

Pedestrian Element Scottsdale Transportation Master Plan

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City of Scottsdale**

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Pedestrian Element

1.0 INTRODUCTION

The purpose of the Pedestrian Element is to encourage walking as a sustainable form of transportation; to make walking a safer, more convenient and a more comfortable travel option; and to provide policy guidance and standards regarding the type, quality and locations of pedestrian facilities throughout the City. This element is designed to be implemented through the City of Scottsdale's *Design Standards & Policy Manual (DS&PM)*, *Standard Details for Public Works Construction (Standard Details)*, and land use and zoning decisions of the City Council, Transportation Commission, Planning Commission, and City Transportation and Planning staff.

The Pedestrian Element has been divided into eight major sections: (1) goals and objectives for the Pedestrian Element; (2) background of pedestrians and walking (3) an overview of existing conditions including existing policies and documents; (4) discussion of future pedestrian demand using a latent demand model; (5) opportunities to enhance and improve the comfort, safety and convenience of walking; (6) a pedestrian route network based on the results of future pedestrian demand; (7) design guidelines to ensure that pedestrian areas meet the needs of all pedestrians; and (8) recommendations to implement the goals and objectives of the Pedestrian Element.

2.0 GOALS AND OBJECTIVES FOR THE PEDESTRIAN ELEMENT

This section lists all goals and objectives for the Pedestrian Element of the *Transportation Master Plan*. For purposes of this section, a goal is defined as a long-term vision to which programs, activities and actions are directed. An objective is a specific, measurable, task that provides progress toward achievement of a goal.

2.1.1 Pedestrian Safety and Security Goal: Create a street environment that is safe and secure for pedestrians.

- Pedestrian Safety and Security Objective 1: Develop and implement a Safe Routes to School Program.
- Pedestrian Safety and Security Objective 2: Create and systematically implement design guidelines that enhance pedestrian safety, including ways to enhance the abilities of pedestrians to cross roadways.
- Pedestrian Safety and Security Objective 3: Create a pedestrian safety action plan using recent guidance developed by the Federal Highway Administration and the Arizona Department of Transportation.
- Pedestrian Safety and Security Objective 4: Consistently maintain existing pedestrian facilities so they remain clear of debris, overgrown vegetation, and poor conditions (such as heaved or broken pavement), responding to complaints and working with city crews and private homeowners.

- Pedestrian Safety and Security Objective 5: Establish patrols in areas with high pedestrian use and enforce traffic laws for pedestrians and motorists.

2.1.2 Pedestrian Access and Connectivity Goal: Create a street environment that allows pedestrians to directly access key destinations by walking.

- Pedestrian Access and Connectivity Objective 1: Create and systematically implement design guidelines that address key pedestrian concerns of directness, capacity and continuity.
- Pedestrian Access and Connectivity Objective 2: Connect pedestrian facilities to link to other pedestrian supportive facilities, such as transit routes and shared use paths.
- Pedestrian Access and Connectivity Objective 3: Design pedestrian facilities using universal design principles and the draft *Guidelines for Accessible Public Rights-of-Way* published by the Public Rights-of-Way Access Advisory Committee of the Access Board¹.

2.1.3 Streetscape and Land Use Goal: Provide pedestrian amenities and promote land uses that enhance public spaces, neighborhoods, commercial and employment areas – amenities that will entice more people to walk.

- Streetscape and Land Use Objective 1: Create and systematically implement design guidelines that provide guidance to enhance visual interest and identify the appropriate level of amenities that responds to anticipated use by pedestrians as identified by the latent demand model.
- Streetscape and Land Use Objective 2: Encourage land use that increases pedestrian activity by providing residential and neighborhood commercial and employment uses within close proximity.
- Streetscape and Land Use Objective 3: Require all development proposals to include a pedestrian circulation element.
- Streetscape and Land Use Objective 4: Promote school site design that encourages non-motorized travel for students and personnel by accommodating direct links between schools and neighborhoods in a manner that minimizes exposure to vehicles.

2.1.4 Education and Promotion Goal: Educate citizens, community groups, school children and parents, businesses and developers on safety, health and civic aspects of walking.

- Education and Promotion Objective 1: Develop and implement comprehensive and proactive pedestrian safety programs for pedestrians and motorists.
- Education and Promotion Objective 2: Promote pedestrian travel as an alternative to driving for short neighborhood trips such as from home to schools, parks, libraries, retail centers, and civic spaces.

¹ Available from www.access-board.gov/prowac/draft.htm.

- Education and Promotion Objective 3: Encourage and promote walking as a way to improve health and reduce vehicle emissions.
- Education and Promotion Objective 4: Sponsor educational opportunities to keep city staff and elected officials informed of recent advances in pedestrian planning and facility design.

2.1.5 Implementation Goal: Incorporate pedestrian needs into the policy-making, planning, design, construction and maintenance of existing and new policies, plans, programs, projects, facilities and operations.

- Implementation Objective 1: Create and adopt design guidelines and standards that create a safe, functional, convenient, accessible and pleasurable walking environment.
- Implementation Objective 2: Continue to provide dedicated funding sources for pedestrian improvements.
- Implementation Objective 3: Construct appropriate pedestrian facilities in new development, and retrofit existing areas to meet pedestrian needs.
- Implementation Objective 4: Prioritize pedestrian improvements based on potential usage by the highest number of pedestrians as identified by the latent demand model.
- Implementation Objective 5: Create and update a comprehensive pedestrian facilities inventory, including existing sidewalks and accessibility features (such as curb cuts, accessible pedestrian signals, etc.).
- Implementation Objective 6: Identify a staff person responsible for reviewing all development proposals and site plans to ensure that all planning and design projects appropriately incorporate pedestrian needs.

3.0 BACKGROUND

3.1 Benefits of Walking

Walking is the most basic form of transportation. All trips begin and end with walking, even for those who use a vehicle for the majority of their trip. Because it generally requires no special equipment, walking is the easiest and most convenient transportation mode. According to the Pedestrian and Bicycle Information Center, walking has a number of economic, environmental, health, quality of life and transportation benefits.²

Walking is one of the most affordable forms of transportation since no special equipment is required beyond assistive devices for persons with mobility impairments. Walking is ideal for short-distance trips and could replace short-distance motor-vehicle trips. According to the 1995 National Personal Transportation Survey, approximately 40 percent of all trips are less than two miles in length – which represents an approximately 30 minute walk.

Walking is an ideal form of exercise that can help contribute to improved health and well-being. Regular exercise can help manage and reduce a wide range of common diseases, such as heart disease, hypertension, obesity, diabetes and depression. Improving walking conditions helps to improve quality of life in communities as well. The ability of people to walk safely and comfortably is a key factor in community livability. Communities with higher livability are better able to attract businesses, workers and tourists.

Walking can also help to meet congestion management goals as well. Some roadways carry more traffic than they were designed to handle, resulting in wasted time and energy, pollution and driver frustration. Increased walking can help offset the costs of providing new roads and parking.

3.2 What is a Pedestrian?

According to Arizona State Law, a pedestrian is:

... any person afoot. A person who uses an electric personal assistive mobility device or a manual or motorized wheelchair is considered a pedestrian unless the manual wheelchair qualifies as a bicycle. (A.R.S. 28-101)

Pedestrians also include rollerskaters, in-line skaters, and skateboarders, as well as users of “electric personal assistive mobility devices” which means a self-balancing two nontandem wheeled device with an electric propulsion system that limits the maximum speed of the device to



Walking is one of the oldest and most basic forms of transportation.



Pedestrians walk in Downtown Scottsdale (3rd Avenue).

² Pedestrian and Bicycle Information Center, www.walkinginfo.org.

fifteen miles per hour or less and that is designed to transport only one person” (A.R.S 28-101). One common brand of these types of devices is the Segway Human Transporter.

The needs of pedestrians vary depending on their age, physical ability, and travel purpose. Children generally require adult supervision and educational programs to increase their awareness of traffic and safe walking behavior. Common age-related characteristics of pedestrians are shown in *Table 1*.

Table 1: Common Pedestrian Characteristics by Age Group	
Age 0 to 4	<ul style="list-style-type: none"> • Learning to walk. • Requires constant parental supervision. • Developing peripheral vision, depth perception.
Age 5 to 9	<ul style="list-style-type: none"> • Lower eye height; 1/3 narrower side vision than adults. • Not able to determine direction of sounds. • Have difficulty judging speed and distance. • Smaller (not as tall); drivers may not see them. • Have short attention span and will grow impatient if they have to wait too long to cross the street. • Assume that if they see a vehicle, it can see them. • Do not understand complicated situations. If one vehicle slows or stop, they may assume that others will do the same.
Age 9 to 12	<ul style="list-style-type: none"> • Increasing independence, but still requiring adult supervision. • Poor depth perception. • Susceptible to darting out into traffic and intersection dash behavior. • Crash rates are highest for 5- to 9-year old males.
Age 13 to 18	<ul style="list-style-type: none"> • Sense of invulnerability. • Runs through intersections without looking first.
Age 19 to 40	<ul style="list-style-type: none"> • Active, fully aware of travel environment.
Age 41 to 65	<ul style="list-style-type: none"> • Slowing of reflexes.
Age 65 +	<ul style="list-style-type: none"> • Street crossing difficulty. • Poor vision. • Difficulty hearing vehicles approaching from behind; reduced ability to detect and differentiate sounds. • Limited attention span, memory and cognitive abilities. • Reduced endurance and tolerance for extreme temperature and environments. • Decreased range of joint motion, balance and stability. • Excessive trust that drivers will obey traffic rules. • High fatality rate.
<p>Sources: Washington State Bicycle Transportation and Pedestrian Walkways Plan, 1994, as cited in the <i>Pedestrian Facilities Guidebook</i>, Washington State Department of Transportation, September 1997, available at www.wsdot.wa.gov/walk/designinfo.htm; <i>Toolbox to Address Safety and Operations on School Grounds and Public Streets Adjacent to Elementary and Middle Schools in Iowa</i>, Iowa Department of Transportation, August 2006; <i>Designing Sidewalks and Trails for Access</i>, Federal Highway Administration, July 1999.</p>	

Physical ability will vary with age, but also varies with the individual.³ For example, medical conditions, such as cardiac disease and degenerative joint disease, may limit a person's ability to walk, and to move quickly out of the path of an oncoming vehicle. Also, parents pushing children in strollers, bicyclists walking with their bicycles, and adults carrying packages or other items will likely not react as quickly to potential hazards due to inattention and limited physical ability caused by taking care of another person. Tourists and people walking in groups may be distracted. All of these pedestrians are likely to walk more slowly and require more maneuvering space than other pedestrians. Walking speeds of different types of pedestrians are shown in *Table 2*.



Parents pushing children in strollers (this pedestrian is on Scottsdale Road) will likely not react as quickly to potential hazards, and require more maneuvering space than other pedestrians.

Table 2: Pedestrian Walking Speeds	
Pedestrian Type	Average Walking Speed, Feet Per Second
Average adult	4.00
Wheelchair user	3.55
Pedestrian with immobilized knee	3.50
Older/senior adult	2.80
Cane or crutch user	2.62
Below-knee amputee	2.46
Pedestrian with knee arthritis	2.46
Pedestrian with hip arthritis	2.24 to 3.66
Pedestrian with walker	2.07
Above-knee amputee	1.97

Source: *FHWA Course on Bicycle and Pedestrian Transportation (for planners and designers)*, Federal Highway Administration, Lesson 8, available at <http://safety.fhwa.dot.gov/pedbike/univcourse>

³ *Designing Sidewalks and Trails for Access*, Federal Highway Administration, July 1999, available at www.fhwa.dot.gov/environment/bikeped/access-1.htm

People with disabilities⁴ need a pedestrian environment free of barriers. An environment designed with the principles of universal design helps to create pedestrian areas that function well for people with disabilities (see *Section 6.8 Design Facilities That Are Universally Accessible*). Pedestrian areas that are designed to be accessible to people with disabilities are generally safer and more user-friendly for all pedestrians. The needs of a pedestrian with a disability will depend on the type of disability, the level of impairment and the capability of the individual. In general, elements that are helpful to pedestrians with disabilities are listed in *Table 3*.

Table 3: Elements Helpful for Pedestrians with Disabilities

- Curb cuts and ramps.
- Tactile warnings.
- Easy-to-reach activation buttons.
- Audible warnings and message systems.
- Raised and Braille letters for communication.
- Signal timing at lower than average walking speed.
- Maximum grade of 1:20 and cross slope of 1:50 (ramps can be 1:12).
- Roadway crossing refuges.
- Reduced roadway crossing distances (bulb-outs and curb extensions).
- Traffic calming.
- Handrails.
- Smooth surfaces and unobstructed travel ways.

Source: *Pedestrian and Streetscape Guide*, Georgia Department of Transportation, September 2003, page 15, available at www.walkable.org/download/Georgia_ped_streetscape_guide.pdf



Pedestrian areas that are designed to be accessible to people with disabilities are generally safer and more user-friendly for all pedestrians.

⁴ *Designing Sidewalks and Trails for Access*, Federal Highway Administration, July 1999, available at www.fhwa.dot.gov/environment/bikeped/access-1.htm. Also see *Pedestrian and Streetscape Guide*, Georgia Department of Transportation, September 2003, page 15, available at www.walkable.org/download/Georgia_ped_streetscape_guide.pdf

3.3 What is a Pedestrian Facility?

Components of the pedestrian transportation system are generally referred to as “pedestrian facilities.” Pedestrian facilities include sidewalks, curb ramps, multiuse paths, multiuse trails, crosswalks, traffic calming features, grade-separated crossings, and other elements that encourage pedestrian movement such as landscaping, site furnishings and amenities, and public art. Pedestrian facilities also include design strategies that help make walking safer, more convenient and more comfortable. Multiuse paths and multiuse trails are discussed in the Bicycle Element of the *Transportation Master Plan*.

3.4 Measuring the Effectiveness of Pedestrian Facilities

The *Kansas City Pedestrian Walkability Plan*⁵ summarizes key factors that affect pedestrian mobility, including directness, capacity, continuity, street crossings, visual interest and amenities, and security. The Maricopa Association of Governments’ (MAG) *Pedestrian Policies and Design Guidelines* also describes common factors found in successful pedestrian environments.⁶ Effective pedestrian environments will include the design elements discussed below.

3.4.1 Directness

National research has shown that distance (real or perceived) is the reason most cited as determining whether people walk. In general, people will choose to walk an approximately 10-15 minute trip (about a 1/4 to 1/2-mile to a destination) if the route is comfortable and safe or if the need is great.

If the sidewalk network is direct and minimizes travel time, a person is more likely to walk. Features such as gated or walled communities can create barriers to nearby transit stops and nearby commercial or entertainment areas. The land use mix and its density influences whether people walk. People are more likely to walk when a variety of destinations, such as home, transit stops, schools, parks, commercial areas and employment are placed within close proximity.



A direct pedestrian facility provides access to nearby destinations, such as shopping. People are more likely to walk when a variety of destinations, such as home, transit stops, schools, parks, commercial areas and employment are placed within close proximity.

While meandering sidewalks may have aesthetic appeal in some situations, they generally add more distance to the pedestrian trip and greater challenges for individuals with physical constraints. Highly meandering sidewalks limit both the efficiency and the effectiveness of the pedestrian trip. People generally want to use the most direct route, and may not use a walkway if it does not provide the most direct route.

⁵ *Kansas City Walkability Plan*, prepared for the City Planning and Development Department, City of Kansas City, Missouri, by LSA Associates, Inc. Adopted March 20, 2003. This document is available at <http://www.kcmo.org/planning/nsf/plnpres/walkability>.

⁶ *Pedestrian Area Policies and Design Guidelines*, Maricopa Association of Governments, 2005, available at www.mag.maricopa.gov.

3.4.2 Capacity

People will choose to walk if the walkway has sufficient capacity. The capacity of a sidewalk will vary based on the number of pedestrians using it, the speed of adjacent traffic and the number and location of obstacles on the sidewalk. The effective walkway width is the portion of the sidewalk actually used by pedestrians for walking. The walkway needs to be sufficiently wide to account for pedestrians moving away from the curb, building walls, light poles, window shopping and street furnishings while traveling.

3.4.3 Continuity

Pedestrians require continuous routes, without gaps. Gaps in continuity can be caused by missing sidewalk segments, providing a sidewalk on only one side of the street, or overgrown vegetation.

Another aspect of continuity is the number of driveways along a walkway since pedestrians must pause at each driveway crossing to look for turning vehicles, and may have to wait or move around waiting vehicles. Minimizing driveway crossings and consolidating driveways creates continuous pedestrian routes.



Driveways along the pedestrian route limits continuity (photo taken in Downtown Scottsdale).

3.4.4 Street Crossings

Pedestrians also often face difficulty at intersections where they must cross. At intersections, where pedestrians interface with automobiles, special attention is needed to provide for a safe pedestrian environment. As streets get wider and carry more traffic, crossing conditions become more challenging for pedestrians.



Special attention is needed where pedestrians interface with automobiles at street crossings.

The ability of a pedestrian to safely cross the street is affected by:⁷

- The number of lanes and widths of the lanes to cross.
- Presence of a raised median or refuge island.
- Presence of a marked crosswalk.
- Use of a pedestrian actuated signal or dedicated pedestrian crossing phase.
- Clear sight lines from motorists to pedestrians.
- Ramps at corners that align with the crosswalks, in both directions.
- Street lighting.

⁷ *Kansas City Walkability Plan*, prepared for the City Planning and Development Department, City of Kansas City, Missouri, by LSA Associates, Inc. Adopted March 20, 2003, page 20. This document is available at <http://www.kcmo.org/planning.nsf/plnpres/walkability> .

3.4.5 Visual Interest and Amenities

People will often choose to walk if the route is interesting. Many pedestrians, especially tourists or visitors new to an area, will walk further than 1/2 mile if the route is made interesting by other pedestrians, public art, landscaping, storefronts with windows, attractive views and places to rest. Walkers looking for exercise are also more likely to walk further than 1/2 mile.



Public art creates visual interest for pedestrians.

Pedestrians feel most comfortable in areas that have human scale in design elements and are organized to meet their needs. The features next to the sidewalk can help create a more comfortable traveling environment. Features to consider include the ratio of building height to street; walkway width; frequency and height of windows, doorways or openings; hardscape and landscaping; and street furnishings, such as seating. Pedestrian environments should be organized to provide clues about where conflicts with other roadway users may occur, and where amenities like shade and benches are provided to help create a human scaled environment.

3.4.6 Safety and Security

According to the Federal Highway Administration, “pedestrian crashes and the resulting injuries represent a serious problem on our highways.” There are a number of risk factors that influence pedestrian crash rates and severity, including:

- Wide roads (pedestrian crash rates are higher on roads with more than four lanes).
- Higher speed, higher traffic volume roadways.
- Intersections with wider crossing distances, wide turning radii, multiple turn lanes or confusing or complex traffic control.
- Drug/alcohol use by drivers and/or pedestrians.
- Lack of sidewalks.
- Older persons are more susceptible to injury and death; younger children are more likely to be struck while darting into the street.⁸



On-street parking provides a barrier from traffic for pedestrians (Scottsdale Road, Downtown Scottsdale).

Information on pedestrian vehicle collisions in the City of Scottsdale is provided in *Section 4.0 Existing Conditions and Appendix C*.

If people do not feel personally secure, even though the pedestrian route is considered safe from traffic, they will not choose to walk. Pedestrians should be clearly visible to other pedestrians and people participating in adjacent activities. Pedestrian areas should be well maintained to keep them free of debris/litter. Separation from traffic, through landscaping, bike lanes, parking, will help provide a more secure and comfortable walking environment. Providing pedestrian-level lighting in areas used at night also enhances personal security.

⁸ *How to Develop a Pedestrian Safety Action Plan*, US Dept. of Transportation, Federal Highway Administration. Publication No. FHWA-SA-05-12, February 2006, Page 1.

4.0 EXISTING CONDITIONS

This section provides an overview of existing policies and plans regarding pedestrians, collision statistics, budgeted pedestrian improvements listed in the City's adopted Capital Improvement Program, and a general discussion of existing pedestrian activity.

4.1 Existing Plans and Policies

Development of pedestrian policy and facilities has been facilitated through a wide range of city, regional and area plans, listed below and summarized in *Appendix B* and the *Existing Conditions Report*, an appendix to the *Transportation Master Plan*.

1. City of Scottsdale *Bicycle/Pedestrian Transportation Plan* (January 1995)
2. City of Scottsdale *General Plan Community Mobility Element* (2001)
3. City of Scottsdale *Downtown Plan and Downtown Urban Design and Architectural Guidelines* (1986, last updated in 2004)
4. City of Scottsdale *Safe Routes to School Implementation Plan* (2006)
5. Maricopa Association of Governments (MAG) *Pedestrian Policies and Design Guidelines* (2005)
6. MAG *Pedestrian Plan 2000* (December 1999)
7. City of Scottsdale and MAG *Downtown Pedestrian Mobility Study* (January 2007)
8. City of Scottsdale *Downtown Circulation Study* (2006)
9. City of Scottsdale *Design Standards and Policy Manual (DS&PM)*
10. Traffic Volume and Collision Rate Data Report (2006 – updated bi-annually)

4.2 Pedestrian-Vehicle Collisions

Some of the common characteristics of pedestrian collisions include:⁹

- Driver and/or pedestrian inattention.
- Struck by vehicle while crossing at an intersection (50 percent of all collisions).
- Struck by vehicle while crossing mid-block (33 percent of all collisions).
- Struck from behind while walking along the roadway in the same direction as traffic (particularly in rural areas).
- Motorist exceeding safe speed (contributes to most pedestrian deaths).
- Darting out into the street at mid-block (most common type of pedestrian collision for children).
- Vehicles backing up (difficult to see children and others walking behind).
- Collisions in urban areas (80 percent of all collisions).

The City of Scottsdale has complete crash data files which contain data on report number, date and time of the crash, crash location (street names and distance and direction from intersection), injury severity, and manner of collision (head-on, rear-end, pedestrian, etc.) and other detailed information. The pedestrian crashes were extracted and reviewed from this data.

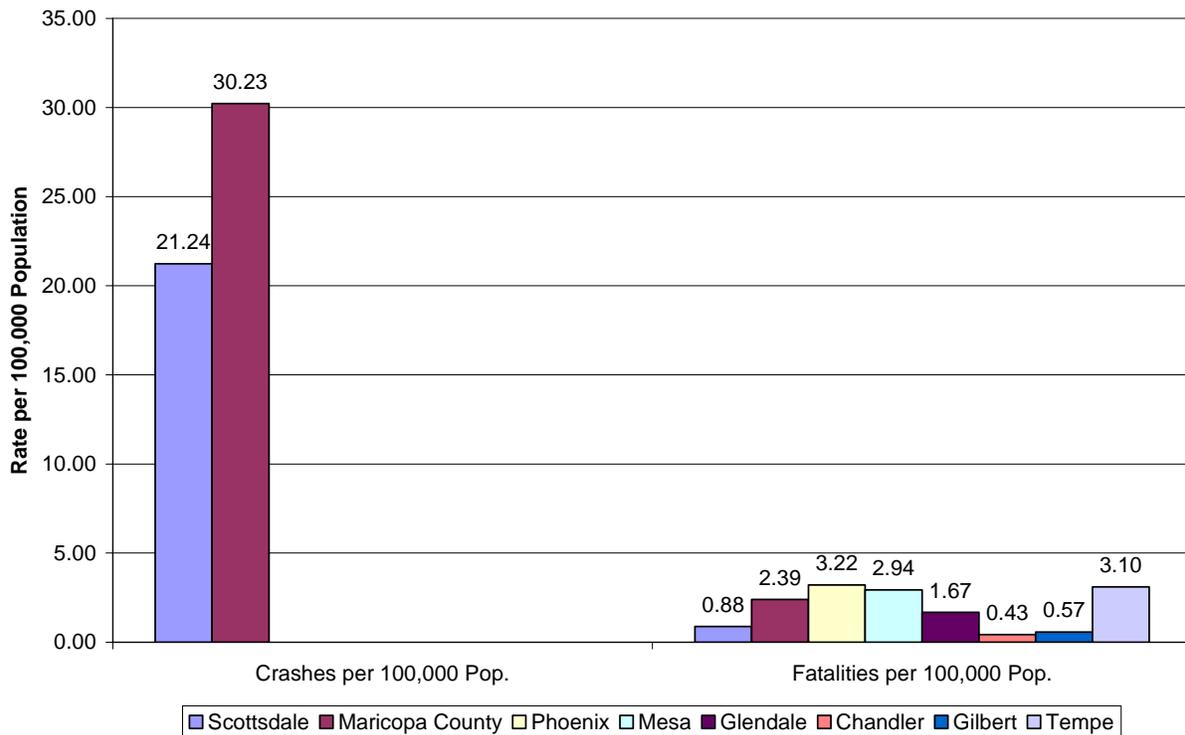
⁹ *Pedestrian and Bicycle Crash Types of the Early 1990s*, Snyder et al., as cited in *Pedestrian and Streetscape Guide*, Georgia Department of Transportation, September 2003, page 10, Table 6, available at www.walkable.org/download/Georgia_ped_streetscape_guide.pdf

Compared to Maricopa County, Scottsdale's pedestrian crash rate in January—December 2005 (crashes per 100,000 population) and pedestrian fatality rate in 2005 (fatalities per 100,000 population) are considerably lower (see *Figure 1*). Scottsdale's pedestrian fatality rate is also much lower than that of Phoenix, Mesa, Glendale, and Tempe, but higher than that of Chandler and Gilbert.^{10, 11}

The lower pedestrian crash rates in Scottsdale compared to Maricopa County may be the result of safer conditions for pedestrians in Scottsdale, and/or lower levels of pedestrian activity than other communities.

Detailed information, graphics and maps pertaining to pedestrian collisions are included in *Appendix C*.

Figure 1: Pedestrian Crashes and Fatalities in Scottsdale and Surrounding Cities



¹⁰ Pedestrian fatality data for Scottsdale and surrounding cities are in *Traffic Safety Facts 2005*, available online at www-nrd.nhtsa.dot.gov/pdf/nrd-30/NCSA/TSFAnn/TSF2005.pdf. This document does not have data on the number of pedestrian crashes.

¹¹ Maricopa County pedestrian crash data are available online at www.mag.maricopa.gov/archive/SafetyWebCrashData/PedCrashTrend99_05.htm

4.3 Planned Pedestrian Improvements

The projects listed in *Table 4* list the pedestrian improvements contained in the City of Scottsdale's Capital Improvement Program FY 2008-2012 (CIP). This list does not encompass all pedestrian or bicycle facility improvements that are planned as many improvements also occur with transit projects and in private developments. Figures in *Appendix D* show planned bicycle and pedestrian improvements anticipated to occur as part of the City's CIP by planning area.

Table 4: Planned Roadway, Bicycle, and Pedestrian Improvements		
Project/Street	Project Description	Estimated Completion
74 th St., Belleview to McDowell Rd.	Improve pedestrian environment; add on-street parking.	2007
Bell Rd., 94 th St. to Thompson Peak Pkwy.	Construct two travel lanes, landscaped median, bike lanes, sidewalks and new wash crossing.	2007
Cactus Rd., Pima Fwy. to Frank Lloyd Wright (FLW)	Construct four-lane major collector between Pima Freeway and 96th St. and two-lane neighborhood collector between 96th St. and FLW. Entire corridor will include medians/center turn lanes, bike lanes, curb and gutter, sidewalk and multi-use non-paved trail. A multi-use paved path will also be included between 96th and FLW.	2009
Cross Cut Canal Shared-use Path System	Completion of the path system from the Tempe border to Indian School Rd.	2008
Indian Bend Rd, Scottsdale to Hayden	Construct to four-lane minor arterial standards with landscaped median, turn lanes, bike lanes, curb and gutter, new all-weather crossing of Indian Bend Wash and sidewalk on south side. A new multi-use path will be installed on north side to connect the Indian Bend path system to McCormick Railroad Park. Additional turn lanes will be constructed at the Scottsdale Rd. and Hayden Rd. intersections.	2008
Indian Bend Wash Shared-use Path System	Redesign and widen the Indian Bend Wash multiuse path system to 10-12 feet in areas where the path is currently 8 feet wide between McDowell and Camelback Roads. Improvements to existing grade-separated crossings and improved connections from side streets will also be considered.	2011
Indian School Rd., Drinkwater Blvd. to Pima Rd.	Construct driveway closures, new turn lanes, bus bays, and a landscaped median to maximize through capacity in the existing four travel lanes, relocate and widen sidewalks, where feasible, and add bike lanes.	2008
McDonald Dr., Scottsdale Rd. to 78 th St.	Reconfigure and add turn lanes at McDonald/Scottsdale Rd. and McDonald/78th St. Enhance pedestrian features in between the Arizona Canal and Miller/Cattletrack Rd.	2008
McDowell Rd., Scottsdale Rd. to Granite Reef Rd.	Add bicycle lanes and enhance sidewalks; add landscaping, site furnishings and pedestrian lighting.	2010

Table 4: Planned Roadway, Bicycle, and Pedestrian Improvements

Project/Street	Project Description	Estimated Completion
Pima Rd., Deer Valley to Pinnacle Peak	Design and construct a six-lane parkway cross-section beginning with approximately 1,400 feet north of Thompson Peak Pkwy., with landscaped median, turn lanes, grade-separated path crossing, bike lanes, sidewalks, curb and gutter, roadway drainage, intelligent transportation system facilities and noise mitigation.	2009
Scottsdale Rd., Frank Lloyd Wright (FLW) to Thompson Peak Pkwy,	Design and construct a six-lane major arterial cross-section with landscaped median, turn lanes, bike lanes, sidewalks, curb and gutter, roadway drainage, and intelligent transportation system facilities. Additional turn lanes at FLW and a new pedestrian crossing of the Central Arizona Project Canal will also be included.	2008
Scottsdale Rd., Thompson Peak Pkwy. to Pinnacle Peak Pkwy.	Design and construct a six-lane major arterial cross-section with landscaped median, turn lanes, bike lanes, sidewalks, curb and gutter, roadway drainage, intelligent transportation system facilities, and a new all-weather crossing of Rawhide Wash.	2010
Scottsdale Rd. between Roosevelt St. to Earll Dr. (Phase 1), and Earll Dr. to and Chaparral Rd. (Phase 2)	Add bicycle lanes and widen sidewalks. Landscaping, shade, site furnishings, pedestrian lighting and crosswalk treatments will also be included.	2009
Thomas Rd., 64 th St. to Pima Rd.	Add bicycle lanes and widen sidewalks; add landscaping, shade and site furnishings. Consider additional turn lanes at intersections.	2010

4.3 Current Pedestrian Activity

There are three primary methods of assessing pedestrian trip activity:

- revealed demand
- evaluating potential trip generators or attractors, and
- latent demand.¹²

Revealed demand identifies pedestrian activity by counting existing pedestrians on roadways. However, actual pedestrian counts do not indicate the level of demand for pedestrian travel for several reasons. First, pedestrian travel is more sensitive to impediments than automobile travel. For example, distance between origins and destinations affects the choice to walk more than the choice to drive. In addition, the conditions of the walking environment, such as whether a sidewalk exists, also affect whether a walking trip is made and what route is used. Furthermore, depending on the purpose of the trip, walking may also not be a reasonable choice when compared with driving. For these reasons existing pedestrian counts do not accurately reflect the amount of pedestrian travel that would occur if there were not as many impediments to the selection of walking as a transportation mode choice.



Pedestrians along Brown Avenue enjoy the activities of Old Town.

Despite its weaknesses as a methodology, revealed demand does help to determine current pedestrian activity. Pedestrian counts for 2005, from the Federal Special Census (the most recent year for which statistics are available) show that 1.5 percent of the City's population over 16 years of age walked as a sole means of transportation to work. Another 1.9 percent of the City's population over 16 years of age population rode a bus or bicycled to work. Compared to the 2000 and 1990 census, people walking as their only mode of travel to work declined as a percent of the total population and absolutely. This decline is more than offset by an overall number of people using public transit, and one could speculate that increased transit service throughout Scottsdale from 1990 to 2005 enabled many people who walked and bicycled to work to shift to public transit as their primary means of commuting. In addition, most of the recent population growth in Scottsdale has occurred in our northern areas where local employment is more limited.

Another way to determine pedestrian travel demand is to assess potential trip starting points and destinations. This method has traditionally been the most common method to estimate pedestrian travel demand. This method of assessing demand also has weaknesses because it tends to focus only on major pedestrian trip destinations, such as schools, parks and retail centers. Therefore, only a fraction of the potential pedestrian trips are considered. In reality, since most pedestrian trips are relatively short in length, virtually every residence and every destination in the community is a pedestrian starting point or destination.



¹² See *Pedestrian Plan 2000 Technical Appendix*, Maricopa Association of Governments, December 1999, available at www.mag.maricopa.gov.

The third method used to quantify pedestrian activity levels is latent demand. Latent demand considers all potential trip starting points and destinations and identifies the amount of pedestrian travel that could occur if there were no obstacles to pedestrian travel. Latent demand methodology acknowledges that pedestrian trip making declines with larger distances between starting points and destinations, and that some types of trips are more likely to be made by pedestrians than drivers. For example, people will generally walk further to work than to a restaurant, since travel to work is perceived as more essential than a trip to a restaurant.

Latent demand is an emerging method to determine pedestrian activity levels. As such, this Pedestrian Element uses latent pedestrian demand to help identify a planned pedestrian facility network and prioritize infrastructure investments as discussed in other sections of the Pedestrian Element.

Barriers to Pedestrian Travel

Section 3.4 Measuring the Effectiveness of Pedestrian Facilities, discussed important features essential to creating a functional pedestrian environment. These features include directness, capacity, continuity, visual interest and amenities, and safety and security. In addition, roadway and traffic conditions often present barriers to pedestrian movement. These barriers, by increasing the perceived hazards of walking, discourage some individuals from walking. Instead, they will use the automobile mode, contributing to traffic, or not make the trip at all. Therefore, the actual number of people walking in Scottsdale is likely less than the potential number. Additional information on pedestrian latent demand is provided in *Section 5.0 Future Pedestrian Demand*.

4.4.1 Lack of Sidewalk

The provision of a sidewalk or other accessible walking surface is probably the most important step in providing a safe and comfortable pedestrian environment. Without a walkway, pedestrians may be forced to walk in the roadway or choose not to walk. For roadways with destinations on both sides of the roadway, sidewalks are important to provide on each side of the roadway.



At Drinkwater Boulevard and Scottsdale Road, there is no sidewalk for pedestrians. The provision of a sidewalk or other accessible walking surface is the most important step in providing a safe and comfortable pedestrian environment.

4.4.2 High Volume of Turning Vehicles

Another traffic condition that causes difficulty for pedestrians is a high volume of turning vehicles, either at intersections or at driveways. Turning motorists often do not look for, or yield to, pedestrians. Right-turn-on-red motorists, for instance, scan to the left for gaps in traffic and often fail to scan to the right for pedestrians crossing in front of them in the crosswalk. At some intersections, a continuous stream of motorists turning right on green means that pedestrians may find it difficult to cross even when they have the Walk signal (and motorists must yield the right-of-way). Excluding crashes occurring on private property (for example, parking lots), 40 percent of pedestrian crashes in Scottsdale from January 2005—October 2006 occurred at intersections.



A high volume of turning vehicles at intersections can make it difficult for pedestrians to cross (Brown Avenue and First Avenue).

4.4.3 Lack of Safe Mid-Block Crossings

Another difficult situation for pedestrians is caused by the lack of safe mid-block crossing locations. Pedestrians who are at a mid-block location and want to cross the street have to choose between crossing mid-block or going out of their way to cross at a signalized intersection. The further they are from a signalized intersection (and the further out of their way they have to go to reach the signalized intersection), the more likely it is that they will cross mid-block. Depending on traffic speeds and volumes, adequate gaps in traffic may be rare, or pedestrians may misjudge the adequacy of gaps. Moreover, high traffic speeds and volumes will prove daunting to some individuals. Rather than choosing between the inconvenience of going out of their way to cross at a signalized intersection and attempting a mid-block crossing, these individuals may decide not to walk at all. Excluding crashes occurring on private property, 60 percent of pedestrian crashes in Scottsdale from January 2005—October 2006 occurred at mid-block locations.



Pedestrians cross Goldwater Boulevard.

The relative exposure (how many crossings occur) of pedestrians at mid-block locations as compared to signalized intersections cannot be determined without an extensive pedestrian mapping study. Also unknown is the degree to which pedestrian error, or possibly cognitive impairments, contributed to the mid-block crash numbers. More detailed crash studies will be required in the future to identify specific locations and roadway improvements which may be appropriate for improving pedestrian mid-block crossing conditions.



Pedestrians wait on a median for a gap in traffic to complete crossing Scottsdale Road.

4.4.4 Wide Roadways

Another condition that makes pedestrian travel difficult is wide roadways. At a signalized intersection, slower pedestrians may not be able to finish crossing a roadway before traffic on that roadway gets the green light. At an unsignalized intersection or a mid-block location, adequate gaps in traffic may be rare, or pedestrians may misjudge the adequacy of gaps.



Wide roadways, such as Scottsdale Road, with infrequent signalized crossings, can be a challenge for pedestrians.



4.4.5 Insufficient Sidewalk Width

Sidewalks serve two primary functions: to accommodate pedestrian travel along the roadway, and to provide access to adjoining land uses. Once these basic functions are served, any additional right-of-way (sidewalk width) should be used for activities or uses that complement the walking environment or adjoining land use. Examples of these activities include sidewalk cafés, information kiosks, and food and merchandise vendors. These activities should be encouraged as vital components of an attractive, active street. Active streets enhance the pedestrian environment and stimulate an area's economic vitality.

While the addition of these pedestrian walkway-based activities can encourage additional pedestrian activity and enhance pedestrian areas, these activities can also impede pedestrian mobility and access within the sidewalk right-of-way. Communities with active streets that also appropriately accommodate pedestrians generally address three areas when faced with a request to use areas adjacent to sidewalks: adequate clear width for pedestrians, accessibility for pedestrians with disabilities, and level of pedestrian safety and comfort provided by the sidewalk width.

Additional information on recommendations related to this issue is provided in *Section 8.20 Sidewalk Cafes/Outdoor Dining*.



Outdoor dining can be an important component of an active street environment, but must be placed in appropriate locations so that pedestrian walkways are not blocked.



Retail activity can also limit pedestrian space.

5.0 FUTURE PEDESTRIAN DEMAND

A latent demand model was prepared during the development of the *Transportation Master Plan* to help identify future pedestrian travel demand. This forecast modeling provides a way to estimate the latent, or potential, demand for pedestrian travel. Performing actual counts only reveals how many people currently walk a given segment of sidewalk, path or trail, not how many might walk that segment if the conditions were improved.

The model provides guidance for recommendations for pedestrian improvements by indicating the areas of highest demand for pedestrian facilities in 2020. This section documents the results of the future latent pedestrian demand model in Scottsdale.

5.1 Forecast 2020 Pedestrian Latent Demand

The methodology and basis of this analysis are discussed in the *Transportation Master Plan, Latent Demand Technical Report*. Latent demand quantifies both ends of the walking trip and considers all origins (i.e., single-family and multi-family residences) and destinations (i.e., work places, shopping opportunities, parks, schools) in a study area for both existing and potential trips. The latent demand model assumes that the trips produced at an origin and attracted to a destination are directly proportional to 1) total trips generated at the origin, 2) total attractions at the destination, 3) a calibrating term, and 4) a socio-economic adjustment factor. This model is based upon a theory similar to that used in roadway travel demand models. It is generally based on an area's proximity to schools/universities, parks/trails, and transit service, as well as the mix of surrounding population and employment. The latent demand score compares all roadways within Scottsdale to one another. Therefore, a roadway with a score of 10 will have the highest possible number of pedestrians of all roadways in Scottsdale, assuming that obstacles to pedestrian travel do not exist. A roadway with a latent demand score of 1 will have the lowest number of pedestrians when compared with all other roadways in Scottsdale, again assuming that obstacles to pedestrian travel do not exist. Detailed maps of the latent demand analysis findings are in *Appendix E*.

The results of the latent demand analysis show the highest areas of latent demand, with a latent demand score of 10, are located predominantly in southern Scottsdale (Indian Bend Road south to the Tempe border) where the areas of highest latent demand are located south of Chaparral Road along Scottsdale and Hayden Roads as well as Camelback, Indian School, Thomas and McKellips roads for the entire breadth of the City. These areas have a relatively high number of residences and employment destinations, as well as schools, parks, trails/paths and transit service. Hayden Road is adjacent to Indian Bend Wash, and is proximate to a number of schools and higher density housing. Along Scottsdale, Indian School, Thomas and McKellips roads are areas of higher commercial activity and population.

In the City north of Shea Boulevard and Loop 101 north to the City boundary, areas of high future latent demand include: Thompson Peak Parkway, near McDowell Mountain Ranch, south of Bell Road; and Frank Lloyd Wright Boulevard between Pima Road and Thompson Peak Parkway. At build-out, the Thompson Peak Parkway area will include substantial commercial development at the intersection of Bell Road and Thompson Peak Parkway, as well as significant residential development. The Frank Lloyd Wright Boulevard area is currently an active commercial and residential area that has not achieved full build out.

Central and northern Scottsdale generally have moderate latent demand, with scores ranging from 5 to 8. Moderate areas of latent demand for pedestrian facilities are generally located along Cactus Road and Shea Boulevard. However, there are areas of relatively high latent demand identified by the analysis. They are Scottsdale Road from Shea Boulevard to Butherus (the entrance to the Scottsdale Airpark), Hayden Road from Indian Bend Road through the Airpark, and 90th Street from Shea Boulevard south to the Salt River Pima-Maricopa Indian Community. Shea Boulevard has substantial retail and higher density developments, especially in the area around the Scottsdale Road intersection where schools, retail, and multi-family housing are located. Shea Boulevard, east of Loop 101, includes the Scottsdale Healthcare Shea Campus, regional and neighborhood shopping venues and multi-family residential development. Cactus Park, a 17-acre community park is located at Cactus and Scottsdale roads and has high potential for social/recreational trips. The Hayden Road area includes substantial open spaces including the Mountain View and Rotary Parks, extensive residential development, and smaller areas of commercial and office development.

6.0 OPPORTUNITIES

This chapter discusses some of the opportunities Scottsdale has for improving the pedestrian environment. Overall, the City provides basic pedestrian facilities that generally foster a safe, enjoyable pedestrian environment, including:

- Comfortable sidewalks along many streets;
- Traffic signals with pedestrian actuators at the intersections of arterial and collector streets;
- Landscaping that provides shade and protection from the elements in many cases;
- Convenient transit stops and transit shelters in many locations; and
- An extensive and connected path system that takes advantage of canals, greenbelts, and other open space and recreation features.

Research done for the State of Washington *Pedestrian Facilities Guidebook*¹³ identified common characteristics of pedestrian-friendly communities. These qualities are listed below and summarized in *Appendix A*.

- Coordination between jurisdictions
- Linkages to a variety of land uses/regional connectivity
- Continuous systems/connectivity
- Shortened-trips and convenient access
- Continuous separation from traffic
- Pedestrian supportive land use patterns
- Well-functioning facilities
- Designated Space
- Security and visibility
- Automobile is not the only consideration
- Neighborhood traffic calming
- Accessible and appropriately located transit
- Lively public spaces
- Character
- Scenic opportunities
- Pedestrian furnishings
- Street trees and landscaping
- Design requirements
- Proper maintenance

In some areas, such as Downtown Scottsdale, enhanced pedestrian facilities are provided with the goal of encouraging walking. As the community approaches build-out and some areas begin to redevelop, such as the SkySong project at Scottsdale and McDowell Roads, new activity, tourist and employment areas with the potential of attracting pedestrians will emerge. As these areas develop and redevelop, it will be important to address the opportunities described in this section.

¹³ *Pedestrian Facilities Guidebook*, Washington State Department of Transportation, September 1997, available at www.wsdot.wa.gov/walk/designinfo.htm

6.1 Enhance Existing and Create New Special Pedestrian-Oriented Districts and Areas

Walking destinations are areas where people go to walk and explore, and go to by walking. Areas such as Downtown Scottsdale should be designed so that walking is the predominant transportation mode. Areas with more pedestrians require more extensive pedestrian facilities, including increased sidewalk width, themed signs, site furnishings, decorative lighting, shade and active streets that encourage pedestrians to linger and explore. Creating pedestrian-friendly streets in these areas is an opportunity. Elements of pedestrian-friendly streets are provided in *Table 5*.



This courtyard in Downtown Scottsdale along First Avenue is an attractive waiting area for pedestrians in a pedestrian-oriented district.

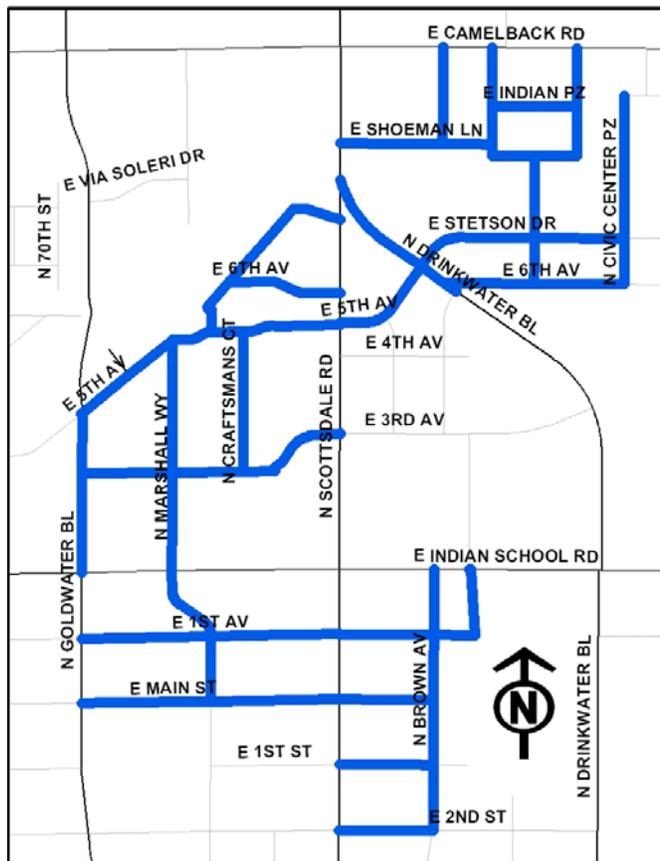
Table 5: Elements of Pedestrian-Friendly Streets

- Interconnected streets with small blocks provide opportunities for pedestrian access, mobility, and safety.
- Narrow streets, scaled for pedestrians, are less conducive to high vehicle speeds (street trees at the edges of the roadway create the perception of a narrower roadway).
- Traffic calming.
- Median refuge islands and mid-block crossing treatments assist pedestrians crossing roadways.
- Public spaces, places to interact and places to rest that are adjacent to the pedestrian walkway enhance comfort and interest.
- Awnings, covered building entrances and shade trees provide shelter from the sun and heat.
- Landscaping can soften building edges and add softness to the built environment.
- Pedestrian level lighting that illuminates the pedestrian walkway, without being harsh or intrusive, improves security.
- Wide, smooth, continuous sidewalks that include elements for pedestrians with disabilities enhance mobility for all pedestrians.
- Separation from the roadway.

Source: *Pedestrian and Streetscape Guide*, Georgia Department of Transportation, September 2003, page 29, available at www.walkable.org/download/Georgia_ped_streetscape_guide.pdf

The latent demand analysis (see *Section 5.0 Future Pedestrian Demand*) shows that Downtown will remain a popular area for walking. As areas of the Downtown intensify and the Downtown expands to include distinct neighborhoods (i.e., Waterfront, Scottsdale Corridor north of Camelback Road, the Downtown core, and Scottsdale Road south of Indian School Road), the demand for pedestrian facilities will also increase. This implies that a greater range of facilities as well as facilities designed to handle a larger number of pedestrians will be necessary.

Recognizing that pedestrian facilities could be improved in the Downtown area, the City obtained a grant from the Maricopa Association of Governments (MAG) in 2005 to measure pedestrian mobility in Downtown Scottsdale, and to determine how and where to make improvements to that mobility. The study used measurable criteria to create a substantial database for the evaluation of mobility. With this database, the City will identify where and what types of impediments or problem areas exist that impede pedestrians' ability to move around Downtown. This information will be the basis for future capital improvement projects. The Downtown Pedestrian Mobility Study information can be found in *Appendix J*.



The downtown roadways shown in blue have been inventoried to assess the quality of the pedestrian environment.

There are other important areas of the City emerging as destinations for pedestrians. While the Downtown will remain an important tourist attraction, the latent demand analysis indicates other areas are, or will become, attractions for pedestrians, including the Village Center at McDowell Mountain Ranch, One Scottsdale and the west side of the Scottsdale Airpark.

In some of these areas, it may be appropriate to create a pedestrian-oriented district. The City of Scottsdale already has an existing pedestrian overlay district, which coincides with the Downtown boundary. The current pedestrian overlay district includes provisions for covered walkways, screened side yards on interior side lot line setbacks, and preservation of at least 2/3 of each building's frontage for "openings or clear glass windows providing views of merchandise displays, building interiors, or courtyards."¹⁴

¹⁴ City of Scottsdale Revised Code, Chapter 49, Appendix B, Article V, Section 5.3081, Pedestrian Overlay District.

6.2 Provide Facilities That Enhance Neighborhood Safety and Connectivity

“Providing opportunities for building community through neighborhood mobility” is a goal of the *General Plan Community Mobility* element. Opportunities to promote neighborhood mobility exist in the implementation of and enhancement to the City’s Safe Routes to School program and by encouraging “back door access” from neighborhoods to nearby shopping centers.

Within the City, pedestrian facilities are often spaced and designed around existing automobile-based networks. Enhancing mid-block crossing opportunities along key corridors of high future latent demand will enhance the overall accessibility of specific areas. Specific opportunities to enhance mid-block crossings exist in areas where the density of pedestrian origins (i.e. residential areas) and destinations (i.e. schools, parks, employment) is the highest. Examples include portions of Frank Lloyd Wright Boulevard, Scottsdale Road south of Indian School Road, near the Scottsdale Road and Shea Boulevard intersection, at 90th Street south of Shea Boulevard, and on the west side of the Scottsdale Airpark.

6.3 Provide Facilities That Serve Quick, Focused Pedestrian Trips

As discussed in *Section 3.1 Benefits of Walking*, walking is ideal for short-distance motor-vehicle trips. According to the 1995 National Personal Transportation Survey, approximately 40 percent of all trips are less than two miles in length – which represents about a 30 minute walk. In addition, increased transit patronage will generate additional demand for pedestrian facilities. Transit use will likely first increase around high-activity areas, such as employment, retail, and entertainment uses. There is an opportunity to design these facilities to aid in direct and quick trips from transit stops to nearby locations and within employment centers such as the Scottsdale Airpark, as they will largely serve an audience with limited time and with specific destinations. These pedestrian-oriented employment centers include the area around the Scottsdale Healthcare campuses, the area at McDowell and Scottsdale Road around SkySong, the Scottsdale Airpark, the area around Shea Boulevard and Scottsdale Road, and the Scottsdale Road/Frank Lloyd Wright Boulevard corridor.



Employees in Downtown Scottsdale take an opportunity to walk for a mid-morning coffee.

As long-term land uses in Scottsdale continue to change, clear corridors of pedestrian activity are emerging, as shown in the latent demand analysis. With the exception of Hayden Road and portions of Thompson Peak Parkway, these areas are concentrated around corridors that are predominantly employment locations.

6.4 Provide Facilities That Reflect the Character of the Neighborhood

Quality design and application of facility and amenity standards will create comfortable and attractive pedestrian spaces and will reinforce Scottsdale's community character and vision. In areas where many pedestrians are expected, such as Downtown Scottsdale, wide sidewalks and additional facilities, such as shade and street furnishings are expected. In areas where fewer pedestrians are expected, a basic sidewalk character should be preserved to provide for mobility. Design standards for sidewalks and other pedestrian facilities are provided in *Section 8.0 Design Guidelines*.



This paved path along Scottsdale Road between Dove Valley and Carefree Highway reflects this area's character.

The City of Scottsdale *General Plan* contains a Character and Design Element that discusses various design standards in the context of Scottsdale's collective vision/values and the community's character. One of the stated goals of this element is to "Determine the appropriateness of all development in terms of community goals, surrounding area character, and the specific context of the surrounding neighborhood." The definition of surrounding areas/neighborhoods is based in the subdivision of the City into four broad zones, which are further subdivided as well: Urban Character Types, Suburban/Suburban Desert Character Types, Rural/Rural Desert Character Types, and Environmentally Sensitive Lands (ESL) and Native Desert Character Types.

The typical cross-section drawings contained in Section 5-3 of the *Design Standards and Policies Manual (DS&PM)* reflect three identified geographic character types. For each roadway functional classification (i.e. minor arterial), a standard cross-section is provided for all appropriate area types (generally rural/ESL, suburban, and urban)¹⁵. Street functional classifications in the *Transportation Master Plan Streets Element* also include rural, suburban, and urban character designations.

Not surprisingly, the character types are also reflected in the latent demand analysis. Areas with relatively high latent demand are generally more urban character areas, while relatively low latent demand is typical in the designated rural/ESL areas. There are some exceptions to this situation that result from the additional level of detail that the latent demand analysis provides. For example, employment cores such as the area surrounding the Airpark are classified as having an Urban Character Type, but have only moderate levels of estimated latent demand. This occurs because highly commercial/industrial areas can only possess high levels of pedestrian demand if residential development is mixed in, thereby providing the opportunity for short home-based walking trips. Also, some urban areas have higher latent demand than other urban areas. This aspect of the latent demand analysis provides the opportunity to provide further stratification within each of the area types.

¹⁵ Several roadways in Scottsdale have been designated as "Scenic Corridors". These corridors are subject to an additional set of design guidelines.

6.5 Provide Facilities and Land Uses That Support A Growing Number of Pedestrians Who Use Public Transportation

Historic transportation data demonstrate that while the number of people who use walking as their sole mode of transportation to work is declining, this decline is more than compensated for by the number of people using public transportation. Pedestrians often arrive to transit stops by walking, and are pedestrians again after deboarding the transit vehicle. The opportunity exists to encourage more pedestrians to use transit by providing a more extensive range of amenities near transit stops.



Pedestrians can lengthen their trip distance by taking advantage of public transportation, such as the bus service on Scottsdale Road.

6.6 Update and Enhance the Pedestrian Standards in the DS&PM

The *DS&PM* includes recommendations and guidance to create a desirable pedestrian environment. However, this guidance is currently broad and generalized and does not reflect the different areas and characteristics of the City. An opportunity exists to include specific standards for pedestrian facilities in the *DS&PM*. See *Section 8.0 Design Guidelines* for details.

6.7 Implement Safety Improvements in the Pedestrian Environment

Section 3.0 described barriers to pedestrian travel and pedestrian facilities to improve these conditions could reduce the number of pedestrian/vehicle collisions.

A pedestrian safety action plan specifically identifies the necessary steps to reduce the number of pedestrian crashes. A pedestrian safety action plan includes: objectives, locations where improvements are needed, selection of techniques to reduce crashes, implementation strategies, changes to planning and design standards, and evaluation.¹⁶

Intersections can pose particular safety hazards for pedestrians. Traffic improvements such as wider streets, adding turn lanes or travel lanes, and using traffic engineering solutions that increase vehicular efficiency can decrease pedestrian safety.¹⁷

Crash data consistently show that collisions with pedestrians occur far more often with turning vehicles than with straight-through traffic. Left-turning vehicles are more often involved in pedestrian accidents than right-turning vehicles, partly because drivers are not able to see pedestrians to the left as well...Pedestrians involved in crashes are more likely to be killed as vehicle speed increases. The fatality rate for a pedestrian hit by a car at 20 mph is 5 percent. The fatality rate rises to 80 percent when vehicle speed is increased to 40 mph...Right turn on red (RTOR) contributes to pedestrian crashes because it creates reduced pedestrian opportunities to cross intersections without having to confront turning vehicles.¹⁸

¹⁶ *How to Develop a Pedestrian Safety Action Plan - Draft*, Federal Highway Administration, August 2005. Chapter 7, Creating the Pedestrian Safety Action Plan.

¹⁷ *Pedestrian Safety at Intersections*, Federal Highway Administration, September 10, 2004, available at <http://safety.fhwa.dot.gov/intersections/interbriefing/03ped.htm> .

¹⁸ Ibid.

The Federal Highway Administration suggests an integrated approach when attempting to improve pedestrian safety by including engineering, educators and enforcement professionals. Enforcement efforts should focus on motorist compliance with pedestrian safety laws, pedestrian compliance to traffic laws, and speed enforcement. Educational efforts need a dedication over an extended period of time and should be comprehensive. Education campaigns should target both motorists and pedestrians.¹⁹

Traffic engineering solutions to improving pedestrian safety include assessing (or reassessing) the adequacy of pedestrian signal timing (See *Table 2: Pedestrian Walking Speeds*), considering pedestrian-only phasing in traffic signal cycles. Pedestrian push buttons should be accessible. Roadway and traffic hazards should be identified and removed. Improvements could include repair or restriping crosswalks, adding stop lines, improving lighting, providing additional signage, and providing median refuge islands (see *Section 8.10 Mid-Block Crossings*). Crosswalk improvements, such as more visible pedestrian crosswalk striping, or pedestrian crossing signs may also be appropriate (See *Section 8.9.1 Crosswalk Markings*). In addition, analysis of pedestrian collisions are completed for each year and this analysis should be used to target high pedestrian collision locations for mitigation proposals.

6.8 Design Facilities That Are Universally Accessible

Designing facilities that are universally accessible improves the environment for all users. Accessibility should be considered at all locations and facilities. Universal design of pedestrian facilities increases the independence of anyone with mobility impairments.

Developed by the Center for Universal Design²⁰, universal design is an approach to designing pedestrian facilities that help to maximize their use by the greatest number of people, emphasizing the value of designing for a person's entire lifespan and range of abilities. There are seven principles of universal design listed below. The accompanying guidelines that comprise key design elements inherent in the principle are found in *Appendix G*.

- Principle One - Equitable Use – the design is useful and marketable to people with diverse abilities.
- Principle Two - Flexibility in Use – the design accommodates a wide range of individual preferences and abilities.
- Principle Three - Simple and Intuitive Use – use of the design is easy to understand, regardless of the



Narrow and cluttered sidewalks can impede pedestrian accessibility and mobility. Heavily textured paving with gaps greater than ¼ inch can create uneven and bumpy surfaces (Scottsdale Road).

¹⁹ Ibid.

²⁰ The Center for Universal Design (1997). *The Principles of Universal Design*, Version 2.0, Raleigh, NC: North Carolina State University. Disclaimer: The Principles of Universal Design were conceived and developed by The Center for Universal Design at North Carolina State University. Use or application of the Principles in any form by an individual or organization is separate and distinct from the Principles and does not constitute or imply acceptance or endorsement by The Center for Universal Design of the use or application.

user's experience, knowledge, language skills, or current concentration levels.

- Principle Four - Perceptible Information – the design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
- Principle Five - Tolerance for Error – the design minimizes hazards and the adverse consequences of accidental or unintended actions.
- Principle Six - Low Physical Effort – the design can be used efficiently and comfortably and with a minimum of fatigue.
- Principle Seven - Size and Space for Approach and Use – appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

6.9 Encourage Sidewalk Cafes in Appropriate Locations

Sidewalk cafés add to the vitality of an urban setting and are appropriate in areas where an active street environment is desired. A vibrant street enhances the pedestrian experience by creating interest and can also encourage passersby to pause and explore the area on a more intimate scale. Encouraging visitors to lounge and explore can enhance commerce by creating sales opportunities. Sidewalk cafes should be encouraged as a vital component of an attractive, active street.

While the addition of sidewalk cafes can encourage additional pedestrian activity and Downtown vitality, the presence of sidewalk cafés can also impede pedestrian access and mobility. The goal should be to ensure a safe environment for pedestrians while encouraging the appropriate use of the public right-of-way for sidewalk cafés.

Communities with active streets that also appropriately accommodate pedestrians generally address three areas when faced with a request to use areas adjacent to sidewalks:

- Would an acceptable level of sidewalk capacity be maintained?
- Would accessibility be preserved for pedestrians with disabilities?
- Would the sidewalk continue to provide an acceptable level of pedestrian safety and comfort?

These issues are discussed in further detail below.

6.9.1 Sidewalk Capacity

Chapters 11 and 18 of the Transportation Research Board's *Highway Capacity Manual (HCM)* address the capacity of sidewalks and other pedestrian facilities. These chapters present key concepts, define level of service criteria, and describe methodologies to assess the capacity of pedestrian facilities.

The following key concepts relate to pedestrian facility capacity:

- Pedestrian speed – the average pedestrian walking speed, expressed in units of feet per second (ft/s) or feet per minute (ft/min).
- Pedestrian flow rate – the number of pedestrians passing a point per unit of time, expressed as pedestrians per minute (p/min) or pedestrians per 15



Sidewalk capacity is reduced by this outdoor dining. Two person tables would accommodate pedestrian access more easily

- minutes ($p/15$ min). A “point” refers to a perpendicular line of sight across the walkway.
- Pedestrian unit flow rate – the flow rate per unit of effective walkway width, expressed as pedestrians per minute per foot ($p/\text{min}/\text{ft}$).
- Pedestrian space – the average area available to each pedestrian, expressed as square feet per pedestrian (ft^2/p).

These concepts are interrelated: as volume increases and space decreases, speed decreases because pedestrians have less space to choose their walking speed.

The *HCM* defines pedestrian level of service (LOS) criteria according to the amount of space per pedestrian and the unit flow rate. The LOS is categorized as A through F. LOS A represents the least crowded condition for pedestrians. As the number of pedestrians increases, the amount of space per pedestrian decreases and it becomes more difficult to pass other pedestrians or to avoid conflicts with crossing (i.e., perpendicular) pedestrians. LOS F is the most crowded condition. In some locations, especially more urban character areas and activity centers, more congested pedestrian LOS are desired.

Effective walkway width refers to the usable width of a walkway. While a sidewalk may be, for example, eight feet wide, pedestrians may not be able to use all of that width. Trees, utility poles, newspaper boxes, and other street furniture may occupy part of the sidewalk. Pedestrians tend to shy away from these obstructions as well as from fences and building faces. *Figure 2* and *3* show that the effective walkway width may be considerably narrower than the total walkway width.

By their very nature, sidewalk cafés, kiosks, and vendors occupy part of the sidewalk and reduce the effective width, thereby degrading the LOS. When evaluating requests for sidewalk cafés, the potential impact on level of service as well as the desire for activating an area needs to be analyzed.

Figure 2: Effective Walkway Width (from Exhibit 3-4 of the AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities)

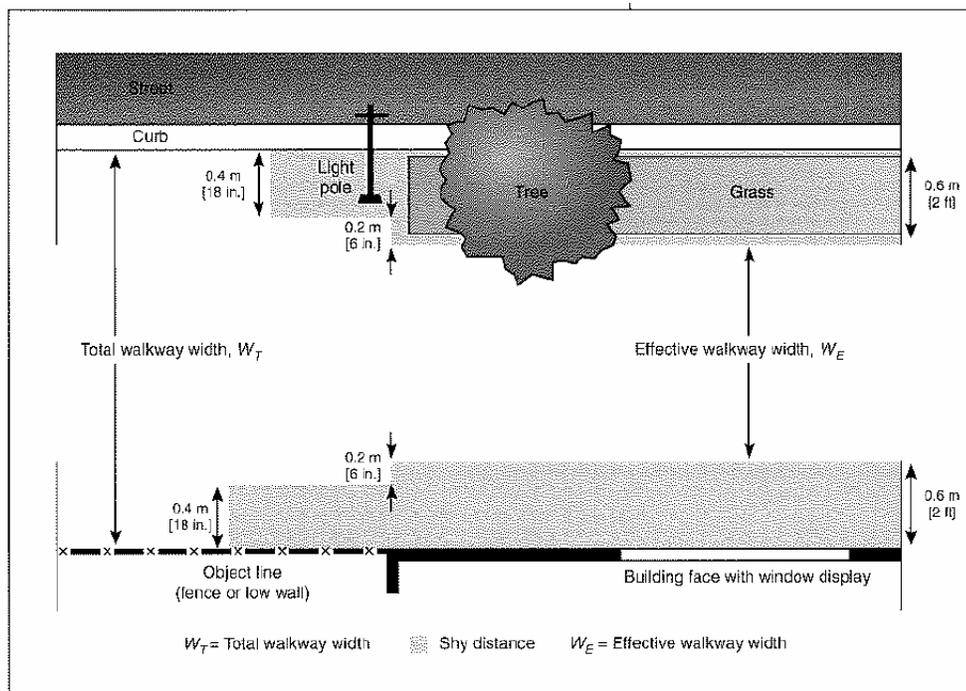
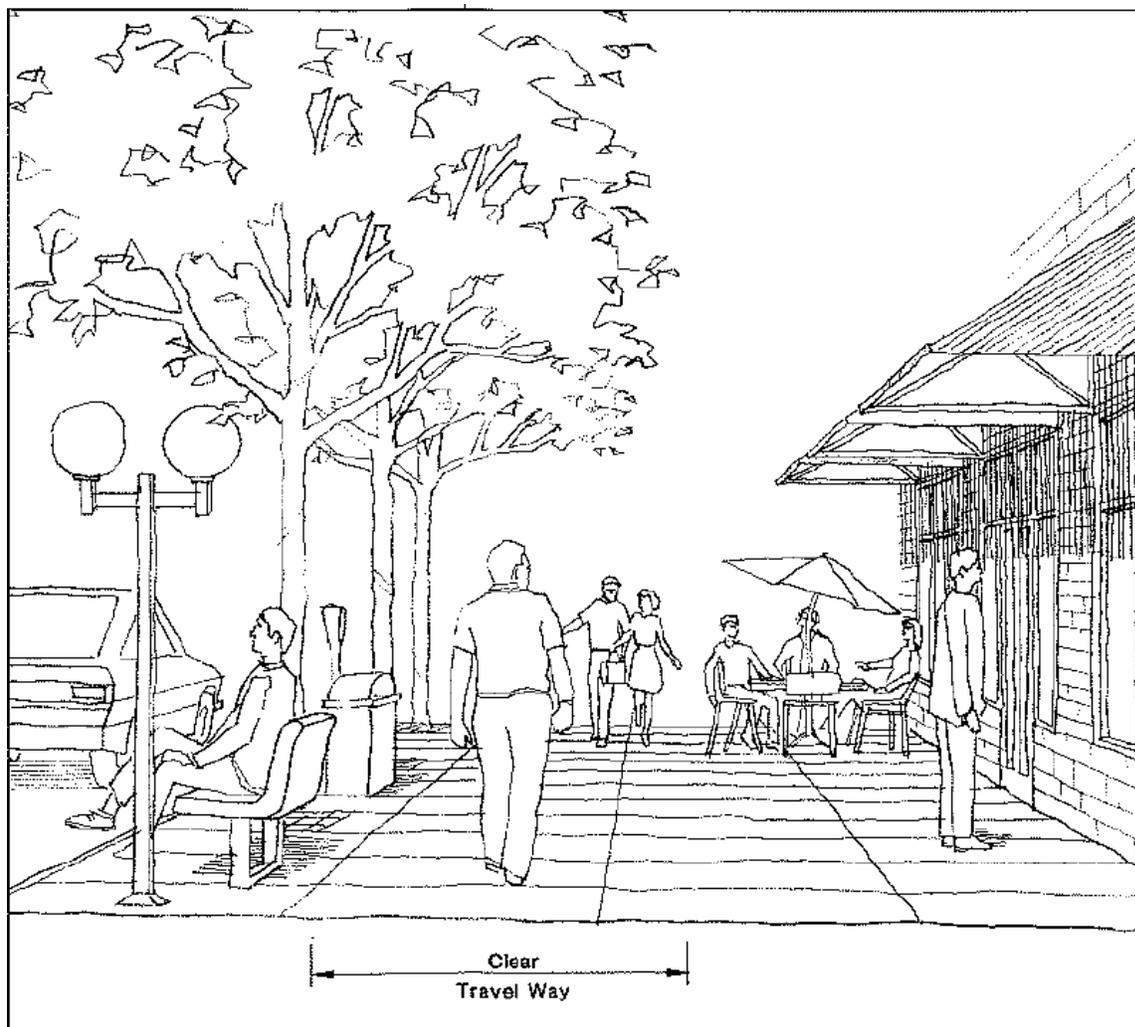


Figure 3: Pedestrian Travelway Clear of Obstructions (from Exhibit 3-5 of the AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities)



6.9.2 Accessibility for Pedestrians with Disabilities

A second consideration in determining appropriate locations for sidewalk cafes is that accessibility needs to be preserved for pedestrians with disabilities. The City wishes to preserve accessible routes along its sidewalks. Current adopted guidance requires a minimum clear width of three feet²¹. However, this federal minimum is only for short distances: if an accessible route has less than five feet of clear width, then passing spaces of at least five feet by five feet shall be provided at intervals not to exceed 200 feet²². The U.S. Access Board is considering the recommendation that sidewalks have a minimum clear width of four feet, not including any attached curb. The Access Board is also considering that where sidewalks are less than five

²¹ Americans with Disabilities Act Accessibility Guidelines (ADAAG), Section 4.3.3.

²² ADAAG, Section 4.3.4

feet in width, passing spaces of five feet by five feet shall be provided at intervals of 200 feet maximum²³. It is the City of Scottsdale's practice to use the best practice guidelines.

6.9.3 Pedestrian Safety and Comfort

When people around the U.S. are asked why they don't walk more frequently, they often reply, "It's not safe." People universally report that they do not feel safe when they are walking immediately next to traffic. They feel safer when they are not adjacent to traffic, or when there is less traffic, or when the traffic is traveling at slow speeds.

Section 5-8.000 of Scottsdale's *DS&PM* indicates that "Pedestrians like to be separated from moving traffic with a buffer, such as on-street parking, landscaping, or bicycle lanes." In addition, Section 5-8.200 states that "In order to improve safety and encourage use, sidewalks and shared use paths should be placed away from the back of curb a minimum of four feet, with eight feet desired, and sometimes greater distances based on available rights-of-way or easement." Furthermore, Section 5-3.300, Part A states that "Generally a minimum eight-foot sidewalk width is required along all major streets (major collector classification or greater); a six-foot wide sidewalk width is required along all minor streets." The buffer width recommendation acknowledges that Scottsdale's residents and visitors feel safer when they are not immediately next to traffic.

²³ *Revised Draft Guidelines for Accessible Public Rights-of-Way*, Sections R301.3.1 and R301.3.2, available online at www.access-board.gov/prowac/draft.htm

7.0 PROPOSED PEDESTRIAN ROUTE NETWORK

This chapter describes the proposed pedestrian route network in the City of Scottsdale. The network includes common walking routes to schools, transit, recreation areas and other pedestrian destinations. The network identifies roadways most in need of pedestrian improvements based on their potential to attract pedestrians, as identified in the latent demand analysis described in *Section 5.0 Future Pedestrian Demand*. It is important to note that roadways not identified in this network may also need pedestrian improvements, and that all roadways in Scottsdale are expected to have basic pedestrian facilities to provide for mobility of all residents, employees and visitors, consistent with each area's character (context sensitive design).

The latent demand model has been used to identify pedestrian improvements for several reasons.²⁴ First, the model includes all potential trip starting points and ending points. The model also recognizes that whether a pedestrian trip is made depends on the purpose of the trip. The model incorporates several different trip purposes, including work trips, shopping and errands, trips to school, trips to parks and trailheads, and trips to trails/shared use paths and linear parks.

In addition, the latent demand model also considers the distance between the trip starting point and the trip ending point. In general, people are willing to walk the furthest to get to work, moderately to get to social or recreational trips, and the least for trips to school.

Finally, the latent demand model also accounts for trips that are made partially by walking, such as a transit ride that begins and starts with a pedestrian trip, and for those trips made entirely by walking, such as a walk to a nearby grocery store.

Figure 4 through Figure 8 identifies the proposed pedestrian route network for each planning zone of the City, based on criteria shown in *Table 6*. The network has been divided into priorities based upon where improvements will affect the largest number of potential pedestrians. The identified network should not be interpreted to imply or mean that pedestrian facilities are not needed in lower priority areas, or that budgeted projects should not be implemented with pedestrian facilities in lower priority areas. Other factors such as key missing links in the network must also be considered. Naturally, if funding for a particular project becomes available through private development, or State or Federal sources, or if the project is a key "missing link" in the system, or could be accomplished through standard maintenance, that project should be pursued regardless of its classification on the proposed pedestrian route network.

²⁴ *Pedestrian Plan 2000 Technical Appendix*. Maricopa Association of Governments, December 1999.

Table 6: Latent Demand Model Interpretation and the Proposed Pedestrian Route Network	
Latent Demand Score	Pedestrian Route Network Classification
10 and 9	High
8 and 7	Medium High
6 and 5	Medium
4 and 3	Medium Low
2 and 1	Low

A latent demand score of 10 is the highest possible score when compared with all other roadways in Scottsdale. The roadway with the score of 10 has the highest likelihood of attracting pedestrians, if conditions are improved to encourage pedestrian travel. In contrast, a latent demand score of 1 means that the roadway has the least likelihood of attracting pedestrians. Additional information on the latent demand model is provided in *Section 5.0 Future Pedestrian Demand*.

Figure 5: 2020 Pedestrian Route Network, Planning Zone B

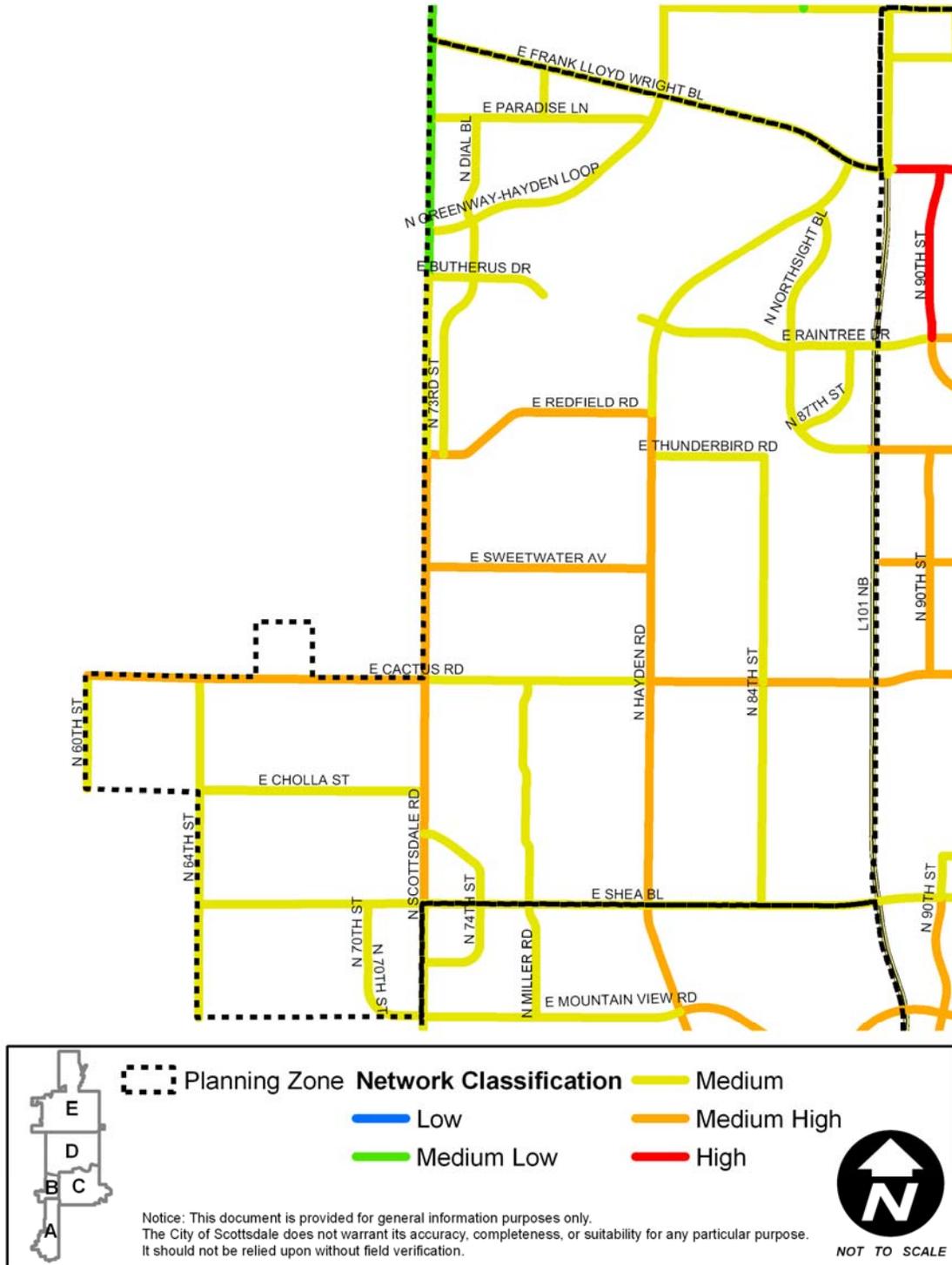
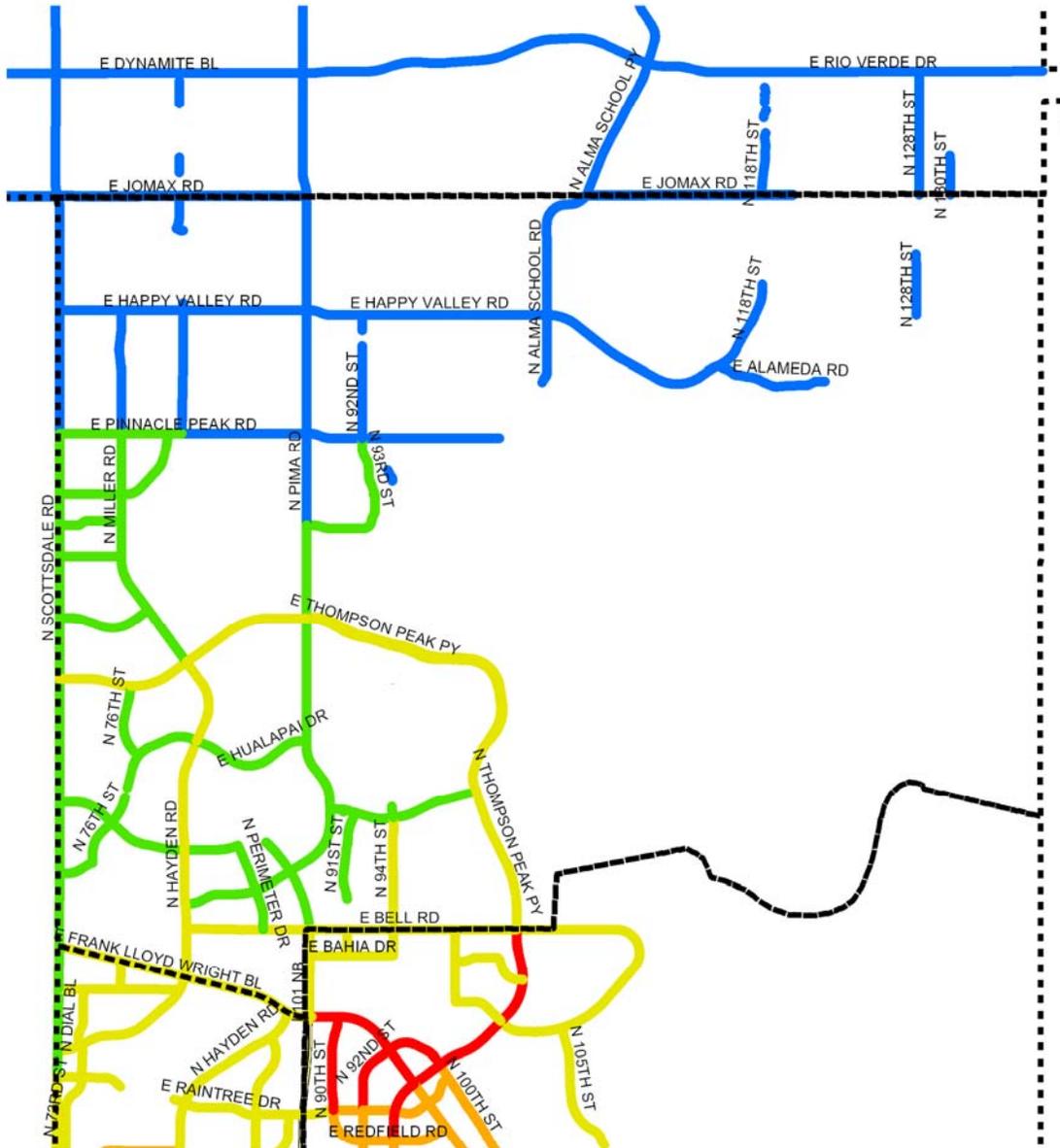


Figure 7: 2020 Pedestrian Route Network, Planning Zone D



Planning Zone

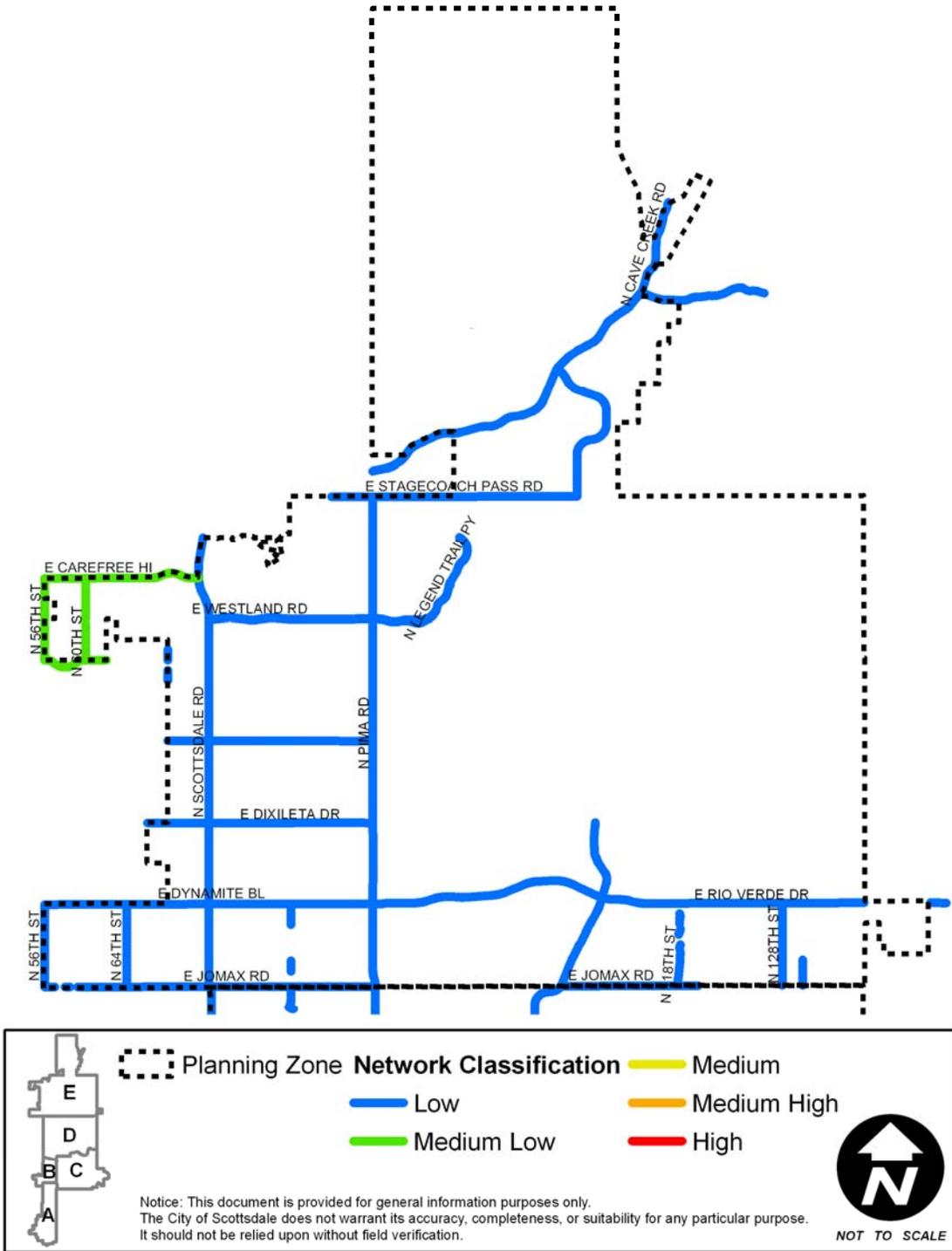
Network Classification

—	Low
—	Medium Low
—	Medium
—	Medium High
—	High

NOT TO SCALE

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Figure 8: 2020 Pedestrian Route Network, Planning Zone E



8.0 DESIGN GUIDELINES²⁵

This chapter outlines pedestrian planning, design and engineering practices that provide safe and comfortable pedestrian travel conditions and will be integrated into an updated pedestrian chapter of the *DS&PM*.

These guidelines apply to typical situations encountered during project development. Unique situations will require flexibility in design solutions. In some situations, the current standard may not be achievable due to geometric, environmental, right-of-way or other constraints and flexible solutions will be determined by the project designers using appropriate professional judgment. In these circumstances, variances from the guidelines outlined in this section may be acceptable. However, a facility should not typically be built to less than the guidelines described in this section.

Furthermore, pedestrian facilities must be built in accordance with existing federal and state standards, such as the *Manual on Uniform Traffic Control Devices* (Federal Highway Administration), requirements of the *Americans with Disabilities Act*, and various documents produced by the American Association of State Highway and Transportation Officials (AASHTO), including *A Policy on Geometric Design of Highways and Streets*, and *Guide for Planning, Design and Operation of Pedestrian Facilities*. The City of Scottsdale has adopted and integrated *The Revised Draft Guidelines for Accessible Public Rights-of-Way*²⁶, published on November 23, 2005 into planning, design, construction and reconstruction of transportation facilities. These guidelines provide the best practice for planners and designers, and should also be followed when planning and designing pedestrian facilities.²⁷

²⁵ This section draws extensively from the following sources: (1) *Pedestrian Policies and Design Guidelines*, Maricopa Association of Governments, 2004, available at www.mag.maricopa.gov. ; (2) *Designing Sidewalks and Trails for Access, Part 1 and Part 2, Best Practices Design Guide*, Barbra McMillen, et. al, U.S. Department of Transportation, Federal Highway Administration, Publication No. FHWA-EP-01-027 HEPH/8-01 (10M) E, September 2001. Available from FHWA Report Center by e-mailing report.center@fhwa.dot.gov.; (3) *Pedestrian Facilities Guidebook*, Washington State Department of Transportation, September 1997, available at www.wsdot.wa.gov/walk/designinfo.htm ; (4) *Pedestrian and Streetscape Guide*, Georgia Department of Transportation, September 2003, available at www.walkable.org/download/Georgia_ped_streetscape_guide.pdf

²⁶ Available from www.access-board.gov/prowac/draft.htm.

²⁷ The original notice of availability of the draft guidelines was published in the Federal Register on June 17, 2002. The Access Board requested information and feedback on the draft guidelines, including usability and cost data. Over 1,400 comments were received from the public in response to the publication of the draft. Of this total, almost 900 comments were tabulated from persons with disabilities and groups representing them. Ten key issues from comment were identified for detailed analysis: crosswalk width; on-street parking; walking speed and pedestrian signal phase timing; elevators at pedestrian overpasses and underpasses; same-side alternate circulation routes; cross slope in crosswalks; detectable warnings; accessible pedestrian signals; roundabouts and roundabout signalization; and alterations. These key issues have been addressed in the November 23, 2005 guidelines. The proposed rule will provide another opportunity for public comment on the guidelines. The Board will then proceed to finalize the guidelines based on public comments received in response to the proposed rule.

8.1 Sidewalk Width; Pedestrian Access Route

Safe pedestrian travel ways must be defined walkways, visually and functionally separate from the path of vehicles.

Figure 4 through Figure 8 identify the pedestrian route network for planning zones of the city. All sidewalks and walkways must provide a minimum of 6 feet of travel space to accommodate pedestrians moving in both directions, including pedestrians using assistive devices (See Figure 9). This minimum width does not include additional space that may be required to accommodate landscaping and site furnishings.

All sidewalks and walkways adjacent to arterials must provide a minimum travel space to accommodate pedestrians, providing sufficient walking areas, not including for example, landscaping or site furnishings. The following listing incorporates the character types of rural, suburban, and urban as well as the pedestrian route network identification:

- Sidewalks and walkways must provide a minimum travel space of 6 feet for rural areas identified on the pedestrian route network maps as low and medium low. A trail could replace a sidewalk or walkway in rural areas identified on the pedestrian route network maps as low.
- Sidewalks and walkways must provide a minimum travel space of 8 feet for suburban areas identified as medium or medium high.
- Sidewalks and walkways must provide a minimum travel space of 10 feet for suburban areas identified as high.
- Sidewalks and walkways must provide a minimum travel space of 10 feet for urban areas, except in urban areas identified on the pedestrian route network maps as high, where a minimum travel space of 12 feet must be provided.

A pedestrian access route is a part of the sidewalk that meets minimum accessibility requirements and connects public streets and sidewalks to destinations. A pedestrian access route is not the entire sidewalk; it is the portion of the sidewalk that allows for basic pedestrian movement and circulation. The pedestrian access route may include sidewalks, street crossings, crosswalks, grade-separated crossings (underpasses or overpasses) and other elements of the sidewalk that provide mobility, including curb ramps, courtyards and landing areas. A pedestrian access route must be continuous and clear of obstructions. The minimum width required for a pedestrian access route is four (4) feet, excluding the width of the curb.²⁸

While meandering sidewalks have aesthetic appeal, they tend to negate an efficient and effective pedestrian travel environment. Meandering sidewalks should be limited to areas where latent demand is low or where topography or site conditions require deviation from a straight configuration. Minimum design speed for sidewalks/walkways should be comparable to minimum design speed for paths.



This sidewalk on Scottsdale Road south of Doubletree Ranch Road is visually and functionally separate from vehicle paths enhancing pedestrian safety. A landscaped buffer between the sidewalk and the curb adds shade, aesthetic appeal and additional comfort for pedestrians.

²⁸ Revised Draft Guidelines for Accessible Rights of Way, United State Access Board, 2005, available from www.access-board.gov/prowac/draft.htm.

Figure 9: Sidewalks Need to Accommodate People Walking Together²⁹



8.2 Sidewalk Surface, Texture and Slope

Sidewalks should be even without heaving. Sidewalks should not have bumpy or textured surfaces, or cracks or indents greater than $\frac{1}{4}$ inch in width or depth. The surface should be firm, stable, slip-resistant, and sloped for drainage, but not more than a 12:1 slope ratio. Cross slopes should not exceed two percent.

Sidewalks should contrast in color or tone from the surrounding area unless there is a desired character in a specific area that precludes contrasting color. In these situations, texture or materials should provide the contrast as opposed to color. In the northern areas of Scottsdale, colored concrete instead of grey or white is desired. The walkway can be a different material, texture, or color to distinguish it from the vehicular traffic area.



Avoid overly textured sidewalks with cracks or indents greater than $\frac{1}{4}$ ".

²⁹ *Pedestrian Area Policies and Design Guidelines*, Maricopa Association of Governments, 2005, page 50, available at www.mag.maricopa.gov.

Sidewalks in suburban and urban areas should be concrete. Alternative surfacing of sidewalks are encouraged for parts of the community that desire to have alternative surfaces, provided that those surfaces are firm and stable. A universally accessible surface, as defined by the ADA, may be composed of materials such as compacted earth, stabilized decomposed granite, playground surfacing, asphalt, or brick.

Surfacing materials and construction methods are available that will provide firm and stable surfacing, and measurement tools can objectively measure outdoor surfaces for firmness and stability.

To provide accent paving that adds aesthetic value and character without negatively impacting the accessibility of the sidewalk, use accent paving as edge treatments only, instead of for the entire surface of the sidewalk. These treatments should be reviewed by the City's ADA Coordinator or Transportation Department General Manager for appropriateness.



Avoid placing multiple paving surfaces in the walkway.

8.3 Clearances

While site furnishings, street vendors, and outdoor dining areas enhance variety and provide interest to pedestrian areas, they should not be designed or located where they protrude into the primary pedestrian route. Protrusions are hazardous, especially to pedestrians with low vision, or pedestrians walking in groups that may not be fully attentive to their surroundings.

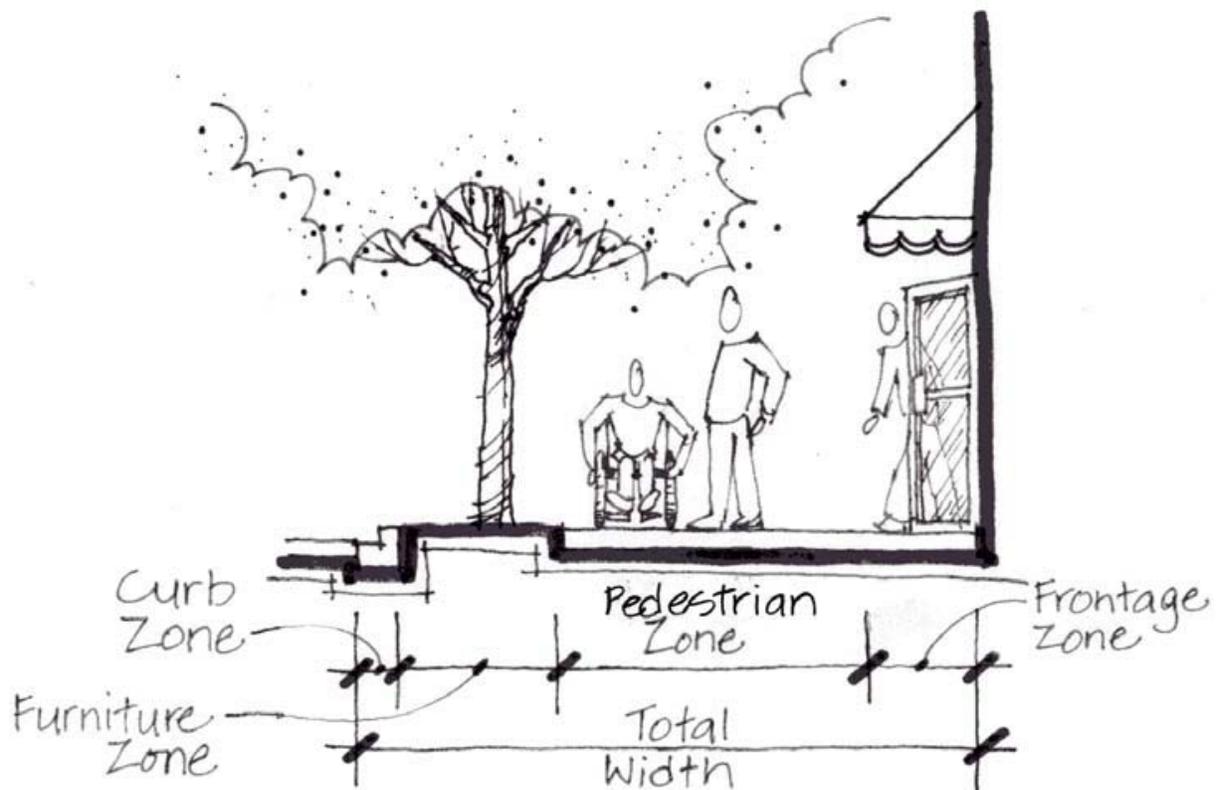
Pedestrian space along the edge of the roadway can be divided into three zones³⁰: the building frontage zone, the pedestrian zone, and the furnishings zone (see *Figure 10*). The building frontage zone is the area where people enter and exit buildings next to the street, and the area where pedestrians may window shop or move more slowly. The building frontage zone could be a pedestrian plaza or include outdoor dining. The width of the building zone varies in width from 2 to 10 feet or more. The building frontage zone is absent in areas where the sidewalk is not adjacent to buildings, such as non-urban areas.

The pedestrian zone is the area where pedestrians travel and varies in width from a minimum of six feet to 20 feet.

The furnishings zone is directly adjacent to the street next to the pedestrian zone. This zone includes utilities, street furniture and landscaping. The width of this zone will vary from two feet to 10 feet or more, depending on conditions such as availability of right-of-way and adjacent land uses.

³⁰ *Pedestrian Facilities Guidebook*, Washington State Department of Transportation, September 1997, available at www.wsdot.wa.gov/walk/designinfo.htm. *Pedestrian Area Policies and Design Guidelines*, Maricopa Association of Governments, 2005, available at www.mag.maricopa.gov.

