

Spot Safety Project Evaluation

Project Log # 200907186

Spot Safety Project # 01-01-266

Spot Safety Project Evaluation of the Traffic Signal Installation at the Intersection of US 158 and North Seachase/Epstein Dr Dare 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

8/31/2009

Date

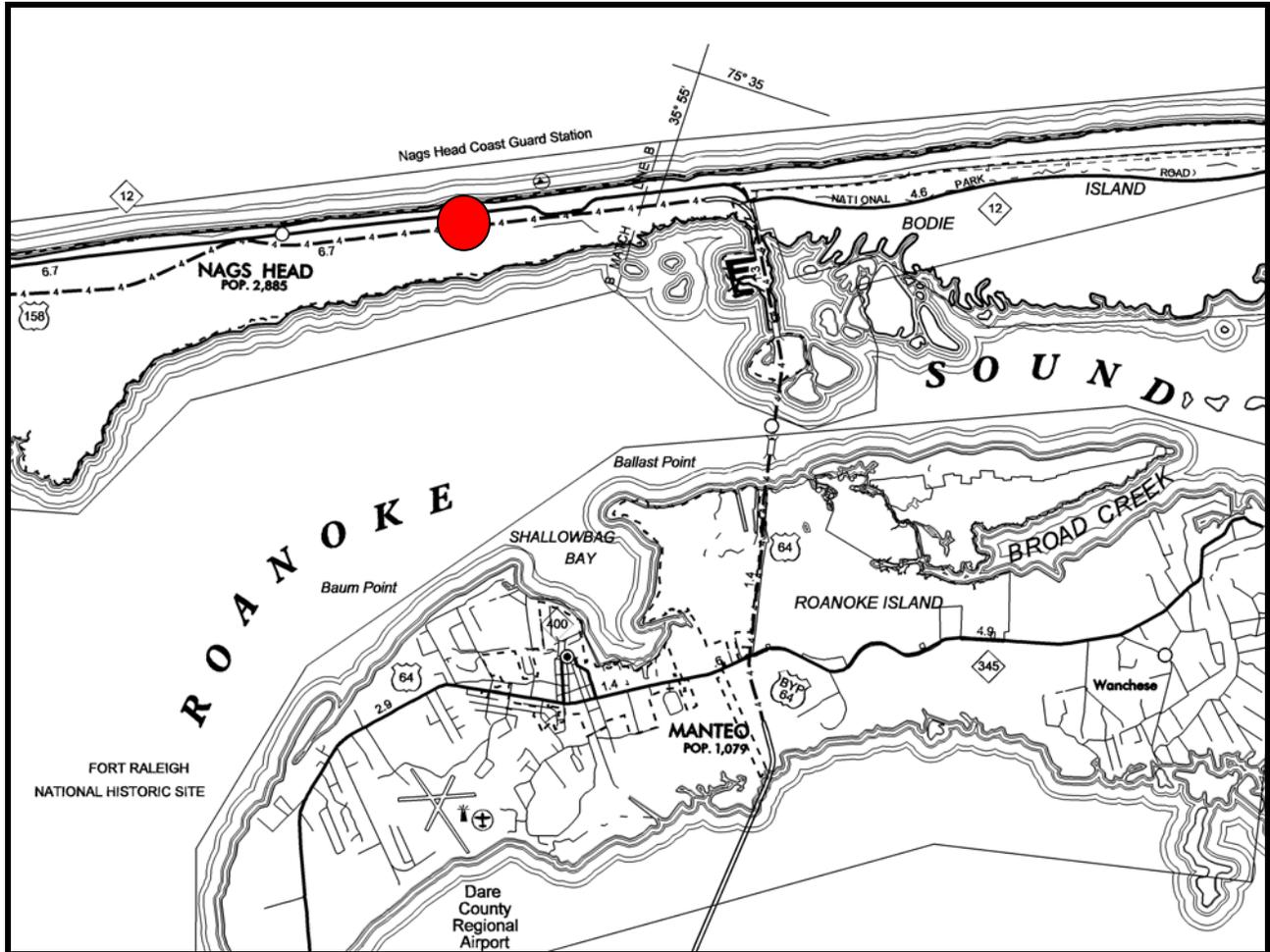
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 01-01-266– The Intersection of US 158 and North Seachase/Epstein in Dare County.

The signal number for this location is 01-0723.



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 traffic signal.

The subject location is a four-leg intersection controlled by stop signs on North Seachase and Epstein in the before period. US 158 is a five-lane facility with a speed limit of 50 mph. North Seachase has a through-left and an exclusive right turn lane at the subject intersection and a speed limit of 25 mph. Epstein is a two-lane road with a speed limit of 35 mph.

The original statement of problem was that motorists entering US 158 from the side streets were having difficulty turning left during peak volume times.

The initial crash analysis was conducted from June 1, 1998 to May 31, 2001 with a total of two reported crashes, one of which was considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on June 30, 2004 with a total cost of \$75,000.00.

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 May 1, 2004 to August 31, 2004. The before period consisted of reported crashes from August 1, 1999 through April 30, 2004 (4 years and 9 months) and the after period consisted of reported crashes from September 1, 2004 through May 31, 2009 (4 years and 9 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.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	3	13	333.3
Total Severity Index	5.93	8.54	44.0
Target Crashes	1	9	800.0
Target Crash Severity Index	8.4	11.07	31.8
Volume	31,000	31,000	0.0

Crash Severity Summary			
Fatal Crashes	0	1	N/A
Class A Crashes	0	0	N/A
Class B Crashes	0	1	N/A
Class C Crashes	2	2	0.0
PDO Crashes	1	9	800.0

The naive before and after analysis at the treatment location resulted in a 333.3 percent increase in Total Crashes, an 800 percent increase in Target Crashes, and no change 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 333.3 percent increase in Total Crashes and an 800 percent increase in Target Crashes. The Total Severity Index increased by 44 percent and the Target Crash Severity Index increased by 32 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 -10.22 considering total crashes. The benefit to cost ratio considering only target crashes is also -10.33. 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.

There was a very large increase in Target Crashes from the before to the after period (from 1 to 9). Seven of the nine after period crashes resulted from a northbound US 158 running a red signal and hitting a vehicle entering the intersection from North Seachase/Epstein Dr. It is not apparent why this is occurring. There are no obvious site distance issues and the crashes were not concentrated on any particular day of the week or time of day.

There was a Left Turn-Same Roadway Target Crash that resulted in a fatality in the after period. This crash involved a southbound US 158 vehicle turning left onto Epstein Dr, failing to yield to a northbound 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 158 and North Seachase/Epstein Dr
 COUNTY: Currituck
 FILE NO.: SS 01-01-266

BY: BDR
 DATE: 8/14/2009

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$75,000	10	0.149	\$11,177
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$75,000	10	0.149	\$11,177

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900
 TOTAL ANNUAL COST= \$14,077
 TOTAL COST OF PROJECT= \$75,000

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	4.75	0	0.00	2	0.42	1	0.21	\$9,305
AFTER	4.75	1	0.21	3	0.63	9	1.89	\$153,221

Annual Benefits from Crash Cost Savings (\$143,916)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$157,993)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -10.22

TOTAL COST OF PROJECT - \$75,000 COMPREHENSIVE B/C RATIO - -10.22

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 158 and North Seachase/Epstein Dr
 COUNTY: Currituck
 FILE NO.: SS 01-01-266 Target Crashes Only

BY: BDR
 DATE: 8/14/2009

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$75,000	10	0.149	\$11,177
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$75,000	10	0.149	\$11,177

ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$900
TOTAL ANNUAL COST=	\$14,077
TOTAL COST OF PROJECT=	\$75,000

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	4.75	0	0.00	0	0.00	1	0.21	\$884
AFTER	4.75	1	0.21	2	0.42	6	1.26	\$146,358

Annual Benefits from Crash Cost Savings (\$145,474)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$159,551)

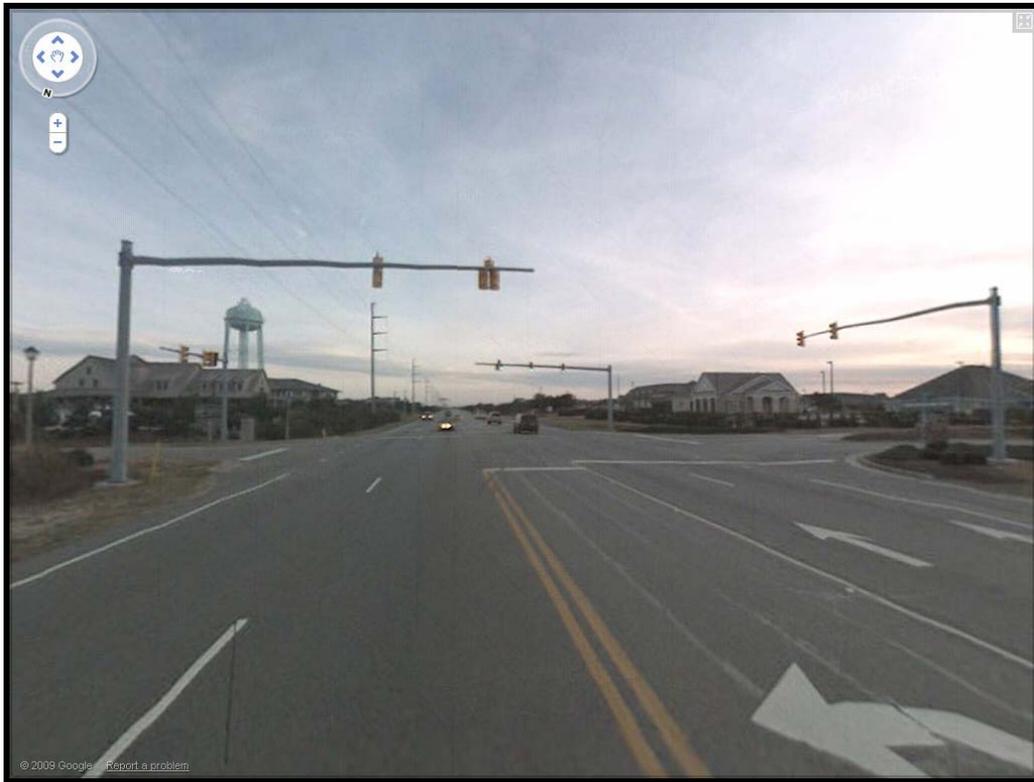
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -10.33

TOTAL COST OF PROJECT - \$75,000 COMPREHENSIVE B/C RATIO - -10.33

Treatment Site Photos from Google Street-View



Looking Northwest on US 158



Looking Southeast on US 158



Looking West from Epstein Dr

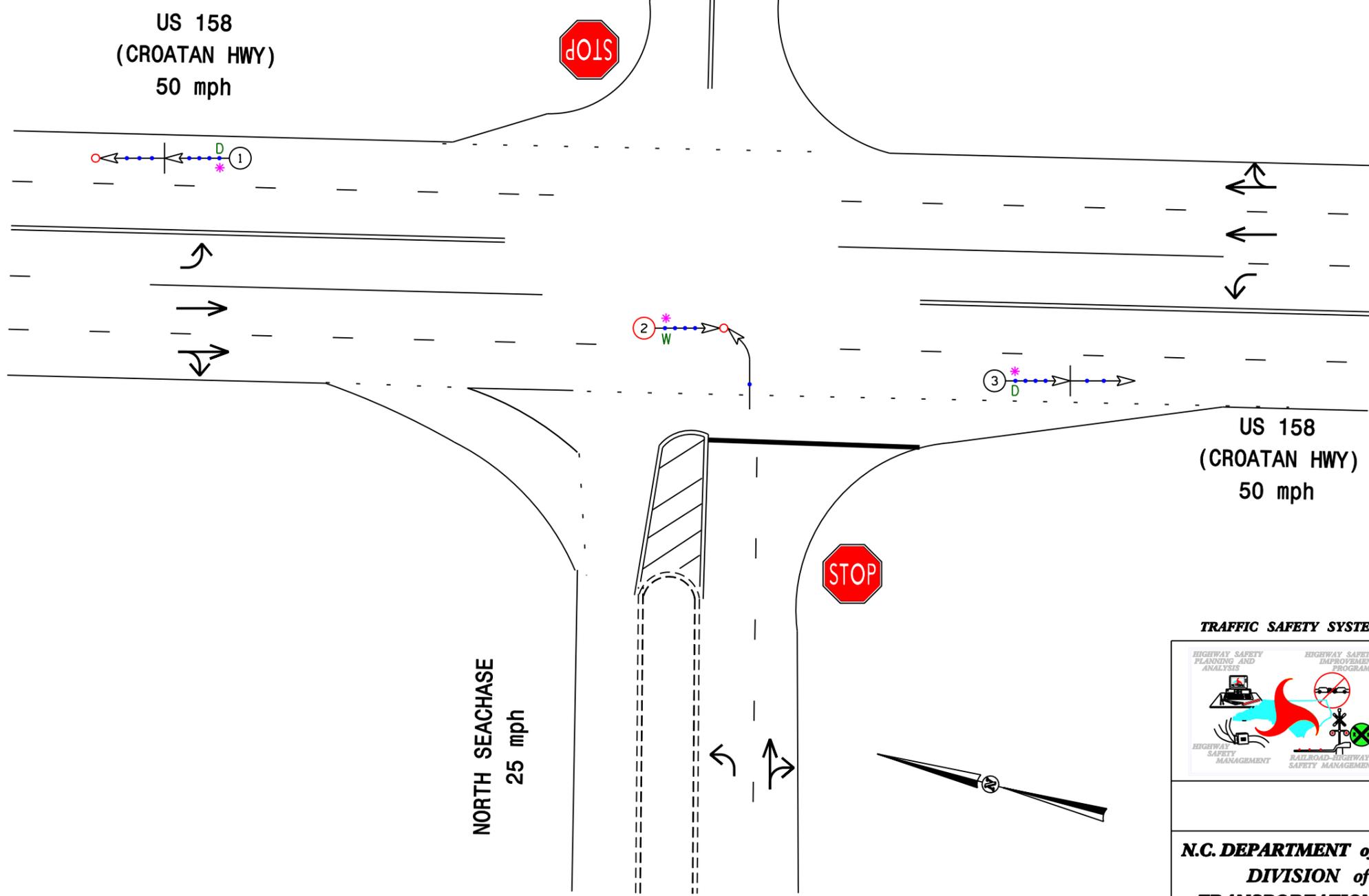


Looking West toward North Seachase

Dare County
 US 158 and
 North Seachase/Epstein
 BEFORE Period
 8/1/1999-4/30/2004

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

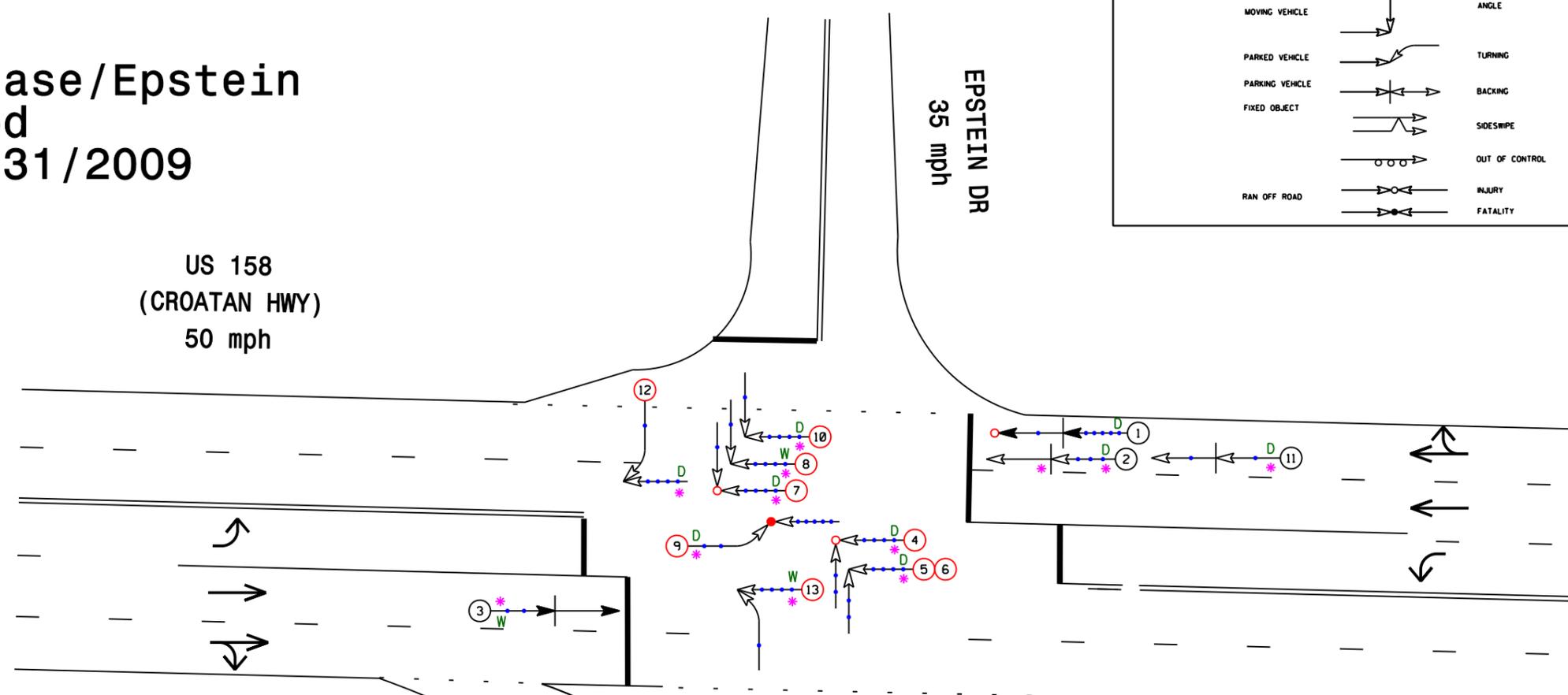
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	DIVISION: 1	AREA:
	STUDY PERIOD: 8/1/99-4/30/04	
	DISTANCE: Y-LINE = 150 FT	
	ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: BDR		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: July 2009		
LOG NUMBER: 20090786		

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

Dare County
 US 158 and
 North Seachase/Epstein
 AFTER Period
 9/1/2004-5/31/2009

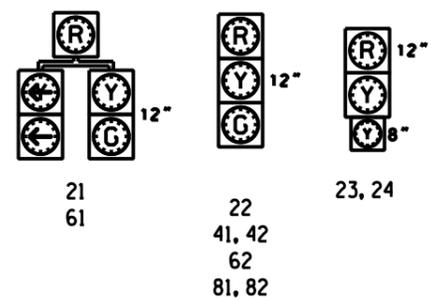
LEGEND

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	



SIGNAL FACE I.D.

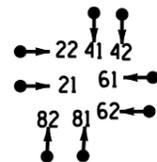
Denotes L.E.D.



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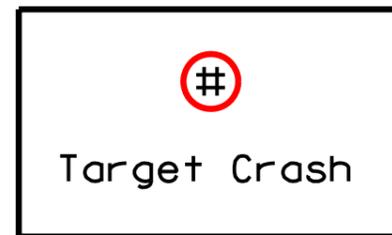
23, 24



US 158
 (CROATAN HWY)
 50 mph

NORTH SEACHASE
 25 mph

EPSTEIN DR
 35 mph



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 1	AREA:
	STUDY PERIOD: 9/1/04-5/3/09	
	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: 20090786		

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