

Improving Pedestrian and Bicyclist Access to Selected Transit Stations



A report produced by the Central Transportation Planning Staff for the Massachusetts Highway Department and the Massachusetts Bay Transportation Authority

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ABSTRACT

This study identifies relatively low-cost, quick-implementation measures that can significantly improve pedestrian and bicyclist access at six locations in the Massachusetts Bay Transportation Authority system: Ayer Station (commuter rail); Boston College Branch (B Line) stops, Boston College Station to Chestnut Hill Avenue (Green Line); Cleveland Circle and Reservoir stops (Green Line, C and D); Forest Hills Station (Orange Line, commuter rail, and bus); Malden Center Station (Orange Line, commuter rail, and bus); and Mansfield Station (commuter rail and bus). Detailed in the report are improvements to both station property and surrounding areas that would eliminate hazards for bicyclists and pedestrians, increase ease of access to the station from surrounding neighborhoods for those users, or otherwise enhance the attractiveness of the station for access by foot or bicycle. The report also includes a summary that describes the types of issues encountered and provides general recommendations.

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Creating and maintaining easy, pleasant, and safe access to transit stations helps to promote the use of public transit. This study identifies small investments that can make significant improvements to pedestrian and bicyclist access at six locations in the Massachusetts Bay Transportation Authority (MBTA) system.

Many transit stations are within convenient walking and bicycling distance of surrounding neighborhoods. In fact, according to the MBTA's Program for Mass Transportation (PMT), across the entire MBTA system 84 percent of riders walk or bicycle to transit stations.¹ Furthermore, approximately 54 percent of the population within the Boston metropolitan region resides within walking distance of transit service.²

However, in some locations, walking or bicycling to transit stations can be inconvenient, unpleasant, or unsafe. Pedestrians and bicyclists are easily deterred if barriers exist, either physical or psychological. Circuitous routes, poor pavement or sidewalk condition, heavy traffic, and dark or isolated corridors are all examples of conditions that discourage walking and bicycling. Thus, eliminating barriers, improving connectivity, and providing desirable travel environments encourage travelers to use public transit and reinforce the behavior of pedestrians and bicyclists who already reach transit stations in these ways.

Moreover, targeted, low-cost improvements that attract pedestrians and bicyclists can yield more from existing transportation facilities and services. Such improvements lessen the need for more capital-intensive projects, by reducing the need for parking spaces at park-and-ride lots, for example. Since walk trips are typically involved in at least one of the ends of a transit trip, investing in pedestrian-friendly environments can generate significant benefits at reasonable cost.

This approach is in line with the state's current investment policies. The 2003 Statewide Road and Bridge Policy, which is based on a policy of "Fix It First," expresses the purpose of providing "enhanced mobility for sustainable transportation modes (walking, bicycling, and public transportation)."³ The "Fix-It-First" initiative is used by the Commonwealth of Massachusetts to guide its investments and policies. It allows the state to plan for growth and development by leveraging its limited financial resources and maximizing past investments and previously built assets.⁴ Furthermore, the "Fix-It-First" policy helps to target investments in order to improve efficiency, economic and community development potential, and quality of life.⁵

¹ *Program for Mass Transportation (PMT)*, prepared for the Massachusetts Bay Transportation Authority (MBTA) by the Central Transportation Planning Staff, May 2003, p. 5B-32.

² Walking distance to transit (used to identify the potential transit market area) is defined as the distance of three-fourths mile or less from a rail station and one-half mile or less from a bus stop. Population is based on 2000 census.

³ "Statewide Road and Bridge Policy," Governor Mitt Romney, Commonwealth of Massachusetts, January 27, 2003. Full text is found at <http://commpres.env.state.ma.us/publications/Road-Policy.pdf>.

⁴ Matt Lambert and Kil Huh, "Fixing It First: Targeting Infrastructure Investments to Improve State Economies and Invigorate Existing Communities," an *Issue Brief* produced by the NGA Center for Best Practices, Washington, D.C., 2004.

⁵ *Ibid.*

Study Background

The MBTA has established an aim of enhancing its service by improving access to the transit system. The PMT notes that providing automobile parking is only one way to improve access to the MBTA system. While the PMT evaluation assigns a high-priority project rating to commuter parking expansion at over a dozen stations, the PMT also highlights an effort to promote pedestrian and bicyclist use of the transit system through targeted improvements to access by those modes. In fact, the PMT assigns a high-priority rating to improving walking paths to commuter and rapid transit stations throughout the system; the anticipated results of such efforts include increased ridership without the costly expansion of parking facilities. Also in the PMT, the MBTA describes an effort to provide new or improved bicycle parking facilities at transit stations. Furthermore, the MBTA is promoting and supporting transit-oriented development through joint development partnerships and by engaging communities in land use planning at MBTA station properties.

In recent years the Executive Office of Transportation and Massachusetts Highway Department (MassHighway), through planning and transportation demand management programs, have encouraged the provision of modes of travel that serve as alternatives to the single-occupant automobile. These agencies are focusing attention on improving circulation around and accessibility to multimodal transportation centers and similar facilities.

The three transportation agencies have a general goal of improving facilities and conditions for walking and bicycling. They are aware that other states (Maryland, Delaware, and Washington, for example) have conducted studies to implement similar objectives and believe that such an effort has merit in Massachusetts, as well. Because of their common interests, the MBTA and MassHighway joined in sponsoring the present study, which has been conducted by CTPS under their guidance.

The concept of improving nonmotorized access to transit stations is also supported by and consistent with local, state, and federal bicycle and pedestrian transportation plans, including—in addition to the PMT—*Accessing the Future: The Intermodal Transportation Policy Plan for the Commonwealth of Massachusetts* (EOTC/Bureau of Transportation Planning and Development, 1995), the Boston MPO's *Regional Transportation Plan* (2003), MassHighway's *Building Better Bicycling: A Manual for Improving Community Bicycling Conditions* (1999), the City of Boston's *Access Boston 2000–2010: Boston Bicycle Plan* (Boston Transportation Department, May 2001), MassHighway's "Bicycle Route and Share the Road Signing Policy" (Policy Directive P-98-003, August 25, 1998), the MBTA's Bicycle Access to Transit program, and the Federal Transit Administration's program *Bicycles and Transit: A Partnership That Works* (August 18, 1998). In addition, the Massachusetts Office for Commonwealth Development, based on their Sustainable Development Principles and the Climate Protection Action Plan, is very supportive of improving access to transit stations.

Another reason the transportation agencies are interested in the issue of bicyclist and pedestrian access to transit is that they want to enhance the sense of well-being and safety of those who are already using those modes of access.

Project Objectives

In order to further the goal of improved nonmotorized access to transit stations, the transportation agencies have articulated three objectives. The first is to identify stations and surrounding areas where there are opportunities for improving the safety and ease with which bicyclists and pedestrians can get to the station. The second objective is to design and implement relatively low-cost, readily achievable measures that can take advantage of those opportunities. The third objective is to assess to what degree the implemented measures did, in fact, improve access to transit stations.

This study was designed to support these objectives, with the focus on the first objective and on identifying the measures to be implemented under the second objective. The tasks of this study are as follows:

1. Identify transit stations to include in this pilot study.
2. Identify opportunities to improve pedestrian and bicyclist access at those stations.
3. Recommend measures to accomplish those identified improvements.

Selection of Transit Sites

Six sites, representing a diverse array of stations, were selected for this pilot study. The selected sites are: Ayer Station (commuter rail); Boston College Branch (B Line) stops, Boston College Station to Chestnut Hill Avenue (Green Line); Cleveland Circle and Reservoir stops (Green Line, C and D); Forest Hills Station (Orange Line, commuter rail, and bus); Malden Center Station (Orange Line, commuter rail, and bus); and Mansfield Station (commuter rail and bus).

The project steering committee initially identified 20 candidate stations to investigate. These stations were selected based on knowledge of the system and of current activities related to these sites. The candidate stations were also chosen to represent different transit modes, rail lines, characteristics, and geographic areas of the region. Station areas that would require major modifications to the station and neighboring facilities in order to improve bicyclist and pedestrian access were not selected for this study.

As part of the final site selection process, CTPS staff visited the station areas. Via photographs and a cursory field audit, staff noted the condition of facilities and assessed need for improvement. To select the final sites to study, the project steering committee used the field-collected information and other criteria, including boardings at stations, park-and-ride lot utilization, walk and bicycle access-mode share, proximity to shared-use paths, nearby residential population and density, surrounding land use patterns, and current transit-oriented development activity.

The study set out to examine the access-to-transit issues at each site and recommend actions. The set of recommendations consists of low-cost, quick-implementation improvements.

Systemwide Conditions

Ridership

Approximately 1,100,000 trips are taken on the MBTA transit system on an average weekday.⁶ The MBTA rapid transit, light rail, and bus rapid transit systems serve 134 stations on six lines: the Green Line, Blue Line, Orange Line, Red Line, Mattapan High Speed Line, and Silver Line. Daily ridership on these systems is about 630,000. On the bus and trackless trolley system, which serves 44 communities, total ridership is approximately 344,000 trips per weekday. The present MBTA commuter rail network is comprised of 13 radial lines, with 123 stations and 365 miles of track; ridership per weekday is approximately 110,000 passengers. The Attleboro/Stoughton Line is the most heavily used commuter rail line, with an average of 10,300 persons boarding per weekday. Commuter boat ridership adds approximately 5,000 trips to the system.

⁶ The ridership figures by transit service that are presented in this paragraph are the Spring 2002 Estimated Daily Boardings from the *2003 Fare Mix Study* (draft), conducted by CTPS for the MBTA. Ridership data are a composite average and are reported as unlinked trips.

<i>Transit Service</i>	<i>Average Weekday Trips</i>
Green Line	183,000
Blue Line	50,000
Orange Line	174,000
Red Line (incl. Mattapan)	223,000
Silver Line	14,000
Bus/trackless trolley	344,000
Commuter rail	110,000
Commuter boat	5,000
Total	1,103,000

Transit Market

Based on 2000 census figures, approximately 54 percent of the population within the Boston metropolitan region⁷ is within walking distance of transit service.⁸ Notably, 55 percent of all work trips and 42 percent of all trips into downtown Boston are by transit. In the Boston metropolitan region overall, 6.8 percent of all trips are made by transit, and that number is projected to increase to 7.5 percent by 2025.⁹

Proportion of Transit Riders Who Walk or Bicycle to a Station

Based on the results of the most recent rapid transit (including light rail) passenger surveys, just over 50 percent of morning-commute riders reached their station by walking.¹⁰ Three out of every four riders at over half of the stations walked from their point of origin to reach the station; and 30 percent of stations on the rapid transit system have a walk-access mode share of 90 percent or more. Although walking is not the primary mode of access to most of the commuter rail stations, pedestrians do make up a significant portion of these riders. On the Needham and Fairmount Lines, for instance, 48 percent of riders walked to their station, and 40 percent of riders on the Worcester Line accessed their station by walking. About a third of riders on the Rockport, Haverhill/Reading, and Fitchburg Lines walked to their station, and one-fifth of riders on the Lowell and Franklin Lines walked to their station.

The passenger surveys from the 1990s indicate that less than one percent of MBTA riders reached their station by riding a bicycle. Although bicycle use is affected by the seasons, the potential exists to increase this mode share through improved access conditions.

⁷ The Boston metropolitan region is defined as the Boston MPO region, comprised of 101 cities and towns in Eastern Massachusetts. The 2000 Census population figure for these communities is 3,066,394 inhabitants. For the 164 cities and towns in the Boston metropolitan transportation planning area, the population figure is 4,306,692, and the potential transit market (as defined in the footnote below) is just under 40 percent.

⁸ Walking distance to transit (used to identify the potential transit market area) is defined as the distance of ³/₄-mile or less from a rail station and ¹/₂-mile or less from a bus stop. Population is based on 2000 census.

⁹ *PMT*, p. 2-1.

¹⁰ The figures in this paragraph's discussion are based on the results from the 1993 passenger survey of commuter rail lines, 1994 passenger survey of rapid transit lines, and the 1998 passenger survey for the Old Colony Commuter Rail Restoration, all conducted by CTPS for the MBTA.

Park-and-Ride Lot Use

Park-and-ride lots at transit stations play a key role in accommodating other transit users, which can drive or carpool to the rail system. Most of the riders on commuter rail lines in the MBTA system are motorists and passengers of park-and-ride vehicles. For instance, over 70 percent of riders on the Providence-Attleboro-Stoughton line, which draws the highest number of morning commuters, arrived at their station via the park-and-ride mode.¹¹ Systemwide, the MBTA reports that 54 percent of users drive to stations to access the commuter rail service.¹²

However, many park-and-ride lots at transit stations are at the limit of their capacity. In fact, 71 percent of the 107 commuter rail station lots surveyed in 2000 and 2002 were reported to be near or at capacity.¹³ Furthermore, 49 of the lots (46 percent) reached capacity well before the last morning peak-period inbound train. Nevertheless, the analysis described in the PMT concludes that expanding parking capacity at most stations is not a viable (or is at least a challenging) option.

Pedestrian Safety

According to 2001 statistics on traffic-related crashes in the state, pedestrians were involved in 1.5 percent of the crashes but the 70 fatalities made up close to 15 percent of all traffic-related fatalities. In the Boston MPO region, pedestrians were involved in 1.5 percent of the crashes, as well, and made up close to 17 percent of the fatalities (46). Both statewide and in the Boston MPO region less than 1 percent of traffic crashes involved a bicyclist. Around 2 percent of traffic-related fatal crashes involved a bicyclist (7 fatalities statewide, 6 in the MPO region).

Conclusion

The idea of improving access to transit by foot and by bicycle is rooted in the principle of customer service. People should not have to struggle or feel unsafe getting from home to the station. Instead, residents living near stations should be provided with an inviting connection. The costs of making links between residential neighborhoods and transit stations safe, convenient, and pleasant are generally very low. The benefits, however, are substantial. For the traveler, these benefits include a true choice of transportation options, healthful exercise, and a safer environment. For the transit operator, the advantages are an increase in ridership with a very small investment, less pressure to build costly parking facilities, and positive community relations. For the public at large, the benefits are reduced congestion, improved air quality, and a reduced subsidy.

The six case studies presented in this report describe, for each study area, the particular issues that need to be addressed and the measures that are appropriate for addressing them. Before these individual cases are discussed, however, a chapter summarizing the study's general findings is provided.

¹¹ Access-to-transit mode from the *1993 Passenger Survey*, conducted by CTPS for the MBTA, 1993.

¹² *PMT*, p. 5B-32.

¹³ Defined as at least 85 percent of parking spaces occupied. Park-and-ride lot surveys performed by CTPS, reported in the 2004 *Congestion Management System* report.



SUMMARY AND LESSONS LEARNED

For each of the six sites studied, the subsequent chapters of this report describe the specific issues that need to be addressed and recommend specific measures for addressing them. This chapter summarizes some of the general issues encountered at the study locations and the types of measures that can be implemented to address the issues.

Examining Access Issues

The field audit conducted for this study examined the physical, safety, and quality elements of walking and bicycling to a transit station. Based on such observations, the study set out to define improvements to both station property and surrounding areas that would eliminate hazards for bicyclists and pedestrians, increase the accessibility of the station from surrounding neighborhoods for those users, or otherwise enhance the attractiveness of the station for access by foot or bicycle. The recommendations focus on relatively low-cost, quick-implementation improvements, such as:

- Striping and painting of crosswalks, bike lanes, and other pavement markings
- Adding or fixing signs (including those related to traffic control, safety, and wayfinding)
- Adjusting signal timing (including changes to pedestrian phases and signal activation)
- Reducing bicycle/pedestrian–vehicle conflicts
- Providing bicycle parking
- Providing additional sidewalks
- Adding or fixing street lighting
- Landscaping and vegetation removal

The study did not closely examine access issues from the perspective of people with disabilities. However, the study did note the presence of wheelchair ramps, especially at street corners and crosswalks.

Pedestrian and Bicyclist Comfort

Accessibility has to do not only with physically being able to get to a place, but also with the safety and quality of that trip. Safety relates to the potential for exposure to crime or for injury due to collisions with vehicles, fixed objects, or other hazards. What is meant here by the quality of an access trip is the traveler's subjective, personal comfort with the surrounding environment in both its practical and its aesthetic aspects.

Despite differences in personal perceptions and choices related to accessibility, pedestrians and bicyclists as a group tell a collective story of what is deemed acceptable or desirable: they express themselves by action. For example, a facility (such as a sidewalk, crosswalk, or bicycle parking rack) having a high number of users typically is an indication of approval and thus of effective deployment (though the potential for improvements must still be examined). On the other hand, users exhibit discomfort or displeasure by not using a facility. Furthermore, users sometimes express a desire for a facility through inventive actions, as demonstrated by a dirt path through the grass or a bicycle chained to a fence; such expressions were noted in this study's field audit.

General Issues and Recommendations

Overall, none of the study locations have issues that seriously impede the access of pedestrians and bicyclists to a transit station. However, general maintenance issues should be addressed in all of the study areas. In addition, conditions and facilities can be further improved in order to enhance the safety and quality of pedestrian or bicyclist access; best-practices guidelines should be consulted and applied when possible.

Maintenance of Existing Facilities and Amenities

In each of the study areas, many of the existing facilities and amenities are in need of repair or upkeep. Faded crosswalk paint, uneven and broken pavement surfaces on sidewalks and roadways, malfunctioning pedestrian signals, and broken streetlamps are examples of facilities and amenities that are in need of attention. At a minimum, these should be in good, functional condition.

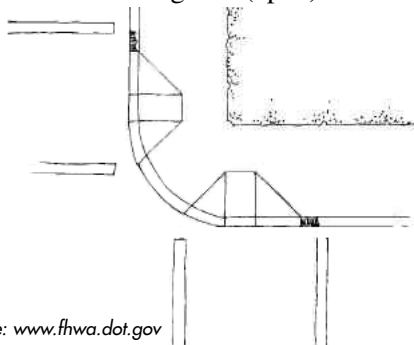
Seasonal Maintenance

Another common condition found at many study locations is a need for regular and seasonal upkeep of sidewalks and roadways. Dirt, sand, and debris accumulate in the gutters of roads and on sidewalks, particularly during and after the winter season. The winter also presents the issue of snow and ice, which are often piled onto sidewalks and along the sides of roads. In the summer, weeds and overgrown plants can obstruct pedestrian and bicyclist movement. Aside from being unpleasant and a nuisance, these conditions create obstructions that may make travel hazardous and impede transit patrons from easily using the MBTA system.

Sidewalks

In general, the streets in the study locations, particularly the main access routes, have sidewalks on both sides. Although the presence of sidewalks is generally not an issue, the sidewalks are often in need of maintenance, as noted above. Surfaces should be level, smooth, and without obstructions in the pathway of pedestrians. In addition, best-practices guidelines recommend a buffer between the sidewalk and the roadway. On most streets in the study areas, roadway widths may not permit this feature.

In a few locations the sidewalks do not have a curb wheelchair ramp at crosswalks. In many locations sidewalks have diagonal (apex) curb ramps, where one ramp is provided at the street corner; these ramps



Source: www.fhwa.dot.gov

typically are not aligned with the marked crosswalks. Diagonal curb ramps are the predominant type used in the study areas; however, this type of curb ramp is not recommended by current Federal Highway Administration best-practices guidelines. Instead, street corners should have two curb ramps, one aligned with one street's crosswalk and the other aligned with the other street's crosswalk (see diagram, left). For additional safety, the bottom of the ramps should have a strip of detectable warning surface.

Crosswalks

The crosswalks in the study areas generally are striped with basic, standard markings. Very few of the crosswalks are marked in a manner that goes above and beyond the Manual on Uniform Traffic Control Devices (MUTCD) standards. Typically, they are striped with two parallel solid white lines or have a ladder-style marking. In most cases, the stop line for vehicle traffic is too close to the crosswalk.

Best-practices guidelines recommend that crosswalks be well marked and accentuated by curb extensions. This study recommends, at a minimum, marking sidewalks with ladder-style striping. A 10-foot distance between the stop lines and crosswalks is recommended. Treatments for multilane roadways should include a 10- to 30-foot distance between the stop line and the crosswalk, pedestrian refuge islands/medians, and curb extensions for increased visibility of pedestrians. Also, this study recommends



appropriate signs to warn motorists of pedestrian crossing activity.

In order to improve sight lines between motorists and crossing pedestrians, on-street parking should be spaced at least 30 feet back from crosswalks. Furthermore, other innovative options for enhancing crosswalks should be considered, including the use of reflective paint or thermoplastic striping, pavement texturing (see photo, left), in-pavement lights, crosswalk cones and barrels, and overhead signs.

Signalized Pedestrian Crosswalks



Some signalized pedestrian crossings in the study area have broken signals and buttons, as well as long activation times for the pedestrian walk phase. As a first step, all existing signals should have functioning buttons and walk signals. Studies should be conducted to investigate reducing activation times at many signals. Moreover, the crossings should be enhanced with more modern signal technology. For example, signals should be equipped with pedestrian activation buttons that light up when pushed, as an indication of having been successfully activated. Also, countdown-style pedestrian crossing signals (see photo, left) should be used in places with a sufficient amount of pedestrian activity.

Intersection Safety



Several intersections in the study areas should be made safer for pedestrians and bicyclists through some minor redesign. Curb extensions at the corners, for instance, create a tighter turning radius for vehicles, which slows the speeds of traffic at turns. Curb extensions also provide better sight lines for motorists to watch for pedestrians and vice versa. Furthermore, medians and islands can be enlarged to better guide and control traffic, often slowing vehicle speeds as well. Medians and traffic islands should be large and visible enough to provide sufficient refuge for pedestrians. Plus, striping should be clear and

delineate the vehicle-turning lanes, the crosswalks, and the stop lines. Lastly, intersections with significant pedestrian activity could be marked as a pedestrian crossing zone (instead of having only crosswalks), where an all-red pedestrian phase is part of the signal cycle.

