

Spot Safety Project Evaluation

Order # 41000003888

Spot Safety Project # 07-01-224

**Spot Safety Project Evaluation of the Traffic Signal Installation
NC 150 (Oak Ridge Road) at SR 2022 (Linville Road)
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



Jason B. Schronce

2-17-2010

Date

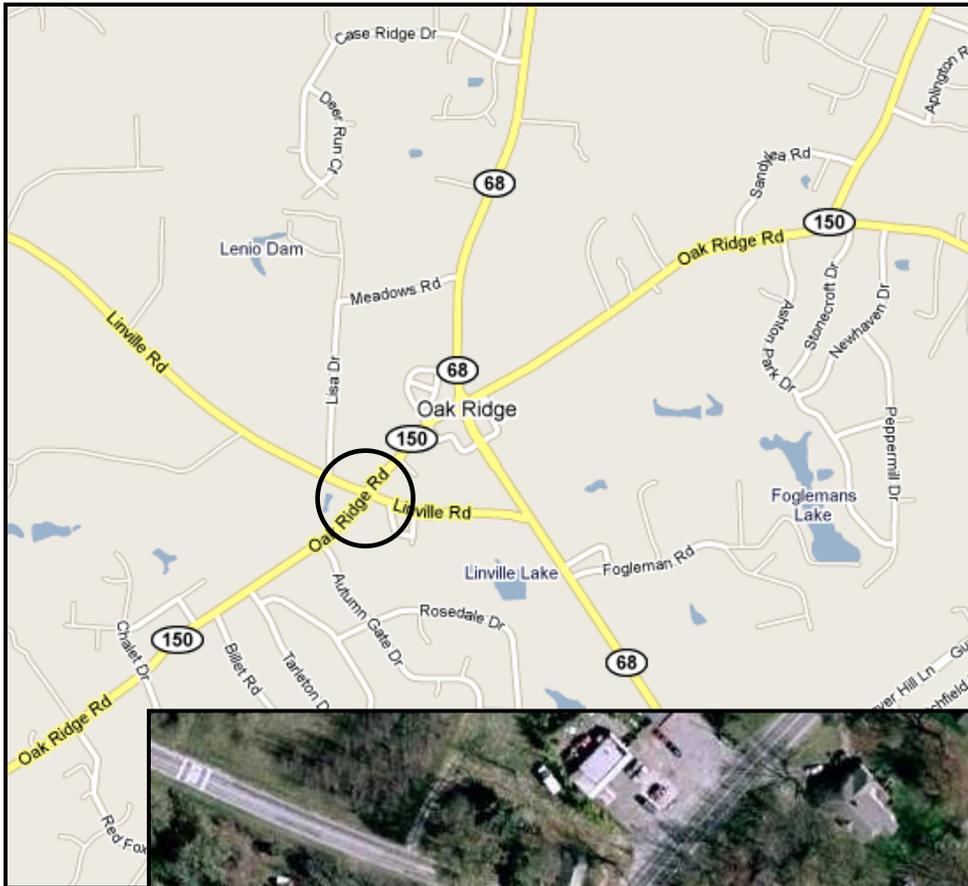
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 07-01-224 located at the Intersection of NC 150 (Oak Ridge Rd) and SR 2022 (Linville Rd) in Guilford County, near the Community of Oak Ridge.

The Sig ID is 07-1479 for this newly installed two-phase 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. NC 150 (Oak Ridge Road) and SR 2022 are both two-lane facilities at the subject intersection with speed limits of 35 mph on all approaches. The subject location is a four-leg crossroads intersection, which was previously controlled by dual posted stop signs on the SR 2022 (Linville Road) approaches.

The original statement of problem was the concern for collisions due to projected growth in the area, current intersection sight distance, a small pattern of angle collisions, and the location of an elementary school in the southwest quadrant of the intersection. The intended purpose of the new traffic signal was to alleviate the accident potential of crashes at this location.

The initial crash analysis was completed from February 1, 1999 to January 31, 2002 with three (3) reported crashes, two (2) of which were deemed correctable angle collisions. The final completion date for the improvement at the subject intersection was on January 6, 2004 with a total cost of \$75,000.

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 December 2003 through January 2004. The before period consisted of reported crashes from February 1, 1998 through November 30, 2003 (5 years and 10 months); and the after period consisted of reported crashes from February 1, 2004 through November 30, 2009 (5 years and 10 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	11	13	18.2 %
Total Severity Index	3.02	3.28	8.6 %
Target Crashes	9	9	0.0 %
Target Crash Severity Index	3.47	3.47	0.0 %
Volume	7,500	11,400	52.0 %

<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	3	1	- 66.7 %
Class C Injury Crashes	0	3	100.0 %
Total Injury Crashes	3	4	33.3 %

The naive before and after analysis at the treatment location resulted in an 18 percent increase in Total Crashes, no change in Target Crashes, and a 9 percent increase in the Total Severity Index. The before period ADT year was 2000 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 an 18 percent increase in Total Crashes and the same number of Target Crashes. The summary results above demonstrate that both Total and Target Crashes appear to have remained consistent at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the before period was experiencing a pattern of eight (8) angle collisions resulting from SR 2022 motorists failing to yield the right-of-way to NC 150 vehicles. These crashes were not the result of people running the dual posted stop signs. After the signal installation, five (5) vehicles ran the red indication stoplight resulting in angle type collisions. There was also an increase in left turn-same roadway crashes at this location from one (1) to four (4) through the analysis.

