Spot Safety Project Evaluation

Project Log # 200811084

Spot Safety Project # 05-95-228

Spot Safety Project Evaluation of the Intersection Geometry Changes and Traffic Signal Installation at SR 1004 (Garner Rd) and SR 2547 (Jones Sausage Rd) Wake County, City of Garner

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

Traffic Safety Project Engineer

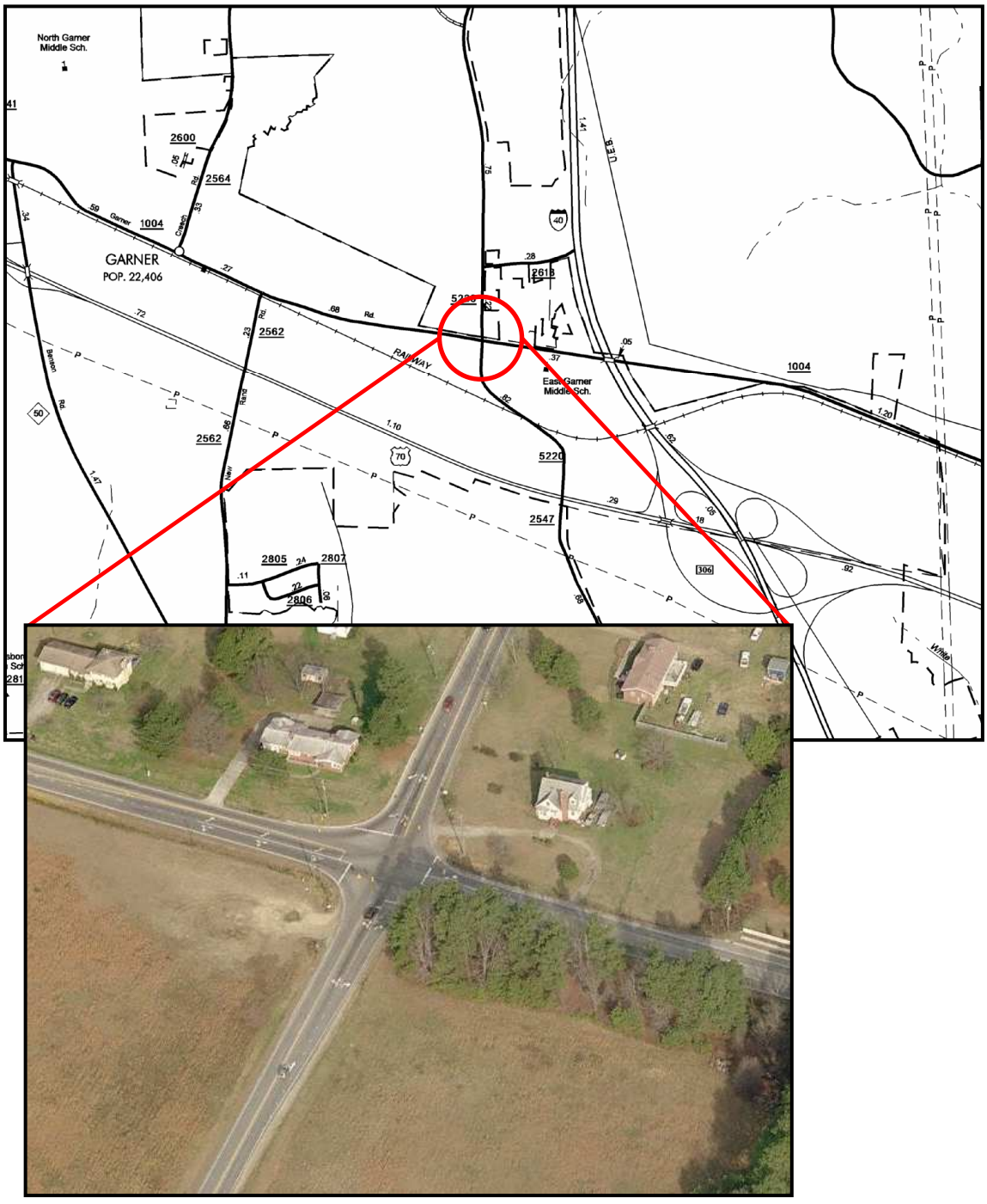
6-10-2009
Date

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 05-95-228 located at the Intersection of SR 1004 (East Garner Road) and SR 2547 / SR 5220 (Jones Sausage Road) in Wake County, Town of Garner.

