



# Strategic Transportation Safety Plan

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*MAG Contract No. 529 Project No. SP13-01*

## **Technical Memorandum No. 3 – Action Areas, Potential Strategies and Performance Measures**

### **3.1 INTRODUCTION**

The Maricopa Association of Governments (MAG) is developing a comprehensive update of the 2005 Strategic Transportation Safety Plan (STSP) with oversight by the MAG Transportation Safety Committee and the Transportation Safety Stakeholders Group (TSSG). The new STSP will establish regional vision, goals, objectives, strategies, and performance measures for transportation safety. It is a data-driven, multi-year comprehensive plan that establishes goals, objectives, and key action areas and integrates the four E's of highway safety – engineering, education, enforcement and emergency medical services (EMS). The STSP allows MAG safety programs and member agencies to work together in an effort to align goals, leverage resources and collectively address the region's safety challenges. The STSP will also identify strategies for addressing new areas of transportation safety. The development of the STSP will be closely coordinated with the ongoing development of the Arizona Strategic Highway Safety Plan (SHSP). The recommendations included in the STSP will be incorporated in the future updates to the MAG Regional Transportation Plan.

This technical memorandum is the third in a series to document the effort on the plan. Technical Memorandum No. 3 summarizes the work completed on Task 2: Establish Regional Vision and Goals for Transportation Safety and Task 3: Action Areas<sup>1</sup>, Potential Strategies and Performance Measures. The execution of these tasks led to the identification of action areas for future regional road safety initiatives, potential strategies, and safety performance measures. The actions were chosen by the TSSG after thorough consideration of the crash data and address a variety of transportation safety problems covering all modes and all aspects of safety.

Strategies were synthesized for each Action Area. Many will help reduce congestion, encourage use of alternative modes, and improve livability. The 2005 STSP action areas (1) Roadway Safety, (2) Enforcement/Education/EMS, and (3) Pedestrian/Bicyclist/Transit Users, and strategies within each, were evaluated and consolidated or expanded for improved effectiveness. Many of the strategies can be implemented with existing resources by existing staff through re-focusing of priorities. Other strategies require initial investment in planning and evaluation to better define specific resource needs and potential funding sources.

The MAG Transportation Safety Committee will help guide implementation of the STSP Vision. Each countermeasure will be monitored and the overall results evaluated annually to see if the rate of transportation fatal and serious injury crashes decline, and if more action should be given to specific safety problems. Performance measures directly related to transportation safety and other measures of overall transportation system performance will be monitored.

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<sup>1</sup> Note: The phrases "Action Area" and "Emphasis Area" convey the same idea in this document. "Emphasis Areas" will be used consistent with that referenced in the Arizona SHSP. The MAG TSSG preferred the use of "Action Areas" which will be used when referring to the MAG STSP.

## 3.2 REGIONAL VISION FOR TRANSPORTATION SAFETY

The Visioning Workshop was held on September 24, 2013 with a presentation by MAG and the consultant team followed by group breakout sessions to form and reach consensus on Action Areas for the STSP.

The following topics were presented to the Transportation Safety Stakeholder's Group (TSSG):

- Overview of MAG Safety Program and 2005 STSP Implementation Activities
- Overview of the Project and Relation to Arizona SHSP
- Overview of Safety Planning at the National and State Level
- Presentation of Task 1 Findings

Discussion for the MAG STSP Vision Statement was conducted and consensus reached on the following vision statement for all road users.

### ***“Zero Deaths – Zero Injuries”***

The action areas of the 2005 MAG STSP, 2007 Arizona SHSP, and other example action areas were also presented. Attendees split into groups for review and discussion. Each group defined a list of approximately eight potential Action Areas, which were compiled, summarized, and presented to the TSSG for consensus. The TSSG identified six Tier I and five Tier II potential Action Areas as follows:

#### **Tier I**

- Eliminate impaired driving
- Eliminate death and injury from speeding and aggressive driving behavior
- Eliminate death and injury related to intersections
- Eliminate death and injury for vulnerable road users (pedestrians, bicyclist, persons with disabilities)
- Improve data collection, quality, availability, integration, and analysis for decision making
- Increase use of safety devices (helmets, restraints, safety wear)

#### **Tier II**

- Improve safety and mobility for older road users
- Eliminate distracted driving
- Eliminate death and injury involving young road users
- Eliminate death and injury as a result of lane departures
- Eliminate death and injury for motorcyclists

The TSSG members saw a need to identify a larger number of Action Areas for the MAG STSP due to the varied crashes types and safety issues occurring in the MAG Planning Area, and the desire to address multiple safety issues.

The MAG STSP effort is working in parallel with the Arizona SHSP process. The Arizona SHSP Task Forces identified twelve (12) Emphasis Areas and two (2) Emphasis Support Areas for the implementation phase of the Arizona SHSP Update. The table below shows the Arizona SHSP Emphasis Areas and the original eleven (11) MAG STSP Action Areas and how they align.

Table 1 - Arizona Strategic Highway Safety Plan Update Emphasis Areas and MAG STSP Action Areas

Arizona SHSP Emphasis Areas	MAG STSP Action Areas
Age Related (Younger/Older Drivers)	<ul style="list-style-type: none"> <li>- Eliminate Death and Injury Involving Young Roadway Users</li> <li>- Eliminate Death and Injury Involving Older Roadway Users</li> </ul>
Distracted Driving	Eliminate Distracted Driving
Heavy Vehicles/Buses/Transit	Defer to State SHSP*
Impaired Driving (Alcohol, Illegal Drugs, Medication, Fatigued)	Eliminate Impaired Driving
Motorcycles	Eliminate Death and Injury for Motorcyclists
Natural Risks (Weather, Animals)	Defer to State SHSP*
Non-Motorized Users (Pedestrians, Bicyclists, Transit Users, School Zone Users)	Eliminate Death and Injury Involving Vulnerable Road Users – Bicyclist, Pedestrians, Persons with Disabilities
Occupant Protection (Safety Belts, Child Safety Seats, Helmets)	Increase Use of Safety Devices
Roadway Infrastructure & Operations Improvement (Lane Departure, Intersections, Rural Roads, Rail Crossings)	<ul style="list-style-type: none"> <li>- Eliminate Death and Injury Related to Intersections</li> <li>- Eliminate Death and Injury Related to Lane Departures</li> </ul>
Speeding & Aggressive Driving	Eliminate Death and Injury from Speeding and Aggressive Driving Behavior
Traffic Incident Management (Secondary Collisions, Work Zones)	Defer to State SHSP*
Interjurisdictional	Defer to the State SHSP*
Arizona Emphasis Area Support	MAG Action Area Support
Data Analysis Improvements	Improve Data Collection, Quality, Availability, Integration, and Analysis for Decision Making
Policy Initiatives	

\* The MAG region has a unique set of issues that may not have associated Action Area(s) that align with all the State SHSP Emphasis areas.

The potential MAG STSP Action Areas fall under the umbrella of the Arizona SHSP Emphasis Areas. The MAG strategies for each potential Action Area were developed and were ranked by the TSSG members at a November 19, 2013 meeting. Each TSSG member and those TSC members who wanted to participate were given \$100 “safety dollars” to “spend” on individual strategies that they considered to be the most effective measures to meet the vision of “**Zero Deaths – Zero Injuries.**” Those in attendance were informed that the strategy they “fund” should address the types of fatal and serious injury crash patterns occurring in the MAG Planning Area based on the analysis of 2008 to 2012 fatal and serious injury crash data. Additionally, guidance on the effectiveness of the strategies based on the “Countermeasures That Work”<sup>2</sup> NHTSA report, and the NCHRP 500 Series reports were provided where this information was

<sup>2</sup> Goodwin, A., Kirley, B., Sandt, L., Hall, W., Thomas, L., O'Brien, N., & Summerlin, D. (2013, April). *Countermeasures that work: A highway safety countermeasures guide for State Highway Safety Offices*. 7th edition. (Report No. DOT HS 811 727). Washington, DC: National Highway Traffic Safety Administration.



available. Prior to assigning “safety dollars”, TSSG members conducted a review to eliminate, add or revise the strategies based on their combined knowledge with Arizona State law and practices/strategies currently being implemented. Those TSSG and TSC members who were not able to attend the November 19 TSSG meeting were also given the opportunity to assign \$100 “safety dollars” to strategies. A total of 26 individuals participated in the exercise to assign “safety dollars” to strategies for the potential MAG Action Areas.

At a March 25, 2014 meeting it was agreed to reduce the number of MAG Action Areas in order to develop a plan that would be more realistically implemented and measured by MAG and its Member and Partnering Agencies and would ultimately have more potential of resulting in a reduction in fatal and serious injury crashes. To assist the TSSG members in prioritizing the potential Action Areas, the Constant Sum Paired Comparison technique was used. This technique permits each TSSG member to evaluate the relative importance of each potential Action Area with each other potential Action Area. By doing this, each participant only has to consider two of the potential Action Areas at a time during the ranking exercise and each potential Action Area has an equal opportunity for point assessment by the total group. The potential result is a relative importance of the various Action Areas.

A total of 18 individuals participated in a Constant Sum Paired Comparison exercise and discussion to identify the final Action Areas. Relevant crash history for each potential Action Area, which is documented in Technical Memorandum No. 1, was provided to each participant along with the 2008 – 2012 crash analysis summary presented in Table 2.

Table 2 – 2008 – 2012 Crash Analysis Summary of Potential Action Areas

Action Areas	% of <u>All</u> Serious Injury (A)	% of <u>All</u> Fatal (K)
Impaired Driving	18	44
Speeding & Aggressive Driving	31	33
Intersections	48	31
Peds, Bikes, Disabled	17	25
Data	-	-
Safety Devices	26	46
Older Road Users	21	16
Distracted Driving	20	13
Young Road Users	38	33
Lane Departures	34*	46*
Motorcycle Riders	25	24

\* Assumes ALL single vehicle, Head On, Sideswipe, and Rear to Side crashes are attributed to lane departure

The Constant Sum Paired Comparison exercise resulted in equal input from the participating TSSG members on the prioritization of the potential Action Areas. Each TSSG member was provided with a list of each potential Action Areas randomly paired with the other ten potential Action Areas for a total of 55 pairs. Each participant considered relevant crash history and compared the two Action Areas in each pair to each other based on their opinion of their relative importance to each other. Each participant divided 20 points between the Action Areas for each pair to reflect their opinion.

For example, if a participant felt that eliminating Impaired Driving is three times more important than eliminating Speeding and Aggressive Driving:

Impaired Driving	15	5	Speeding and Aggressive Driving
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For example, if a participant felt that eliminating Speeding and Aggressive Driving is nineteen times more important than eliminating Impaired Driving:

Impaired Driving	1	19	Speeding and Aggressive Driving
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All participant input was tabulated together with the results showing the relative importance of each of the eleven potential Action Areas. The prioritized list was discussed amongst the group with the top four potential Action Areas and one mid-ranked potential Action Area ultimately selected. Consideration was given to crash history and whether data for each Action Area can be successfully measured.

The following list of five regional road safety Action Areas relate to relevant safety issues occurring in the MAG Planning Area, are data driven, and will be adopted and promoted by MAG:

***Eliminate Impaired Driving***

***Eliminate Death and Injury from Speeding and Aggressive Driving Behavior***

***Eliminate Death and Injury Related to Intersections***

***Eliminate Death and Injury for Vulnerable Road Users – Pedestrians, Bicyclists, and Persons with Disabilities***

***Eliminate Death and Injury Involving Young Road Users***

One Support Action Area will also be carried over from the 2005 STSP as an on-going priority of transportation safety planning in the MAG region:

***Improve Data Collection, Quality, Availability, Integration, and Analysis for Decision Making***

Following the March 25, 2014 meeting, TSSG members also identified a realistic set of performance measures that will be used by MAG to report on progress. Each performance measure identified is a good measure of its Action Area and has data that is currently available or can be obtained for the MAG Planning Area.

A description of each of the five MAG Action Areas is provided Section 3.3 of this Technical Memorandum along with the listing of selected strategies, amount of TSSG member assigned “safety dollars” (\$), documented effectiveness, potential funding sources, lead agencies, and performance measures. Strategies that were determined by TSSG members to be more suitably addressed by the Arizona SHSP are indicated with “Defer to State SSHP”. A tabular summary of this information is provided at the end of the document.

### **3.2.1 Funding for Plan Implementation**

Per the Federal Highway Administration (FHWA), “MAP-21 continues the Highway Safety Improvement Program (HSIP) with the purpose of achieving a significant reduction in traffic fatalities and serious injuries on all public roads. The HSIP requires a data-driven, strategic approach to improving highway safety on all public roads that focuses on performance.”<sup>3</sup> MAP-21 is an acronym for “Moving Ahead for Progress in the 21<sup>st</sup> Century.” Projects must be identified within a Statewide Emphasis Area to be eligible for HSIP funds. Specifically, the FHWA states, eligible use of funds includes a “highway safety improvement project that is any strategy, activity or project on a public road that is consistent with the data-driven State Strategic Highway Safety Plan (SHSP) and corrects or improves a hazardous road location or feature or addresses a highway safety problem.” Additional areas that are specifically not in the State SHSP may not be eligible for HSIP funds, although other regional funding sources may be available. If other funding sources are identified outside of Federal Aid safety funding, MAG may prioritize projects to utilize that funding (i.e., sales tax, bonds, etc.) based on the goals outlined in the MAG STSP.

## **3.3 SAFETY ACTION AREAS**

### **3.3.1 Eliminate Impaired Driving**

The Arizona crash report allows law enforcement officers to indicate conditions influencing the driver, bicyclist or pedestrian and behaviors that contribute to crashes. Driver conditions and behavior, referred to as “impaired driving” in the ADOT SHSP, includes all cases where the physical description of one or more drivers involved in the crash indicated illness, physical impairment, fell asleep/fatigued, alcohol, drugs or medications as reported by the police officer.

A brief summary of the 2008-2012 fatal crash data for the MAG Planning Area, as documented in Technical Memorandum No. 1, is listed below.

- 20% of all serious injury crashes involve an impaired driver
- 44% of all fatal crashes involve an impaired driver
- Annual fatal crashes involving an impaired driver have gone down in the most recent three years compared to the number of crashes in 2008 and 2009.
- 16% of all serious injury crashes involve impairment due to alcohol, drugs, or medications
- 42% of all fatal crashes involve impairment due to alcohol, drugs, or medications
- 1.8% of all serious injury crashes involve impairment due to sleep or fatigue
- 1.3% of all fatal crashes involve impairment due to sleep or fatigue
- 33% of crashes involving impairment due to sleep or fatigue occurred on freeways

The following Arizona Statutes are available pertaining to Arizona DUI laws:

- Title 4 - 241: Selling or giving liquor to underage person; illegally obtaining liquor by underage person; violation; classification; definitions
- Title 28-1381: Driving Under the Influence
- Title 28-1382: Driving Under the Influence with a Blood Alcohol Concentration (BAC) of 0.15 or more (Extreme DUI)
- Title 28-1383: Aggravated Driving Under the Influence

<sup>3</sup> <http://www.fhwa.dot.gov/map21/factsheets/hsip.cfm>, obtained December 12, 2013

### 3.3.1.1 Strategies

### Effectiveness

#### Deterrence (Enforcement)

\$45 □ High visibility DUI saturation patrols

HIGH

#### Communications and Outreach (Education)

\$31 □ Explore methods of educating target groups for impaired driving including mass-media campaigns on DUI dangers and penalties

MED

### 3.3.1.2 Potential Funding Sources

- NHTSA
- Local Dollars

### 3.3.1.3 Lead Agencies

- ❖ MAG Member Agencies
- ❖ Governor's Office of Highway Safety (GOHS)

### 3.3.1.4 Performance Measures

#### Implementation progress measurement (output)

- % or # of MAG member agencies conducting high visibility patrols targeting impaired driving in the past year
- # or % of target population reached
- # of education tools identified

#### Goal-oriented measurement (outcome)

- % or # Reduction (3-year moving average) in Serious Injury and Fatal Crashes involving driver impairment where the physical description one or more drivers involved in the crash indicated alcohol, recreational drugs, medications, or fatigue as reported by the investigating officer.

### 3.3.2 Eliminate death and injury from speeding and aggressive driving behavior

"Speeding" in the context of this analysis is based on data entered by the reporting officer as: "speed too fast for condition" or "exceeded lawful speed". The reporting officers' assessments are based on traffic, roadway, and weather conditions at the time of the crash and do not necessarily represent speeds in excess of the posted speed limit. Annual fatal crashes involving speeding have gone down in the most recent three years compared to the number of crashes in 2008 and 2009. Speeding involved in all serious injury and all fatal crashes in the MAG Planning Area are 31% and 33%, respectively, for the years 2008 through 2012. There is also a strong relationship between speeding/aggressive driving and red-light running.

Aggressive driving is defined as a progression of unlawful driving actions such as: speeding -- exceeding the posted limit or driving too fast for conditions; improper or excessive lane changing: failing to signal intent, failing to see that movement can be made safely, or improper passing -- failing to signal intent, using an emergency lane to pass, or passing on the shoulder. Aggressive driving is not the same as "road rage"; which is criminal behavior employing a car as a weapon, or involving assault arising from driving confrontations.<sup>4</sup>

<sup>4</sup> NCHRP Report 500 Volume 1: A Guide for Addressing Aggressive-Driving Collisions page II-1

*“Because the topic of aggressive driving is a relatively new one, and because arriving at an operational definition has not been easy, there is a lack of data available about the nature of crashes involving aggressive driving. In trying to determine whether a problem exists, it will be difficult to locate these crashes using current data sources. Although some crash reports provide for indication of driver-contributing circumstances, such categories do not allow one to identify all truly aggressive driving actions. Narratives provided on the form by reporting officers may be the key source of information on current forms.*

*New definitions and new coding options are needed. At least one state has placed a check box on its crash report form to identify aggressive driving. Officers have been given an official definition to use. This type of modification may ultimately be necessary in any jurisdiction that desires to document the problem in an accurate manner.”<sup>5</sup>*

### 3.3.2.1 Strategies

### Effectiveness

#### Enforcement

- |  |      |
|--|------|
| \$54 <input type="checkbox"/> Conduct automated enforcement                      | HIGH |
| \$42 <input type="checkbox"/> Officer Enforcement in work zones and school zones | HIGH |

#### Communications and Outreach (Education)

- |  |     |
|--|-----|
| \$38 <input type="checkbox"/> Public Information campaign to support enforcement programs – <b>Defer to SHSP</b> | MED |
|--|-----|

### 3.3.2.2 Potential Funding Sources

- NHTSA
- Congestion Management and Air Quality (CMAQ)
- Local Dollars

### 3.3.2.3 Lead Agencies

- ❖ MAG Member Agencies
- ❖ Governor’s Office of Highway Safety (GOHS)
- ❖ ADOT

### 3.3.2.4 Performance Measures

#### Implementation progress measurement (output)

- # of automated enforcement cameras operating in MAG Planning Area
- # or % of MAG member agencies with automated enforcement cameras
- # of speeding violations recorded in the past year (note: this goes down if cameras are successful)

#### Goal-oriented measurement (outcome)

- % or # Reduction (3-year moving average) in Serious Injury and Fatal Crashes involving speeding or aggressive driving behavior including:
  - Crashes where data entered by the reporting officer as: “speed too fast for condition” or “exceeded lawful speed”.

<sup>5</sup> NCHRP Report 500 Volume 1: A Guide for Addressing Aggressive-Driving Collisions page II-1, II-2

- Crashes where data entered by the reporting officer as: “speed too fast for condition” or “exceeded lawful speed” and improper or excessive lane changing: failing to signal intent, failing to see that movement can be made safely, or improper passing, per ARS 28-695.

### 3.3.3 Eliminate death and injury related to intersection crashes

Intersections constitute only a small part of the overall roadway system, yet intersection-related crashes constitute 31% of all fatal crashes in the MAG Planning Area. It is not unusual that crashes are concentrated at intersections, because intersections are the points along the roadway system where traffic movements most frequently conflict with one another. Good geometric design combined with good traffic control can result in an intersection that operates efficiently and safely.<sup>6</sup>

A brief summary of the 2008-2012 fatal crash data for the MAG Planning Area, as documented in Technical Memorandum No. 1, is listed below.

- 31% of all fatal crashes occurred at intersections,
- 17% of all fatal crashes occurred at signalized intersections,
  - 55% of fatal crashes at intersections occurred at signalized intersections,
    - 38% of fatal crashes at signalized intersections involve right-angle collisions with other vehicles.
    - 27% of fatal crashes at signalized intersections involve collisions with left turning vehicles.
- 9% of all fatal crashes occurred at STOP-controlled intersections,
  - 23% of fatal crashes at intersections occurred at STOP-controlled intersections,
    - 65% of fatal crashes at STOP-controlled intersections involve right-angle collisions with other vehicles.

#### 3.3.3.1 Strategies

#### Effectiveness

##### Engineering

- Select Improvements based on screening for high crash locations
- \$37  Implement systemic Improvements based on identifying characteristics of high risk locations
- \$34  Identify new practices or standards that integrate safety into planning and design HIGH
- \$47  Implement proven design features HIGH
- \$33  Implement countermeasures that go beyond minimum standards (including street design or beyond MUTCD requirements) – **Defer to SHSP**

##### Enforcement

- \$31  Conduct targeted enforcement of high crash locations HIGH
- \$27  Automated enforcement at high crash locations HIGH

##### Education

- \$40  Provide education related to intersection safety

<sup>6</sup> NCHRP 500 Volume 12: A Guide for Reducing Collisions at Signalized Intersections, pgl-2

### 3.3.3.2 Potential Funding Sources

- Highway Safety Improvement Program (HSIP)
- Local Dollars

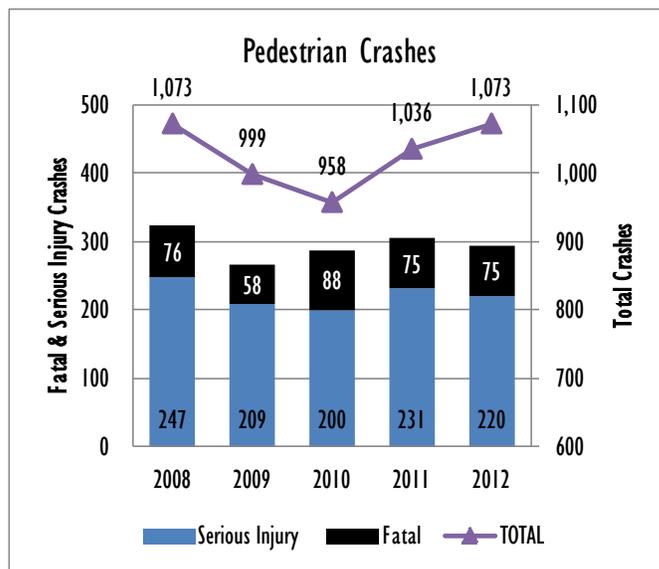
### 3.3.3.3 Lead Agencies

- ❖ MAG Member Agencies
- ❖ MAG
- ❖ ADOT
- ❖ AAA
- ❖ AARP

### 3.3.3.4 Performance Measures

#### Implementation progress measurement (output)

- # of systemic improvement projects targeting intersections with high crash risk in the past year
- # of RSA's conducted at intersections with high crash risk in the past year
- # of proven design features implemented
- # of intersections equipped with automated enforcement systems
- % of representative population educated



#### Goal-oriented measurement (outcome)

- % or # Reduction (3-year moving average) in Serious Injury and Fatal Crashes at intersections including:
  - Crashes at all intersections
  - Crashes at signalized intersections
  - Crashes at STOP-controlled intersections
- # of Deaths and Injuries at Intersections per 100,000 population

### 3.3.4 Eliminate death and injury for vulnerable road users

#### Pedestrians and Persons with Disabilities

A brief summary of the 2008-2012 crash data involving a pedestrian in the MAG Planning Area, as documented in Technical Memorandum No. 1, is listed below:

- 28% of fatal non-intersection related crashes occur on arterials and local roads
- 18% of fatal intersection related crashes occur on arterials and local roads
- 14% of serious injury non-intersection related crashes on arterials and local roads
- 9% of serious injury intersection related crashes on arterials and local roads
- 15 to 19-year old pedestrians are involved in the most pedestrian and bicycle crashes (followed by those in the 20 to 24, and 10 to 14-year old age groups, respectively)
- Pedestrians over 60 are more likely to sustain serious injuries or die from a crash
- Pedestrian crashes peak during the 7 AM and 6 PM hours

Figure 1 - Pedestrian Crashes in the MAG Planning Area

- For the daytime hours of 6 AM to 7 PM, 24% of pedestrian crashes are fatal and serious injury
- For the nighttime hours of 7 PM to 6 AM, 42% of pedestrian crashes are fatal and serious injury
- Most pedestrian crashes occur in areas of higher population density
- 59% of serious injury and fatal pedestrian crashes occur at mid-block locations and 41% occur at intersections

Pedestrian crashes in general tend to be underreported. Past studies have estimated that police-reported crashes represent only about 56% of pedestrian incidents that occur (Stutts & Hunter, 1998). Underreporting likely decreases as the crash severity increases.<sup>7</sup>

Different crash types at different locations involving different age groups can be targeted by different countermeasures. The Pedestrian and Bicycle Crash Analysis Tool (PBCAT) software is available to assist jurisdictions in typing pedestrian and bicycle crashes and developing a database for analyzing their own pedestrian and bicycle crash problems. States and communities can use PBCAT to analyze pedestrian and bicycle crashes and to help select appropriate countermeasures. PBCAT may be downloaded from <http://www.pedbikeinfo.org/pbcats/index.cfm>. Registration is requested for this free software so the user may receive any software updates or important technical information.<sup>8</sup>

An emerging issue is cell phone and electronic devices used as a source of distraction, not only for motorists, but for pedestrians. Talking on cell phones or texting is associated with cognitive distraction that may undermine pedestrian safety, particularly among college-age pedestrians who may be more engaged with such devices (Hatfield & Murphy, 2007; Nasar, Hecht, & Wener, 2007; Stavrinou, Byington, & Schwebel, 2009 and 2001). In a simulation of pedestrian activity, college-age pedestrian study participants who were distracted by music or texting were more likely to look away from the street environment and were more likely to be hit by a vehicle in the virtual pedestrian environment than were undistracted participants (Schwebel et al., 2012). A study by Cooper et al. (2011) conducted at several locations in the Bay Area reported that pedestrian cell phone or mobile device use was between 7 and 15%, giving a sense of the magnitude of the pedestrian distraction issue.<sup>9</sup>

Another issue with respect to pedestrians is the wide streets and often the high speeds and long distances between controlled crossing points in urban areas within the MAG Planning Area. Multiple-threat crashes are more likely to occur on multilane streets, and these crashes tend to have higher severity. Intersection crashes more often involves turning traffic. The use of left-turn phases at traffic signals which helps to separate some of the left turning movements from pedestrians results in longer cycle lengths which tends to encourage pedestrians to ignore the traffic signals. Both driver and pedestrian behavior are related to pedestrian crashes when one or both entities violate the traffic laws. Phoenix has been identified as a Focus City by the FHWA for improving Pedestrian Safety, and Arizona has been identified as a Focus State. Clearly, improving pedestrian safety should be a priority.