An overall increase in the total number of collisions and the same target crash pattern during both time periods has led to a negative benefit-cost ratio as seen below. Also, rear-end collisions at this location increased slightly from one (1) in the before period to two (2) during the after period.

The calculated benefit to cost ratio for this project is **(-0.27) considering total crashes**. The benefit to cost ratio **considering only target crashes is 0.00**. 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 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



Traveling Northeast on NC 150 (Oak Ridge Rd)



Traveling Southwest on NC 150 – Traveling from NC 68



Traveling Northwest on SR 2022 (Linville Road)
Elementary School located to the left



Traveling Southeast on SR 2022 approaching intersection

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: NC 150 at SR 2022		BY: JBS						
COUNTY: Guilford		DATE: 2/17/2010						
FILE NO.: SS 07-01-224		NOTES: Total Crashes						
DETAILED COST:	TYPE IMPROVEMENT - New Traffic Signal							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$75,000	10	0.149	\$11,177				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$75,000	10	0.149	\$11,177				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,000				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
TOTAL ANNUAL COST=				\$14,077				
TOTAL COST OF PROJECT=				\$75,000				
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	5.83	0	0.00	3	0.51	8	1.37	\$14,614
AFTER	5.83	0	0.00	4	0.69	9	1.54	\$18,370
Annual Benefits from Crash Cost Savings								(\$3,756)
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	(\$17,834)	
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	-0.27	
TOTAL COST OF PROJECT		-	\$75,000	COMPREHENSIVE B/C RATIO		-	-0.27	

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: NC 150 at SR 2022		BY: JBS						
COUNTY: Guilford		DATE: 2/17/2010						
FILE NO.: SS 07-01-224		NOTES: Target Crashes - Frontal Impact						
DETAILED COST:	TYPE IMPROVEMENT - New Traffic Signal							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$75,000	10	0.149	\$11,177				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$75,000	10	0.149	\$11,177				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,000				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
TOTAL ANNUAL COST=				\$14,077				
TOTAL COST OF PROJECT=				\$75,000				
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	5.83	0	0.00	3	0.51	6	1.03	\$13,276
AFTER	5.83	0	0.00	3	0.51	6	1.03	\$13,276
Annual Benefits from Crash Cost Savings								\$0
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	(\$14,077)	
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	0.00	
TOTAL COST OF PROJECT		-	\$75,000	COMPREHENSIVE B/C RATIO		-	0.00	



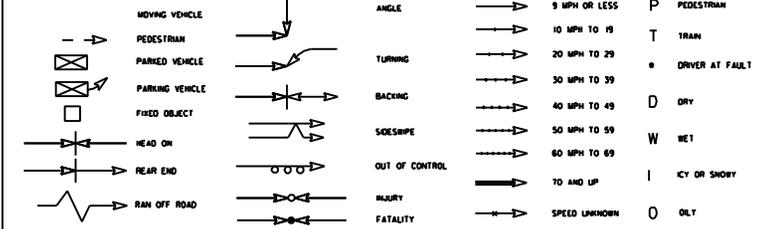
NC 150
Oak Ridge Rd
35 MPH



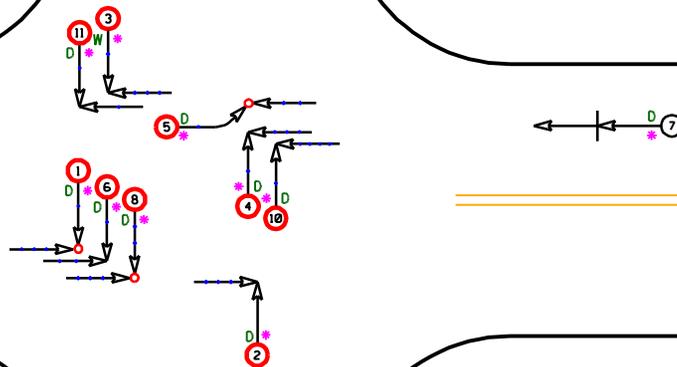
Elementary
School

SR 2022
Linville Rd
35 MPH

LEGEND



SS# 07-01-224
Guilford County
BEFORE Period
2/1/98 - 11/30/03



Frontal Impact
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 7	AREA:
	STUDY PERIOD: 2/1/1998 - 11/30/2003	
	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: 2-11-2004		
LOG NUMBER: SS* 07-01-224 BEFORE		

