

Spot Safety Project Evaluation

Order # 41000005116

Spot Safety Project # 07-02-226

Spot Safety Project Evaluation of the Guardrail Installation Bridge #58 on SR 1914 (Oregon Hill Road) Rockingham 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

04-20-2010

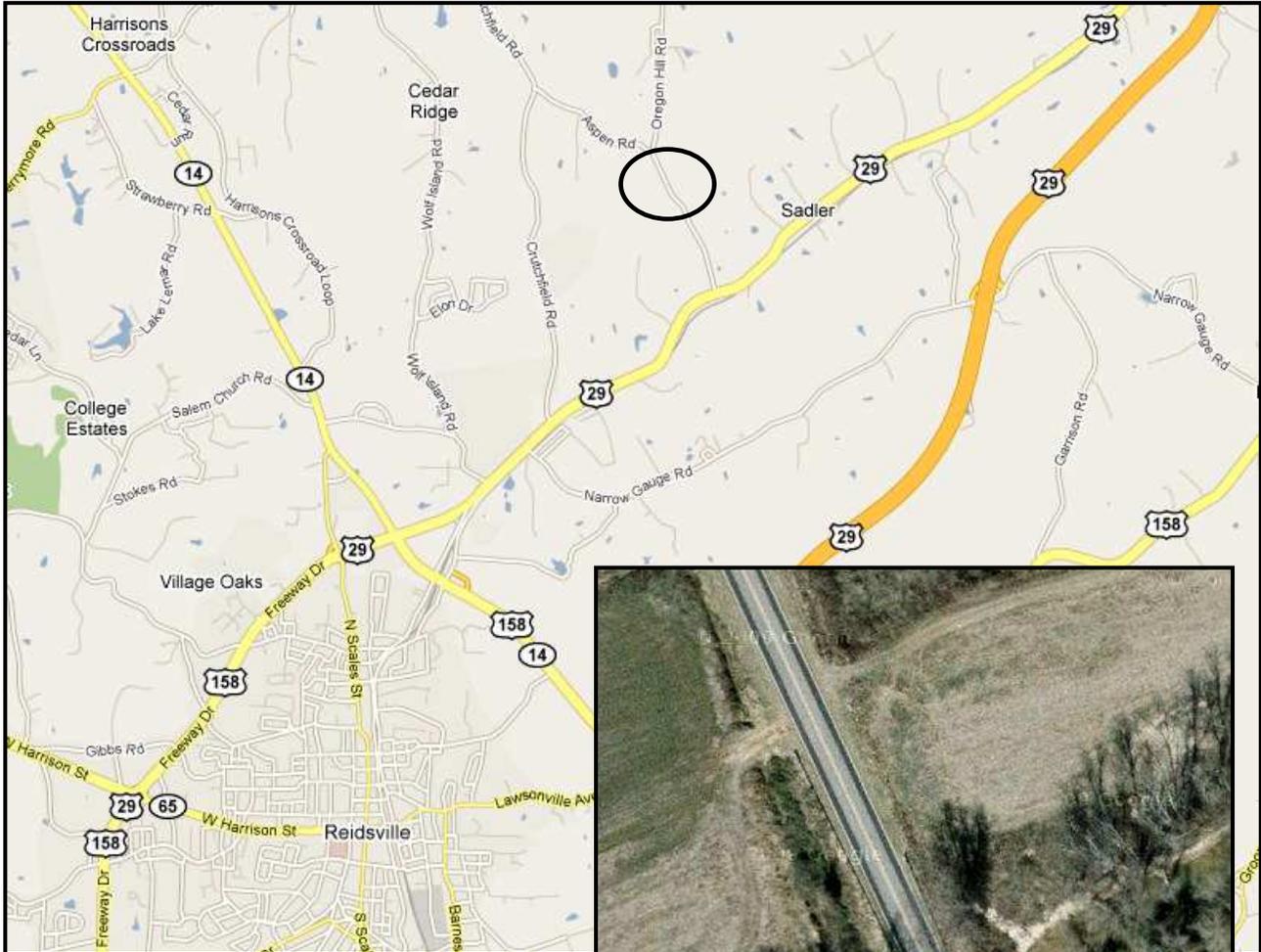
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 07-02-226 located on SR 1914 (Oregon Hill Road) at Bridge #58, approximately 0.2 mile south of SR 1940 (Aspen Road), in Rockingham County, near the City of Reidsville.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of guardrail on all four approaches to the bridge. SR 1914 (Oregon Hill Road) is a two-lane, two-way facility with a 55-mph speed limit. The subject bridge (bridge number 58) has concrete bridge rails and a bridge roadway width of 24 feet. Also, an embankment exists on all four quadrants at the bridge location.

