

Spot Safety Project Evaluation

Project Log # 200812061

Spot Safety Project # 14-01-211

Spot Safety Project Evaluation of the Traffic Signal Installation at the Intersection of NC 107 and SR 1340 (Ashe Settlement Rd) Jackson 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

7/13/09

Date

Traffic Safety Project Engineer

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of an actuated traffic signal with metal poles and mast arms.

The subject location is a three-leg intersection which was controlled by dual stop signs on SR 1340 (Old Ashe Settlement Rd) in the before period. NC 107 is a four-lane divided facility with a grass median. There are left turn lanes on both approaches of NC 107 and a right turn lane on the southbound approach. SR 1340 had a single approach lane in the before period with a median traffic island. The traffic island was removed during the project and a left turn lane was added. The speed limits are 55 mph for NC 107 and 35 mph for SR 1340. The treatment site photos show that bike lanes are currently present on NC 107.

The original statement of problem was that an increase in traffic volume was leading to congestion and delay.

The initial crash analysis was conducted from October 1, 1998 to September 30, 2001 with a total of six 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 October 28, 2003 with a total cost of \$80,000.00.

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 September 1, 2003 to November 30, 2003. The before period consisted of reported crashes from May 1, 1998 through August 31, 2003 (5 years and 4 months) and the after period consisted of reported crashes from December 1, 2003 through March 31, 2009 (5 years and 4 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	12	18	50.0
Total Severity Index	2.85	3.47	21.8
Target Crashes			
Target Crashes	5	10	100.0
Target Crash Severity Index	3.96	4.7	18.7
Volume			
Volume	15,000	16,300	8.7
Crash Severity Summary			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	1	2	100.0
Class C Crashes	2	4	100.0
PDO Crashes	9	12	33.3

The naive before and after analysis at the treatment location resulted in a 50 percent increase in Total Crashes, a 100 percent increase in Target Crashes, and a 9 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 50 percent increase in Total Crashes and a 100 percent increase in Target Crashes. The Total Severity Index increased by 22 percent and the Target Crash Severity Index increased by 19 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 -0.92 considering total crashes. The benefit to cost ratio considering only target crashes is also -0.87. 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 an existing pattern of five crashes between vehicles southbound on NC 107 vehicles and vehicles entering the intersection from SR 1340. This pattern included all of the before period Target Crashes. The pattern increased to seven in the after period, an increase of 40 percent. For all seven crashes in the after period pattern the vehicle traveling straight on NC 107 was faulted for running the red signal.

The other three after period Target Crashes consisted of two Left Turn-Same Roadway Crashes and one crash involving a northbound NC 107 vehicle attempting to make a U-Turn at the intersection. Six of the ten after period crashes occurred during dark conditions.

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 107 at SR 1340
 COUNTY: Jackson
 FILE NO.: SS 14-01-211

BY: BDR
 DATE: 7/7/2009

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$80,000	10	0.149	\$11,922
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$80,000	10	0.149	\$11,922

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900
 TOTAL ANNUAL COST= \$14,822
 TOTAL COST OF PROJECT= \$80,000

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	5.33	0	0.00	3	0.56	9	1.69	\$18,349
AFTER	5.33	0	0.00	6	1.13	12	2.25	\$31,970

Annual Benefits from Crash Cost Savings (\$13,621)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$28,443)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -0.92

TOTAL COST OF PROJECT - \$80,000 COMPREHENSIVE B/C RATIO - -0.92

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 107 at SR 1340
 COUNTY: Jackson
 FILE NO.: SS 14-01-211 Target Crashes Only

BY: BDR
 DATE: 7/7/2009

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$80,000	10	0.149	\$11,922
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 TOTAL ANNUAL COST= \$14,822
 TOTAL COST OF PROJECT= \$80,000

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	5.33	0	0.00	2	0.38	3	0.56	\$9,869
AFTER	5.33	0	0.00	5	0.94	5	0.94	\$22,702

Annual Benefits from Crash Cost Savings (\$12,833)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$27,655)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -0.87

TOTAL COST OF PROJECT - \$80,000 COMPREHENSIVE B/C RATIO - -0.87



Looking Northwest on NC 107



Looking Northwest on NC 107



Looking Southeast on NC 107



Looking Southeast on NC 107



Looking Northeast from SR 1340



Looking Northeast from SR 1340

Jackson County
 NC 107 and SR 1340
 (Ashe Settlement Rd)
 BEFORE Period
 5/1/98-8/31/03

LEGEND

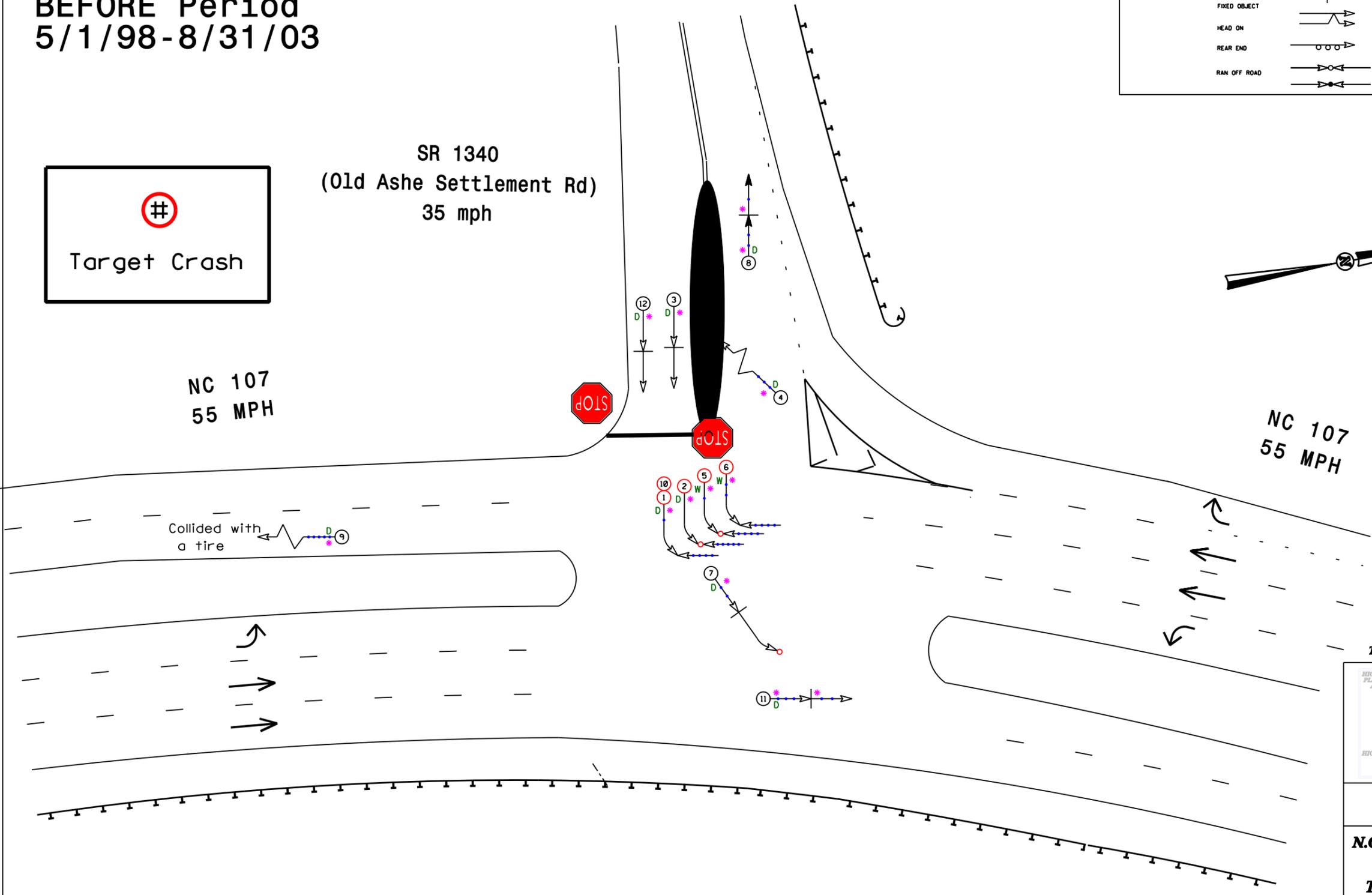
MOVING VEHICLE	ANGLE	9 MPH OR LESS	P PEDESTRIAN
PEDESTRIAN	TURNING	10 MPH TO 19	T TRAIN
PARKED VEHICLE	BACKING	20 MPH TO 29	* DRIVER AT FAULT
PARKING VEHICLE	SIDESWIPE	30 MPH TO 39	D DRY
FIXED OBJECT	OUT OF CONTROL	40 MPH TO 49	W WET
HEAD ON	INJURY	50 MPH TO 59	I ICY OR SNOWY
REAR END	FATALITY	60 MPH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

 Target Crash

SR 1340
 (Old Ashe Settlement Rd)
 35 mph

NC 107
 55 MPH

NC 107
 55 MPH



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: M	AREA:
	STUDY PERIOD: 5/1/98-8/31/03	
	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: 20082061		

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

Jackson County
 NC 107 and SR 1340
 (Ashe Settlement Rd)
 AFTER Period
 12/1/03-3/31/09

LEGEND

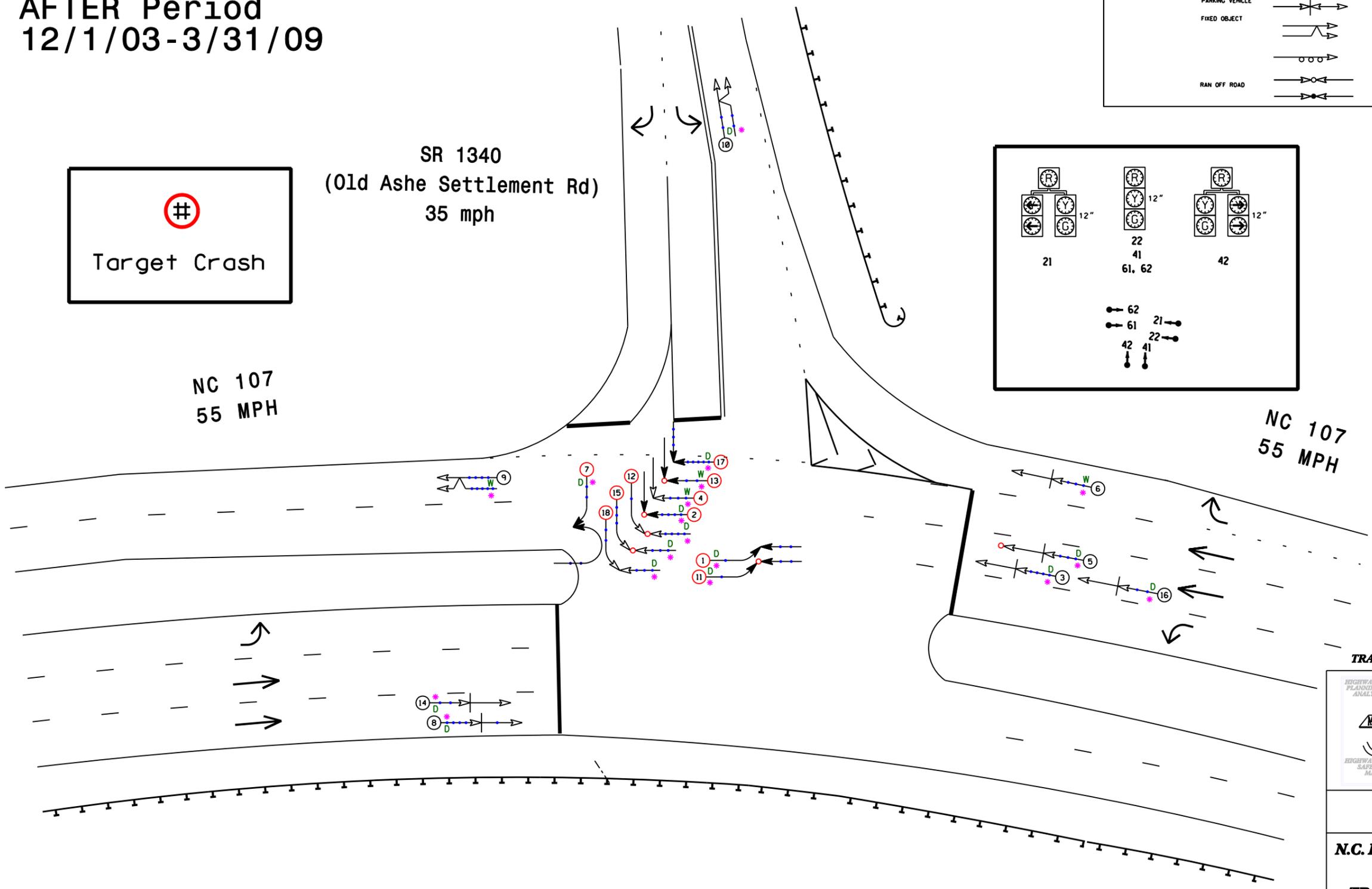
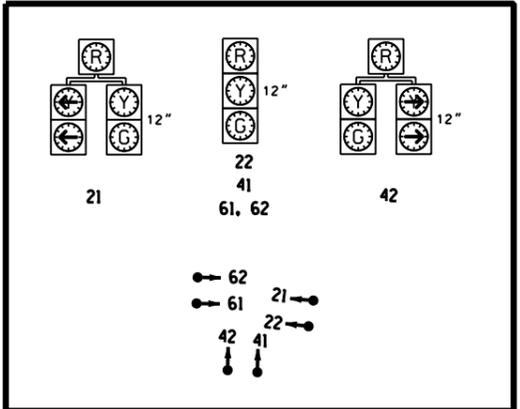
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RAN OFF ROAD	INJURY	50 MPH TO 59	I ICY OR SNOWY
	FATALITY	60 MPH TO 69	O OLY
		70 AND UP	
		SPEED UNKNOWN	

 Target Crash

SR 1340
 (Old Ashe Settlement Rd)
 35 mph

NC 107
 55 MPH

NC 107
 55 MPH



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT



COLLISION DIAGRAM	
DIVISION: M	AREA:
STUDY PERIOD: 12/1/03-3/31/09	
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: 20082061	

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