

# Spot Safety Project Evaluation

Order # 41000018314

Spot Safety Project # 14-07-001

## Spot Safety Project Evaluation of the Pavement Cross-Section Improvement and the Addition of Friction Course Pavement Overlay on US 23-441 from SR 1300, Northward for 2,000 Feet Jackson County

Documents Prepared By:

Safety Evaluation Group  
Traffic Safety Systems Management Section  
Transportation Mobility and Safety Division  
North Carolina Department of Transportation

Principal Investigator



Brad Robinson, PE

3/06/2012

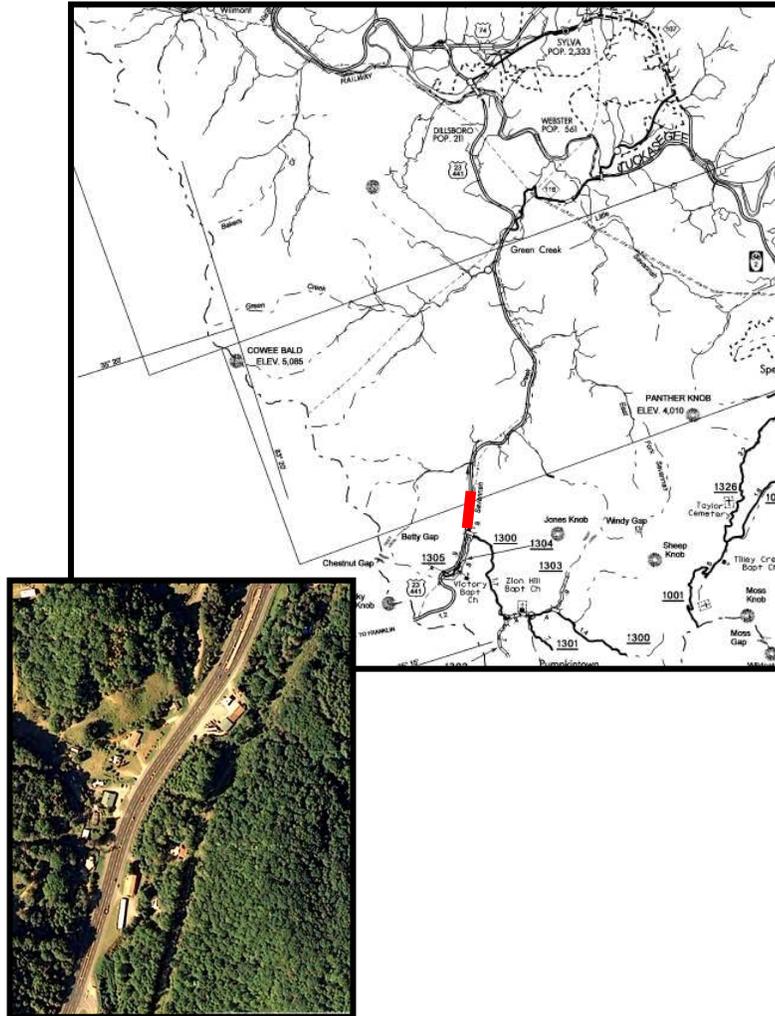
Date

Traffic Safety Project Engineer

# *Spot Safety Project Evaluation Documentation*

## **Subject Location**

Evaluation of Spot Safety Project Number 14-07-001 – US 23-441 from SR 1300 (Pumpkintown Rd), northward for 2,000 feet.



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

The spot safety project improvement countermeasures chosen for the subject location were to improve the pavement cross-section and to add a friction course pavement overlay.

US 23-441 is a five-lane roadway with a center two-way left turn lane and a 55 mph speed limit. Northbound US 23-441 is on a downgrade heading into a reverse turn.

The initial crash analysis was conducted from October 1, 2001 to September 30, 2006 with a total of 13 wet road crashes. The final completion date for the improvements at the subject location was on March 28, 2008 with a total cost of \$175,000.00.

### 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 September 1, 2006 to October 31, 2006. The before period consisted of reported crashes from May 1, 2004 through January 31, 2008 (3 years and 9 months) and the after period consisted of reported crashes from May 1, 2008 through January 31, 2012 (3 years and 9 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 23-441 from just north of SR 1300 to a point 2,000 feet north of the intersection. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Ran Off Road crash types during wet conditions 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. The target crashes are clearly identified in the before and after period crash severity diagrams.

<b><u>Treatment Information</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total Crashes	20	5	-75.0
Total Severity Index	14.59	1	-93.1
Target Crashes	18	0	-100.0
Target Crash Severity Index	16.10	0	-100.0
Volume	12,000	11,000	-8.3
<b><u>Target Crash Severity Summary</u></b>			
Fatal Crashes	3	0	-100.0
Class A Crashes	0	0	N/A
Class B Crashes	1	0	-100.0
Class C Crashes	5	0	-100.0
PDO Crashes	9	0	-100.0

The naive before and after analysis at the treatment location resulted in a 75 percent decrease in Total Crashes, a 100 percent decrease in Target Crashes, and an 8 percent decrease in Average Daily Traffic (ADT). The before period ADT year was 2006 and the after period ADT year was 2010.

## Results and Discussion

The spot safety improvements at the subject location appear to have been very effective at reducing target crashes along this strip of roadway. In the before period 18 of the 20 total crashes were ran off road crash types that occurred during wet conditions. Twelve of the target crashes involved northbound vehicles leaving their lane of travel and six involved southbound vehicles. Three target crashes resulted in fatalities. All three fatal crashes involved vehicles losing control and hitting a vehicle traveling in the opposite direction. In the after period there were only two ran off road crashes, neither occurring during wet conditions.

The calculated benefit to cost ratio for this project is 20.82 considering total crashes. The benefit to cost ratio considering only target crashes is also 20.95. 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*. 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 23-441 from SR 1300, northward for 2000'		BY: bdr						
COUNTY: Jackson		DATE: 3/6/2012						
FILE NO.: SS 14-07-001								
DETAILED COST:	TYPE IMPROVEMENT - cross section improvement and friction course overlay							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$0	0	0.000	\$0			
		\$175,000	10	0.149	\$26,080			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$175,000	10	0.149	\$26,080			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$0			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$26,080			
	TOTAL COST OF PROJECT=				\$175,000			
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	3.75	3	0.80	6	1.60	11	2.93	\$548,613
AFTER	3.75	0	0.00	0	0.00	5	1.33	\$5,733
							Annual Benefits from Crash Cost Savings	\$542,880
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	\$516,800	
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	20.82	
TOTAL COST OF PROJECT		-	\$175,000	COMPREHENSIVE B/C RATIO		-	20.82	

**BENEFIT-COST ANALYSIS WORKSHEET - TARGET**

LOCATION: US 23-441 from SR 1300, northward for 2000'		BY: bdr						
COUNTY: Jackson		DATE: 3/6/2012						
FILE NO.: SS 14-07-001								
DETAILED COST:	TYPE IMPROVEMENT - cross section improvement and friction course overlay							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$0	0	0.000	\$0			
		\$175,000	10	0.149	\$26,080			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$175,000	10	0.149	\$26,080			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$0			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$26,080			
	TOTAL COST OF PROJECT=				\$175,000			
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	3.75	3	0.80	6	1.60	9	2.40	\$546,320
AFTER	3.75	0	0.00	0	0.00	0	0.00	\$0
							Annual Benefits from Crash Cost Savings	\$546,320
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	\$520,240	
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	20.95	
TOTAL COST OF PROJECT		-	\$175,000	COMPREHENSIVE B/C RATIO		-	20.95	

Treatment Site Photos Taken December 13, 2011



Traveling northeast on US 23-441



Traveling northeast on US 23-441



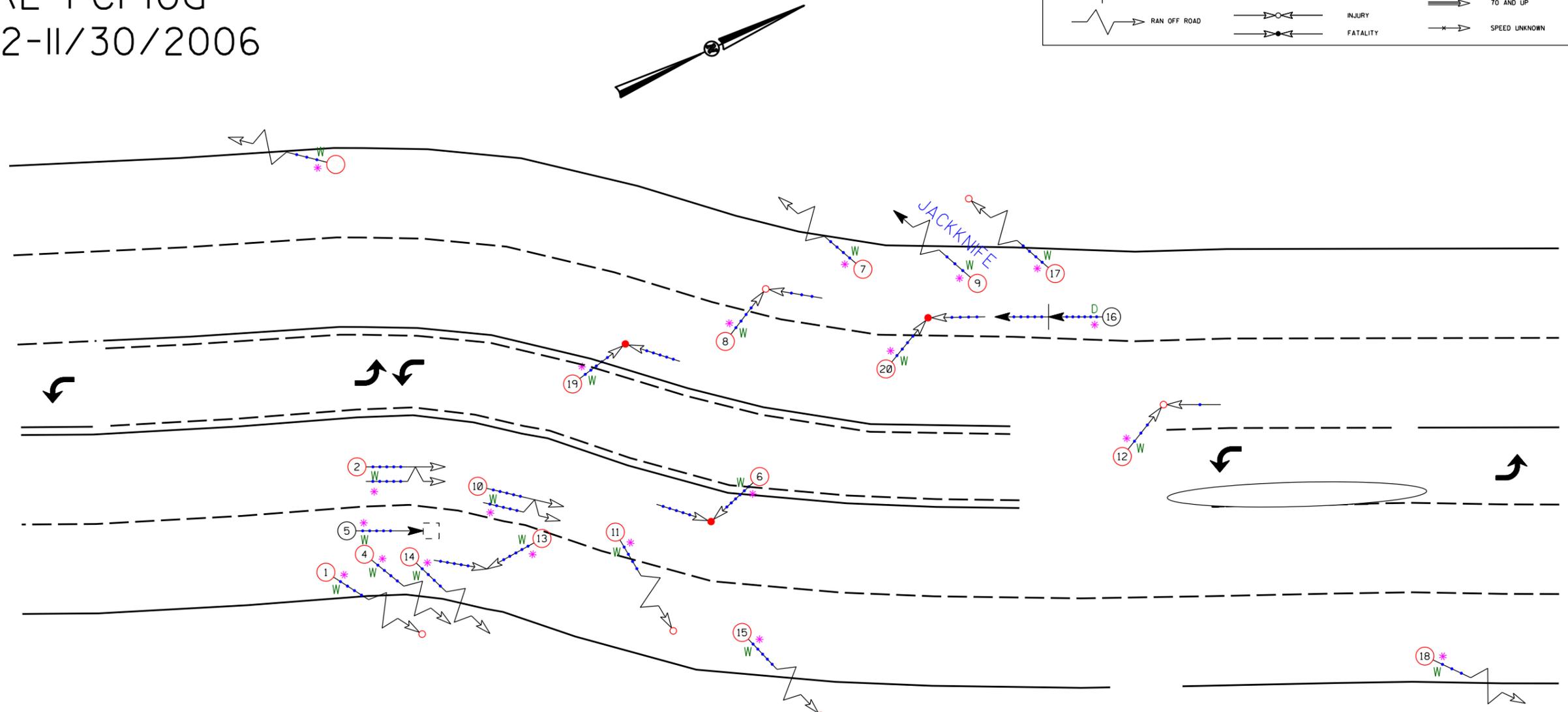
Traveling southwest on US 23-441



Traveling southwest on US 23-441

SS# 14-07-001  
 Order# 41000018314  
 Jackson County  
 BEFORE Period  
 3/1/2002-II/30/2006

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 ONLY



High County Tire

Target Crashes

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

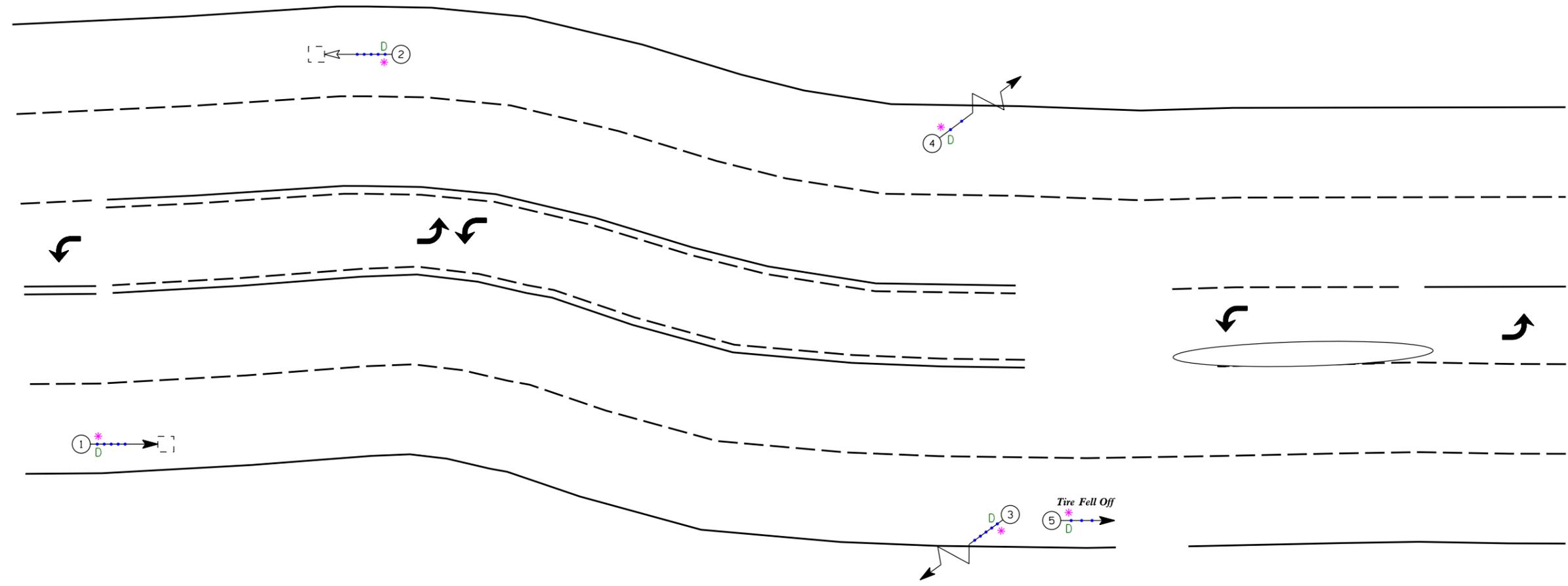
TRAFFIC SAFETY UNIT

Date: March 2012

Prepared By: bdr

SS# 14-07-001  
 Order# 41000018314  
 Jackson County  
 AFTER Period  
 2/1/2007-10/31/2011

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
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			70 AND UP
			SPEED UNKNOWN
			P PEDESTRIAN
			T TRAIN
			* DRIVER AT FAULT
			D DRY
			W WET
			I ICY OR SNOWY
			O OILY



Target Crashes

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

**TRAFFIC SAFETY UNIT**

Date: March 2012      Prepared By: bdr