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<sup>7</sup> NHTSA Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices Seventh Edition, 2013

<sup>8</sup> NHTSA Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices Seventh Edition, 2013

<sup>9</sup> NHTSA Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices Seventh Edition, 2013

**Bicyclists**

Bicyclists come in all ages with many levels of knowledge, skill, perception and judgment. Thus, educational and enforcement programs must take these factors into account and be designed to target age-specific concerns and the knowledge, skills and behavioral attributes of these different groups of riders.<sup>10</sup> A bicycle is defined as a “vehicle”, and when riding in the roadway, bicyclists must obey the rules of the road, including children who represent a class of unlicensed vehicle operators. When riding on the sidewalk, bicyclists must yield to pedestrians and are often vulnerable to motorists turning into and out of driveways and side-streets.

Bicycles have an even smaller profile than motorcycles, are usually purchased without head lights and rear active lights attached, and are more difficult for many motorists to notice than four-wheeled vehicles, especially at night. Because they are human powered, there may be substantial speed differentials between bicycles and motorized traffic. Bicyclists also lack the protective body of a motorized vehicle in the event of a crash and some riders feel uncomfortable mingling with traffic, especially in high speed, high volume situations.<sup>11</sup>

As with all crashes, bicycle crashes often result from multiple contributing factors. Bicyclist and driver pre-crash actions and behaviors (such as distraction, driver speed, and alcohol use), vehicle type and design, cyclist and vehicle volumes/exposure, and elements of the built environment (including roadway design, presence of bicycle facilities) all contribute to cycle crashes. Several resources have provided evidence of the role of the transportation environment in bicycle safety and summarized best practices in planning, engineering, and design for bicycle safety (FHWA, 2011; NACTO, n.d.; AASHTO, 2012). Enacting and implementing Complete Streets policies has been identified as one of the more low-cost and impactful strategies, as evidenced by numerous cities and states across the U.S. (for more on Complete Streets, visit [www.completestreets.org/](http://www.completestreets.org/)).<sup>12</sup>

A brief summary of the 2008-2012 crash data involving a bicyclist in the MAG Planning Area, as documented in Technical Memorandum No. 1, is listed below.

- 5% of fatal non-intersection related crashes on arterials and local roads
- 5% of fatal intersection related crashes on arterials and local roads
- 8% of serious injury non-intersection related crashes on arterials and local roads
- 8% of serious injury intersection related crashes on arterials and local roads
- 15 to 19 year old bicyclists are involved in the most bicycle crashes (followed by 20-24 and 10-14 year olds, respectively)

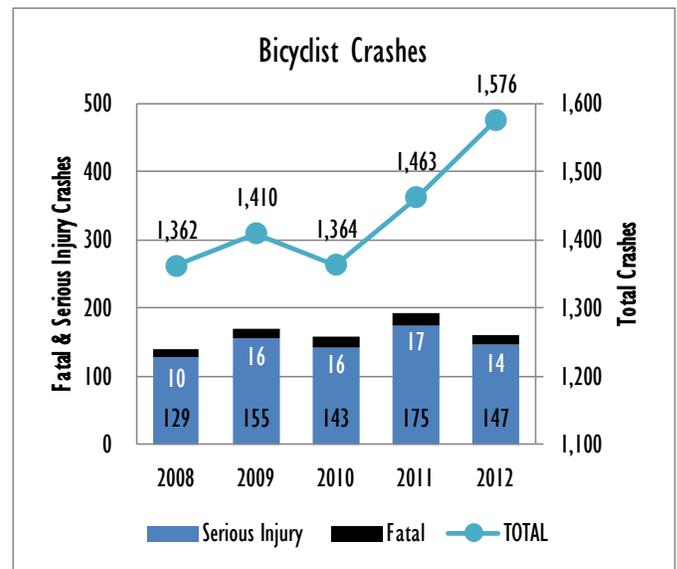


Figure 2 - Bicyclist Crashes in the MAG Planning Area

<sup>10</sup> NHTSA Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices Seventh Edition, 2013

<sup>11</sup> NHTSA Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices Seventh Edition, 2013

<sup>12</sup> NHTSA Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices Seventh Edition, 2013

- bicyclists over 75 are more likely to sustain serious injuries or die from a crash
- bicyclist crashes peak at 7 AM and 4 PM
- fatal and serious injury crashes between 6 AM and 6 PM for bicyclists represent 11% of all bicyclist crashes
- for the nighttime hours of 7 PM to 5 AM, fatal and serious injury crashes for bicyclists represent 19% of all bicyclist crashes
- 55% of serious injury and fatal bicyclist crashes occur at intersections

National and local fatality rate trends, or fatalities adjusted per number of bicycling trips or miles traveled by bicycle, are unavailable because there is no consistent measure of bicycling (exposure) to estimate and compare fatality rates. MAG has initiated a study to count bicyclists at a number of intersections, but this will represent only a small portion of the roadway network.

An analysis by Pucher et al. (2011a) found the average number of cycle trips and the average miles of cycling per capita per year each rose a few percentage points from 2001 to 2009, and more cycling trips were taken by males, adults 24 - 64, people without cars, and people with university degrees. An important note is that while the number of trips has risen, there has not been a significant increase in cycling trip rates (e.g., trips per capita) on a national basis. In select cities, however, there has been a substantial increase in cycling in recent years. In a study of 9 large cities in the U.S. and Canada (Chicago, Minneapolis, Montréal, New York, Portland, San Francisco, Toronto, Vancouver, and Washington, DC), the authors found bike commuting rates more than doubled since 1990, while bicycle fatality rates subsequently dropped (Pucher et al, 2011b). The authors attribute these trends to the substantial investment in infrastructure and bicycle-supporting programs implemented in these cities.<sup>13</sup>

In addition to number of trips, exposure to traffic and crashes is affected by where, when, and for how long a cyclist rides, as well as the skill, knowledge and application of safe behaviors by the cyclist and the drivers around him or her. The risk of a crash may also be increased due to inattention, distraction, or impairment by either the bicyclist or driver. Emerging problems include the use of media players or other electronic devices while riding or driving.<sup>14</sup>

### 3.3.4.1 Strategies

### Effectiveness

#### Engineering

- |      |  |                   |
|------|--|-------------------|
| \$41 | <input type="checkbox"/> Address safety and multimodal connectivity in planning and design   |                   |
| \$10 | <input type="checkbox"/> Establish Complete Streets policies and standards that integrate safety analysis and design throughout the planning process |                   |
| \$39 | <input type="checkbox"/> Install Pedestrian Hybrid Beacons (HAWKs)   | MED <sup>15</sup> |
| \$63 | <input type="checkbox"/> Install Medians and Pedestrian Crossing Islands   | HIGH              |
|      | <input type="checkbox"/> Provide bicycle detection at signalized intersections   |                   |

<sup>13</sup> NHTSA Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices Seventh Edition, 2013

<sup>14</sup> NHTSA Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices Seventh Edition, 2013

<sup>15</sup> Published in 2004, NCHRP Report 500 Volume 10: A Guide for Reducing Collisions Involving Pedestrians reported on signals to alert motorists that pedestrians are crossing, but not the HAWK specifically. Until December 2009, the HAWK was categorized as an experimental device in the United States. Recent studies of the safety effectiveness of the HAWK or Pedestrian Hybrid Beacon have shown "HIGH" effectiveness.

### Enforcement

\$27  Establish bicycle helmet laws for children – **Defer to SHSP**

HIGH

\$36  Decrease wrong-way riding and traffic control violations by bicyclists (through use of pavement markings, signs and legislation);

#### 3.3.4.2 Potential Funding Sources

- NHTSA
- TAP
- HSIP
- CMAQ
- Local Dollars

#### 3.3.4.3 Lead Agencies

- ❖ MAG Member Agencies
- ❖ MAG
- ❖ Governor's Office of Highway Safety (GOHS)
- ❖ ADOT

#### 3.3.4.4 Performance Measures

##### Implementation progress measurement (output)

- # of pedestrian crossing enhancements installed such as HAWKs, pedestrian crossing islands, etc... (not marked crossings)
- # or % of MAG member agencies that combine safety with multimodal connectivity reviews in planning and design
- # or % of MAG member agencies with complete streets policies that rely on safety analysis and design
- # or % of traffic signals with bicycle detection
- # or % of MAG member agencies with bicycle wrong-way riding prohibitions

##### Goal-oriented measurement (outcome)

- % or # Reduction (3-year moving average) in Serious Injury and Fatal Crashes involving a pedestrian
- # of Pedestrian Deaths and Serious Injuries
- % or # Reduction (3-year moving average) in Serious Injury and Fatal Crashes involving a bicyclist
- # of Bicyclist Deaths and Serious Injuries

### 3.3.5 Eliminate death and injury involving young road users

“Young drivers have high crash risks for two main reasons, as documented by extensive research (summarized in Hedlund, Shults, & Compton, 2003). First, they are inexperienced, just learning to drive. The mechanics of driving require much of their attention, so safety considerations frequently are secondary. They do not have experience in recognizing potentially risky situations or in reacting appropriately and controlling their vehicles in these situations. Second, they are immature, sometimes seeking risks for their own sake, often not able or willing to think ahead to the potentially harmful consequences of risky actions.

Inexperience and immaturity combine to make young drivers especially at-risk in five circumstances:

- At night: Driving is more difficult and dangerous at night for everyone, but particularly for teenagers. Young drivers have less experience driving at night than during the day, and drowsiness and alcohol may be more of a factor at night.
- After drinking alcohol: Young drivers' inexperience with both driving and drinking means that they have a higher crash risk at all BAC levels than older drivers.
- With passengers: Teenage passengers can distract young drivers and encourage them to take risks.
- When unbelted: Seat belts reduce the risk of injury or fatality in a crash, but teenage drivers and passengers have lower belt use rates than older drivers and passengers.
- When using cell phones: All drivers are at higher risk when talking or texting; however, young drivers use cell phones more frequently than older drivers and have more difficulty handling distractions. <sup>16</sup>

Young drivers are subject to two traffic laws that apply only to them: GDL and the zero-tolerance BAC laws. Young drivers are also addressed in other sections:

- Impaired Driving
- Distracted Driving
- Motorcycle Safety

A brief summary of the 2008-2012 crash data for the MAG Planning Area involving young drivers age 25 or younger, as documented in Technical Memorandum No. 1, is listed below.

- 28% of fatal freeway crashes
- 30% of fatal non-intersection related crashes on arterials and local roads
- 39% of fatal intersection related crashes on arterials and local roads
- 38% of serious injury freeway crashes
- 36% of serious injury non-intersection related crashes on arterials and local roads
- 41% of serious injury intersection related crashes on arterials and local roads

### 3.3.5.1 Strategies

#### Education

- Explore methods of promoting or implementing Safe Driving pledge campaigns
- Explore methods of educating young road users through mass-media campaigns

\$50  Implement driver education in schools – Defer to SHSP

### 3.3.5.2 Potential Funding Sources

- NHTSA
- Local Dollars

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<sup>16</sup> NHTSA Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices Seventh Edition, 2013

### 3.3.5.3 Lead Agencies

- ❖ ADOT
- ❖ Governor's Office of Highway Safety
- ❖ MAG Member Agencies
- ❖ AAA
- ❖ DOEd

### 3.3.5.4 Performance Measures

#### Implementation progress measurement (output)

- # of tools identified
- % of young road users with signed pledges
- # or % of target population reached

#### Goal-oriented measurement (outcome)

- % or # Reduction (3-year moving average) in Serious Injury and Fatal Crashes involving drivers younger than 25
- # of Deaths and Serious Injuries involving drivers younger than 25

## 3.4 References

- FHWA Focused Approach to Safety, <http://safety.fhwa.dot.gov/fas/>
- FHWA Office of Safety Proven Safety Countermeasures, <http://safety.fhwa.dot.gov/provencountermeasures/>
- FHWA Highway Design Handbook for Older Drivers and Pedestrians, <http://www.fhwa.dot.gov/publications/research/safety/humanfac/01103/>
- NCHRP Report 500: Guidance for Implementation of the AASHTO Strategic Highway Safety Plan Transportation Research, <http://www.trb.org/Main/Blurbs/152868.aspx>
- NHTSA Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices Seventh Edition, 2013

## 4 Appendix I

# Acronyms and Definitions

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<b>A</b>	Incapacitating Injury (Serious Injury) Crash	<b>CARE</b>	(State) Children's Assistance and Resource Event
<b>AAA</b>	American Automobile Association	<b>CFR</b>	Code of Federal Regulations
<b>AARP</b>	American Association of Retired Persons	<b>CMAQ</b>	(Federal) Congestion Mitigation and Air Quality Improvement Program
<b>AASHTO</b>	American Association of State Highway and Transportation Officials	<b>CMF</b>	Crash Modification Factors
<b>ACC</b>	Arizona Corporation Commission	<b>COG</b>	Council of Governments
<b>ACN</b>	Automatic Collision Notification	<b>CRF</b>	Crash Reduction Factor
<b>ADA</b>	Americans with Disabilities Act	<b>DCR</b>	Design Concept Report
<b>ADHS</b>	Arizona Department of Health Services	<b>DOT</b>	Department of Transportation
<b>ADOT</b>	Arizona Department of Transportation	<b>DPS</b>	Department of Public Safety
<b>ADT</b>	Average Daily Traffic	<b>DRE</b>	Drug Recognition Expert
<b>ALERT</b>	Arizona Local Emergency Response Team	<b>DUI</b>	Driving Under the Influence
<b>ALISS</b>	(ADOT) Accident Location Identification Surveillance System	<b>DUID</b>	Driving Under the Influence of Drugs
<b>AMSAC</b>	Arizona Motorcycle Safety Advisory Council	<b>DWI</b>	the offense of driving while impaired by alcohol. In different States the offense may be called driving while intoxicated, driving under the influence (DUI), or other similar terms.
<b>ARS</b>	Arizona Revised Statutes	<b>EMS</b>	Emergency Medical Services
<b>ATIS</b>	Arizona Transportation Information System	<b>EVP</b>	Emergency Vehicle Preemption
<b>B/C</b>	Benefit-Cost Ratio	<b>FARS</b>	(USDOT) Fatal Analysis Reporting System
<b>BAC</b>	Blood alcohol concentration in the body, expressed in grams of alcohol per deciliter (g/dL) of blood, usually measured with a breath or blood test.	<b>FFY</b>	Federal Fiscal Year
<b>BRT</b>	Bus Rapid Transit	<b>FHWA</b>	Federal Highway Administration
<b>CAPP</b>	(State) Children are Priceless Passengers	<b>FMS</b>	(MAG) Freeway Management System
		<b>FRA</b>	Federal Rail Administration
		<b>FSP</b>	Freeway Service Patrol
		<b>FTA</b>	Federal Transit Administration



<b>FY</b>	Fiscal Year	<b>K</b>	Fatal Crash
<b>GDL</b>	Graduated driver licensing, a three-phase system for beginning drivers consisting of a learner's permit, a provisional license, and a full license. A learner's permit allows driving only while supervised by a fully licensed driver. A provisional license allows unsupervised driving under certain restrictions.	<b>LRT</b>	Light Rail Transit
<b>GHSA</b>	Governors Highway Safety Association	<b>LTAP</b>	Local Technical Assistance Program
<b>GIS</b>	Geographic Information Systems	<b>MADD</b>	Mothers Against Drunk Driving.
<b>GIS-T</b>	Geographic Information Systems for Transportation	<b>MAG</b>	Maricopa Association of Governments
<b>GOHS</b>	(Arizona) Governor's Office of Highway Safety	<b>MAP-21</b>	Moving Ahead for Progress in the 21 <sup>st</sup> Century
<b>GRIC</b>	Gila River Indian Community	<b>MEV</b>	Million Entering Vehicles (Intersection Crash Rate)
<b>GTSAC</b>	Governor's Traffic Safety Advisory Council	<b>MPO</b>	Metropolitan Planning Organization. MPOs are designated by the governor to coordinate transportation planning in an urbanized area of the state. MAG is an MPO
<b>HES</b>	(ADOT) Highway Enhancements for Safety	<b>MUTCD</b>	Manual on Uniform Traffic Control Devices
<b>HES</b>	Hazard Elimination and Safety	<b>MVD</b>	(ADOT) Motor Vehicle Division
<b>HPMS</b>	(FHWA) Highway Performance Monitoring System	<b>MVMT</b>	Million Vehicle Miles Traveled (Roadway Segment Crash Rate)
<b>HRRRP</b>	(Federal) High Risk Rural Roads Program	<b>NCHRP</b>	National Cooperative Highway Research Program
<b>HSIP</b>	Highway Safety Improvement Program	<b>NEPA</b>	(Federal) National Environmental Policy Act
<b>HSM</b>	Highway Safety Manual	<b>NHI</b>	National Highway Institute
<b>HURF</b>	(State) Highway User Revenue Fund	<b>NHPP</b>	(Federal) National Highway Performance Program
<b>Illegal per se law:</b>	A law that makes it an offense to operate a motor vehicle with a BAC at or above a specified level.	<b>NHS</b>	(Federal) National Highway System
<b>IM</b>	(Federal) Interstate Maintenance	<b>NHTS</b>	National Household Travel Survey
<b>ITS</b>	Intelligent Transportation Systems	<b>NHTSA</b>	National Highway Traffic Safety Administration
<b>JARC</b>	(Federal) Job Access and Reverse Commute Program	<b>PA</b>	Project Assessment
		<b>PAR</b>	Police Accident Report
		<b>PARA</b>	(ADOT) Planning Assistance for Rural Areas



<b>PAS</b>	Passive alcohol sensor, a device to detect alcohol presence in the air near a driver's face, used to estimate whether the driver has been drinking.	<b>SHSP</b>	(ADOT) Strategic Highway Safety Plan
<b>PBT:</b>	Preliminary breath test device, a small hand-held alcohol sensor used to estimate or measure a driver's BAC.	<b>SPR</b>	(ADOT) Statewide Planning & Research
<b>PDO</b>	Property Damage Only	<b>SRTS</b>	Safe Routes to Schools
<b>RARF</b>	(MAG) Regional Area Road Fund	<b>STIP</b>	Statewide Transportation Improvement Program
<b>RARF</b>	(State) Regional Area Road Funds	<b>STP</b>	Surface Transportation Program
<b>REACT</b>	Regional Emergency Action Team	<b>STSP</b>	(MAG) Strategic Transportation Safety Plan
<b>RESCU</b>	Remote Emergency Satellite Cellular Unit	<b>TADS</b>	(City of Phoenix) Traffic Accident Data System
<b>RHGCP</b>	Railway-Highway Grade Crossing Program	<b>TAP</b>	(Federal) Transportation Alternatives Program
<b>ROSS</b>	Regional Off-Street System	<b>TCN</b>	Traffic Counts Network
<b>RPTA</b>	Regional Public Transportation Authority (aka Valley Metro)	<b>TIP</b>	(MAG) Transportation Improvement Program
<b>RSA</b>	(FHWA) Road Safety Audit	<b>TMA</b>	(Federal) Transportation Management Areas
<b>RSA</b>	(MAG & ADOT) Road Safety Assessment	<b>TPC</b>	(MAG) Transportation Performance Committee
<b>RTP</b>	Regional Transportation Program	<b>TRACS</b>	(Federal) Transit Rail Advisory Committee for Safety
<b>RTSIMS</b>	(MAG) Regional Transportation Safety Information Management System	<b>TraCS</b>	Traffic and Criminal Software
<b>SAFETEA-LU</b>	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users	<b>TSC</b>	(MAG) Transportation Safety Committee
<b>SFST</b>	Standardized Field Sobriety Tests, a battery of three tests (One-Leg Stand, Walk-and-Turn, and Horizontal Gaze Nystagmus) used by law enforcement at the roadside to estimate whether a driver is at or above the legal limit of .08 BAC.	<b>TSSG</b>	(MAG) Transportation Safety Stakeholders Group
<b>SGR</b>	(Federal) State of Good Repair	<b>TTPSF</b>	(Federal) Tribal Transportation Program Safety Funds
<b>SHS</b>	State Highway System	<b>URL</b>	Uniform Resource Locator
		<b>USC</b>	United States Code
		<b>USDOT</b>	United States Department of Transportation
		<b>UTSM</b>	(MAG) Urban Transportation Modeling System
		<b>VMT</b>	Vehicle miles traveled

**5 Appendix II – Tabular Summary of MAG STSP Action Areas, Potential Strategies and Performance Measures**

Appendix II – Tabular Summary of MAG STSP Action Areas, Potential Strategies and Performance Measures

Action Area		Strategies	Documented Effectiveness*	Lead Agency	Implementation Progress Measure (output)	Goal-Oriented Measure (outcome)
Eliminate Impaired Driving	Enforcement	High visibility DUI saturation patrols.	HIGH	MAG Member Agencies GOHS	% or # of MAG member agencies conducting high visibility patrols targeting impaired driving in the past year.	% or # Reduction (3-Yr moving avg) in Fatal and Serious Injury Crashes involving driver impairment where the physical description one or more drivers involved in the crash indicated use of alcohol, recreational drugs, medications, or fatigue as reported by the investigating officer.
	Education	Explore methods of educating target groups for impaired driving including mass-media campaigns on DUI dangers and penalties.	MED		# or % of target population reached. # of tools identified.	
Eliminate Death and Injury from Speeding and Aggressive Driving Behavior	Enforcement	Conduct automated enforcement.	HIGH	MAG Member Agencies	# of automated enforcement cameras operating in MAG Planning Area. # or % of MAG member agencies with automated enforcement cameras. # of speeding violations recorded in the past year.	% or # Reduction (3-yr moving avg) in Fatal and Serious Injury Crashes involving speeding or aggressive driving behavior including:  # of Crashes where data entered by the reporting officer as: "speed too fast for condition" or "exceeded lawful speed".
		Officer enforcement in work zones and school zones.	HIGH		# of speeding or aggressive driving citations issued in work zones or school zones.	
	Education	Public information campaign to support enforcement programs.	MED	MAG Member Agencies GOHS ADOT	Defer to efforts of the SHSP.	# of Crashes where data entered by the reporting officer as: "speed too fast for condition" or "exceeded lawful speed" <u>AND</u> improper or excessive lane changing: failing to signal intent, failing to see that movement can be made safely, or improper passing, per ARS 28-695.

Appendix II – Tabular Summary of MAG STSP Action Areas, Potential Strategies and Performance Measures

Action Area	Strategies	Documented Effectiveness*	Lead Agency	Implementation Progress Measure (output)	Goal-Oriented Measure (outcome)	
Eliminate Death and Injury Related to Intersections	Select Improvements based on screening for high crash locations.	-	MAG Member Agencies MAG ADOT	# of MAG member agencies that identified high crash risk intersections in the past year.	% or # Reduction (3-yr moving avg) in Fatal and Serious Injury Crashes including:  # of Crashes at all intersections  # of Crashes at signalized intersections  # of Crashes at STOP controlled intersections  # of Deaths and Serious Injuries at Intersections per 100,000 population.	
	Implement systemic improvements based on identifying characteristics of high risk locations.	-		# of systemic improvements targeting intersections with high crash risk in the past year.		
	Identify new practices or standards that integrate safety into planning and design.	HIGH		# of RSA's conducted at intersections with high crash risk in the past year.		
	Implement proven design features.	HIGH		# of proven design features implemented.		
	Implement countermeasures that go beyond minimum standards (including street design or beyond MUTCD requirements)	-	MAG Member Agencies ADOT	Defer to efforts of the SHSP.		
	Enforcement	Conduct targeted enforcement of high crash locations.	HIGH	MAG Member Agencies ADOT		# of intersections equipped with automated enforcement systems.
		Automated enforcement at high crash locations.	HIGH			
	Education	Provide education related to intersection safety.	-	AAA ADOT AARP		% of representative population educated.

Appendix II – Tabular Summary of MAG STSP Action Areas, Potential Strategies and Performance Measures

Action Area	Strategies	Documented Effectiveness*	Lead Agency	Implementation Progress Measure (output)	Goal-Oriented Measure (outcome)
Eliminate Death and Injury for Vulnerable Road Users - Pedestrians, Bicyclists and Persons with Disabilities	Install pedestrian Hybrid Beacons (HAWKs).	MED**	MAG Member Agencies MAG GOHS	# of pedestrian crossing enhancements installed such as a HAWK, pedestrian crossing island, etc. (not marked crossings).	% or # Reduction (3-yr moving avg) in Fatal and Serious Injury Crashes involving a pedestrian.  # of Pedestrian Deaths and Serious Injuries. % or # Reduction (3-yr moving avg) in Serious Injury and Fatal Crashes involving a bicyclist. # of Bicyclist Deaths and Serious Injuries.
	Install medians and pedestrian crossing islands.	HIGH			
	Address safety and multimodal connectivity in planning and design.	-	MAG Member Agencies MAG ADOT	# or % of MAG member agencies that combine safety with multimodal connectivity reviews in planning and design.	
	Establish complete streets policies that integrate safety analysis and design throughout the planning process.	-	MAG Member Agencies ADOT	# or % of MAG member agencies with complete streets policies that rely on safety analysis and design.	
	Provide bicycle detection at signalized intersections.	-	MAG Member Agencies	# or % of traffic signals with bicycle detection.	
	Establish bicycle helmet laws for children.	HIGH	GOHS ADOT MAG Member Agencies	Defer to efforts of the SHSP.	
	Decrease wrong-way riding and traffic control violations by bicyclists.	-	GOHS MAG Member Agencies	# or % of MAG member agencies with bicycle wrong-way riding prohibitions	
Eliminate Death and Injury Involving Young Road Users	Explore methods of promoting or implementing Safe Driving pledge campaigns.	-	ADOT GOHS MAG Member Agencies AAA	# of tools identified. % of young road users with signed pledges.	% or # Reduction (3-yr moving avg) in Serious Injury and Fatal Crashes involving drivers younger than 25.  # of Deaths and Serious Injuries involving drivers younger than 25.
	Explore methods of educating young road users through Mass-media campaigns.	-	ADOT GOHS MAG Member Agencies	# or % of target population reached	
	Implement driver education in schools.	-	ADOT GOHS DOEd AAA	Defer to efforts of the SHSP.	

\* Effectiveness of the strategies is based on the "Countermeasures That Work" NHTSA report and the NCHRP 500 Series reports where this information was available.

\*\* Recent studies of the safety effectiveness of the HAWK or Pedestrian Hybrid Beacon have shown "HIGH" effectiveness.