

Spot Safety Project Evaluation

Project Log # 200812062

Spot Safety Project # 14-01-214

**Spot Safety Project Evaluation of the Traffic Signal Installation at the Intersection of
SR 1525 (Dana Rd) and SR 1793 (Tracy Grove Rd)
Henderson 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

7/7/09

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 14-01-214 – The Intersection of SR 1525 (Dana Rd) and SR 1793 (Tracy Grove Rd) in Henderson County.

The signal number for this location is 14-1141.

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 traffic signal with metal poles.

The subject location is a three-leg intersection which was controlled by a stop sign on SR 1793 (Tracy Grove Rd) in the before period. SR 1525 (Dana Rd) has a single approach in each direction and a speed limit of 35 mph. SR 1793 has both a left and a right turn lane at the intersection and also has a speed limit of 35 mph

The original statement of problem was that an increase in traffic volume was leading to congestion and delay. The signal investigation was conducted at the request of a private citizen.

The initial crash analysis was conducted from October 1, 1998 to September 30, 2001 with a total of four reported crashes, three of which were considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on March 27, 2003 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 February 1, 2003 to April 30, 2003. The before period consisted of reported crashes from March 1, 1997 through January 31, 2003 (5 years and 11 months) and the after period consisted of reported crashes from May 1, 2003 through March 31, 2009 (5 years and 11 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.

Treatment Information			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	14	28	100.0
Total Severity Index	11.17	3.38	-69.7
Target Crashes	7	7	0.0
Target Crash Severity Index	17.11	4.17	-75.6
Volume	6,100	6,700	9.8
Crash Severity Summary			
Fatal Crashes	0	0	N/A
Class A Crashes	1	0	-100.0
Class B Crashes	3	1	-66.7
Class C Crashes	6	8	33.3
PDO Crashes	4	19	375.0

The naive before and after analysis at the treatment location resulted in a 100 percent increase in Total Crashes, no change in Target Crashes, and a 10 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 a 100 percent increase in Total Crashes and no change in Target Crashes. The Total Severity Index decreased by 70 percent and the Target Crash Severity Index decreased by 76 percent. The summary results above demonstrate that although Total Crashes appear to have increased, Target Crashes have remained constant at the treatment location from the before to the after period.

The calculated benefit to cost ratio for this project is 6.80 considering total crashes. The benefit to cost ratio considering only target crashes is also 7.89. 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 there was a pattern of five crashes involving vehicles turning left at the intersection from SR 1793 and vehicles traveling east on SR 1525. In the after period this pattern was reduced to three crashes. All three after period crashes in this pattern involved a vehicle on SR 1525 running the red light.

A pattern of Left Turn-Same Roadway Crashes increased at the intersection from two in the before period to four in the after. Three of the four after period crashes in this pattern occurred during dark conditions.

The increase in Total Crashes can be attributed to an increase in Rear-End Crashes on all three approaches to the intersection. In the before period there were six Rear-End Crashes on the westbound approach of SR 1525 and none on the other two legs. In the after period there were eight Rear-End Crashes on the westbound approach of SR 1525, five on the eastbound approach, and two on the SR 1793 approach. There was also one Rear-End Crash on the eastbound lane immediately after the intersection. An increase in Rear-End Crashes is common at intersections when a signal is installed.

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: SR 1525 and SR 1793
 COUNTY: Henderson
 FILE NO.: SS 14-01-214

BY: BDR
 DATE: 7/6/2009

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	5.92	1	0.17	9	1.52	4	0.68	\$139,662
AFTER	5.92	0	0.00	9	1.52	19	3.21	\$43,885

Annual Benefits from Crash Cost Savings \$95,777

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$81,700

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 6.80

TOTAL COST OF PROJECT - \$75,000 COMPREHENSIVE B/C RATIO - 6.80

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1525 and SR 1793
 COUNTY: Henderson
 FILE NO.: SS 14-01-214 Target Crashes Only

BY: BDR
 DATE: 7/6/2009

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	5.92	1	0.17	5	0.84	1	0.17	\$124,020
AFTER	5.92	0	0.00	3	0.51	4	0.68	\$12,973

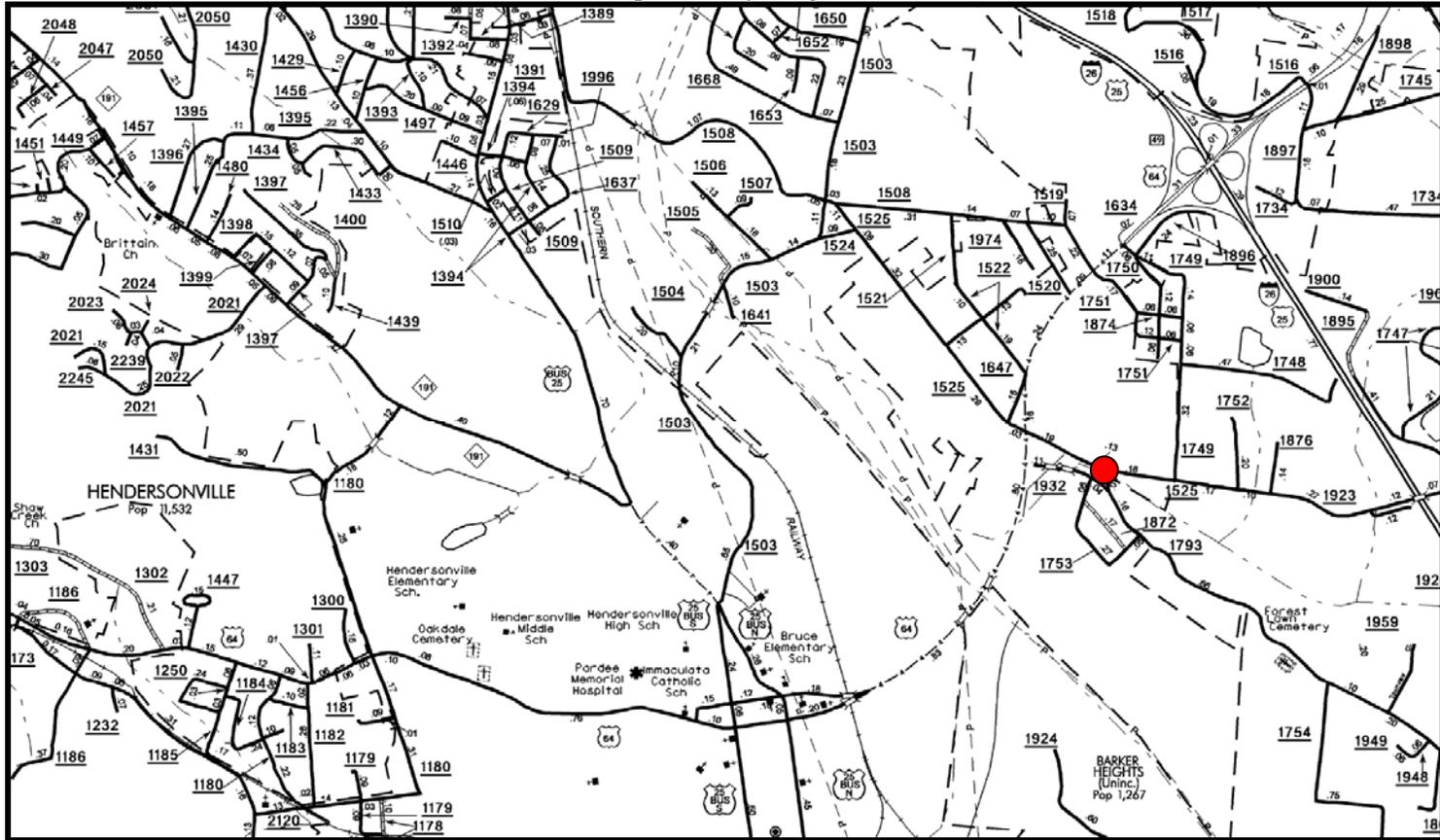
Annual Benefits from Crash Cost Savings \$111,047

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$96,970

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 7.89

TOTAL COST OF PROJECT - \$75,000 COMPREHENSIVE B/C RATIO - 7.89

Location Map
Henderson County
Evaluation of Spot Safety Project #14-01-214



Treatment Location: SR 1525 (Dana Rd) and SR 1793 (Tracy Grove Rd)



Looking west on SR 1525 (Dana Rd)



Looking east on SR 1525 (Dana Rd)

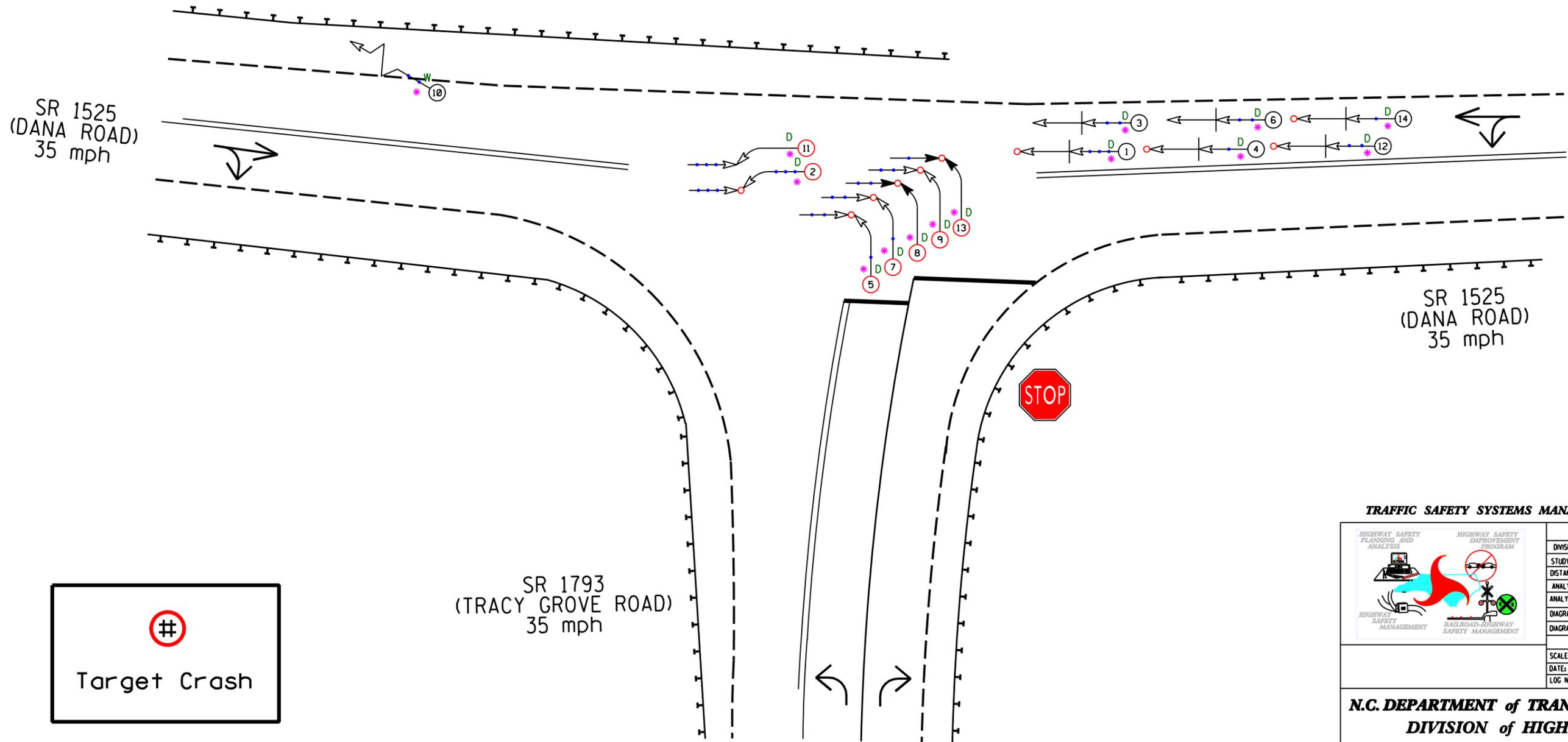


Looking south toward SR 1793 (Tracy Grove Rd) from intersection

Henderson County
 SR 1525 (Dana Rd) and
 SR 1793 (Tracy Grove Rd)
 BEFORE Period
 3/1/1997-1/31/2003

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 ONLY
RAN OFF ROAD		70 AND UP	
		SPEED UNKNOWN	



 Target Crash

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: M	AREA:
STUDY PERIOD: 3/1/97-1/31/03		
DISTANCE: Y-LINE = 150 FT		
ANALYSIS PREPARED BY: BDR		
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: BDR		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: June 2009		
LOG NUMBER: 20082062		

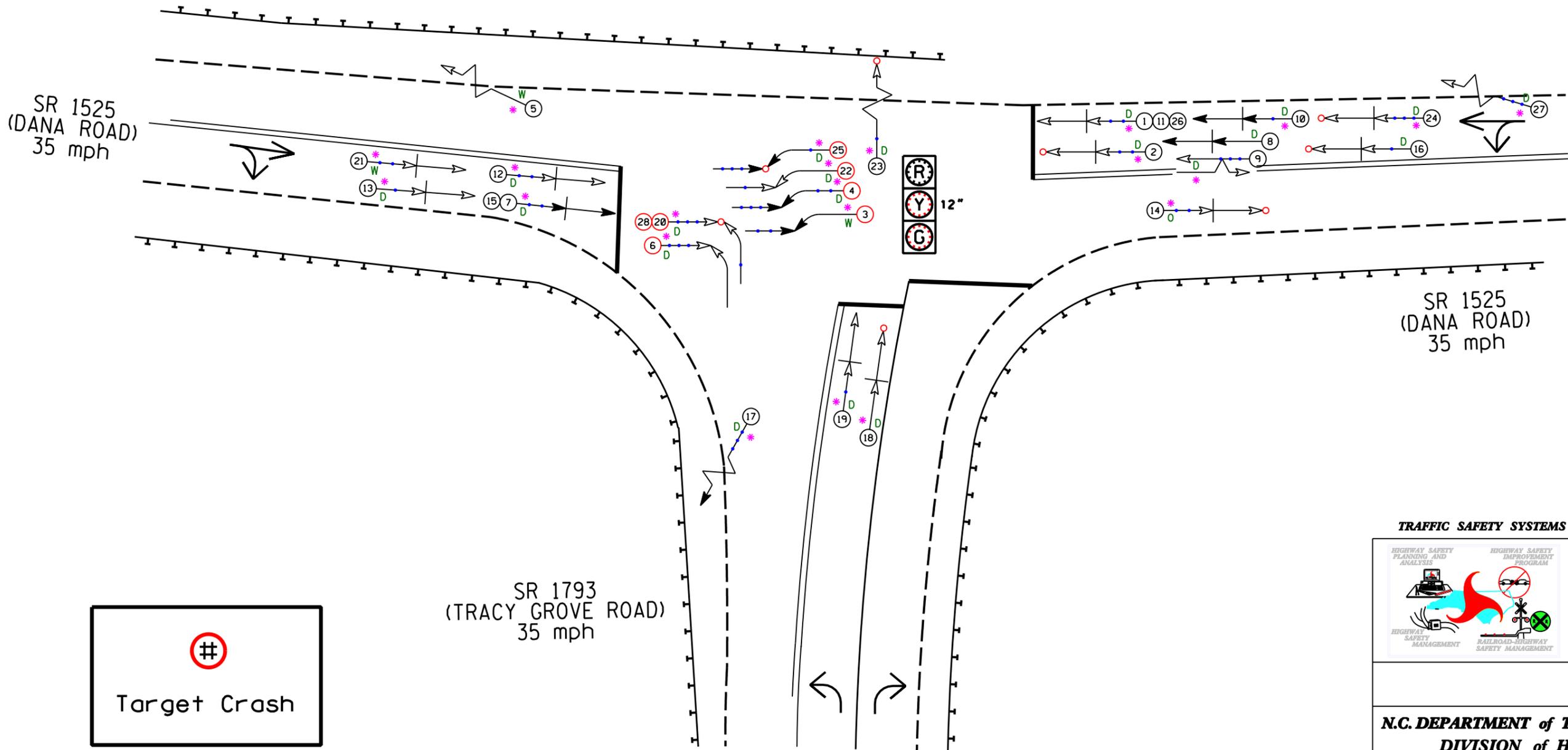
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY AND
SAFETY DIVISION

Henderson County
 SR 1525 (Dana Rd) and
 SR 1793 (Tracy Grove Rd)
 AFTER Period
 5/1/03-3/31/09



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
	OUT OF CONTROL	40 MPH TO 49	W WET
RAN OFF ROAD	INJURY	50 MPH TO 59	I ICY OR SNOWY
	FATALITY	60 MPH TO 69	O ONLY
		70 AND UP	
		SPEED UNKNOWN	



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: M	AREA:
STUDY PERIOD: 5/1/03-3/31/09		
DISTANCE: Y-LINE = 150 FT		
ANALYSIS PREPARED BY: BDR		
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: BDR		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: June 2009		
LOG NUMBER: 20082062		

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