

Spot Safety Project Evaluation

Project Log # 200702030

Spot Safety Project # 06-01-209

Spot Safety Project Evaluation of the Actuated Posted Dual Flashers and “Vehicle Entering” Sign installation at the Intersection of NC 211 and SR 1318 (McQueen Rd) Robeson County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

Jason B. Schronce

5-22-2007
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 06-01-209 – Posted Dual Actuated Flasher and “Vehicle Entering” Sign installation at the Intersection of NC 211 and SR 1318 (McQueen Rd) near Red Springs in Robeson County.

Project Information and Background from the Project File Folder

NC 211 and SR 1318 are currently two lane, 55 mph facilities without left turn lanes. The intersection is controlled by a stop condition on SR 1318 with stop ahead signs on both approaches. Advance crossroad warning signs are located on the approaches of NC 211 positioned beside the countermeasure flashers.

The original problem statement of the project was a pattern of angle crashes resulting from motorists improperly entering from SR 1318. The spot safety project improvement countermeasure chosen for the subject location was the installation of posted dual actuated flashers and “Vehicle Entering” signs on the NC 211 approaches. The initial crash analysis was completed from March 31, 1998 through March 31, 2001 with all nine (9) reported crashes considered correctable by the installation of the actuated flashers.

The final completion date for the actuated flasher installation at the subject intersection was on September 15, 2002 at a cost of \$15,000.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes along the subject road, the crash data omitted from this analysis to consider for an adequate construction period was from August 1, 2002 through October 31, 2002. The before period consisted of reported crashes from August 1, 1998 through July 31, 2002 (4 years) and the after period consisted of reported crashes from November 1, 2002 through October 31, 2006 (4 Years). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed.

The analysis consisted of the treatment data at the intersection of NC 211 and SR 1318 (McQueen Rd) with a 150' y-line. The following data table depicts the Naive Before and After Analysis for the above information. Please note that Frontal Impact Crashes involving opposing roadway vehicles were the target crashes for the applied countermeasure. These crash types considered are as follows: Left turn, different roadways; Right turn, different roadways; and Angle.

Treatment Information			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	15	12	- 20.00 %
Total Severity Index	5.44	4.70	- 13.60
Target Crashes	12	5	- 58.33
Target Crash Severity Index	5.32	5.44	2.26 %
Volume	4,900	5,700	16.32
<u>Injury Summary (Total Crashes)</u>			
Fatal injuries	0	0	N/A
Class A injuries	0	0	N/A
Class B injuries	2	2	0.00 %
Class C Injuries	15	7	- 53.33 %
Total Injuries	17	9	- 47.06

The naive before and after analysis at the treatment location resulted in a 20 percent decrease in Total Crashes, a 58 percent decrease in Frontal Impact Crashes, and a 16 percent increase in Average Daily Traffic (ADT). The before period ADT year was 2000 and the after period ADT year was 2004.

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 20 percent decrease in Total Crashes and a 58 percent decrease in Frontal Impact Crashes. The summary results above demonstrate that the treatment location appears to have had a decrease in the number of Total Crashes and a decrease in the number of Frontal Impact Crashes from the before to the after period.

From the before period compared to the after period collision diagrams, there is a significant reduction in angle crashes, from eleven (11) to five (5). The flashers have apparently raised attentiveness of drivers to the approaching dangers of the intersection. Only one after period collision, crash 6, resulted from the vehicle running the stop sign. There were zero crashes in the before period crashes resulting from a SR 1318 motorists running the stop sign.

The after period did have 3 crashes, two rear-ends and one illegal pass on the left, that involved motorists on NC 211 turning left onto SR 1318. There were no before period crashes of this manner on NC 211.

The calculated benefit to cost ratio for this project is 3.43 considering total crashes. The benefit to cost ratio considering only target crashes is 5.32. 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. The higher target crash benefit-cost ratio shows an effective reduction of frontal impact crashes.

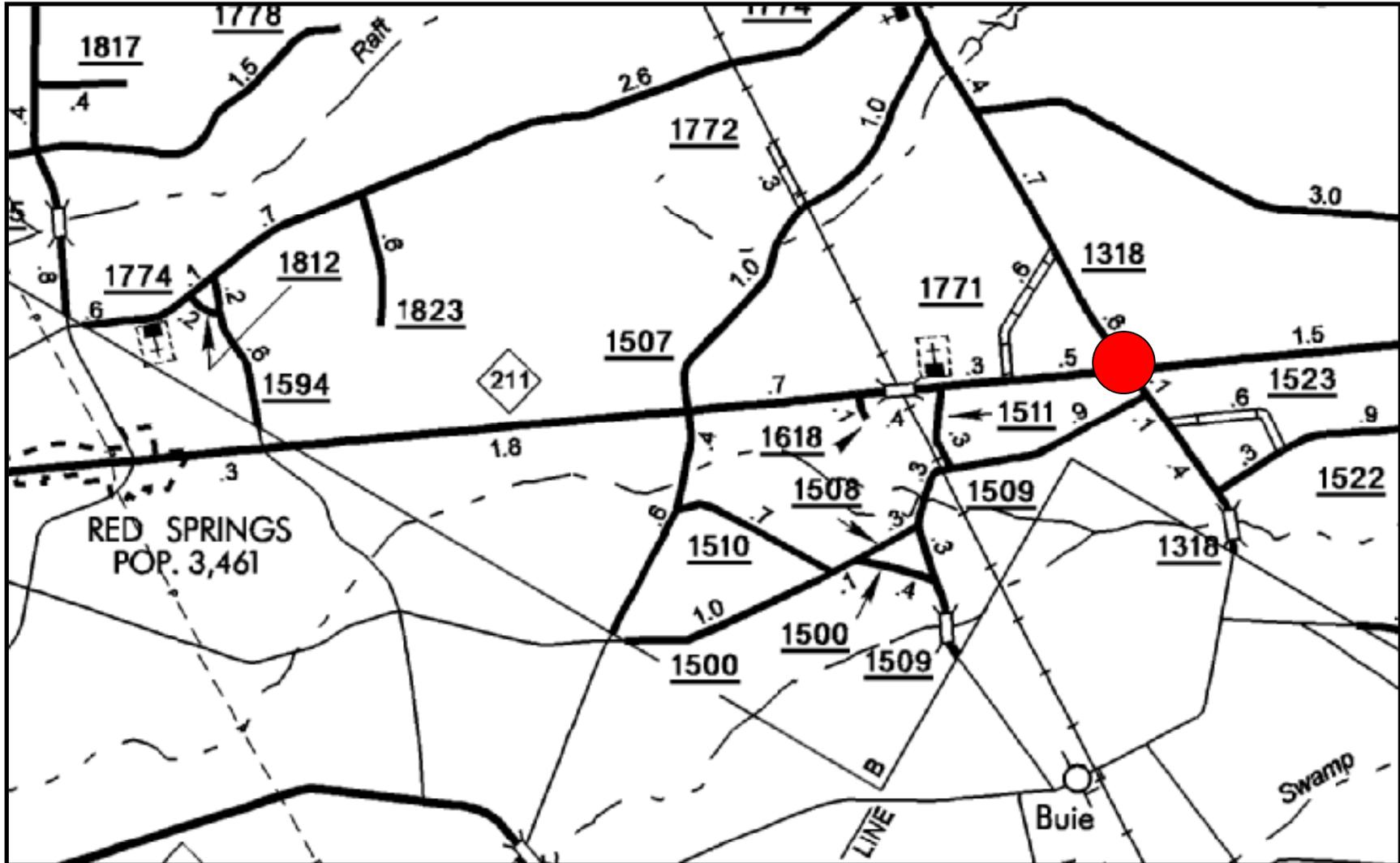
The Safety Evaluation Group observed, during the field investigation, heavy brush overgrowth in the southwest quadrant causing sight distance issues for northbound SR 1318 motorists. Also, the “Keep Right” sign located on the northbound channelization island had been damaged and was lying over at the time of our inspection.

The countermeasure flasher was also installed approximately 10 feet above the roadway, nearly twice the height of a standard roadway sign (*see attached site photos*). It was determined that the long straight roadway segments required the raised flashers for advance warning to the approaching rural intersection.

Please see the attached *Treatment Site Photos*. Photos are provided for all approaches to the treatment intersection, including photos of the countermeasure height placement and sight distance issues as discussed in the *Project Background* section of the report.

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.

Location Map
Robeson County
Evaluation of Spot Safety Project # 06-01-209



Treatment Location: NC 211 (E. 4th Ave) at SR 1318 (McQueen Rd / Buie-Philadelphes Rd)

TREATMENT SITE PHOTO TAKEN 4/25/2007



Traveling North on SR 1318 (McQueen Rd)



Traveling South on SR 1318



Traveling East on NC 211 (Notice distance from sign to intersection)



Traveling East on NC 211



Traveling West on NC 211 (Notice countermeasure visibility from a distance)



Traveling West on NC 211



Countermeasure Sign – notice height compared to roadway



Sight Distance issues on Northbound SR 1318 approach facing West
(Also, at the time of the field investigation, “Keep Right” sign was knocked over)

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 211 at SR 1318
 COUNTY: Robeson
 FILE NO.: SS 06-01-209

BY: JBS
 DATE: 5/10/2007
 NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - Posted Vehicle Entering Flashers x2

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$15,000	10	0.149	\$2,235
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$15,000	10	0.149	\$2,235

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$1,000
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$700
 TOTAL ANNUAL COST= \$3,935
 TOTAL COST OF PROJECT= \$15,000

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	4.00	0	0.00	9	2.25	6	1.50	\$46,350
AFTER	4.00	0	0.00	6	1.50	6	1.50	\$32,850

Annual Benefits from Crash Cost Savings \$13,500

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$9,565

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 3.43

TOTAL COST OF PROJECT - \$15,000 COMPREHENSIVE B/C RATIO - 3.43

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 211 at SR 1318
 COUNTY: Robeson
 FILE NO.: SS 06-01-209

BY: JBS
 DATE: 5/10/2007
 NOTES: Target Crashes

DETAILED COST: TYPE IMPROVEMENT - Posted Vehicle Entering Flashers x2

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$15,000	10	0.149	\$2,235
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$15,000	10	0.149	\$2,235

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$1,000
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$700
 TOTAL ANNUAL COST= \$3,935
 TOTAL COST OF PROJECT= \$15,000

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	4.00	0	0.00	7	1.75	5	1.25	\$36,375
AFTER	4.00	0	0.00	3	0.75	2	0.50	\$15,450

Annual Benefits from Crash Cost Savings \$20,925

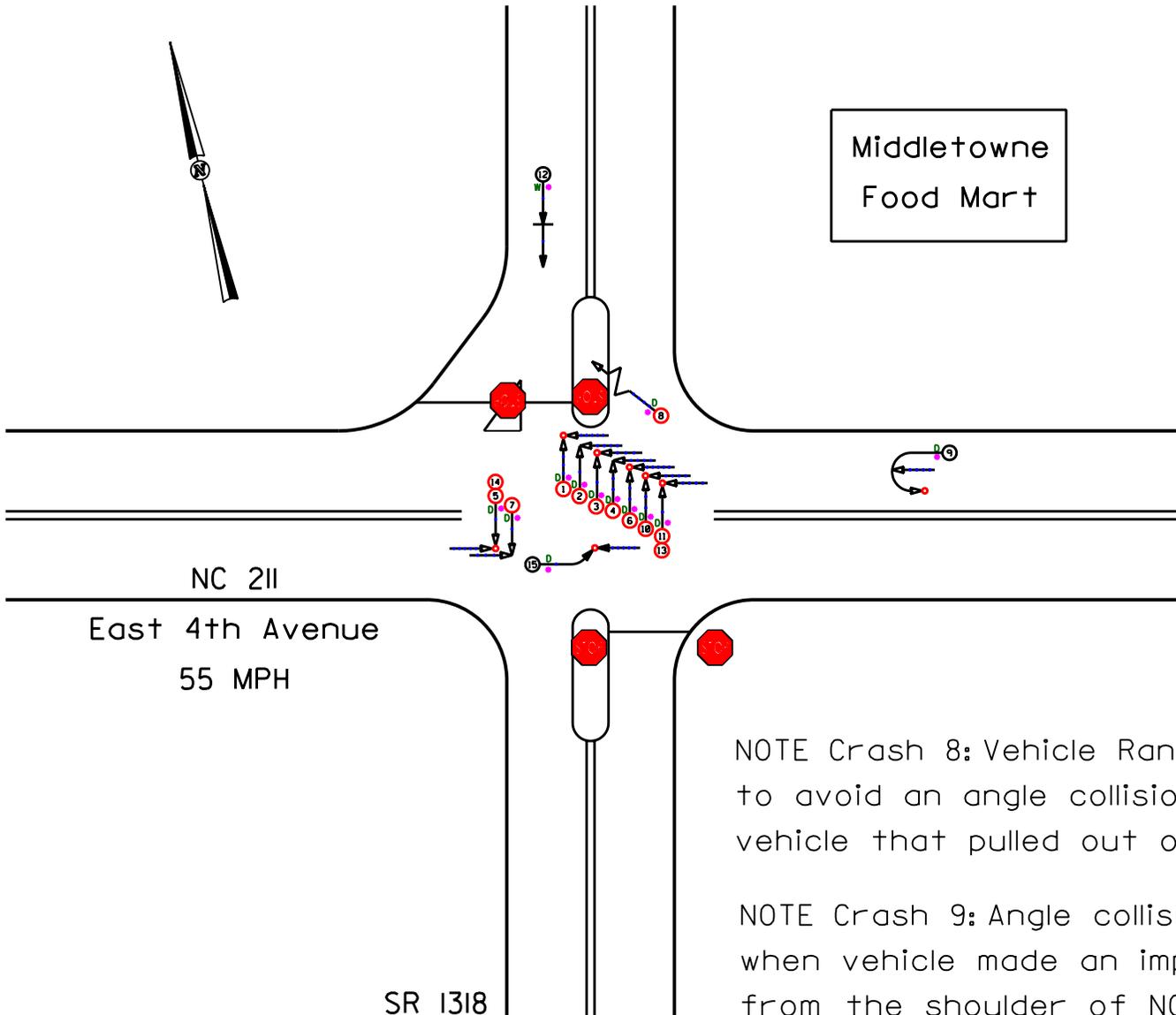
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$16,990

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 5.32

TOTAL COST OF PROJECT - \$15,000 COMPREHENSIVE B/C RATIO - 5.32



Middletowne
Food Mart



NC 211
East 4th Avenue
55 MPH

SR 1318
McQueen Road
55 MPH

LEGEND

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

SS# 06-01-209
Robeson County
Before Period
8/1/98 - 7/31/02
NC 211 at SR 1318

NOTE Crash 8: Vehicle Ran Off Road to avoid an angle collision from another vehicle that pulled out of SR 1318

NOTE Crash 9: Angle collision occurred when vehicle made an improper u-turn from the shoulder of NC 211

Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 6	AREA:
	STUDY PERIOD: 8/1/98 TO 7/31/2002	
	DISTANCE: 1-LINE = 150 FT	
	ANALYSIS PREPARED BY: JBS	
	ANALYSIS CHECKED BY: CS	
	DIAGRAM PREPARED BY: JBS	
	DIAGRAM REVIEWED BY: ST	
	SCALE: NOT TO SCALE	
	DATE: 3-12-2007	
	LOG NUMBER: SS# 06-01-209	

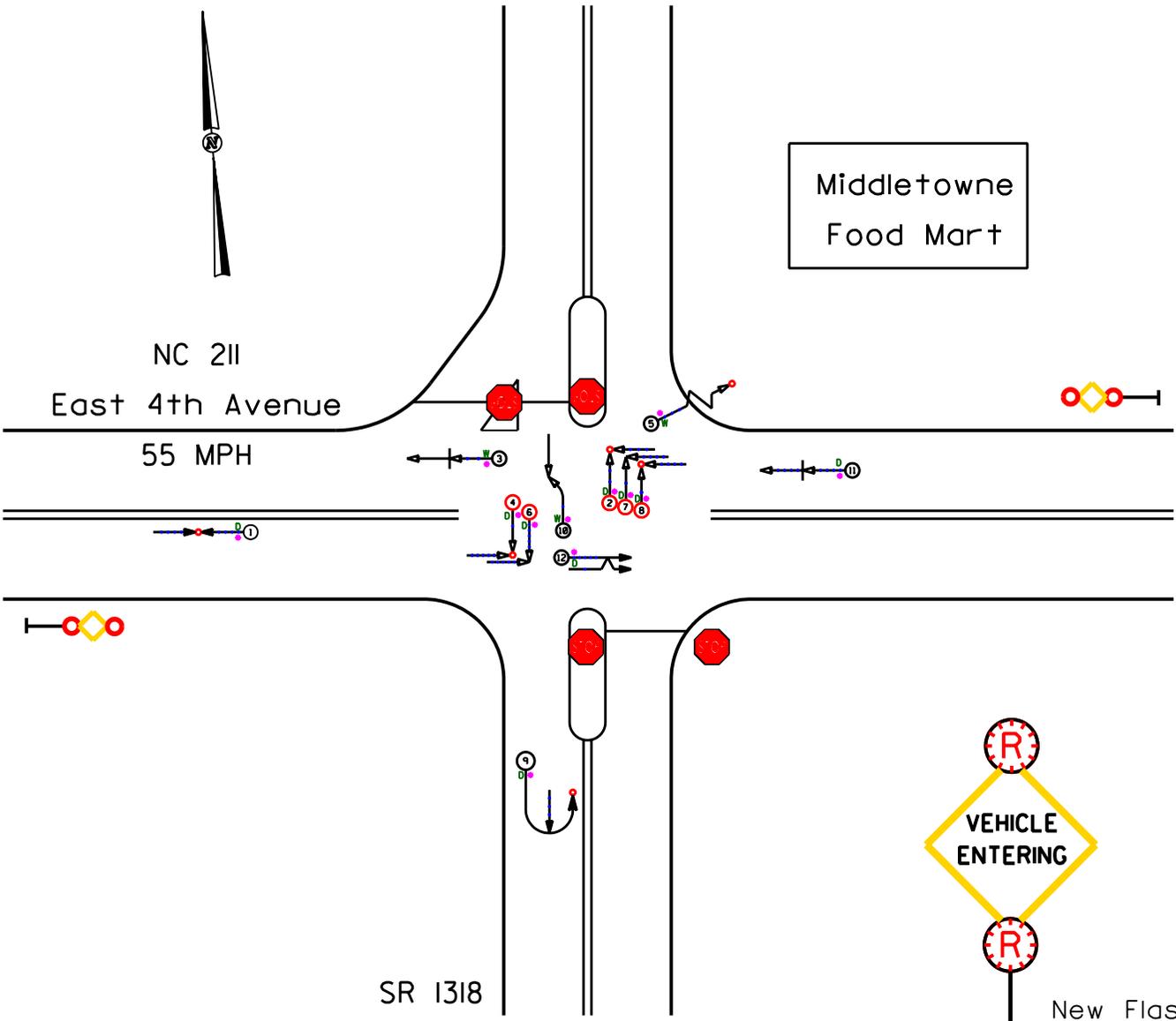
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH



Middletowne
Food Mart

NC 211
East 4th Avenue
55 MPH

SR 1318
McQueen Road
55 MPH



LEGEND

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

SS# 06-01-209
Robeson County
After Period
11/1/02 - 10/31/06
NC 211 at SR 1318



New Flashers for
Vehicles on both
approaches of NC 211



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 6	AREA:
	STUDY PERIOD: 8/1/2002 TO 1/30/2006	
	DISTANCE: 1+LINE = 150 FT	
	ANALYSIS PREPARED BY: JBS	
	ANALYSIS CHECKED BY: CS	
	DIAGRAM PREPARED BY: JBS	
	DIAGRAM REVIEWED BY: ST	
	SCALE: NOT TO SCALE	
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N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH