

Spot Safety Project Evaluation

Order # 41000008502

Spot Safety Project # 01-05-204

Spot Safety Project Evaluation of the Resurfacing of US 64 with Open-Graded Friction Course from the West End of the Washington Baum Bridge to 0.1 Mile West of Pirate's Way Dare 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

9/24/2010

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 01-05-204 – US 64 from the west end of the Washington Baum Bridge to 0.1 mile west of Pirates Way.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was to mill the existing pavement and to overlay it with an open-graded friction course.

US 64 is a four-lane roadway between the bridge and Pirate's Way. It has a left turn lane and a right turn lane on both approaches to its intersection with Pirate's Way. The speed limit is 55mph.

The original statement of problem was that during hard rainstorms excessive amounts of water on the roadway were causing numerous crashes.

The initial crash analysis was conducted from January 1, 2000 to December 31, 2004 with a total of 14 reported crashes, 11 of which were considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on July 7, 2006 with a total cost of \$302,500.00.

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 May 1, 2006 to July 31, 2006. The before period consisted of reported crashes from May 1, 2002 through April 30, 2006 (4 years) and the after period consisted of reported crashes from August 1, 2006 through July 31, 2010 (4 years). 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 64 from the west end of the Washington Baum Bridge to 0.1 mile west of Pirate's Way. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that crashes that occurred during wet conditions were the target crashes for the applied countermeasure. The target crashes are clearly identified in the before and after period collision diagrams.

<u>Treatment Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	27	12	-55.6
Total Severity Index	15.24	3.47	-77.2
Target Crashes			
Target Crashes	16	4	-75.0
Target Crash Severity Index	17.99	2.85	-84.2
Volume			
Volume	19,000	18,000	-5.3
<u>Crash Severity Summary</u>			
Fatal Crashes	1	0	-100.0
Class A Crashes	2	0	-100.0
Class B Crashes	0	0	N/A
Class C Crashes	6	1	-83.3
PDO Crashes	7	3	-57.1

The naive before and after analysis at the treatment location resulted in a 56 percent decrease in Total Crashes, a 75 percent decrease in Target Crashes, and a 5 percent decrease in Average Daily Traffic (ADT). The before period ADT year was 2004 and the after period ADT year was 2008.

Results and Discussion

The resurfacing of the roadway appears to have been effective at reducing wet crashes on US 64 at the subject location. Fifty-nine percent of the before period crashes occurred during wet conditions. In the after period only 33 percent of crashes occurred during wet conditions.

In the before period the Target Crashes included two Rear-End Crashes, six Ran Off Road-Right crashes, three Sideswipe-Same Direction crashes, and five crashes that occurred when a vehicle went out of control on wet pavement, crossed the centerline, and hit an oncoming vehicle in the

opposite direction. One of the crashes involving an out of control vehicle crossing the centerline (Crash #22) resulted in a fatality. A vehicle was traveling west between the bridge and Pirate's Way, hit some water in the roadway and began hydroplaning, going left of center and hitting an eastbound vehicle.

In the after period the Target crashes included two Rear-End Crashes and two Left Turn-Same Roadway Crashes at the intersection.

The calculated benefit to cost ratio for this project is 14.85 considering total crashes. The benefit to cost ratio considering only target crashes is also 11.13. 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: US 64 from Washington Bridge To Pirate's BY: bdr
 COUNTY: Dare DATE: 9/17/2010
 FILE NO.: SS 01-05-204

DETAILED COST: TYPE IMPROVEMENT - **Resurfacing**

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
Right-of-Way	\$302,500	10	0.149	\$45,081
	\$0	0	0.000	\$0
TOTALS	\$302,500	10	0.149	\$45,081

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$0
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$45,081
 TOTAL COST OF PROJECT= \$302,500

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO		ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	CRASHES	CRASHES PER YR	
BEFORE	4.00	4	1.00	11	2.75	12	3.00	\$697,900
AFTER	4.00	0	0.00	4	1.00	8	2.00	\$28,600

Annual Benefits from Crash Cost Savings \$669,300

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$624,219
 BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 14.85

TOTAL COST OF PROJECT - \$302,500 COMPREHENSIVE B/C RATIO - 14.85

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 64 from Washington Bridge To Pirate's BY: bdr
 COUNTY: Dare DATE: 9/17/2010
 FILE NO.: SS 01-05-204 Target Crashes Only

DETAILED COST: TYPE IMPROVEMENT - **Resurfacing**

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
Right-of-Way	\$302,500	10	0.149	\$45,081
	\$0	0	0.000	\$0
TOTALS	\$302,500	10	0.149	\$45,081

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$0
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$45,081
 TOTAL COST OF PROJECT= \$302,500

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO		ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	CRASHES	CRASHES PER YR	
BEFORE	4.00	3	0.75	6	1.50	7	1.75	\$510,025
AFTER	4.00	0	0.00	1	0.25	3	0.75	\$8,225

Annual Benefits from Crash Cost Savings \$501,800

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$456,719

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 11.13

TOTAL COST OF PROJECT - \$302,500 COMPREHENSIVE B/C RATIO - 11.13

Treatment Site Photos from Google Street-View



Looking west on US 64 after coming off of bridge



Looking west on US 64



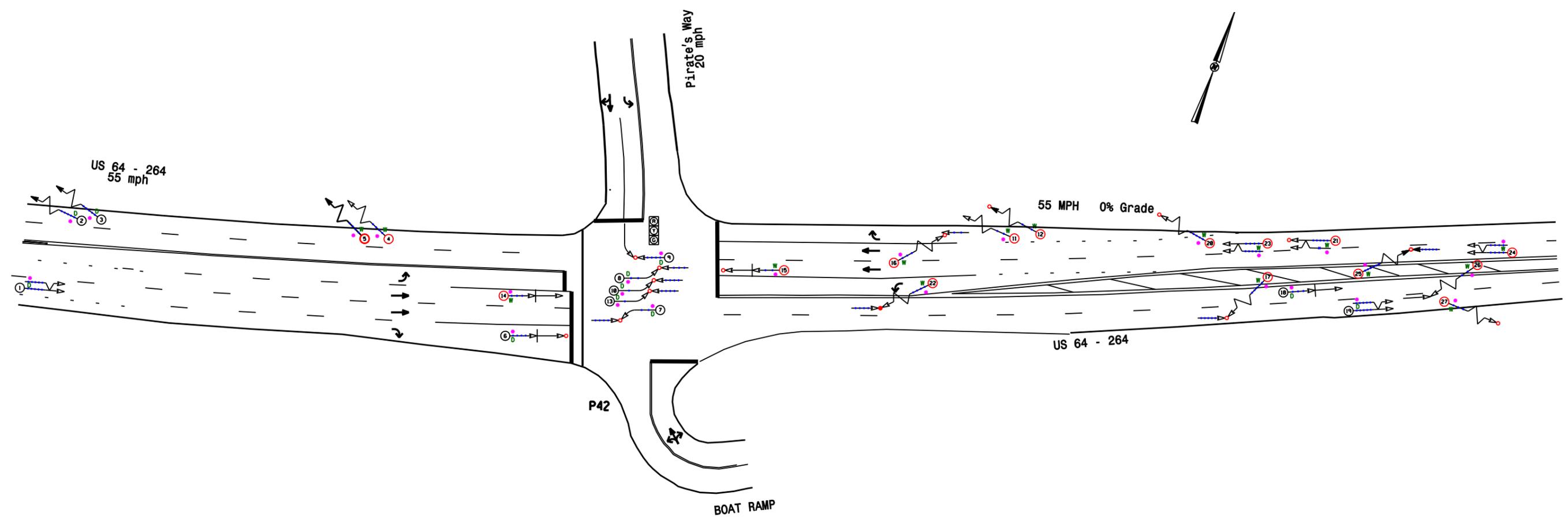
Looking west on US 64, approaching intersection with Pirate's Way



Looking east on US 64 near intersection with Pirate's Way

SS# 01-05-204
 Order# 41000008502
 Dare County
 BEFORE Period
 5/1/2002 - 4/30/2006

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



US 64 from west end of
 Washington Bridge to 0.1 mile
 west of Pirates Way

Target Crashes

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

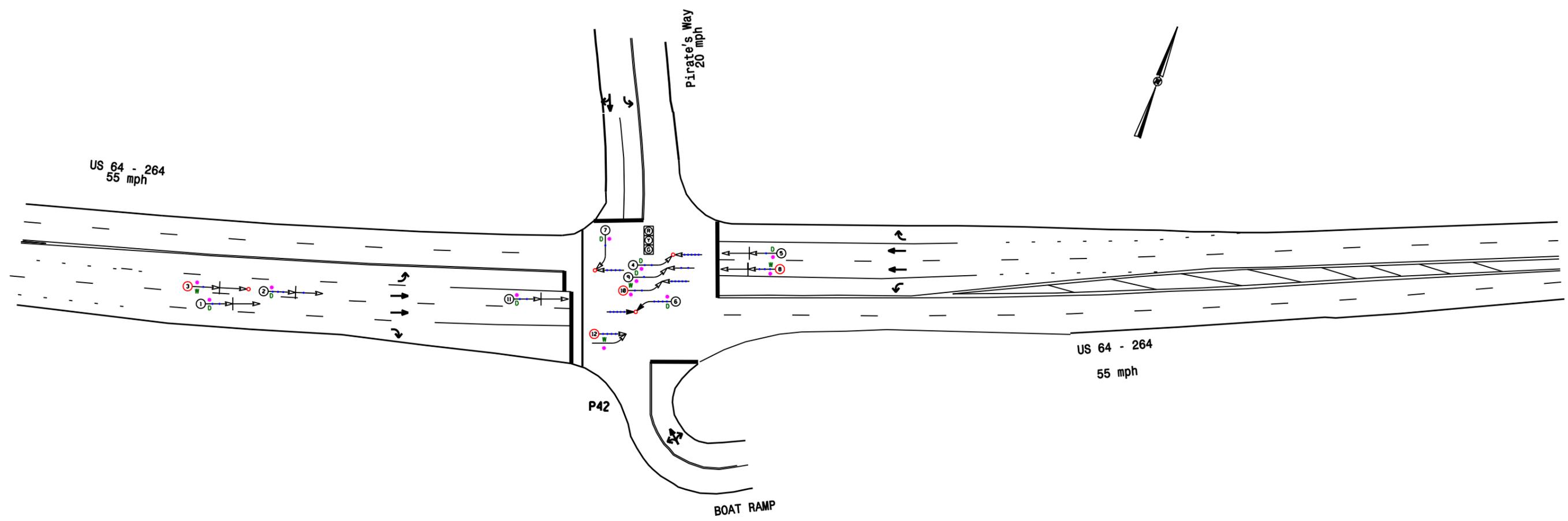
TRAFFIC SAFETY UNIT

Date: September 2010

Prepared By: bdr

SS# 01-05-204
 Order# 41000008502
 Dare County
 AFTER Period
 8/1/2006-7/31/2010

LEGEND			
	MOVING VEHICLE		ANGLE
	PEDESTRIAN		TURNING
	PARKED VEHICLE		BACKING
	PARKING VEHICLE		SIDESWIPE
	FIXED OBJECT		OUT OF CONTROL
	HEAD ON		INJURY
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US 64 from west end of
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 west of Pirates Way

Target Crashes

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
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TRAFFIC SAFETY UNIT

Date: September 2010 Prepared By: bdr