

Spot Safety Project Evaluation

Order # 41000013010

Spot Safety Project # 07-01-219

Spot Safety Project Evaluation of the Left Turn Lane Installation NC 150 and SR 2347 (Lake Brandt 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

8-1-2011

Date

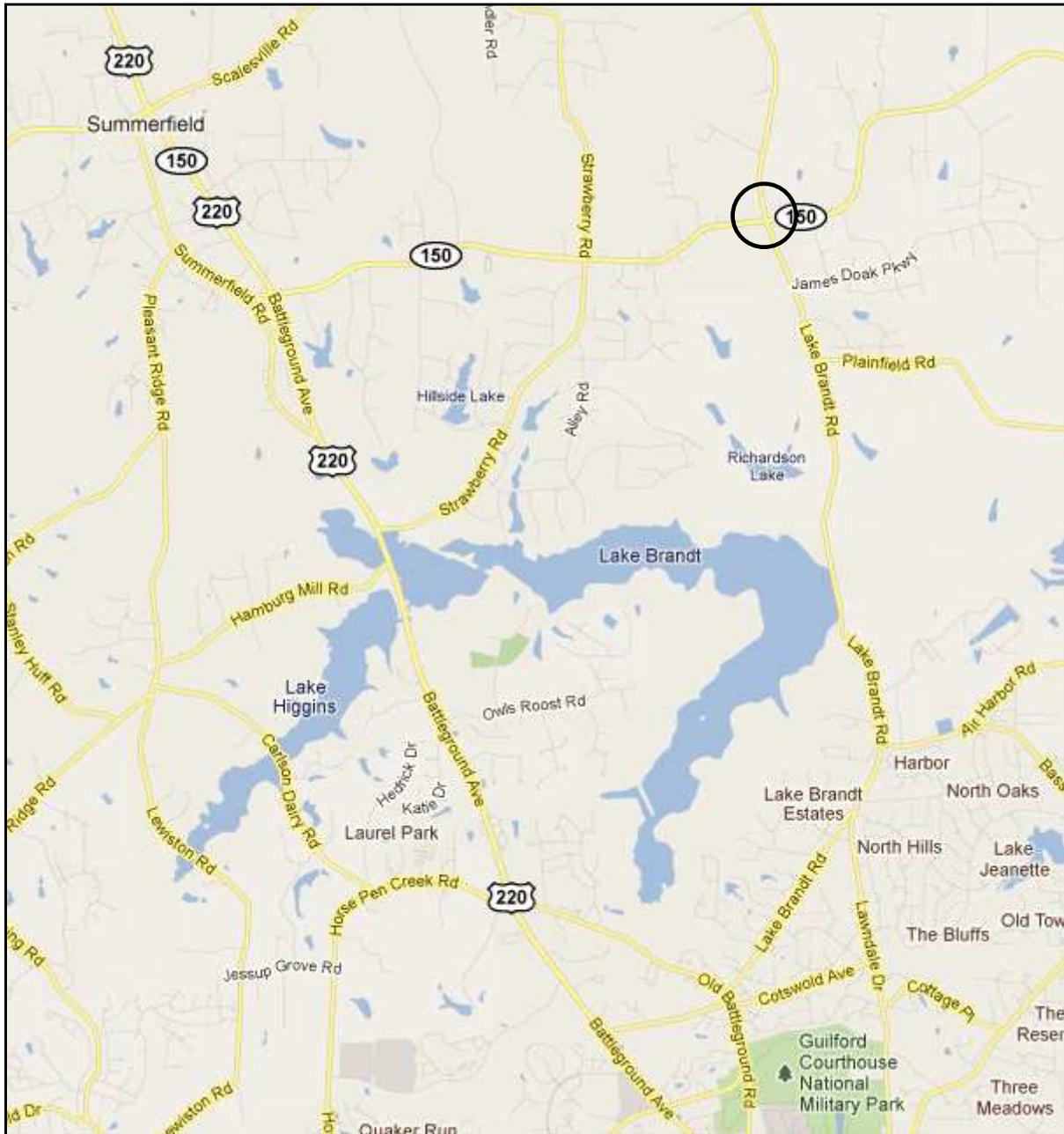
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 07-01-219 located at the Intersection of NC 150 and SR 2347 (Lake Brandt Road) in Guilford County, north the City of Greensboro.

The Sig ID is 07-1460 for this existing traffic signal.





Aerial Photo provided from Google Maps

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation left turn lanes on all four approaches to the subject intersection. The initial project just funded turn lanes for SR 2347 but the Division added \$100,000 of Small Urban Funds to get all four turn lanes installed. NC 150 and SR 2347 (Lake Brandt Road) are both two-lane facilities at the subject intersection with speed limits of 50 mph on all approaches at the intersection. The subject location is a four-leg crossroads intersection, which is controlled by an existing all permissive traffic signal.

The original statement of problem concluded that the single lane approaches to the intersection were resulting in rear-end and left turn-same roadway crashes as traffic queued waiting to make the left turn movement. The intended purpose of the new left turn lanes were to alleviate the accident potential of rear-end and left turn collisions.

The initial crash analysis was completed from April 1, 1998 to March 31, 2001 with seventeen (17) reported crashes, seven (7) of which were deemed correctable left turn same road crashes. The final completion date for the improvement by crash reports appeared to be during the first quarter of 2007 with a total cost of \$250,000 in Spot Safety Funding.

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 November 2006 through March 2007. The before period consisted of reported crashes from October 1, 2002 through October 31, 2006 (4 years and 1 month); and the after period consisted of reported crashes from April 1, 2007 through April 30, 2011 (4 years and 1 month). 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 Turn Lane Crashes were the target crashes for the applied countermeasure. The Turn Lane Crash types considered are as follows: Left turn, same roadway and Rear-End (approaching the intersection).

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	22	12	- 45.5 %
Total Severity Index	4.03	8.55	112.2 %
Target Crashes	16	6	- 62.5 %
Target Crash Severity Index	3.78	3.47	- 8.2 %
Volume (2004, 2009)	13,300	14,300	7.5 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	1	100.0 %
Class B injury Crashes	4	0	- 100.0 %
Class C Injury Crashes	5	2	- 60.0 %
Total Injury Crashes	9	3	- 66.7 %

The naive before and after analysis at the treatment location resulted in a 46 percent decrease in Total Crashes, an 63 percent decrease in Target Crashes, but a 112 percent increase in the Total Severity Index. The before period ADT year was 2004 and the after period ADT year was 2009.

Results and Discussion

Referencing the *Collision Diagrams*, the before period presented a strong pattern of ten (10) left turn same roadway crashes in the intersection. Of these ten crashes, nine (9) occurred in the northbound SR 2347 direction as a vehicle chose an insufficient gap to complete the left turn safely.

With the installation of the left turn lanes, the northbound left turn same roadway crash pattern was reduced to just one (1) collision. Also, rear-end collisions approaching the intersection reduced from six (6) to four (4) through the evaluation time periods.

The calculated benefit to cost ratio for this project is **(-2.98) considering total crashes**. The benefit to cost ratio **considering only target crashes is 0.67**. 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.

From the previous paragraph, the total b-c ratio experienced a negative benefit which resulted from an after period A-injury collision. The severe injury crash was an angle collision (crash #4 on the diagram) where an eastbound NC 150 vehicle ran the red light and was travelling at full speed at impact.

Please see the attached *Treatment Site Photos*. Photos are provided from our field visit on July 21st, 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 Photographs



Travelling East on NC 150 approaching intersection



Travelling West on NC 150 approaching intersection



Travelling North on SR 2347 (Lake Brandt Road)



Travelling North on SR 2347 (Lake Brandt Road) at intersection – sight distance



Travelling South on SR 2347 (Lake Brandt Road)

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: NC 150 at SR 2347		BY: JBS						
COUNTY: Guilford		DATE: 7/28/2011						
FILE NO.: SS 07-01-219								
DETAILED COST: TYPE IMPROVEMENT - Left Turn Lanes								
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$250,000	10	0.149	\$37,257				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$250,000	10	0.149	\$37,257				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$1,600				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0				
TOTAL ANNUAL COST=				\$38,857				
TOTAL COST OF PROJECT=				\$250,000				
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	4.08	0	0.00	9	2.21	13	3.19	\$57,819
AFTER	4.08	1	0.25	2	0.49	9	2.21	\$173,701
Annual Benefits from Crash Cost Savings								(\$115,882)
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						= (\$154,740)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						= -2.98		
TOTAL COST OF PROJECT		-	\$250,000	COMPREHENSIVE B/C RATIO		-	-2.98	

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: NC 150 at SR 2347		BY: JBS						
COUNTY: Guilford		DATE: 7/28/2011						
FILE NO.: SS 07-01-219		Left Turn Crashes - LTSR & Rear-End						
DETAILED COST: TYPE IMPROVEMENT - Left Turn Lanes								
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$250,000	10	0.149	\$37,257				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$250,000	10	0.149	\$37,257				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$1,600				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0				
TOTAL ANNUAL COST=				\$38,857				
TOTAL COST OF PROJECT=				\$250,000				
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	4.08	0	0.00	6	1.47	10	2.45	\$39,951
AFTER	4.08	0	0.00	2	0.49	4	0.98	\$14,020
Annual Benefits from Crash Cost Savings								\$25,931
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						= (\$12,926)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						= 0.67		
TOTAL COST OF PROJECT		-	\$250,000	COMPREHENSIVE B/C RATIO		-	0.67	

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PAKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	FIXED OBJECT		SIDESWIPE		40 MPH TO 49		DRY
	HEAD ON		OUT OF CONTROL		50 MPH TO 59		WET
	REAR END		RAN OFF ROAD		60 MPH TO 69		ICE OR SNOWY
	RAN OFF ROAD		HURRY		TO AND UP		SPEED UNKNOWN
			FATALITY		ONLY		

SS# 07-01-219
 Order# 41000013010
 Guilford County
 AFTER Period
 4/1/07 - 4/30/11

Existing Signalized
 Intersection
 Sig ID 07-1460



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

TRAFFIC SAFETY UNIT

Date: 7-20-2011 Prepared By: J. Schronce

Turn Lanes Target Crashes