On-Street Bicycling

On many roads that lead to transit stations, bicyclists must contend with high traffic volumes and on-street parking. High traffic volumes, particularly when combined with high speeds and frequent turning movements, can be intimidating to bicyclists. On-street parking poses challenges in the form of conflicts between vehicles that are parking or discharging passengers, and bicyclists, who are often negotiating traffic to their left in addition to coping with the parked-vehicle activity to their right.

Roadway design and condition are also issues for bicyclists. Narrow lanes and narrow shoulders are a concern, particularly on roads with high traffic volumes. Potholes and poor pavement should be fixed, as bicyclists are more sensitive to pavement conditions than are motorists. Storm-sewer grates were not an issue in the study areas: the grates either were grids or were parallel bars appropriately placed perpendicular to traffic flow.

The study does not recommend bicycle lanes in the locations examined, due to the common presence of on-street parking and high traffic volumes on major corridors to the stations. However, if local communities are willing to eliminate on-street parking, further study of bicycle traffic volumes should be conducted in order to determine the demand for on-street bicycle lanes.

Bicycle Parking



All of the stations studied, with the exception of Boston College Station, provide at least one bicycle rack. In some cases, additional racks should be installed. Providing sufficient parking capacity for bicycles is not sufficient in itself, however. Some stations would benefit from relocating the existing racks in order to improve visibility, provide shelter, and promote use. Visibility is a big issue for bicyclists; a secure location is often one that is watched by others. Also, proper lighting conditions enhance visibility; hence well-lit locations are preferred for bicycle parking. Protection from the elements is another highly desirable characteristic of a bicycle rack location. Thus, if space is available, racks should be located in a station building; otherwise, a roof or other shelter should be provided. Lastly, racks should be situated in spots that offer enough space not only for storing bicycles but also for maneuvering them.

Current bicycle parking guidelines¹ recommend that providers of bicycle racks select types that:

- Support the bicycle upright by its frame in two places, enabling the frame and one or both wheels to be secured
- Allow both front-in and back-in parking
- Are compatible with today's bike frames and with U-locks

Common bicycle parking racks that meet the above guidelines include: the inverted-U or hoop (see photo, above), “A” (a hoop with a horizontal bar), and post-and-loop (also known as bike hitch) style racks. Many manufacturers produce these or acceptable variations of these styles. These rack elements are typically arranged in a row or array; the spacing between the rack elements should be a minimum of 30 inches (on centers), but preferably a more comfortable 36 to 42 inches.

¹ One reference is *Bicycle Parking Guidelines* (2002), adopted by the Association of Pedestrian and Bicycle Professionals. For more information, please refer to www.bicyclinginfo.org/de/parkguide.htm.

Signs: Wayfinding for Transit Stations

Well-placed wayfinding signs—pointing the way to a transit station—reach out to potential riders. They are similar in function to signs that direct motorists to highway ramps. Care should be taken to install the signs at a height and orientation favorable to pedestrians. Also, these signs should use conventional MBTA symbols, lettering, and colors.

Travel Environment

The aesthetic look and feel of the travel environment encourages use by pedestrians and bicyclists. Communities should implement measures to improve the quality of the street environment through the use of landscaping (trees, shrubs, and flowers, all appropriately placed), lighting, furniture (such as benches and trashcans), and artwork (such as sculptures and murals). Chambers of commerce and business owners should also be encouraged to enhance storefronts and streetscapes.

Future Considerations

The opportunity to implement many of the recommended improvements may only arise when a roadway construction project occurs. Any roadway construction project should apply best-practices guidelines for serving pedestrian and bicyclist travel in general. More specifically, projects should improve walk and bike access to transit stops and stations as much as possible. In essence, the MBTA, MassHighway, local governments, and land developers should coordinate and cooperate on all transportation improvement projects to ensure that pedestrian and bicyclist needs are integrated into the final designs.

When improvements are made to the accessibility of transit to pedestrians and bicyclists, they can be highlighted in public information campaigns promoting the option of bicycling to transit stations. The improved accessibility can be extolled along with the cost, time, and health benefits to individuals.



The commuter rail station located in Ayer serves a community that is undergoing changes. With the closure of the nearby military base at Devens, Ayer is experiencing a change in economy and housing. The population surrounding Ayer Station shares characteristics similar to target environmental justice communities,¹ based on median household income. With the loss of jobs in the area, workers could be looking for opportunities in employment areas served by commuter rail. New developments are reshaping the former military base. Rising housing prices in communities closer to Boston and the Route 128 belt are forcing many homebuyers to communities in the outer suburbs, such as Ayer and nearby Groton. Thus, for more than one reason, Ayer Station could be seeing an increase in riders—and an increase in demand for use of the park-and-ride lot.

However, the Program for Mass Transportation’s evaluation of potential parking expansion projects assigns a low-priority rating to increasing the capacity of the park-and-ride lot at Ayer Station. Obstacles to any expansion include land rights and funds availability, among others.

Recently, a new off-road, paved, shared-use path—the Nashua River Rail Trail—has opened, connecting downtown Ayer (where the station is located) with Groton, Pepperell, and Dunstable to the north. This path is a step toward improving access by pedestrians and bicyclists to the station. Unfortunately, the end of the path is not well connected to the station: the final connection is not direct, the station is partially hidden from view, and traffic along Main Street is constant.

Because of the potential increase in demand for use of the park-and-ride lot and the opportunity to improve the connection between the multiuse path and the station, Ayer Station was chosen as a site for this study.

Station Area Characteristics

About 2,800 people (close to 40 percent of Ayer’s population) in 1,150 households reside within a three-quarter-mile radius of this station, according to the 2000 census. (In the area within a half-mile radius from this station reside approximately 1,800 people in just over 770 households.) Approximately 10 percent of the households do not have a private vehicle. Residential developments make up just over 25 percent of the area; the land use within a three-quarter-mile radius of this station is predominantly undeveloped or undevelopable, including forest and other open space. Among the developed parcels, residential land use takes up 60 percent of the land; commercial 15 percent; and light industrial close to 6 percent.

¹ Environmental justice is the equitable sharing of the transportation system’s benefits and burdens. In order to identify possible target communities—areas with significant minority or low-income populations—this study applied the following criteria: minority population greater than the MPO-region average (21.4 percent); median household annual income less than 75 percent of the MPO-region median (that is, less than \$41,850).

Station Amenities

In terms of station amenities for pedestrians and bicyclists at the Ayer commuter rail station, the following two issues are discussed in this section:

- Bicycle parking
- Station visibility

Bicycle Parking at the Station



On the south (inbound) side of the station platform, a dish-style bicycle rack is located in an open area beside the benches and shelter for the station. No bicycles were parked there on the day of the observation; bicycles were chained to posts on the north side of the station.

Recommendation: Move the existing bike rack to the north side of the station (not MBTA property), between the commuter parking lot and the outbound platform. This spot is more visible, on a hard surface, and in an area where bicyclists have been observed to lock their bicycles. Consider a location next to or behind the building, which may facilitate adding a shelter over the racks. Alternatively, there seems to be enough room between the parking lot and the railroad tracks to comfortably add a rack.

Visibility of the Station



The Ayer commuter rail station is inconspicuously situated behind a commercial/retail area along Main Street (Routes 2A and 111)—even the “T” lollipop sign is hidden from the view from Main Street.

Recommendations:

- Add a more prominent lollipop (the existing one could be taller by about 3 feet).
- Add a trailblazing sign at the entrance to the commuter parking lot. The signs should face both directions of traffic. This sign would follow up on a sign at Columbia Street announcing, “commuter rail parking ahead.” (Note: On the ladder sign for the establishments at “Depot Square” off Main Street, one sign does indicate “T parking.” However, the sign is below two other signs, and the lettering is not standard MBTA lettering.)
- Work with appropriate property owners to add station signs at the following locations:
 - main walkway to the station platform, just to the east of the adjacent building;
 - westside wall of the building immediately to the east of the parking lot entrance.

Station Access by Pedestrians and Bicyclists

This section discusses the station-area accessibility issues at the following locations:

- Access from the North: Park Street and the Rail Trail
- Intersection of Park Street (Route 2A/111) and Main Street
- Bike Path/Rail Trail Terminus at Main Street
- Access from the Northeast and East
- Access to the Station from the Southeast
- Access from the West: W. Main Street

Overview of Station Use and Access by Riders

CTPS field observations on the clear Tuesday morning of September 9, 2003, recorded a total of 188 boardings on the inbound commute trains. Since no passenger survey information is available for this station (which would provide the walk-access mode share), CTPS staff observed how riders arrived at the station; the findings are:

- 53 percent (101 riders) originated as motorists or passengers in vehicles parked at the commuter rail lot
- 26 percent (47 riders) walked from the rail trail (although most of these riders, we later found out, actually parked at the rail trail's lot, and thus are park-and-ride users)
- 11 percent (20 riders) were dropped off at the commuter rail station lot
- 10 percent (18 riders) were pedestrians, of which two came over the tracks from the southeast residential neighborhood
- 2 riders were bicyclists, including one cyclist who chained his bicycle to a post on the north side of the tracks and one who parked his bicycle at the rail trail parking lot racks.

The 64 available parking spaces at the commuter rail lot were all occupied before the second-to-last peak-period train at 7:17 A.M. Nine other vehicles were parked in unmarked spaces, including a dirt/gravel area adjacent to the paved parking lot. After the last peak-period train at 7:41 A.M., staff noted a total of 40 vehicles parked at the rail trail's parking lot. Both lots are fee-free and unattended.

Access from the North: Park Street and the Rail Trail

The main roadway approach from the north is along Park Street (Route 2A/111). The road has 12-foot lanes, with 3-foot shoulders and a 25-mph speed limit south of Brook Street (whereas the posted speed limit is 35 mph north of Brook Street, when the state highway designation begins). The road primarily has commercial development along this stretch, and connects to residential areas to the north.

Between Main Street and a point 80 feet north of the intersection there are 6-foot brick-and-concrete sidewalks on both sides of the road. Further north of this point, a sidewalk is present only on the west side; this sidewalk is 5-feet wide, blacktop, and in good condition (except for cracks at roadway curb cuts). Not many pedestrians were observed using this roadway in the morning commuter hours.

Cyclists and pedestrians traveling from the north are better off using the rail trail than Park Street. In fact, this is what was observed during the morning commute hours: the trail was used by bicyclists and pedestrians, most of whom parked at the rail trail parking lot, and walked south to the train station. A

Dunkin' Donuts establishment is located on the west side of Park Street; no crosswalks are provided in the vicinity of this activity generator.

Overall, though, this is a low-activity corridor for bikes and pedestrians—not many residences are located along and north of this stretch of Park Street. Further north of the rail trail parking lot, there is a connection to the rail trail, via two dirt paths, from the residential area off Park Street. Such connections are important to encourage people to use the rail trail rather than face the conditions on parallel Park Street.

Recommendation: Add trailblazing signs at points far north on Park Street to direct bicyclists to the rail trail.

Intersection of Park Street (Route 2A/111) and Main Street

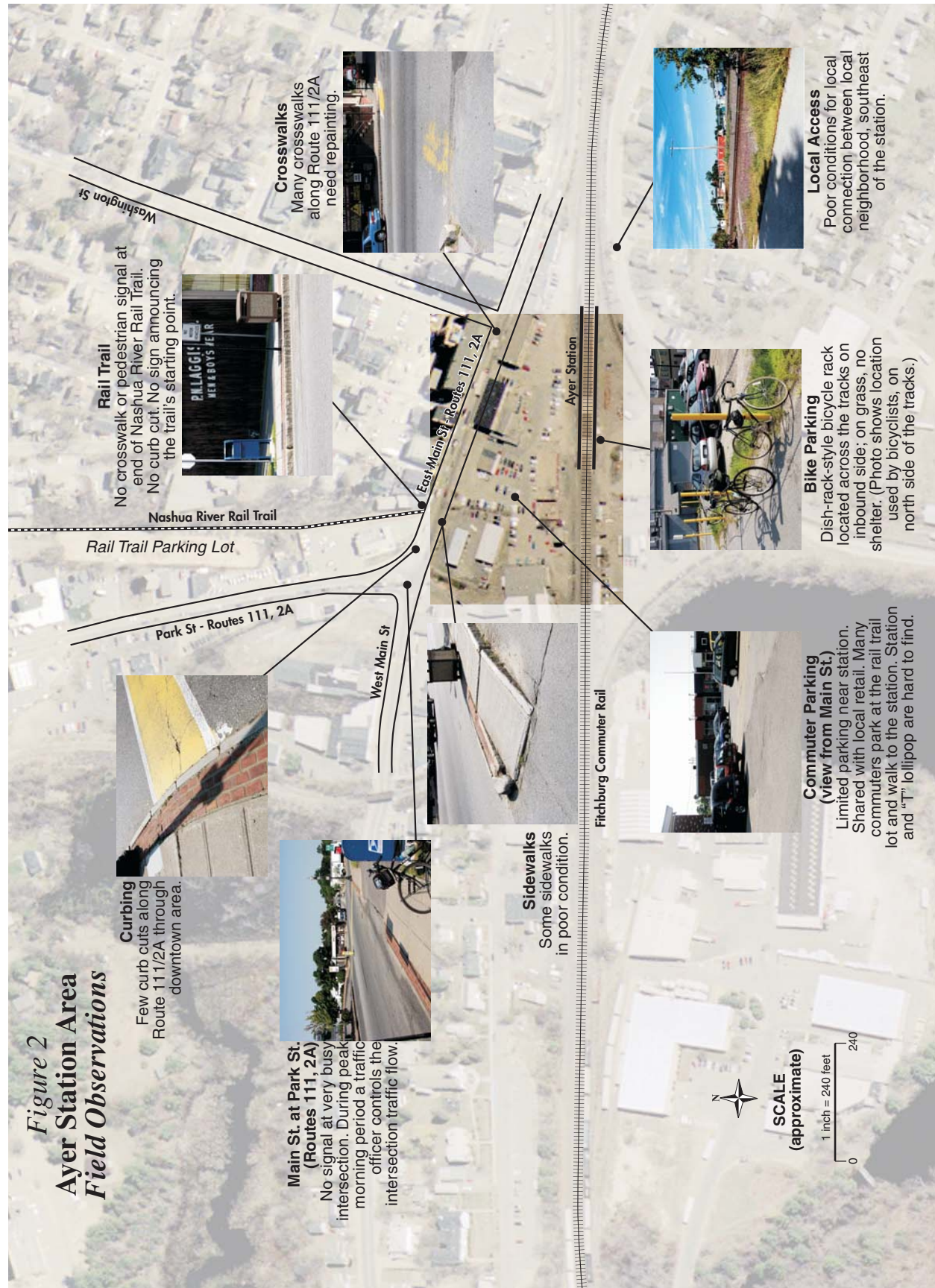


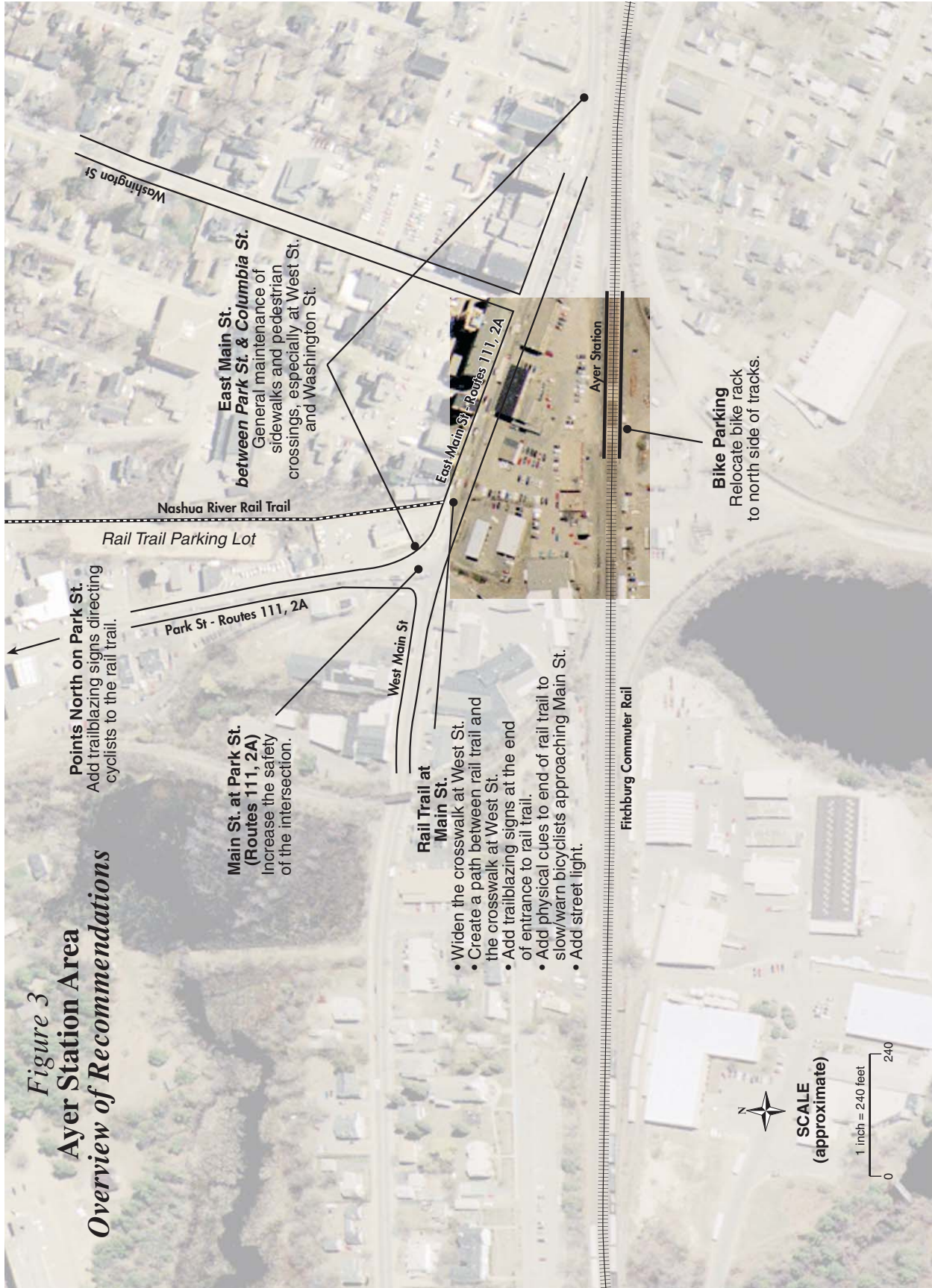
The intersection of Park Street and Main Street is unsignalized. Traffic tends to mostly travel along Route 2A/111, turning between Park Street and E. Main Street. Much truck traffic passes through this intersection; as with most of the traffic here, the primary movement includes the turns. During the peak morning commute hour, a traffic control officer was observed directing traffic. Red stop signs are in place for traffic approaching from the north (Park) and south (driveway).



Recommendations: Increase the safety of the intersection of Main Street at Park Street by implementing the following improvements:

- Install additional street lighting for stronger illumination of the intersection
- Install single-bulb, flashing yellow lights (“flashing beacons”) for the two Main Street traffic approaches and a single-bulb, flashing red light for the southbound Park Street traffic approach
- Install a warning sign for the southbound Park Street traffic indicating that the cross-street traffic does not stop





Bike Path/Rail Trail Terminus at Main Street



The Nashua River Rail Trail ends at Main Street (Routes 2A and 111), across from the Ayer commuter rail station parking lot and the adjacent gas station property. No crosswalk is provided at the rail-trail terminus; the most direct access to the station is via a crosswalk about 12 yards to the east of the rail trail, at West Street.

Five different elements should be improved in order to create a safe crossing of Main Street for bicyclists and pedestrians between the rail trail terminus (on the north side) and the commuter (also commercial) parking lot and station (on the south side). These are described in detail below, beginning with improvements that should be made to the Main Street crosswalk at the west side of West Street.

Crosswalk at West Street

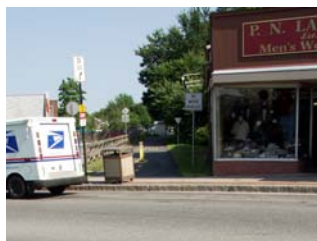


Currently, the crosswalk's paint is worn and faded from its original solid yellow with two parallel white border stripes. The curbs lack wheelchair ramps.

Recommendations:

- Widen the existing crosswalk to 10 feet.
- Add a ramp/curb cut at the north end of the crosswalk.
- Place a pedestrian crossing cone (or barrel) in the middle of the road for both vehicle approaches, similar to the signs found at nearby crosswalks.
- Add additional overhead street lighting for this crossing.
- Install either an overhead pedestrian-crossing sign (preferably illuminated) or in-pavement lights along the crosswalk. Both measures are used to alert oncoming motorists of potential pedestrian activity.
- Add signs warning oncoming motorists of the upcoming pedestrian/bicycle crossing.
- Add a sign at the end of the trail directing bicyclists and pedestrians to use the crosswalk "to the left" (at West Street) in order to reach the commuter rail station.

Rail-Trail-to-Station Connection



The recommendations above should be enhanced by creating a path (a widened sidewalk) along the north side of Main Street between the rail trail and the crosswalk at the west side of West Street. The roadway is wide enough to accommodate such a path, without impacting traffic or the provision of on-street parking.

Recommendation: Create a new path connection by widening the sidewalk on the north side of Main Street by 6 feet. This will still permit a 12-foot eastbound traffic lane with a 3-foot shoulder, a 12-foot westbound lane, and an 11-foot parking lane. The new sidewalk extension should have a smooth surface.

Commuter Rail Parking Lot

On the south side of Main Street, across from West Street, the crosswalk terminates at the Depot Square parking lot entrance, at the west side of the driveway. From here, pedestrians and cyclists must cross the driveway and cut across the lot to reach the station on the south side of the lot.

