

Spot Safety Project Evaluation

Order # 41000004815

Spot Safety Project # 07-03-207

**Spot Safety Project Evaluation of the Ramp Radius Improvements
SR 1239 (US-70 Connector) at I-40/I-85 Westbound Ramp Terminal
Orange 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

4-26-2010

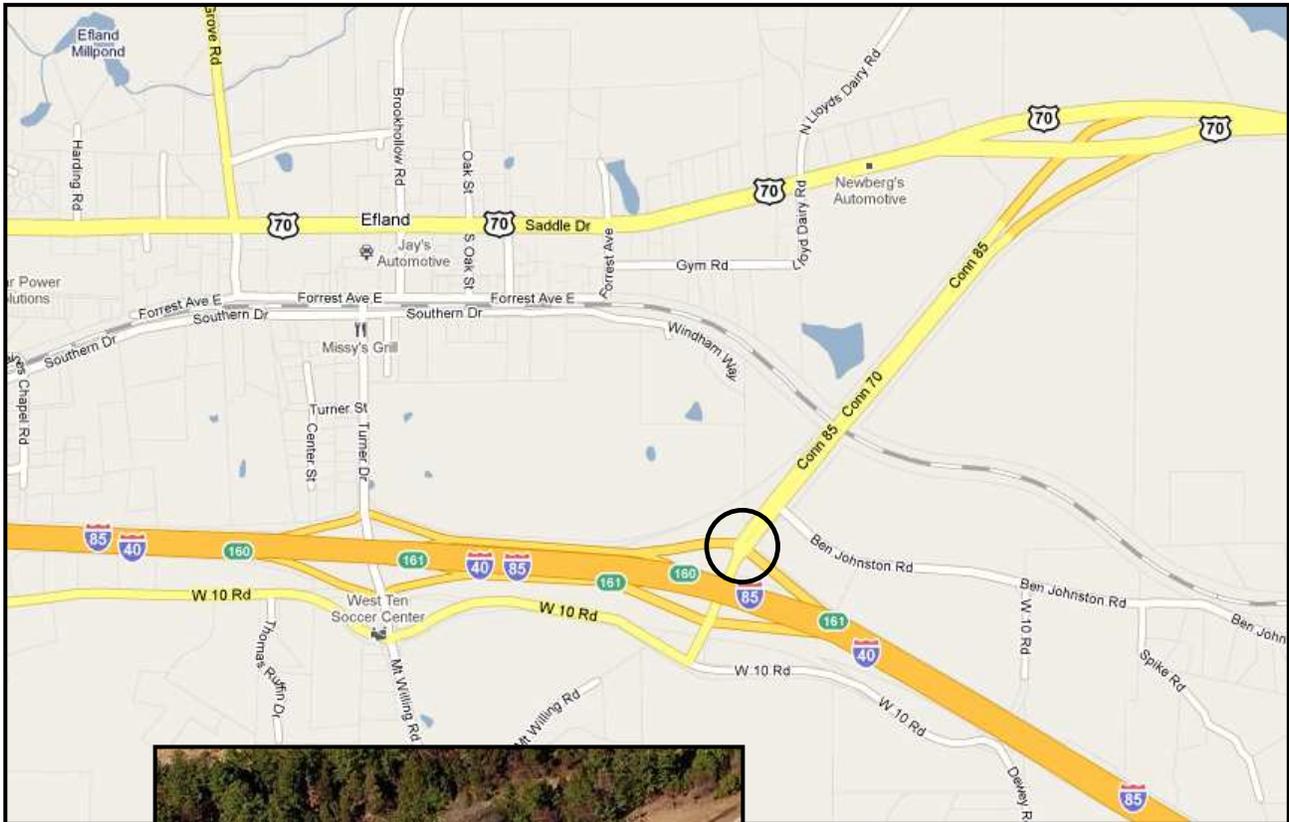
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 07-03-207 located at the Intersection of SR 1239 (US-70 Connector) at the I-40/I-85 Westbound Ramp Terminal (Exit 161) in Orange County, near the Town of Efland.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the improvement of the turning radius accessing the westbound on-ramp at Exit 161. The SR 1239 southbound approach to the westbound ramp terminal intersection has two lanes that split into a through lane and a free-flow right turn lane; and are separated by a concrete median. Both the on-ramp and off-ramp of I-40/I-85 Exit 161 are single lane approaches that widen at the intersection for two-way movement separation. SR 1239 (US-70 Connector) is an access highway linking the interstate to US 70 in the Town of Efland with a speed limit of 45 mph.

The original statement of problem stated that tractor-trailer trucks were rolling over upon entering the westbound on-ramp to I-40/I-85. The intended purpose of this improvement was to alleviate this current crash pattern.

The initial crash analysis was completed from March 1, 1998 to February 28, 2003 with four (4) reported truck rollover crashes, all of which were deemed correctable. The final completion date for the improvement at the subject intersection was on December 31, 2004 with a total cost of \$73,000.

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 November through December 2004. 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 January 1, 2005 through December 31, 2009 (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 150 feet of the subject intersection. *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 location. Please note that Ran-Off Roadway / Rollover Crashes at the On-Ramp were the target crashes for the applied countermeasure.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	4	0	- 100.0 %
Total Severity Index	6.55	0.00	- 100.0 %
Target Crashes	4	0	- 100.0 %
Target Crash Severity Index	6.55	0.00	- 100.0 %
Volume (2002, 2007)	3,300	3,800	15.2 %

<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	1	0	- 100.0 %
Class C Injury Crashes	2	0	- 100.0 %
Total Injury Crashes	3	0	- 100.0 %

The naive before and after analysis at the treatment location resulted in a 100 percent decrease in both the Total and Target Crashes; and also a 100 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

Referencing the *Collision Diagrams*, the before period presented the initial pattern of four (4) tractor-trailer trucks rolling-over as they entered the on-ramp at Exit 161 traveling southbound on SR 1239. Three (3) of these collisions resulted in minor injuries and there were no other crashes at this intersection in the before period. After the ramp radius was improved there were zero (0) crashes at this location. The improvement successfully eliminated the crash issue.

The calculated benefit to cost ratio for this project is **1.56 considering total or target only 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.

Please see the attached *Treatment Site Photos*. Photos are provided from Google Street View for the ramp terminal showing the turning radius improvement. 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.

TREATMENT SITE PHOTOS



Looking South on SR 1239 (US-70 Connector) at the WB Ramp Terminal Ramp Radius Improvements made around Yield Sign



Traveling North on SR 1239 (US-70 Connector) approaching WB Ramps

BENEFIT-COST ANALYSIS WORKSHEET - Total & Target Crashes

LOCATION: SR 1239 at I-40/85 WB Ramp
 COUNTY: Orange
 FILE NO.: SS 07-03-207

BY: JBS
 DATE: 4/22/2010
 NOTES: Total & Target Crashes

DETAILED COST: TYPE IMPROVEMENT - Improve Turning Radius onto Ramp

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$73,000	20	0.102	\$7,435
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$73,000	20	0.102	\$7,435

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$0
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$7,435
 TOTAL COST OF PROJECT= \$73,000

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	3	0.60	1	0.20	\$11,580
AFTER	5.00	0	0.00	0	0.00	0	0.00	\$0

Annual Benefits from Crash Cost Savings \$11,580

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$4,145
 BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 1.56

TOTAL COST OF PROJECT - \$73,000 COMPREHENSIVE B/C RATIO - 1.56

LEGEND

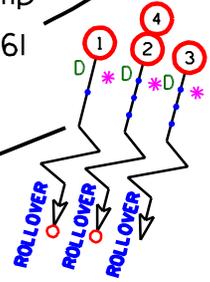
	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAM
	PAKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PARKING VEHICLE		SHOULDER		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		TO AND UP		50 MPH TO 59		ICY OR SNOW
	REAR END		INJURY		60 MPH TO 69		FATALITY
	RAN OFF ROAD		SPEED UNKNOWN		70 MPH TO 79		ONLY

SR 1239
US-70 Connector
45 MPH

Grass Median

SS# 07-03-207
Orange County
BEFORE Period
11/1/99 - 10/31/04
5.0 Years

I-40/I-85 WB
On-Ramp
Exit 161



All 4 Crashes Involved
Tractor-Trailers

I-40/I-85 WB
Off-Ramp
Exit 161

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT



COLLISION DIAGRAM	
DIVISION: 7	AREA:
STUDY PERIOD: 11/1/99 - 10/31/04	
DISTANCE: Y-LINE + 150 FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: M/A	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 4-22-2008	
LOG NUMBER: SS# 07-03-207 BEFORE	

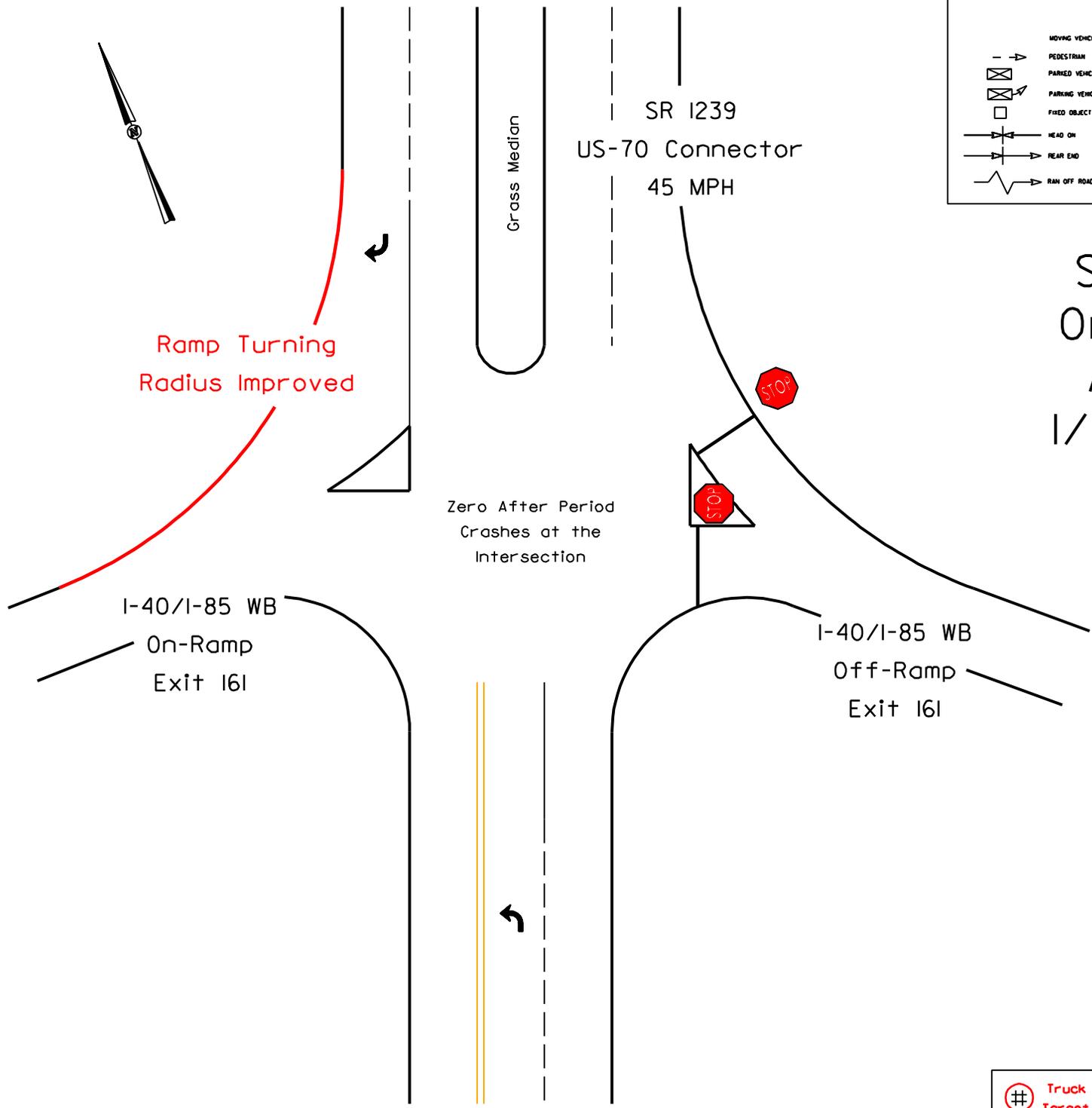
Truck Rollover
Target Crashes

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

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
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	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		INJURY		50 MPH TO 59		ICY OR SNOW
	REAR END		FATALITY		TO AND UP		SPEED UNKNOWN
	RAN OFF ROAD				0		0

SS# 07-03-207
 Orange County
 AFTER Period
 1/1/05 - 12/31/09
 5.0 Years



Zero After Period
 Crashes at the
 Intersection

Truck Rollover
 Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 7	AREA:
	STUDY PERIOD: 1/1/2005 - 12/31/2009	
	DISTANCE: Y-LINE + 150 FT	
	ANALYSIS PREPARED BY: JBS	
	ANALYSIS CHECKED BY: N/A	
	DIAGRAM PREPARED BY: JBS	
	DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE		
DATE: 4-22-2010		
LOG NUMBER: SS* 07-03-207 AFTER		

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