

Spot Safety Project Evaluation

Order # 41000011899

Spot Safety Project # 04-04-204

**Spot Safety Project Evaluation of the Traffic Signal Installation
US 301 (Wesleyan Blvd) at SR 1545 (Bishop Road)
City of Rocky Mount, Nash County**

Documents Prepared By:

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

Principal Investigator



Jason B. Schronce

6-16-2011

Date

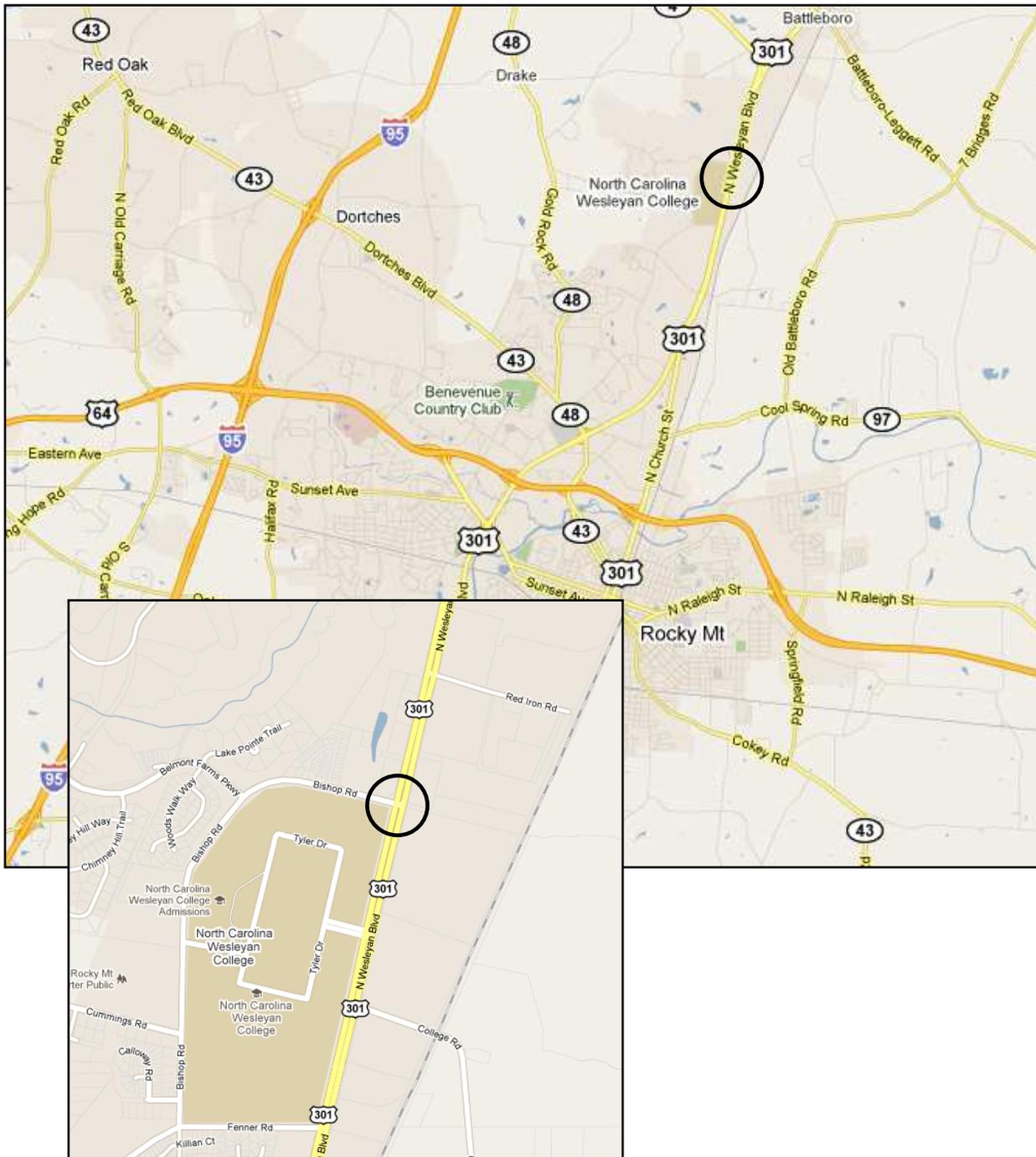
Traffic Safety Project Engineer

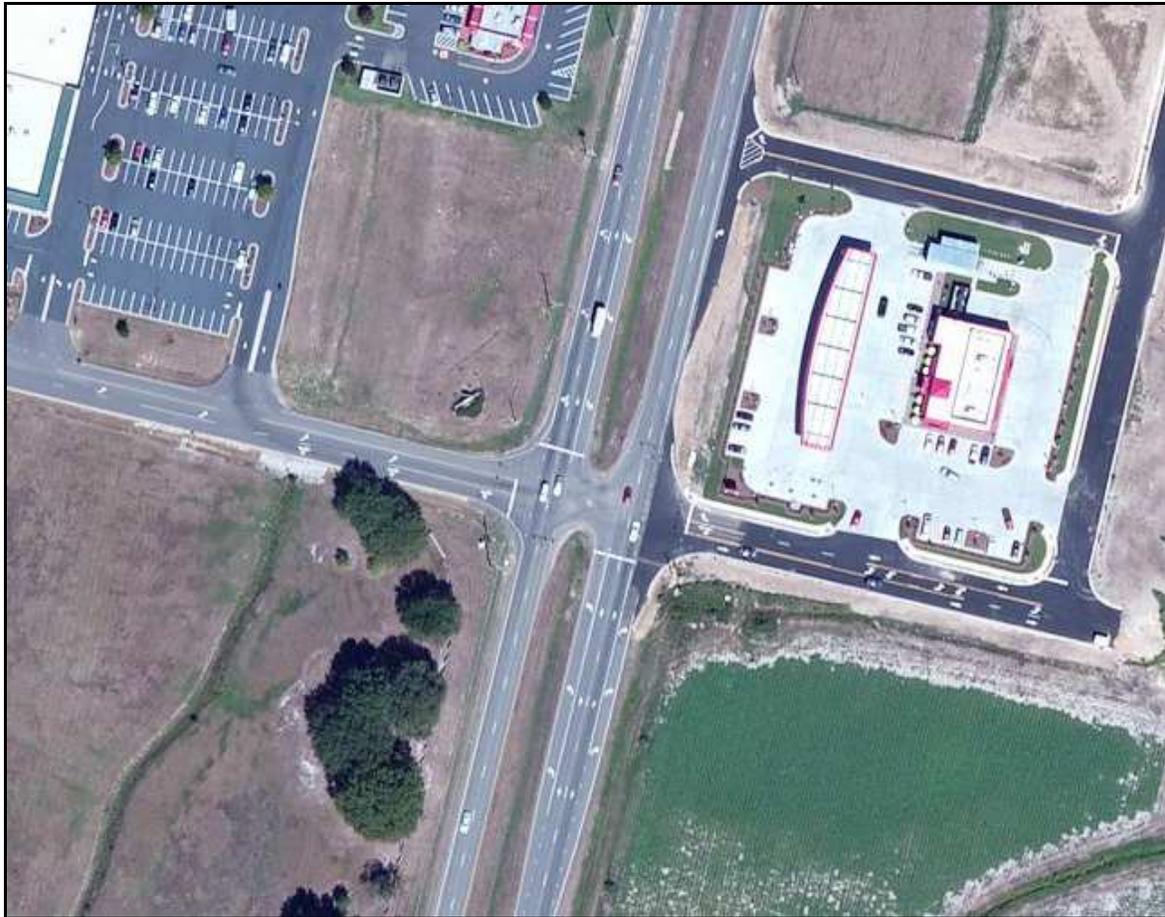
Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 04-04-204 located at the Intersection of US 301 (Wesleyan Boulevard) and SR 1545 (Bishop Road) in Nash County, City of Rocky Mount.

