

Spot Safety Project Evaluation

Order # 41000014267

Spot Safety Project # 06-04-219

**Spot Safety Project Evaluation of the Bridge Guardrail Installation
Bridge #6 on SR 1723 (Parkton-Tobermory Rd) / SR 2251 (Yarborough Rd)
Robeson / Cumberland County Line**

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

12-1-2011

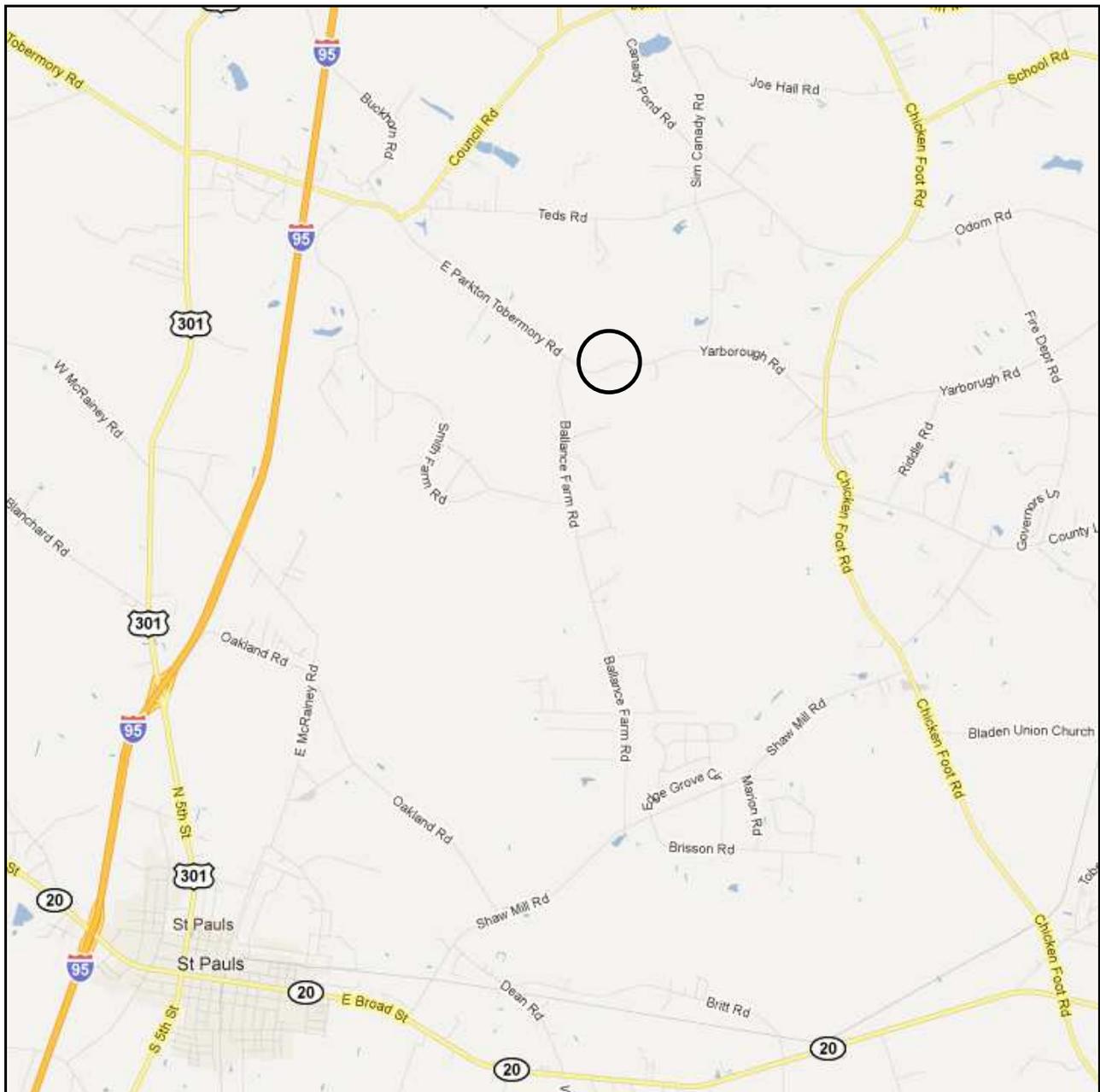
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 06-04-219 located along the routes of SR 1723 (Parkton-Tobermory Road) in Robeson County and SR 2251 (Yarborough Road) in Cumberland County, north of the Town of Saint Pauls. The location is Bridge #6 of Robeson County and constitutes the county line boundary.





Aerial Map provided from Google Maps

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of bridge guardrail on both approaches to Bridge #6. SR 1723 (Parkton-Tobermory Road) which turns into SR 2251 (Yarborough Road) is a two-lane rural roadway with no paved shoulders and a 55-mph speed limit.

The original statement of problem highlighted a small pattern of vehicles striking the bridge or vehicles running off the roadway and proceeding down the embankment. This project resulted from a fatal crash investigation.

The initial crash analysis was completed from September 1, 1999 to August 31, 2004 with two (2) run-off roadway crashes including one fatality collision. The final completion date for the improvement at the subject location was on August 28, 2007 with a total cost of \$16,000.

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 were the months of July through August 2007. The before period consisted of reported crashes from September 1, 2003 through June 30, 2007 (3 years and 10 months); and the after period consisted of reported crashes from September 1, 2007 through June 30, 2011 (3 years and 10 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 from 0.1 mile east of the bridge in Cumberland County to 0.2 mile west of the bridge in Robeson County with a zero (0) foot y-line. *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 segment. Please note that Lane Departure Crashes were the target crashes for the applied countermeasure. The Lane Departure Crash types considered are as follows: Ran-off Roadway (Left, Right, Straight), Fixed Object, Overturn/Roller, Sideswipe (Opposite Direction), and Head-On.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	4	3	- 25.0 %
Total Severity Index	23.65	5.93	- 74.9 %
Target Crashes – Lane Departure	3	3	0.0 %
Target Crash Severity Index	28.73	5.93	- 79.4 %
Volume (2005, 2009)	1,300	1,100	- 15.4 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	1	0	- 100.0 %
Class A injury Crashes	0	0	0.0 %
Class B injury Crashes	0	2	100.0 %
Class C Injury Crashes	2	0	- 100.0 %
Total Injury Crashes	3	2	- 33.3 %

The naive before and after analysis at the treatment location resulted in a 25 percent decrease in Total Crashes, no change in Target Crashes, but a 75 percent decrease in the Total Severity Index. The before period ADT year was 2005 and the after period ADT year was 2009.

Results and Discussion

Referencing the *Collision Diagrams*, the before period presented a pattern of three (3) lane departure collisions including one fatality crash that overturned into the creek, one vehicle striking the bridge rail, and one motorist traveling above 80-mph who was unable to maintain lane control. After the guardrail was added, there were still three (3) ran-off road collisions but a 75 percent reduction in severity. The after period had one vehicle that struck the guardrail in Cumberland County and two others that crashed in the adjacent curves.

The calculated benefit to cost ratio for this project is **59.07 considering total crashes**. The benefit to cost ratio **considering only target crashes is 57.20**. 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 from our Field Visit on September 14th, 2011 for both approaches to the treatment bridge. 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 countermeasure.