Recommendations: The following improvements can be made to enhance the final connection from Main Street to the rail station:

- Paint (or highlight with appropriate pavement surface treatments) a crosswalk across the parking lot driveway. It should be aligned with the sidewalk.
- Repair the sidewalk and wheelchair ramps along Main Street in front of the commuter parking lot.

End of Rail Trail: Safety



The following advisories are located at the end of the rail trail at Main Street: a “hwy x-ing” pavement marking in yellow paint, a “Bike Route—End” sign with a stop-sign-ahead warning, a stop sign, and a median post/bollard. A trash can is located on the sidewalk at the end of the path, also serving as a physical barrier for bicyclists as they reach Main Street.

Recommendation: Improve the safety of bicyclists approaching the end of the trail at Main Street by adding a rumble strip at the end of the path, just before the sidewalk. A rumble strip, in addition to the other features in place, should combine to encourage bicyclists to stop and even dismount at this point.

End of Rail Trail: Directional Signs

The end of the trail does not provide any signs that give users any further direction to landmarks, roadways, or amenities in the area. From the standpoint of bicyclists and pedestrians at the trail entrance no signs are present that indicate that a rail trail begins here; the only sign at the start of the rail trail is a warning that no motor vehicles are allowed.

Recommendations:

- Add a trailblazing sign pointing trail users to:
 - Commuter rail station, accessible via crosswalk “to the left”
 - Main Street (commercial center of Ayer) and town hall, library, and court house, all to the east
 - W. Main Street and the town of Shirley, to the west
- Add sign on eastbound Main Street indicating the beginning of a bicycle path to the north (a “Bike Route—Begin” sign exists in the westbound direction).
- Add a sign for bicyclists and pedestrians at the rail trail indicating the beginning of a trail.

Access from the Northeast and East

Most of the residential areas near the station lie northeast of the station (north of Main Street) and further east (south of Main Street and the railroad tracks). Main Street—the commercial center of Ayer—and roads connecting to it are the main roadway access points to the station from these areas. Sidewalks along Main Street have good design elements for pedestrians: they are wide (typically 4 feet with a 3-foot brick-and-curb buffer from the road on the south side, and 8 feet on the north side with a similar buffer) and have on-street parking lanes on both sides. Accessibility (particularly from a wheelchair-user’s perspective) may be an issue, as there are few ramps at the crosswalks along Main Street, and sidewalk condition could be improved in certain spots. Bicycle travel through here requires alertness by the cyclist, due to the volume of traffic and parked vehicles; however, with posted speeds of 25 mph and the downtown nature of the roadway, a bicyclist should be able to navigate this stretch of road without major discomfort.

Recommendation: Maintain or increase driver awareness of pedestrian/bicycling activity along Main Street. This can be accomplished by some general maintenance: repairing any broken sidewalks and ramps, restriping pedestrian crossings, and ensuring good nighttime visibility

Access to the Station from the Southeast



The residential neighborhood to the southeast of the Ayer commuter rail station lacks a connection to the station platform. Weeds, brush, gravel, and a freight railroad are uninviting elements to pedestrians who may want to approach the station platform from this neighborhood. CTPS staff observed that pedestrians handled these impediments to reach the station by walking through the brush and crossing the gravel and tracks. The alternative path for pedestrians and bicyclists to reach the station is to head east to Main Street and then head west to the station—a half-mile route.



Recommendation: Work with the railroad company to either (1) create a safe connection between the station and the residential neighborhood to the southeast, or (2) take appropriate measures to prevent or discourage such crossings.

Access from the West: W. Main Street

West of Park Street is a small residential area. Its principal connection to the CBD and the commuter rail station is via W. Main Street, a two-lane road with wide lanes and shoulders (15 feet and 2 feet, respectively, in each direction). Although vehicle travel speeds on W. Main Street may be on the higher side—even though the posted speed limit is 25 mph (35 mph west of this area)—bicyclists should feel comfortable with the wide lanes and few (if any) parked vehicles. Thus, striping bike lanes would not be necessary. Looking at pedestrian travel, the sidewalks seem adequate; these are wide and in good condition.



The area around Cleveland Circle is a densely populated, urban neighborhood on the Boston-Brookline city line. About 30 percent of households do not own a vehicle. Two major Green Line stops serve this area: Cleveland Circle, the terminus of the C Line, and Reservoir on the D Line. No park-and-ride facilities are available, and some bus service is provided at Reservoir. These characteristics contribute to a high walk-access rate to the Green Line at these stops.

Cleveland Circle—the intersection of Beacon Street and Chestnut Hill Avenue—bustles with activity. The intersection carries through traffic as well as traffic destined to the commercial establishments in the area. These establishments also attract pedestrians and bicyclists, who must often contend with the local traffic.

The dense, urban character of the neighborhood, the high walk-access rate to the Green Line, and the challenges faced by pedestrians and bicyclists traveling around this busy area, are reasons for the selection of the area around these Green Line stops for inclusion in this study.

Station Area Characteristics

Over 4,500 people in just over 2,500 households reside in the area within a quarter mile of the Cleveland Circle and Reservoir stops on the Green Line, according to the 2000 census. (About 12,000 people reside within a half-mile radius of the area neighboring Cleveland Circle and Reservoir, in over 6,100 households.) Around 30 percent of the households do not have a private vehicle. Sixty percent of the developed land within a quarter-mile radius of Cleveland Circle is residential (multifamily housing and quarter-acre lots) and nearly 40 percent commercial. Heading farther from Reservoir (particularly south, east, and west into Brookline), the area becomes predominantly residential.

A 1994 Green Line passenger survey¹ counted over 700 boardings on the C Line at the Beacon Street stops from Dean Road through Cleveland Circle during the morning peak period, between 6:00 and 9:00 A.M.; the survey counted over 1,500 boardings between 6:00 A.M. and 3:30 P.M. By far the dominant mode of access to these Green Line stops was walking: 89 percent. Of those passengers who walked to the station, 77 percent had a walk of five minutes or less, and over 99 percent had a walk of fifteen minutes or less.

At the Reservoir stop on the D Line, the 1994 passenger survey noted over 900 boardings during the morning peak period, between 6:00 and 9:00 A.M.; the survey counted over 1,800 boardings between 6:00 A.M. and 3:30 P.M. Similar to the other Green Line stops in this area, the dominant mode of access for Reservoir is walking: 80 percent. Over one-third of those passengers who walked to the station had a walk of five minutes or less, and over 96 percent had a walk of fifteen minutes or less.

¹ *MBTA Systemwide Passenger Survey: Rapid Transit/Light Rail 1994*, a report produced by the Central Transportation Planning Staff for the Massachusetts Bay Transportation Authority, May 1996.

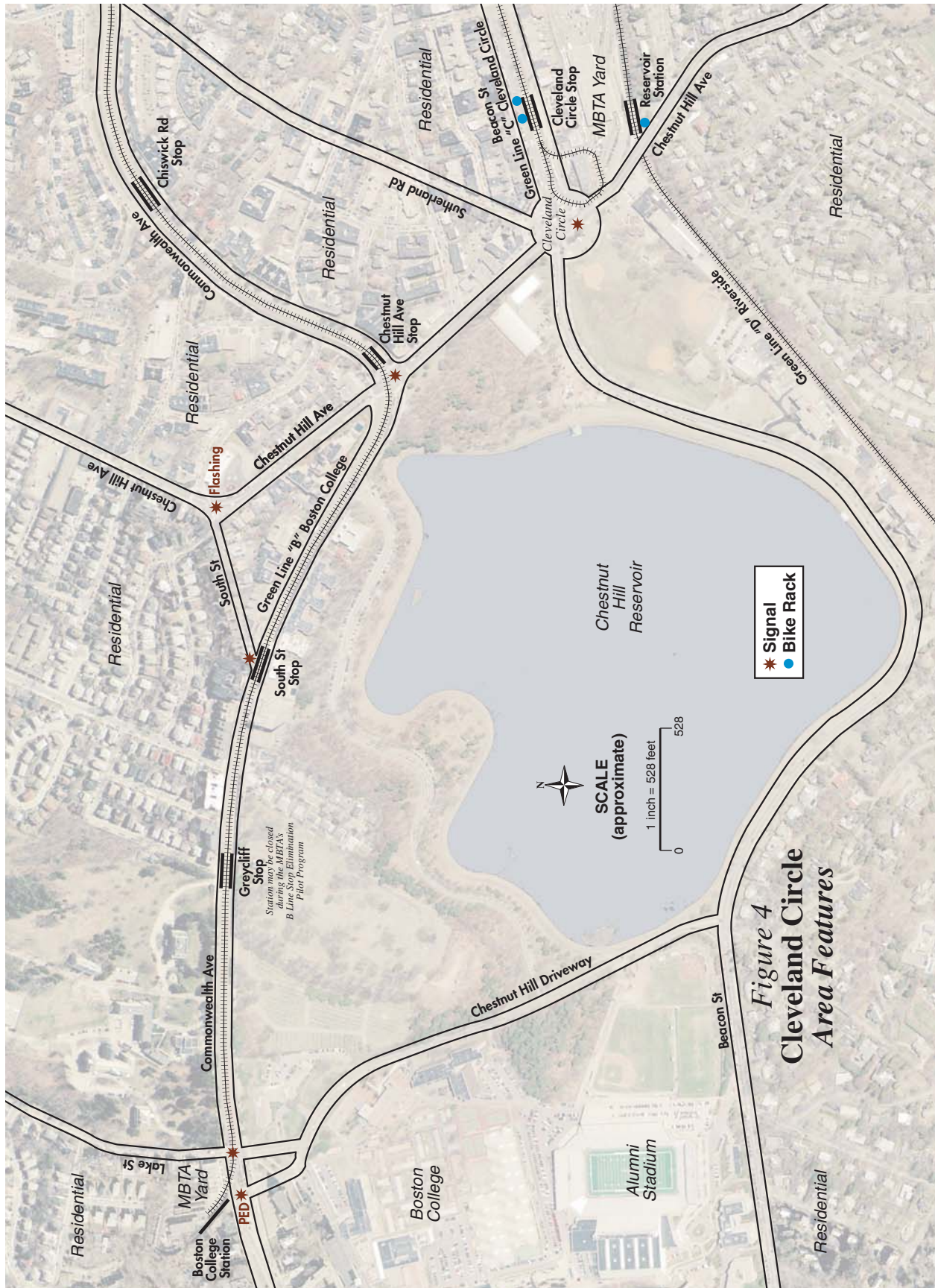


Figure 4
Cleveland Circle
Area Features

Station Amenities

Presented in this section is a discussion of pedestrian crosswalks and bicycle parking facilities at the two stops.

Cleveland Circle Stop

Passengers at the Cleveland Circle stop on the Green Line C Branch board and alight using ground-level platforms on the outside of the tracks. The platforms have recently been upgraded to provide wheelchair accessibility. On the inbound side, a bench with a roof-only shelter is available for riders. A fence separates waiting passengers on the platform and vehicle traffic on Beacon Street.

CTPS observed the patterns of passengers alighting at the Cleveland Circle stop as they dispersed through Cleveland Circle. The observations were conducted on the afternoon of September 10, 2003, a sunny and warm Wednesday. The majority (over 70 percent) of the nearly 250 passengers observed crossed to the north side of Beacon Street and headed toward Sutherland Road or Chestnut Hill Avenue. Ten percent of alighting passengers crossed north to head east, and the remaining 20 percent crossed Beacon Street to the south and overwhelmingly headed in the direction of Chestnut Hill Avenue.

The Cleveland Circle stop has two ribbon bicycle racks on the outbound-side platform, located at opposite ends of the platform. However, the location of the ribbon rack at the end furthest from Cleveland Circle may not be suitable for bicycle parking: the rack is too close to the fence and to the plant/tree area on the sidewalk. These racks do not appear to be at capacity.

On Beacon Street at the Cleveland Circle stop is a pedestrian-activated crossing signal at both the eastbound/inbound and westbound/outbound sides. Our field audit found these pedestrian signals can have a slow response-to-activation time. Once activated, the pedestrian-crossing signals provide 15 seconds of 'Walk' (and flashing 'Don't Walk') time, which is adequate for crossing the road. The crosswalk on the eastbound side of Beacon Street has been paved over.

Recommendations:

- Paint a crosswalk across the eastbound side of Beacon Street at the pedestrian-crossing signal.
- Paint a stop line for traffic at the crosswalk on both sides of Beacon Street. The stop line should be at least 10 feet back, and have a sign stating, "Stop Here for Crosswalk."
- Reduce the queue time for pedestrians waiting for a "walk" signal at the pedestrian-crossing signals.
- Install illuminated pushbuttons at the pedestrian-crossing signals, to indicate to pedestrians that the crossing signal has been activated.
- Place midstreet pedestrian-crossing cones/signs in the crosswalk on the Beacon Street westbound side (where the road is wide), as a warning to vehicular traffic.

Reservoir Station

At the time of the field observations, buses (Reservoir Station is served by Route 51 and Route 86) were not using the bus turnaround to pick up and drop off passengers; instead, the buses were stopping only on Chestnut Hill Avenue across the street from the station. (Update: As of July 29, 2004, construction is still present at the station bus area, but buses are using the turnaround.) A crosswalk with a pedestrian-crossing sign barrel leads pedestrians across Chestnut Hill Avenue to the bus stop on the southbound side.

Reservoir has single-bike posts and three inverted-U bike racks located at the top entrance at the bus turnaround. These are located along the sidewalk leading from the station stairway toward the Chestnut Hill Avenue walkway. The bicycle parking area is not sheltered.

Recommendation: Install bicycle parking racks in the space between the inbound and outbound staircases at Reservoir Station. This location provides visibility and would not interfere with station patron circulation. Furthermore, the existing roof over the walkways and waiting area could be easily extended over this location to provide shelter to the bicycle racks. A rack with 12 inverted-U rack elements would comfortably fit here; the rack should be placed 30 inches from the wall, and the rack elements should be spaced at 36-inch centers.

Station Access by Pedestrians and Bicyclists

This section discusses the station-area accessibility issues at the following locations:

- Cleveland Circle
- Chestnut Hill Avenue North
- Beacon Street East
- Sutherland Road
- Chestnut Hill Avenue South

Cleveland Circle



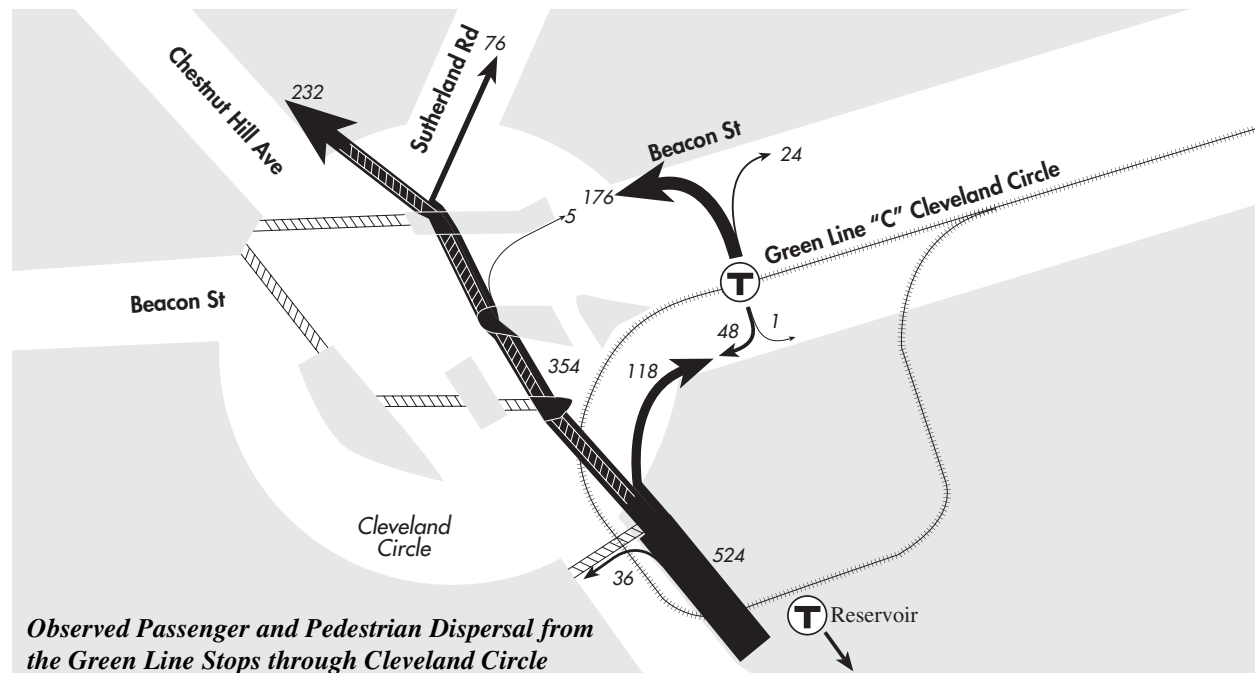
Cleveland Circle—the signalized intersection of Beacon Street and Chestnut Hill Avenue—is a challenging area to negotiate for both pedestrians and bicyclists. The intersection’s design and operation are more complex than usual for a four-leg intersection, which Cleveland Circle is essentially. Its expansive footprint handles busy, two-lane traffic approaches in each direction, in addition to the turning movements of the Green Line light-rail trains. Medians and traffic islands help break up the movements and offer refuge for crossing pedestrians.

Nevertheless, pedestrian and bicyclist circulation through Cleveland Circle is challenging,² as conditions create an intimidating environment: poor crosswalk and pavement condition; misalignment of crosswalks, curb cuts, and traffic/pedestrian islands;

² Even motorists were seemingly confused at navigating the intersection, as we observed a couple of vehicles making illegal turns or heading in the wrong traffic direction!

and the placement of signal and utility poles. Current signal phases create unnecessary wait time for pedestrians crossing Beacon Street.

The signal phasing and timing at Cleveland Circle allow pedestrians to only cross Beacon Street part of the way, forcing pedestrians to wait on traffic islands. The main reason for this is that the right-turn lane from northbound Chestnut Hill Avenue to eastbound Beacon Street has a pedestrian-crossing signal that operates separately from the Beacon Street pedestrian signals. The traffic signal for the intersection of Beacon Street at Chestnut Hill Avenue has an all-red, all-pedestrian-walk phase; vehicles have a “No Turn on Red” restriction.



On the afternoon of September 10, 2003—a sunny and warm Wednesday—CTPS observed the pattern of dispersal of passengers discharging from Reservoir Station. Over 520 pedestrians walked north to Cleveland Circle from the direction of Reservoir Station and Chestnut Hill Avenue, both to the south of the intersection. Nearly 70 percent of these pedestrians headed north along Chestnut Hill Avenue, whereas approximately 25 percent turned right onto Beacon Street. Most of those who chose to cross Chestnut Hill Avenue did so at the crosswalk located just south of Cleveland Circle or proceeded farther north of the intersection. A quarter of those pedestrians who crossed Cleveland Circle heading northbound headed toward Sutherland Road, whereas the majority continued to head north along Chestnut Hill Avenue.

Midblock crossings (those pedestrian crossings not at marked crosswalks) are a common occurrence at Cleveland Circle, despite the high traffic volume.

Recommendations:

- At a minimum, perform the following general maintenance:
 - Restripe pedestrian crosswalks
 - Paint the curbs of the traffic islands yellow
 - Restripe stop lines for vehicular traffic, particularly on Chestnut Hill Avenue
- Since the intersection handles many vehicle turning movements that create conflicts with pedestrians, improvements could be made to the physical design and layout of the intersection even without modification to the traffic circulation—in order to improve the safety of crossings. Suggested design elements to implement consist of the following:
 - Stripe, using yellow paint, narrow shoulders around the traffic islands and medians; this would make these intersection features more visible and help maintain a buffer between vehicles and pedestrians
 - Enlarge particular traffic islands and medians in order to provide pedestrians with more refuge area, as well as to channel traffic better (especially if the above recommendation is implemented)
 - Add a “No Right Turn” from northbound Chestnut Hill Avenue to eastbound Beacon Street at the middle of the intersection on the median between the opposing Beacon Street lanes, since a right-turn bay is already present
 - Consider a bulb-out at the corner of northbound Chestnut Hill Avenue to eastbound Beacon Street, in order to sharpen the turn for vehicles, shorten the crosswalk for pedestrians, and provide additional refuge for crossing pedestrians
 - Realign curb cuts with crosswalks, including correcting for sight and travel interference of signal posts and lampposts
- Adjust pedestrian crossing signals and signal timings to reduce the amount of midintersection wait time. For example, the pedestrian signal for the crossing of westbound Beacon Street lanes did not indicate “walk” at a time when that traffic clearly had a red light phase.
- Install crossing-time-countdown pedestrian signals.

Cleveland Circle Streetscape Plan Recommendations

In 2002, a study team led by The Cecil Group, Inc., studied Cleveland Circle for the Aberdeen and Reservoir Civic Association in an effort to promote and advocate improvements to this intersection. Their report, entitled *Cleveland Circle Streetscape Plan*,³ details long-term recommendations and preliminary designs. The preferred design alternative includes the following notable recommendations:

- Adding textured unit pavers to the midblock crosswalks at the Cleveland Circle stop on Beacon Street
- Enlarging existing traffic islands at Cleveland Circle

³ *Cleveland Circle Streetscape Plan: Final Report*, submitted by The Cecil Group, Inc., and Howard/Stein-Hudson Associates to the Aberdeen & Reservoir Civic Association, October 2002.

- Adding a new traffic island at the northwest corner of Cleveland Circle, channeling right-turning southbound Chestnut Hill Avenue traffic, while providing extra refuge for pedestrians
- Adjusting the curblines at the southeast corner of the intersection, reducing the unnecessary road width for the right-turning northbound Chestnut Hill Avenue traffic
- Straightening the MBTA B Line track on Chestnut Hill Avenue to remove the need for northbound trains to pass through stacked lanes of vehicles on westbound Beacon Street

Chestnut Hill Avenue North



Chestnut Hill Avenue (and Sutherland Road) is the main access road from the north to the Cleveland Circle area. The stretch of Chestnut Hill Avenue to Commonwealth Avenue is a busy, particularly wide four-lane, undivided road with on-street parking and sidewalks on both sides. Chestnut Hill Avenue leads to the B Line stop at Commonwealth Avenue.

The pavement condition on Chestnut Hill Avenue at and north of Cleveland Circle is rough. Rail tracks are also present, adding to the uneven surface. Sidewalks either lack wheelchair ramp/curb cuts at the street corners or have inadequate ones.

Recommendations:

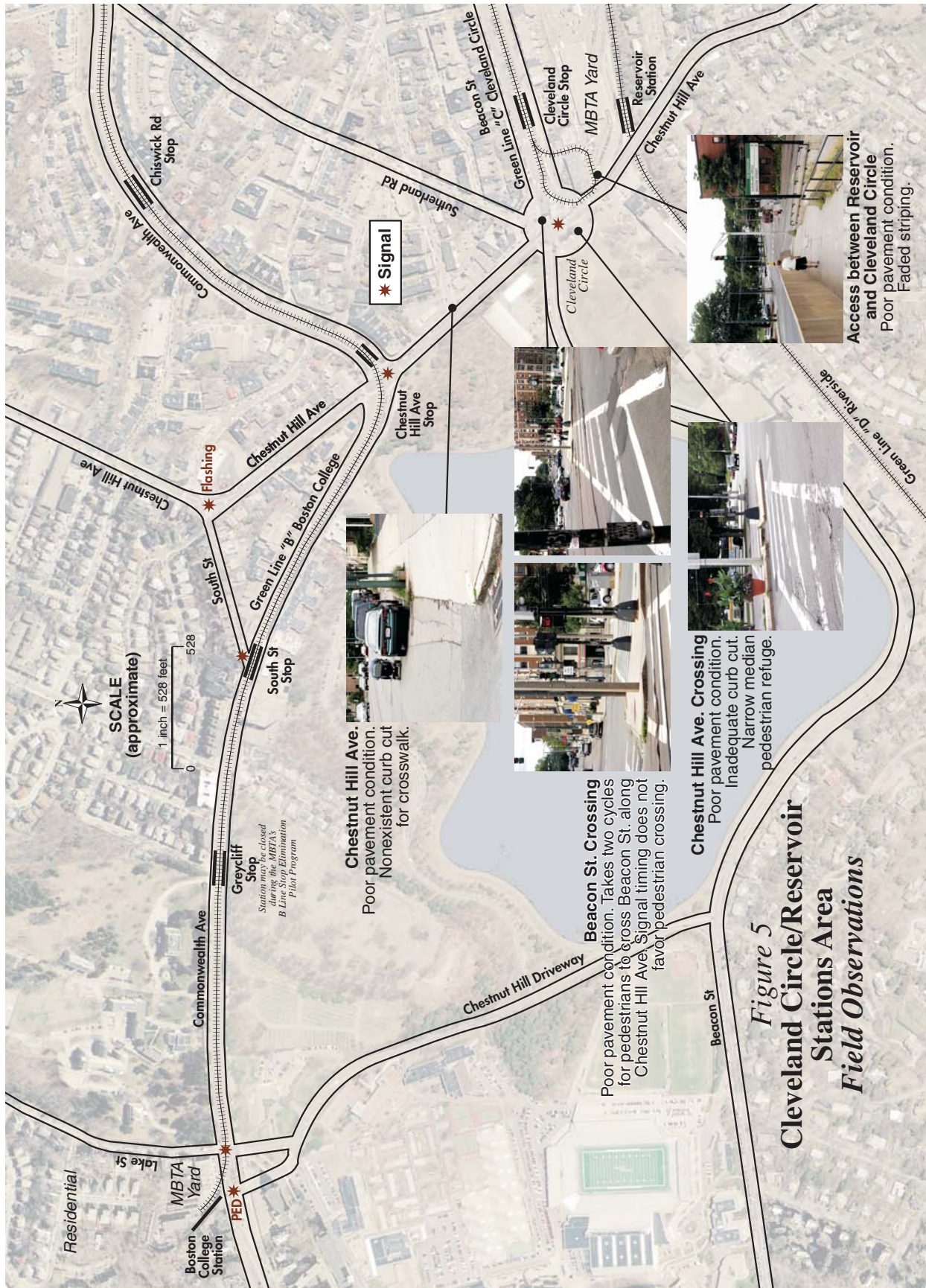
- Repair sidewalks, install curb cuts (particularly in the north-south direction), and repair the road surface pavement, especially at crossings
- Eliminate overgrown weeds and foliage along the sidewalk on the west side of Chestnut Hill Avenue
- Install trailblazing signs along Chestnut Hill Avenue (and at the B, C, D branch station/stops) that inform riders of the connection between the different Green Line branches

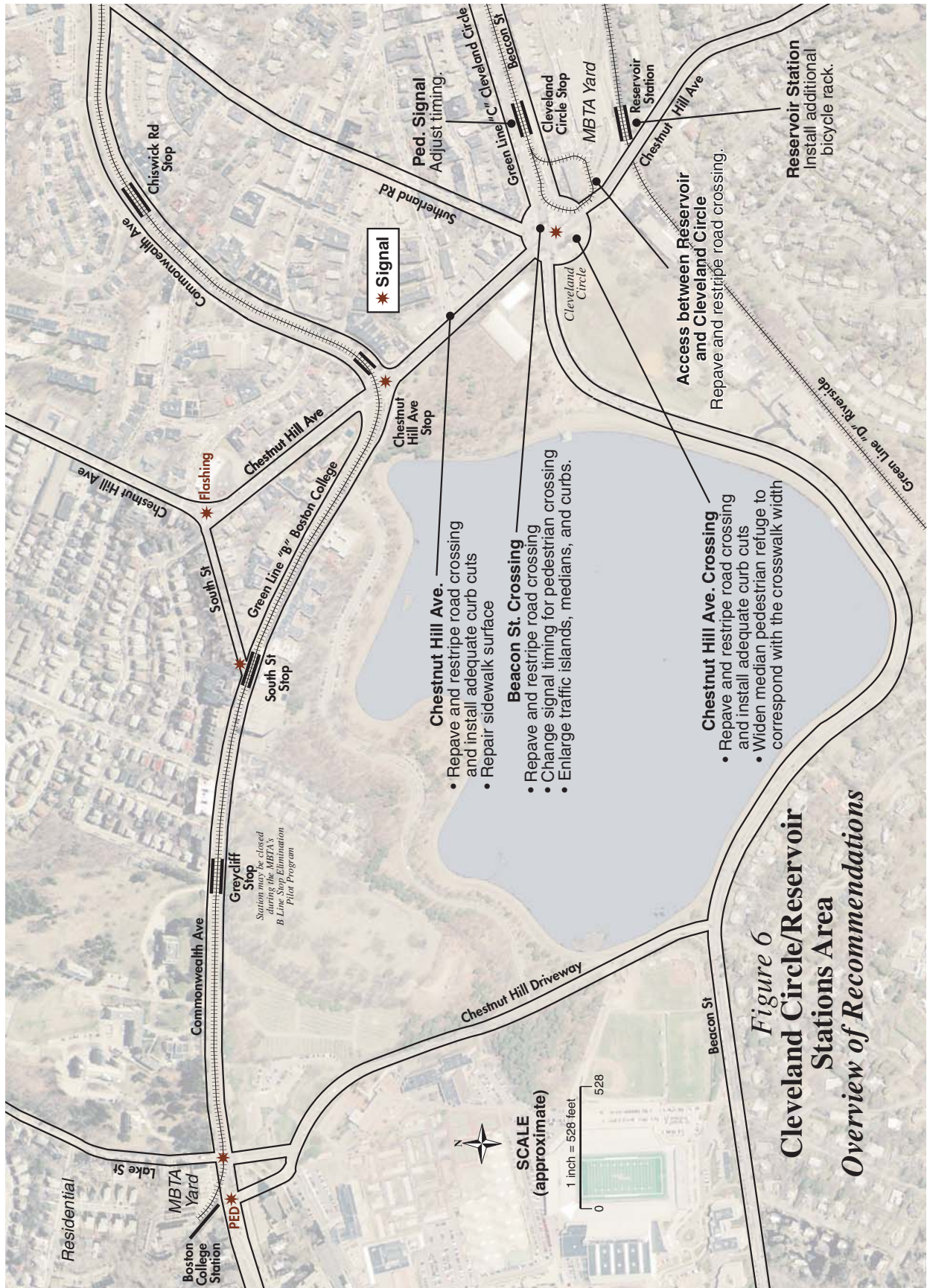
Beacon Street East



Beacon Street is a major access route eastward. The C Line travels along the median of Beacon Street, separating the eastbound and westbound traffic. Sidewalks are provided on the outside of the roadway. East of Ayr Road and the Green Line stop, westbound Beacon Street has three lanes, with on-street parking on both sides (parallel parking on the outside and angled parking along the median). Eastbound Beacon Street has two lanes for traffic, with on-street parking on the outside. West of Ayr Road, along the Cleveland Circle Green Line stop, Beacon Street is only two lanes wide in each direction, with on-street parking. At Cleveland

Circle, though, Beacon Street is four lanes wide at its westbound approach (including turning lanes) and three lanes wide heading east from the intersection.





Sutherland Road

Sutherland Road connects a dense residential neighborhood to the commercial area of Cleveland Circle. Parking is permitted on both sides of the narrow street. Sidewalks are provided on both sides; some repair is needed on the sidewalk on the east side, near Cleveland Circle.

Chestnut Hill Avenue South



Chestnut Hill Avenue south of Reservoir Station is a two-lane roadway. Concrete sidewalks are found along both sides, and they have a grass-and-tree buffer separating them from the roadway lanes.

Along Chestnut Hill Avenue at the Reservoir Station bus turnaround, most of the observed pedestrian activity (about 72 percent, close to 400 pedestrians) took place north of the station (Cleveland Circle direction). Only 11 percent of pedestrians (for a total of about 44 in a two-hour afternoon period) were observed heading to or from Chestnut Hill Avenue south of Reservoir. The remaining pedestrian activity in the area was related to bus passengers, who waited at the stop on Chestnut Hill Avenue. Activity was intermittent, picking up when the Green Line dropped off passengers.



Passengers walking from Reservoir Station to Cleveland Circle must cross the entrance to the MBTA service facility, used by authorized vehicles and trains. The pavement at the MBTA driveway, between the Reservoir walkways and the sidewalk to the north at Cleveland Circle, is in poor condition, and a crosswalk is not provided. The pavement condition of the sidewalk leading to the top of Reservoir on the east side of Chestnut Hill Avenue shows signs of deterioration.

Recommendations:

- Repave and stripe the crossing of the MBTA service facility entrance between the Reservoir walkways and the sidewalk to the north at Cleveland Circle
- Repave the eastside concrete sidewalk/ramp along Chestnut Hill Avenue at Reservoir Station



This chapter presents the conditions on the stretch of the Green Line B Branch along Commonwealth Avenue between the terminal stop at Boston College and the Chestnut Hill Avenue stop to the east. Between these two stops, the Green Line makes stops at South Street and Greycliff Road, which are both located in the median of Commonwealth Avenue.¹

Boston College Station is the terminus for the B Branch of the Green Line light rail transit service. No park-and-ride facilities are available, and the station is not an MBTA bus destination. Consequently, most passengers boarding at these stops arrive by walking.

Private residences and a major college campus characterize the area around the station. The study area is likely to retain its present character and scale of development in the near term. However, Boston College, according to newspaper reports, is exploring opportunities to expand its campus to an area north of Commonwealth Avenue, just east of Lake Street. This may add activity (vehicle, pedestrian, and bicycle) to the study area once new developments are constructed.

The rest of the corridor studied is primarily residential and is densely developed. A high percentage of households do not own a vehicle. The percentage of the population categorized as minority is slightly greater here than the region's average.

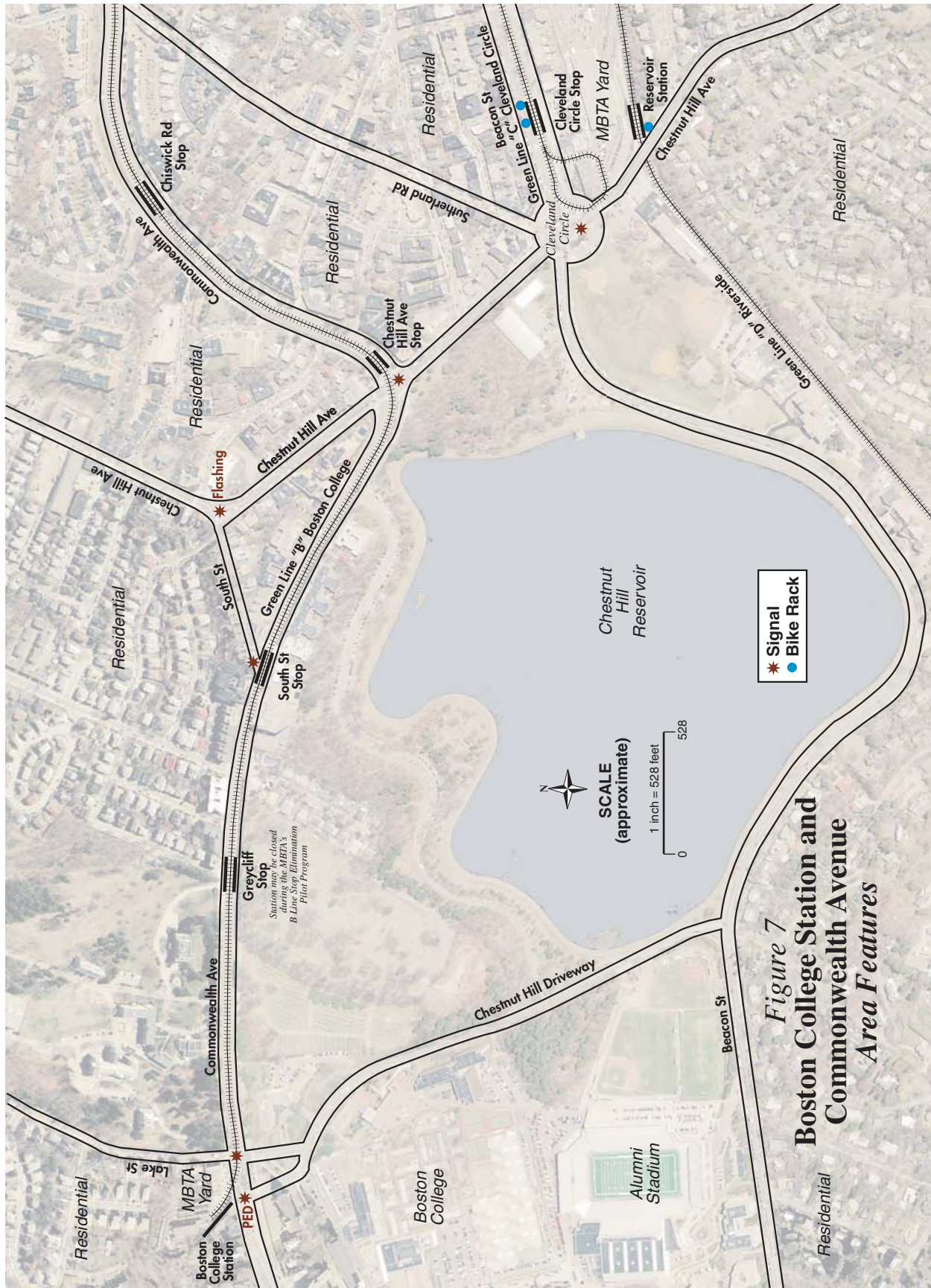
The dense, urban character of the neighborhood, the presence of a major academic institution, and the high walk-access rate, were reasons this Green Line segment along Commonwealth Avenue was selected for this study.

Station Area Characteristics

In the area within a quarter mile of the Boston College stop reside approximately 1,400 people in just over 570 households, according to the 2000 census. (This figure may vary from actual conditions, because of the high number of college students in this area and the Census's classification and geocoding practices.) Just over 10 percent of the households do not have a private vehicle. Three-quarters of the developed land around the station area is residential (multifamily housing and less than quarter-acre lots), with very little commercial and no industrial; other significant land uses include urban open space, as the immediate area includes a university campus and a cemetery.

A bit farther inbound along the B Line, the area characteristics change to a more urban residential character. Within a quarter mile of the Chestnut Hill Avenue stop reside over 5,400 people in just over 3,200 households, according to the 2000 census. Approximately 38 percent of the households do not have a private vehicle. Two-thirds of the developed land around the station area is residential (exclusively multifamily housing), with some commercial and no industrial.

¹ The stop at Greycliff Road is under consideration to be eliminated by the MBTA; it is one of the locations in the MBTA's Stop Elimination Pilot Program, which began in April 2004. Also, the Boston College Station operations are being relocated to the median of Commonwealth Avenue just east of Lake Street: recommendations are made accordingly.



A 1994 Green Line passenger survey² counted 375 boardings on the B Line at the Commonwealth Avenue stops from Boston College through Chestnut Hill Avenue during the morning peak period (6:00 A.M. to 9:00 A.M.); during the longer period of 6:00 A.M. to 3:30 P.M., the survey counted over 1,200 boardings. By far the dominant mode of access for these Green Line stops is walking: 92 percent of passengers surveyed accessed the station by walking. None of the surveyed passengers rode a bicycle to the Green Line. Seventy-one percent of those passengers who walked to the station had a walk of five minutes or less, and over 99 percent of passengers had a walk of fifteen minutes or less.

Station Amenities

In terms of station amenities for pedestrians and bicyclists at these Green Line stops, the following two issues are discussed in this section:

- Bicycle Parking at Boston College Station
- Passenger Wait Area at Chestnut Hill Avenue Stop

Bicycle Parking at Boston College Station



No bicycle parking is provided at Boston College Station. A demand for bicycle parking exists, as demonstrated by the locked bicycle observed along a chain-link fence at the station.

Recommendation: Install a bicycle rack at Boston College Station. A rack with four inverted-U racks elements should be added. An appropriate location for the rack is just to the right of the MBTA information panel. The proposed bicycle rack location is visible to station patrons and personnel, provides shelter, and the platform width can accommodate bicycles while not interfering with the circulation of passengers. (However, a bench is presently located here; the bench can be relocated to the empty space to the right of its current location, where the platform is too narrow for a bicycle rack.)

² *MBTA Systemwide Passenger Survey: Rapid Transit/Light Rail 1994*, a report produced by the Central Transportation Planning Staff for the Massachusetts Bay Transportation Authority, May 1996.

Passenger Waiting Area at Chestnut Hill Avenue Stop



At the Chestnut Hill Avenue stop, the passenger waiting area consists of a narrow (four-foot wide), blacktop median between the inbound tracks and the curving eastbound lanes of Commonwealth Avenue. No crosswalk is provided across Commonwealth Avenue at the head-of-the-train area. The wide inside traffic lane on Commonwealth Avenue does not have a striped shoulder separating traffic from the curb along the median.

Recommendation: Consider measures to increase passenger safety for Green Line riders on the median platform on Commonwealth Avenue. The MBTA's Design and Construction Department should identify appropriate improvements, which may include:

- Restriping the Commonwealth Avenue lanes, particularly in the stretch adjacent to the transit stop, with the intent of narrowing the lanes by one foot each and adding a shoulder to the inside lane. This should slow down traffic and would provide an extra buffer between vehicular traffic and passengers. The inside shoulder solid line should visibly stand out—it could be yellow and light-reflective.
- Installing a fence along the road-side perimeter of the passenger wait area.
- Extending the platform width, in conjunction with the recommendations above.

Station Access by Pedestrians and Bicyclists

This section discusses the station-area accessibility issues at the following locations:

- Boston College Station
- Commonwealth Avenue at Lake Street/St. Thomas More Road (Boston College)
- Green Line Stops at South Street and Greycliff Road
- Commonwealth Avenue between Lake Street and Chestnut Hill Avenue
- Commonwealth Avenue at Chestnut Hill Avenue
- Chestnut Hill Avenue between Commonwealth Avenue and Cleveland Circle

CTPS conducted a sample of midafternoon observations of pedestrian activity at Boston College Station on September 18, 2003, a sunny, warm day. In an hour, approximately 450 pedestrians crossed Commonwealth Avenue to and from the Boston College campus. Pedestrians crossed Commonwealth Avenue at one of two locations, Lake Street or Boston College Station. Approximately the same number of pedestrians crossed Commonwealth Avenue to the Boston College campus side of the street as those who crossed to the north side. (Due to the midafternoon peak-period changes in Green Line operations here, a full peak-period pedestrian observation was not performed.)

For the other stops on this stretch of the Green Line, a walking inspection of the accessibility conditions were made. Some pedestrian observations were made, but no systematic counts.

