MAG Process for Programming FY2010 Highway Safety Improvement Program (HSIP) Funds

The process outlined here was developed by a Working Group of the MAG Transportation Safety Committee. The Group was asked to develop a process to identify a list of safety improvement projects that could be used to program $1 million in federal HSIP funds that ADOT has been suballocated to MAG. The Working Group focused on developing an expedited process for identifying a list of projects for FY 2010, that could be recommended by MAG to ADOT, by the June 1 , 2010, deadline that was recently announced by ADOT. The Working Group has recommended that a process for programming projects for future program years (FY2011 and beyond) be developed soon, as a separate effort, shortly after FY2010 has been programmed.

The Working Group agreed that the 3-month window for developing a recommendation was too short to develop larger projects such as corridor safety improvements that may be identified through the network screening process. The Group has recommended that MAG should program ONLY three types of projects for FY 2010, that are focused on low cost system-wide safety improvements at signalized intersections. The three project categories eligible for FY2010 HSIP funding are:

Category 1: Upgrading of Pedestrian WALK/DON'T WALK signals to Pedestrian Countdown Signals

Category 2: Upgrading existing 8-inch signal heads to 12-inch LED signal heads

Category 3: Installation of additional 12-inch signal heads if an existing Mast Arm can accommodate (complies with 2009 MUTCD) – could include conversion of signal heads at the intersection to LEDs

Draft applications for each project category are included in Appendix A. The draft application format will be reviewed and approved by the MAG Transportation Safety Committee on March 23, 2010. Shorty, thereafter, a Call for Projects will be announced by MAG.

In keeping FHWA and ADOT guidelines, all proposed projects will be required to demonstrate a Benefit/Cost ratio that exceeds 1.0. Proposed projects will be selected for programming purely on technical merit with projects with the highest B/C ratio ranking at the top of the list of projects that will compete for available federal funding.

Data Requirements for Determining the B/C Ratio for Proposed Projects

Data needed for the determination of B/C ratio:

A. List of Intersections for each type of planned improvement – provide cross street names.
B. Category 1 projects: For the years 2006, 2007 and 2008: the number of pedestrian crashes by injury severity for each of the intersections where countdown signal heads are proposed.
C. Category 2 or 3 projects: For the years 2006, 2007 and 2008: the number of crashes by injury severity at each of the intersections where new signal heads will be installed.

MAG will provide an Excel-based Project Application Form that will have the ability to determine the B/C ratio for each proposed project. If any MAG Member agencies require assistance in determining the crash statistics mentioned above for the period 2006-2008, MAG staff will utilize the ALISS database at

MAG to extract the required statistics. Due to the short time frame available all such requests must be sent via email to Leo Luo (lluo@mag.maricopa.gov) by March 31, 2010.

Project application forms, this document and additional information will be made available via the MAG website under Resources at: http://www.mag.maricopa.gov/committee.cms?item=3836

The following data will be provided by MAG:

- Increase/Reduction in annual maintenance and operating cost
- Crash Modification Factors (CMFs) by Project Type -- CMF is a factor $0 < CMF < 1.0$

  Number of crashes after safety improvement = CMF x number of crashes before

The following data will need to be provided by member agency based on past experiences

- Unit Cost of Item for Procurement
- Unit Cost of Labor for Installation by Project Type
- Number of Units

Benefit Cost Analysis Methodology

Annualized Project Cost C = (Total cost to procure and install each pedestrian countdown or 12-inch signal head)/Life cycle of device in years + Increase in annual maintenance cost + Increase in annual operating cost

Project Benefit B = ∑Annual reduction in crash costs due to installation at each intersections + Reduction in annual maintenance cost + Reduction in annual operating cost

Benefit at an intersection ($) = (1-CMF) (Avg annual crash cost at the intersection)
= (1-CMF) {(K-severity/yr)(K-cost)+(A-severity/yr)(A-cost)+
(B-severity/yr)(B-cost) + (C-severity/yr)(C-cost) + (O-severity/yr)(O-cost)}

K-severity, A-severity etc. refers to the average annual number of crashes of different severities that have occurred at the intersection using the KABCO injury scale: K-killed, A-Incapacitating, B-Non-Incapacitating, C-Possible Injury, O-No injury

Benefit/Cost = B/C

As shown above annual project benefit will be estimated based on monetary value of expected safety improvements/crash reduction at the locations where the installations will occur. That will be calculated based on the application of Crash Modification Factors to crashes that are relevant for each type of safety improvement (The CMFs will be provided in the application) against the average annual crash experience at each specific intersection (based on ALISS crash data for 2006, 2007 and 2008). If requested, MAG will provide assistance to member agencies in obtaining historical crash data for the relevant intersections.

The attached Tables 1 & 2 show a Crash Summary Statement that includes crash numbers pertinent to your jurisdiction. These crash statistics may help you identify safety improvement projects that can effectively compete for the available funds. For example, if your agency is proposing a project to install pedestrian countdown heads, but your pedestrian crash numbers for 2006-2008 show few or lower severity pedestrian crashes at the proposed intersections, your application will show a small B-C ratio and therefore ranked lower in comparison to other competing applications.

If you have any questions regarding this process or about the applications please contact Sarath Joshua or Leo Luo at (602) 254-6300.

Planned Schedule for Programming MAG Allocation of FY2010 HSIP funding:

- March 23, 2010 - MAG Transportation Safety Committee will review and recommend the application.
- March 24, 2010 - MAG Call for Projects with applications due to MAG on April 9, 2010 by noon.
- April 9, 2010, Noon - Receive applications and summarize.
- April 20, 2010, 10:00 AM– Special meeting of the Safety Committee to rank projects and take action to recommend project list.
- April 29, 2010 - MAG TRC meeting review and recommendation.
- May 12, 2010 – MAG Management Committee review and recommendation.
- May 26, 2010 – MAG Regional Council approves the list of projects for FY 2010.
- May 27, 2010 – MAG recommendation to ADOT.

MAG action will also result in a FY 2010 TIP amendment to incorporate the recommended projects.

Table-1: Pedestrian Crashes by Injury Severity at Signalized Intersections by Jurisdiction: (Reference for Project 1)

Jurisdiction	Year	C Possible Injury	B Non-Incapacitating Injury	A Incapacitating Injury	K Fatal Crash
Avondale	2006	1	0	0	0
Avondale	2007	0	1	2	0
Avondale	2008	0	1	0	0
Chandler	2006	4	0	1	0
Chandler	2007	2	7	2	0
Chandler	2008	2	4	1	0
Gilbert	2006	3	0	0	0
Gilbert	2007	0	6	2	0
Gilbert	2008	1	6	1	0
Glendale	2006	15	7	4	1
Glendale	2007	7	7	6	1
Glendale	2008	9	1	4	0
Goodyear	2006	2	0	0	0
Goodyear	2007	2	0	0	0
Goodyear	2008	0	1	0	0
Maricopa County	2006	0	1	0	0
Maricopa County	2007	1	3	1	1
Maricopa County	2008	0	0	1	0
Mesa	2006	14	15	2	0
Mesa	2007	14	15	5	1
Mesa	2008	4	20	5	2
Paradise Valley	2008	0	0	1	0
Peoria	2006	1	2	0	0
Peoria	2007	1	2	1	0
Peoria	2008	1	2	0	0
Phoenix	2006	25	75	27	4
Phoenix	2007	47	77	35	5
Phoenix	2008	53	86	30	6
Scottsdale	2006	2	14	3	1
Scottsdale	2007	10	10	3	2
Scottsdale	2008	2	11	4	0
Surprise	2006	0	0	0	1
Surprise	2008	1	0	0	0
Tempe	2006	13	16	10	0
Tempe	2007	9	13	12	0
Tempe	2008	10	11	7	2
Tolleson	2006	0	1	0	0

Table-2: All Crashes by Injury Severity at Signalized Intersections by Jurisdiction (Reference for Project 2&3):

Jurisdiction	Year	O PDO	C Possible Injury	B Non-Incapacitating Injury	A Incapacitating Injury	K Fatal Crash
Apache Junction	2006	80	31	11	3	0
Apache Junction	2007	64	19	10	4	0
Apache Junction	2008	54	16	12	4	0
Avondale	2006	189	38	21	6	1
Avondale	2007	211	43	31	15	1
Avondale	2008	187	34	22	26	0
Buckeye	2006	8	2	1	1	0
Buckeye	2007	3	3	0	1	0
Buckeye	2008	23	7	3	2	0
Carefree	2006	1	0	0	0	0
Carefree	2007	0	1	1	0	0
Cave Creek	2006	8	3	4	0	0
Cave Creek	2007	17	2	0	0	0
Cave Creek	2008	10	2	4	0	0
Chandler	2006	1,096	298	137	31	4
Chandler	2007	1,104	287	191	45	1
Chandler	2008	922	251	131	27	2
El Mirage	2006	42	14	8	0	0
El Mirage	2007	52	20	7	2	0
El Mirage	2008	56	15	7	1	0
Fountain Hills	2006	20	2	5	0	0
Fountain Hills	2007	21	3	4	0	0
Fountain Hills	2008	27	6	6	0	0
Gila Bend	2006	1	0	0	0	0
Gila Bend	2007	1	1	0	0	0
Gilbert	2006	527	172	112	16	2
Gilbert	2007	594	137	123	31	1
Gilbert	2008	610	134	110	29	3
Glendale	2006	1,191	367	189	35	6
Glendale	2007	1,189	415	193	52	5
Glendale	2008	1,071	307	135	29	4
Goodyear	2006	151	35	24	4	0
Goodyear	2007	134	29	19	3	0
Goodyear	2008	150	44	17	7	0
Guadalupe	2006	31	5	5	2	0
Guadalupe	2007	47	9	6	0	0
Guadalupe	2008	38	3	8	0	0

Jurisdiction	Year	O PDO	C Possible Injury	B Non-Incapacitating Injury	A Incapacitating Injury	K Fatal Crash
Litchfield Park	2006	11	5	5	2	1
Litchfield Park	2007	14	6	2	0	0
Litchfield Park	2008	17	9	3	1	0
Maricopa County	2006	682	210	157	43	10
Maricopa County	2007	777	228	146	40	11
Maricopa County	2008	655	175	124	38	4
Mesa	2006	2,198	613	342	125	15
Mesa	2007	1,979	516	336	91	8
Mesa	2008	1,443	428	242	88	10
Paradise Valley	2006	41	13	13	1	0
Paradise Valley	2007	64	20	4	4	1
Paradise Valley	2008	58	9	11	3	0
Peoria	2006	498	137	94	28	4
Peoria	2007	592	125	96	43	4
Peoria	2008	536	146	77	27	1
Phoenix	2006	6,405	2,326	1,542	399	42
Phoenix	2007	6,187	2,155	1,373	351	34
Phoenix	2008	5,033	1,871	1,119	309	30
Queen Creek	2006	2	0	0	0	0
Queen Creek	2007	17	5	2	1	0
Queen Creek	2008	15	5	8	1	0
Scottsdale	2006	1,229	317	326	75	10
Scottsdale	2007	1,151	299	271	63	7
Scottsdale	2008	963	254	226	47	4
Surprise	2006	176	50	25	12	3
Surprise	2007	227	60	52	10	4
Surprise	2008	222	56	40	8	1
Tempe	2006	1,353	420	263	67	5
Tempe	2007	1,198	342	231	77	4
Tempe	2008	1,032	262	173	45	2
Tolleson	2006	82	28	14	3	1
Tolleson	2007	110	32	15	7	0
Tolleson	2008	86	16	20	3	1
Wickenburg	2006	7	2	0	1	0
Wickenburg	2007	6	1	1	0	0
Wickenburg	2008	9	3	0	0	1
Youngtown	2006	0	0	1	0	0
Youngtown	2007	1	1	0	0	0

SAMPLE APPLICATIONS

List of Intersections for Pedestrian Countdown Signals

	Pedestrian Crashes 2006 -2008			
Intersections	Possible Injury Crashes	Non-Incapacitating Injury Crashes	Incapacitating Injury Crashes	Fatal Crashes
Intersection1	1	2	2	
Intersection2	1	2	2	1
Intersection3	1	2	2	1
Intersection4	1	2	2	1

Cost to Benefit Analysis to Replace Existing WALK / DON'T WALK Signals with Pedestrian Countdown Signal Heads

	Possible Injury Crashes	Non-Incapacitating Injury Crashes	Incapacitating Injury Crashes	Fatal Crashes
Total Number of Pedestrian Crashes (2006-2008)	4	8	8	3

Pedestrian Countdown Signals

Benefits Per Year:	
Crash Modification Factor(CMF)	**0.48**
Benefits	
Reduction in Crashes	$3,710,720
Reduction in Maintainance Cost	$0
Reduction in Operating Cost	$0
Total Benefit($Value)	**$3,710,720**

Costs:	
Number of Heads	**500**
Cost of Procurement per Head	**$200**
Cost of Installation per Head	**$100**
Life of the Head	**10**
Capital Cost:	
Procurement	$100,000
Installation Cost	$50,000
Annualized Capital Cost	$15,000
Increase in Annual Maintainance Cost:	$0
Increase in Annual Operating Cost:	$0
Total Cost per Year($Value)	**$15,000**

Benefit/ Cost Ratio	**247.38**

Agency Match(Min 5.7%)		**$3,000**	**OK**
HSIP Funds Request		**$40,000**	
Total Funds for the Project		**$43,000**	**OK**

Note: Only the Cells in **RED** can be updated

List of Intersections Upgrading existing 8-inch signal heads to 12-inch LED signal heads

	2006 -2008				
Intersections	PDO Crashes	Possible Injury Crashes	Non-Incapacitating Injury Crashes	Incapacitating Injury Crashes	Fatal Crashes
Intersection1	1	2	2		1
Intersection2	1	2	2	1	
Intersection3	1	2	2	1	
Intersection4	1	2	2	1	

Cost to Benefit Analysis to Upgrade Existing 8-inch Signal Heads to 12-inch LED Signal Heads

	PDO Crashes	Possible Injury Crashes	Non-Incapacitating	Incapacitating Injury Crashes	Fatal Crashes
Total Number of Crashes (2006-2008)	4	8	8	3	1

12" LED Signal Heads

Benefits Per Year:	
Crash Modification Factor(CMF)	**0.9**
Benefits	
Reduction in Crashes	$265,867
Reduction in Maintainance Cost	$10
Reduction in Operating Cost	$25
Total Benefit($Value)	**$265,902**

Costs:	
Number of Heads	**1**
Cost of Procurement per Head	**$200**
Cost of Installation per Head	**$100**
Life of the Head	**10**
Capital Cost:	
Procurement	$200
Installation Cost	$100
Annualized Capital Cost	$30
Increase in Annual Maintainance Cost:	
Increase in Annual Operating Cost:	
Total Cost per Year($Value)	**$30**

Benefit/ Cost Ratio	**8,863.39**

Agency Match(Min 5.7%)	**$25,000**	**OK**
HSIP Funds Request	**$250,000**	
Total Funds for the Project	**$275,000**	**Value Exceeds Capital Costs Used in Calculations**

Note: Only the Cells in **RED** can be updated

List of Intersections for Installation of Additional 12-inch Signal Heads (complies with 2009 MUTCD) – Also Include Conversion of Signal Heads at the Intersection to LEDs

	2006 -2008				
Intersections	PDO Crashes	Possible Injury Crashes	Non-Incapacitating Injury Crashes	Incapacitating Injury Crashes	Fatal Crashes
Intersection1	1	2	2		1
Intersection2	1	2	2	1	
Intersection3	1	2	2	1	1
Intersection4	1	2	2	1	1
					1
			g		

Cost to Benefit Analysis to Installation of Additional 12-inch Signal Heads (complies with 2009 MUTCD) – Also Include Conversion of Signal Heads at the Intersection to LEDs

	PDO Crashes	Possible Injury Crashes	Non-Incapacitating	Incapacitating Injury Crashes	Fatal Crashes
Total Number of Crashes (2006-2008)	4	8	8	3	4

Additional Signal Heads

Benefits Per Year:	
Crash Modification Factor(CMF)	**0.83**
Benefits	
Reduction in Crashes	$1,437,973
Reduction in Maintainance Cost	
Reduction in Operating Cost	
Total Benefit($Value)	**$1,437,973**

Costs:	
Number of Heads	**1**
Cost of Procurement per Head	**$200**
Cost of Installation per Head	**$100**
Life of the Head	**10**
Capital Cost:	
Procurement	$200
Installation Cost	$100
Annualized Capital Cost	$30
Increase in Annual Maintainance Cost:	$45
Increase in Annual Operating Cost:	$26
Total Cost per Year($Value)	**$101**

Benefit/ Cost Ratio	**14,193.79**

Agency Match(Min 5.7%)		**$3,000**	**OK**
HSIP Funds Request		**$40,000**	
Total Funds for the Project		**$43,000**	**Value Exceeds Capital Costs Used in Calculations**

Note: Only the Cells in **RED** can be updated

Crash Severity	$ Value
Fatal Crash(K)	$5,800,000
Incapacitating (A)	$400,000
Non-Incapacitating (B)	$80,000
Possible Injury (C)	$42,000
PDO (O)	$4,000
Unknown	$4,000