

# Spot Safety Project Evaluation

Order # 41000013034

Spot Safety Project # 07-02-238

**Spot Safety Project Evaluation of the  
Traffic Signal and Left Turn Lane Installation  
SR 1008 (W. Market Street) at SR 2007 (Bunker Hill Road)  
Guilford County, Town of Colfax**

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

8-1-2011

Date

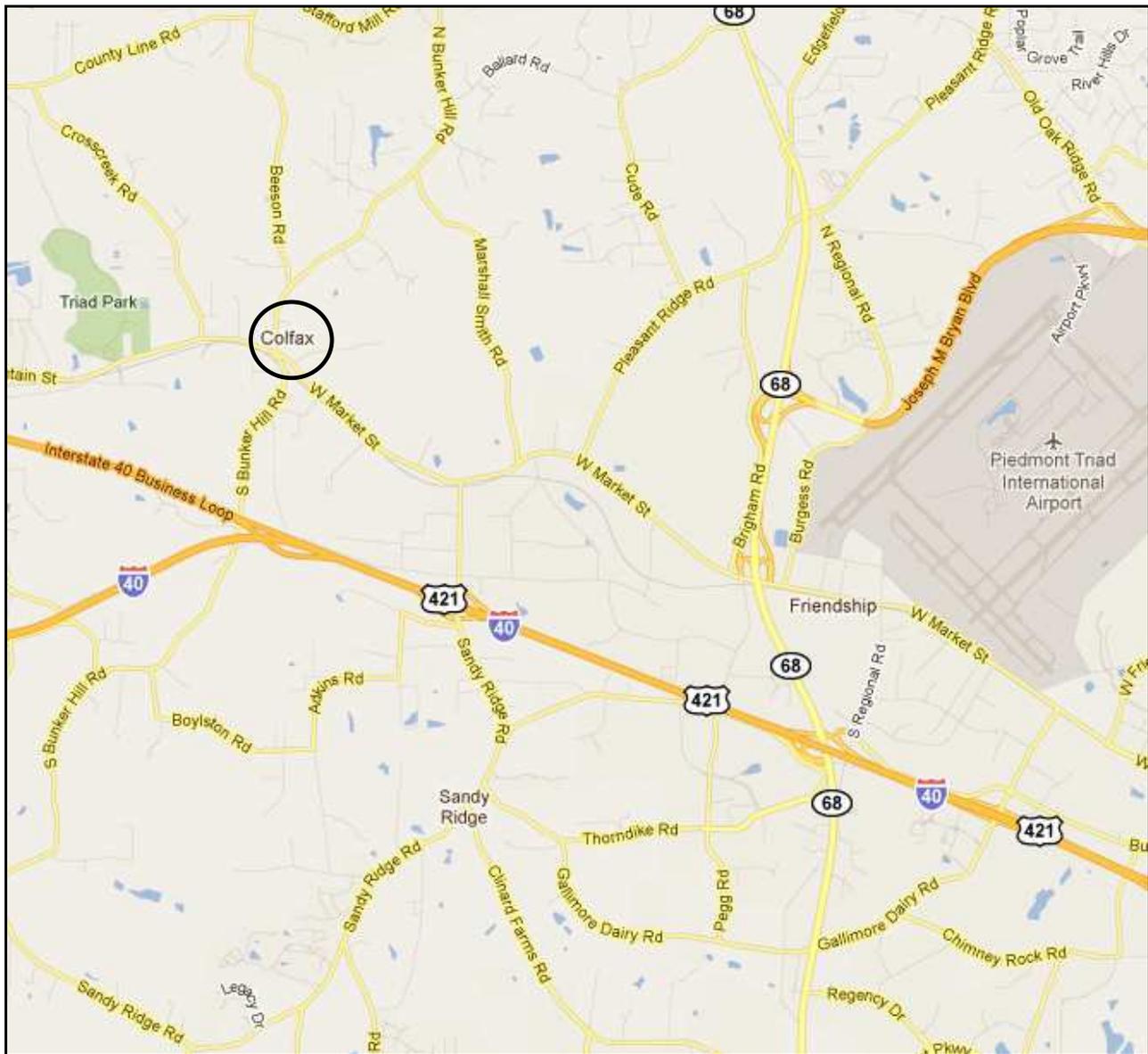
Traffic Safety Project Engineer

# Spot Safety Project Evaluation Documentation

## Subject Location

Evaluation of Spot Safety Project Number 07-02-238 located at the Intersection of SR 1008 (W. Market Street) and SR 2007 (Bunker Hill Road) in Guilford County, Town of Colfax.

The Sig ID is 07-2046 for this newly installed traffic signal.





**Aerial Photograph provided from Google Maps**

### **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 with left turn lanes on both SR 1008 (Market Street) approaches. SR 1008 and SR 2007 (Bunker Hill Road) are both two-lane facilities at the subject intersection with speed limits of 35 mph on all approaches. The subject location is a four-leg crossroads skewed intersection, which was controlled by stop signs on SR 2007 in the before period.

The original statement of problem was the existence of crashes from issues with sight distance due to the intersection sitting at a skew angle and the westbound horizontal curve on SR 1008 approaching the intersection. The intended purpose of the new traffic signal and left turn lanes was to alleviate collisions at the intersection per citizen requests.

The initial crash analysis was completed from June 1, 1999 to May 31, 2002 with twelve (12) reported crashes, nine (9) of which were deemed correctable with the selected improvements. The final completion date for the improvement at the subject intersection was on January 25, 2007 with a total cost of \$225,000.

## 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 November 2006 through January 2007. The before period consisted of reported crashes from August 1, 2002 through October 31, 2006 (4 years and 3 months); and the after period consisted of reported crashes from February 1, 2007 through April 30, 2011 (4 years and 3 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 Signal Target Crashes and SR 1008 (Market Street) Rear-End Crashes were the Left Turn Lane Target Crashes for the applied countermeasures. 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.

<b><u>Treatment Information</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total Crashes	7	3	- 57.1 %
Total Severity Index	6.29	3.47	- 44.8 %
Signal Target – Frontal Impact	4	1	- 75.0 %
Frontal Target Crash Severity Index	8.40	1.00	- 88.1 %
Turn Target – Market Street Rear-End	3	1	- 66.7 %
Left Turn Target Crash Severity Index	3.47	1.00	- 71.2 %
Volume (2004, 2009)	12,900	13,000	0.8 %

<b><u>Injury Crash Summary</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	0	N/A
Class B injury Crashes	0	0	N/A
Class C Injury Crashes	5	1	- 80.0 %
Total Injury Crashes	5	1	- 80.0 %

The naive before and after analysis at the treatment location resulted in a 57 percent decrease in Total Crashes, an 75 percent decrease in Target Crashes, and a 45 percent decrease in the Total Severity Index. The before period ADT year was 2004 and the after period ADT year was 2009.

## Results and Discussion

Referencing the *Collision Diagrams*, the intersection experienced considerable improvement with the after period countermeasures. The before period presented four (4) unique frontal impact crashes and three (3) Market Street Rear-end collisions approaching the intersection. After the improvements, there was one (1) red light run and one (1) rear-end crash both from westbound Market Street. The traffic signal eliminates the limiting sight distance issues from the skewed angle intersection.

The calculated benefit to cost ratio for this project is **0.50 considering total crashes**. The benefit to cost ratio **considering only combined target crashes is 0.63**. 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 our field visit on July 21<sup>st</sup>, 2011 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 (Field Visit 7-21-2011)



Travelling East on SR 1008 (W. Market Street)



**Travelling West on SR 1008 (W. Market Street)**



**Travelling North on SR 2007 (Bunker Hill Road)**



**Travelling South on SR 2007 (Bunker Hill Road)**

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

LOCATION: SR 1008 at SR 2007		BY: JBS						
COUNTY: Guilford		DATE: 7/25/2011						
FILE NO.: SS 07-02-238								
DETAILED COST:	TYPE IMPROVEMENT - Traffic Signal and Left Turn Lanes							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$225,000	10	0.149	\$33,532				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$225,000	10	0.149	\$33,532				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$3,000				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
TOTAL ANNUAL COST=				\$37,432				
TOTAL COST OF PROJECT=				\$225,000				
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	4.25	0	0.00	5	1.18	2	0.47	\$25,553
AFTER	4.25	0	0.00	1	0.24	2	0.47	\$6,729
Annual Benefits from Crash Cost Savings								\$18,824
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$18,608)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	0.50		
TOTAL COST OF PROJECT		-	\$225,000	COMPREHENSIVE B/C RATIO		-	0.50	

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

LOCATION: SR 1008 at SR 2007		BY: JBS						
COUNTY: Guilford		DATE: 7/25/2011						
FILE NO.: SS 07-02-238		Combined Target Crashes - Frontal & Rear-End						
DETAILED COST:	TYPE IMPROVEMENT - Traffic Signal and Left Turn Lanes							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$225,000	10	0.149	\$33,532				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$225,000	10	0.149	\$33,532				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$3,000				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
TOTAL ANNUAL COST=				\$37,432				
TOTAL COST OF PROJECT=				\$225,000				
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	4.25	0	0.00	5	1.18	2	0.47	\$25,553
AFTER	4.25	0	0.00	0	0.00	2	0.47	\$2,024
Annual Benefits from Crash Cost Savings								\$23,529
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$13,902)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	0.63		
TOTAL COST OF PROJECT		-	\$225,000	COMPREHENSIVE B/C RATIO		-	0.63	

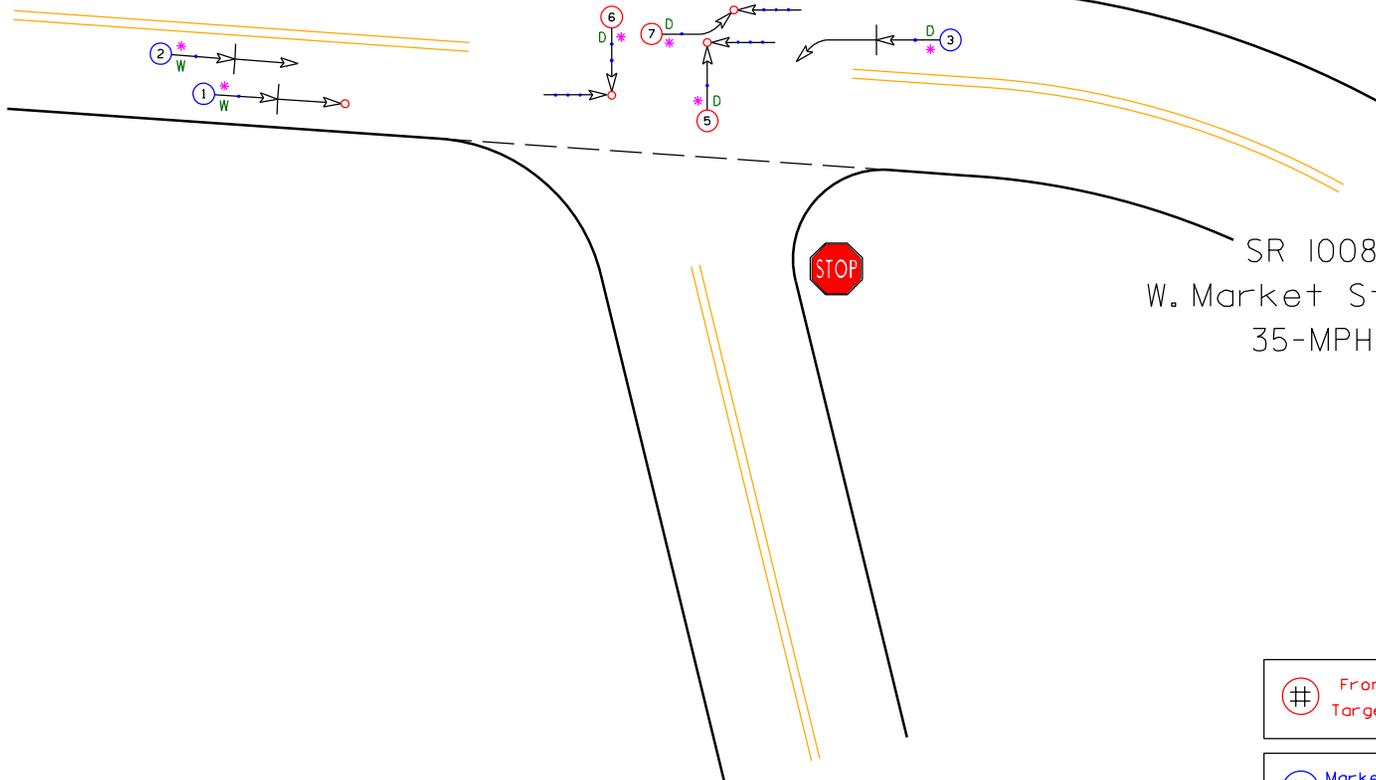


SR 2007  
Bunker Hill Rd  
35-MPH

Store



SR 1008  
W. Market Street  
35-MPH



**LEGEND**

	MOVING VEHICLE		ANGLE		5 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		WET
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		ICY OR SNOWY
	HEAD ON		RAN OFF ROAD		50 MPH TO 59		ONLY
	REAR END		HAZY		60 MPH TO 69		
	FATALITY		TO AND UP		70 MPH TO 79		
			80 MPH TO 89		90 MPH TO 99		
			100 MPH TO 109		110 MPH TO 119		
			120 MPH TO 129		130 MPH TO 139		
			140 MPH TO 149		150 MPH TO 159		
			160 MPH TO 169		170 MPH TO 179		
			180 MPH TO 189		190 MPH TO 199		
			200 MPH TO 209		210 MPH TO 219		
			220 MPH TO 229		230 MPH TO 239		
			240 MPH TO 249		250 MPH TO 259		
			260 MPH TO 269		270 MPH TO 279		
			280 MPH TO 289		290 MPH TO 299		
			300 MPH TO 309		310 MPH TO 319		
			320 MPH TO 329		330 MPH TO 339		
