
South Jersey Transportation Planning Organization

2005 Road Safety Audit

**Richwood Road (CR 609), Swedesboro Road (CR 666), Monroeville
Road (CR 604)
Upper Pittsgrove Township, Salem County**



Prepared By:



Orth-Rodgers & Associates, Inc.
810 Bear Tavern Road, Suite 307
West Trenton, NJ 08628

In Association with:



June 14, 2005

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810 Bear Tavern Road, Suite 307
West Trenton, NJ 08628

In Association with:

A-TECH Engineering Inc.
3739 N. Delsea Drive
Vineland, NJ 08360

June 14, 2005

Introduction

The South Jersey Transportation Planning Organization (SJTPO) has retained Orth-Rodgers & Associates, Inc. (ORA) to conduct their 2005 Road Safety Audit (RSA) of five sections of roadways in southern New Jersey. The sections of roadways to be studied were selected by SJTPO based on a number of factors considered important to the safety and future development of the roadways. Among the factors considered were crash data, traffic volume growth, local cooperation and control, and recent and future development along the roadway. State highways were excluded from the process. County and local officials cooperated with SJTPO in identifying roads that met these parameters. The selection process is detailed in a report prepared by SJTPO dated November 29, 2004.

Two of the roadways are located in Atlantic County, one is in Cumberland County and two are in Salem County. The five roadway sections are:

1. English Creek Road (CR 575) between Ocean Heights Avenue (CR 559A) and Delilah Road (CR 646), in the Township of Egg Harbor, Atlantic County.
2. Delilah Road (CR 646) between the Airport Circle (at Tilton Road, CR 563) and US RT 9 in the Township of Egg Harbor and the City of Pleasantville, Atlantic County.
3. Third Street, Wheaton Avenue, and South Main Road (CR 555) between Main Street (Millville) and Sherman Avenue, in the Cities of Millville and Vineland, Cumberland County.
4. Hook Road (CR 551) between RT 49 and US RT 40 in the Townships of Pennsville and Carneys Point, Salem County.
5. Richwood Road (CR 609), Swedesboro Road (CR 666), and Monroeville Road (CR 604) in the Township of Upper Pittsgrove, Salem County.

Each road will have a separate report, but will share the same introduction, background section, format and some additional text.

Safety audits serve to address safe operation of roadways and to ensure a high level of safety for all road users. The process of a safety audit is two-fold: 1) to conduct a formal examination of highway features and the surrounding environment that increase the potential for crashes; and, 2) identify countermeasures that will reduce or (eliminate) the probability of such crashes. According to the Federal Highway Administration (FHWA), the formal definition of a road safety audit is as follows:

“A Road Safety Audit is the formal examination of an existing or future roadway or traffic project by an independent team of trained specialists.”¹

To accomplish these goals, the Audit Team assesses the crash potential and safety performance of a roadway and prepares a report that documents the safety deficiencies and appropriate countermeasures. Safety audits are especially important during the design phase of a project as they can identify deficiencies before they are built into the project and propose cost-effective safety improvements that can be adopted from the onset. Project managers can then evaluate, select, and justify appropriate project changes within the constraints of budget, time and policy issues.

The purpose of this audit is to identify potential safety deficiencies along the selected section of the five roads. There are three primary parts of the audit: 1) the data collection and evaluation phase; 2) the field view (conducted by the team); and, 3) the preparation of the report and findings.

¹ Federal Highway Administration, Road Safety Audits and Road Safety Audit Reviews , EDL #12345 FHWA XX-03-999

The data collection phase is performed prior to the Audit Team conducting a field view of the entire roadway. The data is intended to assist the team in identifying potential safety problems, as well as to provide a factual and historic component of the study. Traffic count and crash data are collected, an inventory of the traffic control devices is taken, and a capacity analysis of major intersections is performed. The traffic counts were used to analyze solutions for the intersections, as well as aid in identifying the most congested sections of the roads. The crash data assists the team in identifying specific areas and/or conditions that warrant close scrutiny that might have otherwise been overlooked. The inventory of traffic control devices, in addition to documenting what traffic control devices were present before the audit began, often provides clues to safety issues that have been identified or experienced in the past. The capacity analysis of intersections identify how well the intersections are operating and when and where improvements may be needed. Based on an analysis of all data, the Audit Team can conduct a productive and comprehensive evaluation of the roads being studied.

BACKGROUND INFORMATION

A kick-off meeting was held on March 17, 2005, at the County courthouse in Salem City. This meeting featured a presentation by ORA to provide a forum to educate attendees on core elements of the RSA process such as:

1. Definition – What is involved in the typical safety audit and how it differs from other safety review measures currently in use.
2. Process – The required steps involved in a successful audit and the reasons the steps are required.
3. Lessons learned from previous audits.
4. The Draft & Final Report – What to expect.

The kick-off meeting also facilitated the exchange of ideas among attendees. The attendees displayed a genuine interest in safer roadways and more specifically an interest in participating in this audit. A typical audit team is comprised of three to five members. ORA chose to have a larger than usual audit team for this project for the following reasons:

- ♦ There was a wealth of experience that could be tapped into.
- ♦ The team did not want to discourage any effort towards achieving a safer roadway environment.
- ♦ It is hoped that greater participation will increase the likelihood that the findings of the team would be implemented.

At the end of the kick-off meeting, the RSA was scheduled for April 12, 2005, commencing at 10:00 AM at the Upper Pittsgrove Township Town Hall. The attendees at the kick-off meeting are listed below:

KICKOFF MEETING ATTENDEES

Name	Agency
Scott Oplinger	NJDOT Division of Safety and Traffic Engineering
Bill Schiavi	SJTPO
Rosemarie Anderson	DVRPC
Karen Yunk	FHWA
Sgt. S. Ware	Vineland Police Department
Charles Munyon	Salem County Planning Board
John J. Petersack	NJDOT Planning
Bill Miller	Salem County Engineering
Joe Federici	Salem County Engineering
Chuck Sullivan	Salem County
Ron Harvey	Millville Police
Matt Rabbai	Millville Police
Jack Lynch	Pennsville Township
Ed O'Connor	NJDHTS
Mike Barruzza	CC Sheriff's Department
Bill Garrison	CC Sheriff's Department
Richard Jones	Millville Engineering Department
Karl Gleissner	Cumberland County Planning
Ron Groshardt	Cumberland County Engineering
Richard Tesanro	NJSP Woodstown
Jeff Ridgway	Salem City
Ted Vengenock	Salem County Sheriff's Department
Sean H. Phillips	Salem County Sheriff's Department
Robert Brawn	Cumberland County Planning Department
Don Chatin	Pennsville Police
Jack Cimprich	Upper Pittsgrove Township
Barry Foote	Upper Pittsgrove Public Works
Norman Deitch	Orth-Rodgers & Associates, Inc.
George Strathern	Orth-Rodgers & Associates, Inc.

The following sections describe the various tasks undertaken by ORA in partnership with the Safety Audit Team and summarize the findings from the audit process in a manner that will allow the responsible agencies and personnel to prioritize implementation of safety enhancements.

Pre-Audit Data Collection and Analysis

Prior to the audit activities on site, ORA collected and reviewed traffic data and other related materials in order to assist the team in conducting the audit. A description of the materials that were reviewed is provided below.

1. Aerial Photos

Aerial photographs of the study section, scaled at approximately 1"=300' were printed and used as reference at kick-off and audit meetings.

2. Straight Line Plan

The straight line diagram was used as a base for 1"=400' straight line plans of the study section of the road. The crash data, traffic counts and inventory of traffic control device were shown on these plans for use at the audit and for the final report.

3. Traffic Volume Data

At the kick-off meeting, the team agreed that AM (7:00-9:00 AM) and PM (4:00-6:00 PM) peak hour manual counts would be taken at the three intersections forming the triangle. The counts were conducted on April 7, 2005. Due to the very light volumes recorded for all three intersections, capacity analyses (level of service analyses) were not performed. In general, all movements operate at a Level of Service 'A'.

4. Crash Data

SJTPO received and forwarded to ORA the crash reports for the years 2001 and 2002 from the State Police barracks Troop "A". Summary sheets were prepared for each year, as well

as a summary sheet for the two-year period. For the two-year period, a total of 25 accidents were plotted for the study section of road. Nine (9) crashes occurred in 2001 and 16 in 2002. Ten (10) crashes occurred at the intersection of CR 609 and CR 604, three (3) at the intersection of CR 609 and CR 666, and none at the intersection of CR 604 and CR 666.

The type of crashes are characterized as follows:

Zero (0) fatal crashes

Eight (8) injury crashes

Seventeen (17) non-injury crashes

Fourteen (14) right-angle type crashes – Ten (10) at the CR 609 and CR 604 intersection and three (3) at the intersection of CR 609 and CR 666. Local officials also conveyed to the team that a fatal right-angle type crash occurred at the intersection of CR 609 and CR 604 in 2003. Also, one of the team members had a right-angle type crash at the intersection in 2003.

Four (4) fixed-object crashes – all along CR 604 between CR 666 and Three Bridges Road. There is evidence (tire tracks) of single-vehicle run-off-the-road type crashes involving vehicles westbound on CR 604 occurring on RT 666 just west of the CR 604 intersection.

Seven (7) other type crashes – including four (4) that struck deer and one (1) that struck a dog.

An extensive review of the crashes established the following:

- ♦ The critical month for crash occurrence was March. Not considered significant.
- ♦ Monday had the highest frequency of crashes. Not considered significant.
- ♦ The highest frequency of crashes occurred during 7:00-8:00 AM and 1:00-2:00 PM. Not considered significant.
- ♦ The percentage of right-angle type crashes (60%) is much higher than the statewide average for county roads (approximately 22%).

- ♦ The percentage of crashes during daylight hours is consistent with the statewide average for county roads (approximately 70%).
- ♦ The percentage of crashes for wet surface accidents (28%) is consistent with the statewide average for county roads (approximately 29%).
- ♦ The percentage of crashes with injuries (32%) is consistent with the statewide average for county roads (approximately 30%).
- ♦ The percentage of fixed-object type crashes (16%) is somewhat higher than the statewide average for county roads (approximately 12%).

5. Other Information

Additional materials reviewed by ORA prior to the formal audit process included videotapes from pre-audit field views.

All the materials listed above are included in the Appendix.

Audit

On April 12, 2005, the Safety Audit Team met in the Upper Pittsgrove Township municipal building to conduct the roadway inspection. The meeting commenced at 10:00 AM with brief statements by ORA representatives who reiterated the importance of RSAs and outlined the objectives of the safety audit. There were brief introductions by team members followed by an extensive review and discussion of materials described in the previous section. The team then boarded a van provided by Salem County to conduct the audit. Team members are listed below.

SAFETY AUDIT TEAM FOR CR 609 & CR 604 & CR 666

Name	Agency
Barry Foote	Upper Pittsgrove Township Public Works
Jack Cimprich	Upper Pittsgrove Township Mayor
Douglas Akin	Salem County Engineering
Nancy Allen	NJDOT - Traffic Engineering & Investigations
Bill Miller	Salem County Engineers Office
Joe Federici	Salem County Engineer
Norman Deitch	Orth-Rodgers & Associates, Inc.
Bill Schiavi	SJTPO
George Strathern	Orth-Rodgers & Associates, Inc.

The team walked the area of the three intersections and their approaches. The team also drove each approach to the intersection several times.

During the walk, team members identified features on the roadway and its surrounding environment that could contribute to the occurrence or relative severity of roadway crashes. At each intersection and mid-block location, the Audit Team identified safety deficiencies and

inappropriate traffic signs and other items that are not consistent with effective road function and use. A variety of safety improvement measures were discussed with field notes and digital photographs being taken by team members.

The Audit Team returned to the Upper Pittsgrove Township municipal building to review the information gathered during the roadway inspection. The Safety Audit Checklist was completed in correlation with findings from the inspection. The team leader informed other team members on the next step in the audit process; ORA will prepare a draft report summarizing the findings from the audit process and forward the report to all team members for their review and comments.

Mr. Barry Foote, Mr. Bill Schiavi, Mr. Deitch and Mr. Strathern conducted the nighttime safety audit on May 5, 2005.

The next section of the report summarizes the findings from the roadway inspection.

CR 609 & CR 604 & CR 666

The audit for this location is different from the others in this project in that the study areas are along three intersecting roads. The audit is basically an evaluation of the three intersections and their approaches. The three intersections are CR 609 and CR 604, CR 609 and CR 666, and CR 604 and CR 666. The intersections with CR 609 are approximately 600 feet apart. The CR 604 and CR 666 intersection is approximately 700 feet from the CR 609 intersections. The three intersections form a triangle. Their proximity to each other is depicted on the straight-line plan in the Appendix of this report. The intersections are located in what is best described as a rural setting.

INTERSECTION OF CR 609 AND CR 604

This is a four-legged, stop sign controlled intersection with 36"x36" stop signs installed along the CR 604 approaches to the intersection. For discussion purposes, it will be assumed that CR 609 extends in the north-south direction and CR 604 in the east-west direction. Both roadways are two-lane roadways with minimal shoulders. The speed limit on both roadways is 50 MPH. There are fields on two corners of the intersection and grass and tree areas on the remaining corners. There are no sidewalks, curbs, or painted crosswalks at the intersection. There are stop lines supplementing the stop signs at the intersection. No pedestrians were observed during the audit and local officials confirm that pedestrian activity is nil. White thermoplastic rumble strips were installed along the CR 604 approaches to the intersection some time after 2002. All pavement markings at the intersection are worn and should be re-installed, including the rumble strips. The 36"x36" stop signs were also installed after 2002. Bright sticks on the STOP sign posts were also installed after 2002. The existing signing for the intersection and its approaches is shown on the straight-line plan in the Appendix of the report. There is no luminare at the

intersection, but the county is planning to have one installed. (**NOTE:** A luminaire was installed at the intersection on May 4, 2005) Trees and utility poles line the easterly side of CR 609. Trees line both sides of the CR 604 easterly approach to the intersection. Corner sight distance is restricted from the CR 604 easterly approach to the intersection by trees on the northeast and southeast corners of the intersection. Local team members are of the opinion that motorists on the stop sign controlled approaches to the intersection are aware of the stop control. They attribute the crash experience to two factors: 1) the driver's inattention or impatience at the intersection. Since traffic on CR 609 is so light, daily users of the intersection approaching the stop control on CR 604 become accustomed to not having to come to a full stop before entering the intersection; and, 2) restricted sight distance caused by trees. Both assumptions would appear to have merit, as when the team was at the intersection, several motorists on the CR 604 approaches did not come to a full stop and others, after coming to a full stop, inched out beyond the stop line into the intersection to see past the trees before proceeding across the intersection. Examination of the crash data revealed that of the ten right-angle crashes at the intersection, a motorist with a Pittsgrove Township address caused only one. No conclusions can be reached from this on the percentage of repeat users on the CR 604 approaches. It should be noted that Upper Pittsgrove Township does not have its own police department and must rely on state police for traffic enforcement.

The peak hour traffic count data taken at the intersection reveals that traffic is light along all approaches to the intersection. The volumes are shown on the straight-line plan in the Appendix of this report. Traffic on the heavier CR 609 approach was 54 vehicles for the AM peak hour and 79 vehicles for the PM peak hour. Traffic on the heavier CR 604 approach was 61 vehicles during the AM peak hour and 116 vehicles during the PM peak hour.

INTERSECTION OF CR 609 AND CR 666

This is also a four-legged, stop sign controlled intersection. Stop signs are installed along the CR 666 approaches to the intersection. Again, for discussion purposes, it will be assumed that CR 609 extends in the north-south direction and CR 666 in the east-west direction. Both roadways are two-lane roadways with minimal shoulders. The speed limit on both roadways is 50 MPH. There are no sidewalks, curbs, or painted crosswalks at the intersection. There are stop lines supplementing the stop signs at the intersection. No pedestrians were observed during the audit and local officials confirm that pedestrian activity is nil. White thermoplastic rumble strips were installed along the CR 666 approaches to the intersection some time after 2002. All pavement markings at the intersection are worn and should be re-installed, including the rumble strips. The existing signing for the intersection, and its approaches, is shown on the straight-line plan in the Appendix of this report. There is no luminare at the intersection, but the county is planning to have one installed. (**NOTE:** A luminare was installed at the intersection on May 4, 2005.) Trees and utility poles line the easterly side of CR 609. Trees line both sides of the CR 666 easterly approach to the intersection. Corner sight distance is restricted from the CR 666 westerly approach to the intersection by trees on the northwest corner of the intersection. Local team members are of the opinion that motorists on the stop sign controlled approaches to the intersection are aware of the stop control. Also, local team members feel that the CR 666 approaches experience higher volumes during the summer resort season as motorists bound for Atlantic City and the Cape May County seashore destinations use it to avoid congested routes. Traffic at the intersection is light. The volumes are shown on the straight-line plan in the Appendix of this report. Traffic on the heavier CR 609 approach was 68 vehicles for the AM peak hour and 93 vehicles for the PM peak hour. Traffic on the heavier CR 666 approach was 29 vehicles during the AM peak hour and 50 vehicles during the PM peak hour.

INTERSECTION OF CR 604 AND CR 666

This is a three-legged, “Y”-type intersection with CR 666 intersecting the northerly side of CR 604 to form the right fork of the “Y”. The intersection is stop sign controlled with a stop sign installed along the CR 666 approach to the intersection. For discussion purposes, it will be assumed that CR 604 extends in the east-west direction and CR 666 in the northwesterly direction. Both roadways are two-lane roadways with minimal shoulders. The speed limit on both roadways is 50 MPH, however, since CR 666 is stop controlled at CR 609, the prevailing speed along the approach is somewhat lower. This is also true of eastbound CR 604 traffic since it must stop at the CR 609 intersection prior to this intersection. There are no sidewalks, curbs, or painted crosswalks at the intersection. There is a stop line supplementing the stop sign at the intersection. No pedestrians were observed during the audit and local officials confirm that pedestrian activity is nil. All pavement markings at the intersection are worn and should be re-installed. The existing signing for the intersection and its approaches is shown on the straight-line plan in the Appendix of this report. There is a luminare at the intersection. Trees line both sides of the CR 666 approach and the CR 604 westerly approach to the intersection. CR 666 intersects CR 604 at an approximate 45degree angle. This relatively flat angle makes it difficult for motorists on the CR 666 approach to observe eastbound CR 604 traffic; this is particularly true for truck or van drivers. Some motorists were observed positioning their vehicles on more of a right-angle alignment to better view eastbound traffic before entering the intersection.

The peak hour traffic count data taken at the intersection reveals that traffic is light along all approaches to the intersection. The volumes are shown on the straight-line plan in the Appendix of this report. Traffic on the heavier CR 604 approach was 114 vehicles for the AM peak hour and 102 vehicles for the PM peak hour. Traffic on the CR 666 approach was 15 vehicles during the AM peak hour and 50 vehicles during the PM peak hour.

Findings

The findings from the CR 609 & CR 604 & CR 666 safety audit are presented on the following pages.

SAFETY ISSUE		REMEDIAL ACTION	LEVEL OF EFFORT REQUIRED			POTENTIAL SAFETY BENEFIT		
			LOW	MEDIUM	HIGH	LOW	MEDIUM	HIGH
1	CR 609 and CR 604 intersection. There have been 10 right angle type crashes at the intersection in a two-year period, seven in 2002. Also, a fatal right angle type crash occurred in 2003. Some recommendations for the intersection are listed below under other item numbers.	Consideration should be given to installing a flashing signal and four-way stop at the intersection. This option was the subject of much discussion during the audit. An incremental approach (installing the flashing signal and monitoring the intersection, then deciding if a four-way stop was necessary) was also discussed. It was the consensus of the team that both the flashing signal and four-way stop should be considered at this time. While it is not the intent of this audit to be a "WARRANT REPORT" justifying the installation of a flashing signal and four-way stop, the team does believe that this is the best type of control for the safety of the intersection.			X			X
2	If a four-way stop is installed at the CR 609 and CR 604 intersection, inattentive motorists on CR 666 at CR 609 might think that they also have a four-way stop.	Install W4-4p (cross traffic does not stop) warning signs below the stop signs on CR 666 at its' intersection with CR 609. Install R1-3 (4-way) below all stop signs at the CR 609 and CR 604 intersection.	X					X

SAFETY ISSUE		REMEDIAL ACTION	LEVEL OF EFFORT REQUIRED			POTENTIAL SAFETY BENEFIT		
			LOW	MEDIUM	HIGH	LOW	MEDIUM	HIGH
3	Sight distance from the CR 604 easterly approach to CR 609 is somewhat restricted by trees on the northeast and southeast corners.	Remove the closest tree to intersection on both corners.		X				X
4	Open swale with storm pipe on the northeast and northwest corners of CR 609 and CR 604 intersection.	Extend pipes farther from intersection and backfill.		X			X	
5	Sign installation. Many if not most of the signs along the road are installed as "bendaway" rather than "breakaway." Many installed as "breakaway" are installed incorrectly with the snub too far out of the ground or on the wrong side of the post.	Inventory method of sign installation along study area and re-install all signs as "breakaway" in accordance with the most current NJDOT standard.		X			X	
6	Pavement markings throughout study area worn.	Re-install pavement markings.	X			X		
7	There is a 36" pipe under CR 604 approximately 1,000' west of intersection.	Extend pipe farther from edge of road, backfill.		X			X	
8	W3-1 (stop ahead) along the CR 604 easterly approach to CR 609 is located too close to the CR 666 intersection.	Re-locate sign approximately 100 feet to the west.	X			X		
9	W1-2 (curve symbol) sign installed along the south side of CR 604 between CR 609 and CR 666 does not show the CR 666 intersection.	Replace existing W1-2 with one modified to show the intersection of CR 666.	X			X		
10	30" x 30" stop sign is installed along the CR 666 easterly approach to CR 609. There are 36" x 36" stop signs on the other approaches to the intersections in the triangle.	Replace existing 30" x 30" stop sign with 36" x 36" stop sign.	X			X		

SAFETY ISSUE	REMEDIAL ACTION	LEVEL OF EFFORT REQUIRED			POTENTIAL SAFETY BENEFIT		
		LOW	MEDIUM	HIGH	LOW	MEDIUM	HIGH
11	Four trees on the northwest corner of the CR 609 and CR 604 intersection limit sight distance across that corner of the intersection. Trees are on the outer fringe of a wooded area.	X					X
12	Route marker assembly installed along the easterly side of CR 609 just north of the CR 666 intersection. Several "Adopt a Highway" type signs installed below route marker assembly could momentarily obstruct the view of a vehicle southbound on CR 609 from motorist stopped westbound on CR 666 at the intersection	X			X		
13	W3-1 (stop ahead) along the CR 666 easterly approach to CR 609 is located too close to the CR 604 intersection.	X			X		
14	CR 666 shield missing from route marker assembly at CR 604 and CR 666 intersection. County representatives stated that CR 666 shields are frequently stolen because "666" is known as the devil's number.	X			X		
15	S1-1 school advance warning sign installed west of Three Bridges Road on CR 604 facing westbound traffic. School no longer is located on CR 604 in this area.	X			X		
16	Warning sign with "Y" shaped legend installed facing westbound traffic on CR 604 east of CR 666 intersection. Sign lacks "arrow head" on top of "Y" and could be confusing to motorists.	X				X	

SAFETY ISSUE	REMEDIAL ACTION	LEVEL OF EFFORT REQUIRED			POTENTIAL SAFETY BENEFIT		
		LOW	MEDIUM	HIGH	LOW	MEDIUM	HIGH
17	CR 604 and CR 666 intersection. As mentioned in the body of the report, the relative flat angle that CR 666 intersects CR 604 makes it difficult for motorists on the CR 666 approach to view eastbound CR 604 traffic.			X		X	
18	There are swales along both sides of CR 604 westerly approach to CR 609 and another along the northbound side of CR 609 north of the CR 666 intersection.						
19	Due to the rural nature of the roads, it was suggested by some team members that reflectors be installed on utility poles along the approaches.						
20	Increased enforcement of the existing stop control at the intersection should translate into better compliance with the signs.	X					X

SAFETY ISSUE		REMEDIAL ACTION	LEVEL OF EFFORT REQUIRED			POTENTIAL SAFETY BENEFIT		
			LOW	MEDIUM	HIGH	LOW	MEDIUM	HIGH
21	Nighttime audit found the following:							
	<ul style="list-style-type: none"> Luminaries were installed at both CR 604 intersections. They do an excellent job in highlighting the intersection locations in this rural area. 	<ul style="list-style-type: none"> Completed 						
	<ul style="list-style-type: none"> All crossroad, side road, and curve warning signs along the approaches to the intersection have lost some of their reflectivity. 	<ul style="list-style-type: none"> Replace signs. 	X				X	
	<ul style="list-style-type: none"> Additional reflective signing is needed in the gore at the intersection of CR 604 and CR 666. 	<ul style="list-style-type: none"> Consideration should be given to installing signs and pavement markings shown in Figure 1. 	X				X	

Recommendations

As stated earlier, the intent of the road safety audit process is to conduct a formal examination of highway features and surrounding environment that increases the potential for crashes and identify countermeasures that will reduce (or eliminate) the probability of such crashes. The safety issues identified during the conduct of this audit and included in this report have been organized to provide the convenience and flexibility necessary to allow the implementation of the safety improvements as time and budget limitations allow. To the extent possible, the findings have been separated into line items so that the improvements can be implemented independently as appropriate. Clearly, consolidating a number of the safety recommendations will reduce the overall cost of improvements. We recommend that the appropriate management staff review the findings and decide what items can be completed in the immediate future (within 1 year). Many of the deficiencies can be corrected in the short term if the roadway owners dedicate both the time and financial resources to the task. Other findings, such as the installation of a flashing signal (Item #1) and the realignment of the CR 666 approach to CR 604 (Item #17), require a greater expenditure of both time and resources. The Level of Effort indicated on the finding sheets of the report represent the team's best effort at categorizing each item.

The safety audit focused on roadway features on this road. However, as with any road, enforcement is a crucial component of safety. Without proper enforcement, motorists may become lax in obeying and observing the traffic regulations along the road. This disobedience contributes to the crash experience. This is particularly true when the devices not being respected are stop signs. This makes Item #20 of this report of particular relevance.

It is felt that motorists will benefit the most from the installation of a flashing signal and four-way stop at the intersection of CR 609 and CR 604 (Item #1) and selected enforcement (Item #20) of the Stop control at the intersections.

The opinions found in the findings of this Safety Audit report are those of the Safety Audit Team as a whole, and not necessarily the opinions of the SJTPO or the individual team members.

Appendix

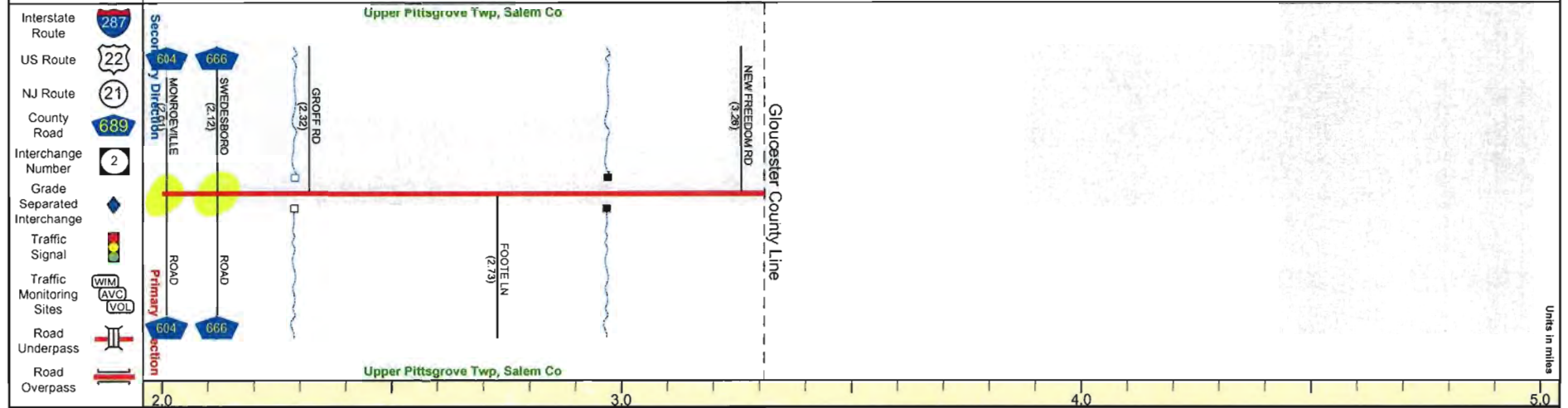
- Street Map of triangle
- Straight-line plan on which are plotted crashes, existing traffic control devices, and traffic volumes.
- Crash Data Summary Sheets
- Crash Data Charts
- Photographs
- Checklists

SALEM COUNTY 609 (South to North)

Mile Posts: 2.000 - 3.310



Pavement	
Shoulder	
Number of Lanes	
Speed Limit	
Street Name	



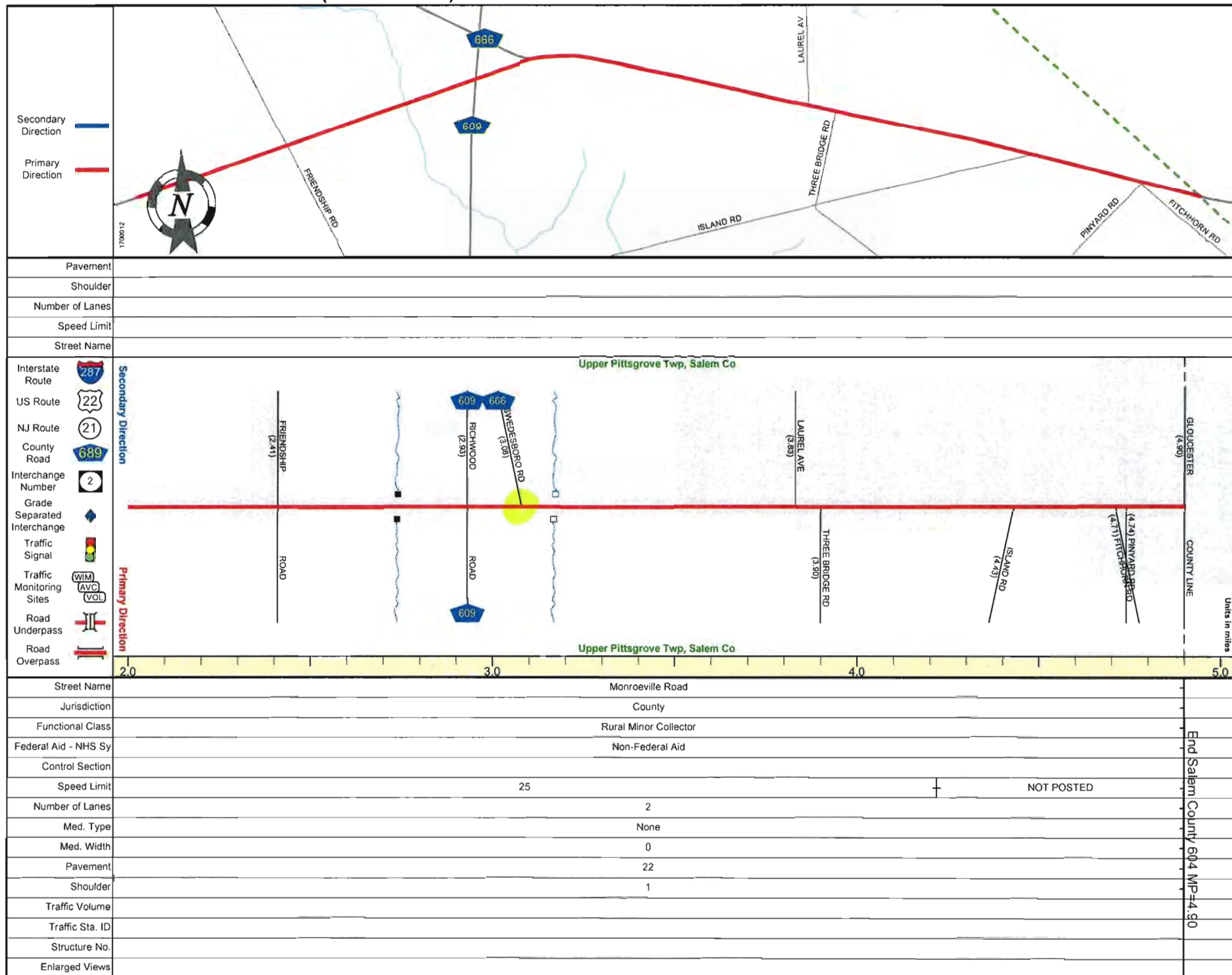
Street Name	Richwood Road	
Jurisdiction	County	
Functional Class	Rural Minor Collector	
Federal Aid - NHS Sy	Non-Federal Aid	
Control Section		
Speed Limit	45	
Number of Lanes	2	
Med. Type	None	
Med. Width	0	
Pavement	21	
Shoulder	1	
Traffic Volume		
Traffic Sta. ID		
Structure No.	CULVERT	CULVERT
Enlarged Views		

