

# Spot Safety Project Evaluation

Work Order #41000012229

Spot Safety Project # 04-05-219

**Spot Safety Project Evaluation of the Right Turn Lane Construction and Traffic Signal Installation at the Intersection of SR 1003 (Buffalo Rd) and SR 1700 (Covered Bridge Rd) Johnston 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

7/7/2011

Date

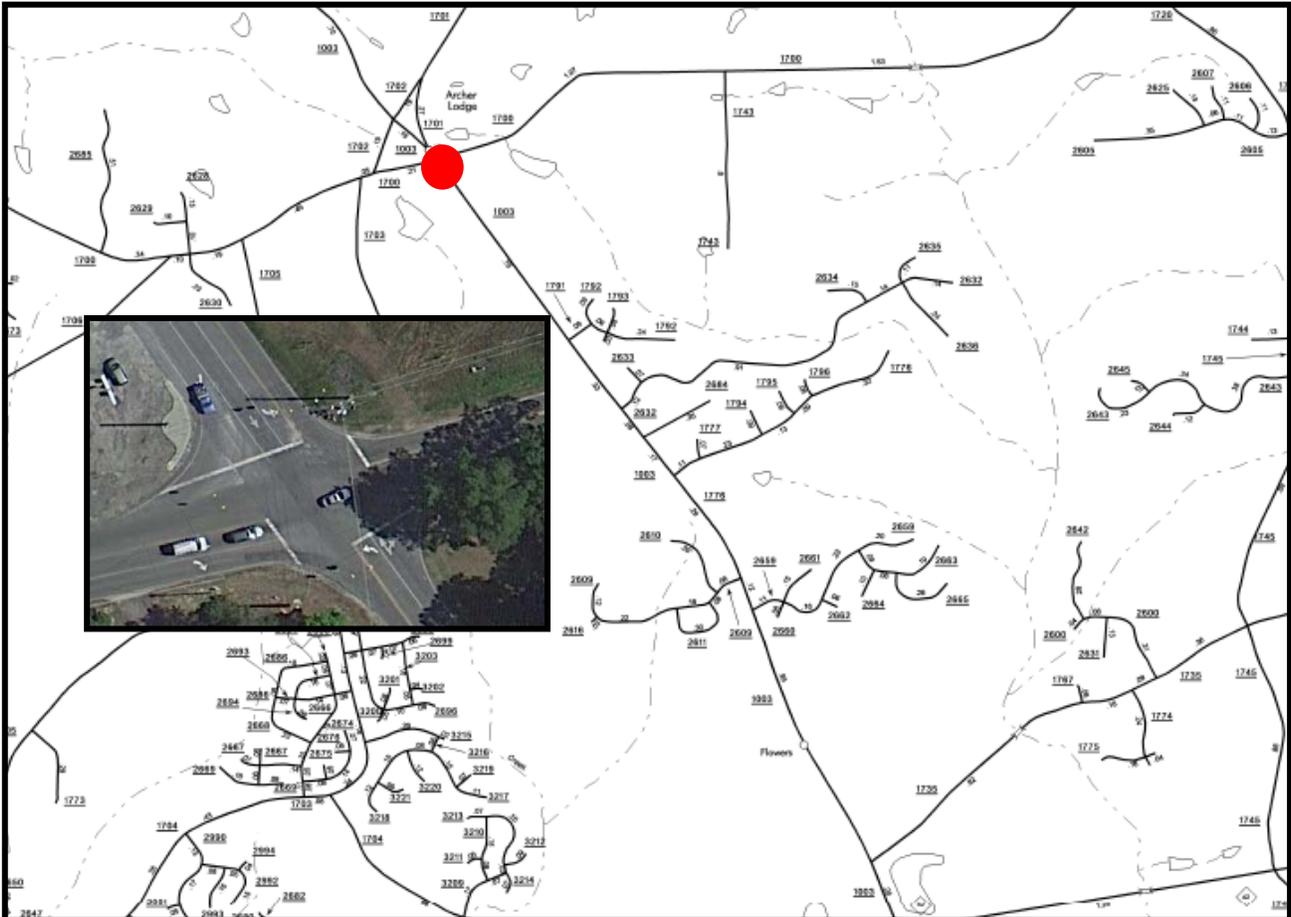
Traffic Safety Project Engineer

# *Spot Safety Project Evaluation Documentation*

## **Subject Location**

Evaluation of Spot Safety Project Number 04-05-219 – The intersection of SR 1003 (Buffalo Rd) and SR 1700 (Covered Bridge Rd) in Johnston County.

The signal number for this location is 04-1181.



## **Project Information and Background from the Project File Folder**

The spot safety project improvement countermeasures chosen for the subject location were to construct a right turn lane on eastbound SR 1700 and to install a traffic signal.

SR 1003 is a two lane roadway that has exclusive left turn lanes on both approaches to the intersection and an exclusive right turn lane on its southbound approach. SR 1700 is also a two lane roadway and did not have any turn lanes at the intersection prior to this project. Both roadways have a 45 mph speed limit.

