

# Spot Safety Project Evaluation

Order # 41000000612

Spot Safety Project # 13-01-213

## Spot Safety Project Evaluation of the Traffic Signal Installation SR 1949 (Salem Road) and SR 1940 (Pete Brittain Road) Burke 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

9-21-2009

Date

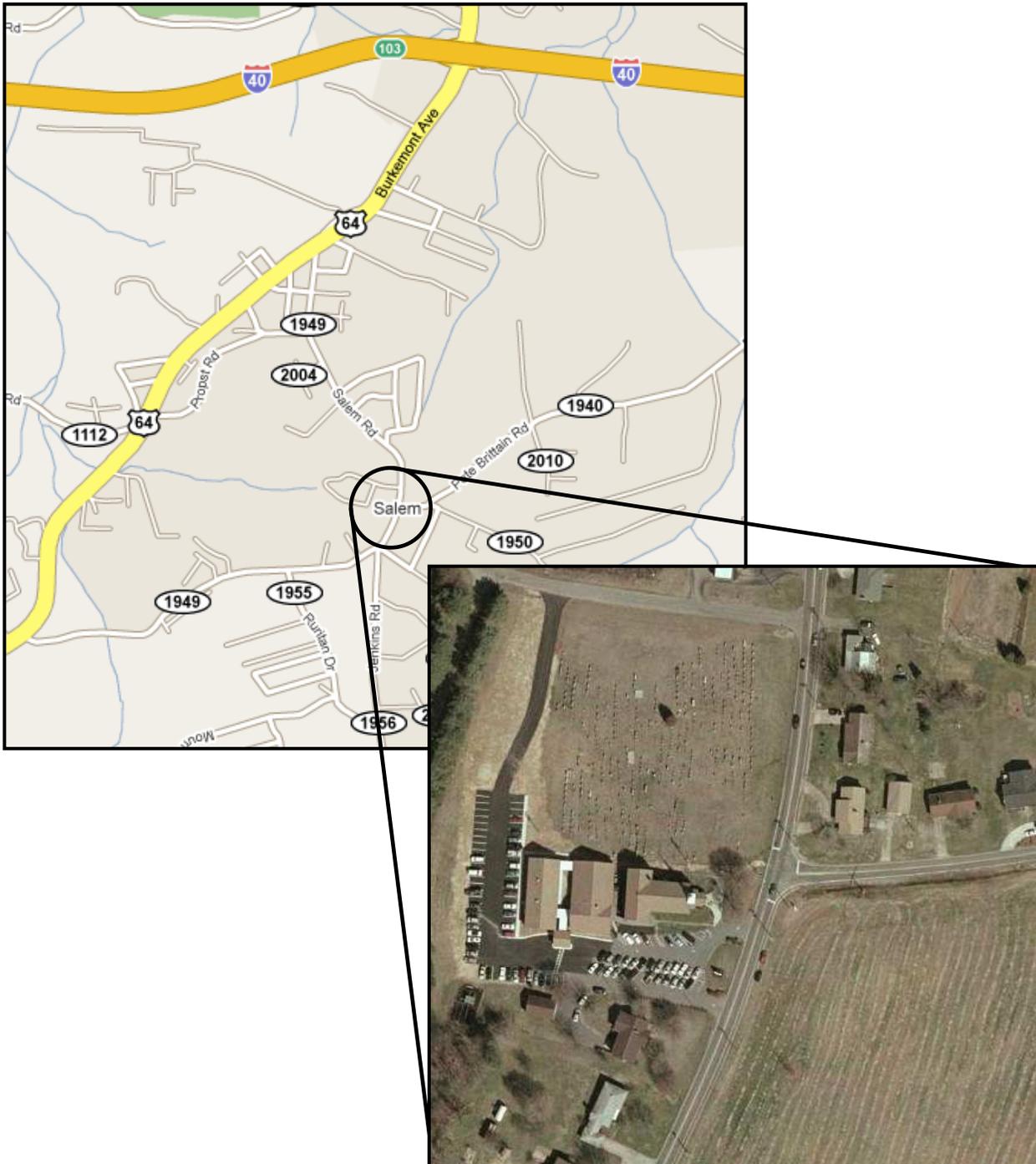
Traffic Safety Project Engineer

# *Spot Safety Project Evaluation Documentation*

## **Subject Location**

Evaluation of Spot Safety Project Number 13-01-213 located at the Intersection of SR 1949 (Salem Road) and SR 1940 (Pete Brittain Road) in Burke County, Town of Salem.

The Sig ID is 13-1177 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 2-phase traffic signal. SR 1949 (Salem Road) and SR 1940 are both two-lane facilities at the subject intersection with speed limits of 35 mph on all approaches. The subject location is a three-leg intersection, which was controlled by a stop sign on SR 1940 (Pete Brittain Road).

The original statement of problem was that this location was experiencing heavy congestion and excessive delay. Several schools feed traffic through this location and the roadway is a corridor between the City of Morganton and US 64. The intended purpose of this signal was to correct congestion management issues.

The initial crash analysis was completed from January 1, 1998 to December 31, 2000 with four (4) reported crashes, one (1) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on February 20, 2004 with a total cost of \$30,000.

## 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 was the months of January through February 2004. The before period consisted of reported crashes from September 1, 1998 through December 31, 2003 (5 years and 4 months); and the after period consisted of reported crashes from March 1, 2004 through June 30, 2009 (5 years and 4 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	5	8	60.0 %
Total Severity Index	3.96	4.70	18.7 %
Target Crashes	3	2	- 33.3 %
Target Crash Severity Index	3.47	8.40	142.1 %
Volume	10,700	10,200	- 4.7 %

<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	1	100.0 %
Class C Injury Crashes	2	3	50.0 %
Total Injury Crashes	2	4	100.0 %

The naive before and after analysis at the treatment location resulted in a 60 percent increase in Total Crashes, a 33 percent decrease in Target Crashes, and a 19 percent increase in the Total Severity Index. The before period ADT year was 2001 and the after period ADT year was 2006.

## 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 60 percent increase in Total Crashes but a 33 percent decrease in Target Crashes. The summary results above demonstrate that Total Crashes and Severity appear to have increased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the before period frontal impact crash pattern at the intersection consisted of three (3) collisions, including two left turn crashes and one vehicle that ran the stop sign. After the traffic signal installation, the pattern changed to two (2) left turn-same roadway collisions on SR 1949. The after period also saw a development of four (4) rear-end collisions, three (3) of which occurred on the southbound SR 1949 approach.

The calculated benefit to cost ratio for this project is **(-1.02) considering total crashes**. The benefit to cost ratio **considering only target crashes is (-0.26)**. 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.

Photos were not available from Google Street View for this location. 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.

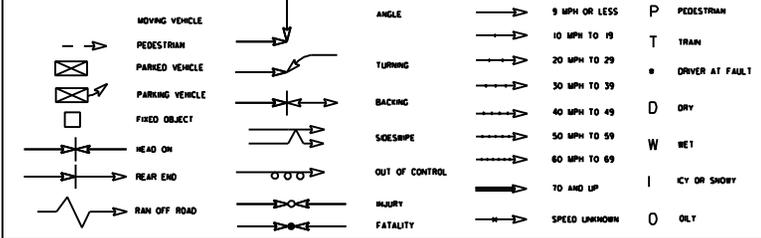
**BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes**

LOCATION: SR 1949 at SR 1940		BY: JBS						
COUNTY: Burke		DATE: 9/10/2009						
FILE NO.: SS 13-01-213		NOTES: Total Crashes						
DETAILED COST:	TYPE IMPROVEMENT - Install 2-Phase Traffic Signal							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$30,000	10	0.149	\$4,471				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$30,000	10	0.149	\$4,471				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,000				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
TOTAL ANNUAL COST=				\$7,371				
TOTAL COST OF PROJECT=				\$30,000				
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	5.33	0	0.00	2	0.38	3	0.56	\$8,949
AFTER	5.33	0	0.00	4	0.75	4	0.75	\$16,435
Annual Benefits from Crash Cost Savings								(\$7,486)
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$14,857)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	-1.02		
TOTAL COST OF PROJECT		-	\$30,000	COMPREHENSIVE B/C RATIO		-	-1.02	

