp/crossroad intersection and immediately return to the mainline.

More detailed information regarding each TI configuration and its ability to accommodate diversions and different modes of travel are provided in **Section 7**.

4. CRASH SUMMARY

A crash summary was conducted for crashes occurring along SR 347 approximately one-half mile north and south of Riggs Road and along Riggs Road approximately 0.125 miles east and west of SR 347 to identify any crash patterns or trends that may be present within the project limits.

Crash data was obtained from ADOT for the dates between January 1, 2017 and December 31, 2021, the five most current full years available.

A total of 306 crashes was reported in the vicinity of SR 347/Riggs Road. Of the 306 total crashes, 183 crashes resulted in no injuries (60 percent) and five crashes resulted in one or more fatalities (two percent). The three most common crash types were rear-end crashes (212 crashes/69 percent), left-turn crashes (30 crashes/10 percent), and same-direction sideswipe crashes (24 crashes/8 percent). Summaries of the total crashes by year, crash severity, and crash type as a percentage of crash severity can be found in **Figures Figure 4.1**, **Figure 4.2**, and **Figure 4.3**, respectively. Note that the "Other" category in these figures includes single-vehicle crashes, head-on crashes, opposite-direction sideswipe crashes, rear-to-side crashes, and crashes classified as "other." **Figure 4.4** shows the locations of all crashes within the study period. **Figure 4.5** shows the locations of all suspected severe injury and fatal crashes within the study period.

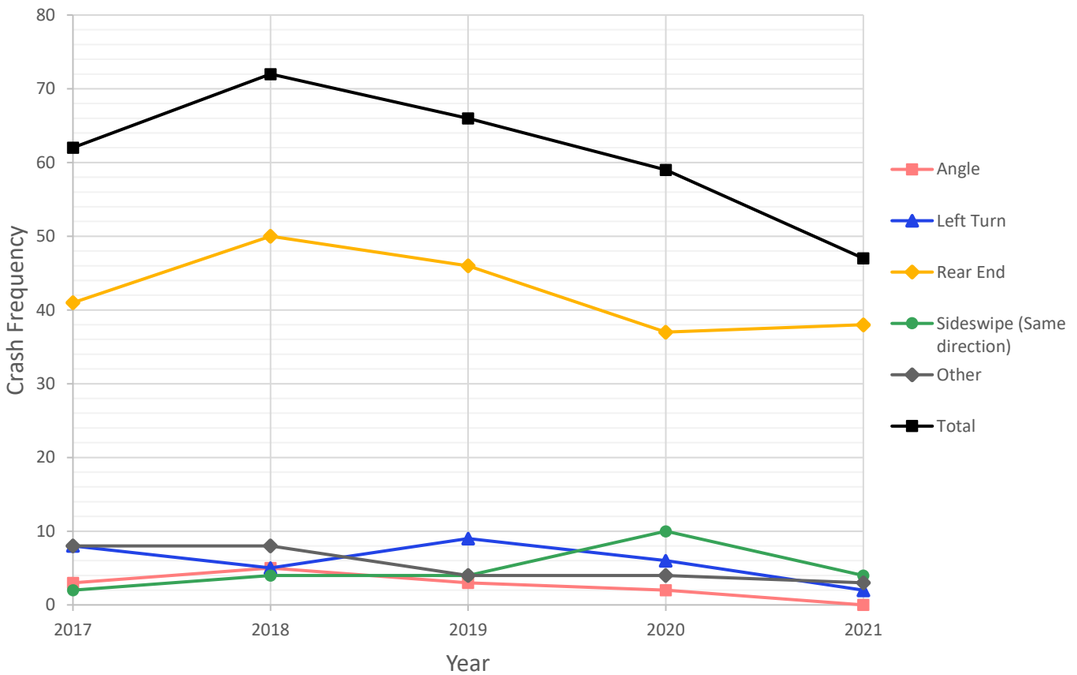


Figure 4.1 – Crash Type by Year

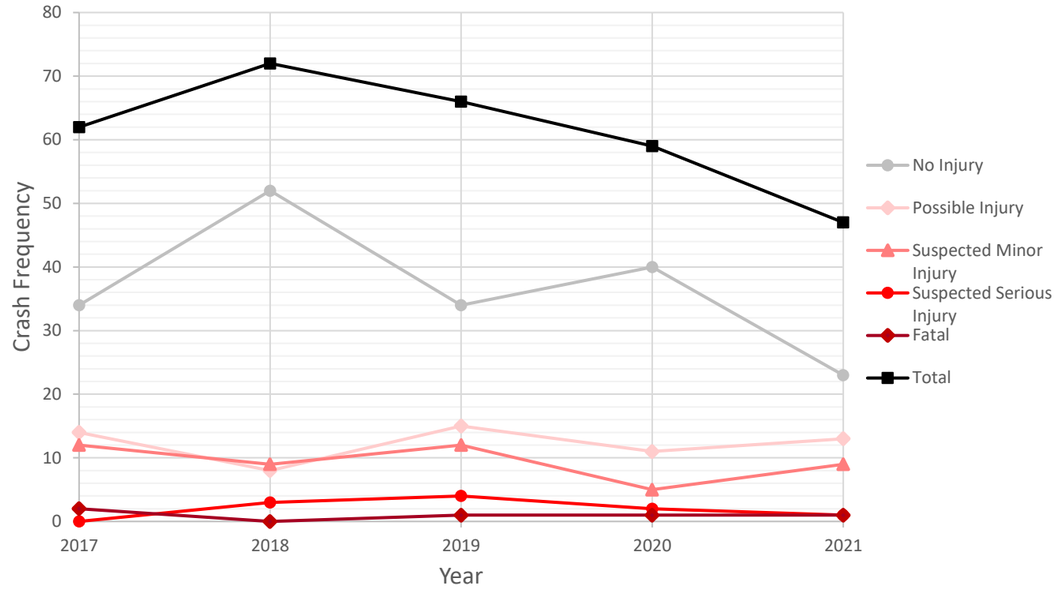


Figure 4.2 – Crash Severity by Year

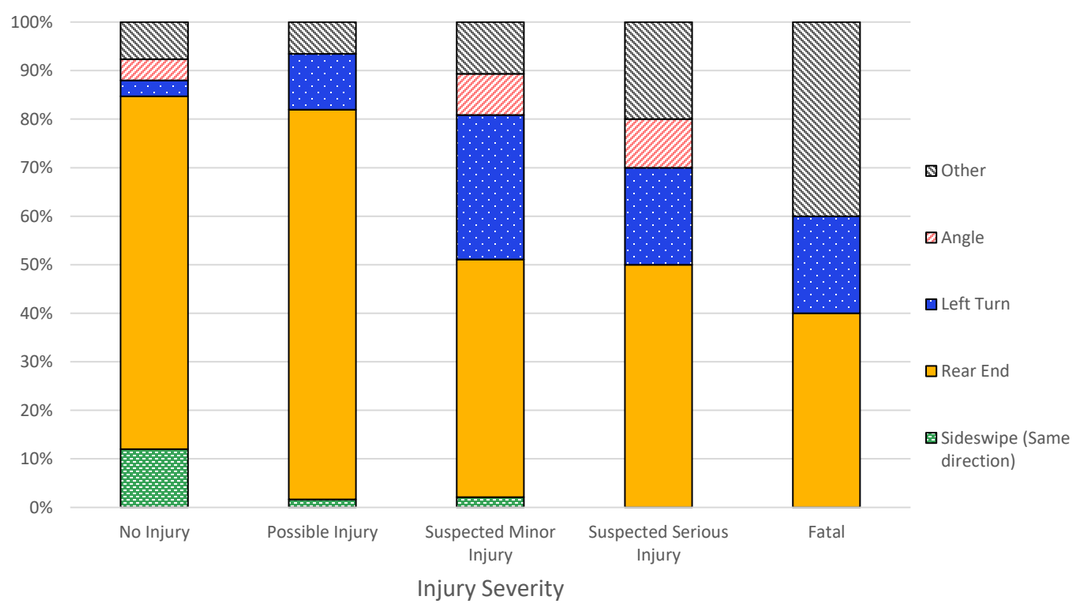


Figure 4.3 – Crash Type as a Percent of Crash Severity

Figure 4.4 – Crash Map - All Crashes

Figure 4.5 – Crash Map - Suspected Severe Injury and Fatal Crashes

The crash data shows that nearly 70 percent of crashes were rear-end crashes, most of which occurred on the SR 347 mainline. The high frequency of rear-end crashes on SR 347 at Riggs Road is anticipated to decrease greatly with the addition of a TI as SR 347 mainline through traffic will no longer need to stop. The moderate frequency of left-turn crashes (about 10 percent) may also be mitigated by the signal timing and/or geometric changes associated with the addition of a TI. The moderate frequency of sideswipe crashes (about 8 percent) would likely not be mitigated by the installation of a TI as sideswipe crashes are typically caused by driver inattention.

Most crashes occurred on the SR 347 mainline approaching the intersection. All suspected serious injury and fatal crashes occurred either at the intersection or on the SR 347 mainline approaching the intersection. Crash data provided in the ADOT SR 347/SR 84 Corridor Profile Study (2018) and MAG SR 347 Corridor Improvement Plan (2021) show that this section of SR 347 has below-average safety performance compared to applicable state averages. This suggests there are existing safety issues on SR 347 at Riggs Road.

5. INTERSECTION OPERATIONAL ANALYSIS

5.1 Analysis Methodology

An intersection operational analysis was performed at SR 347/Riggs Road for the Existing, 2050 No-Build, and 2050 Build conditions (including the previously mentioned potential TI configuration scenarios). The analysis of the scenarios with signalized intersections was completed using Synchro 11 analysis software. For signalized intersections, intersection level of service (LOS) and queue length are typically analyzed using the Highway Capacity Manual, 6th Edition (HCM 6) methodology; however, HCM 6 methodology does not support the analysis of clustered intersections, which are present in the SDI and DDI configuration scenarios. Instead, the Synchro methodology was used to calculate the LOS and queue length for all signalized interchange scenarios, which is a satisfactory substitute for the HCM 6 method.

The analysis of the DRI was completed using Rodel 1.96 analysis software. Rodel uses the HCM 6 methodology for roundabouts to calculate the LOS and queue lengths.

Each intersection, approach, or movement is given a letter designation from LOS A to LOS F. LOS A represents operational conditions with minimal delay and traffic volumes significantly less than available capacity (volume-to-capacity ratio (v/c) < 1). LOS F represents poor operational conditions with a high degree of delay and/or traffic volumes greater than the available capacity (v/c >1). Each LOS grade represents a range of operational conditions.

Table 5.1 shows the average vehicle delay ranges for signalized intersections and unsignalized intersections (including roundabouts) that correspond with each LOS letter grade.

Table 5.1 – Level of Service Thresholds for Signalized and Unsignalized Intersections

Level of Service	Control Delay (s/veh)	
	Signalized Intersections	Unsignalized Intersections
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80 or v/c > 1.0*	> 50 or v/c > 1.0*

*v/c = volume-to-capacity ratio
Source: HCM 6th Edition

The existing peak hour factors (PHF) were adjusted in all future analysis scenarios based on the projected traffic demand and proposed lane geometry per the following guidelines from the ADOT TGP Section 240 for future PHF assumptions:

- PHF = 0.80 for < 75 vehicles per hour (vph) per lane
- PHF = 0.85 for 75 - 300 vph per lane
- PHF = 0.90 for > 300 vph per lane

5.2 2022 Existing Intersection Conditions

The existing LOS, delay, and 95th percentile queues at SR 347/Riggs Road were evaluated using the existing traffic volumes and lane geometry described previously in Section 2.0 of this report. The intersection was analyzed using current signal timings provided by ADOT. Existing signal timing inputs are provided in **Appendix 1**. The results of the 2022 Existing AM and 2022 Existing PM intersection capacity analyses are shown in **Table 5.2** and **Table 5.3**, respectively. Synchro output reports for the 2022 Existing analysis scenarios are provided in **Appendix 3**.

Table 5.2 – 2022 Existing Intersection Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347/Riggs Road													
LOS	E	F	A	E	C	A	E	D		E	D		E
Average Delay (s)	62	97	6	60	25	0	62	37		62	39		71
95th Percentile Queue (ft)	170	*1,714*	70	12	427	0	26	82		130	47		-

Italics = Queue may be longer; queue shown is maximum after two cycles.

SR 347/Riggs Road currently operates at an overall LOS E in the AM peak hour, with all left-turn movements operating at LOS E and the NB through movement operating at LOS F. The NB through movement experiences a 95th percentile queue length of at least 1,714 feet. The NB left-turn movement experiences a 95th percentile queue length of 170 feet, which slightly exceeds the existing storage length.

Table 5.3 – 2022 Existing Intersection Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347/Riggs Road													
LOS	F	C	A	F	F	A	E	E		F	D		F
Average Delay (s)	91	26	7	83	198	0	78	65		82	44		123
95th Percentile Queue (ft)	195	774	64	20	*2,115*	0	73	207		350	49		-

Italics = Queue may be longer; queue shown is maximum after two cycles.

SR 347/Riggs Road currently operates at an overall LOS F in the PM peak hour, with the EB left-turn and through/right-turn movements operating at LOS E and the NB left-turn, SB left-turn and through, and WB left-turn movements operating at LOS F. The SB through movement experiences a 95th percentile queue length of at least 2,115 feet. The NB and WB left-turn movements experience 95th percentile queue lengths of 195 feet and 350 feet, respectively, which exceed the existing storage lengths.

5.3 2050 No-Build Intersection Analysis

The 2050 No-Build LOS, delay, and 95th percentile queues at SR 347/Riggs Road were evaluated using the 2050 No-Build volumes and existing geometry. The results of the 2050 No-Build AM and 2050 No-Build PM intersection capacity analyses are shown in **Table 5.4** and **Table 5.5**, respectively. Synchro output reports for the 2050 No-Build analysis scenarios are provided in **Appendix 4**.

Table 5.4 – 2050 No-Build Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347/Riggs Road													
LOS	F	F	B	F	D	A	F	F		F	E		F
Average Delay (s)	124	330	11	107	45	0	123	93		377	67		234
95th Percentile Queue (ft)	*448*	*4,490*	168	20	1,015	0	75	369		*757*	146		-

Italics = Queue may be longer; queue shown is maximum after two cycles.

SR 347/Riggs Road is anticipated to operate at an overall LOS F in the AM peak hour in 2050 No-Build traffic conditions. The WB through/right-turn movement is anticipated to operate at LOS E, and all left-turn movements and the NB and EB through movements are anticipated to operate at LOS F. The NB and SB through movements experience 95th percentile queue lengths of at least 4,490 feet and 1,015 feet, respectively. The NB and WB left-turn movements experience 95th percentile queue lengths of at least 448 feet and 757 feet, respectively, which exceed the existing storage lengths.

Table 5.5 – 2050 No-Build Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347/Riggs Road													
LOS	F	F	B	F	F	A	F	F		F	D		F
Average Delay (s)	431	98	17	116	525	0	140	196		650	54		367
95th Percentile Queue (ft)	*531*	*1,888*	141	34	*4,191*	0	188	*1,041*		*1,682*	129		-

Italics = Queue may be longer; queue shown is maximum after two cycles.

SR 347/Riggs Road is anticipated to operate at an overall LOS F in the PM peak hour in 2050 No-Build traffic conditions, with all left-turn movements, the NB and SB through movements, and the EB through/right-turn movement operating at LOS F. The NB and SB through movements experience 95th percentile queue lengths of at least 1,888 feet and at least 4,191 feet, respectively. The EB through/right-turn movement experiences a 95th percentile queue length of at least 1,041 feet. The NB and WB left-turn movements experience 95th percentile queue lengths of at least 531 feet and at least 1,682 feet, respectively, which exceed the existing storage lengths.

5.4 2050 Baseline Build Intersection Analysis

The 2050 "Baseline" Build LOS, delay, and 95th percentile queues at SR 347/Riggs Road were evaluated using the 2050 Build volumes and existing geometry, with the exception that a third through lane is added in each direction on SR 347. The 2050 "Baseline" Build scenario was analyzed to determine if widening SR 347 alone is sufficient to provide acceptable LOS or if additional improvements such as grade-separating Riggs Road are also needed. The results of the 2050 Baseline Build AM and 2050 Baseline Build PM intersection capacity analyses are shown in **Table 5.6** and **Table 5.7**, respectively. Synchro output reports for the 2050 Baseline Build analysis scenarios are provided in **Appendix 3**.

Table 5.6 – 2050 Baseline Build Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347/Riggs Road													
LOS	F	F	B	F	D	A	F	F		F	E		F
Average Delay (s)	115	181	12	103	43	0	114	91		159	61		133
95th Percentile Queue (ft)	393	*3,038*	197	21	723	0	64	315		*555*	122		-

Italics = Queue may be longer; queue shown is maximum after two cycles.

SR 347/Riggs Road is anticipated to operate at an overall LOS F in the AM peak hour in 2050 Baseline Build traffic conditions. The EB through/right-turn movement is anticipated to operate at LOS E, and all left-turn movements and the NB through movement are anticipated to operate at LOS F. The NB through movement experiences a 95th percentile queue length of at least 3,038 feet. The NB left-turn, NB right-turn, and WB left-turn movements experience 95th percentile queue lengths of 393 feet, 197 feet, and at least 555 feet, respectively, which exceed the existing storage lengths.

Table 5.7 – 2050 Baseline Build Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347/Riggs Road													
LOS	F	E	C	F	F	A	F	F		F	D		F
Average Delay (s)	447	64	22	116	406	0	137	127		352	46		270
95th Percentile Queue (ft)	*579*	*1,247*	180	34	*3,077*	0	166	*799*		*1,341*	106		-

Italics = Queue may be longer; queue shown is maximum after two cycles.

SR 347/Riggs Road is anticipated to operate at an overall LOS F in the PM peak hour in 2050 Baseline Build traffic conditions. The NB through movement is anticipated to operate at LOS E, and all left-turn movements, the SB through movement, and the EB through/right-turn movement are anticipated to operate at LOS F. The NB and SB through movements experience 95th percentile queue lengths of at least 1,247 feet and at least 3,077 feet, respectively. The EB through/right-turn movement experiences a 95th percentile queue length of at least 799 feet.

The NB left-turn, NB right-turn, and WB left-turn movements experience 95th percentile queue lengths of at least 579 feet, 180 feet, and at least 1,341 feet, respectively, which exceed the existing storage lengths.

5.5 2050 Build Intersection Analysis

The 2050 Build LOS, delay, and 95th percentile queues at SR 347/Riggs Road were evaluated using the 2050 Build volumes and the SDI, SPUI, DDI, and DRI interchange design scenarios described previously in Section 3.0 of this report.

All configurations assume that Riggs Road will be widened to two travel lanes in each direction within the project limits, where feasible, per the MCDOT vision for Riggs Road to ultimately become a four-lane facility.

5.5.1 Spread Diamond Interchange Capacity Analysis Results

An intersection diagram extracted from Synchro showing the SDI lane geometry is presented in **Figure 5.1**. The results of the 2050 Build AM and 2050 Build PM intersection capacity analyses with the SDI configuration are shown in **Table 5.8** and **Table 5.9**, respectively. The Synchro output reports for the SDI configuration are provided in **Appendix 3**.

The configuration shown in **Figure 5.1** shows back-to-back EB and WB left turn lanes between the NB and SB ramp intersections. The ability to provide back-to-back left-turn lanes with the appropriate storage lengths and tapers is dependent on the spacing of the NB and SB ramp intersections. If the intersections are spaced so close together that back-to-back left-turn lanes can't provide adequate storage, a side-by-side configuration for the left-turn lanes may be required to provide adequate left-turn storage.

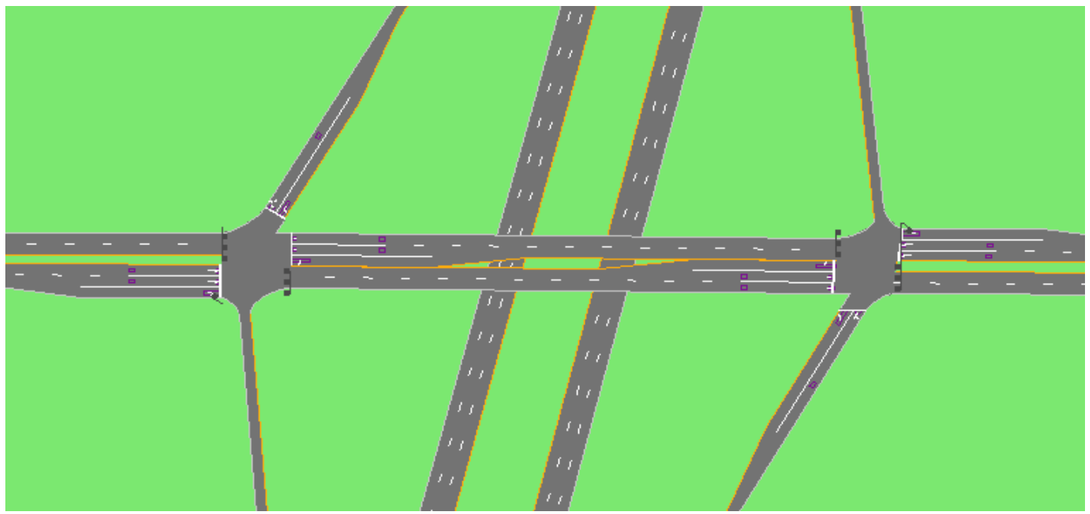


Figure 5.1 – SDI Intersection Diagram

Table 5.8 – 2050 Build with SDI Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347 SB Ramps/Riggs Road													
LOS				B	A			B	A	B	A		B
Average Delay (s)				11	5			16	7	19	8		12
95th Percentile Queue (ft)				5	13			21	33	128	53		-
SR 347 NB Ramps/Riggs Road													
LOS	B	A					C	C			A	A	B
Average Delay (s)	16	5					20	30			9	0	11
95th Percentile Queue (ft)	85	34					24	20			57	0	-

Both SR 347/Riggs Road TI ramp intersections are anticipated to operate at an overall LOS B or better in the 2050 Build with SDI scenario during the AM peak hour. All movements are anticipated to operate at LOS C or better, with 95th percentile queues no greater than 128 feet long.

Table 5.9 – 2050 Build with SDI Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347 SB Ramps/Riggs Road													
LOS				C	B			C	A	C	A		B
Average Delay (s)				24	13			25	10	27	7		19
95th Percentile Queue (ft)				13	16			63	54	235	35		-
SR 347 NB Ramps/Riggs Road													
LOS	C	A					C	C			B	A	B
Average Delay (s)	31	8					27	31			10	0	16
95th Percentile Queue (ft)	147	48					82	8			112	0	-

Both SR 347/Riggs Road TI ramp intersections are anticipated to operate at an overall LOS B or better in the 2050 Build with SDI scenario during the PM peak hour. All movements are anticipated to operate at LOS C or better, with 95th percentile queues no greater than 235 feet long.

5.5.2 Single Point Urban Interchange Capacity Analysis Results

An intersection diagram extracted from Synchro showing the SPUI lane geometry is presented in **Figure 5.2**. The results of the 2050 Build AM and 2050 Build PM intersection capacity analyses with the SPUI configuration are shown in **Table 5.10** and **Table 5.11**, respectively. The Synchro output reports for the SPUI configuration are provided in **Appendix 3**.

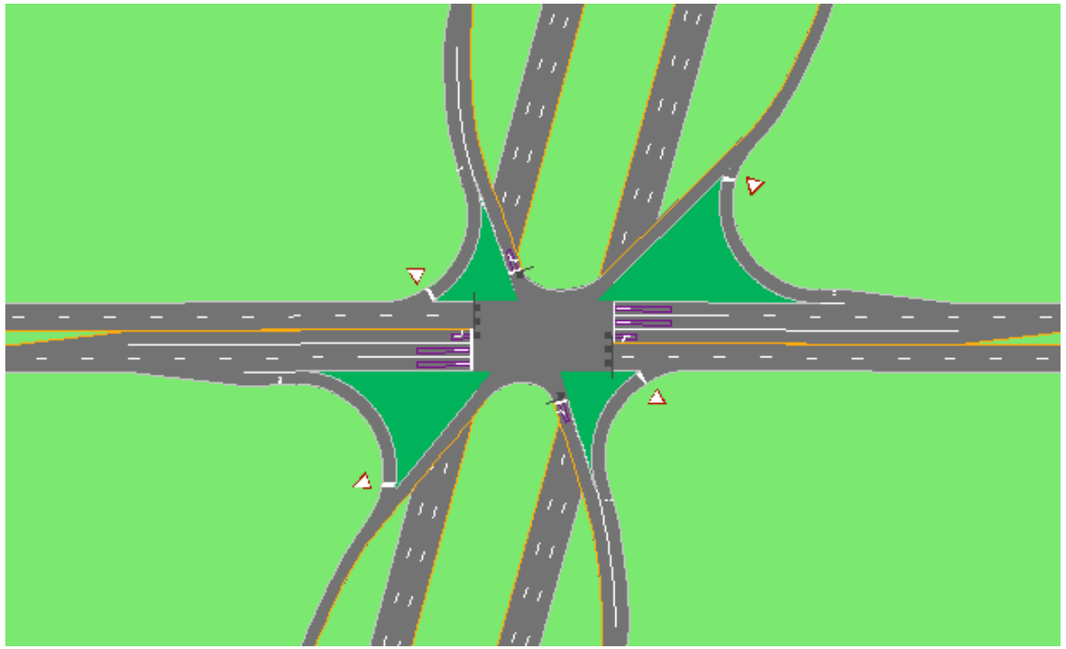


Figure 5.2 – SPUI Intersection Diagram

Table 5.10 – 2050 Build with SPUI Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347/Riggs Road SPUI													
LOS	B		A	B		A	C	C	A	B	B	A	A
Average Delay (s)	18		0	17		0	22	21	0	17	11	0	9
95th Percentile Queue (ft)	108		0	6		0	23	22	0	114	20	0	-

The SR 347/Riggs Road TI is anticipated to operate at an overall LOS A in the 2050 Build with SPUI scenario during the AM peak hour. All movements are anticipated to operate at LOS C or better, with 95th percentile queues no greater than 114 feet long.

Table 5.11 – 2050 Build with SPUI Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 347/Riggs Road SPUI													
LOS	C		A	C		A	C	C	A	C	B	A	B
Average Delay (s)	29		0	28		0	26	30	0	21	15	0	15
95th Percentile Queue (ft)	141		0	13		0	72	45	0	298	17	0	-

The SR 347/Riggs Road TI is anticipated to operate at an overall LOS B in the 2050 Build with SPUI scenario during the PM peak hour. All movements are anticipated to operate at LOS C or better, with 95th percentile queues no greater than 298 feet long.

5.5.3 Diverging Diamond Interchange Capacity Analysis Results

An intersection diagram extracted from Synchro showing the DDI lane geometry and intersection numbering is presented in **Figure 5.3**. Intersection numbers are provided for reference in reviewing the DDI analysis results. The results of the 2050 Build AM and 2050 Build PM intersection capacity analyses with the DDI configuration are shown in **Table 5.12** and **Table 5.13**, respectively. The Synchro output reports for the DDI configuration are provided in **Appendix 3**.

Figure 5.3 – DDI Intersection Diagram

Table 5.12 – 2050 Build with DDI Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
Riggs Road EB/Riggs Road WB [Int. ID 403]													
LOS								A			A		A
Average Delay (s)								6			5		5
95th Percentile Queue (ft)								8			16		-
Riggs Road EB/SR 347 SBL Off-ramp [Int. ID 404]													
LOS				A				A					A
Average Delay (s)				0				3					3
95th Percentile Queue (ft)				0				3					-
Riggs Road WB/Riggs Road EB [Int. ID 406]													
LOS								A			A		A
Average Delay (s)								10			8		8
95th Percentile Queue (ft)								10			29		-
SR 347 NBR Off-ramp/Riggs Road EB [Int. ID 407]													
LOS			A					A					A
Average Delay (s)			1					3					1
95th Percentile Queue (ft)			0					2					-
SR 347 NBL Off-ramp/Riggs Road WB [Int. ID 410]													
LOS	A										A		A
Average Delay (s)	1										3		2
95th Percentile Queue (ft)	0										7		-
Riggs Road WB/SR 347 SBR Off-ramp [Int. ID 412]													
LOS					A						A		A
Average Delay (s)					0						2		2
95th Percentile Queue (ft)					0						7		-

All SR 347/Riggs Road TI intersections are anticipated to operate at an overall LOS A in the 2050 Build with DDI scenario during the AM peak hour. All movements are anticipated to operate at LOS A, with 95th percentile queues no greater than 29 feet long.

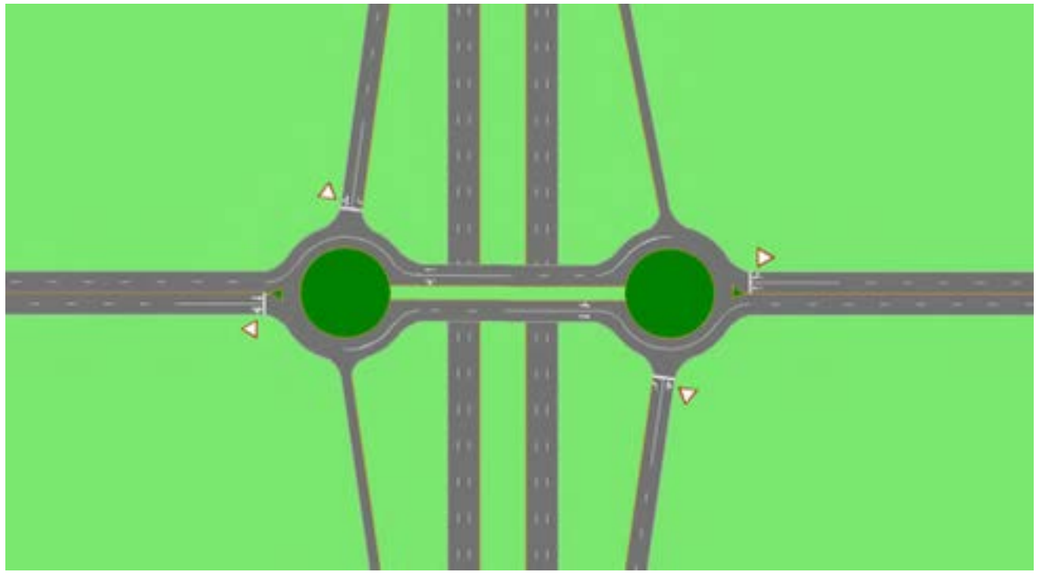
Table 5.13 – 2050 Build with DDI Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
Riggs Road EB/Riggs Road WB [Int. ID 403]													
LOS								A			A		A
Average Delay (s)								6			6		6
95th Percentile Queue (ft)								14			15		-
Riggs Road EB/SR 347 SBL Off-ramp [Int. ID 404]													
LOS				A				A					A
Average Delay (s)				0				3					3
95th Percentile Queue (ft)				0				5					-
Riggs Road WB/Riggs Road EB [Int. ID 406]													
LOS								B			A		A
Average Delay (s)								13			7		8
95th Percentile Queue (ft)								22			65		-
SR 347 NBR Off-ramp/Riggs Road EB [Int. ID 407]													
LOS			A					A					A
Average Delay (s)			0					4					1
95th Percentile Queue (ft)			0					3					-
SR 347 NBL Off-ramp/Riggs Road WB [Int. ID 410]													
LOS	A										A		A
Average Delay (s)	1										2		2
95th Percentile Queue (ft)	4										12		-
Riggs Road WB/SR 347 SBR Off-ramp [Int. ID 412]													
LOS					A						A		A
Average Delay (s)					0						3		3
95th Percentile Queue (ft)					0						6		-

All SR 347/Riggs Road TI intersections are anticipated to operate at an overall LOS A in the 2050 Build with DDI scenario during the PM peak hour. All movements are anticipated to operate at LOS B or better, with 95th percentile queues no greater than 65 feet long.

5.5.4 Double Roundabout Interchange Capacity Analysis Results

An intersection diagram showing the preliminary layout for the teardrop-style DRI with lane geometry is presented in **Figure 5.4**. The results of the 2050 Build AM and 2050 Build PM intersection capacity analyses with the DRI configuration are shown in **Table 5.14** and **Table 5.15**, respectively. The analysis results are provided by approach and for the total intersection. The Rodel output reports for the DRI are provided in **Appendix 3**.



Note: Synchro diagram shown for visual purposes only. Analysis done using Rodel.

Figure 5.4 – DRI Intersection Diagram

Table 5.14 – 2050 Build with DRI Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach	SB Approach	EB Approach	WB Approach	Overall
SR 347 SB Ramps/Riggs Road					
LOS		A	A	A	A
Average Delay (s)		2	2	3	3
95th Percentile Queue (ft)		2	12	29	-
SR 347 NB Ramps/Riggs Road					
LOS	A		A	A	A
Average Delay (s)	3		2	2	2
95th Percentile Queue (ft)	27		3	10	-

Both SR 347/Riggs Road TI ramp intersections are anticipated to operate at an overall LOS A in the 2050 Build with DRI scenario during the AM peak hour. All approaches are anticipated to operate at LOS A or better, with 95th percentile queues no greater than 29 feet long.

Table 5.15 – 2050 Build with DRI Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach	SB Approach	EB Approach	WB Approach	Overall
SR 347 SB Ramps/Riggs Road					
LOS		A	A	A	A
Average Delay (s)		2	3	3	3
95th Percentile Queue (ft)		1	32	37	-
SR 347 NB Ramps/Riggs Road					
LOS	A		A	A	A
Average Delay (s)	3		3	2	2
95th Percentile Queue (ft)	23		9	24	-

Both SR 347/Riggs Road TI ramp intersections are anticipated to operate at an overall LOS A in the 2050 Build with DRI scenario during the PM peak hour. All approaches are anticipated to operate at LOS A or better, with 95th percentile queues no greater than 37 feet long.

6. FREEWAY OPERATIONAL ANALYSIS

6.1 Analysis Methodology

An operational analysis was performed for SR 347 within the project limits, including the general-purpose lanes, ramp junctions, and merge/diverge sections, for the 2050 Build scenario. Three freeway segment types were analyzed:

- *Basic segments* – Freeway segments not influenced by on-ramp and off-ramp traffic
- *Merging segments* – Freeway segments influenced by on-ramp traffic
- *Diverging segments* – Freeway segments influenced by off-ramp traffic

Highway Capacity Software (HCS) was used to provide measures of effectiveness for each analysis segment. HCS outputs LOS as a function of average vehicle density based on the methodology described in HCM 6. HCS also reports other operational measures such as average vehicle speed.

The concept of LOS uses qualitative measures to characterize operational conditions for roadway segments. Segments are given letter designations from LOS A to LOS F, with LOS A representing uncongested free flow conditions and LOS F representing an overcapacity condition with a high degree of congestion and vehicle delay. Each LOS grade represents a range of operational conditions.

Table 6.1 shows the average vehicle density ranges in passenger cars per mile per lane (pc/mi/ln) that correspond with each segment LOS letter grade for urban conditions. For the 2050 Build LOS analysis, the urban roadway type was used for all roadway segments because SR 347 experiences commuter traffic patterns typical of urban conditions during peak periods and these urban conditions are expected to be present in 2050 as well. Per the ADOT Roadway Design Guidelines Table 103.2A, urban freeways should be designed to ideally achieve LOS C/LOS D or better.

Table 6.1 – Freeway Segment Vehicle Density Ranges and Level of Service

Level of Service	Basic Segment Urban Density Range (pc/mi/ln)	Merge/Diverge Segment Urban Density Range (pc/mi/ln)
A	≤ 11	≤ 10
B	> 11 and ≤ 18	> 10 and ≤ 20
C	> 18 and ≤ 26	> 20 and ≤ 28
D	> 26 and ≤ 35	> 28 and ≤ 35
E	> 35 and ≤ 45	> 35
F	> 45 or v/c > 1.0*	v/c > 1.0*

*v/c = volume-to-capacity ratio
Source: HCM 6th Edition

The 2050 Build analysis utilized the 2050 Build volumes and geometry described in Section 3.0 of this report (e.g., three lanes in each direction on SR 347). At the time of this report, the TI configuration and design have not been finalized. Therefore, all on-ramps and off-ramps were analyzed assuming 1,300-foot-long acceleration lanes and 600-foot-long deceleration lanes, respectively, including tapers. These values represent the minimum "fringe-urban freeway" ramp lengths outlined in Figures 504.7 and 504.8A of the ADOT Roadway Design Guidelines and provide a conservative estimate of LOS. All ramps were analyzed as single-lane ramps. A base free-flow speed of 75 mph was assumed on the SR 347 mainline, and a base free-flow speed of 35 mph was assumed on the SR 347 ramps.

6.2 2050 Build Freeway Analysis Results

The average vehicle speed, vehicle density, and corresponding LOS for each freeway segment and peak hour for the 2050 Build scenario are presented in **Table 6.2**. The 2050 Build scenario HCS output reports are provided in **Appendix 4**.

Table 6.2 – 2050 Build Freeway Level of Service by Segment

Mainline Segment	AM Peak Hour			PM Peak Hour		
	Average Speed (mph)	Average Density (pc/mi/ln)	LOS	Average Speed (mph)	Average Density (pc/mi/ln)	LOS
SR 347 NB						
Basic Segment	72.1	20.3	C	74.1	10.0	A
Merging Segment	67.7	21.7	B	69.6	11.2	A
Diverging Segment	65.3	22.4	C	64.5	11.5	B
SR 347 SB						
Basic Segment	74.1	7.3	A	73.4	17.6	B
Merging Segment	69.4	9.7	A	66.4	24.0	C
Diverging Segment	65.7	8.2	A	66.6	19.4	C

Based on the 2050 Build freeway LOS analysis, all freeway segments within the project area are expected to operate at LOS C or better in the AM and PM peak hours, which meets ADOT's desired LOS threshold for freeway operations. The highest density is 24.0 pc/mi/ln at the SB SR 347 on-ramp merge point in the PM peak hour.

For comparative purposes, the SR 347 mainline was also analyzed as only having two lanes in each direction; however, this results in LOS D and LOS E on several segments. A summary of the delay and LOS of each segment with two travel lanes on SR 347 is shown in the Design Analysis Table sections of the HCS reports in **Appendix 4**.

7. Other Traffic Considerations

Several other traffic-related considerations besides traffic operations should be evaluated when determining the advantages and disadvantages of various traffic interchange configurations. These include motorist safety, interchange familiarity, access, traffic diversion accommodation, pedestrian and bicyclist accommodation and safety, and oversize vehicle accommodation.

7.1 Motorist Safety

One measure of motorist safety for interchange configurations is the number of vehicle conflict points, where vehicles may collide if travel right-of-way rules are not observed. Of particular concern are vehicle crossing points, where vehicles traveling in different directions could potentially collide (such as in an angle or left-turn crash). These types of crashes are more likely to cause severe injury to vehicle occupants than vehicles traveling in the same general direction (such as sideswipe crashes). Perpendicular crossing points have a high potential for severe injury to vehicle occupants. The number of conflict points for each interchange configuration is listed below:

- A standard four-legged signalized intersection (the No-Build scenario) has 32 conflict points, including 16 crossing points (4 of which are perpendicular).
- The SDI has 26 conflict points, including 10 crossing points (4 of which are perpendicular).
- The SPUI has 20 conflict points, including 8 crossing points (0 of which are perpendicular).
- The DDI has 14 conflict points, including 2 crossing points (0 of which are perpendicular).
- The DRI has 4 conflict points, including 4 crossing points (0 of which are perpendicular).

Head-on/wrong-way crashes have a high potential for severe injury to vehicle occupants. Head-on/wrong-way travel is prohibited only by signage at the No-Build, SDI, and SPUI, whereas raised curbs and the angles of intersecting lanes make it more difficult to have head-on/wrong-way travel at the DDI and DRI.

Vehicle speeds at the No-Build, SDI, and SPUI are controlled only by traffic lights and signage, whereas raised curbs and roadway geometry help reduce vehicle speeds at the DDI and DRI. This reduces the likelihood of severe injury to vehicle occupants in the event of a crash.

7.2 Interchange Familiarity

Drivers are very familiar with the No-Build configuration as this is the existing condition. Most drivers that pass through SR 347/Riggs Road are likely very familiar with how the SDI operates as the majority of freeway traffic interchanges in the greater Phoenix area are SDIs (or the related and more compact TDI), including the two existing interchanges closest to SR 347/Riggs Road (I-10/SR 347 and I-10/Riggs Road).

Most drivers that pass through SR 347/Riggs Road are likely familiar with how a SPUI operates as SPUIs, while not as prevalent as SDIs, have been present in the greater Phoenix area along I-17, SR 51, and Loop 101 for decades.

Most drivers that pass through SR 347/Riggs Road are likely not very familiar with how a DDI operates as DDIs are relatively new to Arizona. To date, there are only four operating DDIs in the greater Phoenix area: I-17/Happy Valley Road, I-10/Miller Road, Loop 202 South Mountain/Desert Foothills Parkway, and Loop 202 South Mountain/17th Avenue (the latter two of which are half-interchange DDIs). Another DDI is under construction at I-10/Watson Road. GRIC has voiced a preference for DDIs at the nearby I-10/SR 347 and I-10/Wild Horse Pass Boulevard TIs, which are planned to be converted to DDIs in the near future.

Most drivers that pass through SR 347/Riggs Road are likely somewhat familiar with how a DRI operates. Roundabout intersections have become much more prevalent over the last 20 years, but there are currently a limited number of DRIs in the greater Phoenix metropolitan area. A teardrop-style DRI was recently constructed at Loop 202 South Mountain/Estrella Drive and a teardrop-style DRI is also being planned at the I-10/Casa Blanca Road TI. GRIC has expressed a willingness to consider roundabouts as a possible solution at the SR 347/Riggs Road TI. MCDOT has also voiced support for a DRI at this location.

7.3 Access

As stated in Section 506 of the 2022 ADOT Roadway Design Guidelines (RDG), “adequate access control is essential to the safe and efficient operation of traffic interchanges.” All Build interchange configurations (SDI, SPUI, DDI, and DRI) will likely have the same or similar access control requirements that will affect access options on all four corners of the interchange. The No-Build will not affect existing access conditions.

All Build interchange configurations will require the access to the existing substation on the northwest corner of SR 347/Riggs Road to be relocated farther west along Beltline Road (Riggs Road). Per the ADOT RDG, the closest allowable access is supposed to be a right-in/right-out (RIRO) driveway 660 feet west of the SB ramp radius return of the new interchange, with the closest allowable full access 1,320 feet west of the SB ramp radius return of the new interchange. The ADOT RDG acknowledges that “in areas with existing development, it may sometimes be difficult to obtain minimum access control distance along the crossroad. Right-of-way acquisition for the access control must be considered and evaluated based upon land ownership and existing access”.

Interchange alternatives that push the interchange farther to the east could limit access to the existing tribal allottee parcels to the east of SR 347.

The DRI provides convenient U-turn opportunities at either roundabout, which can help minimize the adverse impacts of access control restrictions on Riggs Road. The SDI, SPUI, and DDI do not typically permit U-turns within the interchange.

7.4 Traffic Diversion Accommodation

When there is a closure or restriction on I-10 through the Gila River Indian Community, SR 347 often serves as an alternate route for diverting traffic from I-10 via Riggs Road as there is no developed arterial network nearby. For the same reason, I-10 serves as an alternate route for diverting traffic from SR 347 via Riggs Road. Riggs Road/Beltline Road also serves as an alternate route for diverting traffic from Loop 202 South Mountain due to a closure or restriction.

Interchange geometry and traffic control at SR 347/Riggs Road should recognize the need for flexibility to accommodate significant diversions of traffic periodically due to incident and construction closures or restrictions, including routing mainline traffic to use interchange ramps to bypass the closures or restrictions. Recognizing this, ADOT has recently implemented the practice of providing a two-lane off-ramp and a four-lane ramp approach at TI ramp/crossroad intersections, where feasible, to provide flexibility in how traffic can be redirected. This practice includes providing the ability for traffic to cross straight through ramp/crossroad intersections and use the on-ramp to reenter the mainline.

The No-Build provides flexibility at the signalized intersection to divert traffic but is capacity-constrained by the existing geometry. The SDI provides the desired ability to allow traffic to exit the mainline at the TI, continue across the crossroad at the TI, and then reenter the mainline. Traffic signal timing at an SDI can easily be modified to better accommodate diverted traffic volumes at the TI, minimizing back-ups onto the mainline.

The SPUI and DDI do not typically allow for exiting mainline traffic to cross straight through the ramp/crossroad intersection and immediately get back on the mainline. Through movements are typically not permitted due to the channelized left-turn and right-turn lanes on the off-ramps and on-ramps. Instead, at a typical SPUI or DDI, exiting traffic would need to make a left- or right-turn at the off-ramp/crossroad intersection, make a U-turn somewhere along the crossroad, return to the TI, and then enter the mainline using the on-ramp.

