Spot Safety Project Evaluation

Project Log # 200712078

Spot Safety Project # 04-01-243

Spot Safety Project Evaluation of the Warning Flasher Installation
At the Intersection of NC 96 and SR 1143 (Stricklands X-roads Rd)
Blackman Crossroads, Johnston County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

_____ 2-11-2008
Jason B. Schronce Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 04-01-243 – The Intersection of NC 96 and SR 1143 (Stricklands Crossroads Rd) in Johnston County, also known as Blackman Crossroads.

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 overhead warning flasher. NC 96 and SR 1143 are both two-lane, two-way facilities at the subject intersection with no turn lanes and speed limits of 45 mph. The subject location is a crossroads type intersection, which is controlled by a stop condition on SR 1143 (Strickland Crossroads Rd). The stop control condition is mandated by dual posted oversized stop signs and the overhead flasher under analysis. Eastbound SR 1143 also has a small intersection median where the second stop sign is placed, where as westbound has them placed on each side of the roadway.

The original statement of problem was the severe horizontal alignment shifts on NC 96 coupled with buildings at the intersection that present a sight distance issue. The goal is to heighten motorist's attention to the intersection on NC 96 and reduce angle collisions.

The initial crash analysis was completed from April 1, 1998 to March 31, 2001 with six (6) reported crashes, all of which were deemed correctable frontal impact crashes. The final completion date for the improvement at the subject intersection was on August 1, 2002 with a total cost of $15,000.00.

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, 2002 to August 31, 2002. The before period consisted of reported crashes from July 1, 1997 through June 30, 2002 (5 years) and the after period consisted of reported crashes from September 1, 2002 through August 31, 2007 (5 years). 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	8	6	- 25.00 %
Total Severity Index	4.70	14.87	200.00+ %
Target Crashes	7	5	- 28.57 %
Target Crash Severity Index	4.17	16.16	200.00+ %
Volume	2,770	2,870	3.61 %
Injury Crash Summary - Total			
Fatal injury Crashes	0	0	N / A
Class A injury Crashes	0	1	100.00 %
Class B injury Crashes	1	1	0.00
Class C Injury Crashes	3	0	- 100.00 %
Total Injury Crashes	4	2	- 50.00 %

The naive before and after analysis at the treatment location resulted in a 25 percent decrease in Total Crashes, a 29 percent decrease in Target Crashes, and the Total Severity Index more than doubled. The before period ADT year was 1999 and the after period ADT year was 2005.

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 25 percent decrease in Total Crashes and a 29 percent decrease in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the crash patterns remained fairly consistent from the before to the after periods. The before period consisted of six angle crashes, one left turn, and one crash from the avoidance of a rear-end collision. While the after represents four angle crashes, one left turn, and one rear-end collision. The slight reduction in angle collisions can be accounted for by the heightened awareness to the intersection by the flasher.

The most visible change at the intersection from the table above is the giant increase in crash severity during the naïve study. The numbers are misleading since 'Crash 2' of the after period involved a golf cart versus a motor vehicle and resulted in an A-class injury. Looking at target crash severity minus the golf cart incident, a reduction from 4.17 in the before period to 1.00 in that after occurred. All the target crashes outside of 'Crash 2' on the after period diagram were PDO collisions.

