Spot Safety Project Evaluation

Project Log # 200906130

Spot Safety Project # 04-01-273

Spot Safety Project Evaluation of the Directional Crossover Installation
US 70 and SR 1731 (Piney Grove Road)
Wayne County, near City of La Grange

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Transportation Mobility and Safety Division
North Carolina Department of Transportation

Principal Investigator

_____ 7-6-2009

Jason B. Schronce Date

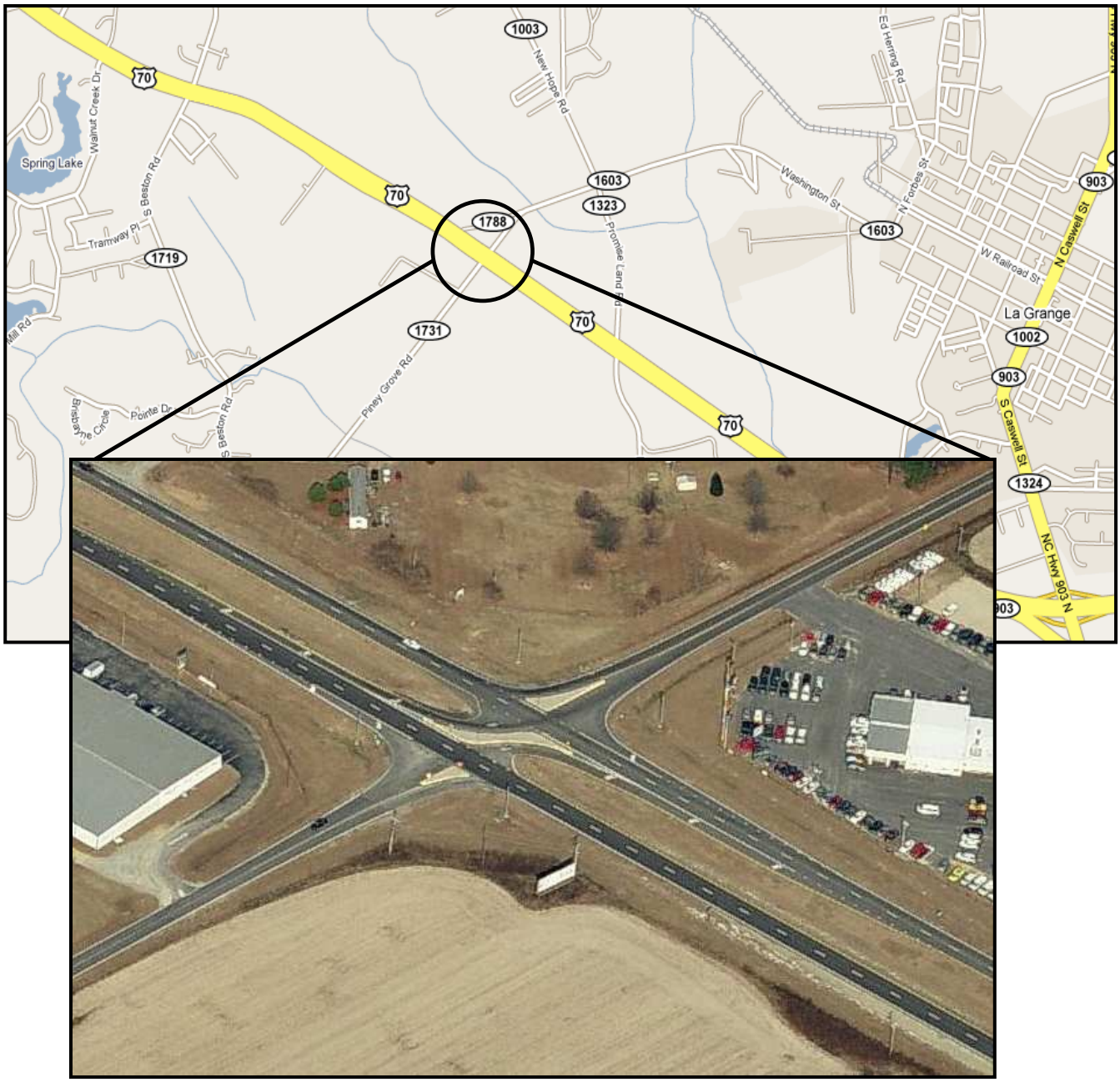
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 04-01-273 located at the Intersection of US 70 and SR 1731 (Piney Grove Road) in Wayne County, near the City of La Grange.

The Sig ID for the existing intersection flasher is 04-0700.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of a US 70 Left Turn Directional Crossover. The original countermeasure chosen was the installation of a traffic signal but that was changed in July 2003 by the Board of Transportation. US 70 is a four-lane divided facility with exclusive left and right turn lanes at the intersection and a speed limit of 55 mph. SR 1731 (Piney Grove Road) is a rural two-lane roadway with a 45 mph speed limit.

The original statement of problem was the existing pattern of angle collisions resulting in severe injuries due to high volumes and a high speed corridor. The intended purpose of this improvement was to reduce the number of angle collisions. This intersection was also listed in the 2001 Highway Safety Improvement Program under PH# 95I00030.

The initial crash analysis was completed from December 1, 1997 to November 30, 2000 with eleven (11) reported crashes, eight (8) of which were deemed correctable angle collisions. The final completion date for the improvement at the subject intersection was on December 17, 2003 with a total cost of $70,000.

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 November and December 2003. The before period consisted of reported crashes from July 1, 1998 through October 31, 2003 (5 years and 4 months); and the after period consisted of reported crashes from January 1, 2004 through April 30, 2009 (5 years and 4 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 Angle Collisions and crashes resulting from avoidance of an angle collision were the target crashes for the applied countermeasure. The target crash types considered are as follows: Angle and Ran-off Roadway when attempting to avoid an angle collision.

Treatment Information			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	27	4	- 85.2 %
Total Severity Index	7.92	2.85	- 64.0 %
Target Crashes	17	0	- 100.0 %
Target Crash Severity Index	10.25	0.00	- 100.0 %
Volume	17,700	17,100	- 3.4 %

Injury Crash Summary	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	0	- 100.0 %
Class B injury Crashes	4	0	- 100.0 %
Class C Injury Crashes	11	1	- 90.9 %
Total Injury Crashes	16	1	- 93.8 %

The naive before and after analysis at the treatment location resulted in an 85 percent decrease in Total Crashes, complete elimination of Target Crashes, and a 64 percent decrease in the Total Severity Index. The before period ADT year was 2001 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 an 85 percent decrease in Total Crashes and complete elimination of 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 period to the after period.

Referencing the *Collision Diagrams*, the before period consisted of a significant pattern of angle collisions from SR 1731 vehicles unsuccessfully crossing US 70. All but one of these angle collisions occurred after the side street motorist had safely accessed the US 70 median. After the directional crossover was installed, target crashes were eliminated due to the removal of the SR 1731 through movement. The after period shows two (2) rear-end collisions from the SR 1731 southbound approach; however this is a reduction from four (4) crashes on this approach in the before period. The directional crossover installation has successfully reduced the number and severity of collisions at this intersection.

The calculated benefit to cost ratio for this project is **13.95 considering total crashes**. The benefit to cost ratio **considering only target crashes is 12.78**. 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

Looking South on SR 1731 (Piney Grove Road)

Looking North on SR 1731 (Piney Grove Road)

Looking East / Southeast on US 70 (from the westbound lane)

Looking West / Northwest on US 70 (from the eastbound lane)

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: US 70 at SR 1731
COUNTY: Wayne
FILE NO.: SS 04-01-273
BY: JBS
DATE: 7/6/2009
NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - New Crossover

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$70,000	10	0.149	$10,432
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$70,000	10	0.149	$10,432

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $100
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $0

TOTAL ANNUAL COST= $10,532
TOTAL COST OF PROJECT= $70,000

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	5.33	1	0.19	15	2.81	11	2.06	$152,514
AFTER	5.33	0	0.00	1	0.19	3	0.56	$5,572

Annual Benefits from Crash Cost Savings $146,942

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $136,410

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 13.95

TOTAL COST OF PROJECT - $70,000 COMPREHENSIVE B/C RATIO - 13.95

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: US 70 at SR 1731
COUNTY: Wayne
FILE NO.: SS 04-01-273
BY: JBS
DATE: 7/6/2009
NOTES: Target Crashes - Angle & Avoidance

DETAILED COST: TYPE IMPROVEMENT - New Directional Crossover

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$70,000	10	0.149	$10,432
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$70,000	10	0.149	$10,432

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $100
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $0

TOTAL ANNUAL COST= $10,532
TOTAL COST OF PROJECT= $70,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

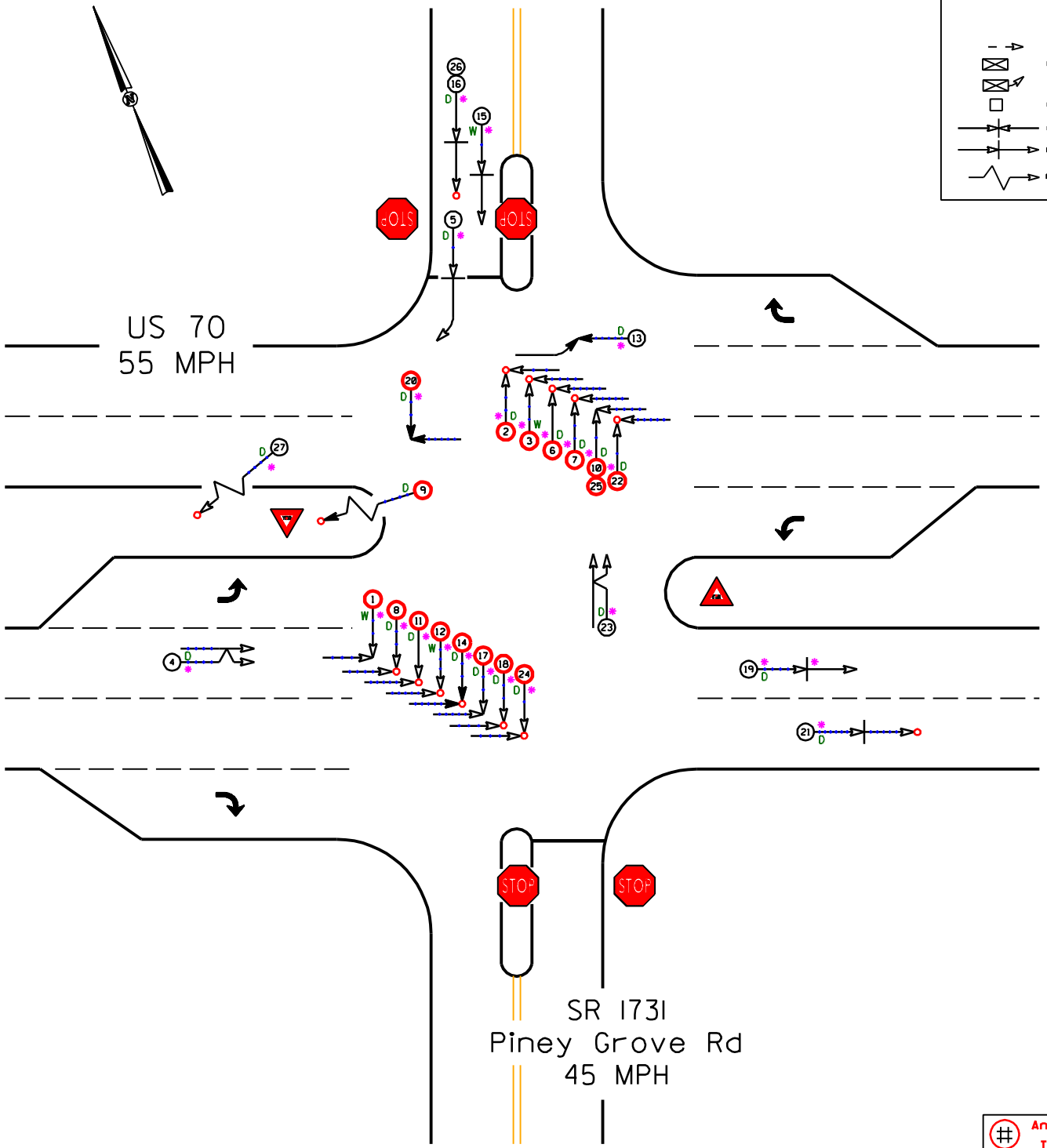
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	5.33	1	0.19	11	2.06	5	0.94	$134,615
AFTER	5.33	0	0.00	0	0.00	0	0.00	$0

Annual Benefits from Crash Cost Savings $134,615

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $124,083

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 12.78

TOTAL COST OF PROJECT - $70,000 COMPREHENSIVE B/C RATIO - 12.78



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# 04-01-273
Wayne County
BEFORE Period
7/1/98 - 10/31/03

Existing
Flasher
Sig ID 04-0700

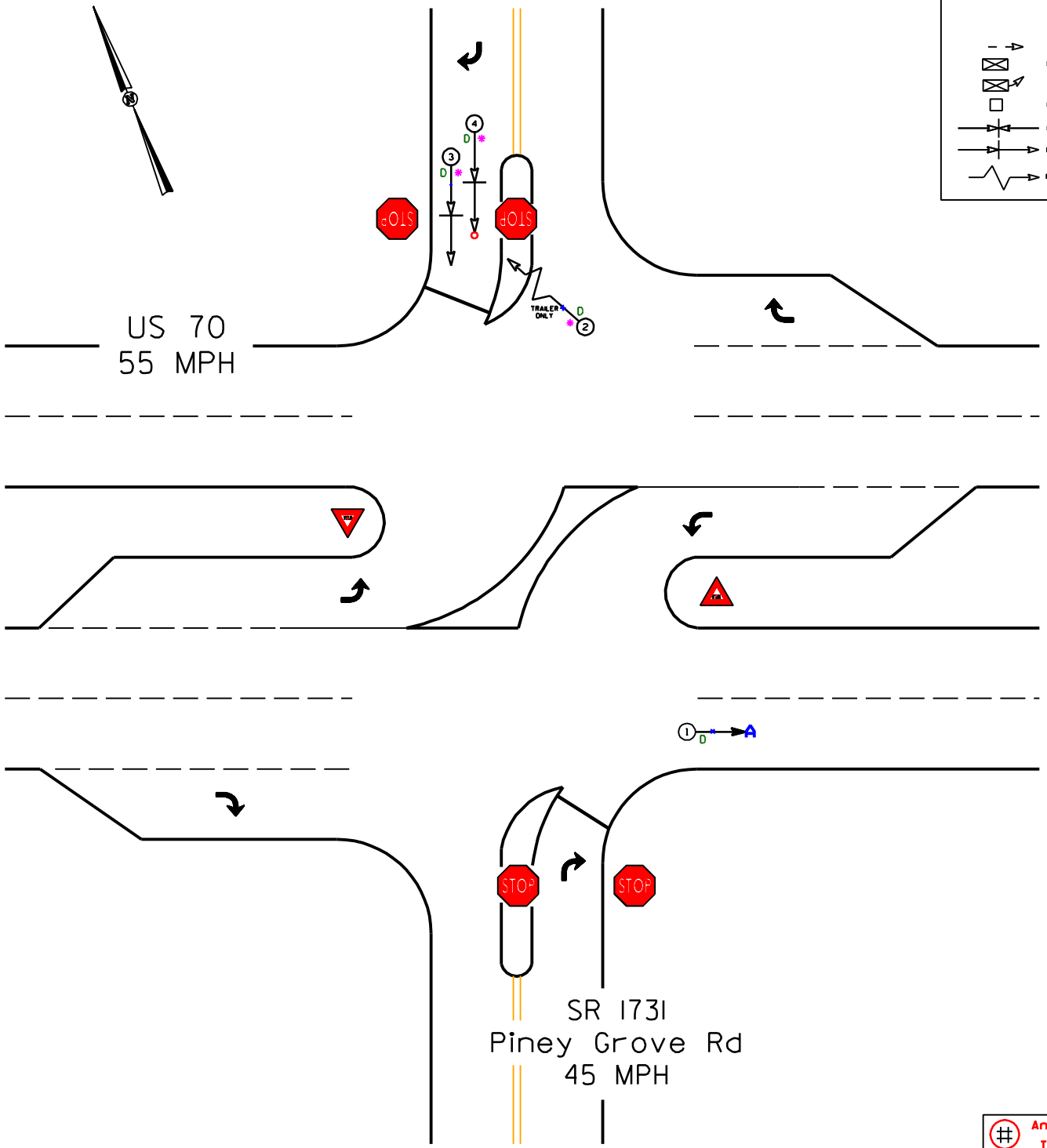
Angle / Avoidance
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM

DIVISION: 4	AREA:
STUDY PERIOD: 7/1/1998 - 10/31/2003	
DISTANCE:	Y-LINE = 150FT
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: N/A	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 6-25-2009	
LOG NUMBER: SS# 04-01-273 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

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9 MPH OR LESS
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70 AND UP
SPEED UNKNOWN

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

SS# 04-01-273
Wayne County
AFTER Period
1/1/04 - 4/30/09

Existing
Flasher
Sig ID 04-0700

Angle / Avoidance
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 4	AREA:
STUDY PERIOD: 1/1/2004 - 4/30/2009	
DISTANCE:	Y-LINE = 150FT
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: N/A	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 6-25-2009	
LOG NUMBER: SS# 04-01-273 AFTER	

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