The Sig ID is 05-1154 for this newly installed traffic signal.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location were the installation of an intersection traffic signal and symmetrical widening to provide turn lanes on all approaches. SR 1004 and SR 2547 were both two-lane facilities with the addition of a northbound right turn lane in the before period and speed limits of 45 mph on all approaches. The subject location is a four-leg crossroads intersection, which was controlled by a stop condition on SR 2547 (Jones Sausage Rd) governed by stop signs and an overhead flasher. The after period intersection widening provided left turn lanes for SR 1004 (Garner Rd) and a southbound right turn lane.

The original statement of problem was that traffic volumes have increased to where side street motorists can no longer maneuver the intersection safely. The intended purpose of these improvements was to alleviate congestion and reduce the existing crash patterns.

The initial crash analysis was completed from January 1, 1996 to December 31, 1998 with twenty-four (24) reported crashes, sixteen (16) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on October 31, 2003 with a total cost of $135,000.00.

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 was the months of August through November 2003. The before period consisted of reported crashes from March 1, 1998 through July 31, 2003 (5 years and 5 months); and the after period consisted of reported crashes from December 1, 2003 through April 30, 2009 (5 years and 5 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; and Angle.

Treatment Information			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	36	23	- 36.1 %
Total Severity Index	7.68	3.57	- 53.5 %
Target Crashes	28	6	- 78.6 %
Target Crash Severity Index	9.32	4.70	- 49.6 %
Volume	14,300	18,700	30.8 %

Injury Crash Summary	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	2	0	- 100.0 %
Class B injury Crashes	4	1	- 75.0 %
Class C Injury Crashes	8	7	- 12.5 %
Total Injury Crashes	14	8	- 42.9 %

The naive before and after analysis at the treatment location resulted in a 36 percent decrease in Total Crashes, a 79 percent decrease in Target Crashes, and a 53.5 percent decrease in the Total Severity Index. The before period ADT year was 2000 and the after period ADT year was 2006.

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 36 percent decrease in Total Crashes and a 79 percent decrease in Target Crashes. The summary results above demonstrate that both Total Crashes 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 was experiencing a significant pattern of angle and left turn type collisions resulting from vehicles improperly entering the intersection from the stop condition. There was only one (1) before period angle crash from a vehicle ignoring and running the stop sign. After the signal installation, frontal impact crashes reduced from twenty-eight (28) to only six (6). Of these frontal impact collisions, five (5) were left turn-same roadway crashes on permissive green phasing and one (1) resulted from a southbound red light run vehicle on SR 2547 (Jones Sausage Road). These intersection improvements have greatly improved the overall safety factor with a reduction in collisions and crash severity.

The calculated benefit to cost ratio for this project is **8.31 considering total crashes**. The benefit to cost ratio **considering only target crashes is 9.00**. 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 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 TAKEN 1/27/2009

Traveling North on SR 2547 (Jones Sausage Rd)

Traveling North on SR 2547

Traveling South on SR 2547 (Jones Sausage Road)

Traveling South on SR 2547

Traveling East on SR 1004 (E. Garner Road)

Traveling West on SR 1004 (E. Garner Road)

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: SR 1004 at SR 2547 | BY: JBS
COUNTY: Wake | DATE: 6/10/2009
FILE NO.: SS 05-95-228 | NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - New Signal / Turn Lanes

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$135,000	10	0.149	$20,119
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$135,000	10	0.149	$20,119

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $3,400
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $24,419
TOTAL COST OF PROJECT= $135,000

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	5.42	2	0.37	12	2.21	22	4.06	$240,185
AFTER	5.42	0	0.00	8	1.48	15	2.77	$37,362

Annual Benefits from Crash Cost Savings $202,823

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $178,404

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 8.31

TOTAL COST OF PROJECT - $135,000 COMPREHENSIVE B/C RATIO - 8.31

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: SR 1004 at SR 2547 | BY: JBS
COUNTY: Wake | DATE: 6/10/2009
FILE NO.: SS 05-95-228 | NOTES: Target Crashes - Frontal Impact

DETAILED COST: TYPE IMPROVEMENT - New Signal / Turn Lanes

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$135,000	10	0.149	$20,119
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$135,000	10	0.149	$20,119

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $3,400
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $24,419
TOTAL COST OF PROJECT= $135,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

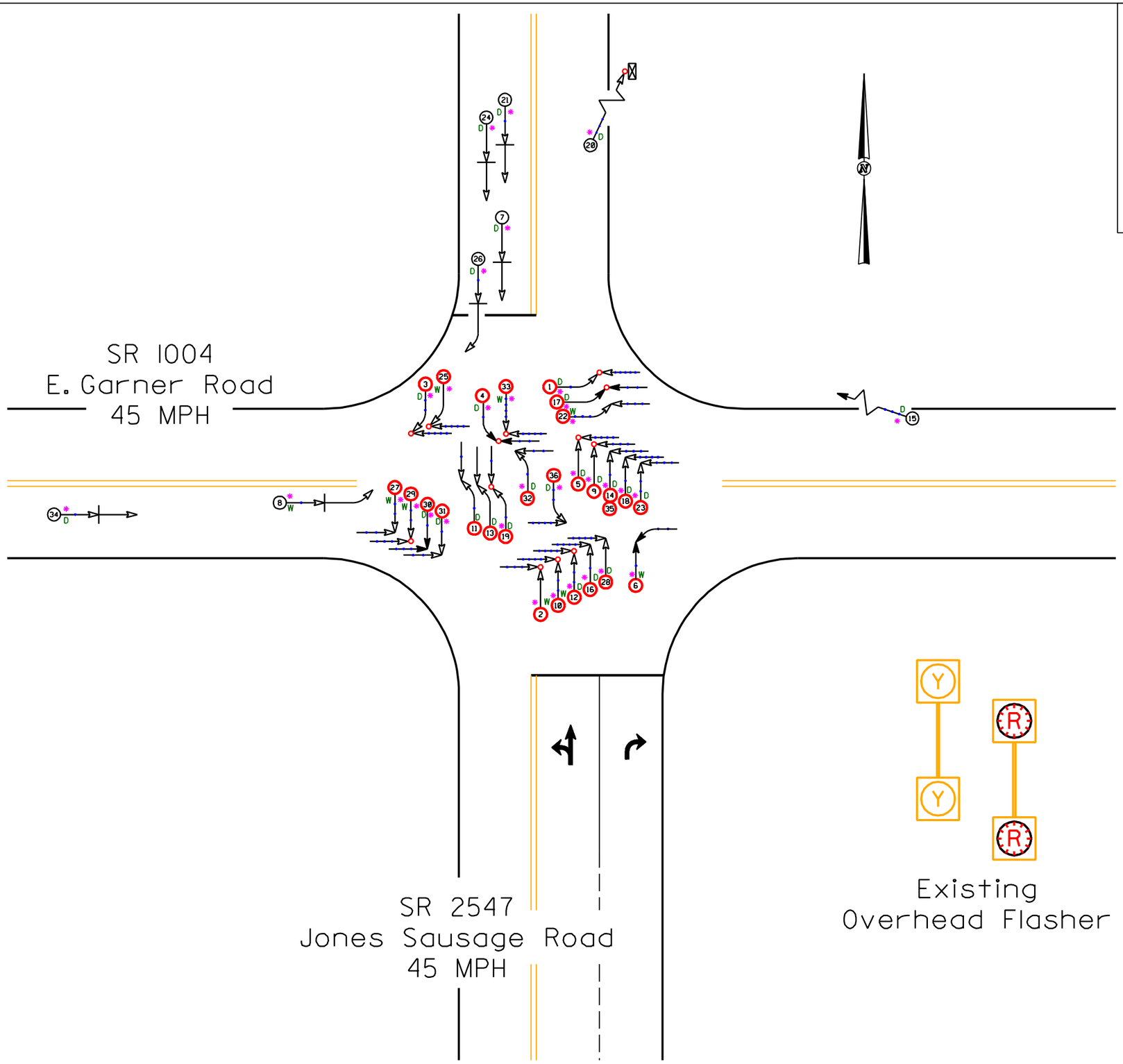
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	5.42	2	0.37	11	2.03	15	2.77	$231,827
AFTER	5.42	0	0.00	3	0.55	3	0.55	$12,122

