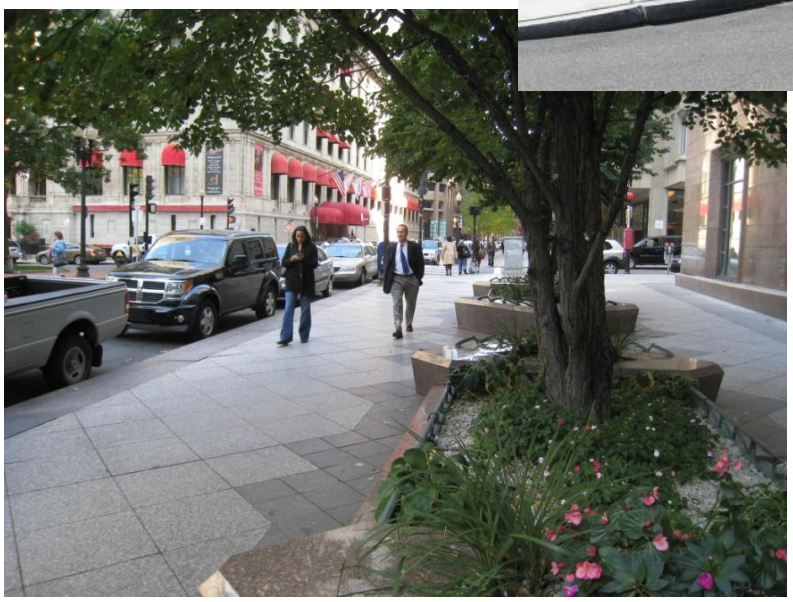
2010

The Boston Region's Pedestrian Transportation Plan



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This study was conducted under the direction of the **Boston Region Metropolitan Planning Organization**. The MPO is composed of state and regional agencies and authorities, and local governments. The **Metropolitan Area Planning Council** (MAPC) was the principal author of this report. MAPC is Greater Boston's regional planning agency whose mission is to promote smart growth and regional collaboration in Metropolitan Boston.

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Hyperlinks

This report contains hyperlinks that refer to other websites for informational purposes. The report is best viewed in an electronic format with internet access.

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Executive Summary

The benefits of walking, such as improving public health, fostering connected communities, decreasing automobile dependence, and reducing air pollution are highlighted in the Boston Region's Pedestrian Transportation Plan (PedPlan2010). There is an increasing need and responsibility to give people the opportunity to walk. PedPlan2010 addresses the importance of walking and what can be done to facilitate and promote it as a viable mode of transportation.

Unfortunately, years of auto-centric public policy decisions have established a transportation system that has not created infrastructure equivalent for pedestrians. As a result, impediments to pedestrian travel have been created that can make walking difficult and dangerous in both urban and suburban communities. Transportation issues such as traffic congestion and speeding vehicles, inefficient snow and ice removal, walkway[1] maintenance, and infrastructure design that accommodate pedestrians are some examples of these impediments. Implementing the recommendations outlined in PedPlan2010 will help to remove these impediments and accomplish the goal of increased walking throughout the Boston region.

PedPlan2010 identifies actions local governments, advocacy organizations, the private sector and individuals should take to encourage walking. At its core, PedPlan2010 is a planning document that describes the existing pedestrian infrastructure in the Boston region's 101 cities and towns, and recommends policies and practices that will facilitate walking as a convenient, safe, and practical form of transportation.

Key Challenges:

- Walking can be difficult and potentially hazardous. Only about half of the region's road and street network has walkways.
- Few commuters walk to work. Only 5.7 percent of commuters walked to work in the Boston Region in 2000. The percent of walking commuters was slightly higher in the Boston Region compared to Massachusetts (4 percent). Within the Boston Region, the percent of those who walked to work ranged from as high as 24 percent in Cambridge to as low as 0 percent in Middleton. There is room to make walking an option for more commuters.
- According to the Centers for Disease Control, the Massachusetts' adult population obesity rate among Massachusetts adults increased from 10-14 percent of the population in 1998 to 20-24 percent in 2008. Almost 25 percent of Massachusetts high school students are overweight or are at-risk of becoming overweight. Obesity can decline if people walk more.

Key Recommendations:

- Municipalities should work with appropriate stakeholders and use PedPlan2010 to develop and implement a comprehensive pedestrian plan for their city or town. The comprehensive pedestrian plan will recommend ways to complete the pedestrian network, integrate well-designed pedestrian infrastructure into the built landscape, and develop measures to adequately fund maintenance and operation programs.
- Educate the public about the benefits and means of incorporating walking into their daily lives. The pedestrian plan provides information on educational programs that encourage walking. Participation in these programs will increase the health, safety and physical activity of the public.

[1] Walkways comprise all facilities that carry pedestrians. This includes sidewalks, paths, shared streets and shared-use paths.

1. Introduction

Importance of Walking

Walking is central to our lives; is a component of virtually all trips; and has positive health environmental and community benefits. Increased walking improves public health and reduces car dependence. In turn, reduced car dependence will ease traffic congestion, improve air quality, and decrease emissions that lead to global warming. Furthermore, strong pedestrian infrastructure can encourage centers of commerce, employment, education, and play that increase community vitality and accessibility for people with disabilities.

Who are Pedestrians?

Pedestrians include people who walk, sit, stand, or use a wheelchair in public spaces. Children, teenagers, adults, the elderly, people with disabilities, workers, residents, shoppers, students and tourists are all pedestrians.

Every trip involves walking, alone or in combination with public transit, motor vehicles or bicycles. Pedestrians include people of all ages from children to older adults as well as people with visual, mobility, and sensory impairments, such as those who use wheelchairs. Efforts to accommodate persons with disabilities should be a priority in the development of any pedestrian improvement plan.

The National Cooperative Highway Research Program (NCHRP) describes walking and the importance of the pedestrian:

> Walking is a basic human activity, and almost everyone is a pedestrian at one time or another…Even though pedestrians are legitimate roadway users, they are frequently overlooked in the quest to build more sophisticated transportation systems. Whether building new infrastructure or renovating existing facilities, it should be assumed that people will walk, and plans should be made to accommodate pedestrians. Where people aren't walking, it is often because they are prevented or discouraged from doing so.[2]

The deficiency of appropriate facilities for pedestrians contributes to physical inactivity. Communities need to provide environments that promote walking and engage residents in physical fitness. In turn, increased pedestrian activity promotes health benefits such as weight control, lower blood pressure, stress reduction, and sleep improvement.

What Does this Plan Do?

It is sometimes stated that there is no point in providing or improving pedestrian facilities because there are no pedestrians in that area. This neglects the fact that the lack of pedestrians may be directly related to the quality or absence of pedestrian infrastructure such as sidewalks or crosswalks.

PedPlan2010 seeks to steer every community toward implementing a pedestrian plan on a local level, whether by improving or establishing a plan to maintain or enhance its existing pedestrian facilities or by

[2] The National Cooperative Highway Research Program (NCHRP) Report 500, Volume 10, A Guide for Reducing Collisions Involving Pedestrians, 2004, page I-1.

developing a strategy to create a pedestrian plan where few if any facilities exist. Most importantly, whether a community is urban, suburban, or quasi-rural, PedPlan2010 seeks to increase awareness of transportation by foot as a fundamental element of the region's overall transportation network and a critical means of promoting public health. Finally, PedPlan2010 provides individual communities with a variety of measures that can be implemented on a cost-effective basis, taking advantage of federal, state, and local funding opportunities or scheduling pedestrian improvements to coincide with other planned infrastructure developments to maximize the level of improvements to be gained with less capital investment.

Major Types of Pedestrian Trips

Terminal Trips
Trips made to and from home or points associated with transportation mode areas such as parking lots, bus stops, and transportation stations.

Utilitarian Trips
Trips made to carry out a specific function, such as business trips related to work or personal business trips that involve shopping, dining or going to a doctor's office.

Recreational Trips
Trips made for purposes related to leisure time or for purposes such as going to the theatre, concerts, and sporting events. Recreational trips also include social activities in which walking is one of the primary purposes.

Source: Pedestrian Malls, Streetscapes, and Urban Spaces, Harvey Rubenstein, 1992.

2. Regional and Local Visions

a. Regional Vision

PedPlan2010 works to advance the goals of MetroFuture, the Metropolitan Area Planning Council's (MAPC) and the Boston Region Metropolitan Planning Organization's (MPO) regional plan for growth and preservation for the people who live and work in the Boston Region. MetroFuture seeks to expand travel choices for the region's workers and residents, to concentrate growth in areas where infrastructure already exists, and to link land use and transportation planning. Increased opportunities for walking play an integral role in achieving MetroFuture's goals. Even with MetroFuture, the Boston Region still faces the challenge of how to identify and implement pedestrian programs. In response to this challenge, PedPlan2010 has been developed.

The overarching goal of PedPlan2010 is to increase walking. It is ultimately up to individuals to make the choice to walk, but local governments, advocacy organizations, and citizen groups can change existing built environments, public policies, and practices to make walking a more attractive transportation and recreational option. Therefore, a key policy goal of PedPlan2010 is to ensure that all road and development projects accommodate pedestrians to the fullest extent. Roads should be designed and buildings sited to make pedestrian access and safety the first priority (over other modes).

The concepts below provide a broader perspective for both regional and local decision making.

Create Complete Streets

Complete Streets are roadways designed and operated to enable safe, attractive, and comfortable access and travel for all users. Pedestrians, bicyclists, motorists and users of public transportation - as well as users of all ages and abilities - should be able to safely and comfortably move along and across a Complete Street. Complete Streets create a sense of place, improve social interaction, and can improve land values of adjacent properties. The Massachusetts Department of Transportation's (MassDOT) Highway Project Development and Design Guide is a nationally referenced best practice document that provides Complete Street design guidance. A few states (including Oregon, Florida, and South Carolina) and a number of regions and cities have adopted Complete Streets policies.[3]

[3] The Commonwealth of Massachusetts is currently preparing a Complete Street Policy that will be consistent with the MassDOT Highway Project Development and Design Guide (2006).

There is no exact formula for a Complete Street, but MassDOT's Highway Project Development and Design Guide should be used as a reference. Additionally, the following characteristics should be present:

- *Facilities for exclusive use by pedestrians on both sides of the street – includes sidewalks, paths, and other facilities physically separated from the roadway.*
- *Crosswalks at all intersections and traffic control devices where greater than two lanes of traffic are crossed.*
- *Traffic calming devices – includes raised crosswalks, raised intersections, and traffic circles.*
- *Audible pedestrian signals.*
- *Curb extensions at crosswalks where parallel parking exists.*
- *Separation of the pedestrian way from travel lanes by various means of landscaped strips, street trees, parallel parking, and bicycle lanes.*
- *Access Control – reduction in both the number and widths of driveways where possible.*

Close Gaps in the Pedestrian Network

Gaps, or areas without sidewalks and walkway systems, need to be closed throughout the region. The urban centers and densely developed communities throughout the region have generally good walkway coverage but numerous gaps remain. Formerly rural roads in the suburbs are now dotted with infill housing developments, but do not always have sidewalks. Communities need to work together to create interconnected and consistent sidewalks and paths.

Improve the Pedestrian Environment

Our transportation system should not only accommodate walking as a matter of right, but also create an environment that encourages walking. The design and siting of buildings, sidewalk placement, and design elements such as street trees, benches, and bicycle racks are all part of the quality of the pedestrian environment that encourages walking. Additionally, all pedestrian facilities in the Boston Region should be connected to an origin and a destination as well as mapped and signed where appropriate.

Prioritize Transit, Schools, Civic and Commercial Sites

Given limited transportation resources, focus should be on providing and improving pedestrian infrastructure at transit facilities, schools, civic and commercial sites. Pedestrian infrastructure includes walkways and crosswalks in areas that access transit services, are within walking distances to schools, locations used by the elderly and those with disabilities, and in retail and commercial centers throughout the region.

Implement Smart Growth Principles

The accommodation of automobiles has often created impediments to pedestrian travel. An overall approach to smart growth needs to be incorporated in future design. Implementing MAPC's Smart Growth Principles, Massachusetts' Sustainable Development Principles, and federal Livability Principles as they pertain to walking, will help to accomplish this goal.

MAPC's Smart Growth Principles as they Pertain to Pedestrian Planning

- Integrate people and place.
- Promote distinctive, attractive communities with a strong sense of place.
- Encourage development in currently developed areas to take advantage of existing community assets.
- Take advantage of compact development design and create walkable neighborhoods.
- Promote more transportation choices through the appropriate development of land.

Massachusetts Sustainable Development Principles as they Pertain to Pedestrian Planning

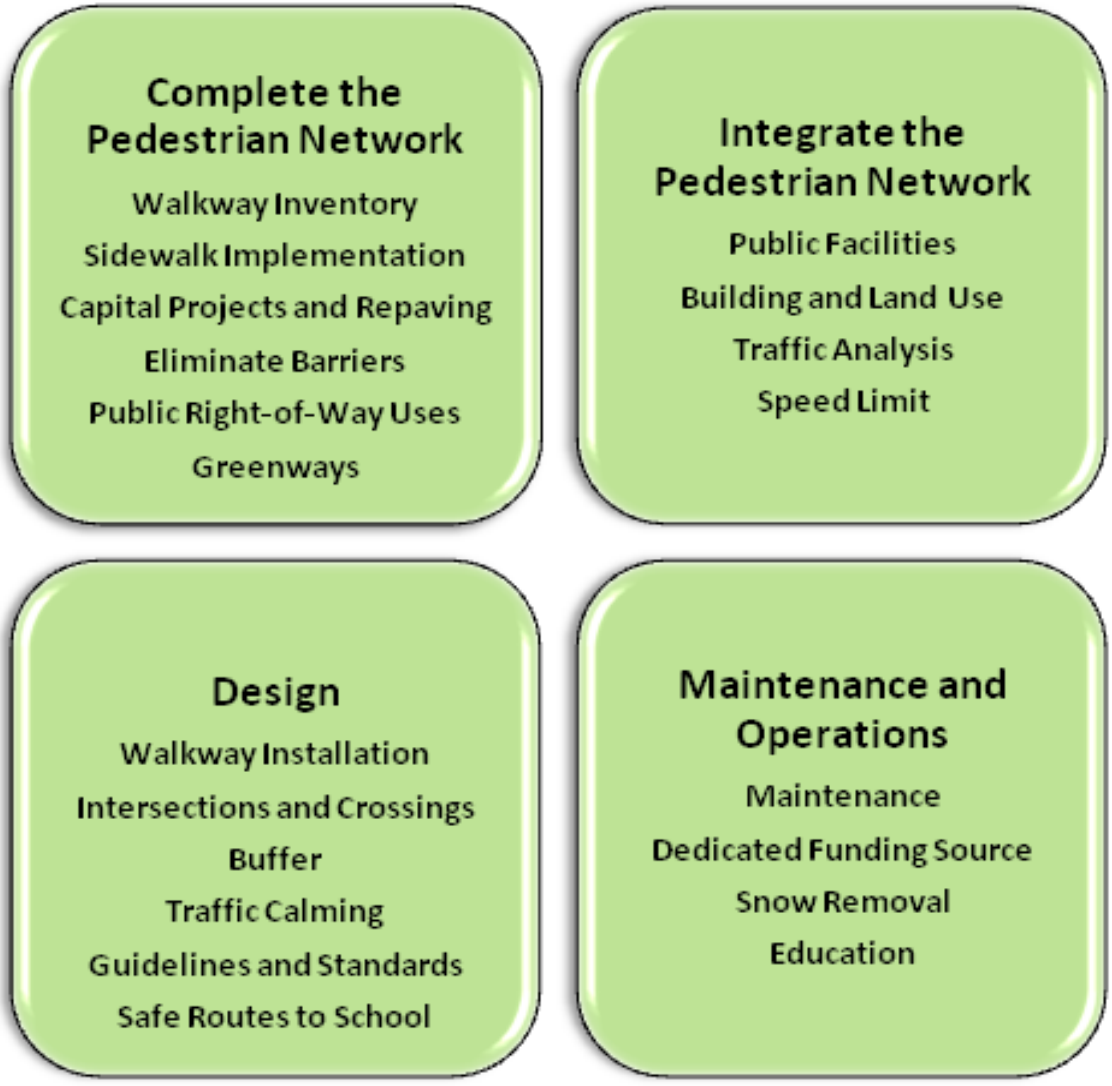
- Refer to the youMove Massachusetts Core Themes that pertain to pedestrian planning.
- Refer to MassDOT's Massachusetts Pedestrian Plan (1998).
- Concentrate development and mix uses.
- Provide transportation choice.

b. Local Visions

PedPlan2010 recognizes that the region's 101 member communities have unique visions for their futures. Some communities support mature urban centers, sustained by a variety of transportation modes, such as commuter rail, subway, and bus service, all of which can be accessed by an existing network of walkways. Others are suburban communities with more limited access to mass transit and a less comprehensive pedestrian network. Finally, many of the region's municipalities are quasi-rural towns with no mass transit services, and little to no pedestrian facilities.

PedPlan2010 seeks to provide guidance for the variety of communities within the region, and to respect individual communities' sense of place by suggesting different approaches to accommodating pedestrians that are appropriate to the unique character of the city or town.

As a planning document, most of the recommendations in PedPlan2010 are for municipalities to implement. It is at the local level where many of the decisions regarding pedestrian infrastructure and programs are made. ***Therefore, a set of key 'Action Items' are available at the end of PedPlan 2010 in Chapter 9 to serve as a guide for municipal officials to follow.*** The 'Action Items' also summarize most of the recommendations made throughout PedPlan2010.' Comprising four categories, the 'Action Items' are depicted below:



3. Walking in the Boston Region

The following chapter describes the current state of walking and pedestrian accommodation in the Boston Region through use of available data. According to U.S. Census Bureau data, 25 percent of workers in the Boston Region walked, biked, or took public transportation to get to work in 2000, almost 40 percent higher than the state's mode share, which was 18 percent.

a. Boston Region Commuting Patterns

According to Figure 1, 'Municipalities with the Highest and Lowest Walk to Work Rates,' an estimated 5.7 percent of commuters walked to work in the Boston Region in 2000, over 40 percent higher compared to the Massachusetts rate of 4 percent. The percent of those who walked to work ranged from as high as 24 percent in Cambridge to as low as 0 percent in Middleton.

Communities with high percentages of commuters who walked to work were Cambridge (24%), Boston (13%), Wellesley (12%), Brookline (10%), and Somerville (9%). Ashland, Hanover, Middleton, Sherborn and Walpole were the lowest, all less than .05 percent of walking commuters.

In general, communities with higher population densities and easier access to public transportation have a greater percentage of commuters walking to work. Overall, communities that have lower numbers of vehicles by occupied housing units are the same communities that have a high percentage of commuters who walk to work. Appendix A, 'Boston Region Commuting Patterns and Vehicle Ownership,' contains further information.

Figure 1 Municipalities with the Highest and Lowest Walk to Work Rates

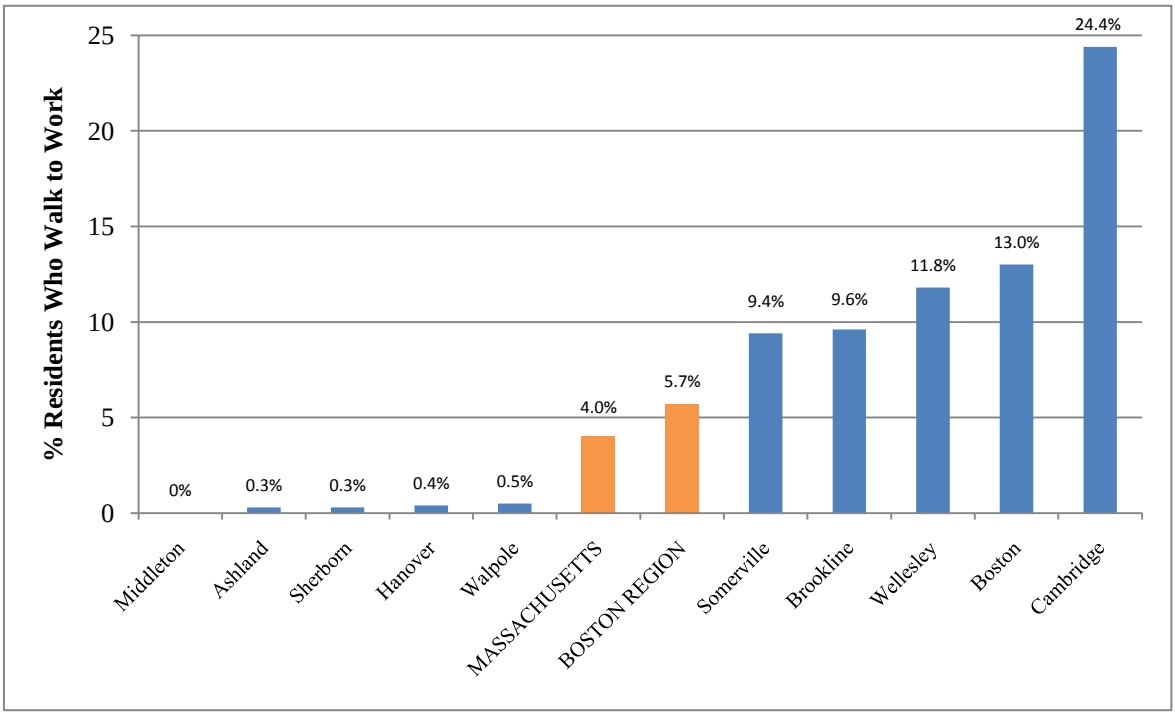
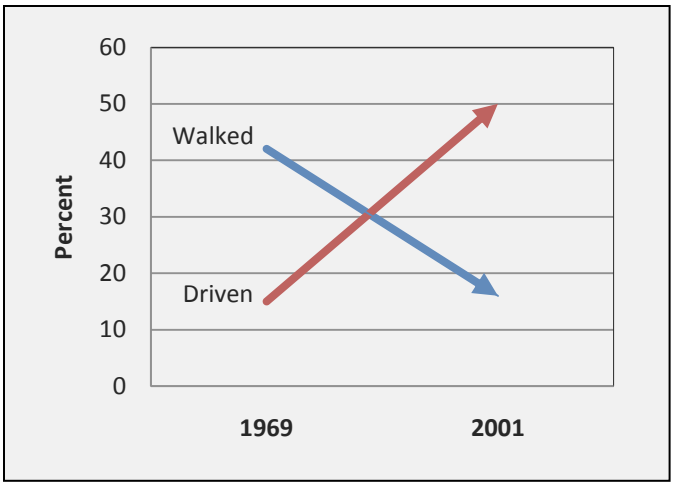


Figure 2 Student Access to School



Source: Federal Highway Administration, NHTS Brief on Travel to School, 2008.

Travel to school has changed dramatically over the past four decades. As depicted in Figure 2, 'Student Access to School', the number of students aged 5 to 18 who walked to school declined by more than half (42% to 16%) while the percent of those who were driven to school more than tripled (15% to 50%) between 1969 and 2001 nationwide. Policies and programs that encourage walking to school need to be implemented to reverse this trend. For example, Massachusetts' Safe Routes to School program reaches 20 percent of the eligible aged school children compared with 9 percent nationwide.

b. Pedestrian Surveys

Three completed surveys, two administered by MAPC and one by the City of Newton, give a picture of pedestrian conditions in the Boston Region. The Pedestrian Facility Planning Survey addressed how municipalities manage and inventory their pedestrian network. The On-Line Pedestrian Plan Survey was conducted to better understand residential pedestrian issues. Information about student access to school was obtained from the City of Newton's Walk to School Assessment Survey.

Pedestrian Facility Planning Survey

One of the key goals of the plan is to provide a continuous and complete pedestrian network. With 101 cities and towns in the region, there are many ways sidewalk and pedestrian facility projects can be programmed and funded.

To better understand how the 101 communities are managing and inventorying their pedestrian network, MAPC sent out the following survey questions in June 2009 to each of the town planners:

1) Does your community have an inventory of its existing walkways (sidewalks, paths, and other pedestrian facilities)?

2) Does your community have a master plan for construction and/or upgrading of walkways (including repainting of crosswalks)?

3) Does your community have a policy for snow removal? If so, are abutters primarily responsible or is the community?

4) Is there a board or committee that has primary responsibility for planning and/or recommending pedestrian facilities? If so, please identify the name of the board or committee.

The responses received from 32 communities are outlined in Table 1, 'Pedestrian Planning Survey Summary.'

Sixty-five percent of the communities that responded have an inventory of their sidewalk and path system. Forty-five percent of the communities have an implementation plan in place for construction or repair of the sidewalk system. Most communities have a sidewalk snow removal policy. For the most part, abutters are responsible for snow removal on sidewalks in predominantly urban communities. Communities have responsibility primarily in developing communities where the density is low and sidewalks are infrequent. Removal of snow on sidewalks by the communities is often focused on the areas near schools. About half of the responding communities have some sort of independent board or committee that evaluates pedestrian programs and policies.

Table 1 Pedestrian Planning Survey Summary

	Community	Sidewalk Inventory	Sidewalk Master Plan	Snow Removal Policy	Pedestrian Board
1	Acton	Yes	Yes	Yes - Municipality	Sidewalk Committee
2	Arlington	No	No	Yes - Abutters	Transportation Advisory Committee
3	Bedford	Yes	Yes	Yes - Abutters	Transportation Advisory Committee
4	Beverly	Yes - GIS	No	Yes - Abutters	No
5	Boxborough	No	No	No	Planning Board
6	Braintree	In Progress	In Progress	No - except special permits	No
7	Brookline	Yes - GIS	Yes	Yes - Abutters	Transportation Board
8	Cambridge	Yes	Yes	Yes - Abutters	Pedestrian Committee
9	Chelsea	No	No	Yes - Abutters	No
10	Cohasset	Yes	Yes	Yes - Municipality	No
11	Concord	Yes - GIS	No	Yes - Municipality	PW Comm & Natural Resources Comm
12	Dedham	Yes	No	Yes - Municipality	Board of Selectmen as Street Commissioners
13	Duxbury	No	No	Yes - Municipality	Sidewalk Bikepath Committee
14	Essex	No	No	Yes - Municipality	Essex Board of Public Works
15	Franklin	Yes	No	Yes - Municipality	No
16	Holliston	Yes	In Progress	Yes - Abutters (town near schools)	Board of Selectmen
17	Lexington	Unknown	Unknown	Unknown	Sidewalk Committee
18	Marlborough	Yes	Yes	Yes - Abutters	City Council
19	Marshfield	Yes	No	Yes - Municipality	Board of Public Works
20	Medford	No	No	No	No
21	Natick	Yes	No	Yes - Abutters	Bicycle & Pedestrian Advisory Committee
22	Newton	Yes - GIS	Yes - limited	Yes - commercial, No - residential	No
23	North Reading	No	No	Yes - Commercial	Unknown
24	Norwell	No	No	Yes - Municipality	Norwell Pathway Committee
25	Quincy	Yes - GIS	Yes - DPW	Yes - Abutters	No
26	Stow	No - planned	No - planned	No	Pedestrian Walkway Committee
27	Sudbury	Yes	Yes	Yes - Municipality	Planning Board
28	Topsfield	Yes	Yes	Yes - Municipality	No
29	Watertown	Yes	Yes - DPW	Yes - Abutters	Bicycle Pedestrian Committee
30	Westwood	Yes - GIS	No	Yes - Abutters	Pedestrian and Bike Safety
31	Woburn	Yes - partial	No	Yes - Abutters	No
32	Wrentham	No	No	Yes - Municipality	Board of Selectmen

Municipality – The municipality is responsible for snow removal.

Abutters – Private owners are responsible for removing snow abutting their property.

On-Line MAPC Pedestrian Plan Survey

To obtain a better understanding of pedestrian issues for residents in the Boston Region, an on-line Pedestrian Plan Survey was conducted. Initiated in 2007 and lasting for a period of two years, over 1,600 respondents completed the survey.

Although the survey is intended to represent the Boston Region, approximately 70 percent of the respondents reported having a home zip code in Arlington, Boston, Cambridge, Medford or Somerville. These communities represent 28 percent of the region's population. The majority (66%) of the respondents were women. Forty-three percent of the women were between the ages of 31 to 50 and 73 percent did not have children under the age of 16 living in their households.

Respondents were asked to estimate what percent of trips they take by each mode of transportation for all trip types, not just commuting. Survey respondents relied heavily on driving (50%); however walking was a significant trip type (28%). A variety of reasons ranging from bad weather (56%), sidewalks or paths not cleared from snow or ice (43%), and lack of time (38%) were given when asked what prevents them from walking.

Having both pedestrian-friendly infrastructure and multiple destinations to walk to are considered good features for a walking environment by survey respondents. The presence of sidewalks (87%) and crosswalks (58%) were considered components of a good walking environment. Walking access to multiple destinations was also given a high criterion for a good walking environment (64%).

Half of the survey respondents clearly indicated a desire to walk to work and about two-thirds would walk to work more often if they lived closer. About two-thirds of the survey respondents indicated they would walk more often if they were closer to shopping areas and friends and one-third if their schedules were more flexible. The decision of whether to walk is more heavily weighted on the distance of destination points rather than conditions of the walking environment. Smart growth, in addition to walking conditions, is essential to encouraging walking as a mode of transportation.

Walk to School Assessment Survey

In the fall of 2008, Newton conducted a Walk to School Assessment Survey. The survey had over 1,000 responses representing 13 schools. The vast majority (80%) of the respondents lived within one mile of a school and over 75 percent reported that they want to live in a community where students walk to school. Eighty-three percent of arterial streets in Newton have sidewalks on at least one side of the street so it can be assumed that walkways are available for most or the entire trip.

Weather, scheduling, convenience and safety (child cannot walk without an adult) are the primary factors that make parents or guardians decide to drive. The majority of the respondents did not find sidewalks to be a specific reason to drive instead of walking. If sidewalks were identified as a problem, the intermittent lack of sidewalks and broken or cracked sidewalks were cited. With the exception of wintertime, 40 percent of respondents walked to school 4-5 days per week. A significantly lower percentage (27%) reported walking home 4-5 days per week. Weather or climate was the leading decision for a parent or guardian to drive instead of letting their child walk either to or from school.

However, respondents reported issues pertaining to snow removal with approximately 45 percent stating that failure of residents to clear snow causes them to drive. Over 50 percent of respondents said that snow piles at corners and sidewalk entrances or that having to step into the street due to snow

causes them to drive to school. Over 40 percent said failure to clear entrances to crosswalks causes them to drive to school.

c. Sidewalk Inventory

Eight maps with a tandem table comprise Appendix B, 'Sidewalk Coverage by Municipality.' The maps comprise the entire Boston Region and identify whether sidewalks exist, on one side, or both sides, or neither side for the "Main Roads" and the "Local Roads." "Main Roads" carry through traffic and generally have limited access points. "Local Roads" have more frequent access points and serve adjacent residential and business land uses. "Local Roads" distribute traffic between neighborhoods and "Main Roads." The companion table indicates the percent lacking sidewalk coverage by street type for each MAPC community. The sidewalk inventory is based on road data from MassDOT. In addition, primary schools and rail transit stations are identified on the maps.

The sidewalk inventory data show that 54 percent of roadway miles in the region that allow pedestrians lack sidewalks.

d. Public Health

Studies have found that there is a direct relation between the built environment in vehicular-oriented communities and physical inactivity.[4] The availability of parks, walking trails, and the walkability of communities all have a direct impact on the transportation choices people make. Having advantageous transportation and community design does have an important role in improving health.

The Centers for Disease Control and Prevention (CDC) has identified physical inactivity (and related chronic health conditions of obesity, diabetes, high blood pressure and stroke) as a major underlying cause of premature mortality in the United States. According to the Centers for Disease Control, the obesity rate among Massachusetts adults increased from 10-14 percent of the population in 1998 to 20-24 percent in 2008. Almost 25 percent of Massachusetts high school students are overweight or are at-risk of becoming overweight.

e. Pedestrian Crash Data

The need to reduce pedestrian injuries and fatalities while promoting increased walking is an important objective. Currently, data on pedestrian crashes and injuries is recorded differently in each community. Specifically, the numbers and locations of the crash data need to be more accurate. For example, many crashes are not reported, and others do not include correct information on the location. The map in Appendix C, 'Pedestrian Fatalities within the Boston Region,' depicts the locations of pedestrian fatalities recorded between 2002-2006.

According to information from MassGIS, there were 149 pedestrian fatalities between 2002 and 2006. The number of fatalities is consistent annually. As shown in Appendix C, the number of pedestrian fatalities is concentrated among municipalities with the greatest population densities. During the same time frame, pedestrian fatalities were reported in about half of the 101 municipalities comprising the Boston Region. Most accidents involving pedestrian fatalities in the Boston Region took place from September to December and between the hours of 5pm and 7pm.

Pedestrian crashes and the resulting injuries and fatalities are a serious problem. In June 2008, a National Pedestrian Crash Report by the US DOT, National Highway Traffic Safety Administration was

[4] Lee V, Mikkelsen L, Srikantharajah J, Cohen L., Strategies for Enhancing the Built Environment to Support Healthy Eating and Active Living. Oakland, CA: Prevention Institute, 2008, page 8.

released. This technical report analyzed trends in pedestrian fatalities and police-reported motor vehicle crashes involving pedestrians in the United States since 1997.

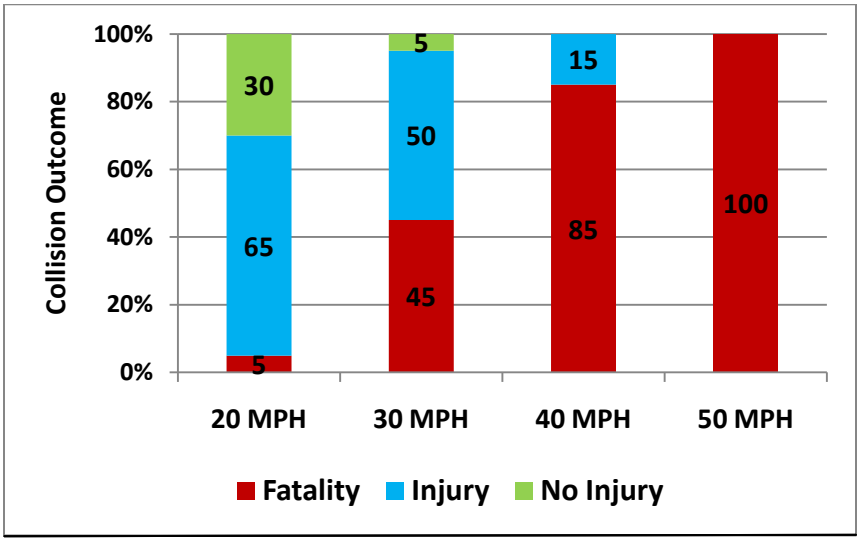
Key findings in the report were:

- *The number of pedestrian fatalities gradually declined between 1997 and 2006.*
- *More than two-thirds of pedestrian crash fatalities took place on urban roads.*
- *Older individuals (over 64) are more likely to become pedestrian fatalities.*

In the Boston Region MPO area, pedestrians were involved in only 1.8 percent of all traffic-related crashes between 1995 and 2001, yet accounted for 25.4 percent of all traffic-related fatalities.[5] This statistic is a strong indicator of pedestrians' vulnerability to vehicular traffic and that safety is critical to improving pedestrian access and networks.

In many communities, the failure of motorists to obey posted speed limits is a major concern for pedestrian safety. The faster a motor vehicle is traveling when it hits a pedestrian, the greater the likelihood of a pedestrian fatality. Lower speeds give drivers and pedestrians more time to react and drivers to slow down. Figure 3, 'Impact Speeds, Pedestrian Fatality and Injury,' depicts this relationship.

Figure 3 Impact Speeds, Pedestrian Fatality and Injury



Source: Effect of Impact Speed on Pedestrian Fatality and Injury (U.S. DOT, Leaf WA, Preusser DF,1999).

Many pedestrian crashes are the result of unsafe motorist and pedestrian behaviors. A study conducted by the NHTSA's National Center for Statistics and Analysis based on national accident data between 1997 and 2006, found that nearly 46 percent of pedestrian fatalities are alcohol-involved. The proportion of alcohol involvement for drivers in fatal pedestrian crashes is less than half that of pedestrians. Nationwide, the peak timeframe when pedestrian fatalities occur is between 5 and 11 pm, when both darkness and alcohol use are factors.

[5] CTPS. Bicycle and Pedestrian Improvements in Town Centers, May 2007, page 3.

Prioritizing programs that are designed to reduce alcohol-related pedestrian fatalities and increasing the availability of buses, taxis, and other forms of public transportation are strategies that may contribute to lowering alcohol-related pedestrian fatalities. Specific roadway design features can contribute to unsafe behaviors by pedestrians and motorists. For example, excessively wide streets encourage higher motorist speeds. High-volume multilane roads that lack safe crossings at regular intervals can encourage pedestrians to cross streets at unsafe locations. Land use decisions such as separating residential areas from shopping areas with high-volume multilane roads can force pedestrians to cross streets in places that may not be safe. These types of design issues are most effectively addressed during preliminary design.

Street Speed Limits

Traffic engineers maintain that speed limits should be established according to the 85th percentile of free flowing traffic. This means the limit should be set at a level at or under which 85 percent of people are driving. Currently, Mass DOT sets the speed limit on all roads and streets, and follows the practice of setting it at 85 percent of the prevailing speed, however fast. In Massachusetts, the posted speed limits represent the maximum safe speed under ideal driving conditions.

However, adherence to the 85th percentile speed standard makes it very difficult for communities to obtain permission to reduce speeds on a particular street without making geometric changes. Although the 85th percentile may be the safest speed for drivers, this does not take into account the safety of pedestrians on the same corridor. As noted in Figure 3, a pedestrian is more likely to be killed than to survive if hit by a vehicle traveling at greater than 30 mph.

Communities can focus on reducing speeds on roadways by employing geometric changes such as traffic calming, narrowing lanes, and adding street trees and other vertical amenities that appear to narrow the street.

According to current state legislation (M.G.L. Chapter 90, Section 17), if there is no posted speed limit in a thickly settled area or business district, the 'default' speed limit is 30 miles per hour. If the rate of speed were changed from 30 miles per hour to 25 miles per hour, a pedestrian's chances of survival would significantly increase if struck by a motor vehicle. There is pending legislation to change the law from 30 to 25 miles per hour (see Chapter 6, section e.).

4. Current Regional Practices

a. MetroFuture

Adopted by the MAPC in 2008, MetroFuture is the regional plan for growth and development for the people living and working in the 101 communities of Metro Boston. It includes a detailed smart growth plan for development and preservation in the region, an implementation strategy to achieve the plan's goals, and a constituency of 'plan builders' who are committed to implementing the plan. MetroFuture is a transformative and sustainable plan that will improve equity among residents, strengthen the economy, protect the environment, and improve quality of life.

Thirteen implementation strategies represent a comprehensive approach to achieving the MetroFuture vision. The recommendations include short-and long-term action steps for planning, policy and spending changes at every level of government, along with steps that can be taken by the private sector and even by individual households across the region.

One of MetroFuture's 65 specific goals is for people to choose to walk for short trips. To meet that goal, the implementation strategies include many recommendations around building communities where more homes, shops, and jobs are accessible by walking, as well as some recommendations specifically targeted at pedestrian infrastructure. Most of these recommendations are contained in the MetroFuture strategy to Coordinate Transportation Alternatives. The following six MetroFuture recommendations promote pedestrian access:

- Create dedicated lane capacity for transit and alternative modes
  Bus, pedestrian, and bicycle service need dedicated corridors and networks if they are to compete with the single occupancy vehicle.

- Incorporate "Complete Street" best practices in roadway development and design efforts
  The region needs to implement roadway design best practices that will foster walking, improve safety, and enhance community character.

- Stabilize and coordinate funding sources for bicycle and pedestrian infrastructure and programs
  The region needs to bolster support for pedestrian and bicycle programs, both to create physical facilities and to create the "professional infrastructure"[6] necessary to develop high quality projects.

- Maintain and manage bicycle and pedestrian facilities and traffic as full-fledged transportation linkages
  Like all other transportation infrastructure, pedestrian and bicycle facilities must be maintained and managed so that they operate safely and efficiently. In addition, pedestrian concerns are addressed in the strategy to Improve City Life and School Quality, as part of a set of recommendations designed to improve urban quality of life.

[6] "Professional infrastructure" refers to the capacity of the region's engineering and construction community (private firms, public agencies, and individuals) to design, bid, and construct pedestrian and bicycle facilities.

- Increase bicycle, pedestrian, and transit accessibility and safety
  Bicycle, pedestrian, and transit infrastructure must be safe and well-maintained, particularly in denser urban areas.

Building healthy habits in children is one of the goals of the MetroFuture strategy to Support Healthy Families. This includes educating them about pedestrian safety in schools, and improving pedestrian infrastructure so more children can safely walk or bicycle to schools, as detailed in the following recommendation:

- Expand programs designed to foster walking and biking to school
  This includes expanded funding for the Safe Routes to Schools program, as well as continued study of the factors that influence mode choice by children and their parents.

b. MPO Policies

The Boston MPO (Metropolitan Planning Organization) has defined policies to guide its planning and programming processes. The following MPO policies pertain to improving the pedestrian realm:

- Assist agencies and communities in planning and implementing projects that provide bicycle and pedestrian routes, networks, and facilities.

- Encourage, through planning and programming, transportation choices that promote a healthy lifestyle, such as walking and bicycling.

- Support designs and fund projects and programs that address safety problems and enhance safe travel for all system users. This includes designs and projects that encourage motorists, public transportation riders, bicyclists, and pedestrians to share the transportation network safely.

- Make transportation investments where existing or planned development will encourage public transportation use, walking, and bicycling.

c. TIP/MPO Process

The Transportation Improvement Program (TIP) is an intermodal program of transportation improvements produced annually by the Boston MPO. The TIP serves as the implementation arm of the long-range Regional Transportation Plan (RTP) by incrementally programming funds for improvements over a four-year period. It programs federal-aid funds for transit projects, and state and federal-aid funds for roadway projects, which include bicycle and pedestrian projects. The MPO is responsible for the development and approval processes of the TIP.

Once endorsed by the Metropolitan Planning Organization, the TIP is incorporated into the State Transportation Improvement Program (STIP), which is distributed to the Federal Highway Administration, Federal Transit Administration, and Environmental Protection Agency for certification before the end of each federal fiscal year (September 30).

There are six types of roadway projects that can be funded in the TIP, one of which is Bicycle/Pedestrian. Walkways, paths, and trails are examples of Pedestrian projects.

Pedestrian projects are categorized as new construction, an improvement, or other. The evaluation of all roadway projects is based on seven categories: Condition, Safety, Mobility and Operations, Environmental Justice, Environment, Land Use, and Economic Development. The evaluation of each roadway project is based on information assembled by the MPO in its Project Information Form (PIF).

For all projects, not just pedestrian, the proponent is expected to identify pedestrian needs that are being addressed and how the project is expected to benefit pedestrians. Pedestrian needs are specifically addressed in five of the seven criteria:

- Condition
  The extent to which pedestrian provisions are included in the project; specifically, whether sidewalks are present on one side or on both sides of the roadway. If the project is a bridge project, determining whether pedestrian accommodations currently exist.

- Safety
  The number of total crashes involving pedestrians.

- Mobility and Operations
  How the proposed project provides multimodal elements, such as access to pedestrian connections or pedestrian access to transit.

- Environment
  How the project relates to community character. For example, is the project located in a pedestrian-oriented area?

- Land Use
  Describe what improvements are in the project for improving pedestrian access.

- Although they should, the Environmental Justice and Economic Development criteria currently do not specifically address pedestrian issues.

Each criterion is numerically evaluated and scored by MPO staff and the relative scores are presented to the MPO when determining TIP projects. The report, Transportation Improvement Program (TIP) Process at the Boston Metropolitan Planning Organization – An Instructional Handbook for Roadway Project Proponents, (January 2009) describes this process in more detail.

d. Massachusetts Department of Transportation Project Development & Design Guidebook

Released in 2006, the Project Development and Design Guidebook takes a flexible and accommodating approach to the construction and design of roadways in Massachusetts. By integrating multi-modal planning and design into every chapter, the Guidebook strives to support a transportation system providing seamless, functional and safe access for all users. In addition, this Guidebook provides direction to the design of Complete Streets.

The Guidebook mainstreams non-motorized planning into the project development process and ensures that the needs of non-motorized users remain integral to project planning and design. The needs of, and the methods to accommodate non-motorized modes of transportation are not segregated into their own sections but are addressed in every chapter of the Guidebook. For example, pedestrian accommodation and design are specifically included in intersection and geometric design, interchanges,

bridges and work zones. Chapter 3, Basic Design Controls, and Chapter 5, Cross-Section and Roadside Elements, have sections which specifically address pedestrian design. Chapter 11, Shared Use Path and Greenways, and Chapter 16, Traffic Calming and Traffic Management, address trails and traffic calming respectively.

e. Roadway and Bridge Design

As part of the process for designing, constructing and implementing state funded roadway and bridge projects, a public hearing is held when 25% design plans have been submitted. Comments received at the hearing are reviewed and considered for incorporation in the 75% design plans. Questions and concerns regarding pedestrian access, such as the inclusion of sidewalks, are required to be addressed at the 25 percent design stage.

f. Massachusetts Environmental Policy Act (MEPA)

The Massachusetts Environmental Policy Act (MEPA) requires that proponents of projects meet certain size and/or impact thresholds. The intent of MEPA review is to inform project proponents and state agencies of potential adverse environmental impacts while a proposal is still in the planning stages. MEPA is a uniform system of environmental impact review to reduce the potential for harm to the environment from certain development, construction or other projects. MAPC is responsible for reviewing and providing feedback on proposed projects that are submitted as part of the MEPA process. MAPC strongly advocates for the inclusion of sidewalks and pedestrian connections, signage, and an overall pedestrian-friendly environment as part of their MEPA review.

g. National Environmental Policy Act (NEPA)

The National Environmental Policy Act (NEPA) requires an environmental analysis for any major Federal action. The NEPA project development process includes balanced transportation decision making by taking into account the potential impacts on the human and natural environment and the public's need for safe and efficient transportation. Federal-aid highway projects require a NEPA analysis.

5. Community Initiatives

A variety of municipal departments and committees have an interest in pedestrian issues, including Public Works and Highway Departments, Planning Boards, safety officials, and other groups such as sidewalk committees. Some committees may have established methods of collaborating between entities with an interest or responsibility in accommodating pedestrians, but many do not.

a. Master Planning

A community may chose to prepare a Pedestrian Master Plan to serve as a guide for long-term implementation of sidewalks and other pedestrian-related projects. Pedestrian programs and issues can be addressed either in the Circulation Element of the existing Master Plan or a stand-alone Master Plan could be prepared.

Figure 4 Pedestrian Wayfinding Sign on Brandeis University Campus

Source: Roll · Barresi & Associates, Inc.

Pedestrian planning does not necessarily need to take place on a municipal level. For example, Brandeis University recently implemented a comprehensive campus signage program. Taking about a year to implement, this well-received program made the campus more welcoming and accessible, improved wayfinding, provided a unifying visual theme, and promoted the university's character and spirit. Figure 4, 'Pedestrian Wayfinding Sign on Brandeis University Campus,' shows one sign in the campus signage program.

Best Practices – Pedestrian Plans

Cambridge

The Cambridge Pedestrian Plan describes the role of walking in Cambridge, current city policies and projects, and the direction of future pedestrian improvements.

Seattle, Washington

Seattle's Pedestrian Master Plan defines the steps needed to make Seattle a more walkable, livable, and healthy city. The plan establishes policies, programs, design criteria, and projects.

b. Sidewalk Construction and Retrofitting

Multiple studies have found that presence of sidewalks greatly increases pedestrian safety. Sidewalk coverage in the Boston Region varies, with large gaps in many communities. Analysis shows that although the presence of well-maintained sidewalks is widely considered to be perhaps the most important element of a good walking environment, 54 percent of the roadway miles in the region that allow pedestrians lack sidewalks.[7]

MassHighway's Project Development and Design Guidebook emphasize the importance of facilities that serve all users and consider pedestrians, bicyclists, and motorists equally. Specifically, the guidelines state, "sidewalks are desirable in all areas where pedestrian activity is present, expected, or desired." There are several possible approaches to increasing sidewalk coverage in a community, including both new and existing roadways. They are discussed below, along with benefits and potential issues to consider.

Land Development Requirements

A community can request or require that private developers build sidewalks on streets within a subdivision and/or along their property frontage. If there are particular reasons why sidewalks cannot or ought not to be built along the development itself, the community can obtain a payment in lieu and use the funds to build sidewalks in more appropriate locations within the community.

There are many benefits of including sidewalk construction as a routine element of new construction. First, it is more efficient to include pedestrian facilities in new construction rather than to go back and retrofit later. Including sidewalks from the beginning will ensure that there is sufficient right-of-way reserved for the sidewalks. This eliminates future confusion over land ownership or the need to secure easements from residents. Second, this approach does not use limited community funds for sidewalk construction which frees up funds for pedestrian improvements in other areas. Unless there are unusual environmental or topographic conditions, inclusion of sidewalk construction is usually a relatively small expense compared to the entire cost of the project. Third, regularly including sidewalks in new developments reinforces the commitment of the community to foster pedestrian-friendly development practices and create a safe pedestrian environment whenever possible.

Challenges/Issues to Consider

It may be difficult for some communities to change subdivision and development regulations to formally require private developers to provide sidewalks. Even in these cases, it can still be possible to request and prioritize sidewalks when conducting plan review discussions. However, it is not enough to just request sidewalks in a new development – in order to be truly useful, sidewalks should connect to one another and to existing pedestrian networks. At a minimum, subdivision and development regulations need to require sidewalks,

Figure 5 Shared Street in Cambridge

[7] Lacking sidewalks is defined as a road with a neither side having a sidewalk.

crosswalks, and trees. See Appendix D, 'Pedestrian-Related Issues to Consider when Reviewing Development Plans.'

Depending on the location and layout of the development, off-road walkways may also be appropriate to create a connected pedestrian network. This is particularly important in cases where roads dead-end or end in a cul-de-sac. Providing connected pedestrian paths could significantly decrease walking distances and facilitate and encourage walking.

One possible challenge to sidewalk building is environmental issues associated with the additional impervious surface necessary to include sidewalks. In many communities, new development occurs in locations with impervious surface limitations based on wetland or watershed conditions.

Another challenge is the argument that sidewalks are unnecessary in small residential subdivisions, as they are inconsistent with small town character and there is not a lot of traffic. However, it may also be argued that if part of the appeal of such areas is that they are quiet and safe to raise a family, then creating a safe walking environment is part of fulfilling this commitment. Establishing 'shared-use' streets, which mix pedestrians, bicyclists, and drivers in a low-speed environment that emphasize a street's community function, should be considered in these areas. Figure 5, 'Shared Street in Cambridge' is an example of a shared street.

Town and State Roadway Projects

MassDOT's Project Development and Design Guidebook recommends that the project designer calculate the cross-section from the right-of-way edge[8] rather than center line, stating that, "through this approach, accommodations of pedestrians and bicyclists is positively encouraged, made safer, and included in every transportation project as required under Chapter 87 of state law." By doing so, walkways are included on all roadway construction projects, whether on town- or state-maintained roads. The exception would be along controlled-access freeways where pedestrian access is not allowed.

Challenges/Issues to Consider

While the focus on providing facilities for pedestrians and bicyclists is prominent in the MassHighway Guidebook, there are still barriers in the mindset of many practitioners.

Even without the challenge of convincing local or state officials to include walkways on roadway projects, it may not be physically or financially feasible to build sidewalks or paths on both sides of every road. Some communities elect to build on one or both sides based on roadway classification. For example, sidewalks are added to one side of local and collector streets and in most cases to both sides of all arterials. While it would be preferable to have sidewalks on both sides of every road, these communities determined that in the interest of building facilities on roadways throughout the entire community, it is acceptable and reasonable to limit construction to just one side of the smaller roads. In theory, local and collector streets would have low enough traffic volume and speeds that a person

[8] The MassDOT Guidebook defines *cross section* as a view of a vertical plane cutting through the roadway, laterally perpendicular to the center line, showing the relationship of various roadway components and *right-of-way* as the land (usually a strip) acquired for or devoted to highway transportation purposes.

walking on the other side would be able to cross to access the sidewalk or specific destinations. On an arterial road with higher traffic volumes and speeds, sidewalks are necessary on both sides.

Individual Property Owner Installation

Although infrequently done, individual property owners can pay to install sidewalks. This approach is beneficial in areas where there is demand for a separate pedestrian facility and no other projects to combine with sidewalk construction or community funds are available for the construction. Allowing individual property owners to build sidewalks does not use community funds, enables private citizens to contribute to the public good and fulfills a need not currently being met.

Challenges/Issues to Consider

Having property owners pay for sidewalk installation can be considerably complicated. The community should have a formal process for ensuring the sidewalk is built to engineering standards, built by a reputable contractor, and have agreements about maintenance and liability.

For example, homeowners in Reading may elect to construct sidewalks and install curbing at their own expense. Homeowners can coordinate with the Town Engineering Office to use a contractor having proper insurance and bonds. A "Sidewalk or Curbing Release" form must be completed by the homeowner prior to final approval. Once sidewalk or curbing is installed and approved by Reading, the town is responsible for ongoing maintenance. Although this option is available to all Reading residents, very few chose to install their own sidewalks or curbing primarily due to the expense. A program for sidewalk construction that is financed by both property owners and municipal funds with a predetermined percentage match could be established.

In addition, new sidewalks need to interconnect with existing sidewalks and close gaps in the pedestrian network.

Neighborhood Petition Assessment / Betterments

Residents can petition for sidewalk construction to be financed by all property owners in the requested area. This type of process typically requires consent of at least 51 percent of the property owners in the improvement area, and a formal petition for no less than one block of the street. Once the request is approved, all property owners in the area will be required to pay for the sidewalk. If the 51 percent decide to build a sidewalk on only one side of the street, all of the residences along both sides of the street are still required to pay for it.

A neighborhood petition assessment is a more organized way to facilitate citizen sidewalk building. It allows the community to ensure that the sidewalk will be continuous and also of a sufficient length to be worth the investment. Also, by requiring a vote of the property owners, it ensures support for sidewalk construction on the street. Using a neighborhood assessment may decrease the cost per household, and depending on the structure of the agreement, it may allow the payments to be spread over a number of years, thereby further reducing the financial burden on households.

Challenges/Issues to Consider

Because sidewalk construction can be contentious in some communities, particularly when paid for by residents, communities should carefully consider the necessary level of resident support to impose a neighborhood assessment. To minimize neighbor conflicts, it may be prudent to require greater than 51 percent support. Also, more affluent parts of a community could afford sidewalks whereas areas with lower incomes and/or higher renter percentages may not.

Municipal Bonding

Municipal bonds are issued by state and local governments and are generally used to raise money for major capital projects. By issuing municipal bonds, states and local governments can raise money for capital expenditures—such as the construction of highways, bridges or a streetscape project.

Challenges/Issues to Consider

The issuer of a municipal bond usually uses proceeds from a bond sale to pay for capital projects it cannot or does not desire to pay for immediately with available funds. Tax regulations generally require all money raised by a municipal bond sale to be spent on one-time capital projects within three to five years of issuance.

In Massachusetts, Proposition 2½ limits the amount of revenue a city or town may raise from local property taxes each year to fund municipal operations. Communities must seek voter approval to raise additional funds beyond Proposition 2½ limits. Proposition 2½ establishes two types of voter-approved increases in taxing authority:

Overrides: An override allows a municipality to permanently exceed its property tax cap of 2.5 percent plus new revenue from growth.

Exclusions: An exclusion increases the amount of property tax revenue a community may raise for a limited or temporary period of time in order to fund specific projects.

Community Constructs Sidewalks Using its own Funds

A community can use its own funds to build sidewalks on roadways. Typically, community funds would be used only on roadways under local control because there is a possibility of being able to use state or federal funds to make improvements on state maintained roadways. There are three main sources of community funds that can be used to build sidewalks: Capital Improvement Program (CIP), Community Preservation Act (CPA), and Chapter 90. CIP is described below; CPA and Chapter 90 funds are described later in Chapter 8, section c.

Capital Improvement Program (CIP)

A Capital Improvements Program (CIP) is a planning blueprint for a community's capital expenditures. It coordinates community planning, financial capacity, and physical development. The CIP is composed of two parts -- a capital budget and a capital program. The capital budget is the upcoming year's spending plan for capital items. The capital program is a plan for capital expenditures that extends beyond the capital budget. A complete and properly developed CIP will identify the most economical means of financing capital projects.

Some communities plan for sidewalk construction and/or maintenance using CIP funds. Newton, for example, uses CIP funds for activities related to sidewalks: curb and sidewalk betterments, curb and sidewalk maintenance, and ADA access curb cuts. If a property owner requests the construction of a sidewalk, the cost is split halfway between the property owner and Newton (if the cost is $500 or more). If the cost is less than $500, the property owner is fully responsible. Newton's betterment program does face funding challenges and the program has a significant backlog of requests.

Community Department Coordination

Creating better pedestrian amenities and walkability is a proven and known key to revitalizing downtowns in cities and suburbs and establishing stronger communities. Working closely with

community departments will help to accomplish this goal. Depending on the community, relevant departments can include Economic Development, Community Development, Planning and Redevelopment.

c. Prioritizing Sidewalk Construction Locations

The need for sidewalk facilities is great, but community resources are limited. Communities that plan to use their own funds for sidewalk construction should have a process for identifying and prioritizing the most critical locations. Below are three communities with programs that prioritize locations for sidewalk construction:

Best Practices – Prioritizing Sidewalk Construction Locations

Cambridge
Cambridge has an extensive Street and Sidewalk Reconstruction Plan that includes an emphasis on Complete Streets.

Charlotte, North Carolina
There are four categories (tiers) of sidewalk ranking in the City of Charlotte. The tiers are primarily based on the traffic volume of each street.

Rockville, Maryland
Rockville has a Sidewalk Prioritization Policy that helps determine in what order sidewalks should be constructed where they are missing. The prioritization is based on a total score, which is the sum of a utility score and a traffic conditions score. Sidewalks are placed into one of five groups, A through E, with A being the highest and E being the lowest range of scores. Available city right-of-way, public support for the construction of the sidewalk, and potential environmental impacts are also taken into consideration.

d. Paths

The development of paths in a community is encouraged. Paths are separated from motorized vehicular traffic by an open space, barrier or curb. Paths provide access to open spaces within a community and if designed appropriately, can be used by bicyclists in limited situations. The Southwest Corridor Park, a 4.7 mile linear park in Boston, has separate bicycle and pedestrian paths. The Somerville Community Path in Somerville, is an example of a shared-use path designed to accommodate both pedestrians and bicyclists. Chapter 11, Shared Use Path and Greenways, of MassDOT's Project Development and Design Guidebook, describes these design guidelines in more detail.

Best Practices – Walkway Planning and Paths

Sudbury

Sudbury has an extensive Walkway Planning and Prioritization Initiative.

Lincoln

Lincoln's long-range plan has resulted in a network of sidewalks and paths throughout the town and along most of its major streets to connect residential areas, schools, parks and commercial centers. An example of a 'Path in Lincoln' is shown in Figure 6.

Figure 6 Path in Lincoln

Wellesley

Wellesley has developed, through signs and maps, an extensive trails network. The Wellesley Trails System comprises 14 trails including nine woodland trails that connect conservation lands, parks and open space, and five interconnecting trails that run along aqueducts, parks and roads. Color coordinated trail blazers are marked at every turn on each route. A Trails Committee is responsible for maintaining and monitoring the trails. An example of a 'Trail in Wellesley' is shown in Figure 7.

Figure 7 Trail in Wellesley

Figure 8 Map of the Bay Circuit Trail

Bay Circuit Trail and Greenway

With over 170 miles open to the public, the Bay Circuit Trail and Greenway is a recreational trail and greenway corridor extending through 34 towns in Eastern Massachusetts and linking the parks and open spaces surrounding metropolitan Boston. When complete, the multi-use trail will form an arc through the outlying suburbs of Boston from the North Shore (Newburyport) to the South Shore (Duxbury), distance of almost 200 miles. A 'Map of the Bay Circuit Trail' is shown in Figure 8.

e. Rail Trails

A rail trail is the conversion of an unused railway easement into a shared-use path, typically for walking and bicycling. Most rail trails are flat, long and can run through historic areas. Rail trails are often graded and covered in gravel or crushed stone, paved with asphalt, or left as dirt. Since both Federal and state laws are involved, rail trail conversions can be complex. Where possible, rail trails should connect to corridors to enable both transportation and recreation.

Best Practice - Bikeway

Minuteman Commuter Bikeway

Running for approximately 12 miles though Bedford, Lexington and Arlington, the Minuteman Commuter Bikeway is an example of a rail trail conversion. The Minuteman Commuter Bikeway is a popular rail trail which is frequently used for both transportation and recreational purposes. On an average day, slightly over 1,200 pedestrians and bicyclists use the Minuteman Commuter Bikeway. Of these users, almost 11 percent are pedestrians.[9]

f. Education and Programs

Education and program efforts in pedestrian planning should include training and education of planning and engineering professionals, transportation maintenance workers, school boards, teachers, law enforcement officials, elected officials as well as the public at large.

Educational efforts directed at motorists (e.g., obeying speed limits), pedestrians (e.g., legally crossing the street) and bicyclists (e.g., obeying traffic signals) can be an effective means to improve safety. School curricula should include programs instructing children on issues of pedestrian safety. Driver education programs should incorporate the rights of pedestrians (e.g., yield to pedestrians when turning). Effective education programs need to be designed with an understanding of the diverse needs and skill levels of various user groups (e.g., children, adults and people with disabilities).

Driver Education

Driver Education and Pedestrians

Educational material provided by the Registry of Motor Vehicles (RMV) addresses motor vehicle laws with regard to pedestrians. Pedestrian safety is addressed in the RMV's Commonwealth of Massachusetts' Driver's Manual.

The Driver's Manual clearly conveys that drivers must always yield to pedestrians who are walking in or are crossing a roadway. The Manual tells drivers to take extra care to look for pedestrians, how to drive defensively, and discusses right-of-way rules. Pedestrian signals and signage are graphically depicted in the Manual. The Driver's Manual also addresses accommodating pedestrians in roundabouts and rules for passing pedestrians in a roadway. A section on rules for pedestrians to follow is even included in the Driver's Manual.

[9] Data is compiled from counts conducted by the Central Transportation Planning Staff (CTPS) in 2009 for the Boston Region MPO Bicycle / Pedestrian Traffic Count Report.

As a means of standardizing driver education throughout the state, the Registry of Motor Vehicles has developed a Driver Education Program. The Driver Education Program contains sections on accommodating pedestrians in its Traffic Signals and Sharing the Road modules. While materials for driver education do exist, there is room for pedestrian safety to be more strongly emphasized in driver education materials, programs and driver tests.

Education and Programs in Schools

Established in 2005, the Massachusetts Safe Routes to School (SRTS) program helps to teach and inspire children to start walking and bicycling more often – to and from school. The SRTS program aims to reduce congestion, air pollution, and traffic conflicts near participating schools, while increasing the health, safety, and mobility of elementary and middle school students. The program is managed by MassDOT and funded by FHWA. It includes separate programs for education and encouragement (delivered by MassRIDES) and for infrastructure improvements.

To date, the SRTS program worked with over 230 elementary and middle schools in over 100 communities statewide, reaching over 85,000 students. Over half of these communities are in the MAPC region. Through this program, schools receive a range of direct professional services to educate students, parents, and school and community officials about the benefits of walking and bicycling to school while addressing safety concerns. The SRTS program includes education, encouragement, enforcement, engineering, and evaluation strategies to ensure a comprehensive and successful program to increase walking and bicycling to and from school.

Technical assistance in designing, implementing, marketing, and evaluating initiatives tailored to each school's needs and priorities is offered through this program. Participating schools receive free promotional materials to implement SRTS, plus no-cost educational materials targeted to students, parents, and community leaders. Training prepares school stakeholders to identify school access challenges and design solutions. Participating schools represent diverse socio-economic communities with varying population densities statewide.

The SRTS program held its third annual Massachusetts Walk to School Day in May 2009. On Massachusetts Walk to School Day, children, parents, school and local officials walked to school together on a designated day. This event is intended to remind everyone of the joy of walking to school, the health benefits of regular daily activity, and the need for safe places to walk. Walk to School Day aims to create long term change by increasing physical activity among children, enhancing pedestrian safety, reducing traffic congestion, improving the environment, and building strong communities.

As communities participated in this event, schools across the state reported a dramatic increase in walking. For example, at Braintree Ross Elementary School, even though all students live within a mile, 80 percent of children are driven to and from school each day. In May 2008, nearly all students walked to school. The collaboration among the school, town, and community contributed to the event's success. To develop a broader program, the school implemented a Pedestrian Safety Training and sponsored 'Trekking Tuesdays.' In the fall, the school organized a Walking School Bus program[10] and participated in International Walk to School Day. Canton, Hingham and Scituate also have Walking School Bus programs.

[10] A Walking School Bus program is a group of children walking to school with one or more adults.

These programs aim to improve walking and bicycling conditions and encourage students to safely walk and bicycle to school. SRTS programs seek to reduce congestion, air pollution, and traffic congestion near participating schools, while increasing the health, safety, and physical activity of elementary and middle school students. The ultimate goal is to develop walking to school as the norm, rather than the exception, and to create long-term sustainable change.

The American Heart Association's Start! Walking Program

The American Heart Association's Start! Walking Program assists companies to encourage their employees to have healthier lifestyles. Companies set up 'walking routes' in the workplace and encourage employees to use them. The Start! Walking Program gives employers materials to start the program (e.g., route stickers, goal sheet). The Start! Walking website contains an inventory of previously established Start! Walking Paths that employers can utilize.

Blue Cross Blue Shield's Walking Works

Health care insurer, Blue Cross Blue Shield of Massachusetts, offers a program, Walking Works, in which all subscribers are eligible to enroll. Walking Works enables participants to create walking programs suited to their specific needs. For example, the program offers an online log to allow participants to track their progress. The goal of Walking Works is to make walking and weight management interactive, easy, and fun. A pedometer and walking routes are some of the materials provided as part of the Walking Works program.

Mass in Motion

Mass in Motion is a Department of Public Health Initiative that combines health, transportation and land use. This program includes regulations to promote healthy eating and physical activity. It also provides grants to cities and towns to make wellness initiatives a priority. Mass in Motion's website gives Massachusetts' residents tips on how to integrate healthy eating and physical activity into their daily lives. Safe walkable streets have been identified by Mass in Motion as a key factor that makes a community healthy.

Green Streets Initiative

The Green Streets Initiative is an international grassroots organization that celebrates, promotes, and advocates for the use of alternative transportation. The organization's aim is to create safer, quieter, and healthier streets for all commuters and citizens. The vision of the Green Streets Initiative is to celebrate alternative transportation, give people an opportunity to make community connections, and promote a festive local atmosphere.

The Green Streets Initiative began in Cambridge and has expanded to the neighboring cities of Boston, Newton, Somerville, and Stoneham. Through educational efforts, and the opportunity to experience and practice alternative transportation, the Green Streets Initiative helps individual citizens, children, and families discover how alternative modes of transportation can enhance their lives by creating safe, healthy, and friendly communities for everyone.

This Initiative is best known for the creation of monthly Walk/Ride Days that occur on the last Friday of every month. On these days people everywhere are invited to participate, and wear green. On a Walk/Ride Day, people who wear and go green are eligible to partake in a host of rewards offered by participating local businesses, or sponsors. These rewards include discounts at local retailers, to participating in an on-line raffle.

Walkable Community Workshops

The Boston Region MPO conducts free Walkable Community Workshops to encourage safe and accessible walking environments in the region. A workshop comprises three parts. First, an MPO employee gives a presentation on good pedestrian design by using local, regional, and national examples. Participants then walk together through a local area chosen by the community to identify shortcomings and discuss possible improvements and strategies for resolving them. Finally, the participants work in small groups to brainstorm on how to make the community more walkable, and present their findings to the entire group.

All members of the community, including elected officials, business owners, involved residents, and local professionals in the fields of planning, engineering, law enforcement, and education are encouraged to participate. Outcomes of this program include the formation of committees to address pedestrian needs in the municipalities. To date, the MPO has given about 40 workshops in the region.

Walking Clubs

In addition to exercise, walking clubs increase the sociability of walking as well as improve mental and physical health. The Massachusetts Department of Public Health's Keep Moving Program maintains a Walking Club Directory as part of the program.

Walk 'n Mass Volkssport Club, part of the American Volkssport Association, is one example of numerous walking clubs in Massachusetts. Since 1985, the Walk 'n Mass Volkssport Club has hosted walking events for participants of all ages, sexes, and levels of athletic ability to exercise outdoors at their own pace. Walking events are non-competitive, usually 5-10 kilometers, and there is no fee to participate. Walks can include historic sites, downtown areas, and woodland trails.

g. Advocacy Groups

Advocacy groups are organizations that seek to influence public policy. Advocacy groups in Massachusetts that are strong supporters of pedestrian issues include:

WalkBoston

WalkBoston is a non-profit membership organization dedicated to improving walking conditions in cities and towns across Massachusetts. Founded in 1990 and representing over 58 cities and towns across the state, WalkBoston's mission is to create and preserve safe walking environments that build vital communities. WalkBoston promotes walking for transportation, health and recreation through education and advocacy.

LivableStreets Alliance

The LivableStreets Alliance is a non-profit organization that believes urban transportation has the power to make the Boston region more connected and more livable. The LivableStreets Alliance challenges people to think differently and to demand a system that balances transit, walking, and biking with automobiles. In addition, this non-profit organization promotes safe, convenient, and affordable transportation for all users in urban Boston. The LivableStreets Alliance advances the theory that when streets are enjoyable to use, they will better support neighborhoods and business districts.

Massachusetts Smart Growth Alliance

Founded in 2003, the Massachusetts Smart Growth Alliance (MSGA) promotes healthy and diverse communities, protects critical environmental resources and working landscapes, advocates for housing and transportation choices, and supports equitable community development and urban reinvestment. MAPC was a founding member of MSGA.

Best Practices – Community Health Programs

Activate Attleboro Initiative

Part of a YMCA-led nationwide program called Activate America, the Activate Attleboro Initiative serves as a leading model of a community collaborative in Massachusetts. It is a strong example of community leaders and representatives from the City's Health Department and School Committee who are improving the health of Attleboro residents by creating positive changes in behavior and striving to create a healthier environment through more than 30 diverse activities aimed to increase physical activity and improve nutrition. Activities that are part of the Activate Attleboro Initiative include:

- Physical Activity Club is an intensive one-on-one educational and awareness program for overweight children who are referred by physicians. This program educates overweight children and their parents about exercise and healthy nutrition. Results from this program included an average increase of 17 percent in daily physical activity.
- With technical support from the National Park Service, Activate Attleboro seeks to improve the city's walkability with an extensive city-wide trail and plans to expand a bike path system.
- The 'corporate step challenge' challenges adults to log at least 10,000 steps per day using a pedometer. This is an example of working with local companies to support walking programs for employees.

Best Practices – Community Health Programs

Cambridge Walks

Coordinated by the Cambridge Public Health Department, CambridgeWalks is a campaign designed to encourage people of all ages to walk for their health, for the environment, and for the benefits of less traffic. City departments, university, state, local health providers, educators, advocates, and community groups have all been involved. CambridgeWalks also includes individuals who are physically challenged.

CambridgeWalks initiated the Hunt for the Golden Shoes, which is now a project of the Cambridge Pedestrian Committee. Once a year, shoes - spray-painted gold - are hidden through the city in places where people walk. People who find the shoes turn them in for prizes donated by local merchants to encourage people to walk and shop in the city. This event inspires people to be active and explore the city.

Keep Moving

Keep Moving is a program that promotes fitness and physical activity for persons over the age of 50. Walking clubs are organized under the auspices of Councils on Aging, senior centers, Park and Recreation Departments, churches, and housing sites. The clubs are locally organized and take on their own unique characteristics. Happy Hoofers of Barnstable, the Quincy Walk of Ages, Walkers of Roslindale, and the Mt. Carmel Striders from Worcester, are examples of the local clubs that have been established.

Keep Moving is supported by the Department of Public Health, the Executive Office of Elder Affairs, the Massachusetts Association of Councils on Aging and Senior Center Directors, and Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts University, as well as financial support from BlueCross BlueShield.

More than 2,500 older adults in the Keep Moving program walk two to three times a week. Walkers vary their routes from urban to rural areas. A sense of camaraderie among the walkers keeps them connected so that exercise becomes a regular part of their daily routines.

NeighborWalk Program

Run by the Boston Public Health Commission, the NeighborWalk program encourages Boston residents of all ages to be physically active by providing support for organized walking groups. All registered NeighborWalk groups are required to complete a weekly electronic walking log. The Electronic Neighborwalk Log provides an on-going progress summary of walking groups with information such as how many people are walking, the number of walks per week, and who is walking.

Walking in Arlington

Walking in Arlington is an example of a community based pedestrian advocacy and walking safety group. Walking in Arlington was formed to make Arlington a more pedestrian-friendly place for people of all ages who live and work in Arlington. In addition to having an extensive website, this advocacy group reaches out to the community by submitting newspaper articles, attending public events and working closely with Town Meeting, the Police, the Selectmen, the Council on Aging, the Superintendent of Schools, the Department of Public Works, the Planning Department as well as business and community groups.

h. Snow and Ice Clearance

Prompt and effective snow clearance on sidewalks is critical to maintaining safe walking conditions. If walkways, crosswalks, islands, and curb ramps are icy or unshoveled, travel is both difficult and dangerous for pedestrians. Children, the elderly and people with disabilities are most affected. Although there are challenges with enforcement, it is critical that municipalities improve sidewalk and road snow and ice clearance and enforce their regulations to encourage walking and increase pedestrian safety. Depending upon jurisdiction, snow and ice removal may be the responsibility of state and municipal agencies or private abutters (e.g., homes, businesses, property owners or tenants).

Both MassDOT and the Department of Conservation and Recreation (DCR) are responsible for maintaining their respective roadways reasonably safe for public travel by keeping them sufficiently clear of ice and snow. Both state agencies carry out these responsibilities under a snow and ice removal partnership. MassDOT is responsible for providing curb-to-curb snow removal for specifically designated DCR Parkways in the Greater Boston Area. However, DCR is responsible for clearing sidewalks related to these parkways. DCR's Winter Storm Plan and Priority Map and MassDOT's snow removal responsibilities further delineate snow removal roles for both agencies.

In dense urban areas property and business owners are required to clear sidewalks (often including curb cuts and ramps) that abut their property. Usually, property and business owners have between three and twenty-four hours to clear sidewalks. Subsequently, communities may issue a warning or a ticket. Communities primarily clear sidewalks adjacent to municipally owned buildings or property. In some cases, communities clear the most heavily traveled sidewalks. To ensure pedestrian access and safety, it is critical that a community's snow removal program address both roadways and sidewalks.

The following is an inventory of snow clearing policies of select communities in the Boston Region. Densely developed mature cities as well as suburban and rural communities have been selected for comparative purposes.

Newton's ordinance (Section 26-8) states that snow and ice must be removed from sidewalks in defined business districts within twenty-four hours. There is no fine indicated in the ordinance if snow removal does not take place. Woburn's ordinance (Title 12, Section 6) requires snow removal from specifically designated sidewalks. The property owner has two hours to remove the snow (6 hours if there is ice) after snowfall and is subject to a onetime 50 dollar fine. If an individual removes ice or snow from public and private property, and places the ice or snow without permission on public or private property they can be subject to a 300 dollar fine. In Westwood, if a person lays, throws, or places snow or ice on any paved town street or sidewalk that creates a hazardous condition or public safety concern, a minimum 300 dollar fine can be issued (Ordinance - Article 10, Section 3).

Bolton has a 100 dollar fine in its ordinance for persons who pile, push, or blow snow or ice onto a public way that is already plowed and sanded by the Town. The Towns of Concord and Essex will issue a 50 dollar fine for the same activity. The Towns of Lincoln and Carlisle can issue a ten dollar fine if a vehicle is parked to prevent the plowing or removal of snow and ice.

Residential and commercial property owners in Boston are required to remove snow within three hours after a snowfall. Cleared paths must be a minimum of 42 inches wide. Removal should be conducted in a manner "that ensures the orderly flow and safety of pedestrian traffic upon such sidewalks." Depending on the severity of the violation, fines range between 50 and 250 dollars per day.

Since the 1960s, Stoughton has been using sidewalk snowplows as part of their snow removal program. Figure 9, 'Sidewalk Snowplow,' is an example of the type of snowplow currently used in Stoughton. Priority snow removal locations, for both sidewalks and roadways, are schools, the town center, the train station, hospitals, and areas where elderly residents are highly concentrated. Residents are not required to clear snow on sidewalks that abut their property. Canton and Sharon also use sidewalk snowplows as part of their snow removal programs.[11]

Figure 9 Sidewalk Snowplow

Source: Prinoth, Ltd.

Best Practices – Snow Removal Regulations

Boston

In 2007, the City of Boston adopted an ordinance (16-12.16 Snow, Slush, and Ice on Sidewalks) that outlines fine policies for the removal of snow and ice from sidewalks and abutting curb ramps.

Depending on building size and length of time it takes to remove snow (greater than three or six hours) and if paths are not shoveled to a minimum of 42 inches wide, daily fines ranging from $50 to $150 can be incurred. If someone removes slush, snow, or ice from privately-owned real property and places it upon any sidewalk or street, a daily fine of $250 will be imposed.

The City of Boston also has an extensive Snow Information and Advisory Program. Interested parties can register for e-mail or text alerts to be notified when snow emergencies are declared.

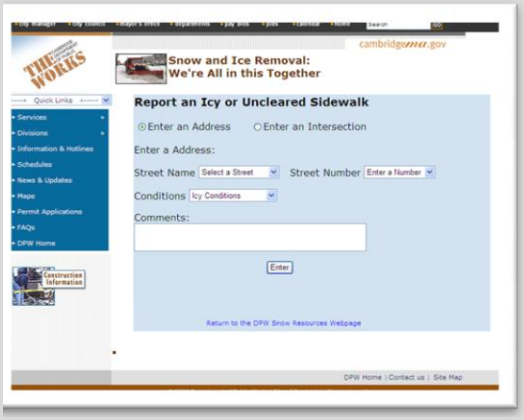
[11] Conversation with Larry Barret, Director of Public Works, Town of Stoughton, Mach 12, 2009.

Best Practices – Snow Removal Program

Cambridge

In Cambridge, property owners are responsible for keeping all sidewalks that border their property clear of snow and ice. The Cambridge Municipal Code requires property owners to remove snow from the sidewalk within 12 hours after snow stops falling in the daytime and before 1:00 P.M. when snow has fallen during the night. Ice must be cleared from sidewalks or treated with an ice-melting substance. In addition, paths must be at least three feet wide and ramps, corners and crosswalks must be cleared (Section 12.16.110, Sidewalk – Snow and Ice Removal).

Figure 10 City of Cambridge's On-Line Snow Removal Reporting System



After a snow storm, Cambridge deploys parking control officers on prioritized routes to ticket property owners who do not clear sidewalks. Failure to comply with the City's sidewalk clearance ordinance is 50 dollars for each day of non-compliance. Cambridge also has an on-line form for residents to report icy or uncleared sidewalks as shown in Figure 10, 'City of Cambridge's On-Line Snow Removal Reporting System.'

WalkBoston Recommendations

The advocacy group WalkBoston has developed seven basic recommendations to improve sidewalk snow and ice clearance for state agencies, communities, individual property owners/managers, and advocacy organizations. The seven recommendations are outlined in its 2007 report, "Keep it Clear - Recommendations for Sidewalk Snow and Ice Removal in Massachusetts."

1. Create a norm of snow and ice clearance through social awareness campaigns.

2. Identify a municipal point person for snow removal.

3. Set priorities for sidewalk snow clearance.

4. Improve monitoring and enforcement.

5. Design sidewalks for easier snow removal.

6. Train municipal and private snow plowing personnel.

7. Create sensible state policies through appropriate legislation.

Monitoring and Enforcement

There are three primary ways in which the clearance of sidewalks can be monitored and enforced:

- Identify who monitors and enforces.
- Define penalties and how they will be collected.
- Implement social awareness campaigns
  (e.g., distributing notices to households that indicate rules and penalties).

It is important for regulations to clearly differentiate between residential and municipal responsibilities regarding snow removal from sidewalks. Regulations should include times by when sidewalks must be cleared before being subject to fines.

Problematic Areas

The most problematic areas are curb ramps and pedestrian-crossing islands. These locations are often subject to poor drainage, which can create dangerous ponds of ice or slush. There are no laws that require abutting property owners to clear these locations and communities often do not take responsibility.

Pending Legislation

There are two bills under review that, if implemented, will serve as strong incentives for property owners to properly remove snow and ice.

In Massachusetts, property owners can be held liable for damages resulting from injuries due to falls on sidewalks adjacent to their property if they have made an attempt to clear the sidewalks. However, if private property owners do nothing to change the condition of the sidewalks, they cannot be held liable in the event of injury. This policy discourages people from clearing sidewalks and actually increases the risk of injury. Currently under legislative review is a bill, *An Act Relative to Snow and Ice Removal*, which proposes to change the liability for property owners who have not cleared their sidewalks from simple negligence to gross negligence. The implementation of this bill will encourage property owners to clear sidewalks abutting their homes and businesses. In addition, proposed bill, *An Act to Promote Pedestrian Safety*, would not make an individual liable for an injury or damage sustained upon a public way, if they removed the snow or ice from the public way in accordance with municipal ordinance or by-law. This proposed act extends statutory immunity of municipalities to individuals.

6. Laws, Codes and Legislation

This chapter highlights existing and proposed national, state and local legislation that promote walking through transportation and building design.

a. Federal

In March 2010, the United States Department of Transportation (US DOT) signed a Policy Statement to reflect US DOT's support for the development of fully integrated active transportation networks and incorporating safe and convenient walking and bicycling facilities into transportation projects.

> Every transportation agency…has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems. Because of the numerous individual and community benefits that walking and bicycling provide — including health, safety, environmental, transportation, and quality of life — transportation agencies are encouraged to go beyond minimum standards to provide safe and convenient facilities for these modes.

The US DOT recommends the following actions in order to achieve the Policy Statement's goals:

- Considering walking and bicycling as equals with other transportation modes.
- Ensuring that there are transportation choices for people of all ages and abilities, especially children.
- Going beyond minimum design standards.
- Integrating bicycle and pedestrian accommodation on new, rehabilitated, and limited access bridges.
- Collecting data on walking and biking trips.
- Setting mode share targets for walking and bicycling and tracking them over time.
- Removing snow from sidewalks and shared-use paths.
- Improving nonmotorized facilities during maintenance projects.

b. National

Title 23 of the United States Code (U.S.C.) §217: Bicycle Transportation and Pedestrian Walkways states that bicyclists and pedestrians shall be given due consideration in the comprehensive transportation plans developed by each metropolitan planning organization and State in accordance with Sections 134 and 135, respectively. Bicycle transportation facilities and pedestrian walkways shall be considered, where appropriate, in conjunction with all new construction and reconstruction of transportation facilities, except where bicycle and pedestrian use are not permitted.

Complete Streets' Bills Introduced in Congress

A more integrated approach to the design of roadways, increasingly referred to as the "Complete Streets" movement, is gaining nationwide momentum. This design paradigm calls for a broader focus beyond vehicle traffic that encompasses the needs and safety of all users, including pedestrians, people with disabilities, bicyclists, users of public transportation, motorists, and others. Legislation introduced in Congress would advance this approach by making it integral to street design. "The Complete Streets Act of 2009," as introduced by bills in both the House and the Senate, requires state and local jurisdictions to adopt laws and policies applying "Complete Streets" principles to the design of new roadways. The introduced bills stipulate the scope, coverage, and content of policies and also authorize the development of accessibility standards for new or altered streets covered by the act. Further

information on the status of the House bill (H.R. 1443) and Senate bill (S. 584) is available on via the Library of Congress website.

The Bills will require each state to have in effect within two years a law, or each State Department of Transportation and MPO a policy statement that will require all federally-funded transportation projects, with certain exceptions, to accommodate the safety and convenience of all users in accordance with Complete Streets principles.

c. State

Chapter 40R, Smart Growth Zoning and Housing Production, of the Massachusetts General Laws is a novel legislative approach designed to encourage denser housing production and mixed-use development at sites with infrastructure and to avoid sprawl. This legislation took effect on July 1, 2004. Providing a variety of transportation choices is a key component of smart growth.

According to Chapter 40R, a city or town may adopt a smart growth zoning district in an eligible location and may include adjacent areas that are served by existing infrastructure and utilities, and that have pedestrian access to at least one destination of frequent use (e.g., schools, civic facilities, places of commercial or business use, places of employment, recreation or transit stations). Accommodations for pedestrians need to be incorporated within the scale and goals of each 40R Project. In addition to Massachusetts General Laws Chapter 40R, Chapter 40A, Zoning, gives cities and towns authority to adopt ordinances and bylaws to regulate the use of land, buildings and structures.

Massachusetts is one of three states that require their state departments of transportation to accommodate pedestrians and bicycles into the design and construction of every project. The bill, enacted as Massachusetts General law Chapter 87 of the Acts of 1996, is sometimes referred to as the 'Paulsen Bill,' after its sponsor, former State Representative Anne Paulsen. This state law is referenced as Massachusetts General Law, Chapter 90E, Section 2A, 'An act relative to bicycle and pedestrian access in construction of public ways.'

Within the past two years, two Compacts have been developed that link transportation and health as well as support pedestrian policies and programs.

In 2009, Massachusetts's transportation reform law, 'An Act Modernizing the Transportation Systems of the Commonwealth' provided a new opportunity for the state to make critical connections between land use, transportation policy and public health. The law establishes a Healthy Transportation Compact (Section 33). This Compact will convene Health and Human Services and Transportation leaders to work collaboratively to adopt best practices to increase efficiency to achieve positive health outcomes through the coordination of land use, transportation and public health policy. The Healthy Transportation Compact calls for the preparation of a health impact assessment for use by planners, transportation administrators, and developers. Moreover, the Compact specifically calls for developing methods to increase pedestrian travel.

Best Practice – Smart Growth and Zoning

North Reading

With 406 units, Edgewood Apartments is the largest fully built out smart growth zoning district. The project began in fall 2004 and occupancy of the site started in spring 2008. The project is about a mile from the MBTA rail stop in Wilmington. The location type is considered to be 'highly suitable.'

d. Local Zoning Codes and Land Use Regulations

Cities and towns should include requirements for pedestrian mobility in their zoning and building codes, land-use plans, and subdivision regulations for both residential and commercial developments. Where appropriate, responsibility for sidewalk construction should be placed on individual developers.

Key elements for creating zoning regulations that support pedestrian activity include:

Mixed Use Development: create zones where retail, office, residential and other uses are combined.

Town Center Planning: encourage development into compact centers, either in new communities or existing developed areas.

Design Guidelines: establish clearly defined roadway, streetscape and public space criteria to ensure that new projects accommodate pedestrian activity.

Form-Based Codes: instead of conventional zoning, create codes that define the size, scale and proportions of buildings.

Best Practices – Local Zoning and Land Use

Cambridge
Cambridge has adopted specific plans and procedures to ensure that pedestrian improvements are consistently included in new development projects, construction work, and retrofits. Article 19 of the Zoning Ordinance has specific requirements about projects being pedestrian-oriented. Additionally, Cambridge requires Transportation Impact Studies (TIS) for large projects. A TIS includes requirements for pedestrian (and bicycle) counts, impacts on Pedestrian Level of Service (LOS) and mitigation for any impacts. A TIS is required by Article 19 of the Zoning Ordinance.

Components of Cambridge's Parking and Transportation Demand Management (PTDM) ordinance promote walking as a mode of transportation to reduce the level of drive-alone travel.

Millis
One of the key goals of the Millis Center Economic Opportunity Overlay District-East is to promote a pedestrian-friendly living and working environment. The Overlay District contains measures to enhance pedestrian access to buildings and between public spaces.

Bedford
Bedford's Depot Park Mixed-Use Overlay District focuses on mixed-use village style redevelopment. The Overlay District ensures the compatibility of structures with parking, pathways and other pedestrian amenities to facilitate pedestrian access.

Norfolk, VA
As part of Norfolk's Lot and Yard Requirements and Standards (I.4.a.5. Pedestrian Access), buildings shall generally be pedestrian way-oriented as well as physically and visually accessible to pedestrians from the pedestrian way. In addition, buildings shall provide pedestrian entrances that open to the front pedestrian way.

Seattle, WA
The Seattle Land Use Code provides for special Pedestrian District Overlays in commercial zones. Known as P1 and P2 overlays, they are intended to preserve and encourage pedestrian-oriented retail areas. Specific standards include a set of permitted and prohibited uses, reduced parking requirements, and limitations on blank facades.

e. Pending

There is pending legislation which addresses Speed Limits, Sidewalk Accessibility, Senior Citizen Safety Zones, and Red Light Camera (RLC) Enforcement:

Speed Limits

According to current state legislation (M.G.L. Chapter 90, Section 17), if there is no posted speed limit in a thickly settled area or business district, the 'default' speed limit is 30 miles per hour. If the rate of speed were changed from 30 miles per hour to 25 miles per hour, a pedestrian's chances of survival significantly increase if struck by a motor vehicle. There is presently a proposed bill in the House, *An Act Relative to Speed Limits*, which would lower the prevailing speed limit in urbanized areas from 30 miles per hour to 25 miles per hour.

