

# Spot Safety Project Evaluation

Order # 41000014131

Spot Safety Project # 08-04-206

**Spot Safety Project Evaluation of the  
Traffic Signal and Left Turn Lane Installations  
US 311 and SR 1526 (Edgar Rd) / SR 1929 (Spencer Rd)  
Randolph 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

12-14-2011

Date

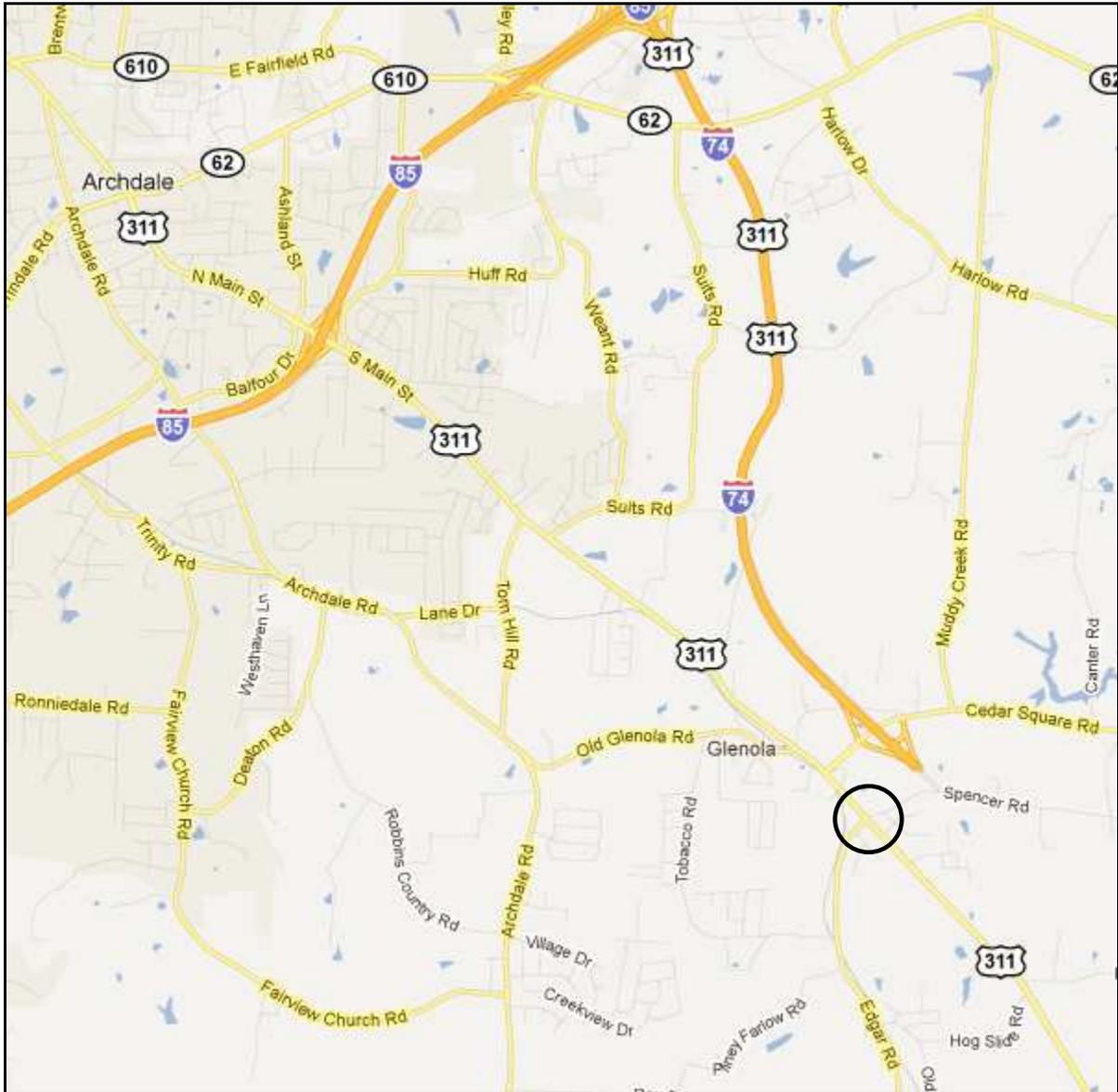
Traffic Safety Project Engineer

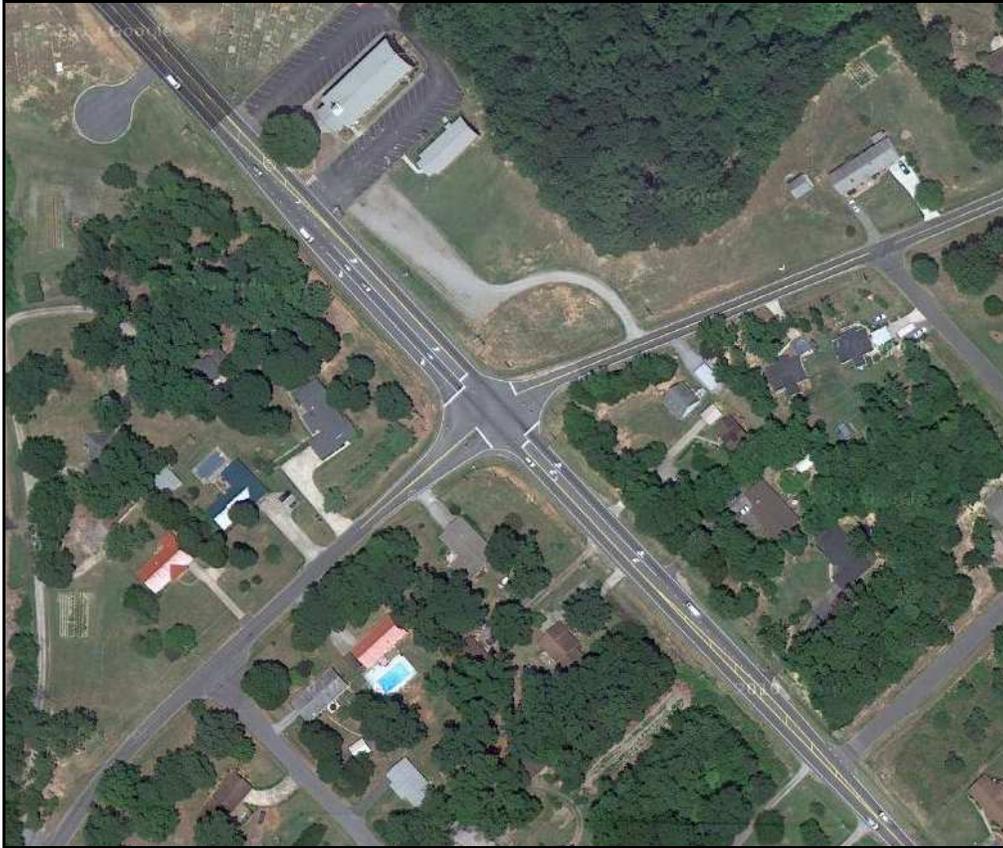
# Spot Safety Project Evaluation Documentation

## Subject Location

Evaluation of Spot Safety Project Number 08-04-206 located at the Intersection of US 311 and SR 1526 (Edgar Road) / SR 1929 (Spencer Road) in Randolph County, southeast of the City of Archdale.

The Sig ID is 08-1071 for this newly installed traffic signal.





**Intersection Aerial from Google Maps**



**Aerial Showing New I-74/US-311 Construction**

## **Project Information and Background from the Project File Folder**

The spot safety project improvement countermeasures chosen for the subject location were the installation of an intersection 2-phase traffic signal and left turn lanes on both approaches of US 311. US 311, SR 1526 (Edgar Road), and SR 1929 (Spencer Road) were all two-lane facilities at the subject intersection with speed limits of 45 mph on all approaches in the before period. Southbound US 311 did provide an exclusive right turn lane onto SR 1526. The subject location is a four-leg crossroads intersection, which was controlled by dual posted stop signs with side street median islands before the signal installation. Also, the northbound US 311 “Signal Ahead” sign was mounted with a signal pole-mounted flasher to warn motorists of the intersection.

The original statement of problem said that motorists from the side streets were failing to yield to vehicles on US 311 resulting in frontal impact crashes. The intended purpose of the new signal and left turn lanes were to reduce the number of crashes and improve the operation of the intersection.

The initial crash analysis was completed from August 1, 2000 to July 31, 2003 with fifteen (15) reported crashes, seven (7) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on December 5, 2007 with a total cost of \$198,250.

This intersection is also being impacted by the construction of the new I-74 / US-311 freeway segment as shown above. In late 2011, construction of the freeway reached this location and SR 1929 (Spencer Road) was cut-off. From the field visit, the Safety Evaluation Group discovered that the SR 1929 designation had been removed and the road was renamed to “Old Spencer Road.” Upon completion, US 311 will be renamed to the freeway segment and this intersection will be listed on US 311 Business.

## **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 September 2007. The before period consisted of reported crashes from July 1, 2003 through March 31, 2007 (3 years and 9 months); and the after period consisted of reported crashes from October 1, 2007 through June 30, 2011 (3 years and 9 months). The ending date for this analysis was limited by the construction of the I-74 freeway which changed the SR 1929 (Spencer Road) leg of the intersection to a dead-end street.

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	10	5	- 50.0 %
Total Severity Index	3.96	2.48	- 37.4 %
Target Crashes – Frontal Impact	5	1	- 80.0 %
Target Crash Severity Index	3.96	1.00	- 74.7 %
Volume (2005, 2009)	13,500	13,100	- 3.0 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	0	N/A
Class B injury Crashes	0	0	N/A
Class C Injury Crashes	4	1	- 75.0 %
Total Injury Crashes	4	1	- 75.0 %

The naive before and after analysis at the treatment location resulted in a 50 percent decrease in Total Crashes, an 80 percent decrease in Target Crashes, and a 37 percent decrease in the Total Severity Index. The before period ADT year was 2005 and the after period ADT year was 2009.

## Results and Discussion

Referencing the *Collision Diagrams*, the before period presented a small pattern of frontal impact collisions including three (3) left turn crashes from the side streets, one (1) angle from running a stop sign, and one (1) left turn same road from a southbound US 311 vehicle using the right turn lane to illegally pass. After the signal installation, these patterns were all eliminated. There was one (1) after period frontal impact crash; a left turn same roadway involving side street vehicles.

However, the after period intersection did experience a slight increase of rear-end crashes approaching the intersection from three (3) in the before period to four (4) in the after period. It is unclear at the moment how the new freeway is going to impact the operation and volumes at this intersection.

The calculated benefit to cost ratio for this project is **0.56 considering total crashes**. The benefit to cost ratio **considering only target crashes is 0.39**. 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*. Photos are provided from our Field Visit on September 14<sup>th</sup>, 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.

**Treatment Site Photos – Field Visit 9/14/2011**



**Southbound US 311 approaching intersection**



**Eastbound/Northbound SR 1526 (Edgar Road) approaching intersection**



**Northbound US 311 Signal Ahead Flasher**



**Northbound US 311 approaching intersection**



**Westbound SR 1929 (Spencer Road) approaching intersection**



**Freeway Construction**

**BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes**

LOCATION: US 311 at SR 1526/1929		BY: JBS						
COUNTY: Randolph		DATE: 12/6/2011						
FILE NO.: SS 08-04-206								
DETAILED COST:	TYPE IMPROVEMENT - Signal & Turn Lanes							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$198,250	10	0.149	\$29,545				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$198,250	10	0.149	\$29,545				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,400				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
TOTAL ANNUAL COST=				\$32,845				
TOTAL COST OF PROJECT=				\$198,250				
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	3.75	0	0.00	4	1.07	6	1.60	\$28,213
AFTER	3.75	0	0.00	1	0.27	4	1.07	\$9,920
Annual Benefits from Crash Cost Savings								\$18,293
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$14,552)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	0.56		
TOTAL COST OF PROJECT		-	\$198,250	COMPREHENSIVE B/C RATIO		-	0.56	

**BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes**

LOCATION: US 311 at SR 1526/1929		BY: JBS						
COUNTY: Randolph		DATE: 12/6/2011						
FILE NO.: SS 08-04-206		Frontal Impact Target Crashes						
DETAILED COST:	TYPE IMPROVEMENT - Signal & Turn Lanes							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$198,250	10	0.149	\$29,545				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$198,250	10	0.149	\$29,545				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,400				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
TOTAL ANNUAL COST=				\$32,845				
TOTAL COST OF PROJECT=				\$198,250				
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	3.75	0	0.00	2	0.53	3	0.80	\$14,107
AFTER	3.75	0	0.00	0	0.00	1	0.27	\$1,147
Annual Benefits from Crash Cost Savings								\$12,960
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$19,885)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	0.39		
TOTAL COST OF PROJECT		-	\$198,250	COMPREHENSIVE B/C RATIO		-	0.39	



ADT (Year)  
14,000 (2005)

LEGEND							
	MOVING VEHICLE		ANGLE		5 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PARKING 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		RAN OFF ROAD		50 MPH TO 59		ICY OR SNOWY
	RAN OFF ROAD		BLURRY		60 MPH TO 69		ONLY
			FATALITY		70 MPH TO 79		
					TO AND UP		
					SPEED UNKNOWN		

SS# 08-04-206  
 Order# 41000014131  
 Randolph County  
 BEFORE Period  
 7/1/03 - 3/31/07

SR 1526  
 Edgar Road  
 45-mph

ADT (Year)  
 2,300 (2005)

ADT (Year)  
 610 (2005)

SR 1929  
 Spencer Road  
 45-mph

US-311  
 45-mph

ADT (Year)  
 10,000 (2005)

**Crash Notes:**

Crash 3 - SB Vehicle illegally passed in the right turn lane

Crash 4 - Vehicle struck an engine block lying in the road



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

**TRAFFIC SAFETY UNIT**

Date: 12-6-2011

Prepared By: J. Schronce

 New Signalized Intersection  
 Sig ID 08-1071  
 (All Permissive)

ADT (Year)  
13,000 (2009)

**LEGEND**

	MOVING VEHICLE		ANGLE		5 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PAKED 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		RUNAWAY		50 MPH TO 59		ICY OR SNOWY
	REAR END		RUNAWAY		60 MPH TO 69		ONLY
	RAN OFF ROAD		FATALITY		TO AND UP		
					SPEED UNKNOWN		

SS# 08-04-206  
 Order# 41000014131  
 Randolph County  
 AFTER Period  
 10/1/07 - 6/30/11

ADT (Year)  
 2,600 (2009)

SR 1526  
 Edgar Road  
 45-mph

ADT (Year)  
 660 (2009)

SR 1929  
 Spencer Road  
 45-mph

US-311  
 45-mph  
 ADT (Year)  
 10,000 (2009)

Countermeasures:  
 1. Intersection Traffic Signal  
 2. US-311 Left Turn Lanes

 Frontal Impact  
 Target Crashes

**N.C. DEPARTMENT of TRANSPORTATION**  
**DIVISION of HIGHWAYS**  
**TRANSPORTATION MOBILITY and SAFETY DIVISION**  
**TRAFFIC SAFETY UNIT**  
 Date: 12-6-2011  
 Prepared By: J. Schronce