

Spot Safety Project Evaluation

Work Order #41000005324

Spot Safety Project # 04-03-005

Spot Safety Project Evaluation of the Traffic Signal Installation at the Intersection of NC 50 and SR 1524 (Old Drug Store Rd) Johnston 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

3/29/2010

Date

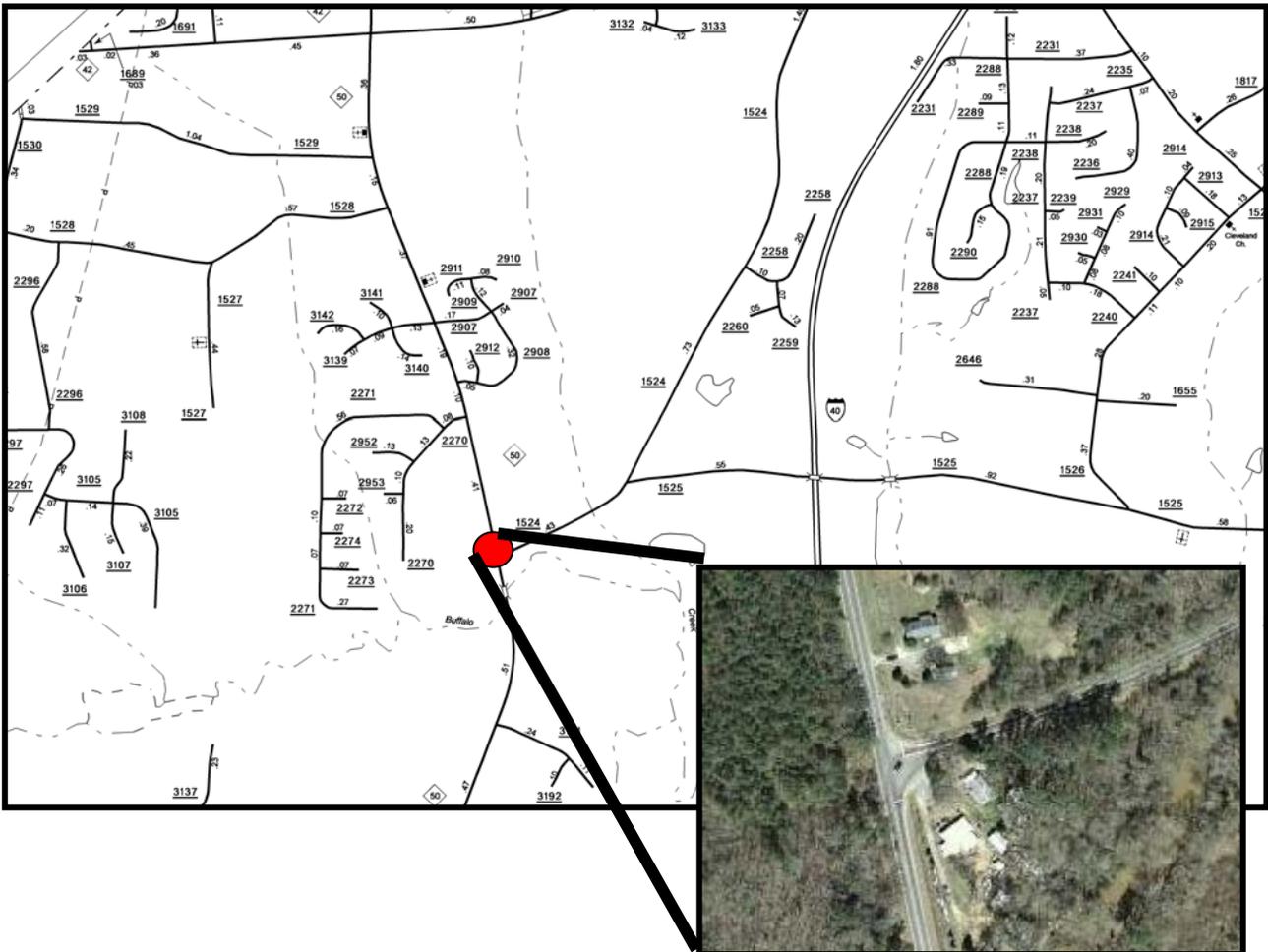
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 04-03-005 – The Intersection of NC 50 and SR 1524 (Old Drug Store Rd) in Johnston County.