A SPUI or DDI can be designed to allow for through movements at the ramp/crossroad intersection; however, completing this movement requires making additional turning movements and passing through an additional intersection. The capacity of these through movements is generally lower than the through movement at an SDI or DRI because typically only one lane is provided to make the through movement and it is not as simple of a movement. An example of a DDI that allows for through movements at the ramp/crossroads intersection can be found at the I-17/Happy Valley Road TI. At this location, NB and SB ramp traffic must make a right turn, cross all EB or WB through lanes, and immediately make a left turn to continue NB or SB through the TI. The SPUI and DDI configuration scenarios require a large footprint to achieve this functionality and the construction phasing is complex.

The DRI provides the desired ability to allow traffic to exit the mainline at the TI, continue across the crossroad at the TI by going partway around the roundabout, and then reenter the mainline. Depending on the roundabout configuration, there could be one or two exiting lanes that would allow traffic to go through the interchange and get back on the mainline. Roundabouts operate using yield control, so the DRI does not have the capability that the signalized SDI does to quickly “flush” a large volume of diverted traffic through the TI unless officer control is implemented at each of the entering approaches of the DRI.

7.5 Pedestrian and Bicyclist Accommodation and Safety

The No-Build includes pedestrian crossing indications and shoulders for bicycle travel but does not include any pedestrian facilities like crosswalks, sidewalks, and ramps. Pedestrians and bicyclists can be accommodated at all four TI configurations being analyzed. The SDI, SPUI, and DDI typically provide separate facilities for pedestrians (sidewalks) and bicyclists (bike lanes). Roundabouts do not typically include bike lanes within the circulating area for safety reasons, so the DRI typically includes ramps for bicyclists to transition from the bike lane to the sidewalk on approach to the TI and then again from the sidewalk to the bike lane when departing the TI.

The No-Build requires pedestrians to cross vehicle paths at least one time to get across the intersection. The SDI requires pedestrians to cross vehicle paths at least two times to get across the TI. There are typically pedestrian crossing phases within the traffic signal cycle that provide “protected” time for pedestrians to cross. If right-turn lanes are channelized, the pedestrian crossing is typically not signalized although it can be. It can take up to two signal cycles for pedestrians to cross the TI.

The SPUI requires pedestrians to cross vehicle paths at least four times to get across the TI. There are typically pedestrian crossing phases within the traffic signal cycle that provide “protected” time for pedestrians to cross the left-turn lanes. The right-turn lanes are channelized and the pedestrian crossing may or may not be signalized. It can take up to four signal cycles for pedestrians to cross the TI.

The DDI requires pedestrians to cross vehicle paths at least four times to get across the TI. There are typically pedestrian crossing phases within the traffic signal cycle that provide “protected” time for pedestrians to cross the left-turn lanes. The right-turn lanes are channelized and the pedestrian crossing may or may not be signalized. It can take up to four signal cycles for pedestrians to cross the TI, but the signal cycle lengths for a DDI are usually much shorter than for an SDI or SPUI.

The DRI requires pedestrians to cross vehicle paths at least two times to get across the TI. With the roundabout being yield-controlled, there are typically no signalized crossings for pedestrians, which can make it challenging for those with disabilities to cross. This may be offset to some degree, however, by the lower speed of vehicles at the crossings, as lower vehicle speeds reduce the likelihood of severe injury to pedestrians. Pedestrian-actuated signals or pedestrian hybrid beacons could be added to address this issue but doing so will impede traffic movements entering and exiting the roundabout when the signals/beacons are activated.

7.6 Oversize Vehicle Accommodation

SR 347 and Riggs Road are both sometimes used as routes for oversize vehicles. The SR 347/Riggs Road TI should be designed to accommodate oversize vehicles, where feasible. This includes providing adequate vertical clearance as well as adequate turning radii.

The No-Build accommodates oversize vehicles well as there are no major horizontal or vertical restrictions (besides the signal poles and mast arms). The SDI can provide adequate vertical clearance by allowing oversize vehicles on SR 347 to “ramp around” the TI bridge if needed by allowing vehicles to cross straight through the ramp/crossroad intersection and immediately return to the mainline. The SDI typically provides adequate turning radii for oversize vehicles.

The SPUI and DDI do not allow oversize vehicles on SR 347 to “ramp around” the TI bridge because there is typically no through movement on the off-ramp at the SPUI or DDI. The constrained path of channelized turn lanes at a SPUI or a DDI may be a challenge for some oversize vehicles to navigate without running up on the curbs.

The DRI can provide adequate vertical clearance by allowing oversize vehicles on SR 347 to “ramp around” the TI bridge if needed by allowing vehicles to cross straight through the ramp/crossroad intersection and immediately return to the mainline if the splitter islands and central island have mountable curbs (which is normally the case at a roundabout). The DRI typically provides adequate turning radii for oversize vehicles by providing a truck apron and mountable curbs for the splitter islands and central island. Some low-clearance oversize vehicles, however, may have a challenge navigating roundabouts because of the varying elevation of the intersection from the many curbs and islands present.

Oversize vehicles on Riggs Road won’t have the option to “ramp around” the TI bridge if SR 347 crosses over Riggs Road as there aren’t any ramps on Riggs Road in any of the TI configuration scenarios.

Vehicle requirements should be coordinated with the contact below during final design to make sure the proper design vehicle is being used:

Christina Pippin
Statewide Permit Services Supervisor
cpippin@azdot.gov
602-712-8280

8. ENVIRONMENTAL REPORT DATA SUMMARY

ADOT requires a Noise Report and Air Quality Report as part of the Environmental Planning process, which includes documentation of vehicle classifications, traffic projections and intersection/interchange LOS analysis for the 2022 Existing, 2050 No-Build, and 2050 Build scenarios. The following section summarizes these results for use in the Noise Report and Air Quality Report.

8.1 Noise Report Data Summary

For the purposes of this analysis, vehicle volumes were divided into the following three vehicle classification categories:

- Passenger cars;
- Medium vehicles; and
- Heavy vehicles.

Traffic volumes were categorically classified using the FHWA 13-Class classification scheme, where passenger cars are in FHWA Classes 1-4, medium vehicles are in FHWA Class 5, and heavy vehicles are in FHWA Classes 6-13. **Table 8.1** summarizes the percentages of passenger cars, medium vehicles, and heavy vehicles on each leg of the SR 347/Riggs Road intersection. These percentages were applied uniformly to each of the analysis scenarios.

Table 8.1 – Noise Report Vehicle Classification Percentages

Roadway Segment	Passenger Cars	Medium Vehicles	Heavy Vehicles
SR 347 north of Riggs Road	94%	1%	5%
SR 347 south of Riggs Road	94%	1%	5%
Riggs Road east of SR 347	92%	2%	6%
Riggs Road west of SR 347	87%	2%	11%

Table 8.2 summarizes the bidirectional ADT volumes and peak hour volumes on each leg of the SR 347/Riggs Road intersection. The bidirectional peak hour volumes were calculated using the K-factors shown in the previously referenced **Table 2.1** and **Table 3.2** and the vehicle classification percentages shown in the previously referenced **Table 8.1**.

Table 8.2 – Noise Report Traffic Volumes

	Roadway Segment	ADT Volume (vpd)	Peak Hour Volume (vph)			
			Total	Passenger Cars	Medium Vehicles	Heavy Vehicles
2022 Existing	SR 347 north of Riggs Road	47,629	3,335	3,135	33	167
	SR 347 south of Riggs Road	53,343	3,735	3,511	37	187
	Riggs Road east of SR 347	4,476	448	412	9	27
	Riggs Road west of SR 347	3,777	378	329	8	42
2050 No-Build	SR 347 north of Riggs Road	66,516	4,657	4,378	47	233
	SR 347 south of Riggs Road	74,496	5,215	4,902	52	261
	Riggs Road east of SR 347	11,728	1,173	1,079	23	70
	Riggs Road west of SR 347	9,897	990	861	20	109
2050 Build	SR 347 north of Riggs Road	74,285	5,200	4,888	52	260
	SR 347 south of Riggs Road	83,196	5,824	5,475	58	291
	Riggs Road east of SR 347	10,241	1,025	943	21	62
	Riggs Road west of SR 347	8,642	865	753	17	95

8.2 Air Quality Report Data Summary

Table 8.3 summarizes the ADTs for all vehicles, truck ADTs (includes the combination of medium and heavy vehicles), and truck percentages (both medium and heavy vehicles) on each leg of the SR 347/Riggs Road intersection.

Table 8.3 – Air Quality Report Daily Traffic Volumes and Truck Percentages

	2022 Existing	2050 No-Build	2050 Build	Difference (2050 Build vs. No-Build)
SR 347 north of Riggs Road				
Total ADT	47,629	66,516	74,285	7,769
Truck ADT	2,858	3,991	4,457	466
Truck %	6%	6%	6%	0%
SR 347 south of Riggs Road				
Total ADT	53,343	74,496	83,196	8,700
Truck ADT	3,201	4,470	4,992	522
Truck %	6%	6%	6%	0%
Riggs Road east of SR 347				
Total ADT	4,476	11,728	10,241	-1,487
Truck ADT	358	938	819	-119
Truck %	8%	8%	8%	0%
Riggs Road west of SR 347				
Total ADT	3,777	9,897	8,642	-1,255
Truck ADT	491	1,287	1,123	-164
Truck %	13%	13%	13%	0%

Table 8.4 summarizes the overall intersection/interchange LOS of each design scenario during the AM and PM peak hours.

Table 8.4 – Air Quality Report Intersection Level of Service

Scenario	LOS	
	AM	PM
2022 Existing	E	F
2050 No-Build	F	F
2050 Baseline Build	F	F
2050 Build (all configurations)	A/B*	A/B*

**LOS A or B in all 2050 Build configurations.*

9. SUMMARY

The principal findings of the traffic analysis are summarized below:

SR 347

- With the current roadway geometry of the SR 347 mainline having two GPLs in each direction, SR 347 experiences significant congestion and delays. This situation is anticipated to worsen without improvements.
- The congestion on SR 347 contributes to crashes along SR 347.
- 2050 traffic volumes are projected to be approximately 1.4 times current levels without the construction of a TI and 1.6 times current levels with the construction of a TI.
- Widening the SR 347 mainline to three GPLs in each direction improves traffic operations but is not sufficient to provide acceptable LOS in 2050. Additional improvements such as grade separation of SR 347/Riggs Road are warranted.

SR 347/Riggs Road

- The existing condition provides an overall LOS E/F at the at-grade signalized intersection in 2022.
- The Baseline Build provides an overall LOS F at the at-grade intersection through 2050.
- The SDI provides an overall LOS B or better at each TI ramp intersection through 2050.
- The SPUI provides an overall LOS B or better at the TI ramps intersection through 2050.
- The DDI provides an overall LOS A at each TI ramp intersection and crossover point through 2050.
- The DRI provides an overall LOS A at each TI ramp intersection through 2050.
- **Table 9.1** summarizes the worst intersection LOS for each scenario with its accompanying delay in seconds. It should be noted that all four build TI configuration scenarios provide acceptable LOS.

Table 9.1 – 2050 Level of Service Summary

SR 347/Riggs Road Scenario	Worst Peak Hour Intersection LOS / Average Delay (s)
2050 No Build (existing condition)	F / 367
2050 Baseline Build (widen to 3 lanes NB/SB on SR 347)	F / 270
2050 Spread Diamond Interchange (2 lanes EB/WB on Riggs Road)	B / 19
2050 Single Point Urban Interchange (2 lanes EB/WB on Riggs Road)	B / 15
2050 Diverging Diamond Interchange (2 lanes EB/WB on Riggs Road)	A / 8
2050 Double Roundabout Interchange (2 lanes EB/WB on Riggs Road)	A / 3

Other Traffic-Related Interchange Considerations

- The DRI provides the most benefit in terms of safety, followed in order by the DDI, the SPUI, and the SDI.
- Drivers are most familiar with the SDI, followed in order by the SPUI, the DRI, and the DDI.
- All four analyzed interchange types will likely have similar access requirements, but only the DRI provides U-turn opportunities at the ramp/crossroad intersections to help with access.
- The SDI provides the most benefit in terms of traffic diversion accommodation, followed by the DRI, the SPUI, and the DDI, with the latter three providing a similar level of benefit.
- The DRI and the DDI provide the most benefit in terms of pedestrian and bicyclist accommodation and safety, followed by the SDI and the SPUI, with the latter two providing a similar level of benefit.
- The SDI provides the most benefit in terms of oversize vehicle accommodation, followed in order by the DRI and then the SPUI and the DDI providing a similar level of benefit.
- Other factors besides traffic considerations (e.g., right-of-way impacts, cost, etc.) should be considered before determining the preferred TI configuration at SR 347/Riggs Road.

The various configuration scenarios were compared to each other using several different evaluation criteria. Some of the evaluation criteria used do not lend themselves to numerical quantification, so the evaluation was performed on a “qualitative” basis using the following descriptors to describe the relative impacts of each of the scenarios plus the “No-Build” scenario:

- ● Strong Advantage;
- ◐ Advantage;
- ○ Neutral;
- ◑ Disadvantage; and
- ● Strong Disadvantage.

The Strong Advantage and Advantage descriptors apply when the implementation of a scenario is anticipated to result in a positive change or improvement compared to existing conditions. The Strong Disadvantage and Disadvantage descriptors apply when the implementation of a scenario is anticipated to result in a negative change or worsening compared to existing conditions. The Neutral descriptor applies when the implementation of a scenario is anticipated to have no impact on current conditions or result in both positive and negative changes that effectively cancel each other out.

Table 9.2 summarizes the relative advantages and disadvantages of the No-Build and Build scenarios analyzed (Baseline Build, SDI, SPUI, DDI, and DRI).

Table 9.2 – Evaluation Matrix of Traffic Configuration Scenarios and Criteria

Evaluation Criteria	No-Build (Signalized Intersection)	Baseline Build (Signalized Intersection, widen to three lanes NB/SB on SR 347)	Spread Diamond Interchange (SDI)	Single-Point Urban Interchange (SPUI)	Diverging Diamond Interchange (DDI)	Double Roundabout Interchange (DRI)
Traffic Operations (2050 AM/PM)	● - LOS F/F - Queues of 4,490'/4,191'	● - LOS F/F - Queues of 3,038'/3,077'	◐ - LOS B/B - Queues of 128'/235'	◐ - LOS A/B - Queues of 114'/298'	● - LOS A/A - Queues of 29'/65'	● - LOS A/A - Queues of 29'/37'
Motorist Safety	● - 32 conflict points, 16 crossing points (4 perpendicular) - Speed and wrong-way control by signals and signs - History of frequent crashes, many of which are severe	● - 32 conflict points, 16 crossing points (4 perpendicular) - Speed and wrong-way control by signals and signs - History of frequent crashes, many of which are severe	◑ - 26 conflict points, 10 crossing points (4 perpendicular) - Speed and wrong-way control by signals and signs	○ - 20 conflict points, 8 crossing points (0 perpendicular) - Speed and wrong-way control by signals and signs	◐ - 14 conflict points, 2 crossing points (0 perpendicular) - Speed and wrong-way control by curbs and roadway geometry	● - 4 conflict points, 4 crossing points (0 perpendicular) - Speed and wrong-way control by curbs and roadway geometry
Driver Familiarity	● - Very common configuration	● - Very common configuration	● - Very common configuration	◐ - Common configuration	◑ - Uncommon configuration	○ - Somewhat common configuration
Access to Adjacent Parcels	○ - No change to existing access conditions	○ - No change to existing access conditions	● - Access restrictions require relocation of substation access and could limit access to tribal allottee parcels east of SR 347	● - Access restrictions require relocation of substation access and could limit access to tribal allottee parcels east of SR 347	● - Access restrictions require relocation of substation access and could limit access to tribal allottee parcels east of SR 347	◑ - Access restrictions require relocation of substation access and could limit access to tribal allottee parcels east of SR 347 - Roundabout provides U-turn opportunity within interchange
Traffic Diversion Accommodation	○ - Flexible but capacity-constrained	○ - Flexible but capacity-constrained	● - Increased capacity with direct through movement at ramps - Can easily modify signal timing to clear queues	◐ - Increased capacity but through movement typically not provided or provided only indirectly at ramps - Can easily modify signal timing to clear queues	◐ - Increased capacity but through movement typically not provided or provided only indirectly at ramps - Can easily modify signal timing to clear queues	◐ - Increased capacity with direct through movement at ramps - Yield control cannot easily be modified to clear queues
Pedestrian and Bicyclist Accommodation and Safety	◑ - 1 crossing required, signalized - Includes pedestrian crossing indications and shoulders but is missing crosswalks, sidewalk, and ramps - High vehicle speeds negatively affect pedestrian and bicyclist safety and comfort	◑ - 1 crossing required, signalized - Includes pedestrian crossing indications and shoulders but is missing crosswalks, sidewalk, and ramps - High vehicle speeds negatively affect pedestrian and bicyclist safety and comfort	○ - 2 crossings required, typically all signalized - Includes standard pedestrian and bicyclist facilities - High vehicle speeds negatively affect pedestrian and bicyclist safety and comfort	○ - 4 crossings required, some or all signalized - Includes standard pedestrian and bicyclist facilities - High vehicle speeds negatively affect pedestrian and bicyclist safety and comfort	◐ - 4 crossings required, some or all signalized - Includes standard pedestrian and bicyclist facilities - Moderate vehicle speeds somewhat affect pedestrian and bicyclist safety and comfort	◐ - 2 crossings required, typically all unsignalized but can be signalized - Includes standard pedestrian and bicyclist facilities - Low vehicle speeds positively affect pedestrian and bicyclist safety and comfort
Oversize Vehicle Accommodation	● - Open geometry with no major horizontal or vertical restrictions	● - Open geometry with no major horizontal or vertical restrictions	◐ - Open geometry with ramp around option	● - Restricted geometry with no ramp around option typically	● - Restricted geometry with no ramp around option typically	◑ - Restricted geometry with ramp around option

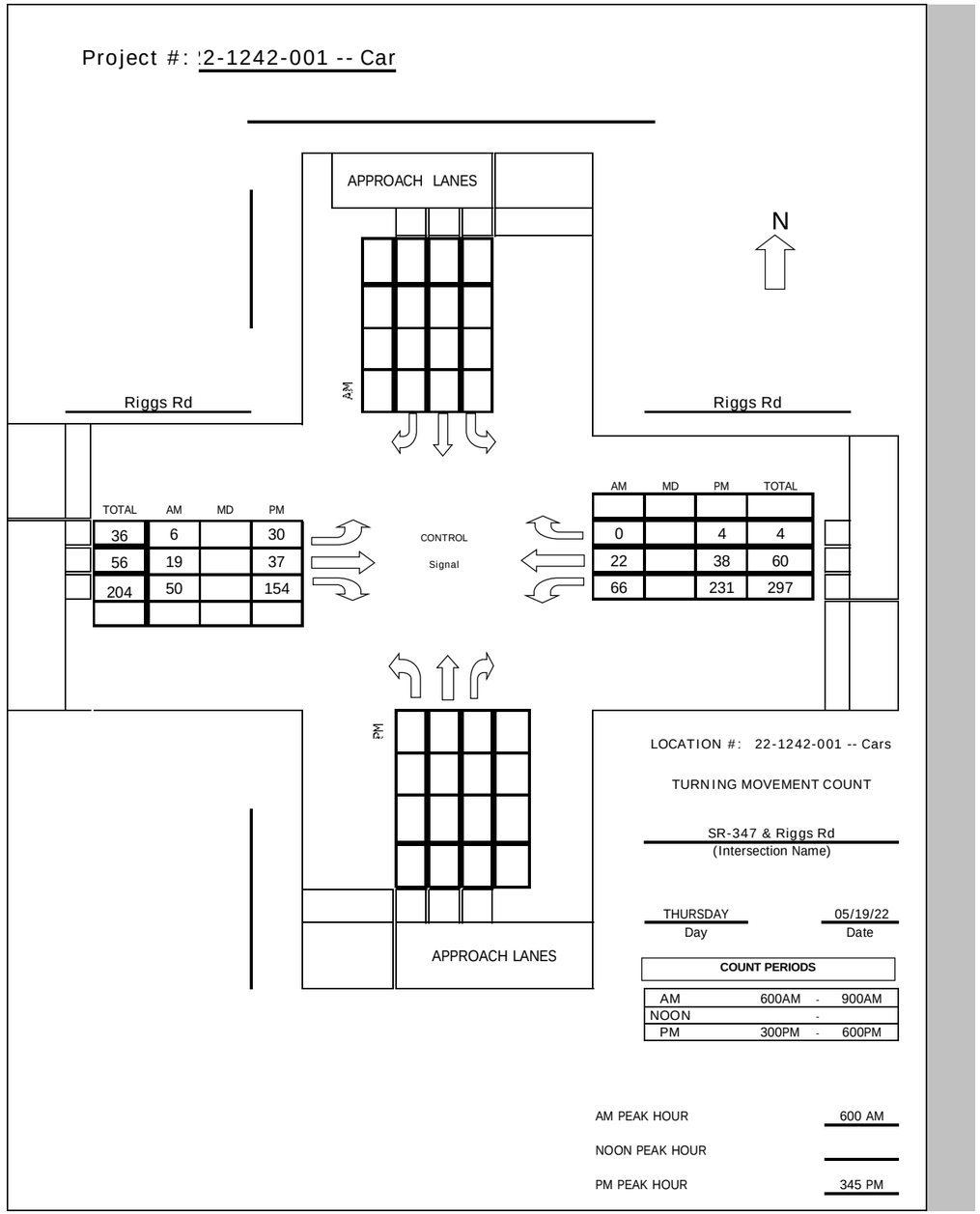
Legend

Strong Advantage ● Advantage ◐ Neutral ○ Disadvantage ◑ Strong Disadvantage ●

Appendix 1. Existing Traffic Volumes and Signal Timings

Intersection Turning Movement
Prepared by:

FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745



Intersection Turning Movement
Prepared by:

FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745
veracity traffi g

N-S STREET: SR-347 DATE: 05/19/22 LOCATION: Chandler

E-W STREET: Riggs Rd DAY: THURSDAY PROJECT# 22-1242-001 -- Cars

	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
LANES:	NL 1	NT 2	NR 1	SL 1	ST 2	SR 1	EL 1	ET 1	ER 0	WL 1	WT 1	WR 0	TOTAL
6:00 AM	27	593	29	2	203	4	0	7	15	9	0	0	889
6:15 AM	20	599	46	0	202	5	0	5	18	16	5	0	916
6:30 AM	27	557	36	0	182	7	0	2	10	23	7	0	851
6:45 AM	19	561	37	0	177	4	6	5	7	18	10	0	844
7:00 AM	22	552	40	2	193	2	7	5	9	33	7	0	872
7:15 AM	27	572	36	0	224	11	0	8	7	22	9	1	917
7:30 AM	23	490	36	0	185	5	5	7	5	24	7	1	788
7:45 AM	16	411	24	0	213	6	2	11	8	17	2	0	710
8:00 AM	14	388	27	0	195	1	3	4	10	27	3	1	673
8:15 AM	17	396	23	2	220	2	2	9	10	23	4	0	708
8:30 AM	11	291	26	2	168	2	2	3	4	29	6	2	546
8:45 AM	10	322	11	0	169	4	0	2	5	19	5	0	547
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													
10:45 AM													
11:00 AM													
11:15 AM													
11:30 AM													
11:45 AM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	233	5732	371	8	2331	53	27	68	108	260	65	5	9261
Approach %	3.68	90.47	5.86	0.33	97.45	2.22	13.30	33.50	53.20	78.79	19.70	1.52	
App/Depart	6336	/	5764	2392	/	2699	203	/	447	330	/	351	

AM Peak Hr Begins at: 600 AM

PEAK													
Volumes	93	2310	148	2	764	20	6	19	50	66	22	0	3500
Approach %	3.65	90.55	5.80	0.25	97.20	2.54	8.00	25.33	66.67	75.00	25.00	0.00	
PEAK HR. FACTOR:		0.959			0.940			0.815			0.733		0.955

CONTROL: Signal
COMMENT 1:
GPS: 33.219224, -111.988897

Intersection Turning Movement

FIELD DATA SERVICES OF ARIZONA, INC. 520.316.6745 veracity traffic

N-S STREET:	SR-347 0	DATE:	05/19/22	LOCATION:	Chandler
E-W STREET:	Riggs Rd	DAY:	THURSDAY	PROJECT#	22-1242-001 -- Cars

	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	1	2	1	1	2	1	1	1	0	1	1	0	
1:00 PM													
1:15 PM													
1:30 PM													
1:45 PM													
2:00 PM													
2:15 PM													
2:30 PM													
2:45 PM													
3:00 PM	29	266	23	2	478	6	4	8	26	60	7	0	909
3:15 PM	26	299	32	2	519	1	6	8	22	52	2	0	969
3:30 PM	17	283	33	0	548	4	9	7	32	38	5	1	977
3:45 PM	22	285	21	2	518	1	6	7	29	57	4	2	954
4:00 PM	21	302	30	0	517	3	6	13	37	52	10	2	993
4:15 PM	17	245	32	4	495	2	12	7	41	71	13	0	939
4:30 PM	26	283	28	0	549	2	6	10	47	51	11	0	1013
4:45 PM	16	287	21	0	504	3	5	6	25	48	10	0	925
5:00 PM	14	322	22	4	547	1	2	5	32	50	5	0	1004
5:15 PM	15	287	23	0	471	0	1	6	37	47	8	1	896
5:30 PM	11	236	16	0	455	1	2	7	17	29	6	0	780
5:45 PM	17	159	15	0	391	2	2	2	24	30	2	1	645
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	231	3254	296	14	5992	26	61	86	369	585	83	7	11004
Approach %	6.11	86.06	7.83	0.23	99.34	0.43	11.82	16.67	71.51	86.67	12.30	1.04	
App/Depart	3781	/	3322	6032	/	6946	516	/	396	675	/	340	

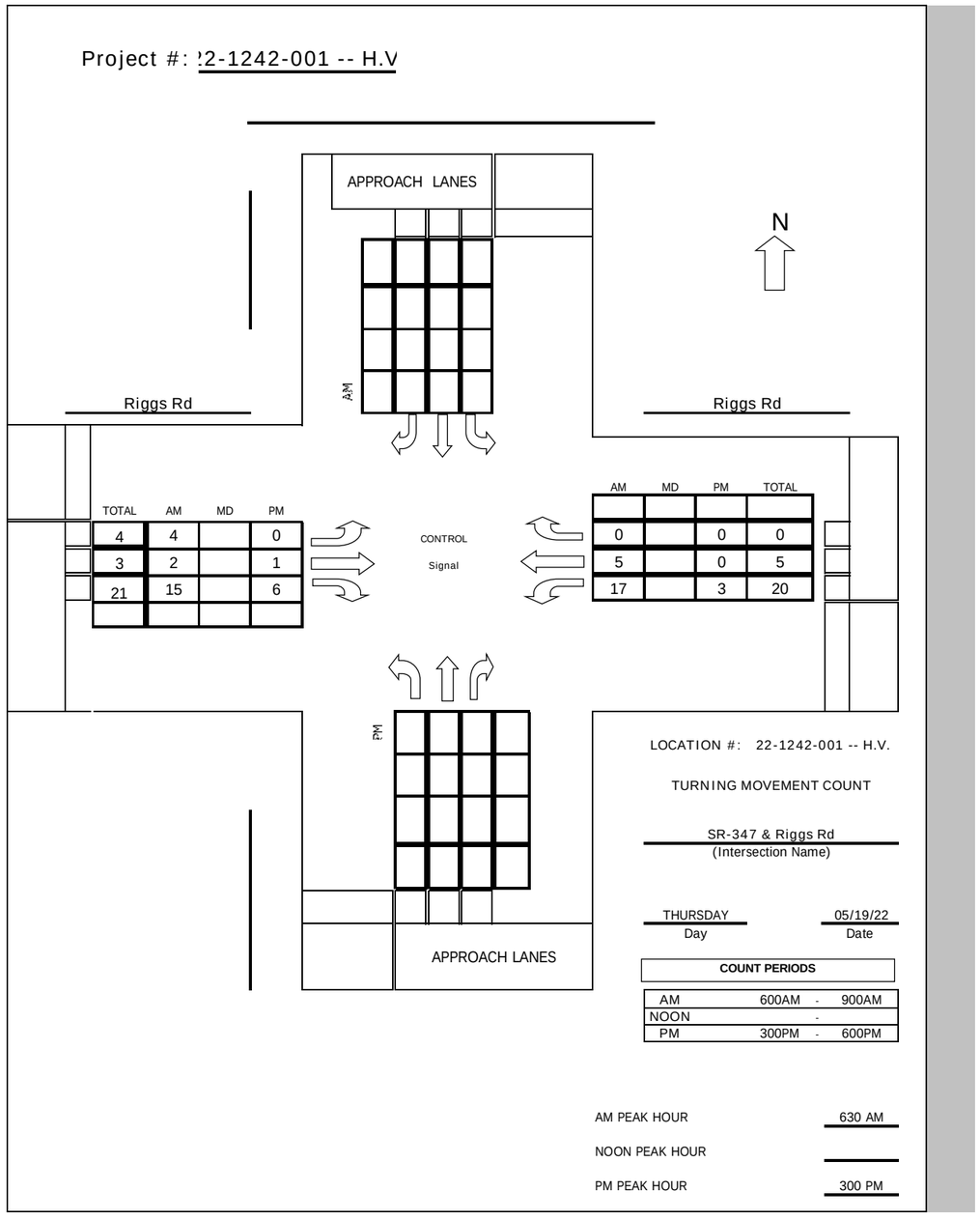
PM Peak Hr Begins at: 345 PM

PEAK													
Volumes	86	1115	111	6	2079	8	30	37	154	231	38	4	3899
Approach %	6.55	84.98	8.46	0.29	99.33	0.38	13.57	16.74	69.68	84.62	13.92	1.47	
PEAK HR. FACTOR:		0.929			0.950			0.877			0.813		0.962

CONTROL: Signal
COMMENT 1: 0
GPS: 33.219224, -111.988897

Intersection Turning Movement
Prepared by:

FIELD DATA SERVICES OF ARIZONA, INC. 520.316.6745



Intersection Turning Movement
Prepared by:

FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745

veracity traffic

N-S STREET:	SR-347	DATE:	05/19/22	LOCATION:	Chandler
E-W STREET:	Riggs Rd	DAY:	THURSDAY	PROJECT#	22-1242-001 -- H.V.

	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	1	2	1	1	2	1	1	1	0	1	1	0	
6:00 AM	5	25	0	0	33	0	0	0	5	5	2	0	75
6:15 AM	4	24	2	0	24	0	0	0	4	2	0	0	60
6:30 AM	6	22	5	0	32	1	1	1	4	8	0	0	80
6:45 AM	8	27	1	0	34	0	1	0	1	4	1	0	77
7:00 AM	0	13	1	0	31	2	1	1	6	5	2	0	62
7:15 AM	2	35	5	0	31	0	1	0	4	0	2	0	80
7:30 AM	5	24	10	0	27	0	0	1	2	7	1	0	77
7:45 AM	6	21	7	0	25	2	0	3	6	1	2	0	73
8:00 AM	2	27	3	0	24	0	0	1	3	0	0	0	60
8:15 AM	1	33	1	0	29	0	1	0	4	1	0	0	70
8:30 AM	3	19	2	0	16	0	0	0	2	1	0	0	43
8:45 AM	3	22	3	0	36	0	0	0	8	7	1	0	80
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													
10:45 AM													
11:00 AM													
11:15 AM													
11:30 AM													
11:45 AM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	45	292	40	0	342	5	5	7	49	41	11	0	837
Approach %	11.94	77.45	10.61	0.00	98.56	1.44	8.20	11.48	80.33	78.85	21.15	0.00	
App/Depart	377	/	297	347	/	432	61	/	47	52	/	61	

AM Peak Hr Begins at: 630 AM

PEAK													
Volumes	16	97	12	0	128	3	4	2	15	17	5	0	299
Approach %	12.80	77.60	9.60	0.00	97.71	2.29	19.05	9.52	71.43	77.27	22.73	0.00	
PEAK HR. FACTOR:	0.744			0.963			0.656			0.688			0.934

CONTROL: Signal
COMMENT 1:
GPS: 33.219224, -111.988897

Intersection Turning Movement

FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745

veracity traffic

N-S STREET:	SR-347	DATE:	05/19/22	LOCATION:	Chandler
E-W STREET:	Riggs Rd 0	DAY:	THURSDAY	PROJECT#	22-1242-001 -- H.V.

	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	1	2	1	1	2	1	1	1	0	1	1	0	
1:00 PM													
1:15 PM													
1:30 PM													
1:45 PM													
2:00 PM													
2:15 PM													
2:30 PM													
2:45 PM													
3:00 PM	4	10	0	0	14	0	0	0	0	1	0	0	29
3:15 PM	5	21	1	0	10	0	0	0	3	0	0	0	40
3:30 PM	1	16	0	0	5	0	0	0	2	1	0	0	25
3:45 PM	6	9	0	0	8	0	0	1	1	1	0	0	26
4:00 PM	2	9	1	0	7	0	0	0	0	1	0	0	20
4:15 PM	0	9	1	1	6	1	1	0	0	0	2	0	21
4:30 PM	1	11	0	0	5	0	0	0	2	1	1	0	21
4:45 PM	0	5	0	0	5	0	0	0	2	0	1	0	13
5:00 PM	2	5	0	0	2	0	0	0	0	1	1	0	11
5:15 PM	0	5	1	0	5	0	0	0	0	0	1	0	12
5:30 PM	1	4	1	0	4	0	0	0	2	0	1	0	13
5:45 PM	1	7	0	0	6	0	0	0	1	3	0	0	18
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	23	111	5	1	77	1	1	1	13	9	7	0	249
Approach %	16.55	79.86	3.60	1.27	97.47	1.27	6.67	6.67	86.67	56.25	43.75	0.00	
App/Depart	139	/	112	79	/	99	15	/	7	16	/	31	

PM Peak Hr Begins at: 300 PM

PEAK													
Volumes	16	56	1	0	37	0	0	1	6	3	0	0	120
Approach %	21.92	76.71	1.37	0.00	100.00	0.00	0.00	14.29	85.71	100.00	0.00	0.00	
PEAK HR. FACTOR:	0.676			0.661			0.583			0.750			0.750

CONTROL: Signal
COMMENT 1: 0
GPS: 33.219224, -111.988897

Field Data Services of Arizona, Inc.

31894 Whitetail Ln.
Temecula, CA 92592
(520) 316-6745

Site Code: Thurs 05/19/22
Station ID: 22-1242-002
SR-347 north of Riggs Rd
33.220198, -111.988581
Latitude: 0' 0.0000 Undefined

Northbound

Start Time	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Total	Truck Total
05/19/2															
2	0	89	6	0	1	1	0	0	7	1	0	0	0	105	10
01:00	0	92	17	0	2	0	0	0	11	1	0	0	0	123	14
02:00	0	138	39	0	1	0	0	0	10	1	0	0	0	189	12
03:00	2	394	123	0	0	1	1	8	48	0	0	0	0	577	58
04:00	12	1020	358	0	3	1	1	10	44	2	1	0	0	1452	62
05:00	9	1444	450	0	9	6	9	5	51	1	0	0	0	1984	81
06:00	19	1877	420	5	8	4	14	10	57	1	1	0	0	2416	100
07:00	9	1675	357	5	7	6	10	8	57	2	0	0	0	2136	95
08:00	3	1182	222	2	10	6	14	10	57	1	2	0	0	1509	102
09:00	6	1111	238	0	13	6	17	11	47	1	1	0	0	1451	96
10:00	7	902	245	0	19	9	9	11	58	3	1	0	0	1264	110
11:00	2	899	205	2	17	18	6	7	64	1	0	0	0	1221	115
12 PM	2	833	251	3	22	6	19	8	46	1	2	0	0	1193	107
13:00	5	820	296	0	27	4	8	7	52	7	3	0	0	1229	108
14:00	3	839	332	0	22	6	1	2	48	0	0	0	0	1253	79
15:00	5	872	284	6	20	5	2	0	21	2	0	0	0	1217	56
16:00	0	927	221	6	12	1	1	3	9	3	0	0	0	1183	35
17:00	4	850	159	2	8	1	0	1	7	2	0	0	0	1034	21
18:00	4	609	90	1	12	1	1	0	7	0	1	0	0	726	23
19:00	5	437	69	0	1	0	0	0	11	1	0	0	0	524	13
20:00	1	339	54	0	5	1	0	1	12	2	0	0	0	415	21
21:00	0	246	22	0	7	1	0	0	6	0	0	0	0	282	14
22:00	1	189	21	0	6	0	0	0	12	0	0	0	0	229	18
23:00	1	78	14	0	1	0	0	0	8	0	0	0	0	102	9
Total	100	17862	4493	32	233	84	113	102	750	33	12	0	0	23814	1359
Percent	0.4%	75.0%	18.9%	0.1%	1.0%	0.4%	0.5%	0.4%	3.1%	0.1%	0.1%	0.0%	0.0%		5.7%
AM Peak	06:00	06:00	05:00	06:00	10:00	11:00	09:00	09:00	11:00	10:00	08:00			06:00	11:00
Vol.	19	1877	450	5	19	18	17	11	64	3	2			2416	115
PM Peak	13:00	16:00	14:00	15:00	13:00	12:00	12:00	12:00	13:00	13:00	13:00			14:00	13:00
Vol.	5	927	332	6	27	6	19	8	52	7	3			1253	108
Grand Total	100	17862	4493	32	233	84	113	102	750	33	12	0	0	23814	1359
Percent	0.4%	75.0%	18.9%	0.1%	1.0%	0.4%	0.5%	0.4%	3.1%	0.1%	0.1%	0.0%	0.0%		5.7%

Field Data Services of Arizona, Inc.
31894 Whitetail Ln.
Temecula, CA 92592
(520) 316-6745
Site Code: Thurs 05/19/22
Station ID: 22-1242-002
SR-347 north of Riggs Rd
33.220198, -111.988581
Latitude: 0' 0.0000 Undefined

Southbound

Start Time	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Total	Truck Total
05/19/2															
2	3	180	24	0	2	0	0	0	15	0	0	0	0	224	17
01:00	0	114	17	0	4	3	0	0	22	0	0	0	0	160	29
02:00	2	103	26	0	3	2	1	3	57	0	1	0	0	198	67
03:00	0	103	56	0	7	6	2	9	47	0	0	0	0	230	71
04:00	5	223	200	0	17	9	8	10	49	0	0	0	0	521	93
05:00	0	314	271	5	31	21	13	23	63	0	0	0	0	741	156
06:00	1	522	263	4	27	15	4	9	65	0	0	0	0	910	124
07:00	5	580	256	2	29	19	2	4	61	0	1	0	0	959	118
08:00	3	537	225	0	21	17	4	3	60	0	0	0	0	870	105
09:00	5	541	182	5	45	20	4	4	67	2	0	0	0	875	147
10:00	3	592	207	0	31	25	3	5	65	1	0	0	0	932	130
11:00	4	713	212	4	16	20	9	3	65	0	0	0	0	1046	117
12 PM	6	902	233	4	20	15	9	5	55	0	0	0	0	1249	108
13:00	3	1093	269	1	18	11	5	1	41	0	0	0	0	1442	77
14:00	9	1460	412	3	10	5	3	3	17	0	0	0	0	1922	41
15:00	5	1668	408	6	16	0	1	2	12	0	0	0	0	2118	37
16:00	12	1692	375	2	7	1	0	4	11	0	0	0	0	2104	25
17:00	7	1543	322	2	4	0	1	0	10	0	0	0	0	1889	17
18:00	3	1247	196	0	4	1	0	0	12	0	0	0	0	1463	17
19:00	1	989	147	0	4	2	0	0	11	0	0	0	0	1154	17
20:00	4	922	118	0	6	0	0	0	7	0	0	0	0	1057	13
21:00	3	652	104	0	2	0	1	0	9	0	0	0	0	771	12
22:00	9	535	65	0	1	0	0	1	6	0	0	0	0	617	8
23:00	2	306	45	0	1	0	0	0	9	0	0	0	0	363	10
Total	95	17531	4633	38	326	192	70	89	836	3	2	0	0	23815	1556
Percent	0.4%	73.6%	19.5%	0.2%	1.4%	0.8%	0.3%	0.4%	3.5%	0.0%	0.0%	0.0%	0.0%		6.5%
AM Peak	04:00	11:00	05:00	05:00	09:00	10:00	05:00	05:00	09:00	09:00	02:00			11:00	05:00
Vol.	5	713	271	5	45	25	13	23	67	2	1			1046	156
PM Peak	16:00	16:00	14:00	15:00	12:00	12:00	12:00	12:00	12:00					15:00	12:00
Vol.	12	1692	412	6	20	15	9	5	55					2118	108
Grand Total	95	17531	4633	38	326	192	70	89	836	3	2	0	0	23815	1556
Percent	0.4%	73.6%	19.5%	0.2%	1.4%	0.8%	0.3%	0.4%	3.5%	0.0%	0.0%	0.0%	0.0%		6.5%

Field Data Services of Arizona, Inc.

31894 Whitetail Ln.
Temecula, CA 92592
(520) 316-6745

Site Code: Thurs 05/19/22
Station ID: 22-1242-002
SR-347 north of Riggs Rd
33.220198, -111.988581
Latitude: 0' 0.0000 Undefined

Northbound, Southbound

Start Time	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Total	Truck Total
05/19/2															
2	3	269	30	0	3	1	0	0	22	1	0	0	0	329	27
01:00	0	206	34	0	6	3	0	0	33	1	0	0	0	283	43
02:00	2	241	65	0	4	2	1	3	67	1	1	0	0	387	79
03:00	2	497	179	0	7	7	3	17	95	0	0	0	0	807	129
04:00	17	1243	558	0	20	10	9	20	93	2	1	0	0	1973	155
05:00	9	1758	721	5	40	27	22	28	114	1	0	0	0	2725	237
06:00	20	2399	683	9	35	19	18	19	122	1	1	0	0	3326	224
07:00	14	2255	613	7	36	25	12	12	118	2	1	0	0	3095	213
08:00	6	1719	447	2	31	23	18	13	117	1	2	0	0	2379	207
09:00	11	1652	420	5	58	26	21	15	114	3	1	0	0	2326	243
10:00	10	1494	452	0	50	34	12	16	123	4	1	0	0	2196	240
11:00	6	1612	417	6	33	38	15	10	129	1	0	0	0	2267	232
12 PM	8	1735	484	7	42	21	28	13	101	1	2	0	0	2442	215
13:00	8	1913	565	1	45	15	13	8	93	7	3	0	0	2671	185
14:00	12	2299	744	3	32	11	4	5	65	0	0	0	0	3175	120
15:00	10	2540	692	12	36	5	3	2	33	2	0	0	0	3335	93
16:00	12	2619	596	8	19	2	1	7	20	3	0	0	0	3287	60
17:00	11	2393	481	4	12	1	1	1	17	2	0	0	0	2923	38
18:00	7	1856	286	1	16	2	1	0	19	0	1	0	0	2189	40
19:00	6	1426	216	0	5	2	0	0	22	1	0	0	0	1678	30
20:00	5	1261	172	0	11	1	0	1	19	2	0	0	0	1472	34
21:00	3	898	126	0	9	1	1	0	15	0	0	0	0	1053	26
22:00	10	724	86	0	7	0	0	1	18	0	0	0	0	846	26
23:00	3	384	59	0	2	0	0	0	17	0	0	0	0	465	19
Total	195	35393	9126	70	559	276	183	191	1586	36	14	0	0	47629	2915
Percent	0.4%	74.3%	19.2%	0.1%	1.2%	0.6%	0.4%	0.4%	3.3%	0.1%	0.0%	0.0%	0.0%		6.1%
AM Peak	06:00	06:00	05:00	06:00	09:00	11:00	05:00	05:00	11:00	10:00	08:00			06:00	09:00
Vol.	20	2399	721	9	58	38	22	28	129	4	2			3326	243
PM Peak	14:00	16:00	14:00	15:00	13:00	12:00	12:00	12:00	12:00	13:00	13:00			15:00	12:00
Vol.	12	2619	744	12	45	21	28	13	101	7	3			3335	215
Grand Total	195	35393	9126	70	559	276	183	191	1586	36	14	0	0	47629	2915
Percent	0.4%	74.3%	19.2%	0.1%	1.2%	0.6%	0.4%	0.4%	3.3%	0.1%	0.0%	0.0%	0.0%		6.1%

Field Data Services of Arizona, Inc.

