Spot Safety Project Evaluation

Order # 41000004043

Spot Safety Project # 08-04-207

Spot Safety Project Evaluation of the Traffic Signal Installation
SR 1004 (Archdale Road) at SR 1570 (Tom Hill Road)
Randolph County

Documents Prepared By:

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

Principal Investigator

_____ 2-4-2010

Jason B. Schronce Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 08-04-207 located at the Intersection of SR 1004 (Archdale Road) and SR 1570 (Tom Hill Road) in Randolph County, Community of Progress.

The Sig ID is 08-1070 for this newly installed traffic signal.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of an intersection traffic signal. SR 1004 and SR 1570 are both two-lane facilities at the subject intersection with speed limits of 45 mph on all approaches. The subject location is a three-leg intersection, which was controlled by a stop sign on SR 1570 (Tom Hill Rd).

The original statement of problem was the existing crash pattern of vehicles on SR 1570 failing to yield the right-of-way when making a left turn onto SR 1004 (Archdale Rd). The intended purpose of the new traffic signal is to alleviate the current intersection crash patterns.

The initial crash analysis was completed from August 1, 2000 to July 31, 2003 with eight (8) reported crashes, five (5) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on December 14, 2004 with a total cost of $51,500.

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 the months of November through December 2004. The before period consisted of reported crashes from December 1, 1999 through October 31, 2004 (4 years and 11 months); and the after period consisted of reported crashes from January 1, 2005 through November 30, 2009 (4 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 Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

Treatment Information	**Before**	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	14	6	- 57.1 %
Total Severity Index	7.47	16.10	115.5 %
Target Crashes	7	1	- 85.7 %
Target Crash Severity Index	12.89	1.00	- 92.2 %
Volume	14,300	10,600	- 25.9 %

Injury Crash Summary	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	1	0.0 %
Class B injury Crashes	0	1	100.0 %
Class C Injury Crashes	2	1	- 50.0 %
Total Injury Crashes	3	3	0.0 %

The naive before and after analysis at the treatment location resulted in a 57 percent decrease in Total Crashes, an 86 percent decrease in Target Crashes, but a 116 percent increase in the Total Severity Index. The before period ADT year was 2002 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 57 percent decrease in Total Crashes and an 86 percent decrease in Target Crashes. The summary results above demonstrate that both Total and Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the before period presented a pattern of seven (7) intersection frontal impact collisions, including one A-injury crash, from motorists who improperly attempted to access SR 1004. After the signal installation, this pattern was reduced to one (1) collision, resulting from a northbound SR 1004 motorist who ran the red indication signal. The newly installed traffic signal also had a positive impact on the rear-end and sideswipe crash patterns shown on the SR 1570 approach.

Referencing the table above, the data shows a 116 percent increase in the total crash severity index. This number appears skewed from an after period A-injury collision with a reduced total number of intersection collisions. The after period severe injury collision was the only northbound SR 1004 rear-end crash. It occurred under wet roadway conditions and had a speed differential of 40 mph.

The calculated benefit to cost ratio for this project is **0.60 considering total crashes**. The benefit to cost ratio **considering only target crashes is 10.26**. 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 roadways of 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 Northwest on SR 1004 (Archdale Rd) approaching intersection

Traveling South on SR 1570 (Tom Hill Road)

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: SR 1004 at SR 1570 | BY: JBS
COUNTY: Randolph County | DATE: 2/4/2010
FILE NO.: SS 08-04-207 | NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - New Traffic Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$51,500	10	0.149	$7,675
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$51,500	10	0.149	$7,675

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

TOTAL ANNUAL COST= $10,575
TOTAL COST OF PROJECT= $51,500

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	4.92	1	0.20	2	0.41	11	2.24	$117,663
AFTER	4.92	1	0.20	2	0.41	3	0.61	$111,321

Annual Benefits from Crash Cost Savings $6,341

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($4,234)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 0.60

TOTAL COST OF PROJECT - $51,500 COMPREHENSIVE B/C RATIO - 0.60

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: SR 1004 at SR 1570 | BY: JBS
COUNTY: Randolph | DATE: 2/4/2010
FILE NO.: SS 08-04-207 | NOTES: Target Crashes - Frontal Crashes

DETAILED COST: TYPE IMPROVEMENT - New Traffic Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$51,500	10	0.149	$7,675
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$51,500	10	0.149	$7,675

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

TOTAL ANNUAL COST= $10,575
TOTAL COST OF PROJECT= $51,500

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

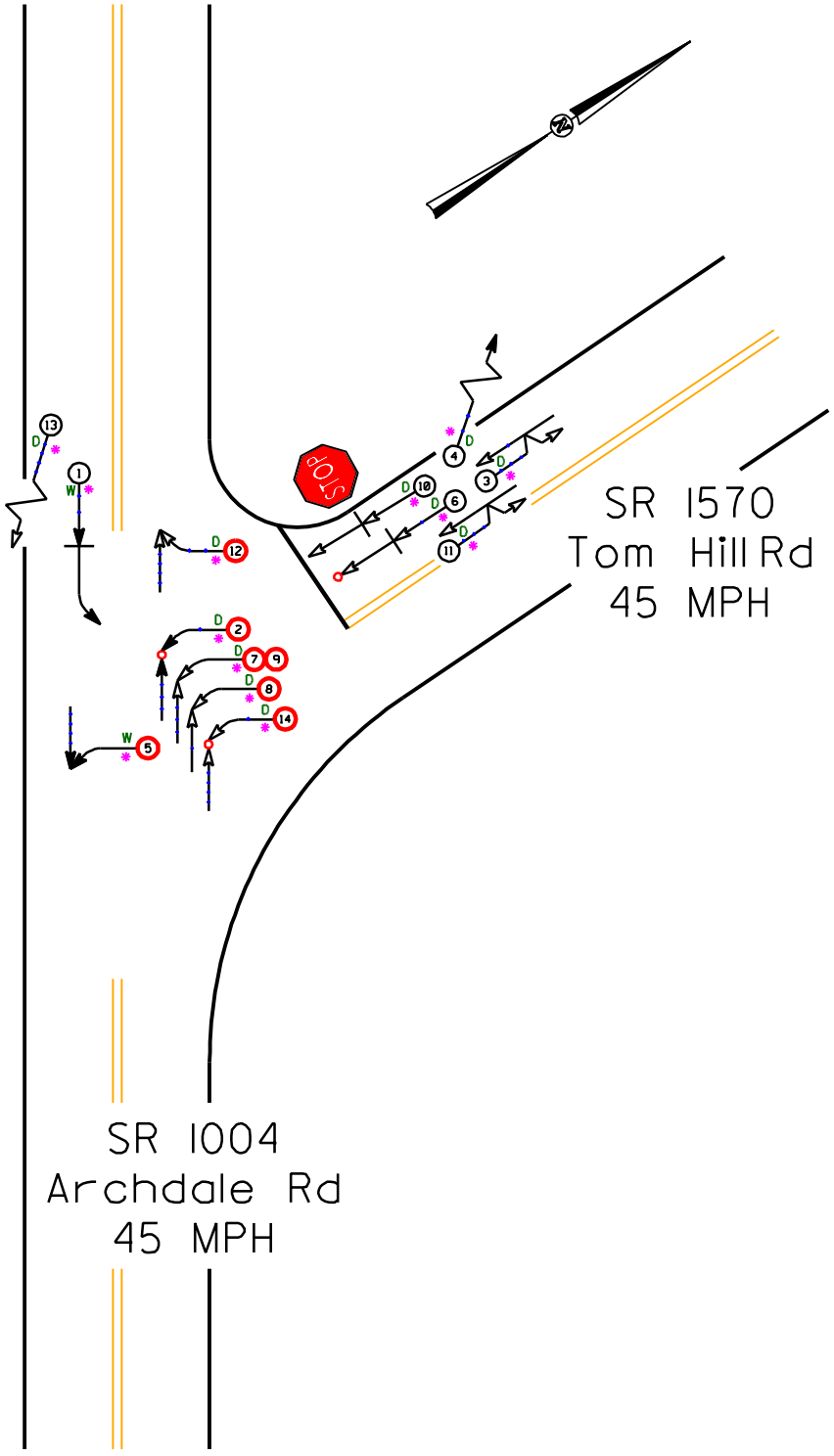
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.92	1	0.20	1	0.20	5	1.02	$109,248
AFTER	4.92	0	0.00	0	0.00	1	0.20	$793

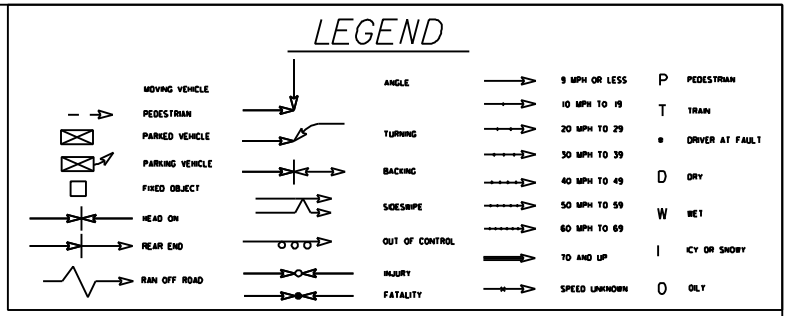
Annual Benefits from Crash Cost Savings $108,455

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $97,880

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 10.26

TOTAL COST OF PROJECT - $51,500 COMPREHENSIVE B/C RATIO - 10.26





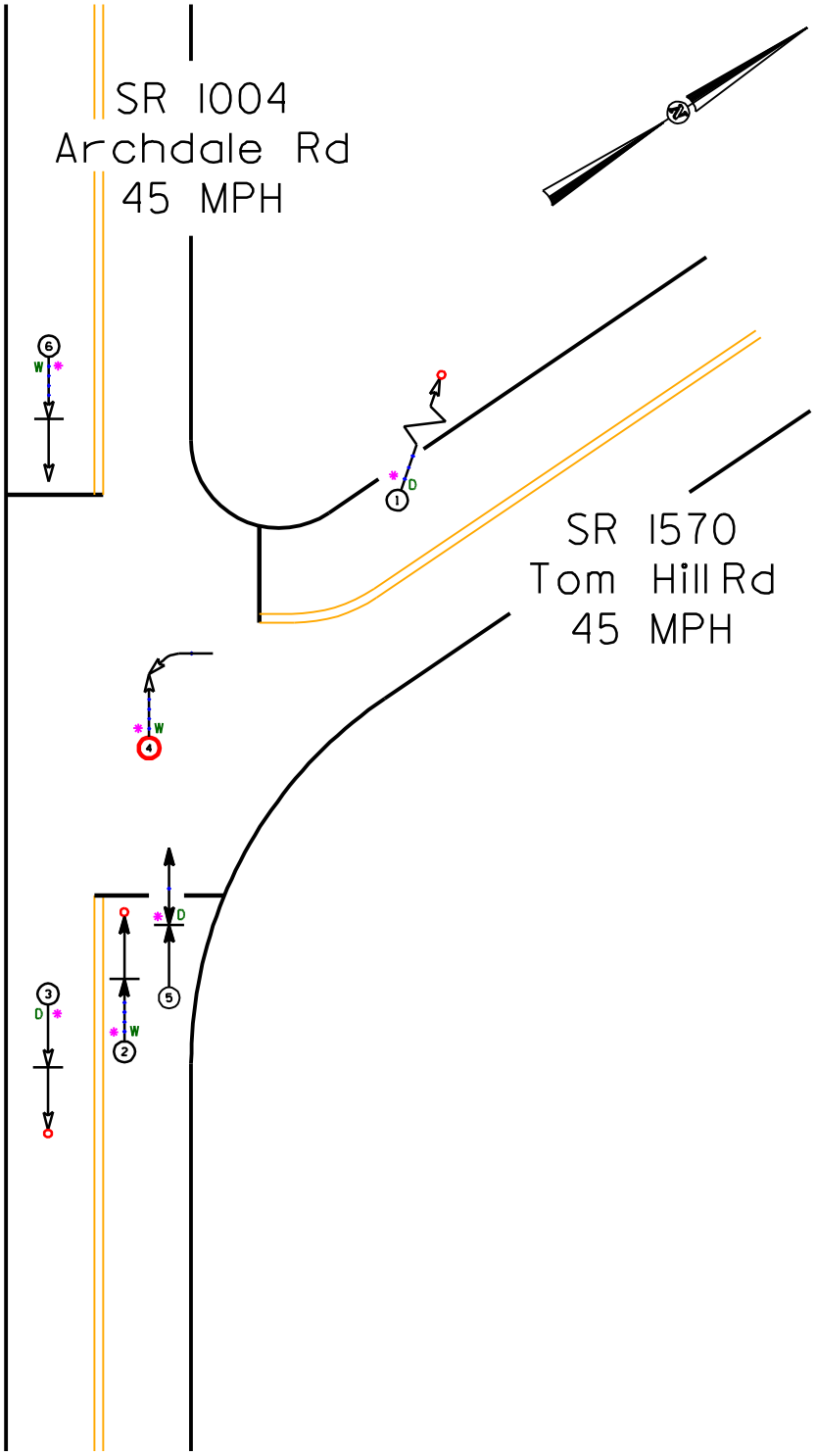
SS# 08-04-207
Randolph County
Town of Progress
BEFORE Period
12/1/99 - 10/31/04

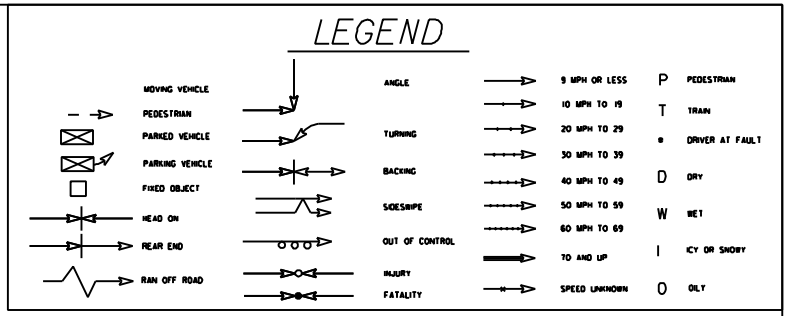
Frontal Impact Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 8	AREA:
STUDY PERIOD: 12/1/1999 - 10/31/2004	
DISTANCE:	Y-LINE = 150FT
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: N/A	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 2-2-2010	
LOG NUMBER: SS# 08-04-207 BEFORE	

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





SS# 08-04-207
Randolph County
Town of Progress
AFTER Period
1/1/05 - 11/30/09

R
Y
G
New Signalized
Intersection
Sig ID 08-1070

Frontal Impact Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 8	AREA:
STUDY PERIOD: 1/1/2005 - 11/30/2009	
DISTANCE:	T-LINE = 150FT
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: N/A	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 2-2-2010	
LOG NUMBER: SS# 08-04-207 AFTER	

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