

# Spot Safety Project Evaluation

Order # 41000000569

Spot Safety Project # 12-03-202

**Spot Safety Project Evaluation of the Traffic Signal Phase Changes  
US 29/74 (Franklin Blvd) and SR 2339 (Church Street)  
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**



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Jason B. Schronce

9-21-2009

Date

Traffic Safety Project Engineer

# Spot Safety Project Evaluation Documentation

## Subject Location

Evaluation of Spot Safety Project Number 12-03-202 located at the Intersection of US 29/74 (Franklin Boulevard) and SR 2329 (Church Street) in Gaston County, in the City of Gastonia next to the Franklin Square Shopping Plaza Center.

The Sig ID is 12-1563 for this existing intersection traffic signal.



## Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the conversion to left turn protected-only signal phasing for both US 29/74 approaches. US 29/74 (Franklin Blvd) is a six-lane curb and gutter facility with a raised concrete median, additional left turn lanes at the intersection, and a speed limit of 50 mph. SR 2339 (Church Street) is a two-lane facility with an additional right turn lane at the intersection and a speed limit of 35 mph. The subject location is a four-leg intersection under signal control and provides access to many retail and commercial establishments.

The original statement of problem was an existing left turn-same roadway crash pattern at the intersection. The crash pattern was created by inadequate gaps in traffic on this high volume roadway operating under permissive signal control. The intended purpose was to alleviate crashes.

The initial crash analysis was completed from April 15, 2000 to April 15, 2003 with sixty-seven (67) reported crashes, thirty-two (32) of which were deemed correctable including one fatality crash. The final completion date for the improvement at the subject intersection was on September 22, 2004 with a total cost of \$22,600.

## 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 September through October 2004. The before period consisted of reported crashes from January 1, 2000 through August 31, 2004 (4 years and 8 months); and the after period consisted of reported crashes from November 1, 2004 through June 30, 2009 (4 years and 8 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 US 29/74 Left Turn-Same Roadway Crashes were the target crashes for the applied countermeasure. US 29/74 u-turn collisions were also included as target crashes because they involve making the same basic driving maneuver and are protected by the new signal phase.

<b><u>Treatment Information</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total crashes	72	29	- 59.7 %
Total Severity Index	4.52	4.57	1.1 %
Target Crashes	41	2	- 95.1 %
Target Crash Severity Index	6.10	4.70	- 23.0 %
Volume	28,800	28,400	- 1.4 %

<u>Injury Crash Summary</u>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Fatal injury Crashes	1	0	- 100.0 %
Class A injury Crashes	0	0	N/A
Class B injury Crashes	5	3	- 40.0 %
Class C Injury Crashes	19	11	- 42.1 %
Total Injury Crashes	25	14	- 44.0 %

The naive before and after analysis at the treatment location resulted in a 60 percent decrease in Total Crashes, a 95 percent decrease in Target Crashes, but a 1 percent increase in the Total Severity Index. The before period ADT year was 2002 and the after period ADT year was 2007.

## **Results and Discussion**

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 60 percent decrease in Total Crashes and a 95 percent decrease in Target Crashes. The summary results above demonstrate that both Total and Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the before period intersection left turn-same roadway crash pattern was the most defined and consisted of forty-one (41) collisions, including the motorcycle fatality crash. After the signal phase change to protected only lefts from US 29/74, this pattern was successfully reduced to just two (2) collisions. The two after period target crashes resulted from a westbound Franklin Boulevard motorist running the red indication signal. Collisions at this location in the after period appear to be random in nature and mainly consist of vehicles accessing the surrounding PVAs.

The calculated benefit to cost ratio for this project is **46.35 considering total crashes**. The benefit to cost ratio **considering only target crashes is 51.14**. 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 the three roadway 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



Looking West on US 29/74 facing intersection



Looking East on US 29/74 facing intersection



Looking South on SR 2339 (Church Street) approaching US 29/74

**BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes**

LOCATION: US 29/74 at SR 2339		BY: JBS						
COUNTY: Gaston		DATE: 9/16/2009						
FILE NO.: SS 12-03-202		NOTES: Total Crashes						
DETAILED COST:	TYPE IMPROVEMENT - Signal Phase Change - US 29/74 Protected Lefts							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$22,600	10	0.149	\$3,368			
	Right-of-Way	\$0	0	0.000	\$0			
		\$0	0	0.000	\$0			
	TOTALS	\$22,600	10	0.149	\$3,368			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$150			
	TOTAL ANNUAL COST=				\$3,718			
	TOTAL COST OF PROJECT=				\$22,600			
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	4.67	1	0.21	24	5.14	47	10.06	\$238,822
AFTER	4.67	0	0.00	14	3.00	15	3.21	\$66,488
							Annual Benefits from Crash Cost Savings	\$172,334
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	\$168,616		
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	46.35		
	TOTAL COST OF PROJECT	-	\$22,600		COMPREHENSIVE B/C RATIO	-		46.35

**BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes**

LOCATION: US 29/74 at SR 2339		BY: JBS						
COUNTY: Gaston		DATE: 9/16/2009						
FILE NO.: SS 12-03-202		NOTES: Target Crashes - US 29/74 Left Turn-Same Rd						
DETAILED COST:	TYPE IMPROVEMENT - Signal Phase Change - US 29/74 Protected Lefts							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$22,600	10	0.149	\$3,368			
	Right-of-Way	\$0	0	0.000	\$0			
		\$0	0	0.000	\$0			
	TOTALS	\$22,600	10	0.149	\$3,368			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$150			
	TOTAL ANNUAL COST=				\$3,718			
	TOTAL COST OF PROJECT=				\$22,600			
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	4.67	1	0.21	18	3.85	22	4.71	\$194,818
AFTER	4.67	0	0.00	1	0.21	1	0.21	\$4,690
							Annual Benefits from Crash Cost Savings	\$190,128
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	\$186,410		
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	51.14		
	TOTAL COST OF PROJECT	-	\$22,600		COMPREHENSIVE B/C RATIO	-		51.14

Gas Station

SR 2339  
Church Street  
35 MPH

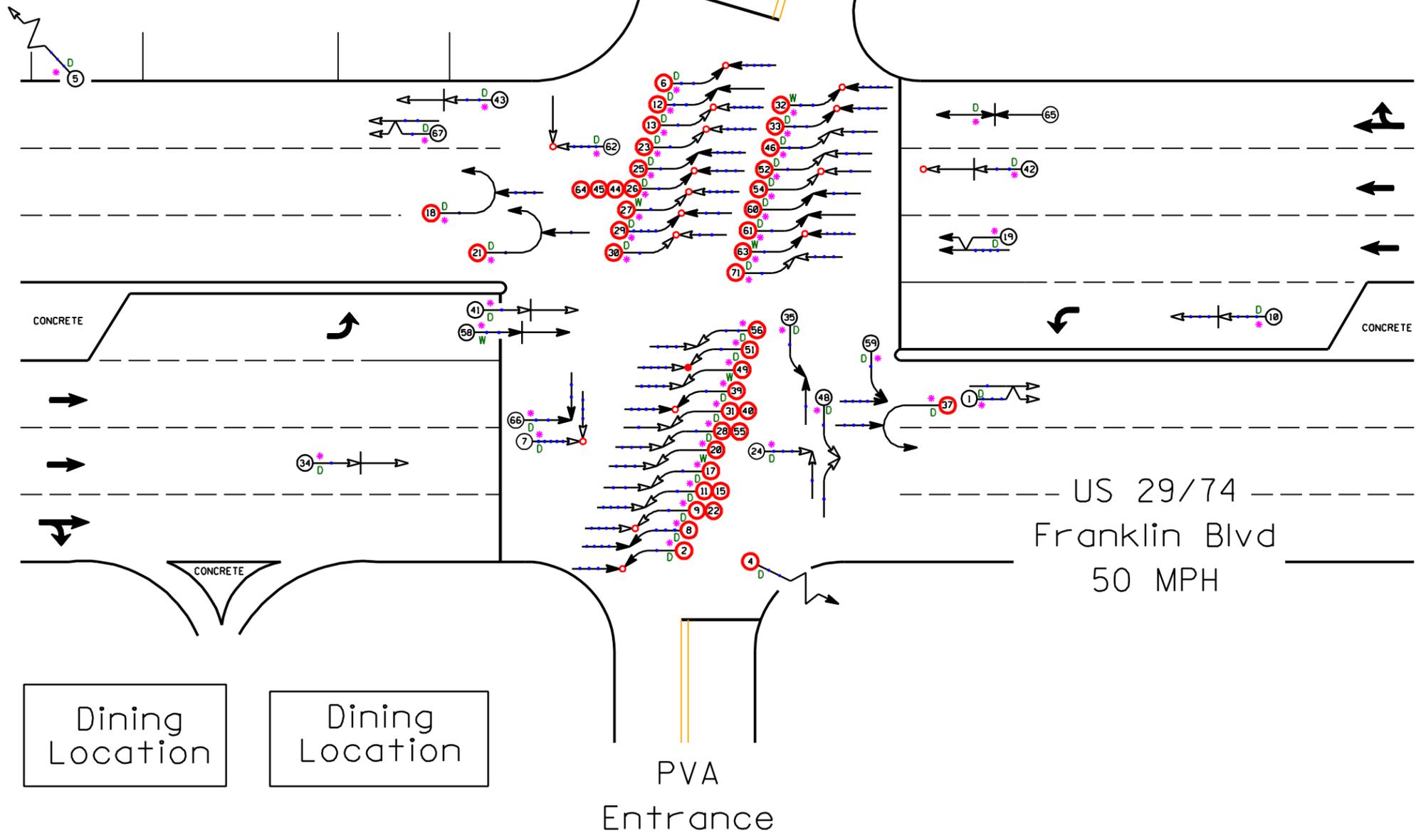
PVA

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		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		INJURY		50 MPH TO 59		ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		70 AND UP
	RAN OFF ROAD		SPEED UNKNOWN		80 AND UP		OILY

SS# 12-03-202  
Gaston County  
City of Gastonia  
BEFORE Period  
1/1/00 - 8/31/04

Existing  
Traffic Signal  
Sig ID 12-1563



Left Turn - Same Rd  
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 12	AREA:
	STUDY PERIOD: 1/1/2000 - 8/31/2004	
	DISTANCE: Y-LINE = 150 FT	
	ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 9-16-2009		
LOG NUMBER: SS* 12-03-202 BEFORE		

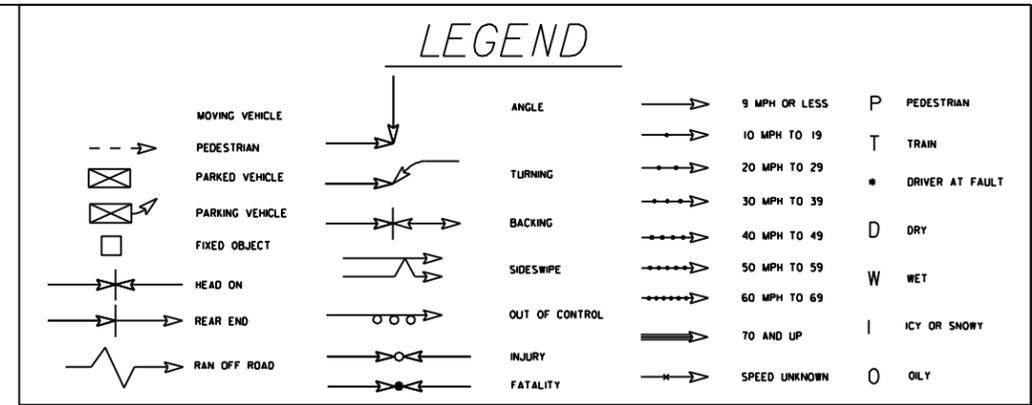
**N.C. DEPARTMENT of TRANSPORTATION**  
**DIVISION of HIGHWAYS**  
**TRANSPORTATION MOBILITY and**  
**SAFETY DIVISION**

Gas Station

SR 2339  
Church Street  
35 MPH

PVA

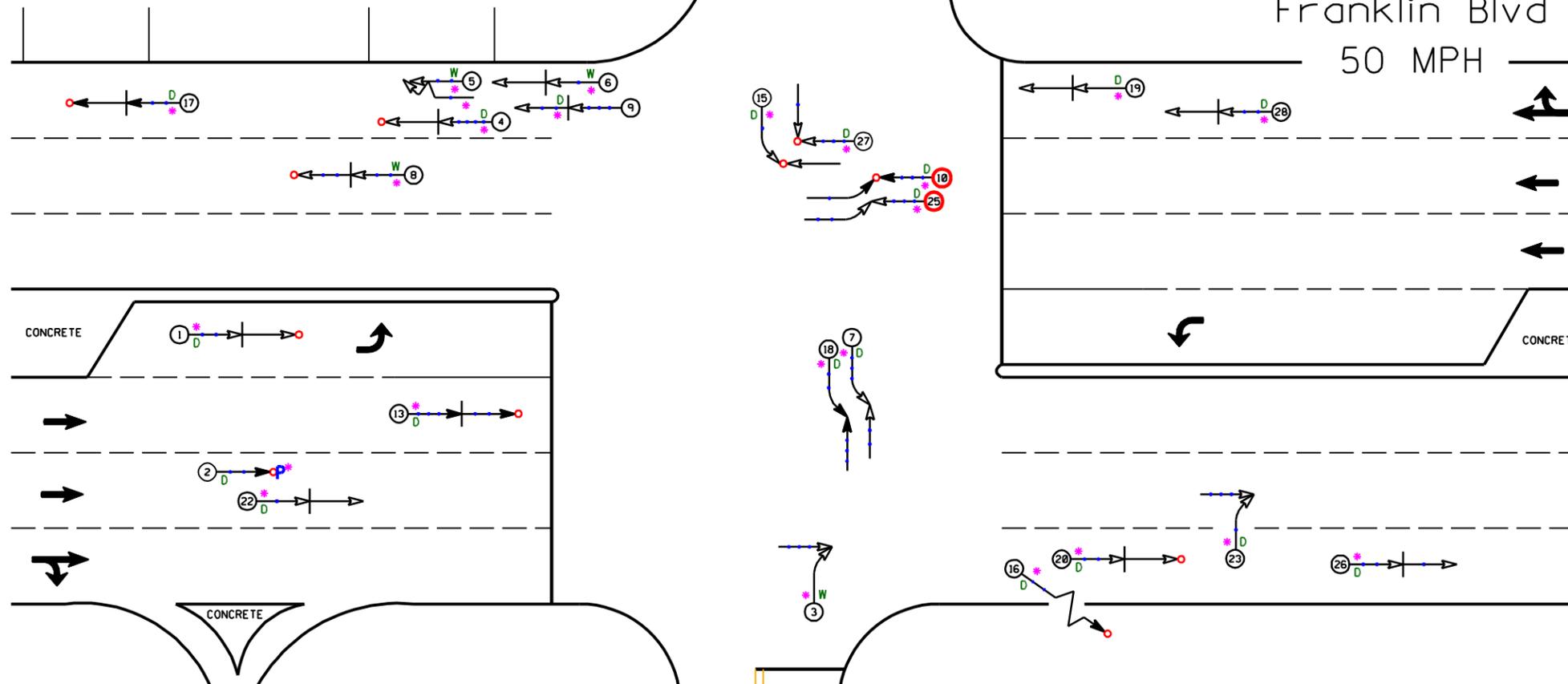
US 29/74  
Franklin Blvd  
50 MPH



SS# 12-03-202  
Gaston County  
City of Gastonia  
AFTER Period  
11/1/04 - 6/30/09



Upgrade  
Traffic Signal  
Sig ID 12-1563  
US 29/74 Protected Lefts



Dining Location

Dining Location

PVA  
Entrance



Left Turn - Same Rd  
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT	
COLLISION DIAGRAM	
DIVISION: 12	AREA:
STUDY PERIOD: 11/1/2004 - 6/30/2009	
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: 9-16-2009	
LOG NUMBER: SS* 12-03-202 AFTER	

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