

Spot Safety Project Evaluation

Project Log # 200611082

Spot Safety Project # 07-00-214 & 07-02-201

**Spot Safety Project Evaluation of the Offset Left Turn Lane (07-00-214)
and New Signal Installation (07-02-201) at the
Intersection of NC 54 Bypass and West Poplar Avenue
Near Carrboro, Orange County**

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

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Traffic Safety Project Engineer

12-10-2007
Date

Spot Safety Project Evaluation Documentation

Subject Location

The Intersection of NC 54 Bypass and West Poplar Avenue in Orange County, near Carrboro.

Project Information

The project improvement countermeasure first chosen for the subject location was to positively offset the median left turn lanes on NC 54. NC 54 Bypass is a four-lane, grass median, divided facility with auxiliary left turn lanes in each direction at the treatment intersection. NC 54 is a major arterial in this area, providing access to and from Chapel Hill including the University of North Carolina campus. The intersection is now controlled by permitted signals with pedestrian crossing activation that was installed under Spot Safety Project 07-02-201. The speed limits are 45 mph on NC 54 Bypass and 25 mph on West Poplar Avenue within the vicinity of the intersection.

The initial crash analysis for the offset left turns at this location was completed from February 1, 1994 through January 31, 2000 with a total of 30 reported crashes. According to the initial crash analysis, there were 8 Left Turn-Same Roadway crashes deemed correctable by offsetting the left turns, resulting in 2 class-A, 1 class-B and 5 class-C injuries.

The initial crash analysis for the signal installation was completed from September 1, 1998 through August 31, 2001 with a total of 16 reported crashes. According to the background information, 9 crashes were deemed correctable, in which all were angle type collisions, resulting in 1 class-A, 10 class-B, and 8 class-C injuries.

According to the Project Justification Sheet, a small traffic island with a stop sign was to be installed on westbound West Poplar Avenue in addition to positively offsetting the left turn lanes on NC 54. This part of the project was not completed at the same time as the left turn offsets were installed. The offset improvement was intended to mitigate the pattern of Left Turn type accidents. The project was completed on December 20, 2002 at an estimated cost of \$75,000. The new traffic signal was completed on June 30, 2004 at an additional cost of \$90,000.

Naïve Before and After Analysis

After reviewing all of the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction periods were from November 1, 2002 through February 28, 2003 and June 1, 2004 through July 31, 2004. The before period consisted of reported crashes from June 1, 1998 through October 31, 2002 (4 Years, 5 Months), the offset left after period consisted of reported crashes from March 1, 2003 through May 31, 2004 (1 Year, 3 Months), and the signal after period consisted of reported crashes from August 1, 2004 through July 31, 2007 (3 Years). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed.

The treatment data consisted of all crashes within 150 feet of the subject intersection. Please see attached *Location Map* for further detail. The following tables depict the Naïve Before and After

Analysis for the Total Crashes and Target Crashes at the treatment location. Please note that the Target Crashes for the offset left countermeasure were Left Turn-Same Roadway (LTSR) Crashes on NC 54 Bypass and Target Crashes for the new signal were angle collisions involving opposing roadway vehicles.

Total Treatment Information	Before (4.42 yrs)	After (1.25 yrs)	After (3 years)	Percent Reduction (-)/ Percent Increase (+) (Before to After Combined)
Total Crashes	24	1	5	- 75.00 %
Total Crashes / year	5.43	0.80	1.67	
Total Severity Index	11.63	8.40	5.44	
Target Crashes	19	0	1	- 94.74 %
Target Severity Index	9.66	0.00	1.00	- 89.65 %
Volume	22,500	21,200	21,200	- 6.13 %

Total Crash Information	Before (4.42 yrs)	After (1.25 yrs)	After (3 years)	Percent Reduction (-)/ Percent Increase (+) (Before to After Combined)
Fatal Injury Crashes	0	0	0	N/A
Class A Injury Crashes	2	0	0	- 100.00 %
Class B Injury Crashes	4	0	2	- 50.00 %
Class C Injury Crashes	10	1	1	- 80.00 %
Total Injury Crashes	16	1	3	- 75.00 %

The naive before and after analysis at the treatment location resulted in a 75 percent decrease in Total Crashes and a 95 percent decrease in Target Crashes. Further investigation shows there was a 75 percent decrease in the Total Number of Injury Crashes over both countermeasure installations. The before period ADT year was 2001 and the after period ADT year was 2004.

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 75 percent decrease in Total Crashes and a 95 percent decrease in Target Crashes. The summary results above demonstrate that the Treatment Location appears to have had a decrease in the number of Total and Target Crashes from the before to the after period using naïve methodologies.

The treatment location also experienced a considerable decrease in crash severity. The Severity Index for the Target Crashes at the treatment intersection decreased by 90 percent. In the before

period, Target Crashes resulted in one Class-A injury crash, four class-B injury crashes, eight class-C injury crashes, and six PDO crashes. In the after period, there was one PDO Target Crash.

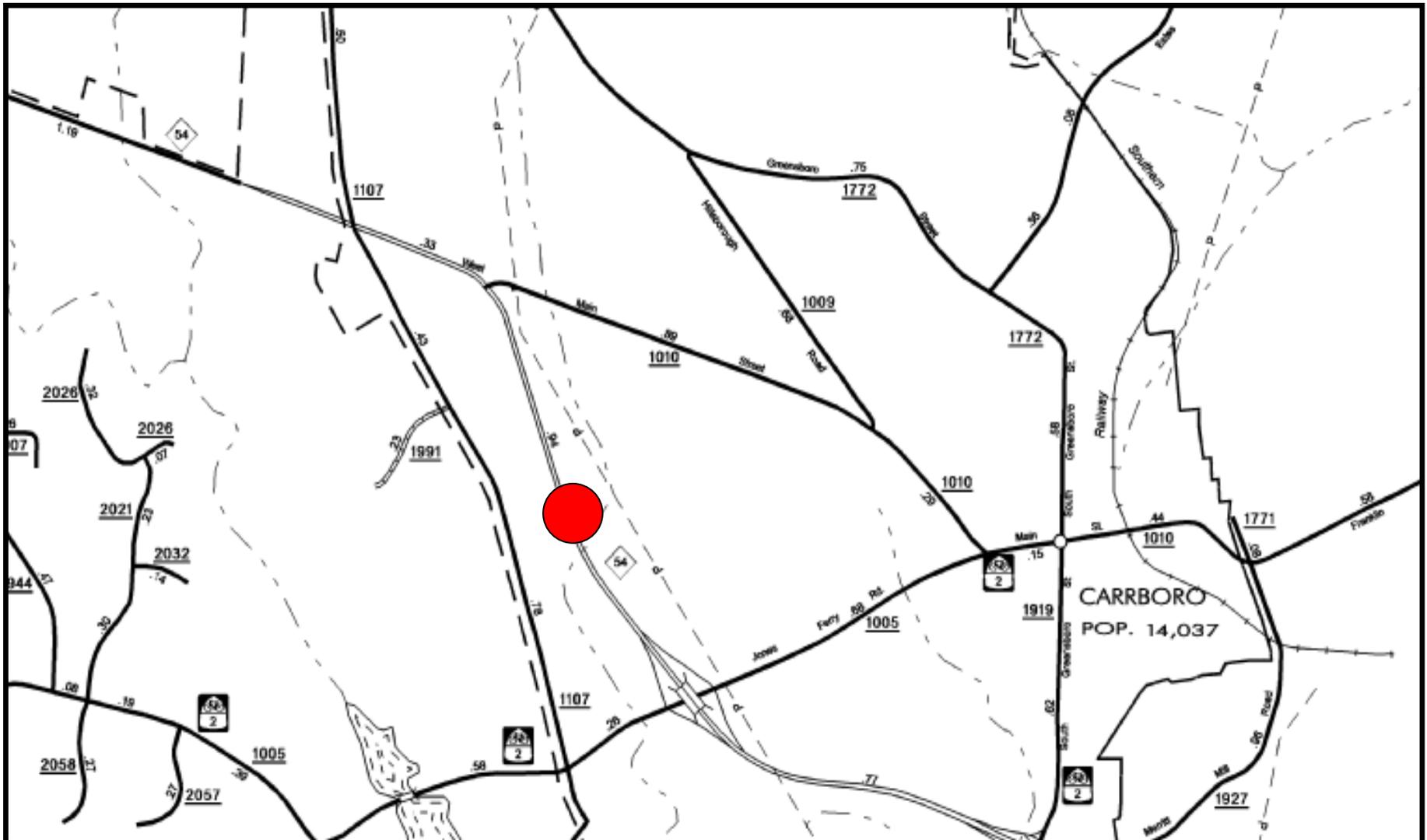
The countermeasure improvements made at this intersection, including the installation of a permitted signal by Spot Safety Project 07-02-201 appeared to correct angle collision crashes from the naïve before and after periods. Angle crashes in the before period, those in which vehicles crossing on West Poplar were struck by traffic on NC 54 Bypass, were the dominating crash pattern with 12 crashes. This problem appears to be properly corrected in the after period naïve study.

The calculated benefit to cost ratio for this project is 9.90 considering total crashes. The benefit to cost ratio considering only target crashes is 6.05. 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. The photos were taken from each leg of the treatment location. As you can see from the photos, offsetting the left-turn lanes has created much clearer sight lines and eliminated the sight restrictions created when left turning motorists were queued in the opposing left turn lane.

As the Safety Evaluation Group completes additional reviews for this type of countermeasure, we will be able to provide more objective and definite information regarding actual crash reduction factors.

**Location Map
Orange County
Evaluation of Spot Safety Project # 07-00-214, 07-02-201**



Treatment Location: NC 54 and W. Popular Ave. near Carrboro

Aerial Map
SS# 07-00-214, 07-02-201



Treatment Photos Taken December 13, 2006



Driving North on NC 54 Bypass



Driving North on NC 54 Bypass



Driving South on NC 54 Bypass



Driving South on NC 54 (Left-turn lane)



Driving East on W. Poplar Ave.



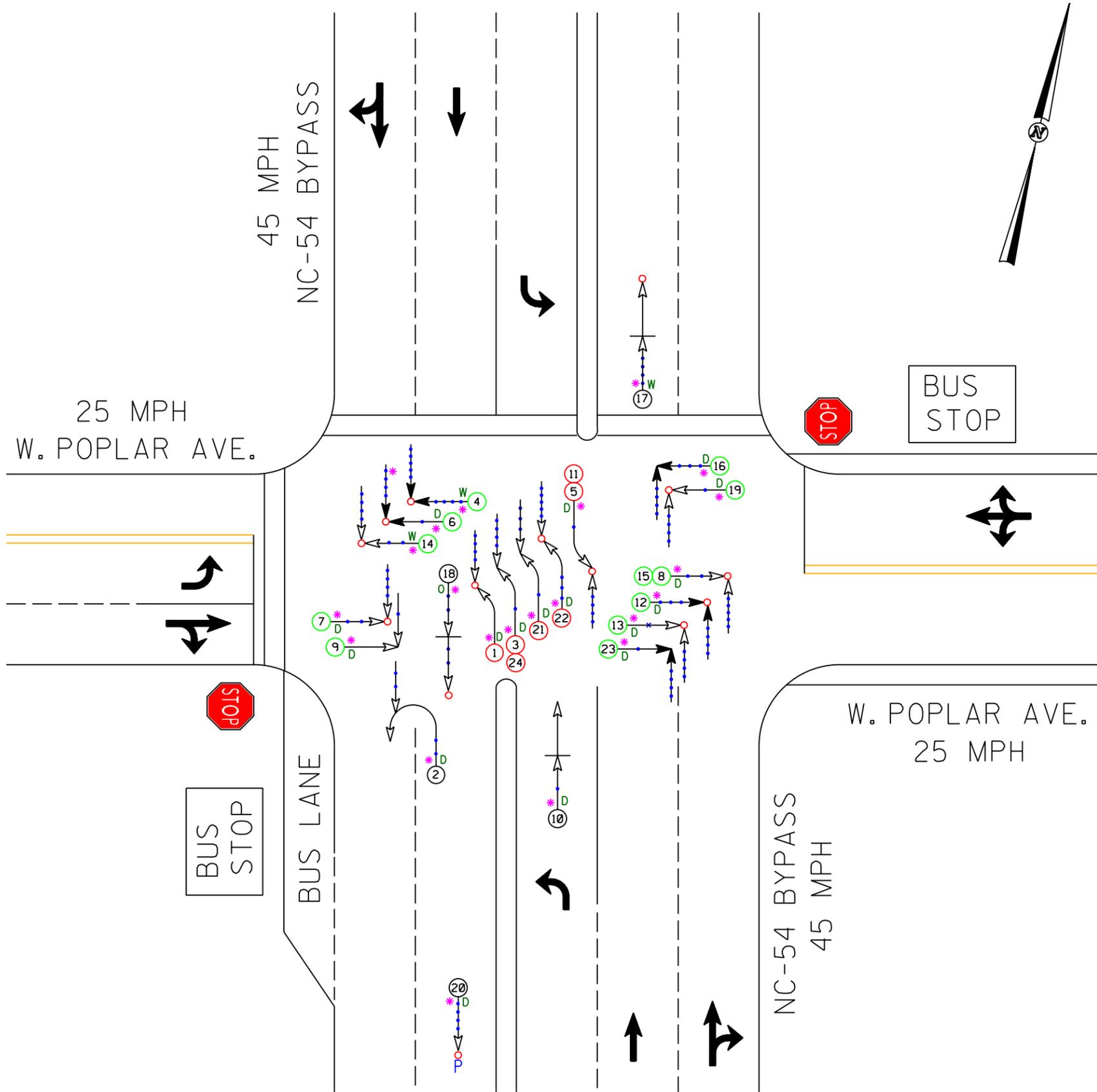
Driving West on W. Poplar Ave.



