



October 17, 2017

Ms. Mona Aglan-Swick, P.E.
Transportation Systems Management & Operations, Traffic Safety
Arizona Department of Transportation
1615 W. Jackson ST., MD 065R
Phoenix, AZ 85007-3217

RE: Highway Safety Improvement Program (HSIP) Project Determination and Application

COG/MPO: MAG

Agency: City of Glendale

Project Name: Install FYA and Geometric Modifications to Improve Safety at Arterial Intersections

Project Location: As a systemic project, the City chose all arterial to arterial intersections within the city (45). Phase 1 included the 12 highest left-turn accident intersections based on MAG ranking. Phase 2 includes 12 intersections that require signal head replacements to be completed by the City of Glendale. Phase 3 includes the remaining 21 arterial to arterial intersections not included in Phases 1 and 2. The approval of the systemic safety improvements provided that Phase 1 and Phase 3 design and Phase 1 construction were funded with FY2016 HSIP monies. This application is for HSIP funding for the construction of Phase 3 using updated systemic crash data.

Dear Ms. Aglan-Swick:

The City of Glendale is submitting herewith a project application for local Highway Safety Improvement Program (HSIP) funding. This road safety improvement project was identified through the state network crash data screening process and meets all requirements of Title 23. The proposed request is for systemic improvements at all arterial to arterial intersections within the City of Glendale. This includes changing the left-turn phasing from either permissive, protected, or protected/permissive phasing to flashing yellow arrow (FYA) protected/permissive phasing, improving left-turn lane offset to create a positive offset, and adding three inch yellow retroreflective sheeting to signal backplates for twenty-one (21) signalized intersections in Glendale, Arizona and does not include any non-infrastructure funding request. Implementation of FYA operation, creating positive left-turn offsets, and installing three inch yellow retroreflective sheeting on the signal backplates are viable countermeasures for improving the safety of 21 arterial to arterial intersection locations within the City of Glendale. Each of those countermeasures are rated as three or four star. FYA operation has proven to enhance safety for left-turn operation because it is easier for drivers to understand and it is considered a safer condition than the circular green ball (i.e., FHWA suggests that if drivers are unsure, they will yield, rather than with a green ball, where drivers tend to assume the right-of-way). Creating a positive offset will give left-turning vehicles better sight distance, and retroreflective sheeting gives the signal better visibility and captures the driver's attention. This systemic project will be conducted in three phases.

Phase 1 encompasses the 12 highest intersection accidents as determined by the 2009-2016 MAG rankings (2009-2013) and was approved as a part of the systemic improvement for FY2016 HSIP funding with design completed in FY2016 and construction scheduled for FY2018.

Phase 2 will include 12 intersections to be completed in-house by the City of Glendale forces and will not incur preliminary design or ADOT Administration fees. Costs for Phase 2 have been included in the B/C calculations.

Phase 3 includes the remaining 21 intersections improvements needed to complete the systematic improvements noted above. The design of both Phase 1 and Phase 3, as well as the construction of Phase 1 were approved for FY 2016 HSIP funding, which is has/will be designed by a consultant and will be constructed by a contractor. This application is for HSIP funding for Phase 3 construction, which will be performed by a contractor.

RE: Highway Safety Improvement Program (HSIP) Project Determination and Application

COG/MPO: MAG

Agency: City of Glendale

During the most recent five year period ending in 2015, the city experienced 3 fatal and 38 incapacitating intersection related left-turn crashes at arterial - arterial intersections city wide. The ADOT approved Combined Crash Reduction Factor of (CRF) of 58.0% is calculated based on CRF of 19.4% for converting left-turn signal operation from permissive, protected, or protected/permissive to flashing yellow arrow (FYA) protected/permissive, a CRF of 38.0% for improving left-turn lane offset to create a positive offset, and a CRF of 15.0% for adding a three inch yellow retroreflective sheeting to signal backplates. All CMF's were obtained from the Crash Modification Clearinghouse, are 4/5 Star and pre-approved by ADOT prior to application submission. Using the combined CMF for left-turn intersection crashes, the City could see a five year reduction of 2 fatal and 22 serious injury left-turn crashes.

The City of Glendale has determined that, in accordance with 23 USC 148(a)(4)(A), this project is consistent with the MAG and State's 2014 SHSP. It supports ADOT's *Roadway Infrastructure and Operations* emphasis area (EA) (Intersections) and MAG's action area (AA), *Eliminate Death and Injuries Related to Intersections*.

B/C Ratio = 5.70

Weighted HSIP Score = 148.20

The City of Glendale has estimated the total cost for the design and construction of the City-Wide Flashing Yellow Arrow improvement project to cost \$4,374,207.55, with the cost of Phase 3 to be \$2,406,102.58. Of that Phase 3 cost amount, the design was funded by the FY2016 HSIP monies and local matching funds. The remaining cost to construct Phase 3 is \$2,251,626.76. Of which, ADOT is asked to determine if \$2,234,784.51. is HSIP eligible with \$16,842.21 being the local match. Design of all three phases of the systematic improvement are in progress. The city of Glendale has programmed local funds to complete Phase 2, which will be done in-house by the City for a cost of \$244,326.23. Phase 1, which obtained FY2016 HSIP funding and is in design, has an estimated total design and construction cost of \$1,320,000.00. In accordance with Title 23, the Federal share for the requested HSIP requested safety improvement items are eligible to be funded at 100% Federal share for the traffic signal related work and 94.3% Federal share for the geometric improvements per 23 U.S.C. 120(c) as described in Code of Federal Register 23 CFR Part 924. The retroreflective sheeting is either 100% or 94.3% Federal share depending upon the backplate being new (100%) or existing to remain (94.3%).

