

Spot Safety Project Evaluation

Project Log # 200704333

Spot Safety Project # 12-98-048

**Spot Safety Project Evaluation of the Traffic Signal and
Left Turn Lane Installation at the Intersection of US 29/74 (Franklin Blvd)
and SR 1135 (Shannon Bradley Rd / Patterson Circle)
City of Gastonia, Gaston County**

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

3-24-2009

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 12-98-048 located at the Intersection of US 29-74 (Franklin Blvd) and SR 1135 (Shannon Bradley Rd / Patterson Circle) in Gaston County.

The Sig ID for this location is 12-1124.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location were the installation of a multi-phase, actuated traffic signal and mainline left turn lanes. In the study period, US 29-74 (Franklin Blvd) was a four lane divided highway with a 55 mph speed limit and no pre-existing left turn lanes at this intersection. The median width along this section is approximately 90 feet. SR 1135 (Shannon Bradley Road) is a standard two-lane road segment with a posted city speed limit of 35 mph. Patterson Circle is an unmarked paved residential two lane roadway with non-posted city speed limit of 35 mph.

The original statement of problem was the excessive side street delay on SR 1135 and left turn delay on the mainline. The goal was to alleviate the accident patterns and reduce side street delay. This intersection met signal warrants 2, 9, and 11.

The initial crash analysis was completed from September 1, 1995 to August 31, 1998 with twenty-one (21) reported crashes, ten (10) which were deemed correctable with the countermeasures. The final completion date for the improvement at the subject intersection was on February 28, 2001 with a total cost of \$115,000.00.

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 for this intersection was from December 1, 2000 to May 31, 2001. The before period consisted of reported crashes from May 1, 1993 through November 30, 2000 (7 years and 7 months) and the after period consisted of reported crashes from June 1, 2001 through December 31, 2008 (7 years and 7 months). The ending date for this analysis was determined by the date of 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 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; and Angle.

<u>Treatment Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	55	49	- 10.9 %
Total Severity Index	5.34	4.96	- 7.1 %
Target Crashes	16	17	6.3 %
Target Crash Severity Index	4.70	3.61	- 23.2 %
Volume	18,100	18,300	1.1 %
<u>Injury Crash Summary</u>			
Fatal injury Crashes	1	0	- 100.0 %
Class A injury Crashes	0	1	100.0 %
Class B injury Crashes	3	3	0.0 %
Class C Injury Crashes	19	13	- 31.6 %
Total Injury Crashes	23	17	- 26.1 %

The naive before and after analysis at the treatment location resulted in an 11 percent decrease in Total Crashes, a 6 percent increase in Target Crashes, and a 7 percent decrease in the Total Injury Crashes. The before period ADT year was 1998 and the after period ADT year was 2004.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in an 11 percent decrease in Total Crashes and a 6 percent increase in Target Crashes. The summary results above demonstrate that Total Crashes and Crash Severity appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, a large portion of the frontal impact crashes at the intersection in the before period (11 of 15) were the result of a vehicle improperly crossing the westbound lanes of US 29-74 between the median crossover and SR 1135. In the before period, it was assumed this angle pattern was, in part, due to the vertical curvature and limited sight distance. Approaching the intersection from the westbound direction yields little sight distance of the signal as seen in photos 4 and 5. Dual posted "Signal Ahead" warning signs have been installed with yellow warning flags to alert drivers of the approaching intersection. These signs were installed by the City of Gastonia shortly after the signal installation was complete.

After the signal installation, the pattern at the westbound lanes of US 29-74 remained consistent with 13 crashes from vehicles running the red light. Of these 13 crashes, five (5) resulted from southbound SR 1135 motorists running the red light and six (6) from westbound US 29-74 vehicles.

