

Spot Safety Project Evaluation

Order # 41000004704

Spot Safety Project # 07-01-220

Spot Safety Project Evaluation of the Left Turn Lane Installation US 220 / NC 150 and SR 2444 (Joseph Hoskins Road) Guilford 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

2-24-2010

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 07-01-220 located at the Intersection of US 220 / NC 150 and SR 2444 (Joseph Hoskins Rd) in Guilford County, Town of Summerfield.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of a US 220 southbound left turn lane. US 220 / NC 150 is a two lane high volume roadway with a speed limit of 55 mph. SR 2444 is a two-way residential roadway with a landscaped median and a posted speed limit of 35 mph. The subject location is a three-leg intersection, which is controlled by a stop sign on SR 2444 (Joseph Hoskins Rd).

The original statement of problem was that the single lane southbound approach of US 220 causes vehicles to queue which has led to a pattern of rear-end, ran-off road, and left turn collisions. The desired result of the left turn lane installation is to alleviate the current crash problem.

The initial crash analysis was completed from August 1, 1998 to July 31, 2001 with eight (8) reported crashes, six (6) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on August 31, 2004 with a total cost of \$100,000.

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 August through September 2004. The before period consisted of reported crashes from May 1, 1999 through July 31, 2004 (5 years and 3 months); and the after period consisted of reported crashes from October 1, 2004 through December 31, 2009 (5 years and 3 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 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 Southbound US 220 Left Turn Related Crashes were the target crashes for the applied countermeasure. The left turn related crash types considered are as follows: Rear-End, Turn; Rear-End, Slow or Stop; Ran-Off Roadway (Avoidance); and Left Turn, Same Road (Illegal Passing Maneuver).

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	8	5	- 37.5 %
Total Severity Index	1.93	2.48	28.5 %
Target Crashes	5	0	- 100.0 %
Target Crash Severity Index	2.48	0.00	- 100.0 %
Volume	19,000	16,500	- 13.2 %

<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	0	1	100.0 %
Class C Injury Crashes	1	0	- 100.0 %
Total Injury Crashes	1	1	0.0 %

The naive before and after analysis at the treatment location resulted in a 38 percent decrease in Total Crashes, complete elimination of Target Crashes, but a 29 percent increase in the Total Severity Index. The before period ADT year was 2001 and the after period ADT year was 2007.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 38 percent decrease in Total Crashes and a 100 percent decrease in Target Crashes. The summary results above demonstrate that both Total and Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the before period southbound US 220 left turn crash pattern at the intersection consisted of five (5) collisions, including one rear-end turning vehicle, two rear-end collisions in the queue, one avoidance, and one illegal passing crash. After the left turn lane installation, this pattern was completely eliminated. The after period collision diagram shows a random collection of crashes without any set patterns. The countermeasure successfully achieved the goal of alleviating the crashes from the high volume roadway.

The calculated benefit to cost ratio for this project is **0.21 considering total crashes**. The benefit to cost ratio **considering only target crashes is 0.60**. 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 three approaches to the treatment intersection. 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



Traveling South on US 220 / NC 150



Traveling South on US 220 / NC 150 at intersection



Looking North on US 220 / NC 150



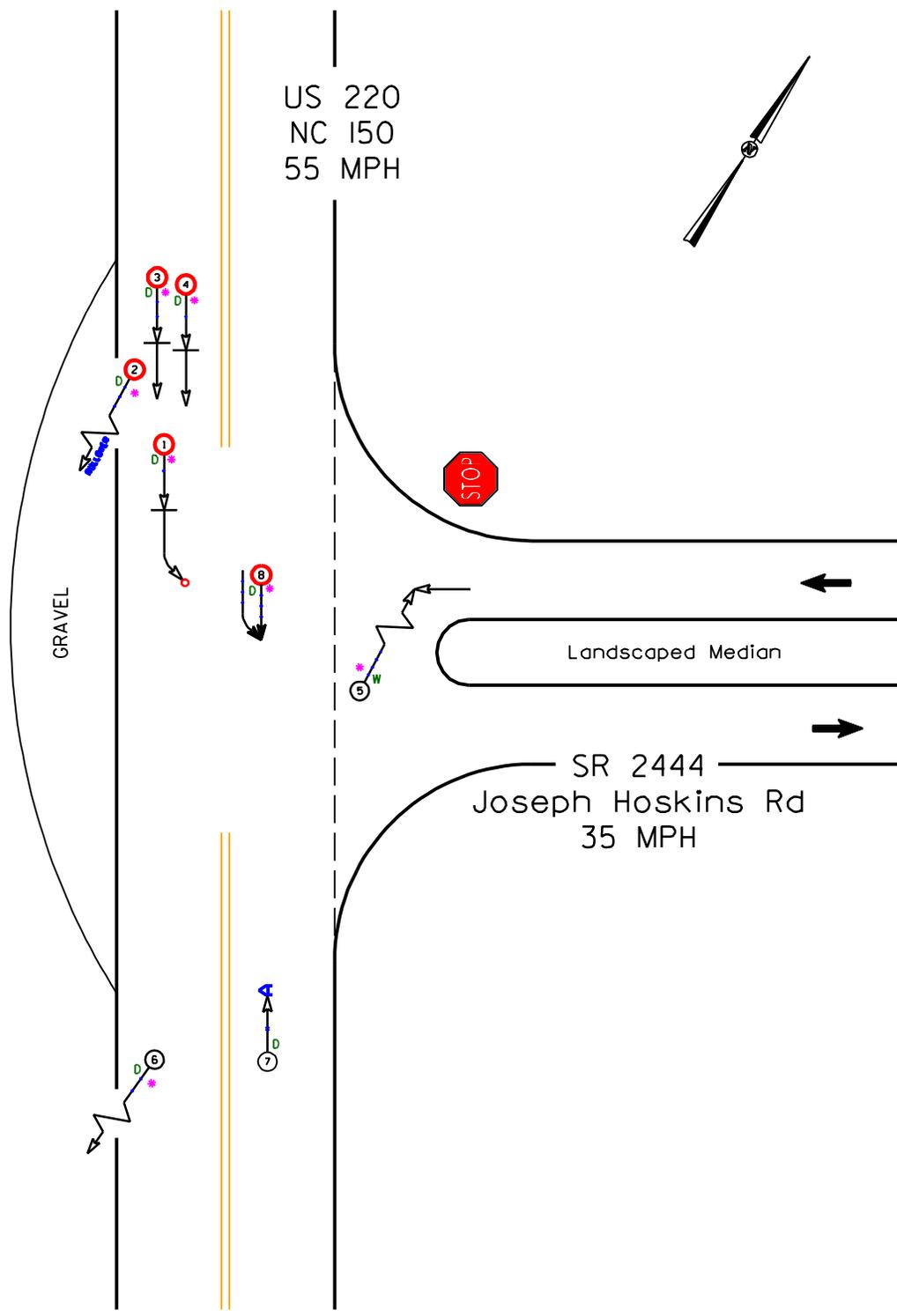
Traveling West on SR 2444 (Joseph Hoskins Road)

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: US 220 at SR 2444		BY: JBS						
COUNTY: Guilford		DATE: 2/24/2010						
FILE NO.: SS 07-01-220		NOTES: Total Crashes						
DETAILED COST:	TYPE IMPROVEMENT -	Southbound Left Turn Lane						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$100,000	20	0.102	\$10,185			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$100,000	20	0.102	\$10,185			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$400			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$10,585			
	TOTAL COST OF PROJECT=				\$100,000			
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	5.25	0	0.00	1	0.19	7	1.33	\$8,629
AFTER	5.25	0	0.00	1	0.19	4	0.76	\$6,400
							Annual Benefits from Crash Cost Savings	\$2,229
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	(\$8,357)	
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	0.21	
TOTAL COST OF PROJECT		-	\$100,000	COMPREHENSIVE B/C RATIO		-	0.21	

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: US 220 at SR 2444		BY: JBS						
COUNTY: Guilford		DATE: 2/24/2010						
FILE NO.: SS 07-01-220		NOTES: Target Crashes - SB Rear-End						
DETAILED COST:	TYPE IMPROVEMENT -	Southbound Left Turn Lane						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$100,000	20	0.102	\$10,185			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$100,000	20	0.102	\$10,185			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$400			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$10,585			
	TOTAL COST OF PROJECT=				\$100,000			
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	5.25	0	0.00	1	0.19	4	0.76	\$6,400
AFTER	5.25	0	0.00	0	0.00	0	0.00	\$0
							Annual Benefits from Crash Cost Savings	\$6,400
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	(\$4,185)	
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	0.60	
TOTAL COST OF PROJECT		-	\$100,000	COMPREHENSIVE B/C RATIO		-	0.60	



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		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 OR LESS		ONLY

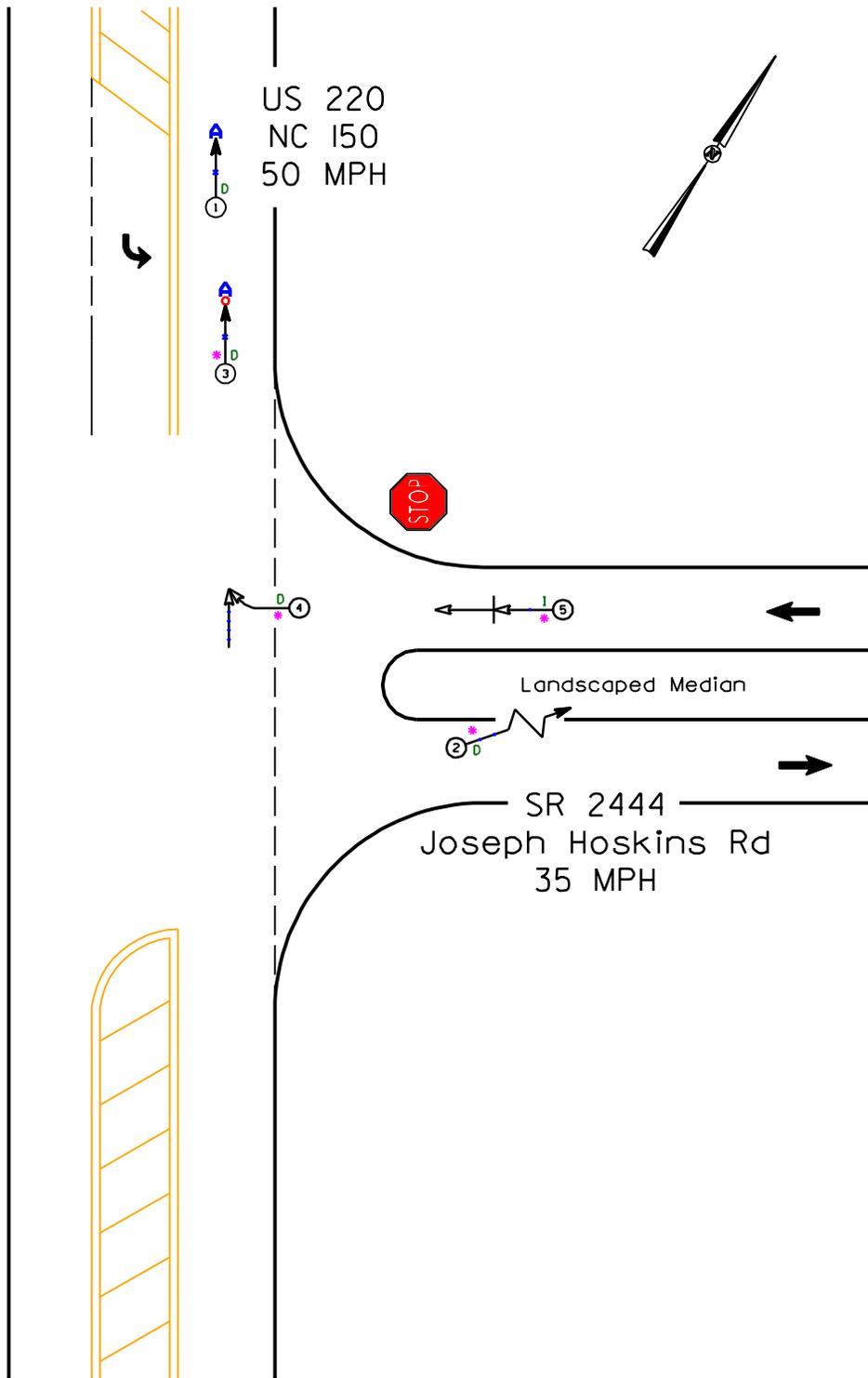
SS# 07-01-220
 Guilford County
 BEFORE Period
 5/1/99 - 7/31/04

Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION 7	AREA:
	STUDY PERIOD: 5/1/1999 - 7/31/2004	
	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: 2-23-2008		
LOG NUMBER: SS* 07-01-220 BEFORE		

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
	PARKING VEHICLE		SHOULDER		30 MPH TO 39		D DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		W WET
	HEAD ON		TO AND UP		50 MPH TO 59		I ICY OR SNOW
	REAR END		INJURY		60 MPH TO 69		F FATALITY
	RAN OFF ROAD		SPEED UNKNOWN		70 MPH TO 79		O ONLY

SS# 07-01-220
 Guilford County
 AFTER Period
 10/1/04 - 12/31/09



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 7	AREA:
	STUDY PERIOD: 10/1/2004 - 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: 2-23-2010		
LOG NUMBER: SS* 07-01-220 AFTER		

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