

Spot Safety Project Evaluation

Order # 41000007293

Spot Safety Project # 01-04-005

Spot Safety Project Evaluation of the Installation of a Reverse "Vehicle Entering" Flasher at the Intersection of NC 903 and NC 11-42 Martin 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

8/2/2010

Date

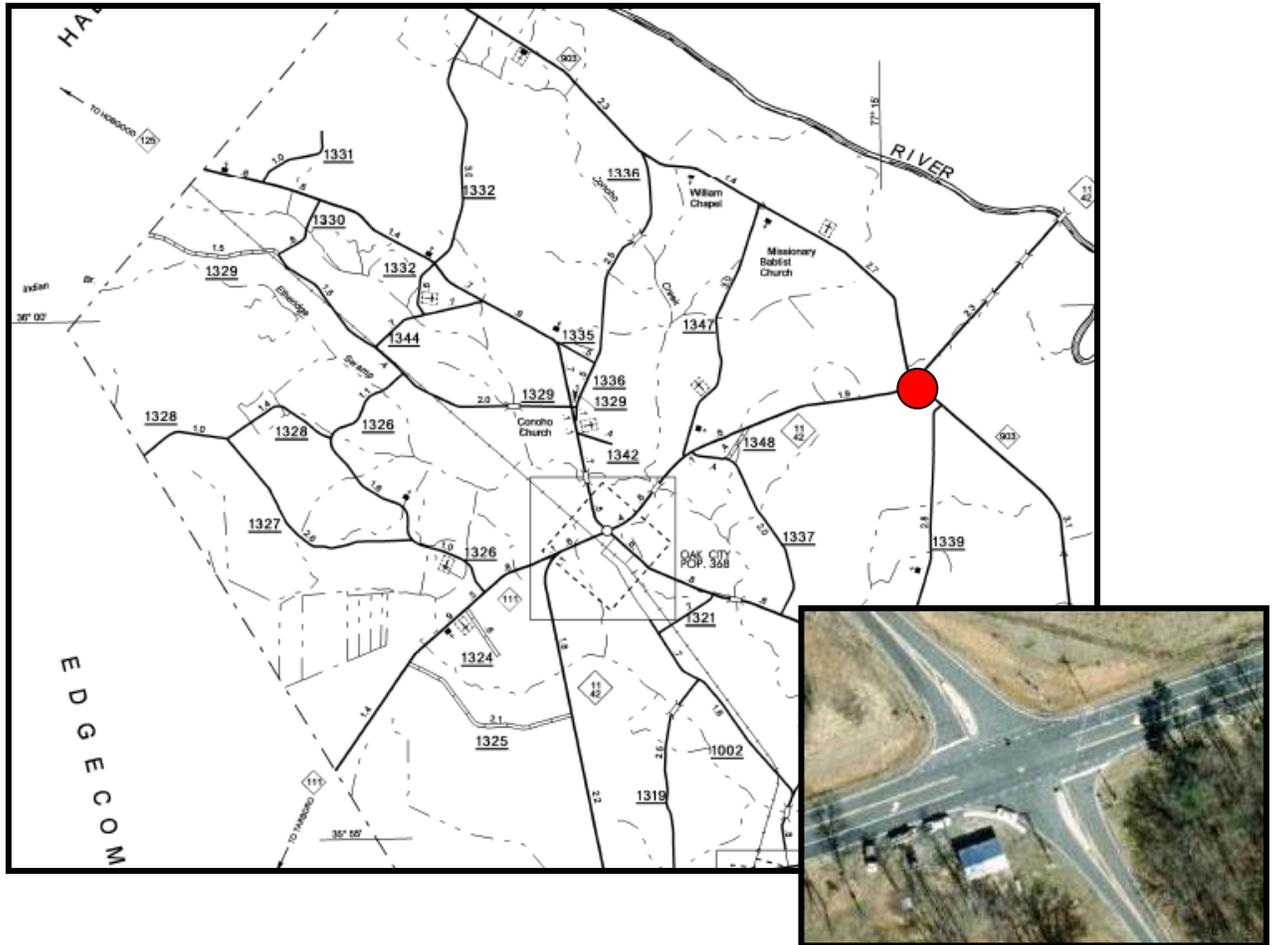
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 01-04-005 – The Intersection of NC 903 and NC 11-42 in Martin County.

The signal number for this location is 01-0307.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was to install reverse “Vehicle Entering” flashers on NC 903.

The subject location is a four-leg intersection that is controlled by dual stop signs on NC 903. There were already existing “Vehicle Entering When Flashing” signs and flashers on the NC 11-42 approaches prior to the project. In addition, there were also existing “Stop Ahead” signs with flashers on both approaches of NC 903. NC 11-42 has left turn lanes on each approach. The speed limit is 55 mph for all approaches.

The original statement of problem was that there was a chronic pattern of frontal impact crashes at the intersection.

The final completion date for the improvements at the subject intersection was on July 22, 2005 with a total cost of \$35,000.00.

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 June 1, 2005 to August 31, 2005. The before period consisted of reported crashes from September 1, 2000 through May 31, 2005 (4 years and 9 months) and the after period consisted of reported crashes from September 1, 2005 through May 31, 2010 (4 years and 9 months). The ending date for this analysis was limited by the available crash data at the time of the 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 Crashes involving vehicles entering the intersection from NC 903 were the target crashes for the applied countermeasure. These crash types are considered as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; 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	18	14	-22.2
Total Severity Index	14.36	5.76	-59.9
Target Crashes	17	13	-23.5
Target Crash Severity Index	15.14	5.55	-63.3
Volume	4,600	4,600	0.0
<u>Target Crash Severity Summary</u>			
Fatal Crashes	2	0	-100.0
Class A Crashes	0	0	N/A
Class B Crashes	3	3	0.0
Class C Crashes	9	5	-44.4
PDO Crashes	3	5	66.7

The naive before and after analysis at the treatment location resulted in a 22 percent decrease in Total Crashes, a 24 percent decrease in Target Crashes, and no change in Average Daily Traffic (ADT). The before period ADT year was 2003 and the after period ADT year was 2008.

Results and Discussion

Target Crashes have decreased at the intersection from the before to the after period, but there is still an Angle Crash pattern between vehicles entering the intersection from the southeast leg NC 903 and the northeast leg of NC 11-42. This pattern only decreased by 10 percent, from 10 crashes in the before period to nine in the after. Eight of the nine after period crashes in this pattern involved vehicles on NC 903 first stopping at the stop sign and then attempting to cross the roadway. One involved a vehicle running the stop signs.

In the before period there were two Fatal Crashes, both of which were Target Crashes. Both were Angle Crashes involving vehicles entering the intersection after coming to a stop on northwest NC 903. There were no severe injuries in the after period.

The calculated benefit to cost ratio for this project is 45.66 considering total crashes. The benefit to cost ratio considering only target crashes is also 46.21. 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 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 903 and NC 11
 COUNTY: Martin
 FILE NO.: SS 01-04-005

BY: bdr
 DATE: 7/27/2010

DETAILED COST: TYPE IMPROVEMENT - Actuated reverse "vehicle entering" flasher

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$35,000	10	0.149	\$5,216
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$35,000	10	0.149	\$5,216

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$500
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$350
 TOTAL ANNUAL COST= \$6,066
 TOTAL COST OF PROJECT= \$35,000

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	4.75	2	0.42	12	2.53	4	0.84	\$319,411
AFTER	4.75	0	0.00	9	1.89	5	1.05	\$42,421

Annual Benefits from Crash Cost Savings \$276,989

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$270,923

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 45.66

TOTAL COST OF PROJECT - \$35,000 COMPREHENSIVE B/C RATIO - 45.66

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 903 and NC 11
 COUNTY: Martin
 FILE NO.: SS 01-04-005 Target Crashes Only

BY: bdr
 DATE: 7/27/2010

DETAILED COST: TYPE IMPROVEMENT - Actuated reverse "vehicle entering" flasher

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$35,000	10	0.149	\$5,216
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$35,000	10	0.149	\$5,216

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$500
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$350
 TOTAL ANNUAL COST= \$6,066
 TOTAL COST OF PROJECT= \$35,000

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	4.75	2	0.42	12	2.53	3	0.63	\$318,505
AFTER	4.75	0	0.00	8	1.68	5	1.05	\$38,211

Annual Benefits from Crash Cost Savings \$280,295

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$274,229

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 46.21

TOTAL COST OF PROJECT - \$35,000 COMPREHENSIVE B/C RATIO - 46.21

Treatment Site Photos from Google Street-View



Looking southwest on NC 11-42



Looking northeast on NC 11-42



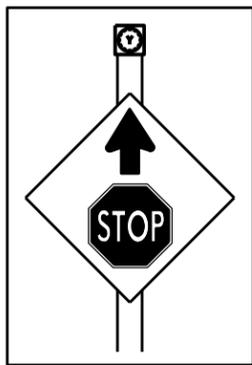
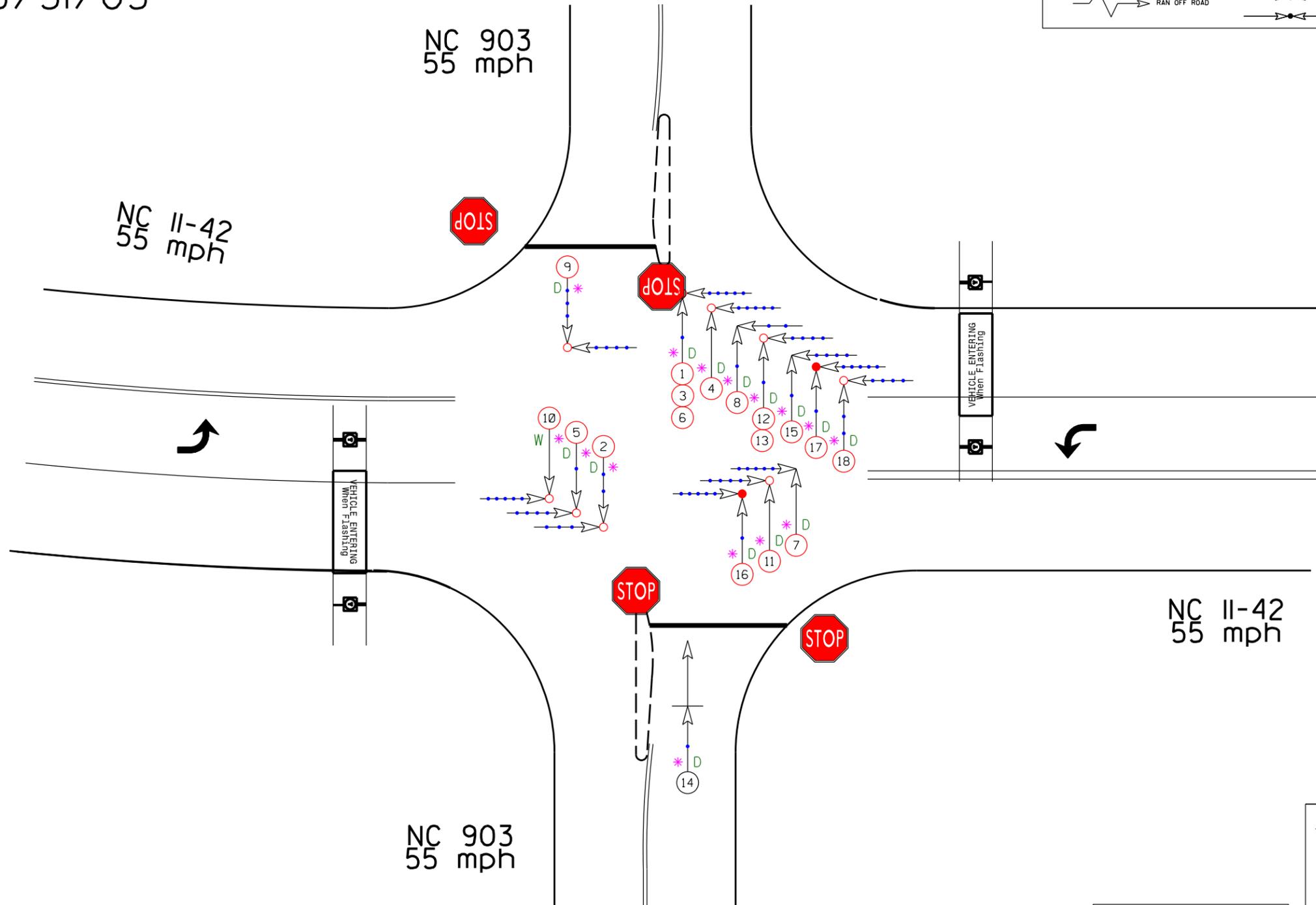
Looking northwest from NC 903



Looking southeast on NC 903

SS# 01-04-005
 Order# 41000007293
 Martin County
 BEFORE Period
 9/1/00-5/31/05

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



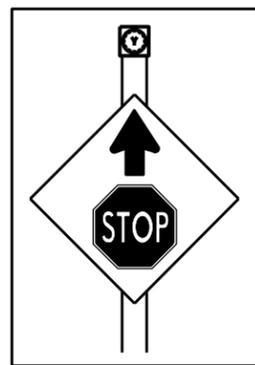
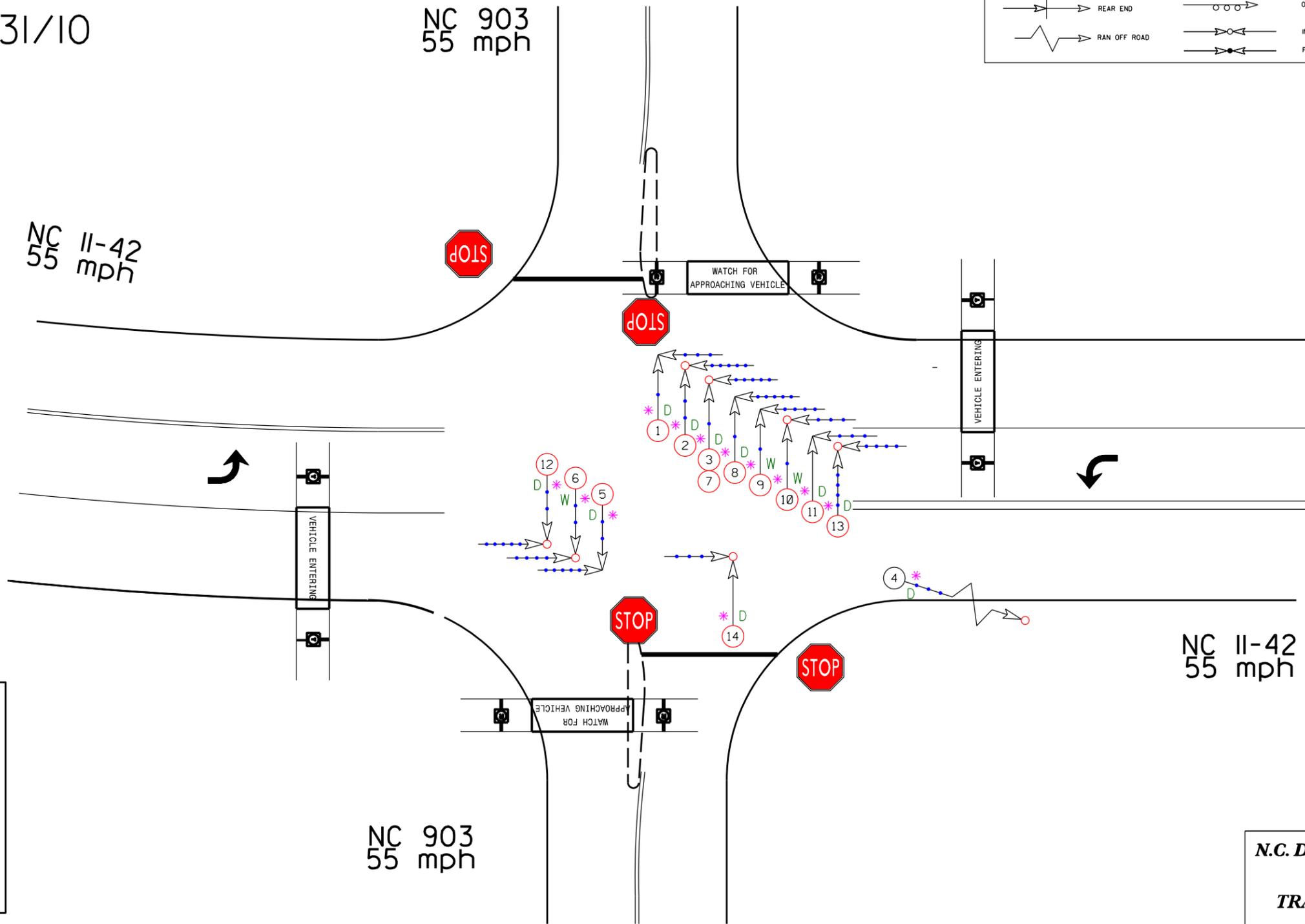
On both approaches of NC 903



N.C. DEPARTMENT of TRANSPORTATION
 DIVISION of HIGHWAYS
 TRANSPORTATION MOBILITY and
 SAFETY DIVISION
TRAFFIC SAFETY UNIT
 Date: July 2010
 Prepared By: bdr

SS# 01-04-005
 Order# 41000007293
 Martin County
 AFTER Period
 9/1/05-5/31/10

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



On both approaches of NC 903



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

TRAFFIC SAFETY UNIT

Date: July 2010 Prepared By: bdr