			340 MPH TO 349		350 MPH TO 359		
			360 MPH TO 369		370 MPH TO 379		
			380 MPH TO 389		390 MPH TO 399		
			400 MPH TO 409		410 MPH TO 419		
			420 MPH TO 429		430 MPH TO 439		
			440 MPH TO 449		450 MPH TO 459		
			460 MPH TO 469		470 MPH TO 479		
			480 MPH TO 489		490 MPH TO 499		
			500 MPH TO 509		510 MPH TO 519		
			520 MPH TO 529		530 MPH TO 539		
			540 MPH TO 549		550 MPH TO 559		
			560 MPH TO 569		570 MPH TO 579		
			580 MPH TO 589		590 MPH TO 599		
			600 MPH TO 609		610 MPH TO 619		
			620 MPH TO 629		630 MPH TO 639		
			640 MPH TO 649		650 MPH TO 659		
			660 MPH TO 669		670 MPH TO 679		
			680 MPH TO 689		690 MPH TO 699		
			700 MPH TO 709		710 MPH TO 719		
			720 MPH TO 729		730 MPH TO 739		
			740 MPH TO 749		750 MPH TO 759		
			760 MPH TO 769		770 MPH TO 779		
			780 MPH TO 789		790 MPH TO 799		
			800 MPH TO 809		810 MPH TO 819		
			820 MPH TO 829		830 MPH TO 839		
			840 MPH TO 849		850 MPH TO 859		
			860 MPH TO 869		870 MPH TO 879		
			880 MPH TO 889		890 MPH TO 899		
			900 MPH TO 909		910 MPH TO 919		
			920 MPH TO 929		930 MPH TO 939		
			940 MPH TO 949		950 MPH TO 959		
			960 MPH TO 969		970 MPH TO 979		
			980 MPH TO 989		990 MPH TO 999		
			1000 MPH TO 1009		1010 MPH TO 1019		
			1020 MPH TO 1029		1030 MPH TO 1039		
			1040 MPH TO 1049		1050 MPH TO 1059		
			1060 MPH TO 1069		1070 MPH TO 1079		
			1080 MPH TO 1089		1090 MPH TO 1099		
			1100 MPH TO 1109		1110 MPH TO 1119		
			1120 MPH TO 1129		1130 MPH TO 1139		
			1140 MPH TO 1149		1150 MPH TO 1159		
			1160 MPH TO 1169		1170 MPH TO 1179		
			1180 MPH TO 1189		1190 MPH TO 1199		
			1200 MPH TO 1209		1210 MPH TO 1219		
			1220 MPH TO 1229		1230 MPH TO 1239		
			1240 MPH TO 1249		1250 MPH TO 1259		
			1260 MPH TO 1269		1270 MPH TO 1279		
			1280 MPH TO 1289		1290 MPH TO 1299		
			1300 MPH TO 1309		1310 MPH TO 1319		
			1320 MPH TO 1329		1330 MPH TO 1339		
			1340 MPH TO 1349		1350 MPH TO 1359		
			1360 MPH TO 1369		1370 MPH TO 1379		
			1380 MPH TO 1389		1390 MPH TO 1399		
			1400 MPH TO 1409		1410 MPH TO 1419		
			1420 MPH TO 1429		1430 MPH TO 1439		
			1440 MPH TO 1449		1450 MPH TO 1459		
			1460 MPH TO 1469		1470 MPH TO 1479		
			1480 MPH TO 1489		1490 MPH TO 1499		
			1500 MPH TO 1509		1510 MPH TO 1519		
			1520 MPH TO 1529		1530 MPH TO 1539		
			1540 MPH TO 1549		1550 MPH TO 1559		
			1560 MPH TO 1569		1570 MPH TO 1579		
			1580 MPH TO 1589		1590 MPH TO 1599		
			1600 MPH TO 1609		1610 MPH TO 1619		
			1620 MPH TO 1629		1630 MPH TO 1639		
			1640 MPH TO 1649		1650 MPH TO 1659		
			1660 MPH TO 1669		1670 MPH TO 1679		
			1680 MPH TO 1689		1690 MPH TO 1699		
			1700 MPH TO 1709		1710 MPH TO 1719		
			1720 MPH TO 1729		1730 MPH TO 1739		
			1740 MPH TO 1749		1750 MPH TO 1759		
			1760 MPH TO 1769		1770 MPH TO 1779		
			1780 MPH TO 1789		1790 MPH TO 1799		
			1800 MPH TO 1809		1810 MPH TO 1819		
			1820 MPH TO 1829		1830 MPH TO 1839		
			1840 MPH TO 1849		1850 MPH TO 1859		
			1860 MPH TO 1869		1870 MPH TO 1879		
			1880 MPH TO 1889		1890 MPH TO 1899		
			1900 MPH TO 1909		1910 MPH TO 1919		
			1920 MPH TO 1929		1930 MPH TO 1939		
			1940 MPH TO 1949		1950 MPH TO 1959		
			1960 MPH TO 1969		1970 MPH TO 1979		
			1980 MPH TO 1989		1990 MPH TO 1999		
			2000 MPH TO 2009		2010 MPH TO 2019		
			2020 MPH TO 2029		2030 MPH TO 2039		
			2040 MPH TO 2049		2050 MPH TO 2059		
			2060 MPH TO 2069		2070 MPH TO 2079		
			2080 MPH TO 2089		2090 MPH TO 2099		
			2100 MPH TO 2109		2110 MPH TO 2119		
			2120 MPH TO 2129		2130 MPH TO 2139		
			2140 MPH TO 2149		2150 MPH TO 2159		
			2160 MPH TO 2169		2170 MPH TO 2179		
			2180 MPH TO 2189		2190 MPH TO 2199		
			2200 MPH TO 2209		2210 MPH TO 2219		
			2220 MPH TO 2229		2230 MPH TO 2239		
			2240 MPH TO 2249		2250 MPH TO 2259		
			2260 MPH TO 2269		227		



