Spot Safety Project Evaluation

Project Log # 200703075

Spot Safety Project # 13-01-205

Spot Safety Project Evaluation of the Traffic Signal Installation at NC191 and SR 3486/3573 in Buncombe County

Documents Prepared By:

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Date

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 13-01-205 – Traffic Signal Installation at NC191 and SR 3486/3573 in Buncombe County.

Project Information and Background from the Project File Folder

NC 191 (Brevard) @ SR 3486 (Avery's Creek / Glen Bridge) / 3573 (Southwick) is a 5 leg intersection. All of the approaches are two lane roadways without turn lanes. The speed limit for the roadways are: SR 3486 (Avery's Creek / Glen Bridge), 35 mph; NC 191 (Brevard), 45 mph; and SR 3573 (Southwick), 25 mph.

The original crash study yielded 22 total and 6 correctable crashes from 12/1/1996 – 11/30/1999. These crashes were related to a traffic volume increase, which caused congestion at the intersection. Determining who had the right of way was becoming more confusing resulting in numerous near misses as reported by local citizens. The countermeasure chosen for this location was to install a traffic signal and upgrade pavement markings to better channelize traffic. The traffic signal installation was completed on 2/5/2002 at a cost of $50,000.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes along the subject road, the crash data omitted from this analysis to consider for an adequate construction period was from January 2002 through March 2002. The before period consisted of reported crashes from May 1, 1997 through December 31, 2001 (4 years, 8 months) and the after period consisted of reported crashes from April 1, 2002 through November 30, 2006 (4 years, 8 months). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed.

The treatment data consisted of all crashes within 150 feet of the subject intersection. The following data table depicts the Naive Before and After Analysis for the above information. Please note that Frontal Impact crash types influenced by the implemented countermeasure were the target crashes for the treatment location. These crash types considered are 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			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total Crashes	15	13	-13.3
Total Severity Index	10.5	9.7	-7.8
Frontal Impact Crashes	9	5	-44.4
Frontal Severity Index	14.4	4.0	-72.4
Volume	9700	10750	10.8
Treatment Injury Crashes			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Fatal	0	0	N/A
Class A	1	1	N/A
Class B	5	2	-60.0
Class C	4	3	-25.0
Property Damage Only	5	7	40.0
Frontal Injury Crashes			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Fatal	0	0	N/A
Class A	1	0	N/A
Class B	3	2	-33.3
Class C	3	0	-100.0
Property Damage Only	2	3	50.0

Table 1.

The naive before and after analysis at the treatment location resulted in a 13 percent decrease in Total Crashes, a 44 percent decrease in Frontal Impact Crashes, and an 11 percent decrease in Average Daily Traffic (ADT). The before period ADT year was 1999 and the after period ADT year was 2004.

Results and Discussion

The naïve before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 13 percent decrease in Total Crashes and a 44 percent decrease in Frontal Impact Crashes. The summary results above demonstrate that the treatment location appears to have had a decrease in the number of Total Crashes and a decrease in the number of Frontal Impact Crashes from the before to the after period.

The before and after collision diagrams show an improvement in the number of frontal impact crashes after the signal installation. Although there is a reduction, a small pattern can be seen in the after period. The small pattern is between north and southbound vehicles on NC 191. There are four left turn, same roadway crashes that occurred in the after period. Since the original problem statement contained information about near misses, these four crashes may be a result numerous near misses.

While driving southbound on NC 191 during the field investigation, it was a little confusing as to which way NC 191 continued (see the second picture in the Photos section). Placing skip lines to delineate NC 191 through the intersection may help to define the travel lane. This may help to reduce near misses or hesitations that occur when traversing through the intersection.

The calculated benefit to cost ratio for this project is 1.33 considering total crashes. The benefit to cost ratio considering only target crashes is 11.75. 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.

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 road.

TREATMENT BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 191 and SR 3486/3573 BY: SDC
COUNTY: Buncombe DATE: 7/23/2007
FILE NO.: SS 13-01-205

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$50,000	10	0.149	$7,451
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$50,000	10	0.149	$7,451

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $10,351
TOTAL COST OF PROJECT= $50,000

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	4.67	1	0.21	9	1.93	5	1.07	$145,931
AFTER	4.67	1	0.21	5	1.07	7	1.50	$132,184

Annual Benefits from Crash Cost Savings $13,747

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $3,396

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 1.33

TOTAL COST OF PROJECT - $50,000 COMPREHENSIVE B/C RATIO - 1.33

TARGET BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 191 and SR 3486/3573 BY: SDC
COUNTY: Buncombe DATE: 7/23/2007
FILE NO.: SS 13-01-205

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$50,000	10	0.149	$7,451
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$50,000	10	0.149	$7,451

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $10,351
TOTAL COST OF PROJECT= $50,000

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	4.67	1	0.21	6	1.28	2	0.43	$131,863
AFTER	4.67	0	0.00	2	0.43	3	0.64	$10,214

Annual Benefits from Crash Cost Savings $121,649

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $111,297

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 11.75

TOTAL COST OF PROJECT - $50,000 COMPREHENSIVE B/C RATIO - 11.75

Location Map: NC 191 at SR 3486/3573.

Treatment Site Photos taken July 18, 2007

Driving south on NC 191

Driving south on NC 191

Driving north on NC 191

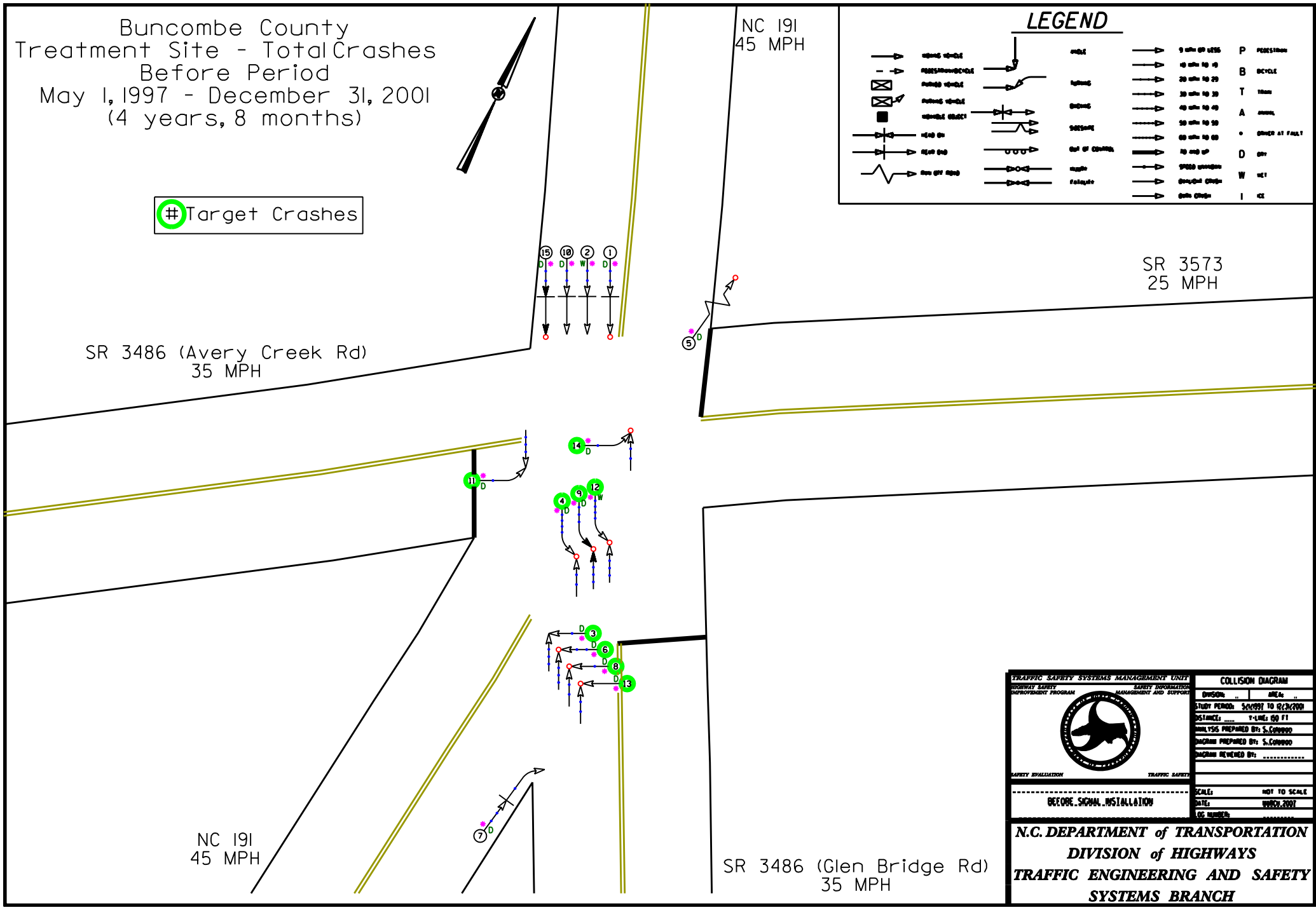
Driving north on NC 191

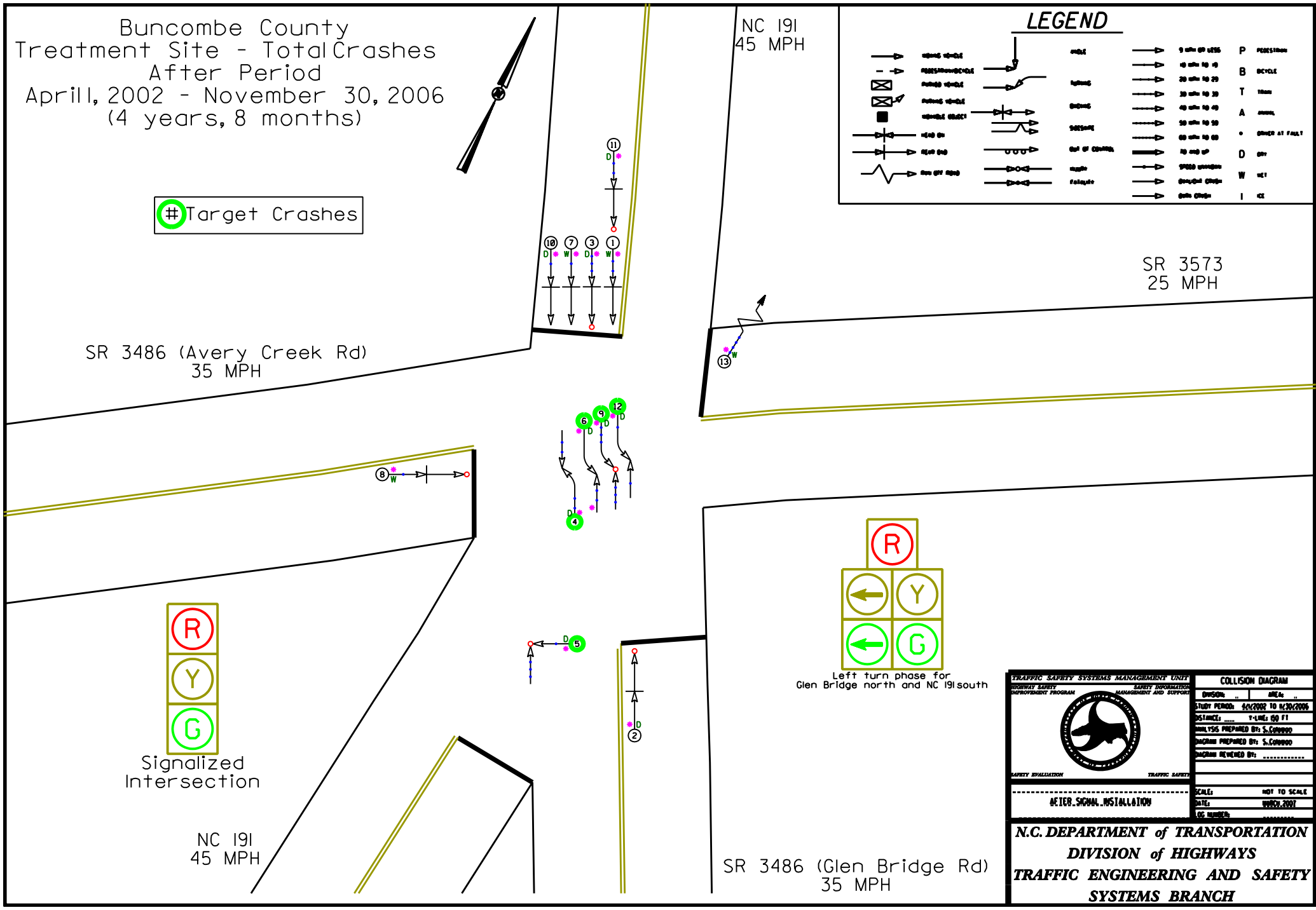
Driving north on Glen Bridge Rd

Driving north on Glen Bridge Rd

Driving west on SR 3573

Driving east on SR 3486


Buncombe County
Treatment Site - Total Crashes
Before Period
May 1, 1997 - December 31, 2001
(4 years, 8 months)
#Target Crashes
NC 191
45 MPH
SR 3573
25 MPH
SR 3486 (Avery Creek Rd)
35 MPH
NC 191
45 MPH
SR 3486 (Glen Bridge Rd)
35 MPH
LEGEND
TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT
HIGHWAY SAFETY IMPROVEMENT PROGRAM
SAFETY INFORMATION MANAGEMENT AND SUPPORT
SAFETY EVALUATION
TRAFFIC SAFETY
COLLISION DIAGRAM
BEFORE SIGNAL INSTALLATION
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH


Buncombe County
Treatment Site - Total Crashes
After Period
April 1, 2002 - November 30, 2006
(4 years, 8 months)
#Target Crashes
NC 191
45 MPH
SR 3573
25 MPH
SR 3486 (Avery Creek Rd)
35 MPH
LEGEND
Signalized
Intersection
Left turn phase for
Glen Bridge north and NC 191 south
NC 191
45 MPH
SR 3486 (Glen Bridge Rd)
35 MPH
TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT
HIGHWAY SAFETY IMPROVEMENT PROGRAM
SAFETY INFORMATION MANAGEMENT AND SUPPORT
SAFETY EVALUATION
TRAFFIC SAFETY
COLLISION DIAGRAM
STUDY PERIOD: 4/1/2002 TO 11/30/2006
SCALE: NOT TO SCALE
DATE: MARCH 2007
ATEIGB_SIGNAL_INSTALLATION
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH