

# Pedestrian Safety Management In New Jersey:

A Strategic Assessment



New Jersey Department of Transportation



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*Prepared by PB*

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## PREFACE

This study was originally conducted in 2004-2005 for the New Jersey Department of Transportation (NJDOT). New Jersey had been identified as one of a group of states with above average pedestrian fatality rates. The purpose of the study was to review the factors involved in pedestrian safety in New Jersey and assess the programs then in place to address them, as a basis for developing a strategic action plan.

In the fall of 2006, Governor Corzine launched a major new pedestrian safety initiative, based in part on the study findings. This report has been modified to serve as a reference document for the NJDOT staff and partner agencies who are involved in that effort, as well as other interested agencies and stakeholders. Chapter 2, Dimensions of the Problem, now incorporates pedestrian crash statistics for the years 2001-2005. However, Chapter 3, Current Pedestrian Safety Practices in New Jersey, remains a snapshot of the programs and initiatives in place as of the original writing and Chapter 4, which provides information on best practices in other states, has not been updated. Note also that a number of the recommendations described in Chapter 5 have already been implemented, or are underway.

For more information on the Governor's Pedestrian Safety Initiative, see the NJDOT website at [www.state.nj.us/transportation](http://www.state.nj.us/transportation) or contact the Bicycle and Pedestrian Program Coordinator at NJDOT, 1035 Parkway Avenue, Trenton, NJ 08625, or by email at [bikeped@dot.state.nj.us](mailto:bikeped@dot.state.nj.us).

## EXECUTIVE SUMMARY

The New Jersey Department of Transportation (NJDOT) has recognized the need for a strategic approach to improving pedestrian safety throughout the state. This study examines the strengths and weaknesses of current approaches and recommends improvements that would provide for a more systematic approach. The study has included a review of literature, data and documents, interviews with key staff and agencies, assessment of current practices, and research on other states' approaches to managing pedestrian safety.

New Jersey has been identified as one of a group of states with significant pedestrian safety problems when compared with the nation as a whole. In a typical year, approximately 145-155 pedestrians are killed statewide, placing New Jersey 16<sup>th</sup> among states in the rate of pedestrians killed per 100,000 residents. For each pedestrian killed, another two are severely injured and 50 are struck altogether.

New Jersey follows the national pattern in which most pedestrian fatalities occur in urban or dense suburban areas. The majority occur under conditions of darkness and away from intersections. The state's typical pedestrian fatality victim is an adult male, while the typical incapacitated pedestrian is a teen aged 13-18.

State highways had the largest share (38%) of pedestrian fatality crashes for 2001-2005, with 278 of the 730 fatalities during this period occurring on state highways. County roads accounted for another 196 fatal crashes (27%) and municipal roads for 22%. In contrast to the fatalities and serious injuries, the less severe crashes tended to involve lower speed municipal roads.

NJDOT and its partner agencies are engaged in a variety of programs to improve pedestrian conditions, including facility improvements, education and enforcement efforts, planning and technical guidance. Related initiatives include the state's updated Bicycle and Pedestrian Master Plan, numerous pedestrian planning and capital grants to municipalities, the development and dissemination of pedestrian design guidelines, training programs, and new legislation. Impressive as many of these initiatives are, to date they have not been sufficiently focused on achieving systematic reductions in pedestrian risks.

Until recently, NJDOT lacked reliable information on pedestrian crash patterns for the state as a whole. Most previous analyses focused only on crash frequency and severity by location (i.e., intersection clusters) rather than the patterns of behavior, crash circumstances, or the demographic characteristics of the pedestrians and drivers involved. With improved reporting procedures underway and new data management systems in place, NJDOT is now in a position to monitor statewide pedestrian safety

patterns and trends, map them, and use this information as a basis for program development.

Programs will be required that address the needs and behavior of adult pedestrians, the drivers who are striking them, and roadway conditions that amplify these risks. To date, few NJDOT programs have addressed the need for improved safety at midblock locations. Approaches such as the use of special pedestrian-oriented lighting at midblock crosswalks, raised medians, traffic calming to reduce speeds, and pedestrian-only signals are possible responses to this prevalent problem. These are relatively unusual methods for NJDOT, presenting both policy and organizational challenges to be worked out. New cost/benefit assessment methods may be needed to document the value of investing in pedestrian safety at midblock locations and along corridors.

### **KEY RECOMMENDATIONS**

This report presents over 100 recommendations for systematically strengthening pedestrian safety management in New Jersey. The recommendations draw on the ideas and suggestions of the many participants in this study, as well as findings from the research literature and program models from other states. The following 14 areas are addressed:

1. Overall policy focus
2. Roadway design policies and standards
3. Project planning, programming, and development
4. Facility maintenance
5. Research and innovation
6. Data and reporting
7. Education
8. Enforcement
9. Technical guidance
10. Organizational structure and coordination
11. Legislation
12. Federal policy
13. Implementation measures
14. Accountability

An overarching recommendation is to place an immediate priority on reducing the number of fatal and severe pedestrian crashes on the state highway system. Strategies for doing this are somewhat different than strategies for the general improvement of pedestrian conditions. In contrast to overall measures, a focus on fatal crashes implies a greater emphasis on 1) adult pedestrian needs and behaviors, 2) midblock

locations, 3) the need to address illumination issues, and 4) the challenge of designing effective educational strategies for the state's urban areas, where literacy in any language cannot be assumed.

High priority should be placed on education for drivers, who seldom fully understand their responsibilities to pedestrians. Pedestrian safety education should be incorporated into the state's driver education programs, driver licensing, and registration and license renewal. The current edition of the state driver's manual is inadequate with respect to pedestrian information and should be revised in time for the next printing.

The study calls for the identification of Pedestrian Safety Zones where special consideration should be given to design treatments that favor pedestrian safety, even if traffic performance will be affected. These zones could be identified using a combination of crash data and the pedestrian priority index developed for the Bicycle and Pedestrian Master Plan, with additional input from the public. Enforcement and education targeted to drivers and pedestrians in these zones would be an integral part of this approach.

Preventative approaches are just as important as responses to current problem spots. A mandatory pedestrian safety review should be incorporated into NJDOT's access permitting process, so that potential pedestrian hazards stemming from the location of new trip attractors can be identified and resolved in a proactive manner. Other proactive land use strategies include measures to encourage the smart siting of schools and senior housing in or near town centers or mixed use developments; sidewalk requirements for new developments; low design speeds for neighborhood streets, and local regulations that encourage shorter blocks and greater street connectivity than is the norm in today's suburbs. A statewide approach to pedestrian risk reduction at major transit facilities is also recommended.

Also critical is to maintain a strong statewide enforcement focus on aggressive driving and speeding. Any measures that can slow traffic speeds in areas where pedestrians are present will be immensely beneficial. This includes promoting the use of traffic calming in urban areas, commercial centers and residential neighborhoods. To help promote the necessary culture change, another recommendation is to create a kit for municipalities with information on conducting a local Yield to Pedestrians campaign.

An annual pedestrian safety summit meeting is suggested in order to develop and maintain a coordinated approach across the many agencies and organizations involved. Finally, an annual report should be prepared to inform the public of trends and progress in managing pedestrian safety.

# INTRODUCTION

## STUDY PURPOSE

The New Jersey Department of Transportation (NJDOT) has recognized the need for a strategic approach to improving pedestrian safety throughout the state. NJDOT is engaged in a variety of programs to improve pedestrian conditions, extend and enhance pedestrian facilities on state highway corridors, and assist local governments and citizen groups in creating more walkable environments at the local level. In addition, a range of educational and enforcement measures aimed at improving pedestrian safety have been taken by NJDOT, the Division of Law and Public Safety, and other agencies.

Important as these initiatives are, to date they have not been sufficiently coordinated or focused on achieving systematic reductions in pedestrian risks. This study is designed to identify the strengths and weaknesses of existing approaches and recommend improvements that would provide for a more systematic approach.

## STUDY METHODOLOGY

The study methodology included a review of literature, data and documents, key staff interviews, case histories of NJDOT's past responses to pedestrian problem locations, and research on other states' practices in managing pedestrian safety. In addition to reviewing the recent technical literature on pedestrian safety, the study team reviewed existing data and documents concerning pedestrian safety in New Jersey, including previous studies and reports, pedestrian crash data, program information, and policy documents.

Key staff responsible for various facets of pedestrian safety management in New Jersey were interviewed for this study, including:

- Sheree Davis, NJDOT Office of Bicycle and Pedestrian Programs
- Elise Bremer-Nei, NJDOT Office of Bicycle and Pedestrian Programs
- William Riviere, NJDOT Office of Bicycle and Pedestrian Programs
- William Beans, NJDOT Bureau of Safety Programs
- Kevin Conover, NJDOT Bureau of Safety Programs
- Doug Bartlett, NJDOT Traffic Engineering
- Mark Stout, NJDOT Capital Programs
- Robert Gaydosh, NJ Division of Law and Public Safety
- Dale Sulpy, NJ TRANSIT, Bus and Light Rail Safety
- Tim Chelius, South Jersey Transportation Planning Organization

- Teresa Thomas, South Jersey Traffic Safety Alliance
- John Madera, Delaware Valley Regional Planning Commission
- Kevin Murphy, Delaware Valley Regional Planning Commission
- Ron Tindall, North Jersey Transportation Planning Authority
- Lois Goldman, North Jersey Transportation Planning Authority
- Sharon Roerty, National Center for Bicycling and Walking
- Ranjit Walia, Bicycle and Pedestrian Resource Center, Voorhees Transportation Center, Rutgers University
- Heather Fenyk, Bicycle and Pedestrian Resource Center, Voorhees Transportation Center, Rutgers University
- Marty Livingston, Burlington County
- Mike Nei, Burlington County

The interviews were structured to gain an understanding of the role each agency or bureau plays in pedestrian safety and the extent and scope of their past and current involvement, programs administered, formal and informal policies and procedures in use, and specific approaches that have been taken to address identified problem locations or common problem types. Interviewees were also asked for their assessment of the strengths and weaknesses of current programs and procedures for addressing pedestrian safety as well as opportunities for improvement.

Background research and telephone interviews were also held with pedestrian coordinators in New York, Washington State, Oregon, Wisconsin, Florida, Maryland, and Vermont. The findings of those interviews are summarized in a separate technical memorandum, "Review of Best Practices and Experience of Other States," August 2004.

## **REPORT CONTENTS**

This report reflects the study findings and recommendations based upon them. The report is organized in the following chapters:

1. Dimensions of the Problem
2. Current Approaches to Pedestrian Safety in New Jersey
3. Best Practices in Pedestrian Safety Management from Other States
4. Strategic Assessment and Recommendations

## CHAPTER ONE: DIMENSIONS OF THE PROBLEM

New Jersey is one of several states with a higher than average number of pedestrian fatalities per person. According to Federal government statistics for 2004, New Jersey’s pedestrian fatality rate that year was 1.75 per 100,000 population, the 13<sup>th</sup> highest among the states. The corresponding rate for the nation was 1.59.<sup>1</sup>

In a typical year, approximately 150 pedestrians are killed statewide, and many more are injured. Table 1 summarizes NJDOT pedestrian crash statistics for the years 2001-2005. During this period, pedestrian crashes averaged approximately 6,600 per year. Approximately 2 percent of the crashes were fatal and another 6 percent led to incapacitating injuries (serious injuries resulting in immobilization). Nationally, roughly 4,500-5,000 pedestrians are killed each year and 90,000 are injured in collisions.<sup>2</sup>

In addition to the impact on human lives, the perception of unsafe pedestrian conditions tends to discourage walking for short trips, resulting in unnecessary traffic congestion and air pollution.

**Table 1: Pedestrian Crashes by Year and Severity (2001-2005)**

Year	Fatalities	Incapacitated Injuries	All Ped Crashes
2001	118	418	6,970
2002	161	430	7,062
2003	140	375	6,951
2004	148	403	6,938
2005	163	386	6,723
Estimate Average per Year	146	402	6,929
<b>All Years</b>	<b>730</b>	<b>2,012</b>	<b>34,644</b>

<sup>1</sup> National Highway Traffic Safety Administration, Fatal Accident Reporting System (FARS) data

<sup>2</sup> J. Stutts, W. Hunter, and W. Pein, “Pedestrian Crash Types: 1990s Update,” Transportation Research Record 1538

## CONTRIBUTING FACTORS AT THE STATE LEVEL

Several factors are thought to contribute to New Jersey's relatively high pedestrian fatality rate. These include the state's population density and automobile-oriented land use patterns that tend to put pedestrians at risk. As part of the New York and Philadelphia metropolitan areas, New Jersey's congested suburban environments often combine an exceptionally high density of activity with a classic suburban-style segregation of land uses.

New Jersey has the highest population density in the nation. As a consequence, traffic volumes are high throughout much of the state. At the same time, New Jersey has a large volume of pedestrian activity. The state has twice the national rate of workers commuting by transit, and many of these passengers walk to bus and rail stations. New Jersey also has an above average percentage of households without vehicles, which also creates more reliance on walking.<sup>3</sup> With high traffic and pedestrian volumes concentrated in many of the most congested urban areas, New Jersey's pedestrians experience greater than average exposure to conflicts with motor vehicles. Speeding vehicles and the prevalence of aggressive driving further compound the risks experienced by pedestrians.

Land use patterns in New Jersey are another probable factor in the pedestrian fatality rate. Much of the state has been developed in an automobile-oriented suburban pattern, with wide streets, fast-moving vehicles and limited pedestrian connectivity. It is not uncommon to find four-lane arterial roads lined with shopping centers, apartment buildings, and schools, with few signalized crossings to connect them. Such environments create formidable challenges to pedestrians and tend to encourage risk-taking behavior. Yet these trunk roads are expected to carry high traffic volumes, and state and local officials typically place a premium on the efficiency of their traffic operations.

Until recent years, relatively little effort was made to address pedestrian needs on the state's higher volume roadways. This is beginning to change, with NJDOT's increased emphasis on pedestrian accommodation and the advent of the Smart Growth movement. However, retrofitting developed areas for greater walkability is bound to be a lengthy, costly process.

Higher than average levels of pedestrian exposure to automobile traffic can be expected to remain a fact of life in New Jersey, requiring a concerted program of

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<sup>3</sup>According to the 2000 U.S. Census Journey to Work data, 9.6% of New Jersey's workers commute by transit, compared with a national average of 4.7%. Nationally, 10.3% of households are without vehicles compared to 12.7% in New Jersey. New Jersey is also on the receiving end of a "suburbanization of poverty" phenomenon in which lower income households often find that their best available housing opportunities are in older suburbs—places that typically lack suitable pedestrian facilities.

measures for managing, rather than eliminating, pedestrian risks. This in turn requires a better understanding of the specific risks that need to be targeted for reduction, whether by location, demographic group, behavioral factors or other circumstances.

Until now, little research has been conducted to identify statewide pedestrian crash patterns. Fortunately, recent improvements in the reporting and management information systems for motor vehicle crashes in New Jersey now permit a systematic statewide examination of pedestrian patterns and trends.

**Table 2:** Total Pedestrian Crash & Fatality Rates by County, 2005

**PEDESTRIAN CRASH LOCATIONS**

New Jersey follows the national pattern in which most pedestrian crashes occur in urban or dense suburban areas. Table 2 shows the estimated pedestrian crash and fatality rates for each New Jersey county in 2005. While the highest overall crash rates were in Essex and Hudson counties, Atlantic County had the highest fatality rate.

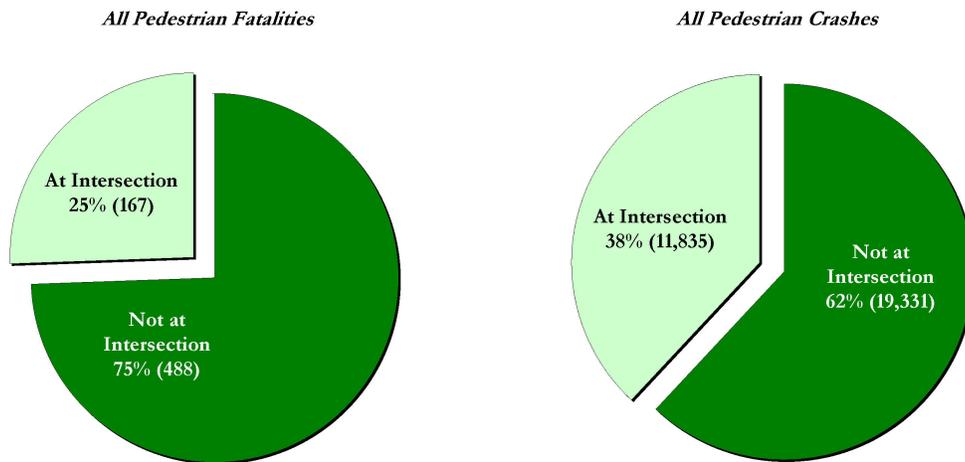
The majority of New Jersey’s pedestrian crashes occur away from intersections, as shown in Table 3 and Figure 1. Between 2001 and 2005, only one in four fatal pedestrian crashes occurred at an intersection. Less severe crashes also tend to occur away from intersections, but the pattern is more pronounced as crash severity increases.

County	Crash Rate per 100,000	Fatality Rate per 100,000
Atlantic	90.9	6.4
Bergen	83.8	2.4
Burlington	32.0	2.9
Camden	70.1	1.0
Cape May	56.3	1.9
Cumberland	59.8	2.0
Essex	152.9	1.9
Gloucester	37.7	2.3
Hudson	142.2	1.9
Hunterdon	10.7	0.0
Mercer	71.3	2.5
Middlesex	62.8	1.0
Monmouth	49.9	1.9
Morris	36.9	0.6
Ocean	45.5	0.5
Passaic	127.1	1.6
Salem	26.4	3.1
Somerset	35.8	1.6
Sussex	22.2	0.0
Union	91.2	2.2
Warren	29.6	0.0

**Table 3:** Pedestrian Crash Locations (2001-2005)

Location / Crash Type	Fatalities	Incapacitated Injuries	All Ped Crashes
Not at Intersection	488	1220	19,311
At Intersection	167	606	11,835
No Record	75	186	3,498
<b>GRAND TOTAL</b>	<b>730</b>	<b>2,012</b>	<b>34,644</b>

**Figure 1:** Crash Locations (2001-2005)

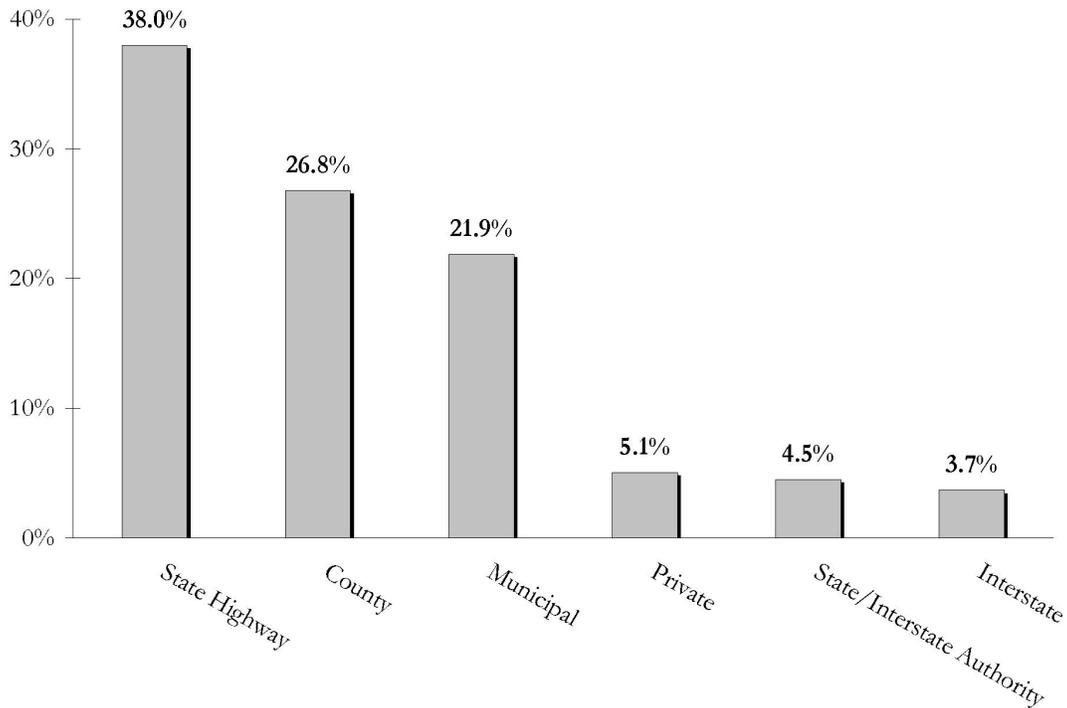


From the standpoint of jurisdictional responsibility and safety program implementation, it is also important to pinpoint the distribution of pedestrian crash risk by roadway classification and ownership type. Table 4 and Figure 2 present a summary of pedestrian crashes and their severity by roadway jurisdiction. State highways had the largest share of fatal pedestrian crashes for 2001-2005 (38%). County roads accounted for another 27% of fatalities and municipal roads accounted for 22%. For the five year period, a total of 3,006 pedestrian crashes were reported on the state highway system, with 278 of them fatal and 354 incapacitating. Another 8,759 crashes occurred on county roads during this period, with 196 fatal and 631 incapacitating. Taken together, state and county roads accounted for 1,459 of the state’s worst pedestrian crashes during this period. Municipal roads had the largest number of pedestrian crashes, but these tended to be less severe, on average.

**Table 4:** Pedestrian Crashes by Roadway Type (2001-2005)

Road System / Crash Type	Fatalities	Incapacitated Injuries	All Ped Crashes
State Highway	278	354	3006
County	196	631	8,759
Municipal	160	737	16,103
Private	37	228	5,410
State/Interstate Authority	33	24	271
Interstate	27	14	171
State Park	1	1	38
US Government	0	0	20
County Authority Park or Institution	0	1	56
No Record	-	22	810
<b>GRAND TOTAL</b>	<b>730</b>	<b>2,012</b>	<b>34,644</b>

**Figure 2:** Fatalities by Roadway Type (2001-2005)



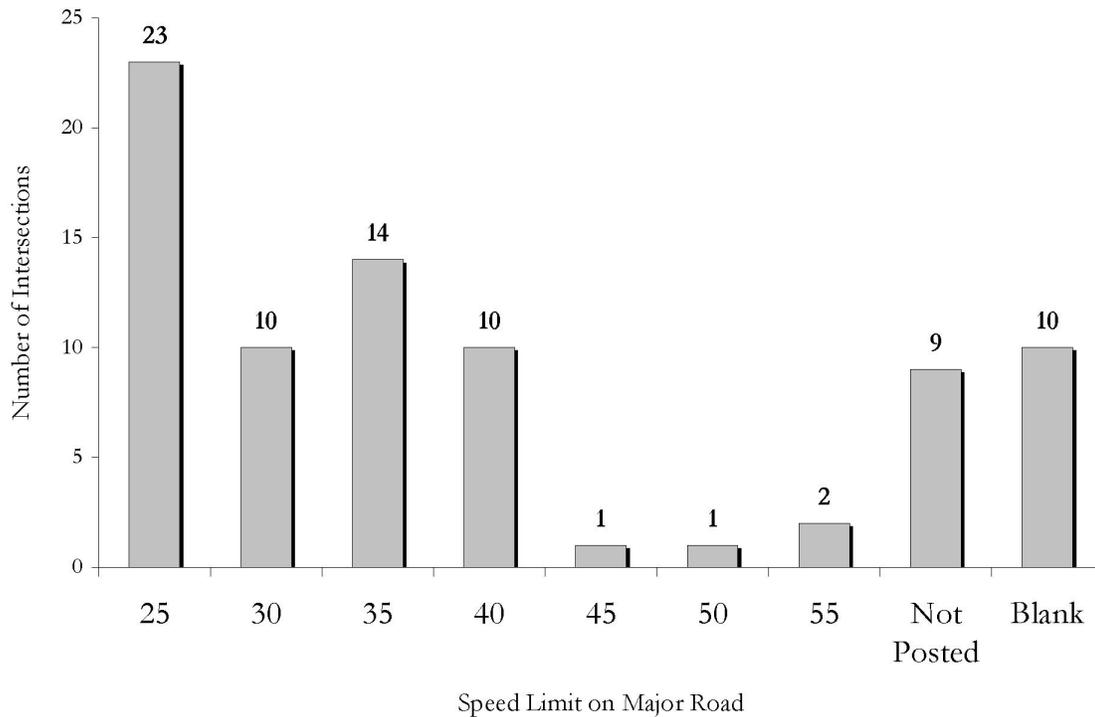
## RECURRENT PROBLEM LOCATIONS

While most of the severe pedestrian crashes occur away from intersections, certain intersections have been identified as recurrent problem locations or “hot spots” for pedestrian crashes. NJDOT maintains a listing of high pedestrian crash intersections in the state for use in project programming. These are intersections having at least two pedestrian crashes during the analysis period that reached a combined minimum severity threshold defined by NJDOT’s Safety Management System. As of 2004, there were 80 intersections on this list, and the counties with the largest number of such locations were Union (15 locations), Hudson, Essex, and Bergen (12 locations each). Also significant were Middlesex (7), Camden (6), and Atlantic (6). Fewer such problem locations were identified in Passaic County and none in Cape May or Cumberland counties, despite these counties’ higher than average overall pedestrian crash rates. Taken together, these 80 intersections accounted for 10 fatal pedestrian crashes over the period 1998-2000.

Recurrent intersection crashes involving pedestrians also tended to cluster on state highways and county roads. Of the 80 multiple crash intersections meeting the threshold for the Safety Management System list in 2004, 28 involved a state highway, 46 involved at least one county road, and 10 involved local roads only. This suggests that the majority of these problem intersections could be resolved through concerted efforts at the state and county level, with county roads being the most critical category. (Of the 10 pedestrian fatalities that occurred at the identified high crash intersections from 1998-2000, 8 involved either a state or county road.)

A further review of the characteristics of these 80 high pedestrian crash intersections indicates that they are nearly evenly split between 2 and 4 lane roads (for the major road), with a small number of 6 lane roads represented. The great majority of the intersections on the list have posted speeds of 25-40 mph on the major road, with the most prevalent posted speeds being 25 mph (29%) and 35 mph (18%), as shown in Figure 3. The majority (67, or 84%) are signalized intersections.

**Figure 3:** Speed Limit for Major Roads in Top 80 Crash Locations



## LIGHTING CONDITIONS

Darkness is known to greatly increase the risk of pedestrian crashes.<sup>4</sup> A study by the University of Michigan’s Transportation Research Institute suggests that pedestrians are from 3 to 6.8 times more vulnerable in the dark than in the daylight.<sup>5</sup> Nationally, almost two-thirds of pedestrian fatalities occur during the hours of darkness, with or without lighting. (By contrast, pedestrian crashes as a whole are concentrated during the day.)<sup>6</sup>

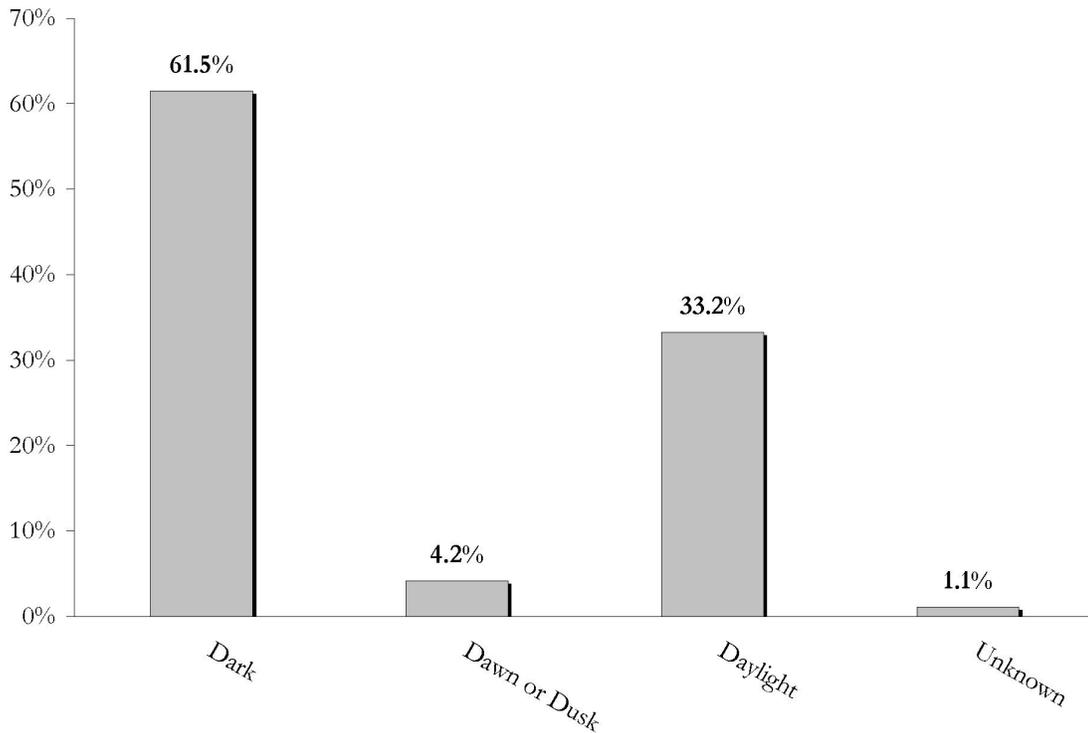
New Jersey’s pedestrian fatalities appear consistent with the national experience. Figure 4 summarizes the reported lighting conditions by fatalities for the five year period in New Jersey. While pedestrian crashes as a whole were most common in daylight hours, 61% – approximately three out of every five fatalities – occurred in the dark.

<sup>4</sup> Campbell et al, op cit.

<sup>5</sup> Sullivan and Flannagan, “Assessing the Potential Benefit of Adaptive Headlighting Using Crash Databases,” University of Michigan Transportation Research Institute, September 1999

<sup>6</sup> Approximately 60% of total pedestrian crashes occur during daylight hours, just under 5% at dusk, and 36% at night (24% on lighted streets and 12% on unlighted streets), according to Campbell, op cit.

**Figure 4:** Pedestrian Fatalities by Lighting Condition



## DEMOGRAPHIC PATTERNS

Demographic patterns are another key to understanding and combating pedestrian risk. Both crash rates and crash types differ significantly based on age and gender. Less is known about the effect of such variables as income, employment status, or ethnicity.

### Age of Victims

National research shows that children and seniors tend to be at greatest risk of involvement in pedestrian crashes, with higher per capita fatality rates than the rest of the population. Children tend to be over-represented in pedestrian crashes, while seniors have much higher pedestrian fatality rates than the rest of the population.<sup>7</sup> Nationally, the fatality rate is highest for pedestrians ages 70 and above (3.21 per 100,000). Additionally, while the national fatality rate has been declining, rates for older pedestrians have declined more slowly than for other groups. Risk factors for seniors may include slow or unsteady walking, slower reaction times, and limitations in vision, hearing, strength, and balance.

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<sup>7</sup> B.J. Campbell, Charles V. Zegeer, Herman H. Huang, and Michael J. Cynecki, *A Review of Pedestrian Safety Research in the United States and Abroad*, FHWA, January 2004.

Recent research performed by the New Jersey Department of Health and Senior Services (NJDHSS) showed that seniors and children experience greater risks as pedestrians in New Jersey as well.<sup>8</sup> The NJDHSS investigation of pedestrian fatalities in New Jersey for the years 1996-2001 revealed that during this period, about 50 pedestrians aged 65 and over were killed each year in New Jersey. The comparable figure for children and young people ages 0-20 was half that, or about 25. This study also showed that New Jersey's pedestrian fatality rates for young people are lower than the national average, while the rates for seniors were higher than the national rates, suggesting that seniors in New Jersey are especially vulnerable.

In addition to the 96 fatalities involving senior pedestrians in 2000-2001, there were 465 non-fatal injuries in this group. Using death certificates and medical examiner data, the NJ DHSS study also found that a disproportionate number of elderly pedestrian fatality victims during this two-year period were unmarried males. Most were walking close to their homes when struck. Half of the fatal crashes involving senior pedestrians occurred in the four urban counties of Bergen, Hudson, Essex, and Union.

Table 5 shows the distribution of pedestrian crashes and their severity by age cohorts based on NJDOT data for 2001-2005. During this period, over half of New Jersey's pedestrian fatality victims were between 30 and 60 years of age, with the largest number found in the 40-49 year old cohort. Young people under 20 years of age accounted for a relatively small share of the state's overall pedestrian fatalities during 2001-2005 (11%). However, children and youth were heavily represented among the less severe crashes. The age 10-19 cohort accounted for 22% of all crash victims overall.

For pedestrian crashes involving school-age children (ages 5-18), during 2001-2005, there were 53 fatalities and 478 incapacitating injuries reported in this group. School-age children accounted for approximately 7% of all pedestrian fatalities and 17% percent of incapacitating injuries in New Jersey during this period. Teenagers (aged 13-18) accounted for the greatest share of school-age victims, suggesting a need for targeted outreach to this group.

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<sup>8</sup> Loretta A. Kelly and Katherine Hempstead, "Older Pedestrian Fatalities in New Jersey, 1999-2000," New Jersey Department of Health and Senior Services, Topics in Health Statistics, August 2004

**Table 5:** Age of Victims (2001-2005)

Age / Crash Type	Fatalities		Incapacitated Injuries		All Ped Crashes	
		percent of total		percent of total		percent of total
0-9	33	5%	138	7%	3,231	9%
10-19	48	7%	338	17%	6,649	19%
20-29	79	11%	241	12%	4,771	14%
30-39	99	14%	283	14%	4,354	13%
40-49	108	15%	298	15%	4,032	12%
50-59	96	13%	215	11%	3,163	9%
60-69	48	7%	131	7%	1,838	5%
70-79	68	9%	115	6%	1,340	4%
80-89	54	7%	53	3%	614	2%
90-99	13	2%	14	1%	96	0%
No Record	84	12%	186	9%	4,556	13%
<b>GRAND TOTAL</b>	<b>730</b>		<b>2,012</b>		<b>34,644</b>	

**Gender**

Nationally, at all ages, males have higher pedestrian fatality rates than females: in 2002, 68% of the U.S. pedestrians killed were male and the male pedestrian fatality rate was 2.31 compared to 1.05 for females.<sup>9</sup> The NJDOT data is consistent with the national pattern.

**Socioeconomic Status**

Information is not available on the distribution of pedestrian crashes in New Jersey by victim’s income or ethnicity. National studies show that as a group, lower income persons experience greater than average levels of pedestrian injury and mortality.<sup>10</sup> This is likely due to higher exposure due to greater reliance on walking and transit use. Given socioeconomic disparities in rates of exposure to pedestrian crashes, the issue of pedestrian safety has an environmental justice dimension. Equity issues should be considered both in the design of safety programs and in the allocation of improvement grants and other resources. It can be assumed that the state’s lower income urban areas generally have the greatest concentration of need for pedestrian safety resources and programs.

<sup>9</sup> Umesh Shankar, “Analysis of Pedestrian Fatalities,” National Highway Traffic Safety Administration, March 29, 2004

<sup>10</sup> Kelly and Hempstead, op cit.

## PEDESTRIAN AND MOTORIST ACTIONS

The actions taken by pedestrians and motorists prior to a crash are important in establishing contributing circumstances and developing appropriate remediation strategies. During the early 1990s, the National Highway Traffic Safety Administration (NHTSA) updated the methodology first developed in the 1970s for typing pedestrian crashes and used it to examine over 5,000 crashes in six states. This research found that common crash types include vehicles turning across a pedestrian's path at an intersection; pedestrians running across an intersection, the "midblock dash" in which a pedestrian runs into the street, and the midblock "dart-out" in which the driver's view of the pedestrian is obscured by a parked vehicle or other object. Another relatively common type of crash involves pedestrians walking along the road shoulder, with most of these being struck from behind.<sup>11</sup> Further details on these crash types and the countermeasures recommended to address them are provided in the Appendix.

Table 6 summarizes the information available for 2001-2005 on the pedestrian maneuvers preceding reported crashes in New Jersey. The highest percentage of fatal crashes (38%) were reported to involve a pedestrian "crossing or entering a roadway not at an intersection." Another 18% involved "crossing or entering a roadway at an intersection." Among pedestrian crashes as a whole, the two highest categories are reversed, with more crossing or entering at an intersection. Other small but significant categories included "walking on the road," "standing in the road," and "coming from behind a parked vehicle." (A limitation of these statistics is the large number of police reports with no information about pedestrian maneuvers. Therefore, these percentages do not reflect all of the crashes in the dataset.)<sup>12</sup>

Nationally, crash types have been found to vary systematically with the age of the pedestrian involved. Pedestrians under 14 years of age are over-represented in crashes that involve playing in the road, a midblock or intersection "dash," exiting or entering a parked vehicle, and in crashes that are bus-related. Teens aged 15-19 are also disproportionately involved in bus-related crashes, as well as those involving walking along the roadway or sitting or leaning on a vehicle.<sup>13</sup> Pedestrians aged 20-44

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<sup>11</sup> Pedestrian and Bicycle Information Center, "Pedestrian Crashes: Crash Types," [www.walkinginfo.org/pc/types](http://www.walkinginfo.org/pc/types), accessed 7/26/04

<sup>12</sup> NJDOT previously reviewed causal factors for the first 11 high pedestrian crash sites to be investigated from the state's Safety Management System. The review indicated several common factors. Besides their urban locations and heavy traffic volumes, these "worst of the worst" intersections typically included crashes in which turning vehicles hit pedestrians in the crosswalk. Incidents also commonly involved transit access trips or school crossings. At some locations, sun glare and excessive signage were also noted as possible factors. Elise Bremer-Nei and Leigh Ann Von Hagen, "Pedestrian Safety Initiatives: State and Local Perspectives," paper presented at ProWalk ProBike Conference, 2002. Locations studied included 3 in Newark, 2 in Irvington, 2 in Atlantic City, and one each in Bergenfield, Harrison, Trenton, and Voorhees.

<sup>13</sup>Stutts, Jane, William Hunter, and Wayne Pein, "Pedestrian Crash Types: 1990s Update," *Transportation Research Record* 1538

are overrepresented in crashes that involve walking along the roadway. Older adults are disproportionately involved in intersection-related crashes (though not intersection “dashes”) as well as those involving backing vehicles. Pedestrians age 45-64 are over-represented in crashes involving vehicles turning at intersections or backing up. Less than 10 percent of crashes in this age group involve “dashes” across the roadway. NJDOT crash data suggests that the primary pedestrian maneuver associated with pedestrian fatalities, crossing/entering a road (not at an intersection), is the most common maneuver for fatalities in all age groups except ages 90-99. The most common maneuver for that cohort is walking on road (with traffic).

**Table 6:** Pedestrian Maneuver (2001-2005)

Pedestrian Maneuver / Crash Type	Fatalities	Incapacitated Injuries	All Ped Crashes
Crossing/Entering Road (not at Intersection)	275	684	7,865
Crossing/Entering Road (at Intersection)	129	587	10,396
Walking on Road (with Traffic)	34	73	960
Standing in Road	22	70	1,370
Walking on Road (Against Traffic)	15	30	424
Pushing or Walking Vehicle	11	20	233
Coming from behind Parked Vehicle	10	69	1,395
Going on/off Vehicle	7	33	711
Other Walking in Roadway	5	25	411
Approaching or Leaving School Bus	2	3	65
Playing in Road	1	21	517
Other	91	253	4,669
No Record	128	144	5,628
<b>GRAND TOTAL</b>	<b>730</b>	<b>2,012</b>	<b>34,644</b>

## ALCOHOL INVOLVEMENT

Alcohol use is a major factor in pedestrian crashes nationally, with some studies reporting as many as 37% of pedestrians and 18% of drivers involved in pedestrian collisions exhibiting alcohol impairment.<sup>14</sup> Younger males are over-represented among intoxicated pedestrian crash victims.<sup>15</sup> The majority of the alcohol impaired pedestrians in these crashes have high intoxication levels with BAC of 0.08 or greater.

<sup>14</sup> Umesh Shankar, “Analysis of Pedestrian Fatalities,” National Highway Traffic Safety Administration, March 29, 2004. Note that other studies cite lower figures for pedestrian intoxication.

<sup>15</sup> Kelly and Hempstead, op cit.

New Jersey's pedestrian crash data does not provide a conclusive picture of the degree of alcohol involvement. Only a small percentage of drivers and pedestrians involved in fatal pedestrian crashes were reported as having been tested. Further investigation of alcohol involvement is warranted.

### **COMPARISON TO ALL MOTOR VEHICLE-RELATED FATALITIES**

A common baseline used to compare pedestrian safety across the US is the ratio of pedestrian fatalities to total motor vehicle-related fatalities in a given time period. The presumption is that a higher ratio indicates a more severe pedestrian problem. By this standard, New Jersey is significantly above average for pedestrian safety concerns. For instance, in 2003, 20% of New Jersey's motor vehicle related fatality victims were pedestrians compared to only 11% nationally.

One problem with this baseline ratio is that it is heavily affected by trends in auto occupant fatalities, which forms the largest component of the denominator. When compared to the nation, New Jersey consistently has a *below average* rate of auto occupants killed in motor vehicle crashes, tending to inflate the ratio of pedestrians to all fatality victims. For this reason, the pedestrian fatality rate per capita is recommended as a more appropriate benchmark to use in monitoring trends.

## CHAPTER TWO: EXISTING PEDESTRIAN SAFETY INITIATIVES IN NEW JERSEY

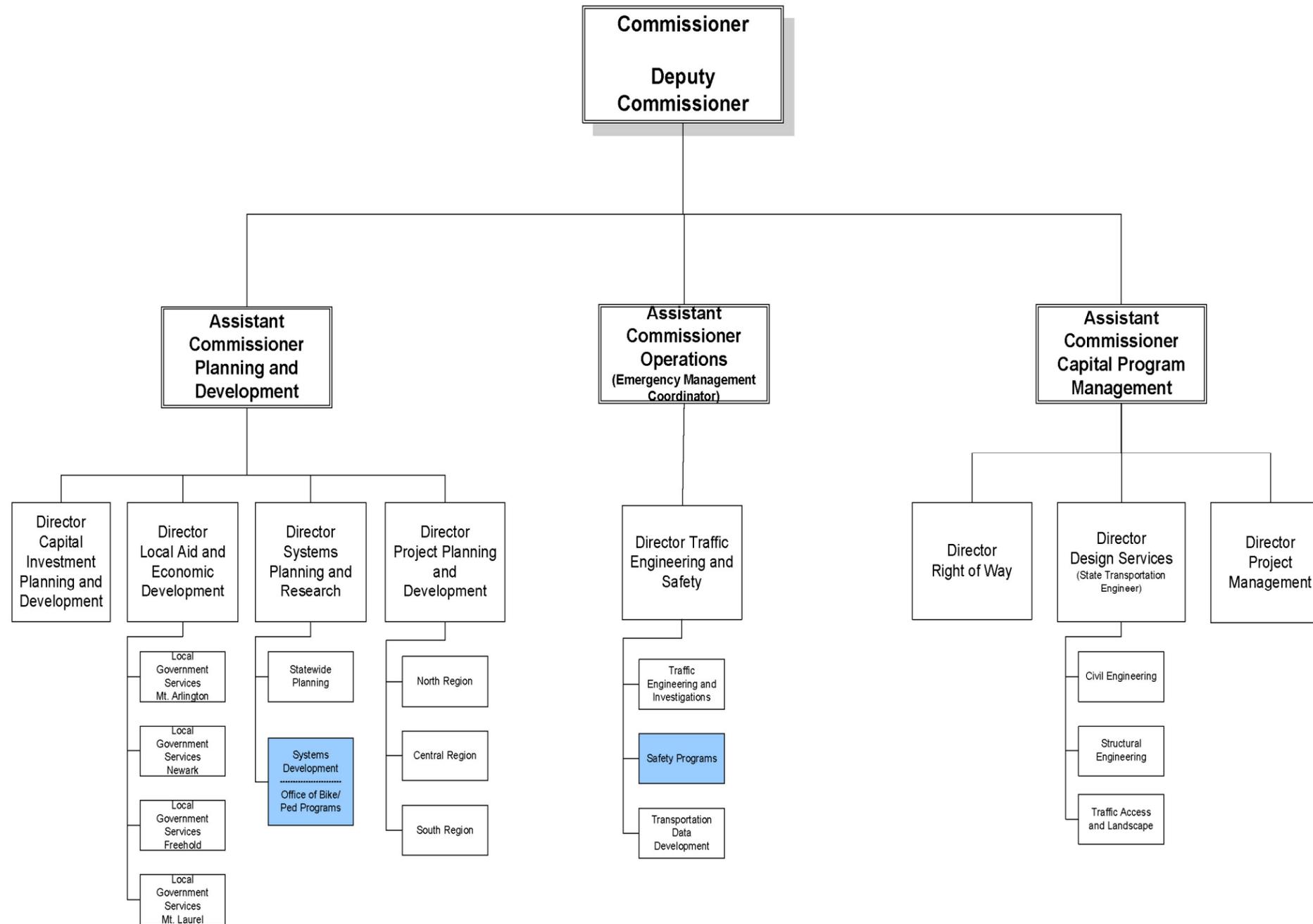
NJDOT and its partner agencies are engaged in a variety of programs to improve pedestrian conditions throughout the state.<sup>16</sup> The majority of NJDOT's efforts are focused on promoting physical improvements to pedestrian facilities ("engineering" measures). The Division of Highway Traffic Safety, under the state's Department of Law and Public Safety, has focused primarily on educational and enforcement measures. Several projects are underway that combine engineering, enforcement and educational approaches at specific locations, although this is not the norm. Figure 4 provides an organization chart of the key NJDOT bureaus involved in pedestrian safety management. Figure 5 identifies the specific roles and relationships with other agencies and external organizations involved in pedestrian safety.

This section describes the State's current involvement in developing site-specific pedestrian safety improvements, as well as related initiatives to promote better walking conditions throughout the State as a whole. Current educational and enforcement efforts and a variety of special programs undertaken by partner agencies and local governments are also described.

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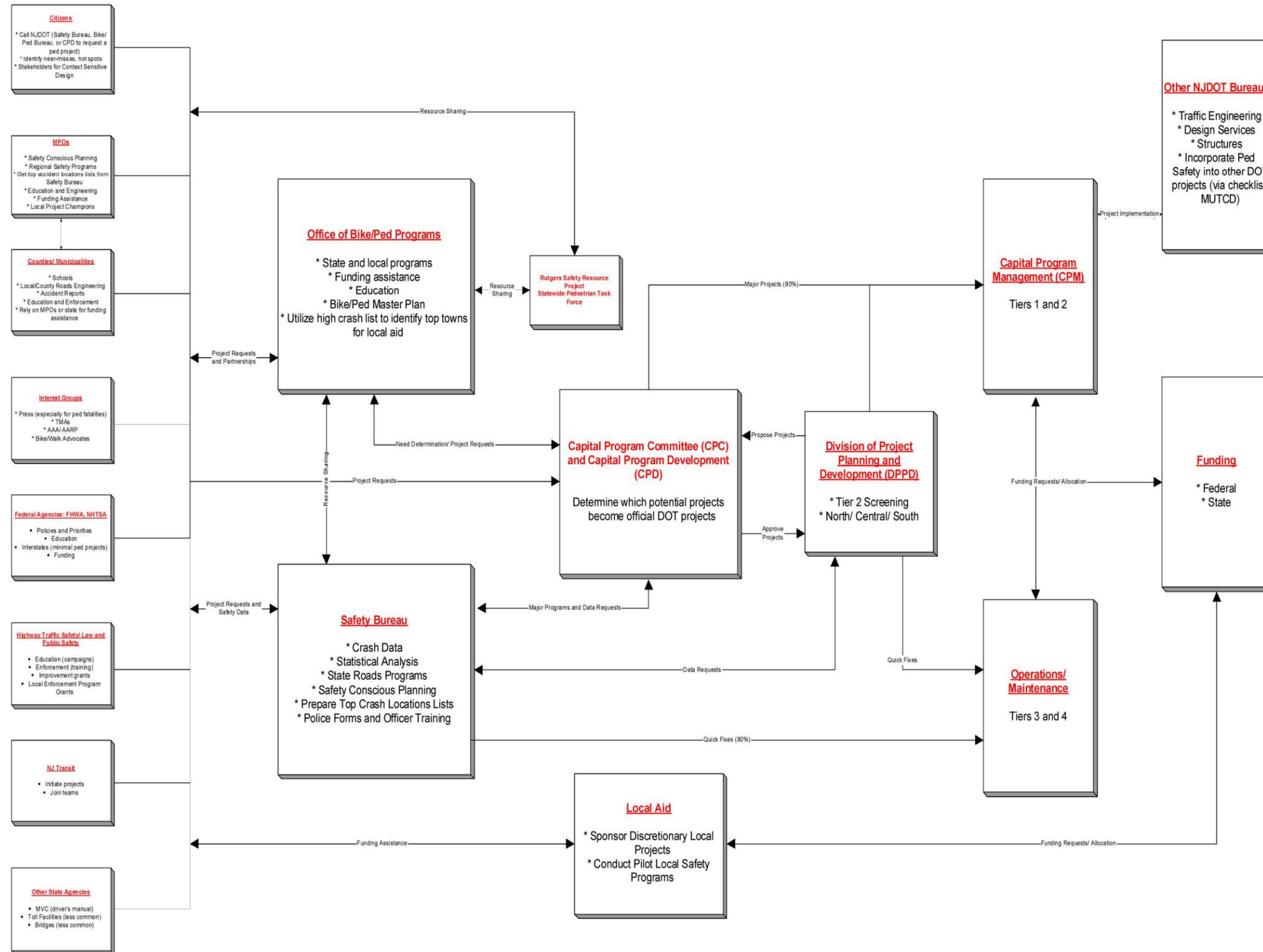
<sup>16</sup> Description current as of 2005

Figure 4: NJDOT Pedestrian Safety Management Organizational Structure



Source: NJDOT Organization Charts, June 2004, and Interview Findings

Figure 5: Pedestrian Safety Roles and Responsibilities



Revised 8/2004

## **SITE-SPECIFIC INTERVENTIONS**

At NJDOT, site-specific interventions to address known or suspected pedestrian safety problems generally begin with the preparation of a problem statement (for capital program tracking) and investigation by one of three groups: the Division of Project Planning and Development, the Office of Bicycle and Pedestrian Programs, or the Bureau of Safety Programs. Site-specific remediation projects are also undertaken on non-state system roads through a variety of local assistance programs.

### **Division of Project Planning and Development**

In the DPPD, pedestrian safety interventions may arise either as part of a highway project in which pedestrian safety is a documented concern at the outset, or as a stand-alone pedestrian safety project. An example of the first type is a study on Route 322 in Glassboro. While this project was designed to address traffic operations from a regional perspective, DPPD planners understood from the outset that an important aspect would be the investigation of pedestrian safety improvements, particularly for the portion of the corridor that runs through the campus of Rowan State University. The project was structured to address both traffic and pedestrian concerns in an integrated fashion, with significant resources devoted up front to developing pedestrian improvement concepts.

An example of the second type of initiative is a study of a two mile section of Route 9 in Manalapan. In this case, NJDOT received a request for fencing on the median barrier to stop pedestrians from taking unsafe shortcuts across this 55 mph highway. (This section of Route 9, in the vicinity of Gordon's Corner Road, is also a heavy bus transit corridor, with four park and ride lots that generate daily crossing activity.) Under NJDOT's new project pipeline assignment process, the first step in this investigation was a screening study, known as a Tier 2 Screening, to identify the issues associated with this potential project and determine whether it would require detailed study (pipelines 1-2), limited study (pipeline 3), or could proceed to construction using NJDOT operations and maintenance forces (pipeline 4). This project is currently moving forward for implementation.

A third, more indirect way in which DPPD engages in site-specific pedestrian improvements is when pedestrian concerns were not an original impetus for the project, but arise later in the project scoping process, either through field observation, a routine review of crash data, in the community involvement process, or when the application of NJDOT pedestrian design guidelines reveals physical deficiencies. For example, the concept development work for a series of intersection improvements on Route 70 in Eatontown and Shrewsbury identified pedestrian activity and a need to complete missing sidewalks in portions of the corridor. This "incidental" form of pedestrian intervention in the course of a larger corridor study has become more

routine in recent years, and less dependent on the involvement of Office of Bicycle and Pedestrian Programs staff, reflecting the gradual institutionalization of a more pedestrian-oriented mindset in the DPPD.<sup>17</sup> This change, while not complete, is a hard-won accomplishment which can be expected to have positive impacts on future projects.

### **Bureau of Safety Programs/ Safety Management System**

Another avenue for developing site-specific pedestrian safety interventions at NJDOT is the Safety Management System (SMS) maintained by the Bureau of Safety Programs (BSP). A key activity of the SMS is BSP's listing of the most dangerous intersections in the state, used for identifying projects under the federal Hazard Elimination Program. Two separate lists are maintained, one for motor vehicles and one for pedestrians. A first wave of projects began in 1998, when 100 top pedestrian locations were identified.<sup>18</sup> At that time, although 5 locations were chosen for investigation, internal organizational issues and funding program restrictions formed obstacles to getting the projects implemented.<sup>19</sup>

In 2001, a revised procedure incorporating a severity index resulted in a list of 60 intersections meeting the pedestrian criteria. It was determined that NJDOT would take responsibility for designing and constructing improvements for the state highway locations on the list, while county and municipal intersections would be addressed by the Office of Bicycle and Pedestrian Programs. Consultant contracts would be used to develop preliminary designs, with local governments taking responsibility for completing the projects with NJDOT funds. For the local projects, NJDOT would also provide the local governments with assistance with the necessary funding applications.

A pilot project program was formed targeting 6 intersections on local roads, 2 in northern New Jersey, 2 in the central region and 2 in the south. The following locations were part of this second phase of the program:

- Atlantic City: Atlantic Avenue at Michigan Avenue and Kentucky Avenue (2 locations)
- Bergenfield: South Washington Avenue at West Main Street

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<sup>17</sup> Another set of DPPD projects, the Integrated Land Use and Transportation Studies or "Smart Growth Corridors," involve a more explicit treatment of pedestrian issues on corridor-length projects, as discussed later in this chapter.

<sup>18</sup> In 1998, a previous governor established the goal of "reducing pedestrian deaths by 50 percent over the next 12 years." The measures outlined included addressing the 100 most dangerous pedestrian locations in the same 12 year period.

<sup>19</sup> Elise Bremer-Nei and Leigh Ann Von Hagen, "Pedestrian Safety Initiatives: State and Local Perspectives," presented at ProWalk ProBike Conference, 2002

- Harrison: Frank E. Rodgers Boulevard at Harrison Avenue
- Trenton: Hamilton Avenue at Clinton Avenue
- Voorhees: Echelon Road at Kirkbridge Road

The majority of these projects, which included such features as pedestrian refuge islands, more visible crosswalks, traffic calming, improved lighting, and sign clutter reduction, encountered obstacles in the local implementation process.

The pedestrian intersection list was again updated in August 2003 with data for 1998-2000, and now contains 80 high pedestrian crash locations. The corresponding list of high motor vehicle crash intersections now contains 115 intersections. (Several intersections are on both lists.) The Safety Bureau has conducted investigations of 44 of the 80 pedestrian intersections. Recommendations have been developed for 31 of these; 18 of these are awaiting approval, 6 are awaiting the start of construction, and temporary measures were undertaken at 4 locations.<sup>20</sup>

A separate pilot program of intersection improvements to address senior driver and pedestrian safety issues is also underway through the leadership of the NJDOT Policy and Priorities Board, with participation by the BSP and the Office of Bicycle and Pedestrian Programs. The first intersection chosen for this program was drawn from the SMS pedestrian list, Routes 93 and CR 501 in Palisades Park, Bergen County. This intersection experienced 9 pedestrian crashes in 6 years, 5 of which involved pedestrians aged 65 and over. Recommendations were based in part on the FHWA's Guidelines to Accommodate Older Drivers and Pedestrians, and included increased pedestrian crossing time, crosswalk installation, altered lane configuration and larger signalheads with backplates to increase contrast. This project is currently being constructed. In addition, as part of the pilot project NJDOT worked with the New Jersey Department of Health and Senior Services and Bergen County to conduct a senior health and mobility fair at a nearby senior center. Pedestrian safety publications were provided and materials were translated into Korean, the prevalent language of seniors living in the area. Two additional intersections, one on Route 22 in Green Brook, Somerset County and one on Route 71 in Asbury Park, Monmouth County, are currently being evaluated using the same process.

### **Office of Bicycle and Pedestrian Programs**

In addition to active participation in the interventions undertaken by the DPPD and other divisions, the Office of Bicycle and Pedestrian Programs coordinates a rapid response program to address critical pedestrian hazards on the state highway system. These projects are primarily "quick fix" efforts designed for implementation by the NJDOT Operations and Maintenance division. Recent projects have included the

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<sup>20</sup> Information current as of August 2004.

construction of median barrier fencing, crosswalk improvements, and other short-term measures on state highways such as Routes 42 and 322. Rapid response projects are also underway on Route 49 in Bridgeton and Route 31 in Hampton.

The Bike/Ped office also serves as a champion for special projects falling outside the scope of other divisions or agencies, including multi-agency initiatives with NJ TRANSIT, local governments, and other parties. In addition to promoting site-specific physical improvements, the Bike/Ped Office is involved in a wide variety of planning, policy, and programmatic initiatives to improve pedestrian conditions on a statewide level, as described later in this chapter.

### **Local Assistance Programs**

NJDOT sponsors additional pedestrian improvements through its local assistance programs. Of particular note is a program of Locally Initiated Pedestrian Projects which was formed in 1999 and covers construction costs. Counties and municipalities are eligible to apply to the program through the district offices of the Division of Local Government Services. Priority is given to projects that improve walking routes to schools, transit, or community facilities and to municipalities with an average of 100 or more significant pedestrian crashes over the past three years.

Other programs that have funded pedestrian projects with safety elements include the MPO Local Scoping and Local Lead projects, the federal Transportation Enhancements program, and federal Section 402 safety funds administered by the Division of Highway Traffic Safety. Section 402 funds have been used in New Jersey for cooperative safety programs in Trenton, Jersey City and Elizabeth that include minor physical improvements as well as educational and enforcement measures. The funds have also sponsored construction of lighted crosswalks in several locations.

### **Other Agencies**

A variety of other agencies are involved in developing and implementing site-specific pedestrian safety improvement projects around the state. NJ TRANSIT, for example, has worked with NJDOT and with municipalities to relocate and improve bus stops for improved passenger access, and to develop improved pedestrian access patterns for existing and new rail stations. For instance, as part of the Monmouth-Ocean-Middlesex Priority Bus Lane initiative, NJ TRANSIT sponsored a consultant study of pedestrian access to the new bus stops and identified needed improvements which were incorporated into the project design.

The state's three Metropolitan Planning Organizations (MPOs) are also active in identifying pedestrian needs and improvement projects. The North Jersey Transportation Planning Authority (NJTPA) has recently spurred improvement

projects for locations with high pedestrian crash rates that also meet their screening criteria for priority locations, such as Kennedy Boulevard in Jersey City, Hudson County. The Delaware Valley Regional Planning Commission (DVRPC) has also undertaken pedestrian safety improvement projects, such as corridor-wide improvements along Route 130 from Camden to Berlin. The South Jersey Transportation Planning Organization has sponsored sidewalk improvements for 5 municipalities and a study to determine low cost pedestrian improvements within Cape May County.

County governments and many local governments also undertake pedestrian safety improvements within their jurisdictions. For example, Burlington County studies all locations with double-digit crash rates to determine “quick fix” improvement options. The County has installed 3 lighted crosswalks, 2 pedestrian-actuated crosswalks, traffic calming measures, and increased pedestrian walk time at signals.

Citizen groups and a variety of non-governmental organizations also play a significant role in identifying pedestrian safety issues and helping to implement improvements.

### **EDUCATIONAL AND ENFORCEMENT PROGRAMS**

A range of educational and enforcement measures aimed at improving pedestrian safety have been undertaken by NJDOT, the Division of Law and Public Safety, and other agencies.

#### **New Jersey Department of Transportation**

NJDOT established the [www.njsafewalk.com](http://www.njsafewalk.com) website to provide interactive information on pedestrian safety, including a pedestrian safety quiz, cartoons, safety tips for drivers and pedestrians, and a comment response form. This website is housed within the NJDOT website. NJDOT has also sponsored several media campaigns focusing on pedestrian safety.

#### **Division of Highway Traffic Safety**

The Division of Highway Traffic Safety (DHTS) supports its core mission of reducing crashes, injuries, and fatalities primarily through education and enforcement efforts. The Division’s programs are funded through National Highway Traffic Safety Administration (NHTSA) dollars, and include:

- Grants to state, county and municipal agencies, including priority funding for pedestrian projects in recent years. Approximately 20% of all DHTS grants are for pedestrian safety programs. Grant applicants must be pre-approved for application based on the crash rate in their town. Thus, the approval rate is

high. Selected pedestrian projects must utilize the Comprehensive Pedestrian Safety strategy of combining education, enforcement, and engineering. The education component places a specific emphasis on high-risk groups including children, senior citizens, and non-English speaking residents. DHTS grants are frequently used to pay for police overtime and for police officers to actively search out motorists and pedestrians exhibiting actions that could jeopardize pedestrian safety. Finally, engineering improvements such as enhanced crosswalk striping and signs are also funded. Agencies must document uses of the money and results of the program. Based on this documentation, funded programs in the pilot locations of Paterson, Jersey City and Elizabeth have led to a 10-25% reduction in pedestrian crashes.

- Statewide advertising campaigns through a contract with the NJ broadcaster's association. This 10 year contract gives DHTS access to radio air time on all 60 stations in New Jersey once per month.
- Production and distribution of pedestrian safety "giveaways" statewide.
- Educational demonstrations using the Traffic Safety Cruiser at parades and fairs. The Cruiser is a former NJ TRANSIT bus, equipped with video equipment for educational programs and brochure distribution.
- Various educational programs, including two pedestrian safety educational kits:
  - Walk Safely Seniors
  - Walk Safely Children

### **Metropolitan Planning Organizations**

MPO involvement in pedestrian safety education and enforcement is relatively limited. The South Jersey Traffic Safety Alliance, which is housed at the South Jersey Transportation Planning Organization (SJTPPO), conducts Safety Needs Assessment Surveys every other year. The assessment includes questions to help identify pedestrian high risk locations. The survey results have not yet been used to initiate pedestrian studies, but this is a potential use for this survey. (The Safety Alliance conducts bicycle safety programs in schools, but does not have a similar pedestrian program.)

### **County Programs**

The DHTS sponsored the formation of 12 "Community Traffic Safety Programs" at the county level and MPO level. Many of these organizations, which include the SJTA (discussed above) and the county programs discussed below, continue to receive funding. These groups serve as the subregional extension of the 3 regions for DHTS (6 counties each – north, central, and south), and are active in enforcement, education, and engineering projects.

The Bergen County Office of Highway Safety has produced two pedestrian safety educational kits: Amber, which focuses on seniors, and Walk Safely with the Universal Safety Squad, which focuses on children. Each kit includes a videotape, educational curriculum, and related fact sheets and resource materials. Atlantic County's Highway Safety Task Force has also engaged in a number of pedestrian safety education projects.

The Burlington County Engineering Department has partnered with the County Sheriff's Office on Safe Routes to School initiatives. This program included radar activated signs showing speeds in 6 school zones adjacent to the flashing lights. The signs have made a significant difference in speed limit compliance and provided data in support of lowering the speed limit in Ayerstown. Burlington County has also formed a County Traffic Safety Committee, comprised of personnel from various departments within the County, to collaborate on pedestrian and motor vehicle safety programs.

### **Community-Based Programs**

With funding and program support from the Division of Highway Traffic Safety, many communities have launched school-based pedestrian safety education. The DHTS Walk Safely Children initiative in 2003 featured the distribution of videos, coloring books, brochures, and giveaways to school children via the county school nurses' association. Municipal police departments are also active in local educational efforts. For example, following a series of pedestrian fatalities on Route 322 in Hamilton Township, Atlantic County, local police performed a door-to-door campaign to alert residents to the need to use caution in crossing the roadway.

### **Transportation Management Associations**

Many of New Jersey's Transportation Management Associations (TMAs) are also spearheading pedestrian safety educational efforts. The Keep Middlesex Moving TMA sponsors the "Crosswalk Flag Program", which is offered free to all Middlesex County communities through a grant from the NJDOT. This program provides brightly colored flags at receptacles near intersections for pedestrians to wave while crossing the street. Additionally, KMM offers tips on training pedestrians and drivers how to properly use the flag system and how communities can maintain this program.

The Greater Mercer Transportation Management Association offers workshops for municipal officials in Mercer County on Transit-Oriented Design, bikeable and walkable communities, and traffic calming practices, among other topics. The Cross County Connection TMA, which serves the counties of Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester and Salem, provides similar educational assistance.

### **Private Sector Programs**

The four American Automobile Associations in New Jersey, AAA Mid-Atlantic, AAA North Jersey, New Jersey Automobile Club, and AAA South Jersey, are involved in several pedestrian safety educational efforts, including:

- Brochures such as “Pedestrian Safety: The Most Important Steps She’ll Ever Learn,” “Parents, Children, and Traffic,” “Parents, Safeguard Your Children,” “The Safest Route to School: A Guide for Parents,” “Safe Walking Tips,” and “Getting Children to School Safely: Parents are the Key.”
- Press Releases on pedestrian safety coinciding with Daylight Savings Time, Halloween, School Year Opening, School Year Closing, Highway Construction Season
- Public Service Announcements on local TV and Cable stations
- Otto the Auto, a remote controlled car used when speaking to children on traffic safety issues

The American Associated for Retired People (AARP) sponsors the “Rules of the Road” educational campaign to encourage grandparents to help teach their grandchildren how to be safe pedestrians.

Additionally, the Active Living by Design Program of the Robert Wood Johnson Foundation (RWJF) is involved in promoting pedestrian safety, especially in New Jersey, which is the home to the Foundation.

The National Safe Kids Campaign is locally sponsored in New Jersey by several organizations, including the Northern New Jersey Safe Communities, Safe Kids Northern New Jersey, and the Atlantic Health System. Education outreach activities of this group include: the quarterly newsletter, *PreventionWorks*, and a website with safety information for “At Home”, “On the Road,” and “At Play” (<http://www.preventionworks-nj.org/>).

### **Related Programs with Pedestrian Safety Implications**

Measures targeting driving habits more generally are also important for pedestrian safety. Such initiatives include:

- “Take Five Arrive Alive” and the #77 aggressive driving campaigns
- Measures to combat drunken driving and public health programs targeting alcohol abuse generally

## **DEMONSTRATION PROGRAMS**

A number of other pilot or demonstration programs provide local governments with assistance in creating more walkable environments. These include:

### **Safe Routes to Schools**

NJDOT, local experts and The RBA Group consultant team have been working on a statewide *Safe Routes to School* program for New Jersey. Safe Routes to Schools (SRTS) is a community approach to encourage more people to walk and bicycle to school safely, improve road safety and reduce child casualties, improve children's health and development, and reduce traffic congestion and pollution.

Community-based tools and resource materials have been developed to address the diverse urban, rural and suburban character of New Jersey's schools. Products such as walkability checklists, local "success stories," fact-sheets with information on New Jersey school busing policies and safety issues, and a "how-to" guide for developing a Safe Routes to School program will become part of a statewide website.

NJDOT will also select and sponsor three SRTS demonstration school sites this year, providing technical assistance to public schools and municipalities in launching successful SRTS activities.

## **TRANSIT VILLAGE INITIATIVE**

NJDOT, NJ TRANSIT and other state agencies have developed the *Transit Village Initiative* to encourage Transit-Oriented Development (TOD). While not specifically a pedestrian safety program, this initiative encourages provision of exemplary pedestrian facilities around transit stations. Under the program, the State recognizes as Transit Villages certain municipalities that have taken aggressive steps to revitalize the quarter-mile to half -mile radius around a transit station. Since 1999, 16 communities have been designated as Transit Villages.

### **Smart Future Planning Grants**

The Office of Smart Growth (OSG) in the NJ Department of Community Affairs administers *Smart Future Planning Grants* to communities across New Jersey. Again, while the grants are not specifically directed to pedestrian safety, municipalities have received grants to plan for transit-oriented, walkable developments and other initiatives of benefit to pedestrians.

### **Local Aid for Centers of Place**

NJDOT provides significant municipal and county transportation assistance under the Local Aid and Economic Development Program. The *Centers of Place* program

assists municipalities that participate in implementation of the New Jersey State Development and Redevelopment Plan (SDRP), which includes provisions for pedestrian mobility. Grants of \$750,000 to \$3 million are awarded under this program to encourage development where infrastructure exists to accommodate that growth.

### **Safe Corridors Program**

Another relevant initiative of the Safety Bureau is the *Safe Corridors* program, an interagency effort to improve safety on 10 designated state highway corridors throughout the State. Although the focus of the program is on motor vehicle safety, pedestrian safety improvements are being addressed as well. For example, on the Route 9 Safe Corridor project, a need was identified for better public information to help transit passengers safely access bus stops along the corridor. A bilingual pedestrian safety information program targeted to bus passengers was implemented. On the Route 46 Safe Corridor project, pedestrian components include crosswalk and curb ramp improvements.

## **PLANNING AND DESIGN**

NJDOT and its partner organizations are involved in a variety of multi-modal planning and design initiatives which will benefit future pedestrians and proactively help to prevent future hazards.

