

Spot Safety Project Evaluation

Order # 41000023146

Spot Safety Project # 04-06-212

Spot Safety Project Evaluation of the Pavement Markings and Paved Shoulders SR 1923 (Booker Dairy Road) from White Oak Drive to Eden Drive Johnston County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Transportation Mobility and Safety Division
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Principal Investigator



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6-18-2013

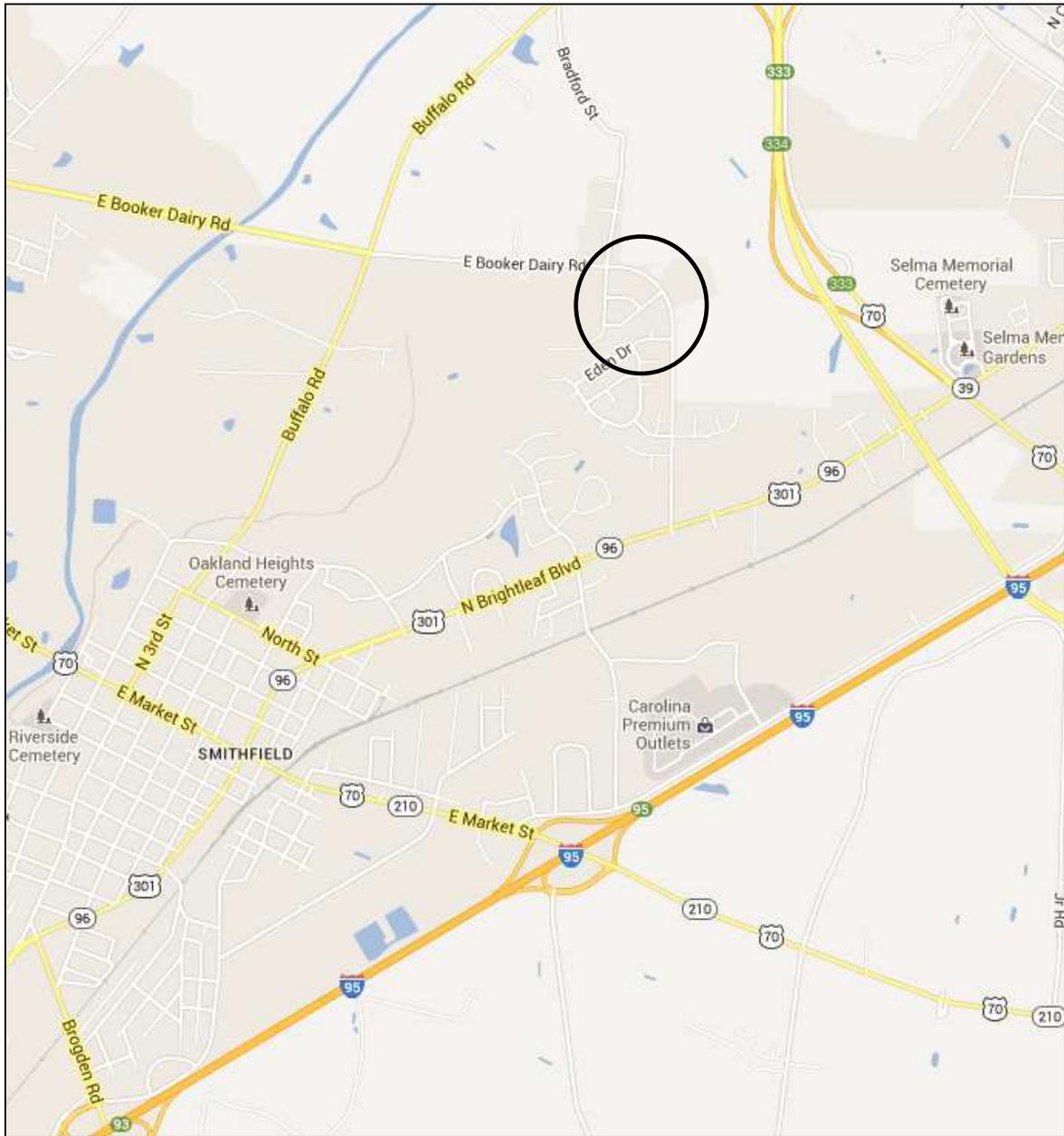
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 04-06-212 located along SR 1923 (Booker Dairy Road) from SR 1988 (White Oak Drive / Bradford Street) to Eden Drive in Johnston County, City of Smithfield. The study milepost range is 2.919 (White Oak Drive) to 3.276 (Eden Drive) on SR 1923 (Booker Dairy Road). The total segment length is 0.357 mile.