Figure 10: Pedestrian Space along the Edge of the Roadway³¹



Specific clearance requirements include:

- A clear circulation path of at least 48 inches should be maintained at all times, free of any obstacles or protruding objects (pedestrian access route). Note that 48 inches of clear circulation is intended only for short distances and a minimum of six feet of clear pedestrian travel area is required on all sidewalks and walking surfaces for pedestrians.
- Wall mounted objects shall not protrude more than 4 inches from a wall when located between 27 inches and 7 feet above the walkway.
- Single post mounted objects shall not overhang more than 4 inches per side of post when located between 27 inches and 7 feet above the walkway.
- The lowest edge of an object mounted on multiple posts having a clear distance between adjacent posts greater than 1 foot shall be no higher than 27 inches or no lower than 7 feet.
- Trees should be trimmed so that the branches are at least 7 feet above the walkway (see the City of Scottsdale *DS&PM* for more information).
- The understory to trees, shrubs, and groundcovers should be free of thorny plants within 2 feet of the edge of the walkway (see the City of Scottsdale *DS&PM* for more information).

³¹ *Pedestrian Area Policies and Design Guidelines*, Maricopa Association of Governments, 2005, page 53, available at www.mag.maricopa.gov.

8.4 Building Facades

The building-height to openings-between-buildings ratio can help to make the pedestrian environment more comfortable. To create a sense of human scale, the street and walkway width should be directly proportional to the height of the buildings. In areas identified on the pedestrian route network as high (see *Figure 4 through Figure 8*), provide the following:³²

- The building-height to openings-between buildings ratio in pedestrian areas (including walkways, sidewalks, trails and plazas) adjacent to buildings should be as near to 1:1 as feasible.
- On longer storefronts, provide windows every 10 feet to help create a human scale.
- Limit the length of individual storefronts to no greater than 60 feet to create human scale.
- Prohibit reflective glass next to public walkways to reduce glare and heat.

8.5 Driveway Crossings and Access Management

To the extent possible, driveway crossings should be minimized in areas classified as medium high or high on the pedestrian route network maps. Streetscape projects on roadways classified as medium high or high on the pedestrian route network (see *Section 7.0*) should integrate access management approaches during the project development, planning and design phase.

Each driveway crossing limits the connectivity of a pedestrian route. In addition, each driveway is a potential point of conflict between pedestrians and turning vehicles (vehicles could be cars, trucks or bicycles). Shared driveways and access management should be encouraged in these areas to improve safety and connectivity. In addition, many of the techniques identified in *Section 8.9 Intersections*, may also help to remove conflicts between pedestrians and motorists at driveway crossings.

Most collisions between pedestrians and motor vehicles occur at points of intersecting movements, such as intersections and driveways. A large number of driveway cuts increases the number of conflict points between pedestrians and vehicles. *Table 7* lists access management techniques and benefits of access management. In addition, access management can increase the efficiency of operations of the roadway for vehicles, as well as improve the pedestrian travel environment.³³

³² *Pedestrian Area Policies and Design Guidelines*, Maricopa Association of Governments, 2005, available at www.mag.maricopa.gov.

³³ *Pedestrian and Streetscape Guide*, Georgia Department of Transportation, September 2003, available at www.walkable.org/download/Georgia_ped_streetscape_guide.pdf

Table 7: Access Management Techniques and Benefits

Techniques

- Reduce the number of existing driveways or consolidate driveways.
- Provide raised or landscaped medians or concrete barriers to control turning movements in the street (accessible pedestrian crossing opportunities should be included at appropriate locations within medians).

Benefits

- The number of conflict points is reduced, particularly with the use of center medians to reduce the number of conflicts between left-turning vehicles and pedestrians.
- Pedestrian crossing opportunities are enhanced with an accessible raised median and fewer conflicts with turning cars.
- It is easier to accommodate people with disabilities with the reduced need for special treatments at driveways.
- Improved traffic flow may reduce the need for road-widening, allowing more space within the right-of-way for use by pedestrians, bicyclists, and enhancements. Fewer travel lanes at intersections will reduce pedestrian crossing distances, pedestrian crossing times and vehicle wait times.

Source: *Pedestrian and Streetscape Guide*, Georgia Department of Transportation, September 2003, table 41, page 113, available at www.walkable.org/download/Georgia_ped_streetscape_guide.pdf.

During the site design and redevelopment process, the quantity and frequency of driveway access points and entrances to sites from streets to adjacent properties should be minimized along key pedestrian routes. Sites can be designed to allow adjacent properties to share access. Another option may be to separate pedestrian and vehicle access to the site. In addition, emergency vehicle access should be designed to allow for quick access that minimizes conflict with pedestrians.

Driveways that intersect sidewalks and walkways should be designed to minimize conflicts between pedestrians and vehicles. If driveways are designed to be less wide, based on minimum standards, they are easier for pedestrians to cross. Providing clear sight lines between the pedestrian and the turning vehicle is also important. Pedestrians using wheelchairs or walkers and pedestrians with strollers need a relatively flat walking surface. The side flares and cross slopes of a driveway apron can cause tipping or a loss of balance. If possible, driveway crossings should be placed outside the path of the sidewalk. When this is not possible, incorporate the driveway into the walkway but provide a clear, level landing behind the driveway apron. For more information, refer to the City of Scottsdale Supplement to Maricopa Association of Governments (MAG) Standard Detail Drawings and the City's DS&PM.

8.6 Curb Ramps

Ramps provide access between changes in elevation for people using mobility assistive devices, and people pulling or pushing strollers, suitcases, or other items. Curb ramps are required wherever a pedestrian route crosses a sidewalk/street transition; at intersections, medians and alleys; and where a public sidewalk ends and pedestrian travel continues on the roadway. Curb ramps should be wholly contained within the crosswalk markings, if they exist. Ramps function best when placed in the center of the crosswalk. Curb ramps should be flush with the street surface, meeting with the surface at grade, without transitions or lips. Alterations

in retrofit development areas shall follow guidelines for new construction unless technically infeasible as determined by the Transportation Department.

The City is improving pedestrian access and safety by requiring the use of directional ramps at all intersections. A directional ramp aligns in the direction of the crosswalk; two per corner are needed. Per the City of Scottsdale Standard Details, directional ramps are preferred and should be installed at all intersections where there is room for both the ramps and the required 4-foot landing area. Where there is not room for the full directional ramp treatment, diagonal ramps with a minimum 8-foot width and 4-foot landing are acceptable; however, if there is not room for the landing, a blended transition ramp should be used. Detectable warning devices (truncated domes) should be installed in conjunction with these ramps to provide important crossing information to pedestrians who are blind or visually impaired. Diagrams of curb ramp design are included in *Appendix F*.

8.7 Physical Separation from Traffic

Sidewalks should be separated from adjacent roadways with either vertical or horizontal separation. Vertical separation can be curbs, bollards, parking (parallel or perpendicular), or buildings. Horizontal separation can be an on-street bike lane, a non-paved area (preferably landscaped), or landscaping in tree grates or planters.

Separations that include landscaping to shade pedestrians that also provide softening of the environment are encouraged.

To increase user comfort, sidewalks should be placed away from the back of curb a minimum of 5 feet, with 8 feet desired, and sometimes greater distances based on available rights-of-way or easement. On roadways with transit routes, the sidewalk should be brought closer to the roadway at transit stop locations to allow boarding and deboarding at transit stops.



This separated sidewalk includes landscaping on both sides of the sidewalk to shade pedestrians and provide a physical separation from traffic (Scottsdale Road near Greenway/Hayden Loop).

A bicycle lane or parked cars (preferably parallel parked) also provide separation from traffic. More information on bicycle lanes can be found in the Bicycle Element of the *Transportation Master Plan*.

Vertical curbs shall be a 4-inch minimum height to be safe to inhibit cars from climbing curbs. Curbs do not have to be connected to the walkway except at transit stops.

Bollards can be used as a vertical element to separate pedestrians from traffic. (see AASHTO roadside design guide for placement).

Buildings act as a vertical separation in situations where the pedestrian facility is completely, or almost completely, separated from roadways by buildings, in areas such as plazas or pocket parks.

8.8 Lighting

Pedestrian level lighting should be provided in all urban areas and in all suburban areas classified as medium high or high in the pedestrian route network (see *Section 7.0*). Pedestrian level lighting is appropriate in areas where there is pedestrian activity in early morning, evening and nighttime hours.

If provided, a minimum of 1 foot candle of light from grade to 5 feet above the walking surface, between sunset and sunrise, at vehicular intersections, changes in grade, and at crosswalks is required. Provide points of illumination along the sidewalk or walkway so that users can move comfortably between light to light. Selection of lighting fixtures that contributes to thematic character is encouraged.

8.9 Intersections

Crossing wide roadways is a significant barrier to pedestrian movement (see *Section 3.4.4 Street Crossings*). Safe intersection design requires that pedestrians have safe and comfortable access while still meeting the needs of drivers. Basic principles that make intersections safer and more comfortable for pedestrians are provided in *Table 8*.

Table 8: Principles of Intersection Design to Meet Pedestrian Needs

- Intersections that work well for pedestrians are compact.
- Eliminate free-flowing motor vehicle movements (such as free-right-turn movements), or slow vehicles as they turn through the intersection.
- All legs of an intersection are available to pedestrian use (unless doing so creates a significant safety hazard, such as pedestrians crossing in front of left-turning vehicles at a T intersection).
- Pedestrians are able to travel in a direct line across the intersection leg.
- The direction of travel across the intersection is clearly defined for all pedestrians, including pedestrians with visual impairments.
- Avoid increasing potential conflicts or the level of pedestrian exposure to motor vehicles, such as that at multiple and skewed intersections.

Source: *Pedestrian and Streetscape Guide*, Georgia Department of Transportation, September 2003, page 121, available at www.walkable.org/download/Georgia_ped_streetscape_guide.pdf

8.9.1 Crosswalk Markings

Best practice planning and design for pedestrians with disabilities (*Revised Draft Guidelines for Accessible Public Rights-of-Way*) recommend that marked crosswalks be provided at all signalized intersections. Crosswalks are part of the pedestrian access route. There are several different types of crosswalk markings. Research has shown that all crosswalk markings are equally effective, but some are more visible than others.³⁴ Scottsdale typically uses the horizontal bars marking pattern at stop-controlled intersections. Higher visibility crosswalk markings are generally used at locations where greater motorist warning is required because a crossing pedestrian may not be expected, and at locations where there are larger numbers of

³⁴ *Pedestrian and Streetscape Guide*, Georgia Department of Transportation, September 2003, page 124, available at www.walkable.org/download/Georgia_ped_streetscape_guide.pdf.

crossing pedestrians. Advantages and disadvantages of major crosswalk marking types are provided in *Figure 11*.

There has been some debate in recent years about the potential safety implications of providing crosswalks at uncontrolled intersections (intersections without a traffic signal or stop sign). Several studies regarding unmarked and marked crosswalks have been summarized in the *Pedestrian and Streetscape Guide*.³⁵

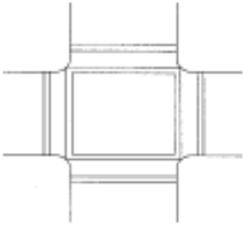
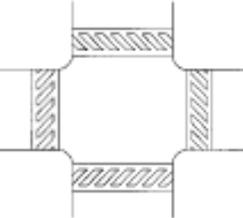
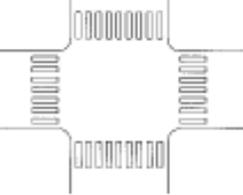
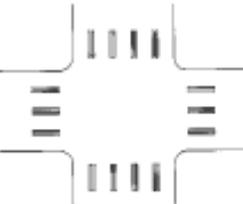
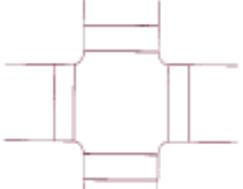
According to the research, on smaller roadways with lighter traffic volumes, markings do not decrease the pedestrian crash risk; conversely, on large-high-volume roadways, the risk actually increases... the needs of pedestrians to safely cross streets cannot be ignored and that engineering and roadway treatments should be used to minimize the pedestrian crash risk... it is rarely appropriate to remove crosswalk markings from multi-lane roadways with high average daily traffic. Instead, the markings should be enhanced with appropriate additional pedestrian treatments such as signing, traffic calming, signalization, or other countermeasures.³⁶

Mid-block crossings are discussed further, along with the preferred combination for different roadway conditions, in *Section 8.10 Mid-Block Crossings*

³⁵ *Pedestrian and Streetscape Guide*, Georgia Department of Transportation, September 2003, pages 121 to 123, available at www.walkable.org/download/Georgia_ped_streetscape_guide.pdf .

³⁶ *Ibid*, page 123.

Figure 11: Advantages and Disadvantages of Crosswalk Marking Patterns³⁷

<i>Marking Pattern</i>	<i>Advantages</i>	<i>Disadvantages</i>
 <p>Horizontal Bars</p>	Common practice at stop controlled intersections, less expensive, easy to install and maintain	Not as visible as some other marking types; bars tend to wear faster than other types; not appropriate for mid-block locations
 <p>Zebra</p>	Highly visible	More maintenance required since wheel friction rubs off diagonal stripes; surface can be slippery
 <p>Ladder Bar</p>	Highly visible	Wider stripes rub off with wheel friction, but can be placed to minimize this effect; surface can be slippery
 <p>Piano</p>	Highly visible and becoming more commonly used; easy to maintain since stripes can be placed outside the wheel friction areas	
 <p>Dashed (European)</p>	Captures attention because it is not a commonly used pattern	May not define space as well as some of the other choices
 <p>Solid</p>	Visible (but may not be as eye catching as other patterns); not commonly used	Expensive; more difficult to install and maintain; surface can be slippery

³⁷ *Pedestrian Facilities Guidebook*, Washington State Department of Transportation, September 1997, available at www.wsdot.wa.gov/walk/designinfo.htm. Table 48, page 121.

8.9.2 Minimizing Crossing Distances at Intersections

Minimizing crossing distances for pedestrians at intersections helps to increase the safety of slower-crossing pedestrians (see *Table 2: Pedestrian Walking Speeds*) and enhances the comfort of all pedestrians. There are several tools that can be used to minimize the crossing distances at intersections, including reducing the curb return radius, medians and center refuge islands, and curb bulb-outs and extensions. These features, and their applicability in the City of Scottsdale, are described below.

Reduced Curb Return Radius. Reducing the curb return radius reduces the crossing distance at intersections and requires vehicles to slow as they turn, allowing vehicles to be more responsive to the presence of pedestrians in the intersection.

In Scottsdale, the use of reduced curb return radius will be considered along urban segments of the pedestrian route network or in suburban segments classified as high or medium high (see *Figure 4 through Figure 8*). A suggested corner radii “is as small as 10 to 15 feet where residential streets intersect to 25 to 30 feet where arterial streets intersect.”³⁸

Even along corridors with extensive pedestrian use (or potential use), the need for shorter pedestrian crossing distances and reduced vehicle turning speeds will need to be balanced with the need to provide adequate curb turning radius lengths to accommodate the types of vehicles that turn at the intersection. A radius that is too small may cause large vehicles, such as buses or delivery trucks, to jump the curb, which can damage the curb and sidewalk, and can also cause vehicles to enter the pedestrian waiting area at the intersection. Small curb radii may also force large vehicles to enter opposing traffic.

Medians and Center Refuge Islands. Medians and refuge islands at intersections provide waiting areas for pedestrians crossing the roadway, allowing pedestrians to cross in only one direction at a time. Refuge islands are generally smaller than medians, but either one can be used at an intersection.

Table 9 lists conditions where refuge islands at intersections are beneficial for pedestrians.

Medians and refuge islands need to be large enough to provide refuge for several pedestrians waiting at once. They generally should be a minimum of 6 feet wide and preferably 8 feet wide or more where possible, face of curb to face of curb. These areas also need to be accessible, with either curb ramps or at-grade cuts. Cut-throughs are generally easier to construct and easier for pedestrians to negotiate than curb ramps, especially on small islands...refuge islands should be raised to provide a vertical barrier between pedestrians and motor vehicles...the use of medians and refuge islands at intersections also help to provide added protection during left-turning movements. Pedestrian push buttons should be mounted in the islands to provide pedestrians control over the signal phases from their refuge position. Push button posts and other poles need to be located out of the pedestrian travel way, but not inconveniently far from reach.³⁹

³⁸ *Pedestrian Area Policies and Design Guidelines*, Maricopa Association of Governments, 2005, page 64, available at www.mag.maricopa.gov.

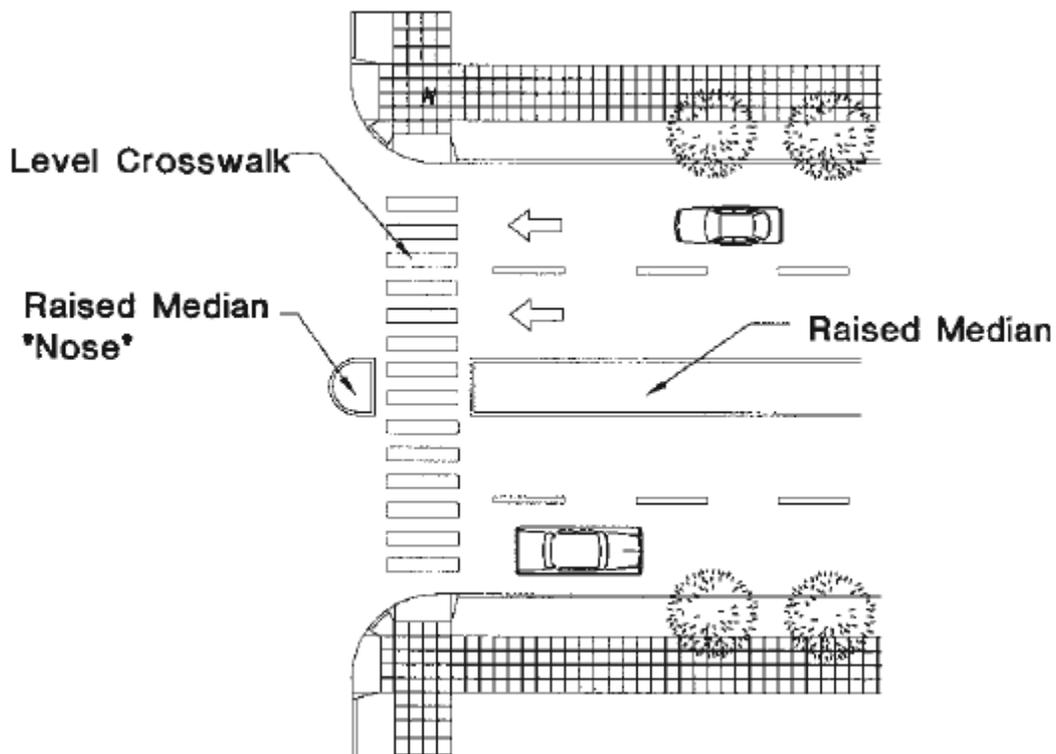
³⁹ *Pedestrian and Streetscape Guide*, Georgia Department of Transportation, September 2003, page 133, available at www.walkable.org/download/Georgia_ped_streetscape_guide.pdf.

Table 9: Locations Where Refuge Islands Benefit Pedestrians

- Wide, two-way unsignalized streets (four or more lanes) with high traffic volumes, high vehicle travel speeds and large pedestrian volumes.
- Roadways where children, pedestrians with disabilities, elderly pedestrians or other slower-moving pedestrians (including tourists) cross regularly.
- Streets where there is insufficient time for slower-moving pedestrians to cross in one cycle.
- Minor access/local residential street where islands function both as traffic calming devices and street crossing aids.

Source: *Pedestrian and Streetscape Guide*, Georgia Department of Transportation, September 2003, page 132, available at www.walkable.org/download/Georgia_ped_streetscape_guide.pdf

Figure 12: Median/Refuge Island at an Intersection⁴⁰

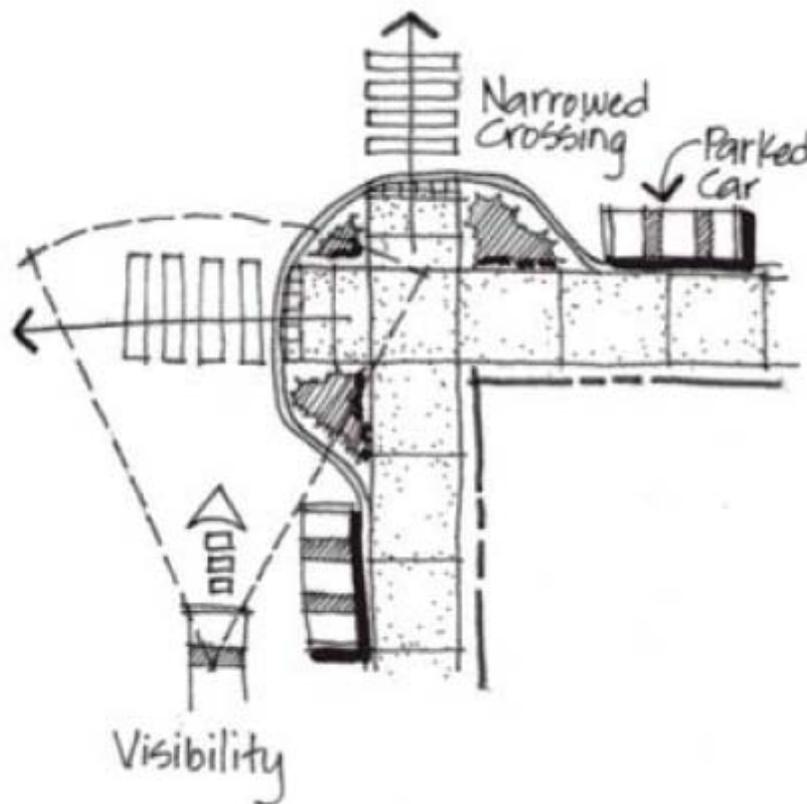


⁴⁰ *Pedestrian Facilities Guidebook*, Washington State Department of Transportation, September 1997, available at www.wsdot.wa.gov/walk/designinfo.htm. Page 128, Figure 71.

Curb Bulb-Outs and Extensions. Curb extensions, which are also referred to as bulb outs, reduce the street crossing distances at intersections and improve sight lines for pedestrians and drivers. Curb extensions are appropriate only where there is on-street parking. Curb extensions also help to slow turning traffic. Extensions may not be appropriate on streets where there are higher numbers of large turning vehicles, such as transit vehicles or delivery vehicles.

In Scottsdale, curb extensions should be considered on corridors where the segment is designate as urban or where the pedestrian route network has a ranking of high or medium high (see *Figure 4 through Figure 8*) and where the other criteria listed above are present. *Figure 13* shows a curb-extension.

Figure 13: Curb Extension/Bulb-Out⁴¹



⁴¹ *Pedestrian Area Policies and Design Guidelines*, Maricopa Association of Governments, 2005, page 62, available at www.mag.maricopa.gov.

8.9.3 Minimizing Pedestrian/Motor Vehicle Conflicts at Intersections

There are many ways to minimize conflicts between pedestrians and motor vehicles at intersections, including enhancing visibility and sight distance, restricting on-street parking, signalizing intersections, grade separation, and regulating turning movements. Many of these techniques also help to reduce conflicts at driveways (see *Section 8.5 Driveway Crossings*).

Visibility and Sight Distance. Providing visibility at intersection corners is important so that drivers can see pedestrians. Features such as signs, landscaping and street furnishings can inhibit visibility, so care is needed in locating these elements. See Chapter 5 of the City of Scottsdale *DS&PM* Figure 5.3-26:5.3-27 for intersection and driveway sight distance requirements.

On-Street Parking Restriction. When cars are parked too close to pedestrian crossings, they may block the line of sight from the driver and the pedestrian, which is an unsafe condition that leads to pedestrian/vehicle collisions. Engineering judgment is required to determine the appropriate distance for parking setbacks from pedestrian crossings.

The ITE Design and Safety of Pedestrian Facilities recommends that parking be restricted within 50 feet of all intersection crossings where the speed of travel on the street is 35 to 45 mph, and be restricted within 100 feet at intersections on streets where the speed of travel is above 45 mph and at mid-block crossings (see *Section 8.10 Mid-Block Crossings*).⁴²

In some situations, the parking setback may be lessened, such as in a downtown area or other areas where travel speeds are lower. Greater setbacks may be required near schools, at unsignalized intersections, or on higher speed roadways.

Signalized Intersections. The needs of pedestrians are important to address at all intersections where traffic signals are installed. Please refer to *Section 8.11 Signal Timing and Pedestrian Actuated Signals*, *Section 8.12 Pedestrian Count-Down Signals* and *Section 8.14 Accessible Pedestrian Signals* for additional information.

Grade Separation. Grade separation is used when traffic conditions require pedestrians to be completely separated from the roadway and may be considered in cases of heavy pedestrian or vehicle volumes. Overpasses and tunnels or underpasses, if designed appropriately, can provide safe pedestrian crossings. Design considerations to make them accessible for people with disabilities (with the use of ramps or elevators) can be expensive and challenging. If using a grade-separated crossing is inconvenient or adds distance to the pedestrian trip, pedestrians may not use them. Grade separations work well when integrated with an overall pathway system, such as the Indian Bend Wash, since they create a continuous path of travel and are convenient and comfortable for pedestrians to use. Grade-separated crossings are also discussed in *Section 8.10 Mid-Block Crossings*.

⁴² *Pedestrian and Streetscape Guide*, Georgia Department of Transportation, September 2003, page 136, available at www.walkable.org/download/Georgia_ped_streetscape_guide.pdf.

Turning Movements. There are many approaches that can be considered to reduce turning movement conflicts at intersections (see *Table 10*). Many of these approaches are discussed elsewhere in the *Design Guidelines* section of this *Pedestrian Element*.

Table 10: Options to Reducing Turning Movement Conflicts for Pedestrians at Intersections

- Consider making intersections more compact, with small turning radii – this requires vehicles to turn more slowly, reducing conflict for pedestrians.
- Restrict left turns in some high-pedestrian use areas (such as Downtown) during certain hours when there are more pedestrians at intersections. Alternatively, provide left turn arrows for motorists after allowing pedestrians to cross at signalized intersections.
- Shorten crossing distances (and exposure for the pedestrian) by using curb extensions or bulb-outs.
- Provide medians and refuge islands at intersections, and appropriate mid-block crossings.
- Ensure that pedestrian crossings have appropriate lighting.
- Improve marking and visibility of crosswalks.
- Use signs to remind motorists to yield to pedestrians in crosswalks.

Source: From the *ITE Design and Safety of Pedestrian Facilities*, as cited in the *Pedestrian and Streetscape Guide*, Georgia Department of Transportation, September 2003, table 51, page 140, available at www.walkable.org/download/Georgia_ped_streetscape_guide.pdf.

8.10 Mid-Block Crossings

Given a choice between an inconvenient safe route and a convenient route that may be less safe, many pedestrians will select the more convenient route. In the example shown in *Figure 14*, transportation professionals would prefer that pedestrians use the traffic signal to cross the roadways. However, since this route adds approximately 40 percent to the pedestrians' crossing distance (and hence, their delay), pedestrians will generally prefer to cross at the mid-block location.

Figure 14: Safer (Solid Line) Vs. Convenient (Dashed Line) Crossings



8.10.1 Guidelines for Installing Pedestrian Crossing Treatments

The *Manual of Uniform Traffic Control Devices* and professional engineering judgment can help identify the need for appropriate crossing treatments. Some jurisdictions have adopted local standards and criteria to help identify where crossing improvements are appropriate. The City of Kirkland, Washington,⁴³ for example, considers the following criteria in evaluating appropriateness of crossing treatments:

- Is the crossing on a route or roadway that is part of a school walking or bicycling route?
- Is the crossing an element of a bicycle or pedestrian route identified in the Transportation Master Plan?
- Does the crossing provide a connection to significant retail?
- Does the crossing provide a connection to transit service?
- Do people in the area require a longer time to cross the street (does the area have a large population of persons with disabilities, children, persons who are elderly or tourists?) – see *Table 2: Pedestrian Walking Speeds*.
- Would the improvement crossing solve a safety problem?

8.10.2 Existing Guidance for Mid-Block Crossings

Currently, the *Manual on Uniform Traffic Control Devices (MUTCD)*⁴⁴ provides several options for mid-block crossings, including: crossing advance and crossing signs, in-pavement flashing lights, and signalized crossings. The *MUTCD* provides specific guidance in the form of signal warrants for the application of mid-block traffic signals for pedestrians. However, the guidance for use of signage and other treatments is in the form of “when used, do the following.” In 1984, Axler created warrants for the Federal Highway Administration (FHWA) addressing the provision of grade-separated crossings.⁴⁵

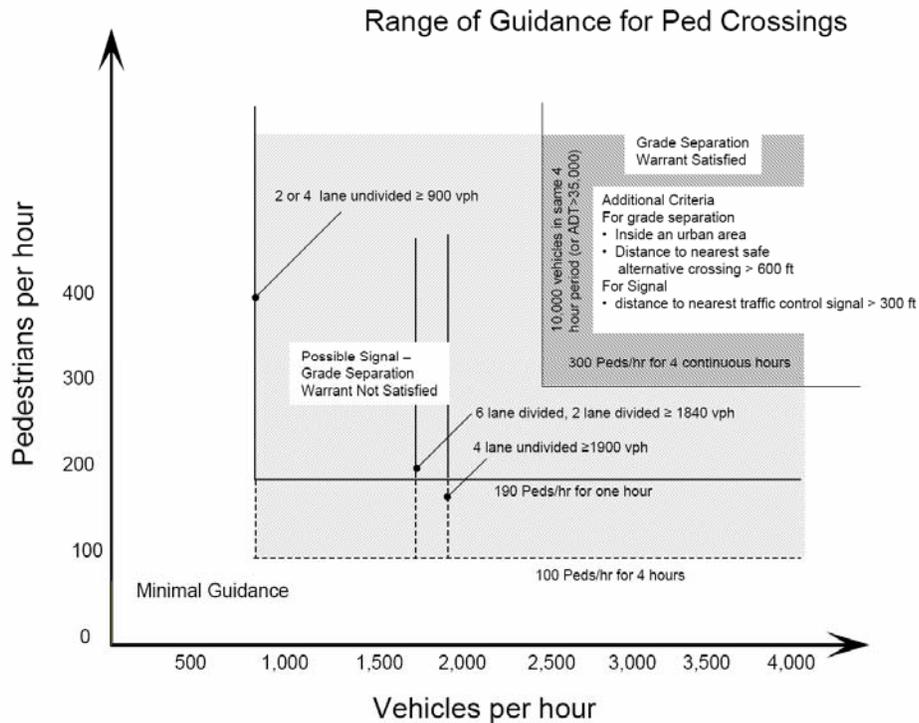
Figure 15 shows the approximate pedestrian and motor vehicle volumes addressed by the *MUTCD* signal and FHWA grade-separated crossing warrants. There is a significant range of pedestrian volumes for which no substantial guidance is provided; for any pedestrian volumes under 100 per hour (for four hours) more guidance is needed. Accordingly, guidance for implementing traffic control at these numerous unsignalized pathway/arterial crossings is needed.

⁴³ Source: Adapted from the City of Kirkland Transportation Department, as listed in the *Pedestrian Facilities Guidebook*, Washington State Department of Transportation, September 1997, page 118, available at www.wsdot.wa.gov/walk/designinfo.htm.

⁴⁴ *Manual on Uniform Traffic Control Devices*, Chapters 2B, 2C, 3B, 4C, and 4L. Federal Highway Administration, US Department of Transportation, 2003.

⁴⁵ Axler, E.A., *Warrants for Pedestrian Over and Under Passes*, Federal Highway Administration, 1984

Figure 15: Range of Existing Guidance for Pedestrian Crossings



The crossing guidelines presented in this section answer four basic questions:

1. Should a grade-separated crossing be provided? If not, then,
2. Is a traffic signal warranted? If not, then,
3. Is a designated mid-block crossing appropriate? If so, then,
4. What specific measures should be installed?

Grade-separated Crossing. According to warrants developed by FHWA⁴⁶, a grade-separated pedestrian crossing is justified if:

1. There are at least 300 pedestrian crossings for four consecutive hours inside an urban area with motor vehicle speeds greater than 40 mph;
2. The motor vehicle volume during the same time period is greater than 10,000 (or the total daily traffic volume is greater than 35,000); and
3. The crossing site is at least 600 feet from the nearest controlled crossing.

If this warrant is met, a grade-separated crossing may be considered to accommodate pedestrians.

⁴⁶ Axler, E.A. *Warrants for Pedestrian Over and Under Passes*. Federal Highway Administration, US Department of Transportation, 1984.

Traffic Signals. The *MUTCD* provides warrants for the installation of traffic signals⁴⁷. Warrant 4, Pedestrian Volumes, states that a signal for a mid-block or intersection crossing can be considered if an engineering study finds both of the following:

1. The pedestrian volume crossing the major street at an intersection or mid-block location during an average day is 100 or more for each of any 4 hours or 190 or more during any one hour; and
2. There are fewer than 60 gaps per hour in the traffic stream of adequate length to allow pedestrians to cross during the same period when the pedestrian volume criterion is satisfied. Where there is a divided street having a median of sufficient width for pedestrians to wait, the requirement applies separately to each direction of vehicular traffic.

The *MUTCD* goes on to say that, in Section 4C.05, “The Pedestrian Volume signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of roadway traffic.”

A Pedestrian Volume signal warrant requires actual pedestrian and motor vehicle counts. Additionally, to satisfy the pedestrian warrant the number of adequate gaps in the roadway traffic stream must be counted. Unfortunately, determining the demand for a potential mid-block crossing location is not something that can be done by counting the existing number of individuals crossing the roadway. Some method using a surrogate site, or perhaps latent demand, must be employed to estimate the number of users that would cross at a new signalized crossing.

Designated Mid-block Crossings. At many mid-block crossing locations throughout the U.S., pedestrian volumes are not high enough to satisfy the *MUTCD*'s Pedestrian Volume warrant for a traffic signal. To determine if a mid-block crossing is appropriate, two criteria will be considered: roadway geometrics and geometric pedestrian delay.

Roadway Geometrics. Roadway geometrics dictate if the mid-block crossing can be designed safely. Two primary factors need to be considered: sight distance and proximity to intersections.

The sight distances available to motorists and pedestrians must be adequate to allow for a safe crossing. *A Policy on the Geometric Design of Streets and Highways*.⁴⁸ states that sight distance provided for motorists should be at least equal to the stopping sight distance for the design speed of the roadway. While motorists are required to yield the right-of-way to pedestrians, pedestrians are more comfortable crossing the street when they have adequate sight distance for them to see far enough up the approach roadway to identify an adequate gap in traffic.

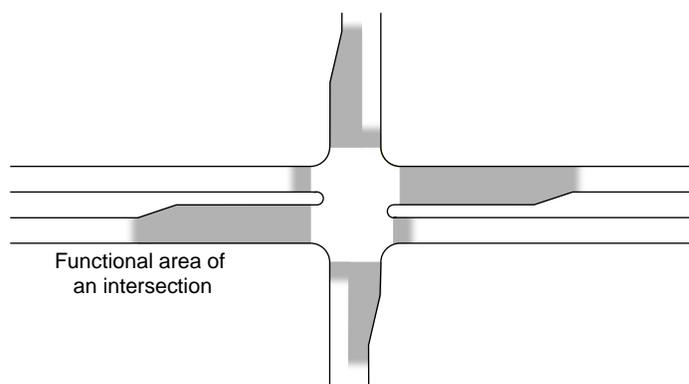
The proximity to intersections is important because of the complexity of motor vehicle movements on the approach to intersections. Essentially, mid-block crossings should not be placed within the functional area of an intersection. The functional area of an intersection (See

⁴⁷ *Manual on Uniform Traffic Control Devices*, Chapter 4C. Federal Highway Administration, US Department of Transportation, 2003.

⁴⁸ *A Policy on the Geometric Design of Streets and Highways*, American Association of State and Highway Transportation Officials (AASHTO), Washington, DC, 2005.

Figure 16) includes both the approaches to and departures from the intersection and the longitudinal limits of the auxiliary lanes.⁴⁹

Figure 16: Functional Area of an Intersection (grey-toned shading)



Pedestrian Volumes. Pedestrian volumes, the number of pedestrians needing to cross, are the next criterion in determining where crossing treatments should be provided for mid-block locations. Combined with the distance to the nearest intersection crossing, pedestrian volume can be used to determine an overall geometric pedestrian delay resulting from the additional distance the pedestrian is required to walk to use the intersection crossing. The proposed criteria for the consideration of a mid-block crossing are as follows:

The total geometric pedestrian delay at a potential crossing location during an average day is:

- 15 minutes or more for each of any four hours; or
- more than 60 minutes during any one hour.

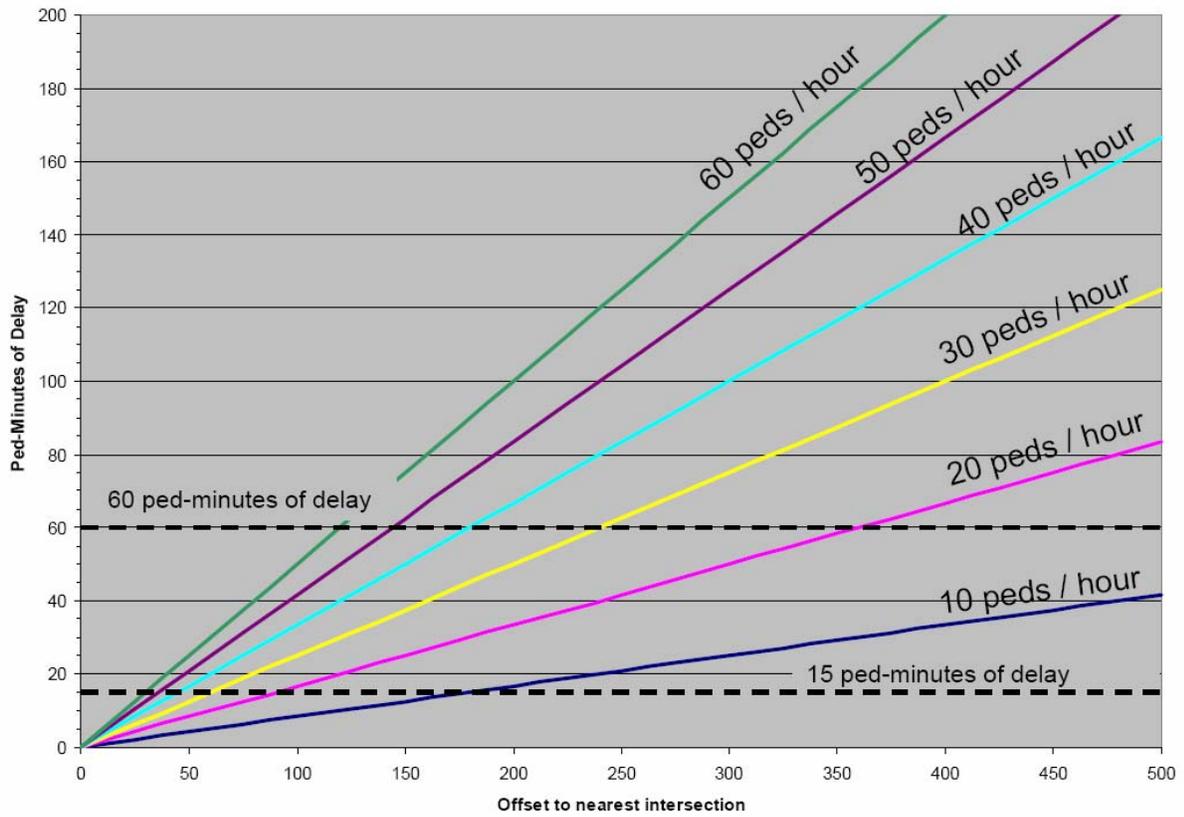
Figure 17 shows the calculated pedestrian-minutes of delay as a function of the volume of pedestrians and the offset distance to the nearest intersection. The delay was based only upon the offset to the intersection and does not include any delay associated with waiting at traffic signals. For purposes of this example, three and a half (3.5) feet per second is the assumed walking speed of a pedestrian. The chart shows, for example, that if there are ten pedestrians per hour and the offset to the nearest intersection is 100 feet, the pedestrians will experience a total of ten minutes of delay. If the offset is 200 feet, the pedestrians will experience a total of 20 minutes of delay (instead of ten), because the pedestrians have to walk farther to and from the nearest intersection (200 feet each way instead of 100 feet). If there are 20 pedestrians per hour and the offset is 100 feet, the pedestrians will experience a total of 20 minutes of delay (instead of ten), because there are 20 pedestrians (instead of 10).

If the delay criteria are met (15 minutes or more for each of any four hours or more than 60 minutes during any one hour), a crossing could be considered at the mid-block location.

If it has been determined that a mid-block crossing is appropriate, the appropriate combinations of traffic control devices to be used will need to be identified. Each situation is unique and will need to be examined for efficiencies and safety.

⁴⁹ Ibid.

Figure 17: Geometric Delay to Pedestrians - Geometric Pedestrian Delay as a Function of Number of Pedestrians and Offset to Nearest Intersection



8.11 Signal Timing and Pedestrian Actuated Signals

Signals are typically timed to efficiently move motorized vehicles. Pedestrians usually must stop and wait to cross at every signalized intersection. In Scottsdale, pedestrian actuated signals at intersections are commonplace and at major roadway intersections the pedestrian signal is automatic. At other intersections however, often pedestrians must actuate the signal in order to activate the pedestrian phase and have sufficient time to cross the street – even in areas ranked as high on the pedestrian route network, where there are large numbers of pedestrians (see *Figure 4 through Figure 8*). In areas designated as urban corridors or in suburban areas ranked as high or medium high on the pedestrian route network (see *Figure 4 through Figure 8*), pedestrians should not be required to actuate the signal to have sufficient time to cross the intersection to enhance the comfort and safety of pedestrians in these areas.



Signals with excessively long waits may cause pedestrians to cross against the signal, increasing the potential for pedestrian/motor vehicle conflicts. Research indicates that many pedestrians stop watching for the light to change, and instead start looking for gaps to cross streets when their delay exceeds 30 seconds.⁵⁰

Signals should be timed closer to the speed of slower pedestrians rather than the average speed of all users. *Table 2* identifies walking speeds for a variety of pedestrians ranging from an average of 4.0 feet per second for the average pedestrian to 1.97 feet per second for an above-the-knee amputee. The *MAG Pedestrian Policies and Design Guidelines* recommends using “a walking speed of 3.0 (0.91m) feet per second or slower to calculate clearance time, based on the walking speed of the elderly, children, and other slower users.”⁵¹ The *ITE Manual Design and Safety of Pedestrian Facilities* also recommends the use of the 3.0 feet per second for signal timing.⁵² This Pedestrian Element of the Transportation Master Plan recommends signal timing to allow walking speeds of 3.5 feet per second.

Pedestrian push buttons need to meet the *Revised Draft Guidelines for Accessible Public Rights-of-Way*.⁵³ Pedestrian push buttons should be a minimum of 2 inches across and need to contrast visually with the mounting surrounding them. Pedestrian push buttons should be placed so that pedestrians can reach them; unobstructed high reach should not exceed 48 inches.

⁵⁰ *Pedestrian and Streetscape Guide*, Georgia Department of Transportation, September 2003, page 138, available at www.walkable.org/download/Georgia_ped_streetscape_guide.pdf.

⁵¹ *Pedestrian Area Policies and Design Guidelines*, Maricopa Association of Governments, 2005, page 66, available at www.mag.maricopa.gov.

⁵² *Pedestrian and Streetscape Guide*, Georgia Department of Transportation, September 2003, page 139, available at www.walkable.org/download/Georgia_ped_streetscape_guide.pdf.

⁵³ *Revised Draft Guidelines for Accessible Public Rights-of-Way*, United States Access Board, 2005, available from www.access-board.gov/prowac/draft.htm.

8.12 Pedestrian Count-Down Signals

The use of pedestrian count-down signals can help provide additional information on the amount of time available to cross the roadway. The City will consider installing countdown timers at intersections designated as urban corridors or where pedestrians must cross four or more lanes, and will prioritize requests according to the following criteria:

- High existing pedestrian volumes and/or latent demand results.
- Traffic volume, traffic speed, number of lanes crossed.
- High pedestrian crash locations.
- Number of citizens requesting the project.
- Significant number of senior citizens, school-age children, pedestrians with disabilities who would be served by the project.
- Designated as urban corridors



These criteria are described in further detail below.

8.13.1 High Pedestrian Volumes/Latent Demand Results

The City will consider installing countdown timers at intersections with high existing or potential pedestrian volumes to maximize the number of pedestrians who benefit. The City will consider installing pedestrian countdown signals along all urban corridors or suburban corridors with a ranking of medium, medium high or high on the pedestrian route network identified in *Figure 4 through Figure 8*). Figures in *Appendix E* show the results of the pedestrian latent demand analysis for Scottsdale by planning area, and reveals that areas with relatively high latent demand are generally the urban character areas, while relatively low latent demand is typical in the designated rural/environmentally sensitive lands areas.⁵⁴

8.13.2 Traffic Volume, Traffic Speed, and Number of Lanes Crossed

Pedestrians often perceive that crossing wide intersections with high traffic volumes and speeds is less safe than crossing smaller intersections with low traffic volumes and speeds. There are several options to assess how safe pedestrians feel when crossing city intersections.

For example, a simple measure could be the product of the number of through-lanes and turn lanes on each street approach: in a 2 x 2 intersection, both intersecting streets have two through-lanes, with an intersection complexity product of 4. In a 2 x 4 intersection, one street has two lanes and one street has four lanes. In order of increasing complexity, intersections may be described as 2 x 2, 2 x 4, 2 x 5 (with turn lanes), 4 x 4, 4 x 6, and 6 x 6, for intersection complexity products of 4, 8, 10, 16, 24, and 36, respectively.

A more precise measure is the Federal Highway Administration's Pedestrian Intersection Safety Index (ISI).⁵⁵

⁵⁴ Latent Demand Technical Appendix. Submitted to the City of Scottsdale, December 2006.

⁵⁵ Carter, D.L., W.W. Hunter, C.V. Zegeer, J.R. Stewart, and H.F. Huang. *Pedestrian and Bicyclist Intersection Safety Indices: Research Report*. Submitted to FHWA, U.S. Department of Transportation, February 2006.

8.13.3 High Pedestrian Crash Locations

A high number of pedestrian crashes may be a result of several factors. For example, there may be a large number of pedestrians and a large number of vehicles. Other things being equal, a location with many pedestrians and/or motor vehicles would be expected to have more pedestrian crashes than a location with few pedestrians and/or motor vehicles.

Pedestrian crashes may also be caused by barriers to pedestrian movement, such as absence of a sidewalk, the lack of pedestrian signals or lack of a mid-block crossing point. Some areas may have more pedestrian crashes since they attract slower-moving or more vulnerable pedestrians. For example, children going to and from school, intoxicated persons, and pedestrians who are older or who have disabilities may need additional features to help improve the safety of the walking environment.

Another cause of pedestrian crashes may be a feature of the characteristics of the intersection. For example, there may be a large number of turning vehicles, a large number of right-turns-on-red, a wide crossing, complex geometry or limited sight distance. Pedestrian count down signals can be one tool used to improve pedestrian safety.

8.13.4 Number of Citizens Requesting the Project

The number of citizens requesting countdown timers at a specific intersection may be a surrogate measure of actual pedestrian volume, latent demand, and perceived safety at that intersection.

8.13.5 Significant Number of Senior Citizens, School-age Children, and Pedestrians with Disabilities

Senior citizens, school-age children, and pedestrians with disabilities cross more slowly than the general population (see *Table 2: Pedestrian Walking Speeds*) and therefore stand to benefit from knowing how much time they have to finish their crossing.

A drawback to using numbers of pedestrians is that many intersections may have latent demand that is not reflected in actual numbers of pedestrians, because of barriers to pedestrian movement.