The signal number for this location is 04-1307.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was to install a traffic signal.

The subject location is a three-leg intersection which was controlled by a stop sign on SR 1524 in the before period. In the study periods all approaches were single lane and had speed limits of 55

mph. A signal plan dated December 2007 was found with the intersection being completely redesigned with a new fourth leg, left turn lanes added to all existing approaches, and a right turn lane added for southbound NC 50. In addition, the signal was redesigned to allow protected/permitted left turning phasing for the three previously existing legs. It is not known when this occurred. A crash report from September 2008 was the last report to show the old configuration and a crash report from October 2009 is the first to show the new configuration.

The original statement of problem was that volumes on SR 1524 had increased dramatically in the years before the project was implemented.

The final completion date for the improvements at the subject intersection was on June 24, 2004 with a total cost of \$63,000.00.

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 May 1, 2004 to July 30, 2004. The before period consisted of reported crashes from December 1, 1999 through April 30, 2004 (4 years and 5 months) and the after period consisted of reported crashes from August 1, 2004 through December 31, 2008 (4 years and 5 months). The ending date for this analysis was limited by the redesign of the intersection as described in the *Project* Background section.

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 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.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	16	14	-12.5
Total Severity Index	3.77	3.64	-3.4
Target Crashes	5	1	-80.0
Target Severity Index	5.44	8.40	54.4
Volume	12,000	13,500	12.5
<u>Target Crash Severity Summary</u>			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	1	1	0.0
Class C Crashes	2	0	-100.0
PDO Crashes	2	0	-100.0

The naive before and after analysis at the treatment location resulted in a 13 percent decrease in Total Crashes, an 80 percent decrease in Target Crashes, and a 13 percent decrease in Average Daily Traffic (ADT). The before period ADT year was 2001 and the after period ADT year was 2007.

Results and Discussion

The naive 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 an 80 percent decrease in Target Crashes. The Total Severity Index decreased by 3 percent and the Target Severity Index decreased by 54 percent. The summary results above demonstrate that both Total and Target Crashes appear to have decreased from the before to the after period.

The calculated benefit to cost ratio for this project is 1.89 considering total crashes. The benefit to cost ratio considering only target crashes is also 3.78. 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.

It appears that the signal installation was effective at reducing Frontal Impact Crashes at the intersection. In the before period all five of the Target Crashes involved vehicles turning left from SR 1524 without yielding to NC 50 vehicles. In the after period the single Target Crash was a Left Turn-Same Roadway crash involving a southbound NC 50 vehicle turning left onto SR 1524.

Ten of the 14 after period crashes were Rear-End Crashes. Seven of these occurred on the northbound NC 50 approach.

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 this type of intersection.

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 50 at SR 1524
 COUNTY: Johnston
 FILE NO.: SS 04-03-005

BY: bdr
 DATE: 3/26/2010

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$63,000	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0

TOTALS \$63,000 #DIV/0! 0.000 \$0

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900
 TOTAL ANNUAL COST= \$2,900
 TOTAL COST OF PROJECT= \$63,000

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	4.42	0	0.00	6	1.36	10	2.26	\$36,652
AFTER	4.42	0	0.00	5	1.13	9	2.04	\$31,176

Annual Benefits from Crash Cost Savings \$5,475

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$2,575

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 1.89

TOTAL COST OF PROJECT - \$63,000 COMPREHENSIVE B/C RATIO - 1.89

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 50 at SR 1524
 COUNTY: Johnston
 FILE NO.: SS 04-03-005 Target Crashes Only

BY: bdr
 DATE: 3/26/2010

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$63,000	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0

TOTALS \$63,000 #DIV/0! 0.000 \$0

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900
 TOTAL ANNUAL COST= \$2,900
 TOTAL COST OF PROJECT= \$63,000