Area Map from Google Maps



Section Map from Google Maps – White Oak Drive to Eden Drive



Aerial Map from Google Maps – SR 1923 at Camelia Drive

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location were the installation of 2-foot paved shoulders from Eden Drive to Camelia Drive and to repaint all pavement markings and install edgeline and centerline raised pavement markers from Eden Drive to White Oak Drive. SR 1923 (Booker Dairy Road) is a 2-lane facility with a posted speed limit of 45-mph. This section of SR 1923 is located in a long sweeping horizontal curve to the left (travelling westbound) and was resurfaced in December 2006 prior to the improvements.

The original statement of problem concluded that the alignment of SR 1923 between Eden Drive and White Oak Road, coupled with poor shoulder conditions, has resulted in a significant number of lane departure crashes. The improvements will aid drivers with identifying the horizontal curvature and give more flexibility to correct lane departure maneuvers.

The initial crash analysis was completed from December 1, 2000 to November 30, 2005 with ten (10) reported target (ran-off road / sideswipe) crashes. The crashes were split between four (4) ran-off road collisions occurring where paved shoulders and raised markers were to be installed and five (5) ran-off road and one (1) sideswipe occurring in the raised markers only section. The final completion date for the improvement at the subject segment was on June 17, 2008 with a total cost of \$48,000.

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 May through June 2008. The before period consisted of reported crashes from July 1, 2003 through April 30, 2008 (4 years and 10 months); and the after period consisted of reported crashes from July 1, 2008 through April 30, 2013 (4 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 within the milepost limits of 2.919 (White Oak Drive / Bradford Street) to 3.276 (Eden Drive) with a zero (0) foot y-line. *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 Lane Departure Crashes were the target crashes for the applied countermeasure. The Lane Departure Crash types considered are as follows: Ran-Off Road (Left, Right, Straight), Sideswipe (Opposite Direction), and Head-On.

The crash data is further split by the two different sections of treatment:

Section 1: Milepost 2.919 – 3.122 – Raised Pavement Markers Only

Section 2: Milepost 3.123 – 3.276 – 2-Foot Paved Shoulders and Raised Pavement Markers

<u>Total Treatment (MP: 2.919-3.276)</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	13	15	7.7 %
Total Severity Index	10.25	2.97	- 71.0 %
Target Crashes – Lane Departure	6	8	33.3 %
Lane Departure Severity Index	17.33	3.78	- 78.2 %
Volume (2005, 2010)	5,400	5,900	9.3 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	0	- 100.0 %
Class B injury Crashes	2	3	33.3 %
Class C Injury Crashes	4	1	- 75.0 %
Property Damage Only	6	11	83.3 %

The naive before and after analysis at the treatment location resulted in an 8 percent increase in Total Crashes, a 33 percent increase in Target Crashes, but a 71 percent reduction in the Total Severity Index. The before period ADT year was 2005 and the after period ADT year was 2010.

<u>Sec-1: Raised Markers Only (MP: 2.919-3.122)</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	7	14	100.0 %
Total Severity Index	5.23	3.11	- 40.5 %
Target Crashes – Lane Departure	3	8	166.7 %
Lane Departure Severity Index	5.93	3.78	- 36.3 %

<u>Sec-2: Paved Shoulders & Markers (MP: 3.123 – 3.276)</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	6	1	- 83.3 %
Total Severity Index	16.10	1.00	- 93.8 %
Target Crashes – Lane Departure	3	0	- 100.0 %
Lane Departure Severity Index	28.73	0.00	- 100.0 %

Results and Discussion

Referencing the *Collision Diagrams*, the before period presented a crash pattern of six (6) lane departure crashes along this long sweeping curve with five (5) of the crashes occurring on the outside of the curve while travelling north/westbound. After the two-part countermeasure installation, Section-2 (with 2-foot paved shoulders) experienced zero (0) lane departure crashes.

However, there were eight (8) target lane departure crashes in Section-1 between White Oak Drive and Camelia Drive where the roadway was only treated with raised pavement markers. The after period of Section-1 showed three (3) left lane departures from south/eastbound vehicles entering the horizontal curve. This section did experience a reduction in severity with zero (0) after period serious injury crashes.

Please see the attached *Treatment Site Photos*. A photo is provided from Google Street View for a sample of this treatment section in the before period. 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 safety improvement.

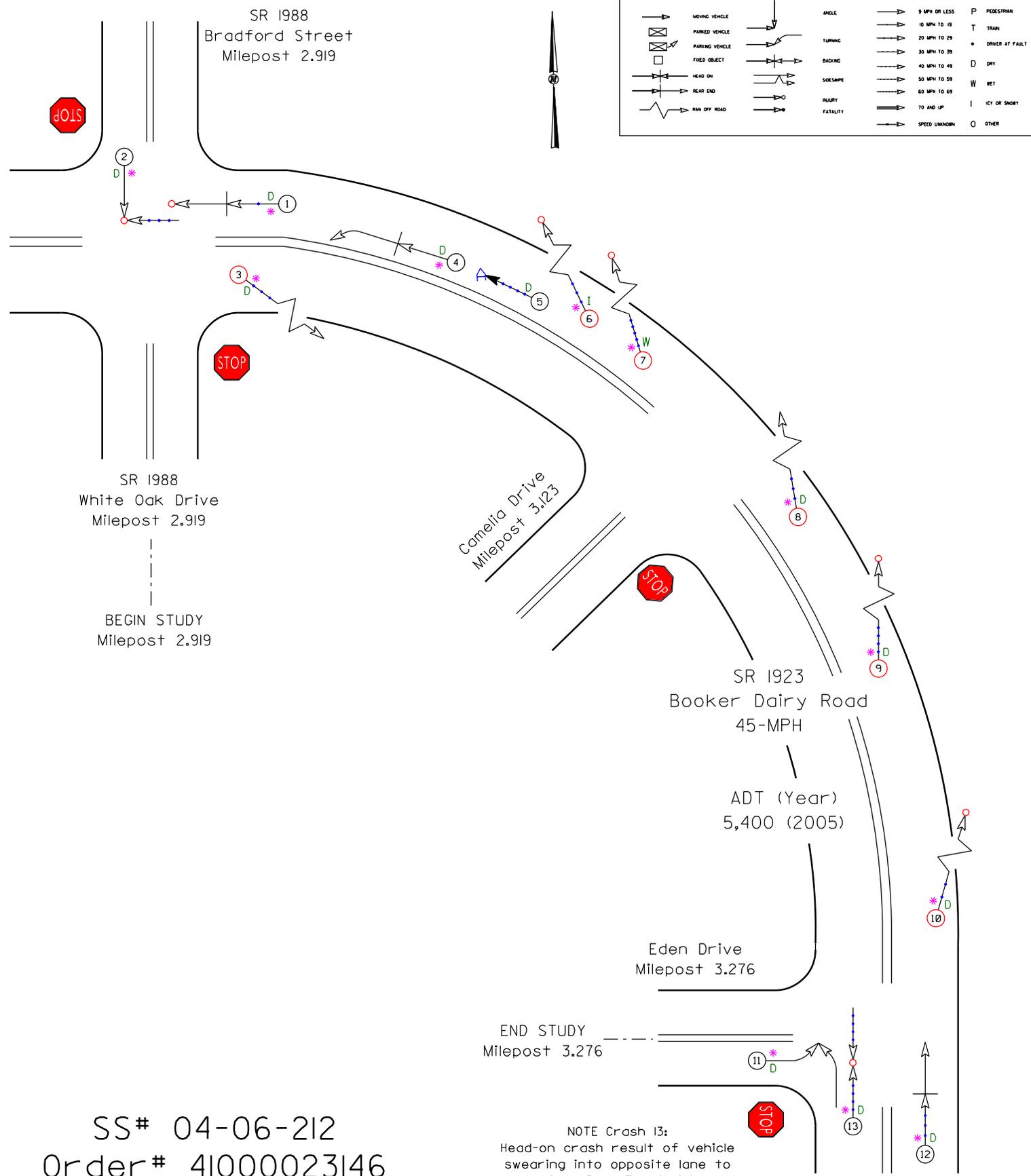
Treatment Site Photos



**Google Maps – Before Period Roadway – January 2008 Photo
Section-1 (Between White Oak Drive and Camelia Drive)**

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PARKED VEHICLE		TURNING		10 MPH TO 19		TRAIN
	PARKING VEHICLE		TURNS		20 MPH TO 29		DRIVER AT FAULT
	FIXED OBJECT		BACKING		30 MPH TO 39		DRY
	HEAD ON		BACKSLIDE		40 MPH TO 49		WET
	REAR END		SKIDSLIP		50 MPH TO 59		ICY OR SNOWY
	RAN OFF ROAD		FLURRY		60 MPH TO 69		ICY OR SNOWY
			FATALITY		70 AND UP		OTHER
					SPEED UNKNOWN		



NOTE Crash 13:
Head-on crash result of vehicle
swearing into opposite lane to
avoid a Rear-End Collision

SS# 04-06-212
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Johnston County
BEFORE Period
7/1/2003 - 4/30/2008

Lane Departure
Target Crashes

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

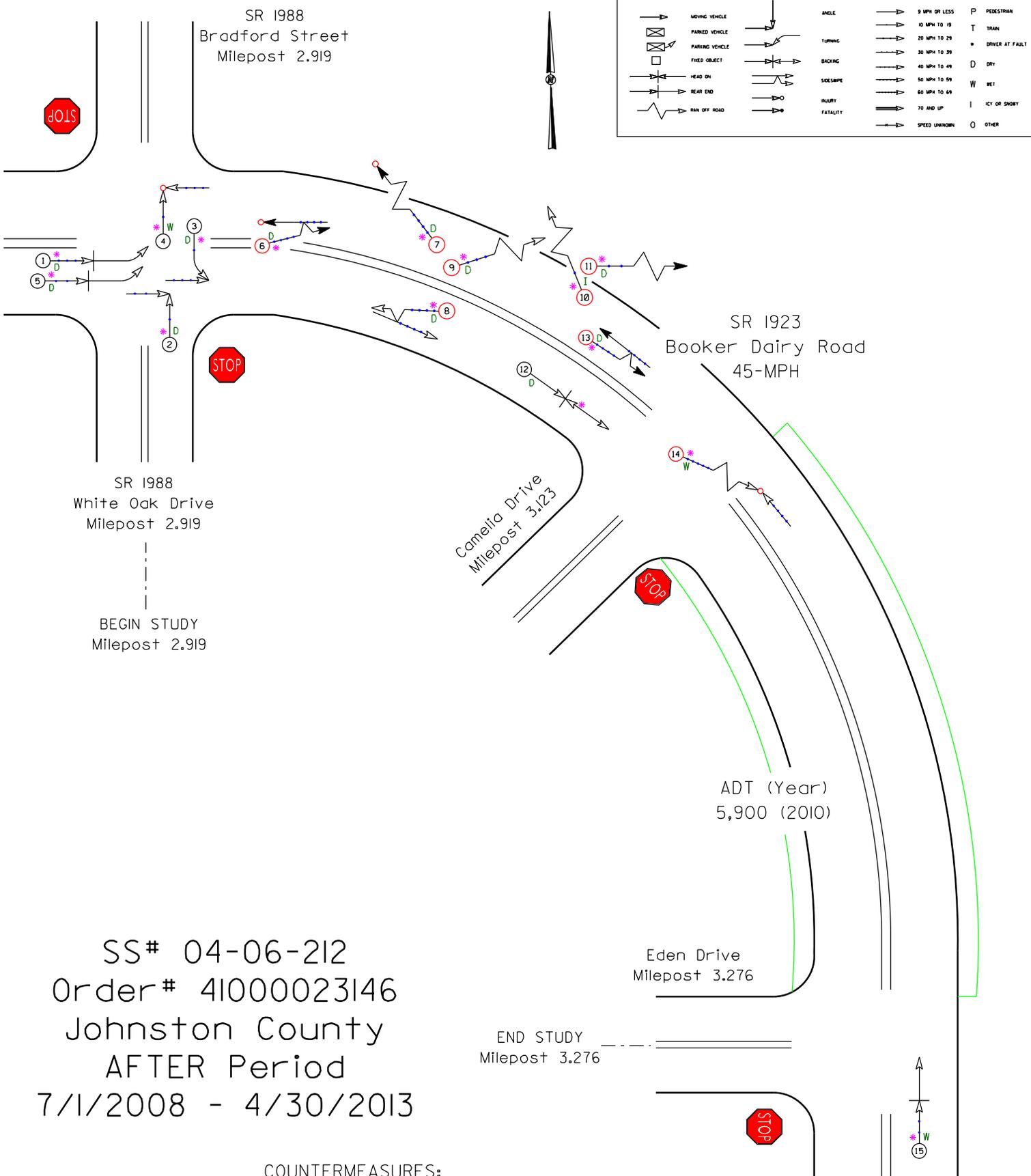
TRAFFIC SAFETY UNIT

Date: 6-18-2013

Prepared By: J. Schrone

LEGEND

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



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AFTER Period
7/1/2008 - 4/30/2013

COUNTERMEASURES:

1. Construct 2' Paved Shoulders (Camelia to Eden)
2. Repaint All Pavement Markings and install edgeline and centerline raised pavement markers (White Oak to Eden)

Lane Departure
Target Crashes

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

TRAFFIC SAFETY UNIT

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