

Spot Safety Project Evaluation

Work Order #41000014601

Spot Safety Project # 06-06-209

Spot Safety Project Evaluation of the Traffic Signal Revision to Provide Fully Protected Left Turn Movements on NC 59 (Hope Mills Rd) at its Intersection with SR 1003 (Camden Rd) Cumberland County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Transportation Mobility and Safety Division
North Carolina Department of Transportation

Principal Investigator



Brad Robinson, PE

10/4/2011

Date

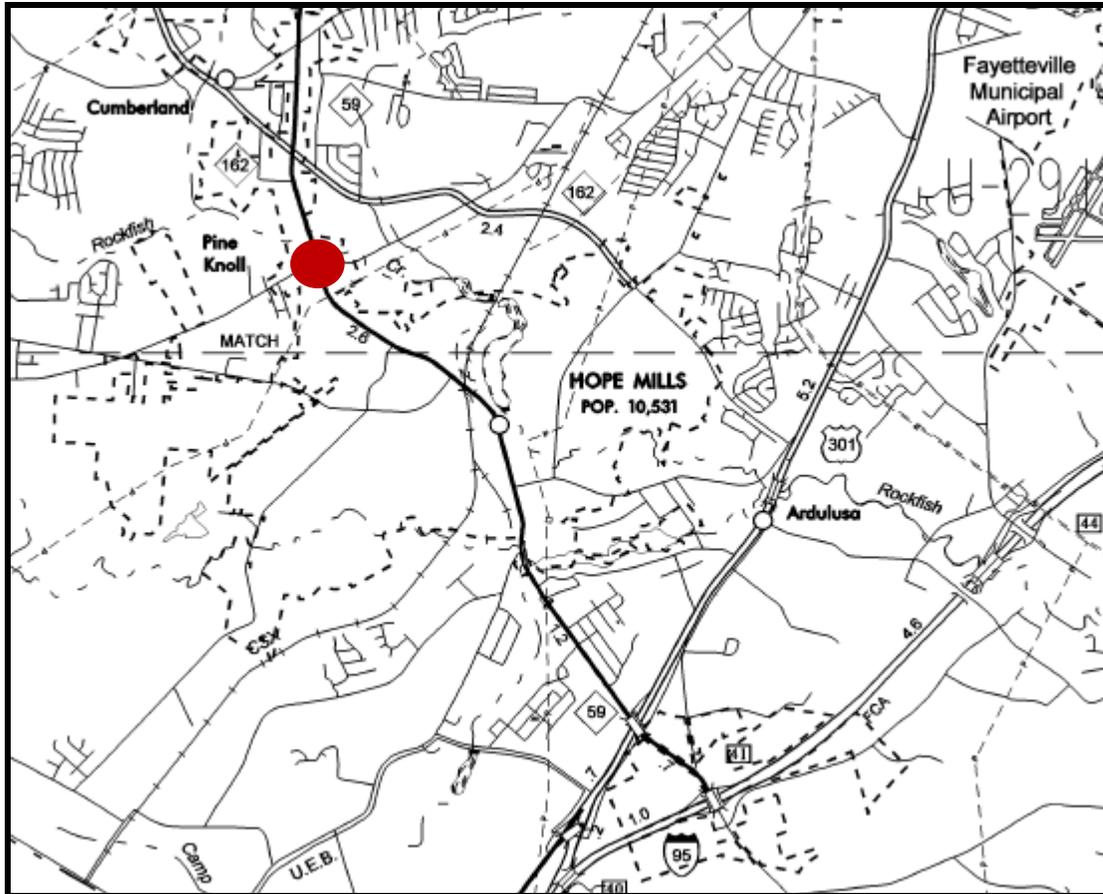
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 06-06-209 – The intersection of NC 59 (Hope Mills Rd) and SR 1003 (Camden Rd) in Cumberland County.

The signal number for this location is 06-0357.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was to upgrade the existing signal on NC 59 to include fully protective left turn movements.

NC 59 is a multi-lane facility with extensive commercial development and a speed limit of 45 mph. Both of its approaches to the intersection have two thru lanes and exclusive right and left turn lanes. SR 1003 is also a multi-lane facility and has a speed limit of 35 mph. Both of its approaches to the intersection have dual left turn lanes, dual right turn lanes, and a single thru lane. There are concrete median islands on all four legs preventing left turns into and out of the commercial driveways located on the corners of the intersection.

The initial crash analysis was conducted from July 31, 2001 to July 31, 2006 with 12 left turn-same roadway crashes which were considered correctable. The final completion date for the improvements at the subject location was on June 22, 2007 with a total cost of \$7,000.00.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from May 1, 2007 to June 30, 2007. The before period consisted of reported crashes from April 1, 2003 through April 30, 2007 (4 years and 1 month) and the after period consisted of reported crashes from July 1, 2007 through July 31, 2011 (4 years and 1 month). The ending date for this analysis was limited by the available crash data at the time the analysis was conducted.

The treatment data consisted of all reported crashes within 150 feet of the subject intersection. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that left turn-same roadway crashes on NC 59 were the target crashes for the applied countermeasure. The target crashes are clearly identified in the before and after period collision diagrams.

<u>Treatment Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	90	79	-12.2
Total Severity Index	5.07	4.65	-8.3
Target Crashes	33	1	-97.0
Target Severity Index	6.44	1	-84.5
Volume	46,400	44,800	-3.4
<u>Target Crash Severity Summary</u>			
Fatal Crashes	0	0	N/A
Class A Crashes	1	0	-100.0
Class B Crashes	4	0	-100.0
Class C Crashes	10	0	-100.0
PDO Crashes	18	1	-94.4

The naive before and after analysis at the treatment location resulted in a 12 percent decrease in total crashes, a 97 percent decrease in target crashes, and a 3 percent decrease in Average Daily Traffic (ADT). The before period ADT year was 2005 and the after period ADT year was 2009.

Results and Discussion

It appears that the traffic signal revision was very effective at reducing target crashes at the intersection. In the before period there was a total of 33 left turn-same roadway crashes involving vehicles on NC 59. Twenty-three involved northbound vehicles turning left and nine involved southbound vehicles turning left. One involved a southbound vehicle making a U-turn during the left turn phase. In the after period there was only a single target crash. It involved a southbound vehicle turning left and being hit by a northbound vehicle that had failed to stop at the red signal.

Although target crashes decreased, three other crash patterns (all angle type crashes) experienced notable increases from the before to the after period. Crashes between eastbound SR 1003 vehicles and northbound NC 59 vehicles increased by 250% (from 8 to 28). Crashes between westbound SR 1003 vehicles and southbound NC 59 vehicles increased by 88% (from 8 to 15). Finally, crashes between westbound SR 1003 vehicles and northbound NC 59 vehicles increased by 100% (from 3 to 6). In the vast majority of these crashes (all but 3 in the before period and all but 6 in the after) it was the vehicle traveling on SR 1003 that was faulted for running the signal on the crash report.

A large portion of the crashes at the intersection occurred during dark conditions. In the before period, 41 of the 90 total crashes and 23 of the 33 target crashes occurred at night. In the after period 31 of the 79 total crashes, including the single target crash, occurred at night. Twenty-four of the after period night crashes belonged to one of the three angle crash patterns described above.

The calculated benefit to cost ratio for this project is 268.24 considering total crashes. The benefit to cost ratio considering only target crashes is 230.98. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

Please see the attached *Treatment Site Photos*. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

BENEFIT-COST ANALYSIS WORKSHEET - TOTAL

LOCATION: NC 59 at SR 1003		BY: bdr						
COUNTY: Cumberland		DATE: 9/19/2011						
FILE NO.: SS 06-06-209								
DETAILED COST:	TYPE IMPROVEMENT - signal revision-fully protected left							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$0	0	0.000	\$0			
	Right-of-Way	\$7,000	10	0.149	\$1,043			
		\$0	0	0.000	\$0			
	TOTALS	\$7,000	10	0.149	\$1,043			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$0			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$1,043			
	TOTAL COST OF PROJECT=				\$7,000			
COMPREHENSIVE COST REDUCTION:								
	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES							
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.08	2	0.49	29	7.11	59	14.46	\$513,162
AFTER	4.08	0	0.00	39	9.56	40	9.80	\$233,333
							Annual Benefits from Crash Cost Savings	\$279,828
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$278,785		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	268.24		
TOTAL COST OF PROJECT		-	\$7,000	COMPREHENSIVE B/C RATIO		-	268.24	

BENEFIT-COST ANALYSIS WORKSHEET - TARGET

LOCATION: NC 59 at SR 1003		BY: bdr						
COUNTY: Cumberland		DATE: 9/19/2011						
FILE NO.: SS 06-06-209								
DETAILED COST:	TYPE IMPROVEMENT - signal revision-fully protected left							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$0	0	0.000	\$0			
	Right-of-Way	\$7,000	10	0.149	\$1,043			
		\$0	0	0.000	\$0			
	TOTALS	\$7,000	10	0.149	\$1,043			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$0			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$1,043			
	TOTAL COST OF PROJECT=				\$7,000			
COMPREHENSIVE COST REDUCTION:								
	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES							
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.08	1	0.25	14	3.43	18	4.41	\$242,010
AFTER	4.08	0	0.00	0	0.00	1	0.25	\$1,054
							Annual Benefits from Crash Cost Savings	\$240,956
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$239,913		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	230.98		
TOTAL COST OF PROJECT		-	\$7,000	COMPREHENSIVE B/C RATIO		-	230.98	

Treatment Site Photos Taken September 14, 2011



Traveling south on NC 59 (Hope Mills Rd)



Traveling north on NC 59 (Hope Mills Rd)



Traveling westbound on SR 1003 (Camden Rd)



Traveling eastbound on SR 1003 (Camden Rd)

SS# 06-06-209
 Order# 41000014601
 Cumberland County
 BEFORE Period
 4/1/03-4/30/07

Walgreens

SR 1003
 (CAMDEN RD) 35 mph
 ADT (YEAR)
 17,500 (2005)

NC 59
 (HOPE MILLS RD)
 45 mph
 ADT (YEAR)
 29,900 (2005)

SR 1003
 (CAMDEN RD) 45 mph
 ADT (YEAR)
 14,400 (2005)

McDonald's

NC 59
 (HOPE MILLS RD)
 45 mph
 ADT (YEAR)
 30,900 (2005)

Eckerd's

LEGEND							
	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PARKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		INJURY		50 MPH TO 59		ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		OILY
	RAN OFF ROAD		SPEED UNKNOWN		70 AND UP		

Target Crashes

N.C. DEPARTMENT of TRANSPORTATION
 DIVISION of HIGHWAYS
 TRANSPORTATION MOBILITY and
 SAFETY DIVISION

TRAFFIC SAFETY UNIT

Date: August 2011

Prepared By: bdr



SS# 06-06-209
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 Cumberland County
 AFTER Period
 7/1/07-7/31/11

Walgreens

SR 1003
 (CAMDEN RD) 35 mph
 ADT (YEAR)
 17,500 (2009)

NC 59
 (HOPE MILLS RD)
 45 mph
 ADT (YEAR)
 29,900 (2009)

SR 1003
 (CAMDEN RD) 45 mph
 ADT (YEAR)
 13,400 (2009)

McDonald's

NC 59
 (HOPE MILLS RD)
 45 mph
 ADT (YEAR)
 28,800 (2009)

Verizon Wireless

LEGEND

MOVING VEHICLE	ANGLE	9 MPH OR LESS	P PEDESTRIAN
PEDESTRIAN	TURNING	10 MPH TO 19	T TRAIN
PARKED VEHICLE	BACKING	20 MPH TO 29	* DRIVER AT FAULT
PARKING VEHICLE	SIDESWIPE	30 MPH TO 39	D DRY
FIXED OBJECT	OUT OF CONTROL	40 MPH TO 49	W WET
HEAD ON	INJURY	50 MPH TO 59	I ICY OR SNOWY
REAR END	FATALITY	60 MPH TO 69	O OILY
RAN OFF ROAD		70 AND UP	
		SPEED UNKNOWN	



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