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REDUCING ALCOHOL-RELATED PEDESTRIAN FATALITIES:

DESIGN OF A MODEL PROGRAM

Prepared for:

State of Florida
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1. Introduction

One out of every seven persons killed in automobile crashes in the United States is a pedestrian. In 1995, 5,585 pedestrians were killed and about 84,000 were injured in this country. Pedestrian fatalities, like motor vehicle-related fatalities in general, have been decreasing in recent years. The 1995 pedestrian fatalities represent a decrease of 18 percent from those killed in 1985 (NHTSA, 1996).

Despite this decline, pedestrian crashes remain the second leading category of traffic deaths. Pedestrian crash victims suffer serious or fatal injuries at a greater rate than bicyclists or motor vehicle occupants (IIHS, 1996). Whereas pedestrian crashes constitute about two percent of all crashes, they account for more than 11 percent of all crash costs. Injury costs related to pedestrian crashes exceed 32 billion dollars annually (Miller, 1993).

Seventy-two percent of pedestrian deaths occur in urban areas. In large cities, up to 50 percent of traffic deaths are pedestrians. Pedestrian crashes are a particular problem for youths, seniors and those who are alcohol-impaired. Children aged five through 15 represent only 16 percent of the U.S. population, yet they accounted for 29 percent of all pedestrian injuries in 1995. Seniors aged 65 and older comprised 23 percent of pedestrian fatalities in 1995, while representing only 13 percent of the population. Fifty-one percent of pedestrians 16 and older killed in nighttime crashes have blood alcohol concentrations above 0.10% (NHTSA,1996).

Extensive and varied efforts have been devoted to reducing alcohol-involved traffic crashes during the past fifteen years. These efforts have contributed to a marked reduction in drinking driver crashes. In the U.S. between 1982 and 1995 the proportion of fatally injured drivers who were legally intoxicated (i.e., had a BAC of 0.10% or higher) declined from 44% to 31% (a decrease of 30%). However, the change in involvement of intoxicated pedestrians has been smaller, from 39% to 31% (a decrease of 20%). It is likely that this difference is because efforts have focused almost exclusively on dissuading individuals from driving after they drink, rather than on efforts that would also reduce drinking pedestrian crashes, or drinking in general.

Pedestrian Crashes in Florida

During 1995, more pedestrians were killed in Florida (560) than in any state other than California. The pedestrian fatality rate of 4.00 (per 100,000 population) was greater than all but two other states (Arizona and New Mexico). In Florida, pedestrian deaths accounted for 20% of all motor vehicle-related deaths during 1995, which is a greater proportion than all but five other states. As is the case nationally, the proportion of fatally injured pedestrians in Florida who have been drinking is substantial. In 1994, 31.8% of fatally injured pedestrians in Florida were legally intoxicated.

The Florida Department of Transportation (FL DOT) has carefully monitored the pedestrian crash problem for several years. As part of that effort, a special study of pedestrian crashes in Orange county was conducted by the Institute for Health and Human Services Research at Florida State University (McNeece and Doan, 1993). Perhaps the most noteworthy finding of that study is that pedestrian crashes involving alcohol were very heavily concentrated in one relatively small area of Orange county. Moreover, within that area a substantial proportion of alcohol-involved pedestrian crashes were located along a single corridor, the South Orange Blossom Trail (OBT). Another study conducted by FL DOT identified Main Street in Jacksonville as another corridor with a substantial concentration of pedestrian crashes involving alcohol.

Project Goals

Previous work on pedestrian crashes has been successful in substantially reducing the problem when crashes are concentrated along a particular stretch of roadway (National Committee for Injury Prevention, 1989). Often it is possible to identify and correct a single factor that is contributing to the large number of crashes. Hence these two sections of roadway in Florida were identified for intensive study by the present project. The high crash roadway locations in Jacksonville and Orlando were studied to determine which, if any, roadway characteristics, traffic patterns, driver behaviors, and pedestrian behaviors appear to be associated with increased risk of motor vehicle-pedestrian crashes. The goal was to recommend engineering treatments and other possible interventions that would have a high likelihood of reducing crashes – particularly those involving alcohol.

Structure of the Report

The remainder of this report describes the project activities. Chapter 2 presents the general procedures used at each site to collect and analyze data, and develop recommended community strategies. Chapter 3 gives a description of the particulars of the project operations in Jacksonville and a summary of findings. Chapter 4 parallels Chapter 3, providing a description of the Orlando portion of the project. Chapter 5 presents a brief discussion of the overall findings and their implications for addressing the alcohol-involved pedestrian crash problem in general.

2. Procedures

This project was conducted in Orlando and Jacksonville, Florida, at two locations determined to have high concentrations of alcohol-related pedestrian crashes. At each of the sites, the project team worked closely with Community Traffic Safety Program (CTSP) officials and the appropriate government agencies to identify conditions that appear to increase the likelihood of pedestrian-motor vehicle collisions. Suggested countermeasures and evaluation plans were developed for each of two neighborhoods and their respective cities to consider for implementation. Data were collected to serve as baseline information for a future study that will examine the effectiveness of interventions that are implemented. The following is a brief summary of the procedures employed at each site. Detailed descriptions of activities at both sites follow in Chapters 3 and 4.

Examination of Roadway Characteristics and Settings

To determine what roadway characteristics may be common to sites with high alcohol-involved pedestrian crash rates, we examined a variety of conditions such as lighting levels, roadway geometric characteristics, roadway markings, signage, and traffic control signals. Overall conditions of the locations were also surveyed. These included traffic and pedestrian volume, presence of sidewalks, distance of sidewalks or other walkways from traffic, crosswalks, signalization, separation of pedestrian walkways from traffic by physical barriers, as well as location of alcohol outlets and other commercial establishments where individuals are particularly likely to walk.

Survey of Driver and Pedestrian Behaviors

We also examined both vehicle and pedestrian traffic to learn what behavioral factors may to lead to pedestrian-vehicle conflicts, especially those that might be modifiable. Because most intoxicated pedestrians killed in crashes are extremely impaired, it is unlikely that anything effective can be done to alter their conscious behavior. However, it might be possible to develop engineering approaches that would modify motorist or pedestrian behavior by altering the walking environment.

Where possible, we gathered additional information about driver and pedestrian behavior from local law enforcement agencies. Officers who worked the sites were interviewed and police reports of pedestrian crashes at these locations were examined for common patterns.

Consultation with Local Community Leaders and Development of Model Program

The project team met with CTSP members in Jacksonville and Orlando to present preliminary findings, solicit local input, and discuss suggested interventions. In particular, input was solicited from community members regarding both the appropriateness and feasibility of a variety of potential approaches for reducing the pedestrian crash problem along Main Street, Jacksonville, and the South Orange

Blossom Trail in Orlando. Information obtained from meetings with community representatives played a central role in framing the series of specific countermeasures developed for each roadway.

Evaluation Plan

It is important that all countermeasure programs be evaluated both in terms of process and outcome. Accordingly, we designed an evaluation plan and collected baseline data on pedestrian and motorist behaviors. These data can be used in the future to determine what effect any engineering modifications or other interventions have had on behaviors that contribute to the pedestrian crash problem along these roadways.

3. Jacksonville

Character of Problem Area

Main street between 1st and 20th streets runs through the Springfield area of Jacksonville, an area with substantial historic significance. As is characteristic of such neighborhoods in large cities, the neighborhood deteriorated as residents moved into newly developing areas on the outskirts of the downtown area several decades ago. There have been efforts by local government and by residents of the area in recent years to begin revitalizing the Springfield neighborhood. However, at present it remains an impoverished area with few businesses besides those typically found in lower income areas: convenience stores, fast food restaurants, pawn shops and used car dealers.

The Springfield community is a residential area bisected by a major urban thoroughfare – Main Street. Approximately 15,000 vehicle trips are made each day along the section of Main Street that runs through the area. The traffic volume on Main Street is increased by congestion along I-95 south of downtown Jacksonville. Rather than endure traffic slowdowns that routinely occur, motorists commonly exit I-95 proceeding northbound through the downtown area onto Main Street. Hence, Main Street becomes an alternate route for I-95. In addition, Main Street is also a corridor from downtown to northern sections of Jacksonville.

The heavy non-local traffic on Main Street, combined with the residential character of the neighborhood and the fact that many neighborhood residents do not own vehicles presents a dangerous confluence of factors. There is, of necessity, heavy pedestrian traffic along Main Street as residents travel to businesses in the area. Thus, in addition to the many thousand daily vehicle trips on Main Street there are also hundreds of pedestrian trips across Main Street every day, resulting in a large number of potential conflicts.

Pedestrian Crash Data

The crash data used in this analysis include all reported pedestrian crashes occurring on Main Street from 1990 through 1994 (five complete years). The physical boundaries of the analysis area between the intersections of Main Street with 1st and 20th Streets. All 33 crashes occurring between these intersections were plotted (see figure 3.1) to determine whether there were specific concentrations of alcohol-involved pedestrian crashes or pedestrian crashes in general. Three areas shown in this figure warranted further examination: 1) between 9th and 10th Streets, 2) between 7th and 8th Streets, and 3) between 2nd and 3rd Streets.

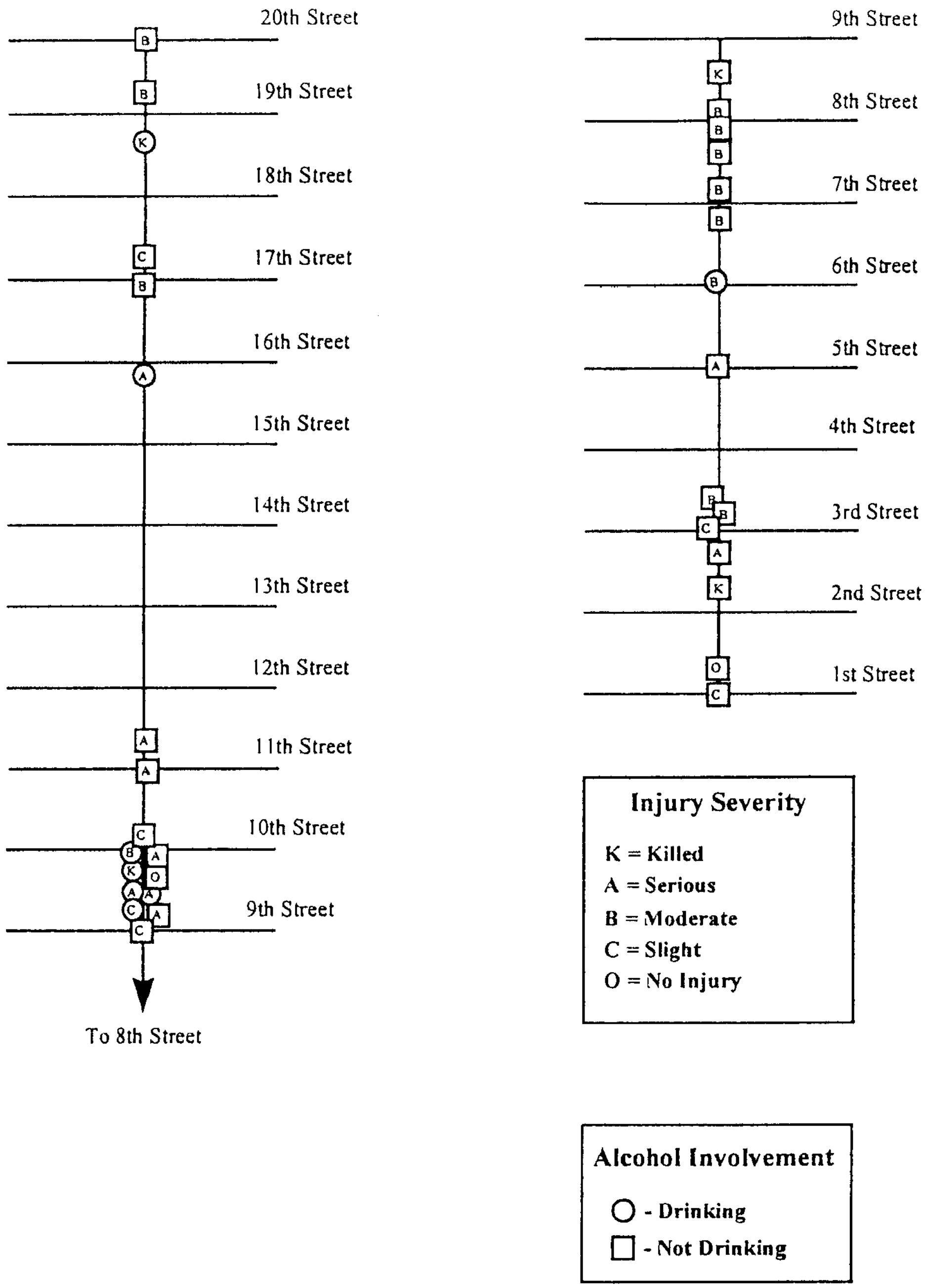


Figure 3.1 Location and severity of pedestrian crashes on Main Street (1990-1994)

For each of these three areas, collision diagrams were drawn to further analyze the characteristics associated with crashes. Figure 3.2 shows those crashes occurring between 9th and 10th Streets. In this one block area, there were 10 pedestrian crashes which is nearly a third (30%) of all pedestrian crashes in the 20-block study area. In 5 of these crashes, the pedestrian was intoxicated or had been drinking. The ages of the pedestrians ranged from 6 to 59 with the majority being between 31 and 44. The majority of the victims were male (7 of 10) and black (7 of 10). Other characteristics associated with these crashes include:

- Half occurred in the midblock area (at distances of 50 ft or more from the intersection proper).
- Half resulted in serious injuries (one fatality and four A-level injuries).
- 6 of 10 occurred in the far lane of the crossing; i.e., the pedestrian was able to cross the first three lanes of traffic safely before being struck in the fourth and last lane.

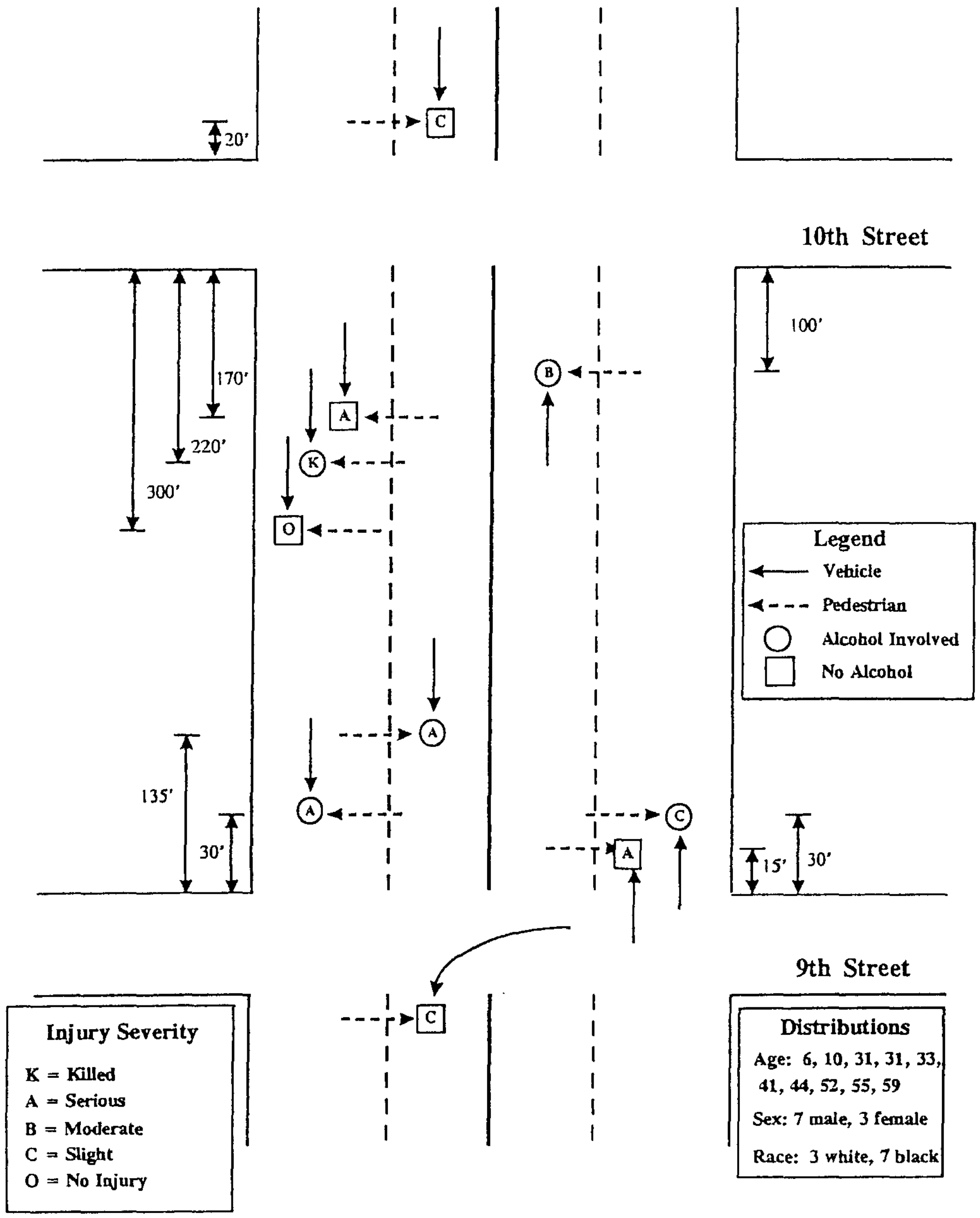


Figure 3.2 Collision diagram for all Main Street pedestrian crashes between 9th and 10th Streets

Six of the crashes occurred at night. The majority of the serious injury accidents (4 out of 5) also occurred at night as did the crashes in which the pedestrian was struck in the far lane (5 out of 6).

For crashes occurring between 2nd and 3rd Streets the problem is primarily at the 3rd Street intersection; 4 of the 5 crashes occurred at this intersection. None of the crashes involved a pedestrian who had been drinking although one crash did involve a drinking driver. The pedestrians ranged in age from 8 to 66; the majority of victims were male and white. Nearly all of these crashes (4 of 5) occurred at night, including the two serious injury crashes.

The third area with a cluster of pedestrian crashes was between 7th and 8th Streets. The ages of the pedestrians ranged from 8 to 61; the majority of the victims were female and black. None of these crashes involved alcohol nor were any of the injuries serious. All of these crashes occurred during the daytime.

Pedestrian Behavior Analysis

From the crash analysis, two locations on Main Street were identified for potential improvement projects that could reduce risks to pedestrians. The first was between 9th and 10th Streets where the majority of the pedestrian crashes occurred. Half of these resulted in severe injuries, and half involved alcohol. The second location was between 2nd and 3rd Streets, which had the second highest concentration of severe injury accidents. Although the crash data provide information related to the specific location of the problems, they do not provide information about pedestrian behavior at these locations. Hence, as a next step, preliminary observational data were collected at these sites to describe pedestrian behaviors and better understand the safety risks. A summary of the preliminary data collected at the selected sites and the results of the analysis is presented below.

Between 9th and 10th Streets, midday and early evening observations were made at the following dates and times:

Thursday, August 1, 1996 .... 7:40—9:30 PM
Friday, August 2, 1996 .... 12:45—2:00 PM
Friday, August 2, 1996 .... 5:30—6:30 PM

Altogether, pedestrian behavior data were collected for just over four hours. For each pedestrian who crossed Main Street the following were recorded: path taken, conflicts with motor vehicles (defined as occurring if one or both parties had to change speed and/or direction), whether they stopped in the road or maneuvered through traffic, and whether they were obviously intoxicated. This information was plotted for each of the time periods shown above; the data from one of the time periods is shown in figure 3.3.

For this location, the behavioral data can be summarized as follows: there were 113 crossings during the 4-hour observation period with the majority (52 percent) to/from the Lil' Champ convenience store. Twenty-two percent of the crossings were midblock (more than 50 ft from either intersection). Most importantly, 32 percent of the crossings were considered to be high-risk crossings, where there was a pedestrian/vehicle conflict or the pedestrian stopped in the road or maneuvered through traffic.

Between 2nd and 3rd Streets, midday and early evening observations were made at the followings dates and times:

Friday, August 2, 1996 .... 3:00—5:00 PM
Friday, August 2, 1996 .... 8:45—11:00 PM

At this location, data were collected for just over four hours. Figure 3.4 is one of the plots from this location. At this site, there were 88 crossings with the majority (68 percent) to/from the Lil' Champ convenience store. Eighteen percent of the crossings were midblock, and over half (52 percent) were considered to be high-risk crossings.

Main Street - Jacksonville

Observed Crossing Behavior

7:40 - 9:30 PM, TH, 8/1/96

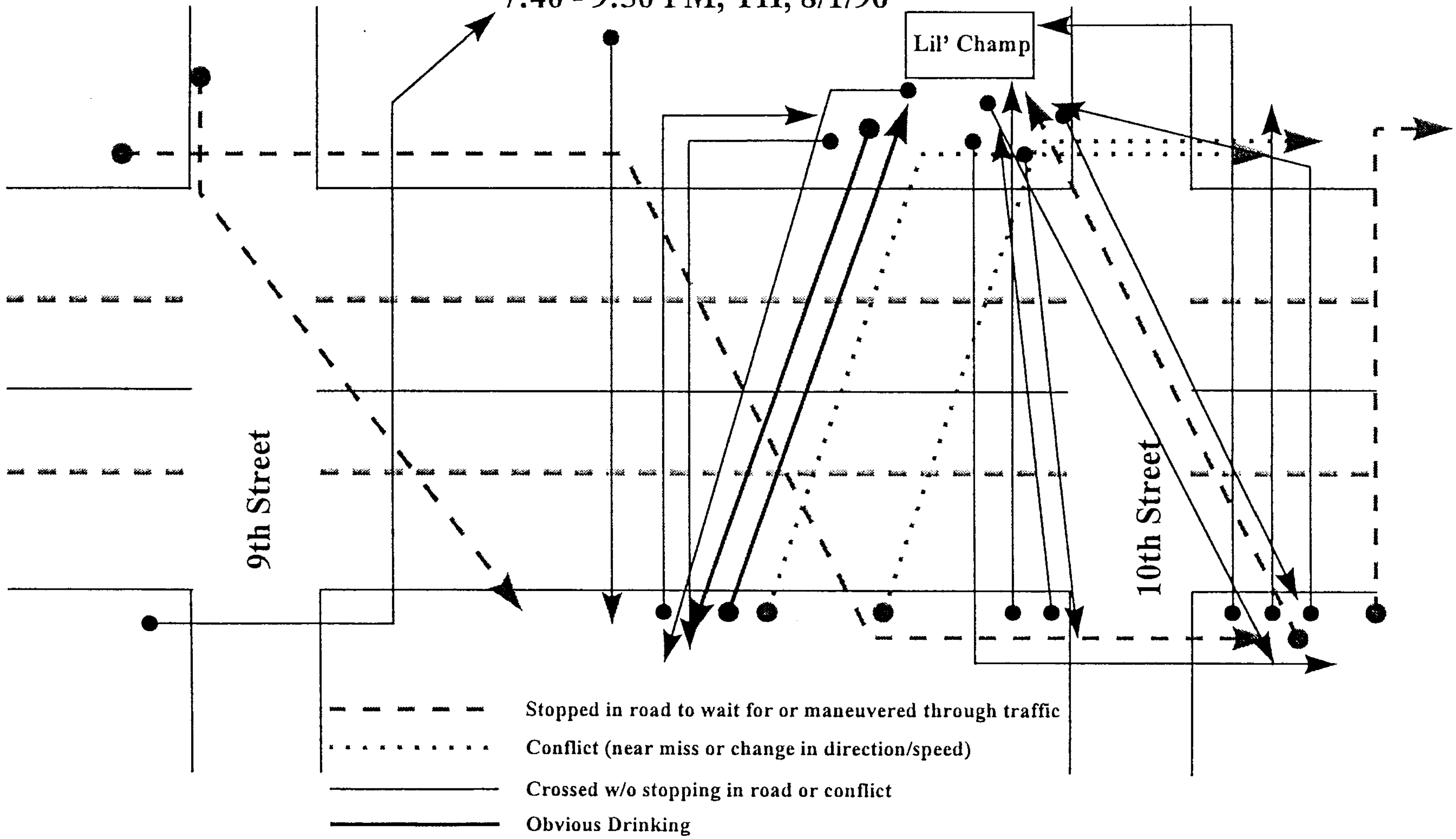


Figure 3.3

Main Street - Jacksonville

Observed Crossing Behavior

3:30 - 5:00 PM, FR, 8/2/96

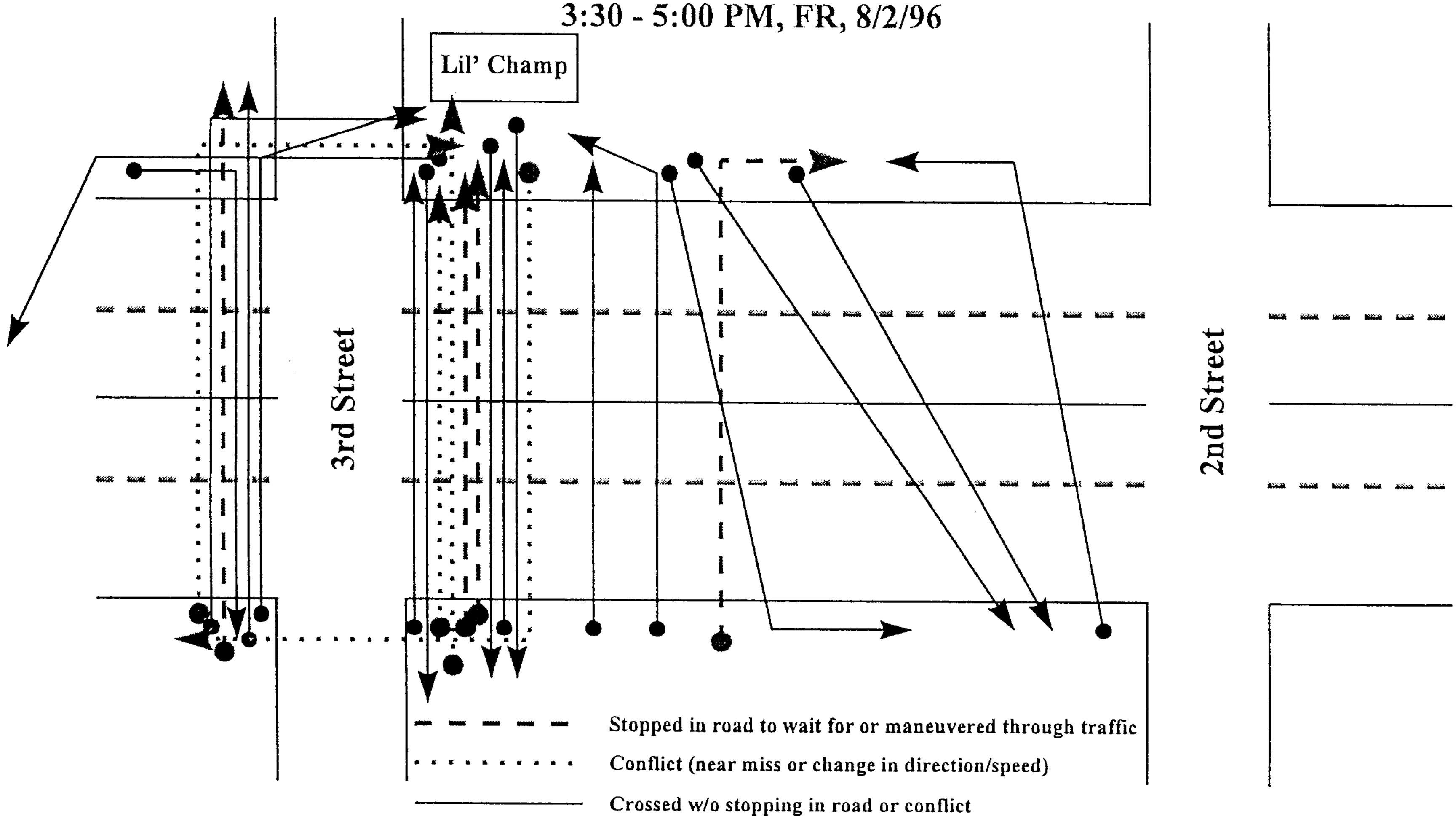


Figure 3.4

Speed Data Analysis

The primary measurable driver behavior involved in pedestrian crashes appears to be speed. Such things as inattentiveness and poor ability to judge what a pedestrian might do are probably also involved in pedestrian-motor vehicle collisions, but these kinds of factors do not lend themselves to field data collection procedures.

The posted speed limit along Main Street between 1st and 4th Streets and between 8th and 11th Streets is 30 mph. As part or the evaluation efforts, speed data were collected using pneumatic pressure tubes over a 24-hour period at a spot location near each of these two sections.[1] Figure 3.5 shows the cumulative speed distributions, including the median and 85th percentile speeds, at two locations. Seventy percent of all vehicles were traveling above the speed limit, 19 percent were traveling more than 10 mph above the limit, and 11 percent were at least 15 mph above the limit.

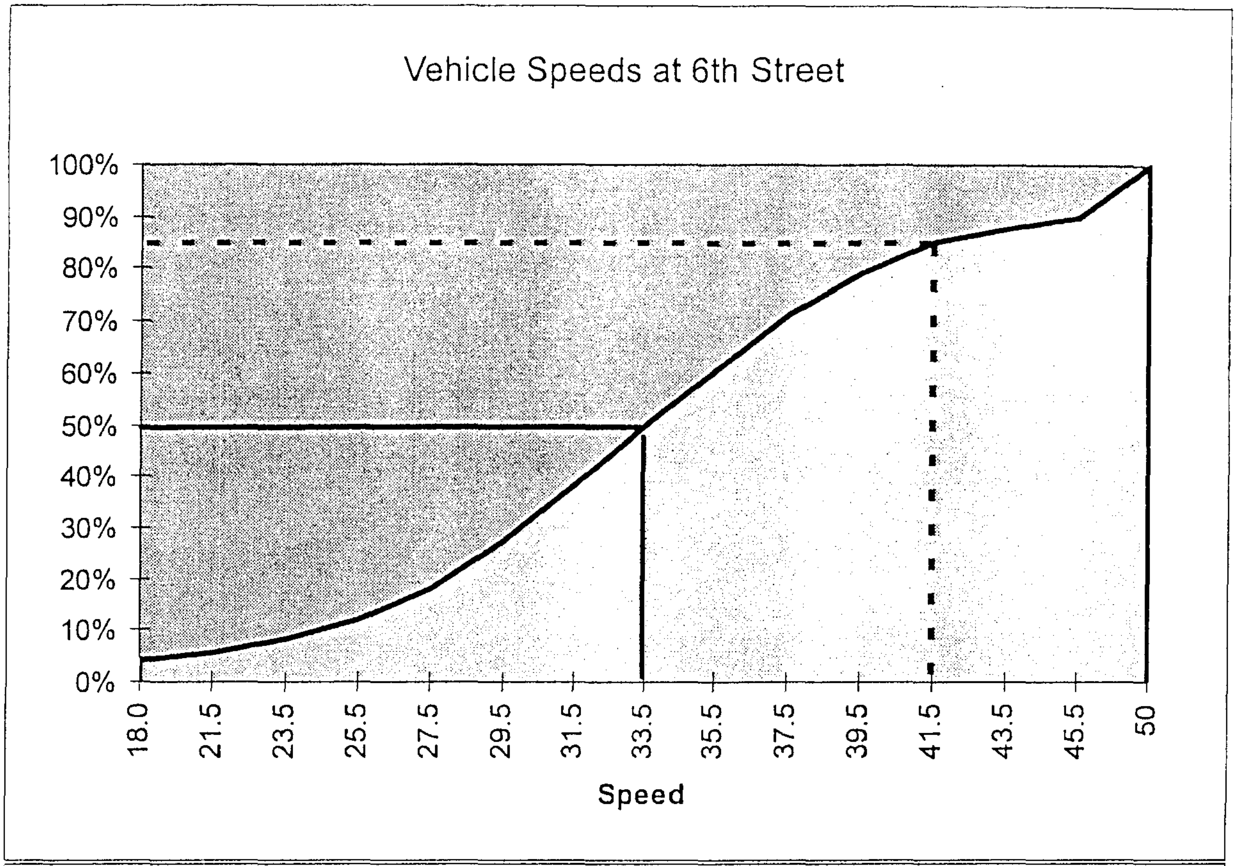
Recommendations

Based on a survey of the characteristics of Main Street – especially those segments with high pedestrian crash concentrations – and the surrounding neighborhood, the initial observations of pedestrian behavior, measurements of vehicle volumes and speeds, and discussions with a number of local officials and Springfield community representatives, a series of recommended interventions was developed. These recommendations were presented formally to the Duval County Community Traffic Safety Team at its August 1996 meeting.

It is recommended that the cross-section of the street be changed to incorporate a number of traffic-calming and pedestrian-friendly features. The block between 9th and 10th Street is the first section of Main Street where significant changes are recommended. An illustration of the recommended design is shown in figure 3.6. This design incorporates a number of features that will help mitigate the identified safety and risk-behavior problems within the existing right-of-way. At the same time this design maintains the parking/bus stop lanes on both sides of the street.

The existing right-of-way is approximately 98 ft; the recommended design produces a cross section of 96 ft. First, the lanes have been narrowed to 11 feet and a 15 foot-wide raised median has been installed along with bulbouts at the intersections and at the midblock crosswalk.

[1] We wish to express our appreciation to Theo Petritsch for obtaining these data.



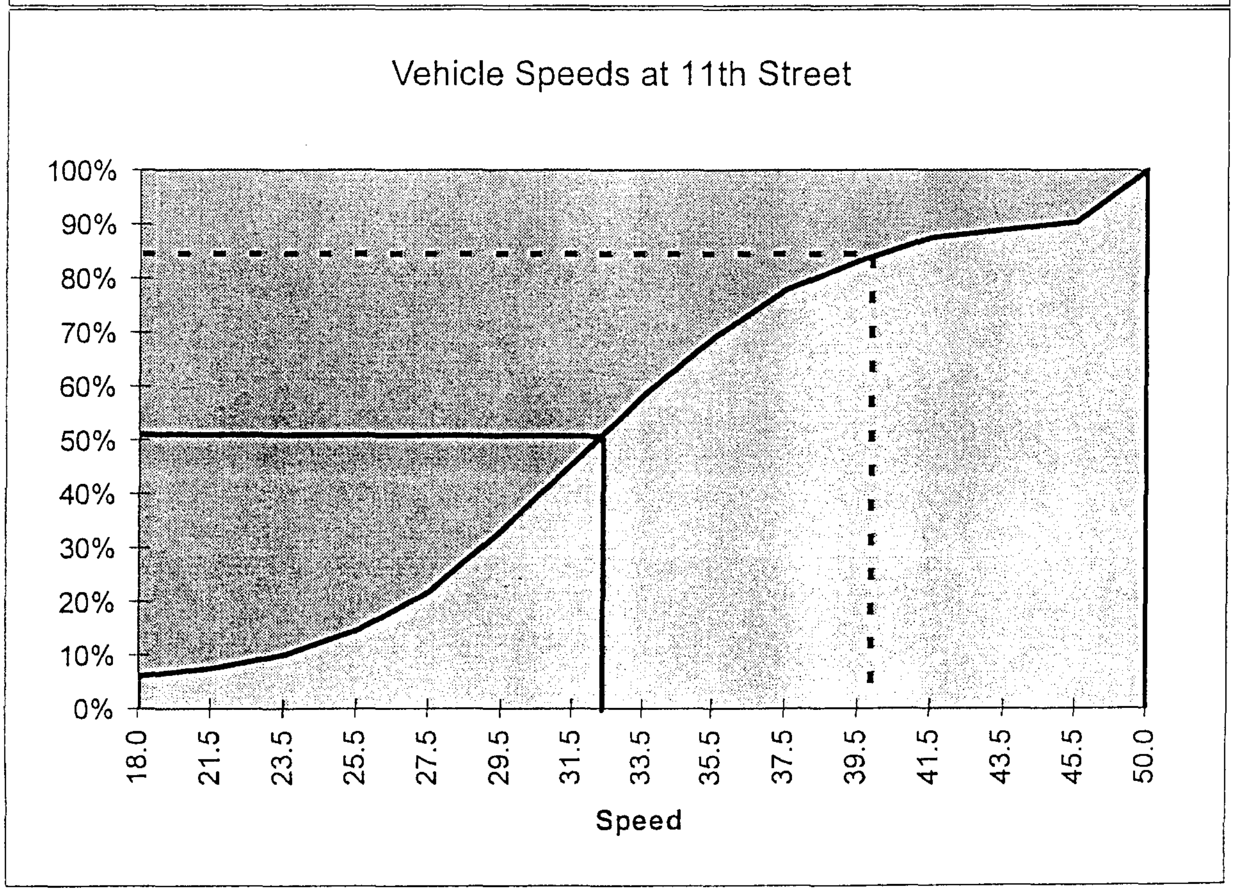


Figure 3.5 Cumulative Speed Distributions Main Street Jacksonville

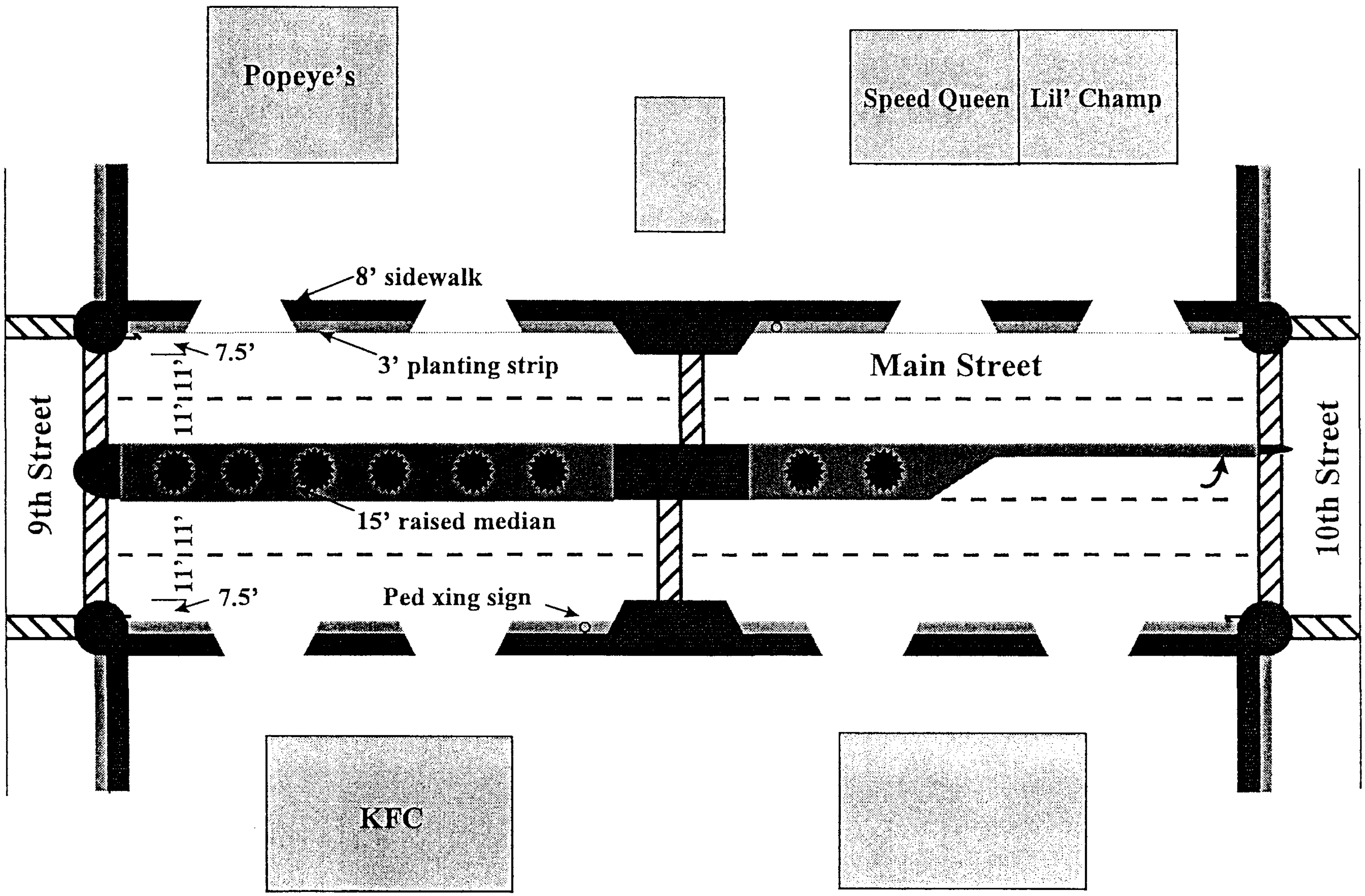


Figure 3.6 Recommended cross-section design for Main Street between 9th and 10th Streets.

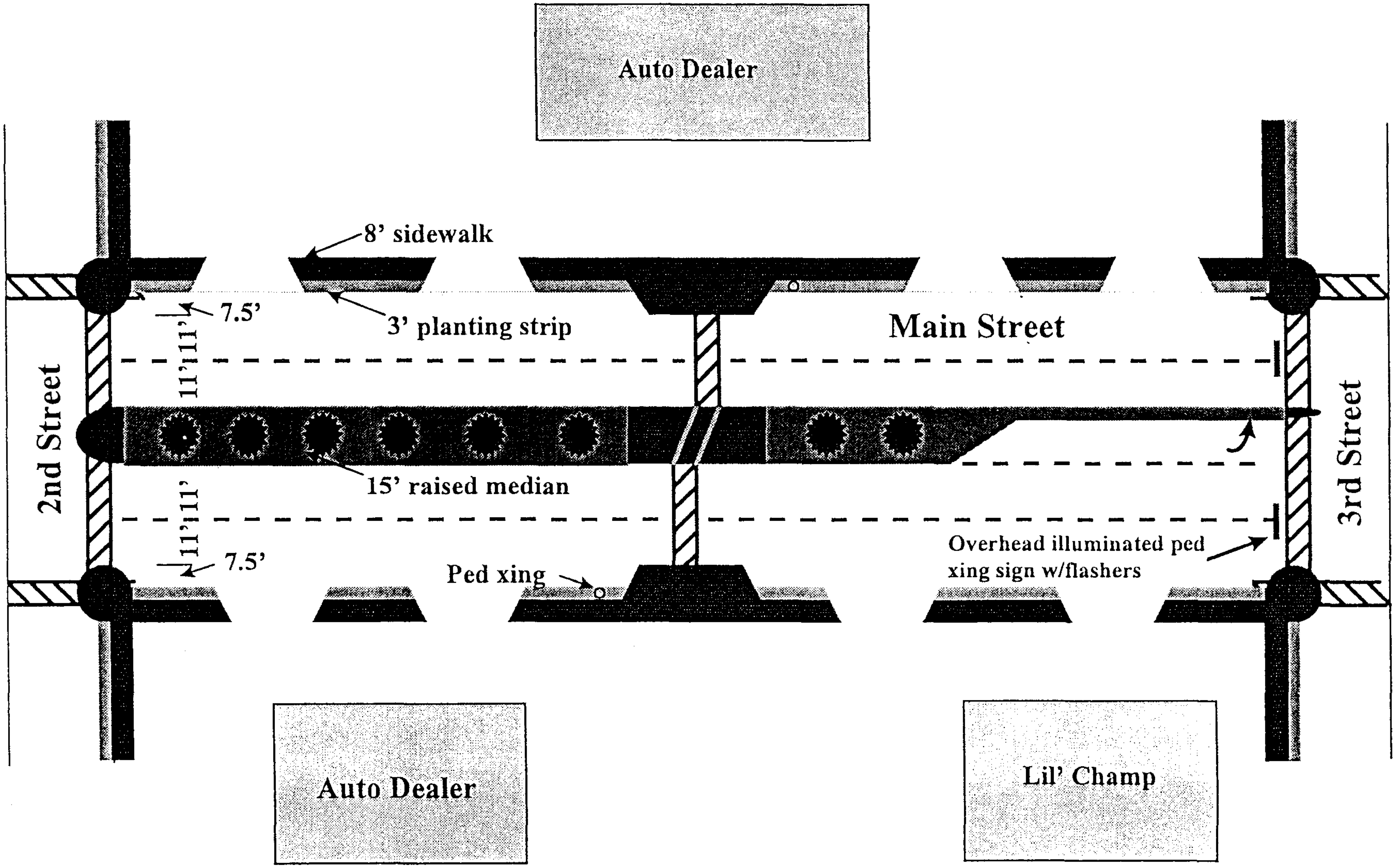


Figure 3.7 Recommended cross-section design for Main Street between 2nd and 3rd Streets.

