

Spot Safety Project Evaluation

Project Log # 200906074

Spot Safety Project # 03-02-221

Spot Safety Project Evaluation of the Signal Phase Changes and Intersection Countermeasure Progression NC 24 Bypass (Kenansville Bypass) at NC 11 Duplin County, Town of Kenansville

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

8-3-2009

Date

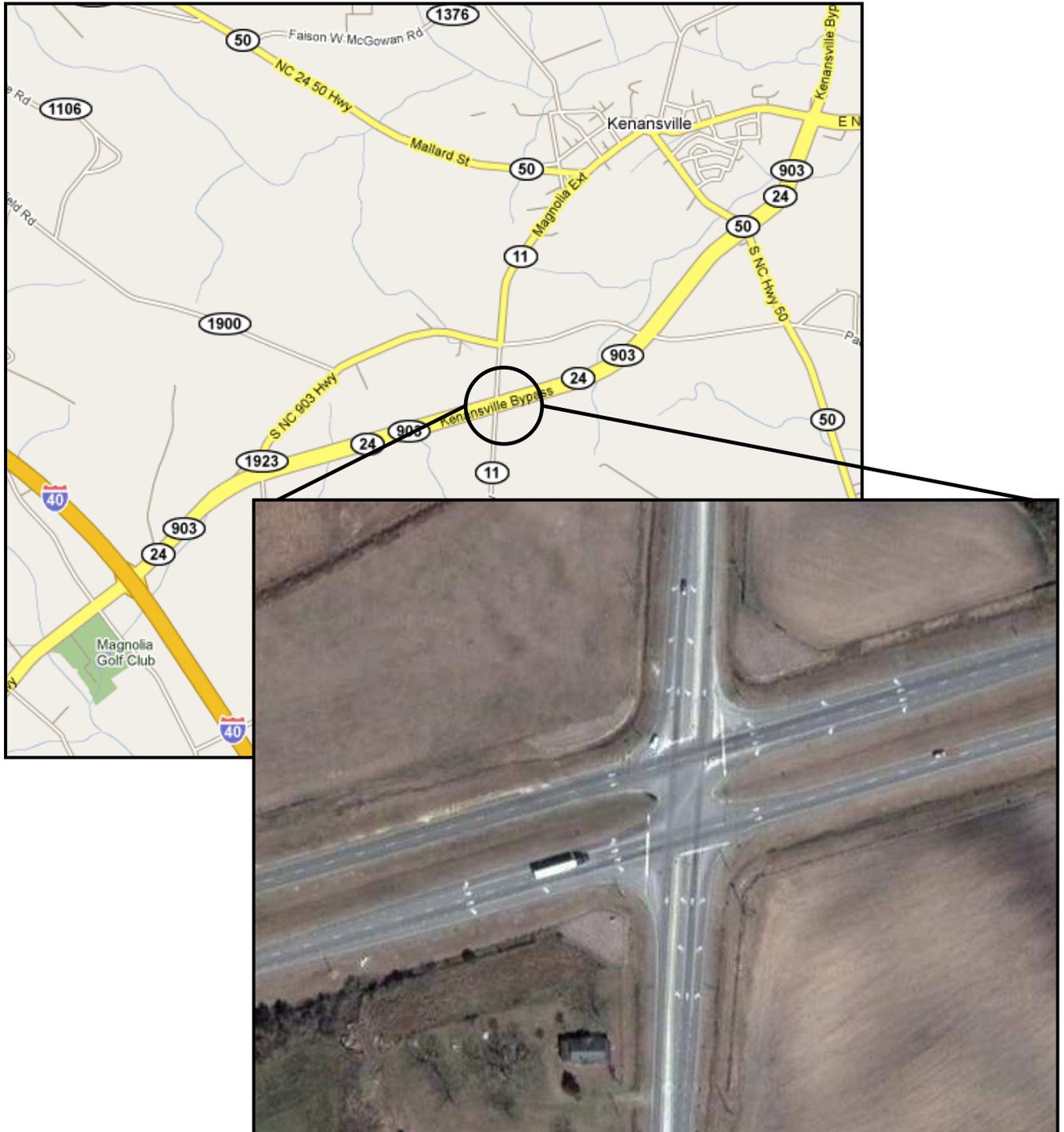
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 03-02-221 located at the Intersection of NC 11 and NC 24 Bypass / NC 903 (Kenansville Bypass) in Duplin County, City of Kenansville.