31894 Whitetail Ln.
Temecula, CA 92592
(520) 316-6745

Site Code: Thurs 05/19/22
Station ID: 22-1242-003
SR-347 south of Riggs Rd
33.218334, -111.989182
Latitude: 0' 0.0000 Undefined

Northbound

Start Time	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Total	Truck Total
05/19/2															
2	0	102	7	0	2	1	0	0	8	2	0	0	0	122	13
01:00	0	96	20	0	3	0	0	0	13	2	0	0	0	134	18
02:00	0	158	39	0	1	0	0	0	12	1	0	0	0	211	14
03:00	3	439	142	0	0	1	1	10	51	1	0	0	0	648	64
04:00	15	1100	398	0	3	1	4	17	50	2	1	0	0	1591	78
05:00	10	1568	506	0	11	6	15	7	62	1	0	0	0	2186	102
06:00	19	2048	484	5	10	5	15	19	73	1	1	0	0	2680	129
07:00	10	1826	413	5	8	7	18	17	71	2	1	0	0	2378	129
08:00	3	1275	258	1	11	7	15	17	64	1	3	0	0	1655	119
09:00	8	1196	278	0	16	8	21	11	56	1	1	1	0	1597	115
10:00	7	959	274	0	22	9	12	14	74	3	1	1	0	1376	136
11:00	3	978	244	2	23	25	6	8	82	2	0	0	0	1373	148
12 PM	3	931	289	4	25	10	19	8	64	3	2	0	0	1358	135
13:00	6	910	336	0	33	4	8	7	66	7	4	0	0	1381	129
14:00	3	937	402	0	27	9	1	2	73	0	0	0	0	1454	112
15:00	6	974	356	7	24	6	3	0	30	2	1	0	0	1409	73
16:00	0	1043	265	6	13	1	1	4	11	3	0	0	0	1347	39
17:00	4	942	191	2	9	2	0	1	10	2	1	0	0	1164	27
18:00	4	684	113	1	15	1	1	0	10	0	1	0	0	830	29
19:00	6	476	84	0	1	0	0	0	13	1	0	0	0	581	15
20:00	2	373	62	0	5	1	0	1	13	2	0	0	0	459	22
21:00	0	281	29	0	7	1	0	0	7	0	0	0	0	325	15
22:00	1	218	24	0	6	0	0	0	16	0	0	0	0	265	22
23:00	1	91	18	0	1	0	0	0	9	0	0	0	0	120	10
Total	114	19605	5232	33	276	105	140	143	938	39	17	2	0	26644	1693
Percent	0.4%	73.6%	19.6%	0.1%	1.0%	0.4%	0.5%	0.5%	3.5%	0.1%	0.1%	0.0%	0.0%		6.4%
AM Peak	06:00	06:00	05:00	06:00	11:00	11:00	09:00	06:00	11:00	10:00	08:00	09:00		06:00	11:00
Vol.	19	2048	506	5	23	25	21	19	82	3	3	1		2680	148
PM Peak	13:00	16:00	14:00	15:00	13:00	12:00	12:00	12:00	14:00	13:00	13:00			14:00	12:00
Vol.	6	1043	402	7	33	10	19	8	73	7	4			1454	135
Grand Total	114	19605	5232	33	276	105	140	143	938	39	17	2	0	26644	1693
Percent	0.4%	73.6%	19.6%	0.1%	1.0%	0.4%	0.5%	0.5%	3.5%	0.1%	0.1%	0.0%	0.0%		6.4%

Field Data Services of Arizona, Inc.

31894 Whitetail Ln.
Temecula, CA 92592
(520) 316-6745

Site Code: Thurs 05/19/22
Station ID: 22-1242-003
SR-347 south of Riggs Rd
33.218334, -111.989182
Latitude: 0' 0.0000 Undefined

Southbound

Start Time	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Total	Truck Total
05/19/2															
2	3	197	26	0	2	0	0	0	20	0	0	0	0	248	22
01:00	0	125	19	0	4	4	0	0	24	0	0	0	0	176	32
02:00	3	108	28	0	4	2	1	3	62	0	1	0	0	212	73
03:00	0	117	63	0	10	11	2	10	54	0	2	0	0	269	89
04:00	5	268	217	0	20	13	9	11	59	0	0	0	0	602	112
05:00	1	366	294	5	35	29	14	23	70	0	0	0	0	837	176
06:00	1	591	288	3	36	26	5	9	77	0	0	0	0	1036	156
07:00	5	646	289	0	31	33	2	5	73	0	1	0	0	1085	145
08:00	3	616	260	0	23	23	5	3	76	1	0	0	0	1010	131
09:00	5	598	198	3	49	32	4	3	80	2	1	0	0	975	174
10:00	3	645	233	1	33	30	4	5	68	1	0	0	0	1023	142
11:00	3	781	238	3	18	22	10	6	71	0	0	0	0	1152	130
12 PM	7	981	271	4	22	19	9	4	66	0	0	0	0	1383	124
13:00	4	1195	311	1	21	14	6	1	47	0	0	0	0	1600	90
14:00	11	1641	467	3	15	5	4	3	20	0	0	0	0	2169	50
15:00	6	1909	464	6	21	0	1	2	16	0	0	0	0	2425	46
16:00	13	1973	451	2	9	2	0	4	12	0	0	0	0	2466	29
17:00	8	1754	368	3	7	3	1	0	10	0	0	0	0	2154	24
18:00	4	1394	223	0	4	1	0	0	13	0	0	0	0	1639	18
19:00	1	1059	160	0	4	2	0	0	13	0	0	0	0	1239	19
20:00	4	976	123	0	6	0	0	0	10	0	0	0	0	1119	16
21:00	3	691	110	0	2	1	1	0	12	0	1	0	0	821	17
22:00	9	569	69	0	1	0	0	1	7	0	0	0	0	656	9
23:00	2	342	48	0	1	0	0	0	10	0	0	0	0	403	11
Total	104	19542	5218	34	378	272	78	93	970	4	6	0	0	26699	1835
Percent	0.4%	73.2%	19.5%	0.1%	1.4%	1.0%	0.3%	0.3%	3.6%	0.0%	0.0%	0.0%	0.0%		6.9%
AM Peak	04:00	11:00	05:00	05:00	09:00	07:00	05:00	05:00	09:00	09:00	03:00			11:00	05:00
Vol.	5	781	294	5	49	33	14	23	80	2	2			1152	176
PM Peak	16:00	16:00	14:00	15:00	12:00	12:00	12:00	12:00	12:00		21:00			16:00	12:00
Vol.	13	1973	467	6	22	19	9	4	66		1			2466	124
Grand Total	104	19542	5218	34	378	272	78	93	970	4	6	0	0	26699	1835
Percent	0.4%	73.2%	19.5%	0.1%	1.4%	1.0%	0.3%	0.3%	3.6%	0.0%	0.0%	0.0%	0.0%		6.9%

Field Data Services of Arizona, Inc.
31894 Whitetail Ln.
Temecula, CA 92592
(520) 316-6745

Site Code: Thurs 05/19/22
Station ID: 22-1242-003
SR-347 south of Riggs Rd
33.218334, -111.989182
Latitude: 0' 0.0000 Undefined

Northbound, Southbound

Start Time	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Total	Truck Total
05/19/2															
2	3	299	33	0	4	1	0	0	28	2	0	0	0	370	35
01:00	0	221	39	0	7	4	0	0	37	2	0	0	0	310	50
02:00	3	266	67	0	5	2	1	3	74	1	1	0	0	423	87
03:00	3	556	205	0	10	12	3	20	105	1	2	0	0	917	153
04:00	20	1368	615	0	23	14	13	28	109	2	1	0	0	2193	190
05:00	11	1934	800	5	46	35	29	30	132	1	0	0	0	3023	278
06:00	20	2639	772	8	46	31	20	28	150	1	1	0	0	3716	285
07:00	15	2472	702	5	39	40	20	22	144	2	2	0	0	3463	274
08:00	6	1891	518	1	34	30	20	20	140	2	3	0	0	2665	250
09:00	13	1794	476	3	65	40	25	14	136	3	2	1	0	2572	289
10:00	10	1604	507	1	55	39	16	19	142	4	1	1	0	2399	278
11:00	6	1759	482	5	41	47	16	14	153	2	0	0	0	2525	278
12 PM	10	1912	560	8	47	29	28	12	130	3	2	0	0	2741	259
13:00	10	2105	647	1	54	18	14	8	113	7	4	0	0	2981	219
14:00	14	2578	869	3	42	14	5	5	93	0	0	0	0	3623	162
15:00	12	2883	820	13	45	6	4	2	46	2	1	0	0	3834	119
16:00	13	3016	716	8	22	3	1	8	23	3	0	0	0	3813	68
17:00	12	2696	559	5	16	5	1	1	20	2	1	0	0	3318	51
18:00	8	2078	336	1	19	2	1	0	23	0	1	0	0	2469	47
19:00	7	1535	244	0	5	2	0	0	26	1	0	0	0	1820	34
20:00	6	1349	185	0	11	1	0	1	23	2	0	0	0	1578	38
21:00	3	972	139	0	9	2	1	0	19	0	1	0	0	1146	32
22:00	10	787	93	0	7	0	0	1	23	0	0	0	0	921	31
23:00	3	433	66	0	2	0	0	0	19	0	0	0	0	523	21
Total	218	39147	10450	67	654	377	218	236	1908	43	23	2	0	53343	3528
Percent	0.4%	73.4%	19.6%	0.1%	1.2%	0.7%	0.4%	0.4%	3.6%	0.1%	0.0%	0.0%	0.0%		6.6%
AM Peak	04:00	06:00	05:00	06:00	09:00	11:00	05:00	05:00	11:00	10:00	08:00	09:00		06:00	09:00
Vol.	20	2639	800	8	65	47	29	30	153	4	3	1		3716	289
PM Peak	14:00	16:00	14:00	15:00	13:00	12:00	12:00	12:00	12:00	13:00	13:00			15:00	12:00
Vol.	14	3016	869	13	54	29	28	12	130	7	4			3834	259
Grand Total	218	39147	10450	67	654	377	218	236	1908	43	23	2	0	53343	3528
Percent	0.4%	73.4%	19.6%	0.1%	1.2%	0.7%	0.4%	0.4%	3.6%	0.1%	0.0%	0.0%	0.0%		6.6%

Field Data Services of Arizona, Inc.

31894 Whitetail Ln.
Temecula, CA 92592
(520) 316-6745

Site Code: Thurs 05/19/22
Station ID: 22-1242-004
Riggs Rd east of SR-347
33.219227, -111.987197
Latitude: 0' 0.0000 Undefined

Eastbound

Start Time	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Total	Truck Total
05/19/2															
2	0	6	1	0	0	0	0	0	0	1	0	0	0	8	1
01:00	0	5	1	0	1	0	0	0	0	1	0	0	0	8	2
02:00	0	11	0	0	0	0	0	0	0	0	0	0	0	11	0
03:00	0	21	8	0	0	0	0	2	0	1	0	0	0	32	3
04:00	1	45	26	0	0	0	2	7	1	0	0	0	0	82	10
05:00	2	80	45	0	1	2	4	2	1	0	0	0	0	137	10
06:00	0	125	44	1	0	0	0	7	1	0	0	0	0	178	9
07:00	0	124	45	1	2	1	8	10	5	0	1	0	0	197	28
08:00	0	78	31	0	1	0	1	7	1	0	0	0	0	119	10
09:00	1	79	30	0	6	1	4	1	0	0	1	0	0	123	13
10:00	0	63	26	0	2	0	3	5	4	0	0	0	0	103	14
11:00	0	77	38	0	3	1	0	1	6	1	0	1	0	128	13
12 PM	1	76	26	1	1	4	0	1	1	2	0	0	0	113	10
13:00	0	61	33	0	5	1	0	0	3	0	1	0	0	104	10
14:00	1	84	47	0	3	1	0	0	4	0	0	0	0	140	8
15:00	1	93	51	1	0	0	1	0	0	0	0	0	0	147	2
16:00	0	125	26	1	0	0	0	0	2	0	0	0	0	154	3
17:00	0	78	22	0	1	0	0	0	0	0	1	0	0	102	2
18:00	0	53	17	0	0	0	0	1	1	0	0	0	0	72	2
19:00	0	32	12	0	0	0	0	0	0	0	0	0	0	44	0
20:00	1	27	8	0	0	0	0	0	2	0	0	0	0	38	2
21:00	0	25	6	0	0	0	0	0	0	0	0	0	0	31	0
22:00	0	25	3	0	0	0	0	0	2	0	0	0	0	30	2
23:00	0	7	4	0	0	0	0	0	0	0	0	0	0	11	0
Total	8	1400	550	5	26	11	23	44	34	6	4	1	0	2112	154
Percent	0.4%	66.3%	26.0%	0.2%	1.2%	0.5%	1.1%	2.1%	1.6%	0.3%	0.2%	0.0%	0.0%		7.3%
AM Peak	05:00	06:00	05:00	06:00	09:00	05:00	07:00	07:00	11:00	00:00	07:00	11:00		07:00	07:00
Vol.	2	125	45	1	6	2	8	10	6	1	1	1		197	28
PM Peak	12:00	16:00	15:00	12:00	13:00	12:00	15:00	12:00	14:00	12:00	13:00			16:00	12:00
Vol.	1	125	51	1	5	4	1	1	4	2	1			154	10
Grand Total	8	1400	550	5	26	11	23	44	34	6	4	1	0	2112	154
Percent	0.4%	66.3%	26.0%	0.2%	1.2%	0.5%	1.1%	2.1%	1.6%	0.3%	0.2%	0.0%	0.0%		7.3%

Field Data Services of Arizona, Inc.
31894 Whitetail Ln.
Temecula, CA 92592
(520) 316-6745
Site Code: Thurs 05/19/22
Station ID: 22-1242-004
Riggs Rd east of SR-347
33.219227, -111.987197
Latitude: 0' 0.0000 Undefined

Westbound

Start Time	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Total	Truck Total
05/19/2															
2	0	7	2	0	0	0	0	0	0	0	0	0	0	9	0
01:00	0	6	2	0	0	0	0	0	0	0	0	0	0	8	0
02:00	1	6	3	0	1	0	0	0	1	0	0	0	0	12	2
03:00	0	13	10	0	2	3	0	0	2	0	2	0	0	32	9
04:00	0	18	21	0	2	2	0	0	3	0	0	0	0	46	7
05:00	1	48	29	0	3	5	0	0	1	0	0	0	0	87	9
06:00	0	63	25	1	7	8	0	0	6	0	0	0	0	110	22
07:00	0	84	39	0	2	10	0	4	4	0	0	0	0	143	20
08:00	0	81	38	0	2	6	0	0	2	0	0	0	0	129	10
09:00	0	53	27	1	3	11	0	0	7	0	2	0	0	104	24
10:00	0	63	26	1	1	4	0	0	2	0	0	0	0	97	8
11:00	0	74	32	0	3	2	0	4	1	0	0	0	0	116	10
12 PM	0	71	41	1	1	4	0	0	4	0	0	0	0	122	10
13:00	0	86	37	0	5	1	0	1	5	0	0	0	0	135	12
14:00	1	126	47	0	5	0	0	0	2	0	0	0	0	181	7
15:00	0	174	54	0	3	0	0	0	0	0	0	0	0	231	3
16:00	1	205	62	0	1	1	0	0	3	0	1	0	0	274	6
17:00	1	151	27	0	3	2	0	2	0	0	0	0	0	186	7
18:00	1	103	22	0	0	0	0	0	0	0	0	0	0	126	0
19:00	0	52	14	0	0	0	0	0	0	0	0	0	0	66	0
20:00	0	43	8	0	1	0	0	0	1	0	0	0	0	53	2
21:00	1	24	9	0	0	1	0	0	1	0	1	1	0	38	4
22:00	0	28	5	0	0	0	0	0	0	0	0	0	0	33	0
23:00	0	20	6	0	0	0	0	0	0	0	0	0	0	26	0
Total	7	1599	586	4	45	60	0	11	45	0	6	1	0	2364	172
Percent	0.3%	67.6%	24.8%	0.2%	1.9%	2.5%	0.0%	0.5%	1.9%	0.0%	0.3%	0.0%	0.0%		7.3%
AM Peak	02:00	07:00	07:00	06:00	06:00	09:00		07:00	09:00		03:00			07:00	09:00
Vol.	1	84	39	1	7	11		4	7		2			143	24
PM Peak	14:00	16:00	16:00	12:00	13:00	12:00		17:00	13:00		16:00	21:00		16:00	13:00
Vol.	1	205	62	1	5	4		2	5		1	1		274	12
Grand Total	7	1599	586	4	45	60	0	11	45	0	6	1	0	2364	172
Percent	0.3%	67.6%	24.8%	0.2%	1.9%	2.5%	0.0%	0.5%	1.9%	0.0%	0.3%	0.0%	0.0%		7.3%

Field Data Services of Arizona, Inc.

31894 Whitetail Ln.
Temecula, CA 92592
(520) 316-6745

Site Code: Thurs 05/19/22
Station ID: 22-1242-004
Riggs Rd east of SR-347
33.219227, -111.987197
Latitude: 0' 0.0000 Undefined

Eastbound, Westbound

Start Time	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Total	Truck Total
05/19/2															
2	0	13	3	0	0	0	0	0	0	1	0	0	0	17	1
01:00	0	11	3	0	1	0	0	0	0	1	0	0	0	16	2
02:00	1	17	3	0	1	0	0	0	1	0	0	0	0	23	2
03:00	0	34	18	0	2	3	0	2	2	1	2	0	0	64	12
04:00	1	63	47	0	2	2	2	7	4	0	0	0	0	128	17
05:00	3	128	74	0	4	7	4	2	2	0	0	0	0	224	19
06:00	0	188	69	2	7	8	0	7	7	0	0	0	0	288	31
07:00	0	208	84	1	4	11	8	14	9	0	1	0	0	340	48
08:00	0	159	69	0	3	6	1	7	3	0	0	0	0	248	20
09:00	1	132	57	1	9	12	4	1	7	0	3	0	0	227	37
10:00	0	126	52	1	3	4	3	5	6	0	0	0	0	200	22
11:00	0	151	70	0	6	3	0	5	7	1	0	1	0	244	23
12 PM	1	147	67	2	2	8	0	1	5	2	0	0	0	235	20
13:00	0	147	70	0	10	2	0	1	8	0	1	0	0	239	22
14:00	2	210	94	0	8	1	0	0	6	0	0	0	0	321	15
15:00	1	267	105	1	3	0	1	0	0	0	0	0	0	378	5
16:00	1	330	88	1	1	1	0	0	5	0	1	0	0	428	9
17:00	1	229	49	0	4	2	0	2	0	0	1	0	0	288	9
18:00	1	156	39	0	0	0	0	1	1	0	0	0	0	198	2
19:00	0	84	26	0	0	0	0	0	0	0	0	0	0	110	0
20:00	1	70	16	0	1	0	0	0	3	0	0	0	0	91	4
21:00	1	49	15	0	0	1	0	0	1	0	1	1	0	69	4
22:00	0	53	8	0	0	0	0	0	2	0	0	0	0	63	2
23:00	0	27	10	0	0	0	0	0	0	0	0	0	0	37	0
Total	15	2999	1136	9	71	71	23	55	79	6	10	2	0	4476	326
Percent	0.3%	67.0%	25.4%	0.2%	1.6%	1.6%	0.5%	1.2%	1.8%	0.1%	0.2%	0.0%	0.0%		7.3%
AM Peak	05:00	07:00	07:00	06:00	09:00	09:00	07:00	07:00	07:00	00:00	09:00	11:00		07:00	07:00
Vol.	3	208	84	2	9	12	8	14	9	1	3	1		340	48
PM Peak	14:00	16:00	15:00	12:00	13:00	12:00	15:00	17:00	13:00	12:00	13:00	21:00		16:00	13:00
Vol.	2	330	105	2	10	8	1	2	8	2	1	1		428	22
Grand Total	15	2999	1136	9	71	71	23	55	79	6	10	2	0	4476	326
Percent	0.3%	67.0%	25.4%	0.2%	1.6%	1.6%	0.5%	1.2%	1.8%	0.1%	0.2%	0.0%	0.0%		7.3%

Field Data Services of Arizona, Inc.

31894 Whitetail Ln.
Temecula, CA 92592
(520) 316-6745

Site Code: Thurs 05/19/22
Station ID: 22-1242-005
Riggs Rd west of SR-347
33.219208, -111.990737
Latitude: 0' 0.0000 Undefined

Eastbound

Start Time	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Total	Truck Total
05/19/2															
2	0	13	1	0	0	0	0	0	5	0	0	0	0	19	5
01:00	0	9	2	0	0	1	0	0	3	0	0	0	0	15	4
02:00	0	3	0	0	0	0	0	0	6	0	0	0	0	9	6
03:00	0	18	3	0	1	2	0	1	5	0	0	0	0	30	9
04:00	0	39	10	0	3	2	1	1	7	0	0	0	0	63	14
05:00	1	42	15	0	1	5	1	0	6	0	0	0	0	71	13
06:00	0	53	22	1	2	3	1	0	10	0	0	0	0	92	17
07:00	0	45	29	1	5	5	0	1	13	0	0	0	0	99	25
08:00	0	36	18	1	1	0	1	1	14	1	0	0	0	73	19
09:00	0	36	15	0	8	1	0	1	9	0	0	0	0	70	19
10:00	0	34	22	0	5	1	1	3	5	0	0	0	0	71	15
11:00	0	42	26	0	1	0	2	0	9	0	1	0	0	81	13
12 PM	1	45	16	0	2	3	0	0	8	0	0	0	0	75	13
13:00	1	56	34	0	2	3	1	0	5	0	0	0	0	102	11
14:00	3	105	39	0	0	0	1	0	2	0	0	0	0	150	3
15:00	1	131	32	1	2	0	0	0	4	0	0	0	0	171	7
16:00	0	169	46	1	1	1	0	0	2	0	0	0	0	220	5
17:00	1	103	33	1	0	2	0	0	0	0	0	0	0	140	3
18:00	0	68	11	0	0	0	0	1	2	0	0	0	0	82	3
19:00	0	32	3	0	0	0	0	0	2	0	0	0	0	37	2
20:00	0	29	3	0	0	0	0	0	4	0	0	0	0	36	4
21:00	0	26	3	0	0	0	0	0	3	0	0	0	0	32	3
22:00	0	23	3	0	0	0	0	0	1	0	0	0	0	27	1
23:00	0	21	1	0	0	0	0	0	2	0	0	0	0	24	2
Total	8	1178	387	6	34	29	9	9	127	1	1	0	0	1789	216
Percent	0.4%	65.8%	21.6%	0.3%	1.9%	1.6%	0.5%	0.5%	7.1%	0.1%	0.1%	0.0%	0.0%		12.1%
AM Peak	05:00	06:00	07:00	06:00	09:00	05:00	11:00	10:00	08:00	08:00	11:00			07:00	07:00
Vol.	1	53	29	1	8	5	2	3	14	1	1			99	25
PM Peak	14:00	16:00	16:00	15:00	12:00	12:00	13:00	18:00	12:00					16:00	12:00
Vol.	3	169	46	1	2	3	1	1	8					220	13
Grand Total	8	1178	387	6	34	29	9	9	127	1	1	0	0	1789	216
Percent	0.4%	65.8%	21.6%	0.3%	1.9%	1.6%	0.5%	0.5%	7.1%	0.1%	0.1%	0.0%	0.0%		12.1%

Field Data Services of Arizona, Inc.

31894 Whitetail Ln.
Temecula, CA 92592
(520) 316-6745

Site Code: Thurs 05/19/22
Station ID: 22-1242-005
Riggs Rd west of SR-347
33.219208, -111.990737
Latitude: 0' 0.0000 Undefined

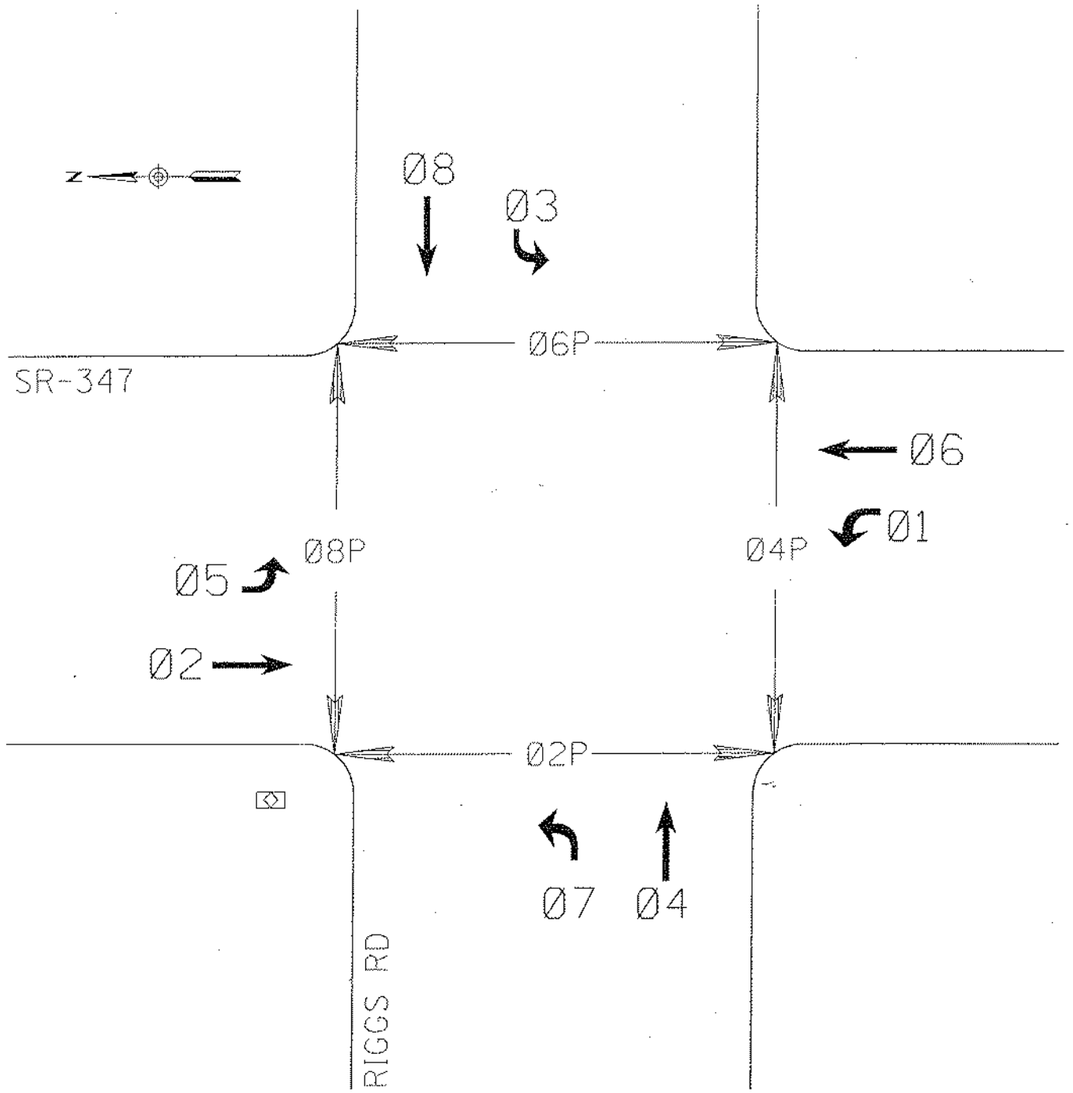
Westbound

Start Time	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Total	Truck Total
05/19/2															
2	0	10	1	0	1	0	0	0	1	0	0	0	0	13	2
01:00	0	3	4	0	0	0	0	0	3	0	0	0	0	10	3
02:00	0	13	1	0	0	0	0	0	4	0	0	0	0	18	4
03:00	1	41	17	0	0	0	0	0	3	0	0	0	0	62	3
04:00	2	47	28	0	2	0	1	0	5	0	0	0	0	85	8
05:00	0	82	32	0	1	0	2	0	10	0	0	0	0	127	13
06:00	0	93	42	2	2	1	1	2	19	0	0	0	0	162	27
07:00	1	90	46	2	4	1	0	3	14	0	0	0	0	161	24
08:00	0	53	26	0	1	1	0	1	6	0	1	0	0	89	10
09:00	1	38	36	3	4	1	0	1	12	0	0	1	0	97	22
10:00	0	38	25	0	5	0	0	1	16	0	0	1	0	86	23
11:00	2	50	33	1	5	7	1	1	16	0	0	0	0	116	31
12 PM	0	59	31	1	3	3	0	0	18	0	0	0	0	115	25
13:00	1	69	36	0	5	0	0	1	15	0	0	0	0	127	21
14:00	1	64	54	0	2	2	0	0	22	0	0	0	0	145	26
15:00	0	73	51	1	4	1	0	0	9	0	1	0	0	140	16
16:00	0	84	50	0	1	1	0	1	4	0	1	0	0	142	8
17:00	1	57	24	0	0	2	0	2	3	0	0	0	0	89	7
18:00	0	46	12	0	3	0	0	0	3	0	0	0	0	64	6
19:00	1	21	7	0	0	0	0	0	2	0	0	0	0	31	2
20:00	0	25	6	0	1	0	0	0	1	0	0	0	0	33	2
21:00	1	21	7	0	0	0	0	0	2	0	0	1	0	32	3
22:00	0	21	4	0	0	0	0	0	2	0	0	0	0	27	2
23:00	0	11	4	0	0	0	0	0	2	0	0	0	0	17	2
Total	12	1109	577	10	44	20	5	13	192	0	3	3	0	1988	290
Percent	0.6%	55.8%	29.0%	0.5%	2.2%	1.0%	0.3%	0.7%	9.7%	0.0%	0.2%	0.2%	0.0%		14.6%
AM Peak	04:00	06:00	07:00	09:00	10:00	11:00	05:00	07:00	06:00		08:00	09:00		06:00	11:00
Vol.	2	93	46	3	5	7	2	3	19		1	1		162	31
PM Peak	13:00	16:00	14:00	12:00	13:00	12:00		17:00	14:00		15:00	21:00		14:00	14:00
Vol.	1	84	54	1	5	3		2	22		1	1		145	26
Grand Total	12	1109	577	10	44	20	5	13	192	0	3	3	0	1988	290
Percent	0.6%	55.8%	29.0%	0.5%	2.2%	1.0%	0.3%	0.7%	9.7%	0.0%	0.2%	0.2%	0.0%		14.6%

Field Data Services of Arizona, Inc.
31894 Whitetail Ln.
Temecula, CA 92592
(520) 316-6745
Site Code: Thurs 05/19/22
Station ID: 22-1242-005
Riggs Rd west of SR-347
33.219208, -111.990737
Latitude: 0' 0.0000 Undefined

Eastbound, Westbound

Start Time	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Total	Truck Total
05/19/2															
2	0	23	2	0	1	0	0	0	6	0	0	0	0	32	7
01:00	0	12	6	0	0	1	0	0	6	0	0	0	0	25	7
02:00	0	16	1	0	0	0	0	0	10	0	0	0	0	27	10
03:00	1	59	20	0	1	2	0	1	8	0	0	0	0	92	12
04:00	2	86	38	0	5	2	2	1	12	0	0	0	0	148	22
05:00	1	124	47	0	2	5	3	0	16	0	0	0	0	198	26
06:00	0	146	64	3	4	4	2	2	29	0	0	0	0	254	44
07:00	1	135	75	3	9	6	0	4	27	0	0	0	0	260	49
08:00	0	89	44	1	2	1	1	2	20	1	1	0	0	162	29
09:00	1	74	51	3	12	2	0	2	21	0	0	1	0	167	41
10:00	0	72	47	0	10	1	1	4	21	0	0	1	0	157	38
11:00	2	92	59	1	6	7	3	1	25	0	1	0	0	197	44
12 PM	1	104	47	1	5	6	0	0	26	0	0	0	0	190	38
13:00	2	125	70	0	7	3	1	1	20	0	0	0	0	229	32
14:00	4	169	93	0	2	2	1	0	24	0	0	0	0	295	29
15:00	1	204	83	2	6	1	0	0	13	0	1	0	0	311	23
16:00	0	253	96	1	2	2	0	1	6	0	1	0	0	362	13
17:00	2	160	57	1	0	4	0	2	3	0	0	0	0	229	10
18:00	0	114	23	0	3	0	0	1	5	0	0	0	0	146	9
19:00	1	53	10	0	0	0	0	0	4	0	0	0	0	68	4
20:00	0	54	9	0	1	0	0	0	5	0	0	0	0	69	6
21:00	1	47	10	0	0	0	0	0	5	0	0	1	0	64	6
22:00	0	44	7	0	0	0	0	0	3	0	0	0	0	54	3
23:00	0	32	5	0	0	0	0	0	4	0	0	0	0	41	4
Total	20	2287	964	16	78	49	14	22	319	1	4	3	0	3777	506
Percent	0.5%	60.6%	25.5%	0.4%	2.1%	1.3%	0.4%	0.6%	8.4%	0.0%	0.1%	0.1%	0.0%		13.4%
AM Peak	04:00	06:00	07:00	06:00	09:00	11:00	05:00	07:00	06:00	08:00	08:00	09:00		07:00	07:00
Vol.	2	146	75	3	12	7	3	4	29	1	1	1		260	49
PM Peak	14:00	16:00	16:00	15:00	13:00	12:00	13:00	17:00	12:00		15:00	21:00		16:00	12:00
Vol.	4	253	96	2	7	6	1	2	26		1	1		362	38
Grand Total	20	2287	964	16	78	49	14	22	319	1	4	3	0	3777	506
Percent	0.5%	60.6%	25.5%	0.4%	2.1%	1.3%	0.4%	0.6%	8.4%	0.0%	0.1%	0.1%	0.0%		13.4%



SR-347 @ RIGGS ROAD
GILA RIVER RESERVATION

ASC3 MaxView Timing Sheet

MaxView Controller Information

Controller Number	2010
Controller Name	SR-347 @ Riggs Rd
Main St.	SR-347
Side St.	Riggs Rd
IP Address	10.16.31.8
NTCIP Receive Port	Automatic
NTCIP Send Port	2600
NTCIP Timeout	1000

Sequence

Ring	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1	2	3	4	9	10	13	14	0	0	0	0	0	0	0	0
2	5	6	7	8	11	12	15	16	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barrier																

Phase In Use/Ped

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
In Use	X	X	X	X	X	X	X	X	.	.	.	.	.	.	.	.
Exclusive ped	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Load Switch Assignment

			Dim				Auto Flash		
Channel	Source	Type	G	Y	R	D	Y	R	T
1	1	Phase Vehicle	.	.	.	.	.	X	.
2	2	Phase Vehicle	.	.	.	.	.	X	X
3	3	Phase Vehicle	.	.	.	.	.	X	.
4	4	Phase Vehicle	.	.	.	.	.	X	X
5	5	Phase Vehicle	.	.	.	X	.	X	.
6	6	Phase Vehicle	.	.	.	X	.	X	X
7	7	Phase Vehicle	.	.	.	X	.	X	.
8	8	Phase Vehicle	.	.	.	X	.	X	X
9	2	Phase Pedestrian	.	.	.	.	.	.	.
10	4	Phase Pedestrian	.	.	.	.	.	.	.
11	6	Phase Pedestrian	.	.	.	X	.	.	.
12	8	Phase Pedestrian	.	.	.	X	.	.	.
13	1	Overlap	.	.	.	.	.	X	.
14	2	Overlap	.	.	.	X	.	X	X
15	3	Overlap	.	.	.	.	.	X	.
16	4	Overlap	.	.	.	X	.	X	X

Start Up Options

Flash > Mon	All Red	Start Up Flash	Power Start Seq
Disabled	8	8	1

Phase

Phase	1	2	3	4	5	6	7	8
Interval	.	redClear	.	.	.	redClear	.	.

Phase	9	10	11	12	13	14	15	16
Interval	.	.	.	.	.	.	.	.

Overlap

Overlap	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	X	X	X	X	.	.	.	.	.	.	.	.	.	.	.	.

Automatic Flash Options

Flash > Mon	Exit Flash	Min Flash
Disabled	Green Walk	8

Phase

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Falsh Entry	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
Flash Exit	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.

Controller Timing Data

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Min Green	6	20	6	6	6	20	6	6	5	5	5	5	5	5	5	5
Bike Min Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cond Service Min Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Delay Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Walk	0	7	0	7	0	7	0	7	0	10	0	10	0	10	0	10
Walk2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Walk Max	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ped Clear	0	22	0	43	0	20	0	40	0	16	0	16	0	16	0	16
Ped Clear 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ped Clear Max	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veh Ext	3.5	4.5	2.5	2.5	2.5	4.5	2.5	2.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Veh Ext2	0.0	0.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max1	40	75	38	55	40	75	23	55	35	35	35	35	35	35	35	35
Max2	40	170	40	72	23	170	40	72	40	40	40	40	40	40	40	40
Max3	25	180	25	45	15	120	35	35	0	0	0	0	0	0	0	0
Dynamic Max	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dynamic Max Step	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow	3.0	5.0	3.0	5.0	3.0	5.0	3.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Red Clear	2.0	1.0	2.0	2.0	2.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Red Max	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red Revert	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Actuations Before	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Added Initial	0.0	2.5	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max Initial	0	40	0	0	0	40	0	0	0	0	0	0	0	0	0	0
Time Before Reduce	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars Before Reduce	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reduce By	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Min Gap	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Overlap Times

Overlap	Type	Lag GRN	Yellow	Red	Advance GRN
1	Other/Econolite	0.0	0.0	0.0	0.0
2	Other/Econolite	0.0	0.0	0.0	0.0
3	Other/Econolite	0.0	0.0	0.0	0.0
4	Other/Econolite	0.0	0.0	0.0	0.0
5	Other/Econolite	0.0	0.0	0.0	0.0
6	Other/Econolite	0.0	0.0	0.0	0.0
7	Other/Econolite	0.0	0.0	0.0	0.0
8	Other/Econolite	0.0	0.0	0.0	0.0
9	Other/Econolite	0.0	0.0	0.0	0.0
10	Other/Econolite	0.0	0.0	0.0	0.0
11	Other/Econolite	0.0	0.0	0.0	0.0
12	Other/Econolite	0.0	0.0	0.0	0.0
13	Other/Econolite	0.0	0.0	0.0	0.0
14	Other/Econolite	0.0	0.0	0.0	0.0
15	Other/Econolite	0.0	0.0	0.0	0.0
16	Other/Econolite	0.0	0.0	0.0	0.0

Overlap Configuration

Overlap	A

Phases	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Included	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Protected	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Modifier	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ped Protect	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Not Overlap	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lag X Phase	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lag 2 Phase	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Overlap	N

Phases	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Included	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Protected	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Modifier	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ped Protect	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Not Overlap	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lag X Phase	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lag 2 Phase	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Overlap	O

Phases	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Included	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Protected	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Modifier	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ped Protect	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Not Overlap	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lag X Phase	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lag 2 Phase	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Overlap	P

Phases	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Included	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Protected	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Modifier	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ped Protect	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Not Overlap	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lag X Phase	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lag 2 Phase	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Phase Table

Phases	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Guar Passage	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
Non Act I	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Non Act II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Dual Entry	.	.	.	X	.	.	.	X	.	.	.	.	.	.	.	.
Cond Reservice	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ped Reservice	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Act Rest in Walk	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Flashing Walk	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ped Clr thru Yellow	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ped Clr thru Red	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Immed Gap Red	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Options

Enable Pretimed Mode	Free Input Enables Pretimed
Enabled	Disabled

Pre-Timed Phases

Phases	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Phases Recall

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Locking Detector	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vehicle Detector	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
Ped Detector	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Max Recall	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Soft Recall	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
No Rest	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Added Int Calc	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Coordination Options

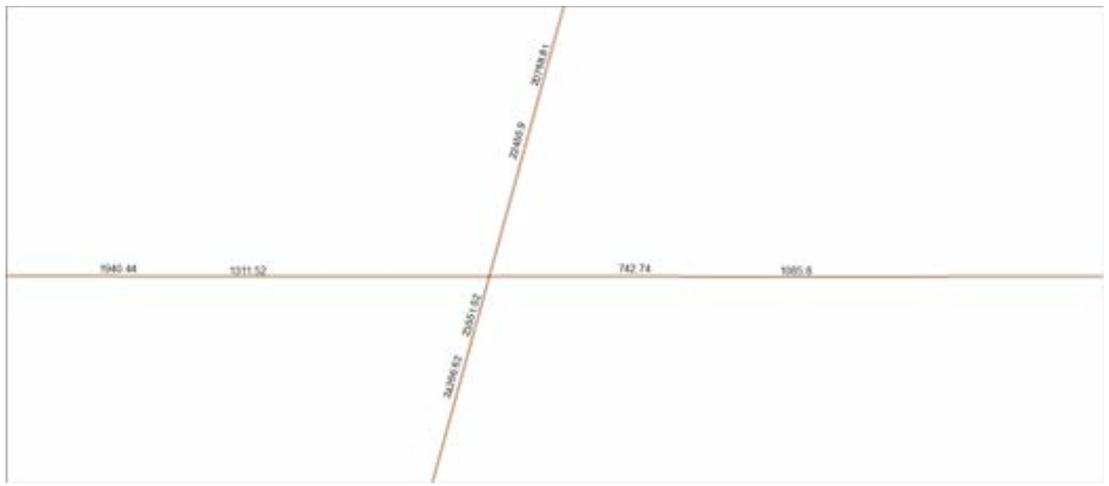
System Source	System	ECPI Coord	Enabled
Transition	Shortway	System Format	Standard
Dwell Add Time	30	Max Select	MaxInhibit
Delay Coord Walk	Disabled	Call Use Ped Time	Enabled
Offset Ref	Lead	Ped Reservice	Disabled
Ped Recall	Disabled	FO Add Initial	Disabled
Local Zero Override	Disabled	Multi Sync	Disabled
Re-sync Count	0	Force Mode	Floating

Patterns

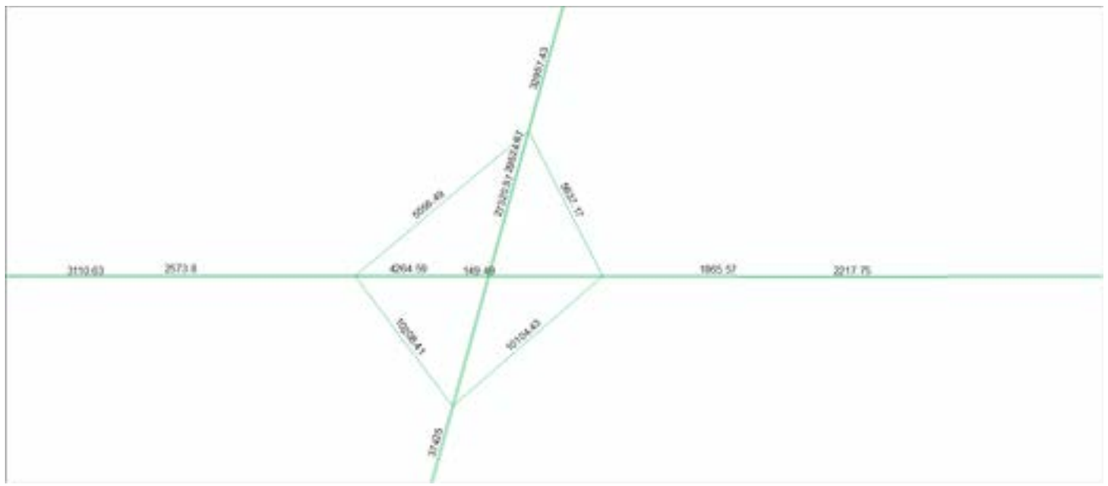
Pattern	Split #	Cycle	Offset	Phase Splits																Coordination Phases													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	3	180	0	23	143	22	52	21	145	22	52	0	0	0	0	0	0	0	0	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
2	2	190	0	23	104	21	40	21	104	23	40	0	0	0	0	0	0	0	0	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
3	3	180	0	13	93	12	62	11	95	12	62	0	0	0	0	0	0	0	0	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
4	4	135	0	21	52	21	41	21	52	21	41	0	0	0	0	0	0	0	0	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
5	5	135	0	11	92	11	21	11	92	11	21	0	0	0	0	0	0	0	0	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
6	6	135	0	11	52	11	61	11	52	11	61	0	0	0	0	0	0	0	0	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
7	7	240	0	23	130	32	55	21	132	22	65	0	0	0	0	0	0	0	0	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
8	8	180	0	13	128	11	28	10	131	11	28	0	0	0	0	0	0	0	0	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
9	9	180	0	13	93	12	62	11	95	12	62	0	0	0	0	0	0	0	0	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
10	10	120	0	18	53	20	29	16	55	20	29	0	0	0	0	0	0	0	0	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
11	11	180	0	11	145	11	13	11	145	11	13	0	0	0	0	0	0	0	0	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
12	12	180	0	130	26	11	13	130	26	11	13	0	0	0	0	0	0	0	0	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
13	13	180	0	130	26	11	13	26	130	11	13	0	0	0	0	0	0	0	0	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
14	14	180	0	26	130	11	13	130	26	11	13	0	0	0	0	0	0	0	0	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
15	15	180	0	11	26	11	132	11	26	11	132	0	0	0	0	0	0	0	0	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
16	16	180	0	11	26	130	13	11	26	130	13	0	0	0	0	0	0	0	0	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
17	17	180	0	11	26	11	132	11	26	130	13	0	0	0	0	0	0	0	0	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
18	18	180	0	11	26	130	13	11	26	13	130	0	0	0	0	0	0	0	0	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
19	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
21	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
22	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
23	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
24	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
25	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
26	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
27	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
28	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
29	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
30	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
31	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
32	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
33	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
34	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
35	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
36	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
37	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
38	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
39	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
40	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
41	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
42	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
43	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
44	44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
45	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
46	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
47	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Appendix 2. MAG Model Traffic Volumes

