

# **Spot Safety Project Evaluation**

Order # 41000002979

Spot Safety Project # 03-00-400

**Spot Safety Project Evaluation of the Traffic Signal Revision and the Construction of  
Additional Storage for Eastbound Left Turns on US 117 (Shipyard Blvd) at its  
Intersection with 41<sup>st</sup> Street/Holly Tree Road  
New Hanover 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

12/03/2009

Date

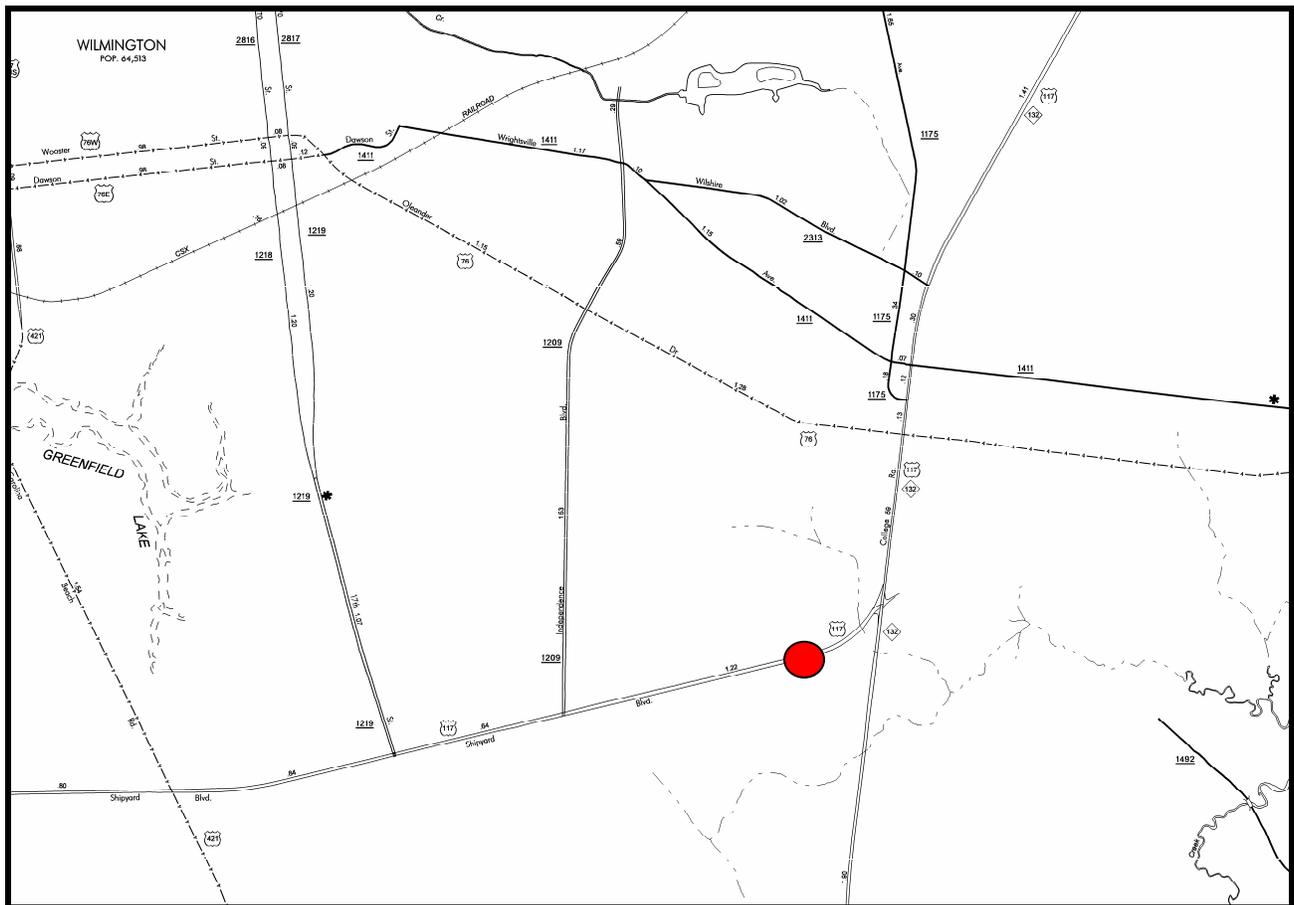
Traffic Safety Project Engineer

# Spot Safety Project Evaluation Documentation

## Subject Location

Evaluation of Spot Safety Project Number 03-00-400 – The Intersection of US 117 (Shipyard Blvd) and 41<sup>st</sup> Street/Holly Tree Road in New Hanover County.

The signal number for this location is 03-0433.



## Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location were the extension of the eastbound left turn lane for additional storage and the revision of the traffic signal to provide fully protected phasing.

The subject location is a four-leg intersection controlled by a signal in both the before and after periods. US 117 (formerly SR 1101) is a four-lane divided highway with auxiliary left and right

turn lanes in a commercial environment. The speed limits are 50 mph for US 117 and 35 mph for the side streets.

The original statement of problem was that a pattern of Angle and Left Turn type accidents were resulting from motorists inability to safely cross US 117.

The initial crash analysis was conducted from December 1, 1996 to November 30, 2000 with a total of 50 reported crashes, 21 of which was considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on October 15, 2004 with a total cost of \$125,000.00.

### 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 November 1, 1999 through August 31, 2004 (4 years and 10 months) and the after period consisted of reported crashes from December 1, 2004 through September 30, 2009 (4 years and 10 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 Left Turn – Same Roadway Crashes on US 117 are the Target Crashes for the applied countermeasure. The target crashes are clearly identified in the before and after period collision diagrams.

<b><u>Treatment Information</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total Crashes	48	40	-16.7
Total Severity Index	5.62	4.51	-19.8
Target Crashes	18	1	-94.4
Target Crash Severity Index	5.93	1	-83.1
Volume	31,300	35,500	13.4
<b><u>Target Crash Severity Summary</u></b>			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	3	0	-100.0
Class C Crashes	9	0	-100.0
PDO Crashes	6	1	-83.3

The naive before and after analysis at the treatment location resulted in a 17 percent decrease in Total Crashes, a 94 percent decrease in Target Crashes, and a 13 percent increase 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 17 percent decrease in Total Crashes and a 94 percent decrease in Target Crashes. The Total Severity Index decreased by 19 percent and the Target Severity Index decreased by 83 percent. 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 2.25 considering total crashes. The benefit to cost ratio considering only target crashes is also 2.83. 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 countermeasures were very effective at reducing Left Turn – Same Roadway Crashes Target Crashes at the intersection. In the before period there were a total of 18 of these types of crashes, 10 involving westbound left turns and eight involving eastbound left turns. In the after period there was only one Target Crash, which involved a westbound left turning vehicle and an eastbound right turning vehicle.

Although Target Crashes experienced a significant decrease at the intersection from the before to the after period, several other Frontal Impact Crash patterns became larger. There were a total of 13 crashes between vehicles on eastbound US 117 and northbound Holly Tree Rd in the after period. There were only five of these crashes in the before period. In 11 of the 13 after period crashes the eastbound driver was faulted for running the red signal. In one of the crashes the fault was undetermined.

Frontal impact crashes also increased between vehicles on eastbound US 117 and southbound 41<sup>st</sup> Street (from 1 to 5), between vehicles on westbound US 117 and southbound 41<sup>st</sup> Street (from 1 to 4) and between vehicles on westbound US 117 and northbound Holly Tree Rd (from 1 to 2).

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 117 at 41st/Holly Tree  
 COUNTY: New Hanover  
 FILE NO.: SS 03-00-400

BY: BDR  
 DATE: 11/30/2009

DETAILED COST: TYPE IMPROVEMENT - Signal Revision (proected left turns) and turn lane extention

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
Right-of-Way	\$125,000	10	0.149	\$18,629
	\$0	0	0.000	\$0
<b>TOTALS</b>	<b>\$125,000</b>	<b>10</b>	<b>0.149</b>	<b>\$18,629</b>

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$400  
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0  
 TOTAL ANNUAL COST= \$19,029  
 TOTAL COST OF PROJECT= \$125,000

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	4.84	0	0.00	30	6.20	18	3.72	\$139,587
AFTER	4.84	0	0.00	19	3.93	21	4.34	\$96,736

Annual Benefits from Crash Cost Savings \$42,851

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$23,823  
 BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 2.25

TOTAL COST OF PROJECT - \$125,000 COMPREHENSIVE B/C RATIO - 2.25

**BENEFIT-COST ANALYSIS WORKSHEET**

LOCATION: US 117 at 41st/Holly Tree  
 COUNTY: New Hanover  
 FILE NO.: SS 03-00-400 Target Crashes Only

BY: BDR  
 DATE: 11/30/2009

DETAILED COST: TYPE IMPROVEMENT - Signal Revision (proected left turns) and turn lane extention

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
Right-of-Way	\$125,000	10	0.149	\$18,629
	\$0	0	0.000	\$0
<b>TOTALS</b>	<b>\$125,000</b>	<b>10</b>	<b>0.149</b>	<b>\$18,629</b>

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$400  
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0  
 TOTAL ANNUAL COST= \$19,029  
 TOTAL COST OF PROJECT= \$125,000

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	4.84	0	0.00	12	2.48	6	1.24	\$54,793
AFTER	4.84	0	0.00	0	0.00	1	0.21	\$868

Annual Benefits from Crash Cost Savings \$53,926

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$34,897

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 2.83

TOTAL COST OF PROJECT - \$125,000 COMPREHENSIVE B/C RATIO - 2.83

## Treatment Site Photos from Google Street-View



Looking northeast on US 117 (Shipyard Blvd)



Looking southwest on US 117 (Shipyard Blvd)



Looking south on 41<sup>st</sup> Street



Looking north on Holly Tree Road

New Hanover County  
 US 117 (Shipyard Blvd)  
 at 41st/Holly Tree  
 BEFORE Period  
 11/1/1999-8/31/2004

S. 41st ST  
 35 mph

US 117  
 (SHIPYARD BLD)  
 50 mph

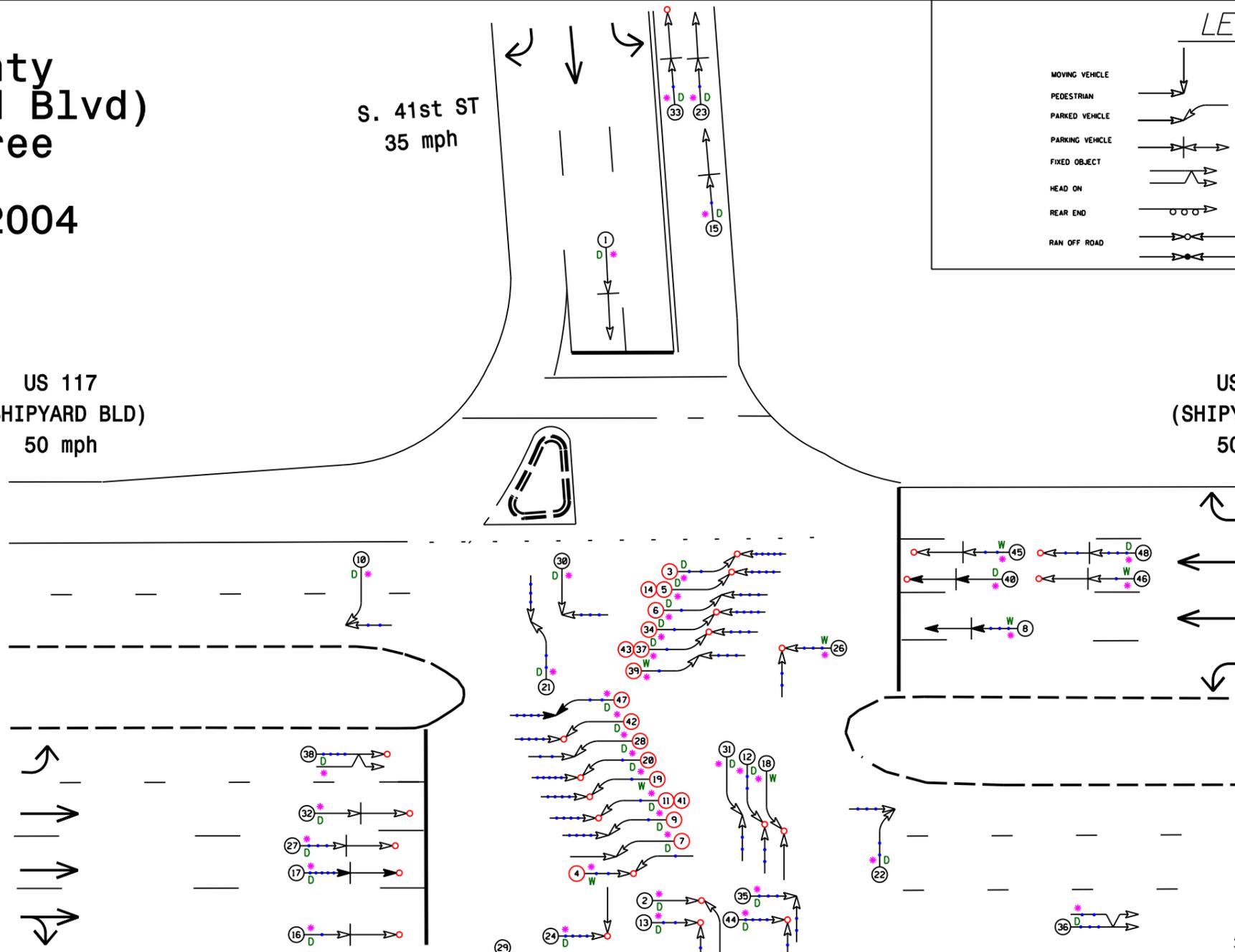
US 117  
 (SHIPYARD BLD)  
 50 mph

Holly Tree Rd  
 35 mph

#  
 Target Crash

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	



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

Not sure of signal configuration

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 3	AREA:
	STUDY PERIOD: 11/1/99-8/31/04	
	DISTANCE: Y-LINE + 150 FT	
	ANALYSIS PREPARED BY: BDR	
	ANALYSIS CHECKED BY:	
	DIAGRAM PREPARED BY: BDR	
	DIAGRAM REVIEWED BY:	
	SCALE: NOT TO SCALE	
	DATE: November 2009	
	LOG NUMBER: 4000002979	

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

New Hanover County  
 US 117 (Shipyard Blvd)  
 at 41st/Holly Tree  
 AFTER Period  
 12/1/2004-9/30/2009

S. 41st ST  
 35 mph

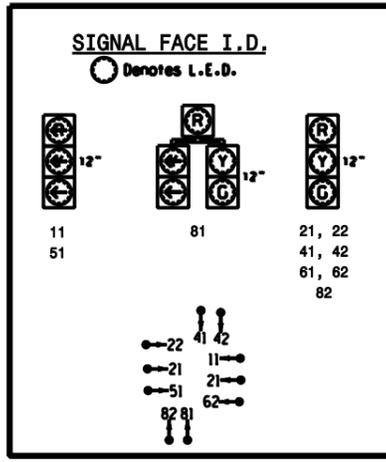
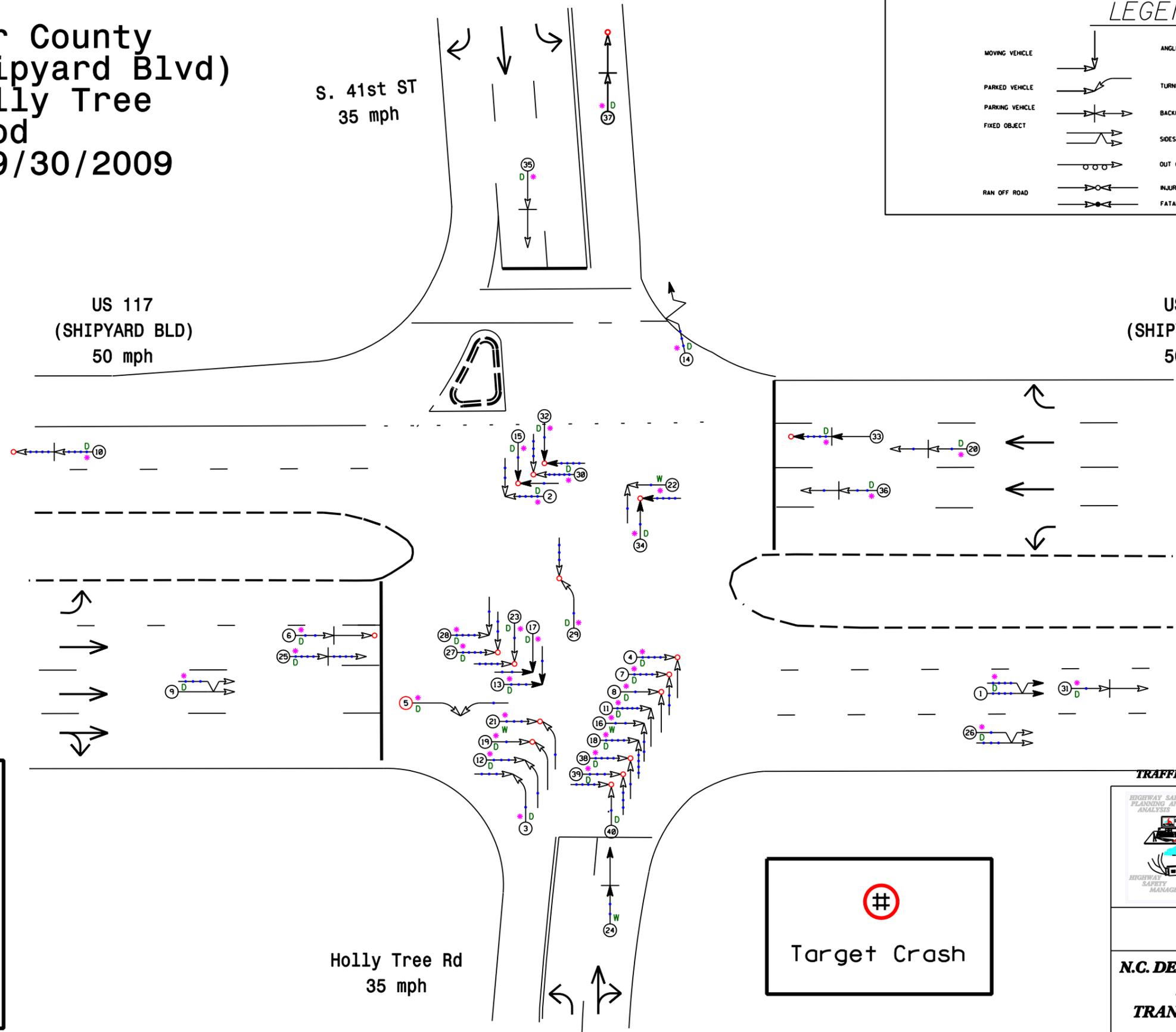
US 117  
 (SHIPYARD BLD)  
 50 mph

US 117  
 (SHIPYARD BLD)  
 50 mph

Holly Tree Rd  
 35 mph

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



#  
 Target Crash

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 3	AREA:
	STUDY PERIOD: 12/1/04-9/30/09	
	DISTANCE: Y-LINE = 150 FT	
	ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: BDR		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: November 2009		
LOG NUMBER: 4000002979		

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