

Spot Safety Project Evaluation

Project Log # 200812182

Spot Safety Project # 10-01-213 (10-00-212)

**Spot Safety Project Evaluation of the Traffic Signal and Left Turn Lane Installation
At the Intersection of SR 2004 (Mt. Holly-Huntersville Road) and
SR 2113 (Vance Road / W.T. Harris Boulevard)
Mecklenburg County, City of Charlotte**

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

4-6-2009

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 10-01-213 located at the Intersection of SR 2004 (Mt. Holly-Huntersville Rd) and SR 2113 (Vance Road / W.T. Harris Blvd) in Mecklenburg County.

The Sig ID is 10-1780 for the subject intersection.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the widening of both SR 2004 and SR 2113 to provide left turn lanes at the intersection and also install the traffic signal funded by Spot Safety Project 10-00-212. In the before period, SR 2004 (Mt. Holly-Huntersville Rd) and SR 2113 (Vance Road / W.T. Harris Blvd) were both two-lane facilities at the subject intersection with no turn lanes and speed limits of 45 mph on all approaches. The subject location is a three-leg intersection, which was controlled by a stop sign on SR 2113.

The original statement of problem for the signal installation by SS# 10-00-212 was a pattern of frontal impact collisions related to vehicles entering a high volume roadway. Also, a few motorists had ran-off the roadway straight after failing to observe the stop sign. The addition of left turn lanes under SS# 10-01-213 was verified by the high volume of left turning vehicles from SR 2004 and the pattern of rear-end collisions in the queue. The intersection met signal warrants 1, 9, and 11.

The initial crash analysis (for funding of both Spot Safety Projects) was completed from September 1, 1996 to September 1, 1999 with twelve (12) reported crashes, eleven (11) of which were deemed correctable. The final completion date for the improvements at the subject intersection was on February 1, 2003 with a total cost of \$147,000.00.

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 both countermeasures was from November 1, 2002 to March 31, 2003. The before period consisted of reported crashes from April 1, 1997 through October 31, 2002 (5 years and 7 months); and the after period consisted of reported crashes from April 1, 2003 through October 31, 2008 (5 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 Intersection Frontal Impact Crashes and Westbound SR 2004 Rear-End Collisions were the two target crash types 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	45	14	- 68.9 %
Total Severity Index	5.15	4.17	- 19.0 %
Frontal Impact Target Crashes	25	2	- 92.0 %
Frontal Impact Crash Severity Index	2.78	4.70	43.9 %
Mainline Rear-End Target Crashes	8	0	- 100.0 %
Mainline Rear-End Severity Index	6.55	0.00	- 100.0 %
Volume	14,800	19,600	32.4 %
<u>Injury Crash Summary</u>			
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	0	- 100.0 %
Class B injury Crashes	4	0	- 100.0 %
Class C Injury Crashes	11	6	- 45.5 %
Total Injury Crashes	16	6	- 62.5 %

The naive before and after analysis at the treatment location resulted in a 69 percent decrease in Total Crashes, a 94 percent decrease in Combined Target Crashes, and a 19 percent decrease in the Total Severity Index. The before period ADT year was 2000 and the after period ADT year was 2006 with an increase of 32 percent.

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 69 percent decrease in Total Crashes and a 94 percent decrease in Combined Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

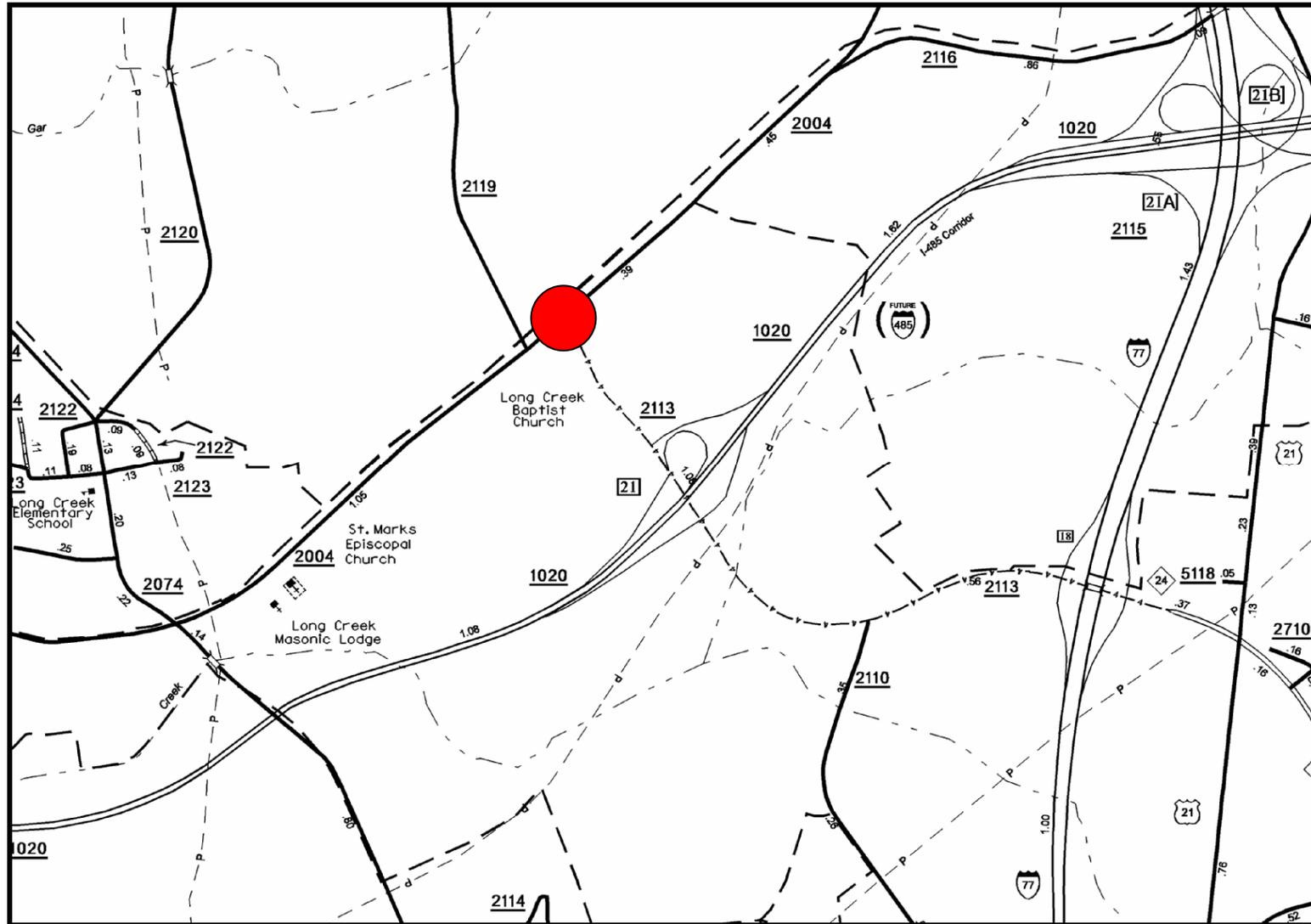
Referencing the *Collision Diagrams*, a large portion of crashes at the intersection in the before period (22 of 45) were the result of a vehicle turning left onto SR 2004 from SR 2113. After the signal installation, this pattern was completely eliminated. The two after period frontal impact crashes were a permissive green movement on SR 2004 and an improper right turning vehicle on red. Motorists running off the road straight also decreased from three (3) in the before period to one (1) in the after period.

Rear-End Crashes at the intersection also benefited greatly from the intersection improvements. Westbound SR 2004 rear-end collisions due to left turning motorists were completely eliminated from eight (8) crashes in the before period. Also, this pattern in the northbound SR 2113 direction reduced from five (5) to three (3) through the analysis. However, the installation of the traffic signal did impact eastbound SR 2004 rear-end collisions with an increase from zero to three (3) in the after period.

The calculated benefit to cost ratio for this project is **5.16 considering total crashes**. The benefit to cost ratio **considering only target crashes is 1.91**. 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. As the Safety Evaluation Group completes additional spot safety reviews for this type of combined countermeasure implementation, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

Location Map
Mecklenburg County, City of Charlotte
Evaluation of Spot Safety Project # 10-01-213 / 10-00-212



Treatment Location: SR 2004 (Mt. Holly-Huntersville Rd) at SR 2113 (W.T. Harris Blvd / Vance Rd)

**SS# 10-01-213 Aerial Map
Mecklenburg County**



**SR 2004
Mt. Holly-Huntersville Rd**

**SR 2113
Vance Road
W.T. Harris Blvd**

TREATMENT SITE PHOTOS TAKEN 1/15/2009



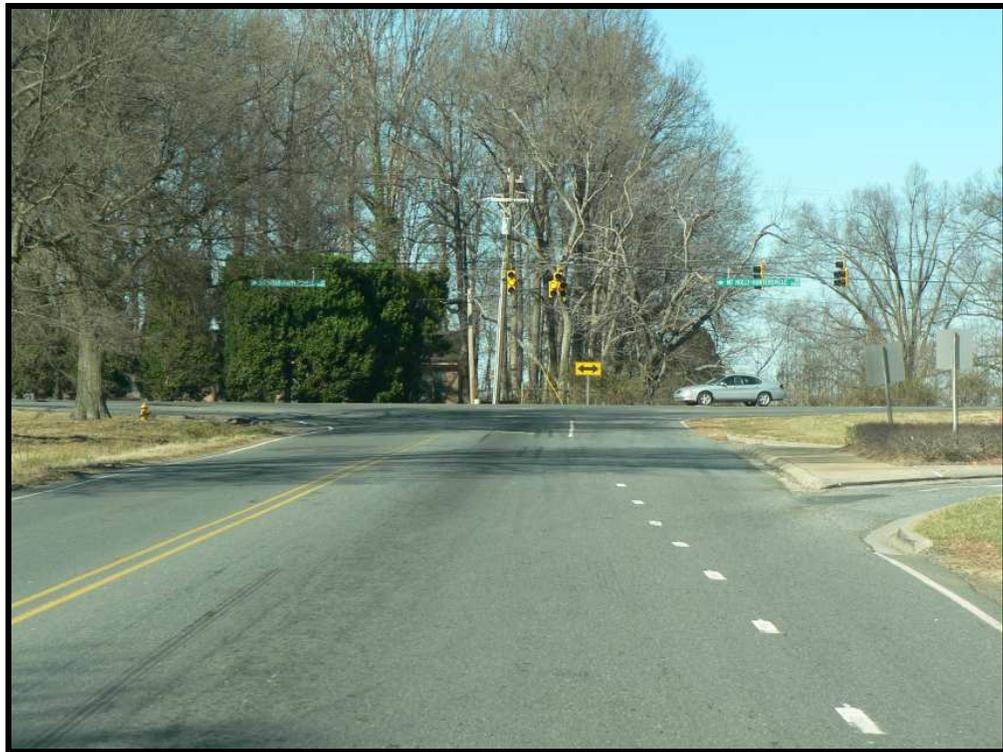
Traveling East on SR 2004 (Mt. Holly-Huntersville Rd)



Traveling East on SR 2004 (Mt. Holly-Huntersville Rd)



Traveling North on SR 2113 (Vance Rd / W.T. Harris Blvd)



Traveling North on SR 2113



Traveling West on SR 2004 (Mt. Holly-Huntersville Road)



Traveling West on SR 2004 (Mt. Holly-Huntersville Road)

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 2004 at SR 2113
 COUNTY: Mecklenburg
 FILE NO.: SS 10-01-213

BY: JBS
 DATE: 4/2/2009
 NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - Left Turn Lanes & New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$147,000	10	0.149	\$21,907
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$147,000	10	0.149	\$21,907

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$3,000
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900
 TOTAL ANNUAL COST= \$25,807
 TOTAL COST OF PROJECT= \$147,000

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	5.59	1	0.18	15	2.68	29	5.19	\$157,979
AFTER	5.59	0	0.00	6	1.07	8	1.43	\$24,902

Annual Benefits from Crash Cost Savings \$133,077

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$107,270

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 5.16

TOTAL COST OF PROJECT - \$147,000 COMPREHENSIVE B/C RATIO - 5.16

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 2004 at SR 2113
 COUNTY: Mecklenburg
 FILE NO.: SS 10-01-213

BY: JBS
 DATE: 4/2/2009
 NOTES: Target Crashes - Combined

DETAILED COST: TYPE IMPROVEMENT - Left Turn Lanes & New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$147,000	10	0.149	\$21,907
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$147,000	10	0.149	\$21,907

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$3,000
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900
 TOTAL ANNUAL COST= \$25,807
 TOTAL COST OF PROJECT= \$147,000

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	5.59	0	0.00	12	2.15	21	3.76	\$53,292
AFTER	5.59	0	0.00	1	0.18	1	0.18	\$3,918

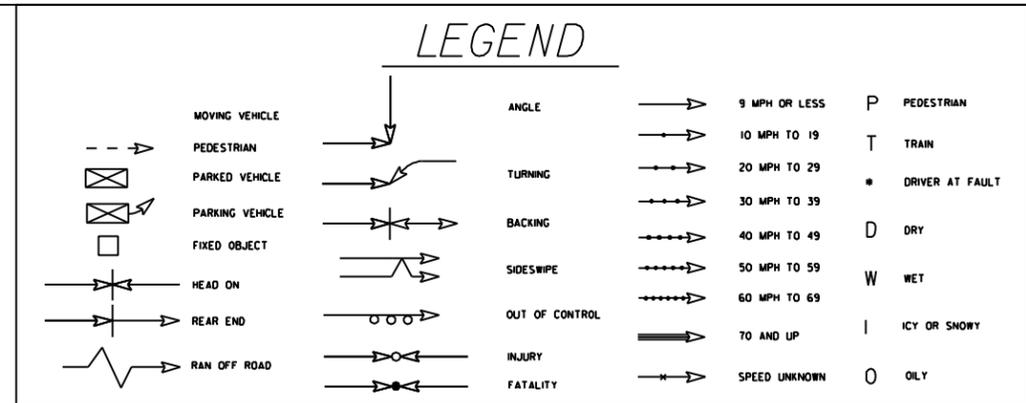
Annual Benefits from Crash Cost Savings \$49,374

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$23,567

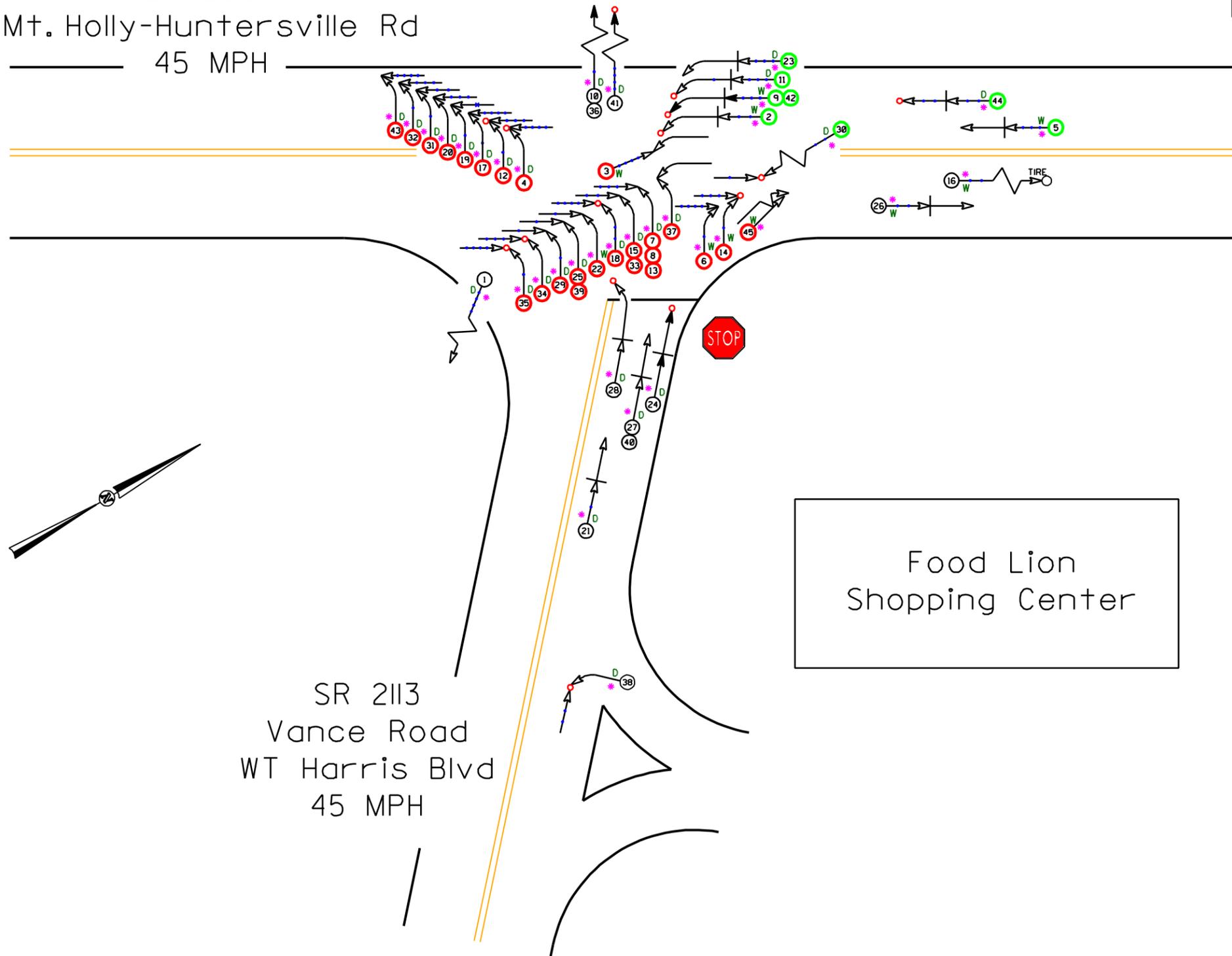
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 1.91

TOTAL COST OF PROJECT - \$147,000 COMPREHENSIVE B/C RATIO - 1.91

SR 2004
Mt. Holly-Huntersville Rd
45 MPH

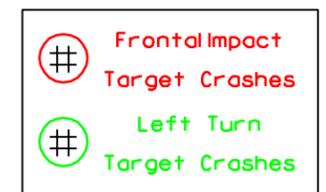


SS# 10-01-213
Mecklenburg County
City of Charlotte
BEFORE Period
4/1/97 - 10/31/02
SR 2004 at SR 2113



SR 2113
Vance Road
WT Harris Blvd
45 MPH

Food Lion
Shopping Center

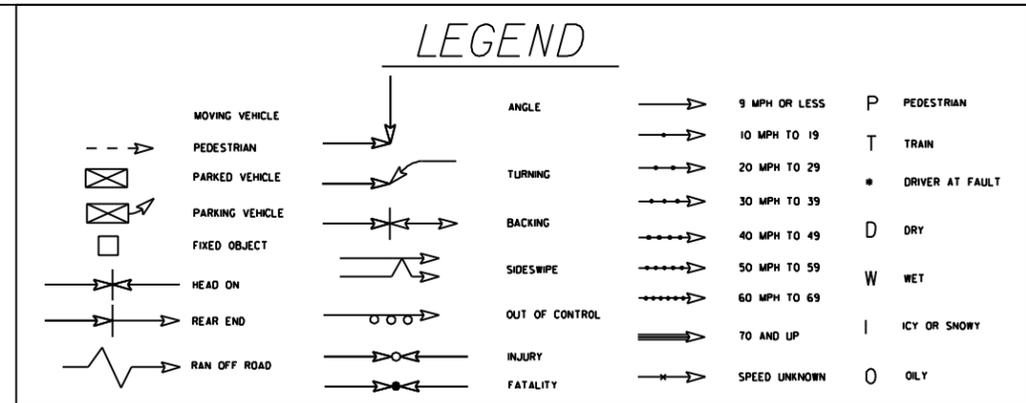
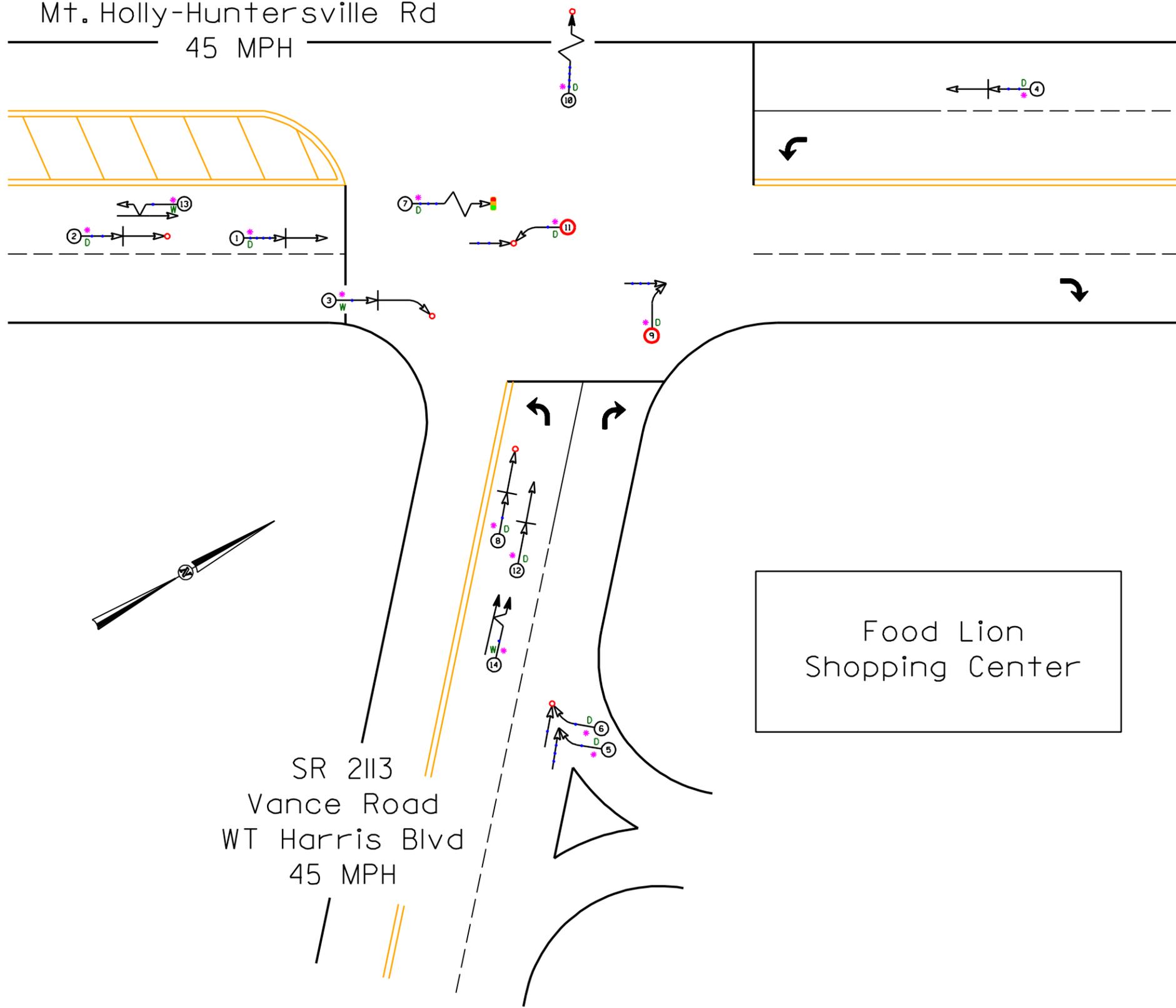


TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 10	AREA:
	STUDY PERIOD: 4/1/1997 - 10/31/2002	
	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: 4-2-2009		
LOG NUMBER: SS* 10-01-213 / 10-00-212		

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

SR 2004
Mt. Holly-Huntersville Rd
45 MPH



SS# 10-01-213
Mecklenburg County
City of Charlotte
AFTER Period
4/1/03 - 10/31/08
SR 2004 at SR 2113

New Signalized
 Intersection
 SIG ID 10-1780

Food Lion
Shopping Center

SR 2113
Vance Road
WT Harris Blvd
45 MPH

Frontal Impact
Target Crashes
 Left Turn
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 10	AREA:
	STUDY PERIOD: 4/1/2003 - 10/31/2008	
	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: 4-2-2009		
LOG NUMBER: SS* 10-01-213 / 10-00-212		

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
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