The original statement of problem was the concern that the unprotected concrete bridge rails have the potential for causing severe injuries during ran-off road type collisions. This project is in response to a fatal collision at this location in January 1997.

The initial crash analysis was completed from January 1, 1997 to December 31, 1999 with one (1) reported crash, which was a fatality crash by striking the bridge rail. The final completion date for the improvement at the subject intersection was on December 30, 2004 with a total cost of \$53,000.

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 November 2004 through January 2005. The before period consisted of reported crashes from November 1, 1999 through October 31, 2004 (5 years); and the after period consisted of reported crashes from February 1, 2005 through January 31, 2010 (5 years). 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 250 feet of the subject bridge with a zero foot y-line. *Please see attached location map and aerial map for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Ran-Off Roadway crashes were the target crashes for the applied countermeasure of guardrail on the bridge approaches.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	2	1	- 50.0 %
Total Severity Index	4.70	1.00	- 78.7 %
Target Crashes	2	1	- 50.0 %
Target Crash Severity Index	4.70	1.00	- 78.7 %
Volume (2002, 2007)	2,000	1,600	- 20.0 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	0	N/A
Class B injury Crashes	0	0	N/A
Class C Injury Crashes	1	0	- 100.0 %
Total Injury Crashes	1	0	- 100.0 %

The naive before and after analysis at the treatment location resulted in a 50 percent decrease in Total Crashes, a 50 percent decrease in Target Crashes, and a 79 percent decrease in the Total Severity Index. The before period ADT year was 2002 and the after period ADT year was 2007.

Results and Discussion

From the project background information, we understand that a fatality crash in January 1997 provided the justification for this improvement. However, referencing the *Collision Diagrams*, the before period experienced two (2) ran-off roadway crashes within the study limits; although neither actually struck the bridge rail. One of these before period crashes occurred when the roadway was flooded by the subject creek. After the guardrail installation, the area surrounding the bridge saw one (1) ran-off roadway crash that impacted the guardrail from a vehicle that crossed the center line.

The calculated benefit to cost ratio for this project is **0.43 considering either total crashes or only target crashes**. 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.

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 - Total Crashes

LOCATION: Bridge 58 on SR 1914		BY: JBS						
COUNTY: Rockingham		DATE: 4/15/2010						
FILE NO.: SS 07-02-226		NOTES: Total Crashes						
DETAILED COST:	TYPE IMPROVEMENT - Guardrail on Bridge Approaches							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$53,000	10	0.149	\$7,899			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$53,000	10	0.149	\$7,899			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$400			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$8,299			
	TOTAL COST OF PROJECT=				\$53,000			
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	5.00	0	0.00	1	0.20	1	0.20	\$4,380
AFTER	5.00	0	0.00	0	0.00	1	0.20	\$780
						Annual Benefits from Crash Cost Savings		\$3,600
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$4,699)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	0.43		
TOTAL COST OF PROJECT		-	\$53,000	COMPREHENSIVE B/C RATIO		-	0.43	

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: Bridge 58 on SR 1914		BY: JBS						
COUNTY: Rockingham		DATE: 4/15/2010						
FILE NO.: SS 07-02-226		NOTES: Target Crashes - Ran-Off Roadway						
DETAILED COST:	TYPE IMPROVEMENT - Guardrail on Bridge Approaches							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$53,000	10	0.149	\$7,899			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$53,000	10	0.149	\$7,899			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$400			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$8,299			
	TOTAL COST OF PROJECT=				\$53,000			
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	5.00	0	0.00	1	0.20	1	0.20	\$4,380
AFTER	5.00	0	0.00	0	0.00	1	0.20	\$780
						Annual Benefits from Crash Cost Savings		\$3,600
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BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	0.43		
TOTAL COST OF PROJECT		-	\$53,000	COMPREHENSIVE B/C RATIO		-	0.43	

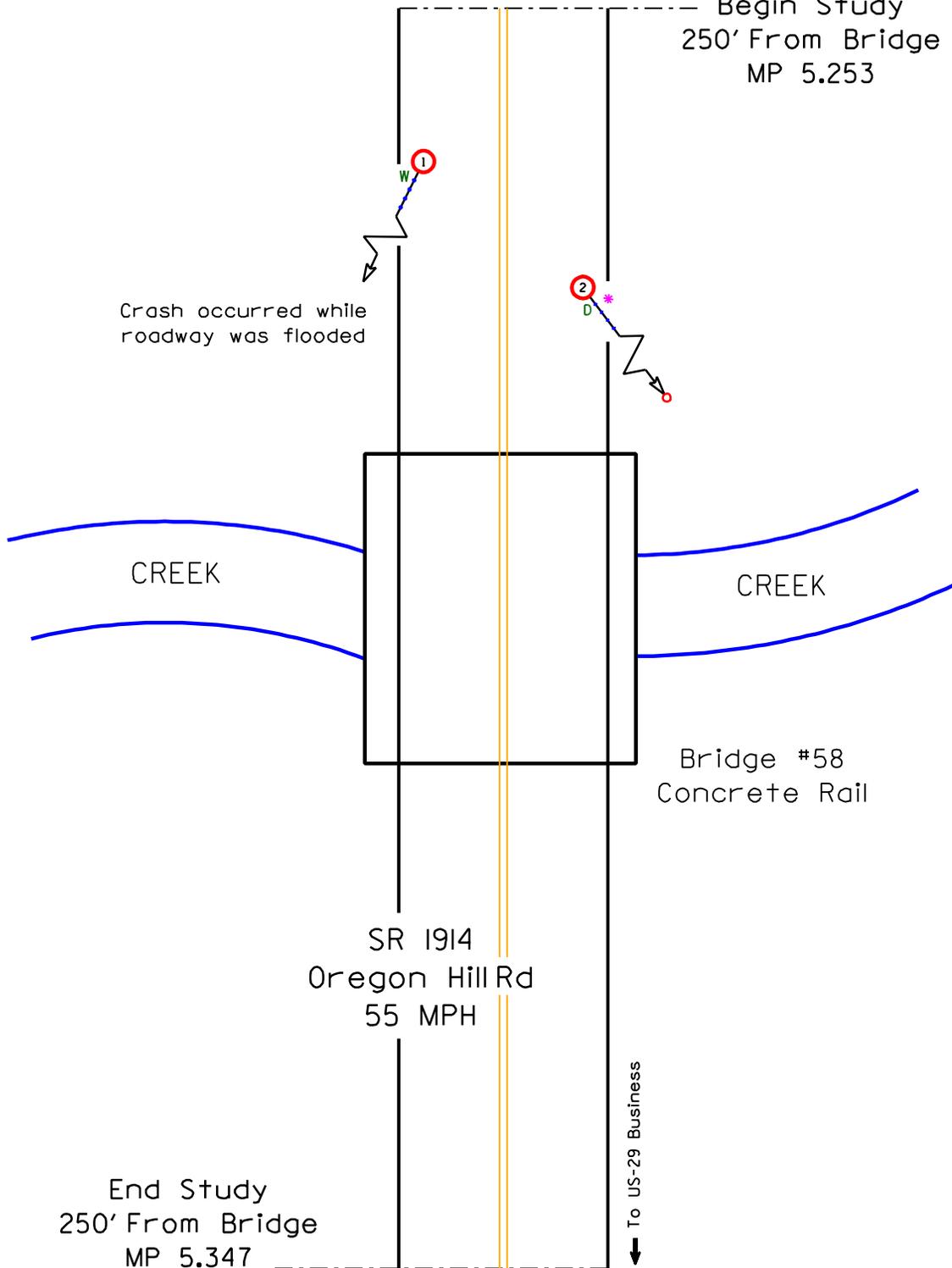
Begin Study
250' From Bridge
MP 5.253

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAM
	PAKED 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		HIT AND RUN		50 MPH TO 59		ICY OR SNOW
	REAR END		INJURY		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD		FATALITY		TO AND LP		ONLY

SS# 07-02-226
Rockingham County
BEFORE Period
11/1/99 - 10/31/04

Crash occurred while
roadway was flooded



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 7	AREA:
	STUDY PERIOD: 11/1/99 - 10/31/04	
	DISTANCE: Y-LINE + OFT	
	ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: M/A		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 4-14-2010		
LOG NUMBER: SS* 07-02-226 BEFORE		

Ran-Off Road
Target Crashes

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

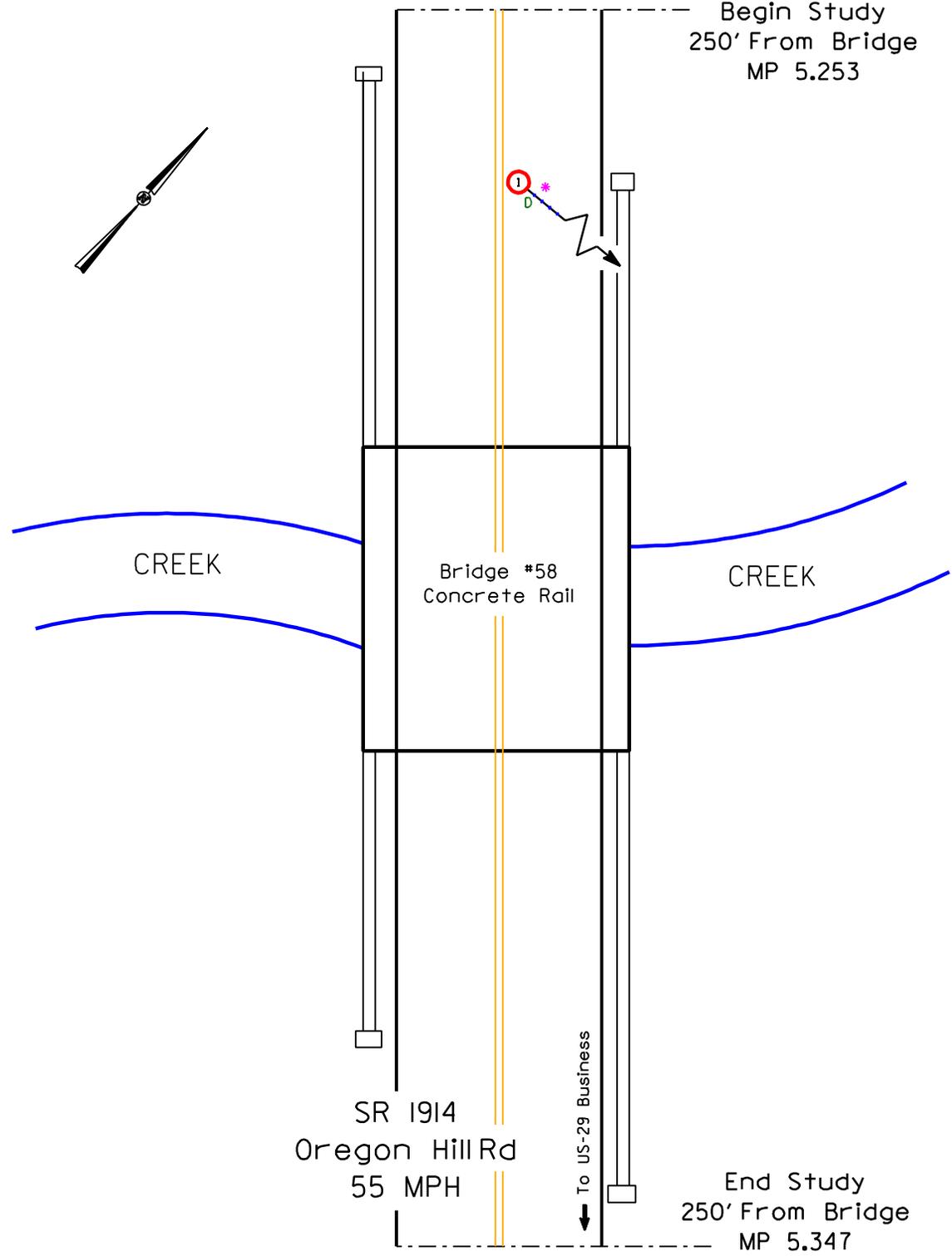
Begin Study
250' From Bridge
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LEGEND

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	PEDESTRIAN		TURNING		10 MPH TO 19		TRAM
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	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		RAN OFF ROAD		50 MPH TO 59		ICY OR SNOW
	REAR END		HURT		60 MPH TO 69		FATALITY
	RAN OFF ROAD		TO AND UP		SPEED UNKNOWN		ONLY

SS# 07-02-226
Rockingham County
AFTER Period
2/1/05 - 1/31/10

Countermeasure:
Install Guardrail on
Bridge Approaches



Ran-Off Road
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 7	AREA:
	STUDY PERIOD: 2/1/2005 - 1/31/2010	
	DISTANCE: Y-LINE + 0FT	
	ANALYSIS PREPARED BY: JBS	
	ANALYSIS CHECKED BY: N/A	
	DIAGRAM PREPARED BY: JBS	
	DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE		
DATE: 4-14-2010		
LOG NUMBER: SS* 07-02-226 AFTER		

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