

Spot Safety Project Evaluation

Work Order #41000009064

Spot Safety Project # 13-05-208

**Spot Safety Project Evaluation of the Traffic Signal Installation at the Intersection of
SR 3495 (Glen Bridge) and SR 3527/3553 (Bradley Branch/New Rockwood)
Buncombe County**

Documents Prepared By:

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

Principal Investigator



Brad Robinson, PE

11/03/2010

Date

Traffic Safety Project Engineer

The initial crash analysis was conducted from August 1, 2000 to July 31, 2005 with a total of 21 reported crashes. The final completion date for the improvements at the subject intersection was on October 31, 2006 with a total cost of \$86,000.00.

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 was from July 1, 2006 to November 30, 2006. The before period consisted of reported crashes from January 1, 2003 through June 30, 2006 (3 years and 6 month) and the after period consisted of reported crashes from December 1, 2006 through May 31, 2010 (3 years and 6 month). The ending date for this analysis was limited by the available crash data at the time the analysis was conducted.

The treatment data consisted of all reported crashes within 150 feet of the subject intersection. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact crash types that occurred in the intersection were the Target Crashes for the applied countermeasure. These crash types are considered as follows: Left Turn, same roadway; Left Turn, different roadway; Right Turn, same roadway; Right Turn, different roadway; Head On and Angle. The target crashes are clearly identified in the before and after period collision diagrams.

Treatment Information Intersection 1			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	20	6	-70.0
Total Severity Index	4.33	3.47	-19.9
Target Crashes			
Target Crashes	17	6	-64.7
Target Severity Index	4.48	3.47	-22.5
Volume			
Volume	4,500	4,500	0.0
Target Crash Severity Summary			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	1	0	-100.0
Class C Crashes	7	2	-71.4
PDO Crashes	9	4	-55.6

The naive before and after analysis at the treatment location resulted in a 70 percent decrease in Total Crashes, a 65 percent decrease in Target Crashes, and no change in Average Daily Traffic (ADT). The before period ADT year was 2004 and the after period ADT year was 2008.

Results and Discussion

The signal installation at the intersection appears to have been very effective in reducing Target crashes at the subject intersection. In the before period there was a large pattern of crashes (11)

between northbound SR 3527 vehicles and eastbound SR 3495 vehicles, including seven angle crashes, one left turn-different roadway crash, and three right turn-different roadway crashes. In the after period there were only three crashes of this type; two angle crashes and one left turn-different roadway.

The calculated benefit to cost ratio for this project is 3.09 considering total crashes. The benefit to cost ratio considering only target crashes is also 2.57. 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 were obtained from Google Street-view. 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 intersections of this type.

Treatment Site Photos from Google Street-View



Looking northeast on SR 3495 (Glen Bridge Rd)



Looking southwest on SR 3495 (Glen Bridge Rd)



Looking northwest on SR 3527 (Bradley Branch Rd)



Looking southeast on SR 3553 (Rockwood Rd)

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 3495 at SR 3527/3553
 COUNTY: Buncombe
 FILE NO.: SS 13-05-208

BY: bdr
 DATE: 10/21/2010

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
Right-of-Way	\$86,000	10	0.149	\$12,817
	\$0	0	0.000	\$0
TOTALS	\$86,000	10	0.149	\$12,817

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900
 TOTAL ANNUAL COST= \$15,717
 TOTAL COST OF PROJECT= \$86,000

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	3.50	0	0.00	9	2.57	11	3.14	\$64,943
AFTER	3.50	0	0.00	2	0.57	4	1.14	\$16,343

Annual Benefits from Crash Cost Savings \$48,600

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$32,883

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 3.09

TOTAL COST OF PROJECT - \$86,000 COMPREHENSIVE B/C RATIO - 3.09

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 3495 at SR 3527/3553
 COUNTY: Buncombe
 FILE NO.: SS 13-05-208 Target Crashes Only

BY: bdr
 DATE: 10/21/2010

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
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	\$86,000	10	0.149	\$12,817
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 TOTAL ANNUAL COST= \$15,717
 TOTAL COST OF PROJECT= \$86,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO		ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	CRASHES	CRASHES PER YR	
BEFORE	3.50	0	0.00	8	2.29	9	2.57	\$56,771
AFTER	3.50	0	0.00	2	0.57	4	1.14	\$16,343

Annual Benefits from Crash Cost Savings \$40,429

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$24,712

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 2.57

TOTAL COST OF PROJECT - \$86,000 COMPREHENSIVE B/C RATIO - 2.57

Buncombe County
 SR 3495 at SR 3527/3553
 BEFORE Period
 1/1/2003-6/30/2006

SR 3553
 (Rockwood Rd)
 45 mph

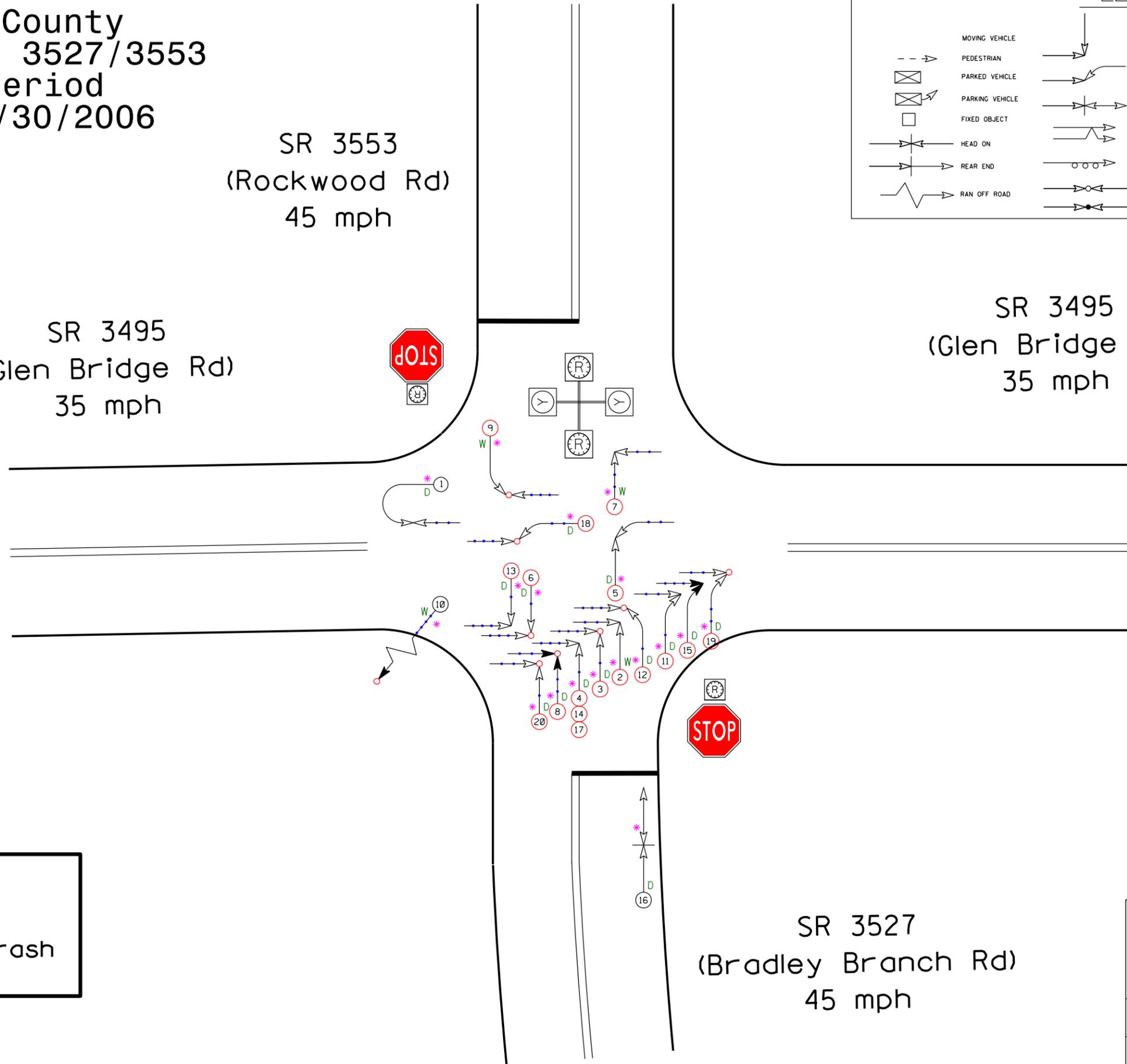
SR 3495
 (Glen Bridge Rd)
 35 mph

SR 3495
 (Glen Bridge Rd)
 35 mph

SR 3527
 (Bradley Branch Rd)
 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		O ONLY
	RAN OFF ROAD				70 AND UP		
					SPEED UNKNOWN		



Target Crash



Buncombe County
 SR 3495 at SR 3527/3553
 AFTER Period
 12/1/2006-5/31/2010

SR 3553
 (Rockwood Rd)
 45 mph

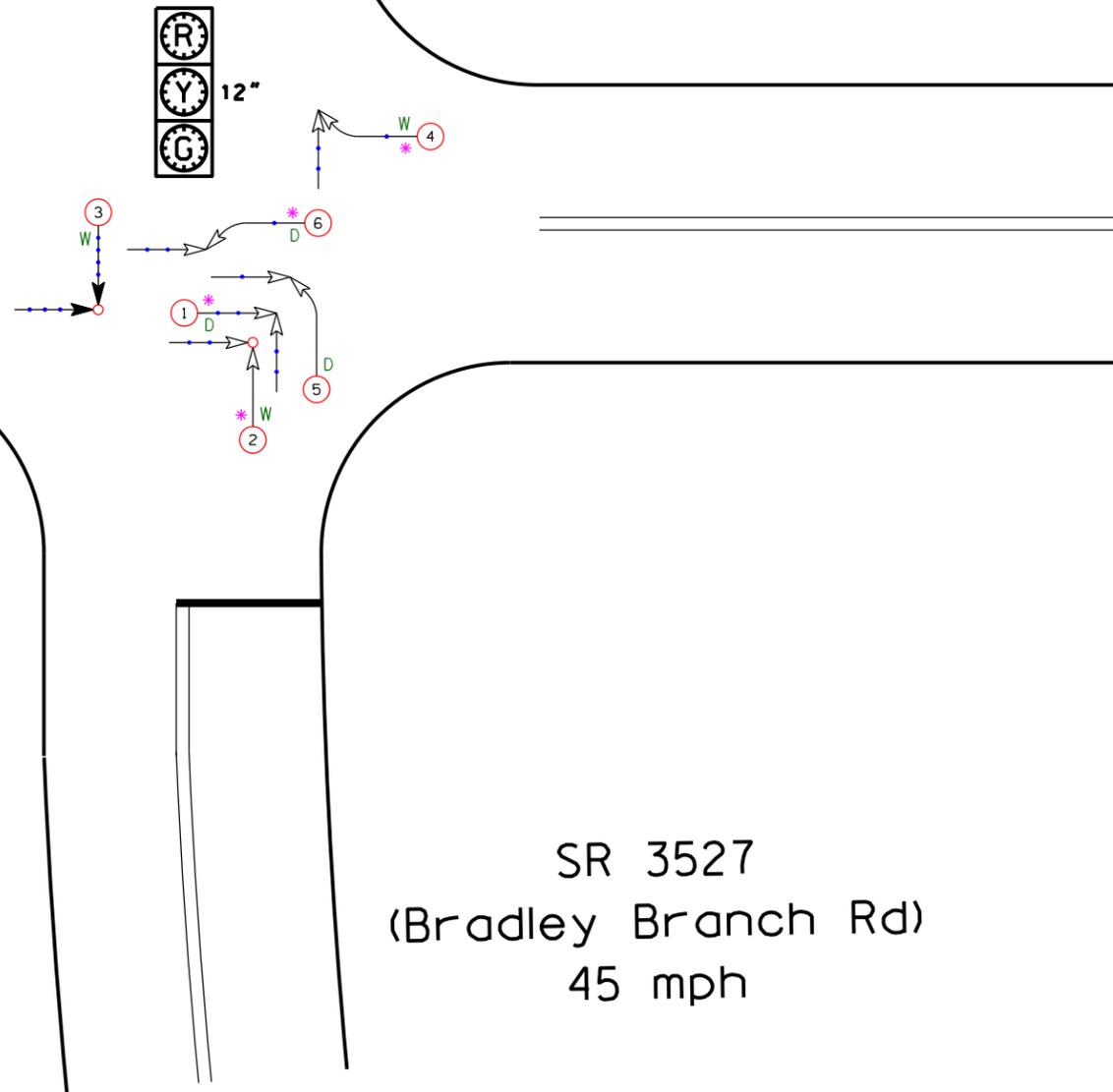
SR 3495
 (Glen Bridge Rd)
 35 mph

SR 3495
 (Glen Bridge Rd)
 35 mph

SR 3527
 (Bradley Branch Rd)
 45 mph

 Target Crash

LEGEND							
	MOVING VEHICLE		ANGLE		9 MPH OR LESS		P PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		T 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		70 AND UP		O SPEED UNKNOWN
	RAN OFF ROAD				30 MPH TO 39		



N.C. DEPARTMENT of TRANSPORTATION
 DIVISION of HIGHWAYS
 TRANSPORTATION MOBILITY and SAFETY DIVISION
TRAFFIC SAFETY UNIT
 Date: October 2010 Prepared By: BDR