Spot Safety Project Evaluation

Work Order #41000007939

Spot Safety Project # 03-02-207

Spot Safety Project Evaluation of the Installation of Four-Foot Paved Shoulders and Superelevation Improvements on SR 1004 Approximately 0.3 Miles East of the Wayne County Line Duplin 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

Brad Robinson, PE

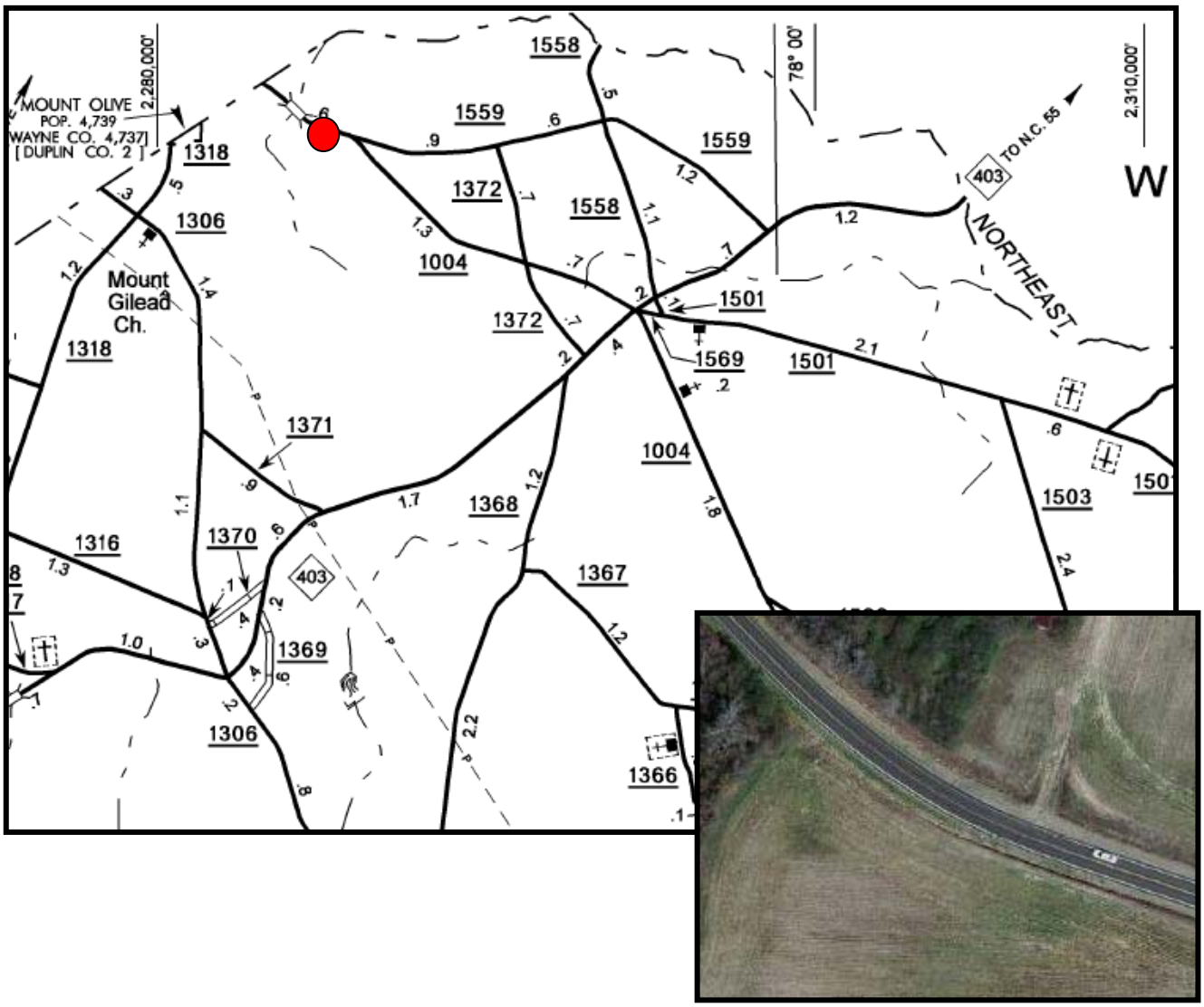
8/23/2010
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 03-02-207 – SR 1004 approximately 0.3 miles east of the Wayne County line in Duplin County.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location were to install a four foot paved shoulder and to improve the super elevation throughout the curve on SR 1004.

SR 1004 is a two-lane roadway with a speed limit of 55 mph. There are curve warning signs with 35 mph advisory speed limits on either side of the curve. Prior to the project there was a one foot paved outer shoulder and a two foot paved inner shoulder along the curve.

The original statement of problem was that there was a Ran-Off-Road Crash pattern at the subject location.

The initial crash analysis was conducted from September 30, 1998 to September 30, 2001 with a total of seven reported crashes, all of which were considered correctable by the chosen countermeasures. The final completion date for the improvements at the subject intersection was on October 4, 2005 with a total cost of $75,000.00.

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, 2005 to October 31, 2005. The before period consisted of reported crashes from January 1, 2001 through August 31, 2005 (4 years and 8 months) and the after period consisted of reported crashes from November 1, 2005 through June 30, 2010 (4 years and 8 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 that occurred in the curve. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Ran Off Road Crashes that occurred on the curve were the Target Crashes for the applied countermeasure. The target crashes are clearly identified in the before and after period collision diagrams.

Treatment Information			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total Crashes	17	2	-88.2
Total Severity Index	7.64	4.7	-38.5
Target Crashes	17	2	-88.2
Target Severity Index	7.64	4.7	-38.5
Volume	2,500	2,700	8.0
Target Crash Severity Summary			
Fatal Crashes	1	0	-100.0
Class A Crashes	0	0	N/A
Class B Crashes	1	0	-100.0
Class C Crashes	4	1	-75.0
PDO Crashes	11	1	-90.9

The naive before and after analysis at the treatment location resulted in an 88 percent decrease in both Total and Target Crashes and an 8 percent increase in Average Daily Traffic (ADT). The before period ADT year was 2003 and the after period ADT year was 2008.

Results and Discussion

All crashes in both the before and the after periods were Target Crashes. In the before period ten of the crashes involved an eastbound vehicle running off the roadway either right or left and six involved a westbound vehicle running off the roadway. There was also a fatal crash that involved a westbound vehicle losing control, crossing the center line, and hitting an eastbound vehicle.

In the after period there was one crash involving an eastbound vehicle running off the road to the right and one crash involving a westbound vehicle running off the road to the right. One of the crashes occurred on wet pavement and the other occurred on snow covered pavement.

The calculated benefit to cost ratio for this project is 21.11 considering total crashes. The benefit to cost ratio considering only target crashes is also 21.11. 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 were obtained from Google Street-view. 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

LOCATION: SR 1004, 0.3 miles east of Waye County L. BY: bdr
COUNTY: Duplin DATE: 8/19/2010
FILE NO.: SS 03-02-207

DETAILED COST: TYPE IMPROVEMENT - 4 foot paved shoulder and superelevation

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$0	0	0.000	$0
	$75,000	20	0.102	$7,639
Right-of-Way	$0	0	0.000	$0
TOTALS	$75,000	20	0.102	$7,639

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $0
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $0

TOTAL ANNUAL COST= $7,639
TOTAL COST OF PROJECT= $75,000

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	4.67	1	0.21	5	1.07	11	2.36	$166,445
AFTER	4.67	0	0.00	1	0.21	1	0.21	$5,203

Annual Benefits from Crash Cost Savings $161,242

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $153,603

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 21.11

TOTAL COST OF PROJECT - $75,000 COMPREHENSIVE B/C RATIO - 21.11

Treatment Site Photos from Google Street-View

Looking southeast on SR 1004

Looking southeast on SR 1004

Looking northwest on SR 1004

Looking northwest on SR 1004

SS# 03-02-207
Order# 41000007939
Duplin County
BEFORE Period
1/1/2001-8/31/2005

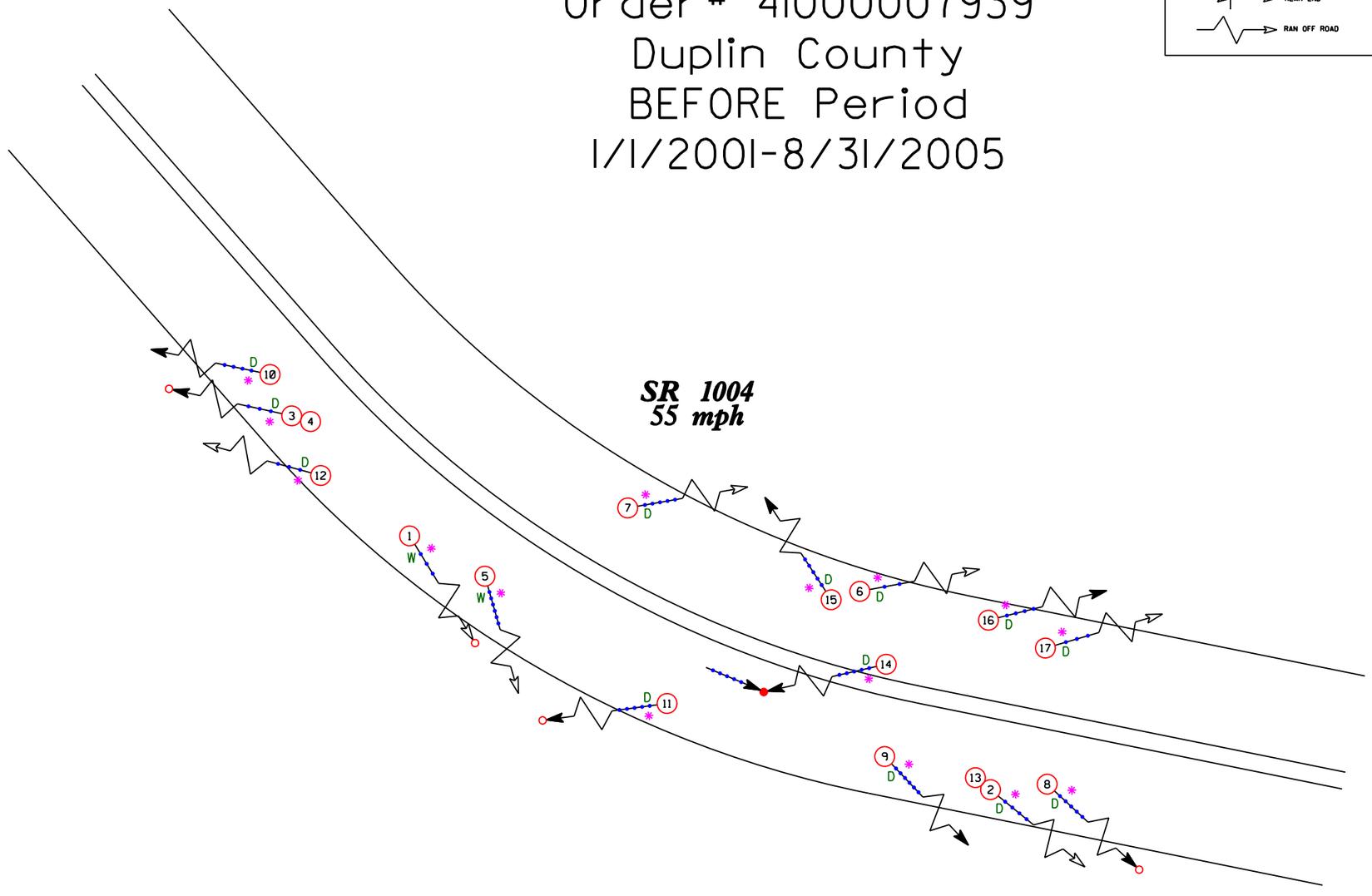
LEGEND

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
TURNING
BACKING
SIDESWIPE
OUT OF CONTROL
INJURY
FATALITY

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



Target Crashes

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

TRAFFIC SAFETY UNIT

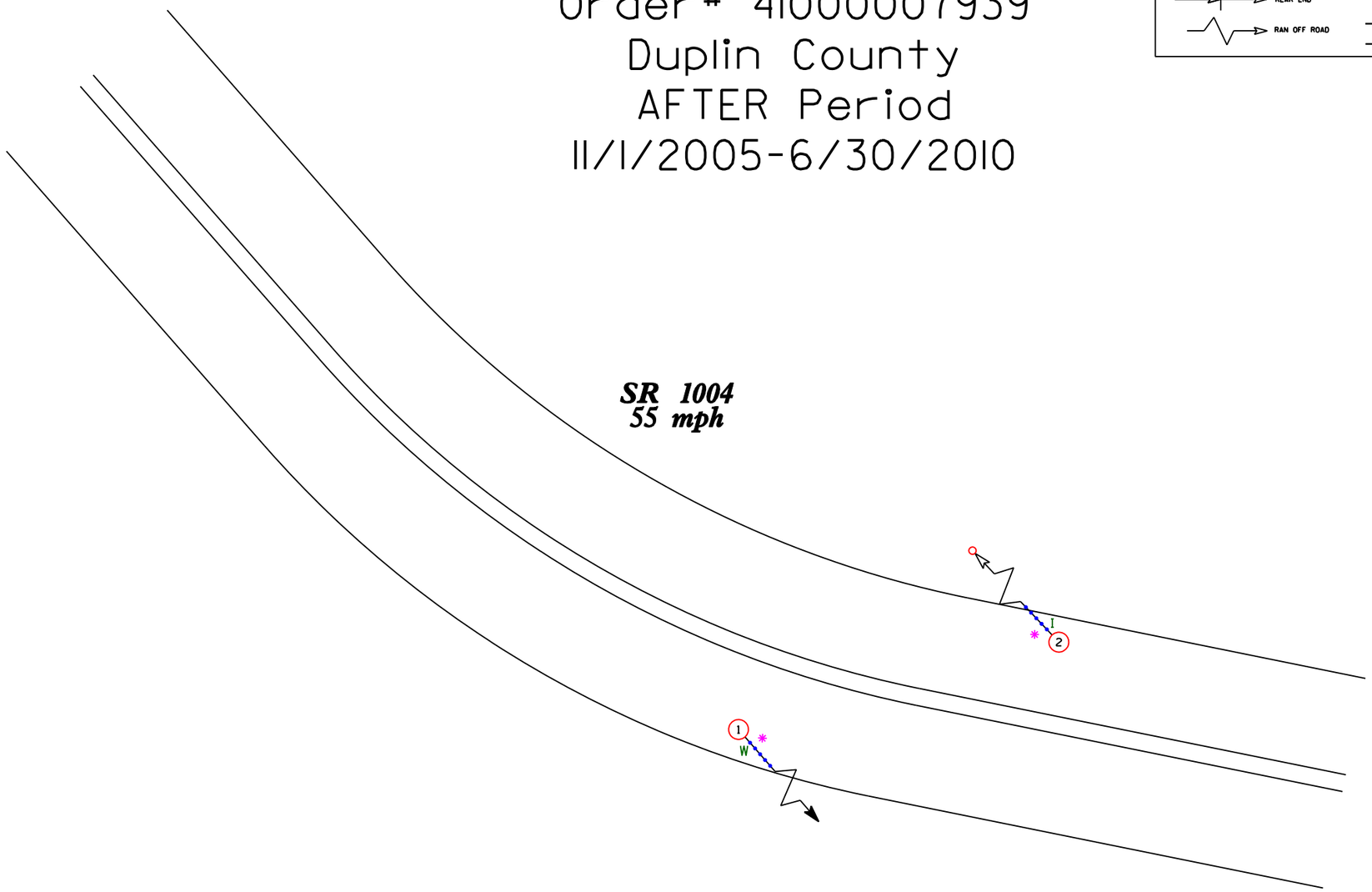
Date: August 2010

Prepared By: bdr

SS# 03-02-207
Order# 41000007939
Duplin County
AFTER Period
11/1/2005-6/30/2010

LEGEND

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



Target Crashes

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