May 10, 2019

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

Agency:	City of Glendale
Project Name:	Installation of Traffic Signal at Northern Ave and 63rd Ave Intersection
Project Location:	Glendale, Arizona

Dear Ms. Aglan-Swick:

The City of Glendale is submitting herewith a project application for Highway Safety Improvement Program (HSIP) funding. This road safety improvement project was identified through the local network crash data screening process and meets all requirements of Title 23. The proposed request is for the installation of a traffic signal at the Northern Ave and 63rd Ave intersection and does not include any non-infrastructure funding request. The traffic signal will facilitate the safe transfer of right-of-way between the intersecting roadways by separating the conflicting movements of traffic through the signal system. City staff will hire a consulant to complete the design, then procure bids for a contractor to build the project. There will be ground disturbing activities, including drilling for foundations, and trenching. It is anticipated that some minor utility relocations will need to happen.

During the most recent five year period - 2012 to 2017, the City experienced 39 total intersection related crashes at this intersection. The intersection experienced a significant number of angle, left-turn crashes, and a pedestrain fatality during this period. Since the intersection meets the signal warrant per Criteria B of Section 4C.08: Warrant 7 of MUTCD, installation of a traffic signal was considered as a candidate countermeasure to mitigate the crash risk associated with these crash types. With a Crash Reduction Factor (CRF) of 31.6% obtained from the CMF Clearinghouse (ID: 5534 - 4 Star Rating) for intersection signalization, the City could see a 5-year reduction of 12 crashes including 6 angle and 3 left-turn crashes at this intersection.

The City of Glendale has determined that, in accordance with 23 USC 148(a)(4))(A), this project is consistent with the MAG Strategic Transportation Safety Plan (STSP) and State's 2014 Strategic Highway Safety Plan (SHSP). It supports MAG's STSP Action Area - "Eliminate Death and Injury Related to Intersections" and Arizona SHSP Emphasis Area "Roadway Infrastructure & Operations Improvement" with the supporting strategy to reduce frequency and severity of intersection crashes through traffic-control and operational improvement. It also supports the State's SHSP goal for Nonmotorized users - "Reduce frequency and severity of crashes involving nonmotorized users by reducing their exposure to vehicular traffic".
B/C Ratio = 6.5 (Element 52 in Application, Tab 2)

The City of Glendale has estimated the total project cost of this project to be $616,947. Of that amount we request ADOT to determine if $616,947 is HSIP eligible, with no non-HSIP eligible, and with no local match or other funds . In accordance with Title 23, the Federal share for safety improvement items are eligible to be funded at 100% Federal share per 23 U.S.C. 120(c) as described in Code of Federal Register 23 CFR Part 924. Therefore, the City of Glendale does not propose to contribute any match for the above mentioned project. The attached table summarizes the anticipated cost estimate projected for this project.

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

Agency: City of Glendale

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 resbumitted in the next call-for-projects.

The City of Glendale agrees to conduct and provide to ADOT Traffic Safety Section (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 623-930-2939 or email DAlbert@glendaleaz.com,

Sincerely,

Debbie Albert, P.E., PTOE
City Traffic Engineer
City of Glendale
6210 W. Myrtle Ave STE#112, Glendale, AZ 85301

Attachments: Application (excel format) to include cost estimate, vicinity map and/or list of locations
B/C Ratio and Crash Data
Cost Estimate
Vicinity map
CMF Document

Agency:	City of Glendale	**Title of Project:**	Installation of Traffic Signal at Northern Ave and 63rd Ave Intersection
County:	Maricopa	**COG/MPO:**	MAG
District:	Central	**Date:**	5/8/2019

Contact:	**Phone:**	**E-Mail:**
Kiran Guntupalli	623-930-2951	kguntupalli@glendaleaz.com

Type of Safety Improvement:	**Spot:** ☑ YES ☐ NO		**Systemic:** ☐ YES ☑ NO	
Mark all that apply to your project:	☑ Design	☑ Construction	☑ Procurement	☐ Non-Infrastructure

Anticipated Total Cost Estimate:	**$572,443**	
Anticipated dollar amount of HSIP Funding:	**$572,443**	
Anticipated Dollar amount of Local Match (5.7%) (5.66%):	**$0.00**	
Anticipated Dollar amount of Other:	**$0.00**	

Funding Source:	☑ 100% HSIP	☐ 94.3%	☐ 94.34% HSIP	**Cost Estimate Tab:** 5. 100% Contract Install
Administration of Project:	**Agency:** ☐ YES ☑ NO		**ADOT:** ☑ YES ☐ NO	
Name and Title of COG/MPO Representative:	Margaret Herrera, Transportation Safety Program Manager			

Basic Project Information

Anticipated Design Year (Construction year cannot be the same):	☑ FY23	
If additional ROW is needed, what FY is purchase anticipated?:	☑ FY23	☐ FY24
Anticipated Construction Year:	☑ FY24	

1.	**Have lower cost countermeasures been considered or implemented?**	☑ YES ☐ NO
1a.	**If "Yes", describe:** **If "No", explain why not:**	2-Way STOP control, Left-turn lane, and paved sidewalk.
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.	This is is a 4-leg urban intersection with 2-way stop control. It has experienced significant number of angle, left-turn crashes, and a pedestrian fatality over the last 5 years. It is proposed to install a new traffic signal at the intersection to mitigate such crashes. CMF Clearinghouse provides a 4-Star CMF (ID: 5534) for intersection signalization with a Crash Reduction Factor (CRF) of 31.6%, which was used to calculate the B/C ratio for this project.	
4.	**Describe the location of this safety project:**	

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District:	Central	**Date:**	5/8/2019

4a.	Northern Ave and 63rd Ave Intersection, Glendale, AZ	
5.	**What crash data screening method was used to identify this project?**	
5a.	Crash data downloaded from ADOT ACIS was provided by MAG for this intersection. The data was analysed to see crash patterns and identify risk factors. A warrant analysis was done to check if a traffic signal is warranted at this intersection.	
6.	**What is the safety justification for the proposed project?**	
6a.	This intersection has experienced significant number of angle, left-turn crashes, and a pedestrain fatality in the last five years. Since the intersection met per Criteria B of Section 4C.08: Warrant 7 of MUTCD, installation of a traffic signal was considered as an appropriate countermeasure to mitigate the crash risk associated with these crash types.	
7.	**Will there be ground disturbing activities?**	☑ YES ☐ NO
8.	**Is project within applicants permanent ROW?**	☑ YES ☐ NO
8a.	**If NO please explain:**	
9.	**Will any temporaty right-of-way acquisitions be required?**	☐ YES ☑ NO
10.	**Will there be any utility relocation needed?**	☑ YES ☐ NO
10a.	**If YES please explain:**	For installation of signal hardware, utility relocation may be required but will be determined during the design process.
11.	**Does Section 4(f) apply to any portion of this project?**	☐ YES ☑ NO
11a.	**If YES please explain:**	
12.	**Are there any other issues that may impact or delay development or construction of this project?**	☐ YES ☑ NO

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12a.	**If YES please explain:**				
13.	**Is this project in compliance with revised ADA Standards?**	☑ YES ☐ NO			
13a.	**If NO please explain:**				
14.	**Does the project support Arizona's Strategic Highway Safety Plan?**	☑ YES ☐ NO			
15.	**Are there any Studies, RSA's or Other evaluations that support this project?**	☐ YES ☑ NO			
16.	**If the project is a traffic control device requiring a warrant, is a copy attached?**	☑ YES ☐ NO			
17.	**HSIP Roadway Functional Classification:**	Urban Principal Arterial - Other			
18.	**For projects on State System:**	**BMP:**		**EMP:**	
19.	**Average Daily Traffic Volume and Year Collected:**	ADT: 21,900	Year: 2018		
20.	**What is the source of ADT?:**	City of Glendale - Arterial Counts 2018			
21.	**What is the posted speed limit?**	40			
22.	**Detailed engineer's cost estimate attached:**	☑ YES ☐ NO			

"Systemic" Safety Project

23.	**Completed B/C Ratio Tabulation Sheet Attached (Required):**	☐ YES ☐ NO
24.	**Most current 5 Years Crash Data from ADOT ALISS database sorted by year & severity (required):**	
25.	**What are the inclusive dates of the crash data?**	
26.	**Have all crashes that will not be influenced by this countermeasure been deleted from the crash list? (pedestrian, pedalcycle, etc. as applicable)**	
27.	**If purchasing equipment or materials, who will install?**	☐ Town/City ☐ County ☐ Tribe ☐ Contractor
28.	**Does the project require proprietary Items (23CFR 635.411)?:**	☐ Yes ☐ No
29.	**Is a list of locations for systemic projects provided on the attached form?**	☐ Yes ☐ No
30.	**How are (will) the proposed locations be prioritized for replacement? (explain below)**	
30a.		

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31.	**Are the supporting structures in good condition, meet local standards and have an anticipated service life longer than the countermeasure being installed?**	☐ Yes ☐ No

"Spot" Improvement Projects Only

32.	**Completed B/C Ratio Tabulation Sheet Attached (required):**	☑ YES ☐ NO
33.	**Is the most current 5 Years Crash Data from ADOT ALISS database sorted by year & severity attached and in correct format? (required):**	☑ YES ☐ NO
34.	**What are the inclusive dates of the crash data?**	2013-2017
35.	**Have all crashes that will not be influenced by this countermeasure been deleted from the crash list? (pedestrian, pedalcycle etc. as applicable)**	Yes
36.	**Have any infrastructure changes occurred within the work limits of this project during the years the crash data covers?**	☐ YES ☑ NO
37.	**If YES please explain:**	
38.	**Project vicinity map is provided:**	☑ YES ☐ NO
39.	**Project work limits map is provided:**	☑ YES ☐ NO

SHSP - All Projects

40.	**Which SHSP Emphasis Area (EA) does this project support?:**	Roadway_Infrastructure_and_Operations	
40a.	**Which EA Strategy does it support?:**	(Intersections) Reduce frequency and severity of intersection crashes through traffic-control and operational improvements.	
40b.	**Does this project support a second SHSP EA? If so, which EA.:**	Nonmotorized_Users	
40c.	**Which EA Strategy supports the second EA?**	(Pedestrians) Reduce pedestrian exposure to vehicle traffic.	
40d.	**Does this project support a third SHSP EA? If so, which EA.:**		
40e.	**Which EA Strategy supports the third EA?**		