The Sig ID is 03-0538 for the subject location.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was to change the protective-permissive left turn phasing to protected only. NC 24 Bypass is a four-lane divided facility that provides left and right turn lanes at the intersection. NC 11 is a two-lane facility that widens at the location to also provide left and right turn lanes. The speed limit is 55 mph on all approaches to the subject intersection. NC 24 Bypass went operational to traffic in October 1998.

The original statement of problem was the severe pattern of left turn same roadway collisions on NC 24 Bypass from vehicles attempting to access NC 11. This pattern was occurring in both directions of NC 24 Bypass. This location was identified in the 2002 Highway Safety Improvement Program.

The initial crash analysis was completed from May 1, 1999 to April 30, 2002 with forty-four (44) reported crashes, thirty-five (35) of which were deemed correctable including a fatality crash with three (3) fatal injuries. The protected phasing improvement was requested following the investigation of the fatal collision. The final completion date for the improvement at the subject intersection was on January 29, 2003 with a total cost of \$5,000.

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 adequate construction periods were the months of February 1999 for signal installation, November 1999 for phase changes, and January 2003 for Spot Safety 03-02-221 phase changes. The crash data is split into the following time periods:

Before 1 (Stop Control): October 1, 1998 – January 31, 1999 (4 Months)

Before 2 (New Permissive Signal): March 1, 1999 – October 31, 1999 (8 Months)

Before 3 (Permissive-Protected Lefts): December 1, 1999 – December 31, 2002 (3 Years, 1 Month)

After (NC-24 Protected Lefts): February 1, 2003 – April 30, 2009 (6 Years, 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 target crashes 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; Angle; and Ran-off Roadway collisions due to avoidance of an angle.

<u>Treatment Information</u>	Before 1 Stop Control 0.33 Yrs	Before 2 Signal 0.67 Yrs	Before 3 Perm – Prot 3.08 Yrs	After Protected Lefts 6.25 Yrs
Total Crashes	6	24	26	25
Total Crashes Per Year	18.2	35.8	8.4	4.0
Total Severity Index	27.50	18.57	13.73	6.99
Target Crashes – Frontal Impact	6	23	23	16
Target Crashes Per Year	18.2	34.3	7.5	2.6
Target Crash Severity Index	27.50	19.01	14.75	9.90
Volume	13,500			14,100

<u>Injury Crash Summary</u>	Before 1 Stop Control 0.33 Yrs	Before 2 Signal 0.67 Yrs	Before 3 Perm – Prot 3.08 Yrs	After Protected Lefts 6.25 Yrs
Fatal injury Crashes	1	1	1	0
Class A injury Crashes	1	3	2	1
Class B injury Crashes	0	8	6	5
Class C Injury Crashes	1	8	8	5
Total Injury Crashes	3	20	17	11

The naive before and after progression analysis at the treatment location resulted in a spike in crashes per year with the signal installation but has decreased to 4.0 crashes per year in the after period. The before period ADT year was 2000 and the after period ADT year was 2006.

Results and Discussion

Referencing the *Collision Diagrams*, the two signal controlled before periods indicate severe patterns of NC 24 left turn same roadway crash patterns especially vehicles accessing NC 11 northbound; including 2 fatal collisions. After the NC 24 protected left turn phase installation, the left turn same roadway pattern was significantly reduced to only 4 crashes over 6.25 years. The after period is still experiencing red light run collisions (seven angles, one ran-off road). Permissive NC 11 left turn same roadway crashes are also occurring at a rate of 0.48 crashes per year. Overall, the crash data demonstrates that the intersection countermeasure progression has had a considerable positive impact on the number and severity of collisions at this location.

Please see the attached *Treatment Site Photos*. Photos are provided by 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



Looking North on NC 11



Looking South on NC 11



Looking West onto NC 24 Bypass from Intersection



Looking East onto NC 24 Bypass from Intersection



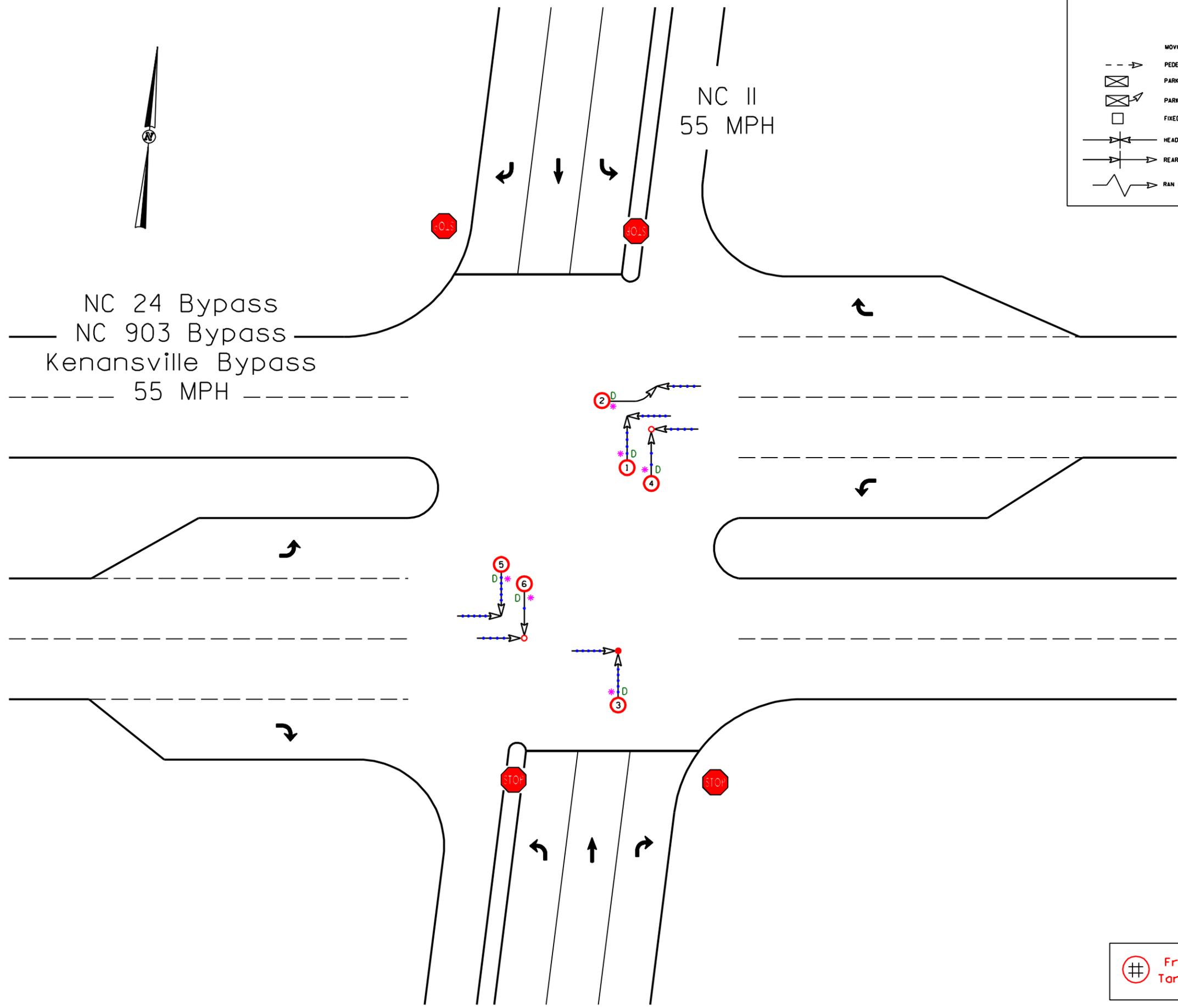
NC II
55 MPH

NC 24 Bypass
NC 903 Bypass
Kenansville Bypass
55 MPH

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		0		OILY

SS# 03-02-221
BEFORE I Period
Stop Control
0.34 Yrs
10/1/98 - 1/31/99

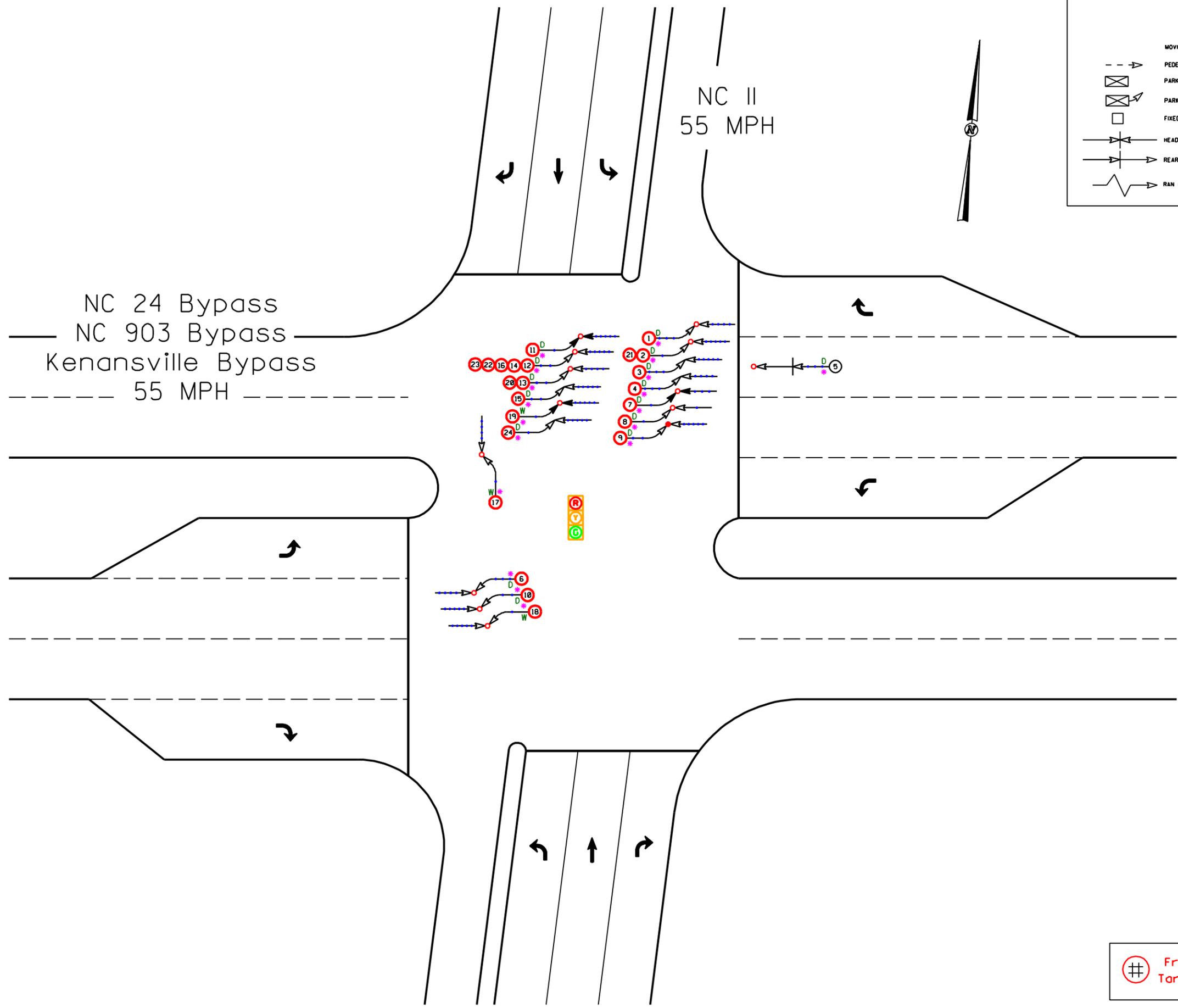


Frontal Impact
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 3	AREA:
	STUDY PERIOD: 10/1/1998 - 1/31/1999	
	DISTANCE: Y-LINE = 150 FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: BR		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 6-22-2009		
LOG NUMBER: SS* 03-02-221 BEFORE I		

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SAFETY DIVISION



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# 03-02-221
 BEFORE 2 Period
 Signal Control
 0.67 Yrs
 3/1/99 - 10/31/99

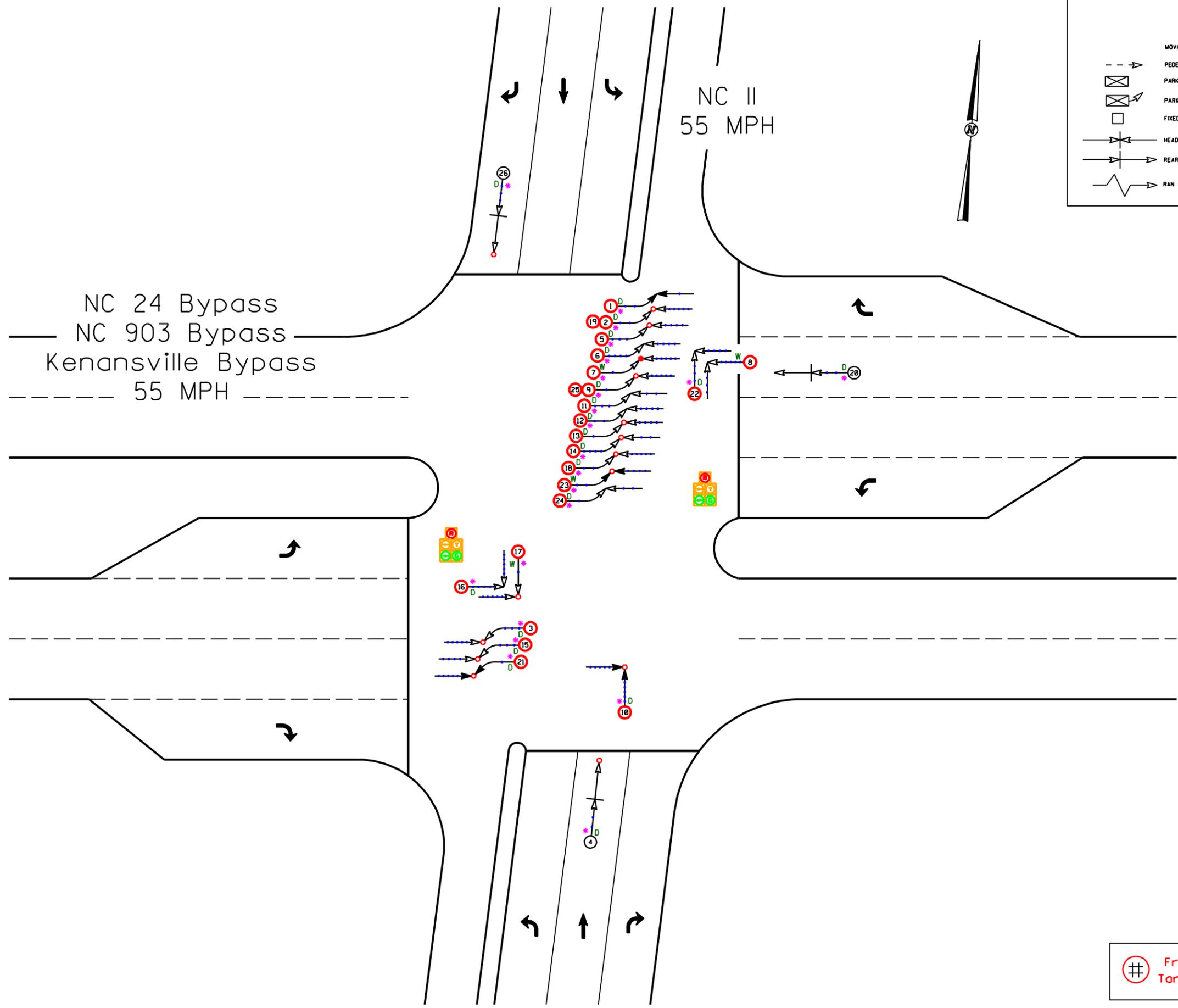
New Signalized
 Intersection
 Sig ID 03-0538

Frontal Impact
 Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 3	AREA:
	STUDY PERIOD: 3/1/1999 - 10/31/1999	
	DISTANCE: Y-LINE = 150 FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: BR		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 6-22-2009		
LOG NUMBER: SS* 03-02-221 BEFORE 2		

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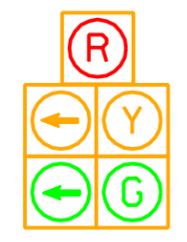
NC II
55 MPH

NC 24 Bypass
NC 903 Bypass
Kenansville Bypass
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LEGEND

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SS# 03-02-221
BEFORE 3 Period
Protected-Permissive
3.08 Yrs
12/1/99 - 12/31/02



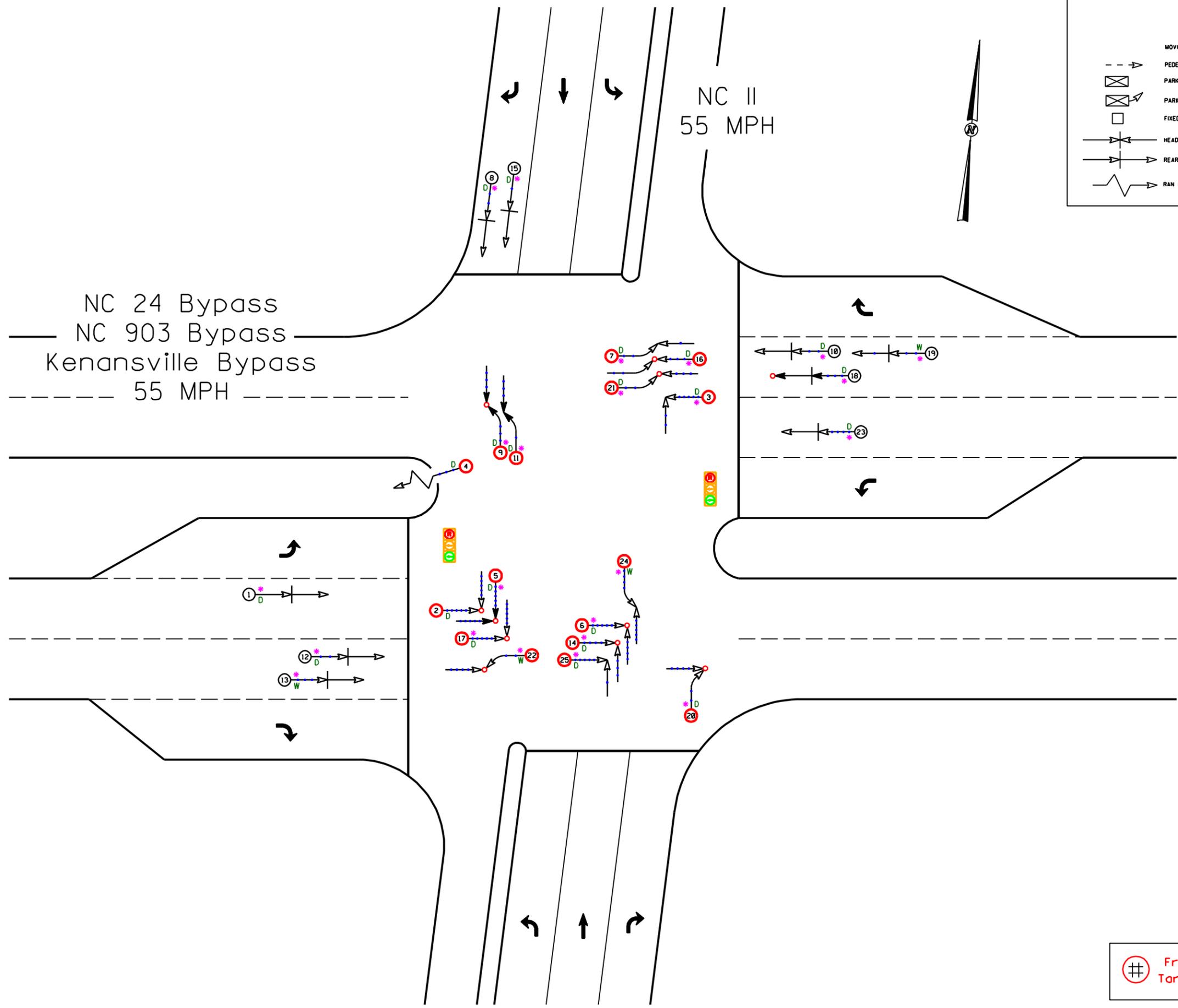
Signal Upgrade
NC 24 Protected/
Permissive Phasing

Frontal Impact
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 3	AREA:
	STUDY PERIOD: 12/1/1999 - 12/31/2002	
	DISTANCE: Y-LINE = 150 FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: BR		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 6-22-2009		
LOG NUMBER: SS* 03-02-221 BEFORE 3		

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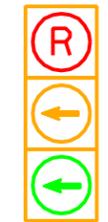
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	REAR END		FATALITY		60 MPH TO 69		OILY
	RAN OFF ROAD		70 AND UP		SPEED UNKNOWN		

SS# 03-02-221
AFTER Period
Protected Phase Only
6.25 Yrs
2/1/03 - 4/30/09



Signal Upgrade
NC 24 Protected
Phasing Only

Frontal Impact
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 3	AREA:
	STUDY PERIOD: 2/1/2003 - 4/30/2009	
	DISTANCE: Y-LINE = 150 FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: BR		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 6-22-2009		
LOG NUMBER: SS* 03-02-221 AFTER		

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