Boston College Station



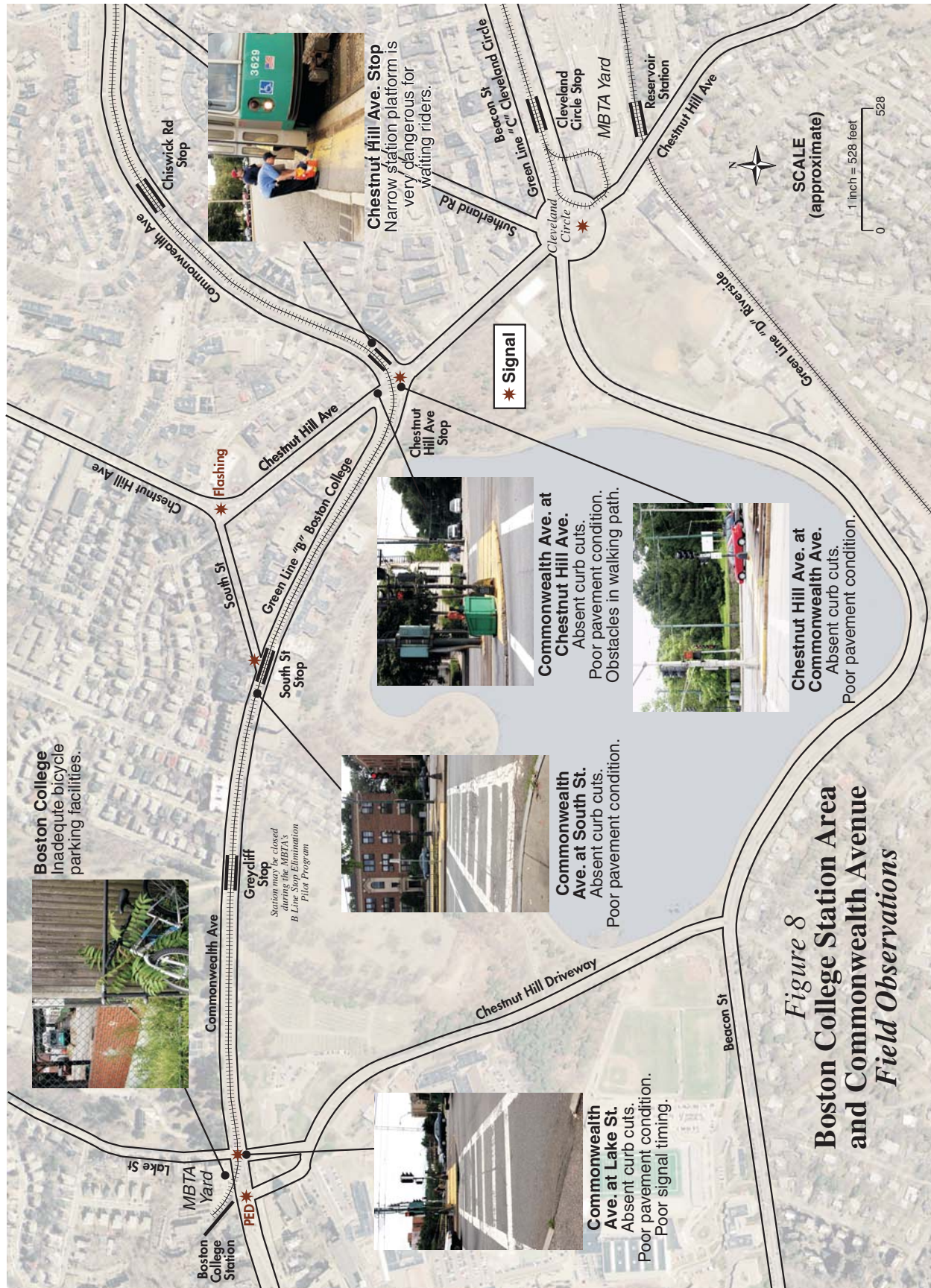
A pedestrian-crossing signal is located at the striped crosswalk at Boston College Station across Commonwealth Avenue from the Boston College campus (and the campus entrance at Fr. Herlihy Drive). Four signal posts, each with a pedestrian-crossing button and signals, make up the signalized portion of this crosswalk; two are located in the median of Commonwealth Avenue and the other two at the north and southbound sides of the crosswalk. The pedestrian-crossing button on the north side of the crosswalk, at Boston College Station, did not trigger the pedestrian crossing signal on the day of the field observation. Also noted was that the “Walk” light displayed properly at all four signals, but the “Don’t Walk” lights only worked on the median post that faces the station. The pedestrian-crossing signal is coordinated with the nearby traffic signal at Lake Street/St. Thomas More Road (Boston College campus). The field observation noted two vehicles ignoring the red signal and making a right turn from Commonwealth Avenue to Boston College without stopping.

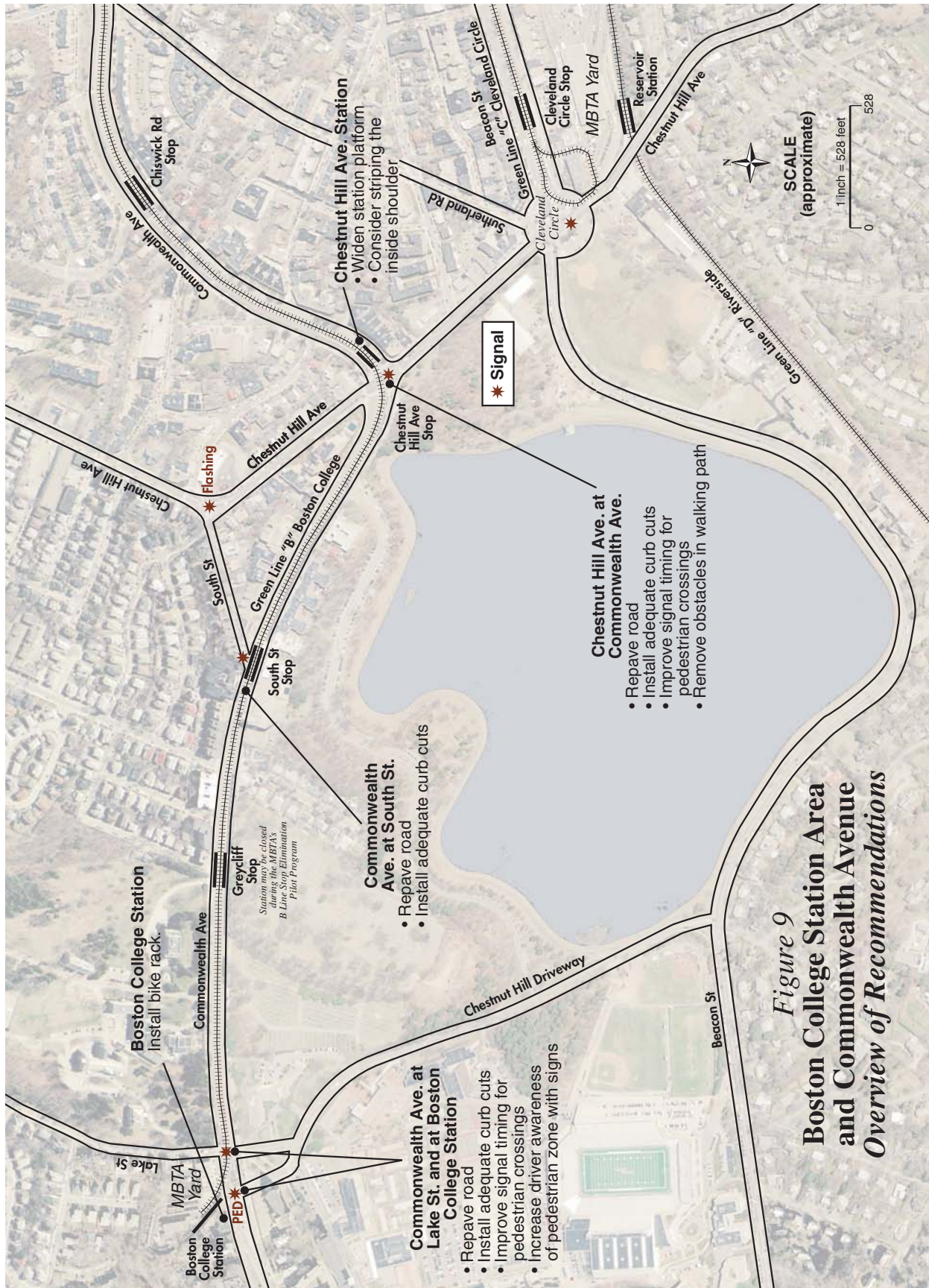
Many pedestrians were observed using the crosswalk at the station, just west of Lake Street and the Boston College campus entrance at Fr. Herlihy Drive.³ From 4:00 to 4:30 P.M., 79 pedestrians crossed from the Boston College Station side to the Boston College campus side (most were riders who got off the B Line train); 57 pedestrians crossed from the campus side to the station side.

Recommendation: General maintenance of the crosswalk and pedestrian-crossing signal is needed, consisting of the following improvements:

- Restripe the pedestrian crosswalk. Consider adding ladder-style stripes for greater visibility.
- Fix the pedestrian-crossing signals and the activation buttons.
- Consider adding “pedestrian crossing” signs to alert motorists.
- Extend the median of Commonwealth Avenue west of Fr. Herlihy Drive approximately 50 feet farther east, in order to limit vehicle and pedestrian conflicts.

³ At the time of the observations, late-afternoon Green Line operations switched from using Boston College Station to pick up/drop off passengers to using the platform on the median of Commonwealth Avenue to the east of Lake Street. Therefore, a full afternoon of counts could not be obtained.





Commonwealth Avenue at Lake Street/St. Thomas More Road (Boston College)



A traffic signal with pedestrian-crossing signals is located on Commonwealth Avenue at Lake Street (to the north) and St. Thomas More Road (to the south, at the Boston College campus). The intersection features many movements, requiring close attention by those traversing this location: westbound and eastbound Commonwealth Avenue traffic is split with a median on which the Green Line trains operate; Lake Street handles one-way traffic heading north from the intersection; St. Thomas More Road is two-way, two-lane street. Right turns are permitted on red at all

approaches. Vehicle loop detectors on Commonwealth Avenue are located in the pavement on which the pedestrian crosswalk is located; not only does this placement of loop detectors create cracks in the crosswalk's pavement, but reduces the efficiency of traffic signal operation as well.

The intersection has two characteristics that may potentially be confusing to motorists. One is the lack of indication that Lake Street is one way heading north of the intersection. The second characteristic is the two westbound Commonwealth Avenue signals located in the median of the roadway: one signal is for the Green Line trains and one is for the Commonwealth Avenue traffic. Although each signal is angled toward the traffic it is supposed to serve, neither one has a sign indicating its purpose. Either of these two characteristics of the intersection can lead to a potentially hazardous situation for pedestrians, as motorists may not be clear on the intersection operation.



A ladder-striped crosswalk is painted across Commonwealth Avenue on the east side only, and both Lake Street and St. Thomas More Road also have crosswalks. The crosswalk paint is visible; across the median, the crosswalk is painted solid yellow. The median, however, does not have curb cuts for the pedestrian crossing. Pedestrians crossed Commonwealth Avenue at a rate corresponding to 180 pedestrian crossings per hour during the afternoon peak period.⁴

Pedestrian-crossing signal phasing and activation at this intersection is not at its most efficient. The pedestrian signals are activated by buttons, and different pedestrian-crossing movements are allowed concurrently with vehicular movements. Two signal light inefficiencies were noticed. First, east-west pedestrian crossing of St. Thomas More Road is not permitted when the eastbound-only Commonwealth Avenue traffic movement phase is active; pedestrians should be allowed to cross at the same time. Second, the north-south Commonwealth Avenue pedestrian crossing requires activation both at the beginning of the crosswalk and at the median signal; this assumes that pedestrians are only proceeding halfway across Commonwealth Avenue.

⁴ From 4:00 to 4:30 P.M., 64 pedestrians crossed from the Boston College campus side to the Lake Street side (although 25 of them did not use the crosswalk); 27 pedestrians crossed from the Lake Street side to the campus side. This rate corresponds to 180 pedestrian crossings per hour during the afternoon peak period. At the time of the field observations, Green Line operations at this end of the B Green Line branch were alternating between use of the station and the Commonwealth Avenue median for passenger boardings and alightings. Therefore, a full afternoon of counts could not be obtained.

Recommendation: In addition to restriping the crosswalks, the signalized intersection should receive an upgrade of the signals and design, consisting of the following improvements:

- Adjusting the pedestrian-crossing signals and the activation buttons in order to allow more opportunities for pedestrian crossing.
- Creating ramps/curb cuts for the pedestrian crossing at the median on Commonwealth Avenue. This may require relocating a storm drain and/or signal posts. If the intersection is redesigned, the vehicle loop detectors should not be at the pedestrian crosswalk.
- Adding signs to the two westbound Commonwealth Avenue signals located in the median of the roadway indicating which traffic is intended for its respective control.
- Adding a bulb-out at the northeast corner of Commonwealth Avenue at Lake Street in order to slow down the right-turning vehicles (which must yield to pedestrians in the crosswalk).
- Adding pedestrian crossing signs to alert motorists.

Greycliff Road and South Street Stops



The Greycliff Road and South Street stops are in the median of Commonwealth Avenue—a typical characteristic of this light-rail branch. Pedestrian crosswalks between the Commonwealth Avenue sidewalks and the median station platforms at the South Street and at the Greycliff Road stops are in poor condition. Although these crosswalks have white, ladder-striped pavement markings, the pavement condition is cracked and ramps/curb cuts are nonexistent. Plus, on the north sidewalk along Commonwealth Avenue, the grass buffer that separates the paved sidewalk and the curb—a recommended design feature of sidewalks—does not contain paved breaks/cuts at the crosswalks.

Recommendation: Add ramps/curb cuts to the pedestrian crossings and perform general rehabilitation of the crosswalk, including restriping and improving pavement condition.

Commonwealth Avenue between Lake Street and Chestnut Hill Avenue

Sidewalks are present on both sides of the road. The northside sidewalk is separated from the road by a three-to-four-foot planted (grass and tree) buffer, and on-street parked vehicles are found on most of the roadway (particularly in the denser residential area between South Street and Chestnut Hill Avenue). The sidewalk on the south side does not feature a similar buffer from the road, except for the on-street parked vehicles. Both sidewalks are approximately six-feet wide and in good condition, although the landscaping care is noticeably better east of South Street than on the rest of the stretch of Commonwealth Avenue to the west.

Commonwealth Avenue at Chestnut Hill Avenue



The four-approach, signalized intersection of Chestnut Hill Avenue at Commonwealth Avenue features two lanes in each direction of east-west through traffic, two railroad tracks for the Green Line light-rail trains, and the north-south lanes of vehicle traffic (two to the north, four to the south). Pedestrian walk signals are present at all four corners of the intersection and at the median on Commonwealth Avenue.

The pedestrian signals seem to function in an appropriate manner. A brief all-red traffic signal (all-walk for pedestrians) coupled with a “No Turn on Red” restriction for vehicular traffic gives pedestrians a chance to cross these streets without turning-vehicle conflicts. Furthermore, partial pedestrian crossing (to the median) of Commonwealth Avenue is permitted depending on the vehicular movement.



The condition of the pedestrian crosswalks is marginal, particularly across Commonwealth Avenue. The pavement has visible signs of pothole patchwork, and railroad tracks cut across the pedestrian crosswalks. The street corners and the medians lack curb cuts for wheelchair access. The median crosswalks on Commonwealth Avenue have obstructions (signal posts) in the pathway of pedestrians. The painted crosswalks have fading paint.

Recommendations: Add ramps/curb cuts to the pedestrian crossings and perform general maintenance of the crosswalks, including restriping and improving pavement condition. Consider adding curb extensions or bulb-outs to protect pedestrians and enhance their use of the intersection.

Chestnut Hill Avenue between Commonwealth Avenue and Cleveland Circle



Chestnut Hill Avenue connects three Green Line branches: B at Commonwealth Avenue, C at Cleveland Circle, and D at Reservoir to the south—all in close proximity to each other. Chestnut Hill Avenue also serves as the main access from the north and south for pedestrians and bicyclists to the Commonwealth Avenue stop.

To the south of Commonwealth Avenue, Chestnut Hill Avenue is a busy, wide, four-lane, undivided road with on-street parking and sidewalks on both sides. The pavement condition on this stretch is rough. Rail tracks are also present, adding to the unevenness of the surface. Sidewalks either lack curb cuts at the street corners or have inadequate ones.

To the north of Commonwealth Avenue, the conditions on Chestnut Hill Avenue seem more pleasant for pedestrians. Traffic is limited to one lane in each direction, and the sidewalks are buffered by parking lanes on both sides of the street. The sidewalk conditions are adequate, and trees line the street.

Recommendations:

- Repair sidewalks, install curb cuts at street corners (particularly in the north-south direction), and repair the roadway surface, especially at crossings.
- Eliminate overgrown weeds and foliage along the sidewalk on the west side of Chestnut Hill Avenue.
- Install trailblazing signs along Chestnut Hill Avenue, particularly at Commonwealth Avenue, that direct Green Line riders to the stations at Cleveland Circle and Reservoir, just two blocks to the south. Some passengers may find different transfer and travel opportunities if they are aware of the ease of accessing one of the neighboring stations.



Situated on the boundary of the Jamaica Plain and Roslindale neighborhoods of Boston, Forest Hills Station serves commuters using MBTA buses, rapid transit, and commuter rail. With multiple transit services offered, this station in an urban area southwest of downtown Boston is a busy destination and transfer point.

Park-and-ride lots, one of which was recently expanded in 1997, accommodates one type of passenger access to the station. However, buses are the most common means of access to the station: over half of passengers here arrive by bus. Still, pedestrians comprise nearly a fifth of all passengers accessing Forest Hills Station. Also, an off-road, shared-use path along the Southwest Corridor Park serves the station.

The station is surrounded by busy, multilane arterial roadways. Thus, pedestrians and bicyclists must face appreciable vehicular traffic as a final obstacle in reaching the station.

The neighborhoods in the vicinity of the station can be classified as a target community for environmental justice. Nearly 50 percent of residents are characterized as minority. And the median household income is just above 75 percent of the metropolitan region's. Furthermore, approximately 25 percent of the households do not have a private vehicle. (All these figures are for the population in the area within a half-mile radius of this station.)

Forest Hills Station was selected as one of the sites for this study because of the makeup of the neighborhood's population, the importance of the station as a destination, and the challenges that await pedestrians and bicyclists accessing the station.

Station Area Characteristics

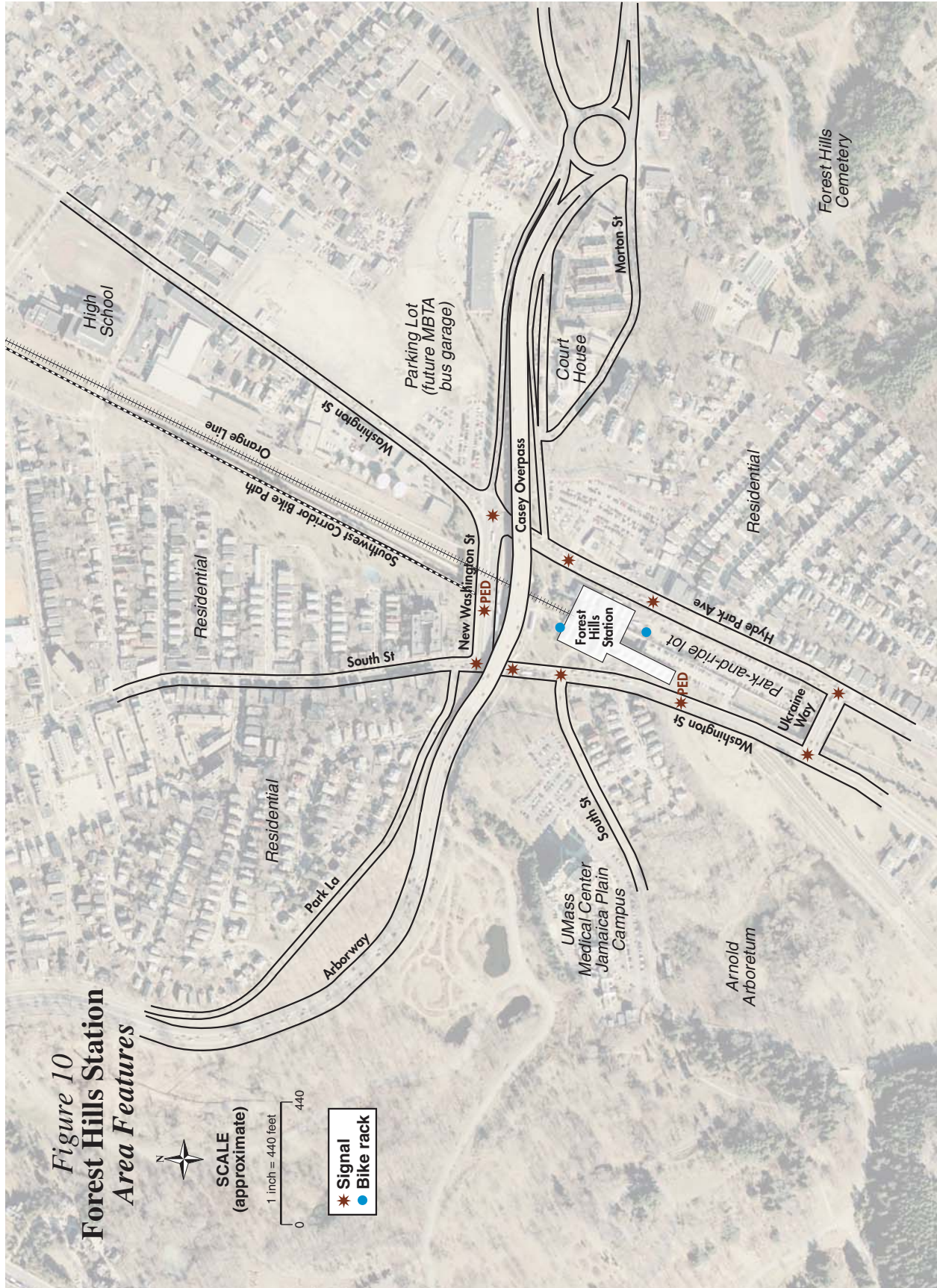
In the area within a half-mile radius of this station reside nearly 7,000 people in just over 2,600 households, according to the 2000 Census. (About 13,500 people reside within a three-quarter-mile radius of this station, in over 5,400 households.) Half of the developed land around the station area is residential (primarily multifamily housing), along with commercial (15 percent) and light industrial (11 percent); other significant land uses include open areas and transportation infrastructure.

