

# Spot Safety Project Evaluation

Order # 41000013053

Spot Safety Project # 07-02-217

## Spot Safety Project Evaluation of the Traffic Signal Upgrade NC 86 (Columbia Street) at Rosemary Street 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**



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Jason B. Schronce

8-4-2011

Date

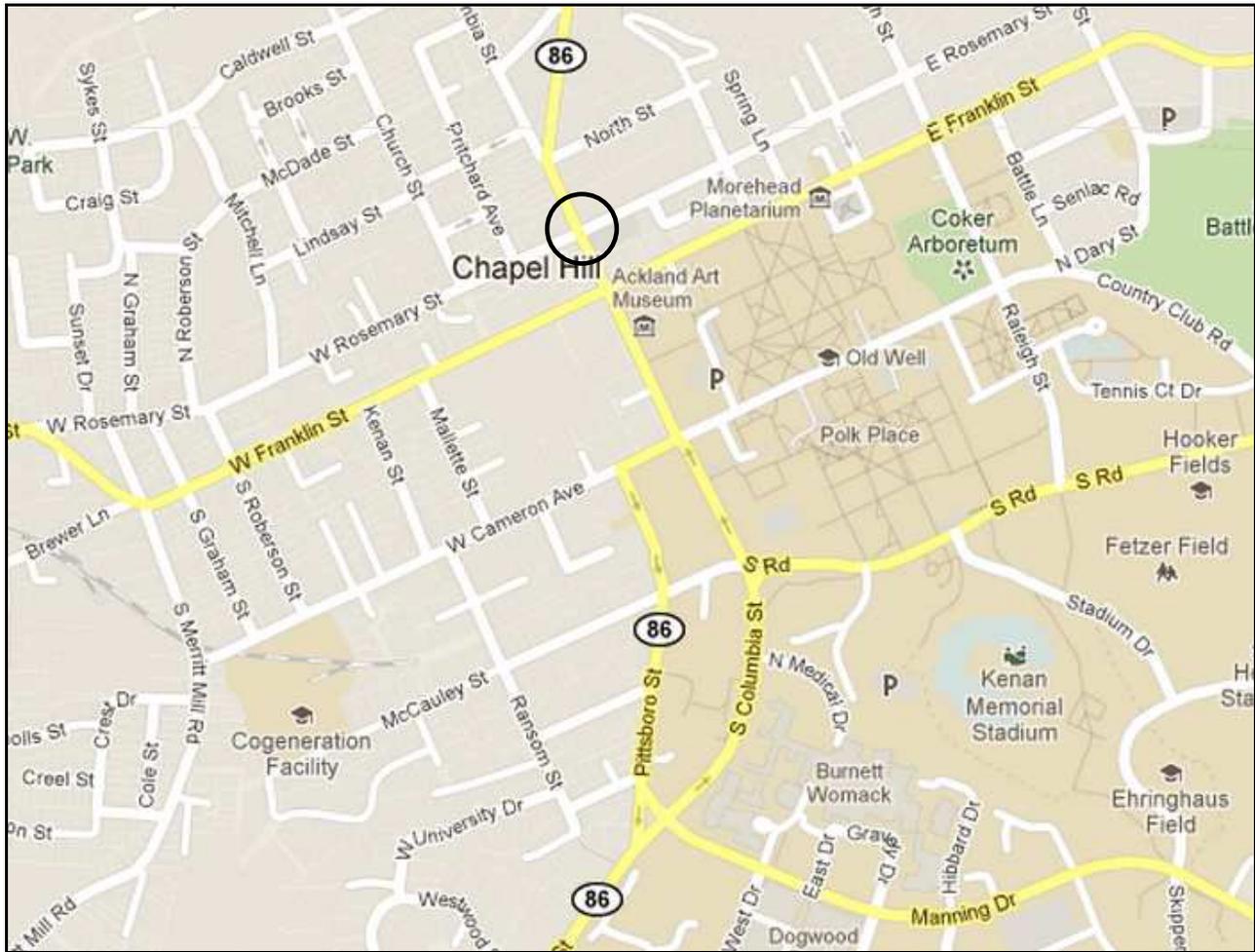
Traffic Safety Project Engineer

# Spot Safety Project Evaluation Documentation

## Subject Location

Evaluation of Spot Safety Project Number 07-02-217 located at the Intersection of NC 86 (Columbia Street) and Rosemary Street in Orange County, City of Chapel Hill (Campus of UNC).

The Sig ID is 07-0517 for this modified traffic signal.





**Aerial Map provided from BING Maps**

### **Project Information and Background from the Project File Folder**

The spot safety project improvement countermeasure chosen for the subject location was the traffic signal upgrade to 12-inch signal heads, metal strain poles, and a northbound NC 86 protected-permitted left turn phase. NC 86 (Columbia Street) presents three lanes northbound with a dedicated left turn lane and four lanes southbound with dedicated left and right turn lanes. The Rosemary Street approaches are two lanes each with dedicated left turn lanes. All approaches to the subject intersection have a 25-mph speed limit and designated pedestrian crosswalks. This intersection is located in downtown Chapel Hill bordering the UNC-Chapel Hill campus.

The original statement of problem mentioned that the intersection was experiencing rear-end, angle, and pedestrian type crashes and needed a general signal upgrade to current standards. The location was part of the 1994 Highway Safety Improvement Program list as HSIP # 67I00012.

The initial crash analysis was completed from November 1, 1998 to October 30, 2001 with thirty-one (31) reported crashes, fourteen (14) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on October 23, 2007 with a total cost of \$35,000.

## 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 August through October 2007. The before period consisted of reported crashes from February 1, 2004 through July 31, 2007 (3 years and 6 months); and the after period consisted of reported crashes from November 1, 2007 through April 30, 2011 (3 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 Northbound Left Turn-Same Roadway Crashes were the target crashes for the applied countermeasure.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	33	31	- 6.1 %
Total Severity Index	3.24	3.15	- 2.8 %
Target Crashes	2	3	50.0 %
Target Crash Severity Index	4.70	1.00	- 78.2 %
Volume (2005, 2009)	24,500	25,700	4.9 %

<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	6	2	- 66.7 %
Class C Injury Crashes	4	7	75.0 %
Total Injury Crashes	10	9	- 10.0 %

The naive before and after analysis at the treatment location resulted in a 6 percent decrease in Total Crashes, a 50 percent increase in Target Crashes, but a 3 percent decrease in the Total Severity Index. The before period ADT year was 2005 and the after period ADT year was 2009.

## Results and Discussion

Referencing the *Collision Diagrams*, this intersection experienced similar crash numbers through the analysis. The before period presented six (6) left turn same roadway crashes, five (5) angle / left turn different roadway, eight (8) rear-end collisions approaching the intersection, and three (3) pedestrian crashes. With the signal upgrade to 12-inch heads and metal poles, the after period intersection presented seven (7) left turn same roadway crashes, four (4) angle / left turn different

roadway, five (5) rear-end collisions approaching the intersection, and two (2) pedestrian crashes. There was an increase in northbound left turn same roadway crashes from two (2) to three (3) collisions with the addition of the northbound NC 86 protected / permissive left turn phase in the after period.

