Spot Safety Project Evaluation

Order # 41000004227

Spot Safety Project # 09-01-214

Spot Safety Project Evaluation of the Traffic Signal Modification
SR 2632 (Old Salem Rd / Sedge Garden Rd) at SR 2643 (Union Cross Rd)
Forsyth County

Documents Prepared By:

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

Principal Investigator

_____ 2-22-2010

Jason B. Schronce Date

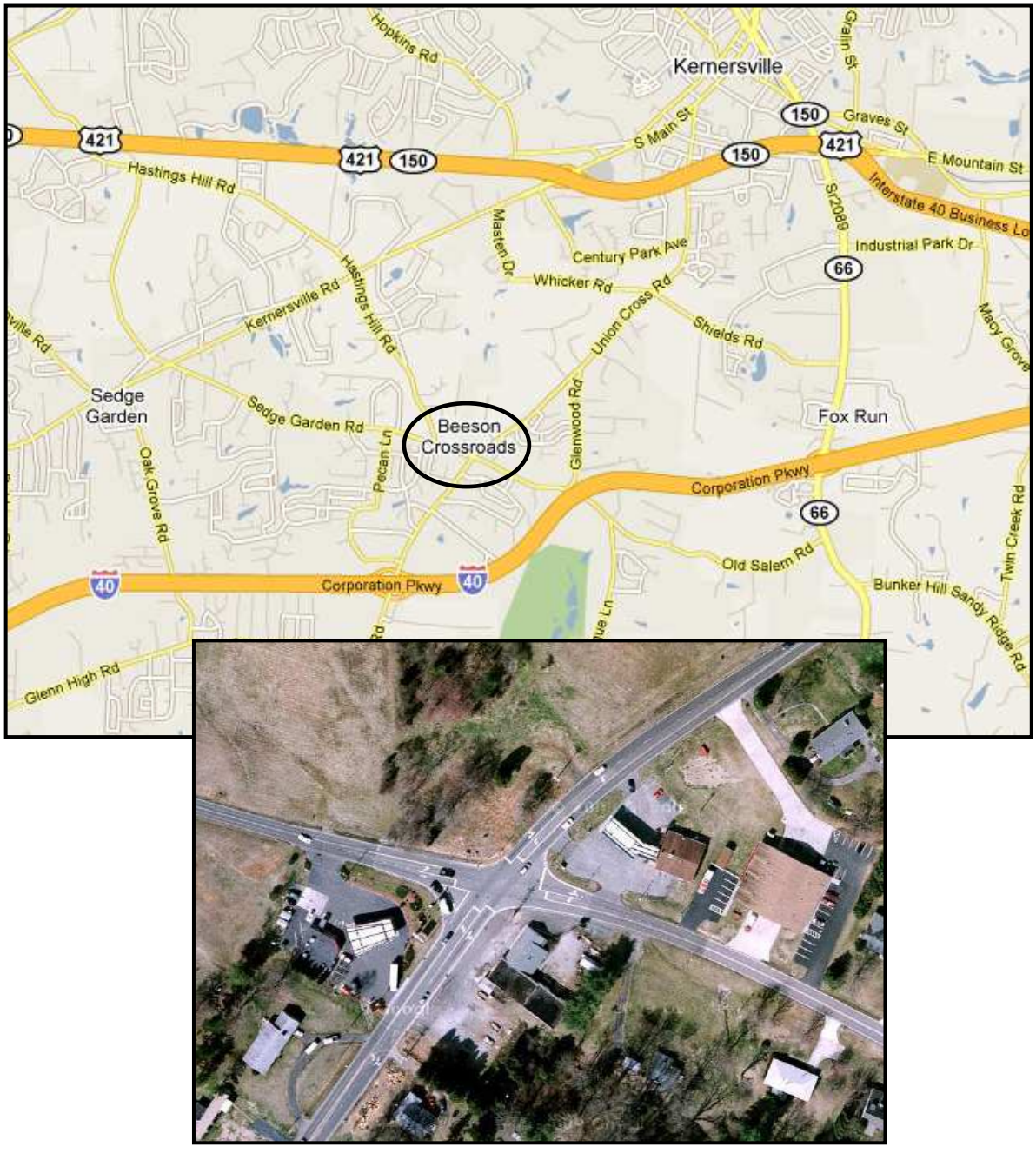
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 09-01-214 located at the Intersection of SR 2632 (Sedge Garden Road / Old Salem Road) and SR 2643 (Union Cross Road) in Forsyth County, south of the City of Kernersville (also known as Beeson Crossroads).

The Sig ID is 09-0649 for this modified traffic signal.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the signal modification to include a protected/permissive left turn phase for westbound SR 2632 (Old Salem Rd). SR 2632 and SR 2643 are both two-lane facilities at the subject intersection with speed limits of 45 mph and left turn lanes on all approaches. The subject location is a four-leg crossroads intersection, which has been signalized since 1986.

The statement of problem was the enhanced delay on the east approach of Old Salem Road due to an increase of left turn movements generated by the opening of the new middle school. This countermeasure was to correct congestion and delay issues with minimum safety impact.

The initial crash analysis was completed from October 1, 1998 to October 1, 2001 with seventeen (17) reported crashes, none of which were deemed correctable. The final completion date for the improvement at the subject intersection was on February 27, 2004 with a total cost of $7,500.

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 were the months of January through March 2004. The before period consisted of reported crashes from July 1, 2001 through December 31, 2003 (2 years and 6 months); and the after period consisted of reported crashes from April 1, 2004 through November 30, 2009 (5 years and 8 months).

The before period for this analysis was limited by the installation of left turn lanes on all approaches under Spot Safety # 09-98-216 completed on June 29, 2001. The ending date was determined with the available crash data at the time of analysis.

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 Westbound Left-Turn Same Roadway collisions were the target crashes for the applied countermeasure.

Treatment Information	**Before 2.50 Yrs**	**After 5.67 Yrs**	**Percent Reduction (-) Percent Increase (+)**
Total Crashes	11	27	
Total Crashes Per Year	4.40	4.76	6.8 %
Total Severity Index	3.69	3.47	- 6.0 %
Target Crashes	0	1	
Target Crashes Per Year	0.00	0.18	100.0 %
Target Crash Severity Index	0.00	8.40	100.0 %
Volume	20,400	20,600	1.0 %

Injury Crash Summary	Before 2.50 Yrs	After 5.67 Yrs	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	
Class A injury Crashes	0	0	
Class B injury Crashes	0	2	
Class C Injury Crashes	4	7	
Total Injury Crashes	4	9	
Injury Crashes Per Year	1.6	1.6	0.0 %

The naive before and after analysis at the treatment location resulted in a 7 percent increase in Total Crashes per year but a 6 percent decrease in the Total Severity Index. The before period ADT year was 2002 and the after period ADT year was 2007.

Results and Discussion

Referencing the *Collision Diagrams* and the tables above, the intersection has maintained a consistent crash performance through the analysis with a seven (7) percent increase in total crashes per year and zero (0) percent change in the injury crashes per year. This location experienced zero westbound SR 2632 (Old Salem Rd) left turn-same roadway crashes in the before period and only one (1) in the after period.

Examining the after period collision diagram, there are a few crash patterns represented. The intersection had five (5) vehicles run the red indication signal and four (4) rear-end collisions at the eastbound right turn slip lane. Also, the left turn-same road crash pattern for eastbound vehicles turning north on SR 2643 consisted of six (6) after period collisions.

The calculated benefit to cost ratio for this project is **(-0.84) considering total crashes**. The benefit to cost ratio **considering only target crashes is (-2.16)**. 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 are provided from Google Street View for all four 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

Traveling West on SR 2632 (Old Salem Road)

Traveling West on SR 2632 (Old Salem Road) at intersection
New Signal Head for Protected/Permitted Left Turns

Looking South on SR 2643 (Union Cross Road)

Looking North on SR 2643 (Union Cross Road)

Looking East on SR 2632 (Sedge Garden Road)

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: SR 2632 at SR 2643 | BY: JBS
COUNTY: Forysth | DATE: 2/22/2010
FILE NO.: SS 09-01-214 | NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - Signal Modifications

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$7,500	10	0.149	$1,118
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$7,500	10	0.149	$1,118

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $200
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $150

TOTAL ANNUAL COST= $1,468
TOTAL COST OF PROJECT= $7,500

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	2.50	0	0.00	4	1.60	7	2.80	$39,720
AFTER	5.67	0	0.00	9	1.59	18	3.17	$40,952

Annual Benefits from Crash Cost Savings ($1,232)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($2,700)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -0.84

TOTAL COST OF PROJECT - $7,500 COMPREHENSIVE B/C RATIO - -0.84

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: SR 2632 at SR 2643 | BY: JBS
COUNTY: Forysth | DATE: 2/22/2010
FILE NO.: SS 09-01-214 | NOTES: Target Crashes - WB Left Turn-Same Rd

DETAILED COST: TYPE IMPROVEMENT - Signal Modifications

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$7,500	10	0.149	$1,118
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$7,500	10	0.149	$1,118

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $200
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TOTAL ANNUAL COST= $1,468
TOTAL COST OF PROJECT= $7,500

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

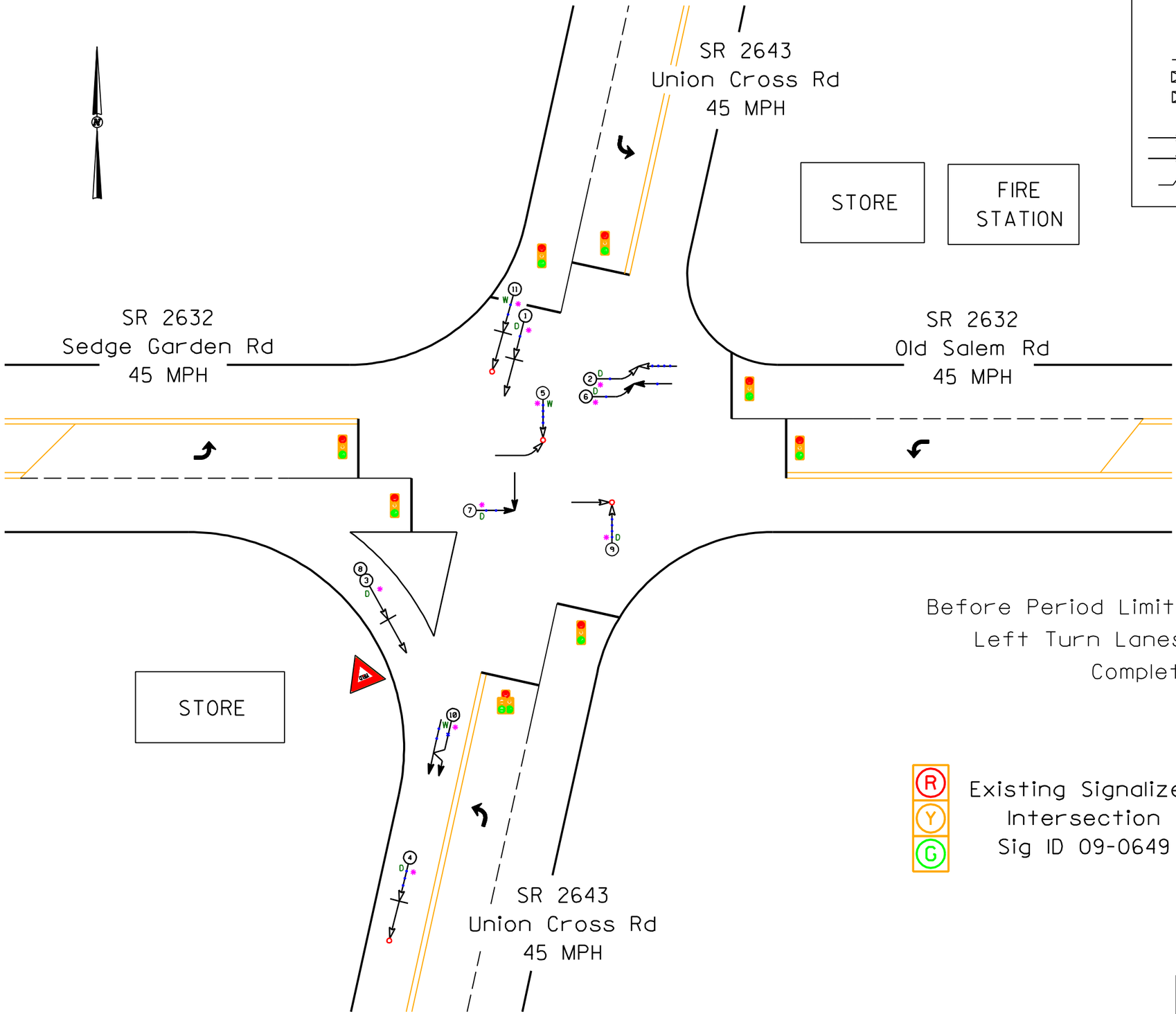
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	2.50	0	0.00	0	0.00	0	0.00	$0
AFTER	5.67	0	0.00	1	0.18	0	0.00	$3,175

Annual Benefits from Crash Cost Savings ($3,175)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($4,642)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -2.16

TOTAL COST OF PROJECT - $7,500 COMPREHENSIVE B/C RATIO - -2.16



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

SS# 09-01-214
Forsyth County
BEFORE Period
7/1/01 - 12/31/03
2.50 Years

Before Period Limited by the installation of
Left Turn Lanes under SS# 09-98-216;
Completed 6-29-2001

R Y G Existing Signalized Intersection
Sig ID 09-0649

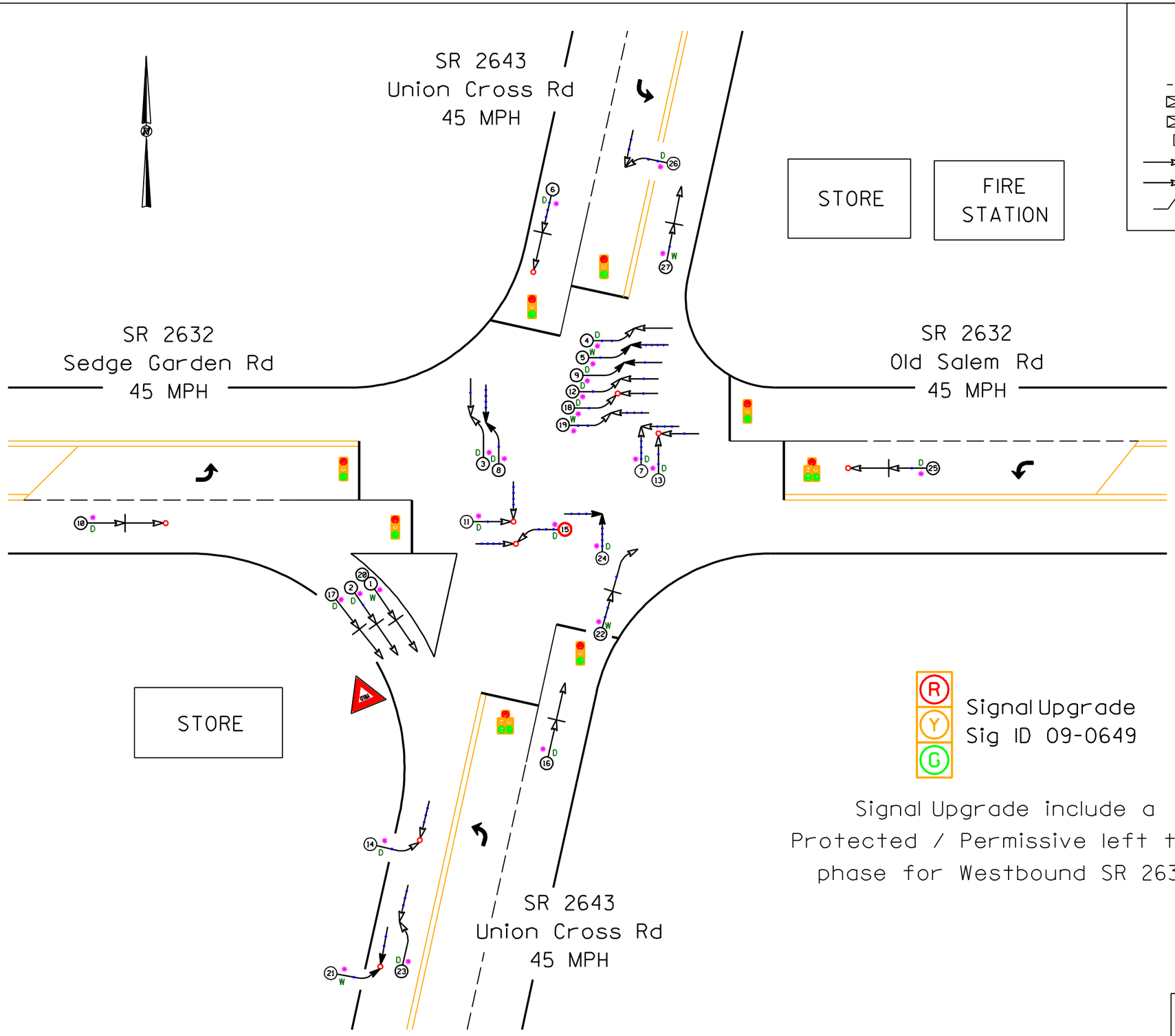
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

HIGHWAY SAFETY PLANNING AND ANALYSIS | HIGHWAY SAFETY IMPROVEMENT PROGRAM | HIGHWAY SAFETY MANAGEMENT | RAILROAD-HIGHWAY SAFETY MANAGEMENT

COLLISION DIAGRAM	
DIVISION: 9	AREA:
STUDY PERIOD: 7/1/2001 - 12/31/2003	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: N/A	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 1-27-2010	
LOG NUMBER: SS# 09-01-214 BEFORE	

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



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T TRAIN
* DRIVER AT FAULT
D DRY
W WET
I ICY OR SNOWY
O OILY

SS# 09-01-214
Forsyth County
AFTER Period
4/1/04 - 11/30/09
5.67 Years

Signal Upgrade
Sig ID 09-0649

Signal Upgrade include a
Protected / Permissive left turn
phase for Westbound SR 2632

Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 9	AREA:
STUDY PERIOD: 4/1/2004 - 11/30/2009	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: N/A	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 1-28-2010	
LOG NUMBER: SS# 09-01-214 AFTER	

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