The City of Glendale is aware that, if funded, additional HSIP funds above the attached estimated cost are not available to pay for excess costs and that other funds, whether STP, local or other will have to be provided or secured by the City of Glendale to cover the additional costs or the project will have to be withdrawn and resubmitted in the next call-for-projects.

The City of Glendale agrees to conduct and provide to ADOT TSS on a yearly basis a written before-and-after study utilizing the same crash data included in the countermeasure influence area in order to determine the effectiveness of the countermeasure on fatal and serious injury crashes.

The City of Glendale further understands that Federal funds can only be used once to install or upgrade either a spot or systemic countermeasure and that once installed, the City of Glendale will maintain the countermeasure at or above the standard to which it was installed.

If you have any questions, please contact me at 623-251-1071 or email TEbersole@glendaleaz.com.

Sincerely,



Trevor Ebersole, Director, Transportation Department
City of Glendale, Arizona
6210 W. Myrtle Avenue, Ste 112
Glendale, Arizona 85301

Attachments: Application (excel format) to include cost estimate, vicinity map and/or list of locations
2015 FYA Study
B/C Ratio and Crash Data
ADOT 2015 Eligibility Letter

ADOT HIGHWAY SAFETY IMPROVEMENT PROGRAM APPLICATION

Agency:	City of Glendale	Title of Project:	Install FYA and Geometric Modifications to Improve Safety at Arterial Intersections
County:	Maricopa	COG/MPO:	MAG
District:	Central	HSIP Funds:	<input type="checkbox"/> STATE <input checked="" type="checkbox"/> LOCAL
Contact:		Phone:	E-Mail:
Kiran Guntupalli		623-930-2951	kguntupalli@glendaleaz.com
Type of Safety Improvement:	Spot: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	Systemic: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
Mark all that apply to your project: <input type="checkbox"/> Design <input checked="" type="checkbox"/> Const. <input type="checkbox"/> Procurement <input type="checkbox"/> Non-Infrastructure			
Anticipated Total Cost Estimate:	\$4,374,207.55		for Phases 1-3
Anticipated dollar amount of HSIP Funding:	\$2,786,865.93		for Phase 3 Constuct.
Anticipated Dollar amount of Local Match (5.7%) (5.66%):	\$23,015.39		for Phase 3 Constuct.
Anticipated Dollar amount of Other:	\$244,326.23		for Phase 2
Funding Source: <input checked="" type="checkbox"/> 100% HSIP <input checked="" type="checkbox"/> 94.3% HSIP <input type="checkbox"/> 94.34% HSIP	Cost Estimate Tab:	6. Phased Cost Est.	
Administration of Project:	Agency: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	ADOT: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
Name and Title of COG/MPO Representative:		Margaret Boone, P.E.	
Basic Project Information			
Anticipated Design Year (Construction year cannot be the same):		<input type="checkbox"/> FY18 (Local) <input type="checkbox"/> FY19	
If additional ROW is needed, what FY is purchase anticipated?:		<input type="checkbox"/> FY19 <input type="checkbox"/> FY20	
Anticipated Construction Year:		<input type="checkbox"/> FY19* <input checked="" type="checkbox"/> FY20	
1.	Have lower cost countermeasures been considered or implemented?		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
1a.	If "Yes", describe: If "No", explain why not:	City of Glendale periodically reviews signal phasing and timing at all intersections.	
2.	Which 23 USC 148 highway safety improvement project category does this project come under?		
2a.	1. Intersection safety improvement		
3.	Describe your safety improvement project in detail: (50 words or less)		
3a.	The scope of work includes three elements. The City intends to 1. Convert permissive, protected, and protected/permissive left-turns to Flashing Yellow Arrow (FYA) protected/permissive signal operation, CMF 0.194. 2. Cut back medians and install carrots to eliminate negative left-turn lane offset and create positive offset, CMF 0.380. 3. Add 3" retroreflective sheeting to all signal back plates to improve visibility, CMF 0.150.		
4.	Describe the location of this safety project:		

ADOT HIGHWAY SAFETY IMPROVEMENT PROGRAM APPLICATION

Agency:	City of Glendale	Title of Project:	Install FYA and Geometric Modifications to Improve Safety at Arterial Intersections
County:	Maricopa	COG/MPO:	MAG
District:	Central	HSIP Funds:	<input type="checkbox"/> STATE <input checked="" type="checkbox"/> LOCAL
4a.	<p>As a systemic project, the City chose all arterial to arterial intersections within the city (45). Phase 1 included the 12 highest left-turn accident intersections based on MAG ranking. Phase 2 includes 12 intersections that require signal head replacements to be completed by the City of Glendale. Phase 3 includes the remaining 21 arterial to arterial intersections not included in Phases 1 and 2. The approval of the systemic safety improvements provided that Phase 1 and Phase 3 design and Phase 1 construction were funded with FY2016 HSIP monies. This application is for HSIP funding for the construction of Phase 3 using updated systemic crash data.</p> <p>For intersections included in Phase 3, all 5-section protected, protected/permissive and permissive signal heads will be removed and replaced with 4-section flashing yellow arrow signal heads. Dependent on intersection geometry, mast arms may need to be replaced and signal poles may need to be relocated or replaced in order to install new signal heads. Medians will be cut back a maximum of 20 feet and striping "carrots" will be placed in order to shift vehicles to the left to eliminate negative offset and create a positive offset in left-turn lanes and improve sight distance. In addition, 3" retroreflective sheeting will be added to all signal backplates to improve visibility.</p>		
5.	What crash data screening method was used to identify this project?		
5a.	MAG crash rankings were used to determine the locations within the City that have the highest crash rankings. Data downloaded from ADOT Safety DataMart was used in this application. The crash data is included with application.		
6.	What is the safety justification for the proposed project?		
6a.	<p>1. NCHRP/FHWA have studied the use of Flashing Yellow Arrow signal operation and determined that it is safe and more effective than the circular green ball in conveying to drivers the need to yield before turning left. In addition, FYA tends to have a safer fail condition than the circular green in that drivers will yield on the FYA rather than proceed on a circular green.</p> <p>2. FHWA research has determined that a strategy of eliminating a negative left-turn lane offset has the potential to reduce total and target crashes.</p> <p>3. FHWA has published reports supporting the installation of 3" retroreflective sheeting (borders) on signal backplated to increase the visibility of traffic signals, especially at night, and identified it as a countermeasure to reduce crashes by improving driver awareness of signals.</p>		
7.	Will there be ground disturbing activities?	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
8.	Is project within applicants permanent ROW?	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
8a.	If NO please explain:		
9.	Will any temporary right-of-way acquisitions be required?	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO

ADOT HIGHWAY SAFETY IMPROVEMENT PROGRAM APPLICATION

Agency:	City of Glendale	Title of Project:	Install FYA and Geometric Modifications to Improve Safety at Arterial Intersections	
County:	Maricopa	COG/MPO:	MAG	
District:	Central	HSIP Funds:	<input type="checkbox"/> STATE	<input checked="" type="checkbox"/> LOCAL
10.	Will there be any utility relocation needed?			<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
10a.	If YES please explain:	When relocating signal poles, utility relocation may be necessary but will be determined during design process.		
11.	Does Section 4(f) apply to any portion of this project?			<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
11a.	If YES please explain:			
12.	Are there any other issues that may impact or delay development or construction of this project?			<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
12a.	If YES please explain:			
13.	Is this project in compliance with revised ADA Standards?			<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
13a.	If NO please explain:			
14.	Does the project support Arizona's Strategic Highway Safety Plan?			<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
15.	Are there any Studies, RSA's or Other evaluations that support this project?			<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
16.	HSIP Roadway Functional Classification:	Urban Principal Arterial - Other		
17.	Average Daily Traffic Volume and Year Collected:	ADT: ~25,000 vpd	Year: 2015	
18.	What is the source of ADT?:	City of Glendale		
19.	What is the posted speed limit?	40 mph		
20.	Detailed engineer's cost estimate attached:			<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
"Systemic" Safety Project				
21.	Completed B/C Ratio Tabulation Sheet Attached (Required):			<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
22.	Most current 5 Years Crash Data from ADOT ALISS database sorted by year & severity (required):			<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
23.	What are the inclusive dates of the crash data?	2011-2015		

ADOT HIGHWAY SAFETY IMPROVEMENT PROGRAM APPLICATION

Agency:	City of Glendale	Title of Project:	Install FYA and Geometric Modifications to Improve Safety at Arterial Intersections
County:	Maricopa	COG/MPO:	MAG
District:	Central	HSIP Funds:	<input type="checkbox"/> STATE <input checked="" type="checkbox"/> LOCAL
24.	Have all crashes that will not be influenced by this countermeasure been deleted from the crash list? (pedestrian, pedalcycle, etc. as applicable)		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
25.	If purchasing equipment or materials, who will install?	<input type="checkbox"/> Town/City <input type="checkbox"/> County <input checked="" type="checkbox"/> Contractor <input type="checkbox"/> Tribe	
26.	Does the project require proprietary Items (23CFR 635.411)?:		<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
27.	Is a list of locations for systemic projects provided on the attached form?		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
28.	How are (will) the proposed locations be prioritized for replacement? (explain below)		
28a.	The locations for Phase 1 were prioritized by MAG crash rank. The locations for Phase 2 were prioritized by intersections that required the most simple improvements to employ the countermeasures. Phase 3 locations encompassed all of the remaining arterial to arterial intersections within the City of Glendale.		
29.	Are the supporting structures in good condition, meet local standards and have an anticipated service life longer than the countermeasure being installed?		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
"Spot" Improvement Projects Only			
30.	Completed B/C Ratio Tabulation Sheet Attached (required):		<input type="checkbox"/> YES <input type="checkbox"/> NO
31.	Is the most current 5 Years Crash Data from ADOT ALISS database sorted by year & severity attached and in correct format? (required):		<input type="checkbox"/> YES <input type="checkbox"/> NO
32.	What are the inclusive dates of the crash data?		
	Have all crashes that will not be influenced by this countermeasure been deleted from the crash list? (pedestrian, pedalcycle etc. as applicable)		<input type="checkbox"/> YES <input type="checkbox"/> NO
33.	Have any infrastructure changes occurred within the work limits of this project during the years the crash data covers?		<input type="checkbox"/> YES <input type="checkbox"/> NO
34.	If YES please explain:		
35.	Project vicinity map is provided:		<input type="checkbox"/> YES <input type="checkbox"/> NO
36.	Project work limits map is provided:		<input type="checkbox"/> YES <input type="checkbox"/> NO
SHSP - All Projects			
37.	Which SHSP Emphasis Area (EA) does this project support?:	Roadway_Infrastructure_and_Operations	

ADOT HIGHWAY SAFETY IMPROVEMENT PROGRAM APPLICATION

Agency:	City of Glendale	Title of Project:	Install FYA and Geometric Modifications to Improve Safety at Arterial Intersections
County:	Maricopa	COG/MPO:	MAG
District:	Central	HSIP Funds:	<input type="checkbox"/> STATE <input checked="" type="checkbox"/> LOCAL
37a.	Which EA Strategy does it support?:	(Intersections) Reduce frequency and severity of intersection crashes through traffic-control and operational improvements.	
37b.	Does this project support a second SHSP EA? If so, which EA.:	Roadway_Infrastructure_and_Operations	
37c.	Which EA Strategy supports the second EA?	(Intersections) Reduce frequency and severity of intersection crashes through geometric improvements.	
37d.	Does this project support a third SHSP EA? If so, which EA.:		
37e.	Which EA Strategy supports the third EA?		
38.	Does this project support one of the nine FHWA proven countermeasures?:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
38a.	If so, which countermeasure?:	Backplates with Retroreflective Borders	
39.	Does this project support one of the three Arizona Focus Areas?:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
39a.	If so, which focus area?:	Intersection	
40.	Which HSIP Improvement Category does this project support?:	Intersection_Traffic_Control	
40a.	Which HSIP Improvement Sub-Category does this project support?:	Modify traffic signal – add flashing yellow arrow	
41.	Does your COG/MPO have a Strategic Transportation Safety Plan (STSP)?:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
41a.	If "YES", does this project support an Emphasis Area in the COG/MPO STSP?:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
41b.	List the EA:	Eliminate Death and Injuries Related to Intersections	
41c.	If your COG/MPO has a STSP and it was Federally Funded and you answered NO in 41a, explain why this project is being submitted over a STSP identified project.		
41d.	Rational		
42.	Are any temporary safety countermeasures needed prior to this permanent solution being installed?	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	

ADOT HIGHWAY SAFETY IMPROVEMENT PROGRAM APPLICATION

Agency:	City of Glendale	Title of Project:	Install FYA and Geometric Modifications to Improve Safety at Arterial Intersections	
County:	Maricopa	COG/MPO:	MAG	
District:	Central	HSIP Funds:	<input type="checkbox"/> STATE <input checked="" type="checkbox"/> LOCAL	
42a.	If yes, please explain:			
B/C Ratio and SHSP Score				
43.	The calculated B/C Ratio is:	5.70	The SHSP Score is:	148.20

**HIGHWAY SAFETY IMPROVEMENT PROGRAM
APPLICATION - COST ESTIMATE**

Agency:	City of Glendale	Name of Project:	Install FYA and Geometric Modifications to Improve Safety at Arterial Intersections							
HSIP Project Cost Estimate Worksheet										
Project Cost Estimate:	Description:	Unit	Quantity:	Unit Cost:	Total Cost:	HSIP: 100.00%	HSIP: 94.30%	Local Match: 5.70%	Other Funds	TOTAL COST
Phase 1										
2016 HSIP PROJECT CURRENTLY IN DESIGN										
Total Design and Construction	Intersections Requiring Signal Head Modification		12	\$ 110,000.00	\$ 1,320,000.00	\$ -	\$ -	\$ -	\$ -	\$ 1,320,000.00
PHASE 1 TOTAL COST					\$ 1,320,000.00	\$ -	\$ -	\$ -	\$ -	\$ 1,320,000.00

**HIGHWAY SAFETY IMPROVEMENT PROGRAM
APPLICATION - COST ESTIMATE**

Phase 2										
CITY OF GLENDALE IN-HOUSE PROJECT										
Total Design and Construction	Intersections Requiring Signal Head Modification		12	\$ 20,360.52	\$ 244,326.23	\$ -	\$ -	\$ -	\$ 244,326.23	\$ 244,326.23
PHASE 2 TOTAL COST					\$ 244,326.23	\$ -	\$ -	\$ -	\$ 244,326.23	\$ 244,326.23