Treatment Site Photos – Field Visit 9-14-2011



Travelling East on SR 1723 in Robeson County



Travelling West on SR 2251 in Cumberland County

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

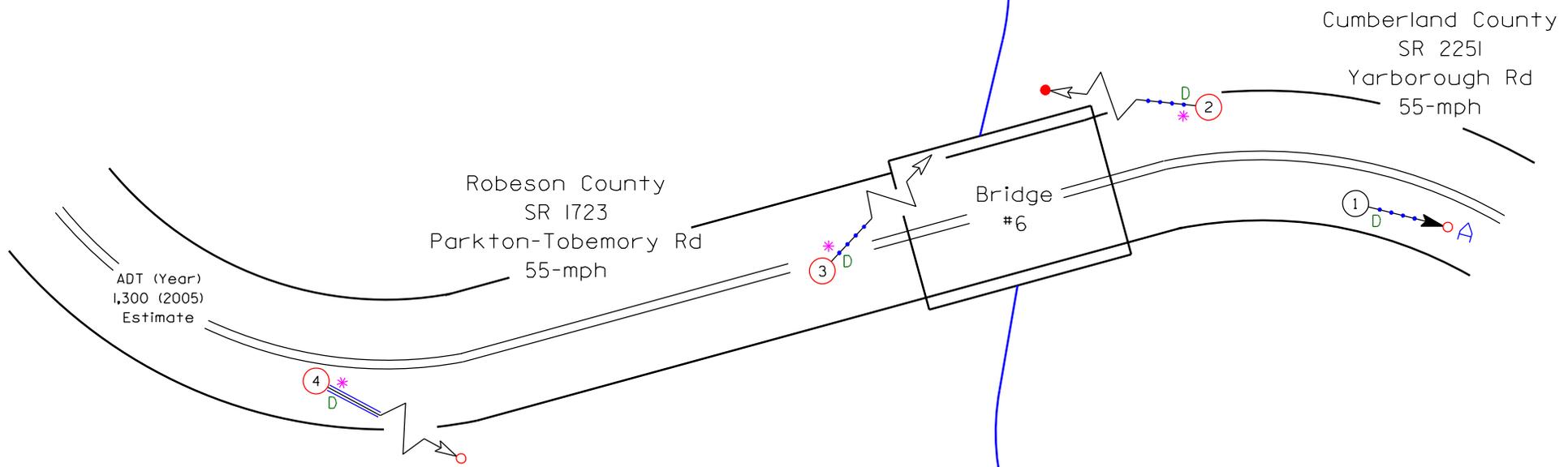
LOCATION: Bridge #6		BY: JBS							
COUNTY: Robeson / Cumberland		DATE: 12/1/2011							
FILE NO.: SS 06-04-219									
DETAILED COST:	TYPE IMPROVEMENT - Bridge Guardrail								
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
	Construction	\$16,000	10	0.149	\$2,384				
		\$0	0	0.000	\$0				
	Right-of-Way	\$0	0	0.000	\$0				
	TOTALS	\$16,000	10	0.149	\$2,384				
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$400				
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0				
	TOTAL ANNUAL COST=				\$2,784				
	TOTAL COST OF PROJECT=				\$16,000				
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	3.83	1	0.26	2	0.52	1	0.26	\$176,057	
AFTER	3.83	0	0.00	2	0.52	1	0.26	\$11,567	
								Annual Benefits from Crash Cost Savings	\$164,491
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$161,706			
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	59.07			
TOTAL COST OF PROJECT		-	\$16,000	COMPREHENSIVE B/C RATIO		-	59.07		

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: Bridge #6		BY: JBS							
COUNTY: Robeson / Cumberland		DATE: 12/1/2011							
FILE NO.: SS 06-04-219		Lane Departure - Target Crashes							
DETAILED COST:	TYPE IMPROVEMENT - Bridge Guardrail								
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
	Construction	\$16,000	10	0.149	\$2,384				
		\$0	0	0.000	\$0				
	Right-of-Way	\$0	0	0.000	\$0				
	TOTALS	\$16,000	10	0.149	\$2,384				
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$400				
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0				
	TOTAL ANNUAL COST=				\$2,784				
	TOTAL COST OF PROJECT=				\$16,000				
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	3.83	1	0.26	1	0.26	1	0.26	\$170,836	
AFTER	3.83	0	0.00	2	0.52	1	0.26	\$11,567	
								Annual Benefits from Crash Cost Savings	\$159,269
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$156,484			
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	57.20			
TOTAL COST OF PROJECT		-	\$16,000	COMPREHENSIVE B/C RATIO		-	57.20		

SS# 06-04-219
 Order# 41000014267
 Robeson/Cumberland Counties
 BEFORE Period
 9/1/03 - 6/30/07

LEGEND							
	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PAKING VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	FIXED OBJECT		SIDESWIPE		40 MPH TO 49		DRY
	HEAD ON		OUT OF CONTROL		50 MPH TO 59		WET
	REAR END		NARROW		60 MPH TO 69		ICY OR SNOWY
	RAN OFF ROAD		HURRY		TO AND UP		SPEED UNKNOWN
			FATALITY		SPEED UNKNOWN		ONLY



Study Limits:
 0.2 Mile from Bridge in Robeson County
 0.1 Mile from Bridge in Cumberland County

Lane Departure
Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 12-1-2011 Prepared By: J. Schronce

SS# 06-04-219
 Order# 41000014267
 Robeson/Cumberland Counties
 AFTER Period
 9/1/07 - 6/30/11

