

# Spot Safety Project Evaluation

Order # 41000004369

Spot Safety Project # 09-00-203

**Spot Safety Project Evaluation of the Traffic Signal Installation  
SR 3010 (Old NC 52) at SR 1821 (Hinkle Lane)  
Town of Welcome, Davidson County**

Documents Prepared By:

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

**Principal Investigator**



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Jason B. Schronce

2-18-2010

Date

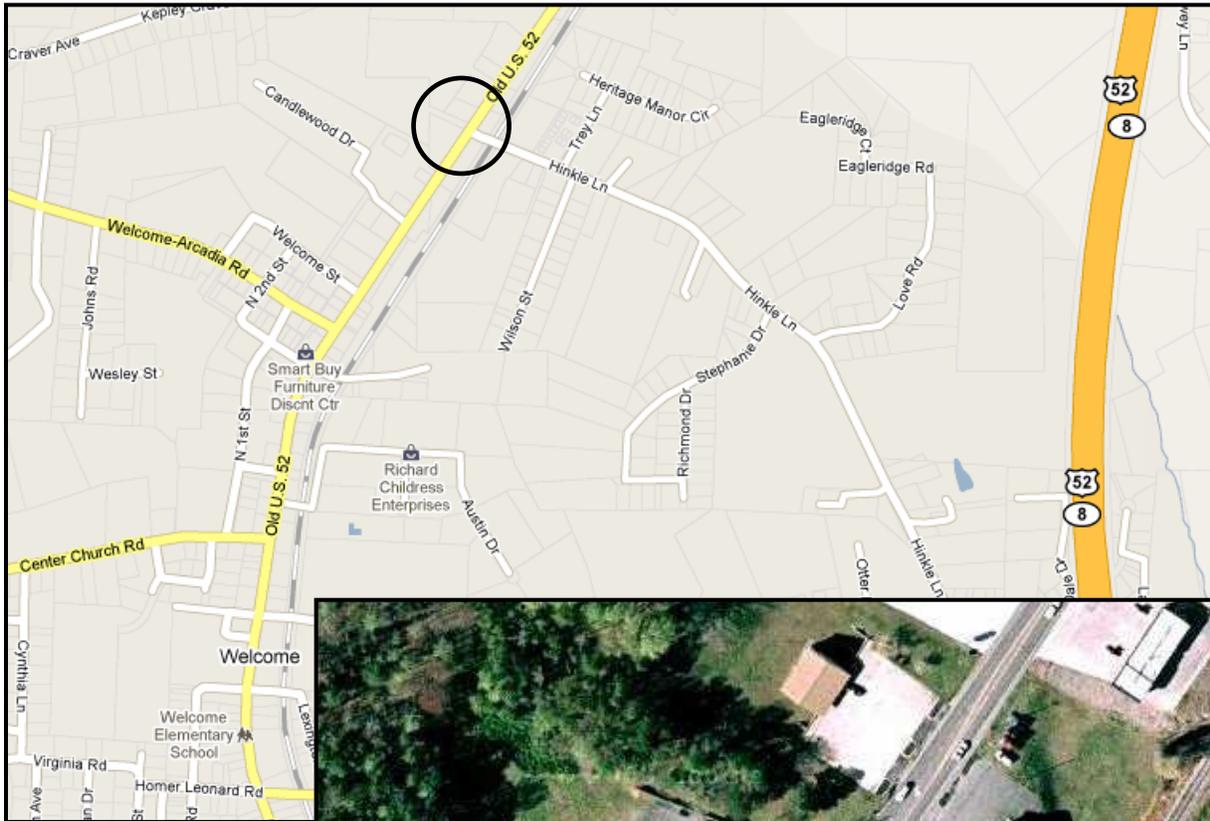
Traffic Safety Project Engineer

# Spot Safety Project Evaluation Documentation

## Subject Location

Evaluation of Spot Safety Project Number 09-00-203 located at the Intersection of SR 3010 (Old US 52) and SR 1821 (Hinkle Lane) in Davidson County, Town of Welcome.

The Sig ID is 09-1263 for this newly installed traffic signal.



## 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. The signal also has railroad preemption for the at-grade crossing (WSSB-836380V) located on SR 1821 approximately 200 feet east of the intersection. SR 3010 is a three-lane segment roadway with a center turn lane to the south and a left turn lane north of the intersection that serves access to multiple commercial developments. SR 1821 is a two-lane facility at the subject intersection. The speed limit is 45 mph around this location. The subject location is a three-leg intersection, which was controlled by a stop sign on SR 1821 (Hinkle Lane).

The original statement of problem were the existing conditions of congestion and a pattern of left turn crashes from SR 1821 vehicles entering a high volume roadway. The intended purpose of the new traffic signal was to alleviate the accident pattern of left turn collisions and reduce congestion.

The initial crash analysis was completed from September 10, 1996 to September 1, 1999 with ten (10) reported crashes, three (3) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on March 26, 2004 with a total cost of \$60,000.

## 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 March through April 2004. The before period consisted of reported crashes from August 1, 1998 through February 29, 2004 (5 years and 7 months); and the after period consisted of reported crashes from May 1, 2004 through November 30, 2009 (5 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.

<b><u>Treatment Information</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total crashes	21	7	- 66.7 %
Total Severity Index	4.88	3.11	- 36.3 %
Target Crashes	9	1	- 88.9 %
Target Crash Severity Index	5.11	1.00	- 80.4 %
Volume	13,300	15,100	13.5 %

<u>Injury Crash Summary</u>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	0	N/A
Class B injury Crashes	2	0	- 100.0 %
Class C Injury Crashes	9	2	- 77.8 %
Total Injury Crashes	11	2	- 81.8 %

The naive before and after analysis at the treatment location resulted in a 67 percent decrease in Total Crashes, an 89 percent decrease in Target Crashes, and a 36 percent decrease in the Total Severity Index. The before period ADT year was 2001 and the after period ADT year was 2007.

## **Results and Discussion**

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 67 percent decrease in Total Crashes and an 89 percent decrease in Target Crashes. The summary results above demonstrate that both Total and Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the before period indicates a pattern nine (9) left turn collisions from SR 1821 vehicles unsuccessfully accessing SR 3010 (Old US 52). Also, the before period shows six (6) left turning collisions from vehicles entering/exiting the surrounding commercial establishments on SR 3010. With the installation of the signal, the one (1) SR 3010 frontal impact collision at the intersection was the result of a permissive green left turn movement. Also, the after period demonstrates that the signal provided gaps for PVA access since this pattern was completely eliminated. This signal was very effective of designating the proper right-of-way for safe movement through this location.

The calculated benefit to cost ratio for this project is **2.75 considering total crashes**. The benefit to cost ratio **considering only target crashes is 1.54**. 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 Google Street View for all three 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



Traveling West on SR 1821 (Hinkle Lane)



Traveling South on SR 3010 (Old US 52)



Traveling North on SR 3010 (Old US 52)



Traveling North on SR 3010 at SR 1821 intersection

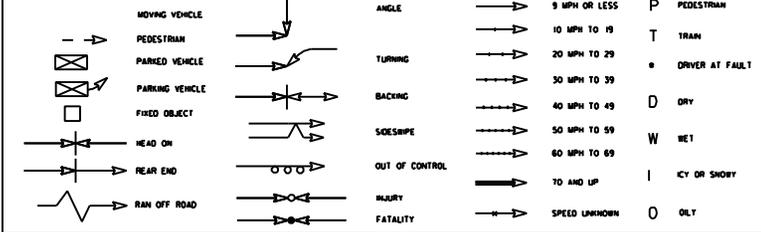
**BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes**

LOCATION: SR 3010 at SR 1821		BY: JBS						
COUNTY: Davidson		DATE: 2/18/2010						
FILE NO.: SS 09-00-203		NOTES: Total Crashes						
DETAILED COST:	TYPE IMPROVEMENT - <b>New Traffic Signal</b>							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$60,000	10	0.149	\$8,942			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$60,000	10	0.149	\$8,942			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,000			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$11,842			
	TOTAL COST OF PROJECT=				\$60,000			
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	5.58	0	0.00	11	1.97	10	1.79	\$42,473
AFTER	5.58	0	0.00	2	0.36	5	0.90	\$9,946
						Annual Benefits from Crash Cost Savings		\$32,527
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$20,685		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	2.75		
TOTAL COST OF PROJECT		-	\$60,000	COMPREHENSIVE B/C RATIO		-	2.75	

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

LOCATION: SR 3010 at SR 1821		BY: JBS						
COUNTY: Davidson		DATE: 2/18/2010						
FILE NO.: SS 09-00-203		NOTES: Target Crashes - Frontal Impact						
DETAILED COST:	TYPE IMPROVEMENT - <b>New Traffic Signal</b>							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$60,000	10	0.149	\$8,942			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$60,000	10	0.149	\$8,942			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,000			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$11,842			
	TOTAL COST OF PROJECT=				\$60,000			
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	5.58	0	0.00	5	0.90	4	0.72	\$18,925
AFTER	5.58	0	0.00	0	0.00	1	0.18	\$699
						Annual Benefits from Crash Cost Savings		\$18,226
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$6,384		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	1.54		
TOTAL COST OF PROJECT		-	\$60,000	COMPREHENSIVE B/C RATIO		-	1.54	

LEGEND



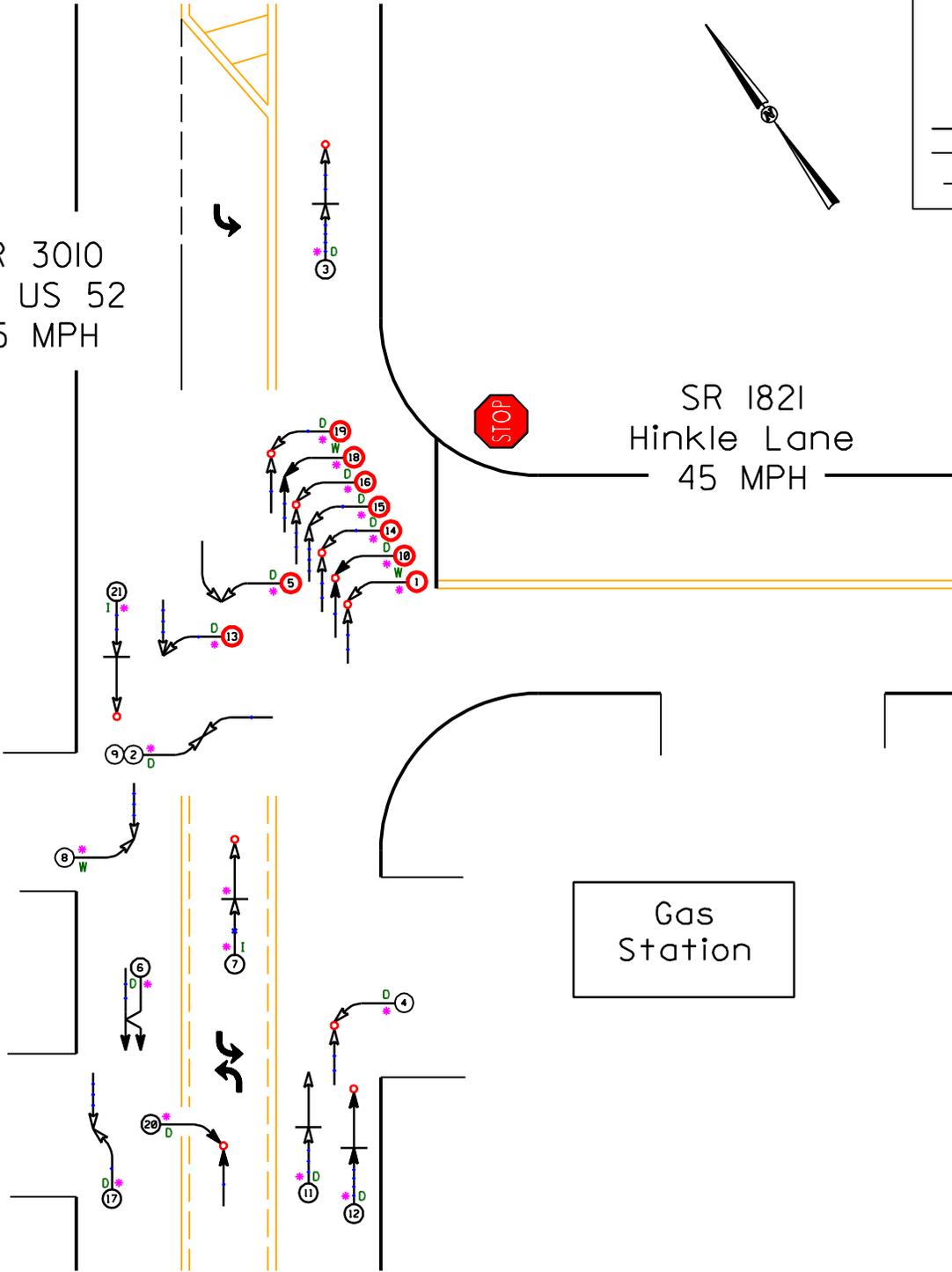
SR 3010  
Old US 52  
45 MPH

SR 1821  
Hinkle Lane  
45 MPH

SS# 09-00-203  
Davidson County  
Town of Welcome  
BEFORE Period  
8/1/98 - 2/29/04

Gas Station

Gas Station



Frontal Impact  
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION 9	AREA:
	STUDY PERIOD: 8/1/98 - 2/29/2004	
	DISTANCE: Y-LINE + 150 FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: N/A		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 2-17-2010		
LOG NUMBER: SS# 09-00-203 BEFORE		

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

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAM
	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		HAZARD		50 MPH TO 59		ICY OR SNOW
	REAR END		FATALITY		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD				TO AND LP		

SS# 09-00-203  
 Davidson County  
 Town of Welcome  
 AFTER Period  
 5/1/04 - 11/30/09



New Signalized  
 Intersection  
 Sig ID 09-1263

Gas Station

Gas Station

SR 3010  
 Old US 52  
 45 MPH

SR 1821  
 Hinkle Lane  
 45 MPH



Frontal Impact  
 Target Crashes

**TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT**

	COLLISION DIAGRAM	
	DIVISION 9	AREA:
	STUDY PERIOD: 5/1/2004 - 11/30/2009	
	DISTANCE: Y-LINE + 150 FT	
	ANALYSIS PREPARED BY: JBS	
	ANALYSIS CHECKED BY: N/A	
	DIAGRAM PREPARED BY: JBS	
	DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE		
DATE: 2-17-2010		
LOG NUMBER: SS* 09-00-203 AFTER		

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