

Hazard Elimination Project Evaluation

Project Log # 200502113

Hazard Elimination Project W-3420

Evaluation of the Intersection Realignment, Left Turn Lane Construction, and Traffic Signal Installation at the Intersection of SR 2133-Pleasant Ridge Rd at SR 2137-Old Oak Ridge Rd, SR 2271-Prentiss Rd, and SR 2267-Montague St, in Guilford County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
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3/1/2006

Date

Hazard Elimination Project Evaluation Documentation

Subject Location

Evaluation of Hazard Elimination Project W-3420 –
The Intersection of SR 2133 (Pleasant Ridge Rd) at SR 2137 (Old Oak Ridge Rd), SR 2271 (Prentiss Rd), and SR 2267 (Montague St) in Guilford County

Introduction

In an attempt to assess the safety of our roads, the Safety Evaluation Group of the Traffic Safety Systems Management Section has evaluated the above project. The methodologies used in this evaluation offer various philosophies and ideas, in an effort to provide objective countermeasure crash reduction results. A naive before and after analysis has been completed to measure the effectiveness of this hazard elimination project. This information is provided to you so the benefit or lack of benefit for this type of project can be recognized and utilized for future projects.

Project Information and Background from the Project File Folder

The safety countermeasures chosen for the subject location were to:

- 1) Widen SR 2137 (Old Oak Ridge Rd) and both approaches of SR 2133 (Pleasant Ridge Rd) to provide left turn lanes,
- 2) Realign SR 2137 (Old Oak Ridge Rd) to tee into SR 2133 (Pleasant Ridge Rd) across from SR 2271 (Prentiss Rd), and
- 3) Install a three-phase traffic signal with southbound protected-permitted phasing at the Treatment Intersection.

The subject location is situated in a rural residential area. The speed limits on SR 2133 (Pleasant Ridge Rd) and SR 2137 (Old Oak Ridge Rd) are 50 mph and 45 mph, respectively. Prior to the improvements, the south leg of SR 2133 (Pleasant Ridge Rd) tied into SR 2137 (Old Oak Ridge Rd) and the north leg of SR 2133 (Pleasant Ridge Rd) as a stop condition. SR 2271 (Prentiss Rd) tied into the south leg of SR 2133 (Pleasant Ridge Rd) while SR 2267 (Montague St) tied into SR 2137 (Old Oak Ridge Rd) creating a five-legged intersection.

The initial crash analysis for this location was completed from March 1, 1991 through February 28, 1994 with a total of 23 reported crashes. According to the initial crash analysis, there were nine Angle crashes, six Left Turn-Same Roadway crashes, five Rear End crashes, and three Run-Off-Road crashes. The Project File Folder states that the five-legged intersection had restrictive sight distance, which caused motorists to run stop signs and pull out in front of oncoming vehicles. The project was completed on November 6, 1998 at a cost of \$325,000.

Naïve Before and After Analysis

After reviewing the hazard elimination 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 from June 1, 1998 through May 31, 1999. The before period consisted of reported crashes from June 1, 1992 through May 31, 1998 (6 Years) and the after period consisted of reported crashes from June 1, 1999 through May 31, 2005 (6 Years). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed.

In order to include the left turn lanes within the project limits, the treatment data consisted of all crashes within a 250 feet Y-line of the intersection on the south leg of SR 2133 (Pleasant Ridge Rd) and within a 375 feet Y-line of the intersection on the north leg of SR 2133 (Pleasant Ridge Rd). In addition, a 720 feet Y-line was used on the approach leg of SR 2137 (Old Oak Ridge Rd). Where no left turn lanes were installed, a 150 feet Y-line was used on the approach legs of SR 2271 (Prentiss Rd) and SR 2267 (Montague St). Please see the attached *Location Map* for further detail.

The following table depicts 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 applied countermeasure were:

- Frontal Impact crashes, which include Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle *AND*
- Rear End crashes on the approaches of SR 2133 (Pleasant Ridge Rd) and SR 2137 (Old Oak Ridge Rd).

