

Spot Safety Project Evaluation

Project Log # 200907187

Spot Safety Project # 01-02-212

**Spot Safety Project Evaluation of the Traffic Signal Upgrade for Long Vehicle Detection at
the Intersection of US 17/158 and SR 1416/1339 (Northside/Commissary)
Pasquotank 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

8/26/2009

Date

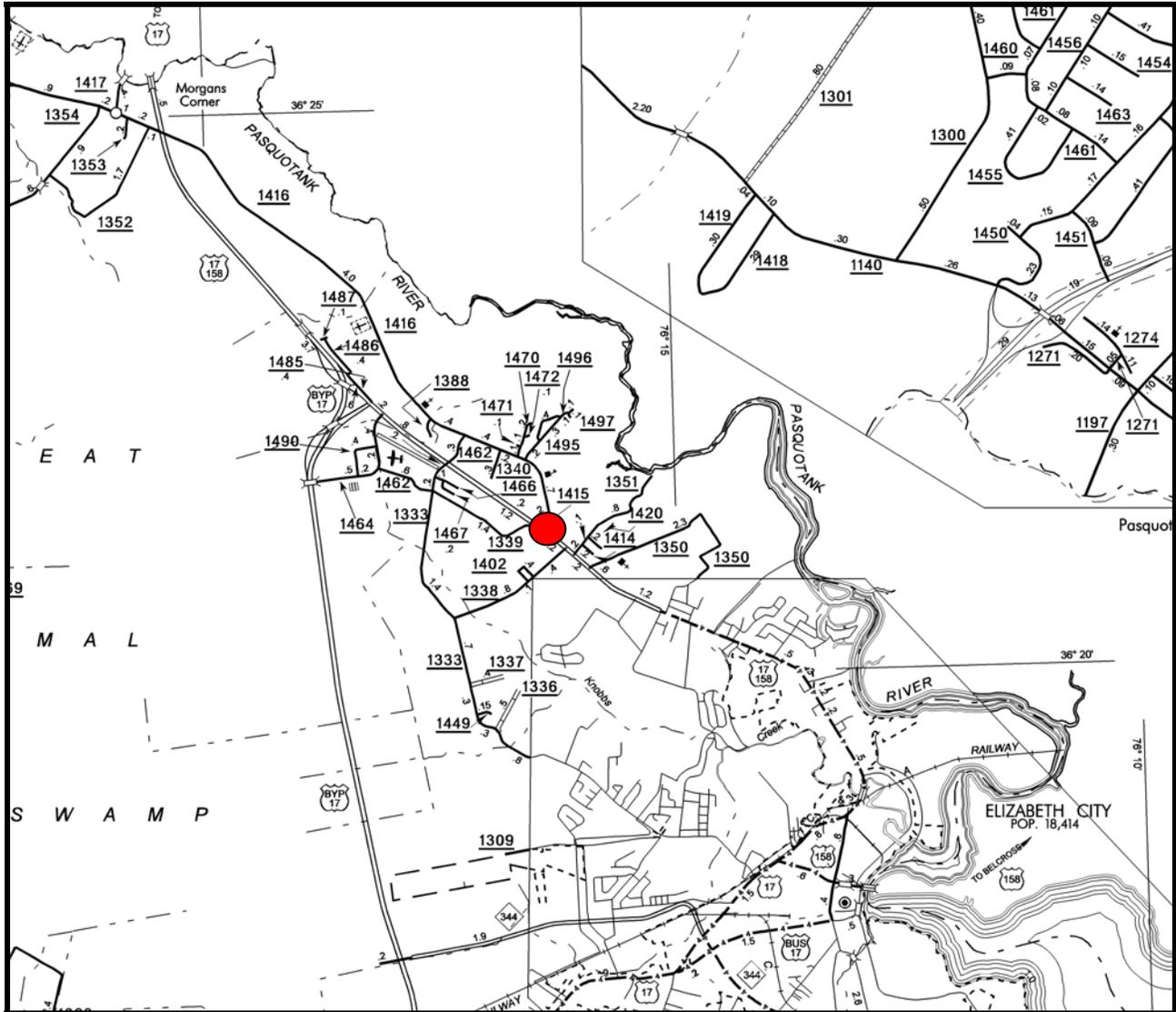
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 01-02-212– The Intersection of US 17/158 and SR 1416/1339 (Northside Rd/Commissary Rd) in Pasquotank County.

The signal number for this location is 01-0524.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was to upgrade the signal for long vehicle detection on both approaches of US 17.

The subject location is a four-leg intersection controlled by a signal in both the before and after periods. US 17 is a four-lane divided highway with left and right turn lanes at the intersection. SR 1416 and SR 1339 both have single lane approaches and raised center islands at the intersection. The speed limit for both US 17 and SR 1416 is 55 mph. The speed limit for SR 1339 is 45 mph.

The original statement of problem was that the lack of long vehicle detection on both approaches of US 17 was resulting in longer vehicles being caught in the dilemma zone with little opportunity to react.

The initial crash analysis was conducted from December 1, 1998 to November 30, 2001 with a total of one reported crashes, which was not considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on October 30, 2004 with a total cost of \$15,000.00.

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, 2004 to November 30, 2004. The before period consisted of reported crashes from March 1, 2000 through August 31, 2004 (4 years and 6 months) and the after period consisted of reported crashes from December 1, 2004 through May 31, 2009 (4 years and 6 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 involving trucks on US 17 (Vehicle styles 10-16 on crash reports) 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	7	9	28.6
Total Severity Index	7.34	2.64	-64.0
Target Crashes	0	1	N/A
Target Crash Severity Index	0	1	N/A
Volume	12,000	13,000	8.3

Crash Severity Summary			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	1	1	0.0
Class C Crashes	5	1	-80.0
PDO Crashes	1	7	600.0

The naive before and after analysis at the treatment location resulted in a 29 percent increase in Total Crashes, an increase from zero to one in Target Crashes, and an 8 percent increase in Average Daily Traffic (ADT). The before period ADT year was 2001 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 29 percent increase in Total Crashes and an increase in Target Crashes from zero to one. The Total Severity Index decreased by 64 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 5.21 considering total crashes. The benefit to cost ratio considering only target crashes is also -0.40. 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 were two crashes involving trucks, but neither were Target Crashes. The first one (crash #5) involved a diabetic driver passing out, swerving off the roadway several times, and rear-ending a vehicle. The second truck crash (crash #6) involved a truck turning left from SR 1416 and being hit by a northbound US 17 vehicle. It is unknown who was at fault since both drivers claimed to have the green light.

The single after period Target Crash (crash #5) was a Left Turn-Different Roadway Crash involving a truck traveling north on US 17 running the signal and hitting a left turning vehicle from SR 1416. There was a second after period crash involving a truck that was not a Target Crash. This crash (crash #4) involved a truck entering the intersection from SR 1416 and being hit by a northbound US 17 vehicle.

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 17 at SR 1416/1339
 COUNTY: Pasquotank
 FILE NO.: SS 01-02-212

BY: BDR
 DATE: 8/18/2009

DETAILED COST: TYPE IMPROVEMENT - Signal Upgrade - Long Vehicle Detection

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$15,000	10	0.149	\$2,235
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$15,000	10	0.149	\$2,235

ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$100
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$0
TOTAL ANNUAL COST=	\$2,335
TOTAL COST OF PROJECT=	\$15,000

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	4.50	0	0.00	6	1.33	1	0.22	\$27,600
AFTER	4.50	0	0.00	2	0.44	7	1.56	\$15,422

Annual Benefits from Crash Cost Savings \$12,178

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$9,842

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 5.21

TOTAL COST OF PROJECT - \$15,000 COMPREHENSIVE B/C RATIO - 5.21

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 17 at SR 1416/1339
 COUNTY: Pasquotank
 FILE NO.: SS 01-02-212 Target Crashes Only

BY: BDR
 DATE: 8/18/2009

DETAILED COST: TYPE IMPROVEMENT - Signal Upgrade - Long Vehicle Detection

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$15,000	10	0.149	\$2,235
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$15,000	10	0.149	\$2,235

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$100
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$2,335
 TOTAL COST OF PROJECT= \$15,000

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	4.50	0	0.00	0	0.00	0	0.00	\$0
AFTER	4.50	0	0.00	0	0.00	1	0.22	\$933

Annual Benefits from Crash Cost Savings (\$933)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$3,269)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -0.40

TOTAL COST OF PROJECT - \$15,000 COMPREHENSIVE B/C RATIO - -0.40

Treatment Site Photos from Google Street-View



Looking North on US 17



Looking South on US 17



Looking east toward SR 1416 (Northside Rd) from intersection



Looking west toward SR 1339 (Commissary Rd) from intersection

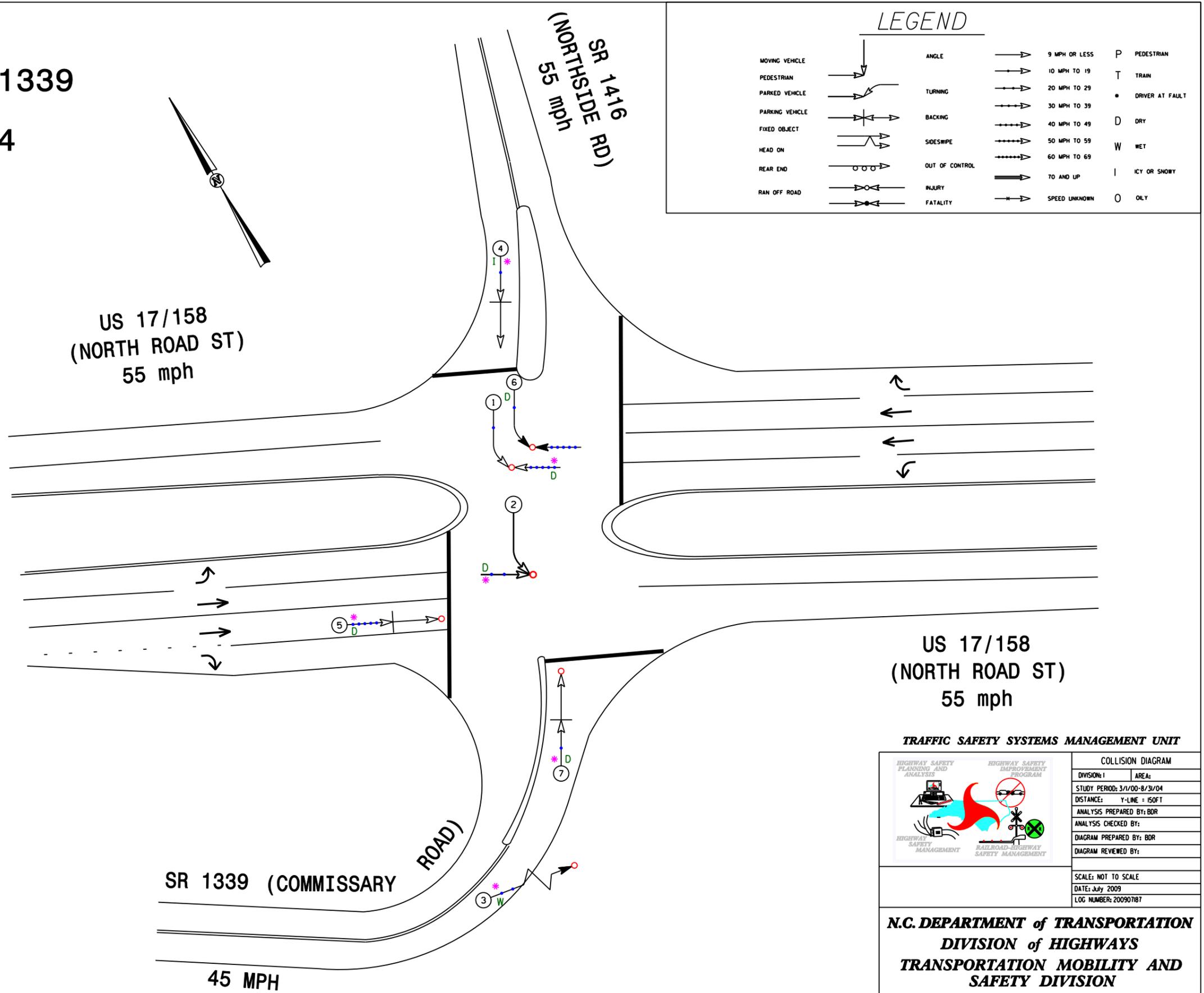
Pasquotank County
 US 17 at SR 1416/1339
 BEFORE Period
 3/1/2000-8/31/2004


 Target Crash

SIGNAL FACE I.D.
 Denotes L.E.D.

12"	12"	12"
11,51	41 81	21,22 42 61,62 82

41 42	11
22	61
21	62
51	82 81



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	

US 17/158
 (NORTH ROAD ST)
 55 mph

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

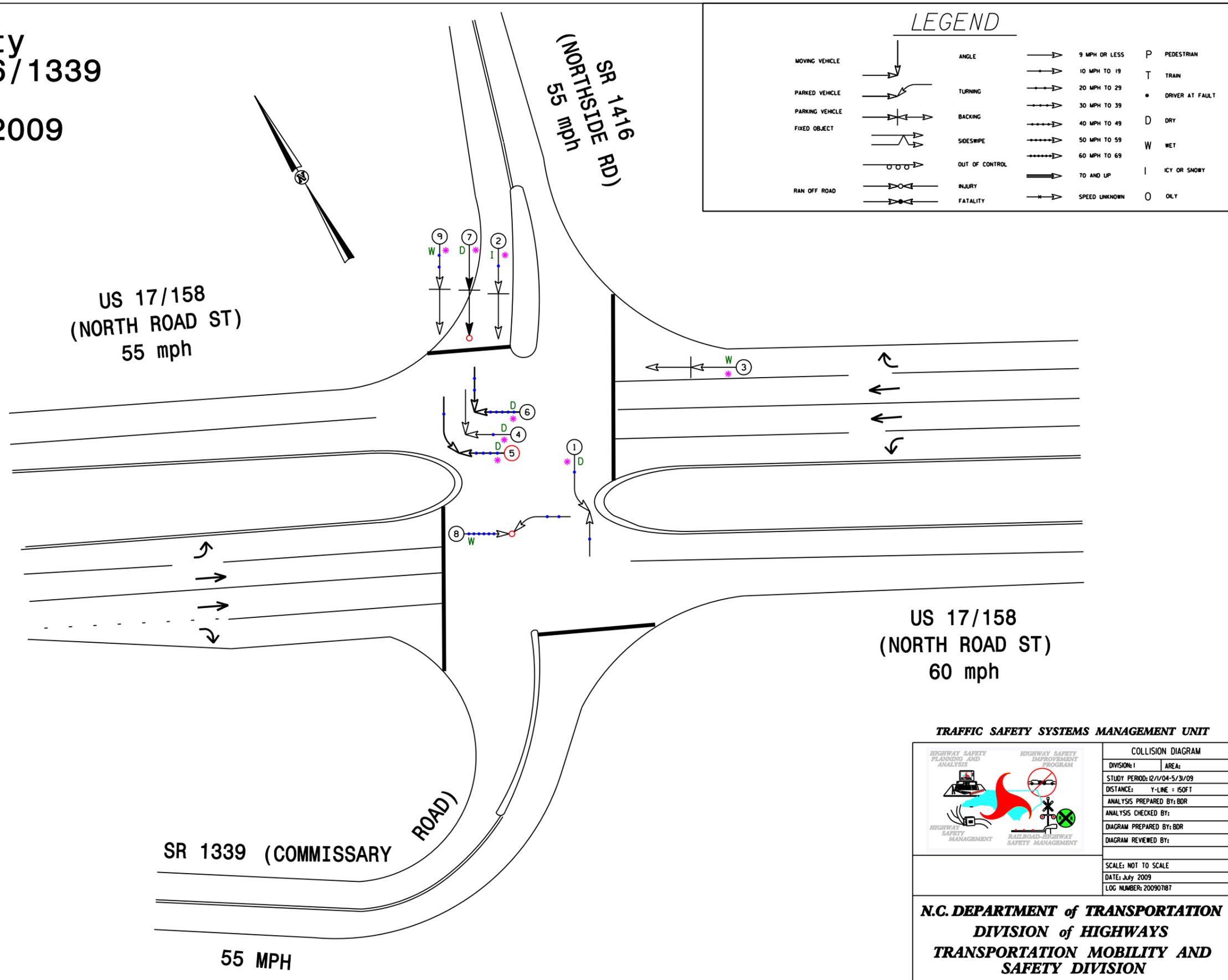
	COLLISION DIAGRAM
DIVISION: 1	AREA:
STUDY PERIOD: 3/1/00-8/31/04	
DISTANCE: Y-LINE = 150 FT	
ANALYSIS PREPARED BY: BOR	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: BOR	
DIAGRAM REVIEWED BY:	
SCALE: NOT TO SCALE	
DATE: July 2009	
LOG NUMBER: 20090787	

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

Pasquotank County
 US 17 at SR 1416/1339
 AFTER Period
 12/1/2004-5/31/2009


 Target Crash

SIGNAL FACE I.D.
 Denotes L.E.D.



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 1	AREA:
STUDY PERIOD: 12/1/04-5/31/09		
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: 20090787		

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