### **Bicycle and Pedestrian Master Plan**

In 2004, NJDOT published a comprehensive update to the state's *Bicycle and Pedestrian Master Plan*. The Plan sets out policy and programmatic recommendations for improving pedestrian conditions statewide. It also identifies priority pedestrian corridors based on a combination of pedestrian demand and roadway characteristics. Both the priority corridors and the screening tool used to develop them have the potential to become an integral part of New Jersey's pedestrian safety management process.

### **Local Bicycle and Pedestrian Planning Assistance Grants**

The *Local Bicycle and Pedestrian Planning Assistance Program* was established in 1998. To date, NJDOT has funded 37 planning grants to municipalities throughout the state under this program. Many of these studies have explicitly addressed pedestrian safety issues, with recommendations for completing sidewalk networks, improving midblock or intersection accommodations, or implementing traffic calming measures.

### **Smart Corridors (Integrated Land Use and Transportation) Program**

The Division of Project Planning and Development (DPPD) has launched the *Smart Corridors Program* with 18 pilot corridors currently under study and investigation. In

partnership with other state agencies and local governments, NJDOT is working to develop corridor plans that better integrate transportation and local land use patterns, provide for more pedestrian-friendly streetscapes, lower design speeds, and incorporate traffic calming features where appropriate. DPPD is also providing planning assistance and consultant resources to local jurisdictions to help them develop land use planning alternatives which shift trips to non-automobile modes and make better use of the local road infrastructure, with a goal of improving network connectivity. Several of these corridor plans have incorporated the creation of new streets and sidewalks in a traditional grid pattern, relocation of parking behind stores, reorientation of buildings towards the street for easier pedestrian access and an enhanced walking experience, and the creation of pedestrian pathways throughout new mixed-use developments.

### **Safety Conscious Planning Initiatives**

The three MPOs, NJDOT, DHTS, Rutgers's Center for Advanced Infrastructure and Transportation (CAIT), and other state, county, and local agencies are collaborating in a statewide *Safety Conscious Planning* initiative that addresses ways to more efficiently combine safety engineering with traffic engineering. As a regional aspect of this effort, the NJTPA has initiated "The Development of Regional Safety Priorities" project as a component of the 2030 Regional Plan to identify transportation safety needs and solutions in northern and central New Jersey. The travel safety needs of senior citizens, school children, people with mobility impairments, the goods movement industry and low-income communities also will be included in this analysis.

### **Design Initiatives**

NJDOT design initiatives with pedestrian safety implications include:

- NJDOT has developed new pedestrian-oriented design guidelines to be incorporated in the State's *Roadway Design Manual*, along with new guidelines on bicycles and traffic calming. Codifying pedestrian design practices in the design manual will promote a more consistent approach to pedestrian accommodation in the design of new projects, with safety benefits. The guidelines will also be made available as stand-alone documents, serving to update NJDOT's existing guidance documents on pedestrian and bicycle friendly design.
- NJDOT has adopted the use of *pedestrian countdown signals* as the standard for new pedestrian signalhead installations statewide. In addition, NJDOT is testing the use of lighted crosswalks in several locations.

- NJDOT's *Context-Sensitive Solutions* process allows for design flexibility in certain circumstances, such as where the state highway also serves as a local "main street." This has enabled design exceptions such as the introduction of curb extensions and other traffic calming devices in areas with pedestrian demand, as recently implemented in the shore community of Avon-by-the-Sea. Similarly, at the entrances to several rural villages along Route 57 in Warren County, NJDOT will be introducing narrower travel lanes, colorized shoulders, and gateway signage to encourage motorists to slow down.

## **TRAINING AND TECHNICAL RESOURCES**

### **Statewide Bicycle and Pedestrian Clearinghouse**

In 2000, NJDOT provided funds to establish a Statewide Bicycle and Pedestrian Clearinghouse at the Voorhees Transportation Center, Rutgers University. The Clearinghouse has provided information and technical support for a variety of initiatives, including numerous pedestrian safety forums and issue papers.

### **Continuing Education Workshops**

NJDOT has sponsored or co-sponsored a significant number of continuing education workshops for transportation professionals that include pedestrian friendly design. Examples include "Real Intersection Design" workshops, Pedestrian Safety Road Shows, Context Sensitive Solutions training, Safety Conscious Planning workshops, and in-house training on FHWA's Guidelines for Senior Drivers and Pedestrians.

### **Model Circulation Element**

NJDOT is currently developing a guide for municipalities on the preparation of the Circulation Element of the local master plan. The guide incorporates principles of smart growth, walkability, and transit-friendly development with numerous examples of successful pedestrian projects.

## **PEDESTRIAN SAFETY DATA AND ANALYSIS CAPABILITIES**

The Safety Bureau is working to improve the quality of the crash reporting and data management that underlie the Safety Management System and has made major strides in this effort for the 2001-2003 data years used in this study. These efforts include police training, complete redesign of the crash report form, electronic transmission of crash report data, and significant upgrades to the database and query tools utilized at NJDOT.

Anticipated upgrades to the safety data include greater use of electronic transmission between municipalities, GPS-based data, GIS data mapping, and more query tools on the NJDOT website.

The New Jersey State Police issues Fatal Accident Reporting System (FARS) reports every month. These reports provide a short synopsis of fatal crashes by location and a running total per calendar year.

### **ADVOCACY SUPPORT**

Two key initiatives have been led by NJDOT to provide advocacy support for pedestrian accommodations in New Jersey:

- NJDOT helped to establish a Pedestrian Task Force in 1999. The Task Force includes a variety of stakeholder organizations and meets on a monthly basis.
- NJDOT sponsored a Common Ground summit in 2004 to explore a wide range of issues in providing for pedestrian-friendly, active communities.

### **RELATED POLICY INITIATIVES**

NJDOT and several New Jersey legislators have also been developing legislative proposals to strengthen pedestrian rights at crosswalks and improve motorist compliance with existing crosswalk law. Legislation was recently passed that increases the fine for failing to yield to a pedestrian in a crosswalk to \$100.

NJDOT has established a Safety Management Task Force with a broad mission that includes improving pedestrian safety. The Task Force is envisioned as the primary body responsible for implementing the recommendations of this study.

## CHAPTER THREE: BEST PRACTICES IN STATEWIDE PEDESTRIAN SAFETY MANAGEMENT

Relatively little comparative research has been done to establish best practices for pedestrian safety management at the state level. Most pedestrian safety research has been geared for local application and has concentrated on the identification and assessment of countermeasures for different crash types, rather than the overall strategies, policies and procedures needed to manage the various facets of pedestrian risk at the state level. At present, to our knowledge no systematic national research has been done to evaluate the effectiveness of statewide pedestrian safety programs or statewide investment patterns in reducing crash risk over time. For this reason, little guidance is available to state DOTs seeking to determine the most effective allocation of resources between capital projects ("engineering") and behavioral strategies such as education and enforcement.<sup>21</sup>

Several efforts have been made to inventory the states' pedestrian programs, including safety related programs. FHWA conducted a survey of the states' pedestrian safety planning efforts in 2004.<sup>22</sup> An earlier inventory by the Maryland State Highway Administration compiled program information from 12 states.<sup>23</sup> In 2002, FHWA sponsored an inventory of pedestrian safety campaign materials including those in use by 16 states.<sup>24</sup> State-by-state analyses have also included benchmarking efforts, such as the scan of state DOT practices undertaken by the National Center for Bicycling and Walking.<sup>25</sup> The National Center study included comparative indicators such as whether or not sidewalks were routinely included in state highway projects, the existence of staff training programs, and the use of measurable objectives to assess progress toward achieving statewide pedestrian goals. Finally, a variety of conference papers detail the efforts specific states have taken to develop strategic approaches to pedestrian safety management.

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<sup>21</sup> Since this writing, FHWA has developed a guide for states and cities on how to prepare pedestrian safety action plans.

<sup>22</sup> FHWA Office of Safety, draft compilation, May 2004

<sup>23</sup> Maryland State Highway Administration Research Division, "State of the Art Pedestrian Safety Programs and Literature Search," February 2001

<sup>24</sup> LISBOA, Inc., "Report on Task A: Review of Existing Pedestrian Safety Campaign Materials," prepared for FHWA, January 2002

<sup>25</sup> Bill Wilkinson and Bob Chauncey, "Are We There Yet? Assessing the Performance of State Departments of Transportation on Accommodating Bicycles and Pedestrians," National Center for Bicycling and Walking, February 2003

## **INTERVIEW SURVEY OF SELECTED STATES**

To supplement the available literature and focus on comparative practices of specific interest to this study, PB conducted a telephone/email interview survey of current practices in the following 8 states:

- New York
- Oregon
- Michigan
- Wisconsin
- Washington State,
- Florida
- Maryland
- Vermont

The interview survey included questions on the states' approaches to identifying, tracking and addressing pedestrian safety problems, the inclusion of pedestrian safety features in highway projects, education and enforcement programs, coordination with local governments, and the coordinators' assessment of priority unmet needs.

## **SYNTHESIS OF FINDINGS**

This section compares the states' responses by topic to provide a basis for comparison with New Jersey and for the identification of useful practices for potential application in New Jersey. The following topics are covered:

- Process for problem detection, response, and follow-up
- Crash data quality and analysis
- Education and enforcement programs
- Addressing pedestrian safety on local roads
- Capital investment in pedestrian safety
- Additional priorities/unmet needs

### **Process for Problem Detection, Response and Follow-up**

The survey shows that New Jersey is fairly typical of other states in the mechanisms used to identify pedestrian problem locations for state intervention. Most states surveyed rely principally on communications from citizens, elected officials or regional staff to identify pedestrian problems for follow-up action. Crash data reports are used by some states, but these appear to form a secondary source of information. States report the following mechanisms for detecting pedestrian safety problem locations:

- Concerns expressed by citizens or elected officials (NY, WA, OR, MD, VT)
- Publicity concerning fatalities or injuries (NY, OR, MD, VT)
- Regional staff with first-hand knowledge of trouble spots (NY, WI, WA, FL)
- Suggestions from pedestrian advocates (WI, VT)
- Suggestions from community safety teams (FL)
- Suggestions from district safety champions (FL)
- Results of technical studies (NY)
- Crash data reports (NY, FL, WA, MD, VT)<sup>26</sup>

One key difference is in the routine reliance many states place on regional DOT staff to identify specific problem locations or corridors. In contrast to centrally administered DOTs such as NJDOT, states with district management have staff closer to the problem areas, with advantages both in problem detection and follow-up. Several of the states have either regional bike/ped staff or regional safety staff with some knowledge of bike/ped issues, serving to extend the capabilities of the coordinator and central office staff.

Once a problem is identified, the range of responses is similar to those seen in New Jersey, again with the difference that district offices may be the ones pursuing funding for improvement projects. As in New Jersey, some problems trigger pipeline project initiation, with pedestrian projects competing against other project types; others are referred to highway maintenance units. Few states appear to designate capital funds specifically for pedestrian safety. However, Florida's new Strategic Highway Safety Plan procedure requires each district to identify priority corridors for pedestrian safety improvement on an annual basis.

The states described several useful practices for project identification and development:

- Washington State uses a Pedestrian Risk Program that combines the local expertise provided by a field team of regional "point" persons with an objective set of criteria and a prioritization process developed by the state to identify locations for study.
- Oregon, Washington, and Florida all recommend analyzing pedestrian risk along corridors, rather than focusing solely on individual intersections or midblock locations. Florida specifies an average corridor length of 3 miles for these studies.

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<sup>26</sup> Maryland SHA red flags areas with a certain threshold of pedestrian fatalities for candidate safety improvement projects.

- Washington State includes local pedestrian advocacy group members in the project study process, along with traffic engineers.
- Oregon targets pedestrian problem locations for a combined approach of engineering countermeasures and targeted education and enforcement (similar to the approach New Jersey is using to address motor vehicle safety in the Safe Corridors program).
- Similarly, Florida targets schools near high-crash locations for school-based pedestrian safety training.
- On one project, Oregon implemented a coordinated approach with the local transit provider to address transit-related pedestrian fatalities along an 8-mile corridor. The transit provider is relocating or closing transit stops and the DOT is installing crosswalks with median islands and advance stop bars; these measures are to be evaluated after 2 years for potential replication in other areas.

The interviews revealed a variety of assumptions about what constitutes a "proactive" approach to pedestrian safety. Some respondents equated a proactive approach with the systematic use of crash data to identify priorities for project development. Others viewed the use of risk measures or corridor-level pedestrian assessments as a more proactive way to generate priorities, since these methods do not simply respond to crashes that have already taken place but identify risks more comprehensively. In line with this distinction, some states are seeking to apply standard pedestrian countermeasures to documented hot spots on a more systematic basis, while others are looking more to the design of new facilities to preventatively build in pedestrian safety features.

### **Crash Data Quality and Analysis**

The survey revealed a great deal of variation in the quality and currency of pedestrian crash data, as well as the formats in which it is available to the coordinators for identification and monitoring of trends.

Most states experience a significant lag between crash occurrence and the availability of reports to the coordinators. As in New Jersey, the data is often fairly old by the time it reaches the coordinator or is incorporated into planning and program development. Of the states surveyed, Washington State had the most current system with 2003 data in use in 2004. Vermont's data is generally about a year old. The states described a variety of efforts being made to improve the quality and utility of pedestrian crash data. For example, as in New Jersey, Vermont DOT had recently worked with the state police to improve the reporting form.

Several states have conducted comprehensive analyses of their pedestrian crash data. Some of the studies were done to identify hot spots, as in New Jersey. Others, such as Wisconsin's and Florida's, were done for the purpose of gauging general patterns or trends in the types of crashes and associated factors. For example, as background research for their 2020 pedestrian plan, Wisconsin DOT examined all pedestrian fatalities in the state from 1997-99 to determine the degree of alcohol involvement and to investigate factors such as age, posted speeds, and rural/urban distinctions.<sup>27</sup> These studies can involve laborious analysis of individual police reports, especially if automated reporting systems do not include all of the variables of interest or if fields are left blank. Perhaps for this reason, few states indicated plans to continuously update these crash or fatality profiles; some planned to do so on an occasional basis.

Only one of the states investigated, Washington, appears to routinely map pedestrian crashes in GIS for monitoring purposes. Others will prepare maps on special request. NYSDOT has developed a software platform, the New York State Pedestrian Bicyclists Reporting System, to provide crash data at the county and municipal level. The data includes pedestrian action and other human and apparent factors. Individual corridors can be analyzed and GIS maps prepared on request. In Florida, pedestrian crash mapping has been done by some of the individual jurisdictions, such as Miami.

### **Education and Enforcement Programs**

A wide variety of pedestrian safety education and enforcement programs are in place among the states interviewed. Some of the more innovative approaches include a mobile safety unit sponsored by the state of Maryland that will take pedestrian education into Baltimore's inner city, and Wisconsin DOT's study on judges' resistance to prosecuting pedestrian violations. Several states have conducted yield to pedestrian "sting" operations as well as law enforcement training and recognition programs. Safe Routes to Schools programs have also become popular in most of the states surveyed.

As in New Jersey, the responsibility for pedestrian safety education is often located outside the bike/ped unit, either in a traffic safety bureau (as in Wisconsin) or the state's Education department (New York). Most of the states surveyed indicated good working relationships among the various bureaus responsible for pedestrian safety.

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<sup>27</sup> Florida DOT investigated fatality data (for all modes) and compared large, medium and small counties to identify those with above average pedestrian fatalities. This information was used to target educational efforts.

### **Addressing Pedestrian Safety on Local Roads**

None of the states surveyed has an active program of state intervention to initiate the development of pedestrian safety projects on local roads. Most will provide technical assistance and consider applications for local aid or hazard elimination funding for pedestrian projects, on the initiative of the locality. Oregon uses a streamlined funding application for pedestrian projects, regardless of road ownership. Washington State will not initiate local studies but will collaborate with the towns on them and help them locate funding, recognizing that most of their pedestrian fatalities are on local roads. NYSDOT has no formal venues for coordination with local governments on pedestrian safety issues.

Several coordinators mentioned the provision of design guidelines as the most useful role they could play in assisting municipalities with pedestrian issues on local roads. Some states are already doing this and others, such as Wisconsin, are preparing pedestrian design guidance documents.

### **Capital Investment in Pedestrian Safety**

Most of the states lack precise data on the capital investments made for pedestrian safety, since costs for highway-related pedestrian improvements are often not separately tracked. NYSDOT estimated that pedestrian safety projects represent about 1% of all highway funding. Oregon DOT put their estimate at 1.25%, or about \$10 million per year for pedestrian projects, about half for stand-alone projects and half for pedestrian measures incorporated within highway projects. Wisconsin provided information for the hazard elimination program, stating that 5-10% of those funds are spent on bike/ped projects combined.

### **Additional Priorities/Unmet Needs**

The coordinators had very different views on the needs they would address given additional funding. Both the New York and Florida coordinators saw the primary need as getting more professionals trained in pedestrian facility engineering throughout their states. Washington, Oregon, and Wisconsin all stressed capital funding needs, such as being able to fund more capital investments in urban areas (Washington), build more median refuges (Wisconsin), complete sidewalk gaps, and integrate crossings into all highway studies (Oregon). Maryland and Vermont identified public education and enforcement as priorities, along with sidewalk projects in downtowns and village centers (Vermont).

## **POTENTIAL APPLICATIONS FOR NEW JERSEY**

This review of other states' approaches to pedestrian safety has identified a number of practices of potential value to New Jersey, as well as confirmed New Jersey's leadership in certain areas. The following concepts are recommended for consideration in NJDOT's Pedestrian Safety Action Plan:

### **1. Cultivate local support networks for problem identification and follow-up, as in Washington State.**

Unlike the other states interviewed, NJDOT's centralized administrative structure puts the burden of investigating localized pedestrian safety problems on central office staff, who have many other requirements on their time. NJDOT has employed a variety of strategies to overcome the limitations of this centralized structure, including regional assignment of project development staff, extensive use of consultants, and sponsorship of technical training for local professionals. Other measures that could be considered to complement these approaches and extend staff expertise further include the following:

- Cultivate a network of local pedestrian advocates that could serve on location-specific study teams.
- Establish a Pedestrian Risk Program similar to Washington State's, which brings local expertise together with state-level project planning criteria to establish project priorities. In New Jersey, this approach might be combined with the implementation of the priority index system developed for the Bicycle and Pedestrian Master Plan.

### **2. Develop an integrated 3-E approach targeted to priority corridors, as in Florida, Oregon and Washington.**

- Pedestrian education and enforcement measures could be focused on selected priority locations in combination with engineering measures (similar to the approach NJDOT is using in the Safe Corridors program). For example, school-based pedestrian safety training could be offered on a priority basis in schools near identified safety problem areas and/or those schools located within the highest priority pedestrian corridors identified in the Master Plan.
- For such corridor programs, the focus should be more comprehensive than individual intersections, including a review of the pedestrian network for the corridor as a whole.

- 3. Establish a streamlined funding application process for pedestrian projects, as in Oregon.**
  - NJDOT could consider a separate, streamlined funding process for pedestrian projects that would be the same regardless of the ownership of the roadway, similar to that used in Oregon.
  
- 4. Create a GIS-based reporting system that can produce updated pedestrian crash maps on a routine basis, as in Washington State.**
  - A GIS-based system would allow anyone working on transportation improvements or planning projects in New Jersey to query the system and immediately identify the locations of all reported pedestrian crashes within their project's study area. This could apply to corridor studies, Tier 2 studies, Local Planning Assistance Studies, and Safe Routes to Schools plans, as well as safety conscious planning for municipalities, counties, MPO regions or other areas of interest. Having this information immediately available from an interactive GIS system, rather than having to request the data for each such study, would be immensely beneficial.
  - Over time, NJDOT could work toward linking crash factors and other data variables associated with each crash directly into the GIS database, allowing more sophisticated queries of crashes by age of victim, lighting conditions, pedestrian maneuvers, and the like. Being able to map this information for any given study area would be extremely valuable for the development of appropriate improvement measures.
  
- 5. Consider legislation to require municipalities to prepare local circulation plans that include a pedestrian element, as in Oregon.**
  
- 6. Expand training of law enforcement officers in pedestrian-related law and best practices for effective enforcement, as in Florida.**
  
- 7. Consider using a mobile teaching center (van) to provide pedestrian safety education to children in urban areas, as in Maryland.**

## CHAPTER FOUR: STRATEGIC ASSESSMENT AND RECOMMENDATIONS

NJDOT has undertaken a variety of initiatives to improve pedestrian conditions, add pedestrian facilities to state highway corridors, and assist local governments in creating more walkable environments. NJDOT, the Division of Highway Traffic Safety, and other agencies are also undertaking various educational and enforcement measures aimed at improving pedestrian safety. Important as these initiatives are, to date they have not been sufficiently coordinated or focused to achieve systematic reductions in pedestrian risks.

- NJDOT's policy on pedestrian accommodation has led to the inclusion of pedestrian signals and crosswalks in many highway projects. NJDOT has been a national leader in providing technical guidance to local governments and transportation professionals on pedestrian issues. With the advent of Context-Sensitive Design and smart growth, there is far more attention than in the past to the goal of creating walkable places. However, relatively few initiatives systematically target documented pedestrian hazards.
- An exception is NJDOT's effort to address the 80 high pedestrian crash intersections identified in the Safety Management System. Roughly half of these locations have been investigated, and improvement concepts for many of them are in the NJDOT project pipeline. A limitation of this program is its exclusive focus on intersections, since a majority of pedestrian fatalities occur at midblock locations. Further, since only about 2% of the state's pedestrian fatalities occur at these 80 locations, even a complete elimination of pedestrian risks at these locations would have little effect on New Jersey's pedestrian fatality rate.
- NJDOT has recently undertaken several corridor-level pedestrian safety projects to address multiple fatalities along certain highway segments, as on Route 42 in Gloucester County. These corridor projects, by addressing risks in broader zones, provide a promising model for future efforts.
- Until recently, NJDOT lacked reliable information on pedestrian crash patterns for the state as a whole. Most previous analysis focused only on crash frequency and severity by location (i.e., intersection clusters) rather than the patterns of behavior, crash circumstances, or the demographic characteristics of the pedestrians and drivers involved. With improved reporting procedures underway and new data management systems in place, NJDOT is now in a

- position to monitor statewide pedestrian safety patterns and trends and use this information, in addition to locational clusters, as a basis for program development. Since statewide analysis of pedestrian crash trends is a new function for the Bureau of Safety Programs, new procedures and staff resources will be needed to develop and distribute this information.
- Perhaps as a result of the lack of systematic information, several misconceptions have developed about pedestrian fatalities in New Jersey. One is that most fatalities occur on local roads. In fact, as discussed in Chapter 2, NJDOT's data for 2001-2005 shows that 38% of the state's pedestrian fatalities occurred on state highways; another 27% occurred on county roads. Only 22% occurred on municipally controlled roads. This important distinction should inform future programs.
  - Another frequent misconception is that pedestrian fatalities mostly involve children and can be best addressed through programs such as Safe Routes to School. For the years 2001-2005, NJDOT data suggests otherwise: only 12% of pedestrian fatalities involved persons under age 20, and only 7% involved school-age children (ages 5-18). School-based programs offer many benefits in encouraging safe mobility, active living, and greater acceptance of nonmotorized modes of travel. However, in order to significantly reduce New Jersey's pedestrian fatality rate, programs will be required that address the needs and behavior of adult pedestrians, the drivers who are striking them, and roadway conditions that amplify these risks.
  - Chapter 2 showed that most of New Jersey's pedestrian fatalities occur away from intersections, often in conditions of darkness. Few NJDOT programs to date address the need for improved midblock crossing safety, which is a particular problem when intersections are far apart. Approaches such as the use of special pedestrian-oriented lighting at midblock crosswalks, raised medians, traffic calming to reduce speeds, and pedestrian-only signals are possible responses to this prevalent problem. These are relatively unusual methods for NJDOT, presenting both policy and organizational challenges. It is generally easier for NJDOT to install barrier fencing along medians. While barrier fencing can be an important strategy, and is the only reasonable option in some locations, tools that enhance crossability are also needed.
  - With some exceptions, it remains a challenge for NJDOT to work effectively across divisions to prioritize pedestrian safety improvements. Study participants report that despite NJDOT's policy on pedestrian accommodation, the inclusion of sidewalks and other pedestrian facilities in

- capital projects has not become enough of a priority. Some cite a lingering organizational culture of neglect of, or even antipathy to, pedestrian needs. Others attribute the problem to a lack of clear procedures for addressing those pedestrian issues that involve multiple units and divisions. New Jersey is not unique in this respect; similar challenges are being faced by state DOTs across the nation. Much can be learned in working with these other states.
- There is a need for a coordinated statewide strategy on pedestrian safety education. At the state level, this should include NJDOT, the Division of Highway Traffic Safety, and the Motor Vehicle Commission, whose pedestrian safety initiatives are largely independent of one another. Coordination would provide for greater efficiency and allow for programmatic innovation. For example, safety education and enforcement grants under the federal Section 402 program could be combined with targeted corridor improvements to provide a concerted approach on problem corridors. The MVC's extensive contact with the driving public provides an unsurpassed opportunity to educate drivers on pedestrian rights. The Department of Health and Senior Services should also be brought into this partnership to help address the specific challenges of educating senior pedestrians.
  - NJDOT's highest priority for the near future should be reducing the number of fatal and severe pedestrian crashes on the state highway system. Strategies for doing this are somewhat different than strategies for the general improvement of pedestrian conditions. In contrast to overall measures, a focus on fatal and severe crashes implies a greater emphasis on 1) adult pedestrian needs and behaviors, 2) midblock locations, 3) the need to address illumination issues, and 4) the challenge of designing effective educational strategies for the state's urban areas, where literacy in any language cannot be assumed.
  - In order to address fatal and severe injuries on the state highway system, four types of targets should be considered:
    - The main *groups* of people being killed and injured;
    - The main *situations* involved in these crashes;
    - The specific *behaviors*, both of pedestrians and drivers, that are associated with these fatalities and injuries, and
    - The *locations* where significant problems occur, by roadway segment or zone.
  - While much is known about each of these characteristics from a national standpoint, more analysis is needed to uncover the specific patterns that apply

in New Jersey, including the relationships among these variables. Understanding the specific environmental and behavioral risks affecting a particular group of pedestrians, as well as the characteristic actions of drivers, will help New Jersey design more effective educational and enforcement strategies. For example, a special campaign may be needed to reach non-English speaking adults who are at risk while walking along the roadway.

- In addition to the “3E” approaches, consideration should be given to health and behavioral strategies for improving the physical competency of both pedestrians and drivers. Such strategies may include the implementation of vision testing upon license renewal and improved access to vision care for indigent pedestrians. Alcohol and substance abuse programs are also relevant.
- By establishing a more comprehensive cost-benefit methodology for the justification of pedestrian projects, one which is not limited to intersections, NJDOT may be able to use federal Hazard Elimination funds for a broader range of pedestrian safety improvements. This is potentially the most important step NJDOT can take to accelerate the funding and implementation of pedestrian safety infrastructure improvements.
- Finally, both the Office of Bicycle and Pedestrian Programs and the Bureau of Safety Programs are seriously understaffed for the level of effort required to implement a comprehensive pedestrian safety strategy on a statewide basis. Consideration should be given to the appointment of a full-time Pedestrian Safety Coordinator in one of these units.

The remainder of this report presents initial recommendations for consideration. The recommendations address the following 14 areas:

1. Overall policy focus
2. Roadway design policies and standards
3. Project planning, programming, and development
4. Facility maintenance
5. Research and innovation
6. Data and reporting
7. Education
8. Enforcement
9. Technical guidance
10. Organizational structure and coordination
11. Legislation
12. Federal policy
13. Implementation measures

### 14. Accountability

A review process will be needed to determine which of the recommendations are most promising for inclusion in the statewide Pedestrian Safety Action Plan, and to set priorities and define responsibilities for implementing those that are selected.

## OVERALL POLICY FOCUS

This section recommends policy changes to better address pedestrian safety on a statewide basis. Recommended policies would refocus attention on the state highway system, establish a zone-based approach to risk reduction, and develop a new methodology to help qualify non-intersection pedestrian improvements for federal Hazard Elimination funding. Another key policy initiative would incorporate a mandatory pedestrian safety review into NJDOT's access permitting process. Finally, a mechanism would be developed for encouraging pedestrian safety improvements on county-owned roads.

### 1. Focus first on the state highway system.

For the next 3 years, NJDOT's pedestrian safety efforts should focus on reducing pedestrian fatalities and injuries on the state highway system. A coordinated effort is needed to get all of the involved units working together toward this goal. Since county roads account for a significant percentage of fatal pedestrian crashes, a second priority is to help the affected counties adopt a more systematic approach to pedestrian hazards.

Only once a significant reduction in pedestrian fatalities on state and county roads has been achieved should NJDOT branch out to devote scarce staff resources to the time-consuming and complex process of initiating municipal projects to address pedestrian safety issues on local roadways. (Local aid, technical assistance, and other program funds would of course continue to be available for such projects.) So that NJDOT can concentrate on improving pedestrian safety on state highways, an appropriate division of labor should be worked out, with organizations such as the MPOs or TMAs taking on the responsibility of fostering improvement concepts and grant applications for municipal-level pedestrian projects.<sup>28</sup>

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<sup>28</sup> There are many precedents for this function. DVRPC has provided technical assistance to several of its member municipalities on pedestrian concerns, SJTPO has helped local governments develop sidewalk projects, and NJTPA has initiated a safety conscious planning initiative. CATS, the MPO for the Chicago region, is beginning a demonstration program in which they will map pedestrian crashes for individual municipalities, then meet with local officials to discuss possible countermeasures, as well as distributing educational materials for use in local programs. The Orlando, Florida MPO has also undertaken a pedestrian safety program with an enforcement component. The MPO for the Washington, DC region has created an ambitious, long-term pedestrian and bicycle safety campaign known as Street Smart. The MPO board has agreed to assess each member jurisdiction an amount equal to five

**2. Establish a zone-based risk reduction approach.**

NJDOT should adopt FHWA’s guidance and establish a zone-based risk reduction approach to pedestrian safety project development and prioritization, beginning with zone identification on the state highway system.<sup>29</sup> Zones would be identified through a combination of crash history data from the Bureau of Safety Programs and estimated rates of pedestrian exposure to motor vehicle/pedestrian conflicts. Exposure rates could be derived from the pedestrian priority corridor assessment used in the Bicycle and Pedestrian Master Plan, which reflects a combined index of demand and crossability. The precise zone boundaries, including any side streets to be included in the zone, should be selected in collaboration with county and local officials. Zonal or corridor-based approaches to the development of pedestrian countermeasures have been implemented in several states, including Washington, Oregon, and Florida.

**3. Develop a new cost-benefit methodology for zone-based projects.**

NJDOT should work with FHWA to develop an appropriate methodology for assessing the costs and benefits of zone-based pedestrian safety projects. This could potentially enable the projects to qualify for federal funding under the Hazard Elimination program.

Since zone-based risks are geographically diffuse, this new methodology would need to incorporate an assessment of risk, rather than relying strictly on crash history. Other states using such an approach include Virginia, Oregon, and Washington. For example, Virginia DOT evaluates pedestrian (and bicycle) safety projects based not only on crash data but on risk factors. Projects may target either the number and severity, or the risk of and exposure to, crashes.

It is also possible that with an appropriate methodology in place, FHWA would entertain the use of these funds for more “generic” categories of improvement measures, such as the installation of pedestrian-oriented lighting or completion of missing sidewalks in areas of high demand, whether or not these locations have an established history of severe pedestrian crashes.<sup>30</sup> Establishing a new

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cents per capita to provide secure funding for the campaign, which previously relied on uncertain year-to-year funding from member states.

<sup>29</sup>NHTSA/FHWA, “Zone Guide for Pedestrian Safety,” 1998.

<sup>30</sup> Several states provide models for this type of approach. For instance, Maine DOT funds an ongoing statewide guardrail upgrade program based on an assumed benefit/cost ratio for this type of improvement. A similar approach might be used to justify a statewide program to install pedestrian lighting, with several pedestrian zones completed in each funding cycle.

methodology for the justification of pedestrian projects, one which is not limited to intersections, is potentially the most important step NJDOT can take to accelerate the funding and implementation of pedestrian safety infrastructure improvements.

#### **4. Select an initial set of Pedestrian Safety Zones for improvement projects.**

From the Pedestrian Safety Zones identified in 1.2, approximately 6-10 zones would be selected for an initial program of analysis and remediation. This effort could work on the same principle as NJDOT's Safe Corridors program and combine engineering, enforcement, and targeted educational strategies within each zone. In prioritizing zones, as with many NJDOT programs, an attempt should also be made to include several regions of the state, both for geographic equity and to build local experience with the process. Once work on these zones was underway, another set could be identified for a second round, and so on.

#### **5. Develop an integrated "3E" approach for each zone.**

An integrated 3E (Engineering, Education, and Enforcement) approach should be developed for each Pedestrian Safety Zone selected for the program. This could include multifaceted efforts to reduce excessive vehicular speeds in these zones, through speed limit enforcement, traffic calming measures, and motorist education. Speed limit reductions may also be sought. Where bus or other transit service is provided, NJ TRANSIT or the appropriate transit provider should be part of the process for developing zone improvements. Existing bus stop locations and crossing patterns should be carefully evaluated. If there are schools in the zone, access routes should be evaluated and school-based pedestrian safety training should be provided through a partnership process with the municipality and school district. Similar evaluations should be made for senior housing complexes and senior centers in the zones. While this program would be focused on pedestrians, it should include attention to motor vehicle and bicycle hazards in the zone as well, just as the Safe Corridor projects have incorporated some pedestrian elements.

#### **6. Apply a participatory process to zone definition and project development.**

Encourage MPOs, counties, local governments and citizens to comment on the Pedestrian Safety Zones and their priority order for remediation, and during the study process, to participate in defining zone endpoints and propose connecting county or local streets for inclusion in the analysis and remediation process on a state-local partnership basis. A participatory process would also help to identify specific local factors and concerns to be taken into account in developing improvements. Consideration could be given to establishing a permanent

structure for stakeholder and citizen participation in pedestrian problem-solving that would go beyond the life of any individual project. Washington State's Pedestrian Risk Program is an example of a local support network that brings local expertise together with statewide project planning criteria to establish project priorities.

**7. Conduct before and after studies to gauge how effective the zone program and individual zone projects have been in reducing pedestrian fatalities and injuries.**

**8. Incorporate a mandatory pedestrian safety review into NJDOT's access permitting process.**

An important step in preventing future problems is to proactively review pedestrian safety issues when an access permit is under consideration. In numerous instances around the state, pedestrian risks can be traced to the opening of new trip attractors across a multi-lane arterial from an existing pedestrian trip generator.<sup>31</sup> For example, a supermarket opens across the state highway from an apartment complex, or a fast food restaurant or convenience store opens across from a school. Soon after, individuals – often persons without access to a private vehicle -- are understandably tempted to fulfill basic needs at the new facility directly across from their home, school, or workplace. Some may take jobs in the new commercial establishment, and walking across the highway becomes an obvious route to work despite the risks. Once several of these pedestrians are hit by cars, a pedestrian safety crisis is announced.

A process should be established for detecting these situations when they are about to occur, and requiring developers to provide or pay for appropriate pedestrian safety facilities in these areas, such as sidewalks, refuge islands, enhancements to crosswalks, and in some cases, pedestrian barrier fencing. Developers acquiring access permits on the state highway system are receiving a major public benefit and should generally be willing to pay a modest fee to cover these facilities. The access permit process provides an important window of opportunity to detect the creation of these new “pedestrian desire lines” and attempt to accommodate the projected crossing behavior. Consideration might be given to the creation of a statewide revolving fund that developers would pay into to finance these accommodations. With this approach, it might also be possible to subsidize a shuttle transportation service in selected areas where safe pedestrian crossings of the affected highway are simply infeasible. These initiatives could require new legislation.

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<sup>31</sup> A similar pattern has been observed in Oregon, according to the ODOT Bike/Ped Coordinator.

**9. Develop a mechanism for working with NJ’s county engineering and traffic safety officials to identify and implement strategies for reducing risk on county highway system.**

NJDOT data show that over one in four pedestrian fatalities occurs on a county-owned road. Nearly one third of all incapacitating injury crashes also occur on county roads. Moreover, 46 of the state’s 80 worst intersections for pedestrians include at least one county road. A mechanism is needed for more systematically addressing pedestrian hazards on the county systems. The first step might be a summit meeting of county traffic safety officers to discuss the issues and possible solutions. NJDOT data on pedestrian crash patterns in each county could be mapped and provided to foster discussion. Other opportunities would include technical training workshops on pedestrian facility design, and incentive funding programs for county road improvements addressing pedestrian safety. These programs should be targeted to the counties with the most serious problems.

**10. Review existing policies and practices concerning bus stop siting and operations.**

NJDOT, NJ TRANSIT, and local government representatives should conduct an interagency review of current practices for locating official bus stops, as well as an examination of current practices involving unofficial or “courtesy” bus stops that are occasionally permitted along state highways. While the number of statewide pedestrian fatalities associated with bus transit access or egress is not known, these problems have been well documented for certain corridors. Pedestrian safety, motor vehicle safety, and the safety and effectiveness of the transit operation itself need to be carefully balanced when bus stops and shelters are sited. Attention is also needed to the access routes for express bus park-and-ride facility users, who must often cross a major roadway for one portion of their trip.

**11. Provide additional staff for the Office of Bicycle and Pedestrian Programs and the Bureau of Safety Programs.**

Both of these units are seriously understaffed for the level of effort required to implement a comprehensive pedestrian safety strategy on a statewide basis. Understaffing in related units is also a problem. For example, a lack of staff resources in Local Aid limits NJDOT’s ability to help local governments prepare applications and implement needed pedestrian safety improvements. Understaffing in Traffic Engineering limits the ability to rapidly process work orders for new crosswalk and signal projects. These staff constraints are perhaps the largest single obstacle to developing a comprehensive pedestrian safety strategy.

## **12. Roadway Design Policies and Standards**

This section recommends changes in design policies and practices related to pedestrian accommodation, including lighting, signals, signage, and crosswalks, among others.

## **13. Publish and widely disseminate the new NJDOT Pedestrian, Bicycle and Traffic Calming resource documents.**

The resource documents were originally developed to inform the development of new guidelines for pedestrians, bicyclists and traffic calming in the NJDOT Roadway Design Manual. The Pedestrian Accommodations resource contains important guidance on such topics as in-street Yield to Pedestrian signs, raised crosswalks, pedestrian signal phasing and timing, and curb ramp design. Relevant pedestrian-oriented design policies should also be incorporated in NJDOT's Design Templates initiative as it moves forward.

## **14. Clarify NJDOT's roadway design policy with respect to the installation of pedestrian safety features, such as median refuge islands, in high hazard locations.**

Several study participants have described reluctance within parts of the agency to implement pedestrian accommodations such as median refuges and traffic calming techniques as part of highway improvement projects. Recent research has confirmed the findings of earlier studies that raised medians are one of the most effective techniques available for improving pedestrian safety.<sup>32</sup> NJDOT should consider adopting a more proactive policy or internal warrant process for the installation of raised medians in pedestrian hazard areas.

## **15. In Pedestrian Safety Zones, NJDOT design and traffic engineering units should give special consideration to design treatments that favor pedestrian safety, even if traffic performance may be affected.**

When a project is being conducted in a Pedestrian Safety Zone, this should be a signal that a flexible design approach may be needed, and that some of the usual tradeoffs between pedestrian access and traffic performance may have to be made in the pedestrian's favor. Examples of design treatments that might be given special consideration include:

- Lead Pedestrian Indication/all red phase
- Longer duration pedestrian indication

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<sup>32</sup> FHWA, *Pedestrian Synthesis Report: A Review of Pedestrian Safety Research in the U.S. and Abroad*, 2004, p. 121.

- Median refuge islands
- Midblock pedestrian signals
- Midblock lighting
- Traffic calming devices
- Speed limit reduction

**16. Provide pedestrian-oriented lighting at intersections and at midblock crosswalks on a priority basis in all Pedestrian Safety Zones.**

Systematic investment in improved illumination in high demand areas may be one of the most promising strategic measures for reducing pedestrian fatalities.

**17. Consider the use of Leading Pedestrian Intervals (LPI) or longer all-red phases in pedestrian zones.**

The LPI gives pedestrians a head start into the intersection, making them more visible to turning motorists. Where heavy left turning movements conflict with high pedestrian crossing volumes, efforts should be made to reduce conflicts and optimize the signal for all categories of users, not just drivers. This measure could also include the judicious use of signs such as “Turning Traffic Must Yield to Pedestrians” (R10-15).

**18. Promote the use of fluorescent yellow-green crosswalk signs with arrows pointing to the crosswalk in all new highway projects and on an expedited retrofit basis in Pedestrian Safety Zones.**

**19. Promote greater consistency in crosswalk design across levels of government, in order to improve driver understanding and recognition.**

At present, motorists encounter multiple designs with widely varying marking and signage, making detection more difficult and lessening compliance rates. The goal should be to agree on 3-4 standard crosswalk designs, with recommended accompanying signage, for use in different situations.

20. **Disseminate guidelines on providing for ADA accessibility and safety in sidewalks, walkways and curb ramps.**
21. **To promote safer access by visually impaired pedestrians, develop a policy to install audible traffic signals and accessible pedestrian pushbuttons with audible feedback in pedestrian areas.**
22. **Continue installing vandal-resistant pushbutton designs, such as the “bull dog” style pushbutton.**
23. **In pedestrian zones with a higher than average concentration of senior citizens, or where senior pedestrian activity is known to be significant, assume a slower walking speed in establishing signal timings.**
24. **Implement FHWA’s senior-friendly design guidelines as the norm on NJDOT projects.**

As New Jersey’s population ages, much can be done to improve the user-friendliness and safety of the road system for both older drivers and pedestrians. Improvements aimed at motorists will often help pedestrians as well by reducing confusion at conflict points. FHWA has developed a senior-friendly design handbook: *Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians*. The handbook includes techniques such as extended pedestrian crossing time for senior walking speeds, pedestrian refuge islands, and larger street name signs.

25. **Improve local governments’ understanding of the NJDOT approval process for traffic control devices such as crosswalks and pedestrian signalheads.**

Many local officials appear to misunderstand NJDOT’s approval process for traffic controls on non-state roads. With abundant misunderstanding about which measures require NJDOT approval, which do not, and the process involved, NJDOT has become a convenient scapegoat for local inaction in situations where NJDOT policy does not provide a true impediment. The perception that a standard device that is helpful to pedestrians cannot be used because “DOT would never approve it” should be actively discouraged. A brochure or web page could be developed for this purpose.

## **PROJECT PLANNING, PROGRAMMING, AND DEVELOPMENT**

This section provides recommendations for new and enhanced techniques to better incorporate pedestrian safety into project planning and programming.

Recommendations include new methods of evaluation for pedestrian safety projects, as well as funding sources and options.

**1. For planning and project development purposes, create an updated Pedestrian Checklist that encompasses more information specifically related to pedestrian safety.**

The new checklist should include guidelines for detailed observation of motorist and pedestrian behavior patterns at conflict points to identify specific risks. An example is the checklist included in the FHWA/NHTSA “Zone Guide for Pedestrian Safety.” The checklist should also prompt planners to consider future pedestrian needs due to planned or probable development in the area.

**2. Incorporate the zone-based approach to pedestrian safety improvements discussed in section 1.0 into subarea planning and larger corridor projects, as appropriate.**

A GIS map of these zones would be an important tool for this effort.

**3. Adopt and utilize a safety-oriented Pedestrian Level of Service methodology for intersections.**

When discussing the trade-offs between pedestrian needs and traffic performance at a given location, pedestrian advocates are often at a disadvantage due to the lack of an accepted Pedestrian Level of Service measure. Adoption of a Pedestrian LOS methodology by NJDOT would help to level the playing field, making it possible to say that a particular intersection or approach “fails for pedestrians,” or that by lengthening the pedestrian interval, the intersection would “improve from an LOS of D to a B for pedestrians,” in much the same way that motor vehicle LOS measures are used. Several measures are available or under development that could be considered for this purpose.<sup>33</sup>

**4. Continue to support integrated approaches to transportation and land use planning.**

The DPPD’s Smart Corridors, or Integrated Transportation and Land Use Studies, described in Chapter 3 are an important step in creating better and safer pedestrian environments. These projects are testing and enhancing NJDOT’s

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<sup>33</sup> Although the Highway Capacity Manual contains a pedestrian LOS measure, this is chiefly a capacity measure that is not suitable for assessing the safety and convenience of crossings.

capacity to innovate in implementing pedestrian-friendly designs and help foster compact, mixed use development. They are also creating unique partnerships with local governments, landowners and developers whose value will go beyond the particular corridor studies. The projects also have significant symbolic value in demonstrating approaches that can be adopted by county and local governments as well, such as the potential to integrate “big box” stores into a walkable environment.

Other land use strategies of particular benefit from a future pedestrian safety standpoint are measures to encourage the smart siting of schools, senior housing and senior centers in or near town centers or mixed use developments; sidewalk requirements for new developments; low design speeds for new neighborhood streets, and local regulations that encourage shorter blocks and greater street connectivity than is the norm in today’s suburbs. NJDOT is part of a working group with the state’s Office of Smart Growth and other agencies seeking to promote several initiatives of this type.

### **5. Create a statewide approach to pedestrian risk reduction at major transit facilities.**

NJ TRANSIT and NJDOT have worked together to address pedestrian access measures at several of the state’s newer rail stations during the station development process. NJDOT Statewide Planning is currently involved in fostering pedestrian access improvements through its work on the Transit Village program. However, there are many other rail stations and bus stops where pedestrian access improvements are important. A systematic statewide look at the issue of safe pedestrian access to transit is needed. A logical first step would be a screening process to identify the stations with the largest pedestrian risks, based on a combination of crash experience and exposure. Passenger boarding data and average daily traffic data for the access roadways around the station could be used to construct an exposure index. Once the stations of greatest concern are identified, pedestrian access improvement plans could be developed for several of the stations each year, beginning with those with the highest risks.

### **6. Develop a statewide senior pedestrian safety program.**

This program would identify priority actions to reduce risks to senior pedestrians across the state. The effort would be coordinated with NJDOT’s existing Senior Safety Pilot Program, an interagency partnership with the Department of Health and Senior Services focusing on safety improvements and driver and pedestrian education at selected locations in the state’s Safety Management System.

