

Spot Safety Project Evaluation

Order # 41000009271

Spot Safety Project # 06-04-213

**Spot Safety Project Evaluation of the Directional Crossover Median Installation
At the Intersection of US 74 / 76 (Andrew Jackson Highway)
and SR 1800 (Blacksmith Road)
North of Bolton, In Columbus County**

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Transportation Mobility and Safety Division
North Carolina Department of Transportation

Principal Investigator



Chad J. Neilson

11-4-2010

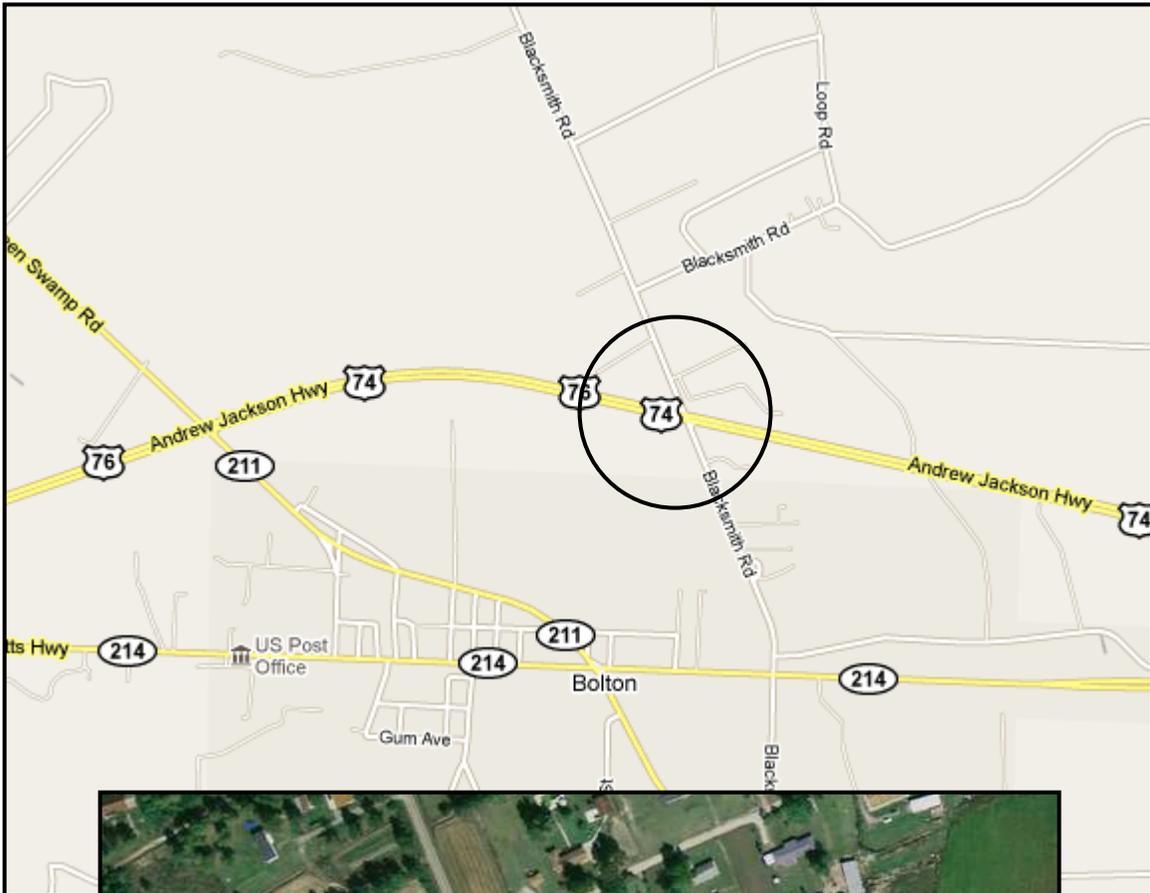
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 06-04-212 located at the intersection of US 74 / 76 (Andrew Jackson Highway) and SR 1800 (Blacksmith Road) north of Bolton, Columbus County.



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 directional crossover median. Additionally, U-Turn locations were installed along US 74 / 76 (Andrew Jackson Highway) both upstream and downstream from the subject intersection. US 74 / 76 (Andrew Jackson Highway) is a four-lane, median divided facility at the subject intersection with speed limit of 55 mph for both approaches. SR 1800 (Blacksmith Road) is a two-lane facility with a speed limit of 55 mph for both approaches. The subject location is a stop signed controlled, full access intersection with SR 1800 (Blacksmith Road) encountering the stop signs.

The original statement of problem was motorists on SR 1800 (Blacksmith Road) failing to yield to vehicles traveling along US 74 / 76 (Andrew Jackson Highway). The failure to yield is resulting in far side angle type crashes.

The initial crash analysis was completed from October 1, 2000 to September 30, 2003 with five (5) reported crashes, all of which were deemed correctable. The final completion date for the improvement at the subject intersection was on November 15, 2006 with a total cost of \$400,000.00.

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 August 2006 through December 2006. The before period consisted of reported crashes from November 1, 2002 through July 31, 2006 (3 years and 9 months); and the after period consisted of reported crashes from January 1, 2007 through September 30, 2010 (3 years and 9 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.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	11	6	- 45.45 %
Total Crash Severity Index	13.27	4.70	- 64.58 %
Target Crashes	9	0	- 100.0 %
Target Crash Severity Index	15.18	0.00	- 100.0 %
Volume (2004, 2008)	12,500	9,500	- 24.00 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	1	0	- 100.00 %
Class A injury Crashes	0	0	N/A
Class B injury Crashes	6	0	- 100.00 %
Class C Injury Crashes	2	3	50.00 %
Total Injury Crashes	9	3	- 66.67 %

The naive before and after analysis at the treatment location resulted in a forty-five (45) percent decrease in Total Crashes, one-hundred (100) percent elimination of Target Crashes, and a sixty-four (64) 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 two crash patterns. The northbound angle crash pattern consisted of four (4) target crashes. The southbound angle crash pattern consisted of five (5) target crashes. After the directional crossover median installation, both of the crash patterns were completely eliminated.

The calculated benefit to cost ratio for this project is **4.66 considering total crashes**. The benefit to cost ratio **considering only target crashes is 4.97**. 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 SR 1800 (Blacksmith Rd)



Looking West on US 74 / 76 (Andrew Jackson Hwy)



Looking South on SR 1800 (Blacksmith Rd)



Looking East on US 74 / 76 (Andrew Jackson Hwy)



Looking West on US 74 / 76 (U-Turn location east of SR 1800)



Looking East on US 74 / 76 (U-Turn location west of SR 1800)

BENEFIT-COST ANALYSIS WORKSHEET - TOTAL

LOCATION: US 74 / 76 (Andrew Jackson Highway) at SR 1800 (Blacksmith Rd)		BY: C Neilson							
COUNTY: Columbus		DATE: 10/27/2010							
FILE NO.: SS 06-04-213									
DETAILED COST:	TYPE IMPROVEMENT -	Directinoal Crossover							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
	Construction	\$400,000	20	0.102	\$40,741				
		\$0	0	0.000	\$0				
	Right-of-Way	\$0	0	0.000	\$0				
	TOTALS	\$400,000	20	0.102	\$40,741				
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$800				
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0				
	TOTAL ANNUAL COST=				\$41,541				
	TOTAL COST OF PROJECT=				\$400,000				
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	3.75	1	0.27	8	2.13	2	0.53	\$212,960	
AFTER	3.75	0	0.00	3	0.80	3	0.80	\$19,440	
								Annual Benefits from Crash Cost Savings	\$193,520
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	\$151,979			
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	4.66			
	TOTAL COST OF PROJECT	-	\$400,000	COMPREHENSIVE B/C RATIO	-			4.66	

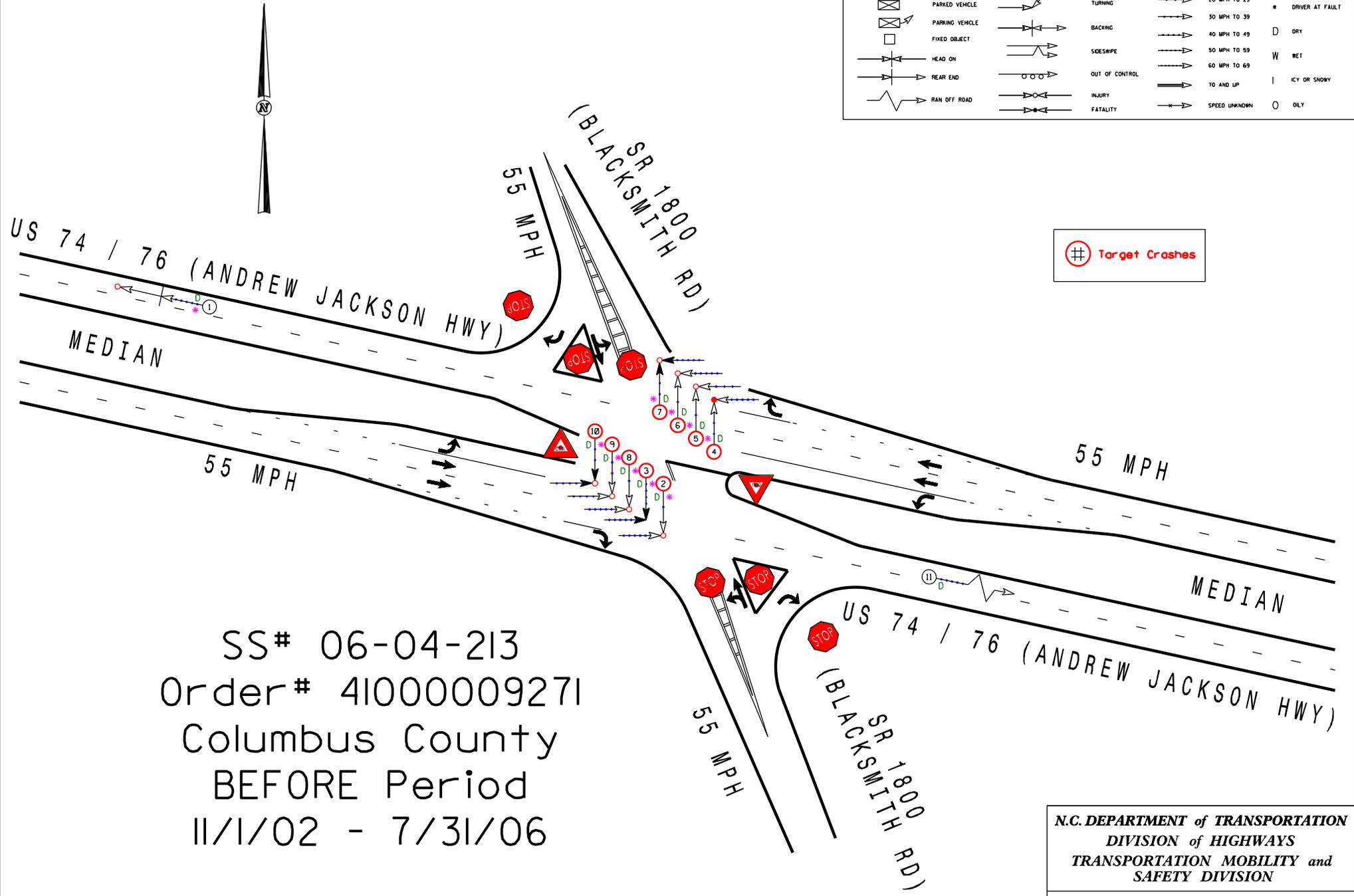
BENEFIT-COST ANALYSIS WORKSHEET - TARGET

LOCATION: US 74 / 76 (Andrew Jackson Highway) at SR 1800 (Blacksmith Rd)		BY: C Neilson							
COUNTY: Columbus		DATE: 10/27/2010							
FILE NO.: SS 06-04-213									
DETAILED COST:	TYPE IMPROVEMENT -	Directinoal Crossover							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
	Construction	\$400,000	20	0.102	\$40,741				
		\$0	0	0.000	\$0				
	Right-of-Way	\$0	0	0.000	\$0				
	TOTALS	\$400,000	20	0.102	\$40,741				
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$800				
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0				
	TOTAL ANNUAL COST=				\$41,541				
	TOTAL COST OF PROJECT=				\$400,000				
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	3.75	1	0.27	7	1.87	1	0.27	\$206,480	
AFTER	3.75	0	0.00	0	0.00	0	0.00	\$0	
								Annual Benefits from Crash Cost Savings	\$206,480
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	\$164,939			
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	4.97			
	TOTAL COST OF PROJECT	-	\$400,000	COMPREHENSIVE B/C RATIO	-			4.97	

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		70 AND UP		SPEED UNKNOWN
	RAN OFF ROAD						

Target Crashes



SS# 06-04-213
 Order# 41000009271
 Columbus County
 BEFORE Period
 11/1/02 - 7/31/06

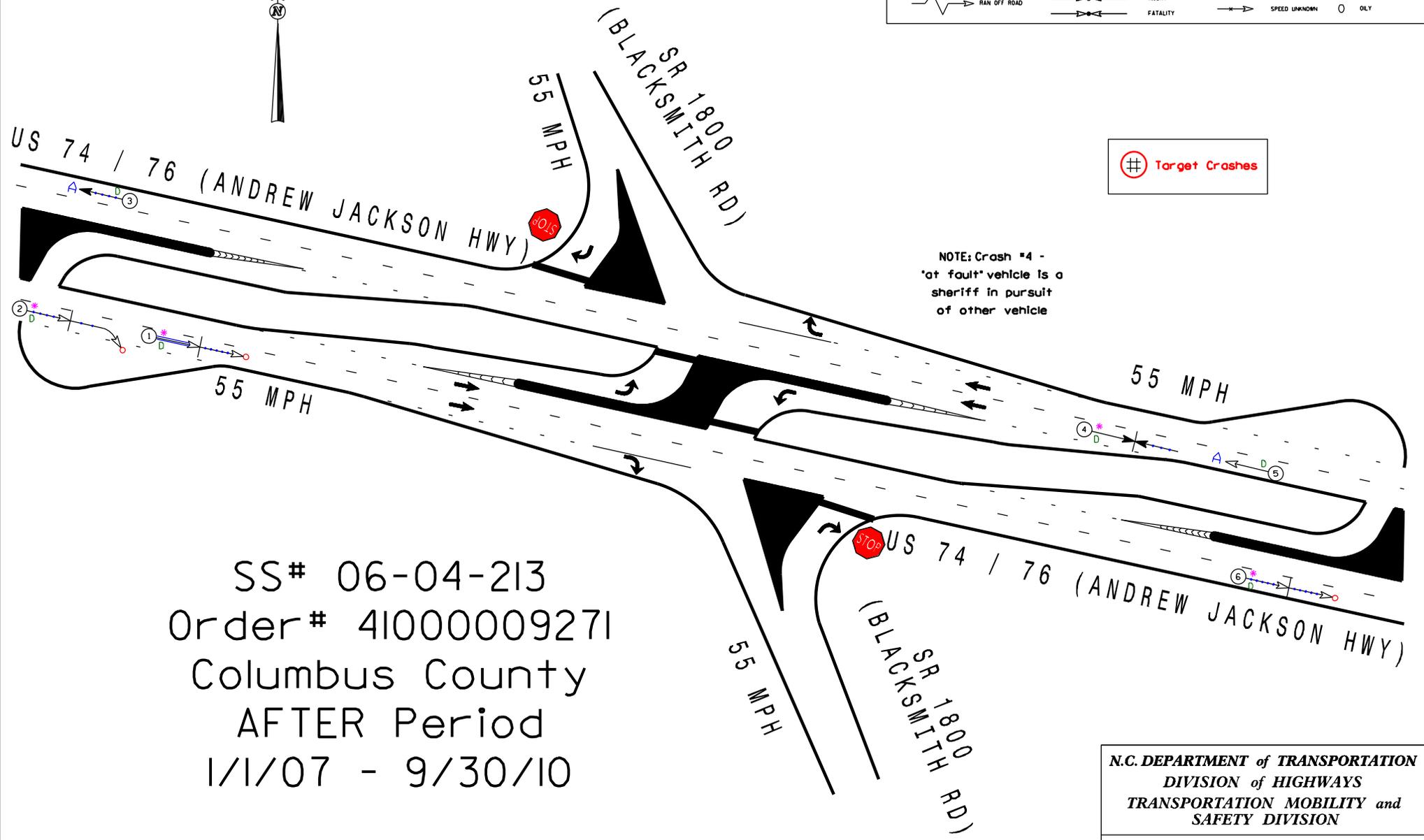
N.C. DEPARTMENT of TRANSPORTATION
 DIVISION of HIGHWAYS
 TRANSPORTATION MOBILITY and
 SAFETY DIVISION

TRAFFIC SAFETY UNIT

Date: 10-27-2010 Prepared By: C Neilson

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		SPEED UNKNOWN
	RAN OFF ROAD				TO AND LIP		ONLY



Target Crashes

NOTE: Crash #4 -
 'at fault' vehicle is a
 sheriff in pursuit
 of other vehicle

SS# 06-04-213
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 Columbus County
 AFTER Period
 1/1/07 - 9/30/10

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

TRAFFIC SAFETY UNIT

Date: 10-27-2010

Prepared By: C Neilson