

Spot Safety Project Evaluation

Order # 41000006428

Spot Safety Project # 07-01-212

Spot Safety Project Evaluation of the Installation of Left Turn Lanes and Protected/Permitted Phasing on US 70 (Burlington Rd) at its Intersection with NC 61

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

6/17/2010

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 07-01-212 – The Intersection of US 70 (Burlington Rd) and NC 61 in Guilford County.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of both eastbound and westbound left turn lanes on US 70. The signal was also changed in order to give protected/permitted phasing to westbound US 70 vehicles turning left onto NC 61.

The subject location is a four-leg intersection which was controlled by a signal in both the before and the after period. Prior to the turn lane construction all approaches were single lane. The speed limit is 45 mph for all approaches.

The original statement of problem was that the existing single-lane approaches on US 70 were causing left-turning traffic to queue, leading to the potential for Rear-End and Left Turn-Same Road type crashes.

The initial crash analysis was conducted from April 1, 1998 to March 31, 2001 with a total of 13 reported crashes, five of which were considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on February 8, 2005 with a total cost of \$150,000.00.

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 January 1, 2005 to February 28, 2005. The before period consisted of reported crashes from December 1, 1999 through December 31, 2004 (5 years and 1 month) and the after period consisted of reported crashes from March 1, 2005 through March 31, 2010 (5 years and 1 month). 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 both Rear-End Crashes approaching the intersection on US 70 and Left Turn-Same Roadway Crashes on US 70 were the Target Crashes for the applied countermeasure.

<u>Treatment Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	25	9	-64.0
Total Severity Index	3.96	12.71	221.0
Target Crashes	7	1	-85.7
Target Crash Severity Index	4.17	8.4	101.4
Volume	11,800	11,100	-5.9
<u>Crash Severity Summary</u>			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	0	0	N/A
Class C Crashes	3	1	-66.7
PDO Crashes	4	0	-100.0

The naive before and after analysis at the treatment location resulted in a 64 percent decrease in Total Crashes, an 86 percent decrease in Target Crashes, and a 6 percent decrease in Average Daily Traffic (ADT). The before period ADT year was 2002 and the after period ADT year was 2007.

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 64 percent decrease in Total Crashes and an 86 percent decrease in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

The calculated benefit to cost ratio for this project is -3.93 considering total crashes. The benefit to cost ratio considering only target crashes is 0.49. 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.

The turn lane installation and protected/permitted phase change appears to have been effective in reducing Target Crashes at the intersection. In the before period there were four Left Turn-Same Roadway Crashes on US 70, all involving westbound vehicles turning left. In the after period there were no crashes of this type. Rear-End Crashes involving vehicles on US 70 approaching the intersection were reduced from three in the before period to one in the after period.

There was a fatality in the after period which occurred due to a westbound vehicle on US 70 running the signal and hitting a southbound vehicle. The vehicle was traveling 90 mph and was fleeing from the police. This crash contributed to the high increase in the Total Severity Index and the negative benefit to cost ratio.

The large increase (101%) in the Target Severity Index can be misleading. There was only a single Target Crash in the after period. This was a Rear-End Crash which resulted in a 'C' injury.

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: US 70 and NC 61
 COUNTY: Guilford
 FILE NO.: SS 07-01-212

BY: bdr
 DATE: 6/11/2010

DETAILED COST: TYPE IMPROVEMENT - Left Turn Lanes

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
Right-of-Way	\$150,000	10	0.149	\$22,354
	\$0	0	0.000	\$0
TOTALS	\$150,000	10	0.149	\$22,354

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$800
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$23,154
 TOTAL COST OF PROJECT= \$150,000

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	5.09	0	0.00	10	1.96	15	2.95	\$51,965
AFTER	5.09	1	0.20	4	0.79	4	0.79	\$142,868

Annual Benefits from Crash Cost Savings (\$90,904)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$114,058)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -3.93

TOTAL COST OF PROJECT - \$150,000 COMPREHENSIVE B/C RATIO - -3.93

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 70 and NC 61
 COUNTY: Guilford
 FILE NO.: SS 07-01-212 Target Crashes only

BY: bdr
 DATE: 6/11/2010

DETAILED COST: TYPE IMPROVEMENT - Left Turn Lanes

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
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Right-of-Way	\$150,000	10	0.149	\$22,354
	\$0	0	0.000	\$0
TOTALS	\$150,000	10	0.149	\$22,354

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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	5.09	0	0.00	3	0.59	4	0.79	\$15,167
AFTER	5.09	0	0.00	1	0.20	0	0.00	\$3,929

Annual Benefits from Crash Cost Savings \$11,238

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$11,917)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 0.49

TOTAL COST OF PROJECT - \$150,000 COMPREHENSIVE B/C RATIO - 0.49

Treatment Site Photos from Google Street-View



Looking east on US 70 (Burlington Rd)



Looking west on US 70 (Burlington Rd)



Looking north on NC 61

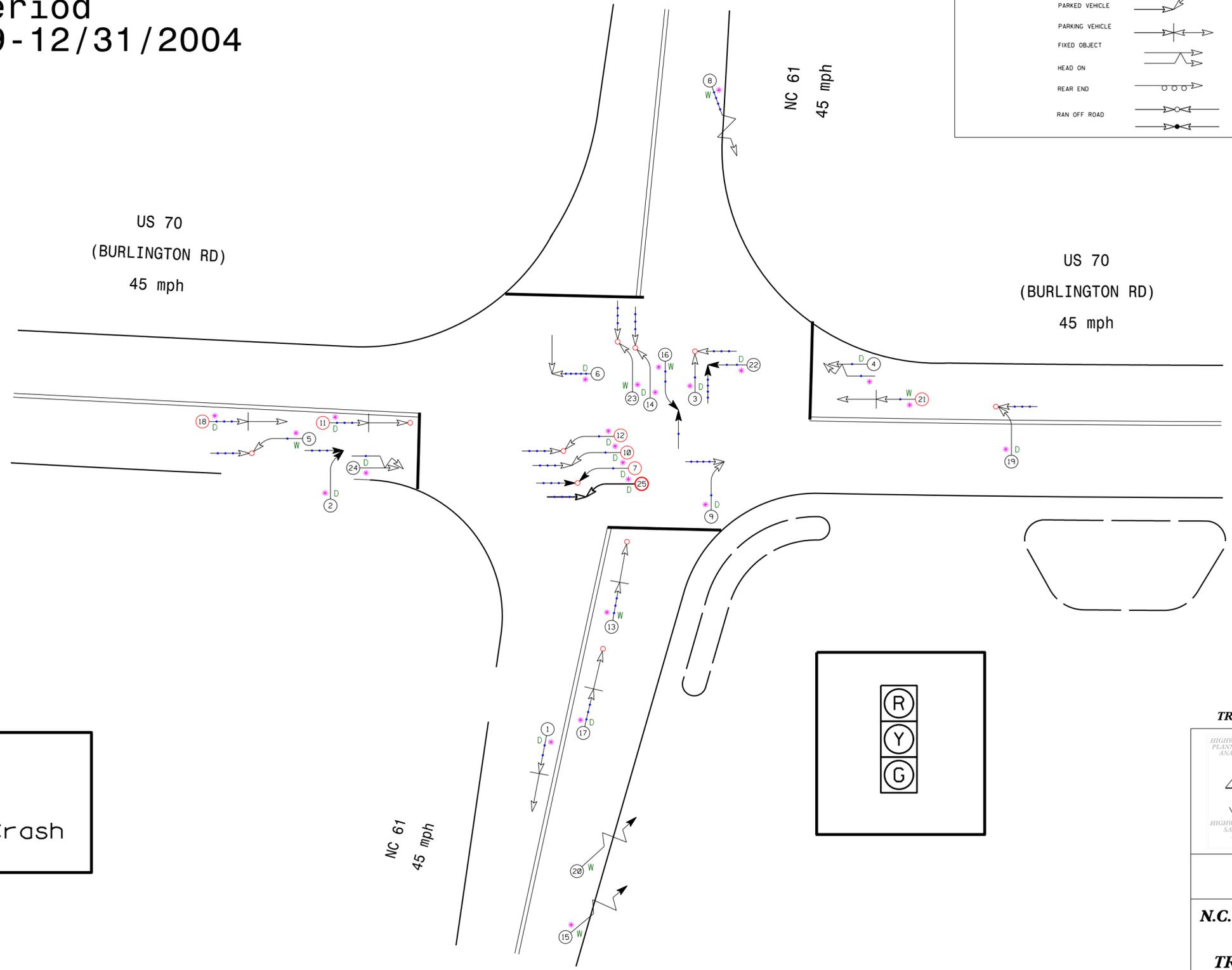


Looking south on NC 61

Guilford County
 US 70 at NC 61
 BEFORE Period
 12/1/1999-12/31/2004

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

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

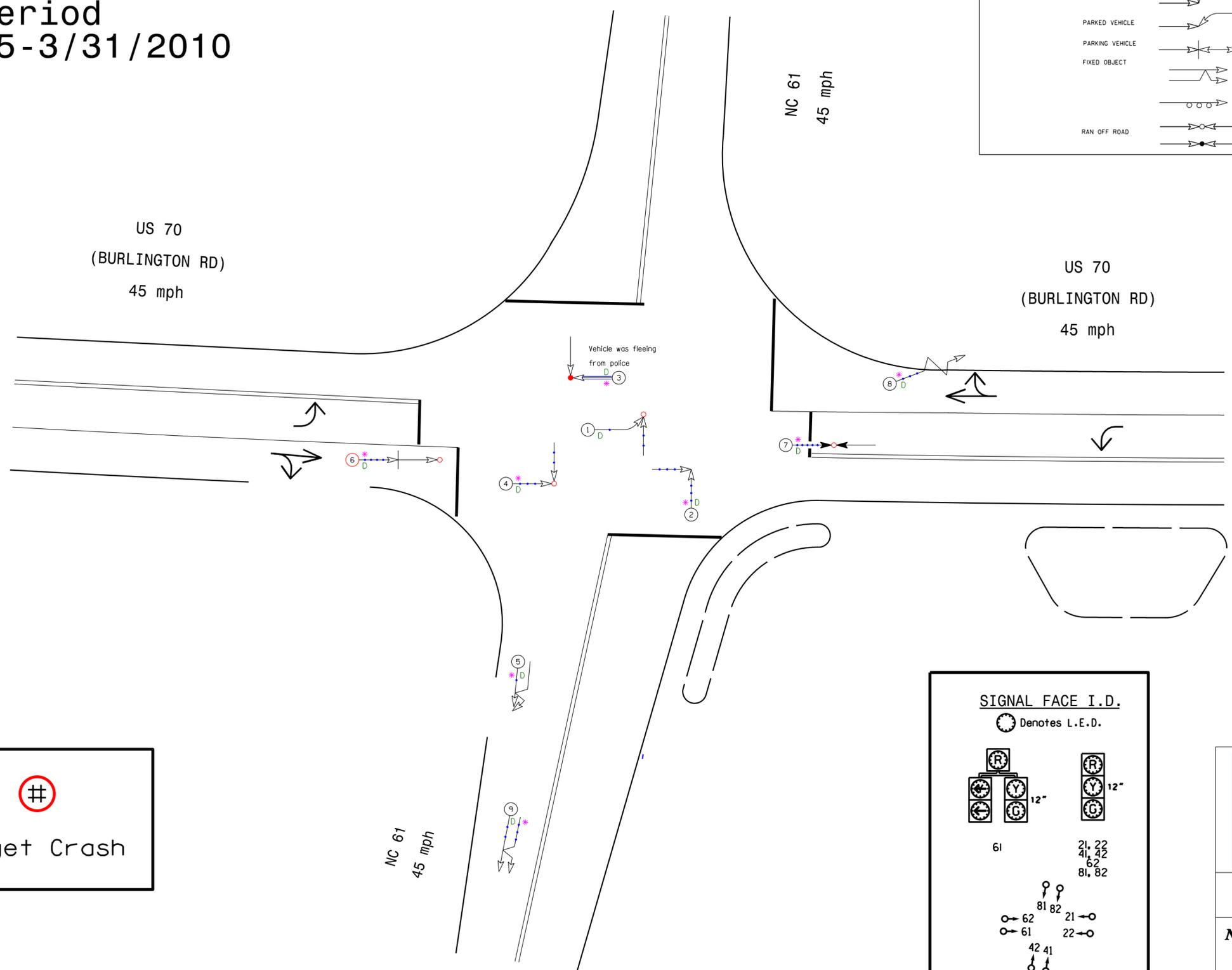
COLLISION DIAGRAM	
DIVISION: 7	AREA:
STUDY PERIOD: 11/1/99-8/31/04	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: BDR	
DIAGRAM REVIEWED BY:	
SCALE: NOT TO SCALE	
DATE: May 2010	
ORDER NUMBER: 41000006428	

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

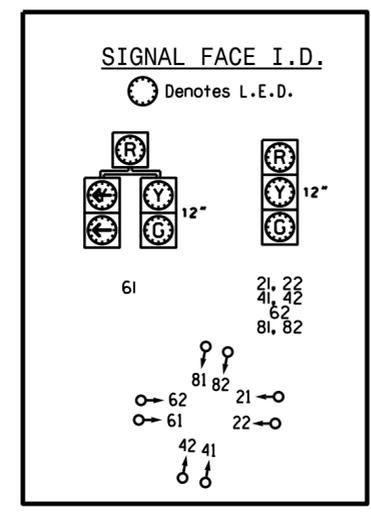
Guilford County
 US 70 at NC 61
 AFTER Period
 3/1/2005-3/31/2010

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



 Target Crash



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 7	AREA:
STUDY PERIOD: 3/1/05-3/31/10	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: BDR	
DIAGRAM REVIEWED BY:	
SCALE: NOT TO SCALE	
DATE: May 2010	
ORDER NUMBER: 4100006428	

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