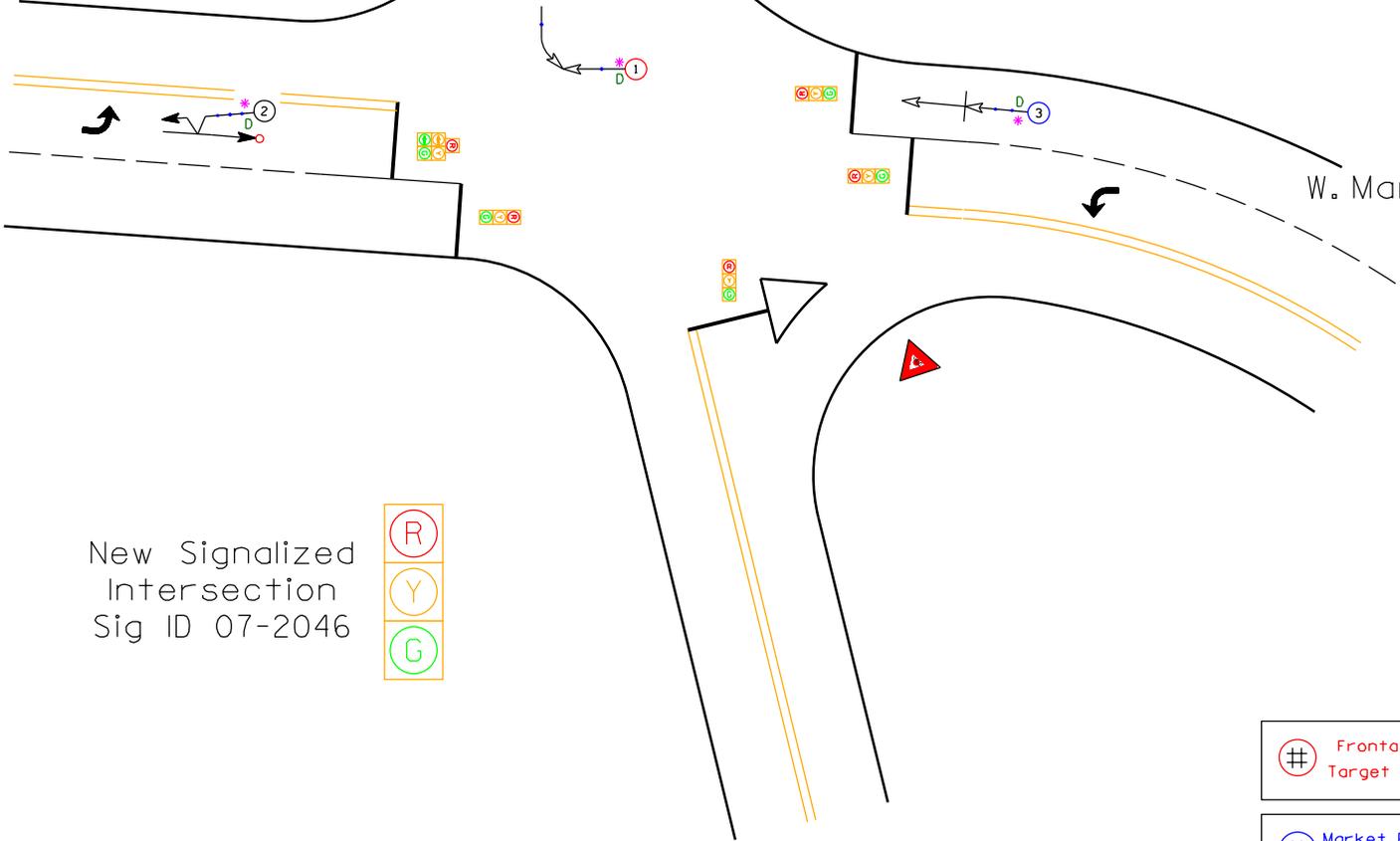
SR 2007  
Bunker Hill Rd  
35-MPH

Store

SS# 07-02-238  
Order# 41000013034  
Guilford County  
AFTER Period  
2/1/07 - 4/30/11

**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
	PAKED VEHICLE		SIDESWIPE		40 MPH TO 49		DRY
	FIXED OBJECT		OUT OF CONTROL		50 MPH TO 59		WET
	HEAD ON		RAN OFF ROAD		60 MPH TO 69		ICY OR SNOWY
	REAR END		NARROW		TO AND UP		SPEED UNKNOWN
	RAN OFF ROAD		FATALITY		SPEED UNKNOWN		ONLY



SR 1008  
W. Market Street  
35-MPH

New Signalized  
Intersection  
Sig ID 07-2046



Frontal Impact  
Target Crashes

Market Rear-End  
Target Crashes

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

**TRAFFIC SAFETY UNIT**

Date: 7-20-2011

Prepared By: J. Schronce