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	4.42	0	0.00	3	0.68	2	0.45	\$15,475
AFTER	4.42	0	0.00	1	0.23	0	0.00	\$4,525

Annual Benefits from Crash Cost Savings \$10,950

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$8,050

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 3.78

TOTAL COST OF PROJECT - \$63,000 COMPREHENSIVE B/C RATIO - 3.78

Treatment Site Photos



Looking north on NC 50



Looking south on NC 50

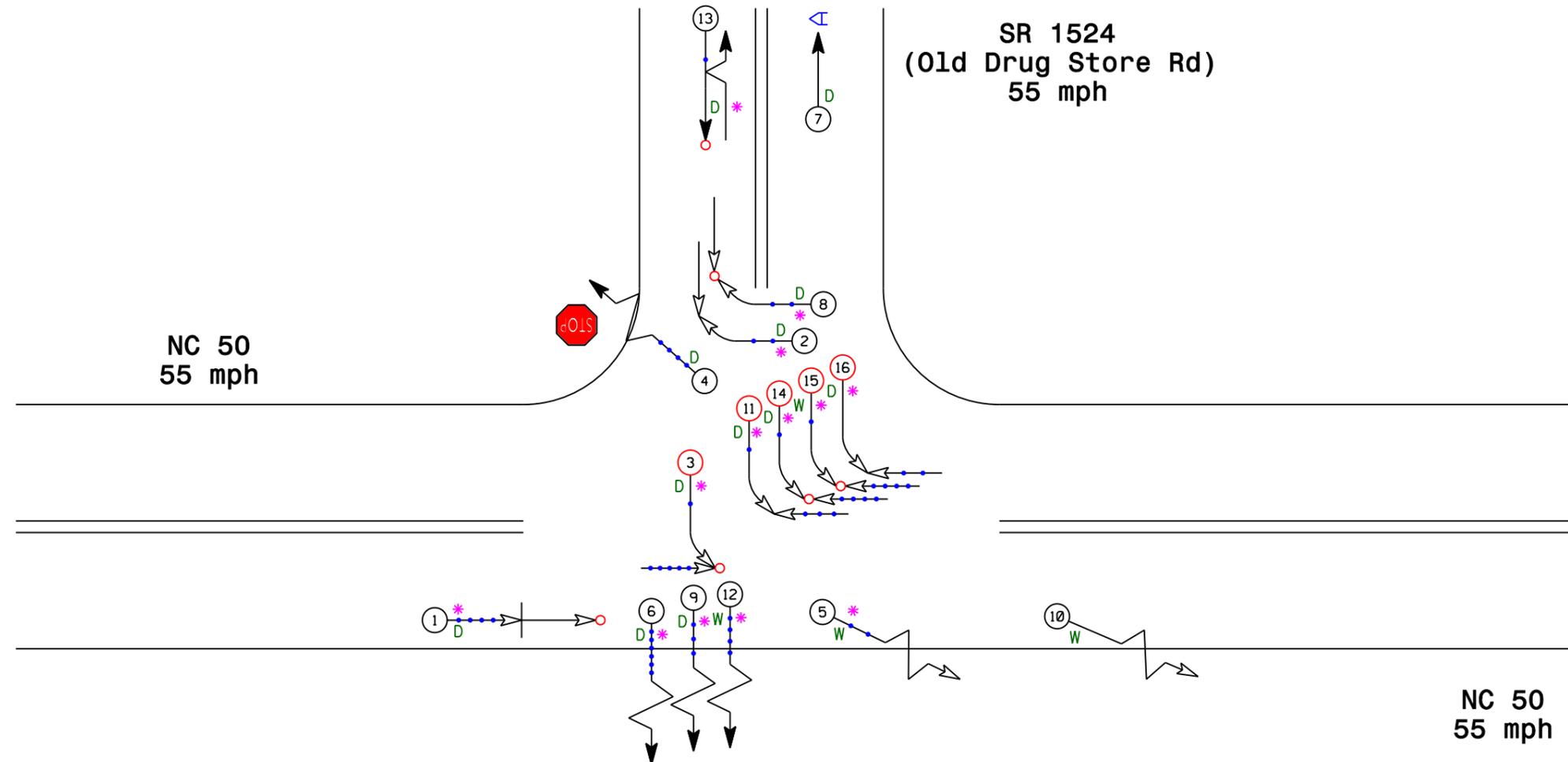


Looking east toward SR 1524 from intersection

Johnston County
 NC 50 at SR 1524
 (Old Drug Store Rd)
 BEFORE Period
 12/1/1999-4/30/2004

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		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		INJURY		50 MPH TO 59		ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		OILY
	RAN OFF ROAD		SPEED UNKNOWN		70 AND UP		

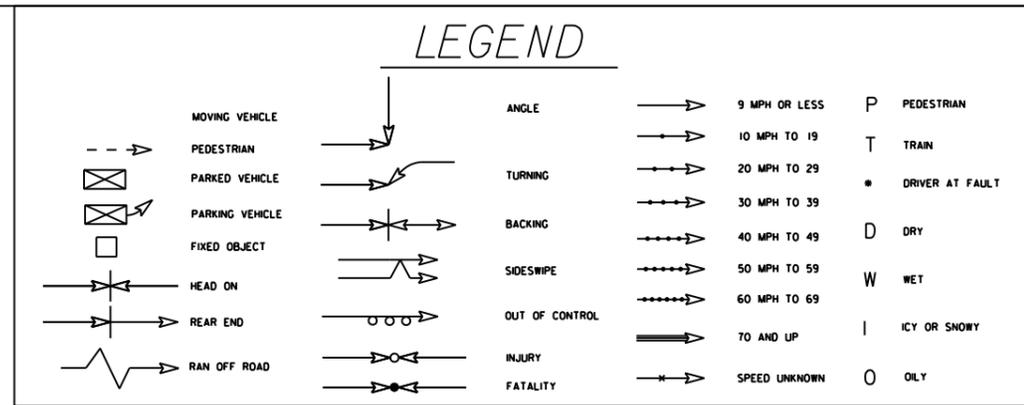


TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 4	AREA:
	STUDY PERIOD: 12/1/99-4/30/04	
	DISTANCE: Y-LINE = 150 FT	
	ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: BDR		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: March 2004		
LOG NUMBER: 4000005324		

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

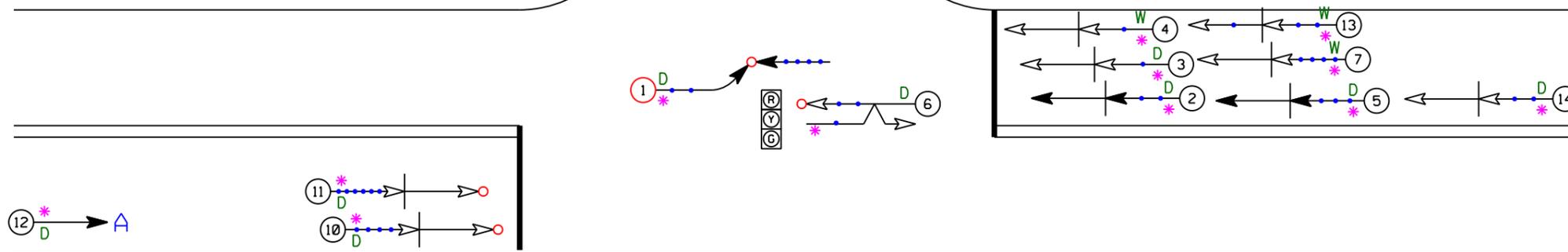
Johnston County
 NC 50 at SR 1524
 (Old Drug Store Rd)
 AFTER Period
 8/1/2004-12/31/2008



SR 1524
 (Old Drug Store Rd)
 55 mph

NC 50
 55 mph

Target Crash



NC 50
 55 mph

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 4	AREA:
STUDY PERIOD: 8/1/04-12/31/08	
DISTANCE: Y-LINE = 150 FT	
ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: BDR	
DIAGRAM REVIEWED BY:	
SCALE: NOT TO SCALE	
DATE: March 2010	
LOG NUMBER: 400000598	

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