

Spot Safety Project Evaluation

Order # 41000004794

Spot Safety Project # 07-02-213

**Spot Safety Project Evaluation of the Signal Modifications
SR 1010 (Franklin St) at SR 1748 (Raleigh Rd / Hillsborough St)
Orange County, City of Chapel Hill**

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

3-1-2010

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 07-02-213 located at the Intersection of SR 1010 (Franklin Street) and SR 1748 (Raleigh Road / Hillsborough Street) in Orange County, City of Chapel Hill. This location borders the UNC Chapel Hill Campus.

The Sig ID is 07-0513 for this existing traffic signal.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location were modifications to the existing traffic signal. These modifications included installing new pedestrian signal heads, upgrading vehicular signal heads to 12 inches, and installing mast arm poles for signal support.

SR 1010 (Franklin Street) has three lane approaches to the intersection with a dedicated left turn lane and a speed limit of 20 mph. Raleigh Road is a two-lane, two-way roadway with a single approach at this location and a speed limit of 25 mph. Raleigh Road travels directly through the UNC campus and is a main thoroughfare for university vehicles. Hillsborough Street contains a two lane approach with a dedicated left turn lane and a speed limit of 25 mph.

The original statement of problem was the existing accident occurrence at the intersection including the pattern of vehicles running the red light. The intended purposes of these improvements were to alleviate the existing collision patterns.

The initial crash analysis was completed from December 1, 1998 to November 30, 2001 with thirteen (13) reported crashes, eight (8) of which were deemed correctable. The final completion date for these improvements at the subject intersection was on June 11, 2004 with a total cost of \$100,000.

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 May through June 2004. The before period consisted of reported crashes from November 1, 1997 through April 30, 2004 (5 years and 6 months); and the after period consisted of reported crashes from July 1, 2004 through December 31, 2009 (5 years and 6 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 Red Light Run Crashes resulting in angle collisions were the target crashes for the applied countermeasure.

Treatment Information	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	40	34	- 15.0 %
Total Severity Index	2.85	2.31	- 18.9 %
Target Crashes	14	8	- 42.9 %
Target Crash Severity Index	2.59	1.00	- 61.4 %
Volume	28,000	25,400	- 9.3 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	0	N/A
Class B injury Crashes	4	2	- 50.0 %
Class C Injury Crashes	6	4	- 33.3 %
Total Injury Crashes	10	6	- 40.0 %

The naive before and after analysis at the treatment location resulted in a 15 percent decrease in Total Crashes, a 43 percent decrease in Target Crashes, and a 19 percent decrease in the Total Severity Index. The before period ADT year was 2001 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 15 percent decrease in Total Crashes and a 43 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 shows a high crash pattern of frontal impact collisions with fourteen (14) red light run crashes and eight (8) left turn same roadway collisions. After the signal modifications including 12 inch signal heads, red light run crashes were reduced to eight (8) crashes. Also, left turn same road collisions were reduced to five (5) accidents including the most significant reduction (from five to two) on the westbound SR 1010 approach. There was one (1) pedestrian and bicycle crash in the before period with just one (1) bicycle collision in the after period. As previously stated, this location serves UNC Chapel Hill and contains a varied mixed use of transportation modes including walking pedestrians, bicyclists, cars, and buses.

The calculated benefit to cost ratio for this project is **0.94 considering total crashes**. The benefit to cost ratio **considering only target crashes is 0.77**. 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 East on SR 1010 (Franklin Street)



Looking West on Franklin Street



Traveling North on SR 1748 (Raleigh Road)



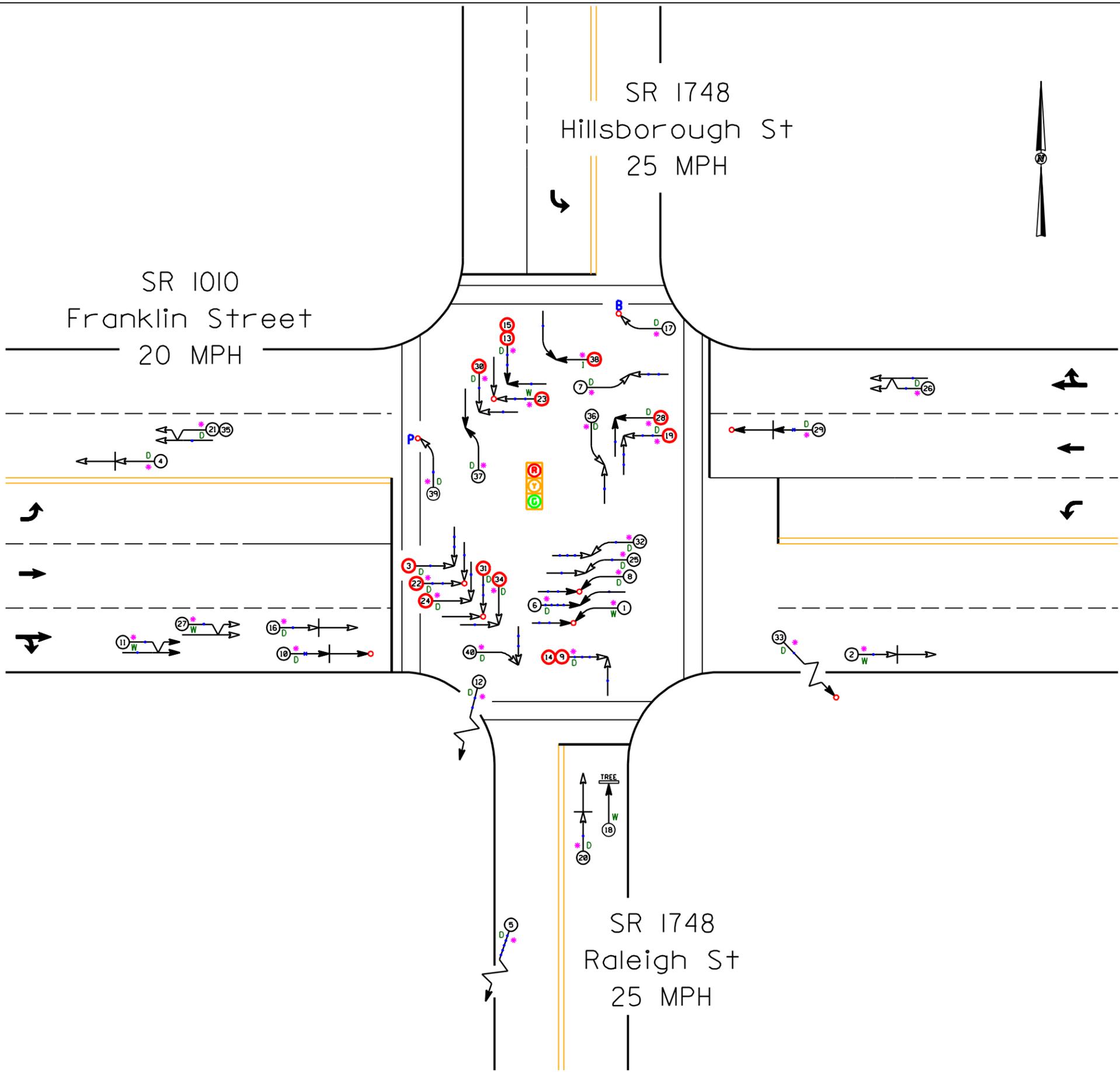
Looking South on SR 1748 (Hillsborough Street)
Picture shows roadway being repaved with no travel lines

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: Franklin at Raleigh		BY: JBS						
COUNTY: Orange		DATE: 3/1/2010						
FILE NO.: SS 07-02-213		NOTES: Total Crashes						
DETAILED COST:	TYPE IMPROVEMENT - Signal Modifications							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$100,000	10	0.149	\$14,903				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$100,000	10	0.149	\$14,903				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$400				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$150				
TOTAL ANNUAL COST=				\$15,453				
TOTAL COST OF PROJECT=				\$100,000				
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	5.50	0	0.00	10	1.82	30	5.45	\$54,000
AFTER	5.50	0	0.00	6	1.09	28	5.09	\$39,491
Annual Benefits from Crash Cost Savings								\$14,509
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						= (\$944)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						= 0.94		
TOTAL COST OF PROJECT		-	\$100,000	COMPREHENSIVE B/C RATIO		-	0.94	

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: Franklin at Raleigh		BY: JBS						
COUNTY: Orange		DATE: 3/1/2010						
FILE NO.: SS 07-02-213		NOTES: Target Crashes - Red Light Run						
DETAILED COST:	TYPE IMPROVEMENT - Signal Modifications							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$100,000	10	0.149	\$14,903				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$100,000	10	0.149	\$14,903				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$400				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$150				
TOTAL ANNUAL COST=				\$15,453				
TOTAL COST OF PROJECT=				\$100,000				
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	5.50	0	0.00	3	0.55	11	2.00	\$17,618
AFTER	5.50	0	0.00	0	0.00	8	1.45	\$5,673
Annual Benefits from Crash Cost Savings								\$11,945
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						= (\$3,507)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						= 0.77		
TOTAL COST OF PROJECT		-	\$100,000	COMPREHENSIVE B/C RATIO		-	0.77	



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		OILY
	RAN OFF ROAD		70 AND UP		SPEED UNKNOWN		

SS# 07-02-213
 Orange County
 City of Chapel Hill
 UNC Campus
 BEFORE Period
 11/1/98 - 4/30/04