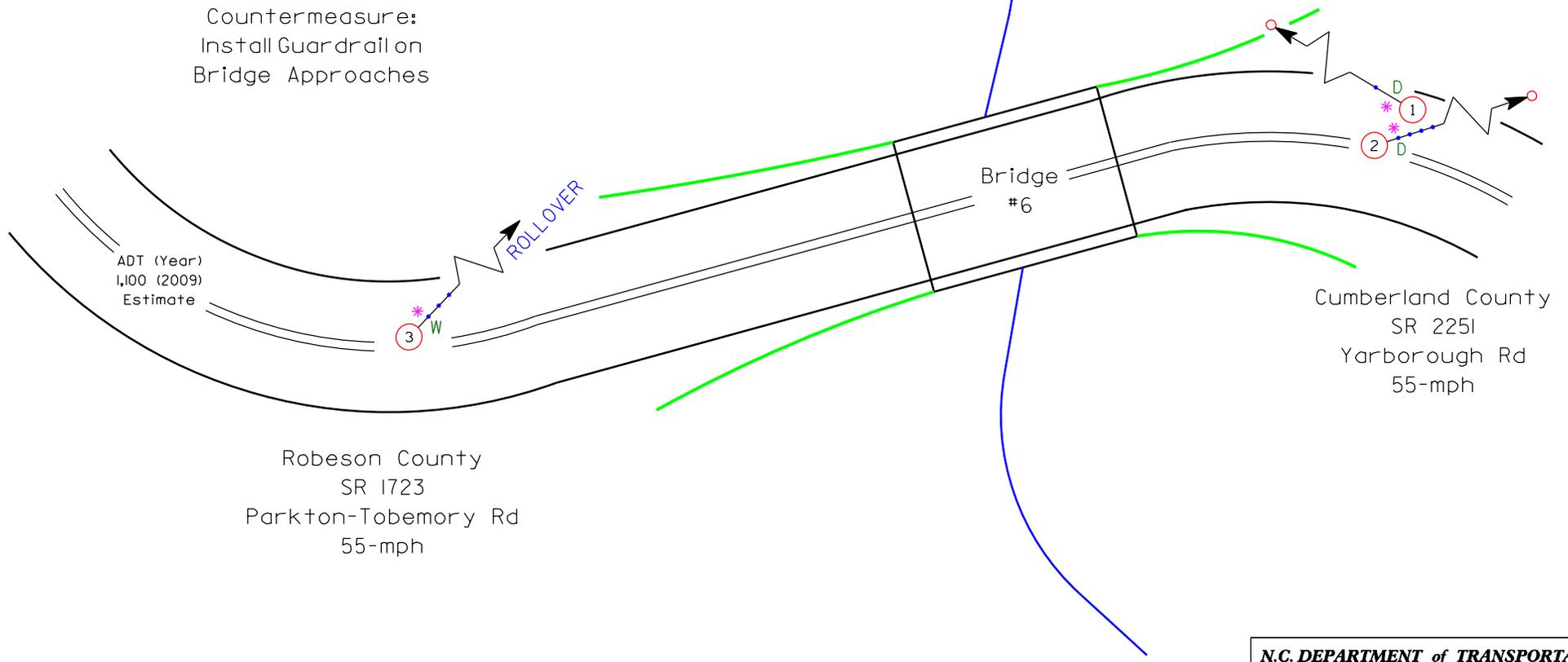
LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PAKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PAKED VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		RAN OFF ROAD		50 MPH TO 59		ICY OR SNOWY
	REAR END		RAN OFF ROAD		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD		RAN OFF ROAD		TO AND UP		ONLY
	RAN OFF ROAD		RAN OFF ROAD		RAN OFF ROAD		RAN OFF ROAD



Study Limits:
 0.2 Mile from Bridge in Robeson County
 0.1 Mile from Bridge in Cumberland County

Countermeasure:
 Install Guardrail on
 Bridge Approaches



ADT (Year)
 1,100 (2009)
 Estimate

Robeson County
 SR 1723
 Parkton-Tobemory Rd
 55-mph

Cumberland County
 SR 2251
 Yarborough Rd
 55-mph

Lane Departure
 Target Crashes

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DIVISION of HIGHWAYS
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TRAFFIC SAFETY UNIT

Date: 12-1-2011 Prepared By: J. Schronce