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



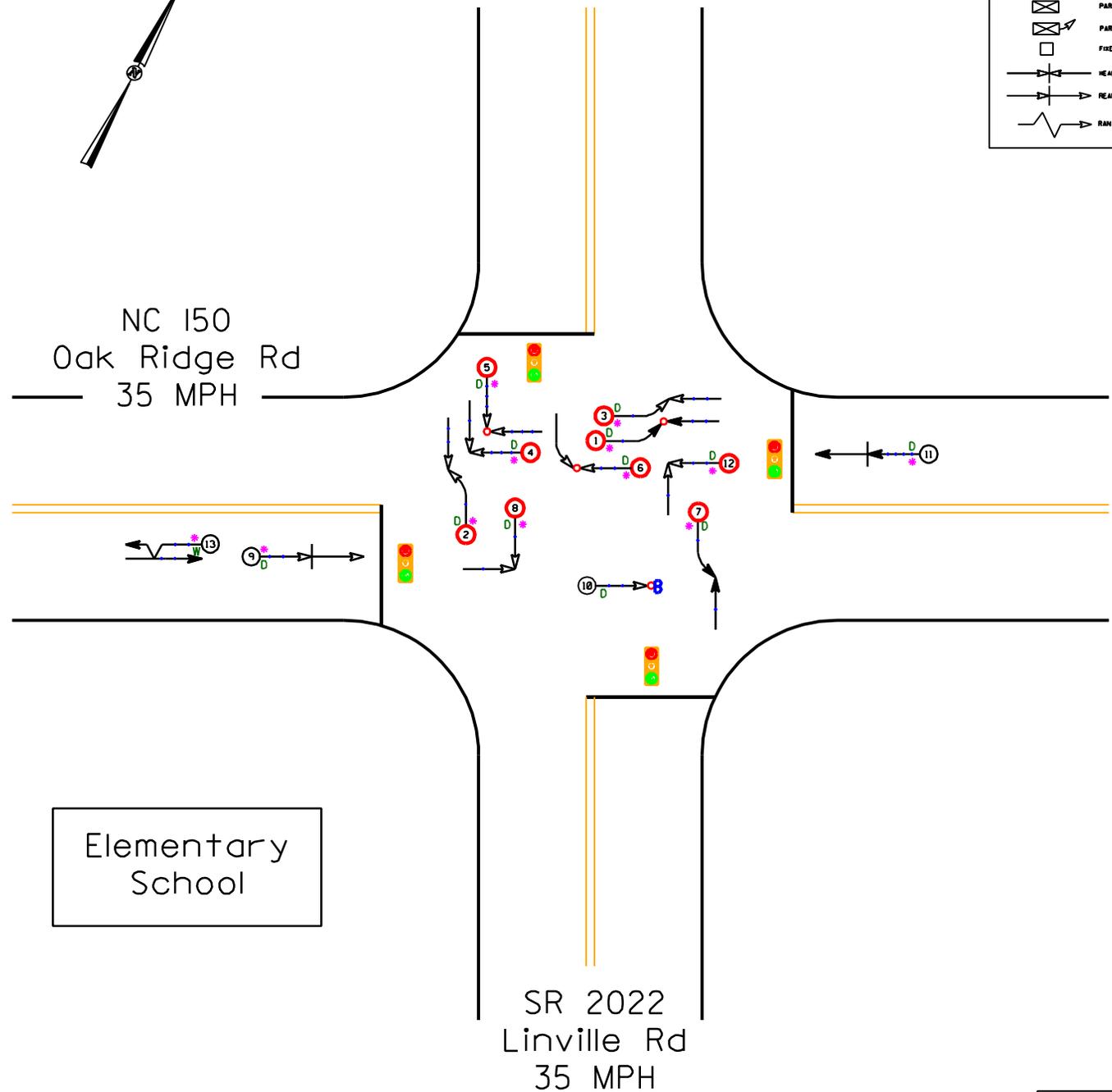
LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAM
	PARKED 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		HURRY		50 MPH TO 59		ICY OR SNOW
	REAR END		FATALITY		60 MPH TO 69		TO AND UP
	RAN OFF ROAD		SPEED UNKNOWN		70 AND UP		ONLY

SS# 07-01-224
 Guilford County
 AFTER Period
 2/1/04 - 11/30/09

NC 150
 Oak Ridge Rd
 35 MPH

R
Y
G
 New Signalized
 Intersection
 Sig ID 07-1479



Elementary
 School

SR 2022
 Linville Rd
 35 MPH

Frontal Impact
 Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 7	AREA:
	STUDY PERIOD: 2/1/2004 - 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: 2-11-2010		
LOG NUMBER: SS* 07-01-224 AFTER		

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