

Spot Safety Project Evaluation

Project Log # 200811086

Spot Safety Project # 05-99-209

**Spot Safety Project Evaluation of the Traffic Signal Installation
SR 2215 (Buffaloe Road) and SR 2214 (Southall Drive)
Wake County, City of Raleigh**

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

6-8-2009

Date

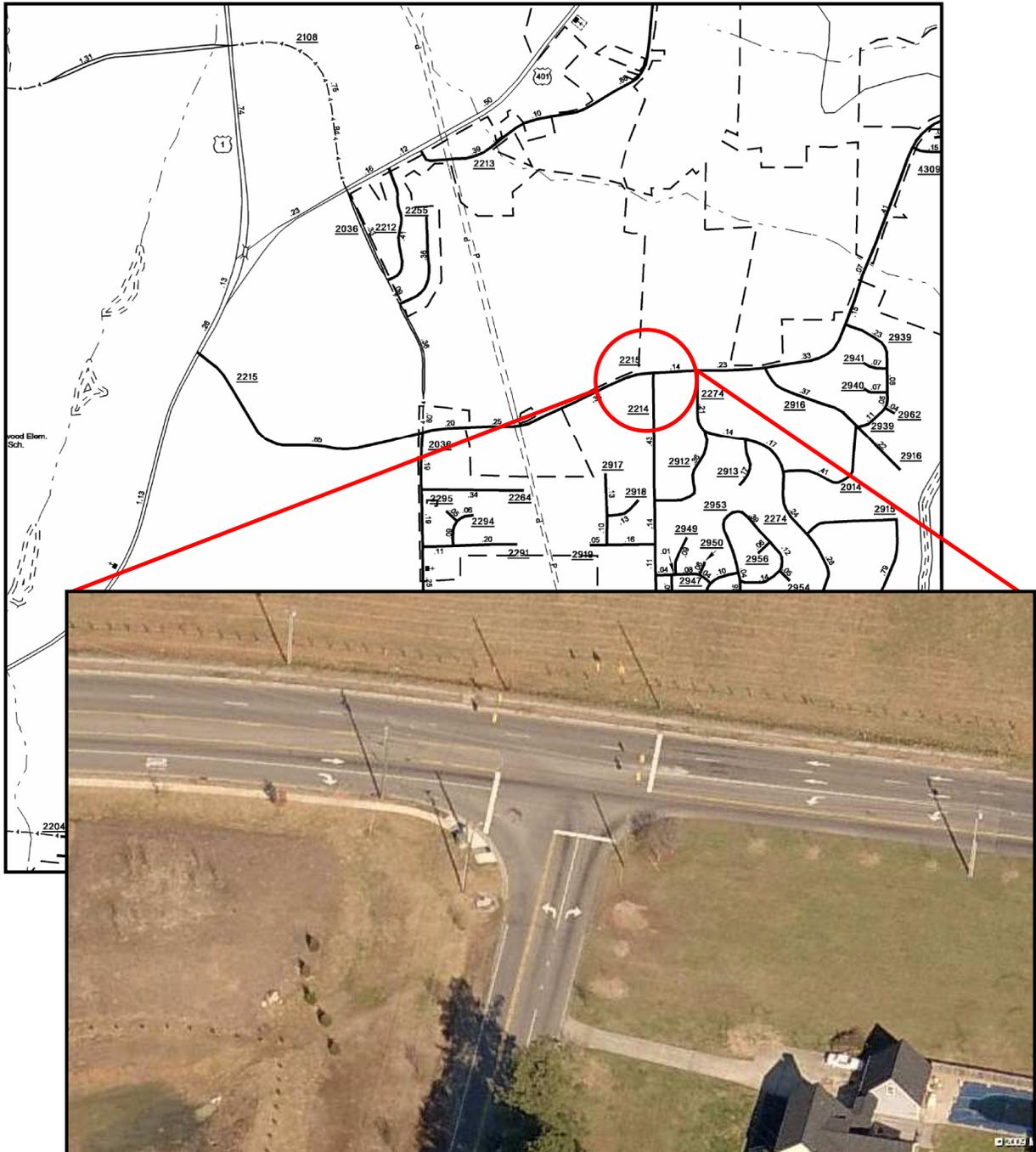
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 05-99-209 located at the Intersection of SR 2215 (Buffaloe Road) and SR 2214 (Southall Drive) in Wake County, in the City of Raleigh.

The Sig ID is 05-1780 for this newly installed traffic signal.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of an intersection traffic signal. Initially, SR 2215 and SR 2214 were both two-lane facilities at the subject intersection with no turn lanes and a speed limit of 45 mph on all approaches. In mid-2001, the intersection was part of a corridor improvement of SR 2215 (Buffaloe Road) to a five-lane curb and gutter section which provided a dedicated westbound left turn and eastbound right turn lane at this location. SR 2214 (Southall Drive) was also altered to provide both a left and right dedicated turn lanes through the upgrades. The widening project was completed by the City of Raleigh. The subject location is a three-leg intersection, which was controlled by a stop sign on SR 2214 (Southall Drive) in the before period.

The original statement of problem was that traffic volumes have increased to where motorists are having difficulty accessing this location safely. The intended purpose of the new traffic signal is to alleviate the intersection congestion and the existing left turn accident pattern. The intersection met signal warrants 9 and 11.

The initial crash analysis was completed from December 1, 1995 to November 30, 1998 with sixteen (16) reported crashes, four (4) of which were deemed correctable by the addition of the traffic signal. The final completion date for the improvement at the subject intersection was on August 5, 2003 with a total cost of \$55,000.00.

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 periods were the months of May through August 2001 for the widening of SR 2215 and August through September 2003 for the signal installation. This evaluation was divided into three time periods to accurately show the progression of intersection improvements. The ending date for this analysis was determined by the date of available crash data at the time of analysis.

2 Lane Before – Stop Control: May 1, 1998 to April 30, 2001 (3 Years)

5 Lane Before – Stop Control: September 1, 2001 to July 31, 2003 (1 Year, 11 Months)

After Period – Signal Control: October 1, 2003 to April 30, 2009 (5 Years, 7 Months)

The treatment data consisted of all crashes within 150 feet of the subject intersection. *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 Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; Angle; and Ran-off roadway as an collision avoidance measure.

<u>Treatment Information</u>	2-Ln Before 3.0 Yrs	5-Ln Before 1.92 Yrs	After Signal 5.58 Yrs
Total Crashes	20	14	18
Total Crashes per Year	6.67	7.29	3.23
Total Severity Index	3.96	3.11	3.88
Target Crashes – Frontal Impact	6	5	7
Target Crashes per Year	2.00	2.60	1.25
Target Crash Severity Index	2.23	2.48	6.29
Volume	16,700	17,700	17,000

<u>Injury Crash Summary</u> <u>Total Crashes</u>	2-Ln Before 3.0 Yrs	5-Ln Before 1.92 Yrs	After Signal 5.58 Yrs
Fatal injury Crashes	0	0	0
Class A injury Crashes	0	0	0
Class B injury Crashes	2	0	0
Class C Injury Crashes	6	4	7
Total Injury Crashes	8	4	7

The naive before and after analysis at the treatment location resulted in a 56 percent decrease in Total Crashes per year and a 52 percent decrease in Target Crashes per year from the 5-Lane Before period to the After Period. The before period ADT years were 1999 and 2002; the after period ADT year was 2006.

Results and Discussion

Referencing the *Collision Diagrams*, the 2-lane before period indicates two defined crash patterns including westbound SR 2215 rear-end collisions and left turning collisions from SR 2214. From the City of Raleigh widening project, the 5-lane before period shows elimination of the westbound rear-end crash pattern. Also in this period, left turning crashes from Southall Drive show a slight increase from 2.0 to 2.6 crashes per year. After the signal is installed, frontal impact crashes per year reduced by 52 percent. However, the majority (5 out of 7) that still occurred resulted from an eastbound SR 2215 (Buffaloe Road) vehicle running the red indication signal.

The calculated benefit to cost ratio for this project is **2.44 considering total crashes**. The benefit to cost ratio **considering only target crashes is (-0.18)**. The benefits are calculated using the change in annual crash costs from the 5-lane before period 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 for all three approaches to the treatment intersection. 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.

TREATMENT SITE PHOTOS TAKEN 1/27/2009



Traveling East on SR 2215 (Buffaloe Road)



Traveling East on SR 2215



Traveling West on SR 2215 (Buffaloe Road)



Traveling West on SR 2215



Traveling North on SR 2214 (Southall Drive)



Traveling North on SR 2214

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: SR 2214 at SR 2215		BY: JBS						
COUNTY: Wake		DATE: 6/4/2009						
FILE NO.: SS 05-99-209		NOTES: Total Crashes						
DETAILED COST:	TYPE IMPROVEMENT -	New Signal (5-Lane Before to After Periods)						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$55,000	10	0.149	\$8,197			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$55,000	10	0.149	\$8,197			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$11,297			
	TOTAL COST OF PROJECT=				\$55,000			
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	1.92	0	0.00	4	2.08	10	5.21	\$57,813
AFTER	5.58	0	0.00	7	1.25	11	1.97	\$30,269
							Annual Benefits from Crash Cost Savings	\$27,544
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	\$16,247
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	2.44
	TOTAL COST OF PROJECT	-	\$55,000	COMPREHENSIVE B/C RATIO	-			2.44

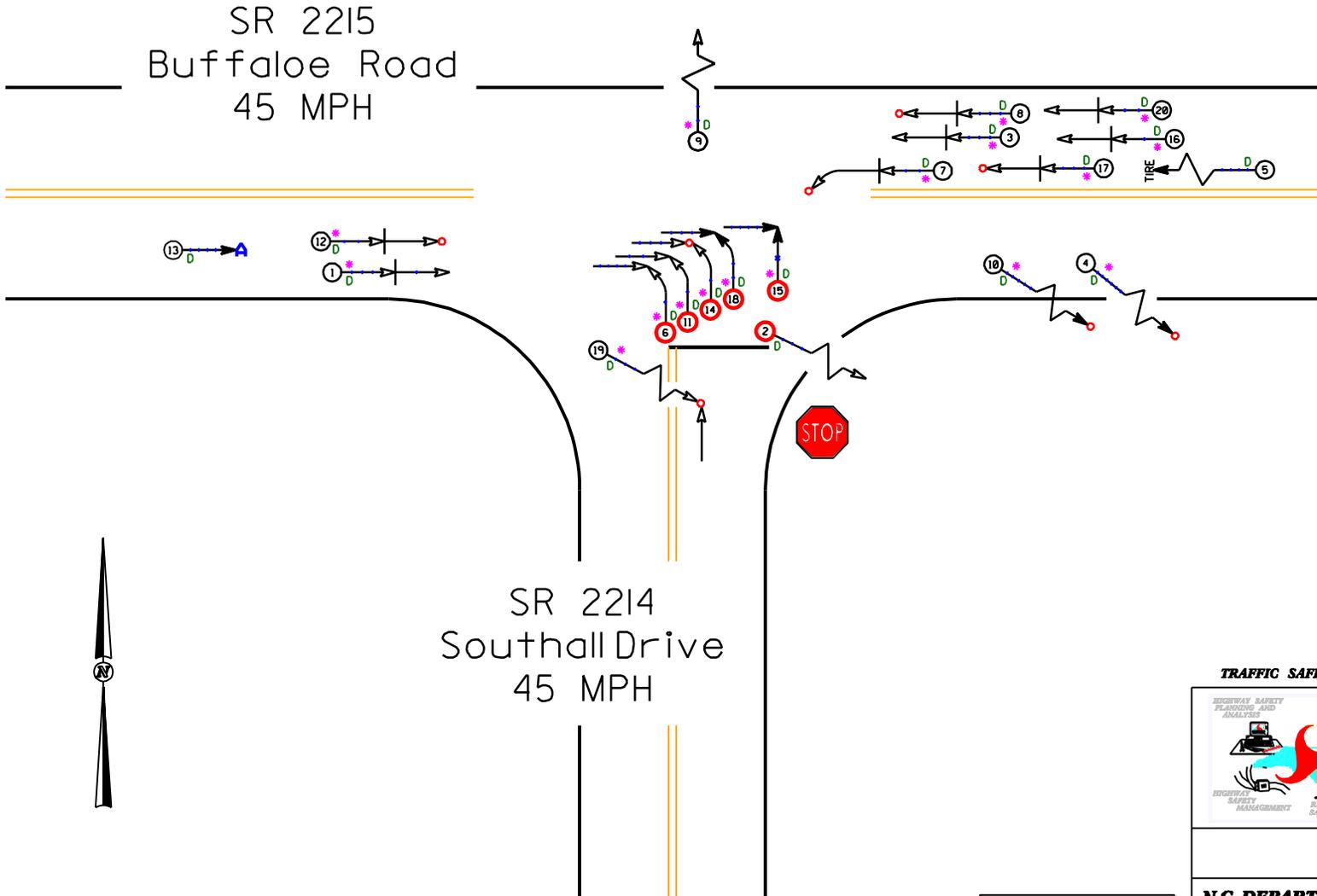
BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: SR 2214 at SR 2215		BY: JBS						
COUNTY: Wake		DATE: 6/4/2009						
FILE NO.: SS 05-99-209		NOTES: Target Crashes - Frontal Impact						
DETAILED COST:	TYPE IMPROVEMENT -	New Signal (5-Lane Before to After Periods)						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$55,000	10	0.149	\$8,197			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$55,000	10	0.149	\$8,197			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$11,297			
	TOTAL COST OF PROJECT=				\$55,000			
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	1.92	0	0.00	1	0.52	3	1.56	\$15,469
AFTER	5.58	0	0.00	5	0.90	2	0.36	\$17,527
							Annual Benefits from Crash Cost Savings	(\$2,058)
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	(\$13,355)
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	-0.18
	TOTAL COST OF PROJECT	-	\$55,000	COMPREHENSIVE B/C RATIO	-			-0.18

SS# 05-99-209
 Wake County (City of Raleigh)
 BEFORE Period - 2 Lanes
 5/1/98 - 4/30/01 (3 Years)

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PAKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		HURT		50 MPH TO 59		ICY OR SNOW
	REAR END		FATALITY		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD				70 AND UP		



Frontal Impact
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

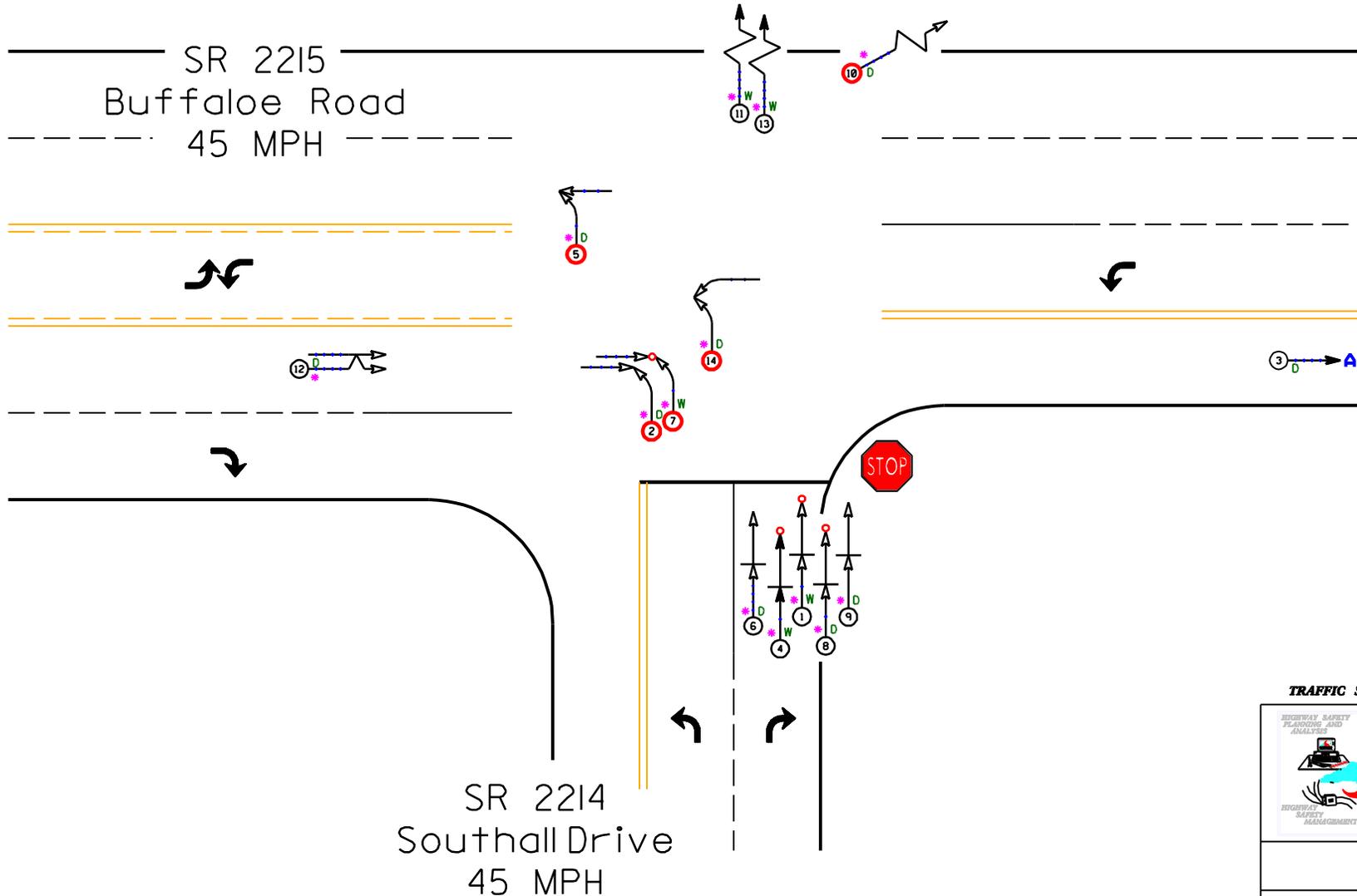
	COLLISION DIAGRAM	
	DIVISION 5	AREA:
	STUDY PERIOD: 5/1/98 - 4/30/2001	
	DISTANCE: Y-LINE + 150 FT	
	ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: N/A		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 6-3-2009		
LOG NUMBER: SS* 05-99-209 BEFORE 1		

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

SS# 05-99-209
 Wake County (City of Raleigh)
 BEFORE Period - 5 Lanes
 9/1/01 - 7/31/03 (1.92 Years)

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAM
	PARKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		HIT AND RUN		50 MPH TO 59		ICY OR SNOW
	REAR END		INJURY		60 MPH TO 69		FATALITY
	RAN OFF ROAD		SPEED UNKNOWN		9 MPH OR LESS		ONLY



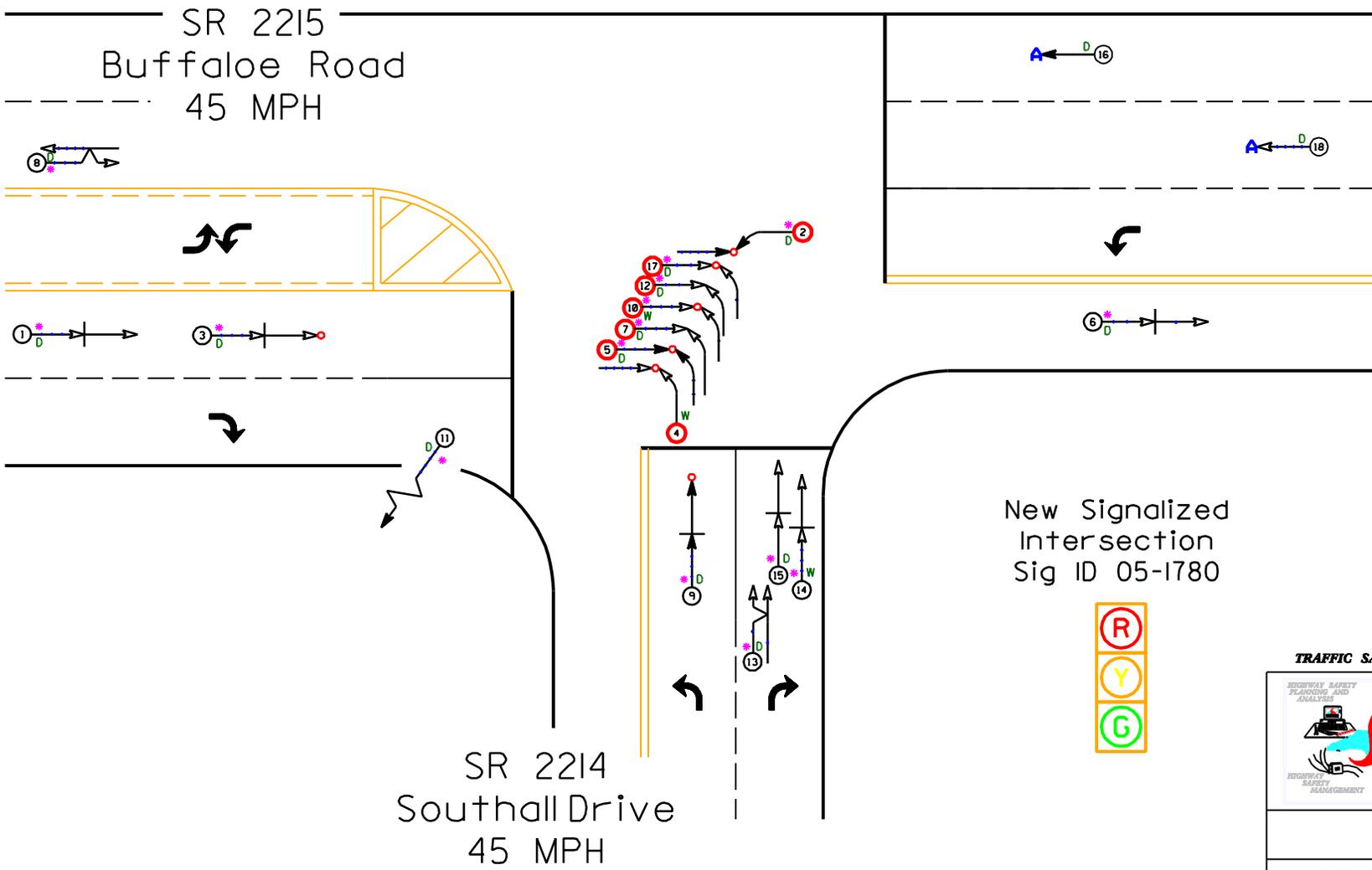
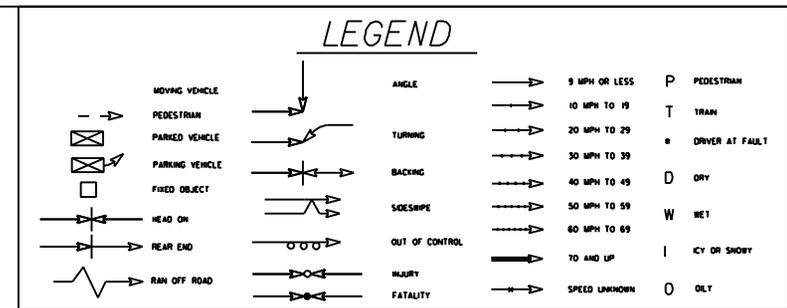
Frontal Impact
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION 5	AREA:
	STUDY PERIOD: 9/1/2001 - 7/31/2003	
	DISTANCE: Y-LINE + 150 FT	
	ANALYSIS PREPARED BY: JBS	
	ANALYSIS CHECKED BY: N/A	
	DIAGRAM PREPARED BY: JBS	
	DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE		
DATE: 6-3-2009		
LOG NUMBER: SS* 05-99-209 BEFORE 2		

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

SS# 05-99-209
 Wake County (City of Raleigh)
 After Period - 5 Lanes
 10/1/03 - 4/30/09 (5.58 Years)



Frontal Impact
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION 5	AREA:
STUDY PERIOD: 10/1/2003 - 4/30/2009	
DISTANCE: Y-LINE + 150 FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: N/A	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 6-3-2009	
LOG NUMBER: SS* 05-99-209 AFTER	

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