Phase 3										
Planning or Study:			0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Preliminary Engineering:			1	\$ 372,169.71	\$ 372,169.71	\$ 299,968.79	\$ 68,085.47	\$ 4,115.45	\$ -	\$ 372,169.71
Non-Infrastructure (NI) Elements:			0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
ADOT Admin Costs:			1	\$ 186,084.86	\$ 186,084.86	\$ 149,984.39	\$ 34,042.74	\$ 2,057.73	\$ -	\$ 186,084.86
Design Sub-Total					\$ 558,254.57	\$ 449,953.18	\$ 102,128.21	\$ 6,173.18		\$ 558,254.57
2020001	REMOVE STRUCTURES AND OBSTRUCTIONS	L.SUM	1	\$12,000.00	\$12,000.00	\$ -	\$ 11,316.00	\$ 684.00	\$ -	\$ 12,000.00
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	2857	\$9.00	\$25,713.00	\$ -	\$ 24,247.36	\$ 1,465.64	\$ -	\$ 25,713.00
2020057	REMOVE AND SALVAGE (TRAFFIC SIGNAL EQUIPMENT)	EACH	208	\$300.00	\$62,400.00	\$ -	\$ 58,843.20	\$ 3,556.80	\$ -	\$ 62,400.00
2020365	REMOVE LEAD-BASED STRIPING	L.FT.	480	\$10.00	\$4,800.00	\$ -	\$ 4,526.40	\$ 273.60	\$ -	\$ 4,800.00
2020366	REMOVE LEAD-BASED PAINT MATERIALS	L.SUM	1	\$21,000.00	\$21,000.00	\$ -	\$ 19,803.00	\$ 1,197.00	\$ -	\$ 21,000.00
2020370	DISPOSE OF LEAD-BASED PAINT MATERIALS (FORCE ACCOUNT)	L.SUM	21	\$1,000.00	\$21,000.00	\$ -	\$ 19,803.00	\$ 1,197.00	\$ -	\$ 21,000.00
3030022	AGGREGATE BASE, CLASS 2	CU. YD.	93	\$100.00	\$9,300.00	\$ -	\$ 8,769.90	\$ 530.10	\$ -	\$ 9,300.00
4040125	FOG COAT	TON	2	\$1,500.00	\$3,000.00	\$ -	\$ 2,829.00	\$ 171.00	\$ -	\$ 3,000.00
4040163	BLOTTER MATERIAL	TON	6	\$500.00	\$3,000.00	\$ -	\$ 2,829.00	\$ 171.00	\$ -	\$ 3,000.00
4090006	ASPHALTIC CONCRETE (MISCELLANEOUS STRUCTURAL)	TON	26	\$50.00	\$1,300.00	\$ -	\$ 1,225.90	\$ 74.10	\$ -	\$ 1,300.00
6070054	SIGN POST (PERFORATED) (2 S)	L.FT.	400	\$15.00	\$6,000.00	\$ 6,000.00	\$ -	\$ -	\$ -	\$ 6,000.00
6070060	FOUNDATION FOR SIGN POST (CONCRETE)	EACH	40	\$200.00	\$8,000.00	\$ 8,000.00	\$ -	\$ -	\$ -	\$ 8,000.00
6080005	WARNING, MARKER, OR REGULATORY SIGN PANEL	SQ.FT.	1244	\$30.00	\$37,320.00	\$ 37,320.00	\$ -	\$ -	\$ -	\$ 37,320.00
7016030	BARRICADE (TYPE II, VERT.PANEL, TUBULAR MARKER)	EACH-DAY	10794	\$0.25	\$2,698.50	\$ -	\$ 2,544.69	\$ 153.81	\$ -	\$ 2,698.50
7016032	PORTABLE SIGN STANDS (RIGID)	EACH-DAY	2436	\$0.75	\$1,827.00	\$ -	\$ 1,722.86	\$ 104.14	\$ -	\$ 1,827.00
7016035	WARNING LIGHTS (TYPE A)	EACH-DAY	2436	\$0.30	\$730.80	\$ -	\$ 689.14	\$ 41.66	\$ -	\$ 730.80
7016037	WARNING LIGHTS (TYPE C)	EACH-DAY	10164	\$0.30	\$3,049.20	\$ -	\$ 2,875.40	\$ 173.80	\$ -	\$ 3,049.20
7016051	TEMPORARY SIGN (LESS THAN 10 S.F.)	EACH-DAY	2856	\$0.50	\$1,428.00	\$ -	\$ 1,346.60	\$ 81.40	\$ -	\$ 1,428.00
7016061	FLASHING ARROW PANEL	EACH-DAY	84	\$30.00	\$2,520.00	\$ -	\$ 2,376.36	\$ 143.64	\$ -	\$ 2,520.00
7016078	FLAGGING SERVICES (LOCAL ENFORCEMENT OFFICER)	hour	336	\$65.00	\$21,840.00	\$ -	\$ 20,595.12	\$ 1,244.88	\$ -	\$ 21,840.00
7040006	PAVEMENT MARKING (YELLOW EXTRUDED THERMOPLASTIC) (0.090")	L.FT.	2400	\$1.75	\$4,200.00	\$ 4,200.00	\$ -	\$ -	\$ -	\$ 4,200.00
7040072	PAVEMENT MARKING (TRANSVERSE) (THERMOPLASTIC) (ALKYD) (0.090")	L.FT.	1800	\$2.00	\$3,600.00	\$ 3,600.00	\$ -	\$ -	\$ -	\$ 3,600.00
7080001	PERMANENT PAVEMENT MARKING (PAINTED) (WHITE)	L.FT.	1800	\$0.75	\$1,350.00	\$ 1,350.00	\$ -	\$ -	\$ -	\$ 1,350.00
7080011	PERMANENT PAVEMENT MARKING (PAINTED) (YELLOW)	L.FT.	2400	\$0.75	\$1,800.00	\$ 1,800.00	\$ -	\$ -	\$ -	\$ 1,800.00
7310590	MAST ARM (40 FT.) (TAPERED)	EACH	7	\$2,000.00	\$14,000.00	\$ 14,000.00	\$ -	\$ -	\$ -	\$ 14,000.00
7310600	MAST ARM (45 FT.) (TAPERED)	EACH	1	\$3,000.00	\$3,000.00	\$ 3,000.00	\$ -	\$ -	\$ -	\$ 3,000.00
7310610	MAST ARM (50 FT.) (TAPERED)	EACH	7	\$3,000.00	\$21,000.00	\$ 21,000.00	\$ -	\$ -	\$ -	\$ 21,000.00
7310620	MAST ARM (55 FT.) (TAPERED)	EACH	13	\$4,500.00	\$58,500.00	\$ 58,500.00	\$ -	\$ -	\$ -	\$ 58,500.00
7320070	ELECTRICAL CONDUIT (3") (PVC)	L.FT.	2100	\$15.00	\$31,500.00	\$ 31,500.00	\$ -	\$ -	\$ -	\$ 31,500.00
7330031	TRAFFIC SIGNAL (FYA - FLASHING YELLOW ARROW SIGNAL FACE)	EACH	168	\$1,000.00	\$168,000.00	\$ 168,000.00	\$ -	\$ -	\$ -	\$ 168,000.00
7330060	TRAFFIC SIGNAL FACE (TYPE F)	EACH	91	\$700.00	\$63,700.00	\$ 63,700.00	\$ -	\$ -	\$ -	\$ 63,700.00
7330210	TRAFFIC SIGNAL FACE (PEDESTRIAN) (MAN/HAND)	EACH	42	\$500.00	\$21,000.00	\$ 21,000.00	\$ -	\$ -	\$ -	\$ 21,000.00
7330220	PEDESTRIAN PUSH BUTTON	EACH	42	\$300.00	\$12,600.00	\$ 12,600.00	\$ -	\$ -	\$ -	\$ 12,600.00
7330340	TRAFFIC SIGNAL MOUNTING ASSEMBLY (TYPE V)	EACH	21	\$500.00	\$10,500.00	\$ 10,500.00	\$ -	\$ -	\$ -	\$ 10,500.00
7330360	TRAFFIC SIGNAL MOUNTING	EACH	21	\$600.00	\$12,600.00	\$ 12,600.00	\$ -	\$ -	\$ -	\$ 12,600.00
7340101	CONTROL CABINET (COG DETAIL T4-METER PEDESTAL CABINET	EACH	0	\$25,000.00	\$0.00	\$ -	\$ -	\$ -	\$ -	\$ -
7340120	METER PEDESTAL CABINET	EACH	0	\$3,000.00	\$0.00	\$ -	\$ -	\$ -	\$ -	\$ -
7340125	SERVICE PEDESTAL CABINET	EACH	0	\$500.00	\$0.00	\$ -	\$ -	\$ -	\$ -	\$ -
7340304	CONTROL CABINET FOUNDATION	EACH	0	\$1,200.00	\$0.00	\$ -	\$ -	\$ -	\$ -	\$ -
7350120	LOOP DETECTOR FOR TRAFFIC	EACH	336	\$1,000.00	\$336,000.00	\$ 336,000.00	\$ -	\$ -	\$ -	\$ 336,000.00
7378916	GROUND ROD (ALL SIGNAL	EACH	19	\$80.00	\$1,520.00	\$ 1,520.00	\$ -	\$ -	\$ -	\$ 1,520.00
9210100	CONCRETE UNIT PAVERS	S.Y.	90	\$100.00	\$9,000.00	\$ -	\$ 8,487.00	\$ 513.00	\$ -	\$ 9,000.00
9240111	MISCELLANEOUS WORK (3" RETRO-	L.FT.	5796	\$1.50	\$8,694.00	\$ 8,694.00	\$ -	\$ -	\$ -	\$ 8,694.00
9240112	MISCELLANEOUS WORK (CONC CURB	L.FT.	82	\$20.00	\$1,640.00	\$ -	\$ 1,546.52	\$ 93.48	\$ -	\$ 1,640.00
9240113	MISCELLANEOUS WORK (CONC	L.FT.	250	\$15.00	\$3,750.00	\$ -	\$ 3,536.25	\$ 213.75	\$ -	\$ 3,750.00
9240119	MISCELLANEOUS WORK (REMOVE	EACH	40	\$400.00	\$16,000.00	\$ 16,000.00	\$ -	\$ -	\$ -	\$ 16,000.00
9240120	MISCELLANEOUS WORK (2" PVC ELECTRICAL CONDUIT ELBOW BELL	EACH	40	\$5.00	\$200.00	\$ 200.00	\$ -	\$ -	\$ -	\$ 200.00
9240121	MISCELLANEOUS WORK (CITY OF	EACH	5	\$6,000.00	\$30,000.00	\$ 30,000.00	\$ -	\$ -	\$ -	\$ 30,000.00

**HIGHWAY SAFETY IMPROVEMENT PROGRAM
APPLICATION - COST ESTIMATE**

9240122	MISCELLANEOUS WORK (FOUNDATION FOR CITY OF PEORIA	EACH	5	\$4,000.00	\$20,000.00	\$ 20,000.00	\$ -	\$ -	\$ -	\$ 20,000.00
9240127	MISCELLANEOUS WORK (CITY OF	EACH	5	\$3,000.00	\$15,000.00	\$ 15,000.00	\$ -	\$ -	\$ -	\$ 15,000.00
9240171	MISCELLANEOUS WORK (COG Q116	EACH	21	\$5,000.00	\$105,000.00	\$ 105,000.00	\$ -	\$ -	\$ -	\$ 105,000.00
9240172	MISCELLANEOUS WORK (COG FOUNDATION FOR Q SIGNAL POLES)	EACH	17	\$2,000.00	\$34,000.00	\$ 34,000.00	\$ -	\$ -	\$ -	\$ 34,000.00
9240173	MISCELLANEOUS WORK (COG TYPE-A	EACH	2	\$2,500.00	\$5,000.00	\$ 5,000.00	\$ -	\$ -	\$ -	\$ 5,000.00
9240174	MISCELLANEOUS WORK	EACH	2	\$500.00	\$1,000.00	\$ 1,000.00	\$ -	\$ -	\$ -	\$ 1,000.00
9240175	MISCELLANEOUS WORK (INSTALL	EACH	21	\$2,000.00	\$42,000.00	\$ 42,000.00	\$ -	\$ -	\$ -	\$ 42,000.00
9240176	MISCELLANEOUS WORK (REMOVE AND	EACH	168	\$100.00	\$16,800.00	\$ 16,800.00	\$ -	\$ -	\$ -	\$ 16,800.00
9240177	MISCELLANEOUS WORK (LOOP (STUB-	EACH	42	\$500.00	\$21,000.00	\$ 21,000.00	\$ -	\$ -	\$ -	\$ 21,000.00
9240178	MISCELLANEOUS WORK (Type PB (COG T5-19) Pole)	EACH	21	\$700.00	\$14,700.00	\$ 14,700.00	\$ -	\$ -	\$ -	\$ 14,700.00
9240179	MISCELLANEOUS WORK (Foundation (COG T5-19)) for Type PB Pole)	EACH	21	\$700.00	\$14,700.00	\$ 14,700.00	\$ -	\$ -	\$ -	\$ 14,700.00
9240187	MISCELLANEOUS WORK (COG T8-4 VERTICAL SIGNAL HANGER)	EACH	91	\$400.00	\$36,400.00	\$ 36,400.00	\$ -	\$ -	\$ -	\$ 36,400.00
9240188	MISCELLANEOUS WORK (REMOVE FOUNDATION TOP)	EACH	21	\$1,000.00	\$21,000.00	\$ 21,000.00	\$ -	\$ -	\$ -	\$ 21,000.00
9240189	MISCELLANEOUS WORK (REWIRE ENTIRE INTERSECTION)	EACH	21	\$12,000.00	\$252,000.00	\$ 252,000.00	\$ -	\$ -	\$ -	\$ 252,000.00
9250001	CONSTRUCTION SURVEYING AND LAYOUT	L.SUM	1	\$10,000.00	\$10,000.00	\$ -	\$ 9,430.00	\$ 570.00	\$ -	\$ 10,000.00
Construction Item Sub-Total					\$ 1,691,680.50	\$ 1,469,684.00	\$ 209,342.70	\$ 12,653.80	\$ -	\$ 1,691,680.50
Traffic Control (Itemized Above)				0.00%	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Mobilization				10.00%	\$ 169,168.05	\$ 146,968.40	\$ 20,934.27	\$ 1,265.38	\$ -	\$ 169,168.05
Construction Sub-Total					\$ 1,860,848.55	\$ 1,616,652.40	\$ 230,276.97	\$ 13,919.18	\$ -	\$ 1,860,848.55
Construction Admin :				14.00%	\$ 260,518.80	\$ 226,331.34	\$ 32,238.78	\$ 1,948.69	\$ -	\$ 260,518.81
Contingencies :				5.00%	\$ 93,042.43	\$ 80,832.62	\$ 11,513.85	\$ 695.96	\$ -	\$ 93,042.43
Post Design:				1.00%	\$ 18,608.49	\$ 16,166.52	\$ 2,302.77	\$ 139.19	\$ -	\$ 18,608.48
Communications:				1.00%	\$ 18,608.49	\$ 16,166.52	\$ 2,302.77	\$ 139.19	\$ -	\$ 18,608.48
Post Construction Sub-Total					\$ 390,778.21	\$ 339,497.00	\$ 48,358.17	\$ 2,923.03	\$ -	\$ 390,778.20
Construction Total					\$ 2,251,626.76	\$ 1,956,149.40	\$ 278,635.14	\$ 16,842.21	\$ -	\$ 2,251,626.75
PHASE 3 TOTAL COST					\$ 2,809,881.33	\$ 2,406,102.58	\$ 380,763.35	\$ 23,015.39	\$ -	\$ 2,809,881.32