7. **Begin a concerted program of constructing refuge islands at midblock crossings in identified pedestrian safety zones.**
8. **Develop a streamlined approach to providing local aid funds for safety projects.**
9. **Encourage each MPO to prepare and maintain a pedestrian needs database.**
10. **Establish a minimum annual level of pedestrian safety funding that is based on estimated needs.**

Many pedestrian advocates have called for establishing a minimum level of capital funding that would be devoted to pedestrian safety projects each year. If this approach were to be adopted, the funds might be applied to either zone remediation, intersection remediation from the original Safety Management System lists, or other documented problems such as missing sidewalks and lighting deficiencies.

The amount of funding to be set aside should be a defensible one, based on estimated needs over a defined period such as 5-10 years.<sup>34</sup> An order of magnitude estimate would be prepared for a hypothetical set of pedestrian safety projects to be accomplished in that time (i.e., so many miles of sidewalk on existing ROW, so many miles on acquired ROW, so many intersection improvements, raised medians, barrier fencing projects, lighting projects, overpass projects, etc.). The number of projects included in this estimate should be scaled to reasonable expectations about the total number of projects needed to help reduce pedestrian fatalities and injuries on the state highway system by a significant amount over 5-10 years.

11. **Continue efforts to accelerate pedestrian projects through the use of NJDOT project pipelines 3 and 4.**

NJDOT's revised pipeline process has allowed relatively low-cost pedestrian improvements to be spun off from larger capital projects for expedited construction. This "quick fix" approach is useful in addressing a wide range of

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<sup>34</sup> Some advocates have instead proposed minimum funding levels or percentages based on the relative share of crashes involving pedestrians. For example, it is argued that 20% of highway fatalities are pedestrians, so 20% of safety funding should go to pedestrians. This "parity" type argument is not recommended as a capital planning methodology, since it ignores the costs of the various countermeasures (those for pedestrians vs. those for motor vehicle crashes).

pedestrian hazards, including missing sidewalks, crosswalks, and signal deficiencies. The approach may not always be suitable for pedestrian elements requiring more detailed design, such as some traffic calming devices, or for controversial measures such as sidewalk installation in existing residential areas.

### **12. Consider future demand when determining the need for sidewalks in highway projects.**

In suburban areas where lower density development is occurring, planners sometimes conclude that sidewalks are unnecessary based on existing sparse development and a lack of visible pedestrian activity along the roadway. Planning methods and pedestrian checklists should be developed that encourage consideration of future land development and appropriate provisions, such as right of way reservation, for future sidewalk construction.

### **13. Review the project selection criteria for Locally Initiated Pedestrian Projects.**

One of the six selection criteria for this relatively new program is safety related. This factor, “Significant Safety Enhancements,” assigns priority to improvements in a “municipality with an average of 100 or more significant pedestrian crashes over the past three years.” Depending on how the term “significant” is defined, this is a high threshold that may preclude participation by smaller municipalities.

### **14. Consider modifying the grant selection process for various local assistance programs by encouraging or setting aside some pedestrian grants for communities with lower median household incomes.**

Since low income citizens are often dependent on walking, they are more at risk for pedestrian collisions than the public as a whole. Discretionary programs should be structured to ensure an equitable level of attention to their needs. This could be accomplished through set-asides for less affluent communities such as the Urban Coordinating Council municipalities.

### **15. Incorporate a routine review of the effect of proposed projects on pedestrian mobility and safety in the Community Impact Assessment process.**

NJDOT’s Division of Project Planning and Development recently established a Community Impact Assessment Unit, which is responsible for conducting community assessments and Environmental Justice screenings for capital projects. The CIA Unit is currently in the process of developing guidelines and procedures for these assessments. Consideration of a project’s pedestrian impacts should be a routine part of the CIA and EJ assessment process.

**16. Develop an annual estimate of the funding devoted to pedestrian accommodation, across NJDOT programs.**

Information on current funding and expenditures for pedestrian facilities is important both for program planning and to help the public understand NJDOT's level of commitment to pedestrian infrastructure. Expenditure estimates should capture the cost of pedestrian facilities incorporated into various highway improvement projects as well as standalone pedestrian facilities, to provide a full picture of the pedestrian investments being made.

**FACILITY MAINTENANCE**

This section recommends programs and educational initiatives to improve pedestrian facility maintenance, including crosswalk striping, pedestrian signals and pushbuttons.

**1. Create programs to maintain crosswalk striping on a more regular basis, especially in locations where hazards or high pedestrian demand have been identified.**

**2. Designate a staff person to periodically inspect pedestrian signals and pushbuttons on the state highway system.**

This individual could also check the presence and condition of curb ramps when inspecting signals.

**3. Establish a citizen hotline where pedestrians can report problems with signals, pushbuttons, and crosswalks.**

The hotline system could be staffed by the TMAs, who would verify the information and report only confirmed problems to the appropriate jurisdiction, saving NJDOT and other agencies the trouble of making field visits based on erroneous information (such as functioning pushbuttons that are reported to be broken).

**4. Establish funding, procedures and intergovernmental agreements for snow removal on sidewalks along state highways.**

## **TECHNICAL RESEARCH AND INNOVATION**

This section includes recommendations regarding potential areas for research and innovation that could lead to revised or enhanced design guidelines and policies for pedestrian safety.

### **1. Research and develop an updated standard for pedestrian lighting at intersections and midblock crosswalks.**

Existing standards tend to backlight pedestrians, while research shows front-lighting makes pedestrians more visible to motorists. NJDOT should monitor ongoing research on pedestrian illumination, including the forthcoming FHWA publication “Guidelines for the Lighting of Mid-block Pedestrian Crosswalks.” These guidelines will be provided to AASHTO for consideration in developing national standards. NJDOT should also consider adopting the pedestrian illuminance recommendations of the Illumination Engineering Society of North America (ANSI/IESNA RP-8-2000).

### **2. Develop a palette of possible designs for an Enhanced Crosswalk that can be used in situations involving pedestrian risk as well as to provide enhanced pedestrian compatibility in areas of demand.**

The Enhanced Crosswalk might include one or more features such as in-ground Yield to Pedestrian signs, activated flashing lights, reflectors, pavement texture changes, median paint schemes, raised median, raised crosswalk, curb extensions, etc. One variant should address the best methods for integrating the Enhanced Crosswalk with bus stops or shelters located at the crosswalk, working with NJ TRANSIT. Through internal discussion, create a design template for an official, approved NJDOT Enhanced Crosswalk. This effort could be developed in coordination with NJDOT’s Design Templates initiative.

### **3. Research new designs for pedestrian crossings at interchange ramps and jughandles.**

### **4. Consider the potential for ITS measures to help address pedestrian safety.**

A variety of Intelligent Transportation System measures could help pedestrians. These include innovations in signal systems, motion-activated devices, and the like. There is also a need to consider the best means of ensuring pedestrian safety on transit corridors with bus signal pre-emption systems. Operational improvements that provide for accelerated bus travel times should be combined with protective measures for pedestrians, including bus passengers.

**5. Explore the use of an overhead crosswalk illumination system at midblock locations or unsignalized intersections with high pedestrian volumes or documented hazards.**

This concept has been used effectively in Salt Lake City. In addition to a pedestrian-activated overhead flashing light on a mast arm, a metal halide light attached to the mast arm is specifically configured to illuminate the rectangular crosswalk area. During hours of darkness, the light is lit at 30% light output; when a pedestrian activates the pushbutton, the light illuminates at full capacity during the time the flashing lights are activated, providing another visual cue to drivers. The City has observed a large increase in motorists yielding to pedestrians at these locations.<sup>35</sup> Additionally, consideration could be given to the use of motion-actuated pedestrian signals and/or lighting.

**6. Test alternative pushbutton designs with a feedback response.**

Since jaywalking is often attributed to pedestrians' failure to understand that the pedestrian phase is delayed, a standard sign has been developed to explain the use of the pushbutton.<sup>36</sup> However, the sign is complex and requires English literacy. For multi-lingual areas in New Jersey, a more suitable alternative may be the use of pushbutton designs that provide a feedback response when activated, such as an intermittent beeping noise until the light turns.

**7. To address locations on multi-lane highways where risk-taking crossing behavior is a major factor causing fatalities, develop 2-3 basic designs for pedestrian fencing or other median barriers and test their effectiveness over a 5 year period.**

Involve engineers, community officials and pedestrians in selecting the designs and developing associated policies for sidewalks and crosswalks at adjacent intersections. Criteria for effectiveness should include: prevents jaywalking; no pedestrian crashes; cost; resistance to vandalism; durability and maintenance issues; appearance over time, and community acceptance.

**8. Research the effectiveness of available methods to warn pedestrians to use caution in crossing at hazardous locations including signs, in-curb letterings and other available techniques.**

This could include future use of the proposed Pedestrians Watch for Turning Vehicles sign. The need for larger signs or sign fonts for senior pedestrians should be considered, as well as options for using iconic symbols.

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<sup>35</sup> "Salt Lake City Pedestrian Safety Program, Pedestrian Safety Measures," December 2004, <http://www.slcgov.com/transportation/PedestrianTraffic/PDF/PedSafe.pdf>

<sup>36</sup> MUTCD (2003) signs R10-3b, 3c, 3d, and 3e

**9. Explore the use of illuminated No Turn on Red signs in locations where violations pose significant hazards to pedestrians.**

**10. Provide actuated No Turn on Red signs in locations with permitted RTOR.**

Permitted right turns on red are often considered important for intersection traffic performance, but may create conflicts with pedestrians. In such situations, consideration could be given to the use of an actuated No Turn on Red sign that would illuminate only when a pedestrian pushed a button to cross.

**11. Research the role of alcohol impairment (both drivers and pedestrians) in NJ pedestrian fatalities and severe injuries.**

Current data does not support the ability to make inferences about intoxication rates.<sup>37</sup>

**12. Collect before-and-after information to monitor the long-term effectiveness of innovative pedestrian safety measures.**

Review the effectiveness of new measures being implemented such as in-ground Yield to Pedestrian signs, in-pavement crosswalk lighting, and countdown signals.

**13. Monitor national research on pedestrian technologies and facility designs for findings applicable to future New Jersey projects and policies.**

## **DATA AND REPORTING**

An enhanced data management and reporting system is essential to enable strategic targeting of pedestrian safety measures geographically, demographically, and behaviorally. GIS mapping would be the logical cornerstone of such a system.

**1. Create an annual reporting system for pedestrian crashes, fatalities and severe injuries.**

A reporting system should be developed to provide the Office of Bicycle and Pedestrian Programs and other relevant NJDOT units with annual updates from the Bureau of Safety Programs data on pedestrian (and bicycle) crashes, fatalities

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<sup>37</sup> Intoxication rates for pedestrian victims appear to vary widely from place to place. Wisconsin DOT has determined that alcohol is one of three key factors involved in their state's pedestrian crashes and fatalities. (The others were vehicle speed and the age of pedestrians and drivers.) In contrast, a relatively low percentage of California's pedestrian fatality victims are intoxicated. A better understanding of the role of alcohol impairment in New Jersey pedestrian fatalities and injuries would help in formulating specific Action Plan objectives regarding impaired pedestrians.

and injuries. The updates should include total crashes by severity level, municipality, and road type, as well as more detailed summary data for fatalities and severe injuries including time of day, lighting conditions, pedestrian maneuver, and ages of pedestrians and drivers. This information should also be provided to each county's traffic safety, engineering, and public health officials. The reporting system would have two main functions: first, providing a basis for planning and monitoring of countermeasure programs, and second, drawing external attention to problems to help mobilize local responses. While data can be obtained from the NJDOT online query system, not all county officials make use of this tool. A "push marketing" approach to crash data would increase the power of this information as a catalyst for action. This effort should be coordinated with other database efforts underway, such as at NJTPA, as well as the existing Division of Highway Traffic Safety's existing reporting system.

**2. A system should also be developed to routinely alert the Office of Bicycle and Pedestrian Programs whenever a pedestrian (or bicycle) fatality is reported to the Bureau of Safety Programs.**

A routine system of alerts would help the bike/pedestrian staff maintain a complete and up-to-date knowledge of where problems are occurring. It is awkward for staff to have to rely on newspaper reports or calls from politicians to learn where serious crashes have occurred, and difficult to deploy technical resources efficiently based on scattershot information. At current rates, these alerts would need to occur on average about twice per week. An intranet web page could be used to post the information, with email alerts going to designated staff.

**3. Create a GIS map showing the location of all NJ pedestrian fatalities and severe injuries in the past 3 years on a highway base map.**

This effort would support the development of the pedestrian zone system outlined earlier, and it could be used to track the effectiveness of zone-based countermeasure programs. The map would be analyzed visually to identify locational clusters and other geographic patterns. Locations of pedestrian priority corridors from the Master Plan should be compared to map "hot spots" to determine the extent of overlap. This map should be updated at least annually, or until an automatic process is in place for geocoding the data as it comes in. Separate maps should also be developed to show the geographic distribution of crashes involving each major type of pedestrian maneuver, crashes occurring at night, and crashes involving specific groups such as senior and child pedestrians. This will provide a better understanding of the types of problems prevalent in each geographic area and on each major corridor.

**4. Establish a GIS-based query system that can produce updated pedestrian crash maps on a routine basis.**

As an ultimate goal, this system should be available on the NJDOT website for use by any local engineer, planner, consultant or developer working on a project throughout the state. While it is now possible to query the online system for basic crash records, with this type of system, crash maps could be generated for any user-defined study area of interest. Once the study area was defined, a map layer would show the location of all recent pedestrian crashes with color coding to designate crash severity. A further enhancement would be the ability to click on any of these points and see the data associated with the record (exclusive of any confidential information), allowing the researcher to investigate underlying conditions such as age of pedestrian, time of day, pedestrian maneuver, etc. Since the same system would be beneficial for depicting motor vehicle crashes (not involving pedestrians), this initiative could be designed as a broader effort covering both. This system would also be valuable during the Tier 2 screening process for projects, providing the analyst with immediate access to crash data; it would also lessen the burden on the Bureau of Safety Programs to process individual data requests for these screenings.

**5. Add sidewalk data to NJDOT's straight line diagrams**

This is also one of the recommendations of the Bicycle and Pedestrian Master Plan and is a planned initiative of NJDOT.

## **EDUCATION**

This section includes suggestions for statewide educational campaigns, as well as concepts that could be encouraged at the local level through federal Section 402 grants, technical assistance efforts, or peer-to-peer exchanges.

**1. Interagency coordination should be improved to ensure the most cost-effective use of funds for pedestrian safety education.**

A coordinated approach involving the Division of Highway Traffic Safety, Motor Vehicle Commission, NJDOT, and the TMAs should be developed.

**2. Educational efforts should include both locally targeted promotions conducted as part of a coordinated 3E approach to defined pedestrian zones, and broader campaigns targeting specific demographic groups and geographic areas of the state that are most at risk.**

For example, if NJDOT installs new crosswalks or pedestrian signals in a pedestrian zone, there should be a corresponding safety program in the zone on

the proper use of the crosswalks. PennDOT is using a similar approach in a program that lends out in-ground Yield to Pedestrian signs to municipalities, along with guidance for using them and making them the basis for a pedestrian safety campaign. Specific demographic groups should include teenage drivers and pedestrians, perhaps via new driver education courses, as this cohort is highly represented in crash involvement. DHTS recommends statewide message mobilizations in “short burst” as the most effective outreach (such as the “Click It or Ticket” campaign).

- 3. Create a profile of the “design driver(s)” and “design pedestrian(s)” to be targeted for educational campaigns, and use these to establish all the elements of the campaign, including the specific behaviors to be influenced, the messages that audience is likely to best respond to, and the use of distribution channels appropriate to that audience.**

- 4. Tailor educational programs to at-risk populations.**

Tailor messages and distribution channels to reach the most vulnerable populations, including urban males age 75 and older. Ideally, messages and delivery systems should be developed in consultation with members of the identified target audience to ensure that they are effective, engaging, and culturally relevant. Focus groups are useful for this purpose. For example, Hawaii DOT has used focus groups and surveys to better understand senior pedestrian behavior and craft appropriate educational measures, which they describe as a “social marketing” approach. In New Jersey, a series of similar focus groups could be conducted with pedestrians and drivers representing different ages and ethnic and socioeconomic backgrounds.

Develop educational materials suitable for adult non-readers.

Educational approaches should avoid over-reliance on written media, since a large number of adults in New Jersey have limited literacy in any language. This is a particular issue in Essex County and Hudson County, where an estimated one-third of adults are below a fifth grade reading level. Low-literacy figures are even higher in some cities such as Newark and Camden.<sup>38</sup> Limited literacy and low English proficiency may be even more common in some of the areas and among some groups at greatest risk for pedestrian crashes. Alternatives such as radio, TV, and pictorial treatments such as posters and comic books could be explored. Materials could be placed in community medical clinics and human service agency offices.

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<sup>38</sup> National Institute for Literacy, *The State of Literacy in America: Estimates at the Local, State, and National Levels*, 1998.

**5. Conduct a statewide telephone survey to determine the baseline level of awareness of pedestrian rights and what constitutes a crosswalk.**

This would provide a gauge to measure the effectiveness of future statewide media campaigns.

**6. Explore the potential for partnerships with NYSDOT and PennDOT for joint media campaigns in shared media markets.**

This would help spread the high cost of radio campaigns over a larger market.

**7. High priority should be placed on education for drivers, who seldom fully understand their responsibilities to pedestrians.**

Pedestrian safety messages targeted to drivers should include practical information on avoiding collisions, such as appropriate driving practices when turning across a crosswalk at an intersection. The distinction between what is required of a driver at a midblock crossing and a stop-controlled or signalized intersection is not always understood; similarly, the cognitive and perceptual requirements involved in scanning for pedestrians and stopping at the appropriate point vary greatly from one location to another.

These differences, coupled with widely varying crosswalk designs and inconsistent signage conventions, add up to a confusing picture even for the well-intentioned driver. Therefore education should provide practical guidance in *how* to safely accommodate pedestrian movement and avoid collisions. One strategy would be to provide a short videotape on this topic which would play in the waiting areas of the Motor Vehicle Commission offices. Such a system could be used for other important safety messages such as how to share the road with bicyclists, how to cope with aggressive drivers, etc. These videos could also be shown on local access cable television stations. This method could also be used to better acquaint pedestrians with the operation of pedestrian signals and pushbuttons.

**8. Pedestrian safety education for drivers should be incorporated into driver licensing, registration and license renewal.**

High school driver education should include videos of common situations involving driver/pedestrian conflicts, and discussion of what both drivers and pedestrians should do. Copies of crash reports have been used effectively with this age group as well. The Graduated Driver Licensing requirements should also incorporate training on pedestrian rights.

**9. Modify the state driver’s manual to fully cover pedestrian rights.**

The current edition is inadequate with respect to pedestrian information. A useful example to consider is the Oregon driver’s manual.

**10. Use Motor Vehicle Commission mailings and the MVC web page to better inform drivers of pedestrian laws and safety procedures.**

The MVC web page is now used routinely for online registration, providing a captive audience of drivers.

**11. Include an online pedestrian safety tutorial as part of the process for online MVC registration renewal.**

A system could be set up to offer a one-time \$5-\$10 registration discount to each licensed driver who completes a brief online tutorial and correctly answers a quiz on pedestrian rights at the conclusion of the tutorial.

**12. At MVC vehicle inspection centers, hand out a pedestrian safety information card to each motorist as he or she enters the inspection line or leaves the inspection bay.**

**13. Print and widely distribute “This Vehicle Stops for Pedestrians” bumper stickers.**

**14. Target transit passengers for pedestrian safety messages on buses and at bus shelters.**

This approach was recently implemented on the Route 9 Safe Corridor project.

**15. Train NJ TRANSIT bus drivers in techniques for encouraging safe passenger access and encourage the delivery of warnings to passengers observed running across the roadway to the bus.**

**16. Consider developing a Safe Routes for Seniors program mirroring the Safe and Active Routes to Schools initiative. Such programs would focus on senior centers and senior housing complexes.**

**17. The Department of Health and Senior Services could work to establish local speakers' bureaus in which senior citizens would speak to various organizations and community groups on the need to use care as a pedestrian (and driver).**

A speakers' bureau that included pedestrian crash survivors and victims' relatives would be especially effective.

**18. Specialized educational campaigns may be needed to deal with specific categories of risk, such as the relatively small but consistent number of people who die walking on interstate highways.**

This would include messages about not walking away from a vehicle or working on a vehicle unless it can be removed from the road shoulder, etc.

**19. Consider the use of sidewalk paintings to create visually compelling pedestrian safety advertisements at urban hot spots.**

A program of this type was used in Boston, Massachusetts. Sidewalk paintings were created at each of 12 high-injury areas to encourage pedestrians to use the pushbutton. Comic book style lettering promoted the message "Think of the raw power. Stop a dozen massive, speeding vehicles with a single touch." An arrow pointed to the pushbutton location.<sup>39</sup>

**20. Consider using a mobile teaching center to provide pedestrian safety education to children in urban areas.**

The DHTS Traffic Safety Cruiser could be scheduled for periodic use for this purpose. Parent-oriented education regarding children and reducing risks should also be included and translated, at a minimum, into Spanish. Materials could also be distributed via pediatricians' offices.

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<sup>39</sup> "City of Boston Launches Boston Pedestrian Protection Program to Reduce Pedestrian Injuries," Media Release, Boston Public Health Commission Home Page, November 9, 1999

**21. Consider testing an initiative to provide a safety-enhancing clothing accessory that could be distributed free in areas with large numbers of pedestrian fatalities.**

This could include white caps and/or reflective belts, or other items. A focus group of local residents could help determine what might be accepted and used and where it should be distributed (bars, liquor stores, grocery stores, doctor's offices, for instance).

**22. Engage in public-private partnerships to provide or fund expanded education programs.**

Organizations such as AAA currently offer a wide range of pedestrian safety education programs. NJDOT or the Division of Highway Traffic Safety could potentially leverage resources through a partnership arrangement with AAA as well as AARP to reach specific groups of pedestrians and drivers. Funding could also be sought from private partners such as the Robert Wood Johnson Foundation for a one-time intensive pedestrian crash prevention program in a high-risk location such as Hudson County.

## **ENFORCEMENT**

This section includes recommendations for enforcement training, tools, targets and policies.

**1. Maintain a strong statewide enforcement focus on aggressive driving and speeding.**

The relationship between vehicular speed and the severity of pedestrian crashes is well established. Existing initiatives such as Take 5: Stay Alive, \*77, and traffic calming projects are relevant for pedestrian safety as well as for motor vehicle and bicycle safety. Local initiatives, such as Haddonfield's Drive 25 campaign, should also be encouraged.

**2. Create a kit for municipalities on how to carry out a Yield to Pedestrians (or Stop for Pedestrians) campaign.**

The kit could include a suggested process for enhancing crosswalk visibility, creating citizen awareness, implementing a phased enforcement process, training officers, and maintaining compliance over time. The kit could also feature sample press releases, brochures, and information to be handed out with warnings and citations. The kit could also be a component of a statewide Stop for Pedestrians campaign, if there is legislative success in changing NJ Title 39 to require drivers to stop for rather than simply yield to pedestrians.

**3. Consider a pilot project to test the use of positive incentives for drivers who do stop for pedestrians at crosswalks.**

This measure would test the use of a “carrot” approach to complement the enforcement process. During a “sting” operation in which police are ticketing noncompliant motorists, random motorists “caught” stopping for pedestrians would receive gift coupons or tickets for a prize drawing. These awards could be privately financed by local merchants or a philanthropic group. This initiative could be implemented by individual municipalities, or by a group of participating municipalities, which would allow a larger prize to be awarded and might generate more extensive media coverage. Either way, this measure is likely to bring public attention to the issue of crosswalk compliance. Holding these drawings periodically could create significant publicity and interest in a yield to pedestrian campaign. In addition, it could make pedestrian enforcement a more positive experience for police officers, who are often resistant to writing pedestrian tickets, thereby creating goodwill for future pedestrian enforcement efforts.

**4. Expand training of law enforcement officers in pedestrian-related law and best practices for effective enforcement, as is currently done in Florida.**

This training might be implemented through a partnership between NJDOT, the Division of Highway Traffic Safety, and selected local governments.

**5. Establish an educational initiative for judges to improve awareness and understanding of the laws concerning pedestrians.**

This could include a review of recent court decisions.

**6. Research existing practices concerning alcohol testing of drivers and pedestrians involved in pedestrian-motor vehicle collisions to determine whether they are adequate.**

**7. Increased enforcement of speed limits in school zones should also be a priority.**

The NJ Traffic Safety Officer Association could be encouraged to create its own Safe Routes to School initiative, on the same model as the DARE substance abuse program which is supported by local police.

## TECHNICAL GUIDANCE

This section includes recommendations for expanding the technical guidance available to county and local decision-makers, transportation professionals, and other stakeholders, as well as increasing the opportunities for professional training.

### **1. Continue providing general technical guidance to municipalities and professionals.**

This is an area in which NJDOT has been particularly strong. New Jersey was one of the first states to publish pedestrian planning and design guidelines and has recently updated them. The NJDOT Office of Bicycle and Pedestrian Programs has sponsored a variety of bike/pedestrian training seminars for state and local staff and other transportation professionals. They have also sponsored numerous local Bicycle and Pedestrian Planning Grants that provide consultant services to help municipalities address local needs, including pedestrian deficiencies. They have also provided support for the creation of a comprehensive bike/ped resource clearinghouse at the Voorhees Transportation Center of Rutgers University to which citizen groups and localities can turn to have many of their questions answered.

In addition, NJDOT is currently developing an updated guide to the preparation of the Circulation Element for municipal master plans. The guide emphasizes the link between mobility and community form, with substantial information on how to incorporate pedestrian planning into the Circulation Element. Another initiative to consider would be a brochure aimed at local real estate developers on “designing pedestrians in, not out” of new developments. The brochure could be distributed to municipalities for their use as they work with prospective developers. In addition, NJDOT could post sample sidewalk ordinances on its website.

### **2. Establish a joint state-county Pedestrian Safe Design committee with county engineers; the committee would develop a palette of model typical section concepts that could be used over time to retrofit excessively wide suburban collector and arterial roads throughout the state.**

Concepts could include landscaped boulevards, installation of raised medians or pedestrian refuge islands, “road diets,” traffic calming measures, and land use integration. Work with FHWA to determine whether federal funds could be used to finance a pilot program to design and implement these concepts on selected county highways and to study their effectiveness in reducing pedestrian hazards.

**3. Explain current policy on the NJDOT approval process for local installation of midblock crosswalks under the 90 day review process.**

As a component of this policy, provide local governments with guidance on how to establish a crosswalk ordinance, sample language, locational and design considerations for midblock crosswalks, and recommended procedures for publicizing the crosswalk and enforcing compliance.

**4. Develop a “response kit” for local governments to use in addressing pedestrian hazards. Also post this material on the NJDOT website, and provide links to additional technical resources on pedestrian safety.**

The response kit could include an assortment of readily available materials on crash assessment and countermeasure selection (including the free PBCAT crash analysis software and the FHWA PedSafe tool), as well as educational materials such as the FHWA Pedestrian Campaign Planner. There is also some interest in the advocacy community in developing an Emergency Action Plan that would be sent to local governments immediately following a fatal pedestrian crash in their jurisdiction. This would be a time when local actors may be especially receptive to such information. This concept might be more effective if implemented by a non-governmental organization rather than NJDOT.

**5. Encourage area educational institutions with programs in engineering, planning, public health or public safety to offer courses covering pedestrian safety and related topics, both in their professional degree programs and continuing education programs.**

**6. Set up a peer-to-peer information exchange for local Traffic Safety Officers on the pedestrian safety education and enforcement approaches being used successfully around New Jersey.**

This project might be undertaken by the NJ Traffic Safety Officer Association, perhaps in partnership with VTC, which could host materials on a section of the bike/pedestrian resource website, create and moderate a list-serve, or convene an occasional statewide workshop.

**7. Provide a roving engineer and/or grant writer for municipalities with pedestrian safety issues.**

This could be a function for MPOs to provide, or NJDOT at a later time if more staff resources become available.

**8. Implement a peer cities program specifically for the larger urban areas.**

Through this initiative, cities of comparable size such as Elizabeth, Patterson, Jersey City and Newark would work together on new approaches to improving pedestrian safety on city streets, and perhaps have a roving engineer assigned to work with them as a group. The North Jersey TPA would be a logical coordinator for this type of program.

**9. Cultivate local support networks for problem identification and follow-up: cultivate a network of local pedestrian advocates who could serve on location-specific study teams.**

Unlike many states, NJDOT's centralized administrative structure puts the burden of investigating localized pedestrian safety problems on central office staff, who have many other requirements on their time. NJDOT has employed a variety of strategies to overcome the limitations of this centralized structure, including regional assignment of project development staff, extensive use of consultants, and sponsorship of technical training for local professionals. A local support network could complement this approach. This could include establishing a Pedestrian Risk Program similar to Washington State's, which brings local expertise together with state-level project planning criteria to establish project priorities. The Transportation Management Associations could potentially play a coordinating role. In New Jersey, this approach might be combined with the implementation of the priority index system developed for the Bicycle and Pedestrian Master Plan.

**10. Adopt and encourage use of the "Complete Streets" concept to foster awareness of the need to provide for the mobility and safety of all roadway users.**

## **ORGANIZATIONAL STRUCTURE AND COORDINATION**

This section includes recommendations for coordinating pedestrian safety initiatives internally within NJDOT and across other agencies.

**1. Hold an annual pedestrian safety summit meeting with all involved parties.**

Better coordination is needed throughout the agencies and divisions responsible for the various facets of pedestrian safety. Within NJDOT, a more integrated effort focused on state highways should involve the Office of Bicycle and Pedestrian Programs, the Division of Project Planning and Development, Traffic Engineering, and the Bureau of Safety Programs. Better coordination is also

needed between NJDOT and NJ TRANSIT to address safe access to transit, and between NJDOT, the Division of Highway Traffic Safety, and MVC concerning pedestrian safety education.

**2. Identify division champions**

To create a unified effort across divisions, it is important to develop pedestrian safety champions in each of the relevant units who can work closely with the Office of Bicycle and Pedestrian Programs. Such champions should be identified in Traffic Engineering, the Bureau of Safety Programs, and Local Aid.

**3. Improve coordination between NJDOT and the Division of Highway Traffic Safety on pedestrian safety education and enforcement.**

**LEGISLATION**

This section includes recommendations for potential legislative actions to enhance pedestrian safety.

- 1. Pass proposed legislation modifying NJ Title 39 to require motorists to stop, rather than simply yield, at crosswalks.**
  
- 2. If necessary to accomplish recommendation #8, pass legislation mandating the consideration of pedestrian safety in NJDOT's access permitting process.**
  
- 3. Implement the state's vision testing requirement for all drivers upon license renewal.**

New Jersey law (39:3-10c) calls for every licensed driver to undertake a mandatory vision screening at least once every 10 years as a condition for driver's license renewal. However, this law was never implemented. (Currently, New Jersey is one of only four states that do not require any form of vision retesting during a driver's lifetime.)
  
- 4. Consider legislation to require municipalities to prepare local circulation plans that include a pedestrian element.**

## **FEDERAL POLICY**

This section includes recommendations for ways NJDOT can work with the federal government and advocate for pedestrian safety.

**1. Work with FHWA and AASHTO to revise the pedestrian signal and pedestrian overpass warrants.**

The warrants currently require documentation of a large volume of pre-existing pedestrian crossing activity at the identified location. This criterion is often impossible to meet, particularly if the only pedestrians crossing at that spot are doing so illegally and at great personal risk. The methodology should be revised to place a greater emphasis on pedestrian safety rather than evidence of aggregate demand. Even in locations where legal crossings exist, the warrant process makes it difficult to provide these facilities in suburban or rural locations where demand may be relatively light but crossing risks high.

**2. Work with FHWA and NHTSA to seek revised documentary provisions for the Hazard Elimination program that better reflect the distribution of pedestrian hazards.**

Since severe pedestrian crashes do not generally exhibit the degree of geographic clustering that motor vehicle crashes do, the program appears to favor projects that address motor vehicle hot spots over those that target pedestrian problems. While this report has recommended that NJDOT develop a methodology to address this difference, a long term solution would be to revise the federal program expectations.

**3. Encourage adoption of national vehicle design standards for car manufacturers to reduce the hazards of collisions with pedestrians.**

The New Jersey State Attorney General could join with other states in requesting new U.S. regulations on the design of car bodies to make them less injurious to pedestrians when hit.

## **IMPLEMENTATION MEASURES**

This section includes recommendations for the implementation of pedestrian safety improvements and policies.

**1. Provide additional staff for the Office of Bicycle and Pedestrian Programs and the Bureau of Safety Programs.**

See also #116 below, on the appointment of a Pedestrian Safety Coordinator.

**2. Establish a Pedestrian Safety Action Team and Action Plan.**

Based on the recommendations in this report, develop an Action Plan that sets priorities for a 3-5 year period and spells out roles and responsibilities for accomplishing them. An Action Team should be established to implement the plan. The team should include all those agencies and organizations that are expected to have a role, including all relevant NJDOT units, the Division of Highway Traffic Safety, the Motor Vehicle Commission, NJ TRANSIT, the Department of Health and Senior Services, MPOs, TMAs, county and municipal representatives, and stakeholder groups. Stakeholder groups could include advocates for persons with disabilities, advocates for low income groups or service workers, child safety organizations, AAA, AARP, and the Pedestrian Task Force. Consideration should be given to forming the Action Team as a committee of the existing Safety Management Task Force to avoid creating an additional layer of meetings. A list serve could be established for the Action Team as a means of communicating and conducting coordination activities between meetings.

**3. Form an expert panel to guide the Action Team in preparing and implementing the Action Plan.**

An expert panel could be created consisting of FHWA and academic specialists in pedestrian safety. A team of specialists is currently available to provide assistance to NJDOT through a FHWA contract that is preparing a How to Guide for states and cities on developing pedestrian safety action plans.

**4. Appoint a Pedestrian Safety Coordinator.**

For maximum effectiveness, the action team should have a full-time staff person assigned to coordinate the implementation of the Action Plan.

**5. Appoint and train a pedestrian (and bicycle) “point person” within each NJDOT district.**

These district representatives would assist the Pedestrian Safety Coordinator and the NJDOT Office of Bicycle and Pedestrian Programs as a whole by providing an “ear to the ground,” attending local meetings that cannot be covered by Office staff, and providing support on individual safety improvement projects.

## **ACCOUNTABILITY**

This section includes recommendations for progress measures and benchmarks to ensure accountability for achieving the recommended pedestrian safety initiatives.

### **1. Identify Progress Measures for the Action Plan and identify responsibilities for collecting the necessary data.**

In the beginning stages of plan implementation, benchmarks and progress measures should focus on intermediate outputs, rather than end results (crash rates). Examples include miles of sidewalk installed, number of crosswalks or pedestrian signals upgraded, number of schools covered by pedestrian skill training, number of police officers trained in pedestrian law enforcement, etc.

It may also be possible to establish benchmarks and trends in crosswalk compliance rates for both motorists and pedestrians, by selecting a statewide sample of crosswalks to monitor at specific times each year. Time-lapse photography or webcams could potentially be used for this purpose. Video from these sources would also help to document the problems pedestrians face attempting to cross New Jersey roadways.

### **2. Provide an Annual Report to the Public.**

For the purpose of accountability, the Pedestrian Safety Coordinator should prepare a brief annual report for the general public that would summarize the efforts underway, Action Plan accomplishments, and pedestrian crash trends. The report should be posted on the NJDOT website.

## APPENDIX: CRASH TYPES AND COUNTERMEASURES FROM THE FHWA PEDESTRIAN FACILITIES USERS GUIDE

The FHWA Pedestrian Facilities Users Guide provides an extensive classification based on the detailed NHTSA categories.<sup>40</sup> The guide provides a matrix of suggested countermeasures for each of twelve general categories of crashes:

- *Midblock dart/dash*, in which the pedestrian “walked or ran into the roadway and was struck by a vehicle. The motorist’s view of the pedestrian may have been blocked until an instant before the impact, and the motorist may have been speeding.” Possible problems of this type include a child running into the street or a pedestrian trying to cross a high speed or high volume arterial.
- *Multiple threat*, in which the pedestrian “entered the traffic lane in front of stopped traffic and was struck by a vehicle traveling in the same direction as the stopped vehicle,” which may have blocked the driver’s view of the pedestrian. In this type, the motorist may also have been speeding. As in the first category, the pedestrian may have been trying to cross a high speed or high volume arterial, or the pedestrian may not have had adequate time to cross a multi-lane roadway, all typical situations encountered in New Jersey.
- *Mailbox or other type of midblock*, in which the pedestrian was struck while getting into or out of a parked or stopped vehicle, while crossing the road to or from a mailbox, newspaper box, ice-cream truck, etc.
- *Failure to yield at unsignalized location*, in which either the motorist failed to yield to the pedestrian and/or or the pedestrian stepped directly into the path of the oncoming vehicle. This type includes motorist failure to yield at a low-speed, two-lane crosswalk (as often occurs when a New Jersey roadway serves both as a through road and “Main Street”). This category also includes situations in which motorists are unwilling to yield due to high speeds or high traffic volumes.
- *Bus-related* crashes include those in which the pedestrian was crossing in front of a stopped transit bus, going to or from a transit bus or waiting near the bus stop, or going to or from a school bus stop. Serious pedestrian crashes

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<sup>40</sup> Charles V. Zegeer, Cara Seiderman, Peter Lagerwey, Mike Cynecki, Michael Ronkin, and Robert Schneider, *Pedestrian Facilities Users Guide – Providing Safety and Mobility*, FHWA, March 2002.

involving bus passengers en route to their bus stops have been documented in several locations in New Jersey, such as along the Route 9 bus corridor.

- *Turning vehicle at intersection*, in which the pedestrian “was attempting to cross at an intersection and was struck by a vehicle that was turning right or left.” Problems associated with this type include conflicts between pedestrians and either left or right-turning vehicles, large numbers of school children at an intersection with major turning movements, and inadequate sight distance or geometric deficiencies.
- *Through vehicle at intersection*, in which a pedestrian “was struck at a signalized or unsignalized intersection by a vehicle that was traveling straight ahead.” This may occur because the pedestrian could not see the traffic signal, could not tolerate the excessive delay prior to getting a WALK signal, or failed to comply with the WALK phase for other reasons. Alternatively, the motorist may not have seen the pedestrian in time to stop. Children hit while crossing at an intersection in a school zone are also included in this category.
- *Walking along roadway*, in which the pedestrian was walking or running and struck from the front or from behind. Underlying situations include an inadequate walking area, high vehicles speeds and/or volumes, an inadequate route to school, or lack of accessibility to pedestrians with disabilities.
- *Working or playing in road* includes crashes involving a disabled vehicle or play vehicles such as skateboards or sleds.
- *Not in road* includes crashes in which the pedestrian was walking or standing on the sidewalk or near the edge of the roadway, or in a driveway or parking lot.
- *Backing vehicle* crashes may occur on a street, in a driveway, sidewalk, parking lot, or other location.
- *Crossing on expressway* includes situations in which the pedestrian has left a disabled vehicle, or a section of an expressway that is routinely crossed by pedestrians.

The following pages are reproduced from the User’s Guide and provide suggested countermeasures for each crash type. The full User’s Guide can be downloaded from the FHWA website. In addition, an interactive software tool, PedSafe, has been developed to help localities identify appropriate countermeasures for different types of problems.

Of the more than 60 specific pedestrian crash types, there are 13 crash groupings (12 specific types and 1 miscellaneous type) that are most useful for identifying safety problems and corresponding countermeasures. They are defined below:

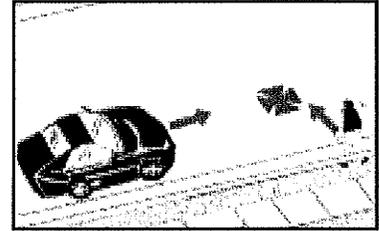
## Definitions of Pedestrian Crash Types

### 1. Midblock: Dart/Dash

The pedestrian walked or ran into the roadway and was struck by a vehicle. The motorist's view of the pedestrian may have been blocked until an instant before the impact, and/or the motorist may have been speeding.

#### Possible Cause/Problem #1

Child runs into neighborhood/collector street.



#### General Countermeasures

- a. Implement traffic-calming measures such as speed humps, speed tables, or chicanes.
- b. Remove or restrict on-street parking.
- c. Provide adequate nighttime lighting.
- d. Provide curb extensions.
- e. Install spot street narrowing at high midblock-crossing locations.
- f. Narrow travel lanes.
- g. Install street closure/diagonal diverter at selected intersection(s).
- h. Provide adult crossing guard (in school zone).
- i. Educate children about safe crossing behavior and adults about speeding.
- j. Add on-street bike lanes.
- k. Convert street to woonerf, pedestrian street, or driveway link/serpentine.
- l. Design gateway to alert motorists that they are entering neighborhood with high level of pedestrian activity.
- m. Provide a raised pedestrian crossing.

#### Possible Cause/Problem #2

Pedestrian tries to cross high-speed and/or high-volume arterial street.

#### General Countermeasures

- a. Install medians or pedestrian crossing islands.
- b. Provide staggered crosswalk through the median (forcing pedestrians to walk and look to the right for oncoming traffic in the second half of street).
- c. Provide curb extensions at intersections or midblock to improve direct line of sight between vehicle and pedestrian.
- d. Improve/add nighttime lighting.
- e. Install midblock traffic signal with pedestrian signals, if warranted.
- f. Install standard warning sign (see *Manual on Uniform Traffic Control Devices* (MUTCD)) or yellow or fluorescent yellow/green signs to alert drivers to pedestrian crossing area.
- g. Install overpass or underpass.

- h. Enforce speed limits, pedestrian ordinances.
- i. Add traffic-calming measures.
- j. Bus young children across busy streets or adjust school district boundaries.
- k. Relocate bus stop.
- l. Use speed-monitoring trailer.

## 2. Multiple Threat

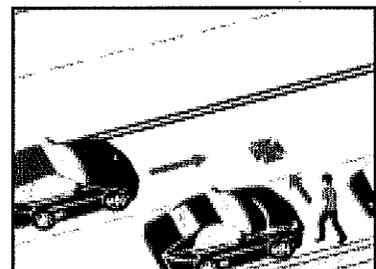
The pedestrian entered the traffic lane in front of stopped traffic and was struck by a vehicle traveling in the same direction as the stopped vehicle. The stopped vehicle may have blocked the visibility between the pedestrian and the striking vehicle, and/or the motorist may have been speeding.

### Possible Cause/Problem #1

Motorist's view of pedestrian is blocked and motorist fails to yield.

#### General Countermeasures

- a. Recess stop lines 9.1 m (30 ft) in advance of crosswalk.
- b. Install traffic signals with pedestrian Hand/Man or WALK/DON'T WALK signals, if warranted.
- c. Provide midblock or intersection curb extensions.
- d. Install traffic-calming devices such as speed tables or raised pedestrian crossings on local or other neighborhood streets.
- e. Install barriers or signs to prohibit crossings and direct pedestrians to safer crossing locations nearby.
- f. Provide raised crosswalks to improve pedestrian visibility.
- g. Install advance warning signs or flashers.
- h. Relocate bus stop to far side of crossing area.
- i. Improve roadway lighting.
- j. Enforce crosswalk laws.



### Possible Cause/Problem #2

Pedestrian tries to cross high-speed and/or high-volume arterial street.

#### General Countermeasures

- a. Narrow travel lanes (e.g., add bike lanes) to slow vehicle speeds and reduce crossing distance.
- b. Reduce roadway width. For example, modify four-lane undivided roadways to two through lanes with sidewalks and bike lanes, plus a center two-way left-turn lane (or raised median).
- c. Increase police enforcement of speed limit.
- d. Construct overpass or underpass.
- e. Install raised median or pedestrian crossing island.

### Possible Cause/Problem #3

Pedestrian does not have adequate time to cross multi-lane roadway.

#### General Countermeasures

- a. Install traffic signals with pedestrian WALK/DON'T WALK signals, if warranted.

- b. Adjust pedestrian signal timing.
- c. Provide raised crosswalk to improve pedestrian visibility.
- d. Provide midblock or intersection curb extensions.
- e. Install raised pedestrian crossing island.
- f. Enforce crosswalk laws.
- g. Reduce roadway width.

### 3. Mailbox or Other Midblock

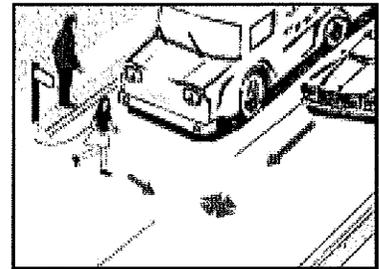
The pedestrian was struck while getting into or out of a stopped vehicle or while crossing the road to/from a mailbox, newspaper box, ice-cream truck, etc.

#### Possible Cause/Problem #1

Pedestrian struck while going to/from a private residence mailbox/newspaper box.

#### General Countermeasures

- a. Relocate mailboxes to safer crossing area or provide safer crossings at existing location.
- b. Improve lighting.
- c. Provide traffic-calming measures (e.g., chicanes or raised devices on residential streets).
- d. Add bike lanes and reduce total roadway and lane width.
- e. Install pedestrian warning signs (see MUTCD).
- f. Implement driver education program.
- g. Implement pedestrian education program.
- h. Provide raised median on multi-lane arterial street.
- i. Construct gateway or provide signs that identify neighborhood as an area with high levels of pedestrian activity.



#### Possible Cause/Problem #2

Pedestrian struck while going to/from an ice-cream vendor or similar destination.

#### General Countermeasures

- a. Reduce lane or roadway width.
- b. Add pedestrian crossing islands to roadway.
- c. Provide traffic-calming measures on local streets.
- d. Create Public Service Announcements (PSAs) to educate parents, children, and drivers.
- e. Adopt an Ice-Cream Truck Ordinance. This ordinance would prohibit motorists from passing a stopped ice-cream truck. Trucks would be equipped with flashing lights and a "stop" arm that would extend when the truck stopped to serve children.

#### Possible Cause/Problem #3

Pedestrian struck while getting into/out of parked vehicle or by an emergency or speeding vehicle.

### General Countermeasures

- a. Implement speed-reduction measures such as chicanes or speed tables.
- b. Implement traffic-calming measures on local/collector streets.
- c. Restrict on-street parking.
- d. Increase police enforcement of speed limit.

## 4. Failure to Yield at Unsignalized Location

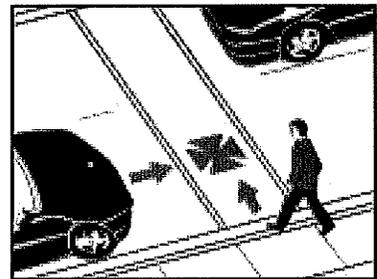
At an unsignalized intersection or midblock location, a pedestrian stepped into the roadway and was struck by a vehicle. The motorist failed to yield to the pedestrian and/or the pedestrian stepped directly into the path of the oncoming vehicle.

### Possible Cause/Problem #1

Motorist fails to yield to pedestrian at two-lane, low-speed road crosswalk (or unmarked crossing).

### General Countermeasures

- a. Install raised intersection, raised crosswalk, speed table, or speed humps with truncated domes at both ends.
- b. Install overhead CROSSWALK, school zone, or other warning signs.
- c. Install curb extensions or choker.
- d. Construct raised pedestrian crossing island.
- e. Install traffic signal with pedestrian signals, if warranted.
- f. Add chicane, use serpentine design or use special paving treatments along street to slow traffic.
- g. Use landscaping that slows vehicle speeds without impeding sightlines.
- h. Reduce curb radius to slow vehicle speeds.

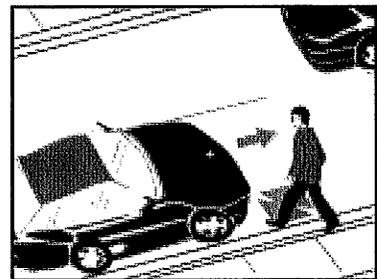


### Possible Cause/Problem #2

Pedestrian has difficulty crossing multi-lane road.

### General Countermeasures

- a. Install raised medians or pedestrian crossing islands.
- b. Install traffic signal with pedestrian signals, if warranted.
- c. Modify four-lane, undivided street to two lanes plus a two-way, left-turn lane (TWLTL) or median with turning pockets and bike lanes.
- d. Install nighttime lighting.
- e. Use police speed enforcement.
- f. Use far-side bus stops.
- g. Narrow lanes, reduce number of lanes, and/or install bike lanes.
- h. Construct overpass or underpass.
- i. Ensure that curb ramps are provided to make crossing easier for all pedestrians.



### Possible Cause/Problem #3

Motorist unwilling to yield due to high motorist speeds or high traffic volumes.

### General Countermeasures

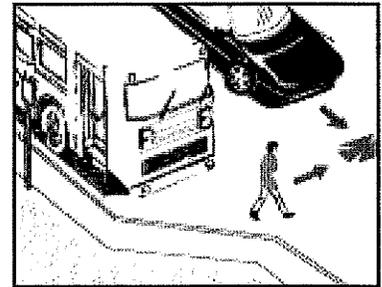
- a. Implement traffic-calming measures.
- b. Narrow roadway by reducing number of lanes, reducing lane widths, and/or adding bicycle lanes.
- c. Provide gateway, identify neighborhood with signs, and/or create a pedestrian street.
- d. Increase police enforcement of speed limit.
- e. Construct pedestrian crossing islands.
- f. Install traffic signal with pedestrian signals, if necessary.
- g. Install signs or sidewalk barriers to guide pedestrians to safer crossing locations.
- h. Use speed-monitoring trailer.

## 5. Bus-Related

The pedestrian was struck by a vehicle either: (1) by crossing in front of a commercial bus stopped at a bus stop; (2) going to or from a school bus stop; or (3) going to or from, or waiting near, a commercial bus stop.

### Possible Cause/Problem #1

Motorist fails to yield to pedestrian or pedestrian crosses during inadequate gap in traffic due to limited sight distance at intersection.



### General Countermeasures

- a. Move bus stop to far side of intersection or crosswalk.
- b. Install curb extension.
- c. Consider an alternative bus stop location.
- d. Install pedestrian crossing islands or raised crosswalk.
- e. Install or improve roadway lighting.
- f. Install crosswalk markings to encourage pedestrians to cross in the crosswalk behind the bus.
- g. Mark bus stop area with pedestrian warning signs.
- h. Remove parking in areas that obstruct the vision of motorists and pedestrians.

### Possible Cause/Problem #2

Pedestrian has difficulty walking along roadway and crossing at midblock location with high vehicle speeds and/or high volumes.

### General Countermeasures

- a. Provide bus pull-off area.
- b. Consider an alternative bus stop location.
- c. Install midblock curb extensions.
- d. Provide curb ramps and an accessible sidewalk.
- e. Install sidewalk and/or sidewalk barriers to direct pedestrians to a nearby crossing location.
- f. Provide pedestrian education/training.
- g. Add bike lanes or painted shoulder.
- h. Add recessed stop lines.

- i. Increase police speed enforcement.
- j. Install or improve roadway lighting.
- k. Reduce number of roadway lanes.
- l. Install traffic and pedestrian signals, if warranted.

### **Possible Cause/Problem #3**

Pedestrian has difficult time crossing, waiting, or walking in the vicinity of school bus stop.

### **General Countermeasures**

- a. Select safer location for school bus stop.
- b. Implement pedestrian/driver education programs.
- c. Involve school, neighborhood groups, and PTA in promoting enforcement and education.
- d. Provide sidewalks.
- e. Provide street furniture or other amenities at bus stop.
- f. Install or improve roadway lighting.
- g. Enforce regulations against passing stopped school bus.
- h. Educate pedestrians to cross behind the bus.

## **6. Turning Vehicle at Intersection**

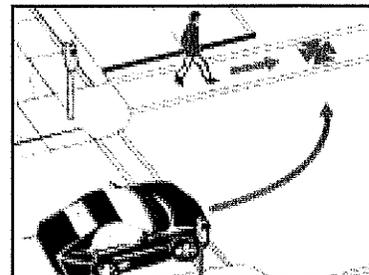
The pedestrian was attempting to cross at an intersection and was struck by a vehicle that was turning right or left.

### **Possible Cause/Problem #1**

Conflict between pedestrian and left-turning vehicle.

### **General Countermeasures**

- a. Prohibit left turns.
- b. Provide separate left-turn and WALK/DON'T WALK signals.
- c. Add special pedestrian signal phasing (e.g., exclusive protected pedestrian signal or leading pedestrian interval).
- d. Convert to one-way street network (if justified by surrounding areawide pedestrian and traffic volume study).
- e. Install warning signs for pedestrians and/or motorists (see MUTCD).
- f. Develop/provide Public Safety Announcement (PSA) safety messages.
- g. Add curb extensions or curb ramps.
- h. Convert intersection to modern roundabout or mini-circle where all motorists turn right.
- i. Consider closing street or using modified T-intersection, diverter, or intersection median barrier.
- j. Construct overpass or underpass.
- k. Install pedestrian crossing island and raised median.
- l. Use traffic-calming devices, such as a raised intersection or raised pedestrian crossing, to reduce vehicle speeds.

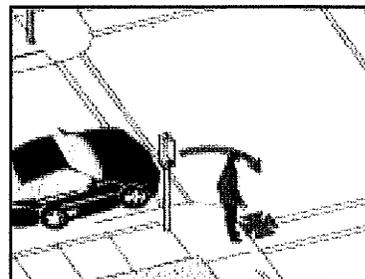


### **Possible Cause/Problem #2**

Conflict between pedestrian and right-turning vehicle.

#### **General Countermeasures**

- a. Prohibit Right Turn on Red (RTOR).
- b. Reduce right-turn radii.
- c. Add curb extensions or curb ramps.
- d. Improve right-turn slip-lane design.
- e. Install warning signs for pedestrians and/or motorists.
- f. Provide leading pedestrian interval.
- g. Remove intersection snow/clutter at the corner to improve visibility and give pedestrian space to stand outside of roadway.
- h. Improve intersection lighting to improve visibility.
- i. Provide advanced stop lines and marked crosswalks.
- j. Consider street closure.
- k. Move bus stop to far side of intersection.
- l. Construct overpass or underpass.
- m. Install pedestrian crossing island and raised median.
- n. Use a traffic-calming device, such as a raised intersection or raised pedestrian crossing, to reduce vehicle speeds.
- o. Remove on-street parking from the approaches to crosswalks.



### **Possible Cause/Problem #3**

Substantial number of school children crossing and large turning vehicle movement.

#### **General Countermeasures**

- a. Provide adult crossing guards during school crossing periods, or two guards for wide streets.
- b. Provide police enforcement at the intersection.
- c. Educate children about safe crossing behavior.
- d. Install pedestrian crossing islands for wide two-way streets.
- e. Prohibit left turns.
- f. Add exclusive pedestrian phase or leading pedestrian interval.
- g. Improve intersection lighting.
- h. Consider closing street or using modified T-intersection, diverter, or intersection median barrier.

### **Possible Cause/Problem #4**

Inadequate sight distance and/or intersection geometrics.

#### **General Countermeasures**

- a. Remove sight obstructions and/or roadside obstacles (e.g., trees/shrubs, mailboxes, poles, newsstands, trash cans).
- b. Provide special pedestrian signal phasing (e.g., exclusive protected pedestrian signal interval).
- c. Install pedestrian warning signs and/or motorist regulatory signs (see MUTCD).
- d. Prohibit left turns.

- e. Reduce turn radii.
- f. Install right-turn slip lane with pedestrian safety islands.
- g. Improve intersection lighting.
- h. Add paving treatments that improve visibility of pedestrian crossing areas.
- i. Prohibit Right Turn on Red (RTOR).

## 7. Through Vehicle at Intersection

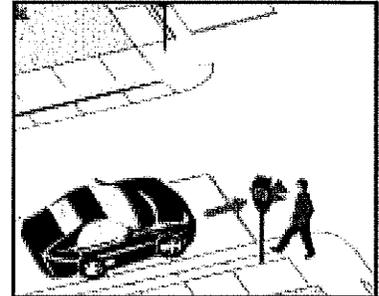
The pedestrian was struck at a signalized or unsignalized intersection by a vehicle that was traveling straight ahead.

### Possible Cause/Problem #1

Pedestrian could not see traffic signal.

### General Countermeasures

- a. Install new or larger pedestrian WALK/DON'T WALK or automated pedestrian signals.
- b. Move bus stop to far side of intersection.



### Possible Cause/Problem #2

Children crossing in school zones.

### General Countermeasures

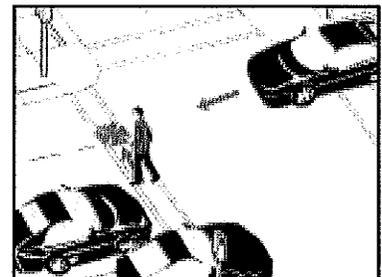
- a. Provide adult crossing guards, or two guards for wide streets.
- b. Install pedestrian overpass or underpass.
- c. Install pedestrian signals.
- d. Install school regulatory flashers (e.g., SPEED LIMIT 25 MPH WHEN FLASHING).
- e. Provide school zone signs and pavement markings.
- f. Provide pedestrian education to students and motorists.
- g. Increase police enforcement.
- h. Use traffic-calming devices such as raised intersection or mini-circle to reduce vehicle speeds.
- i. Consider closing street or using diverter or intersection median barrier.
- j. Provide advanced stop lines.
- k. Provide curb extensions to reduce crossing distance.
- l. Provide curb ramps to make crossing easier for all pedestrians.
- m. Provide a raised pedestrian crossing.
- n. Convert to one-way street network (if justified by surrounding areawide pedestrian and traffic volume study).

### Possible Cause/Problem #3

Excessive delay to pedestrians prior to getting the WALK interval.

### General Countermeasures

- a. Re-time signal to be more responsive to pedestrian needs (e.g., shorter cycle lengths or convert to fixed-time operation).
- b. Provide quick-response pedestrian push-buttons or automatic (e.g., microwave or infrared) detectors.



- c. Install pedestrian overpass or underpass (if justified based on high pedestrian volumes with high traffic speeds or volumes).
- d. Provide pedestrian crossing islands.

**Possible Cause/Problem #4**

Lack of pedestrian compliance with WALK phase due to other causes.

**General Countermeasures**

- a. Re-time signal to be more responsive to pedestrian needs (e.g., shorter cycle length).
- b. Provide adequate WALK and clearance intervals.
- c. Provide leading pedestrian interval.
- d. Provide pedestrian education to students and motorists.
- e. Provide adult crossing guard at school crossings.

**Possible Cause/Problem #5**

Motorist did not see pedestrian in time to stop.

**General Countermeasures**

- a. Remove sight obstructions such as mailboxes or parked vehicles.
- b. Add pedestrian crossing islands or raised crosswalk.
- c. Remove on-street parking near intersection (e.g., up to 30.5 m [100 ft]).
- d. Use traffic-calming devices, such as speed tables or a speed-monitoring trailer, on streets approaching the intersection if speed is an issue.
- e. Add curb extensions.
- f. Construct raised intersection.
- g. Improve nighttime lighting.
- h. Move bus stop to far side of intersection.
- i. Add paving treatments that improve visibility of pedestrian crossing areas.

**Possible Cause/Problem #6**

Motorist ran red light at signalized intersection.

**General Countermeasures**

- a. Increase police enforcement.
- b. Install camera enforcement.
- c. Add short all-red interval at signal.

**8. Walking Along Roadway**

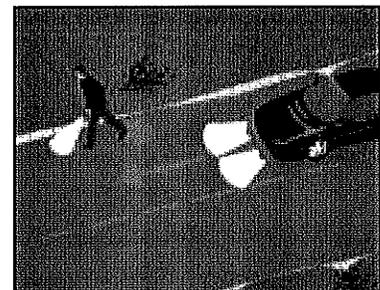
The pedestrian was walking or running along the roadway and was struck from the front or from behind by a vehicle.

**Possible Cause/Problem #1**

Inadequate walking area.

**General Countermeasures**

- a. Provide a sidewalk on both sides of road.



- b. Provide an asphalt path or paved shoulder.
- c. Reduce number of lanes (e.g., four lanes to three lanes) and add sidewalk, planting strip, bike lanes, or painted shoulder.
- d. Construct and maintain sidewalks and curb ramps to be usable by people with disabilities.

**Possible Cause/Problem #2**

High vehicle speeds and/or volume.

**General Countermeasures**

- a. Add sidewalk or walkway.
- b. Provide nighttime lighting.
- c. Install "Walk on Left Facing Traffic" signs.
- d. Increase lateral separation between pedestrians and motor vehicles (e.g., bike lanes or landscape buffers).
- e. Increase police enforcement of speed limit.
- f. Construct and maintain sidewalks and curb ramps to be usable by people with disabilities.
- g. Use speed-monitoring trailers.
- h. Construct gateway or install signs to identify neighborhood as area with high pedestrian activity.

**Possible Cause/Problem #3**

Indequate route to school.

**General Countermeasures**

- a. Provide sidewalks.
- b. Involve school groups and PTA in evaluating safe routes to school and promoting education and enforcement.
- c. Provide adult crossing guards.
- d. Implement traffic-calming methods at selected sites.
- e. Construct and maintain sidewalks and curb ramps to be usable by people with disabilities.

**Possible Cause/Problem #4**

Sidewalks are not accessible to all pedestrians.

**General Countermeasures**

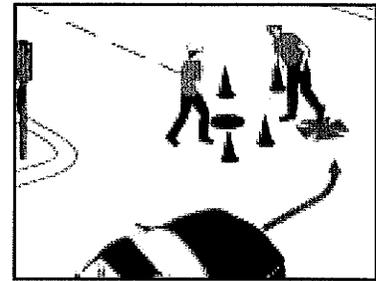
- a. Construct curb ramps.
- b. Remove obstacles in sidewalk.
- c. Build missing sidewalk segments.
- d. Relocate poles and street furniture to provide continuous passage in sidewalk area.
- e. Enforce parking laws to prevent cars from blocking sidewalks.

## 9. Working/Playing in Road

A vehicle struck a pedestrian who was: (1) standing or walking near a disabled vehicle, (2) riding a play vehicle that was not a bicycle (e.g., wagon, sled, tricycle, skates), (3) playing in the road, or (4) working in the road.

### Possible Cause/Problem #1

Worker, policeman, etc. struck in roadway (arterial street).



### General Countermeasures

- a. Provide better physical separation/protection from motor vehicles.
- b. Improve nighttime lighting and retroreflective materials on workers.
- c. Improve traffic control measures (e.g., signs, markings, cones, barricades, and flashers) warning motorists of workers' presence.
- d. Increase police enforcement of speed limits in work zones.
- e. Increase worker safety training.

### Possible Cause/Problem #2

Pedestrian was struck playing on foot or on play vehicle (e.g., skateboard, wagon, sled, in-line skates) on local/collector street.

### General Countermeasures

- a. Provide accessible sidewalks or walkways on both sides of street.
- b. Introduce traffic-calming measures (e.g., speed humps, street narrowing).
- c. Improve nighttime lighting.
- d. Implement pedestrian and motorist education programs.
- e. Provide community park/playground.
- f. Convert streets to a woonerf or use signs to identify neighborhood as area with high levels of pedestrian activity.
- g. Consider street closures (full or partial) or using diverters.

### Possible Cause/Problem #3

Vehicle speeds are excessive on local street.

### General Countermeasures

- a. Narrow streets and/or travel lanes.
- b. Install traffic-calming devices such as speed humps, speed tables, mini-circles, and/or chicanes.
- c. Convert to driveway link/serpentine street.
- d. Use speed-monitoring trailers in conjunction with police enforcement.

### Possible Cause/Problem #4

Disabled vehicle-related (walking to/from disabled vehicle).

### General Countermeasures

- a. Provide sidewalks, walkways, or paved shoulders.
- b. Implement pedestrian/driver education program.
- c. Provide adequate nighttime lighting.
- d. Provide motorist assistance program.

### **Possible Cause/Problem #5**

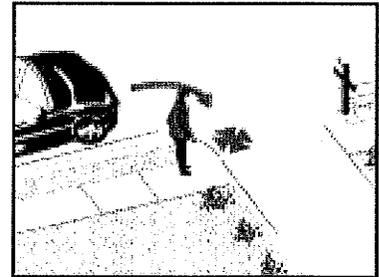
Working on or standing by a disabled vehicle.

#### **General Countermeasures**

- a. Provide paved shoulders.
- b. Provide adequate nighttime lighting.
- c. Educate drivers about what to do if a vehicle becomes disabled.
- d. Provide a motorist assistance program.

## **10. Not in Road (Sidewalk, Driveway, Parking Lot, or Other)**

The pedestrian was standing or walking near the roadway edge, on the sidewalk, in a driveway or alley, or in a parking lot, when struck by a vehicle.



### **Possible Cause/Problem #1**

Pedestrian was struck while waiting to cross roadway, standing at or near curb.

#### **General Countermeasures**

- a. Provide accessible sidewalks/walkways and crosswalks.
- b. Install curb extensions for better line of sight between pedestrians and motor vehicles.
- c. Reduce curb radii to slow turning cars.
- d. Implement driver education program.
- e. Install sidewalk barriers.
- f. Improve nighttime lighting.
- g. Increase speed enforcement.
- h. Provide sidewalk buffer (landscape strip or bike lane).
- i. Use adult crossing guard.

### **Possible Cause/Problem #2**

Pedestrian was struck in parking lot, driveway, private road, gas station, alley, etc.

#### **General Countermeasures**

- a. Redesign or re-stripe parking lot to provide pedestrian access.
- b. Maintain level sidewalk across driveway area.
- c. Implement pedestrian and motorist education programs.
- d. Move sidewalk farther back so that driver will have more time to stop for a pedestrian crossing a driveway.
- e. Improve nighttime lighting.
- f. Build/improve local parks for child activities.
- g. Provide clear pedestrian path across parking lot.
- h. Remove landscaping or other visual obstructions near driveways.

### **Possible Cause/Problem #3**

Vehicle entered or exited a driveway or alley and struck pedestrian.

### General Countermeasures

- a. Provide sidewalk or walkway.
- b. Add adequate planting strip or sidewalk separation.
- c. Remove sight obstructions (e.g., trim hedges or lower fencing).
- d. Maintain level sidewalks across driveways or alleys.
- e. Narrow driveways and reduce turning radii.
- f. Provide clear walking path across driveway.
- g. Remove unneeded driveways and alleys.
- h. Provide advance warning signs for drivers.

## 11. Backing Vehicle

The pedestrian was struck by a backing vehicle on a street, in a driveway, on a sidewalk, in a parking lot, or at another location.

### Possible Cause/Problem #1

Pedestrian struck by backing vehicle.

### General Countermeasures

- a. Enhance pedestrian education.
- b. Enhance motorist education.
- c. Provide auditory backing alert on vehicle.
- d. Eliminate, modify, or relocate parking if feasible.
- e. Remove unneeded driveways and alleys.
- f. Remove landscaping or other sight obstruction near driveways.
- g. Provide clearly delineated walkways for pedestrians in parking lots.
- h. Relocate pedestrian walkways.
- i. Improve nighttime lighting.
- j. Provide raised pedestrian crossings or curb extensions to improve the visibility of pedestrians to backing motorists.



## 12. Crossing on Expressway

The pedestrian was struck while crossing a limited-access expressway or expressway ramp.

### Possible Cause/Problem #1

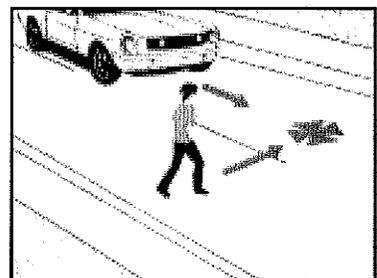
Disabled vehicle (pedestrian crosses expressway to seek help).

### General Countermeasures

- a. Install/upgrade roadway lighting.
- b. Increase police surveillance.
- c. Provide motorist assistance program.
- d. Educate drivers on what to do if a vehicle is disabled.

### Possible Cause/Problem #2

Pedestrians routinely cross section of expressway.



### **General Countermeasures**

- a. Install large, visible pedestrian warning signs.
- b. Install/upgrade nighttime lighting.
- c. Provide pedestrian overpass/underpass.
- d. Install pedestrian fencing or barriers along roadway right-of-way
- e. Increase police surveillance.

## **13. Miscellaneous**

This category includes all other pedestrian crash types, such as: intentional crashes, driverless vehicle, a secondary crash after a vehicle/vehicle collision, a pedestrian struck by falling cargo, emergency vehicle striking a pedestrian, a pedestrian standing or lying in the road, or other/unknown circumstances.

The information described above on pedestrian crash groups is referenced in the next chapter for selecting corresponding pedestrian safety improvements.



### **Possible Cause/Problem #1**

Pedestrian lying in road.

### **General Countermeasures**

- a. Install or upgrade nighttime lighting.
- b. Increase police enforcement and surveillance.
- c. Provide taxi rides home from bars.

### **Possible Cause/Problem #2**

Emergency vehicle-related.

### **General Countermeasures**

- a. Increase police surveillance.
- b. Install/upgrade lighting.
- c. Provide public education.

### **Possible Cause/Problem #3**

Pedestrian falls from vehicle.

### **General Countermeasures**

- a. Increase police enforcement of teens "vehicle surfing."
- b. Pass/enforce laws and provide education programs against riding in back of pickup trucks.

### **Possible Cause/Problem #4**

Pedestrian standing in road prior to crash — action unknown.

### **General Countermeasures**

- a. Provide accessible sidewalks/walkways and crosswalks.
- b. Install/upgrade roadway lighting.
- c. Provide raised median (multi-lane roads).
- d. Add pedestrian crossing islands.

- e. Enforce speed limit.
- f. Provide safe pedestrian crossings (e.g., traffic signal, if warranted).

**Possible Cause/Problem #5**

Pedestrian struck by driverless vehicle.

**General Countermeasures**

- a. Require mandatory statewide vehicle inspection.
- b. Address through State driver education program.