All of these features combine to create an environment that should slow motor vehicle speeds. In turn, slower speeds result in more reaction time for motorists to respond to a pedestrian in their path and less serious injury should a collision occur. For this treatment to work, however, the narrow lanes and intersection bulbouts must be extended to either side of the area where the speed reduction is desired. Thus, it is recommended that this design be incorporated between 8th and 11th Streets. However, no midblock crosswalks are needed in the extension blocks; this feature is only required between 9th and 10th Streets.

For pedestrians, this new design will offer several advantages. The raised median and refuge islands allow them to cross one direction of traffic at a time. It is generally difficult for pedestrians to estimate the speed of traffic. This becomes a significant problem when they must combine that estimate with their own estimated travel time to cross the street. Pedestrians experiencing impairment from alcohol or for other reasons find such a task even more difficult. The crash analysis indicates that 60 percent of the pedestrian crashes occurred in the far lane of the crossing. The median and refuge islands should help resolve part of this problem.

Observational data indicate that 22 percent of pedestrians crossed at midblock locations. The addition of the midblock crosswalk is designed to channelize those pedestrians desiring to cross midblock to a central location and to alert motorists to the fact that there are pedestrians crossing in the middle of this block. This midblock crosswalk should be supplemented with strong yellow-green pedestrian crossing signs to alert motorists. These signs should also be used at the intersection crosswalk locations, particularly at 9th Street which is unsignalized.

At both the intersections and the midblock location, bulbouts have been incorporated. For the pedestrian, this design offers two advantages. First, it reduces the width of the street that must be crossed. Second, it increases their visibility by placing them more directly in the line of sight of motorists. Finally, the sidewalk has been separated from the travel and parking lanes by a planting strip. This setback makes the walking environment more comfortable for pedestrians and may also prevent a pedestrian (particularly an intoxicated pedestrian) from wandering off the sidewalk and into the street.

The other section of Main Street where it is recommended that the cross section be changed is between 2nd and 3rd Streets. The design is similar to that described above and is shown in figure 3.7. Recalling from the crash analysis and the pedestrian observation data that the primary problem here was at the unsignalized 3rd Street crossing, it is also recommended that overhead illuminated pedestrian crossing signs be installed to increase driver awareness that pedestrians may be crossing here. The low-end approach would be to install overhead signs that would constantly be illuminated. The problem with this type of installation is that motorists become unresponsive to the unchanging sign and it will lose its effectiveness. A high-end approach would be to supplement the illuminated sign with flashing amber lights, which would be illuminated only when a pedestrian was present at the crossing. The lights could be activated by push buttons or infrared detectors. The latter is recommended to maximize the effectiveness of the treatment. Finally, in order to obtain the desired effect within the 2nd and 3rd Street block, the cross-section geometric design should be extended from 1st Street to 4th Street.

One other recommendation that should be considered as part of any reconstruction effort is an improvement in lighting. The street lighting itself appears to be more than adequate. However, this lighting is intended to do just what the name implies, i.e., light the street. Supplemental lighting should be provided to light the sidewalk areas where pedestrians walk and stand. Such backlighting will increase the visibility of pedestrians to motorists at night; it can be attached to the same standards as the street lighting.

In summary,

Vehicle speeds along Main Street are too high. The posted speed limit is 30 mph. During a recent 24 hour period, about 70% of all vehicles were traveling above the speed limit, 19% were traveling more than 10 mph above the limit, and 11% were at least 15 mph above the speed limit.

Suggestions to reduce vehicle speeds:

- Install traffic calming treatments, including bulbouts, raised median, and pedestrian refuge islands from 1st to 4th and 8th to 11th streets.
- Implement well-publicized, continuing speed enforcement from the 1st - 4th and 8th - 11th St. areas. This enforcement effort may have the secondary effect of reducing traffic volume as well.

  Publicity about this effort should emphasize that there is heavy pedestrian traffic and that too many drivers are placing pedestrians (and their own emotional well-being) at risk by speeding. This program might begin with placement of speed trailers along Main St. for a week or two, followed by enforcement actions. **There will need to be a continuing speed enforcement effort in the area to sustain reductions in speed.** Time and location of enforcement should be varied and non-systematic.

- Install textured sections of roadway between 1st to 4th and 8th to 11th. Install raised Pedestrian crosswalks.

There is little to assist pedestrians in safely crossing Main Street at 3rd, 9th, or 10th. There is no traffic control signal at 2nd, 3rd or 9th. The signal at 10th provides inadequate time for pedestrians to cross. At least one pedestrian crossing signal at 10th street is not working. Pedestrians were frequently observed to cross Main St. at uncontrolled intersections and mid-block. They routinely had to negotiate with vehicles, stopping in the roadway during a trip across. At both these locations the road is a very wide stretch (~ 60 feet) for a pedestrian to cross with the traffic volume found on Main St. (11,000 - 13,000 vehicles per day).

Suggestions to reduce pedestrian exposure to traffic:

- Install raised median with mid-block pedestrian crossing, running from 1st to 4th and 8th to 11th Streets.
- Install bulbouts at intersections of Main with 2nd, 3rd, 8th, 9th & 10th Streets.
- Ensure that all pedestrian crossing signals work, and increase crossing time to be adequate for slow moving pedestrians. Infrared detectors to activate pedestrian crossing signals may be useful in these areas. Buttons to activate crossing signals that provide immediate feedback to the pedestrian should also be considered.
- Move bus stop locations from near- to far-side of intersections, to reduce potential pedestrian conflicts with vehicular traffic.

Pedestrians crossing Main St. at night are difficult for drivers to see. In this area, the large majority of pedestrians observed at night were wearing dark colored clothing. Lighting does not appear to be adequate for drivers to easily see pedestrians in this area even though the roadway appears to be well-lighted.

Suggestions to improve pedestrian visibility:

- Improve lighting of pedestrian areas (sidewalks) from 1st to 4th St., and 8th to 11th St.
- Install strong yellow/green pedestrian crossing signs to alert drivers to the presence of heavy pedestrian traffic in the area. (Note that done alone, this is unlikely to have any beneficial effect.)

Pedestrians in this area do not routinely cross at marked intersections or in conjunction with traffic controls. A number of 'confrontations' between vehicles and pedestrians were observed that are risky for pedestrians. Both drivers and pedestrians are known to misjudge both the likely actions and the maneuvering capabilities of one another.

Suggestions to improve pedestrian responsibility:

- Community policing educational effort (in combination with fixing crosswalk signals) to encourage the use of designated crosswalks — not enforcement actions against pedestrians
- Community-based public information campaign directed at residents regarding (1) risks of crossing street away from traffic signals/crosswalks (combined with making sure signals work) and (2) risks of walking when impaired (by alcohol, drugs, mental problems, age).

Baseline Data

The final task of the present project was to design a plan to evaluate the effect of interventions that might be implemented in the two areas studied. Although it is not known which of several possible actions may be taken, those will be directed, in some manner, at altering driver or pedestrian behavior, or both. Accordingly, we designed a data collection procedure to obtain pertinent information about driver speed and a variety of pedestrian behaviors that might be altered by the intervention(s). Baseline data were then collected. Below we present a brief summary of the information obtained. In addition, a copy of the raw data file is included with this report to the Florida Department of Transportation.

Pedestrian Behavior

Baseline data were collected in mid-September. A data collection form was designed to allow efficient collection of data on pedestrian age, sex, color of clothing, and path taken in crossing the street. Data collectors were acquainted with the observation protocol during a four-hour training session.

Table 3.1 Characteristics of Pedestrians Observed

Age (N = 491)	**Percent**
16-25	41
26-35	32
36-45	14
46+	13
Sex (N = 609)	
Male	70
Female	30
Clothing (N = 627)	
Dark	45
Light	55
Looked Before Crossing (N = 590)	
Yes	85
No	15
Crossing Speed (N = 625)	
Run	9
Walk	68
Slow	7
Run-Walk	16

Observations of pedestrian behavior were conducted by teams of two data collectors between noon Thursday and late afternoon on Sunday, September 14-16, 1996. Each location was observed for an equal period of time, covering both weekdays and weekends. Crash data indicated that pedestrian crashes between midnight and noon are rare, hence observational data were not collected during those hours. A total of 629 pedestrian crossings were observed. The data were coded and entered into a computer file for analysis.

Basic distributions for all data recorded are provided in Tables 3.1 through 3.6. Table 3.1 shows characteristics of the pedestrians observed and their crossing behaviors. Three quarters were under age 35, they were largely males, and slightly more than half wore light rather than dark clothing. Most looked both ways before crossing, and the large majority walked all the way across rather than running all or part of the way. A small percentage were observed to walk especially slowly. This is typically a person with children, an elderly person, or someone who is physically impaired in some way.

Table 3.2 Traffic Density at Time of Observed Pedestrian Crossing

Traffic Density (N = 622)	**Percent**
Light	65
Moderate	27
Heavy	8

Table 3.2 indicates that most crossings took place when traffic was relatively light. Even though traffic on Main street is fairly heavy, it is to be expected that most crossings would take place when there is a safe opportunity, i.e., when traffic is light.

Table 3.3 Pedestrian Crossing Type

Crossing Type (N = 629)	**Percent**
Direct, At Intersection	52
Two Street	11
Diagonal Intersection	5
Midblock Direction	10
Midblock Diagonal	15
Minor Street Only	6
Other	1

Table 3.3 shows the distribution of crossing types. A diagram of the type of crossings coded is provided in figure 3.8. One quarter of crossings occurred midblock, and 5% were particularly risky diagonal crossings through intersections. Half of all crossings were at intersections, but it is important to remember that only one of three intersections observed had any kind of traffic control device. Moreover, as Table 3.4 shows, fewer than half of pedestrians who crossed at the signalized intersection pushed the button for the pedestrian signal when confronted with a no walk signal.

Pedestrian Crossing Behavior Categories

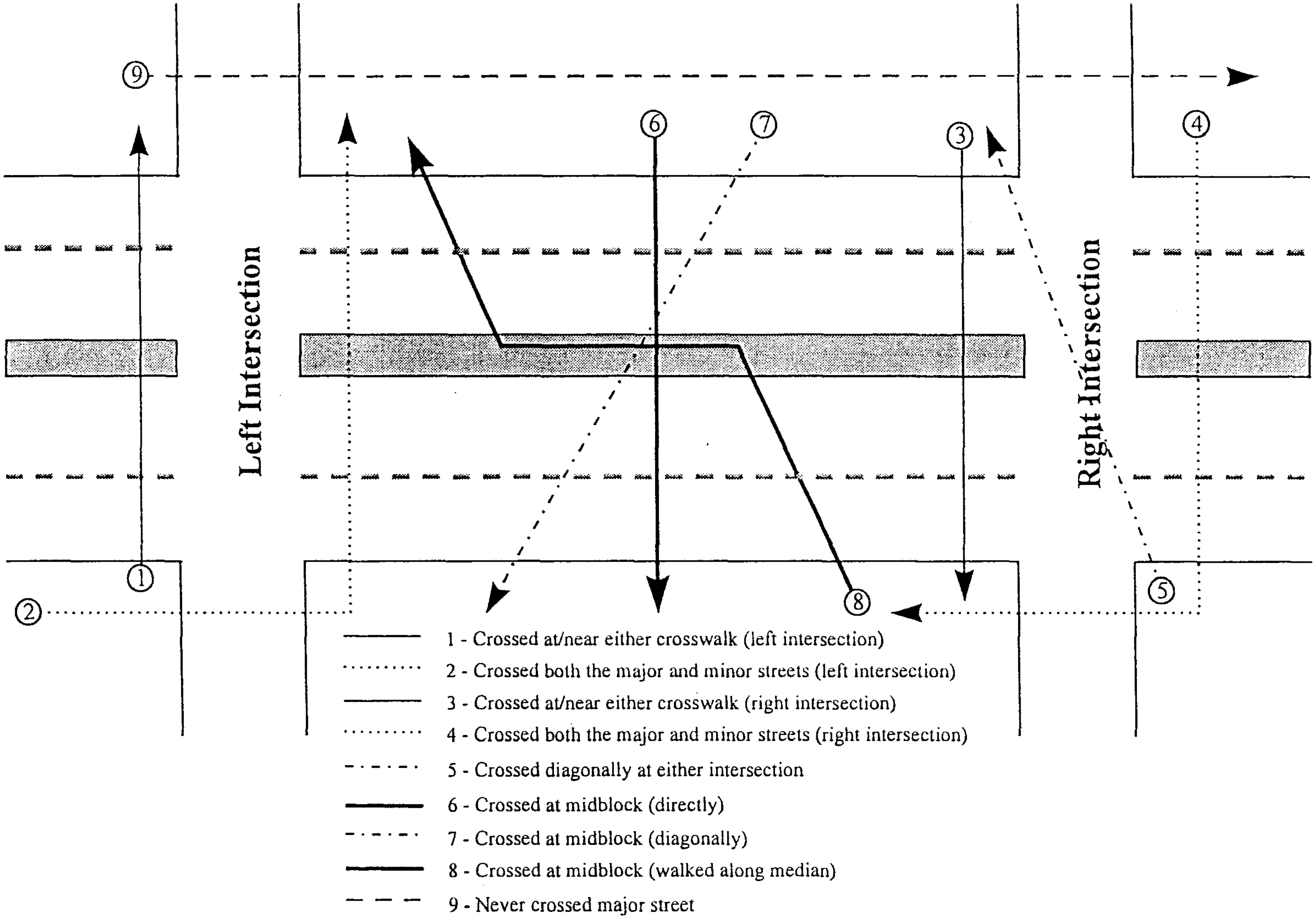


Figure 3.8

Table 3.4 Percent of Pedestrians Crossing at 11th Street Who Pressed Button for Pedestrian Walk Signal

Pushed Button (N = 151)	**Percent**
Yes	41
No	59

Table 3.5 Pedestrian Crossing Type by Site

Crossing Type	**Site**		
	2nd & 3rd (%)	9th & 10th (%)	Row Total (%)
Direct, At Intersection	56	48	52
Two Street	12	10	11
Diagonal Intersection	8	2	5
Midblock Direction	7	12	10
Midblock Diagonal	11	19	15
Minor Street Only	5	6	6
Other	1	2	1
Total N	315	313	628

Table 3.5 shows the differences in crossing patterns at the two locations observed. Between 2nd and 3rd streets, most crossings occurred near 3rd street. The land use in this area is such that pedestrians traffic would infrequently have the need to cross midblock.

Table 3.6 Pedestrian Clothing by Time of Day

Clothing	**Time of Day**		
	Day/Evening (%)	Night (after 8) (%)	Row Total (%)
Dark	40	53	45
Light	60	47	55
Total N	406	221	627

Table 3.6 illustrates an interesting phenomenon. Although one would normally expect that light clothing would be worn at night to enhance visibility, the reverse appears to be the case. We can only speculate why that might be. It may be that light clothing is more often worn during the daytime to reflect heat. It might also be that being 'street smart' in some neighborhoods involves decreasing rather than enhancing visibility.

Driver Behavior

The primary observable driver behavior associated with pedestrian crashes is speed. Baseline volume and speed counts were collected using pneumatic pressure tubes installed across traffic lanes. These data were obtained for continuous 24-hour time periods. Data were collected in mid-June in the vicinity of the identified trouble spots along Main Street in Jacksonville, near the 6th and 11th street intersections. These data are summarized above in figure 3.5 and are included in a separate data file with this report.

4. Orlando

Character of Problem Area

As is commonly the case with concentrations of pedestrian fatalities, the area around the South Orange Blossom Trail (OBT) is economically depressed. As new areas of the county have developed, business establishments along the OBT have been abandoned. Currently there are a number of convenience stores, gas stations, auto parts stores, used car dealerships, nightclubs and aging motels along the OBT between I-4 and Colonial Drive. These businesses are not characteristic of a typical residential area.

The heavy non-local traffic on Orange Blossom Trail, combined with the residential character of the neighborhood results in a dangerous mix. There is, of necessity, heavy pedestrian traffic along OBT as residents travel to businesses in the area. Thus, in addition to the many thousand daily vehicle trips on OBT there are also hundreds of pedestrian trips across OBT every day, resulting in a large number of potential conflicts.

Pedestrian Crash Data

The crash data used in this analysis include all reported pedestrian crashes occurring on Orange Blossom Trail from 1990 through 1994. The physical boundaries of the analysis area are between the intersections of OBT/Colonial Drive and OBT/30th Street. All 50 crashes occurring between these intersections were plotted (see figure 4.1) to search for specific concentrations of alcohol-involved pedestrian crashes as well as pedestrian crashes in general. The primary area that warranted further analysis was between 17th Street and 24th Street. Almost half of all crashes (24 out of 50) occurred in this 7-block area. Moreover, nearly all of the crashes during 1993 and 1994 occurred in this area. The pedestrians involved ranged in age from 17 to 55. The majority of the victims were also male (83 percent) and white (67 percent). Other characteristics associated with these incidents are described below are :

- One-third (8 out of 24) of the crashes involved a pedestrian who was intoxicated or had been drinking, with the largest concentration of alcohol-involved crashes occurring between 18th Street and 20th Street.
- One-third of the crashes resulted in a serious injury. Again, the majority of these serious injury crashes occurred between 18th Street and 20th Street.
- One-half of the 24 crashes occurred at night, and 7 of the 8 serious-injury crashes occurred at night. The heaviest concentration of nighttime crashes was at or near Kaley Street where 5 of the 12 nighttime crashes occurred.
- Examining the location of the crashes revealed that 14 of the 24 crashes occurred in the second half of the crossing. In other words, the pedestrian safely crossed one-half of the street avoiding vehicles traveling in one direction, but was then struck in the second-half of the crossing by a vehicle traveling in the opposite direction. In 9 of these 14 crashes, the collision occurred in the far (last) lane of the crossing.

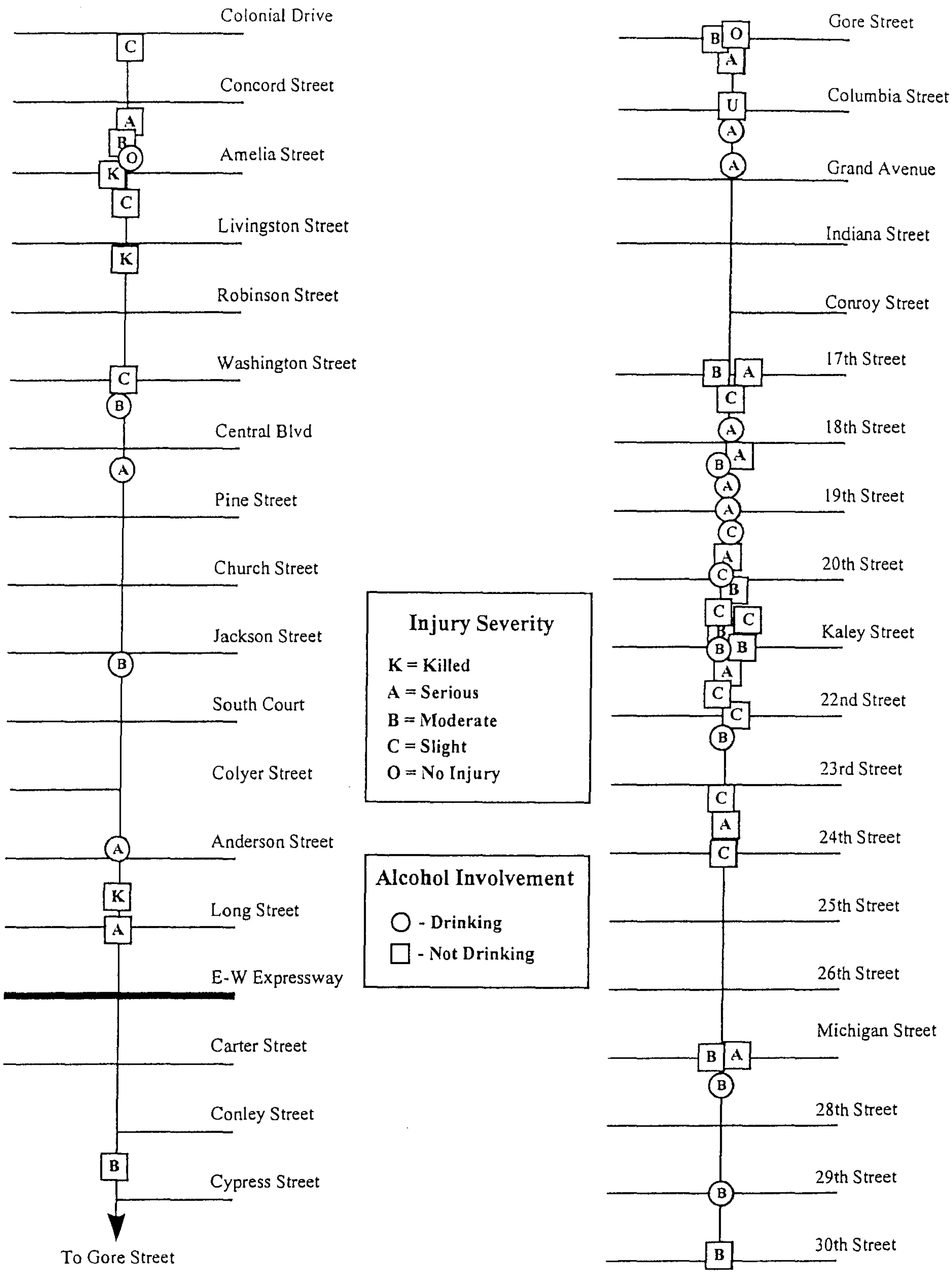


Figure 4.1 Location and severity of pedestrian crashes on Orange Blossom Trail (1990 - 1994).

- One third of the crashes occurred in the midblock area (at distances of 50 ft or more from the intersection proper). Three of these eight crashes were in the vicinity of Kaley Street.

Figure 4.2 presents the collision diagram for the block between Kaley and 22nd Streets, which had the greatest concentration of crashes.

Pedestrian Behavior Analysis

From the crash analysis, the 7-block section of Orange Blossom Trail between 17th Street and 24th Street was identified for a potential improvement project to reduce pedestrian crashes. Almost half of the crashes in the study area occurred in this relatively short segment with one-third of those crashes resulting in serious injury and one-third involving a pedestrian who had been drinking or was intoxicated. Although the accident data provide information related to the location of the problem, they do not provide information about pedestrian behavior in this area. Thus, as a next step, preliminary observational data were collected along this segment of roadway to characterize pedestrian behavior and better understand the safety risks. A summary of the results is provided below.

Preliminary observational data were collected during the early evening hours for three different blocks within the identified segment. The locations, dates, and times when the data were collected are as follows:

19th - 20th Streets

Friday, August 9, 1996 .... 5:10 - 6:40 PM
Saturday, August 10, 1996 .... 8:50 - 9:20 PM

20th - Kaley Streets

Friday, August 9, 1996 .... 9:15 - 11:15 PM
Saturday, August 10, 1996 .... 9:50 - 11:00 PM

Kaley - 22nd Streets

Friday, August 9, 1996 .... 6:50 - 8:40 PM
Saturday, August 10, 1996 .... 6:10 - 7:30 PM

Altogether, pedestrian behavior data were collected for more than seven hours. For each pedestrian who crossed a street the following were recorded: the path taken, conflicts with motor vehicles (defined as occurring if one or both parties had to change speed and/or direction), whether they stopped in the road or maneuvered through traffic, and whether they were obviously intoxicated. This information was plotted for each of the time periods shown above; as an example, the data from one of the time periods for one block is shown in figure 4.3.

For the entire three blocks, the behavioral data can be summarized as follows. There were a total of 111 crossings during the seven hours of observation. A large proportion of these was generated by two locations (23 percent were to/from the Popular Plaza convenience store and 20 percent to/from the Texaco Food Mart).

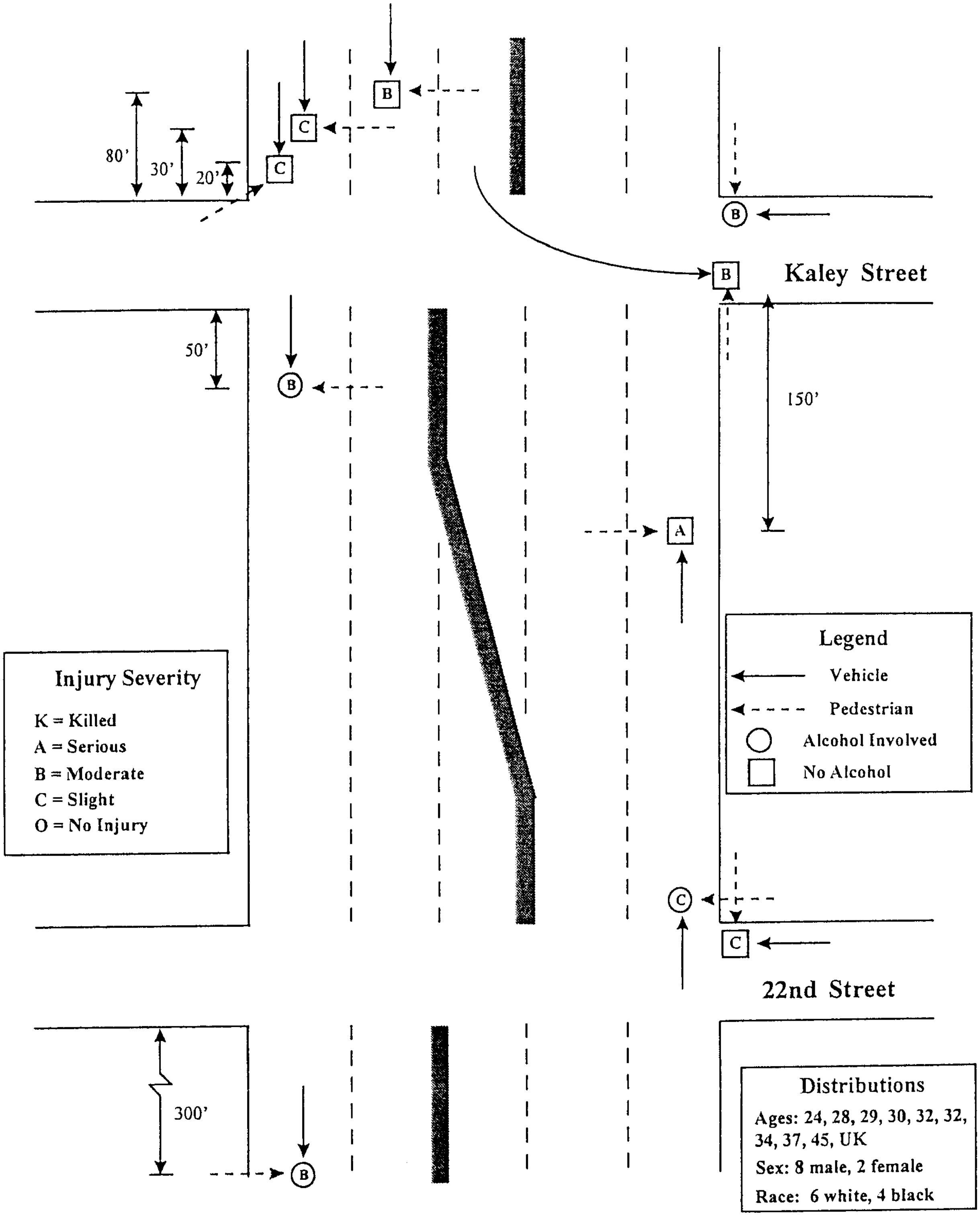


Figure 4.2 Collision diagram for all Orange Blossom Trail pedestrian crashes between Kaley and 22nd Streets.

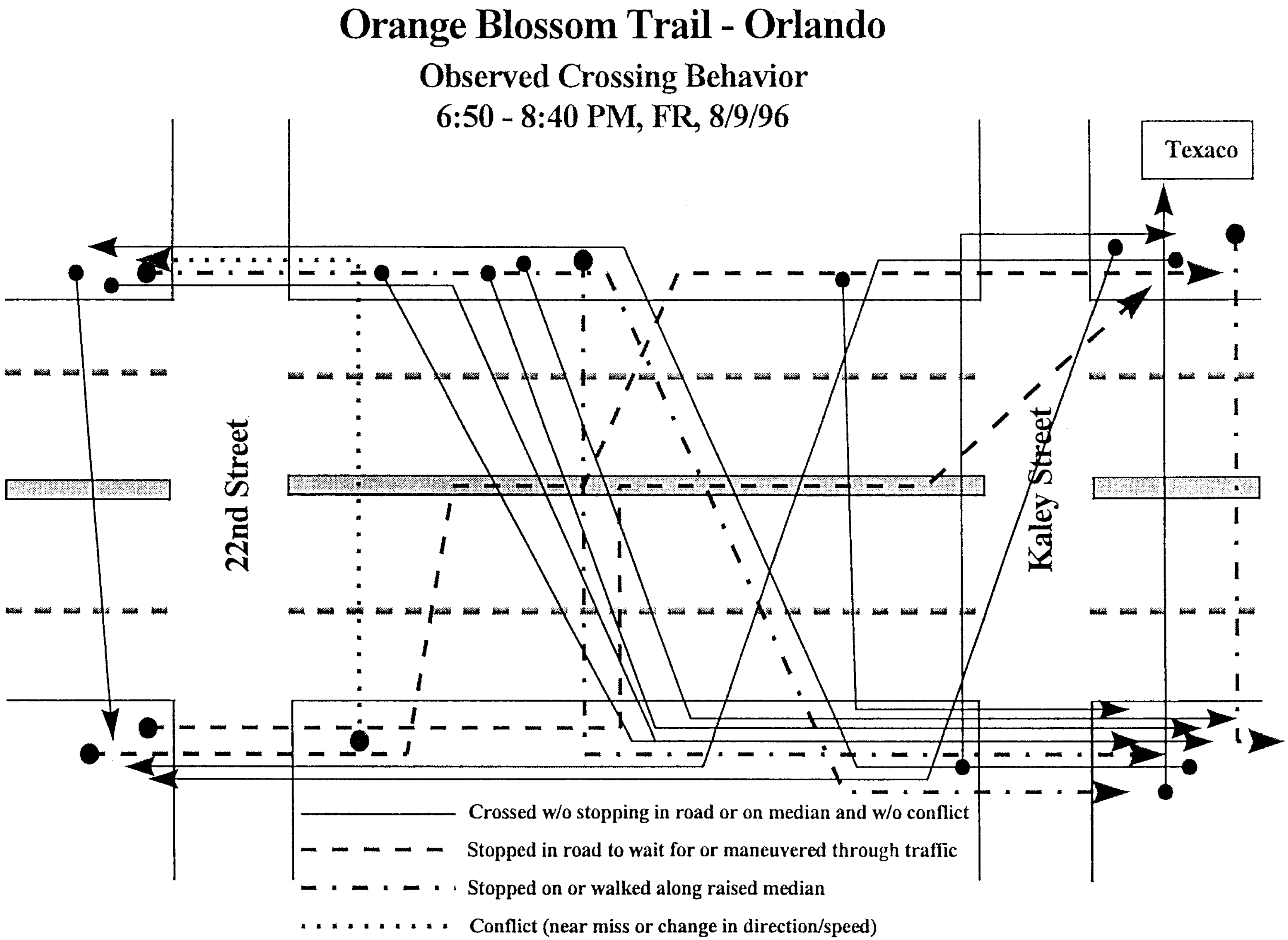

Orange Blossom Trail - Orlando
Observed Crossing Behavior
6:50 - 8:40 PM, FR, 8/9/96
Texaco
22nd Street
Kaley Street
Crossed w/o stopping in road or on median and w/o conflict
Stopped in road to wait for or maneuvered through traffic
Stopped on or walked along raised median
Conflict (near miss or change in direction/speed)

Figure 4.3

Sixty percent of the crossings were midblock (more than 50 ft from either intersection), and 41 percent of the crossings resulted in the pedestrian using the channelizing median to wait for traffic to pass. Finally, 14 percent of the crossings were considered to be high-risk crossings, defined as those crossings where there was a pedestrian/vehicle conflict or the pedestrian stopped in the road (as opposed to stopping on the median) or maneuvered through traffic.

Speed Data Analysis

As part of the evaluation efforts, speed data were also collected over 24 hour time periods at 15th Street, at 19th Street, and at 22nd Street – both Northbound and Southbound.[2] The cumulative distributions, along with median and 85th percentile speeds, are shown in figures 4.4 through 4.6, respectively. The average speed at each location is around 30 mph, with slightly higher speeds in the Southbound direction. The 85th percentile speeds are approximately 35 mph, again slightly higher southbound.

Recommendations

Since 1990, the bulk of pedestrian crashes on the Orange Blossom Trail between Interstate 4 and Colonial Drive have occurred in the 5 block stretch from 17th to 22nd Streets. Of the 50 crashes reported between 1990 and 1994, twelve occurred in this three block stretch from 19th to 22nd. Moreover, in the most recent two years for which data were available — 1993 & 1994 — pedestrian crashes were even more heavily concentrated in this short segment of the OBT. There are several businesses that attract pedestrian traffic to this area from the surrounding community. Several convenience stores are clustered here. In addition this section of the OBT is not well-lighted at night on the west side, which may facilitate congregating of pedestrians after dark.

It may be possible to address the problem here, as in Jacksonville, with spot treatments focusing only on this short section of roadway. However, it is important to recognize that another problem cluster can, and probably will, emerge as new businesses that attract pedestrian traffic locate along the OBT. This corridor is currently undergoing revitalization. A number of new businesses have opened in the past few years along the OBT between I-4 and Colonial Drive. Examining pedestrian crashes across time suggests that the location of the problem has moved since the early 1990s when more crashes occurred further north than has been the case in more recent years. It is likely that this reflects the changing character of the area as it affects pedestrian traffic.

Based on a survey of characteristics of the OBT– especially those segments with high pedestrian crash concentrations– and the surrounding neighborhood, the initial observations of pedestrian behavior, measurements of vehicle volumes and speeds, and discussions with local officials, a series of recommended interventions was developed. These recommendations were discussed with members of the Orange County Community Traffic Safety Program in early September and are presented below.

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2 We wish to express our appreciation to Steve Wilmarth and Chen Sheng Yang for obtaining these data.

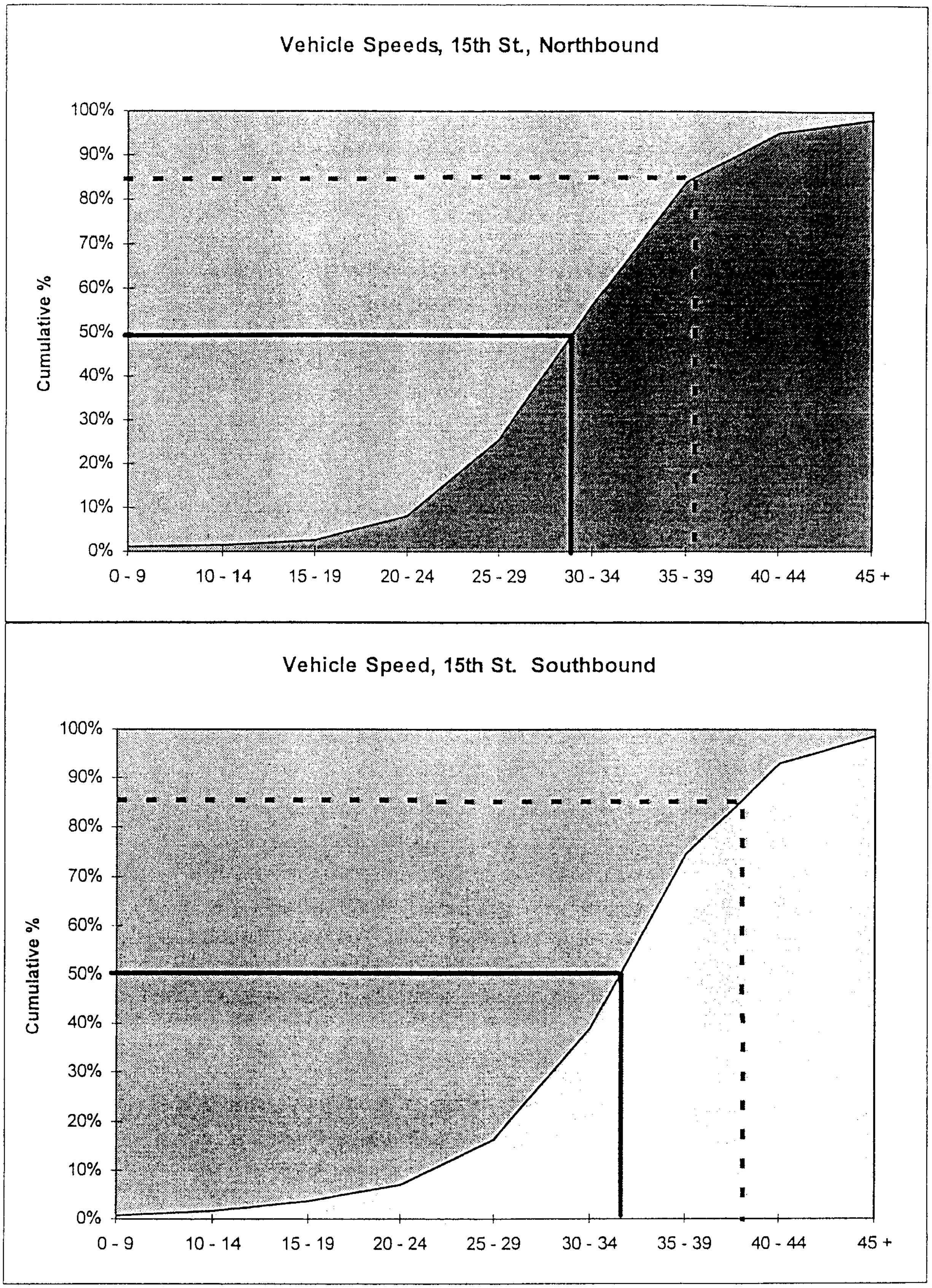

Figure 4.4 Cumulative Speeds at 15th Street

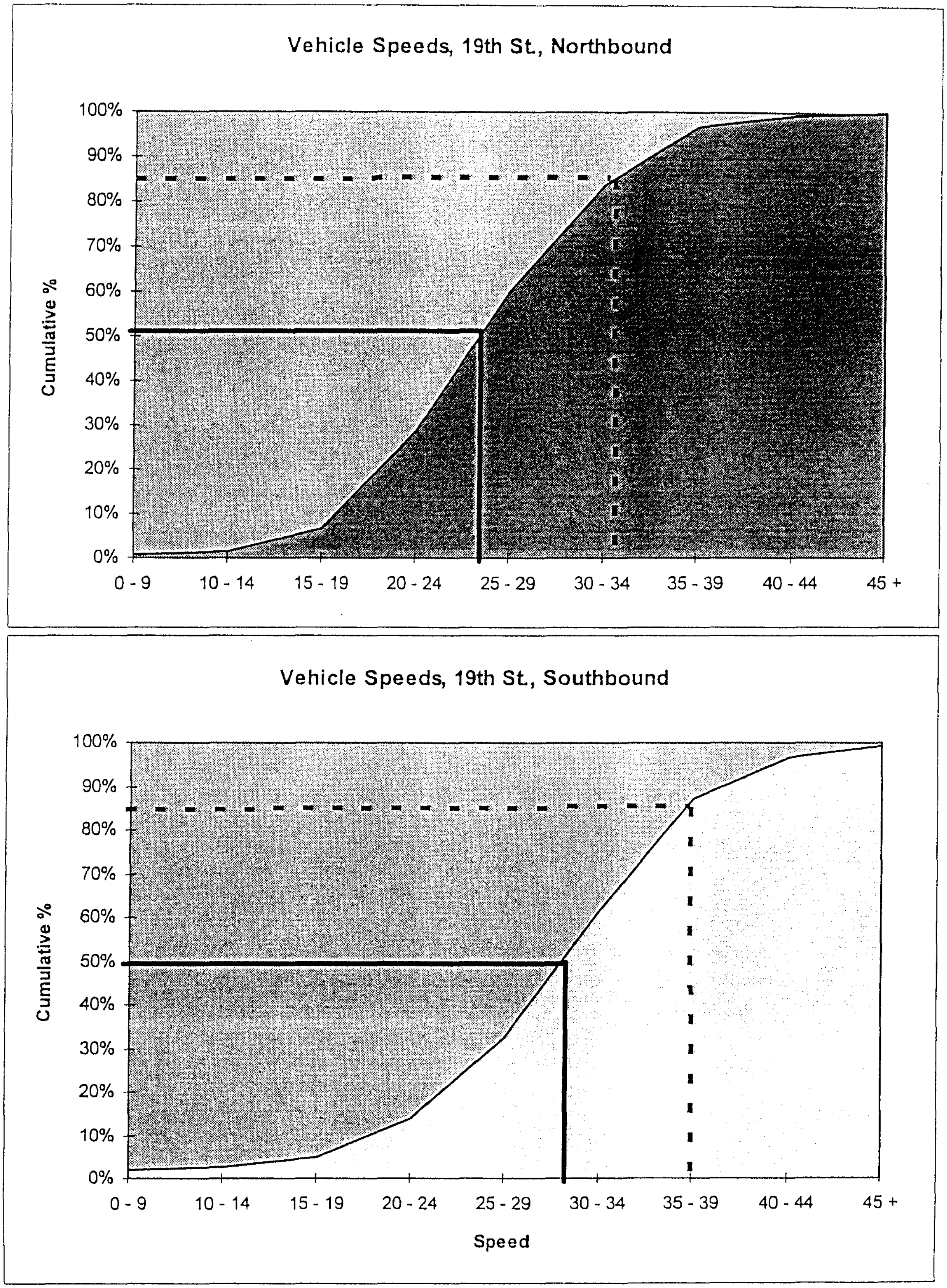

Figure 4.5 Cumulative Speeds at 19th Street

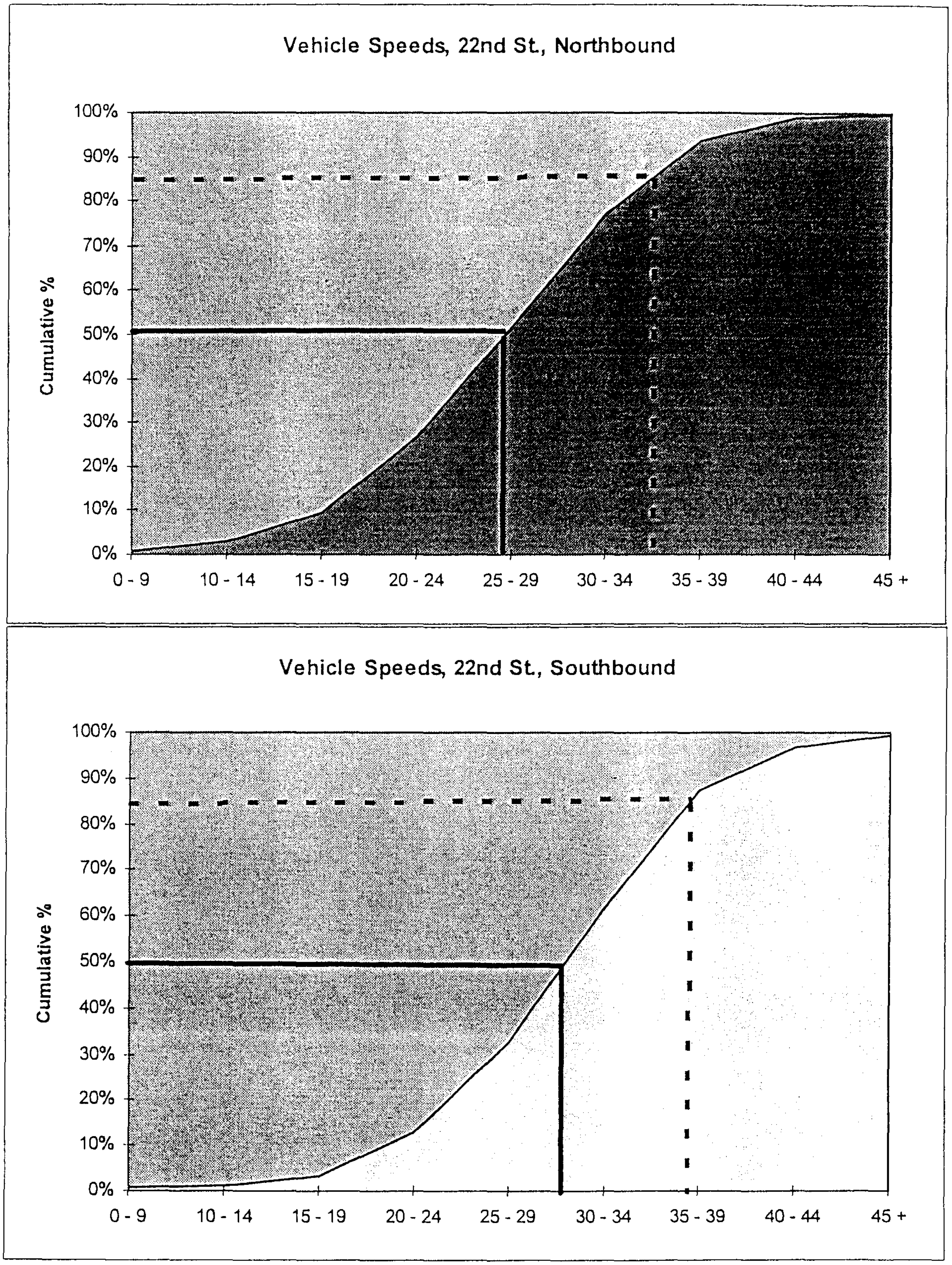

Figure 4.6 Cumulative Speeds at 22nd Street

It is recommended that the cross-section of the street be changed to incorporate a number of traffic-calming and pedestrian-friendly features. The seven-block segment between 17th and 24th Streets is the area of Orange Blossom Trail where significant changes are recommended. An illustration of the recommended design for one of the blocks is shown in figure 4.7. This design incorporates a number of features that will help reduce the identified safety and risk-behavior problems within the existing right-of-way.

The right-of-way in this seven-block segment ranges from 80 feet to 100 feet; the recommended cross section is 80 ft. First, the lanes have been narrowed to 11 feet and a 14 foot-wide raised median has been installed along with bulbouts at the intersections. All of these features combined create an environment that should slow motor vehicle speeds; slower speeds result in more reaction time for motorists to respond to a pedestrian in their path. For this reconfiguration to work, however, the narrow lanes and intersection bulbouts must be extended to either side of the area where the speed reduction effects are desired. Thus, it is recommended that this design be incorporated between 16th and 25th Streets.

For pedestrians, this new design offers several advantages. The raised median and refuge islands allow them to cross one direction of traffic at a time. It is generally difficult for pedestrians to estimate the speed of traffic. This becomes a significant problem when they must combine that estimate with their own estimated travel time to cross the street. The crash analysis indicates that 58 percent of the pedestrian crashes occurred in the second half of the crossing and 38 percent of the crashes occurred in the far lane of the crossing. The median and refuge islands should help resolve part of this problem.

The observational data indicate that 60 percent of pedestrians crossed at midblock locations. Nonetheless, at present, the addition of midblock crosswalks is not specifically recommended along Orange Blossom Trail because there was not a single concentration of midblock crossings. However, more intensive observations may reveal that such a crossing is desired. If so, the crossing should be designed to channelize those pedestrians desiring to cross midblock to a central location and to alert motorists to the fact that there are pedestrians crossing in the middle of this block. This midblock crosswalk should be supplemented with the strong yellow-green pedestrian crossing signs to alert motorists. For more information on the specifics of the design, refer to figure 3.6 in the previous chapter.

At the intersections, bulbouts have been incorporated. For the pedestrian, this design offers two advantages. First, it reduces the width of the street that must be crossed. Second, it increases their visibility by placing them more directly in the line of sight of motorists.

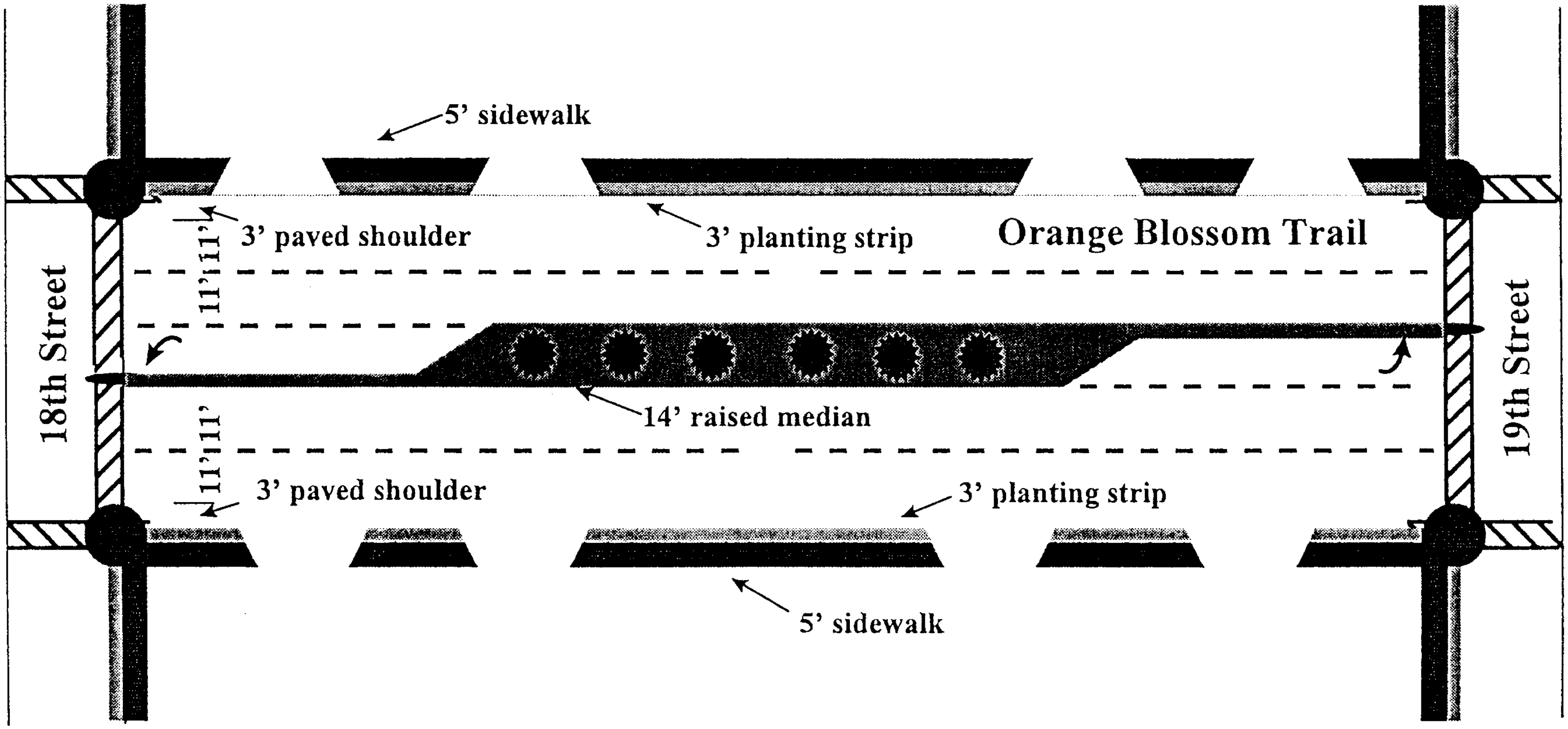

Figure 4.7 Recommended cross-section design for Orange Blossom Trail between 18th and 19th Streets.

Finally, the sidewalk has been separated from the travel and parking lanes by a planting strip. This setback makes the walking environment more comfortable for pedestrians and may also prevent a pedestrian (particularly an intoxicated pedestrian) from wandering off the sidewalk and into the street.

One other recommendation that should be considered as part of any reconstruction effort is an improvement in lighting. The street lighting itself appeared to be more than adequate. However, this lighting is intended to do just what the name implies – light the street. Supplemental lighting should be provided to light the sidewalk areas where pedestrians walk and stand. Such backlighting can be attached to the same standards as the street lighting and will increase the visibility of pedestrians to motorists at night.

More specifically, the **recommendations** are as follows:

Vehicle speeds along the Orange Blossom Trail between 15th and 22nd Streets are generally well within the posted speed limit of 40 mph. During a 24 hour period in September, about 80% of all vehicles were traveling at or below the speed limit. Eighty-fifth percentile speeds were also consistently below the posted speed limit, ranging from about 33 mph for northbound traffic at 19th Street to almost 40 mph for southbound traffic at 15th Street.

- Speeds are consistently a few miles per hour higher in the southbound lanes than for vehicles traveling north. During the early morning hours (from about 4 am to 9 am), southbound speeds are most likely to exceed those of northbound traffic. This is consistent with the fact that a slightly greater proportion of pedestrian crashes occurred in the southbound lanes of OBT (44% vs. 38%). Although generally within the posted speed limit, these speeds are incompatible with heavy pedestrian traffic. In the interest of pedestrian safety these should be reduced.

Suggestions to reduce vehicle speeds:

- Install traffic calming treatments, including bulbouts, raised median, and pedestrian refuge islands from 16th to 25th streets.

There is little to assist pedestrians in safely crossing the OBT in the area from 19th to 22nd Streets where pedestrian traffic tends to be fairly heavy. There is a traffic control signal at Kaley St. (between 20th and 22nd). Several businesses at this corner attract pedestrians, and the greatest concentration of pedestrian crashes occurred at the intersection of Kaley and OBT. The pedestrian crossing signal at this corner appears to work, and to respond relatively quickly to activation.[3] Nonetheless, virtually no pedestrians observed crossing the OBT at this intersection attempted to activate the pedestrian crossing signal by pushing the button mounted on the standards. Moreover, the large majority (93%) of pedestrian crossings between 19th and 22nd occurred away from this intersection.

Pedestrians were routinely observed to negotiate with vehicles while crossing, stopping in the roadway during a trip across. The OBT is a wide stretch of roadway for

[3] The pedestrian signal is obscured from view by a utility pole for those crossing Kaley southbound on the west side of OBT.

a pedestrian to cross with the traffic volume found here (20,000 - 33,000 vehicles per day). Although there is a narrow median that pedestrians might use as a temporary refuge, it is not nearly wide enough to provide any genuine protection or separation from traffic.

Suggestions to reduce pedestrian exposure to traffic:

- Install raised median with mid-block pedestrian crossing, running from the 16th to 25th Street intersections.
- Install bulbouts at each intersection from 16th to 25th.
- Ensure that all pedestrian crossing signals work, and that crossing time is adequate for slow moving pedestrians
- Infrared detectors to activate pedestrian crossing signals may be useful in these areas. Buttons to activate crossing signals that provide immediate feedback to the pedestrian should also be considered.
- Move bus stop locations from near- to far-side of intersections to reduce potential pedestrian-motor vehicle conflicts.

Pedestrians crossing or walking along the OBT at night are difficult for drivers to see. Lighting does not appear to be adequate for drivers to easily see pedestrians in this area. Complicating this is the fact that, in this area, a substantial proportion of pedestrians observed at night were wearing dark colored clothing. Lighting of the street itself appears to be more than adequate. However, supplemental lighting for the sidewalk areas where pedestrians typically walk and stand would greatly increase their visibility to motorists at night.

Suggestions to improve pedestrian visibility:

- Improve roadside lighting , especially along those stretches of the roadway where lighting currently exists only on one side.
- Install strong yellow/green pedestrian crossing signs to alert drivers to the presence of heavy pedestrian traffic in the area. (Note that done alone, this is unlikely to have any beneficial effect.)

Pedestrians in this area do not routinely cross at marked intersections or in conjunction with traffic controls. Both drivers and pedestrians are known to misjudge both the likely actions and the maneuvering capabilities of one another. Consequently these are very high risk crossings.

- Traffic calming and enlarged medians will provide some measure of safety for pedestrians without inconveniencing motorists by the installation of additional traffic control signals.

Baseline Data

The final task of the present project was to design a plan to evaluate the effect of interventions that might be implemented in the two areas studied. Although it is not known which of several possible actions may be taken, those will be directed, in some manner, at altering driver or pedestrian behavior, or both. Accordingly, we designed a data collection procedure to obtain pertinent information about driver speed and a variety of pedestrian behaviors that might be altered by the intervention(s). Below we present a brief summary of the information obtained.

Pedestrian Behavior

Baseline data were collected in mid-September. A data collection form was designed to allow efficient collection of data on pedestrian age, sex, color of clothing, and path taken in crossing the street. Data collectors were acquainted with the protocol during a four hour training session. Data were collected on both week nights and weekend nights.

Baseline data on pedestrian behavior were collected by teams of two data collectors between noon Thursday and late afternoon on Sunday, September 14-16, 1996. Each location was observed for an equal amount of time covering both weekday and weekend periods. Crash data indicated that pedestrian crashes between midnight and noon are rare, hence observational data were not collected during those hours. A total of 767 pedestrian crossings were observed. The data were coded and entered into a computer file for analysis.

Basic distributions for all data recorded are provided in Tables 4.1 through 4.4. Table 4.1 shows characteristics of the pedestrians observed and their crossing behaviors. Two-thirds were under age 35 and they were largely male; half wore dark clothing both at night and during the daylight hours.

Table 4.1 Characteristics of Pedestrians Observed

Age (N = 718)	**Percent**
16-25	27
26-35	38
36-45	26
46+	9
Sex (N = 758)	
Male	71
Female	29
Clothing (N = 751)	
Dark	50
Light	50
Looked Before Crossing (N = 619)	
Yes	60
No	40
Crossing Speed (N = 752)	
Run	4
Walk	69
Slow	14
Run-Walk	13

Most looked both ways before crossing, and the large majority walked all the way across rather than running all or part of the way. A small percentage were observed to walk especially slowly. This was typically a person with children, an elderly person, or someone who was physically impaired in some way.

Table 4.2 Traffic Density at Time of Observed Pedestrian Crossing

Traffic Density (N = 751)	**Percent**
Light	35
Moderate	47
Heavy	18

Although traffic on the OBT tends to be heavy, that was not the case when pedestrians chose to cross, as is to be expected (see table 4.2). What is somewhat surprising is that despite traffic being moderate to heavy during nearly two-thirds of crossings, only 4% of pedestrians ran across the road and only 17% ran part of the way during a crossing (see table 4.1).

Table 4.3 shows the distribution of crossing types. A diagram of the type of crossings coded is provided in figure 4.8. One-third of crossings occurred midblock, and 40% involved crossing only of minor intersecting streets rather than OBT. Another 9% involved crossing both a minor street and OBT. This helps to explain the large number of pedestrian collisions that occurred at intersections with vehicles turning onto or off OBT. There were no particularly striking differences in crossing types in the three blocks observed.

Pedestrian Crossing Behavior Categories

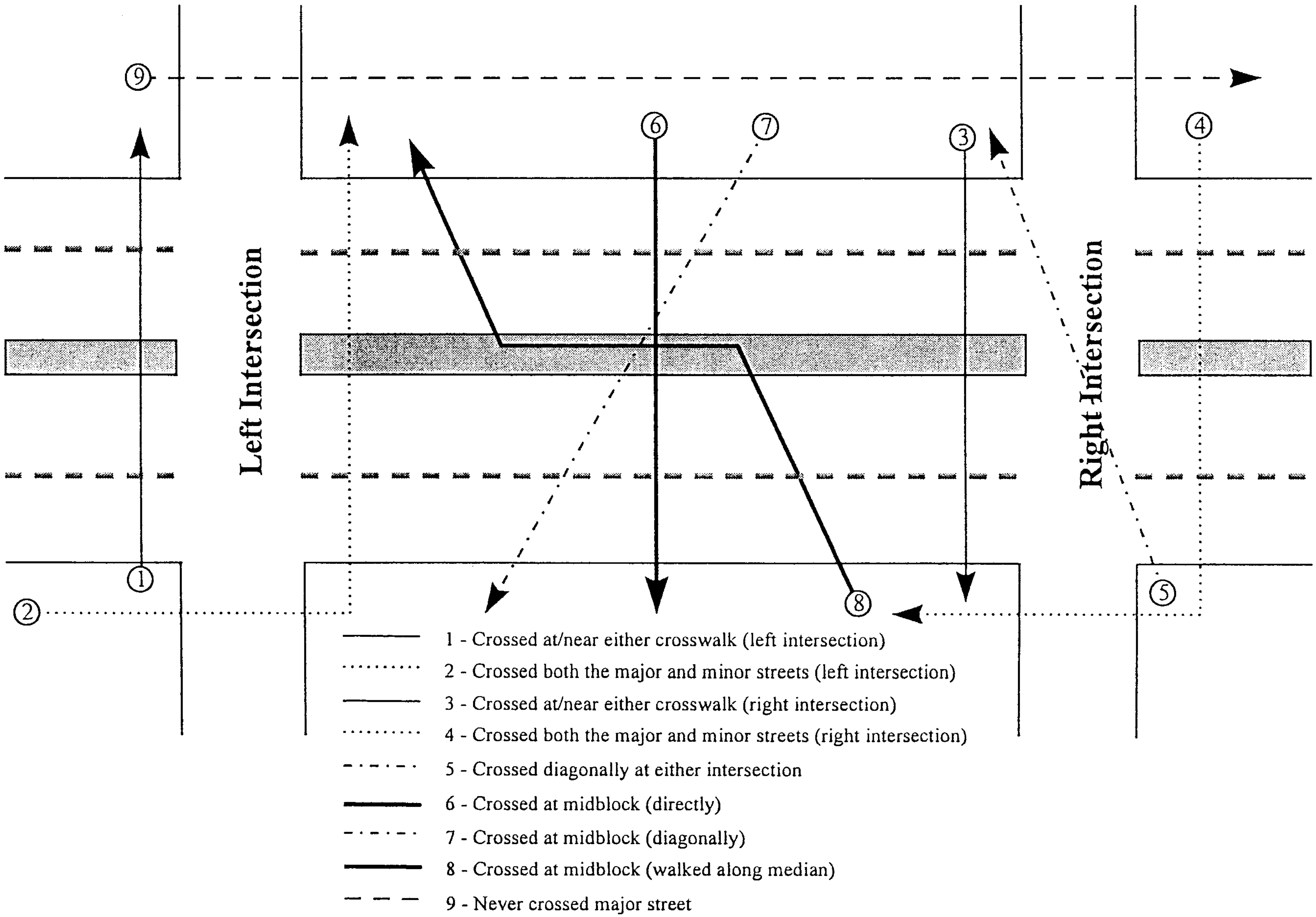

Figure 4.8

Table 4.3 Pedestrian Crossing Type by Site

Crossing Type	Crossing Location			
	19th to 20th (%)	20th to Kaley (%)	Kaley to 22nd (%)	Row Total (%)
Other	7	5	4	5
Direct, At Intersection	10	15	5	11
2 Street	10	6	11	9
Diagonal Intersection	6	2	1	3
Midblock Direct	6	9	4	7
Midblock Diagonal	16	17	16	16
Midblock, Median	13	5	8	9
Minor Only	32	41	51	40
Total N	290	279	198	767

Driver Behavior

Speed is the primary observable driver behavior associated with pedestrian crashes. Baseline speed and volume counts were collected for continuous 24-hour time periods using pneumatic pressure tubes on Orange Blossom Trail at 15th Street, 19th Street, and 22nd Street. Figures 4.4 through 4.6 above provide cumulative distributions of the speeds recorded at the three locations.

As with Jacksonville, the data files for pedestrian and motorist behavior can serve as baseline information for future evaluation of the effectiveness of any engineering changes made to this section of Orange Blossom Trail in Orlando.

5. Discussion and Conclusions

Perhaps the most noteworthy thing to recognize about the problem of pedestrian crashes in the two areas studied is that there are multiple reasons or 'causes' of these crashes. They can be attributed to pedestrian carelessness, pedestrian impairment (of various types), driver recklessness, engineering inadequacies, or failures in urban planning or by local government. Typically the victim is seen as most responsible. Although this might be accurate in the sense that, if they didn't cross the roadway when and where they did, they would not have been hit. By the same logic motorists frequently could also be held responsible, or urban planners – for allowing a major thoroughfare to run through a residential neighborhood where large numbers of individuals will of necessity be walking.

In order to reduce pedestrian - vehicle conflicts, it is not important to assess ultimate 'responsibility' for crashes. Rather, it should be recognized that individuals need to walk places, and in neighborhoods such as those under study here, many will do so. In addition, in an economically depressed area there will be a number who are impaired -- by alcohol, by drugs, by mental limitations, by age (both young and old). Similarly motorists need to travel without great inconvenience. The challenge is to work within these parameters to reduce conflicts in the most cost effective manner.

Within these constraints, traffic calming approaches provide the most desirable way to reduce pedestrian crashes. They do not rely on thousands of individuals, either pedestrians or drivers, consciously monitoring their behaviors with safety in mind every time they are in a location where pedestrian and vehicle traffic is heavy. This is not to say that the behaviors of individual pedestrians and drivers should not be addressed, but rather that there are more and less effective ways of doing so. Putting up signs that warn motorists to slow down because of heavy pedestrian traffic will have relatively less effect than an engineering/environmental modification that either forces drivers to slow down or which unobtrusively encourages them to do so – both of which traffic calming techniques accomplish. Similarly, warning motorists to watch for pedestrians in a poorly lit area will not likely be as useful as simply improving the lighting so that they are more easily seen as motorists engage in normal scanning behavior while driving.

Although the initial concern that prompted the present project was a relatively high incidence of alcohol-involved pedestrian crashes, we have made no recommendations specifically regarding alcohol. There are several reasons for this. First, it is not completely clear that alcohol plays a causal role in a large proportion of the alcohol-involved crashes that occur along the two corridors studied. Clearly there is a high proportion of crashes that do involve pedestrians who have been drinking. However, in most instances there is no measurement of the BAC levels of the pedestrians. Because of this, and a lack of evidence about the general prevalence of elevated BAC levels among pedestrians in these areas, there is simply no way to be sure of the extent to which alcohol contributed to the crashes.

Another reason that interventions to reduce alcohol consumption are not recommended is that there is substantial evidence of other types of impairment among pedestrians in the area. Indeed it is probably more appropriate to think of the problem as one of impairment in general rather than alcohol per se. There is reason to believe that individuals walking in the areas studied may be impaired by the use of drugs other than, or in addition to, alcohol. Informal discussions with community members and law enforcement officials, which indicate there are a number of group living facilities in the vicinity of the corridors studied, also suggest that a number of pedestrians are impaired by reduced mental functioning.

It is widely recognized that a number of techniques to improve pedestrian safety for the elderly population will benefit other populations as well. Similarly, we believe that techniques to ensure the safety of impaired pedestrians, if carefully chosen, will also benefit the majority of pedestrians. Hence, in the interest of cost effectiveness, we prefer approaches that do not target a specific subgroup unless that appears to be necessary.

Finally, the difficulty of markedly affecting the drinking behavior of individuals, many of whom are alcohol abusers, is well-established in the literature on alcohol. Similarly, attempting to modify the situation-specific behaviors of individuals who have been drinking, using illicit drugs, or who have diminished mental capacity is futile. Typical techniques for doing this rely heavily on cognitive processing and somewhat rational decision-making; these are incompatible with impairment. Hence, warning individuals who have been drinking to wait for a pedestrian crossing signal, threatening to arrest jaywalkers, or handing out literature to convenience store patrons has little chance of producing any desired effect.

We have recommended interventions for Main Street in Jacksonville that do attempt to modify both drivers' and pedestrians' behaviors through informational and enforcement approaches. These appear to be promising approaches in view of the nature of the community. They help to round out the approach to the problem rather than relying on a single strategy. There are two important points to be made about these recommendations. First, speed enforcement is well-known to have very limited effects. While efforts are clearly in place, speeds are reduced. When intensive enforcement ceases or moves, speeds tend to return to earlier levels.

We believe that sustained positive effects of a speed enforcement program may well be achievable in the limited area of Main Street in Jacksonville. To do this will require a continuing high degree of publicity about the effort, along with enough actual enforcement to ensure that the threat is believed. Moving enforcement locations along Main Street and rotating time of day and day of week on an essentially random schedule will help to achieve the latter. In essence, motorists who drive Main Street regularly need to believe that the entire stretch (from the intersections of 1st to 20th Streets) is a continuing 'speed trap.'

It is also recommended that local health department contacts with households in the Springfield community be used to raise awareness of the hazards of crossing roadways, especially when impaired. This is a unique opportunity, which is presented by the existing network to address a variety of health issues within this population. It is important to note that this intervention should be targeted at family and friends of individuals who are likely to experience impairment -- not the individuals themselves. There are a number of ways in which community and family members can reduce the pedestrian crash risks of such individuals. These range from accompanying them on trips that will involve crossing a busy street, to making necessary trips for them, to discouraging them from walking at all when impaired, to encouraging and helping them to obtain needed assistance in recovering from whatever the cause of their impairment may be.

Summary

The two areas studied are characterized by heavy pedestrian and vehicle traffic flows. Pedestrian crashes tend to cluster heavily in areas where there is an obvious need for pedestrians to cross a heavily traveled roadway. Both areas are economically depressed and the pedestrian population reflects this in several ways that contribute to pedestrian crashes. There is greater need to walk due to a for lack of alternate transportation, and businesses frequented tend to be located on major thoroughfares where the physical conditions are far less than optimal for pedestrians. Moreover, a number of pedestrians exhibit impairments that likely affect their ability to negotiate a safe crossing of a wide expanse of pavement with heavy, relatively high speed traffic. Especially because of the nature of the businesses that populate these roadways, the lighting is not particularly good, making it difficult for motorists to see pedestrians at night. Newer businesses tend to have well-lighted premises, and the ambient light from these greatly improves visibility. Currently, there are several areas where lighting of areas adjacent to the roadway is inadequate given the amount of nighttime pedestrian traffic and the tendency to wear clothing that does not enhance visibility. Many of these conditions can be improved through environmental modifications. In some instances, it appears that enforcement and educational interventions may also be useful in reducing pedestrian deaths and injuries from traffic crashes.

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