A 1994 survey of Orange Line passengers counted over 5,000 boardings on that line at Forest Hills during the morning peak period, between 6:00 and 9:00 A.M., the highest number of boardings on the Orange Line.¹ Although the dominant mode of access to Forest Hills is by bus (over half the passengers at this station), about 20 percent of the passengers surveyed accessed the station by walking. One half of those passengers who walked to the station had a walk of five minutes or less, and over 92 percent of them had a walk of fifteen minutes or less.

Adjacent commuter park-and-ride lots fill to a combined 89 percent of capacity according to both the 2000 and 2002 surveys.²

¹ *MBTA Systemwide Passenger Survey: Rapid Transit/Light Rail 1994*, a report produced by the Central Transportation Planning Staff for the Massachusetts Bay Transportation Authority, May 1996.

² The year 2000 survey was conducted by CTPS; results are documented a report entitled *Commuter Rail and Rapid Transit Parking and Ridership Demand Forecasts (January 2002)*. The year 2002 survey was conducted by CTPS for the Congestion Management System. In early 2003, the parking fees were raised to \$3.50 per vehicle per day.



Station Amenities

Bicycle Parking



Bicycle rack, southeast



Bicycle rack, north

Bicycle racks are located on the north side and southeast side of the station. At the north entrance, toward the South Street side, two ribbon racks (8 spaces each) are situated just under the station roof overhang. On the southeast side of the station platform (Hyde Park Avenue entrance), two ribbon bicycle racks are located in an open area (unsheltered) just north of the parking lot. The spaces at the north entrance's bicycle racks were nearly all occupied, while most spaces were available at the bicycle racks on the southeast side.

Recommendations:

- Install a bicycle rack with 18 inverted-U rack elements at the north entrance in the same area as the ribbon racks. This location provides shelter from precipitation and is visible to users of the north station entrance. The rack should be placed 30 inches from the building's outside wall, and the rack elements should be spaced at 36-inch centers.
- Install a bicycle rack with 6 inverted-U rack elements at the southeast entrance under the station's roof. The placement could be near the base of the escalator/staircase or at the end of bus berth #1. The location near the stairs is visible to station users and personnel, and it provides desirable shelter. A rack here would not interfere with the circulation of station users. (One of the benches that is currently near the stairs could be relocated closer to the bus waiting area, in order to provide even more room at this location for bicycle parking.) The location at the bus berth platform is also visible to station patrons and would not interfere with the circulation of station users. The station roof could be extended to provide complete shelter. The rack should be placed 24 to 30 inches from the building's outside wall, and the rack elements should be spaced at 30-inch centers.
- Install a bicycle rack with 8 inverted-U rack elements at the southwest (Washington Street) side of the station, near the T operator house. This location provides bicycles with protection from the weather, and it is very visible—MBTA employees and patrons are present in this area. Bicycle parking here would not adversely affect the circulation of station users in this area. The rack should be placed 30 inches from the building's outside wall, and the rack elements should be spaced at 36-inch centers.

Station Access by Pedestrians and Bicyclists

This section discusses the station-area accessibility issues at the following locations:

- South Street West
- Washington Street at South Street West
- Washington Street South
- South Street
- South Street at New Washington Street
- Southwest Corridor Park at New Washington Street
- Washington Street at New Washington Street and Hyde Park Avenue
- Washington Street North
- Hyde Park Avenue between New Washington Street and Ukraine Way
- Hyde Park Avenue South

South Street West

South Street, which heads west from Washington Street and Forest Hills Station, serves a small residential area and the University of Massachusetts Medical Center–Jamaica Plain campus. Sidewalks are found on both sides of the street only up to the medical center. The sidewalks are not buffered from the street and were found to be in good condition. The street lighting appears adequate. West of the medical center, the sidewalks are replaced by a soft shoulder as South Street heads into the Arnold Arboretum.

Recommendation: Consider extending the sidewalk on the north side of South Street to where the Arboretum has an entrance at Beech Path Gate. Pathways through the Arboretum connect to Centre Street on the west side.

Washington Street at South Street West



The intersection of South Street at Washington Street at the west side of the station is signalized (cycle length is 80 seconds). Pedestrian walk signals activate when concurrent traffic has a green phase. Pedestrian crosswalks are marked only for the north–south movements (across South Street and across the bus exit) and for the southeast–west movement (across Washington Street). This design discourages pedestrians from crossing Washington Street at the north side of the intersection, which handles most of the turning traffic. South Street traffic onto Washington Street in the



evening has a predominant left-turning movement. Since traffic has a “Yield to Pedestrians on Turns” sign, pedestrians can cross Washington Street to the station (east) side along the south crosswalk while most of South Street traffic has a green phase. Significant southbound traffic from Washington Street turns right onto South Street heading west.

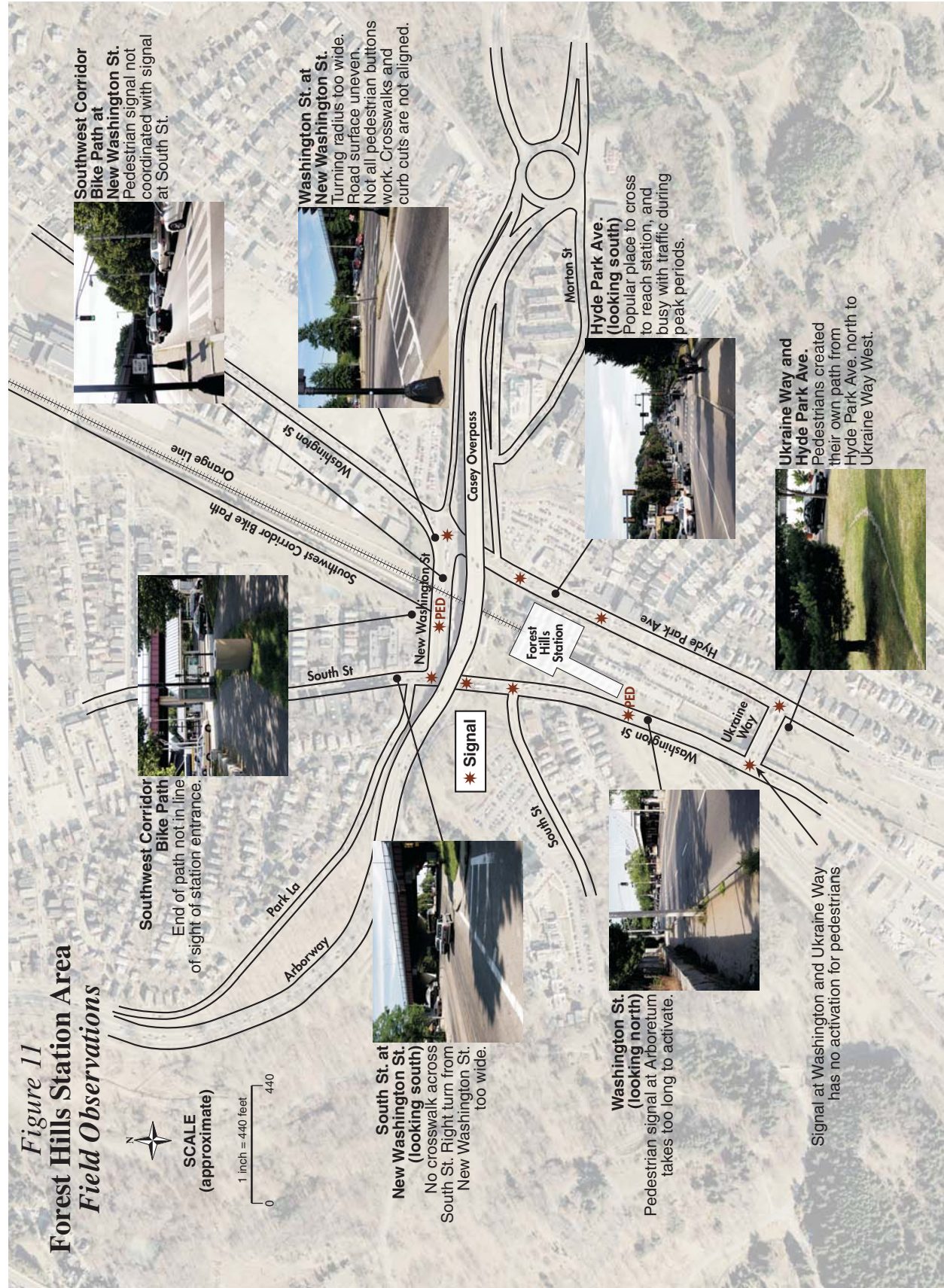
CTPS staff observed over 170 pedestrians and 40 bicyclists traversing this intersection during a two-hour afternoon period.³ Half of the crossing pedestrians observed crossed Washington Street from South Street heading toward the Forest Hills Station side. (Presumably, the generator of this pedestrian traffic is the University of Massachusetts Medical Center–Jamaica Plain campus on South Street.) As noted earlier, the design of the intersection leads pedestrians to cross Washington Street along the south side of the intersection. However, many pedestrians from South Street happen to arrive at the intersection on the north side of the intersection; similarly, from the station side, pedestrians who have walked along the busway’s northside sidewalk (the only one available) also arrive at the intersection on the north side. In both cases, pedestrians who wish to cross Washington Street must first cross the street southbound to reach the Washington Street crosswalk. Pedestrians, however, were observed crossing along the north side of the intersection, despite the lack of a marked crosswalk.

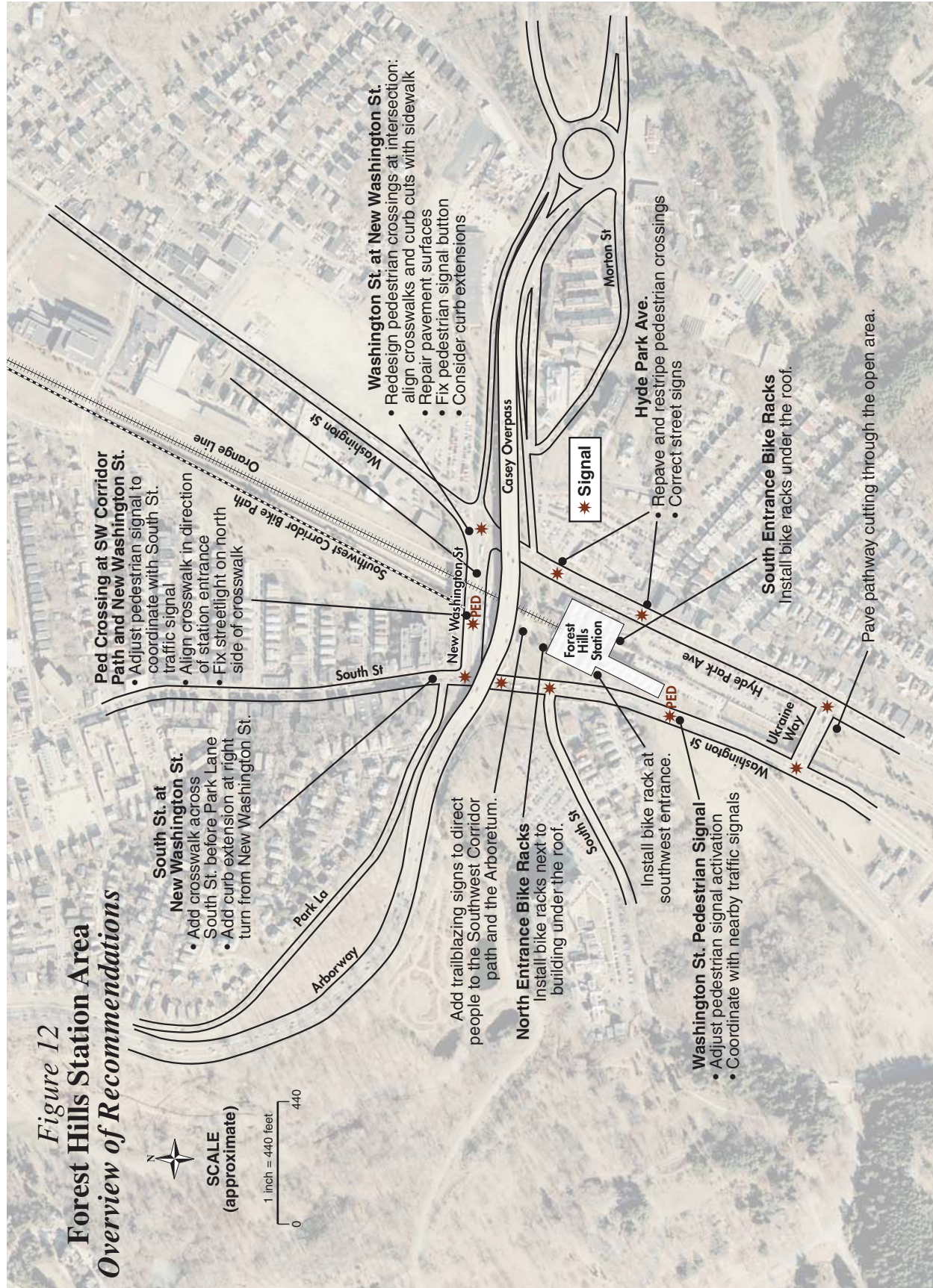
Of the observed bicycle traffic, two-thirds headed south along Washington Street; no bikes were observed traveling along South Street.

Recommendations:

- Improve visibility of the pedestrian crossings by restriping the crosswalks, which are faded
- Install pedestrian-crossing signs, as further warning to vehicles
- Consider installing pedestrian-crossing signals with animated-eyes displays, as a reminder to pedestrians to watch for turning vehicles

³ CTPS staff observed midweek, late-afternoon pedestrian and bicycle activity at several points around Forest Hills Station. The observations took place between 4:00 and 6:00 P.M. on September 11, 2003, a sunny and warm day. (The data collectors took a 15-minute break, so the reported totals are for a period of just under two hours.)





Washington Street South



Washington Street to the south is a four-lane arterial roadway with narrow shoulders and heavy traffic. Bicyclists were observed using this road heading north and south between South Street and points south off of Washington Street; some bicyclists were observed using the sidewalk. Sidewalks are provided on both sides, with no buffer separation between the road and pedestrian traffic. The sidewalk on the west side is of adequate width, but weeds and dirt/debris accumulation are contributing to reducing the practical width. The midblock pedestrian crossing signal at the Arboretum entrance (on the west side, across from the bus bay at the station) does not function well: the signal takes too

long to activate (two minutes); the field audit also noted that the signal is not coordinated with the signal at South Street to the north or Ukraine Way to the south. The traffic signal at Ukraine Way has pedestrian crossing signals; they are not pedestrian activated and turn on at appropriate signal phases.

Recommendations: Improve pedestrian and bicyclist safety and comfort by implementing the following:

- Keep the sidewalk clear of weeds and dirt/debris.
- Adjust the midblock pedestrian-crossing signal between South Street and Ukraine Way to activate more quickly. Consider coordinating the activation with either or both traffic signals to the north and south.
- Consider adding a sign for pedestrians at the Ukraine Way intersection to encourage crossing only when they have the “Walk” signal, since the signal is not pedestrian activated.

South Street



South Street approaching from the north side of the station area is a two-lane road with parked vehicles on both sides of the street. In addition, along the middle of the roadway are two sets of inactive trolley railroad tracks. The condition of the pavement is bumpy and poor. Although this street connects a heavily residential neighborhood to the station area, bicyclists are better off not riding along this street. The Southwest Corridor should be used instead, if possible.

The sidewalk along South Street seems adequate: it is wide and in good condition. However, ramp/curb cuts for wheelchairs are absent on many nearby intersections at side streets. Streetlights are present on both sides of the street.

South Street at New Washington Street



The intersection of South Street at New Washington Street and the Arborway eastbound on-ramp is signalized. South Street at the intersection is wide enough for four lanes of traffic, although no striping is present other than the middle-of-the-road yellow stripe. No pedestrian crossing is marked across South Street north of the intersection with New Washington Street.



Recommendation: Install a crosswalk across South Street, to guide pedestrians from South Street and Park Lane in the direction of the station's north entrance. Since the intersection with New Washington Street is wide, consider the following when installing this crosswalk:

- Place the crosswalk farther north, between St. Marks Street on the east and Park Lane on the west. This would discourage pedestrians from crossing South Street at the intersection, which does not have a pedestrian crossing signal or crosswalk.
- The crosswalk should be striped and have a pedestrian signpost or barrel in the center of the roadway as an added caution to drivers.
- Alternatively, or in addition, South Street could be narrowed at the intersection of New Washington Street to slow down through and turning traffic. A bulb-out at the northeast corner of the intersection, for instance, would slow down the right-turning vehicles from New Washington Street to South Street.

Southwest Corridor Park at New Washington Street



The Southwest Corridor Park (and Bike Path) approaches Forest Hills Station from the north. Leaving it at New Washington Street, across from the station, bicyclists and pedestrians can cross midblock using a signalized (pedestrian actuated) and striped pedestrian crossing.

Over 360 pedestrians and over 40 bicycles crossed here during the afternoon peak period. The majority of pedestrians (over 80 percent) traveled north (away) from the station, while the majority of bicycles (nearly 80 percent) traveled south from the bike path. These southbound bicyclists are likely users of the Southwest Corridor Bike Path headed to neighborhoods south of the transit station.



Vehicle queues can extend back from the New Washington Street intersection at South Street. These queues are far enough to block the crosswalk at the Southwest Corridor Park.

The design of the New Washington Street crossing of the Southwest Corridor and the north entrance of the station fails to make a good connection between these transportation facilities. The crosswalk (and median curb cut) angle away from the station's north entrance; the crosswalk does not follow desire lines of users of the Southwest Corridor Park to the station entrance. Furthermore, no signs are posted directing station users exiting the station to the Southwest Corridor Park and Bike Path; and from the southbound perspective heading toward the station, the north entrance location is not easily visible.

Recommendations:

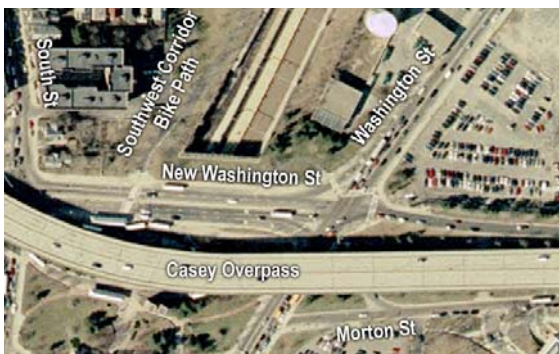
- Prevent the unnecessary blocking of the pedestrian crosswalk at Southwest Corridor Park by implementing the following:
 - Add a “Do Not Block Crosswalk” sign for vehicles approaching from either direction.
 - Coordinate the pedestrian signal with the downstream signal at South Street. Thus, the pedestrian-crossing signal would become activated every time traffic is stopped downstream at South Street. This would prevent vehicles from driving past the pedestrian crossing only to be stopped a several yards downstream.
- Improve the flow of pedestrians and cyclists between the station's north access and the Southwest Corridor Park by implementing the following:
 - Realign the crosswalk toward the north station entrance. This includes partial reconstruction of the median and its curb cuts.
 - Restripe the existing crosswalk.
 - Install pedestrian-crossing signs for vehicular traffic.
 - Fix the broken streetlight on north side of the pedestrian crossing of New Washington Street at Southwest Corridor.

- Add more street lighting along New Washington Street. Currently, streetlights along New Washington Street are only located along the south side of the roadway, and these are spaced widely apart. (In the park on the north side, a pathway parallel to New Washington Street has street lights.)
- Install additional lighting along the connection between the north station entrance and the Southwest Corridor Park crosswalk.
- Install trailblazing signs on the north side of the station directing users to the Southwest Corridor Park.

Washington Street at New Washington Street and Hyde Park Avenue



Five roadway legs intersect just northeast of Forest Hills Station: Washington Street to the north, Hyde Park Avenue to the south, New Washington Street to the west, plus Morton Street to the southeast and the Arborway exit ramp to the east. The intersection is wide and intimidating for pedestrians and bicyclists. Many of the approaches carry two lanes of through and/or turning traffic, which is channeled by medians and islands. Pavement conditions are rough and uneven, old railroad tracks cross the intersection, and the striping of the pedestrian crossings is fading. North-south pedestrian crossing along the west side is not encouraged, as shown by the absence of pedestrian crosswalks and walk signals; such a crossing should take place farther west at the pedestrian crossing signal at Southwest Corridor Park. Not many pedestrians were observed crossing this intersection during busy periods.



Recommendations: Improve the intersection design and operation to increase the comfort and safety of pedestrian crossings and bicycle navigation.

- Restripe pedestrian crosswalks
- Narrow the turning lanes to slow traffic
- Redesign traffic islands and pavement striping, in order to reduce the expanse of the intersection, giving it a less intimidating appearance
- Paint the corner curbs yellow, especially those of the traffic islands, in order to increase visibility
- Repair the pavement surface
- Install additional street lighting

Washington Street North



Washington Street to the north of the station is a busy two-lane roadway. The street allows for parking on both sides of the road. A school located farther north on Washington Street generates pedestrian activity toward the station. Sidewalks between the school and the station area seem adequate. Bicycle conditions are not favorable due to on-street parking and the high traffic volumes along Washington Street.

Hyde Park Avenue between New Washington Street and Ukraine Way



Hyde Park Avenue, which runs along the east side of the station, is a busy four-lane road. The avenue lies between a residential neighborhood to the east and the station to the west. A series of closely spaced driveways create the need for two signalized intersections (for access to the bus bays, Tower Street, and Woodlawn Street), and one unsignalized intersection (at the southeast parking lot), all of which handle many turning vehicles and pedestrian crossings. The street sign at Tower Street indicates that the north-south avenue is called “Washington St.” not “Hyde Park Ave.”

Over 450 pedestrians were observed crossing at the signalized intersection of Hyde Park Avenue at the north bus

entrance during the afternoon peak period. Three-quarters of this activity was made up of pedestrians crossing Hyde Park Avenue from the Forest Hills Station side. The distribution was fairly even throughout the late-afternoon period, with approximately 63 pedestrians crossing every fifteen minutes. Over 160 pedestrians traveled east toward/along Morton Street, just northeast of the station.

Bike activity was also observed along this stretch of Hyde Park Avenue: 14 bicycles traveled south during the observation period, and 4 traveled north.



There is just as much pedestrian activity at Hyde Park Avenue at the south bus entrance across from Tower Street as at the intersection of Hyde Park Avenue at the north bus entrance and parking lot. Nearly 500 pedestrians crossed during a two-hour late-afternoon period. The majority, 60 percent, of the east-west crossings of Hyde Park Avenue were eastbound (away from the station). As in the other locations, most observed bicyclists were headed south.

Approximately 80 pedestrians crossed Hyde Park Avenue at the unsignalized intersection at Woodlawn Street, across from the commuter parking lot entrance. The distribution of trips favored the station as the destination.

Recommendations: Improvements along Hyde Park Avenue between Ukraine Way and New Washington Street should facilitate driver awareness and visibility of pedestrian activity at the intersections along this stretch of road. Basic improvements should consist of the following:

- Restripe the pedestrian crosswalks.
- Add pedestrian crossing signs.
- Move all stop lines 10 feet back from crosswalks, and add “Stop Here on Red” sign.
- Consider posting “No Turn on Red” signs, but not before analyzing their impact on traffic operations. Alternatively, add “Yield to Pedestrians on Turns” signs.
- Consider signs for pedestrians to encourage street crossing only during the “Walk” signal.
- Correct the street name sign at Tower Street, to indicate that the roadway heading north is “Washington St.” and the roadway heading south is “Hyde Park Ave.”

Hyde Park Avenue South



To the south of the station, and south of Ukraine Way, Hyde Park Avenue continues as a four-lane road with narrow shoulders. On-street parking is allowed on the northbound side of the street. The sidewalks on both sides are in good condition but are not buffer-separated from the street curb. However, the decorative streetlights, closely spaced along this stretch of road, act as a physical separation of traffic and pedestrian activity. Although pedestrians do not have any challenges using this corridor to reach the station, bicyclists have to deal with a challenging road, particularly northbound. Street sweeping and removal of debris should be done frequently in order to reduce hazards for bicyclists.



Malden is one of the more populous and densely developed of the inner suburbs of the Boston metropolitan area. Malden Center Station is situated right in the center of this city’s activity, adjacent to the government and commercial center of the community as well as to residential areas. Furthermore, the City of Malden has recently undertaken efforts to support development in the vicinity of MBTA transit infrastructure in its community. Therefore, this community just five miles north of downtown Boston not only produces many transit trips, but attracts many trips as well. In the immediate area around the station, the population meets the environmental justice criteria for both minority percentage (34 percent of residents are considered minorities) and household income (the median is less than 75 percent of the metropolitan region’s median household income).

Malden Center Station is served by Orange Line rapid transit, bus, and commuter rail. A commuter parking lot is available for riders; however, this lot reaches capacity early in the morning. The most recent MBTA Program for Mass Transportation rates parking expansion at Malden Center as “low” in priority, primarily due to the lack of available land for at-grade parking.

Malden Center Station was chosen for inclusion in this study because of the level of activity; the function of a multimodal transit station on a rapid transit line; the support of transit-oriented development; a population with lower incomes and a high percentage of minorities and of car-free households; and a limited opportunity for adding park-and-ride capacity.

Station Area Characteristics

In the area within half a mile of this station approximately 11,400 people reside in just over 5,200 households, according to the 2000 census. (Nearly 24,250 people reside within a three-quarter-mile radius of this station, in over 10,200 households.) Approximately 25 percent of the households do not have a private vehicle. Forty-six percent of the land use in the station area is residential, 22 percent commercial, and 22 percent light industrial.

A 1994 survey of Orange Line passengers revealed approximately 4,500 boardings at Malden Center during the morning peak period, between 6:00 and 9:00 A.M.¹ Forty-four percent of passengers surveyed accessed the station by walking—the dominant mode of access. Malden Center Station is also a significant bus-to-rail transfer point: nearly 25 percent of passengers arrived at the station by bus. Out of those passengers who walked to the station, 44 percent had a walk of five minutes or less, and over 93 percent had a walk of fifteen minutes or less.

¹ *MBTA Systemwide Passenger Survey: Rapid Transit/Light Rail 1994*, a report produced by the Central Transportation Planning Staff for the Massachusetts Bay Transportation Authority, May 1996.



Station Amenities

In terms of station amenities for pedestrians and bicyclists at Malden Center Station, the following three issues are discussed in this section:

- Bicycle parking
- Crosswalks and sidewalks
- Station signs

During the time of the field audit and this study, Malden Center Station was undergoing a general improvement program, which included wheelchair accessibility.² The discussion in this (and the next) section notes any relevant features that are included on the design/construction plans.

Bicycle Parking



According to an inventory conducted by CTPS for the Congestion Management System program,³ Malden Center Station provides the third-highest number of bicycle parking spaces on the transit system, with 62 spaces. On the day of the inventory, 52 spaces were used (78 percent).

On the west side, the bicycle rack (containing eight inverted-U rack elements) is located adjacent to the station building near the entrance. A short roof overhang provides partial cover for the parked bicycles.

On the east side, where most of the bicycle parking is provided, the bicycle racks were located in the open square, just northeast of the station entrance. During the recent construction period, eight inverted-U racks were relocated to the outside sidewalk of the bus/vehicle passenger drop-off area, along Commercial Street. These provide fewer bicycle parking spaces than the previous location. These racks were being used; additional bicycles were found locked to the fence along bus platform #2, on the east side of the station.

The site plans for the station improvements have designs for bicycle parking. Inverted-U racks have been installed on the east side (21 new racks), and another set is planned for installation on the west side (28 new racks). Essentially, once construction is completed, the same number of spaces will still be provided. On the west side of the station, the existing and proposed racks are provided in a good location (close to building, in visible area, yet away from pedestrian traffic), but lack adequate shelter. On the east side of the station, the bicycle racks do not have a shelter. Furthermore, a set of 15 inverted-U racks on the east side are located in an area that is hidden from most of the station activity; the other set of 6 inverted-U racks are situated in an open area next to the newly reconstructed square.

Recommendations:

- Add a roof/shelter over each of the bike rack locations. This should be easiest at those locations closest to the station building.
- Add another streetlight to illuminate the set of 15 bicycle racks on the east side.

² Malden Center Station Accessibility Improvements, Site Plan, MBTA Contract Number A32CN01.

³ CTPS conducted an inventory of bicycle racks at MBTA rapid transit stations and their use in August 2002.

Crosswalks and Sidewalks

As part of the Malden Center Station accessibility construction, concrete wheelchair ramps are being reconstructed on the west side of the station. The MBTA is replacing the existing sidewalk and wheelchair ramps at the crosswalk ends along the MBTA vehicle bays at the end of Pleasant Street, the two midblock crosswalks, and the entrance at Centre Street.

Pedestrians heading to the west and southwest areas of the station often cut through the commuter parking lot to reach the sidewalk along Centre Street near Pearl Street. At the southwest corner of the parking lot a path is present leading from the parking lot pavement to the sidewalk; it is well worn, indicating heavy use.

Recommendation: Construct a concrete staircase at the southwest corner of the commuter parking lot, connecting the lot to the sidewalk on Centre Street.

Station Signs

On the commuter rail platform as viewed from the rapid transit platform side, the Malden Center signs are orange with white lettering—not the usual commuter-rail white-on-purple.

Recommendation: The station identification sign at the commuter rail platform should be the standard purple with white lettering.

The station has “lollipop” T signs on the east and the west sides. The two north-south-facing signs are each about midblock between Pleasant Street and Centre Street. An east-west-facing sign is located on the northeast side of the station area on Pleasant Street. All these lollipops are short in height, and they are not visible from many locations outside the immediate station area, such as Pleasant Street east of Malden Government Center.

Recommendations: The station signs should be more prominent. The height of the two north-south-facing lollipop signs could be raised. In addition, the MBTA should consider adding a big T sign at the railroad overpasses/bridges at Pleasant Street and at Route 60/Centre Street; these overpasses face east and westbound traffic and are visible from a block or two away.

Station Access by Pedestrians and Bicyclists

This section discusses the station-area accessibility issues at the following locations:

- Pleasant Street and Elm Street
- Pearl Street and Centre Street (West)
- Summer Street
- Florence Street
- Florence Street at Pleasant Street and Commercial Street
- Malden Center and Pleasant Street East
- Exchange Street
- Centre Street (Route 60) East
- Centre Street (Route 60) at Commercial Street
- Commercial Street South

Pleasant Street and Elm Street

The main approach to Malden Center Station from the west is along Pleasant Street. Abutting the north side of the station property, Pleasant Street is a two-lane road between Commercial Street and Pearl Street. Sidewalks are available on both sides, and appear adequate, except for the sidewalk adjacent to the MBTA commuter parking lot.



The short section of Pleasant Street between Pearl Street and Centre Street carries one-way traffic in the westbound direction only. Here a sidewalk is available on the north side of the street; on the south side, a triangular-shaped public square is present. The public square—bounded by Pleasant Street to the north, Centre Street to the south, and Pearl Street to the east—has an east–west sidewalk traversing the center of the triangle, benches, and shrubs and trees.

West of Centre Street, Pleasant Street (also Route 60) is a two-lane arterial roadway with on-street parking and concrete sidewalks on both sides. An elementary school is located along Pleasant Street between Centre Street and Highland Avenue. Before and after school hours, crossing guards are active at two midblock crosswalks across Pleasant Street. The sidewalk on the north (school) side of the street is wide. All the crosswalks on this stretch of road are brick with white borders. The signalized intersection of Pleasant Street with Highland Avenue has pedestrian-activated crossing signals and brick crosswalks with white borders.

Elm Street to the north of the elementary school also functions as a westside access route to Malden Center Station. This street splits from Pleasant Street two short blocks west of the station. Despite being a one-way (westbound) street at this point, the split street width is very great. Farther west, Elm Street has two-way traffic and functions more as a residential street or collector road. Wide sidewalks are located on both sides of the street, and streetlights are present from the station to Highland Avenue.

Recommendations:

- Repair the sidewalk on the south side of Pleasant Street adjacent to the commuter parking lot. Consider reducing the roadway width by two feet in order to provide a landscaped buffer between the sidewalk and the roadway.
- Extend the sidewalk and curb at the gore of the Elm Street–Pleasant Street split to reduce the lane width for vehicles and provide additional refuge for pedestrians. Pavement striping, particularly for lane shoulders for vehicles, should clearly delineate the roadway split. The curb at the gore point should be clearly marked, possibly with yellow paint on the curb and/or reflective or nonreflective pavement markers.





Figure 15
Malden Center Station
Overview of Recommendations



Pearl Street and Centre Street (West)



Centre Street (and the Route 60 designation) splits off from Pleasant Street just west of Pearl Street. Centre Street abuts the south side of Malden Center Station and is used by MBTA buses approaching from the west. Centre Street is a four-lane, median-divided road on this stretch. Sidewalks are available on both sides and appear to be in good condition.

Pearl Street, a north–south street that intersects Centre Street just to the west of the Malden Center Station commuter parking lot, serves a primarily residential neighborhood. Pearl Street is a narrow, two-lane street with no marked shoulders, sidewalks on both sides, and street lamps along the east side.



The intersection of Pearl Street at Centre Street (Route 60) is signalized. Northbound-to-eastbound right-turning traffic has its own lane, which is channel-separated from the northbound through and left-turning traffic. The design of the sidewalk curb cuts and crosswalks does not favor pedestrian movement in the direction of the nearby station. This may explain why pedestrians were observed crossing Pearl and Centre Streets outside of the crosswalks.

The traffic signal cycle has an all-red/all-walk phase for pedestrians, which is activated by push buttons. Vehicles are allowed to turn on a red light. Not all of the pedestrian-activated buttons seem to function, though, and the east-facing pedestrian “walk” signal on the south side does not turn on. A pedestrian crossing signal is missing for those pedestrians crossing Centre Street from the northeast side to Pearl Street.

Recommendations: The intersection of Pearl Street at Centre Street should be redesigned to improve pedestrian flow; the following actions should be implemented:

- Align the ramps/curb cuts and the corresponding crosswalks in the direction of pedestrian flow, parallel to Centre Street
- Paint the crosswalks with ladder-style stripes
- Fix the malfunctioning pedestrian-activated push buttons and install the missing pedestrian crossing signal
- Add a “Yield to Pedestrians” sign to all traffic approaches

Summer Street



Summer Street approaches Malden Center Station from the north, linking a large residential area to Pleasant Street on the northwest side of the station. Summer Street is a two-lane road with on-street parking and concrete sidewalks on both sides. The sidewalks are paved to the curb and have trees, posts, and signs along their extent. The intersections, such as those with Maple Street, Mountain Avenue, Chestnut/Lincoln Street, and Clifton Street, all have a similar crosswalk design: two parallel, solid white lines delineating the crosswalk with ramps/curb cuts placed back from the intersection. In general, the sidewalks along Summer Street are in good

condition. However, at some street corners, obstructions (such as mailboxes, streetlights, and sign posts) are in the pathway of pedestrians and the crosswalk/curb cuts.

The crosswalks at the signalized intersection of Summer Street at Pleasant Street are also simply striped with two parallel, solid white lines. The traffic signal cycle has a pedestrian-activated all-red/all-walk phase; turns on a red light are permitted.

Recommendations: In order to enhance pedestrian safety and comfort at the intersections along Summer Street, implement the following improvements:

- Add ladder-style striping to the crosswalks, in order to increase visibility
- Relocate mailboxes and other obstructions from the path of pedestrians
- Add “Yield to Pedestrians” signs at the intersections, particularly at Pleasant Street
- Redo the corner curbs at Mountain Avenue and at Clifton Street to add perpendicular wheelchair ramps
- Consider adding bulb-outs at the intersection with Mountain Avenue

Florence Street



Florence Street approaches Malden Center Station from the northeast, bringing vehicular and pedestrian traffic from residential and commercial areas in Malden Center. Florence Street has two lanes of traffic in each direction, and on-street parking is not allowed. A raised median separates the opposing traffic on Florence Street, and is narrow at intersections to provide for a turning lane.

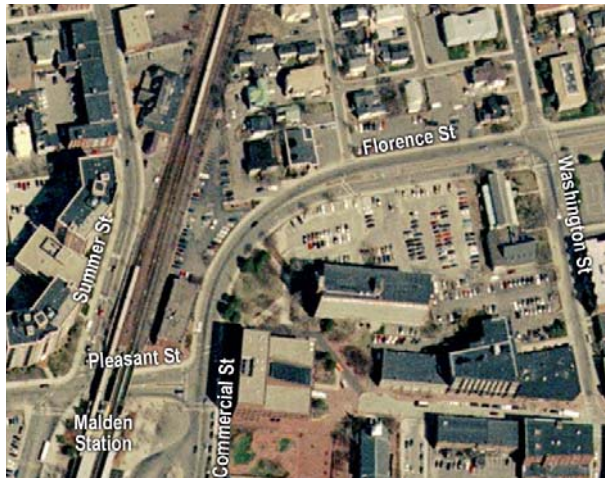
The intersection of Florence Street at Washington Street is signalized. The crosswalks at the intersection are striped with two parallel, solid white lines. The traffic signal cycle has a pedestrian-activated all-red/all-walk phase. However, not all the buttons are functioning. Turns on a red light are allowed.

The sidewalks on both sides of Florence Street west of Washington Street are in poor condition: street curb cuts are present that lead to a fence, no buffer separates vehicle traffic from the sidewalk, significant cracks are found in the concrete, and debris was found along both the street curb and the fence that lines the sidewalk. (Please note that the City of Malden is currently selecting proposals for redeveloping property along Florence Street. Changes could occur within the next three years.)

Recommendations:

- Improve the sidewalk condition and design along Florence Street by implementing the following:
 - Reconstruct the sidewalk in order to correct for unnecessary street curb cuts and improve surface condition. Consider narrowing the traffic lanes in order to increase the sidewalk width or even add a landscaped buffer to further separate vehicle traffic from pedestrian activity.
 - Stripe shoulder lanes to provide a buffer between vehicle traffic and the sidewalk
- Increase pedestrian safety at the intersection of Florence Street at Washington Street by implementing the following:
 - Add ladder-style striping to the crosswalks
 - Extend the median closer into the intersection in order to create a midcrossing refuge for pedestrians using the crosswalk
 - Fix malfunctioning pedestrian-activated push buttons
 - Add a “Yield to Pedestrians” sign to all traffic approaches

Florence Street at Pleasant Street and Commercial Street



Just northeast of the station is the signalized intersection of Florence Street at Pleasant Street and Commercial Street. This three-legged intersection features many turning vehicles, particularly right turns from southbound Florence Street, right turns from eastbound Pleasant Street, and left turns from northbound Commercial Street; right turns are permitted on red. Crosswalk signal buttons activate an all-walk pedestrian phase. Crosswalks on all three approaches are simply two parallel white lines, which are fading. During recent observations in the morning peak hour, 360 pedestrians crossed Pleasant Street, over 168 pedestrians crossed Commercial Street, and 106 pedestrians crossed

Florence Street.⁴ Evening peak-hour pedestrian volumes were approximately 60 percent of the morning peak-hour volumes.

As part of the Malden Center Station accessibility construction, the crosswalk curb ramps across Pleasant Street at Commercial Street and at Florence Street have been reconfigured. The MBTA is replacing the existing sidewalk and wheelchair ramp at the crosswalk ends with new concrete wheelchair ramps. A new concrete wheelchair ramp is also being constructed on the east side of Commercial Street at Pleasant Street.

Recommendations: Increase pedestrian safety at the intersection of Florence Street at Pleasant Street and Commercial Street by implementing the following:

- Restripe the existing crosswalks, adding ladder-style striping
- Add signs indicating vehicles should yield to pedestrians in the crosswalk
- Install pedestrian signals that have the crossing-time countdown display
- Extend the median at Pleasant Street closer toward the intersection so that the pedestrians using the crosswalk have a mid-crossing refuge
- Add bulb-outs at the intersection corners and the eastside crosswalk curb cuts; this will shorten crossing distances and increase vehicle awareness of crossing pedestrians

⁴ Pedestrian counts were conducted on Tuesday, June 4, 2003, for the *Congested Intersections Study in the Inner Core Subregion*, conducted by CTPS for MassHighway [T. Nixon, March 2004]. Morning peak hour occurs at 7:45–8:45 A.M., evening peak hour at 5:00–6:00 P.M.

Exchange Street



Exchange Street at Commercial Street, on the east side of Malden Center Station, is a signalized intersection. Traffic at this intersection also enters the station's eastside passenger drop-off bay. The northbound and southbound lanes have unlimited green signal time (Exchange Street is a one-way, eastbound street), except when triggered by an all-way pedestrian-actuated walk signal. Crosswalks are simply striped with two parallel white lines, on the north side of the intersection (leading toward the station entrance) and across Exchange Street.

This intersection experiences much pedestrian activity.⁵ In the morning peak hour, over 650 pedestrians crossed Commercial Street, and nearly 100 crossed Exchange Street. Evening peak hour counts are slightly lower than those observed in the morning.



As part of the Malden Center Station accessibility construction, the crosswalk and curbs across Commercial Street at Exchange Street have been reconfigured. The MBTA is replacing the existing sidewalk and wheelchair ramp at the crosswalk ends with new wheelchair ramps. New white thermoplastic striping will be added to the crosswalk, including ladder stripes. The MBTA is also removing and resetting the northern-end curb of the drop-off bay back by eight feet.

Recommendations: The following amenities should be provided to increase pedestrian safety at the intersection of Exchange Street and Commercial Street:

- Restripe the existing crosswalks, adding ladder-style striping.
- Add signs indicating that vehicles should yield to pedestrians in the crosswalk.
- Install pedestrian-crossing signals that have the crossing-time countdown display.
- Add a curb extension on the west side of the crossing on Commercial Street at the passenger drop-off bay. This would slow right-turning traffic and possibly keep vehicles from stopping too close to the crosswalk.

⁵ See preceding footnote.

Centre Street (Route 60) at Commercial Street



Centre Street (Route 60) at Commercial Street is a busy, signalized intersection. Each approach of the intersection has two lanes, and Centre Street is divided by a landscaped median. Pedestrian crossings are striped across all four approaches, with only simple, parallel white stripes; each corner features only one sidewalk curb cut for wheelchair ramps. Pedestrian walk signals turn on concurrently with the two-way through traffic, during which left turns are permitted. A sign is posted for pedestrians with the warning, “Watch for Turning Vehicles on Walk Signal.” However, the concurrent pedestrian walk signal does not activate during the phase that includes one-way through traffic and a protected left.

As part of the Malden Center Station accessibility construction, the corner curbs on the northeast and northwest corners of the intersection of Commercial Street and Centre Street have been reconfigured. The MBTA is replacing the existing sidewalk and wheelchair ramp on the northwest corner with two new wheelchair ramps. These two new ramps will line up with the

crosswalks across Commercial Street and Centre Street. A new wheelchair ramp will be added to the northeast corner, across Commercial Street. New thermoplastic striping will be added to the north Commercial Street crosswalk and halfway across the west Centre Street crosswalk.

Recommendation: Increase pedestrian safety at the intersection of Centre Street (Route 60) at Commercial Street by implementing the following:

- Restripe the existing crosswalks, and add ladder-style striping.
- Add signs indicating that vehicles should yield to pedestrians in the crosswalk.
- Extend the median at Centre Street closer toward the intersection so that the pedestrians using the crosswalk have a midcrossing refuge.
- Install pedestrian-crossing signals that have a crossing-time countdown display.
- Add a concurrent “walk” phase for pedestrians crossing Commercial Street at the eastbound side of Centre Street. In other words, pedestrians should be able to cross Commercial Street during Centre Street’s eastbound-through-and-protected-left-turn phase. Currently, the “walk” phase for crossing the south side of Commercial Street only activates during the subsequent signal phase (Centre Street through movements). Thus, this modification would provide a longer opportunity for pedestrians to cross Commercial Street. (Furthermore, this additional phase actually provides the safest crossing for pedestrians, because opposing left-turn vehicles from Centre Street westbound will not be crossing the southside crosswalk.)

Centre Street (Route 60) East

Centre Street (Route 60) provides a link to commercial establishments east of Commercial Street, including a major grocery store. Concrete sidewalks are present on both sides of this four-lane, divided roadway; no buffer is present between the sidewalk and the roadway. Traffic signals are closely spaced along this stretch of road, with signals at Commercial Street, Jackson Street, Middlesex Street, and Main Street.

The pedestrian-actuated signal at Jackson Street is near the grocery store; however, no ramp/curb cut for wheelchair access is present at the crosswalk, which is simply striped with two parallel white lines.

Recommendation: The following amenities should be provided to increase pedestrian safety along Centre Street:

- Restripe the existing crosswalks, adding ladder-style striping
- Add a curb cut/wheelchair ramp at the crosswalk at the Jackson Street pedestrian-crossing signal

Commercial Street South

South of Centre Street, the area is primarily commercial and light industrial. Commercial Street is the main north–south approach road serving this area. Concrete sidewalks are provided on both sides of the street; neither are buffered from the four-lane, undivided road. The street is wide and lined with trees. No improvements are suggested for this stretch of road.

The cities of Malden and neighboring Medford and Everett have plans to redevelop an area farther south along Commercial Street called River’s Edge (formerly Telecom City). If this development comes to fruition, Commercial Street may become a more important connection for pedestrians and bicyclists between the development and Malden Center Station. In fact, roadway improvements near Wellington Station are underway.

Also planned for the neighboring area is the Bike-to-the-Sea shared-use path. Connections are strongly suggested for bicyclists (and pedestrians) to this path from the station, whether these connections are made via an on-street, signed route or via a striped/buffered lane along existing roadways. Ferry Street to Pleasant Street through the Malden business district may be one possible connector route; Charles Street to either Canal or Commercial Street would be another option. The City of Malden should keep these options open as it redevelops and reshapes its downtown area.

Malden Center and Pleasant Street East



Currently, Pleasant Street at the Malden Center business district is cut off from Commercial Street and Malden Center Station by the Malden Government Center buildings and plaza. This eastern extension of Pleasant Street itself offers a favorable pedestrian environment: the wide, brick sidewalks with street-level shops are buffered from the low traffic volumes by on-street parking.

In order to access the station from the commercial center of Malden, travelers must either walk through the Government Center plaza and down stairs (or a long ramp) to Commercial Street, or take a side street to

Exchange Street, which connects to Commercial Street and the station. The station is not clearly visible from the west end of Pleasant Street (the T “lollipop” sign is not visible at all), and trailblazing signs at Government Center do not direct people to the station.

The City of Malden and the Malden Redevelopment Authority are considering proposals to sell and redevelop Malden Government Center. The City is encouraging the concept of reconnecting Pleasant Street at Commercial Street, which would entail demolishing the current city offices building and plaza.



The Mansfield commuter rail station serves not only the residents of this southern suburb of Boston, but also those of other, nearby communities. Therefore, park-and-ride lots strongly define the character of the station. They allow the station to accommodate commuters from neighboring towns such as Foxborough, Sharon, Easton, and Norton. The parking lot's capacity is often fully utilized, and projections indicate a possible increase in demand of 75 to 100 percent by the year 2010. The Program for Mass Transportation assigns a medium priority rating to parking expansion at Mansfield Station, but it cites costs as one potential barrier to achieving additional capacity.

The station is located near the historic town center and the residential areas around it. Furthermore, construction of an off-street shared-use path to the center of town from the south was completed last year; the path terminates a few blocks south of the station and connects to the station via an on-street path and signed network.

Mansfield Station was chosen for analysis because it has the potential to increase ridership despite park-and-ride lot capacity constraints through enhanced access for pedestrians and bicyclists.

Station Area Characteristics

In the area within a half-mile of this station reside just over 3,200 people in slightly more than 1,400 households, according to the 2000 census. (About 5,500 people reside within a three-quarter-mile radius from this station, in fewer than 2,400 households.) Most of the land use in this area is residential (quarter- to half-acre lots), with very little multifamily housing. Less than 9 percent of households do not have a private vehicle.

Park-and-ride commuters are the primary users of Mansfield Station. The facilities around the station illustrate this: large parking lots are located on the west side of the station as well as to the southwest, just across Route 106. Additional parking is also found to the immediate east (along Mansfield Avenue) and to the southeast (along Old Colony Road).

Based on a recent boarding audit of the commuter rail service through Mansfield, over 1,400 passengers boarded the inbound trains from 6:00 to 10:00 A.M.



Figure 16
Mansfield Station
Area Features

Station Amenities

Please note that observations were made during the time Mansfield Station was undergoing construction of a new station house, which opened in March 2004.

Bicycle Parking



Only one bicycle rack is installed at the station, a ribbon rack on the south side of the station on the east (inbound) side of the tracks. On the day of the field audit and passenger observation, the rack was used by eight bicycles. In addition, two bicycles were locked to the chain-link fence.

Recommendation: The bicycle parking facilities should be enhanced by installing a covered bicycle parking rack at the following locations:

- On the south side of the station house, for cyclists arriving via the pedestrian bridge
- On the north side of the station house, close to Mansfield Avenue, for cyclists arriving from the north and east
- On the outbound-track side, near the staircase, for cyclists arriving from the west

Station Access by Pedestrians and Bicyclists

Staff spent a Wednesday morning (on September 10, 2003, which was clear and cool) observing the use of the station by commuters. They noted the use of the park-and-ride lots and the volume and approach direction of riders arriving at the station. The observations were made from 6:00 A.M. (just after the first inbound train of the day) until the end of the boardings for the second-to-last peak-period inbound train at 8:07 A.M.

This section discusses the station-area accessibility issues at the following locations:

- Rail-Trail-to-Station Connection
- Pedestrian Bridge over Route 106
- N. Main Street at Route 106/Chauncy Street
- Access from the Southwest
- Access from the West
- Mansfield Avenue
- N. Main Street at Mansfield Avenue

Rail-Trail-to-Station Connection



In 2003, a new paved, off-road shared-use path was constructed in Mansfield. Called the Old Colony Rail Trail, this path extends north from the Mansfield-Norton town line to North Main Street in downtown Mansfield at Old Colony Road/High Street. The terminus is just four blocks south of the commuter rail station. On-street signs and even a short on-street bike lane are in place to guide bicyclists to and from the commuter rail station. Our field audit found that some modifications are called for to the trailblazing signs that direct bicyclists to and from the commuter rail station; these recommendations, along with others related to the path are described below.

Northernmost Segment of Off-Street Bike Path

Between the terminus of the bicycle path at N. Main Street and Court Street two blocks south, this northernmost section of the path shares right-of-way with housing parking lots and driveways. Hence, even though the path is technically still an off-street path at this point, bicyclists must contend with vehicles accessing the residences along the parking lot.

Recommendation: Install raised pavement markers along the sides of the bicycle path. These will provide a physical delineation of the bicycle path, while not interfering with bicycle and motor vehicle operations.

Signs at Northern Terminus of Off-Street Bike Path at N. Main Street



At the north end of the off-street path at N. Main Street, a sign directs bicycle traffic to head north along Main Street. Taking this route, a cyclist heading to the station would encounter the traffic of Main Street and have to navigate the intersection with Route 106/Chauncy Street. However, a signed on-street route is in place to lead cyclists from the end of the bicycle path, through a residential neighborhood along High Street and Rumford Avenue, straight to a pedestrian/bicyclist crossing of Route 106 to Mansfield Station.

Recommendations:

- Reverse the arrow on the sign on Main Street facing the bicycle path so that it points left, instead of right. This will direct bicyclists to the on-street, signed bicycle route.
- Add a sign that specifically points bicyclists to the commuter rail station.

Signs along the Northbound On-Street Bike Route

Westbound on High Street, bicyclists encounter a sign directing them to the right. The intent of the sign is to let bicyclists know that they should turn right onto Rumford Avenue. However, the placement of the sign midblock in a stretch with several curb cuts may create some confusion as to where the right turn should occur.

Recommendation: Move the bike-route right-turn sign on High Street to the end of the block, at the intersection with Rumford Avenue.

Signs along the Southbound On-Street Bike Route

Heading south toward the Old Colony Rail Trail from the station, cyclists can use a bike lane along Old Colony Road. A one-way street, Old Colony Road heads south from Rumford Avenue and Thomas Street, just southeast of Mansfield Station. The bike lane is clearly marked along the right side of the road, adjacent to on-street vehicle parking; the marked lane width varies between four and six feet. The bike lane ends at N. Main Street, just short of High Street, where a sign indicates to cyclists that a bike route continues to the right (on High Street) or left (Old Colony Road and rail trail).

Recommendations: At the start of the Old Colony Rail Trail, a more prominent sign indicating the beginning of the bike path could be added. In addition, or instead, a trailblazing sign that points to the bike route to the left could be placed at the southeast corner of N. Main Street and Old Colony Road; the sign should face the southbound bicycle traffic.

N. Main Street at Route 106/Chauncy Street

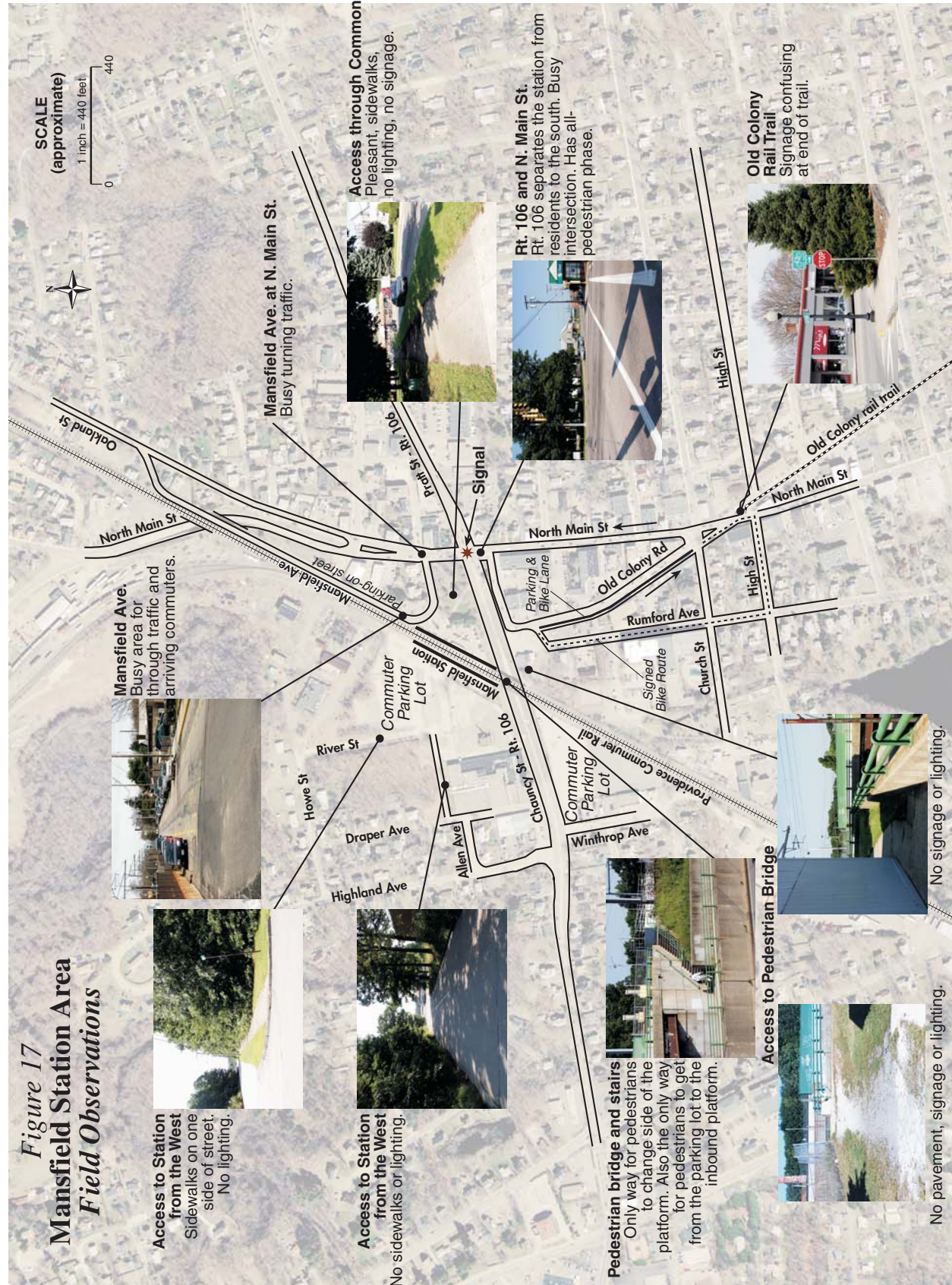


Pedestrians approaching from the east must cross N. Main Street to get to the station. If coming from along Route 106/Chauncy Street or from points south of Chauncy Street, the safest and easiest crossing is at the signalized intersection of these two streets. The pedestrian phase is actuated by pedestrian-crossing buttons; this triggers an all-walk phase for pedestrians. The time seems adequate, with a total of 26 seconds of “Walk” and flashing “Don’t Walk” signals. However, pedestrians must wait until the all-walk phase enters the cycle, which lasts 135 seconds. Also, the red “Don’t Walk” signals did not work at some signal posts.



Recommendations:

- Add ladder-style stripes to the crosswalks, in addition to the existing horizontal lines
- Fix malfunctioning and broken pedestrian crossing signals
- Add additional lighting to the sidewalks on the public common at the northwest corner of N. Main Street and Route 106



Pedestrian Bridge over Route 106



Route 106 (Chauncy Street) separates the commuter rail station from the parking and residential areas to the south. The roadway is divided and below grade where its four lanes cross under the railroad tracks. Both sides of the road have sidewalks, which are elevated from the street level and separated from the vehicle lanes by metal railing. In order to cross to the south side from the station, pedestrians and bicyclists must use the pedestrian overpass, which is adjacent to the railroad right-of-way.



The pedestrian overpass, to the south and east of the station, leads pedestrians and bicyclists across Route 106 to an area behind a commercial building. There is a paved sidewalk that heads east, parallel to Route 106 and along the building, to a commuter parking area and commercial establishments in the Thomas Street and N. Main Street area. The field audit noted desire lines in the hard ground leading around the other (south) side of the commercial building toward Rumford Street, where there is additional commuter parking and the beginning/end of the on-street bike lane and route. An often-used access point to the station, the pathway to the pedestrian bridge is unmarked (no signs), hidden from view, and uninviting.

Neither the pedestrian bridge nor the paved and unpaved pathways on the southeast side have direct lighting. Nearby street lamps do provide some illumination, but this light does not even illuminate the surface of the bridge walkway.

The pedestrian bridge across the below-grade Route 106/Chauncy Street was utilized by 288 commuters during the morning of the field observations. The commuters originated from the southwest lot (149 were counted during the observation period) or the smaller southeast parking and drop-off area (139 commuters). Approximately 40 of the commuters who approached from the southeast area were dropped off; seven cyclists were observed coming from the southeast area across Route 106.

Recommendation: Pedestrian and bicyclist access to the pedestrian bridge should be enhanced by implementing the following:

- Install trailblazing signs that direct station users to the pedestrian bridge behind the commercial building; these signs could be MBTA-issued signs
- Improve bridge, staircase, and pathway lighting conditions, for visibility and safety of users at night; light should shine directly onto the walking surfaces
- Pave the dirt pathway on the south side of the commercial building, where desire lines currently exist, for bicyclist and pedestrian use

Access from the Southwest

People from the residential areas to the southwest and those commuters from the southwest parking lot heading to the station use a pedestrian underpass to cross the railroad tracks and an overpass to cross Route 106. In order to reach the Route 106 crossing, pedestrians can choose to either walk on the sidewalk along Route 106 or cut through the commuter parking lot. The area and existing facilities do not appear to present any barriers to pedestrians or bicyclists heading to the station. Sidewalks are present along the local neighborhood streets, which do not seem to carry much traffic. Lighting conditions appear adequate on both sides of Route 106 and in the commuter parking lot.

Access from the West



People from the residential areas to the immediate west of the station have to walk on the street in order to reach the commuter parking lot and west side of the station. However, most of these streets (such as River Street) lead to cul-de-sacs within a small residential area (approximately 60 houses), and thus do not carry much traffic. The only exception is Allen Street, which leads traffic to the commuter rail lot from Route 106 (via Highland Avenue). No sidewalks or streetlights are present on these roads.

Residents from the neighborhood even farther west have a natural barrier—a brook—and, thus, must first walk south to Route 106 in order to head east toward the station. A sidewalk follows Route 106 to the pedestrian under/overpass at the south entrance to the station.

CTPS staff observed that most of the people originating from the west side were park-and-ride users. Only eight pedestrians were observed arriving from the neighborhood streets to the west. The parking lot on the west side of the station and the on-street parking along Mansfield Avenue filled up by the 8:07 A.M. peak-period inbound train.

Recommendations: Install simple safety improvements that visually connect drivers with pedestrians or that keep vehicle speeds low. These improvements should include:

- Install street lighting
- Post low-speed-limit signs or pedestrian activity signs
- Add speed humps along the approach to the commuter parking lot
- Cut back the foliage at street corners to provide visibility for turning vehicles

Mansfield Avenue



From the north, pedestrians and cyclists can approach the station along Mansfield Avenue. Both Oakland Street and N. Main Street connect to Mansfield Avenue. Mansfield Avenue has a sidewalk only on the east side; this is adequate for the pedestrian volume observed. The west side of Mansfield Avenue, which is adjacent to the railroad right-of-way, offers vehicle parking for commuters.

The most defining characteristic of Mansfield Avenue is the considerable traffic volume, especially in such proximity to the station house. The stretch of Oakland

Street between Mansfield Avenue and North Main Street is designated for one-way northbound traffic. Therefore, southbound traffic on Oakland Street coming from the north must use Mansfield Avenue to head south toward N. Main Street and Route 106. Trucks are allowed and traverse this segment of roadway, even during commuter-activity periods.

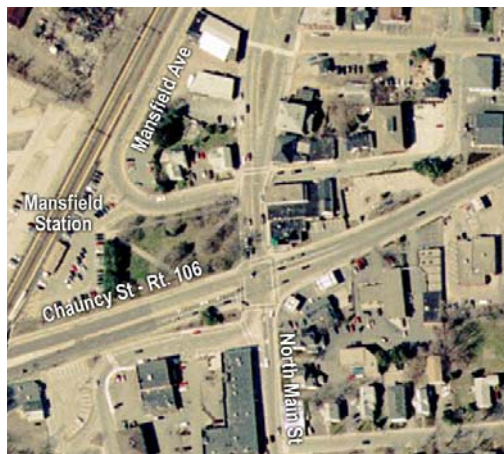
The through-traffic volume on Mansfield Avenue creates a conflict between pedestrians and other commuters arriving at the station from the north and east directions. After all, this is the side of the commuter rail station with the station house, the northbound (inbound) train platform, and a drop-off area for kiss-and-ride commuters as well as GATRA bus/shuttle passengers. Due to the high volume of traffic and vehicle parking, bicycle travel along Mansfield Avenue requires heightened awareness by bicyclists.

On the day of passenger observations, CTPS staff counted 299 commuters who approached the station from the east using Mansfield Avenue. These commuters were, in terms of access mode, park-and-ride users (parking spaces are available along Mansfield Avenue), kiss-and-ride commuters, pedestrians, and persons dropped off by the GATRA transit shuttles or taxis. Slightly over one-third of the commuters were observed walking south along Mansfield Avenue to the station; these were pedestrians and park-and-riders. Another third of the commuters were dropped off by private vehicles. Fifty pedestrians approached from the east, typically through the common. In addition, GATRA shuttled 24 commuters to the station during this period; the shuttle service with the most drop-offs was the Norton–Mansfield/Route 140 route.

Where Mansfield Avenue curves at the station, recent improvements include pavement markings and striping that help delineate the drop-off and wait areas and the through traffic lanes, and sidewalk improvements on the station side.

(Please note: The area between Mansfield Avenue and Oakland Street has been identified as a candidate site for redevelopment; alternatively, it may be part of the station area improvements headed by GATRA.)

N. Main Street at Mansfield Avenue



Approaching the station from east of N. Main Street and north of Chauncy Street, pedestrians do not have any signalized locations to cross. A pedestrian crosswalk is striped on the north side of Mansfield Avenue to cross N. Main Street; this crosswalk is a short distance north of the signalized intersection with Chauncy Street. The crosswalk leads pedestrians to a sidewalk on the north side of Mansfield Avenue, just east of the station. This sidewalk has just been rebuilt as part of the station area improvements. It remains without a buffer separation from the road but has a yellow-painted curb. Across the street, a wide, grass-buffer-separated sidewalk is located on the south side of Mansfield Avenue along the common.



The current configuration of the crosswalks at Mansfield Avenue at N. Main Street encourages pedestrians to cross N. Main Street to the north side of Mansfield Avenue using the striped crosswalk, or alternatively, walk down to Chauncy Street and cross using the signalized intersection. In other words, a crosswalk across N. Main Street to the south side of Mansfield Avenue is absent. Such a crosswalk would create conflicts with the numerous right-turning vehicles from Mansfield Avenue to southbound N. Main Street.

Recommendations:

- Paint the crosswalks with ladder-style stripes
- Align the wheelchair ramp/curb cuts with the crosswalks
- Add signs warning motorists of pedestrian activity
- Add a bulb-out at each of the Mansfield Avenue corners of the intersection, in order to slow down the turning traffic

