

# Spot Safety Project Evaluation

Project Log # 200901024

Spot Safety Project # 08-00-203

**Spot Safety Project Evaluation of the Traffic Signal Installation  
At the Intersection of US 220 Business (Fayetteville Street) and  
SR 1150 (McDowell Road)  
Randolph County, City of Asheboro**

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

5-4-2009

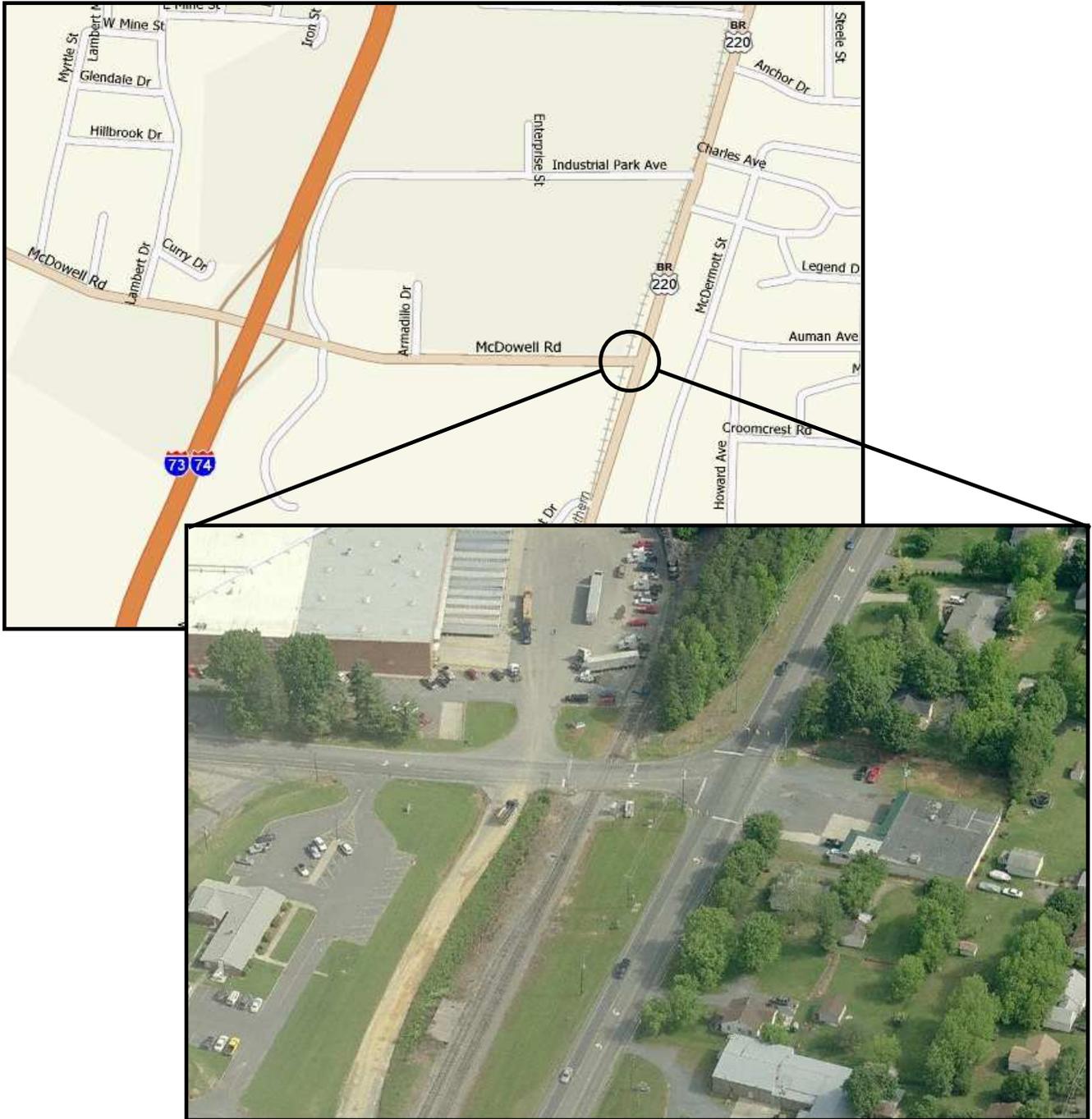
Date

Traffic Safety Project Engineer

# *Spot Safety Project Evaluation Documentation*

## **Subject Location**

Evaluation of Spot Safety Project Number 08-00-203 located at the Intersection of US 220 Business (Fayetteville Street) and SR 1150 (McDowell Road) in Randolph County, within the City of Asheboro.



## **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 3-phase, actuated traffic signal. US 220 Business and SR 1150 are both three-lane facilities at the subject intersection with continuous center turn lanes and speed limits of 45 mph on all approaches. The subject location is a three-leg intersection, which was controlled by a stop sign on SR 1150 (McDowell Rd) in the before period. A Norfolk Southern at-grade rail crossing is also located on SR 1150 approximately 50 feet from the subject intersection. In December 2008, the signal controller was upgraded from a NEMA controller to the modern 2070L controller.

The original statement of problem was that excessive delay exists for SR 1150 left turning motorists. The intended purpose of the new signal is to alleviate congestion, reduce delay, and decrease a frontal impact crash pattern. The intersection met signal warrants 1, 8, 9, and 11.

The Sig ID is 08-0973 for this new signal installation.

The initial crash analysis was completed from October 1, 1996 to September 30, 1999 with nine (9) reported crashes, three (3) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on March 17, 2003 with a total cost of \$85,000.00.

## **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 was the months of February and March 2003. The before period consisted of reported crashes from April 1, 1997 through January 31, 2003 (5 years and 10 months); and the after period consisted of reported crashes from April 1, 2003 through January 31, 2009 (5 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 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	18	13	- 27.8 %
Total Severity Index	2.64	3.28	24.2 %
Target Crashes	15	5	- 66.7 %
Target Crash Severity Index	2.97	1.00	- 66.3 %
Volume	14,900	13,700	- 8.1 %
<u>Injury Crash Summary</u>			
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	0	N/A
Class B injury Crashes	1	1	0.0 %
Class C Injury Crashes	3	3	0.0 %
Total Injury Crashes	4	4	0.0 %

The naive before and after analysis at the treatment location resulted in a 28 percent decrease in Total Crashes, a 67 percent decrease in Target Crashes, but a 24 percent increase in the Total Severity Index. The before period ADT year was 2000 and the after period ADT year was 2006.

## Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 28 percent decrease in Total Crashes and a 67 percent decrease in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the frontal impact crashes at the intersection in the before period consisted of two defined patterns; left turning SR 1150 motorists colliding with left turning US 220B vehicles and northbound US 220B left turning motorists shortcutting the turning movement. After the signal installation, the northbound US 220B shortcutting was reduced by half (from 6 to 3) and the one left turn-different roadway crash resulted from a southbound US 220B vehicle running the red light.

There was also a development of Rear-End Crashes approaching the intersection through the analysis from zero (0) to six (6) collisions.

The calculated benefit to cost ratio for this project is **0.21 considering total crashes**. The benefit to cost ratio **considering only target crashes is 1.04**. 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 see the attached *Treatment Site Photos*. Photos are provided for all approaches to the treatment intersection, including one from the gravel parking lot of AC Delco that comprises the fourth leg of the subject 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 TAKEN 4/15/2009**



Traveling East on SR 1150 (McDowell Rd)  
Georgia Pacific Company on Left



Traveling East on SR 1150 (McDowell Rd)



Traveling North on US 220 Business



Traveling North on US 220 Business



Traveling South on US 220 Business (Fayetteville Street)



Traveling South on US 220 Business



Traveling West from the AC Delco gravel parking lot

**BENEFIT-COST ANALYSIS WORKSHEET**

LOCATION: US 220B at SR 1150		BY: JBS						
COUNTY: Randolph		DATE: 4/30/2009						
FILE NO.: SS 08-00-203		NOTES: Total Crashes						
DETAILED COST:	TYPE IMPROVEMENT -	New Signal						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$85,000	10	0.149	\$12,668			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$85,000	10	0.149	\$12,668			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$15,768			
	TOTAL COST OF PROJECT=				\$85,000			
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	5.84	0	0.00	4	0.68	14	2.40	\$21,678
AFTER	5.84	0	0.00	4	0.68	9	1.54	\$18,339
						Annual Benefits from Crash Cost Savings		\$3,339
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	(\$12,428)		
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	0.21		
	TOTAL COST OF PROJECT	-	\$85,000	COMPREHENSIVE B/C RATIO	-			0.21

**BENEFIT-COST ANALYSIS WORKSHEET**

LOCATION: US 220B at SR 1150		BY: JBS						
COUNTY: Randolph		DATE: 4/30/2009						
FILE NO.: SS 08-00-203		NOTES: Target Crashes - Frontal Impact						
DETAILED COST:	TYPE IMPROVEMENT -	New Signal						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$85,000	10	0.149	\$12,668			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$85,000	10	0.149	\$12,668			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$15,768			
	TOTAL COST OF PROJECT=				\$85,000			
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	5.84	0	0.00	4	0.68	11	1.88	\$19,675
AFTER	5.84	0	0.00	0	0.00	5	0.86	\$3,339
						Annual Benefits from Crash Cost Savings		\$16,336
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	\$568		
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	1.04		
	TOTAL COST OF PROJECT	-	\$85,000	COMPREHENSIVE B/C RATIO	-			1.04

LEGEND

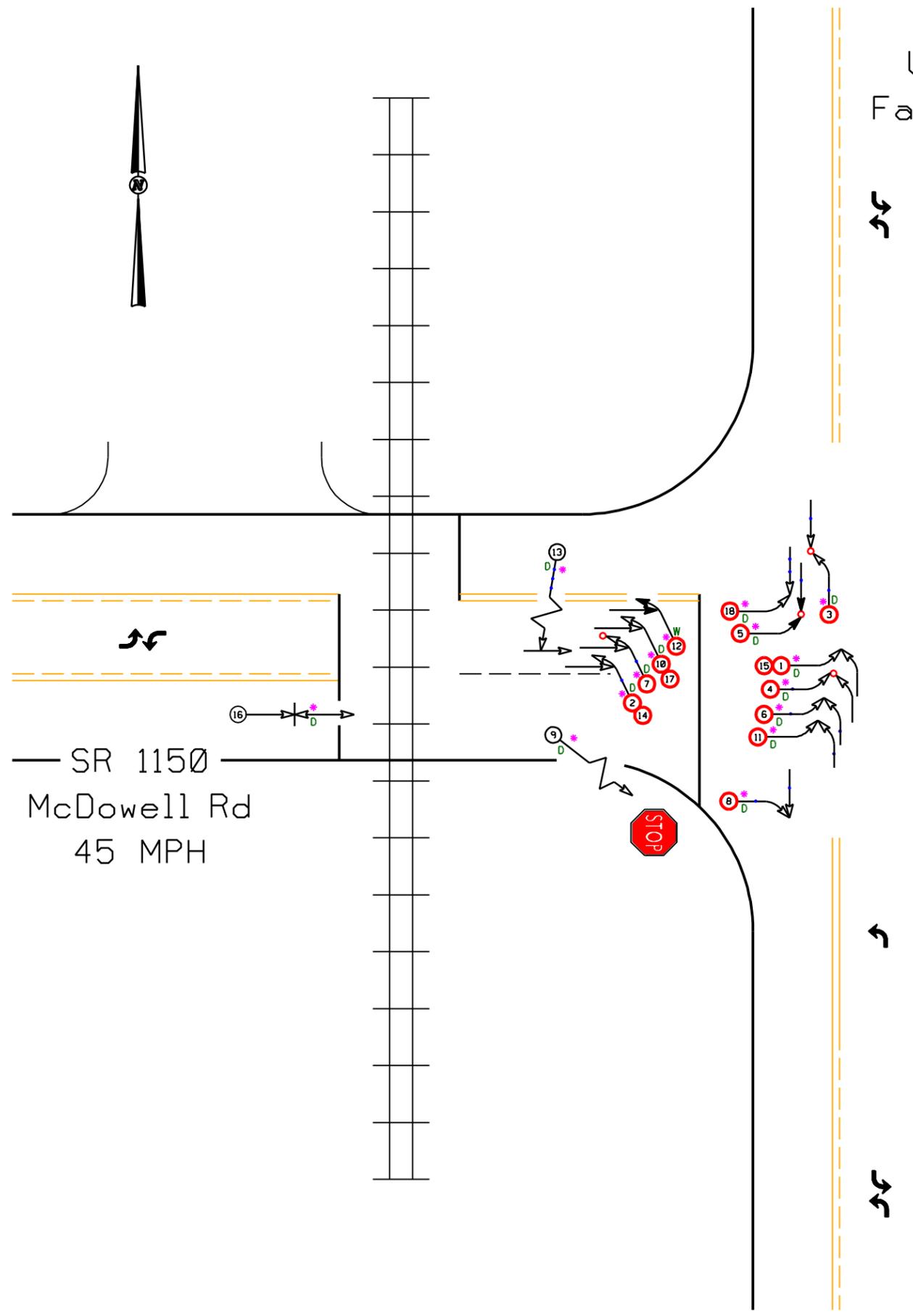
	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PARKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		INJURY		50 MPH TO 59		ICY OR SNOWY
	REAR END		FATALITY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

US 220 Business  
Fayetteville Street  
45 MPH

SS# 08-00-203  
Randolph County  
City of Asheboro  
BEFORE Period  
4/1/97 - 1/31/03

Note Crash 13: SB Vehicle on US 220 Business  
lost trailer and impacted stopped vehicle on SR 1150

SR 1150  
McDowell Rd  
45 MPH



Frontal Impact  
 Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: B	AREA: 1
	STUDY PERIOD: 4/1/1997 - 1/31/2003	
	DISTANCE: Y-LINE = 150 FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: BR		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 4-28-2009		
LOG NUMBER: SS# 08-00-203 BEFORE		

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

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		SPEED UNKNOWN		70 AND UP		

US 220 Business  
Fayetteville Street  
45 MPH

SS# 08-00-203  
Randolph County  
City of Asheboro  
AFTER Period  
4/1/03 - 1/31/09

SR 1150  
McDowell Rd  
45 MPH

New Signal  
Installation  
SIG ID 08-0973

Frontal Impact  
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: B	AREA:
	STUDY PERIOD: 4/1/2003- 1/31/2009	
	DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: BR		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 4-28-2009		
LOG NUMBER: SS* 08-00-203 AFTER		

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