SRI = 17000609__

Date last inventoried: May 2001

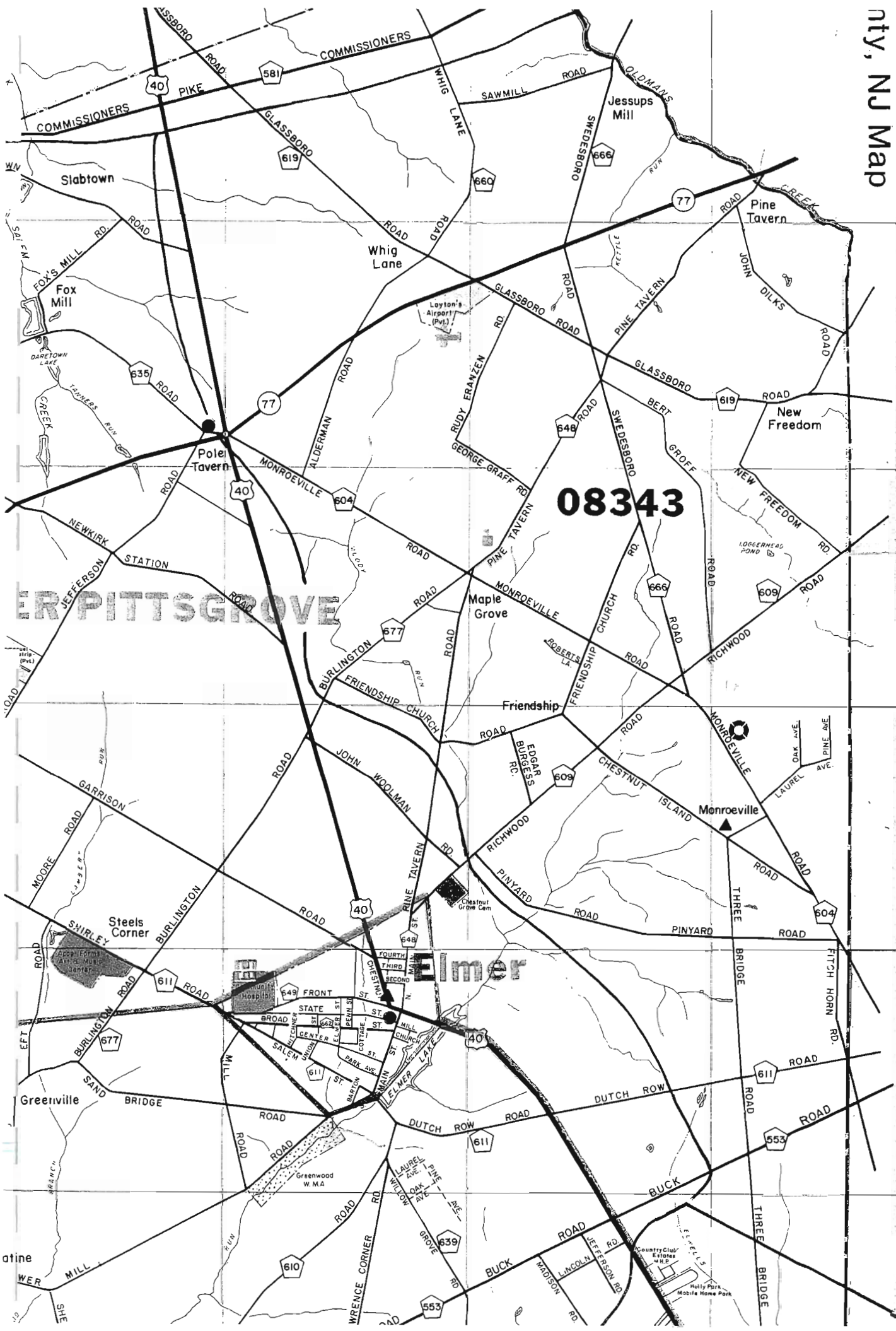
SALEM COUNTY 604 (West to East)

Mile Posts: 2.000 - 4.900



SRI = 17000604__

Date last inventoried: May 2001



08343

Elmer

12

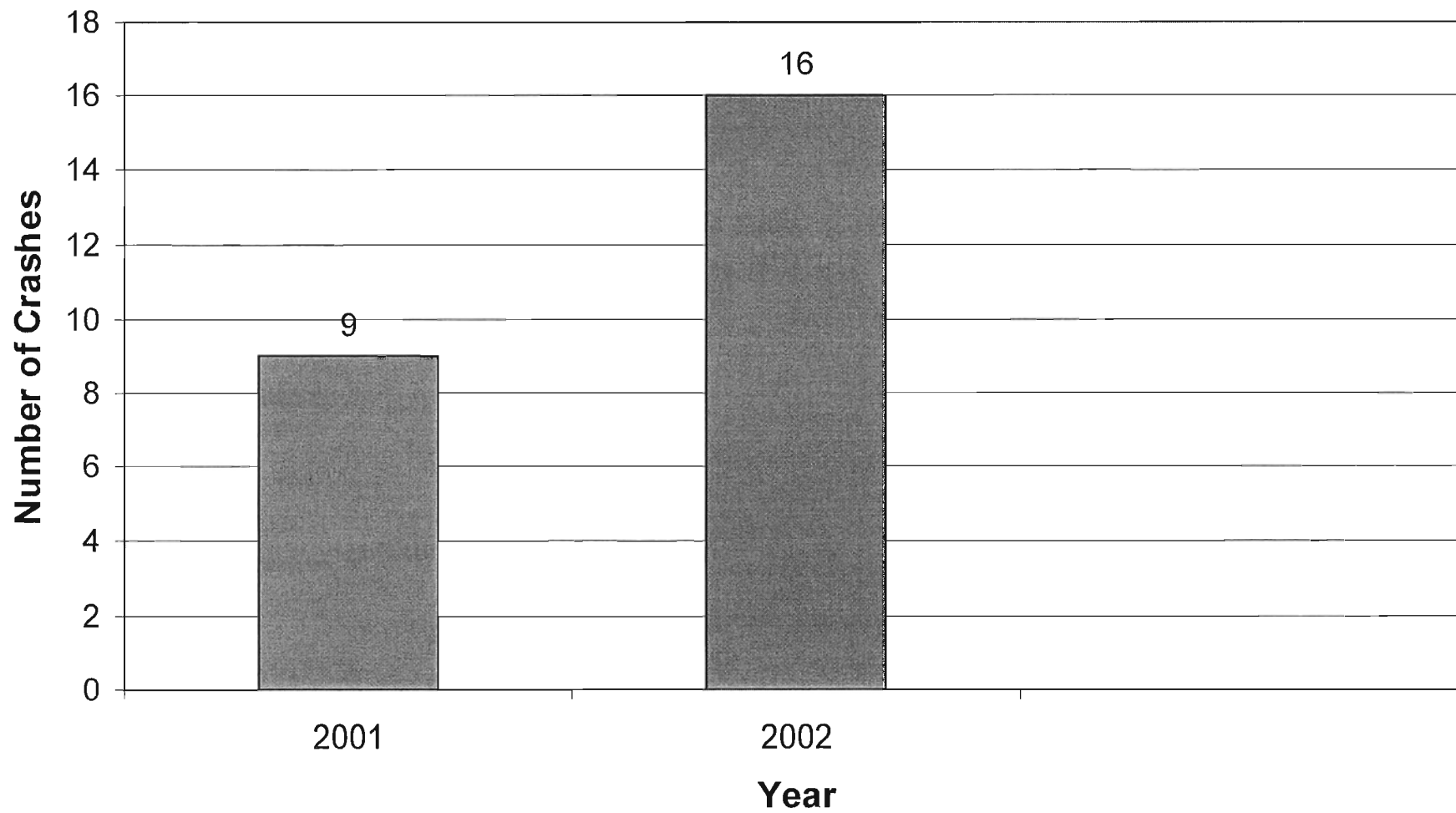
13

14

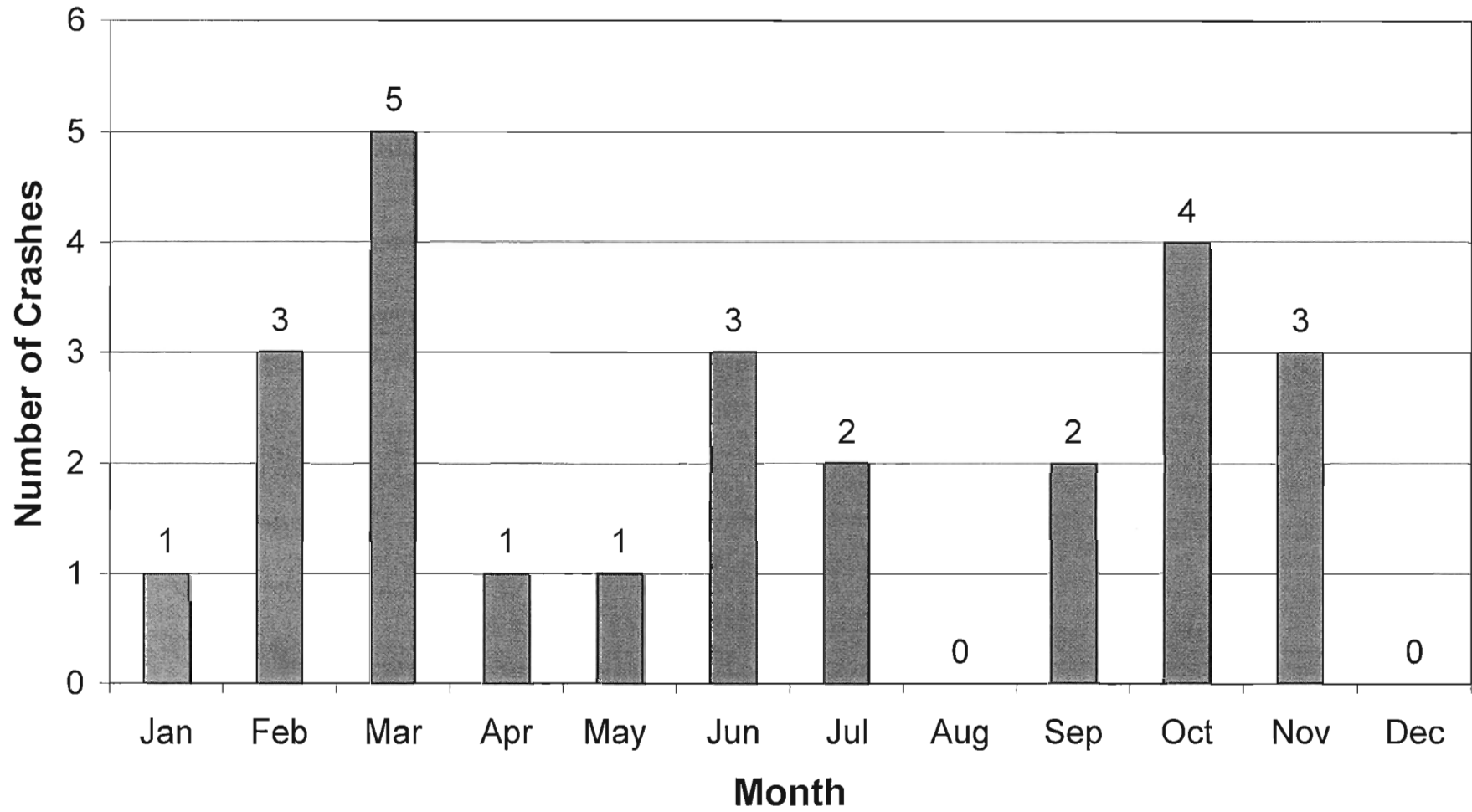
15

16

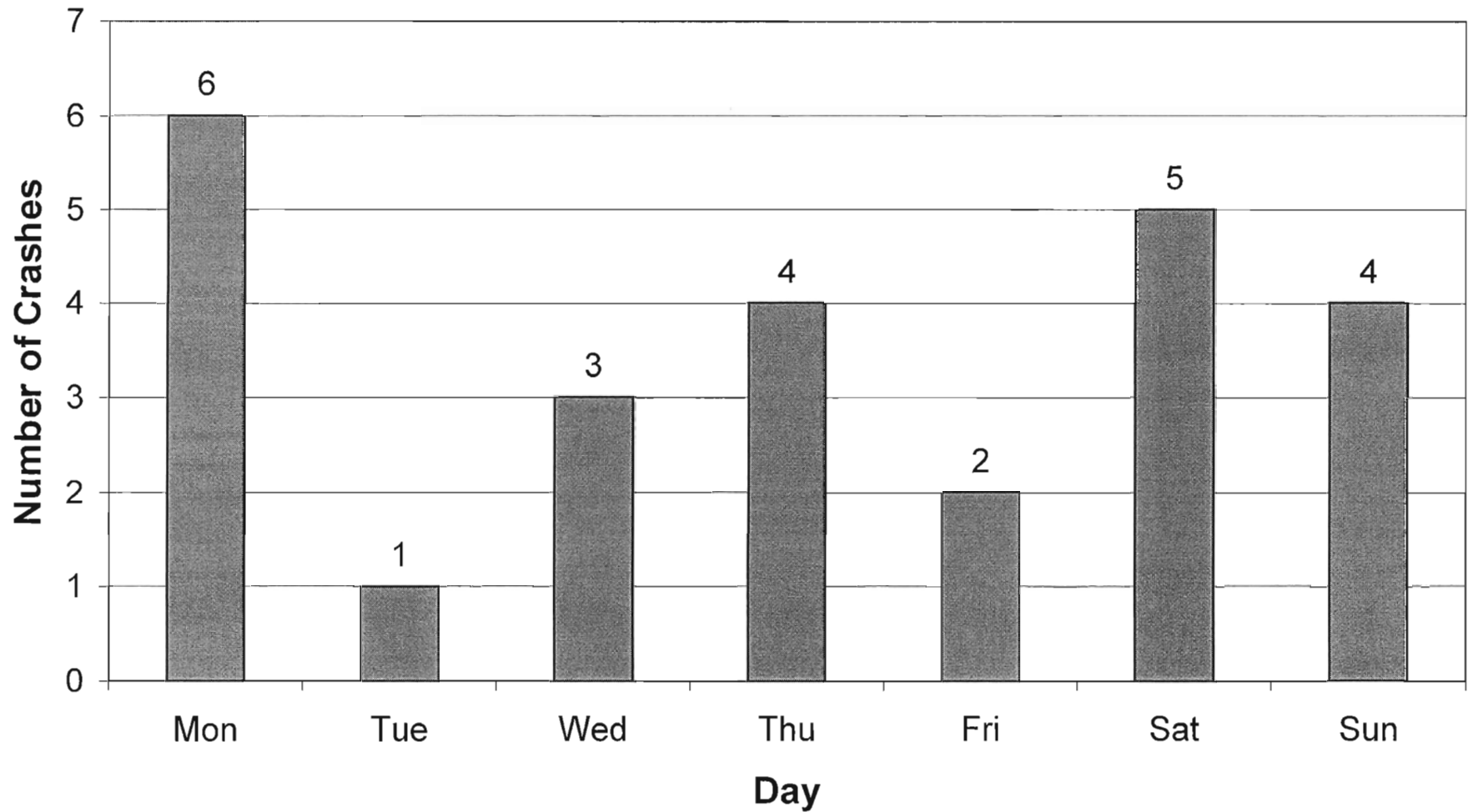
**CR 609, CR 666, CR 604
2 Year Trend**



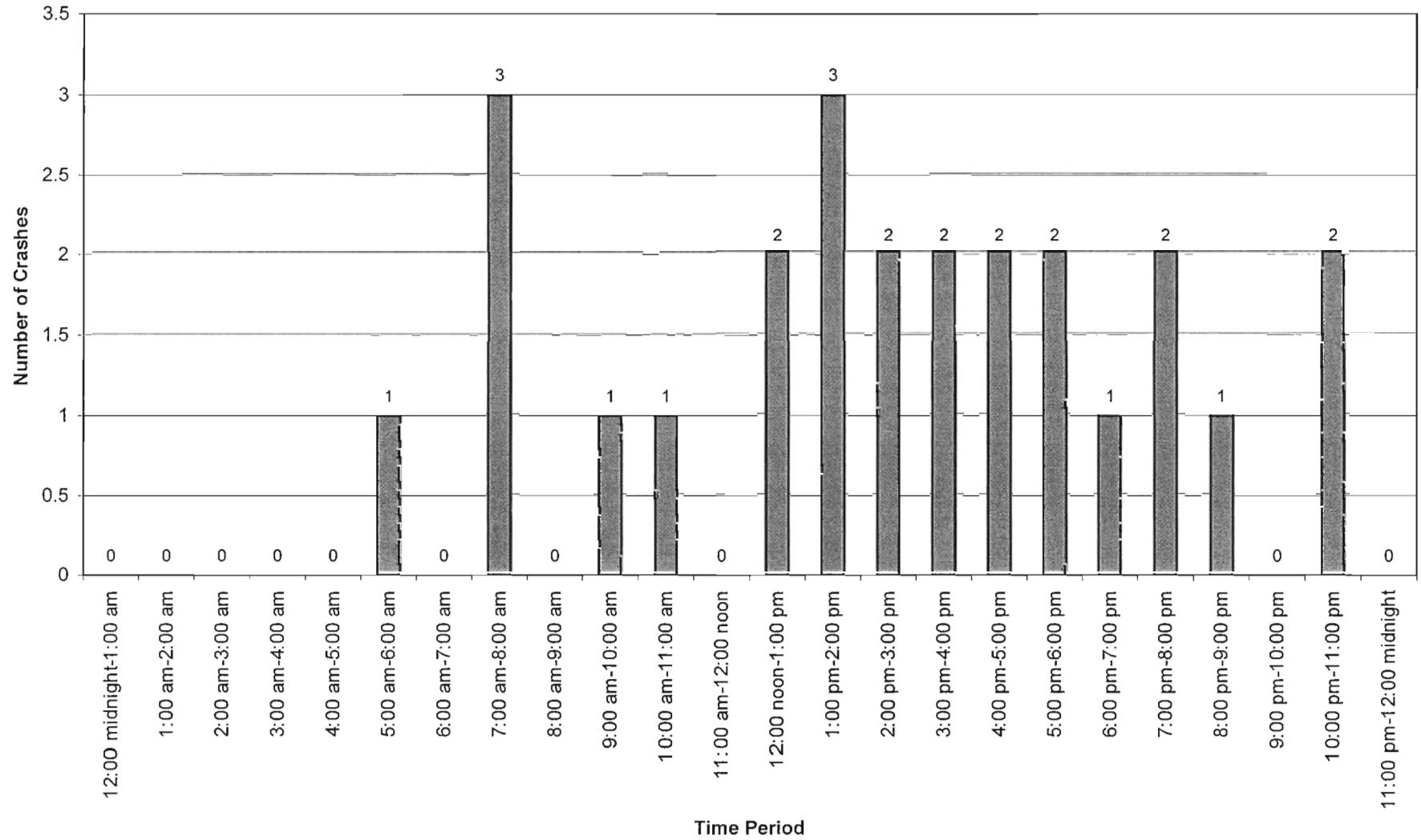
CR 609, CR 666, CR 604
Crash Occurrence by Month



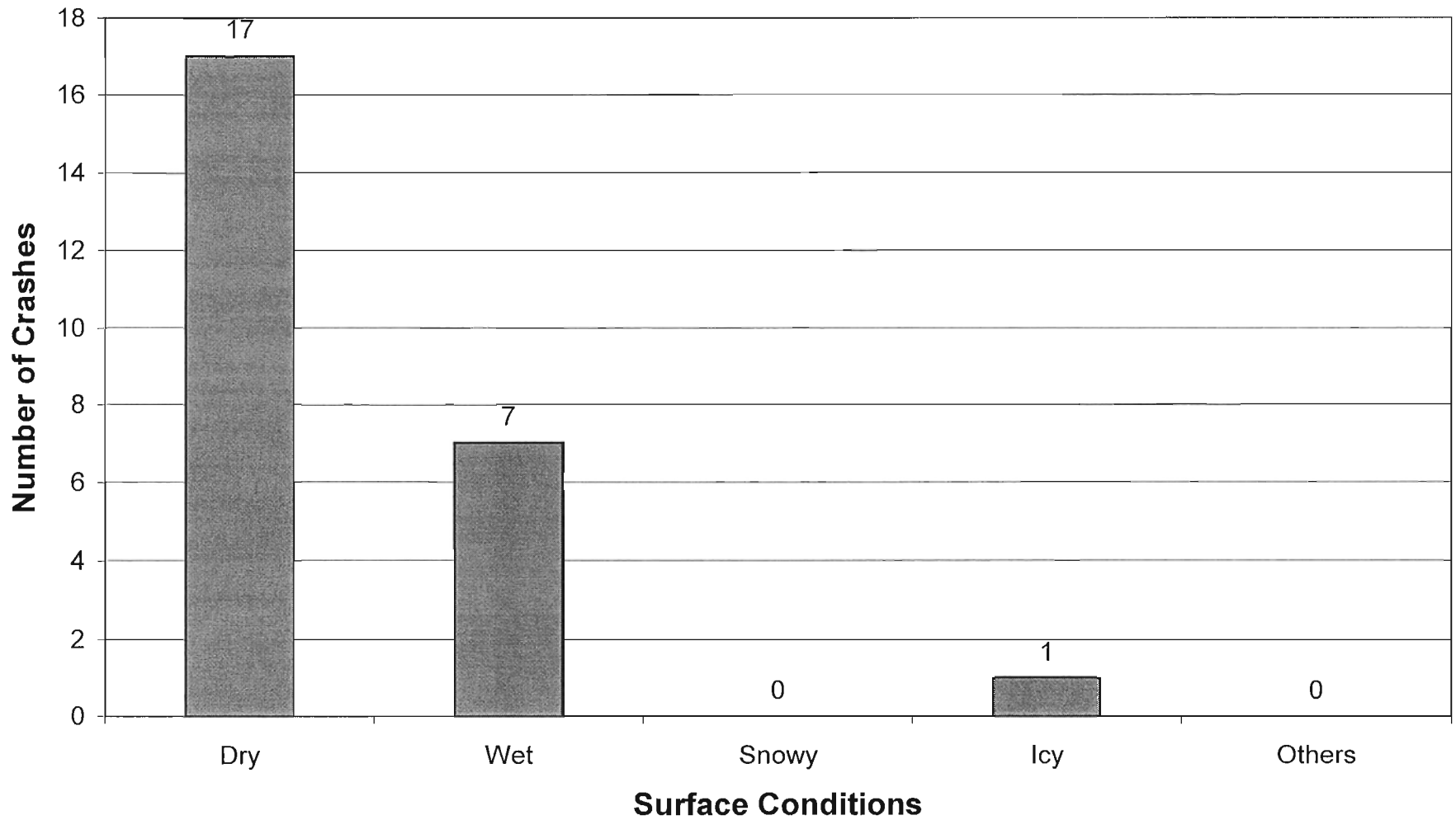
CR 609, CR 666, CR 604
Crash Occurrence by Day of Week



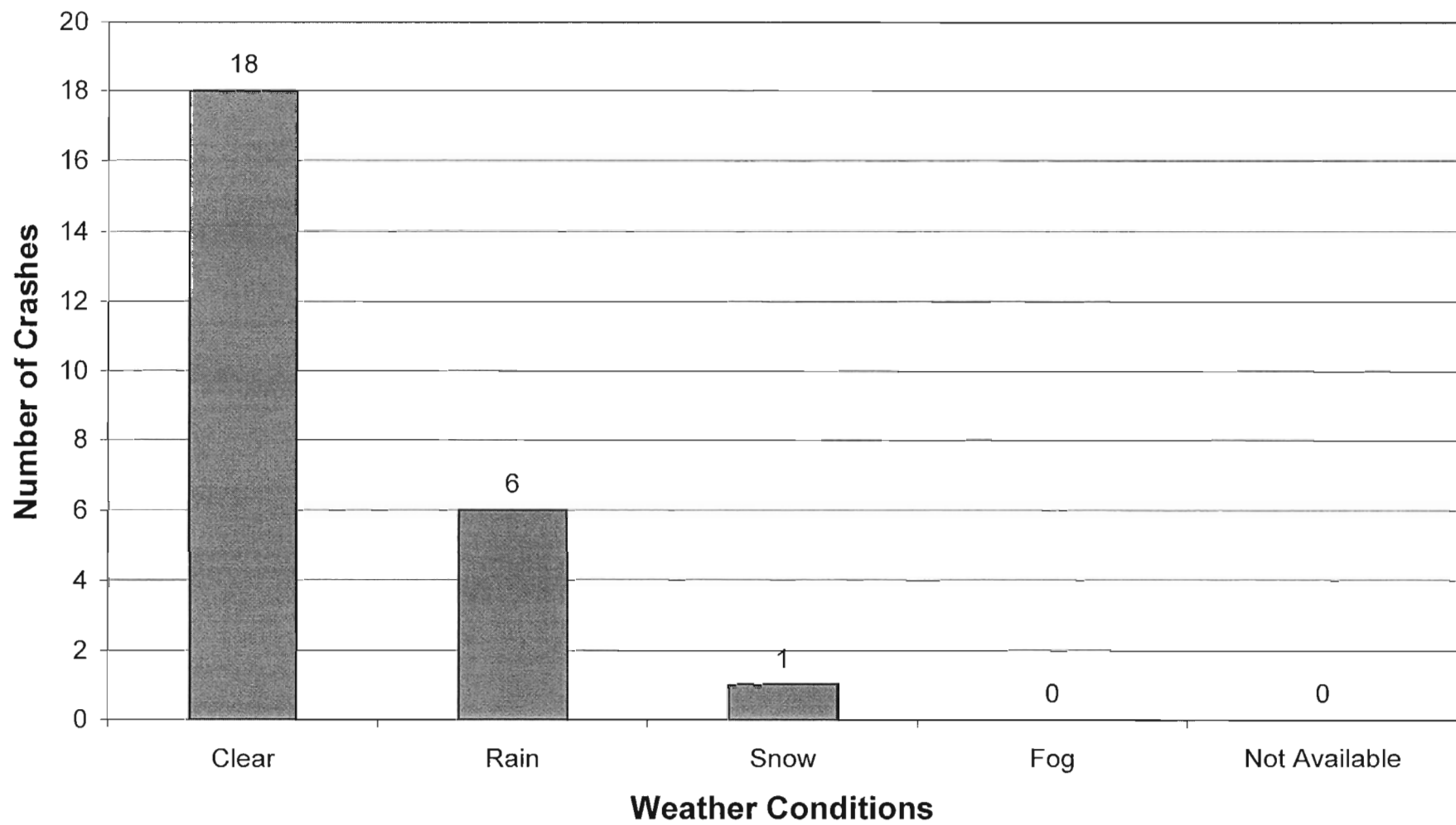
CR 609, CR 666, CR 604
Crash Occurrence by Time of Day



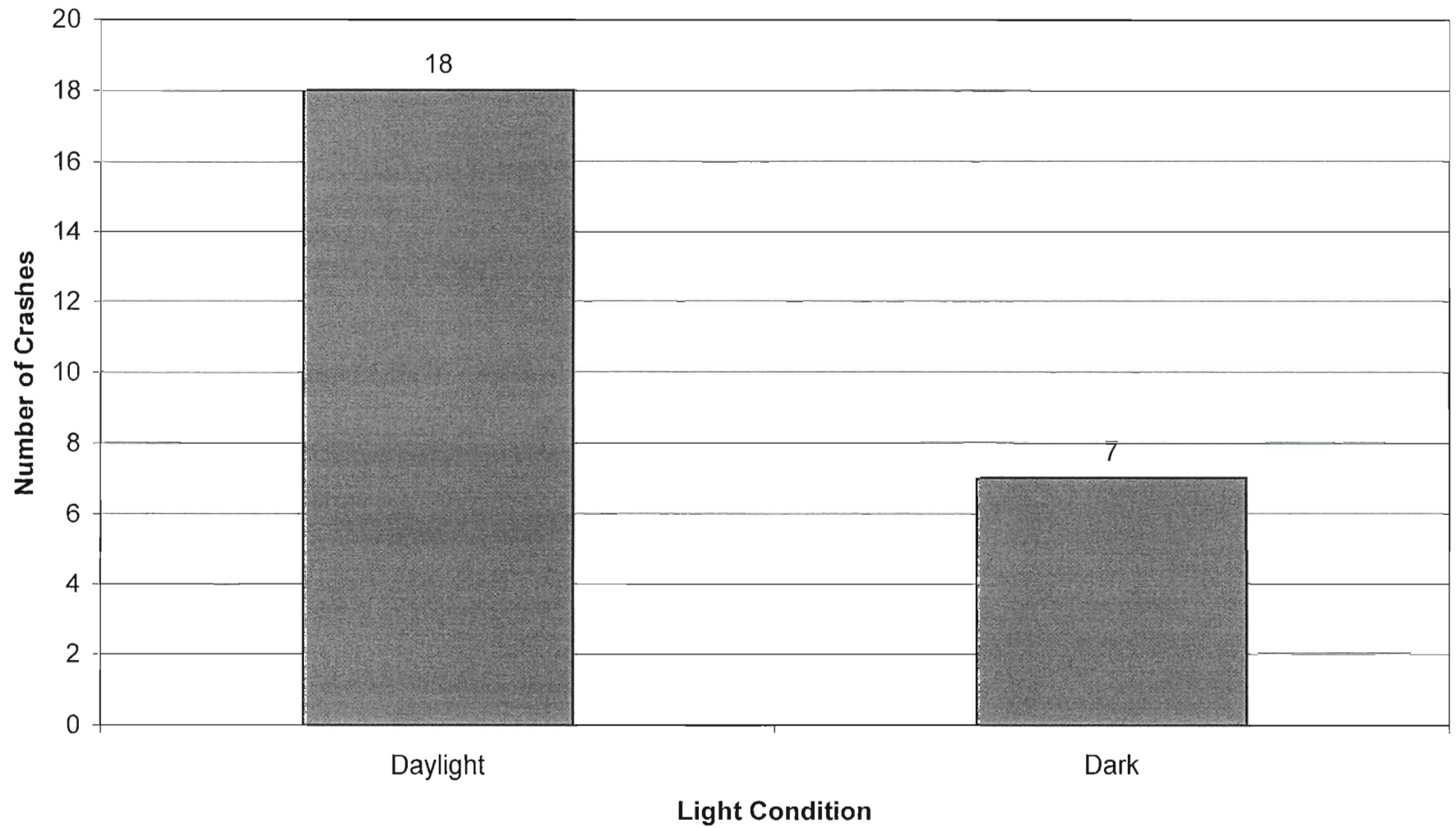
CR 609, CR 666, CR 604
Crash Occurrence by Surface Conditions



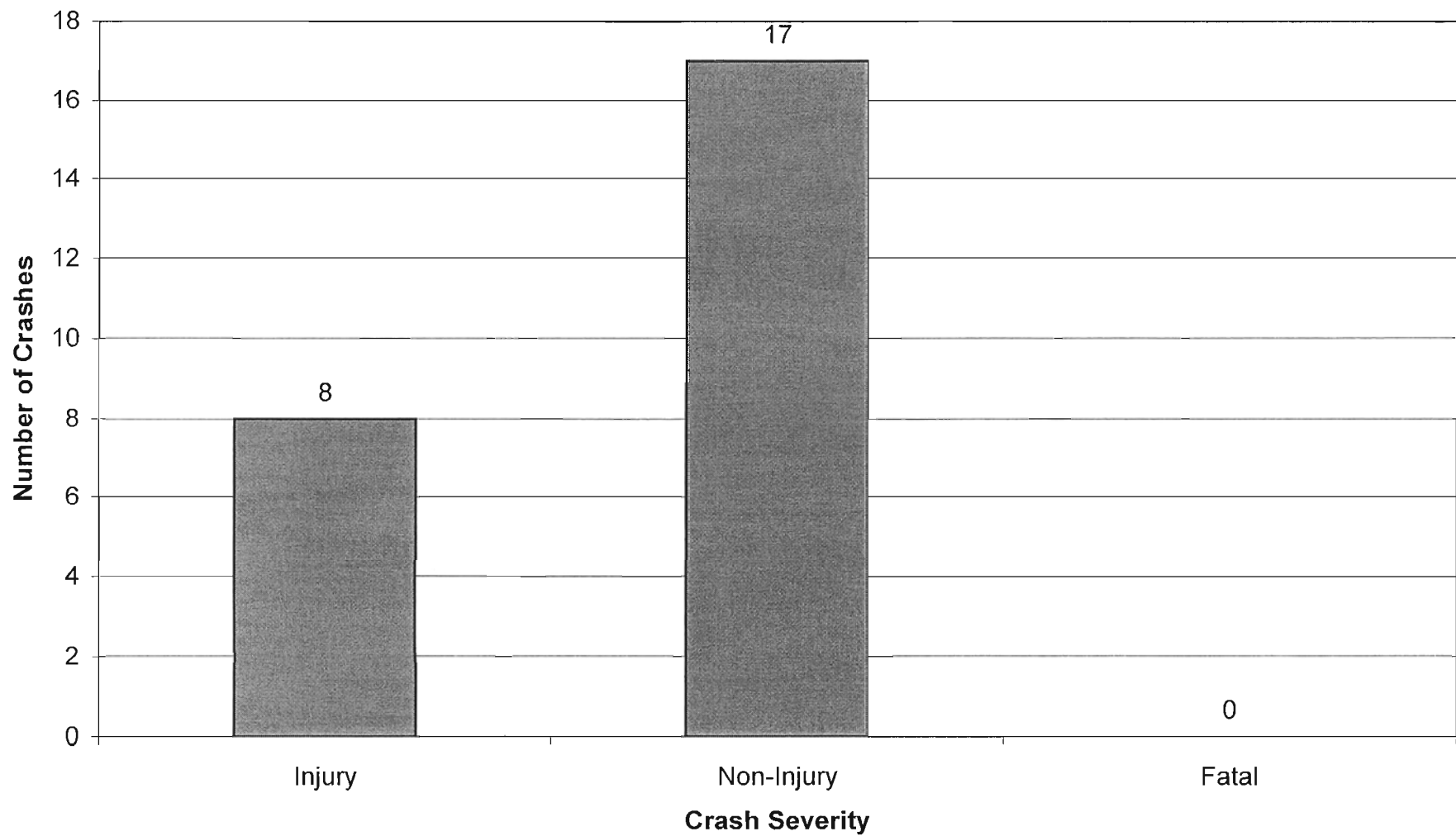
CR 609, CR 666, CR604
Crash Occurrence by Weather Conditions



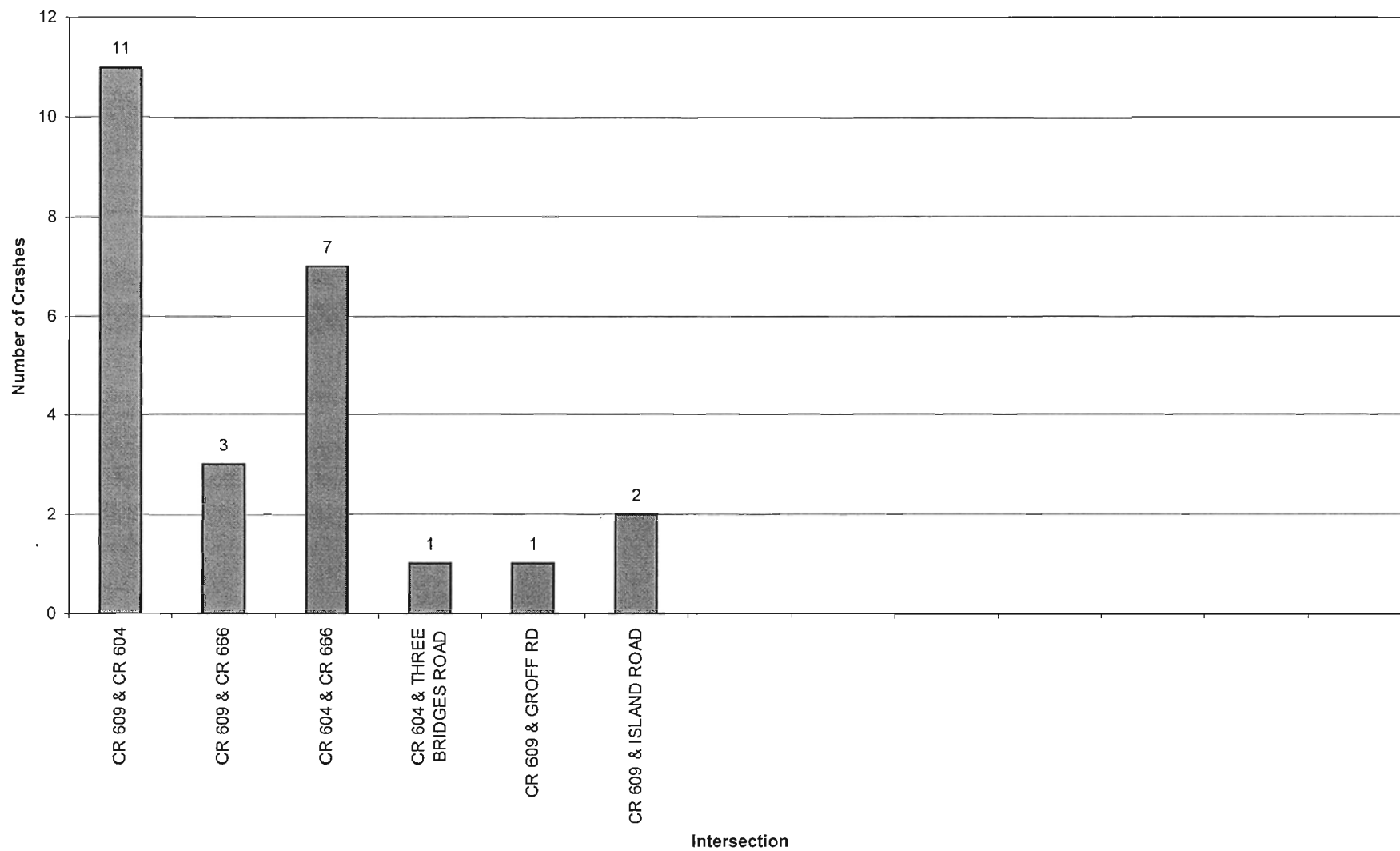
CR 609,CR 666, CR 604
Crash Occurrence by Light Condition



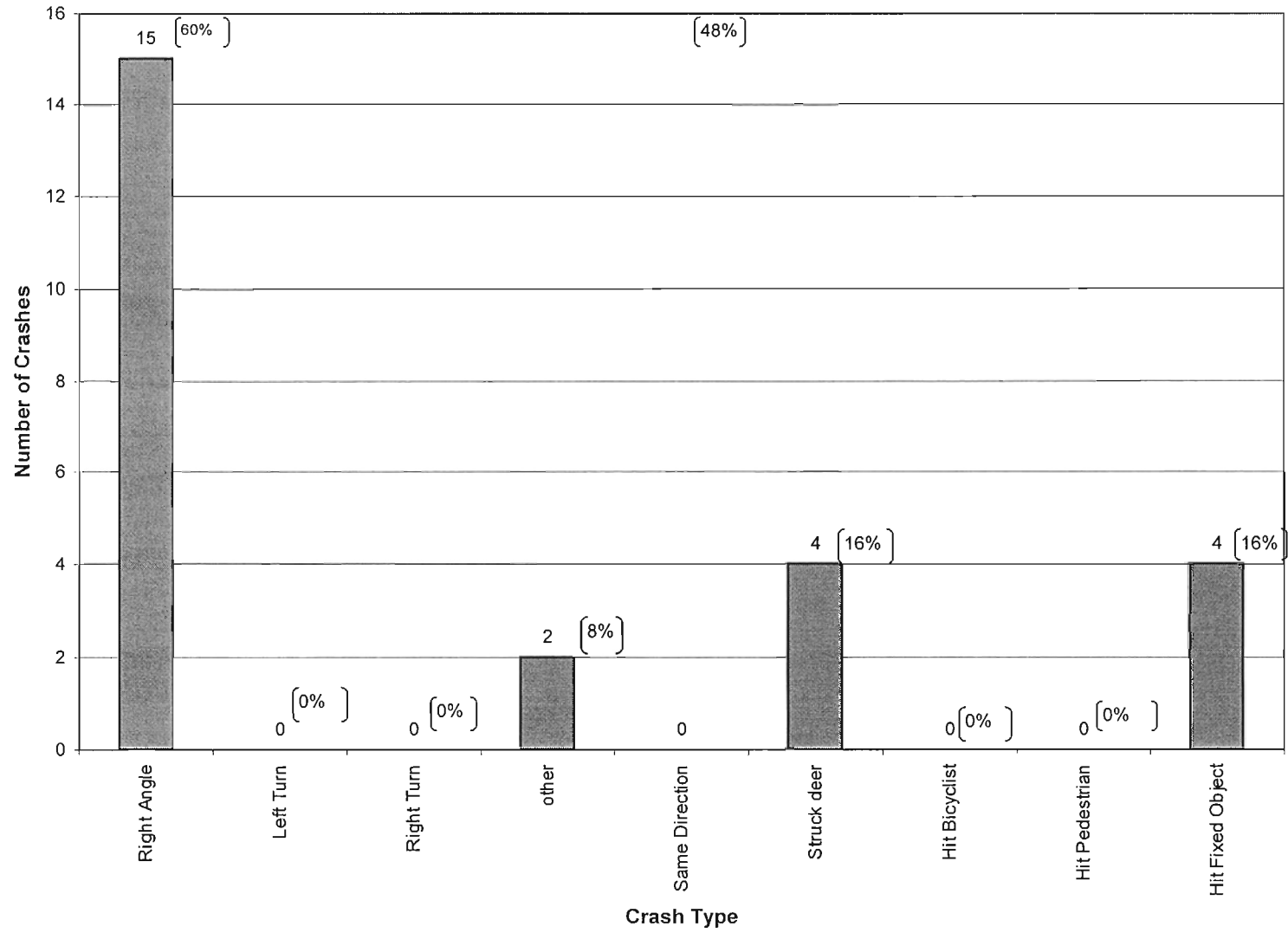
CR 609, CR 666, CR 604
- Crash Severity



CR 609, CR 666, CR 604
Spot Location of Crashes (Proximity to Nearest Intersection)



CR 609, CR 666, CR 604
Crash Type



CR 609, CR 666, CR 604
UPPER PITTSBURGH TOWNSHIP
ACCIDENT SUMMARY 2001-2002
TOTAL-25 CRASHES
Month

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
<u>1</u>	<u>3</u>	<u>5</u>	<u>1</u>	<u>1</u>	<u>3</u>	<u>2</u>	<u>0</u>	<u>2</u>	<u>4</u>	<u>3</u>	<u>0</u>

Time of Day				Day of Week	
AM	Number of	PM	Number of		Number of
Midnight - Noon	Crashes	Noon - Midnight	Crashes		Crashes
Midnight – 1:00	0	12:00-1300	2	Monday	6
1:00 – 2:00	0	1300-1400	3	Tuesday	1
2:00 – 3:00	0	1400-1500	2	Wednesday	3
3:00 – 4:00	0	1500-1600	2	Thursday	4
4:00 – 5:00	0	1600-1700	2	Friday	2
5:00 – 6:00	1	1700-1800	2	Saturday	5
6:00 – 7:00	0	1800-1900	1	Sunday	4
7:00 – 8:00	3	1900-2000	2		
8:00 – 9:00	0	2000-2100	1		
9:00 – 10:00	1	2100-2200	0		
10:00 – 11:00	1	2200-2300	2		
11:00 – 12 Noon	0	2300-2400	0		

Crashes Caused By

Local Resident 5 County Resident 11 State Resident 6 Out-of-State 3 Resident 0

DAY 18

NIGHT 7

DRY 17 WET 7 SNOWY 0 ICY 1 OTHERS

CLEAR 18 RAIN 6 SNOW 1 FOG

INJURY 8 NON-INJURY 17 FATAL 0

Right Angle	Same Direction	Left Turn	Right Turn	Side Swipe
15	0	0	0	0

Fixed Object	Head On	Other	Pedestrian	Bike
4	0	6(4 DEER, 1 DOG)	0	0

Parking Related 0

CR 609, CR 666, CR 604
UPPER PITTSBURGH TOWNSHIP
CRASH SUMMARY 2001
TOTAL-9 CRASHES
Month

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
<u>1</u>	<u>0</u>	<u>3</u>	<u>0</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>2</u>	<u>0</u>	<u>0</u>

Time of Day				Day of Week	
AM	Number of	PM	Number of		Number of
Midnight - Noon	Crashes	Noon - Midnight	Crashes		Crashes
Midnight – 1:00	0	12:00-1300	1	Monday	3
1:00 – 2:00	0	1300-1400	0	Tuesday	0
2:00 – 3:00	0	1400-1500	1	Wednesday	2
3:00 – 4:00	0	1500-1600	1	Thursday	1
4:00 – 5:00	0	1600-1700	1	Friday	2
5:00 – 6:00	1	1700-1800	0	Saturday	1
6:00 – 7:00	0	1800-1900	0	Sunday	0
7:00 – 8:00	2	1900-2000	1		
8:00 – 9:00	0	2000-2100	0		
9:00 – 10:00	1	2100-2200	0		
10:00 – 11:00	0	2200-2300	0		
11:00 – 12 Noon	0	2300-2400	0		

Crash Caused By

Local Resident 2 County Resident 4 State Resident 2 Out-of-State Resident 1 Unknown

DAY 7

NIGHT 2

DRY 5 WET 3 SNOWY ICY 1 OTHERS 0

CLEAR 6 RAIN 2 SNOW 1 FOG

INJURY 1 NON-INJURY 8 FATAL

Right Angle	Same Direction	Left Turn	Right Turn	Side Swipe
<u>4</u>				

Fixed Object	Head On	Other	Pedestrian	Bike
<u>1</u>		<u>4 (3 DEER, 1 DOG)</u>		

CR 609, CR 666, CR 604
UPPER PITTSBURGH TOWNSHIP
CRASH SUMMARY 2002
TOTAL-16 CRASHES
Month

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
<u>0</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>0</u>	<u>2</u>	<u>1</u>	<u>0</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>0</u>

Time of Day				Day of Week	
AM Midnight - Noon	Number of Crashes	PM Noon - Midnight	Number of Crashes		Number of Crashes
Midnight – 1:00	0	12:00-1300	1	Monday	3
1:00 – 2:00	0	1300-1400	3	Tuesday	1
2:00 – 3:00	0	1400-1500	1	Wednesday	1
3:00 – 4:00	0	1500-1600	1	Thursday	3
4:00 – 5:00	0	1600-1700	1	Friday	0
5:00 – 6:00	0	1700-1800	2	Saturday	4
6:00 – 7:00	0	1800-1900	1	Sunday	4
7:00 – 8:00	1	1900-2000	1		
8:00 – 9:00	0	2000-2100	1		
9:00 – 10:00	0	2100-2200	0		
10:00 – 11:00	1	2200-2300	2		
11:00 – 12 Noon	0	2300-2400	0		

Crash Caused By

Local Resident 3 County Resident 7 State Resident 4 Out-of-State Resident 2 Unknown 0

DAY 11

NIGHT 5

DRY 12 WET 4 SNOWY 0 ICY 0 OTHERS 0

CLEAR 12 RAIN 4 SNOW FOG

INJURY 7 NON-INJURY 9

Right Angle	Same Direction	Left Turn	Right Turn	Side Swipe
<u>11</u>				

Fixed Object	Head On	Other	Pedestrian	Bike
<u>3</u>		<u>2 (1 DEER)</u>		

Parking Related

SJTPO Safety Audits



MVC-001S.JPG



MVC-002S.JPG



MVC-003S.JPG



MVC-004S.JPG

SJTPO Safety Audits



MVC-005S.JPG



MVC-006S.JPG



MVC-007S.JPG



MVC-008S.JPG

SJTPO Safety Audits



MVC-009S.JPG



MVC-010S.JPG



MVC-011S.JPG



MVC-012S.JPG

SJTPO Safety Audits



MVC-013S.JPG

Route _____

Date _____

Safety Audit Stage 5**Operation/Existing Roads***Checklist 5-1**General Topics*

Item	Issues to be Considered	Check	Comments
1 Landscaping	Is landscaping in accordance with guidelines (e.g., clearances, sight distance)?		
	Are required clearances and sight distances not likely to be restricted following future plant growth (landscaping and natural)?		
2 Parking	Are provisions for parking satisfactory in relation to traffic operations and safety?		
3 Temporary works	Are all locations free of construction or maintenance equipment, and any signing or temporary traffic control devices that are no longer required?		
4 Headlight glare	Have any problems due to headlight glare (e.g., two-way service road close to main traffic lanes) been addressed?		

Checklist 5-2

Alignment and Cross Section

Project _____

Audit Team Members _____

Date _____

Item	Issues to be Considered	Check	Comments
1 Visibility, sight distances	Is sight distance adequate for the speed of traffic using the route?		
	Is adequate sight distance provided for intersections, crossings (e.g., pedestrian, cyclist, cattle, railway) etc.?		
2 Design speed	Is the horizontal and vertical alignment suitable for the (85th percentile) traffic speed? If not:		
	(a) Are warning signs installed?		
	(b) Are advisory speed signs installed?		
	Are the posted advisory speeds for curves appropriate?		

Checklist 5-2**Alignment and Cross Section**

Project _____

Audit Team Members _____

Date _____

Item	Issues to be Considered	Check	Comments
3 Overtaking	Are adequate passing opportunities provided?		
4 Readability by drivers	Are there any sections of roadway which may cause confusion e.g.:		
	(a) Is alignment of roadway clearly defined?		
	(b) Has disused pavement (if any) been removed or treated?		
	(c) Have old pavement markings been removed properly?		
	(d) Do streetlight and tree lines conform with the road alignment?		

Checklist 5-2

Alignment and Cross Section

Project _____

Audit Team Members _____

Date _____

Item	Issues to be Considered	Check	Comments
5 Widths	Are all traffic lanes and roadway widths, including bridges, adequate?		
6 Shoulders	Are shoulder widths appropriate (e.g. for broken down or emergency vehicles)?		
	Are shoulders traversable for all vehicles and road users?		
	Is the shoulder cross slope sufficient to provide proper drainage?		
7 Side slopes	Are the side slopes and table drains safe for run off vehicles to traverse?		

Checklist 5-3

Intersections

Project _____

Audit Team Members _____

Date _____

Item	Issues to be Considered	Check	Comments
1 Location	Are intersections located safely with respect to horizontal and vertical alignment?		
2 Warning	Where intersections occur at the end of high speed environments (e.g., at approaches to towns), are there traffic control devices to alert drivers?		
3 Controls	Are pavement markings and intersection control signing satisfactory?		
4 Layout	Is the alignment of curbs, traffic islands and medians satisfactory?		
	Is the intersection layout obvious to all users?		
	Are turning radii and tapers appropriate?		

Checklist 5-3

Intersections

Project _____

Audit Team Members _____

Date _____

Item	Issues to be Considered	Check	Comments
5 Visibility, sight distances	Is sight distance adequate for all movements and all users?		

Checklist 5-4

Auxiliary Lanes and Turn Lanes

Project _____

Audit Team Members _____

Date _____

Item	Issues to be Considered	Check	Comments
1 Tapers	Are starting and finishing tapers located and aligned correctly?		
2 Shoulders	Are appropriate shoulder widths provided at merges in accordance with design guidelines?		
3 Signs	Is signing and marking installed in accordance with standards?		
4 Turning traffic	Is there advance warning of the approaching auxiliary lane?		

Checklist 5-4

Auxiliary Lanes and Turn Lanes

Project _____

Audit Team Members _____

Date _____

Item	Issues to be Considered	Check	Comments
5 Visibility, sight distances	Have right turn movements within the length of the auxiliary lane been avoided?		
	Has stopping sight distance been provided to the rear of turning vehicles?		
	Has stopping sight distance been provided for entering and leaving vehicles?		

Checklist 5-5

Non-Motorized Traffic

Project _____

Audit Team Members _____

Date _____

Item	Issues to be Considered	Check	Comments
1 Paths	Are there appropriate travel paths and crossing points for pedestrians and cyclists?		
2 Barriers and fencing	Where necessary, is fencing installed to guide pedestrians and cyclists to crossings or overpasses?		
	Is fencing of your design (e.g., avoid solid horizontal rails)?		
	Where necessary, is crash barrier installed to separate vehicle, pedestrian and cyclist flows?		
3 Bus stops	Are bus stops appropriately located with adequate clearance from the traffic lane for safety and visibility?		
4 Elderly and disabled	Are there adequate provisions for the elderly, the disabled, children, wheelchairs and baby carriages (e.g., holding rails, curb and median crossings, ramps)?		
	Where necessary, are hand rails provided (e.g., on bridges, ramps), and are they adequate?		

Checklist 5-5

Non-Motorized Traffic

Project _____

Audit Team Members _____

Date _____

Item	Issues to be Considered	Check	Comments
Elderly and disabled (cont.)	Distance between stop line and pedestrian crossing at signalized intersections (for visibility of pedestrians from truck driver's seat).		
	Signal timing - cycle length - pedestrian clearance time - are pedestrian buttons operable?		
5 Cyclists	Is the pavement width adequate for the number of cyclists using the route?		
	Is the bicycle route continuous, i.e., free of squeeze points or gaps?		
	Are bicycle safe grates provided at drainage pits where necessary?		

Checklist 5-6

Signs and Lighting

Project _____

Audit Team Members _____

Date _____

Item	Issues to be Considered	Check	Comments
1 Lighting	Is appropriate lighting installed at intersections, roundabouts, pedestrian and bicycle crossings, pedestrian refuges, etc?		
	Is all lighting operating satisfactorily?		
	Are the appropriate types of poles used for all locations and correctly installed (e.g. slip base at correct height, rigid poles protected if within clear zone)?		
	Are all locations free of any lighting which may conflict visually with traffic signals or signs?		
	Has lighting for signs, particularly overhead signs, been provided where necessary?		
2 Signs	Are all necessary regulatory, warning and direction signs (including detours) in place? Are they conspicuous?		
	Are there any redundant signs?		

Checklist 5-6

Signs and Lighting

Project _____

Audit Team Members _____

Date _____

Item	Issues to be Considered	Check	Comments
Signs (cont.)	Are traffic signs in their correct locations, and properly positioned with respect to lateral clearance and height?		
	Are the correct signs used for each situation, and is each sign necessary?		
	Are signs placed so as not to restrict sight distance, particularly for vehicles?		
	Are all signs effective for all likely conditions (e.g. day, night, rain, fog, rising or setting sun, oncoming headlights, poor lighting)?		
	Do sign supports conform to guidelines?		
3 Marking and delineation	Have retroreflective markers been installed? Where colored markers are used, have they been installed correctly?		
	Is all necessary pavement marking installed?		
	Are pavement markings (center lines, edge lines, transverse lines) clearly visible and effective for all likely conditions (e.g. day, night, rain, fog, rising or setting sun, oncoming headlights, light colored pavement surface, poor lighting)?		

Checklist 5-6

Signs and Lighting

Project _____

Audit Team Members _____

Date _____

Item	Issues to be Considered	Check	Comments
Marking and delineation (cont.)	On light colored pavement surfaces (e.g. concrete) are RRPMS used to simulate traffic lanes?		
	Has raised profile edge marking been provided where necessary (e.g. fatigue zones)?		
	Is delineation adequate and in accordance with guidelines (e.g. post-mounted delineators, RRPMS, chevron alignment markers)?		
	Is delineation effective for all likely conditions (e.g. day, night, rain, fog, rising or setting sun, oncoming headlights)?		
	If chevron alignment markers are installed, have the correct types of markers been used?		
	Are vehicle paths through intersections delineated where required?		
	On truck routes, are reflective devices appropriate to driver's eye height?		

Checklist 5-7

Traffic Signals

Project _____

Audit Team Members _____

Date _____

Item	Issues to be Considered	Check	Comments
1 Operation	Are traffic signals operating correctly? Is the number and location of signal displays appropriate?		
2 Visibility	Are traffic signals clearly visible to approaching motorists?		
	Is the end of likely vehicle queues visible to motorists so that they may stop safely?		
	Have any visibility problems caused by the rising or setting sun been addressed?		
	Are signal displays shielded so that they can be seen only by the motorists for whom they are intended?		
	Where signal displays are not visible from an adequate distance, are signal warning signs and/or flashing lights installed?		
3 Other provisions	Where necessary, are there provisions for visually impaired pedestrians (e.g., audio-tactile push buttons, tactile markings)? Are they working?		
	Where necessary, are there provisions for elderly or disabled pedestrians (e.g., extended green phase, phase displacement)?		

Checklist 5-8

Physical Objects

Project _____

Audit Team Members _____

Date _____

Item	Issues to be Considered	Check	Comments
1 Clear zone	Is a clear zone provided in accordance with the guidelines?		
	Is the appropriate treatment or protection provided for any objects within the clear zone (e.g., slip-base or frangible poles, crash barrier, crash cushions, sloping culvert, headwalls)?		

Checklist 5-8

Physical Objects

Project _____

Audit Team Members _____

Date _____

Item	Issues to be Considered	Check	Comments
2 Crash barriers	Are safety barriers installed at all necessary locations, including on bridges, in accordance with guidelines?		
	Are the crash barrier systems suitable for the purpose?		
	Is the length of crash barrier at each installation adequate? Are the crash barriers correctly installed?		
	Are Guard Rail Energy Absorbing Terminals (GREAT) or crash cushions installed where necessary (e.g., off ramp, bridge piers)?		

Checklist 5-8

Physical Objects

Project _____

Audit Team Members _____

Date _____

Item	Issues to be Considered	Check	Comments
Crash barriers (cont.)	Where works are subject to stage construction, are temporary barriers installed in accordance to guidelines?		
	Is there a safe run off area behind breakaway terminals?		
3 Fencing	Is pedestrian fencing where needed?		
	Is fencing in the clear zone free of separate horizontal rails?		
	Is there adequate delineation/visibility of barriers and fences at night?		

Checklist 5-9

Delineation

Project _____

Audit Team Members _____

Date _____

Item	Issues to be Considered	Check	Comments
1 Line markings	Are all line markings (center line, edge line, transverse lines) in good condition?		
2 Guide posts	Are guide posts correctly placed, clean, and visible?		
3 Raised and Recessed Pavement Markings	Are RPM's in good condition?		
4 Chevron Alignment Markers	Are Chevron Alignment Markers placed correctly, and used only according to standards?		

Safety Audit Stage 5

Operation/Existing Roads

Checklist 5-10

Pavement

Project _____

Audit Team Members _____

Date _____

Item	Issues to be Considered	Check	Comments
1 Pavement defects	Is the pavement free of defects (e.g., excessive roughness or rutting, potholes, etc.) which could result in safety problems (e.g., loss of steering control)?		
2 Skid resistance	Does the pavement appear to have adequate skid resistance, particularly on curves, steep grades and approaches to intersection? Has skid resistance testing been carried out where necessary?		
3 Ponding	Is the pavement free of areas where ponding or sheet flow of water may occur with resultant safety problems?		
4 Loose screenings	Is the pavement free of loose screenings?		