

Spot Safety Project Evaluation

Order # 41000010150

Spot Safety Project # 05-97-209

Spot Safety Project Evaluation of the Revised Signal Phasing and Turn Lane Installation At the Intersection of SR 1829 (Strickland Road) and SR 1826 (Ray Road) Raleigh, Wake County

Documents Prepared By:

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

Principal Investigator



Chad J. Neilson

12/15/2010
Date

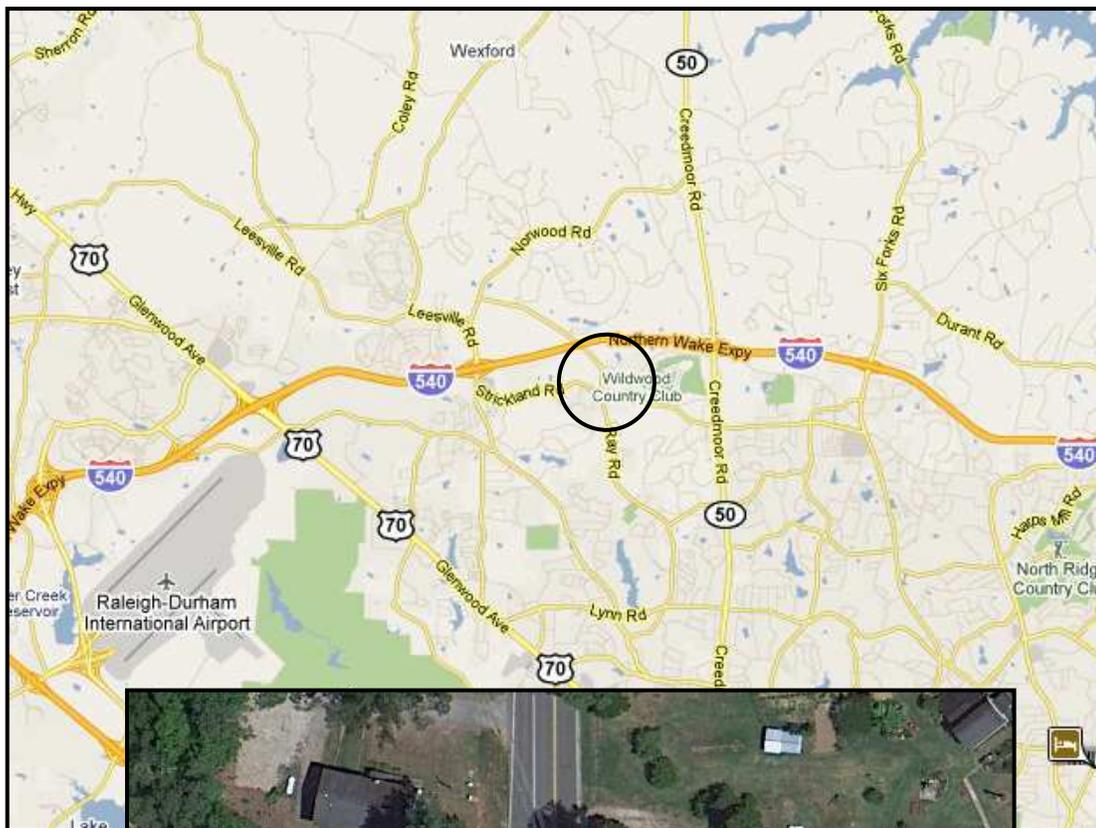
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 05-97-209 located at the intersection of SR 1829 (Strickland Road) and SR 1826 (Ray Road) in Raleigh, Wake County.

The signal ID for the existing signal is 05-1106.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the revision of the signal phasing and the installation of a left turn lane for both the northbound and southbound approaches on SR 1826 (Ray Road). The phasing was upgraded to include a protected-permitted phase for southbound motorists along SR 1826 (Ray Road) as well as westbound motorists along SR 1829 (Strickland Road). SR 1829 (Strickland Road) is a two-lane facility at the subject intersection with speed limit of 45 mph for both approaches. SR 1826 (Ray Road) is a two-lane facility with a speed limit of 45 mph for both approaches. The subject location is a signalized four-leg intersection with existing left turn lanes for both approaches along SR 1829 (Strickland Road).

The original statement of problem was the traffic volumes at the intersection have reached the point where they are not allowing sufficient gaps for left turning traffic to safely maneuver on a permitted phase.

The initial crash analysis was completed from April 1, 1996 to March 31, 1999 with twenty-one (21) reported crashes, of which eight (8) were deemed correctable. The final completion date for the improvement at the subject intersection was on July 7, 2006 with a total cost of \$145,000.00.

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 were the months of June 2006 through August 2006. The before period consisted of reported crashes from April 1, 2002 through May 31, 2006 (4 years and 2 months); and the after period consisted of reported crashes from September 1, 2006 through October 31, 2010 (4 years and 2 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. Rear-end crashes along the northbound and southbound approaches will be considered as target crashes.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	15	15	0.00 %
Total Crash Severity Index	3.47	4.95	- 42.65 %
Target Crashes	13	10	- 23.08 %
Target Crash Severity Index	3.85	4.70	22.08 %
Volume (2004, 2008)	14,800	14,700	- 0.68 %

<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	3	0.00 %
Class C Injury Crashes	2	5	150.00 %
Total Injury Crashes	5	8	60.00 %

The naive before and after analysis at the treatment location resulted in a zero (0) percent change in Total Crashes, thirty (30) percent decrease of Target Crashes, and a forty-two (42) percent decrease in the Total Severity Index. The before period ADT year was 2004 and the after period ADT year was 2008.

Results and Discussion

Referencing the *Collision Diagrams*, the before period presented thirteen (13) target crashes. There was a southbound left turn, same roadway crash pattern at the intersection that accounted for three (3) target crashes. After the revision to the signal phasing and the installation of the left-turn lanes, there were ten (10) target crashes. The southbound left turn, same roadway crash pattern increased in the after period to seven (7) target crashes.

The calculated benefit to cost ratio for this project is **(-0.47) considering total crashes**. The benefit to cost ratio **considering only target crashes is 0.13**. 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 provided for this location by Google Street View for all four approaches of this 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



Looking North on SR 1826 (Ray Rd)



Looking West on SR 1826 (Strickland Rd)



Looking South on SR 1826 (Ray Rd)



Looking East on SR 1829 (Strickland Rd)

BENEFIT-COST ANALYSIS WORKSHEET - TOTAL

LOCATION: SR 1829 (Strickland Road) at SR 1826 (Ray Road)		BY: C Neilson						
COUNTY: Wake		DATE: 12/9/2010						
FILE NO.: SS 05-97-209								
DETAILED COST:	TYPE IMPROVEMENT -	Signal Phasing Update with new turns lanes						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$145,000	10	0.149	\$21,609			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$145,000	10	0.149	\$21,609			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,400			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$150			
	TOTAL ANNUAL COST=				\$24,159			
	TOTAL COST OF PROJECT=				\$145,000			
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	4.17	0	0.00	5	1.20	10	2.40	\$34,293
AFTER	4.17	0	0.00	8	1.92	7	1.68	\$45,588
							Annual Benefits from Crash Cost Savings	(\$11,295)
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST							(\$35,454)
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST							-0.47
	TOTAL COST OF PROJECT -	\$145,000		COMPREHENSIVE B/C RATIO -				-0.47

BENEFIT-COST ANALYSIS WORKSHEET - TARGET

LOCATION: SR 1829 (Strickland Road) at SR 1826 (Ray Road)		BY: C Neilson						
COUNTY: Wake		DATE: 12/9/2010						
FILE NO.: SS 05-97-209								
DETAILED COST:	TYPE IMPROVEMENT -	Signal Phasing Update with new turns lanes						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$145,000	10	0.149	\$21,609			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$145,000	10	0.149	\$21,609			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,400			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$150			
	TOTAL ANNUAL COST=				\$24,159			
	TOTAL COST OF PROJECT=				\$145,000			
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	4.17	0	0.00	5	1.20	8	1.92	\$32,230
AFTER	4.17	0	0.00	5	1.20	5	1.20	\$29,137
							Annual Benefits from Crash Cost Savings	\$3,094
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST							(\$21,066)
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST							0.13
	TOTAL COST OF PROJECT -	\$145,000		COMPREHENSIVE B/C RATIO -				0.13



AADT (YEAR)
4300 (2004)

45 MPH

SR 1826 (RAY ROAD)

45 MPH

AADT (YEAR)
9300 (2004)



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SR 1829 (STRICKLAND ROAD)

SR 1829 (STRICKLAND ROAD)

AADT (YEAR)
9300 (2004)



45 MPH

SR 1826 (RAY ROAD)

AADT (YEAR)
6700 (2004)

45 MPH

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PARKED 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		INJURY		50 MPH TO 59		I ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		TO AND LIP
	RAN OFF ROAD		SPEED UNKNOWN		70 MPH TO 79		O ONLY

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