<u>Treatment Information</u>	Before	After	Percent Reduction (-)/ Percent Increase (+)
Total Crashes	63	15	-76.2%
Total Severity Index	7.66	9.01	17.6%
Target - Frontal Impact Crashes	47	9	-80.9%
Target - Frontal Impact Severity Index	8.83	12.71	43.9%
Target – Rear End Crashes	12	4	-66.7%
Target – Rear End Severity Index	4.70	2.85	-39.4%
Volume	8400	14200	69.0%

<u>Total Crash Information</u>	Before	After	Percent Reduction (-)/ Percent Increase (+)
Fatal Injury Crashes	0	0	N/A
Non-Fatal Injury Crashes	29	7	-75.9%
Total Injury Crashes	29	7	-75.9%
Night Crashes	15	2	-86.7%
Wet Crashes	16	3	-81.3%

The naïve before and after analysis at the treatment location resulted in a 76.2 percent decrease in Total Crashes, an 80.9 percent decrease in Target Frontal Impact Crashes, a 66.7 percent decrease in Target Rear End Crashes, and a 69.0 percent increase in Average Daily Traffic (ADT). Further investigation shows there was a 17.6 percent increase in the Severity Index for Total Crashes, a 43.9 percent increase in the Severity Index for Target Frontal Impact Crashes, and a 39.4 percent decrease in the Severity Index for Target Rear End Crashes. The before period ADT year was 1995 and the after period ADT year was 2002.

Results and Discussion

The naïve before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 76.2 percent decrease in Total Crashes, an 80.9 percent decrease in Target Frontal Impact Crashes, and a 66.7 percent decrease in Target Rear End Crashes.

Further investigation shows there was a 17.6 percent increase in the Severity Index for Total Crashes, a 43.9 percent increase in the Severity Index for Target Frontal Impact Crashes, and a 39.4 percent decrease in the Severity Index for Target Rear End Crashes. The summary results above demonstrate that the Treatment Location appears to have had a substantial decrease in the number of crashes from the before to the after period using naïve methodologies. Although the severity index increased for Total Crashes and Frontal Impact Crashes, both experienced a dramatic decrease in the number of injury crashes from the before to the after period.

A breakdown of the Target crashes in the before and after period revealed the following results. Rear End crashes on SR 2137 and SR 2133 were a component of the Target Crashes because of the left-turn installation countermeasure on these approaches. In the before period, there were twelve (12) Rear-End crashes at the Treatment Location, resulting in six (6) injury crashes. In the after period, there were four (4) Rear-End crashes at the Treatment Location, resulting in one (1) injury crash.

The Target Crashes for this evaluation also included Frontal Impact Crashes. In the before period, fourteen (14) of the forty-seven (47) Frontal Impact crashes were caused by northbound vehicles on SR 2133 pulling out in front of southbound vehicles on SR 2133. An additional twenty-one (21) Frontal Impact crashes were caused by left-turning vehicles on SR 2137 choosing improper gaps and turning in front of oncoming traffic. As previously stated, limited sight distance at the intersection did appear to be an issue in this crash pattern. In the after period, there were nine (9) Frontal Impact crashes. Seven (7) of these were caused by left-turning vehicles on southbound SR

2133 choosing improper gaps and turning in front of northbound SR 2133 traffic. The number of Frontal Impact injury crashes decreased (by 77.3 percent) from twenty-two (22) in the before period to five (5) in the after period.

Also notice that the number of Night crashes and Wet crashes decreased dramatically from the before to the after period. The total number of Night crashes decreased (by 86.7 percent) from fifteen (15) crashes in the before period to two (2) crashes in the after period. The total number of Wet crashes decreased (by 81.3 percent) from sixteen (16) crashes in the before period to three (3) crashes in the after period.

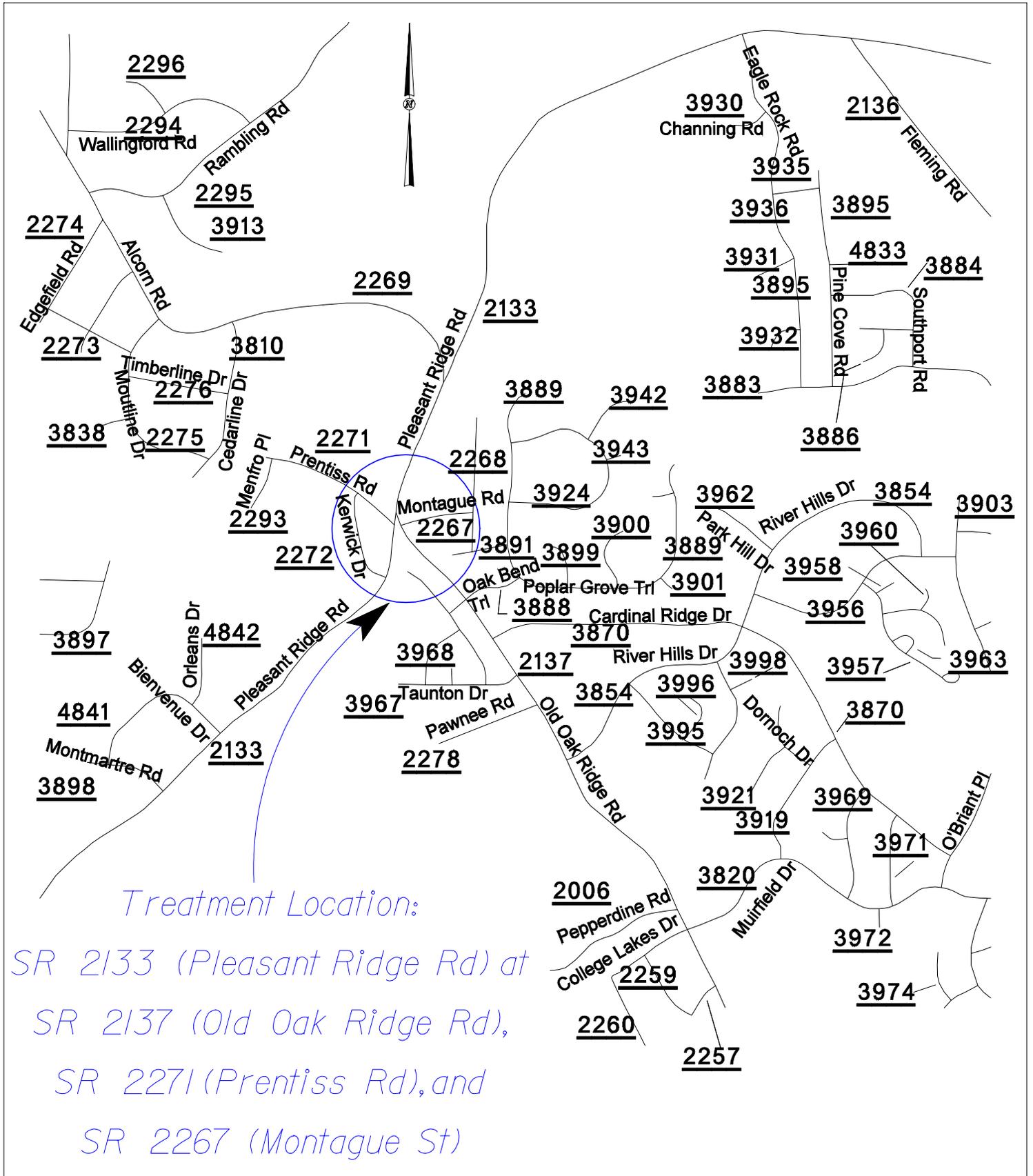
Please see the attached Treatment Site Photos. Photos are provided for all approaches of the Treatment Intersection. The photos provided reflect the left-turn lane installations, the intersection realignment, and the signal installation.

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

Hazard Elimination Project W3420

Guilford County



Treatment Site Photos (Taken on November 5, 2005)



Driving South on SR 2133 (Pleasant Ridge Rd) towards the Treatment Intersection.
Notice the Signal Ahead Warning Sign.



Driving South on SR 2133 (Pleasant Ridge Rd) at the Treatment Intersection.

Treatment Site Photos (Taken on November 5, 2005)



Driving North on SR 2133 (Pleasant Ridge Rd) towards the Treatment Intersection.
Notice the Signal Ahead Warning sign.



Driving North on SR 2133 (Pleasant Ridge Rd) at the Treatment Intersection.

Treatment Site Photos (Taken on November 5, 2005)



Driving East on SR 2271 (Prentiss Rd) at the Treatment Intersection.



Driving West on SR 2137 (Old Oak Ridge Rd) towards the Treatment Intersection.
Notice the Signal Ahead Warning sign.

Treatment Site Photos (Taken on November 5, 2005)



Driving West on SR 2137 (Old Oak Ridge Rd) towards the Treatment Intersection.



Driving West on SR 2137 (Old Oak Ridge Rd) towards the Treatment Intersection.
SR 2267 (Montague St), which intersects with SR 2137 (Old Oak Ridge Rd) at right, is Stop Sign controlled.

Treatment Site Photos (Taken on November 5, 2005)



Another view of the Treatment Intersection, taken from the northwest quadrant.
Notice the Yield Sign for traffic turning right from northbound SR 2133 (Pleasant Ridge Rd)
onto SR 2137 (Old Oak Ridge Rd).

SR 2133 (Pleasant Ridge Rd) at SR 2137 (Old Oak Ridge Rd),
 SR 2271 (Prentiss Rd), and SR 2267 (Montague St)
 Guilford County
 June 1, 1992 - May 31, 1998
 (6 YRS)
 Before Period - Total Crashes

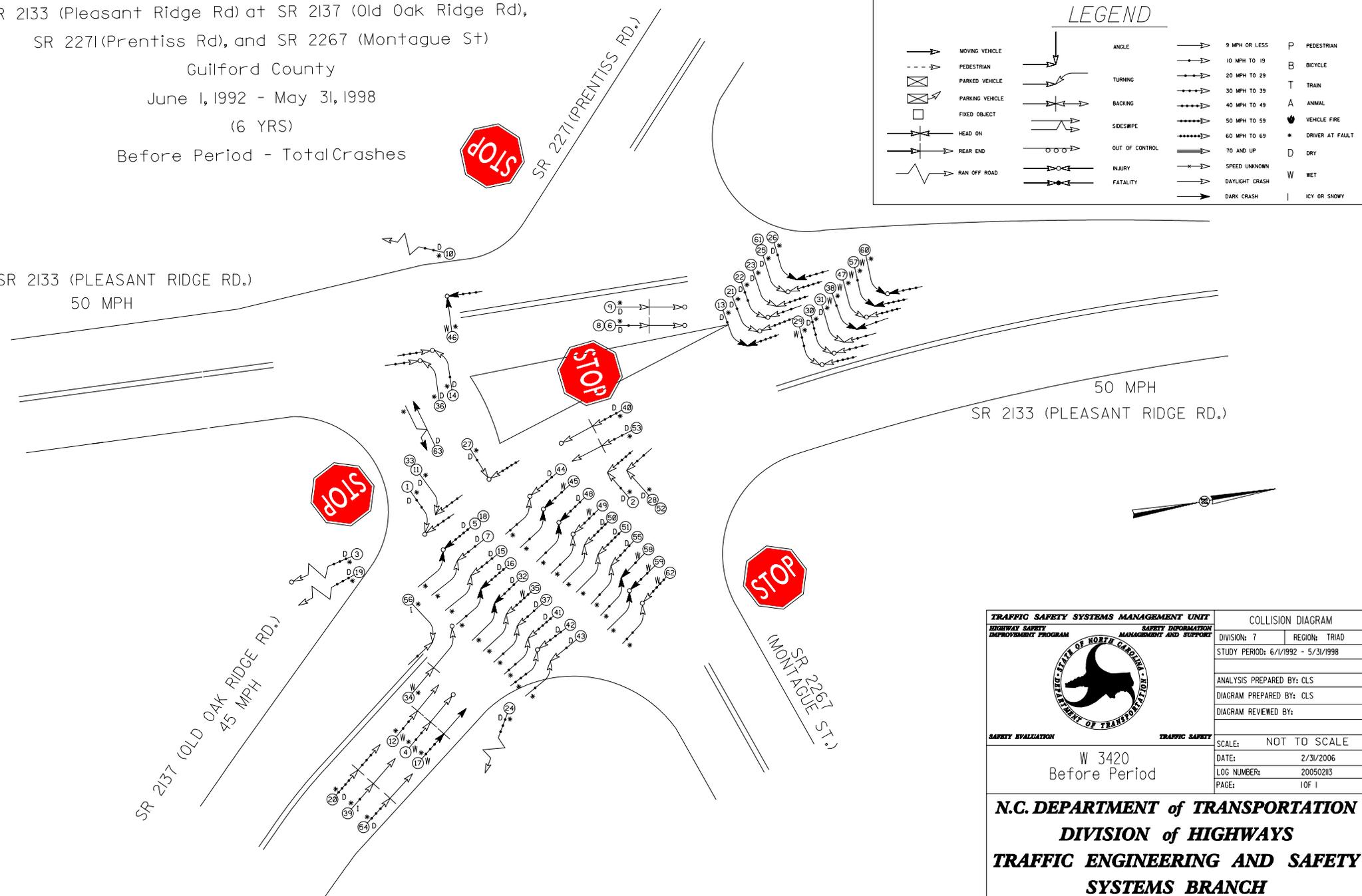
LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		BICYCLE
	PARKED VEHICLE		BACKING		20 MPH TO 29		TRAIN
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		ANIMAL
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		VEHICLE FIRE
	HEAD ON		INJURY		50 MPH TO 59		DRIVER AT FAULT
	REAR END		FATALITY		60 MPH TO 69		DRY
	RAN OFF ROAD		DAYLIGHT CRASH		TO AND UP		WET
			DARK CRASH		SPEED UNKNOWN		ICY OR SNOWY

SR 2133 (PLEASANT RIDGE RD.)
 50 MPH

SR 2137 (OLD OAK RIDGE RD.)
 45 MPH

50 MPH
 SR 2133 (PLEASANT RIDGE RD.)



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT		COLLISION DIAGRAM	
HIGHWAY SAFETY IMPROVEMENT PROGRAM	SAFETY INFORMATION MANAGEMENT AND SUPPORT	DIVISION: 7	REGION: TRIAD
		STUDY PERIOD: 6/1/1992 - 5/31/1998	
		ANALYSIS PREPARED BY: CLS	
		DIAGRAM PREPARED BY: CLS	
		DIAGRAM REVIEWED BY:	
SAFETY EVALUATION	TRAFFIC SAFETY	SCALE: NOT TO SCALE	
W 3420 Before Period		DATE: 2/31/2006	
		LOG NUMBER: 20050213	
		PAGE: 1 OF 1	
N.C. DEPARTMENT of TRANSPORTATION DIVISION of HIGHWAYS TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH			

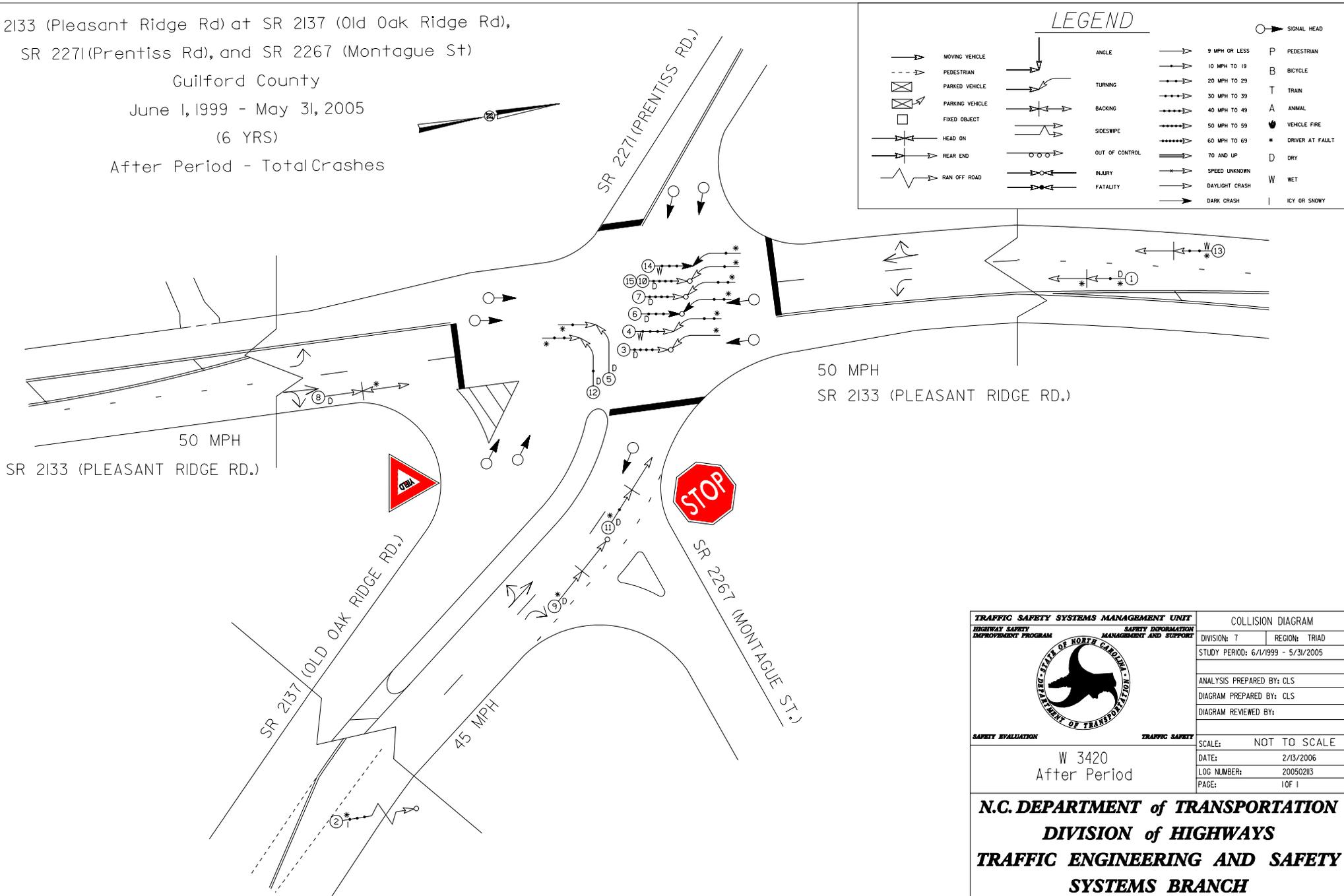
SR 2133 (Pleasant Ridge Rd) at SR 2137 (Old Oak Ridge Rd),
 SR 2271 (Prentiss Rd), and SR 2267 (Montague St)

Guilford County

June 1, 1999 - May 31, 2005

(6 YRS)

After Period - Total Crashes



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT		COLLISION DIAGRAM	
RIGHTWAY SAFETY IMPROVEMENT PROGRAM	SAFETY INFORMATION MANAGEMENT AND SUPPORT	DIVISION: 7	REGION: TRIAD
		STUDY PERIOD: 6/1/1999 - 5/31/2005	
		ANALYSIS PREPARED BY: CLS	
		DIAGRAM PREPARED BY: CLS	
		DIAGRAM REVIEWED BY:	
SAFETY EVALUATION	TRAFFIC SAFETY	SCALE: NOT TO SCALE	
W 3420 After Period		DATE: 2/13/2006	
		LOG NUMBER: 20050213	
		PAGE: 1 OF 1	
N.C. DEPARTMENT of TRANSPORTATION DIVISION of HIGHWAYS TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH			