

Spot Safety Project Evaluation

Order # 41000010450

Spot Safety Project # 03-04-212

Spot Safety Project Evaluation of the Paved Shoulders and Spiral Widening Installation through Curves SR 1105 (Haws Run Road) from NC 50 to NC 53 Onslow 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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6-16-2011

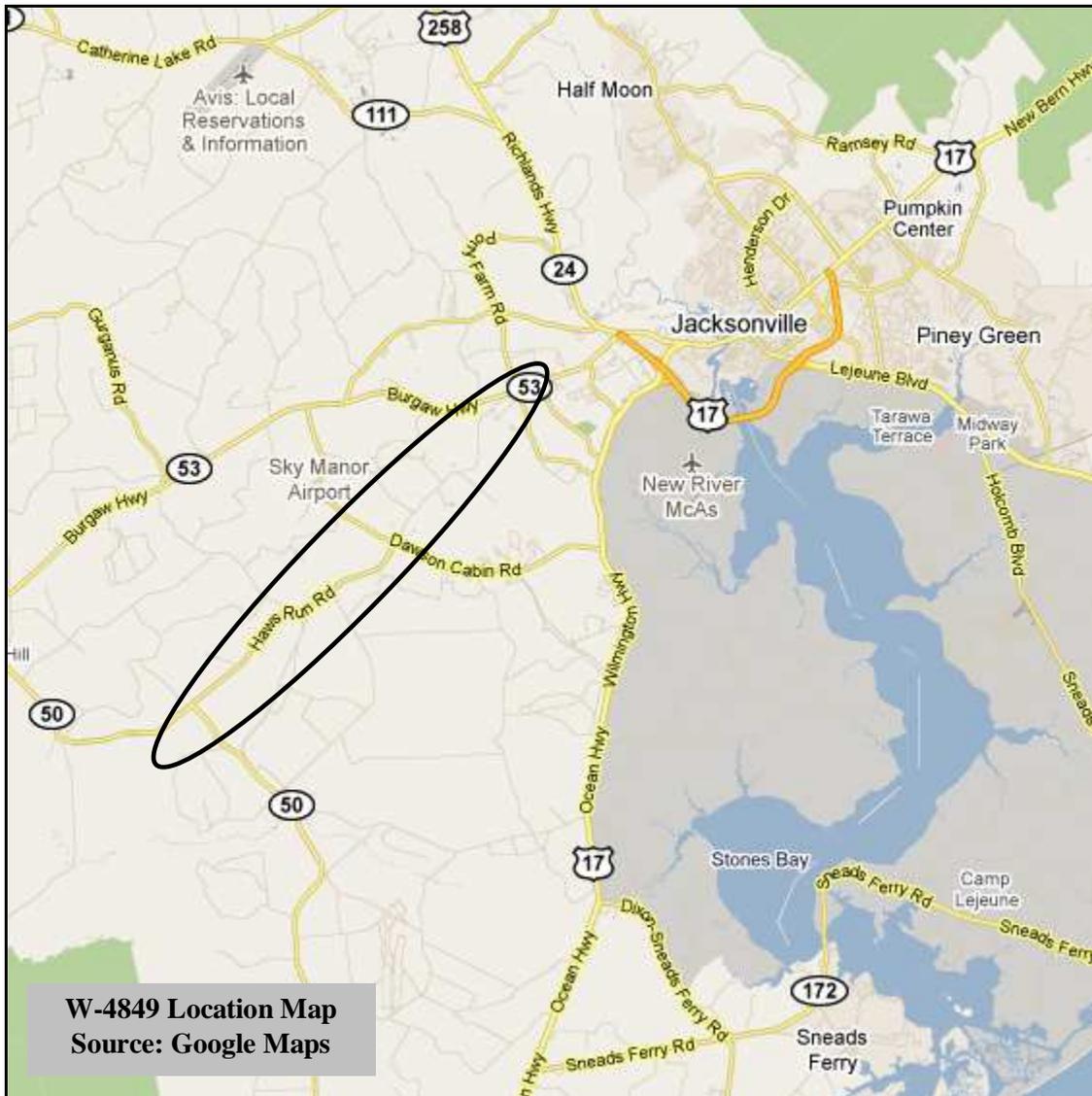
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 03-04-212 located along the entire roadway of SR 1105 (Haws Run Road) from NC 50 to NC 53 (Burgaw Highway) in Onslow County, East of Camp Lejeune and the City of Jacksonville. The study consists of the full Haws Run Road's 9.80 miles.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of spiral widening in the curves and installing paved shoulders in specific portions of the route as recommended in the road safety audit. SR 1105 (Haws Run Road) is a two-lane, two-way facility that is fairly level with several horizontal curves. The roadway has a flat terrain, approximately eight (8) foot grass shoulders, and a posted speed limit of 45 mph. There are an abundant of intersections and private driveways but no traffic signals within the corridor.

The original statement of problem stated that this route had a fatal crash rate that was considerably higher than the statewide average; which made it a prime candidate for a Road Safety Review Audit. It was discovered that many portions of this corridor have a non-traversable ditch immediately beyond the soil shoulders and many driveway headwalls which prevent vehicles from taking proper corrective measures when leaving the roadway.

The Road Safety Review Audit was conducted the NCDOT Traffic Safety Unit on August 13, 2004. The RSA stated that this route had a crash history of seven (7) fatal crashes with eleven (11) individual deaths and nineteen (19) A-injury collisions from September 1991 through August 2003. The RSA Committee recommended specific roadway site improvements that are addressed with this Spot Safety Project.

The initial crash analysis was completed from April 1, 2000 to April 1, 2005 with 45 reported crashes, 33 of which were deemed correctable run-off roadway collisions. The final completion date for the improvement at the subject intersection was on January 30, 2007 with a total cost of \$415,000 (funding was split between Spot Safety Funds and Division Maintenance 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 December 2006 through January 2007. The before period consisted of reported crashes from February 1, 2003 through November 30, 2006 (3 years and 10 months); and the after period consisted of reported crashes from February 1, 2007 through November 30, 2010 (3 years and 10 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 entire SR 1105 route (MP 0.00 – 9.80) 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, Same Direction).

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	100	125	25.0 %
Total Severity Index	9.21	5.99	- 35.0 %
Target Crashes – Lane Departure	61	58	- 4.9 %
Target Crash Severity Index	11.76	8.65	- 26.4 %
Lane Departure – Wet Road Crashes	12	11	- 8.3 %
LD-Wet Crash Severity Index	4.08	2.35	- 42.4 %
Volume (2004, 2008)	2,400	2,300	- 4.2 %

<u>Additional Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Injuries			
Fatal Injury Crashes	3	2	- 33.3 %
Class-A Injury Crashes	5	3	- 40.0 %
Class-B Injury Crashes	14	11	- 21.4 %
Class-C Injury Crashes	15	22	46.7 %
Property Damage Only Crashes	63	87	38.1 %
Contributing Factors			
Total Night Crashes	49	71	44.9 %
Total Wet Road Crashes	20	19	- 5.0 %
Total Alcohol Related Crashes	8	15	87.5 %
Lane Departure Crash Types			
Fixed Object	45	45	0.0 %
Head-On	0	2	100+ %
Movable Object	1	4	100+ %
Overturn / Rollover	5	0	- 100.0 %
Parked Motor Vehicle	1	1	0.0 %
Ran Off Road (Right)	6	1	- 83.3 %
Ran Off Road (Straight)	1	0	- 100.0%
Sideswipe, Opposite Direction	1	3	100+ %
Sideswipe, Same Direction	1	2	100.0 %

The naive before and after analysis at the treatment location resulted in a 25 percent increase in Total Crashes, a 5 percent decrease in Target Crashes, and a 35 percent decrease in the Total Severity Index. The before period ADT year was 2004 and the after period ADT year was 2008.

Further Curve Analysis

The actual spot safety improvement for this roadway occurred in four specific curve sections along SR 1105 and included adding spiral widening and paved shoulders. These locations included milepost ranges 2.56-3.35, 4.0-5.1, 7.2-8.6, and 8.9-9.1. The following charts separate these locations and *Collision Diagrams* are provided for these individual segments.