Facing North on NC 54 Bypass (Left-turn lane)



Facing South on NC 54 Bypass (Left-turn lane)



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		9 MPH OR LESS		OILY

SS# 07-00-214, 07-02-201
 BEFORE PERIOD
 ORANGE COUNTY
 6/1/1998 - 10/31/2002
 NC-54 at POPLAR AVE

Offset Left Target
 Signal Target

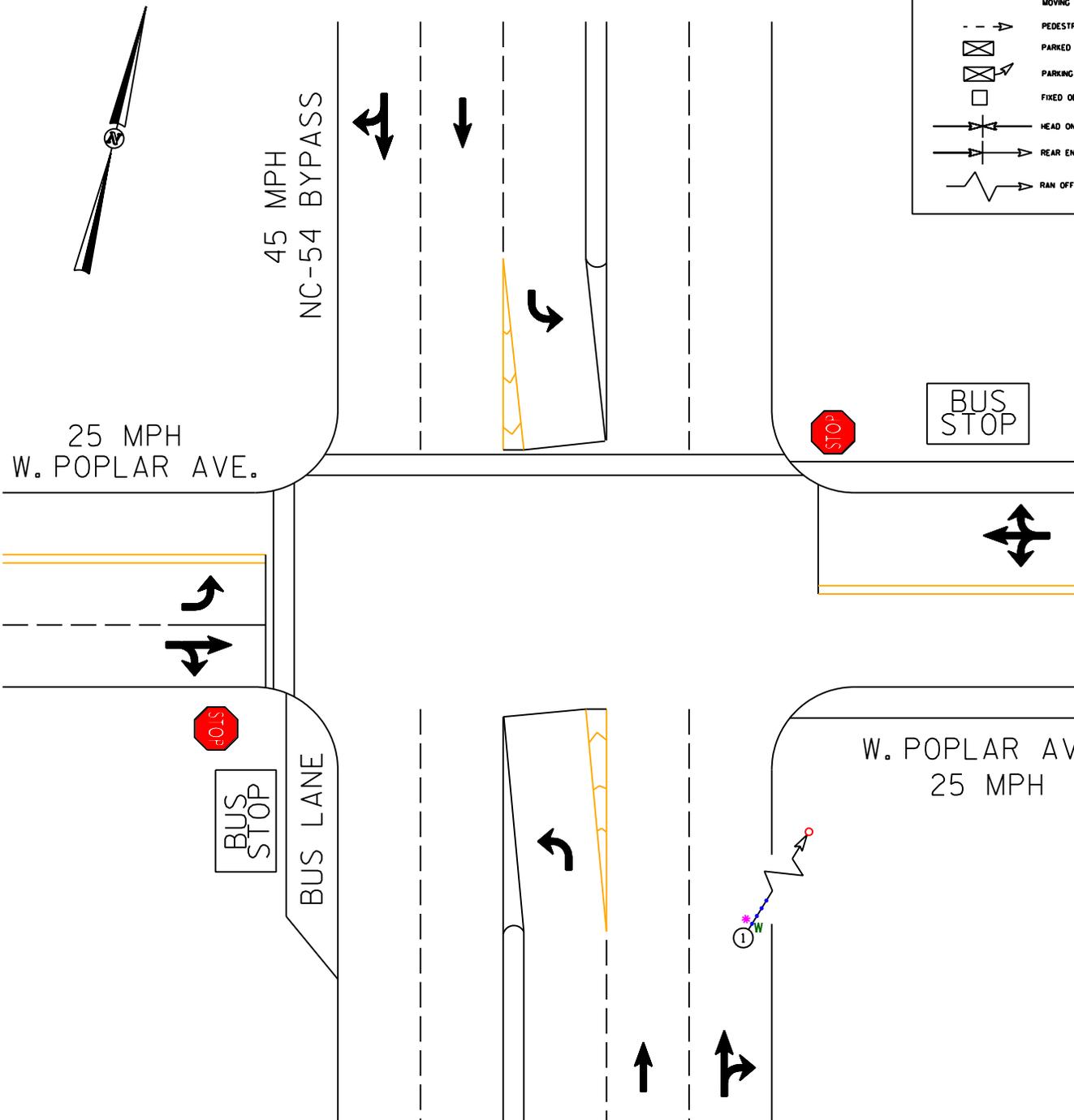
TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 7	AREA:
	STUDY PERIOD: 6/1/1998 TO 10/31/2002	
	DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: CS		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: JBS		
SCALE: NOT TO SCALE		
DATE: 11-28-2007		
LOG NUMBER: SS* 07-00-214		

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH

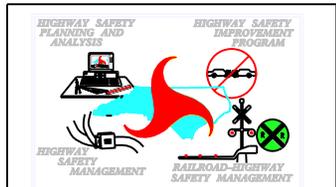
LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		P PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		T TRAIN
	PARKED VEHICLE		BACKING		20 MPH TO 29		• DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		D DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		W WET
	HEAD ON		INJURY		50 MPH TO 59		I ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		70 AND UP
	RAN OFF ROAD		SPEED UNKNOWN		70 AND UP		O ONLY



SS# 07-00-214, 07-02-201
 AFTER PERIOD
 OFFSET-LEFT Only
 ORANGE COUNTY
 3/1/03 - 5/31/04 (1.25 yr)
 NC-54 at POPLAR AVE

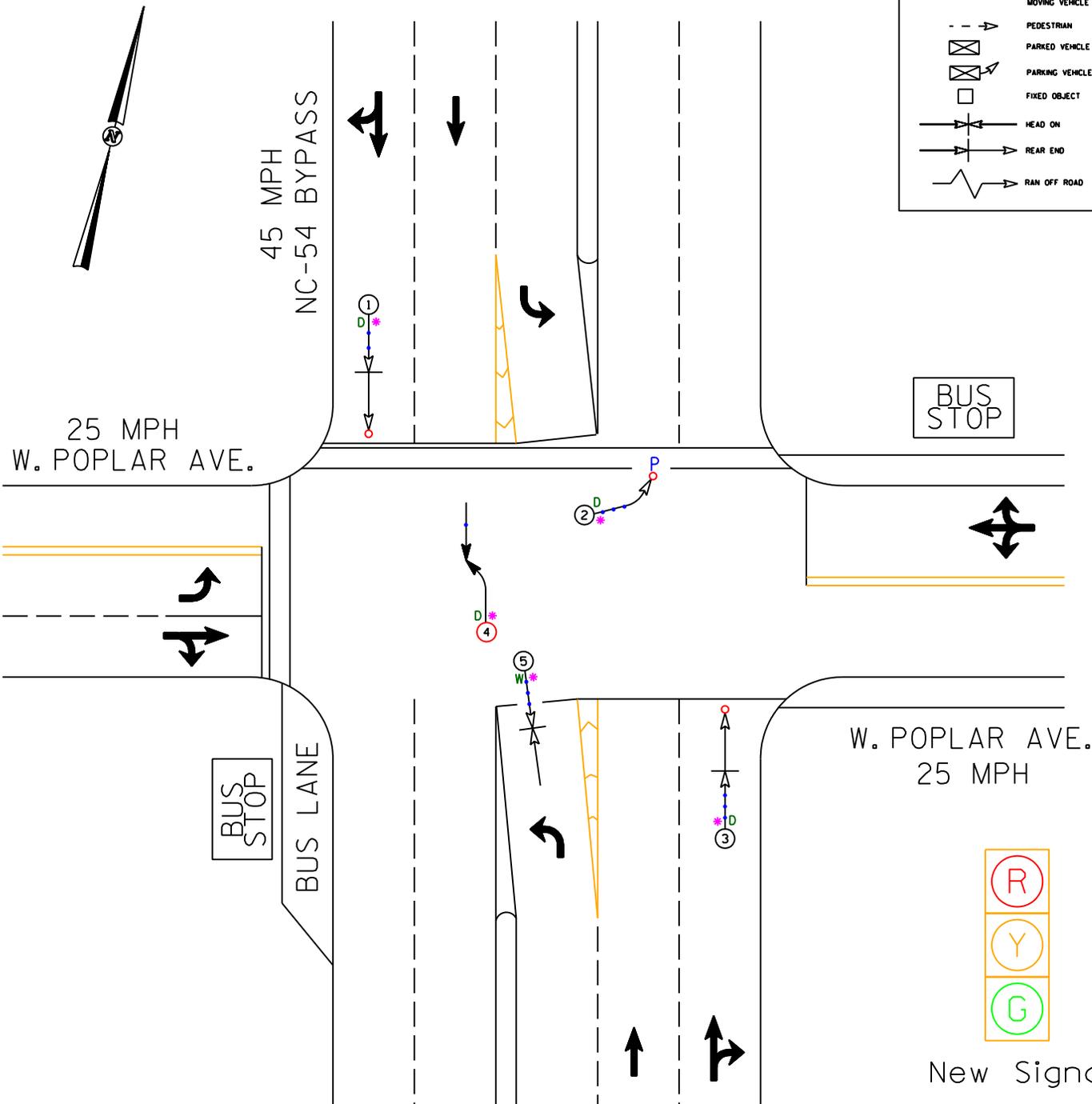
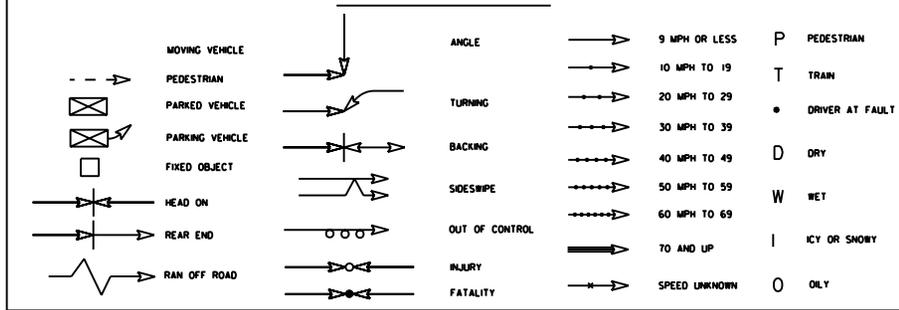
TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT



COLLISION DIAGRAM	
DIVISION: T	AREA:
STUDY PERIOD: 3/1/2003 TO 5/31/2004	DISTANCE: Y-LINE = 150 FT
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: CS	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: JBS	
SCALE:	NOT TO SCALE
DATE: 11-28-2007	
LOC NUMBER: SS# 07-00-214, 07-02-201	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH

LEGEND



SS# 07-00-214, 07-02-201
 AFTER PERIOD
 OFFSET-LEFT & SIGNAL
 ORANGE COUNTY
 8/1/04 - 7/31/07 (3 yrs)
 NC-54 at POPLAR AVE

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

HIGHWAY SAFETY PLANNING AND ANALYSES		HIGHWAY SAFETY IMPROVEMENT PROGRAM	
COLLISION DIAGRAM		DIVISION: T AREA:	
STUDY PERIOD: 8/1/2004 TO 7/31/2007		DISTANCE: Y-LINE = 150 FT	
ANALYSIS PREPARED BY: JBS		ANALYSIS CHECKED BY: CS	
DIAGRAM PREPARED BY: JBS		DIAGRAM REVIEWED BY: JBS	
SCALE: NOT TO SCALE		DATE: 11-28-2007	
LOG NUMBER: SS* 07-00-214, 07-02-201			

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH