

Spot Safety Project Evaluation

Order # 41000009675

Spot Safety Project # 09-03-209

**Spot Safety Project Evaluation of the Turn Lane Additions
SR 1003 (High Point Road) at SR 2643 (Union Cross Road)
Forsyth 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

12-20-2010

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 09-03-209 located at the Intersection of SR 1003 (High Point Road) and SR 2643 (Union Cross Road) in Forsyth County, near the City of Kernersville.

The Sig ID is 09-0190 for this existing and updated traffic signal.





Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location were the installation of multiple turn lanes through roadway widening. The improvements include: a southbound SR 2643 (Union Cross Rd) left turn lane, an eastbound SR 1003 left turn lane, westbound SR 1003 (High Point Rd) left and right turn lanes, and protected-permitted left turn phases for southbound and westbound vehicles. The northbound approach of SR 2643 was also repainted to include a dedicated left turn lane.

The before period SR 1003 presented a two-lane roadway with a speed limit of 55 mph. The before period SR 2643 had a southbound approach consisting of a two-lane roadway with a four-lane northbound approach and a speed limit of 45 mph. The subject location is a four-leg crossroads intersection, which is controlled by an existing traffic signal under all permissive phasing.

The original statement of problem stated that motorists were experiencing extreme congestion and delay through this intersection. The congestion appeared to be developing from heavy turning movements from southbound SR 2643 and westbound SR 1003. The existing level of service was calculated at “F” with a simulated improvement to level of service “C” with turn lane additions.

The initial crash analysis was completed from March 1, 2000 to February 28, 2003 with eleven (11) reported crashes, five (5) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on October 2, 2006 with a total cost of \$250,000.

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 July through October 2006. The before period consisted of reported crashes from August 1, 2002 through June 30, 2006 (3 years and 11 months); and the after period consisted of reported crashes from November 1, 2006 through September 30, 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 a target crash type was not selected since the applied countermeasure was installed to enhance intersection mobility.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	10	15	50.0 %
Total Severity Index	3.22	2.97	- 7.8 %
Volume (2004, 2008)	16,900	15,900	- 5.9 %

<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	2	100.0 %
Class C Injury Crashes	3	2	- 33.3 %
Total Injury Crashes	3	4	33.3 %

The naive before and after analysis at the treatment location resulted in a 50 percent increase in Total Crashes but an 8 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 a crash pattern of ten (10) total collisions with four (4) frontal impact crashes in the intersection. Of these frontal impact crashes three (3) were angles from red light run vehicles and one (1) left turn on permissive green phase.

After the turn lane additions and signal modifications, there were fifteen (15) total collisions and seven (7) frontal impact crashes. Of the after period frontal impact collisions, five (5) were red light run angles and two (2) left turn on permissive green phases.

Crashes did increase by 50 percent at this location even with a 6 percent reduction in the total ADT. At this time, the Safety Evaluation Group does not have methods by which to evaluate the congestion and delay benefits that this intersection possibly received from the improvements.

The calculated benefit to cost ratio for this project is **(-0.24) considering total crashes**. 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



Looking East on SR 1003 (High Point Road)



Traveling West on SR 1003 (High Point Road)



Traveling South on SR 2463 (Union Cross Road)



Traveling North on SR 2643 (Union Cross Rd)

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: SR 1003 at SR 2643
 COUNTY: Forsyth
 FILE NO.: SS 09-03-209

BY: JBS
 DATE: 12/13/2010

DETAILED COST: TYPE IMPROVEMENT - Left Turn Lanes on 3 Approaches

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 = \$1,200
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$300
 TOTAL ANNUAL COST= \$38,757
 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	3.92	0	0.00	3	0.77	7	1.79	\$22,985
AFTER	3.92	0	0.00	4	1.02	11	2.81	\$32,474

Annual Benefits from Crash Cost Savings (\$9,490)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$48,247)

