

# Spot Safety Project Evaluation

Order # 41000012230

Spot Safety Project # 02-06-203

**Spot Safety Project Evaluation of the Installation of Polyurea Pavement Markings and Bridge Rail Delineators on US 17-70 (Trent River Bridges), US 17-NC 55 (Neuse River Bridges) and the Associated Ramp Bridges #s 83, 84, 85, 86, 87, 88, 89, and 231 Craven County**

Documents Prepared By:

Safety Evaluation Group  
Traffic Safety Systems Management Section  
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**Principal Investigator**



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8/12/2011

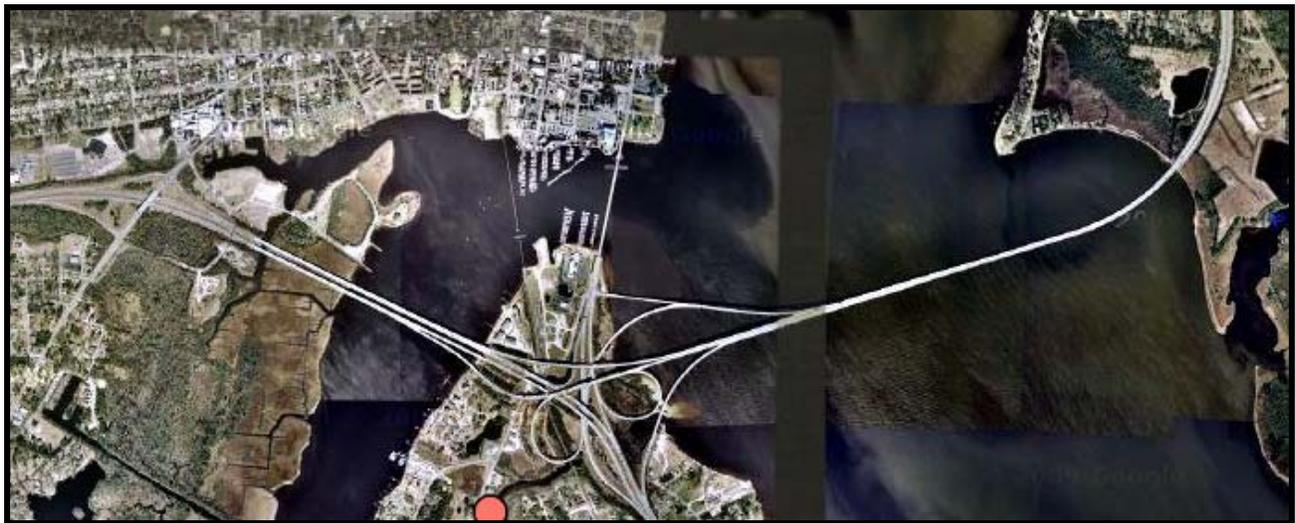
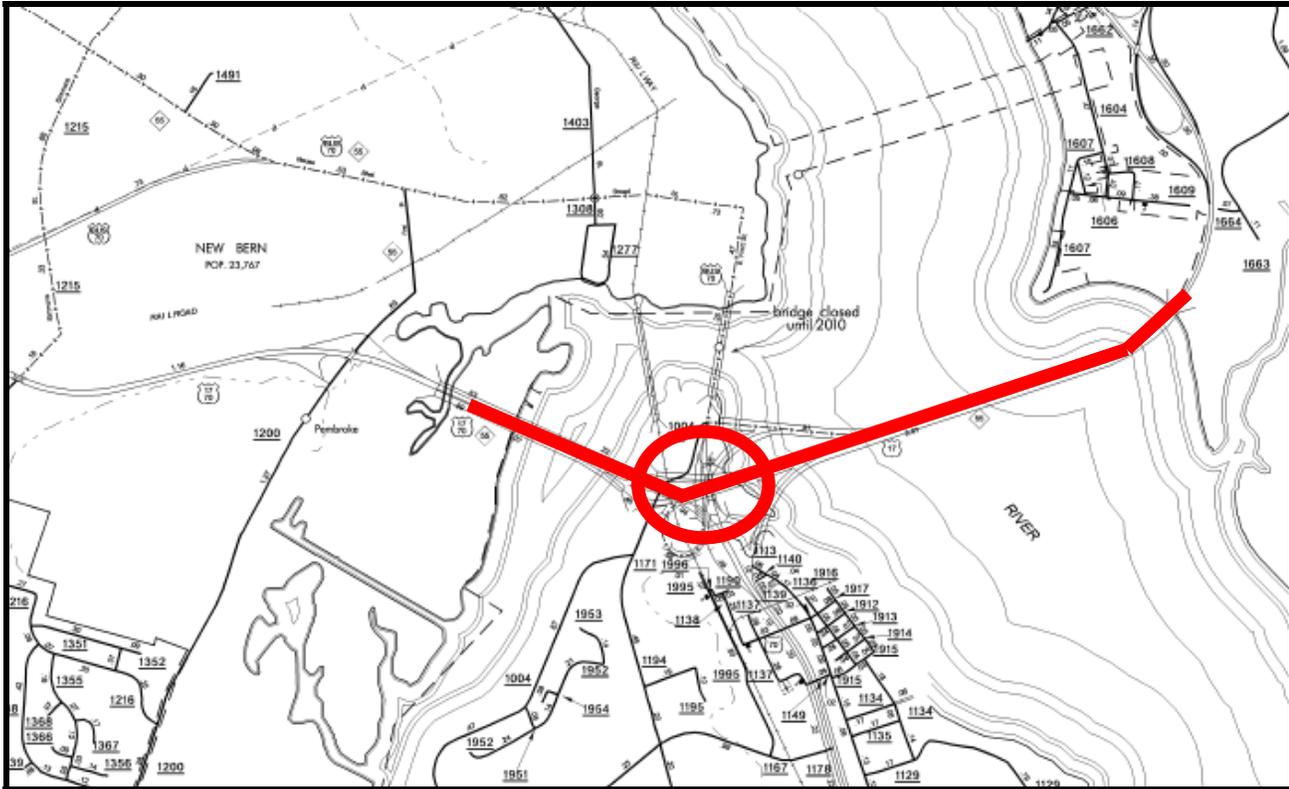
Date

Traffic Safety Project Engineer

# Spot Safety Project Evaluation Documentation

## Subject Location

Evaluation of Spot Safety Project Number 02-06-203 – US 17-70 (Trent River Bridges), US 17-NC 55 (Neuse River Bridges), and the associated ramp bridges #83, 84, 85, 86, 87, 88, 89, and 231 in Craven County.



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

The spot safety project improvement countermeasures chosen for the subject locations were to install polyuria pavement markings and bridge rail delineators.

US 17-70 over the Trent River is a 4-lane divided facility with parallel bridges. US 17-NC 55 is a multi-lane bridge over the Neuse River and has a concrete median divider. Both have speed limits of 55 mph.

The original statement of problem was that due to the alignment of the roadway and the associated bridges and ramps, coupled with the lateral restrictions created by guardrail and bridge rails at the location, there were a significant number of run-off road vehicles hitting guardrail and bridge rails.

The final completion date for the improvements was on December 3, 2007 with a total cost of \$153,600.00.

## **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 October 1, 2007 to December 31, 2007. The before period consisted of reported crashes from August 1, 2004 through September 30, 2007 (3 years, 2 months) and the after period consisted of reported crashes from January 1, 2008 through February 28, 2011 (3 years, 2 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 on US 17 starting at the US 17-70 bridge over the Trent River (approximately 1500 feet east of the SR 1200 overpass) to the end of the US 17-NC 55 bridge over the Neuse River (approximately 1 mile south of the NC 55 overpass). In addition, crashes on the associated ramps between US 17 and US 70 were included in the analysis.

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.

<b>Treatment Information</b>			
	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total Crashes	87	97	11.5
Total Severity Index	4.85	4.47	-7.8
Target Crashes	45	54	20.0
Target Crash Severity Index	3.63	2.78	-23.4
Volume	54,000	61,000	13.0
<b>Target Crash Severity Summary</b>			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	5	3	-40.0
Class C Crashes	11	10	-9.1
PDO Crashes	29	41	41.4

<b>Target Crash Details</b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-)/ Percent Increase (+)</b>
<b>Segment Crashes – Injuries</b>			
Fatal Injury Crashes	0	0	N/A
Non-Fatal Injury Crashes	16	13	-18.8
Property Damage Only Crashes	29	41	41.4
<b>Crashes - Contributing Factors</b>			
Night Crashes	11	16	45.5
Wet Road Crashes	13	16	23.1
Alcohol Related	2	2	0.0
<b>Lane Departure Crash Types</b>			
Fixed Object	28	39	39.3
Jackknife	0	1	N/A
Overturn / Rollover	2	2	0.0
Ran Off Road (Right & Left)	4	6	50.0
Sideswipe, Same Direction	11	6	-45.5

## Results and Discussion

The naive before and after analysis at the treatment location resulted in a 12 percent increase in Total Crashes, a 20 percent increase in Target Crashes, and a 13 percent increase in Average Daily Traffic (ADT). The before period ADT year was 2006 and the after period ADT year was 2009.

Target crashes occurring at night and in wet conditions also increased from the before to the after period.

A non-target fatal crash occurred in the after period. It involved pedestrians who had stopped their vehicles on the bridge in order to pick up debris off of the roadway. Another vehicle rear-ended the stopped vehicle, causing it to collide with the pedestrians.

The calculated benefit to cost ratio for this project is -1.88 considering total crashes. The benefit to cost ratio considering only target crashes is 0.03. 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 roadway.

**BENEFIT-COST ANALYSIS WORKSHEET - TOTAL**

LOCATION: US 17-70 and US 17-NC 55 bridges and ramps		BY: bdr						
COUNTY: Craven		DATE: 8/11/2011						
FILE NO.: SS 02-06-203								
DETAILED COST:	TYPE IMPROVEMENT -	Polyurea pavement markings and bridge rail delineators						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$0	0	0.000	\$0			
		\$153,600	2	0.561	\$86,134			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$153,600	2	0.561	\$86,134			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$0			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$86,134			
	TOTAL COST OF PROJECT=				\$153,600			
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	3.16	1	0.32	35	11.08	51	16.14	\$490,285
AFTER	3.16	2	0.63	25	7.91	70	22.15	\$652,215
							Annual Benefits from Crash Cost Savings	(\$161,930)
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST							(\$248,065)
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST							-1.88
	TOTAL COST OF PROJECT	-	\$153,600		COMPREHENSIVE B/C RATIO	-		-1.88

**BENEFIT-COST ANALYSIS WORKSHEET - TARGET**

LOCATION: US 17-70 and US 17-NC 55 bridges and ramps		BY: bdr						
COUNTY: Craven		DATE: 8/11/2011						
FILE NO.: SS 02-06-203								
DETAILED COST:	TYPE IMPROVEMENT -	Polyurea pavement markings and bridge rail delineators						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$0	0	0.000	\$0			
		\$153,600	2	0.561	\$86,134			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$153,600	2	0.561	\$86,134			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$0			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$86,134			
	TOTAL COST OF PROJECT=				\$153,600			
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	3.16	0	0.00	16	5.06	29	9.18	\$140,728
AFTER	3.16	0	0.00	13	4.11	41	12.97	\$138,070
							Annual Benefits from Crash Cost Savings	\$2,658
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST							(\$83,476)
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST							0.03
	TOTAL COST OF PROJECT	-	\$153,600		COMPREHENSIVE B/C RATIO	-		0.03

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



**On US 70 ramp to US 17 North/NC 55 East**



**On US 17 North/NC 55 East over Neuse River**