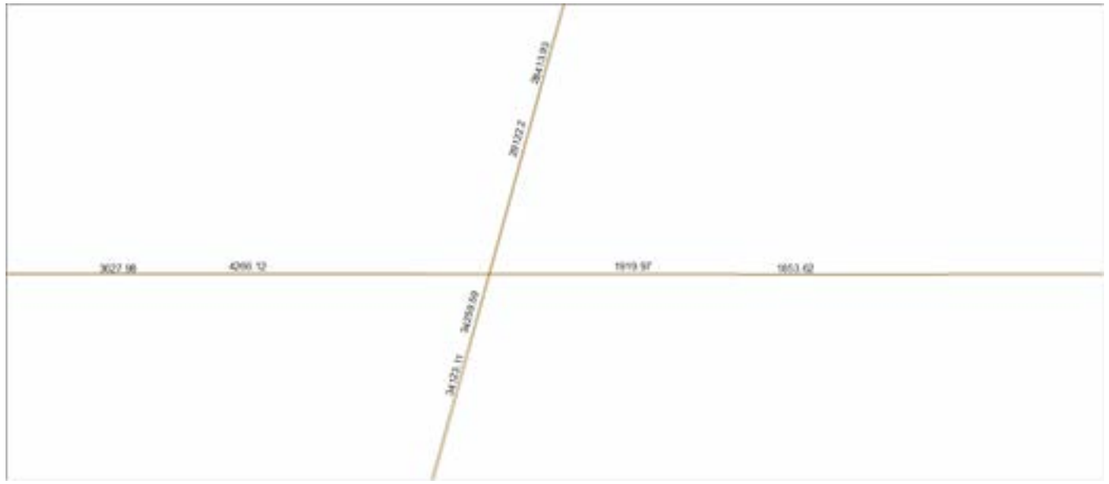
MAG Existing 2020 – 24 Hour Segment Volumes



MAG 2050 Build – 24 Hour Segment Volumes



MAG 2050 No-Build – 24 Hour Segment Volumes



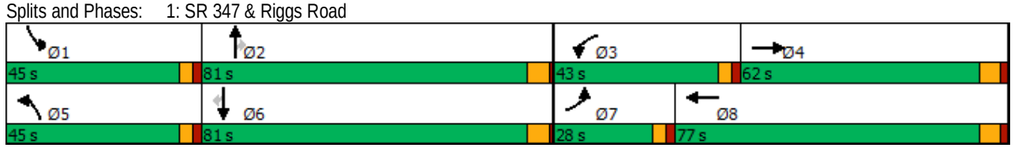
Appendix 3. Synchro and Rodel Output Reports (Existing, 2050 No-Build, 2050 Baseline Build, 2050 Build)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	20	64	85	25	1	116	2408	156	2	887	21
Future Volume (vph)	8	20	64	85	25	1	116	2408	156	2	887	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		0	155		0	165		175	175		185
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	100			100			180			180		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.886			0.996				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1626	1517	0	1703	1785	0	1719	3438	1538	1719	3438	1538
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1626	1517	0	1703	1785	0	1719	3438	1538	1719	3438	1538
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		64			1				90			90
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		4234			5790			9202			8325	
Travel Time (s)		52.5			71.8			114.1			103.2	
Peak Hour Factor	0.85	0.85	0.85	0.72	0.72	0.72	0.96	0.96	0.96	0.94	0.94	0.94
Heavy Vehicles (%)	11%	11%	11%	6%	6%	6%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	9	24	75	118	35	1	121	2508	163	2	944	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	9	99	0	118	36	0	121	2508	163	2	944	22
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases									2			6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	20.0	20.0	6.0	20.0	20.0
Minimum Split (s)	11.0	57.0		11.0	54.0		11.0	35.0	35.0	11.0	33.0	33.0
Total Split (s)	28.0	62.0		43.0	77.0		45.0	81.0	81.0	45.0	81.0	81.0
Total Split (%)	12.1%	26.8%		18.6%	33.3%		19.5%	35.1%	35.1%	19.5%	35.1%	35.1%
Maximum Green (s)	23.0	55.0		38.0	70.0		40.0	75.0	75.0	40.0	75.0	75.0
Yellow Time (s)	3.0	5.0		3.0	5.0		3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	1.0	1.0	2.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	7.0		5.0	7.0		5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5	2.5		2.5	2.5		2.5	4.5	4.5	3.5	4.5	4.5
Recall Mode	None	None		None	None		None	Min	Min	None	Min	Min
Walk Time (s)		7.0			7.0			7.0	7.0		7.0	7.0
Flash Dont Walk (s)		43.0			40.0			22.0	22.0		20.0	20.0
Pedestrian Calls (#/hr)		0			0			0	0		0	0
Act Effct Green (s)	6.4	9.0		14.4	26.3		14.6	75.7	75.7	6.3	58.1	58.1
Actuated g/C Ratio	0.05	0.08		0.12	0.22		0.12	0.64	0.64	0.05	0.49	0.49
v/c Ratio	0.10	0.57		0.58	0.09		0.58	1.15	0.16	0.02	0.56	0.03
Control Delay	61.6	36.6		61.9	38.7		61.8	96.5	5.9	60.0	25.1	0.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.6	36.6		61.9	38.7		61.8	96.5	5.9	60.0	25.1	0.0
LOS	E	D		E	D		E	F	A	E	C	A
Approach Delay		38.7			56.5			89.7			24.6	
Approach LOS		D			E			F			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 231			
Actuated Cycle Length: 119.2			
Natural Cycle: 145			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.15			
Intersection Signal Delay: 71.4		Intersection LOS: E	
Intersection Capacity Utilization 97.9%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 1: SR 347 & Riggs Road



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	9	99	118	36	121	2508	163	2	944	22
v/c Ratio	0.10	0.57	0.58	0.09	0.58	1.15	0.16	0.02	0.56	0.03
Control Delay	61.6	36.6	61.9	38.7	61.8	96.5	5.9	60.0	25.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.6	36.6	61.9	38.7	61.8	96.5	5.9	60.0	25.1	0.0
Queue Length 50th (ft)	7	25	84	20	86	~1138	18	1	257	0
Queue Length 95th (ft)	26	82	130	47	170	#1714	70	12	427	0
Internal Link Dist (ft)		4154		5710		9122			8245	
Turn Bay Length (ft)	165		155		165		175	175		185
Base Capacity (vph)	316	740	547	1058	582	2181	1009	582	2181	1009
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.13	0.22	0.03	0.21	1.15	0.16	0.00	0.43	0.02

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

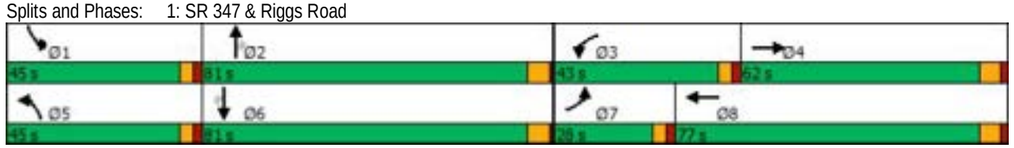
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	36	126	202	21	5	100	1224	118	4	2132	9
Future Volume (vph)	27	36	126	202	21	5	100	1224	118	4	2132	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		0	155		0	165		175	175		185
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	100			100			180			180		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.883			0.971				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1626	1511	0	1703	1740	0	1719	3438	1538	1719	3438	1538
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1626	1511	0	1703	1740	0	1719	3438	1538	1719	3438	1538
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		72			5				90			90
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		4234			5790			9202			8325	
Travel Time (s)		52.5			71.8			114.1			103.2	
Peak Hour Factor	0.94	0.94	0.94	0.84	0.84	0.84	0.94	0.94	0.94	0.96	0.96	0.96
Heavy Vehicles (%)	11%	11%	11%	6%	6%	6%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	29	38	134	240	25	6	106	1302	126	4	2221	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	29	172	0	240	31	0	106	1302	126	4	2221	9
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases									2			6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	20.0	20.0	6.0	20.0	20.0
Minimum Split (s)	11.0	57.0		11.0	54.0		11.0	35.0	35.0	11.0	33.0	33.0
Total Split (s)	28.0	62.0		43.0	77.0		45.0	81.0	81.0	45.0	81.0	81.0
Total Split (%)	12.1%	26.8%		18.6%	33.3%		19.5%	35.1%	35.1%	19.5%	35.1%	35.1%
Maximum Green (s)	23.0	55.0		38.0	70.0		40.0	75.0	75.0	40.0	75.0	75.0
Yellow Time (s)	3.0	5.0		3.0	5.0		3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	1.0	1.0	2.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	7.0		5.0	7.0		5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5	2.5		2.5	2.5		2.5	4.5	4.5	3.5	4.5	4.5
Recall Mode	None	None		None	None		None	Min	Min	None	Min	Min
Walk Time (s)		7.0			7.0			7.0	7.0		7.0	7.0
Flash Dont Walk (s)		43.0			40.0			22.0	22.0		20.0	20.0
Pedestrian Calls (#/hr)		0			0			0	0		0	0
Act Effct Green (s)	16.3	16.4		28.5	34.0		15.1	93.9	93.9	6.5	75.8	75.8
Actuated g/C Ratio	0.10	0.10		0.18	0.21		0.09	0.59	0.59	0.04	0.48	0.48
v/c Ratio	0.17	0.78		0.79	0.08		0.65	0.64	0.13	0.06	1.36	0.01
Control Delay	77.5	65.0		82.4	43.6		90.5	26.1	7.0	83.0	198.0	0.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	77.5	65.0		82.4	43.6		90.5	26.1	7.0	83.0	198.0	0.0
LOS	E	E		F	D		F	C	A	F	F	A
Approach Delay		66.8			77.9			29.0			197.0	
Approach LOS		E			E			C			F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 231			
Actuated Cycle Length: 159.1			
Natural Cycle: 145			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.36			
Intersection Signal Delay: 122.5		Intersection LOS: F	
Intersection Capacity Utilization 104.5%		ICU Level of Service G	
Analysis Period (min) 15			

Splits and Phases: 1: SR 347 & Riggs Road



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	29	172	240	31	106	1302	126	4	2221	9
v/c Ratio	0.17	0.78	0.79	0.08	0.65	0.64	0.13	0.06	1.36	0.01
Control Delay	77.5	65.0	82.4	43.6	90.5	26.1	7.0	83.0	198.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	77.5	65.0	82.4	43.6	90.5	26.1	7.0	83.0	198.0	0.0
Queue Length 50th (ft)	30	103	240	21	108	441	15	4	~1595	0
Queue Length 95th (ft)	73	207	350	49	195	774	64	20	#2115	0
Internal Link Dist (ft)		4154		5710		9122			8245	
Turn Bay Length (ft)	165		155		165		175	175		185
Base Capacity (vph)	285	575	411	777	436	2028	944	436	1638	780
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.30	0.58	0.04	0.24	0.64	0.13	0.01	1.36	0.01

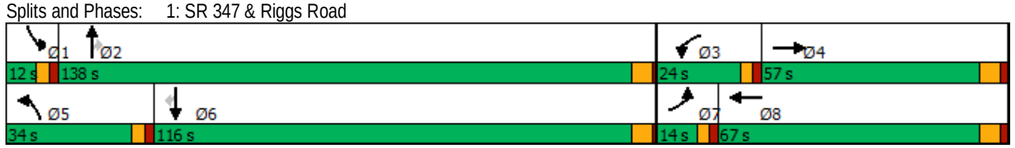
Intersection Summary
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	52	168	223	66	3	162	3363	218	3	1239	29
Future Volume (vph)	21	52	168	223	66	3	162	3363	218	3	1239	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		0	155		0	160		175	175		185
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	100			100			180			180		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.885			0.993				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1626	1515	0	1703	1780	0	1719	3438	1538	1719	3438	1538
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1626	1515	0	1703	1780	0	1719	3438	1538	1719	3438	1538
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		65			1				90			113
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		4234			5790			9202			8325	
Travel Time (s)		52.5			71.8			114.1			103.2	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	11%	11%	11%	6%	6%	6%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	25	61	198	262	78	4	180	3737	242	3	1377	32
Shared Lane Traffic (%)												
Lane Group Flow (vph)	25	259	0	262	82	0	180	3737	242	3	1377	32
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases									2			6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	20.0	20.0	6.0	20.0	20.0
Minimum Split (s)	11.0	57.0		11.0	54.0		11.0	35.0	35.0	11.0	33.0	33.0
Total Split (s)	14.0	57.0		24.0	67.0		34.0	138.0	138.0	12.0	116.0	116.0
Total Split (%)	6.1%	24.7%		10.4%	29.0%		14.7%	59.7%	59.7%	5.2%	50.2%	50.2%
Maximum Green (s)	9.0	50.0		19.0	60.0		29.0	132.0	132.0	7.0	110.0	110.0
Yellow Time (s)	3.0	5.0		3.0	5.0		3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	1.0	1.0	2.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	7.0		5.0	7.0		5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5	2.5		2.5	2.5		2.5	4.5	4.5	3.5	4.5	4.5
Recall Mode	None	None		None	None		None	Min	Min	None	Min	Min
Walk Time (s)		7.0			7.0			7.0	7.0		7.0	7.0
Flash Dont Walk (s)		43.0			40.0			22.0	22.0		20.0	20.0
Pedestrian Calls (#/hr)		0			0			0	0		0	0
Act Effct Green (s)	7.7	32.7		19.1	46.5		25.3	135.0	135.0	6.4	106.8	106.8
Actuated g/C Ratio	0.04	0.16		0.09	0.22		0.12	0.65	0.65	0.03	0.52	0.52
v/c Ratio	0.42	0.88		1.67	0.20		0.86	1.67	0.23	0.06	0.78	0.04
Control Delay	122.5	93.2		377.1	67.2		122.7	329.7	10.8	107.0	46.1	0.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	122.5	93.2		377.1	67.2		122.7	329.7	10.8	107.0	46.1	0.1
LOS	F	F		F	E		F	F	B	F	D	A
Approach Delay		95.8			303.2			302.2			45.2	
Approach LOS		F			F			F			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 231			
Actuated Cycle Length: 207			
Natural Cycle: 145			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.67			
Intersection Signal Delay: 234.2		Intersection LOS: F	
Intersection Capacity Utilization 142.6%		ICU Level of Service H	
Analysis Period (min) 15			

Splits and Phases: 1: SR 347 & Riggs Road



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	25	259	262	82	180	3737	242	3	1377	32
v/c Ratio	0.42	0.88	1.67	0.20	0.86	1.67	0.23	0.06	0.78	0.04
Control Delay	122.5	93.2	377.1	67.2	122.7	329.7	10.8	107.0	46.1	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	122.5	93.2	377.1	67.2	122.7	329.7	10.8	107.0	46.1	0.1
Queue Length 50th (ft)	33	262	~502	90	235	~3792	76	4	818	0
Queue Length 95th (ft)	75	369	#757	146	#413	#4490	168	20	1043	0
Internal Link Dist (ft)		4154		5710		9122			8245	
Turn Bay Length (ft)	165		155		160		175	175		185
Base Capacity (vph)	70	417	157	519	242	2241	1034	58	1836	874
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.62	1.67	0.16	0.74	1.67	0.23	0.05	0.75	0.04

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	94	330	529	55	13	140	1709	165	6	2977	13
Future Volume (vph)	71	94	330	529	55	13	140	1709	165	6	2977	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		0	155		0	160		175	175		185
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	100			100			180			180		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.883			0.972				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1626	1511	0	1703	1742	0	1719	3438	1538	1719	3438	1538
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1626	1511	0	1703	1742	0	1719	3438	1538	1719	3438	1538
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		54			5				90			90
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		4234			5790			9202			8325	
Travel Time (s)		52.5			71.8			114.1			103.2	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	11%	11%	11%	6%	6%	6%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	84	111	388	622	65	15	156	1899	183	7	3308	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	84	499	0	622	80	0	156	1899	183	7	3308	14
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases									2			6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	20.0	20.0	6.0	20.0	20.0
Minimum Split (s)	11.0	57.0		11.0	54.0		11.0	35.0	35.0	11.0	33.0	33.0
Total Split (s)	25.0	61.0		41.0	77.0		17.0	117.0	117.0	12.0	112.0	112.0
Total Split (%)	10.8%	26.4%		17.7%	33.3%		7.4%	50.6%	50.6%	5.2%	48.5%	48.5%
Maximum Green (s)	20.0	54.0		36.0	70.0		12.0	111.0	111.0	7.0	106.0	106.0
Yellow Time (s)	3.0	5.0		3.0	5.0		3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	1.0	1.0	2.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	7.0		5.0	7.0		5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5	2.5		2.5	2.5		2.5	4.5	4.5	3.5	4.5	4.5
Recall Mode	None	None		None	None		None	Min	Min	None	Min	Min
Walk Time (s)		7.0			7.0			7.0	7.0		7.0	7.0
Flash Dont Walk (s)		43.0			40.0			22.0	22.0		20.0	20.0
Pedestrian Calls (#/hr)		0			0			0	0		0	0
Act Effct Green (s)	16.1	54.0		36.0	73.9		12.0	118.2	118.2	6.6	106.0	106.0
Actuated g/C Ratio	0.07	0.23		0.16	0.32		0.05	0.51	0.51	0.03	0.46	0.46
v/c Ratio	0.74	1.27		2.35	0.14		1.75	1.08	0.22	0.14	2.10	0.02
Control Delay	140.2	196.1		650.2	54.3		431.0	98.1	16.6	115.7	525.3	0.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	140.2	196.1		650.2	54.3		431.0	98.1	16.6	115.7	525.3	0.1
LOS	F	F		F	D		F	F	B	F	F	A
Approach Delay		188.1			582.3			114.6			522.2	
Approach LOS		F			F			F			F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 231			
Actuated Cycle Length: 231			
Natural Cycle: 145			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 2.35			
Intersection Signal Delay: 366.8		Intersection LOS: F	
Intersection Capacity Utilization 163.8%		ICU Level of Service H	
Analysis Period (min) 15			

Splits and Phases: 1: SR 347 & Riggs Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	84	499	622	80	156	1899	183	7	3308	14
v/c Ratio	0.74	1.27	2.35	0.14	1.75	1.08	0.22	0.14	2.10	0.02
Control Delay	140.2	196.1	650.2	54.3	431.0	98.1	16.6	115.7	525.3	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	140.2	196.1	650.2	54.3	431.0	98.1	16.6	115.7	525.3	0.1
Queue Length 50th (ft)	128	~888	~1543	83	~351	~1632	71	11	~4181	0
Queue Length 95th (ft)	188	#1041	#1682	129	#531	#1888	141	34	#4191	0
Internal Link Dist (ft)		4154		5710		9122			8245	
Turn Bay Length (ft)	165		155		160		175	175		185
Base Capacity (vph)	140	394	265	560	89	1759	831	52	1577	754
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.60	1.27	2.35	0.14	1.75	1.08	0.22	0.13	2.10	0.02

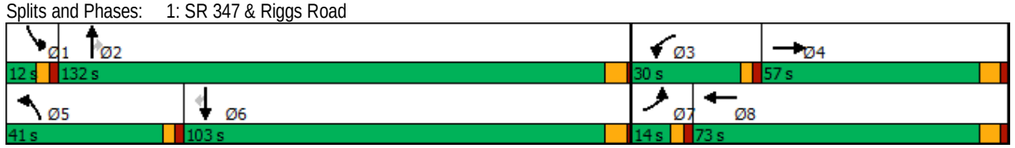
Intersection Summary
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	46	146	194	57	2	181	3756	243	3	1383	33
Future Volume (vph)	18	46	146	194	57	2	181	3756	243	3	1383	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		0	155		0	160		175	175		185
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	100			100			180			180		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt		0.886			0.996				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1626	1517	0	1703	1785	0	1719	4940	1538	1719	4940	1538
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1626	1517	0	1703	1785	0	1719	4940	1538	1719	4940	1538
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		63			1				90			113
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		4234			5790			9202			8325	
Travel Time (s)		52.5			71.8			114.1			103.2	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.90	0.90	0.90	0.85	0.85	0.85
Heavy Vehicles (%)	11%	11%	11%	6%	6%	6%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	21	54	172	228	67	2	201	4173	270	4	1627	39
Shared Lane Traffic (%)												
Lane Group Flow (vph)	21	226	0	228	69	0	201	4173	270	4	1627	39
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases									2			6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	20.0	20.0	6.0	20.0	20.0
Minimum Split (s)	11.0	57.0		11.0	54.0		11.0	35.0	35.0	11.0	33.0	33.0
Total Split (s)	14.0	57.0		30.0	73.0		41.0	132.0	132.0	12.0	103.0	103.0
Total Split (%)	6.1%	24.7%		13.0%	31.6%		17.7%	57.1%	57.1%	5.2%	44.6%	44.6%
Maximum Green (s)	9.0	50.0		25.0	66.0		36.0	126.0	126.0	7.0	97.0	97.0
Yellow Time (s)	3.0	5.0		3.0	5.0		3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	1.0	1.0	2.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	7.0		5.0	7.0		5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5	2.5		2.5	2.5		2.5	4.5	4.5	3.5	4.5	4.5
Recall Mode	None	None		None	None		None	Min	Min	None	Min	Min
Walk Time (s)		7.0			7.0			7.0	7.0		7.0	7.0
Flash Dont Walk (s)		43.0			40.0			22.0	22.0		20.0	20.0
Pedestrian Calls (#/hr)		0			0			0	0		0	0
Act Effct Green (s)	7.5	27.4		25.1	49.8		27.6	127.7	127.7	6.5	97.2	97.2
Actuated g/C Ratio	0.04	0.14		0.13	0.25		0.14	0.64	0.64	0.03	0.48	0.48
v/c Ratio	0.35	0.87		1.07	0.16		0.85	1.33	0.27	0.07	0.68	0.05
Control Delay	114.1	90.5		159.1	61.1		115.2	180.7	12.2	103.3	43.3	0.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	114.1	90.5		159.1	61.1		115.2	180.7	12.2	103.3	43.3	0.1
LOS	F	F		F	E		F	F	B	F	D	A
Approach Delay		92.5			136.4			168.1			42.4	
Approach LOS		F			F			F			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 231			
Actuated Cycle Length: 200.5			
Natural Cycle: 145			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.33			
Intersection Signal Delay: 133.4		Intersection LOS: F	
Intersection Capacity Utilization 118.9%		ICU Level of Service H	
Analysis Period (min) 15			

Splits and Phases: 1: SR 347 & Riggs Road



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	21	226	228	69	201	4173	270	4	1627	39
v/c Ratio	0.35	0.87	1.07	0.16	0.85	1.33	0.27	0.07	0.68	0.05
Control Delay	114.1	90.5	159.1	61.1	115.2	180.7	12.2	103.3	43.3	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	114.1	90.5	159.1	61.1	115.2	180.7	12.2	103.3	43.3	0.1
Queue Length 50th (ft)	27	214	~319	72	256	~2527	93	5	599	0
Queue Length 95th (ft)	64	315	#555	122	393	#3038	197	21	723	0
Internal Link Dist (ft)		4154		5710		9122			8245	
Turn Bay Length (ft)	165		155		160		175	175		185
Base Capacity (vph)	73	427	213	590	309	3147	1012	60	2429	813
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.53	1.07	0.12	0.65	1.33	0.27	0.07	0.67	0.05

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

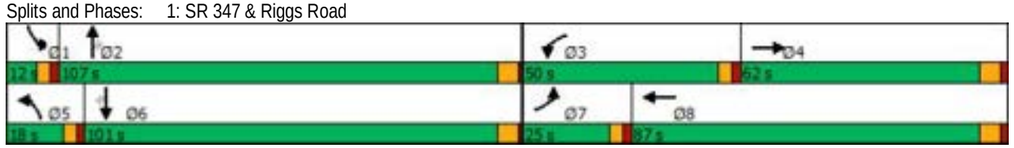
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	62	82	288	462	48	11	156	1909	184	6	3325	14
Future Volume (vph)	62	82	288	462	48	11	156	1909	184	6	3325	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		0	155		0	160		175	175		185
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	100			100			180			180		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt		0.883			0.972				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1626	1511	0	1703	1742	0	1719	4940	1538	1719	4940	1538
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1626	1511	0	1703	1742	0	1719	4940	1538	1719	4940	1538
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		68			6				90			113
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		4234			5790			9202			8325	
Travel Time (s)		52.5			71.8			114.1			103.2	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	11%	11%	11%	6%	6%	6%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	73	96	339	544	56	13	173	2121	204	7	3694	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	73	435	0	544	69	0	173	2121	204	7	3694	16
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases									2			6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	20.0	20.0	6.0	20.0	20.0
Minimum Split (s)	11.0	57.0		11.0	54.0		11.0	35.0	35.0	11.0	33.0	33.0
Total Split (s)	25.0	62.0		50.0	87.0		18.0	107.0	107.0	12.0	101.0	101.0
Total Split (%)	10.8%	26.8%		21.6%	37.7%		7.8%	46.3%	46.3%	5.2%	43.7%	43.7%
Maximum Green (s)	20.0	55.0		45.0	80.0		13.0	101.0	101.0	7.0	95.0	95.0
Yellow Time (s)	3.0	5.0		3.0	5.0		3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	1.0	1.0	2.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	7.0		5.0	7.0		5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5	2.5		2.5	2.5		2.5	4.5	4.5	3.5	4.5	4.5
Recall Mode	None	None		None	None		None	Min	Min	None	Min	Min
Walk Time (s)		7.0			7.0			7.0	7.0		7.0	7.0
Flash Dont Walk (s)		43.0			40.0			22.0	22.0		20.0	20.0
Pedestrian Calls (#/hr)		0			0			0	0		0	0
Act Effct Green (s)	15.0	55.0		45.0	85.0		13.0	108.2	108.2	6.6	95.0	95.0
Actuated g/C Ratio	0.06	0.24		0.19	0.37		0.06	0.47	0.47	0.03	0.41	0.41
v/c Ratio	0.70	1.06		1.64	0.11		1.80	0.92	0.27	0.14	1.82	0.02
Control Delay	137.2	127.2		351.6	45.5		447.4	64.1	21.8	115.7	405.8	0.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	137.2	127.2		351.6	45.5		447.4	64.1	21.8	115.7	405.8	0.1
LOS	F	F		F	D		F	E	C	F	F	A
Approach Delay		128.6			317.1			87.2			403.5	
Approach LOS		F			F			F			F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 231			
Actuated Cycle Length: 231			
Natural Cycle: 145			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.82			
Intersection Signal Delay: 269.5		Intersection LOS: F	
Intersection Capacity Utilization 139.7%		ICU Level of Service H	
Analysis Period (min) 15			

Splits and Phases: 1: SR 347 & Riggs Road



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	73	435	544	69	173	2121	204	7	3694	16
v/c Ratio	0.70	1.06	1.64	0.11	1.80	0.92	0.27	0.14	1.82	0.02
Control Delay	137.2	127.2	351.6	45.5	447.4	64.1	21.8	115.7	405.8	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	137.2	127.2	351.6	45.5	447.4	64.1	21.8	115.7	405.8	0.1
Queue Length 50th (ft)	111	~640	~1192	64	~393	1058	98	11	~3093	0
Queue Length 95th (ft)	166	#799	#1341	106	#579	#1247	180	34	#3077	0
Internal Link Dist (ft)		4154		5710		9122			8245	
Turn Bay Length (ft)	165		155		160		175	175		185
Base Capacity (vph)	140	411	331	645	96	2313	768	52	2031	699
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	1.06	1.64	0.11	1.80	0.92	0.27	0.13	1.82	0.02

Intersection Summary
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

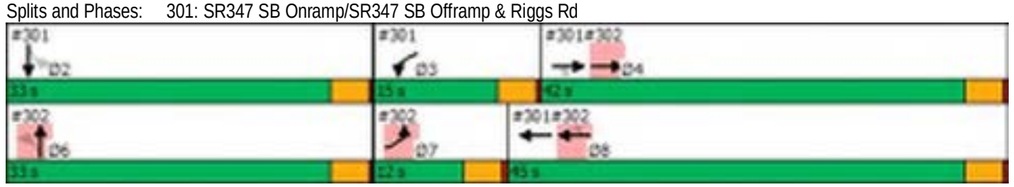
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	64	146	194	238	0	0	0	0	3	1	33
Future Volume (vph)	0	64	146	194	238	0	0	0	0	3	1	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		150	150		0	0		0	150		0
Storage Lanes	0		1	1		0	0		0	1		0
Taper Length (ft)	25			100			25			100		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850								0.854	
Flt Protected				0.950						0.950		
Satd. Flow (prot)	0	3252	1455	1703	3406	0	0	0	0	1719	1545	0
Flt Permitted				0.950						0.950		
Satd. Flow (perm)	0	3252	1455	1703	3406	0	0	0	0	1719	1545	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			172								41	
Link Speed (mph)		45			45			30			45	
Link Distance (ft)		1429			660			834			962	
Travel Time (s)		21.7			10.0			19.0			14.6	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.92	0.92	0.92	0.80	0.80	0.80
Heavy Vehicles (%)	11%	11%	11%	6%	6%	6%	2%	2%	2%	5%	5%	5%
Adj. Flow (vph)	0	75	172	228	280	0	0	0	0	4	1	41
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	75	172	228	280	0	0	0	0	4	42	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2	1	1	2					1	2	
Detector Template		Thru	Right	Left	Thru					Left	Thru	
Leading Detector (ft)		100	20	20	100					20	100	
Trailing Detector (ft)		0	0	0	0					0	0	
Detector 1 Position(ft)		0	0	0	0					0	0	
Detector 1 Size(ft)		6	20	20	6					20	6	
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	
Detector 2 Position(ft)		94			94						94	
Detector 2 Size(ft)		6			6						6	
Detector 2 Type		Cl+Ex			Cl+Ex						Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0						0.0	
Turn Type		NA	Perm	Prot	NA					Perm	NA	
Protected Phases		4		3	8						2	

Lane Group	Ø6	Ø7
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Heavy Vehicles (%)		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Enter Blocked Intersection		
Lane Alignment		
Median Width(ft)		
Link Offset(ft)		
Crosswalk Width(ft)		
Two way Left Turn Lane		
Headway Factor		
Turning Speed (mph)		
Number of Detectors		
Detector Template		
Leading Detector (ft)		
Trailing Detector (ft)		
Detector 1 Position(ft)		
Detector 1 Size(ft)		
Detector 1 Type		
Detector 1 Channel		
Detector 1 Extend (s)		
Detector 1 Queue (s)		
Detector 1 Delay (s)		
Detector 2 Position(ft)		
Detector 2 Size(ft)		
Detector 2 Type		
Detector 2 Channel		
Detector 2 Extend (s)		
Turn Type		
Protected Phases	6	7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases			4							2		
Detector Phase		4	4	3	8					2	2	
Switch Phase												
Minimum Initial (s)		5.0	5.0	5.0	5.0					5.0	5.0	
Minimum Split (s)		20.0	20.0	17.0	20.0					20.0	20.0	
Total Split (s)		42.0	42.0	15.0	45.0					33.0	33.0	
Total Split (%)		46.7%	46.7%	16.7%	50.0%					36.7%	36.7%	
Maximum Green (s)		38.0	38.0	11.0	41.0					29.0	29.0	
Yellow Time (s)		3.5	3.5	3.5	3.5					3.5	3.5	
All-Red Time (s)		0.5	0.5	0.5	0.5					0.5	0.5	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0					0.0	0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	
Lead/Lag		Lag	Lag	Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0	3.0	3.0	3.0					3.0	3.0	
Recall Mode		None	None	None	None					None	None	
Walk Time (s)		5.0	5.0		5.0					5.0	5.0	
Flash Dont Walk (s)		11.0	11.0		11.0					11.0	11.0	
Pedestrian Calls (#/hr)		0	0		0					0	0	
Act Effct Green (s)		7.1	7.1	11.5	18.1					10.9	10.9	
Actuated g/C Ratio		0.18	0.18	0.29	0.46					0.28	0.28	
v/c Ratio		0.13	0.43	0.46	0.18					0.01	0.09	
Control Delay		15.9	7.4	18.5	8.0					11.3	5.4	
Queue Delay		0.0	0.0	0.0	0.0					0.0	0.0	
Total Delay		15.9	7.4	18.5	8.0					11.3	5.4	
LOS		B	A	B	A					B	A	
Approach Delay		10.0			12.7						6.0	
Approach LOS		A			B						A	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 39.2			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.46			
Intersection Signal Delay: 11.5		Intersection LOS: B	
Intersection Capacity Utilization 36.2%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 301: SR347 SB Onramp/SR347 SB Offramp & Riggs Rd



Lane Group	Ø6	Ø7
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	20.0	9.0
Total Split (s)	33.0	12.0
Total Split (%)	37%	13%
Maximum Green (s)	29.0	8.0
Yellow Time (s)	3.5	3.5
All-Red Time (s)	0.5	0.5
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		Lead
Lead-Lag Optimize?		
Vehicle Extension (s)	3.0	3.0
Recall Mode	None	None
Walk Time (s)	5.0	
Flash Dont Walk (s)	11.0	
Pedestrian Calls (#/hr)	0	
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	SBL	SBT
Lane Group Flow (vph)	75	172	228	280	4	42
v/c Ratio	0.13	0.43	0.46	0.18	0.01	0.09
Control Delay	15.9	7.4	18.5	8.0	11.3	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.9	7.4	18.5	8.0	11.3	5.4
Queue Length 50th (ft)	7	0	27	5	1	0
Queue Length 95th (ft)	21	33	128	53	5	13
Internal Link Dist (ft)	1349			580		882
Turn Bay Length (ft)		150	150		150	
Base Capacity (vph)	3003	1357	499	3259	1294	1173
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.13	0.46	0.09	0.00	0.04

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	49	0	0	251	2	181	1	243	0	0	0
Future Volume (vph)	18	49	0	0	251	2	181	1	243	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	0		150	150		0	0		0
Storage Lanes	1		0	0		1	1		0	0		0
Taper Length (ft)	100			25			100			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850		0.851				
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1626	3252	0	0	3406	1524	1719	1540	0	0	0	0
Flt Permitted	0.950						0.950					
Satd. Flow (perm)	1626	3252	0	0	3406	1524	1719	1540	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						61		286				
Link Speed (mph)		45			45			45			30	
Link Distance (ft)		660			2381			973			807	
Travel Time (s)		10.0			36.1			14.7			18.3	
Peak Hour Factor	0.80	0.80	0.80	0.85	0.85	0.85	0.85	0.85	0.85	0.92	0.92	0.92
Heavy Vehicles (%)	11%	11%	11%	6%	6%	6%	5%	5%	5%	2%	2%	2%
Adj. Flow (vph)	23	61	0	0	295	2	213	1	286	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	23	61	0	0	295	2	213	287	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2	1	1	2				
Detector Template	Left	Thru			Thru	Right	Left	Thru				
Leading Detector (ft)	20	100			100	20	20	100				
Trailing Detector (ft)	0	0			0	0	0	0				
Detector 1 Position(ft)	0	0			0	0	0	0				
Detector 1 Size(ft)	20	6			6	20	20	6				
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex				
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0				
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0				
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0				
Detector 2 Position(ft)		94			94			94				
Detector 2 Size(ft)		6			6			6				
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				
Turn Type	Prot	NA			NA	Perm	Perm	NA				
Protected Phases	7	4			8			6				

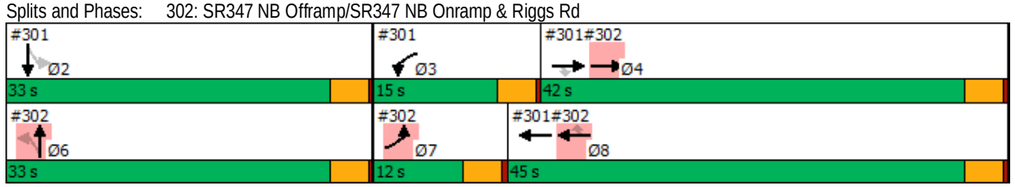
Lane Group	Ø2	Ø3
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Heavy Vehicles (%)		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Enter Blocked Intersection		
Lane Alignment		
Median Width(ft)		
Link Offset(ft)		
Crosswalk Width(ft)		
Two way Left Turn Lane		
Headway Factor		
Turning Speed (mph)		
Number of Detectors		
Detector Template		
Leading Detector (ft)		
Trailing Detector (ft)		
Detector 1 Position(ft)		
Detector 1 Size(ft)		
Detector 1 Type		
Detector 1 Channel		
Detector 1 Extend (s)		
Detector 1 Queue (s)		
Detector 1 Delay (s)		
Detector 2 Position(ft)		
Detector 2 Size(ft)		
Detector 2 Type		
Detector 2 Channel		
Detector 2 Extend (s)		
Turn Type		
Protected Phases	2	3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases						8	6					
Detector Phase	7	4			8	8	6	6				
Switch Phase												
Minimum Initial (s)	5.0	5.0			5.0	5.0	5.0	5.0				
Minimum Split (s)	9.0	20.0			20.0	20.0	20.0	20.0				
Total Split (s)	12.0	42.0			45.0	45.0	33.0	33.0				
Total Split (%)	13.3%	46.7%			50.0%	50.0%	36.7%	36.7%				
Maximum Green (s)	8.0	38.0			41.0	41.0	29.0	29.0				
Yellow Time (s)	3.5	3.5			3.5	3.5	3.5	3.5				
All-Red Time (s)	0.5	0.5			0.5	0.5	0.5	0.5				
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0				
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
Lead/Lag	Lead	Lag			Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0				
Recall Mode	None	None			None	None	None	None				
Walk Time (s)		5.0			5.0	5.0	5.0	5.0				
Flash Dont Walk (s)		11.0			11.0	11.0	11.0	11.0				
Pedestrian Calls (#/hr)		0			0	0	0	0				
Act Effct Green (s)	6.4	7.1			18.1	18.1	10.9	10.9				
Actuated g/C Ratio	0.16	0.18			0.46	0.46	0.28	0.28				
v/c Ratio	0.09	0.10			0.19	0.00	0.45	0.45				
Control Delay	20.1	29.9			8.5	0.0	16.0	4.7				
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0				
Total Delay	20.1	29.9			8.5	0.0	16.0	4.7				
LOS	C	C			A	A	B	A				
Approach Delay		27.2			8.4			9.5				
Approach LOS		C			A			A				

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 39.2
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.46
Intersection Signal Delay: 10.8 Intersection LOS: B
Intersection Capacity Utilization 36.2% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 302: SR347 NB Offramp/SR347 NB Onramp & Riggs Rd



Lane Group	Ø2	Ø3
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	20.0	17.0
Total Split (s)	33.0	15.0
Total Split (%)	37%	17%
Maximum Green (s)	29.0	11.0
Yellow Time (s)	3.5	3.5
All-Red Time (s)	0.5	0.5
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		Lead
Lead-Lag Optimize?		
Vehicle Extension (s)	3.0	3.0
Recall Mode	None	None
Walk Time (s)	5.0	
Flash Dont Walk (s)	11.0	
Pedestrian Calls (#/hr)	0	
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		

Intersection Summary

Lane Group	EBL	EBT	WBT	WBR	NBL	NBT
Lane Group Flow (vph)	23	61	295	2	213	287
v/c Ratio	0.09	0.10	0.19	0.00	0.45	0.45
Control Delay	20.1	29.9	8.5	0.0	16.0	4.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.1	29.9	8.5	0.0	16.0	4.7
Queue Length 50th (ft)	6	8	14	0	40	0
Queue Length 95th (ft)	24	20	57	0	85	34
Internal Link Dist (ft)		580	2301			893
Turn Bay Length (ft)	150			150	150	
Base Capacity (vph)	347	3003	3259	1461	1294	1230
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.02	0.09	0.00	0.16	0.23

Intersection Summary

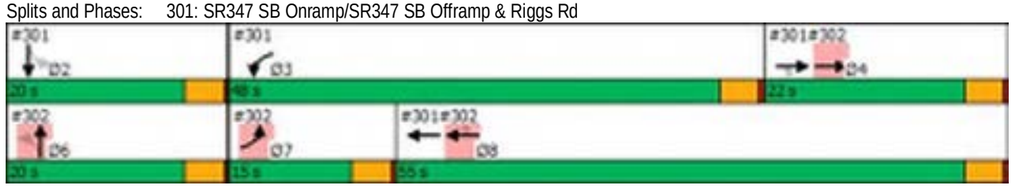
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	144	288	462	204	0	0	0	0	6	1	14
Future Volume (vph)	0	144	288	462	204	0	0	0	0	6	1	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		150	150		0	0		0	150		0
Storage Lanes	0		1	1		0	0		0	1		0
Taper Length (ft)	25			100			25			100		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850								0.858	
Flt Protected				0.950						0.950		
Satd. Flow (prot)	0	3252	1455	1703	3406	0	0	0	0	1719	1553	0
Flt Permitted				0.950						0.950		
Satd. Flow (perm)	0	3252	1455	1703	3406	0	0	0	0	1719	1553	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			339								18	
Link Speed (mph)		45			45			30			45	
Link Distance (ft)		1429			660			834			962	
Travel Time (s)		21.7			10.0			19.0			14.6	
Peak Hour Factor	0.85	0.85	0.85	0.90	0.90	0.90	0.92	0.92	0.92	0.80	0.80	0.80
Heavy Vehicles (%)	11%	11%	11%	6%	6%	6%	2%	2%	2%	5%	5%	5%
Adj. Flow (vph)	0	169	339	513	227	0	0	0	0	8	1	18
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	169	339	513	227	0	0	0	0	8	19	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2	1	1	2					1	2	
Detector Template		Thru	Right	Left	Thru					Left	Thru	
Leading Detector (ft)		100	20	20	100					20	100	
Trailing Detector (ft)		0	0	0	0					0	0	
Detector 1 Position(ft)		0	0	0	0					0	0	
Detector 1 Size(ft)		6	20	20	6					20	6	
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	
Detector 2 Position(ft)		94			94						94	
Detector 2 Size(ft)		6			6						6	
Detector 2 Type		Cl+Ex			Cl+Ex						Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0						0.0	
Turn Type		NA	Perm	Prot	NA					Perm	NA	
Protected Phases		4		3	8						2	

Lane Group	Ø6	Ø7
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Heavy Vehicles (%)		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Enter Blocked Intersection		
Lane Alignment		
Median Width(ft)		
Link Offset(ft)		
Crosswalk Width(ft)		
Two way Left Turn Lane		
Headway Factor		
Turning Speed (mph)		
Number of Detectors		
Detector Template		
Leading Detector (ft)		
Trailing Detector (ft)		
Detector 1 Position(ft)		
Detector 1 Size(ft)		
Detector 1 Type		
Detector 1 Channel		
Detector 1 Extend (s)		
Detector 1 Queue (s)		
Detector 1 Delay (s)		
Detector 2 Position(ft)		
Detector 2 Size(ft)		
Detector 2 Type		
Detector 2 Channel		
Detector 2 Extend (s)		
Turn Type		
Protected Phases	6	7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases			4							2		
Detector Phase		4	4	3	8					2	2	
Switch Phase												
Minimum Initial (s)		5.0	5.0	5.0	5.0					5.0	5.0	
Minimum Split (s)		20.0	20.0	9.0	20.0					20.0	20.0	
Total Split (s)		22.0	22.0	48.0	55.0					20.0	20.0	
Total Split (%)		24.4%	24.4%	53.3%	61.1%					22.2%	22.2%	
Maximum Green (s)		18.0	18.0	44.0	51.0					16.0	16.0	
Yellow Time (s)		3.5	3.5	3.5	3.5					3.5	3.5	
All-Red Time (s)		0.5	0.5	0.5	0.5					0.5	0.5	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0					0.0	0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	
Lead/Lag		Lag	Lag	Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0	3.0	3.0	3.0					3.0	3.0	
Recall Mode		Min	Min	None	Min					None	None	
Walk Time (s)		5.0	5.0		5.0					5.0	5.0	
Flash Dont Walk (s)		11.0	11.0		11.0					11.0	11.0	
Pedestrian Calls (#/hr)		0	0		0					0	0	
Act Effct Green (s)		10.1	10.1	23.3	30.7					11.7	11.7	
Actuated g/C Ratio		0.17	0.17	0.40	0.53					0.20	0.20	
v/c Ratio		0.30	0.64	0.75	0.13					0.02	0.06	
Control Delay		25.1	9.7	27.4	6.9					24.3	13.4	
Queue Delay		0.0	0.0	0.0	0.0					0.0	0.0	
Total Delay		25.1	9.7	27.4	6.9					24.3	13.4	
LOS		C	A	C	A					C	B	
Approach Delay		14.8			21.1						16.6	
Approach LOS		B			C						B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 58			
Natural Cycle: 65			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.75			
Intersection Signal Delay: 18.5		Intersection LOS: B	
Intersection Capacity Utilization 55.3%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 301: SR347 SB Onramp/SR347 SB Offramp & Riggs Rd



Lane Group	Ø6	Ø7
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	20.0	9.0
Total Split (s)	20.0	15.0
Total Split (%)	22%	17%
Maximum Green (s)	16.0	11.0
Yellow Time (s)	3.5	3.5
All-Red Time (s)	0.5	0.5
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		Lead
Lead-Lag Optimize?		
Vehicle Extension (s)	3.0	3.0
Recall Mode	None	None
Walk Time (s)	5.0	
Flash Dont Walk (s)	11.0	
Pedestrian Calls (#/hr)	0	
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	SBL	SBT
Lane Group Flow (vph)	169	339	513	227	8	19
v/c Ratio	0.30	0.64	0.75	0.13	0.02	0.06
Control Delay	25.1	9.7	27.4	6.9	24.3	13.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.1	9.7	27.4	6.9	24.3	13.4
Queue Length 50th (ft)	26	0	194	17	2	0
Queue Length 95th (ft)	63	54	235	35	13	16
Internal Link Dist (ft)	1349			580		882
Turn Bay Length (ft)		150	150		150	
Base Capacity (vph)	1088	712	1341	2933	511	474
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.48	0.38	0.08	0.02	0.04

Intersection Summary

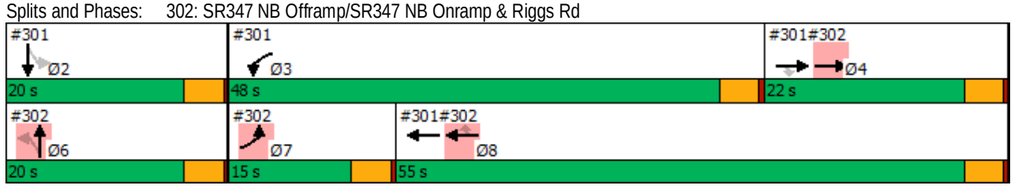
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	62	88	0	0	510	11	156	1	184	0	0	0
Future Volume (vph)	62	88	0	0	510	11	156	1	184	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	0		150	150		0	0		0
Storage Lanes	1		0	0		1	1		0	0		0
Taper Length (ft)	100			25			100			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850		0.851				
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1626	3252	0	0	3406	1524	1719	1540	0	0	0	0
Flt Permitted	0.950						0.950					
Satd. Flow (perm)	1626	3252	0	0	3406	1524	1719	1540	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						61		216				
Link Speed (mph)		45			45			45			30	
Link Distance (ft)		660			2381			973			807	
Travel Time (s)		10.0			36.1			14.7			18.3	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.92	0.92	0.92
Heavy Vehicles (%)	11%	11%	11%	6%	6%	6%	5%	5%	5%	2%	2%	2%
Adj. Flow (vph)	73	104	0	0	600	13	184	1	216	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	73	104	0	0	600	13	184	217	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2	1	1	2				
Detector Template	Left	Thru			Thru	Right	Left	Thru				
Leading Detector (ft)	20	100			100	20	20	100				
Trailing Detector (ft)	0	0			0	0	0	0				
Detector 1 Position(ft)	0	0			0	0	0	0				
Detector 1 Size(ft)	20	6			6	20	20	6				
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex				
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0				
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0				
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0				
Detector 2 Position(ft)		94			94			94				
Detector 2 Size(ft)		6			6			6				
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				
Turn Type	Prot	NA			NA	Perm	Perm	NA				
Protected Phases	7	4			8			6				

Lane Group	Ø2	Ø3
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Heavy Vehicles (%)		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Enter Blocked Intersection		
Lane Alignment		
Median Width(ft)		
Link Offset(ft)		
Crosswalk Width(ft)		
Two way Left Turn Lane		
Headway Factor		
Turning Speed (mph)		
Number of Detectors		
Detector Template		
Leading Detector (ft)		
Trailing Detector (ft)		
Detector 1 Position(ft)		
Detector 1 Size(ft)		
Detector 1 Type		
Detector 1 Channel		
Detector 1 Extend (s)		
Detector 1 Queue (s)		
Detector 1 Delay (s)		
Detector 2 Position(ft)		
Detector 2 Size(ft)		
Detector 2 Type		
Detector 2 Channel		
Detector 2 Extend (s)		
Turn Type		
Protected Phases	2	3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases						8	6					
Detector Phase	7	4			8	8	6	6				
Switch Phase												
Minimum Initial (s)	5.0	5.0			5.0	5.0	5.0	5.0				
Minimum Split (s)	9.0	20.0			20.0	20.0	20.0	20.0				
Total Split (s)	15.0	22.0			55.0	55.0	20.0	20.0				
Total Split (%)	16.7%	24.4%			61.1%	61.1%	22.2%	22.2%				
Maximum Green (s)	11.0	18.0			51.0	51.0	16.0	16.0				
Yellow Time (s)	3.5	3.5			3.5	3.5	3.5	3.5				
All-Red Time (s)	0.5	0.5			0.5	0.5	0.5	0.5				
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0				
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
Lead/Lag	Lead	Lag			Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0				
Recall Mode	None	Min			Min	Min	None	None				
Walk Time (s)		5.0			5.0	5.0	5.0	5.0				
Flash Dont Walk (s)		11.0			11.0	11.0	11.0	11.0				
Pedestrian Calls (#/hr)		0			0	0	0	0				
Act Effct Green (s)	8.3	10.1			30.7	30.7	11.7	11.7				
Actuated g/C Ratio	0.14	0.17			0.53	0.53	0.20	0.20				
v/c Ratio	0.31	0.18			0.33	0.02	0.53	0.45				
Control Delay	27.4	30.6			10.0	0.0	30.5	8.0				
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0				
Total Delay	27.4	30.6			10.0	0.0	30.5	8.0				
LOS	C	C			B	A	C	A				
Approach Delay		29.3			9.8			18.3				
Approach LOS		C			A			B				

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 58			
Natural Cycle: 65			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.75			
Intersection Signal Delay: 15.6		Intersection LOS: B	
Intersection Capacity Utilization 55.3%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 302: SR347 NB Offramp/SR347 NB Onramp & Riggs Rd



Lane Group	Ø2	Ø3
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	20.0	9.0
Total Split (s)	20.0	48.0
Total Split (%)	22%	53%
Maximum Green (s)	16.0	44.0
Yellow Time (s)	3.5	3.5
All-Red Time (s)	0.5	0.5
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		Lead
Lead-Lag Optimize?		
Vehicle Extension (s)	3.0	3.0
Recall Mode	None	None
Walk Time (s)	5.0	
Flash Dont Walk (s)	11.0	
Pedestrian Calls (#/hr)	0	
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		

Intersection Summary

Lane Group	EBL	EBT	WBT	WBR	NBL	NBT
Lane Group Flow (vph)	73	104	600	13	184	217
v/c Ratio	0.31	0.18	0.33	0.02	0.53	0.45
Control Delay	27.4	30.6	10.0	0.0	30.5	8.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.4	30.6	10.0	0.0	30.5	8.0
Queue Length 50th (ft)	28	21	68	0	54	0
Queue Length 95th (ft)	82	8	112	0	147	48
Internal Link Dist (ft)		580	2301			893
Turn Bay Length (ft)	150			150	150	
Base Capacity (vph)	332	1088	2933	1321	511	609
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.10	0.20	0.01	0.36	0.36

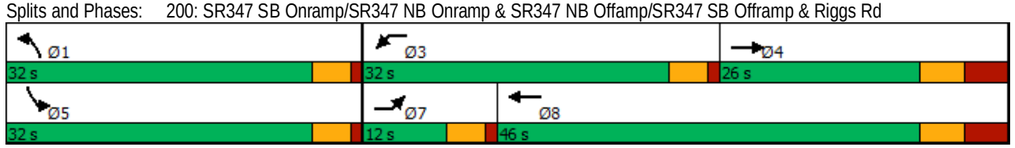
Intersection Summary

Lane Group	EBL	EBT	EBR2	WBL	WBT	WBR2	NBL	NBR2	SBL	SBR2
Lane Configurations										
Traffic Volume (vph)	18	46	146	194	57	2	181	243	3	33
Future Volume (vph)	18	46	146	194	57	2	181	243	3	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			300			0		0	
Storage Lanes	1			1			1		1	
Taper Length (ft)	100			100			25		25	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850		0.850		0.850
Flt Protected	0.950			0.950			0.950		0.950	
Satd. Flow (prot)	1626	3252	1455	1703	3406	1524	1719	1538	1719	1538
Flt Permitted	0.950			0.950			0.950		0.950	
Satd. Flow (perm)	1626	3252	1455	1703	3406	1524	1719	1538	1719	1538
Right Turn on Red			Yes			Yes		Yes		Yes
Satd. Flow (RTOR)			224			224		286		224
Link Speed (mph)		45			45					
Link Distance (ft)		1169			1072					
Travel Time (s)		17.7			16.2					
Peak Hour Factor	0.80	0.80	0.80	0.85	0.85	0.85	0.85	0.85	0.80	0.80
Heavy Vehicles (%)	11%	11%	11%	6%	6%	6%	5%	5%	5%	5%
Adj. Flow (vph)	23	58	183	228	67	2	213	286	4	41
Shared Lane Traffic (%)										
Lane Group Flow (vph)	23	58	183	228	67	2	213	286	4	41
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Right
Median Width(ft)		12			12					
Link Offset(ft)		0			0					
Crosswalk Width(ft)		16			16					
Two way Left Turn Lane										
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60		60	60		15	60	15	60	15
Number of Detectors	1	1	1	1	1	1	1	1	1	1
Detector Template	Left		Right	Left			Left	Right	Left	
Leading Detector (ft)	20	50	20	20	50	50	20	20	20	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	50	20	20	50	50	20	20	20	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel										
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	Free	Prot	Free
Protected Phases	7	4		3	8		1		5	
Permitted Phases			Free			Free		Free		Free
Detector Phase	7	4		3	8		1		5	
Switch Phase										
Minimum Initial (s)	5.0	4.0		5.0	4.0		5.0		5.0	
Minimum Split (s)	9.5	24.0		9.5	24.0		9.5		9.5	

Lane Group	EBL	EBT	EBR2	WBL	WBT	WBR2	NBL	NBR2	SBL	SBR2
Total Split (s)	12.0	26.0		32.0	46.0		32.0		32.0	
Total Split (%)	13.3%	28.9%		35.6%	51.1%		35.6%		35.6%	
Maximum Green (s)	7.5	18.0		27.5	38.0		27.5		27.5	
Yellow Time (s)	3.5	4.0		3.5	4.0		3.5		3.5	
All-Red Time (s)	1.0	4.0		1.0	4.0		1.0		1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0		0.0	
Total Lost Time (s)	4.5	8.0		4.5	8.0		4.5		4.5	
Lead/Lag	Lead	Lag		Lead	Lag					
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0		3.0	
Recall Mode	None	None		None	None		None		None	
Walk Time (s)		5.0			5.0					
Flash Dont Walk (s)		11.0			11.0					
Pedestrian Calls (#/hr)		0			0					
Act Effct Green (s)	7.7	7.9	39.9	13.1	15.0	39.9	12.4	39.9	8.8	39.9
Actuated g/C Ratio	0.19	0.20	1.00	0.33	0.38	1.00	0.31	1.00	0.22	1.00
v/c Ratio	0.07	0.09	0.13	0.41	0.05	0.00	0.40	0.19	0.01	0.03
Control Delay	22.2	20.6	0.2	17.2	10.5	0.0	17.7	0.3	17.3	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.2	20.6	0.2	17.2	10.5	0.0	17.7	0.3	17.3	0.0
LOS	C	C	A	B	B	A	B	A	B	A
Approach Delay		6.6			15.6					
Approach LOS		A			B					

Intersection Summary		
Area Type:	Other	
Cycle Length: 90		
Actuated Cycle Length: 39.9		
Natural Cycle: 60		
Control Type: Actuated-Uncoordinated		
Maximum v/c Ratio: 0.41		
Intersection Signal Delay: 9.3		Intersection LOS: A
Intersection Capacity Utilization 37.9%		ICU Level of Service A
Analysis Period (min) 15		

Splits and Phases: 200: SR347 SB Onramp/SR347 NB Onramp & SR347 NB Offamp/SR347 SB Offramp & Riggs Rd



Lane Group	EBL	EBT	EBR2	WBL	WBT	WBR2	NBL	NBR2	SBL	SBR2
Lane Group Flow (vph)	23	58	183	228	67	2	213	286	4	41
v/c Ratio	0.07	0.09	0.13	0.41	0.05	0.00	0.40	0.19	0.01	0.03
Control Delay	22.2	20.6	0.2	17.2	10.5	0.0	17.7	0.3	17.3	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.2	20.6	0.2	17.2	10.5	0.0	17.7	0.3	17.3	0.0
Queue Length 50th (ft)	6	7	0	53	4	0	49	0	1	0
Queue Length 95th (ft)	23	22	0	114	20	0	108	0	6	0
Internal Link Dist (ft)		1089			992					
Turn Bay Length (ft)	300		200	300		200		200		200
Base Capacity (vph)	396	1766	1455	1219	2850	1524	1231	1538	1231	1538
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.03	0.13	0.19	0.02	0.00	0.17	0.19	0.00	0.03

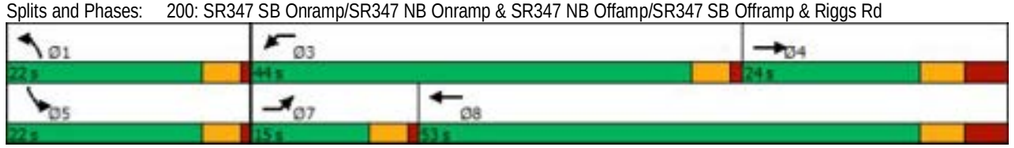
Intersection Summary

Lane Group	EBL	EBT	EBR2	WBL	WBT	WBR2	NBL	NBR2	SBL	SBR2
Lane Configurations										
Traffic Volume (vph)	62	82	288	462	48	11	156	184	6	14
Future Volume (vph)	62	82	288	462	48	11	156	184	6	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			300			0		0	
Storage Lanes	1			1			1		1	
Taper Length (ft)	100			100			25		25	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850		0.850		0.850
Flt Protected	0.950			0.950			0.950		0.950	
Satd. Flow (prot)	1626	3252	1455	1703	3406	1524	1719	1538	1719	1538
Flt Permitted	0.950			0.950			0.950		0.950	
Satd. Flow (perm)	1626	3252	1455	1703	3406	1524	1719	1538	1719	1538
Right Turn on Red			Yes			Yes		Yes		Yes
Satd. Flow (RTOR)			339			224		224		224
Link Speed (mph)		40			40					
Link Distance (ft)		1169			1072					
Travel Time (s)		19.9			18.3					
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.80	0.80
Heavy Vehicles (%)	11%	11%	11%	6%	6%	6%	5%	5%	5%	5%
Adj. Flow (vph)	73	96	339	544	56	13	184	216	8	18
Shared Lane Traffic (%)										
Lane Group Flow (vph)	73	96	339	544	56	13	184	216	8	18
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Right
Median Width(ft)		12			12					
Link Offset(ft)		0			0					
Crosswalk Width(ft)		16			16					
Two way Left Turn Lane										
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15	9	15	9
Number of Detectors	1	1	1	1	1	1	1	1	1	1
Detector Template	Left		Right	Left			Left	Right	Left	
Leading Detector (ft)	20	50	20	20	50	50	20	20	20	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	50	20	20	50	50	20	20	20	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel										
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	Free	Prot	Free
Protected Phases	7	4		3	8		1		5	
Permitted Phases			Free			Free		Free		Free
Detector Phase	7	4		3	8		1		5	
Switch Phase										
Minimum Initial (s)	5.0	4.0		5.0	4.0		5.0		5.0	
Minimum Split (s)	9.5	24.0		9.5	24.0		9.5		9.5	

Lane Group	EBL	EBT	EBR2	WBL	WBT	WBR2	NBL	NBR2	SBL	SBR2
Total Split (s)	15.0	24.0		44.0	53.0		22.0		22.0	
Total Split (%)	16.7%	26.7%		48.9%	58.9%		24.4%		24.4%	
Maximum Green (s)	10.5	16.0		39.5	45.0		17.5		17.5	
Yellow Time (s)	3.5	4.0		3.5	4.0		3.5		3.5	
All-Red Time (s)	1.0	4.0		1.0	4.0		1.0		1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0		0.0	
Total Lost Time (s)	4.5	8.0		4.5	8.0		4.5		4.5	
Lead/Lag	Lead	Lag		Lead	Lag					
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0		3.0	
Recall Mode	None	None		None	None		None		None	
Walk Time (s)		5.0			5.0					
Flash Dont Walk (s)		11.0			11.0					
Pedestrian Calls (#/hr)		0			0					
Act Effct Green (s)	15.7	9.3	57.6	26.8	22.9	57.6	13.9	57.6	9.4	57.6
Actuated g/C Ratio	0.27	0.16	1.00	0.47	0.40	1.00	0.24	1.00	0.16	1.00
v/c Ratio	0.17	0.18	0.23	0.69	0.04	0.01	0.44	0.14	0.03	0.01
Control Delay	26.3	30.1	0.4	21.0	14.5	0.0	29.0	0.2	27.8	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.3	30.1	0.4	21.0	14.5	0.0	29.0	0.2	27.8	0.0
LOS	C	C	A	C	B	A	C	A	C	A
Approach Delay		9.7			19.9					
Approach LOS		A			B					

Intersection Summary		
Area Type:	Other	
Cycle Length: 90		
Actuated Cycle Length: 57.6		
Natural Cycle: 70		
Control Type: Actuated-Uncoordinated		
Maximum v/c Ratio: 0.69		
Intersection Signal Delay: 14.7		Intersection LOS: B
Intersection Capacity Utilization 51.3%		ICU Level of Service A
Analysis Period (min) 15		

Splits and Phases: 200: SR347 SB Onramp/SR347 NB Onramp & SR347 NB Offamp/SR347 SB Offramp & Riggs Rd



Lane Group	EBL	EBT	EBR2	WBL	WBT	WBR2	NBL	NBR2	SBL	SBR2
Lane Group Flow (vph)	73	96	339	544	56	13	184	216	8	18
v/c Ratio	0.17	0.18	0.23	0.69	0.04	0.01	0.44	0.14	0.03	0.01
Control Delay	26.3	30.1	0.4	21.0	14.5	0.0	29.0	0.2	27.8	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.3	30.1	0.4	21.0	14.5	0.0	29.0	0.2	27.8	0.0
Queue Length 50th (ft)	8	17	0	171	10	0	62	0	3	0
Queue Length 95th (ft)	72	45	0	298	17	0	141	0	13	0
Internal Link Dist (ft)		1089			992					
Turn Bay Length (ft)	300		200	300		200		200		200
Base Capacity (vph)	566	1246	1455	1156	2540	1524	708	1538	708	1538
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.08	0.23	0.47	0.02	0.01	0.26	0.14	0.01	0.01

Intersection Summary

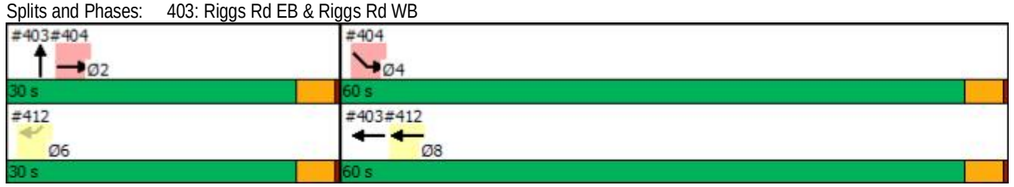
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	238	0	0	64	0	0	0	0
Future Volume (vph)	0	0	0	0	238	0	0	64	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Frt												
Flt Protected												
Satd. Flow (prot)	0	0	0	0	3438	0	0	3252	0	0	0	0
Flt Permitted												
Satd. Flow (perm)	0	0	0	0	3438	0	0	3252	0	0	0	0
Right Turn on Red			Yes			Yes	Yes		Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		275			309			280			328	
Travel Time (s)		4.2			4.7			4.2			5.0	
Peak Hour Factor	0.92	0.92	0.92	0.85	0.85	0.85	0.80	0.80	0.80	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	5%	5%	5%	11%	11%	11%	0%	0%	0%
Adj. Flow (vph)	0	0	0	0	280	0	0	80	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	280	0	0	80	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		0			0			0			0	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors					1			1				
Detector Template					Pres			Pres				
Leading Detector (ft)					50			50				
Trailing Detector (ft)					0			0				
Detector 1 Position(ft)					0			0				
Detector 1 Size(ft)					50			50				
Detector 1 Type					Cl+Ex			Cl+Ex				
Detector 1 Channel												
Detector 1 Extend (s)					0.0			0.0				
Detector 1 Queue (s)					0.0			0.0				
Detector 1 Delay (s)					0.0			0.0				
Turn Type					NA			NA				
Protected Phases					8			2				
Permitted Phases												
Detector Phase					8			2				
Switch Phase												
Minimum Initial (s)					4.0			4.0				
Minimum Split (s)					20.0			20.0				
Total Split (s)					60.0			30.0				
Total Split (%)					66.7%			33.3%				
Maximum Green (s)					56.0			26.0				

Lane Group	Ø4	Ø6
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Heavy Vehicles (%)		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Enter Blocked Intersection		
Lane Alignment		
Median Width(ft)		
Link Offset(ft)		
Crosswalk Width(ft)		
Two way Left Turn Lane		
Headway Factor		
Turning Speed (mph)		
Number of Detectors		
Detector Template		
Leading Detector (ft)		
Trailing Detector (ft)		
Detector 1 Position(ft)		
Detector 1 Size(ft)		
Detector 1 Type		
Detector 1 Channel		
Detector 1 Extend (s)		
Detector 1 Queue (s)		
Detector 1 Delay (s)		
Turn Type		
Protected Phases	4	6
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	4.0	4.0
Minimum Split (s)	20.0	20.0
Total Split (s)	60.0	30.0
Total Split (%)	67%	33%
Maximum Green (s)	56.0	26.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)					3.5			3.5				
All-Red Time (s)					0.5			0.5				
Lost Time Adjust (s)					0.0			0.0				
Total Lost Time (s)					4.0			4.0				
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)					3.0			3.0				
Recall Mode					None			None				
Walk Time (s)					5.0			5.0				
Flash Dont Walk (s)					11.0			11.0				
Pedestrian Calls (#/hr)					0			0				
Act Effct Green (s)					8.2			6.6				
Actuated g/C Ratio					0.44			0.35				
v/c Ratio					0.18			0.07				
Control Delay					4.5			6.2				
Queue Delay					0.0			0.0				
Total Delay					4.5			6.2				
LOS					A			A				
Approach Delay					4.5			6.2				
Approach LOS					A			A				

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 18.6			
Natural Cycle: 40			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.18			
Intersection Signal Delay: 4.9		Intersection LOS: A	
Intersection Capacity Utilization 16.6%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 403: Riggs Rd EB & Riggs Rd WB



Lane Group	Ø4	Ø6
Yellow Time (s)	3.5	3.5
All-Red Time (s)	0.5	0.5
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Vehicle Extension (s)	3.0	3.0
Recall Mode	None	None
Walk Time (s)	5.0	5.0
Flash Dont Walk (s)	11.0	11.0
Pedestrian Calls (#/hr)	0	0
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		

Intersection Summary

Lane Group	WBT	NBT
Lane Group Flow (vph)	280	80
v/c Ratio	0.18	0.07
Control Delay	4.5	6.2
Queue Delay	0.0	0.0
Total Delay	4.5	6.2
Queue Length 50th (ft)	8	3
Queue Length 95th (ft)	16	8
Internal Link Dist (ft)	229	200
Turn Bay Length (ft)		
Base Capacity (vph)	3438	3252
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.08	0.02

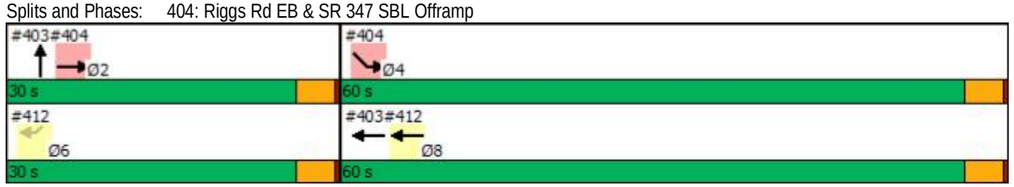
Intersection Summary

Lane Group	EBL	EBT	WBT	WBR	SEL	SER	Ø6	Ø8
Lane Configurations								
Traffic Volume (vph)	0	64	0	0	3	0		
Future Volume (vph)	0	64	0	0	3	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00		
Frt								
Flt Protected					0.950			
Satd. Flow (prot)	0	3252	0	0	1719	0		
Flt Permitted					0.950			
Satd. Flow (perm)	0	3252	0	0	1719	0		
Right Turn on Red				Yes	Yes	Yes		
Satd. Flow (RTOR)					767			
Link Speed (mph)		45	45		45			
Link Distance (ft)		328	280		313			
Travel Time (s)		5.0	4.2		4.7			
Peak Hour Factor	0.80	0.80	0.92	0.92	0.80	0.80		
Heavy Vehicles (%)	11%	11%	0%	0%	5%	5%		
Adj. Flow (vph)	0	80	0	0	4	0		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	0	80	0	0	4	0		
Enter Blocked Intersection	No	No	No	No	No	No		
Lane Alignment	Left	Left	Left	Right	Left	Right		
Median Width(ft)		0	0		12			
Link Offset(ft)		0	0		0			
Crosswalk Width(ft)		16	16		16			
Two way Left Turn Lane								
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00		
Turning Speed (mph)	15			9	15	9		
Number of Detectors		1			1			
Detector Template		Pres			Pres			
Leading Detector (ft)		50			50			
Trailing Detector (ft)		0			0			
Detector 1 Position(ft)		0			0			
Detector 1 Size(ft)		50			50			
Detector 1 Type		Cl+Ex			Cl+Ex			
Detector 1 Channel								
Detector 1 Extend (s)		0.0			0.0			
Detector 1 Queue (s)		0.0			0.0			
Detector 1 Delay (s)		0.0			0.0			
Turn Type		NA			Prot			
Protected Phases		2			4		6	8
Permitted Phases								
Detector Phase		2			4			
Switch Phase								
Minimum Initial (s)		4.0			4.0		4.0	4.0
Minimum Split (s)		20.0			20.0		20.0	20.0
Total Split (s)		30.0			60.0		30.0	60.0
Total Split (%)		33.3%			66.7%		33%	67%
Maximum Green (s)		26.0			56.0		26.0	56.0

Lane Group	EBL	EBT	WBT	WBR	SEL	SER	Ø6	Ø8
Yellow Time (s)		3.5			3.5		3.5	3.5
All-Red Time (s)		0.5			0.5		0.5	0.5
Lost Time Adjust (s)		0.0			0.0			
Total Lost Time (s)		4.0			4.0			
Lead/Lag								
Lead-Lag Optimize?								
Vehicle Extension (s)		3.0			3.0		3.0	3.0
Recall Mode		None			None		None	None
Walk Time (s)		5.0			5.0		5.0	5.0
Flash Dont Walk (s)		11.0			11.0		11.0	11.0
Pedestrian Calls (#/hr)		0			0		0	0
Act Effct Green (s)		6.6			8.2			
Actuated g/C Ratio		0.35			0.44			
v/c Ratio		0.07			0.00			
Control Delay		3.3			0.0			
Queue Delay		0.0			0.0			
Total Delay		3.3			0.0			
LOS		A			A			
Approach Delay		3.3						
Approach LOS		A						

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 18.6			
Natural Cycle: 40			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.18			
Intersection Signal Delay: 3.1		Intersection LOS: A	
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 404: Riggs Rd EB & SR 347 SBL Offramp



Lane Group	EBT	SEL
Lane Group Flow (vph)	80	4
v/c Ratio	0.07	0.00
Control Delay	3.3	0.0
Queue Delay	0.0	0.0
Total Delay	3.3	0.0
Queue Length 50th (ft)	1	0
Queue Length 95th (ft)	3	0
Internal Link Dist (ft)	248	233
Turn Bay Length (ft)		
Base Capacity (vph)	3252	1719
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.02	0.00

Intersection Summary

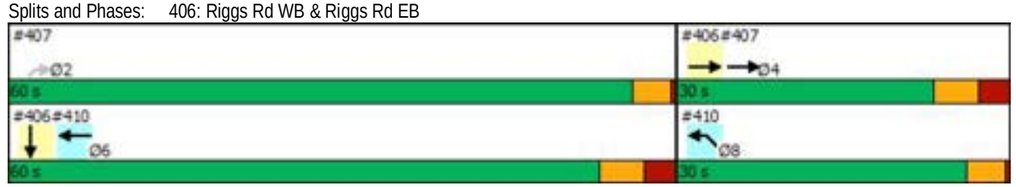
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	49	0	0	0	0	0	0	0	0	251	0
Future Volume (vph)	0	49	0	0	0	0	0	0	0	0	251	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt												
Flt Protected												
Satd. Flow (prot)	0	3252	0	0	0	0	0	0	0	0	3406	0
Flt Permitted												
Satd. Flow (perm)	0	3252	0	0	0	0	0	0	0	0	3406	0
Right Turn on Red			Yes			Yes			Yes	Yes		Yes
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		229			261			263			242	
Travel Time (s)		3.5			4.0			4.0			3.7	
Peak Hour Factor	0.80	0.80	0.80	0.92	0.92	0.92	0.92	0.92	0.92	0.85	0.85	0.85
Heavy Vehicles (%)	11%	11%	11%	0%	0%	0%	0%	0%	0%	6%	6%	6%
Adj. Flow (vph)	0	61	0	0	0	0	0	0	0	0	295	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	61	0	0	0	0	0	0	0	0	295	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		0			0			0			0	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1									1	
Detector Template		Pres									Pres	
Leading Detector (ft)		50									50	
Trailing Detector (ft)		0									0	
Detector 1 Position(ft)		0									0	
Detector 1 Size(ft)		50									50	
Detector 1 Type		Cl+Ex									Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)		0.0									0.0	
Detector 1 Queue (s)		0.0									0.0	
Detector 1 Delay (s)		0.0									0.0	
Turn Type		NA									NA	
Protected Phases		4									6	
Permitted Phases												
Detector Phase		4									6	
Switch Phase												
Minimum Initial (s)		4.0									4.0	
Minimum Split (s)		23.0									11.0	
Total Split (s)		30.0									60.0	
Total Split (%)		33.3%									66.7%	
Maximum Green (s)		23.0									53.0	

Lane Group	Ø2	Ø8
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Heavy Vehicles (%)		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Enter Blocked Intersection		
Lane Alignment		
Median Width(ft)		
Link Offset(ft)		
Crosswalk Width(ft)		
Two way Left Turn Lane		
Headway Factor		
Turning Speed (mph)		
Number of Detectors		
Detector Template		
Leading Detector (ft)		
Trailing Detector (ft)		
Detector 1 Position(ft)		
Detector 1 Size(ft)		
Detector 1 Type		
Detector 1 Channel		
Detector 1 Extend (s)		
Detector 1 Queue (s)		
Detector 1 Delay (s)		
Turn Type		
Protected Phases	2	8
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	4.0	4.0
Minimum Split (s)	20.0	20.0
Total Split (s)	60.0	30.0
Total Split (%)	67%	33%
Maximum Green (s)	56.0	26.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)		4.0									4.0	
All-Red Time (s)		3.0									3.0	
Lost Time Adjust (s)		0.0									0.0	
Total Lost Time (s)		7.0									7.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0									3.0	
Recall Mode		None									None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		6.4									11.2	
Actuated g/C Ratio		0.25									0.44	
v/c Ratio		0.07									0.20	
Control Delay		9.6									7.7	
Queue Delay		0.0									0.0	
Total Delay		9.6									7.7	
LOS		A									A	
Approach Delay		9.6									7.7	
Approach LOS		A									A	

Intersection Summary		
Area Type:	Other	
Cycle Length: 90		
Actuated Cycle Length: 25.6		
Natural Cycle: 45		
Control Type: Actuated-Uncoordinated		
Maximum v/c Ratio: 0.24		
Intersection Signal Delay: 8.1	Intersection LOS: A	
Intersection Capacity Utilization 21.9%	ICU Level of Service A	
Analysis Period (min) 15		

Splits and Phases: 406: Riggs Rd WB & Riggs Rd EB



Lane Group	Ø2	Ø8
Yellow Time (s)	3.5	3.5
All-Red Time (s)	0.5	0.5
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Vehicle Extension (s)	3.0	3.0
Recall Mode	None	None
Walk Time (s)	5.0	5.0
Flash Dont Walk (s)	11.0	11.0
Pedestrian Calls (#/hr)	0	0
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		

Intersection Summary

Lane Group	EBT	SBT
Lane Group Flow (vph)	61	295
v/c Ratio	0.07	0.20
Control Delay	9.6	7.7
Queue Delay	0.0	0.0
Total Delay	9.6	7.7
Queue Length 50th (ft)	3	16
Queue Length 95th (ft)	10	29
Internal Link Dist (ft)	149	162
Turn Bay Length (ft)		
Base Capacity (vph)	2744	3406
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.02	0.09

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	NEL	NER	Ø6	Ø8
Lane Configurations								
Traffic Volume (vph)	49	0	0	0	0	243		
Future Volume (vph)	49	0	0	0	0	243		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00	1.00		
Frt						0.865		
Flt Protected								
Satd. Flow (prot)	3252	0	0	0	0	1565		
Flt Permitted								
Satd. Flow (perm)	3252	0	0	0	0	1565		
Right Turn on Red		Yes				Yes		
Satd. Flow (RTOR)						805		
Link Speed (mph)	45			45	45			
Link Distance (ft)	261			599	409			
Travel Time (s)	4.0			9.1	6.2			
Peak Hour Factor	0.80	0.80	0.92	0.92	0.85	0.85		
Heavy Vehicles (%)	11%	11%	2%	2%	5%	5%		
Adj. Flow (vph)	61	0	0	0	0	286		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	61	0	0	0	0	286		
Enter Blocked Intersection	No	No	No	No	No	No		
Lane Alignment	Left	Right	Left	Left	Left	Right		
Median Width(ft)	0			0	0			
Link Offset(ft)	0			0	0			
Crosswalk Width(ft)	16			16	16			
Two way Left Turn Lane								
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00		
Turning Speed (mph)		9	15		15	9		
Number of Detectors	2					1		
Detector Template	Thru					Right		
Leading Detector (ft)	100					20		
Trailing Detector (ft)	0					0		
Detector 1 Position(ft)	0					0		
Detector 1 Size(ft)	6					20		
Detector 1 Type	Cl+Ex					Cl+Ex		
Detector 1 Channel								
Detector 1 Extend (s)	0.0					0.0		
Detector 1 Queue (s)	0.0					0.0		
Detector 1 Delay (s)	0.0					0.0		
Detector 2 Position(ft)	94							
Detector 2 Size(ft)	6							
Detector 2 Type	Cl+Ex							
Detector 2 Channel								
Detector 2 Extend (s)	0.0							
Turn Type	NA					Perm		
Protected Phases	4						6	8
Permitted Phases						2		
Detector Phase	4					2		
Switch Phase								

Lane Group	EBT	EBR	WBL	WBT	NEL	NER	Ø6	Ø8
Minimum Initial (s)	4.0					4.0	4.0	4.0
Minimum Split (s)	23.0					20.0	11.0	20.0
Total Split (s)	30.0					60.0	60.0	30.0
Total Split (%)	33.3%					66.7%	67%	33%
Maximum Green (s)	23.0					56.0	53.0	26.0
Yellow Time (s)	4.0					3.5	4.0	3.5
All-Red Time (s)	3.0					0.5	3.0	0.5
Lost Time Adjust (s)	0.0					0.0		
Total Lost Time (s)	7.0					4.0		
Lead/Lag								
Lead-Lag Optimize?								
Vehicle Extension (s)	3.0					3.0	3.0	3.0
Recall Mode	None					None	None	None
Walk Time (s)						5.0		5.0
Flash Dont Walk (s)						11.0		11.0
Pedestrian Calls (#/hr)						0		0
Act Effct Green (s)	6.4					13.4		
Actuated g/C Ratio	0.25					0.52		
v/c Ratio	0.07					0.24		
Control Delay	3.2					0.5		
Queue Delay	0.0					0.0		
Total Delay	3.2					0.5		
LOS	A					A		
Approach Delay	3.2					0.5		
Approach LOS	A					A		

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 25.6			
Natural Cycle: 45			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.24			
Intersection Signal Delay: 0.9		Intersection LOS: A	
Intersection Capacity Utilization 27.5%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 407: SR347 NBR Offramp & Riggs Rd EB

Lane Group	EBT	NER
Lane Group Flow (vph)	61	286
v/c Ratio	0.07	0.24
Control Delay	3.2	0.5
Queue Delay	0.0	0.0
Total Delay	3.2	0.5
Queue Length 50th (ft)	1	0
Queue Length 95th (ft)	2	0
Internal Link Dist (ft)	181	
Turn Bay Length (ft)		
Base Capacity (vph)	2744	1565
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.02	0.18

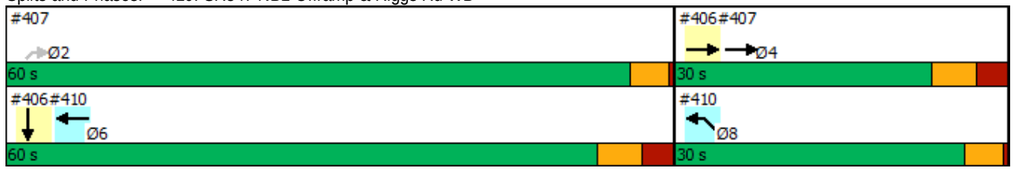
Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR	Ø2	Ø4
Lane Configurations								
Traffic Volume (vph)	0	0	0	251	181	0		
Future Volume (vph)	0	0	0	251	181	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00		
Frt								
Flt Protected					0.950			
Satd. Flow (prot)	0	0	0	3406	1719	0		
Flt Permitted					0.950			
Satd. Flow (perm)	0	0	0	3406	1719	0		
Right Turn on Red		Yes			Yes	Yes		
Satd. Flow (RTOR)					574			
Link Speed (mph)	45			45	45			
Link Distance (ft)	268			263	331			
Travel Time (s)	4.1			4.0	5.0			
Peak Hour Factor	0.92	0.92	0.85	0.85	0.85	0.85		
Heavy Vehicles (%)	0%	0%	6%	6%	5%	5%		
Adj. Flow (vph)	0	0	0	295	213	0		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	0	0	0	295	213	0		
Enter Blocked Intersection	No	No	No	No	Yes	No		
Lane Alignment	Left	Right	Left	Left	Left	Right		
Median Width(ft)	0			0	12			
Link Offset(ft)	12			-12	0			
Crosswalk Width(ft)	0			0	16			
Two way Left Turn Lane								
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00		
Turning Speed (mph)		9	15		15	9		
Number of Detectors				1	1			
Detector Template				Pres	Pres			
Leading Detector (ft)				50	50			
Trailing Detector (ft)				0	0			
Detector 1 Position(ft)				0	0			
Detector 1 Size(ft)				50	50			
Detector 1 Type				Cl+Ex	Cl+Ex			
Detector 1 Channel								
Detector 1 Extend (s)				0.0	0.0			
Detector 1 Queue (s)				0.0	0.0			
Detector 1 Delay (s)				0.0	0.0			
Turn Type				NA	Prot			
Protected Phases				6	8		2	4
Permitted Phases								
Detector Phase				6	8			
Switch Phase								
Minimum Initial (s)				4.0	4.0		4.0	4.0
Minimum Split (s)				11.0	20.0		20.0	23.0
Total Split (s)				60.0	30.0		60.0	30.0
Total Split (%)				66.7%	33.3%		67%	33%
Maximum Green (s)				53.0	26.0		56.0	23.0

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR	Ø2	Ø4
Yellow Time (s)				4.0	3.5		3.5	4.0
All-Red Time (s)				3.0	0.5		0.5	3.0
Lost Time Adjust (s)				0.0	0.0			
Total Lost Time (s)				7.0	4.0			
Lead/Lag								
Lead-Lag Optimize?								
Vehicle Extension (s)				3.0	3.0		3.0	3.0
Recall Mode				None	None		None	None
Walk Time (s)					5.0		5.0	
Flash Dont Walk (s)					11.0		11.0	
Pedestrian Calls (#/hr)					0		0	
Act Effct Green (s)				11.2	8.6			
Actuated g/C Ratio				0.44	0.34			
v/c Ratio				0.20	0.22			
Control Delay				2.8	0.5			
Queue Delay				0.0	0.0			
Total Delay				2.8	0.5			
LOS				A	A			
Approach Delay				2.8	0.5			
Approach LOS				A	A			

Intersection Summary		
Area Type:	Other	
Cycle Length: 90		
Actuated Cycle Length: 25.6		
Natural Cycle: 45		
Control Type: Actuated-Uncoordinated		
Maximum v/c Ratio: 0.24		
Intersection Signal Delay: 1.8		Intersection LOS: A
Intersection Capacity Utilization 37.7%		ICU Level of Service A
Analysis Period (min) 15		

Splits and Phases: 410: SR347 NBL Offramp & Riggs Rd WB



Lane Group	WBT	NWL
Lane Group Flow (vph)	295	213
v/c Ratio	0.20	0.22
Control Delay	2.8	0.5
Queue Delay	0.0	0.0
Total Delay	2.8	0.5
Queue Length 50th (ft)	4	0
Queue Length 95th (ft)	7	0
Internal Link Dist (ft)	183	251
Turn Bay Length (ft)		
Base Capacity (vph)	3406	1636
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.09	0.13

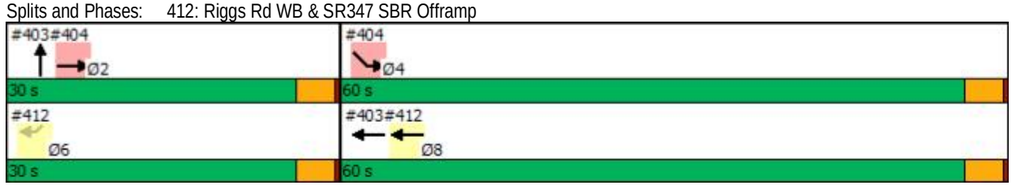
Intersection Summary

Lane Group	EBL	EBT	WBT	WBR	SWL	SWR	Ø2	Ø4
Lane Configurations								
Traffic Volume (vph)	0	0	238	0	0	33		
Future Volume (vph)	0	0	238	0	0	33		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00		
Frt						0.865		
Flt Protected								
Satd. Flow (prot)	0	0	3438	0	0	1565		
Flt Permitted								
Satd. Flow (perm)	0	0	3438	0	0	1565		
Right Turn on Red				Yes		Yes		
Satd. Flow (RTOR)						613		
Link Speed (mph)		45	45		45			
Link Distance (ft)		393	275		549			
Travel Time (s)		6.0	4.2		8.3			
Peak Hour Factor	0.92	0.92	0.85	0.85	0.80	0.80		
Heavy Vehicles (%)	2%	2%	5%	5%	5%	5%		
Adj. Flow (vph)	0	0	280	0	0	41		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	0	0	280	0	0	41		
Enter Blocked Intersection	No	No	No	No	No	No		
Lane Alignment	Left	Left	Left	Right	Left	Right		
Median Width(ft)		0	0		0			
Link Offset(ft)		0	0		0			
Crosswalk Width(ft)		16	16		16			
Two way Left Turn Lane								
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00		
Turning Speed (mph)	15			9	15	9		
Number of Detectors			2			1		
Detector Template			Thru			Right		
Leading Detector (ft)			100			20		
Trailing Detector (ft)			0			0		
Detector 1 Position(ft)			0			0		
Detector 1 Size(ft)			6			20		
Detector 1 Type			Cl+Ex			Cl+Ex		
Detector 1 Channel								
Detector 1 Extend (s)			0.0			0.0		
Detector 1 Queue (s)			0.0			0.0		
Detector 1 Delay (s)			0.0			0.0		
Detector 2 Position(ft)			94					
Detector 2 Size(ft)			6					
Detector 2 Type			Cl+Ex					
Detector 2 Channel								
Detector 2 Extend (s)			0.0					
Turn Type			NA			Perm		
Protected Phases			8				2	4
Permitted Phases						6		
Detector Phase			8			6		
Switch Phase								

Lane Group	EBL	EBT	WBT	WBR	SWL	SWR	Ø2	Ø4
Minimum Initial (s)			4.0			4.0	4.0	4.0
Minimum Split (s)			20.0			20.0	20.0	20.0
Total Split (s)			60.0			30.0	30.0	60.0
Total Split (%)			66.7%			33.3%	33%	67%
Maximum Green (s)			56.0			26.0	26.0	56.0
Yellow Time (s)			3.5			3.5	3.5	3.5
All-Red Time (s)			0.5			0.5	0.5	0.5
Lost Time Adjust (s)			0.0			0.0		
Total Lost Time (s)			4.0			4.0		
Lead/Lag								
Lead-Lag Optimize?								
Vehicle Extension (s)			3.0			3.0	3.0	3.0
Recall Mode			None			None	None	None
Walk Time (s)			5.0			5.0	5.0	5.0
Flash Dont Walk (s)			11.0			11.0	11.0	11.0
Pedestrian Calls (#/hr)			0			0	0	0
Act Effct Green (s)			8.2			6.5		
Actuated g/C Ratio			0.44			0.35		
v/c Ratio			0.18			0.04		
Control Delay			2.4			0.1		
Queue Delay			0.0			0.0		
Total Delay			2.4			0.1		
LOS			A			A		
Approach Delay			2.4			0.1		
Approach LOS			A			A		

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 18.6			
Natural Cycle: 40			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.18			
Intersection Signal Delay: 2.1		Intersection LOS: A	
Intersection Capacity Utilization 16.6%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 412: Riggs Rd WB & SR347 SBR Offramp



Lane Group	WBT	SWR
Lane Group Flow (vph)	280	41
v/c Ratio	0.18	0.04
Control Delay	2.4	0.1
Queue Delay	0.0	0.0
Total Delay	2.4	0.1
Queue Length 50th (ft)	4	0
Queue Length 95th (ft)	7	0
Internal Link Dist (ft)	195	
Turn Bay Length (ft)		
Base Capacity (vph)	3438	1565
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.08	0.03

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	204	0	0	144	0	0	0	0
Future Volume (vph)	0	0	0	0	204	0	0	144	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Frt												
Flt Protected												
Satd. Flow (prot)	0	0	0	0	3438	0	0	3252	0	0	0	0
Flt Permitted												
Satd. Flow (perm)	0	0	0	0	3438	0	0	3252	0	0	0	0
Right Turn on Red			Yes			Yes	Yes		Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		275			309			280			328	
Travel Time (s)		4.2			4.7			4.2			5.0	
Peak Hour Factor	0.92	0.92	0.92	0.85	0.85	0.85	0.85	0.85	0.85	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	5%	5%	5%	11%	11%	11%	0%	0%	0%
Adj. Flow (vph)	0	0	0	0	240	0	0	169	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	240	0	0	169	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		0			0			0			0	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors					1			1				
Detector Template					Pres			Pres				
Leading Detector (ft)					50			50				
Trailing Detector (ft)					0			0				
Detector 1 Position(ft)					0			0				
Detector 1 Size(ft)					50			50				
Detector 1 Type					Cl+Ex			Cl+Ex				
Detector 1 Channel												
Detector 1 Extend (s)					0.0			0.0				
Detector 1 Queue (s)					0.0			0.0				
Detector 1 Delay (s)					0.0			0.0				
Turn Type					NA			NA				
Protected Phases					8			2				
Permitted Phases												
Detector Phase					8			2				
Switch Phase												
Minimum Initial (s)					4.0			4.0				
Minimum Split (s)					20.0			20.0				
Total Split (s)					60.0			30.0				
Total Split (%)					66.7%			33.3%				
Maximum Green (s)					56.0			26.0				

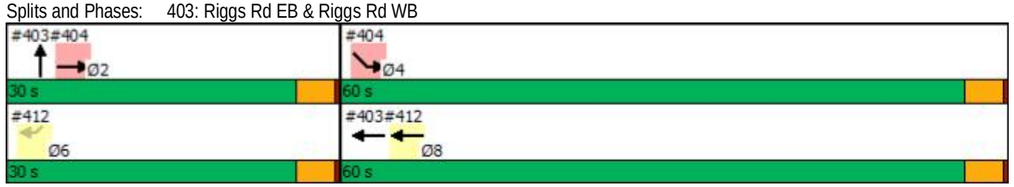
Lanes, Volumes, Timings
403: Riggs Rd EB & Riggs Rd WB
2050 DDI PM

Lane Group	Ø4	Ø6
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Heavy Vehicles (%)		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Enter Blocked Intersection		
Lane Alignment		
Median Width(ft)		
Link Offset(ft)		
Crosswalk Width(ft)		
Two way Left Turn Lane		
Headway Factor		
Turning Speed (mph)		
Number of Detectors		
Detector Template		
Leading Detector (ft)		
Trailing Detector (ft)		
Detector 1 Position(ft)		
Detector 1 Size(ft)		
Detector 1 Type		
Detector 1 Channel		
Detector 1 Extend (s)		
Detector 1 Queue (s)		
Detector 1 Delay (s)		
Turn Type		
Protected Phases	4	6
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	4.0	4.0
Minimum Split (s)	20.0	20.0
Total Split (s)	60.0	30.0
Total Split (%)	67%	33%
Maximum Green (s)	56.0	26.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)					3.5			3.5				
All-Red Time (s)					0.5			0.5				
Lost Time Adjust (s)					0.0			0.0				
Total Lost Time (s)					4.0			4.0				
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)					3.0			3.0				
Recall Mode					None			None				
Walk Time (s)					5.0			5.0				
Flash Dont Walk (s)					11.0			11.0				
Pedestrian Calls (#/hr)					0			0				
Act Effct Green (s)					7.5			6.7				
Actuated g/C Ratio					0.36			0.33				
v/c Ratio					0.19			0.16				
Control Delay					5.5			6.4				
Queue Delay					0.0			0.0				
Total Delay					5.5			6.4				
LOS					A			A				
Approach Delay					5.5			6.4				
Approach LOS					A			A				

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 20.6			
Natural Cycle: 40			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.19			
Intersection Signal Delay: 5.9		Intersection LOS: A	
Intersection Capacity Utilization 16.3%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 403: Riggs Rd EB & Riggs Rd WB



Lane Group	Ø4	Ø6
Yellow Time (s)	3.5	3.5
All-Red Time (s)	0.5	0.5
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Vehicle Extension (s)	3.0	3.0
Recall Mode	None	None
Walk Time (s)	5.0	
Flash Dont Walk (s)	11.0	
Pedestrian Calls (#/hr)	0	
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		

Intersection Summary

Lane Group	WBT	NBT
Lane Group Flow (vph)	240	169
v/c Ratio	0.19	0.16
Control Delay	5.5	6.4
Queue Delay	0.0	0.0
Total Delay	5.5	6.4
Queue Length 50th (ft)	7	5
Queue Length 95th (ft)	15	14
Internal Link Dist (ft)	229	200
Turn Bay Length (ft)		
Base Capacity (vph)	3438	3252
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.07	0.05

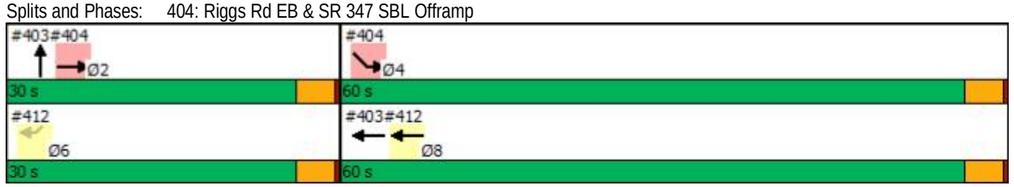
Intersection Summary

Lane Group	EBL	EBT	WBT	WBR	SEL	SER	Ø6	Ø8
Lane Configurations								
Traffic Volume (vph)	0	144	0	0	6	0		
Future Volume (vph)	0	144	0	0	6	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00		
Frt								
Flt Protected					0.950			
Satd. Flow (prot)	0	3252	0	0	1719	0		
Flt Permitted					0.950			
Satd. Flow (perm)	0	3252	0	0	1719	0		
Right Turn on Red				Yes	Yes	Yes		
Satd. Flow (RTOR)					515			
Link Speed (mph)		45	45		45			
Link Distance (ft)		328	280		313			
Travel Time (s)		5.0	4.2		4.7			
Peak Hour Factor	0.85	0.85	0.92	0.92	0.80	0.80		
Heavy Vehicles (%)	11%	11%	0%	0%	5%	5%		
Adj. Flow (vph)	0	169	0	0	8	0		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	0	169	0	0	8	0		
Enter Blocked Intersection	No	No	No	No	No	No		
Lane Alignment	Left	Left	Left	Right	Left	Right		
Median Width(ft)		0	0		12			
Link Offset(ft)		0	0		0			
Crosswalk Width(ft)		16	16		16			
Two way Left Turn Lane								
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00		
Turning Speed (mph)	15			9	15	9		
Number of Detectors		1			1			
Detector Template		Pres			Pres			
Leading Detector (ft)		50			50			
Trailing Detector (ft)		0			0			
Detector 1 Position(ft)		0			0			
Detector 1 Size(ft)		50			50			
Detector 1 Type		Cl+Ex			Cl+Ex			
Detector 1 Channel								
Detector 1 Extend (s)		0.0			0.0			
Detector 1 Queue (s)		0.0			0.0			
Detector 1 Delay (s)		0.0			0.0			
Turn Type		NA			Prot			
Protected Phases		2			4		6	8
Permitted Phases								
Detector Phase		2			4			
Switch Phase								
Minimum Initial (s)		4.0			4.0		4.0	4.0
Minimum Split (s)		20.0			20.0		20.0	20.0
Total Split (s)		30.0			60.0		30.0	60.0
Total Split (%)		33.3%			66.7%		33%	67%
Maximum Green (s)		26.0			56.0		26.0	56.0

Lane Group	EBL	EBT	WBT	WBR	SEL	SER	Ø6	Ø8
Yellow Time (s)		3.5			3.5		3.5	3.5
All-Red Time (s)		0.5			0.5		0.5	0.5
Lost Time Adjust (s)		0.0			0.0			
Total Lost Time (s)		4.0			4.0			
Lead/Lag								
Lead-Lag Optimize?								
Vehicle Extension (s)		3.0			3.0		3.0	3.0
Recall Mode		None			None		None	None
Walk Time (s)		5.0			5.0			5.0
Flash Dont Walk (s)		11.0			11.0			11.0
Pedestrian Calls (#/hr)		0			0			0
Act Effct Green (s)		6.7			7.5			
Actuated g/C Ratio		0.33			0.36			
v/c Ratio		0.16			0.01			
Control Delay		3.4			0.0			
Queue Delay		0.0			0.0			
Total Delay		3.4			0.0			
LOS		A			A			
Approach Delay		3.4						
Approach LOS		A						

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 20.6			
Natural Cycle: 40			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.19			
Intersection Signal Delay: 3.3		Intersection LOS: A	
Intersection Capacity Utilization 14.0%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 404: Riggs Rd EB & SR 347 SBL Offramp



Lane Group	EBT	SEL
Lane Group Flow (vph)	169	8
v/c Ratio	0.16	0.01
Control Delay	3.4	0.0
Queue Delay	0.0	0.0
Total Delay	3.4	0.0
Queue Length 50th (ft)	3	0
Queue Length 95th (ft)	5	0
Internal Link Dist (ft)	248	233
Turn Bay Length (ft)		
Base Capacity (vph)	3252	1719
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.05	0.00

Intersection Summary

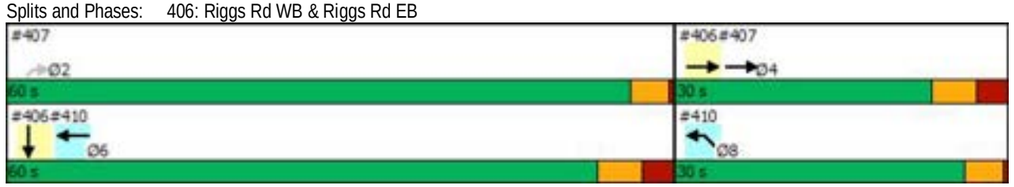
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	88	0	0	0	0	0	0	0	0	510	0
Future Volume (vph)	0	88	0	0	0	0	0	0	0	0	510	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt												
Flt Protected												
Satd. Flow (prot)	0	3252	0	0	0	0	0	0	0	0	3406	0
Flt Permitted												
Satd. Flow (perm)	0	3252	0	0	0	0	0	0	0	0	3406	0
Right Turn on Red			Yes			Yes			Yes	Yes		Yes
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		229			261			263			242	
Travel Time (s)		3.5			4.0			4.0			3.7	
Peak Hour Factor	0.85	0.85	0.85	0.92	0.92	0.92	0.92	0.92	0.92	0.90	0.90	0.90
Heavy Vehicles (%)	11%	11%	11%	0%	0%	0%	0%	0%	0%	6%	6%	6%
Adj. Flow (vph)	0	104	0	0	0	0	0	0	0	0	567	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	104	0	0	0	0	0	0	0	0	567	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		0			0			0			0	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1									1	
Detector Template		Pres									Pres	
Leading Detector (ft)		50									50	
Trailing Detector (ft)		0									0	
Detector 1 Position(ft)		0									0	
Detector 1 Size(ft)		50									50	
Detector 1 Type		Cl+Ex									Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)		0.0									0.0	
Detector 1 Queue (s)		0.0									0.0	
Detector 1 Delay (s)		0.0									0.0	
Turn Type		NA									NA	
Protected Phases		4									6	
Permitted Phases												
Detector Phase		4									6	
Switch Phase												
Minimum Initial (s)		4.0									4.0	
Minimum Split (s)		23.0									23.0	
Total Split (s)		30.0									60.0	
Total Split (%)		33.3%									66.7%	
Maximum Green (s)		23.0									53.0	

Lane Group	Ø2	Ø8
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Heavy Vehicles (%)		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Enter Blocked Intersection		
Lane Alignment		
Median Width(ft)		
Link Offset(ft)		
Crosswalk Width(ft)		
Two way Left Turn Lane		
Headway Factor		
Turning Speed (mph)		
Number of Detectors		
Detector Template		
Leading Detector (ft)		
Trailing Detector (ft)		
Detector 1 Position(ft)		
Detector 1 Size(ft)		
Detector 1 Type		
Detector 1 Channel		
Detector 1 Extend (s)		
Detector 1 Queue (s)		
Detector 1 Delay (s)		
Turn Type		
Protected Phases	2	8
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	4.0	4.0
Minimum Split (s)	20.0	20.0
Total Split (s)	60.0	30.0
Total Split (%)	67%	33%
Maximum Green (s)	56.0	26.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)		4.0									4.0	
All-Red Time (s)		3.0									3.0	
Lost Time Adjust (s)		0.0									0.0	
Total Lost Time (s)		7.0									7.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0									3.0	
Recall Mode		None									None	
Walk Time (s)		5.0									5.0	
Flash Dont Walk (s)		11.0									11.0	
Pedestrian Calls (#/hr)		0									0	
Act Effct Green (s)		7.1									16.6	
Actuated g/C Ratio		0.23									0.53	
v/c Ratio		0.14									0.32	
Control Delay		13.0									7.4	
Queue Delay		0.0									0.0	
Total Delay		13.0									7.4	
LOS		B									A	
Approach Delay		13.0									7.4	
Approach LOS		B									A	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 31.5			
Natural Cycle: 50			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.32			
Intersection Signal Delay: 8.2		Intersection LOS: A	
Intersection Capacity Utilization 29.1%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 406: Riggs Rd WB & Riggs Rd EB



Lane Group	Ø2	Ø8
Yellow Time (s)	3.5	3.5
All-Red Time (s)	0.5	0.5
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Vehicle Extension (s)	3.0	3.0
Recall Mode	None	None
Walk Time (s)		5.0
Flash Dont Walk (s)		11.0
Pedestrian Calls (#/hr)		0
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		

Intersection Summary

Lane Group	EBT	SBT
Lane Group Flow (vph)	104	567
v/c Ratio	0.14	0.32
Control Delay	13.0	7.4
Queue Delay	0.0	0.0
Total Delay	13.0	7.4
Queue Length 50th (ft)	8	35
Queue Length 95th (ft)	22	65
Internal Link Dist (ft)	149	162
Turn Bay Length (ft)		
Base Capacity (vph)	2355	3406
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.04	0.17

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	NEL	NER	Ø6	Ø8
Lane Configurations								
Traffic Volume (vph)	88	0	0	0	0	184		
Future Volume (vph)	88	0	0	0	0	184		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00	1.00		
Frt						0.865		
Flt Protected								
Satd. Flow (prot)	3252	0	0	0	0	1565		
Flt Permitted								
Satd. Flow (perm)	3252	0	0	0	0	1565		
Right Turn on Red		Yes				Yes		
Satd. Flow (RTOR)						648		
Link Speed (mph)	45			45	45			
Link Distance (ft)	261			599	409			
Travel Time (s)	4.0			9.1	6.2			
Peak Hour Factor	0.85	0.85	0.92	0.92	0.85	0.85		
Heavy Vehicles (%)	11%	11%	2%	2%	5%	5%		
Adj. Flow (vph)	104	0	0	0	0	216		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	104	0	0	0	0	216		
Enter Blocked Intersection	No	No	No	No	No	No		
Lane Alignment	Left	Right	Left	Left	Left	Right		
Median Width(ft)	0			0	0			
Link Offset(ft)	0			0	0			
Crosswalk Width(ft)	16			16	16			
Two way Left Turn Lane								
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00		
Turning Speed (mph)		9	15		15	9		
Number of Detectors	2					1		
Detector Template	Thru					Right		
Leading Detector (ft)	100					20		
Trailing Detector (ft)	0					0		
Detector 1 Position(ft)	0					0		
Detector 1 Size(ft)	6					20		
Detector 1 Type	Cl+Ex					Cl+Ex		
Detector 1 Channel								
Detector 1 Extend (s)	0.0					0.0		
Detector 1 Queue (s)	0.0					0.0		
Detector 1 Delay (s)	0.0					0.0		
Detector 2 Position(ft)	94							
Detector 2 Size(ft)	6							
Detector 2 Type	Cl+Ex							
Detector 2 Channel								
Detector 2 Extend (s)	0.0							
Turn Type	NA					Perm		
Protected Phases	4						6	8
Permitted Phases						2		
Detector Phase	4					2		
Switch Phase								

Lane Group	EBT	EBR	WBL	WBT	NEL	NER	Ø6	Ø8
Minimum Initial (s)	4.0					4.0	4.0	4.0
Minimum Split (s)	23.0					20.0	23.0	20.0
Total Split (s)	30.0					60.0	60.0	30.0
Total Split (%)	33.3%					66.7%	67%	33%
Maximum Green (s)	23.0					56.0	53.0	26.0
Yellow Time (s)	4.0					3.5	4.0	3.5
All-Red Time (s)	3.0					0.5	3.0	0.5
Lost Time Adjust (s)	0.0					0.0		
Total Lost Time (s)	7.0					4.0		
Lead/Lag								
Lead-Lag Optimize?								
Vehicle Extension (s)	3.0					3.0	3.0	3.0
Recall Mode	None					None	None	None
Walk Time (s)	5.0						5.0	5.0
Flash Dont Walk (s)	11.0						11.0	11.0
Pedestrian Calls (#/hr)	0						0	0
Act Effct Green (s)	7.1					18.7		
Actuated g/C Ratio	0.23					0.59		
v/c Ratio	0.14					0.18		
Control Delay	3.5					0.3		
Queue Delay	0.0					0.0		
Total Delay	3.5					0.3		
LOS	A					A		
Approach Delay	3.5					0.3		
Approach LOS	A					A		

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 31.5			
Natural Cycle: 50			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.32			
Intersection Signal Delay: 1.4		Intersection LOS: A	
Intersection Capacity Utilization 29.1%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 407: SR347 NBR Offramp & Riggs Rd EB

Lane Group	EBT	NER
Lane Group Flow (vph)	104	216
v/c Ratio	0.14	0.18
Control Delay	3.5	0.3
Queue Delay	0.0	0.0
Total Delay	3.5	0.3
Queue Length 50th (ft)	1	0
Queue Length 95th (ft)	3	0
Internal Link Dist (ft)	181	
Turn Bay Length (ft)		
Base Capacity (vph)	2355	1565
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.04	0.14

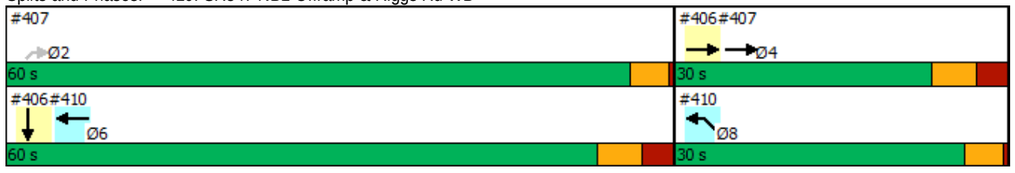
Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR	Ø2	Ø4
Lane Configurations								
Traffic Volume (vph)	0	0	0	510	156	0		
Future Volume (vph)	0	0	0	510	156	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00		
Frt								
Flt Protected					0.950			
Satd. Flow (prot)	0	0	0	3406	1719	0		
Flt Permitted					0.950			
Satd. Flow (perm)	0	0	0	3406	1719	0		
Right Turn on Red		Yes			Yes	Yes		
Satd. Flow (RTOR)					313			
Link Speed (mph)	45			45	45			
Link Distance (ft)	268			263	331			
Travel Time (s)	4.1			4.0	5.0			
Peak Hour Factor	0.92	0.92	0.90	0.90	0.85	0.85		
Heavy Vehicles (%)	0%	0%	6%	6%	5%	5%		
Adj. Flow (vph)	0	0	0	567	184	0		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	0	0	0	567	184	0		
Enter Blocked Intersection	No	No	No	No	Yes	No		
Lane Alignment	Left	Right	Left	Left	Left	Right		
Median Width(ft)	0			0	12			
Link Offset(ft)	12			-12	0			
Crosswalk Width(ft)	0			0	16			
Two way Left Turn Lane								
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00		
Turning Speed (mph)		9	15		15	9		
Number of Detectors				1	1			
Detector Template				Pres	Pres			
Leading Detector (ft)				50	50			
Trailing Detector (ft)				0	0			
Detector 1 Position(ft)				0	0			
Detector 1 Size(ft)				50	50			
Detector 1 Type				Cl+Ex	Cl+Ex			
Detector 1 Channel								
Detector 1 Extend (s)				0.0	0.0			
Detector 1 Queue (s)				0.0	0.0			
Detector 1 Delay (s)				0.0	0.0			
Turn Type				NA	Prot			
Protected Phases				6	8		2	4
Permitted Phases								
Detector Phase				6	8			
Switch Phase								
Minimum Initial (s)				4.0	4.0		4.0	4.0
Minimum Split (s)				23.0	20.0		20.0	23.0
Total Split (s)				60.0	30.0		60.0	30.0
Total Split (%)				66.7%	33.3%		67%	33%
Maximum Green (s)				53.0	26.0		56.0	23.0

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR	Ø2	Ø4
Yellow Time (s)				4.0	3.5		3.5	4.0
All-Red Time (s)				3.0	0.5		0.5	3.0
Lost Time Adjust (s)				0.0	0.0			
Total Lost Time (s)				7.0	4.0			
Lead/Lag								
Lead-Lag Optimize?								
Vehicle Extension (s)				3.0	3.0		3.0	3.0
Recall Mode				None	None		None	None
Walk Time (s)				5.0	5.0			5.0
Flash Dont Walk (s)				11.0	11.0			11.0
Pedestrian Calls (#/hr)				0	0			0
Act Effct Green (s)				16.6	9.2			
Actuated g/C Ratio				0.53	0.29			
v/c Ratio				0.32	0.25			
Control Delay				2.4	1.3			
Queue Delay				0.0	0.0			
Total Delay				2.4	1.3			
LOS				A	A			
Approach Delay				2.4	1.3			
Approach LOS				A	A			

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 31.5	
Natural Cycle: 50	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.32	
Intersection Signal Delay: 2.2	Intersection LOS: A
Intersection Capacity Utilization 39.8%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 410: SR347 NBL Offramp & Riggs Rd WB



Lane Group	WBT	NWL
Lane Group Flow (vph)	567	184
v/c Ratio	0.32	0.25
Control Delay	2.4	1.3
Queue Delay	0.0	0.0
Total Delay	2.4	1.3
Queue Length 50th (ft)	8	0
Queue Length 95th (ft)	12	4
Internal Link Dist (ft)	183	251
Turn Bay Length (ft)		
Base Capacity (vph)	3406	1427
Starvation Cap Reductn	24	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.17	0.13

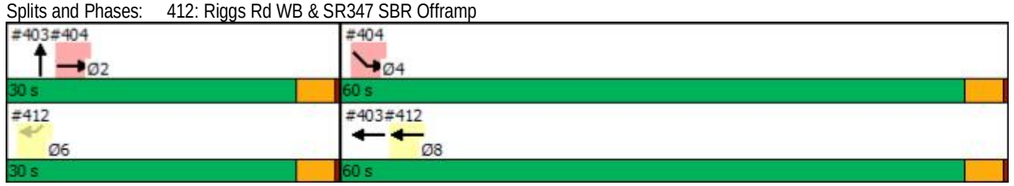
Intersection Summary

Lane Group	EBL	EBT	WBT	WBR	SWL	SWR	Ø2	Ø4
Lane Configurations								
Traffic Volume (vph)	0	0	204	0	0	14		
Future Volume (vph)	0	0	204	0	0	14		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00		
Frt						0.865		
Flt Protected								
Satd. Flow (prot)	0	0	3438	0	0	1565		
Flt Permitted								
Satd. Flow (perm)	0	0	3438	0	0	1565		
Right Turn on Red				Yes		Yes		
Satd. Flow (RTOR)						666		
Link Speed (mph)		45	45		45			
Link Distance (ft)		393	275		549			
Travel Time (s)		6.0	4.2		8.3			
Peak Hour Factor	0.92	0.92	0.85	0.85	0.80	0.80		
Heavy Vehicles (%)	2%	2%	5%	5%	5%	5%		
Adj. Flow (vph)	0	0	240	0	0	18		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	0	0	240	0	0	18		
Enter Blocked Intersection	No	No	No	No	No	No		
Lane Alignment	Left	Left	Left	Right	Left	Right		
Median Width(ft)		0	0		0			
Link Offset(ft)		0	0		0			
Crosswalk Width(ft)		16	16		16			
Two way Left Turn Lane								
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00		
Turning Speed (mph)	15			9	15	9		
Number of Detectors			2			1		
Detector Template			Thru			Right		
Leading Detector (ft)			100			20		
Trailing Detector (ft)			0			0		
Detector 1 Position(ft)			0			0		
Detector 1 Size(ft)			6			20		
Detector 1 Type			Cl+Ex			Cl+Ex		
Detector 1 Channel								
Detector 1 Extend (s)			0.0			0.0		
Detector 1 Queue (s)			0.0			0.0		
Detector 1 Delay (s)			0.0			0.0		
Detector 2 Position(ft)			94					
Detector 2 Size(ft)			6					
Detector 2 Type			Cl+Ex					
Detector 2 Channel								
Detector 2 Extend (s)			0.0					
Turn Type			NA			Perm		
Protected Phases			8				2	4
Permitted Phases						6		
Detector Phase			8			6		
Switch Phase								

Lane Group	EBL	EBT	WBT	WBR	SWL	SWR	Ø2	Ø4
Minimum Initial (s)			4.0			4.0	4.0	4.0
Minimum Split (s)			20.0			20.0	20.0	20.0
Total Split (s)			60.0			30.0	30.0	60.0
Total Split (%)			66.7%			33.3%	33%	67%
Maximum Green (s)			56.0			26.0	26.0	56.0
Yellow Time (s)			3.5			3.5	3.5	3.5
All-Red Time (s)			0.5			0.5	0.5	0.5
Lost Time Adjust (s)			0.0			0.0		
Total Lost Time (s)			4.0			4.0		
Lead/Lag								
Lead-Lag Optimize?								
Vehicle Extension (s)			3.0			3.0	3.0	3.0
Recall Mode			None			None	None	None
Walk Time (s)			5.0				5.0	5.0
Flash Dont Walk (s)			11.0				11.0	11.0
Pedestrian Calls (#/hr)			0				0	0
Act Effct Green (s)			7.5			6.7		
Actuated g/C Ratio			0.36			0.33		
v/c Ratio			0.19			0.02		
Control Delay			2.8			0.1		
Queue Delay			0.0			0.0		
Total Delay			2.8			0.1		
LOS			A			A		
Approach Delay			2.8			0.1		
Approach LOS			A			A		

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 20.6			
Natural Cycle: 40			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.19			
Intersection Signal Delay: 2.6		Intersection LOS: A	
Intersection Capacity Utilization 16.3%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 412: Riggs Rd WB & SR347 SBR Offramp



Lane Group	WBT	SWR
Lane Group Flow (vph)	240	18
v/c Ratio	0.19	0.02
Control Delay	2.8	0.1
Queue Delay	0.0	0.0
Total Delay	2.8	0.1
Queue Length 50th (ft)	3	0
Queue Length 95th (ft)	6	0
Internal Link Dist (ft)	195	
Turn Bay Length (ft)		
Base Capacity (vph)	3438	1565
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.07	0.01

Intersection Summary

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	SR 347	344	0	23.00	2	28.00	2	168.00	135.50	10.50
2	Riggs Rd	90	0	24.70	2	28.00	2	56.15	135.60	15.50
3	SR 347	198	0	23.00	2	28.00	2	124.00	230.00	14.00
4	Riggs Rd	270	0	24.50	2	28.00	2	92.30	153.80	14.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	SR 347	164.00	33.00	2	24.00	1	12.00	1
2	Riggs Rd	164.00	33.00	2	30.80	2	24.70	2
3	SR 347	164.00	33.00	2	16.50	1	14.60	1
4	Riggs Rd	164.00	33.00	2	27.70	2	23.80	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	SR 347	0	1.000	0	1.000	20.00	3435	0	12.00	1792	0
2	Riggs Rd	0	1.000	0	1.000	20.00	3689	0	24.70	3689	0
3	SR 347	0	1.000	0	1.000	20.00	3435	0	14.60	2181	0
4	Riggs Rd	0	1.000	0	1.000	20.00	3659	0	23.80	3555	0

2050 AM Peak
50% Confidence Level
Daylight conditions

West Roundabout (SB Ramps)

Project: SR 347 -Riggs
Scheme: Layout 1
Rodel-Win1 - Full Geometry

Operational Results

2050 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	SR 347	None	36		432		0	2174		0.0166	
2	Riggs Rd	None	210		197		271	2075		0.1012	
3	SR 347	None	0		0		340	0		0.0000	
4	Riggs Rd	None	432		0		67	2459		0.1757	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	SR 347	None	1.72		1.72	0.06		A		A
2	Riggs Rd	None	2.44		2.44	0.46		A		A
3	SR 347	None	0.00		0.00	0.00		A		A
4	Riggs Rd	None	2.97		2.97	1.14		A		A

Global Results

Performance and Accidents

2050 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	678		678
Capacity	veh/hr	6708		6708
Average Delay	sec/veh	2.74		2.74
L.O.S. (Signal)	A – F	A		A
L.O.S. (Unsig)	A – F	A		A
Total Delay	veh.hrs	0.52		0.52

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	SR 347	344	0	23.00	2	28.00	2	168.00	135.50	10.50
2	Riggs Rd	90	0	24.70	2	28.00	2	56.15	135.60	15.50
3	SR 347	198	0	23.00	2	28.00	2	124.00	230.00	14.00
4	Riggs Rd	270	0	24.50	2	28.00	2	92.30	153.80	14.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	SR 347	164.00	33.00	2	24.00	1	12.00	1
2	Riggs Rd	164.00	33.00	2	30.80	2	24.70	2
3	SR 347	164.00	33.00	2	16.50	1	14.60	1
4	Riggs Rd	164.00	33.00	2	27.70	2	23.80	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	SR 347	0	1.000	0	1.000	20.00	3435	0	12.00	1792	0
2	Riggs Rd	0	1.000	0	1.000	20.00	3689	0	24.70	3689	0
3	SR 347	0	1.000	0	1.000	20.00	3435	0	14.60	2181	0
4	Riggs Rd	0	1.000	0	1.000	20.00	3659	0	23.80	3555	0

Operational Results

2050 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	SR 347	None	20		666		0	1985		0.0101	
2	Riggs Rd	None	432		468		218	1882		0.2295	
3	SR 347	None	0		0		750	0		0.0000	
4	Riggs Rd	None	666		0		150	2459		0.2708	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	SR 347	None	2.35		2.35	0.05		A		A
2	Riggs Rd	None	3.22		3.22	1.28		A		A
3	SR 347	None	0.00		0.00	0.00		A		A
4	Riggs Rd	None	2.65		2.65	1.48		A		A

2050 PM Peak
50% Confidence Level
Daylight conditions

West Roundabout (SB Ramps)

Project: SR 347 -Riggs
Scheme: Layout 1
Rodel-Win1 - Full Geometry

Global Results

Performance and Accidents

2050 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	1118		1118
Capacity	veh/hr	6326		6326
Average Delay	sec/veh	2.86		2.86
L.O.S. (Signal)	A – F	A		A
L.O.S. (Unsig)	A – F	A		A
Total Delay	veh.hrs	0.89		0.89

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	SR 347	344	0	24.00	2	28.00	2	131.40	135.50	14.00
2	Riggs Rd	90	0	24.50	2	28.00	2	75.90	175.50	13.00
3	SR 347	198	0	28.00	2	28.00	2	92.80	235.50	14.00
4	Riggs Rd	270	0	24.20	2	28.00	2	74.90	105.00	12.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	SR 347	180.20	29.50	2	18.70	1	17.50	1
2	Riggs Rd	180.20	21.90	1	30.00	2	23.70	2
3	SR 347	180.20	30.00	2	16.50	1	14.60	1
4	Riggs Rd	180.20	21.90	1	32.40	2	24.70	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	SR 347	0	1.000	0	1.000	20.00	3584	0	17.50	2614	0
2	Riggs Rd	0	1.000	0	1.000	20.00	3659	0	23.70	3540	0
3	SR 347	0	1.000	0	1.000	20.00	4182	0	14.60	2181	0
4	Riggs Rd	0	1.000	0	1.000	20.00	3614	0	24.70	3689	0

2050 AM Peak
50% Confidence Level
Daylight conditions

East Roundabout (NB Ramps)

Project: SR 347 -Riggs
Scheme: Layout 1
Rodel-Win1 - Full Geometry

Operational Results

2050 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	SR 347	None	0		0		20	0		0.0000	
2	Riggs Rd	None	67		0		432	2249		0.0298	
3	SR 347	None	424		67		0	2502		0.1694	
4	Riggs Rd	None	253		199		292	2235		0.1132	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	SR 347	None	0.00		0.00	0.00		A		A
2	Riggs Rd	None	2.01		2.01	0.13		A		A
3	SR 347	None	2.81		2.81	1.07		A		A
4	Riggs Rd	None	1.69		1.69	0.39		A		A

Global Results

Performance and Accidents

2050 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	744		744
Capacity	veh/hr	6987		6987
Average Delay	sec/veh	2.36		2.36
L.O.S. (Signal)	A – F	A		A
L.O.S. (Unsig)	A – F	A		A
Total Delay	veh.hrs	0.49		0.49

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	SR 347	344	0	24.00	2	28.00	2	131.40	135.50	14.00
2	Riggs Rd	90	0	24.50	2	28.00	2	75.90	175.50	13.00
3	SR 347	198	0	28.00	2	28.00	2	92.80	235.50	14.00
4	Riggs Rd	270	0	24.20	2	28.00	2	74.90	105.00	12.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	SR 347	180.20	29.50	2	18.70	1	17.50	1
2	Riggs Rd	180.20	21.90	1	30.00	2	23.70	2
3	SR 347	180.20	30.00	2	16.50	1	14.60	1
4	Riggs Rd	180.20	21.90	1	32.40	2	24.70	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	SR 347	0	1.000	0	1.000	20.00	3584	0	17.50	2614	0
2	Riggs Rd	0	1.000	0	1.000	20.00	3659	0	23.70	3540	0
3	SR 347	0	1.000	0	1.000	20.00	4182	0	14.60	2181	0
4	Riggs Rd	0	1.000	0	1.000	20.00	3614	0	24.70	3689	0

Operational Results

2050 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	SR 347	None	0		0		73	0		0.0000	
2	Riggs Rd	None	150		0		666	2249		0.0667	
3	SR 347	None	340		150		0	2434		0.1397	
4	Riggs Rd	None	521		218		272	2213		0.2354	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	SR 347	None	0.00		0.00	0.00		A		A
2	Riggs Rd	None	2.58		2.58	0.34		A		A
3	SR 347	None	2.96		2.96	0.90		A		A
4	Riggs Rd	None	1.99		1.99	0.97		A		A

2050 PM Peak
50% Confidence Level
Daylight conditions

East Roundabout (NB Ramps)

Project: SR 347 -Riggs
Scheme: Layout 1
Rodel-Win1 - Full Geometry

Global Results

Performance and Accidents

2050 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	1011		1011
Capacity	veh/hr	6897		6897
Average Delay	sec/veh	2.41		2.41
L.O.S. (Signal)	A – F	A		A
L.O.S. (Unsig)	A – F	A		A
Total Delay	veh.hrs	0.68		0.68

Appendix 4. HCS Output Reports (2050 Build)

HCS7 Basic Freeway Report

Project Information

Analyst	JPW	Date	9/13/2022
Agency	ADOT	Analysis Year	2050
Jurisdiction	GRIC	Time Period Analyzed	AM Peak
Project Description	SR 347/Riggs Rd DCR - 2050 Build NB	Unit	United States Customary

Geometric Data

Number of Lanes, ln	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.4	Total Ramp Density (TRD), ramps/mi	0.33
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	74.1
Right-Side Lateral Clearance, ft	10		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	1.000
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	3756	Heavy Vehicle Adjustment Factor (f_{HV})	0.952
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	1461
Total Trucks, %	5.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.61
Passenger Car Equivalent (ET)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	72.1
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	20.3
Total Ramp Density Adjustment	1.3	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	74.1		

Design Analysis Table

Number of Lanes, ln	2	3	4	5
Density, pc/mi/ln	37.0	20.3	14.8	11.8
LOS	E	C	B	B

HCS7 Freeway Diverge Report

Project Information

Analyst	JPW	Date	1/30/2023
Agency	ADOT	Analysis Year	2050
Jurisdiction	GRIC	Time Period Analyzed	AM Peak
Project Description	SR 347/Riggs Rd DCR - 2050 Build NB	Unit	United States Customary

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	75.4	35.0
Segment Length (L) / Deceleration Length (L_A),ft	1500	600
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i)	3756	425
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (vi),pc/h	4384	496
Capacity (c), pc/h	7200	2000
Volume-to-Capacity Ratio (v/c)	0.61	0.25

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O)	1
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.473
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	1446
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	59.6
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	0.628	Outer Lanes Freeway Speed (S_O), mi/h	81.0
Flow in Lanes 1 and 2 (v_{12}), pc/h	2938	Ramp Junction Speed (S), mi/h	65.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	22.4
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	24.1

Design Analysis Table								
Freeway Lanes, ln	2	2	3	3	4	4	5	5
Ramp Lanes, ln	1	2	1	2	1	2	1	2
Density, pc/mi/ln	36.8	36.8	22.4	21.9	15.9	15.4	12.7	12.3
LOS	E	D	C	B	B	A	B	A

HCS7 Freeway Merge Report

Project Information			
Analyst	JPW	Date	9/13/2022
Agency	ADOT	Analysis Year	2050
Jurisdiction	GRIC	Time Period Analyzed	AM Peak
Project Description	SR 347/Riggs Rd DCR - 2050 Build NB	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	75.4	35.0
Segment Length (L) / Acceleration Length (LA),ft	1500	1300
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	3756	21
Peak Hour Factor (PHF)	0.90	0.80
Total Trucks, %	5.00	11.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.952	0.901
Flow Rate (vi),pc/h	4384	29
Capacity (c), pc/h	7200	2000
Volume-to-Capacity Ratio (v/c)	0.61	0.01

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	1
Distance to Upstream Ramp (LUP), ft	-	Speed Index (MS)	0.289
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	1692
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influence Area Speed (SR), mi/h	65.7
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	0.614	Outer Lanes Freeway Speed (SO), mi/h	71.1
Flow in Lanes 1 and 2 (v12), pc/h	2692	Ramp Junction Speed (S), mi/h	67.7
Flow Entering Ramp-Infl. Area (vR12), pc/h	2721	Average Density (D), pc/mi/ln	21.7
Level of Service (LOS)	B	Density in Ramp Influence Area (DR), pc/mi/ln	18.6

Design Analysis Table								
Freeway Lanes, ln	2	2	3	3	4	4	5	5
Ramp Lanes, ln	1	2	1	2	1	2	1	2
Density, pc/mi/ln	38.7	38.4	21.7	21.6	15.7	15.7	12.5	12.4
LOS	D	D	B	B	B	A	A	A

HCS7 Basic Freeway Report

Project Information

Analyst	JPW	Date	9/13/2022
Agency	ADOT	Analysis Year	2050
Jurisdiction	GRIC	Time Period Analyzed	AM Peak
Project Description	SR 347/Riggs Rd DCR - 2050 Build SB	Unit	United States Customary

Geometric Data

Number of Lanes, ln	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.4	Total Ramp Density (TRD), ramps/mi	0.33
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	74.1
Right-Side Lateral Clearance, ft	10		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	1.000
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	1383	Heavy Vehicle Adjustment Factor (f_{HV})	0.952
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	538
Total Trucks, %	5.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.22
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	74.1
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	7.3
Total Ramp Density Adjustment	1.3	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	74.1		

Design Analysis Table

Number of Lanes, ln	2	3	4	5
Density, pc/mi/ln	10.9	7.3	5.5	4.4
LOS	A	A	A	A

HCS7 Freeway Diverge Report

Project Information			
Analyst	JPW	Date	1/30/2023
Agency	ADOT	Analysis Year	2050
Jurisdiction	GRIC	Time Period Analyzed	AM Peak
Project Description	SR 347/Riggs Rd DCR - 2050 Build SB	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	75.4	35.0
Segment Length (L) / Deceleration Length (LA),ft	1500	600
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	1383	36
Peak Hour Factor (PHF)	0.90	0.80
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.952	0.952
Flow Rate (vi),pc/h	1614	47
Capacity (c), pc/h	7200	2000
Volume-to-Capacity Ratio (v/c)	0.22	0.02

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	1
Distance to Upstream Ramp (LUP), ft	-	Speed Index (DS)	0.432
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	443
Distance to Downstream Ramp (LDOWN), ft	-	Off-Ramp Influence Area Speed (SR), mi/h	61.0
Prop. Freeway Vehicles in Lane 1 and 2 (PFD)	0.717	Outer Lanes Freeway Speed (SO), mi/h	82.7
Flow in Lanes 1 and 2 (v12), pc/h	1171	Ramp Junction Speed (S), mi/h	65.7
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi/ln	8.2
Level of Service (LOS)	A	Density in Ramp Influence Area (DR), pc/mi/ln	8.9

Design Analysis Table								
Freeway Lanes, ln	2	2	3	3	4	4	5	5
Ramp Lanes, ln	1	2	1	2	1	2	1	2
Density, pc/mi/ln	13.2	13.2	8.2	7.8	5.7	5.6	4.5	4.5
LOS	B	A	A	A	A	A	A	A

HCS7 Freeway Merge Report

Project Information			
Analyst	JPW	Date	9/13/2022
Agency	ADOT	Analysis Year	2050
Jurisdiction	GRIC	Time Period Analyzed	AM Peak
Project Description	SR 347/Riggs Rd DCR - 2050 Build SB	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	75.4	35.0
Segment Length (L) / Acceleration Length (LA),ft	1500	1300
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	1383	341
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	5.00	8.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.952	0.926
Flow Rate (vi),pc/h	1614	409
Capacity (c), pc/h	7200	2000
Volume-to-Capacity Ratio (v/c)	0.28	0.20

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	1
Distance to Upstream Ramp (LUP), ft	-	Speed Index (MS)	0.246
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	623
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influence Area Speed (SR), mi/h	67.2
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	0.614	Outer Lanes Freeway Speed (SO), mi/h	75.0
Flow in Lanes 1 and 2 (v12), pc/h	991	Ramp Junction Speed (S), mi/h	69.4
Flow Entering Ramp-Infl. Area (vR12), pc/h	1400	Average Density (D), pc/mi/ln	9.7
Level of Service (LOS)	A	Density in Ramp Influence Area (DR), pc/mi/ln	8.1

Design Analysis Table								
Freeway Lanes, ln	2	2	3	3	4	4	5	5
Ramp Lanes, ln	1	2	1	2	1	2	1	2
Density, pc/mi/ln	15.2	15.1	9.7	9.6	7.3	7.1	5.8	5.7
LOS	B	B	A	A	A	A	A	A

HCS7 Basic Freeway Report

Project Information			
Analyst	JPW	Date	9/13/2022
Agency	ADOT	Analysis Year	2050
Jurisdiction	GRIC	Time Period Analyzed	PM Peak
Project Description	SR 347/Riggs Rd DCR - 2050 Build NB	Unit	United States Customary

Geometric Data			
Number of Lanes, ln	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.4	Total Ramp Density (TRD), ramps/mi	0.33
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	74.1
Right-Side Lateral Clearance, ft	10		

Adjustment Factors			
Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	1.000
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity			
Demand Volume veh/h	1909	Heavy Vehicle Adjustment Factor (f_{HV})	0.952
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	743
Total Trucks, %	5.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.31
Passenger Car Equivalent (E_T)	2.000		

Speed and Density			
Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	74.1
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	10.0
Total Ramp Density Adjustment	1.3	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	74.1		

Design Analysis Table				
Number of Lanes, ln	2	3	4	5
Density, pc/mi/ln	15.1	10.0	7.5	6.0
LOS	B	A	A	A

HCS7 Freeway Diverge Report

Project Information			
Analyst	JPW	Date	1/30/2023
Agency	ADOT	Analysis Year	2050
Jurisdiction	GRIC	Time Period Analyzed	PM Peak
Project Description	SR 347/Riggs Rd DCR - 2050 Build NB	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	75.4	35.0
Segment Length (L) / Deceleration Length (L_A),ft	1500	600
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (V_i)	1909	341
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.952	0.952
Flow Rate (vi),pc/h	2228	398
Capacity (c), pc/h	7200	2000
Volume-to-Capacity Ratio (v/c)	0.31	0.20

Speed and Density			
Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O)	1
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.464
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	575
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	59.9
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	0.686	Outer Lanes Freeway Speed (S_O), mi/h	82.7
Flow in Lanes 1 and 2 (v_{12}), pc/h	1653	Ramp Junction Speed (S), mi/h	64.5
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	11.5
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	13.1

Design Analysis Table								
Freeway Lanes, ln	2	2	3	3	4	4	5	5
Ramp Lanes, ln	1	2	1	2	1	2	1	2
Density, pc/mi/ln	18.6	18.6	11.5	10.9	8.1	7.8	6.5	6.2
LOS	B	B	B	A	A	A	A	A

HCS7 Freeway Merge Report

Project Information			
Analyst	JPW	Date	9/13/2022
Agency	ADOT	Analysis Year	2050
Jurisdiction	GRIC	Time Period Analyzed	PM Peak
Project Description	SR 347/Riggs Rd DCR - 2050 Build NB	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	75.4	35.0
Segment Length (L) / Acceleration Length (LA),ft	1500	1300
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	1909	74
Peak Hour Factor (PHF)	0.90	0.80
Total Trucks, %	5.00	11.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.952	0.901
Flow Rate (vi),pc/h	2228	103
Capacity (c), pc/h	7200	2000
Volume-to-Capacity Ratio (v/c)	0.32	0.05

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	1
Distance to Upstream Ramp (LUP), ft	-	Speed Index (MS)	0.247
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	860
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influence Area Speed (SR), mi/h	67.2
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	0.614	Outer Lanes Freeway Speed (SO), mi/h	74.1
Flow in Lanes 1 and 2 (v12), pc/h	1368	Ramp Junction Speed (S), mi/h	69.6
Flow Entering Ramp-Infl. Area (vR12), pc/h	1471	Average Density (D), pc/mi/ln	11.2
Level of Service (LOS)	A	Density in Ramp Influence Area (DR), pc/mi/ln	8.8

Design Analysis Table								
Freeway Lanes, ln	2	2	3	3	4	4	5	5
Ramp Lanes, ln	1	2	1	2	1	2	1	2
Density, pc/mi/ln	17.6	17.4	11.2	11.1	8.3	8.1	6.7	6.5
LOS	B	B	A	A	A	A	A	A

HCS7 Basic Freeway Report

Project Information

Analyst	JPW	Date	9/13/2022
Agency	ADOT	Analysis Year	2050
Jurisdiction	GRIC	Time Period Analyzed	PM Peak
Project Description	SR 347/Riggs Rd DCR - 2050 Build SB	Unit	United States Customary

Geometric Data

Number of Lanes, ln	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	75.4	Total Ramp Density (TRD), ramps/mi	0.33
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	74.1
Right-Side Lateral Clearance, ft	10		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	1.000
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	3325	Heavy Vehicle Adjustment Factor (f_{HV})	0.952
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	1294
Total Trucks, %	5.00	Capacity (c), pc/h/ln	2400
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	2400
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.54
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	73.4
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	17.6
Total Ramp Density Adjustment	1.3	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	74.1		

Design Analysis Table

Number of Lanes, ln	2	3	4	5
Density, pc/mi/ln	29.8	17.6	13.1	10.5
LOS	D	B	B	A

HCS7 Freeway Diverge Report

Project Information			
Analyst	JPW	Date	1/30/2023
Agency	ADOT	Analysis Year	2050
Jurisdiction	GRIC	Time Period Analyzed	PM Peak
Project Description	SR 347/Riggs Rd DCR - 2050 Build SB	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	75.4	35.0
Segment Length (L) / Deceleration Length (LA),ft	1500	600
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	3325	21
Peak Hour Factor (PHF)	0.90	0.80
Total Trucks, %	5.00	5.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.952	0.952
Flow Rate (vi),pc/h	3881	28
Capacity (c), pc/h	7200	2000
Volume-to-Capacity Ratio (v/c)	0.54	0.01

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	1
Distance to Upstream Ramp (LUP), ft	-	Speed Index (DS)	0.431
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	1302
Distance to Downstream Ramp (LDOWN), ft	-	Off-Ramp Influence Area Speed (SR), mi/h	61.0
Prop. Freeway Vehicles in Lane 1 and 2 (PFD)	0.662	Outer Lanes Freeway Speed (SO), mi/h	81.5
Flow in Lanes 1 and 2 (v12), pc/h	2579	Ramp Junction Speed (S), mi/h	66.6
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi/ln	19.4
Level of Service (LOS)	C	Density in Ramp Influence Area (DR), pc/mi/ln	21.0

Design Analysis Table								
Freeway Lanes, ln	2	2	3	3	4	4	5	5
Ramp Lanes, ln	1	2	1	2	1	2	1	2
Density, pc/mi/ln	31.8	31.8	19.4	19.1	13.6	13.5	10.9	10.8
LOS	D	C	C	B	B	A	B	A

HCS7 Freeway Merge Report

Project Information			
Analyst	JPW	Date	9/13/2022
Agency	ADOT	Analysis Year	2050
Jurisdiction	GRIC	Time Period Analyzed	PM Peak
Project Description	SR 347/Riggs Rd DCR - 2050 Build SB	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	3	1
Free-Flow Speed (FFS), mi/h	75.4	35.0
Segment Length (L) / Acceleration Length (LA),ft	1500	1300
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	3325	751
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	5.00	8.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (fHV)	0.952	0.926
Flow Rate (vi),pc/h	3881	901
Capacity (c), pc/h	7200	2000
Volume-to-Capacity Ratio (v/c)	0.66	0.45

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	1
Distance to Upstream Ramp (LUP), ft	-	Speed Index (MS)	0.334
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	1498
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influence Area Speed (SR), mi/h	64.2
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	0.614	Outer Lanes Freeway Speed (SO), mi/h	71.8
Flow in Lanes 1 and 2 (v12), pc/h	2383	Ramp Junction Speed (S), mi/h	66.4
Flow Entering Ramp-Infl. Area (vR12), pc/h	3284	Average Density (D), pc/mi/ln	24.0
Level of Service (LOS)	C	Density in Ramp Influence Area (DR), pc/mi/ln	22.6

Design Analysis Table								
Freeway Lanes, ln	2	2	3	3	4	4	5	5
Ramp Lanes, ln	1	2	1	2	1	2	1	2
Density, pc/mi/ln	45.8	45.4	24.0	23.7	17.3	17.2	13.7	13.6
LOS	D	D	C	C	B	B	B	B

APPENDIX H: Construction Sequence Exhibits

LEGEND

PHASE 1

PHASE 1 TEMPORARY PAVEMENT

DIRECTION OF TRAVEL

FINAL
DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

	NAME	DATE
DESIGN	EGK	9/24
DRAWN	EG	9/24
CHECKED	EGK	9/24

Kimley»Horn

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

TRAFFIC CONTROL PHASE 1

ROUTE: SR 347
MILEPOST:
STRUCTURE NO.:

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	347 MA 184	NFA	1	3	

LOCATION: RIGGS ROAD TRAFFIC INTERCHANGE
DWG NO.:
TRACS NO. F0476 01C
ADOT
____ OF ____

12:30:23 PM 9/6/2024 Erubiel.Guerrero K:\PHX_Roadway\Worksets\ADOT_CONNECT_PROJECTS_10.10_291749000-F0476-SR_347_Riggs_Rd_TI\dgn\Traffic\f0476_ph01.dgn

LEGEND

PHASE 2

PHASE 2 TEMPORARY PAVEMENT

DIRECTION OF TRAVEL

FINAL **DCR** **Review** NOT FOR CONSTRUCTION OR RECORDING		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION PROJECT MANAGEMENT GROUP	ROUTE SR 347	F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	DESIGN	EGK	9/24				ARIZ.	347 MA 184	NFA	2	3	
	DRAWN	EG	9/24		MILEPOST	LOCATION RIGGS ROAD TRAFFIC INTERCHANGE						DWG NO.
	CHECKED	EGK	9/24		STRUCTURE NO.	TRACS NO. F0476 01C						____ OF ____
	Kimley»Horn © 2024 KIMLEY-HORN AND ASSOCIATES, INC.			TRAFFIC CONTROL PHASE 2		ADOT						

12:24:33 PM 9/6/2024 Erubiel.Guerrero K:\PHX_Roadway\Worksets\ADOT_CONNECT_PROJECTS_10.10_291749000-F0476-SR_347_Riggs_Rd_TI\dgn\Traffic\f0476_ph02.dgn

LEGEND

PHASE 3

DIRECTION OF TRAVEL

FINAL **DCR** **Review** NOT FOR CONSTRUCTION OR RECORDING		NAME	DATE	ARIZONA DEPARTMENT OF TRANSPORTATION INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION PROJECT MANAGEMENT GROUP	ROUTE SR 347	F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	DESIGN	EGK	9/24				ARIZ.	347 MA 184	NFA	3	3	
	DRAWN	EG	9/24		MILEPOST	LOCATION RIGGS ROAD TRAFFIC INTERCHANGE						DWG NO.
	CHECKED	EGK	9/24		STRUCTURE NO.	TRACS NO. F0476 01C						____ OF ____
	Kimley»Horn © 2024 KIMLEY-HORN AND ASSOCIATES, INC.			TRAFFIC CONTROL PHASE 3		ADOT						

12:23:10 PM 9/6/2024 Erubiel.Guerrero K:\PHX_Roadway\Worksets\ADOT_CONNECT_PROJECTS_10.10_291749000-F0476-SR_347_Riggs_Rd_TI\dgn\Traffic\f0476_ph03A.dgn

APPENDIX I: Access Control Exhibit

N

SR 347 SB

SR 347 NB

660'
Right-In,
Right-Out Only

660'
Full Access Control

330'
Full Access Control

990'
Right-In,
Right-Out Only

Riggs Rd

Riggs Rd

990'
Right-In,
Right-Out Only

330'
Full Access Control

660'
Full Access Control

660'
Right-In,
Right-Out Only

SR 347 SB

SR 347 NB

LEGEND

ADOT Maintenance Limits

MCDOT Maintenance Limits

Proposed Access Control

APPENDIX I
ACCESS CONTROL
ADOT/MCDOT MAINTENANCE LIMITS

Kimley»Horn

9/09/2024

PROJECT NO.

F0476 01L 347 MA 184

Riggs Rd TI at SR 347

Scale: 1"=100'

$TIME$ $DATE$ $USERNAME$ $FILE$

APPENDIX J: Draft Bridge Selection Report

ARIZONA DEPARTMENT OF TRANSPORTATION
BRIDGE GROUP
BRIDGE DESIGN SECTION A

DRAFT BRIDGE SELECTION REPORT

September 2024

TRACS No. 347 MA 184 F0476 01L

Federal Aid Project No. NFA

Riggs Road OP

New Structure #TBD

State Route 347 & Riggs Road

Prepared By:

Kimley»Horn

Date: September 2024

TABLE OF CONTENTS

1 INTRODUCTION

An Initial Design Concept Report (IDCR) Riggs Road Traffic Interchange (TI) at State Route (SR) 347 has been prepared which describes the recommendation for providing a grade separated interchange on Maricopa Road/State Route 347 (SR 347) at Riggs Road near Milepost 185.29.

1.1 Project Information

TRACS No.:	347 MA 184 F0476 01L
Federal Aid Project No.:	NFA
Name of Project:	Maricopa Road (State Route 347): Riggs Road Traffic Interchange
Project Milepost (MP):	SR 347 MP 185.29
Type of Project:	Grade Separated Crossing
Route Numbers:	SR 347
Structure Number:	As this is a new bridge structure, a structure number will not be assigned until the bridge type and geometry are determined. The Structure Number will be included in the Final Bridge Selection Report.

1.2 Project Location

The Maricopa Road (State Route 347): Riggs Road Traffic Interchange improvements project is located in the Arizona Department of Transportation's (ADOT) Central District and is within Maricopa County in south-central Arizona. The project location and project vicinity map are shown in **Figure 1.1** and **Figure 1.2**, respectively.

1.3 Current Project Programming Status

Construction for the project is not yet funded. Construction schedule is not determined and will be scheduled based on available funding.

1.4 Highway Classification

The SR 347 is classified as a principal arterial highway with partial control of access.

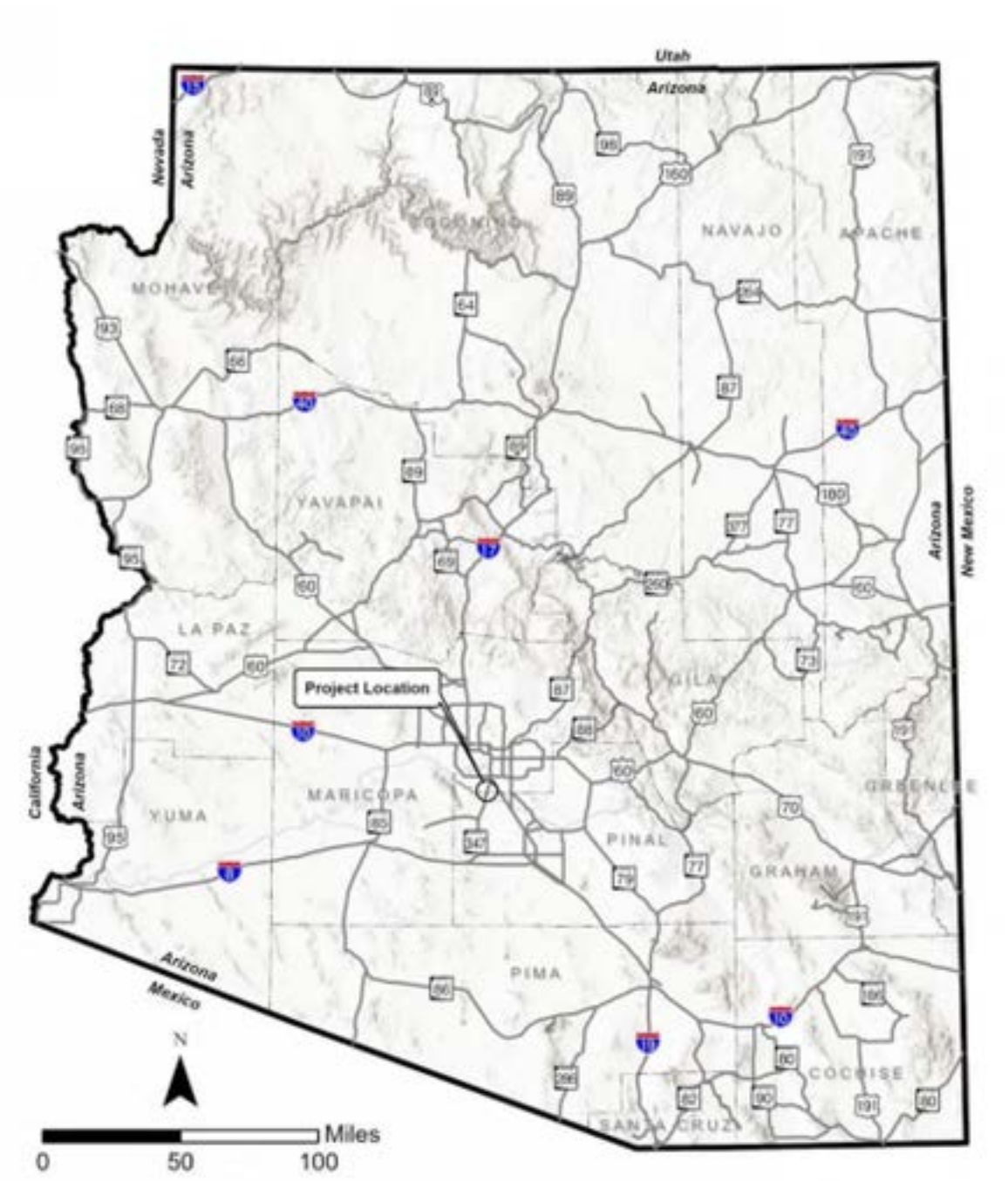


Figure 1.1 – Project Location

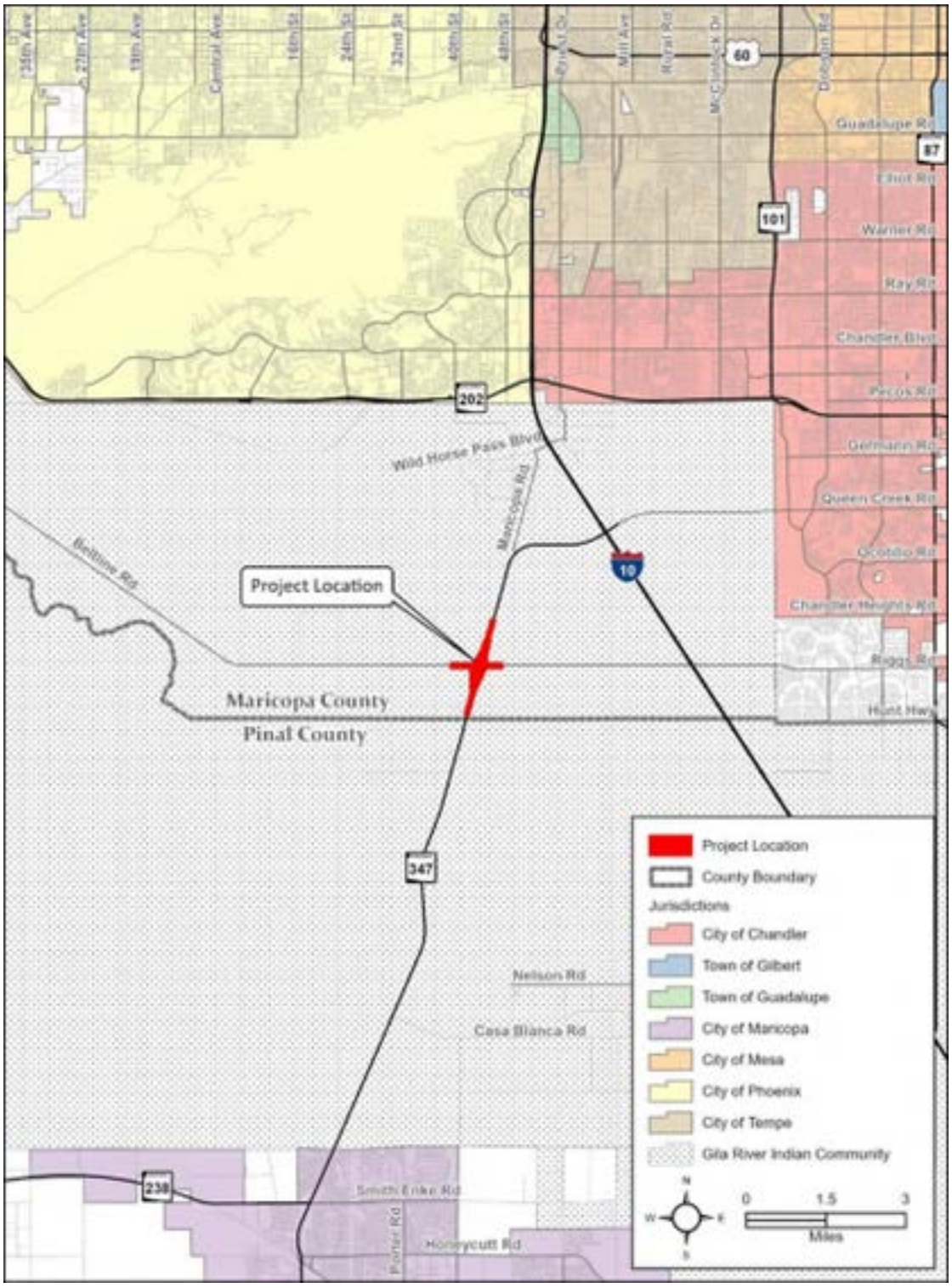


Figure 1.2 – Bridge Location

2 EXISTING ROADWAY GEOMETRY AND CONDITION

The existing SR 347 northbound (NB) and southbound (SB) roadway sections include two general purpose lanes (GPL) in each direction that are each 12 feet wide. Approaching the Riggs Road intersection, the SR 347 NB and SB roadway sections include one left turn auxiliary lane and one right turn auxiliary lane in each direction that are each 12 feet wide. The SR 347 NB and SB lanes are separated by a 38-foot unpaved median. Inside paved shoulders are 4 feet wide or less for both NB and SB travel lanes and outside paved shoulders are 10 feet wide both directions as well. Along SR 347, standard 2.0% cross slopes are maintained consistently. The horizontal alignment of SR 347 is tangential throughout the project. The terrain throughout the corridor is level, with maximum grades along the SR 347 mainline at 0.7% in both directions of travel.

Riggs Road eastbound (EB) and westbound (WB) roadway sections include one general purpose lane (GPL) in each direction that are each 12 feet wide. Approaching the SR 347 intersection, the Riggs Road EB and WB roadway sections include one left turn auxiliary lane in each direction that are each 12 feet wide. Riggs Road does not currently have a median nor inside shoulders, and the outside paved shoulders are 5 feet wide generally for both EB and WB directions. It is currently owned and maintained by Maricopa County Department of Transportation. The terrain throughout the intersection and neighboring areas is level, with grades meeting current standards and the curves meeting vertical stopping sight distance criteria. Superelevation is not used along Riggs Road in this area.

3 EXISTING BRIDGE GEOMETRY AND CONDITION

The existing intersection is an at grade, four-way signalized intersection without a bridge.

4 EXISTING BRIDGE HYDRAULICS

There is no existing bridge at this intersection. See the ADOT 2024 IDCR Riggs Rd TI at SR 347 for discussion on the existing roadway drainage patterns at the intersection.

5 EXISTING UTILITIES

Existing utilities have been identified crossing or adjacent to SR 347 including culverts, electric, fiber optics, gas irrigation, sewer, storm drains, telephone, traffic signals, and water.

See the ADOT 2024 IDCR Riggs Rd TI at SR 347 for additional existing utility information.

6 EXISTING RIGHT-OF-WAY

See the ADOT 2024 IDCR Riggs Rd TI at SR 347 for existing right-of-way information.

7 PROPOSED ROADWAY GEOMETRY

The preferred alternative in the ADOT 2024 IDCR Riggs Rd TI at SR 347 is the shifted diamond alternative with a new bridge for SR 347 over Riggs Road. With this alternative, the existing SR 347 alignment will be shifted to the east of the current location utilizing

large radii reverse curves along the SR 347 centerline. A tight diamond interchange at Riggs Road will be constructed. The SR 347 Northbound and Southbound lanes will each have a total clear roadway width of 60'-0". This will provide 12'-0" outside shoulders, three 12'-0" lanes, and 12'-0" inside shoulders. The interim roadway configuration will carry only 2 lanes on SR 347 until the future corridor widening project comes through to restripe for 3 lanes.

Riggs Road will remain at grade and SR 347 will be elevated to cross Riggs Road with a bridge. No retaining walls will be required. The vertical alignment of SR 347 will be designed to provide the required minimum vertical clearance of 16'-6" beneath the bridge structure. In each direction, Riggs Road will provide a 5'-0" bike lane, two 12'-0" lanes, and one 12'-0" shoulder. There will be an 8'-0" median separating the two directions at the center of Riggs Road.

8 PROPOSED BRIDGE GEOMETRY

The existing SR 347 alignment will be shifted to the east of the current location and cross over Riggs Road with a bridge. The new bridge will be a two-span structure with a pier in the median of Riggs Road. The span lengths vary depending on the bridge alternative and will be discussed further in Section 18 of the report. The bridge will be two separate structures with a 4" open joint between the two decks and will share an abutment cap. Each structure will accommodate a 12'-0" inside shoulder, three 12'-0" lanes, and a 12'-0" outside shoulder to provide 60'-0" clear roadway width.

Each bridge structure will have a total out-to-out width of 63'-0". The bridge abutments will have a joint at the center of the abutment between the two bridges. The pier caps will be separate caps and columns for each bridge. All bridge alternatives will have drilled shaft foundations under the abutments and pier. The inside barrier for both structures will be a 42-inch single-slope concrete barrier; the outside barrier will be a 38-inch single-slope concrete barrier.

9 DESIGN SPECIFICATIONS AND LOADINGS

The technical design specifications and guidelines followed in the development of this initial bridge selection report are:

- *AASHTO LRFD Bridge Design Specifications, 8th Edition 2017, except as modified by the ADOT Bridge Group – "Bridge Design Guidelines".*
- *Loading Class HL93.*
- *Dead Load – Includes allowance for 25 psf for future wearing surface.*

10 BRIDGE FOUNDATION INVESTIGATION

There is not an existing bridge at this location, therefore there is limited information about the subsurface soils. A geotechnical report will be required for this project. Based on other structures along the corridor, it is assumed that drilled shafts will be the best foundation type for this bridge.

11 BRIDGE HYDRAULICS

The drainage of the new bridge deck will collect at the outside gutter lines and will be conveyed to the north and south ends of the bridge. The runoff will be collected in the roadway drainage system.

12 UTILITIES

See Section 5 “Existing Utilities” for the identified utilities in the vicinity of the bridge. Utilities will need to be confirmed and identified through ADOT Utilities and Railroad Engineering as part of final design. No new utilities are proposed to be located within or supported on the bridge structure.

13 RIGHT-OF-WAY

See the ADOT 2024 IDCR Riggs Rd TI at SR 347 for right-of-way information.

14 ENVIRONMENTAL

See the ADOT 2024 IDCR Riggs Rd TI at SR 347 for environmental concerns and required clearances.

15 AESTHETICS

The overall bridge layout and configuration should produce the appearance of openness and freedom to the driver. It is important to neither distract nor distress the driver passing beneath bridges. Gentle open slopes with short stub type abutments convey an unrestricted visual range to the driver and maximize the driver’s site distance and perspective. In addition, long multi-span bridges with stub abutments are generally thought to be more attractive than short tunnel-like bridges with full-height abutments. When feasible, long span and multi-span bridges with stub abutments are preferred.

Piers, wingwalls, abutment faces, and outer faces of the barriers will be designed to accommodate integral artwork designs and rustication patterns. All exposed bridge surfaces, with the exception of the roadway surface and inside face of barriers, will be painted. Bridge Aesthetics and painting will be coordinated during final design.

16 CONSTRUCTABILITY AND CONSTRUCTION PHASING & TRAFFIC CONTROL

The construction of the new bridge must be accomplished while maintaining traffic on both the SR 347 and Riggs Road during construction. The bridge will be constructed to the east of the current alignment of SR 347. On the SR 347, two lanes for both NB and SB must remain open. The new bridge will not need to have phased construction since the existing roadway can be maintained while the bridge is constructed to the east of the SR 347. The northbound lanes will be detoured onto the new ramps during bridge construction because of the close proximity of the bridge as well as the roadway embankment extending over the existing lanes. The northbound off and on ramps will be constructed to accommodate the current traffic lanes to maintain the existing traffic flow.

It is likely that there will be restrictions to Riggs Road during construction of the overpass. Short-term lane closures on Riggs Road during overhead bridge construction activities are required in accordance with accepted ADOT practices and should be anticipated. This can be accomplished during off-peak hours and in coordination with the construction efforts on adjacent crossroads.

17 ACCELERATED BRIDGE CONSTRUCTION METHODS

The ADOT Accelerated Bridge Construction Guidelines state “ADOT Bridge Group encourages the exploration and use of Accelerated Bridge Construction (ABC) methods in delivering bridge design and construction projects…”. “During the development of all scoping documents involving bridge construction projects, ABC methods shall be evaluated for solutions to lesson impacts to stakeholders such as the travelling public, railroad, businesses and other entities. Improve the safety of the travelling public and contractor’s personnel in the work zone, mitigate environmental impacts and shorten construction duration.”

ABC methods were considered on this project to reduce the construction impact, project duration and safety to the travelling public. An ABC meeting has not been held with ADOT staff at this point in the project but will be scheduled before the 30% submittal. The preliminary ABC scoring matrix scored this bridge at a 31, which requires consideration of ABC methods if it creates an advantage for the project. Using the ABC Decision Flowchart, it was determined that the benefits of ABC do not outweigh additional costs of using ABC methods. It was determined that ABC methods are not a viable option for this location and conventional bridge construction methods will be used. See Appendix C for the ABC Decision Making Matrix and ABC flowchart.

18 BRIDGE ALTERNATIVES

Two bridge types were considered for the Shifted Diamond TI (SHDI) preferred alternative from the DCR (Alternative B1). The first bridge type uses precast, prestressed bulb tee girders on stub abutments supported on drilled shafts. The second bridge type uses precast, prestressed bulb tee girders with pier-style abutments and MSE walls.

Other superstructure types were also considered for this location. Steel girders were considered, but because of higher steel costs in Arizona they are not as cost effective as precast concrete girders for the short spans of this bridge. Precast, prestressed bulb tee girders on full-height abutments were also considered, but because of the large amount of concrete used at the abutment, the cost was higher than other abutment styles. AASHTO I-Girders were considered as well, however they are deeper than the Wide Flange girders and would require greater increase of the SR 347 profile with no reduction in bridge costs.

18.1 Alternative B1-1 – Two-Span, Precast, Prestressed 50-Inch Bulb Tee Girder Bridge with Stub Abutments at the Shifted Diamond Interchange (SHDI)

18.1.1 Superstructure Type

The superstructure type for Alternative B1-1 is a two-span, precast, prestressed 50-inch Bulb Tee Girder (BT50) bridge. The bridge will have 7 lines of girders in each bound spaced at 9’-3” with 3’-9” overhangs. The bridge will have an 8-inch-thick reinforced concrete deck. The total superstructure depth will be 5’-2”.

18.1.2 Bridge Configurations and Span Arrangement

The span lengths are both 107’-0” yielding a total bridge length of 218’-2”. This span configuration will provide a clear Riggs Road roadway width of 41’-0” in each travel direction with variable fill slopes (2:1 maximum). This will allow three 12’-0” lanes and a 5’-0” bike lane in each direction with the ability to utilize a retaining wall in the fill slopes for a future widening of Riggs Road.

18.1.3 Substructure and Foundation Types

The abutments and pier are parallel to the Riggs Road construction centerline. Both abutments utilize stub-type abutments supported on a single row of four 48-inch diameter drilled shafts and will have conventional cantilever wingwalls.

The pier for both bounds consists of a standard pier cap supported on five 54-inch diameter circular columns bearing on 72-inch diameter drilled shafts.

18.1.4 Cost Estimate

The unit costs used in estimating the construction cost are based on the ADOT Estimated Engineering Construction Cost E2C2 program. See Appendix B for estimated item quantities and costs.

2-Span, Precast, Prestressed 50-inch Bulb Tee Girder Superstructure
Stub Abutments on Drilled Shafts
Pier Cap supported on Circular Columns on Drilled Shafts
Total Structure Cost: $10,668,720
Unit Structure Cost per SF: $388.09

18.1.5 Advantages and Disadvantages

Precast, prestressed concrete girder bridges are very common in Arizona. The bulb tee girder has become a very common girder type in Arizona and has been shown to be very efficient. The bulb tee girders provide a shorter superstructure depth to limit the SR 347 profile. The precast, prestressed girder bridges can be erected without the negative risk associated with falsework. They are also simple to construct.

The stub abutment alternative will help the bridge have the appearance of openness and is generally thought to be more attractive than tunnel-like bridges with full-height abutments or pier-style abutments and an MSE wall. The stub abutment alternative allows for a future widening of Riggs Road utilizing a retaining wall where the slope paving is located.

18.2 Alternative B1-2 - Two-Span, Precast, Prestressed 42-Inch Bulb Tee Girder Bridge with Exposed Pier-Style Abutments and MSE Walls at the Shifted Diamond Interchange (SHDI)

18.2.1 Superstructure Type

The superstructure type for Alternative B1-2 is a two-span, precast, prestressed 42-inch Bulb Tee Girder bridge. The bridge will have 5 lines of girders in each bound spaced at 11’-1” with 3’-9½” overhangs. The bridge will have a 9-inch-thick reinforced concrete deck. The total superstructure depth will be 4’-5”.

18.2.2 Bridge Configurations and Span Arrangement

The span lengths are both 70’-0” yielding a total bridge length of 143’-2”. This span configuration will provide a clear Riggs Road roadway width of 41’-0”. This will allow three 12’-0” lanes and a 5’-0” bike lane in each direction on Riggs Road.

18.2.3 Substructure and Foundation Types

The abutments and pier are parallel to the Riggs Road construction centerline. Both abutments utilize pier-style abutments with each cap consisting of five 54-inch diameter circular columns each supported on a single 72-inch diameter drilled shaft. Behind each abutment is an MSE wall. A “jump-span” on the approach slab is required to span the gap between the abutments and MSE walls.

The pier for both bounds consists of a standard pier cap supported on five 54-inch diameter circular columns bearing on 72-inch diameter drilled shafts.

18.2.4 Cost Estimate

The unit costs used in estimating the construction cost are based on the ADOT Estimated Engineering Construction Cost E2C2 program. See Appendix B for estimated item quantities and costs.

2-Span, Precast, Prestressed 42-inch Bulb Tee Girder Superstructure
Pier-Style Abutments on Circular Columns on Drilled Shafts
Pier Cap supported on Circular Columns on Drilled Shafts
Total Structure Cost: $7,492,260
Unit Structure Cost per SF: $415.31
Total MSE Wall Cost: $2,810,898
Total Cost: $10,303,158

18.2.5 Advantages and Disadvantages

As stated in Alternative B1-1, the bulb tee girders provide a shorter superstructure depth to limit the SR 347 profile. The precast, prestressed girder bridges can be erected without the negative risk associated with falsework. They are also simple to construct.

The superstructure depth of this structure will be more shallow than Alternative B1-1. The span lengths are shorter and there are also fewer girder lines than Alternative B1-1. Both of these factors create a lower superstructure cost.

The pier-style abutments with MSE walls alternative will give the appearance of a tunnel-like bridge. The stub abutment alternative allows for a future widening of Riggs Road utilizing a retaining wall where the slope paving is located.

19 RECOMMENDED ALTERNATIVE

SUMMARY OF ALTERNATIVES TABLE				
Alt. No.	**Description**	**Advantages**	**Disadvantages**	**Cost**
B1-1	Two-Span, Precast, Prestressed 50-Inch Bulb Tee Girder Bridge with Stub Abutments at the Shifted Diamond Interchange	-Future widening potential -Easily constructed -Longer spans -Open bridge concept	-Deeper superstructure -More girders	$10,668,720
B1-2	Two-Span, Precast, Prestressed 42-Inch Bulb Tee Girder Bridge with Exposed Pier-Style Abutments and MSE Walls at the Shifted Diamond Interchange	-Fewer girders -Easily constructed -More-shallow superstructure	-No future widening -Tunnel-like bridge	$10,303,158

Alterative B1-1, a two-span, precast, prestressed 50-inch Bulb Tee girder bridge with stub abutments supported on a single row of 48-inch diameter drilled shafts and a standard pier cap on circular columns supported on 72-inch drilled shafts is the recommended bridge type and configuration for this location for the shifted diamond interchange (SDI). This alternative allows for a future widening to Riggs Road and prevents the bridge from appearing tunnel-like. It also provides minimal maintenance, greater sight distance for motorists, and local contractors have a high familiarity with the construction of this kind of bridge.

Appendix A: Estimated Quantities and Cost

CONSTRUCTION COST ESTIMATE
SR 347 Riggs Rd TI OP - Alternative B1-1

Structure Name:	**SR 347 Riggs Rd TI OP - Alternative B1-1**	**No. Spans:**	**2**	
Superstructure Type:	**BT50 Prestressed Girders**	**Span Length:**	**107.00**	ft
Substructure Type:	**Stub Abut & Multi-Column Pier**	**Skew:**	**15.563**	Rt
		Total Bridge Length:	**218.17**	ft
Foundation Type:	**Drilled Shafts**	**Bridge Width (out to out):**	**63.000**	ft
		Bridge Area:	**27,490**	ft^2

Bridge Items

ITEM No.	Item Description	Unit	Quantity	Unit Cost	Cost
2030501 A	STRUCTURAL EXCAVATION	CU.YD.	170	$100	$ 17,000
2030506 A	STRUCTURE BACKFILL	CU.YD.	846	$200	$ 169,200
6010003 A	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,500)	CU.YD.	798	$1,200	$ 957,600
6010005 A	STRUCTURAL CONCRETE (CLASS S) (F'C = 4,500)	CU.YD.	934	$1,800	$ 1,681,200
6010835 A	BRIDGE DECK TEXTURING (SAWED GROOVES)	SQ.YD.	3,310	$25	$ 82,750
6011150 A	SINGLE SLOPE BRIDGE CONCRETE BARRIER AND TRANSITION (38")	L.FT.	498	$250	$ 124,500
6011151 A	SINGLE SLOPE BRIDGE CONCRETE BARRIER AND TRANSITION (42")	L.FT.	498	$250	$ 124,500
6011343 A	DECK JOINT ASSEMBLY (FLANGELESS STRIP SEAL)	L.FT.	252	$600	$ 151,200
6011371 A	APPROACH SLAB (SD 2.01)	SQ.FT.	3,780	$60	$ 226,800
6014974 A	PRECAST, P/S MEMBER (BT58 GIRDER)	L.FT.	3,004	$650	$ 1,952,600
6015101 A	RESTRAINERS, VERTICAL EARTHQUAKE (FIXED)	EACH	12	$600	$ 7,200
6015102 A	RESTRAINERS, VERTICAL EARTHQUAKE (EXPANSION)	EACH	24	$800	$ 19,200
6050002 A	REINFORCING STEEL	LB.	410,740	$2.50	$ 1,026,850
9999903 A	LUMP SUM STRUCTURE (TOTAL OF PRECEEDING STRUCTURE ITEMS)	L.SUM	1	$6,540,600	$ 6,540,600
				SUBTOTAL:	**$ 6,540,600**

Other Items

ITEM No.	Item Description	Unit	Quantity	Unit Cost	Cost
6090048 B	DRILLED SHAFT FOUNDATION (48")	L.FT.	1,500	$900	$ 1,350,000
6090072 B	DRILLED SHAFT FOUNDATION (72")	L.FT.	376	$1,300	$ 488,800
9240038 B	MISCELLANEOUS WORK (SLOPE PAVING)	SQ.FT.	2556	$200	$ 511,200
				SUBTOTAL:	**$ 2,350,000**
				TOTAL:	**$ 8,890,600**
			20%	**CONTINGENCY:**	**$ 1,778,120**
				GRAND TOTAL COST:	**$ 10,668,720**
				TOTAL COST / SF :	**$ 388.09**

CONSTRUCTION COST ESTIMATE
SR 347 Riggs Rd TI OP - Alternative B1-2

Structure Name:	**SR 347 Riggs Rd TI OP - Alternative B1-2**	**No. Spans:**	**2**	
Superstructure Type:	**BT42 Prestressed Girders**	**Span Length:**	**70-0**	ft
Substructure Type:	**Pier-Style Abut & Multi-Column Pier**	**Skew:**	**15.563**	Rt
		Total Bridge Length:	**143.17**	ft
Foundation Type:	**Drilled Shafts**	**Bridge Width (out to out):**	**63.000**	ft
		Bridge Area:	**18,040**	ft²

Bridge Items

ITEM No.	Item Description	Unit	Quantity	Unit Cost	Cost
2030501 A	STRUCTURAL EXCAVATION	CU.YD.	54	$100	$ 5,400
2030506 A	STRUCTURE BACKFILL	CU.YD.	64	$200	$ 12,800
6010003 A	STRUCTURAL CONCRETE (CLASS S) (F'C = 3,500)	CU.YD.	858	$1,200	$ 1,029,600
6010005 A	STRUCTURAL CONCRETE (CLASS S) (F'C = 4,500)	CU.YD.	616	$1,800	$ 1,108,800
6010835 A	BRIDGE DECK TEXTURING (SAWED GROOVES)	SQ.YD.	2,310	$25	$ 57,750
6011150 A	SINGLE SLOPE BRIDGE CONCRETE BARRIER AND TRANSITION (38")	L.FT.	348	$250	$ 87,000
6011151 A	SINGLE SLOPE BRIDGE CONCRETE BARRIER AND TRANSITION (42")	L.FT.	348	$250	$ 87,000
6011343 A	DECK JOINT ASSEMBLY (FLANGELESS STRIP SEAL)	L.FT.	252	$600	$ 151,200
6011371 A	APPROACH SLAB (SD 2.01)	SQ.FT.	3,780	$60	$ 226,800
6014974 A	PRECAST, P/S MEMBER (BT42 GIRDER)	L.FT.	1,686	$650	$ 1,095,900
6015101 A	RESTRAINERS, VERTICAL EARTHQUAKE (FIXED)	EACH	10	$600	$ 6,000
6015102 A	RESTRAINERS, VERTICAL EARTHQUAKE (EXPANSION)	EACH	20	$800	$ 16,000
6050002 A	REINFORCING STEEL	LB.	357,160	$2.50	$ 892,900
9999903 A	LUMP SUM STRUCTURE (TOTAL OF PRECEEDING STRUCTURE ITEMS)	L.SUM	1	$4,777,150	$ 4,777,150
				SUBTOTAL:	**$ 4,777,150**

Other Items

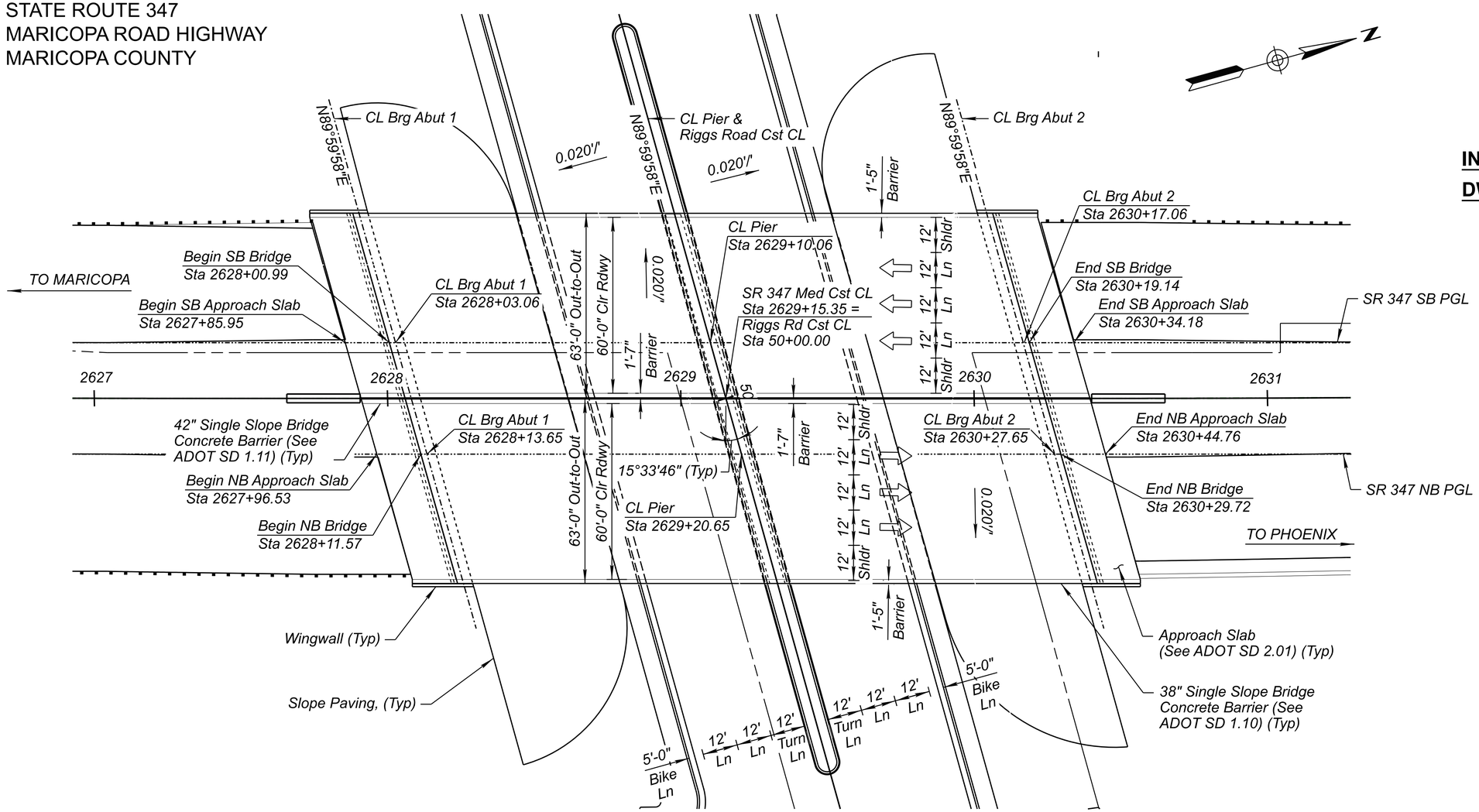
ITEM No.	Item Description	Unit	Quantity	Unit Cost	Cost
6090072 B	DRILLED SHAFT FOUNDATION (72")	L.FT.	1128	$1,300	$ 1,466,400
				SUBTOTAL:	**$ 1,466,400**
				TOTAL:	**$ 6,243,550**
			20%	**CONTINGENCY:**	**$ 1,248,710**
				GRAND TOTAL COST:	**$ 7,492,260**
				TOTAL COST / SF :	**$ 415.31**

Other Items

ITEM No.	Item Description	Unit	Quantity	Unit Cost	Cost
9290001 B	MECHANICALLY STABILIZED EARTH RETAINING WALLS	SQ.FT.	11,710	$200	$ 2,342,000
				SUBTOTAL:	**$ 2,342,000**
				TOTAL:	**$ 2,342,415**
			20%	**CONTINGENCY:**	**$ 468,483**
				GRAND TOTAL COST:	**$ 2,810,898**

Appendix B: Bridge Plans, Elevations, Typical Sections and Construction Phasing

STATE ROUTE 347
MARICOPA ROAD HIGHWAY
MARICOPA COUNTY



INDEX OF DRAWINGS

DWG NO	TITLE
S-1.01	GENERAL PLAN
S-1.02	ELEVATION
S-1.03	TYPICAL SECTION

PLAN

New 2-Span Precast Prestressed BT50 Girder Bridge
Stations are along SR 347 Med Cst CL
All Dimensions are normal to respective Cst CL
Skew = 15°33'46"
Contour Interval = 1'-0"
Scale: 1"=20'-0"

LEGEND

⇨ *Indicates Direction of Traffic*

PRELIMINARY
STAGE II
Review
NOT FOR CONSTRUCTION OR RECORDING

	NAME	DATE
DESIGN	DgnBy	8/24
DRAWN	DrnBy	8/24
CHECKED	ChkBy	8/24

Kimley»Horn

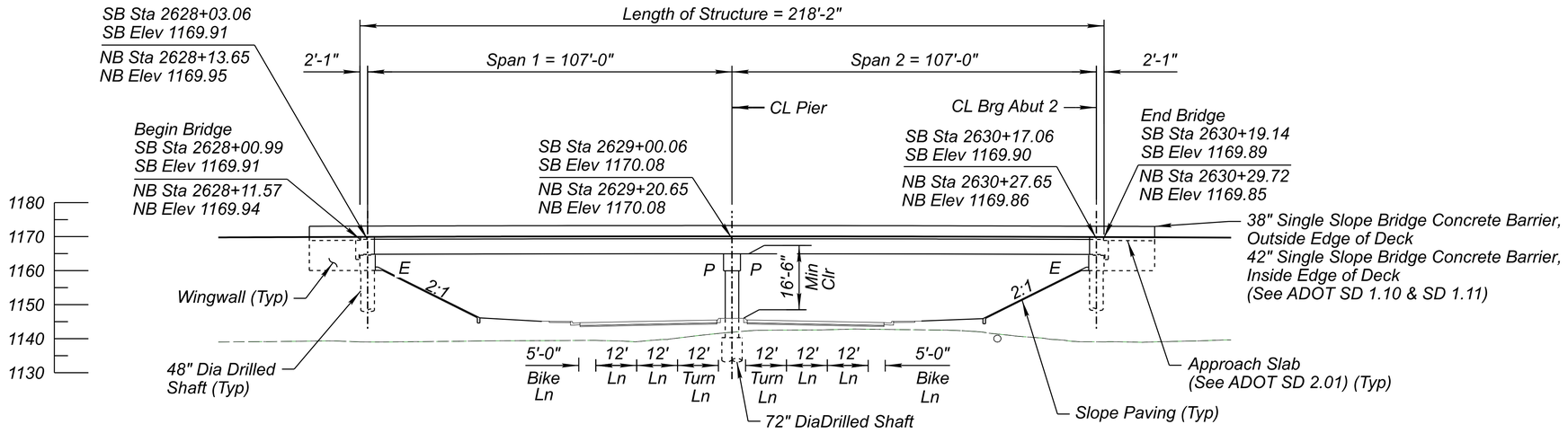
ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
BRIDGE GROUP

STA 2628+00
RIGGS RD TI OP
GENERAL PLAN - ALTERNATIVE B1-1

ROUTE: SR 347
MILEPOST: XXX.XX
STRUCTURE NO.: TBD

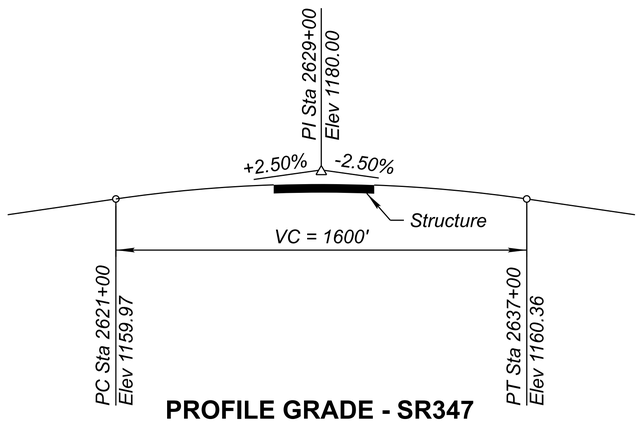
F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	347 MA 184	NFA	1	3	

LOCATION: RIGGS ROAD TRAFFIC INTERCHANGE
DWG NO. S-1.01
TRACS NO.
ADOT
____ OF ____



ELEVATION

Stations are along SR 347 Cst CL
Elevations are along SR 347 SB/NB PGL
Scale: 1"=20'-0"



PROFILE GRADE - SR347

Scale: 3/16" = 1'-0"

PRELIMINARY
STAGE II
Review
NOT FOR CONSTRUCTION OR RECORDING

	NAME	DATE
DESIGN	DgnBy	8/24
DRAWN	DrnBy	8/24
CHECKED	ChkBy	8/24

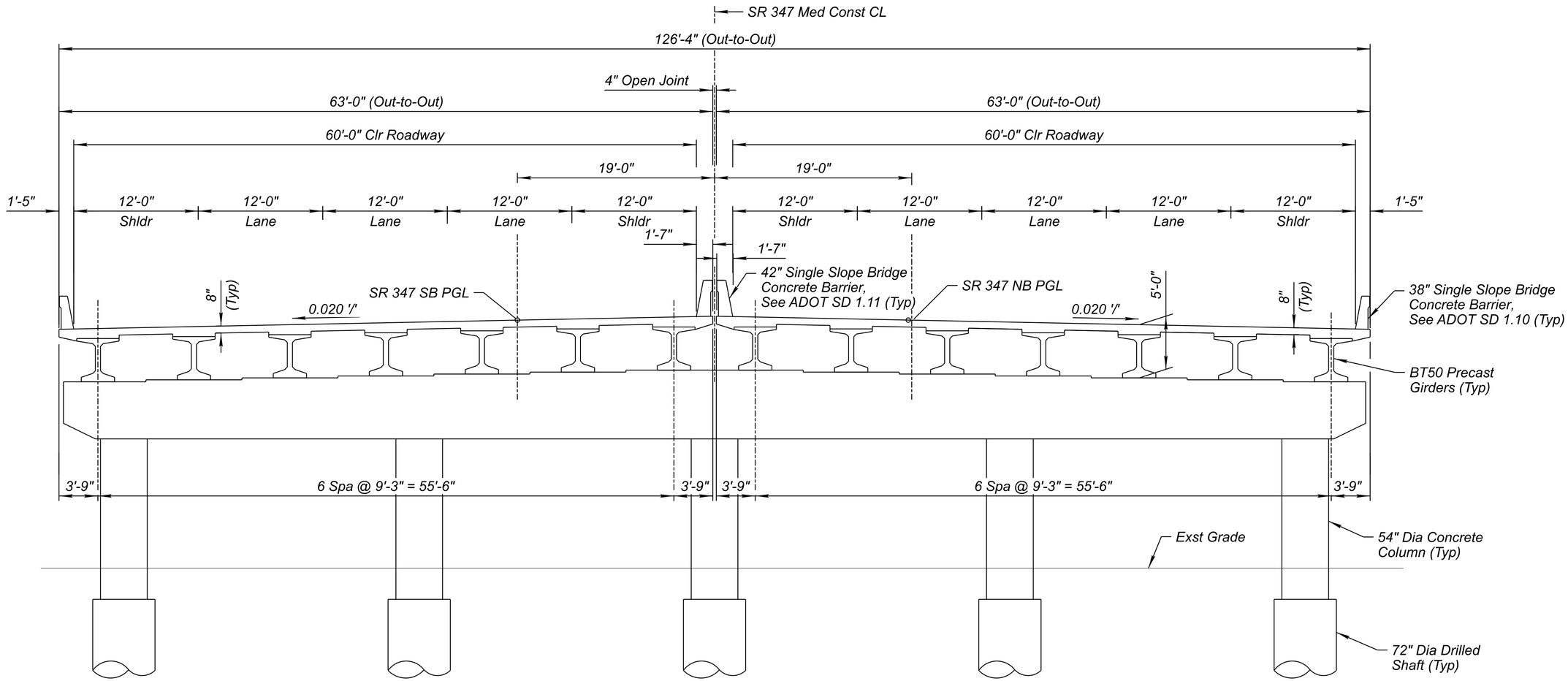
Kimley»Horn

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
BRIDGE GROUP

STA 2628+00
RIGGS RD TI OP
ELEVATION - ALTERNATIVE B1-1

ROUTE	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
SR 347	ARIZ.	347 MA 184	NFA	2	3	

MILEPOST XXX.XX
STRUCTURE NO. TBD
F.H.W.A. Arizona Division
LOCATION RIGGS ROAD TRAFFIC INTERCHANGE
TRACS NO.
ADOT
DWG NO. S-1.02
___ OF ___



TYPICAL SECTION - ALTERNATIVE B1-1

Scale: $\frac{3}{16}$" = 1'-0"

PRELIMINARY
STAGE II
Review
NOT FOR CONSTRUCTION OR RECORDING

	NAME	DATE
DESIGN	DgnBy	8/24
DRAWN	DrnBy	8/24
CHECKED	ChkBy	8/24

Kimley»Horn

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
BRIDGE GROUP

STA 2628+00
RIGGS RD TI OP
TYPICAL SECTION ALTERNATIVE B1-1

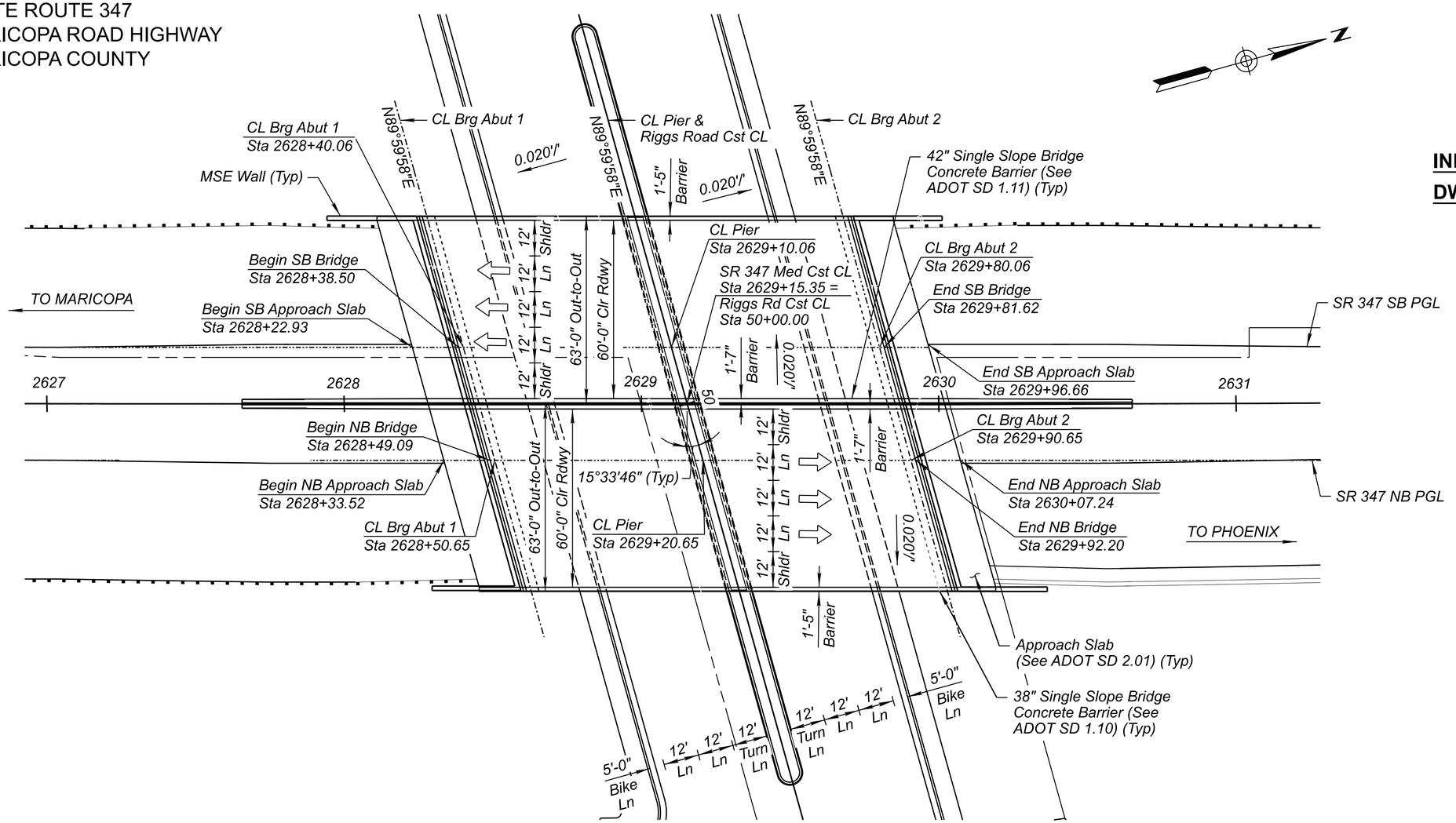
ROUTE SR 347
MILEPOST XXX.XX
STRUCTURE NO. TBD

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	347 MA 184	NFA	3	3	

LOCATION RIGGS ROAD TRAFFIC INTERCHANGE
DWG NO. S-1.03
TRACS NO.
ADOT
___ OF___

STATE ROUTE 347
MARICOPA ROAD HIGHWAY
MARICOPA COUNTY



PLAN

New 2-Span Precast Prestressed BT42 Girder Bridge
Stations are along SR 347 Med Cst CL
All Dimensions are normal to respective Cst CL
Skew = 15°33'46"
Contour Interval = 1'-0"
Scale: 1"=20'-0"

INDEX OF DRAWINGS

DWG NO	TITLE
S-2.01	GENERAL PLAN
S-2.02	ELEVATION
S-2.03	TYPICAL SECTION

LEGEND

⇨ *Indicates Direction of Traffic*

PRELIMINARY
STAGE II
Review
NOT FOR CONSTRUCTION OR RECORDING

	NAME	DATE
DESIGN	DgnBy	8/24
DRAWN	DrnBy	8/24
CHECKED	ChkBy	8/24

Kimley»Horn

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
BRIDGE GROUP

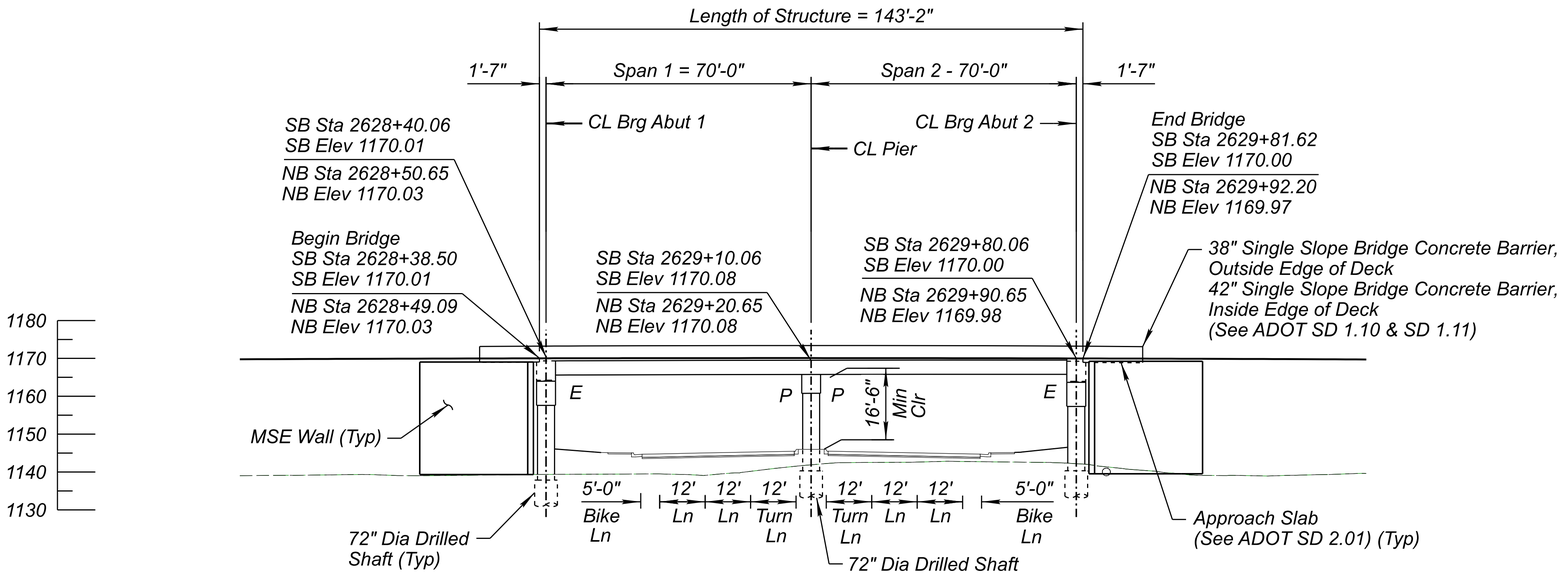
STA 2628+00
RIGGS RD TI OP
GENERAL PLAN - ALTERNATIVE B1-2

ROUTE: SR 347
MILEPOST: XXX.XX
STRUCTURE NO.: TBD

F.H.W.A. Arizona Division

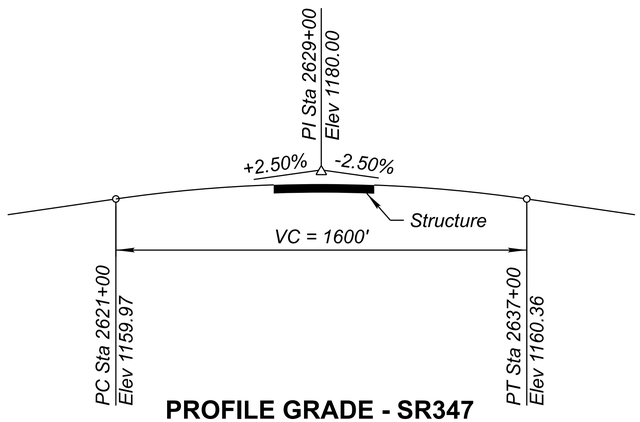
STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	347 MA 184	NFA	1	3	

LOCATION: RIGGS ROAD TRAFFIC INTERCHANGE
DWG NO. S-2.01
TRACS NO.
ADOT
___ OF ___



ELEVATION

Stations are along SR 347 Cst CL
Elevations are along SR 347 SB/NB PGL
Scale: 1"=20'-0"



PROFILE GRADE - SR347

Scale: 3/16" = 1'-0"

PRELIMINARY
STAGE II
Review
NOT FOR CONSTRUCTION OR RECORDING

	NAME	DATE
DESIGN	DgnBy	8/24
DRAWN	DrnBy	8/24
CHECKED	ChkBy	8/24

Kimley»Horn

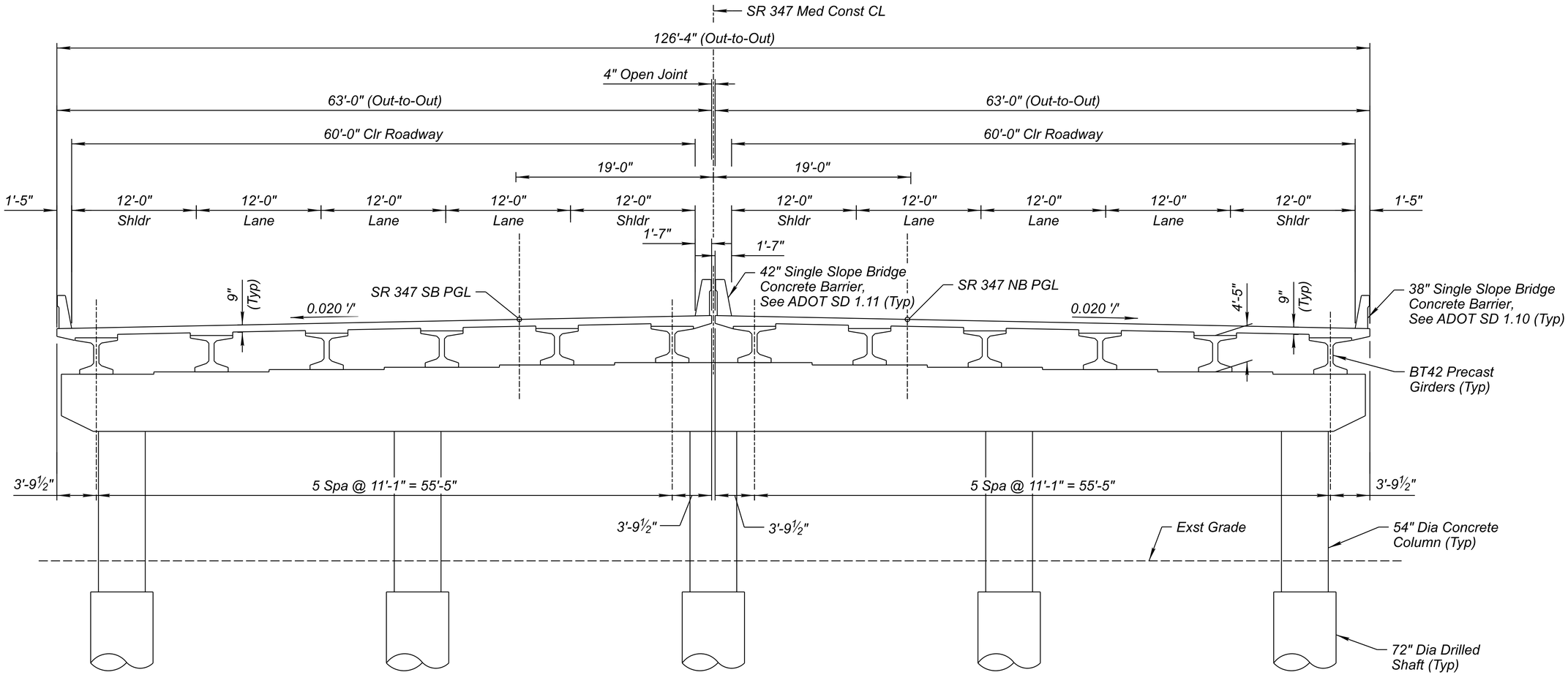
ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
BRIDGE GROUP

STA 2628+00
RIGGS RD TI OP
ELEVATION - ALTERNATIVE B1-2

ROUTE	MILEPOST	STRUCTURE NO.
SR 347	XXX.XX	TBD

F.H.W.A. Arizona Division	STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
	ARIZ.	347 MA 184	NFA	2	3	

LOCATION: RIGGS ROAD TRAFFIC INTERCHANGE
DWG NO. S-2.02
TRACS NO.
ADOT
___ OF ___



TYPICAL SECTION - ALTERNATIVE B1-2

Scale: 3/16" = 1'-0"

PRELIMINARY
STAGE II
Review
NOT FOR CONSTRUCTION OR RECORDING

	NAME	DATE
DESIGN	DgnBy	8/24
DRAWN	DrnBy	8/24
CHECKED	ChkBy	8/24

Kimley»Horn

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
BRIDGE GROUP

STA 2628+00
RIGGS RD TI OP
TYPICAL SECTION ALTERNATIVE B1-2

ROUTE SR 347
MILEPOST XXX.XX
STRUCTURE NO. TBD

F.H.W.A. Arizona Division

STATE	PROJECT NO.	FEDERAL ID NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
ARIZ.	347 MA 184	NFA	3	3	

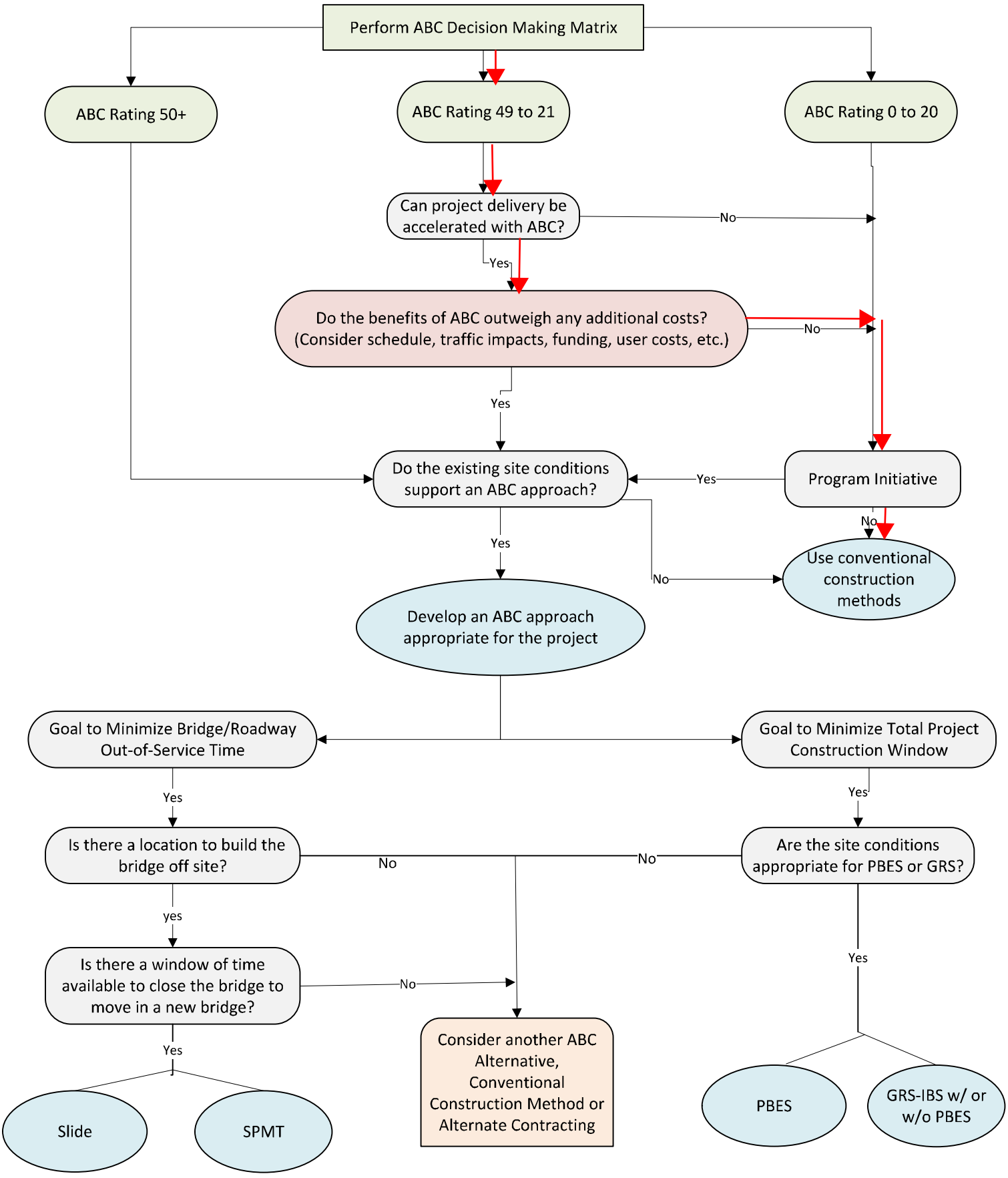
LOCATION RIGGS ROAD TRAFFIC INTERCHANGE
DWG NO. S-2.03
TRACS NO.
ADOT
___ OF ___

Appendix C: ABC Decision Making Matrix and Flowchart

ADOT ABC Decision Making Matrix

Category	*Decision-Making Item*	*Possible Points*	*Points Allocated*	*Scoring Guidance*
Railroad	Railroad/ Rail Transit under Bridge?	*4*	*0*	*0 No track under bridge* *2 Minor track under bridge* *4 Major track(s) under bridge*
Construction Impacts	ADT (Combined ADT on and under bridge)	*10*	*6*	*1 ADT under 10,000* *3 ADT 10,000 to 25,000* *5 ADT 25,000 to 50,000* *6 ADT 50,000 to 75,000* *7 ADT 75,000 to 100,000* *10 ADT 100,000+*
	Allowable Lane Closure (Roadway on Bridge)	*4*	*4*	*0 Long Term Lane Reduction Allowed During Construction* *4 No Long Term Lane Reduction Allowed During Construction*
	Allowable Lane Closure (Roadway under Bridge)	*4*	*4*	*0 Long Term Lane Reduction Allowed During Construction* *4 No Long Term Lane Reduction Allowed During Construction*
	Allowable Bridge Closure (Roadway on Bridge)	*6*	*0*	*0 Bridge Can closed - Viable Detour Available* *6 Bridge Cannot be Closed*
	Allowable Roadway Closure (Roadway under bridge)	*4*	*4*	*0 Roadway under can be closed* *4 Roadway under cannot be closed*
	Permanent Align Shift w/ single phase an option	*3*	*0*	*0 A permanent alignment shift is achievable to facilitate construction* *3 A permanent alignment shift is achievable, but undesirable.*
	Is phased construction with widening an option?	*8*	*0*	*0 Widening will fit updated standards or future roadway improvements* *6 Widening achievable, but undesireable due to unused investment* *8 No alternatives available for widening*
	Impact to Local Access (Local business access, Local resident access etc.)	*6*	*0*	*0 Minor or no impact to access* *3 Moderate impact to access* *6 Major impact to access*
Project Duration	Impacts Critical Path of the Total Project?	*8*	*8*	*0 Minor or no impact to critical path of total project* *4 Moderate impact to critical path of the total project* *8 Major impact to critical path of the total project*
	Restricted Construction Time (Environmental schedules, Economic Impact-e.g. local business access, special events, etc.)	*10*	*0*	*0 No construction time restrictions* *3 Minor construction time restrictions* *6 Moderate construction time restrictions* *10 Major construction time restrictions*
	Seasonal Limitations for conventional construction?	*4*	*0*	*0 No seasonal limitations for conventional construction* *4 Seasonal limitations for conventional construction*
Environment	Does ABC mitigate a critical environmental impact or sensitive environmental issue?	*5*	*0*	*0 ABC does not mitigate an environmental issue* *2 ABC mitigates a minor environmental issue* *3 ABC mitigates several minor environmental issues* *4 ABC mitigates a major environmental issue* *5 ABC mitigates several major environmental issues*
Safety	Safety (Workers Concerns)	*8*	*0*	*0 Short duration impact* *4 Normal duration impact* *8 Extended duration impact*
	Safety (Traveling Public Concerns)	*8*	*4*	*0 Short duration impact* *4 Normal duration impact* *8 Extended duration impact*
Economy of Scale	Bridge Economy of Scale (repetition of components in a bridge or bridges in a project) (Total spans=sum of all spans on all bridges on the project)	*4*	*1*	*0 1 total span* *1 2 total spans* *2 3 total spans* *3 4 total spans* *4 5+ total spans*
Risk Management	Does ABC allow management of a particular risk?	*4*	0	*0-4 Use judgement to determine if risks can be managed through ABC that arent covered in other topics*
	Total Possible	100		
	Sum of Points:	*31*		

ABC Decision Flowchart



APPENDIX K: Americans with Disabilities Act Compliance and Feasibility Report

PROJECT 347 MA 184 F0476 01C
NFA
MARICOPA ROAD
STATE ROUTE 347: RIGGS ROAD TRAFFIC INTERCHANGE
CONSTRUCT TRAFFIC INTERCHANGE

ADA COMPLIANCE AND FEASIBILITY REPORT

January 20, 2023

PREPARED BY

Kimley»Horn

PREPARED FOR

ADOT Intermodal Transportation

ARIZONA DEPARTMENT OF TRANSPORTATION

TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

INTRODUCTION

Project 347 MA 184 F0476 01C, Maricopa Road (State Route 347): Riggs Road Traffic Interchange provides a grade separated traffic interchange (TI) at the intersection of State Route 347 and Riggs Road (Milepost 185.3). The proposed project is located in the Arizona Department of Transportation's (ADOT's) Central District within Maricopa County in south-central Arizona. The approximate length of project is 1.1 miles. The Project Manager is Bharat Kandel (Phone: 602-712-8736).

All Americans with Disabilities Act (ADA) features within ADOT right-of-way (ROW) will be impacted by this project. All ADA features within the project limits were evaluated for compliance with the 2010 ADA Standards for Accessible Design (2010 Standards).

There are nine ADA features within the project limits of which none are listed in the ADOT Feature Inventory System (FIS). Three are outside existing ADOT ROW. Of the nine ADA features within the project limits, seven are not in compliance with the 2010 ADA standards. A summary of the non-compliant locations and locations which need to be evaluated for compliance is included in this listing. These locations should be inspected post-construction to determine whether the feature exists and if it is ADA compliant. A summary of the total compliant and non-compliant features is shown in the table below.

Table 1: ADOT FIS Summary of ADA Features

Feature Type	Compliant	Non-Compliant	Total
Sidewalk	0	0	0
Crosswalks	0	0	0
Curb Ramps	0	0	0
Driveways	2	2	4
Pedestrian Traffic Island Crossings	0	0	0
Accessible Pedestrian Signals	0	5	5
Handrail	0	0	0
Obstructions/Needs	0	0	0
Total	2	7	9

A total of 9 improvements are proposed with this project. A summary of all action items proposed to be implemented is shown in the table below.

Table 2: Summary of All Action Items

Proposed Action Item- Driveways	Total Proposed Improvements	Total Constructed Improvements
Driveway will be reconstructed with this project	3	
Driveway will be removed with this project	1	
Proposed Action Item- Accessible Pedestrian Signals		
Pedestrian signal will be removed with this project	5	
Total	9	

1. SIDEWALK

There is no sidewalk within the project limits.

2. CROSSWALKS

There are no crosswalks within the project limits.

3. CURB RAMPS

There are no curb ramps within the project limits.

4. DRIVEWAYS

There are four driveways within the project limits, none of which are listed in the ADOT FIS. Two locations are non-compliant. The action items for driveways are summarized in the table below:

Table 3: Driveway Action Items

Asset ID	Location	Beginning MP	Compliance Evaluation		DCR Proposed Action	Final Proposed Action	Construction Action
			From FIS Report	From Field Survey			
XXXDW01	Revolution Industrial Driveway	185.19 (Lt)	Not in FIS Database	Cross Slope > 2%	Driveway will be reconstructed with this Project		
XXXDW02	Revolution Industrial Driveway	185.20 (Lt)	Not in FIS Database	Compliant	Driveway will be reconstructed with this Project		
XXXDW03	Revolution Industrial Driveway	185.21 (Lt)	Not in FIS Database	Cross Slope > 2%	Driveway will be reconstructed with this Project		
XXXDW04	Gila River Indian Community Utility Authority Maricopa Substation Driveway	185.29 (Lt)	Not in FIS Database	Compliant	Driveway will be removed with this Project		

5. PEDESTRIAN ISLAND CROSSINGS

There are no pedestrian island crossings within the project limits.

6. ACCESSIBLE PEDESTRIAN SIGNAL LOCATIONS

There are five Accessible Pedestrian Signal locations within the project limits, none of which are listed in the ADOT FIS. All locations are non-compliant. The action items for accessible pedestrian signals are summarized in the table below:

Table 4: Accessible Pedestrian Signal Action Items

Asset ID	Location	Beginning MP	Compliance Evaluation		DCR Proposed Action	Final Proposed Action	Construction Action
			From FIS Report	From Field Survey			
XXAPS01	SR 347 and Riggs Rd, Southwest Corner	185.27 (Lt)	Not in FIS Database	Not aligned with crosswalk & no ADA accessible route	Pedestrian signal will be removed with this project		
XXAPS02	SR 347 and Riggs Rd, Southeast Corner	185.29 (Rt)	Not in FIS Database	Not aligned with crosswalk & no ADA accessible route	Pedestrian signal will be removed with this project		
XXAPS03	SR 347 and Riggs Rd, Southeast Corner	185.29 (Rt)	Not in FIS Database	Not aligned with crosswalk & no ADA accessible route	Pedestrian signal will be removed with this project		
XXAPS04	SR 347 and Riggs Rd, Northwest Corner	185.29 (Lt)	Not in FIS Database	Not aligned with crosswalk & no ADA accessible route	Pedestrian signal will be removed with this project		
XXAPS05	SR 347 and Riggs Rd, Northwest Corner	185.29 (Lt)	Not in FIS Database	Not aligned with crosswalk & no ADA accessible route	Pedestrian signal will be removed with this project		

7. HANDRAIL LOCATIONS

There is no handrail within the project limits.

8. OBSTRUCTIONS & ADA FEATURES NEEDED

There are no Obstructions nor additional ADA features needed within the project limits.

APPENDICES

Project 347 MA 184 F0476 01C

ADA Feature Location Map

Kimley»Horn

APPENDIX A
PAGE 1

1:11:40 PM 1/18/2023 sam.grombacher K:\PHX_ROADWAY\WORKSETS\ADOT_CONNECT_PROJECTS\F0476-SR 347 RIGGS RD TI\DGN\ROADWAY\ADA\R0476_ADA_FEASIBILTY_01.DGN

ADA Feature Location Map

Kimley»Horn

1:11:45 PM 1/18/2023 sam.grombacher K:\PHX_ROADWAY\WORKSETS\ADOT_CONNECT_PROJECTS\F0476-SR 347 RIGGS RD TI\DGN\ROADWAY\ADA\R0476_ADA_FEASIBILTY_02.DGN

Project 347 MA 184 F0476 01C

N

MATCHLINE PAGE 2

MATCHLINE PAGE 4

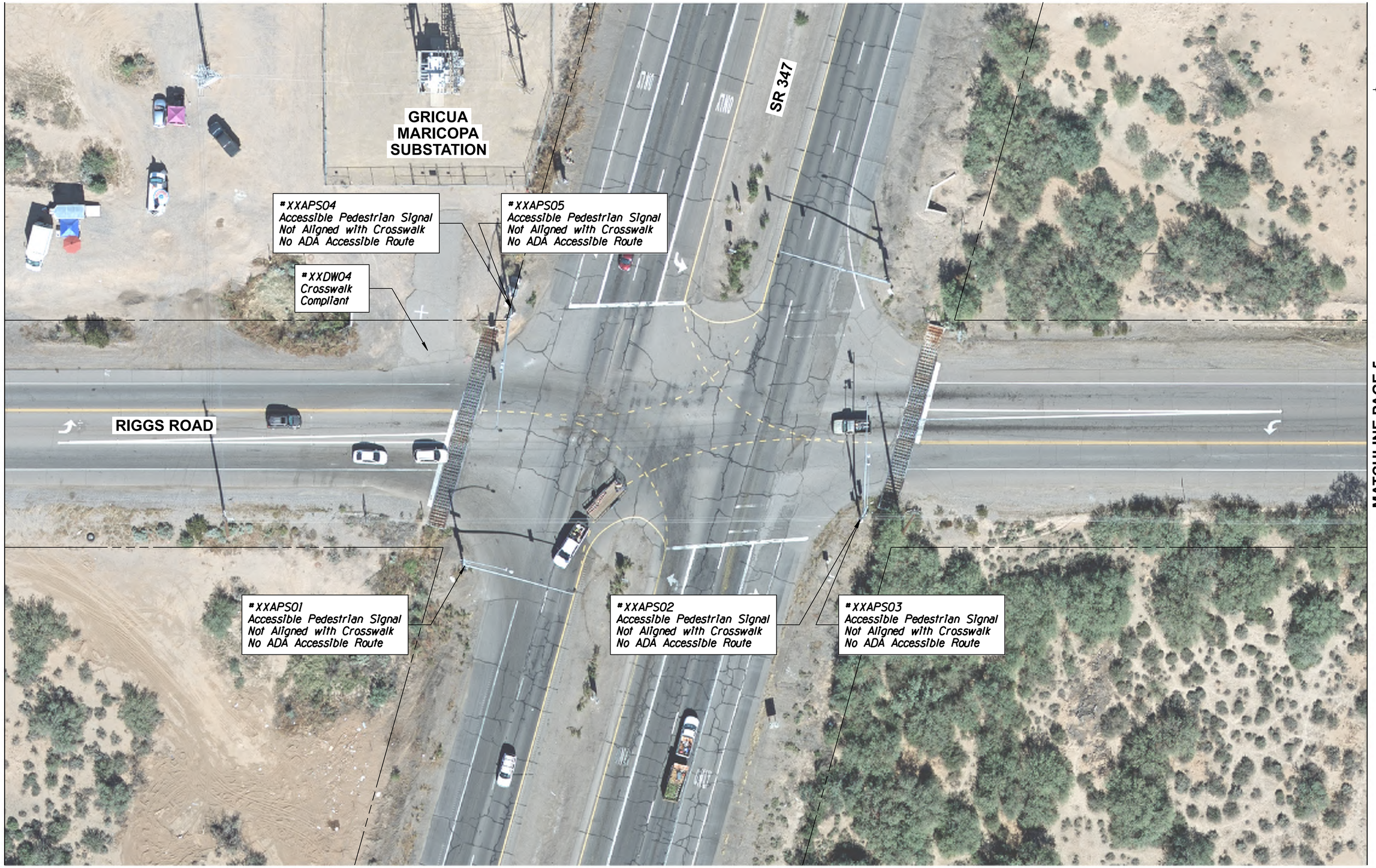
No ADA Facilities

RIGGS ROAD

ADA Feature Location Map

Kimley»Horn

1:11:48 PM 1/18/2023 sam.grombacher K:\PHX_ROADWAY\WORKSETS\ADOT_CONNECT_PROJECTS\F0476-SR 347 RIGGS RD TI\DGN\ROADWAY\ADA\R0476_ADA_FEASIBILTY_03.DGN



MATCHLINE PAGE 3

MATCHLINE PAGE 5

ADA Feature Location Map

1:11:51 PM 1/18/2023 sam.grombacher K:\PHX_ROADWAY\WORKSETS\ADOT_CONNECT_PROJECTS\F0476-SR 347 RIGGS RD TI\DGN\ROADWAY\ADA\R0476_ADA_FEASIBILTY_04.DGN

MATCHLINE PAGE 4

MATCHLINE PAGE 6

N

No ADA Facilities

RIGGS ROAD

ADA Feature Location Map

Kimley»Horn

1:11:54 PM 1/18/2023 sam.grombacher K:\PHX_ROADWAY\WORKSETS\ADOT_CONNECT_PROJECTS\F0476-SR 347 RIGGS RD TI\DGN\ROADWAY\ADA\R0476_ADA_FEASIBILTY_05.DGN

MATCHLINE PAGE 5

MATCHLINE PAGE 7

N

No ADA Facilities

RIGGS ROAD

ADA Feature Location Map

Kimley»Horn

1:11:57 PM 1/18/2023 sam.grombacher K:\PHX_ROADWAY\WORKSETS\ADOT_CONNECT_PROJECTS\F0476-SR 347 RIGGS RD TI\DGN\ROADWAY\ADA\R0476_ADA_FEASIBILTY_06.DGN

MATCHLINE PAGE 6

MATCHLINE PAGE 8

N

No ADA Facilities

RIGGS ROAD

ADA Feature Location Map

Kimley»Horn

1:12:00 PM 1/18/2023 sam.grombacher K:\PHX_ROADWAY\WORKSETS\ADOT_CONNECT_PROJECTS\F0476-SR 347 RIGGS RD TI\DGN\ROADWAY\ADA\R0476_ADA_FEASIBILTY_07.DGN

ADA Feature Location Map

Kimley»Horn

1:12:24 PM 1/18/2023 sam.grombacher K:\PHX_ROADWAY\WORKSETS\ADOT_CONNECT_PROJECTS\F0476-SR 347 RIGGS RD TI\DGN\ROADWAY\ADA\R0476_ADA_FEASIBILTY_08.DGN

ADA Feature Location Map

Kimley»Horn

1:13:11 PM 1/18/2023 sam.grombacher K:\PHX_ROADWAY\WORKSETS\ADOT_CONNECT_PROJECTS\F0476-SR 347 RIGGS RD TI\DGN\ROADWAY\ADA\R0476_ADA_FEASIBILTY_09.DGN

XXXDW01

XXXDW02

XXXDW03

XXXDW04

XXAPS01

XXAPS02

XXAPS03

XXAPS04

XXAPS05