<u>Curve Section 1 – MP 2.56-3.35</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	7	8	14.3 %
Target Crashes – Lane Departure	5	5	0.0 %
Severe Injury Crashes (Fatal + A-Injury)	0	1	100.0 %
Moderate Injury Crashes (B + C-Injury)	3	1	- 66.7%
Property Damage Only Crashes	4	6	50.0 %

Curve Section including SR 1106 (William Gurganus Road) and SR 1104 (Padgett Road) Intersections

<u>Curve Section 2 – MP 4.0-5.1</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	8	5	- 37.5 %
Target Crashes – Lane Departure	4	2	- 50.0 %
Severe Injury Crashes (Fatal + A-Injury)	2	0	- 100.0%
Moderate Injury Crashes (B + C-Injury)	1	0	- 100.0 %
Property Damage Only Crashes	5	5	0.0 %

<u>Curve Section 3 – MP 7.2-8.6</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	16	36	125.0 %
Target Crashes – Lane Departure	12	20	66.7 %
Severe Injury Crashes (Fatal + A-Injury)	3	1	- 66.7 %
Moderate Injury Crashes (B + C-Injury)	5	10	100.0 %
Property Damage Only Crashes	8	25	212.5 %

Curve Section including Bridge Number 72

<u>Curve Section 4 – MP 8.9-9.1</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	4	2	- 50.0 %
Target Crashes – Lane Departure	3	1	- 66.7 %
Severe Injury Crashes (Fatal + A-Injury)	1	0	- 100.0 %
Moderate Injury Crashes (B + C-Injury)	1	1	0.0 %
Property Damage Only Crashes	2	1	- 50.0 %

Results and Discussion

Referencing the Overall Charts above and the *GIS Collision Diagrams*, the study corridor experienced a total crash increase by 25 percent but reduction in the severity index. With the reduction of severe injury crashes (fatal and A-injury) reduced from eight (8) to five (5), this location experienced a positive benefit-cost ratio.

Further analysis and highlighting the curve segments indicate how the improvements affected each location differently. Curve Sections 2 and 4 experienced crash reductions and eliminated the three (3) severe injury crashes. However, the crash patterns in Curve 1 seem very consistent and the collisions in Curve Section 3 more than doubled. Examining Curve Section 3's after period collision diagram, 25 percent (5 out of 20 lane departure crashes) occurred under wet roadway conditions.

From the tables above, it was also observed that the night crashes increased by 45 percent in the after period. The following table explains this further; as you can see the increase in night crashes can be attributed to an increase in night animal vehicular strikes and not lane departure type collisions.

<u>Night Crashes on SR 1105</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Night Crashes	49	71	44.9 %
Night Lane Departure Crashes	34	33	- 2.9 %
Night Animal Crashes	10	24	140.0 %

The calculated benefit to cost ratio for this project is **7.26 considering total crashes**. The benefit to cost ratio **considering only target crashes is 7.91**. 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 our field visit in April 2011. 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.

Segment Photographs – SR 1105 (Haws Run Road) – Onslow County – SS# 03-04-212



Typical Roadway Segment



Curve 1 at SR 1106



Curve 1 at SR 1104



Curve 2



Typical Roadway - Headwalls



SR 1107 Intersection – 4 Legs



Curve 3



Curve 3 at Bridge



Curve 4

SS# 03-04-212
Onslow County
SR 1105 (Haws Run Rd)
AFTER Period
2/1/2007 - 11/30/2010

Total Crashes
Crash Severity Diagram

Notes
 Crashes Mileposted to nearest 0.1 mile for visual clarity.
 SR 1105 from NC-50 (0.00) to NC-53 (9.80)

After Period Countermeasure:
 Install Spiral Widening in Curves,
 Install Paved Shoulders in
 specific locations based from
 Road Safety Review Audit

Total Section Length = 9.80 Miles

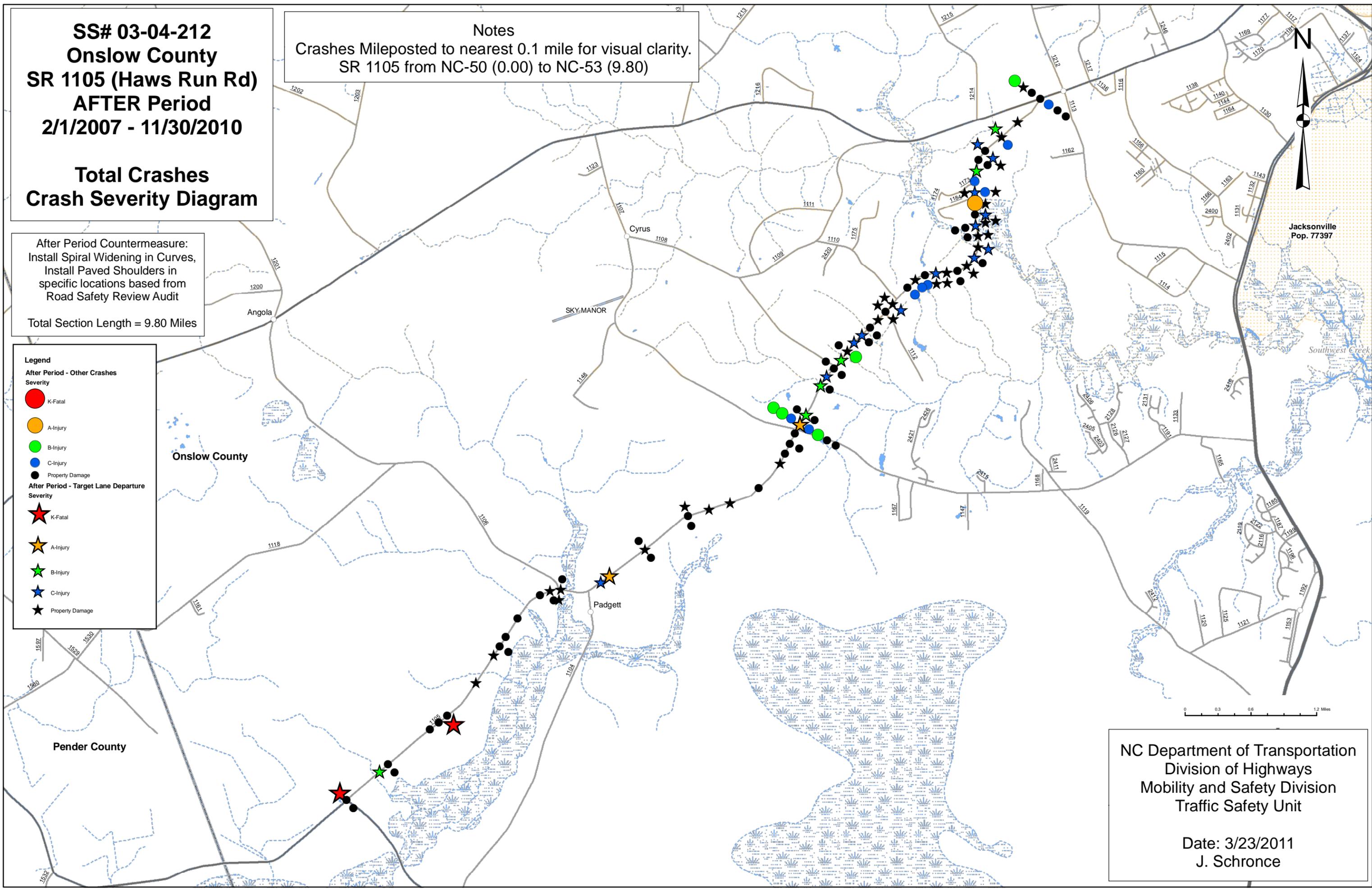
Legend

After Period - Other Crashes Severity

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

After Period - Target Lane Departure 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: 3/23/2011
 J. Schronce

SS# 03-04-212
 Order# 41000010450
 Onslow County
 BEFORE/AFTER Periods
 B: 2/1/03 - 11/30/06
 A: 2/1/07 - 11/30/10

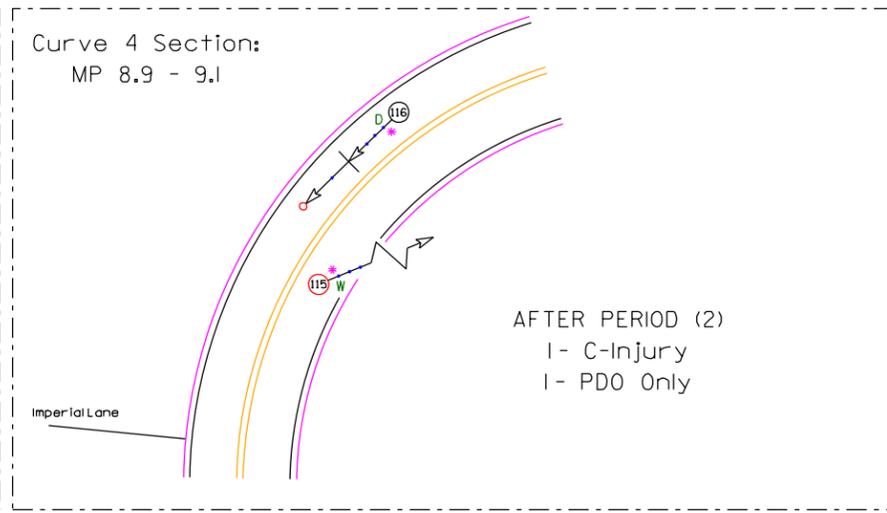
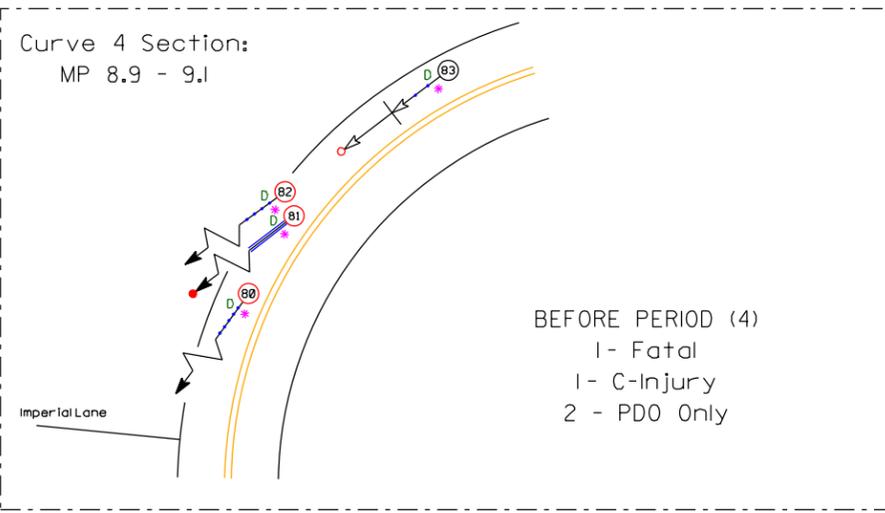
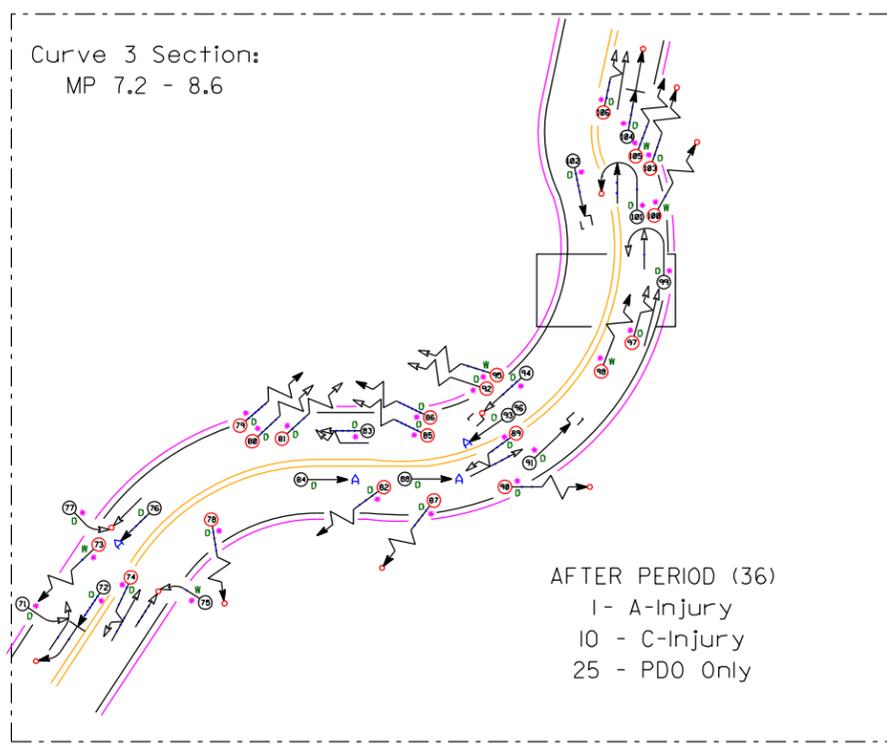
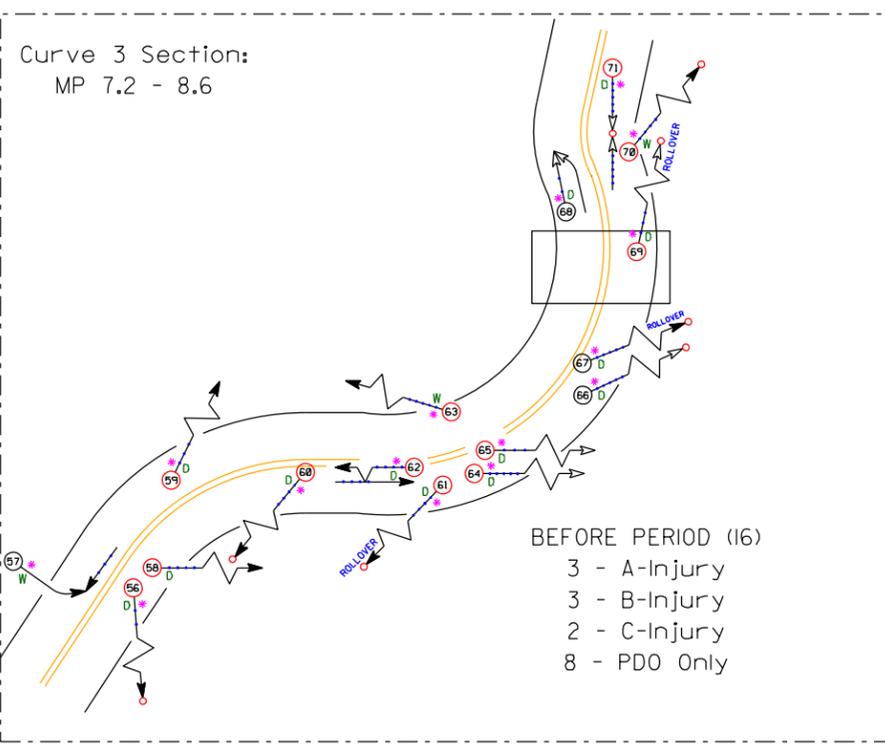
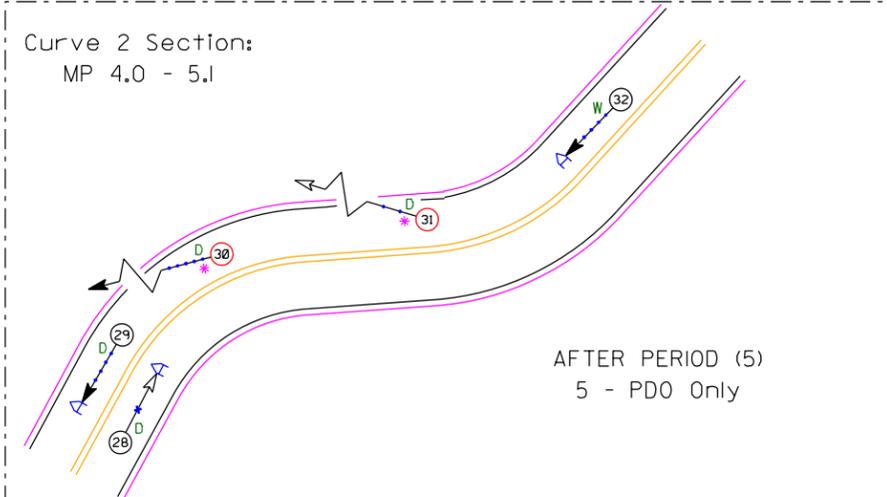
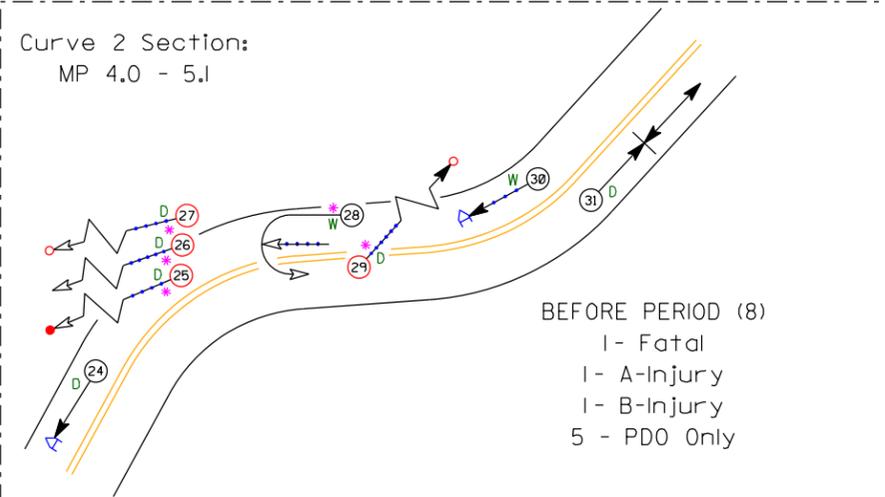
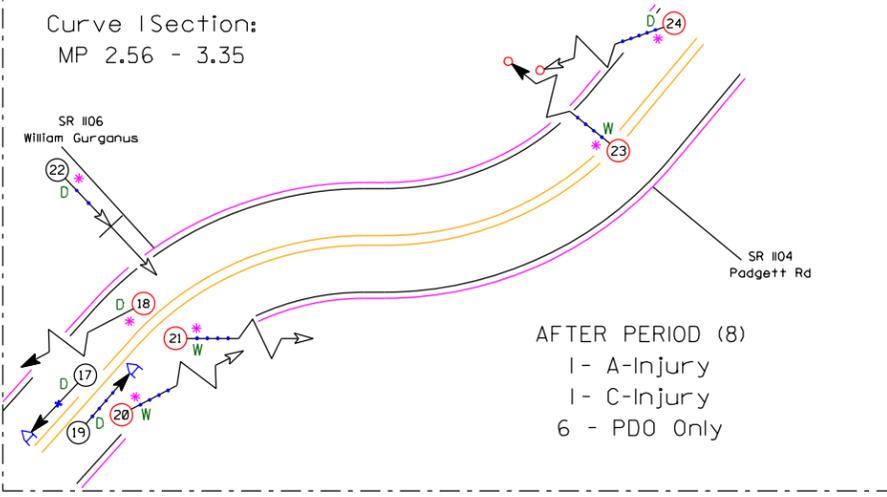
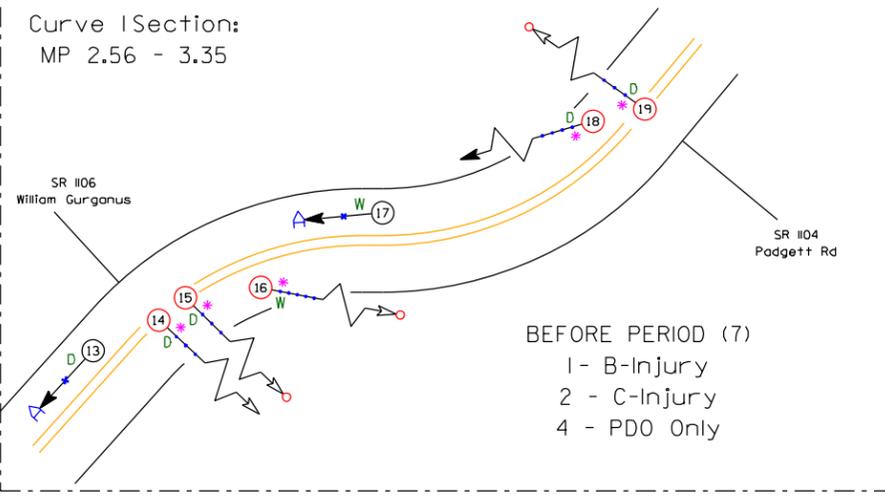
SR 1105
 Haws Run Road
 45 MPH

4 Sections of
 Paved Shoulder
 Installation



LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PARKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		INJURY		50 MPH TO 59		ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		OILY
	RAN OFF ROAD				70 AND UP		



Improvements made under
 Spot Safety #03-04-212;
 recommendations from
 Traffic Safety Road
 Safety Review Audit

Lane Departure
 Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 4-25-2011

Prepared By: J. Schronce