The Sig ID for this newly installed traffic signal is 04-1314.





Aerial Map showing After Period Signalized Intersection with Sheetz Gas Station

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of an intersection traffic signal and an eastbound left turn lane on SR 1545. US 301 (Wesleyan Blvd) is a four-lane divided facility with northbound left and right turn lanes, a southbound left turn lane, and has a speed limit of 55 mph. SR 1545 (Bishop Road) is a two-lane facility at the subject intersection and has a speed limit of 45 mph. The subject location is a three-leg intersection with the fourth leg entering multiple businesses and was controlled by stop signs on SR 1545 during the before period.

The original statement of problem was the concern for collisions due to new development along SR 1545 that is attracting additional traffic to this area. The intended purpose of the new signal is to allow motorists on Bishop Road to enter the roadway safely. The intersection met Signal Warrants 1A, 1B, 1C, 2, 3B, and 8.

The initial crash analysis was completed from July 1, 2000 to June 30, 2003 with six (6) reported crashes, two (2) of which were deemed correctable frontal impact collisions. The final completion for the improvement at the subject intersection was during the 2nd Quarter of 2006 based off crash data with a total cost of \$143,000.

The signal design for this location included protected-permitted phasing for the US 301 (Wesleyan Blvd) left turn movements. It appears that the signal was upgraded to the “Flashing Yellow Arrow” instead of the traditional doghouse signal head for this movement. During our research phase of the evaluation, the Safety Evaluation Group was informed that this signal location was to be upgraded to protected-only lefts for US 301. This improvement occurred around April-May 2011 after this evaluation and study was complete but before our field photos were taken; so therefore the photos show the protected-left turn movement.

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 were the months of April through July 2006. The before period consisted of reported crashes from September 1, 2001 through March 31, 2006 (4 years and 7 months); and the after period consisted of reported crashes from August 1, 2006 through February 28, 2011 (4 years and 7 months). The ending date for this analysis was determined by the date of available crash data at the time of analysis.

The treatment data consisted of all crashes within 150 feet of the subject intersection. *Please see attached location map, aerial map, and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	9	50	455.6 %
Total Severity Index	12.71	7.25	- 43.0 %
Target Crashes – Frontal Impact	5	32	540.0 %
Target Crash Severity Index	6.92	6.78	- 2.0 %
Volume (2003, 2008)	21,000	19,800	- 5.7 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	1	0.0 %
Class B injury Crashes	3	10	233.3 %
Class C Injury Crashes	1	22	2,100.0 %
Total Injury Crashes	5	33	560.0 %

The naive before and after analysis at the treatment location resulted in a 455 percent increase in Total Crashes, a 540 percent increase in Target Crashes, but a 43 percent decrease in the Total Severity Index. The before period ADT year was 2003 and the after period ADT year was 2008.

Results and Discussion

Referencing the *Collision Diagrams*, the before period presented four (4) frontal impact crashes from vehicles pulling out into US 301 traffic and one (1) Wesleyan Blvd left turn same roadway collision. With the signal installation, the crash patterns at this intersection rose steeply. The after period frontal impact crash patterns consisted of: four (4) red-light run angle/left turn-different road, one (1) southbound u-turn, and twenty-seven (27) left turn same roadway crashes. Of the severe crash increase, 23 collisions occurred from northbound US 301 vehicles improperly accessing Bishop Road. This side of the intersection consists of a shopping center with Food Lion and McDonald's along with accessing the North Carolina Wesleyan College.

The major dominate crash patterns identified in this analysis have been addressed with the installation of protected-only left turn movements on US 301, which were installed after this analysis as previously discussed.

The calculated benefit to cost ratio for this project is **(-5.46) considering total crashes**. The benefit to cost ratio **considering only target crashes is (-3.95)**. 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 included *Site Photos*. Photos are provided from our Field Visit on May 25, 2011 for all four approaches to the treatment intersection. 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.

Site Photographs



Northbound US 301 (Wesleyan Boulevard)



Southbound US 301 (Wesleyan Boulevard)



Eastbound SR 1545 (Bishop Road)



Westbound from Sheetz Entrance

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: US 301 at SR 1545		BY: JBS						
COUNTY: Nash		DATE: 5/31/2011						
FILE NO.: SS 04-04-204								
DETAILED COST:	TYPE IMPROVEMENT - Signal Installation							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$143,000	10	0.149	\$21,311				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$143,000	10	0.149	\$21,311				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,400				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
TOTAL ANNUAL COST=				\$24,611				
TOTAL COST OF PROJECT=				\$143,000				
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	4.58	1	0.22	4	0.87	4	0.87	\$158,777
AFTER	4.58	1	0.22	32	6.99	17	3.71	\$293,253
Annual Benefits from Crash Cost Savings								(\$134,476)
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$159,087)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	-5.46		
TOTAL COST OF PROJECT		-	\$143,000	COMPREHENSIVE B/C RATIO		-	-5.46	

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: US 301 at SR 1545		BY: JBS						
COUNTY: Nash		DATE: 5/31/2011						
FILE NO.: SS 04-04-204		Target - Frontal Impact Crashes						
DETAILED COST:	TYPE IMPROVEMENT - Signal Installation							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$143,000	10	0.149	\$21,311				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$143,000	10	0.149	\$21,311				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,400				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
TOTAL ANNUAL COST=				\$24,611				
TOTAL COST OF PROJECT=				\$143,000				
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	4.58	0	0.00	4	0.87	1	0.22	\$18,406
AFTER	4.58	0	0.00	25	5.46	7	1.53	\$115,742
Annual Benefits from Crash Cost Savings								(\$97,336)
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$121,947)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	-3.95		
TOTAL COST OF PROJECT		-	\$143,000	COMPREHENSIVE B/C RATIO		-	-3.95	



Food Lion
McDonald's

ADT (Year)
18,000 (2003)

US 301
Wesleyan Blvd
55 mph

SR 1545
Bishop Rd
45 mph

ADT (Year)
3,000 (2003)

Wesleyan
College

ADT (Year)
21,000 (2003)
Estimate

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PAKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PAKED VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		RAN OFF ROAD		50 MPH TO 59		ICY OR SNOWY
	REAR END		RAN OFF ROAD		60 MPH TO 69		TO AND UP
	RAN OFF ROAD		RAN OFF ROAD		70 MPH TO 79		SPEED UNKNOWN
	RAN OFF ROAD		RAN OFF ROAD		RAN OFF ROAD		RAN OFF ROAD
	RAN OFF ROAD		RAN OFF ROAD		RAN OFF ROAD		RAN OFF ROAD

SS# 04-04-204
Order# 41000011899
Nash County
City of Rocky Mount
BEFORE Period
9/1/01 - 3/31/06

Frontal Impact
Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 5-31-2011

Prepared By: J. Schronce

LEGEND

	MOVING VEHICLE		ANGLE		5 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PARKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	FIXED OBJECT		SIDESWIPE		30 MPH TO 39		DRY
	HEAD ON		OUT OF CONTROL		40 MPH TO 49		WET
	REAR END		OUT OF CONTROL		50 MPH TO 59		ICY OR SNOWY
	RAN OFF ROAD		HEAVY		60 MPH TO 69		FATALITY
			FATALITY		TO AND UP		KEY OR SMOKY
			SPEED UNKNOWN		70 MPH TO 79		ONLY

SS# 04-04-204
 Order# 41000011899
 Nash County
 City of Rocky Mount
 AFTER Period
 8/1/06 - 2/28/11

New Signalized
 Intersection
 Sig ID 04-1314



Frontal Impact
Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 5-31-2011

Prepared By: J. Schronce

Food Lion
McDonald's

Sheetz
Gas Station

Wesleyan
College

ADT (Year)
15,000 (2007)

ADT (Year)
21,000 (2007)
Estimate

US 301
Wesleyan Blvd
55 mph

SR 1545
Bishop Rd
45 mph
ADT (Year)
2,400 (2007)