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

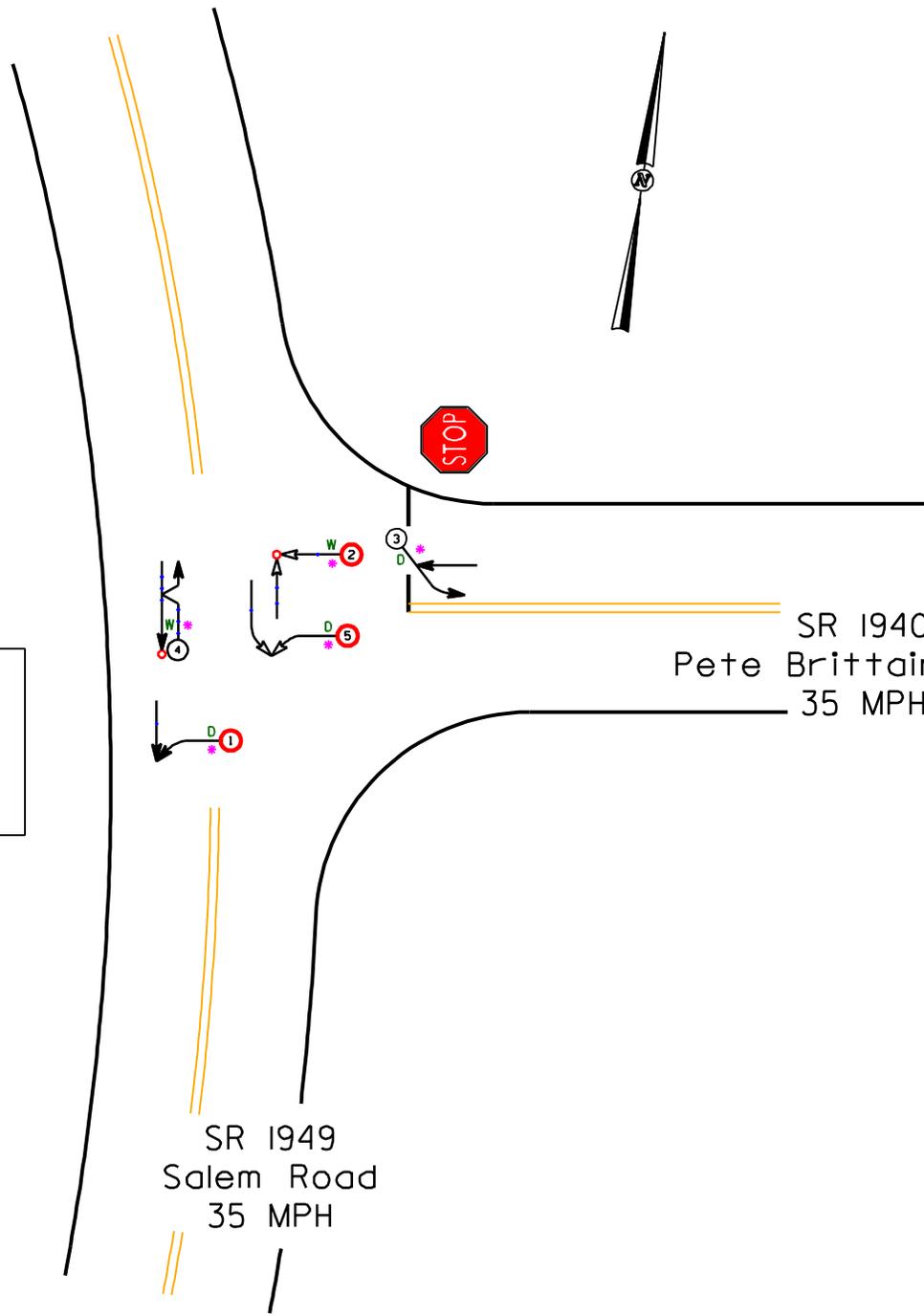
LOCATION: SR 1949 at SR 1940		BY: JBS						
COUNTY: Burke		DATE: 9/10/2009						
FILE NO.: SS 13-01-213		NOTES: Target Crashes - Frontal Impact						
DETAILED COST:	TYPE IMPROVEMENT - Install 2-Phase Traffic Signal							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$30,000	10	0.149	\$4,471				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$30,000	10	0.149	\$4,471				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,000				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
TOTAL ANNUAL COST=				\$7,371				
TOTAL COST OF PROJECT=				\$30,000				
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	5.33	0	0.00	1	0.19	2	0.38	\$4,841
AFTER	5.33	0	0.00	2	0.38	0	0.00	\$6,754
Annual Benefits from Crash Cost Savings								(\$1,914)
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$9,285)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	-0.26		
TOTAL COST OF PROJECT		-	\$30,000	COMPREHENSIVE B/C RATIO		-	-0.26	

LEGEND



SS# 13-01-213  
 Burke County  
 BEFORE Period  
 9/1/98 - 12/31/03

Church  
PVA



SR 1940  
 Pete Brittain Road  
 35 MPH

SR 1949  
 Salem Road  
 35 MPH

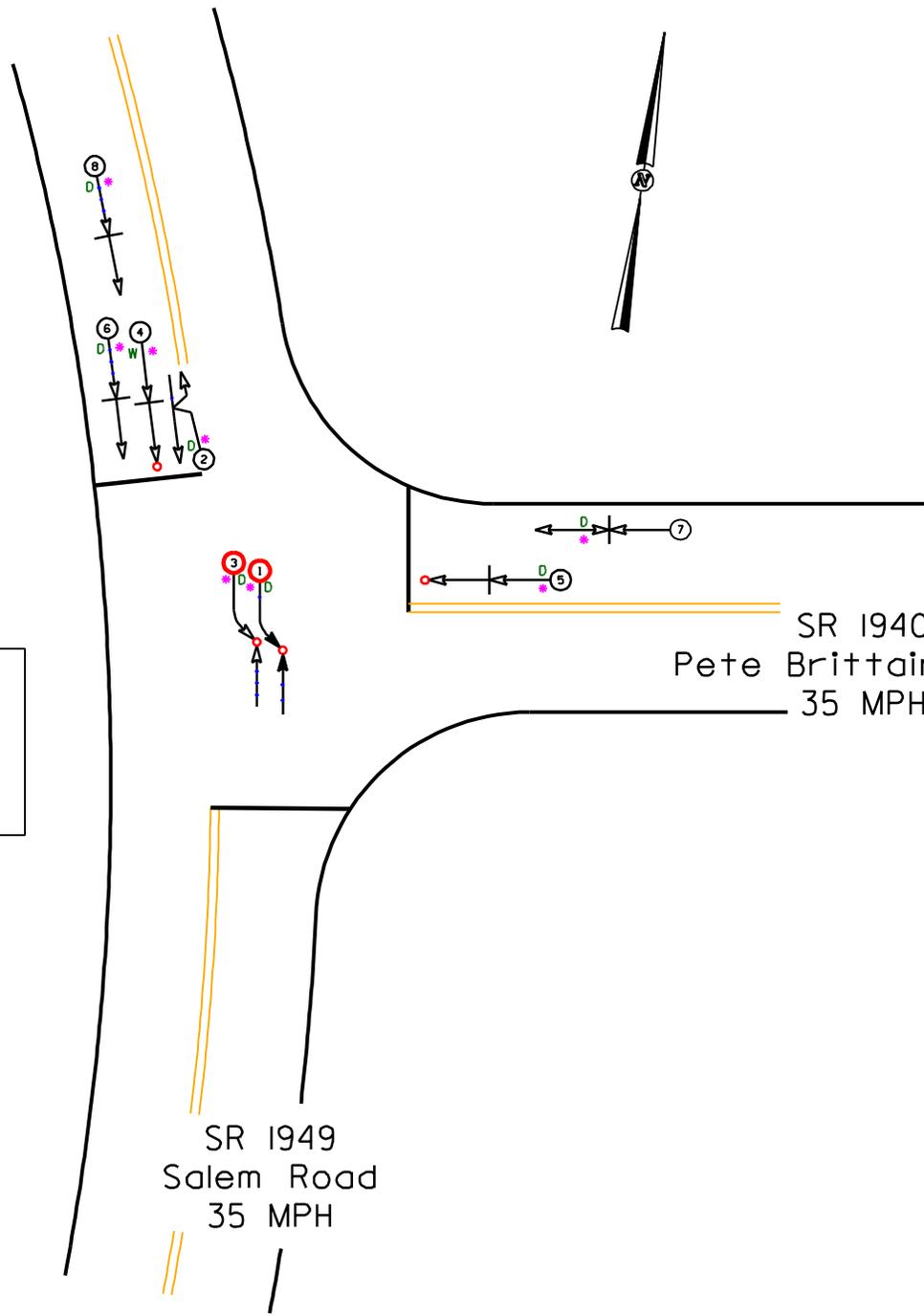
Frontal Impact  
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT



COLLISION DIAGRAM	
DIVISION: 13	AREA:
STUDY PERIOD: 9/1/98 - 12/31/2003	
DISTANCE: Y-LINE + 150 FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 9-10-2009	
LOG NUMBER: SS* 13-01-213 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		D DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		W WET
	HEAD ON		TO AND UP		50 MPH TO 59		I ICY OR SNOW
	REAR END		INJURY		60 MPH TO 69		F FATALITY
	RAN OFF ROAD		SPEED UNKNOWN		70 AND UP		O ONLY

SS# 13-01-213  
 Burke County  
 AFTER Period  
 3/1/04 - 6/30/09

Church  
PVA

SR 1940  
Pete Brittain Road  
35 MPH

SR 1949  
Salem Road  
35 MPH



New Signalized  
Intersection  
Sig ID 13-1177

Frontal Impact  
Target Crashes

**TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT**

	<b>COLLISION DIAGRAM</b>	
	DIVISION: 13	AREA:
STUDY PERIOD: 3/1/2004 - 6/30/2009		
DISTANCE: Y-LINE + 150 FT		
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: BR		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 9-10-2009		
LOG NUMBER: SS* 13-01-213 AFTER		

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