

# 2016

## Safety Management System Annual Report



Curtis Road Safety Improvements – Photos by Daniel Lucero



Traffic Engineering Division  
Department of Transportation



Dear Reader:

December 28, 2017

In 2016, Pima County roadway crashes resulted in the loss of 21 people and injury to 733 more. Statewide in 2016, 962 people were lost and 56,636 were injured. Nationally in 2016, 37,461 people were lost which is the highest amount since 2007. This dreadful toll leads to considerable and avoidable pain and suffering and is a tremendous drain on both human and financial resources, as individuals, and collectively as a society.

While many of the deaths and injuries were the result of a series of unlikely and unfortunate circumstances, many could have been prevented if those involved had taken the following simple precautions:

- Used seat belts, child restraints, or helmets, as appropriate
- Not driven, rode, or walked impaired
- Driven at a reasonable speed for conditions and followed at sufficient distance to react to the unexpected
- Not engaged in distracted behavior and stayed focused on the task of driving, walking, or riding
- Crossed the street at a signal or designated crossing
- Been alert, especially when riding or walking, do not assume vehicles see you or will stop/yield for you
- Been more conspicuous, wear lighted or retroreflective and bright colored clothing or vests, use front and back bike lights both night and day!
- Been patient, not aggressive, well rested and in the right mood to drive
- Avoided driving, walking and riding at night or in unsafe weather
- Avoided unprotected left turns (right turns are typically lower risk) and other conflict laded or high risk maneuvers
- Kept the vehicle in good repair
- Purchased a vehicle with the highest safety rating, and advanced driver assist systems

Our life and well-being are a gift. It is our responsibility to protect and be accountable for this gift, not only for others but, more importantly, for ourselves as well.

Do not be selfish with your trip and time. Know that it is better to be a little late than being on time if that means you have to drive faster, push yellow lights, roll or run a stop sign that puts you at a higher risk of causing a crash that might take a life or cause injury. This self-focused behavior enhances the chances of a crash that could have very negative life changing consequences, such as the guilt of having killed or injured someone, jail time, financial setbacks or ruin, and death or lasting injury to yourself.

So, protect your life; for your sake, for the sake of those who care about you, and for the sake of those you care about. Please wear seat belts, wear a helmet, do not drive impaired, drive reasonable speeds, give yourself space, do not be distracted, cross streets at safe places, and be peaceful, patient and vigilant while driving, riding and walking. Do this and help others to do this. Lead by example, focus on the fact that the value of all life, and protecting that life, is the highest value of all.

Thank you,

Seth Chalmers, PE  
Traffic Engineering Division Manager

**Traffic Engineering Division**

**DATE:** Dec 28, 2017

**TO:** Seth W. Chalmers, PE  
Division Manager

**FROM:** William R. Strickler, PE  
Civil Engineering Manager, SMS

**SUBJECT:** Safety Management System Program 2016 Annual Report  
For Reported Crashes from January 1<sup>st</sup>, 2016 to December 31<sup>st</sup>, 2016

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Enclosed with this memo is the SMS Annual Update Report for Calendar Year 2016 data for your use. A copy of this report and the corresponding statistical tables, charts and summary tables will also be available on the Pima County Department of Transportation (PCDOT), Traffic Engineering Division (TED) website (<http://dot.pima.gov/trafeng/>).

Following the nationwide trend for the last two years, the total number of crashes increased from 2,636 in calendar year 2015 to 2,668 in calendar year 2015, an increase of 1.2%. Due to the increase in crashes and a slight reduction in the estimated County population, the per capita rate increased from 7.30 to 7.39. Also for 2016, fatal crashes in Pima County increased from 14 in 2015 to 20 in 2016, an increase of 50%. The increase in critical-injury and fatal crashes increased the critical-injury/fatal per capita rate from 0.23 to 0.26. The County crash severity index for calendar year 2016 was calculated to be 1.43, which is a slight increase from the 1.42 calculated in 2015.



William R. Strickler

## Dedication

This final SMS Annual Report is dedicated to Bob Roggenthen who was instrumental in developing the Safety Management System 15 years ago.

"May your hands always be busy,  
May your feet always be swift,  
May you have a strong foundation,  
When the winds of changes shift."

Forever Young ~ *Bob Dylan*

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List of Abbreviations, Acronyms, Initials and Symbols

<b>AASHTO</b> American Association of State Highway and Transportation Officials	<b>P/p LT</b> Protected/permitted Left turn
<b>ADOT</b> Arizona Department of Transportation	<b>PAG</b> Pima Association of Governments
<b>ADT</b> Average Daily Traffic	<b>PDO</b> Property Damage Only
<b>BI</b> Boulevard	<b>PCDOT</b> Pima County Department of Transportation
<b>CAR</b> Crash Assessment Report	<b>POLT</b> Protected Only Left Turn
<b>CIP</b> Capital Improvement Program	<b>POO</b> Project of Opportunity
<b>Cmno</b> Camino	<b>PI</b> Priority Index
<b>DOT</b> Department of Transportation	<b>RPM</b> Reflective Pavement Marker
<b>Dr</b> Drive	<b>RSA</b> Road Safety Assessment
<b>EB</b> Eastbound	<b>RTA</b> Regional Transportation Authority
<b>FHWA</b> Federal Highway Administration	<b>SB</b> Southbound
<b>FLAP</b> Federal Lands Access Program	<b>SI</b> Severity Index
<b>GOHS</b> Governor's Office of Highway Safety	<b>SMS</b> Safety Management System
<b>HAWK</b> High Intensity Activated Cross Walk	<b>SN</b> Street Name
<b>HSIP</b> Highway Safety Improvement Program	<b>SR</b> State Route
<b>HURF</b> Highway User Revenue Fund	<b>SRTS</b> Safe Routes to School
<b>I</b> Interstate, such as I-10	<b>STP</b> Surface Transportation Fund
<b>IGA</b> Inter-Governmental Agreement	<b>TAP</b> Transportation Alternative Program
<b>MPH</b> Miles per hour	<b>TAR</b> Traffic Action Request
<b>MUTCD</b> Manual on Uniform Traffic Control Devices	<b>TED</b> Traffic Engineering Division (Pima County)
<b>NB</b> Northbound	<b>TOSS</b> Traffic Operations Sign Software
<b>NTMP</b> Neighborhood Traffic Management Program	<b>WB</b> Westbound
	<b>WO</b> Work Order

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## 1. Introduction

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The purpose of the annual Safety Management System (SMS) report is to screen and evaluate the roadway system for changes in crash frequency, location or severity and then identify, evaluate and prioritize potential improvement projects based upon a ranking system. Pima County Department of Transportation (PCDOT) programs the projects for design and construction based on the priority ranking and funding availability.

PCDOT is currently developing a new crash analysis system so this document represents the final SMS report.

PCDOT provides for the safe and efficient movement of people and goods on Pima County's roadway and transportation system. The department plans, designs, constructs, maintains and operates capital transportation features consisting of roadways, bridges, drainage structures, streetlights, traffic signals, traffic signage, bicycle and pedestrian facilities and transit. The current Pima County transportation related infrastructure consists of the following:

- 2,135 miles of roadways, 1,866 paved and 269 unpaved
- 206 bridges
- 105 traffic signals
- 243 miles of bicycle routes
- 16 pedestrian HAWK crossings
- 350 bus stops



## 1.1 Safety Management System History and 2016 Goals

In 2002 after discussions with the County's attorney, PCDOT implemented the SMS program to develop potential safety related improvement projects based on a network wide crash history ranking system of intersections and roadway segments. Then this network list is narrowed down to 20 to 40 segments and intersections that were evaluated for crash assessments (CARs). Then these potential projects were subjected to a second ranking system based on crashes, project costs, volumes, etc., for future funding and construction, e.g. the "SMS Ranking List". This program also initiated the first annual SMS program reporting document dated 2002.

Each year thereafter, in addition to updating and publishing the intersection/segment ranking list, the County also publishes a project ranking list and identifies projects targeted for design and construction over the next 5 years. PCDOT processes funding requests for in house operating Highway User Funds (HURF), Pima Association of Governments Regional Transportation Authority (PAG/RTA) funding, or Federal funding including GOHS, HSIP STP and FLAP. Application for funding does not guarantee success because almost all local or federal funding programs are competitive. Projects not funded remain on the priority list but are re-ranked each subsequent year.

Pima County has a consistent history of providing safety improvement projects as far back as 1974. Pima County also had General Obligation bonds in 1974, 1980, 1985 and 1986 that targeted transportation projects. However the biggest effort came from 1974 to 2011, when a total of 124 safety projects were designed and constructed using the initial 1979 General Obligation Bond and later the 1997 HURF Revenue Bond. These bond packages provided DOT-57 Safety Funding that was specifically designated for road safety.



### SMS Goals

The Safety Management System Program Documentation Report, August 2002 defines the current SMS program. This report established five primary goals for the Pima County SMS program, which are as follows:

1. Reduce the annual number of traffic crashes per capita.
2. Reduce the annual number of critical-injury/fatal traffic crashes per capita.
3. Reduce the overall number of critical-injury and fatal crashes each year.
4. Reduce the crash severity index.
5. Promote community awareness and support for improving traffic safety.

Goals 1 through 4 are quantitative goals and goal number 5 is qualitative. PCDOT tracks the quantitative goals on a yearly basis and a 5-year rolling average basis that is less prone to variability.

### 2016 Crash statistics compared with the preceding year

In calendar year 2016, the total number of crashes decreased 4.0% from calendar year 2015, from 2,637 down to 2,544 crashes. The severity index for 2016 on unincorporated county roadways increased from 1.42 in 2015 to 1.43 in 2016. The following is a table listing the County safety goals and results for 2016 compared to 2015.

**Figure 2 - SMS Goals Status for 2016**

<b>Crashes per Capita</b>	<b>2015</b>	<b>2016</b>	<b>Change</b>	<b>Meet Goal?</b>
<i>Crashes per Capita</i>	7.30	7.07	Decrease	<b>Yes</b>
<i>Critical Injury/Fatal Crashes per Capita</i>	0.23	0.26	Increase	<b>No</b>
<i>Critical Injury/Fatal Crashes</i>	84	95	Increase	<b>No</b>
<i>Crash Severity Index</i>	1.42	1.43	Increase	<b>No</b>

The severity index is used in the Crash Statistics calculation of the Priority Index. It indicates whether an intersection or segment has a low, average, or higher than average number of severe injury crashes.

Another statistic for comparison is the percent of fatal crashes, which is simply the number of fatal crashes divided by the total number of crashes. For instance from Figure 8, Arizona statewide averaged 0.682% fatal crashes for 2016 while Pima Counties’ facilities averaged 0.750% fatal crashes.

The following is a table of the statistics for 2016. Some of the more surprising numbers are the fact that Pima County averages over 7 crashes each day and someone is injured in an average of 2 crashes each day. Alcohol continues to influence crashes, and is a factor in over 14 percent of all crashes and almost 29 percent of the fatalities.

**Figure 3 - 2016 Pima County Statistics at a Glance**

	<b>Quantity</b>	<b>Crash Rate</b>
<i>Vehicle Fatalities</i>	21	One fatality every 17.38 days
<i>Motorcycle Fatalities</i>	3	One fatality every 121.67 days
<i>Bicycle fatalities</i>	2	One fatality every 182.5 days
<i>Pedestrian fatalities</i>	2	One fatality every 182.5 days
<i>Total Traffic Crashes</i>	2,668	7.30 crashes per day
<i>Injury Crashes</i>	733	2.01 crashes per day
<i>Property Damage Only Crashes</i>	1,915	5.25 crashes per day
<i>Pedestrian fatal crashes</i>	23	8.70 percent were fatal (2)
<i>Alcohol related crashes</i>	187	14.27 percent of all crashes
<i>Alcohol related fatalities</i>	6	28.57 percent of all fatalities

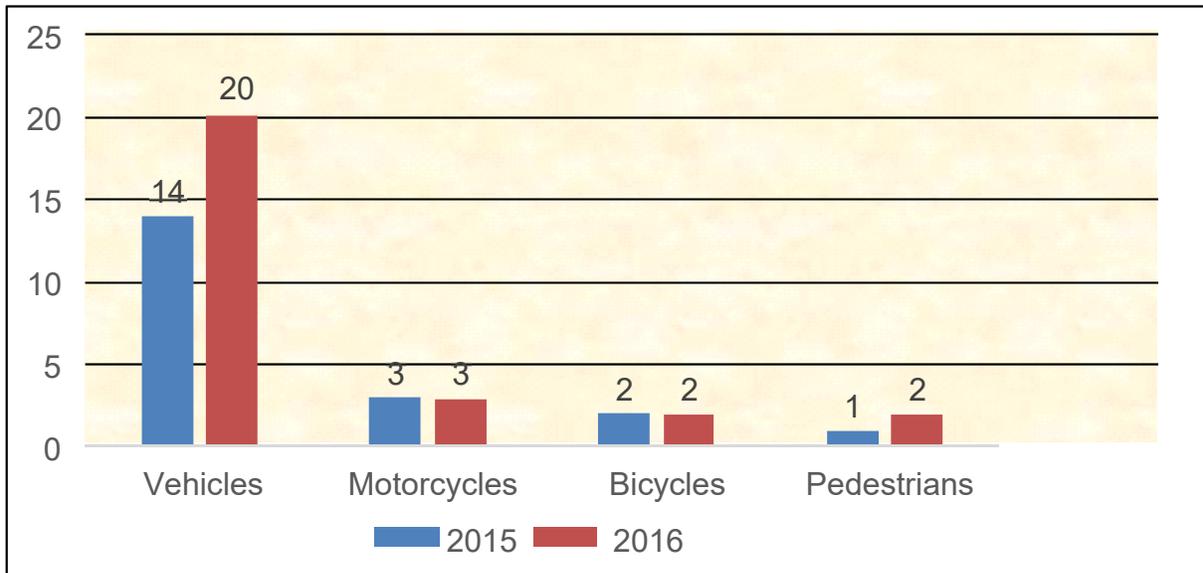
**Current Trends in Crashes**

Over the past decade, fatality statistics were consistently declining due to improvements in vehicle crash technology, an economic downturn, and programs promoting seat belt use and anti-drunk driving. Nevertheless, in the last two years, fatalities have risen dramatically across the country, states and counties. Nationwide in 2015 and 2016 substantial increases in fatalities of 8.4% and

5.6% respectively have returned the country to the 2008 fatality level. The last time the nation experienced increases of this magnitude was in 1964/1965 era.

Arizona statewide also saw increases in fatalities from 774 in 2014 to 895 in 2015 and on to 962 in 2016. These increases of 15.5% and 7.5% also brought Arizona back to the fatality levels of the 2007/2008 pre-recession era. In Pima County, results were mixed in that there was a decrease in fatalities from 16 to 14 in 2015 or a decrease of 12.5%. Unfortunately, the number of fatalities rose dramatically from 14 to 21 in 2016, which represents an increase of 50%. Figure 4, graphically shows the “spike” in vehicle related fatalities from 2015 to 2016.

**Figure 4 - 2016 and 2015 Pima County Fatal Crashes by Transportation Mode**



**Figure 5 - Nationwide/State/Pima County 2016 Fatality Increases from 2015**

	<i>Nationwide</i>	<i>Arizona</i>	<i>Pima County</i>
<i>Fatalities</i>	37,461 Up 5.6%	962 Up 7.25%	21 Up 50%

The recent increases in national fatalities are generally attributed to our burgeoning economy, which promotes additional driving for work as well as personal trips. Especially with regards to younger drivers (less than 37 years of age). Other factors often cited as affecting crash rates are increases in distracted driving, speeding and alcohol abuse.

An analysis is shown below in Figure 6, which compares the fatalities per 100,000 people for the nation, Arizona and Pima County for the past 15 years. Historically the data shows that while Arizona has higher than the national rate for fatalities, Pima County has consistently shown less than the national average. This figure also shows the recent increases in fatalities for the nation and for Arizona starting in 2014. The upward trend for Pima County actually started a year later in 2015.

**Figure 6 - Nationwide/State/Pima County Fatalities per 100k People**

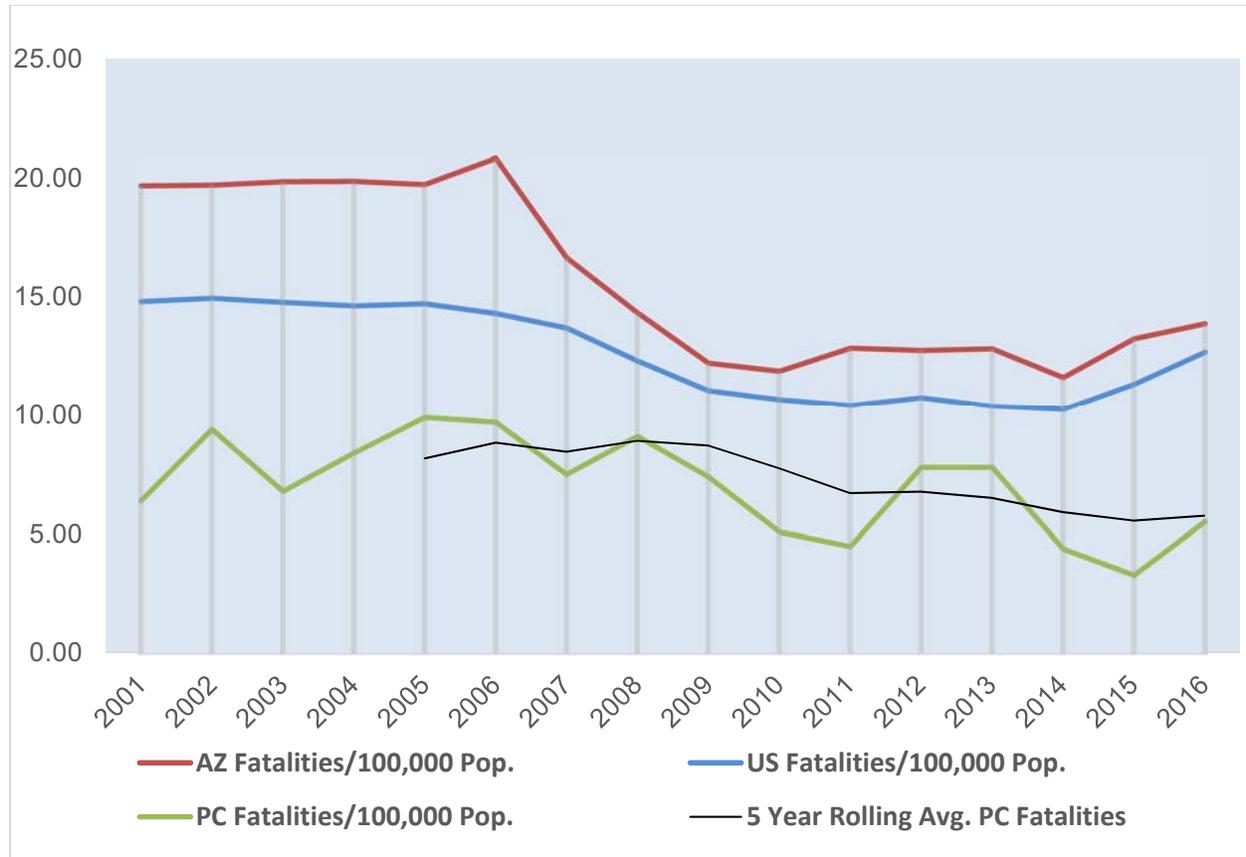
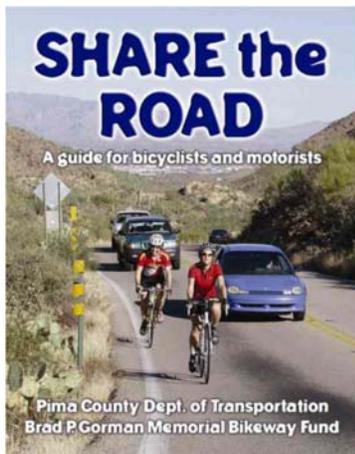


Figure 7 shows the current crash data as compared to previous years. In the 2015 SMS Report many of these crash categories were plotted with data from the last 15 years to show the upward or downward trends. The 5-year rolling averages are computed to smooth the data by removing some of the variation in crash data frequency. In general, all the trend lines are of a decreasing nature except for the recent increases in crashes and fatalities.



In the next to the last line in Figure 7 below, the number of bicycle involved crashes has risen from 34 in 2014 to 42 in 2015 to 54 in 2016. Overall this represents an increase of 59% since 2014. Pima County positions itself as a major national bicycle destination with facilities such as “the Loop” and bike sharing programs, and multiple bicycle events. It is anticipated the County will continue its dedication to the many bicycle/vehicle interaction education programs to provide the best bicycle environment possible.

**Bicycle & Pedestrian Program**  
 (520) 724-BIKE (2453)

**Figure 7 - Safety Statistics for Single Year and Five-Year "Rolling Averages"**

<i>Measures of Effectiveness Data</i>	Single Year					Five-Year "Rolling Averages"				
	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
<i>Total Number of Crashes</i>	2,990	2,843	2,508	2,636	2,668	3,251	3,064	2,924	2,776	2,729
<i>Population (Unincorporated Pima county)</i>	356,881	358,172	362,067	361,023	361,000	359,056	357,869	357,093	358,620	359,829
<b><i>Crashes per Capita (Crashes per 1,000 people)</i></b>	8.38	7.94	6.93	7.30	<b>7.39</b>	9.05	8.56	8.19	7.74	7.59
<b><i>Critical Injury and Fatal Crashes (class 4/5)</i></b>	123	121	105	84	<b>102</b>	129	121	114	108	107
<b><i>Critical Injury and Fatal Crashes per Capita (per 1,000 people)</i></b>	0.345	0.338	0.290	0.233	<b>0.283</b>	0.360	0.338	0.319	0.302	0.298
<i>Total Number of Fatality Crashes (class 5)</i>	28	28	16	14	20	24	23	21	20	21
<i>Fatal Crashes per Capita (per 1,000 people)</i>	0.078	0.078	0.044	0.039	0.055	0.068	0.065	0.059	0.057	0.059
<b><i>Number of Actual Fatalities</i></b>	28	30	16	14	<b>21</b>	25	24	22	21	22
<i>Number of Injury Crashes (class 4, 3, 2)</i>	830	837	754	777	733	932	880	839	810	786
<b><i>Severity Index</i></b>	1.44	1.47	1.47	1.42	<b>1.43</b>	1.45	1.45	1.44	1.45	1.44
<i>Fatal Crashes per 100,000 people</i>	7.85	7.82	4.42	3.88	5.54	6.78	6.53	5.94	5.69	5.90
<i>Fatal Crashes, Involving a Teen Driver</i>	3	3	1	3	4	3	2	2	3	3
<i>Fatal Crashes, Drug/Alcohol Involved</i>	12	14	3	7	6	8	9	8	8	8
<i>Fatal Crashes, with no belt use</i>	10	14	6	5	5	8	9	9	8	8
<i>Fatal Crashes, Excessive Speeding</i>	3	2	3	1	3	4	2	2	2	2
<i>All Crashes, Drug/Alcohol Involved</i>	221	228	158	203	187	228	221	209	208	199
<i>All Crashes, Signal Running</i>	105	99	94	107	110	112	110	103	100	103
<i>All Crashes, Stop Sign running</i>	51	45	41	58	64	68	64	59	55	52
<i>All Crashes, Excessive Speeding Involved</i>	51	49	55	39	43	68	53	52	49	47
<i>All Crashes, Pedestrian Involved *</i>	25	44	38	40	23	32	34	34	35	34
<i>Pedestrian Fatal Crashes</i>	4	6	4	1	2	3	4	4	4	3
<i>All Crashes, Motorcycle Involved</i>	108	123	94	77	80	127	122	111	102	96
<i>Motorcycle Fatal Crashes</i>	6	5	2	3	3	7	6	5	4	4
<i>Motorcycle Fatal Crashes, no helmet</i>	1	2	2	3	1	4	3	2	2	2
<i>All Crashes, Bicycle Involved</i>	41	58	34	42	54	50	50	46	44	46
<i>Bicycle Fatal Crashes</i>	0	3	0	2	2	1	1	1	1	1

\* NOTE: Pedestrian crashes were updated from 2010 to 2014 with data entry revisions.

Common crash types and their counts for 2016 are shown in Figure 8. The percentages for 2016 are very close to the percentages shown in the 2015 SMS Report. For unsignalized intersections the prevalent crash type is an angle crash between two vehicles with one of the drivers failing to yield properly. For signalized intersections the prevailing crash type is the rear-end collision

where one vehicle fails to stop and runs into the back of another vehicle. This crash may include extenuating factors such as unexpected slow or long queues, speeding, and/or distracted driving. Rural and urban roadway crashes are predominantly lane departure crashes that are also caused by speeding, distracted driving and other types of driver error. As depicted in the pie chart, rural and urban segment crashes account for over half (53%) of the crashes in Pima County.

**Figure 8 - Intersection and Segment Crash Counts in Pima County 2016**

Unsignalized Intersections

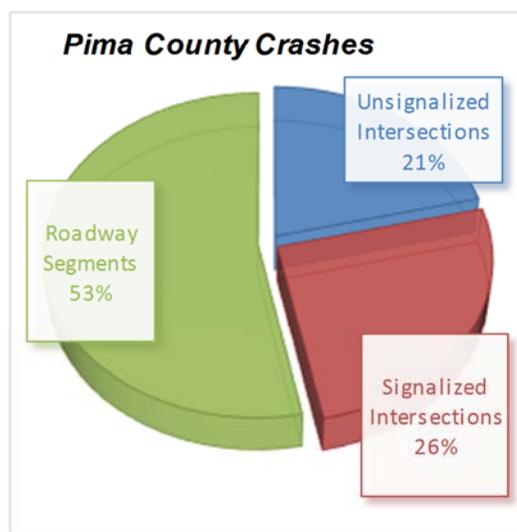
Type of Crash	Count	Percent
Angle	258	48%
Rear End	125	23%
Fixed Object	42	8%
Misc	63	12%
Turning	37	7%
Out of Control	6	1%
Backing	6	1%
Head-on	1	0%
	538	100%

Signalized Intersections

Type of Crash	Count	Percent
Rear End	376	58%
Turning	115	18%
Angle	72	11%
Misc	68	10%
Fixed Object	9	1%
Backing	4	1%
Out of Control	5	1%
Head-on	4	1%
	653	100%

Rural and Urban Segments

Type of Crash	Count	Percent	Total
Lane Departure*	490		36%
Fixed Object*	252	18%	
Side Swipe*	79	6%	
Out of Control*	144	11%	
Head-on*	15	1%	
Rear End	390		29%
Misc	303		22%
Angle	107		8%
Turning	39		3%
Backing	22		2%
	1351		100%



\*Lane departure total crashes include Fixed Object, Side Swipe, Out of Control and Head-on categories.

Arizona DOT publishes an annual review of the statewide crashes the latest being the “Arizona Motor Vehicle Crash Facts 2016.” In Figure 9 the 2016 crash data for Pima County is compared to the 2016 statewide crash data. Even though Arizona had 126,845 crashes compared to 2,668 for Pima County the percent of fatal crashes is higher in the county, 0.75% compared to 0.682% for the state. This is understandable because the state calculations include the Interstate freeways, which have the lowest crash rates. Much of the data shown in figure 9 was plotted in the SMS report for 2015, for the previous 15 years. At a glance it is obvious that Injury crashes and number of injured columns have decreased dramatically from the year 2000 levels.

**Figure 9 - Pima County Crashes Compared to Arizona State Wide Crashes**

Pima County Crashes							
Year	Total Crashes	Fatal Crashes	% Fatal Crashes	Number of Fatalities	Injury Crashes	Number of Injured	Property Damage Crashes
2000	3,509	23	0.655	24	1,337	2,179	2,149
2001	3,740	20	0.535	21	1,327	2,047	2,393
2002	3,704	30	0.810	32	1,210	1,854	2,464
2003	4,008	22	0.549	28	1,240	1,875	2,746
2004	4,261	28	0.657	31	1,345	1,984	2,888
2005	4,131	34	0.823	39	1,264	1,894	2,833
2006	3,987	34	0.853	37	1,236	1,906	2,717
2007	4,029	27	0.670	31	1,252	1,818	2,750
2008	3,776	33	0.874	34	1,097	1,674	2,646
2009	3,211	27	0.841	27	960	1,371	2,222
2010	3,375	18	0.533	18	922	1,270	2,432
2011	2,903	16	0.551	16	850	1,275	2,036
2012	2,990	28	0.936	28	830	1,171	2,131
2013	2,843	28	0.985	30	837	1,129	1,981
2014	2,508	16	0.638	16	754	1,031	1,739
2015	2,637	14	0.531	14	780	1,139	1,845
<b>2016</b>	<b>2,668</b>	<b>20</b>	<b>0.750</b>	<b>21</b>	<b>733</b>	<b>1,010</b>	<b>1,915</b>

Arizona Statewide Crashes							
Year	Total Crashes	Fatal Crashes	% Fatal Crashes	Number of Fatalities	Injury Crashes	Number of Injured	Property Damage Crashes
2000	131,368	891	0.678	1,036	47,485	76,626	82,992
2001	131,573	934	0.710	1,047	46,150	73,962	84,489
2002	134,228	984	0.733	1,132	46,209	74,230	87,045
2003	130,895	971	0.742	1,118	45,177	71,901	84,747
2004	138,899	998	0.719	1,159	46,789	73,693	91,120
2005	140,574	1,049	0.746	1,193	45,526	71,053	93,699
2006	143,043	1,125	0.786	1,300	45,271	69,814	96,699
2007	141,092	952	0.675	1,071	43,530	66,015	96,610
2008	119,588	842	0.704	937	37,180	56,009	81,566
2009	107,149	709	0.662	806	33,506	50,809	72,934
2010	106,895	695	0.650	759	33,416	50,459	72,784
2011	103,945	756	0.727	827	33,220	49,849	69,969
2012	103,909	738	0.710	821	33,576	50,057	69,595
2013	107,348	777	0.724	844	34,047	50,284	72,524
2014	109,554	708	0.646	774	34,451	50,890	74,395
2015	116,609	811	0.695	895	36,139	53,554	79,659
<b>2016</b>	<b>126,845</b>	<b>865</b>	<b>0.682</b>	<b>962</b>	<b>38,544</b>	<b>56,636</b>	<b>87,436</b>

## 1.2 Purpose of the Annual Report

Each year, the SMS section with a significant input from Studies and Data, within the Traffic Engineering Division (TED) produces the SMS Annual Update Report (the report contained within) to:

- Briefly summarize the SMS program
- List the preceding years crashes and related statistics
- Describe the SMS work performed in the preceding calendar year
- Plan SMS work for the next fiscal year and the future

Through the systematic collection and analysis of county-related crash data, the SMS Program Annual Update Report aids in identifying the following factors:

- Information needed for safety analysis
- High-crash locations and system-wide crash types
- Significant crash patterns and generally related causes and potential countermeasures
- Standard values for service life, capitol recovery factors, costs, and effectiveness

### Data Retrieval

The SMS program systematically uses data collected by the TED Studies and Data group to prioritize safety improvements to target available and potential funding to implement safety projects. The crash data is the basis for all the SMS intersection and segment studies and Project Priority Ranking, and comes directly from the Pima County Sheriff's Department Crash Reports.

## 1.3 Scope of the Annual Report

Pima County DOT primarily receives Sheriff's Department crash records for the unincorporated areas of the County; therefore, the crash data for the following jurisdictions is not included in this report:

- City of Tucson
- City of South Tucson
- Marana
- Oro Valley
- Sahuarita

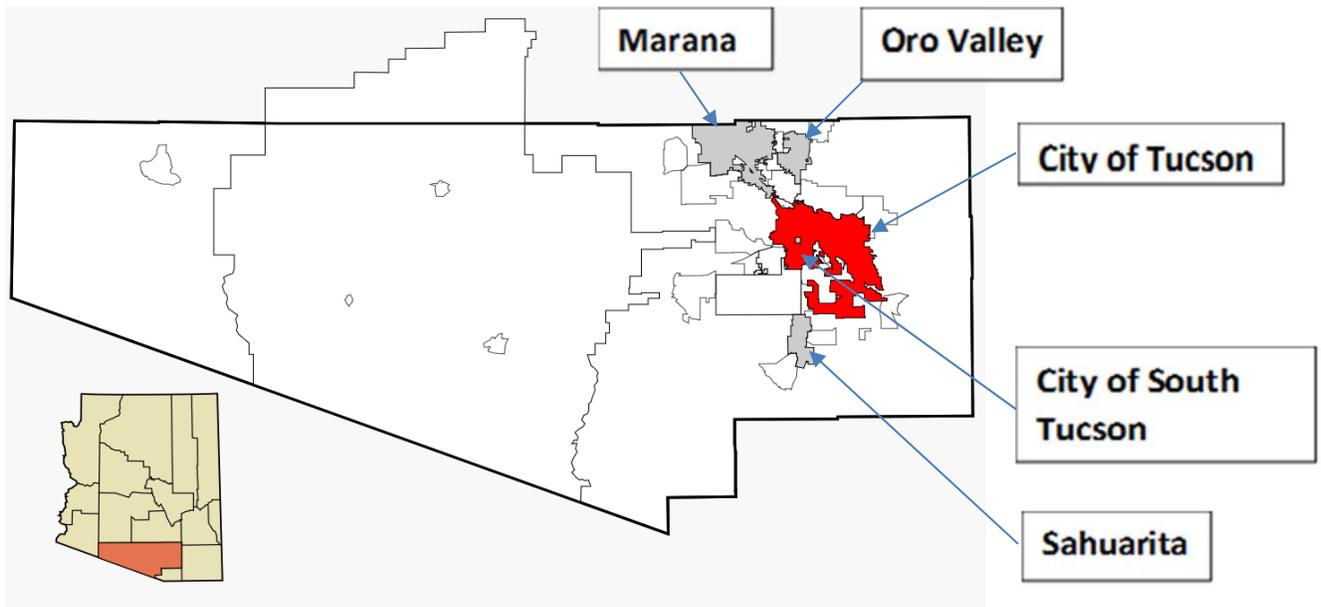
Throughout this report, references to Pima County shall be construed as "Unincorporated" Pima County. For a comprehensive crash analysis of the entire county, please contact the Pima Association of Governments, (PAG) or the Arizona Department of Transportation (ADOT).

Below is a list of some of the routes where the crash data is also not included in Unincorporated Pima County Crash data:

- State Routes including, SR77, SR83, SR85, SR86, SR386, SR 286, and Interstates I-10 & I-19, and their frontage roads,
- Privately owned roads,
- Commercially owned roads, such as mining facilities,
- Tohono O'odhan Nation Roads or Pascua Yaqui Tribe Roads not maintained by Pima County,

- Some roads in the Saguaro National Park and other federal owned refuges and national monuments. However PCDOT maintains various routes under IGA's or permits with these entities.

**Figure 10 - Five areas of Incorporated Pima County not included in this report**



Pima County is the second most populated county in Arizona with 362,067 residents in the unincorporated area and Pima County DOT manages and operates nearly 2,200 miles of roadways, 104 signalized intersections and 10,026 unsignalized intersections

**1.4 Additional SMS Services**



Special Event – El Tour de Tucson

TED works on a variety of traffic and transportation-related issues, many of which stem from requests from the Pima County Board of Supervisors, citizens, other Pima County departments, and other agencies. Many of these requests require data collection and analysis, handled by the Studies Data Section. The Signal, Sign, or Marking Shop handles service and maintenance requests, depending on the nature of the request. In 2016, TED handled 1,216 requests. These are broken down in the following way:

- 655 general maintenance items
  - 406 signing and striping maintenance requests
  - 249 electrical and signal issues reported
- 561 traffic study and safety concerns including:
  - crash and safety studies
  - traffic signal warrant studies, including left-turn phasing and roundabout studies

- Neighborhood Traffic Management Program (NTMP)
  - data requests
  - signing/striping reviews/needs studies
  - miscellaneous study requests
  - development services, right-of-way and private development reviews
- 67 special event permits

These requests resulted in the following:

- Over 1,700 maintenance work orders for repair of existing installations/facilities including:
  - hundreds of work orders for recommended improvements based on traffic study/review
  - dozens of safety project proposals:
    - projects for installation of traffic signals or roundabouts
    - projects for roadway widening (two-way left-turn lanes and paved shoulders)

Most of the data and analysis represented by this report is due to the direct output of the Studies and Data Section. All of these efforts have resulted in a positive impact on the operations and maintenance of the Pima County roads. Although it is difficult to actually measure or quantify these direct impacts on safety individually, collectively they represent an overall effort in prevention.



## 2. 2016 Projects

### 2.1 Started or Completed Safety Projects 2016

Multiple safety projects were started, completed or on going in 2016 and are described in the figure below. The Capital Improvement Program (CIP) projects are included in the table because their effects on safety are also studied.

**Figure 11 - Safety Management Projects Started or Completed in 2016**

<b>Project Description</b>	<b>Scope</b>	<b>Progress</b>
<b>Projects of Opportunity (POO)</b>		
<i>Anklam Road</i>	Constructed Safety Shoulders and Guardrail	Construction Complete
<i>Avra Valley, I-10 to Airport Road</i>	Constructed Safety Shoulders	Construction Complete
<i>Nogalas @ Airpark Blvd.</i>	Median Left turn Lane	Complete
<b>Governor's Office of Highway Safety (GOHS)</b>		
<i>Mission Road and Alvernon Way</i>	Speed Feedback Signs	Installation Completed
<b>Regional Transportation Authority (RTA)</b>		
<i>Flashing Beacons Phase I</i>	Miscellaneous locations identified by Studies	Complete
<i>Manzanita Elementary School Safe Routes to School (SRTS)</i>	Two 5' wide pedestrian paths along North Campbell Ave.	Complete
<b>DOT 57</b>		
<i>Los Reales at Mission Road</i>	Median, lighting, mumble strips	Complete
<i>Motor Pullouts and Concrete Median Modifications</i>	Construct Motor Patrol pullouts for County Sheriff's Dept.	Complete
<i>Accessible Pedestrian Signals</i>	ADA Improvements	Complete
<i>Sign Post Upgrades</i>	Replace County sign posts with square breakaway posts	Ongoing
<i>Flowing Wells Wabash</i>	Install HAWK	Complete
<i>Palo Verde at Columbia</i>	Bus Pullout	Complete
<i>Palo Verde at Alvernon</i>	Bicycle Pathway Connection	Complete
<i>I-19 West Frontage Road</i>	Solar Lights and Beacons	Complete
<i>Julian Wash Guardrail</i>	Install Guardrail	Complete
<b>Highway Safety Improvement Program (HSIP)</b>		
<i>Sign Inventory and Panel Replacement</i>	Eligibility Requested	Started

<i>Durable Pavement Markings Program</i>	Eligibility Requested	Started
<i>Cactus Forest at Old Spanish Trail</i>	Left Turn Lane	Started
<b>Capital Improvement Program (CIP)</b>		
<i>Tanque Verde Road at Emily Gray JHS Hawk</i>	Install HAWK	Construction Complete
<i>Elephant Head Road Bridge Reconstruction</i>	Bridge Rehabilitation	Construction Complete
<i>Manzanita Elementary School Bicycle and Pedestrian Improvement Project</i>	Detached pathway and drainage	Construction Complete
<i>Bowes RD at Vallarta (Sabino High School) HAWK</i>	Install HAWK	Construction Complete
<i>Palo Verde Road at Milton and Alvord HAWKS</i>	Install HAWK	Construction Complete
<i>Valencia Road: Mark Road to Wade Road</i>	2.5 miles of Urban Roadway with Signals	Construction Complete
<i>Harrison Rd Bike Lanes</i>	1.9 miles of 6 foot Bicycle Lanes	Construction Complete
<i>Colossal Cave Roadway Improvements</i>	0.9 miles of Roadway Reconstruction	Started
<i>Sunset Road – Silverbell Road to I-10</i>	3-lane Roadway with bridge over the Santa Cruz River	Started
<i>Camino de la Tierra/Rillito River Path Improvement Project</i>	Bike/Pedestrian Bridge over Camino de la Tierra	Started



Manzanita Elementary School Bicycle and Pedestrian Improvement Project

### 3. Crash Assessment Reports (CARs)

#### 3.1 2016 Crash Assessment Reports and Recommendations

Crash Assessment Reports (CARs) are a key component of the Pima County Safety Management System process. In 2017, the Studies and Data Section completed CARs for 8 intersections and 8 segments utilizing the 2016 crash data. These CARs and the associated recommendations are summarized in Figure 12 below. TED uses these assessments to develop future projects

**Figure 12 - 2016 Crash Assessment Summary**

*Unsignalized Intersections*

<i>Camino De Oeste at El Camino Del Cerro</i>	
<b>Crash History</b>	Five Year Crash History (Jan. 1, 2012 to Dec. 31, 2016) there were 9 crashes. All 9 crashes occurred in the daylight. 8 crashes occurred during the weekdays. (89%) 5 vehicles crashed while making turn movements.
<b>Recommendations</b>	Intersection sight distance studies (most recent 6/22/2017) were conducted previously, safety improvements to upgrade the sheeting of the 25 MPH plaque, install advance Street Name (SN) plaque, and upsize the SN plaque are in progress. Change the existing Side Road (W2-2) warning signs to an Offset Side Roads warning sign (W2-7R). Install the missing 25 MPH pavement marking for the southbound approach.
<b>Follow-up</b>	In progress.

*La Cholla Bl at Wetmore Road*

**Crash History**

Five year Crash History (Jan 1, 2012 to Dec. 31, 2016) there were 16 crashes.  
 No reported alcohol related crashes  
 1 crash involved a pedestrian, but there were no injuries  
 2 Rear end crashes  
 10 crashes involved an eastbound driver, (63%)  
 No crashes occurred at night

**Recommendations**

Upsize the EB stop sign to 36 inch and add EB "Stop Ahead" sign like the WB has.

**Follow-up**

In progress.

*Magee Road at Oldfather Drive*

**Crash History**

Five Year Crash History (Jan. 1, 2012 to Dec. 31, 2016) there were 14 crashes.  
 5 crashes occurred at night (36%)  
 10 angle crashes, 3 rear-end crashes and 1 side swipe  
 7 crashes failed to yield or stop (50%)  
 1 crash involved rear ending a motorcycle

**Recommendations**

Relocate the EB Stop Ahead sign to approximately 300 ft. ahead of the stop signs. Refresh the pavement markings (long lines and stop lines) at the intersection. Consider flashing beacons to supplement the stop signs.

**Follow-up**

In progress.

*Rudasill Road at Sandario Road*

**Crash History**

Five Year Crash History (Jan 1, 2012 to Dec. 31, 2016) there were 7 crashes.  
 2 NB rear-ends (29%)  
 2 crashes failure to stop (29%)  
 1 crash occurred at night (14%)  
 2 crashes involved speeding

**Recommendations**

With only 1 or 2 crashes per year, no significant crash patterns were noted. The recent installation of flashing beacons will require more time to determine their effectiveness. No specific recommendations at this time.

**Follow-up**

In progress.

*Signalized Intersections*

*Campbell Avenue at Skyline Drive*

**Crash History**

Five Year Crash History (Jan 1, 2012 to Dec. 31, 2016) there were 70 crashes.  
 There were 51 rear-end crashes (73%)  
 16 EB rear-end crashes (23% of total) and 25 WB rear-end crashes (36% of total)  
 13 crashes occurred at night (19%)  
 Speeding was cited in 39 crashes (56%)

**Recommendations**

Recommend evaluating the signal timing to determine if the westbound green or yellow should be increased.

**Follow-up**

In progress.

*Cardinal Avenue at Valencia Road*

**Crash History**

Five Year Crash History (Jan 1, 2012 to Dec. 31, 2016) there were 140 crashes.  
 There were 82 rear-end crashes (59%)  
 Drivers were cited for speeding in 69 crashes (49%)  
 Pedestrians were involved in 2 crashes and a cactus was involved in 1 crash  
 46 crashes occurred at night and 9 occurred at dusk  
 29 crashes occurred on a Saturday

**Recommendations**

Reconstruct and restripe left turn lanes to provide a positive off-set to improve sight distance. Install retroreflective borders on the signal backplates for additional visibility. Restripe and reinstall RPMs per the current standards. Clear vegetation from the drainage channel in the NW corner of the intersection. Also in the NW quadrant reconstruct about 40 feet of sidewalk that slopes towards the drainage channel as this is not ADA compliant.

**Follow-up**

In progress.

*Craycroft Road at River Road*

**Crash History**

Five Year Crash History (Jan. 1, 2012 to Dec. 31, 2016) there were 45 crashes.  
 20 crashes were rear-ends, the predominate crash type (44%)  
 13 crashes occurred with turning vehicles, (29%)  
 35 crashes occurred during daylight conditions (78%)  
 17 crashes involved speed too fast for conditions (38%)  
 12 crashes involved a failure to stop (27%)

**Recommendations**

From recent studies change the existing P/pLT control to POLT control for NB and SB traffic supplemented with a "LEADING LEFT TURN ARROW" signs and "LEFT ON GREEN ARROW ONLY" signs. Install Signal Ahead signs with Street Name plaque (River Road) for NB and SB. Refer to SMS for the feasibility of installing Signal Ahead signs with Street Ahead signs with Street Name plaque (River Road) and flashing beacons for NB and SB.

**Follow-up**

In progress.

*Overton Road at Shannon Road*

**Crash History**

Five Year Crash History (Jan. 1, 2012 to Dec. 31, 2016) there were 30 crashes.  
 2 reported alcohol related crashes  
 9 rear-end crashes, 7 of those were WB  
 10 crashes drivers were cited for running the red light, 7 of these crashes occurred between 3:26 pm and 5:58 pm, possibly due to sun in their eyes.  
 5 crashes occurred at night  
 Speeding was cited in 12 crashes (40%)

**Recommendations**

Recommend adding red light enforcement by the Sheriff's Department. The suggested time could possibly be Tuesdays, from 3:15 pm to 3:45 pm and from 5:30 pm to 6:00 pm.  
 Add anti-glare plates to signal heads and flashing beacons to Advance Signal Ahead sign.

**Follow-up**

In progress.

*Low Volume Roadway Segments (< 10,000 VPD)*

*General Hitchcock Highway: MP 16 to 20*

**Crash History**

Five Year Crash History (Jan. 1, 2012 to Dec. 31, 2016) there were 30 crashes.  
 8 Crashes involved Motorcycles (27%)  
 Bicycles were involved in 4 crashes (13%), the single fatality was a bicyclist.  
 Failure to negotiate a curve was a factor in 18 crashes (60%)  
 Animals were involved in 3 crashes (10%)  
 8 crashes occurred at night (27%) and 0 occurred at dusk  
 25 crashes were lane departures (83%)  
 24 crashes involved "Speed too fast for conditions" or exceeded the lawful speed (80%)

**Recommendations**

Review curve signing throughout the segment, ball-bank curves and redesign signing/stripping in accordance with the MUTCD. Install thermoplastic striping and an 8-inch outside white line with vertical edge delineators. Review guardrail installations for proper end treatments and height, install guardrail reflectors.

**Follow-up**

In progress.

*General Hitchcock Highway: MP 20 to 24*

**Crash History**

Five Year Crash History (Jan. 1, 2012 to Dec. 31, 2016) there were 34 crashes.

10 Crashes involved Motorcycles (29%)

Failure to negotiate a curve was a factor in n 20 crashes (59%)

Animals were involved in 3 crashes (9%)

11 crashes occurred at night and 1 occurred at dusk

28 crashes were lane departures (82%)

28 crashes involved "Speed to fast for conditions" (82%)

**Recommendations**

Review curve signing throughout the segment, ball-bank curves and redesign signing/stripping in accordance with the MUTCD. Install thermoplastic striping and an 8 inch outside white line with vertical edge delineators. Review guardrail for proper end treatments and height, install guardrail reflectors. Install radar speed feedback signs to address the crash clusters at MP 21.0 and 22.0.

**Follow-up**

In progress.

*Sandario Road: Rudasill Road to Picture Rocks Road*

**Crash History**

Five Year Crash History (Jan. 1, 2012 to Dec. 31, 2016) there were 10 crashes.

1 reported crash related to alcohol

3 rear end crashes, 3 NB and 1 SB

3 crashes occurred at night

5 crashes involved a NB vehicle and 5 crashes involved a SB vehicle

4 crashes occurred between 3:40 pm and 4:35 pm.

Speeding too fast for conditions contributed to 5 crashes (50%)

**Recommendations**

No recommendations at this time.

**Follow-up**

None required

*Wetmore Road: Highway Drive to La Cholla Bl*

**Crash History**

Five Year Crash History (Jan. 1, 2012 to Dec. 31, 2016) there were 8 crashes.  
 No reported Alcohol related crashes  
 2 rear-end crashes, both westbound  
 1 crash occurred at night  
 2 crashes involved speed too fast for conditions  
 7 of the 8 crashes (88%) involved a WB vehicle

**Recommendations**

No recommendations at this time.

**Follow-up**

None Required.

*High Volume Roadway Segments (> 10,000 VPD)*

*Cardinal Avenue: Valencia Road to Bilby Road*

**Crash History**

Five Year Crash History (Jan. 1, 2012 to Dec. 31, 2016) there were 30 crashes  
 Intersection Crashes, Capistrano 6, San Paulus 2, Century Dr. 2, Cmno Oro Blanco 2, Cmno Bueno 1.  
 17 Crashes occurred along the corridor, 9 Rear end crashes - 7 NB and 2 SB.  
 11 Crashes occurred at night, 18 during the day and 1 at dusk.  
 25 Crashes involved two or more vehicles.  
 1 Crash involved a pedestrian in the roadway (not in sidewalk).  
 Excessive speed was cited in 11 crashes, Failure to Yield was cited in 9 crashes.

**Recommendations**

The pedestrian crash was influenced by the lack of street lighting. Check the illumination warrants to determine if additional lighting is required at Capistrano intersection (50% of the crashes were either in the dark or at dusk) or continuous corridor lighting. Coordinate with homeowner to remove vegetation from SE corner of Capistrano and Cardinal intersection to improve sight distance. Refresh striping along Cardinal Ave.

**Follow-up**

In progress.

*Palo Verde Road: Ajo Way to 44<sup>th</sup> Street*

**Crash History**

Five Year Crash History (Jan. 1, 2012 to Dec. 31, 2016) there were 39 crashes. Crashes have escalated from 4 in 2012 and 2013, to 12 in 2015 and 11 in 2016.  
 14 Crashes were rear-ends (36%)  
 14 Crashes involved "speed too fast for conditions" (36%)  
 13 Crashes occurred at the Broadmont intersection (33%), of these 13 crashes, 11 involved speed too fast for conditions, (85%).  
 2 Crashes occurred at night (5%)

**Recommendations**

Palo Verde crashes have escalated from 4 in 2012 and 2013, to 12 in 2015 and 11 in 2016. From the field review the project area was recently resurfaced and has freshly painted striping. To address speeding at Broadmount intersection (11 out of 13 crashes involved speeding) install advance signal signing with flashing beacons on NB Palo Verde. The long term goal would be to construct raised median in the existing TWLTL from the raised median 500 ft., North of Ajo Way to the raised median 700 ft. North of 44<sup>th</sup> St.

**Follow-up**

In progress.

*Mission Road: Drexel Road to Irvington Road*

**Crash History**

Five Year Crash History (Jan. 1, 2012 to Dec. 31, 2016) there were 55 crashes.  
 7 crashes involved alcohol (13%)  
 5 crashes were rear-ends (9%)  
 10 crashes occurred at night (18%)  
 14 crashes occurred south of Holladay Street (25%)  
 Excessive speed was involved in 11 crashes (20%)

**Recommendations**

Recommend extending the raised median to Drexel Road. Also, recommend modifications to the SB drop-lane signing and striping to account for the bicycle lane.

**Follow-up**

In progress.

### *Skyline Drive: Campbell Avenue to Sunrise Drive*

#### Crash History

Five Year Crash History (Jan. 1, 2012 to Dec. 31, 2016) there were 23 crashes.

1 Alcohol related crash

11 rear-end crashes (48%)

6 crashes occurred at night (26%)

2 crashes involved bicycles

13 crashes involved speed too fast for conditions (57%)

3 crashes involved motorcycles (13%)

#### Recommendations

Speed humps were installed two years ago to alert drivers to bicycles. There are no additional recommendations at this time.

#### Follow-up

None required.

### **Safety Project Priority List**

Due to the upcoming transition to a new crash analysis system that will replace our current SMS process, a Project Priority List was not developed for 2016.