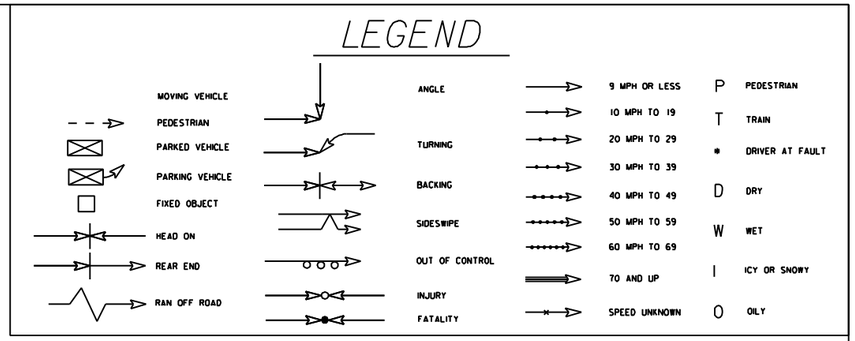
Annual Benefits from Crash Cost Savings $219,705

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $195,286

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 9.00

TOTAL COST OF PROJECT - $135,000 COMPREHENSIVE B/C RATIO - 9.00





SS # 05-95-228
Wake County
City of Garner
BEFORE Period
3/1/98 - 7/31/03

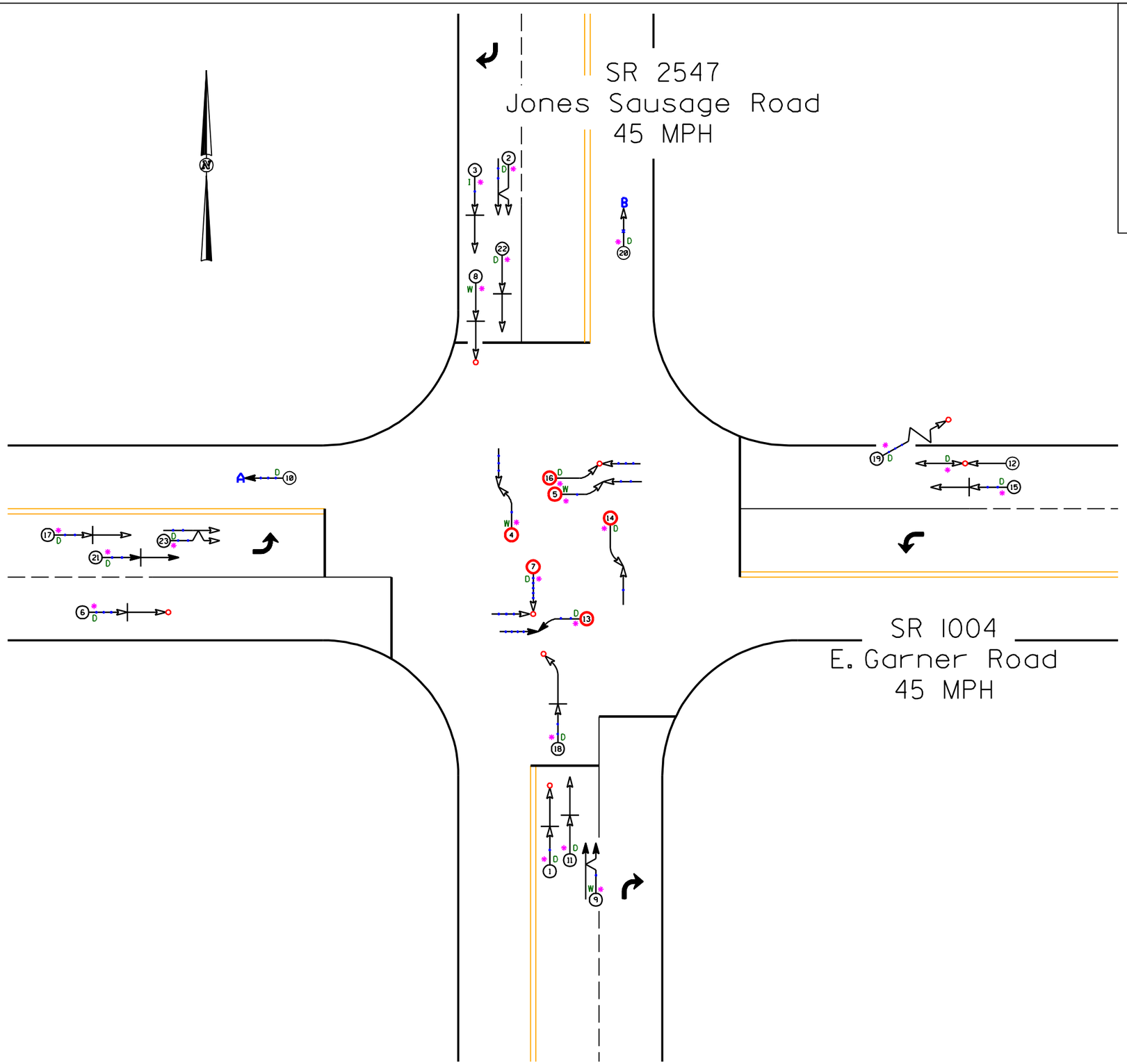
Existing
Overhead Flasher

Frontal Impact
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 5	AREA:
STUDY PERIOD: 3/1/1998 - 7/31/2003	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: ST	
DIAGRAM REVIEWED BY: JBS	
SCALE: NOT TO SCALE	
DATE: 6-9-2009	
LOC NUMBER: SS# 05-95-228 BEFORE	

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



LEGEND

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
TURNING
BACKING
SIDESWIPE
OUT OF CONTROL
INJURY
FATALITY

9 MPH OR LESS
10 MPH TO 19
20 MPH TO 29
30 MPH TO 39
40 MPH TO 49
50 MPH TO 59
60 MPH TO 69
70 AND UP
SPEED UNKNOWN

P PEDESTRIAN
T TRAIN
* DRIVER AT FAULT
D DRY
W WET
I ICY OR SNOWY
O OILY

SS # 05-95-228
Wake County
City of Garner
AFTER Period
12/1/03 - 4/30/09

R
Y
G

New Signalized
Intersection
Sig ID 05-1154

Frontal Impact
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 5	AREA:
STUDY PERIOD: 12/1/2003 - 4/30/2009	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: ST	
DIAGRAM REVIEWED BY: JBS	
SCALE: NOT TO SCALE	
DATE: 6-9-2009	
LOG NUMBER: SS# 05-95-228 AFTER	

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