The initial crash analysis was conducted from July 1, 2000 to June 30, 2005 with a total of 15 reported crashes. The final completion date for the improvements at the subject intersection was on August 9, 2007 with a total cost of \$128,000.00.

### 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 July 1, 2007 to August 31, 2007. The before period consisted of reported crashes from December 1, 2003 through May 31, 2007 (3 years and 6 months) and the after period consisted of reported crashes from September 1, 2007 through February 28, 2011 (3 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 crashes were the target crashes for the applied countermeasure. These crash types are considered as follows: left turn, same roadway; left turn, different roadway; right turn, different roadway; head on and angle. 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	13	5	-61.5
Total Severity Index	11.95	17.64	47.6
Target Crashes	7	4	-42.9
Target Severity Index	18.17	21.80	20.0
Volume	8,700	8,700	0.0
<b><u>Target Crash Severity Summary</u></b>			
Fatal Crashes	0	0	N/A
Class A Crashes	1	1	0.0
Class B Crashes	2	1	-50.0
Class C Crashes	4	0	-100.0
PDO Crashes	0	2	N/A

The naive before and after analysis at the treatment location resulted in an 62 percent decrease in total crashes and a 43 percent decrease in target crashes. The before period ADT year was 2005 and the after period ADT year was 2009.

### Results and Discussion

In the before period all seven of the target crashes were angle type crashes. In the after period this pattern was reduced to only one crash. The other three after period target crashes were left turn-same roadway crashes involving vehicles on SR 1700, one resulting in a Class 'A' injury.

The calculated benefit to cost ratio for this project is 2.04 considering total crashes. The benefit to cost ratio considering only target crashes is 1.17. 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*. 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: SR 1700 and SR 1003  
 COUNTY: Johnston  
 FILE NO.: SS 04-05-219

BY: bdr  
 DATE: 6/21/2011

DETAILED COST: TYPE IMPROVEMENT - Signal and Right Turn Lane

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$128,000	10	0.149	\$19,076
Right-of-Way	\$0	0	0.000	\$0
<b>TOTALS</b>	<b>\$128,000</b>	<b>10</b>	<b>0.149</b>	<b>\$19,076</b>

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,400  
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900  
 TOTAL ANNUAL COST= \$22,376  
 TOTAL COST OF PROJECT= \$128,000

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	3.50	1	0.29	9	2.57	3	0.86	\$235,114
AFTER	3.50	1	0.29	1	0.29	3	0.86	\$189,400

Annual Benefits from Crash Cost Savings \$45,714

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$23,339  
 BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 2.04

TOTAL COST OF PROJECT - \$128,000 COMPREHENSIVE B/C RATIO - 2.04

**BENEFIT-COST ANALYSIS WORKSHEET**

LOCATION: SR 1700 and SR 1003  
 COUNTY: Johnston  
 FILE NO.: SS 04-05-219 Target Crashes Only

BY: bdr  
 DATE: 6/21/2011

DETAILED COST: TYPE IMPROVEMENT - Signal and Right Turn Lane

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
Right-of-Way	\$128,000	10	0.149	\$19,076
	\$0	0	0.000	\$0
<b>TOTALS</b>	<b>\$128,000</b>	<b>10</b>	<b>0.149</b>	<b>\$19,076</b>

ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$2,400
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$900
TOTAL ANNUAL COST=	\$22,376
TOTAL COST OF PROJECT=	\$128,000

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	3.50	1	0.29	6	1.71	0	0.00	\$214,286
AFTER	3.50	1	0.29	1	0.29	2	0.57	\$188,171

Annual Benefits from Crash Cost Savings \$26,114

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$3,739

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 1.17

TOTAL COST OF PROJECT - \$128,000 COMPREHENSIVE B/C RATIO - 1.17

**Treatment Site Photos Taken May 25, 2011**



Looking west on SR 1700 (Covered Bridge Rd)



Looking east on SR 1700 (Covered Bridge Rd)



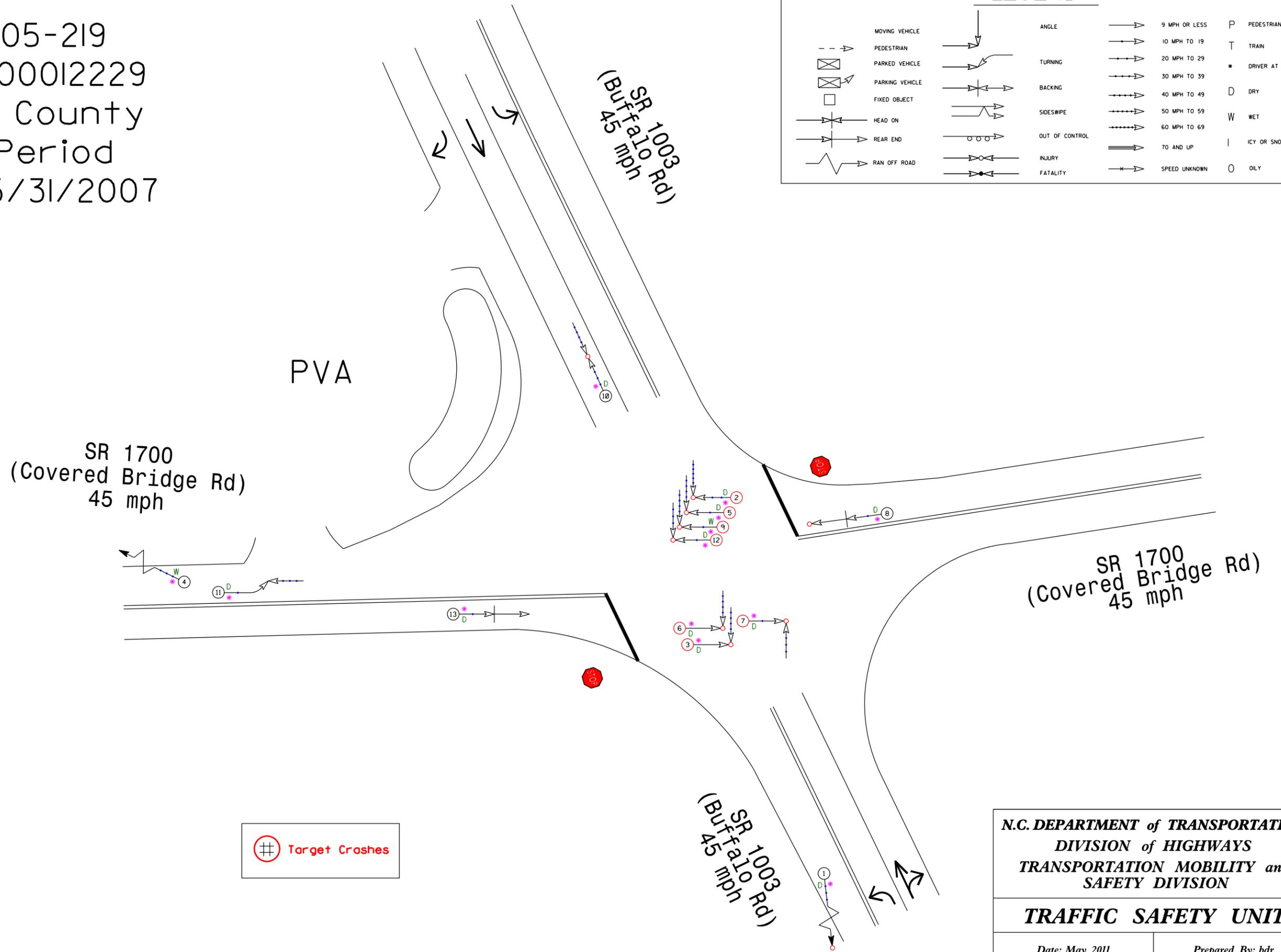
Looking north on SR 1003 (Buffalo Rd)



Looking south on SR 1003 (Buffalo Rd)

SS# 04-05-219  
 Order# 4100012229  
 Johnston County  
 BEFORE Period  
 12/1/2003-5/31/2007

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



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

**TRAFFIC SAFETY UNIT**

Date: May 2011      Prepared By: bdr

SS# 04-05-219  
 Order# 4100012229  
 Johnston County  
 AFTER Period  
 9/1/2007-2/28/2011

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

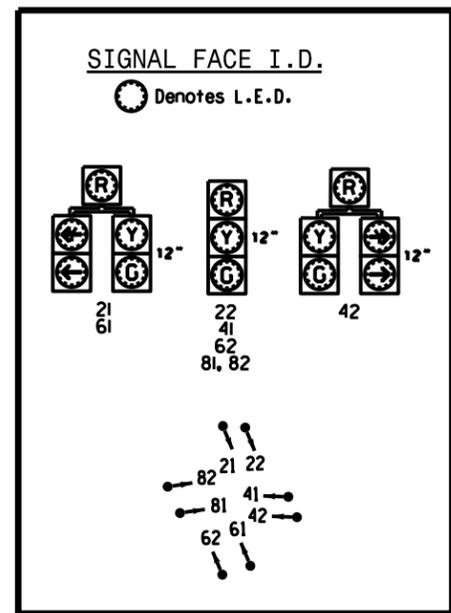
SR 1700  
 (Covered Bridge Rd)  
 45 mph

SR 1003  
 (Buffalo Rd)  
 45 mph

SR 1700  
 (Covered Bridge Rd)  
 45 mph

SR 1003  
 (Buffalo Rd)  
 45 mph

PVA



Target Crashes

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

**TRAFFIC SAFETY UNIT**

Date: May 2011      Prepared By: bdr