

Spot Safety Project Evaluation

Order # 41000010204

Spot Safety Project # 12-02-211

**Spot Safety Project Evaluation of the Signal Phase Change
NC 18 (Fallston Road / E. Grover Street) at SR 1950 (Wyke Road)
Cleveland County, City of Shelby**

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

12-30-2010

Date

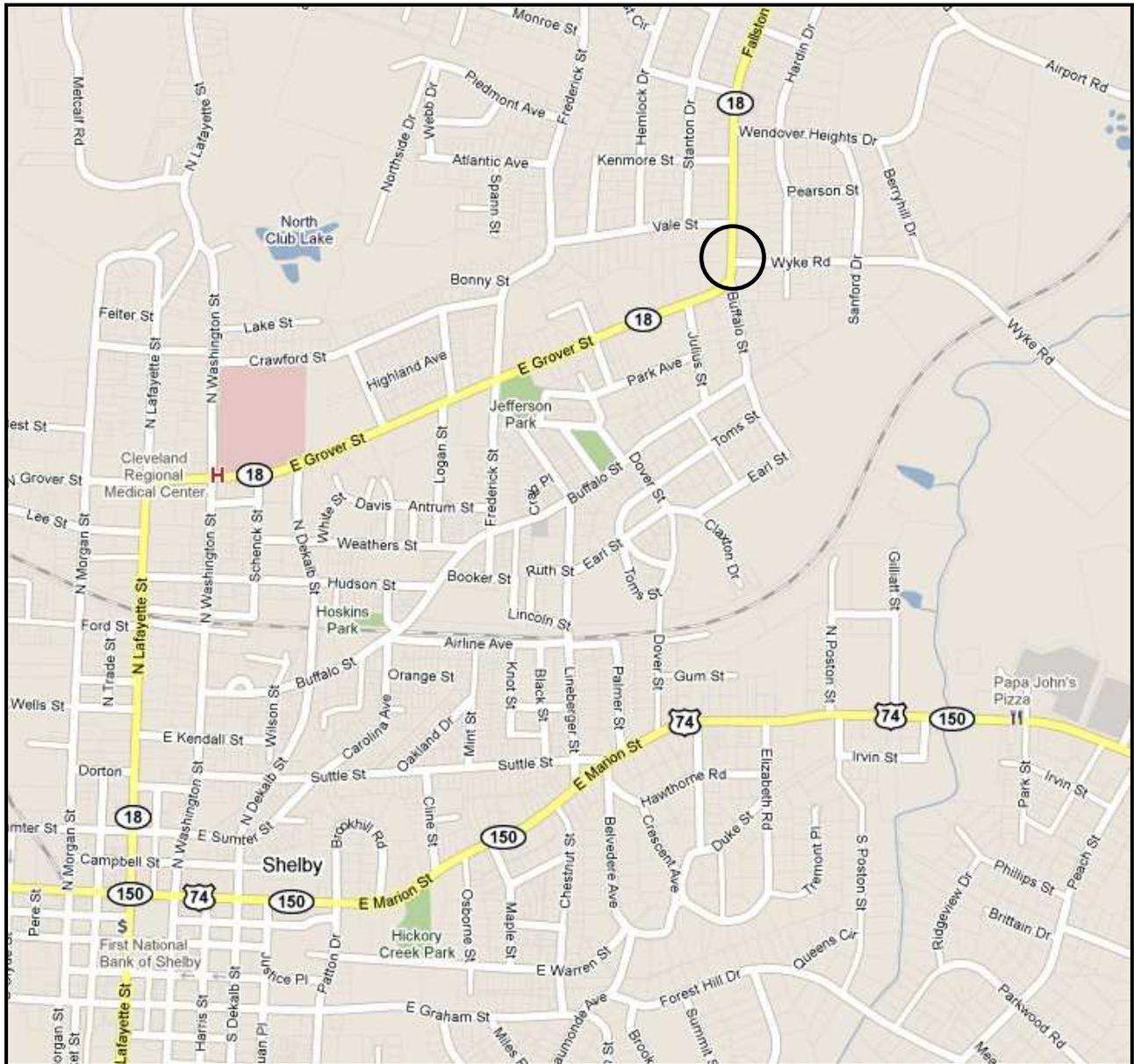
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 12-02-211 located at the Intersection of NC 18 (Fallston Road / East Grover Street) and SR 1950 (Wyke Road) in Cleveland County, City of Shelby.

The Sig ID is 12-0993 for this modified traffic signal.





Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the addition of a southbound NC 18 left turn protected-permitted phase. The signal was also upgraded with a new controller, cabinet, and LED signal heads. NC 18 is a four-lane roadway with a 40 mph speed limit and a sharp horizontal curve northbound leading into the intersection. SR 1950 (Wyke Rd) is a two-lane facility at the subject intersection with a speed limit of 35 mph. The subject location is a three-leg intersection, which is controlled by an existing 2-phase traffic signal.

The original statement of problem was the presence of excessive delay on the southbound approach of the intersection. The highest left turn cross product experienced was 98,568. The intended purpose of the improvement was to reduce delay and improve safety of the southbound approach.

The initial crash analysis was completed from December 1, 1998 to November 30, 2001 with eleven (11) reported crashes, two (2) of which were deemed correctable left turn collisions. The final completion date for the improvement at the subject intersection was on November 9, 2006 with a total cost of \$33,000.

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 October through November 2006. The before period consisted of reported crashes from November 1, 2002 through September 30, 2006 (3 years and 11 months); and the after period consisted of reported crashes from December 1, 2006 through October 31, 2010 (3 years and 11 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 Southbound NC 18 Left Turn Related Crashes were the target crashes for the applied countermeasure. The Left Turn Crash types considered are as follows: Left turn, same roadway; Rear-end, Turn (in southbound inner lane); and Sideswipe (southbound direction).

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	23	22	- 4.3 %
Total Severity Index	3.57	4.03	12.9 %
Target Crashes	6	4	- 33. 3%
Target Crash Severity Index	4.70	4.70	0.0 %
Volume (2004, 2008)	19,900	19,600	- 1.5 %

<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	1	1	0.0 %
Class C Injury Crashes	7	8	14.3 %
Total Injury Crashes	8	9	12.5 %

The naive before and after analysis at the treatment location resulted in a 4 percent decrease in Total Crashes, a 33 percent decrease in Target Crashes, but a 13 percent increase 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 six (6) related southbound left turn collisions. These crashes included two (2) left turn same roadway (in the intersection), two (2) rear-end turn (waiting to turn left), and two (2) sideswipes (southbound vehicles merging out of the queue). These crashes were reduced to four (4) in the after period with the additional signal phase. The after period crashes included three (3) left turn same roadway (turn on permissive green) and one (1) merging sideswipe.

Outside of the southbound left turn improvement, the intersection experienced approximately the same number of total crashes with a slight increase in the total severity index. There does not appear to be any particular crash patterns of interest. There were three (3) gas station related crashes with the NC 18 entrance closest to the intersection in the after period; which increased from zero (0) in the before period.

The calculated benefit to cost ratio for this project is **(-0.55) considering total crashes**. The benefit to cost ratio **considering only target crashes is 1.18**. 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 both approaches of NC 18 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 South on NC 18 (Fallston Road): New SB Left Turn Phase



Looking North on NC 18 (E. Grover Street)

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: NC 18 at SR 1950		BY: JBS						
COUNTY: Cleveland		DATE: 12/28/2010						
FILE NO.: SS 12-02-211								
DETAILED COST:	TYPE IMPROVEMENT - SB Left Turn Protected-Permitted Phase							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$33,000	10	0.149	\$4,918			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$33,000	10	0.149	\$4,918			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$150			
	TOTAL ANNUAL COST=				\$5,268			
	TOTAL COST OF PROJECT=				\$33,000			
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	3.92	0	0.00	8	2.04	15	3.83	\$57,270
AFTER	3.92	0	0.00	9	2.30	13	3.32	\$60,179
						Annual Benefits from Crash Cost Savings		(\$2,908)
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$8,176)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	-0.55		
TOTAL COST OF PROJECT		-	\$33,000	COMPREHENSIVE B/C RATIO		-	-0.55	