Signalized
 Intersection
 Sig ID 07-0513

Red Light Run
 Target Crashes

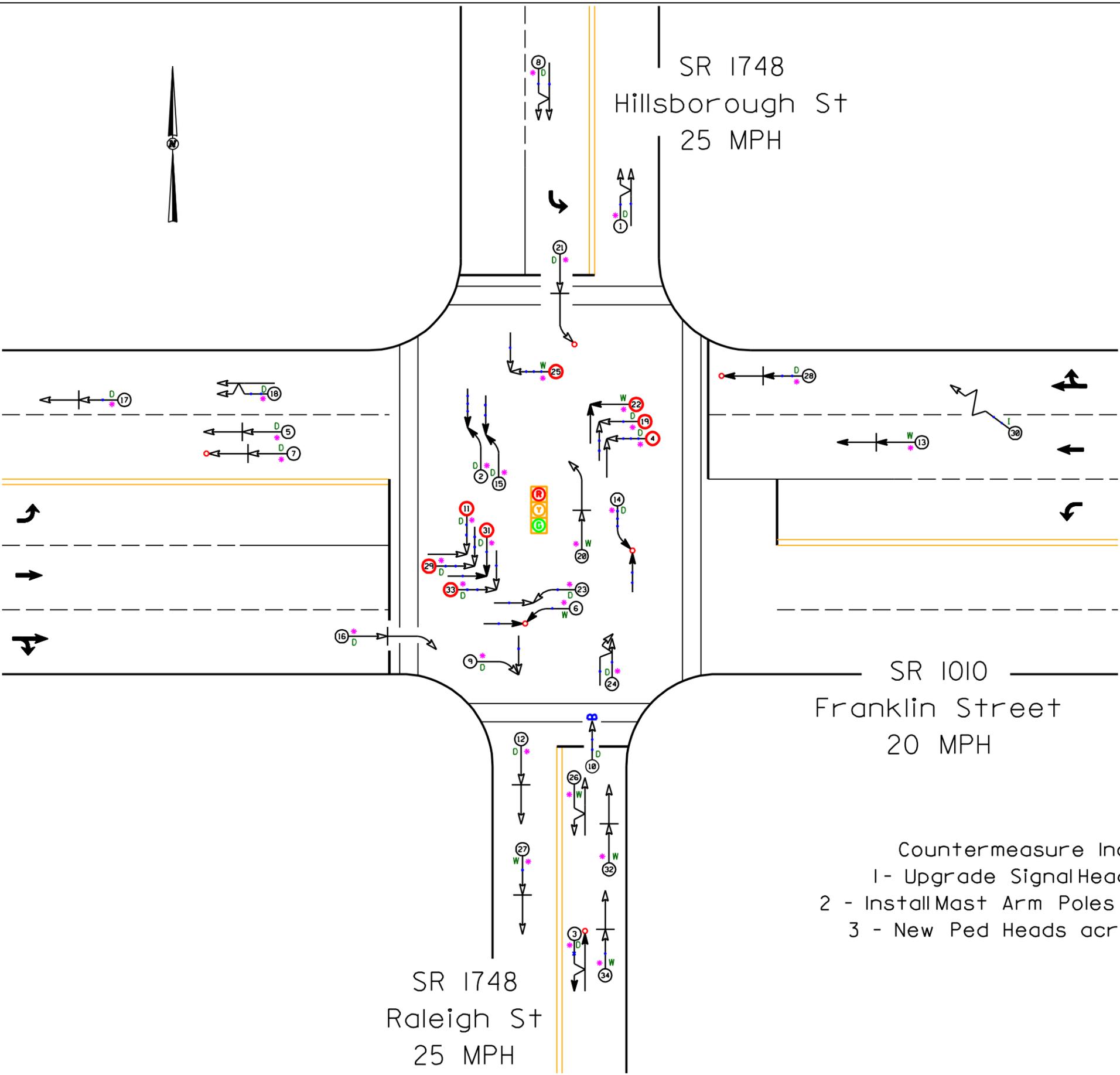
TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 7	AREA: 1
	STUDY PERIOD: 11/1/1998 - 4/30/2004	
	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: 2-24-2010		
LOG NUMBER: SS* 07-02-213 BEFORE		

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



SR 1748
Hillsborough St
25 MPH



SR 1010
Franklin Street
20 MPH

SR 1748
Raleigh St
25 MPH

- Countermeasure Included:
- 1- Upgrade Signal Heads to 12"
 - 2 - Install Mast Arm Poles for support
 - 3 - New Ped Heads across SR 1010

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		OILY
	RAN OFF ROAD		70 AND UP		SPEED UNKNOWN		

SS# 07-02-213
Orange County
City of Chapel Hill
UNC Campus
AFTER Period
7/1/04 - 12/31/09

Signal
Modifications
Sig ID 07-0513

Red Light Run
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 7	AREA:
STUDY PERIOD: 7/1/2004 - 12/31/2009	
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: 2-25-2010	
LOG NUMBER: SS* 07-02-213 AFTER	

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