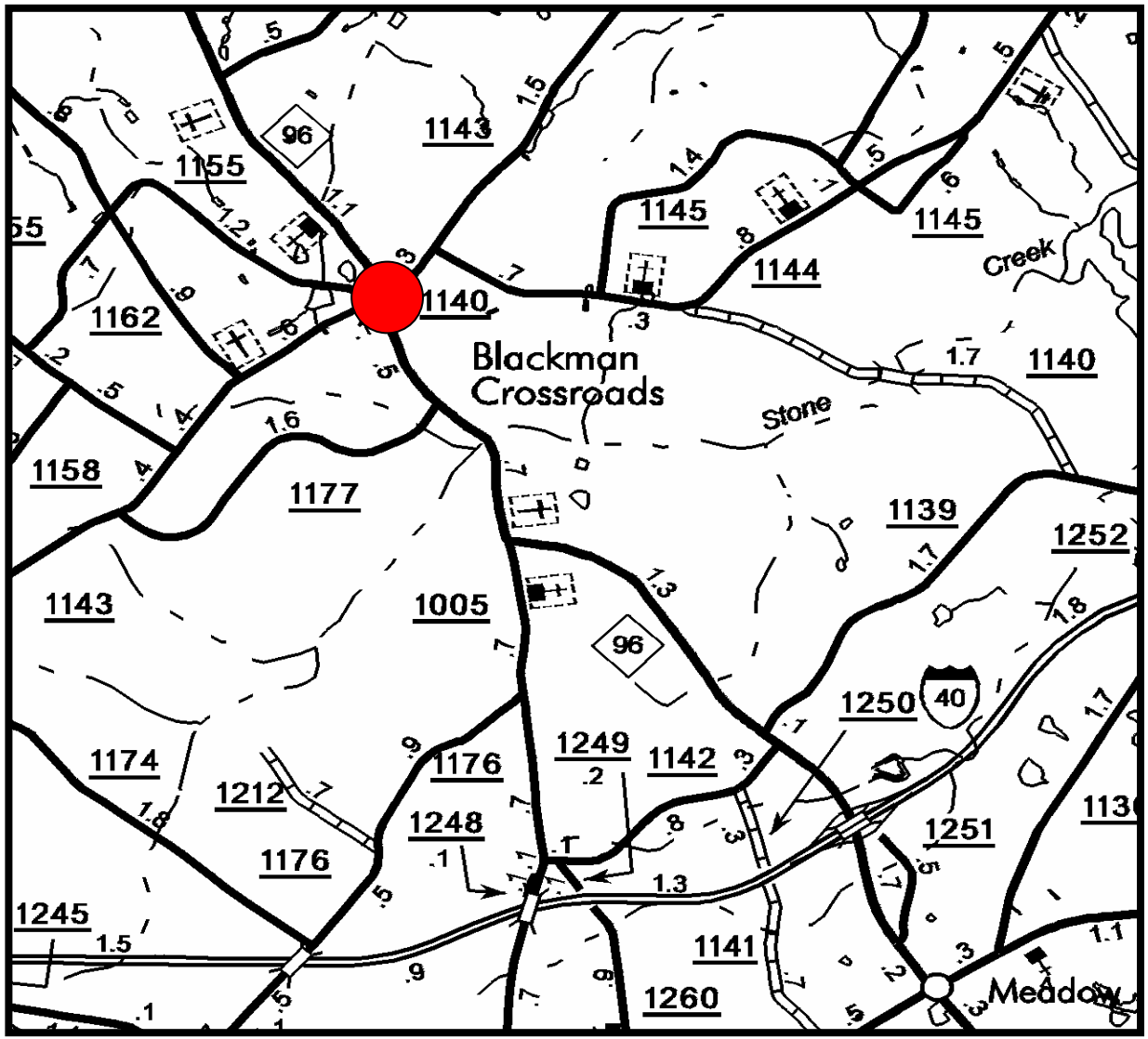
The calculated benefit to cost ratio for this project is -30.91 considering total crashes and also when the ratio is calculated only with target crashes. The target crash benefit to cost ratio when excluding

‘Crash 2’ in the after period as discussed previously is 3.74. 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 for all approaches to the treatment intersection. Notice the labeling of the oversized and dual posted stop signs along with minimum visibility of the intersection traveling northbound on NC 96.

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.

Location Map
Johnston County
Evaluation of Spot Safety Project # 04-01-243

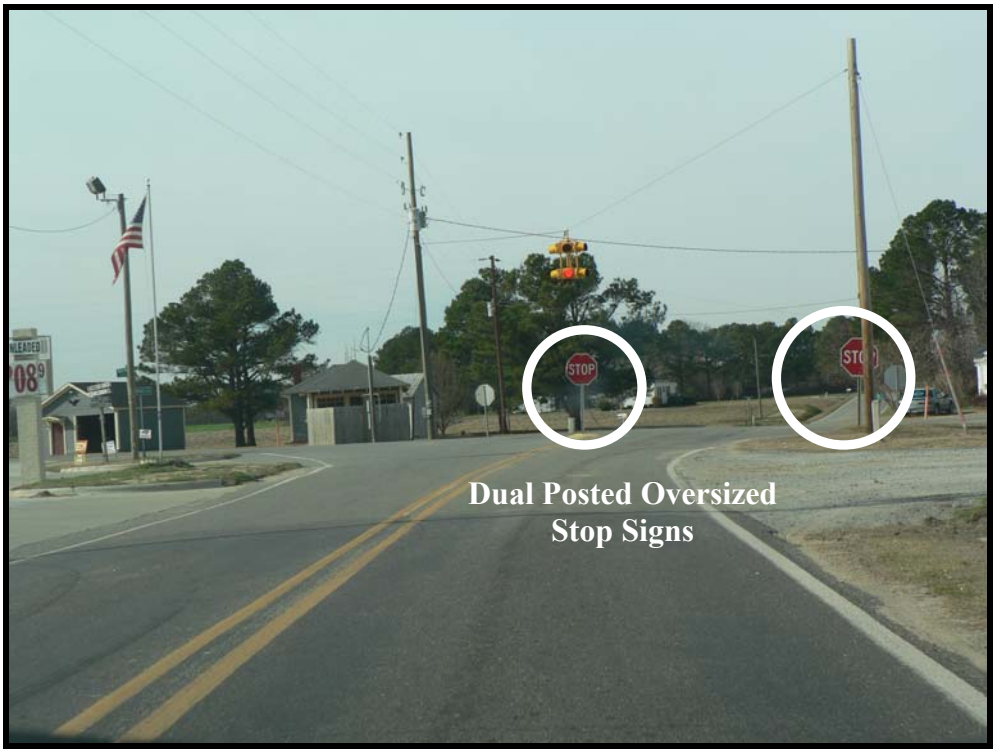


Treatment Location: NC 96 at SR 1143 (Stricklands X-roads Rd)

SS# 04-01-243 Aerial Map
Johnston County – Blackman Crossroads

TREATMENT SITE PHOTOS TAKEN 1/16/2008

Traveling East on SR 1143 (Stricklands X-roads Rd)



Traveling West on SR 1143

Traveling North on NC 96

Traveling South on NC 96 – Minimal sight distance of intersection

Traveling South on NC 96

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 96 at SR 1143 | BY: JBS
COUNTY: Johnston | DATE: 1/23/2008
FILE NO.: SS 04-01-243 | NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - New Flasher

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$15,000	10	0.149	$2,235
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$15,000	10	0.149	$2,235

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $300
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $350

TOTAL ANNUAL COST= $2,885
TOTAL COST OF PROJECT= $15,000

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	5.00	0	0.00	4	0.80	4	0.80	$17,520
AFTER	5.00	1	0.20	1	0.20	4	0.80	$106,720

Annual Benefits from Crash Cost Savings ($89,200)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($92,085)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -30.91

TOTAL COST OF PROJECT - $15,000 COMPREHENSIVE B/C RATIO - -30.91

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 96 at SR 1143 | BY: JBS
COUNTY: Johnston | DATE: 1/23/2008
FILE NO.: SS 04-01-243 | NOTES: Target Crashes - Frontal Impact

DETAILED COST: TYPE IMPROVEMENT - New Flasher

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$15,000	10	0.149	$2,235
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$15,000	10	0.149	$2,235

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $300
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $350

TOTAL ANNUAL COST= $2,885
TOTAL COST OF PROJECT= $15,000

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	5.00	0	0.00	3	0.60	4	0.80	$13,920
AFTER	5.00	1	0.20	0	0.00	4	0.80	$103,120

Annual Benefits from Crash Cost Savings ($89,200)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($92,085)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -30.91

TOTAL COST OF PROJECT - $15,000 COMPREHENSIVE B/C RATIO - -30.91

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 96 at SR 1143 | BY: JBS
COUNTY: Johnston | DATE: 1/23/2008
FILE NO.: SS 04-01-243 | NOTES: Target Crashes - Frontal Impact (w/o Crash 2)

DETAILED COST: TYPE IMPROVEMENT - New Flasher

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$15,000	10	0.149	$2,235
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$15,000	10	0.149	$2,235

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $300
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $350

TOTAL ANNUAL COST= $2,885
TOTAL COST OF PROJECT= $15,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

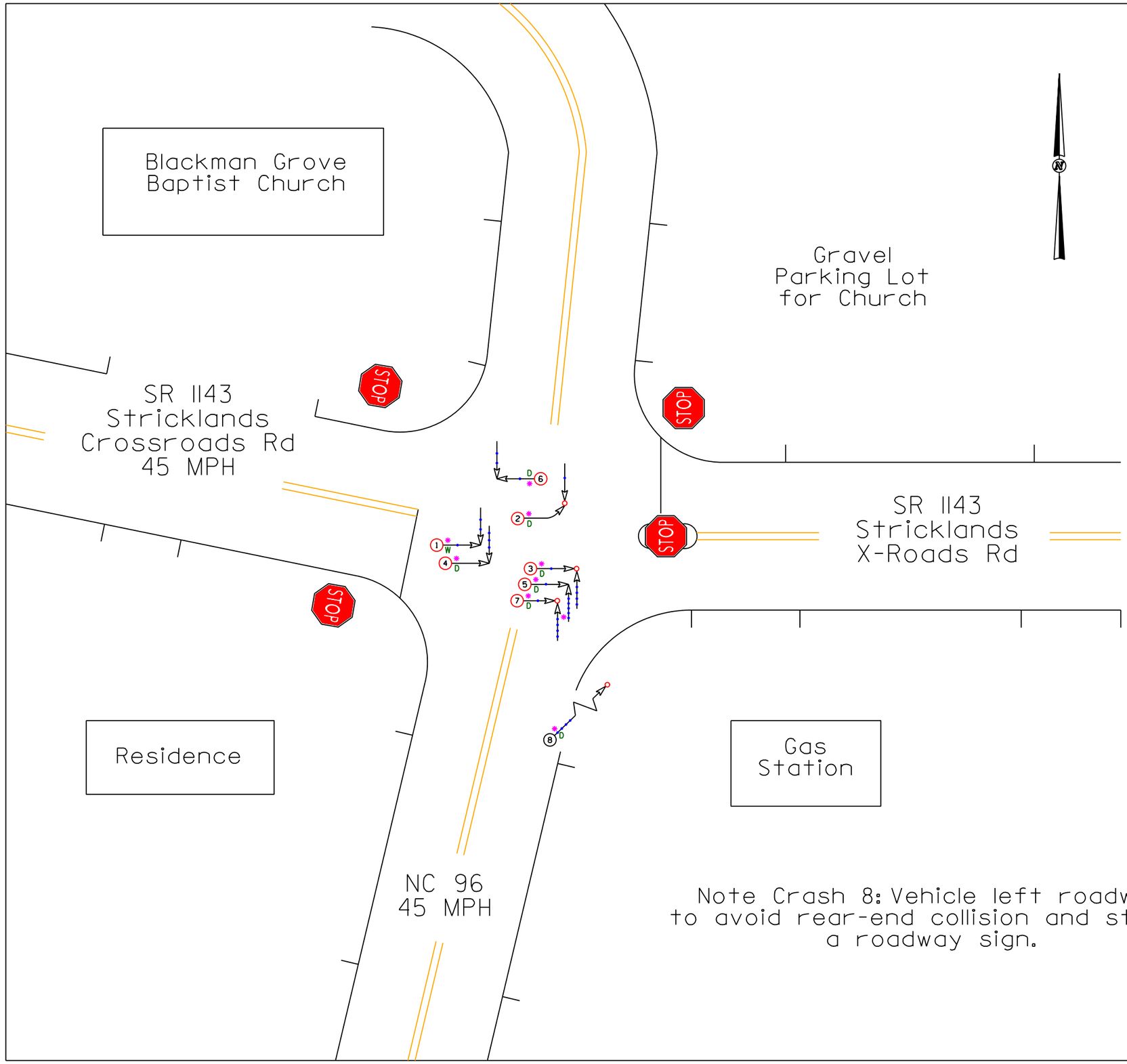
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	5.00	0	0.00	3	0.60	4	0.80	$13,920
AFTER	5.00	0	0.00	0	0.00	4	0.80	$3,120

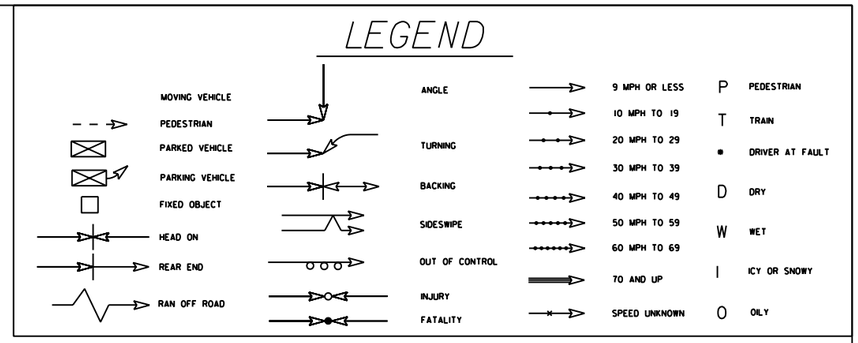
Annual Benefits from Crash Cost Savings $10,800

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $7,915

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 3.74

TOTAL COST OF PROJECT - $15,000 **COMPREHENSIVE B/C RATIO - 3.74**



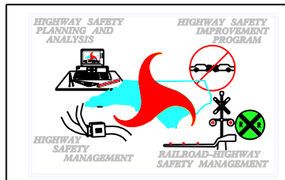


SS# 04-01-243
Johnston County
BEFORE Period
7/1/97 - 6/30/02
NC 96 at SR 1143

Note Crash 8: Vehicle left roadway to avoid rear-end collision and struck a roadway sign.

