ADOT

Task Assignment: MPD0012-18

BICYCLIST

Safety Action Plan Update

FINAL REPORT

June 2018

Prepared by:

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NOTICE

Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or rail-way-highway crossings, pursuant to sections 130, 144, and 148 [152] of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

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1. INTRODUCTION

The Arizona Department of Transportation (ADOT) Multimodal Planning Division (MPD) initiated an update to the 2012 Bicycle Safety Action Plan (BSAP). The 2018 BSAP Update will result in a strategic action plan that effectively focuses resources on making the changes that reduce the greatest number of severe injury and fatal bicycle-motor vehicle crashes.

ADOT recognizes that the focus of the BSAP Update, the State Highway System (SHS), shown in **Figure 2** (see page 2), addresses and diagnoses only a small percentage of the total number of bicyclist crashes that occur in the state of Arizona because it does not include any crashes off the SHS. As such, development of the BSAP is the first of many steps required to adequately address bicycle safety in Arizona. It is envisioned that other agencies and jurisdictions in Arizona will develop their own bicycle safety action plans to meet their respective needs. An example of this is in Flagstaff, which addresses bicycle safety in their *Active Transportation Master Plan*.

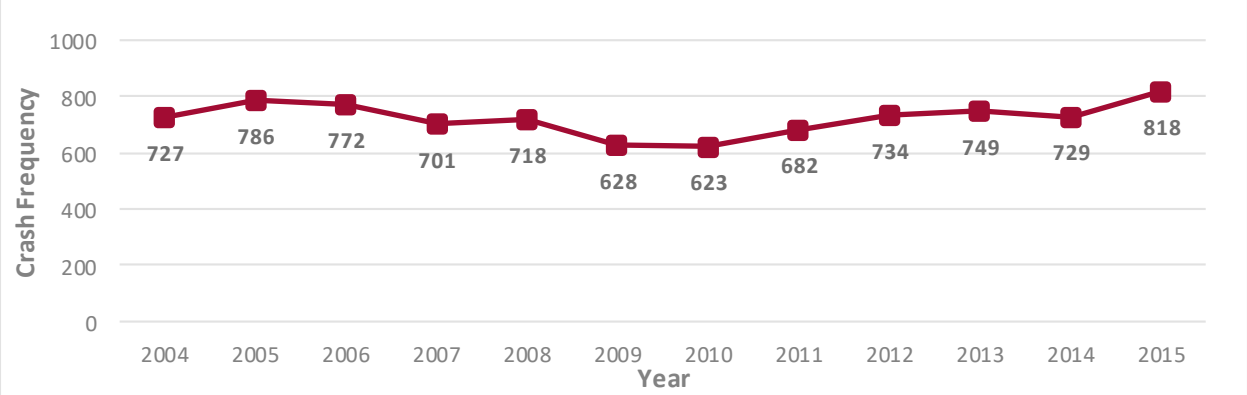
Project Objectives

The 2018 BSAP Update uses a data-driven approach to assess bicycle crashes on the SHS. The following objectives guide the 2018 BSAP Update development:

- Evaluate the strategies, progress, and effectiveness of the 2012 BSAP to reduce the frequency of bicycle crashes.
- Collect and analyze bicycle crash data on the SHS for the most recent five years available (2012-2016). Identify crash types and review contributing factors to the crashes.
- Identify high-priority bicyclist crash locations.
- Identify specific steps, actions, and potential countermeasures that, upon implementation and over time, will measurably reduce bicycle crashes, injuries, and fatalities on the SHS.

Background

Nationally, the number of bicyclist fatalities reached a low in 2010, according to data from the National Highway Traffic Safety Administration (NHTSA) Fatality Analysis Reporting System (FARS). Since 2010, the number of bicyclist fatalities has increased to 818 in 2015 **(Figure 1), an increase of 31.3%**. In 2015, the most recent year of published data, Arizona had the **9th highest number of fatalities** from bicycle-motor vehicle crashes in the United States.



Source: NHTSA Fatality Analysis Reporting System (FARS)

Figure 1. National Bicyclist Fatalities (2004 to 2015)

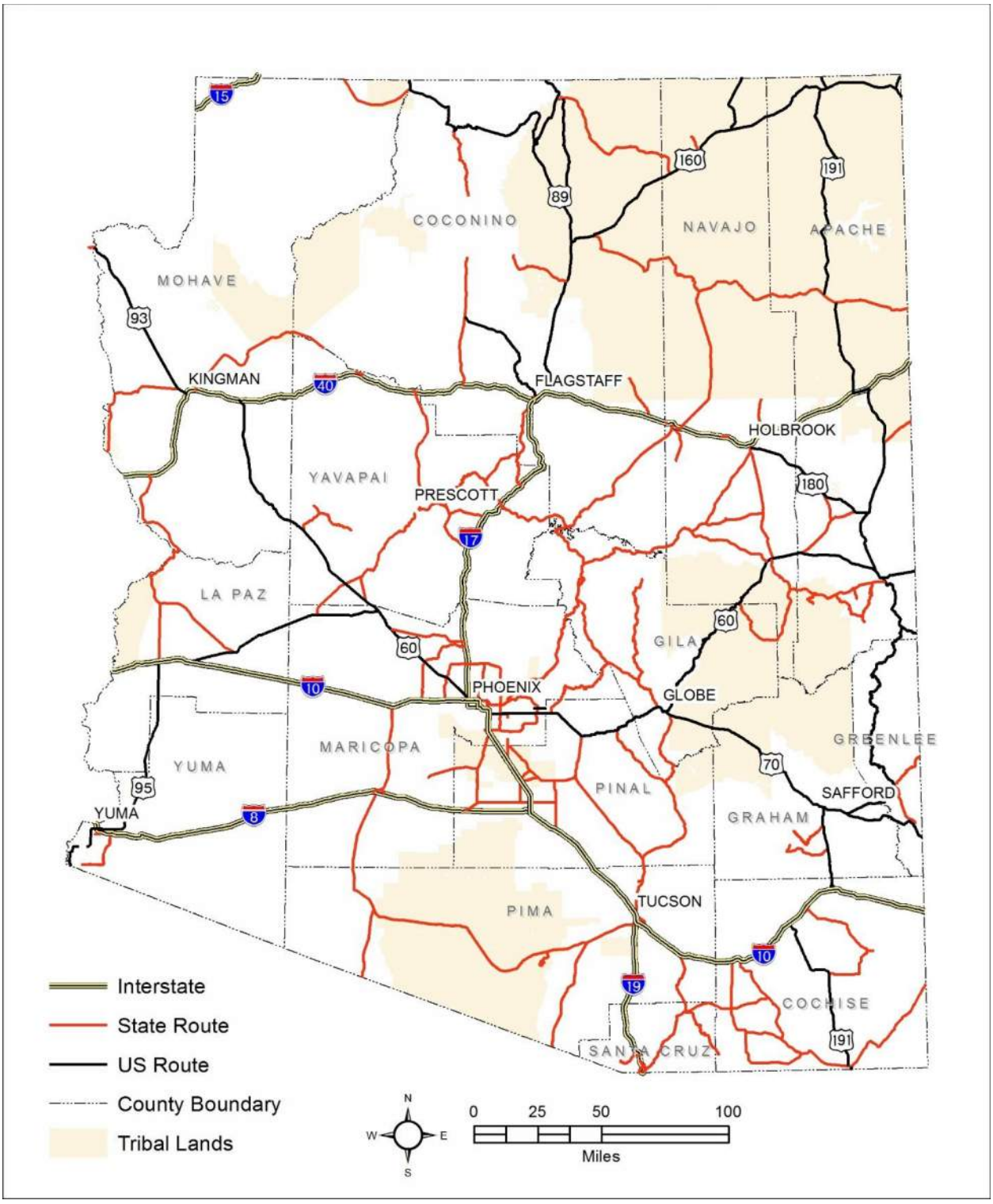
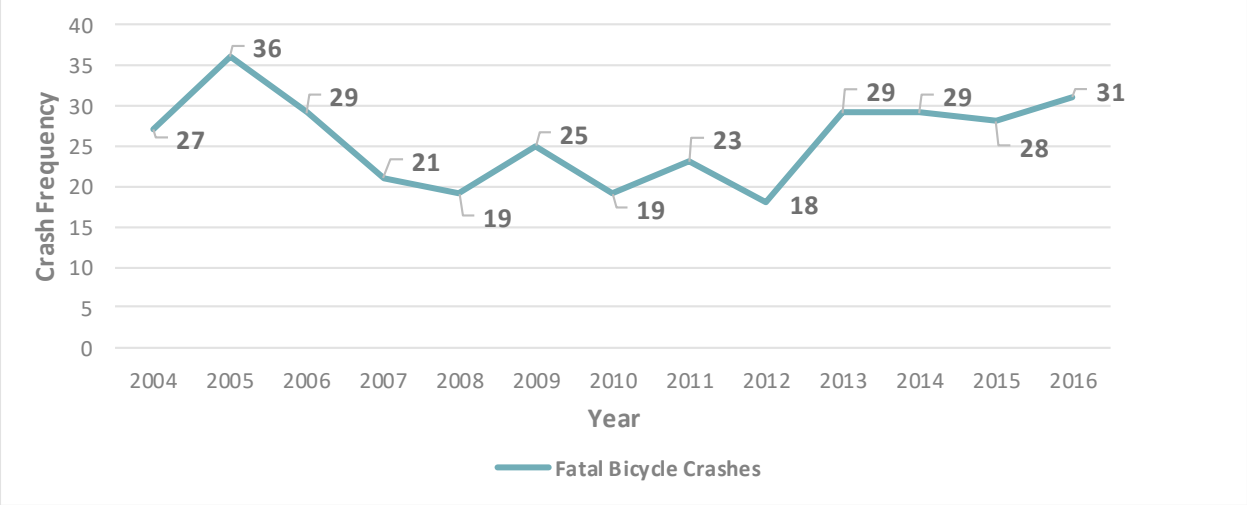
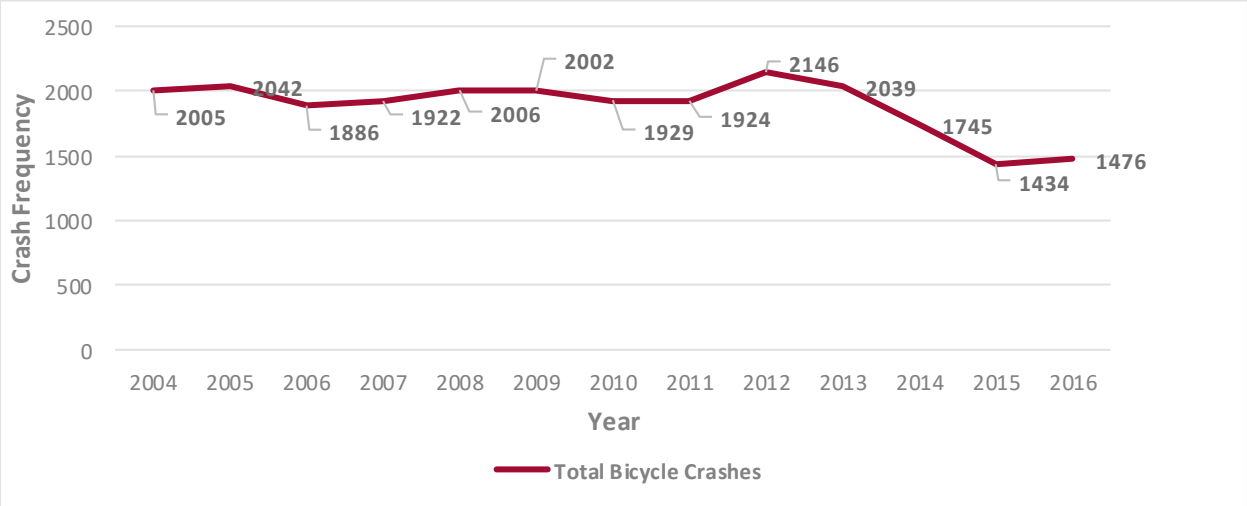


Figure 2. State Highway System (SHS) Map

The total and fatal statewide bicycle crashes that have been reported on all public roads in Arizona are summarized by year in **Figure 3**. The total number of bicycle-motor vehicle crashes on all of Arizona's public roads decreased from 2013 to 2016. However, the data shows that the total bicyclist fatalities generally increased from 2012 to 2016.

A significant trend was reported in the Arizona Bike Law website, http://azbikelaw.org/number-and-severity-of-arizona-bike-mv-crashes/, which is that reported low-severity bicycle-motor vehicle crashes in Chandler, Flagstaff, Glendale, Gilbert, Mesa, Scottsdale, and Tempe have decreased dramatically comparing 2009 to 2013 data versus 2014 to 2016 data, suggesting some sort of policy change. Further research is needed to determine policy changes which have occurred in these areas.





Source: Arizona Crash Facts (ADOT)

Figure 3. Statewide Bicycle Crash Trends (2004 - 2016)

Final Report Overview

This report is organized into the following chapters:

1. Introduction – Provides an overview of this BSAP.
2. Evaluation of 2012 BSAP – Evaluates the strategies, progress, and effectiveness of the 2012 BSAP.
3. Bicycle Crash Data Analysis, 2012-2016 – Presents an analysis of bicycle crashes and the identification of high-crash segments and intersections and interchanges on the SHS. Reviews and summarizes the 2012-2016 bicycle/motor vehicle-related crash reports and assigns crash typing based on the Pedestrian-Bicycle Crash Analysis Tool (PBCAT) methodology.
4. State Highway System Bicycle High-Crash Locations – Identifies bicycle crash hot spots/focus areas/concentration areas on the state highway system.
5. Bicycle Crash Potential Assessment – Discusses a crash potential assessment methodology to identify state highway segments and intersections where investment can help to lower the potential for bicycle crashes.
6. Priority Locations and Potential Countermeasures – Discusses potential countermeasures that were identified for each crash hot spot and high-crash potential location identified in the crash analysis and identifies planning-level costs.
7. Opportunities in the FY 2018-2022 ADOT Five-Year Transportation Facilities Construction Program – Reviews the FY 2018-2022 ADOT Five-Year Transportation Facilities Construction Program to determine programmed projects within or near high-crash or high-crash potential segments.
8. Funding Sources for Bicycle Infrastructure and Programs – Provides an overview of potential federal, state, and regional bicycle safety funding sources that may be used for the SHS.
9. 2018 BSAP Goals – Presents updated BSAP goals, as informed by analysis performed in this project, and goals established by other state and federal plans.
10. Next Steps – Provides recommendations on next steps in the areas of policies, tools, resources, programs, and data.

2. EVALUATION OF 2012 BSAP

This chapter assesses the 2012 BSAP in the following ways:

- Compares bicycle crash data analyzed in the 2012 BSAP with the bicycle crash data analyzed for the 2018 BSAP Update to determine how the number of crashes and injury severity has changed over time, and assesses how the 2012 BSAP goal of a 12 percent reduction in bicycle crashes was met.
- Reviews the status of priority locations identified in the 2012 BSAP.
- Reviews the status of 2012 BSAP recommendations and considerations.

2012 BSAP and 2018 BSAP Bicycle Crash Data Comparisons

Figure 4 compares crash data from two periods:

- 2004 to 2008 (*Evaluation period for the 2012 BSAP*)
- 2012 to 2016 (*Evaluation period for the 2018 BSAP Update*)

The data illustrates the following:

- 8,840 bicyclist crashes (all public roadways) were reported in 2012 to 2016, a **10.4 percent reduction** as compared to the 2004 to 2008 period.
- 778 bicyclist crashes were reported on the State Highway System in 2012 to 2016, a **28.6 percent reduction** from the 2004 to 2008 period.
- Bicyclist fatalities decreased from 33 (2004 to 2008 period) to 18 (2012 to 2016 period), a **45.4 percent reduction**.

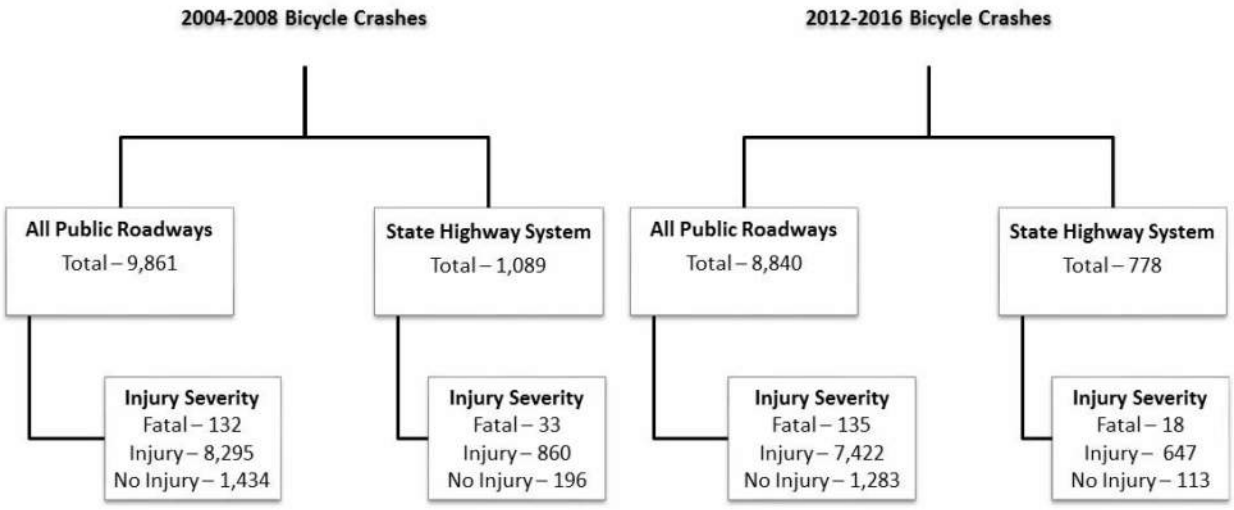


Figure 4. Statewide Bicyclist Crash Trend Comparison

Progress Toward 2012 BSAP Goals

Table 1 compares the 2004 to 2008 bicycle-motor vehicle crash data with the 2012 to 2016 data within the context of goals established in the 2012 BSAP.

The 2012 BSAP established a goal to reduce the annual average of bicycle-motor vehicle crashes on the SHS by 12 percent by the year 2018. As illustrated in **Table 1**, bicycle crashes on the SHS, based on 2012 to 2016 data, decreased by 27.9 percent.

Table 1. 2012 BSAP Goal Status Summary

	2004-2008 Crashes	2012-2016 Crashes	2012 BSAP Goal		Actual % Change
Annual Average Bicycle Crashes (State Highway System, fatalities and injuries)	218 per year	157 per year	Fewer than 191 crashes per year	**12% Reduction by 2018**	**- 27.9%**

It should be noted that some road segments that were formerly State Highway segments during the 2004 to 2008 time-frame were turned back to the local agencies after 2012. These include Segment 44a (US 95, Arizona Avenue to 24th Street) and Segment 44b (SR 8B, 7th Street to Catalina Drive), and Segment 5 (SR 287 / SR 387, Cottonwood Lane to Arizona Road) which comprise approximately 9.6 miles of the approximately 6,127 miles of SHS (*2015 State Highway System Log Mileage Summary Booklet*).

Bicycle count data would be valuable in determining whether any changes in the number of injuries and fatalities are the result of changes in bicycle ridership. This is being addressed, in part, through an ADOT Bicycle and Pedestrian Count Project that is currently underway.

Status of Priority Locations

2012 BSAP High-Crash Segments/Intersections

The 2012 BSAP identified 19 high-crash location segments and 15 intersection/interchange locations.

Table 2 presents a comparison of 2012 to 2016 crash data to 2004 to 2008 crash data at high-crash intersection/interchange locations. **Table 3** presents a comparison of 2012-2016 crash data to 2004-2008 crash data at high-crash segment locations.

Table 2 shows a decrease in bicycle crashes at 10 of 15 intersection/interchange locations, and **Table 3** shows a decrease at 14 of 19 segment locations. As documented in **Table 2**, four of 15 high-crash intersection/interchange locations have had a bicycle-related improvement implemented since 2012. As documented in **Table 3,** nine of 19 high-crash location segments had bicycle-related improvements implemented since 2012.

2012 BSAP Countermeasures Improvements Status

The 2012 BSAP presented potential infrastructure countermeasures that may be considered for implementation at each high bicycle-motor vehicle crash location. The 2012 BSAP emphasized that additional site-specific engineering analysis is required for each bicycle crash location prior to final countermeasure selection. Potential countermeasures were identified considering crash typing, field review, and stakeholder input. **Table 2** summarizes crash statistics, whether bicycle crashes have increased or decreased over time, and whether improvements were implemented at 2012 BSAP priority intersections and interchanges. **Table 3** summarizes this information for 2012 BSAP road segments.

Table 2. 2012 BSAP Intersections/Interchanges, Crashes 2004-2008 and 2012-2016

Location ID	City / Town	On Street	Intersecting Street	Number of Crashes (2004 - 2008)	Number of Crashes (2012 - 2016)	Increase/ Decrease	Projects Implemented, 2012 to 2016*
39b	Tempe	Scottsdale Road	SR 202 Ramp	8	11	▲	No
18c	Mesa	SR 87	SR 202 Ramp	6	1	▼	Yes
26b	Phoenix	Indian School Road	SR 51 Ramp	6	5	▼	No
28c	Phoenix	Northern Avenue	I-17 Frontage Road/Ramp	6	8	▲	Yes
28e	Phoenix	Bethany Home Road	I-17 Frontage Road/Ramp	6	9	▲	Yes
30a	Phoenix	Indian School Road	I-17 Frontage Road/Ramp	6	2	▼	Yes
39a	Tempe	Priest Drive	SR 202 Ramp	6	4	▼	No
39e	Tempe	Baseline Road	I-10 Ramp	6	3	▼	No
6a	Chandler	Elliot Road	SR 101 Ramp/ Frontage Road	5	4	▼	No
6d	Chandler	SR 87	SR 202 Ramp	5	3	▼	No
18e	Mesa	SR 87	McKellips Rd	5	5	-	No
26f	Phoenix	7th Street	I-10 Ramp	5	3	▼	No
26h	Phoenix	24th Street	SR 202 Ramp	5	5	-	No
27b	Phoenix	27th Avenue	SR 101 Frontage Road (Beardsley Road)	5	2	▼	No
39f	Tempe	Priest Drive	US 60	5	2	▼	No

*Note: "Projects Implemented" include bicycle safety improvements.

Table 3. 2012 BSAP Segments, Crashes 2004-2008 and 2012-2016

Location ID	City /Town	On Street	Limits	Number of Lanes	Length (Miles)	No. of Crashes (2004 - 2008)	Crashes/ Mile/Year (2004 - 2008)	Number of Crashes (2012 - 2016)	Crashes/ Mile/ Year (2012-2016)	Increase/ Decrease	Projects Implemented 2012 to 2016**
11c	Flagstaff	SR 40B	SR 89A to Elden Street	4	1	56	11.2	35	7.0	▼	No
11a	Flagstaff	SR 89A (Milton Road)	I-17 to SR 40B	4	1.3	33	5.1	22	3.4	▼	No
18a	Mesa	SR 101 Frontage Road/ Ramp	University Drive to Broadway Road	2	1.01	15	3.0	7	1.4	▼	No
11d	Flagstaff	Route 66	Switzer Canyon Drive to Lockett Road	4	3.1	45	2.9	22	1.4	▼	Yes
22c	Oro Valley	SR 77	Mountain Vista Drive to Ina Road	6	1.33	19	2.9	10	1.5	▼	Yes
40a	Tucson	SR 77 (Oracle Road)	River Road to Miracle Mile	6	2.5	32	2.6	30	2.4	▼	No
8	Cottonwood	SR 89A	Cottonwood Street to Groseta Ranch Road	4	0.71	8	2.5	2	0.16	▼	Yes
***44b**	Yuma	SR 8B	7th Street to Catalina Drive	4 or 6	3.05	35	2.3	N/A*	N/A*	N/A*	No
24a	Payson	SR 87	Forest Drive to Ridge Lane	4	1.95	22	2.3	8	0.8	▼	Yes
5	Casa Grande	SR 287/ SR 387	Cottonwood Lane to Arizona Road	4	3.5	37	2.1	7	1.4	▼	Yes
14b	Kingman	SR 66	I-40 to Armour Avenue	4	0.5	5	2.0	1	0.2	▼	Yes

Table 3. 2012 BSAP Segments, Crashes 2004-2008 and 2012-2016, Continued

Location ID	City /Town	On Street	Limits	Number of Lanes	Length (Miles)	No. of Crashes (2004 - 2008)	Crashes/ Mile/Year (2004 - 2008)	Number of Crashes (2012 - 2016)	Crashes/ Mile/ Year (2012-2016)	Increase/ Decrease	Projects Implemented 2012 to 2016**
25e	Peoria and Glendale	US 60	Northern Avenue to Bethany Home Road	6	0.5	5	2	5	1	-	No
***44a**	Yuma	US 95	Arizona Avenue to 24th Street	4	3.02	26	1.9	N/A*	N/A*	N/A*	No
40b	Tucson	SR 77 (Miracle Mile)	Fairview Avenue to Romero Road	4	0.67	6	1.8	2	0.4	▼	No
35	Sedona	SR 89A	Dry Creek Road to Soldier Pass Road	4	1.88	15	1.6	11	2.2	▼	Yes
11e	Flagstaff	US 180	SR 40B to Meade Lane	2	1.4	11	1.6	16	3.2	▲	Yes
17b	Mesa	US 60X	Sossaman Road to Meridian Drive	6	5.02	34	1.4	36	7.2	▲	No
37a	Sierra Vista	SR 92/SR 90	MLK Parkway/Tree Top Avenue to Calle Mercancia	4	2.49	15	1.2	10	2	▼	Yes
19a	Mesa / Gilbert	SR 87	Guadalupe Road to Baseline Road	6	1.02	6	1.2	5	1	▼	No

*Note: Segments 44a US 95 and 44b SR 8B have been transferred to City of Yuma.

**Note: "Projects Implemented" include bicycle safety improvements.

2012 BSAP Policy/Program Consideration Status

The 2012 BSAP provided considerations for new policies and programs that, upon their development and implementation, will serve to reduce bicycle crashes on the SHS. In addition, the BSAP included considerations for modifications to existing policies and practices that, if adopted, will improve bicycle safety on the SHS.

An overview of considerations that were recommended and a status summary is provided in **Table 4**. A complete description of all considerations, including those that were not implemented, is provided in **Technical Memorandum 1.**

Table 4. Status of Policy and Program Considerations in the 2012 BSAP

Policy/Program	Consideration or Revision Proposed	Status Summary
ADOT State Engineer Bicycle Policy	Not applicable.	This policy was "sunsetted" because it was believed that the policy guidance is duplicated within the Traffic Engineering Guidelines and Processes (TGP) and other ADOT guidance, including Complete Transportation Guidebook, 2016.
ADOT Roadway Design Guidelines	Multiple revisions were recommended (see Technical Memorandum 1).	Not implemented
ADOT Safety Action Plan - ASAP (2009)	Superseded by 2014 Strategic Highway Safety Plan.	Not applicable
Arizona Strategic Highway Safety Plan (SHSP) - 2007	SHSP updated in 2014.	The 2014 SHSP Update included an Emphasis Area for Nonmotorized Users, which consists of bicyclists and pedestrians. Seven strategies are identified to achieve the Nonmotorized Users Goal which is to "Reduce fatalities and the occurrence and severity of serious injuries resulting from crashes involving nonmotorized users on all public roadways in Arizona." Additionally, a Nonmotorized Emphasis Area Team was established as a part of the 2014 SHSP, which meets quarterly to address safety issues in Arizona including issues of bicyclist safety. The goal established by the Nonmotorized Emphasis Area Team includes reducing bicyclist fatalities and serious injuries by 20% by the year 2020.
FHWA and ADOT Stewardship and Oversight Agreement for Arizona	Reference bicycle safety.	A new Stewardship and Oversight Agreement on Project Assumption and Program Oversight between the FHWA and ADOT was established on April 9, 2015. Bicycle safety was not specifically referenced in this document. The agreement does include a reference to the annual Activity "Transportation Performance Management (TPM) for Safety," with the remarks that state: "Per MAP-21, States and MPOs must set targets for established measures. Targets must be assessed for achievement."

Table 4. Status of Policy/Program Considerations in 2012 BSAP (cont.)

Policy/Program	Consideration or Revision Proposed	Status Summary
Install Pavement Markings or Signs to Discourage Wrong-Way Bicycle Riding	Two recommendations: Install a bicycle lane symbol with a directional arrow. Install "Bicycle Wrong Way" (Section 9B.07, R5-1b) and "Ride with Traffic" (R9-3cP) signs, consistent with the Manual on Uniform Traffic Control Devices (MUTCD).	There is no indication that either change has been implemented on a statewide or district basis, but the recommended traffic signs are a part of the Arizona Manual of Approved Signs and are available for use.
Develop and Adopt Arizona Complete Streets Policy	The 2012 BSAP recommended that ADOT develop and implement a Complete Streets Policy.	ADOT prepared the Complete Transportation Guidebook in 2016, which describes tools and strategies to implement complete streets concepts on the SHS. While the Complete Transportation Guidebook has not been adopted as policy, nor has ADOT adopted a Complete Streets Policy, several agencies within the state have done so, including the Pima Association of Governments (PAG) and the cities of Phoenix, Scottsdale, Surprise, Tempe, and Mesa. Efforts are underway to develop a Complete Streets Policy in Tucson/Pima County. The Maricopa Association of Governments (MAG) developed a Complete Streets Guide in 2011.
Consider Bicycles at Single-Point Urban Interchanges (SPUIs)	Add consideration for adopting a more bicycle-friendly SPUI design.	There is no indication that this change was implemented.
Recommended Modifications to Arizona Crash Report Form	Recommendations for 10 specific changes to the Arizona Crash Report Form that was last updated in 2009.	A new Arizona Crash Report Form was developed and went into use on November 1, 2017. Specific bicyclist-related changes included: • Added "U-turn" field back to the "manner of crash" impact box but not pedestrian or pedalcyclist. The reason is the officer should mark the crash impact for non-motorist crashes based on the vehicle action, so if the vehicle struck a non-motorist while making a left turn, then "left turn" should be marked. This is made clear in the crash manual as well. • Box 16 – traffic control device – added "traffic circle/roundabout" and "pedestrian hybrid beacon/HAWK." • Box 24 – location of non-motorist – changed many elements in this box in terms of the wording and added some new fields.
Develop and Implement a Bicycle Counting Program	Recommended action of 2012 BSAP and USDOT Policy Statement on Bicycle and Pedestrian Accommodation Regulations from March 15, 2010.	A project was initiated in 2017 for the development of a Bicyclist and Pedestrian Count Strategy Plan for the Arizona SHS. Funding is available to conduct a one-time limited number of bicyclist and pedestrian counts. No automated bicyclist permanent count stations (PCSs) are included as a part of the current count project, and there is no funding to return the only bicycle PCS on the State Highway System to operational status (SR 179 at mile point 307). This project could be the beginning for a future periodic SHS bicycle (and pedestrian) count program.

Table 4. Status of Policy/Program Considerations in 2012 BSAP (cont.)

Policy/Program	Consideration or Revision Proposed	Status Summary
Recommend Enhancements to the Arizona Driver License Manual	Collaborate with Motor Vehicle Division (MVD) to include additional mandatory questions on the Arizona Driver License test regarding bicyclist laws and bicyclist rights. Collaborate with MVD to revise the Arizona Driver License Manual and Customer Service Guide to emphasize bicycle safety.	The Arizona Driver License Manual was updated in April 2017. The following changes recommended in the 2012 BSAP were addressed in the new Manual: The 3-ft rule with respect to sharing the road with bicycles WAS provided in the text of the Manual and was provided in a separate paragraph stating: "When sharing a lane with a bicycle, allow at least 3-feet of clearance between you and the bicycle. Moderate your speed." The important rule for bicyclists, "Ride in the same direction as traffic," WAS added as a separate bullet point and is listed first on page 41. Two test questions regarding bicyclist laws and operating procedures were recommended to be added to the Arizona Driver License test. There are three sample tests on the MVD website. No bicycle safety-related questions are included in two of the sample tests, but Sample Test #3 includes three bicycle safety-related questions.
Establish Connectivity and Alternative Routes to State Highways through Local Jurisdictions	ADOT should continue to improve accommodation of bicyclists on state highways. Local cities and towns should develop bicycle alternatives to the state highway.	ADOT completed a study in September 2015 to identify and obtain AASHTO approval to adopt United States Bicycle Route (USBR) 90 across Arizona for a continuous bicycle route that connects New Mexico with California and extends through the Tucson and Phoenix metropolitan areas using a combination of state highways, county roads, local streets, and portions of off-road paths. ADOT continues to work with MAG and Phoenix on the I-17 Spine Study to explore the possibility of providing additional ½-mile crossings and arterial improvements for bicyclists across the freeway.
Develop and Implement Bicyclist and Motorist Education Campaigns	Integrate the BSAP into ADOT Bicycle and Pedestrian Safety Education Materials, such as the ADOT "Be a Roll Model" campaign.	This recommendation is being implemented through the actions of the Arizona SHSP Non-Motorized Emphasis Area Team, which meets quarterly. ADOT maintains a Bicycle and Pedestrian webpage with numerous educational materials, resources, and links to various safety agency websites, and keeps it up-to-date. The ADOT Statewide Bicycle and Pedestrian Plan Update Final Report was published in June 2013. ADOT is updating its statewide Cycle Arizona Bicycle User Map, which contains state laws regarding bicycling as well as several roadway and safety tips. The Governor's Office of Highway Safety (GOHS) was awarded a $900,000 Statewide Pedestrian and Bicyclist Focus Education and Enforcement grant from NHTSA in 2017.

Table 4. Status of Policy/Program Considerations in 2012 BSAP (cont.)

Policy/Program	Consideration or Revision Proposed	Status Summary
Collaborate with Law Enforcement	Bicycle education of public safety and law enforcement officers that leads to better enforcement of traffic laws can have a trickle-down effect of educating the public.	Law Enforcement officers participated in the Arizona SHSP Non-Motorized Emphasis Area Team meetings. Department of Public Safety (DPS) officers participated in the Technical Advisory Committee for the 2017 Pedestrian Safety Action Plan. Law Enforcement officers have been invited to the Arizona Bicycle Summit in Mesa in 2016 and 2017. The 2017 Arizona Bicycle Summit featured a presentation on a collaborative effort with Glendale Police Department and the Coalition of Arizona Bicyclists on bicycle law enforcement that is based on a model program from North Carolina.
Recommended Changes to Arizona Revised Statutes	Revisions recommended relative to prohibiting bicyclists riding on sidewalks or shoulders against the flow of traffic, with specific revisions recommended to ARS 28-904 (Driving on Sidewalk).	Not implemented.
Implement ADOT Access Management Program	Noted access management strategies that would improve safety.	While no specific access management guidelines adopted since 2012 can be found, the State Transportation Board maintains an Access Management Policy. ADOT TGP 240 (Traffic Impact Analysis) references "ADOT Access Management Guidelines," but TGP 1060 (Median Openings) includes a note that states "This serves as an interim guideline until the publication of ADOT Access Management Guidelines. Once ADOT-level access management guidelines are in place, this TGP will be rescinded." TGP 240 and 1060 were both last updated in June 2015.

3. BICYCLE CRASH DATA ANALYSIS, 2012-2016

This chapter presents an analysis of 2012 to 2016 bicycle crashes on the SHS. This chapter also discusses how crash typing was used at individual locations to identify contributing factors for that crash. The locations of bicycle crashes for the years 2012-2016 are shown in **Figure 5**.

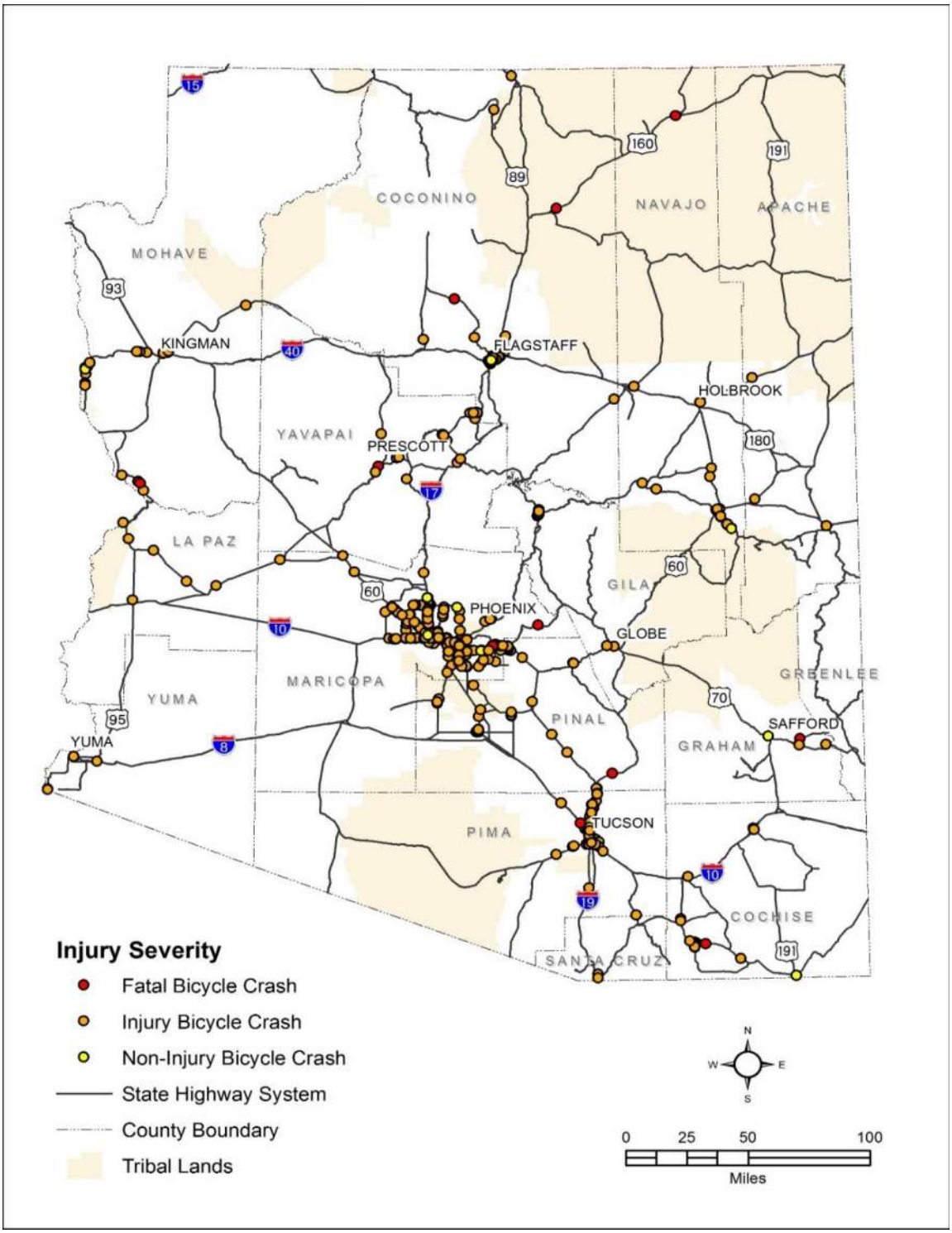


Figure 5. State Highway System Bicycle Crashes

State Highway System Bicycle Crash Severity

Figure 6 shows the number of SHS crashes by injury severity as defined by Arizona's Crash Report Forms Instruction Manual – 11th Edition (November 1, 2017):

K* – *Fatal injury: *Any injury that results in death within 30 days after the motor vehicle crash occurred. If the person did not die at the scene but died within 30 days of the motor vehicle crash in which the injury occurred, the injury classification should be changed from the attribute previously assigned to the attribute "fatal injury."*

A* – *Suspected Serious Injury: *Any injury other than a fatal injury that results in one or more of the following:*

- *Severe laceration resulting in exposure of underlying tissues/muscle/organs or resulting in significant loss of blood*
- *Broken or distorted extremity (arm or leg)*
- *Crush injuries*
- *Suspected skull, chest, or abdominal injury other than bruises or minor lacerations*
- *Significant burns (second- and third-degree burns over 10% or more of the body)*
- *Unconsciousness when taken from the crash scene*
- *Paralysis*

These are crashes where a person is transported to the hospital by emergency vehicle.

B* – *Suspected Minor Injury: *A minor injury is any injury that is evident at the scene of the crash, other than fatal or serious injuries. Examples include a lump on the head, abrasions, bruises, or minor lacerations (cuts on the skin surface with minimal bleeding and no exposure of deeper tissue/muscle).*

C* – *Possible Injury: *An injury reported or claimed which is not a fatal, suspected serious or suspected minor injury. Examples include momentary loss of consciousness, claim of injury, limping, or complaint of nausea. Possible injuries are those which are reported by the person or are indicated by his/her behavior, but no wounds or injuries are readily evident.*

O* – *No Injury: *No apparent injury is a situation where there is no reason to believe that the person received any bodily harm from the motor vehicle crash. There is no physical injury and the person does not report any change in normal function. It should be noted that in 2014, the Tucson Police Department stopped dispatching for Property Damage Only collisions. Self-reporting is an option.*

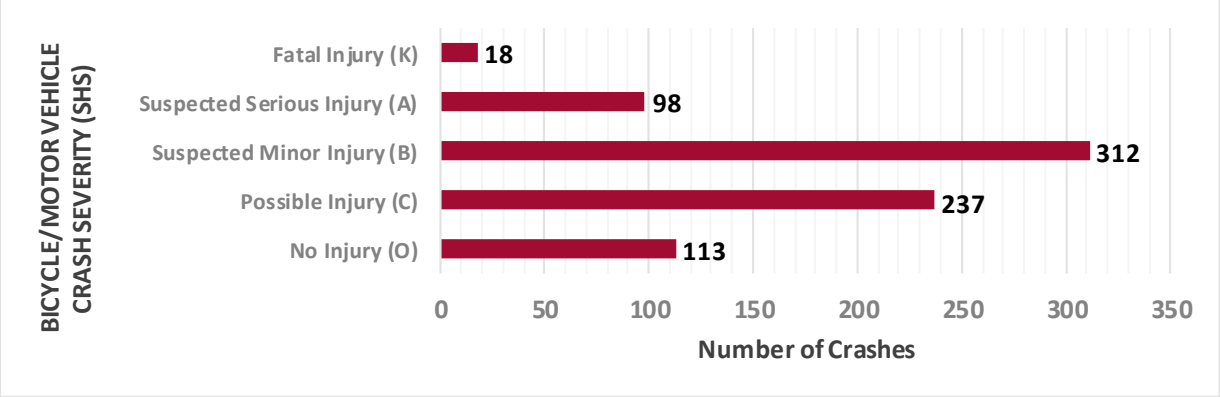


Figure 6. Bicycle Crashes (SHS), 2012-2016 by Injury Severity

Figure 7 shows the SHS number of bicycle/motor vehicle crashes by year. The data is categorized as a rural or urban area crash. The data shows that 114 crashes in 2016 occurred in urban areas (defined as

urbanized area by the U.S. Census Bureau), while 11 occurred in rural areas. The bicycle/motor vehicle crash trends show that over 90 percent of the SHS crashes occurred in urbanized areas.

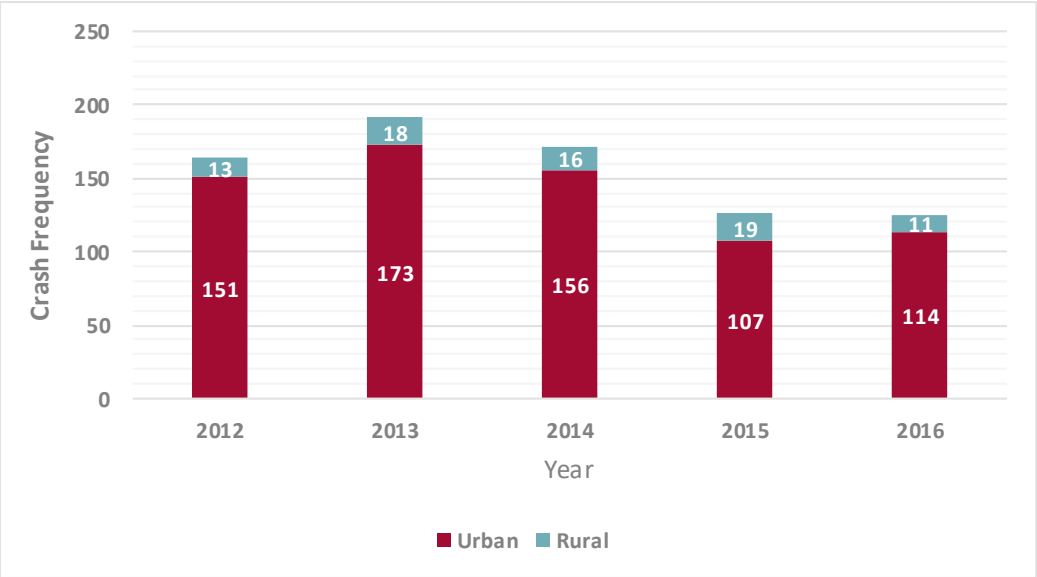


Figure 7. Bicycle Crashes (SHS), 2012-2016 by Urban/Rural Area

In addition, crashes were evaluated by month, by day of the week, and by time of day as shown in **Figures 8 to 10**. The following was observed:

- During the 2012-2016 period, bicycle-related crashes peaked in September and October.
- Thursday, Friday, and Tuesday showed the highest number of crashes when compared to other days of the week.
- The time of day period between 3:00 PM to 4:00 PM showed the highest number of crashes.

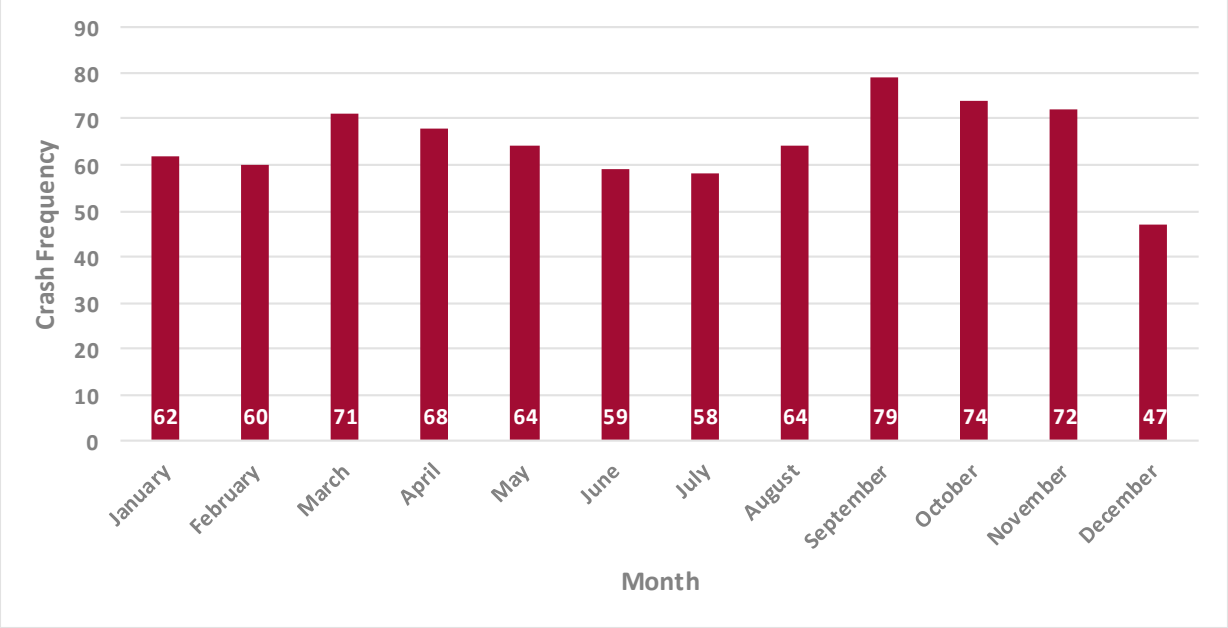


Figure 8. Bicycle Crashes (SHS), 2012-2016 by Month

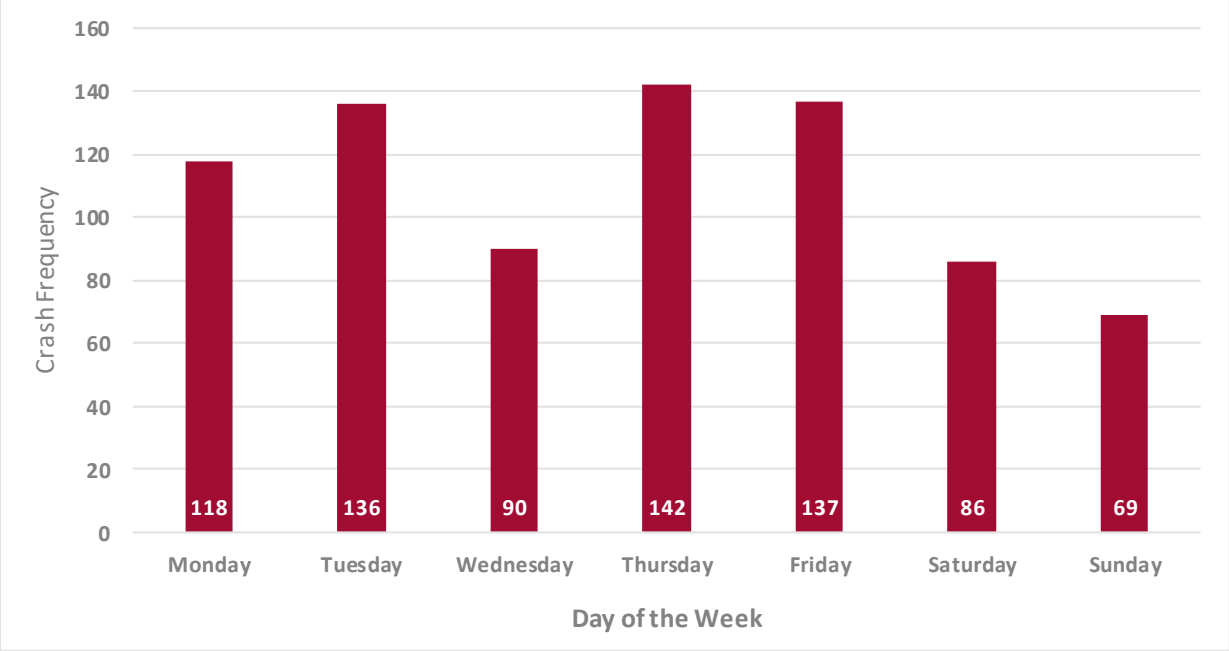


Figure 9. Bicycle Crashes (SHS), 2012-2016 by Day of the Week

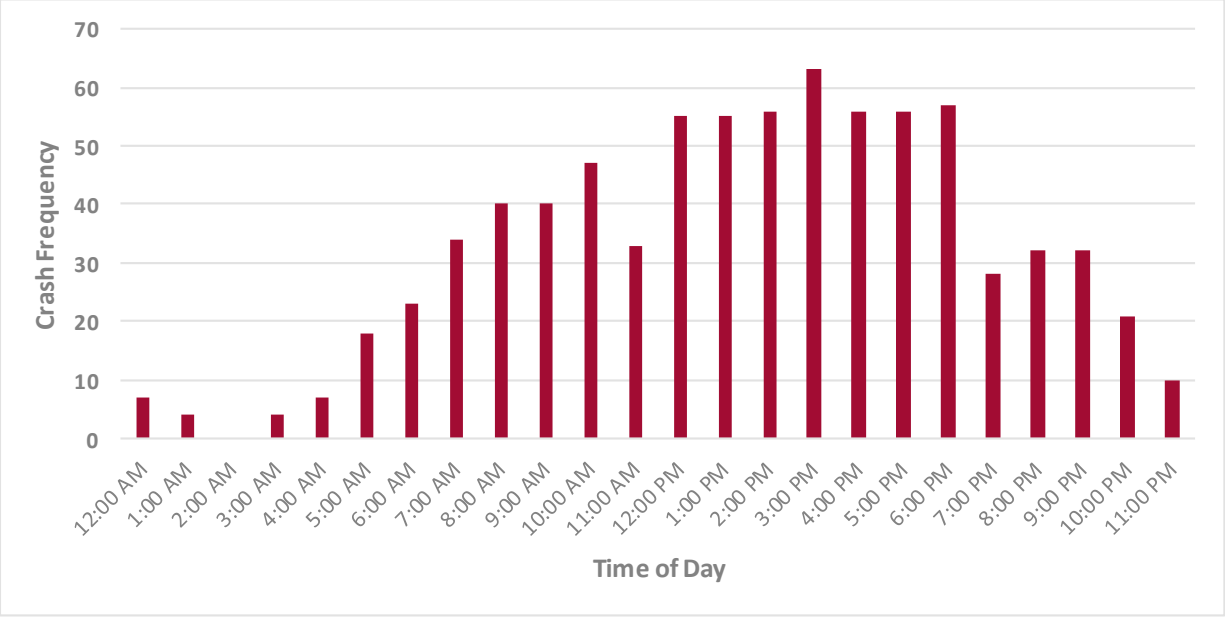


Figure 10. Bicycle Crashes (SHS), 2012-2016 by Time of Day

Environmental and Roadway Conditions

This section summarizes the environmental and roadway conditions for each of the bicycle-related crashes that occurred on the SHS. **Table 5** summarizes the environmental conditions, and **Table 6** summarizes the reported roadway conditions.

Key findings include the following:

- Nearly 72 percent of the reported bicyclist/motor-vehicle crashes occurred during daylight conditions and 18 percent occurred during dark (lighted) conditions. Approximately five percent occurred during dark (not lighted) conditions.
- Over 38 percent of the reported SHS bicyclist/motor-vehicle crashes occurred on local/municipal roads with traffic interchanges within ADOT right-of-way.
- Over 35 percent of the reported crashes occurred on two-way divided highways with a raised median.
- A majority of the reported crashes occurred at intersections, with over 52 percent of the **total (778) bicyclist/motor-vehicle crashes** occurring at signalized intersections.
- Over 62 percent of the reported crashes occurred when there was no bicycle facility present. Bicycle facilities are identified as:
    - Bicycle Lane
    - Paved Shoulder
    - Shared-Use Path
    - Wide Curb Lane
    - Combined Parking/Bike Lane

Table 5. Summary of Environmental Conditions

Environmental Factor	Condition	Crashes	Percent of Crashes
Lighting Condition	Daylight	559	71.9%
	Dawn or Dusk	43	5.5%
	Dark (Lighted)	140	18.0%
	Dark (Not Lighted)	36	4.6%
Weather Condition	Clear	685	88.0%
	Cloudy	69	8.9%
	Rain	14	1.8%
	Snow	1	0.1%
	Severe Crosswinds	1	0.1%
	Unknown	8	1.0%
Roadway Surface Condition	Dry	732	94.1%
	Wet	22	2.8%
	Snow	1	0.1%
	Unknown	23	3.0%

Table 6. Summary of Roadway Conditions

Roadway Factor	Condition	Crashes	Percent of Crashes
Roadway Type	Interstate (Mainline and Ramps)	50	6.4%
	US Route	98	12.6%
	State Route	324	41.6%
	Local/Municipal (Traffic Interchanges)	297	38.2%
	Private Property	1	0.1%
	Unknown	8	1.0%
Roadway Configuration	One-Way Traffic	104	13.4%
	Two-Way Not-Divided	116	14.9%
	Two-Way Not-Divided with Continuous Left-Turn Lane	176	22.6%
	Two-Way Divided/Unprotected Painted 4-Foot Median	94	12.1%
	Two-Way Divided/Positive Median Barrier	277	35.6%
	Unknown	11	1.4%
Crash Location	Intersection	509	65.4%
	Intersection-Related	46	5.9%
	Non-Intersection	208	26.7%
	Non-Roadway	1	0.1%
	Unknown	14	1.8%

Table 6. Summary of Roadway Conditions (cont.)

Roadway Factor	Condition	Crashes	Percent of Crashes
Traffic Control	Traffic Control Signal	406	52.2%
	STOP Sign	93	12.0%
	No Control	246	31.6%
	Flashing Signal	1	0.1%
	Flagger	1	0.1%
	YIELD Sign	22	2.8%
	Warning Sign	1	0.1%
	Other	3	0.4%
	Unknown	5	0.6%
Bicycle Facility Presence	Paved Shoulder ≥ 4 ft.	212	27.2%
	Paved Shoulder < 4 ft.	43	5.5%
	Shared-Use Path	7	0.9%
	Wide Curb Lane	18	2.3%
	None	488	62.7%
	Unknown	10	1.3%
Posted Speed Limit on Roadway	15 MPH	5	0.6%
	20 to 25 MPH	65	8.4%
	30 to 35 MPH	193	24.8%
	40 to 45 MPH	373	47.9%
	50 to 60 MPH	42	5.4%
	> 60 MPH	58	7.5%
	Unknown	42	5.4%

Unit Characteristics

This section summarizes the unit characteristics (motor vehicle and bicyclist) for each of the bicycle-related crashes that occurred on the SHS. Key findings include the following:

- Nearly 30 percent of bicyclists involved in bicycle/motor vehicle crashes were between the ages of 26-45 years old. A similar percentage of motorists (33%) were in the same age range (Refer to **Figure 11).** A majority of crashes where the motorist's age was unknown were due to hit and run crashes.
- As illustrated in **Figure 12**, a higher proportion of crashes involved males, as compared to females, for both motorists and bicyclists. Nearly 80% of bicyclists involved in crashes were male.
- The most prominent violation for motorists was failure to yield the right-of-way (20.6 percent) (Refer to **Table 7**). For bicyclists, the most prominent violation was driving/riding in the opposing traffic lane (25.1 percent) and disregarding traffic signals (12.7 percent).

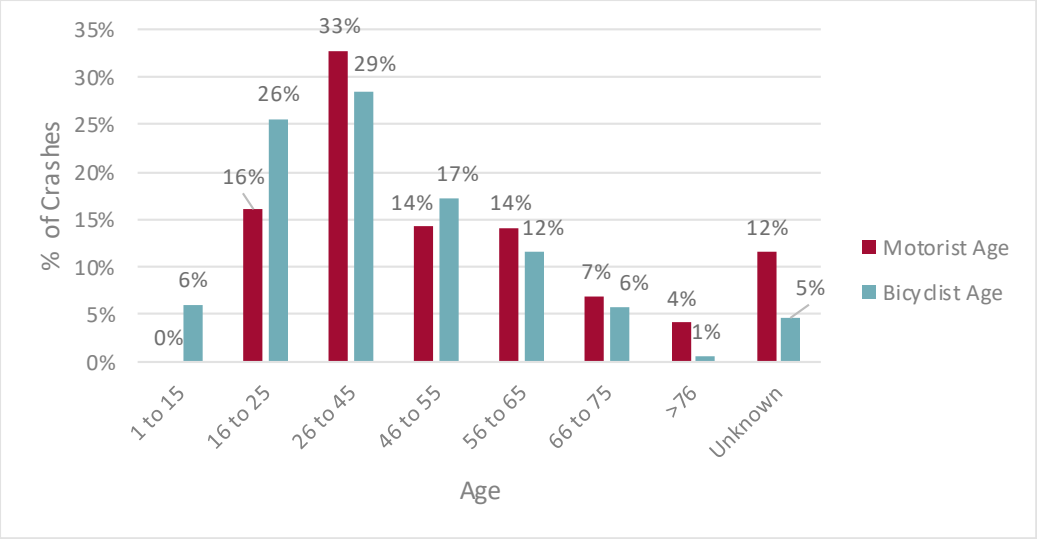


Figure 11. Crashes by Motorist and Bicyclist Age

Note: the high number of motorist unknown is likely due to hit-and-run crashes.

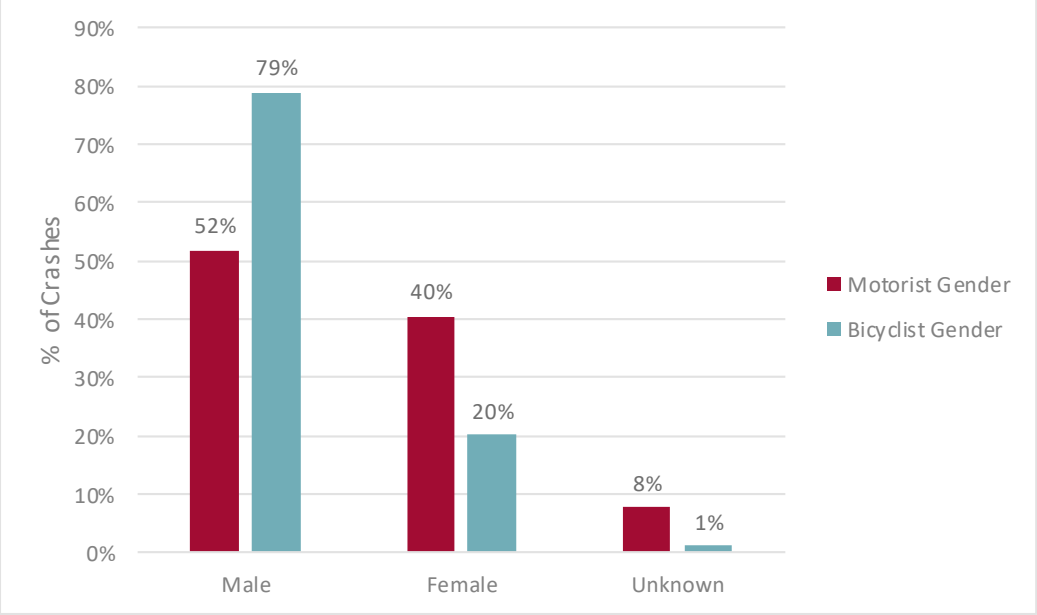


Figure 12. Crashes by Motorist and Bicyclist Gender

Note: the high number of motorist unknown is likely due to hit-and-run crashes.

Table 7. Summary of Unit Factors

Unit Factors	Condition	Motorist	Percent of Crashes	Bicyclist	Percent of Crashes
Unit Influence	Drugs	2	0.3%	7	0.9%
	Alcohol	5	0.6%	25	3.2%
	Fell Asleep/Fatigued	3	0.4%	2	0.3%
	Physical Impairment	2	0.3%	0	0.0%
	Illness	0	0.0%	1	0.1%
	Medications	1	0.1%	0	0.0%
	None	664	85.3%	685	88.0%
	Unknown	101	13.0%	58	7.5%
Unit Violation	No Improper Action	356	45.8%	245	31.5%
	Speed Too Fast for Conditions	32	4.1%	4	0.5%
	Exceeded Lawful Speed	2	0.3%	0	0.0%
	Followed Too Closely	1	0.1%	2	0.3%
	Ran Stop Sign	3	0.4%	2	0.3%
	Disregarded Traffic Signal	17	2.2%	99	12.7%
	Made Improper Turn	12	1.5%	7	0.9%
	Drove/Rode in Opposing Traffic Lane	2	0.3%	195	25.1%
	Knowingly Operated with Faulty Missing Equipment	0	0.0%	11	1.4%
	Unsafe Lane Change	4	0.5%	13	1.7%
	Failed to Keep in Proper Lane	9	1.2%	11	1.4%
	Disregarded Pavement Markings	2	0.3%	0	0.0%
	Other Unsafe Passing	11	1.4%	4	0.5%
	Inattention/Distraction	68	8.7%	14	1.8%
	Did Not Use Crosswalk	0	0.0%	13	1.7%
	Rode on Wrong Side of Road	0	0.0%	5	0.6%
	Electronic Communications Device	1	0.1%	0	0.0%
	Failed to Yield Right-of-Way	160	20.6%	48	6.2%
	Other	26	3.3%	52	6.7%
	Unknown	72	9.3%	53	6.8%

- Based on a review of the crash reports, it was determined by the investigating officer that the bicyclist was primarily at fault in nearly 43 percent of the reported crashes. The motorist was judged to be primarily at fault in almost 39 percent of the reported crashes. Both were at fault in 7.7% of the crashes, and fault could not be determined or was not reported in 8.5% of the bicyclist/motor-vehicle crashes (Refer to **Figure 13**).
- Over 58 percent of the reported bicycle crashes occurred when the bicyclist was riding along the sidewalk, riding in the crosswalk, or crossing a driveway. Twenty-one (21) percent of the crashes included the bicyclist riding in the general travel lane (no bicycle lane present) (Refer to **Figure 14**).

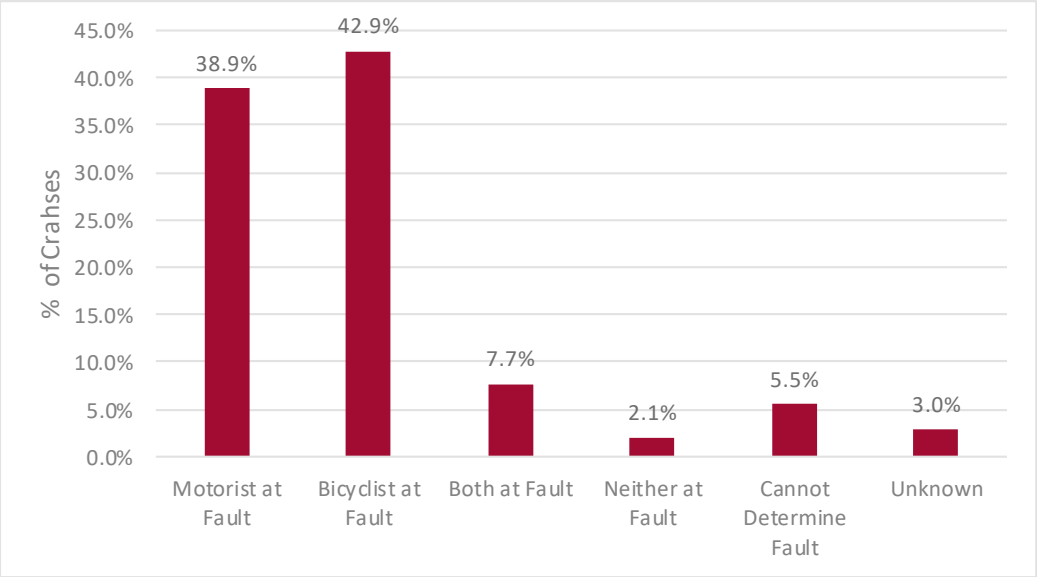


Figure 13. Crashes by Unit at Fault

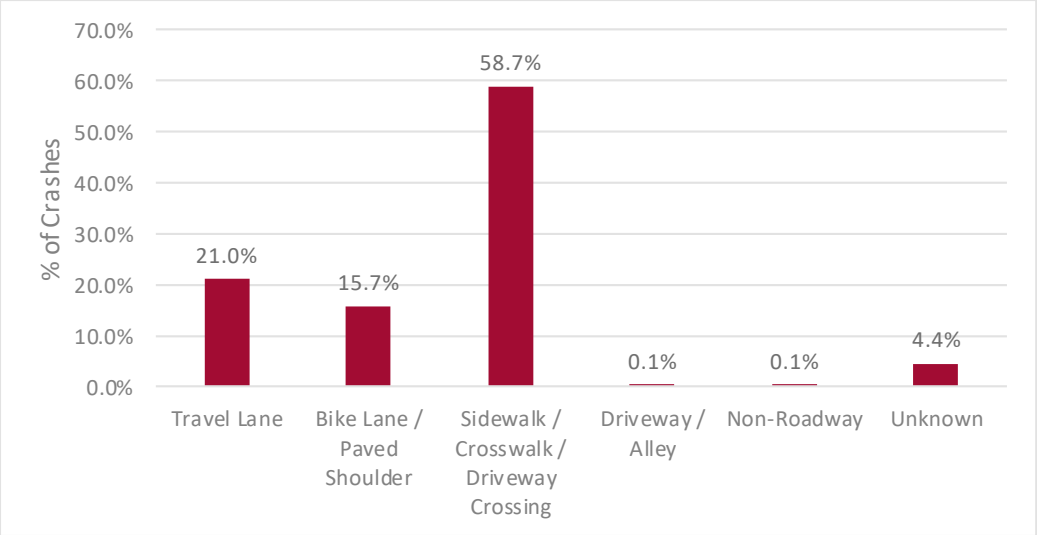


Figure 14. Crashes by Bicyclist Position

- Nearly 50 percent of the reported bicycle crashes occurred when the bicyclist was riding against traffic (facing traffic) (Refer to **Figure 15**).

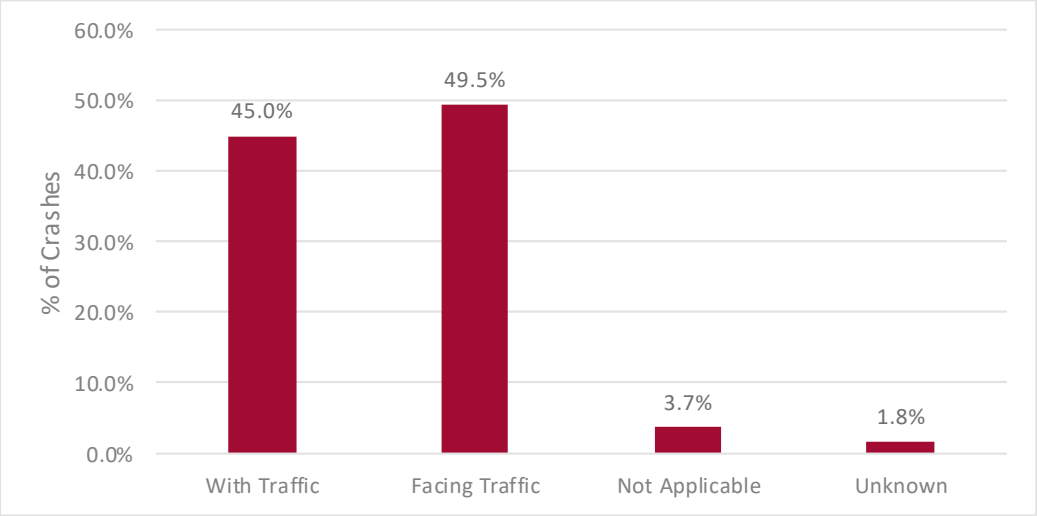


Figure 15. Crashes by Bicyclist Direction

Bicycle Crash Typing

Crash reports for each SHS bicycle/motor-vehicle crash were obtained from ADOT for the 2012-2016 analysis period. Each report was thoroughly reviewed to retrieve any significant information that can lead to a better understanding of the contributing factors for that crash. Crash details were entered into a database developed for this project that is consistent with the Federal Highway Administration (FHWA) crash typing methodology used in the PBCAT[1]. Data from the ADOT Safety Data Mart, as well as Google Earth and Street View, were additional tools used to obtain complemental details of the crash locations such as the presence of bicycle facilities (shoulders, etc.). Visuals for each crash group and crash type are provided in **Appendix B**. Note that not all crash types have an image associated with them.

Crash typing provides enhanced insight on the sequence of events that led up to the bicyclist/motor vehicle crash. The crash groups and crash types include the following as shown in **Table 8** and **Table 9**, respectively.

[1] http://www.pedbikeinfo.org/pbcat_us/

Table 8. Crash Groups Summary

ID	Crash Group	Crashes	Percent of Crashes
158	Bicyclist Failed to Yield – Signalized Intersection	149	19.2%
215	Motorist Right Turn/Merge	133	17.1%
150	Motorist Failed to Yield – Signalized Intersection	94	12.1%
210	Motorist Left Turn/Merge	60	7.7%
230	Motorist Overtaking Bicyclist	53	6.8%
145	Bicyclist Failed to Yield – Sign-Controlled Intersection	43	5.5%
140	Motorist Failed to Yield – Sign-Controlled Intersection	43	5.5%
310	Bicyclist Failed to Yield – Midblock	38	4.9%
320	Motorist Failed to Yield – Midblock	34	4.4%
850	Crossing Paths – Other Circumstances	33	4.2%
220	Bicyclist Left Turn/Merge	20	2.6%
910	Non-Roadway	19	2.4%
-	Other/Unknown – Insufficient Details	23	3.0%
-	Unknown	12	1.5%
225	Parallel Paths – Other Circumstances	10	1.3%
110	Loss of Control/Turning Error	5	0.6%
258	Head-On	4	0.5%
240	Bicyclist Overtaking Motorist	3	0.4%
850	Other/Unusual Circumstances	2	0.3%
225	Bicyclist Right Turn/Merge	0	0.0%
219	Parking/Bus-Related	0	0.0%

Table 9. Crash Type Summary

ID	Crash Type	Crashes	Percent of Crashes
153	Bicyclist Ride Out – Signalized Intersection	72	9.3%
155	Bicyclist Ride Through – Signalized Intersection	64	8.2%
214	Motorist Right Turn – Opposite Direction	64	8.2%
213	Motorist Right Turn – Same Direction	60	7.7%
151	Motorist Drive Out – Right-Turn-On-Red	46	5.9%
212	Motorist Left Turn – Opposite Direction	41	5.3%
142	Bicyclist Ride Out – Sign-Controlled Intersection	34	4.4%
141	Motorist Drive Out – Sign-Controlled Intersection	32	4.1%
910	Non-Roadway	29	3.7%
312	Bicyclist Ride Out – Commercial Driveway/Alley	25	3.2%
322	Motorist Drive Out – Commercial Driveway/Alley	25	3.2%
152	Motorist Drive Out – Signalized Intersection	21	2.7%
232	Motorist Overtaking – Misjudged Space	21	2.7%
211	Motorist Left Turn – Same Direction	19	2.4%
380	Crossing Paths – Midblock – Other/Unknown	16	2.1%
231	Motorist Overtaking – Undetected Bicyclist	16	2.1%

ID	Crash Type	Crashes	Percent of Crashes
221	Bicyclist Left Turn – Same Direction	14	1.8%
154	Motorist Drive Through – Signalized Intersection	12	1.5%
143	Motorist Drive Through – Sign-Controlled Intersection	11	1.4%
144	Bicyclist Ride Through – Sign-Controlled Intersection	10	1.3%
280	Parallel Paths – Other/Unknown	10	1.3%
321	Motorist Drive Out – Residential Driveway	9	1.2%
239	Motorist Overtaking – Other/Unknown	9	1.2%
158	Signalized Intersection – Other/Unknown	9	1.2%
160	Crossing Paths – Uncontrolled Intersection	8	1.0%
222	Bicyclist Left Turn – Opposite Direction	6	0.8%
318	Bicyclist Ride Out – Other Midblock	6	0.8%
156	Bicyclist Failed to Clear – Trapped	5	0.6%
235	Motorist Overtaking – Bicyclist Swerved	5	0.6%
250	Head-On – Bicyclist	4	0.5%
157	Bicyclist Failed to Clear – Multiple Threat	3	0.4%
311	Bicyclist Ride Out – Residential Driveway	3	0.4%
129	Bicyclist Lost Control – Other/Unknown	2	0.3%
241	Bicyclist Overtaking – Passing on Right	2	0.3%
319	Bicyclist Ride Out – Midblock – Unknown	2	0.3%
223	Bicyclist Right Turn – Same Direction	2	0.3%
180	Crossing Paths – Intersection – Other/Unknown Control	2	0.3%
139	Motorist Lost Control – Other/Unknown	2	0.3%
218	Motorist Right-Turn-On-Red – Opposite Direction	2	0.3%
112	Motorist Turning Error – Right Turn	2	0.3%
123	Bicyclist Lost Control – Alcohol/Drug Impairment	1	0.1%
122	Bicyclist Lost Control – Oversteering	1	0.1%
124	Bicyclist Lost Control – Surface Conditions	1	0.1%
243	Bicyclist Overtaking – Parked Vehicle	1	0.1%
242	Bicyclist Overtaking – Passing on Left	1	0.1%
225	Bicyclist Ride Out – Parallel Path	1	0.1%
255	Head-On – Motorist	1	0.1%
133	Motorist Lost Control – Alcohol/Drug Impairment	1	0.1%
132	Motorist Lost Control – Oversteering	1	0.1%
219	Motorist Turn/Merge – Other/Unknown	1	0.1%
700	Play Vehicle-Related	1	0.1%
148	Sign-Controlled Intersection – Other/Unknown	1	0.1%
-	Unknown	16	2.1%
970	Unknown Approach Paths	4	0.5%
980	Unknown Location	19	2.4%
800	Unusual Circumstances	2	0.3%

4. STATE HIGHWAY SYSTEM BICYCLE HIGH-CRASH SEGMENTS, INTERSECTIONS/INTERSECTIONS

This chapter summarizes high-crash segments and intersections/interchanges on the SHS. Each segment/interchange/intersection was identified using Geographic Information Systems (GIS) and subsequently verified by visual inspection.

A high-crash intersection/interchange or segment includes at least 3 bicycle crashes within the 5-year period (2012 to 2016).

Table 10 lists high-crash intersection/interchange locations, and **Table 11** lists high-crash segment locations**.** Segments and intersections/interchanges are sorted in descending order by number of bicycle crashes within the segment or at the intersection/interchange.

Table 12 and **Table 13** provide additional details for each state highway high-crash intersection/interchange (**Table 12**) and road segment (**Table 13)**, including crash type. Note that there is overlap between high-crash intersections and high-crash segments. A high-crash intersection may be located within a high-crash segment. Also, note that high-crash segments account for 6 of 18 fatal bicycle crashes (2012-2016), and 34 of 98 serious injury crashes (2012-2016).

It should be noted that the segments/intersections/interchanges listed in **Table 12** and **Table 13** are those that remain after initial screening. As such, numbering is not sequential (e.g., Segment/Intersection ID 2 and 3 were initially identified but were subsequently screened out and removed from the analysis).

Bicyclist count data were collected at several of the segments/intersections/interchanges as part of a separate project (*ADOT Bicycle and Pedestrian Count Strategy Plan, Final Report, June 2018*), and is noted in **Appendix A** where available. The purpose of the counts is to provide insight into the bicycle exposure on the segment/intersection/interchange.

Table 10. State Highway High-Crash Intersections/Interchanges

Intersection ID	Area	On Road	Intersecting Road	Total Bicycle Crashes
18	Tempe	Scottsdale Road	SR 202	**11**
36	Phoenix	Camelback Road	I-17	**10**
37	Phoenix	Bethany Home Road	I-17	**10**
38	Phoenix	Glendale Avenue	I-17	**9**
39	Phoenix	Northern Avenue	I-17	**9**
57	Flagstaff	Route 66	Ponderosa Parkway	**9**
40	Phoenix	Dunlap Avenue	I-17	**8**
1	Tucson	6th Avenue	I-10	**7**
15	Mesa	Broadway Road	SR 101	**6**
16	Tempe	University Drive	SR 101	**6**
23	Mesa	Power Road	US 60	**6**
26	Phoenix	32nd Street	SR 202	**6**
27	Phoenix	24th Street	SR 202	**6**
56	Flagstaff	Route 66 (Santa Fe Ave)	US 180 (Humphreys Street)	**6**
5	Tucson	SR 77	Wetmore Road	**5**
7	Tucson	SR 77	Ina Road	**5**
14	Mesa	Southern Avenue	SR 101	**5**
17	Tempe	McClintock Drive	SR 202	**5**
20	Tempe	Priest Drive	SR 202	**5**
24	Mesa	SR 87	McKellips Road	**5**
30	Phoenix	Indian School Road	SR 51	**5**
35	Avondale	Dysart Road	I-10	**5**
41	Phoenix	Peoria Avenue	I-17	**5**
45	Phoenix	Union Hills Drive	I-17	**5**
49	Phoenix	McDowell Road	SR 143	**5**
54	Kingman	Stockton Hill Road	I-40	**5**
6	Tucson	SR 77	Prince Road	**4**
8	Chandler	Arizona Avenue	SR 202	**4**
11	Tempe	Elliot Road	SR 101	**4**
12	Tempe	Guadalupe Road	SR 101	**4**
22	Mesa	Greenfield Road	US 60	**4**
25	Chandler	I-10	Baseline Road	**4**
29	Phoenix	Thomas Road	SR 51	**4**
32	Phoenix	Grand Avenue	McDowell Road/19th Ave	**4**
33	Phoenix	Grand Avenue	27th Avenue/Thomas Road	**4**
43	Phoenix	Greenway Road	I-17	**4**
44	Phoenix	Bell Road	I-17	**4**
50	Phoenix	Bell Road	SR 51	**4**
53	Peoria	Grand Avenue	Peoria Avenue	**4**
4	Tucson	Kino Parkway	I-10	**3**

Table 10. State Highway High-Crash Intersections/Interchanges (cont.)

Intersection ID	Area	On Road	Intersecting Road	Total Bicycle Crashes
13	Tempe	Baseline Road	SR 101	**3**
28	Phoenix	McDowell Road	SR 51	**3**
31	Phoenix	7th Street	I-10/Portland Street	**3**
46	Phoenix	Deer Valley Road	I-17	**3**
47	Peoria	Thunderbird Road	SR 101	**3**
51	Phoenix	Grand Avenue	35th Avenue	**3**
52	Glendale	Grand Avenue	51st Avenue/Bethany Home	**3**
55	Flagstaff	SR 89A	University Drive	**3**

Table 11. State Highway High-Crash Segments

Segment ID	Area	Highway	From	To	Length (mi)	Total Bicycle Crashes
61	Tucson	SR 77	Fort Lowell Rd	River Road	2.25	**32**
86	Flagstaff	SR 89A	State Business 40	Elden Street	1.01	**29**
69	Maricopa County	US 60X	Meridian Road	Sossaman Road	5.02	**20**
82	Sedona	SR 89A	Arroyo Pinon Drive	SR 179	3.11	**15**
84	Flagstaff	SR 89A (Milton)	University Avenue	State Business 40	0.7	**15**
63	Oro Valley	SR 77	Ina Road	El Conquistador	3.62	**13**
88	Flagstaff	US 180	Humphreys St	Meade Lane	0.83	**12**
89	Flagstaff	SB 40	Ponderosa Parkway	Fanning Drive	2.4	**12**
62	Tucson	SR 77	River Road	Ina Road	2.8	**11**
58	Sierra Vista	SR 92	Calle Mercancia	SR 90	1.79	**10**
72	Payson	SR 87	Green Valley Parkway	Forest Drive	2.12	**10**
85	Flagstaff	State Business 40	Thompson Street	Milton Road	1.04	**9**
60	Tucson	SR 77	Flowing Wells Road	Oracle Road	1.79	**8**
71	Sun City	Grand Avenue	107th Avenue	Bell Road	4.4	**8**
78	Bullhead City	SR 95	Bullhead Parkway	Hancock Road	5.33	**8**
65	Casa Grande	SR 387	O'Neil Drive	Florence Boulevard	1.26	**7**
67	Mesa	SR 87	Baseline Road	Campbell Road	1.54	**7**
68	Apache Junction	SR 88	US 60	Apache Trail	1.75	**7**
66	Maricopa	SR 347	Edwards Avenue	Cobblestone Farms Dr.	2.03	**6**
59	Tucson	SR 86	Mission Road	Holiday Boulevard	0.5	**5**
73	Pinetop-Lakeside	SR 260	Woodland Lake Road	Niels Hansen Dr.	3.18	**5**
74	Show Low	SR 260	Webb Drive	US 60	4.46	**5**
80	San Luis	US 95	Juan Sanchez Boulevard	Urtuzuastegui Street	0.51	**5**
87	Flagstaff	US 180	Route 66	Columbus Avenue	0.61	**5**
64	Catalina	SR 77	Golder Ranch Dr.	Mainsail Blvd.	1	**4**
70	Coolidge	SR 87	Coolidge Avenue	SR 87	2	**4**
76	Kingman	Andy Devine Avenue	I-40	Thompson Avenue	3.5	**4**
79	Lake Havasu City	SR 95	Mulberry Avenue	Lake Shore Boulevard	13.85	**4**
81	Cottonwood	SR 260	SR 89A	Cove Parkway	0.65	**4**
83	Flagstaff	SR 89A (Milton Rd)	McConnell Dr	West University Drive	0.8	**4**
75	Show Low	US 60	Clark Road	SR 260	1.97	**3**
77	Golden Valley	SR 68	Bowie Road	Colorado Road	4.77	**3**

Table 12. High-Crash Intersection, Severity and Crash Types

Intersection ID	Area	On Road	Intersecting Road	Bicycle Crashes		Description
				Severity	Quantity	
1	Tucson	6th Avenue	I-10	**K** **A** **B** **C** **O** **Total**	0 0 3 3 1 **7**	More than half of the crashes occurred in Daylight conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (2)* *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Left Turn – Opposite Direction (1)* *Motorist Right Turn – Same Direction (1)* *Non-Roadway (1)* *Unknown Location (1)*
4	Tucson	Kino Parkway	I-10	**K** **A** **B** **C** **O** **Total**	0 0 0 2 1 **3**	2 crashes occurred in Dark conditions and 1 crash occurred in Daylight conditions; crash types included: *Motorist Left Turn – Same Direction (1)* *Non-Roadway (1)* *Parallel Paths – Other/Unknown (1)*
5	Tucson	SR 77	Wetmore Road	**K** **A** **B** **C** **O** **Total**	0 0 2 2 1 **5**	A majority of the crashes occurred during Daylight conditions; crash types included: *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Drive Out – Commercial Driveway/Alley (1)* *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Left Turn – Opposite Direction (1)* *Motorist Right Turn – Opposite Direction (1)*
6	Tucson	SR 77	Prince Road	**K** **A** **B** **C** **O** **Total**	0 0 1 0 3 **4**	All crashes occurred in Daylight conditions; crash types included: *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Right Turn – Same Direction (2)* *Signalized Intersection – Other/Unknown (1)*
7	Tucson	SR 77	Ina Road	**K** **A** **B** **C** **O** **Total**	0 1 4 0 0 **5**	The majority of the crashes occurred in Daylight conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (1)* *Bicyclist Right Turn – Same Direction (1)* *Motorist Drive Through – Signalized Intersection (1)* *Motorist Right Turn – Opposite Direction (1)* *Motorist Right Turn – Same Direction (1)* **Average of approximately 168 bicycles per day (75 bicycles on SR 77 and 93 bicycles crossing SR 77 at Ina Road)**

Table 12. High-Crash Intersection, Severity and Crash Types (cont.)

Intersection ID	Area	On Road	Intersecting Road	Bicycle Crashes		Description
				Severity	Quantity	
8	Chandler	Arizona Avenue	SR 202	**K** **A** **B** **C** **O**	0 0 2 1 1	The majority of the crashes occurred in Daylight conditions; crash types included: *Motorist Drive Out – Signalized Intersection (1)* *Motorist Left Turn – Opposite Direction (1)* *Motorist Right-Turn-on-Red – Opposite Direction (1)* *Unknown (1)*
				Total	**4**	
11	Tempe	Elliot Road	SR 101	**K** **A** **B** **C** **O**	0 0 0 4 0	The majority of the crashes occurred in Daylight conditions; crash types included: *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Right Turn – Same Direction (2)* *Unknown Location (1)*
				Total	**4**	
12	Tempe	Guadalupe Road	SR 101	**K** **A** **B** **C** **O**	0 1 2 0 1	All crashes occurred in Daylight conditions; crash types included: *Bicyclist Ride Out – Commercial Driveway/Alley (1)* *Motorist Left Turn – Same Direction (1)* *Motorist Right Turn – Same Direction (1)* *Unknown Location (1)*
				Total	**4**	
13	Tempe	Baseline Road	SR 101	**K** **A** **B** **C** **O**	0 1 1 1 0	All crashes occurred in Daylight conditions; crash types included: *Bicyclist Ride Through – Sign-Controlled Intersection (1)* *Motorist Right Turn – Same Direction (2)*
				Total	**3**	
14	Mesa	Southern Avenue	SR 101	**K** **A** **B** **C** **O**	0 0 3 2 0	The majority of the crashes occurred in Daylight conditions; crash types included: *Bicyclist Ride Out – Commercial Driveway/Alley (1)* *Bicyclist Ride Out – Signalized Intersection (1)* *Motorist Drive Through – Signalized Intersection (1)* *Motorist Left Turn – Same Direction (1)* *Motorist Right Turn – Opposite Direction (1)*
				Total	**5**	

Table 12. High-Crash Intersection, Severity and Crash Types (cont.)

Intersection ID	Area	On Road	Intersecting Road	Bicycle Crashes		Description
				Severity	Quantity	
15	Mesa	Broadway Road	SR 101	**K** **A** **B** **C** **O**	0 0 4 1 1	The majority of the crashes occurred in Daylight conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (2)* *Bicyclist Ride Through – Sign-Controlled Intersection (1)* *Motorist Left Turn – Same Direction (1)* *Motorist Right Turn – Opposite Direction (1)* *Unknown (1)*
				Total	**6**	
16	Tempe	University Drive	SR 101	**K** **A** **B** **C** **O**	0 0 3 2 1	The majority of the crashes occurred in Daylight conditions, with 1 crash occurring in Dark conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (1)* *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Motorist Drive Through – Signalized Intersection (1)* *Unknown (2)* *Unknown Location (1)*
				Total	**6**	
17	Tempe	McClintock Drive	SR 202	**K** **A** **B** **C** **O**	0 0 2 1 2	3 crashes occurred in Dark (Lighted) conditions and 2 crashes occurred in Daylight conditions; crash types included: *Motorist Left Turn – Opposite Direction (1)* *Motorist Left Turn – Same Direction (1)* *Motorist Right Turn – Opposite Direction (1)* *Motorist Right Turn – Same Direction (1)* *Unknown (1)*
				Total	**5**	
18	Tempe	Scottsdale Road	SR 202	**K** **A** **B** **C** **O**	0 0 8 1 2	The majority of the crashes occurred in Daylight conditions, with 2 crashes occurring in Dark conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (1)* *Bicyclist Ride Through – Signalized Intersection (1)* *Bicyclist Ride Through – Sign-Controlled Intersection (3)* *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Right Turn – Opposite Direction (3)* *Unknown (1)* *Unknown Approach Paths (1)* *Bicyclist drug and alcohol involvement for 1 crash*
				Total	**11**	

Table 12. High-Crash Intersection, Severity and Crash Types (cont.)

Intersection ID	Area	On Road	Intersecting Road	Bicycle Crashes		Description
				Severity	Quantity	
20	Tempe	Priest Drive	SR 202	K A B C O	0 0 4 1 0	The majority of the crashes occurred in Daylight conditions, with 1 crash occurring in Dark conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (2)* *Motorist Left Turn – Same Direction (1)* *Non-Roadway (1)* *Unknown (1)*
				Total	**5**	
22	Mesa	Greenfield Road	US 60	K A B C O	0 0 0 3 1	3 crashes occurred in Daylight conditions and 1 crash occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Motorist Right Turn – Opposite Direction (1)* *Motorist Turning Error – Right Turn (1)* *Unknown (1)*
				Total	**4**	
23	Mesa	Power Road	US 60	K A B C O	0 0 2 3 1	All crashes occurred in Daylight conditions; crash types included: *Crossing Paths – Intersection – Other/Unknown Control (1)* *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Lost Control – Other/Unknown (1)* *Motorist Right Turn – Same Direction (2)* *Unknown Location (1)*
				Total	**6**	
24	Mesa	SR 87	McKellips Road	K A B C O	0 1 0 3 1	3 crashes occurred in Daylight conditions and 2 crashes occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Failed to Clear – Trapped (1)* *Motorist Drive Out – Commercial Driveway/Alley (1)* *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Drive Out – Signalized Intersection (1)* *Motorist Right Turn – Opposite Direction (1)*
				Total	**5**	
25	Chandler	I-10	Baseline Road	K A B C O	0 0 2 1 1	All crashes occurred in Daylight conditions; crash types included: *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Right Turn – Opposite Direction (2)* *Unknown (1)* **Average of approximately 267 bicycles per day (258 bicycles crossing I-10 ramps and 9 bicycles crossing Baseline Road)**
				Total	**4**	

Table 12. High-Crash Intersection, Severity and Crash Types (cont.)

Intersection ID	Area	On Road	Intersecting Road	Bicycle Crashes		Description
26	Phoenix	32nd Street	SR 202	**K** **A** **B** **C** **O**	0 0 5 1 0	The majority of the crashes occurred in Daylight conditions, with 1 crash occurring in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (1)* *Bicyclist Ride Through – Signalized Intersection (2)* *Motorist Drive Out – Sign-Controlled Intersection (2)* *Unknown (1)*
				Total	**6**	*Bicyclist drug and alcohol involvement for 1 crash*
27	Phoenix	24th Street	SR 202	**K** **A** **B** **C** **O**	1 0 4 0 1	The majority of the crashes occurred in Daylight conditions and 1 crash occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (2)* *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Left Turn – Opposite Direction (1)* *Motorist Right Turn – Opposite Direction (1)* *Unknown (1)*
				Total	**6**	*Bicyclist drug and alcohol involvement for 1 crash*
28	Phoenix	McDowell Road	SR 51	**K** **A** **B** **C** **O**	0 0 2 1 0	2 crashes occurred in Daylight conditions and 1 crash occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Motorist Drive Through – Signalized Intersection (1)* *Motorist Right Turn – Same Direction (1)*
				Total	**3**	
29	Phoenix	Thomas Road	SR 51	**K** **A** **B** **C** **O**	0 0 3 1 0	All crashes occurred in Daylight conditions; crash types included: *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Drive Out – Signalized Intersection (1)* *Motorist Drive Out – Sign-Controlled Intersection (1)* *Unknown (1)*
				Total	**4**	
30	Phoenix	Indian School Road	SR 51	**K** **A** **B** **C** **O**	0 1 3 1 0	3 crashes occurred in Daylight conditions and 2 crashes occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (1)* *Bicyclist Ride Through – Signalized Intersection (2)* *Motorist Drive Out – Sign-Controlled Intersection (1)* *Unknown (1)* **Average of approximately 289 bicycles per day (273 bicycles crossing I-10 ramps and 16 bicycles crossing Indian School Road)**
				Total	**5**	

Table 12. High-Crash Intersection, Severity and Crash Types (cont.)

Intersection ID	Area	On Road	Intersecting Road	Bicycle Crashes		Description
				Severity	Quantity	
31	Phoenix	7th Street	I-10/Portland Street	K A B C O	0 0 1 1 1	2 crashes occurred in Daylight conditions and 1 crash occurred in Dark (Lighted) conditions; crash types included: *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Drive Out – Sign-Controlled Intersection (1)* *Motorist Right Turn – Opposite Direction (1)*
				Total	**3**	
32	Phoenix	Grand Avenue	McDowell Road/ 19th Avenue	K A B C O	1 2 0 1 0	2 crashes occurred in Daylight conditions, 1 crash occurred in Dark (Lighted) conditions, and 1 crash occurred in Dawn conditions; crash types included: *Bicyclist Failed to Clear – Multiple Threat (1)* *Bicyclist Ride Out – Signalized Intersection (1)* *Bicyclist Ride Through – Signalized Intersection (1)* *Unknown (1)*
				Total	**4**	*Bicyclist drug and alcohol involvement for 1 crash*
33	Phoenix	Grand Avenue	27th Avenue/ Thomas Road	K A B C O	0 1 0 2 1	3 crashes occurred in Daylight conditions and 1 crash occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Midblock – Unknown (1)* *Bicyclist Ride Out – Signalized Intersection (2)* *Bicyclist Ride Through – Signalized Intersection (1)*
				Total	**4**	
35	Avondale	Dysart Road	I-10	K A B C O	0 1 2 2 0	2 crashes occurred in Daylight conditions, 2 crashes occurred in Dark (Lighted) conditions, and 1 crash occurred in Dawn conditions; crash types included: *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Right Turn – Opposite Direction (1)* *Unknown (2)* *Unknown Approach Paths (1)*
				Total	**5**	**Approx. 348 bicycles per day (339 bicycles crossing I-10 ramps, 9 bicycles crossing Dysart Rd)**
36	Phoenix	Camelback Road	I-17	K A B C O	0 0 8 1 1	6 crashes occurred in Daylight conditions and 4 crashes occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (3)* *Bicyclist Ride Through – Signalized Intersection (1)* *Crossing Paths – Midblock – Other/Unknown (1)* *Motorist Drive Through – Signalized Intersection (1)* *Motorist Right Turn – Same Direction (1)* *Unknown (3)*
				Total	**10**	*Bicyclist drug and alcohol involvement for 1 crash*

Table 12. High-Crash Intersection, Severity and Crash Types (cont.)

Intersection ID	Area	On Road	Intersecting Road	Bicycle Crashes		Description
				Severity	Quantity	
37	Phoenix	Bethany Home Road	I-17	K A B C O	0 2 4 4 0	6 crashes occurred in Daylight conditions and 4 crashes occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Commercial Driveway/Alley (1)* *Bicyclist Ride Out – Signalized Intersection (1)* *Bicyclist Ride Through – Signalized Intersection (3)* *Crossing Paths – Uncontrolled Intersection (1)* *Motorist Drive Out – Commercial Driveway/Alley (1)* *Motorist Drive Out – Right-Turn-on-Red (2)* *Unknown (1)* **Approx. 174 bicycles per day (35 vehicles on I-17 SB ramps and 139 vehicles crossing I-17 SB ramps)**
				Total	**10**	
38	Phoenix	Glendale Avenue	I-17	K A B C O	1 0 2 5 1	2 crashes occurred in Daylight conditions and 7 crashes occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (3)* *Bicyclist Ride Through – Signalized Intersection (1)* *Crossing Paths – Midblock – Other/Unknown (1)* *Motorist Right Turn – Opposite Direction (1)* *Unknown (2)* *Unknown Location (1)* *Bicyclist drug and alcohol involvement for 2 crashes*
				Total	**9**	
39	Phoenix	Northern Avenue	I-17	K A B C O	0 1 3 5 0	5 crashes occurred in Daylight conditions and 4 crashes occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (3)* *Bicyclist Ride Through – Signalized Intersection (2)* *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Left Turn – Same Direction (1)* *Signalized Intersection – Other/Unknown (1)* *Unknown (1)*
				Total	**9**	
40	Phoenix	Dunlap Avenue	I-17	K A B C O	0 2 4 2 0	The majority of the crashes occurred in Daylight conditions and 1 crash occurred in Dusk conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (3)* *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Drive Through – Signalized Intersection (1)* *Motorist Right Turn – Opposite Direction (2)* *Unknown (1)*
				Total	**8**	
41	Phoenix	Peoria Avenue	I-17	K A B C O	0 1 2 2 0	All crashes occurred in Daylight conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (1)* *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Right Turn – Opposite Direction (2)* *Unknown (1)*
				Total	**5**	

Table 12. High-Crash Intersection, Severity and Crash Types (cont.)

Intersection ID	Area	On Road	Intersecting Road	Bicycle Crashes		Description
				Severity	Quantity	
43	Phoenix	Greenway Road	I-17	**K** **A** **B** **C** **O**	0 0 1 2 1	3 crashes occurred in Daylight conditions and 1 crash occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Through – Signalized Intersection (1)* *Bicyclist Ride Through – Sign-Controlled Intersection (1)* *Motorist Drive Through – Signalized Intersection (1)* *Unknown (1)*
				Total	**4**	
44	Phoenix	Bell Road	I-17	**K** **A** **B** **C** **O**	0 1 1 2 0	3 crashes occurred in Daylight conditions and 1 crash occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Commercial Driveway/Alley (1)* *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Drive Out – Right-Turn-on-Red (1)* *Non-Roadway (1)*
				Total	**4**	
45	Phoenix	Union Hills Drive	I-17	**K** **A** **B** **C** **O**	0 0 4 0 1	4 crashes occurred in Daylight conditions and 1 crash occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Lost Control – Oversteering (1)* *Motorist Drive Out – Right-Turn-on-Red (2)* *Motorist Drive Out – Signalized Intersection (1)* *Motorist Drive Through – Signalized Intersection (1)*
				Total	**5**	
46	Phoenix	Deer Valley Road	I-17	**K** **A** **B** **C** **O**	0 0 3 0 0	All crashes occurred in Daylight conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (1)* *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Drive Through – Signalized Intersection (1)*
				Total	**3**	
47	Peoria	Thunderbird Road	SR 101	**K** **A** **B** **C** **O**	0 0 1 2 0	All crashes occurred in Daylight conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (2)* *Unknown (1)*
				Total	**3**	

Table 12. High-Crash Intersection, Severity and Crash Types (cont.)

Intersection ID	Area	On Road	Intersecting Road	Bicycle Crashes		Description
				Severity	Quantity	
49	Phoenix	McDowell Road	SR 143	K A B C O	0 1 2 1 1	3 crashes occurred in Daylight conditions and 2 crashes occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (1)* *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Drive Out – Signalized Intersection (1)* *Motorist Left Turn – Same Direction (1)* *Bicyclist drug and alcohol involvement for 1 crash*
				Total	**5**	
50	Phoenix	Bell Road	SR 51	K A B C O	0 0 3 1 0	3 crashes occurred in Daylight conditions and 1 crash occurred in Dusk conditions; crash types included: *Motorist Right Turn – Opposite Direction (1)* *Unknown (3)*
				Total	**4**	
51	Phoenix	Grand Avenue	35th Avenue	K A B C O	1 1 1 0 0	1 crash occurred in Daylight conditions and 2 crashes occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Midblock – Unknown (1)* *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Right Turn – Same Direction (1);* *Bicyclist drug and alcohol involvement for 1 crash*
				Total	**3**	
52	Glendale	Grand Avenue	51st Avenue/ Bethany Home Road	K A B C O	0 0 0 2 1	2 crashes occurred in Daylight conditions and 1 crash occurred in Dark (Lighted) conditions; crash types included: *Motorist Overtaking – Misjudged Space (1)* *Motorist Right Turn – Opposite Direction (1)* *Motorist Right Turn – Same Direction (1)*
				Total	**3**	
53	Peoria	Grand Avenue	Peoria Avenue	K A B C O	0 0 2 2 0	3 crashes occurred in Daylight conditions and 1 crash occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (1)* *Motorist Right Turn – Opposite Direction (1)* *Motorist Right Turn – Same Direction (1)* *Non-Roadway (1)*
				Total	**4**	

Table 12. High-Crash Intersection, Severity and Crash Types (cont.)

Intersection ID	Area	On Road	Intersecting Road	Bicycle Crashes		Description
				Severity	Quantity	
54	Kingman	Stockton Hill Road	I-40	**K** **A** **B** **C** **O** **Total**	0 1 2 0 2 **5**	4 crashes occurred in Daylight conditions and 1 crash occurred in Dusk conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (1)* *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Drive Out – Signalized Intersection (1)* *Motorist Overtaking – Bicyclist Swerved (1)* *Motorist Right Turn – Opposite Direction (1)*
55	Flagstaff	SR 89A (Milton Road)	University Drive	**K** **A** **B** **C** **O** **Total**	0 0 0 2 1 **3**	All crashes occurred in Daylight conditions; crash types included: *Bicyclist Lost Control – Other/Unknown (1)* *Bicyclist Ride Out – Commercial Driveway/Alley (1)* *Motorist Drive Through – Signalized Intersection (1)*
56	Flagstaff	Route 66 (Santa Fe Avenue)	Humphreys Street (US 180)	**K** **A** **B** **C** **O** **Total**	0 0 0 5 1 **6**	All crashes occurred in Daylight conditions; crash types included: *Bicyclist Overtaking – Passing on Right (1)* *Motorist Left Turn – Opposite Direction (1)* *Motorist Right Turn – Same Direction (4)*
57	Flagstaff	Route 66	Ponderosa Parkway	**K** **A** **B** **C** **O** **Total**	0 2 7 0 0 **9**	The majority of the crashes occurred in Daylight conditions, with 1 crash occurring in Dark (Lighted) conditions and 1 crash occurring in Dark (Not Lighted) conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (2)* *Bicyclist Ride Through – Signalized Intersection (2)* *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Drive Out – Signalized Intersection (1)* *Motorist Right Turn – Same Direction (1)* *Unknown (2)* *Bicyclist drug and alcohol involvement for 2 crashes*

Table 13. High-Crash Segment, Severity and Crash Types

Segment ID	Area	Highway	From	To	Length (mi)	Bicycle Crashes		Description
						Severity	Quantity	
58	Sierra Vista	SR 92	Calle Mercancia	SR 90	1.79	**K** **A** **B** **C** **O**	0 0 0 6 4	All crashes occurred in Daylight conditions; crash types included: *Bicyclist Failed to Clear – Multiple Threat (1)* *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Right Turn – Same Direction (2)* *Non-Roadway (4) and Unknown (1)* **Average of approximately 63 bicycles per day (38 bicycles on SR 92 and 25 vehicles crossing SR 92 at SR 90)**
						Total	**10**	
59	Tucson	SR 86	Mission Road	Holiday Boulevard	0.50	**K** **A** **B** **C** **O**	0 2 3 0 0	3 crashes occurred in Daylight conditions and 2 crashes occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Left Turn – Opposite Direction (1)* *Crossing Paths – Midblock – Other/Unknown (1)* *Motorist Left Turn – Opposite Direction (2)* *Motorist Left Turn – Same Direction (1)*
						Total	**5**	
60	Tucson	SR 77	Flowing Wells Road	Oracle Road	1.79	**K** **A** **B** **C** **O**	1 0 6 1 0	6 crashes occurred in Daylight conditions and 2 crashes occurred in Dusk conditions; crash types included: *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Bicyclist Right Turn – Same Direction (1)* *Motorist Overtaking – Other/Unknown (1)* *Motorist Right Turn – Opposite Direction (1)* *Non-Roadway (1) and Unknown (3)* *Bicyclist drug and alcohol involvement for 3 crashes*
						Total	**8**	
61	Tucson	SR 77	Fort Lowell Road	River Road	2.25	**K** **A** **B** **C** **O**	0 6 7 10 9	A majority of crashes occurred in Daylight conditions; 4 crashes occurred in Dark (Lighted) conditions, 2 crashes in Dusk conditions; crash types: *Bicyclist Left Turn – Same Direction (1)* *Bicyclist Ride Out – Commercial Driveway/Alley (3)* *Bicyclist Ride Through – Signalized Intersection (1)* *Crossing Paths – Midblock – Other/Unknown (1)* *Crossing Paths – Uncontrolled Intersection (1) | Head-On – Bicyclist (1)* *Motorist Drive Out – Commercial Driveway/Alley (2)* *Motorist Drive Out – Right-Turn-on-Red (3)* *Motorist Drive Through – Sign-Controlled Intersection (1)* *Motorist Left Turn – Opposite Direction (5)* *Motorist Overtaking – Bicyclist Swerved (1)* *Motorist Right Turn – Opposite Direction (3)* *Motorist Right Turn – Same Direction (6) | Non-Roadway (1)* *Signalized Intersection – Other/Unknown (1) | Unknown Approach Paths (1)* *Bicyclist drug and alcohol involvement for 1 crash* **Average of 113 bicycles per day (80 bicycles on SR 77 and 33 bicycles crossing SR 77)**
						Total	**32**	

Table 13. High-Crash Segment, Severity and Crash Types (cont.)

Segment ID	Area	Highway	From	To	Length (mi)	Bicycle Crashes		Description
						Severity	Quantity	
62	Tucson	SR 77	River Road	Ina Road	2.80	K A B C O	0 1 6 2 2	The majority of the crashes occurred in Daylight conditions, with 2 crashes occurring in Dark (Lighted) conditions and 2 crashes occurring in Dark (Not Lighted) conditions; crash types included: *Bicyclist Ride Out – Commercial Driveway/Alley (1)* *Bicyclist Ride Through – Sign-Controlled Intersection (1)* *Crossing Paths – Uncontrolled Intersection (1)* *Motorist Drive Out – Commercial Driveway/Alley (1)* *Motorist Drive Out – Signalized Intersection (1)* *Motorist Drive Out – Sign-Controlled Intersection (1)* *Motorist Drive Through – Sign-Controlled Intersection (1)* *Motorist Right Turn – Opposite Direction (1)* *Motorist Right Turn – Same Direction (2)* *Signalized Intersection – Other/Unknown (1)* *Bicyclist drug and alcohol involvement for 1 crash* **Average of approximately 168 bicycles per day (75 bicycles on SR 77 and 93 bicycles crossing SR 77 at River Road)**
						Total	**11**	
63	Oro Valley	SR 77	Ina Road	El Conquistador	3.62	K A B C O	0 2 3 4 4	The majority of the crashes occurred in Daylight conditions, with 4 crashes occurring in Dark (Lighted) conditions and 1 crash occurring in Dark (Not Lighted) conditions; crash types included: *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Bicyclist Ride Through – Signalized Intersection (1)* *Crossing Paths – Midblock – Other/Unknown (1)* *Motorist Drive Out – Residential Driveway (1)* *Motorist Drive Through – Sign-Controlled Intersection (1)* *Motorist Left Turn – Opposite Direction (3)* *Motorist Right Turn – Opposite Direction (1)* *Motorist Right Turn – Same Direction (2)* *Unknown (1)* *Unusual Circumstances (1)*
						Total	**13**	
64	Catalina	SR 77	East Golder Ranch Drive	Mainsail Boulevard	1.00	K A B C O	0 0 3 1 0	All crashes took place in Daylight conditions; crash types included: *Motorist Drive Out – Residential Driveway (1)* *Motorist Overtaking – Undetected Bicyclist (1)* *Unknown (2)*
						Total	**4**	

Table 13. High-Crash Segment, Severity and Crash Types (cont.)

Segment ID	Area	Highway	From	To	Length (mi)	Bicycle Crashes		Description
						Severity	Quantity	
65	Casa Grande	SR 387	O'Neil Drive	Florence Boulevard	1.26	K A B C O	0 0 4 2 1	5 crashes occurred in Daylight conditions and 2 crashes occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Commercial Driveway/Alley (1)* *Bicyclist Ride Out – Residential Driveway (1)* *Bicyclist Ride Out – Signalized Intersection (1)* *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Motorist Drive Out – Signalized Intersection (1)* *Motorist Left Turn – Opposite Direction (1)* *Non-Roadway (1)*
						Total	**7**	
66	Maricopa	SR 347	Edwards Avenue	Cobblestone Farms Drive	2.03	K A B C O	0 1 1 4 0	All crashes occurred in Daylight conditions; crash types included: *Bicyclist Ride Out – Commercial Driveway/Alley (1)* *Bicyclist Ride Through – Sign-Controlled Intersection (1)* *Motorist Drive Out – Commercial Driveway/Alley (2)* *Motorist Left Turn – Opposite Direction (1)* *Motorist Left Turn – Same Direction (1)*
						Total	**6**	
67	Mesa	SR 87	Baseline Road	Campbell Road	1.54	K A B C O	0 1 5 0 1	All crashes occurred in Daylight conditions; crash types included: *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Drive Through – Sign-Controlled Intersection (1)* *Motorist Right Turn – Opposite Direction (1)* *Non-Roadway (1)* *Unknown (1)*
						Total	**7**	
68	Apache Junction	SR 88	US 60	Apache Trail	1.75	K A B C O	0 1 0 5 1	The majority of the crashes occurred in Daylight conditions, with 1 crash occurring in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (1)* *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Drive Out – Sign-Controlled Intersection (1)* *Motorist Turning Error – Right Turn (1)* *Unknown (1)*
						Total	**7**	

Table 13. High-Crash Segment, Severity and Crash Types (cont.)

Segment ID	Area	Highway	From	To	Length (mi)	Bicycle Crashes		Description
						Severity	Quantity	
69	Apache Junction	US 60X	Meridian Road	Sossaman Road	5.02	K A B C O	1 1 9 3 6	The majority of the crashes occurred in Daylight conditions, with 4 crashes occurring in Dark (Lighted) conditions and 3 crashes occurring in Dark (Not Lighted) conditions; crash types included: *Bicyclist Overtaking – Parked Vehicle (1)* *Bicyclist Ride Out – Commercial Driveway/Alley (1)* *Bicyclist Ride Out – Residential Driveway (1)* *Bicyclist Ride Out – Sign-Controlled Intersection (2)* *Bicyclist Ride Through – Signalized Intersection (2)* *Head-On – Bicyclist (1)* *Motorist Drive Out – Sign-Controlled Intersection (1)* *Motorist Overtaking – Misjudged Space (1)* *Motorist Overtaking – Undetected Bicyclist (1)* *Non-Roadway (1)* *Sign-Controlled Intersection – Other/Unknown (1)* *Unknown (6)* *Unknown Location (2)*
						Total	**20**	*Bicyclist drug and alcohol involvement for 1 crash*
70	Coolidge	SR 87	Coolidge Avenue	SR 87	2.00	K A B C O	0 0 1 3 0	2 crashes occurred in Daylight conditions, 1 crash occurred in Dark (Not Lighted) conditions, and 1 crash occurred in Dusk conditions; crash types included: *Bicyclist Failed to Clear – Trapped (1)* *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Motorist Right Turn – Opposite Direction (1)* *Unknown Location (1)*
						Total	**4**	*Bicyclist drug and alcohol involvement for 1 crash*
71	Sun City	Grand Avenue	107th Avenue	Bell Road	4.40	K A B C O	0 2 3 3 0	5 crashes occurred in Daylight conditions and 3 crashes occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Motorist Drive Out – Commercial Driveway/Alley (1)* *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Drive Through – Sign-Controlled Intersection (1)* *Motorist Right Turn – Opposite Direction (1)* *Parallel Paths – Other/Unknown (1)* *Unknown (1)*
						Total	**8**	*Unknown Location (1)*

Table 13. High-Crash Segment, Severity and Crash Types (cont.)

Segment ID	Area	Highway	From	To	Length (mi)	Bicycle Crashes		Description
						Severity	Quantity	
72	Payson	SR 87	Green Valley Parkway	Forest Drive	2.12	K A B C O	0 0 4 5 1	All crashes occurred in Daylight conditions; crash types included: *Bicyclist Ride Out – Commercial Driveway/Alley (1)* *Bicyclist Ride Through – Signalized Intersection (1)* *Head-On – Bicyclist (1)* *Motorist Drive Out – Commercial Driveway/Alley (1)* *Motorist Drive Out – Residential Driveway (1)* *Motorist Drive Out – Sign-Controlled Intersection (1)* *Motorist Overtaking – Misjudged Space (1)* *Motorist Right Turn – Same Direction (1)* *Motorist Right-Turn-on-Red – Opposite Direction (1)* *Unknown (1)*
						Total	**10**	*Bicyclist drug and alcohol involvement for 1 crash*
73	Pinetop-Lakeside	SR 260	Woodland Lake Road	Niels Hansen Drive	3.18	K A B C O	0 1 1 2 1	4 crashes occurred in Daylight conditions and 1 crash occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Commercial Driveway/Alley (1)* *Motorist Overtaking – Bicyclist Swerved (1)* *Motorist Overtaking – Misjudged Space (1)* *Motorist Right Turn – Opposite Direction (1)* *Unknown Location (1)*
						Total	**5**	
74	Show Low	SR 260	Webb Drive	US 60	4.46	K A B C O	0 1 2 1 1	All crashes occurred in Daylight conditions; crash types included: *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Crossing Paths – Midblock – Other/Unknown (1)* *Motorist Drive Out – Commercial Driveway/Alley (1)* *Motorist Right Turn – Same Direction (2)*
						Total	**5**	

Table 13. High-Crash Segment, Severity and Crash Types (cont.)

Segment ID	Area	Highway	From	To	Length (mi)	Bicycle Crashes		Description
						Severity	Quantity	
75	Show Low	US 60	Clark Road	SR 260	1.97	K A B C O	0 0 2 0 1	All crashes took place in Daylight conditions; crash types included: *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Motorist Drive Out – Commercial Driveway/Alley (1)* *Motorist Right Turn – Opposite Direction (1)*
						Total	**3**	
76	Kingman	Andy Devine Avenue	I-40	Thompson Avenue	3.50	K A B C O	1 0 2 1 0	3 crashes occurred in Daylight conditions and 1 crash occurred in Dusk conditions; crash types included: *Bicyclist Left Turn – Opposite Direction (1)* *Bicyclist Ride Out – Commercial Driveway/Alley (1)* *Non-Roadway (1)* *Play Vehicle-Related (1)*
						Total	**4**	
77	Golden Valley	SR 68	Bowie Road	Colorado Road	4.77	K A B C O	0 0 2 1 0	2 crashes occurred in Dark (Not Lighted) conditions and 1 crash occurred in Dusk conditions; crash types included: *Motorist Drive Through – Sign-Controlled Intersection (1)* *Motorist Right Turn – Same Direction (1)* *Parallel Paths – Other/Unknown (1)*
						Total	**3**	
78	Bullhead City	SR 95	Bullhead Parkway	Hancock Road	5.33	K A B C O	1 1 2 3 1	The majority of the crashes occurred in Daylight conditions, with 1 crash occurring in Dark (Lighted) conditions; crash types included: *Crossing Paths – Midblock – Other/Unknown (1)* *Motorist Drive Out – Residential Driveway (2)* *Motorist Drive Out – Sign-Controlled Intersection (1)* *Motorist Drive Through – Signalized Intersection (1)* *Motorist Left Turn – Same Direction (1)* *Motorist Overtaking – Undetected Bicyclist (1)* *Unknown (1)* *Bicyclist drug and alcohol involvement for 1 crash*
						Total	**8**	
79	Lake Havasu City	SR 95	Mulberry Avenue	Lake Shore Boulevard	13.85	K A B C O	2 2 0 0 0	3 crashes occurred in Daylight conditions and 1 crash occurred in Dark (Not Lighted) conditions; crash types included: *Bicyclist Left Turn – Same Direction (1)* *Crossing Paths – Midblock – Other/Unknown (1)* *Motorist Overtaking – Misjudged Space (1)* *Unknown (1)*
						Total	**4**	

Table 13. High-Crash Segment, Severity and Crash Types (cont.)

Segment ID	Area	Highway	From	To	Length (mi)	Bicycle Crashes		Description
						Severity	Quantity	
80	San Luis	US 95	Juan Sanchez Boulevard	Urtuzuastegui Street	0.51	K A B C O	0 0 0 3 2	4 crashes occurred in Daylight conditions and 1 crash occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Left Turn – Same Direction (1)* *Motorist Drive Out – Sign-Controlled Intersection (2)* *Motorist Drive Through – Sign-Controlled Intersection (1)* *Unknown (1)*
						Total	**5**	
81	Cottonwood	SR 260	SR 89A (Cottonwood Street)	Cove Parkway	0.65	K A B C O	0 0 3 0 1	All crashes occurred in Daylight conditions; crash types included: *Motorist Drive Out – Residential Driveway (1)* *Motorist Left Turn – Opposite Direction (1)* *Motorist Right Turn – Opposite Direction (1)* *Unknown (1)*
						Total	**4**	
82	Sedona	SR 89A	Arroyo Pinon Drive	SR 179	3.11	K A B C O	0 2 7 3 3	The majority of the crashes occurred in Daylight conditions, with 1 crash occurring in Dusk conditions and 1 crash occurring in Dark (Lighted) conditions; crash types included: *Bicyclist Overtaking – Passing on Right (1)* *Bicyclist Ride Out – Commercial Driveway/Alley (2)* *Bicyclist Ride Out – Signalized Intersection (1)* *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Motorist Drive Out – Commercial Driveway/Alley (1)* *Motorist Drive Through – Sign-Controlled Intersection (1)* *Motorist Overtaking – Misjudged Space (1)* *Motorist Overtaking – Other/ Unknown (1)* *Motorist Right Turn – Same Direction (3)* *Non-Roadway (2)* *Unknown (1)*
						Total	**15**	*Bicyclist drug and alcohol involvement for 1 crash*

Table 13. High-Crash Segment, Severity and Crash Types (cont.)

Segment ID	Area	Highway	From	To	Length (mi)	Bicycle Crashes		Description
						Severity	Quantity	
83	Flagstaff	SR 89A (Milton Road)	McConnell Drive	West University Drive	0.80	K A B C O	0 0 0 3 1	3 crashes occurred in Daylight conditions and 1 crash occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Drive Out – Commercial Driveway/Alley (1)* *Motorist Left Turn – Opposite Direction (1)*
						Total	**4**	
84	Flagstaff	SR 89A (Milton Road)	University Avenue	State Business 40	0.70	K A B C O	0 1 5 6 3	The majority of the crashes occurred in Daylight conditions and 4 crashes occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Commercial Driveway/Alley (2)* *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Motorist Drive Out – Commercial Driveway/Alley (4)* *Motorist Drive Out – Residential Driveway (1)* *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Drive Out – Sign-Controlled Intersection (1)* *Motorist Left Turn – Opposite Direction (1)* *Motorist Right Turn – Opposite Direction (1)* *Motorist Right Turn – Same Direction (1)* *Unknown (2)* *Bicyclist drug and alcohol involvement for 1 crash* **Average of 378 bicycles on Milton Road and 201 bicycles crossing Milton Road at the Milton Road/University Drive intersection**
						Total	**15**	
85	Flagstaff	State Business 40	Thompson Street	Milton Road	1.04	K A B C O	0 1 3 1 4	5 crashes occurred in Daylight conditions and 4 crashes occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Drive Out – Commercial Driveway/Alley (1)* *Motorist Left Turn – Opposite Direction (2)* *Motorist Right Turn – Opposite Direction (2)* *Motorist Right Turn – Same Direction (1)* *Unknown Location (1)*
						Total	**9**	

Table 13. High-Crash Segment, Severity and Crash Types (cont.)

Segment ID	Area	Highway	From	To	Length (mi)	Bicycle Crashes		Description
						Severity	Quantity	
86	Flagstaff	SR 89A	State Business 40	Elden Street	1.01	K A B C O	0 1 12 6 10	The majority of the crashes occurred in Daylight conditions, 3 crashes occurred in Dusk conditions, and 8 crashes occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (2)* *Bicyclist Ride Through – Signalized Intersection (3)* *Bicyclist Ride Through – Sign-Controlled Intersection (1)* *Crossing Paths – Uncontrolled Intersection (1)* *Motorist Drive Out – Commercial Driveway/Alley (1)* *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Drive Out – Signalized Intersection (1)* *Motorist Drive Out – Sign-Controlled Intersection (3)* *Motorist Left Turn – Opposite Direction (1)* *Motorist Left Turn – Same Direction (1)* *Motorist Overtaking – Other/Unknown (1)* *Motorist Right Turn – Opposite Direction (2)* *Motorist Right Turn – Same Direction (7)* *Motorist Turn/Merge – Other/Unknown (1)* *Non-Roadway (3)*
						Total	**29**	*Bicyclist drug and alcohol involvement for 1 crash*
87	Flagstaff	US 180 (Humphreys Street)	Route 66	Columbus Avenue	0.61	K A B C O	0 1 3 0 1	2 crashes occurred in Daylight conditions and 3 crashes occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (1)* *Motorist Drive Out – Sign-Controlled Intersection (1)* *Motorist Right Turn – Same Direction (1)* *Non-Roadway (1)* *Unknown (1)* *Bicyclist drug and alcohol involvement for 1 crash* **Average of approximately 325 bicycles per day (67 bicycles on US 180 and 258 bicycles crossing US 180 at Birch Street)**
						Total	**5**	

Table 13. High-Crash Segment, Severity and Crash Types (cont.)

Segment ID	Area	Highway	From	To	Length (mi)	Bicycle Crashes		Description
						Severity	Quantity	
88	Flagstaff	US 180	Humphreys Street	Meade Lane	0.83	K A B C O	0 4 5 2 1	The majority of the crashes occurred in Daylight conditions, with 1 crash occurring in Dark (Not Lighted) conditions and 1 crash occurring in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Sign-Controlled Intersection (4)* *Motorist Drive Out – Sign-Controlled Intersection (1)* *Motorist Left Turn – Opposite Direction (2)* *Non-Roadway (2)* *Unknown (2)* *Unknown Location (1)* *Bicyclist drug and alcohol involvement for 1 crash* **Average of approximately 134 bicycles per day (83 bicycles on US 180 and 51 bicycles crossing US 180 at Forest Avenue)**
						Total	**12**	
89	Flagstaff	SB 40	Ponderosa Parkway	Fanning Drive	2.40	K A B C O	0 0 6 3 3	5 crashes occurred in Daylight conditions, 2 crashes occurred in Dusk conditions, 1 crash occurred in Dark (Not Lighted) conditions, and 4 crashes occurred in Dark (Lighted) for conditions; crash types included: *Bicyclist Left Turn – Same Direction (1)* *Bicyclist Ride Out – Commercial Driveway/Alley (2)* *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Drive Out – Commercial Driveway/Alley (1)* *Motorist Drive Out – Signalized Intersection (1)* *Motorist Drive Out – Sign-Controlled Intersection (2)* *Motorist Right Turn – Opposite Direction (2)* *Motorist Right Turn – Same Direction (1)* *Unknown (1)* *Bicyclist drug and alcohol involvement for 2 crashes*
						Total	**12**	

5. BICYCLE CRASH-POTENTIAL ASSESSMENT

A key element of improving bicyclist safety in Arizona is to proactively identify segments where bicycle improvements are needed, leading to projects to address the need. This chapter introduces an assessment methodology to identify segments where the potential for crashes is higher, due to geometric and environmental conditions. The purpose of the assessment is to assist ADOT to identify state highway segments where investment can help to lower the potential for bicycle crashes.

The proposed methodology is similar to a process used in the 2017 *ADOT Pedestrian Safety Action Plan*. However, the exercise was limited to segments (rather than intersections) because of the randomness and infrequent number of bicycle crashes at individual intersections or interchanges, and bicyclists, unlike pedestrians, are required to follow the "rules of the road" when operating on a roadway, and most bicycle trips are typically several miles. The assessment methodology represents an approach through which higher-crash potential segments can be identified and addressed before bicyclist/motor-vehicle crashes occur.

Methodology

The methodology considers factors that are frequently identified as contributing factors or environmental/facility conditions that are common to bicycle crashes on the SHS. These factors are associated with the roadway facilities' existing conditions that relate to the absence of sufficient bicycle accommodation and bicycle demand as data is available. Bicycle demand can be estimated based on the facilities' proximity to specific land uses such as institutional areas that include schools, colleges, or universities, or being part of a known popular cycling route or corridor. Strava is a tool that can be used to help identify the popularity of cycling routes and corridors, although the Strava app data may be used more by recreational bicyclists.

Application of the methodology occurred through a **GIS-based screening** that utilized available statewide GIS data to identify and screen potential SHS locations where bicycle facilities should be considered, consistent with an established set of crash potential criteria. *Note that interstate freeways were excluded from the screening as the intent of this application was to identify and direct resources to roadways where they will be the most effective.*

Table 14 summarizes the factors and scoring for the assessment process for segments along the SHS.

Table 14. Crash Potential Factors

Factor	Score
Operating Environment/Width of Roadway	
6-Lane Highway	6
4- or 5-Lane Undivided Highway	3
2- or 3-Lane Undivided Highway	2
2- or 3- or 4-Lane Divided Highway	1

Factor	Score
Posted Travel Speed	
50 mph or greater	6
35-45 mph	4
25-30 mph	2
20 mph or less	0
Paved Effective Shoulder Width/ Wide Curb Lane	
0-4 feet	6
4-8 feet	0
Bicyclist Exposure to Vehicles	
>7,500 ADT	6
2,500-7,500 ADT	3
<2,500 ADT	0
Designated U.S. Bicycle Route (USBR) 90*	
Yes	3
No	0
Environment Type	
Urban	6
Rural	3

**The USBR is not a crash potential factor, it is used to gain higher priority for improvements with that designation.*

Screening Results

A scale was developed based on the distribution of the overall scores assigned to the SHS. The scale is defined in **Table 15**. The visual results of the GIS screening are illustrated in **Figure 16.** Due to the geo-processing of the GIS data, a segment defined in the table commonly consists of multiple sub-segments; thus, an average was taken from each of the sub-segments within the defined segment.

Table 15. Bicyclist/Motor-Vehicle Crash Potential Assessment Levels

SCALE	CRASH POTENTIAL LEVEL
≥ 20	Higher Crash Potential
14 - 19	Medium Crash Potential
≤ 13	Lower Crash Potential

Table 16 lists the resulting higher-crash potential segments identified through the assessment and screening process. The higher-crash potential segments are shown in **Figure 17** (on page 62). **Table 17** provides a summary of each segment.

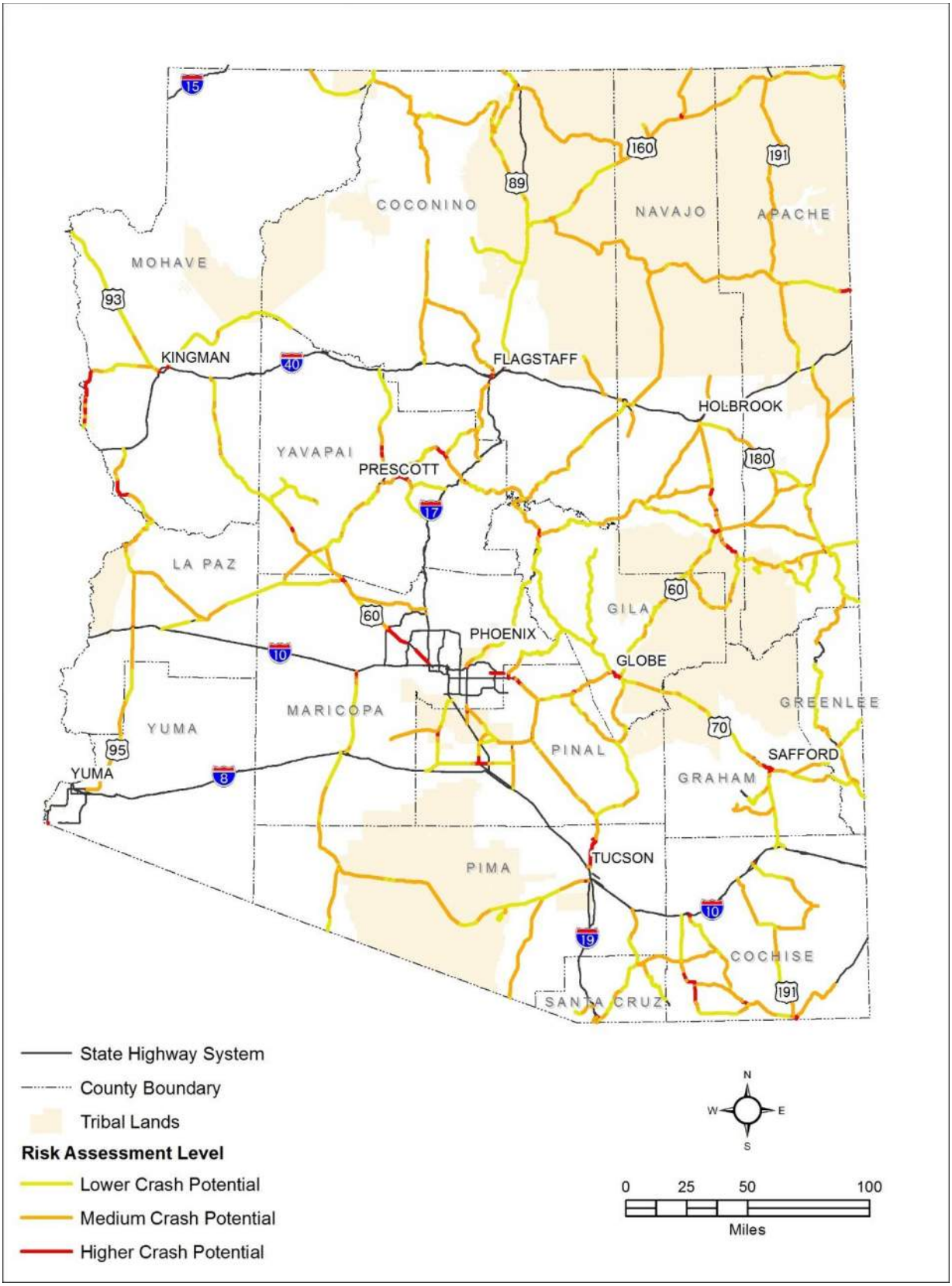


Figure 16. Step 1 Crash Potential Assessment Results

Table 16. High-Crash Potential Locations

ID	Segment	Area	Beginning Milepost	Ending Milepost	Length (miles)	Average Score
1	SR 68	Bullhead City	Bullhead Parkway (MP 0)	MP 4.0	4.5	20
2	SR 95	Bullhead City	MP 240.7	Bullhead Parkway (MP 250)	9.3	24
3	SR 95	Bullhead City	MP 234.4	MP 240.7	6.3	23
4	SR 95	South of Bullhead City	MP 227.3	MP 234.4	7.1	20
5	SR 95	Lake Havasu City	MP 177	MP 187.5	10.5	26
6	US 93	Kingman	MP 70	MP 71	1.0	23
7	US 93	Mohave County	MP 161	MP 174	13.0	21
8	SR 69	Prescott Valley	MP 282	MP 296	14.0	21
9	SR 89A	Cottonwood	MP 349	MP 353.1	4.1	24
10	SR 260	Cottonwood	MP 206.48	MP 209	2.5	25
11	SR 87	Payson	MP 251	MP 254	3.0	25
12	SR 260	East of Star Valley	MP 257	MP 260	3.0	20
13	US 60	Globe-Miami	MP 247	MP 253	6.0	24
14	US 60	Surprise-El Mirage	MP 138.5	MP 149.0	10.5	25
15	US 60	Peoria/Glendale	MP 149.0	MP 161.7	12.7	26
16	US 60X	Maricopa County	MP 189	MP 194	5.0	29
17	SR 88	Apache Junction	MP 194	MP 196.1	2.1	24
18	US 60	Apache Junction	MP 199	MP 203	4.0	25
19	SR 347	Maricopa	MP 172.5	MP 174.5	2.0	25
20	SR 387	Casa Grande	Florence Boulevard	MP 2.2	2.2	25
21	SR 79	Florence	MP 134	MP 136.4	2.4	20
22	US 70	Safford-Thatcher	MP 331	MP 342	11.0	23
23	US 191	Safford	MP 118.8	MP 121	2.2	24
24	US 90	Sierra Vista	MP 317.2	MP 321.2	4.0	23
25	SR 92	Sierra Vista	MP 321.2	MP 328.5	7.3	23
26	SR 80	Bisbee	MP 340	MP 342	2.0	21
27	SR 260	Pinetop-Lakeside	MP 345	MP 355	10.0	21
28	SR 260	Show Low	MP 340.1	MP 342.2	2.1	23
29	SR 77	Snowflake-Taylor	MP 357	MP 360	3.0	23
30	SR 77	Tucson	MP 69.5	MP 75	5.5	24
31	SR 77	Tucson-Oro Valley	MP 75	MP 81.8	6.8	24

Table 17. High-Crash Potential Locations, Severity and Crash Types

Segment ID	Area	Highway	From	To	Length (mi)	Bicycle Crashes		Description
						Severity	Quantity	
1	Bullhead City	SR 68	Bullhead Parkway (MP 0)	MP 4.0	4.5	**K** **A** **B** **C** **O**	0 0 0 0 0	*No crashes.*
						Total	**0**	
2	Bullhead City	SR 95	MP 240.7	Bullhead Parkway (MP 250)	9.3	**K** **A** **B** **C** **O**	1 1 2 4 1	***Except for 1 Severity Type C, these crashes are included in Segment 78 of the High-Crash Segment Locations*** The majority of the crashes occurred in Daylight conditions, with 1 crash occurring in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Through – Sign Controlled Intersection (1)* *Crossing Paths – Midblock – Other/Unknown (1)* *Motorist Drive Out – Residential Driveway (2)* *Motorist Drive Out – Sign-Controlled Intersection (1)* *Motorist Drive Through – Signalized Intersection (1)* *Motorist Left Turn – Same Direction (1)* *Motorist Overtaking – Undetected Bicyclist (1)* *Unknown (1)*
						Total	**9**	*Bicyclist drug and alcohol involvement for 1 crash*
3	Bullhead City	SR 95	MP 234.4	MP 240.7	6.3	**K** **A** **B** **C** **O**	0 0 1 1 0	1 Crash occurred in Daylight conditions and 1 crash occurred during Dark (Not lighted) conditions; crash types included: *Parallel Paths – Other/Unknown (1)* *Unknown Approach Paths (1)*
						Total	**2**	
4	South of Bullhead City	SR 95	MP 227.3	MP 234.4	7.1	**K** **A** **B** **C** **O**	0 0 0 0 0	*No crashes.*
						Total	**0**	
5	Lake Havasu City	SR 95	MP 177	MP 187.5	10.5	**K** **A** **B** **C** **O**	0 1 0 0 0	***Note this crash is included in Segment 79 of the High-Crash Segment Locations*** Crash occurred in Dark (Not Lighted) conditions; crash type included: *Bicyclist Left Turn – Same Direction (1)*
						Total	**1**	

Table 17. High-Crash Potential Locations, Severity and Crash Types (cont.)

Segment ID	Area	Highway	From	To	Length (mi)	Bicycle Crashes		Description
						Severity	Quantity	
6	Kingman	US 93	MP 70	MP 71	1.0	**K** **A** **B** **C** **O**	0 0 0 0 0	*No crashes.*
						Total	**0**	
7	Mohave County	US 93	MP 161	MP 174	13.0	-	-	No crashes. This segment is within limits of an improvement project to improve US 93 to four-lane divided highway. As such, this segment was not advanced as a Priority Location.
8	Prescott Valley	SR 69	MP 282	MP 296	14.0	-	-	No crashes. This segment is not in proximity to a high-crash segment or intersection. As such, this segment was not advanced as a Priority Location.
9	Cottonwood	SR 89A	MP 349	MP 353.1	4.1	**K** **A** **B** **C** **O**	0 0 1 0 0	Crash occurred in Dark (Not Lighted) conditions; crash type included: *Motorist Overtaking – Other/Unknown*
						Total	**1**	
10	Cottonwood	SR 260	MP 206.48	MP 209	2.5	**K** **A** **B** **C** **O**	0 0 1 1 0	1 Crash occurred in Daylight conditions and 1 crash occurred during Dark (Lighted) conditions; crash types included: *Motorist Drive Out – Right-Turn-on-Red (1)* *Unknown (1)*
						Total	**2**	
11	Payson	SR 87	MP 251	MP 254	3.0	**K** **A** **B** **C** **O**	0 0 4 5 0	***Note: These crashes are included in Segment 72 of the High-Crash Segment Locations*** All crashes occurred in Daylight conditions; crash types included: *Bicyclist Ride Out – Commercial Driveway/Alley (1)* *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Drive Out – Commercial Driveway/Alley (1)* *Motorist Drive Out – Residential Driveway (1)* *Motorist Drive Out – Sign-Controlled Intersection (1)* *Motorist Overtaking – Misjudged Space (1)* *Motorist Right Turn – Same Direction (1)* *Motorist Right-Turn-on-Red – Opposite Direction (1)* *Unknown (1)* *Bicyclist drug and alcohol involvement for 1 crash*
						Total	**9**	

Table 17. High-Crash Potential Locations, Severity and Crash Types (cont.)

Segment ID	Area	Highway	From	To	Length (mi)	Bicycle Crashes		Description
						Severity	Quantity	
12	SR 260	East of Star Valley	MP 257	MP 260	3.0	-	-	No crashes. This segment is within limits of an improvement project to improve SR 260 to four-lane divided highway. As such, this segment was not advanced as a Priority Location.
13	Globe-Miami	US 60	MP 247	MP 253	6.0	-	-	No crashes. This segment is not within proximity to a high-crash segment or intersection. As such, this segment was not advanced as a Priority Location.
14	Surprise-El Mirage	US 60	MP 138.5	MP 149.0	10.5	**K** **A** **B** **C** **O** **Total**	0 2 5 2 1 **10**	***Except for 1 Severity Type B and 1 Severity Type O, these crashes are included in Segment 71 of the High-Crash Segment Locations*** 7 crashes occurred in Daylight conditions and 3 crashes occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Bicyclist Ride Out – Signalized Intersection (1)Signalized Intersection – Other/Unknown (1)* *Motorist Drive Out – Commercial Driveway/Alley (1)* *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Drive Through – Sign-Controlled Intersection (1)* *Motorist Right Turn – Opposite Direction (1)* *Parallel Paths – Other/Unknown (1)* *Unknown (1)* *Unknown Location (1)*
15	Peoria/Glendale	US 60	MP 149.0	MP 161.7	12.7	**K** **A** **B** **C** **O** **Total**	0 2 3 7 0 **12**	*5 crashes occurred in Daylight conditions, 4 crashes occurred in Dark (Lighted), 2 crashes occurred in Dark (Not Lighted), and 1 crash occurred in Dawn conditions; crash types included:* *Motorist Drive Through – Sign Controlled Intersection (1)* *Motorist Drive Out – Right-Turn—on-Red (1)* *Bicyclist Ride Out – Signalized Intersection (1)* *Bicyclist Ride Through – Signalized Intersection (1)* *Bicyclist Left Turn – Same Direction (1)* *Motorist Overtaking – Undetected Bicyclist (1)* *Bicyclist Ride Out – Other Midblock (1)* *Motorist Drive Out – Commercial Driveway/Alley (1)* *Non-Roadway (1)* *Unknown (3)*

Table 17. High-Crash Potential Locations, Severity and Crash Types (cont.)

Segment ID	Area	Highway	From	To	Length (mi)	Bicycle Crashes		Description
						Severity	Quantity	
16	Maricopa County	US 60X	MP 189	MP 194	5.0	K A B C O	1 1 9 3 6	***Note these crashes are included in Segment 69 of the High-Crash Segment Locations*** The majority of the crashes occurred in Daylight conditions, with 4 crashes occurring in Dark (Lighted) conditions and 3 crashes occurring in Dark (Not Lighted) conditions; crash types included: *Bicyclist Overtaking – Parked Vehicle (1)* *Bicyclist Ride Out – Commercial Driveway/Alley (1)* *Bicyclist Ride Out – Residential Driveway (1)* *Bicyclist Ride Out – Sign-Controlled Intersection (2)* *Bicyclist Ride Through – Signalized Intersection (2)* *Head-On – Bicyclist (1)* *Motorist Drive Out – Sign-Controlled Intersection (1)* *Motorist Overtaking – Misjudged Space (1)* *Motorist Overtaking – Undetected Bicyclist (1)* *Non-Roadway (1)* *Sign-Controlled Intersection – Other/Unknown (1)* *Unknown (6)* *Unknown Location (2)*
						Total	**20**	*Bicyclist drug and alcohol involvement for 1 crash*
17	Apache Junction	US 88	MP 194	MP 196.1	2.1	K A B C O	0 1 0 5 1	***Note these crashes are included in Segment 68 of the High-Crash Segment Locations*** The majority of the crashes occurred in Daylight conditions, with 1 crash occurring in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (1)* *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Drive Out – Sign-Controlled Intersection (1)* *Motorist Turning Error – Right Turn (1)* *Unknown (1)*
						Total	**7**	
18	Apache Junction	US 60	MP 199	MP 203	4.0	K A B C O	0 0 0 0 0	*No crashes.*
						Total	**0**	

Table 17. High-Crash Potential Locations, Severity and Crash Types (cont.)

Segment ID	Area	Highway	From	To	Length (mi)	Bicycle Crashes		Description
						Severity	Quantity	
19	SR 347	Maricopa	MP 172.5	MP 174.5	2.0	K A B C O	0 1 1 4 0	This segment was not advanced as a Priority Location as it is within the limits of a current project (grade separation over the UPRR in Maricopa).
						Total	**6**	
20	Casa Grande	SR 387	Florence Boulevard	MP 2.2	2.2	K A B C O	0 0 4 2 1	***Note these crashes are included in Segment 65 of the High-Crash Segment Locations*** 5 crashes occurred in Daylight conditions and 2 crashes occurred in Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Commercial Driveway/Alley (1)* *Bicyclist Ride Out – Residential Driveway (1)* *Bicyclist Ride Out – Signalized Intersection (1)* *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Motorist Drive Out – Signalized Intersection (1)* *Motorist Left Turn – Opposite Direction (1)* *Non-Roadway (1)*
						Total	**7**	
21	Florence	SR 79	MP 134	MP 136.4	2.4	K A B C O	0 0 1 0 0	Crash occurred during Dusk conditions; crash type included: *Motorist Left Turn – Opposite Direction (1)*
						Total	**1**	
22	Safford-Thatcher	US 70	MP 331	MP 342	11.0	-	-	No crashes. Not included because it was not in proximity to a high-crash segment or intersection.
23	Safford	US 191	MP 118.8	MP 121	2.2	-	-	Not included because it was not in proximity to a high-crash segment or intersection.
24	Sierra Vista	US 90	MP 317.2	MP 321.2	4.0	K A B C O	0 1 1 0 0	All crashes occurred in Daylight conditions; crash types included: *Bicyclist Ride Out – Signalized Intersection (1)* *Unknown (1)*
						Total	**2**	

Table 17. High-Crash Potential Locations, Severity and Crash Types (cont.)

Segment ID	Area	Highway	From	To	Length (mi)	Bicycle Crashes		Description
						Severity	Quantity	
25	Sierra Vista	SR 92	MP 321.1	MP 328.5	7.3	K A B C O	0 0 0 6 4	***Note these crashes are included in Segment 58 of the High-Crash Segment Locations*** *All crashes occurred in Daylight conditions; crash types included:* *Bicyclist Failed to Clear – Multiple Threat (1)* *Bicyclist Ride Through – Signalized Intersection (1)* *Motorist Drive Out – Right-Turn-on-Red (1)* *Motorist Right Turn – Same Direction (2)* *Non-Roadway (4) and Unknown (1)*
						Total	**10**	
26	Bisbee	SR 80	MP 340	MP 342	2.0	K A B C O	0 0 0 0 0	*No crashes occurred, but this segment is part of USBR 90.*
						Total	**0**	
27	Pinetop-Lakeside	SR 260	MP 345	MP 355	10.0	K A B C O	0 1 2 3 2	7 crashes occurred during Daylight conditions and 1 crash occurred during Dark (Lighted) conditions; crash types included: *Bicyclist Ride Out – Commercial Driveway/Alley (1)* *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Motorist Overtaking – Bicyclist Swerved (1)* *Motorist Overtaking – Misjudged Space (1)* *Motorist Right Turn – Opposite Direction (1)* *Motorist Right Turn – Same Direction (2)* *Unknown Location (1)*
						Total	**8**	
28	Show Low	SR 260	MP 340.1	MP 342.2	2.1	K A B C O	0 0 2 0 1	*All crashes took place in Daylight conditions; crash types included:* *Bicyclist Ride Out – Sign-Controlled Intersection (1)* *Motorist Drive Out – Commercial Driveway/Alley (1)* *Motorist Right Turn – Opposite Direction (1)*
						Total	**3**	
29	Snowflake-Taylor	SR 77	MP 357	MP 360	3.0	-	-	No crashes. This segment is not within proximity to a high-crash segment or intersection. As such, this segment was not advanced as a Priority Location.

Table 17. High-Crash Potential Locations, Severity and Crash Types (cont.)

Segment ID	Area	Highway	From	To	Length (mi)	Bicycle Crashes		Description
						Severity	Quantity	
30	Tucson	SR 77	MP 69.5	MP 75	5.5	K A B C O	0 7 13 12 12	***Except for 1 Severity Type B, these crashes are included in Segment 61 and Segment 62 of the High-Crash Segment Locations*** A majority of crashes occurred in Daylight conditions; 6 crashes occurred in Dark (Lighted) conditions, 2 crashes in Dark (Not Lighted) conditions, 2 crashes in Dusk conditions; crash types: *Bicyclist Left Turn – Same Direction (1)* *Bicyclist Ride Out – Commercial Driveway/Alley (4)* *Bicyclist Ride Through – Signalized Intersection (1)* *Bicyclist Ride Through – Sign-Controlled Intersection (1)* *Crossing Paths – Midblock – Other/Unknown (1)* *Crossing Paths – Uncontrolled Intersection (2) | Head-On – Bicyclist (1)* *Motorist Drive Out – Commercial Driveway/Alley (3)* *Motorist Drive Out – Signalized Intersection (1)* *Motorist Drive Out – Sign-Controlled Intersection (1)* *Motorist Drive Out – Right-Turn-on-Red (3)* *Motorist Drive Through – Sign-Controlled Intersection (2)* *Motorist Left Turn – Opposite Direction (5)* *Motorist Overtaking – Bicyclist Swerved (1)* *Motorist Right Turn – Opposite Direction (4)* *Motorist Right Turn – Same Direction (9) | Non-Roadway (1)* *Signalized Intersection – Other/Unknown (2) | Unknown Approach Paths (1)*
						Total	**44**	
31	Tucson-Oro Valley	SR 77	MP 75	MP 81.8	6.8	K A B C O	0 3 3 4 4	*6 crashes occurred in Daylight conditions, 5 crashes occurred in Dark (Lighted), 1 crashes occurred in Dark (unlighted) conditions and 1 crash occurred in Dawn conditions; crash types included:* *Bicycle Ride Out – Sign Controlled Intersection (1)* *Bicyclist Ride Through – Signalized Intersection (3)* *Crossing Paths – Midblock – Other/Unknown (1)* *Motorist Drive Through – Sign-Controlled Intersection (1)* *Motorist Left Turn – Same Direction (1)* *Motorist Left Turn – Opposite Direction (3)* *Motorist Right Turn – Same Direction (1)* *Motorist Right Turn – Opposite Direction (1)* *Motorist Drive out – Residential Driveway (1)* *Unusual Circumstance (1)*
						Total	**14**	

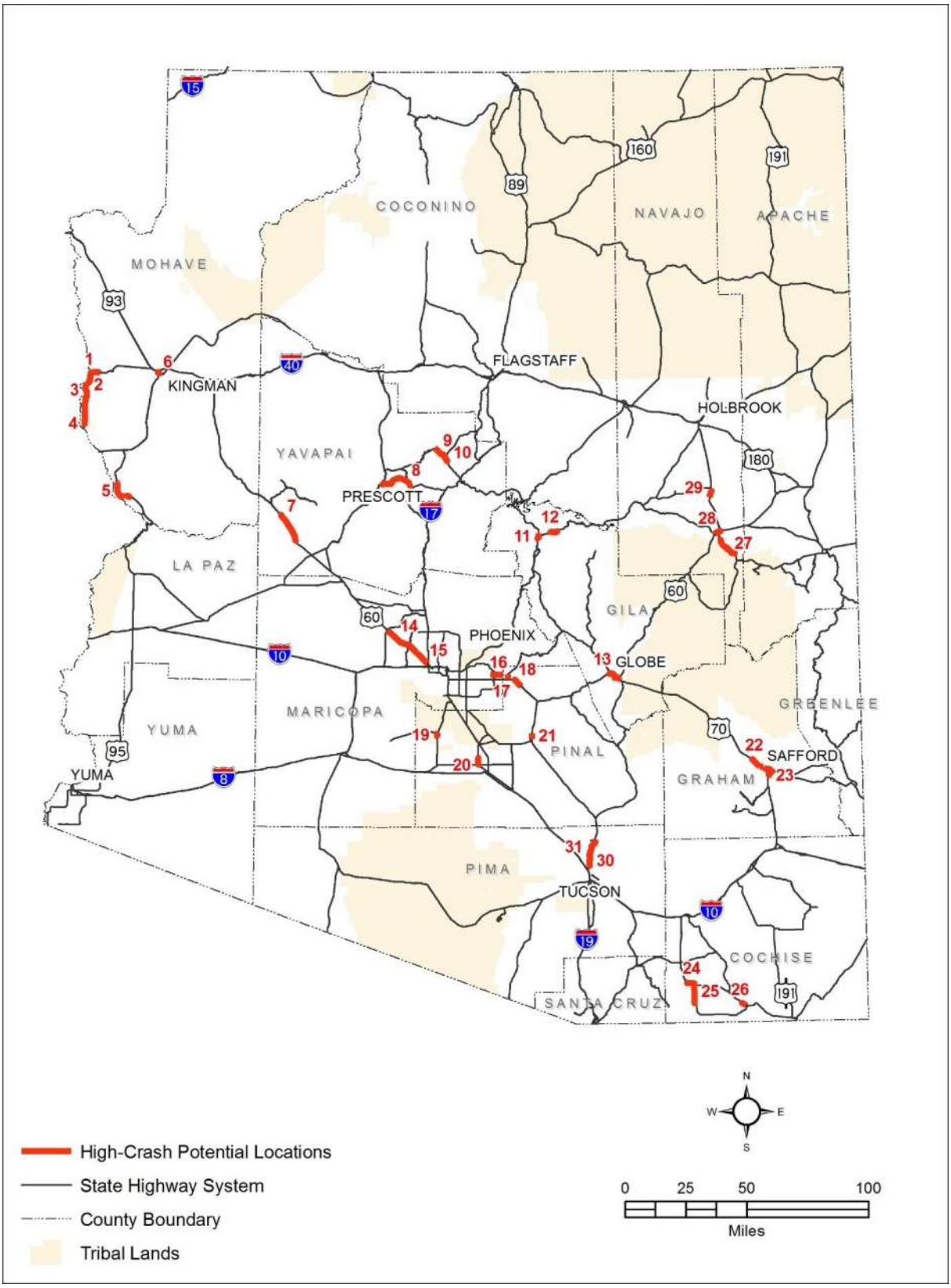


Figure 17. Crash Potential Locations

6. PRIORITY LOCATIONS AND COUNTERMEASURES

This chapter describes the process to group the segments and intersections into geographic units for which countermeasures can then be identified. Potential countermeasures are discussed.

Selecting Priority Locations for Evaluation

The Crash Modification Clearinghouse, used in support of the Highway Safety Manual (HSM), includes very few 3-star or better bicycle safety countermeasures. The lack of high-quality crash modification factors (CMFs) for bicycle-related treatments makes a benefit-cost analysis, to prioritize countermeasure projects, impractical.

Therefore, the study team applied a network planning analysis approach to identify priority corridor locations and countermeasures to provide safety improvements for bicyclists. As noted in Chapter 5, such an analysis is justified because bicyclists, unlike pedestrians, are required to follow the "rules of the road" when operating on a roadway, and most bicycle trips are typically several miles. Thus, more emphasis should be placed on providing safe conditions for bicycle travel all along a corridor (segment) and within the bicycle travel network, as opposed to analyzing risk analysis of individual spots (intersections), as would be the case for most pedestrian safety treatments. Furthermore, bicyclist crashes at individual intersections are typically less frequent than pedestrian crashes, and in most cases these crashes involve bicyclists riding on the sidewalk, making the identification of treatments at intersections far less productive.

A comprehensive description of a network planning analysis process is found in the FHWA *Separated Bike Lane Planning and Design Guide* (2014), in which the following detailed elements and considerations for improving the bicycle network are suggested:

- Step 1 – Choose bicycling segments (connecting bike travel origins and destinations, selection of appropriate treatments, gaining user support)
- Step 2 – Additional contextual considerations (consideration of pedestrian and motor vehicle traffic, corridor analysis, transit, parking requirements)
- Step 3 – Identify installation opportunities (evaluate design options; leverage other construction projects that are being planned)
- Step 4 – Assess other planning issues (consideration of project costs, funding options, maintenance needs, outreach and agency coordination)
- Step 5 – Project coordination (evaluate all street users, measure changes to crashes, volumes, collect pre- and post-data, and communicate the effect of the changes on all road users)

To apply this network analysis approach to the 2018 BSAP Update for the Arizona SHS, high-crash intersections and segments and high-crash potential segments were grouped into Priority Locations. A Priority Location may consist of one or more high-crash segments, intersection, or high-crash potential segments. The Priority Locations are listed in **Table 18.** These Priority Locations comprise 94% of the high-crash segments, 100% of the high-crash intersections, and 74% of the high-crash potential segments. A summary of the crashes by severity within each Priority Location is found in **Table 19**.

Table 18. 2018 BSAP Priority Locations

Priority Location	Name	Route	Beginning MP	Ending MP	HC Segment, HC Intersection, and/or HP Segment
1	Bullhead City	SR 95	244.4	249.8	HC Segment 78, HP Segment 2
2	Lake Havasu City (Urban)	SR 95	177.0	187.5	HC Segment 79 (part), HP Segment 5
3	Lake Havasu City (Rural)	SR 95	167.6	177.0	HC Segment 79 (part)
4	Kingman (SR 66)	SR 66	56.7	60.2	HC Segment 76
5	Golden Valley	SR 68	20.8	25.6	HC Segment 77
6	Flagstaff (SR 40B)	SR 40B	197.5	199.9	HC Segment 89, HC Intersection 57
7	Flagstaff (US 180)	US 180	215.4	216.9	HC Segments 87, 88; HC Intersection 56
8	Flagstaff Area	SR 40B, Route 66, SR 89A (Milton Rd)	See map in Appendix A		HC Segments 83, 84, 85, 86; HC Intersection 55
9	Cottonwood Area	SR 260/SR 89A	209 (SR 260)	349 (SR 89A)	HC Segment 81, HP Segments 9 and 10
10	Sedona	SR 89A	371.0	341.1	HC Segment 82
11	Grand Avenue (NW of Loop 101)	US 60	138.6 (Loop 303)	149.0 (Loop 101)	HC Segment 71, HP Segment 14
12	Grand Avenue (SE of Loop 101)	US 60	149.0 (Loop 101)	161.7 (McDowell Rd)	HC Intersections 32, 33, 51, 52, 53; HP Segment 15
13	Mesa (SR 87)	SR 87	171.7 (Baseline Rd)	170.2 (Campbell Rd)	HC Segment 67
14	Maricopa County (US 60X)	US 60X	189 (Sossaman Rd)	194 (Meridian Rd)	HC Segment 69, HP Segment 16
15	Apache Junction (SR 88)	SR 88	194.0 (US 60)	196.1 (Apache Trail)	HC Segment 68, HP Segment 17
16	Casa Grande	SR 387	0.0 (Florence Blvd)	2.2 (Casa Grande Lakes Blvd)	HC Segment 65, HP Segment 20
17	Coolidge/Florence Area	SR 87 and SR 79	See map in Appendix A		HC Segment 70, HP Segment 21
18	Show Low/Pinetop-Lakeside Area	US 60 and SR 260	See map in Appendix A		HC Segments 73, 74, 75; HP Segments 27, 28
19	Payson	SR 87	250 (Green Valley Pkwy)	253.2 (Forest Dr)	HC Segment 72, HP Segment 11
20	Tucson (South SR 77)	SR 77	68.5 (Flowing Wells Rd)	72 (River Rd)	HC Segments 60, 61; HC Intersections 5, 6; HP Segment 30
21	Tucson (North SR 77)	SR 77	72.0 (River Rd)	81.8 (Tangerine Rd)	HC Segments 62, 63, 64; HC Intersection 7; HP Segments 30, 31
22	Tucson (SR 86)	SR 86	170.3 (Mission Rd)	170.8 (Holiday Blvd)	HC Segment 59
23	Sierra Vista	SR 90 and SR 92	317.2 (SR 90)	328.5 (SR 92 at SR 90)	HC Segment 58; HP Segments 24, 25
24	Kingman	-	I-40/Stockton Hill Rd		HC Intersection 54
25	Phoenix Metro - Diamond Interchanges	-	See map in Appendix A		HC Intersections 8, 9, 11, 13, 14, 15, 16, 17, 20, 22, 23, 25, 35, 41, 43, 44, 45, 46, 47
26	Phoenix Metro - SPUI Interchanges	-	See map in Appendix A		HC Intersections 12, 18, 26, 27, 28, 29, 30, 31, 36, 37, 38, 39, 40, 50
27	Mesa	-	SR 87/McKellips Rd		HC Intersection 24

Table 18. 2018 BSAP Priority Locations (cont.)

Priority Location	Name	Route	Beginning MP	Ending MP	HC Segment, HC Intersection, and/or HP Segment
28	Phoenix	-	SR 143/McDowell Rd		HC Intersection 49
29	Tucson - Interchanges	-	I-10/6th Ave and I-10/Kino Pkwy		HC Intersections 1, 4
30	Mohave Valley Area	SR 95 and SR 68	See map in Appendix A		HP Segments 1, 3, 4
31	Kingman (US 93)	US 93	70.0	71.0 (I-40)	HP Segment 6
32	Apache Junction Area	US 60	199.0	203.0	HP Segment 18
33	Bisbee	SR 80	340.0	342.0	HP Segment 26

Table 19. 2018 BSAP Priority Location Crash Summary

Priority Location	Area	Classification	Crash Severity					Total Crashes
			K	A	B	C	O	
1	Bullhead City	High-Crash Intersections	0	0	0	0	0	**8**
		High-Crash Segments	1	1	2	3	1	
		High-Crash Potential Locations*	0	0	0	0	0	
2	Lake Havasu City (Urban)	High-Crash Intersections	0	0	0	0	0	**1**
		High-Crash Segments	0	1	0	0	0	
		High-Crash Potential Locations*	0	0	0	0	0	
3	Lake Havasu City (Rural)	High-Crash Intersections	0	0	0	0	0	**3**
		High-Crash Segments	2	1	0	0	0	
		High-Crash Potential Locations	0	0	0	0	0	
4	Kingman (SR 66)	High-Crash Intersections	0	0	0	0	0	**4**
		High-Crash Segments	1	0	2	1	0	
		High-Crash Potential Locations	0	0	0	0	0	
5	Golden Valley	High-Crash Intersections	0	0	0	0	0	**3**
		High-Crash Segments	0	0	2	1	0	
		High-Crash Potential Locations	0	0	0	0	0	
6	Flagstaff (SR 40B)	High-Crash Intersections	0	2	7	0	0	**21**
		High-Crash Segments	0	0	6	3	3	
		High-Crash Potential Locations	0	0	0	0	0	
7	Flagstaff (US 180)	High-Crash Intersections	0	0	0	5	1	**23**
		High-Crash Segments	0	5	8	2	2	
		High-Crash Potential Locations	0	0	0	0	0	
8	Flagstaff Area	High-Crash Intersections	0	0	0	2	1	**60**
		High-Crash Segments	0	3	20	16	18	
		High-Crash Potential Locations	0	0	0	0	0	

**Total number of crashes excludes those overlapping with high-crash intersections or high-crash segments.*

Table 19. 2018 BSAP Priority Location Crash Summary (cont.)

Priority Location	Area	Classification	Crash Severity					Total Crashes
			K	A	B	C	O	
9	Cottonwood Area	High-Crash Intersections	0	0	0	0	0	**7**
		High-Crash Segments	0	0	3	0	1	
		High-Crash Potential Locations*	0	0	2	1	0	
10	Sedona	High-Crash Intersections	0	0	0	0	0	**15**
		High-Crash Segments	0	2	7	3	3	
		High-Crash Potential Locations	0	0	0	0	0	
11	Grand Avenue (NW of Loop 101)	High-Crash Intersections	0	0	0	0	0	**10**
		High-Crash Segments	0	2	3	3	0	
		High-Crash Potential Locations*	0	0	1	0	1	
12	Grand Avenue (SE of Loop 101)	High-Crash Intersections	2	4	3	7	2	**30**
		High-Crash Segments	0	0	0	0	0	
		High-Crash Potential Locations*	0	2	3	7	0	
13	Mesa (SR 87)	High-Crash Intersections	0	0	0	0	0	**7**
		High-Crash Segments	0	1	5	0	1	
		High-Crash Potential Locations	0	0	0	0	0	
14	Maricopa County (US 60X)	High-Crash Intersections	0	0	0	0	0	**20**
		High-Crash Segments	1	1	9	3	6	
		High-Crash Potential Locations*	0	0	0	0	0	
15	Apache Junction (SR 88)	High-Crash Intersections	0	0	0	0	0	**7**
		High-Crash Segments	0	1	0	5	1	
		High-Crash Potential Locations*	0	0	0	0	0	
16	Casa Grande	High-Crash Intersections	0	0	0	0	0	**7**
		High-Crash Segments	0	0	4	2	1	
		High-Crash Potential Locations*	0	0	0	0	0	

Table 19. 2018 BSAP Priority Location Crash Summary (cont.)

Priority Location	Area	Classification	Crash Severity					Total Crashes
			K	A	B	C	O	
17	Coolidge/Florence Area	High-Crash Intersections	0	0	0	0	0	**5**
		High-Crash Segments	0	0	1	3	0	
		High-Crash Potential Locations	0	0	1	0	0	
18	Show Low/Pinetop-Lakeside Area	High-Crash Intersections	0	0	0	0	0	**13**
		High-Crash Segments	0	2	5	3	3	
		High-Crash Potential Locations*	0	0	0	0	0	
19	Payson	High-Crash Intersections	0	0	0	0	0	**10**
		High-Crash Segments	0	0	4	5	1	
		High-Crash Potential Locations*	0	0	0	0	0	
20	Tucson (South SR 77)	High-Crash Intersections	0	0	3	2	4	**49**
		High-Crash Segments	1	6	13	11	9	
		High-Crash Potential Locations*	0	0	0	0	0	
21	Tucson (North SR 77)	High-Crash Intersections	0	1	4	0	0	**34**
		High-Crash Segments	0	3	12	7	6	
		High-Crash Potential Locations*	0	1	0	0	0	
22	Tucson (SR 86)	High-Crash Intersections	0	0	0	0	0	**5**
		High-Crash Segments	0	2	3	0	0	
		High-Crash Potential Locations	0	0	0	0	0	
23	Sierra Vista	High-Crash Intersections	0	0	0	0	0	**12**
		High-Crash Segments	0	0	0	6	4	
		High-Crash Potential Locations*	0	1	1	0	0	
24	Kingman	High-Crash Intersections	0	1	2	0	2	**5**
		High-Crash Segments	0	0	0	0	0	
		High-Crash Potential Locations	0	0	0	0	0	
25	Phoenix Metro - Diamond Interchanges	High-Crash Intersections	0	3	35	28	10	**76**
		High-Crash Segments	0	0	0	0	0	
		High-Crash Potential Locations	0	0	0	0	0	

Table 19. 2018 BSAP Priority Location Crash Summary (cont.)

Priority Location	Area	Classification	Crash Severity					Total Crashes
			K	A	B	C	O	
26	Phoenix Metro - SPUI Interchanges	High-Crash Intersections	2	7	52	24	7	**92**
		High-Crash Segments	0	0	0	0	0	
		High-Crash Potential Locations	0	0	0	0	0	
27	Mesa	High-Crash Intersections	0	1	0	3	1	**5**
		High-Crash Segments	0	0	0	0	0	
		High-Crash Potential Locations	0	0	0	0	0	
28	Phoenix	High-Crash Intersections	0	1	2	1	1	**5**
		High-Crash Segments	0	0	0	0	0	
		High-Crash Potential Locations	0	0	0	0	0	
29	Tucson - Interchanges	High-Crash Intersections	0	0	3	3	1	**7**
		High-Crash Segments	0	0	0	0	0	
		High-Crash Potential Locations	0	0	0	0	0	
30	Mohave Valley Area	High-Crash Intersections	0	0	0	0	0	**3**
		High-Crash Segments	0	0	0	0	0	
		High-Crash Potential Locations	0	0	1	2	0	
31	Kingman (US 93)	High-Crash Intersections	0	0	0	0	0	**0**
		High-Crash Segments	0	0	0	0	0	
		High-Crash Potential Locations	0	0	0	0	0	
32	Apache Junction Area	High-Crash Intersections	0	0	0	0	0	**0**
		High-Crash Segments	0	0	0	0	0	
		High-Crash Potential Locations	0	0	0	0	0	
33	Bisbee	High-Crash Intersections	0	0	0	0	0	**0**
		High-Crash Segments	0	0	0	0	0	
		High-Crash Potential Locations	0	0	0	0	0	

Countermeasure Selection

The next step in the network analysis process is to identify appropriate bicycle safety treatment(s) for each priority location based on design and operational characteristics of the site, the types and causes of past bicycle crashes, and the behaviors of motorists and bicyclists along the segment which are likely to lead to future crashes. The countermeasure selection process generally included the following steps:

1. Review the location's context for bicycle safety issues, need, and patterns.
2. Document site characteristics using ADOT GIS data, ADOT Photo Log, and geometric conditions: roadway cross-section, posted speed limit, existing bicycling facilities.
3. Identify potential countermeasures utilizing the following resources:
   - Study team experience and engineering judgement.
   - Bicycle Safety Guide and Countermeasure Selection System (BIKESAFE)[2].
   - Federal Highway Administration (FHWA), Office of Safety, Proven Safety Countermeasures (http://safety.fhwa.dot.gov/provencountermeasures/)
   - Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices (http://www.ghsa.org/resources/countermeasures2015)

The selection of one or more bicycle countermeasures is based on guidelines set forth in the MUTCD, AASHTO design guidelines (e.g., AASHTO Guide for the Development of Bicycle Facilities), FHWA bicycle safety research and guidelines (e.g., BIKESAFE, FHWA Separated Bike Lane Guide), and Arizona standards and guidelines including the ADOT Complete Transportation Guidebook[3]. Other considerations in countermeasure selection include current practices of various geometric treatments, traffic control devices, and other treatments from the literature and from experiences of project effectiveness in Arizona in recent years. Countermeasures may consist of a combination of engineering, education, and enforcement solutions, as illustrated in **Table 20**.

Table 20. Menu of Potential Countermeasures

Countermeasure Type	Example Countermeasures
Engineering Solutions ***Changes to the roadway environment or operations that affect the movement of bicycles, vehicles, and other road users.***	• Conduct Roadway Safety Assessments (RSA) • Striped paved shoulders (4' minimum effective width). Effective shoulder width is the amount of shoulder width available for use by the bicyclist excluding the rumble strip or gutter pan. • Marked bicycle lanes • Access management: medians, driveway consolidations • Parallel off-street alternative bicycle routes (adjacent shared-use paths, bicycle boulevards on parallel streets/corridors) • Roadway lighting • Enhanced signal operations for bicyclists, bicycle detection • Roadway signing and pavement markings – Enhanced marking of bicycle/motor vehicle conflict areas • High visibility crossings

[2] http://www.pedbikesafe.org/BIKESAFE/index.cfm
[3] https://www.azdot.gov/planning/transportation-programs/complete-transportation-guidebook

Table 20. Menu of Potential Countermeasures (cont.)

Countermeasure Type	Example Countermeasures
	• Crossing improvements such as PHBs/Bike HAWKs, RRFBs, and islands • Interchange modifications: ramps, signal timing, turn lane geometry • Construct additional bicycle/pedestrian-only crossings over interstate freeways or provide improved bicycle and pedestrian facilities along highways at existing interstate crossings • Collaborate with other ongoing studies and plans or conduct additional studies or assessments • Evaluate regulatory posted speed limit using USLIMITS2 and per Traffic Engineering Guidelines and Processes (TGP) 222
Education Measures ***Raise awareness of a law, practice, or behavior and motivate a change in behavior that will have a positive effect on motorist and bicyclist safety.***	• Bicycle Safety Education Campaign in partnership with the local jurisdiction. Elements could potentially include safety awareness, facility design training, bicycle skills training. • Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.
Enforcement ***Promote compliance with laws, ordinances, and regulations related to motorist and bicyclist safety.***	• Increase enforcement to target speeding along the corridor. • Increase enforcement for motorists and bicyclists failing to yield the right-of-way at intersections and driveways.

Priority locations and potential countermeasures are listed in **Appendix A**. The crash analysis identified many crashes that occur on the state highway system occur at interstate interchanges with local arterials. **Figures 18** through **22** show potential bicycle safety countermeasures for the following:

- Single Point Urban Interchange (SPUI) with bike lanes on the cross street (**Figure 18**)
- SPUI without bike lanes on cross street (**Figure 19**)
- Diamond interchange with bike lanes on cross street (**Figure 20**)
- Diamond interchange without bike lanes on cross street (**Figure 21**)
- Diverging diamond interchange (**Figure 22**)

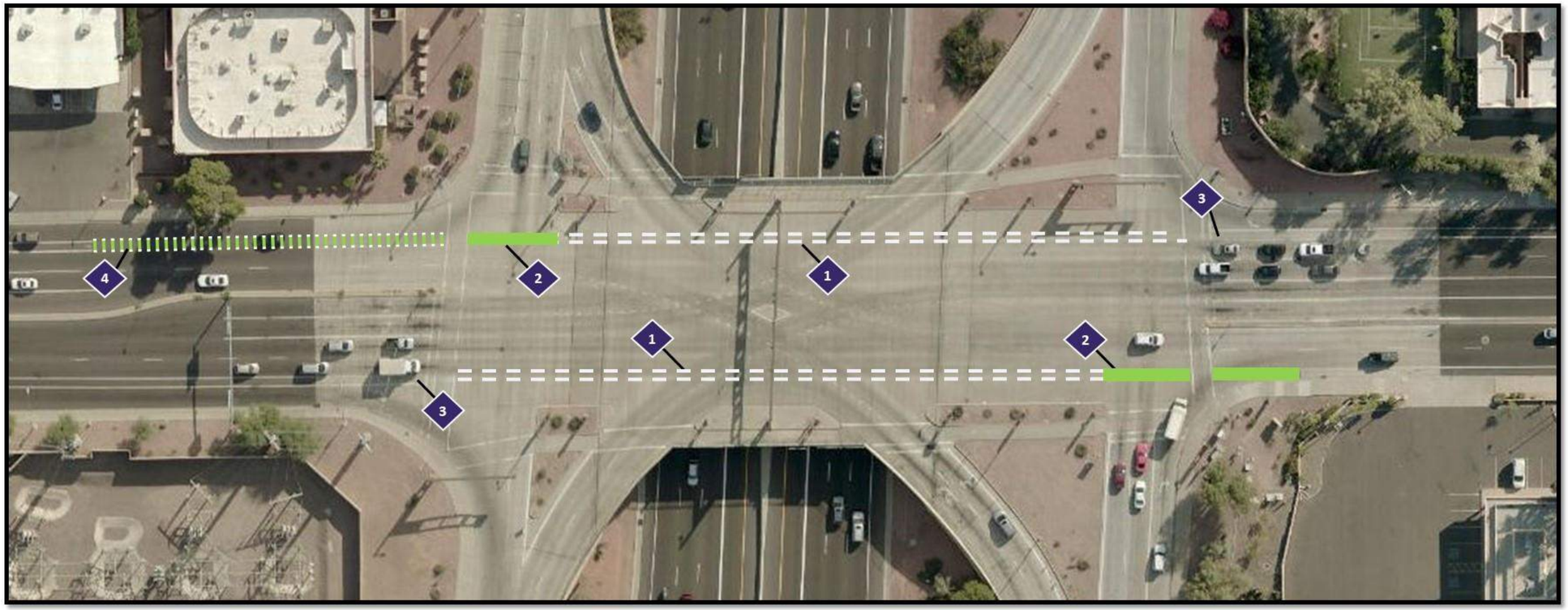
Note that the FHWA has issued interim approval for the optional use of green pavement markings for bicycle lanes or bicycle lane extensions, which requires ADOT to obtain permission for use of green pavement markings consistent with IA-14.[4] Design involving green pavement markings shall comply with the MUTCD. Design guidelines for green pavement markings are available in a growing number of publications including the FHWA Separated Bike Lane Planning and Design Guide and MassDOT Separated Bike Lane Planning & Design Guide.

[4] FHWA issued Interim Approval 14 for the optional use of colored pavements for bike lanes April 15, 2011, https://mutcd.fhwa.dot.gov/resources/interim_approval/ia14/index.htm

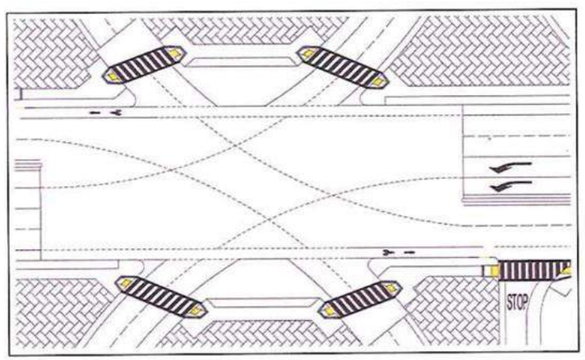
Furthermore, at the interchange crossings where the road is maintained by the local jurisdiction (typically where the interchange signal is maintained by the local authority), the green pavement markings would likely be maintained by that local jurisdiction, and would require local agency approval.

All countermeasures are subject to a comprehensive engineering review. While a menu of countermeasures is identified, further detailed site-specific analysis, field review, and engineering analysis are required at each location to determine which of the listed countermeasures should be implemented.

SPUI WITH BIKE LANES ON CROSS STREET



1



Skip Striping Within a SPDI *(ITE Recommended Design Guidelines to Accommodate Pedestrians and Bicycles at Interchanges)*

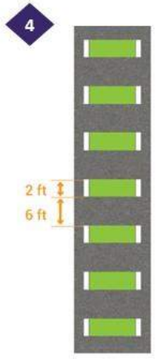
2

Green Buffered Bike Lane Through an Interchange *(ITE Recommended Design Guidelines to Accommodate Pedestrians and Bicycles at Interchanges)*

3

Install loops or non-intrusive detection to allow bicyclists to call for more time on next green cycle.

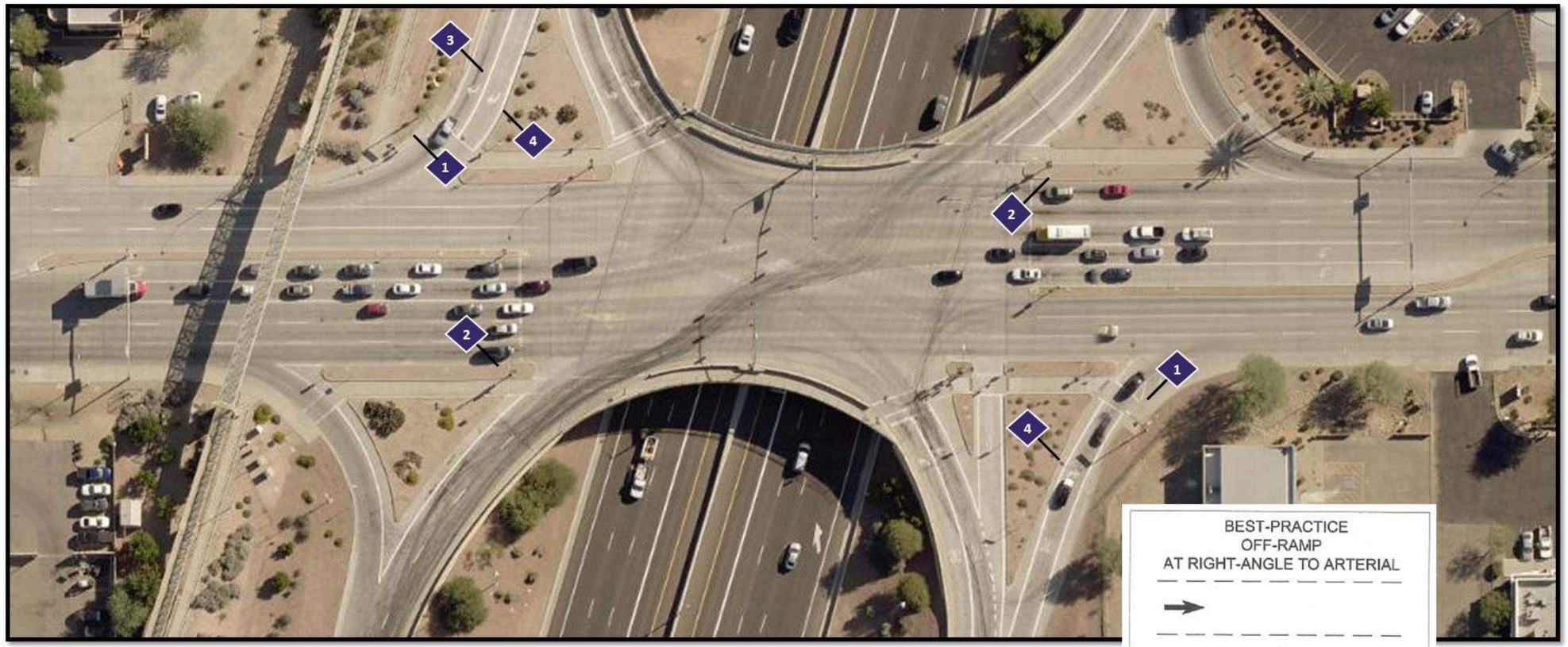
4



The pattern of the green colored pavement may be in a manner matching the pattern of the dotted lines; filling in only the areas directly between a pair of dotted line segments. *(MUTCD Interim Approval IA-14)*

Figure 18. Bicycle Safety Countermeasures for SPUI with Bike Lanes on Cross Street

SPUI WITHOUT BIKE LANES ON CROSS STREET

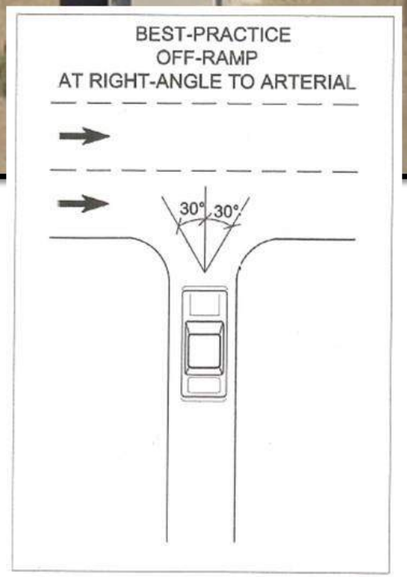


1. Replace YIELD signs with STOP Signs

2. Install bicycle push button to allow bicyclists to call for more time on next green cycle. R10-24 sign:

3. Combine dual right turn lanes into one to reduce conflicts between vehicles and bicycles. This would also improve sight distance by removing the possibility of two cars entering the cross street at once.

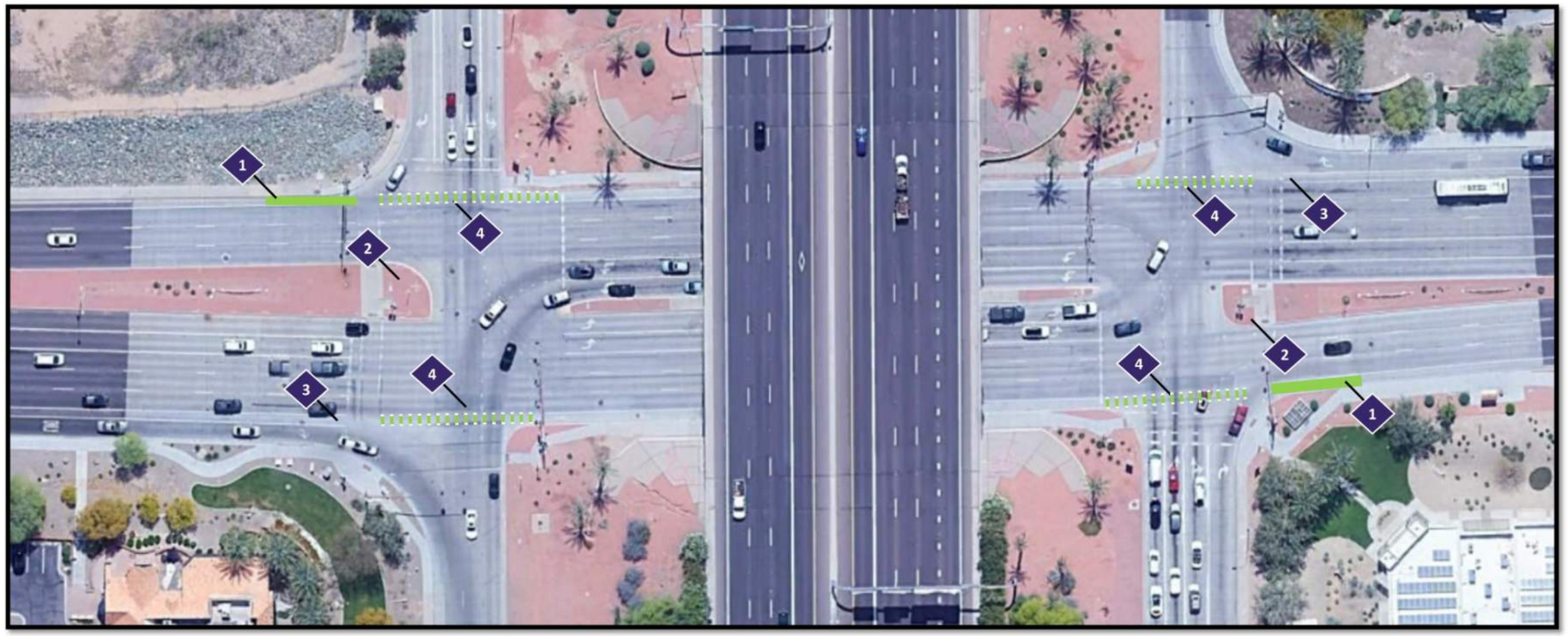
4. Best-Practice Off-Ramp at Right-Angle to Arterial *(ITE Recommended Design Guidelines to Accommodate Pedestrians and Bicycles at Interchanges)*



Y2K ENGINEERING

Figure 19. Bicycle Safety Countermeasures for SPUI without Bike Lanes on Cross Street

DIAMOND INTERCHANGE WITH BIKE LANES ON CROSS STREET



1

Green Buffered Bike Lane Through an Interchange *(ITE Recommended Design Guidelines to Accommodate Pedestrians and Bicycles at Interchanges)*

2 Install No Right Turn on Red signs

3 Install loops or non-intrusive detection to allow bicyclists to call for more time on next green cycle.

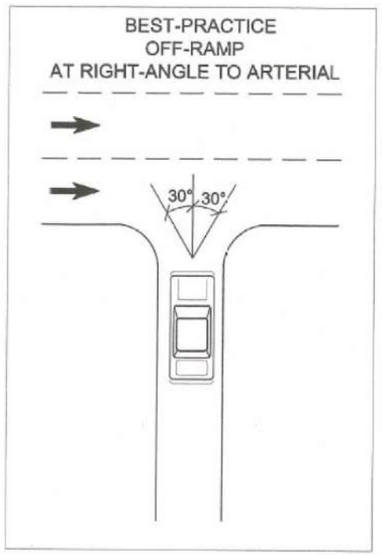
R10-22

4 The pattern of the green colored pavement may be in a manner matching the pattern of the dotted lines; filling in only the areas directly between a pair of dotted line segments. *(MUTCD Interim Approval IA-14)*

Figure 20. Bicycle Safety Countermeasures for Diamond Interchange with Bike Lanes on Cross Street

DIAMOND INTERCHANGE WITHOUT BIKE LANES ON CROSS STREET

1 Best-Practice Off-Ramp at Right-Angle to Arterial *(ITE Recommended Design Guidelines to Accommodate Pedestrians and Bicycles at Interchanges)*

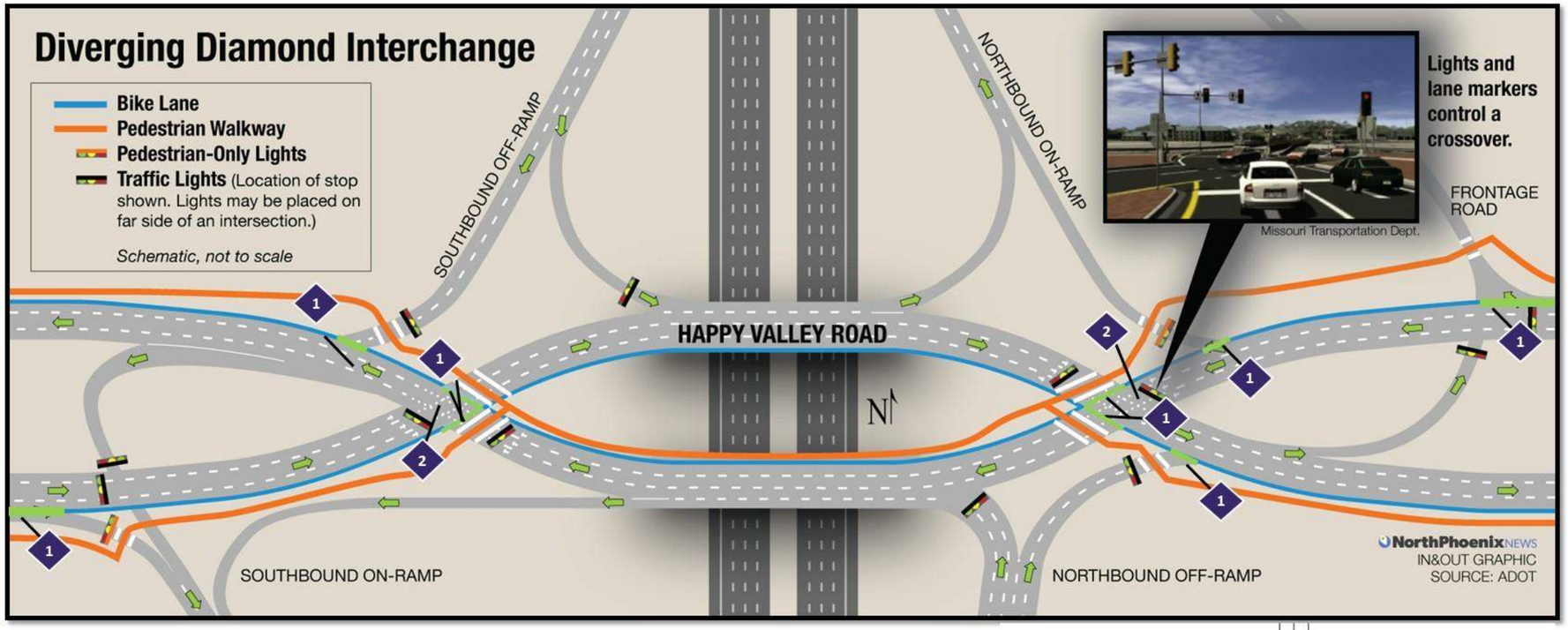


2 Install No Right Turn on Red signs

3 Widen bridge and/or reduce through lane width to provide width for bike lanes on cross street.

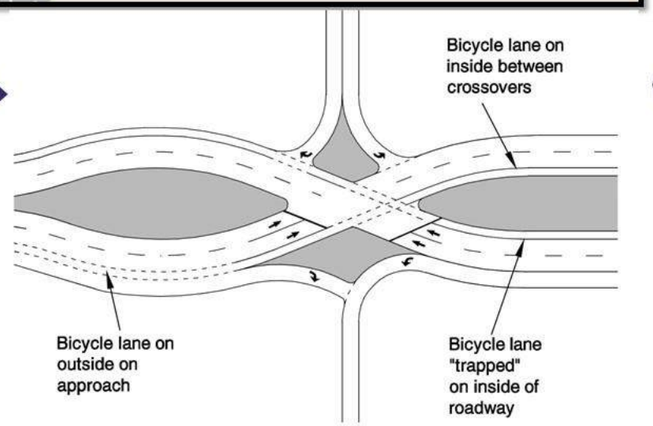
Figure 21. Bicycle Safety Countermeasures for Diamond Interchange without Bike Lanes on Cross Street

DIVERGING DIAMOND INTERCHANGE



1 Green pavement increases awareness of bicycles and should be used to indicate the area of potential conflict between bicyclists and motor vehicles. Pair with arrow pavement markings and signs to provide clear direction on the right-way of travel. The pattern of the green colored pavement may be in a manner matching the pattern of the dotted lines; filling in only the areas directly between a pair of dotted line segments. *(MUTCD Interim Approval IA-14)*

2



Schematic for Placement of Bike Lane on Right Side of Vehicular Traffic *(Diverging Diamond Interchange Informational Guide by FHWA, August 2014)*

Figure 22. Bicycle Safety Countermeasures for Diverging Diamond Interchange

7. OPPORTUNITIES IN THE 2018-2022 ADOT FIVE-YEAR TRANSPORTATION FACILITIES CONSTRUCTION PROGRAM

Bicyclist safety improvements are most economically constructed when done as part of reconstruction or construction projects. The ADOT *2018-2022 ADOT Five-Year Transportation Facilities Construction Program* was reviewed to determine programmed projects within or near high-crash or high-crash potential segments.

Twenty-four programmed projects were identified in areas with demonstrated bicycle safety needs (see **Table 21**). In addition, two other projects listed in the ADOT *2018-2022 ADOT Five-Year Transportation Facilities Construction Program* (not shown in **Table 21**) will directly benefit bicyclists:

- Item No 8878, I-10 at Western Canal (Spine Option 5) – Right-of-way and utilities for bike path (FY 2019)
- Item No 8879, I-10 at Highline Canal (Spine Option 7) – Right-of-way and utilities for bike path (FY 2019)

Opportunities to incorporate bicycle safety improvements into the other projects currently programmed should be considered. Opportunities to provide bicycle facilities along the SHS should also be considered for projects constructed by private development as part of their off-site improvements. Appropriate facilities that provide safe operation for bicyclists should be a consideration in the planning, design, and construction of all projects along the SHS where bicyclists are allowed.

Table 21 lists each bicycle safety priority location, programmed projects in the area (as included in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*), programmed project description, milepost location, construction fiscal year, funding source, and cost (x $1,000). This information indicates where the bicycle safety improvement project areas can be included with programmed projects.

Table 21. Programmed Projects on Priority Locations

Project Location	Milepost	Project Type/Project Description	Construction Fiscal Year	Funds	Cost ($000)
Priority Location 1: SR 95, Bullhead City, H-C Segment 78 and H-P Segment 2					
• No projects identified in 2018-2022 ADOT Five-Year Transportation Facilities Construction Program					
Priority Location 2: SR 95, Lake Havasu City (Urban), H-C Segment 79 and H-P Segment 5, MP 244.4 – MP 249.8					
SR 95 at Kiowa Blvd Item No 8377 TRACS No F002901C	185	Right turn lanes / raised median	2018	Highway Safety Improvement Program	730
Priority Location 3: SR 95, Lake Havasu City (Rural), H-C Segment 79, MP 167.6 – MP 177.0					
• No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Priority Location 4: SR 66, Kingman, H-C Segment 76, MP 56.7 (I-40) – MP 60.2					
• No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Priority Location 5: SR 68, Golden Valley, H-C Segment 77, MP 20.8 – MP 25.6					
• No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Priority Location 6: SR 40B in Flagstaff, H-C Segment 89 and H-C Intersection 57, MP 197.5 – MP 199.9					
• No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Priority Location 7: US 180, Flagstaff, H-C Segments 87 and 88 and H-C Intersection 56, MP 215.4 (SB 40, Route 66) – MP 216.9					
US 180, SR 40B to Aspen Ave Item No 8319 TRACS No F006001C	215	Construct turn lane, SR 40B to Aspen Ave	2019	Surface Transportation Program Block Grant	1,340
Priority Location 8: SR 40B, SR 89A (Milton Rd), Flagstaff, H-C Segments 83, 84, 85, 86 and H-C Intersection 55, MP varies					
JCT SR 89A / Plaza Way (Flagstaff) Item No 16614 TRACS No H839901C	403	Construct right turn lane	2018	Surface Transportation Program	722
I-40B, Rio De Flag Bridge, STR #295 Item No 7863 TRACS No H890501C	196	Construct bridge replacement	2019	National Highway Performance Program	2,500
Priority Location 9: SR 260 and SR 89A, Cottonwood, H-C Segment 81 and H-P Segments 9 & 10, MP 209 on SR 260 to MP 349 on SR 89A					
• No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Priority Location 10: SR 89A, Sedona, H-C Segment 82, MP 371.0-MP 374.1					
• No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					

Table 21. Programmed Projects on Priority Locations (cont.)

Project Location	Milepost	Project Type/Project Description	Construction Fiscal Year	Funds	Cost ($000)
Priority Location 11: US 60 (Grand Ave., Northwest), H-C Segment 71 and H-P Segment 14, MP 138.5 – MP 149					
US 60 (Grand Ave), Greenway Rd to Thompson Ranch Rd (Thunderbird Rd)	145	Construct frontage road	2018	Regional Area Road Fund	5,700
Priority Location 12: US 60 (Grand Ave., Southeast), H-C Intersections 32, 33, 51, 52, and 53 and H-P Segment 15, MP 149 – MP 161.7					
US 60, Northern Avenue and Bethany Home Road Item No 9164 TRACS Fxxxx01C	156	Left turn bay extension	2020	National Highway Performance Program	422
Priority Location 13: SR 87, Mesa, H-C Segment 67, MP 171.7 to MP 170.2					
• No projects identified in 2018-2022 ADOT Five-Year Transportation Facilities Construction Program					
Priority Location 14: US 60X, Maricopa County, H-C Segment 69 and H-P Segment 16, MP 189 – MP 194					
• No projects identified in 2018-2022 ADOT Five-Year Transportation Facilities Construction Program					
Priority Location 15: SR 88, Apache Junction, H-C Segment 68 and H-P Segment 17, MP 194 – MP 196.1					
SR 88, Superstition Blvd Item No 16214 TRACS No H830801C	196	Construct roundabout at MP 196	2018	Highway Safety Improvement Program (HSIP)	4,500
Priority Location 16: SR 387, Casa Grande, H-C Segment 65 and H-P Segment 20, MP 0 – MP 2.2					
• No projects identified in 2018-2022 ADOT Five-Year Transportation Facilities Construction Program					
Priority Location 17: SR 87 (Coolidge), SR 79 (Florence), H-C Segment 70 and H-P Segment 21, MP 132.7 (Coolidge Ave, SR 87) and MP 132 (Florence, SR 79)					
SR 87, Ruins Drive at SR 87 Item No 8377 TRACS No H883801C	134	Left turn lane and intersection lighting	2018	HSIP	87
Priority Location 18: US 60 and SR 260, Show Low and Pinetop-Lakeside, H-C Segments 73, 74, and 75 and H-P Segments 27, 28, MP 340.1 – MP 342.2 (US 60), MP 341.7 – MP 355.0 (SR 260)					
SR 260, Church Street – Knottingham Lane Item No 9114 TRACS No Fxxxx01C	343 – 348	Pavement preservation	2021	Surface Transportation Program Block Grant / National Highway Performance Program	7,088
Priority Location 19: SR 87, Payson, H-C Segment 72 and H-P Segment 11, MP 250-MP 253.6					
• No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					

Table 21. Programmed Projects on Priority Locations (cont.)

Project Location	Milepost	Project Type/Project Description	Construction Fiscal Year	Funds	Cost ($000)
Priority Location 20: SR 77 (South of River Road), Tucson, H-C Segments 60 and 61, H-C Intersections 5 and 6, and H-P Segment 30, MP 68.5 – MP 72					
Jct I-10 - Genematas Dr. Item No 9120 TRACS No Hxxx01C	68 – 72	Pavement Rehabilitation	2018	National Highway Performance Program	7,819
Priority Location 21: SR 77 (North of River Road), Tucson, H-C Segments 62, 63, and 64, H-C Intersection 7, and H-P Segments 30 and 31, MP 72 – MP 81.8 and MP 85.7 – MP 86.7					
SR 77, Genematas Dr.-Calle Concordia	72 – 77	Pavement Rehabilitation	2021	National Highway Performance Program	11,446
SR 77, Las Lomitas – Ina Rd Item No 9121 TRACS No F 01D	73 – 75	Street lighting	2020	HSIP	2,819
SR 77, Oracle Rd – Orange Grove Road Intersection Item No 9167 TRACS No Fxxxx01C	74	Intersection Improvement	2020	HSIP	215
Priority Location 22: SR 86, Tucson, H-C Segment 59, MP 170.3 – MP 170.8					
• No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Priority Location 23: SR 92 and SR 90, Sierra Vista, H-C Segment 58 and H-P Segments 24 and 25, MP 317.2 (SR 90) – MP 328.5 (SR 92)					
SR 92, JCT SR 90 – Kachina Item No 12017 TRACS No H871701C	321 – 325	Pavement Rehabilitation	2018	National Highway Performance Program	4,900
SR 92 @ Foothills Dr Item No 17014 TRACS No H826501C	322	Intersection improvements and right-of-way	2018	National Highway Performance Program and HSIP	4,650
Priority Location 24: Stockton Hill Road at I-40, Kingman, H-C Intersection 54					
• No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Priority Location 25: Phoenix Metro - Diamond Interchanges, H-C Intersections 8, 9, 11, 13, 14, 15, 16, 17, 20, 22, 23, 25, 35, 41, 43, 44, 45, 46, and 47					
H-C interchange 35 – Dysart Rd/I-10					

Table 21. Programmed Projects on Priority Locations (cont.)

Project Location	Milepost	Project Type/Project Description	Construction Fiscal Year	Funds	Cost ($000)
I-10, Dysart Rd to I-17 - Item No 11717 TRACS No H878601C	130 – 143	Pavement Rehabilitation	2018	National Highway Performance Program	26,500
H-C Interchange 44 – Bell Rd/I-17					
I-17(Black Canyon), Bell Rd TI Project No 9154	212	TI reconstruction	2022	National Highway Performance Program and Regional Area Road Fund	96,350
H-C Interchange 9 – Chandler Blvd/SR 101L *H-C Interchange 11 – Elliot Rd/SR 101L* *H-C Interchange 13 – Baseline Rd/SR 101L*					
SR 101L, US 60 (Superstition) to SR 202L (Santan) Item No. 7795	55 – 60	Construction general purpose lane	2019	Regional Area Road Fund	44,230
H-C Interchange 8 – Arizona Ave/SR 202 *H-C Interchange 17 – McClintock Dr/SR 202* *H-C Interchange 20 – Priest Dr/SR 202*					
SR 202L(Santan), Gilbert Rd to I-10	44 – 55	Design General Purpose Lane	Design 2022	Regional Area Road Fund	6,000
Priority Location 26: Phoenix Metro - Single-Point Urban Interchange Intersections, H-C Intersections 12, 18, 26, 27, 28, 29, 30, 31, 36, 37, 38, 39, 40, and 50					
H-C Interchange 12 – Guadalupe Rd/SR 101L					
SR 101L, US 60 (Superstition) to SR 202L (Santan) Item No. 7795	55 – 60	Construction general purpose lane	2019	Regional Area Road Fund	44,230
H-C Interchange 36 – Camelback Rd/I-17					
I-17 / Camelback Rd TI Item No 8887	212	Construct widening of TI	2022	National Highway Performance Program and Regional Area Road Fund	96,350
H-C Interchange 38 – Glendale Ave/I-17					
I-17 / Glendale Ave TI Item No 9152	205	Predesign for traffic interchange	Predesign 2021	Regional Area Road Fund	2,750
H-C Interchange 39 – Northern Ave/I-17					
I-17/ Northern Ave TI Item No 9153	206	Predesign for traffic interchange	Predesign 2021	Regional Area Road Fund	2,750

Table 21. Programmed Projects on Priority Locations (cont.)

Project Location	Milepost	Project Type/Project Description	Construction Fiscal Year	Funds	Cost ($000)
Priority Location 27: SR 87 at McKellips Road, Mesa, H-C Intersection 24, MP 176					
• No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Priority Location 28: SR 143 at McDowell Road, Phoenix, H-C Intersection 49, MP 4					
• No projects identified in 2018-2022 ADOT Five-Year Transportation Facilities Construction Program					
Priority Location 29: 6th Avenue/I-10 and Kino Parkway/I-10, Tucson, H-C Intersections 1 and 4					
• No projects identified in 2018-2022 ADOT Five-Year Transportation Facilities Construction Program					
Priority Location 30: SR 95 and SR 68, Mohave Valley, H-P Segments 1, 2, 3, and 4, MP 227.3 - 244.4 (SR 95) and MP 0.0 - 4.0 (SR 68)					
SR 95, Teller Road - Aztec Road Item No 8247 TRACS No F005601C	237 – 239	Construct Raised Median and Roundabout	2019	National Highway Performance Program and HSIP	4,022
Priority Location 31: US 93, Kingman, H-P Segment 6, MP 70-71					
US 93/I-40 West Kingman TI Project No 9031	93	Modernization	Design in 2018, ROW in 2020, construction date not listed	National Highway Performance Program	15,000
Priority Location 32: US 60, Gold Canyon, H-P Segment 18, MP 199-MP 203					
• No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					
Priority Location 33: SR 80, Bisbee, H-P Segment 26, MP 340-342					
• No projects identified in *2018-2022 ADOT Five-Year Transportation Facilities Construction Program*					

8. FUNDING SOURCES FOR BICYCLE INFRASTRUCTURE AND PROGRAMS

Funding for bicycle improvements and/or new bicycle facilities along the SHS is available from a variety of sources, including federal programs and state and regional revenue sources; however, these are limited and may not be available for several years due to other projects and programs that are currently programmed. This chapter provides an overview of these potential funding sources. The need for bicycle infrastructure and safety programs outweighs funding available and the time it takes to authorize and obligate federal fund leaves road users at risk while waiting for implementation of improvements. It is critical for the State to support initiatives that would increase State and Regional funding sources for bicycle infrastructure and transportation safety programs.

Federal Programs

Several federal funding sources have potential to be used for bicycle improvement projects:

- Better Utilizing Investments to Leverage Development (BUILD) Grant Program
- Transportation Infrastructure Finance and Innovation Act (TIFIA)
- Federal Transit Administration (FTA) Grant Programs
- Congestion Mitigation and Air Quality (CMAQ) Program
- Highway Safety Improvement Program (HSIP)
- National Highway Performance Program (NHPP)
- Surface Transportation Block Grant Program (STBG)
- Transportation Alternatives Set-Aside (TA Set-Aside)
- Recreational Trails Program (RTP)
- Safe Routes to School (SRTS)
- Statewide Planning and Research (SP&R) or Metropolitan Planning Funds
- NHTSA Section 402: State and Community Highway Safety Grant Program
- NHTSA Section 405: National Priority Safety Programs (Nonmotorized Safety)
- Federal Lands and Tribal Transportation Programs

A summary of these funding programs is provided in **Table 22**, which provides information on:

- Funding program
- Project type (construction, non-construction, or both)
- Required matching funds (percent)
- 2017 Arizona apportionment
- Eligible projects
- Comments
- Source (website link for more information)

A brief overview of these programs is provided as follows.

Better Utilizing Investments to Leverage Development (BUILD) Grant Program

BUILD Transportation grants replace the pre-existing Transportation Investment Generating Economic Recovery (TIGER) grant program. As the Administration looks to enhance America's infrastructure, FY 2018 BUILD Transportation grants are for investments in surface transportation infrastructure and are to be awarded on a competitive basis for projects that will have a significant local or regional impact. BUILD funding can support roads, bridges, transit, rail, ports, or intermodal transportation.

Transportation Infrastructure Finance and Innovation Act (TIFIA)

The TIFIA program provides credit assistance for qualified projects of regional and national significance. Many large-scale surface transportation projects – highway, transit, railroad, intermodal freight, and port access – are eligible for assistance. Eligible applicants include state and local governments, transit agencies, railroad companies, special authorities, special districts, and private entities. The program's fundamental goal is to leverage federal funds by attracting substantial private and other non-federal co-investment in critical improvements to the nation's surface transportation system.

Federal Transit Administration (FTA) Grant Programs

The following FTA grant programs listed bicycle improvements as eligible for funding to provide access to transit:

- FTA Section 5311: Rural Areas – Grants can support a joint development improvement, such as pedestrian and bicycle access to a public transportation facility.

Congestion Mitigation and Air Quality (CMAQ) Program

The Fixing America's Surface Transportation (FAST) Act, which was signed into law on December 4, 2015 and funds surface transportation programs from FY 2016 to FY 2020, continued the CMAQ program to provide a flexible funding source to state and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. Funding is available to reduce congestion and improve air quality for areas that do not meet the National Ambient Air Quality Standards for ozone, carbon monoxide, or particulate matter (nonattainment areas) and for former nonattainment areas that are now in compliance (air quality maintenance areas). The Maricopa Association of Governments manages CMAQ funds for their planning area.

Highway Safety Improvement Program (HSIP)

The FAST Act continued the HSIP. The purpose of this program is to achieve a significant reduction in traffic fatalities and serious injuries on all public roads, including non-state-owned roads and roads on Tribal land. The HSIP requires a data-driven, strategic approach to improving highway safety on all public roads with a focus on performance. Bicycle safety countermeasures compete poorly under the current Arizona HSIP Guidelines due to their lack of four- and five-star crash modification factors.

National Highway Performance Program (NHPP)

The FAST Act continued the NHPP, which was established under MAP-21. The NHPP provides support for the condition and performance of the National Highway System (NHS). All bicycle/pedestrian improvements using this funding source must be associated with a NHS facility.

Surface Transportation Block Grant Program (STBG)

The STBG provides flexible funding that may be used by states and localities for projects to preserve and improve the conditions and performance on any Federal-aid highway. Eligible projects related to bicyclist safety include pedestrian and bicycle projects, safety projects, recreational trails, safe routes to school projects, and projects within the pre-FAST Act Title 23 definition of "transportation alternatives" (see the Transportation Alternatives Set-Aside description below). Eligible projects must be identified in the Statewide Transportation Improvement Program (STIP) and be consistent with the Long-Range Statewide Transportation Plan and the Metropolitan Transportation Plan.

Transportation Alternatives Set-Aside

The FAST Act eliminated the MAP-21 Transportation Alternatives Program (TAP) and replaced it with a set-aside of STBG program funding for transportation alternatives (TA). These set-aside funds include all projects and activities that were previously eligible under the TAP, encompassing a variety of smaller-scale transportation projects such as pedestrian and bicycle facilities, recreational trails, and safe routes to school projects.

Recreational Trails Program (RTP)

The RTP provides funds to the states to develop and maintain recreational trails and trail-related facilities for both nonmotorized and motorized recreational trail uses.

The FAST Act reauthorized the RTP for federal fiscal years 2016 through 2020 as a set-aside of funds from the TA Set-Aside under the STBG.

Safe Routes to School (SRTS)

SRTS is now funded within the Transportation Alternatives Set-Aside.

Statewide Planning and Research (SP&R) or Metropolitan Planning Funds

Funding is provided for SP&R by a 2% set-aside from each state's apportionments of four programs: NHPP, Surface Transportation Program (STP), HSIP, and CMAQ. A minimum of 25% must be used for research purposes, and the remaining funds are used for statewide and metropolitan planning.

NHTSA Section 402: State and Community Highway Safety Grant Program

To receive Section 402 grant funds, a state must have an approved HSP and provide assurances that it will implement activities in support of national goals that also reflect the primary data-related factors within the state, as identified by the state highway safety planning process. States can distribute highway safety grant funds to a wide network of sub-grantees, including local law enforcement agencies, municipalities, universities, health care organizations, and other local institutions. The Arizona Governor's Office of Highway Safety manages these funds and has historically only provided funding to law enforcement agencies.

States may spend 402 funds in accordance with an approved HSP that complies with the uniform national guidelines for highway safety programs. One of the eligible programs is to improve pedestrian and bicycle safety.

NHTSA Section 405: National Priority Safety Programs (Nonmotorized Safety)

Under the FAST Act, Section 405 is the National Priority Safety Program, which provides grant funding to address selected national priorities for reducing highway deaths and injuries. The FAST Act added two new grants under this program, one of which is for nonmotorized safety. States are eligible if the annual combined pedestrian and bicyclist fatalities in the state exceed 15 percent of the total annual crash fatalities in the state using the most recently available fatal data from NHTSA's Fatality Analysis Reporting System (FARS). Eligible states may use Section 405 grant funds only for training law enforcement on state laws applicable to pedestrian and bicyclist safety; enforcement mobilizations and campaigns designed to enforce those state laws; or public education and awareness programs designed to inform motorists, pedestrians, and bicyclists of those state laws.

Federal Lands and Tribal Transportation Programs

Programs under the FHWA, Office of Federal Lands Highway (FLH), relate to projects for improving transportation to and within Federal and Tribal lands. Programs that can potentially fund bicycle and pedestrian safety improvements are:

- Federal Lands Access Program
- Federal Lands Transportation Program
- Tribal Transportation Program
- Nationally Significant Federal Lands and Tribal Projects

Arizona Funding Sources

Highway User Revenue Fund

The state of Arizona taxes motor fuels and collects a variety of fees and charges relating to the registration and operation of motor vehicles on the public highways of the state. These collections include gasoline and use fuel taxes, motor carrier taxes, vehicle license taxes, motor vehicle registration fees, and other miscellaneous fees. These revenues are deposited in the Arizona Highway User Revenue Fund (HURF) and are then distributed to the cities, towns, and counties and to the State Highway Fund. These taxes represent a primary source of revenues available to the state for highway construction, improvements, and other related expenses.

Regional Funding Sources

Maricopa County Transportation Excise Tax and Regional Area Road Fund (RARF)

In November 2004, the voters of Maricopa County approved the extension of the levy of the Maricopa County Transportation Excise Tax for an additional 20 years, ending December 31, 2025. Often referred to as the "half-cent sales tax," the tax is levied upon business activities in Maricopa County. The tax revenues are distributed as follows:

- 66.7% goes into the Maricopa County RARF consisting of 56.2% for freeways and routes on the SHS, including design, right-of-way, construction, maintenance, and debt service for projects included in the Regional Transportation Plan (RTP) for Maricopa County and 10.5% for major arterial streets and intersection improvements, including debt service, capital expense, and implementation studies.

- 33.3% goes to a public transportation fund to be used solely for capital costs, maintenance, and operation of public transportation classifications along with capital costs and utility relocation costs associated with a light rail public transit system.

Pima Association of Governments (PAG) Regional Transportation Authority (RTA) Half-Cent Sales Tax

Pima County voters approved the half-cent sales tax on May 16, 2006 to fund the RTA Plan. The state, in turn, transfers the collected funds to a regional transportation fund. The RTA is limited to collecting the tax for up to 20 years. Over 20 years, the tax levy is expected to generate $2.1 billion. Of the $2.1 billion, $80 million will fund pedestrian improvements (as part of the Safety and Environmental Elements in the RTA Plan) such as crosswalks and sidewalks to increase pedestrian accessibility. The Roadway Element in the RTA Plan is expected to receive $1.2 billion over 20 years and comprise 35 distinct roadway projects that also have bicyclist components.

Table 22. Summary of Funding Programs

Funding Programs	Project Type (Construction, Non-construction, or Both)	Required Matching Funds	Arizona Apportionment	Eligible Projects	Comments	Source
Federal Funding Programs						
Better Utilizing Investments to Leverage Development (BUILD) Grant Program	Both	0 – 20%	ADOT maximum funding is $150M (FY 2018)	Primarily projects that can be fully integrated into surface transportation projects such as: • Bicycle lanes on roads • Paved shoulders for bicycle and pedestrian use • Bike racks on transit • Bicycle share (capital and equipment) • Bridges/overcrossings for pedestrians and bicyclists • Historic preservation (pedestrian and bicycle and transit facilities) • Lighting (pedestrian and bicyclist scale associated with pedestrian/bicyclist project) Eligible projects for BUILD Transportation Discretionary Grants are capital projects that include, but are not limited to: (1) highway, bridge, or other road projects eligible under title 23, United States Code; (2) public transportation projects; (3) passenger and freight rail transportation projects; (4) port infrastructure investments and (5) intermodal projects. The FY 2018 Appropriations Act allows up to $15 million for the planning, preparation, or design of projects eligible for BUILD Transportation funding.	BUILD Transportation grants replace the pre-existing Transportation Investment Generating Economic Recovery (TIGER) grant program. Like TIGER, FY 2018 BUILD Transportation Grants are for investments in surface transportation infrastructure and are to be awarded on a competitive basis for projects that will have a significant local or regional impact. The FY 2018 BUILD Transportation Discretionary Grants program will give special consideration to projects located in rural areas. By statute, BUILD funds must be obligated within three years of the end of the fiscal year for which they are authorized.	https://www.transportation.gov/BUILDgrants
Transportation Infrastructure Finance and Innovation Act (TIFIA)	Both	N/A	Total federal funds for credit assistance: • FY 2018: $285M • FY 2019: $300M • FY 2020: $300M	Pedestrian and bicycle infrastructure networks – construction of pedestrian and bicyclist facilities, rest areas, access improvements, crosswalks, curb ramps, lighting, road diet (roadway reconfiguration), sidewalks, signs and signal improvements, spot improvement programs, stormwater improvements, traffic calming, trail bridges, trail/highway intersections, and bridges/tunnels for pedestrians or bicyclists.	TIFIA provides credit assistance for qualified projects of regional and national significance. The credit assistance is limited to 33% of reasonable anticipated eligible project costs. The program offers assistance only in the form of secured loans, loan guarantees, or standby lines of credit, but can be combined with other grant sources, subject to total federal assistance limitations.	https://www.transportation.gov/tifia/tifia-credit-program-overview
Federal Transit Administration (FTA) Grant Programs	Both	10% – 20%	Varies by grant	FTA Section 5311 – Rural Areas: Grants can support a joint development improvement, an example being pedestrian and bicycle and pedestrian access to a public transportation facility.	Grant opportunities as of April 2017, that noted pedestrian projects as potentially eligible for funding include: • FTA Section 5310 – Enhanced Mobility of Seniors and Individuals with Disabilities • FTA Section 5311 – Formula Grants for Rural Areas FTA Section 5307 – Urbanized Area Formula Grants: Note the previous requirement for spending 1% of grant funds on associated improvements (which could be used for pedestrian improvements) has been removed under the FAST Act.	https://www.transit.dot.gov/grants https://azdot.gov/planning/TransitProgramsandGrants/5311-rural-public-transportation-program/overview

Table 22: Summary of Funding Programs (cont.)

Funding Programs	Project Type (Construction, Non-construction, or Both)	Required Matching Funds	Arizona Apportionment	Eligible Projects	Comments	Source
Congestion Mitigation and Air Quality (CMAQ) Program	Both	0% – 20%	$53.6M (FY 2018)	Limiting portions of roads to be used for non-motorized transportation, constructing sidewalks, constructing and maintaining trails, promotional programs, and funding pedestrian and bicycle coordinator positions at the state and local levels. CMAQ funds may be used for shared-use paths but may not be used for trails that are primarily for recreational use.	Most activities require a 20% match; a 10% match is required for certain interstate activities; and no match is required for projects such as traffic control signalization and carpooling. Projects must demonstrate emissions reduction and benefit to air quality.	https://www.fhwa.dot.gov/environment/air_quality/cmaq/
Highway Safety Improvement Program (HSIP)	Construction	10% (Except as provided in 23 U.S.C 120 and 130)	The 2018 call for projects was for SFY 21 and SFY 22. Available funds for those years are: • SFY 21: $23M • SFY 22: $32M In SFY 19 funding for state projects was State: $26.1 M, local $11.56M; In SFY 20 funding for state projects is $32.10M; local $9.62M	Bicycle safety improvements on any public road or publicly owned pedestrian or bicycle pathway. Funding for bike lanes, separated bike lanes, shared-use paths, paved shoulders, road diet (roadway reconfiguration), bridges/tunnels for bicyclists and/or pedestrians, sidewalks, crosswalks, curb ramps, signs, counting equipment, data collection for pedestrians and bicyclists, maps, training, and RSAs.	The HSIP is a core Federal-aid highway program, the purpose of which is to achieve a significant reduction in fatalities and serious injuries on all public roads. A state must develop a State SHSP to be eligible for Federal funding.	https://safety.fhwa.dot.gov/hsip/hsip.cfm https://www.azdot.gov/docs/default-source/traffic-library/hsip-presentation-021518.pdf?sfvrsn=2
National Highway Performance Program (NHPP)	Construction	10% – 20%	$427.1M (FY 2018)	Construction of pedestrian and bicycle facilities, rest areas, access improvements, crosswalks, curb ramps, lighting, road diet (roadway reconfiguration), sidewalks, signs and signal improvements, spot improvement programs, stormwater improvements, traffic calming, trail bridges, trail/highway intersections, bridges/tunnels for pedestrians or bicyclists, counting equipment, data collection for pedestrians and bicyclists, and RSAs.	All bicycle/pedestrian improvement projects or activities must be associated with an NHS facility. Projects must be identified in the STIP and be consistent with the Long-Range Statewide Transportation Plan and the Metropolitan Transportation Plan(s).	https://www.fhwa.dot.gov/specialfunding/nhpp/160309.cfm
Surface Transportation Block Grant Program (STBG)	Both	10% – 20%	$214.4M (FY 2018)	RTP projects eligible under 23 U.S.C. 206, pedestrian and bicycle projects in accordance with 23 U.S.C. 217, and SRTS projects under Section 1404 of SAFETEA-LU (23 U.S.C 402 note). Includes: Pedestrian or bicycle improvements, bicycle and/or pedestrian plans, bicycle helmets, maps, bicycle parking, bicycle share, coordinator positions, training, safety education, safety enforcement, safety program technical assessment, rest areas, access improvements, crosswalks, curb ramps, lighting, road diet (roadway reconfiguration), sidewalks, signs and signal improvements, spot improvement programs, stormwater improvements, traffic calming, trail bridges, trail/highway intersections, bridges/tunnels for pedestrians or bicyclists, counting equipment, data collection for pedestrians and bicyclists, RSAs, access improvements to public transportation ADA improvements, historic preservation, and landscaping.	The STBG program provides flexible funding that may be used by states and localities for projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge, and tunnel project on any public road; pedestrian and bicycle infrastructure; and transit capital projects, including intercity bus terminals. Projects must be identified in the STIP and be consistent with the Long-Range Statewide Transportation Plan and the Metropolitan Transportation Plan.	https://www.fhwa.dot.gov/specialfunding/stp/160307.cfm#d

Table 22: Summary of Funding Programs (cont.)

Funding Programs	Project Type (Construction, Non-construction, or Both)	Required Matching Funds	Arizona Apportionment	Eligible Projects	Comments	Source
Transportation Alternatives Set-Aside (TA Set-Aside)	Both	10% – 20%	$17.7M (FY 2018) Note: $1.93M is set aside for the RTP and up to 25% of the statewide TA funds can be transferred to other federal aid categories (25% was transferred in FY 2016)	Eligible projects are *transportation alternatives*, which include on- and off-road pedestrian and bicycle facilities, infrastructure projects for improving non-driver access to public transportation and enhanced mobility, community improvement activities such as historic preservation and vegetation management, and environmental mitigation related to stormwater and habitat connectivity; recreational trail projects; SRTS projects; and projects for planning, designing, or constructing boulevards and other roadways largely in the right-of-way of former divided highways.	The TA Set-Aside projects are set-aside projects under the STBG program. Although separate funding sources in the past, the RTP and SRTS programs are now funded within the TA Set-Aside.	https://www.fhwa.dot.gov/fastact/factsheets/transportationalternativesfs.cfm
Recreational Trails Program (RTP)	Both	10% – 20%	$1.92M (FY 2018)	Develop and maintain recreational trails and trail-related facilities for both non-motorized and motorized recreational trail uses. Eligible projects include recreational trails, trail bridges and intersections, construction and maintenance equipment for trails, trailside and trailhead facilities, shared-use paths, ADA improvements, sidewalks, crosswalks, curb ramps, bicycle parking, bridges/tunnels for pedestrians and/or bicyclists, counting equipment, data collection for pedestrians and/or bicyclists, lighting, spot improvements, stormwater improvements, and training.	The RTP is intended to fund recreational trails. Each state develops its own procedures to solicit projects from applicants and to select projects for funding, in response to the recreational trail needs within the state. RTP is now funded within the TA Set-Aside.	https://www.fhwa.dot.gov/environment/recreational_trails/
Safe Routes to School (SRTS)	Both	10% – 20%	N/A - funded within the TA Set-Aside	Infrastructure-related and behavioral projects that provide a safe and appealing walking atmosphere. Eligible infrastructure projects include sidewalk improvements, traffic calming and speed reduction improvements, pedestrian and bicycle crossing improvements, on-street bicycle facilities, off-street bicycle facilities, secure bike parking facilities, and traffic diversion programs near schools. Eligible non-infrastructure improvements include public awareness campaigns and outreach, traffic education and enforcement, student sessions on bicycle and pedestrian safety, and funding for training volunteers and managers of SRTS programs.	SRTS funds are available until expended (they are not subject to the usual Federal-aid highway four-year rule of availability). 10-30% of each state's funding is to be spent on non-infrastructure activities. SRTS is now funded within the TA Set-Aside.	https://www.fhwa.dot.gov/environment/safe_routes_to_school/guidance/#toc123542199 https://www.fhwa.dot.gov/environment/transportation_alternatives/
Statewide Planning and Research (SP&R) or Metropolitan Planning Funds	Non-Construction	20%	$6.0M (FY 2018) (Metropolitan Planning)	Eligible projects include engineering and economic surveys, planning of future highway programs, planning and funding of local transportation systems, development and implementation of management systems/plans/processes, studies of surface transportation systems and taxation, research and development, and planning of real-time monitoring elements.	Funding is provided for SP&R by a 2% set-aside from each state's apportionments of four programs: NHPP, STP, HSIP, and CMAQ. A minimum of 25% must be used for research purposes, and the remaining funds are used for statewide and metropolitan planning.	https://www.fhwa.dot.gov/map21/factsheets/spr.cfm
NHTSA Section 402: State and Community Highway Safety Grant Program	Non-Construction	5% – 20%	Varies: Pedestrian and Bicycle Safety Enforcement Program: $0.165M - (FFY 2016), $0.004M (FFY 2017) Pedestrian and Bicycle Safety Awareness Program: $0.110M (FFY 2016), $0.115 (FFY 2017) School Zone and School Bus Operations Enforcement: $0.027M (FFY 2016), $0.076 (FFY 2017)	Highway safety projects, training courses for traffic engineers, safety-related events, enforcement, and educational materials. Funding for education, enforcement, and research programs designed to reduce traffic crashes and resulting deaths, injuries, and property damage.	A state is eligible for State Highway Safety Program grants by having and implementing an approved HSP.	https://safety.fhwa.dot.gov/legislationandpolicy/policy/section402/

Table 22: Summary of Funding Programs (cont.)

Funding Programs	Project Type (Construction, Non-construction, or Both)	Required Matching Funds	Arizona Apportionment	Eligible Projects	Comments	Source
NHTSA Section 405h: National Priority Safety Programs (Nonmotorized Safety)	Non-Construction	20%	$0.096M for Pedestrian and Bicycle Safety Enforcement Program (*State of Arizona HSP – Federal Fiscal Year 2017*)	Highway safety programs designed to reduce pedestrian/bicyclist deaths and injuries that result from crashes involving a motor vehicle.	States are eligible if the quantity of annual combined pedestrian and bicyclist fatalities exceeds 15% of the total annual crash fatalities. Grant funds can be used for: - Training of law enforcement officials on state laws applicable to pedestrian and bicycle safety -Campaigns to enforce traffic laws relating to pedestrian and bicyclist safety -Public education and awareness programs designed to inform motorists, pedestrians, and bicyclists of state traffic laws applicable to pedestrian and bicycle safety	See Section H: https://www.law.cornell.edu/uscode/text/23/405
Federal Lands and Tribal Transportation Programs	Both	0% – 10%	Varies by grant	Transportation planning, research, maintenance, engineering, rehabilitation, restoration, construction, and reconstruction of Tribal transportation facilities; the operation or maintenance of transit programs and facilities; and any transportation project eligible for assistance under 23 U.S.C. that is located within or provides access to a Tribal land and/or Tribal government.	Includes: A) Federal Lands Access Program; B) Federal Lands Transportation Program; C) Tribal Transportation Program (0% match); D) Nationally Significant Federal Lands and Tribal Projects (10% match).	https://flh.fhwa.dot.gov/programs/ttp http://www.fhwa.dot.gov/map21/factsheets/ttp.cfm
Arizona Funding Sources						
Highway User Revenue Funds (HURF)	Construction	N/A	FY 2018 – $1,462.5M	Highway construction and improvements and other related expenses.	HURF funds are collected from gasoline and use fuel taxes, motor carrier taxes, vehicle license taxes, motor vehicle registration fees, and other miscellaneous fees. Funds are distributed via formulas to the State Highway Fund, cities and towns, cities with a population over 300,000, and counties.	https://www.azdot.gov/docs/default-source/businesslibraries/hurfcastproc1726.pdf?sfvrsn=4 http://www.azdot.gov/docs/default-source/financial-management-services/hurfdist_formulas.pdf?sfvrsn=2
Regional Funding Sources						
Maricopa County						
Transportation Excise Tax (Half-Cent Sales Tax)	Both	N/A	FY 2018 forecast distribution – $432.0M	Freeway and regional arterial regional bus service and other special transportation services, and high capacity transit services such as light rail, bus rapid transit, and express buses.	66.7% of the annual funds from the tax go to the RARF.	https://www.azdot.gov/docs/default-source/businesslibraries/rarfcastproc1826.pdf?sfvrsn=4
Regional Area Road Fund (RARF)	Both	N/A	FY 2018 forecast distribution – $242.8M freeways $45.4M arterial streets	Construction of new freeways, widening of existing freeways and highways, improvements to the arterial street system, and public transportation.	Funds are used for freeways and arterial road networks.	https://www.azdot.gov/docs/default-source/businesslibraries/rarfcastproc1826.pdf?sfvrsn=4

Table 22: Summary of Funding Programs (cont.)

Funding Programs	Project Type (Construction, Non-construction, or Both)	Required Matching Funds	Arizona Apportionment	Eligible Projects	Comments	Source
Pima County						
Regional Transportation Authority (RTA) Half-Cent Sales Tax	Construction	N/A	Total of $2.1B from 2006 through 2026 FY 2016-2017 revenues were $77.14M	Construction of greenways, bikeways, pathways, and sidewalks.	The RTA plan consists of 35 distinct roadway projects. The RTA funding source is, by the enabling legislation, restricted to those projects identified in the RTA plan approved by the voters. Therefore, RTA funds are not programmed through the same process as other regional funds. The RTA projects will be paid with funds generated from a half-cent excise tax over the 20-year life of the plan.	http://www.rtamobility.com/Home/tabid/38/Default.aspx FY 2016-2017 RTA Annual Report: http://www.rtamobility.com/documents/fullpageRTAadDec2017StarFin2.pdf

9. 2018 BSAP GOALS

This section presents updated BSAP goals, as informed by analysis performed in this project, and goals established by other state and federal plans.

Goals Established in Previous Plans and Studies

Several statewide and national plans, completed since 2012, include bicycle safety-focused goals and objectives. Goals developed for the 2018 BSAP should support the state and national overall goals summarized below.

2016 FHWA Strategic Agenda for Pedestrian and Bicycle Transportation

Federal Highway Administration Strategic Agenda for Pedestrian and Bicycle Transportation, September 2016, established the following goals:

- *"Achieve an 80 percent reduction in pedestrian and bicycle fatalities and serious injuries in 15 years and zero pedestrian and bicycle fatalities and serious injuries in the next 20 to 30 years.*
- *Increase the percentage of short trips represented by bicycling and walking to 30 percent by the year 2025. This will indicate a 50 percent increase over the 2009 value of 20 percent. Short trips are defined as trips 5 miles or less for bicyclists and 1 mile or less for pedestrians."*

MAP-21/FAST-ACT National Safety Program Performance Measures

The FHWA Safety Performance Management Measures regulation requires State Departments of Transportation and Metropolitan Planning Organizations to set Highway Safety Improvement Program (HSIP) targets for five safety performance measures. State Departments of Transportation are required to report HSIP targets to FHWA by August 31, 2017 (http://safety.fhwa.dot.gov/hsip/spm/timeline.cfm). The Safety Final Rule establishes five performance measures as the five-year rolling averages for:

1) Number of Fatalities,
2) Rate of Fatalities per 100 million Vehicle Miles Traveled (VMT),
3) Number of Serious Injuries,
4) Rate of Serious Injuries per 100 million VMT, and
5) **Number of Non-motorized Fatalities and Non-motorized Serious Injuries.**

The Arizona 2017 HSIP Annual Report establishes a target of 790 non-motorized fatalities and serious injuries (statewide, *all public roads*). Arizona established this safety performance projection based on the 5-year rolling averages of statewide crash data.

State of Arizona Highway Safety Plan, Federal Fiscal Year 2018

The Arizona Governor's Office of Highway Safety (GOHS) prepares the annual Highway Safety Plan (HSP) to serve as the implementation guide for highway safety projects throughout Arizona. The HSP is also an application for funding through the National Highway Traffic Safety Administration (NHTSA). The HSP states that bicycle fatalities accounted for three percent of total fatalities in 2015, and continues to be a focus for GOHS. The HSP established the following bicycle and pedestrian safety performance goals:

- An increase in pedestrian fatalities by no more than 29.4% from 143 (2011-2015 average) to 185 by 2018.
- An increase in bicyclist fatalities by no more than 45.8% from 24 (2011-2015 average) to 37 by 2018.

To reduce the number of bicyclist and pedestrian fatalities, the HSP submitted the following project request to NHTSA:

- **Pedestrian and Bicycle Safety Enforcement Program –** GOHS supports the purchase of bicycle helmets, print and electronic media, and other materials for bicyclist and pedestrian safety events throughout the state, such as bicycle rodeos. This project also provides funding to GOHS for the development of public education and awareness materials relating to pedestrian and bicycle safety.

2014 Arizona Strategic Highway Safety Plan (SHSP)

The 2014 Arizona SHSP established an objective to:

- *"Reduce the total number of fatalities and serious injuries in Arizona by three to seven percent* during the next five years from the 2013 base year."

The SHSP also established a goal for non-motorized users:

- *"Reduce fatalities and the occurrence and severity of serious injuries resulting from crashes involving non-motorized users on all public roadways in Arizona."*

2014 Arizona SHSP, Non-Motorized Users Emphasis Area Team

The 2014 Arizona SHSP Non-Motorized Users Emphasis Area Team established the following goal:

- 20-20 by 2020 – Reduce the total number of nonmotorized (pedestrian and bicycle) crashes, injuries, and deaths in Arizona by 20 percent by 2020 from the 2013 base year (A*rizona Strategic Highway Safety Plan, Non-motorized Users Emphasis Area Meeting, February 13, 2015)*

ADOT Long Range Transportation Plan

The Arizona Long Range Transportation Plan, entitled "What Moves You Arizona 2040" (WMYA) was recently updated (January 2018). The plan establishes the following goal and objective:

- Goal Area 1*:* **Improve Mobility, Reliability, and Accessibility** – Implement critical/cost-effective investments to improve access to multimodal transportation and optimize mobility and reliability for passengers and freight.
- Objectives*:* Better accommodate bicycle and pedestrian use on the state system.

2012 BSAP Goal

The bicycle safety goal established in the 2012 BSAP is:

- Reduce the total number of bicycle crashes (fatalities and non-fatalities) on Arizona state highways by 12 percent by the year 2018.

The reduction in bicycle crashes is measured by a five-year average (2014-2018), with the years 2004 through 2008 acting as the base years. With a baseline of 218 bicyclist crashes per year (2004-2008), the target is a reduction to a five-year average of 191 crashes per year in 2018.

There were 778 bicycle/motor-vehicle crashes reported on Arizona state highways from 2012-2016. **Table 23** compares the 2004-2008 crash data with 2012-2016 crash data within the context of the 2012 BSAP goals. As revealed by the data, the 5-year goal (reduce to 191 or fewer crashes per year) established in the 2012 BSAP was exceeded. Bicycle crashes decreased on the SHS during the 2012-2016 period as compared to the 2004-2008 data by 29% (155 crashes/year), a greater reduction from the goal of a 12% reduction (191 crashes/year). It should be noted that there was a small reduction in the number of centerline miles of the SHS due to turnover of certain roads to local jurisdictions.

Table 23. 2012 BSAP Goal Status Summary

	2004-2008 Bicycle Crashes	2012-2016 Bicycle Crashes	2012 BSAP Goal	% Change
Total Bicycle Crashes (All Public Roadways)	9,861	8,840	-	**10%** reduction
SHS Bicycle Crashes	1,089	778	12% reduction	**29%** reduction
SHS Fatal Crashes	33	18	-	**45%** reduction
SHS Injury Crashes	860	647	-	**25%** reduction
SHS No Injury Crashes	196	113	-	**42%** reduction
Average Annual SHS Bicycle Crashes / Year	218	156	192 crashes per year	**29%** reduction

Recommended 2018 BSAP Goal

Goals developed for the 2018 BSAP are consistent with and support those established by the Arizona SHSP non-motorized emphasis area team. The goal proposed in **Table 24** establishes the bicycle safety goal for ADOT for the next five years (2022).

Table 24. 2018 BSAP Goal

	2012-2016 Crashes	2018 BSAP Goal	
Annual Average Bicycle Crashes (State Highway System, fatalities and injuries)	156 per year	Fewer than 125 crashes per year	**20% Reduction by 2022**

10. NEXT STEPS

Additional policies, tools, resources, programs, and data that should be developed to meet bicycle safety goals and objectives are provided in this chapter.

Policy/Design Guidelines Recommendations

Considerations for Updates to the ADOT Roadway Design Guidelines (April 2014 Edition)

Some new additional considerations for updates to the ADOT Roadway Design Guidelines are:

Page 1, under References:

- "7. Guide for the Development of Bicycle Facilities, AASHTO, 1999" – update to Guide for the Development of Bicycle Facilities, AASHTO, 4th edition, 2012
- "9. MGT 02-1 Bicycle Policy, ADOT, February 27, 2007" – delete
- Consider adding: "Complete Transportation Guidebook, ADOT 2016" (see https://www.azdot.gov/docs/default-source/planning/ctguidebook.pdf).

Page 300-59 under 316.2 – Traffic Lanes and Shoulder Width:

Since "bicyclists have the right to operate in a legal manner on all State highways including fully controlled-access highways except where specifically excluded by administrative regulation and where posted signs give notice of a prohibition" (107.1 – Bicycle Facilities), it is suggested to:

- On page 300-59, delete: "When bicycle traffic is prevalent," as follows:

  "Undivided highways: the minimum detour shoulder width for a two-lane two-directional detour on a rural undivided highway is 2 ft. ~~When bicycle traffic is prevalent,~~ **A** minimum 4 ft shoulder should be provided. When the shoulder width of the approach roadway is greater than 4 ft, the existing shoulder width may be carried through the detour but may be reduced to no less than 4 ft after consideration is given to the factors listed above.
  Where longitudinal barriers are required, an additional 2 ft offset to face of barrier should be provided."

Page 400-30 under 408.11 – Right-Turn Channelization

Since "bicyclists have the right to operate in a legal manner on all State highways including fully controlled-access highways except where specifically excluded by administrative regulation and where posted signs give notice of a prohibition" (107.1 – Bicycle Facilities), it is suggested to:

- On Page 400-30, delete: "Where bicycles are expected to be prevalent," as follows:
  "E) Bicycle Buffer: ~~Where bicycles are expected to be prevalent,~~ A buffer area between the through lane and the right-turn lane should be provided. Figure 408.11A shows the bicycle buffer with a wide curb lane. The buffer area is formed by the extension of the through lane and the face of curb line. Figure 408.11B shows the bicycle buffer for non-curb and gutter sections. The buffer may be omitted where bicycle traffic or right-turn traffic is expected to be infrequent.

Page 600-12, under 606.2 – Inlets, B) Restrictions on inlet types

- Change "**All grates shall be bicycle safe on facilities where bicycles are allowed (see ADOT Bicycle Policy).** Construction Standard Drawing C-15.50 grates are preferred. See Figures 606.2A and 606.2B for bicycle safe inlet requirements for freeway ramp termini at cross streets and frontage roads." to:

  "All grates shall be bicycle-compatible on facilities where bicycles are allowed (see ADOT Traffic Engineering Guidelines and Processes 1030 Controlled-Access Highways as Bikeways). Construction Standard Drawing C-15.50 grates are preferred. See Figures 606.2A and 606.2B for bicycle compatible inlet requirements for freeway ramp termini at cross streets and frontage roads."

Data Recommendations

Bicycle count data program – The *ADOT Bicycle and Pedestrian Count Strategy Plan* is the first step for ADOT to implement a bicycle and pedestrian count program. The project, nearing completion, will provide a database of bicycle and pedestrian counts to support safety assessments, performance measurement, and reporting, and has provided supporting information at several high-crash locations identified in this study. This data collection program should be continued, particularly at other high-crash locations. Implementation of a pedestrian and bicyclist count data system within the Traffic Data Management System (TDMS) (developed by and licensed from MS2) and used by ADOT for their motorized traffic data will help institutionalize pedestrian and bicyclist data within ADOT. This will make it easier for other agencies to use the count data in their analyses and applications. This process will also encourage other agencies across the state to follow suit, enabling other agencies to provide bicyclist count data that can also be used to help assess the SHS.

Encourage more complete and consistent crash reporting – Work with DPS, local police agencies, and Tribal communities to encourage consistent collection of more detailed bicycle crash reports at the state and local level. Work to ensure the crash report coding is accurate and the narrative descriptions by officers are comprehensive through training provided at the academies and at police/DPS briefings. Provide outreach and education to Tribal agencies to inform them of the benefit of reporting non-motorized crash data to help in identifying safety needs and justifying roadway improvement funding.

Education and Outreach Program Recommendations

1. **Targeted bicycle safety communications and outreach to communities that are experiencing high numbers of or serious bicyclist crashes** – ADOT has developed several multimedia materials to inform and educate bicyclists, pedestrians, and motorists about rules of the road, laws, and safety. The education materials target pedestrians and bicyclists of all ages, motorists, community leaders, public facility administrators, and facility designers. The printable and downloadable materials can be used in a variety of ways. ADOT should partner with communities, including the bicycling community, as well as MPOs to provide bicycle safety training. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.

2. ADOT should partner with communities as well as MPOs to provide bicycle safety education and training to drivers and bicyclists focused on crash groups and crash types resulting in the greatest number of crashes (See Table 8 and Table 9 in Chapter 3). The objectives of any cyclist training program are to improve traffic cycling skills, to increase knowledge and awareness of crashes, and to present methods to avoid crashes. To have a significant impact, such courses must be readily available, and the cycling population, particularly adults, must be convinced of their value.

Legislative Recommendations

1. **Review the status of distracted driver legislation** – State and local agencies within Arizona should implement strategies to address the growing problem of distracted driving. Arizona law, effective July 1, 2018, prohibits drivers under age 18 who have a Class G license from using any wireless device while they hold a learner's permit and during the first six months of their license. Arizona only bars school bus drivers from texting. Other states such as Texas prohibit the use of cell phones while driving near schools. Sixteen states and DC prohibit all drivers from using hand-held cell phones while driving, and 47 states and DC ban text messaging for all drivers.[5] Any new laws will require public education and enforcement.

2. **Amend State Statute** – Clarify bicyclist operation on sidewalks, crosswalks, and shared-use paths, based on *ADOT Statewide Bicycle and Pedestrian Plan Update*, Strategy 5, pages 39 and 40, "Amend State Statute to clarify bicyclist operation on sidewalks, crosswalks, and shared use paths" based on a proposal prepared by the National Committee on Uniform Traffic Control Devices (NCUTCD), Bicycle Technical Committee, as recommended to the Rules of the Road Task Force established within the NCUTCD: "Bicycle-Related Proposals for Amendments to the Uniform Vehicle Code."

11-1209	Bicycles on sidewalks	Adds restrictions needed for safe operation	Comments on 11-1209

In a 1980 Arizona Supreme Court case concerning whether a bicyclist may ride in a crosswalk, Justice Hays noted in a concurring opinion that he was "disturbed" by the lack of clarity regarding the duties of bicyclists. Maxwell, 126 Ariz. at 100, 612 P.2d at 1064 (Hays, J. specially concurring):

> I am disturbed by the fact that the legal duties and obligations of persons on bicycles are not defined in the law. Some bicyclists ride with traffic, others ride facing traffic, and of course some ride in the crosswalk. Our statutes give no indication of what is and what is not appropriate. I think this is a matter for the legislature and I hope that they will take

[5] Source: Insurance Institute for Highway Safety 2017, and National Conference of State Legislatures (NCSL) website, http://www.ncsl.org/research/transportation/cellular-phone-use-and-texting-while-driving-laws.aspx

the time to determine what should be the rights and the obligations of those who use bicycles in today's heavy traffic.

Research and Evaluation Recommendations

1. **Annual high-crash evaluation program** – An annual review will help ADOT to identify new hot-spot corridors or intersections. The annual update would review the most recent five-year bicycle crash data to identify any new locations. The top ten to 20 locations would be the focus for conducting RSAs on an ongoing basis. This step would continue to identify attributes associated with bicycle fatalities and serious injuries to inform policy decisions about high-crash bicycle areas and treatment needs.

2. Quinquennial Crash Typing – A thorough crash typing review every five years for the most recent five-year bicycle crash data with supplemental investigation such as the presence of bicycle facilities will inform countermeasure selection and policy decisions about high-crash bicycle areas. This crash typing review will also inform focus areas for driver and bicyclist education and training.

Engineering Treatment Recommendations

1. **Infrastructure improvements** – Plan, program, design, and implement infrastructure improvements at high-crash and high-crash potential segments, intersections, and interchanges (Refer to **Appendix A**). While Appendix A provides recommendations at specific locations on the SHS, systematic bicycle safety countermeasures may be pursued at locations across the SHS.

2. **Continued emphasis on routine accommodation** – Continue to emphasize use of ADOT's 2016 Complete Transportation Guidebook in design development. Strategies such as road diets (roadway reconfiguration), paved shoulders and bicycle lanes, bicycle accommodation on new and rehabilitated bridges, and improving bicycle and pedestrian facilities during resurfacing and other maintenance projects can help provide a safer environment for bicyclists. An example is the recommendations in the US 60X, Sossaman to Meridian Road Comprehensive Transportation Study (February 2018), where new bike lanes and pedestrian improvements were part of both short-term and long-term improvements.

3. **Interchange design modification** – Consider modifications to interchange design practices to better accommodate bicyclists through interchange areas. Many of the high-crash locations involving bicyclists identified in this study were located at interchanges. Examples of countermeasures are provided in **Chapter 6**.

4. **Separated crossings** – Support and facilitate the crossing of SHS facilities, particularly freeways, by bicyclists at alternate routes such as bridges or underpasses located parallel to and between interchanges. These could be designed exclusively for pedestrians and bicyclists or as collector street crossings with accommodation for pedestrians and bicyclists.

Enforcement Recommendations

Enforcement recommendations based on analysis of high-crash and high-crash potential locations are:

- Increase enforcement to target speeding along the corridor.
- Increase enforcement for motorists and bicyclists failing to yield the right-of-way at intersections and driveways.

Funding Recommendations

- Create a Highway User Revenue Fund set-aside percentage specifically for non-motorized safety countermeasures.
- Support initiatives that would increase State and Regional funding sources for bicycle infrastructure and transportation safety programs.
- Investigate methods to accelerate use of Federal funding for bicycle infrastructure, education, enforcement, and transportation safety programs.
- Partner with appropriate parties to support the increase of regional transportation tax revenues distributed specifically for transportation safety countermeasures and non-motorized transportation improvements.

APPENDIX A – PRIORITY LOCATIONS AND POTENTIAL COUNTERMEASURES

Priority Locations and Potential Countermeasures

The following are identified as priority locations on the state highway system. They are not listed in priority (Priority Location 1 does not imply that it's the highest priority location on the state highway system).

Contents

Priority Location 1: SR 95, Bullhead City, H-C Segment 78 and H-P Segment 2

General Project Information

Primary Route/Street: SR 95
City/Town Name: Bullhead City
County: Mohave
District: Northwest
Begin Limit: MP 244.4 (Hancock Rd)
End Limit: MP 249.8 (Bullhead Pkwy)
Segment Length: 5.4 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/y7r99vnp

Location Summary

The SR 95 segments are located in Bullhead City.
Programmed Projects: None
Identified in 2012 BSAP: Partially (Marina Blvd. to 7th St.)
Segment Type (High-Crash/High-Crash Potential): High-Crash and High-Crash Potential
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway (TWLTL)
Bicycle Facility Presence: Wide curb lane
AADT: 27,800 vehicles per day
Posted Speed Limit: 45 mph
Lighting: Yes
Number of Bicycle Crashes: 8 (including 1 fatal crash and 1 serious injury).

Project Need

Reported bicycle crashes along SR 95 between MP 244.4 and MP 249.8 have occurred evenly between intersection and non-intersection locations. The crash types were predominately *Motorist Drive Out*. The urban area includes many driveways and signalized intersections.

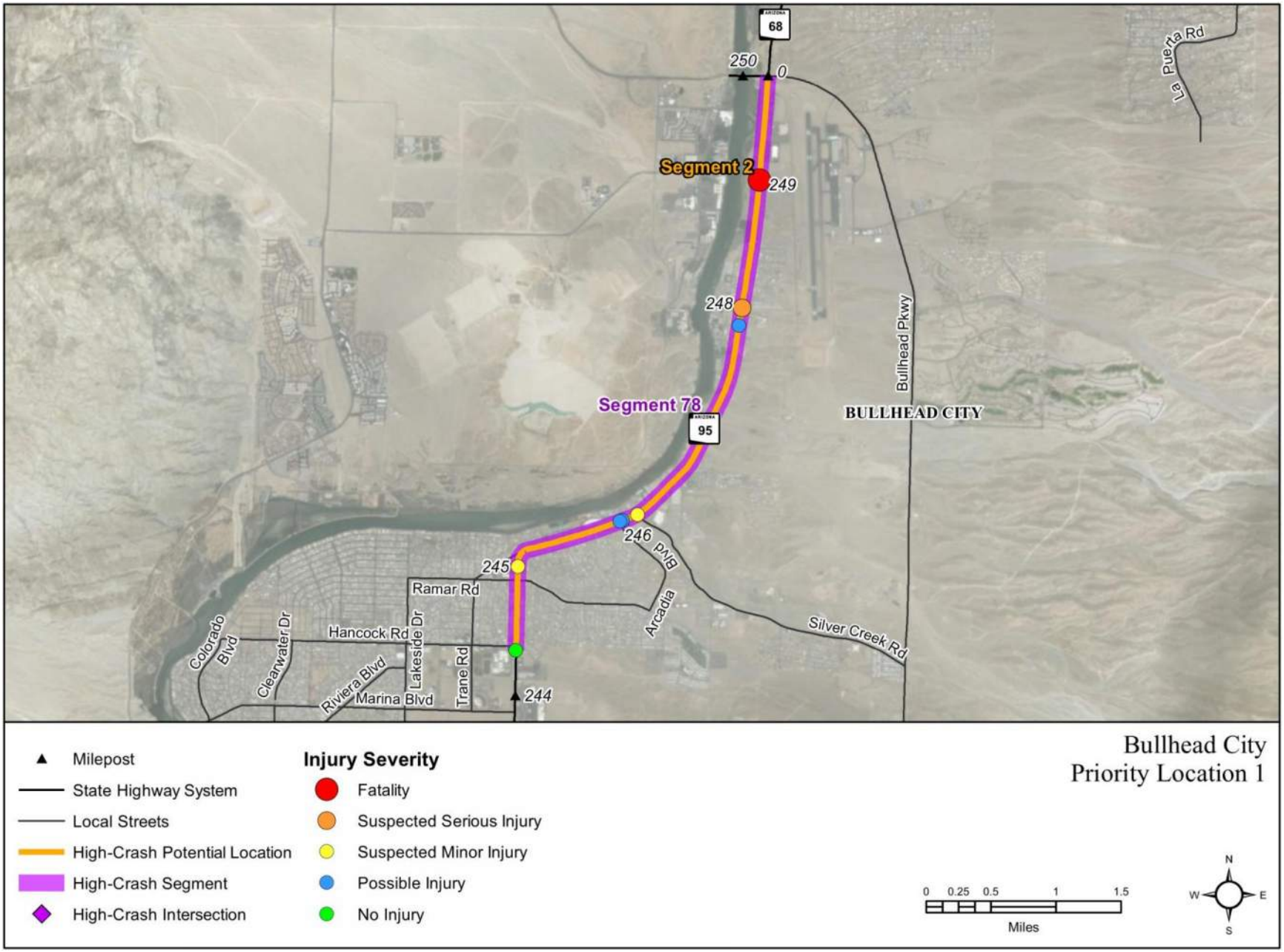
Project Purpose

Reduce the number of bicycle crashes on SR 95 by increasing the visibility of potential bicyclists and increase awareness of safer bicycle travel through bicycle safety education.

Potential Countermeasures

Option 1: Conduct RSA
A RSA was completed for MP 242 to MP 250, October 20-22, 2008. Review and update bicycle safety-focused recommendations.

Option 2: Engineering Countermeasures
Striped Paved Shoulder
Assess feasibility of a 4' striped shoulder (measured from gutter seam to the center of the white stripe). Record drawings for SR 95 show 24 meters (66.9') typical width. Striped shoulder may require one or more travel lanes to be reduced to 11'. A striped or paved shoulder should be considered for remainder of SR 95, MP 226.8 (California Border) to Junction SR 68.
Roadway Signing Improvements
Consider installing R4-11 Bicyclists May Use Full Lane (BMUFL) sign with R4-11aP Change Lanes to Pass plaque.
Option 3: Collaborate with Ongoing Access Management Study
Collaborate with ADOT and Bullhead City to implement recommendations from the SR 95 – Aviation Way to Teller Lane Access Management Plan, which identifies targeted improvement areas such as raised medians and restricted/combined access points.
Option 4: Bicycle Education Campaigns
Partner with WACOG and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.


68
250
0
La Puerta Rd
Segment 2
249
248
Bullhead Pkwy
Segment 78
95
BULLHEAD CITY
246
BLVD
245
Ramar Rd
Arcadia
Silver Creek Rd
Colorado Blvd
Clearwater Dr
Hancock Rd
Lakeside Dr
Trane Rd
Riviera Blvd
Marina Blvd
244
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Bullhead City
Priority Location 1
0 0.25 0.5 1 1.5
Miles
N
W
E
S

Priority Location 2: SR 95, Lake Havasu City (Urban), H-C Segment 79 and H-P Segment 5

General Project Information

Primary Route/Street: SR 95
City/Town Name: Lake Havasu City
County: Mohave
District: Northwest
Begin Limit: MP 177.0 (McCulloch Blvd)
End Limit: MP 187.5 (Chenoweth Dr)
Segment Length: 10.5 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/ycpawr2n

Location Summary

The SR 95 segment is located in Lake Havasu City. One bicycle crash with a serious injury was reported. Priority Location 2 is included as it is identified as a high-crash potential location.
Programmed Projects: None
Identified in 2012 BSAP: Partially (Swanson Ave. to Mesquite Ave.)
Segment Type (High-Crash/High-Crash Potential): High-Crash and High-Crash Potential
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five lane highway (TWLTL)
Bicycle Facility Presence: Shared use path/wide curb lane
AADT: 8,100 vehicles per day
Posted Speed Limit: 45-55 mph
Lighting: At signalized intersections
Number of Bicycle Crashes: 1 (also refer to Priority Location 3 which included 3 crashes)

Project Need

The reported bicycle crash along SR 95 between MP 177.0 and 187.5 occurred during dark conditions. The crash type included *Bicyclist Left Turn – Same Direction*.

Project Purpose

Reduce the number of bicycle crashes on SR 95 by increasing the visibility of potential bicyclists and increase awareness of safer bicycle travel through bicycle safety education.

Potential Countermeasures

Option 1: Engineering Countermeasures

Striped Paved Shoulder

Assess feasibility of a 4' striped shoulder (measured from gutter seam to the center of the white stripe). Record drawings for SR 95 show a 68' typical width. A 4' effective width (that available for use by the bicyclist excluding the rumble strip or gutter pan) striped shoulder should be considered in both directions. This may require one or more travel lanes to be reduced to 11'. Shoulder improvements should also be considered for segments between Parker and Lake Havasu City where effective shoulder width is less than 4'.

Roadway Signing Improvements

Consider installing R4-11 BMUFL sign with R4-11aP Change Lanes to Pass plaque.

Provide Roadway Lighting

Consider continuous roadway and path lighting along the high-crash and high-crash potential segment.

Evaluate Speed Limit

Evaluate the posted speed limit along portions of SR 95 to determine if it should be reduced in conformance with the increasing urbanization of the land use along the segment. Utilize USLIMITS2 (https://safety.fhwa.dot.gov/uslimits/)

Option 2: Bicycle Education Campaigns

Partner with LHMPO and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.


188
Chenoweth Dr
187
186
Avalon Ave
London Bridge Rd
Palo Verde Blvd
Kiowa Blvd
Bison Blvd
185
LAKE HAVASU CITY
Segment 5
El Dorado
Copper Ln
Havasupai Blvd
184
El Dorado Ave
Smoketree Ave
McCulloch Blvd
183
Mesquite Ave
Swanson Ave
Daytona Ave
Jamaica Blvd
Chemehuevi Blvd
Lake Side Rd
SR-95
182
Saratoga Ave
Grande Blvd
Mojave Dr
Acoma Blvd
Oro
178
Beachcomber Blvd
Segment 79
180
179
177
95
176
175
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Lake Havasu City (Urban)
Priority Location 2
0 0.25 0.5 1 1.5 2
Miles
N
W
E
S

Priority Location 3: SR 95, Lake Havasu City (Rural), H-P Segment 79

General Project Information

Primary Route/Street: SR 95
City/Town Name: Unincorporated
County: Mohave
District: Northwest
Begin Limit: MP 167.6
End Limit: MP 177.0 (McCulloch Blvd)
Segment Length: 9.4 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/ycaqljud

Location Summary

The SR 95 high-crash segment is south of Lake Havasu City. Three bicycle crashes were reported; two resulting in fatalities and one in a serious injury.
Programmed Projects: None
Identified in 2012 BSAP: No
Segment Type (High-Crash/High-Crash Potential): High-Crash
Area Type (Urban-Suburban/Rural): Rural
Facility Type: Two-lane highway (some portions of three-lane highway, alternating sides of the roadway)
Bicycle Facility Presence: Paved shoulder
AADT: 12,000-26,600 vehicles per day
Posted Speed Limit: 55-65 mph
Lighting: None
Number of Bicycle Crashes: 3 (2 fatalities, 1 crash with serious injury has unknown information)

Project Need

The reported bicycle crashes along SR 95 MP 167.6 to MP 177.0 include crash types of *Crossing Paths* and *Motorist Overtaking – Misjudged Space*. Two of the three bicyclist crashes resulted in fatalities.

Project Purpose

Reduce the number of bicycle crashes on SR 95 by increasing the visibility of potential bicyclists and increase awareness of safer bicycle travel through bicycle safety education.

Potential Countermeasures

Option 1: Engineering Countermeasures

Assess Existing Paved Shoulders to Improve to 4' Minimum Effective Shoulder Width

Assess feasibility to improve effective shoulder width to minimum of 4'. Effective shoulder width is the amount of shoulder width available for use by the bicyclist excluding the rumble strip. Per record drawings, SR 95 existing typical shoulder width is 5' with a rumble strip utilizing 1.5' as measured from the edge line. This results in an effective shoulder width of 3.5' (when installed per plans).

Roadway Signing Improvements

Consider installing R4-11 BMUFL sign with R4-11aP Change Lanes to Pass plaque.

Option 2: Bicyclist and Motorist Education Campaign

Partner with LHMPO and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic. Promote and provide motorists and bicyclist safety education at tourist destinations and nearby Lake Havasu City.


181
SR-95
Jamaica Blvd
180
Acoma Blvd
179
95
178
McCulloch Blvd
176
LAKE HAVASU CITY
Segment 79
170
168
167
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Lake Havasu City (Rural)
Priority Location 3
0 0.25 0.5 1 1.5 2
Miles
N
W
E
S

Priority Location 4: SR 66, Kingman, H-C Segment 76

General Project Information

Primary Route/Street: SR 66 (Andy Devine Avenue)
City/Town Name: Kingman
County: Mohave
District: Northwest
Begin Limit: MP 56.7 (I-40)
End Limit: MP 60.2 (Thompson Ave)
Segment Length: 3.5 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/ybrgkmkf

Location Summary

The SR 66 segment is located in Kingman. Four bicycle crashes were reported; one resulting in a fatality. At least 2 crashes involved juveniles.
Programmed Projects: None
Identified in 2012 BSAP: Partially, I-40 to Armour Ave
Segment Type (High-Crash-/High-Crash Potential): High-Crash
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway (TWLTL), four-lane divided
Bicycle Facility Presence: Paved shoulder, shared-use path
AADT: 14,100 vehicles per day
Posted Speed Limit: 35-55 mph
Lighting: Along undivided section only (0.4 miles)
Number of Bicycle Crashes: 4 (includes 1 fatal crash)

Project Need

The reported bicycle crashes along MP 56.7 to MP 60.2 have occurred evenly between intersections and non-intersections. The reported crash types include *Play Vehicle-Related, Non-Roadway, Bicyclist Ride Out – Commercial Driveway/Alley,* and *Bicyclist Left Turn – Opposite Direction*.

Project Purpose

Reduce the number of bicycle crashes on SR 66 by increasing the visibility of potential bicyclists, and increase awareness of safer bicycle travel through bicycle safety education.

Potential Countermeasures

Option 1: Engineering Countermeasures

Striped Paved Shoulder in Urban/Curbed Sections

Curbed/urban section extends from I-40 interchange to approximately 1,900 feet northeast along SR 66. Shared-use path begins approximately 2,300 feet northeast of I-40 interchange. Consider striping the existing outside lane within the urban section to a 5' paved shoulder. Evaluate including an unmarked bike lane (ADOT RDG 408.11 – Right-Turn Channelization, E) Bicycle Buffer) buffer between the right turn lane and the travel lane at intersection approaches.

Option 2: Bicycle Education Campaign

Partner with WACOG and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic. Two of the bicycle crashes involved youth or children under the age of 18. As such, the bicycle safety education may be accomplished through the schools.


Thompson Ave
66
Bond St
Northern Ave
60
Bank St
Castle Rock Rd
Willow Rd
Sierra Vista Ave
59
SR-66
Gordon Dr
Segment 76
Kino Ave
Western Ave
Stockton Hill Rd
Roosevelt St
58
KINGMAN
Airway Ave
Sycamore Ave
Burbank St
Harrison St
Railroad Ave
Wilshire Ave
Beverly Ave
53
I-40
52
54
56
56
40
55
Detroit Ave
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Kingman (SR 66)
Priority Location 4
0
0.25
0.5
1
Miles
N
W
E
S

Priority Location 5: SR 68, Golden Valley, H-C Segment 77

General Project Information

Primary Route/Street: SR 68
City/Town Name: Golden Valley
County: Mohave
District: Northwest
Begin Limit: MP 20.8 (Colorado Road)
End Limit: MP 25.6 (Bowie Road)
Segment Length: 4.8 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/yck4q6gf

Location Summary

The SR 68 high-crash segment is in Golden Valley. Three bicycle crashes were reported. No crashes resulted in serious injury or fatalities.
Programmed Projects: None
Identified in 2012 BSAP: No
Segment Type (High-Crash/ Crash Potential): High-Crash
Area Type (Urban-Suburban/Rural): Rural
Facility Type: Four-lane divided (0.9 miles of the segment), five-lane highway (TWLTL)
Bicycle Facility Presence: Paved shoulder
AADT: 12,700 vehicles per day
Posted Speed Limit: 55 mph
Lighting: No
Number of Bicycle Crashes: 3

Project Need

The reported bicycle crashes along MP 20.8 to MP 25.6 have occurred during night or dusk conditions. The segment has no bicycle facilities besides a wide shoulder and few crossing opportunities.

Project Purpose

Reduce the number of bicycle crashes on SR 68 by increasing the visibility of potential bicyclists and providing bicycle safety education.

Potential Countermeasures

Option 1: Engineering Countermeasures

Implement Improvements Identified in 2016 SR 68 Golden Valley PA (MP 14.0-MP 27.16)

The SR 68 Project Assessment was completed in November 2016 to identify safety improvements. The PA recommended raised median and roundabouts. Both improvements will reduce vehicle speeds and the number of potential conflict points. These countermeasures were carried forward in the 2018 SR 95/SR 68 Corridor Profile Study.

Provide Roadway Lighting

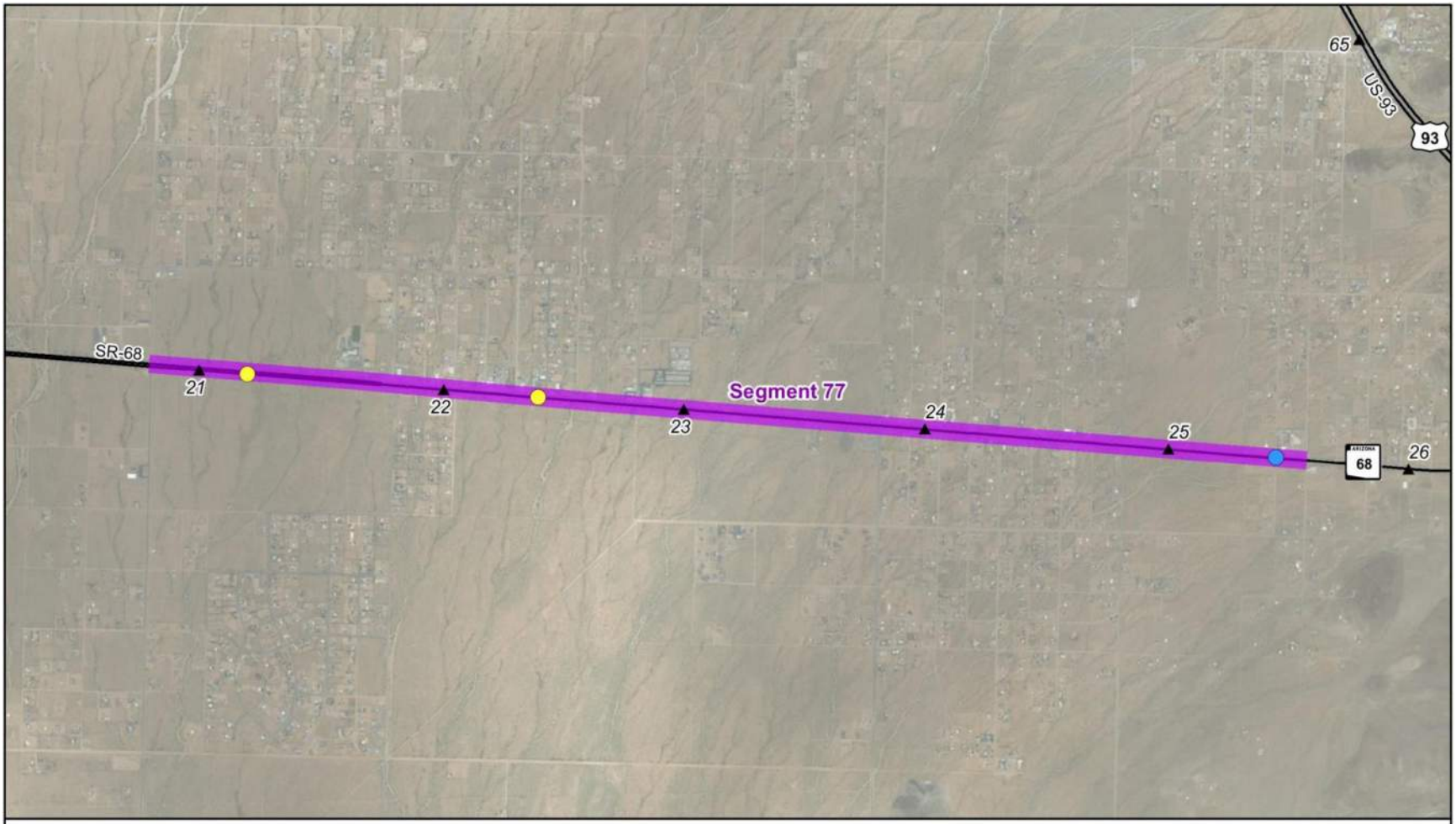
Evaluate the need for lighting along the corridor from Bacobi Road to Verde Road (approximately 3 miles) to increase bicycle visibility. At minimum, intersection lighting at major intersections is recommended. This countermeasure was recommended in the 2018 SR 95/SR 68 Corridor Profile Study.

Option 2: Bicycle and Motorist Education Campaign

Partner with WACOG and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.

Option 3: Enforcement

Increase enforcement to target speeding along the corridor.


65
US-93
93
SR-68
21
22
23
Segment 77
24
25
68
26
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
SR 68 in Golden Valley
Priority Location 5
0
0.25
0.5
1
Miles
N
W
E
S

Priority Location 6: SR 40B in Flagstaff, H-C Segment 89 and H-C Intersection 57

General Project Information

Primary Route/Street: SR 40B (Route 66) / US 180
City/Town Name: Flagstaff
County: Coconino
District: Northcentral
Begin Limit: MP 197.5 (Ponderosa Pkwy)
End Limit: MP 199.9 (Fanning Dr)
Intersections: SR 40B/Ponderosa Pkwy
Segment Length: 2.4 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/y9479nno

Location Summary

SR 40B high-crash segment and intersection is located in Flagstaff. Twenty-one bicycle crashes were reported, with two resulting in serious injury.
Programmed Projects: None
Identified in 2012 BSAP: Yes (Segment 89)
Segment Type (High-Crash/High-Crash Potential): High-Crash (and High-Crash Intersection)
Area Type (Urban-Suburban/Rural): Urban-Suburban
Segment Facility Type: Five-lane highway (TWLTL)
Intersection Facility Type (Major/Minor): Five-lane highway (TWLTL)/ Five-lane highway (TWLTL)
Bicycle Facility Presence: Narrow striped shoulder
Segment AADT: 26,700 vehicles per day
Posted Speed Limit: 40 mph
Lighting: Yes
Number of Bicycle Crashes: 21 (4 involved alcohol/drugs; 3 involved unknown conditions); 9 occurred at H-C Intersection 57.

Project Need

The majority of the reported bicycle crashes along MP 197.5 - MP 199.9 were reported as failing to yield by either the motorist (six crashes) or the bicyclist (seven crashes). The reported common crash groups include *Motorist Drive Out, Bicyclist Ride Out,* and *Motorist Right Turn*.

Project Purpose

Reduce bicycle crashes that involve motorists and bicyclists failing to yield the right-of-way and increase bicycle safety education.

Potential Countermeasures

Option 1: Engineering Countermeasures

Review Existing Striping

Determine feasibility to modify existing striping to provide a striped paved shoulder of at least 4'. Effective shoulder width excludes the gutter pan.

Construct Parallel Off-Street Bicycle Route

Collaborate with FMPO, City of Flagstaff, and NAU to implement the Flagstaff Active Transportation Plan (http://www.flagstaff.az.gov/3181/Active-Transportation-Master-Plan), including the Eastside PedBikeWay, which would widen the existing FUTS trail that parallels Route 66 (SR 40B) to 10', and realign it away from the roadway. PedBikeWays are comprised of a variety of facilities, including paved trails, protected bikeways, and bike boulevards. They may be parallel to busy streets like Route 66, but are physically separated from traffic whenever possible.

Option 2: Bicyclist and Motorist Education Campaign

Partner with FMPO and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.

Option 3: Enforcement

Increase enforcement for motorists and bicyclists failing to yield the right-of-way at the intersections and driveways, and for motorists failing to yield while entering or exiting driveways or turning right.


Cedar Ave
Elder Dr
Kaspar Dr
199
200
Soliere Ave
4th St
Steves Blvd
Lake Powell Blvd
Patterson Blvd
Lakin Dr
Forest Ave
West St
6th Ave
Industrial Dr
I-40 Front
40
199
200
200
Turquoise Dr
Segment 89
FLAGSTAFF
I-40
Fox Lair Dr
Switzer Canyon Dr
Huntington Dr
198
199
Foxglenn St
Continental Dr
Intersection 57
Ponderosa Pkwy
197
SR-40B (4)
I-40 Front nonCard
Butler Ave
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Flagstaff (SR 40B)
Priority Location 6
0
0.25
0.5
Miles
N
W
E
S

Priority Location 7: US 180, Flagstaff, H-C Segments 87 and 88 and H-C Intersection 56

General Project Information

Primary Route/Street: US 180 (Humphreys St/Fort Valley Rd)
City/Town Name: Flagstaff
County: Coconino
District: Northcentral
Begin Limit: MP 215.4 (SB 40, Route 66)
End Limit: MP 216.9 (Meade Ln)
Intersections: Route 66 (SB 40)/Humphreys St (US 180)
Segment Length: 1.5 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/y939q2c6

Location Summary

The US 180 segment and intersection is located in Flagstaff.
Programmed Projects: FY 2019; US 180, construct turn lane SB 40 to Aspen Ave (F006001C)
Identified in 2012 BSAP: Yes (Segments 87 and 88)
Segment Type (High-Crash/High-Crash Potential): High-Crash (and High-Crash Intersection)
Area Type (Urban-Suburban/Rural): Urban-Suburban
Segment Facility Type: Two-lane, three-lane with TWLTL
Intersection Facility Types (Major/Minor): Three-lane with TWLTL/Five-lane divided with TWLTL
Bicycle Facility Presence: Shared-use, off-road path along Fort Valley Rd. None along Humphreys St.
Segment AADT: 13,400 vehicles per day
Posted Speed Limit: 25-35 mph
Lighting: At intersections and some midblock
Number of Bicycle Crashes: 23 (2 involved alcohol/drugs; 5 serious injuries, 4 involved unknown conditions); 6 crashes occurred at H-C Intersection 56

Project Need

A majority of the reported bicycle crashes along US 180 and at the US 180/SR 40B signalized intersection have occurred at intersection locations. The majority of reported crash types are *Motorist Right Turn – Same Direction* and *Bicyclist Ride Out – Sign-Controlled Intersection*. Crash groups consist mainly of *Bicyclist Failed to Yield* and *Motorist Right Turn/Merge*.

Project Purpose

Reduce the number of bicycle crashes on US 180 by increasing the visibility of bicyclists, educating motorists and bicyclists to address failing to yield, and providing intersection improvements and safer bicycle facilities.

Potential Countermeasures

Option 1: Collaborate with Ongoing US 180 Corridor Master Plan

Collaborate to develop and implement recommendations from the current US 180 Corridor Master Plan.

Option 2: Engineering Countermeasures

Construct Parallel Off-Street Bicycle Route

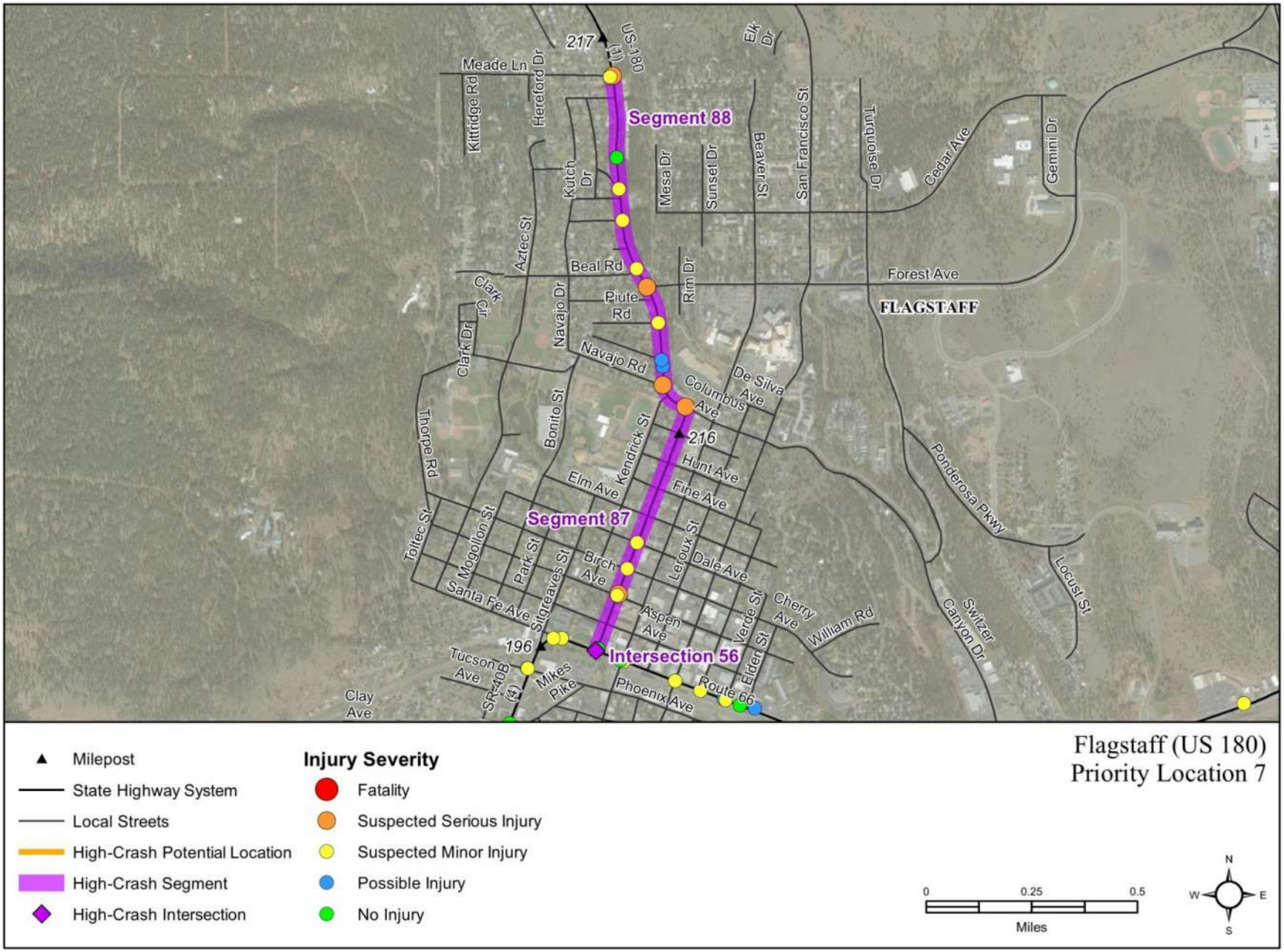
Collaborate with FMPO, City of Flagstaff, and NAU to implement the Flagstaff Active Transportation Plan (http://www.flagstaff.az.gov/3181/Active-Transportation-Master-Plan), including the Downtown/Southside PedBikeWays.

Option 3: Bicyclist and Motorist Education Campaign

Partner with FMPO and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.

Option 4: Enforcement

Based on the existing crash characteristics, increase enforcement for motorists and bicyclists failing to yield the right-of-way at the intersections and driveways, and for motorists failing to yield to bicyclists when turning right.


Segment 88
Segment 87
Intersection 56
217
216
196
Meade Ln
Hereford Dr
Kittridge Rd
U.S. 180 (1)
Elk Dr
Kutch Dr
Mesa Dr
Sunset Dr
Beaver St
San Francisco St
Turquoise Dr
Cedar Ave
Gemini Dr
Aztec St
Beal Rd
Rim Dr
Forest Ave
FLAGSTAFF
Clark Cir
Clark Dr
Navajo Dr
Piute Rd
Navajo Rd
De Silva Ave
Columbus Ave
Thorpe Rd
Bonito St
Kendrick St
Hunt Ave
Elm Ave
Fine Ave
Ponderosa Pkwy
Toltec St
Mogollon St
Park St
Silgreaves St
Birch Ave
Leroux St
Dale Ave
Locust St
Santa Fe Ave
Aspen Ave
Verde St
Cherry Ave
William Rd
Switzer Canyon Dr
Elden St
Tucson Ave
SR-40B (4)
Mikes Pike
Phoenix Ave
Route 66
Clay Ave
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Flagstaff (US 180)
Priority Location 7
0
0.25
0.5
Miles
N
W
E
S

Priority Location 8: SR 40B, SR 89A (Milton Rd), Flagstaff, H-C Segments 83, 84, 85, 86 and H-C Intersection 55

General Project Information

Primary Route/Street: SR 40B (Route 66), Milton Road (89A)
City/Town Name: Flagstaff
County: Coconino
District: Northcentral
Begin Limit: varies (see map)
End Limit: varies (see map)
Intersections: SR 89A (Milton Rd)/University Dr.
Segment Length: 3.5 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/yb9p7u2f

Location Summary

The high-crash segments and intersection are located in Flagstaff. Sixty bicycle crashes were reported; three serious injury crashes and no fatal crashes.
Programmed Projects: None
Identified in 2012 BSAP: Yes, partially.
Segment Type (High-Crash/High-Crash Potential): High-Crash (and High-Crash Intersection)
Area Type (Urban-Suburban/Rural): Urban-Suburban
Segment Facility Type: Five-lane highway (TWLTL)
Intersection Facility Type (Major/Minor): Five-lane highway (TWLTL)/two-lane divided
Bicycle Facility Presence: None
Segment AADT: 40,600 vehicles per day
Posted Speed Limit: 30, 35, 40 mph
Lighting: Yes
Number of Bicycle Crashes: 60 (2 involved alcohol/drugs; 3 involved unknown conditions)

Project Need

Reported bicycle crashes include crash types of *Motorists Left/Right Turn, Bicyclist Ride Out,* and *Motorist Drive Out.* Fifteen crashes involved *Motorist Failed to Yield,* and thirteen crashes involved the *Bicyclist Failed to Yield* crash groups. This area experiences high bicycle traffic due to nearby NAU.

Project Purpose

Reduce the number of bicycle crashes in the Flagstaff area by increasing the visibility of bicyclists, providing safer bicycle facilities, and increasing motorist and bicyclist education.

Potential Countermeasures

Option 1: Engineering Countermeasures

Construct Parallel Off-Street Bicycle Route

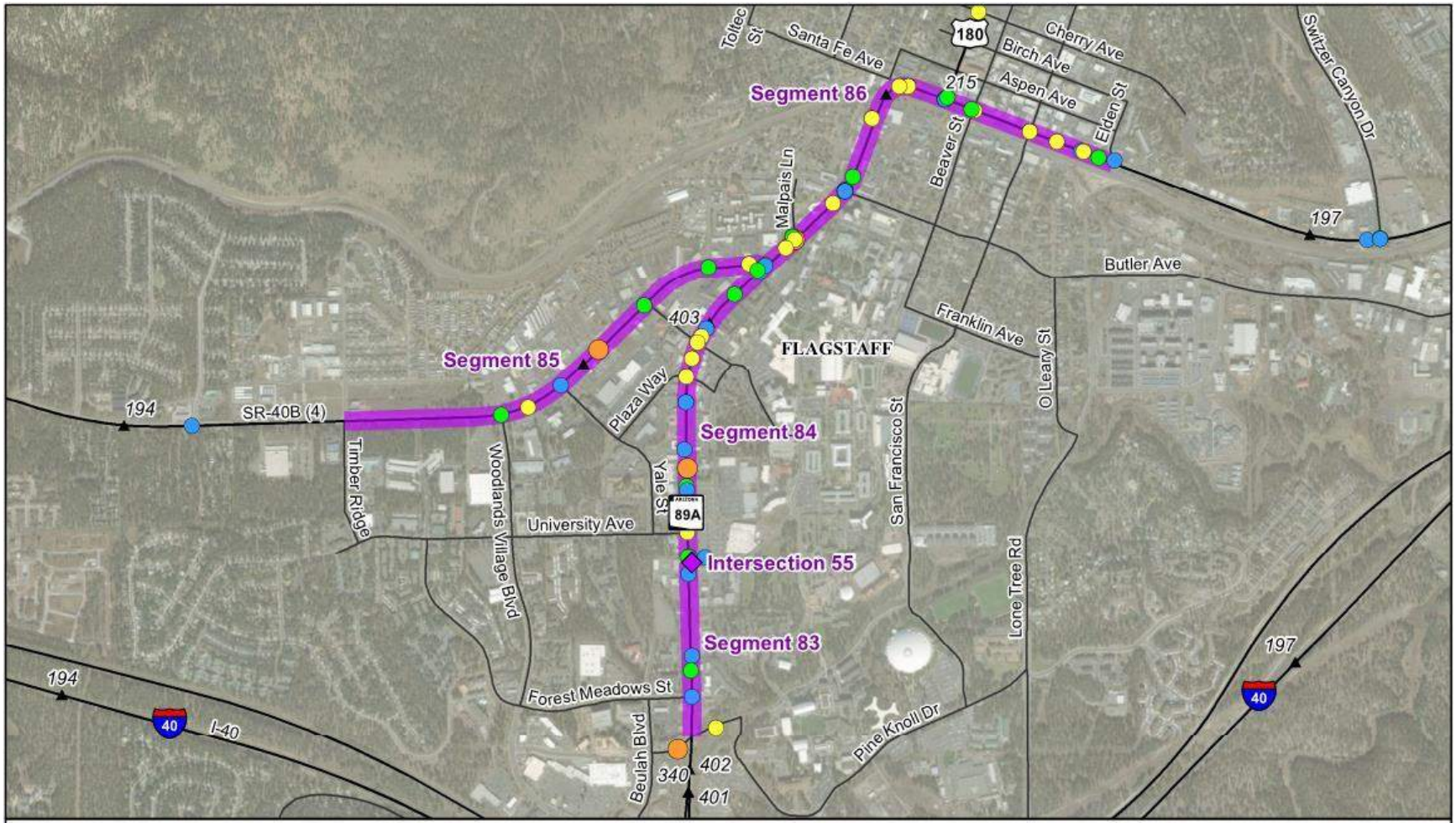
Collaborate with FMPO, City of Flagstaff, and NAU to implement the Flagstaff Active Transportation Plan (http://www.flagstaff.az.gov/3181/Active-Transportation-Master-Plan), including the Milton Road PedBikeWay. PedBikeWays are comprised of a variety of facilities, including paved trails, protected bikeways, and bike boulevards. They may be parallel to busy streets like Milton Road, but are physically separated from traffic whenever possible to increase bicyclist comfort and safety.

Option 2: Collaborate with Milton Road Corridor Master Plan

Collaborate with ongoing Milton Road Corridor Master Plan to identify improvements that will effectively improve bicycle safety.

Option 3: Bicyclist and Motorist Education Campaign

Partner with FMPO and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.


Segment 86
Segment 85
Segment 84
Segment 83
Intersection 55
FLAGSTAFF
Santa Fe Ave
Cherry Ave
Birch Ave
Aspen Ave
Elden St
Switzer Canyon Dr
Beaver St
Malpais Ln
Butler Ave
Franklin Ave
O Leary St
San Francisco St
Lone Tree Rd
Pine Knoll Dr
Plaza Way
Yale St
University Ave
Woodlands Village Blvd
Timber Ridge
Forest Meadows St
Beulah Blvd
SR-40B (4)
I-40
180
215
197
194
403
402
401
340
89A
40
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
0
0.25
0.5
Miles
N
W
E
S
Flagstaff Area
Priority Location 8

Priority Location 9: SR 260 and SR 89A, Cottonwood, H-C Segment 81 and H-P Segments 9 & 10

General Project Information

Primary Route/Street: SR 260 and SR 89A
City/Town Name: Cottonwood
County: Yavapai
District: Northcentral
Begin Limit: MP 209 on SR 260 (Prairie Ln)
End Limit: MP 349 on SR 89A (Clarkdale Pkwy)
Segment Length: 7.3 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/y86e2ty7

Location Summary

The SR 260 and SR 89A segments are in Cottonwood. Seven bicycle crashes were reported, with none resulting in serious or fatal injuries.
Programmed Projects: None
Identified in 2012 BSAP: Partially, SR 89A (Cottonwood St to Grosetta Rd)
Segment Type (High-Crash/High-Crash Potential): High-Crash and High-Crash Potential
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway (TWLTL) and four-lane divided sections
Bicycle Facility Presence: Wide curb lane
AADT: 10,700-26,600 vehicles per day
Posted Speed Limit: 35, 45 mph
Lighting: At signalized intersections and roundabouts
Number of Bicycle Crashes: 7 (1 involved unknown conditions)

Project Need

The reported bicycle crashes along the high-crash and high-crash potential segments include crash types of *Motorists Left/Right Turn* and *Motorist Drive Out.* Two of the four crashes included the *Motorist Failed to Yield* crash group.

Project Purpose

Reduce the number of bicycle crashes in the Cottonwood area by increasing motorist and bicyclist education and by providing improved bicyclist facilities along the state highway.

Potential Countermeasures

Option 1: Bicyclist and Motorist Education Campaign

Partner with local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic; involve the Cottonwood Bicycle Advisory Committee. Promote use of the bicycle facilities and promote motorist and bicycle safety.

Option 2: Engineering Countermeasures

Striped Paved Shoulder

Assess feasibility of installation of a striped paved shoulder on SR 89A. Per record drawings**,** 89A, Cement Plant Road to Black Hills Drive, travel lane widths are 16’ (outside lane) and 14’ (inside lane). A 5’ striped shoulder should be considered; a potential configuration is to reduce outside lane to 12’ and inside lane to 13’. Striped shoulder would be dropped at each roundabout, and appropriate signage installed.

On SR 89A south of Black Hills Drive, record drawings show a typical section of 5 lanes, with a curb-to-curb width of 64’. This includes 14’ outside lanes, 12’ inside lanes, and 12’ two-way center left turn lane (TWLTL). A possible reconfiguration is 5’ striped shoulder, 10.5’ outside travel lanes, 11’ inside travel lanes, and a 11’ center left turn lane. Intersection improvements would be required to maintain a striped bicycle buffer through intersections. A detailed striping inventory and assessment is required.

On SR 260, MP 206 and MP 209, record drawings show a curb to curb width of 66.9’. A possible reconfiguration is 5’ striped shoulder, 11’ travel lanes, and a 12’ center left turn lane.


349
348
347
345
344
346
350
351
352
353
360
359
358
357
356
206
207
208
209
Segment 9
Segment 81
Segment 10
JEROME
CLARKDALE
COTTONWOOD
Old Hwy 89a
Groseta Ranch Rd
Tuzigoot Rd
Main St
Mingus Ave
Blackhills Dr
Willard St
SR-89A
6th St
12th St
Fir St
Camino Real
Viejo Dr
Contention Ln
Peila Ave
Rio Mesa Trl
SR-260
Western Dr
Zele Sky Rd
Cornville Rd
Verde Santa Fe Pkwy
Tissaw Rd
Giroux St
89A
260
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Cottonwood Area
Priority Location 9
0 0.25 0.5 1 1.5 2
Miles
N
W
E
S

Priority Location 10: SR 89A, Sedona, H-C Segment 82

General Project Information

Primary Route/Street: SR 89A
City/Town Name: Sedona
County: Coconino/Yavapai
District: Northcentral
Begin Limit: MP 371.0 (Arroyo Pinion Dr)
End Limit: MP 374.1 (SR 179)
Segment Length: 3.1 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/yby5dnmo

Location Summary

The SR 89A segment is located in West Sedona. Fifteen bicycle crashes were reported; two resulting in serious injuries.
Programmed Projects: None
Identified in 2012 BSAP: Partially (Dry Creek Rd to Soldier Pass Rd)
Segment Type (High-Crash/High-Crash Potential): High-Crash
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway (TWLTL)
Bicycle Facility Presence: Bicycle lane
AADT: 25,700 vehicles per day
Posted Speed Limit: 35, 40 mph
Lighting: Most of the segment, except 1 mile (east end)
Number of Bicycle Crashes: 15 (1 involved alcohol/drugs and 1 marked unknown. Two involved serious injuries)

Project Need

The reported bicycle crashes along MP 371.0 to MP 374.1 include crash types of *Bicyclist Ride Out* – of either *Commercial Driveway/Alley, Signalized Intersection, or Sign-Controlled Intersection* types, or *Motorist Right Turn – Same Direction,* or *Non-Roadway*. Crashes have occurred at intersection and non-intersection locations.

Project Purpose

Reduce both intersection and non-intersection related bicycle crashes by increasing the visibility of bicyclists along SR 89A, providing safer bicycle facilities, and increasing motorists and bicyclist education.

Potential Countermeasures

Option 1: Engineering Countermeasures

Construct Parallel Bicycle Boulevard

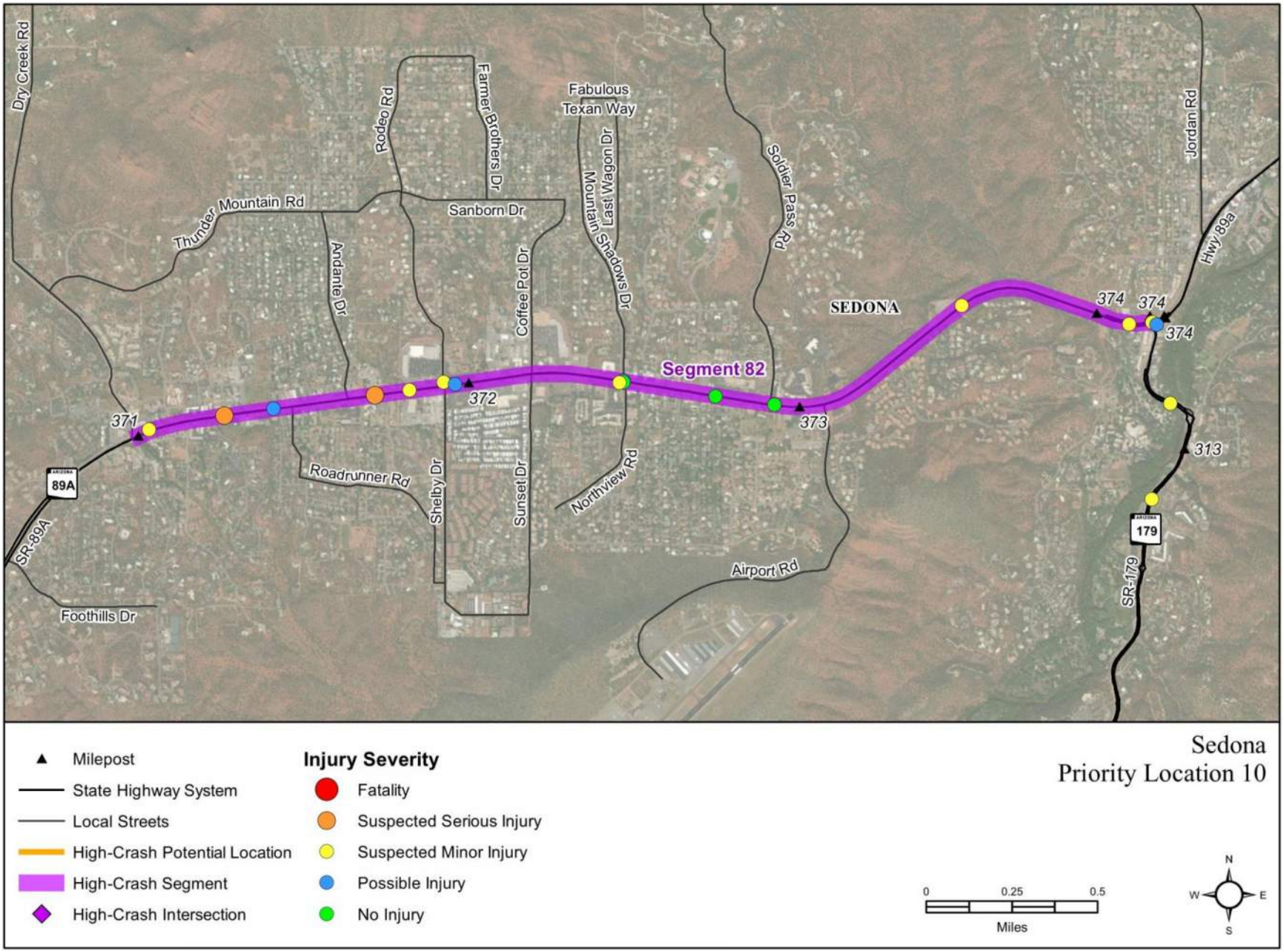
Collaborate with the City of Sedona to construct a Bicycle Boulevard north and south of SR 89A through West Sedona. The Bicycle Boulevard is recommended in the Sedona Transportation Master Plan. Bicycle boulevards are streets with low motorized traffic volumes and speeds, designated and designed to give bicycle travel priority. Bicycle Boulevards use signs, pavement markings, and speed and volume management measures to discourage through trips by motor vehicles and create convenient bicycle crossings of busy arterial streets. The West Sedona Bicycle Boulevard would consist of a combination of local streets connected by short segments of shared-use paths to form a continuous route for bicycles.

Conduct Access Management Plan

Evaluate feasibility of a raised median and consolidating driveways to reduce the number of potential conflicts points between bicyclists and vehicles. Collaborate with the City of Sedona to conduct the evaluation.

Option 2: Bicyclist and Motorist Education Campaign

Partner with NACOG and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic. Promote motorist and bicyclist safety along the corridor at nearby tourist destinations.


Dry Creek Rd
Rodeo Rd
Farmer Brothers Dr
Fabulous Texan Way
Jordan Rd
Thunder Mountain Rd
Sanborn Dr
Andante Dr
Coffee Pot Dr
Mountain Shadows Dr
Last Wagon Dr
Soldier Pass Rd
Hwy 89a
SEDONA
374
374
374
Segment 82
372
371
373
313
Roadrunner Rd
Shelby Dr
Sunset Dr
Northview Rd
89A
SR-89A
179
SR-179
Airport Rd
Foothills Dr
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Sedona
Priority Location 10
0
0.25
0.5
Miles
N
W
E
S

Priority Location 11: US 60 (Grand Ave., Northwest), H-C Segment 71 and H-P Segment 14

General Project Information

Primary Route/Street: US 60 (Grand Ave)
City/Town Name: Sun City
County: Maricopa
District: Central
Begin Limit: MP 138.5 **(**Loop 303)
End Limit: MP 149.0 (Loop 101)
Segment Length: 10.5 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private, Railroad
Google Map: https://www.google.com/maps/

Location Summary

The US 60 segment is primarily in Surprise. Ten bicyclist crashes were reported, with two resulting in incapacitating injuries.
Programmed Projects: MCDOT 99th Avenue
Identified in 2012 BSAP: No
Segment Type (High-Crash/High-Crash Potential): High-Crash and High-Crash Potential
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided highway (curbed median)
Bicycle Facility Presence: Paved shoulder
AADT: 51,600 vehicles per day
Posted Speed Limit: 55-65 mph
Lighting: At signalized intersections; partial
Number of Bicycle Crashes: 10 (none involved alcohol/drugs)

Project Need

Reported bicycle crashes between Loop 303 and Loop 101 have occurred at intersections. The majority of reported crash types include *Motorist Drive Through and Motorist Drive Out*.

Project Purpose

Reduce potential for bicycle crashes by providing safer facilities and solutions for crossing and travel on US 60 (Grand Avenue).

Potential Countermeasures

Option 1: Conduct RSA

An RSA with an emphasis on bicyclist safety should be conducted at each intersection to further evaluate safety issues.

Option 2: Engineering Countermeasures

Shared-Use Path/Sidewalk Treatment

Evaluate installing a 10'-wide shared-use path made of stabilized decomposed granite. The shared-use path would extend from 99th Avenue to New River Trail. Sidewalk gaps should be filled in with concrete or stabilized decomposed granite to provide continuous sidewalks in developed areas.

Striped Paved Shoulder / Bike Lanes

Assess feasibility of bike lanes (during future restriping project) MP 138 to MP 149. Consider use of a W11-1 bicycle traffic sign with an "ON ROAD" placard.

Roadway Signing Improvements

Consider installing R4-11 BMUFL sign with R4-11aP Change Lanes to Pass plaque along US 60.

Improve Crossing Conditions

Maintain or add new shared-use path at all railroad crossings by installing fencing similar to 163rd Ave and Grand Ave.

Provide Roadway Lighting

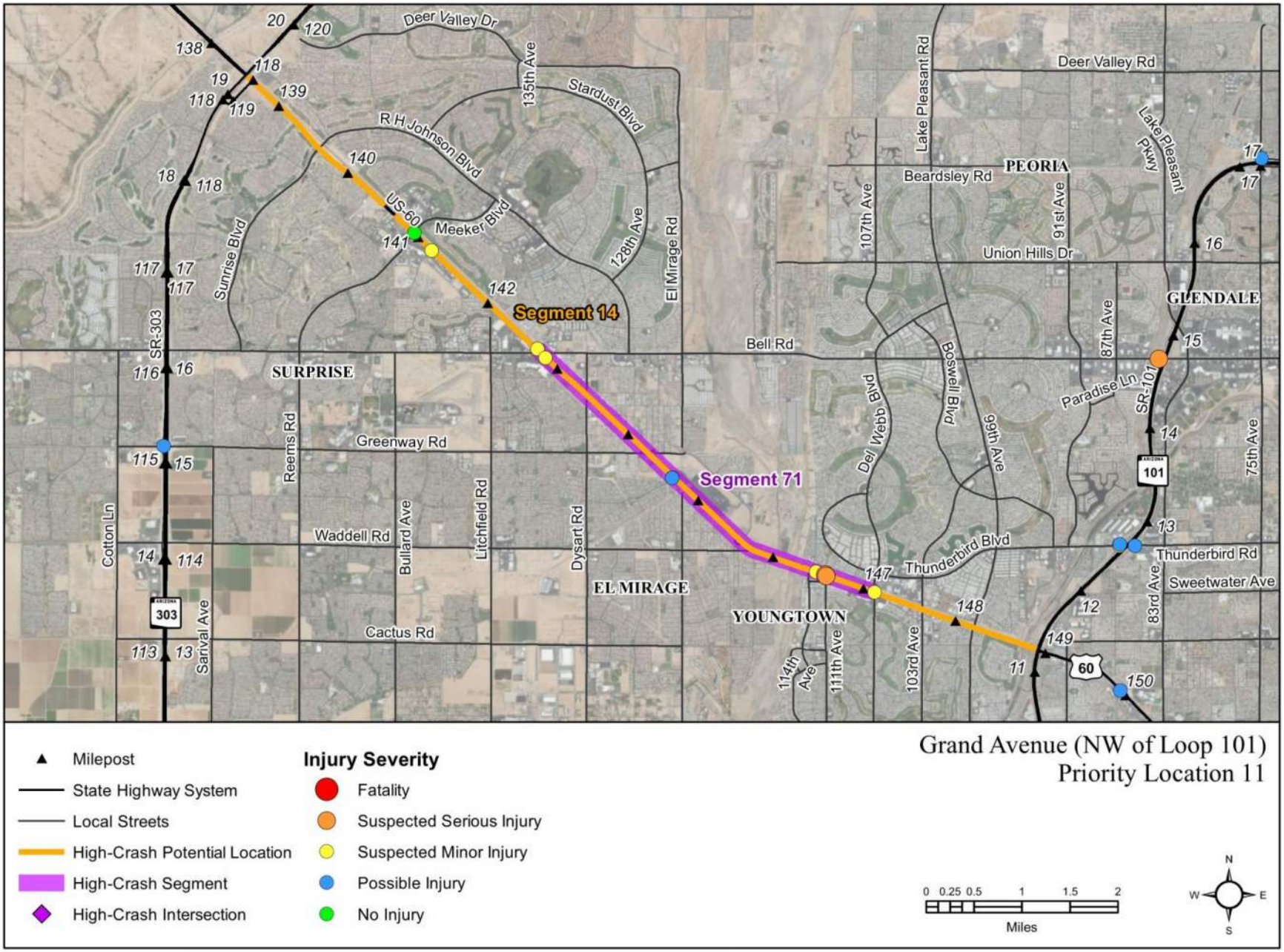
Evaluate the need for additional lighting along the corridor to increase bicycle visibility.

Coordinate with Crossroad Projects

Coordinate with MCDOT on their future corridor study of 99th Avenue which includes the intersection of 99th Avenue and Grand Avenue.

Option 3: Bicyclist and Motorist Education Campaign

Partner with MAG, MCDOT, and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.


Deer Valley Dr
135th Ave
Stardust Blvd
Lake Pleasant Rd
Deer Valley Rd
Lake Pleasant Pkwy
R H Johnson Blvd
Beardsley Rd
PEORIA
107th Ave
91st Ave
Meeker Blvd
US-60
Sunrise Blvd
128th Ave
El Mirage Rd
Union Hills Dr
GLENDALE
87th Ave
SR-303
SURPRISE
Bell Rd
Del Webb Blvd
Boswell Blvd
99th Ave
Paradise Ln
SR-101
75th Ave
Reems Rd
Greenway Rd
Segment 14
Segment 71
Cotton Ln
Bullard Ave
Litchfield Rd
Dysart Rd
Waddell Rd
Thunderbird Blvd
Thunderbird Rd
Sweetwater Ave
83rd Ave
EL MIRAGE
YOUNGTOWN
Cactus Rd
Sarival Ave
114th Ave
111th Ave
103rd Ave
303
101
60
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Grand Avenue (NW of Loop 101)
Priority Location 11
0 0.25 0.5 1 1.5 2
Miles
N
W
E
S

Priority Location 12: US 60 (Grand Ave., Southeast), H-C Intersections 32, 33, 51, 52, and 53 and H-P Segment 15

General Project Information

Primary Route/Street: US 60
City/Town Name: Peoria/Glendale
County: Maricopa
District: Central
Begin Limit: MP 149.0 (Loop 101)
End Limit: MP 161.7 (McDowell Rd)
Segment Length: 12.7 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private, Railroad
Google Map: https://tinyurl.com/y7ly27o5

Location Summary

The US 60 intersections are primarily in Peoria and Glendale. Thirty bicyclist crashes were reported, two resulting in fatalities and six resulting in incapacitating injury.
Programmed Projects: None
Identified in 2012 BSAP: Partially (Northern Ave to Bethany Home Rd)
Segment Type (High-Crash/High-Crash Potential): High-Crash and High-Crash Potential
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided highway (curbed median)
Bicycle Facility Presence: Paved shoulder
AADT: 45,000 vehicles per day
Posted Speed Limit: 55-65 mph
Lighting: At signalized intersections; partial
Number of Bicycle Crashes: 30 (2 involved alcohol/drugs)

Project Need

The reported bicycle crashes within the segment have occurred at both daylight and nighttime conditions both at intersections and midblock locations. The most prevelant crash types are *Bicylists Ride Out, Bicyclist Ride Through,* and *Motorists Right Turn.*

Project Purpose

Reduce potential for bicycle crashes by providing safer facilities and solutions for crossing and travel on US 60 (Grand Avenue).

Potential Countermeasures

Option 1: Conduct RSA

An RSA with an emphasis on bicyclist safety should be conducted at each high-crash potential intersection and high-crash potential corridor segment to further evaluate safety issues.

Option 2: Engineering Countermeasures

Identify Alternative Routes

Collaborate with local jurisdictions to identify alternative routes to US 60/Grand Avenue.

Install Bike Lanes at Intersections

Evaluate installing bike lanes and high visibility markings across major intersections to ensure that bicycle crossings are well identified.

Add Bicycle Detection

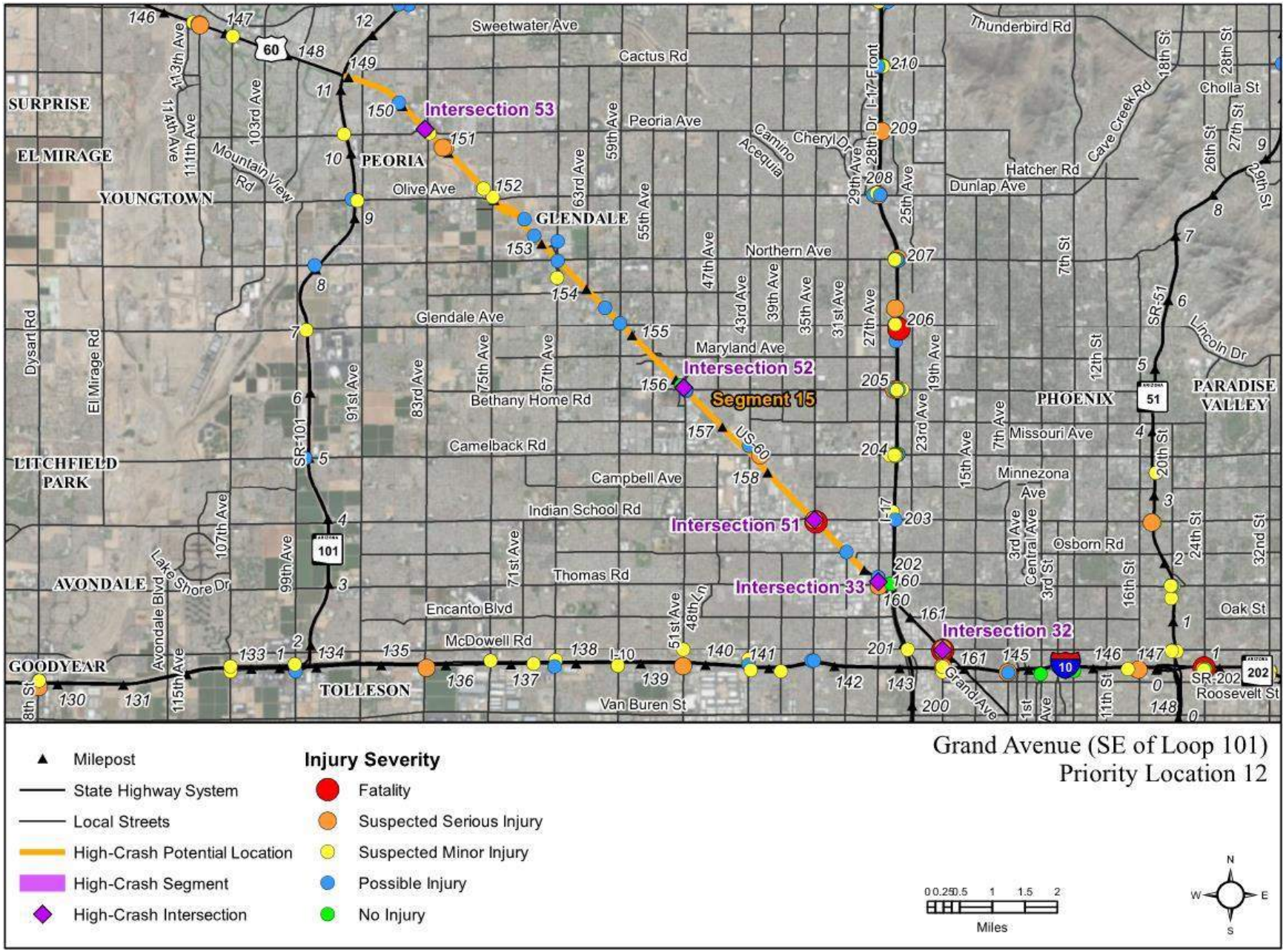
Consider adding non-intrusive video bike detection with a detection symbol pavement marking at all signalized intersections. When a bicycle is detected the green time will be extended to allow the bicycle enough time to safely cross the intersection.

Provide Roadway Lighting

Evaluate the need for additional lighting along the corridor to increase bicycle visibility.

Striped Paved Shoulder/Bike Lanes

Assess feasibility of bike lanes (during future restriping project). Consider use of a W11-1 bicycle traffic sign with an “ON ROAD” placard.


Intersection 53
Intersection 52
Segment 15
Intersection 51
Intersection 33
Intersection 32
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Grand Avenue (SE of Loop 101)
Priority Location 12
Miles
SURPRISE
EL MIRAGE
YOUNGTOWN
PEORIA
GLENDALE
PHOENIX
PARADISE VALLEY
LITCHFIELD PARK
AVONDALE
GOODYEAR
TOLLESON
Sweetwater Ave
Cactus Rd
Peoria Ave
Olive Ave
Northern Ave
Glendale Ave
Maryland Ave
Bethany Home Rd
Camelback Rd
Campbell Ave
Indian School Rd
Thomas Rd
Encanto Blvd
McDowell Rd
Van Buren St
Thunderbird Rd
Cholla St
Hatcher Rd
Dunlap Ave
Missouri Ave
Minnezona Ave
Osborn Rd
Oak St
Roosevelt St
Lincoln Dr
Cave Creek Rd
Dysart Rd
El Mirage Rd
Mountain View Rd
Camino Acequia
Cheryl Dr
Lake Shore Dr
Avondale Blvd
Grand Ave
I-17
I-10
US-60
SR-101
SR-51
SR-202

Priority Location 13: SR 87, Mesa, H-C Segment 67

General Project Information

Primary Route/Street: SR 87 (Country Club Dr)
City/Town Name: Mesa/Gilbert
County: Maricopa
District: Central
Begin Limit: MP 171.7 (Baseline Rd)
End Limit: MP 170.2 (Campbell Rd/Sun Circle Trail)
Segment Length: 1.5 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/y8ss975e

Location Summary

This SR 87 segment is in the southwestern corner of Mesa near Gilbert and Chandler. Seven bicycle crashes were reported, and one resulted in incapacitating injury.
Programmed Projects: City of Mesa BSAP
Identified in 2012 BSAP: Partially (Baseline Rd to Guadalupe Rd)
Segment Type (High-Crash/High-Crash Potential): High-Crash
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided (TWLTL)
Bicycle Facility Presence: None
AADT: 38,000 vehicles per day
Posted Speed Limit: 40, 45 mph
Lighting: Yes
Number of Bicycle Crashes: 7

Project Need

A majority of reported bicycle crashes occurred at signalized intersections. Reported crash types include *Bicyclist Ride Out/Through, Motorist Drive Out/Through, and Motorist Right Turn*. Bicycle lanes are not present on SR 87 (Arizona Avenue), but are present on the intersecting roadways of San Angelo, Guadalupe, and Obispo. Marked crosswalks exist at signalized intersections. Crosswalks at unsignalized intersections and driveways are mostly unmarked.

Project Purpose

Reduce potential for bicycle crashes by providing safer facilities for crossing and travel along SR 87.

Potential Countermeasures

Option 1: Engineering Countermeasures

Improve Signal Operations for Bicyclists

Evaluate existing operations at signalized intersections where cross-road bicycle facilities exist. Evaluate signal timing/phasing for pedestrians and bicyclists. Consider adding bicycle detection, minimum green time for bicyclist, and leading bicycle interval.

Striped Paved Shoulder

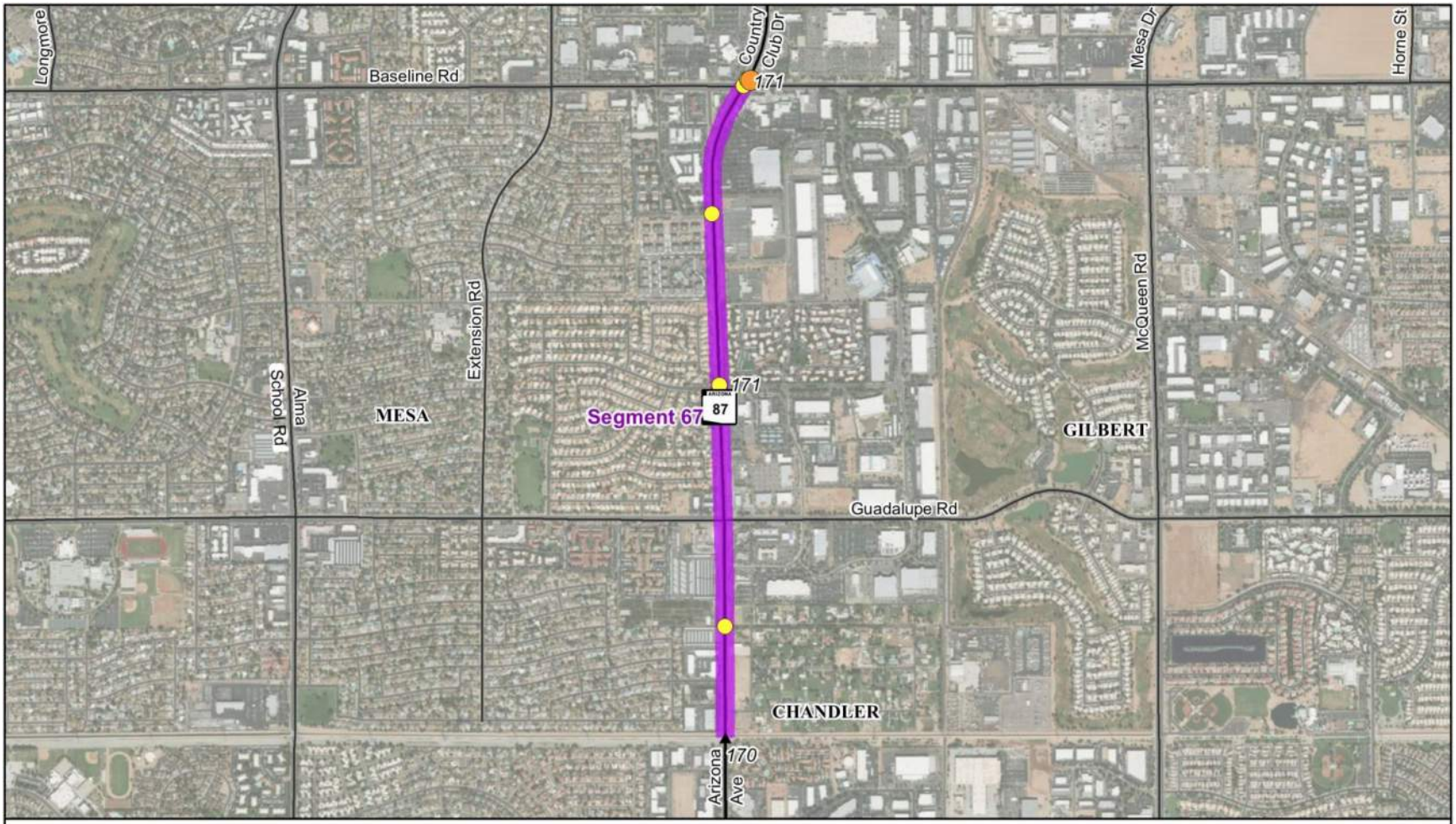
Assess feasibility of a striped paved shoulder. Record drawings show existing curb-to-curb width of 84'. To accommodate a 5' striped shoulder, the 6 travel lanes may need to be reduced to 5 lanes (2 lanes in one direction and 3 lanes in the other resulting in unbalanced lanes). Segments north and south of SR 87 are owned by local agencies (Mesa and Chandler); coordination will be required to provide consistency throughout the corridor.

Roadway Signing Improvements

Consider installing R4-11 BMUFL sign with R4-11aP Change Lanes to Pass plaque.

Option 2: Enforcement

Based on the existing crash characteristics, increase enforcement for motorists failing to yield the right-of way at the intersections.


Longmore
Baseline Rd
Country Club Dr
171
Mesa Dr
Horne St
Extension Rd
McQueen Rd
School Rd
Alma
MESA
Segment 67
87
171
GILBERT
Guadalupe Rd
CHANDLER
Arizona Ave
170
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Mesa (SR 87)
Priority Location 13
0
0.25
0.5
Miles
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W
E
S

Priority Location 14: US 60X, Maricopa County, H-C Segment 69 and H-P Segment 16

General Project Information

Primary Route/Street: US 60X (Main St)
City/Town Name: Mesa/Unincorporated
County: Maricopa
District: Central
Begin Limit: MP 189 (Sossaman Rd)
End Limit: MP 194 (Meridian Rd)
Segment Length: 5 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/ychkkk9y

Location Summary

This US 60X segment is on the east side of Mesa bordering Apache Junction. 20 bicycle crashes were reported, including one fatal and one incapacitating injury.
Programmed Projects: MPD0011-17 (ADOT PARA Study)
Identified in 2012 BSAP: Yes
Segment Type (High-Crash/High-Crash Potential): High-Crash and High-Crash Potential
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided highway (earth median)
Bicycle Facility Presence: None
AADT: 23,000 vehicles per day
Posted Speed Limit: 45 mph
Lighting: No
Number of Bicycle Crashes: 20 (1 involved alcohol/drugs and 6 involved unknown conditions and 1 involved fatal injuries).

Project Need

The reported crashes occurred along the segment both at intersections and along the roadway. A majority of the reported crash types are *Bicyclist Ride Out, Bicyclist Ride Through,* and *Motorist Overtaking.* This segment is a six-lane divided highway which has a very large earth median. The US 60X Corridor Master Plan was recently completed by the Arizona Department of Transportation.

Project Purpose

Reduce potential for bicycle crashes by providing safer facilities for crossing and travel on US 60X.

Potential Countermeasures

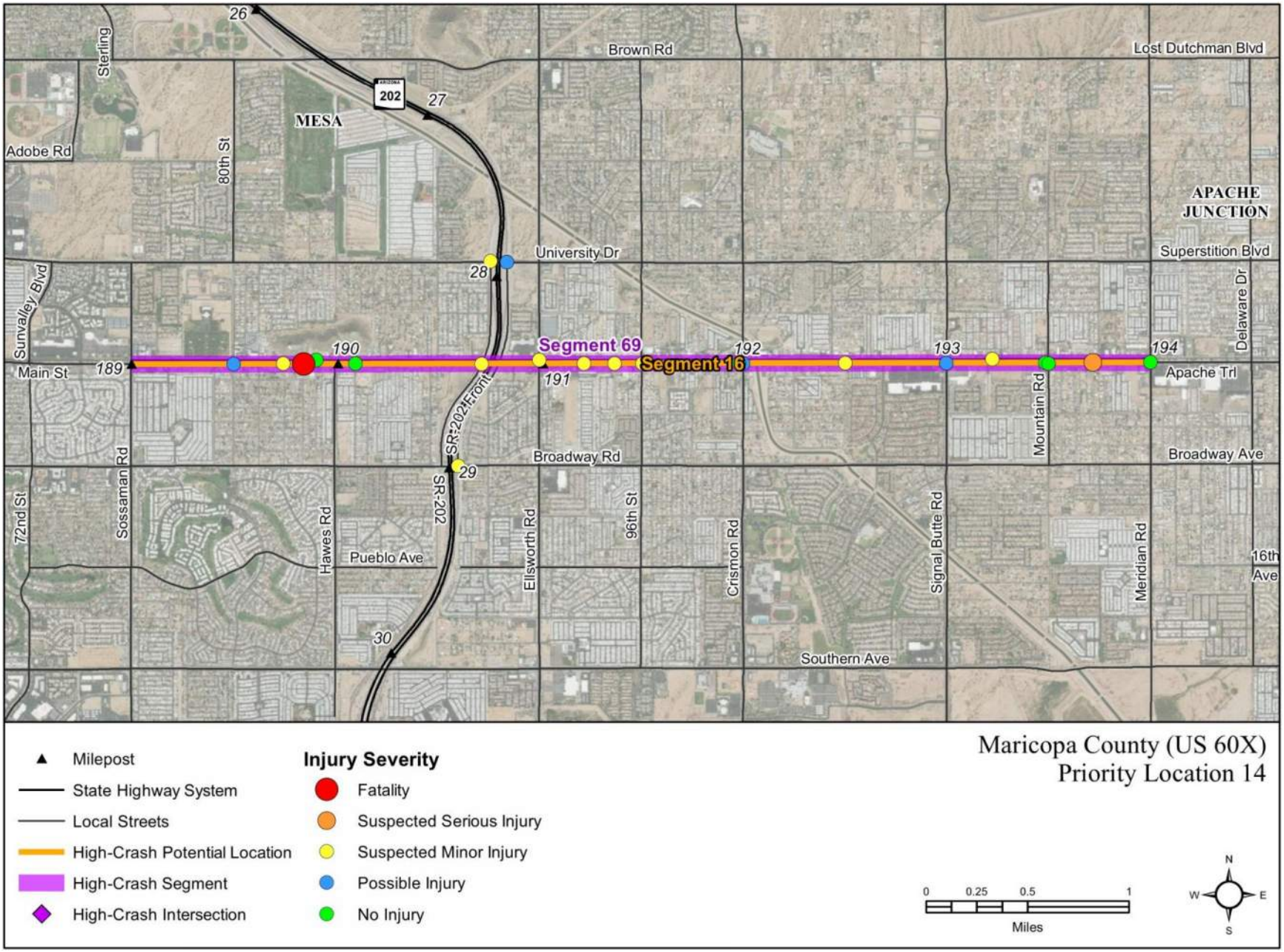
Option 1: Implement ADOT US 60X Corridor Study Recommendations

A previous study was conducted by the Arizona Department of Transportation for US 60X from Sossaman Rd to Meridian Rd that was published in February of 2018. This study recommends both short- and long-term improvements that involve adding bicycle lanes in the segment. This may include eliminating one vehicle lane in each direction, to allow striped paved shoulder or bicycle lanes to be installed.

Note that Phoenix Regional Traffic Office prepared a Speed Study using USLIMITS2 for US 60X (Apache Trail), Sossaman Road to Meridian Road. The posted regulatory speed limit was reduced from 50 mph to 45 mph by the State Traffic Engineer on January 26, 2016.

Option 2: Bicyclist and Motorist Education Campaign

Partner with MAG, MCDOT, and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.


26
27
28
29
30
189
190
191
192
193
194
Segment 69
Segment 16
MESA
APACHE JUNCTION
Brown Rd
Lost Dutchman Blvd
Adobe Rd
Sterling
80th St
University Dr
Superstition Blvd
Sunvalley Blvd
Delaware Dr
Main St
Apache Trl
SR-202 Front
Mountain Rd
Broadway Rd
Broadway Ave
Sossaman Rd
72nd St
Hawes Rd
Pueblo Ave
SR-202
Ellsworth Rd
96th St
Crismon Rd
Signal Butte Rd
Meridian Rd
16th Ave
Southern Ave
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Maricopa County (US 60X)
Priority Location 14
0
0.25
0.5
1
Miles
N
W
E
S

Priority Location 15: SR 88, Apache Junction, H-C Segment 68 and H-P Segment 17

General Project Information

Primary Route/Street: SR 88 (Idaho Road)
City/Town Name: Apache Junction
County: Pinal
District: Central
Begin Limit: MP 194.0 (US 60)
End Limit: MP 196.1 (Apache Trail)
Segment Length: 2.1 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/y835apnp

Location Summary

This SR 88 segment is in Apache Junction. Seven bicycle crashes were reported, including one incapacitating injury
Programmed Projects: None
Identified in 2012 BSAP: Partially (Broadway Ave to 14th Ave)
Segment Type (High-Crash/High-Crash Potential): High-Crash and High-Crash Potential
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway (TWLTL)
Bicycle Facility Presence: None
AADT: 13,500 vehicles per day
Posted Speed Limit: 45 mph
Lighting: Partial; at signalized intersections
Number of Bicycle Crashes: 7

Project Need

A majority of reported bicycle crashes along SR 88 within the segment limits have been reported as the crash type *Bicyclist Ride Out* and *Motorist Drive Out.* This segment has primarily residential development. There are no existing bike lanes within the segment.

Project Purpose

Reduce potential for bicycle crashes by providing safer facilities for crossing and travel on SR 88.

Potential Countermeasures

Option 1: Conduct RSA

An RSA with an emphasis on bicycle safety should be conducted within the defined SR 88 segment limits.

Option 2: Engineering Countermeasures

Roadway Lighting Enhancement

Evaluate the existing lighting conditions as part of the RSA to determine any deficiency in terms of bicycle visibility and provide continuous lighting along corridor.

Striped Paved Shoulder

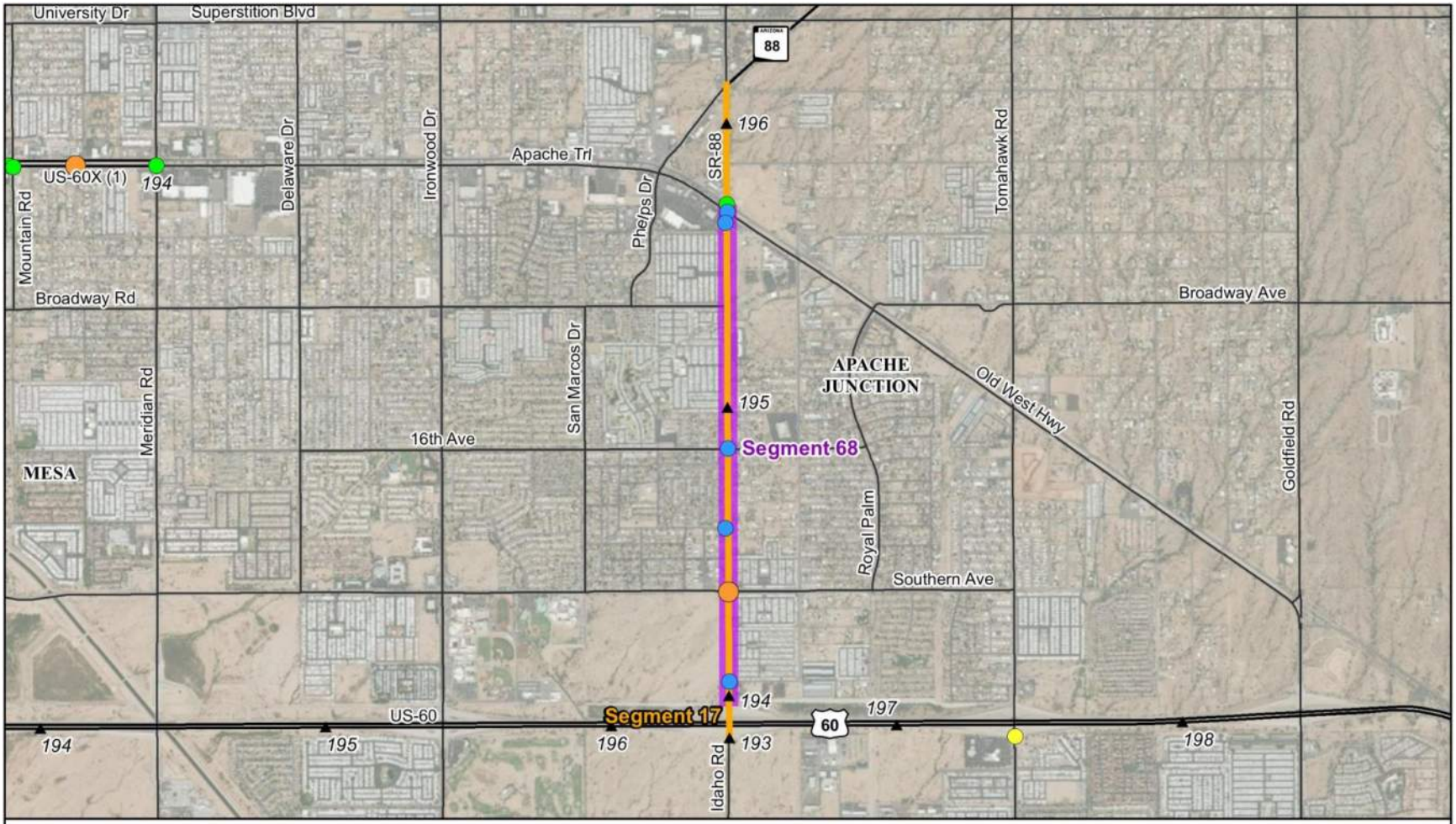
Daily traffic volumes (13,500) may be able to be accommodated by a single through lane. Evaluate if roadway can be reconfigured to 3-lane segment with buffered striped paved shoulder in each direction. Alternative option is to implement unbalanced lanes (2 lanes in one direction, a two-way center left turn lane, and a single lane in the other direction, or to reduce the lane width to 11'.

Option 3: Bicyclist and Motorist Education Campaign

Partner with MAG, MCDOT, and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.

Option 4: Enforcement

Based on the existing crash characteristics, increase enforcement for motorists failing to yield the right-of way at the intersections.



Apache Junction (SR 88)
Priority Location 15

Priority Location 16: SR 387, Casa Grande, H-C Segment 65 and H-P Segment 20

General Project Information

Primary Route/Street: SR 387
City/Town Name: Casa Grande
County: Pinal
District: Southcentral
Begin Limit: MP 0.0 (Florence Blvd)
End Limit: MP 2.2 (Casa Grande Lakes Blvd)
Segment Length: 2.2 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/yc7jrb8f

Location Summary

The SR 387 segments are located in Casa Grande. Seven bicycle crashes were reported; no crashes resulted in fatal or serious injuries.
Programmed Projects: None
Identified in 2012 BSAP: Partially (Florence Blvd to Cottonwood Lane)
Segment Type (High-Crash/High-Crash Potential): High-Crash and High-Crash Potential
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway (TWLTL)
Bicycle Facility Presence: None
AADT: 20,500 vehicles per day
Posted Speed Limit: 35-45 mph
Lighting: MP 0.0-1.3 yes; remainder of the segment only lighting at the signalized intersections
Number of Bicycle Crashes: 7

Project Need

The reported bicycle crashes along SR 387 between MP 0.0 and MP 2.2 have occurred due to crash types involving *Bicyclist Ride Out (*either *Commercial Driveway/Alley, Residential Driveway, Signalized Intersection*, or *Sign-Controlled Intersection* types). The more urban area includes many driveways and access locations. Two crashes occurred in the dark conditions but where lighting is present.

Project Purpose

Reduce bicycle-related crashes by increasing the visibility of bicyclists and providing safer bicycle facilities.

Potential Countermeasures

Option 1: Engineering Countermeasures

Parallel Off-street Alternative Bicycle Routes

Per record drawings, SR 387 is 64’ wide (face of curb to face of curb). This width is insufficient for a 5’ striped paved shoulder. As such, alternate routes should be promoted for bicycle activity. Examples include evaluating installation of a striped paved shoulder on Casa Grande Avenue (34’ pavement width) or constructing a bicycle boulevard on neighborhood streets east or west of SR 387. It is recommended that ADOT collaborate with City of Casa Grande to prepare a bicycle and pedestrian plan.

Roadway Signing Improvements

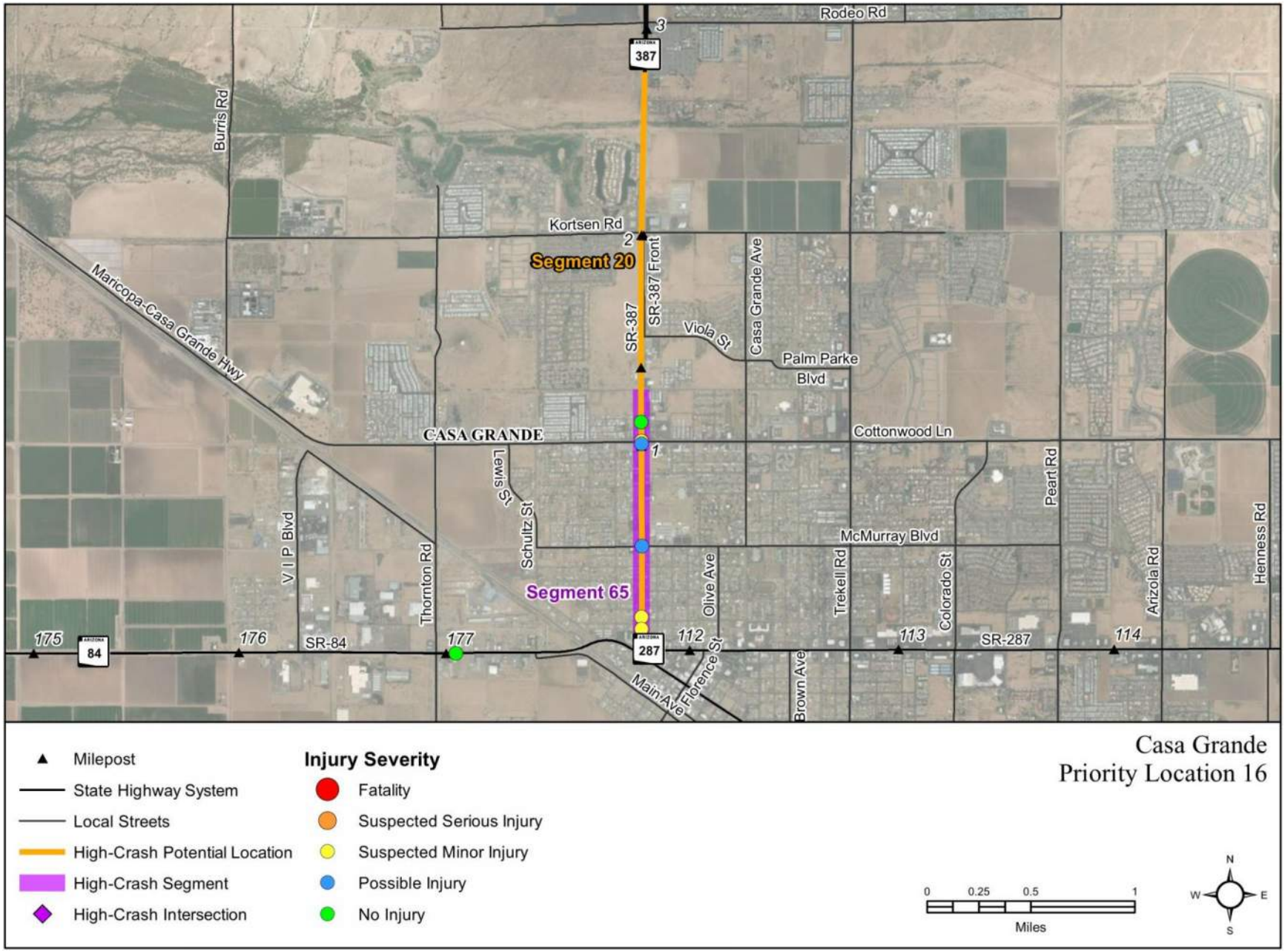
Consider installing R4-11 BMUFL sign with R4-11aP Change Lanes to Pass plaque.

Option 2: Bicycle Education Campaigns

Promote use of the shared-use path with signalized crossings and promote bicycle safety.

Option 3: Enforcement

Based on the existing crash characteristics, increase enforcement for motorists and bicyclists failing to yield the right-of-way at the intersections and driveways.


Rodeo Rd
3
387
Burris Rd
Kortsen Rd
2
Segment 20
SR-387
SR-387 Front
Viola St
Casa Grande Ave
Palm Parke Blvd
Maricopa-Casa Grande Hwy
CASA GRANDE
Cottonwood Ln
1
Lewis St
Schultz St
V I P Blvd
Thornton Rd
McMurray Blvd
Peart Rd
Henness Rd
Segment 65
Olive Ave
Trekell Rd
Colorado St
Arizola Rd
175
84
176
SR-84
177
287
112
113
SR-287
114
Main Ave
Florence St
Brown Ave
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Casa Grande
Priority Location 16
0
0.25
0.5
1
Miles
N
W
E
S

Priority Location 17: SR 87 (Coolidge), SR 79 (Florence), H-C Segment 70 and H-P Segment 21

General Project Information

Primary Route/Street: SR 87 and SR 79
City/Town Name: Coolidge and Florence
County: Pinal
District: Southcentral
Begin Limit: MP 132.7 (Coolidge Ave, SR 87) and MP 132.0 (Florence, SR 79)
End Limit: MP 134.7 (SR 287, SR 87) and MP 136.4 (Florence, SR 79)
Segment Length: 2.0 miles (SR 87) and 4.4 miles (SR 79)
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/y9u3y28e

Location Summary

Both segments are part of U.S. Bicycle Route 90.
Programmed Projects: None
Identified in 2012 BSAP: No
Segment Type (High-Crash/High-Crash Potential): High-Crash and High-Crash Potential
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway (TWLTL) (SR 87); two-lane highway and five-lane highway (TWLTL) (SR 79)
Bicycle Facility Presence: Wide curb lane, none (SR 79), None (SR 87)
AADT: 18,200 (SR 87) and 13,500 (SR 79) vpd
Posted Speed Limit: 35-45 mph (SR 87), 45 mph (SR 79)
Lighting: Yes, excluding SR 79 MP 132.0-133.0 and MP 134.0-136.4
Number of Bicycle Crashes: 5 (1 involved alcohol/drugs)

Project Need

The reported bicycle crashes along MP 132.7 to MP 134.7 on SR 87 include crash types of *Motorist Right Turn – Opposite Direction, Bicyclist Failed to Clear,* and *Bicyclist Ride Out.* Two crashes included the bicyclist failing to yield. These segments of SR 87 and SR 79 are along U.S. Bicycle Route 90.

Project Purpose

Reduce the number of bicycle crashes on SR 87 and SR 79 by increasing the visibility of potential bicyclists and increase awareness of safer bicycle travel through bicycle safety education.

Potential Countermeasures

Option 1: Engineering Countermeasures

Parallel Off-street Alternative Bicycle Routes

Per record drawings, SR 87, north of MP 134 has existing paved shoulders. However, south of MP 134 has a street width of 64' (face of curb to face of curb). This width is insufficient for a striped paved shoulder of at least 5' effective width. As such, alternate routes should be promoted for bicycle activity south of MP 134. 4th Street, located east of SR 87, could be designated as a bicycle route or improved as a bicycle boulevard. Bicycle boulevards are streets with low motorized traffic volumes and speeds, designated and designed to give bicycle travel priority. Bicycle boulevards use signs, pavement markings, and speed and volume management measures to discourage through trips by motor vehicles and create convenient bicycle crossings of busy arterial streets[1]. It is recommended that ADOT collaborate with City of Coolidge to prepare a bicycle and pedestrian plan.

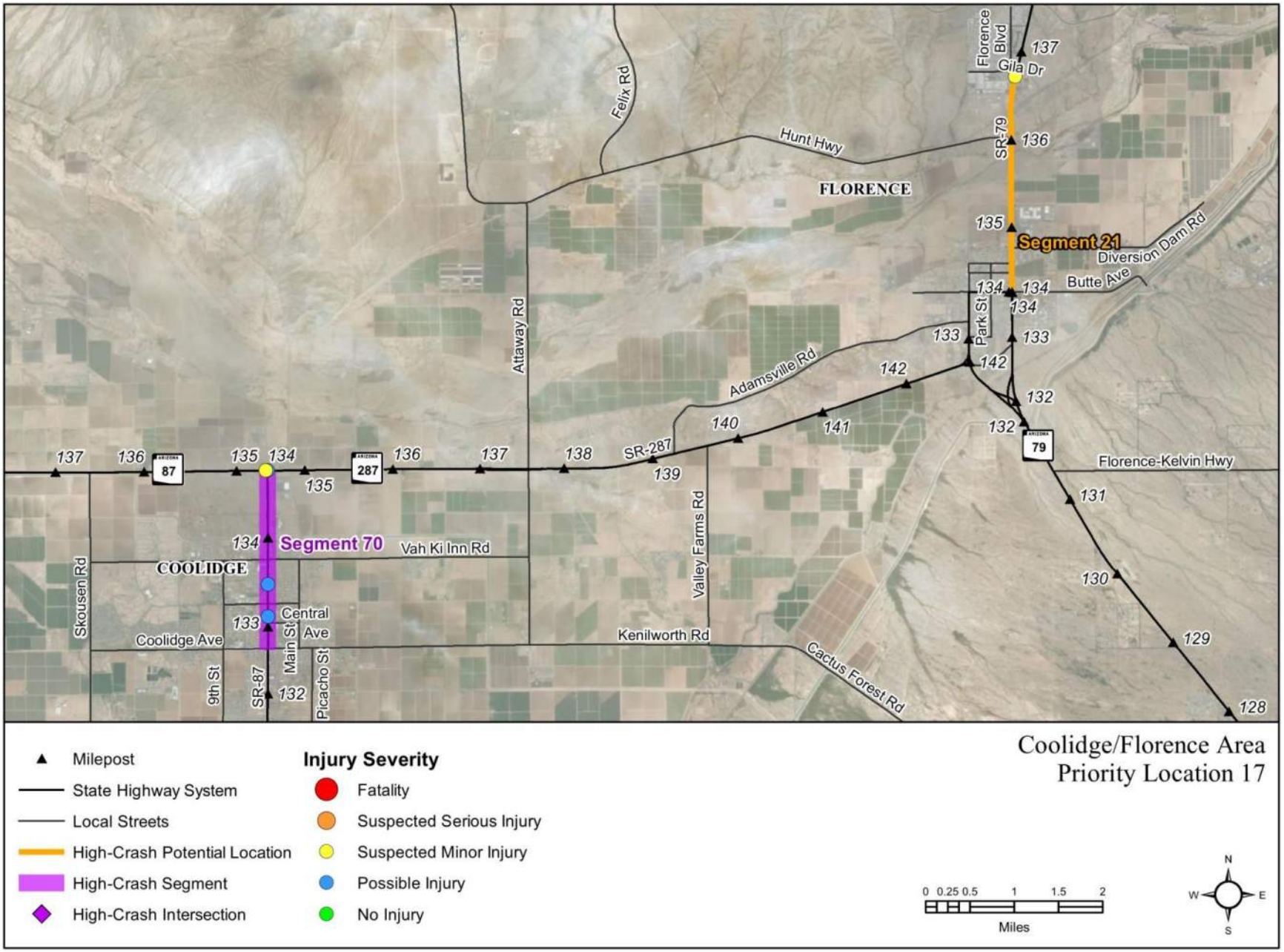
Roadway Signing Improvements

Consider installing R4-11 BMUFL sign with R4-11aP Change Lanes to Pass plaque along US 60.

Option 2: Shared Lane Markings

Placed on section of roadway that has a speed limit of 35 mph.

[1] https://nacto.org/publication/urban-bikeway-design-guide/bicycle-boulevards/


Florence Blvd
Gila Dr
Felix Rd
Hunt Hwy
SR-79
FLORENCE
Segment 21
Diversion Dam Rd
Butte Ave
Park St
Attaway Rd
Adamsville Rd
SR-287
Florence-Kelvin Hwy
Valley Farms Rd
Segment 70
Vah Ki Inn Rd
COOLIDGE
Skousen Rd
Central Ave
Main St
Coolidge Ave
Kenilworth Rd
Cactus Forest Rd
9th St
SR-87
Picacho St
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Coolidge/Florence Area
Priority Location 17
0 0.25 0.5 1 1.5 2
Miles
N
W
E
S

Priority Location 18: US 60 and SR 260, Show Low and Pinetop-Lakeside, H-C Segments 73, 74, and 75 and H-P Segments 27, 28

General Project Information

Primary Route/Street: US 60 and SR 260
City/Town Name: Show Low/Pinetop-Lakeside
County: Navajo
District: Northeast
Begin Limit: MP 340.1 (US 60), MP 341.7 (SR 260)
End Limit: MP 342.2 (US 60), MP 355.0 (SR 260)
Segment Length: 2.1 miles (US 60) and 13.3 miles (SR 260) – 15.4 miles total
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/yd3culkw

Location Summary

Thirteen bicycle crashes reported; two serious injuries.
Programmed Projects: FY 2019 & 2021 pavement preservation project; Church St to Knottingham Ln (Item No. 9114)
Identified in 2012 BSAP: Partial, SR 260, Rainbow Lake Dr. to Woodland Lake Rd
Segment Type (High-Crash/High-Crash Potential): High-Crash and High-Crash Potential
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway (TWLTL)
Bicycle Facility Presence: Wide curb lane/paved shoulder
AADT: 30,300 vehicles per day
Posted Speed Limit: 35 mph (US 60); 35, 40, 45 mph (SR 260)
Lighting: US 60, Yes; SR 260, At signalized intersections
Number of Bicycle Crashes: 13 (1 involved unknown conditions)

Project Need

The majority of the reported bicycle crashes along the high-crash and high-crash potential segments have occurred at non-intersection locations. Crash types include *Motorist Right Turn – Same or Opposite Direction* and *Bicyclist Ride Out – Sign-Controlled Intersection*. Eight of the 13 bicycle crashes involved the bicycle location of *Sidewalk/Crosswalk/Driveway Crossing*. The urban areas include many driveways.

Project Purpose

Reduce bicycle-related crashes by increasing awareness of motorists and bicyclists along the roadway and provide a separation between the bicyclist and vehicles along the high-speed roadway.

Potential Countermeasures

Option 1: Conduct RSA

An RSA with an emphasis on bicycle safety should be conducted within the Show Low and Pinetop-Lakeside area.

Option 2: Engineering Countermeasures

Assess Construction of a Raised Median

Implement recommendations from the 2015 Pinetop-Lakeside Pedestrian Safety Solutions Study, which identified segments to be improved to a raised median. Conduct an assessment to identify other locations on SR 260 through unincorporated county and Show Low where a raised median would improve safety.

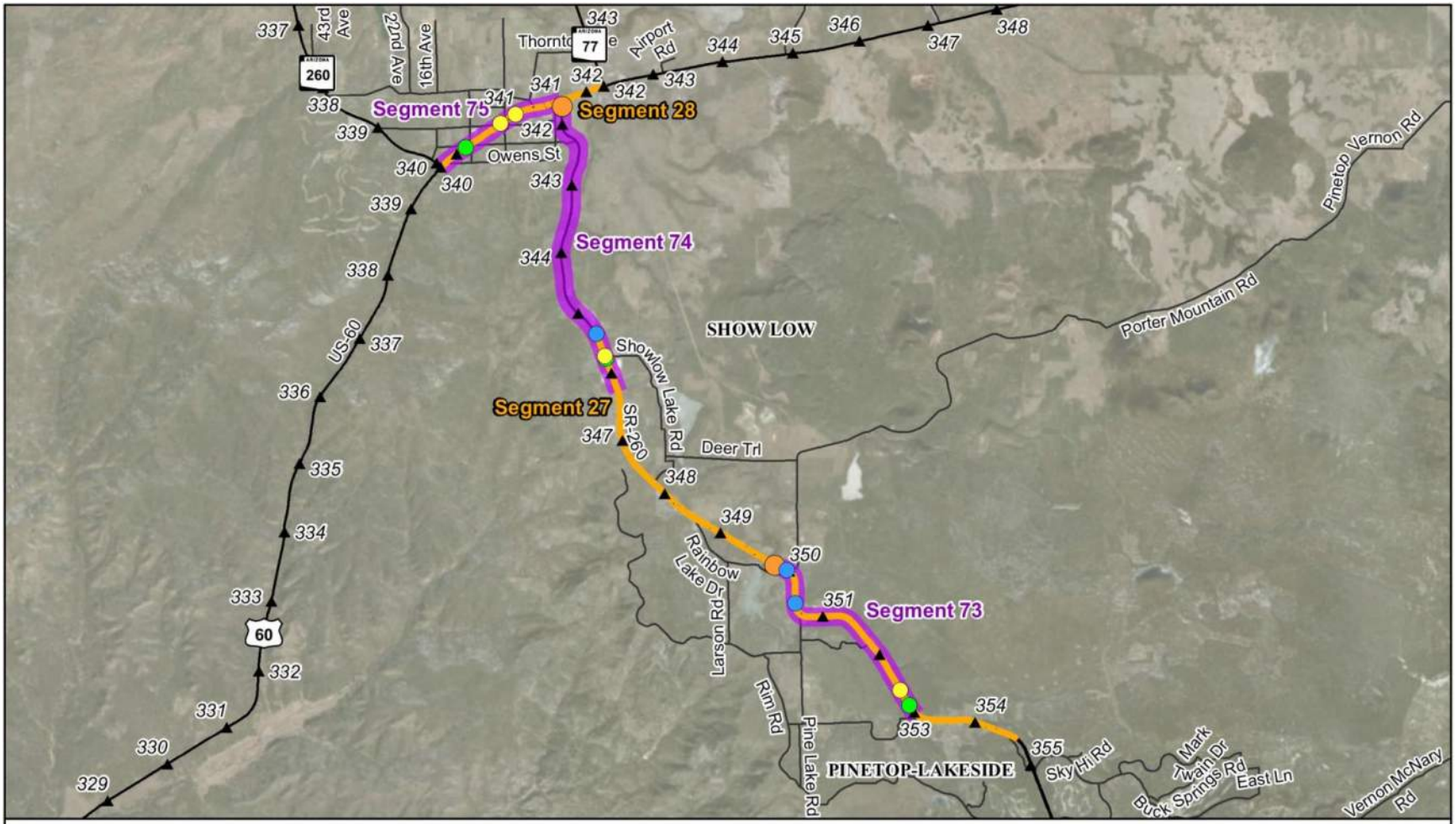
Striped Paved Shoulder

Assess feasibility of striped paved shoulder (4' minimum effective width, as measured from gutter seam to the center of the white stripe) on SR 260. Roadway widths vary along SR 260; typical width is 64-68'. A 4' striped shoulder through curbed sections may require one or more travel lanes to be reduced to 11'; shoulder widening may be required through some segments.

A striped or paved shoulder should also be considered on US 60. This could be accommodated by reducing the travel lanes to 11' with a 12' two-way center left turn lane.

Roadway Signing Improvements

Consider installing R4-11 BMUFL sign with R4-11aP Change Lanes to Pass plaque.


Segment 75
Segment 28
Segment 74
Segment 27
Segment 73
SHOW LOW
PINETOP-LAKESIDE
Thornton
Owens St
Showlow Lake Rd
SR-260
Deer Trl
Rainbow Lake Dr
Larson Rd
Rim Rd
Pine Lake Rd
Airport Rd
Porter Mountain Rd
Pinetop Vernon Rd
Sky Hi Rd
Mark Twain Dr
Buck Sprngs Rd
East Ln
Vernon McNary Rd
US-60
43rd Ave
22nd Ave
16th Ave
260
77
60
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Show Low/Pinetop-Lakeside Area
Priority Location 18
0 0.25 0.5 1 1.5 2
Miles
N
W
E
S

Priority Location 19: SR 87, Payson, H-C Segment 72 and H-P Segment 11

General Project Information

Primary Route/Street: SR 87
City/Town Name: Payson
County: Gila
District: Northcentral
Begin Limit: MP 250.0 (Green Valley Pkwy)
End Limit: MP 253.6 (Rancho Road)
Segment Length: 3.6 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/yd5fevqr

Location Summary

The SR 87 segments are located in Payson. Ten bicycle crashes were reported, with none resulting in fatal or serious injuries.
Programmed Projects: None
Identified in 2012 BSAP: Partially (Ridge Ln to Forest Dr.)
Segment Type (High-Crash/High-Crash Potential): High-Crash and High-Crash Potential
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway (TWLTL)
Bicycle Facility Presence: Wide curb lane
AADT: 23,300 vehicles per day
Posted Speed Limit: 35-40-45 mph
Lighting: Yes
Number of Bicycle Crashes: 10 (1 involved alcohol and 1 involved unknown conditions)

Project Need

The reported bicycle crashes along SR 87 between MP 250.0 and 253.2 have occurred mostly due to motorists or bicyclists failing to yield. The crash types include *Motorist Drive Out* and the bicycle position was mainly *Sidewalk/Crosswalk/Driveway Crossing*. The urban area includes many driveways and signalized intersections.

Project Purpose

Reduce the number of bicycle crashes on SR 87 by increasing the visibility of bicyclists, educating motorists and bicyclists to address failing to yield, and providing intersection improvements and safer bicycle facilities.

Potential Countermeasures

Option 1: Engineering Countermeasures

Access Management Study

Conduct an access management study. Recommendations may include driveway consolidation and constructing a raised median.

Striped Paved Shoulder

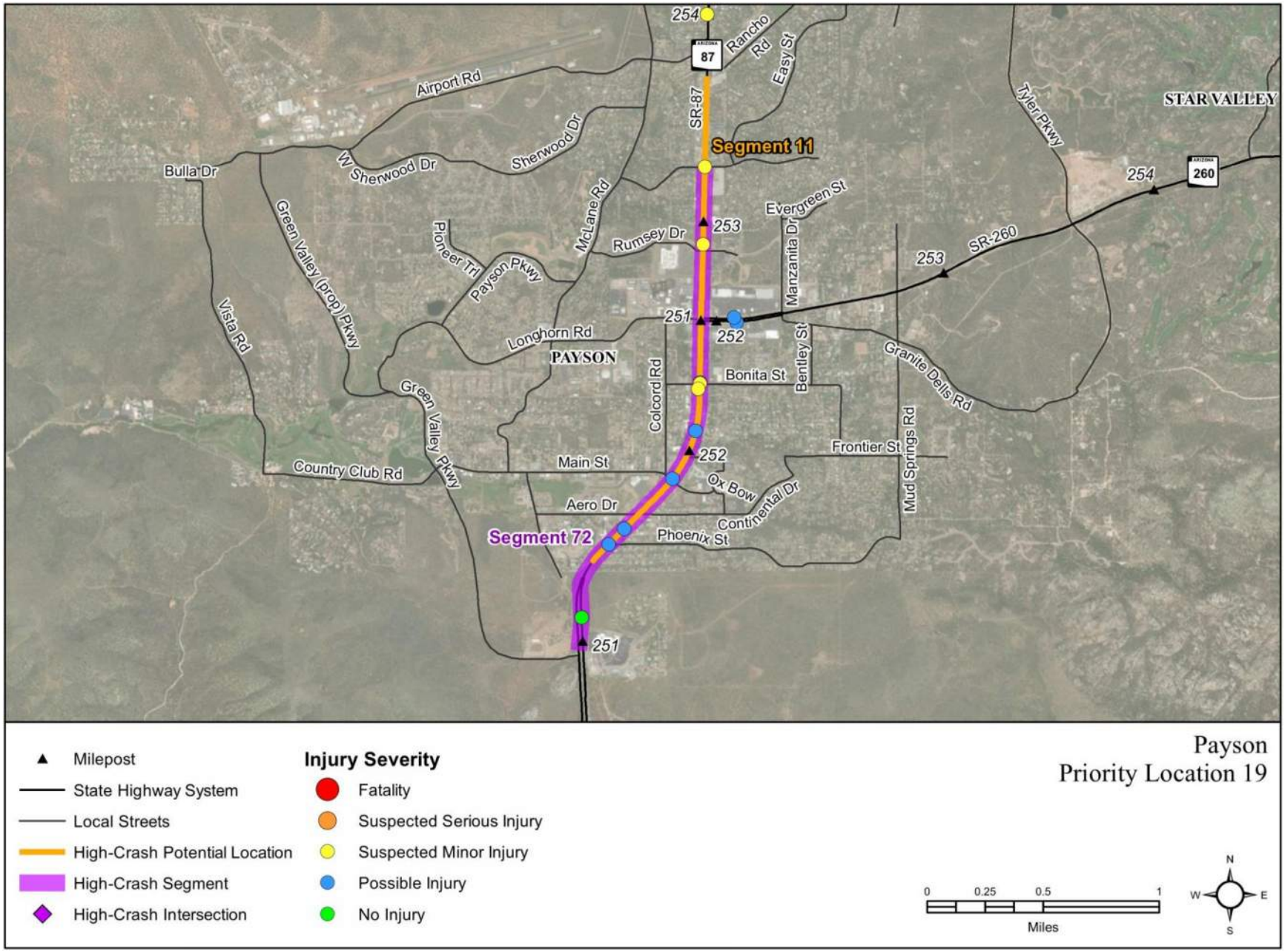
Assess feasibility of striped paved shoulder on SR 87. Per record drawings, SR 87 typical width is 68'. A 4' striped shoulder (as measured from gutter seam to the center of the white stripe) could be installed on SR 87 in both directions. Striped shoulder may require one or more travel lanes to be reduced to 11'. A striped or paved shoulder should also be considered for remainder of SR 87 north through the Town of Payson.

Roadway Signing Improvements

Consider installing R4-11 BMUFL sign with R4-11aP Change Lanes to Pass plaque.

Option 2: Bicyclist and Motorist Education Campaign

Partner with CAG and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.


254
87
Rancho Rd
Easy St
Airport Rd
SR-87
Segment 11
STAR VALLEY
Tyler Pkwy
Bulla Dr
W Sherwood Dr
Sherwood Dr
McLane Rd
254
260
Evergreen St
Rumsey Dr
253
Manzanita Dr
SR-260
Pioneer Trl
Payson Pkwy
Green Valley (prop) Pkwy
Vista Rd
251
252
Longhorn Rd
PAYSON
Bentley St
Granite Dells Rd
Bonita St
Colcord Rd
Green Valley Pkwy
Frontier St
Mud Springs Rd
Main St
Country Club Rd
Ox Bow
Continental Dr
Aero Dr
Segment 72
Phoenix St
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Payson
Priority Location 19
0
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Miles
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Priority Location 20: SR 77 (South of River Road), Tucson, H-C Segments 60 and 61, H-C Intersections 5 and 6, and H-P Segment 30

General Project Information

Primary Route/Street: SR 77 (Oracle Rd/Miracle Mile)
City/Town Name: Tucson
County: Pima
District: Southcentral
Begin Limit: MP 68.5 (Flowing Wells Rd)
End Limit: MP 72.0 (River Rd)
Intersections: SR 77/Wetmore Rd and SR 77/Prince Rd
Segment Length: 3.5 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/y94jz3kq

Location Summary

Counts reveal approximately 113 bicycles per day on H-C Segment 61.
Programmed Projects: FY 2019; SR 77, pavement rehabilitation, Jct I-10 to Genematas Dr (MP 68-72)
Identified in 2012 BSAP: Yes
Segment Type (High-Crash/High-Crash Potential): High-Crash and High-Crash Potential (and High-Crash Intersection)
Area Type (Urban-Suburban/Rural): Urban-Suburban
Segment Facility Type: Four-lane and six-lane divided
Intersection Facility Types (Major/Minor): Six-lane divided/five-lane divided (TWLTL)
Bicycle Facility Presence: Bike route with striped paved shoulder (south of Roger Road)
Segment AADT: 44,700 vehicles per day
Posted Speed Limit: 40 mph
Lighting: Yes
Number of Bicycle Crashes: 49 (4 involved alcohol/drugs (including 1 fatal); 3 involved unknown conditions)

Project Need

The reported bicycle crashes along SR 77 have occurred occurred mostly due to motorists and bicyclists failing to yield and motorists making right turns. The majority of the reported crashes occurred at signalized intersections and include left or right turning movements. Thirteen of the crashes included *Motorist Right Turn – Same or Opposite Direction* crash type.

Project Purpose

Reduce bicycle crashes that involve motorists and bicyclists failing to yield the right-of-way and increase bicycle safety education and enforcement.

Potential Countermeasures

Option 1: Conduct RSA

An RSA with an emphasis on bicycle safety should be conducted for the SR 77 corridor in Tucson.

Option 2: Engineering Countermeasures

Enhance Signal Operations for Bicyclists

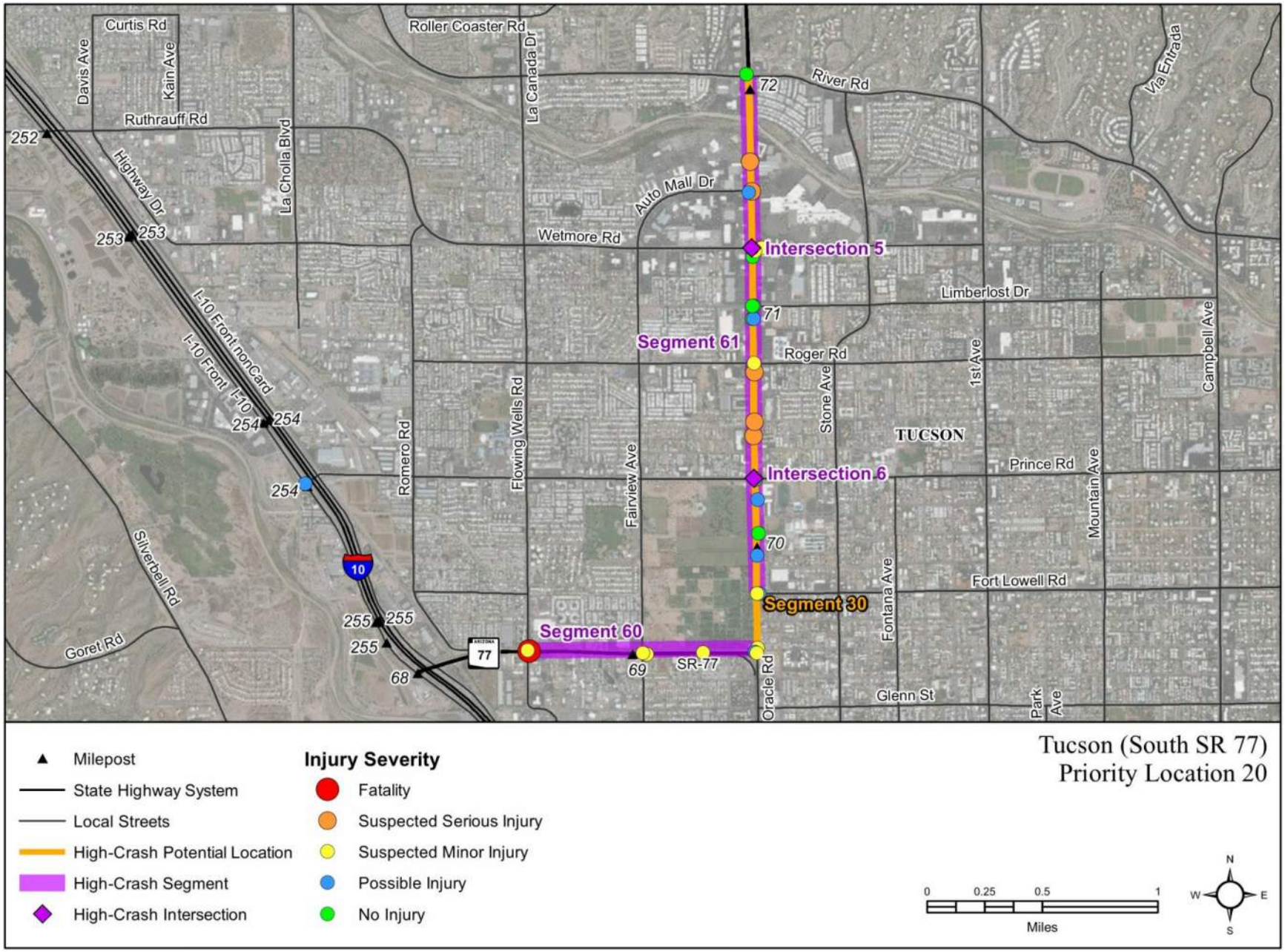
Evaluate existing traffic signal operations at major signalized intersections. Consider right-turn on red restrictions, or exclusive bicycle phases to better accommodate the heavy bicycle traffic. Consider pavement markings to increase visibility of bicyclists.

Option 3: Bicycle and Motorist Education Campaign

Partner with PAG and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.

Option 4: Enforcement

Based on the existing crash characteristics, increase enforcement for motorists and bicyclists failing to yield the right-of-way at the intersections and driveways.


Curtis Rd
Davis Ave
Kain Ave
Roller Coaster Rd
La Canada Dr
River Rd
Via Entrada
Ruthrauff Rd
252
Highway Dr
La Cholla Blvd
Auto Mall Dr
253
253
Wetmore Rd
Intersection 5
Limberlost Dr
71
Segment 61
Roger Rd
I-10 Frontnoncard
I-10 Front
I-10
254
254
254
Romero Rd
Flowing Wells Rd
Stone Ave
1st Ave
Campbell Ave
TUCSON
Fairview Ave
Prince Rd
Intersection 6
Mountain Ave
Silverbell Rd
10
70
Fort Lowell Rd
Fontana Ave
255
255
255
Segment 30
Segment 60
Goret Rd
77
69
SR-77
68
Oracle Rd
Glenn St
Park Ave
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Tucson (South SR 77)
Priority Location 20
0
0.25
0.5
1
Miles
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W
E
S

Priority Location 21: SR 77 (North of River Road), Tucson, H-C Segments 62, 63, and 64, H-C Intersection 7, and H-P Segments 30 and 31

General Project Information

Primary Route/Street: SR 77 (Oracle Rd)
City/Town Name: Tucson
County: Pima
District: Southcentral
Begin Limit: MP 72.0 (River Rd) & MP 85.7 (Golder Ranch Dr.)
End Limit: MP 81.8 (Tangerine Rd) & MP 86.7 (Mainsail Blvd)
Intersections: SR 77/Ina Rd
Segment Length: 10.8 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/yadq4o5h

Location Summary

168 bicycles per day on Oracle Rd (Segment 62/63, Int. 7).
Programmed Projects: FY 2021, SR 77, pavement rehabilitation, MP 72-77 (F14401C); FY 2020, SR 77, construct street lighting, MP 73-75 (H891901C); FY 2020, SR 77, intersection improvement, Oracle/Orange Grove (F015801C)
Identified in 2012 BSAP: Partial (Mountain Vista to Ina Rd)
Segment Type (High-Crash/High-Crash Potential): High-Crash and High-Crash Potential (and High Crash Intersection)
Area Type (Urban-Suburban/Rural): Urban-Suburban
Segment Facility Type: Six-lane divided
Intersection Facility Types (Major/Minor): Six-lane divided/four-lane divided
Bicycle Facility Presence: Shared-use path on east side of Segment 64 only, paved shoulders
Segment AADT: 55,700 vehicles per day
Posted Speed Limit: 45, 50, 55 mph
Number of Bicycle Crashes: 34 (1 involved alcohol/drugs; 3 involved unknown conditions)

Project Need

The reported bicycle crashes along the SR 77 were described as motorists and bicyclists failing to yield and motorists making right turns. The majority of the reported crashes occurred at signalized intersections or driveways and include right turning movements. Eight of the crashes included *Motorist Right Turn – Same or Opposite Direction* crash types. Note that a recent project in Segment 64 added new striped paved shoulders and a shared-use path through Catalina.

Project Purpose

Reduce bicycle crashes that involve motorists and bicyclists failing to yield the right-of-way and increase bicycle safety education and enforcement.

Potential Countermeasures

Option 1: Conduct RSA

Review recommendations from October 2012 RSA, SR 77 Milepost 72.9 to 74.85, which recommended: "Install bike lane markings on the shoulder to discourage motorists from driving on the shoulder" (these markings would make it easier to enforce for motorists driving on shoulder); for Oracle and Ina a "bicycle buffer" for southbound approach and "two-stage turn queue bike boxes" – refer to July 13, 2017 Interim Approval for the Optional Use of Two-Stage Bicycle Turn Boxes (IA-20).

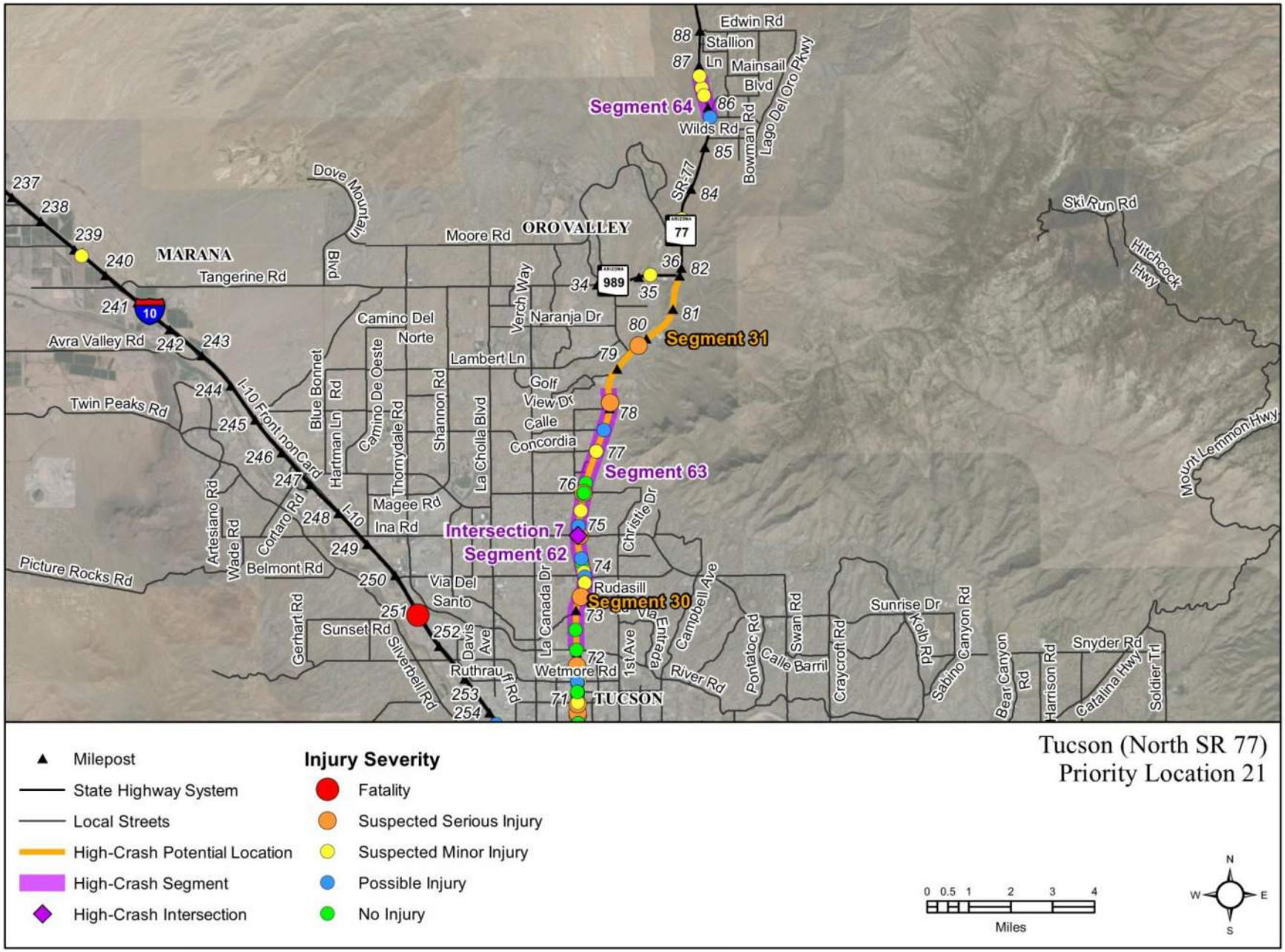
Option 2: Engineering Countermeasures

Enhance Signal Operations for Bicyclists

Evaluate existing traffic signal operations at major signalized intersections. Consider right-turn on red restrictions, or exclusive bicycle phases to better accommodate the heavy bicycle traffic. Consider pavement markings to increase visibility of bicyclists.

Option 3: Bicycle Education Campaign

Partner with PAG and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.


Segment 64
Segment 31
Segment 63
Intersection 7
Segment 62
Segment 30
ORO VALLEY
MARANA
TUCSON
Edwin Rd
Stallion Ln
Mainsail Blvd
Wilds Rd
Bowman Rd
Lago Del Oro Pkwy
SR-77
Moore Rd
Dove Mountain Blvd
Tangerine Rd
Avra Valley Rd
Twin Peaks Rd
Picture Rocks Rd
Camino Del Norte
Naranja Dr
Lambert Ln
Golf View Dr
Calle Concordia
Verch Way
Blue Bonnet Rd
Hartman Ln
Camino De Oeste
Thornydale Rd
Shannon Rd
La Cholla Blvd
I-10 Frontnoncard
I-10
Magee Rd
Ina Rd
Cortaro Rd
Artesiano Rd
Wade Rd
Belmont Rd
Via Del Santo
Rudasill
Sunset Rd
Silverbell Rd
Gerhart Rd
Davis Ave
Ruthrauff Rd
Wetmore Rd
La Canada Dr
1st Ave
Christie Dr
Campbell Ave
Via Entrada
River Rd
Pontatoc Rd
Calle Barril
Swan Rd
Craycroft Rd
Sunrise Dr
Kolb Rd
Sabino Canyon Rd
Bear Canyon Rd
Harrison Rd
Snyder Rd
Catalina Hwy
Soldier Trl
Ski Run Rd
Hitchcock Hwy
Mount Lemmon Hwy
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Tucson (North SR 77)
Priority Location 21
0 0.5 1 2 3 4
Miles
N
W
E
S

Priority Location 22: SR 86, Tucson, H-C Segment 59

General Project Information

Primary Route/Street: SR 86 (Ajo Way)
City/Town Name: Tucson
County: Pima
District: Southcentral
Begin Limit: MP 170.3 (Mission Rd)
End Limit: MP 170.8 (Holiday Blvd)
Segment Length: 0.50 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/y7gm4y7a

Location Summary

The SR 86 high-crash segment is in Tucson. Five bicycle crashes were reported; two crashes resulted in a serious injury.
Programmed Projects: None
Identified in 2012 BSAP: No
Segment Type (High-Crash/High-Crash Potential): High-Crash
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway (TWLTL)
Bicycle Facility Presence: None (narrow striped shoulder)
AADT: 30,500 vehicles per day
Posted Speed Limit: 40 mph
Lighting: Yes
Number of Bicycle Crashes: 5

Project Need

A majority of reported bicycle crashes along SR 86 MP 170.3 to MP 170.8 included the crash type of *Motorists Left Turn – Opposite or Same Direction*. Two of the five crashes (and one of the serious injury crashes) included left-turning motorists not at intersections. The other serious injury crash included a bicyclist left turn not at an intersection.

Project Purpose

Reduce bicycle crashes that involve motorist and bicyclists failing to yield the right-of-way and increase bicycle safety education.

Potential Countermeasures

Option 1: Engineering Countermeasures

Assess Feasibility of Raised Median

Assess feasibility of a raised median throughout the high-crash segment. A raised median will help with access control for the many driveways along the segment and increase overall safety of all transportation modes. Explore feasibility to provide a full-width bicycle lane.

Option 2: Bicyclist and Motorist Education Campaigns

Partner with PAG and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.


Segment 59
TUCSON
Freedom Dr
Holiday Blvd
Ajo
SR-86 Way
86
Mission Rd
Via Canto
Phoebe Ave
Probasco Dr
Brown Dr
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
0
0.05
0.1
Miles
N
W
E
S
Tucson (SR 86)
Priority Location 22

Priority Location 23: SR 92 and SR 90, Sierra Vista, H-C Segment 58 and H-P Segments 24 and 25

General Project Information

Primary Route/Street: SR 90 and SR 92
City/Town Name: Sierra Vista
County: Cochise
District: Southcentral
Begin Limit: MP 317.2 (SR 90)
End Limit: MP 328.5 (SR 92)
Segment Length: 11.3 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/y845s994

Location Summary

The SR 90 and SR 92 high-crash and high-crash potential segments are located in Sierra Vista. Twelve bicycle crashes were reported; no fatal and one serious injury bicycle crashes. Approximately 125 bicycles per day on Segment 58. A portion of SR 90 is along U.S. Bicycle Route 90.
Programmed Projects: None
Identified in 2012 BSAP: Partially (Calle Mercancia to Martin Luther King Jr Pkwy)
Segment Type (High-Crash/High-Crash Potential): High-Crash and High-Crash Potential
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane divided (median or TWLTL) highway, Four-lane divided highway
Bicycle Facility Presence: Shared-use path, paved shoulder
AADT: 23,900 vehicles per day
Posted Speed Limit: 45-55 mph
Lighting: At signalized intersections
Number of Bicycle Crashes: 12 (1 involved unknown)

Project Need

The reported bicycle crashes along SR 92 and SR 90 occurred mostly at intersections. The reported crash types vary and include both bicyclists and motorists' failure to yield. Bicycle position in a majority of crashes was *Sidewalk/Crosswalk/Driveway Crossing.* The urban areas include multiple driveways. A portion of SR 90 is along U.S. Bicycle Route 90

Project Purpose

Reduce bicycle-related crashes in Sierra Vista by increasing the visibility of bicyclists, encouraging use of current bicycle facilities, and increasing motorist and bicyclist education.

Potential Countermeasures

Option 1: Engineering Countermeasures

Consider Extending Paved Shared-Use Path

Consider extending the existing shared-use path on west side of SR 92 from Calle Mercancia south to Buffalo Soldier Trail (in conjunction with future development).

Assess Existing Paved Shoulders, Improve to 4' Minimum Effective Shoulder Width

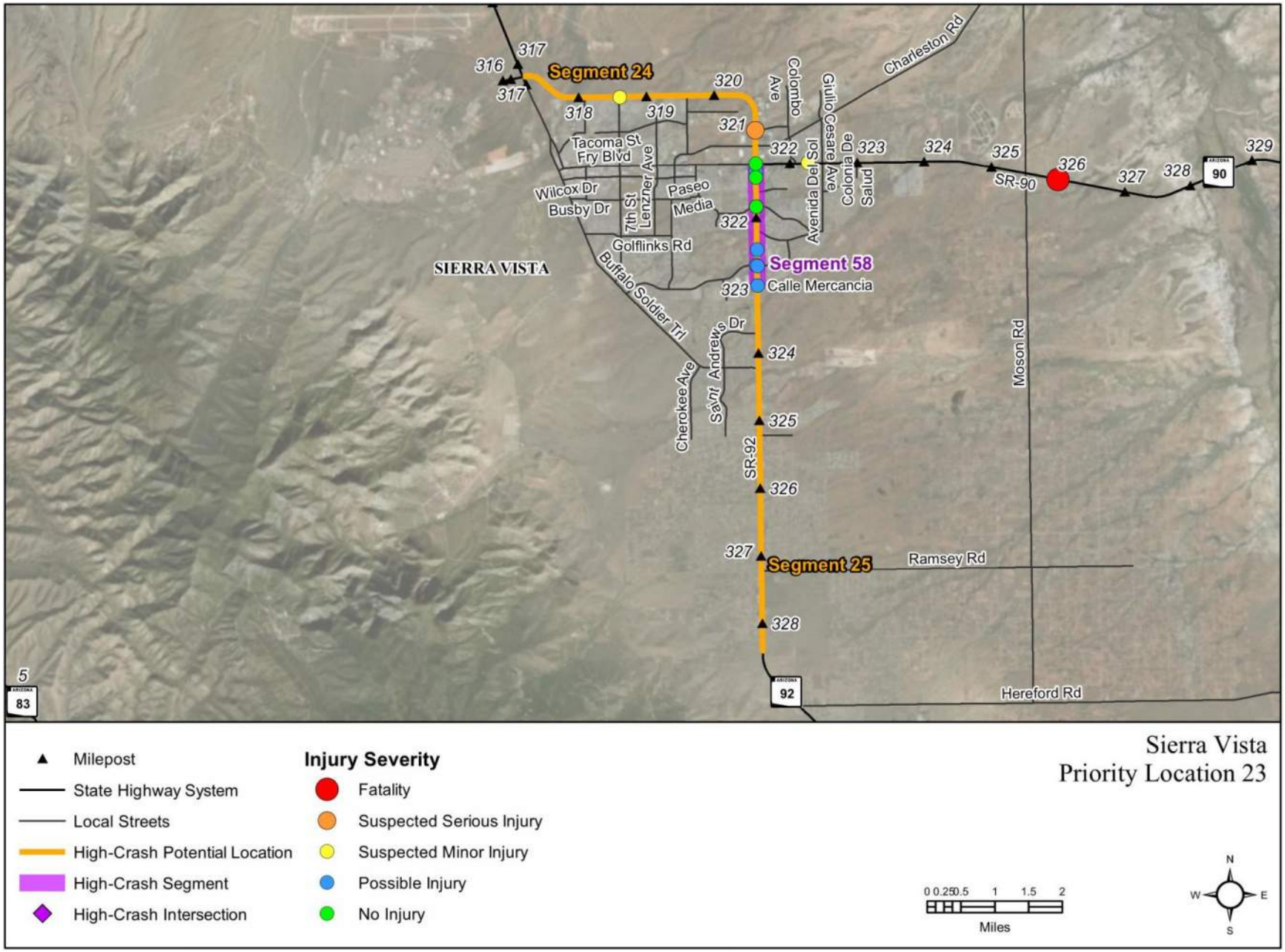
Assess feasibility to improve effective shoulder widths on SR 90, MP 320.5 to MP 321 and SR 92, Calle Mercancia (SR 92) to MP 328 to minimum effective width of 4'. Effective shoulder width is the width available for use by bicyclists excluding rumble strip, gutter pan, etc. Install bicycle buffers between right turn lanes and through lanes at intersections.

Roadway Signing Improvements

Consider installing R4-11 BMUFL sign with R4-11aP Change Lanes to Pass plaque.

Option 2: Enforcement

Based on the existing crash characteristics, increase enforcement for motorists and bicyclists failing to yield the right-of-way at the intersections and driveways.


Segment 24
Segment 58
Segment 25
SIERRA VISTA
Tacoma St
Fry Blvd
Wilcox Dr
Busby Dr
7th St
Lenzner Ave
Paseo
Media
Golflinks Rd
Buffalo Soldier Trl
Calle Mercancia
Colombo Ave
Giulio Cesare Ave
Avenida Del Sol
Colonia De
Salud
Charleston Rd
SR-90
Moson Rd
Saint Andrews Dr
Cherokee Ave
SR-92
Ramsey Rd
Hereford Rd
316
317
318
319
320
321
322
323
324
325
326
327
328
329
5
83
92
90
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
0 0.25 0.5 1 1.5 2
Miles
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W
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S
Sierra Vista
Priority Location 23

Priority Location 24: Stockton Hill Road at I-40, Kingman, H-C Intersection 54

General Project Information

Interchange: Stockton Hill Road at I-40
City/Town Name: Kingman
County: Mohave
District: Northwest
Begin Limit: N/A
End Limit: N/A
Segment Length: N/A
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/yccd8877

Location Summary

The I-40/Stockton Hill Road interchange is in Kingman. The interchange is a diamond configuration. Five bicycle crashes were reported; one crash involved serious injury.
Programmed Projects: None
Identified in 2012 BSAP: Yes
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Four-lane divided roadway
Bicycle Facility Presence: Crosswalks
AADT: 29,500 vehicles per day
Posted Speed Limit: 35 mph
Lighting: Yes
Number of Bicycle Crashes: 5 (1 involved alcohol). 4 of the 5 crashes occurred at the EB I-40 off-ramps to Stockton Hill Road.

Project Need

The reported bicycle crashes at the Stockton Hill Road interchange occurred during both daylight and nighttime (lighted) conditions. The crash types involved *Motorist Right Turn*, *Motorist Drive Out,* and *Bicyclist Ride Out*.

Project Purpose

Reduce bicycle crashes that involve motorists and bicyclists failing to yield the right-of-way and increase bicycle safety education.

Potential Countermeasures

Option 1: Conduct RSA

An RSA with an emphasis on bicycle safety should be conducted. RSA should closely review bicycle crashes and the bicycle/motor-vehicle intersections at the interchange.

Option 2: Engineering Countermeasures

Consider Lengthening Yellow and Red Phasing for Cross Street

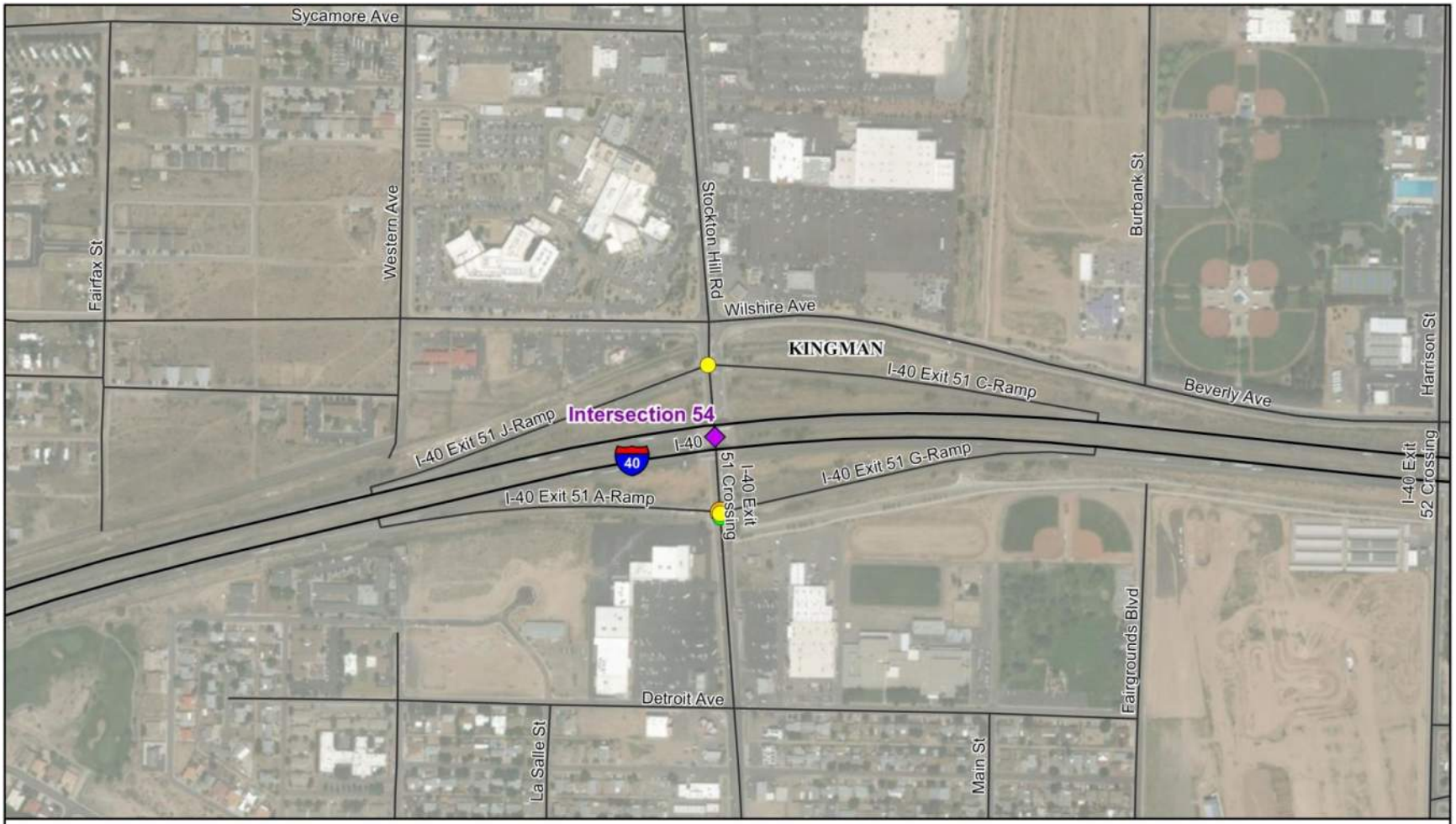
This option provides additional time for bikes to clear the wide intersection. Explore the possible use of LBI – Leading Bicycle Interval (using bicyclist detection) if turning motorists are not yielding to bicyclists. Would require Interim Approval for Optional Use of a Bicycle Signal Face (IA-16) https://mutcd.fhwa.dot.gov/resources/interim_approval/ia16/index.htm.

Parallel Off-street Alternative Bicycle Routes

Encourage use of Harrison Street underpass 0.6 miles to the east. Additional locations to cross the freeway on collector roads would divert bicycle traffic away from interchanges by providing alternate routes. Select additional crossings could be provided for pedestrians and bicyclists only.

Option 3: Bicyclist and Motorist Education Campaign

Partner with WACOG and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.


Sycamore Ave
Fairfax St
Western Ave
Stockton Hill Rd
Burbank St
Wilshire Ave
KINGMAN
I-40 Exit 51 C-Ramp
Beverly Ave
Harrison St
I-40 Exit 51 J-Ramp
Intersection 54
I-40
40
I-40 Exit 51 G-Ramp
I-40 Exit 51 A-Ramp
I-40 Exit 51 Crossing
I-40 Exit 52 Crossing
Fairgrounds Blvd
Detroit Ave
La Salle St
Main St
State Highway System
Local Streets
High-Crash Intersections
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Kingman
Priority Location 24
0
0.1
0.2
Miles
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S

Priority Location 25: Phoenix Metro - Diamond Interchanges, H-C Intersections 8, 11, 13, 14, 15, 16, 17, 20, 22, 23, 25, 35, 41, 43, 44, 45, 46, and 47

General Project Information

Primary Routes: I-17, I-10, SR 202, SR 101
City/Town Name: Phoenix, Tempe
County: Maricopa
District: Central
Intersection Locations: *See list below/next page**
Segment Length: N/A
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/y8rmkj8r

Location Summary

Diamond Interchanges are located throughout the metro Phoenix area and at locations with and without bike lanes. A majority of the interchanges do not have bicycle lanes striped through the interchange.

Programmed Projects: Yes
Identified in 2012 BSAP: Several interchanges identified
Area Type (Urban-Suburban/Rural): Urban-Suburban
Major Facility Type: Variable; commonly 6-lane arterial
Minor Facility Type: Freeway ramps
AADT: Varies
Bicycle Facility Presence: Varies, bicycle lane (typically no)
Posted Speed Limit: Varies, typically 35-45 mph
Lighting: Yes
Number of Bicycle Crashes: 83 crashes total (ranges from 2-6 crashes at each intersection)

***Intersection Locations**
SR 202/Arizona Ave, SR 101/Elliot Rd, SR 101/Baseline Rd, SR 101/Southern Ave, SR 101/Broadway Rd, SR

Project Need

Interchanges present several challenges for bicyclists. Ramp angles and design speeds encourage drivers to primarily focus on vehicular traffic and not provide specific attention to bicyclists and pedestrians. The radii are often large at the on/off ramps encouraging higher vehicle speeds. Entrance-ramps and exit-ramps should provide pavement markings and signage for bicyclists; however, these items are often discontinuous through interchange areas. Many of the interchanges are operated by the local agencies, making suggested improvements more challenging for ADOT to implement.

Project Purpose

Reduce the number of bicycle crashes at diamond interchanges by reducing vehicle speeds at conflict points and increasing the presence of and visibility of bike lanes to provide better crossing opportunities.

Potential Countermeasures

Option 1: Conduct Roadway Safety Assessments

Conduct RSAs at high-crash interchanges and extend the recommendations to similar interchanges.

Option 2: Engineering Countermeasures

High-visibility Pavement Markings

Install bike lanes on cross streets; consider high-visibility green pavement markings for bicycle lanes or bicycle lane extensions (request interim approval per FHWA Interim Approval 14).

Evaluate Modifying Dual Channelized Right-Turn Lanes to Single Right-Turn Lane

Reduces weave conflicts between bicyclists and turning vehicles and improves sight distance by removing possibility of an adjacent vehicle to block the view of a bicyclist on cross street.

Consider Converting YIELD Signs to STOP Signs

Would reduce vehicle speeds through channelized right turn lanes at off ramps.

Align Off-Ramp Angle to Arterial Street

Slows traffic exiting the freeway; speed is a primary factor with regard to severity.

Identify and Construct Additional Bicycle Crossings

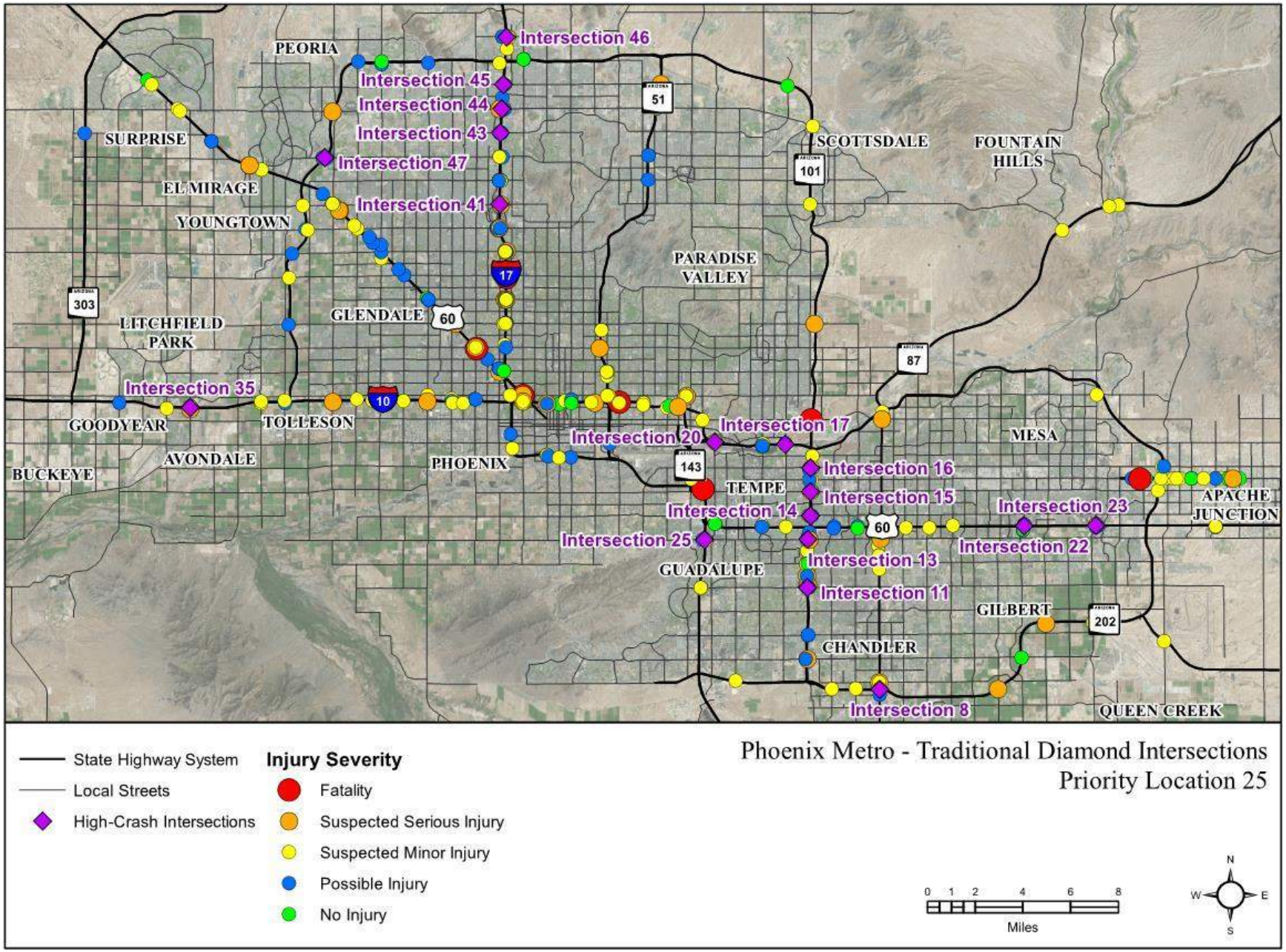
Create additional locations for bicyclists and pedestrians to cross the freeway at collector road points to attract bicycle traffic away from interchanges.

101/University Dr, SR 202/McClintock Dr, SR 202/Priest Dr, US 60/Greenfield Rd, US 60/Power Rd, I-10/Baseline Rd, I-10/Dysart Rd, I-17/Peoria Ave, I-17/Greenway Rd, I-17/Bell Rd, I-17/Union Hills Dr, I-17/Deer Valley Rd, SR 101/Thunderbird Rd

Option 3: ***Maricopa Association of Governments (MAG) I-10/I-17 Corridor Master Plan***

Consider recommendations from MAG I-10/I-17 Corridor Master Plan:

- I-17 and Peoria Avenue Interchange Upgrades: Upgrade traffic interchange to improve bicycle and pedestrian safety. Integrate into the interchange reconstruction.
- I-17 and Greenway Road Interchange Upgrades: Upgrade traffic interchange to improve safety and connectivity consistent with the Phoenix's 2014 Comprehensive Bicycle Master Plan.
- I-17 and Bell Road Interchange Upgrades: Upgrade traffic interchange to improve bicycle and pedestrian safety and connectivity consistent with the Phoenix's 2014 Comprehensive Bicycle Master Plan. Integrate into the interchange reconstruction noted above.
- I-17 and Union Hills Drive Interchange Upgrades: Upgrade traffic interchange to improve bicycle and pedestrian safety and connectivity consistent with the Phoenix's 2014 Comprehensive Bicycle Master Plan.


Intersection 46
Intersection 45
Intersection 44
Intersection 43
Intersection 47
Intersection 41
Intersection 35
Intersection 17
Intersection 20
Intersection 16
Intersection 15
Intersection 14
Intersection 25
Intersection 23
Intersection 22
Intersection 13
Intersection 11
Intersection 8
PEORIA
SURPRISE
EL MIRAGE
YOUNGTOWN
GLENDALE
LITCHFIELD PARK
GOODYEAR
TOLLESON
AVONDALE
BUCKEYE
PHOENIX
PARADISE VALLEY
SCOTTSDALE
FOUNTAIN HILLS
TEMPE
MESA
APACHE JUNCTION
GUADALUPE
GILBERT
CHANDLER
QUEEN CREEK
51
101
87
303
17
10
60
143
202
State Highway System
Local Streets
High-Crash Intersections
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Phoenix Metro - Traditional Diamond Intersections
Priority Location 25
0 1 2 4 6 8
Miles
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S

Priority Location 26: Phoenix Metro - Single-Point Urban Interchange Intersections, H-C Intersections 12, 18, 26, 27, 28, 29, 30, 31, 36, 37, 38, 39, 40, and 50

General Project Information

Intersection: I-17, I-10, SR 51, SR 202, SR 101
City/Town Name: Phoenix, Tempe
County: Maricopa
District: Central
Intersection Locations: SR 101/Guadalupe Rd, SR 202/Scottsdale Rd, SR 202/32nd Street, SR 202/24th Street, SR 51/McDowell Rd, SR 51/Indian School Rd, SR 51/Thomas Rd, I-10/7th St, I-17/Camelback Rd, I-17/Bethany Home Rd, I-17/Glendale Ave, I-17/Northern Ave, I-17/Dunlap Ave, SR 51/Bell Rd
Segment Length: N/A
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/y8rmkj8r

Location Summary

These SPUIs are located throughout the metro Phoenix area and are made up of locations with and without bike lanes.
Programmed Projects: Yes
Identified in 2012 BSAP: Multiple interchanges identified in the 2012 BSAP
Area Type (Urban-Suburban/Rural): Urban-Suburban
Major Facility Type: Variable, commonly 6-lane arterial
Minor Facility Type: Freeway ramps
Bicycle Facility Presence: Variable, typically no bike lane
AADT: Varies
Posted Speed Limit: 35-45 mph
Lighting: Yes
Number of Bicycle Crashes: 92 (7 involved alcohol/drugs

Project Need

SPUIs present several challenges for bicyclists, especially at 4-phase interchanges where frontage roads exist along the freeways and numerous conflict points and high speed turns creates challenges for bicyclists. Ramp angles and design speeds encourage drivers to focus on vehicular traffic and not pay attention to bicyclists and pedestrians. Bicycle lanes on cross-streets are often discontinuous across entrance-ramps and exit-ramps through interchange areas. Traffic signal timing may be insufficient for a bicyclist entering on green or yellow to make it across before green-time for the opposing traffic begins. Many of the interchanges are operated by the local agencies, making suggested improvements more challenging for the State to implement.

Project Purpose

Reduce the number of bicycle crashes at SPUI interchanges by reducing vehicle speeds at conflict points and increasing the presence of and visibility of bike lanes to provide better crossing opportunities.

Potential Countermeasures

Option 1: Conduct Roadway Safety Assessments

Conduct RSAs at a selected number of the higher crash SPUIs in the Phoenix metropolitan area representing different interchange types (3-phase and 4-phase), and extend the recommend improvements to the similar-type interchanges.

Option 2: Engineering Countermeasures

High-visibility Pavement Markings

Install bike lanes on cross streets; consider high-visibility green pavement markings for bicycle lanes or bicycle lane extensions (request interim approval per FHWA Interim Approval 14).

Install/Configure Non-Intrusive Bicycle Detection Where Bike Lanes Exist on Cross-Streets

Would allow bicyclists to call for more time on next green cycle. System also could be installed as a loop bicycle detection system. Use bicycle detection pavement symbol.

Consider Lengthening Yellow and Red Phasing for Cross Street

This option provides additional time for bikes to clear the wide intersection. Convert any signals from leading to lagging left turn off the cross streets to reduce the clearance distance for bicyclists.

Evaluate Modifying Dual Channelized Right-Turn Lanes to Single Right-Turn Lane
Reduces weave conflicts between bicyclists and turning vehicles. Also provides more sight distance by removing possibility of an adjacent vehicle to block visibility. Evaluate the effect on existing traffic operations at the interchange.

Consider Converting YIELD Signs to STOP Signs
Would reduce vehicle speeds through channelized right-turn lanes at SPUI off-ramps.

Align Off-Ramp Angle to Arterial Street
Aligning the off-ramp from the freeway to the arterial at right-angle slows traffic exiting the freeway and thus can reduce injury severity.

Identify and Construct Additional Bicycle Crossings
Creating additional locations to cross the freeway at collector road points would divert bicycle traffic away from interchanges by providing alternate routes. These could be crossings for pedestrians and bicyclists only, or include motor vehicle access as well.

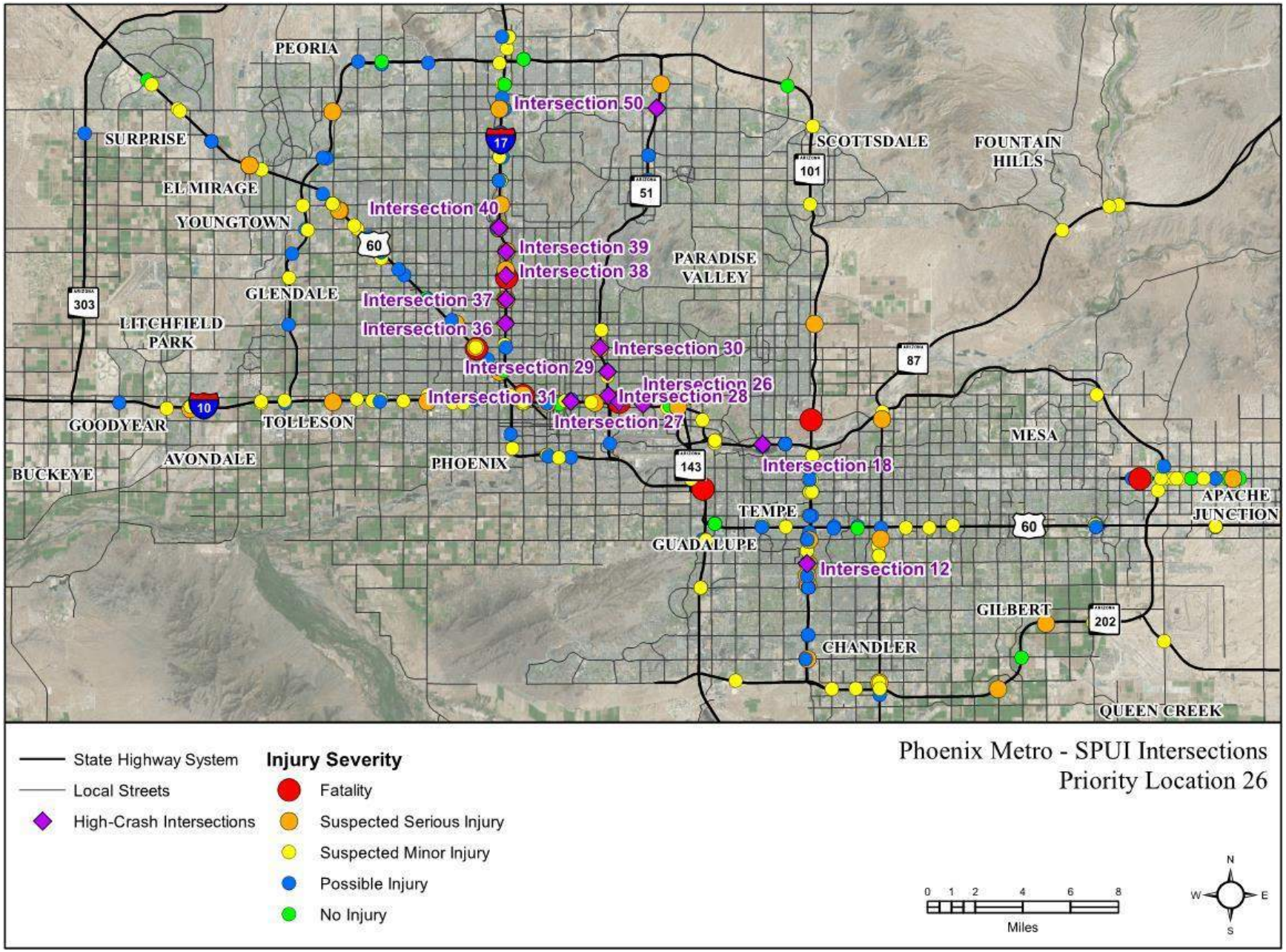
Option 3: Maricopa Association of Governments (MAG) I-10/I-17 Corridor Master Plan

Consider recommendations from MAG I-10/I-17 Corridor Master Plan:

- I-10 and 32nd Street Interchange Upgrades: Upgrade traffic interchange to improve safety and efficiency and to incorporate bicycle and pedestrian improvements as outlined in Phoenix's 2014 Comprehensive Bicycle Master Plan.
- I-17 and Northern Avenue Interchange Upgrades: Upgrade traffic interchange to improve bicycle and pedestrian safety. Integrate into the interchange reconstruction.

Option 4: Bicyclist and Motorist Education Campaign

Partner with MAG and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.


PEORIA
SURPRISE
EL MIRAGE
YOUNGTOWN
GLENDALE
LITCHFIELD PARK
GOODYEAR
TOLLESON
AVONDALE
BUCKEYE
PHOENIX
SCOTTSDALE
FOUNTAIN HILLS
PARADISE VALLEY
MESA
TEMPE
GUADALUPE
APACHE JUNCTION
GILBERT
CHANDLER
QUEEN CREEK
Intersection 50
Intersection 40
Intersection 39
Intersection 38
Intersection 37
Intersection 36
Intersection 30
Intersection 29
Intersection 26
Intersection 28
Intersection 31
Intersection 27
Intersection 18
Intersection 12
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202
State Highway System
Local Streets
High-Crash Intersections
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Phoenix Metro - SPUI Intersections
Priority Location 26
0 1 2 4 6 8
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Priority Location 27: SR 87 at McKellips Road, Mesa, H-C Intersection 24

General Project Information

Intersection: SR 87 (Country Club Rd)/McKellips Rd
City/Town Name: Mesa
County: Maricopa
District: Central
Begin Limit: N/A
End Limit: N/A
Segment Length: N/A
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/ydd2755m

Location Summary

This SR 87 intersection is in the northwest corner of Mesa. Five bicycle crashes were reported, and one resulted in incapacitating injury.
Programmed Projects: City of Mesa BSAP
Identified in 2012 BSAP: Yes
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: None (crosswalks)
Bicycle Facility Presence: None at intersection
AADT: 19,100 vehicles per day (SR 87)
Posted Speed Limit: 45 mph (SR 87), 45 mph (McKellips Rd)
Lighting: Yes
Number of Bicycle Crashes: 5

Project Need

A majority of the reported bicycle crashes at the intersection of SR 87 (Country Club Rd) and McKellips Rd have been the crash types *Motorist Drive Out.* Three of the four legs of the intersection have bike lanes approaching the intersection, but they are discontinuous at and through the intersection. All four corners of the intersection have commercial developments with driveway access to both streets.

Project Purpose

Reduce potential for bicycle crashes by providing safer facilities for crossing and travel within the intersection of SR 87 and McKellips Rd.

Potential Countermeasures

Option 1: Engineering Countermeasures

Improve Signal Operations for Bicyclists

Evaluate the existing traffic signal operations at the signalized intersections where cross-road bicycle facilities exist. Evaluate signal timing/phasing for pedestrians and bicyclists. Consider adding bicycle detection, and minimum green time for bicyclist.

Add Striped Bike Lane Through Intersection

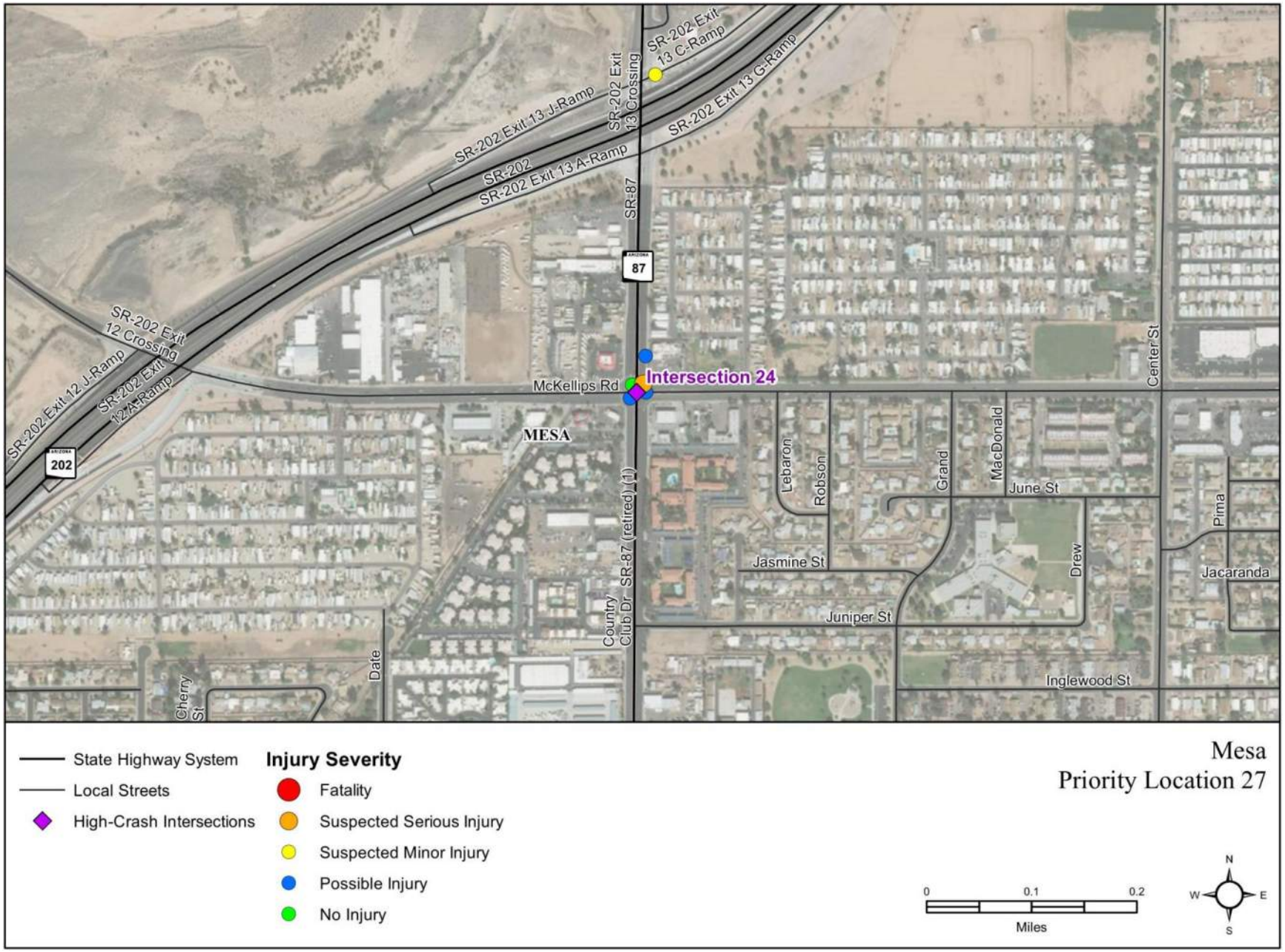
Assess feasibility of striped bike lanes in each direction through the intersection by narrowing all travel lanes to provide adequate space for bicyclists. The bike lanes at the intersection crossings should clearly indicate bicycle presence in and around the intersection.

Install/Configure Non-Intrusive Bicycle Detection

Would allow bicyclists to call for more time on next green cycle. System also could be installed as a loop bicycle detection system in the bike lane on the approach. Use bicycle detection pavement symbol.

Option 2: Bicyclist and Motorist Education Campaign

Partner with MAG and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.


SR-202 Exit 13 C-Ramp
SR-202 Exit 13 Crossing
SR-202 Exit 13 J-Ramp
SR-202 Exit 13 G-Ramp
SR-202
SR-202 Exit 13 A-Ramp
SR-87
87
SR-202 Exit 12 Crossing
SR-202 Exit 12 J-Ramp
SR-202 Exit 12 A-Ramp
202
McKellips Rd
Intersection 24
MESA
Center St
Lebaron
Robson
Grand
MacDonald
June St
Pima
Jasmine St
Drew
Jacaranda
Juniper St
Country Club Dr
SR-87 (retired) (1)
Date
Cherry St
Inglewood St
State Highway System
Local Streets
High-Crash Intersections
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Mesa
Priority Location 27
0
0.1
0.2
Miles
N
W
E
S

Priority Location 28: SR 143 at McDowell Road, Phoenix, H-C Intersection 49

General Project Information

Intersection: SR 143/McDowell Rd
City/Town Name: Phoenix
County: Maricopa
District: Central
Begin Limit: N/A
End Limit: N/A
Segment Length: N/A
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/yatnrgus

Location Summary

This SR 143 intersection is in the southeast side of Phoenix. Five bicycle crashes were reported.
Programmed Projects: None
Identified in 2012 BSAP: No
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Six-lane divided roadway
Bicycle Facility Presence: None (crosswalks on south and east leg)
AADT: 29,000 vehicles per day
Posted Speed Limit: 40 mph
Lighting: Yes
Number of Bicycle Crashes: 5 (1 involved alcohol/drugs)

Project Need

A majority of the reported bicycle crashes at the intersection of SR 143 and McDowell Road were crash types *Bicycle Ride Out* and *Motorist Drive Out*. There are no bike lanes on either approach. The cross-cut canal lies directly east of the intersection. Pedestrian and bicycle access is prohibited on SR 143. There are pedestrian refuge islands on either side of the SR 143 approach, but the north/south crossing is across the east leg of the intersection.

Project Purpose

Reduce potential for bicycle crashes by providing safer facilities for crossing and travel within the intersection of SR 143 and McDowell Rd.

Potential Countermeasures

Option 1: Conduct RSA

An RSA with an emphasis on bicyclist safety should be conducted at the intersection to further evaluate safety issues.

Option 2: Engineering Countermeasures

Turn Radius Modifications

Consider creating a sharper eastbound to southbound right turn, and use a truck apron to accommodate larger trucks.

Restrict Right Turn on Red

Evaluate restricting the right turn on red movement for northbound to eastbound right-turning vehicles on SR 143 at McDowell Rd. Drivers that turn right on red can fail to come to a complete stop and look towards their turning direction, posing a larger threat to bicyclists.

Align Off-Ramp Angle to Arterial Street

Align the off-ramp from the freeway to the arterial at right-angle to slow traffic exiting the freeway and thus reduce injury severity as speed is a primary factor with regard to severity.

Striped Paved Shoulder/Bike Lanes

Perform an engineering assessment to determine if bike lanes can be installed when restriped, particularly on McDowell Road and 48th Street (connecting the existing bike lanes in the area).


Hubbell St
Palm Ln
42nd St
43rd St
44th Pl
45th St
46th St
47th St
47th Pl
Holly St
49th St
50th St
48th Pl
Granada Rd
Coronado Rd
51st St
Almeria Rd
46th Pl
PHOENIX
44th St
McDowell Rd
Intersection 49
SR-143
48th St
Brill St
43rd Pl
143
Private
Willetta St
Belleview St
Culver St
SR-143 Exit 3 C-Ramp
SR-202 Exit 3 A0-Ramp
49th Pl
Moreland St
State Highway System
Local Streets
High-Crash Intersections
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Phoenix
Priority Location 28
0
0.1
0.2
Miles
N
W
E
S

Priority Location 29: 6th Avenue/I-10 and Kino Parkway/I-10, Tucson, H-C Intersections 1 and 4

General Project Information

Interchange: 6th Ave at I-10 and Kino Pkwy at I-10
City/Town Name: Tucson
County: Pima
District: Southcentral
Begin Limit: N/A
End Limit: N/A
Segment Length: N/A
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/yabdzh7n

Location Summary

The 6th Avenue and Kino Parkway TIs at I-10 are located in Tucson. Ten bicycle crashes were reported, with no crashes resulting in serious injury or fatality. Seven of the 10 crashes occurred at the 6th Avenue intersection and three occurred at the Kino Parkway intersection.
Programmed Projects: None
Identified in 2012 BSAP: Yes (6th Ave at I-10)
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Four-lane divided or Five-lane highway (TWLTL)
Bicycle Facility Presence: Crosswalks
AADT: 30,900 (Kino Pkwy), 28,400 (6th Ave) vehicles per day
Posted Speed Limit: 35 mph (6th Ave); 40 mph (Kino Pkwy)
Lighting: Yes
Number of Bicycle Crashes: 10 (1 unknown conditions)

Project Need

The reported bicycle crashes at the two high-crash intersections vary in crash type and condition. Seven of the 10 crashes occurred at the 6th Avenue intersection. Crash types include *Bicyclist Ride-Out, Motorist Left Turn,* and *Motorist Right Turn*. Three of the crashes included bicyclists failing to yield while the majority of remaining crashes include motorist turning movements. There are striped shoulders on the approach to the Kino interchange, but there is no bicycle space designated through the interchange. There are striped shoulders at the 6th Avenue Interchange and to the south, but not north of the interchange.

Project Purpose

Reduce the number of bicycle crashes at the high-crash intersections by increasing the visibility of bicyclists and providing intersection improvements.

Potential Countermeasures

Option 1: Conduct a Roadway Safety Assessment

Conduct a bicycle-focused RSA at these interchange locations.

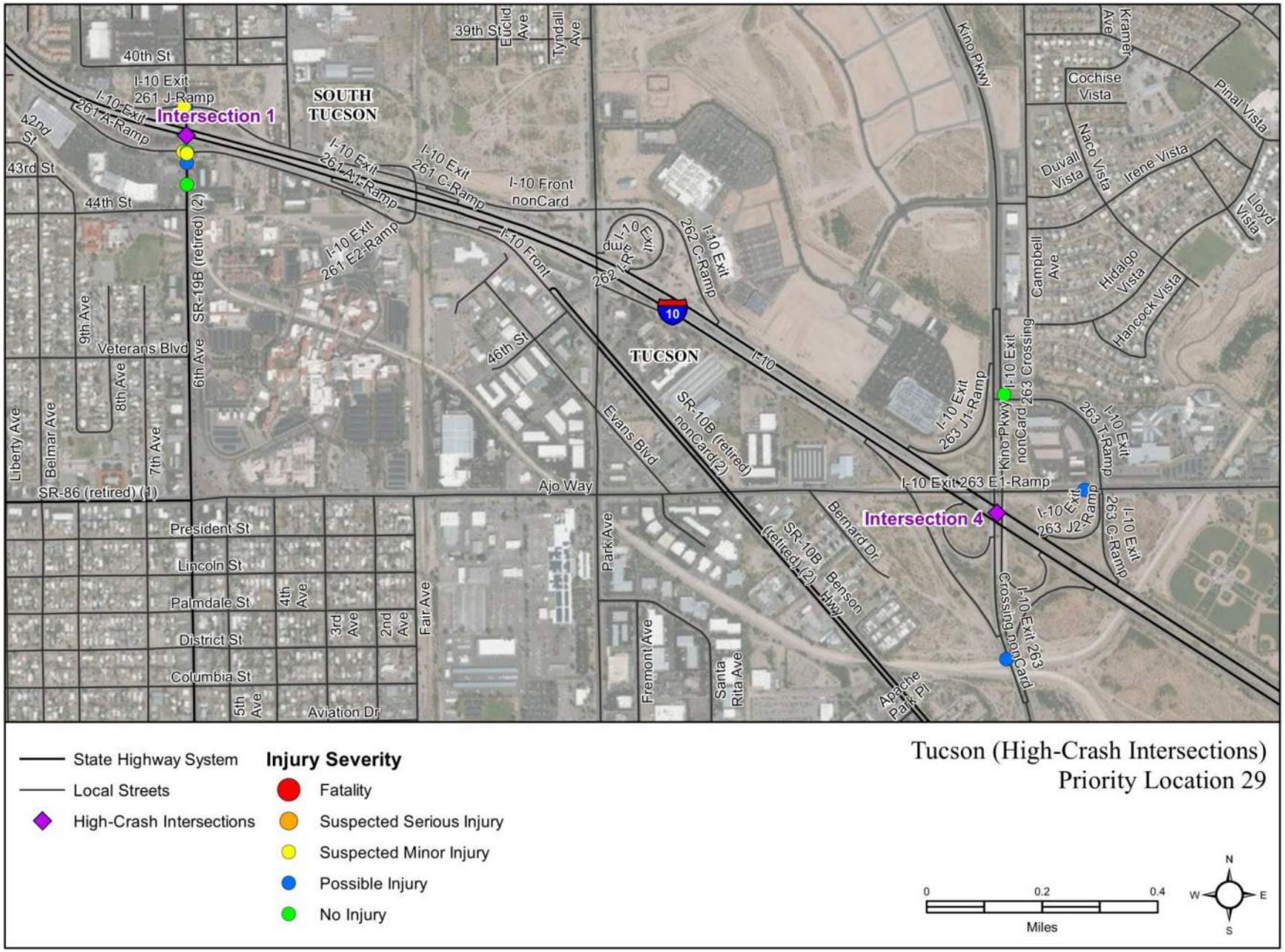
Option 2: Engineering Countermeasures

Assess Feasibility of Bike Lanes on Cross Streets

Currently, signed and striped bicycle routes are located north and south of the interchange. Assess feasibility of striped bicycle routes/lanes through the interchange cross street (Kino).

Identify and Construct Additional Bicycle Crossings

Creating additional locations to cross the freeway at collector road points would divert bicycle traffic away from interchanges by providing alternate routes. These could be crossings for pedestrians and bicyclists only, or include motor vehicle access as well.


Intersection 1
Intersection 4
SOUTH TUCSON
TUCSON
I-10 Exit 261 J-Ramp
I-10 Exit 261 A-Ramp
I-10 Exit 261 A1-Ramp
I-10 Exit 261 C-Ramp
I-10 Front nonCard
I-10 Exit 261 E2-Ramp
I-10 Front
I-10 Exit 262 I-Ramp
I-10 Exit 262 C-Ramp
I-10
I-10 Exit 263 J1-Ramp
I-10 Exit 263 Crossing nonCard
I-10 Exit 263 I-Ramp
I-10 Exit 263 E1-Ramp
I-10 Exit 263 J2-Ramp
I-10 Exit 263 C-Ramp
I-10 Exit 263 Crossing nonCard
SR-10B (retired) nonCard (2)
SR-10B (retired) (2)
SR-19B (retired) (2)
SR-86 (retired) (1)
Kino Pkwy
Campbell Ave
Kramer Ave
Cochise Vista
Pinal Vista
Naco Vista
Duvall Vista
Irene Vista
Lloyd Vista
Hidalgo Vista
Hancock Vista
39th St
40th St
42nd St
43rd St
44th St
46th St
Euclid Ave
Tyndall Ave
9th Ave
8th Ave
7th Ave
6th Ave
Liberty Ave
Belmar Ave
Veterans Blvd
Evans Blvd
Ajo Way
Bernard Dr
Benson Hwy
Park Ave
Fair Ave
Fremont Ave
Santa Rita Ave
Apache Park Pl
President St
Lincoln St
Palmdale St
District St
Columbia St
Aviation Dr
4th Ave
3rd Ave
2nd Ave
5th Ave
State Highway System
Local Streets
High-Crash Intersections
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Tucson (High-Crash Intersections)
Priority Location 29
0
0.2
0.4
Miles
N
W
E
S

Priority Location 30: SR 95 and SR 68, Mohave Valley, H-P Segments 1, 2, 3, and 4

General Project Information

Primary Route/Street: SR 95 and SR 68
City/Town Name: Fort Mohave
County: Mohave
District: Northwest
Begin Limit: MP 227.3 (SR 95, Courtwright Rd) & MP 0.0 (SR 68, Bullhead Pkwy North)
End Limit: MP 244.4 (SR 95, Hancock Rd) & MP 4.0 (SR 68)
Segment Length: 21.1 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private and Fort-Mojave Indian Reservation
Google Map: https://tinyurl.com/ybdoqhzm

Location Summary

The SR 95 and SR 68 segments are located in Mohave County south and north of Bullhead City. These segments have been identified as high-crash potential crash segments.
Programmed Projects: FY 2019 and 2020, SR 95, construct raised median and roundabouts, Teller Rd to Valencia Rd (F005601C, F01401 R and C)
Identified in 2012 BSAP: No
Segment Type (High-Crash/High-Crash Potential): High-Crash Potential
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway (TWLTL)/Four-lane divided
Bicycle Facility Presence: Wide curb lane/paved shoulder
AADT: 11,900-41,600 vehicles per day
Posted Speed Limit: 45, 55 mph
Lighting: At signalized intersections and some developed areas
Number of Bicycle Crashes: 3

Project Need

These high-crash potential segments are adjacent to Priority Location 1 and have similar characteristics to High-Crash Segment 78 with crashes occurring mostly due to motorists failing to yield. The high-crash potential segments include both rural and urban type development.

Project Purpose

Reduce potential for bicycle crashes in the high-crash potential segments by creating a more accommodating environment for bicyclists, providing safer bicycle facilities, and increasing motorists and bicyclist education.

Potential Countermeasures

Option 1: Conduct RSA

An RSA was completed for MP 242 to MP 250, October 20-22, 2008. Recommendations should be reviewed and updated with an emphasis on bicyclist safety. Bicycle counts along this corridor would also be helpful.

Option 2: Engineering Countermeasures

Striped Paved Shoulder

Assess feasibility of striped paved shoulder on SR 95. A 4' striped shoulder (as measured from gutter seam to the center of the white stripe) should be installed on SR 95 in both directions. Striped shoulder may require one or more travel lanes to be reduced to 11'.

Roadway Signing Improvements

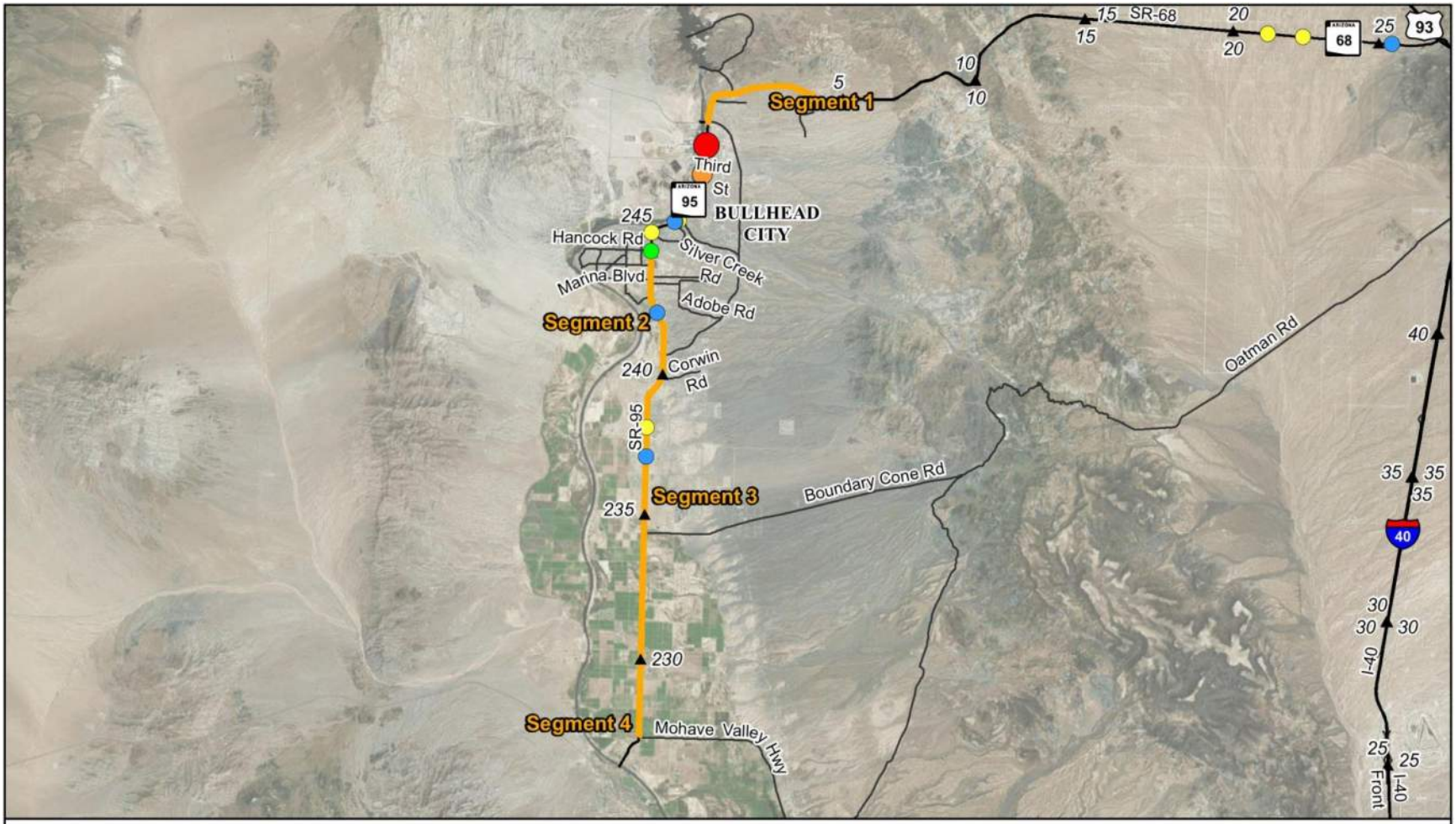
Consider installing R4-11 BMUFL sign with R4-11aP Change Lanes to Pass plaque.

Option 3: Collaborate with Ongoing Access Management Study

Collaborate with ADOT and Bullhead City to implement future recommendations from the current SR 95 – Aviation Way to Teller Lane Access Management Plan.

Option 4: Bicyclist and Motorist Education Campaign

Partner with WACOG and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.


Segment 1
Segment 2
Segment 3
Segment 4
Third St
BULLHEAD CITY
Hancock Rd
Silver Creek Rd
Marina Blvd
Adobe Rd
Corwin Rd
SR-95
Boundary Cone Rd
Oatman Rd
Mohave Valley Hwy
SR-68
I-40
Front
245
240
235
230
5
10
15
20
25
30
35
40
93
68
95
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Mohave Valley Area
Priority Location 30
0 1 2 4 6 8
Miles
N
W
E
S

Priority Location 31: US 93, Kingman, H-P Segment 6

General Project Information

Primary Route/Street: US 93
City/Town Name: Kingman
County: Mohave
District: Northwest
Begin Limit: MP 70
End Limit: MP 71
Segment Length: 1.0 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/y8dsngxb

Location Summary

The US 93 segment is located in Kingman and has been identified as a high-crash potential location.
Programmed Projects: FY 2019 & 2020 Modernization project; US93/I-40 West Kingman TI (PN: H799301D/R)
Identified in 2012 BSAP: No
Segment Type (High-Crash/High-Crash Potential): High-Crash Potential
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Five-lane highway (TWLTL)
Bicycle Facility Presence: None
AADT: 25,000 vehicles per day
Posted Speed Limit: 35 mph
Lighting: Yes (MP 70.0-70.3 No)
Number of Bicycle Crashes: 0

Project Need

This location routinely experiences heavy traffic and delay due to the interchange at US 93/I-40. The area includes many driveways and has potential bicycle safety issues. Bicycles are not accommodated on the roadway with the current cross section (5 lanes, 60' wide seam of curb to seam of curb, according to record drawings).

Note that there was a recent crash within this segment: "Austrian bicyclist dies from Beale Street crash" https://kdminer.com/news/2018/apr/10/austrian-bicyclist-dies-beale-street-crash/

Project Purpose

Ensure bicycle and pedestrian improvements are incorporated from the current programmed project.

Potential Countermeasures

Option 1: Collaborate with Programmed Project

Collaborate with design team for US 93/I-40 Interchange reconstruction to ensure bicycle improvements to US 93 are incorporated. Upon interchange reconstruction, traffic volumes on this segment of US 93 will decrease significantly, improving conditions for bicyclists. Roadway segment should be modified to accommodate multimodal travel. Lane width decreases, striped paved shoulders, and other bicycle improvements should be considered.


93
70
Fort Beale Dr
Betty Ln
Clare Ave
KINGMAN
Evelyn Dr
Metwell Dr
Segment 6
Alma Ave
I-40
40
Elm St
Metcalf Rd
Grandview Ave
Gold St
Lampton Ave
I-40 Exit 48 C-Ramp
I-40 Exit 48 C-Ramp
Spring St
49
Oak St
US-93
Beale St
71
52
SR-40B (retired) (0)
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Kingman (US 93)
Priority Location 31
0
0.125
0.25
Miles
N
W
E
S

Priority Location 32: US 60, Gold Canyon, H-P Segment 18

General Project Information

Primary Route/Street: US 60
City/Town Name: Gold Canyon (unincorporated Pinal County)
County: Pinal
District: Central
Begin Limit: MP 199 (near Goldfield Rd)
End Limit: MP 203 (Southeast of Kings Ranch Road)
Segment Length: 4.0 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Public and Private
Google Map: https://tinyurl.com/yarmwc6m

Location Summary

This US 60 segment is in Gold Canyon and part of the U.S. Bicycle Route 90. The segment has been identified as a high-crash potential crash segment.
Programmed Projects: None
Identified in 2012 BSAP: No
Segment Type (High-Crash/High-Crash Potential): High-Crash Potential
Area Type (Urban-Suburban/Rural): Rural
Facility Type: Four-lane divided (earth median)
Bicycle Facility Presence: Paved shoulder
AADT: 32,000 vehicles per day
Posted Speed Limit: 55 mph
Lighting: No
Number of Bicycle Crashes: 0

Project Need

This segment is relatively rural and connects the Gold Canyon residential development with Apache Junction. The segment is a divided highway with limited access points. There is a 6' right shoulder EB and a 10' shoulder WB along both sides of the roadway.

Project Purpose

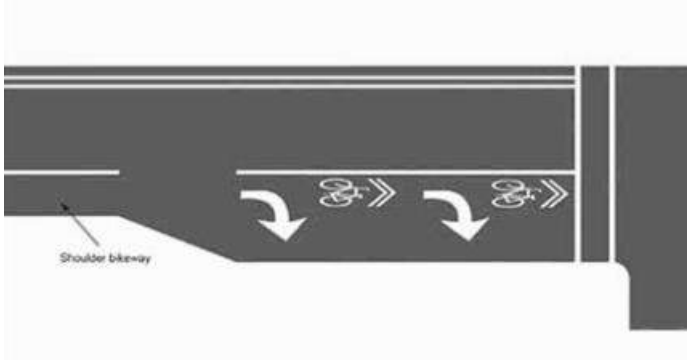
Reduce potential for bicycle crashes by providing safer facilities for travel on US 60, which is part of USBR 90.

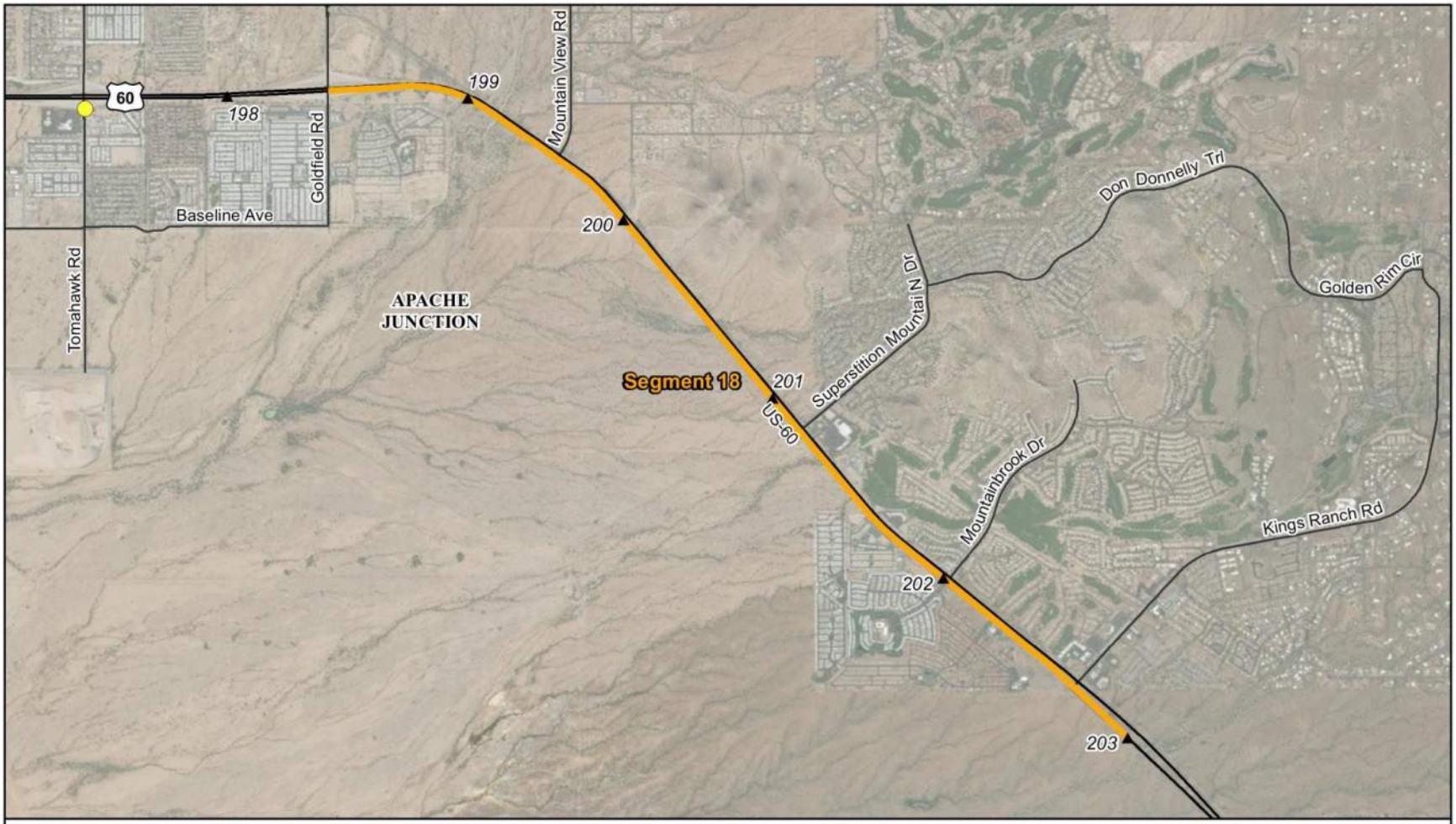
Potential Countermeasures

Option 1: Engineering Countermeasures

Assess Feasibility of Bicycle Buffer at Intersections

Current shoulder widths along the segment appear adequate. However, at intersections, a bicycle buffer should be installed between the through lane and the right turn lane (if sufficient space); an alternative is a Shared Lane Marking in the right turn lane, as illustrated below (Source: ITE Traffic Control Devices Handbook, 2nd Edition).




60
198
199
200
201
202
203
Mountain View Rd
Goldfield Rd
Baseline Ave
Tomahawk Rd
APACHE JUNCTION
Segment 18
US-60
Superstition Mountai N Dr
Don Donnelly Trl
Golden Rim Cir
Mountainbrook Dr
Kings Ranch Rd
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Apache Junction Area
Priority Location 32
0
0.25
0.5
1
Miles
N
W
E
S

Priority Location 33: SR 80, Bisbee, H-P Segment 26

General Project Information

Primary Route/Street: SR 80
City/Town Name: Bisbee
County: Cochise
District: Southeast
Begin Limit: MP 340
End Limit: MP 342
Segment Length: 2.0 miles
Right-of-Way Ownership: ADOT
Adjacent Land Ownership: Private
Google Map: https://tinyurl.com/yabpltle

Location Summary

The SR 80 high-crash potential segment is located in Bisbee and has been identified as a high-crash potential crash segment. The segment has one nearby minor injury bicycle-related crash.
Programmed Projects: None
Identified in 2012 BSAP: No
Segment Type (High-Crash/High-Crash Potential): High-Crash Potential
Area Type (Urban-Suburban/Rural): Urban-Suburban
Facility Type: Two-lane, three-lane, and four-lane undivided highway
Bicycle Facility Presence: Paved shoulder/wide curb lane
AADT: 3,100 vehicles per day
Posted Speed Limit: 45 mph
Lighting: No
Number of Bicycle Crashes: 0

Project Need

This location has potential bicycle safety issues with a lack of continuous bicycle facilities along the highway. This portion of SR 80 is along U.S. Bicycle Route 90.

Project Purpose

Evaluate and identify any potential deficiencies of the facility as this high-crash potential segment relates to similar corridors on the SHS.

Potential Countermeasures

Option 1: Engineering Countermeasures

Assess Existing Paved Shoulders to Improve to 4' Minimum Effective Shoulder Width

Assess feasibility of improving shoulders to minimum effective width of 4'. Effective shoulder width is the amount of shoulder width available for use by the bicyclist excluding the rumble strip and gutter pan seam. MP 340 to approximately MP 340.5 has adequate shoulders; however, entire segment should be evaluated.

Striped Paved Shoulder in Urban/Curbed Sections

Curbed/urban section extends from Old Bisbee exit ramp/interchange south towards SR 80/SR 92 roundabout. Consider striping the existing outside lane within the curbed section to a 5' paved shoulder. The existing outside wide curb lanes are generally 17'.

Option 2: Bicyclist and Motorist Education Campaign

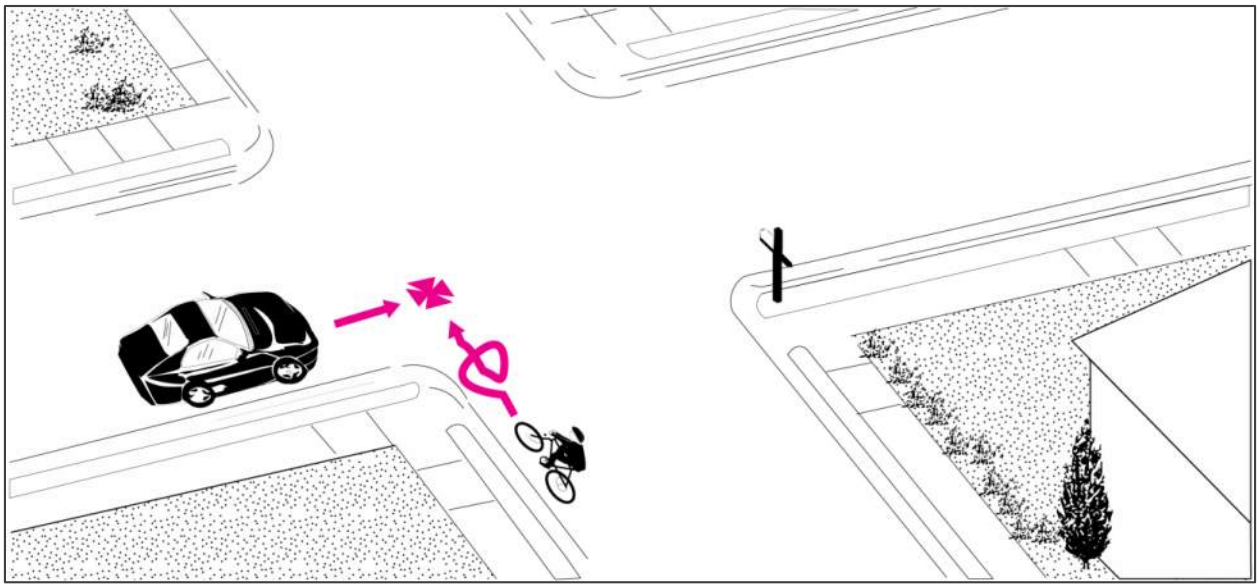
Partner with SEAGO and local agencies to provide education, outreach, and training to increase bicyclist and motorist awareness and improved behaviors. Increasing level of traffic bicycling skills can help to make bicyclists more comfortable when riding in traffic, improve relations between bicyclists and motorists, and facilitate the smooth and orderly flow of traffic.


Sims Rd
Locklin Ave
Star Ave
Warren St
Moon Cyn
340
Highway 80
Summit Ave
Gantner Rd
Adams Ave
Warren Hl
Mayor St
Laundry Hill St
Art Ave
Brophy Ave
Garden Ave
Tombstone Cyn
Oak Ave
Roberts Ave
Higgins Ave
BISBEE
Quality Hill Walk
Quality Hill Rd
High Rd
Clawson Ave
Maxfield Ave
Main St
Subway St
Shearer Ave
Howell Ave
Opera Dr
Taylor Ave
Ok St
Naco Rd
Dart Rd
Zacatlacas Cyn
Brewery Ave
Youngblood Ave
SR-80
341
Segment 26
342
SR-80 Exit 342 R-Ramp
ARIZONA 80
Milepost
State Highway System
Local Streets
High-Crash Potential Location
High-Crash Segment
High-Crash Intersection
Injury Severity
Fatality
Suspected Serious Injury
Suspected Minor Injury
Possible Injury
No Injury
Bisbee
Priority Location 33
0
0.2
0.4
Miles
N
W
E
S

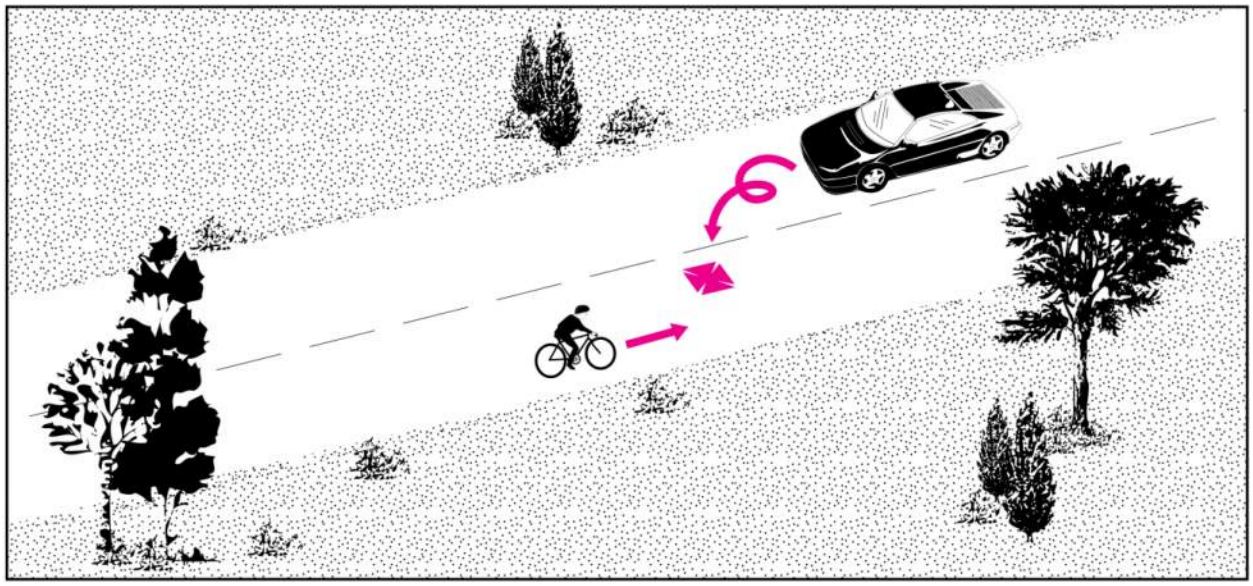
APPENDIX B – BICYCLE CRASH TYPES

110 – Loss of Control / Turning Error

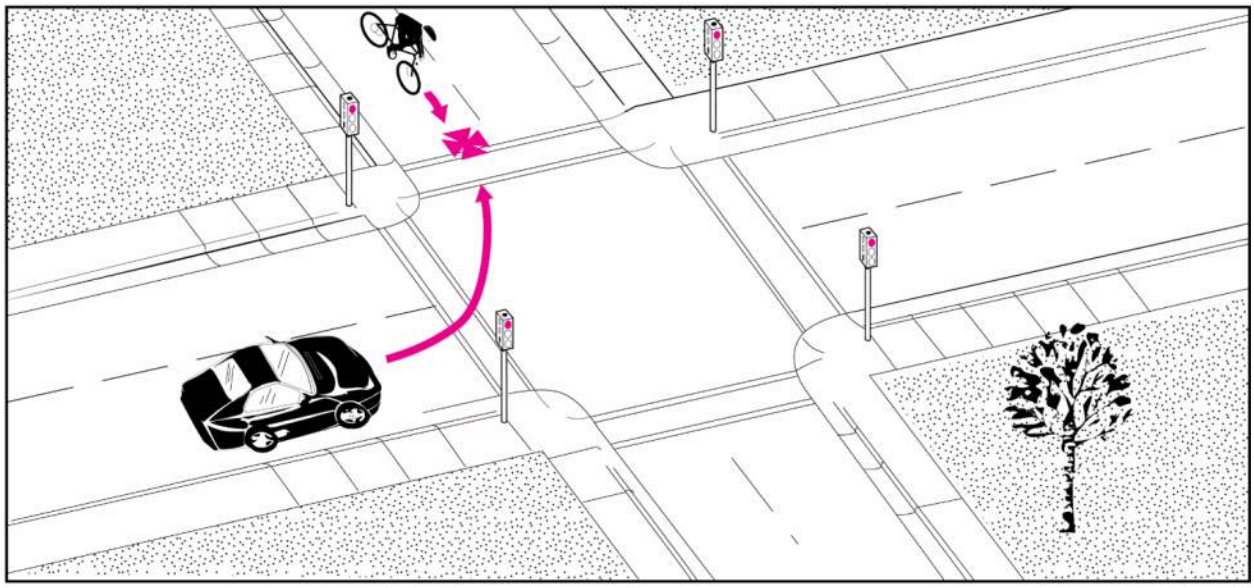
120 – Bicyclist Lost Control



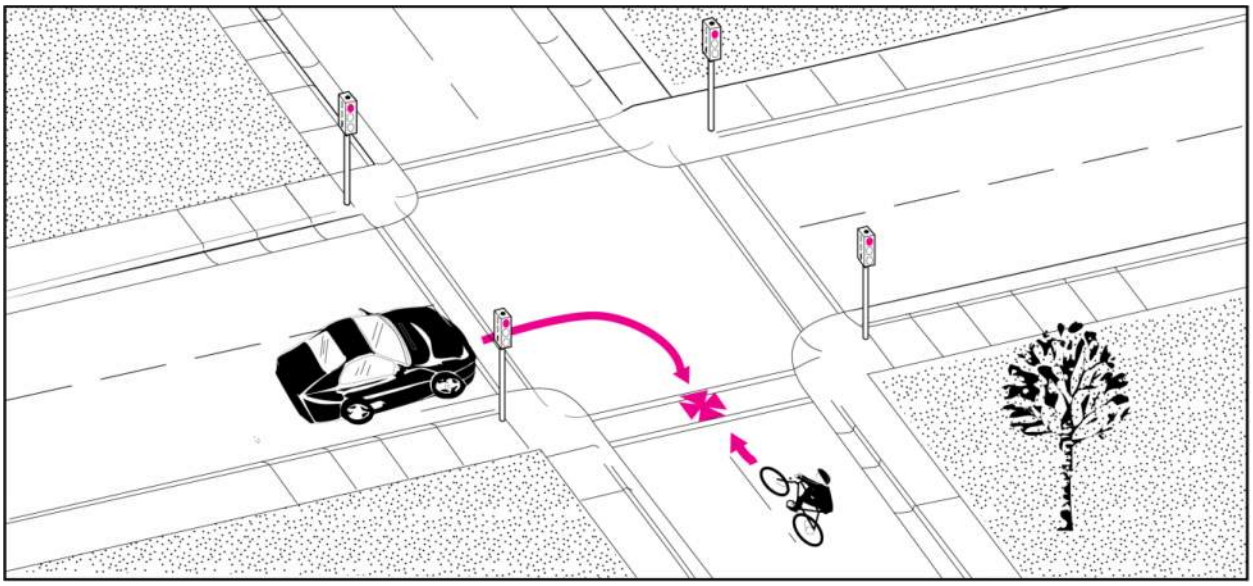
130 – Motorist Lost Control



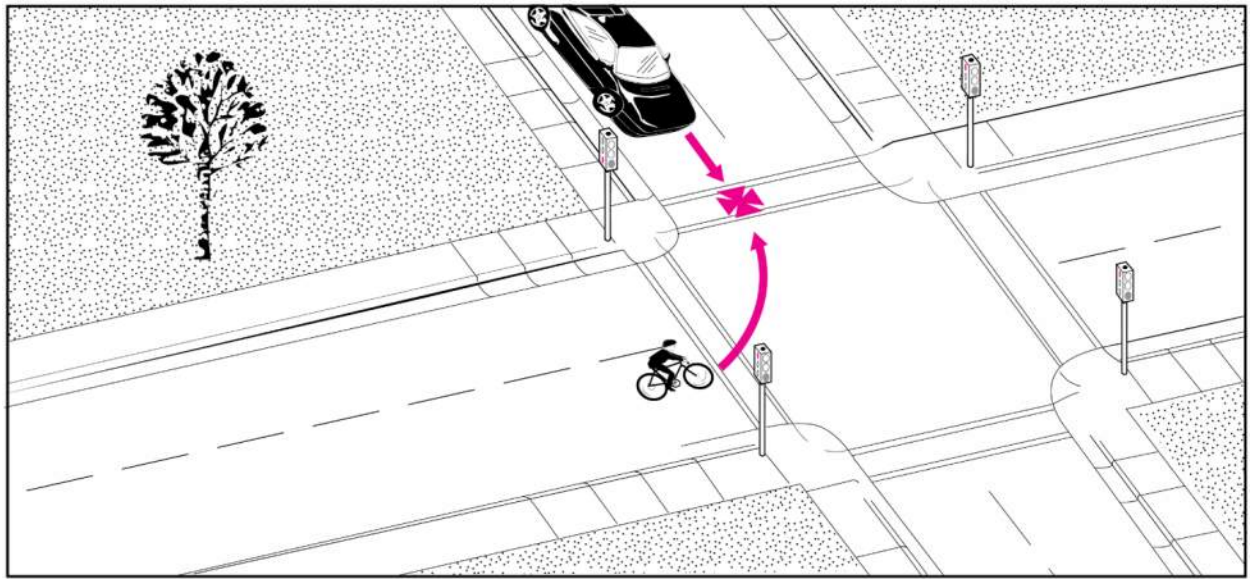
111 – Motorist Turning Error – Left Turn



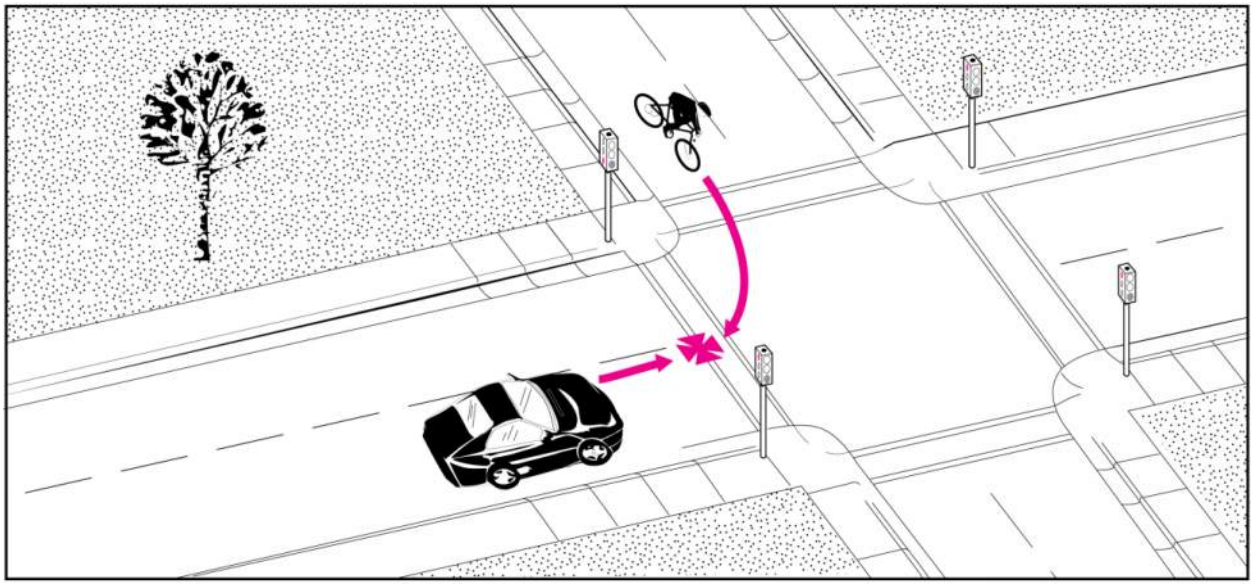
112 – Motorist Turning Error – Right Turn



114 – Bicyclist Turning Error – Left Turn

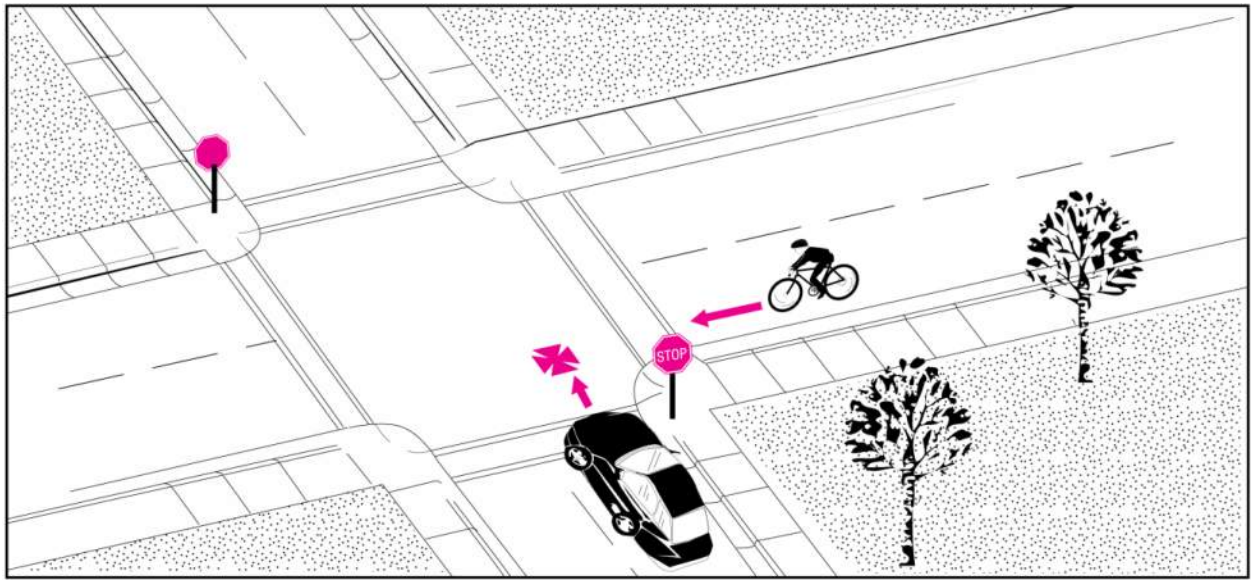


115 – Bicyclist Turning Error – Right Turn

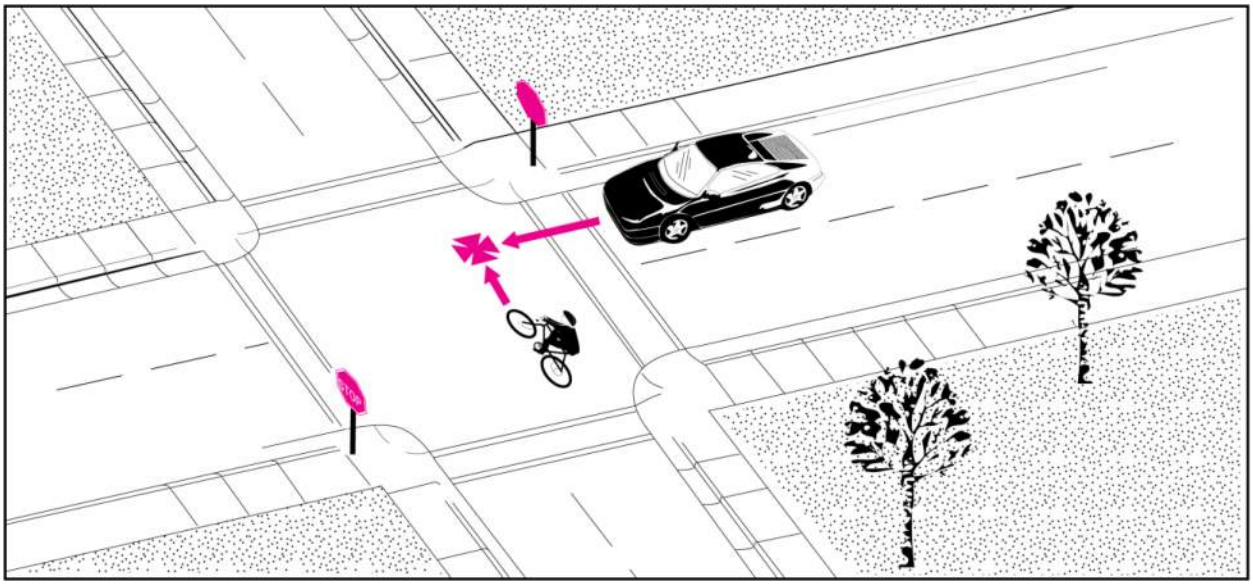


140 – Motorist Failed to Yield – Sign-Controlled Intersection

141 – Motorist Drive Out – Sign-Controlled Intersection

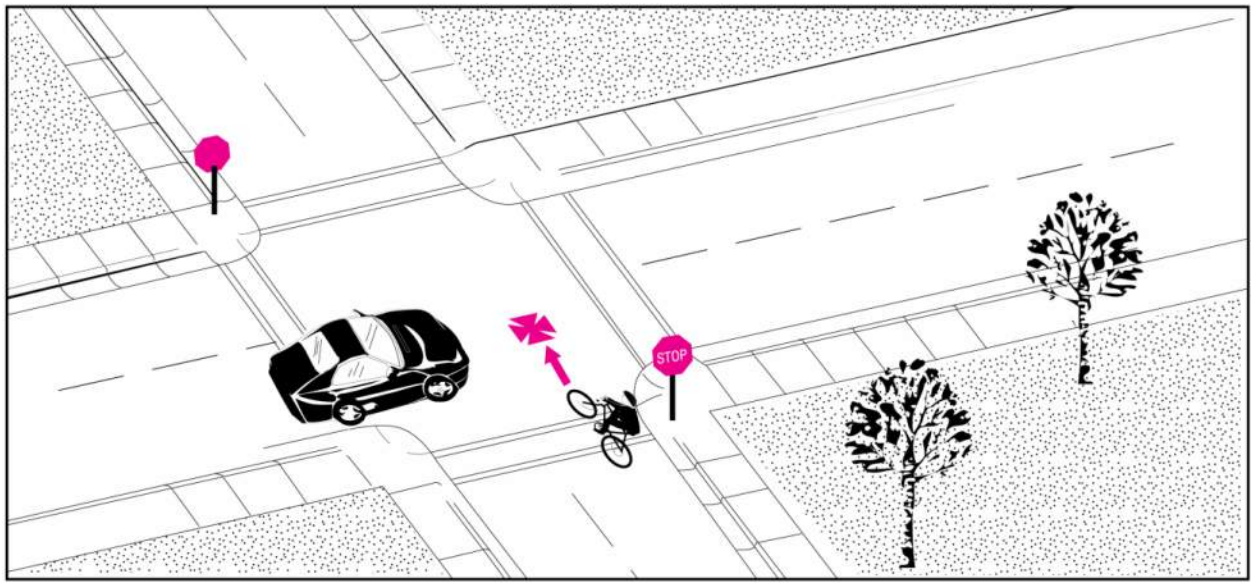


143 – Motorist Drive Through – Sign-Controlled Intersection

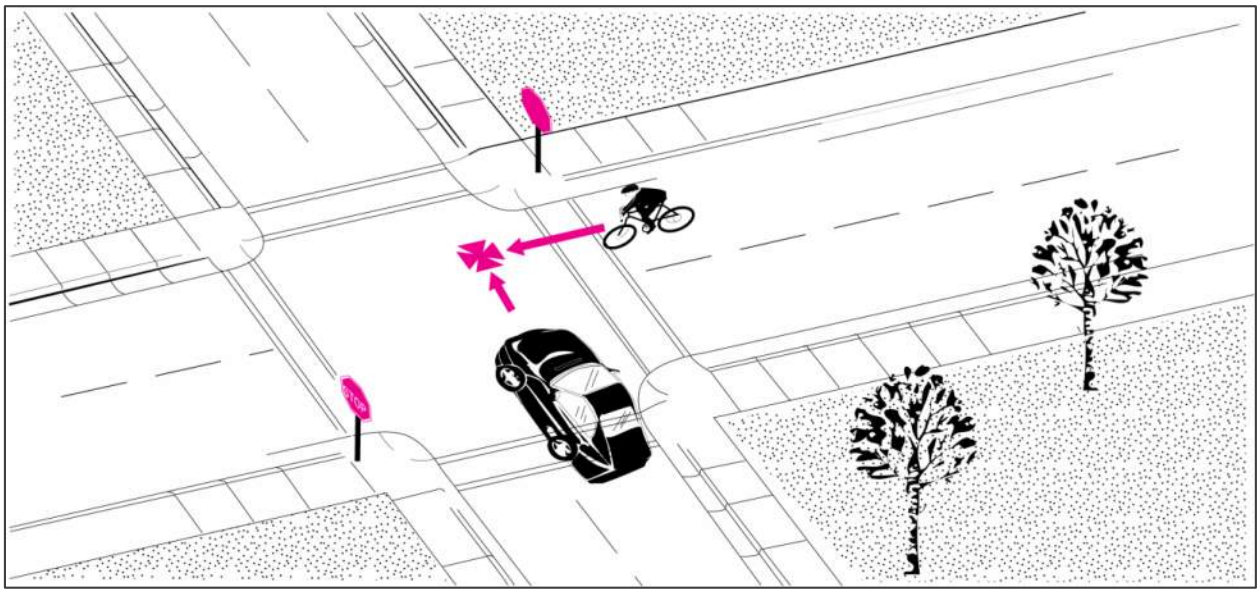


145 – Bicyclist Failed to Yield – Sign-Controlled Intersection

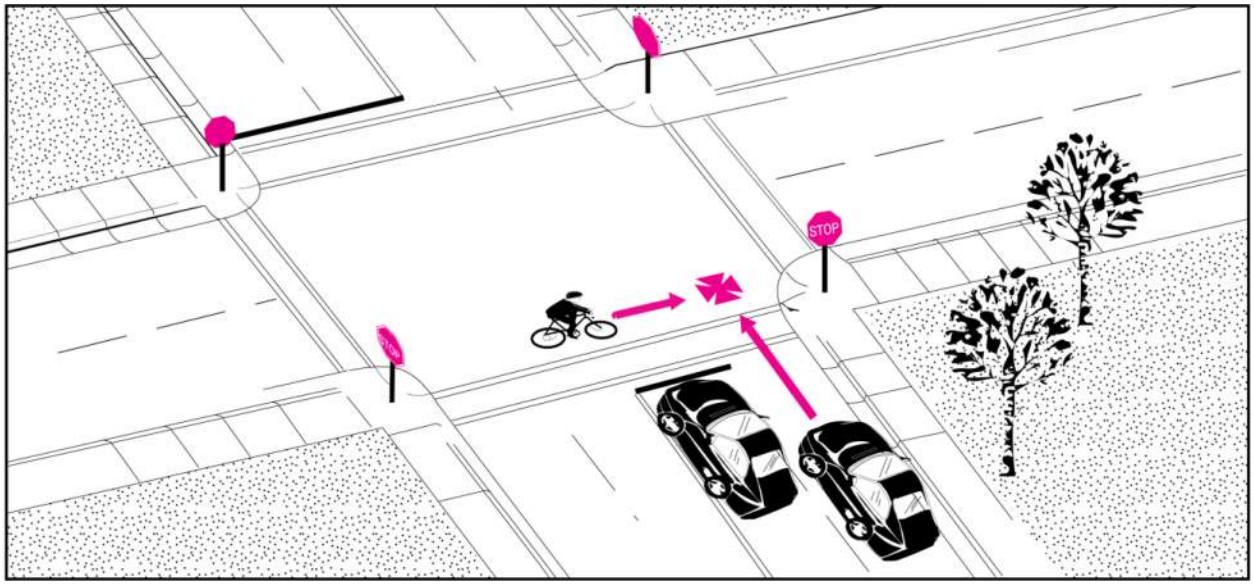
142 – Bicyclist Ride Out – Sign-Controlled Intersection



144 - Bicyclist Ride Through—Sign-Controlled Intersection

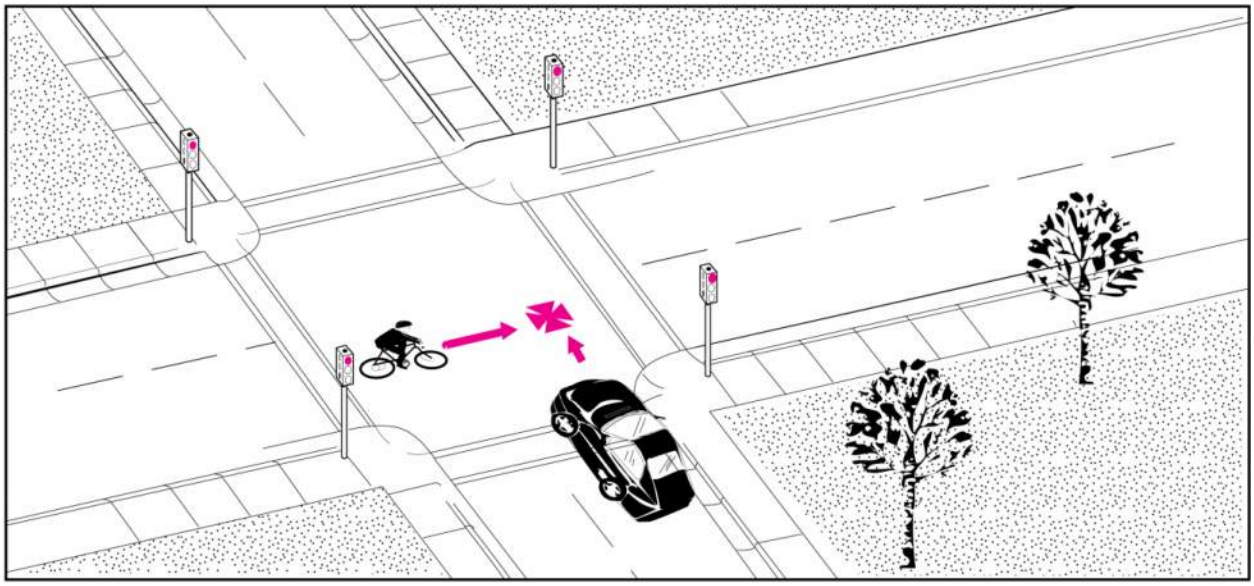


147 – Multiple Threat – Sign-Controlled Intersection

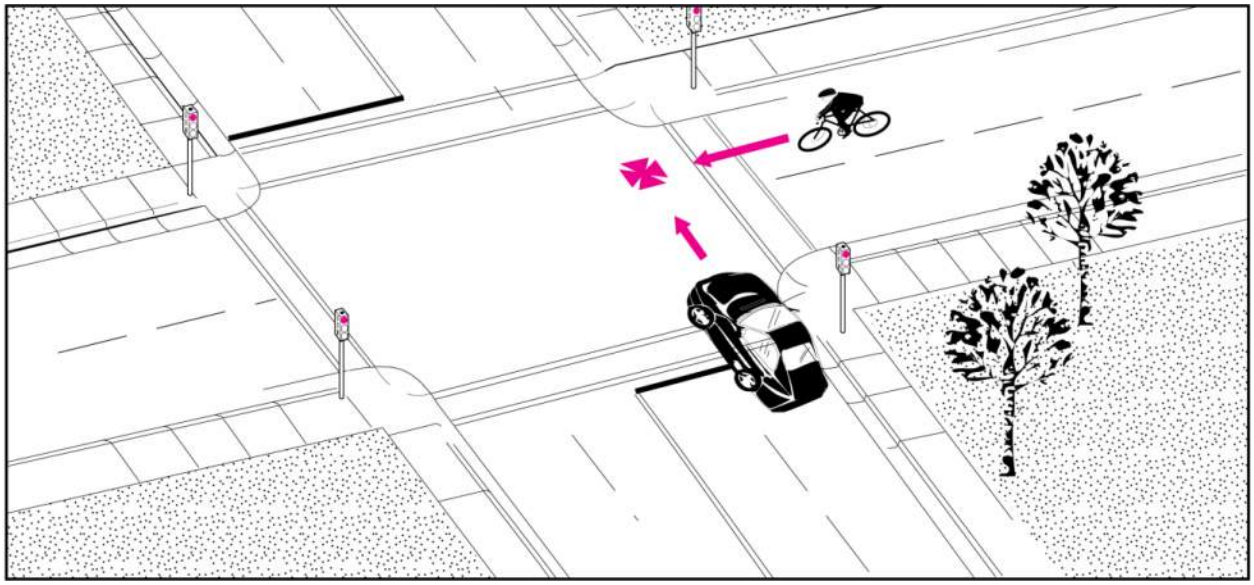


150 – Motorist Failed to Yield – Signalized Intersection

152 – Motorist Drive Out – Signalized Intersection

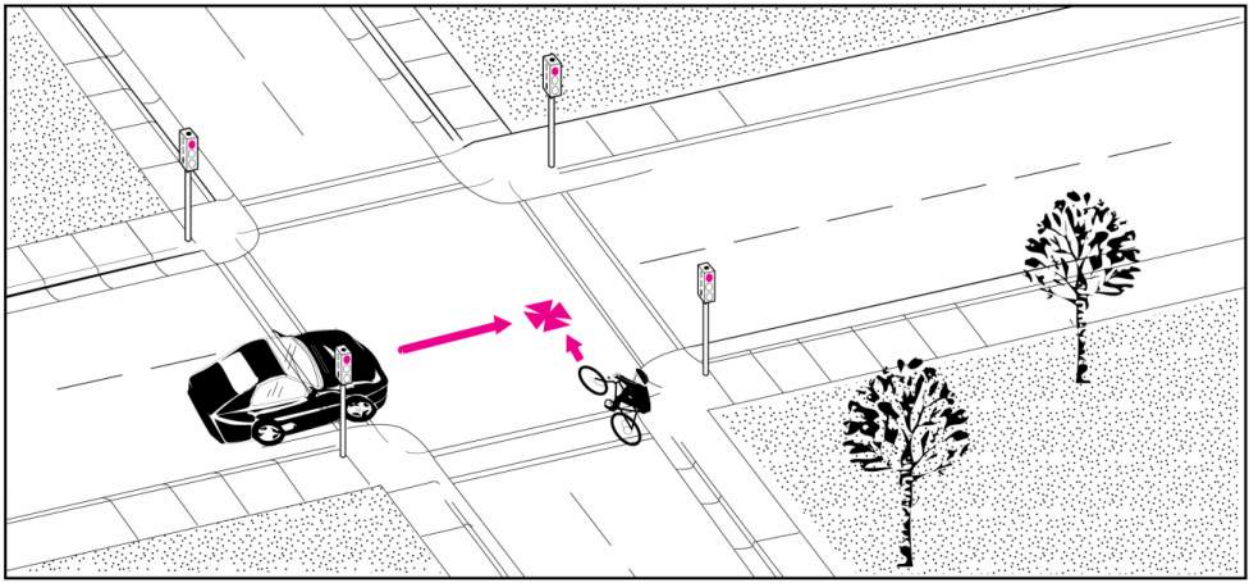


154 – Motorist Drive Through – Signalized Intersection

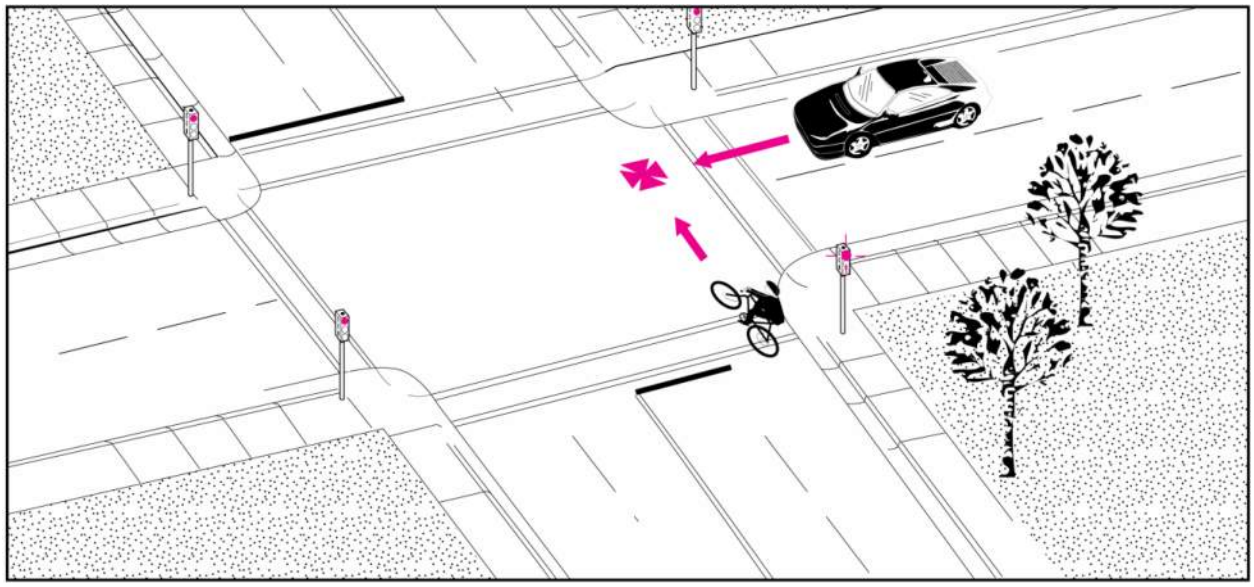


158 – Bicyclist Failed to Yield – Signalized Intersection

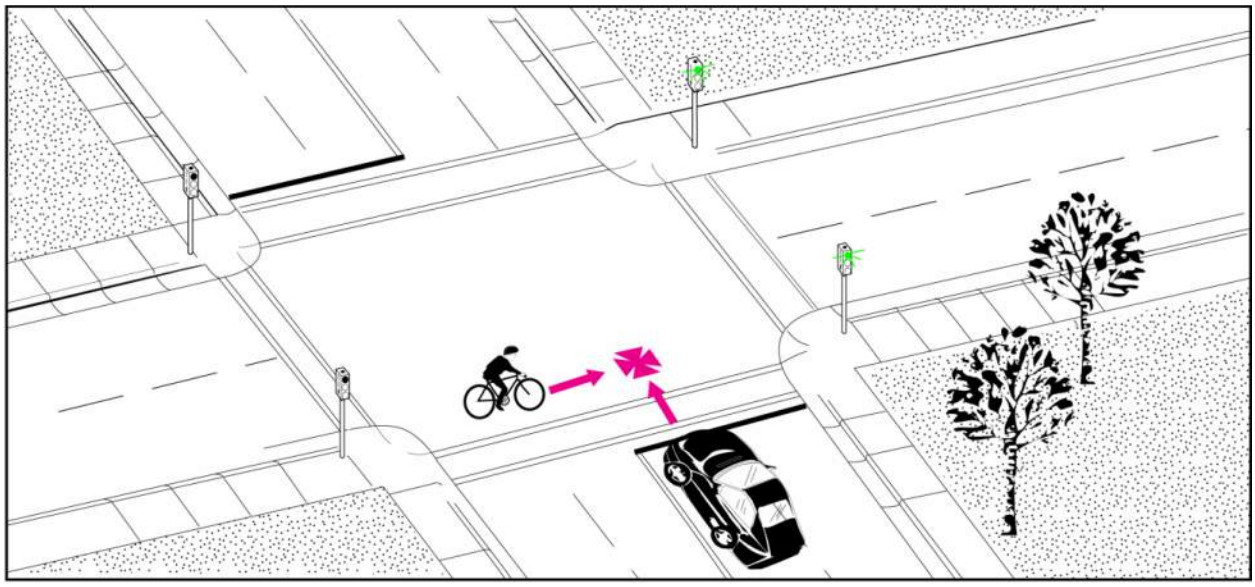
153 – Bicyclist Ride Out – Signalized Intersection



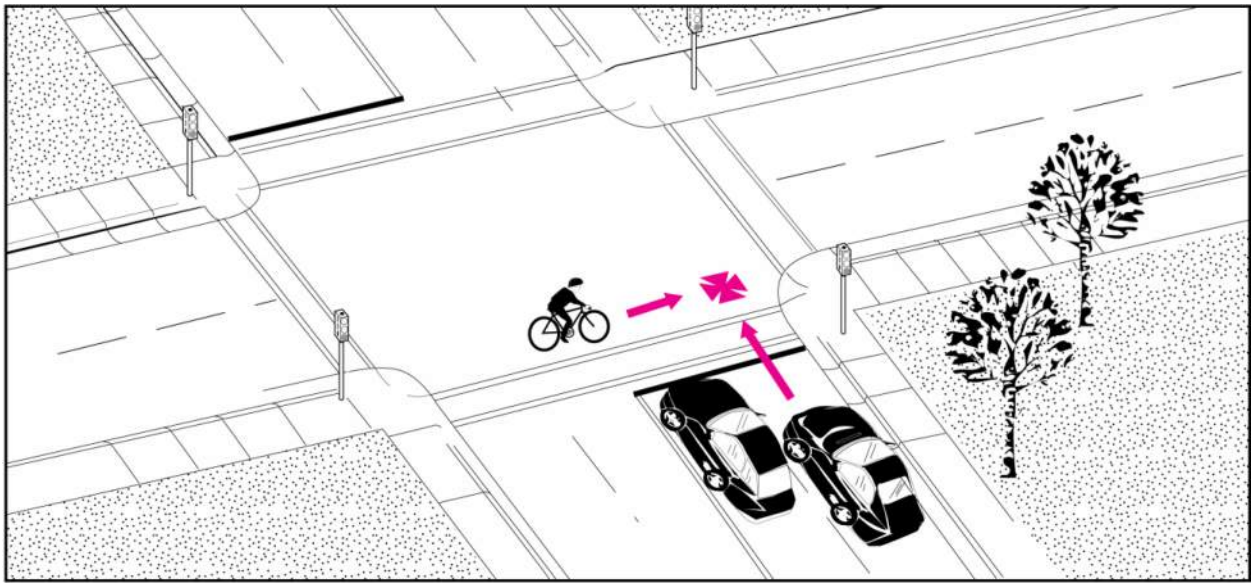
155 – Bicyclist Ride Through – Signalized Intersection



156 – Bicyclist Failed to Clear – Trapped

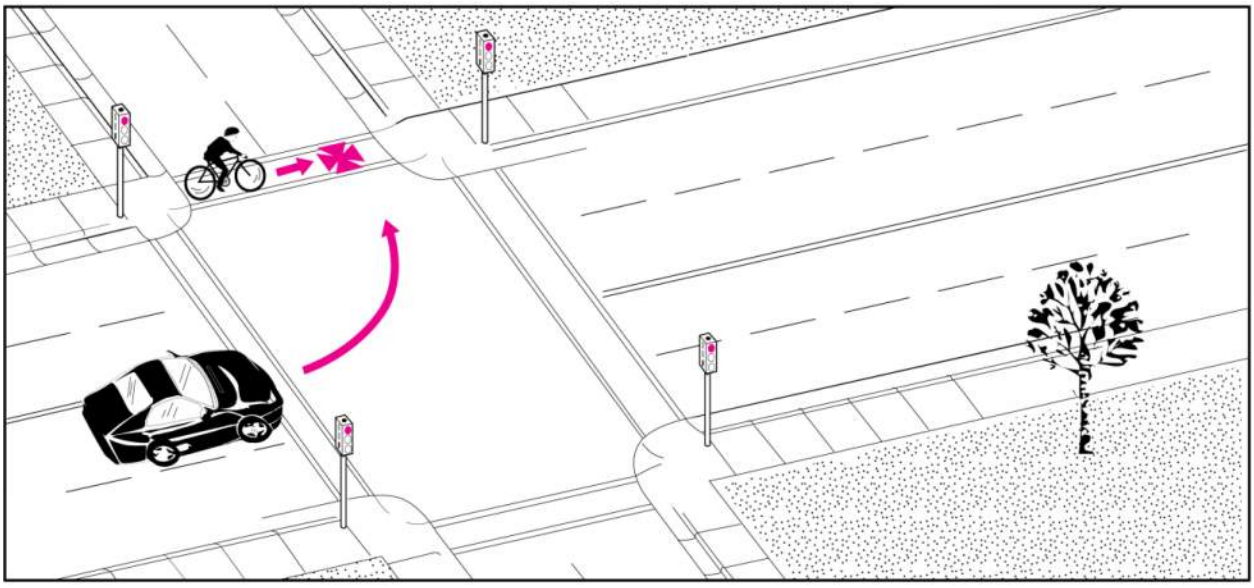


157 – Bicyclist Failed to Clear – Multiple Threat

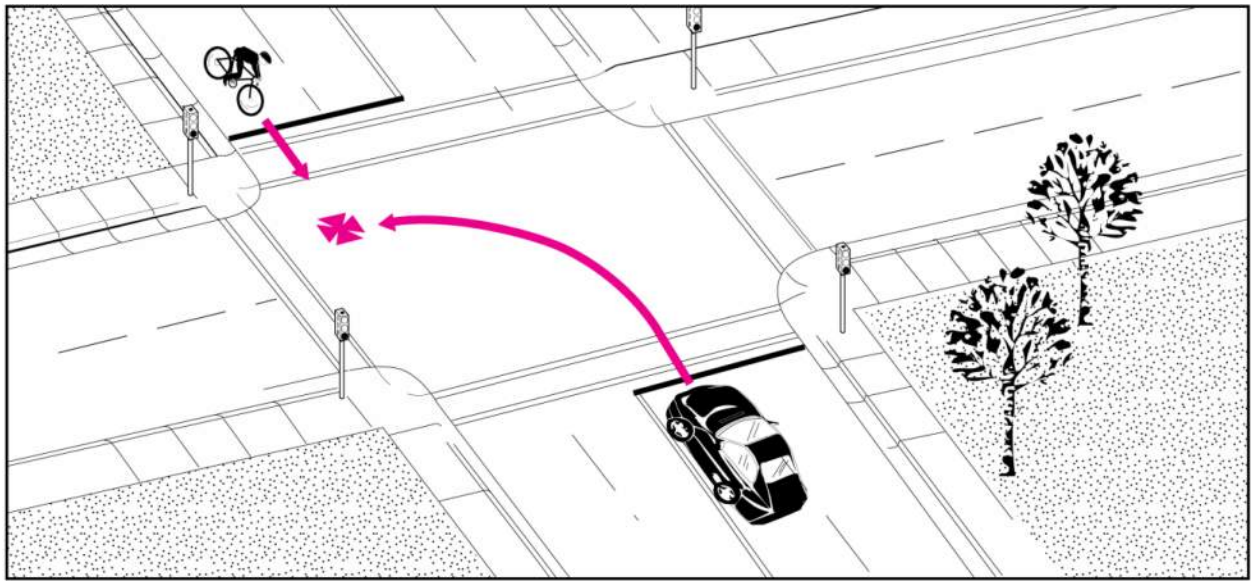


210 – Motorist Left Turn / Merge

211 – Motorist Left Turn – Same Direction

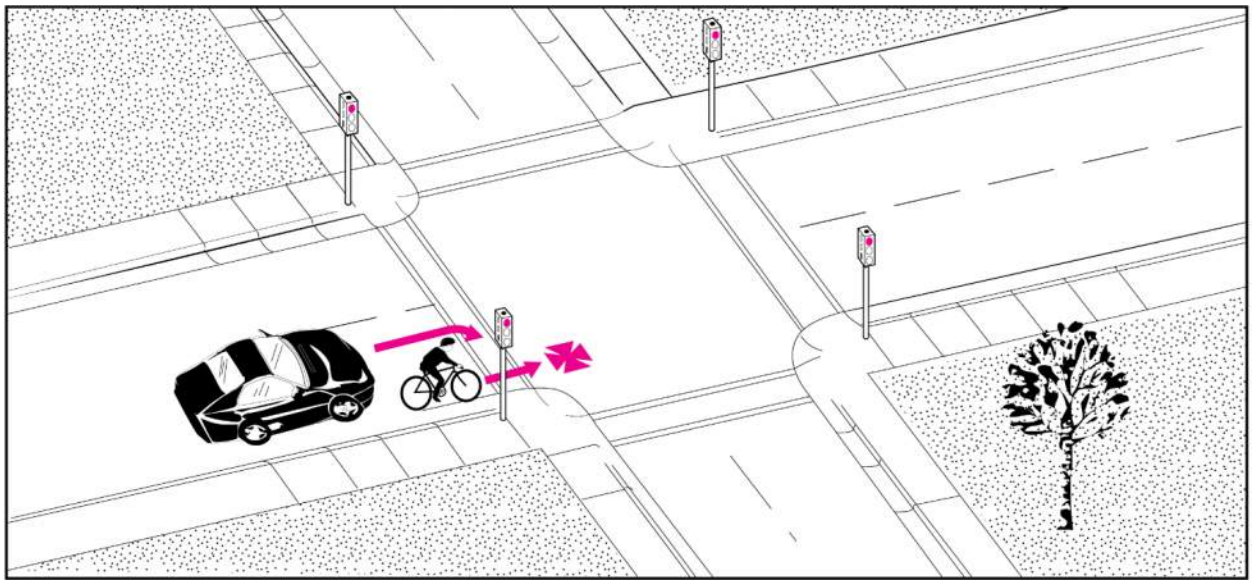


212 – Motorist Left Turn – Opposite Direction

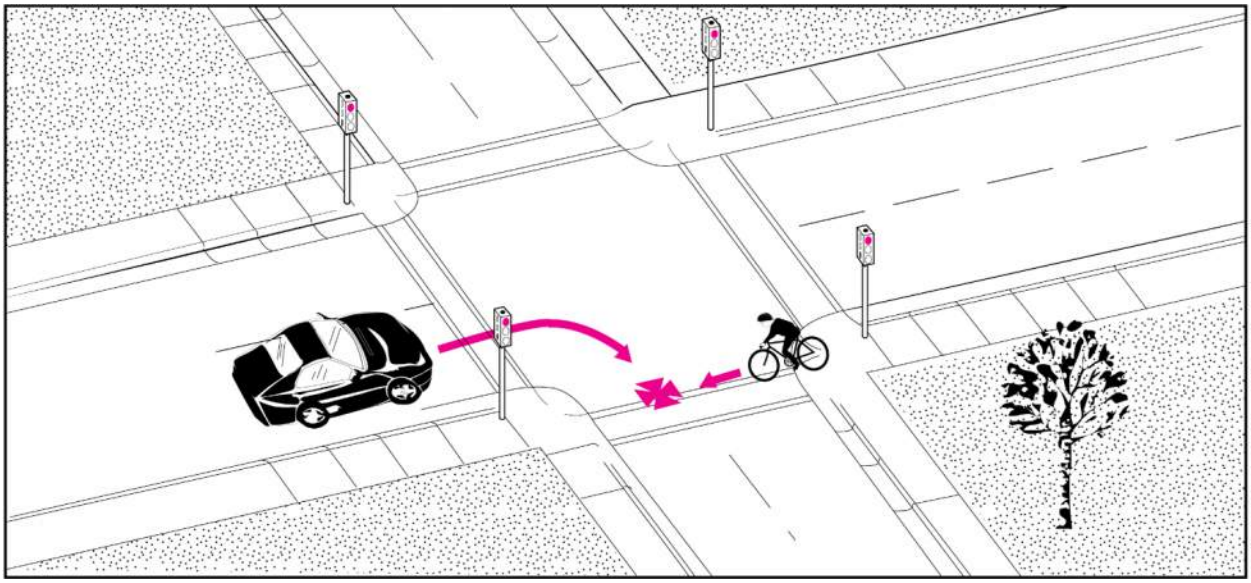


215 – Motorist Right Turn / Merge

213 – Motorist Right Turn – Same Direction

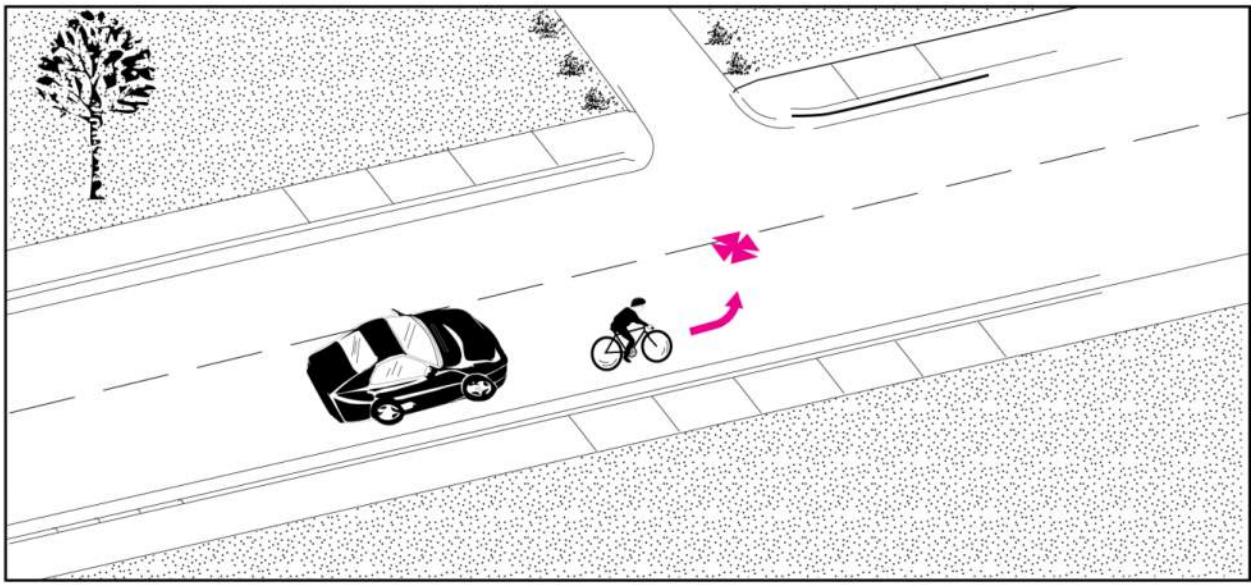


214 – Motorist Right Turn – Opposite Direction

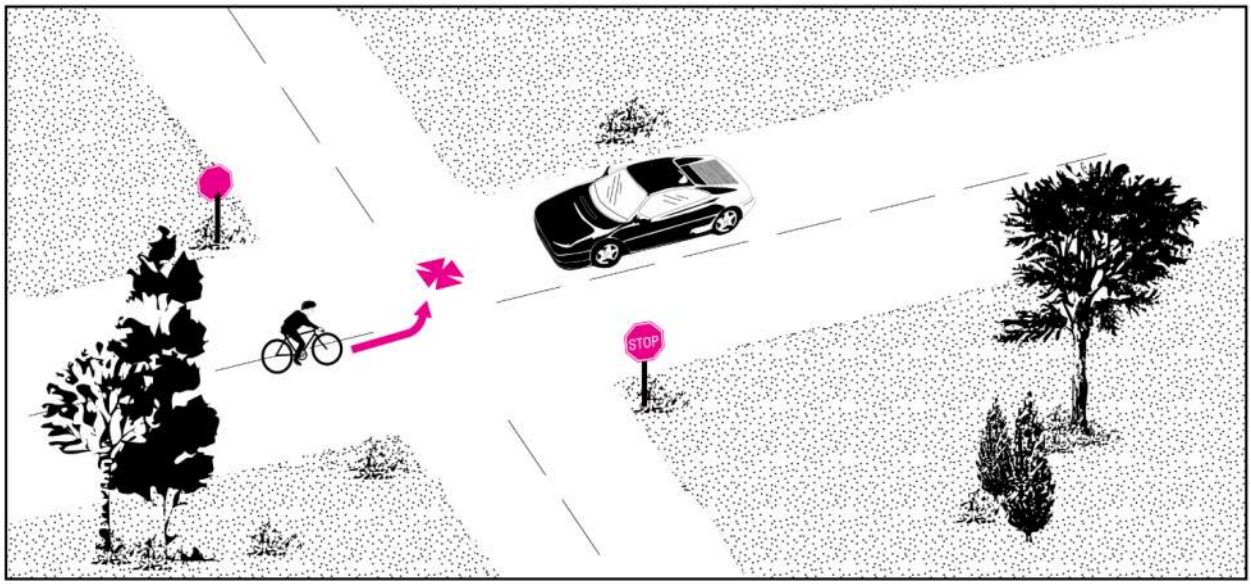


220 – Bicyclist Left Turn / Merge

221 – Bicyclist Left Turn – Same Direction

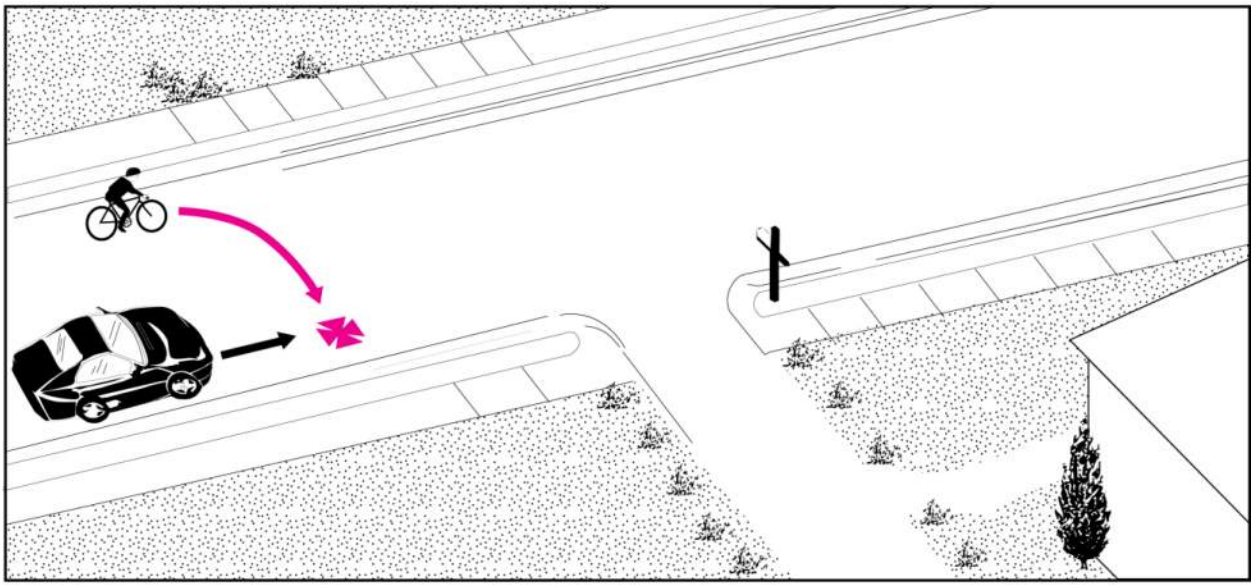


222 – Bicyclist Left Turn – Opposite Direction

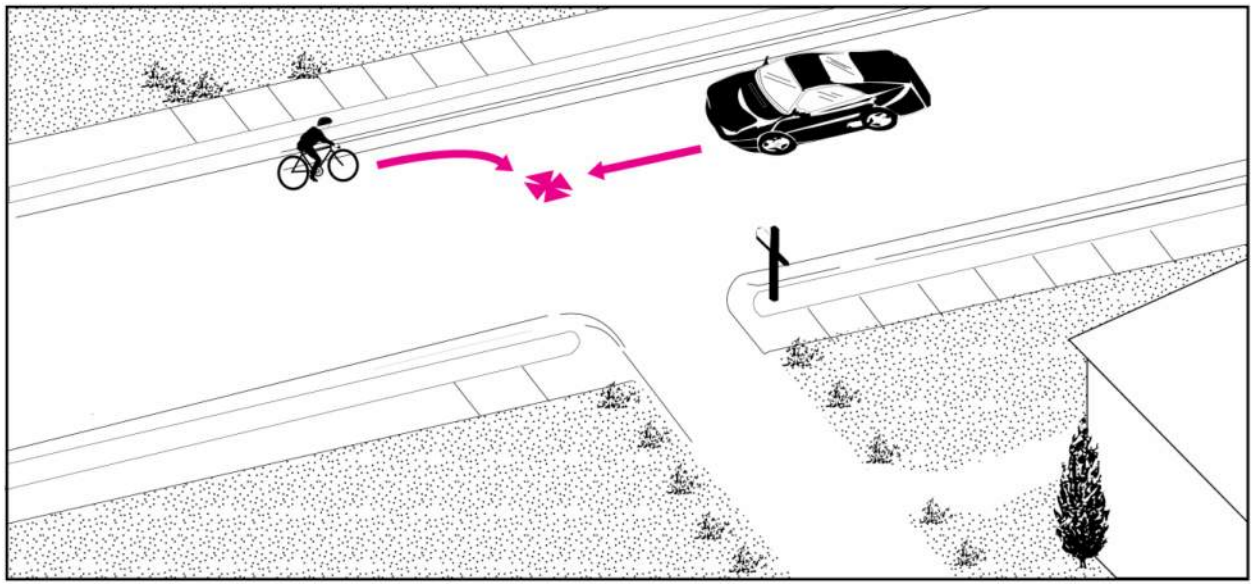


225 – Bicyclist Right Turn / Merge

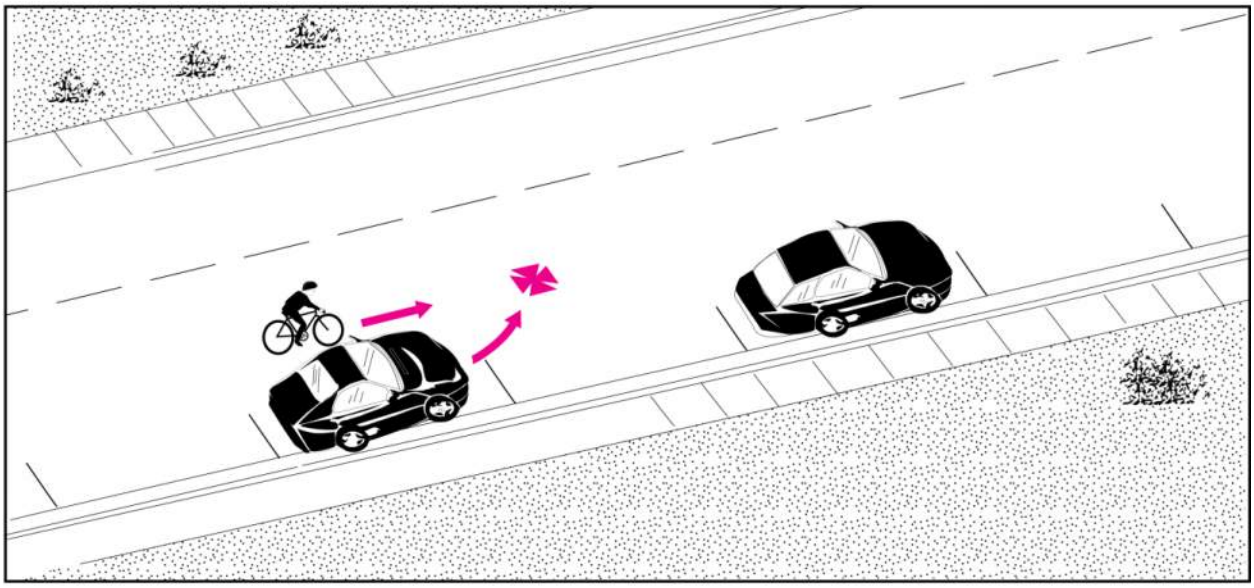
223 – Bicyclist Right Turn – Same Direction



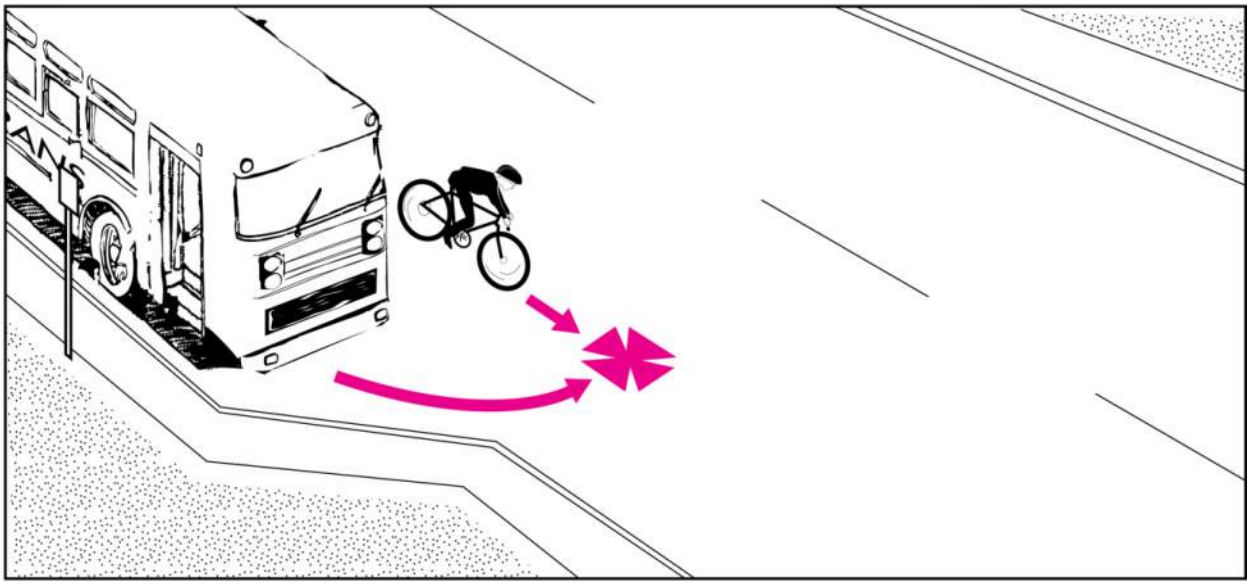
224 – Bicyclist Right Turn – Opposite Direction



215 – Motorist Drive-In / Out Parking

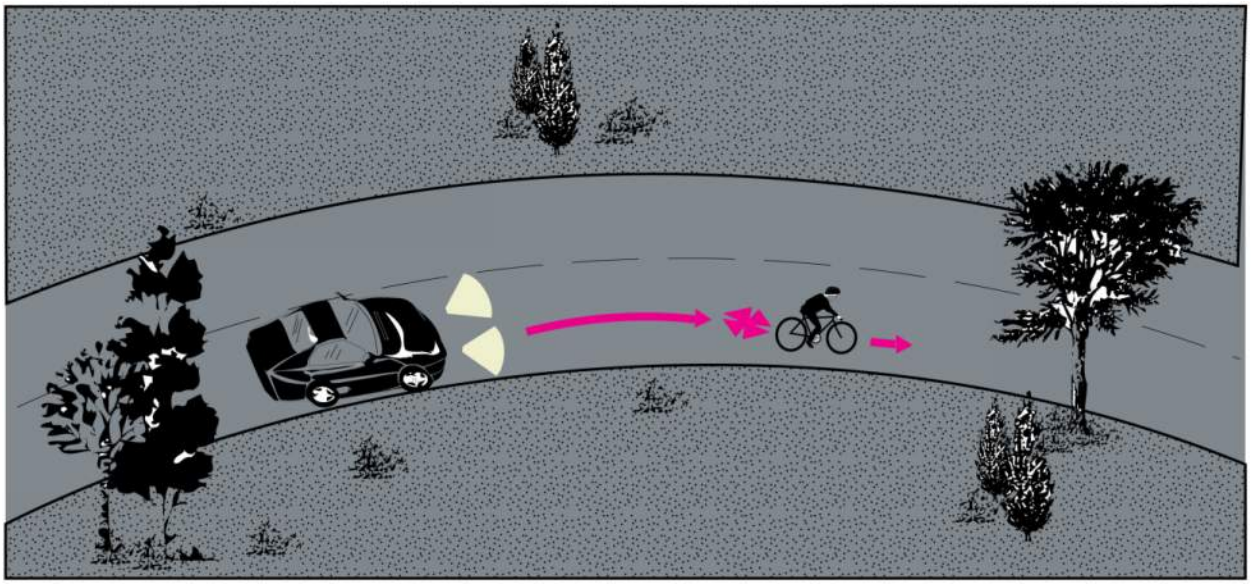


216 – Bus / Delivery Vehicle Pullover

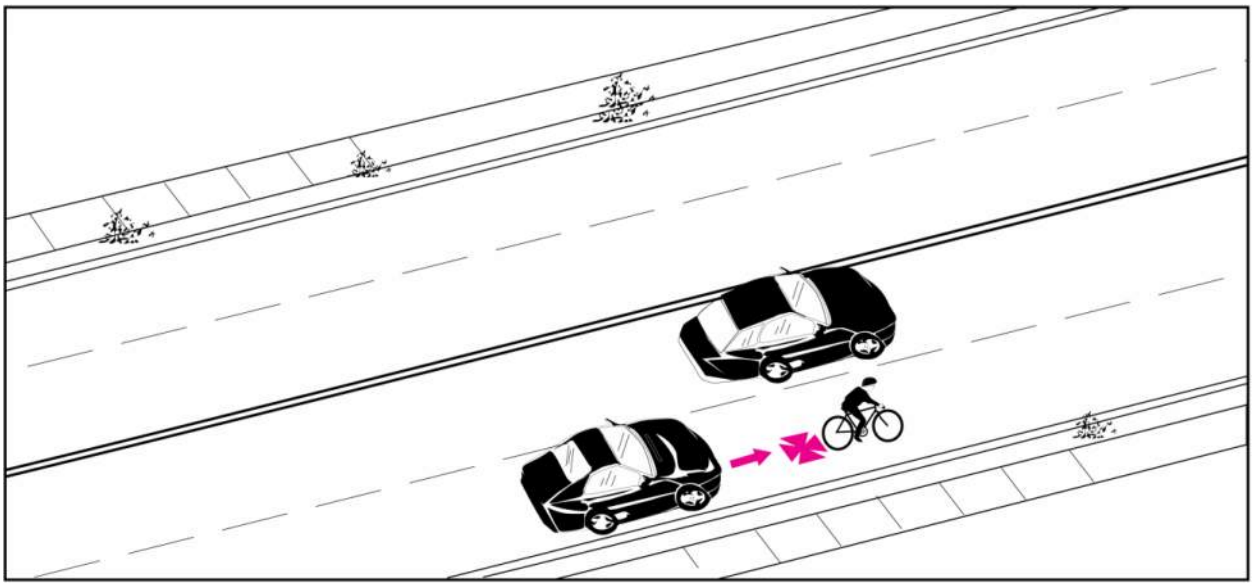


230 – Motorist Overtaking Bicyclist

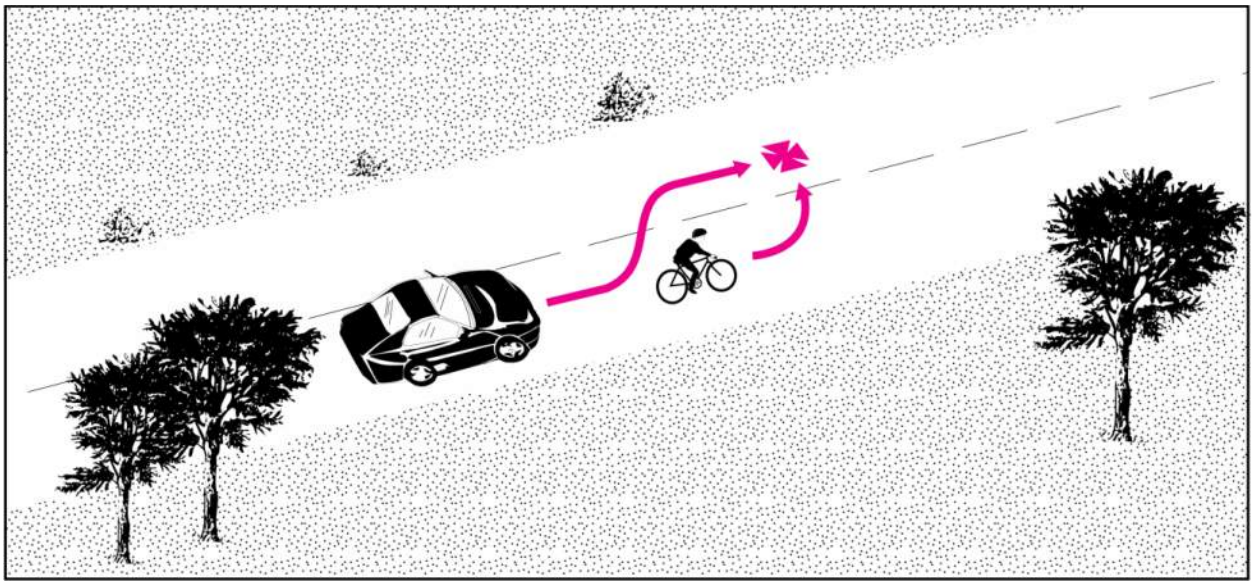
231 – Motorist Overtaking – Undetected Bicyclist



232 – Motorist Overtaking – Misjudged Space

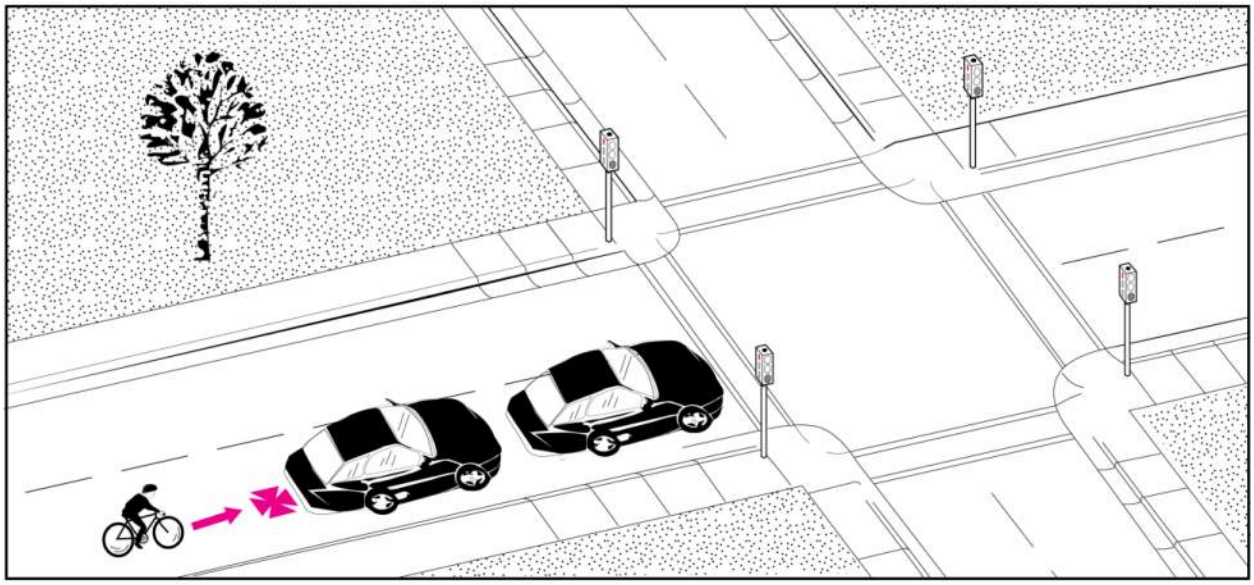


235 – Motorist Overtaking – Bicyclist Swerved

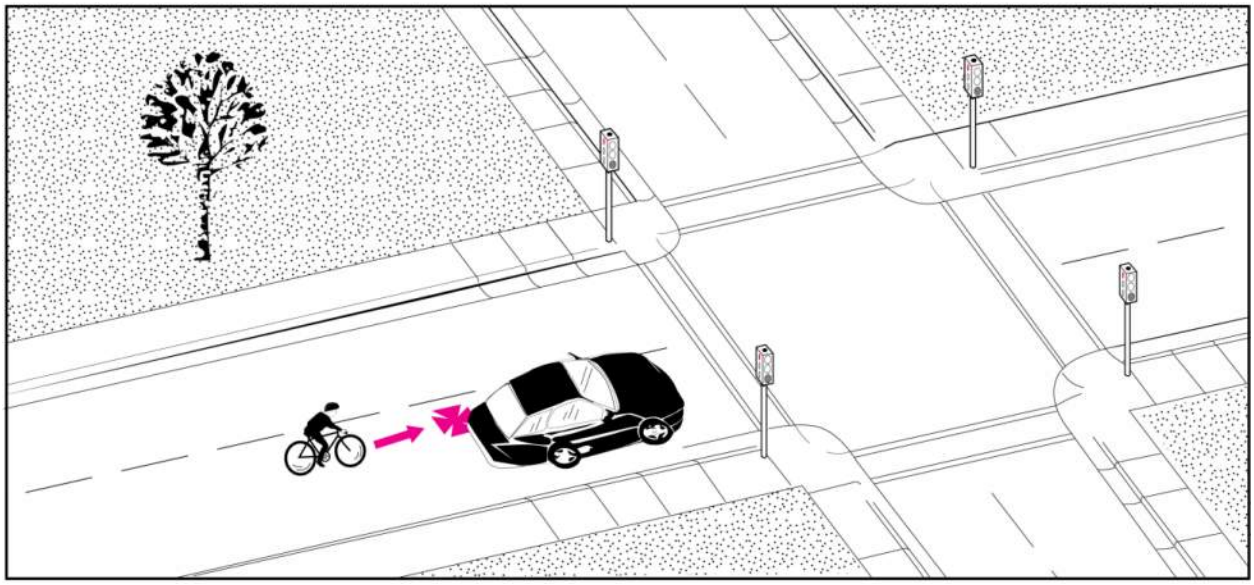


240 – Bicyclist Overtaking Motorist

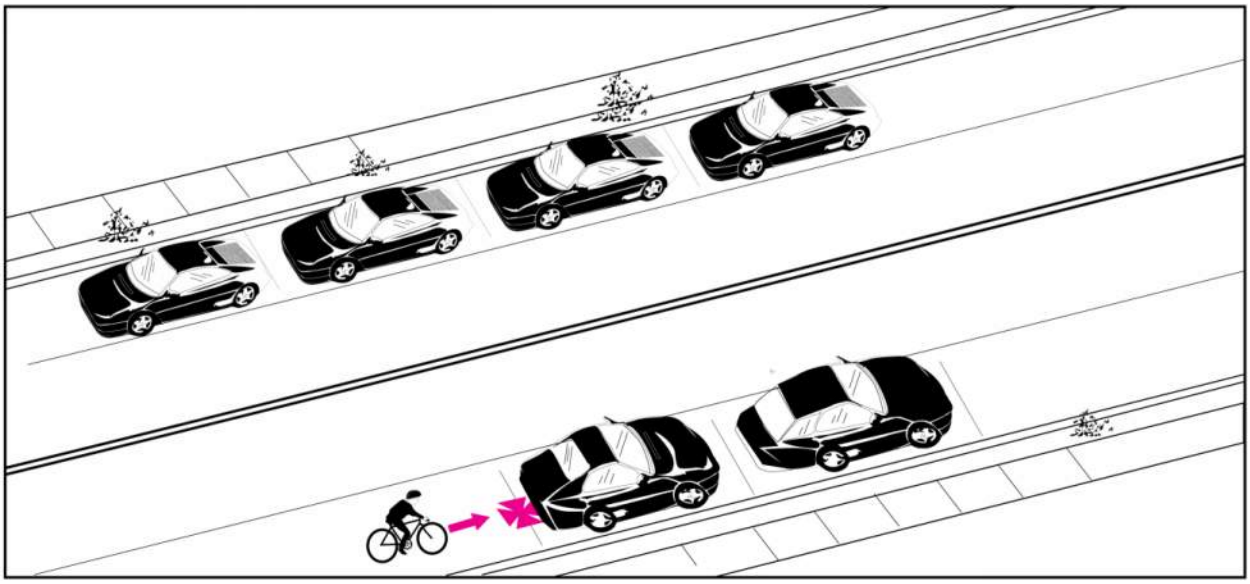
241 – Bicyclist Overtaking – Passing on Right



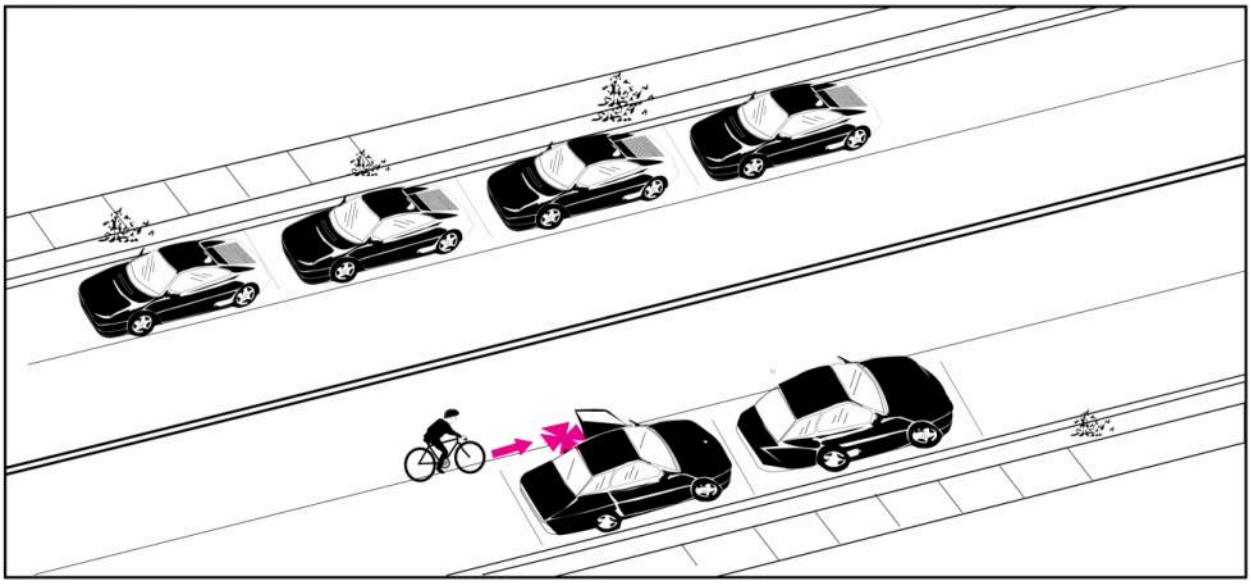
242 – Bicyclist Overtaking – Passing on Left



243 – Bicyclist Overtaking – Parked Vehicle

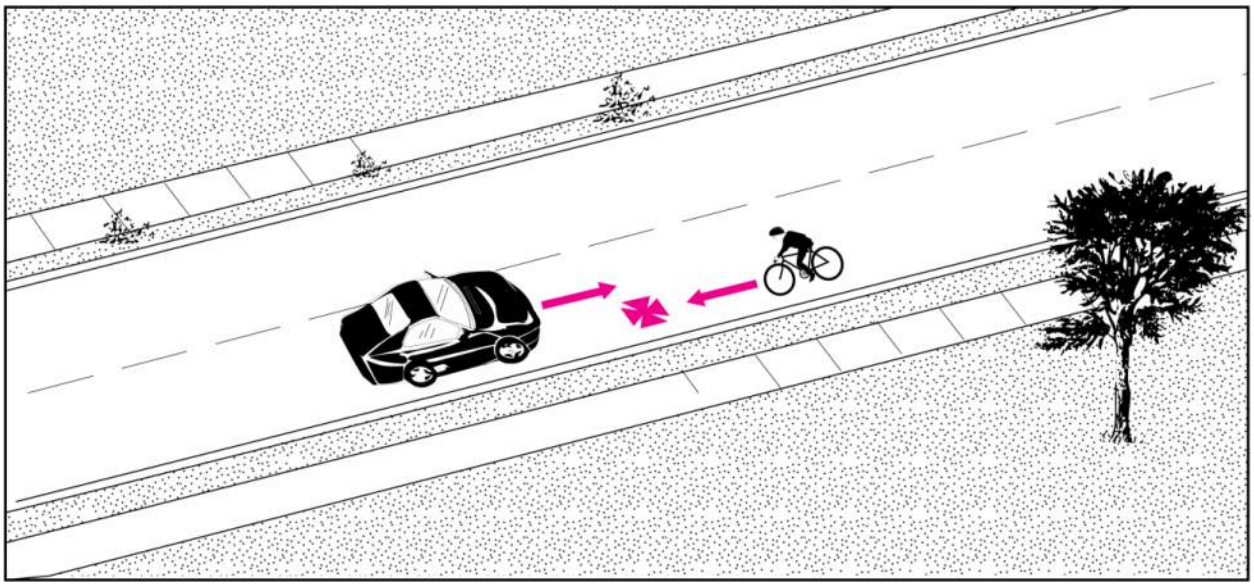


244 – Bicyclist Overtaking – Extended Door



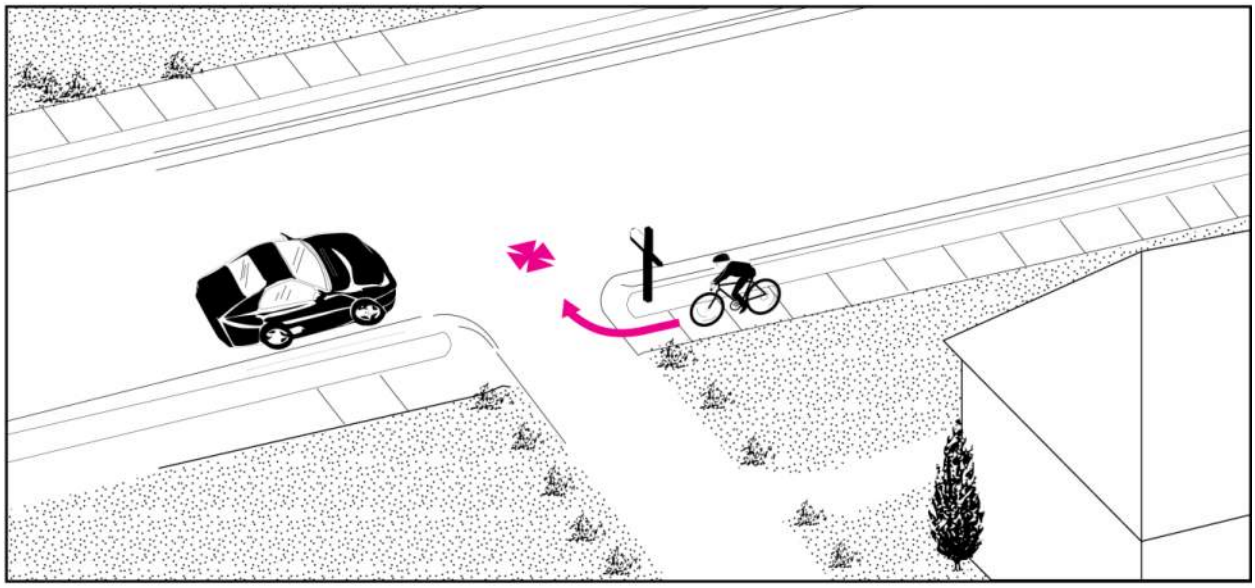
258 – Head-On

250 – Head-on Bicyclist / Motorist / Unknown



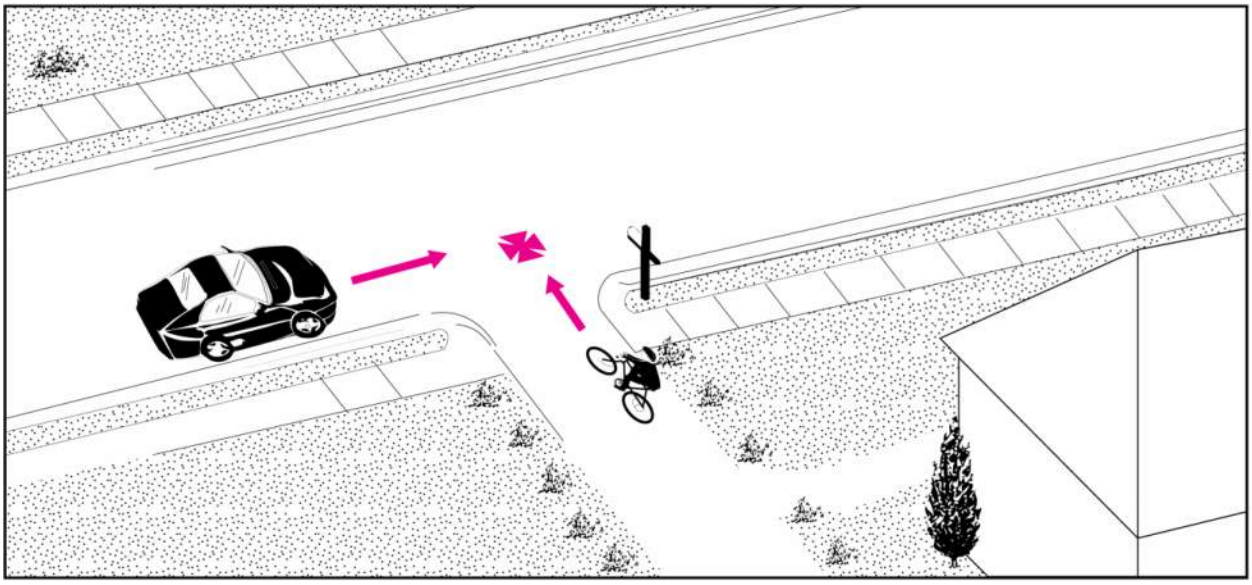
290 – Parallel Paths – Other Circumstances

225 – Bicyclist Ride Out – Parallel Path

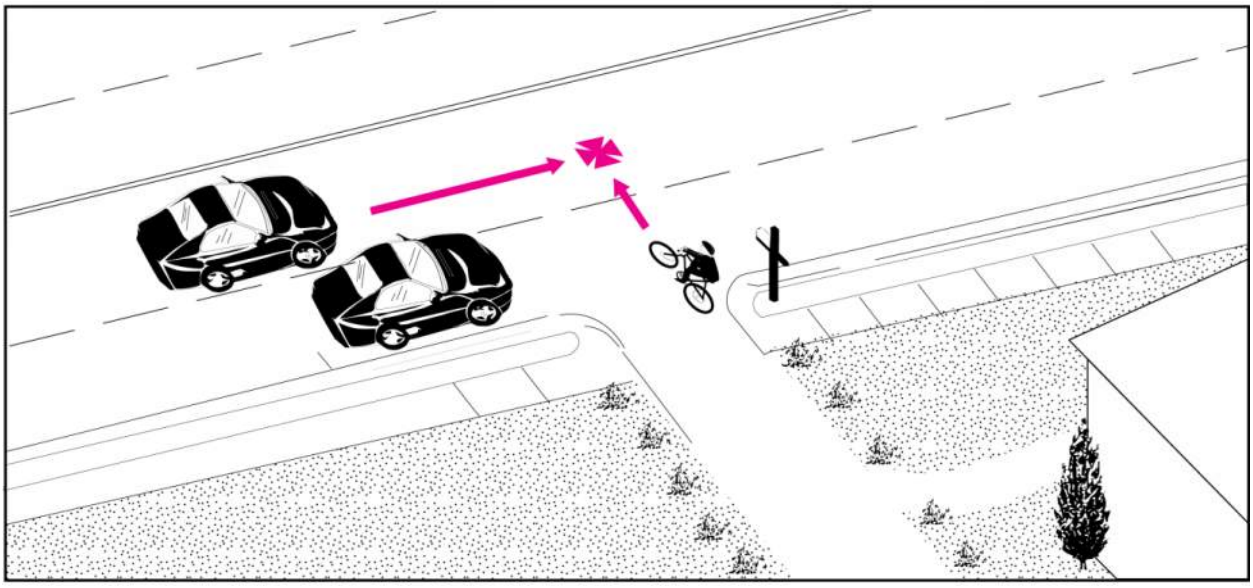


310 – Bicyclist Failed to Yield – Midblock

311 – Bicyclist Ride Out – Residential Driveway

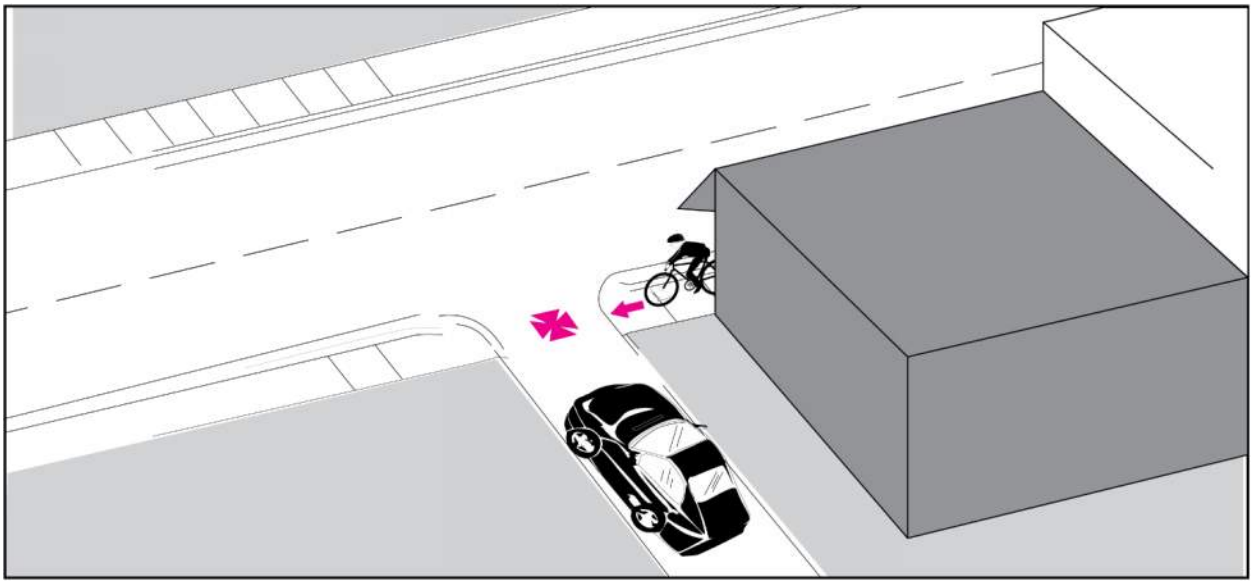


357 – Multiple Threat – Midblock



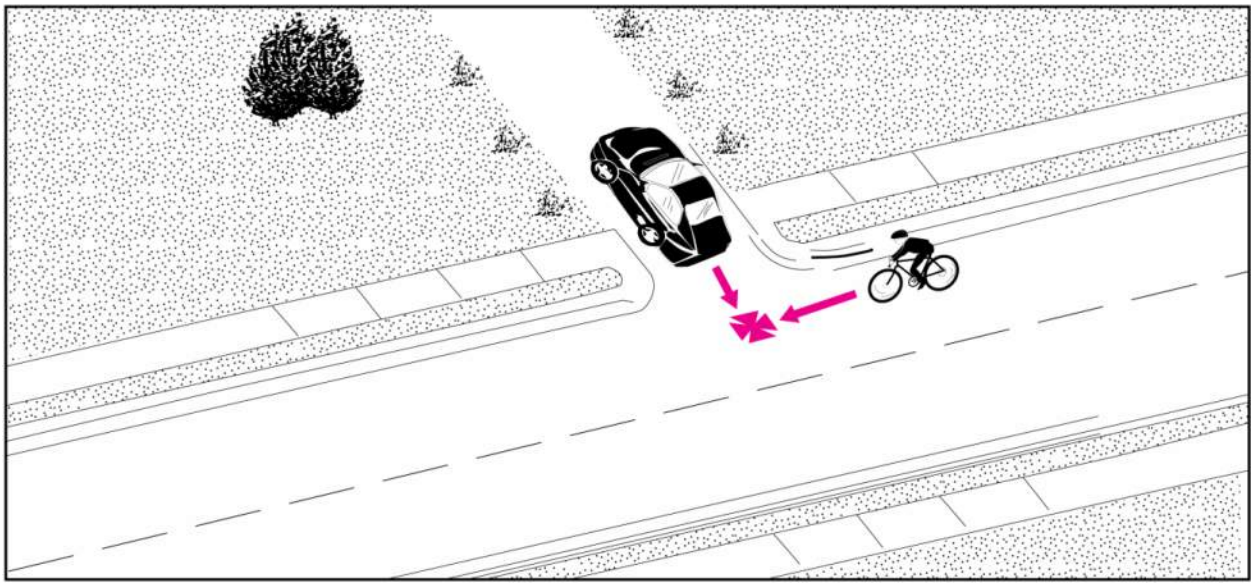
320 – Motorist Failed to Yield – Midblock

321 – Motorist Drive Out – Residential Driveway



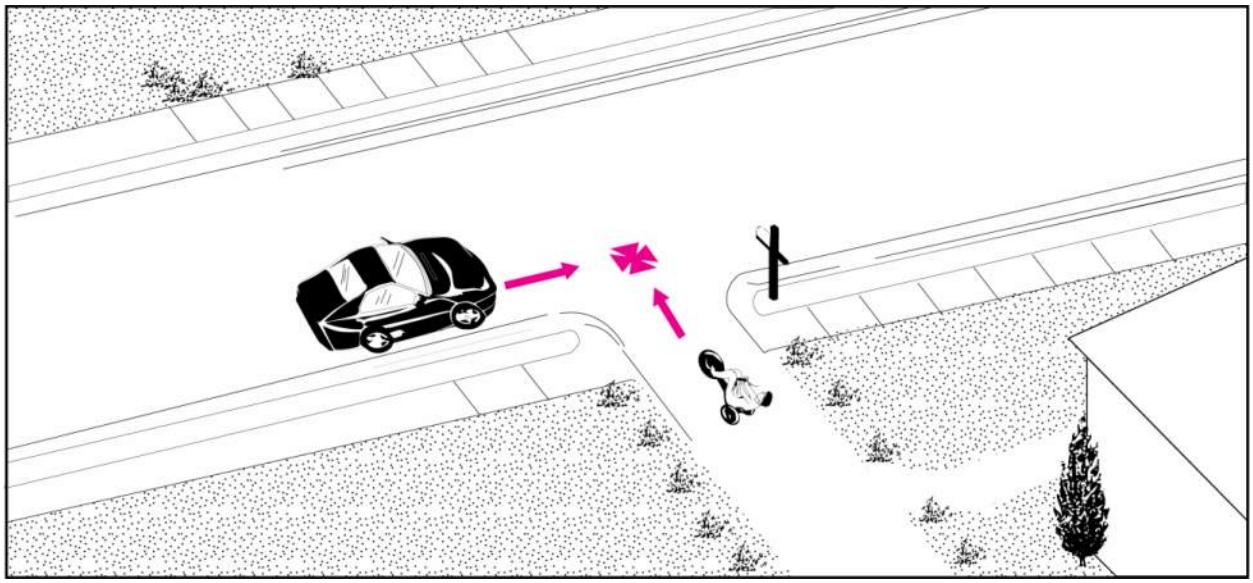
600 – Backing Vehicle

600 – Backing Vehicle

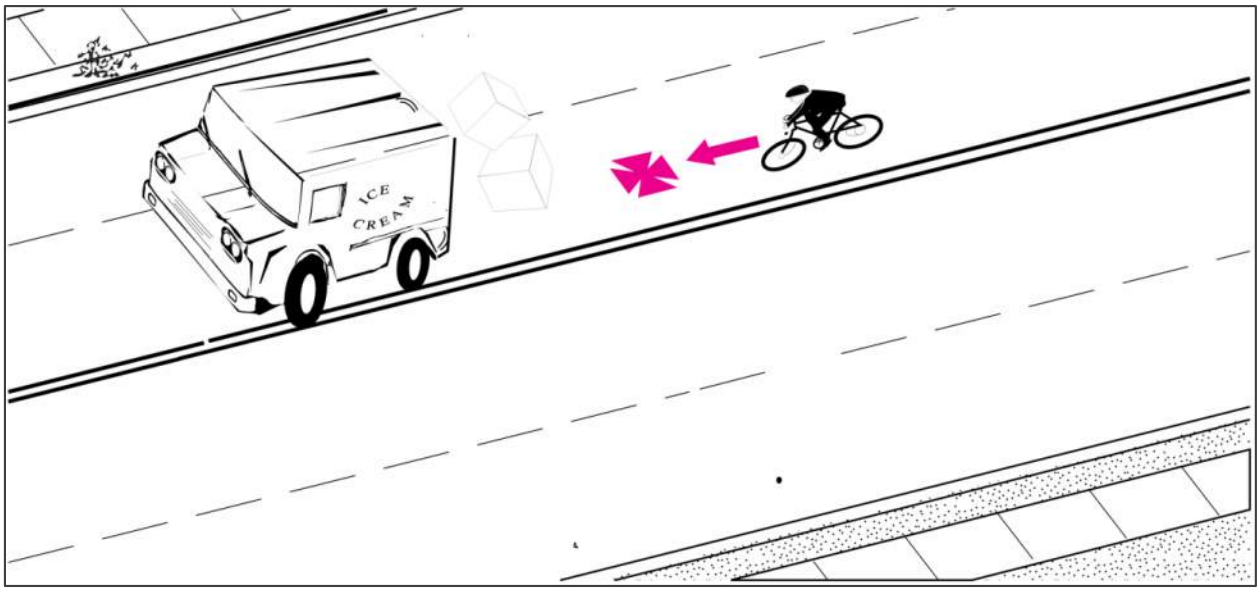


850 – Other / Unusual Circumstances

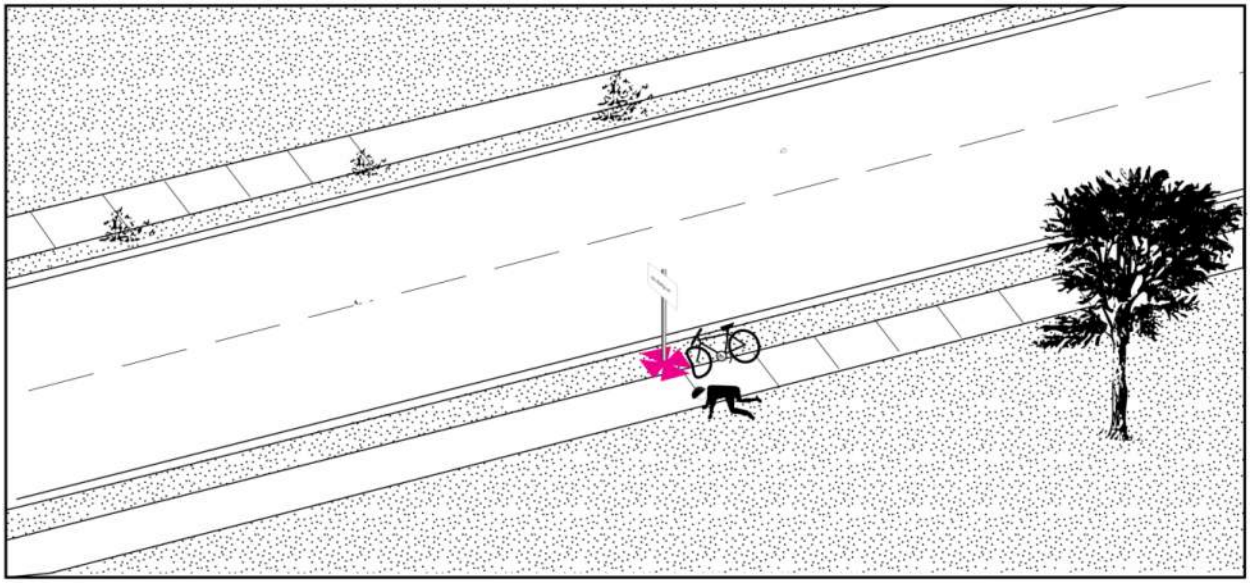
700 – Play Vehicle-Related



800 – Unusual Circumstances



400 – Bicycle Only



910 – Non-Roadway

910 – Non-Roadway