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: NC 18 at SR 1950		BY: JBS						
COUNTY: Cleveland		DATE: 12/28/2010						
FILE NO.: SS 12-02-211								
DETAILED COST:	TYPE IMPROVEMENT - SB Left Turn Protected-Permitted Phase							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$33,000	10	0.149	\$4,918			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$33,000	10	0.149	\$4,918			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$150			
	TOTAL ANNUAL COST=				\$5,268			
	TOTAL COST OF PROJECT=				\$33,000			
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	3.92	0	0.00	3	0.77	3	0.77	\$18,597
AFTER	3.92	0	0.00	2	0.51	2	0.51	\$12,398
						Annual Benefits from Crash Cost Savings		\$6,199
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$931		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	1.18		
TOTAL COST OF PROJECT		-	\$33,000	COMPREHENSIVE B/C RATIO		-	1.18	

NC 18
Fallston Rd
40 MPH

ADT (Year)
12,000 (2004)

SR 1950
Wyke Road
35 MPH

ADT (Year)
8,800 (2004)

ADT (Year)
17,000 (2004)

NC 18
E. Grover St.
40 MPH

LEGEND

	MOVING VEHICLE		ANGLE		5 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		30 MPH TO 25		TRAIN
	PARADED VEHICLE		BACKING		30 MPH TO 20		OTHER AT FAULT
	PAKING VEHICLE		SIDESWIPE		40 MPH TO 40		DRY
	FIXED OBJECT		OUT OF CONTROL		50 MPH TO 50		WET
	HEAD ON		REAR END		60 MPH TO 60		TO AND UP
	NEAR END		RUN OFF ROAD		SPEED INCREASE		CITY OR STREET
	RUN OFF ROAD		REAR END		SPEED INCREASE		ONLY
	RUN OFF ROAD		REAR END		SPEED INCREASE		ONLY
	RUN OFF ROAD		REAR END		SPEED INCREASE		ONLY

SS# 12-02-211
Order# 41000010204
Cleveland County
BEFORE Period
11/1/02 - 9/30/06
City of Shelby

Existing
Traffic Signal
Sig ID: 12-0993

Restaurant

Gas Station

SB Left Turn
Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 12-20-2010 Prepared By: J. Schronce

NC 18
Fallston Rd
40 MPH

ADT (Year)
12,000 (2008)

SR 1950
Wyke Road
35 MPH

ADT (Year)
9,200 (2008)

ADT (Year)
16,000 (2008)

NC 18
E. Grover St.
40 MPH

Restaurant

Gas Station

LEGEND

	MOVING VEHICLE		ANGLE		5 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		30 MPH TO 25		TRAIN
	PAKED VEHICLE		BACKING		30 MPH TO 35		OTHER AT FAULT
	PAKED VEHICLE		SHOULDER		40 MPH TO 45		DRY
	FIXED OBJECT		OUT OF CONTROL		50 MPH TO 55		WET
	HEAD ON		REAR END		60 MPH TO 65		TO AND UP
	REAR END		REAR END		REAR END		SPEED EXCEEDED
	RUN OFF ROAD		REAR END		REAR END		REAR END
			REAR END		REAR END		REAR END
			REAR END		REAR END		REAR END

SS# 12-02-211
Order# 41000010204
Cleveland County
AFTER Period
12/1/06 - 10/31/10
City of Shelby



Modified
Traffic Signal
Sig ID: 12-0993

Southbound NC 18
Thru-Left Lane Changed
to Protected-Permitted

SB Left Turn
Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 12-21-2010 Prepared By: J. Schronce