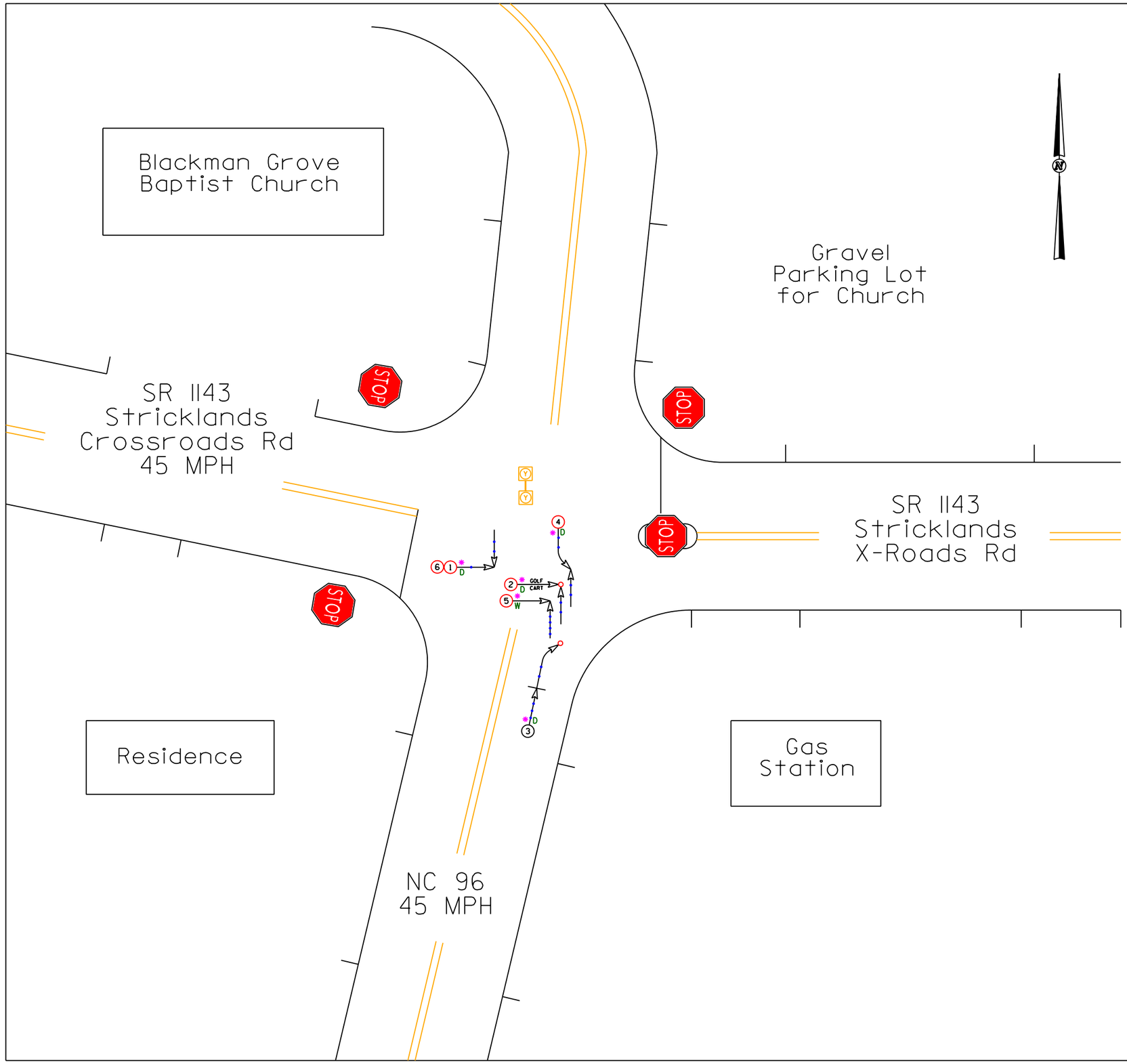
Target Crashes
Frontal Impact

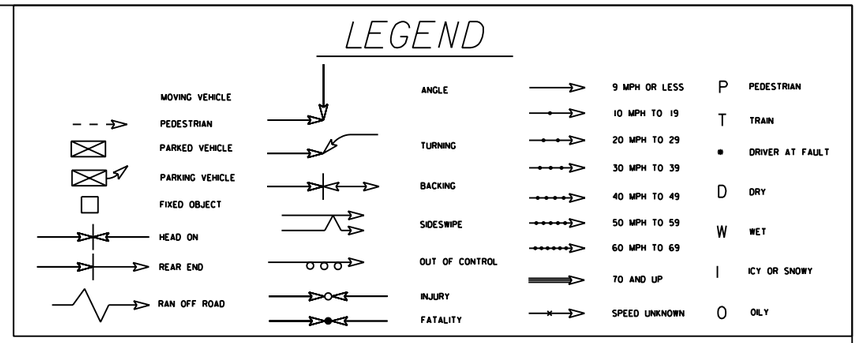
TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT



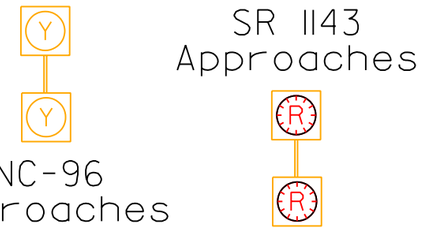
COLLISION DIAGRAM	
DIVISION: 4	AREA:
STUDY PERIOD: 7/1/1997 TO 6/30/2002	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 1-22-2008	
LOG NUMBER: SS# 04-01-243	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH





SS# 04-01-243
Johnston County
AFTER Period
9/1/02 - 8/31/07
NC 96 at SR 1143



Target Crashes
Frontal Impact

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 4	AREA:
STUDY PERIOD: 9/1/2002 TO 8/31/2007	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 1-22-2008	
LOG NUMBER: SS# 04-01-243	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH