

# Spot Safety Project Evaluation

Project Log # 200812042

Spot Safety Project # 12-99-205

**Spot Safety Project Evaluation of the Traffic Signal Installation at the Intersection of  
SR 1401 (Sandy Ridge Rd) and SR 1501 (33<sup>rd</sup> Ave)  
Catawba County**

Documents Prepared By:

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

**Principal Investigator**



Brad Robinson, PE

5/12/2009

Date

Traffic Safety Project Engineer

## ***Spot Safety Project Evaluation Documentation***

### **Subject Location**

Evaluation of Spot Safety Project Number 12-99-205 – The Intersection of SR 1401 (Sandy Ridge Rd) and SR 1501 (33<sup>rd</sup> Ave) in Catawba County

The Signal ID is 12-1685 for the subject location.

### **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 two-phase actuated traffic signal at the intersection.

The subject location is a three-leg intersection which was controlled by a stop sign on SR 1501 (33<sup>rd</sup> Ave NE) in the before period. SR 1401 (Sandy Ridge Rd) and SR 1501 are both two-lane facilities. The speed limits are 45 mph for SR 1401 and 35 mph for SR 1501.

The original statement of problem was that the side street (SR 1401) was experiencing delay.

The initial crash analysis was completed from April 1, 1996 to March 31, 1999 and found no reported crashes. The final completion date for the improvement at the subject intersection was on March 12, 2003 with a total cost of \$40,000.00.

### **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 from February 1, 2003 to April 31, 2003. The before period consisted of reported crashes from July 1, 1997 through January 31, 2003 (5 years and 7 months); and the after period consisted of reported crashes from May 1, 2003 through November 30, 2008 (5 years and 7 months). The ending date for this analysis was determined by the available crash data at the time of analysis.

The treatment data consisted of all reported crashes within 150 feet of the subject intersection. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact crash types were the Target Crashes for the applied countermeasure. These crash types considered are as follows: Left Turn, same roadway; Left Turn, different roadway; Right Turn, same roadway; Right Turn, different roadway; Head On and Angle. The target crashes are clearly identified in the before and after period collision diagrams.

<b>Treatment Information</b>			
	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total Crashes	11	11	0.0
Total Severity Index	3.69	4.36	18.2
<b>Target Crashes</b>			
Target Crashes	6	6	0.0
Target Crash Severity Index	2.23	3.47	55.6
<b>Volume</b>			
Volume	10,500	12,600	20.0
<b>Crash Severity Summary</b>			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	0	0	N/A
Class C Crashes	4	5	25.0
PDO Crashes	7	6	-14.3

The naive before and after analysis at the treatment location resulted in a no change in either Total Crashes or Target Crashes and a 20 percent increase in Average Daily Traffic (ADT). 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 no change in either Total Crashes or Target Crashes. The Total Severity Index increased by 18 percent and the Target Crash Severity Index increased by 56 percent. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have increased at the treatment location from the before to the after period.

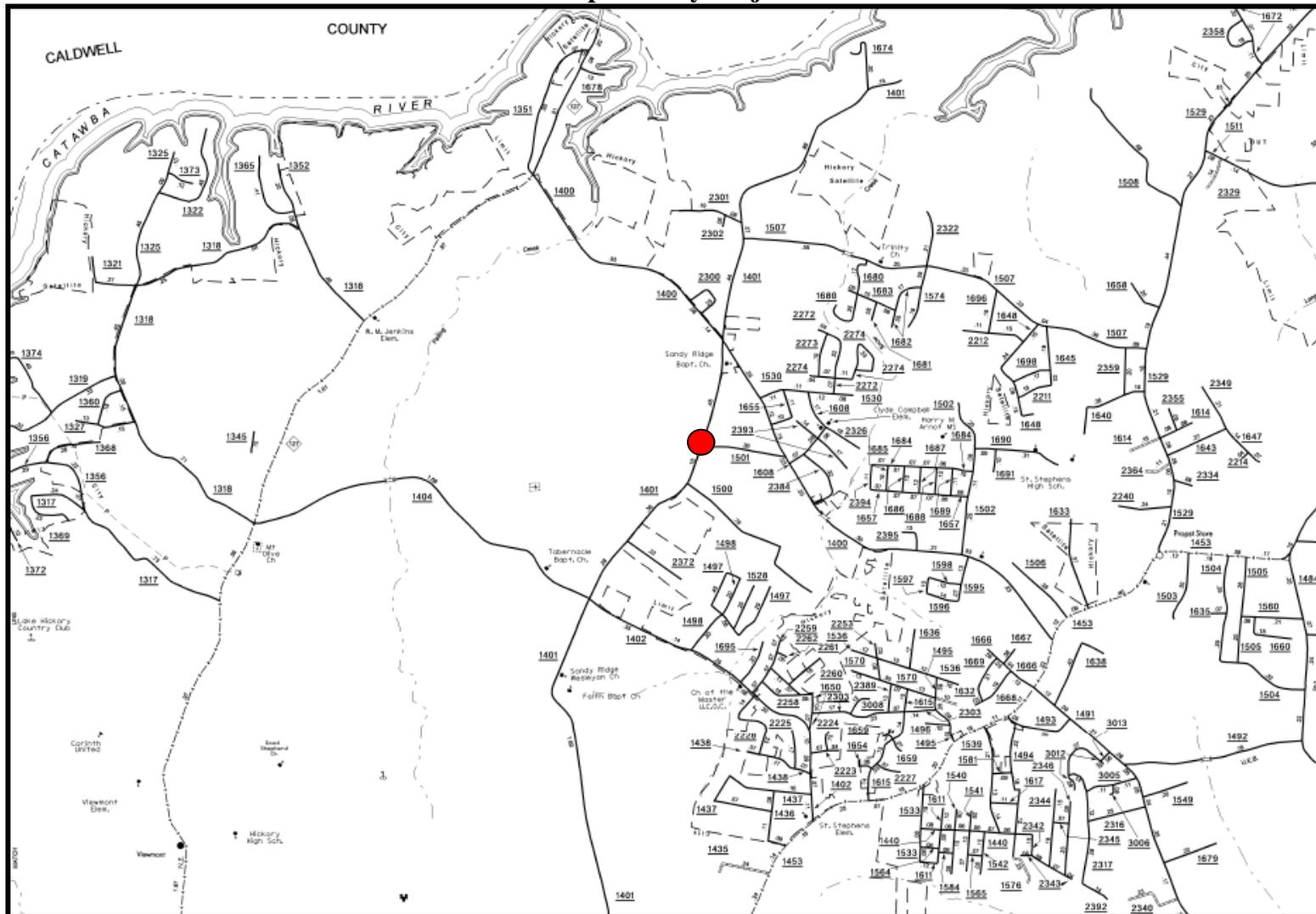
The calculated benefit to cost ratio for this project is -0.32 considering total crashes. The benefit to cost ratio considering only target crashes is -0.32. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related 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.

It appears that the signal installation was not effective in reducing the number of Target Crashes at the intersection from the before to the after period. As stated in the *Project Background* section the primary reason for the signal was to alleviate delay rather than for safety reasons. The naïve before and after analysis does not measure operational benefits to the intersection resulting from the signal installation.

In five of the six after period Target Crashes the driver of the vehicle traveling through the intersection on SR 1401 was faulted for running a red signal.

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**  
**Catawba County**  
**Evaluation of Spot Safety Project #12-99-205**



Treatment Location: SR 1401 (Sandy Ridge Rd) and SR 1501 (33<sup>rd</sup> Ave) in Hickory



Looking North on SR 1401



Looking South on SR 1401



Looking West on SR 1501

**BENEFIT-COST ANALYSIS WORKSHEET**

LOCATION: SR 1401 and SR 1501  
 COUNTY: Catawba  
 FILE NO.: SS 12-99-205

BY: BDR  
 DATE: 4/20/2009

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$40,000	10	0.149	\$5,961
Right-of-Way	\$0	0	0.000	\$0
<b>TOTALS</b>	<b>\$40,000</b>	<b>10</b>	<b>0.149</b>	<b>\$5,961</b>

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000  
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900  
 TOTAL ANNUAL COST= \$8,861  
 TOTAL COST OF PROJECT= \$40,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO		ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	CRASHES	CRASHES PER YR	
BEFORE	5.59	0	0.00	4	0.72	7	1.25	\$19,571
AFTER	5.59	0	0.00	5	0.89	6	1.07	\$22,397

Annual Benefits from Crash Cost Savings (\$2,826)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$11,688)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -0.32

TOTAL COST OF PROJECT - \$40,000 COMPREHENSIVE B/C RATIO - -0.32

**BENEFIT-COST ANALYSIS WORKSHEET**

LOCATION: SR 1401 and SR 1501  
 COUNTY: Catawba  
 FILE NO.: SS 12-99-205 Target Crashes

BY: BDR  
 DATE: 4/20/2009

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$40,000	10	0.149	\$5,961
Right-of-Way	\$0	0	0.000	\$0
<b>TOTALS</b>	<b>\$40,000</b>	<b>10</b>	<b>0.149</b>	<b>\$5,961</b>

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000  
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900  
 TOTAL ANNUAL COST= \$8,861  
 TOTAL COST OF PROJECT= \$40,000

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	5.59	0	0.00	1	0.18	5	0.89	\$7,335
AFTER	5.59	0	0.00	2	0.36	4	0.72	\$10,161

Annual Benefits from Crash Cost Savings (\$2,826)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$11,688)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -0.32

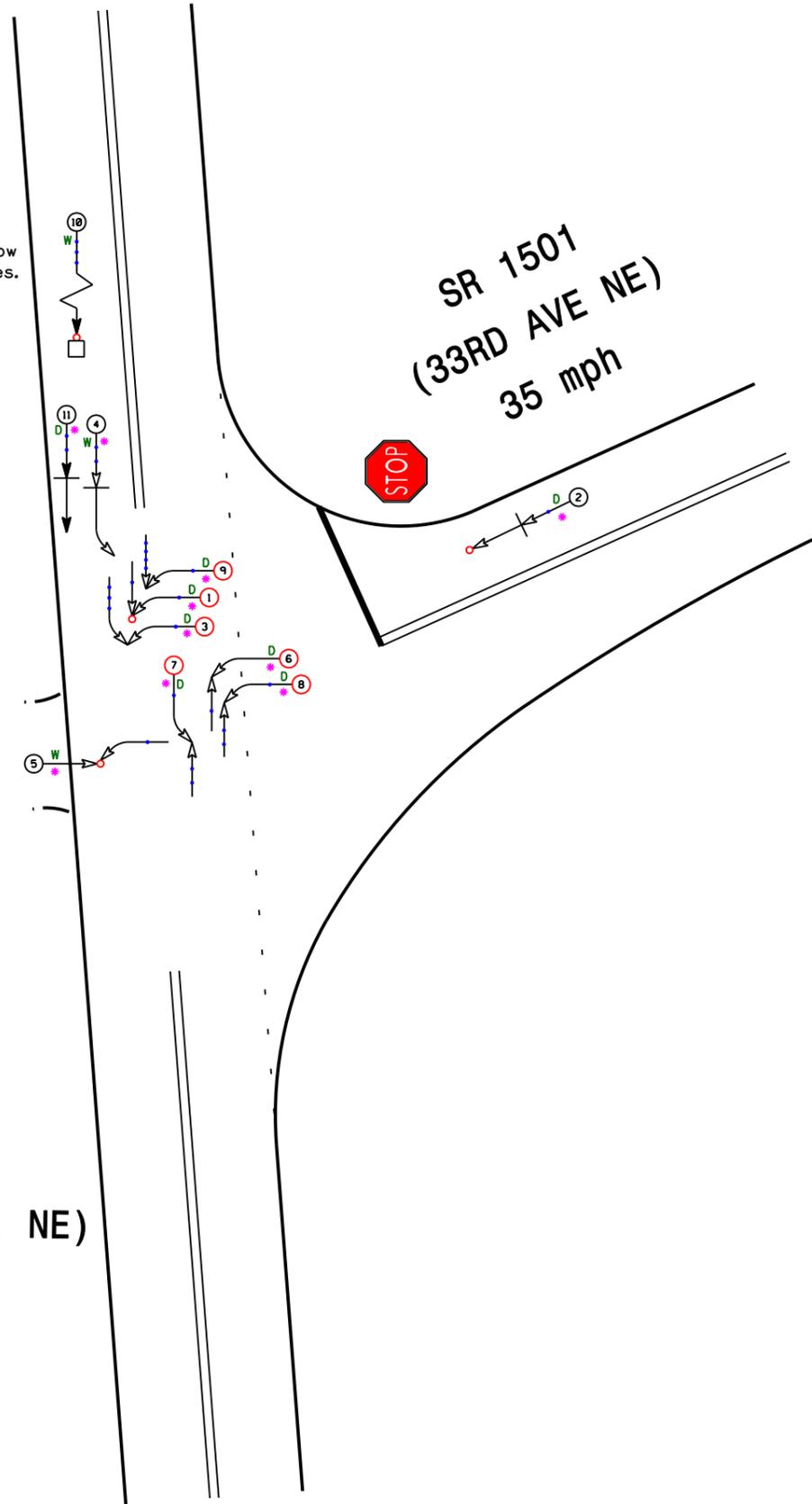
TOTAL COST OF PROJECT - \$40,000 COMPREHENSIVE B/C RATIO - -0.32

Catawba County  
 SR 1401 (Sandy Ridge Rd/  
 16th St NE) and SR 1501  
 (33rd AVE NE)  
 BEFORE Period  
 7/1/1997-1/31/2003

Note: Vehicle hit low hanging power lines.



SR 1401  
 (SANDY RIDGE RD./16TH ST. NE)  
 45 mph



**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		ONLY
	RAN OFF ROAD		70 AND UP		SPEED UNKNOWN		

Frontal Impact  
 Target Crash

**TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT**

	COLLISION DIAGRAM	
	DIVISION: 12	AREA:
STUDY PERIOD: 7/1/1997-1/31/2003		
DISTANCE: Y-LINE = 150 FT		
ANALYSIS PREPARED BY: BDR		
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: BDR		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: March 2009		
LOG NUMBER: 20082042		

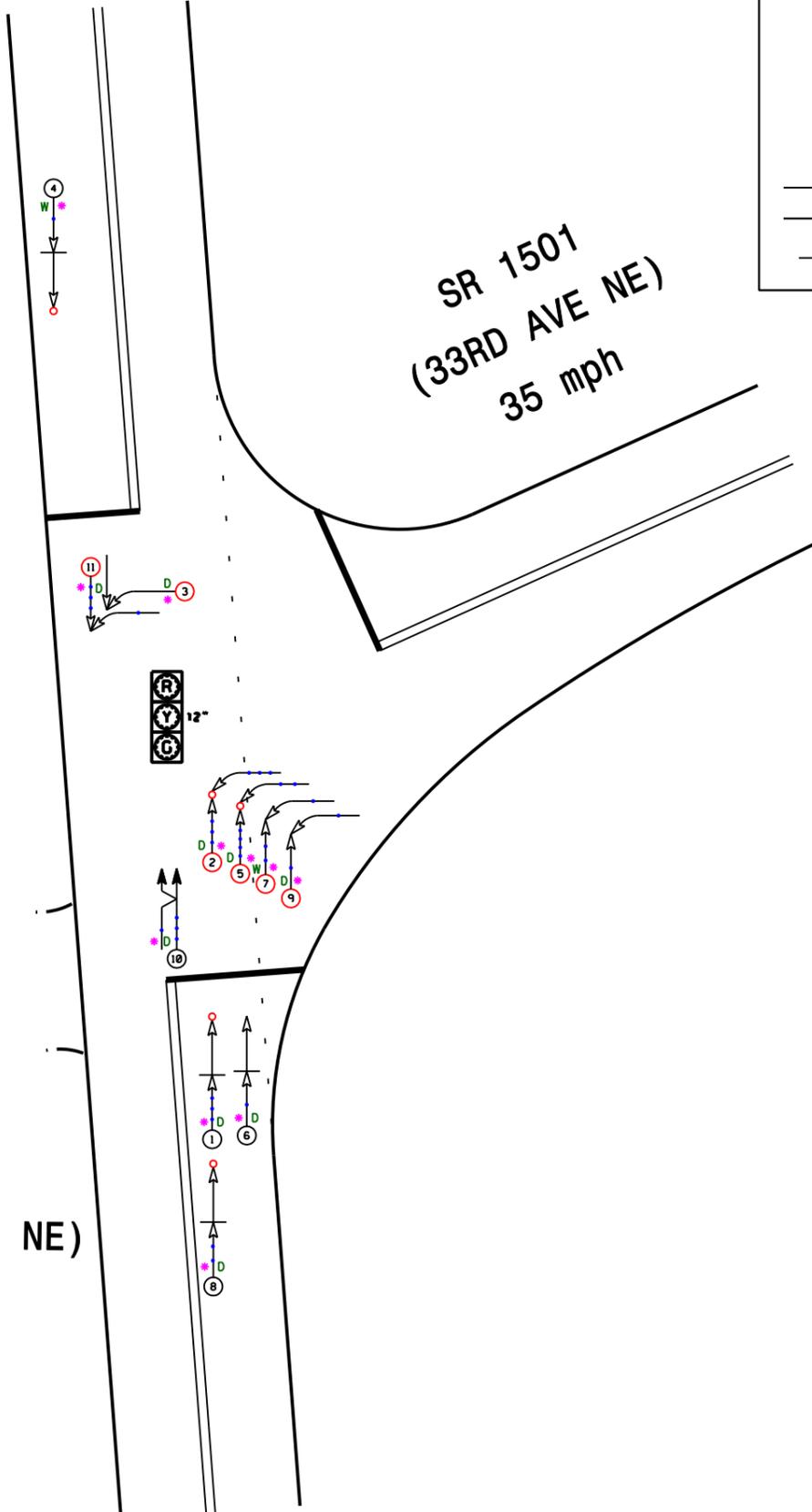
**N.C. DEPARTMENT of TRANSPORTATION**  
**DIVISION of HIGHWAYS**  
**TRANSPORTATION MOBILITY AND**  
**SAFETY DIVISION**

Catawba County  
 SR 1401 (Sandy Ridge Rd/  
 16th St NE) and SR 1501  
 (33rd AVE NE)  
 AFTER Period  
 5/1/2003-11/30/2008



SR 1401  
 (SANDY RIDGE RD./16TH ST. NE)  
 45 mph

SR 1501  
 (33RD AVE NE)  
 35 mph



**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
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	RAN OFF ROAD				70 AND UP		
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 Frontal Impact  
 Target Crash

**TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT**

	COLLISION DIAGRAM	
	DIVISION: 12	AREA:
STUDY PERIOD: 5/1/2003-11/30/2008		
DISTANCE: Y-LINE = 150 FT		
ANALYSIS PREPARED BY: BDR		
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: BDR		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: March 2009		
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