8.14 Accessible Pedestrian Signals

An accessible pedestrian signal (APS) is “a device that communicates information about pedestrian timing in non-visual format such as audible tones, verbal messages, and/or vibrating surfaces.” APS provides information to pedestrians about the existence and location of a pedestrian push button, the direction of the crosswalk, and other information about the intersection. Although used commonly throughout Europe, audible crossings have not been widely used in the United States due to concerns about noise pollution and disagreement among people who are blind about the need for and effectiveness of audible signals.⁵⁶

Techniques used by people who are visually impaired will vary by the characteristics of the street crossing and the individual’s level of vision. Changes in the travel environment over the past two decades have affected the ability of people who are blind to use traditional street crossing techniques. These changes include intersection design changes, driver behavior and technology of autos, and signalization changes. For example, wider streets require more precise alignment of crosswalks and wide radius turns make alignment more difficult and

⁵⁶ Accessible Pedestrian Signals: Synthesis and Guide to Best Practice. Available at www.walkinginfo.org/aps/home.cfm

increase crosswalk length. Vehicles have become quieter, making it more difficult for pedestrians who are visually impaired to hear them. Intersection signalization has also become more complex, making it more difficult for pedestrians who are visually impaired to recognize the pedestrian phase.⁵⁷

There are four major design types of devices that provide information on the Walk and Don't Walk cycles: (1) Pedhead mounted; (2) Pushbutton integrated; (3) Vibrotactile only; and (4) Receiver based. All products produce a sound, vibration, or both, during the Walk interval. Pedhead mounted is the most common type of device installed in this country. The pushbutton integrated device has a speaker mounted inside or in the vicinity of the pedhead. Pushbutton integrated APS systems have a speaker integrated into the pushbutton housing, and are commonly used in Europe and Australia. Vibrotactile only devices have been installed in a few US locations to respond to concerns about noise and misleading information provided by pedhead-mounted signals. Receiver-based systems are still considered experimental.⁵⁸

It is the policy of the City of Scottsdale to apply the best practice guidelines to ensure the accessibility of all public rights of way. According to recent research on APS:

Currently in the US, APS are typically installed upon request along a specific route of travel for a particular individual or group of individuals who are blind or visually impaired. Various states and municipalities have established policies on installation of APS, some of which are not in accord with ADA requirements.

Title II of the ADA requires municipalities and states to make their 'programs' accessible. Pedestrian circulation is considered a program, and APS may be necessary to provide access to certain types of intersections. Some municipalities have considered the addition of APS at intersections as part of their ADA transition plan.

[Draft Public Rights-of-Way Accessibility Guidelines](#) were published on June 17, 2002 for comment. These Draft Guidelines require APS at all newly constructed or reconstructed intersections where visual pedestrian signals are installed. (See US [Rules and Regulations](#) Related to APS.)⁵⁹

Therefore, accessible pedestrian signals are to be installed with all new constructed, or reconstructed intersections where pedestrian signals are installed.

City of Scottsdale should continue to monitor the development of this rapidly standardizing technology to obtain the features that are desired beyond the basic APS requirements. Walkinginfo.org – Pedestrian and Bicycle Information Center (<http://www.walkinginfo.org>) will continue to be a valuable source of information.

A preferred approach to APS is still under development. Pedestrian signal devices should comply with PROWAC R-306 (<http://www.access-board.gov/prowac/draft.htm>). Walkinginfo.org is currently working on the latest specifications for pedestrian signal devices, and the *Manual for Uniform Traffic Control Devices* scheduled to be published by FHWA in 2008 will contain the most recent specifications.

⁵⁷ Ibid.

⁵⁸ Ibid.

⁵⁹ Ibid.

8.15 Shade

Pedestrians in the Phoenix area will seek protection from the sun from late spring through fall. For other months of the year, when temperatures are cooler, pedestrians seek filtered or direct sunlight to be comfortable. The most intense sunlight and temperature extreme occur from May to September, from 12:00 noon to sunset. Shade cover can be provided by either an architectural feature, such as a covered walkway or shelter, or the canopy of a tree. In parts of Downtown, structured shade is a component of the walking environment. Where structured shade is provided, providing appropriate lighting will increase security of pedestrians during early morning or late afternoon hours.



Shade is provided by trees in some areas of Downtown Scottsdale. Note that the landscaping and on-street parking also provides a buffer between pedestrians and the roadway.

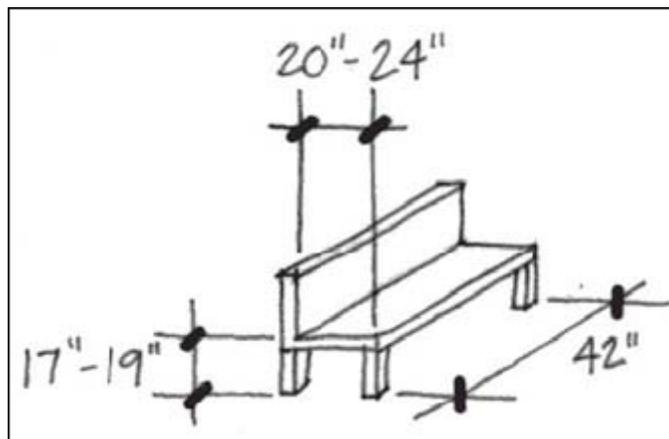
Another common method of providing shade is with trees. Continuous shade is best achieved when trees are equally spaced. Concentrated shade is most appropriate at gathering places or nodes such as transit stops. When providing shade through awnings or canopies, follow requirements for clearances identified in *Section 8.3 Clearances*.

Figure 4 through Figure 8 identify the pedestrian route network for planning zones of the city. The level of shade required varies with the pedestrian route network map classifications, as shown in *Table 11* on the next page.

8.16 Seating

Comfortable and frequent seating can help promote walking and creates a comfortable pedestrian environment. All benches or other seating surfaces must meet guidelines for accessibility, including a seat surface between 17 and 19 inches above the walkway surface, a length of at least 42 inches, a depth of 20 to 24 inches, and a back support. *Figure 18* shows minimum seating dimensions.

Figure 18: Minimum Seating Dimensions⁶⁰



Seating and other furnishings should not protrude into the pedestrian route of travel (see *Section 8.3 Clearances*). Benches should be placed to allow a person in a wheelchair to have immediate adjacent access (3 foot radius minimum). Seating opportunities can be either fixed or moveable and the seating surface should not be so rough that it is uncomfortable to sit or can damage skin or clothing. Seating opportunities should consider the intense heat and sun of our climate through appropriate placement, materials, and sensitive designs that mitigate heat retention.

Figure 4 through Figure 8 identify the pedestrian route network for planning zones of the city. The level of shade required varies with the pedestrian route network map classifications as shown in *Table 11*. Additional shade should be provided in areas with more elderly persons, more children, and in areas with more persons with disabilities.

Table 11: Shade and Seating Requirements		
Network Classification	Pedestrian Shade Requirement	Pedestrian Seating Requirement Per 660 Feet (1/8 Mile) Of Roadway Frontage
Low	No shade requirement.	No seating requirement.
Medium Low	No shade requirement.	No seating requirement.
Medium	50 percent shade coverage in the heat-intense summer months along pedestrian routes and at gathering places. Provide some shade year-round on the walkway.	1
Medium High	60 percent shade (could be in areas with more elderly persons or more persons with disabilities) continuous coverage.	2
High	Provide 75 percent shade or greater along the walkway.	2

⁶⁰ *Pedestrian Area Policies and Design Guidelines*, Maricopa Association of Governments, 2005, page 69, available at www.mag.maricopa.gov.

8.17 Parking Lots

Conflicts with motor vehicles in parking lots can be a concern for pedestrians. Clarification of the appropriate pedestrian path of travel is important to address in the site design process to enhance safety and comfort.

Pedestrian access points should be clearly identified with striping, delineation of walking zones, and provision of walkway medians and islands. Drop-off and pick-up zones should be clearly identified and separate from the flow of vehicles.⁶¹



Separating destinations from nearby streets with large expanses of parking limits pedestrian access.

When possible, locate large parking lots to the rear or underneath the building (instead of between the building and the street), with direct connections to the pedestrian route and provisions for shade or trees. Consider shared parking for multiple businesses (this may also help provide a more continuous pedestrian route by limiting the number of driveways). These design approaches are especially important in areas classified as high or medium high on the pedestrian route maps (see *Figure 4 through Figure 8*).

Provide off-street parking in landscaped lots with direct pedestrian access to building entries. Access from the parking area to the building entrance should not exceed one-eighth of a mile.

⁶¹ *Pedestrian Facilities Guidebook*, Washington State Department of Transportation, September 1997, chapter 10, available at www.wsdot.wa.gov/walk/designinfo.htm.

8.18 Maintenance

Pedestrian surfaces that are clean, smooth and level are important for all pedestrians, but especially for pedestrians using wheelchairs, older adults and children. Common maintenance hazards for pedestrians include pavement heaving and cracking, separation of expansion joints, or debris on sidewalks.⁶² The maintenance guidelines outlined in this section can help ensure effective functioning of pedestrian facilities. Poorly maintained pedestrian facilities can create hazards for pedestrians, liability risks for the City and property owners, and negatively impact community image.⁶³

As mentioned in *Section 8.2 Sidewalk Surface, Texture and Slope*, sidewalks should be even, without heaving, and without cracks or indents greater than ¼ inch in width or depth. Changes in vertical elevation greater than ¼ inch require correction or repair.

Adoption of a periodic inspection and maintenance program will help insure the appropriate maintenance and repair of pedestrian facilities.⁶⁴ In Scottsdale, citizens and others are able to report potential sidewalk maintenance concerns through the City's web site. By clicking on "report a problem" on the home page, web users are directed to a place where they can report damaged sidewalks or other problems. Requests submitted through the web site are quickly routed to appropriate staff for resolution. Pedestrian facility maintenance requirements are listed in *Appendix H*.

8.19 Work Zone Safety

Construction activities can have a significant impact on pedestrians by disrupting sidewalks and other curbside areas. Construction plans must specify how pedestrian facilities are kept open and function, or identify an appropriate alternative that creates a convenient and accessible option for all pedestrians, including pedestrians with mobility limitations. The removal of a sidewalk, even for a short time, can effectively remove access to a building or transit stop for a pedestrian using a wheelchair, a pedestrian pushing a stroller, or a delivery person using a hand truck. When accessible elements of the pedestrian environment are removed, such as a curb ramp, care must be taken to create a detour route that is not overly lengthy or circuitous.⁶⁵ Guidelines for pedestrian accommodation in work zones are located in *Appendix I*.

8.20 Sidewalk Cafes/Outdoor Dining

Sidewalk cafes/outdoor dining can create a unique environment for relaxation, eating and exploration. A vibrant street helps to enhance the pedestrian experience by creating interest and can also encourage passersby to pause and explore the area on a more intimate scale. Encouraging visitors to lounge and explore can enhance commerce by creating sales opportunities. Sidewalk cafes should be encouraged as a vital component of an attractive, active street.

⁶² *Pedestrian and Streetscape Guide*, Georgia Department of Transportation, September 2003, available at www.walkable.org/download/Georgia_ped_streetscape_guide.pdf

⁶³ *Pedestrian Compatible Planning and Design Guidelines. Chapter 4: Operations and Maintenance of Pedestrian Facilities*. New Jersey Department of Transportation. Available at <http://www.state.nj.us/transportation/publicat/pdf/PedComp/pedoperations.pdf>

⁶⁴ Ibid.

⁶⁵ *Pedestrian Compatible Planning and Design Guidelines. Chapter 4: Operations and Maintenance of Pedestrian Facilities*. New Jersey Department of Transportation. Available at <http://www.state.nj.us/transportation/publicat/pdf/PedComp/pedoperations.pdf>

While the addition of sidewalk cafes can encourage additional pedestrian activity and downtown redevelopment, the presence of sidewalk cafes can also impede pedestrian access and mobility. The goal of the guidance in this section is to ensure a safe environment for pedestrians while encouraging the appropriate use of the public right-of-way for sidewalk cafes.

Due to the need to maintain pedestrian access and mobility, outdoor dining/sidewalk cafes are not appropriate for all areas of the city. In general, outdoor dining:

- May be located within the public right-of-way only in conjunction with, and adjacent to, a street-level establishment that serves food and/or beverages.
- Must have an approved license agreement for private use of City's public right-of-way.
- May need additional parking for sidewalk cafes larger than 500 square feet.
- Must have approved liquor license agreements for businesses serving liquor.
- Must have a *minimum* six-foot pedestrian clearance, exclusive of obstructions and landscaped areas, along sidewalks and walkways.

Other requirements are detailed in *Appendix K*.

9.0 RECOMMENDATIONS

This section lists recommendations that will implement the goals and objectives of the Pedestrian Element of the *Transportation Master Plan*. Pedestrian goals and objectives are listed in *Section 2.0* and goals are listed in *Figure 19*. Each recommendation is equally important and supports at least one goal and/or objective.

Figure 19: Pedestrian Goals

- Safety and Security Goal: Create a street environment that is safe and secure for pedestrians.
- Pedestrian Access and Connectivity Goal: Create a street environment that allows pedestrians to directly access key destinations by walking.
- Streetscape and Land Use Goal: Provide pedestrian amenities and promote land uses that enhance public spaces, neighborhoods, commercial and employment areas – amenities that will entice more people to walk.
- Education and Promotion Goal: Educate citizens, community groups, businesses and developers on safety, health and civic aspects of walking.
- Implementation Goal: Incorporate pedestrian needs into the policy-making, planning, design, construction and maintenance or existing and new policies, plans, programs, projects, facilities, and operations.

9.1 Implement a Comprehensive Safe Routes to School Program

City staff has created a comprehensive Safe Routes to School Implementation Plan to build upon safety audits performed at many public schools in Scottsdale. Work should advance with the Scottsdale, Cave Creek and Paradise Valley Unified School Districts to implement Safe Routes to School programs for all primary and secondary schools within the City. Approaches to be used should include engineering, enforcement, encouragement and education. The Safe Routes to School Implementation Plan is provided in *Appendix L*.

Estimated Cost: Additional staff may be required to implement the program, and funding is required for promotional and educational items.

9.2 Implement Design Guidelines in Section 8.0 and Update the Pedestrian Chapter of the *DS&PM* with the Design Guidelines

Section 8.0 Design Guidelines outlines pedestrian planning, design and engineering practices that will create safe and comfortable pedestrian travel conditions. The design guidelines account for the needs of pedestrians for secure, direct and continuous pedestrian facilities that have sufficient capacity, visual interest and amenities, and comfortable street crossings. The guidelines address all types of pedestrian facilities and other design strategies that help to make walking safer, more convenient, and more comfortable.

These design guidelines should be integrated into an updated pedestrian chapter of the *DS&PM*. Good design is important for pedestrians because pedestrian are unlikely to use uncomfortable facilities, or facilities that feel unsafe.

Estimated Cost: This work can be included in current city staff workloads.

9.3 Create a Pedestrian Safety Action Plan⁶⁶

A pedestrian safety action plan specifically identifies the necessary steps to reduce the number of pedestrian crashes. A pedestrian safety action plan should include objectives, locations where improvements are needed, specific techniques and tools to reduce crashes, and implementation strategies. A pedestrian safety action plan should also identify changes to planning and design standards that would enhance pedestrian safety, and evaluation measures to be sure that pedestrian safety is being increased by the selected implementation strategies. Stakeholders, including citizens, businesses and developers, community groups, elected officials, media, and city staff, should be involved in the development and implementation of a pedestrian safety action plan.

Data should be collected that helps identify and quantify pedestrian safety deficiencies, and solutions identified to address the problems identified. Solutions could be for individual locations, entire corridors, targeted areas or general problems that affect the entire city. Solutions will likely need to be prioritized to fit within funding constraints.

Estimated Cost: This work might be addressed by a staff effort, but consultant assistance could enable quicker production and implementation of a pedestrian safety action plan.

9.4 Systematically Implement Pedestrian Improvements Based on the Priorities Established in the Pedestrian Route Network Maps

Section 7.0 outlines the Pedestrian Route Network using the results of the latent demand analysis. The network identifies roadways most in need of pedestrian improvements based on their potential to entice pedestrians, as identified in the latent demand analysis described in *Section 5.0 Future Pedestrian Demand*. It is important to note that roadways not identified in this network may also need pedestrian improvements, and that all roadways in Scottsdale are expected to have basic pedestrian facilities to provide for mobility of all residents, employees and visitors.

The pedestrian route network divides arterial and collector roadways in the City into five categories based on the latent demand analysis: high, medium high, medium, medium low, and low. While all roadways in Scottsdale are expected to have basic pedestrian facilities, a ranking of “high” means that this corridor has a higher priority for investments in pedestrian facilities than one ranked “medium high.” The pedestrian route network should be used to prioritize investments in the city’s pedestrian network. The City should also continue its commitment to providing dedicated funding sources through the annual capital budgeting process for pedestrian improvements.

Estimated Cost: This work may be addressed by a staff effort.

⁶⁶ *How to Develop a Pedestrian Safety Action Plan - Draft*, Federal Highway Administration, August 2005. Chapter 7, Creating the Pedestrian Safety Action Plan.

9.5 Improve Plan Review and Site Development Process to Better Incorporate the Needs of Pedestrians

Improving the plan review and site development process begins by assigning responsibility for reviewing development proposals and site plans to a particular staff person. This person should assume responsibility for assuring that planning and design projects appropriately incorporate pedestrian needs. Educating City staff, elected officials and members of City boards and commissions about appropriate pedestrian design is also important to improving developments to meet pedestrian needs.

Good site design for pedestrians will enhance safe and convenient access for pedestrians and help to increase pedestrian travel. Pedestrian travel has a number of community benefits as discussed in *Section 3.0*. Important considerations for pedestrian friendly site design include:⁶⁷

- Delineated walkways through parking lots.
- Connections to neighborhoods and surrounding areas.
- Easy-to-identify building entrances.
- Building frontages located along streets rather than across parking lots.
- Convenient and safe access to transit and adjacent sidewalks.
- Alignment of walkways for convenience and reduced travel distances.
- Accessible routes of travel to and from the site, as well as throughout the site.
- No barriers (walls, ditches, landscaping, or roads without safe crossings) to pedestrian travel.

Specific recommendations related to site design include:

- Require all developments, new or retrofit, to provide a site master plan showing direct pedestrian routes of ¼ mile or less to adjacent arterial and/or collector streets and to prepare a walkability index similar to that used by the City of Kansas City, MO.⁶⁸
- Require all new commercial development to identify opportunities for direct pedestrian access between retail and office buildings within the development and adjacent residential areas. Retrofitting neighborhoods with back-door access should also be considered where possible. In both cases, the Planning and Development Services Department would work with the adjacent neighbors, property owners, or developers to achieve the desired result (see *Figure 19*).

⁶⁷ *Pedestrian Facilities Guidebook*, Washington State Department of Transportation, September 1997, table 58, page 186, available at www.wsdot.wa.gov/walk/designinfo.htm.

⁶⁸ *Kansas City Walkability Plan*, prepared for the City Planning and Development Department, City of Kansas City, Missouri, by LSA Associates, Inc. Adopted March 20, 2003. This document is available at <http://www.kcmo.org/planning.nsf/plnpres/walkability>.

Figure 20: Back Door Access



- Link transit stops, building entrances, waiting and drop-off zones, parking facilities and bicycle parking facilities to appropriately designed (see *Section 8.0 Design Guidelines*) pedestrian facilities.
- To facilitate pedestrian linkages to transit, provide appropriately designed pedestrian connections from public transportation stops to schools.
- Mix commercial, retail, and residential land uses because people are more likely to walk to their workplace, entertainment venues, or destinations that provide basic necessities if they are within one-half mile.
- Provide incentives for developments that encourage healthy communities, where people can mingle, are flexible in site design, encourage a diversity of people (age, income, culture, race), allow increased residential density, and encourage a range of housing products.
- Provide pedestrian facilities, appropriate for areas classified as high or medium high in the pedestrian route network shown in *Figure 4* through *Figure 8* on all roadways with transit routes.
- Provide cross access between commercial developments.
- Follow other recommendations in *Section 8.0 Design Guidelines* to ensure an attractive and comfortable pedestrian environment, including providing pedestrian access through parking lots, limiting the number and frequency of driveway access points to minimize interruption of the sidewalk, creating building facades that interest pedestrians, and other amenities such as landscaping, seating areas, and distinctive character building elements.

9.6 Implement Pedestrian/Motorist Education and Encouragement Programs

Public education programs are a vital component of a comprehensive pedestrian transportation program and aim to change behavior. Education is typically considered one of the Five E's of a successful pedestrian program: engineering, education, enforcement, encouragement and evaluation.

Education programs begin with the selection of a key message and the target audience. Target audiences could include children, adults, new drivers, children walking to school, transit riders or elderly persons. Identifying the target audience will also help identify the appropriate means of communication, which could be media buys, printed materials, radio buys, or other means.

Some potential education topics for drivers include Arizona law regarding crosswalks, looking for pedestrians before turning right on red, looking for pedestrians before turning left, or watching for pedestrians when entering and existing driveways.

Pedestrians could be educated on how to use crosswalks, how to use a pedestrian actuated signal, the meaning of pedestrian signal indications and other safe walking behaviors.

Other education efforts should target City staff and elected officials, along with members of City boards and commissions, to keep them informed about recent advances and best practices in pedestrian planning and facility design.

Additional educational efforts could be targeted toward encouraging people to walk in particular areas, or to walk instead of using another travel mode. Educating people about the health, economic and environmental benefits of walking can help encourage more people to walk. Promotional efforts can encourage people to walk as an alternative to driving for short neighborhood trips, such as trips from home to school, shopping centers, nearby parks, libraries and other civic spaces.

Another way to encourage people to walk is to sponsor community walking events, such as Walk/Bike to School events, or walking events to benefit non-profit organizations. People who participate in special events may be inspired by a positive walking experience to begin walking on a more regular basis, or to try walking instead of driving.

Estimated Cost: City staff working with Scottsdale Healthcare system and perhaps the Mayo Clinic to promote the health benefits of walking would require staff time and effort.

9.7 Create and Maintain a Comprehensive Pedestrian Facilities Inventory

Creating, and maintaining, a comprehensive pedestrian facilities inventory is an important first step in creating an ADA Transition Plan as well as identifying the need for future pedestrian capital projects. A pedestrian facilities inventory should include existing sidewalks and accessibility features. The information gathered should be recorded electronically for inclusion in a GIS layer within the City's GIS information system. This will enable processing of the relevant data fields for prioritization of construction, reconstruction and maintenance according to the magnitude of variation from relevant local, regional and national standards.

Each year 20 percent of all sidewalk pedestrian elements should be assessed or reassessed for accessibility, maintenance, and GIS mapping using a Sidewalk Assessment Process that records objective grades, cross slopes, changes in grade or cross slope, clear space dimensions, surface firmness and stability, and obstruction information. The inventory should begin with the southern portion of the community, because employment and residential densities are greater, infrastructure is older, and the pedestrian route network rankings are higher (see *Figure 4* through *Figure 8*).

Obstruction information collected should include areas where minimum clearance widths are not met, vertical clearances, presence of protruding objects, changes in level, and presence of detectable warnings. Sidewalk elements including sidewalk width, availability and type of curb ramp, accessibility of driveway crossings, presence of roadway medians or pedestrian crossing islands, pork chop islands, bus stops, and sidewalk furniture should all be assessed using specific assessment forms. Photos of obstructions are also important and should be included in

the inventory. Generic assessment forms for the measurement of sidewalk elements have been provided in *Appendix M*.

The actual measurement for each component of a sidewalk element should be recorded during assessments, i.e. 7.8 percent slope, versus recording “meets or does not meet maximum requirement of 8.3 percent slope.” Design standards can change and it is important to know the actual conditions that exist. This also assists with planning priorities for reconstruction. For example, a ramp with a maximum slope of 11.3 percent is going to be placed on higher priority for reconstruction than one that has a maximum slope of 8.9 percent slope.

Local schools and universities can be used to recruit students to assist with sidewalk corridor and element assessment. Students can be quickly trained to make these types of measurements accurately and efficiently, and record the information. Cost factors to be considered would include the staff time required to train and manage student interns that are tasked with measuring sidewalk elements and corridors. Training should be provided to staff members and interns who will be responsible for assessment of pedestrian environments on how to properly perform sidewalk assessments.

Proper sidewalk assessment tools need to be purchased to enable accurate measurements to be made. Detailed information about the assessment tools needed for a sidewalk assessment is included in *Appendix M*.

GIS layers should be created for recording detailed information on each sidewalk element. There are currently layers for medians and for bus stops in Scottsdale. Fields can be added to record the detailed information related to sidewalk width, curb ramps, driveway crossings, roadway medians, pork chop islands, bus stops, and sidewalk corridors. A High Efficiency Sidewalk Assessment Chart can help to quickly record all of the information electronically into a database for import in the GIS layer (see *Appendix M*) Cost factors to be considered would include a one-time cost to set up fields and layers in the City’s GIS information system; ongoing cost to import the data into that system should be minimal, given that appropriate measuring tools are available.

It is also possible to check all sidewalk elements against the aerial photos in the Scottsdale GIS information system. The information can be located in the field according to the nearest intersection and, if available, using a handheld GPS unit. Once the information is in the GIS information system, the coordinates of any sidewalk element can be precisely referenced.

9.8 Update ADA Transition Plan for Pedestrian Facilities on Public Rights-Of-Way

Since early 2007, the City of Scottsdale ADA Team has been updating an ADA Transition Plan for the City of Scottsdale. As a component of the larger team, the Sidewalks and Bus Stops Workgroup is focused on public rights-of-way. The Workgroup has two main goals:

- Create an ADA Transition Plan.
- Review and update the Design Standards and Policy Manual, and Standard Details for Public Work Construction, so that new development is constructed to meet ADA.

Major issues to be addressed by the Workgroup include:

- Funding. Some areas of the community have mature infrastructure. Funding is needed through the annual budget process to repair and replace aging infrastructure.

- Data Collection and Uniformity. There is existing data in a variety of formats. There is a desire to have the data uniformly mapped and geocoded so that it can be analyzed and displayed using GIS. Resources are need for this task, as well as consideration of how data will be maintained, updated and revised.
- Pedestrian Facilities Inventory. The pedestrian facilities inventory could focus first on arterial and collector roadways, and focus on areas with more employment and residential density. Roadways with upcoming CIP projects do not need to be inventoried since they will be built using current guidelines. Identifying needs on roadways with bus routes is particularly important.

Several existing data sources have been identified to implement the Workgroup's goals, including:

- Transit Stops and Bus Routes. There is an existing inventory of transit stops, and city staff is working to identify if these are ADA accessible. The inventory is occurring on a route-by-route basis and is anticipated to be completed by the end of 2008.
- Sidewalk Inventory South of Via de Ventura. The Field Services Division created a sidewalk inventory, begun in 2003, handwritten on quarter-section maps, of sidewalks. The inventory identifies whether a sidewalk exists, but not its width, texture or other features. Curb ramps and other pedestrian facilities are not inventoried in this area.
- Downtown Scottsdale Pedestrian Mobility Study. The Downtown Scottsdale Pedestrian Mobility study assessed and measured pedestrian mobility, and identified where future improvements were needed in the Downtown. Existing conditions were inventoried, mapped and analyzed throughout downtown to assess the quality of the pedestrian environment (See *Appendix J*). All information has been mapped, but is not geocoded.

An ADA Transition Plan should include four major elements. The first element is a list of barriers to accessibility, including their precise location and photos documenting the barrier. The second element is detailed information on how the barrier will be eliminated. For example, if the barrier is an inaccessible transit stop, the steps for removing the barrier might include purchasing additional right-of-way for the transit stop, or adding additional width to the transit stop to allow boarding and deboarding of the transit vehicle. The third element is a reasonable schedule for achieving compliance, including interim milestones for multi-year schedules. Finally, the ADA Transition Plan should also assign responsibility for implementation of the barrier-removal plan.

The Transition Plan should address access routes to municipal buildings from public transit, since many people with disabilities use public transit. The Transition Plan should also include access routes to public buildings from transit stops, routes of travel along transit routes and the presence of curb cuts and ramps, as well as presence of obstructions.

As part of the implementation of the ADA Transition Plan, 20 percent of facilities should be reassessed each year after the preliminary assessment of all facilities. A formal input mechanism for the disability community should also be created. The transition plan should be documented in writing. The financial impact of one lawsuit can far outweigh the prevention of such a lawsuit by performing assessments of existing facilities, creating input mechanisms for the disability community to provide input into the pedestrian planning process, and by systematically prioritizing and improving the accessibility of all pedestrian environments.

Estimated Cost: Cost factors to be considered would include outside staff assistance needed to draft the initial plan and ongoing staff time to complete assessments, coordinate community

input and planning, and to coordinate with other departments. Capital investments would also be required.

9.9 Enhance Pedestrian Facilities in Downtown

Downtown Scottsdale is one of the most acclaimed tourist areas in the state of Arizona with an eclectic mix of southwestern and contemporary art galleries, specialty retail, upscale dining, active nightlife and museum elements for residents and visitors. The downtown area, generally bounded by Earll Drive and Chapparal Road, and 68th Street to Miller Road, is known for its distinctive urban design and architectural features. Although comforting features that encourage pedestrian travel, such as shade, public art, aesthetically pleasing elements, vegetation, and seating are characteristic of the area, Downtown Scottsdale was designed without the concepts of universal design in mind. As a result, much of the area is not universally accessible.

New residential and mixed-use developments will create more of a 24-hour, 7 days a week character in Downtown requiring the addition of more pedestrian-friendly features. New destinations like the W Hotel, expanding commercial and mixed use areas such as the Scottsdale Waterfront, renovations to existing properties such as the Hotel Valley Ho and Mondrian Hotel are being created. These areas will attract more pedestrians into and through Downtown.

In addition, all of the City's current trolley services (Downtown Trolley, Neighborhood Circulator, Giants and Resort shuttles) serve Downtown destinations, creating a connection between transit services and higher pedestrian demand.

To address these issues, the City requested funding from the Maricopa Association of Governments to measure pedestrian mobility in Downtown Scottsdale, and to determine how and where to make improvements to that mobility. The study assessed Downtown within its four established districts - Old Town, Main Street, 5th Avenue, and Marshall Way Arts. Concurrently, the City's Downtown Group sponsored a similar effort to assess mobility issues within the Northeast Quadrant, an emerging district east of Scottsdale Road, south of Camelback, north of Goldwater Boulevard, and west of 75th Street (see *Appendix J* for a district map). While each established district has its distinct character, the districts have begun to grow together and are within a comfortable walking distance of one another, pointing to a need for a degree of connectivity and cohesion for the pedestrian clientele. After discussion of all the individual District deficiencies, a set of the top three prioritized improvements was formulated for each district (see *Table 12*).

Table 12: Top Three Prioritized Improvements for Downtown Districts

Old Town

First Priority

- Create an accessible entrance to Brown/Main into Civic Center Mall (a temporary solution to this concern is already in place, but a more permanent solution is desired).
- Sidewalk reconstruction (increase sidewalk width; improve sidewalk surface/texture by smoothing surfaces, adding clearance and ramps; modify curb heights).
- Sidewalk surface renovation.
- Expand western themed improvements.
- Make all trolley stops accessible and comfortable.

Second Priority

- Fix clearance issue on all streets, minimum 3 foot clearance.
- Streetscape installation – landscaping, pedestrian facilities.
- Adjust covered walkway supports (for clearance) or modify design standards.
- Replace thorny plants with friendlier vegetation.

Third Priority

- Brown Avenue – fix slopes, update ramps, add landscaping and shade.
- Add lighting and street amenities.
- Upgrade lighting in pedestrian areas.
- Improve sidewalk surfaces, ramps, and alleys.

Other Suggestions

- Main Street: fix surfaces, update ramps.
- Buckboard Trail: widen sidewalk; add shade, seating, and landscaping; and add additional amenities north of Indian School to connect to hotels.
- Downtown (overall): Create/adopt guidelines for outdoor dining, sidewalk cafes, and other uses in public right-of-way)

Table 12: Top Three Prioritized Improvements for Downtown Districts

Main Street Arts District

First Priority

- Main Street: widen the sidewalk; fix slopes, curb height and surfaces; create a minimum 3 foot clearance and a continuous path of travel; update ramps; and enhance lighting.
- Sidewalk reconstruction (increase sidewalk width; improve sidewalk surface/texture by smoothing surfaces, adding clearance and ramps; modify curb heights).
- Improve pedestrian/courtyard areas on Main.
- Fix curbs so they are a consistent height.

Second Priority

- Marshall Way: widen the sidewalk, fix irregular surfaces, consolidate materials, establish a minimum 3 foot clearance, create a continuous path of travel, update ramps, add lighting and seating, enhance theme, and add trees or structured shade.
- Add landscaping.
- Add public seating, and improve streetscape (both public and private).

Third Priority

- First Avenue: widen sidewalks, fix irregular surfaces, add more seating west of Scottsdale Road, and add theme and landscaping.
- Add amenities.
- Upgrade lighting.

Table 12: Top Three Prioritized Improvements for Downtown Districts

Marshall Way /5th Avenue Arts District

First Priority

- Marshall Way: widen the sidewalks, smooth irregular sidewalk surfaces, lower the curb height, update ramps, enhance signals to include pedestrian countdown signals, and consolidate driveways where possible.
- Sidewalk reconstruction (increase sidewalk width; improve sidewalk surface/texture by smoothing surfaces, adding clearance and ramps; modify curb heights).
- Redesign the southeast corner of 3rd Avenue/Marshall Way to improve accessibility for patrons and pedestrians.

Second Priority

- Fifth/Stetson: widen the sidewalks, smooth irregular sidewalk surfaces, update ramps, improve clearances and doors (doors open outward into pedestrian walking area), and enhance lighting.
- Add seating.
- Improve lighting, and add special lighting for art areas.

Third Priority

- Third Avenue: enhance this roadway as pedestrian corridor by widening the sidewalk, updating ramps, enhancing lighting, and adding landscape character.
- Add landscape and amenities.
- Repair/replace curbs and building entries where steps intrude into the pedestrian walking area.

Other Suggestions

- Sixth Avenue: upgrade this street so it is comparable to other streets in the District (widen the sidewalk, update ramps, enhance lighting, and add landscape character); consider partial or full closure to vehicles at certain times.
- Craftsman Court: consider partial or full closure to vehicles part or all day.
- Arts District: enhance all features associated with art.
- 6th Avenue/Scottsdale Road: evaluate need for traffic signal.

Table 12: Top Three Prioritized Improvements for Downtown Districts
<p>Northeast Quadrant</p> <p>First Priority</p> <ul style="list-style-type: none"> • Create urban design guidelines for the entire district; add open space areas. • Sidewalk reconstruction (increase sidewalk width; improve sidewalk surface/texture by smoothing surfaces, adding clearance and ramps; modify curb heights). • Complete a plan for the area. • Improve lighting. <p>Second Priority</p> <ul style="list-style-type: none"> • This area needs character defining elements (art, landscape, furnishings, seating, etc.). Widen the sidewalks, fix diverse sidewalk textures, and update ramps. • Add shade (trees and structures). • Improve lighting with standard and special fixtures. • Design a streetscape theme for district. <p>Third Priority</p> <ul style="list-style-type: none"> • Enhance lighting. • Add amenities (bathrooms!). • Improved, more visible street crossings for nighttime safety of pedestrians and drivers are needed. • Add pedestrian countdown timers in this area. <p>Source: <i>City of Scottsdale Downtown Pedestrian Mobility Study</i>, Maricopa Association of Governments and City of Scottsdale, January 2007.</p>

In addition to those concerns listed in *Table 12*, additional specific recommendations for Downtown Scottsdale include:

- Update all roadways in Downtown to meet design standards appropriate for areas ranked as high on the pedestrian route network map. All roadways in Downtown are ranked as high in *Figure 4*.
- As infill and/or redevelopment occurs, reconfigure Scottsdale Road to accommodate minimum ten-foot sidewalks, landscaping, and parallel parking. Provide two through travel lanes in each direction from Chaparral to Earll.
- Reconfigure couplet transitions on Scottsdale Road to accommodate pedestrian and bicycle travel. Possible pedestrian crossing enhancements and bicycle through lanes and crossing movements need to be further evaluated at the Scottsdale/Drinkwater and Scottsdale/Goldwater intersections, and have been explored as part of the Scottsdale Road Streetscape project. This is an area of special study that will continue to be evaluated and addressed as part of the design development of Scottsdale Road improvements.⁶⁹
- Enhance the Camelback/Scottsdale intersection, especially the southeast corner. Provide pedestrian enhancements on the bridge located on the east side of the intersection of Camelback and Scottsdale roads. These enhancements should include minimum eight-foot sidewalks on both sides of the street, pedestrian enhancements including shade and wayfinding. A mid-block crossing at the south side of the bridge should be evaluated.

⁶⁹ *Scottsdale Road Downtown Circulation Study*, City of Scottsdale, September 2006. Appendix D of the document presents five detailed options to address pedestrian and bicycle mobility through the couplet intersections at Scottsdale/Drinkwater and Scottsdale/Goldwater.

- Provide pedestrian activated signals and pedestrian countdown signals throughout Downtown.
- Assess additional mid-block crossings in Downtown, preferably at a maximum distance of one-quarter mile spacing along all major east-west arterials (see *Section 8.10 Mid-Block Crossings*).
- Improve connections and wayfinding to, and through, prominent recreation areas such as the Arizona Canal and the Indian Bend Wash.

9.10 Enhance Pedestrian Facilities in The Scottsdale Airpark to Facilitate Quick, Focused Trips

- Create pedestrian linkages to connect retail uses at the intersection of Frank Lloyd Wright Boulevard and Scottsdale Road to other, substantial retail and employment uses within the Airpark.
- Install appropriately designed, enhanced pedestrian facilities along 73rd Street between Redfield Road and Paradise Lane.
- Add appropriate designed pedestrian facilities to 76th and 78th Streets and Paradise Lane.

Estimated Cost:

9.11 Incorporate the Standards in *Revised Draft Guidelines for Accessible Public Rights-of-Way*⁷⁰ in All Alterations and Additions to Existing Facilities

According to the Revised Draft Guidelines for Accessible Public Rights-of-Way:

Alterations include, but are not limited to, renovation, rehabilitation, reconstruction, historic restoration, resurfacing of circulation paths or vehicular ways, or changes or rearrangement of structural parts or elements of a facility. The U.S. Department of Justice Title II regulation at 28 CFR 35.151(e) requires that curb ramps be installed whenever pedestrian walkways on sidewalks and across streets are newly constructed or altered. A 1993 case, *Kinney v. Yerusalim*, 9 F.3d 1067 (3d Cir. 1993), cert. denied, 511 U.S. 1033 (1994), held that resurfacing of a street constitutes an alteration that requires the installation of curb ramps (for text see <http://www.ada.gov/deldot.htm>). Pavement patching and liquid-applied sealing, lane restriping, and short-term maintenance activities are not alterations.

Any alteration of a roadway or pedestrian facility must meet the requirements listed above.

⁷⁰ Available from <http://www.access-board.gov/prowac/draft.htm#202>

9.12 Enhance City Website Information

The City's website <https://www.scottsdaleaz.gov/ServiceRequest/> should be enhanced to include additional categories for which a resident may provide input regarding a request for improvement of a given pedestrian design element. One additional major heading should be included for an Accessibility Improvement or Design Service request. The sub elements to this heading should include: Sidewalk Environments, Shared use Path Environments, Crosswalk Environments, Bus Stops, Stairways, and Street Furniture. In addition, elevators and lifts should be included in the maintenance section that is already on the website. Additional information should be added to the website to explain the accessibility review process that will occur. It may be beneficial to consult other cities' websites to get an idea of how other cities are doing this as well.

Always use person first language to reference pedestrians with cognitive, mobility, hearing or vision impairments or disabilities in all publications within the Scottsdale website.

Reference to "disabled persons" uses the term "disabled" as an adjective, indicating that the individual is disabled as a person rather than a "person" first that may have a disability or impairment that affects their mobility. Use of the terms "handicapped", "disabled" and "the physically disabled" should be avoided all together. Use of the term "disability" in person first language is acceptable as in "persons with cognitive or physical disabilities". The World Health Organization has redefined the terminology regarding disability. The term "disabled" defines a person's lack of ability to participate in one or more social functions in a normal manner. Hopefully through good universal design within the City, more people will be able to participate in all community activities. So the term "impairment" is preferred as in "resources for citizens with cognitive, sensory and physical impairments".

Replace "blind" with "persons with visual impairments."

Replace "deaf" with "persons with hearing impairments."

Replace "Developmentally disabled" with "persons with a cognitive impairment or citizens with cognitive disabilities."

APPENDIX A: PEDESTRIAN FRIENDLY COMMUNITY CHARACTERISTICS

Common Characteristics of Pedestrian Friendly Communities	
Characteristic	Description
Coordination Between Jurisdictions	Providing pedestrian facilities to meet current and future needs requires close coordination between jurisdictions and other modes of transportation.
Linkages to a Variety of Land Uses/Regional Connectivity	Pedestrian circulation and access is provided to shopping, transit, downtown, schools, parks, offices, mixed-use developments, and other community origins and destinations, as well as adjacent communities.
Continuous Systems/Connectivity	A complete system of interconnected streets, pedestrian walkways, and other pedestrian facilities will increase pedestrian travel.
Shortened-Trips and Convenient Access	Provide connections between popular origins and destinations, between dead-end streets or cul-de-sacs, or as shortcuts through open spaces.
Continuous Separation from Traffic	Street and driveway crossings locations are well defined or minimized as appropriate. Buffers from motor vehicles and separation of uses are provided.
Pedestrian Supportive Land Use Patterns	Land use patterns, such as a grid layout or short blocks in business districts and Downtown, enhance pedestrian mobility.
Well-Functioning Facilities	Provide adequate width and sight distance, accessible grades, and alignment to avoid blind corners. Common problems, such as poor drainage, are avoided.
Designated Space	Pedestrian facilities should be well delineated, signed, and marked. Designing a secure environment for pedestrians is important.
Security and Visibility	Lighting, increased visibility, open sight-lines, and access to police and emergency vehicles enhances security.
Automobile is not the Only Consideration	Streets are designed for all modes of transportation. Parking supply is reduced or managed using methods that encourage walking.
Neighborhood Traffic Calming	Narrowed streets lined with trees, traffic circles, curb bulbs, neckdowns, and other techniques can lower vehicle speeds and create safer conditions for pedestrians.
Accessible and Appropriately Located Transit	Siting of transit facilities adjacent to work, residential areas, shopping, and recreational facilities encourages pedestrian trips. Transit stops and centers should typically be located in areas of supporting densities (4 to 7 units per acre minimum). Development of adequate pedestrian facilities to access transit is essential to their success as an alternative mode of travel.
Lively Public Spaces	Secure, attractive, and active spaces – such as pedestrian plazas - provide focal points in the community where people can gather and interact.
Character	Preservation of important cultural, historic, and architectural resources strengthens community heritage and character.
Scenic Opportunities	Attractive environments and scenic views encourage pedestrian use, particularly when facilities are oriented toward them.

Common Characteristics of Pedestrian Friendly Communities	
Characteristic	Description
Pedestrian Furnishings	Furnishings, such as benches, restrooms, drinking fountains, artwork and other elements, create a more attractive and functional environment for pedestrians.
Street Trees and Landscaping	Street trees bring human scale to the street environment. Landscaping in planting strips between the sidewalk and curb, in containers, and in other areas soften surrounding hard edges of buildings and parking lots and add life, color, and texture to the pedestrian's field of vision.
Design Requirements	Guidelines and adopted standards are followed and, if deviated from, justified and documented.
Proper Maintenance	Frequent cleanup and repair on a regular basis ensures ongoing, consistent use.
Source: <i>Pedestrian Facilities Guidebook</i> , Washington State Department of Transportation, September 1997, available at www.wsdot.wa.gov/walk/designinfo.htm	

APPENDIX B: CURRENT PEDESTRIAN POLICIES AND DOCUMENTS

1.0 City of Scottsdale Bicycle/Pedestrian Transportation Plan (January 1995)

The City of Scottsdale *Bicycle/Pedestrian Transportation Plan* was adopted in January 1995. The Plan provides guidance for integrating non-motorized modes of transportation into City plans and policies, ensuring that Scottsdale continues to grow as a pedestrian/bicycle friendly community. The *Bicycle/Pedestrian Transportation Plan* looks at pedestrian movement as a transportation mode and reviews travel demand, safety, convenience, cost, intermodal connections, and similar factors. The goals of the plan are listed below.

PLANNING AND IMPLEMENTATION GOAL: The City of Scottsdale will incorporate the needs of human-powered transportation into the policy-making, planning, design, construction and maintenance phase of all existing and new City policies, plans, programs, projects, facilities and operations.

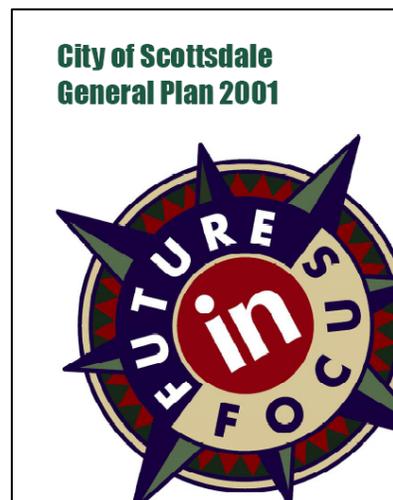
DESIGN AND STANDARDS GOAL: The City of Scottsdale will devise and adopt design guidelines and standards needed to implement a safe, functional, convenient, accessible and pleasurable walking and cycling environment for recreation and transportation.

SAFETY, EDUCATION AND ENFORCEMENT GOAL: The City of Scottsdale will develop and implement comprehensive and proactive safety, education and enforcement programs for all bicyclists, pedestrians and motorists.

PROMOTION AND ECONOMICS GOAL: The City of Scottsdale will employ comprehensive and proactive programs to promote cycling and walking as viable, economically desirable forms of transportation and recreation for both residents and visitors.

2.0 City of Scottsdale General Plan Community Mobility Element

The *Transportation Master Plan's* Pedestrian Element has been developed consistent with the pedestrian mobility goals contained in the Community Mobility element of the Scottsdale *General Plan*. The Community Mobility element recognizes, among other things, that "Land use and transportation plans need to incorporate multimodal opportunities now and in the future." As a result, the Community Mobility element focuses on three levels of mobility: regional; citywide; and neighborhood. At the regional level, mobility takes precedence over access; at the city level mobility and access are balanced. It is at the local/neighborhood level where access takes precedence over mobility, and non-motorized mobility types (for example: walking, biking, and in some neighborhoods horseback riding) are a priority. To this end, the following *General Plan* goals and approaches were selected as most applicable to guide the specific recommendations of this Pedestrian Element, found in *Section 9.0 Recommendations*:



GOAL 9: Protect neighborhoods from negative impacts of regional and citywide networks.

- Explore neighborhood street layouts and design that are not necessarily aligned with the citywide and regional network to prevent cut-through automobile traffic, reduce speeding and noise, provide greater and safer opportunities for non-motorized modes, and to create an environment where the neighborhood can flourish.
- Look for opportunities to provide grade-separated crossings for various travel modes (e.g. bicycle, pedestrian, equestrian) that connect neighborhoods to high demand locations and other neighborhoods, especially when separated by city or regional corridors.

GOAL 10: Encourage a diversity of links between neighborhood systems and with citywide and regional systems.

- Explore alternative layouts that use existing connections such as alleys, drainage corridors, dead-end streets, vista corridors, grade-separated crossings, and open space to create additional non-motorized connections between neighborhoods.
- Provide accessibility to mass transit by enhancing the pedestrian experience, providing non-motorized routes and transit options that are not on fixed routes (such as shuttles, or Dial-a-ride type services).
- Ensure that intermodal connections are functional so that movement between types of transportation is convenient and uninterrupted.

GOAL 11: Provide opportunities for building "community" through neighborhood mobility.

- Provide non-motorized modes of transportation as an alternative to the automobile and develop opportunities to foster a sense of community by linking civic spaces.
- Strive for the highest standards of safety and security for all motorized and non-motorized modes.
- Promote non-motorized travel for short neighborhood trips such as homes to schools, parks, libraries, retail centers, and civic spaces.
- Promote school site design that encourages non-motorized travel for students and personnel by accommodating direct links between schools and neighborhoods in a manner that minimizes exposure to vehicles.
- Provide a high level of service for pedestrians through facilities that are separated and protected from vehicle travel (e.g., placing landscaping between curbs and sidewalks).
- Emphasize strong pedestrian orientation (e.g. shaded safe paths, links to civic spaces) to foster a strong sense of community.

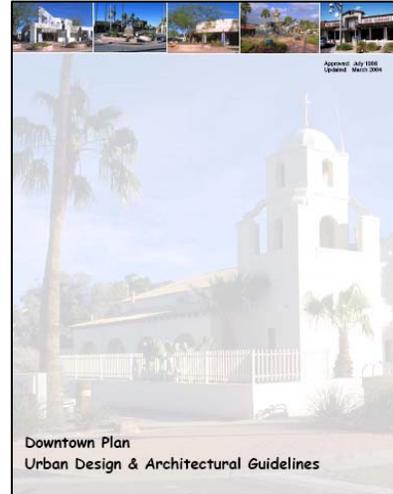
GOAL 12: Recognize the diversity of neighborhoods throughout the City and their different mobility needs.

- Continuously communicate with the community that the strength of live, work and play land use relationships will have a direct impact on the service levels and number of mobility choices that a neighborhood may experience. Mixed-use development will have a stronger emphasis on pedestrian-oriented design and contain more dynamic non-motorized connections. On the other hand, more singular land uses such as low-density equestrian areas may place more emphasis on local trail systems to maintain connectivity.

- In maturing neighborhoods explore retrofitting of aging infrastructure, re-design of streets, and connections for non-motorized traffic to augment a neighborhood's livability and safety.
- Consider the use of grade separations to enhance safety and provide choices for mobility of different modes.

3.0 City of Scottsdale Downtown Plan's Downtown Urban Design and Architectural Guidelines (1986; updated in 2004)

The Guidelines list recommendations for site development, building form, architectural and landscape character to assure that new development contributes to Downtown urban design goals and is compatible with the character of existing Downtown districts. Many of the goals address pedestrian needs, such as:



- Urban Design Goal 2: Strengthen pedestrian character and create new pedestrian linkages. Downtown's pedestrian character distinguishes it from other places in the Valley. It serves as an attraction to visitors and an important part of the City's heritage valued by residents. All new Downtown projects should emphasize and extend this pedestrian character. An attractive network of clear pedestrian linkages between the separate Downtown districts should be developed, making it possible for enjoyable walks through a wider area of Downtown.
- Urban Design Goal 3: Create a compact downtown with an intensified and diverse mix of activities. Downtown Scottsdale can accept growth and prosper if it keeps its pedestrian character and presents an attractive alternative to the automobile-oriented nature of other places in the metropolitan area. Downtown should attract housing, hotels, offices and other activities to complement its present specialty shopping reputation. The Development area should be compact and intense while maintaining present pedestrian scale.
- Urban Design Goal 6: Continue and expand the tradition of downtown's covered walkways. The covered walkways are a key part of Downtown's architectural heritage. The walkways unify diverse fronts, provide people with shaded protection from the sun, and further serve as a consistent architectural element of pedestrian scale. Covered walkways are required in the Pedestrian Overlay District and are strongly encouraged in all areas as a unifying urban design element, signaling Scottsdale's special pedestrian character.
- Urban Design Goal 7: Create coherent and consistent street spaces. Downtown's streets, building setback areas and building frontages should work together to create a unified image. Site planning of individual projects should give priority to establishing complementary and supportive relationships with neighboring properties and the urban design goals of their districts.
- Urban Design Goal 9: Expand the downtown trolley system. The trolleys are a promising method of moving Downtown visitors. They provide linkages between Districts, strengthen pedestrian choices and reduce traffic congestion. The Trolleys should be emphasized as a key to solving Downtown's traffic circulation problems. Individual projects should be planned to accommodate its expansion.

The Guidelines divided Downtown into two different development area types: Type 1 (compact development area) and Type 2 (intermediate development area). The Type 1 Development

areas contain most of the Old Town, West Main and Fifth Avenue and Marshall Way - Craftsman's Court districts. Urban design goals for these districts are:

- Preservation of existing pedestrian-scale and strengthening of fine-grain building character.
- Development of strong pedestrian linkages between districts.
- Improvement of the quality and continuity of "street spaces".
- Compatibility of architectural character.

The Type Development Areas comprise the major portion of Downtown. The size of development sites in Type 2 Areas varies widely, ranging from small infill projects to large assemblages of land for multi-building developments. Urban Design goals for these districts are:

- Development of unified street spaces with consistent design principles for the building setback zone.
- Development of pedestrian and vehicular linkages between adjacent large projects.
- Consistent planting design principles to achieve visual structure on important arterial streets.
- Careful handling of architectural form to reduce the apparent size and bulk of larger buildings.

The Planning and Development Services Department is undertaking an update of the Downtown Plan which is anticipated to be completed in 2008.

4.0 City of Scottsdale Safe Routes to School Implementation Plan (2006)

This document identifies the purpose of the City's Safe Routes to School (SR2S) program, specific program elements, and required resources to implement the program. There are two primary goals with the SR2S program:

- Wherever it's safe, encourage children to walk and bicycle to school.
- Where safety deficiencies exist, correct them so that children are able to safely walk and bicycle to school.

Program elements would include creating a Transportation Safety Committee at each school, conducting a committee kick-off meeting, creating partnership agreements, collecting information, creating a map of routes used to get to school and evaluating the travel environment, identifying issues and finding solutions, developing a Safe Routes to School Improvement and Implementation Plan, funding the plan, and acting, evaluating and making changes if needed.

5.0 Maricopa Association of Governments (MAG) Pedestrian Policies and Design Guidelines (2005)

The *Pedestrian Area Policies and Design Guidelines* identifies policies and design guidance to help make pedestrian areas safe and comfortable. The document provides an overview of pedestrians and their abilities, recommendations for jurisdictions, design principles, a methodology to identify the appropriate type of pedestrian facility, and specific design guidelines on aspects such as sidewalk width and texture, appropriate clearances, landscaping, and provision of pedestrian amenities. This document is referred to extensively in the design guidelines created for the Pedestrian Element of the *Transportation Master Plan*.

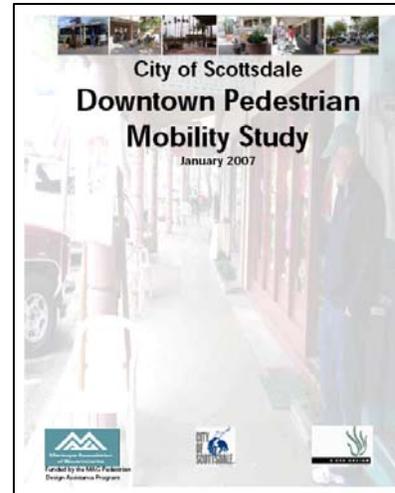
6.0 MAG Pedestrian Plan 2000 (December 1999)

The MAG Pedestrian Plan 2000 includes programs and actions to promote better pedestrian accommodation in the regional transportation system. The Plan provides flexible design tools,

and goals and objectives. Major goals of the Plan address land use, public awareness, funding, designing for people, and linkage.

7.0 Downtown Pedestrian Mobility Study (January 2007)

This Downtown Scottsdale Pedestrian Mobility Study was done with a MAG grant to the City of Scottsdale. The City requested the funds to measure pedestrian mobility in Downtown Scottsdale, and to determine how and where to make improvements to that mobility. The Study assessed Downtown Scottsdale within its four established districts - Old Town, Main Street, 5th Avenue, and Marshall Way Arts. Concurrently, the City's Downtown Group sponsored a similar effort to assess mobility issues within the Northeast Quadrant area, an emerging district east of Scottsdale Road, south of Camelback, north of Goldwater Boulevard, and west of 75th Street. While each established district has its distinct character, the districts have begun to grow together and are within a comfortable walking distance of one another, pointing to a need for a degree of connectivity and cohesion for pedestrians.



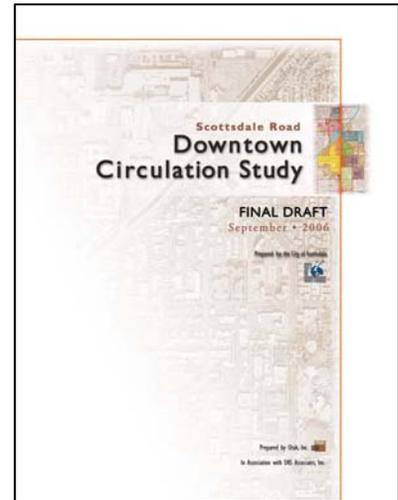
The study combines the MAG *Pedestrian Policies and Design Guidelines* with the City's *Downtown Urban Design and Architectural Guidelines* to establish measurable criteria and a substantial database for the evaluation of mobility. With this database, the City will pinpoint where and what types of impediments or problem areas exist that impede pedestrians' ability to move around Downtown. This information will be the basis for future capital improvement projects.

Major issues of concern throughout Downtown identified in the Study include:

- Discontinuous or blocked sidewalks; lack of a clearly defined and intuitively continuous pedestrian walkway of sufficient width.
- Wide intersections that create disconnections between Districts and across major streets.
- Uneven, narrow or disjointed walkways.
- Ramps which do not provide direction to the crosswalk or to the ramp across the street.
- No line of sight or ADA access to the Civic Center Mall from Brown Avenue or First Avenue (Note that a temporary ramp has since been installed in this location).
- Sidewalk boundaries that are not discernible to pedestrians with low vision.
- Unclear walkway access to buildings and/or around streetside uses, such as sidewalk cafes and retail displays.
- Unclear street signage and conflicts with vehicles, parked or moving, especially during periods of high activity such as special events.
- Jaywalking at night across major roadways, such as Scottsdale Road, during evening hours and special events.

8.0 City of Scottsdale Downtown Circulation Study (September 2006)

The Downtown Circulation Study examined existing conditions related to motor vehicle traffic, pedestrian and bicycle travel, transit, and parking in Downtown Scottsdale. This study also analyzed the various modes of travel and made recommendations for improving circulation throughout Downtown. The study was completed as part of the Scottsdale Road Streetscape project, which includes design guidelines and streetscape designs for Scottsdale Road from McKellips Road (now Roosevelt Road) to Chaparral Road. The pedestrian circulation section describes general conditions related to pedestrian travel in Downtown, specific opportunities and challenges including Scottsdale Road as both a connecting and dividing force, and variations in sidewalk capacity and pedestrian flow.



The Study identifies several opportunities and challenges to pedestrian mobility in Downtown as discussed below.

- Scottsdale Road/Downtown intersections.
- Sidewalk capacity and pedestrian flow.
- Accessibility and barriers to pedestrian travel.
- Pedestrian access to Downtown.
- Pedestrian lighting.

As Downtown continues to add more residential and mixed-use projects and improvements are made between districts, pedestrian travel between destinations and districts will intensify. Improvements to various walking routes, crossings, and intersections will need to keep pace with the changes in Downtown and new travel patterns that develop. New features that help pedestrians cross roadways, improved pedestrian lighting, removal of obstructions (columns, furnishings, street lights, etc.) in the pedestrian path of travel, and accessible curb ramps will be needed. There are several places in Downtown Scottsdale where sidewalk widths are too narrow for pedestrian traffic and where there are barriers for people with physical challenges and disabilities.

Angled and front-in perpendicular parking along Scottsdale Road can create safety concerns for pedestrians and motorists. When maneuvering into or out of these spaces, visibility and safety of pedestrians walking along the sidewalk becomes compromised.

At many intersections in Downtown along Scottsdale Road, pedestrians are required to push the walk signal activation button in order to obtain sufficient time to cross the street. In some cases, even when the pedestrian cycle is activated by the push button, the amount of time available for crossing may be insufficient for some pedestrians, especially those who have slower walking speeds or mobility impairments.

Intersections along Scottsdale Road that require particular attention to improve mobility for pedestrians include Indian School Road, Camelback Road, Arizona Canal, Chaparral Road, Highland Avenue, and Osborn Road. Enhancements are also suggested at Indian School

Road/Goldwater Boulevard and Indian School Road/Marshall Way. Intersection improvements are also needed at 2nd Street, 3rd Avenue, and 5th Avenue along Scottsdale Road since these are the primary east-west streets that tie into the couplet system.

The intersection of Indian School and 68th Street also should be improved for pedestrians given the redevelopment of the Valley Ho and new residential units on the south side that create the need to enhance pedestrian mobility and safety north to the Arizona Canal. Other intersections of concern that create challenges for pedestrians include the crossing of Goldwater Blvd. at Main Street, the crossing of Drinkwater Blvd. at Brown, near Stetson/Goldwater (south of Camelback Road), the crossing of Camelback Road at 73rd Street, and the crossing of Goldwater Blvd. at 5th Avenue.

Currently north-south pedestrian access into and out of Downtown is difficult. Major pedestrian barriers exist where the couplet streets merge with Scottsdale Road. At the intersections of Scottsdale and Goldwater in north Downtown, and the intersection of Scottsdale and Drinkwater in south Downtown, pedestrian crossing and sidewalk improvements are needed. The configurations of these merge areas are not conducive for pedestrians. Lack of crosswalks and sidewalks make crossings impossible and prohibited. These conditions create major barriers for pedestrians seeking access to Downtown from the surrounding neighborhoods. It is also a challenge for pedestrians to cross at the intersection of Scottsdale Road and Camelback since no sidewalk exists on the west side of Scottsdale Road.

9.0 Design Standards and Policy Manual (DS&PM)

The *DS&PM* encourages multiple pedestrian connections, short direct access, and separation between the back of curb and sidewalks. The only mandatory pedestrian requirements are related to sidewalks and curb ramps and are as follows:

Sidewalks are typically provided on all arterial, collector, and local streets. Some streets within the northern area of the City do not provide sidewalks or other pedestrian facilities. Scottsdale requires a minimum six-foot sidewalk on all minor streets; eight-foot or wider sidewalks are required along all major streets (major collector classification or greater). The City requires sidewalks to be a minimum of four feet from the back of curb (eight feet being typical). The exception to this setback rule is when a sidewalk is adjacent to a bus stop, or in areas with a more urban design character, such as Downtown.

These guidelines should be updated to also reflect latent demand when determining locations and widths.

The *DS&PM* encourages the following measures to enhance the connectivity and safety of the pedestrian environment:

- Reduced curb cuts.
- Provision of through pedestrian access from cul-de-sacs and dead ends, across drainage easements, and between commercial developments to destinations.

Recently, the City has taken substantial steps to improve curb ramp facilities. The *DS&PM* requires curb ramps to be placed wherever a pedestrian access route crosses a sidewalk/street transition, at intersections, medians, alleys, and where pedestrian travel continues on the roadway once a public sidewalk ends.

Additionally, the City requires alterations in retrofit development areas to follow guidelines for new construction unless technically infeasible as determined by the Scottsdale Transportation Department.

Finally, the City is working to improve pedestrian access and safety by requiring the use of directional ramps at all intersections. The City of Scottsdale *Standard Details* require that where physically feasible, directional ramps should be installed at all intersections. In locations without sufficient space to accommodate full directional ramp treatment, a diagonal ramp with a minimum eight-foot wide and four-foot deep landing at the back of the ramp is preferred. In all cases, ramps shall be provided with truncated domes, a detectable warning device.

APPENDIX C: PEDESTRIAN COLLISION INFORMATION FROM 2000 TO 2006

Maps of pedestrian collisions by Planning Zone from 2000 to 2006 are shown in *Figure 1* through *Figure 5*.

Figure 1: Pedestrian Collisions in Scottsdale, Planning Zone A, 2000—2006

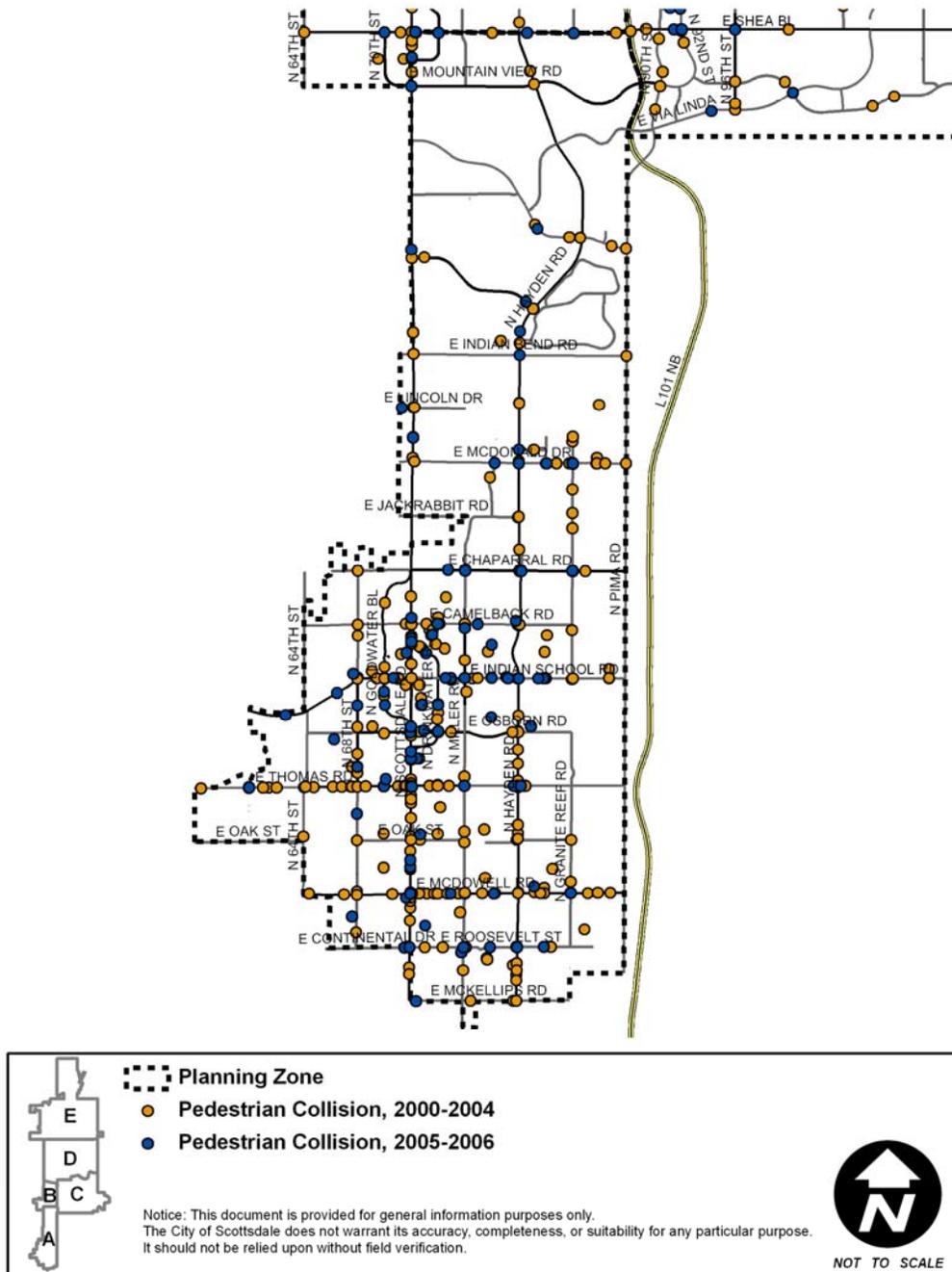


Figure 2: Pedestrian Collisions in Scottsdale, Planning Zone B, 2000—2006

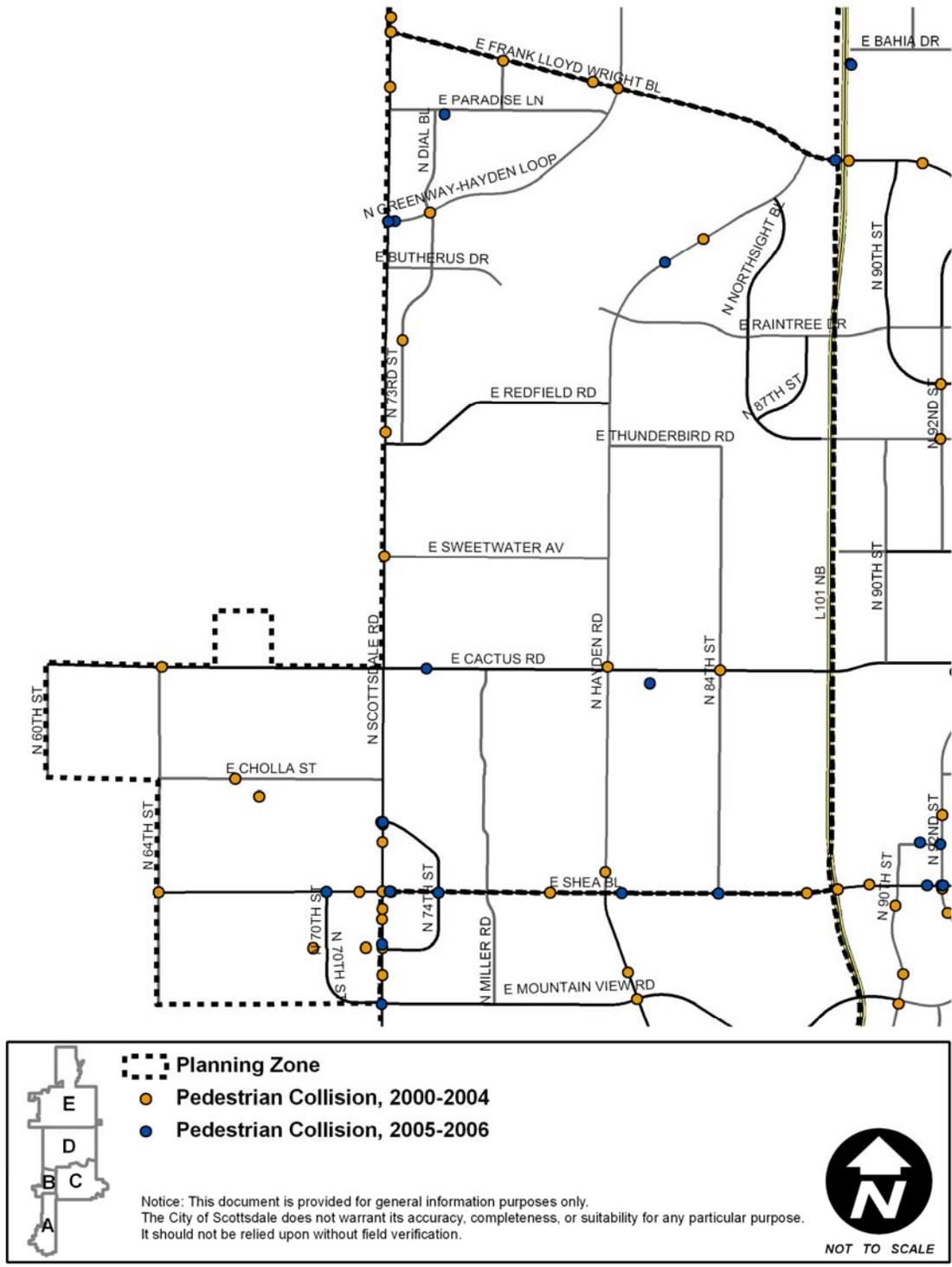


Figure 3: Pedestrian Collisions in Scottsdale, Planning Zone C, 2000—2006

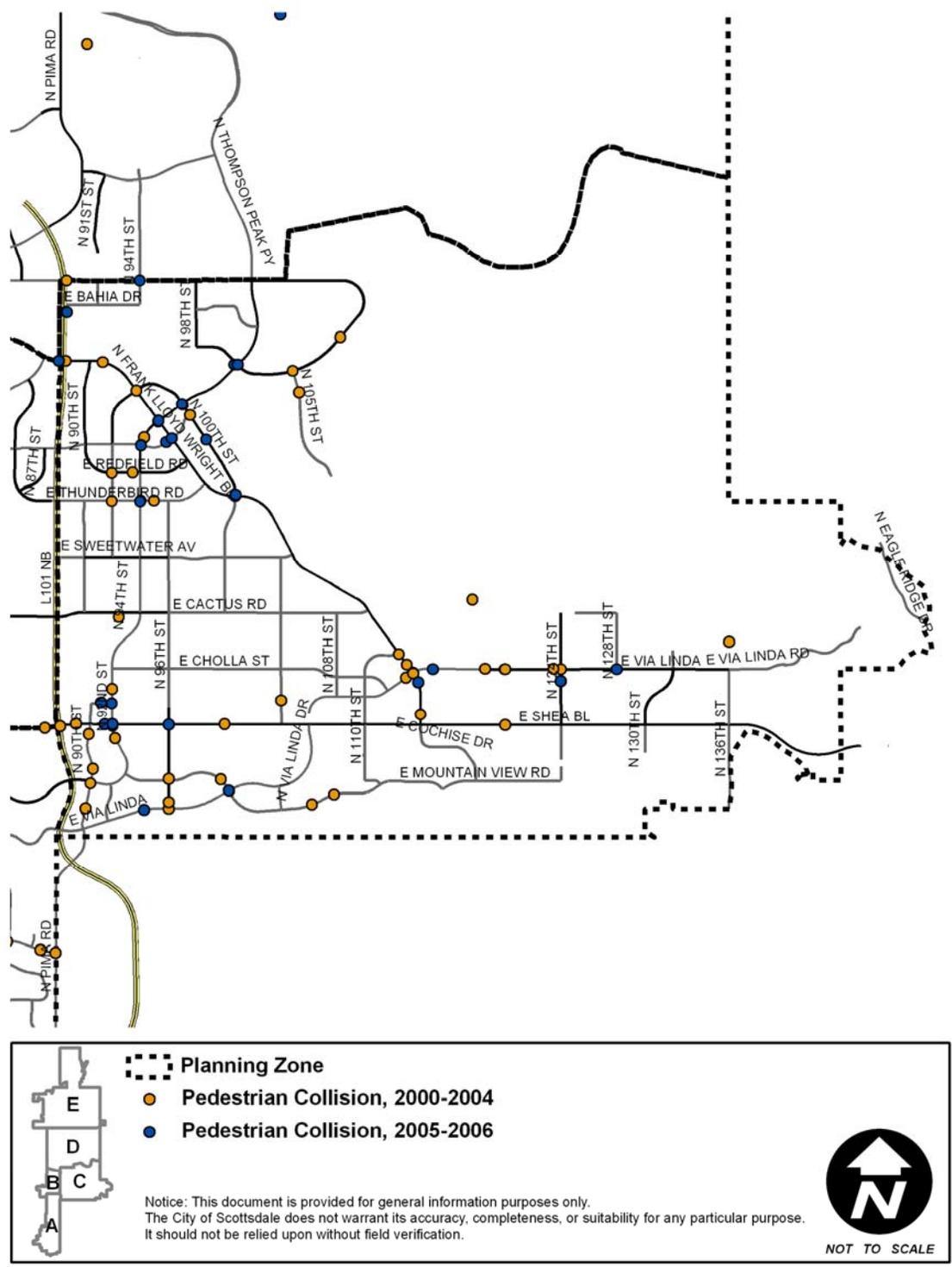


Figure 4: Pedestrian Collisions in Scottsdale, Planning Zone D, 2000—2006

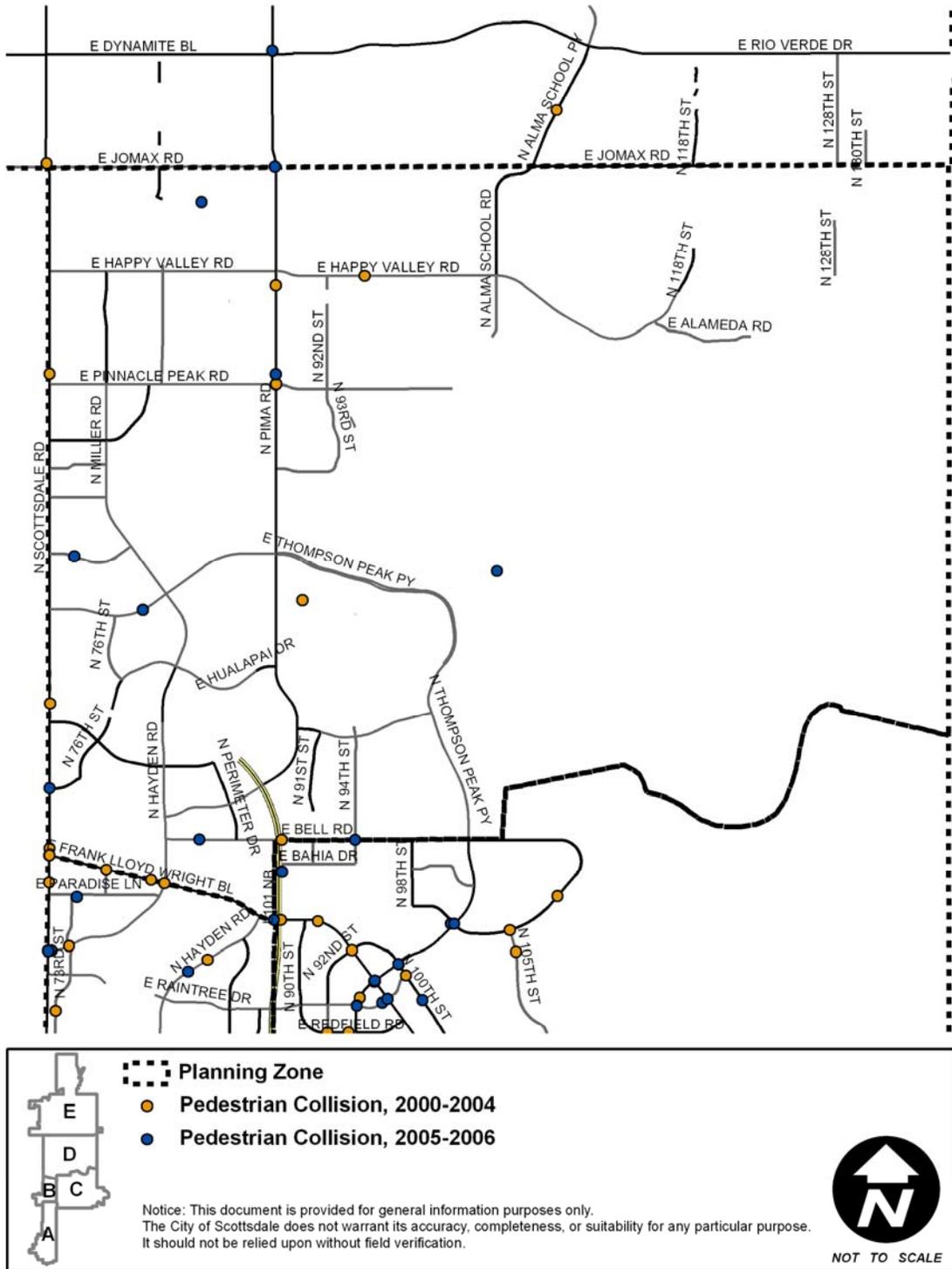


Figure 5: Pedestrian Collisions in Scottsdale, Planning Zone E, 2000—2006

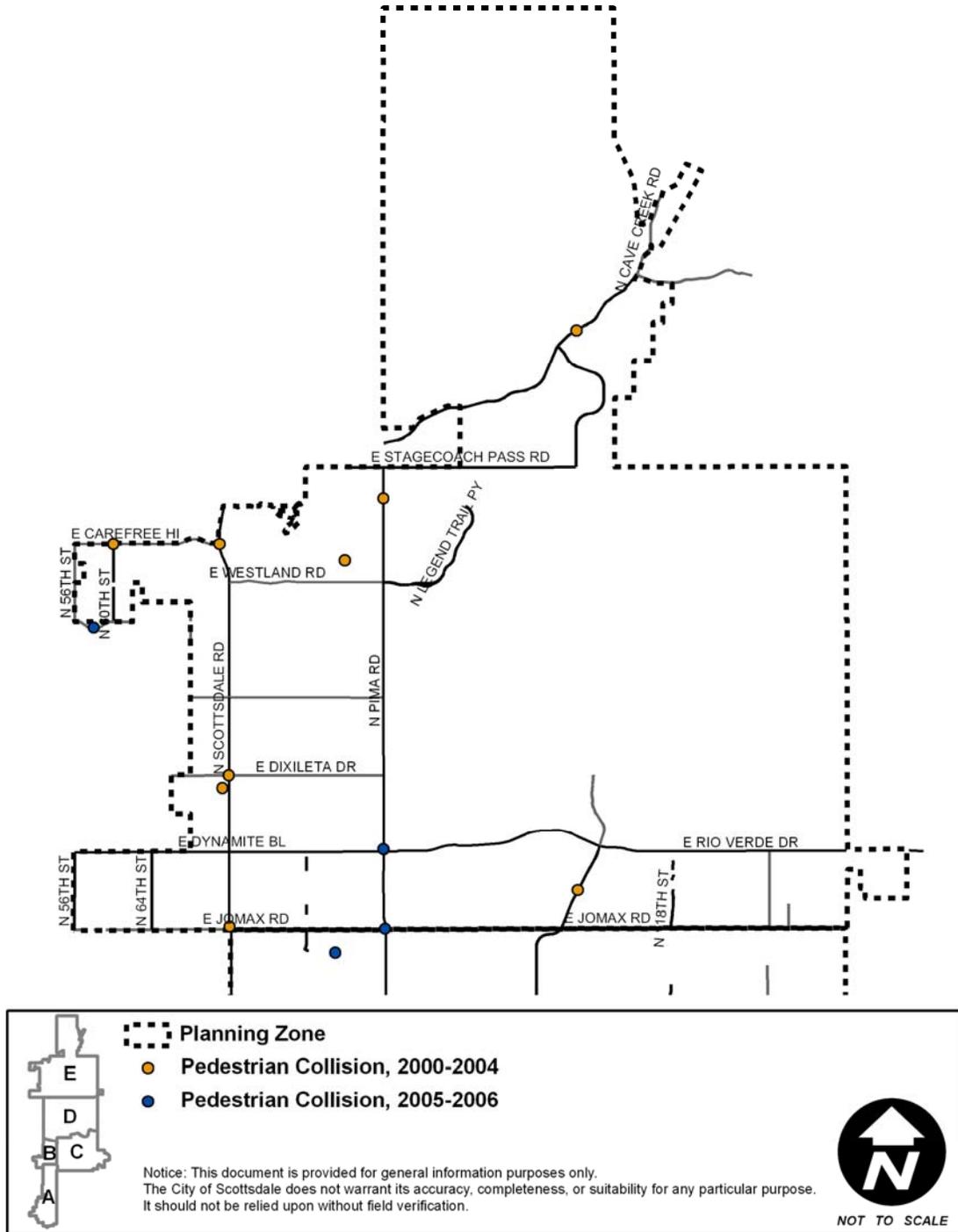
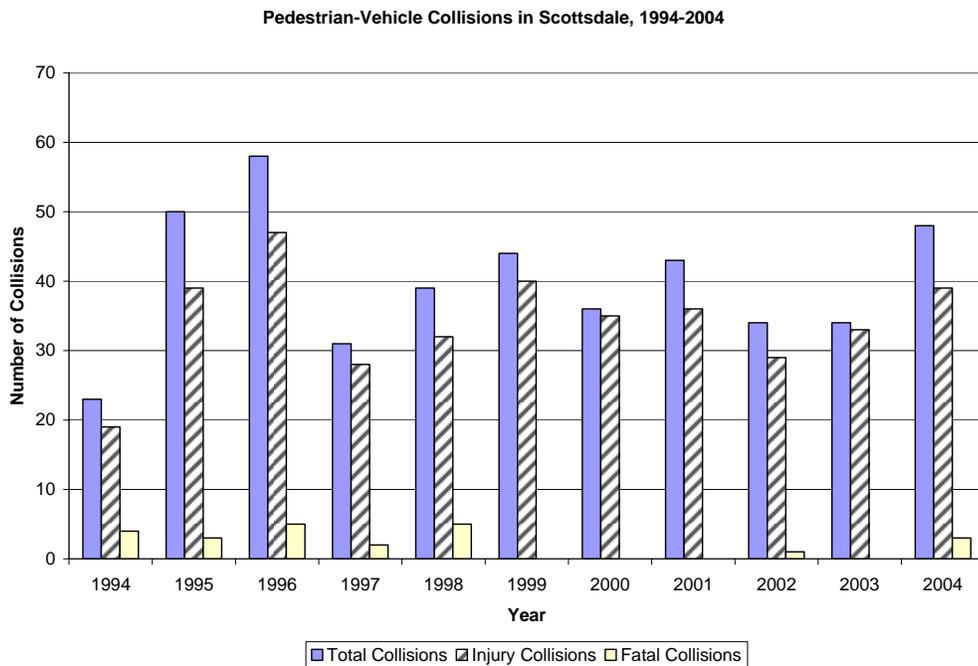


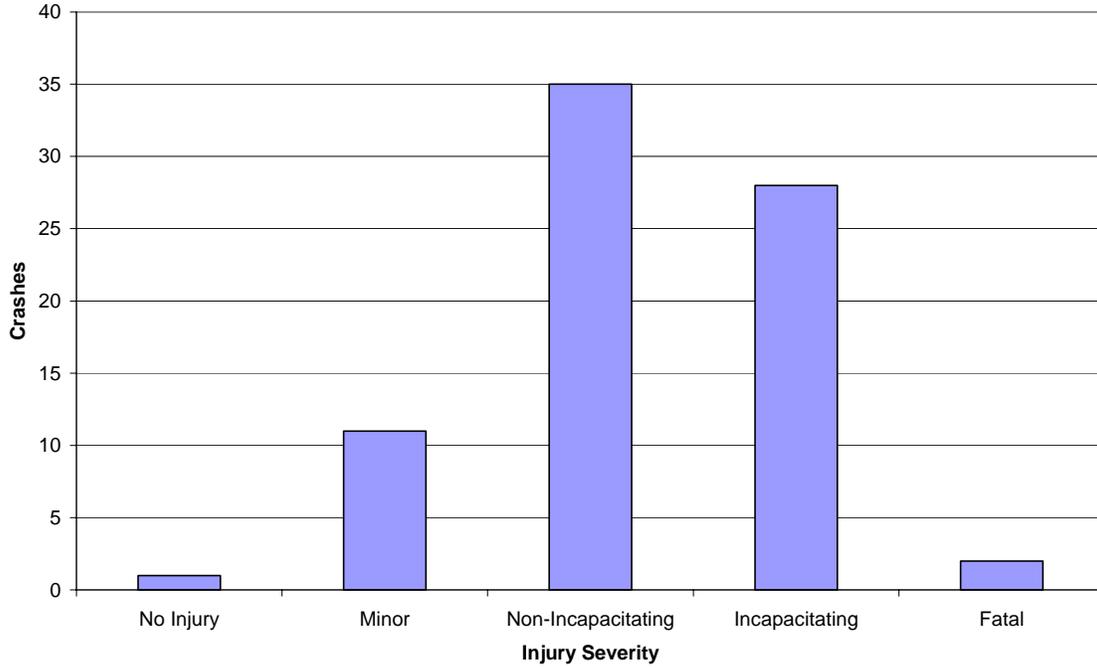
Figure 6 illustrates the number of reported pedestrian-vehicle collisions in the City of Scottsdale from 1994 through 2004, separated into total collisions, injury collisions, and fatal collisions. The lowest number of pedestrian-vehicle collisions occurred in 1994 with a total of 23 crashes, 19 of which resulted in injury and four resulted in fatalities. The highest number of pedestrian collisions occurred two years later with 58 total collisions, 47 of which were injury related and five fatalities. The majority of pedestrian-vehicle collisions resulted in injury.

Figure 6: Pedestrian-vehicle Collisions in Scottsdale, 1994—2004



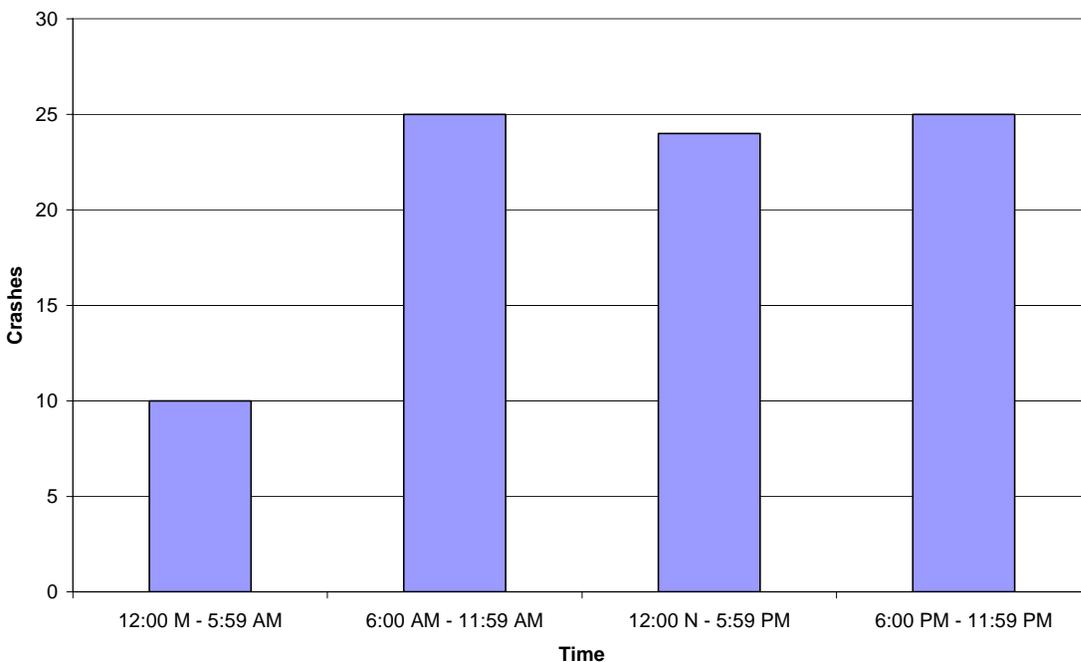
An additional 85 pedestrian crashes were reported during January 2005—October 2006. These 85 pedestrian crashes were analyzed to gain an understanding of crash characteristics. Most crashes resulted in an injury to the pedestrian (see Figure 7 on the next page). Only one crash did not result in an injury. There was one pedestrian fatality.

Figure 7: Pedestrian Crashes, Injury Severity, January 2005—October 2006



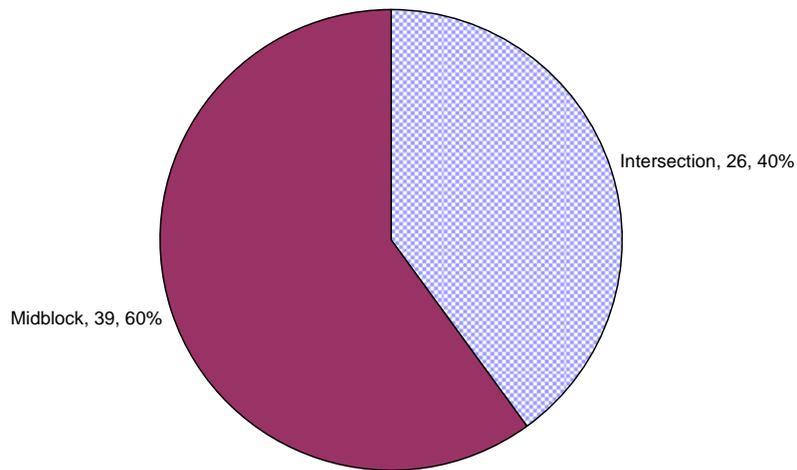
By time of day, pedestrian crashes were fairly evenly distributed among three time periods: 6:00 AM to 11:59 AM; 12:00 Noon to 5:59 PM; and 6:00 PM to 11:59 PM (see *Figure 8*). The fewest crashes occurred during the overnight hours of 12:00 AM to 5:59 AM.

Figure 8: Pedestrian Crashes By Time of Day, January 2005—October 2006



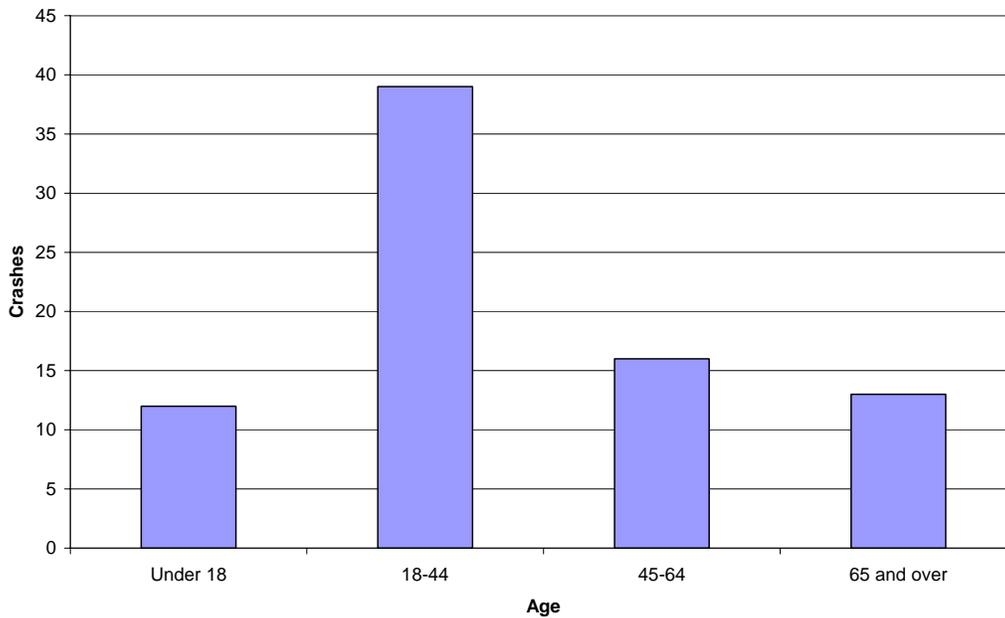
Excluding crashes occurring on private property (for example, parking lots), 40 percent of pedestrian crashes occurred at intersections (see *Figure 9*) and the majority of the collisions occurred between intersections or midblock of the intersection.

**Figure 9: Pedestrian Crashes by Location
January 2005—October 2006**



Pedestrians involved in the crashes were most commonly between 18 and 44 years of age (see *Figure 10*).

**Figure 10: Pedestrian Crashes By Age of Pedestrian
January 2005—October 2006**



The majority of pedestrians had no apparent defects in their physical condition (see *Figure 11*). However, 13 percent of the pedestrians had been drinking.

**Figure 11: Physical Condition of the Pedestrian
January 2005—October 2006**

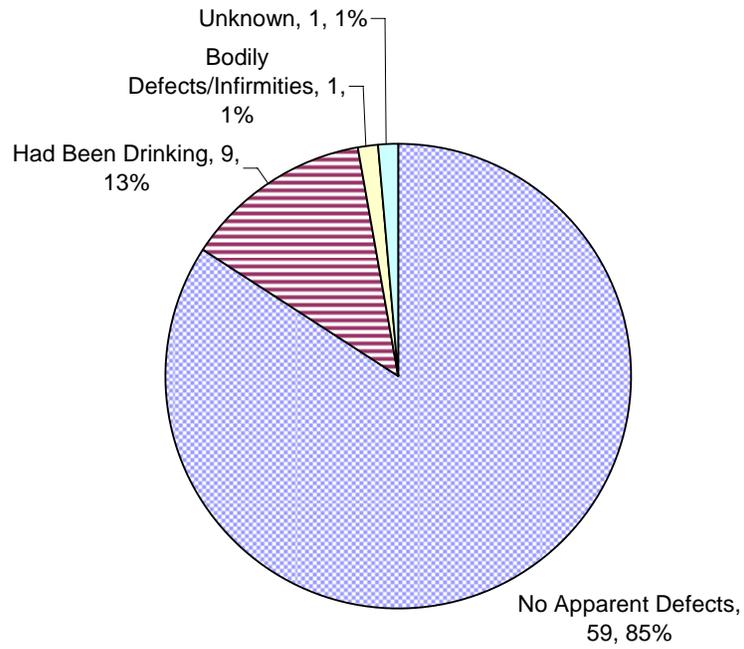
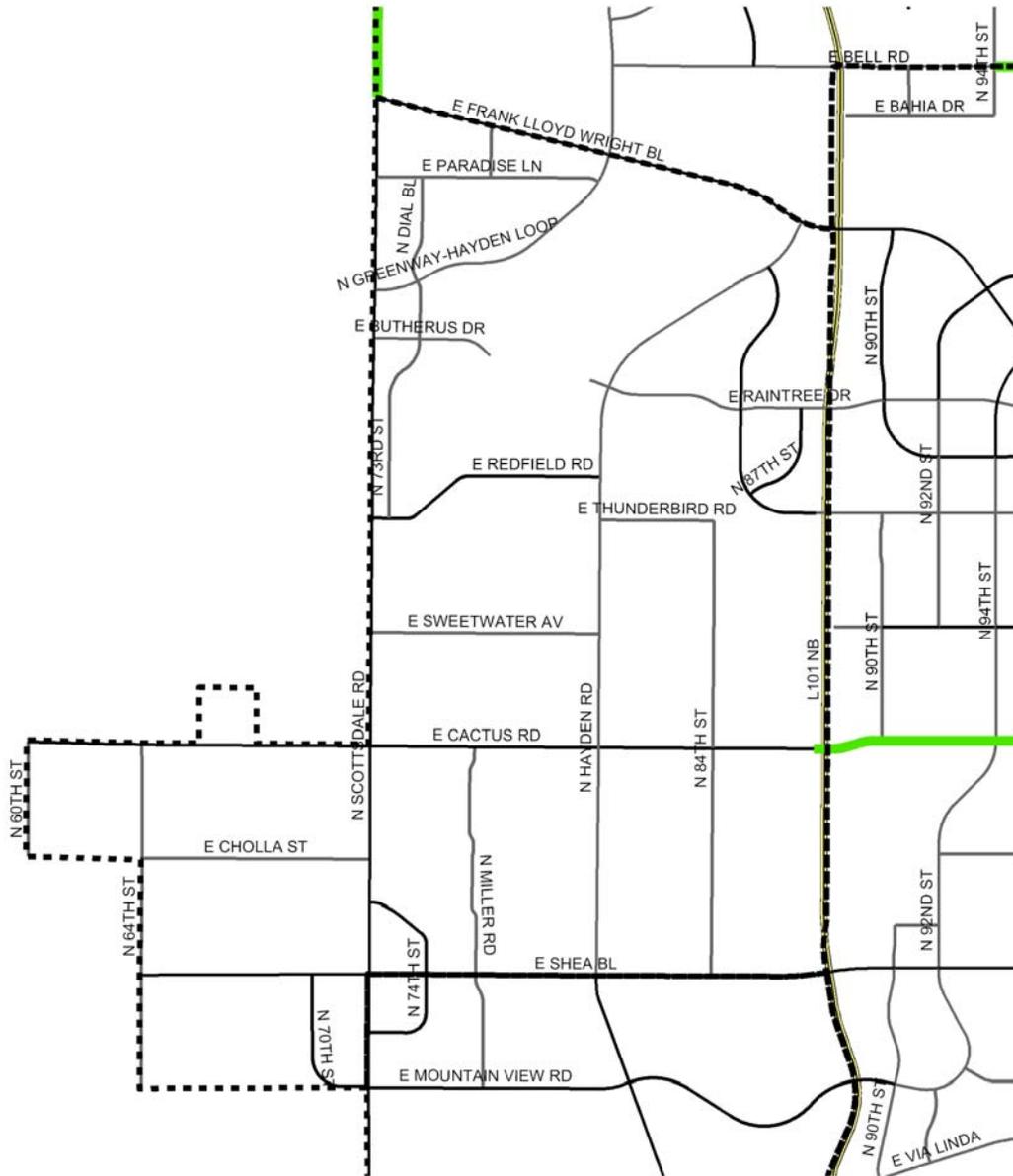


Figure 2: FY 2008 – 2012 Capital Improvement Projects, Planning Zone B



Planning Zone

CIP Projects With Bike/Pedestrian Elements

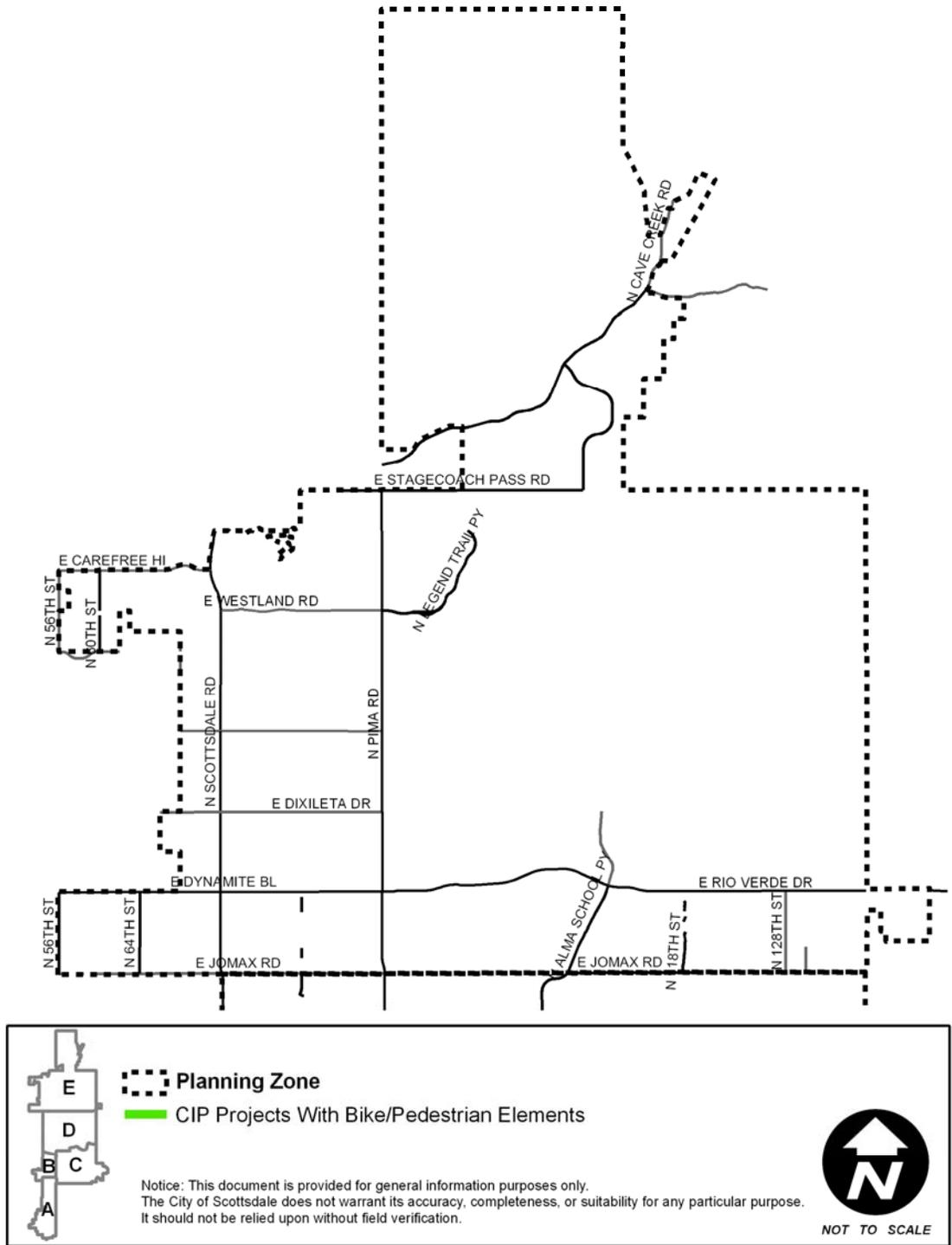
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NOT TO SCALE

Figure 3: FY 2008 –2012 Capital Improvement Projects, Planning Zone C



Figure 5: FY 2008 –2012 Capital Improvement Projects, Planning Zone E



APPENDIX E: PEDESTRIAN LATENT DEMAND

The following maps detail the results of the latent demand analysis by Planning Area. While the results shown in *Figures 1 through 5* are tied to particular study roadway segments, latent demand for areas between the segments can generally be estimated.

Figure 1: 2020 Pedestrian Latent Demand, Planning Zone A



Figure 2: 2020 Pedestrian Latent Demand, Planning Zone B

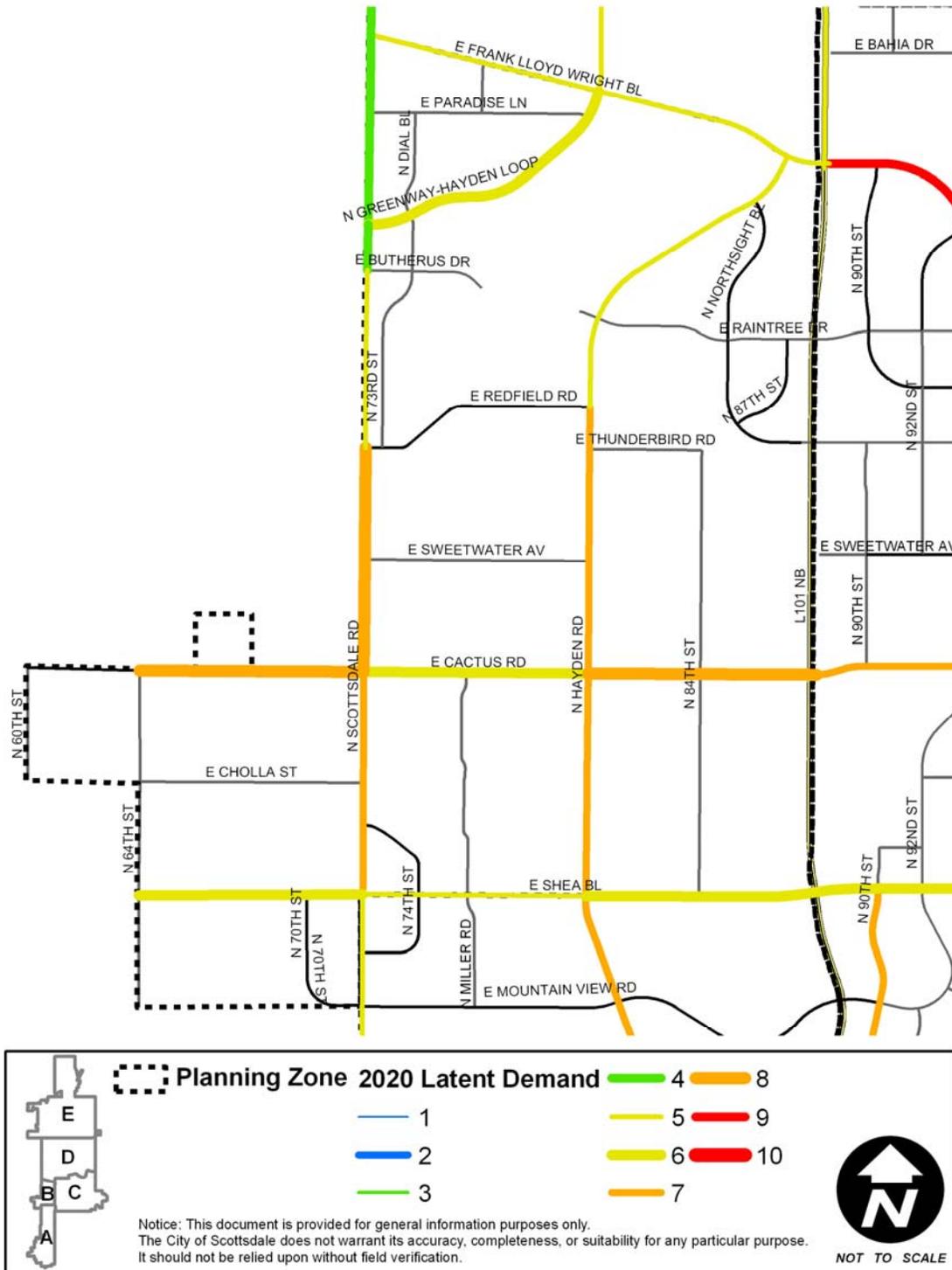
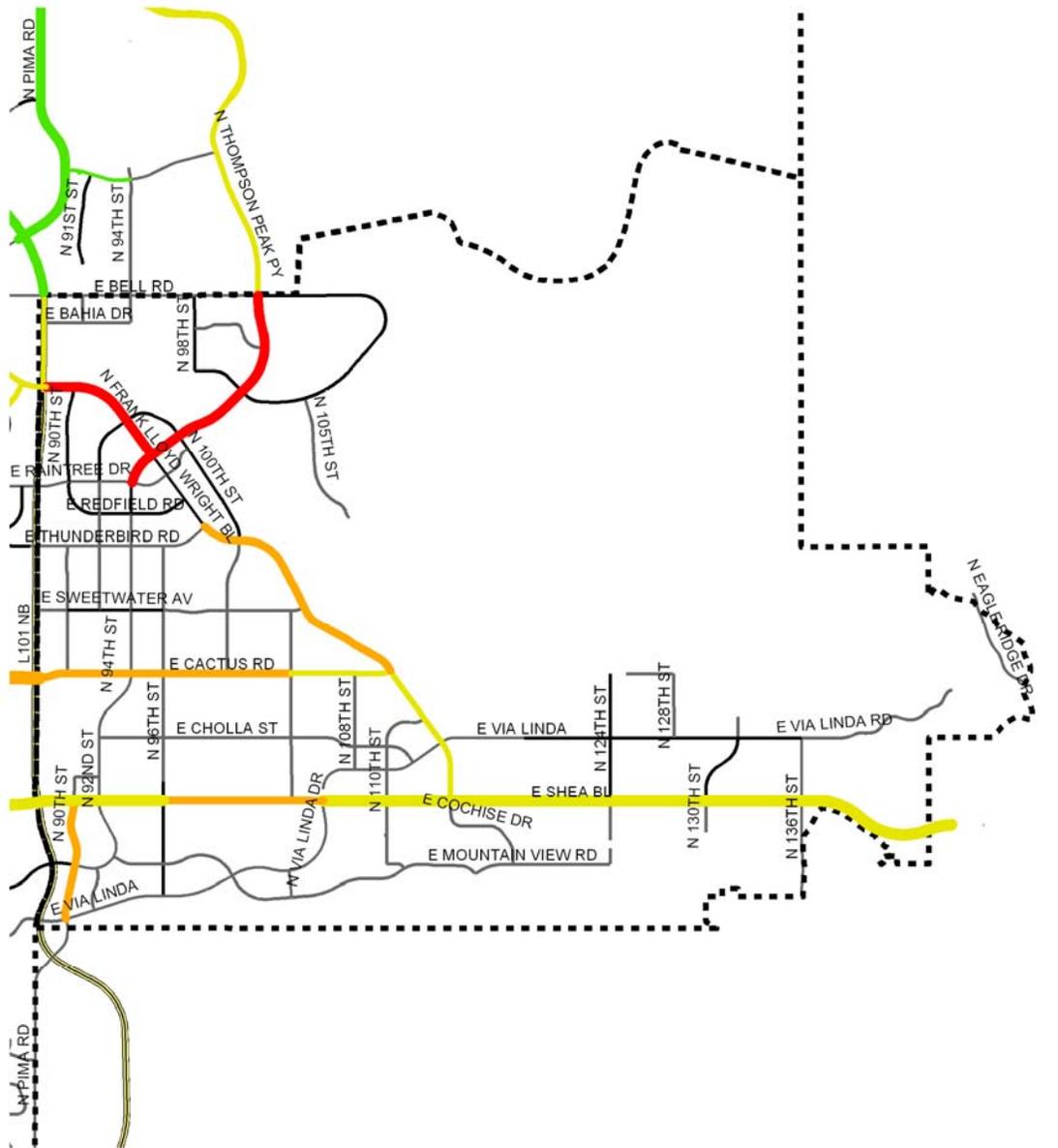


Figure 3: 2020 Pedestrian Latent Demand, Planning Zone C



	Planning Zone 2020 Latent Demand		4	8
	1	5	9	10
2	3	7		

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NOT TO SCALE

Figure 4: 2020 Pedestrian Latent Demand, Planning Zone D

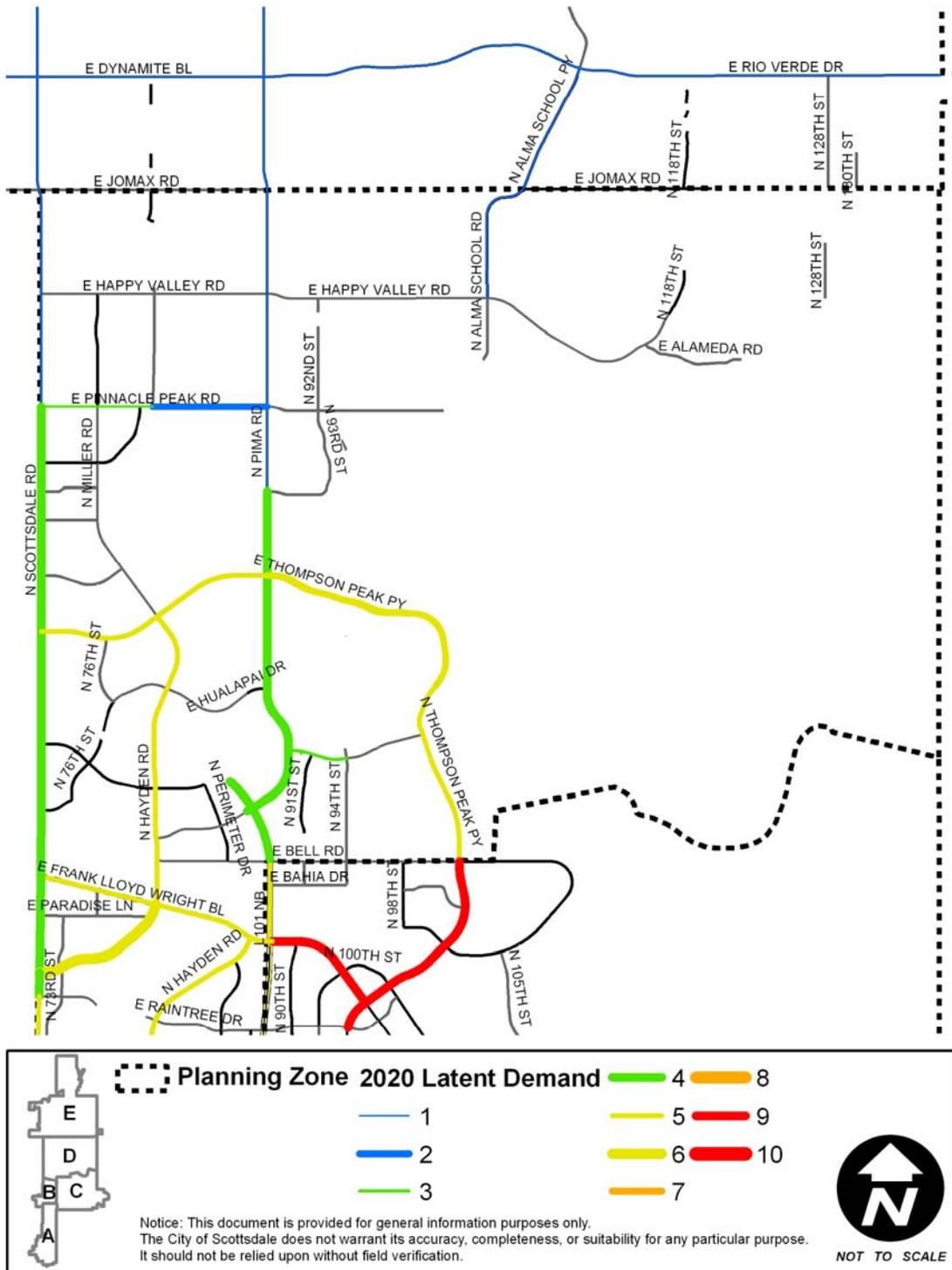
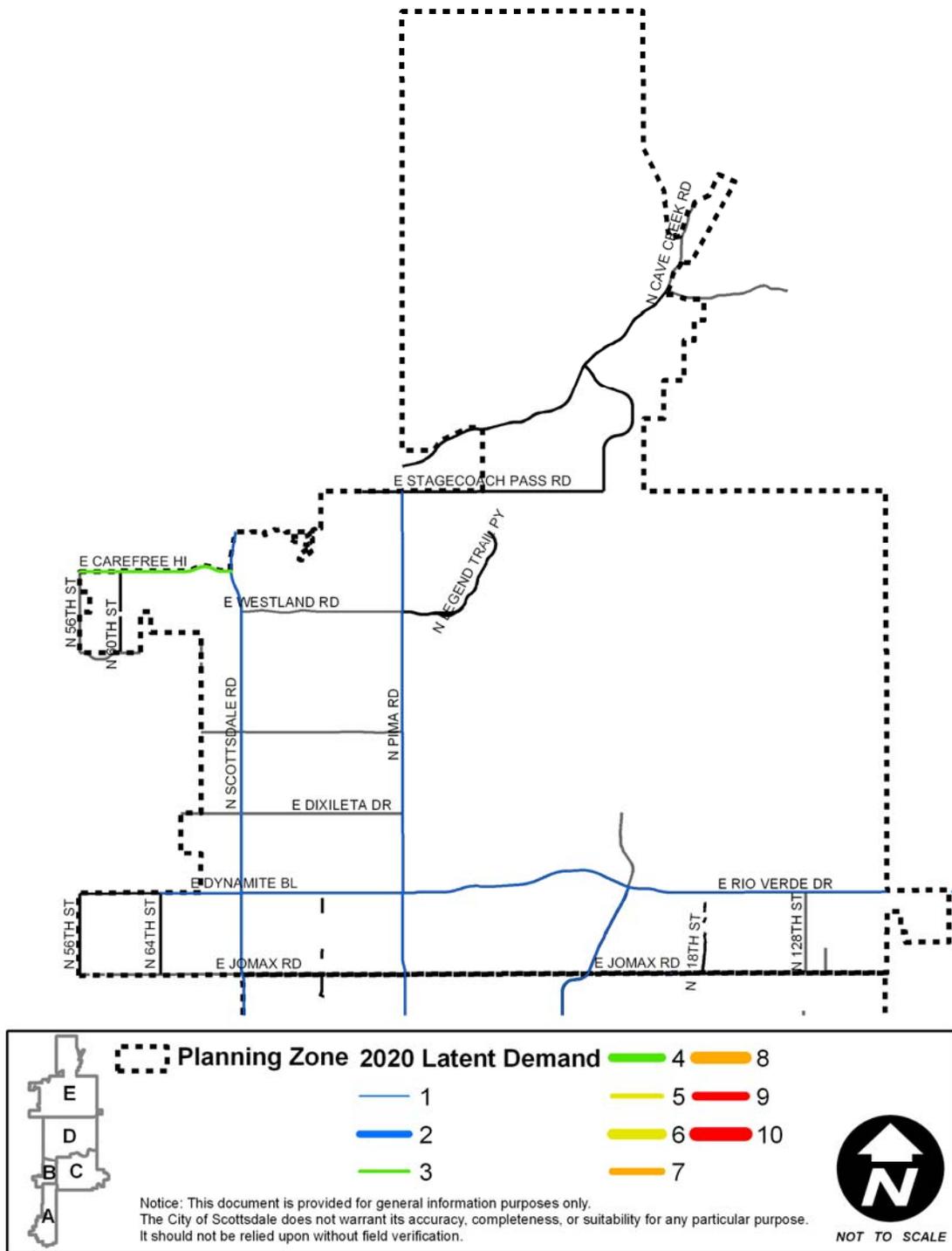
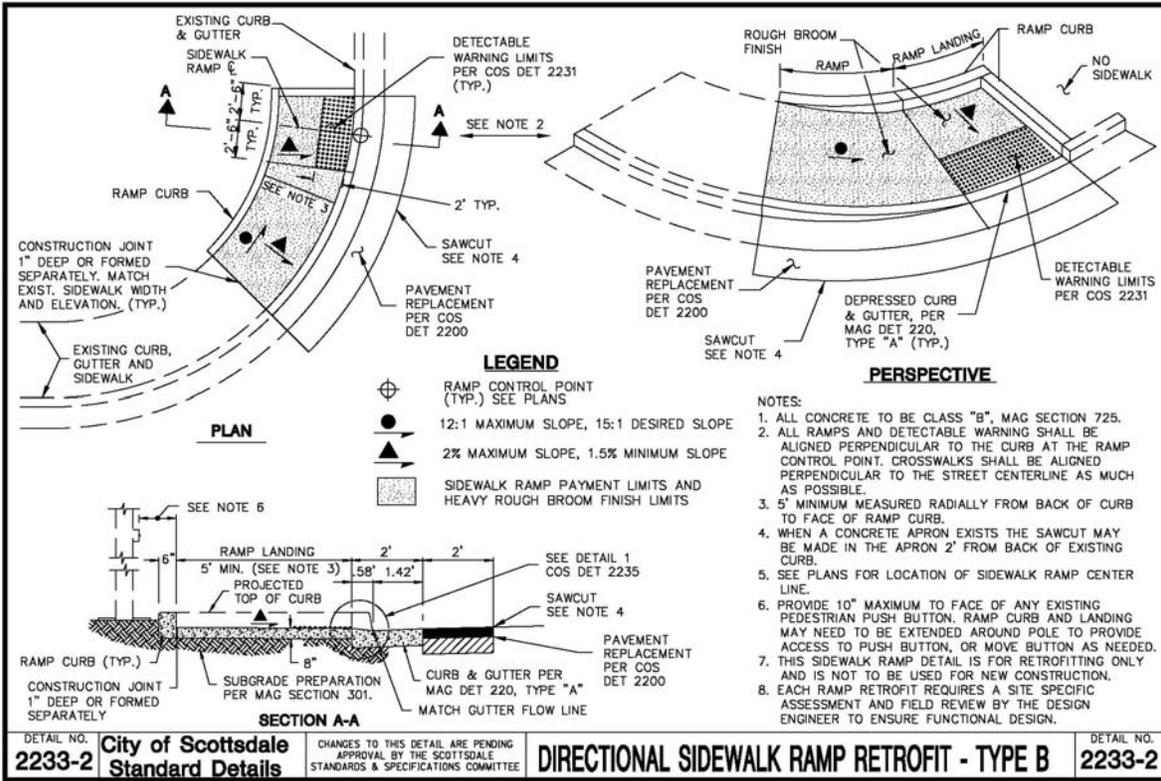


Figure 5: 2020 Pedestrian Latent Demand, Planning Zone E

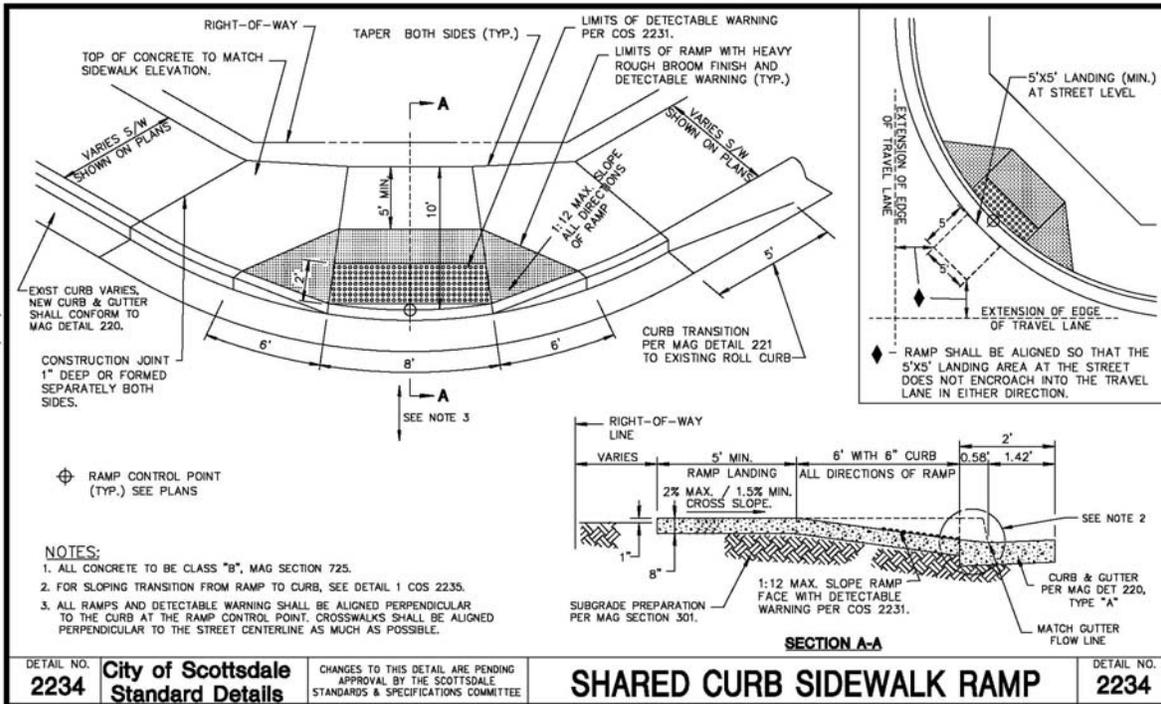


REVISED 10/26/07



DETAIL NO. **2233-2** City of Scottsdale Standard Details CHANGES TO THIS DETAIL ARE PENDING APPROVAL BY THE SCOTTSDALE STANDARDS & SPECIFICATIONS COMMITTEE **DIRECTIONAL SIDEWALK RAMP RETROFIT - TYPE B** DETAIL NO. **2233-2**

REVISED 10/26/07



DETAIL NO. **2234** City of Scottsdale Standard Details CHANGES TO THIS DETAIL ARE PENDING APPROVAL BY THE SCOTTSDALE STANDARDS & SPECIFICATIONS COMMITTEE **SHARED CURB SIDEWALK RAMP** DETAIL NO. **2234**

APPENDIX G: PRINCIPLES OF UNIVERSAL DESIGN

Principle One - Equitable Use – the design is useful and marketable to people with diverse abilities.

- Guideline 1a. Provide the same means of use for all users: identical whenever possible; equivalent when not.
- Guideline 1b. Avoid segregating or stigmatizing any users.
- Guideline 1c. Provisions for privacy, security, and safety should be equally available to all users.

Principle Two - Flexibility in Use – the design accommodates a wide range of individual preferences and abilities.

- Guideline 2a. Provide choice in methods of use.
- Guideline 2b. Accommodate right- or left-handed access and use.
- Guideline 2c. Facilitate the user's accuracy and precision.
- Guideline 2d. Provide adaptability to the user's pace.

Principle Three - Simple and Intuitive Use – use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration levels.

- Guideline 3a. Eliminate unnecessary complexity.
- Guideline 3b. Be consistent with user expectations and intuition.
- Guideline 3c. Accommodate a wide range of literacy and language skills.
- Guideline 3d. Arrange information consistent with its importance.
- Guideline 3e. Provide effective prompting and feedback during and after task completion.

Principle Four - Perceptible Information – the design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

- Guideline 4a. Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.
- Guideline 4b. Provide adequate contrast between essential information and its surroundings.
- Guideline 4c. Maximize "legibility" of essential information.
- Guideline 4d. Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).
- Guideline 4e. Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

Principle Five - Tolerance for Error – the design minimizes hazards and the adverse consequences of accidental or unintended actions.

- Guideline 5a. Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded.
- Guideline 5b. Provide warnings of hazards and errors.
- Guideline 5c. Provide fail safe features.
- Guideline 5d. Discourage unconscious action in tasks that require vigilance.

Principle Six - Low Physical Effort – the design can be used efficiently and comfortably and with a minimum of fatigue.

- Guideline 6a. Allow user to maintain a neutral body position.
- Guideline 6b. Use reasonable operating force.
- Guideline 6c. Minimize repetitive actions.
- Guideline 6d. Minimize sustained physical effort.

Principle Seven - Size and Space for Approach and Use – appropriate size and space is provided for approach, reach, manipulation, and use regardless of user’s body size, posture, or mobility.

- Guideline 7a. Provide a clear line of sight to important elements for any seated or standing user.
- Guideline 7b. Make reach to all components comfortable for any seated or standing user.
- Guideline 7c. Accommodate variations in hand and grip size.
- Guideline 7d. Provide adequate space for the use of assistive devices or personal assistance.

APPENDIX H: PEDESTRIAN FACILITY MAINTENANCE REQUIREMENTS

Pedestrian Facility Maintenance Requirements		
Pedestrian Facility	Concern	Maintenance Activity
Sidewalks and Walkways	Tree roots have caused cracking and heaving of the sidewalk.	Remove damaged sidewalks, cut roots and install new sidewalk. Consult arborist before removing large tree roots.
	Section of sidewalk has popped up, creating a vertical height difference greater than 1/4 inch.	Replace defective section of sidewalk or provide temporary asphalt shim.
	Cracked surface and poorly placed temporary patches.	Replace defective sections of sidewalk.
	Separation of expansion and construction joints so that space between adjoining sections are greater than 1/4 inch.	Fill joint with hardening expansion compound.
	Trash, loose sand, oil or grease is present on walkway or sidewalk.	Serve notice to abutting land owners to clean and maintain sidewalks.
	Materials, signs, vending machines, etc. restricting the effective sidewalk width.	Require responsible parties to remove obstructions.
	Low hanging tree limbs, bushes, weeds and other foliage growing into sidewalk and/or posing obstructions and sight restrictions.	Enforce local regulations requiring abutting property owners to perform timely clearance activity. Alternatively, hire private contractor to clear sidewalk and assess cost to abutting property owner. Or, city staff clears the sidewalk.
Crosswalks and Curb Ramps	Curb ramp surface is worn into a glazed and slippery surface.	Replace curb ramp.
	Poor drainage is causing water retention in the gutter area.	Clean gutter and catch basin area.
	Street rutting is causing water ponding in the crosswalk.	Resurface street or crosswalk area.
	Street repaving has resulted in a step or transition problem at bottom of curb ramp.	Repaving contract specification should specify a maximum of ¼ inch vertical edge between new pavement and gutter or curb ramp.
	Slippery manhole covers in crosswalk.	When manholes must be located in crosswalk, they should have slip resistant cover design, be flush with the surface, and visible.
	Deterioration of crosswalk markings.	Identify high volume locations that require additional refurbishing activities, and program funding for improvements.

Pedestrian Facility Maintenance Requirements		
Pedestrian Facility	Concern	Maintenance Activity
	Expansion and construction joints have separated so that space between adjoining sections are greater than 1/4 inch.	Fill joint with hardening expansion compound.
Overpasses and Underpasses	Objects are falling from the overpass.	Enclose overpass with fencing.
	Sparse pedestrian use of underpass.	Underpass should be well lit and as wide as possible to provide a feeling of personal safety.
	Worn step or ramp surfaces.	Overlay, replace or texturize to provide a slip-free and unbroken surface.
	Section of walking surface has popped up, creating a vertical height difference greater than 1/2 inch.	Replace defective section of walking surface or provide temporary asphalt shim.
Work Zones	Temporary pathways at work zones are typically constructed of relatively inexpensive, short life materials.	Frequently inspect the pathway surface. Wooden surface materials should be treated with no slip strips or surface treatment. Surface materials with holes, cracks or abrupt changes in elevation should be replaced.
	The roadway to which traffic has been detoured experiences greater traffic volumes; placement of pedestrian path on detour roadway may create difficulties for pedestrians.	Periodically check detour pathway for adequacy of pedestrian and vehicular signal timing, proper pedestrian detour signing, pedestrian traffic hazards, and proper motorist information.
	Construction materials debris in pathway.	Require contractor to maintain a clear pathway.
	Pedestrian accommodation needs have changed due to dynamic construction activities.	Perform periodic inspection to ensure pedestrian information needs keep pace with construction activities.
	Traffic barricades are damaged.	Replace barricade and re-evaluate their adequacy to ensure pedestrian safety.
Traffic Control Devices	Sign is not readily visible to pedestrian.	Inspect sign from vantage point of pedestrian (consider pedestrian in wheelchair, as well). Ensure sign is not obscured by other signs, landscaping or street furnishings.
	Pedestrian sign is not at height that can be viewed by all pedestrians.	Mount signs in accordance with <i>Section 8.3 Clearances</i> .
	Pedestrian signal must be maintained.	Inspect pedestrian signal periodically for damage due to turning vehicles. If damaged, consider back bracketing the pedestrian assembly. Refurbish signal as needed, including lens cleaning and bulb replacement.

Pedestrian Facility Maintenance Requirements		
Pedestrian Facility	Concern	Maintenance Activity
Source: <i>Planning, Design and Maintenance of Pedestrian Facilities</i> . Federal Highway Administration. 1989 as cited in <i>Pedestrian Compatible Planning and Design Guidelines. Chapter 4: Operations and Maintenance of Pedestrian Facilities</i> , Table 8, New Jersey Department of Transportation., available at http://www.state.nj.us/transportation/publicat/pdf/PedComp/pedoperations.pdf		

APPENDIX I: PEDESTRIAN ACCOMMODATION IN WORK ZONES

Guidelines for Pedestrian Accommodation in Work Zones

Planning Considerations

- Consider origins, destinations and walking paths to determine (1) where pedestrian access should be maintained and (2) where it may be blocked and provided with an alternate path.
- Because most pedestrians take the shortest path of travel, make it very difficult for pedestrians to walk where it is unsafe by using barricades, barriers, signals, etc. In addition, provide an alternative that is safe and accessible that appears to be convenient and is as direct as possible. Pedestrians must feel that their needs have been adequately addressed by the detour route, or they will choose their own route that they feel is convenient and safe. Pedestrians should feel secure and not be subjected to undue risk. Adequate accommodations must be provided to meet the needs of all types of pedestrians, including children, pedestrians who are visually impaired, and older pedestrians.
- Check for pedestrian-generating land uses, such as schools, senior centers, facilities used by pedestrians with mobility or cognitive impairments, shopping centers, restaurants, parks, transit stops, etc. to determine if additional pedestrian detour routes or facilities are necessary.
- Consider needs for nighttime accommodation, especially the potential masking effect of barricade lights and high visibility work site markings.
- To avoid blockage of the pedestrian path by construction material, equipment and debris, establish a designated location for these items as a part of the construction contract and require in the contract that identified pedestrian routes will be kept accessible and clear.
- Consider staging construction when there is no acceptable alternative routing for pedestrians.

Guidelines for Pedestrian Accommodation in Work Zones

Information Needs

Four (4) types of information are required for pedestrians in work zones: advance information, transition information, information to guide the pedestrian through the work zone, and information on how to exit the work zone.

Advance Information

- Advance information is required only for detours and bypasses.
- Pedestrians need advance warning of any sidewalk/path blockages. Information should advise of the blockage and identify the alternate path.
- In general, no advance information is needed for the following situations: (1) an accessible pedestrian walkway is provided through the work zone and there is no need for sidewalk blockage, closure or pedestrian diversion; and/or (2) the continuity of the accessible pedestrian pathway is maintained and the pathway itself is obvious to all pedestrians (including pedestrians with visual impairments).
- Tailor sign messages to specific needs. Typical messages include: Sidewalk Closed Ahead, Sidewalk Closed — Use Other Side, and Pedestrian Detour — Follow Arrow. Signs should be located on barricades detectable to the blind.
- If groups with special needs are known to use the facility, hold public meetings to describe the project, its duration, and its impact on users. In addition, a guide may be posted to alert these users during the initial period following the start of construction.

Transition Information

- Provide proper transition and channelization into the work zone path with a bypass or detour.
- Select appropriate channelization devices based on project duration.
- Devices suitable for channelization purposes include: closely spaced cones; temporary marking tape; barricades, ropes or chains; wood railings; portable concrete barriers; etc. Use of tape, rope, chains or railings must take into account the needs and limitations of pedestrians who are visually impaired.

Guidance Through Work Zones

- Clearly define boundaries of the pathway through the work zone.
- Select guidance and pathway delineation devices consistent with the duration of the project and the level of hazard.
- Devices suitable for pathway delineation and protection include closely spaced cones, wooden railings, barricades, and portable concrete type barriers.

Exit Information

- No exit information is required if the existing pathway is used, or if the continuity of the accessible pathway is obvious to all pedestrians (including pedestrians who are visually impaired).
- In case of a bypass or detour, pedestrians need positive direction to return to the original path. Appropriate signing and other devices must be provided for this purpose.

Guidelines for Pedestrian Accommodation in Work Zones

Pedestrian Pathway Considerations

- Provide walkway widths consistent with original sidewalk width or sufficient to satisfy current pedestrian volumes (See *Section 8.1 Sidewalk Width; Pedestrian Access Route*).
- Clearly define the boundaries of the pathway for all pedestrians, including pedestrians who are visually impaired.
- Keep the walkway surface even and free of holes, wide cracks, fixed obstructions, and steep grades. Pedestrian walkway surface should be made of stabilized material (See *Section 8.2 Sidewalk Surface, Texture and Slope*).
- Provide a non-slip surface for temporary pathways.
- The transition into and out of redefined or relocated walkways should be clearly defined by markings, signs, or barricades to provide positive direction to pedestrians (including pedestrians who are visually impaired).
- A physical barrier may be necessary to keep pedestrians from wandering into a traffic lane or the construction area.
- Provide ramping where grade differential along the pathway is more than ½ inch between existing and temporary designated sidewalk. All ramping should be rigid and firmly secured to ensure safety of pedestrians.
- Do not allow changes in construction to block the pedestrian pathway. A periodic inspection and maintenance of the work zone area may be necessary.
- Physical separators between pedestrians and traffic should be selected based on duration of the project and space availability. In all cases, a separator should be used to confine pedestrians to a safe walkway space.
- The interior of overhead protected (canopy type) pedestrian walkways should be properly illuminated for nighttime visibility.
- All pathways must be kept clear of projecting items or other obstacles. See *Section 8.3 Clearances*.
- Evaluate potential impacts of drainage along all identified pedestrian routes and assure that water is effectively removed and that no ponding will occur.

Guidelines for Pedestrian Accommodation in Work Zones

Intersection Crossings

- If the original crosswalk is altered or removed, provide a clearly defined new crosswalk path using temporary marking tape. Make sure that the original crosswalk markings are not visible.
- Keep the crosswalk clear of debris, mud, construction materials, construction equipment, and other devices.
- Appropriately warn motorists if the pedestrian crossing is unexpected. Evaluate any possible need for pedestrian crossing signs. Special warning signing may be needed if the problem is severe.
- Provide signing and/or markings to define the entrance to the crosswalk. Channelize pedestrians into the new crosswalk area.
- Modify traffic signal timing/phasing and location if changed pedestrian needs require it. (See *Section 8.11 Signal Timing and Pedestrian Actuated Signals*).
- Consider deactivating pedestrian signals or covering signal heads and pushbutton signs when an existing crossing is not to be used.
- Provide covers, or metal plates, over any cuts or ditches in the area for the entire width of the existing or modified crosswalk.
- Consider lighting the area, including curb ramps, for nighttime visibility if the cut in pavement is deep or hazardous.

Sidewalk Closure and Blockage

- If an existing sidewalk through a work zone is to be closed, detour pedestrian traffic to the other side of the roadway where a sidewalk or a pedestrian path is available. Provide adequate signs and barriers for diverting pedestrian traffic to designated crosswalks. Signs should be placed logically and conspicuously for proper visibility from all approaches. Possible sign messages are: Sidewalk Closed Ahead and Sidewalk Closed, Pedestrians Use Other Side, with an arrow. Warnings/signage should be detectable to all pedestrians, including pedestrians with visual impairments.
- Sidewalk closure should be accomplished with a substantial barrier. Use signs indicating there is a sidewalk closure and pedestrian diversion.
- If pedestrians have to cross the roadway due to a sidewalk closure, ensure that an adequate crossing is provided using signing, crosswalk markings, traffic signal modification, and pedestrian signs, if warranted. Curb ramps must be available.
- For short-term utility operations, use less permanent devices, such as barricades, or even closely spaced cones. Use signs and cones for delineation and channelization for safe walking around work zones.

Pedestrian Protection

- Separators provided on both traffic and construction sides should be compatible with the level of hazard.
- The type of separator used should not create an additional hazard.
- A physical separator may be needed if the sidewalk on the side of the roadway where construction is located will be closed and pedestrian traffic will be diverted close to moving traffic.
- If there is construction overhead, and the possibility of falling debris or wet concrete, overhead protection should be provided for pedestrians walking below.

Guidelines for Pedestrian Accommodation in Work Zones

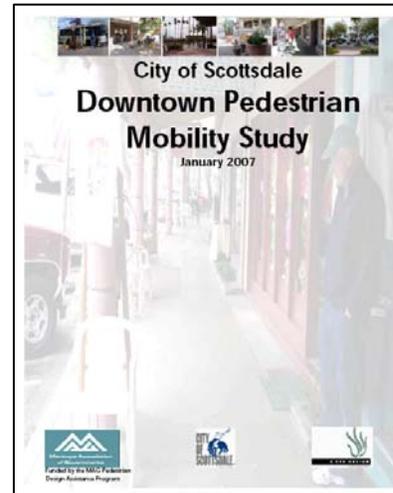
Inspection and Maintenance

- Check for compliance with the traffic control plan for pedestrian accommodations.
- Periodically check for missing signs or other traffic control devices installed for pedestrian accommodations in work zones.
- Check for changes in construction activity that would require a change in pedestrian accommodations.
- Check for any material in pedestrian pathways, such as spilled concrete, sedimentation, debris, construction materials, and equipment.
- Maintain signal equipment in operational condition. Check bulbs periodically.
- Following rain, check to ensure the pedestrian route is clear and accessible.

Source: From the Planning, Design and Maintenance of Pedestrian Facilities, Federal Highway Administration, 1989, as cited in the *Pedestrian Compatible Planning and Design Guidelines. Chapter 4: Operations and Maintenance of Pedestrian Facilities*, Table 7, New Jersey Department of Transportation, available at <http://www.state.nj.us/transportation/publicat/pdf/PedComp/pedoperations.pdf>

APPENDIX J: DOWNTOWN PEDESTRIAN MOBILITY STUDY (JANUARY 2007)

The Downtown Scottsdale Pedestrian Mobility Study was done with a MAG grant to the City of Scottsdale. The City requested the funds to measure pedestrian mobility in Downtown Scottsdale, and to determine how and where to make improvements to that mobility. The Study assessed Downtown Scottsdale within its four established districts - Old Town, Main Street, 5th Avenue, and Marshall Way Arts. Concurrently, the City's Downtown Group sponsored a similar effort to assess mobility issues within the Northeast Quadrant area, an emerging district east of Scottsdale Road, south of Camelback, north of Goldwater Boulevard, and west of 75th Street. While each established district has its distinct character, the districts have begun to grow together and are within a comfortable walking distance of one another, pointing to a need for a degree of connectivity and cohesion for pedestrians.

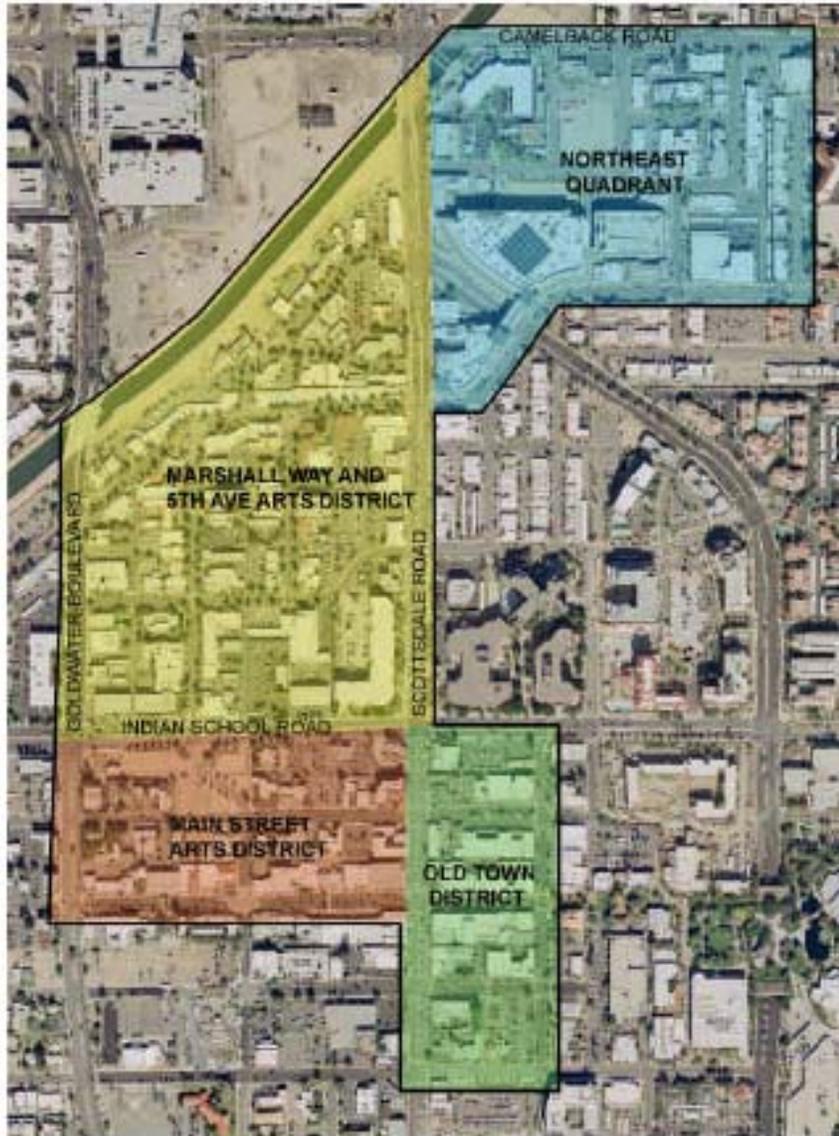


The study combines the MAG *Pedestrian Policies and Design Guidelines* with the City's *Downtown Urban Design and Architectural Guidelines* to establish measurable criteria and a substantial database for the evaluation of mobility. With this database, the City will pinpoint where and what types of impediments or problem areas exist that impede pedestrians' ability to move around Downtown. This information will be the basis for future capital improvement projects.

Major issues of concern throughout Downtown identified in the Study include:

- Discontinuous or blocked sidewalks; lack of a clearly defined and intuitively continuous pedestrian walkway of sufficient width.
- Wide intersections that create disconnections between Districts and across major streets.
- Uneven, narrow or disjointed walkways.
- Ramps which do not provide direction to the crosswalk or to the ramp across the street.
- No line of sight or ADA access to the Civic Center Mall from Brown Avenue or First Avenue (Note that a temporary ramp has since been installed in this location).
- Sidewalk boundaries that are not discernible to pedestrians with low vision.
- Unclear walkway access to buildings and/or around streetside uses, such as sidewalk cafes and retail displays.
- Unclear street signage and conflicts with vehicles, parked or moving, especially during periods of high activity such as special events.
- Jaywalking at night across major roadways, such as Scottsdale Road, during evening hours and special events.

Figure 1: Downtown Pedestrian Mobility Study Project Area



CITY OF SCOTTSDALE
PEDESTRIAN MOBILITY STUDY - STUDY AREA **FIGURE 1**

Major Pedestrian Deficiencies in Downtown Districts

Old Town

- Sidewalk Clearance and Obstructions. Most segments have light posts and canopy supports that do not allow for the minimum 3 foot horizontal clearance; many areas have wall-mounted objects protruding more than 4 inches from a wall.
- Curbs. Three (3) segments had high curbs, or inconsistent curb height varying from 0 to 8 inches high.
- Accessible Ramps. Corners lack tactile strips, color contrast, and dual/directional types of ramps.
- Lighting. There are significant ranges of bright to dark exist from existing light fixtures.
- 2nd Street & Buckboard Trail. These segments do not have the same level of amenities as the other segments in this District. These streets lack seating, have more frequent driveways making for a discontinuous path of travel, and lack the thematic landscaping/shade and architectural elements common within the District.

Main Street Arts District

- Sidewalk Width. Maximum and minimum widths are variable, ranging from less than 4 feet to over 8 feet in width.
- Sidewalk Surface and Texture. A number of sidewalk surface materials prevail in this District.
- Curbs. Curb height varies.
- Accessible Ramps. Segments lack of tactile strips and portions have double or triple curbs.
- Driveway Crossings. First Avenue has frequent driveway crossings.
- Lighting. Light fixtures have a wide range of bright to dark.
- Shade. Infrequent tree spacing offers little shade.
- Theme. First Avenue and Marshall Way segments lack a cohesive theme and seating.

Marshall Way/5th Avenue Arts District

- Sidewalk Width. Sidewalk width varies in these districts from less than 3 feet to more than 14 feet. An isolated section of 3rd Avenue is 22 feet wide.
- Sidewalk Clearances and Obstructions. Some wall-mounted objects and landscaping protrude into the walkway. The frontage zone for opening doors and window shopping is insufficient. Some boulders, benches and planters are obstacles in the pedestrian travel path. Some outdoor dining uses appear to infringe on the pedestrian travel way.
- Sidewalk Surface and Texture. Many areas with sidewalk joints have expanded, and buckled curbs and sidewalks exist.
- Driveways and Crossings. There are a large number of driveways that makes the pedestrian path of travel discontinuous.
- Accessible Ramps. Ramps lack tactile strips and color contrast. Ramps do not provide direction to the crosswalk or to the ramp across the street.
- Theme. An overall theme is lacking in this area, where public art is scarce and seating is infrequent.

Major Pedestrian Deficiencies in Downtown Districts

Northeast Quadrant

- Sidewalk Width. Sidewalk width in this area varies from four feet to more than 10 feet in width.
- Sidewalk Surface and Texture. All segments have uneven surfaces with indents greater than one-quarter inch.
- Driveway Crossings. Most segments have a large number of driveway crossings.
- Accessible Ramps. All segments lack ramps with tactile strips and color contrast. Ramps do not provide direction to the crosswalk or to the ramp across the street.
- Lighting. In general, most segments have very low lighting or none at all.
- Theme. There is no cohesive theme in this area. Landscaping is lacking, along with seating, shade and architectural elements. No public art or public space exists in this District.

Source: *City of Scottsdale Downtown Pedestrian Mobility Study*, Maricopa Association of Governments and City of Scottsdale, January 2007.

APPENDIX K: REVIEW OF SIDEWALK CAFES

Process

License Agreement Requirements. Requests for sidewalk cafes on public rights of way must have a license agreement with the City of Scottsdale. The issuance of a permit to encroach on the public right-of-way with a sidewalk cafe shall not constitute or be construed to constitute an abandonment of the City of Scottsdale of its interest in the public right-of-way or associated easements. Outdoor dining improvements should be temporary in nature as the City of Scottsdale may require that items be moved from the public right-of-way. At minimum, the Transportation General Manager, or a person designated by the Transportation General Manager, must review all requests to infringe upon the public right-of-way with a sidewalk cafe.

Parking Requirements. If more than 500 square feet of sidewalk cafe is added, additional parking may be required. Parking requirements will vary based on a number of factors, including the type of business and its location. Business owners should ensure that available parking at the business location meets the requirements of the zoning code.

In Downtown Scottsdale certain properties may have parking credits assigned to them or other specific parking conditions affecting parking requirements and availability. This information should be sought from the building owner, leasing agent or the City. For Downtown parking information from the City, call 480-312-7734. For general parking information on requirements in other areas of the City, call the One Stop Shop at 480-312-2500.

Liquor Service Requirements. If liquor will be served in the outdoor patio/sidewalk cafe, requirements of the City of Scottsdale and Arizona Department of Liquor Licenses and Control must be followed. As part of Scottsdale's liquor license process, applicants are required to complete and submit a liquor license questionnaire to the City of Scottsdale Planning and Development Services Department, submit a state liquor license application to be processed concurrently with the Scottsdale conditional use permit request, and complete and submit a City of Scottsdale liquor license application. Additional information is located on the City of Scottsdale Web page at www.scottsdaleaz.gov/bldgresources/counterresources/LiquorLicenses/default.asp.

Evaluation of Sidewalk Cafes

For all sidewalk cafes, the Transportation Department staff will evaluate the width of the sidewalk, presence of potential barriers and obstacles that may infringe on a continuous pedestrian path of travel, and the amount of pedestrian use and the impact of the cafe's location on pedestrian activity.

The Planning and Development Services Department will evaluate all sidewalk cafes for compliance with liquor license agreements and parking requirements.

Capital Projects Management/Real Estate Group will evaluate whether a license agreement is necessary for use of the City's right-of-way and work with the property owner to create an appropriate agreement.

The Downtown Group will evaluate sidewalk cafes proposed for Downtown Scottsdale.

General Requirements. Sidewalk cafe operators must:

- Ensure that the sidewalk cafe operations do not interfere with pedestrians or limit their free and unobstructed passage.
- Keep the sidewalk cafe clean.
- Keep the area surrounding the sidewalk cafe clean.
- Provide trash receptacles for use by cafe patrons if throw-away utensils, cups and plates are used.
- Keep site furnishings and landscaping clean and in good condition.
- All operations, including serving of food and beverages, must occur within the defined sidewalk cafe area and/or within any enclosure.

Pedestrian Clearance. Exceptions to the pedestrian clearance requirements may be granted after a site review by the Transportation Department.

A minimum six-foot pedestrian clearance is required along sidewalks and walkways. An eight-foot minimum clearance is desirable in areas with high levels of pedestrian activity, such as Downtown Scottsdale. The minimum clear zone shall be measured from the outermost point of the sidewalk café to the nearest obstruction in the pedestrian travel way. The minimum clear zone shall be a continuous sidewalk that is free of obstructions, including street furniture and landscaping. A landscaped strip is not included in the six-foot minimum.

Recesses in building facades shall not be used to satisfy the minimum clear zone requirement.

The sidewalk/walkway minimum clear zone must be clearly defined and continuous. Linkages to accessible building entrances and parking areas, waiting and drop off zones, sidewalks and walkways, and transit stops must be maintained.

The sidewalk/walkway minimum clear zone must be well maintained at all times and free of litter.

The sidewalk/walkway minimum clear zone must be free of barriers and obstacles, such as traffic signals or signs, bus stops, benches, newspaper stands, trash receptacles, tables and chairs, planters and landscaping, and similar items.

The sidewalk/walkway minimum clear zone shall be free of utility covers, decorative pavers with joints, and other surface features that create a rough or bumpy surface that may pose difficulties to persons using wheelchairs or scooters.

The sidewalk cafe shall be designed to allow for safe passageway for persons with disabilities and persons with visual impairments. Truncated domes or other devices may be required to alert pedestrians with visual impairments of crossings or other changes in use of the sidewalk.

The grade of the sidewalk/walkway minimum clear zone should generally follow that of the adjacent roadway. The cross slope of the minimum clear zone should be two percent or less.

Fencing and Barriers. Fencing should have an open appearance with a defined edge. Barriers required for establishments serving liquor need to meet additional requirements. Fencing/barriers should be removable to allow for other uses of the public right-of-way.

To ensure the access of visually impaired pedestrians, fencing should be a minimum height of 27 inches and be detectible with a cane.

Location. Sidewalk cafe areas should ideally be located in areas where the sidewalk/walkway is at least 10 feet wide. Sidewalk cafes may be considered in areas with sidewalks/walkways less than 10 feet if safety issues of pedestrian clearance, sidewalk surface and pedestrian separation from vehicular traffic are addressed.

Sidewalk cafes shall not extend onto the frontage of adjacent property owners unless written permission is obtained.

Sidewalk cafes are not permitted in areas where, in the opinion of the Transportation General Manager or designee, they obstruct sight lines at intersections or cause operational or safety issues on public rights of way.

Furnishings and Landscaping. Furnishings in the sidewalk cafe shall consist only of moveable tables, moveable chairs and moveable umbrellas. Landscaping may be placed in moveable planters.

Cafe furniture should not be attached, permanently or temporarily, to lampposts, streetlights, trees or any public street furniture.

Sidewalk cafe improvements shall be set up only during hours of operation and may not be stored or stacked outside on the public right-of-way at any time.

Cafe furniture shall not infringe on the required sidewalk/walkway minimum clear zone.

Existing public site furniture, landscaping and planters may NOT be removed to satisfy the clear zone requirement unless approval is received from the City of Scottsdale Planning and Development Services Department.

Relationship to Crosswalk. If a crosswalk is adjacent to the property with a sidewalk cafe, the crosswalk must intersect perpendicularly with the sidewalk/walkway minimum clear zone. Sidewalk curb ramps must be located at the center of the sidewalk and provide a level landing space of four feet by four feet minimum (five feet by five feet is preferred) with a maximum two percent slope.

Liability and Insurance Requirements. Liability and insurance requirements when using the public right-of-way for a sidewalk cafe are addressed in the license agreement between the property owner and the City of Scottsdale.

APPENDIX L: CITY OF SCOTTSDALE SAFE ROUTES TO SCHOOL PROGRAM

1.0 Introduction

Safe Routes to School (SR2S) programs began in Denmark in the 1970s to address children pedestrian fatalities.⁷¹ SR2S programs can help:

- to reduce the number of children hit by cars
- reduce congestion around schools by encouraging more students to walk and bicycle to school
- improve children's health by increasing physical activity that can help reduce obesity and related physical ailments caused by obesity
- improve air quality by reducing vehicle emissions
- increase a child's sense of freedom, establish a lifetime of habits and teach safe bicycling and walking skills.⁷²

2.0 Current School Safety Efforts

In September 2005, the City of Scottsdale's Traffic Engineering Division initiated proactive school site transportation audits to identify potential transportation improvements that would help provide safe access to and from schools in Scottsdale. An initial goal was set to audit every public school in the city by the end of the school year, May 2006. The intention of the transportation audit was to identify major issues at many schools and to focus on areas adjacent to school and existing school crossings for engineering and safety improvements.

Since that time, Transportation Department staff has performed on-site visits of Scottsdale schools during morning drop-off and afternoon pick-up hours. Following each site visit, a report was prepared which indicated general observations by staff from Traffic Engineering and Transportation Planning who attended the review. Each report also lists recommended changes and other issues that could be addressed as part of a longer-range program.

3.0 Toward A Comprehensive Program

According to the National Highway Traffic Safety Administration⁷³, the most successful SR2S programs use elements from the following four approaches:

- **Engineering.** Engineering approaches focus on creating physical improvements to the infrastructure surrounding the school, determine school speed limit zones, and establishing safe crossings. Engineering can help influence and change behavior by creating safer environments for bicycling and walking.

⁷¹ Safe Routes to School Workshop, Roadrunner Elementary School, Phoenix, Arizona, September 21, 2005.

⁷² Ibid.

⁷³ Safe Routes to School Toolkit, National Highway Traffic Safety Administration, September 2002 DOT HS 809 497, <http://www.nhtsa.dot.gov/people/injury/pedbimot/bike/Safe-Routes-2002/>.

- **Enforcement.** Enforcement strategies use local law enforcement to help improve driver behavior, help children follow traffic rules, decrease parent perceptions of danger and increase awareness of pedestrians and bicyclists.
- **Education.** Education strategies teach students and drivers important safety skills, creates awareness of safety and helps to foster life-long safety habits. Education programs should include children, parents, neighbors and drivers in the school area.
- **Encouragement.** Encouragement strategies use events and contests to entice students to try walking and bicycling to school.

Many programs also include a fifth “E” – evaluation - to assess the effectiveness of different engineering, enforcement, education and encouragement measures.

In doing the safety audits described previously, the city has already taken a critical step in identifying engineering solutions necessary to ensure school safety. By focusing on low cost, easy to implement solutions, such as signage, paint/stripping and curb ramps, it was hoped that support for other elements of a comprehensive program: more thorough engineering treatments, enforcement, education and encouragement would be generated. The overall purpose of a SR2S program, specific elements of the proposed SR2S program, and required resources are outlined below.

4.0 Program Purpose and Goals

There are two primary goals with a SR2S program:

- Wherever it’s safe, encourage children to walk and bicycle to school.
- Where safety deficiencies exist, correct them so that children are able to safely walk and bicycle to school.

5.0 Program Elements

5.1 Create a Transportation Safety Committee at Each School

A transportation safety committee should be created at each school. Some schools may already have transportation safety committees. To be effective, the committee should meet on a monthly or quarterly basis, and may meet more often as activities warrant. The committee should have the ability and means to communicate to the entire school the content and decisions discussed at the meeting through updates to a school newsletter or other appropriate means. The committee should be limited to 10 members to promote efficiency in decision making.

Providing a safe environment for students to travel to and from school requires the attention and cooperation of city officials, the police department, students, parents, school district officials, and school personnel. Therefore, at a minimum, a transportation safety committee should include:

- City staff liaison (s)
- Parent (s) who represent the Parent Teacher Organization
- School staff member (s), such as the School Secretary

- Law enforcement officials/school resource officer
- Crossing guard (s)
- School Principal
- School District Transportation Department Representative

Other participants in the SR2S Committee could also include children/students, nearby businesses, community groups, and neighbors.

For each school, the committee should be formalized with a linkage to the parent teacher organization or as a part of the school's safety committee to ensure credibility and sufficient resources. The Committee can assist in collecting information, organizing events and contests to encourage students to walk or bicycle to school, providing donations and prizes for contests, and promoting and publicizing the program through school newsletters, flyers, press releases or presentations to community organizations.

The Committee will also perform school safety audits to identify potential improvements that may enhance the safety of students traveling to and from school. This process is discussed further in the following pages.

5.2 Committee Kick-Off Meeting

After volunteers are organized to participate in the Committee, a kick-off meeting to discuss the goals and purpose of the SR2S program should be held. A draft presentation that can be used to educate committee members about the SR2S program has been created, using information provided by the Centers for Disease Control and Prevention (<http://www.cdc.gov/nccdphp/dnpa/kidswalk/>) and other sources. This presentation can be tailored for each school and it can be supplemented with additional talking points available at the US Department of Transportation web site at <http://www.nhtsa.dot.gov/people/injury/pedbimot/bike/Safe-Routes-2002/toc.html>. At the kick-off meeting, create a list of key tasks or strategies to accomplish the goals (such as creating a SR2S event), assign tasks to Committee members and identify a timeline for their completion. The main focus of the committee should be to create a specific SR2S implementation plan for their school.

5.3 Create Partnership Agreements

Having the cooperation of all agencies responsible for implementing a SR2S program is critical to the program's success. Partnership agreements from the city, the school board and the school principal demonstrate an agency commitment to the SR2S program and commit to participating by providing staff resources. The city of Scottsdale can help provide police enforcement for events, and the transportation department can serve as a resource for data collection. Commitment from the principal and school board will help to assure class time is set aside for the program and to help promote events and contests.

5.4 Collect Information

Collecting information is important to understanding the different dynamics of each school and can also be used to determine the effectiveness of the SR2S program in changing behaviors

and addressing program goals. Collecting baseline data through surveys and traffic counts can help identify how students currently arrive at school. Student surveys can be used (a show of hands during homeroom classes) to identify how students arrive at school (being dropped off by a parent or sibling in a car, carpooling with another adult, walking with a parent, walking alone, bicycling, skateboarding or roller blading, or arriving by bus). Surveys can be done by older students as a way to incorporate SR2S into other school curriculum, or by volunteers from the SR2S Committee. Repeating the survey at the end of the school year can help identify changes in student travel behavior.

Traffic counts can supplement survey information by determining how many vehicles enter school grounds to drop off children, how many children bicycle or walk to school, and how many children are bussed to school. A simple traffic count requires volunteers at each school entrance to count cars that arrive during the half-hour before school begins. Counting the number of bicycles parked in the bicycle rack after school begins demonstrates the number of children bicycling to school, and bus drivers can count the number of children on their buses. Traffic counts can be repeated at the end of the school year to determine any changes in traffic patterns, and can also be repeated during SR2S events. Older students also can conduct this traffic count survey as a classroom activity.

Parent surveys can be used to measure attitudes and opportunities for changing behavior. Ask parents who drive their children to school what might get them to allow their children to walk or bicycle to school. This information will aid in the design of a SR2S program that addresses safety concerns of parents. Surveys should also ask parents if they want to volunteer, and provide space on the survey for their name and contact information. Parent surveys can be distributed to parents by mail or sent home with students; discuss the best options with the SR2S Committee and school staff.

Other important data includes traffic and crash data to help identify any potential problem areas, the geographic boundaries of the non-busing area, the number of students within the walk/bike area, and the school population breakdown by grade.

5.5 Create a Map of Routes Used To Get To School and Evaluate the Travel Environment

After collecting data and finalizing partnership agreements, the Transportation Safety Committee should move forward to create a map of routes used by students to get to school. The objective of this map is to identify an environment where children and parents feel comfortable walking or bicycling to school. The Committee should identify safe routes to school for all students within the walking attendance boundary for the school. Ideally the Committee should walk or bicycle the routes in groups to complete the evaluation form. This evaluation may occur over multiple meeting times, and should include some analysis during both school drop-off and pick-up hours since conditions during these times may be different.

Students can also be involved in the evaluation effort. Pedestrians and bicyclists can map their own routes to school and identify problems because those who walk and bike regularly are already familiar with their streets.

City staff can lend assistance in providing aerial base map information. When identifying the safest routes to school, the Committee should aim to minimize street crossings and avoid

crossing busy streets where possible. The Committee may identify several concerns in the walking attendance boundary that would prevent an environment where children and parents feel comfortable walking or bicycling to school.

Once the map is completed, the school should distribute the aerial maps documenting the safest routes to school to students and parents and should also have it available in the school office for new students. If the walking boundaries of the school change, additional evaluation will need to occur and the map can be revised.

5.6 Identify Issues and Find Solutions

After identifying a map and completing the evaluation tool, problems will be evident. These problems will likely require a combination of engineering, education, enforcement and encouragement solutions. The Transportation Safety Committee can work with city staff to help identify solutions for safety issues like speeding cars, congested and wide intersections, lack of sidewalks, missing or ineffective crosswalks, overgrown landscaping, lack of bike lanes, etc.

Toolboxes of engineering, enforcement, and education solutions abound, and include:

- The Safe Routes to School web site sponsored by the National Highway Traffic Safety Administration, <http://www.nhtsa.dot.gov/people/injury/pedbimot/bike/Safe-Routes-2002/>
- The National Center for Safe Routes to School at www.saferoutesinfo.org.
- The Safe Routes to School web site maintained by the Marin County Bicycle Coalition at <http://www.saferoutestoschools.org/>
- A document titled "Toolbox to Address Safety and Operations on School Grounds and Public Streets Adjacent to Elementary and Middle Schools in Iowa", dated August 2006 and available from the Center for Transportation Research and Education.

It is anticipated that specific educational and encouragement solutions will be selected by the Transportation Safety Committee depending on the issues identified.

5.7 Develop a SR2S Improvement and Implementation Plan

After identifying the issues most important to address, the Transportation Safety Committee should create an improvement plan. The plan should identify major issues and solutions that include engineering, enforcement, education, and encouragement solutions.

It is important to obtain sufficient feedback, review and comment on the draft SR2S Improvement Plan before it is finalized. It may be appropriate to present the school map and draft Plan to the parent teacher organization and other parents. Comments received can then be incorporated into the plan before it is finalized. Presenting the draft plan to a broader audience may also help to generate support for the SR2S program and its implementation.

An important component of the plan is prioritization and timing of specific measures. Prioritization helps to focus limited resources on the most important solutions to implement. It is likely that the some solutions will have to be relatively easy to implement within available resources, while others may not be able to be implemented without additional funding. The plan should include an implementation schedule and assign responsibility for implementation to the appropriate person or organization (school, school district, city, police department, parent organization, teachers, etc.).

Traffic control recommendations will be the responsibility of the City of Scottsdale, and could include items such as “No Parking” signs, “Stop” signs, 15-mph school crossings, or new traffic signals. Most times traffic studies will be needed to determine appropriate changes. These studies may require traffic volume measurement, pedestrian volume measurement, speed measurement, and review of traffic accident history. Traffic control decisions must meet State and Federal criteria. With the exception of a new traffic signal, most traffic control changes can be accomplished within a few months time frame.

Infrastructure recommendations can also be implemented by the City of Scottsdale. Examples of infrastructure recommendations are sidewalk repair or construction and addition of turn lanes at intersections. Because these improvements are subject to the availability of existing funding and the overall budgeting process for the Capital Improvement Program, infrastructure improvements may take several months or years to complete.

The City can also assist with property maintenance recommendations. Public property maintenance, including replacement of damaged signs and trimming of landscaping can be addressed by initiating a work order. These kinds of concerns can usually be addressed fairly quickly, typically within a few weeks. Private property maintenance, including trimming of landscaping, can be referred to the City’s Code Enforcement department to be addressed. Code enforcement issues can usually be resolved within a few months.

Recommendations for improvements on school property would need to be evaluated by the School District and the school. City staff can assist the school and the district on potential changes, such as those to drop off and pick up locations and procedures. The city can also help the school develop parent “parking patrols” to assist with the safe and efficient completion of pickup and dropping off of students. Parking patrols, staffed by parents and other community volunteers, could be one solution organized by the Transportation Safety Committee and included in the SR2S Improvement and Implementation Plan.

The City can also assist the school in identifying the need for education and encouragement measures. Bicycle and safety training can occur through a number of organizations through school assemblies or classroom lessons. It is envisioned that school curricula would need to meet district requirements and would therefore be developed jointly by members of the Transportation Safety Committee with oversight provided by the school and the school district.

The SR2S Improvement and Implementation Plan should be compiled into a document by city staff. The draft document should be reviewed by all Transportation Safety Committee members and their comments should be incorporated into the final document. The document should include the aerial map identifying the safest routes to school, a copy of all evaluation checklists, a copy of recommendations, an action plan with assigned responsibility and timeframe. The final

document should be retained by all members of the Transportation Safety Committee for future reference.

5.8 Fund the Plan

Funding sources are available to implement SR2S programs, including federal transportation funding sources such as the Congestion Mitigation and Air Quality Program, the Transportation Enhancement Program, and the Arizona Department of Transportation Safe Routes to School Program. The City can also provide funding for capital improvements subject to the annual budgeting process.

5.9 Act, Evaluate and Make Changes if Needed

The next step is to implement the SR2S Improvement Plan, which could include items such as hosting school events, educating children and parents, enforcement in school zones and sidewalk improvements. After changes are made, evaluating their effectiveness with student and parent surveys will help to determine if changes to the plan are needed.

6.0 Maintain Enthusiasm for the Program

According to the National Highway Traffic Safety Administration, “it takes time to develop new cultural attitudes about transportation. Be sure to reintroduce your program every year at the beginning of the school year.” Some ideas from the NHTSA include:

- Holding a kick-off event or assembly to generate excitement about the SR2S program.
- Notify parents by including program information in parent packages sent from the school.
- Hold regular Transportation Safety Committee meetings at times when most people can attend.
- Meet with the principal and teachers at the beginning of the school year to plan in-classroom activities for the year.
- Hold parent gathering events to encourage parents to form “walking school buses”, “bike trains” and carpools.
- Keep the school community informed about the program. Each new success can help to build increased support for the program.
- Measure success through surveys. Surveys that show increasing numbers of pedestrians, bicyclists and carpoolers coming to school show that the SR2S program is working!
- Inform the community about the program through press releases and newsletter articles.
- Celebrate every success, large or small. Reward all involved for a job well done.

7.0 Implementation Plan for City of Scottsdale

The table on the following pages lists an implementation plan for a SR2S program in Scottsdale. Because existing resources remain fixed, the program will need to be built slowly. Program expansions will build upon lessons learned during the implementation of the program with a few schools.

Action Item	Tentative Timeline	Responsibility
Initial contact schools with publication describing program.	December 2006	South Area: ??? Central Area: ??? North Area: ???
Apply for ADOT SR2S funding for giveaway items and contract worker support for program.	November and December 2006	
Follow up and determine which schools are willing to participate in the program. The goal is to identify one or two schools willing to implement a program for the 2007/2008 school year (Grayhawk Elementary will likely be one of these schools).	January 2007	
Finalize list of schools willing to participate in program.	January 2007	
Publication #2: parent safety tips, child safety tips, nutrition	February 2007	
Meet with school officials to describe program; create transportation safety committees; committee kick-off meetings	January to March 2007	
Finalize partnership agreements	March 2007	
Publication #3: sun safety at school, creating a SR2S implementation plan, ideas for activities for walk to school month.	April 2007	
Identify potential events to be included in FY 2007-2008 school programs	April and May 2007	Transportation Safety Committee
Collect information and create map of routes used to get to schools	April and May 2007	Transportation Safety Committee

Action Item	Tentative Timeline	Responsibility
Identify issues and identify solutions	April and May 2007	Transportation Safety Committee
Assemble materials to be included in welcome to school packets; organize kick-off event	June or July 2007 (depends on ability of committee to meet during summer months)	Transportation Safety Committee; Jim McIntyre, COS
Plan in-room classroom activities	August 2007	Transportation Safety Committee; Jim McIntyre, COS
Publication #4: benefits of walk to school events; ideas for activities for walk to school month.	August 2007	
Create SR2S Implementation Plans	August and September 2007	Transportation Safety Committee
Implement Plan; Evaluate Programs	Beginning September 2007	Transportation Safety Committee; Others as Identified in Plan
Publication #5.	October 2007	
Walk/Bike to School Events to Coincide with International Walk to School Month	October 2007	
Publication #6	December 2007	

APPENDIX M: ACCESSIBILITY DETAILS AND FORMS

APPENDIX N: LATENT DEMAND TECHNICAL REPORT

Introduction

As part of the Pedestrian Element of the City of Scottsdale's *Transportation Master Plan*, a pedestrian demand analysis was performed. Specifically, the latent demand method was used to estimate potential pedestrian trip activity throughout the City. The basis of this analysis was the results from a similar effort performed for and adopted in the Maricopa Association of Governments' (MAG) *Pedestrian Plan 2000*. That analysis (for horizon year 2020) was expanded and updated for Scottsdale. The following report documents various methods for estimating pedestrian demand, outlines the latent demand method procedure in detail, and describes the update that was performed for the City of Scottsdale.

Methods of Assessing Potential Pedestrian Trip Activity

There are three primary methods of assessing pedestrian trip activity. The first method is documenting *revealed demand*. This is accomplished by simply counting the existing number of people walking on the streets. A second method is to identify, map, and *evaluate potential trip generators or attractors*. In practice, this method tends to focus on major pedestrian trip attractors. The third method is to assess the *latent demand* throughout the study area. Assessing latent demand considers both existing and pent-up pedestrian activity. It also enables planners and engineers to anticipate and plan for future pedestrian travel needs. The following paragraphs briefly describe each of these three methods, their advantages and disadvantages.

Revealed demand

This method consists of compiling counts of existing pedestrians on the roadways. Its usefulness is limited to areas that already have an extensive sidewalk network that provides an overall high-quality walking environment. This method is not usable for the vast majority of U.S. metro area transportation networks, due to their generally poor pedestrian accommodation.

Evaluation of Key Pedestrian Trip Generators and/or Attractors

Until recently, this method has been the most common method of estimating pedestrian travel demand. However, it has two major problems: the limited number of pedestrian attractors it considers, and the fact that it generally focuses only on attractors – therefore only one end of the pedestrian trip is considered.

The first problem with this method is that it tends to focus on *major* pedestrian trip attractors such as schools, parks, and neighborhood retail centers, and thus only a fraction of the existing and potential pedestrian trip attractors are represented. In fact, virtually every residence, every business, and every social and service establishment in a study area is a pedestrian trip generator or attractor. Thus this method, in practice, fails to account for that fact.

The method's second shortcoming is directly related to the first. Since the method focuses on major attractors, only one end of the pedestrian trip – the destination, is quantified. This is a problem because the method does not account for the production (or supply) of trips available to that attractor. For example, a particular park may have many amenities, and hence exhibit a high trip attraction rate, but if it is in a rather remote area (i.e., the surrounding population density is very low) the actual pedestrian trip

activity (or interchange) between the attractor (park) and generator (population) would be low. Consequently, the method does not account for the pedestrian trip interchange reality that exists *among* generators and attractors.

Latent Demand

The method that quantifies both ends of the walking trip as well as considers *all* generators and attractors in a study area for both existing and potential trips is the *Latent Demand Method*. The *Latent Demand Method* is a logical extension of the second method, and it is rapidly becoming the method of choice for metropolitan areas throughout the United States. Numerous U.S. metro areas are using this method to estimate the potential of roadway corridors to serve bicycle and/or pedestrian trip activity; among them are Baltimore (MD), Birmingham (AL), Philadelphia (PA), Orlando (FL), Tampa (FL), Phoenix (AZ), Atlanta (GA), and Westchester, Rockland & Putnam Cos. (NY).

The *Latent Demand Model* is essentially a gravity model, based upon a theory similar to that used in the prevailing four step Urban Transportation Planning System-based travel demand models throughout the United States. The following sections outline its theory and technical application in a Geographic Information System (GIS) transportation planning environment.

THE LATENT DEMAND METHOD

Travel patterns in a metropolitan area are well described by Newton's law of universal gravitation as applied to trip interchanges, which is shown in Figure 1. This relationship essentially reflects that the number of trips, regardless of travel mode, between two areas is *directly* related to the number of trip productions (e.g. population residences) in one area and the number of trip attractions (eg., workplaces, shopping opportunities, schools, etc.) in the other (destination) area. The relationship also shows that impedances (e.g., travel distance and/or time between the areas, conditions of the travel environment, etc.) play a significant role in *reducing* the amount of trips made between those areas.

Walking activity patterns can be described by a similar relationship, see Figure 2. However, unlike those for the automobile travel mode, the impedances to the walking mode play a greater role. For example, the distance between trip origins and destinations affects walking more dramatically than it does for automobile travel. Additionally, the condition of the walking environment affects whether a walking trip is made and how far, and what route, a person is willing to travel (see Figure 3). Furthermore, depending on the purpose of the walk trip, the carrying, or "payload" capacity plays a role in not only the walk travel distances but also whether or not a walking trip is even made.

Impedances are different for different trip purposes. For example, people are typically willing to walk a greater distance to work than they are to simply pick up a convenience item at a neighborhood store. This phenomenon is reflected in national survey data, as depicted for three trip purposes in Figure 4. Essentially, the trip making probability varies according to the distance between origins and destinations, and it also depends on the purpose of the trip.

Application to Urban Travel Simulation

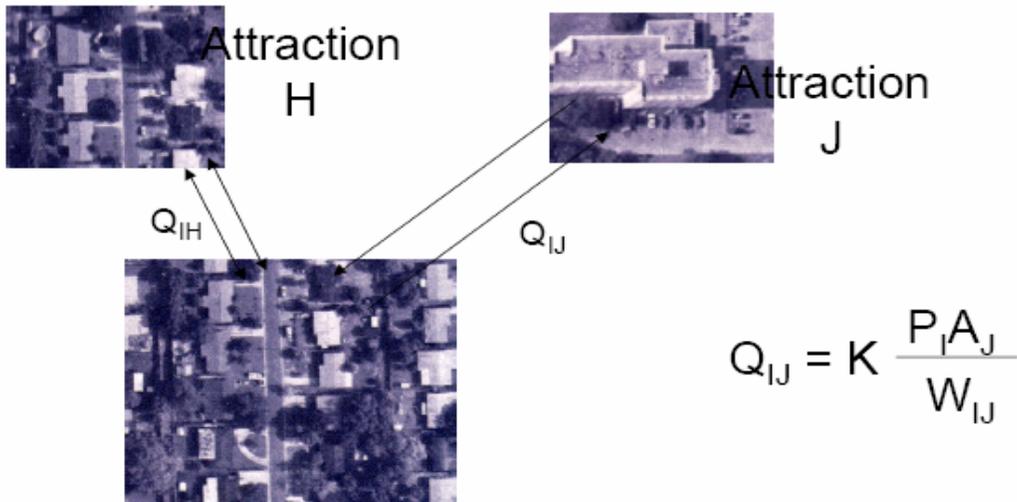


Figure 1 Newton's gravity model as applied to trip interchange.

Application to Urban Pedestrian Travel Simulation

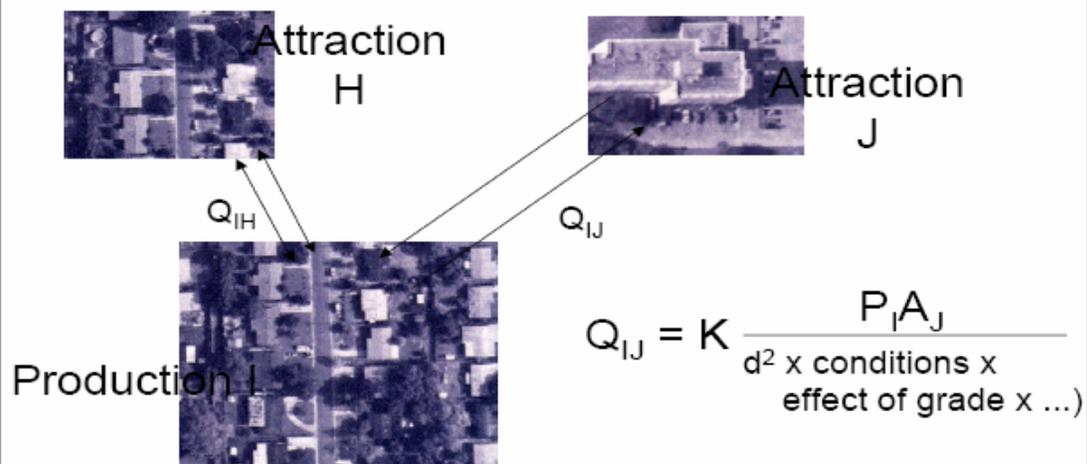


Figure 2 Walking trip interchange relationship.



Figure 3 Roadway conditions have a large effect on bicycling.

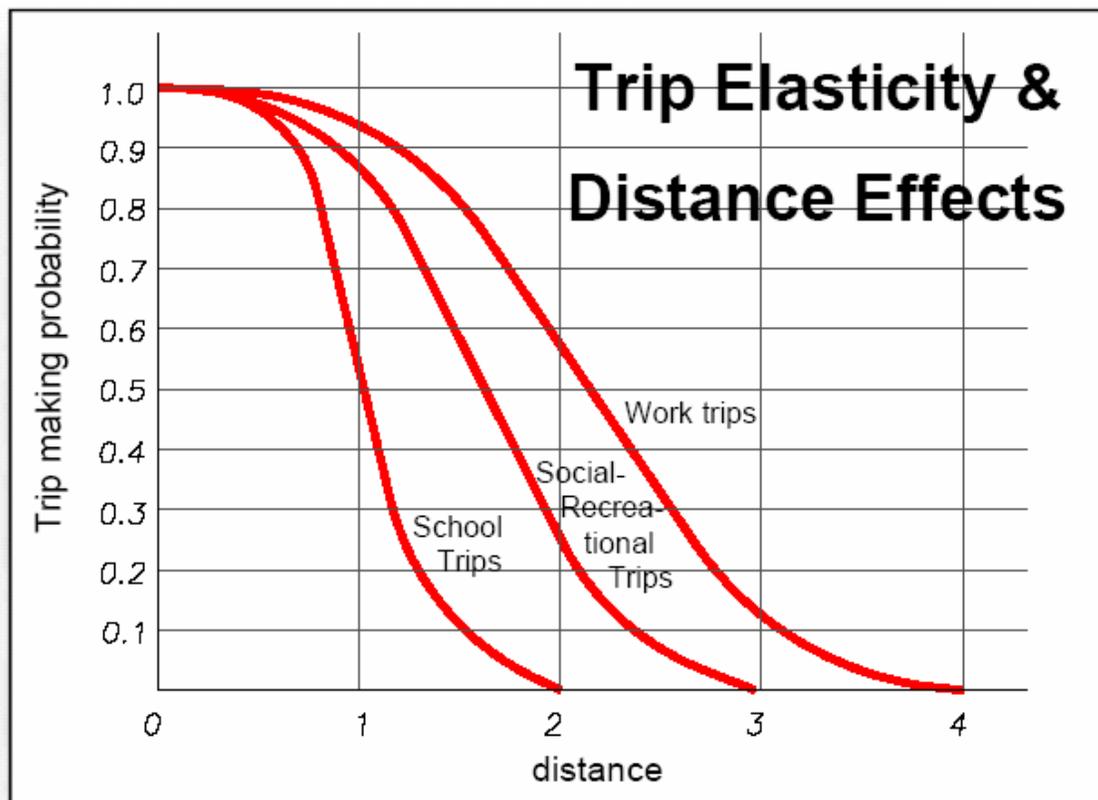


Figure 4 Typical trip making probability (impedance effects) due to distance.

The *Latent Demand Method* accounts for the above outlined characteristics of pedestrian travel in an area. While it is not a full and rigorous four-step travel demand model, it includes the trip interchange relationship in a gravity model trip distribution analysis but is conducted with a corridor focus. It models trips according to the four general utilitarian trip purposes identified in the National Household Transportation Survey (NHTS) shown in Figure 5. The *Latent Demand Model* is an analysis of the entire region, using a corridor-based, geographic information system (GIS) algorithm to quantify relative potential pedestrian trip activity.

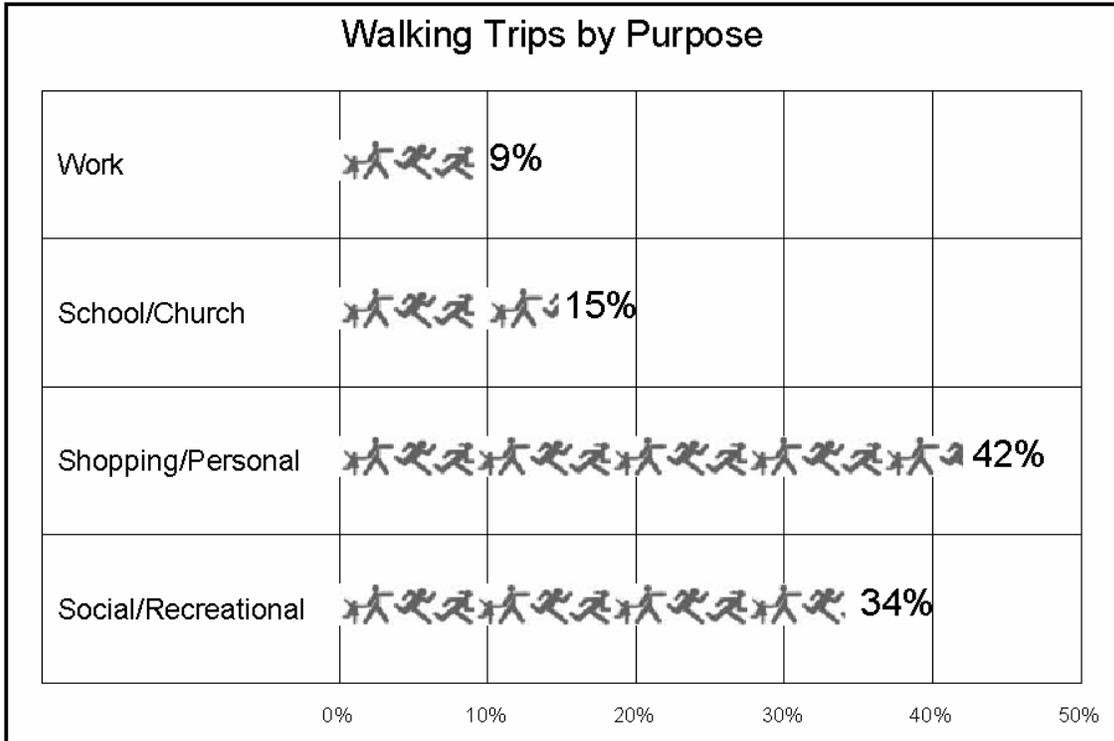


Figure 5 Walking Trips by Purpose.

The *Latent Demand Method* is an effective analysis tool for assessing pedestrian travel demand. It:

- Includes all potential trip generators and attractors
- Quantifies the potential trip interchange between generators and attractors
- Recognizes that different trip types account for differing shares of the total trips
- Estimates the trip making probability of each trip type as a function of distance, and
- Can be employed to assess the latent demand for any roadway network

As previously outlined, the impedances to walking as a transportation mode play a large role in the probability of a walking trip occurring. One of the significant impedances, the effect of motor vehicle traffic, is assumed not to exist for the purpose of calculating non-linked, or *latent* trips. This assumption is based on the premise that if motor vehicle traffic was not present, the “latent” pedestrian trips would become “revealed” trips.

Latent pedestrian travel activity is directly related to the frequency, magnitude, and proximity of trip generators and attractors to a roadway segment. Figure 6 is a stylized representation of the potential trip activity around a work trip attractor, such as an office complex. The intensity of the shading on the surrounding street network graphically depicts the relative trip activity given that the trips are coming from all directions and that there is no vehicular traffic on the streets. Figures 7 and 8 are stylized representations of this effect around attractors for social/recreational trips and school trips, respectively.

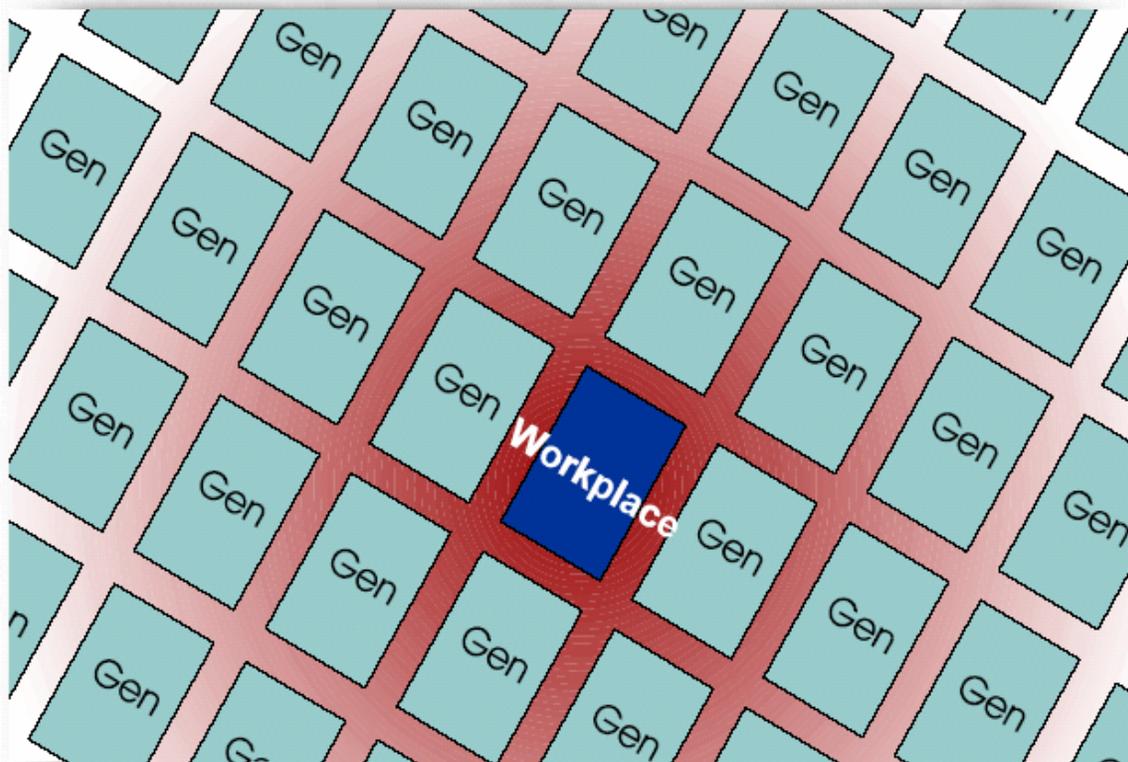


Figure 6 Potential trip activity around a work trip attractor.

The *Latent Demand Model* process takes these “snapshots” of the potential trip activity for *all* attractors and generators throughout the study area and essentially assembles them into a composite, as depicted in Figure 9. The intensity of the shading of the streets within this figure depicts the total relative potential pedestrian trip activity surrounding the generators and attractors. The street segments with the more intense areas of shading represent the corridor areas with the highest potential pedestrian trip activity. Figure 10 shows the mathematical expression of this GIS-based region-wide method.

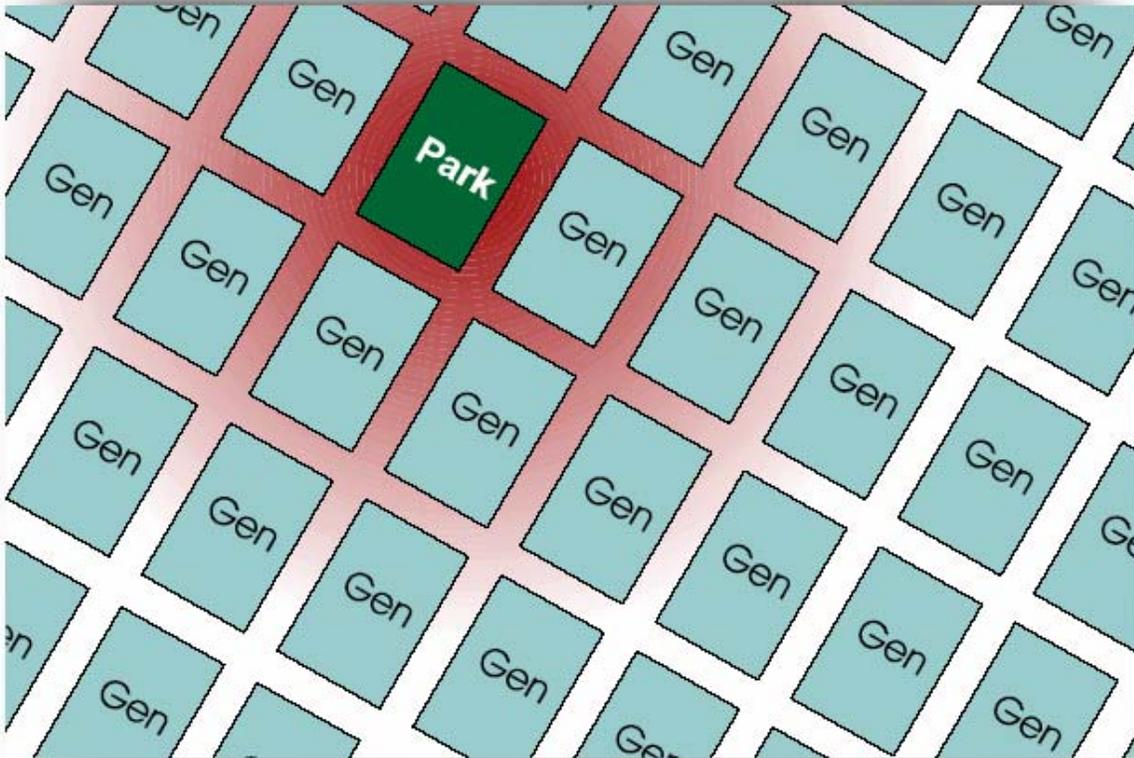


Figure 7 Potential trip activity around a social/recreational attractor.

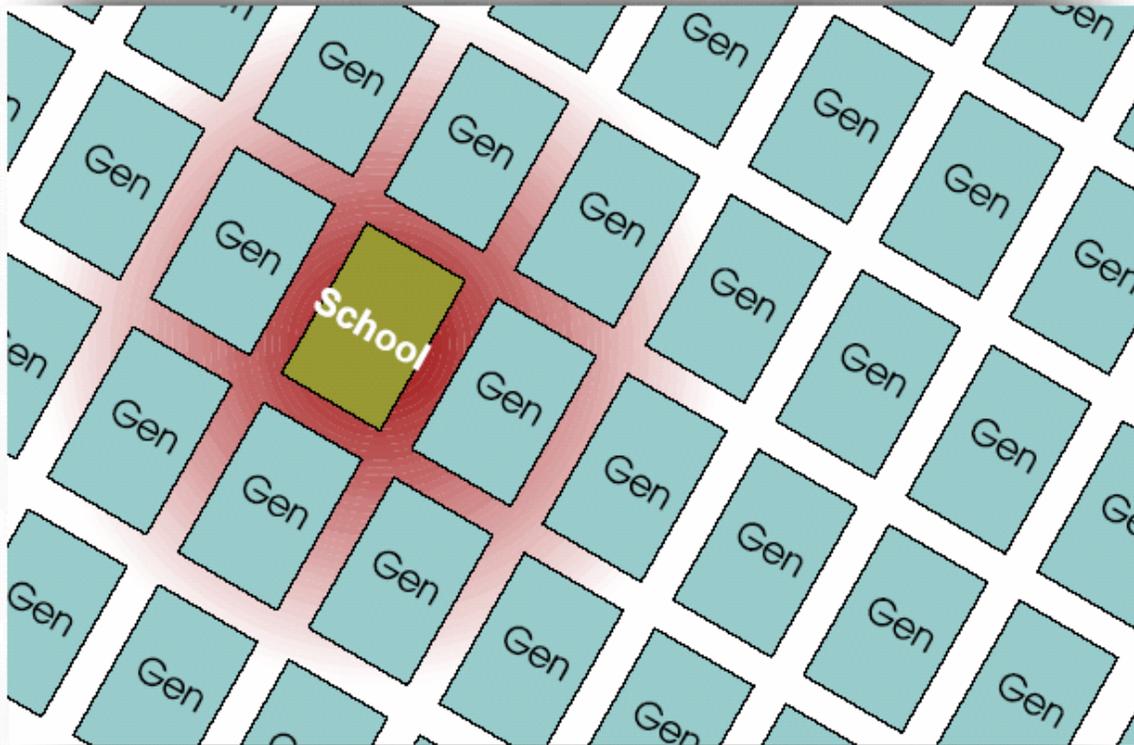


Figure 8 Potential trip activity around a school.

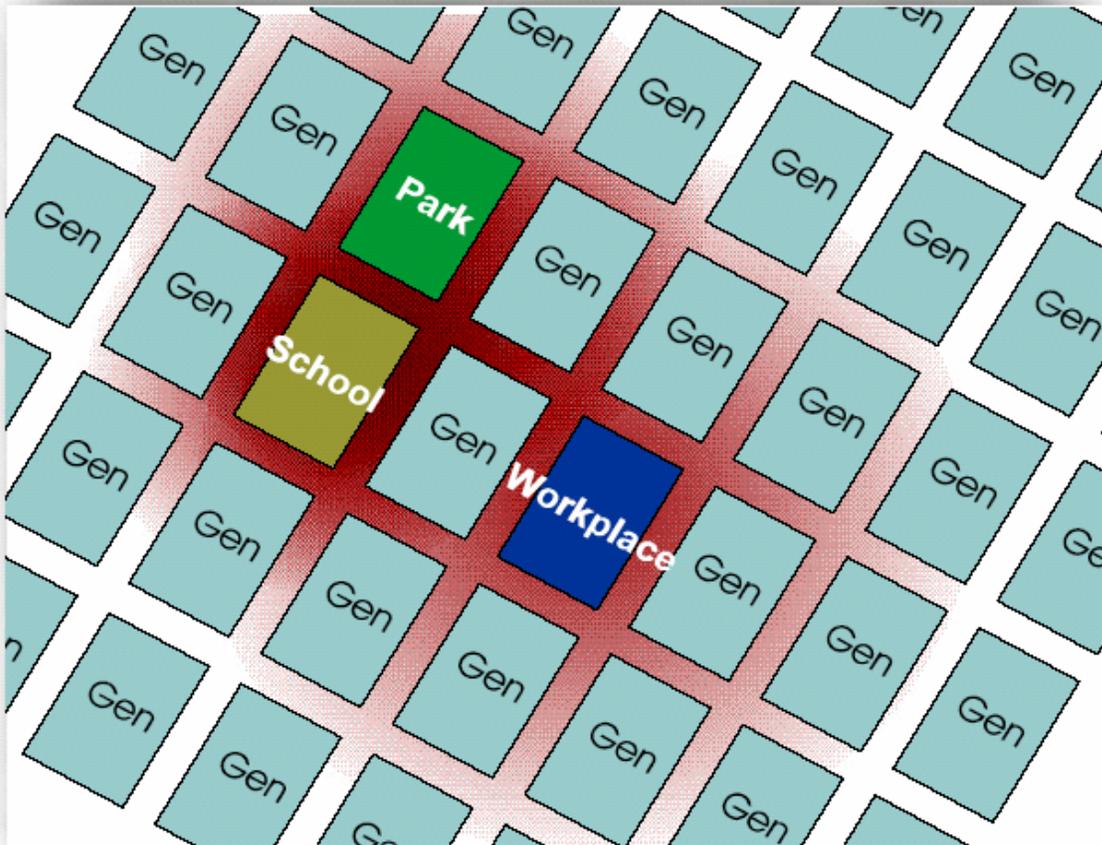


Figure 9 Composite of potential trip activity for three types of trip attractors.

$$LDS = \sum_{n=1}^4 TTS_n \times \frac{\sum_{n=1}^4 (GA_n \times \overline{TG}_n)}{(\overline{GA}_n \times \overline{TG}_n)} \times \left[\overline{TG}_n \sum_{d=1}^I P_{nd} \times ga_n \right]$$

n = bicycle trip purpose (e.g., work, personal/business, recreation, school)
 TTS = trip purpose share of all bicycle trips
 GA = number of generators or attractors per trip purpose
 \overline{TG} = average trip generation of attractor or generator
 P = effect of travel distance on trip interchange, expressed as a probability
 ga = number of generators or attractors within specified travel distance range
 d = travel distance range from generator or attractor

Figure 10 The Basic Latent Demand (score) Algorithm.

The following sections describe how the pedestrian travel demand analysis is performed within a GIS environment.

Generators, Attractors, and Spatial Queries

The first step in the process is to identify the generators and attractors that represent the trip ends for the four general trip purposes. Generators are the origin end of the trip and are represented by every residence in the study area.

Attractors are the destination end and are represented by every business, school, park and trail, and social and service establishment. The generators and attractors form the foundation of the pedestrian travel demand calculations that the *Latent Demand* method follows.

While the locations of many of the generators and attractors are individually identified, particularly for the school and social-recreational (parks) trip purposes, aggregated data is used for modeling the other trip purposes. For example, while the *Latent Demand Method* quantifies the trip generation of every residence for work trips, it does not use the physical location of every residence within the study area. Rather, the *Method* uses the aggregated population, as compiled in the Traffic Analysis Zone (TAZ) data from the region's transportation planning model. Likewise, the work trip and work errand demand analyses are based on TAZ employment data.

Once the generator and attractor data have been identified and geocoded or "mapped" into the GIS environment, spatial queries are performed around the network road corridors. The spatial queries "capture" the data for the calculation of potential trip interchange between origins and destinations within various travel distance ranges. The travel ranges are established from national survey data as reported in the NHTS study, and vary according to trip purpose. Each travel range represents a "buffer," and the buffers are the geographic limits of the spatial queries.

As the spatial queries are performed, their results are used to populate a database. That database is then programmed to calculate the trips within each buffer, per trip purpose. The road segments are used to represent a corridor area or "travel shed." The following sections document, for each of the four trip purposes, the generators and attractors identified, the mathematical relationship between them, and how the spatial queries are performed.

Work (Wk.) Trips The generators and attractors used to estimate the potential trip activity for this trip type are the TAZs' population density and TAZ total employment, respectively. The following equation shows the computational form of the spatial queries.

$$Q_{Wk} = \sum_{d=1}^n P_d \times \left[\sum_{z=1}^n \left(E_z \times \frac{\rho_z}{E_z} \right) \right]$$

Where:

Q_{Wk} = Total trip interchange potential for work trips

d = Spatial query buffer

n = Total number of buffers

- P = Effect of travel distance on trip interchange, expressed as a probability (see Figure 4)
- z = TAZ adjacent to network segment
- E = Total employment within buffer
- r = Population within buffer

Restriction:

$$\frac{\rho_z}{E_z} \leq 1$$

Figure 11a depicts the three spatial queries performed for work trips. The queries are segment-based which means that the queries/buffers are centered on the individual network segments. The buffer width of each query for this trip type (and indeed all of the trip types) is based on the pedestrian trip distances reported in the NHTS study.

While trips to colleges and universities might be considered as school trips, they are *modeled* as “work trips” due to the similarity of their trip characteristics with work trips (primarily trip length and regularity). Furthermore, the *generator* for trips to colleges and universities is the same as that for work trips - population. The attractors are the colleges and university locations. Their individual full-time enrollments (FTE’s) are used in the calculation of the trip interchange. Equation 2 mathematically describes how this trip interchange is calculated and how the spatial queries account for this information.

$$Q_{C\&U} = \sum_{d=1}^n P_d \times \left[\sum_{A=1}^n (FTE) \times S \times \frac{\rho_z}{FTE} \right]$$

Where:

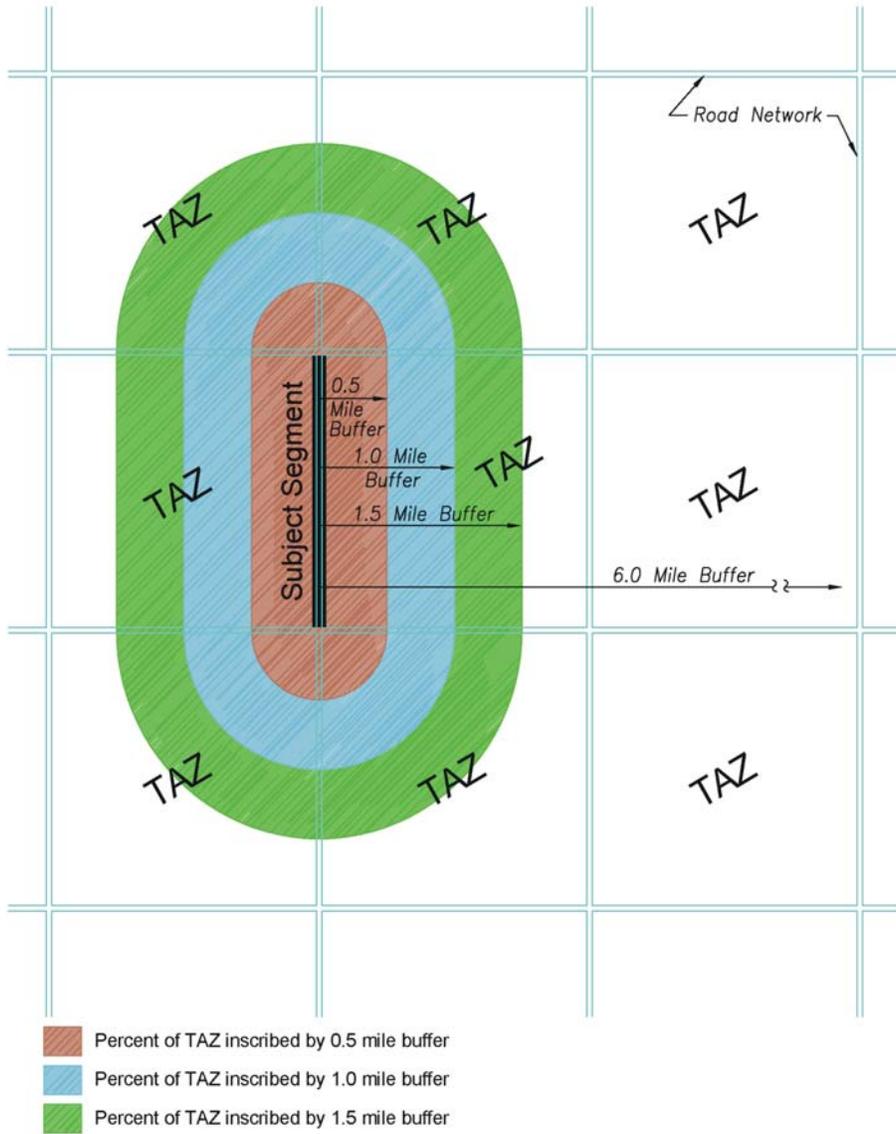
- Q_{C&U} = Total trip interchange potential for college and university trips
- d = Spatial query buffer
- n = Total number of buffers
- P = Effect of travel distance on trip interchange, expressed as a probability (see Figure 5)
- A = Number of attractors
- FTE = Full-time enrollment of college or university
- S = Percent of segment within TAZ
- r = Population within TAZ

Restriction:

$$\frac{\rho_z}{FTE} \leq 1$$

Figure 11a

Work Trip Spatial Queries (Segment-Based)



F:\data\001\8022-001\Bike Latent Demand Fig 11a.dwg

The spatial queries for college/university trips are performed differently from the other work trips. The essential difference is that the spatial queries for colleges and universities are *attractor-based* rather than segment-based. This means that the spatial queries are centered on the individual colleges and universities (see Figure 11b), rather than the corridor. As Figure 11b illustrates, the percent of the corridor falling within each buffer is used to normalize the corridor's trip interchange potential.

Shopping and Errands (SE) Trips As with the work trip, the generator for shopping and errand trips is population. The attractor is total employment per TAZ. The *Latent Demand Method* further subdivides this trip type into two categories of shopping and errand trips. The first is work-based errands, or those made by, and between, places of employment. For example, a person who picks up his/her dry cleaning during lunchtime is performing a work-based errand. The second category is home-based errands. An example of a home-based errand is a person going from their residence to a neighborhood store for a carton of milk or video rental.

Equation 3 is the mathematical expression that quantifies these two categories of shopping and errand trips.

$$Q_{SE} = \sum_{d=1}^n P_d \times \left[\sum_{z=1}^n (E_z + \rho_z) \right]$$

Where:

- Q_{SE} = Total trip interchange potential for the shopping and errand trips
- d = Spatial query buffer
- n = Total number of buffers
- P = Effect of travel distance on trip interchange, expressed as a probability (see Figure 5)
- z = TAZ adjacent to roadway segment
- E = Total employment
- r = Population within buffer

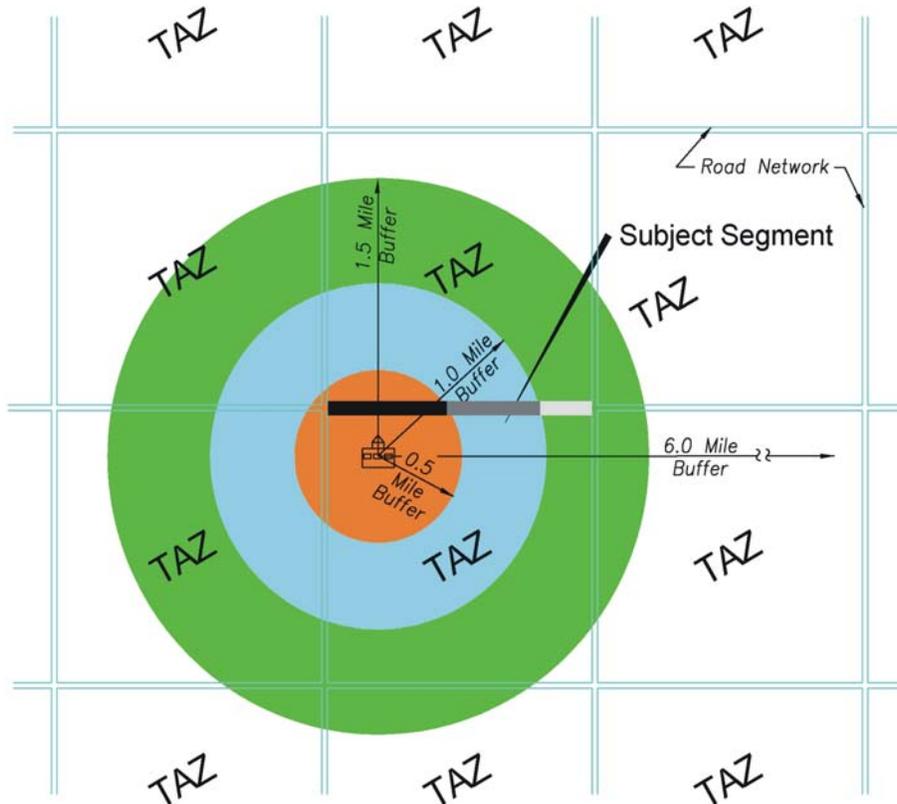
Restriction:

$$\frac{\rho_z}{E_z} \leq 1$$

The spatial queries for the shopping and errand trips are segment-based. Figure 12 graphically illustrates the two spatial queries performed for this trip type.

Figure 11b

Spatial Queries for Colleges and Universities (Attractor-Based)

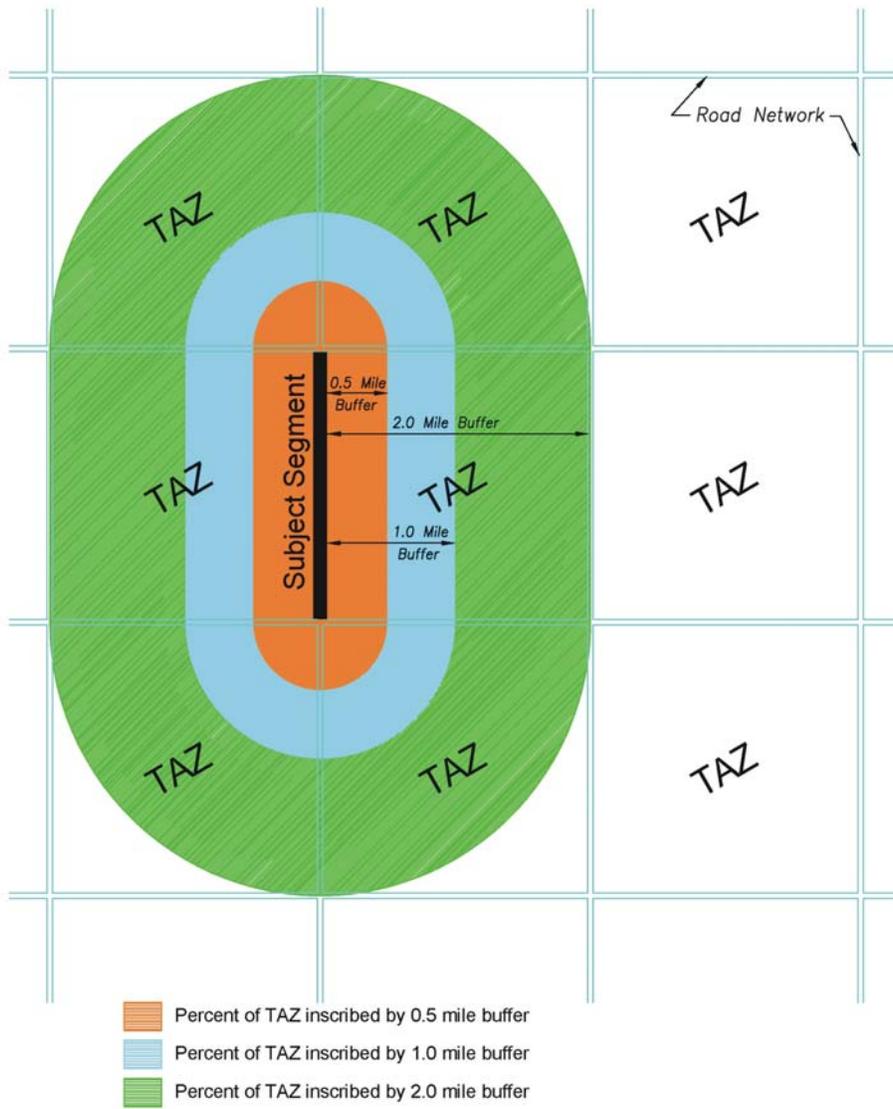


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- | | | | |
|---|---|---|---|
|  | Percent of TAZ inscribed by 0.5 mile buffer |  | % of Segment inscribed in 0.5 Mile Buffer |
|  | Percent of TAZ inscribed by 1.0 mile buffer |  | % of Segment inscribed in 1.0 Mile Buffer |
|  | Percent of TAZ inscribed by 1.5 mile buffer |  | % of Segment inscribed in 1.5 Mile Buffer |

Figure 12

Spatial Queries for Shopping and Errands (Segment-Based)



F:\peds\001\0025-22\Bike-Landsc Demand Fig. 12

School (Sc) Trips The locations of elementary, middle and high schools are the attractors for this trip type. Since students living within a two-mile radius of a school are generally not eligible to use the school transportation system, they are considered potential pedestrians. This two-mile radius constitutes a transportation exclusion zone for which potential pedestrian trip activity is measured. Equation 4 mathematically expresses the calculation of potential school trips. Average school enrollment for the entire school district is the base quantity used in determining potential trips.

$$Q_{Sc} = \sum_{d=1}^n P_d \times \left[\sum_{A=1}^n (2 \times ASE \times S) \right]$$

Where:

- Q_{Sc} = Total trip interchange potential for home-based school trips
- d = Spatial query buffer
- n = Total number of buffers or TAZs
- P = Effect of travel distance on trip interchange, expressed as a probability (see Figure 5)
- A = Number of attractors
- ASE = Average school enrollment
- S = Percent of road segment within buffer

As with colleges and universities, the spatial queries for this trip type are attractor-based. Figure 13 illustrates the two spatial queries performed for this trip type, and how the percent of the transportation network segment falling within each “buffer” is likewise calculated.

RECREATIONAL AND SOCIAL (RS) TRIPS

Public parks, trail heads, and trails are the attractors used for the Recreational and Social (RS) trip purpose demand assessment. They have been separated into two groups, 1) parks and trail-heads, and 2) urban trails.

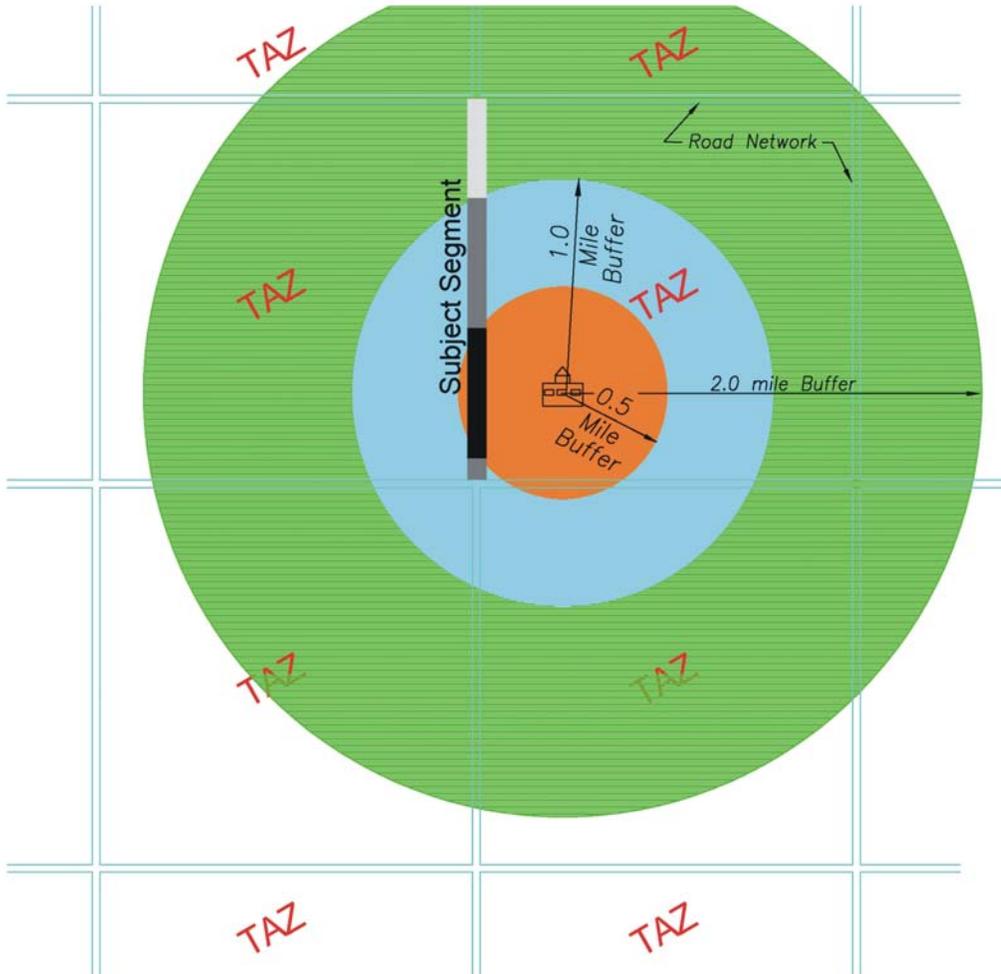
The reason for separating urban trails from the parks and trail-heads lies in how the spatial queries are performed. An urban trail is, in effect, a linear park. Therefore, the spatial query is performed from the trail itself to describe the portion of the road segment proximate to that portion of the attractor (the trail). Thus, the spatial queries for trails are attractor-based, whereas the spatial queries for parks and trail-heads are segment-based.

Prior to performing spatial queries on parks and trail-heads, the parks were stratified into three categories; major parks, staffed parks, and minor parks. The reason: the “attractiveness” of different types of parks. For example, a park that has ball fields and a swimming pool generally attracts more users than a park of equal size with fewer amenities. Accordingly, the trip attraction for the former will be higher than that for the latter. A definition of each park type along with its associated trip generation, follows:

- Major Parks – these are characterized as parks that have regularly programmed events and large, staffed events. Trip generation = 2,058 trips. [This is based on an average major park size of 688 acres multiplied by a Trip Generation Rate of 2.99 per acre.]

Figure 13

Spatial Queries for School Trips (Attractor-Based)



- | | |
|---|---|
| Percent of TAZ inscribed by 0.5 mile buffer | % of Segment inscribed in 0.5 Mile Buffer |
| Percent of TAZ inscribed by 1.0 mile buffer | % of Segment inscribed in 1.0 Mile Buffer |
| Percent of TAZ inscribed by 2.0 mile buffer | % of Segment inscribed in 2.0 Mile Buffer |

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- Staffed Parks – these typically have intermittently programmed events and staffed events. Trip generation = 313 trips. [This is based on an average major park size of 16.3 acres multiplied by a Trip Generation Rate of 19.15 per acre.]
- Minor parks – these generally do not have programmed events nor do they have staffed events. Trip generation = 11 trips. [This is based on an average major park size of 6.9 acres multiplied by a Trip Generation Rate of 2.23 per acre.]

Additionally, due to their attractiveness, trail-heads are considered major parks, and are assigned the same trip generation. The quantification of trip interchange for parks and trail heads is shown in equation 5, below.

$$Q_{\text{Parks}} = \sum_{B=1}^x \left[\sum_{C=1}^4 (A \times TG) \right] \times P_{nd} \quad (5)$$

Where:

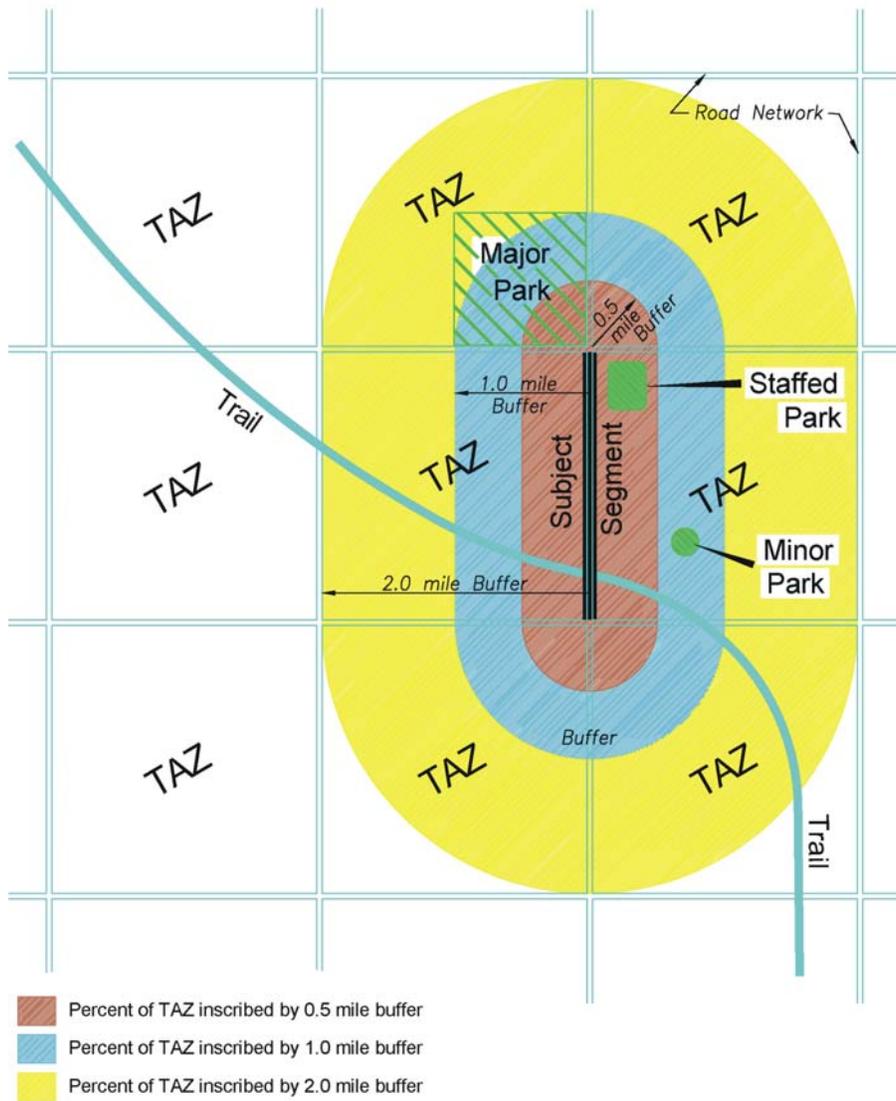
- Q_{Parks} = Total trip interchange potential for park trips
 B = Spatial query buffer
 x = Total number of buffers
 C = Type of park
 A = Number of attractors
 W = Weighted population density surrounding a road segment, see Eqn. (1a)
 TG = Trip generation (attraction) for park type
 P = effect of travel distance on trip interchange, expressed as a probability (see Figure 5)
 n = Pedestrian trip purpose (e.g., work, personal/business, recreation, school)
 d = travel distance range from generator, attractor, or segment (i.e., buffer)

Figure 14a is a graphic representation of the segment-based spatial queries used for the parks and trail head LDS analysis.

As previously described, quantification of the travel demand associated with trails is separated from parks due to the fact that the spatial queries are attractor-based, or more appropriately centered on the trail itself. The generator used in the trip interchange calculation for this category is once again the population surrounding the subject road segment. The trip generation used for the calculation is the same figure as for a staffed park.

Figure 14a

Spatial Queries for Parks (Segment-Based)



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Equation (5b) represents the calculation of potential trip activity for trails:

$$Q_{\text{trails}} = \sum_{A=1}^n S \times TG$$

Where:

- Q_{Trails} = Total trip interchange potential for trail trips
- A = Number of attractors
- n = Total number of buffers
- S = Percent of segment within buffer
- TG = Trip generation rate

Figure 14b depicts the two spatial queries performed for this trip purpose, which are attractor-based.

In addition to being recreational facilities, urban trails are also transportation facilities. The generator for this trail *transportation* trip is similar to the road network which includes population, employment, school locations, and transit routes. The attractor for trail *transportation* trips is the trail itself. Spatial queries are performed similar to those for trails (as depicted in Figure 14b), *except that the subject segment is the trail*.

Access To Transit The attractors are transit routes, modified by the number of buses that serve each route daily. Equation 6 represents the calculation of potential trip activity.

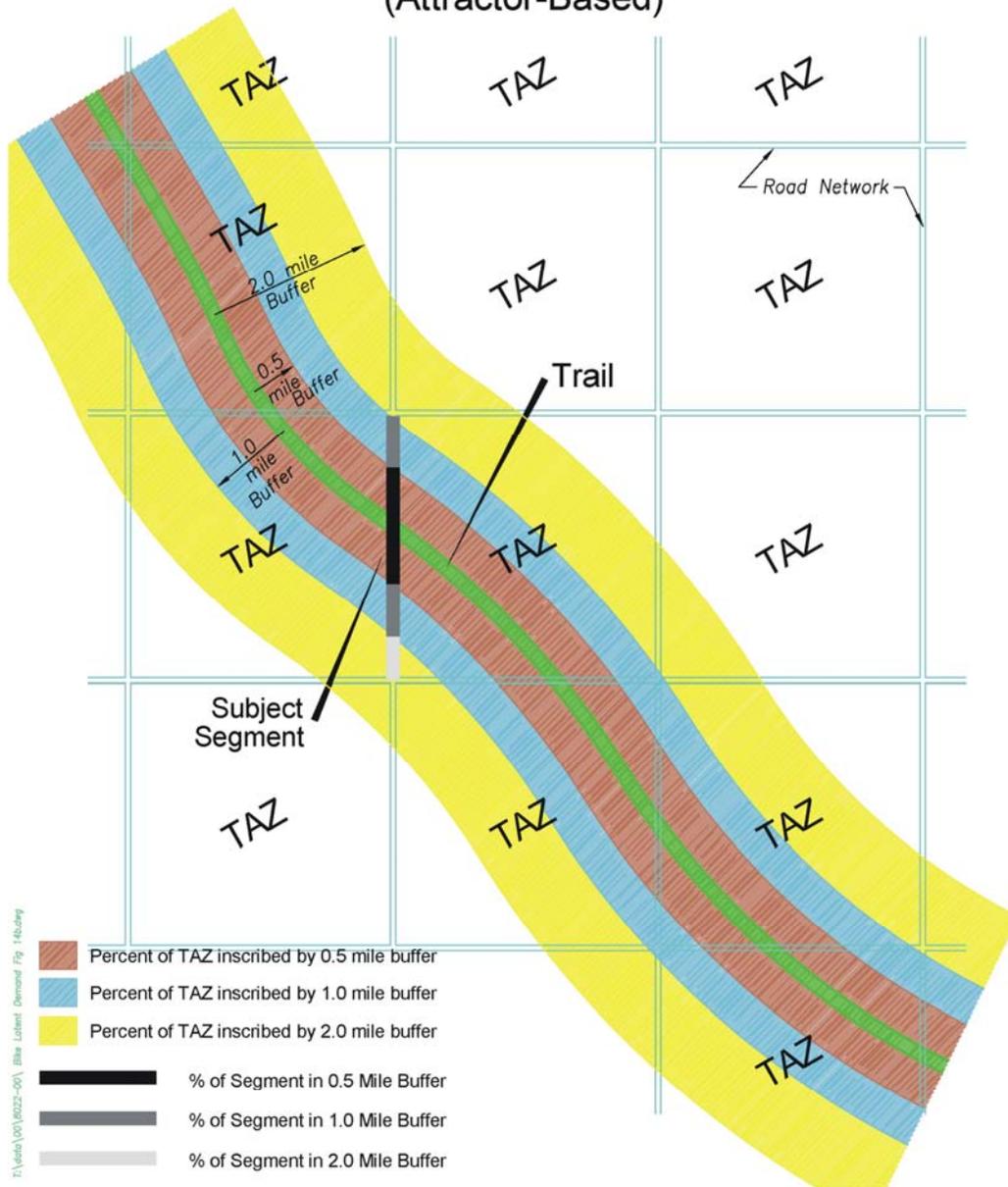
$$Q_{\text{transit}} = \sum_{R=1}^n T$$

Where:

- R = Transit route
- n = Total number of transit routes
- T = number of bus/transit trips

Figure 14b

Spatial Queries for Trails / Linear Parks (Attractor-Based)



REGIONAL RESULTS

Using the study network, the TAZ demographic and employment data, and the mapped trip attractors and/or generators, all corridor segments are analyzed according to the aforementioned method. After populating the database with the results from the spatial queries (all trip types), the values are ranked on a 100% scale for each trip purpose, with 100% representing the highest percentage of *Latent Demand*. The segments are sorted in descending order based on the highest *Latent Demand* score (LDS) of all trip types for that segment and are stratified by jurisdiction. The following equation shows the computations calculating the final 100% *Latent Demand* score for each network study segment:

$$LDS = \text{Max. Value} \left[\overline{TG}_n \sum_{d=1}^1 P_{nd} \times ga_n \right]_1^5$$

n = walking trip purpose (e.g., work, personal/business, recreation, school)
 \overline{TG} = average trip generation of attractor or generator
 P = effect of travel distance on trip interchange, expressed as a probability
 ga = number of generators or attractors within specified travel distance range
 d = travel distance range from generator or attractor

The corresponding results are contained in MAG's *Pedestrian Plan 2000*. The expansion/update of this analysis for the City of Scottsdale's *Transportation Master Plan* is outlined in the next section.

RESULTS UPDATE FOR CITY OF SCOTTSDALE TRANSPORTATION MASTER PLAN (PEDESTRIAN ELEMENT)

The preceding methodology was used to determine pedestrian latent demand for the entire MAG region as part of MAG'S *Pedestrian Plan 2000*. The corresponding results have been expanded and updated for use in developing components of the pedestrian element of the City of Scottsdale's *Transportation Master Plan*. The socio-economic inputs are based on horizon year 2020 TAZ projections (as earlier approved by MAG); discussions with City staff indicate that this is a reasonable planning horizon for this expanded/updated analysis as well. However, because of some changes that have occurred within Scottsdale since the MAG plan was performed, certain elements were added for this analysis. Specifically, seven new public schools and one new major park were included as attractors in the analysis. Nine network segments have also been included that were not part of the original MAG results. These segments reflect recent growth patterns and are generally located in the airpark region of the City. All of these additions are reflected in the graphical and tabular results, which are shown in Figure 15 and Table 1, respectively.

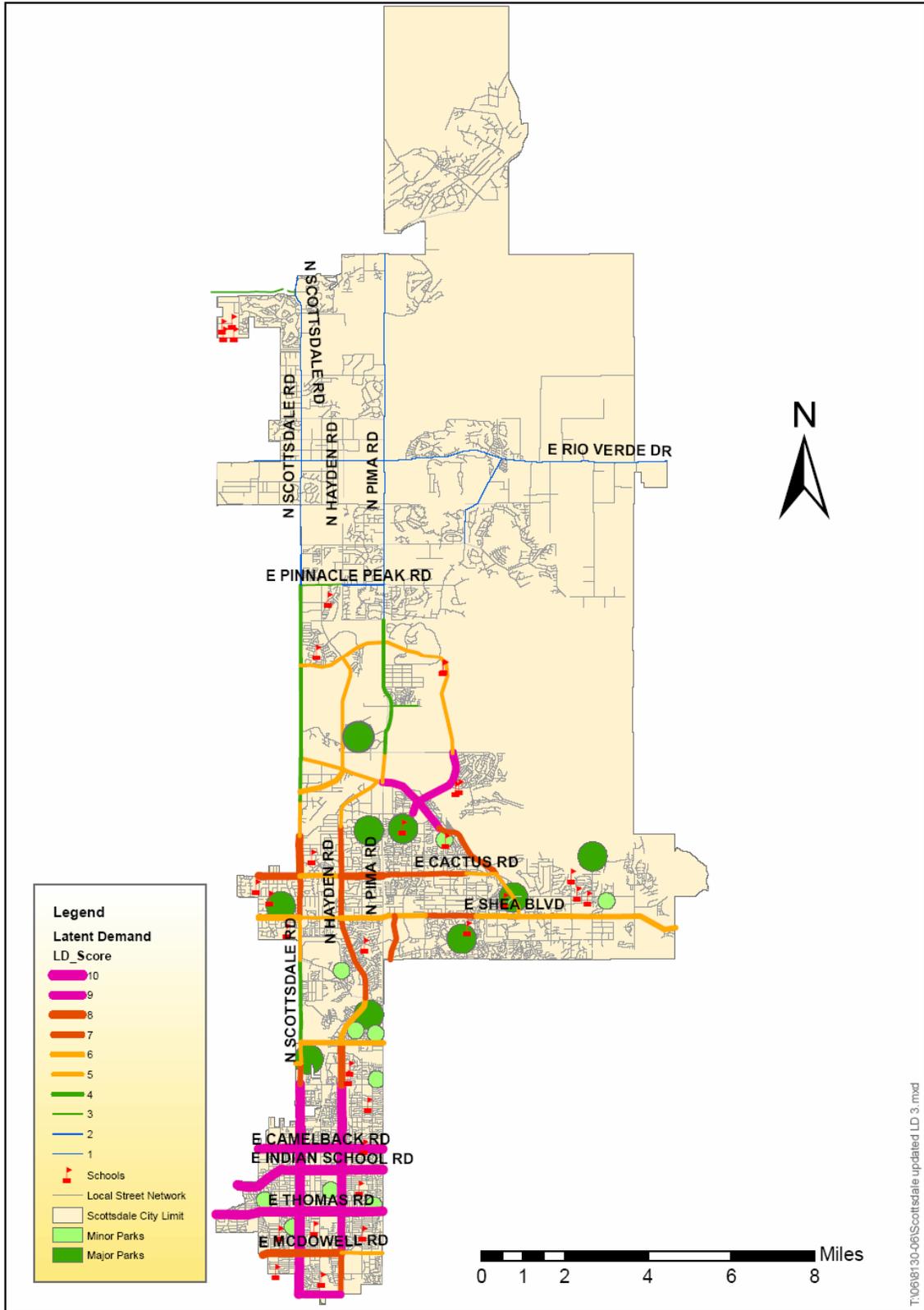


Figure 15 Scottsdale Pedestrian Latent Demand Results (expanded)

DEFINITIONS AND ABBREVIATIONS

AASHTO - American Association of State Highway and Transportation Officials.

Accessible - An environment or facility that provides equal access to people with different abilities.

Accessible Pedestrian Signal - A device that communicates information about the WALK phase in audible and vibrotactile formats.

ADA - Americans with Disabilities Act - This federal civil rights law was passed in 1990. The law prohibits discrimination against people with disabilities, and requires public entities and public accommodations to provide accessible accommodations for people with disabilities.

Crosswalk - According to Arizona State Law (Section 28.601), a crosswalk is “that part of the roadway at an intersection included within the prolongations or connections of the lateral lines of the sidewalks on opposite sides of the highway measured from the curbs or, in absence of curbs, from the edges of the traversable roadway.” A crosswalk is also “any portion of a roadway at an intersection or elsewhere that is distinctly indicated for pedestrian crossing by lines or other markings on the surface.”

CPTED - Crime Prevention through Environmental Design. CPTED is a series of design principles that can result in an environment being safer and more secure for pedestrians.

Cross Slope - The grade that is perpendicular to the direction of accessible pedestrian travel.

Curb ramp - A combined ramp and landing that accomplishes a change in level at a curb. This element provides street and sidewalk access to pedestrians using wheelchairs.

Detectable Warning - A surface feature of truncated dome material built in or applied to the walking surface to advise of an upcoming change from pedestrian to vehicular way.

Effective Walkway Width - The portion of the sidewalk that is free from barriers such as utilities, slower pedestrians, people waiting, furniture, building elements or plant material.

Feasible - Capable of being accomplished with a reasonable amount of effort, cost, or other hardship. With regard to ADA compliance, feasibility is determined on a case-by-case basis. For example, it might not be feasible to install a ramp that meets ADAAG specifications on a very steep hill, but it would be feasible to install an ADAAG ramp at the entrance of a building.

FHWA - Federal Highway Administration.

Grade - The slope parallel to the direction of travel that is calculated by dividing the vertical change in elevation by the horizontal distance covered.

Grade-separated crossings - Facilities such as overpasses, underpasses, skywalks, or tunnels that allow pedestrians and motor vehicles to cross a street at different levels.

Human Scale - A scale of surroundings that is proportional to the human comfort level.

Intersection - According to Arizona State Law (Section 28.601), an intersection is “the area embraced within the prolongation or connection of the lateral curb lines, or if none, the lateral boundary lines of the roadways of two highways that join one another at, or approximately at, right angles, or the area within which vehicles traveling on different highways joining at any other angle may come in conflict. If a highway includes two roadways thirty or more feet apart, each crossing of each roadway of the divided highway by an intersecting highway is a separate intersection. If the intersecting highway also includes two roadways thirty or more feet apart, each crossing of two roadways of the highways is a separate intersection.”

Landing - A level area of sidewalk at the top of a curb ramp facing the ramp path.

MAG - Maricopa Association of Governments.

Motorized wheelchair – any self-propelled wheelchair that is used by a person for mobility.

MUTCD - Manual of Uniform Traffic Control Devices. The MUTCD establishes uniform standards for traffic control devices that regulate, warn, and guide road users along United States roadways.

Pedestrian - According to Arizona State Law, a pedestrian is “... any person afoot. A person who uses an electric personal assistive mobility device or a manual or motorized wheelchair is considered a pedestrian unless the manual wheelchair qualifies as a bicycle. For the purposes of this paragraph, motorized wheelchair means a self-propelled wheelchair that is used by a person for mobility. (A.R.S. 28-101) Pedestrians also include rollerskaters, in-line skaters, and skateboarders. Pedestrians also include users of “electric personal assistive mobility devices”, which “means a self-balancing two nontandem wheeled device with an electric propulsion system that limits the maximum speed of the device to fifteen miles per hour or less and that is designed to transport only one person” (A.R.S 28-101).

Pedestrian Facility - Pedestrian facilities include sidewalks, curb ramps, multiuse paths, multiuse trails, crosswalks, traffic calming features, grade-separated crossings, and other elements that encourage pedestrian movement such as landscaping, site furnishings and amenities, and public art. Pedestrian facilities also include design strategies that help to make walking safer, more convenient and more comfortable.

Pedestrian Access Route - A continuous and unobstructed walkway within a pedestrian circulation path that provides accessibility.

Pedestrian Latent Demand Model - A travel demand model that estimates the potential amount of pedestrian activity that could occur along a roadway if conditions were ideal for walking and impediments to walking were removed.

Pushbutton Locator Tone - A repeating sound that identifies the pushbutton location and indicates the need to actuate pedestrian timing.

Public Right-of-way - Land which by deed, conveyance, agreement, easement, dedication, usage or process of law is reserved for or dedicated to the general public for street, highway, alley, public utility, pedestrian walkway, bikeway or drainage purposes.

Roadway – According to Arizona State Law, a roadway is that portion of a highway that is improved, designed or ordinarily used for vehicular travel, exclusive of the berm or shoulder. If a highway includes two or more separate roadways, roadway refers to any such roadway separately but not to all such roadways collectively.

Running Slope - The grade that is parallel to the direction of travel, expressed as a ratio of rise to run or as a percent.

Safety Zone – According to Arizona State Law a pedestrian safety zone is the area or space that is both 1) officially set apart within a roadway for the exclusive use of pedestrians 2) protected or either marked or indicated by adequate signs as to be plainly visible at all times while set apart as a safety zone.

Sidewalk - According to Arizona State Law (Section 28.601), a sidewalk is the “portion of the street between the curb lines or lateral lines of the roadway and adjacent property lines intended for use by pedestrians.”

Sidewalk Cafe - A permitted area within the public right-of-way consisting of tables, chairs and other accessories for the use of consumption of food and/or beverages sold to patrons from, or in, an adjacent cafe or restaurant.

Street Furniture - Features that enhance the comfort of pedestrians including benches, trash receptacles, transit shelters and other hardscape.

Traffic – pedestrians, ridden or herded animals, vehicles, and other conveyances either singly or together while using a highway for purposes of travel.

Truncated domes - Small domes with flattened tops that are used as tactile warnings at transit platforms and curb edges.

Vibrotactile - A vibrating surface, located on the accessible pedestrian signal button, that communicates information through touch.