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41.	**Does this project support one of the nine FHWA proven countermeasures?:**			☐ YES ☑ NO
41a.	**If so, which countermeasure?:**			
42.	**Does this project support one of the three Arizona Focus Areas?:**			☑ YES ☐ NO
42a.	**If so, which focus area?:**	**Intersection**		
43.	**Which HSIP Improvement Category does this project support?:**			**Intersection_Traffic _Control**
43a.	**Which HSIP Improvement Sub-Category does this project support?:**			
	Intersection traffic control - other			
44.	**Does your COG/MPO have a Strategic Transportation Safety Plan (STSP)?:**			☑ YES ☐ NO
44a.	**If "YES", does this project support an Emphasis Area in the COG/MPO STSP?:**			Yes
44b.	**List the EA:**	Eliminate Death and Injuries Related to Intersections		
44c.	**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. (For Local Agencies Only)**			
44d.	**Rational:**			
45.	**Are any temporaty safety countermeasures needed prior to this permanent solution being installed?**			
45a.	**If yes, please explain:**			
46.	**For State Agencies, has the Regional Traffic Engineer been made aware of this potential project and does he/she concur with it?**			☐ YES ☐ NO
Strategic Transportation Safety Plans Funds (COG/MPO)				
47.	**What is the date of your last STSP or update completed?**			
48.	**How many projects that were identified In your last STSP or update were submitted for HSIP funding?**			
49.	**What was the total dollar amount of the projects in question 45?**			
50.	**How many projects that were submitted for HSIP funding were eligible and funded by ADOT?**			
51.	**What was the total dollar amount of the projects in question 47?**			
B/C Ratio				

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District:	Central		**Date:**	5/8/2019	
52.	**The calculated B/C Ratio is:**	**7.00**		**CMF ID Number:**	5534
				2nd CMF ID No.:	
				3rd CMF ID NO.:	

HIGHWAY SAFETY IMPROVEMENT PROGRAM
APPLICATION - COST ESTIMATE

Agency:	City of Glendale		Name of Project:	MAG SAFETY SA-1906		Non-State Agency Cost Estimate - Countermeasure 100% HSIP Eligible				
HSIP Project Cost Estimate Worksheet (Cost related to Traffic Signal, ADA Ramps and Median Modification for Left Turn Storage at the Intersection)										
Project Cost Estimate:	**Description:**	**Unit of Measure**	**Quantity**	**Unit Cost:**	**Total Cost**	**HSIP Eligible:**	**HSIP:**	**State Match:**	**Other Amt:**	**TOTAL COST**
							100.00%	0.00%	0.00%	
Design		1	LS	$ 100,000.00	$ 100,000.00	$ 100,000.00	$ 100,000.00	$ -	$ -	$ 100,000.00
Right-of-Way Acquisition		1	LS	$ -		$ -	$ -	$ -	$ -	$ -
Environmental & Utility Clearance		1	LS	$ 30,000.00	$ 30,000.00	$ 30,000.00	$ 30,000.00	$ -	$ -	$ 30,000.00
ADOT Admin Costs:		1	LS	$ 30,000.00	$ 30,000.00	$ 30,000.00	$ 30,000.00	$ -	$ -	$ 30,000.00
Design Sub-Total					**$ 160,000.00**	**$ 160,000.00**	**$ 160,000.00**	**$ -**	**$ -**	**$ 160,000.00**
Inflation Factor			**5.00%**		$ 8,000.00	$ 8,000.00	$ 8,000.00	$ -	$ -	$ 8,000.00
Total Design Cost					**$ 168,000.00**	**$ 168,000.00**	**$ 168,000.00**	**$ -**	**$ -**	**$ 168,000.00**
Construction: Item #	**Description:**	**Unit of Measure**	**Quantity**	**Unit Cost:**	**Total Cost**	**HSIP Eligible:**	**HSIP:**	**State Match:**	**Other Amt:**	**TOTAL COST**
							100.00%	0.00%	0.00%	
6080005	WARNING, MARKER, OR REGULATORY SIGN PANEL	SQ.FT.	60.00	$22.00	$1,320.00	$1,320.00	$ 1,320.00	$ -	$ -	$ 1,320.00
7015051	OBLITERATE PAVEMENT MARKING (ARROW, SYMBOL OR LEGEND)	EACH	8.00	$150.00	$1,200.00	$1,200.00	$ 1,200.00	$ -	$ -	$ 1,200.00
7015052	OBLITERATE PAVEMENT MARKING (STRIPE)	L.FT.	2000.00	$2.50	$5,000.00	$5,000.00	$ 5,000.00	$ -	$ -	$ 5,000.00
7040005	PAVEMENT MARKING (WHITE EXTRUDED THERMOPLASTIC) (0.090")	L.FT.	1200.00	$1.00	$1,200.00	$1,200.00	$ 1,200.00	$ -	$ -	$ 1,200.00
7040006	PAVEMENT MARKING (YELLOW EXTRUDED THERMOPLASTIC) (0.090")	L.FT.	1200.00	$1.00	$1,200.00	$1,200.00	$ 1,200.00	$ -	$ -	$ 1,200.00
7040072	PAVEMENT MARKING (TRANSVERSE) (THERMOPLASTIC) (ALKYD) (0.090")	L.FT.	800.00	$1.46	$1,168.00	$1,168.00	$ 1,168.00	$ -	$ -	$ 1,168.00
7040073	PAVEMENT LEGEND (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	4.00	$200.00	$800.00	$800.00	$ 800.00	$ -	$ -	$ 800.00
7040074	PAVEMENT SYMBOL (EXTRUDED THERMOPLASTIC) (ALKYD) (0.090")	EACH	8.00	$200.00	$1,600.00	$1,600.00	$ 1,600.00	$ -	$ -	$ 1,600.00
7060013	PAVEMENT MARKER, RAISED, TYPE C	EACH	30.00	$6.00	$180.00	$180.00	$ 180.00	$ -	$ -	$ 180.00
7310011	POLE (TYPE A) (8')	EACH	4.00	$600.00	$2,400.00	$2,400.00	$ 2,400.00	$ -	$ -	$ 2,400.00
7310130	POLE (TYPE Q)	EACH	3.00	$8,500.00	$25,500.00	$25,500.00	$ 25,500.00	$ -	$ -	$ 25,500.00
7310140	POLE (TYPE R)	EACH	1.00	$8,700.00	$8,700.00	$8,700.00	$ 8,700.00	$ -	$ -	$ 8,700.00
7310200	POLE FOUNDATION (TYPE A)	EACH	4.00	$500.00	$2,000.00	$2,000.00	$ 2,000.00	$ -	$ -	$ 2,000.00
7310310	POLE FOUNDATION (TYPE Q)	EACH	3.00	$2,000.00	$6,000.00	$6,000.00	$ 6,000.00	$ -	$ -	$ 6,000.00
7310320	POLE FOUNDATION (TYPE R)	EACH	1.00	$2,600.00	$2,600.00	$2,600.00	$ 2,600.00	$ -	$ -	$ 2,600.00
	ANCHOR BOLTS	Each	32.00	$500.00	$16,000.00	$16,000.00	$ 16,000.00	$ -	$ -	$ 16,000.00
	Luminaire Mast Arm	Each	4.00	$2,500.00	$10,000.00	$10,000.00	$ 10,000.00	$ -	$ -	$ 10,000.00
7310610	MAST ARM (50 FT.) (TAPERED)	EACH	3.00	$3,200.00	$9,600.00	$9,600.00	$ 9,600.00	$ -	$ -	$ 9,600.00
7310635	MAST ARM (60 FT.) (TAPERED)	EACH	1.00	$4,000.00	$4,000.00	$4,000.00	$ 4,000.00	$ -	$ -	$ 4,000.00
7320070	ELECTRICAL CONDUIT (3") (PVC)	L.FT.	350.00	$21.01	$7,353.50	$7,353.50	$ 7,353.50	$ -	$ -	$ 7,353.50
7320274	ELECTRICAL CONDUIT (2-3") (PVC) (DIRECTIONAL DRILL)	L.FT.	850.00	$50.00	$42,500.00	$42,500.00	$ 42,500.00	$ -	$ -	$ 42,500.00
7320421	PULL BOX (NO. 7) (WITH EXTENSION)	EACH	6.00	$750.97	$4,505.82	$4,505.82	$ 4,505.82	$ -	$ -	$ 4,505.82
7320650	CONDUCTORS	L.SUM	1.00	$10,000.00	$10,000.00	$10,000.00	$ 10,000.00	$ -	$ -	$ 10,000.00
7330060	TRAFFIC SIGNAL FACE (TYPE F)	EACH	12.00	$600.00	$7,200.00	$7,200.00	$ 7,200.00	$ -	$ -	$ 7,200.00
7330210	TRAFFIC SIGNAL FACE (PEDESTRIAN) (MAN/HAND)	EACH	8.00	$467.86	$3,742.88	$3,742.88	$ 3,742.88	$ -	$ -	$ 3,742.88
7330310	TRAFFIC SIGNAL MOUNTING ASSEMBLY (TYPE II)	EACH	8.00	$147.44	$1,179.52	$1,179.52	$ 1,179.52	$ -	$ -	$ 1,179.52
7330330	TRAFFIC SIGNAL MOUNTING ASSEMBLY (TYPE IV)	EACH	4.00	$500.00	$2,000.00	$2,000.00	$ 2,000.00	$ -	$ -	$ 2,000.00
7330360	TRAFFIC SIGNAL MOUNTING ASSEMBLY (TYPE VII)	EACH	4.00	$450.00	$1,800.00	$1,800.00	$ 1,800.00	$ -	$ -	$ 1,800.00
7340103	CONTROL CABINET (CITY OF GLENDALE)	EACH	1.00	$25,000.00	$25,000.00	$25,000.00	$ 25,000.00	$ -	$ -	$ 25,000.00
7340120	METER PEDESTAL CABINET	EACH	1.00	$5,000.00	$5,000.00	$5,000.00	$ 5,000.00	$ -	$ -	$ 5,000.00
7350060	PEDESTRIAN PUSH BUTTON	EACH	8.00	$1,500.00	$12,000.00	$12,000.00	$ 12,000.00	$ -	$ -	$ 12,000.00
7350060	LUMINAIRE (HORIZONTAL MOUNT) (113 WATT)	EACH	4.00	$700.00	$2,800.00	$2,800.00	$ 2,800.00	$ -	$ -	$ 2,800.00
7360160	POWER SUPPLY (BATTERY BACKUP)	EACH	1.00	$6,500.00	$6,500.00	$6,500.00	$ 6,500.00	$ -	$ -	$ 6,500.00
7370455	MISCELLANEOUS ELECTRICAL (CCTV CAMERA W/CABLE AND MOUNT ASSEMBLY)	L.SUM	1.00	$10,000.00	$10,000.00	$10,000.00	$ 10,000.00	$ -	$ -	$ 10,000.00
9080296	CONCRETE SIDEWALK RAMP	EACH	8.00	$5,000.00	$40,000.00	$40,000.00	$ 40,000.00	$ -	$ -	$ 40,000.00
9240015	FORCE ACCOUNT WORK (PROVIDE ELECTRICAL SERVICE)	L.SUM	1.00	$5,000.00	$5,000.00	$5,000.00	$ 5,000.00	$ -	$ -	$ 5,000.00
9240095	MISCELLANEOUS WORK (LANDSCAPE MODIFICATIONS)	L.SUM	1.00	$5,000.00	$5,000.00	$5,000.00	$ 5,000.00	$ -	$ -	$ 5,000.00
9250001	CONSTRUCTION SURVEYING AND LAYOUT	L.SUM	1.00	$8,000.00	$8,000.00	$8,000.00	$ 8,000.00	$ -	$ -	$ 8,000.00
7011001	TRAFFIC CONTROL	L.SUM	1.00	$10,000.00	$10,000.00	$10,000.00	$ 10,000.00	$ -	$ -	$ 10,000.00
9010001	MOBILIZATION	L.SUM	1.00	$15,000.00	$15,000.00	$15,000.00	$ 15,000.00	$ -	$ -	$ 15,000.00
Sub-Total					**$ 325,049.72**	**$ 325,049.72**	**$ 325,050.72**	**$ -**	**$ -**	**$ 325,049.72**
Construction Admin :	Construction Engineering		**12.00%**		$ 39,005.97	$ 39,005.97	$ 39,005.97	$ -	$ -	$ 39,005.97
Contingencies :	Contingencies		**5.00%**		$ 16,252.49	$ 16,252.49	$ 16,252.49	$ -	$ -	$ 16,252.49
Post Design:	Post Design Services and Record Drawings		**1.00%**		$ 3,250.50	$ 3,250.50	$ 3,250.50	$ -	$ -	$ 3,250.50
Communications:	Public Involvement		**0.50%**		$ 1,625.25	$ 1,625.25	$ 1,625.25	$ -	$ -	$ 1,625.25
						$ -	$ -	$ -	$ -	$ -
						$ -	$ -	$ -	$ -	$ -
						$ -	$ -	$ -	$ -	$ -
						$ -	$ -	$ -	$ -	$ -
						$ -	$ -	$ -	$ -	$ -
Post Sub-Total					**$ 60,134.20**	**$ 60,134.21**	**$ 60,134.21**	**$ -**	**$ -**	**$ 60,134.21**
Construction Sub-Total					**$ 385,183.92**	**$ 385,183.93**	**$ 385,183.93**	**$ -**	**$ -**	**$ 385,183.93**
Inflation Factor			**5.00%**		$ 19,259.20	$ 19,259.20	$ 19,259.20	$ -	$ -	$ 19,259.20
Construction Total					**$ 404,443.11**	**$ 404,443.12**	**$ 404,443.12**	**$ -**	**$ -**	**$ 404,443.12**
TOTAL REQUEST					**$ 572,443.11**	**$ 572,443.12**	**$ 572,443.12**	**$ -**	**$ -**	**$ 572,443.12**

Comments:

Required for all HSIP Applications

Agency:	City of Glendale	Title of Project:	

Benefit / Cost Ratio Tabulation

Annual Benefit Tabulation

Severity	Annual Average	Estimated **CRF*** Reduction	Total Reduction	Unit Cost	Annual Benefit
Fatal	**0.20**	**32%**	0.06	$9,515,371	$601,371
Incapacitating Injury	**0.00**	**0%**	0.00	$550,499	$0
				Total Annual Benefits	$601,371

Costs

Total Project Cost	$572,443
Project Life (years)	10
Interest Rate (%)	8%
Capital Recovery Factor	0.1490
Annual Construction Cost	$85,311
Annual Maintenance Cost	$0.00
Total Annual Costs	$85,311

Benefit / Cost

Annual Benefit	Annual cost	Benefit / Cost Ratio
$601,371	$85,311	7.0

***REQUIRED: Use 4 and 5 star CMFs from ADOT Lists Only at Tabs 11 - 12 preferred. The CMF's CRF is used in the above calculation**

Standard Detail Report

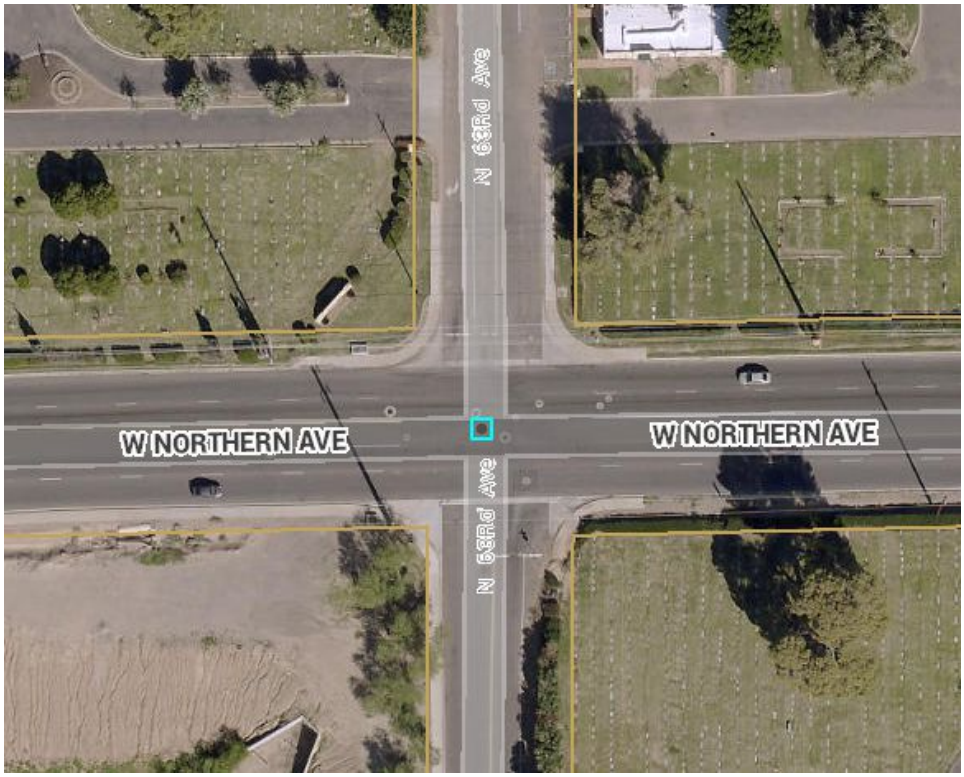
ADOT

Incident ID	Incident Date & Time	Incident On Road	Incident Crossing Feature	Incident Injury Severity Description	Incident First Harmful Description	Incident Collision Manner Desc	Incident Light Condition Desc	Incident Weather Desc	Incident Intersection Type Desc	Incident Junction Relation Desc
2765590	6/5/2013 2:50:00 AM	07 NORTHERN AVE	63rd Ave	Fatal	Pedestrian	Other	Dark Lighted	Clear	FOUR_WAY_INTERSECTION	Intersection Non Interchange

N

Figure 1: Glendale, Arizona

Figure 2: Northern Avenue and 63rd Avenue



CMF / CRF Details

CMF ID: 5534

Install a traffic signal

Description:

Prior Condition: Stop controlled intersection

Category: Intersection traffic control

Study: *Comparison of Safety Evaluation Approaches for Intersection Signalization in Florida*, Wang and Abdel-Aty, 2014

Star Quality Rating:	★★★★☆ [View score details]

Crash Modification Factor (CMF)	
Value:	0.684
Adjusted Standard Error:	
Unadjusted Standard Error:	0.093

Crash Reduction Factor (CRF)	
Value:	31.6 *(This value indicates a **decrease** in crashes)*
Adjusted Standard Error:	

Unadjusted Standard Error:	9.3

Applicability

Crash Type:	All
Crash Severity:	K (fatal),A (serious injury),B (minor injury),C (possible injury)
Roadway Types:	Not specified
Number of Lanes:	2 to 4
Road Division Type:	
Speed Limit:	
Area Type:	Not specified
Traffic Volume:	
Time of Day:	Not specified

If countermeasure is intersection-based

Intersection Type:	Roadway/roadway (not interchange related)
Intersection Geometry:	3-leg,4-leg
Traffic Control:	Stop-controlled
Major Road Traffic Volume:	35000 to Annual Average Daily Traffic (AADT)
Minor Road Traffic Volume:	

Development Details

Date Range of Data Used:	2004 to 2009
Municipality:	
State:	FL

Country:	
Type of Methodology Used:	Before/after using empirical Bayes or full Bayes
Sample Size Used:	
Before Sample Size Used:	214

Other Details

Included in Highway Safety Manual?	No
Date Added to Clearinghouse:	Aug-12-2014
Comments:	CMF applies to intersections with major road AADT >35,000

This site is funded by the U.S. Department of Transportation Federal Highway Administration and maintained by the University of North Carolina Highway Safety Research Center

May 2nd, 2019
Wood Project No. 3720195004

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Kiran Guntupalli, P.E., PTOE
Principal Engineer - Transportation
City of Glendale
5850 W. Glendale Avenue, Glendale, AZ 85301

Dear Kiran,

Reference: Signal Warrant Analysis for intersection of Northern Avenue and 63rd Avenue in Glendale, Arizona.

Wood completed this traffic signal warrant analysis for the intersection of Northern Avenue and 63rd Avenue in Glendale, Arizona. The signal warrant analysis is completed based on the methodology described in the Manual on Uniform Traffic Control Devices (MUTCD) 2009 Edition. Figure 1a shows the intersection location and Figure 1b shows an aerial view of the study intersection.

Figure 1a: Area Location Map

Figure 1b: Intersection Aerial View

Existing Conditions

Northern Avenue: near the study intersection, Northern Avenue is a four-lane road with a center turn lane. The posted speed limit is 40 miles per hour (mph). Northern Avenue is classified a principal arterial.

63rd Avenue: Is a two-lane road with posted speed limit of 25 mph. 63rd Avenue is classified as a major collector road.

The intersection of Northern Avenue at 63rd Avenue is a four-legged, intersection with stop control on 63rd Avenue. The eastbound and westbound approaches of Northern Avenue form the major street at this intersection and 63rd Avenue is the minor street. Figure 2 shows the existing geometry of this intersection.

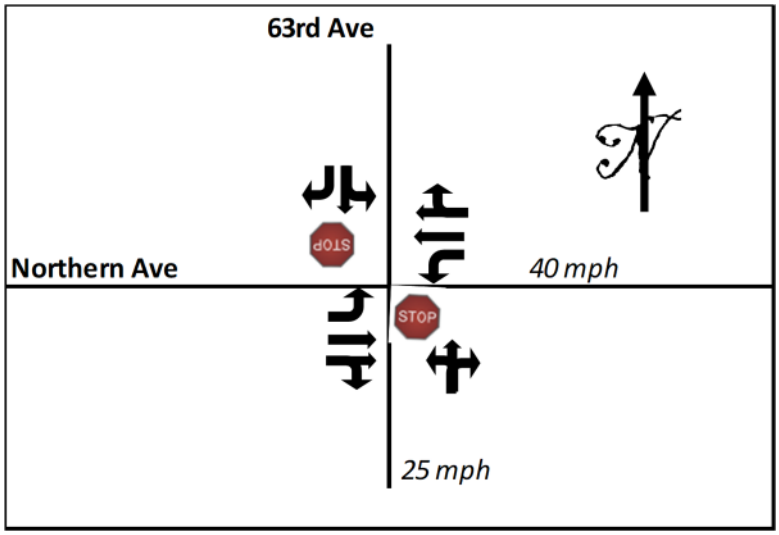


Figure 2: Existing Intersection Geometry

Traffic Volumes

Traffic counts for this were provided by the City of Glendale and include 24-hr turning movement volumes at this intersection.

Signal Warrant Analysis

The MUTCD 2009 provides the following, eight different signal warrants and satisfaction of a warrant or warrants conclude that a signal is warranted. The MUTCD also states that just satisfaction of a warrant shall itself does not require installation of a traffic signal.

Warrant 1: Eight-hour vehicular volume	Warrant 2: Four – hour vehicular volume
Warrant 3: Peak Hour	~~Warrant 4: Pedestrian Volume~~
~~Warrant 5: School Crossing~~	~~Warrant 6: Coordinated Signal System~~
Warrant 7: Crash Experience	~~Warrant 8: Roadway Network~~

Based on the available data, Warrants 1, 2, 3, and 7 are analyzed in this report.

Warrant 1, Eight-Hour Vehicular Volume

For Warrant 1 to be met, Condition A or Condition B from the table below must be met. If either condition is met, a signal is warranted at the intersection.

Condition A is where the volume of intersecting traffic is the main reason for installing a signal, and Condition B is applicable when the minor street suffers excessive delay when entering the

major street. Traffic volumes from Table 1 were distributed in a descending order with highest to lowest intersection volumes.

Table 1 also shows the warrant criteria and 8-hour volumes at this intersection. From this table, the conditions for Warrant 1B are satisfied and met.

Table 1: Warrant 1 Conditions

No.	Hours	Northern Ave	63rd Ave	Warrant 1A*			Warrant 1B*		
				Criteria (100%)		Met?	Criteria (100%)		Met?
		Major Street	Minor Street	Major	Minor		Major	Minor	
1	16:00	2,084	126	600	150	No	900	75	Yes
2	17:00	1,957	125			No			Yes
3	15:00	1,943	91			No			Yes
4	14:00	1,639	77			No			Yes
5	7:00	1,595	109			No			Yes
6	12:00	1,278	106			No			Yes
7	8:00	1,469	80			No			Yes
8	6:00	1,315	76			No			Yes

*For 2 or more lanes on Major Street, 1 lane on Minor Street

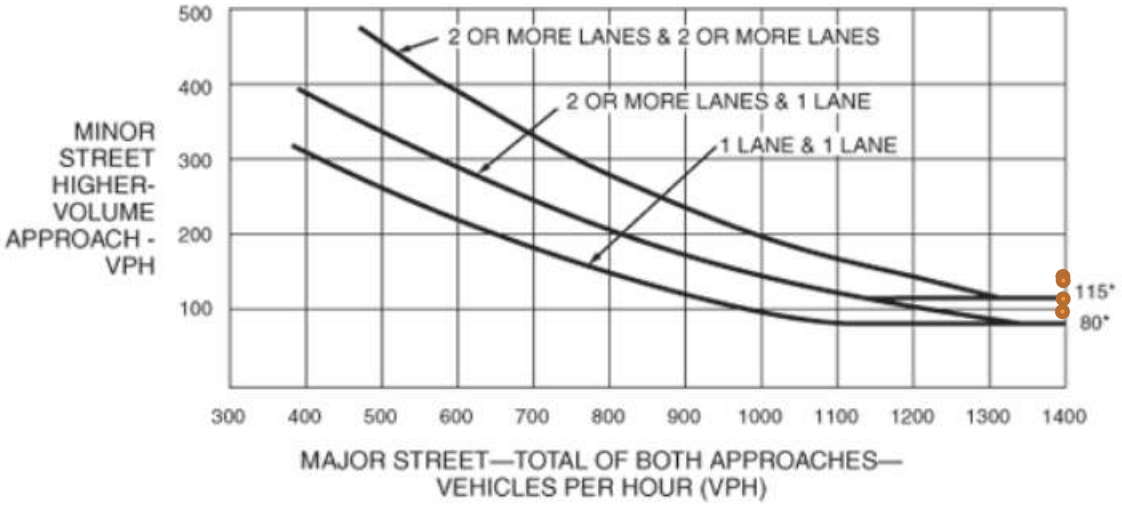
Warrant 2, Four-Hour Vehicular Volume

Warrant 2 is applicable where the volume of intersecting traffic is the main reason for installing a signal. The warrant is met if the Four-Hour Vehicular volumes are plotted on the graph below and exceed the applicable curve. In this case, the curve used is the "2 or More Lanes and 1 Lane "curve. Hours 1,2,3 4 and 5 from Table 1 are used in this warrant. The warrant states that any 4 hours of an average day may be used. From these volumes plotted below in an orange dot and the requirements for Warrant 2 are satisfied and Warrant 2 is met.

Warrant 3, Peak Hour

This warrant is applicable when the minor street suffers excessive delay during a minimum of 1 hour of an average day. If the volumes of the peak hour plotted on this graph are above the "2 or More Lanes and 1 Lane" curve, then the warrant is satisfied. The traffic counts were used to determine the peak hour on the minor and major street. During the peak hour, the major street (63rd Avenue), recorded 2,084 vph and on the minor street, recorded 126 vph. Plotting these two volumes on the figure below as the orange dot, and the requirements for Warrant 3 are satisfied and Warrant 3 is met.

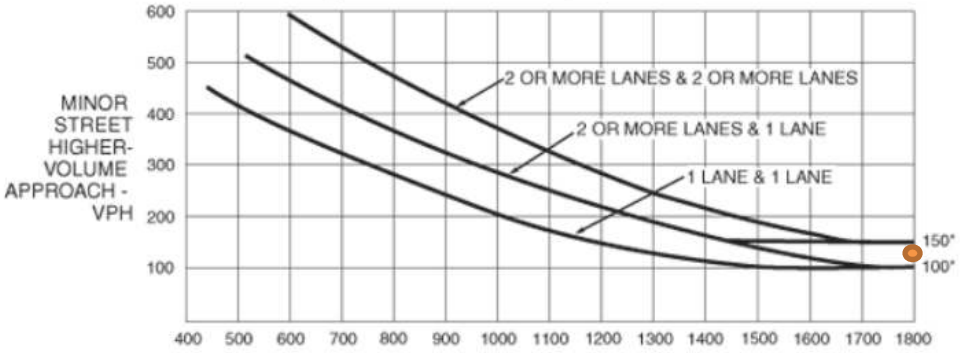
Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Legend
Minor-Major Street Volumes =

Figure 4C-3. Warrant 3, Peak Hour



Legend
Minor-Major Street Volumes

*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Warrant 7, Crash Experience

This warrant is applicable where the severity and frequency of crashes are the primary reason to install a signal. All three conditions of this warrant must be met in order to warrant a signal.

Condition A: States that if a trial of alternative that have been observed and enforcement have failed to reduce crash frequency, then Condition A is met.

Condition B: States that if there are 5 or more crashes (that can be corrected with the use of a signal) during a 12-month period, then the condition is met. During 2016 and 2017, there were a total of 6 and 9 angle crashes, respectively.

Condition C: States that the 80% columns of Condition A or B form Table 4C-1 (Warrant 1) must be met for this Condition to be met.

Table 2: 5-Year crashes by Type

Year	Angle	Pedestrian	Head On	LTHO	Rear End	Side Swipe	Single Vehicle	Total
2013	1	1						2
2014	1			2				3
2015	1		1	2	3	1	1	8
2016	6		1	2	1			10
2017	9			3	3			16
Total	18	1	2	9	7	1	1	39

Table 3: Crash Type Correctable with Signal – Angle and Pedestrian

Crashes by Severity	Angle	Pedestrian
Fatal		1
PDO	12	
Possible Injury	5	
Suspected Minor Injury	1	
Total	**18**	**1**

The traffic volumes conditions for Warrant 1B are met, hence 80% of Warrant 1 condition A and B are met. All three conditions of Warrant 7 are met, and thus a signal is warranted for this condition.

Conclusions/Results

As discussed above, the traffic volumes at this intersection warrant a signal. The posted speed limit being only 40 mph on the major street, the 100% conditions were used to determine. Only Warrants 1, 2, 3 and 7 were applicable at this intersection and the conditions for Warrants 1, 2, 3 and 7 are met.

Upon your review of this information, please feel free to contact me with your questions or comments.

Wood Environment & Infrastructure Solutions, Inc.

Anita S Johari
Lead Traffic Engineer
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Email: anita.johari@woodplc.com

Attachments: *Traffic Counts: Northern Avenue at 63rd Avenue*