

# Spot Safety Project Evaluation

Order # 41000010559

Spot Safety Project # 04-04-202

**Spot Safety Project Evaluation of the Installation of a Traffic Signal  
At the Intersection of NC 50 and SR 1533 (Mount Pleasant Road) / SR 1517 (Sanders Road)  
South of Garner, In Johnston 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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Chad J. Neilson

1/14/2011

Date

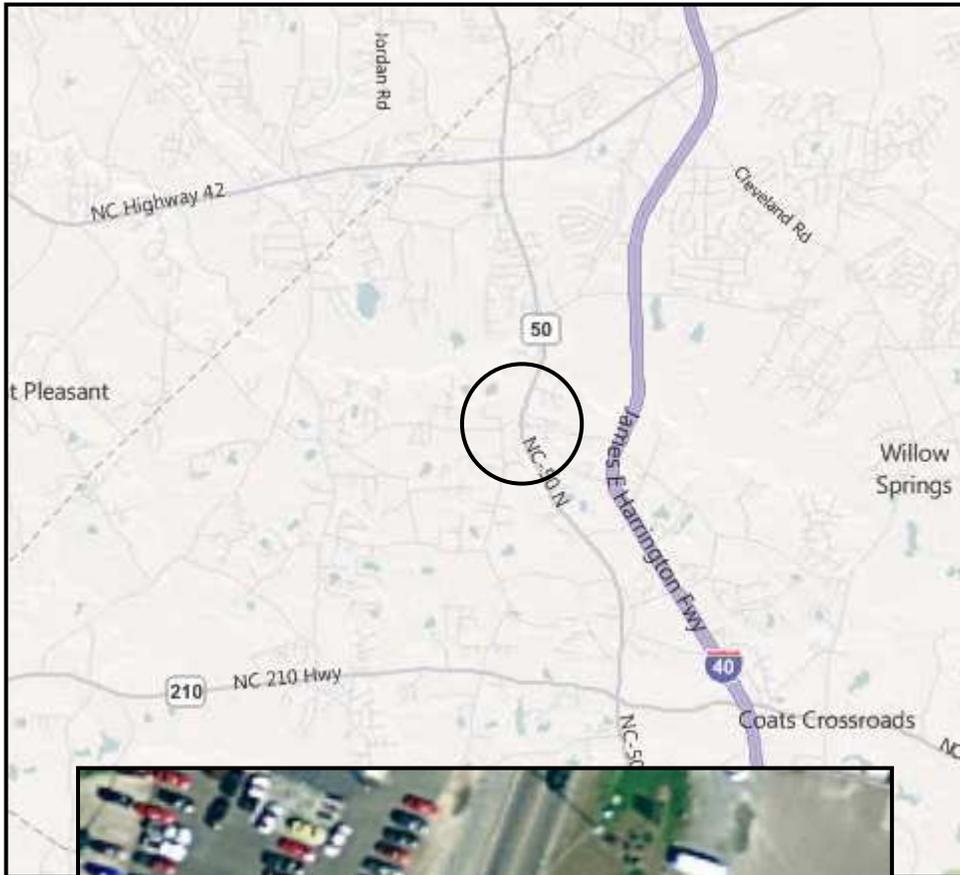
Traffic Safety Project Engineer

# *Spot Safety Project Evaluation Documentation*

## **Subject Location**

Evaluation of Spot Safety Project Number 04-04-202 located at the intersection of NC 50 and SR 1533 (Mount Pleasant Road) / SR 1517 (Sanders Road) south of Garner, Johnston County.

The signal ID for the newly installed signal is 04-0498.



## Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of a traffic signal at the intersection of NC 50 and SR 1533 (Mount Pleasant Road) / SR 1517 (Sanders Road). NC 50 is a two-lane facility at the subject intersection with a speed limit of 55 mph for both approaches. SR 1533 (Mount Pleasant Road) and SR 1517 (Sanders Road) are both two-lane facilities with speed limits of 55 mph for both approaches. The subject location is a stop sign controlled four-leg intersection with the SR 1533 (Mount Pleasant Road) / SR 1517 (Sanders Road) approaches encountering the stop sign condition.

The original statement of problem was a high number of angle crashes at the intersection due to a short sight distance from the skewed angles at which SR 1533 (Mount Pleasant Road) and SR 1517 (Sanders Road) intersect with NC 50.

The initial crash analysis was completed from June 1, 2000 to May 31, 2003 with thirteen (13) reported crashes, of which six (6) were deemed correctable. The final completion date for the improvement at the subject intersection was on May 30, 2006 with a total cost of \$53,500.00.

### 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 were the months of April 2006 through June 2006. The before period consisted of reported crashes from November 1, 2001 through March 31, 2006 (4 years and 5 months); and the after period consisted of reported crashes from July 1, 2006 through November 30, 2010 (4 years and 5 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 150 feet of the subject intersection. *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 Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

<b><u>Treatment Information</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total Crashes	24	15	- 37.50 %
Total Crash Severity Index	10.71	3.96	- 63.03 %
Target Crashes	22	4	- 81.81 %
Target Crash Severity Index	11.25	6.55	- 41.78 %
Volume (2004, 2008)	13,100	13,500	3.05 %

<u>Injury Crash Summary</u>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	2	0	- 100.00 %
Class B injury Crashes	4	1	- 75.00 %
Class C Injury Crashes	7	5	- 28.57 %
Total Injury Crashes	13	6	- 53.85 %

The naive before and after analysis at the treatment location resulted in a thirty-seven (37) percent decrease in Total Crashes, an eighty-one (81) percent decrease of Target Crashes, and a sixty-three (63) percent decrease in the Total Severity Index. The before period ADT year was 2004 and the after period ADT year was 2008.

## **Results and Discussion**

Referencing the *Collision Diagrams*, the before period presented twenty-two (22) target crashes. There was an eastbound angle crash pattern that accounted for four (4) target crashes. There was an eastbound left-turn, different roadway crash pattern that accounted for six (6) target crashes. There was a northbound/southbound left-turn, same roadway crash pattern that accounted for four (4) target crashes. There was a westbound/eastbound left-turn, same roadway crash pattern that accounted for five (5) target crashes. After the installation of the traffic signal, there were four (4) target crashes. The eastbound left-turn, different roadway crash pattern accounted for two (2) target crashes in the after period.

The calculated benefit to cost ratio for this project is **28.57 considering total crashes**. The benefit to cost ratio **considering only target crashes is 30.03**. 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 were provided for this location by Google Street View for all four approaches of this intersection. 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.

## TREATMENT SITE PHOTOS



Looking North on NC 50



Looking West on SR 1517 (Sanders Rd)



Looking South on NC 50



Looking East on SR 1533 (Mt Pleasant Rd)

**BENEFIT-COST ANALYSIS WORKSHEET - TOTAL**

LOCATION: NC 50 at SR 1533 (Mt Pleasant Road) / SR 1517 (Sanders Road)		BY: C Neilson						
COUNTY: Johnston		DATE: 1/10/2011						
FILE NO.: SS 04-04-202								
DETAILED COST:	TYPE IMPROVEMENT -	Signal						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$53,000	10	0.149	\$7,899			
		\$0	0	0.000	\$0			
	Right-of-Way	\$500	50	0.082	\$41			
	TOTALS	\$53,500	10	0.148	\$7,939			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,000			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$10,839			
	TOTAL COST OF PROJECT=				\$53,500			
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	4.42	2	0.45	11	2.49	11	2.49	\$345,543
AFTER	4.42	0	0.00	6	1.36	9	2.04	\$35,905
							Annual Benefits from Crash Cost Savings	\$309,638
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST			=	\$298,799			
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST			=	28.57			
	TOTAL COST OF PROJECT	-	\$53,500	COMPREHENSIVE B/C RATIO	-	28.57		

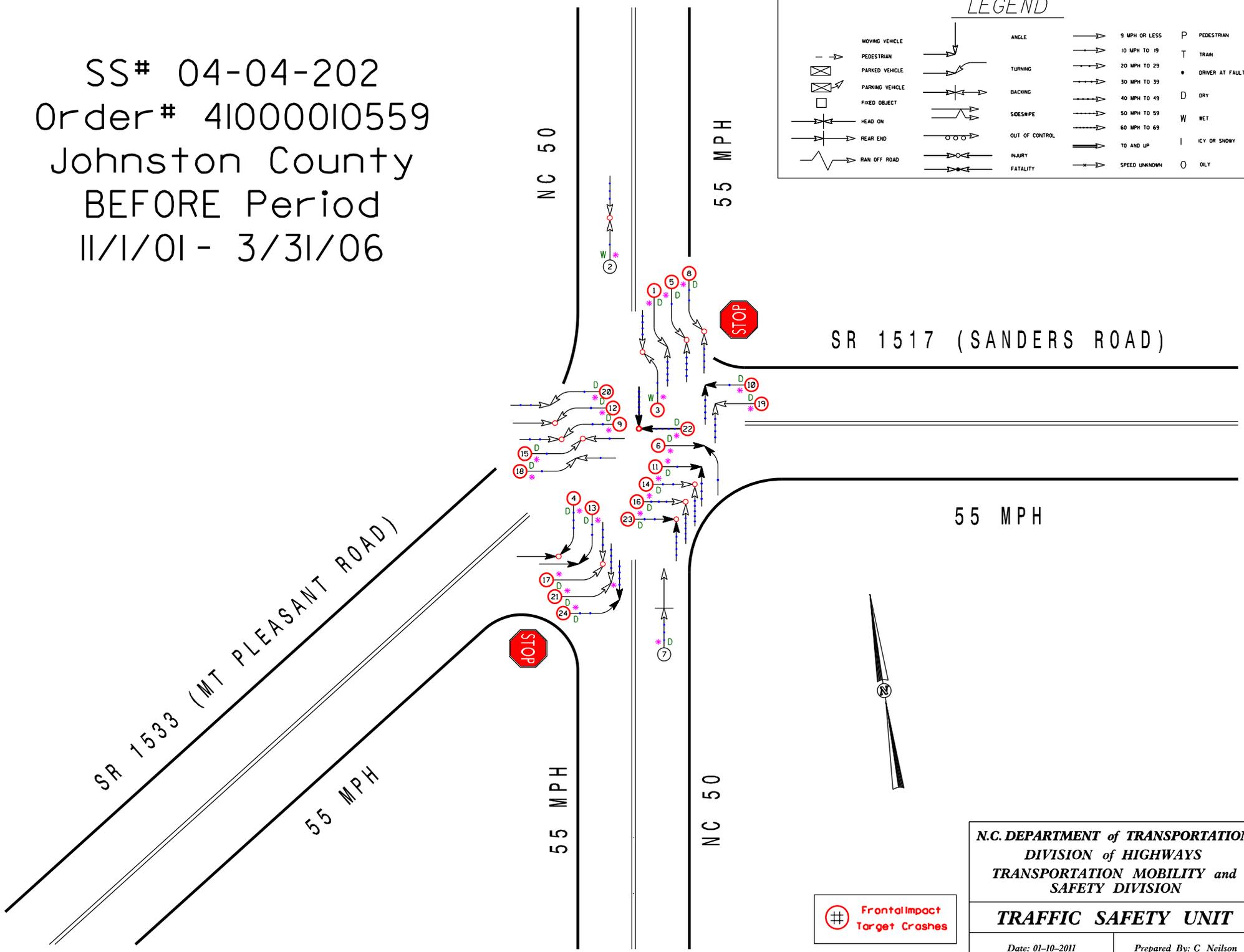
**BENEFIT-COST ANALYSIS WORKSHEET - TARGET**

LOCATION: NC 50 at SR 1533 (Mt Pleasant Road) / SR 1517 (Sanders Road)		BY: C Neilson						
COUNTY: Johnston		DATE: 1/10/2011						
FILE NO.: SS 04-04-202								
DETAILED COST:	TYPE IMPROVEMENT -	Signal						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$53,000	10	0.149	\$7,899			
		\$0	0	0.000	\$0			
	Right-of-Way	\$500	50	0.082	\$41			
	TOTALS	\$53,500	10	0.148	\$7,939			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,000			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$10,839			
	TOTAL COST OF PROJECT=				\$53,500			
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	4.42	2	0.45	10	2.26	10	2.26	\$340,045
AFTER	4.42	0	0.00	3	0.68	1	0.23	\$14,548
							Annual Benefits from Crash Cost Savings	\$325,498
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST			=	\$314,658			
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST			=	30.03			
	TOTAL COST OF PROJECT	-	\$53,500	COMPREHENSIVE B/C RATIO	-	30.03		

SS# 04-04-202  
 Order# 41000010559  
 Johnston County  
 BEFORE Period  
 11/1/01 - 3/31/06

**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
	PARKED VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		TO AND LIP		50 MPH TO 59		ICY OR SNOWY
	REAR END		INJURY		60 MPH TO 69		FATALITY
	RAN OFF ROAD		SPEED UNKNOWN		SPEED UNKNOWN		ONLY



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 DIVISION of HIGHWAYS  
 TRANSPORTATION MOBILITY and  
 SAFETY DIVISION

**TRAFFIC SAFETY UNIT**

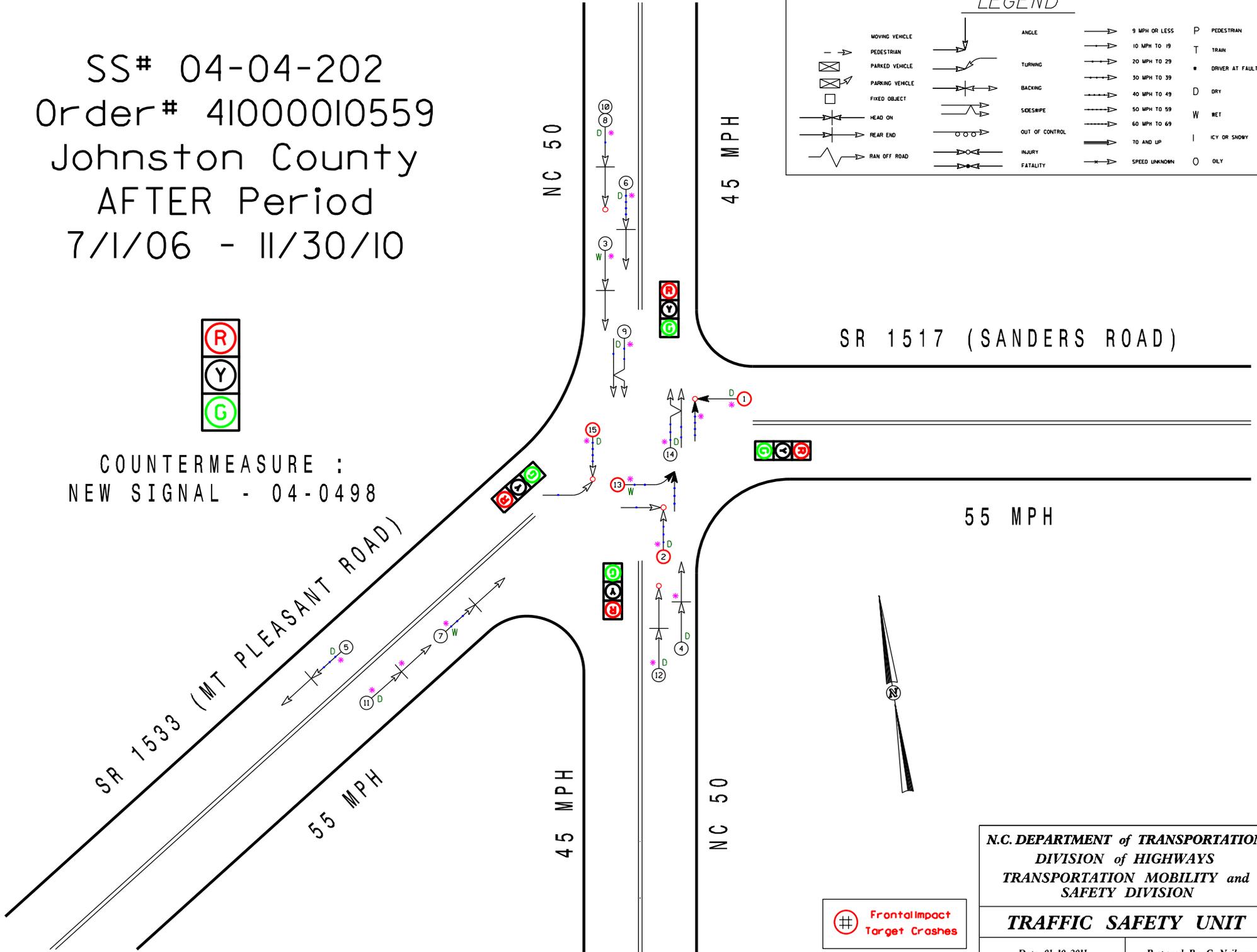
Date: 01-10-2011      Prepared By: C Neilson

Frontal Impact  
Target Crashes

SS# 04-04-202  
 Order# 41000010559  
 Johnston County  
 AFTER Period  
 7/1/06 - 11/30/10



COUNTERMEASURE :  
 NEW SIGNAL - 04-0498



**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		TO AND LIP		SPEED UNKNOWN
	RAN OFF ROAD				SPEED UNKNOWN		ONLY

SR 1517 (SANDERS ROAD)

55 MPH

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

**TRAFFIC SAFETY UNIT**



Date: 01-10-2011

Prepared By: C Neilson