The calculated benefit to cost ratio for this project is **1.25 considering total crashes**. The benefit to cost ratio **considering only target crashes is 0.59**. 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 (July 21<sup>st</sup>, 2011)**  
**Arrived at site immediately following summertime thunderstorm**



**Travelling North on NC 86 (Columbia Street) approaching intersection**



**Travelling South on NC 86 (Columbia Street) approaching intersection**



**Travelling East on Rosemary Street approaching intersection**



**Travelling West on Rosemary Street approaching intersection**

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

LOCATION: Columbia at Rosemary		BY: JBS						
COUNTY: Orange		DATE: 8/3/2011						
FILE NO.: SS 07-02-217								
DETAILED COST:	TYPE IMPROVEMENT -	Signal Upgrade						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$35,000	10	0.149	\$5,216			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$35,000	10	0.149	\$5,216			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$150			
	TOTAL ANNUAL COST=				\$5,566			
	TOTAL COST OF PROJECT=				\$35,000			
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	3.50	0	0.00	10	2.86	23	6.57	\$85,400
AFTER	3.50	0	0.00	9	2.57	22	6.29	\$78,457
							Annual Benefits from Crash Cost Savings	\$6,943
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	\$1,377		
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	1.25		
	TOTAL COST OF PROJECT	-	\$35,000		COMPREHENSIVE B/C RATIO	-		1.25

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

LOCATION: Columbia at Rosemary		BY: JBS						
COUNTY: Orange		DATE: 8/3/2011						
FILE NO.: SS 07-02-217		NB Left Turn Same Roadway Crashes						
DETAILED COST:	TYPE IMPROVEMENT -	Signal Upgrade						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$35,000	10	0.149	\$5,216			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$35,000	10	0.149	\$5,216			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$150			
	TOTAL ANNUAL COST=				\$5,566			
	TOTAL COST OF PROJECT=				\$35,000			
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	3.50	0	0.00	1	0.29	1	0.29	\$6,943
AFTER	3.50	0	0.00	0	0.00	3	0.86	\$3,686
							Annual Benefits from Crash Cost Savings	\$3,257
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	(\$2,309)		
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	0.59		
	TOTAL COST OF PROJECT	-	\$35,000		COMPREHENSIVE B/C RATIO	-		0.59



**LEGEND**

	MOVING VEHICLE		ANGLE		1 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PAKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	FIXED OBJECT		SIDESWIPE		30 MPH TO 39		DRY
	HEAD ON		OUT OF CONTROL		40 MPH TO 49		WET
	REAR END		BLURRY		50 MPH TO 59		ICY OR SNOWY
	RAN OFF ROAD		FATALITY		60 MPH TO 69		SPEED UNKNOWN
					TO AND UP		ONLY

SS# 07-02-217  
 Order# 41000013053  
 Orange County  
 BEFORE Period  
 2/1/04 - 7/31/07

Rosemary St.  
 25-mph

NC 86  
 Columbia St.  
 25-mph

On-Street Parking

To Franklin



Existing  
 Traffic Signal  
 Sig ID 07-0517

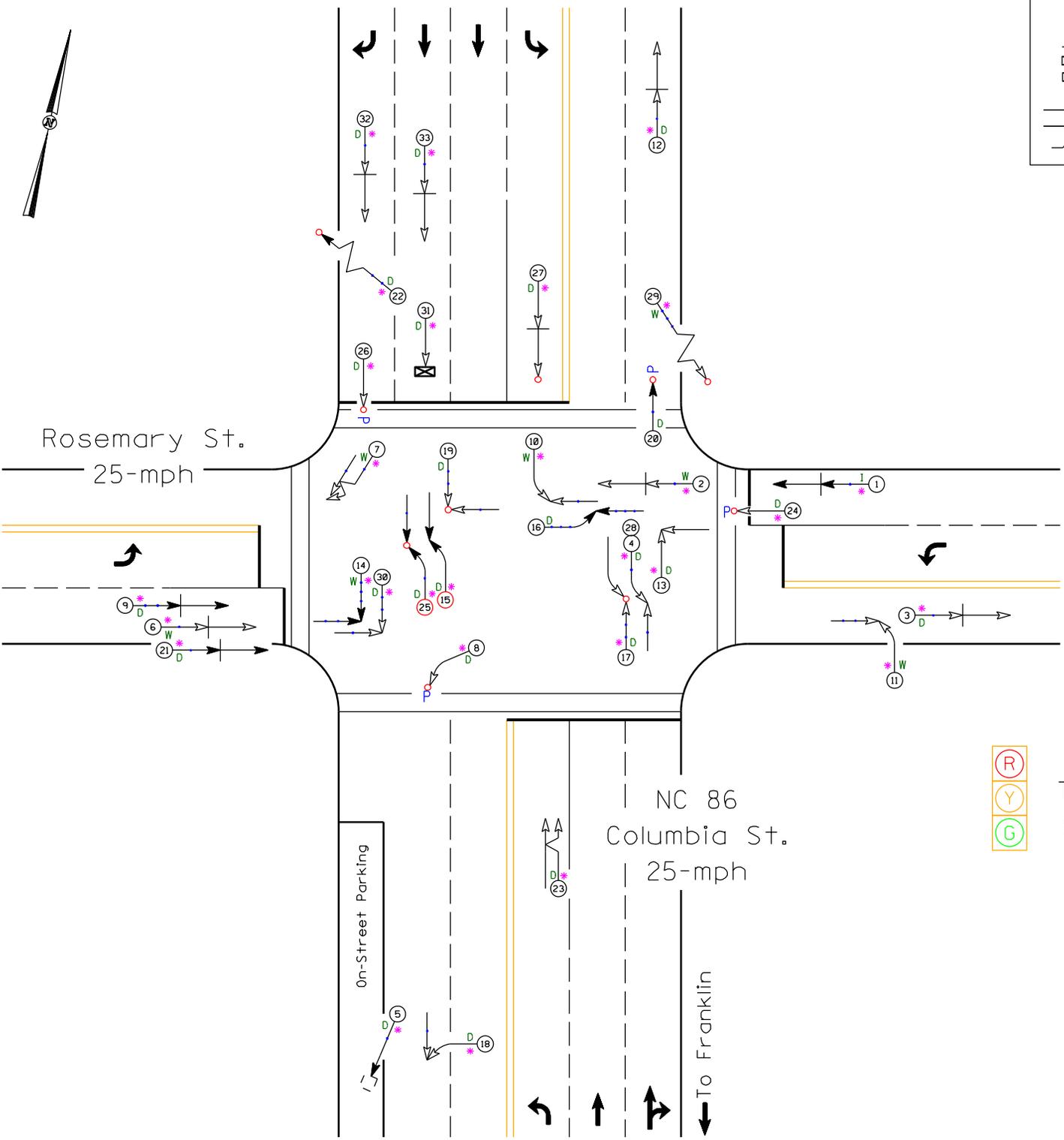


**N.C. DEPARTMENT of TRANSPORTATION**  
**DIVISION of HIGHWAYS**  
**TRANSPORTATION MOBILITY and SAFETY DIVISION**

**TRAFFIC SAFETY UNIT**

Date: 7-26-2011

Prepared By: J. Schronce



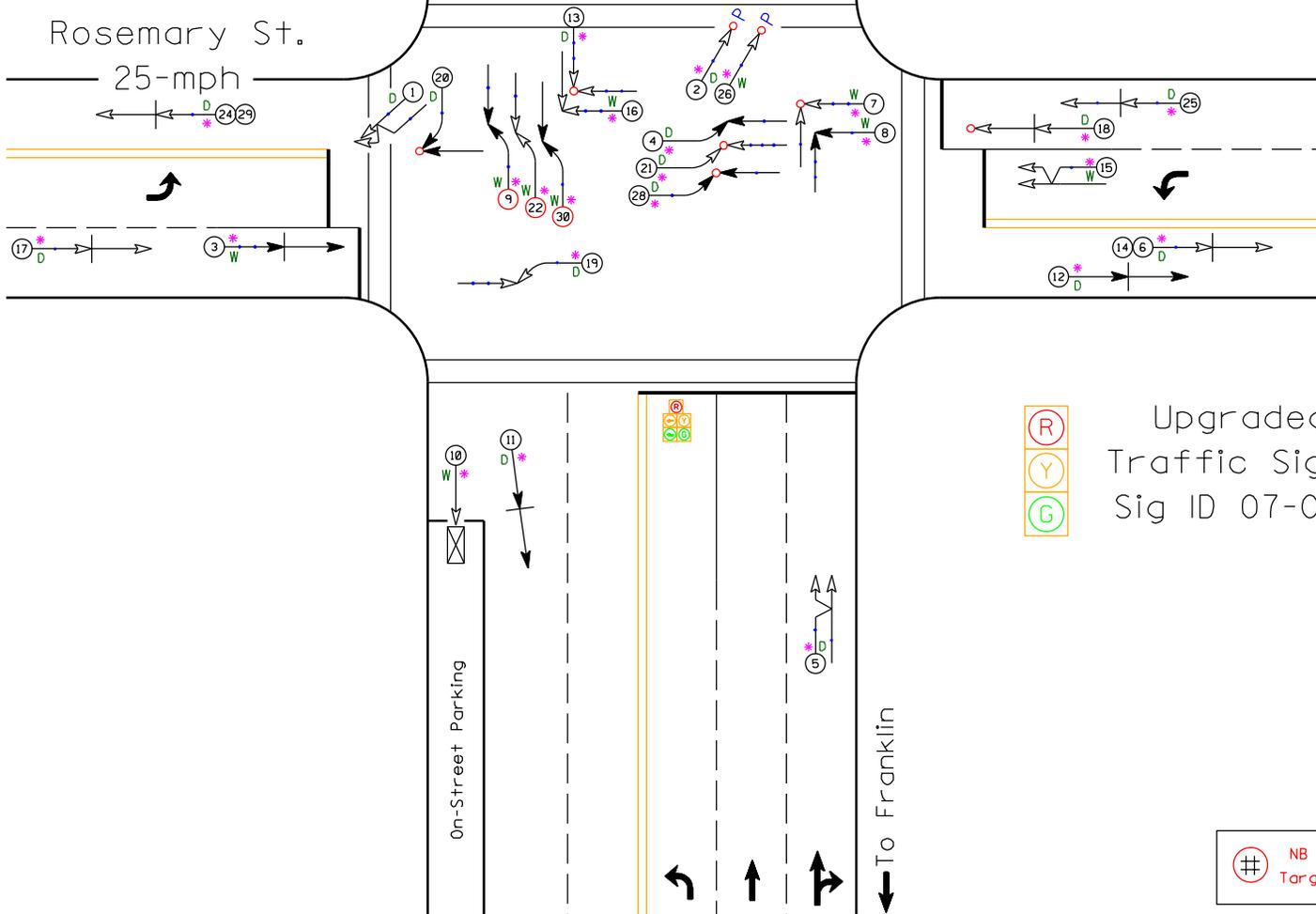


LEGEND

	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
	FIXED OBJECT		SIDESWIPE		30 MPH TO 39		DRY
	HEAD ON		OUT OF CONTROL		40 MPH TO 49		WET
	REAR END		RAN OFF ROAD		50 MPH TO 59		ICY OR SNOWY
	RAN OFF ROAD		INJURY		60 MPH TO 69		FATALITY
			SPEED UNKNOWN		TO AND UP		KEY OR SMOKY
					ONLY		

NC 86  
Columbia St.  
25-mph

Rosemary St.  
25-mph



SS# 07-02-217  
Order# 41000013053  
Orange County  
City - Chapel Hill  
AFTER Period  
11/1/07 - 4/30/11



Upgraded  
Traffic Signal  
Sig ID 07-0517

Upgraded Signal  
with 12' Heads, Metal  
Strain Poles, and a  
Northbound NC-86  
Protected/Permitted  
Left Turn Phase



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

**TRAFFIC SAFETY UNIT**

Date: 7-27-2011

Prepared By: J. Schronce