

Spot Safety Project Evaluation

Order # 41000010657

Spot Safety Projects # 02-07-204 & 02-07-205

**Spot Safety Project Evaluation of the Paved Shoulders Installation
NC 58 (Trenton Highway) from Jones County Line to US 70
Lenoir County, South of Kinston**

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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2-29-2012

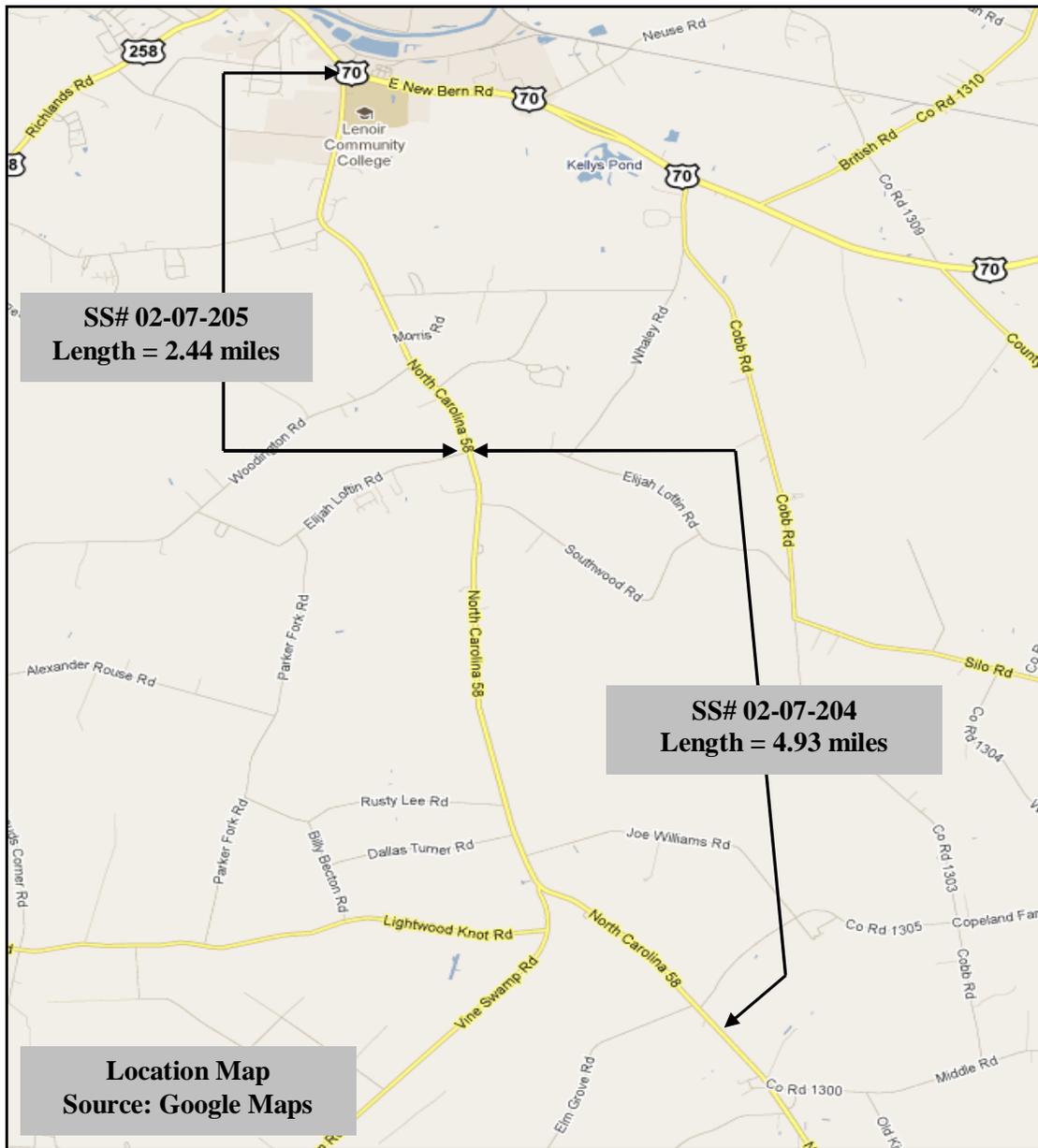
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of two conjoint Spot Safety Projects; 02-07-204 and 02-07-205, located along NC 58 (Trenton Highway) from Jones County Line to US 70 (New Bern Road) in Lenoir County, South of the City of Kinston. The study consists of SS# 02-07-204 from Jones County Line (MP-0.00) to SR 1929 (MP-4.93) and SS# 02-07-205 from SR 1929 (MP-4.93) to US-70 (MP 7.37).



Segment Photographs



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for these two subject segments were the installation of paved shoulders along both sides of the route. NC 58 (Trenton Highway) is a two-lane, two-way facility that is fairly level with several horizontal curves. The roadway has a flat terrain with a speed limit of 55-mph along most of the strip; with a 50-mph speed limit around Lenoir Community College near US 70. There are two short 3-lane segments around Lenoir Community College and Southwood Elementary School. The segments have an abundant of intersections and private driveways with the only traffic signal within the corridor located at the US-70 intersection.

The original statement of problem stated that the lack of paved shoulders has resulted in numerous run-off roadway and other loss of control type crashes. The purpose of this countermeasure will provide motorists additional space to correct their vehicles and maintain their lane of travel.

Both initial crash analyses were completed from January 1, 2002 to December 31, 2006. SS# 02-07-204 presented 88 crashes with a 15.24 crash rate over the 4.93 miles; while SS# 02-07-205 presented 63 crashes with an 11.34 crash rate over the 2.44 mile segment. The final completion date for the improvement at the subject intersection was on October 23, 2007 with a total cost of \$425,000 each (funding was split between Spot Safety Funds and Division Funds).

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 were the months of August through October 2007. The before period consisted of reported crashes from June 1, 2003 through July 31, 2006 (4 years and 2 months); and the after period consisted of reported crashes from November 1, 2007 through December 31, 2011 (4 years and 2 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 along the segment of NC 58 (MP 0.00 – 7.37) with a zero (0) foot y-line. *Please see attached location map and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Lane Departure Crashes were the target crashes for the applied countermeasures. The Lane Departure Crash types considered are as follows: Fixed Object; Head-On; Moveable Object; Overturn/Rollover; Parked Motor Vehicle; Ran-Off Road (Left, Right, Straight); and Sideswipe-Opposite Direction.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	130	151	16.2 %
Total Severity Index	6.46	5.36	- 17.0 %
Target Crashes – Lane Departure	56	58	3.6 %
Target Crash Severity Index	4.17	7.86	88.5 %
Lane Departure – Wet Road Crashes	20	30	50.0 %
LD-Wet Crash Severity Index	3.22	8.77	172.4 %
Volume (2006, 2009)	6,100	5,600	- 8.2 %

<u>Additional Information</u>	Before	After	Percent Reduction (-)/ Percent Increase (+)
Injuries			
Fatal Injury Crashes	2	2	0.0 %
Class-A Injury Crashes	2	2	0.0 %
Class-B Injury Crashes	23	12	- 47.8 %
Class-C Injury Crashes	32	36	12.5 %
Property Damage Only Crashes	71	99	39.4 %
Contributing Factors			
Total Night Crashes	45	53	17.8 %
Total Animal Crashes	24	45	87.5 %
Total Wet Road Crashes	34	39	14.7 %
Total Alcohol Related Crashes	3	7	133.3 %
Lane Departure Crash Types			
Fixed Object	41	45	9.8 %
Head-On	2	1	- 50.0 %
Overturn / Rollover	5	4	- 20.0 %
Ran Off Road (Left)	3	5	66.7 %
Ran Off Road (Right)	4	2	- 50.0 %
Ran Off Road (Straight)	0	1	100.0 %
Sideswipe, Opposite Direction	1	0	- 100.0 %

The naive before and after analysis at the treatment location resulted in a 16 percent increase in Total Crashes, a 4 percent increase in Target Crashes, and a 17 percent decrease in the Total Severity Index. The before period ADT year was 2006 and the after period ADT year was 2009.

Results and Discussion

Referencing the Overall Charts above and the *GIS Collision Diagrams*, the study corridor experienced a total crash increase by 16 percent but a 17 percent reduction in the severity index. The overall corridor however experienced the same number of severe injury crashes (Fatal and A-injuries) in the before and after periods with four (4) collisions in each.

Further analysis of the data charts highlight that lane departure collisions were nearly equal but wet road lane departures increased by 50 percent. The target crash severity index also rose by 89 percent due to three (3) of the four (4) after period severe injury collisions being of a lane departure nature. The three (3) are listed below:

After Period Fatal 1 (102447885) – Driver crossed centerline striking oncoming vehicle head-on, dry roadway conditions.

After Period A-injury 1 (102554467) – Vehicle ran-off road right under wet road conditions on a straight road segment, driver ejected due to not wearing seatbelt.

After Period Fatal 2 (102557721) – Vehicle ran-off road right under wet road conditions in a curve portion, vehicle struck a tree.

Other contributing crash factors that also experienced throughout the study included an 18 percent increase in night crashes, an 87.5 percent increase in animal collisions, and a 133 percent increase in alcohol related incidents.

The calculated benefit to cost ratio for this project is **0.06 considering total crashes**. The benefit to cost ratio **considering only target crashes is (-5.27)**. 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 note the following *Segment Photographs*. Photos are provided from Google Maps 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 countermeasure.

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

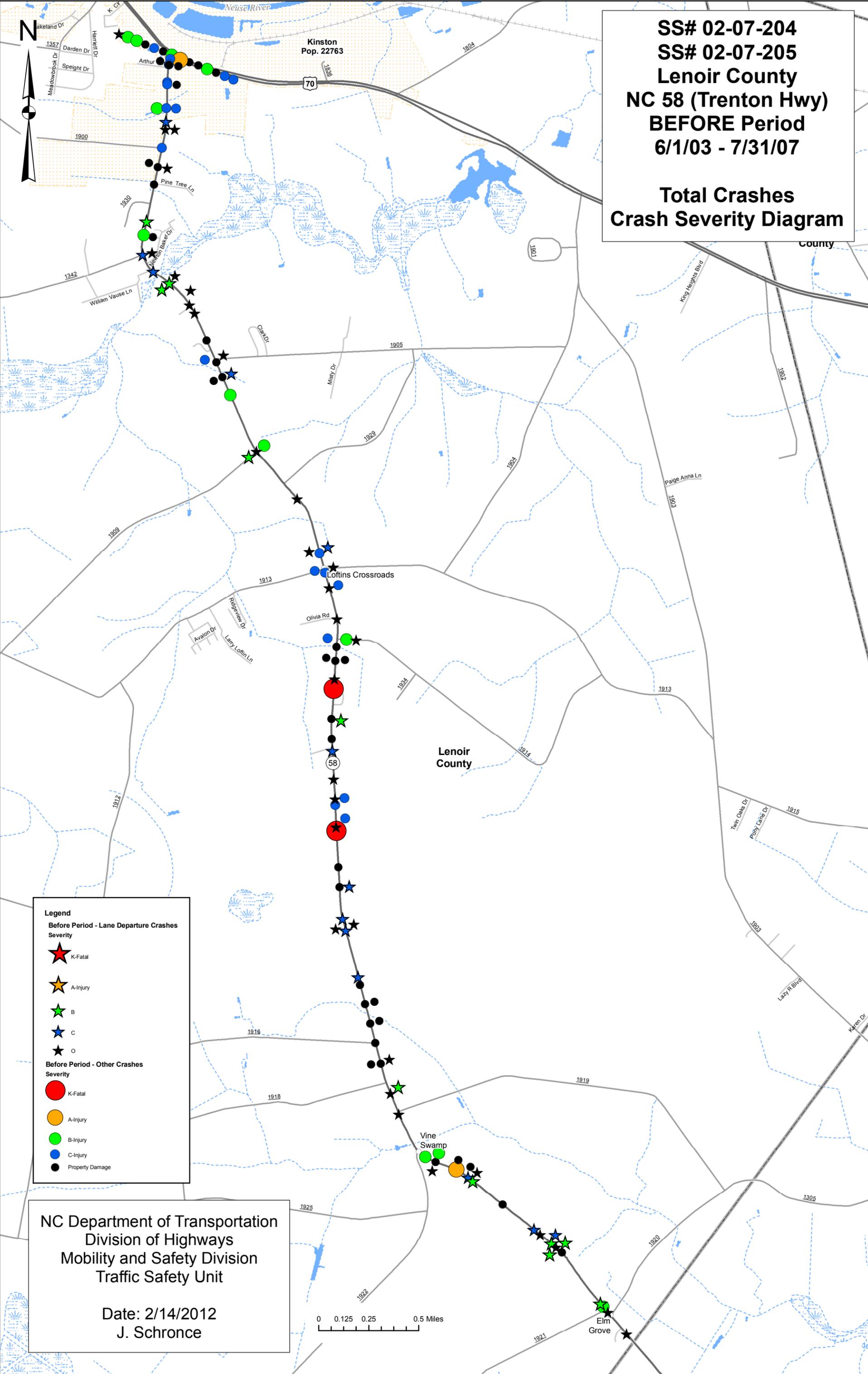
LOCATION: NC 58 - Lenoir County		BY: JBS							
COUNTY: Lenoir		DATE: 5/5/2011							
FILE NO.: SS 02-07-204 & 02-07-205									
DETAILED COST:	TYPE IMPROVEMENT - Paved Shoulders								
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
	Construction	\$850,000	20	0.102	\$86,574				
	Right-of-Way	\$0	0	0.000	\$0				
	TOTALS	\$850,000	20	0.102	\$86,574				
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				(\$1,474)				
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0				
	TOTAL ANNUAL COST=				\$85,100				
	TOTAL COST OF PROJECT=				\$850,000				
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	4.17	4	0.96	55	13.19	71	17.03	\$941,319	
AFTER	4.17	4	0.96	48	11.51	99	23.74	\$936,619	
						Annual Benefits from Crash Cost Savings		\$4,700	
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	(\$80,400)			
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	0.06			
	TOTAL COST OF PROJECT	-	\$850,000	COMPREHENSIVE B/C RATIO	-	0.06			

BENEFIT-COST ANALYSIS WORKSHEET - Lane Departure Crashes

LOCATION: NC 58 - Lenoir County		BY: JBS							
COUNTY: Lenoir		DATE: 5/5/2011							
FILE NO.: SS 02-07-204 & 02-07-205									
DETAILED COST:	TYPE IMPROVEMENT - Paved Shoulders								
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
	Construction	\$850,000	20	0.102	\$86,574				
	Right-of-Way	\$0	0	0.000	\$0				
	TOTALS	\$850,000	20	0.102	\$86,574				
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				(\$1,474)				
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0				
	TOTAL ANNUAL COST=				\$85,100				
	TOTAL COST OF PROJECT=				\$850,000				
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	4.17	0	0.00	24	5.76	32	7.67	\$148,106	
AFTER	4.17	3	0.72	23	5.52	32	7.67	\$596,547	
						Annual Benefits from Crash Cost Savings		(\$448,441)	
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	(\$533,542)			
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	-5.27			
	TOTAL COST OF PROJECT	-	\$850,000	COMPREHENSIVE B/C RATIO	-	-5.27			

SS# 02-07-204
SS# 02-07-205
Lenoir County
NC 58 (Trenton Hwy)
BEFORE Period
6/1/03 - 7/31/07

Total Crashes
Crash Severity Diagram



Legend

Before Period - Lane Departure Crashes
Severity

- ★ K-Fatal
- ★ A-Injury
- ★ B
- ★ C
- ★ O

Before Period - Other Crashes
Severity

- K-Fatal
- A-Injury
- B-Injury
- C-Injury
- Property Damage

NC Department of Transportation
 Division of Highways
 Mobility and Safety Division
 Traffic Safety Unit

Date: 2/14/2012
 J. Schronce



**SS# 02-07-204
 SS# 02-07-205
 Lenoir County
 NC 58 (Trenton Hwy)
 AFTER Period
 11/1/07 - 12/31/11**

**Total Crashes
 Crash Severity Diagram**

After Period Countermeasure
 Construct Paved
 Shoulders both sides

Total Section Length = 7.36 Miles

Legend

After Period - Lane Departure Crashes
 Severity

- K-Fatal
- A-Injury
- B-Injury
- C-Injury
- Property Damage

After Period - Other Crashes
 Severity

- K-Fatal
- A-Injury
- B-Injury
- C-Injury
- Property Damage

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