

Spot Safety Project Evaluation

Project Log # 200907174

Spot Safety Project # 01-01-258

Spot Safety Project Evaluation of the Traffic Signal Installation at the Intersection of NC 168 and SR 1358 (North Point Blvd) Currituck 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

8/17/2009

Date

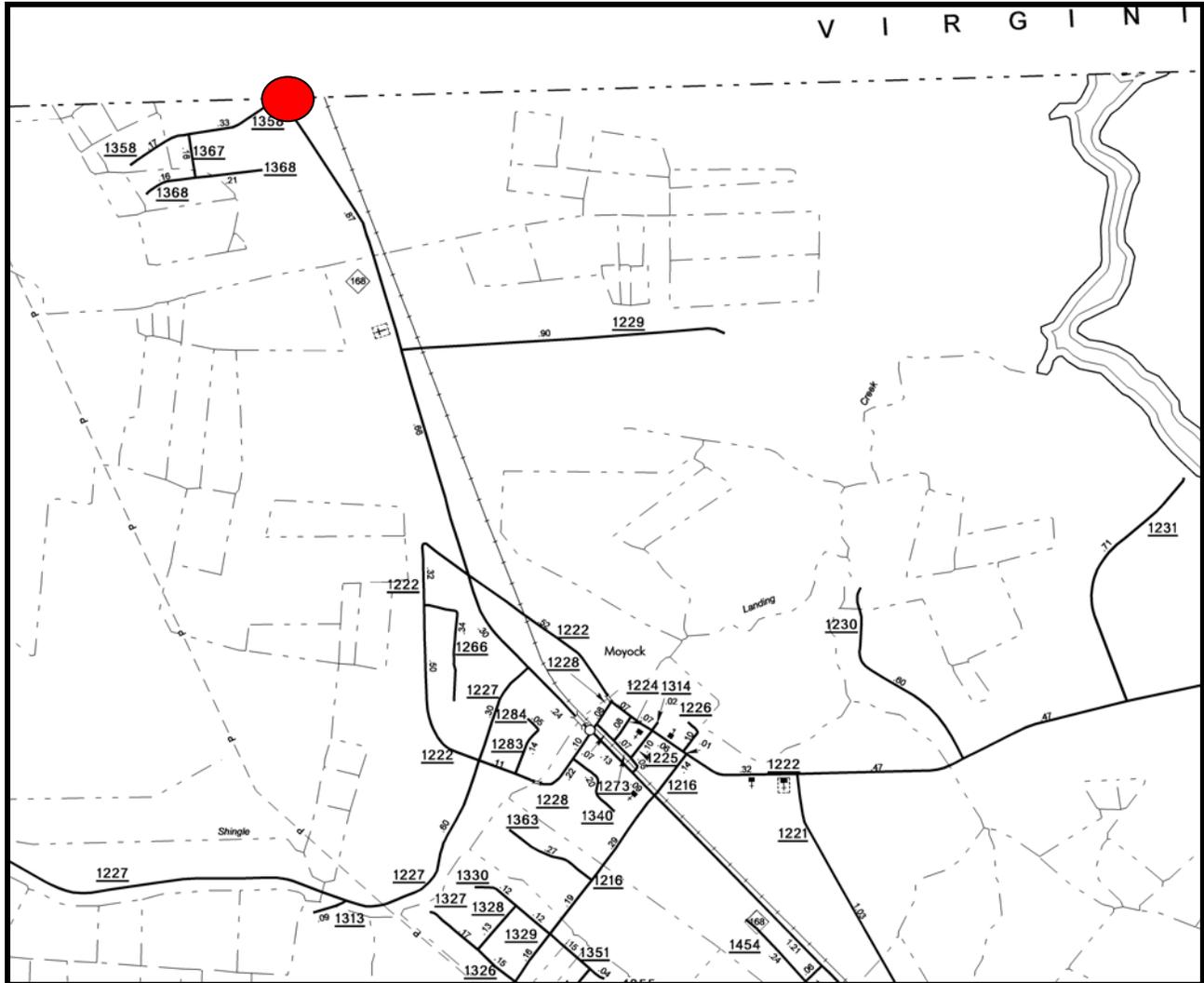
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 01-01-258 – The Intersection of NC 168 and SR 1358 (North Point Blvd) in Currituck County. The intersection is at the Virginia boarder.

The signal number for this location is 01-0628.



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 fully-actuated traffic signal.

The subject location is a three-leg intersection which was controlled by a stop sign on SR 1358 in the before period. The NC-VA State line goes through the intersection. The northbound approach (NC 168) is a five-lane roadway with a center left turn lane and a speed limit of 50 mph. The southbound approach (VA 168) is a four-lane divided roadway. SR 1358 has both exclusive left and right turn lanes at the intersection and a speed limit of 25 mph.

The original statement of problem was that due to the traffic volumes, vehicles on SR 1358 were having difficulty entering NC 168 safely.

The initial crash analysis was conducted from August 1, 1998 to July 31, 2001 with a total of two reported crashes, only one of which was considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on January 30, 2004 with a total cost of \$75,000.00.

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 December 1, 2003 to April 30, 2004. The before period consisted of reported crashes from November 1, 1998 through November 30, 2003 (5 years and 1 months) and the after period consisted of reported crashes from May 1, 2004 through May 31, 2009 (5 years and 1 months). The ending date for this analysis was limited by the available crash data at the time the analysis was conducted.

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.

<u>Treatment Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	6	10	66.7
Total Severity Index	14.87	5.44	-63.4
Target Crashes	4	3	-25.0
Target Crash Severity Index	21.80	8.40	-61.5
Volume	24,000	25,000	4.2

Crash Severity Summary			
Fatal Crashes	1	0	-100.0
Class A Crashes	0	0	N/A
Class B Crashes	0	2	N/A
Class C Crashes	1	4	300.0
PDO Crashes	4	4	0.0

The naive before and after analysis at the treatment location resulted in a 67 percent increase in Total Crashes, a 25 percent decrease in Target Crashes, and a 4 percent increase in Average Daily Traffic (ADT). The before period ADT year was 2001 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 67 percent increase in Total Crashes and a 25 percent decrease in Target Crashes. The Total Severity Index decreased by 63 percent and the Target Crash Severity Index decreased by 62 percent. The summary results above demonstrate that although Total Crashes appear to have increased, Target Crashes have decreased at the treatment location from the before to the after period.

The calculated benefit to cost ratio for this project is 7.41 considering total crashes. The benefit to cost ratio considering only target crashes is also 8.37. 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.

In the before period all four Target Crashes were Left Turn-Different Roadway Crashes involving a vehicle turning left from SR 1358. One of these crashes resulted in a fatality. This pattern was reduced to only one in the after period.

The increase in Total Crashes can be attributed to an increase in Rear-End Crashes from the before to the after period. In the before period there were two Rear-End Crashes at the intersection and in the after period there were six. An increase in Rear-End Crashes is common at intersections when a signal is installed.

Please see the attached *Treatment Site Photos*. Photos are provided for all three approaches to the treatment intersection. Photos were obtained from Google Street-view. 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.

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 168 at SR 1358
 COUNTY: Currituck
 FILE NO.: SS 01-01-258

BY: BDR
 DATE: 8/13/2009

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$75,000	10	0.149	\$11,177
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$75,000	10	0.149	\$11,177

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900
 TOTAL ANNUAL COST= \$14,077
 TOTAL COST OF PROJECT= \$75,000

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	5.08	1	0.20	1	0.20	4	0.79	\$131,260
AFTER	5.08	0	0.00	6	1.18	4	0.79	\$26,929

Annual Benefits from Crash Cost Savings \$104,331

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$90,253

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 7.41

TOTAL COST OF PROJECT - \$75,000 COMPREHENSIVE B/C RATIO - 7.41

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 168 at SR 1358
 COUNTY: Currituck
 FILE NO.: SS 01-01-258 Target Crashes Only

BY: BDR
 DATE: 8/13/2009

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$75,000	10	0.149	\$11,177
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$75,000	10	0.149	\$11,177

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900
 TOTAL ANNUAL COST= \$14,077
 TOTAL COST OF PROJECT= \$75,000

COMPREHENSIVE COST REDUCTION:

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES						ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	
BEFORE	5.08	1	0.20	1	0.20	2	0.39	\$129,606
AFTER	5.08	0	0.00	3	0.59	0	0.00	\$11,811

Annual Benefits from Crash Cost Savings \$117,795

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$103,718

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 8.37

TOTAL COST OF PROJECT - \$75,000 COMPREHENSIVE B/C RATIO - 8.37

Treatment Site Photos From Google Street View



Looking Northwest on NC 168 and SR 1358 (North Point Blvd)



Looking Northwest on NC 168 and SR 1358 (North Point Blvd)



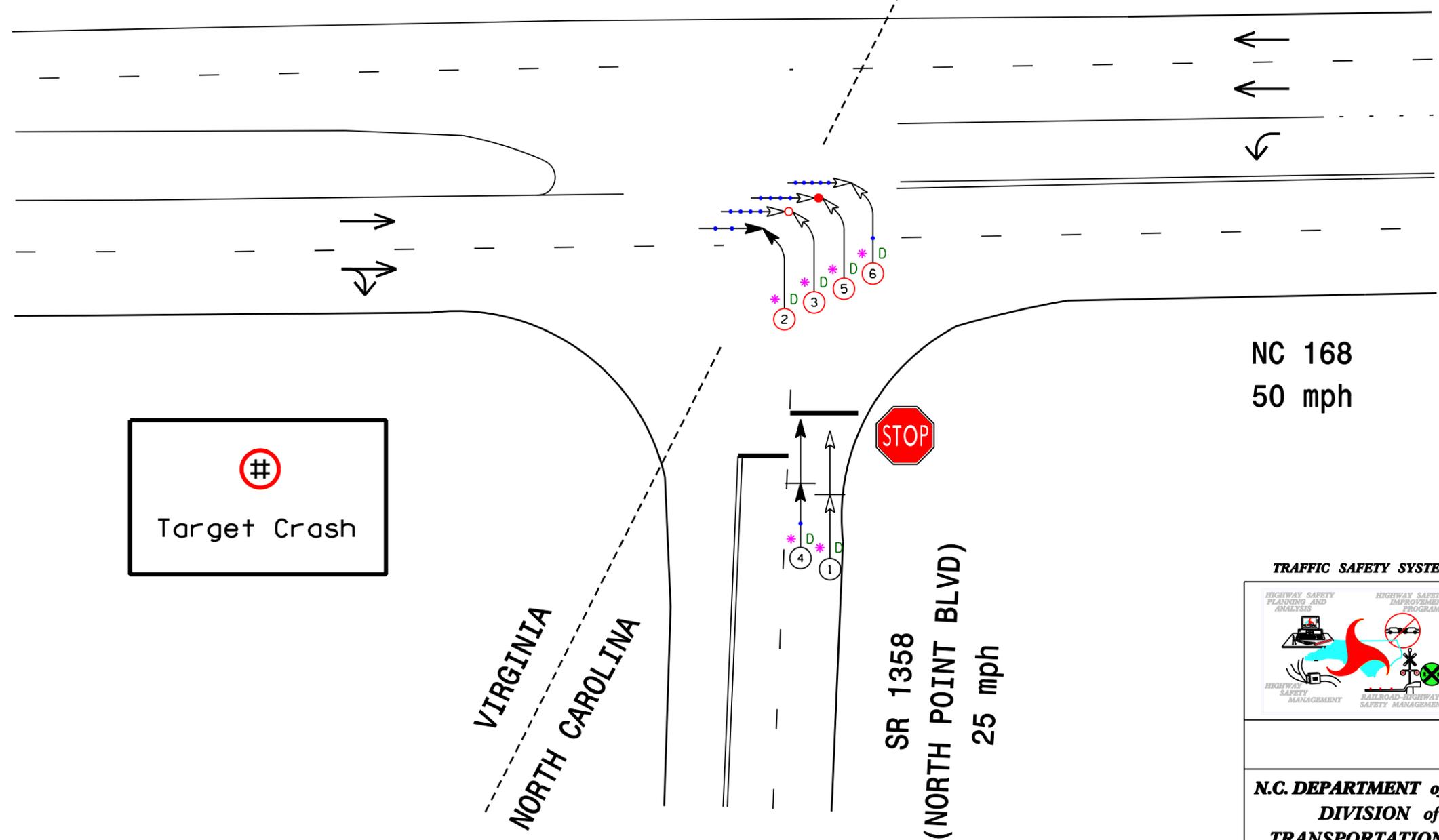
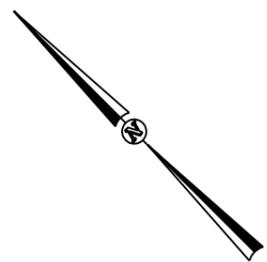
Looking west from intersection at SR 1358 (North Point Blvd)

Currituck County
 NC 168 and SR 1358
 (North Point Blvd)
 BEFORE Period
 11/1/98-11/30/03

VA 168
 50mph

LEGEND

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



 Target Crash

NC 168
 50 mph



SR 1358
 (NORTH POINT BLVD)
 25 mph

VIRGINIA
 NORTH CAROLINA

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 1	AREA:
	STUDY PERIOD: 11/1/98	
	DISTANCE: Y-LINE = 150 FT	
	ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: BDR		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: July 2009		
LOG NUMBER: 20090714		

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

Currituck County
 NC 168 and SR 1358
 (North Point Blvd)
 AFTER Period
 5/1/04-5/31/09

VA 168
 50mph

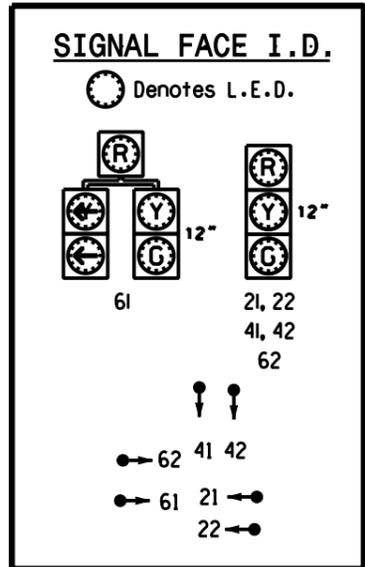
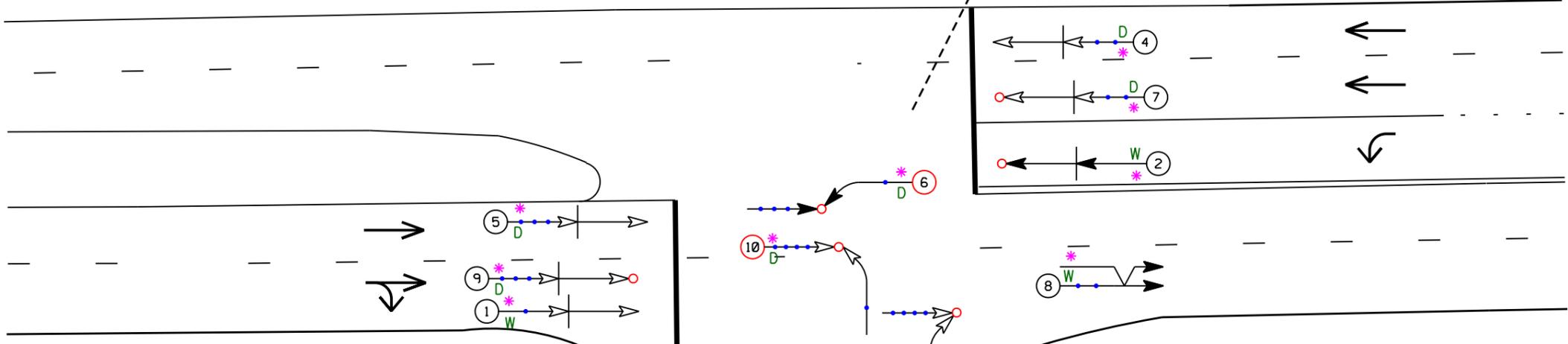
NC 168
 50 mph

SR 1358
 (NORTH POINT BLVD)
 25 mph

VIRGINIA
 NORTH CAROLINA

LEGEND

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



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 1	AREA:
	STUDY PERIOD: 5/1/04-5/31/09	
	DISTANCE: Y-LINE = 150 FT	
	ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: BDR		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: July 2009		
LOG NUMBER: 20090714		

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