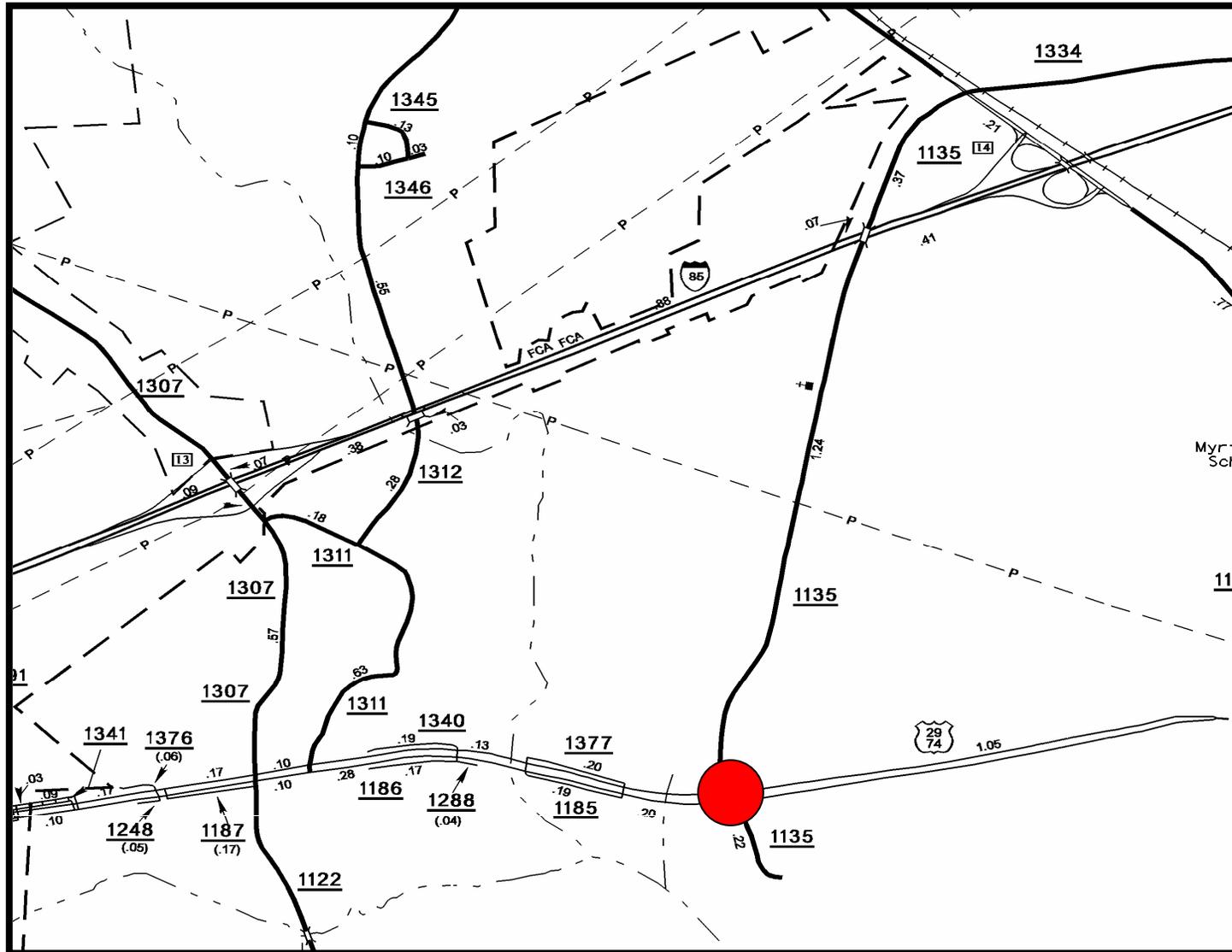
Rear-end crashes at the intersection have also increased at this location. The westbound approach increased from seven (7) rear-end crashes in the before period due to turning motorists to nine (9) in the after period. The eastbound approach of Franklin Blvd also increased from two (2) to seven (7) rear-end collisions.

The calculated benefit to cost ratio for this project is **0.70 considering total crashes**. The benefit to cost ratio **considering only target crashes is 0.16**. 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 for all approaches to the treatment intersection. Notice the steep elevation change from the westbound and eastbound lanes of US 29-74 along with the signal head placement.

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.

**Location Map
Gaston County
Evaluation of Spot Safety Project # 12-98-048**



Treatment Location: US 29 / 74 (Franklin Blvd) at SR 1135 (Shannon Bradley Rd / Patterson Circle)

**SS# 12-98-048 Aerial
City of Gastonia**



TREATMENT SITE PHOTO TAKEN 7/11/2007



Traveling East on US 29/74 (Franklin Blvd)



Traveling East on Franklin Blvd



Traveling West on US 29/74 (Franklin Blvd)



Traveling West on Franklin Blvd – Advance Warning with Flags



Traveling West on Franklin Blvd



Traveling South on SR 1135 (Shannon Bradley Road)



Traveling North on Patterson Circle



Median Storage Area with Double Set of Signals

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 29/74 at SR 1135
 COUNTY: Gaston
 FILE NO.: SS 12-98-048

BY: JBS
 DATE: 3/19/2009
 NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$115,000	10	0.149	\$17,138
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$115,000	10	0.149	\$17,138

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,400
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900
 TOTAL ANNUAL COST= \$20,438
 TOTAL COST OF PROJECT= \$115,000

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	7.58	1	0.13	22	2.90	32	4.22	\$134,670
AFTER	7.58	1	0.13	16	2.11	32	4.22	\$120,422

Annual Benefits from Crash Cost Savings \$14,248

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$6,190)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 0.70

TOTAL COST OF PROJECT - \$115,000 COMPREHENSIVE B/C RATIO - 0.70

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 29/74 at SR 1135
 COUNTY: Gaston
 FILE NO.: SS 12-98-048

BY: JBS
 DATE: 3/19/2009
 NOTES: Target Crashes

DETAILED COST: TYPE IMPROVEMENT - New Signal

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 TOTAL ANNUAL COST= \$20,438
 TOTAL COST OF PROJECT= \$115,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

