

Spot Safety Project Evaluation

Project Log # 200712096

Spot Safety Project # 08-01-212

**Spot Safety Project Evaluation of the Traffic Signal Installation
At the Intersection of US-1-15-501 and SR 1157 (Hickory House Rd)
Lee County**

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
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North Carolina Department of Transportation

Principal Investigator

Jason B. Schronce

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 08-01-212 – The Intersection of US-1-15-501 and SR 1157 (Hickory House Road) which is near the City of Sanford in Lee 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 a 2-phase, actuated traffic signal. In the full study period, US-1-15-501 is a four lane divided facility with auxiliary left turn lanes, a northbound right turn lane, and controlled with a speed limit of 45 mph. SR 1157 is a two-lane facility at the subject intersection with no turn lanes and a speed limit of 35 mph. The subject location is a three-leg intersection, which was controlled by a stop sign on SR 1157 (Hickory House Rd). The fourth leg of the intersection is the entrance to Dale's Greenhouse and Garden Center which was also included into the after period signal plans.

The original statement of problem stated that this intersection was experiencing a high volume of vehicles on US 1 causing a delay to vehicles attempting to enter from the side street. The main purpose of the intersection improvement was to alleviate congestion and delay from SR 1157. The intersection meet signal warrants 1A, 1B, 2, and 3B.

The initial crash analysis was completed from December 31, 1997 to December 31, 2000 with eight (8) reported crashes, three (3) of which were deemed correctable with the installation of the signal. The final completion date for the improvement at the subject intersection was on November 13, 2002 with a total cost of \$50,000.00.

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 October 1, 2002 to December 31, 2002. The before period consisted of reported crashes from December 1, 1997 through September 30, 2002 (4 years and 10 months); and the after period consisted of reported crashes from January 1, 2003 through October 31, 2007 (4 years and 10 months). The ending date for this analysis was determined by the date of available crash data at the time of analysis.

The treatment data consisted of all crashes within 150 feet of the subject intersection. *Please see attached location map and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

Treatment Information			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	20	31	55.00 %
Total Severity Index	4.70	9.47	101.49 %
Target Crashes	12	14	16.67 %
Target Crash Severity Index	5.32	11.17	109.96 %
Volume	22,300	28,000	25.56 %
<u>Injury Crash Summary</u>			
Fatal injury Crashes	0	1	100.00 %
Class A injury Crashes	0	1	100.00 %
Class B injury Crashes	1	2	100.00 %
Class C Injury Crashes	9	13	44.44 %
Total Injury Crashes	10	17	70.00 %

The naive before and after analysis at the treatment location resulted in a 55 percent increase in Total Crashes, a 17 percent increase in Target Crashes, and over a 100 percent increase in the Total Severity Index. The before period ADT year was 2000 and the after period ADT year was 2005.

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 55 percent increase in Total Crashes and a 17 percent increase in Target Crashes. 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.

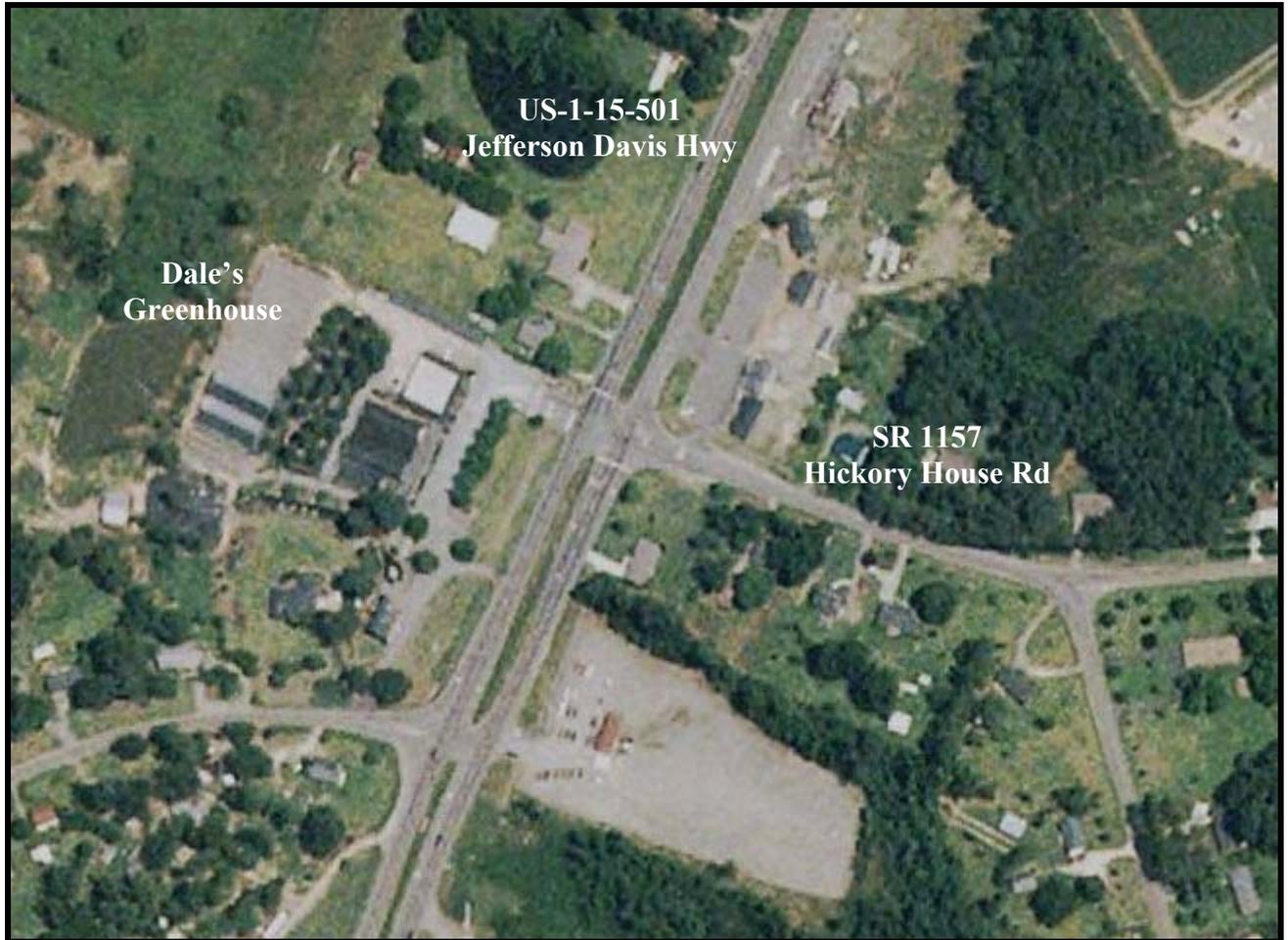
Referencing the *Collision Diagrams*, the target crashes at the intersection in the before period were split equally between angle and left turn style collisions. After the signal installation, the angle crash pattern reduced by 75 percent to just two crashes caused by US-1 vehicles running the red light. However, the left turn same roadway crash pattern doubled and included a fatality crash as a vehicle attempted to access Dale's Greenhouse PVA. From the fatal investigation report, it was determined that no roadway fault was apparent and that age was a factor in this motor vehicle death.

There was also a distinctive increase in Rear-End Crashes on the mainline (US-1-15-501) from one (1) to nine (9) in the after period. Although, the same pattern of Rear-End Crashes reduced slightly on Hickory House Road from five (5) to two (2).

The calculated benefit to cost ratio for this project is -22.11 considering total crashes. The benefit to cost ratio considering only target crashes is -10.64. 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.

Please see the attached *Treatment Site Photos*. Photos are provided for all approaches to the treatment intersection, including the right / thru and left turn lanes from Dale's Greenhouse PVA entrance. 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.

**SS# 08-01-212 Aerial Map
Lee County, near Sanford**



TREATMENT SITE PHOTOS TAKEN 3/26/2008



Traveling North on US-1-15-501 (Jefferson Davis Hwy)



Traveling South on US-1-15-501



Traveling East from Dale's Greenhouse PVA



Traveling West on SR 1157 (Hickory House Rd)

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US-1 at SR 1157
 COUNTY: Lee
 FILE NO.: SS 08-01-212

BY: JBS
 DATE: 4/14/2008
 NOTES: Target Crashes - Frontal Impact

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$50,000	10	0.149	\$7,451
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$50,000	10	0.149	\$7,451

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900
 TOTAL ANNUAL COST= \$10,351
 TOTAL COST OF PROJECT= \$50,000

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	4.83	0	0.00	7	1.45	5	1.04	\$30,124
AFTER	4.83	1	0.21	9	1.86	4	0.83	\$140,290

Annual Benefits from Crash Cost Savings (\$110,166)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$120,517)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -10.64

TOTAL COST OF PROJECT - \$50,000 COMPREHENSIVE B/C RATIO - -10.64

LEGEND

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

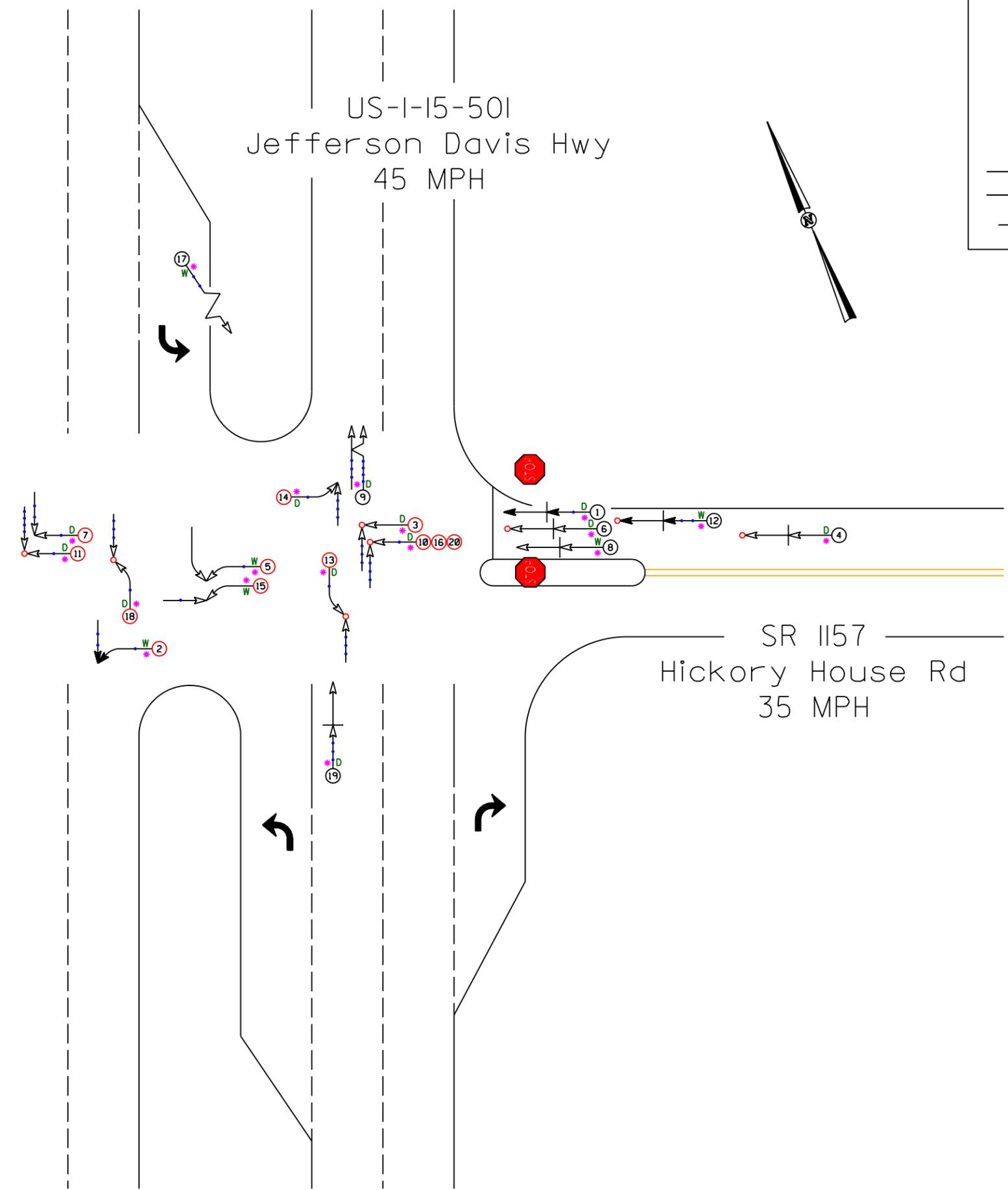


US-1-15-501
Jefferson Davis Hwy
45 MPH

SS# 08-01-212
Lee County
BEFORE Period
12/1/97 - 9/30/02
US-1 at SR 1157

Dale's
Greenhouse

SR 1157
Hickory House Rd
35 MPH

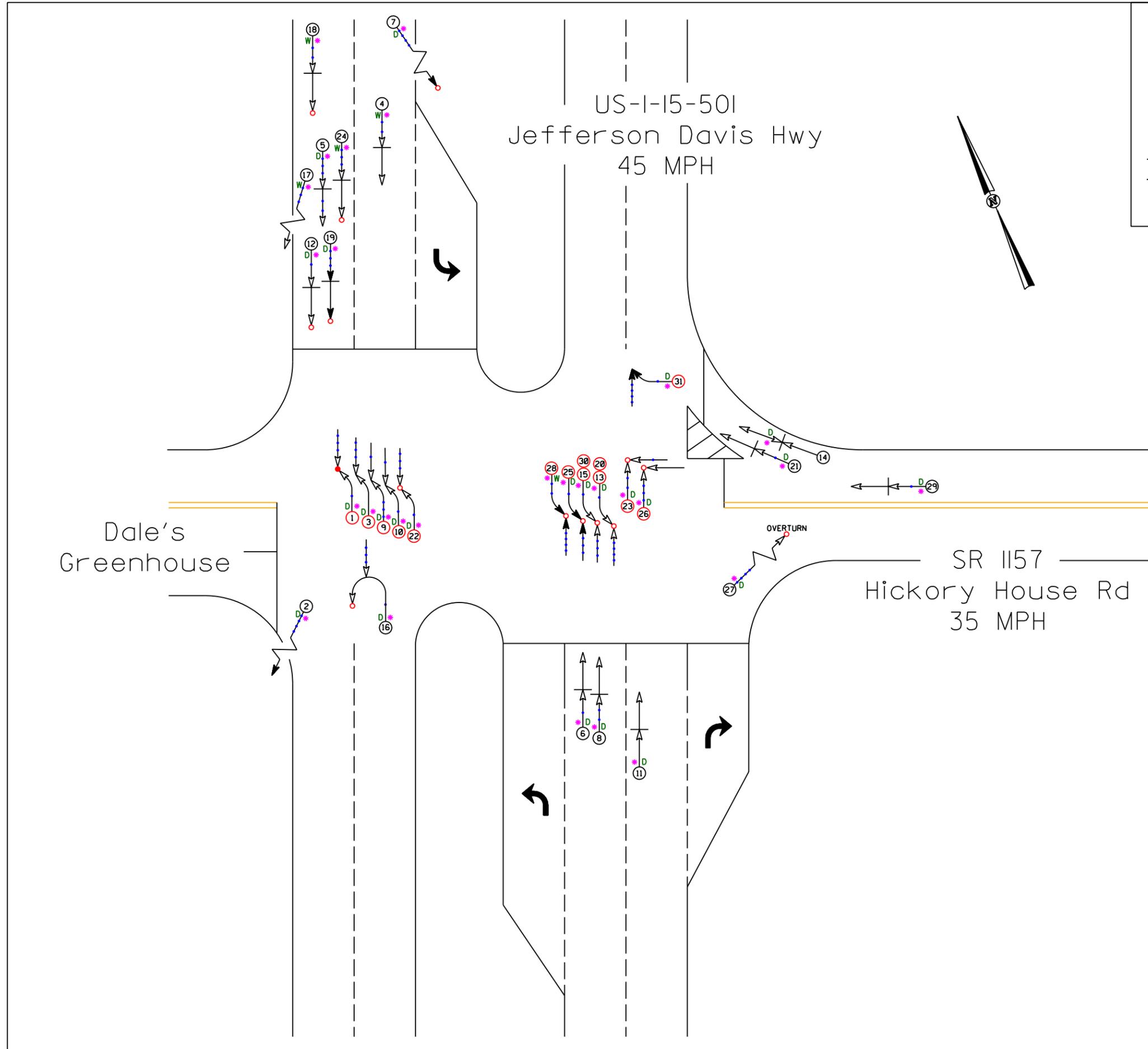


Target Crashes
 Frontal Impact

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 8	AREA: 1
	STUDY PERIOD: 12/1/1997 - 9/30/2002	
	DISTANCE: Y-LINE = 150 FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: BR		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 4-1-2008		
LOG NUMBER: SS* 08-01-212		

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH



LEGEND

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

SS# 08-01-212
Lee County
AFTER Period
1/1/03 - 10/31/2007
US-1 at SR 1157

New
 Signalized
 Intersection

Target Crashes
 Frontal Impact

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 8	AREA: 1
	STUDY PERIOD: 1/1/2003 - 10/31/2007	
	DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: BR		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 4-1-2008		
LOG NUMBER: SS* 08-01-212		

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