



Arizona Safety HSIP Countermeasures

October 25, 2018

Tim Jordan

State Custodian of Crash Records

Overview

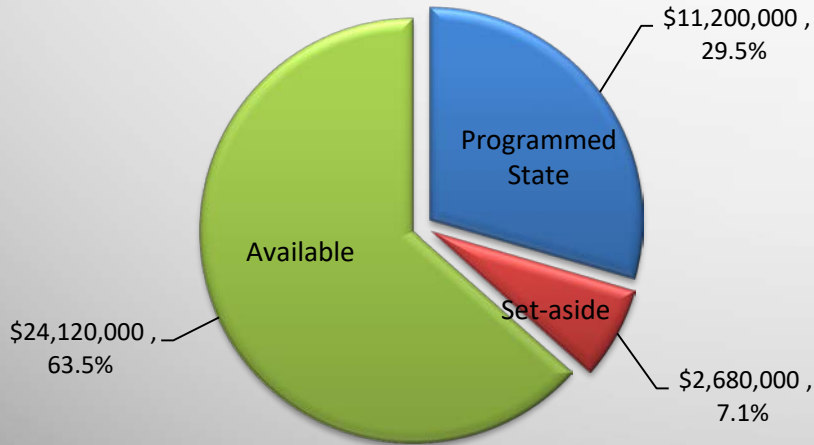
- ADOT's HSIP Statewide call for projects
- Safety HSIP Countermeasures

Statewide Call for Projects

- January 2018 was the Call For Projects – FY 21 & FY 22
- Jan to May – Applications reviewed and accepted
 - Use most recent 5 years of crash data
 - Benefit to Cost Ratio (B/C Ratio) has to be ≥ 1.5
 - Countermeasure has to correct/impact type of crashes
 - Minimum project cost of \$250,000

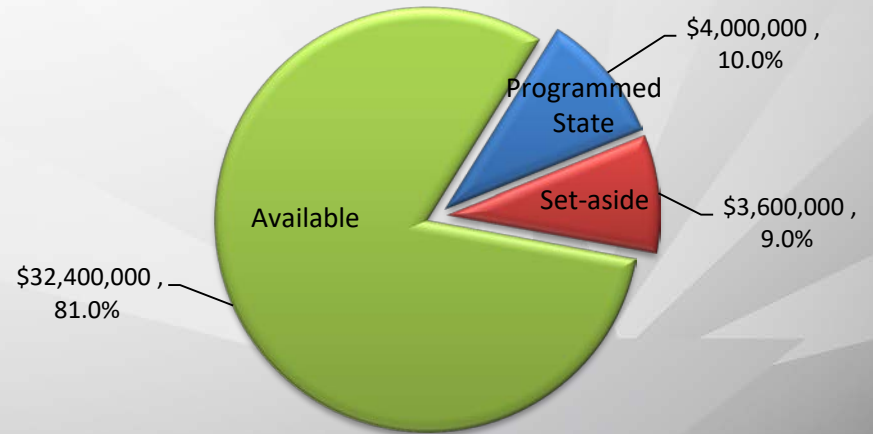
Breakout of Total HSIP Funding on January 2018

FY21



\$ 32 million

FY22



\$ 40 million

Ranking Criteria

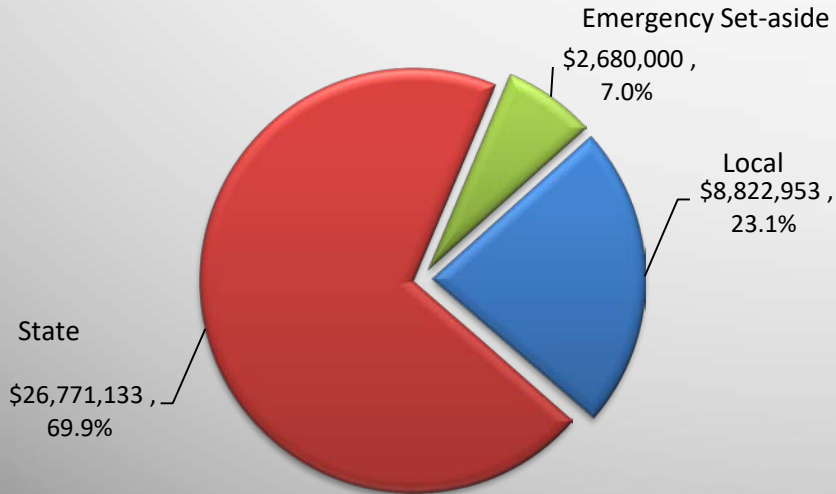
- Overall list based on the Benefit to Cost ratio (B/C Ratio) of each project
- Systemic projects limited to 20% of available HSIP funding by SFY

Statewide Call for Projects Results

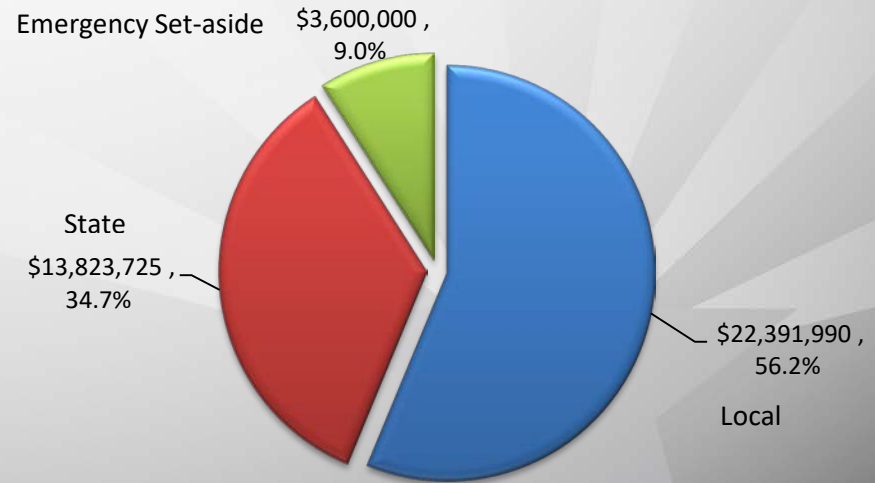
- Total Applications Submitted = 62
- Total Applications Funded = 47
- FY21 Funded = 7 of which 3 were systemic
- FY22 Funded = 40 of which 4 were systemic
- Average Project Cost = \$1,285,000
- Benefit to Cost Ratio (B/C Ratio) Range = 3.9 to 56.5
- Number of projects= 31 Local vs 16 State

Total HSIP Funding Programmed

SFY21



SFY22



Funded Projects vs Crash Types

Crash Type	Funded		5 – Year Crash History
Lane/Roadway Departure	43.3%	vs	33.2%
Intersection Related	14.4%	vs	42.1%
Pedestrian	20.0%	vs	12.3%
Speed	10.9%		
Wrong Way	9.6%	vs	0.2%
Non- Infrastructure	1.8%		
Other			12.2%

Countermeasures

- Lane/Roadway Departure:
 - Edgeline and centerline rumble strips
 - Shoulder widening
 - Tree removal
 - High Friction Surface Treatment (HFST)
 - Horizontal Curve Warning Signs



Longitudinal Rumble Strips and Stripes

SAFETY BENEFITS:

Center Line Rumble Strips
44-64%

Head-on, opposite-direction, and sideswipe fatal and injury crashes

Shoulder Rumble Strips
13-51%

Single vehicle, run-off-road fatal and injury crashes

Source: NCHRP Report 641, *Guidance for the Design and Application of Shoulder and Centerline Rumble Strips.*



Countermeasures

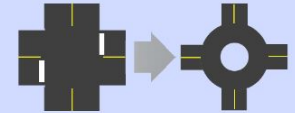
- Intersection Related

- Traffic signal
- Roundabout
- Left turn lanes and positive offset
- Right turn lanes
- Raised median
- Lighting



Roundabouts

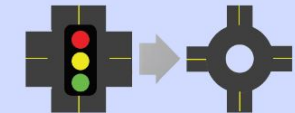
Two-Way Stop-Controlled Intersection to a Roundabout



82%

Reduction in severe crashes

Signalized Intersection to a Roundabout



78%

Reduction in severe crashes

Source: Highway Safety Manual

Countermeasures

- Pedestrian
 - Pedestrian Hybrid Beacon
 - Lighting
 - Raised median



Medians and Pedestrian Crossing Islands in Urban and Suburban Areas



Median and pedestrian crossing islands near a roundabout.

Source: www.pedbikemages.org / Dan Burden

SAFETY BENEFITS:

Raised Median
46%

Reduction in pedestrian crashes

Pedestrian Crossing Island
56%

Reduction in pedestrian crashes

Source: *Desktop Reference for Crash Reduction Factors, FHWA-SA-08-011, September 2008, Table 11.*



Pedestrian Hybrid Beacons

Safety Benefits:

69%

Reduction in pedestrian crashes

29%

Reduction in total crashes

15%

Reduction in serious injury and fatal crashes



Countermeasures

- Speed
- Wrong Way
- Non- Infrastructure
 - (RSA, Safety Analyst, TRaCS)
- Other

<https://safety.fhwa.dot.gov/provencountermeasures/>



Road Safety Audits

A road safety audit is a proactive formal safety performance examination of an existing or future road or intersection by an independent and multi-disciplinary team.

SAFETY BENEFIT:

10-60%

Reduction in total crashes

Source: Road Safety Audits: An Evaluation of RSA Programs and Projects, FHWA-SA-12-037; and FHWA Road Safety Audit Guidelines, FHWA-SA-06-06.



B/C Ratio KABCO Crash Costs

In the past Call for Projects, ADOT has used the following crash unit costs in the B/C ratio analysis:

K = \$5,800,000

A = \$400,000

In January 2018, FHWA released their Crash Costs for Highway Safety Analysis Guide and Tool. Chapter 6 discusses in detail how to calculate the State-Adjusted Crash Costs. The Crash Cost Spreadsheet Tool provides for an easy to use calculator to determine the State-adjusted KABCO crash unit costs from the national Maximum Abbreviated Injury Scale (MAIS) person-injury unit costs.

B/C Ratio KABCO Crash Costs

Based on the most recent 5 year average of crash severities, the below KABCO unit costs were calculated for Arizona.

Severity	Economic Unit Cost	QALY Unit Cost	Comprehensive Unit Cost
K	\$1,437,932	\$8,077,438	\$9,515,371
A	\$109,815	\$440,684	\$550,499
B	\$41,304	\$107,828	\$149,132
C	\$35,361	\$67,784	\$103,145
O	\$10,680	\$0	\$10,680

Since Arizona only uses K & A in their B/C Ratio Analysis, we experienced a 62% increase in total unit costs (\$10,065,870 vs \$6,200,000); therefore, we will increase the minimum B/C ratio from ≥ 1.5 to ≥ 2.5 in the next Call for Projects.

Thank You!

Traffic Safety Section:

Kerry Wilcoxon, P.E., PTOE

Kwilcoxon@azdot.gov

602-712-2060

Mona Aglan-Swick, P.E.

Maglan-swick@azdot.gov

602-712-7374

Larry Talley

Ltalley@azdot.gov

602-712-7709