

Spot Safety Project Evaluation

Order # 41000014589

Spot Safety Project # 03-02-218

**Spot Safety Project Evaluation of the Center Turn Lane Installation
SR 1509 (Queens Creek Road) from SR 1576 to SR 1620
Onslow 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

10-5-2011

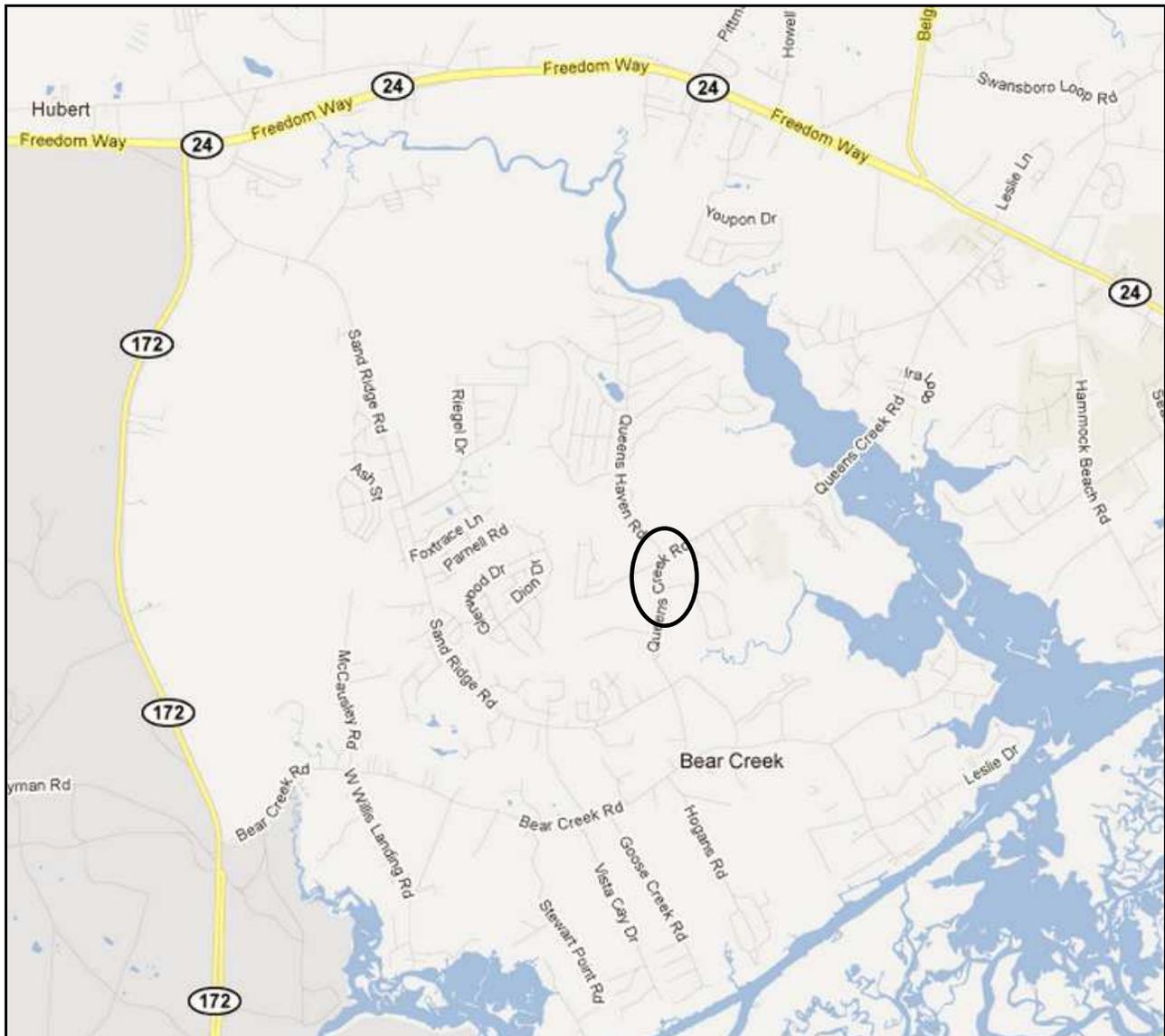
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 03-02-218 located along SR 1509 (Queens Creek Road) from MP 2.732 to MP 2.988 including the intersections of SR 1576 (Queens Haven Road), SR 1565 (Smallwood Road), and SR 1620 (Henson Road) in Onslow County, west of Swansboro.





Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the roadway widening and installation of a center turn lane (3-lane roadway segment) on SR 1509 (Queens Creek Road). The widening portion extends for approximately 0.3 mile and includes the SR 1576 (Queens Haven Rd), SR 1565 (Smallwood Rd), and SR 1620 (Henson Road) intersections. SR 1509 is two-lane facility with many residential driveways and a posted 45-mph speed limit, with a 35-mph advisory speed limit through the horizontal curve.

The original statement of problem indicated patterns of ran-off roadway and rear-end collisions due to vehicles being stopped in the through lane while waiting to turn left. This segment of roadway also has a sharp horizontal curve that limits sight distance.

The initial crash analysis was completed from April 1, 1999 to March 31, 2002 with ten (10) reported crashes, eight (8) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on October 23, 2007 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 was the month of October 2007. The before period consisted of reported crashes from February 1, 2004 through September 30, 2007 (3 years and 8 months); and the after period consisted of reported crashes from November 1, 2007 through June 30, 2011 (3 years and 8 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 on SR 1509 (Queens Creek Road) from milepost 2.732 (150 feet north of SR 1576) to milepost 2.988 (150 feet south of SR 1620) with a 150 feet 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 location. Please note that two crash types were highlighted as Target Crashes:

- 1 – Ran-Off Roadway Crashes (ran-off road right, ran-off road left, and fixed object)
- 2 – Rear-End Crashes (vehicles waiting to turn left in the through lane)

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	28	11	- 60.7 %
Total Severity Index	6.61	9.24	39.8 %
Target Crashes – Ran-Off Roadway	10	3	- 70.0 %
Ran-Off Road Crash Severity Index	4.70	26.27	200+ %
Target Crashes – Rear-End	8	1	- 87.5 %
Rear-End Crash Severity Index	2.85	1.00	- 64.9 %
Volume (2005, 2009)	7,520	8,030	6.8 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	1	0.0 %
Class B injury Crashes	3	1	- 66.7 %
Class C Injury Crashes	8	1	- 87.5 %
Total Injury Crashes	12	3	- 75.0 %

The naive before and after analysis at the treatment location resulted in a 61 percent decrease in Total Crashes, a 70 percent decrease in Ran-Off Roadway Target Crashes, and an 87.5 percent decrease in the Rear-End Target Crashes. 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 showed a strong pattern of eight (8) rear-end collisions while SR 1509 vehicles were stopped in the roadway to make a left turn onto SR 1576 (Queens Haven Road). With the roadway widening and center turn lane this pattern was eliminated in the after period. However, the SR 1576 intersection with SR 1509 experienced a slight increase in left turn different roadway / angle crashes from two (2) to three (3) through the analysis.

This segment of roadway also had a pattern of ran-off roadway collisions in the horizontal curve between Smallwood Road and Henson Road. The evaluation experienced a decrease of ran-off roadway crashes from ten (10) in the before period to three (3) in the after period. However, after period crash number 8 was a motorcycle rollover collision which resulted in an A-class injury. This A-injury crash caused a negative target benefit-cost ratio as seen below.

The calculated benefit to cost ratio for this project is **3.63 considering total crashes**. The benefit to cost ratio **considering only target crashes is (-7.71)**. 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 investigation on September 29th, 2011. 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 location.

Treatment Site Photos (Field Visit 9/29/2011)



Travelling South/West on SR 1509 at SR 1576 (Queens Haven Rd)



Travelling South/West on SR 1509 at Smallwood Road intersection



Travelling South on SR 1509 at Henson Road intersection



Travelling North/East on SR 1509 at SR 1576 (Queens Haven Rd)



Sight Distance North – Making Left Turn from SR 1576 onto SR 1509



Sight Distance South – From SR 1576 onto SR 1509

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

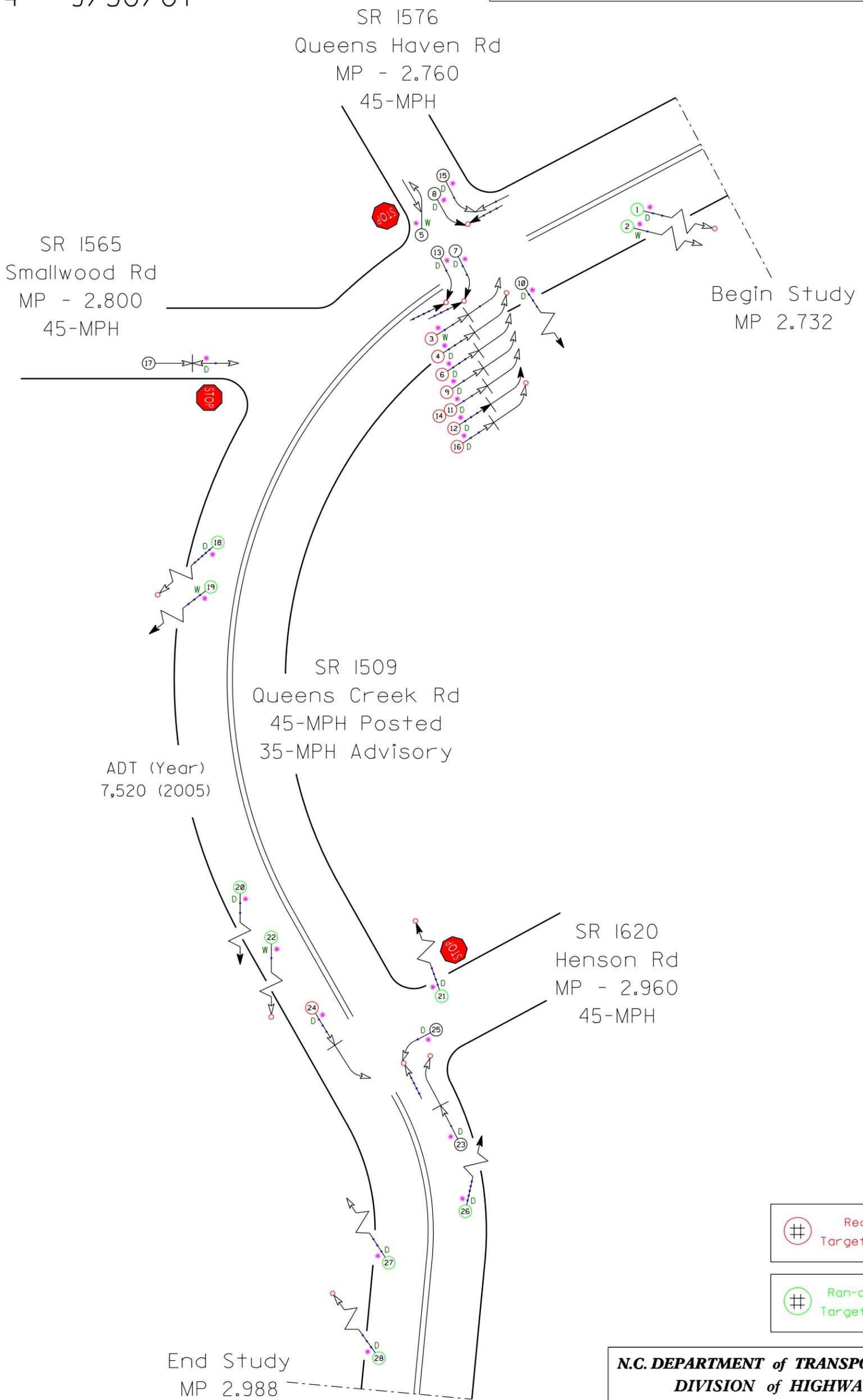
LOCATION: SR 1509 near SR 1576		BY: JBS						
COUNTY: Onslow		DATE: 10/4/2011						
FILE NO.: SS 03-02-218								
DETAILED COST:	TYPE IMPROVEMENT - Shoulder Guardrail							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$100,000	10	0.149	\$14,903			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$100,000	10	0.149	\$14,903			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$1,200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$16,103			
	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	3.67	1	0.27	11	3.00	16	4.36	\$250,354
AFTER	3.67	1	0.27	2	0.54	8	2.18	\$191,935
						Annual Benefits from Crash Cost Savings		\$58,420
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$42,317		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	3.63		
TOTAL COST OF PROJECT		-	\$100,000	COMPREHENSIVE B/C RATIO		-	3.63	

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: SR 1509 near SR 1576		BY: JBS						
COUNTY: Onslow		DATE: 10/4/2011						
FILE NO.: SS 03-02-218		Combined Targets - Rear-End & Ran-Off Roadway						
DETAILED COST:	TYPE IMPROVEMENT - Shoulder Guardrail							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$100,000	10	0.149	\$14,903			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$100,000	10	0.149	\$14,903			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$1,200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$16,103			
	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	3.67	0	0.00	7	1.91	11	3.00	\$51,035
AFTER	3.67	1	0.27	0	0.00	3	0.82	\$175,177
						Annual Benefits from Crash Cost Savings		(\$124,142)
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$140,245)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	-7.71		
TOTAL COST OF PROJECT		-	\$100,000	COMPREHENSIVE B/C RATIO		-	-7.71	

SS# 03-02-218
 Order# 41000014589
 Onslow County
 BEFORE Period
 2/1/04 - 9/30/07

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



Rear-End Target Crashes

Ran-off Road Target Crashes

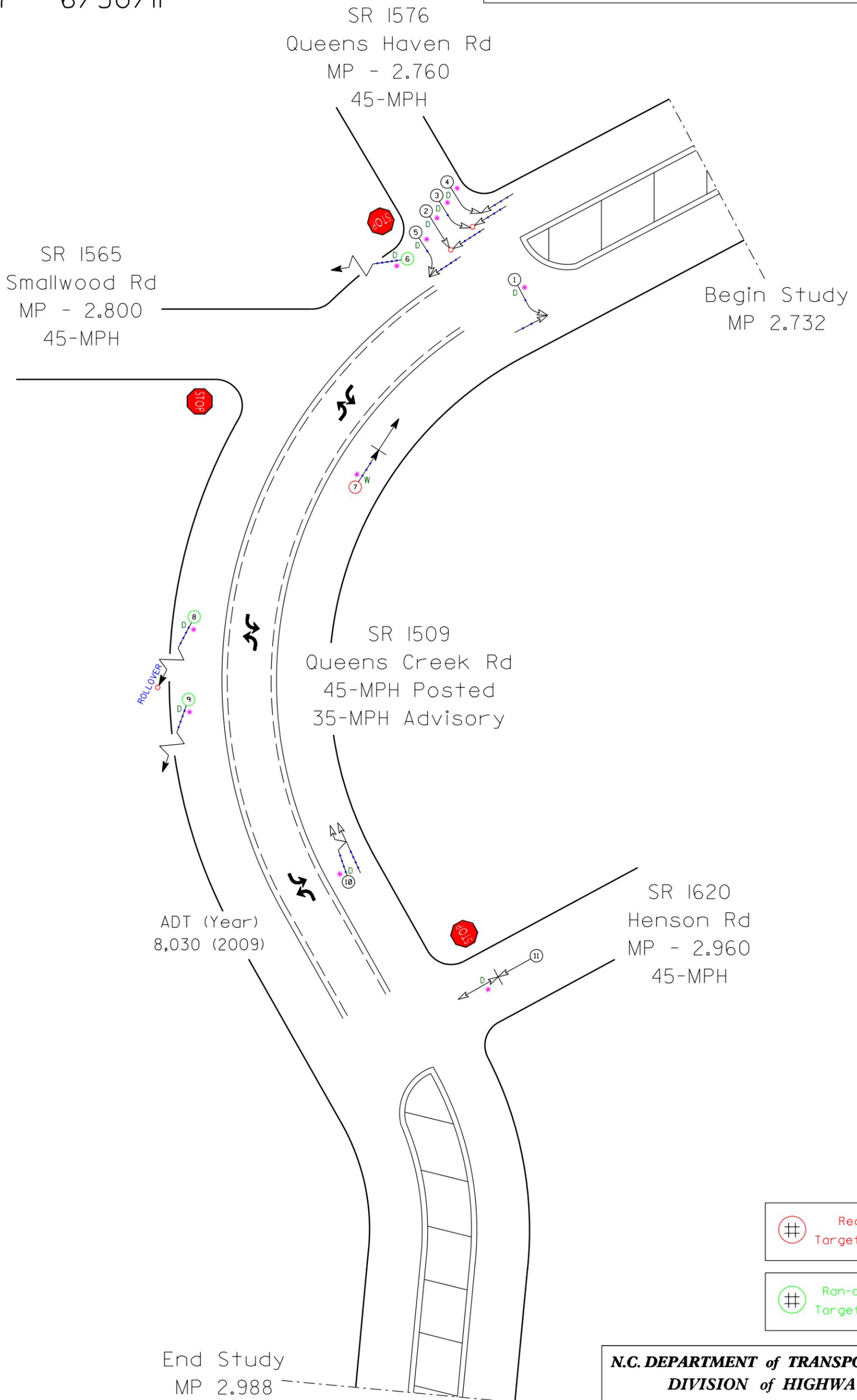
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and SAFETY DIVISION

TRAFFIC SAFETY UNIT

Date: 10-3-2011 Prepared By: J. Schronce

SS# 03-02-218
 Order# 41000014589
 Onslow County
 AFTER Period
 11/1/07 - 6/30/11

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



Rear-End Target Crashes

Ran-off Road Target Crashes

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