APPENDIX B

B.4 ECAT ANALYSIS RESULTS

Eastern Corridor Segments II & III (PID 86462) ECAT Analysis

Summary of Results

PREPARED FOR:	Stantec
PREPARED BY:	Eggeman Engineering & Consulting, LLC
DATE:	March 18, 2019

The purpose of this memorandum is to present the results of Economic Crash Analysis Tool (ECAT) analysis for key intersections which were studied in connection with the Eastern Corridor Segment II/III project. The analyses were performed for:

- SR 32 @ 8 Mile Road
- SR 32 @ Clough Pike
- SR 32 @ Hickory Lane
- SR 32 @ Round Bottom Road
- US 50 @ Meadowlark Lane
- US 50 @ Newtown Road

The analyses were performed for various improvement alternatives for each intersection, as described below.

ECAT Analysis

ECAT is an Ohio Department of Transportation (ODOT) customized tool to complete Part C Predictive Method with Part C and D Crash Mitigation Factors (CMF'S) as described in AASHTO's Highway Safety Manual. Through this process, the existing predicted number of crashes for the existing conditions was compared with the predicted number of crashes for the proposed condition, to quantify the expected benefit-cost ratio (crash cost savings divided by the construction cost) associated with each alternative improvement.

SR 32 at 8 Mile Road

Two scenarios were evaluated using ECAT for the intersection of SR 32 at 8 Mile Road. According to the Ohio Department of Public Safety (ODPS) crash statistics, 12 crashes were recorded within the intersection influence area over a 3-year time period. According to the ECAT analysis, 1.7 crashes per year are expected per year. The analysis shows that similar intersections around the country are expected to experience 1.3 crashes per year. So, in terms of safety, this intersection is performing slightly worse than average under existing conditions.

Alternative 3b – Green Tee

Alternative 3b would convert this intersection from stop sign controlled to traffic signal controlled, with a Green Tee configuration. In order to analyze this Alternative in ECAT, a two-step process was necessary:

Step 1: Quantify the safety (dis)benefits to convert from stop sign control to signalized control;

Step 2: Quantify the safety benefits to convert from signalized control to a Green T intersection.

In Step 1, the predicted crash rate for a traditional signalized intersection was calculated to be 3.711 crashes per year – significantly higher than existing conditions. This would result in a safety disbenefit of **$1,255,411** over the course of the 20-year design life.

In Step 2, the Green Tee configuration was expected to reduce those crashes by 4.2%, according to the CMF Clearinghouse web site. This would reduce the expected number of crashes, and result in a **$102,809** improvement in crash cost. Therefore, the expected net disbenefit of the improvement is negative $1,152,602. (The net benefit is calculated by adding negative **$1,255,411** + **$102,809**).

Alternative 3c – Roundabout
The predicted crash frequency with a roundabout at this location is 1.2 accidents per year. The net present day safety benefit of this improvement was calculated to be $23,232. The expected cost of the project is approximately $4.5M – resulting in a benefit cost ratio of less than 0.01.

SR 32 at Clough Pike
Two scenarios were evaluated using ECAT for the intersection of SR 32 at Clough Pike. According to the ODPS crash statistics, the 12 crashes were recorded within the intersection influence area over a 3-year time period. According to the ECAT analysis, 5.9 crashes per year are expected. The analysis also shows that similar intersections around the country are expected to experience 6.7 crashes per year. So, in terms of safety, this intersection is performing slightly better than average under existing conditions.

Alternative 7c – Roundabout
The predicted crash frequency with a roundabout at this location is 4.2 accidents per year. The net present day safety benefit of this improvement was calculated to be $1,306,421. The expected cost of the project is approximately $2.0M – resulting in a benefit cost ratio of approximately 0.7.

Alternative 7d – Green Tee
Alternative 7d would convert this intersection from signal controlled to Green-Tee signal controlled. According to the CMF Clearinghouse web site, the Green Tee configuration was expected to reduce those crashes by 4.2%, according to the CMF Clearinghouse web site. This would reduce the expected number of crashes and result in a $102,809 improvement in crash cost.

SR 32 at Hickory Creek Drive – Add a left-turn lane
ODPS crash statistics showed 4 crashes over a 3-year study period. According to the ECAT analysis, 0.3 crashes per year are expected and predicted per year, which means that safety conditions at this location are approximately average.

The predicted crash frequency with a left-turn lane added at this location is 0.2 accidents per year. The net present day safety benefit of this improvement was calculated to be $49,868. The expected cost of the project is approximately $1.5M – resulting in a benefit cost ratio of less than 0.01.

SR 32 at Round Bottom Road – Construct a Roundabout
ODPS crash statistics showed 21 crashes over a 3-year study period. According to the ECAT analysis, 7.7 crashes per year are expected and predicted per year, which means that safety conditions at this location are approximately average.

The predicted crash frequency associated with a roundabout at this location is 4.7 accidents per year. The net present day safety benefit of this improvement was calculated to be $1,632,330. The expected cost of the project is approximately $5.6M – resulting in a benefit cost ratio of 0.3.

US 50 at Meadowlark Lane – Construct a Roundabout
ODPS crash statistics showed 6 crashes over a 3-year study period. According to the ECAT analysis, 5.1 crashes per year are expected and 6.5 accident are predicted. Therefore, safety conditions at this location are slightly better than average.

The predicted crash frequency associated with a roundabout at this location is 4.0 accidents per year. The net present day safety benefit of this improvement was calculated to be $1,338,674. The expected cost of the project is approximately $1.5M – resulting in a benefit cost ratio of 0.9.

US 50 at Newtown Road – Construct a Roundabout
ODPS crash statistics showed 21 crashes over a 3-year study period. According to the ECAT analysis, 7.4 crashes per year are expected and 7.5 accident are predicted. Therefore, safety conditions at this location are approximately average.

The predicted crash frequency associated with a roundabout at this location is 4.7 accidents per year. The net present day safety benefit of this improvement was calculated to be $1,387,743. The expected cost of the project is approximately $1.8M – resulting in a benefit cost ratio of 0.8.

TABLE 1
Summary of ECAT Results

INTERSECTION	Traffic Control		3-Year Accident Total	N (Existing)		N (Proposed)	Safety Benefits	Improvement Cost	B/C RATIO
	Existing	Proposed		Predicted	Expected	Predicted			
SR 32 at 8 Mile Rd									
Alternative 3b	Stop	Green Tee	12	1.3	1.7	4.6	-$1,152,602	$1,987,500	-0.6
Alternative 3c	Stop	Roundabout	12	1.3	1.7	1.2	$23,232	$4,050,000	0.0
Alternative 3e	Stop	Grade Separation	12	1.3	1.7	N/A		$14,050,000	0.0
SR 32 at Clough Pike									
Alternative 7c	Signal	Roundabout	15	6.7	5.9	4.2	$1,306,421	$2,000,000	0.7
Alternative 7d	Signal	Green Tee	15	6.7	5.9	6.4	$102,809	$4,700,000	0.1
SR 32 at Hickory Creek Drive	Stop	Add LT Lane	5	0.3	0.3	0.2	$49,686	$1,550,000	0.0
SR 32 at Round Bottom Rd	Signal	Roundabout	25	7.7	7.7	4.7	$1,632,330	$5,625,000	0.3
US 50 at Meadowlark	Signal	Roundabout	9	6.5	5.1	4.0	$1,338,674	$1,500,000	0.9
US 50 at Newtown	Signal	Roundabout	22	7.5	7.4	4.7	$1,387,743	$1,792,500	0.8

Existing Conditions: General Information and Data for Urban And Suburban Arterial Intersection

General Information		Location Information	
Analyst	MJH	Route	SR32
Agency or Company	EEC	Logpoint	6.82
Date Performed	07/02/18	Common Name	SR 32 at 8 Mile Rd
Intersection	SR32; 6.82	Analysis Year	2022
Signalized/Unsignalized	Unsignalized		

Input Data				Existing Conditions	HSM Base Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)				3ST	--
AADT $_{major}$ (veh/day) (total entering on major approaches)*	$AADT_{MAX}$ =	45,700	(veh/day)	20,790	--
AADT $_{minor}$ (veh/day) (total entering on minor approaches)*	$AADT_{MAX}$ =	9,300	(veh/day)	3,180	--
Intersection lighting (present/not present)				Present	Not Present
Calibration factor, C_i				Varies, See Below	1.00
Data for unsignalized intersections only:					
Number of major-road approaches with left-turn lanes				1	0
Number of major-road approaches with right-turn lanes				1	0
Data for signalized intersections only:					
Number of approaches with left-turn lanes					0
Number of approaches with right-turn lanes					0
Number of approaches with left-turn signal phasing					--
Type of left-turn signal phasing for Leg #1					Permissive
Type of left-turn signal phasing for Leg #2					--
Type of left-turn signal phasing for Leg #3					--
Not Applicable					--
Number of approaches with right-turn-on-red prohibited					0
Intersection red light cameras (present/not present)					Not Present
Sum of all pedestrian crossing volumes (PedVol)					--
Maximum number of lanes crossed by a pedestrian (n_{lanesx})					--
Number of bus stops within 300 m (1,000 ft) of the intersection					0
Schools within 300 m (1,000 ft) of the intersection (present/not present)					Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection					0
Locality:				State System	

Existing Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Arterial Intersection

(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.6700	1.0000	0.8600	1.0000	0.9999	1.0000	0.5762

Existing Conditions: Multiple-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(6)*(7)*(8)
Crash Severity Level	**SPF Coefficients** from Table 12-10			**Overdispersion Parameter, k** from Table 12-10	**Initial N_{bimv}** from Equation 12-21	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	a	b	c							
Total	-13.36	1.11	0.41	0.80	2.671	1.000	2.671	0.58	0.76	1.169

Fatal and Injury (FI)	-14.01	1.16	0.30	0.69	0.944	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.327	0.874	0.58	0.62	0.312
Property Damage Only (PDO)	-15.38	1.20	0.51	0.77	1.942	$(5)_{TOTAL}-(5)_{FI}$ 0.673	1.797	0.58	0.82	0.849

Existing Conditions: Single-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients** from Table 12-12			**Overdispersion Parameter, k** from Table 12-12	**Initial N_{bisv}** from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bisv}** (6)*(7)*(8)
	a	b	c							
Total	-6.81	0.16	0.51	1.14	0.331	1.000	0.331	0.58	0.54	0.103
Fatal and Injury (FI)	--	--	--	--	0.103	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.302	0.100	0.58	0.47	0.027
Property Damage Only (PDO)	-8.36	0.25	0.55	1.29	0.237	$(5)_{TOTAL}-(5)_{FI}$ 0.698	0.231	0.58	0.57	0.076

Existing Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Stop-Controlled Intersections

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{pedi}** from Table 12-16	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
Total	1.169	0.103	1.272	0.010	1.11	0.014
Fatal and injury (FI)	--	--	--	--	1.11	0.014

Existing Conditions: CMFs for Vehicle-Pedestrian Crash Summary for Urban And Suburban Arterial Signalized Intersections

(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
--	--	--	--

Existing Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Signalized Intersections

(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients** from Table 12-14					**Overdispersion Parameter, k**	**$N_{pedbase}$** from Equation 12-29	**Combined CMF** (4) from Worksheet 2H	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
	a	b	c	d	e					
Total	--	--	--	--	--	--	--	--	--	--
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	--	--

Existing Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{bikei}** from Table 12-17	**Calibration factor, C_i**	**Predicted N_{bikei}** (4)*(5)*(6)
Total	1.169	0.103	1.272	0.0057	1.16	0.008
Fatal and injury (FI)	--	--	--	--	1.16	0.008

Project Information

General Information

Project Name	Eastern Corridor	Contact Email	mhunter@eec-eng.com
Project Description	Regional Traffic Study	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/2/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		
Perform Benefit Cost Analysis?	Yes		

Do the proposed improvements fundamentally change the conditions of the base safety performance function (SPF), Or is crash data unavailable for the analysis condition, Or is only predicted (and not expected) analysis needed for the existing or proposed condition?	**Yes**

(Examples: unsignalized to signalized, undivided to divided, increase or decrease in the number of lanes, change the number of approaches to an intersection, significant realignment of the roadway)

If Yes, are you analyzing the existing or proposed conditions?	**Proposed**

Project Elements Description Table

Project Element ID (Must be Unique)	Site Type	Intersection Control Type	Location Information					
			NLFID	Begin Logpoint/ Intersection Midpoint	End Logpoint *(Leave blank for Intersection)*	Length (mi) OR Intersection Radius Buffer (mi)	Cross Route NLFID(s)	Common Name
SR32; 6.82	Urban & Suburban Arterial Intersection	Signalized	SHAMSR00032**C	6.82		0.05		SR 32 at 8 Mile Rd

Traffic Volume Growth Rate Calculation For Benefit Cost Analysis

	Year	AADT	
Present ADT (PADT)	2022	20,790	veh / day
Future ADT (FADT)	2042	22,380	veh / day
Annual Linear Growth Rate		0.0038	

Select Other Non-Site Characteristic Based Countermeasures For Entire Project

CMF Nbr	Countermeasure	CMF KA Value	CMF B Value	CMF C Value	CMF O Value	CMF Valid for the Following Site Types
CMF 1						
CMF 2						
CMF 3						
CMF 4						
CMF 5						
CMF 6						
CMF 7						
CMF 8						
CMF 9						
CMF 10						

Proposed Conditions: General Information and Data for Urban And Suburban Arterial Intersection

General Information		Location Information	
Analyst	MJH	Route	SR32
Agency or Company	EEC	Logpoint	6.82
Date Performed	07/02/18	Common Name	SR 32 at 8 Mile Rd
Intersection	SR32; 6.82	Analysis Year	2022
Signalized/Unsignalized	Signalized		

Input Data				Proposed Conditions	HSM Base Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)				3SG	--
AADT $_{major}$ (veh/day) (total entering on major approaches)*	$AADT_{MAX}$ =	58,100	(veh/day)	20,790	--
AADT $_{minor}$ (veh/day) (total entering on minor approaches)*	$AADT_{MAX}$ =	16,400	(veh/day)	3,180	--
Intersection lighting (present/not present)				Not Present	Not Present
Calibration factor, C_i				Varies, See Below	1.00
Data for unsignalized intersections only:					
Number of major-road approaches with left-turn lanes					0
Number of major-road approaches with right-turn lanes					0
Data for signalized intersections only:					
Number of approaches with left-turn lanes				1	0
Number of approaches with right-turn lanes				2	0
Number of approaches with left-turn signal phasing				2	--
Type of left-turn signal phasing for Leg #1				Protected	Permissive
Type of left-turn signal phasing for Leg #2				Protected	--
Type of left-turn signal phasing for Leg #3				Not Applicable	--
Not Applicable					--
Number of approaches with right-turn-on-red prohibited				0	0
Intersection red light cameras (present/not present)				Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol)				1	--
Maximum number of lanes crossed by a pedestrian (n_{lanesx})				2	--
Number of bus stops within 300 m (1,000 ft) of the intersection				0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)				Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection				0	0
Locality:				State System	

Proposed Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Arterial Intersection

(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.9300	0.8836	0.9200	1.0000	1.0000	1.0000	0.7560

Proposed Conditions: Multiple-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(6)*(7)*(8)
Crash Severity Level	**SPF Coefficients** from Table 12-10			**Overdispersion Parameter, k** from Table 12-10	**Initial N_{bimv}** from Equation 12-21	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	a	b	c							
Total	-12.13	1.11	0.26	0.33	2.726	1.000	2.726	0.76	2.25	4.636

Fatal and Injury (FI)	-11.58	1.02	0.17	0.30	0.934	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ = 0.359	0.977	0.76	1.46	1.079
Property Damage Only (PDO)	-13.24	1.14	0.30	0.36	1.671	$(5)_{TOTAL}-(5)_{FI}$ = 0.641	1.748	0.76	2.68	3.542

Proposed Conditions: Single-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients** from Table 12-12			**Overdispersion Parameter, k** from Table 12-12	**Initial N_{bisv}** from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bisv}** (6)*(7)*(8)
	a	b	c							
Total	-9.02	0.42	0.40	0.36	0.198	1.000	0.198	0.76	1.49	0.223
Fatal and Injury (FI)	-9.75	0.27	0.51	0.24	0.052	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ = 0.267	0.053	0.76	1.66	0.067
Property Damage Only (PDO)	-9.08	0.45	0.33	0.53	0.143	$(5)_{TOTAL}-(5)_{FI}$ = 0.733	0.145	0.76	1.42	0.156

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Stop-Controlled Intersections

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{pedi}** from Table 12-16	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
Total	--	--	--	--	--	--
Fatal and injury (FI)	--	--	--	--	--	--

Proposed Conditions: CMFs for Vehicle-Pedestrian Crash Summary for Urban And Suburban Arterial Signalized Intersections

(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
1.00	1.00	1.00	1.00

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Signalized Intersections

(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients** from Table 12-14					**Overdispersion Parameter, k**	**$N_{pedbase}$** from Equation 12-29	**Combined CMF** (4) from Worksheet 2H	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
	a	b	c	d	e					
Total	-6.60	0.05	0.24	0.41	0.09	0.52	0.002	1.00	0.69	0.001
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	0.69	0.001

Proposed Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Arterial Intersection

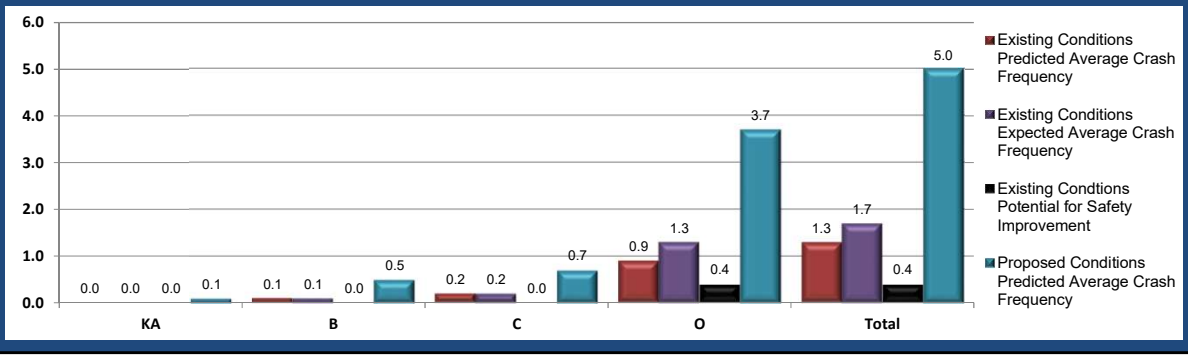
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{bikei}** from Table 12-17	**Calibration factor, C_i**	**Predicted N_{bikei}** (4)*(5)*(6)
Total	4.636	0.223	4.860	0.0079	4.00	0.154
Fatal and injury (FI)	--	--	--	--	4.00	0.154

Project Safety Performance Report

General Information

Project Name	Eastern Corridor	Contact Email	mhunter@eec-eng.com
Project Description	Regional Traffic Study	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/2/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		

Summary of Anticipated Safety Performance of the Project (average crashes/year)



Project Summary Results (Without Animal Crashes)

	KA	B	C	O	Total
$N_{predicted}$ - Existing Conditions	0.0304	0.1349	0.1966	0.9250	1.2869
$N_{expected}$ - Existing Conditions	0.0302	0.1440	0.1936	1.3271	1.6949
$N_{potential\ for\ improvement}$ - Existing Conditions	-0.0002	**0.0091**	-0.0030	**0.4021**	**0.4080**
$N_{predicted}$ - Proposed Conditions	0.1081	0.4963	0.6957	3.6979	4.9980

Existing Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 6.82	SR 32 at 8 Mile Rd	0.0304	0.1349	0.1966	0.925	1.2869

Existing Conditions Project Element Expected Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 6.82	SR 32 at 8 Mile Rd	0.0302	0.144	0.1936	1.3271	1.6949

Existing Conditions Project Element Potential for Safety Improvement Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 6.82	SR 32 at 8 Mile Rd	-0.0002	**0.0091**	-0.003	**0.4021**	**0.408**

Proposed Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 6.82	SR 32 at 8 Mile Rd	0.1081	0.4963	0.6957	3.6979	4.998

Summary by Crash Type

Crash Type	Existing			Proposed
	Predicted Crash Frequency	Expected Crash Frequency	PSI	Predicted Crash Frequency
Unknown	0.0014	0.0015	**0.0001**	0.0014
Head On	0.0087	0.0087	0.0000	0.0087
Rear End	0.6987	1.1192	**0.4205**	0.6987
Backing	0.0365	0.0356	-0.0009	0.0365
Sideswipe - Meeting	0.0198	0.0197	-0.0001	0.0198
Sideswipe - Passing	0.1714	0.1551	-0.0163	0.1714
Angle	0.2537	0.2307	-0.0230	0.2537
Parked Vehicle	0.0500	0.0479	-0.0021	0.0500
Pedestrian	0.0168	0.0168	0.0000	0.0168
Animal	0.0000	0.0000	0.0000	0.0000
Train	0.0001	0.0000	-0.0001	0.0001
Pedalcycles	0.0098	0.0098	0.0000	0.0098
Other Non-Vehicle	0.0000	0.0000	0.0000	0.0000
Fixed Object	0.0803	0.0763	-0.0040	0.0803
Other Object	0.0029	0.0028	-0.0001	0.0029
Overturning	0.0044	0.0044	0.0000	0.0044
Other Non-Collision	0.0107	0.0107	0.0000	0.0107
Left Turn	0.1485	0.2031	**0.0546**	0.1485
Right Turn	0.0000	0.0000	0.0000	0.0000

Safety Benefit - Cost Analysis

General Information

Project Name	Eastern Corridor	Contact Email	mhunter@eec-eng.com
Project Description	Regional Traffic Study	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/2/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		

Select Site Types to be used in Benefit-Cost Analysis:

All Sites

Comments:

Countermeasure Service Lives, Costs, and Safety Benefits

Countermeasures	Service Life (Years)	Initial Cost of Countermeasure	Annual Maintenance & Energy Costs	Salvage Value	Net Present Cost of Countermeasure	Total Cost of Countermeasures	Summary of Annual Crash Modifications	Net Present Value of Safety Benefits
Install Green T Traffic Signal	20	$1,987,500.00			$1,987,500.00	$1,987,500.00	3.711	($1,255,411)
					$0.00	$0.00		
					$0.00	$0.00		
					$0.00	$0.00		
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
Totals		**$1,987,500.00**	**$0.00**	**$0.00**	**$1,987,500.00**	**$1,987,500.00**	**3.711**	**($1,255,411)**

Benefit - Cost Calculator

Net Present Value of Project	$1,987,500.00
Net Present Value of Safety Benefits	($1,255,410.73)
Net Benefit	($3,242,910.73)
Benefit / Cost Ratio	-0.63

Expected Annual Crash Adjustment

Number of Fatal & Incapacitating Injury Crashes	0.078
Number of Injury Crashes	0.938
Number of Total Crashes	3.711

Comments:

Project Information

General Information

Project Name	Eastern Corridor	Contact Email	mhunter@eec-eng.com
Project Description	Regional Traffic Study	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/2/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		
Perform Benefit Cost Analysis?	Yes		

Do the proposed improvements fundamentally change the conditions of the base safety performance function (SPF), Or is crash data unavailable for the analysis condition, Or is only predicted (and not expected) analysis needed for the existing or proposed condition?	**Yes**

(Examples: unsignalized to signalized, undivided to divided, increase or decrease in the number of lanes, change the number of approaches to an intersection, significant realignment of the roadway)

If Yes, are you analyzing the existing or proposed conditions?	**Proposed**

Project Elements Description Table

Project Element ID (Must be Unique)	Site Type	Intersection Control Type	Location Information					
			NLFID	Begin Logpoint/ Intersection Midpoint	End Logpoint *(Leave blank for Intersection)*	Length (mi) OR Intersection Radius Buffer (mi)	Cross Route NLFID(s)	Common Name
SR32; 6.82	Urban & Suburban Arterial Intersection	Unsignalized	SHAMSR00032**C	6.82		0.05		SR 32 at 8 Mile Rd

Traffic Volume Growth Rate Calculation For Benefit Cost Analysis

	Year	AADT	
Present ADT (PADT)	2022	20,790	veh / day
Future ADT (FADT)	2042	22,380	veh / day
Annual Linear Growth Rate		0.0038	

Select Other Non-Site Characteristic Based Countermeasures For Entire Project

CMF Nbr	Countermeasure	CMF KA Value	CMF B Value	CMF C Value	CMF O Value	CMF Valid for the Following Site Types
CMF 1	Conversion of stop-controlled intersection into multi-lane roundabout	0.95	0.95	0.95	0.95	7 / 10
CMF 2						

Project Elements Description Table

	Project Element ID (Must be Unique)	Site Type	Intersection Control Type	Location Information					
				NLFID	Begin Logpoint/ Intersection Midpoint	End Logpoint *(Leave blank for Intersection)*	Length (mi) OR Intersection Radius Buffer (mi)	Cross Route NLFID(s)	Common Name
CMF 3									
CMF 4									
CMF 5									
CMF 6									
CMF 7									
CMF 8									
CMF 9									
CMF 10									

Proposed Conditions: General Information and Data for Urban And Suburban Arterial Intersection

General Information		Location Information	
Analyst	MJH	Route	SR32
Agency or Company	EEC	Logpoint	6.82
Date Performed	07/02/18	Common Name	SR 32 at 8 Mile Rd
Intersection	SR32; 6.82	Analysis Year	2022
Signalized/Unsignalized	Unsignalized		

Input Data				Proposed Conditions	HSM Base Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)				3ST	--
AADT $_{major}$ (veh/day) (total entering on major approaches)*	$AADT_{MAX}$ =	45,700	(veh/day)	20,790	--
AADT $_{minor}$ (veh/day) (total entering on minor approaches)*	$AADT_{MAX}$ =	9,300	(veh/day)	3,180	--
Intersection lighting (present/not present)				Present	Not Present
Calibration factor, C_i				Varies, See Below	1.00
Data for unsignalized intersections only:					
Number of major-road approaches with left-turn lanes				1	0
Number of major-road approaches with right-turn lanes				1	0
Data for signalized intersections only:					
Number of approaches with left-turn lanes					0
Number of approaches with right-turn lanes					0
Number of approaches with left-turn signal phasing					--
Type of left-turn signal phasing for Leg #1					Permissive
Type of left-turn signal phasing for Leg #2					--
Type of left-turn signal phasing for Leg #3					--
Not Applicable					--
Number of approaches with right-turn-on-red prohibited					0
Intersection red light cameras (present/not present)					Not Present
Sum of all pedestrian crossing volumes (PedVol)					--
Maximum number of lanes crossed by a pedestrian (n_{lanesx})					--
Number of bus stops within 300 m (1,000 ft) of the intersection					0
Schools within 300 m (1,000 ft) of the intersection (present/not present)					Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection					0
Locality:				State System	

Proposed Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Arterial Intersection