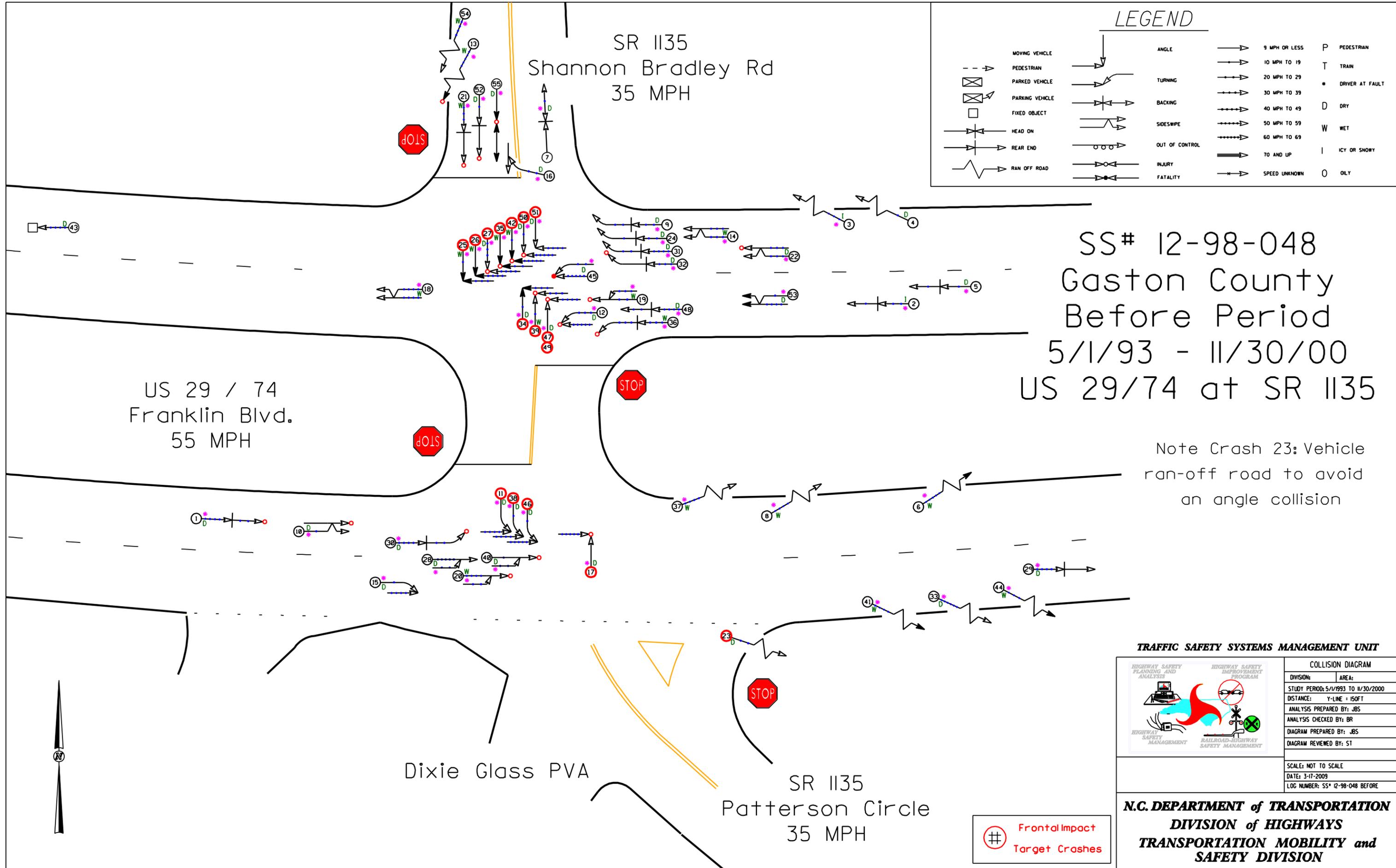
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	7.58	0	0.00	8	1.06	8	1.06	\$23,113
AFTER	7.58	0	0.00	6	0.79	11	1.45	\$19,908

Annual Benefits from Crash Cost Savings \$3,206

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$17,233)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 0.16

TOTAL COST OF PROJECT - \$115,000 COMPREHENSIVE B/C RATIO - 0.16



SS# 12-98-048
 Gaston County
 Before Period
 5/1/93 - 11/30/00
 US 29/74 at SR 1135

Note Crash 23: Vehicle
 ran-off road to avoid
 an angle collision

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION:	AREA:
STUDY PERIOD: 5/1/1993 TO 11/30/2000	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 3-17-2009	
LOG NUMBER: SS* 12-98-048 BEFORE	

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

⊕ Frontal Impact
 ⊕ Target Crashes

SR 1135
Shannon Bradley Rd
35 MPH

US 29 / 74
Franklin Blvd.
45 MPH

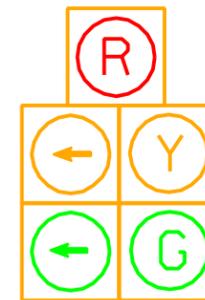
Dixie Glass PVA

SR 1135
Patterson Circle
35 MPH

SS# 12-98-048
Gaston County
After Period
6/1/01 - 12/31/08
US 29/74 at SR 1135

LEGEND

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



Frontal Impact
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION:	AREA:
	STUDY PERIOD: 6/1/2001 TO 12/31/2008	
	DISTANCE: Y-LINE = 150FT	
	ANALYSIS PREPARED BY: JBS	
	ANALYSIS CHECKED BY: BR	
	DIAGRAM PREPARED BY: JBS	
	DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE		
DATE: 3-17-2009		
LOG NUMBER: SS* 12-98-048 AFTER		

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

