

# **Spot Safety Project Evaluation**

Project Log # 200704283

Spot Safety Project # 07-00-210

## **Spot Safety Project Evaluation of the Traffic Signal Installation at the Intersection of SR 3045 (Mount Hope Church Rd) and SR 3051/3142 (Knox Rd) Guilford 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, EI

10/7/2008  
Date

Traffic Safety Project Engineer

# ***Spot Safety Project Evaluation Documentation***

## **Subject Location**

Evaluation of Spot Safety Project Number 07-00-210 – The Intersection of SR 3045 (Mount Hope Church Rd) and SR 3051/SR 3142 (Knox Rd) in Guilford County.

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

The spot safety project improvement countermeasure chosen for the subject location was to install a traffic signal. The subject intersection is a four-leg intersection that was controlled by stop signs on SR 3051/3142 (Knox Rd) in the before period. The southeast leg of SR 3045 (Mount Hope Church Rd) has a two-lane approach to the intersection with a left turn lane and a thru-right lane. The northwest leg of SR 3045 has a three-lane approach with a left turn, thru, and a thru-right lane. SR 3051/3142 has single lane approaches to the intersection. The speed limit for all approaches is 45 mph.

The original statement of problem was that vehicles could not safely enter the intersection due to insufficient gaps in traffic. The problem was said to be primarily a congestion-delay problem.

The initial crash analysis was conducted from March 1, 1997 to February 29, 2000 with a total of five reported crashes, two of which were considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on August 15, 2002 with a total cost of \$40,000.00.

## **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 July 1, 2002 to September 30, 2002. The before period consisted of reported crashes from October 1, 1996 through June 30, 2002 (5 years and 9 months) and the after period consisted of reported crashes from October 1, 2002 through June 30, 2008 (5 years and 9 months). 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 Frontal Impact crash types were considered the Target Crashes for the applied countermeasure. These crash types are considered as follows: Left Turn, same roadway; Left Turn, different roadway; Right Turn, same roadway; Right Turn, different roadway; Head On and Angle. The target crashes are clearly identified in the before and after period collision diagrams.

<b>Treatment Information</b>			
	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total Crashes	22	22	0.0
Total Severity Index	3.02	2.68	-11.3
Target Crashes	17	8	-52.9
Target Crash Severity Index	3.61	1.92	-46.8
Volume	8900	7200	-19.1
<b><u>Crash Severity Summary</u></b>			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	2	0	-100.0
Class C Crashes	4	5	25.0
PDO Crashes	16	17	6.3

The naive before and after analysis at the treatment location resulted in no change in Total Crashes, a 53 percent decrease in Target Crashes, and a 19 percent decrease in Average Daily Traffic (ADT). The before period ADT year was 1999 and the after period ADT year was 2005.

## **Results and Discussion**

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in no change in Total Crashes, a 53 percent decrease Target Crashes, and a 11 percent decrease in the Severity Index. The summary results above demonstrate that Total Crashes and both types of Target Crashes appear to have decreased at the treatment location from the before to the after period.

The calculated benefit to cost ratio for this project is 0.89 considering total crashes. The benefit to cost ratio considering only target crashes is 6.68. 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.

Referencing the Collision Diagrams, the traffic signal revision appears effective at reducing the existing crash patterns. Angle crashes between southbound SR 3051 traffic and westbound SR 3045 traffic reduced from eight in the before period to one in the after. Left Turn-Different Roadway crashes between SR 3051 left-turning traffic and eastbound SR 3045 traffic went from four in the before period to none in the after period.

A small pattern of Left Turn-Same Roadway crashes (four crashes) developed in the after period involving vehicles turning left from SR 3051 onto SR 3045. There was only one crash of this type in the before period. There was also a small increase in rear-end crashes at the intersection, from one in the before period to four in the after period.

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 roadway.

**BENEFIT-COST ANALYSIS WORKSHEET**

LOCATION: SR 3045 at SR 3051/3142  
 COUNTY: Guilford  
 FILE NO.: SS 07-00-210

BY: BDR  
 DATE: 10/1/2008

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$10	40000	0.080	\$1
Right-of-Way	\$0	0	0.000	\$0
<b>TOTALS</b>	<b>\$10</b>	<b>#NUM!</b>	<b>0.080</b>	<b>\$1</b>

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000  
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900  
 TOTAL ANNUAL COST= \$2,901  
 TOTAL COST OF PROJECT= \$10

COMPREHENSIVE COST REDUCTION:

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES						ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	
BEFORE	5.75	0	0.00	6	1.04	16	2.78	\$31,235
AFTER	5.75	0	0.00	5	0.87	17	2.96	\$28,643

Annual Benefits from Crash Cost Savings \$2,591

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$309)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 0.89

TOTAL COST OF PROJECT - \$10 COMPREHENSIVE B/C RATIO - 0.89

**BENEFIT-COST ANALYSIS WORKSHEET**

LOCATION: SR 3045 at SR 3051/3142  
 COUNTY: Guilford  
 FILE NO.: SS 07-00-210 Target Crashes

BY: BDR  
 DATE: 10/1/2008

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$10	40000	0.080	\$1
Right-of-Way	\$0	0	0.000	\$0

TOTALS \$10 #NUM! 0.080 \$1

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000  
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900  
 TOTAL ANNUAL COST= \$2,901  
 TOTAL COST OF PROJECT= \$10

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO		ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	CRASHES	CRASHES PER YR	
BEFORE	5.75	0	0.00	6	1.04	11	1.91	\$27,670
AFTER	5.75	0	0.00	1	0.17	7	1.22	\$8,296

Annual Benefits from Crash Cost Savings \$19,374

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$16,473

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 6.68

TOTAL COST OF PROJECT - \$10 COMPREHENSIVE B/C RATIO - 6.68

Site Photos Taken February 18, 2008



Driving Eastbound on SR 3045 (Mount Hope Church Rd)



Driving Westbound on SR 3045 (Mount Hope Church Rd)



Driving Northbound on SR 3142 (Knox Rd)



Driving Southbound on SR 3051 (Knox Rd)



Guilford County  
Treatment Site - Total Crashes  
Before Period  
October 1, 1996 - June 30, 2002

# Target Crashes

SR 3045  
(Mount Hope Church Rd)  
45 mph

SR 3051  
(Knox Rd)  
45 mph

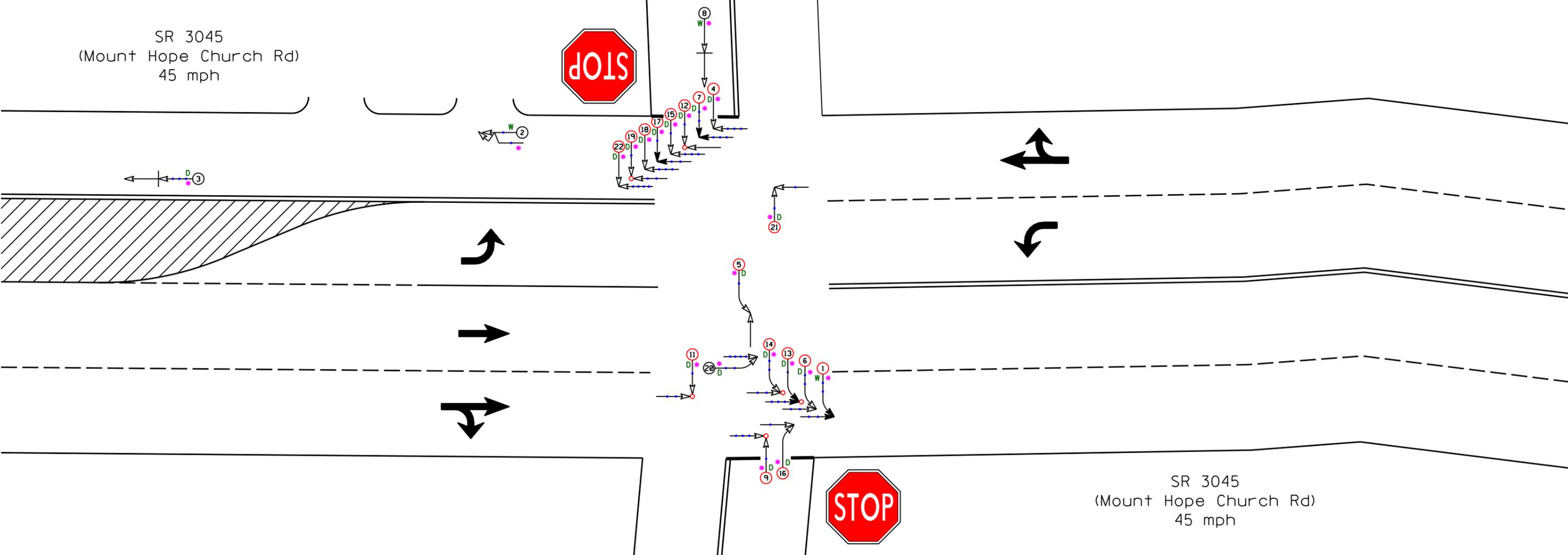


SR 3045  
(Mount Hope Church Rd)  
45 mph

SR 3142  
(Knox Rd)  
45 mph

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN/BICYCLE		TURNING		10 MPH TO 19		BICYCLE
	PARKED VEHICLE		BACKING		20 MPH TO 29		TRAIN
	PARKING VEHICLE		SLOPESIDE		30 MPH TO 39		ANIMAL
	MOVABLE OBJECT		OUT OF CONTROL		40 MPH TO 49		DRIVER AT FAULT
	HEAD ON		HAZARD		50 MPH TO 59		DRY
	REAR END		FATALITY		60 MPH TO 69		WET
	RAN OFF ROAD		DAYLIGHT CRASH		70 AND UP		ICE



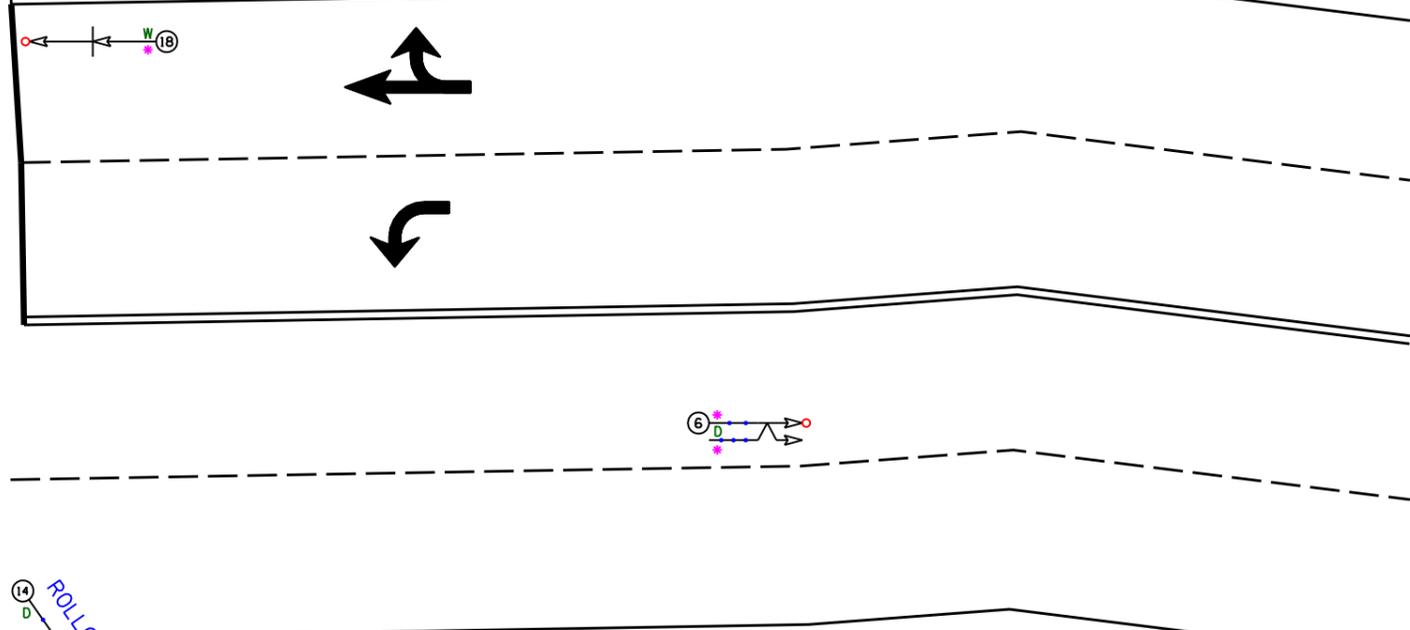
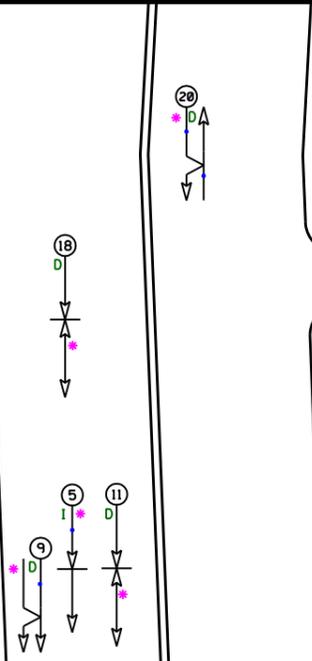
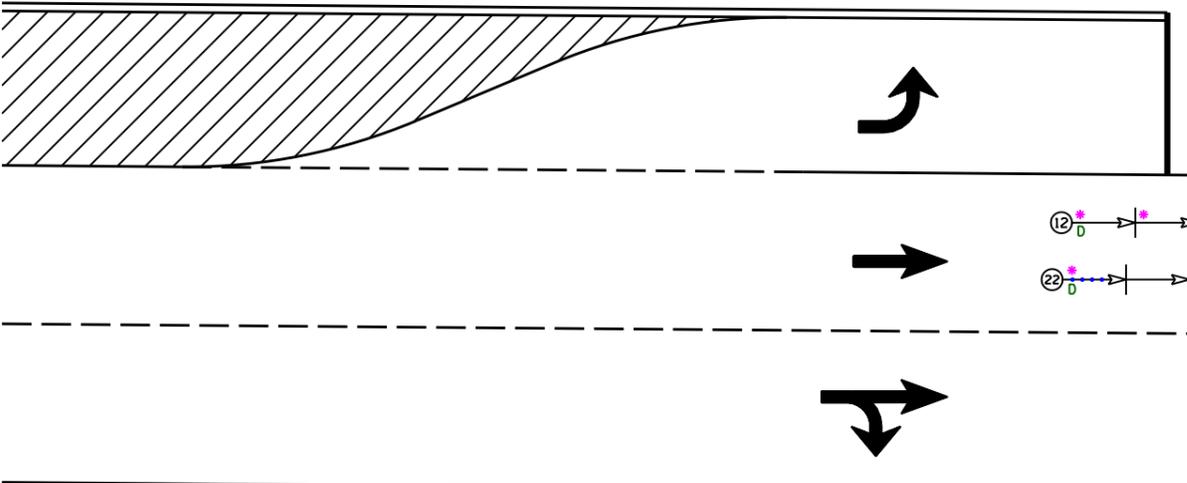
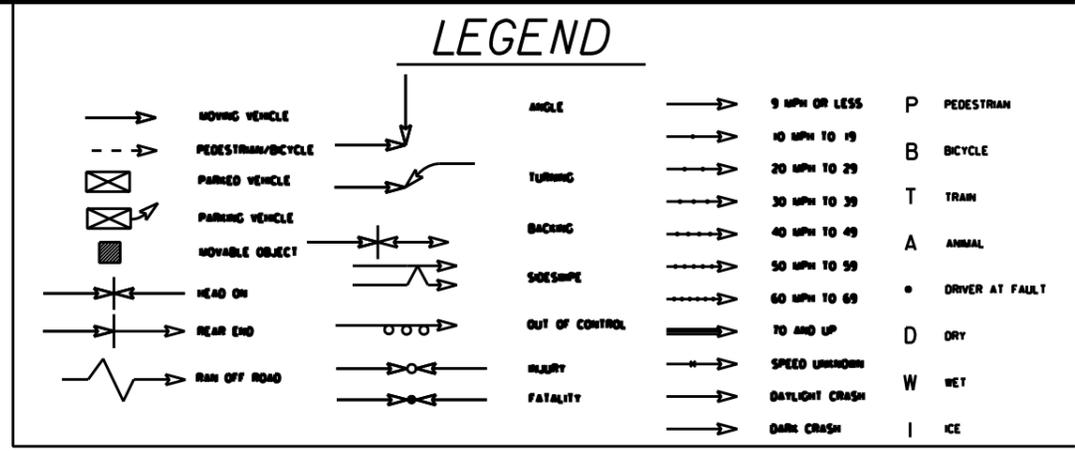
TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT		COLLISION DIAGRAM	
HIGHWAY SAFETY IMPROVEMENT PROGRAM		DIVISION: ..	AREA: ..
		STUDY PERIOD: 10/1/1996 TO 6/30/2002	
		DISTANCE: ..... Y-LINE: 150 FT	
SAFETY EVALUATION		ANALYSIS PREPARED BY: B. Robles90	
TRAFFIC SAFETY		DIAGRAM PREPARED BY: B. Robles90	
BEFORE SIGNAL INSTALLATION		DIAGRAM REVIEWED BY: .....	
DATE: Sep10@08c_2008		SCALE: NOT TO SCALE	
LOG NUMBER: .....		LOG NUMBER: .....	
<b>N.C. DEPARTMENT of TRANSPORTATION</b> <b>DIVISION of HIGHWAYS</b> <b>TRAFFIC ENGINEERING AND SAFETY</b> <b>SYSTEMS BRANCH</b>			

Guilford County  
Treatment Site - Total Crashes  
After Period  
October 1, 2002 - June 30, 2008

# Target Crashes

SR 3045  
(Mount Hope Church Rd)  
45 mph

SR 3051  
(Knox Rd)  
45 mph



R  
Y  
G

SR 3142  
(Knox Rd)  
45 mph

SR 3045  
(Mount Hope Church Rd)  
45 mph

14  
W  
D  
A  
R  
O  
L  
L  
O  
V  
E  
R

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT		COLLISION DIAGRAM	
HIGHWAY SAFETY IMPROVEMENT PROGRAM	SAFETY INFORMATION MANAGEMENT AND SUPPORT	DIVISION: ..	AREA: ..
		STUDY PERIOD: 10/1/2002 TO 6/30/2008	DISTANCE: ..... Y-LINE: 150 FT
		ANALYSIS PREPARED BY: B. Robles90	DIAGRAM PREPARED BY: B. Robles90
SAFETY EVALUATION		TRAFFIC SAFETY	
AFTER SIGNAL INSTALLATION		SCALE: NOT TO SCALE	DATE: Sep10@08c_2008
		LOG NUMBER: .....	

**N.C. DEPARTMENT of TRANSPORTATION**  
**DIVISION of HIGHWAYS**  
**TRAFFIC ENGINEERING AND SAFETY**  
**SYSTEMS BRANCH**