(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.6700	1.0000	0.8600	1.0000	0.9999	1.0000	0.5762

Proposed Conditions: Multiple-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(6)*(7)*(8)
Crash Severity Level	**SPF Coefficients** from Table 12-10			**Overdispersion Parameter, k** from Table 12-10	**Initial N_{bimv}** from Equation 12-21	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	a	b	c							
Total	-13.36	1.11	0.41	0.80	2.671	1.000	2.671	0.58	0.76	1.169

Fatal and Injury (FI)	-14.01	1.16	0.30	0.69	0.944	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.327	0.874	0.58	0.62	0.312
Property Damage Only (PDO)	-15.38	1.20	0.51	0.77	1.942	$(5)_{TOTAL}-(5)_{FI}$ 0.673	1.797	0.58	0.82	0.849

Proposed Conditions: Single-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients** from Table 12-12			**Overdispersion Parameter, k** from Table 12-12	**Initial N_{bisv}** from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bisv}** (6)*(7)*(8)
	a	b	c							
Total	-6.81	0.16	0.51	1.14	0.331	1.000	0.331	0.58	0.54	0.103
Fatal and Injury (FI)	--	--	--	--	0.103	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.302	0.100	0.58	0.47	0.027
Property Damage Only (PDO)	-8.36	0.25	0.55	1.29	0.237	$(5)_{TOTAL}-(5)_{FI}$ 0.698	0.231	0.58	0.57	0.076

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Stop-Controlled Intersections

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{pedi}** from Table 12-16	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
Total	1.169	0.103	1.272	0.010	1.11	0.014
Fatal and injury (FI)	--	--	--	--	1.11	0.014

Proposed Conditions: CMFs for Vehicle-Pedestrian Crash Summary for Urban And Suburban Arterial Signalized Intersections

(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
--	--	--	--

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Signalized Intersections

(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients** from Table 12-14					**Overdispersion Parameter, k**	**$N_{pedbase}$** from Equation 12-29	**Combined CMF** (4) from Worksheet 2H	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
	a	b	c	d	e					
Total	--	--	--	--	--	--	--	--	--	--
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	--	--

Proposed Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Arterial Intersection

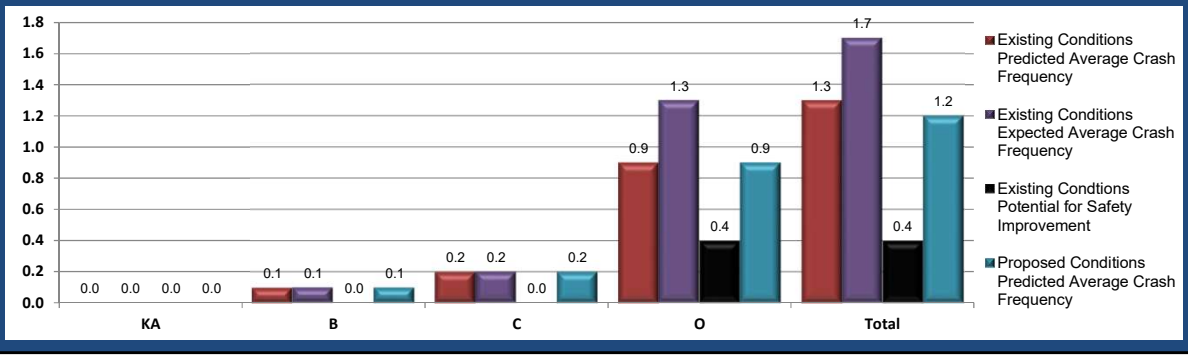
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{bikei}** from Table 12-17	**Calibration factor, C_i**	**Predicted N_{bikei}** (4)*(5)*(6)
Total	1.169	0.103	1.272	0.0057	1.16	0.008
Fatal and injury (FI)	--	--	--	--	1.16	0.008

Project Safety Performance Report

General Information

Project Name	Eastern Corridor	Contact Email	mhunter@eec-eng.com
Project Description	Regional Traffic Study	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/2/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		

Summary of Anticipated Safety Performance of the Project (average crashes/year)



Project Summary Results (Without Animal Crashes)

	KA	B	C	O	Total
$N_{predicted}$ - Existing Conditions	0.0304	0.1349	0.1966	0.9250	1.2869
$N_{expected}$ - Existing Conditions	0.0302	0.1440	0.1936	1.3271	1.6949
$N_{potential\ for\ improvement}$ - Existing Conditions	-0.0002	**0.0091**	-0.0030	**0.4021**	**0.4080**
$N_{predicted}$ - Proposed Conditions	0.0289	0.1282	0.1868	0.8787	1.2226

Existing Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 6.82	SR 32 at 8 Mile Rd	0.0304	0.1349	0.1966	0.925	1.2869

Existing Conditions Project Element Expected Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 6.82	SR 32 at 8 Mile Rd	0.0302	0.144	0.1936	1.3271	1.6949

Existing Conditions Project Element Potential for Safety Improvement Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 6.82	SR 32 at 8 Mile Rd	-0.0002	**0.0091**	-0.003	**0.4021**	**0.408**

Proposed Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 6.82	SR 32 at 8 Mile Rd	0.0289	0.1282	0.1868	0.8787	1.2226

Summary by Crash Type

Crash Type	Existing			Proposed
	Predicted Crash Frequency	Expected Crash Frequency	PSI	Predicted Crash Frequency
Unknown	0.0014	0.0015	**0.0001**	0.0014
Head On	0.0087	0.0087	0.0000	0.0087
Rear End	0.6987	1.1192	**0.4205**	0.6987
Backing	0.0365	0.0356	-0.0009	0.0365
Sideswipe - Meeting	0.0198	0.0197	-0.0001	0.0198
Sideswipe - Passing	0.1714	0.1551	-0.0163	0.1714
Angle	0.2537	0.2307	-0.0230	0.2537
Parked Vehicle	0.0500	0.0479	-0.0021	0.0500
Pedestrian	0.0168	0.0168	0.0000	0.0168
Animal	0.0000	0.0000	0.0000	0.0000
Train	0.0001	0.0000	-0.0001	0.0001
Pedalcycles	0.0098	0.0098	0.0000	0.0098
Other Non-Vehicle	0.0000	0.0000	0.0000	0.0000
Fixed Object	0.0803	0.0763	-0.0040	0.0803
Other Object	0.0029	0.0028	-0.0001	0.0029
Overturning	0.0044	0.0044	0.0000	0.0044
Other Non-Collision	0.0107	0.0107	0.0000	0.0107
Left Turn	0.1485	0.2031	**0.0546**	0.1485
Right Turn	0.0000	0.0000	0.0000	0.0000

Safety Benefit - Cost Analysis

General Information

Project Name	Eastern Corridor	Contact Email	mhunter@eec-eng.com
Project Description	Regional Traffic Study	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/2/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		

Select Site Types to be used in Benefit-Cost Analysis:

All Sites

Comments:

Countermeasure Service Lives, Costs, and Safety Benefits

Countermeasures	Service Life (Years)	Initial Cost of Countermeasure	Annual Maintenance & Energy Costs	Salvage Value	Net Present Cost of Countermeasure	Total Cost of Countermeasures	Summary of Annual Crash Modifications	Net Present Value of Safety Benefits
					$0.00	$0.00	0.000	$12
					$0.00	$0.00		
					$0.00	$0.00		
					$0.00	$0.00		
CMF 1 - Conversion of stop-controlled intersection into multi-lane roundabout	20	$1,000,000.00			$1,000,000.00	$1,000,000.00	-0.064	$23,220
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
Totals		**$1,000,000.00**	**$0.00**	**$0.00**	**$1,000,000.00**	**$1,000,000.00**	**-0.064**	**$23,232**

Benefit - Cost Calculator

Net Present Value of Project	$1,000,000.00
Net Present Value of Safety Benefits	$23,232.33
Net Benefit	($976,767.67)
Benefit / Cost Ratio	0.02

Expected Annual Crash Adjustment

Number of Fatal & Incapacitating Injury Crashes	-0.002
Number of Injury Crashes	-0.018
Number of Total Crashes	-0.064

Comments:

Existing Conditions: General Information and Data for Urban And Suburban Arterial Intersection

General Information		Location Information	
Analyst	MJH	Route	SR32
Agency or Company	EEC	Logpoint	2.15
Date Performed	07/08/18	Common Name	SR 32 @ Clough Pike
Intersection	SR32; 2.15	Analysis Year	2020
Signalized/Unsignalized	Signalized		

Input Data				Existing Conditions	HSM Base Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)				3SG	--
AADT $_{major}$ (veh/day) (total entering on major approaches)*	$AADT_{MAX}$ =	58,100	(veh/day)	19,110	--
AADT $_{minor}$ (veh/day) (total entering on minor approaches)*	$AADT_{MAX}$ =	16,400	(veh/day)	4,950	--
Intersection lighting (present/not present)				Present	Not Present
Calibration factor, C_i				Varies, See Below	1.00
Data for unsignalized intersections only:					
Number of major-road approaches with left-turn lanes					0
Number of major-road approaches with right-turn lanes					0
Data for signalized intersections only:					
Number of approaches with left-turn lanes				0	0
Number of approaches with right-turn lanes				0	0
Number of approaches with left-turn signal phasing				2	--
Type of left-turn signal phasing for Leg #1				Permissive	Permissive
Type of left-turn signal phasing for Leg #2				Permissive	--
Type of left-turn signal phasing for Leg #3				Not Applicable	--
Not Applicable				Not Applicable	--
Number of approaches with right-turn-on-red prohibited				1	0
Intersection red light cameras (present/not present)				Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol)				1	--
Maximum number of lanes crossed by a pedestrian (n_{lanesx})				2	--
Number of bus stops within 300 m (1,000 ft) of the intersection				0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)				Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection				0	0
Locality:				State System	

Existing Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Arterial Intersection

(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
1.0000	1.0000	1.0000	0.9800	0.9999	1.0000	0.9799

Existing Conditions: Multiple-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(6)*(7)*(8)
Crash Severity Level	**SPF Coefficients** from Table 12-10			**Overdispersion Parameter, k** from Table 12-10	**Initial N_{bimv}** from Equation 12-21	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	a	b	c							
Total	-12.13	1.11	0.26	0.33	2.785	1.000	2.785	0.98	2.25	6.140

Fatal and Injury (FI)	-11.58	1.02	0.17	0.30	0.924	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.348	0.968	0.98	1.46	1.386
Property Damage Only (PDO)	-13.24	1.14	0.30	0.36	1.734	$(5)_{TOTAL}-(5)_{FI}$ 0.652	1.816	0.98	2.68	4.770

Existing Conditions: Single-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients** from Table 12-12			**Overdispersion Parameter, k** from Table 12-12	**Initial N_{bisv}** from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bisv}** (6)*(7)*(8)
	a	b	c							
Total	-9.02	0.42	0.40	0.36	0.228	1.000	0.228	0.98	1.49	0.333
Fatal and Injury (FI)	-9.75	0.27	0.51	0.24	0.064	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.286	0.065	0.98	1.66	0.106
Property Damage Only (PDO)	-9.08	0.45	0.33	0.53	0.159	$(5)_{TOTAL}-(5)_{FI}$ 0.714	0.163	0.98	1.42	0.227

Existing Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Stop-Controlled Intersections

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{pedi}** from Table 12-16	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
Total	--	--	--	--	--	--
Fatal and injury (FI)	--	--	--	--	--	--

Existing Conditions: CMFs for Vehicle-Pedestrian Crash Summary for Urban And Suburban Arterial Signalized Intersections

(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
1.00	1.00	1.00	1.00

Existing Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Signalized Intersections

(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients** from Table 12-14					**Overdispersion Parameter, k**	**$N_{pedbase}$** from Equation 12-29	**Combined CMF** (4) from Worksheet 2H	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
	a	b	c	d	e					
Total	-6.60	0.05	0.24	0.41	0.09	0.52	0.002	1.00	0.69	0.001
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	0.69	0.001

Existing Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{bikei}** from Table 12-17	**Calibration factor, C_i**	**Predicted N_{bikei}** (4)*(5)*(6)
Total	6.140	0.333	6.474	0.0079	4.00	0.205
Fatal and injury (FI)	--	--	--	--	4.00	0.205

Project Information

General Information

Project Name	SR 32 @ Clough Pike	Contact Email	mhunter@eec-eng.com
Project Description	Replace signalized intersection with a modern roundabout	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/8/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		
Perform Benefit Cost Analysis?	Yes		

Do the proposed improvements fundamentally change the conditions of the base safety performance function (SPF), Or is crash data unavailable for the analysis condition, Or is only predicted (and not expected) analysis needed for the existing or proposed condition?	**Yes**

(Examples: unsignalized to signalized, undivided to divided, increase or decrease in the number of lanes, change the number of approaches to an intersection, significant realignment of the roadway)

If Yes, are you analyzing the existing or proposed conditions?	**Proposed**

Project Elements Description Table

Project Element ID (Must be Unique)	Site Type	Intersection Control Type	Location Information					
			NLFID	Begin Logpoint/ Intersection Midpoint	End Logpoint *(Leave blank for Intersection)*	Length (mi) OR Intersection Radius Buffer (mi)	Cross Route NLFID(s)	Common Name
SR32; 2.15	Urban & Suburban Arterial Intersection	Signalized	SHAMSR00032**C	2.15		0.05	CHAMCR0035	SR 32 @ Clough Pike

Traffic Volume Growth Rate Calculation For Benefit Cost Analysis

	Year	AADT	
Present ADT (PADT)	2022	19,110	veh / day
Future ADT (FADT)	2042	19,350	veh / day
Annual Linear Growth Rate		0.0006	

Select Other Non-Site Characteristic Based Countermeasures For Entire Project

CMF Nbr	Countermeasure	CMF KA Value	CMF B Value	CMF C Value	CMF O Value	CMF Valid for the Following Site Types
CMF 1	Conversion of signalized intersection into single- or multi-lane roundabout	0.29	0.29	0.29	0.74	7 / 10
CMF 2						
CMF 3						
CMF 4						
CMF 5						
CMF 6						
CMF 7						
CMF 8						
CMF 9						
CMF 10						

Proposed Conditions: General Information and Data for Urban And Suburban Arterial Intersection

General Information		Location Information	
Analyst	MJH	Route	SR32
Agency or Company	EEC	Logpoint	2.15
Date Performed	07/08/18	Common Name	SR 32 @ Clough Pike
Intersection	SR32; 2.15	Analysis Year	2022
Signalized/Unsignalized	Signalized		

Input Data				Proposed Conditions	HSM Base Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)				3SG	--
AADT $_{major}$ (veh/day) (total entering on major approaches)*	$AADT_{MAX}$ =	58,100	(veh/day)	19,110	--
AADT $_{minor}$ (veh/day) (total entering on minor approaches)*	$AADT_{MAX}$ =	16,400	(veh/day)	4,950	--
Intersection lighting (present/not present)				Present	Not Present
Calibration factor, C_i				Varies, See Below	1.00
Data for unsignalized intersections only:					
Number of major-road approaches with left-turn lanes					0
Number of major-road approaches with right-turn lanes					0
Data for signalized intersections only:					
Number of approaches with left-turn lanes				0	0
Number of approaches with right-turn lanes				0	0
Number of approaches with left-turn signal phasing				2	--
Type of left-turn signal phasing for Leg #1				Permissive	Permissive
Type of left-turn signal phasing for Leg #2				Permissive	--
Type of left-turn signal phasing for Leg #3				Not Applicable	--
Not Applicable				Not Applicable	--
Number of approaches with right-turn-on-red prohibited				1	0
Intersection red light cameras (present/not present)				Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol)				1	--
Maximum number of lanes crossed by a pedestrian (n_{lanesx})				2	--
Number of bus stops within 300 m (1,000 ft) of the intersection				0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)				Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection				0	0
Locality:				State System	

Proposed Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Arterial Intersection

(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
1.0000	1.0000	1.0000	0.9800	0.9999	1.0000	0.9799

Proposed Conditions: Multiple-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(6)*(7)*(8)
Crash Severity Level	**SPF Coefficients** from Table 12-10			**Overdispersion Parameter, k** from Table 12-10	**Initial N_{bimv}** from Equation 12-21	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	a	b	c							
Total	-12.13	1.11	0.26	0.33	2.785	1.000	2.785	0.98	2.25	6.140

Fatal and Injury (FI)	-11.58	1.02	0.17	0.30	0.924	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.348	0.968	0.98	1.46	1.386
Property Damage Only (PDO)	-13.24	1.14	0.30	0.36	1.734	$(5)_{TOTAL}-(5)_{FI}$ 0.652	1.816	0.98	2.68	4.770

Proposed Conditions: Single-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients** from Table 12-12			**Overdispersion Parameter, k** from Table 12-12	**Initial N_{bisv}** from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bisv}** (6)*(7)*(8)
	a	b	c							
Total	-9.02	0.42	0.40	0.36	0.228	1.000	0.228	0.98	1.49	0.333
Fatal and Injury (FI)	-9.75	0.27	0.51	0.24	0.064	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.286	0.065	0.98	1.66	0.106
Property Damage Only (PDO)	-9.08	0.45	0.33	0.53	0.159	$(5)_{TOTAL}-(5)_{FI}$ 0.714	0.163	0.98	1.42	0.227

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Stop-Controlled Intersections

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{pedi}** from Table 12-16	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
Total	--	--	--	--	--	--
Fatal and injury (FI)	--	--	--	--	--	--

Proposed Conditions: CMFs for Vehicle-Pedestrian Crash Summary for Urban And Suburban Arterial Signalized Intersections

(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
1.00	1.00	1.00	1.00

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Signalized Intersections

(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients** from Table 12-14					**Overdispersion Parameter, k**	**$N_{pedbase}$** from Equation 12-29	**Combined CMF** (4) from Worksheet 2H	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
	a	b	c	d	e					
Total	-6.60	0.05	0.24	0.41	0.09	0.52	0.002	1.00	0.69	0.001
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	0.69	0.001

Proposed Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Arterial Intersection

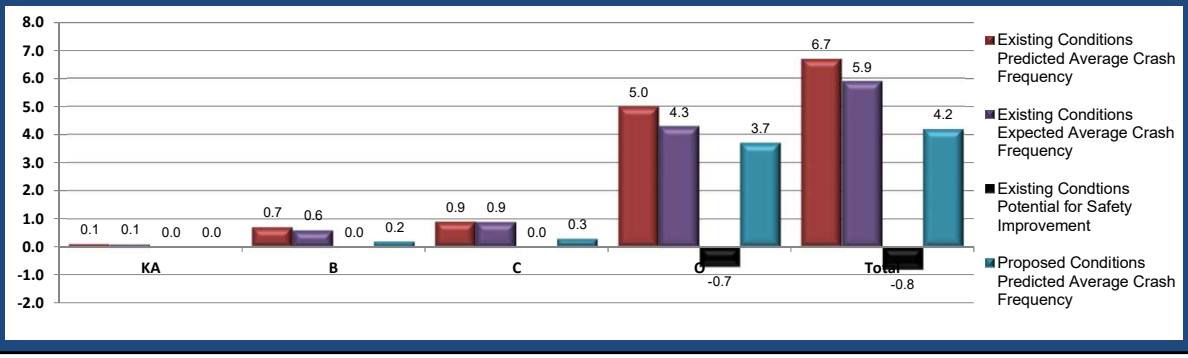
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{bikei}** from Table 12-17	**Calibration factor, C_i**	**Predicted N_{bikei}** (4)*(5)*(6)
Total	6.140	0.333	6.474	0.0079	4.00	0.205
Fatal and injury (FI)	--	--	--	--	4.00	0.205

Project Safety Performance Report

General Information

Project Name	SR 32 @ Clough Pike	Contact Email	mhunter@eec-eng.com
Project Description	Replace signalized intersection with a modern roundabout	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/8/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		

Summary of Anticipated Safety Performance of the Project (average crashes/year)



Project Summary Results (Without Animal Crashes)

	KA	B	C	O	Total
$N_{predicted}$ - Existing Conditions	0.1428	0.6504	0.9046	4.9970	6.6948
$N_{expected}$ - Existing Conditions	0.1410	0.6196	0.8772	4.2890	5.9268
$N_{potential\ for\ improvement}$ - Existing Conditions	-0.0018	-0.0308	-0.0274	-0.7080	-0.7680
$N_{expected}$ - Proposed Conditions	0.0414	0.1886	0.2623	3.6978	4.1901

Existing Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 2.15	SR 32 @ Clough Pike	0.1428	0.6504	0.9046	4.997	6.6948

Existing Conditions Project Element Expected Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 2.15	SR 32 @ Clough Pike	0.141	0.6196	0.8772	4.289	5.9268

Existing Conditions Project Element Potential for Safety Improvement Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 2.15	SR 32 @ Clough Pike	-0.0018	-0.0308	-0.0274	-0.708	-0.768

Proposed Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 2.15	SR 32 @ Clough Pike	0.0414	0.1886	0.2623	3.6978	4.1901

Summary by Crash Type

Crash Type	Existing			Proposed
	Predicted Crash Frequency	Expected Crash Frequency	PSI	Predicted Crash Frequency
Unknown	0.0017	0.0016	-0.0001	0.0025
Head On	0.0265	0.0265	0.0000	0.0251
Rear End	2.0493	2.0878	**0.0385**	2.5300
Backing	0.1042	0.1122	**0.0080**	0.1517
Sideswipe - Meeting	0.0586	0.0627	**0.0041**	0.0683
Sideswipe - Passing	0.4947	0.4353	-0.0594	0.6786
Angle	0.7515	0.7177	-0.0338	0.8655
Parked Vehicle	0.0580	0.0569	-0.0011	0.0898
Pedestrian	0.0009	0.0009	0.0000	0.0005
Animal	0.0000	0.0000	0.0000	0.0000
Train	0.0001	0.0000	-0.0001	0.0001
Pedalcycles	0.1328	0.1260	-0.0068	0.0712
Other Non-Vehicle	0.0000	0.0000	0.0000	0.0000
Fixed Object	0.0931	0.1036	**0.0105**	0.1360
Other Object	0.0033	0.0033	0.0000	0.0051
Overturning	0.0051	0.0051	0.0000	0.0060
Other Non-Collision	0.0124	0.0141	**0.0017**	0.0186
Left Turn	0.4446	0.4178	-0.0268	0.4741
Right Turn	0.0000	0.0000	0.0000	0.0000

Safety Benefit - Cost Analysis

General Information

Project Name	SR 32 @ Clough Pike	Contact Email	mhunter@eec-eng.com
Project Description	Replace signalized intersection with a modern roundabout	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/8/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		

Select Site Types to be used in Benefit-Cost Analysis:

All Sites

Comments:

Countermeasure Service Lives, Costs, and Safety Benefits

Countermeasures	Service Life (Years)	Initial Cost of Countermeasure	Annual Maintenance & Energy Costs	Salvage Value	Net Present Cost of Countermeasure	Total Cost of Countermeasures	Summary of Annual Crash Modifications	Net Present Value of Safety Benefits
Site Characteristic Improvements (Please add description about improvements i.e. Lane widening)					$0.00	$0.00	0.000	$0
Site Characteristic Improvements (Please add description about improvements i.e. Lighting)					$0.00	$0.00		
Site Characteristic Improvements (Please add description about improvements i.e. Signal Phasing)					$0.00	$0.00		
Site Characteristic Improvements (Please add description about improvements i.e. Added Right Turn Lane)					$0.00	$0.00		
CMF 1 - Conversion of signalized intersection into single- or multi-lane roundabout	20	$4,700,000.00			$4,700,000.00	$4,700,000.00	-2.505	$1,306,421
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
Totals		**$4,700,000.00**	**$0.00**	**$0.00**	**$4,700,000.00**	**$4,700,000.00**	**-2.505**	**$1,306,421**

Benefit - Cost Calculator

Net Present Value of Project	$4,700,000.00
Net Present Value of Safety Benefits	$1,306,420.71
Net Benefit	($3,393,579.29)
Benefit / Cost Ratio	0.28

Expected Annual Crash Adjustment

Number of Fatal & Incapacitating Injury Crashes	-0.101
Number of Injury Crashes	-1.206
Number of Total Crashes	-2.505

Comments:

Project Information

General Information

Project Name	Eastern Corridor	Contact Email	mhunter@eec-eng.com
Project Description	Regional Traffic Study	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/2/2018
Analyst	MJH	Analysis Year	2018
Agency/Company	EEC		
Perform Benefit Cost Analysis?	Yes		

Do the proposed improvements fundamentally change the conditions of the base safety performance function (SPF), Or is crash data unavailable for the analysis condition, Or is only predicted (and not expected) analysis needed for the existing or proposed condition?	**Yes**

(Examples: unsignalized to signalized, undivided to divided, increase or decrease in the number of lanes, change the number of approaches to an intersection, significant realignment of the roadway)

If Yes, are you analyzing the existing or proposed conditions?	**Existing**

Project Elements Description Table

Project Element ID (Must be Unique)	Site Type	Intersection Control Type	Location Information					
			NLFID	Begin Logpoint/ Intersection Midpoint	End Logpoint *(Leave blank for Intersection)*	Length (mi) OR Intersection Radius Buffer (mi)	Cross Route NLFID(s)	Common Name
SR32; 6.17	Urban & Suburban Arterial Intersection	Unsignalized	SHAMSR00032**C	6.17		0.05		

Traffic Volume Growth Rate Calculation For Benefit Cost Analysis

	Year	AADT	
Present ADT (PADT)			veh / day
Future ADT (FADT)			veh / day
Annual Linear Growth Rate		0.0000	

Project Information

General Information

Project Name	SR 32 at Hickory Lane	Contact Email	mhunter@eec-eng.com
Project Description	Add WB left-turn Lane	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/2/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		
Perform Benefit Cost Analysis?	Yes		

Do the proposed improvements fundamentally change the conditions of the base safety performance function (SPF), Or is crash data unavailable for the analysis condition, Or is only predicted (and not expected) analysis needed for the existing or proposed condition?	**Yes**

(Examples: unsignalized to signalized, undivided to divided, increase or decrease in the number of lanes, change the number of approaches to an intersection, significant realignment of the roadway)

If Yes, are you analyzing the existing or proposed conditions?	**Proposed**

Project Elements Description Table

Project Element ID (Must be Unique)	Site Type	Intersection Control Type	Location Information					
			NLFID	Begin Logpoint/ Intersection Midpoint	End Logpoint *(Leave blank for Intersection)*	Length (mi) OR Intersection Radius Buffer (mi)	Cross Route NLFID(s)	Common Name
SR32; 6.17	Urban & Suburban Arterial Intersection	Unsignalized	SHAMSR00032**C	6.17		0.05		SR 32 at Hickory Lane

Traffic Volume Growth Rate Calculation For Benefit Cost Analysis

	Year	AADT	
Present ADT (PADT)			veh / day
Future ADT (FADT)			veh / day
Annual Linear Growth Rate		0.0000	

Select Other Non-Site Characteristic Based Countermeasures For Entire Project

CMF Nbr	Countermeasure	CMF KA Value	CMF B Value	CMF C Value	CMF O Value	CMF Valid for the Following Site Types
CMF 1						
CMF 2						
CMF 3						
CMF 4						
CMF 5						
CMF 6						
CMF 7						
CMF 8						
CMF 9						
CMF 10						

Proposed Conditions: General Information and Data for Urban And Suburban Arterial Intersection

General Information		Location Information	
Analyst	MJH	Route	SR32
Agency or Company	EEC	Logpoint	6.17
Date Performed	07/02/18	Common Name	SR 32 at Hickory Lane
Intersection	SR32; 6.17	Analysis Year	2018
Signalized/Unsignalized	Unsignalized		

Input Data				Proposed Conditions	HSM Base Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)				3ST	--
AADT $_{major}$ (veh/day) (total entering on major approaches)*	$AADT_{MAX}$ =	45,700	(veh/day)	17,000	--
AADT $_{minor}$ (veh/day) (total entering on minor approaches)*	$AADT_{MAX}$ =	9,300	(veh/day)	50	--
Intersection lighting (present/not present)				Not Present	Not Present
Calibration factor, C_i				Varies, See Below	1.00
Data for unsignalized intersections only:					
Number of major-road approaches with left-turn lanes				1	0
Number of major-road approaches with right-turn lanes				0	0
Data for signalized intersections only:					
Number of approaches with left-turn lanes					0
Number of approaches with right-turn lanes					0
Number of approaches with left-turn signal phasing					--
Type of left-turn signal phasing for Leg #1					Permissive
Type of left-turn signal phasing for Leg #2					--
Type of left-turn signal phasing for Leg #3					--
Not Applicable					--
Number of approaches with right-turn-on-red prohibited					0
Intersection red light cameras (present/not present)					Not Present
Sum of all pedestrian crossing volumes (PedVol)					--
Maximum number of lanes crossed by a pedestrian (n_{lanesx})					--
Number of bus stops within 300 m (1,000 ft) of the intersection					0
Schools within 300 m (1,000 ft) of the intersection (present/not present)					Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection					0
Locality:				State System	

Proposed Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Arterial Intersection

(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.6700	1.0000	1.0000	1.0000	1.0000	1.0000	0.6700

Proposed Conditions: Multiple-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(6)*(7)*(8)
Crash Severity Level	**SPF Coefficients** from Table 12-10			**Overdispersion Parameter, k** from Table 12-10	**Initial N_{bimv}** from Equation 12-21	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	a	b	c							
Total	-13.36	1.11	0.41	0.80	0.389	1.000	0.389	0.67	0.76	0.198

Fatal and Injury (FI)	-14.01	1.16	0.30	0.69	0.215	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.540	0.210	0.67	0.62	0.087
Property Damage Only (PDO)	-15.38	1.20	0.51	0.77	0.183	$(5)_{TOTAL}-(5)_{FI}$ 0.460	0.179	0.67	0.82	0.098

Proposed Conditions: Single-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients** from Table 12-12			**Overdispersion Parameter, k** from Table 12-12	**Initial N_{bisv}** from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bisv}** (6)*(7)*(8)
	a	b	c							
Total	-6.81	0.16	0.51	1.14	0.039	1.000	0.039	0.67	0.54	0.014
Fatal and Injury (FI)	--	--	--	--	0.012	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.342	0.013	0.67	0.47	0.004
Property Damage Only (PDO)	-8.36	0.25	0.55	1.29	0.023	$(5)_{TOTAL}-(5)_{FI}$ 0.658	0.025	0.67	0.57	0.010

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Stop-Controlled Intersections

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{pedi}** from Table 12-16	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
Total	0.198	0.014	0.212	0.010	1.11	0.002
Fatal and injury (FI)	--	--	--	--	1.11	0.002

Proposed Conditions: CMFs for Vehicle-Pedestrian Crash Summary for Urban And Suburban Arterial Signalized Intersections

(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
--	--	--	--

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Signalized Intersections

(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients** from Table 12-14					**Overdispersion Parameter, k**	**$N_{pedbase}$** from Equation 12-29	**Combined CMF** (4) from Worksheet 2H	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
	a	b	c	d	e					
Total	--	--	--	--	--	--	--	--	--	--
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	--	--

Proposed Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{bikei}** from Table 12-17	**Calibration factor, C_i**	**Predicted N_{bikei}** (4)*(5)*(6)
Total	0.198	0.014	0.212	0.0057	1.16	0.001
Fatal and injury (FI)	--	--	--	--	1.16	0.001

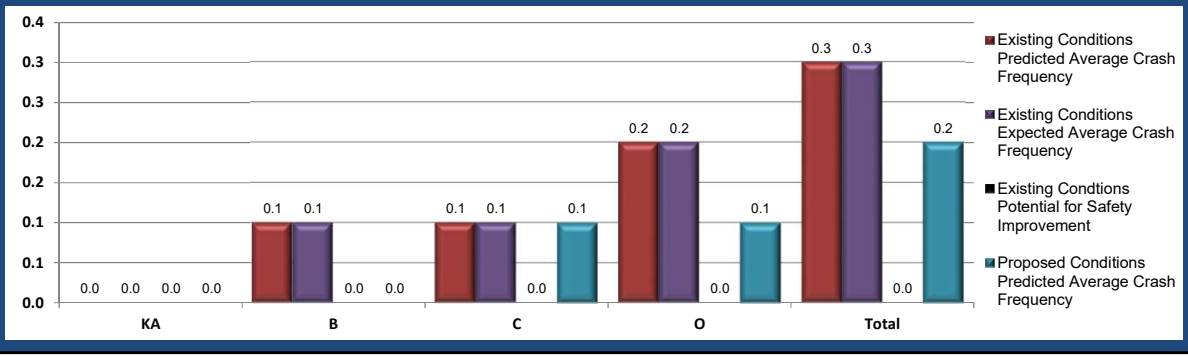
Project Safety Performance Report

ECAT Economic Crash Analysis Tool

General Information

Project Name	SR 32 at Hickory Lane	Contact Email	mhunter@eec-eng.com
Project Description	Add WB left-turn Lane	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/2/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		

Summary of Anticipated Safety Performance of the Project (average crashes/year)



Project Summary Results (Without Animal Crashes)

	KA	B	C	O	Total
$N_{predicted}$ - Existing Conditions	0.0112	0.0522	0.0787	0.1614	0.3035
$N_{expected}$ - Existing Conditions	0.0113	0.0517	0.0868	0.1935	0.3433
$N_{potential\ for\ improvement}$ - Existing Conditions	0.0001	-0.0005	0.0081	0.0321	0.0398
$N_{predicted}$ - Proposed Conditions	0.0075	0.0350	0.0527	0.1081	0.2033

Existing Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 6.17		0.0112	0.0522	0.0787	0.1614	0.3035

Existing Conditions Project Element Expected Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 6.17		0.0113	0.0517	0.0868	0.1935	0.3433

Existing Conditions Project Element Potential for Safety Improvement Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 6.17		1E-04	-0.0005	0.0081	0.0321	0.0398

Proposed Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 6.17	SR 32 at Hickory Lane	0.0075	0.035	0.0527	0.1081	0.2033

Summary by Crash Type

Crash Type	Existing			Proposed
	Predicted Crash Frequency	Expected Crash Frequency	PSI	Predicted Crash Frequency
Unknown	0.0001	0.0001	0.0000	0.0001
Head On	0.0016	0.0015	-0.0001	0.0016
Rear End	0.0954	0.1251	0.0297	0.0954
Backing	0.0038	0.0038	0.0000	0.0038
Sideswipe - Meeting	0.0029	0.0029	0.0000	0.0029
Sideswipe - Passing	0.0198	0.0197	-0.0001	0.0198
Angle	0.0379	0.0376	-0.0003	0.0379
Parked Vehicle	0.0045	0.0045	0.0000	0.0045
Pedestrian	0.0024	0.0024	0.0000	0.0024
Animal	0.0000	0.0000	0.0000	0.0000
Train	0.0000	0.0000	0.0000	0.0000
Pedalcycles	0.0014	0.0014	0.0000	0.0014
Other Non-Vehicle	0.0000	0.0000	0.0000	0.0000
Fixed Object	0.0075	0.0075	0.0000	0.0075
Other Object	0.0003	0.0002	-0.0001	0.0003
Overturning	0.0004	0.0004	0.0000	0.0004
Other Non-Collision	0.0010	0.0009	-0.0001	0.0010
Left Turn	0.0242	0.0241	-0.0001	0.0242
Right Turn	0.0000	0.0000	0.0000	0.0000

Safety Benefit - Cost Analysis

General Information

Project Name	SR 32 at Hickory Lane	Contact Email	mhunter@eec-eng.com
Project Description	Add WB left-turn Lane	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/2/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		

Select Site Types to be used in Benefit-Cost Analysis:

All Sites

Comments:

Countermeasure Service Lives, Costs, and Safety Benefits

Countermeasures	Service Life (Years)	Initial Cost of Countermeasure	Annual Maintenance & Energy Costs	Salvage Value	Net Present Cost of Countermeasure	Total Cost of Countermeasures	Summary of Annual Crash Modifications	Net Present Value of Safety Benefits
Add left-turn lane	20	$1,550,000.00			$1,550,000.00	$1,550,000.00	-0.100	$49,686
Site Characteristic Improvements (Please add description about improvements i.e. Lighting)					$0.00	$0.00		
Site Characteristic Improvements (Please add description about improvements i.e. Signal Phasing)					$0.00	$0.00		
Site Characteristic Improvements (Please add description about improvements i.e. Added Right Turn Lane)					$0.00	$0.00		
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
Totals		**$1,550,000.00**	**$0.00**	**$0.00**	**$1,550,000.00**	**$1,550,000.00**	**-0.100**	**$49,686**

Benefit - Cost Calculator

Net Present Value of Project	$1,550,000.00
Net Present Value of Safety Benefits	$49,686.29
Net Benefit	($1,500,313.71)
Benefit / Cost Ratio	0.03

Expected Annual Crash Adjustment

Number of Fatal & Incapacitating Injury Crashes	-0.004
Number of Injury Crashes	-0.047
Number of Total Crashes	-0.100

Comments:

Project Information

General Information

Project Name	SR 32 @ Round Bottom Rd	Contact Email	mhunter@eec-eng.com
Project Description	Replace signalized intersection with modern roundabout	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/8/2018
Analyst	MJH	Analysis Year	2038
Agency/Company	EEC		
Perform Benefit Cost Analysis?	No		

Do the proposed improvements fundamentally change the conditions of the base safety performance function (SPF), Or is crash data unavailable for the analysis condition, Or is only predicted (and not expected) analysis needed for the existing or proposed condition?	**Yes**

(Examples: unsignalized to signalized, undivided to divided, increase or decrease in the number of lanes, change the number of approaches to an intersection, significant realignment of the roadway)

If Yes, are you analyzing the existing or proposed conditions?	**Existing**

Project Elements Description Table

Project Element ID (Must be Unique)	Site Type	Intersection Control Type	Location Information					
			NLFID	Begin Logpoint/ Intersection Midpoint	End Logpoint *(Leave blank for Intersection)*	Length (mi) OR Intersection Radius Buffer (mi)	Cross Route NLFID(s)	Common Name
SR32; 4.46	Urban & Suburban Arterial Intersection	Signalized	SHAMSR00032**C	4.46		0.05	CHAMCR003	SR 32 at Round Bottom

Project Information

General Information

Project Name	SR 32 @ Round Bottom Rd	Contact Email	mhunter@eec-eng.com
Project Description	Replace signalized intersection with modern roundabout	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/8/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		
Perform Benefit Cost Analysis?	Yes		

Do the proposed improvements fundamentally change the conditions of the base safety performance function (SPF), Or is crash data unavailable for the analysis condition, Or is only predicted (and not expected) analysis needed for the existing or proposed condition?	**Yes**

(Examples: unsignalized to signalized, undivided to divided, increase or decrease in the number of lanes, change the number of approaches to an intersection, significant realignment of the roadway)

If Yes, are you analyzing the existing or proposed conditions?	**Proposed**

Project Elements Description Table

Project Element ID (Must be Unique)	Site Type	Intersection Control Type	Location Information					
			NLFID	Begin Logpoint/ Intersection Midpoint	End Logpoint *(Leave blank for Intersection)*	Length (mi) OR Intersection Radius Buffer (mi)	Cross Route NLFID(s)	Common Name
SR32; 4.46	Urban & Suburban Arterial Intersection	Signalized	SHAMSR00032**C	4.46		0.05	CHAMCR0037	SR 32 at Round Bottom Rd

Traffic Volume Growth Rate Calculation For Benefit Cost Analysis

	Year	AADT	
Present ADT (PADT)	2022	19,970	veh / day
Future ADT (FADT)	2042	20,680	veh / day
Annual Linear Growth Rate		0.0018	

Select Other Non-Site Characteristic Based Countermeasures For Entire Project

CMF Nbr	Countermeasure	CMF KA Value	CMF B Value	CMF C Value	CMF O Value	CMF Valid for the Following Site Types
CMF 1	Conversion of signalized intersection into single- or multi-lane roundabout	0.29	0.29	0.29	0.74	7 / 10
CMF 2						
CMF 3						
CMF 4						
CMF 5						
CMF 6						
CMF 7						
CMF 8						
CMF 9						
CMF 10						

Proposed Conditions: General Information and Data for Urban And Suburban Arterial Intersection

General Information		Location Information	
Analyst	MJH	Route	SR32
Agency or Company	EEC	Logpoint	4.46
Date Performed	07/08/18	Common Name	SR 32 at Round Bottom Rd
Intersection	SR32; 4.46	Analysis Year	2022
Signalized/Unsignalized	Signalized		

Input Data				Proposed Conditions	HSM Base Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)				4SG	--
AADT $_{major}$ (veh/day) (total entering on major approaches)*	$AADT_{MAX}$ =	67,700	(veh/day)	19,970	--
AADT $_{minor}$ (veh/day) (total entering on minor approaches)*	$AADT_{MAX}$ =	33,400	(veh/day)	5,790	--
Intersection lighting (present/not present)				Present	Not Present
Calibration factor, C_i				Varies, See Below	1.00
Data for unsignalized intersections only:					
Number of major-road approaches with left-turn lanes					0
Number of major-road approaches with right-turn lanes					0
Data for signalized intersections only:					
Number of approaches with left-turn lanes				4	0
Number of approaches with right-turn lanes				2	0
Number of approaches with left-turn signal phasing				4	--
Type of left-turn signal phasing for Leg #1				Protected/Permissive	Permissive
Type of left-turn signal phasing for Leg #2				Protected/Permissive	--
Type of left-turn signal phasing for Leg #3				Protected/Permissive	--
Type of left-turn signal phasing for Leg #4				Protected/Permissive	--
Number of approaches with right-turn-on-red prohibited				0	0
Intersection red light cameras (present/not present)				Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol)				1	--
Maximum number of lanes crossed by a pedestrian (n_{lanesx})				3	--
Number of bus stops within 300 m (1,000 ft) of the intersection				0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)				Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection				0	0
Locality:				State System	

Proposed Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Arterial Intersection

(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.6600	0.9606	0.9200	1.0000	0.9999	1.0000	0.5832

Proposed Conditions: Multiple-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(6)*(7)*(8)
Crash Severity Level	**SPF Coefficients** from Table 12-10			**Overdispersion Parameter, k** from Table 12-10	**Initial N_{bimv}** from Equation 12-21	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	a	b	c							
Total	-10.99	1.07	0.23	0.39	4.942	1.000	4.942	0.58	2.48	7.148

Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	1.569	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.330	1.630	0.58	1.91	1.816
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	3.188	$(5)_{TOTAL}-(5)_{FI}$ 0.670	3.312	0.58	2.75	5.312

Proposed Conditions: Single-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients** from Table 12-12			**Overdispersion Parameter, k** from Table 12-12	**Initial N_{bisv}** from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bisv}** (6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.321	1.000	0.321	0.58	1.70	0.318
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.084	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.263	0.084	0.58	1.48	0.073
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.234	$(5)_{TOTAL}-(5)_{FI}$ 0.737	0.236	0.58	1.79	0.247

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Stop-Controlled Intersections

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{pedi}** from Table 12-16	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
Total	--	--	--	--	--	--
Fatal and injury (FI)	--	--	--	--	--	--

Proposed Conditions: CMFs for Vehicle-Pedestrian Crash Summary for Urban And Suburban Arterial Signalized Intersections

(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
1.00	1.00	1.00	1.00

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Signalized Intersections

(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients** from Table 12-14					**Overdispersion Parameter, k**	**$N_{pedbase}$** from Equation 12-29	**Combined CMF** (4) from Worksheet 2H	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.003	1.00	0.47	0.002
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	0.47	0.002

Proposed Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Arterial Intersection

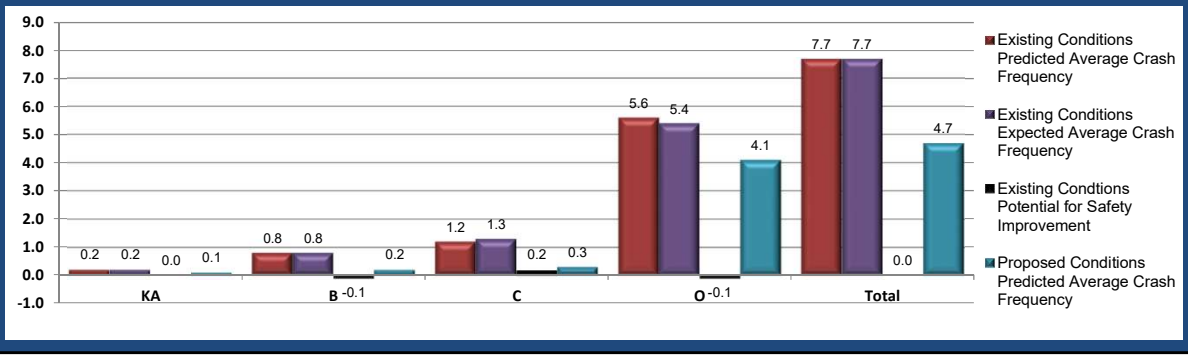
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{bikei}** from Table 12-17	**Calibration factor, C_i**	**Predicted N_{bikei}** (4)*(5)*(6)
Total	7.148	0.318	7.466	0.0076	4.51	0.256
Fatal and injury (FI)	--	--	--	--	4.51	0.256

Project Safety Performance Report

General Information

Project Name	SR 32 @ Round Bottom Rd	Contact Email	mhunter@eec-eng.com
Project Description	Replace signalized intersection with modern roundabout	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/8/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		

Summary of Anticipated Safety Performance of the Project (average crashes/year)



Project Summary Results (Without Animal Crashes)

	KA	B	C	O	Total
$N_{predicted}$ - Existing Conditions	0.1761	0.8164	1.1537	5.5587	7.7049
$N_{expected}$ - Existing Conditions	0.1770	0.7627	1.3242	5.4105	7.6744
$N_{potential\ for\ improvement}$ - Existing Conditions	0.0009	-0.0537	0.1705	-0.1482	-0.0305
$N_{expected}$ - Proposed Conditions	0.0511	0.2368	0.3346	4.1134	4.7359

Existing Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 4.46	SR 32 at Round Bottom	0.1761	0.8164	1.1537	5.5587	7.7049

Existing Conditions Project Element Expected Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 4.46	SR 32 at Round Bottom	0.177	0.7627	1.3242	5.4105	7.6744

Existing Conditions Project Element Potential for Safety Improvement Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 4.46	SR 32 at Round Bottom	0.0009	-0.0537	0.1705	-0.1482	-0.0305

Proposed Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR32; 4.46	SR 32 at Round Bottom Rd	0.0511	0.2368	0.3346	4.1134	4.7359

Summary by Crash Type

Crash Type	Existing			Proposed
	Predicted Crash Frequency	Expected Crash Frequency	PSI	Predicted Crash Frequency
Unknown	0.0052	0.0052	0.0000	0.0021
Head On	0.0940	0.0929	-0.0011	0.0257
Rear End	7.2496	5.3577	-1.8919	2.4846
Backing	0.3679	0.3205	-0.0474	0.1458
Sideswipe - Meeting	0.2072	0.1983	-0.0089	0.0676
Sideswipe - Passing	1.7481	1.5254	-0.2227	0.6573
Angle	2.6602	1.9703	-0.6899	0.8583
Parked Vehicle	0.1876	0.1767	-0.0109	0.0777
Pedestrian	0.0019	0.0019	0.0000	0.0005
Animal	0.0000	0.0000	0.0000	0.0000
Train	0.0003	0.0002	-0.0001	0.0000
Pedalcycles	0.4985	0.4166	-0.0819	0.0785
Other Non-Vehicle	0.0000	0.0000	0.0000	0.0000
Fixed Object	0.2907	0.3596	0.0689	0.1126
Other Object	0.0107	0.0106	-0.0001	0.0044
Overturning	0.0141	0.0141	0.0000	0.0040
Other Non-Collision	0.0394	0.0390	-0.0004	0.0158
Left Turn	1.5747	1.4473	-0.1274	0.4757
Right Turn	0.0000	0.0000	0.0000	0.0000

Safety Benefit - Cost Analysis

General Information

Project Name	SR 32 @ Round Bottom Rd	Contact Email	mhunter@eec-eng.com
Project Description	Replace signalized intersection with modern roundabout	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/8/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		

Select Site Types to be used in Benefit-Cost Analysis:

All Sites

Comments:

Countermeasure Service Lives, Costs, and Safety Benefits

Countermeasures	Service Life (Years)	Initial Cost of Countermeasure	Annual Maintenance & Energy Costs	Salvage Value	Net Present Cost of Countermeasure	Total Cost of Countermeasures	Summary of Annual Crash Modifications	Net Present Value of Safety Benefits
Site Characteristic Improvements (Please add description about improvements i.e. Lane widening)					$0.00	$0.00	0.000	($53)
Site Characteristic Improvements (Please add description about improvements i.e. Lighting)					$0.00	$0.00		
Site Characteristic Improvements (Please add description about improvements i.e. Signal Phasing)					$0.00	$0.00		
Site Characteristic Improvements (Please add description about improvements i.e. Added Right Turn Lane)					$0.00	$0.00		
CMF 1 - Conversion of signalized intersection into single- or multi-lane roundabout	20	$5,625,000.00			$5,625,000.00	$5,625,000.00	-2.969	$1,632,330
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
Totals		**$5,625,000.00**	**$0.00**	**$0.00**	**$5,625,000.00**	**$5,625,000.00**	**-2.969**	**$1,632,277**

Benefit - Cost Calculator

Net Present Value of Project	$5,625,000.00
Net Present Value of Safety Benefits	$1,632,277.42
Net Benefit	($3,992,722.58)
Benefit / Cost Ratio	0.29

Expected Annual Crash Adjustment

Number of Fatal & Incapacitating Injury Crashes	-0.125
Number of Injury Crashes	-1.524
Number of Total Crashes	-2.969

Comments:

Project Information

General Information

Project Name	US 50 at Meadowlark Lane	Contact Email	mhunter@eec-eng.com
Project Description	Replace signalized intersection with Roundabout	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/8/2018
Analyst	MJH	Analysis Year	2020
Agency/Company	EEC		
Perform Benefit Cost Analysis?	No		

Do the proposed improvements fundamentally change the conditions of the base safety performance function (SPF), Or is crash data unavailable for the analysis condition, Or is only predicted (and not expected) analysis needed for the existing or proposed condition?	**Yes**

(Examples: unsignalized to signalized, undivided to divided, increase or decrease in the number of lanes, change the number of approaches to an intersection, significant realignment of the roadway)

If Yes, are you analyzing the existing or proposed conditions?	**Existing**

Project Elements Description Table

Project Element ID (Must be Unique)	Site Type	Intersection Control Type	Location Information					
			NLFID	Begin Logpoint/ Intersection Midpoint	End Logpoint *(Leave blank for Intersection)*	Length (mi) OR Intersection Radius Buffer (mi)	Cross Route NLFID(s)	Common Name
US50; 29.75	Urban & Suburban Arterial Intersection	Signalized	SHAMUS00050**C	29.75		0.05	CHAMCR004	US 50 at Meadowlark Lane

Project Information

General Information

Project Name	US 50 at Meadowlark Lane	Contact Email	mhunter@eec-eng.com
Project Description	Replace signalized intersection with Roundabout	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/8/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		
Perform Benefit Cost Analysis?	Yes		

Do the proposed improvements fundamentally change the conditions of the base safety performance function (SPF), Or is crash data unavailable for the analysis condition, Or is only predicted (and not expected) analysis needed for the existing or proposed condition?	**Yes**

(Examples: unsignalized to signalized, undivided to divided, increase or decrease in the number of lanes, change the number of approaches to an intersection, significant realignment of the roadway)

If Yes, are you analyzing the existing or proposed conditions?	**Proposed**

Project Elements Description Table

Project Element ID (Must be Unique)	Site Type	Intersection Control Type	Location Information					
			NLFID	Begin Logpoint/ Intersection Midpoint	End Logpoint *(Leave blank for Intersection)*	Length (mi) OR Intersection Radius Buffer (mi)	Cross Route NLFID(s)	Common Name
US50; 29.75	Urban & Suburban Arterial Intersection	Signalized	SHAMUS00050**C	29.75		0.05	CHAMCR0046	US 50 at Meadowlark Lane

Traffic Volume Growth Rate Calculation For Benefit Cost Analysis

	Year	AADT	
Present ADT (PADT)	2022	17,110	veh / day
Future ADT (FADT)	2042	17,150	veh / day
Annual Linear Growth Rate		0.0001	

Select Other Non-Site Characteristic Based Countermeasures For Entire Project

CMF Nbr	Countermeasure	CMF KA Value	CMF B Value	CMF C Value	CMF O Value	CMF Valid for the Following Site Types
CMF 1	Conversion of signalized intersection into single- or multi-lane roundabout	0.29	0.29	0.29	0.74	7 / 10
CMF 2						
CMF 3						
CMF 4						
CMF 5						
CMF 6						
CMF 7						
CMF 8						
CMF 9						
CMF 10						

Proposed Conditions: General Information and Data for Urban And Suburban Arterial Intersection

General Information		Location Information	
Analyst	MJH	Route	US50
Agency or Company	EEC	Logpoint	29.75
Date Performed	07/08/18	Common Name	US 50 at Meadowlark Lane
Intersection	US50; 29.75	Analysis Year	2022
Signalized/Unsignalized	Signalized		

Input Data				Proposed Conditions	HSM Base Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)				4SG	--
AADT $_{major}$ (veh/day) (total entering on major approaches)*	$AADT_{MAX}$ =	67,700	(veh/day)	17,110	--
AADT $_{minor}$ (veh/day) (total entering on minor approaches)*	$AADT_{MAX}$ =	33,400	(veh/day)	3,110	--
Intersection lighting (present/not present)				Present	Not Present
Calibration factor, C_i				Varies, See Below	1.00
Data for unsignalized intersections only:					
Number of major-road approaches with left-turn lanes					0
Number of major-road approaches with right-turn lanes					0
Data for signalized intersections only:					
Number of approaches with left-turn lanes				2	0
Number of approaches with right-turn lanes				3	0
Number of approaches with left-turn signal phasing				4	--
Type of left-turn signal phasing for Leg #1				Protected	Permissive
Type of left-turn signal phasing for Leg #2				Protected/Permissive	--
Type of left-turn signal phasing for Leg #3				Permissive	--
Type of left-turn signal phasing for Leg #4				Permissive	--
Number of approaches with right-turn-on-red prohibited				0	0
Intersection red light cameras (present/not present)				Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol)				1	--
Maximum number of lanes crossed by a pedestrian (n_{lanesx})				2	--
Number of bus stops within 300 m (1,000 ft) of the intersection				0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)				Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection				0	0
Locality:				State System	

Proposed Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Arterial Intersection

(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.8100	0.9306	0.8800	1.0000	0.9999	1.0000	0.6633

Proposed Conditions: Multiple-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(6)*(7)*(8)
Crash Severity Level	**SPF Coefficients** from Table 12-10			**Overdispersion Parameter, k** from Table 12-10	**Initial N_{bimv}** from Equation 12-21	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	a	b	c							
Total	-10.99	1.07	0.23	0.39	3.631	1.000	3.631	0.66	2.48	5.972

Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	1.140	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.327	1.188	0.66	1.91	1.505
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	2.346	$(5)_{TOTAL}-(5)_{FI}$ 0.673	2.443	0.66	2.75	4.456

Proposed Conditions: Single-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients** from Table 12-12			**Overdispersion Parameter, k** from Table 12-12	**Initial N_{bisv}** from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bisv}** (6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.244	1.000	0.244	0.66	1.70	0.275
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.065	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.269	0.066	0.66	1.48	0.064
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.178	$(5)_{TOTAL}-(5)_{FI}$ 0.731	0.178	0.66	1.79	0.212

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Stop-Controlled Intersections

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{pedi}** from Table 12-16	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
Total	--	--	--	--	--	--
Fatal and injury (FI)	--	--	--	--	--	--

Proposed Conditions: CMFs for Vehicle-Pedestrian Crash Summary for Urban And Suburban Arterial Signalized Intersections

(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
1.00	1.00	1.00	1.00

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Signalized Intersections

(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients** from Table 12-14					**Overdispersion Parameter, k**	**$N_{pedbase}$** from Equation 12-29	**Combined CMF** (4) from Worksheet 2H	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.003	1.00	0.47	0.001
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	0.47	0.001

Proposed Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Arterial Intersection

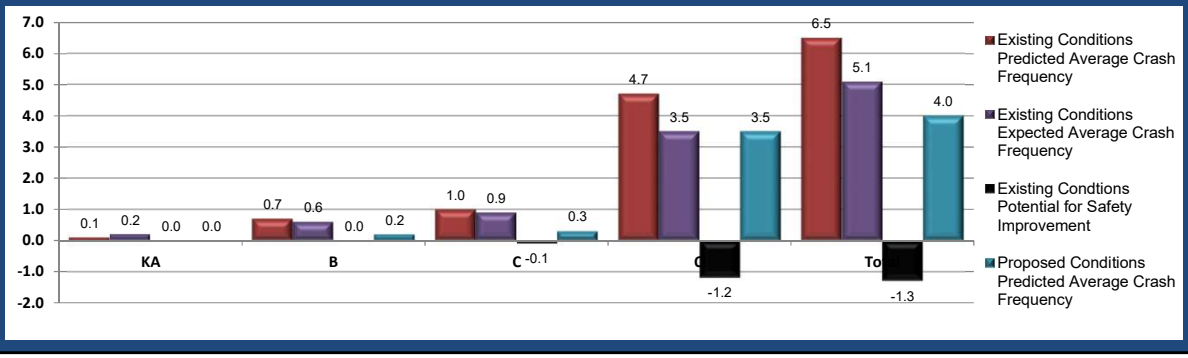
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{bikei}** from Table 12-17	**Calibration factor, C_i**	**Predicted N_{bikei}** (4)*(5)*(6)
Total	5.972	0.275	6.248	0.0076	4.51	0.214
Fatal and injury (FI)	--	--	--	--	4.51	0.214

Project Safety Performance Report

General Information

Project Name	US 50 at Meadowlark Lane	Contact Email	mhunter@eec-eng.com
Project Description	Replace signalized intersection with Roundabout	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/8/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		

Summary of Anticipated Safety Performance of the Project (average crashes/year)



Project Summary Results (Without Animal Crashes)

	KA	B	C	O	Total
$N_{predicted}$ - Existing Conditions	0.1468	0.6793	0.9584	4.6681	6.4526
$N_{expected}$ - Existing Conditions	0.1521	0.6421	0.8687	3.4595	5.1224
$N_{potential\ for\ improvement}$ - Existing Conditions	0.0053	-0.0372	-0.0897	-1.2086	-1.3302
$N_{expected}$ - Proposed Conditions	0.0426	0.1970	0.2779	3.4544	3.9719

Existing Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
US50; 29.75	US 50 at Meadowlark Lane	0.1468	0.6793	0.9584	4.6681	6.4526

Existing Conditions Project Element Expected Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
US50; 29.75	US 50 at Meadowlark Lane	0.1521	0.6421	0.8687	3.4595	5.1224

Existing Conditions Project Element Potential for Safety Improvement Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
US50; 29.75	US 50 at Meadowlark Lane	0.0053	-0.0372	-0.0897	-1.2086	-1.3302

Proposed Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
US50; 29.75	US 50 at Meadowlark Lane	0.0426	0.197	0.2779	3.4544	3.9719

Summary by Crash Type

Crash Type	Existing			Proposed
	Predicted Crash Frequency	Expected Crash Frequency	PSI	Predicted Crash Frequency
Unknown	0.0030	0.0030	0.0000	0.0019
Head On	0.0448	0.0445	-0.0003	0.0230
Rear End	3.5268	2.3263	-1.2005	2.2340
Backing	0.1819	0.1695	-0.0124	0.1314
Sideswipe - Meeting	0.1003	0.0981	-0.0022	0.0608
Sideswipe - Passing	0.8589	0.7500	-0.1089	0.5917
Angle	1.2863	1.0220	-0.2643	0.7711
Parked Vehicle	0.1082	0.1046	-0.0036	0.0727
Pedestrian	0.0015	0.0015	0.0000	0.0006
Animal	0.0000	0.0000	0.0000	0.0000
Train	0.0002	0.0002	0.0000	0.0000
Pedalcycles	0.2428	0.2214	-0.0214	0.0704
Other Non-Vehicle	0.0000	0.0000	0.0000	0.0000
Fixed Object	0.1711	0.1818	0.0107	0.1056
Other Object	0.0062	0.0062	0.0000	0.0041
Overturning	0.0089	0.0089	0.0000	0.0038
Other Non-Collision	0.0230	0.0229	-0.0001	0.0148
Left Turn	0.7567	0.6677	-0.0890	0.4269
Right Turn	0.0000	0.0000	0.0000	0.0000

Safety Benefit - Cost Analysis

General Information

Project Name	US 50 at Meadowlark Lane	Contact Email	mhunter@eec-eng.com
Project Description	Replace signalized intersection with Roundabout	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/8/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		

Select Site Types to be used in Benefit-Cost Analysis:

All Sites

Comments:

Countermeasure Service Lives, Costs, and Safety Benefits

Countermeasures	Service Life (Years)	Initial Cost of Countermeasure	Annual Maintenance & Energy Costs	Salvage Value	Net Present Cost of Countermeasure	Total Cost of Countermeasures	Summary of Annual Crash Modifications	Net Present Value of Safety Benefits
Site Characteristic Improvements (Please add description about improvements i.e. Lane widening)					$0.00	$0.00	0.000	$0
Site Characteristic Improvements (Please add description about improvements i.e. Lighting)					$0.00	$0.00		
Site Characteristic Improvements (Please add description about improvements i.e. Signal Phasing)					$0.00	$0.00		
Site Characteristic Improvements (Please add description about improvements i.e. Added Right Turn Lane)					$0.00	$0.00		
CMF 1 - Conversion of signalized intersection into single- or multi-lane roundabout	20	$1,500,000.00			$1,500,000.00	$1,500,000.00	-2.481	$1,338,674
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
					$0.00	$0.00	0.000	$0
Totals		**$1,500,000.00**	**$0.00**	**$0.00**	**$1,500,000.00**	**$1,500,000.00**	**-2.481**	**$1,338,674**

Benefit - Cost Calculator

Net Present Value of Project	$1,500,000.00
Net Present Value of Safety Benefits	$1,338,674.40
Net Benefit	($161,325.60)
Benefit / Cost Ratio	0.89

Expected Annual Crash Adjustment

Number of Fatal & Incapacitating Injury Crashes	-0.104
Number of Injury Crashes	-1.267
Number of Total Crashes	-2.481

Comments:

Existing Conditions: General Information and Data for Urban And Suburban Arterial Intersection

General Information		Location Information	
Analyst	MJH	Route	US50
Agency or Company	EEC	Logpoint	32.14
Date Performed	07/09/18	Common Name	US 50 at Newtown Road
Intersection	US50; 32.14	Analysis Year	2020
Signalized/Unsignalized	Signalized		

Input Data				Existing Conditions	HSM Base Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)				3SG	--
AADT $_{major}$ (veh/day) (total entering on major approaches)*	$AADT_{MAX}$ =	58,100	(veh/day)	24,070	--
AADT $_{minor}$ (veh/day) (total entering on minor approaches)*	$AADT_{MAX}$ =	16,400	(veh/day)	8,630	--
Intersection lighting (present/not present)				Present	Not Present
Calibration factor, C_i				Varies, See Below	1.00
Data for unsignalized intersections only:					
Number of major-road approaches with left-turn lanes					0
Number of major-road approaches with right-turn lanes					0
Data for signalized intersections only:					
Number of approaches with left-turn lanes				2	0
Number of approaches with right-turn lanes				1	0
Number of approaches with left-turn signal phasing				2	--
Type of left-turn signal phasing for Leg #1				Protected	Permissive
Type of left-turn signal phasing for Leg #2				Protected	--
Type of left-turn signal phasing for Leg #3				Not Applicable	--
Not Applicable					--
Number of approaches with right-turn-on-red prohibited				0	0
Intersection red light cameras (present/not present)				Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol)				1	--
Maximum number of lanes crossed by a pedestrian (n_{lanesx})				2	--
Number of bus stops within 300 m (1,000 ft) of the intersection				0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)				Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection				0	0
Locality:				State System	

Existing Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Arterial Intersection

(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.8600	0.8836	0.9600	1.0000	0.9999	1.0000	0.7294

Existing Conditions: Multiple-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(6)*(7)*(8)
Crash Severity Level	**SPF Coefficients** from Table 12-10			**Overdispersion Parameter, k** from Table 12-10	**Initial N_{bimv}** from Equation 12-21	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	a	b	c							
Total	-12.13	1.11	0.26	0.33	4.157	1.000	4.157	0.73	2.25	6.823

Fatal and Injury (FI)	-11.58	1.02	0.17	0.30	1.286	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.325	1.353	0.73	1.46	1.441
Property Damage Only (PDO)	-13.24	1.14	0.30	0.36	2.665	$(5)_{TOTAL}-(5)_{FI}$ 0.675	2.804	0.73	2.68	5.482

Existing Conditions: Single-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients** from Table 12-12			**Overdispersion Parameter, k** from Table 12-12	**Initial N_{bisv}** from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bisv}** (6)*(7)*(8)
	a	b	c							
Total	-9.02	0.42	0.40	0.36	0.314	1.000	0.314	0.73	1.49	0.342
Fatal and Injury (FI)	-9.75	0.27	0.51	0.24	0.090	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.298	0.094	0.73	1.66	0.114
Property Damage Only (PDO)	-9.08	0.45	0.33	0.53	0.212	$(5)_{TOTAL}-(5)_{FI}$ 0.702	0.220	0.73	1.42	0.228

Existing Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Stop-Controlled Intersections

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{pedi}** from Table 12-16	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
Total	--	--	--	--	--	--
Fatal and injury (FI)	--	--	--	--	--	--

Existing Conditions: CMFs for Vehicle-Pedestrian Crash Summary for Urban And Suburban Arterial Signalized Intersections

(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
1.00	1.00	1.00	1.00

Existing Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Signalized Intersections

(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients** from Table 12-14					**Overdispersion Parameter, k**	**$N_{pedbase}$** from Equation 12-29	**Combined CMF** (4) from Worksheet 2H	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
	a	b	c	d	e					
Total	-6.60	0.05	0.24	0.41	0.09	0.52	0.002	1.00	0.69	0.001
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	0.69	0.001

Existing Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{bikei}** from Table 12-17	**Calibration factor, C_i**	**Predicted N_{bikei}** (4)*(5)*(6)
Total	6.823	0.342	7.165	0.0079	4.00	0.226
Fatal and injury (FI)	--	--	--	--	4.00	0.226

Project Information

General Information

Project Name	US 50 at Newtown Road	Contact Email	mhunter@eec-eng.com
Project Description	Replace signalized intersection with modern roundabout	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/9/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		
Perform Benefit Cost Analysis?	Yes		

Do the proposed improvements fundamentally change the conditions of the base safety performance function (SPF), Or is crash data unavailable for the analysis condition, Or is only predicted (and not expected) analysis needed for the existing or proposed condition?	**Yes**

(Examples: unsignalized to signalized, undivided to divided, increase or decrease in the number of lanes, change the number of approaches to an intersection, significant realignment of the roadway)

If Yes, are you analyzing the existing or proposed conditions?	**Proposed**

Project Elements Description Table

Project Element ID (Must be Unique)	Site Type	Intersection Control Type	Location Information					
			NLFID	Begin Logpoint/ Intersection Midpoint	End Logpoint *(Leave blank for Intersection)*	Length (mi) OR Intersection Radius Buffer (mi)	Cross Route NLFID(s)	Common Name
US50; 32.14	Urban & Suburban Arterial Intersection	Signalized	SHAMUS00050**C	32.14		0.05		US 50 at Newtown Road

Traffic Volume Growth Rate Calculation For Benefit Cost Analysis

	Year	AADT	
Present ADT (PADT)	2022	24,070	veh / day
Future ADT (FADT)	2042	24,300	veh / day
Annual Linear Growth Rate		0.0005	

Select Other Non-Site Characteristic Based Countermeasures For Entire Project

CMF Nbr	Countermeasure	CMF KA Value	CMF B Value	CMF C Value	CMF O Value	CMF Valid for the Following Site Types
CMF 1	Conversion of signalized intersection into single- or multi-lane roundabout	0.29	0.29	0.29	0.74	7 / 10
CMF 2						

Proposed Conditions: General Information and Data for Urban And Suburban Arterial Intersection

General Information		Location Information	
Analyst	MJH	Route	US50
Agency or Company	EEC	Logpoint	32.14
Date Performed	07/09/18	Common Name	US 50 at Newtown Road
Intersection	US50; 32.14	Analysis Year	2022
Signalized/Unsignalized	Signalized		

Input Data				Proposed Conditions	HSM Base Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)				3SG	--
AADT $_{major}$ (veh/day) (total entering on major approaches)*	$AADT_{MAX}$ =	58,100	(veh/day)	24,070	--
AADT $_{minor}$ (veh/day) (total entering on minor approaches)*	$AADT_{MAX}$ =	16,400	(veh/day)	8,630	--
Intersection lighting (present/not present)				Present	Not Present
Calibration factor, C_i				Varies, See Below	1.00
Data for unsignalized intersections only:					
Number of major-road approaches with left-turn lanes					0
Number of major-road approaches with right-turn lanes					0
Data for signalized intersections only:					
Number of approaches with left-turn lanes				2	0
Number of approaches with right-turn lanes				1	0
Number of approaches with left-turn signal phasing				2	--
Type of left-turn signal phasing for Leg #1				Protected	Permissive
Type of left-turn signal phasing for Leg #2				Protected	--
Type of left-turn signal phasing for Leg #3				Not Applicable	--
Not Applicable					--
Number of approaches with right-turn-on-red prohibited				0	0
Intersection red light cameras (present/not present)				Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol)				1	--
Maximum number of lanes crossed by a pedestrian (n_{lanesx})				2	--
Number of bus stops within 300 m (1,000 ft) of the intersection				0	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)				Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection				0	0
Locality:				State System	

Proposed Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Arterial Intersection

(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.8600	0.8836	0.9600	1.0000	0.9999	1.0000	0.7294

Proposed Conditions: Multiple-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(6)*(7)*(8)
Crash Severity Level	**SPF Coefficients** from Table 12-10			**Overdispersion Parameter, k** from Table 12-10	**Initial N_{bimv}** from Equation 12-21	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	a	b	c							
Total	-12.13	1.11	0.26	0.33	4.157	1.000	4.157	0.73	2.25	6.823

Fatal and Injury (FI)	-11.58	1.02	0.17	0.30	1.286	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.325	1.353	0.73	1.46	1.441
Property Damage Only (PDO)	-13.24	1.14	0.30	0.36	2.665	$(5)_{TOTAL}-(5)_{FI}$ 0.675	2.804	0.73	2.68	5.482

Proposed Conditions: Single-Vehicle Crash Summary for Urban And Suburban Arterial Intersection

(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients** from Table 12-12			**Overdispersion Parameter, k** from Table 12-12	**Initial N_{bisv}** from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27	**Proportion of Total Crashes**	**Adjusted N_{bimv}** $(4)_{TOTAL}$*(5)	**Combined CMFs** (7) from Worksheet 2B	**Calibration Factor, C_i**	**Predicted N_{bisv}** (6)*(7)*(8)
	a	b	c							
Total	-9.02	0.42	0.40	0.36	0.314	1.000	0.314	0.73	1.49	0.342
Fatal and Injury (FI)	-9.75	0.27	0.51	0.24	0.090	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.298	0.094	0.73	1.66	0.114
Property Damage Only (PDO)	-9.08	0.45	0.33	0.53	0.212	$(5)_{TOTAL}-(5)_{FI}$ 0.702	0.220	0.73	1.42	0.228

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Stop-Controlled Intersections

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{pedi}** from Table 12-16	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
Total	--	--	--	--	--	--
Fatal and injury (FI)	--	--	--	--	--	--

Proposed Conditions: CMFs for Vehicle-Pedestrian Crash Summary for Urban And Suburban Arterial Signalized Intersections

(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
1.00	1.00	1.00	1.00

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Signalized Intersections

(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients** from Table 12-14					**Overdispersion Parameter, k**	**$N_{pedbase}$** from Equation 12-29	**Combined CMF** (4) from Worksheet 2H	**Calibration factor, C_i**	**Predicted N_{pedi}** (4)*(5)*(6)
	a	b	c	d	e					
Total	-6.60	0.05	0.24	0.41	0.09	0.52	0.002	1.00	0.69	0.001
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	0.69	0.001

Proposed Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Arterial Intersection

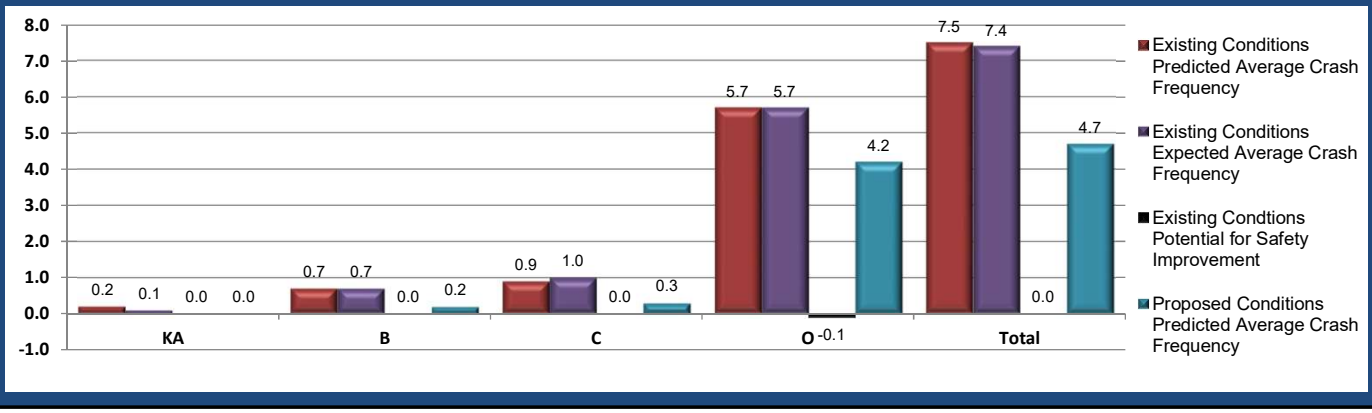
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}** (9) from Worksheet 2C	**Predicted N_{bisv}** (9) from Worksheet 2E	**Predicted N_{bi}** (2) + (3)	**f_{bikei}** from Table 12-17	**Calibration factor, C_i**	**Predicted N_{bikei}** (4)*(5)*(6)
Total	6.823	0.342	7.165	0.0079	4.00	0.226
Fatal and injury (FI)	--	--	--	--	4.00	0.226

Project Safety Performance Report

General Information

Project Name	US 50 at Newtown Road	Contact Email	mhunter@eec-eng.com
Project Description	Replace signalized intersection with modern roundabout	Contact Phone	937.631.4915
Reference Number	N/A	Date Performed	7/9/2018
Analyst	MJH	Analysis Year	2022
Agency/Company	EEC		

Summary of Anticipated Safety Performance of the Project (average crashes/year)



Project Summary Results (Without Animal Crashes)

	KA	B	C	O	Total
$N_{predicted}$ - Existing Conditions	0.1509	0.6848	0.9467	5.7105	7.4929
$N_{expected}$ - Existing Conditions	0.1490	0.6527	0.9945	5.6529	7.4491
$N_{potential\ for\ improvement}$ - Existing Conditions	-0.0019	-0.0321	**0.0478**	-0.0576	-0.0438
$N_{expected}$ - Proposed Conditions	0.0437	0.1986	0.2746	4.2258	4.7427

FIGURE 1
CRASH DIAGRAM - SR 125 AT 8-MILE ROAD

SR 32

CLOUGH PIKE

01 02 03 04 05 06 07 08 09 10 11 12

SYMBOLS	CRASH TYPES
MOVING VEHICLE	REAR END (STOPPED)
STOPPED VEHICLE	REAR END (MOVING)
VEHICLE AT FAULT	SIDE SWIPE
FIXED OBJECT	PEDESTRIAN
	ANGLE
	FIXED OBJECT
	LEFT TURN
	BACKING
	OUT OF CONTROL

N

SCHEMATIC

RED - 2015
BLUE - 2016
BLACK- 2017

FIGURE 2
CRASH DIAGRAM - SR 32 AT CLOUGH PIKE

FIGURE 3
CRASH DIAGRAM - SR 32 AT HICKORY CREEK DR

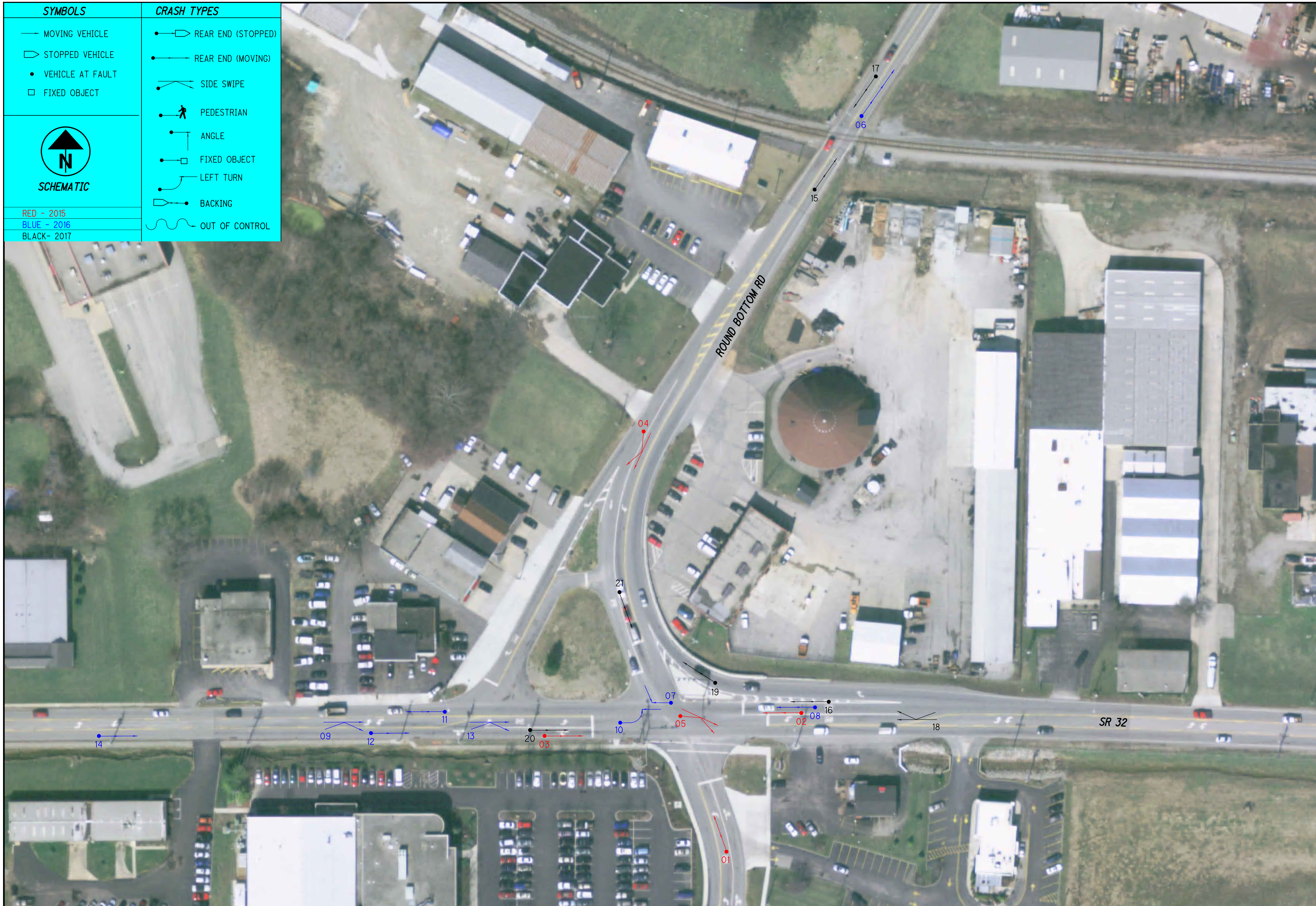


FIGURE 4
CRASH DIAGRAM - SR 32 AT ROUND BOTTOM RD

FIGURE 5

CRASH DIAGRAM - US 50 AT MEADOWLARK LANE

N

FIGURE 6
CRASH DIAGRAM - US 50 AT NEWTOWN RD