Sidewalk Accessibility

An Act Relative to Improved Sidewalk Accessibility proposes that all newly constructed sidewalks in Massachusetts not be made of brick or from materials that are considered to limit the disability community's ability to access sidewalks. Establishing a 'Massachusetts Commission on Sidewalk Accessibility' is also proposed as part of this act.

Senior Citizen Safety Zones

The proposed bill, *An Act Authorizing the Establishment of Senior Citizen Safety Zones*, will enable a municipality to establish, by ordinance, a Senior Citizen Safety Zone on a public way. If a Senior Citizen Safety Zone is established, the municipality may reduce speed limits to not less than 20 miles per hour in this designated area.

Red Light Camera (RLC) Enforcement

Red Light Camera (RLC) enforcement is used to enforce traffic control signals by imposing penalties for violations. An RLC system automatically detects when a vehicle illegally enters a signalized intersection and takes a photograph or video (or both) of the infraction. Subsequently, a violation would be issued and mailed. If enacted, RLC enforcement would be part of Chapter 90 of the Massachusetts General Laws (M.G.L.) as a local option law.

Currently RLCs are permitted in 12 states and 47 cities, including Atlanta, Chicago, Houston, Los Angeles, New York City, Philadelphia, Phoenix, San Francisco, Seattle, and Washington, DC. Studies have concluded there are downward trends in red light running crashes and violations because of RLCs.

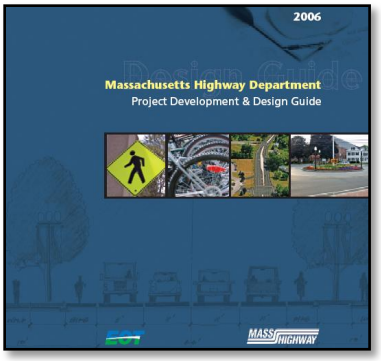
7. Pedestrian Infrastructure Design

This chapter outlines design elements of the pedestrian infrastructure and identifies design standards to accommodate pedestrians. To the extent possible, pedestrian concerns expressed by the public should be incorporated.

a. Design Guidelines

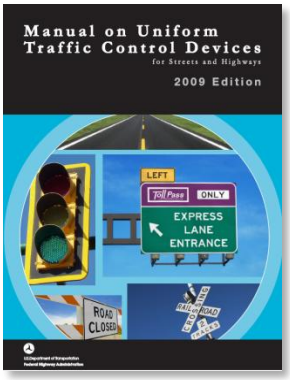
When implementing design tools for roadway infrastructure, it is critical to accommodate pedestrians. This section contains a brief description and direct links to reference the resources. These resources are considered to be the state and Federal standards in design for pedestrian infrastructure.

MassDOT's Development and Design Guidebook



The primary resource that should be adhered to is the MassDOT Project Development and Design Guidebook.

Multimodal accommodation that encourages and supports safe travel for pedestrians, bicyclists and other modes of travel is a key feature of the MassDOT Guidebook. The MassDOT Guidebook directs the designer to begin at the edge with the pedestrian and work their way in, to ensure that the needs of non-motorized users remain integral to project planning and design. This approach facilitates the use of context-sensitive design, environmental protection and the careful consideration of the safety and accessibility needs of pedestrians, bicyclists and non-motorized facility users.

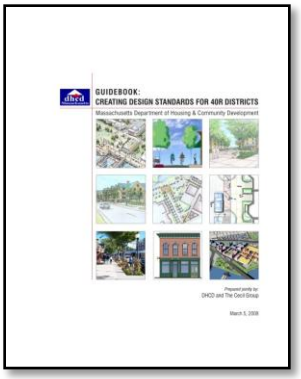


Manual on Uniform Traffic Control Devices (MUTCD)

The Manual on Uniform Traffic Control Devices, or MUTCD defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public traffic. States must adopt the 2009 National MUTCD as their legal State standard for traffic control devices within two years.

The MUTCD gives guidelines regarding the location and frequency of crosswalk installation, how long a pedestrian should wait at an intersection before crossing, how much time a pedestrian has to cross a street as well as the design and placement of signals and striping.

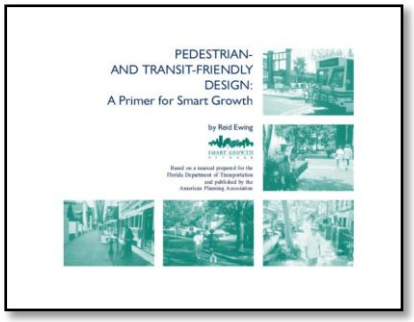
Creating Design Standards for 40R Districts



Prepared jointly by the Massachusetts Department of Housing and Community Development and the Cecil Group in 2008, this Guidebook serves as a resource for communities and citizens in Massachusetts working to establish special design standards in conjunction with Smart Growth Zoning Districts enabled by M.G.L. Chapter 40R.

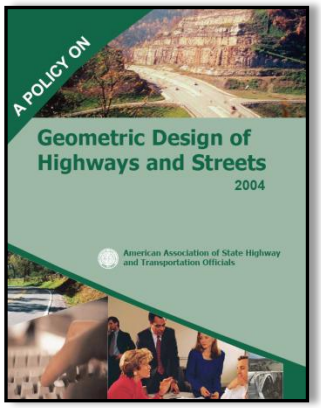
It provides practical information and references for crafting workable standards that will apply to the land uses and development within Smart Growth Zoning Districts. Accommodations for pedestrians such as walkway and sidewalk width, provision of benches, lighting fixtures and other street furniture elements are addressed in this Guidebook.

Pedestrian and Transit-Friendly Design: A Primer for Smart Growth

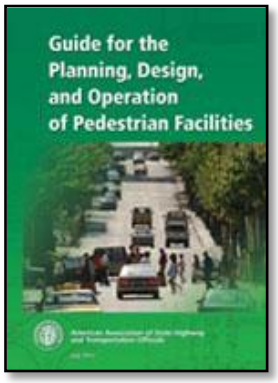


Published by the Smart Growth Network, this guide is based on a manual prepared for the Florida Department of Transportation. The publication is a general guide to and discussion of design concepts that support pedestrian activity and transit use.

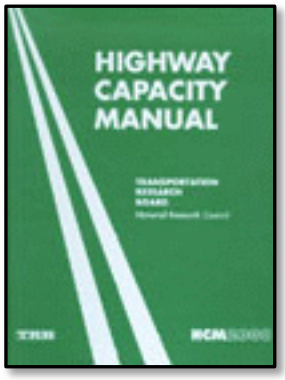
The concepts are not presented in the format of design standards but they do provide some of the underlying rationale and strategies around which a community might develop measurable standards. The guide's various elements are broken into three categories: "Essential Features", "Highly Desirable Features", and "Nice Additional Features."



AASHTO's A Policy on Geometric Design of Highways and Streets (2004)
Frequently referred to as the 'Green Book', this policy manual contains information about the latest design practices in universal use as the standard for highway geometric design. The intent of the 'Green Book' is to provide guidance to the designer by referencing a recommended range of values for critical dimensions. The pedestrian and pedestrian facilities are referenced throughout the 'Green Book.'



AASHTO's Guide for the Planning, Design and Operation of Pedestrian Facilities (2004)
The purpose of this guide is to provide guidance on the planning, design, and operation of pedestrian facilities along streets and highways. Specifically, the guide focuses on identifying effective measures for accommodating pedestrians on public rights-of-way. The AASHTO Guide is widely used in the planning and engineering industry.



Highway Capacity Manual (HCM) (2000)
A publication of the Transportation Research Board (TRB), The Highway Capacity Manual (HCM) contains concepts, guidelines, and computational procedures for computing the capacity and quality of service of various highway facilities, including freeways, highways, arterial roads, roundabouts, signalized and unsignalized intersections, rural highways, and the effects of mass transit, pedestrians, and bicycles on the performance of these systems. The fifth edition, HCM 2010, is expected to be published in early 2010.

b. Accessibility

Pedestrian facility design must comply with accessibility standards in the Rehabilitation Act of 1973 (Section 504) and the Americans with Disabilities Act (ADA) of 1990. ADA Standards for Accessible Design applies to all projects involving new or altered pedestrian facilities, not just projects funded by state or federal sources. Although improvements for people with disabilities are mandated, street designs that accommodate people with disabilities creates a better walking environment for all pedestrians.

The U.S. Access Board has drafted standards which act as interim guidance for pedestrian facilities *within* the public right-of-way. Some standards have been approved for building sites (curb ramps, accessible routes, ground and floor surfaces, and bus stops and shelters) and are contained in the ADA Accessibility Guidelines (ADAAG). These have a higher standing since they are approved by federal agencies as final standards and need to be followed for pedestrian facilities in the public right-of-way. These are also featured as a subset of the drafted standards contained in the PROWAC guides.[12] Since the PROWAC guidance has been recently revised and includes the latest ADAAG requirements for these facilities, it may be easier to follow PROWAC guidance.

The Architectural Access Board (AAB) is a regulatory agency within the Massachusetts Office of Public Safety. Its legislative mandate is to develop and enforce regulations designed to make public buildings accessible to, functional for and safe for use by persons with disabilities. To carry out the board's mandate, the "Rules and Regulations", which appear in the code of Massachusetts Regulations as 521 CMR 1.00, have been developed and amended. Part C, Exterior, Sections 20-22 specifically applies to pedestrian access in the public right-of-way. These regulations are incorporated in the Massachusetts building code as a "specialized code", making them enforceable by all local and state building inspectors, as well as by the Board itself. It is critical that municipalities ensure compliance with ADA and AAB standards. This could be done through developing and implementing self-evaluation and transition plans.

Another important resource is Designing Sidewalks and Trails for Access, Part II of II: Best Practices Design Guide, prepared by the US Department of Transportation, Federal Highway Administration. This guidebook is the second part of a two-phase project focused on designing sidewalks and trails for access. It was created to provide planners, designers, and transportation engineers with a better understanding of how sidewalks and trails should be developed to promote pedestrian access for all users, including those with disabilities.

In addition, mobility, access and operational needs associated with emergency services, such as fire and ambulance operations, must be accommodated. Street width, number of travel lanes, geometric design of intersections, access management features, and signal timing are key factors that need to be addressed in street design. Accommodating mobility, access, and operational needs will improve response times and provide a safer environment for emergency vehicles.

[12] PROWAC is an acronym for the U.S. Access Board's Public Rights of Way Accessibility Committee's Guidelines.

c. Design Essentials

A safe and attractive pedestrian environment requires a high standard of facility design. This includes the quality of pedestrian facilities, the integration with the vehicular way and relation to surrounding buildings and activity centers.

Implementation of pedestrian facilities has often run counter to the action items identified in this plan. The first image that follows (Figure 11, 'Examples of what is Wrong'), taken within the MAPC region, identifies a long list of issues that run counter to the goals of this plan in accommodating and embracing pedestrian transportation. The contrasting second image (Figure 12, 'Examples of what is Right'), also within the MAPC region, shows a number of design elements that meet the action items of this plan. Note that sidewalks at both of these locations have been reconstructed within the past five years.

Figure 11 Examples of what is Wrong

Figure 12 Examples of what is Right

The following outlines recommended design practices for pedestrian facilities and the relationships with surrounding infrastructure. Design practices are separated into three sections; Walkways, Roadways, and Intersections.

i. Walkways

Walkways comprise all facilities that carry pedestrians. This includes sidewalks, paths, and shared streets and shared-use paths.

Sidewalks

Sidewalks are critical components for an effective pedestrian network. Sidewalks, provided on both sides of a street, are generally the preferred pedestrian facility and provide for a safe walking area outside the motor vehicle traffic travel-way.

Sidewalk Material and Surface - According to the ADA Accessibility Guidelines for Buildings and Facilities (ADAAG) any material used for walkways must meet their 'stable, firm and slip-resistant' criteria. The preferred and most common sidewalk surface is concrete as it provides requires the least amount of maintenance and has a long life span. Other materials such as asphalt, brick, crushed granite/stone, or bricks and pavers may be used as long as ADAAG requirements are met. Sidewalks should be built to accommodate all pedestrians, and should be as flat as practical with a grade of 5 percent or less.[13]

Figure 13 Brick Sidewalk in Newton

There has been considerable debate regarding the use of brick as a sidewalk material. Aesthetic appeal and historic associations are positive aspects to using brick. Old brick sidewalks were set in stone dust which can create significant unevenness over time. The unevenness cases a tripping hazard and is noncompliant with the ADA. Although newer brick sidewalks are set in concrete, the surface can still be uneven and be slippery when wet. Appendix X, Sidewalk Construction Specifications, of the Cambridge Pedestrian Plan serves as a good model for sidewalk design standards. Figure 13, 'Brick Sidewalk in Newton,' is an example of a well maintained brick sidewalk.

Sidewalk Width - According to the Institute of Transportation Engineers (ITE), a sidewalk width of 5 feet is needed for two adult pedestrians to comfortably walk side-by-side. The Americans with Disabilities Act (ADA) mandates a minimum width of 3 feet of unobstructed sidewalk passageway. Reasonable flexibility exists to allow communities to adjust some dimensions to meet community goals. The ADA also requires an inclusion of a 5-by-5 foot passing space every 200 feet if a public sidewalk is less than 5 feet wide. The width of a sidewalk depends primarily on the number of pedestrians who are expected to use the sidewalk - high-use sidewalks should be wider than low-use sidewalks.

[13] Pedestrian Facilities Users Guide, FHWA, 2002.

Sidewalk Furnishings and Obstructions - Streetlights, utility poles, signposts, fire hydrants, mail boxes, parking meters, benches, and other street furniture should not be located in a sidewalk's Travel Zone, but rather the Curb Zone. If a wider sidewalk cannot be provided, sidewalk furnishings and obstructions should be consistently located outside of the sidewalk. Each of these surface factors work in conjunction with each other to determine ease of use.

Walkinginfo.org, a website funded by the U.S. Department of Transportation Federal Highway Administration and maintained by the Pedestrian and Bicycle Information Center, provides more information about sidewalk design recommended guidelines for sidewalks.

Sidewalk Corridors - According to the Federal Highway Administration, sidewalk corridors that promote access include the following characteristics:

- Wide pathways;
- Clearly defined pedestrian, furniture, and frontage zones;
- Minimal obstacles and protruding objects;
- Moderate grades;
- Minimal changes in level;
- Firm, stable, and slip resistant surfaces; and
- Good lighting.

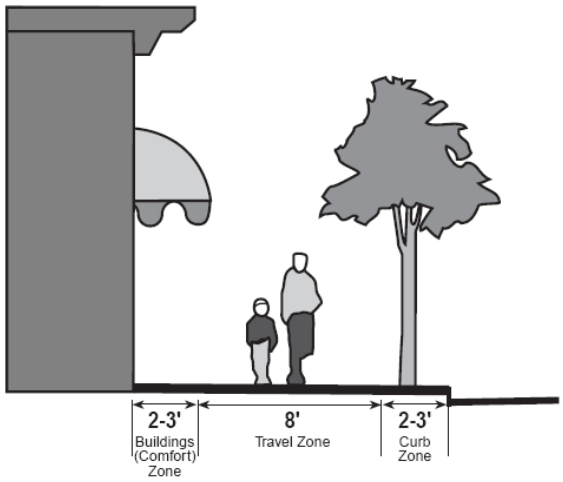
Each of these surface factors work in conjunction with the others to determine how easily pedestrians can use the sidewalk.

Sidewalk Zones - According to Cambridge's Pedestrian Plan and depicted in Figure 14, 'Sidewalk Zones,' the sidewalk is divided into three zones: Curb Zone, Travel Zone and the Building or Comfort Zone. The width of each zone depends in part on the overall width of the sidewalk. Sufficient Curb and Building or Comfort Zones are necessary in order to maintain a usable Travel Zone.

The Curb Zone

The curb zone is the portion of the sidewalk immediately adjacent to the curb. Most street furniture, signs, trash cans, signal control boxes, bollards, and plantings are installed in this zone so they will not interfere with pedestrian traffic. This zone provides a buffer for pedestrians from the roadway.

Figure 14 Sidewalk Zones



Source: Cambridge Pedestrian Plan, 2000.

The Travel Zone

The Travel Zone is the area of the sidewalk corridor that is reserved for pedestrian travel. Ideally, it should be free of obstacles and protruding objects.

The Building or Comfort Zone

The Building or Comfort Zone is the section of the sidewalk that is adjacent to the property line. In business districts, window shoppers often use this zone and it can be used for sidewalk cafes, building entrances or window sills.

Figure 15 Sidewalk in Norfolk, Massachusetts

Source: CTPS, Pedestrian and Bicycle Improvements in Town Centers

Sidewalk Widening - Whenever roads are reconstructed, options for widening sidewalks should be considered, particularly for streets with heavy pedestrian traffic. Decisions about changing the width of sidewalks should be made on a street-by-street basis, taking into account cost, drainage, utility locations, vegetation, and other factors. Wider sidewalks can reduce vehicle speeds and increase safety for pedestrians. Figure 15, 'Sidewalk in Norfolk, Massachusetts,' is a good example of a sidewalk.

Best Practices – Sidewalk Design Requirements

Norwell

Norwell's Subdivision Rules and Regulations contain specific design requirements for sidewalks.

Reading

Reading's Downtown Smart Growth District Design Guidelines and Proposed Downtown Smart Growth Overlay contains specific design requirements for sidewalks.

Paths

Paths are walkways that are typically physically separated from the street at a greater distance than a typical concrete sidewalk. Paths may be wide enough (10 feet) to accommodate bicycle traffic or they may meander to avoid trees, walls, and other obstructions. The obstructions are often beneficial to the quality of the pedestrian environment and are part of the context sensitivity of the location. Good examples of paths are shown in Figure 16, 'Paths in Lincoln and Natick.'

Figure 16 Paths in Lincoln (walking, left) and Natick (shared use, right)

Shared Streets

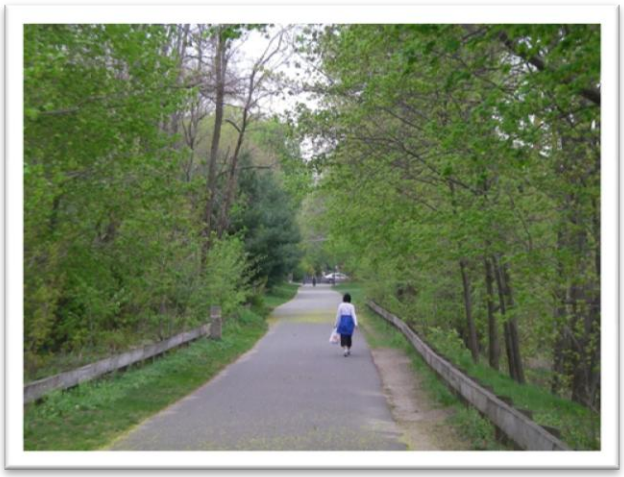
Many streets have narrow sidewalks as well as limited roadway width. Some are located in commercial districts with buildings adjacent to the sidewalks. As a result, pedestrians are squeezed on the limited sidewalk space and often spill into the adjacent roadway. A concept of a "shared street" is beginning to be implemented in the United States to address these issues.

Figure 17 Shared Street in Harvard Square, Cambridge

A shared street is designed such that the entire roadway is raised to the level of the sidewalk. Drivers as well as pedestrians share the same space on the street. Street furniture such as benches, trees, or outdoor dining may be placed in the street while retaining enough of a clear width to allow motor vehicles to pass. Drivers and cyclists must travel at a speed that allows sharing of the roadway with pedestrians.

The City of Cambridge has recently implemented two shared streets in Harvard Square. Both are one-way streets with low traffic volumes, high pedestrian traffic, and retail on both sides of the street. Placement of buildings is also oriented toward the street. Shared streets are encouraged throughout the region where the right mix of uses and foot traffic is present. Figure 17, 'Shared Street in Harvard Square, Cambridge,' depicts one of the shared streets.

Figure 18 A Shared-Use Path



Shared-Use Path

A shared-use path is a path that is also designed to accommodate bicycles and other wheeled users. Where a walking path may be as narrow as 4 feet wide, a shared use path is typically 10 feet wide or wider and either paved or a supportive surface such as stone dust. Shared-use paths are typically located away from the street right of way. An example of a shared-use path is shown in Figure 18.

ii. Roadways

Driveways

Driveways that cut across sidewalks can be a significant hazard for pedestrians. The pedestrian right-of-way is more easily established when a sidewalk is extended across the driveway, at a constant elevation so drivers are aware they are entering a pedestrian area. Curb radii should be kept as small as possible and driveway widths should be at a minimum to help slow down entering and exiting vehicles. Driveway grades across sidewalks (e.g. "cross slopes") should not exceed two percent. Driveway grades across sidewalks (e.g.; 'cross slopes') should not exceed two percent, as can be seen in Figure 19, 'Example of Driveway Treatment.' This is more usable for all pedestrians and makes it clear to motorists that they must look for pedestrians.[14]

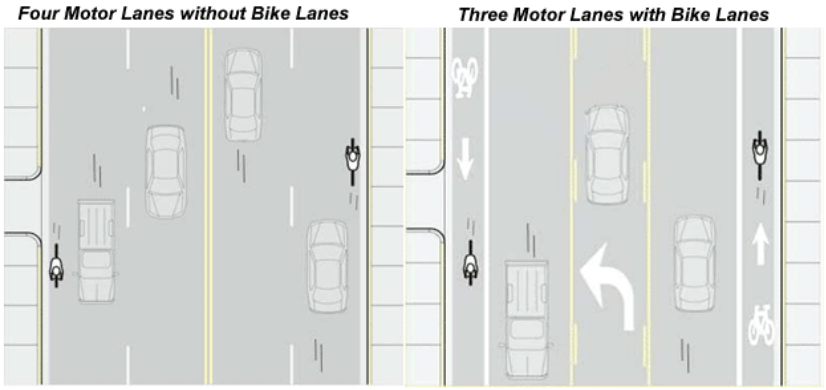
Figure 19 Driveway Crossing at Sidewalk Level

Source: www.pedbikeimages.org.

Lane Rechannelization

Lane rechannelization refers to a reduction in the number of vehicle travel lanes. An example of lane rechannelizaton is taking a four lane roadway (two lanes in each direction) and reducing it to a three lane roadway, with one lane in each direction, a center turn lane, and bike lanes. Lanes can be rechannelized by extending curbs, reducing curb radii, adding on-street parking, pedestrian refuge islands, and landscaping as shown in Figure 20, 'Lane Rechannelization,' and Figure 21, 'Street that has Undergone Lane Rechannelization.' With fewer lanes to cross, pedestrian safety is usually improved. Vehicular safety can also be improved since a turning lane can provide a safe refuge.

Figure 20 Lane Rechannelization



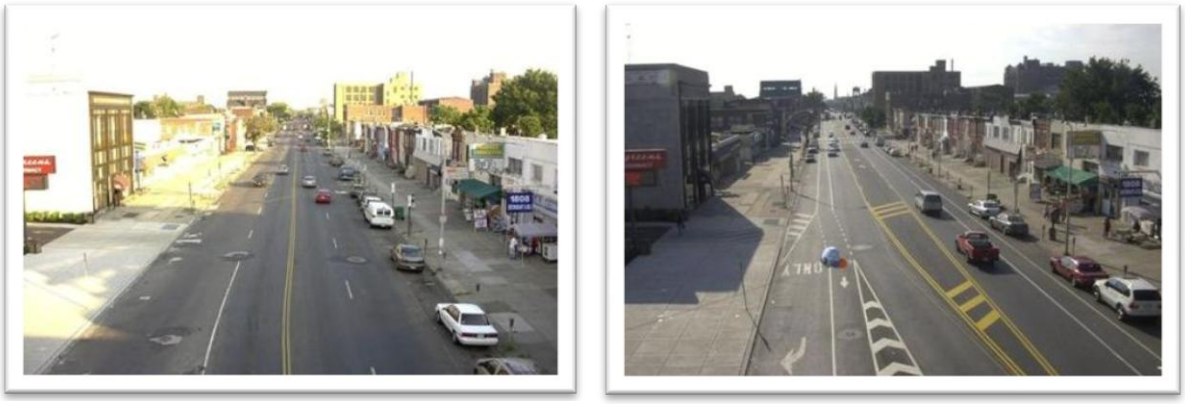
Adding two bike lanes, a turning lane and removing one vehicle travel lane from four vehicle travel lanes is an example of lane rechannelization.

Source: Chicago Department of Transportation.

[14] FHWA, Pedestrian Facilities Users Guide, 2002, page 55.

Figure 21 Street that has Undergone Lane Rechannelization

Before **After**



The 'Before' picture shows an aging main street (location unknown). There are four wide traffic lanes as well as parking on both sides of the street. The 'After' picture shows the same street, but with improvements. There are now two travel lanes with on street parking. Bike lanes as well as left and right turn lanes have been added. The center lane is now a turn lane and has stripes running across it to deter travel in that lane.

Source: US DOT, FHWA, Pedestrian and Bicycle Safety.

Separation

Walkways should be separated from moving vehicle traffic to provide safety and security for the pedestrian as well as an attractive pedestrian environment. Separation can include any number of the following; street trees and planter strips, street furniture, bicycle lanes, and parallel parking.

Figure 22 Example of a Planter Strip

Planter Strips

Planter strips are often the most attractive and accommodating for pedestrians, providing a green space between the street and the sidewalk as shown in Figure 22, 'Example of a Planter Strip.' They can serve to provide drainage and filtering of runoff as well as green and cool the area through street trees. Street trees provide shade, beautify the community, can create a buffer between pedestrians and vehicles as well as pull carbon dioxide from the atmosphere.

Figure 23 Example of a Bicycle Lane

Source: http://pactsblog.org/blog/tag/bike-lane/

Bicycle Lanes

Bicycle lanes are sections of a roadway, which have been designated by striping, signing and pavement markings for the exclusive use of bicyclists. Bicycle lanes provide a consistent separation and provide a buffer between vehicles and bicyclists as can be seen in Figure 23, 'Example of a Bicycle Lane.' The potential conflicts between pedestrians and motorists are reduced and vehicular speeds are encouraged to be lower with the addition of bicycle lanes.

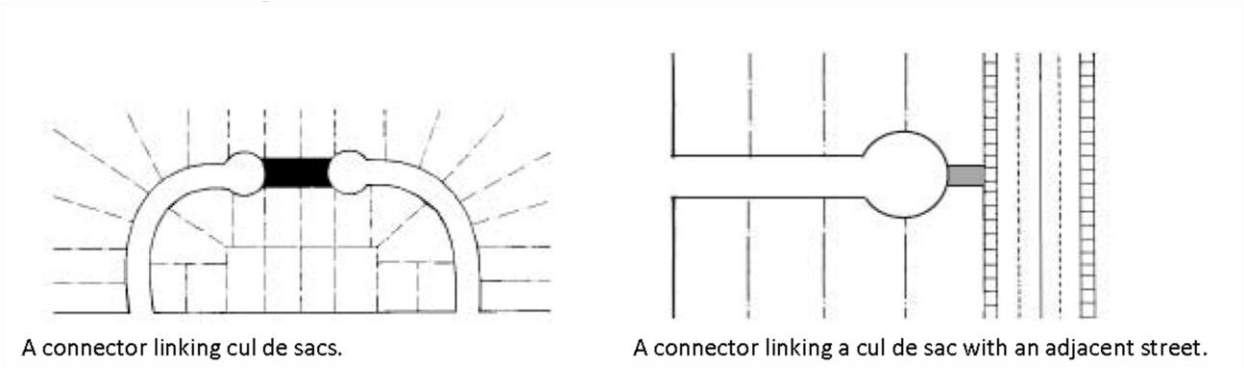
Parallel Parking

A simple solution on wide streets is to provide parallel parking that has the benefit of separating pedestrians from moving vehicles. Parallel parking as a buffer is most effective in business districts or high density residential areas where most of the spaces are occupied by parked vehicles.

Cul de Sacs

Cul de sacs eliminate through traffic and they are seen as a benefit for homeowners who want less traffic. Unfortunately, they can create barriers for pedestrians, add vehicular trips on adjacent roads (since walking distances are greater) and increase congestion to the connecting roads. Where feasible, pedestrian connections should be added to cul de sacs but creating new cul de sacs is discouraged. Pedestrian connections can be made between a cul de sac and an adjacent roadway or between cul de sacs as shown in Figure 24, 'Cul de Sac Connectors.'

Figure 24 Cul de Sac Connectors



Source: Planning and Designing for Pedestrians, 2002.

Lighting

Pedestrians often assume that motorists can see them at night. Without appropriate lighting, motorists may not be able to see pedestrians in time to stop. Well-designed and well-placed street lighting improves pedestrian visibility and safety.

Providing street lighting at pedestrian crossing areas and locations where there are high concentrations of pedestrian activity is important. In areas with high concentrations of pedestrian activity (e.g., schools, shopping districts or downtown areas), placing pedestrian-level lighting over the sidewalks in addition to street lighting is recommended. Mercury vapor, incandescent, or high-pressure sodium lighting are preferred pedestrian-level lighting types. Pedestrian lighting should conserve electricity and avoid glare.

Lighting that is designed for motorists is not necessarily appropriate for pedestrians. Pedestrians have a smaller field of focus and move at a slower pace. As a result, pedestrians require shorter light standards to direct more intense light onto a smaller space. Lighting for pedestrians should be spaced continuously to provide a consistent level of light and lighting levels should also be uniform. In order to avoid light pollution, it is important that lighting be directed downward, towards the pedestrian, not up to the sky.

iii. Intersections

Pedestrians are most vulnerable at intersections. Although vehicles turn in multiple directions at intersections, signals and crosswalks provide various levels of protection for pedestrians.

There are a variety of pedestrian crossing improvements to enhance safety and encourage more walking. Well placed and designed crossing improvements assist pedestrians in traversing complex intersections, make pedestrians more visible to oncoming traffic and encourage pedestrians to cross at specified locations.

Crosswalks

Marked crosswalks are used to help designate right-of-way for motorists to yield to pedestrians and direct pedestrians to preferred crossing points. Features such as the number of lanes that pedestrians must cross, proximity to existing traffic signals, and the number of pedestrians who cross the street are critical factors that decide whether a marked crosswalk should be installed.

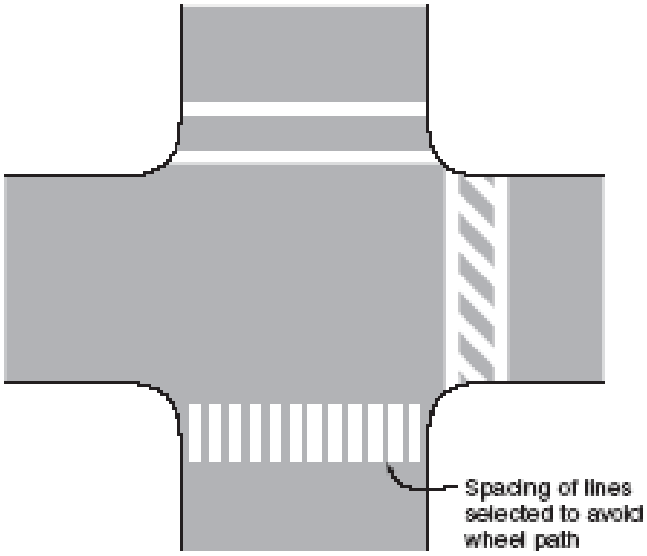
Marked crosswalks contribute towards pedestrian safety. Ideally, marked crosswalks should be used in conjunction with other measures, such as curb extensions, advance warning signage for motorists, traffic signals and traffic calming treatments, to improve pedestrian crossing safety. Marked crosswalks should be provided at intersections where there is pedestrian activity, be placed at regular intervals and convenient locations for pedestrians, and be visible to both the motorist and the pedestrian. ADA-compliant wheelchair ramps should be provided at all crosswalks. The design of a marked crosswalk is dependent on traffic volumes, pedestrian volumes, speed and the number of lanes.

Thermoplastic and inlay tape are the preferred materials for marking crosswalks. Although initially more costly than paint, both inlay tape and thermoplastic are more cost-effective in the long run as both are longer-lasting and require less maintenance. Inlay tape and thermopolastic are more visible at night and slip resistant than paint when wet.

As seen in Figure 25, 'Examples of Crosswalk Markings,' the MUTCD contains various crosswalk marking patterns. Since the pattern is more visible to motorists, MAPC strongly recommends the "continental" pattern as the preferred marking for crosswalks. Figure 26, 'Continental Crosswalk Marking' is an

example of a continental crosswalk. Parallel bar crosswalks are not recommended due to their minimal visibility at night, and confusion with the vehicle stop bar in advance of the crosswalk.
Details on innovative pedestrian crossing treatments for crosswalks have been published in a document by the Institute of Transportation Engineers, *Alternative Treatments for At- Grade Pedestrian Crossings,* 2001. Measures such as incorporating signage, striping, lighting, curb extensions, textured paving and other alternative surface treatments, speed tables, signal equipment, pedestrian detection are described in this resource.

Figure 25 Examples of Crosswalk Markings



Source: Manual on Uniform Traffic Control Devices (MUTCD), FHWA, Washington DC, 2009

For a crosswalk to be useful, drivers must be aware of the crosswalk and the pedestrians need to utilize the crosswalk. Both sides of a marked crosswalk should have a strong connection to a destination or destinations towards which pedestrians are already heading. It is important for drivers to have adequate sight distance, the distance that a driver can see along the roadway before curvature or obstructions block the view, before approaching a crosswalk.

Figure 26 Continental Crosswalk Marking - Recommended

Yield lines and set-back stop lines in advance of crosswalks improve a driver's view of pedestrians in crosswalks. Stop lines are used in advance of marked crosswalks at signalized intersections, while yield lines are placed in advance of unsignalized crosswalks. Restricting parking at corners improves visibility of the crossing for both drivers and pedestrians. Signage and crosswalks with in-roadway warning lights, also referred to as 'flashing crosswalks', may be used to further alert drivers to crosswalks. Figure 27, 'Alternative Zebra Crosswalk Marking,' and Figure 28, 'Parallel Crosswalk Marking,' are respective examples of good and poor crosswalks.

Mid-Block Crosswalks

A mid-block crosswalk is a marked crosswalk located away from an intersection that may be either signalized or unsignalized. According to the MUTCD, mid-block crosswalks must be marked. Mid-block crosswalks serve to bridge long gaps between intersections and to serve high pedestrian demand.

The following guidelines can assist in evaluating whether mid-block crosswalks should be installed:

- Assess the relationship of roadway width, the preference to cross at mid-block, and crossing safety;
- Evaluate location (e.g.; the distance to nearby intersections) and the relationship to adjacent land uses (e.g.; a building entry placed at mid-block with a parking lot directly across the street can create a demand for mid-block pedestrian movements); and
- Analyze traffic volumes and speeds as well as pedestrian volumes.

If a mid-block crosswalk is designated for installation, then warning indicators such as signs, pavement markings, flashing lights, and pedestrian-activated traffic control signals need to be determined[15]. It has been debated that providing signs and markings at mid-block crosswalks gives pedestrians a false sense of security. There is no guarantee that a driver may be aware of the mid-block crosswalk and will exercise caution at the intersection.

Some general principles for mid-block crossings include:

- Reduce the number of lanes. Fewer lanes limit pedestrian crossing distances and generally lessen the likelihood of a collision.;
- Install geometric changes that narrow or divide crossing the roadway (e.g.; curb extensions and raised islands or medians);
- Improve crossing visibility (e.g.; restrict parking and manage landscaping in the vicinity of the mid-block crosswalk);
- Mark mid-block crosswalks with highly reflective material;
- Use flashing yellow warning beacons, often referred to as flashers, in conjunction with advance warning signs; and
- Provide adequate lighting to increase pedestrian safety.

In the early 1990s, the National Highway Traffic Safety Administration evaluated crash types for more than 5,000 pedestrian crashes in six states. The results showed that mid-block accidents were the second major grouping of crash types, accounting for 26.5 percent of all crashes. Increased enforcement and driver education will contribute towards a higher percentage of vehicles yielding as required by law to pedestrians.

Marked or Unmarked Crosswalks

A Federal Highway Administration (FHWA) study on whether it is safer for crosswalks to be marked or unmarked where there are no traffic signals or STOP signs present was conducted in 2005[16]. This study analyzed five years of pedestrian crash data at 1,000 marked crosswalks and 1,000 unmarked comparison sites. The study concluded that on two-lane roads, the presence of marked crosswalks alone at an uncontrolled location was associated with no difference in pedestrian crash rates, compared to unmarked crosswalks. However, marked crosswalks on multi-lane roads with traffic volumes above

[15] Walkinginfo.org
[16] Safety Effects of Marked versus Unmarked Crosswalks at Uncontrolled Locations, USDOT, FHWA, September 2005.

about 12,000 vehicles per day were associated with higher pedestrian crash rates compared to unmarked crosswalks.

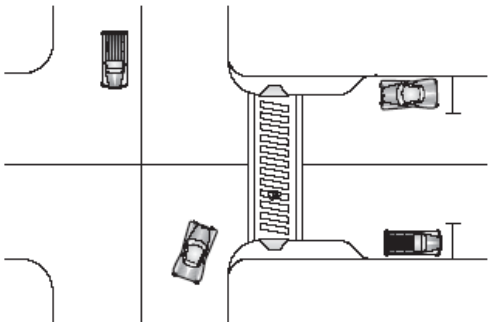
Raised Pedestrian Crossing

A raised pedestrian crossing can is designed to slow drivers' speeds, which will increase the likelihood of yielding to crossing pedestrians. The FHWA study concluded that raised medians significantly lower pedestrian crash rates at multi-lane sites with both marked and unmarked crosswalks[17]. This type of pedestrian crossing is most appropriate on local or neighborhood streets with low speed limits.

Curb Extensions

Curb extensions extend the sidewalk into the street, reducing the time and distance it takes a pedestrian to cross. Curb extensions can also prevent drivers from parking in front of crosswalks and blocking curb ramps. The visibility between drivers and pedestrians is also improved with curb extensions because pedestrians start crossing farther out into the street. Curb extensions also reduce the curb turning radius and narrow the roadway. Curb extensions should not extend more than 6 feet from the curb.[18] In addition they must not extend into travel or bicycle lanes and are only appropriate when there is on-street parking.[19] Figures 29 and 30, 'Curb Extensions,' are model examples of curb extensions.

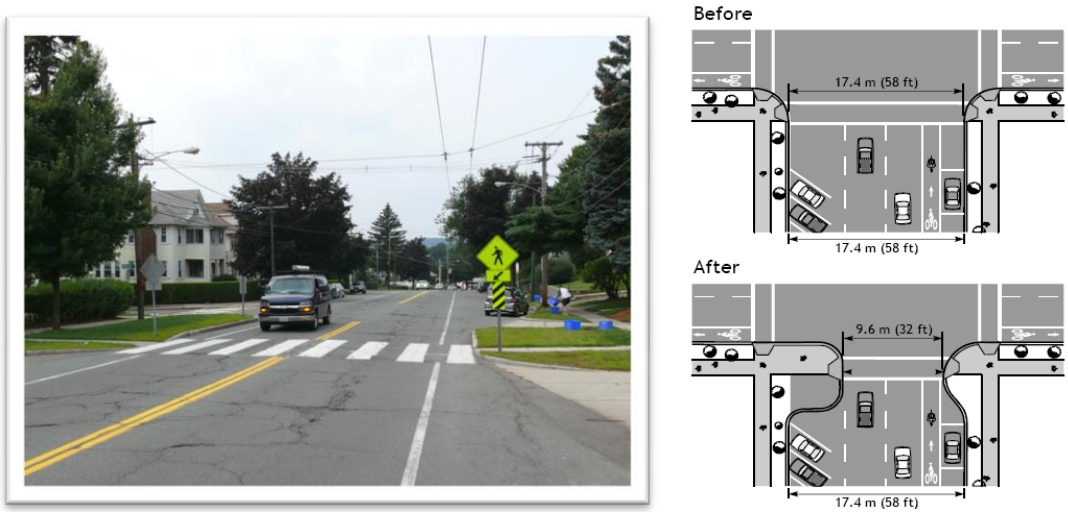
Figure 27 Curb Extensions



Source: Cambridge Pedestrian Plan, 2000.

[17] *Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations*, FHWA, USDOT, Research, Development, and Technology Turner-Fairbank Highway Research Center, September 2005.
[18] Except as shown in Figure 27 which is a curb in conjunction with angled parking.
[19] FHWA, Pedestrian Facilities Users Guide, 2002, page 69.

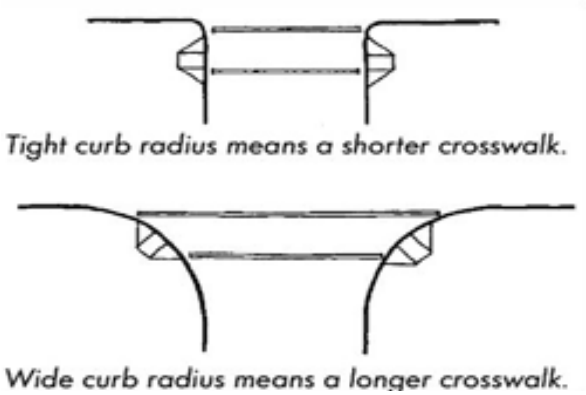
Figure 28 Curb Extension – Image and Graphic



Source: U.S. DOT, FHWA.

Curb Radii

Figure 29 Diagram of Curb Radii



Curb radii is the measurement of the sharpness of a corner at an intersection. Generally, a smaller or tighter curb radius is better for pedestrians. Compared to a large curb radius, a smaller curb radius allows for more pedestrian area at the corner, flexibility in the placement of curb ramps, shorter street crossings, requires vehicles to slow as they turn the corner, and improves sight distance between pedestrians and drivers. An appropriate turning radius for new construction is about 15 feet and about 25 feet for arterial streets that carry a significant volume of turning buses and/or trucks.[20] Having curb radii that accommodate emergency vehicles (e.g., the ability to turn at an intersection) is essential. Figure 31, 'Diagram of Curb Radii,' and Figure 32, 'Small Curb Radii and Large Curb Radii,' depict the differences between small and large curb radii.

[20] FHWA, Pedestrian Facilities Users Guide, 2002, page 58.

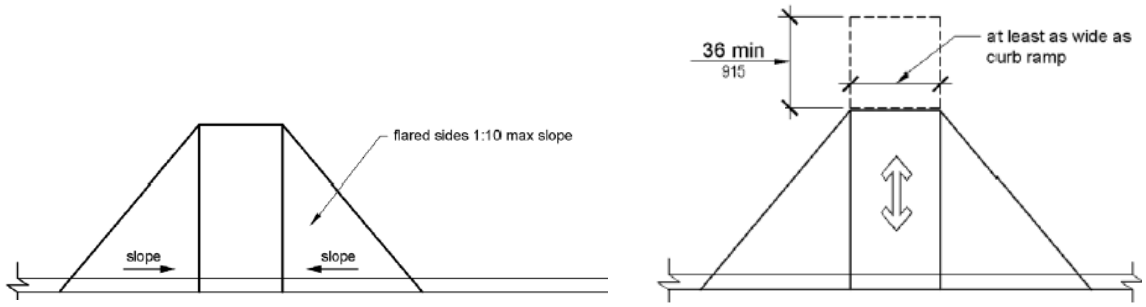
Figure 30 Small Curb Radii (left) and Large Curb Radii (right)

Curb Ramps

Curb ramps are used wherever there is a difference in level along a path a pedestrian is traversing. They should be designed to provide an accessible route so pedestrians may safely transition from a roadway to a curbed sidewalk and vice versa. Curb ramps are most commonly found at intersections, but they may also be used at other locations such as on-street parking, driveways, loading zones, bus stops, and midblock crossings. Curb ramps should be designed to provide direct access and have proper width and slope.

Curb ramps must have a slope no greater than 1:12 (8.3 percent). The minimum curb ramp width is 36 inches; however, 48 inches is the desirable minimum. If a curb ramp is located where pedestrians must walk across the ramp, the ramp must have flared sides of no more than 1:10 (10 percent) slope, as depicted in Figure 33, 'Sides of Curb Ramps and Landings at the Top of Curb Ramps.' These flares are not needed where ramps are placed in a landscaped area. Curb ramps also require a minimum of 36 inches of level and clear passage of 48 inches or more are desirable at the top also depicted in Figure 29. Curb ramps must be designed in accordance with the ADA guidelines.[21] A good example of a curb ramp is shown in Figure 34, 'Curb Ramp.'

Figure 31 Sides of Curb Ramps (left) and Landings at the Top of Curb Ramps (right)



Source: ADA and ABA Accessibility Guidelines.

[21] FHWA, Pedestrian Facilities Users Guide, 2002, page 44.

Figure 32 Curb Ramp

Signals at Intersections

In an effort to create safe and walkable communities, different actions that can be taken to help make traffic signals work well for pedestrians. Most situations where traffic control devices affect pedestrians are addressed in detail in Part 4 of the Manual on Uniform Traffic Control Devices (MUTCD).

Signal timing is an important component to how an intersection operates for pedestrians. Traffic signals create gaps in the traffic flow and allow pedestrians to safely cross a street. Signals need to be designed and timed to be pedestrian friendly and allow for adequate crossing time. They must provide a safe and efficient flow of vehicles, pedestrians and bicycles. Pedestrian signal indications are recommended to be used at all traffic signals, unless it is at a location where walking is not recommended. In general, shorter cycle lengths and longer walk intervals better serve pedestrians and promote signal compliance. Pedestrian signals should be clearly visible to the pedestrian at all times.

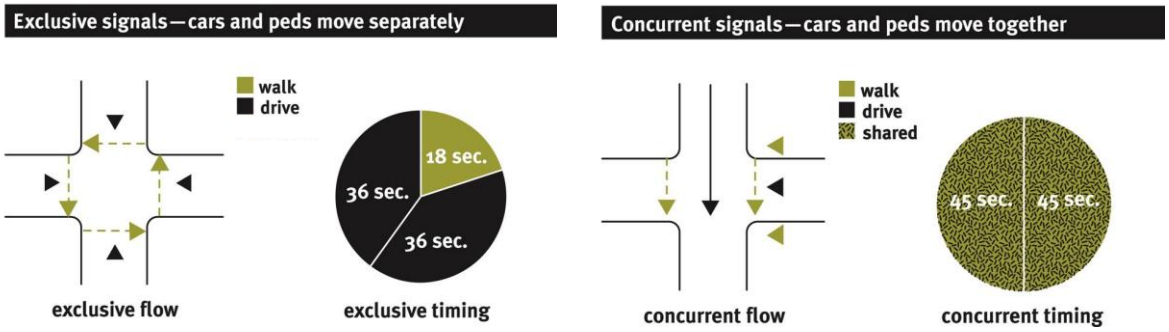
Concurrent and Exclusive Signal Timing - There are two main ways that a pedestrian crossing phase is included at a signalized intersection – concurrent or exclusive. Concurrent signal timing allows pedestrians to cross while vehicles moving in the same direction have a green light. Exclusive signal timing stops traffic in all directions, allowing pedestrians to cross while all vehicles have red lights.

With a concurrent pedestrian signal, motorists may turn left or right across pedestrians' paths after yielding to pedestrians. Wait times for a pedestrian signal are the same or similar to wait times for motor vehicles. In general, concurrent phases are preferred since they reduce the wait time for both pedestrians and vehicles and allow for the maximum time for pedestrians to cross a street.

While vehicle/pedestrian conflicts are reduced or eliminated with exclusive signal timing, wait times for a pedestrian signal are typically much longer than motor vehicles at the same intersection. This type of phasing is most appropriate in locations with high pedestrian volumes, high turning movement conflicts, or high speed locations.

However, a major drawback with concurrent signals is that pedestrian and vehicular movements can conflict with each other (pedestrians can cross while vehicles moving in the same direction have a green light). This situation can be alleviated with Leading Pedestrian Intervals (LPI). Figure 35, 'Concurrent and Exclusive Signals,' depicts the differences between these two signal types.

Figure 33 Concurrent and Exclusive Signals

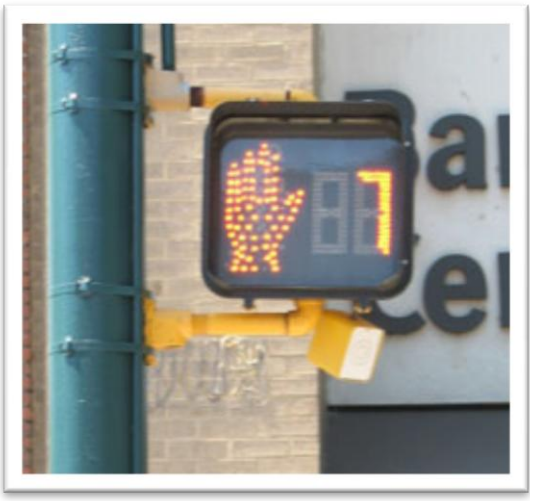


Source: WalkBoston/ Nina Garfinkle.

Leading Pedestrian Intervals (LPI) - An LPI gives pedestrians an advance walk signal before the driver gets a green light, giving the pedestrian several seconds to start in the crosswalk where there is a concurrent signal. This allows pedestrians to enter the crosswalk before turning traffic is released and reduces conflicts between pedestrians and turning vehicles. As a result, pedestrians are more visible to motorists and motorists are more likely to yield to them when their signal turns green. Signal cycles should be kept short (ideally 90 seconds maximum) to reduce pedestrian delay.

A Countdown Timer displays the number of seconds that pedestrians have to cross the street before the light changes. Countdown timers can aid pedestrians in choosing whether to start across the intersection, or to cross more quickly in order to avoid on-coming traffic. An example of a countdown timer is shown in Figure 36, 'Countdown Timer.'

Figure 34 Countdown Timer



Source: walkinginfo.org.

Pedestrian Actuation - Pedestrian actuation, or the initiation of a change in or extension of a traffic signal phase by the pedestrian (e.g., pushbuttons), should only be used when pedestrian crossings are intermittent and should be made accessible to all pedestrians, including those with disabilities. Quick response to the pushbutton or feedback to the pedestrian (e.g., indicator light comes on) should be programmed into the system.

Pedestrian Detectors - Pedestrian detectors are currently being installed and tested in some U.S. cities. Detectors can be used to automatically activate the red traffic and WALK signals when pedestrians are detected or they can be used to extend the crossing time for slower moving pedestrians in the crosswalk. Pedestrian detectors are still considered experimental and their reliability may vary under different environmental conditions.

Audible Tones and Speech Messages - Accessible Pedestrian Signals (APS) are devices that communicate information about pedestrian timing in nonvisual formats such as audible tones, verbal messages that provide standard information about the status of the signal cycle (e.g., WALK, DON'T WALK) and/or vibrating surfaces. Information on the location, direction of travel, and the name of the street to be crossed is sometimes also included. APS units are recommended in PROWAC[22] whenever pedestrian signal systems are added or altered at intersections. Refer to either the Access Board (R306) or walkinginfo.org for more information.

The MUTCD recommends that accessible pedestrian signals have both audible and vibrotactile indications[23]. Audible walk indications are broadcast from a speaker that is incorporated into the pedestrian pushbutton housing. The MUTCD requires that the volume of the audible walk indication be carefully adjusted to be heard a minimum of 6 feet and a maximum of 12 feet from the pushbutton, or to the building line, whichever is less[24]. The MUTCD standard for automatic volume adjustment in response to ambient traffic sound level is a maximum volume of 100 dBA. Audible tone walk indications shall repeat at eight to ten ticks per second. Vibrotactile pedestrian devices provide information to pedestrians who are blind and deaf. These accessible pedestrian signals communicate, by touch, information about pedestrian timing using a vibrating surface. A vibrotactile walk indication is usually an arrow on the pushbutton that vibrates during the walk interval. The placement of audible and vibrotactile indicators on pedestrian signals is determined by appropriate engineering judgment.

For the past 25 years, APS units have been provided at certain intersections at the request of people who are impaired. The incorporation of APS for all new and altered signal systems with pedestrian indicators will become required if PROWAC is approved in its present form by the Access Board and FHWA.

Signage - Signs can provide important information that can improve road safety. By letting people know what to expect and how to behave, prudently installed signs can guide appropriate reactions for both pedestrians and drivers. For example, giving motorists advance warning of an upcoming pedestrian crossing will alert them to modify their speed.

Crosswalks - Marked crosswalks at signals should always be installed. Crosswalks encourage pedestrians to cross at the signal and discourage motorists from encroaching into the crossing area.

Best Practice – Pedestrian Signal

Accessible Pedestrian Signals (APS)
As part of a signalization upgrade in 2001, Community Development Block Grant (CDBG) funds were used to install Accessible Pedestrian Signals (APS) at 19 intersections in Newton, Massachusetts. APS features of some of the signals included walk indication with audible rapidly repeating tones, pushbutton locator tone, and automatic volume adjustment in response to ambient sound. Over the next few years, the City intends to add additional APS devices with similar features at selected high-volume pedestrian intersections.

[22] PROWAC is an acronym for the U.S. Access Board's Public Rights of Way Accessibility Committee's Guidelines.
[23] Section 4E.11 Accessible Pedestrian Signals and Detectors – Walk Indications.
[24] Section 4E.12 Accessible Pedestrian Signals and Detectors – Tactile Arrows and Locator Tones.

d. Buildings and Land Use

There is an integral connection between transportation planning and land use regulations. Land use regulations can encourage an accessible pedestrian network if pedestrian needs and mobility issues are incorporated into the development of zoning regulations and subdivision ordinances. Traditionally, zoning regulations have not encouraged mixed-use developments and subdivision ordinances have focused on vehicles as the primary mode of transportation. Subdivision ordinances often lack requirements for sidewalks on streets and pedestrian connections between the streets. As a result, these practices have led to increased dependency on vehicles.

Communities should establish regulations that would require developers to design attractive and pedestrian accessible buildings and connect them with various land uses. For example, this could be done by implementing zoning regulations that require mixed-use development as well as the placement of buildings that relate to and are oriented toward the street and surrounding buildings (Figure 37, Building Façade Treatment in Needham and Figure 38, Street-Oriented Building in Canton). Parking lots should have clear pedestrian paths through them and be placed behind buildings. Massachusetts' Smart Energy/Smart Growth Toolkit has a model by-law that communities can follow when developing their own building design guidelines.

Figure 35 Building Facade Treatment in Needham on Path to Parking behind Streetfront Buildings

Figure 36 Street-Oriented Building in Canton

The following recommendations promote pedestrian accessibility and a pedestrian-friendly environment and should be considered for communities to incorporate when revising their zoning regulations and subdivision ordinances.[25]

General

- Provide adequate pedestrian access to buildings, public spaces, and between adjacent uses.
- Encourage mixed use developments with higher densities and increase allowable densities near major destination points, transit lines and multi-use paths.
- Encourage design that promotes human scale and pedestrian-oriented character.
- Require commercial districts that contain shopping and employment centers to have multiple building entrances and an on-site walkway system.
- Make developments pedestrian-friendly by using amenities such as wide sidewalks/pathways, outdoor seating, and/or landscaping.
- Design structures, parking, pathways and other pedestrian amenities to maximize ease of pedestrian access.
- Include pedestrian-friendly street and sidewalk design principles as required components of a pedestrian network.
- Require developers to include pedestrian facilities early in the site planning process, so planners can coordinate with other planned transportation improvements.

Building Orientation

- Orient buildings toward the street to encourage pedestrian activity.
- Orient buildings to enhance pedestrian access to buildings and between sites.

Building Design

- Encourage the use of glass as an architectural and design element on building facades. Glass can provide variety, interest and openness.
- Walls facing streets should have windows and architectural features such as awnings, cornice work, step-backs, edge detailing and other decorative finish materials.
- Do not permit continuous lengths of flat, blank walls adjacent to streets, pedestrian pathways, or open spaces.
- Require commercial uses to be located at the ground floor.
- Do not allow doors to extend beyond the exterior façade into pedestrian pathways.

Building Scale

- The size and detailing of buildings shall be pedestrian oriented (e.g.; have vertical elements that visually break up the width of the structure).

[25] Southeastern Indiana Gateway: US 50 Transportation and Land Use Plan, January 2007 and Planning and Policy Models for Pedestrian and Bicycle Friendly Communities in New York State, September 2007.

Parking

- Locate vehicular parking spaces behind or beside buildings wherever possible.
- Parking design should maximize the efficient use of existing and proposed parking facilities, and minimize the area of land to be paved for parking.
- Reduce requirements for parking spaces.
- Require shared parking.

Sidewalk

- Limit driveways across sidewalks frequently used by pedestrians.
- Minimize curb cuts.
- Adhere to use of appropriate sidewalk materials.
- Ensure sidewalks comply with appropriate width requirements.

Landscaping

- Encourage pedestrian-friendly amenities, such as wide sidewalks/pathways, outdoor seating, patios, porches or courtyards.
- Landscaping shall not encroach on sidewalks in a way that impedes pedestrian traffic.

Lighting

- Direct lighting so that it does not cause glare for pedestrians.

Best Practices – Pedestrian Oriented Neighborhoods

Davis Square, the Essex Street Pedestrian Mall and Mashpee Commons incorporate several components of the design tools discussed earlier in this section.

Figure 37 Davis Square, Somerville

Source: www.sixoneseven.net, by John Whittington

Davis Square

Davis Square is an exceptional example of a pedestrian-oriented, mixed-use activity center anchored by the Red Line station in an established urban neighborhood. Traffic calming measures such as neck-downs, pedestrian safety islands, clearly marked crosswalks, signage, and pedestrian signalization all contribute to reducing the speed of traffic flow and improving pedestrian safety. Benches, trash receptacles, street lighting, plantings, public art, and sidewalk materials, all enhance the pedestrian experience.[26] A main intersection at Davis Square is shown in Figure 39..

Figure 38 Essex Street Pedestrian Mall, Salem

Source: Salem News

Essex Street Pedestrian Mall

The City of Salem is known for its pedestrian mall, referred to as the Essex Street Pedestrian Mall. Created about 30 years ago and located in downtown Salem, the pedestrian mall is lined with storefronts and historic sites and is closed off to most automobile traffic. Museum Place and the East India Marine Hall are depicted in Figure 40.

Figure 39 Mashpee Commons, Mashpee

Source: Smart Growth/Smart Energy Toolkit

Mashpee Commons

In 1988, an underutilized five acre auto-oriented shopping center and strip mall in Mashpee, Massachusetts was successfully converted into Mashpee Commons, a mixed-use, mixed-income, pedestrian-oriented town center. There are over 278,000 square feet of commercial tenants and forty residential units above the retail space. A library, church, post office, movie theater, restaurants and elderly housing are also present at Mashpee Commons. A main intersection at Mashpee Commons is shown in Figure 41.

[26] http://www.mass.gov/envir/smart_growth_toolkit/pages/CS-tod-somerville.html.

Best Practice – Pedestrian Connection

Ipswich

The Ipswich Historic Riverwalk is designed to heighten awareness of the town's natural resources and to provide a recreational destination for residents and tourists. This project connects the town on both sides of the Ipswich River with its commercial center and facilitates access to the Ipswich commuter rail station.

The twelve-foot wide pedestrian bridge encourages downtown pedestrian traffic to benefit local businesses. In addition, the Riverwalk project creates a cohesive and attractive pathway system, increases tourism with a pedestrian-friendly downtown, and improves pedestrian access to downtown and public transportation.

Best Practices – Studies, Plans and Guidelines to Improve the Pedestrian Environment

Canton

The Town of Canton's Design Review Guidelines provide advice for building owners, tenants, and developers and provide guidance for the Design Review Board when reviewing applications within the Canton Center Economic Opportunity District.

Concord and Lincoln

The Walden Passage Feasibility Study researches the feasibility of establishing a combined crossing for wildlife and recreational users along a predefined study area, a 2.5-mile section of Route 2 in Concord and Lincoln, Massachusetts.

Needham

The Needham Center Development Plan is an endeavor to develop a comprehensive plan for the future of the Needham Center commercial area. One of the plan's key goals is to improve the pedestrian environment.

Stoughton

Stoughton Center's Design Review Guidelines are intended to provide additional support to the by-law that established the Stoughton Center Mixed-Use Overlay District. The by-law includes creating a more compact, pedestrian-friendly living and working environment that encourages transit use and bicycling.

Woburn

Woburn's Busy Bend Design Study addresses streetscape and storefront façade guidelines that can be applied throughout the Woburn Square Revitalization Area. Specific pedestrian improvements include curb extensions and sidewalk upgrades.

Best Practices – Pedestrian Corridor Enhancements

Arlington

The Massachusetts Avenue Corridor Project looks at converting Massachusetts Avenue from a transportation corridor to a pedestrian-friendly street. The primary goal of the project is to create a healthy balance between automobiles, bikes, pedestrians, and transit users.

Cambridge

The Prospect Street Corridor Study is an urban design study exploring possible ways to improve this corridor. Improvements focus on urban design and the quality of the streetscape, and will aim to create a more pleasant environment and enhance the pedestrian experience.

Concord

Concord's Recommendations for the Village Center Study provides recommendations on what needs to be preserved and what ideally should change for three centers in Concord. One of the study's primary goals is to provide direction on public investment for infrastructure which includes pedestrian enhancements.

8. Funding

Since development of pedestrian projects and programs occurs primarily at the community level, local communities hold the greatest share of responsibility for implementing them. Therefore, the implementation of the system is highly dependent upon communities recognizing and planning for pedestrian travel in locally adopted transportation elements of comprehensive plans and to allocating projects into local capital improvement programs.

In Fiscal Year 2009, Massachusetts spent $53.2 million in Federal-Aid Highway Program Funding for Pedestrian and Bicycle Facilities and Programs. Approximately 43 percent of Federal-Aid Highway Program Funding was spent in Fiscal Year 2009 compared to Fiscal Years 1999-2009 combined. For example, in Fiscal Years 2008 and 2007, Massachusetts spent $13.2 and $15.7 million respectively in Federal-Aid Highway Program Funding according to the FHWA Fiscal Management Information System.

Federal surface transportation law provides tremendous flexibility to states and MPOs to fund pedestrian improvements from a wide variety of programs. When improving conditions for walking, it is strongly encouraged to include pedestrian improvements as an incidental part of larger projects, and to review and use the most appropriate funding source for a particular project.

There are several programs that provide Federal funds for pedestrian projects. The Federal Highway Administration (FHWA) does have specific Bicycle and Pedestrian Provisions of Federal Transportation Legislation.

The following list is an inventory of key funding programs which communities can utilize. The program name, funding source, and web link are provided in the section below. Prior to applying for funding, communities should thoroughly research a program's applicability to a candidate project.

a. Federal Highway Administration

National Highway System
The National Highway System (NHS) is composed of 163,000 miles of urban and rural roads serving major population centers, major travel destinations, international border crossings, and intermodal transportation facilities.

Eligibility- Bicycle and pedestrian facilities within NHS corridors are eligible activities for NHS funds, including projects within Interstate rights-of-way (23 U.S.C. 103(b)(6)).

Matching funds- 80% Federal, 20% State, subject to a sliding scale. The Federal share is generally 80%. When funds are used for Interstate projects to add high occupancy vehicle or auxiliary lanes, but not other lanes, the Federal share may be 90%. Certain safety improvements listed in 23 USC 120(c) have a Federal share of 100%.

Surface Transportation Program
The Surface Transportation Program (STP) provides states with flexible funds which may be used for a wide variety of projects on any Federal-aid Highway including the NHS, bridges on any public road, and transit facilities.

Eligibility- Bicycle and pedestrian improvements are eligible activities under the STP. This covers a wide variety of projects such as on-road facilities, off-road trails, sidewalks, crosswalks, bicycle and pedestrian

signals, parking, and other ancillary facilities. The modification of sidewalks to comply with the requirements of the Americans with Disabilities Act is an eligible activity.

Matching funds- 80% Federal, 20% State, subject to sliding scale. When funds are used for Interstate projects, including projects to add high occupancy vehicle or auxiliary lanes (but excluding projects to add any other lanes), the Federal share may be 90 percent. Certain safety improvements as listed in 23 USC 120(c) may have a Federal share of 100 percent, but this provision is limited to 10 percent of the total funds apportioned to a State under 23 U.S.C. 104.

Transportation Enhancement Program
Ten percent of a state's STP apportionment must be set-aside for Transportation Enhancement (TE) activities.

Eligibility- Of the 12 eligible activities, three relate specifically to pedestrian transportation:

- provision of facilities for pedestrians.
- provision of safety and educational activities for pedestrians.
- preservation of abandoned railroad corridors (including the conversion and use for pedestrian or bicycle trails).

Matching funds- The TE guidance describes several flexibility provisions.

Highway Safety Improvement Program (HSIP)
SAFETEA-LU established the Highway Safety Improvement Program (HSIP) in 2005. It replaced the previous set-aside of each state's STP apportionment for infrastructure safety activities. HSIP has specific program information and reporting requirements. HSIP funds can be used for pedestrian and bicycle safety improvements. States may obligate funds under the HSIP to carry out:

Any highway safety improvement project on any public road or publicly owned bicycle or pedestrian pathway or trail; or

As provided under Flexible Funding for states with a Strategic Highway Safety Plan, other safety projects.

Safe Routes to School Program
The Safe Routes to Schools Program was created by Section 1404 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users Act (SAFETEA-LU).
The purposes of the program are:

- To enable and encourage children, including those with disabilities, to walk and bicycle to school
- To make bicycling and walking to school a safer and more appealing transportation alternative, thereby encouraging a healthy and active lifestyle from an early age; and
- To facilitate the planning, development and implementation of projects and activities that will improve safety, reduce traffic, fuel consumption, and air pollution in the vicinity (approximately 2 miles) of primary and middle schools (Grades K-8).

Each state administers its own program and develops its own procedures to solicit and select projects for funding. The program establishes two distinct types of funding opportunities: infrastructure projects (engineering improvements) and non-infrastructure related activities (such as education, enforcement, and encouragement programs). This program is 100-percent federally funded at no cost to the community.

Congestion Mitigation and Air Quality Improvement Program
The Congestion Mitigation and Air Quality Improvement (CMAQ) Program assists areas designated as nonattainment or maintenance under the Clean Air CMAQ Act Amendments of 1990 to achieve and maintain healthful levels of air quality by funding transportation projects and programs.

Eligibility- Projects funded under the CMAQ program must be located in areas that were designated as a non-attainment area Section 107(d) of the Clean Air Act and classified pursuant to Sections 181(a), 186(a), or 188(a) or (b) of the Clean Air Act. The entire Boston Region is in a non-attainment area.

Recreational Trails Program
The Recreational Trails Program provides funds to states to develop and maintain recreational trails and trail-related facilities for both nonmotorized and motorized recreational trail uses. Each state administers its own program - usually through a state resource or park agency - and develops its own application and project selection process. In Massachusetts, this program is administered through the Department of Conservation Resources.

Matching funds- In general, the maximum Federal share for each project is 80%; however, see RTP Matching Share for more information.

National Scenic Byways Program
The National Scenic Byways Program recognizes roads having outstanding scenic, historic, cultural, natural, recreational and archaeological qualities by designating them as National Scenic Byways or All-American Roads.

Eligibility- Funds may be spent on a variety of activities including "construction along a scenic byway of a facility for pedestrians and bicyclists, rest area, turnout, highway shoulder improvement passing lane, overlook, or interpretive facility." Projects must be either associated with a National Scenic Byway, All-American Road, or a State Scenic Byway. Between 1992 and 2008, Massachusetts has received over $8.4 million in National Scenic Byways Grant funding for 59 projects.

Matching funds- The Federal share is 80%.

State and Community Highway Safety Grant Program (Section 402)
The State and Community Highway Safety Grant Program supports state highway safety programs designed to reduce traffic crashes and resulting deaths, injuries, and property damage.

Eligibility- States are eligible for these funds (known as "Section 402 funds") by submitting a Performance Plan, with goals and performance measures, and a Highway Safety Plan describing actions to achieve the Performance Plan. Grant funds are provided each year according to a statutory formula based on population and road mileage.

Matching funds- Federal share is 80%.

b. Federal Transit Administration

Statewide Planning Funds
Statewide Planning Funds
Eligibility- Two percent of the funds states receive for the NHS, STP, CMAQ and Bridge programs are available only for planning, research, and technology transfer activities. This list includes the Statewide Long Range Transportation Plan and Transportation Improvement Program, and may include bicycle- and pedestrian-related plans, research, and technology transfer activities.

Matching funds- Federal share is 80%, but this may be increased by the Secretary of Transportation.

Metropolitan Planning Funds
Metropolitan Planning Funds
Eligibility- One percent of the funds authorized for the NHS, STP, CMAQ, and Bridge programs are available only for metropolitan transportation planning. The funds are allocated to each state based on the population of urbanized areas in each state. Funds may be used for bicycle- and pedestrian-related plans that are part of the metropolitan transportation planning process.

Matching funds- Federal share is 80%, but this may be increased by the U.S. Secretary of Transportation.

Urbanized Area Formula Grants (transit)
The Urbanized Area Formula Grants program provides transit capital and operating assistance to urbanized areas with populations of more than 50,000.

Eligibility- Capital projects are defined as including "pedestrian and bicycle access to a mass transportation facility."

Matching funds- Federal share is typically 80%.

Transit Enhancements
One percent of the Urbanized Area Formula Grants apportioned to urban areas of at least 200,000 people are set aside for a new category of transit enhancements. This program is distinct from the Transportation Enhancement Program.

Matching funds- Federal share for bicycle-related transit enhancements is 95%. Federal share for all other transit enhancements including pedestrian is 80%.

Capital Investment Grants and Loans Program
The renamed Capital Investment Grants and Loans Program (formerly Discretionary Grants) provides transit capital assistance for new fixed guideway systems and extensions to existing fixed guideway systems (New Starts), fixed guideway modernization, and bus related facilities.

Eligibility- Capital projects are defined as including "pedestrian and bicycle access to a mass transportation facility."

Matching funds- Federal share is typically 80%.

c. State

The Chapter 90 Program
Under Massachusetts General Laws Chapter 90, Section 34, each year Massachusetts makes funds available to all communities for approved local road construction, preservation, and improvement projects that create or extend the life of their transportation infrastructure. Chapter 90 funds consist of state revenues appropriated through the Massachusetts Legislature as part of the Transportation Bond Bill and through supplemental budget agreements.

The vast majority of local road projects are funded using monies available through the Chapter 90 Program. This locally administered funding source is used for maintenance, resurfacing, sidewalk repair, traffic signal and other local improvements. Chapter 90 funds may also be used to design and construct sidewalks, as well as pedestrian projects. Chapter 90 projects are not approved by the MPO and are not included in the TIP.

Chapter 90 projects are approved by MassDOT district offices before they begin and municipal costs are reimbursed. Chapter 90 projects are strongly encouraged to follow the provisions in MassHighway's Project Development and Design Guidebook. If communities established a separate program for municipal pedestrian facilities to supplement the Chapter 90 program, this would allow communities to meet pedestrian needs without reducing funding for vehicle traffic improvements. Sources may include the Public Works Economic Development (PWED) Program, other state funding sources or federal funds. It is the community's responsibility to prioritize the use of Chapter 90 funds.

Community Preservation Act (CPA)
In 2000, a law was passed that enabled Massachusetts communities to establish a local Community Preservation Fund. One of the allowable spending purposes, as defined in the Community Preservation Act, is the conversion of land for recreational use. So, for example, if a community were to convert land into a recreational use (including blighted land) or to rehabilitate an historic path, the community would likely be eligible to use CPA funds to improve pedestrian accommodations within the new space. CPA funds cannot be used to create new recreational uses, or to improve facilities, on existing land already devoted to recreation. Distribution of CPA funds is administered by the Community Preservation Coalition.

Commonwealth Capital
Commonwealth Capital is a state policy that utilizes grants and low interest loans from programs offered by MassDOT and the Executive Offices of Administration and Finance, Energy and Environmental Affairs, and Housing and Economic Development as an incentive to municipalities to plan and zone consistent with the Commonwealth's Sustainable Development Principles. Municipal smart growth/smart energy consistency is assessed through a Commonwealth Capital application that examines municipal implementation of 32 land use planning and regulatory practices. Scores are part of the evaluation process for 14 grant or loan programs; the higher a community's Commonwealth Capital score, the greater the likelihood that it will receive funding.

One of the 32 land use planning and regulatory practices pertains specifically to facilitating and integrating walking (and biking) into the transportation system. Points can be earned for planning, projects that support walking, or regulations that require development projects to provide pedestrian facilities. Examples include town-wide pedestrian plans, requiring sidewalks in new developments, providing new or expanded shared use paths, implementing a Safe Routes to School program, improving

connectivity, and applying streetscape improvements (e.g., benches and lighting, crosswalks, pedestrian signals, and signage).

In addition, Commonwealth Capital encourages communities to adopt zoning for Transit Oriented Development that puts a high priority on serving transit and pedestrians as well as produce corridor plans that incorporates pedestrian linkages and pedestrian-oriented streetscapes.

The Public Works Economic Development (PWED) Program

A Commonwealth Capital program, MassDOT provides Public Works Economic Development (PWED) grants to municipalities for transportation infrastructure improvements that will spur economic development, job creation, smart growth, and better pedestrian access. Specifically, the PWED Program community grants pay for the design and construction of roads and other transportation related projects that support economic development. The PWED regulations (7.01 CMR 5.00 et seq.) are designed to provide eligible communities with maximum flexibility and discretion as it relates to project development and implementation.

As part of the review process, PWED grant applications are reviewed to ensure they will implement the state's Sustainable Development Principles. This consists of supporting a balanced and multimodal transportation plan that includes pedestrians. One of the criteria for receiving PWED funding is ensuring that the project will facilitate economic growth consistent with applicable state policies. Based on a competitive application process, the PWED program has a long history stimulating job growth and commercial development for cities and towns in Massachusetts. Since 2000, MassDOT has awarded almost $100 million dollars of PWED contracts for 98 projects in 66 municipalities in the Commonwealth.

Transit-Oriented Development Bond Program

A Commonwealth Capital program, the intent of the Transit-Oriented Development (TOD) Bond Program is to increase compact, mixed-use, walkable development close to transit stations. To accomplish this objective, the TOD Bond Program provides financing for pedestrian improvements, bicycle facilities, housing projects, and parking facilities within .25 (1/4) miles of a commuter rail station, subway station, bus station, bus rapid transit station, or ferry terminal.

d. Construction Safety and Maintenance

Construction Safety

Construction projects often require temporarily closing and/or detouring pedestrian routes. If there is rerouting, it is critical that pedestrian safety not be compromised. Municipalities should require developers to submit construction maintenance plans for construction projects. Construction maintenance plans will enable planners and engineers to review the temporary accommodations for pedestrians prior to the start of a construction project.

Key components for maintaining pedestrian safety during a construction project are:

- Avoid proximity to construction vehicles and equipment.
- Detours should be safe, accessible and as close to the original route as possible.
- Maintain access to crosswalks and public transit to the fullest extent possible.
- Warn pedestrians well in advance of a construction project.

Maintenance

Sidewalks require regular maintenance to reduce damage caused over time by the effects of weather, tree roots and use. Communities should allocate specified funds for sidewalk maintenance programs. Funding for sidewalk maintenance programs can be obtained when a community sets aside money for sidewalks or when the private developer of a project in a community is required to set aside money for sidewalks.

Many maintenance issues can be allayed if properly addressed during project planning and design before construction on new sidewalks begins. It is equally important that frequent assessments of sidewalk conditions are conducted. Communities should develop plans that clearly specify the implementation of sidewalk maintenance (e.g., when a street is repaved) and enforce the obligations of property owners to maintain sidewalks. Properly maintained sidewalks may increase pedestrian safety and travel.

e. Other Programs

Access to Jobs

The Access to Jobs Program provides competitive grants to local governments and non-profit organizations to develop transportation services to connect welfare recipients and low-income persons to employment and support services. Programs must be approved by a transit agency. Project selection is made by states in communities under 200,000 and MPOs in urban areas with populations greater than 200,000. The Federal share for Access to Jobs projects is 50%. The Access to Jobs Program is administered by the Massachusetts Department of Transitional Assistance (DTA).

Transportation and Community and System Preservation (TCSP) Pilot Program

The TCSP is a competitive grant program designed to support exemplary or innovative projects that show how transportation projects and plans, community development, and preservation activities can be integrated to create communities with a higher quality of life. The annual grant program is administered by the FHWA, in partnership with the FTA and Environmental Protection Agency, and may be used to fund state, MPO, or local government agencies. Bicycling, walking, and traffic calming projects are eligible activities.

Emergency Relief

An emergency relief fund is available for the reconstruction of highways, roads, and trails in any part of the United States that the Secretary finds has suffered serious damage as a result of natural disaster over a wide area (e.g., flood, hurricane, tidal wave, earthquake) or catastrophic failure from any external cause. The restoration of pedestrian facilities, including shared-use paths, is an eligible activity for Emergency Relief funds. This program is administered by FHWA.

9. Action Items

As stated previously in PedPlan2010, most of the recommendations outlined here are for municipalities to implement. It is at the local level where many of the decisions regarding pedestrian infrastructure and programs are made.

In order to implement the goals and guidelines outlined in PedPlan2010, a series of key Action Items have been prepared. This chapter can serve as a checklist for municipal planners, planning boards, advocacy groups, and volunteers.

The Action Items comprise four categories: Complete the Pedestrian Network, Integrate the Pedestrian Network, Design, and Maintenance and Operation. Advance planning and coordination are important for the successful implementation of the Action Items. The chapters of where each Action Item is described in more detail in PedPlan2010 are referenced.

NOTE: The term "walkway" is used throughout the action items as a global term to identify pedestrian facilities. The type of walkway implemented could be a sidewalk (concrete with curb and gutter), path (often asphalt, meandering within street right-of-way), shared street or a shared-use path.

Complete the Pedestrian Network

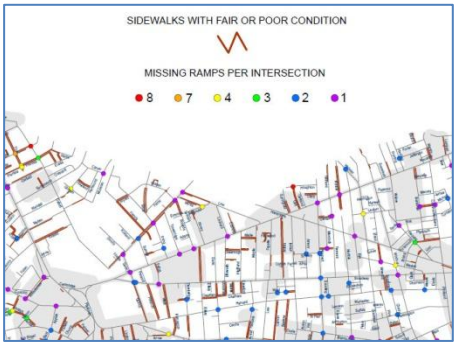
The pedestrian network throughout the Boston Region is disjointed with missing walkways along many roads, barriers to access, and lack of cohesion to identify pedestrian networks. The following Action Items seek to identify deficiencies and implement solutions.

Walkway Inventory

Each community should inventory their street network to identify all missing and deficient walkways along each road and other desire lines in order to guide the prioritization of future projects and close gaps in the pedestrian network. The walkway inventory should be mapped and available for public input.

Chapter 3, Section c - page 3-11

Sidewalk Prioritization, Funding and Implementation



Missing and deficient walkway sections identified in the inventory should be prioritized (e.g., based on utility and traffic conditions) and a funding plan developed to advance implementation.

Chapter 5, Section c - page 5-23
Chapter 8 - pages 8-65 - 8-71

Capital Projects and Repaving

All roadway projects from basic repaving to full depth construction are opportunities that should be used to add or improve adequate pedestrian facilities. Walkways should be constructed where missing. Curb extensions should be added, curb radii reduced, and roadway cross sections modified as appropriate during all such projects. Likewise, development of adjacent parcels should be used as an opportunity to upgrade or add walkways.

Chapter 2 – page 2- 4
Chapter 5 – pages 5-19 – 5-23

Eliminate Barriers

Ensure that people can reach all destinations in a community safely on foot. Each community should identify barriers to pedestrians. In addition to missing sidewalks, barriers may include road crossings, accessibility and visual impediments.

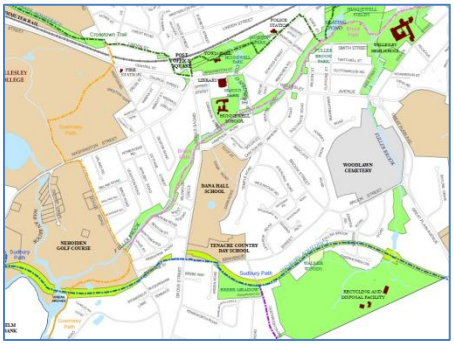
Chapter 7, Section c - pages 7-41 – 7-46

Public Right-of-Way Uses

Communities should improve their public right-of-way by locating beneficial pedestrian amenities such as trees, planters, benches, lighting and signage.

Chapter 7, Section c, i - pages 7-44 – 7-46

Greenways



Communities should consider developing a mapped and signed pedestrian route system that combines sidewalks on low traffic streets, paths, and scenic or recreational facilities that makes these transportation corridors ideal for walking. Communities should work together to connect their respective walkways and pathways and strive to keep this type of pedestrian route system separate from vehicles.

Chapter 5, Section d – page 5-24

Integrate the Pedestrian Network

Destinations must be connected by walkways and streetscapes oriented to serve pedestrians.

Public Facilities

Schools, libraries, community and civic centers, town offices, and transit facilities should all be top priority for pedestrian access improvements.

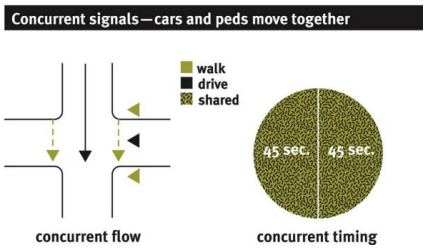
Chapter 2, Section a – pages 2-3 – 2-5
Chapter 7, Section b – page 7-40

Building and Land Use

Design buildings that encourage pedestrian access. Place buildings with entrances facing streets, adjacent to sidewalks with parking on the street or behind the buildings. Design the physical environment in proportion to human (walking scale) dimensions. This includes size, height and/or massing of buildings.

Chapter 7, Section d – page 7-60– 7-62

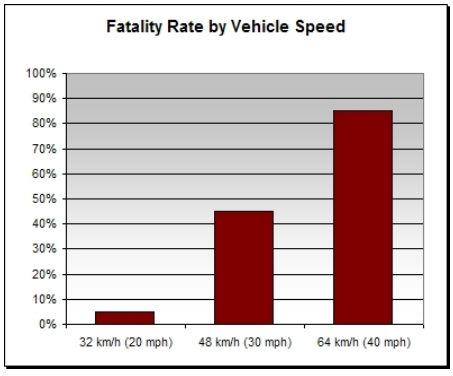
Traffic Analysis



Traffic analysis should always include pedestrians and their needs as part of the design process. Traffic impact studies and intersection analyses should include pedestrians equitably with vehicles. Level of service for pedestrians at a given intersection should be equal or greater to that for motor vehicles.

Chapter 7, Section c, iii – pages 7- 51 – 7-59

Speed Limit



Communities should strongly advocate the Legislature to lower the allowable minimum speed limit from 30 mph to 20 mph. The chance of a pedestrian fatality drops from 45% to 5% (comparing 30 mph to 20 mph).

Chapter 3, Section e – pages 3-12- 3-13
Chapter 6, Section e – page 6-37

Design

The following Action Items outline some of the most important design concepts to be carried through in accommodating pedestrians on our street network.

Walkway Installation

Walkways should be provided on all streets including both sides of all arterial and collector streets. The choice of a sidewalk or path is dictated by local conditions. Walkway construction should be a part of any road reconstruction project and considered on all pavement overlay projects.

Chapter 3, Section c – page 3-11
Chapter 7, Section c, i – pages 7-43 – 7-46
Appendix B

Intersections and Crossings

Design intersections that provide for easy, safe movement for pedestrians. This can be done by:

- Providing median islands or pedestrian refuges in the center of multi-lane roadways.
- Shortening pedestrian crossing distances by reducing corner radii and adding curb extensions.
- Providing curb ramps at locations where pedestrians must change grade between the sidewalk and street.
- Installing highly visible, (continental style recommended) crosswalks at all signalized intersections and all legs with sidewalks.
- Provide automatic (no buttons) walk signals (concurrent preferred) at all signalized intersections.
- Provide sufficient time for pedestrians to cross at signals.

Chapter 7, Section c - pages 7-41 – 7-46

Buffer

Provide a buffer between the street and sidewalk. A buffer can be any combination of trees, landscaping strip, bicycle lanes parallel parking, or street furniture. A buffer further separates pedestrians from vehicles and provides a more comfortable and safer walking environment. A buffer also reduces direct pollution and noise from motor vehicles.

Chapter 7, Section c - pages 7-44 - 7-45 and 7-48 - 7-49

Traffic Calming

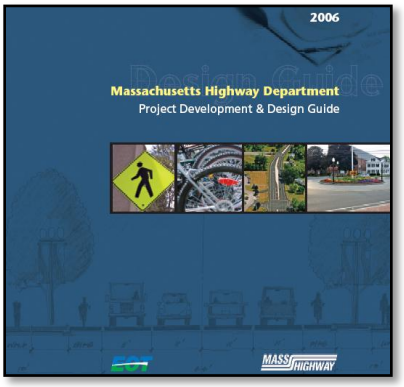
Employ traffic calming measures (e.g., when there are high traffic speeds and volumes) that will help control driver behavior and reduce motor vehicle speeds and volumes.

Common speed control measures include raised intersections (photo), speed tables and humps, roundabouts, chicanes, neckdowns, and chokers. Common volume control measures include closures, diverters, and median barriers.

Further information and links on traffic calming can be found here:
http://en.wikipedia.org/wiki/Traffic_calming

Chapter 2, Section a – pages 2-3 – 2-5

Guidelines and Standards



Consistently use MassDOT's Project Development and Design Guide (2006) especially for Complete Street guidance.

Consistently use the Manual on Uniform Traffic Control Devices (MUTCD) (2009) for design standards such as the installation of signalized pedestrian crossings.

Chapter 7, Section a – page 7-38

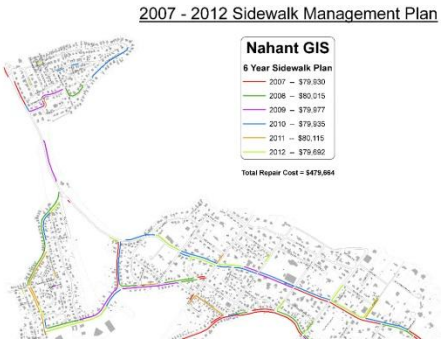
Safe Routes to School

Each community should establish a Safe Routes to School program that both encourages school children to walk to school and prioritizes pedestrian facility development in proximity of the school.

Chapter 4 , Section a - page 4-15
Chapter 5, Section f – pages 5-26 – 5-27
Chapter 8, Section a – pages 8-65-8-67

Maintenance and Operation
Construction of pedestrian facilities is only part of the picture. They must be maintained.

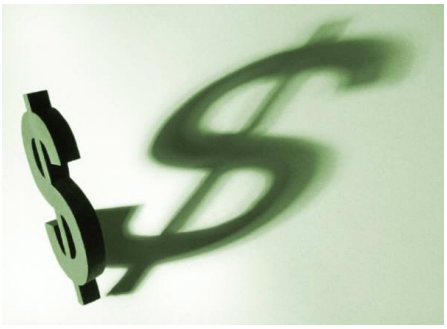
Maintenance



Communities should assess walkway conditions on an ongoing basis based on pavement conditions, gaps and accessibility. Prioritize reconstruction or maintenance based on current conditions, and update the ranked list at least yearly.

Chapter 8, Section d- pages 8-70 - 8-71

Dedicated Funding Source for Project Maintenance



Establish a dedicated funding source for maintenance of projects. Such a funding source may buffer the political desire to focus spending on new projects.

Chapter 8, Section d- pages 8-70 - 8- 71

Snow Removal

Each community within the region should develop and enforce a snow removal policy that maintains pedestrian access and safe walking conditions along pedestrian corridors within 24 hours after snow accumulation. All streets that are plowed should have adjacent sidewalks cleared per city ordinance by the community or by abutters.

Chapter 5, Section h – pages 5-31 – 5-34

Education

Provide education to the public about the importance of pedestrian planning and the public about pedestrian safety.

Chapter 5, Section g – pages 5-28 – 5-29

Appendix A Boston Region Commuting Patterns & Vehicle Ownership 2000 Census Data

Municipality	Population	Walk (%)	Drive (%)	Other (%)*	No Vehicles (%) by Housing Unit
Acton	20,331	1.2	88.2	10.5	3.1
Arlington	42,389	1.8	74.5	23.7	10.2
Ashland	14,674	0.3	90.3	9.3	2.8
Bedford	12,595	1.4	90.5	8.1	4.7
Bellingham	15,314	1.0	93.7	5.3	2.5
Belmont	24,194	1.5	79.7	18.8	6.6
Beverly	39,862	3.7	84.9	11.3	9.2
Bolton	4,148	0.9	88.9	10.1	1.8
Boston	589,141	13.0	50.7	36.2	34.9
Boxborough	4,868	1.1	90.6	8.3	1.4
Braintree	33,828	1.4	87.2	11.4	8.4
Brookline	57,107	9.6	52.5	38.0	20.4
Burlington	22,876	1.0	92.5	6.5	4.3
Cambridge	101,355	24.4	40.4	35.2	27.7
Canton	20,775	1.0	83.0	16.0	6.7
Carlisle	4,717	1.7	81.4	17.0	2.8
Chelsea	35,080	6.6	65.4	28.1	32.2
Cohasset	7,261	2.4	79.6	18.0	3.5
Concord	16,993	2.8	82.0	15.2	2.5
Danvers	25,212	1.3	93.0	5.7	5.3
Dedham	23,464	2.4	85.1	12.5	6.1
Dover	5,558	1.3	82.6	16.0	0.5
Duxbury	14,248	0.6	85.7	13.7	4.0
Essex	3,267	3.2	85.5	11.3	3.9
Everett	38,037	4.7	73.5	21.8	21.7
Foxborough	16,246	0.7	89.7	9.6	5.1
Framingham	66,910	2.5	88.6	8.9	7.8
Franklin	29,560	1.4	87.1	11.6	5.1
Gloucester	30,273	5.0	86.2	8.8	11.7
Hamilton	8,315	1.1	87.2	11.7	2.9
Hanover	13,164	0.4	92.5	7.1	4.9
Hingham	19,882	1.0	80.3	18.7	2.9
Holbrook	10,785	2.0	89.3	8.7	5.3
Holliston	13,801	0.6	90.7	8.7	3.0
Hopkinton	13,346	1.3	90.5	8.2	2.3
Hudson	18,113	1.6	94.1	4.3	7.7
Hull	11,050	2.6	84.4	13.0	6.0
Ipswich	12,987	1.7	88.6	9.7	7.0
Lexington	30,355	1.7	84.6	13.7	5.1
Lincoln	8,056	3.8	84.1	12.1	2.5
Littleton	2,816	1.1	90.0	8.9	4.0
Lynn	89,050	4.6	83.5	11.9	20.6
Lynnfield	11,542	1.4	87.7	10.9	3.7
Malden	56,340	3.6	70.2	26.3	17.3
Manchester	5,228	4.6	82.3	13.1	3.6
Marblehead	20,377	3.7	82.8	13.5	4.6
Marlborough	36,255	2.2	92.6	5.2	7.6
Marshfield	24,324	0.7	93.1	6.2	3.6
Maynard	10,433	2.3	91.1	6.5	5.6
Medfield	12,273	1.4	85.4	13.3	3.3
Medford	55,765	4.5	74.7	20.8	13.3
Medway	12,448	1.0	89.7	9.4	4.3
Melrose	27,134	3.3	78.6	18.1	10.9
Middleton	7,744	0.0	94.4	5.6	3.4
Milford	26,799	1.6	95.2	3.3	7.8
Millis	7,902	1.0	90.7	8.4	4.1
Milton	26,062	3.8	80.2	16.0	6.4
Nahant	3,632	0.6	86.6	12.8	4.4
Natick	32,170	1.7	85.7	12.7	5.4
Needham	28,911	2.4	78.4	19.2	6.0
Newton	83,829	4.8	75.3	19.9	6.7
Norfolk	10,460	1.8	86.5	11.7	3.4
North Reading	13,837	1.1	91.2	7.8	4.0
Norwell	9,765	1.5	85.6	12.9	2.7
Norwood	28,587	2.1	84.3	13.6	7.9
Peabody	48,129	1.3	94.0	4.7	8.0
Pembroke	16,927	0.6	91.0	8.4	3.2
Quincy	88,025	3.2	73.5	23.3	15.5
Randolph	30,963	1.8	85.3	12.9	8.3
Reading	23,708	1.5	89.0	9.5	5.5
Revere	47,283	2.4	74.6	23.0	21.1
Rockland	17,670	1.4	93.1	5.5	6.0
Rockport	7,767	5.4	81.5	13.1	9.6
Salem	40,407	5.9	81.8	12.3	13.2
Saugus	26,078	1.3	88.4	10.3	6.7
Scituate	17,863	1.4	85.6	13.0	4.5
Sharon	6,024	1.3	79.7	19.0	3.4
Sherborn	4,200	0.3	87.0	12.7	1.5
Somerville	77,478	9.4	55.6	35.0	22.7
Southborough	8,781	1.3	93.0	5.6	2.4
Stoneham	22,219	1.1	87.6	11.2	6.8
Stoughton	27,149	1.6	86.5	11.9	5.6
Stow	5,902	1.2	88.8	10.1	2.8
Sudbury	16,841	1.7	88.6	9.7	2.2
Swampscott	14,412	1.9	81.0	17.0	7.0
Topsfield	6,141	1.0	88.6	10.4	2.5
Wakefield	24,804	2.0	85.2	12.8	6.5
Walpole	22,824	0.5	89.3	10.2	4.8
Waltham	59,226	6.7	81.4	11.9	10.5
Watertown	32,986	4.9	74.5	20.7	10
Wayland	13,100	0.6	87.7	11.7	2.5
Wellesley	26,613	11.8	69.9	18.3	3.7
Wenham	4,440	7.2	80.4	12.4	4.9
Weston	11,469	4.5	79.3	16.2	3.3
Westwood	14,117	1.3	83.5	15.2	6.2
Weymouth	53,988	1.7	87.5	10.7	7.3
Wilmington	21,363	0.5	93.3	6.3	3.2
Winchester	20,810	2.0	80.6	17.4	4.9
Winthrop	18,303	2.4	72.5	25.1	13.1
Woburn	37,258	1.7	91.6	6.7	7.2
Wrentham	10,554	1.0	89.8	9.2	4.0
MAPC Region	**3,049,642**	**5.7**	**74.7**	**19.6**	**10.9**

Municipalities with five highest percentages.
Municipalities with five lowest percentages.

* Public transit, bicycling, working from home define 'other modes.'
Source: U.S. Census Bureau, Journey to Work, 2000.

Appendix B Sidewalk Coverage by Municipality (2007)

	Percent of Roadway with Sidewalks	
	Main Roads	Local Roads
ACTON	13%	33%
ARLINGTON	66%	77%
ASHLAND	38%	27%
BEDFORD	43%	21%
BELLINGHAM	28%	40%
BELMONT	72%	56%
BEVERLY	64%	76%
BOLTON	3%	4%
BOSTON	90%	77%
BOXBOROUGH	15%	0%
BRAINTREE	57%	48%
BROOKLINE	90%	92%
BURLINGTON	18%	28%
CAMBRIDGE	89%	82%
CANTON	31%	45%
CARLISLE	6%	0%
CHELSEA	89%	76%
COHASSET	16%	32%
CONCORD	27%	44%
DANVERS	67%	44%
DEDHAM	59%	62%
DOVER	1%	6%
DUXBURY	1%	6%
ESSEX	7%	48%
EVERETT	89%	76%
FOXBOROUGH	37%	32%
FRAMINGHAM	43%	69%
FRANKLIN	60%	30%
GLOUCESTER	21%	52%
HAMILTON	21%	22%
HANOVER	13%	3%
HINGHAM	27%	59%
HOLBROOK	42%	70%
HOLLISTON	41%	32%
HOPKINTON	43%	8%
HUDSON	48%	39%
HULL	33%	81%
IPSWICH	14%	20%
LEXINGTON	31%	52%
LINCOLN	1%	8%
LITTLETON	11%	28%
LYNN	75%	99%
LYNNFIELD	74%	66%
MALDEN	80%	92%
MANCHESTER	27%	50%
MARBLEHEAD	49%	82%
MARLBOROUGH	51%	41%
MARSHFIELD	24%	43%
MAYNARD	29%	66%
MEDFIELD	49%	12%
MEDFORD	84%	55%
MEDWAY	33%	36%
MELROSE	69%	85%
MIDDLETON	32%	16%
MILFORD	48%	40%
MILLIS	22%	48%
MILTON	64%	60%
NAHANT	47%	72%
NATICK	57%	66%
NEEDHAM	77%	72%
NEWTON	83%	77%
NORFOLK	29%	14%
NORTH READING	46%	28%
NORWELL	6%	20%
NORWOOD	77%	39%
PEABODY	74%	48%
PEMBROKE	28%	16%
QUINCY	79%	82%
RANDOLPH	60%	80%
READING	49%	43%
REVERE	68%	78%
ROCKLAND	67%	84%
ROCKPORT	17%	49%
SALEM	77%	77%
SAUGUS	32%	64%
SCITUATE	19%	43%
SHARON	47%	32%
SHERBORN	17%	34%
SOMERVILLE	93%	78%
SOUTHBOROUGH	25%	25%
STONEHAM	57%	60%
STOUGHTON	31%	49%
STOW	15%	0%
SUDBURY	3%	6%
SWAMPSCOTT	73%	99%
TOPSFIELD	23%	21%
WAKEFIELD	65%	56%
WALPOLE	73%	50%
WALTHAM	35%	63%
WATERTOWN	90%	90%
WAYLAND	5%	26%
WELLESLEY	47%	66%
WENHAM	25%	22%
WESTON	12%	43%
WESTWOOD	36%	29%
WEYMOUTH	48%	80%
WILMINGTON	25%	25%
WINCHESTER	49%	75%
WINTHROP	86%	99%
WOBURN	47%	59%
WRENTHAM	27%	19%
MAPC Average	**56%**	**52%**

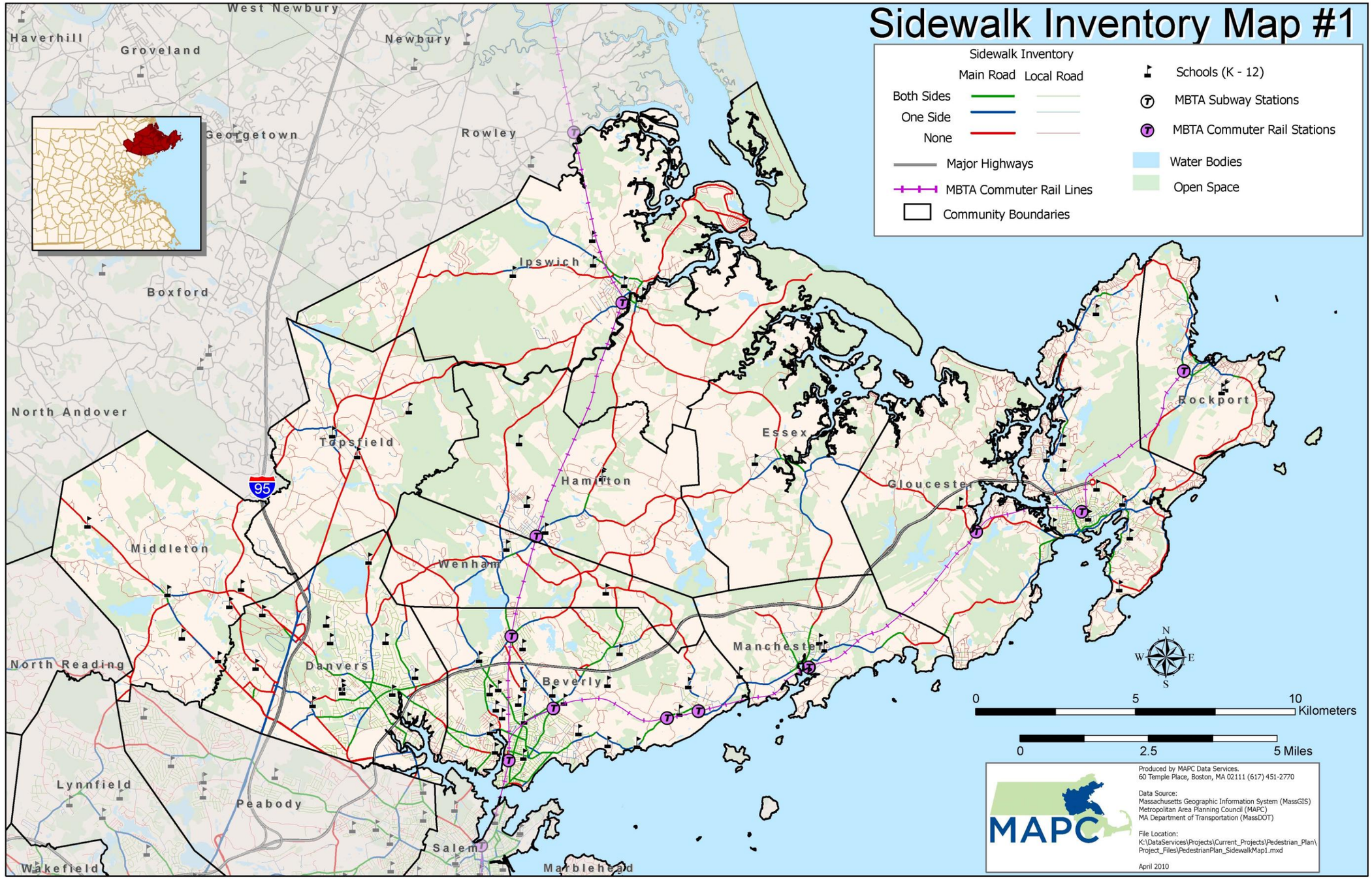
0% -	25%
26% -	50%
51% -	75%
76% -	100%

"With Sidewalks" is defined as a street having a sidewalk on one or both sides.
"Main Roads" carry through traffic and generally have limited access points.
"Local Roads" have more frequent access points and serve adjacent residential and business land uses. "Local Roads" distribute traffic between neighborhoods and "Main Roads."
Source: The sidewalk inventory is based on the MassDOT Road Inventory. Data collected through December, 2007 was distributed by MassGIS.

Appendix B Sidewalk Coverage by Municipality

Source: The sidewalk inventory is based on the MassDOT Road Inventory. Data collected through December, 2007 was distributed by MassGIS.

Does not include paths or other off-road paths.


Sidewalk Inventory Map #1
Sidewalk Inventory
Main Road
Local Road
Both Sides
One Side
None
Major Highways
MBTA Commuter Rail Lines
Community Boundaries
Schools (K - 12)
MBTA Subway Stations
MBTA Commuter Rail Stations
Water Bodies
Open Space
West Newbury
Haverhill
Groveland
Newbury
Georgetown
Rowley
Ipswich
Boxford
North Andover
Topsfield
Essex
Rockport
Hamilton
Gloucester
Middleton
Wenham
Manchester
North Reading
Danvers
Beverly
Lynnfield
Peabody
Salem
Wakefield
Marblehead
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10
Kilometers
0
2.5
5 Miles
MAPC
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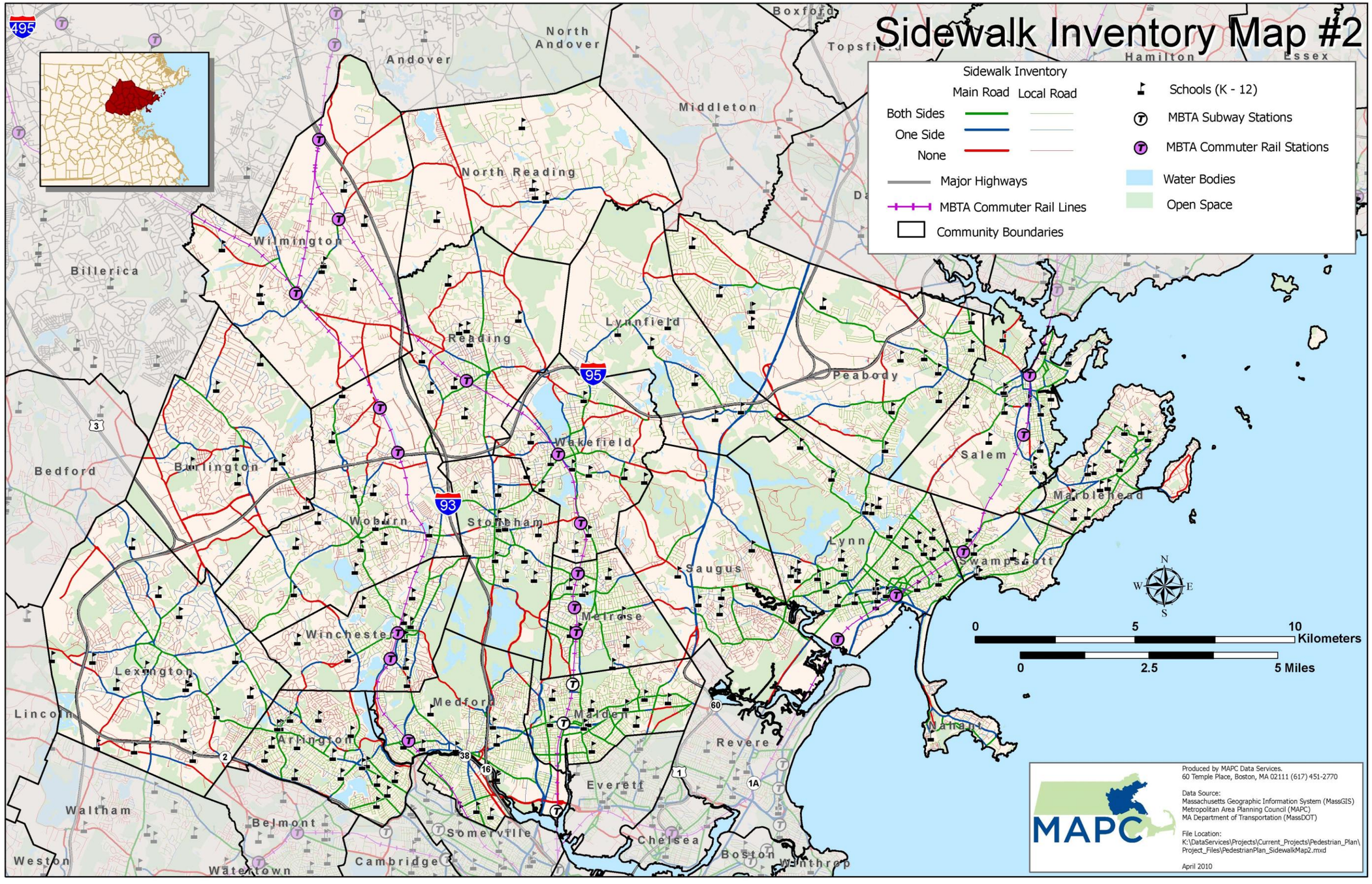
April 2010


Sidewalk Inventory Map #2
Sidewalk Inventory
Main Road
Local Road
Both Sides
One Side
None
Major Highways
MBTA Commuter Rail Lines
Community Boundaries
Schools (K - 12)
MBTA Subway Stations
MBTA Commuter Rail Stations
Water Bodies
Open Space
North Andover
Andover
Boxford
Topsfield
Hamilton
Essex
Middleton
North Reading
Wilmington
Billerica
Reading
Lynnfield
Peabody
Wakefield
Salem
Marblehead
Bedford
Burlington
Woburn
Stoneham
Saugus
Lynn
Swampscott
Melrose
Winchester
Lexington
Lincoln
Medford
Malden
Arlington
Revere
Everett
Waltham
Belmont
Somerville
Chelsea
Boston
Winthrop
Watertown
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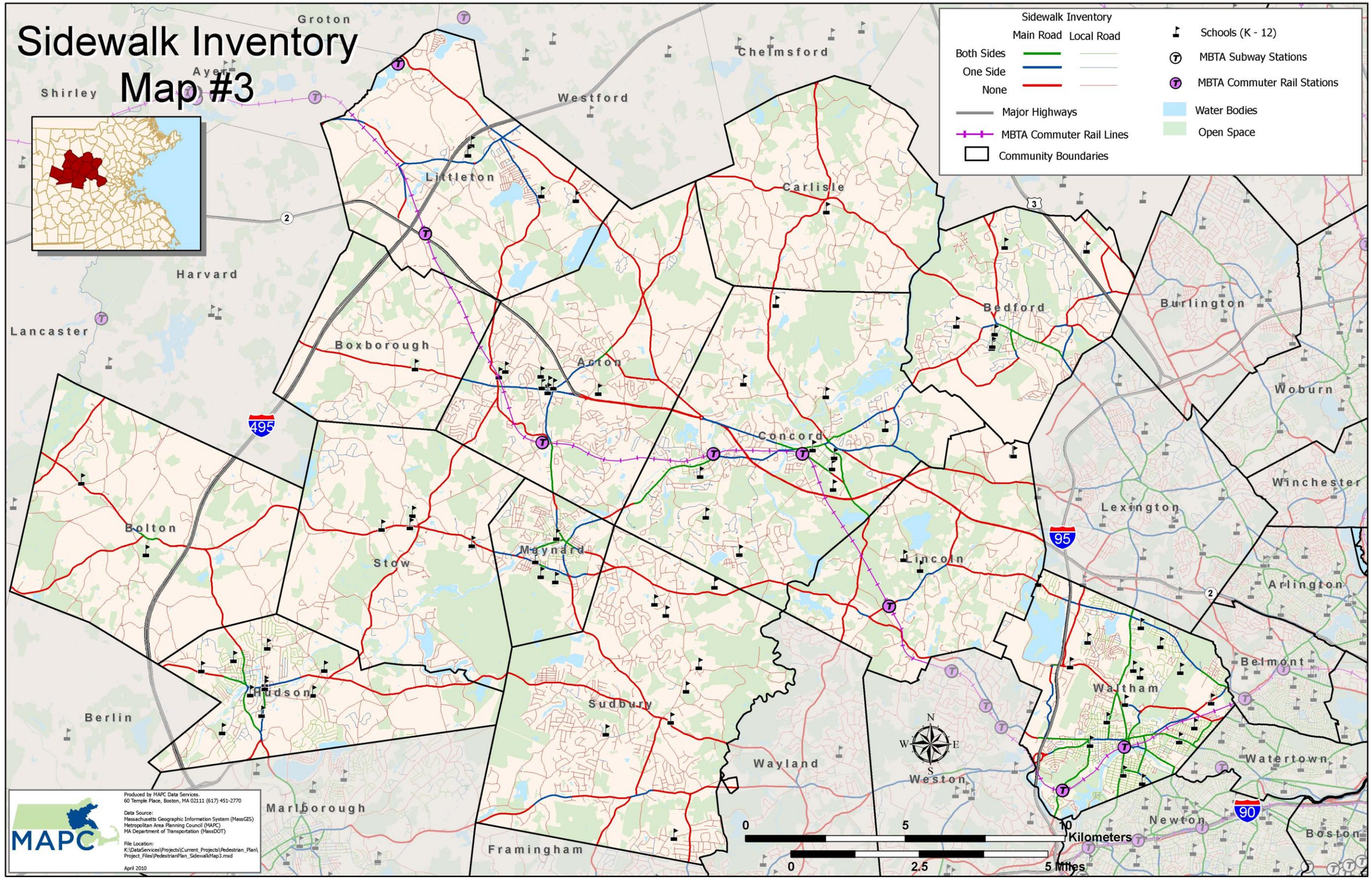
Sidewalk Inventory
Map #3
Sidewalk Inventory
Main Road
Local Road
Both Sides
One Side
None
Major Highways
MBTA Commuter Rail Lines
Community Boundaries
Schools (K - 12)
MBTA Subway Stations
MBTA Commuter Rail Stations
Water Bodies
Open Space
Groton
Ayer
Shirley
Harvard
Lancaster
Littleton
Westford
Chelmsford
Carlisle
Boxborough
Acton
Concord
Bedford
Burlington
Woburn
Winchester
Lexington
Arlington
Belmont
Waltham
Watertown
Newton
Boston
Weston
Wayland
Sudbury
Framingham
Marlborough
Hudson
Berlin
Bolton
Stow
Maynard
Lincoln
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MAPC
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Kilometers
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2.5
5 Miles
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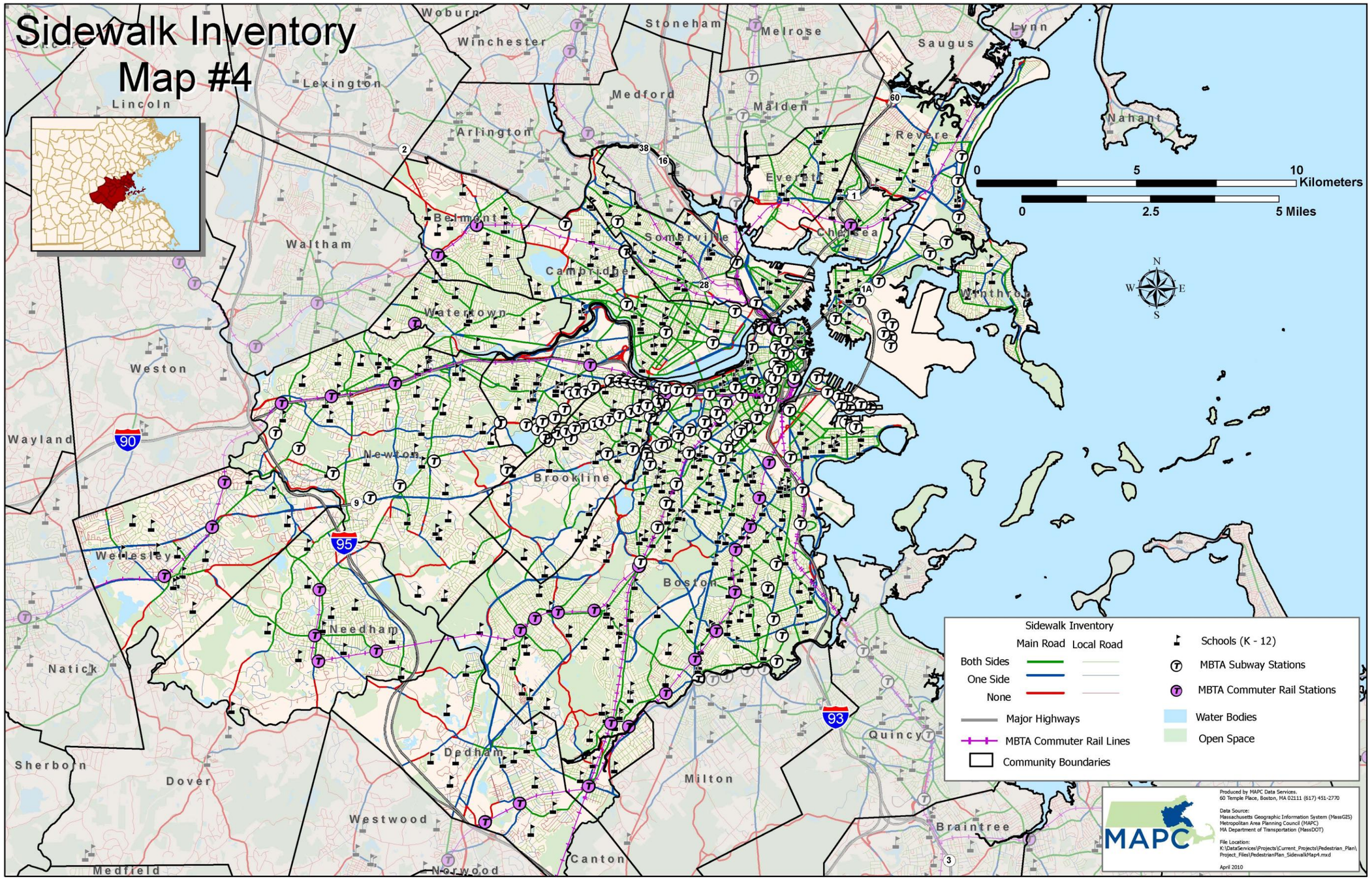
Sidewalk Inventory
Map #4
Woburn
Winchester
Stoneham
Melrose
Saugus
Lynn
Lexington
Lincoln
Medford
Malden
Nahant
Arlington
Revere
Everett
Belmont
Somerville
Chelsea
Waltham
Cambridge
Winthrop
Watertown
Weston
Wayland
Newton
Brookline
Wellesley
Boston
Needham
Natick
Dedham
Quincy
Sherborn
Dover
Milton
Westwood
Braintree
Canton
Medfield
Norwood
0 5 10 Kilometers
0 2.5 5 Miles
N
W E
S
Sidewalk Inventory
Main Road Local Road
Both Sides
One Side
None
Major Highways
MBTA Commuter Rail Lines
Community Boundaries
Schools (K - 12)
MBTA Subway Stations
MBTA Commuter Rail Stations
Water Bodies
Open Space
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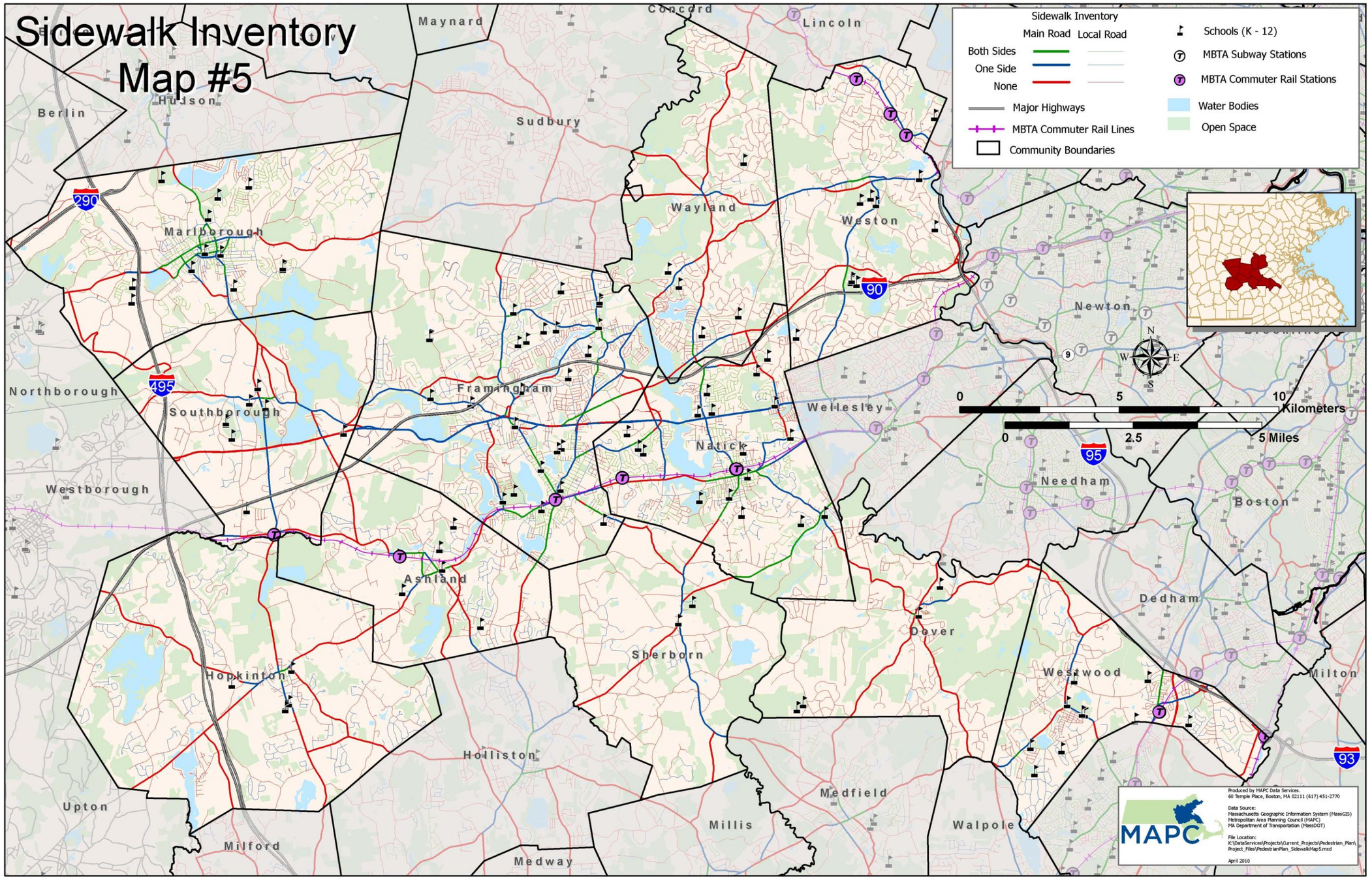
Sidewalk Inventory
Map #5
Sidewalk Inventory
Main Road
Local Road
Both Sides
One Side
None
Major Highways
MBTA Commuter Rail Lines
Community Boundaries
Schools (K - 12)
MBTA Subway Stations
MBTA Commuter Rail Stations
Water Bodies
Open Space
Maynard
Concord
Lincoln
Berlin
Hudson
Sudbury
Wayland
Weston
Marlborough
Newton
Northborough
Southborough
Framingham
Wellesley
Natick
Westborough
Needham
Boston
Ashland
Dedham
Dover
Sherborn
Hopkinton
Westwood
Milton
Holliston
Upton
Medfield
Millis
Walpole
Milford
Medway
290
495
90
95
93
0
5
10
Kilometers
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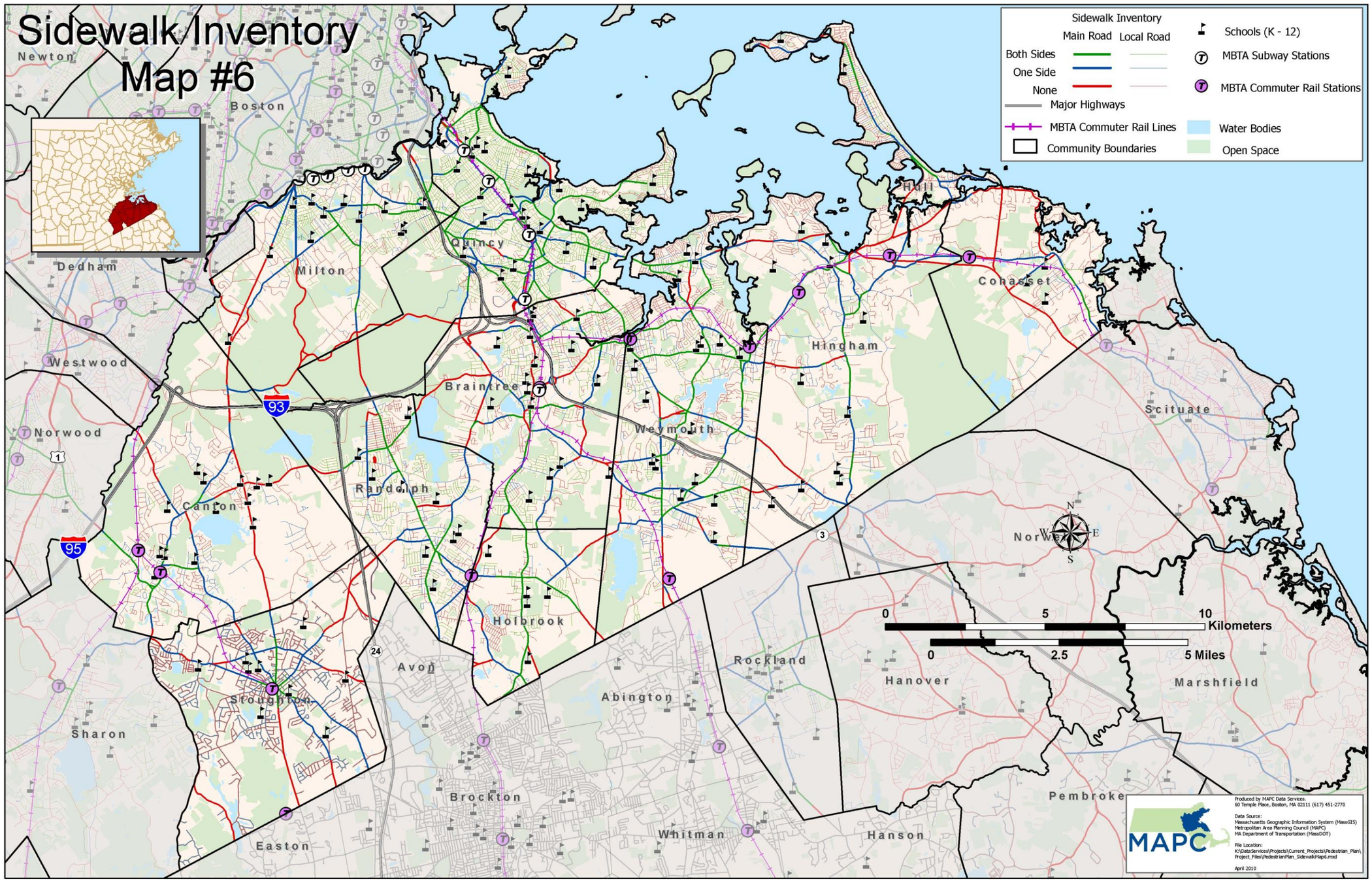
April 2010
MAPC


Sidewalk Inventory
Map #6
Sidewalk Inventory
Main Road
Local Road
Both Sides
One Side
None
Major Highways
MBTA Commuter Rail Lines
Community Boundaries
Schools (K - 12)
MBTA Subway Stations
MBTA Commuter Rail Stations
Water Bodies
Open Space
Newton
Boston
Dedham
Milton
Quincy
Hull
Cohasset
Hingham
Westwood
Braintree
Weymouth
Scituate
Norwood
Randolph
Canton
Holbrook
Avon
Stoughton
Sharon
Abington
Rockland
Hanover
Marshfield
Brockton
Whitman
Hanson
Pembroke
Easton
93
95
1
24
3
N
W
E
S
0
5
10
Kilometers
0
2.5
5 Miles
MAPC
Produced by MAPC Data Services.
60 Temple Place, Boston, MA 02111 (617) 451-2770
Data Source:
Massachusetts Geographic Information System (MassGIS)
Metropolitan Area Planning Council (MAPC)
MA Department of Transportation (MassDOT)
File Location:
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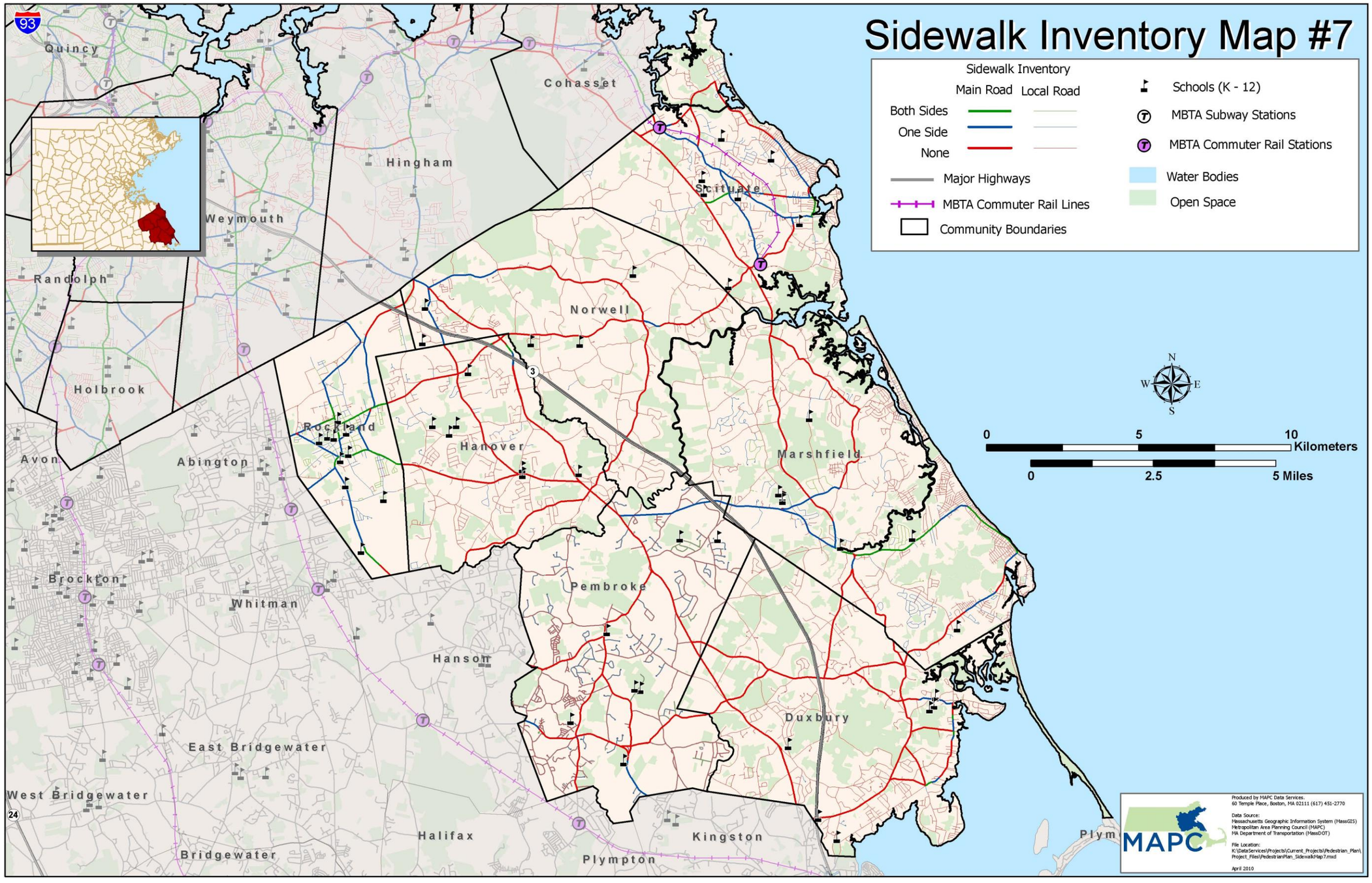
April 2010


Sidewalk Inventory Map #7
Sidewalk Inventory
Main Road
Local Road
Both Sides
One Side
None
Major Highways
MBTA Commuter Rail Lines
Community Boundaries
Schools (K - 12)
MBTA Subway Stations
MBTA Commuter Rail Stations
Water Bodies
Open Space
N
W
E
S
0
5
10
Kilometers
0
2.5
5 Miles
Produced by MAPC Data Services.
60 Temple Place, Boston, MA 02111 (617) 451-2770
Data Source:
Massachusetts Geographic Information System (MassGIS)
Metropolitan Area Planning Council (MAPC)
MA Department of Transportation (MassDOT)
File Location:
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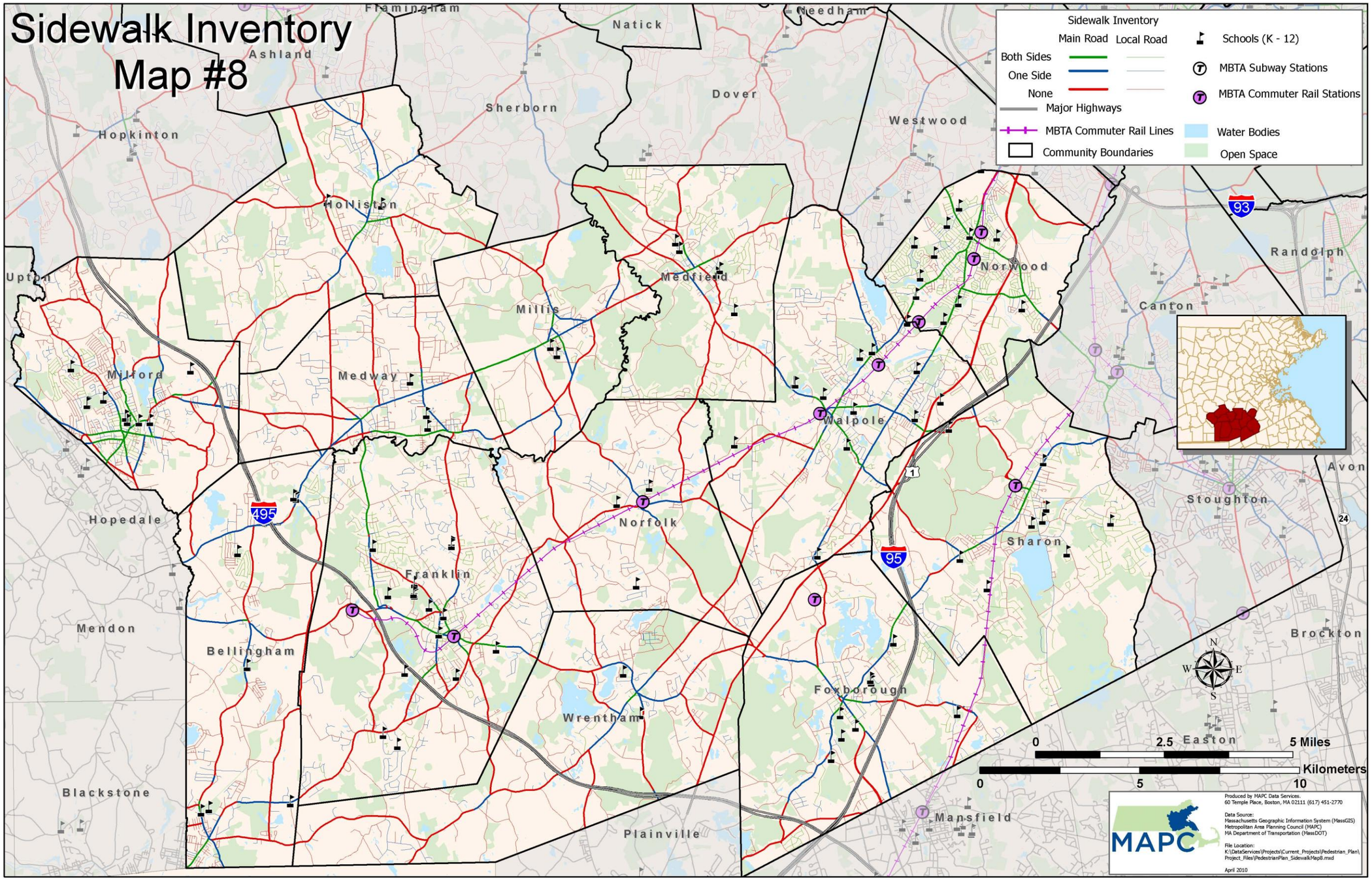
April 2010
MAPC
Quincy
Cohasset
Hingham
Scituate
Weymouth
Randolph
Norwell
Holbrook
Rockland
Hanover
Marshfield
Avon
Abington
Brockton
Whitman
Pembroke
Hanson
Duxbury
East Bridgewater
West Bridgewater
Halifax
Kingston
Plympton
Bridgewater
Plym
93
3
24


Sidewalk Inventory
Map #8
Framingham
Natick
Needham
Ashland
Sherborn
Dover
Westwood
Hopkinton
Holliston
Upton
Medfield
Millis
Norwood
Canton
Randolph
Milford
Medway
Walpole
Avon
Stoughton
Hopedale
Norfolk
Sharon
Franklin
Mendon
Bellingham
Brockton
Foxborough
Wrentham
Blackstone
Plainville
Mansfield
Easton
Sidewalk Inventory
Main Road
Local Road
Both Sides
One Side
None
Major Highways
MBTA Commuter Rail Lines
Community Boundaries
Schools (K - 12)
MBTA Subway Stations
MBTA Commuter Rail Stations
Water Bodies
Open Space
0
2.5
5 Miles
0
5
10
Kilometers
MAPC
Produced by MAPC Data Services.
60 Temple Place, Boston, MA 02111 (617) 451-2770
Data Source:
Massachusetts Geographic Information System (MassGIS)
Metropolitan Area Planning Council (MAPC)
MA Department of Transportation (MassDOT)
File Location:
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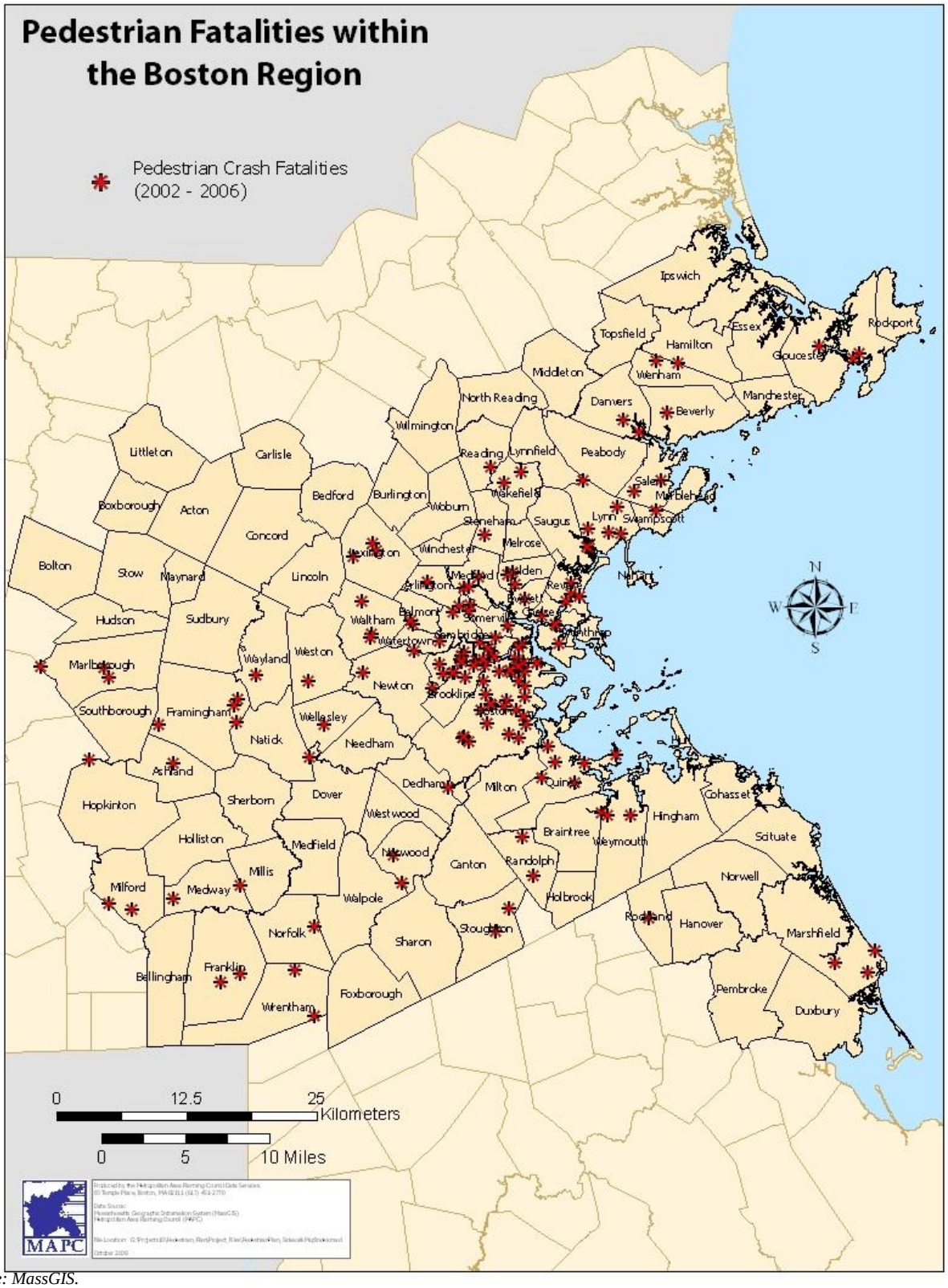
April 2010

Appendix C Pedestrian Fatalities within the Boston Region (2002-2006)



Source: MassGIS.

Appendix D Pedestrian-Related Issues to Consider when Reviewing Development Plans

Access to the Site

Is it possible to walk to the site?

Look for and consider:

- Sidewalks connecting to adjacent land uses.
- Connecting off-road paths that link cul-de-sacs or link to schools, recreational, or other attractions off-site.
- Signs and signals that make the appropriate route clear.

Is the site served by transit?

Look for and consider:

- Transit stops/stations in prominent, well-lit locations that are attractive and provide protection from weather.
- Clear and direct pedestrian access to transit.
- Is adequate space provided for bus turnarounds? (this is also worth considering for potential future bus service).

Are parking areas safe for pedestrians?

Look for and consider:

- Sidewalks and crosswalks around and through parking areas.
- Are there multiple uses that could share parking at different times of day, thereby reducing the overall need for parking?

On the Site

Do streets provide choices of travel mode?

Look for and consider:

- Walkways connecting various buildings and features within the site.
- Crosswalks to access key destinations.
- Curb ramps to allow pedestrians in wheelchairs or strollers to cross the street.

Is the site designed to facilitate travel by foot?

Look for and consider:

- Sidewalks along and between the site buildings and other activity areas .
- Sidewalks along the site frontage and connecting to sidewalks and streets on adjacent and nearby properties.
- Sidewalk width does not have permanent obstructions, such as utility poles or traffic signs.
- Connected and easy to navigate street pattern.

Does the design of the buildings facilitate access by foot?

Look for and consider:

- Buildings and entrances oriented toward the street.
- Large parking areas located to the side or to the rear of buildings.
- First floor use of non-residential buildings is pedestrian friendly.

Does the design of the site offer other safety and comfort measures for pedestrians?

Look for and consider:

- Lighting along roads, public areas and transit stops.
- Shade trees to shelter streets and sidewalks.
- Landscaping and planting strips between sidewalks and roadways.

Is the site designed or located in an area that allows pedestrian access to multiple destinations?

Look for and consider:

- Proximity and connections to various destinations such as: schools, stores, post offices, parks, restaurants, banks.

Appendix E Resources

Important Numbers

America Walks – 703-738-4889
http://www.americawalks.org

APBP - The Association of Pedestrian and Bicycle Professionals - 262-375-6180
http://www.apbp.org

CTPS – Central Transportation Planning Staff, Boston MPO Staff – 617-973-7100
http://www.bostonmpo.org/bostonmpo

Designing Streets for Pedestrians and Bicyclists - 541-914-1401
http://www.michaelronkin.com

Federal Highway Administration Bicycle and Pedestrian Program Office - 202-366-8044
http://www.fhwa.dot.gov/environment/bikeped

ITE - The Institute of Transportation Engineers -202-289-0222
http://www.ite.org

Massachusetts Department of Transportation (MassDOT) - 617-973-7000
http://www.massdot.state.ma.us/main

MAPC - Metropolitan Area Planning Council – 617-451-2770
http://www.mapc.org

The National Center for Bicycling and Walking – 973-821-5405
http://www.bikewalk.org/aboutus.php

The Pedestrian and Bicycle Information Center - 919-962-7801
http://www.walkinginfo.org

Walk Boston – 617-367-9255
http://www.walkboston.org

Walkable Communities, Inc. – 866-347-2734
http://www.walkable.org

State and Regional

Central Transportation Planning Staff, Bicycle and Pedestrian Improvements in Town Centers, May 2007.
http://www.bostonmpo.org/bostonmpo/4_resources/1_reports/1_studies/4_bicycle/ped_bic_imp.html

Central Transportation Planning Staff, Transportation Improvement Program (TIP) Process at the Boston Metropolitan Planning Organization – An Instructional Handbook for Roadway Project Proponents, 2009.
http://www.bostonmpo.org/bostonmpo/3_programs/2_tip/2009_TIP_Handbook.pdf

Commonwealth Capital Program.
http://www.mass.gov/?pageID=gov3subtopic&L=5&L0=Home&L1=Key+Priorities&L2=Job+Creation+%26+Economic+Growth&L3=Clean+Energy+%26+Smart+Growth-Smart+Energy&L4=Commonwealth+Capital&sid=Agov3

The General Laws of Massachusetts.
http://www.mass.gov/legis/laws/mgl

Massachusetts Department of Housing and Community Development and the Cecil Group, Creating Design Standards for 40R Districts, 2008.
http://www.mass.gov/Ehed/docs/dhcd/cd/ch40r/40rdesignstandardsguidebook.pdf

Massachusetts Department of Transportation, Massachusetts Pedestrian Plan, 1998.
http://www.mhd.state.ma.us/default.asp?pgid=../common/walk/pedplan&sid=about

Massachusetts Department of Transportation, Draft Massachusetts Strategic Highway Safety Plan, 2006.

Massachusetts Department of Transportation, Procedures for Speed Zoning on State and Municipal Roadways, 2005.

Massachusetts Department of Transportation, Project Development and Design Guidebook, 2006.
http://www.mhd.state.ma.us/default.asp?pgid=content/designGuide&sid=about

Metropolitan Area Planning Council, MetroFuture.

Smart Growth/Smart Energy Toolkit.
http://www.mass.gov/envir/smart_growth_toolkit

Municipal

City of Cambridge, Pedestrian Plan, 2000.
http://www.cambridgema.gov/~CDD/et/ped/plan/ped_plan.html

Walking in Arlington.

Wellesley Trail System.

Additional Resources

Alta Planning + Design and Initiative for Bicycle and Pedestrian Innovation, Fundamentals of Bicycle Boulevard Planning and Design, 2009.
http://www.altaplanning.com/

The American Association of State Highway and Transportation Officials Guide for the Planning, Design and Operation of Pedestrian Facilities, 2004.

The American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets, 2001.

Citizens' Housing and Planning Association and MAPC, The Use of Chapter 40R in Massachusetts, October 2009.
http://www.mapc.org/sites/default/files/Chapter_40R_Report.pdf

Community Design + Architecture, Inc. W-Trans, Planning and Designing for Pedestrians, June 2002.
http://www.sandag.org/uploads/publicationid/publicationid_713_3269.pdf

Department of Justice, Code of Federal Regulations, ADA Standards for Accessible Design, 28 CFR, Part 36, 1994.

Ewing, Reid and the Smart Growth Network, Pedestrian and Transit-Friendly Design: A Primer for Smart Growth.
http://www.epa.gov/smartgrowth/pdf/ptfd_primer.pdf#search='Primer%20on%20Street%20Design%20Guidelines

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http://nhts.ornl.gov/briefs/Travel%20To%20School.pdf

Federal Highway Administration of Pedestrian and Bicycle Safety Research
http://www.tfhrc.gov/safety/pedbike/index.htm

Insurance Institute for Highway Safety
http://www.iihs.org

Lee V, Mikkelsen L, Srikantharajah J, Cohen L. Strategies for Enhancing the Built Environment to Support Healthy Eating and Active Living. Oakland, CA: Prevention Institute; 2008.
http://www.healthykidshealthycommunities.org/resources/strategies-enhancing-built-environment-support-healthy-eating-and-active-living

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http://mutcd.fhwa.dot.gov/pdfs/2009/pdf_index.htm

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http://www.bikewalk.org/ncbw_pubs.php

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Pedestrian Safety Guide and Countermeasure Selection System.
http://www.walkinginfo.org/pedsafe/moreinfo_sidewalks.cfm

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United States Department of Transportation, Federal Highway Administration, Pedestrian Facilities Users Guide- Providing Safety and Mobility, Publication No. FHWA-RD-01-102, March 2002.

University at Albany – State University of New York, Planning and Policy Models for Pedestrian and Bicycle Friendly Communities in New York State, September 2007.
http://www.albany.edu/~ihi/ModelZoningCode.pdf

Walk Boston, Keep it Clear - Recommendations for Sidewalk Snow and Ice Removal in Massachusetts, 2007.
http://www.walkboston.org/work/snow.htm

Washington State Transportation Center (TRAC), Anne Vernez Moudon, Lin Lin and Phil Hurvitz. Managing Pedestrian Safety I: Injury Severity, 2007.

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Boston Region Metropolitan Planning Organization, Bicycle and Pedestrian Improvements in Six Urban Centers, February 2010.
http://ctps.org/bostonmpo/4_resources/1_reports/1_studies/4_bicycle/urban_centers.html

Central Transportation Planning Staff, Pedestrian and Bicyclist Access to Selected Transit Stations, September 2005.
http://ctps.org/bostonmpo/4_resources/1_reports/1_studies/4_bicycle/improving_access.html

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http://www.bostonmpo.org/bostonmpo/3_programs/2_tip/2009_TIP_Handbook.pdf

Commonwealth Capital Program.
http://www.mass.gov/?pageID=gov3subtopic&L=5&L0=Home&L1=Key+Priorities&L2=Job+Creation+%26+Economic+Growth&L3=Clean+Energy+%26+Smart+Growth-Smart+Energy&L4=Commonwealth+Capital&sid=Agov3

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http://www.mass.gov/envir/smart_growth_toolkit

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http://nhts.ornl.gov/briefs/Travel%20To%20School.pdf

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http://mutcd.fhwa.dot.gov/pdfs/2009/pdf_index.htm

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http://safety.transportation.org/guides.aspx?cid=29

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http://www.oki.org/

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http://www.walkinginfo.org/pedsafe/moreinfo_sidewalks.cfm

United States Census Bureau
http://www.census.gov/

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http://www.walkboston.org/work/snow.htm

Washington State Transportation Center (TRAC), Anne Vernez Moudon, Lin Lin and Phil Hurvitz. Managing Pedestrian Safety I: Injury Severity, 2007.