

Spot Safety Project Evaluation

Work Order #41000010353

Spot Safety Project # 06-02-224

Spot Safety Project Evaluation of the Sight Distance Improvements at the Intersection of SR 1006 (Old Stage Rd) and NC 210 Harnett County

Documents Prepared By:

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

Principal Investigator



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3/29/2011

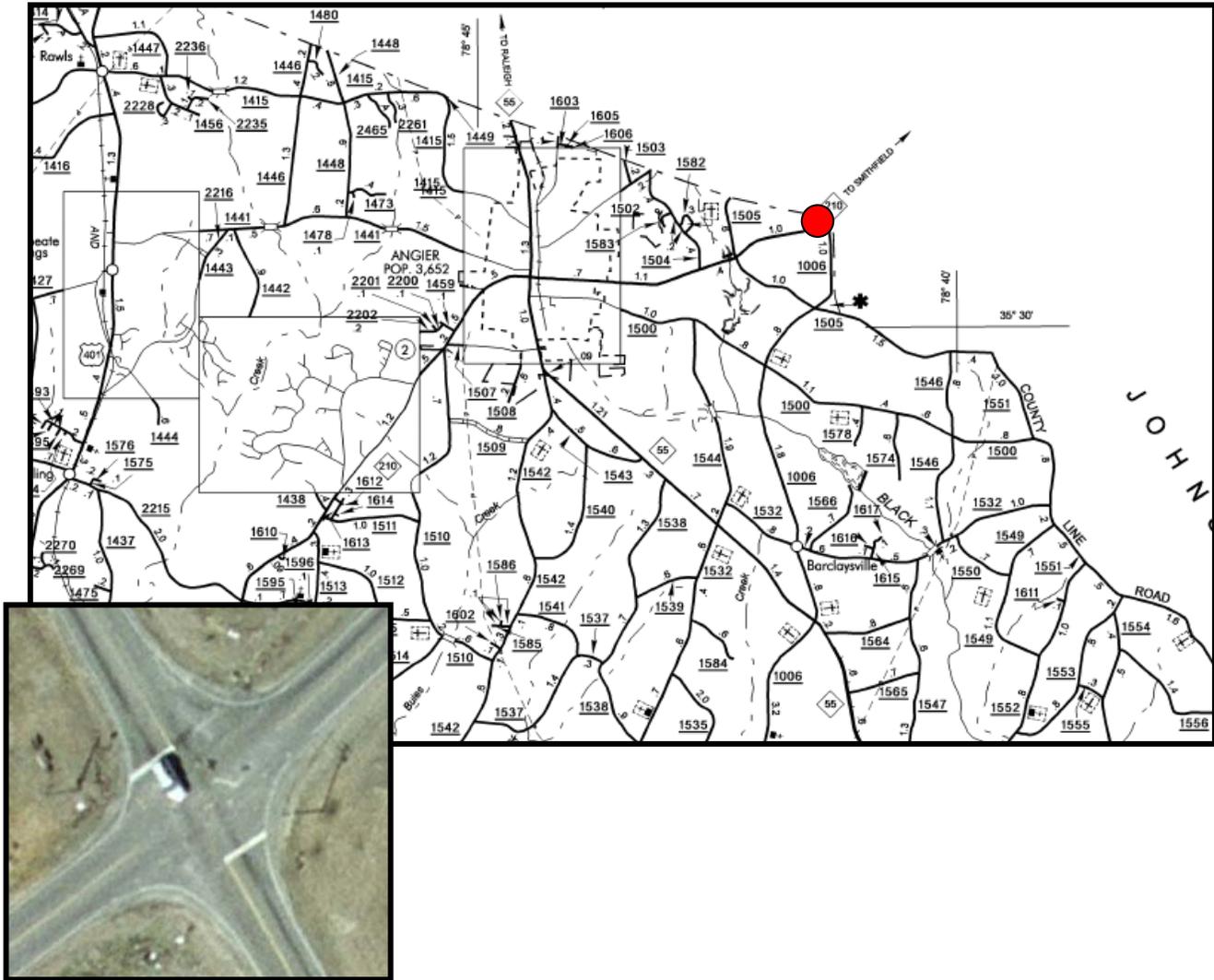
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 06-02-224 – The intersection of SR 1006 (Old Stage Rd) and NC 210 in Harnett County.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was to remove a portion of the raised grade on NC 210 in order to improve sight distance for motorists on SR 1006. After reviewing crash reports at the intersection, it appears that left turn lanes were constructed on NC 210 at the same time as this project.

The subject location is a four-leg intersection which is controlled by stop signs on SR 1006 in addition to a flasher. The speed limit is 55 mph for all approaches. Prior to the project all approaches to the intersection were single lane.

The original statement of problem was that was that the grade on SR 1006 was lower than the grade on NC 210, causing vehicles approaching the intersection to have limited sight distance.

The initial crash analysis was conducted from June 1, 1999 to May 31, 2002 with a total of 14 reported crashes, eight of which were considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on December 4, 2006 with a total cost of \$176,000.00.

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 October 1, 2006 to December 31, 2006. The before period consisted of reported crashes from December 1, 2002 through September 30, 2006 (3 years and 10 months) and the after period consisted of reported crashes from January 1, 2007 through October 31, 2010 (3 years and 10 months). 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 crashes that involved vehicles entering the intersection from SR 1006 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	27	19	-29.6
Total Severity Index	7.64	6.06	-20.7
Target Crashes			
Target Crashes	20	16	-20.0
Target Severity Index	9.6	6.55	-31.8
Volume			
Volume	8,300	8,400	1.2
<u>Target Crash Severity Summary</u>			
Fatal Crashes	0	0	N/A
Class A Crashes	1	0	-100.0
Class B Crashes	6	4	-33.3
Class C Crashes	7	8	14.3
PDO Crashes	6	4	-33.3

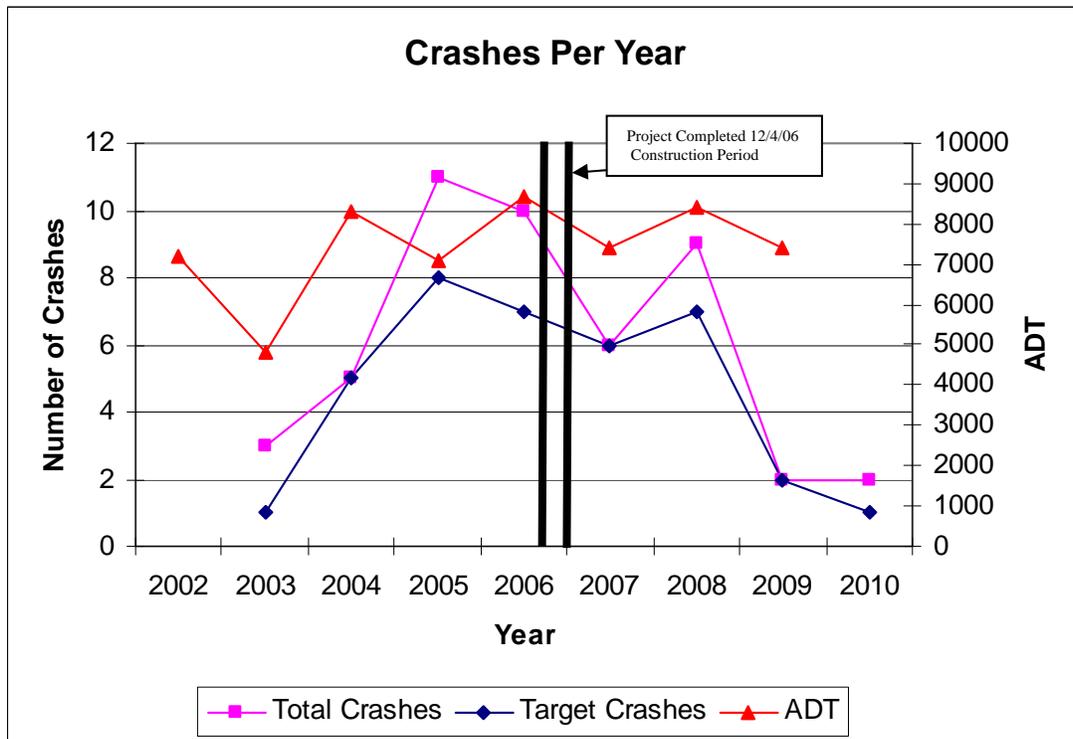
The naive before and after analysis at the treatment location resulted in a 30 percent decrease in Total Crashes, a 20 percent decrease in Target Crashes, and a 1 percent increase in Average Daily Traffic (ADT). The before period ADT year was 2003 and the after period ADT year was 2008.

Results and Discussion

The calculated benefit to cost ratio for this project is 6.56 considering total crashes. The benefit to cost ratio considering only target crashes is 6.73. 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.

The sight distance improvements at the intersection appear to have helped to reduce Frontal Impact Crashes at the subject location, although there are still Target Crash patterns at the intersection in the after period. The majority of Target Crashes in the after period (13 of 16) involved vehicles entering the intersection from the northwest leg of SR 1006. In the majority of these crashes it appears that the at-fault vehicle first stopped at the stop sign before pulling out. Crash #19 was the only crash where it was obvious that a vehicle failed to first come to a stop.

The following chart depicts the crash trends at the intersection. The number of Total and Target Crashes per year are plotted in the before and after period, along with the ADT. Crash numbers from 2002 are not plotted since this analysis only included one month of the year. Crash numbers from 2010 include only the first 10 months of the year.



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: SR 1006 at NC 210
 COUNTY: Harnett
 FILE NO.: SS 06-02-224

BY: bdr
 DATE: 2/8/2011

DETAILED COST: TYPE IMPROVEMENT - Sight Distance

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
Right-of-Way	\$176,000	10	0.149	\$26,229
	\$0	0	0.000	\$0
TOTALS	\$176,000	10	0.149	\$26,229

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$0
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$26,229
 TOTAL COST OF PROJECT= \$176,000

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	3.83	1	0.26	14	3.66	12	3.13	\$251,070
AFTER	3.83	0	0.00	13	3.39	6	1.57	\$74,621

Annual Benefits from Crash Cost Savings \$176,449

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$150,220

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 6.73

TOTAL COST OF PROJECT - \$176,000 COMPREHENSIVE B/C RATIO - 6.73

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1006 at NC 210
 COUNTY: Harnett
 FILE NO.: SS 06-02-224 Target Crashes

BY: bdr
 DATE: 2/8/2011

DETAILED COST: TYPE IMPROVEMENT - Sight Distance

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
Right-of-Way	\$176,000	10	0.149	\$26,229
	\$0	0	0.000	\$0
TOTALS	\$176,000	10	0.149	\$26,229

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$0
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$26,229
 TOTAL COST OF PROJECT= \$176,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES						ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	
BEFORE	3.83	1	0.26	13	3.39	6	1.57	\$239,112
AFTER	3.83	0	0.00	12	3.13	4	1.04	\$67,154

Annual Benefits from Crash Cost Savings \$171,958

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$145,729

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 6.56

TOTAL COST OF PROJECT - \$176,000 COMPREHENSIVE B/C RATIO - 6.56

Treatment Site Photos from Google Street-View



Looking northwest on SR 1006 (Old Stage Rd)



Looking southeast on SR 1006 (Old Stage Rd)



Looking northeast on NC 210



Looking southwest on NC 210

SS# 06-02-224
 Order# 41000010353
 Harnett County
 BEFORE Period
 12/1/2002-9/30/2006

ADT (Year)
 3100 (2004)

SR 1006
 (Old Stage)
 55 mph

NC 210
 55 mph

ADT (Year)
 5200 (2004)

NC 210
 55 mph

ADT (Year)
 5200 (2004)

ADT (Year)
 3100 (2004)

SR 1006
 (Old Stage)
 55 mph

LEGEND

MOVING VEHICLE	↓	ANGLE	→	9 MPH OR LESS	P	PEDESTRIAN
PEDESTRIAN	→		→	10 MPH TO 19	T	TRAIN
PARKED VEHICLE	↙	TURNING	↘	20 MPH TO 29	*	DRIVER AT FAULT
PARKING VEHICLE	↔	BACKING	↔	30 MPH TO 39	D	DRY
FIXED OBJECT	↔	SIDESWIPE	↔	40 MPH TO 49	W	WET
HEAD ON	↔	OUT OF CONTROL	↔	50 MPH TO 59	I	ICY OR SNOWY
REAR END	↔	INJURY	↔	60 MPH TO 69	O	ONLY
RAN OFF ROAD	↔	FATALITY	↔	70 AND UP		
			↔	SPEED UNKNOWN		



⊕ Target Crashes

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

TRAFFIC SAFETY UNIT

Date: December 2010

Prepared By: bdr

SS# 06-02-224
 Order# 41000010353
 Harnett County
 AFTER Period
 1/1/2007-10/31/2010

LEGEND

MOVING VEHICLE	ANGLE	9 MPH OR LESS	P PEDESTRIAN
PARKED VEHICLE	TURNING	10 MPH TO 19	T TRAIN
PARKING VEHICLE	BACKING	20 MPH TO 29	* DRIVER AT FAULT
FIXED OBJECT	SIDESWIPE	30 MPH TO 39	D DRY
RAN OFF ROAD	OUT OF CONTROL	40 MPH TO 49	W WET
	INJURY	50 MPH TO 59	I ICY OR SNOWY
	FATALITY	60 MPH TO 69	O OILY
		70 AND UP	
		SPEED UNKNOWN	

ADT (Year)
2700 (2008)

SR 1006
(Old Stage)
55 mph

NC 210
55 mph

ADT (Year)
5700 (2008)

NC 210
55 mph

ADT (Year)
5700 (2008)

SR 1006
(Old Stage)
55 mph

ADT (Year)
2700 (2008)

⊕ Target Crashes

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TRAFFIC SAFETY UNIT

Date: December 2010

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