Spot Safety Project Evaluation

Order # 41000001632

Spot Safety Project # 03-01-204

Spot Safety Project Evaluation of the Traffic Signal Installation at the Intersection of US 74 (Eastwood Rd) and the Entrances to the Subdivisions of Landfall/Lion's Gate New Hanover 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

12/4/2009
Date

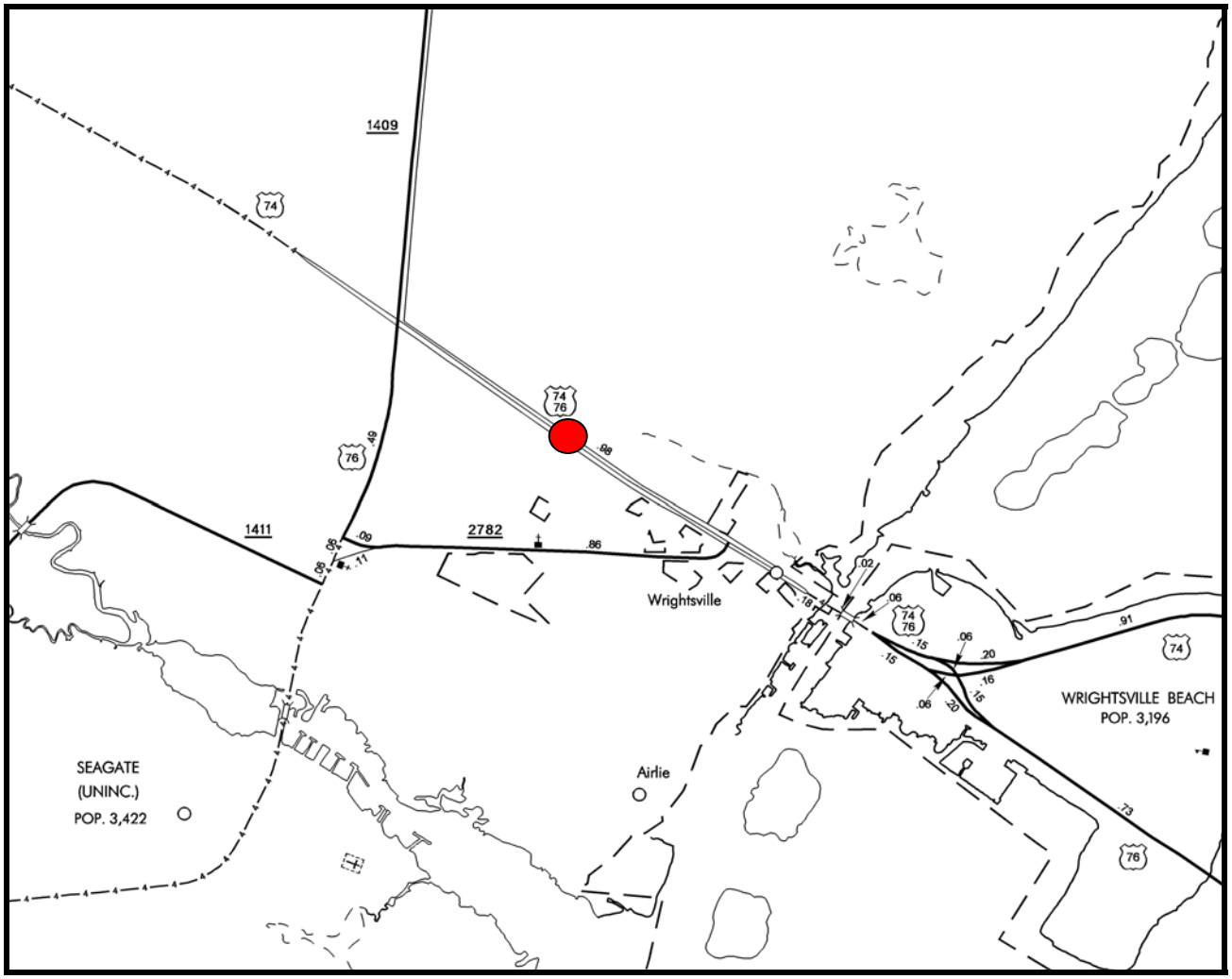
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 03-01-204 – The Intersection of US 74 and Landfall Subdivision Entrance/Lion's Gate Entrance

The signal number for this location is 03-0751.



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 traffic signal.

The subject location is a four-leg intersection which was controlled by stop signs at the subdivision entrances in the before period. US 74 (Eastwood Dr) is a four-lane divided roadway with auxiliary left and right turn lanes in each direction at the subject intersection. The entrances to both subdivisions have single lane approaches.

The original statement of problem was that due to the large volume of traffic on US 74, it was difficult to access US 74 from either of the two side roads.

The initial crash analysis was conducted from August 31, 1998 to August 31, 2001 with a total of one reported crash, which was not considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on January 15, 2004 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 December 1, 2003 to February 28, 2004. The before period consisted of reported crashes from July 1, 1998 through November 30, 2003 (5 years and 5 months) and the after period consisted of reported crashes from March 1, 2004 through July 31, 2009 (5 years and 5 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 within 150 feet of the subject intersection. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact crash types were the Target Crashes for the applied countermeasure. These crash types considered are as follows: Left Turn, same roadway; Left Turn, different roadway; Right Turn, same roadway; Right Turn, different roadway; Head On and Angle. The target crashes are clearly identified in the before and after period collision diagrams.

Treatment Information			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total Crashes	8	8	0.0
Total Severity Index	11.40	3.77	-66.9
Target Crashes	5	7	40.0
Target Crash Severity Index	17.64	4.17	-76.4
Volume	23,500	27,400	16.6
Target Crash Severity Summary			
Fatal Crashes	0	0	N/A
Class A Crashes	1	0	-100.0
Class B Crashes	1	1	0.0
Class C Crashes	0	2	N/A
PDO Crashes	3	4	33.3

The naive before and after analysis at the treatment location resulted in a no change in Total Crashes, a 40 percent increase in Target Crashes, and a 16 percent increase in Average Daily Traffic (ADT). The before period ADT year was 2001 and the after period ADT year was 2006.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in no change in Total Crashes and a 40 percent increase in Target Crashes. The Total Severity Index decreased by 67 percent and the Target Severity Index decreased by 76 percent. The summary results above demonstrate that while Total Crashes appear to have remained constant, Target Crashes have actually decreased at treatment location from the before to the after period.

The calculated benefit to cost ratio for this project is 7.79 considering total crashes. The benefit to cost ratio considering only target crashes is also 7.68. 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.

The crashes at the intersection appear to be mostly random. There was one small pattern (3 crashes) of Left Turn-Same Roadway crashes involving vehicles turning into Landfall in the before period, and one small pattern (3 crashes) of Left Turn-Same Roadway crashes involving vehicles turning into Lion's Gate in the after period. As stated in the *Project Background* section, the signal was installed more for operational benefits than for safety reasons. The naïve before and after analysis does not measure this effect.

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 intersection.

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 74 at Landfall/Lion's Gate BY: BDR
COUNTY: Jackson DATE: 12/1/2009
FILE NO.: SS 03-01-204

DETAILED COST: TYPE IMPROVEMENT - Shoulder Guardrail

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$0	0	0.000	$0
	$75,000	10	0.149	$11,177
Right-of-Way	$0	0	0.000	$0
TOTALS	$75,000	10	0.149	$11,177

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $14,077
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	5.42	1	0.18	1	0.18	6	1.11	$124,576
AFTER	5.42	0	0.00	3	0.55	5	0.92	$14,945

Annual Benefits from Crash Cost Savings $109,631

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $95,554

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 7.79

TOTAL COST OF PROJECT - $75,000 COMPREHENSIVE B/C RATIO - 7.79

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 74 at Landfall/Lion's Gate BY: BDR
COUNTY: Jackson DATE: 12/1/2009
FILE NO.: SS 03-01-204 Target Crashes Only

DETAILED COST: TYPE IMPROVEMENT - Shoulder Guardrail

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$0	0	0.000	$0
	$75,000	10	0.149	$11,177
Right-of-Way	$0	0	0.000	$0
TOTALS	$75,000	10	0.149	$11,177

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $14,077
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	5.42	1	0.18	1	0.18	3	0.55	$122,251
AFTER	5.42	0	0.00	3	0.55	4	0.74	$14,170

Annual Benefits from Crash Cost Savings $108,081

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $94,004

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 7.68

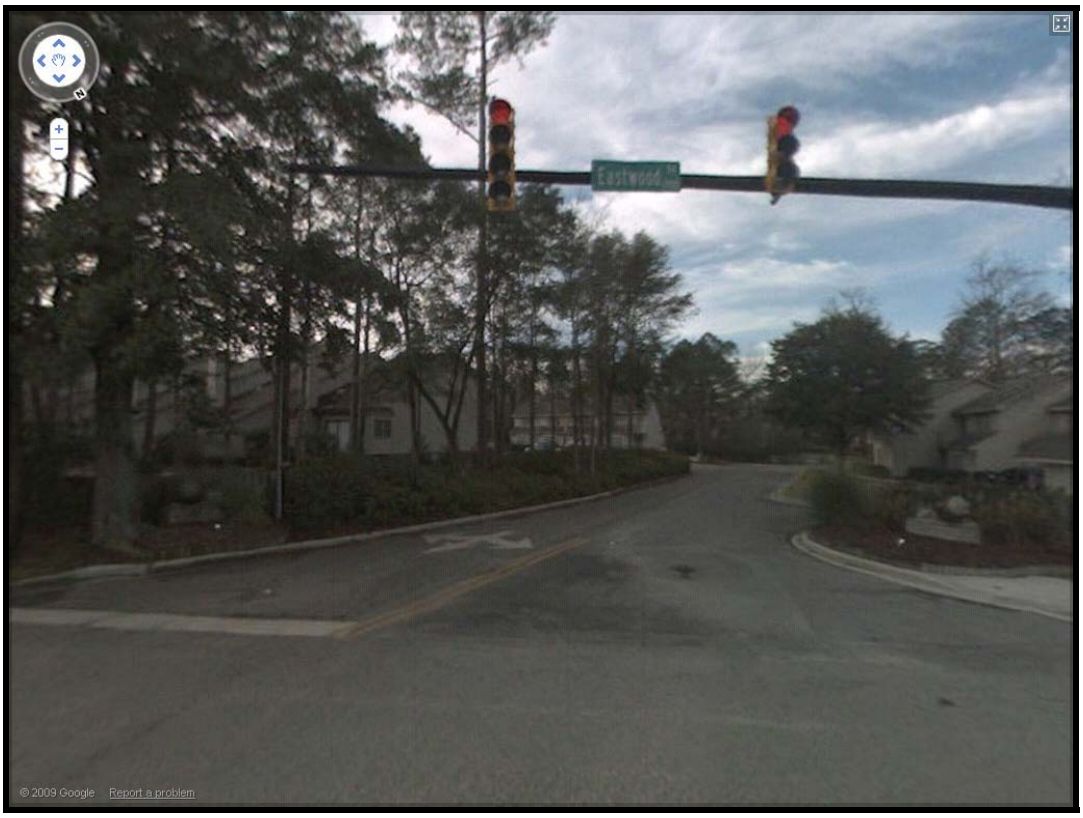
TOTAL COST OF PROJECT - $75,000 COMPREHENSIVE B/C RATIO - 7.68

Treatment Site Photos from Google Street-View

Looking southeast on US 74 (Eastwood Dr)

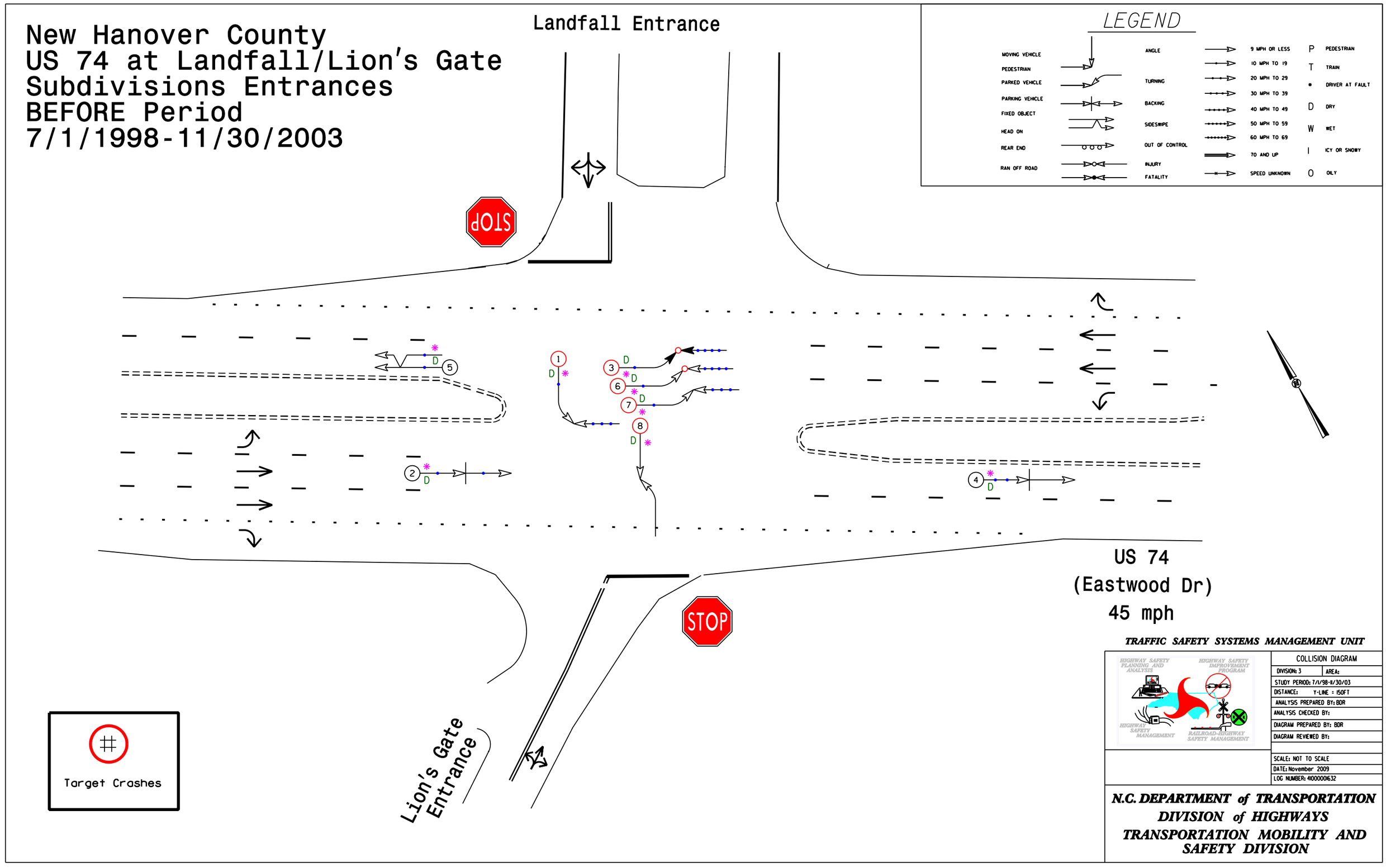
Looking northwest on US 74 (Eastwood Dr)

Looking north from intersection towards Landfall entrance



Looking south from intersection towards Lion's Gate Entrance

New Hanover County
US 74 at Landfall/Lion's Gate Subdivisions Entrances
BEFORE Period
7/1/1998-11/30/2003



LEGEND

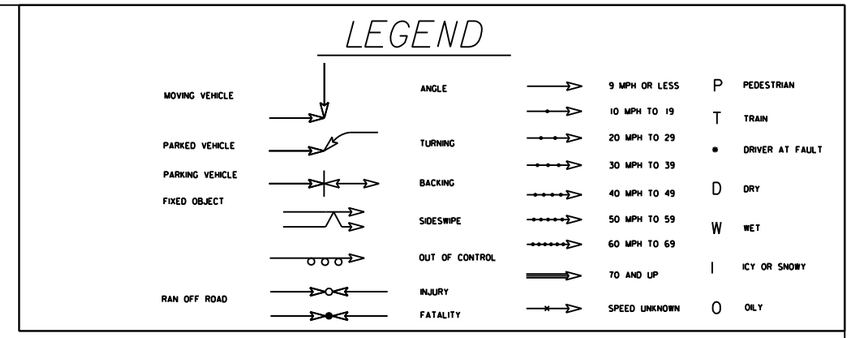
MOVING VEHICLE	ANGLE	9 MPH OR LESS	P	PEDESTRIAN
PEDESTRIAN		10 MPH TO 19	T	TRAIN
PARKED VEHICLE	TURNING	20 MPH TO 29	*	DRIVER AT FAULT
PARKING VEHICLE	BACKING	30 MPH TO 39		
FIXED OBJECT		40 MPH TO 49	D	DRY
HEAD ON	SIDESWIPE	50 MPH TO 59	W	WET
REAR END	OUT OF CONTROL	60 MPH TO 69	I	ICY OR SNOWY
RAN OFF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

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 3	AREA:
STUDY PERIOD: 7/1/98-11/30/03	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: BDR	
DIAGRAM REVIEWED BY:	
SCALE: NOT TO SCALE	
DATE: November 2009	
LOG NUMBER: 41000001632	

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

New Hanover County
US 74 at Landfall/Lion's Gate Subdivisions Entrances
AFTER Period
3/1/2004-7/31/2009



Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 3	AREA:
STUDY PERIOD: 3/1/04-7/31/09	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: BDR	
DIAGRAM REVIEWED BY:	
SCALE: NOT TO SCALE	
DATE: November 2009	
LOG NUMBER: 41000001632	

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