Project Grand Total										\$4,374,207.55
----------------------------	--	--	--	--	--	--	--	--	--	----------------

Required for all HSIP Applications

Agency:	City of Glendale	Title of Project:	Install FYA and Geometric Modifications to Improve Safety at Arterial Intersections
----------------	------------------	--------------------------	---

Benefit / Cost Ratio Tabulation

Annual Benefit Tabulation

Severity	Annual Average	Estimated CRF* Reduction	Total Reduction	Unit Cost	Annual Benefit
Fatal	0.60	58%	0.35	\$5,800,000	\$2,018,400
Incapacitating Injury	7.60	58%	4.41	\$400,000	\$1,763,200
Total Annual Benefits					\$3,781,600

Costs

Total Project Cost	\$4,374,208
Project Life (years)	10
Interest Rate (%)	8%
Capital Recovery Factor	0.1490
Annual Construction Cost	\$651,886
Annual Maintenance Cost	\$1,000.00
Total Annual Costs	\$652,886

Benefit / Cost

Annual Benefit	Annual cost	Benefit / Cost Ratio
\$3,781,600	\$652,886	5.7

***REQUIRED: Use 4 and 5 star CMFs from ADOT Lists Only at Tabs 14 - 15 preferred. The CMF's CRF is used in the above calculation**

INTERSECTION PHASE	INCIDENT ID	DATE/TIME	ON ROAD	CROSSING FEATURE	COLLISION MANNER	INJURY SEVERITY
1	2515086	3/16/2011 16:56	67TH AVE	BELL RD	LEFT TURN	INCAPACITATING INJURY
1	2515504	3/17/2011 16:05	GLENDALE AVE	67TH AVE	LEFT TURN	INCAPACITATING INJURY
1	2518986	3/15/2011 15:13	59TH AVE	THUNDERBIRD RD	LEFT TURN	INCAPACITATING INJURY
1	2580775	11/5/2011 8:42	GLENDALE AVE	67TH AVE	LEFT TURN	INCAPACITATING INJURY
1	2644278	7/2/2012 9:14	51ST AVE	PEORIA AVE	LEFT TURN	INCAPACITATING INJURY
1	2648507	4/23/2012 20:16	67TH AVE	GLENDALE AVE	LEFT TURN	INCAPACITATING INJURY
1	2653133	8/17/2012 12:29	67TH AVE	GLENDALE AVE	LEFT TURN	INCAPACITATING INJURY
1	2662753	9/11/2012 7:25	51ST AVE	PEORIA AVE	LEFT TURN	INCAPACITATING INJURY
1	2691504	11/30/2012 21:13	59TH AVE	PEORIA AVE	LEFT TURN	INCAPACITATING INJURY
1	2718978	3/7/2013 9:01	51ST AVE	PEORIA AVE	LEFT TURN	INCAPACITATING INJURY
1	2773342	9/18/2013 11:27	NORTHERN AVE	59TH AVE	LEFT TURN	INCAPACITATING INJURY
1	2781959	10/22/2013 10:06	BELL RD	59TH AVE	LEFT TURN	INCAPACITATING INJURY
1	2794652	11/20/2013 10:14	BELL RD	59TH AVE	LEFT TURN	INCAPACITATING INJURY
1	2808236	11/30/2013 14:15	67TH AVE	GLENDALE AVE	LEFT TURN	INCAPACITATING INJURY
1	2859910	5/16/2014 21:28	PEORIA AVE	51ST AVE	LEFT TURN	FATAL
1	2930846	12/9/2014 11:12	59TH AVE	PEORIA AVE	LEFT TURN	INCAPACITATING INJURY
1	2948369	1/5/2015 3:58	GLENDALE AVE	67TH AVE	LEFT TURN	INCAPACITATING INJURY
1	2959425	3/10/2015 6:57	OLIVE AVE	51ST AVE	LEFT TURN	INCAPACITATING INJURY
1	2970038	4/22/2015 17:50	NORTHERN AVE	51ST AVE	LEFT TURN	INCAPACITATING INJURY
1	3013705	8/3/2015 12:29	51ST AVE	NORTHERN AVE	LEFT TURN	INCAPACITATING INJURY
1	3055338	12/16/2015 8:49	PEORIA AVE	59TH AVE	LEFT TURN	INCAPACITATING INJURY
2	2525656	5/8/2011 19:34	GLENDALE AVE	51ST AVE	LEFT TURN	INCAPACITATING INJURY
2	2541672	6/28/2011 14:08	59TH AVE	UNION HILLS DR	LEFT TURN	INCAPACITATING INJURY
2	2609005	2/12/2012 0:23	51ST AVE	PEORIA AVE	LEFT TURN	INCAPACITATING INJURY
2	2782560	7/9/2013 12:41	DEER VALLEY RD	67TH AVE	LEFT TURN	INCAPACITATING INJURY
2	2970027	4/3/2015 7:32	GLENDALE AVE	EL MIRAGE RD	LEFT TURN	INCAPACITATING INJURY
2	2979675	5/11/2015 8:01	59TH AVE	BELL RD	LEFT TURN	INCAPACITATING INJURY
2	3030413	9/25/2015 15:15	51ST AVE	GLENDALE AVE	LEFT TURN	INCAPACITATING INJURY
2	3030418	9/24/2015 13:07	51ST AVE	NORTHERN AVE	LEFT TURN	INCAPACITATING INJURY
2	3030504	9/21/2015 12:41	NORTHERN AVE	51ST AVE	LEFT TURN	INCAPACITATING INJURY
3	2567705	10/24/2011 17:12	99TH AVE	GLENDALE AVE	LEFT TURN	INCAPACITATING INJURY
3	2580572	11/5/2011 19:34	83RD AVE	CAMELBACK RD	LEFT TURN	INCAPACITATING INJURY
3	2617141	2/28/2012 7:05	59TH AVE	CACTUS RD	LEFT TURN	INCAPACITATING INJURY
3	2726835	4/1/2013 14:24	99TH AVE	CAMELBACK RD	LEFT TURN	INCAPACITATING INJURY
3	2814422	11/23/2013 23:43	67TH AVE	CAMELBACK RD	LEFT TURN	INCAPACITATING INJURY
3	2907296	10/20/2014 7:31	CAMELBACK RD	59TH AVE	LEFT TURN	INCAPACITATING INJURY
3	2954538	2/12/2015 14:23	CAMELBACK RD	75TH AVE	LEFT TURN	INCAPACITATING INJURY
3	3030921	10/17/2015 21:45	CAMELBACK RD	83RD AVE	LEFT TURN	INCAPACITATING INJURY
3	3042088	3/19/2015 1:49	67TH AVE	UNION HILLS DR	LEFT TURN	FATAL
3	3052076	11/6/2015 16:36	83RD AVE	GLENDALE AVE	LEFT TURN	FATAL
3	3055812	12/14/2015 7:16	59TH AVE	CACTUS RD	LEFT TURN	INCAPACITATING INJURY

SYSTEMIC PROJECT LOCATIONS PER PHASE

City of Glendale Flashing Yellow Arrow Project

Phase	Intersection
1	51st Ave & Peoria Ave
1	59th Ave & Northern Ave
1	59th Ave & Bethany Home Rd
1	59th Ave & Thunderbird Rd
1	59th Ave & Bell Rd
1	59th Ave & Peoria Ave
1	67th Ave & Glendale Ave
1	67th Ave & Bell Rd
1	67th Ave & Olive Ave
1	51st Ave & Northern Ave
1	75th Ave & Glendale Ave
1	51st Ave & Olive Ave
2	59th Ave & Olive Ave
2	59th Ave & Union Hills Dr
2	51st Ave & Glendale Ave
2	59th Ave & Glendale Ave
2	67th Ave & Deer Valley Rd
2	Dysart Rd & Glendale Ave
2	75th Ave & Deer Valley Rd
2	83rd Ave & Bethany Home Rd
2	El Mirage Rd & Glendale Ave
2	67th Ave & Parkside Ln/Pinnacle Pk
2	99th Ave & Bethany Home Rd
2	Landfill Rd & Glendale Ave
3	Glen Harbor Blvd and Glendale Ave
3	99 th Ave and Camelback Rd
3	99 th Ave and Glendale Ave
3	91 st Ave and Camelback Rd
3	83 rd Ave and Camelback Rd
3	83 rd Ave and Glendale Ave
3	75 th Ave and Camelback Rd
3	75 th Ave and Bethany Home Rd
3	75 th Ave and Union Hills Rd
3	67 th Ave and Camelback Rd
3	67 th Ave and Bethany Home Rd
3	67 th Ave and Peoria Rd
3	67 th Ave and Cactus Rd
3	67 th Ave and Thunderbird Rd
3	67 th Ave and Greenway Rd
3	67 th Ave and Union Hills Rd

3	59 th Ave and Camelback Rd
3	59 th Ave and Cactus Rd
3	59 th Ave and Greenway Rd
3	59 th Ave and Deer Valley Rd
3	51 st Ave and Camelback Rd