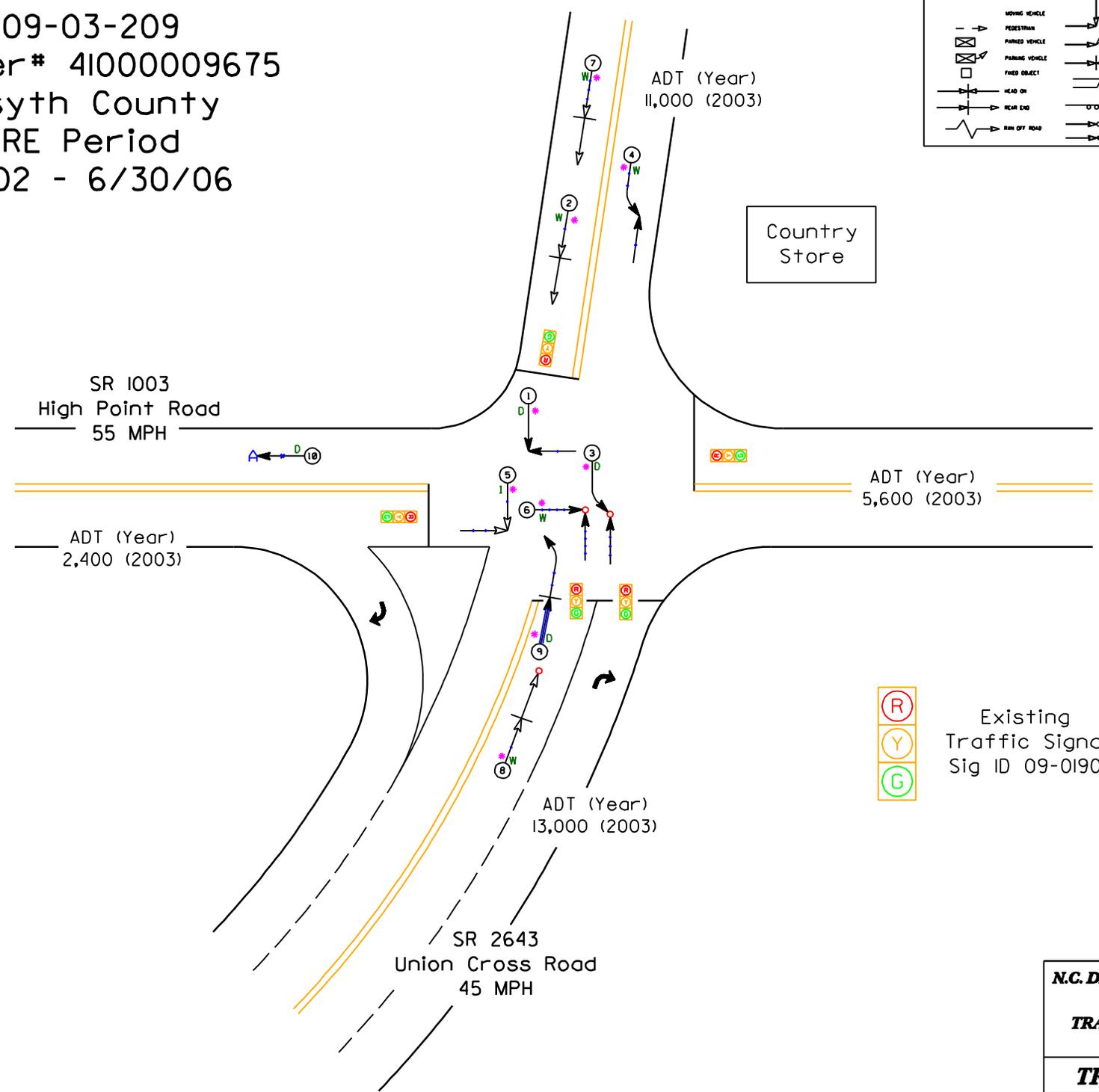
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -0.24

TOTAL COST OF PROJECT - \$250,000 COMPREHENSIVE B/C RATIO - -0.24

SS# 09-03-209
 Order# 41000009675
 Forsyth County
 BEFORE Period
 8/1/02 - 6/30/06

LEGEND

	MOVING VEHICLE		ANGLE		5 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		30 MPH TO 75		TRAIN
	PAKED VEHICLE		BACKING		30 MPH TO 35		OTHER AT FAULT
	PAKED VEHICLE		SIDESWAY		40 MPH TO 45		D DRY
	FIXED OBJECT		OUT OF CONTROL		50 MPH TO 55		W WET
	HEAD ON		HAPPY		60 MPH TO 65		CITY OR STREET
	NEAR END		HAPPY FATALITY		TO AND UP		ONLY
	RAN OFF ROAD				SPEED ENHANCE		



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

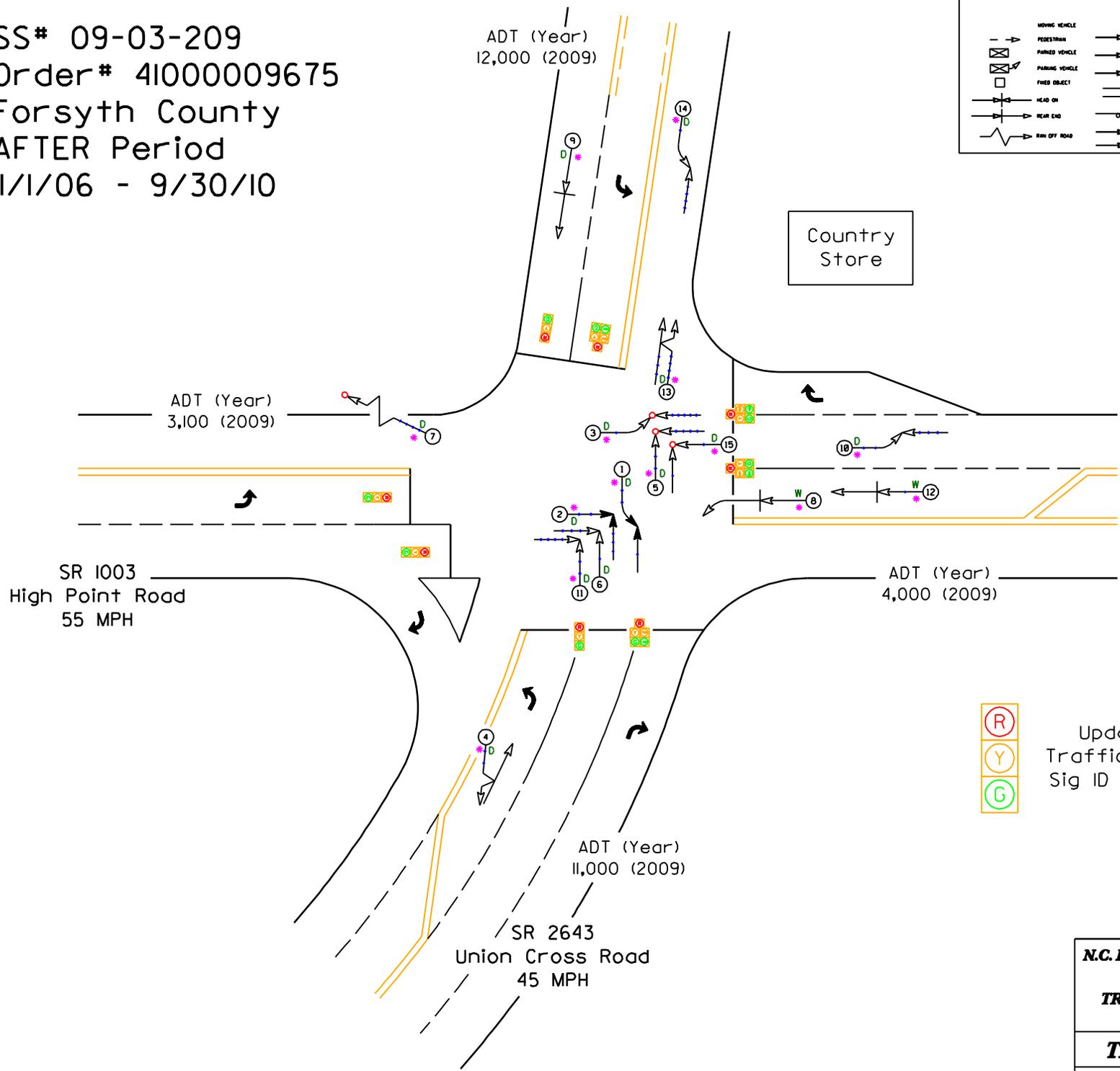
TRAFFIC SAFETY UNIT

Date: 12-7-2010 Prepared By: J. Schronce

SS# 09-03-209
 Order# 41000009675
 Forsyth County
 AFTER Period
 11/1/06 - 9/30/10

LEGEND

	MOVING VEHICLE		ANGLE		5 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		30 MPH TO 35		TRAIN
	PARKED VEHICLE		BACKING		40 MPH TO 45		OTHER AT FAULT
	PARKING VEHICLE		SHOULDER		50 MPH TO 55		DRY
	FIXED OBJECT		OUT OF CONTROL		60 MPH TO 65		WET
	HEAD ON		RAN OFF ROAD		TO AND UP		CITY OR STREET
	NEAR END		RAN OFF ROAD		SPEED UP/DOWN		ONLY
	RAN OFF ROAD		RAN OFF ROAD		RAN OFF ROAD		RAN OFF ROAD
	RAN OFF ROAD		RAN OFF ROAD		RAN OFF ROAD		RAN OFF ROAD



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

TRAFFIC SAFETY UNIT

Date: 12-9-2010 Prepared By: J. Schronce