

# Spot Safety Project Evaluation

Order # 41000010631

Spot Safety Project # 06-05-206

## Spot Safety Project Evaluation of the Shoulder Widening NC 27 between SR 2105 and SR 1210 (Hoover Road) 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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Jason B. Schronce

6-23-2011

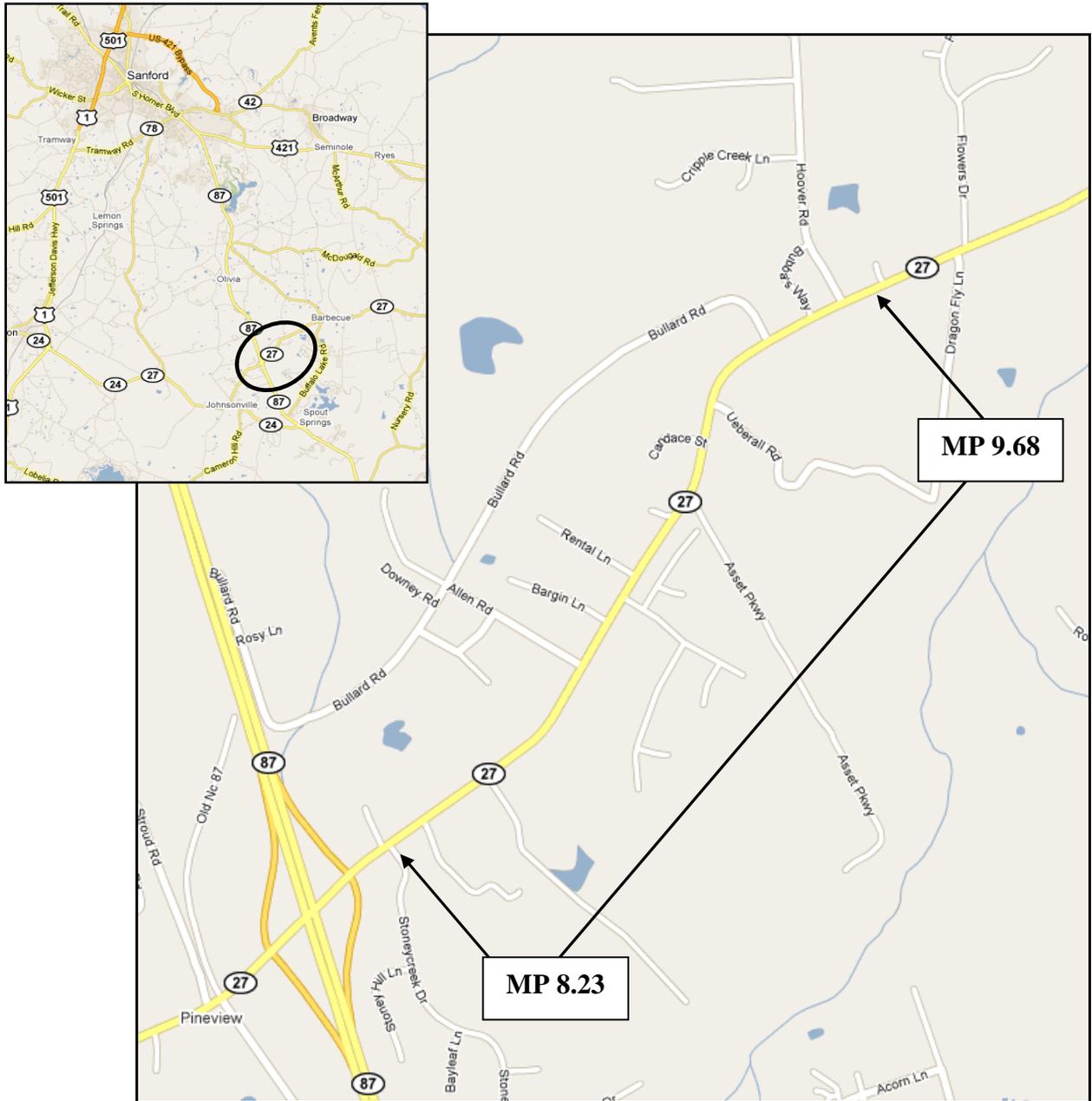
Date

Traffic Safety Project Engineer

# Spot Safety Project Evaluation Documentation

## Subject Location

Evaluation of Spot Safety Project Number 06-05-206 located along the segment of NC 27 from the intersection of SR 2105 (Stoneycreek Drive) to 0.1 mile northeast of the intersection of SR 1210 (Hoover Road) in Harnett County, Community of Pineview. The milepost study limits are from 8.23 (SR 2105) to 9.68 (0.1 mile NE of SR 1210); total segment length is 1.45 miles



**Location Photographs (provided by Google Street View)**



**Traveling North / Northeast on NC 27 near Allen Road**



**Traveling North / Northeast on NC 27 near Ueberall Road**

## Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the shoulder improvement by widening on both sides of NC 27. This segment of NC 27 is a two-lane roadway with a number of curves, narrow lanes, and numerous pavement edge drop-offs. The speed limit is 55-mph with a sand/silt soil shoulder material.

The original statement of problem was the existence of a ran-off roadway crash problem where motorists were leaving the roadway, over-correcting, and losing control of their vehicles. This location was identified through the 2003 Highway Safety Improvement Program (HSIP) under number 42S00010. This segment met warrant S-2 criteria with 88% of the 16 reported crashes consisting of ran-off roadway in the 3 year crash study.

The initial crash analysis was completed from March 1, 2000 to February 28, 2005 with twenty-four (24) reported ran-off road crashes. The final completion date for the improvement at the subject roadway section was on December 11, 2007 with a total cost of \$102,000.

## 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 October through November 2007. The before period consisted of reported crashes from October 1, 2004 through September 30, 2007 (3 years); and the after period consisted of reported crashes from December 1, 2007 through November 30, 2010 (3 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 the study limit mileposts (8.23 – 9.68) 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 countermeasure. The Lane Departure Crash types considered are as follows: Fixed Object; Head-On; Overturn / Rollover; Ran-off Roadway (Left / Right); and Sideswipe – Opposite Direction.

<b><u>Treatment Information</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total Crashes	17	14	- 17.6 %
Total Severity Index	13.40	9.59	- 28.4 %
Target Crashes – Lane Departure	9	10	11.1 %
Target Crash Severity Index	5.11	11.25	120.2 %
Volume (2006, 2009)	3,500	4,700	34.3 %

<b><u>Additional Information</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-)/ Percent Increase (+)</b>
<b>Injuries</b>			
Fatal Injury Crashes	0	1	100.0 %
Class-A Injury Crashes	2	0	- 100.0 %
Class-B Injury Crashes	4	3	- 25.0 %
Class-C Injury Crashes	4	3	- 25.0 %
Property Damage Only Crashes	7	7	0.0 %
<b>Contributing Factors</b>			
Total Night Crashes	5	7	40.0 %
Total Wet Road Crashes	3	0	- 100.0 %
Total Alcohol Related Crashes	1	1	0.0 %
<b>Lane Departure Crash Types</b>			
Fixed Object	7	8	14.3 %
Overturn / Rollover	1	1	0.0 %
Ran Off Road (Right)	0	1	100.0 %
Sideswipe, Opposite Direction	1	1	0.0 %

The naive before and after analysis at the treatment location resulted in an 18 percent decrease in Total Crashes, a 11 percent increase in Target Crashes, but a 28 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 Tables above and the *Collision GIS Diagrams*, both periods indicate similar lane departure crash patterns in the “s-curve” roadway section between Asset Parkway and Bullard Road. A separate collision diagram has been provided to compare this segment through the study. The tables show a 17 percent decrease in total crashes but an 11 percent increase in lane departure collisions through the evaluation. The before period saw seven (7) run-off road right crashes and two (2) run-off left crashes; while the after period experienced (7) run-off road right crashes, two (2) run-off left crashes, and one (1) sideswipe opposite direction crash.

The two (2) A-injury crashes in the before period both occurred at the intersection of NC 27 with SR 1210 (Hoover Road). These collisions were a motorcycle left turn same road crash and a left turn different roadway vehicle pulling out of SR 1210. Neither collision was correctable by the countermeasure chosen.

There was one (1) fatal lane departure crash during the after period. This motorist ran-off the roadway right, overcorrected, crossed the road left and struck a tree. There were no immediate recommendations based off the fatal investigation report; however the NCDOT planned to monitor the reverse curve section where the crash occurred to see if that pattern continues along this roadway segment.

The calculated benefit to cost ratio for this project is **22.14 considering total crashes**. The benefit to cost ratio **considering only target crashes is (-20.96)**. 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.

Photos are provided from Google Street View for two different locations along the treatment section. 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 improvement.

**BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes**

LOCATION: NC 27: 8.23 - 9.68		BY: JBS						
COUNTY: Harnett		DATE: 4/5/2011						
FILE NO.: SS 06-05-206								
DETAILED COST:	TYPE IMPROVEMENT -	Paved Shoulder Improvements						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$102,000	20	0.102	\$10,389			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$102,000	20	0.102	\$10,389			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				(\$300)			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$10,089			
	TOTAL COST OF PROJECT=				\$102,000			
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	3.00	2	0.67	8	2.67	7	2.33	\$483,367
AFTER	3.00	1	0.33	6	2.00	7	2.33	\$260,033
							Annual Benefits from Crash Cost Savings	\$223,333
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	\$213,244		
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	22.14		
	TOTAL COST OF PROJECT	-	\$102,000	COMPREHENSIVE B/C RATIO	-	22.14		

**BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes**

LOCATION: NC 27: 8.23 - 9.68		BY: JBS						
COUNTY: Harnett		DATE: 4/5/2011						
FILE NO.: SS 06-05-206		Lane Departure Crashes Only						
DETAILED COST:	TYPE IMPROVEMENT -	Paved Shoulder Improvements						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$102,000	20	0.102	\$10,389			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$102,000	20	0.102	\$10,389			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				(\$300)			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$10,089			
	TOTAL COST OF PROJECT=				\$102,000			
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	3.00	0	0.00	5	1.67	4	1.33	\$39,067
AFTER	3.00	1	0.33	5	1.67	5	1.67	\$250,500
							Annual Benefits from Crash Cost Savings	(\$211,433)
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	(\$221,522)		
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	-20.96		
	TOTAL COST OF PROJECT	-	\$102,000	COMPREHENSIVE B/C RATIO	-	-20.96		

**SS# 06-05-206**  
**Harnett County**  
**NC 27**  
**MP: 8.23-9.68**  
**BEFORE Period**  
**10/1/04 - 9/30/07**

**Total Crashes**  
**Crash Severity Diagram**



Harnett County

0 0.035 0.07 0.14 Miles

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

Date: 4/5/2011  
 J. Schronce

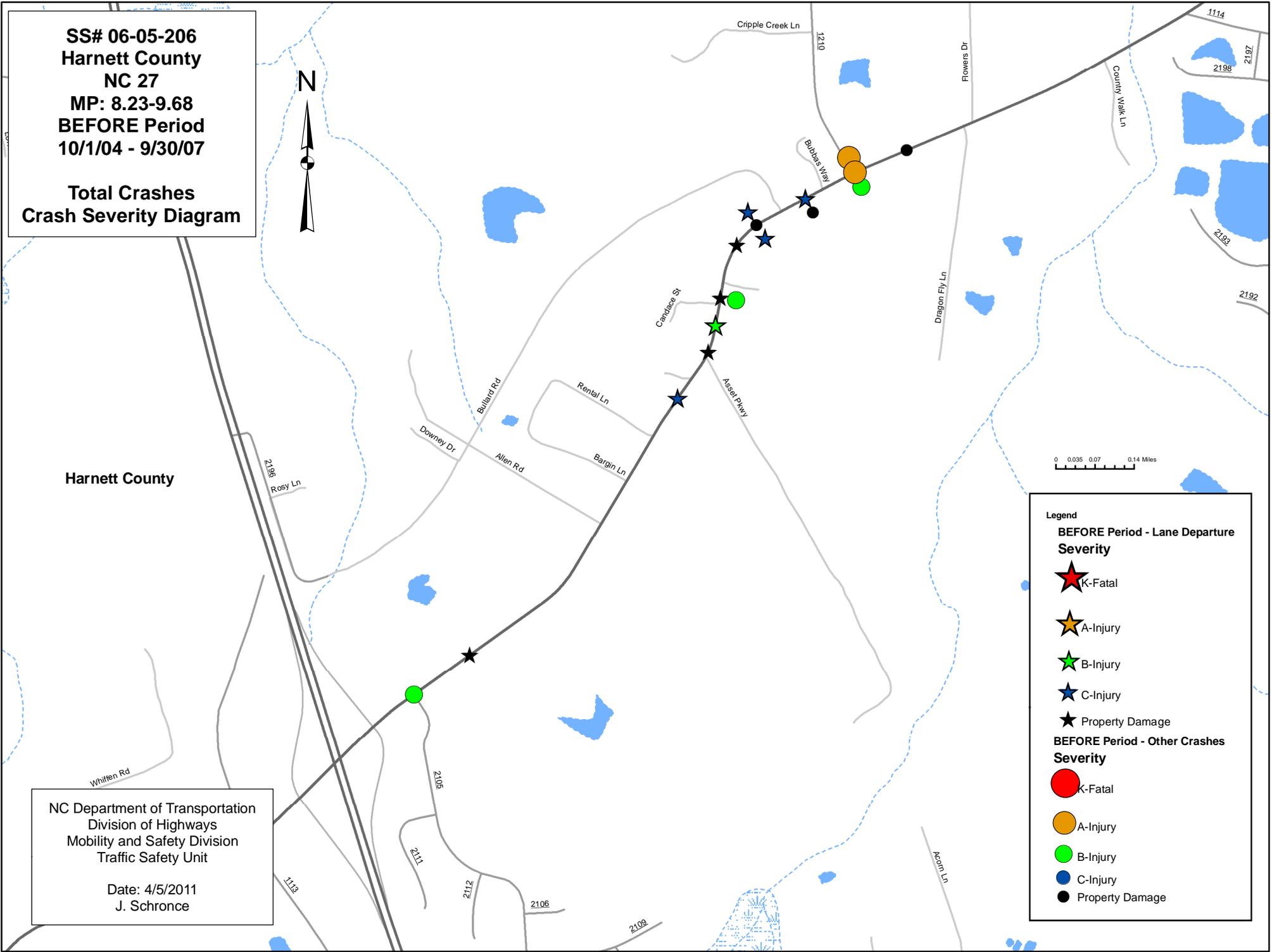
**Legend**

**BEFORE Period - Lane Departure Severity**

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

**BEFORE Period - Other Crashes Severity**

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



**SS# 06-05-206**  
**Harnett County**  
**NC 27**  
**MP: 8.23-9.68**  
**AFTER Period**  
**12/1/07 - 11/30/10**

**Total Crashes**  
**Crash Severity Diagram**

After Period Countermeasure  
 Widen or Improve  
 Paved Shoulders

Section Length = 1.57 Miles

Harnett County

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

Date: 4/5/2011  
 J. Schronce



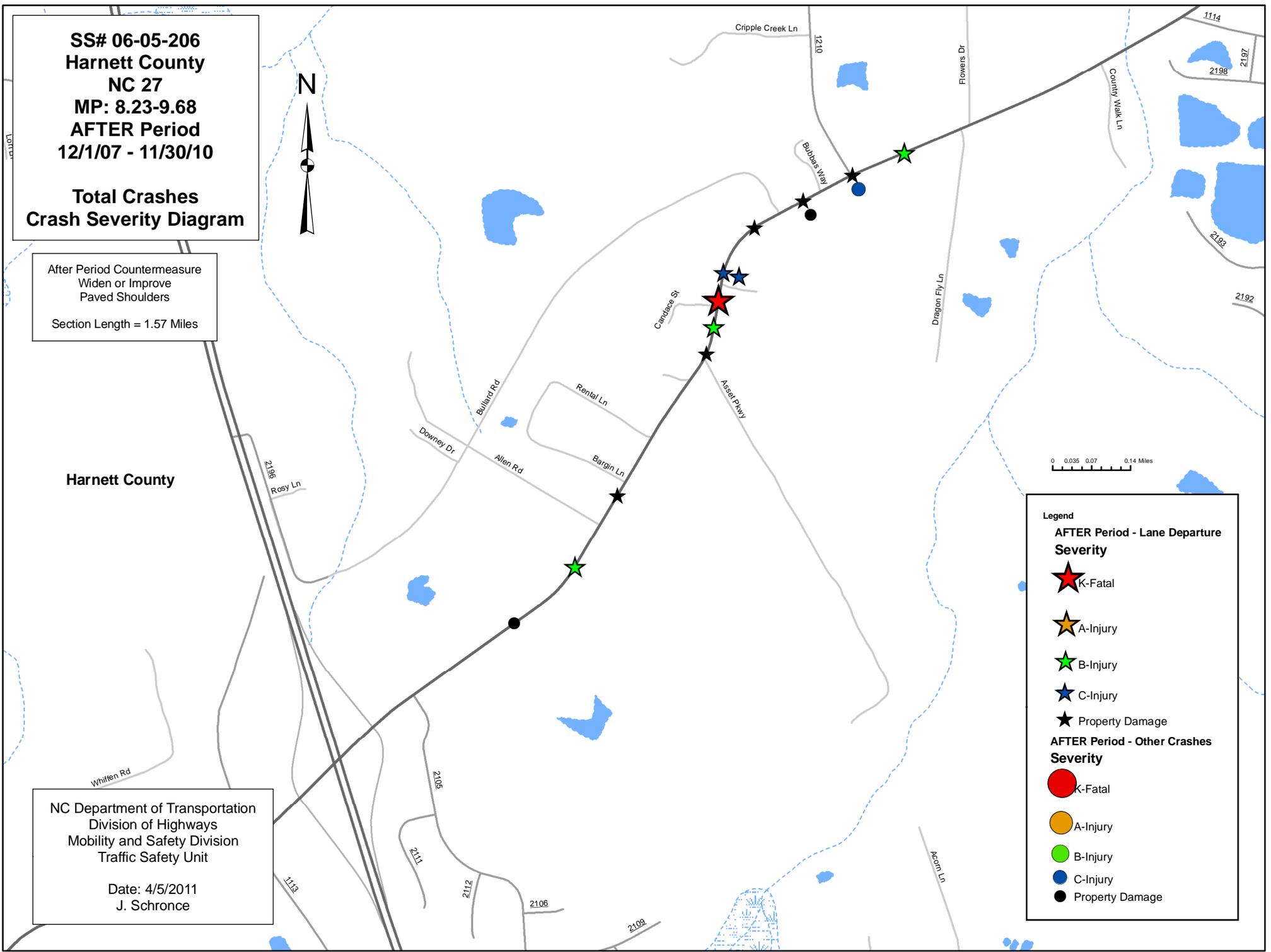
**Legend**

**AFTER Period - Lane Departure Severity**

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

**AFTER Period - Other Crashes Severity**

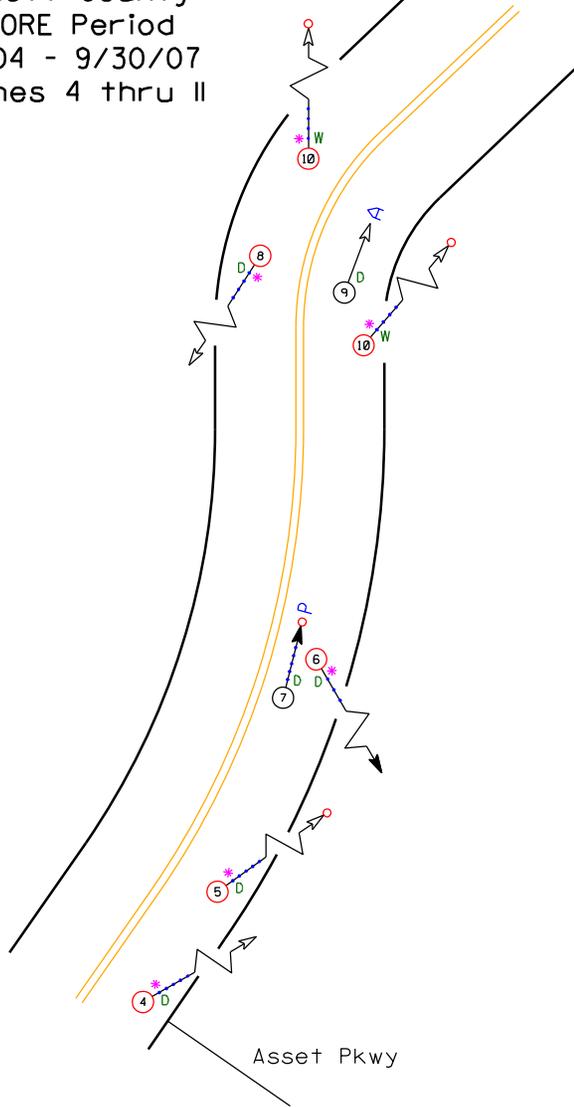
- K-Fatal
- A-Injury
- B-Injury
- C-Injury
- Property Damage





SS# 06-05-206  
 Harnett County  
 BEFORE Period  
 10/1/04 - 9/30/07  
 Crashes 4 thru 11

SR 2196  
 Bullard Rd

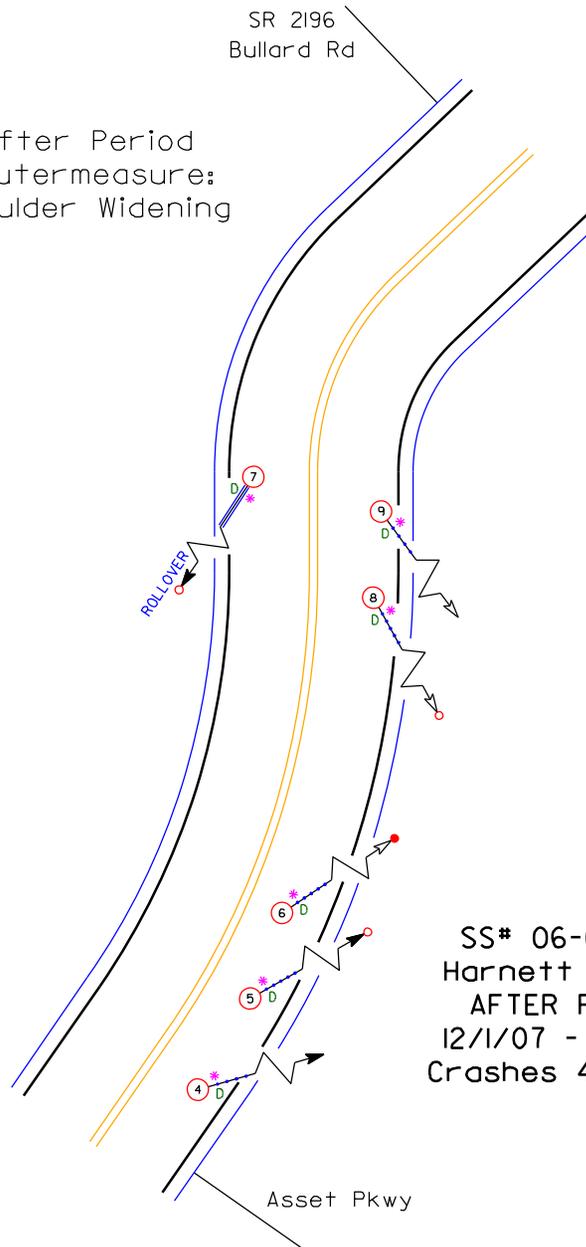


Asset Pkwy

**LEGEND**

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PARKING VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	FIXED OBJECT		SIDEWIPER		30 MPH TO 39		DRY
	HEAD ON		OUT OF CONTROL		40 MPH TO 49		WET
	REAR END		HURRY		50 MPH TO 59		ICY OR SNOWY
	RAN OFF ROAD		FATALITY		60 MPH TO 69		SPEED UNKNOWN

After Period  
 Coutermeasure:  
 Shoulder Widening



SS# 06-05-206  
 Harnett County  
 AFTER Period  
 12/1/07 - 11/30/10  
 Crashes 4 thru 9

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

**TRAFFIC SAFETY UNIT**

Date: 6-23-2011

Prepared By: J. Schronce

Lane Departure  
 Target Crashes