

Spot Safety Project Evaluation

Project Log # 200806135

Spot Safety Project # 01-01-251

**Spot Safety Project Evaluation of the Traffic Signal Installation
At the Intersection of NC 168 (Caratoke Hwy) and SR 1215 (Survey Rd)
Currituck County**

Documents Prepared By:

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

Principal Investigator

Jason B. Schronce

8-22-2008
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 13-97-006 located at the Intersection of NC 168 (Caratoke Highway) and SR 1215 (Survey Road) in Currituck 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. NC 168 (Caratoke Highway) is a five lane facility with two thru lanes in each direction and a center turn lane that forms a dedicated westbound left turn lane at the intersection. NC 168 also provides a small eastbound right turn lane and a 55 mph speed limit. SR 1215 (Survey Road) is a two lane roadway with a statutory 55 mph speed limit. The subject location is a three-leg intersection, which was controlled by a stop sign on SR 1215 (Survey Rd).

The original statement of problem was the future development and build-out of a golf course community with SR 1215 as their only access. Also, a new middle school was completed on SR 1215 in August of 2002. The justifications for this traffic signal were operational and capacity based with an expected signal warrant of 3B.

The initial crash analysis was completed from June 1, 1998 to May 31, 2001 with two (2) reported crashes, one (1) of which was deemed correctable. The final completion date for the improvement at the subject intersection was on July 1, 2003 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 the months of June and July of 2003. The before period consisted of reported crashes from October 1, 1998 through May 31, 2003 (4 years and 9 months); and the after period consisted of reported crashes from August 1, 2003 through March 31, 2008 (4 years and 9 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, aerial 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.

| <u>Treatment Information</u> | | | |
|--|---------------|--------------|---|
| | Before | After | Percent Reduction (-) Percent Increase (+) |
| Total crashes | 3 | 7 | 133.33 % |
| Total Severity Index | 5.87 | 5.17 | - 11.93 % |
| | | | |
| Target Crashes | 1 | 2 | 100.00 % |
| Target Crash Severity Index | 8.30 | 8.30 | 0.00 % |
| | | | |
| Volume | 21,400 | 19,600 | |
| | | | |
| <u>Injury Crash Summary - Total</u> | | | |
| Fatal injury Crashes | 0 | 0 | N/A |
| Class A injury Crashes | 0 | 0 | N/A |
| Class B injury Crashes | 1 | 1 | 0.00 % |
| Class C Injury Crashes | 1 | 3 | 200.00 % |
| Total Injury Crashes | 2 | 4 | 100.00 % |

The naive before and after analysis at the treatment location resulted in a 133 percent increase in Total Crashes, a 100 percent increase in Target Crashes, but a 12 percent decrease in the Total Severity Index. The before period ADT year was 2001 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 133 percent increase in Total Crashes and a 100 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*, frontal impact crashes increased from one (1) to two (2) once the signal was installed. Both after period target crashes resulted from vehicles on the five-lane NC 168 running the red light. Total crashes also significantly increased due to an increase in rear-end collisions at the new signal from zero (0) in the before to four (4) in the after period.

The calculated benefit to cost ratio for this project is **-0.67 considering total crashes**. The benefit to cost ratio considering only **target crashes is -0.27**. 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. 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# 01-01-251 Aerial Map
Currituck County, near Town of Moyock**



TREATMENT SITE PHOTOS TAKEN 8/7/2008



Traveling East on NC 168 (Caratoke Highway)



Traveling East on NC 168



Traveling North on SR 1215 (Survey Road)



Traveling North on SR 1215



Traveling West on NC 168 (Caratoke Highway)

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 168 at SR 1215
 COUNTY: Currituck
 FILE NO.: SS 01-01-251

BY: JBS
 DATE: 8/19/2008
 NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - New Signal

| ITEMS | TOTAL | SERVICE | CRF | ANNUAL COST |
|--------------|----------|---------|-------|-------------|
| Construction | \$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 | 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 | 4.67 | 0 | 0.00 | 2 | 0.43 | 1 | 0.21 | \$8,544 |
| AFTER | 4.67 | 0 | 0.00 | 4 | 0.86 | 3 | 0.64 | \$17,923 |

Annual Benefits from Crash Cost Savings (\$9,379)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$23,456)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -0.67

TOTAL COST OF PROJECT - \$75,000 COMPREHENSIVE B/C RATIO - -0.67

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 168 at SR 1215
 COUNTY: Currituck
 FILE NO.: SS 01-01-251

BY: JBS
 DATE: 8/19/2008
 NOTES: Target Crashes - Frontal Impact

DETAILED COST: TYPE IMPROVEMENT - New Signal

| ITEMS | TOTAL | SERVICE | CRF | ANNUAL COST |
|--------------|----------|---------|-------|-------------|
| Construction | \$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

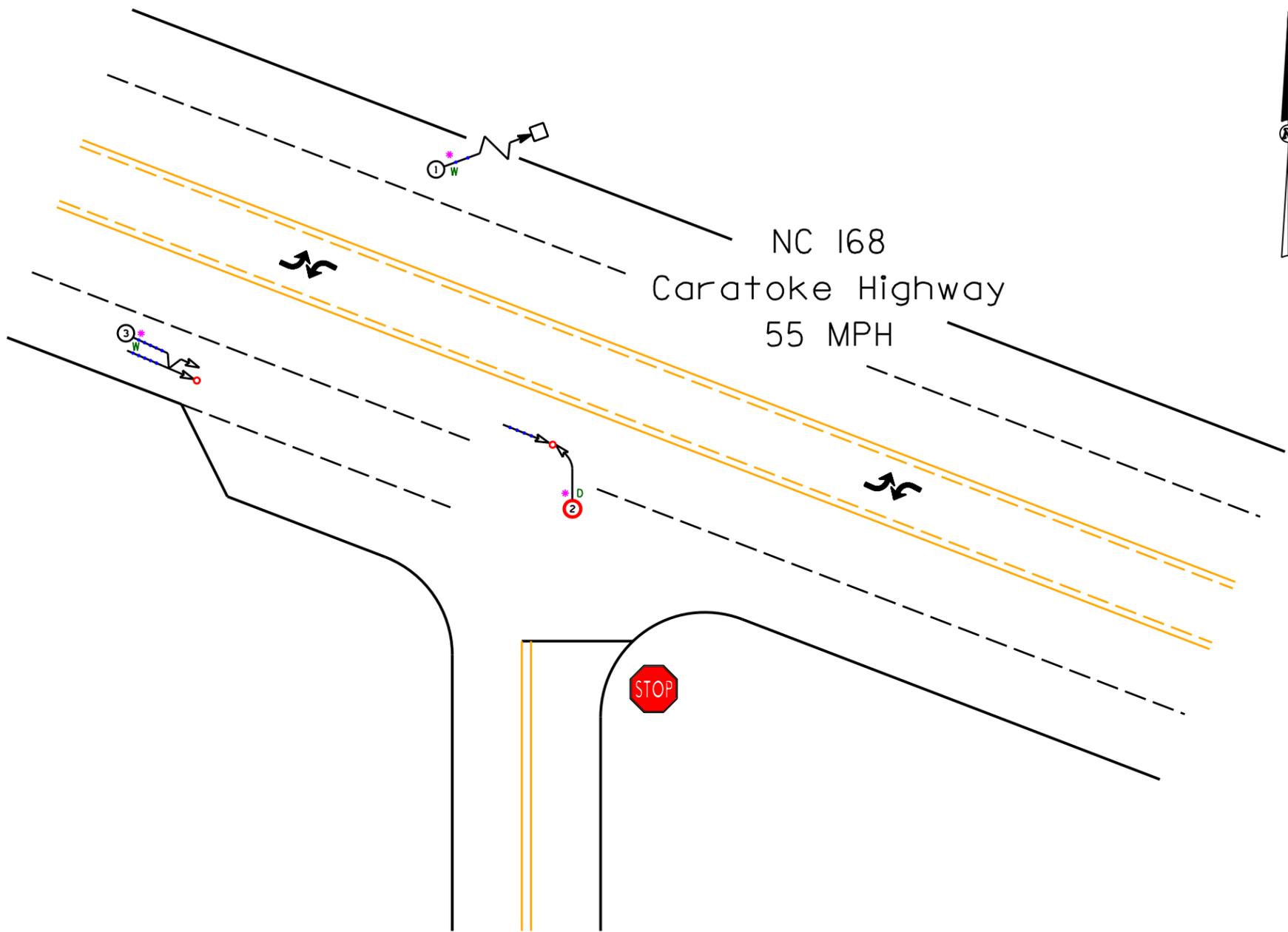
| TIME PERIOD | YEARS | K & A CRASHES | K & A CRASHES PER YR | B & C CRASHES | B & C CRASHES PER YR | PDO CRASHES | PDO CRASHES PER YR | ANNUAL COSTS |
|-------------|-------|------------------|----------------------------|------------------|----------------------------|----------------|--------------------------|-----------------|
| BEFORE | 4.67 | 0 | 0.00 | 1 | 0.21 | 0 | 0.00 | \$3,854 |
| AFTER | 4.67 | 0 | 0.00 | 2 | 0.43 | 0 | 0.00 | \$7,709 |

Annual Benefits from Crash Cost Savings (\$3,854)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$17,932)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -0.27

TOTAL COST OF PROJECT - \$75,000 COMPREHENSIVE B/C RATIO - -0.27



NC 168
Caratoke Highway
55 MPH

SR 1215
Survey Rd

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 | | SPEED UNKNOWN |
| | RAN OFF ROAD | | | | 70 AND UP | | |
| | | | | | OILY | | |

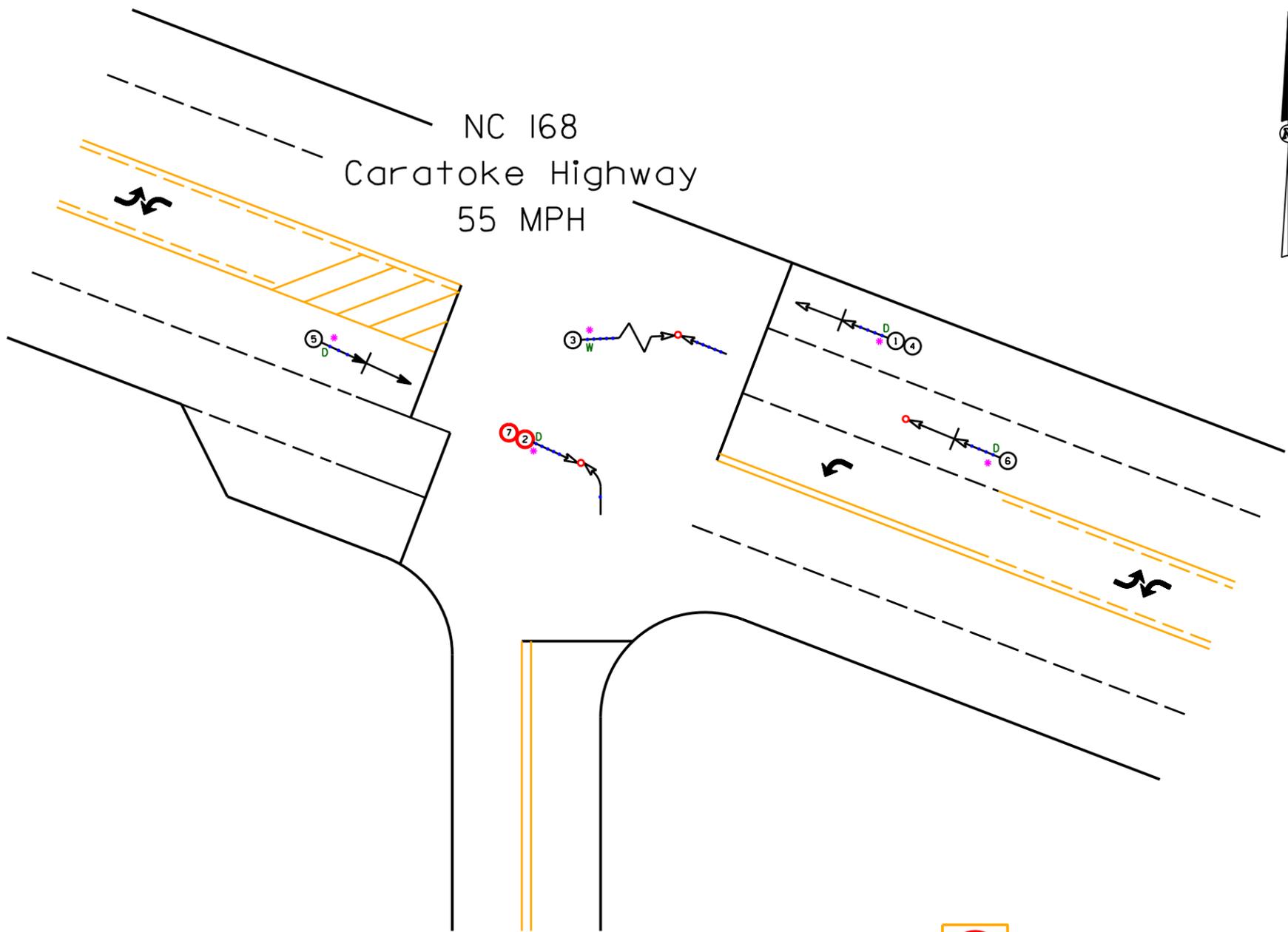
SS# 01-01-251
Currituck County
BEFORE Period
10/1/98 - 5/31/03
NC 168 at SR 1215

Target Crashes
Frontal Impact

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

| | | |
|---------------------------|-------------------------------------|---------|
| | COLLISION DIAGRAM | |
| | DIVISION: I | AREA: 1 |
| | STUDY PERIOD: 10/1/1998 - 5/31/2003 | |
| | 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: 7-14-2008 | | |
| LOG NUMBER: SS* 01-01-251 | | |

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



NC 168
Caratoke Highway
55 MPH

SR 1215
Survey Rd



New Signalized
Intersection

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 | | SPEED UNKNOWN |
| | RAN OFF ROAD | | | | 70 AND UP | | OILY |

SS# 01-01-251
Currituck County
AFTER Period
8/1/03 - 3/31/08
NC 168 at SR 1215

Target Crashes
Frontal Impact

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

| | | |
|---------------------------|------------------------------------|---------|
| | COLLISION DIAGRAM | |
| | DIVISION: 1 | AREA: 4 |
| | STUDY PERIOD: 8/1/2003 - 3/31/2003 | |
| | 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: 7-14-2008 | | |
| LOG NUMBER: SS* 01-01-251 | | |

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