

Spot Safety Project Evaluation

Order # 41000006456

Spot Safety Project # 07-02-227

**Spot Safety Project Evaluation of the Guardrail Installation at Bridge #121 on
SR 1136 (Bellemont-Mount Hermon Rd)
Alamance 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

6/17/2010

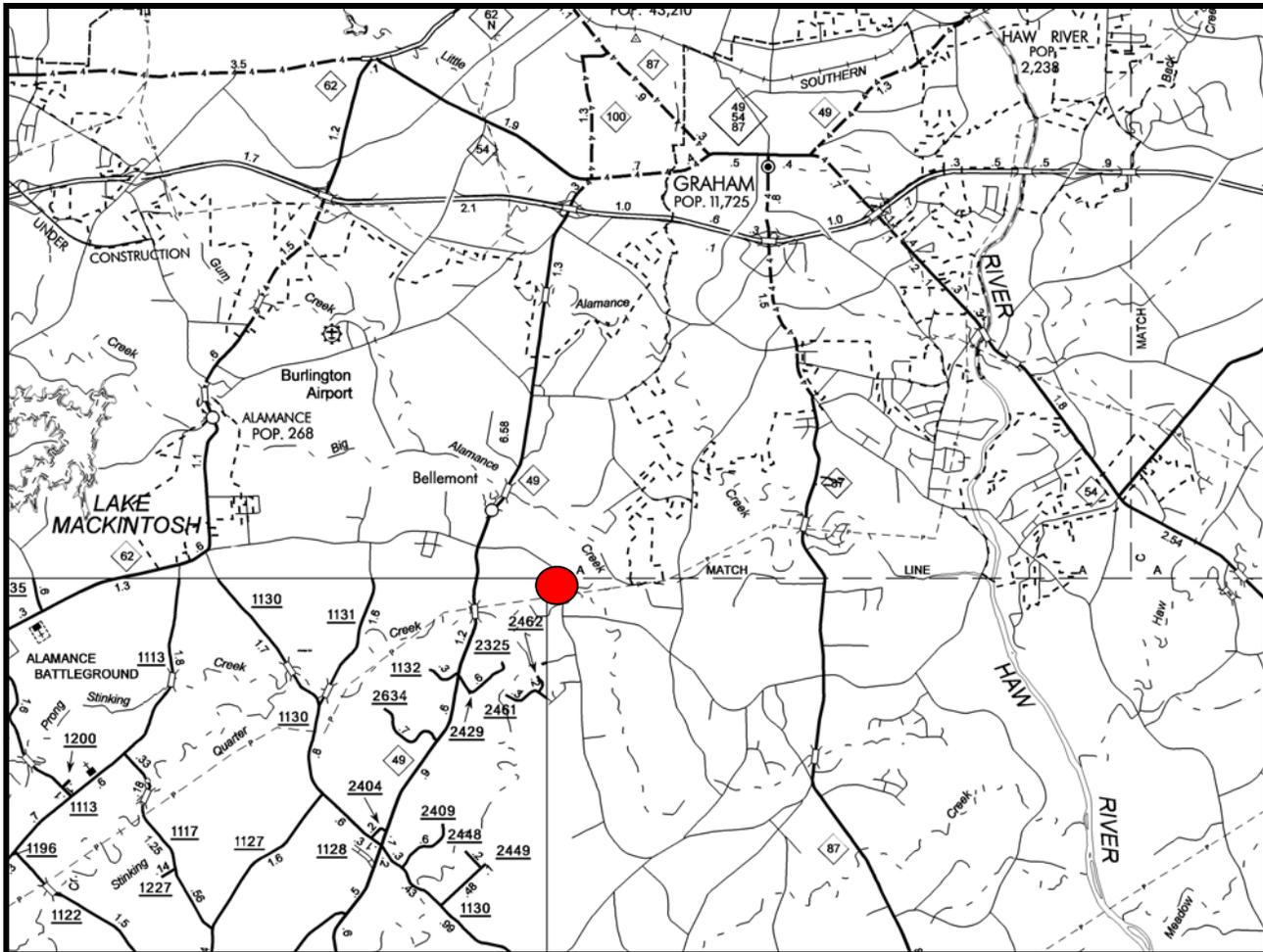
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 07-02-227 – Bridge #121 on SR 1136 (Bellemont-Mount Hermon Rd) in Alamance County.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was to install guardrail on all four approaches to the bridge. SR 1136 is a two-lane roadway with a speed limit of 45 mph in the vicinity of the bridge.

The original statement of problem was that the unprotected concrete bridge rails had potential for causing severe injuries in Ran Off Road type crashes.

The initial crash analysis was conducted at the subject location from February 1, 1999 to January 31, 2002 with a total of one reported crash. The crash was considered correctable by the chosen countermeasure and resulted in a fatality. The final completion date for the improvements was on March 1, 2005 with a total cost of \$53,000.00.

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 February 1, 2005 to March 31, 2005. The before period consisted of reported crashes from February 1, 2000 through January 31, 2005 (5 years) and the after period consisted of reported crashes from April 1, 2005 through March 31, 2010 (5 years). 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 on SR 1136 within 200 feet of Bridge #121. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Ran Off Road crash types were the target crashes for the applied countermeasures. Ran Off Road crash types considered are as follows: Ran Off Road – Left, Ran Off Road – Right, Ran Off Road – Straight, Fixed Object, Head-on, Sideswipe – Same Direction, Sideswipe – Opposite Direction, and Overturn / Rollover. 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	2	0	-100.0
Total Severity Index	38.9	0	-100.0
Target Crashes	2	0	-100.0
Target Crash Severity Index	38.9	0	-100.0
Volume	4,100	5,000	22.0
<u>Target Crash Severity Summary</u>			
Fatal Crashes	1	0	-100.0
Class A Crashes	0	0	N/A
Class B Crashes	0	0	N/A
Class C Crashes	0	0	N/A
PDO Crashes	1	0	-100.0

Results and Discussion

The naive before and after analysis at the treatment location resulted in 100 percent decrease in both Total Crashes and Target Crashes and a 22 percent increase in Average Daily Traffic (ADT). The before period ADT year was 2002 and the after period ADT year was 2007.

The calculated benefit to cost ratio for this project is 16.06 considering total crashes. The benefit to cost ratio considering only target crashes is also 16.06. 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.

Both of the before period crashes were also Target Crashes. The first crash occurred during wet road conditions and resulted in a fatality. The vehicle was traveling southbound on SR 1136, ran off the road to the right, and collided with the end of the bridge rail. The second crash occurred during icy road conditions. The vehicle was also traveling south, ran off the road to the left, and then went down an embankment and overturned. There were no reported crashes of any kind in the after period.

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 roadway.

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1136 at Bridge #121 BY: bdr
 COUNTY: Alamance DATE: 2/22/2007
 FILE NO.: SS 07-02-227 (Total B/C and Target Crash B/C the same)

DETAILED COST: TYPE IMPROVEMENT - Shoulder Guardrail

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$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 = \$0
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$7,899
 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	1	0.20	0	0.00	1	0.20	\$126,860
AFTER	5.00	0	0.00	0	0.00	0	0.00	\$0

Annual Benefits from Crash Cost Savings \$126,860

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$118,961

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 16.06

TOTAL COST OF PROJECT - \$53,000 COMPREHENSIVE B/C RATIO - 16.06

Treatment Site Photos from Google Street-View



Looking north on SR 1136 (Bellemont-Mount Hermon Rd)

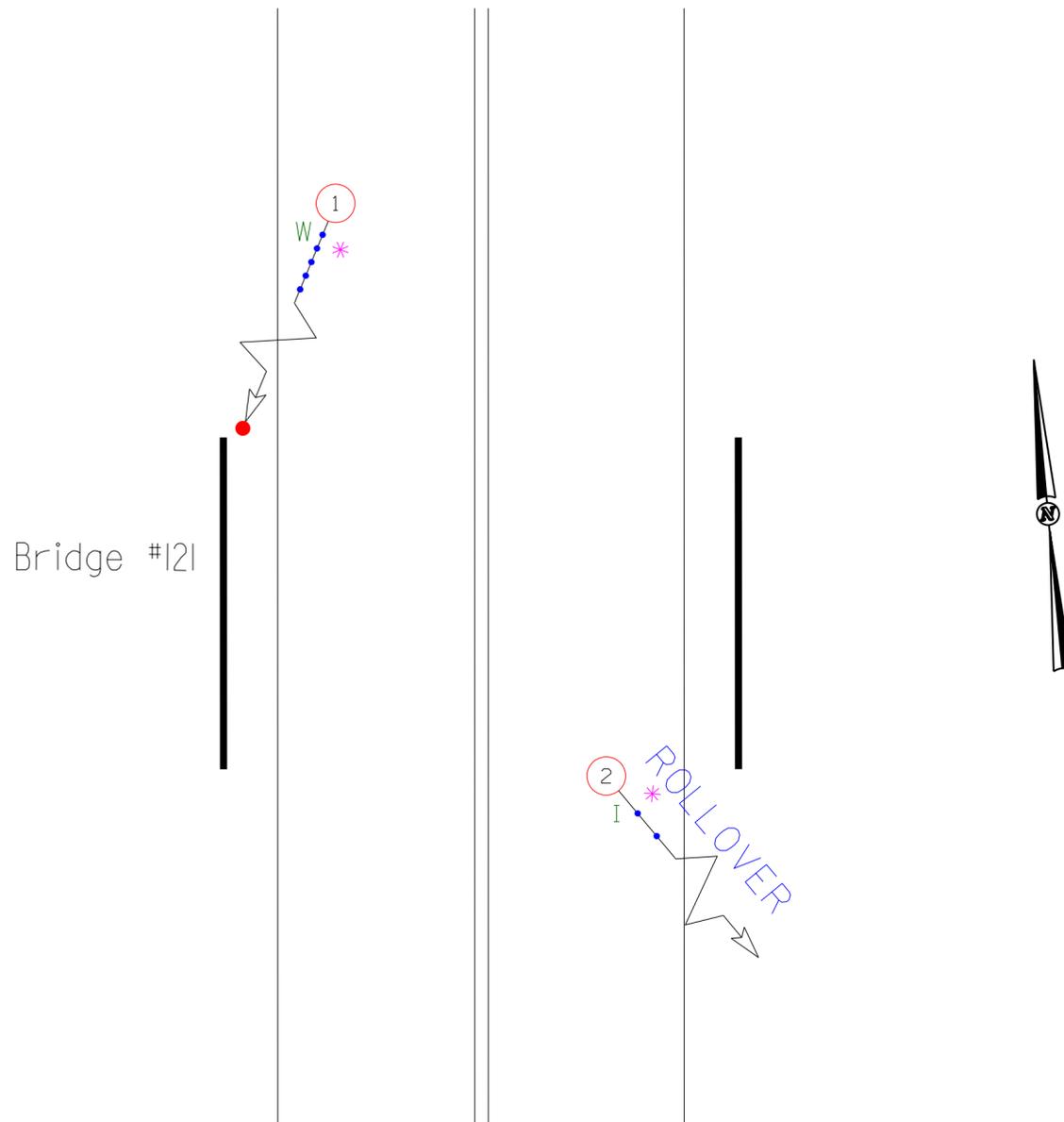


Looking south on SR 1136 (Bellemont-Mount Hermon Rd)

Alamance County
 SR 1136 at Bridge #121
 BEFORE Period
 2/1/2000-1/31/2005

SR 1136
 (Bellemont-Mount Hermon Rd)

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



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 7	AREA:
	STUDY PERIOD: 2/1/00-1/31/05	
	DISTANCE: Y-LINE = OFT	
	ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: BDR		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: June 2010		
ORDER NUMBER: 4000006456		

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

Alamance County
 SR 1136 at Bridge #121
 AFTER Period
 4/1/2005-3/31/2010

SR 1136
 (Bellemont-Mount Hermon Rd)

Guardrail

Guardrail

NO REPORTED CRASHES

Bridge #121

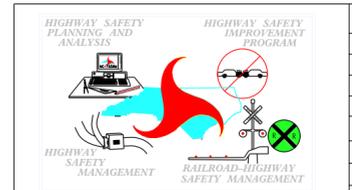


LEGEND

MOVING VEHICLE		ANGLE		9 MPH OR LESS	P PEDESTRIAN
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TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT



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DIVISION: 7	AREA:
STUDY PERIOD: 4/1/05-3/31/10	
DISTANCE: Y-LINE + OFT	
ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: BDR	
DIAGRAM REVIEWED BY:	
SCALE: NOT TO SCALE	
DATE: June 2010	
ORDER NUMBER: 4100006456	

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