

Our Crumbling Pathways: Maintenance Needs on the Charles River Paths

Developed by the Massachusetts Bicycle Coalition (MassBike) Metro Boston Chapter

With the assistance and endorsement of the:

- Cambridge Bicycle Advisory Committee
- Watertown Bicycle Advisory Committee
- Newton Bicycle and Pedestrian Task Force

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Summary

The 26-mile system of pathways along the Charles River provides an invaluable recreational resource for residents of the greater Boston area, as well as serving as a critical transportation linkage for bicyclists and other non-motorized travelers. Despite its heavy use, the path system has suffered from a serious lack of maintenance by the regional and state agencies which have overseen it, most recently the Department of Conservation and Recreation (DCR). Narrow paths, crumbling pavement, hazardous intersection crossings, encroaching vegetation, and other problems make the paths uncomfortable and unsafe in many locations.

Many of these problems will need to be addressed through major capital investments. Fortunately, though, others can be addressed in the short term through relatively minor maintenance and improvements. This report provides a detailed inventory and recommendations regarding problems that could be addressed through short-term, relatively low-cost strategies. The organizations endorsing this report strongly urge the DCR to address these issues immediately, and the Commonwealth of Massachusetts to provide sufficient funding to the DCR to allow these needs to be addressed.

The key recommendations of this report include:

- 1) **Address major pavement problems** such as root heave, expansion cracks, and other pavement distress along certain pathway segments.
- 2) **Fix major potholes, sinkholes, and other isolated, hazardous bumps.**
- 3) **Improve safety at key intersections** by means such as installing pedestrian signals and additional signage, repainting crosswalks, and/or relocating curb cuts.
- 4) **Increase the resources dedicated to vegetation removal** to ensure that the path remains clear of overhanging tree branches and encroaching shrubbery.
- 5) **Clear sand and other debris** from isolated sections with poor drainage immediately following major rainstorms.
- 6) **Improve signage** at street crossings and other path discontinuities, especially on the path sections upstream of Watertown Square.

These actions are critically important to ensure the comfort and safety of path users, as well as to encourage more residents of the Greater Boston area to bike, walk, jog, and skate on a daily basis for recreation and for transportation. The full report details specific locations where these improvements are needed.

I. Scope and Purpose

The purpose of this report is to describe problems that prevent the pathways along the Charles River from realizing their full potential, especially as a component of the regional transportation network. The primary focus of the report is on problems that can be addressed through relatively low-cost, short-term maintenance and repair activities, rather than major/long-term capital investments. The Charles River Basin Master Plan includes numerous recommendations for long-term, higher-capital improvements that are also needed to improve the functioning of the pathways along the Charles River.

The report addresses problems along the entire 25-mile non-motorized pathway system that skirts both banks of the Charles River for most of its length, beginning at the Museum of Science dam in Boston and continuing upriver to Prospect Street in Waltham. This pathway system includes the Paul Dudley White Paths as well as other paths through various sections of the Charles River Reservation. Some segments of the pathway system are part of the East Coast Greenway, a 2,500 trail system under development that will connect communities from Maine to Florida. The Department of Conservation and Recreation (DCR) is continuing to expand the Charles River pathway system along the upriver segments in Watertown, Waltham, and Newton, and connections will eventually be made all the way to Commonwealth Avenue.

The report was developed based on surveys conducted in June and July 2006 by the MassBike Metro Boston Chapter, Cambridge Bicycle Advisory Committee, and the Newton Bicycle and Pedestrian Task Force, working with members of other local partners including the Watertown Bicycle Committee. All of these groups have endorsed the findings and recommendations of the report.

The remainder of this report is organized as follows:

- Section 2 of the report presents a vision for the Charles River paths as a primary component of the region's transportation network as well as important recreational facilities.
- Section 3 discusses common themes and major concerns with the pathway system.
- Section 4 prioritizes these problems based on the consensus of the endorsers of this report.
- Appendix A includes a map showing path condition ratings by segment.
- Appendix B includes diagrams of proposed intersection improvements.
- Appendix C includes more detailed inventory of problems in the City of Cambridge, based on surveys conducted the Cambridge Bicycle Committee.
- Appendix D includes a more detailed inventory of problems west of Watertown Square in Watertown, Waltham, and Newton, based on surveys conducted by the Newton Bicycle and Pedestrian Task Force.

II. Vision for the Paths

The Charles River paths are important for both transportation and recreational purposes, at many different scales and for many different types of users. Local residents use them for access to the riverfront, adjacent parklands, and nearby destinations. They are also part of a larger network of linear park and path facilities, linking – either currently or in the future – with other paths and corridors such as the Emerald Necklace, the Rose Kennedy Greenway, the planned Watertown Branch path, and the planned Linear Park extension from Somerville through East Cambridge to North Point. Furthermore, this system of paths provides key transportation linkages as well as important recreational opportunities for urban residents. In many cases, the pathway system provides the most direct and convenient access for bicyclists, pedestrians, and other non-motorized travelers to major destinations such as downtown Boston, Back Bay, Boston University, the Fenway, Harvard Square, MIT, and Watertown Square.

It is likely that the importance of the pathway system for transportation will only increase in the future, as gas prices rise, awareness and concern for environmental problems such as global warming and energy dependence increases, and traffic congestion continues to mount. Furthermore, both the transportation and recreational opportunities provided by the paths provide important physical activity for residents of the Boston area, helping to reduce obesity and other health problems associated with sedentary lifestyles.

The value and importance of the paths is evidenced by their heavy usage. Yet in many places they have suffered years or decades of neglect, with basic maintenance needs unattended. These problems compound the well-documented problems of underdesigned segments that are not sufficiently wide or have other geometric deficiencies that prevent the paths from comfortably and safely handling the high volumes of different types of path users. Poorly designed intersection crossings also pose significant safety hazards. The design deficiencies are numerous but in many cases, potentially costly and difficult to fix. These problems will require sustained long-term attention as well as funding from the DCR, other Commonwealth sources, and partner groups supporting the paths.

Fortunately, many of the worst pathway deficiencies can be addressed through shorter-term, lower-cost maintenance and repair actions. Examples include patching of broken pavement, minor intersection improvements, addressing root heave, and appropriate signage and markings. Specific recommendations for maintenance-type improvements are addressed in the next section.

III. Common Themes and Principal Concerns

Maintenance-related problems and needs along the paths are discussed under five general categories:

- A. Path and edge surface
- B. Intersections
- C. Vegetation encroachment
- D. Drainage and debris
- E. Signage and wayfinding
- F. Other miscellaneous problems

A. Path and Edge Surface

Rough or broken pavement surfaces create considerable discomfort for cyclists as well as in-line skaters, and increase the risk of crashes and falls. They may also increase the risk of collisions with other path users as cyclists take action to avoid broken spots. Pavement surface problems fall under a number of sub-categories, which can be addressed with varying levels of effort:

- a) Root heave;
- b) Thermal expansion cracks;
- c) Potholes and other pavement distress;
- d) Edge drop-offs at the edge of the path pavement.

Pavement conditions tend to vary widely by path segment, depending upon when the segment was last paved or repaved, the construction method, presence of trees, and other factors. This report does not include a detailed inventory of specific hazards, but rather identifies segments that are in particularly poor condition. Appendix A includes a segment-by-segment description and map illustrating path conditions. Appendix C includes a survey by the Cambridge Bicycle Advisory Committee of hazards on paths within the City of Cambridge.

Particularly poor segments, from east to west, include:

- 1) North side between Harvard Bridge and BU Bridge (Cambridge): Significant root heaves and other distress are present, especially in the first section adjacent to MIT.
- 2) South side between the BU Bridge and River Street (Boston) – This segment, primarily the stretch between the BU Bridge and the Turnpike Extension, has numerous root heaves and other pavement distress.
- 3) North side between the BU Bridge and River Street (Cambridge) – Curb cuts at the entrances to Magazine Beach are rough; dirt also accumulates here and turns to slippery mud in wet weather. Potholes, thermal expansion cracks, and edge drop-off are also a problem along this path segment.
- 4) North side between JFK Street and Fresh Pond Parkway (Cambridge) – This segment suffers from thermal expansion cracks, root heave (primarily near the BB&N Boathouse), and potholes (Figure 1). It also has some severe edge drop-offs; in some cases (especially closer to JFK Street) these could be addressed through filling and packing of the adjacent ground.
- 5) South side, approaching Arsenal Street from the east (Boston) – Just before the intersection there is a short segment with a pavement differential between concrete on the

riverside and an asphalt strip on the roadside (Figure 2). Combined with the narrow path cross-section and presence of signs in the path, the pavement differential creates a hazard because cyclists cannot safely transition from the lower asphalt pavement to the higher concrete if they need to maneuver to avoid another path user.

- 6) South side, along Nonantum Road, near the Daly Memorial Skating Rink (Boston/Newton) – This segment suffers from severe root heaves.
- 7) North side, just east of Galen Street (Watertown Square) – A short stretch suffers from major expansion cracks and other distress.
- 8) North side between Prospect and Moody Streets (Waltham) – This segment suffers from severe root heaves.

Figure 1 Root Heave, Cambridge, East of Eliot Bridge



Figure 2 Pavement Differential, Boston, East of Arsenal Street



Many other sections of the path suffer from thermal expansion cracks, minor bumps and unevenness, and isolated root heaves, although in most cases these tend to pose an annoyance rather than a safety hazard.

In addition to these general segment conditions, there are a number of isolated yet severe hazards, such as sinkholes and major potholes, that deserve specific attention. These include:

- 1) South side path in Boston, by the Northeastern Boathouse– sinkhole;
- 2) North side path in Cambridge, across from Hawthorne Street (Figure 3);
- 3) South side path in Watertown, just downstream from Galen Street/Watertown Square – sinkhole;
- 4) Waltham, near biomedical plant – sinkhole;
- 5) North side path, Cambridge, at railroad overpass near BU Bridge – dangerously large (3 inch?) transition between pavement elevations over the bridge (Figure 4).

Figure 3 Large Pothole, Cambridge, Across from Hawthorne St.



Figure 4 Transition Over Railroad Bridge east of BU Bridge



B. Intersections

Hazardous conditions are often present where the Charles River pathways intersect with major cross-streets. Many of these conditions could be improved through relatively low-cost fixes such as adding a pedestrian signalhead and walk phase to an existing traffic signal, painting or repainting crosswalks, adding warning signage, or realigning curb cuts.

Specific locations that are particularly hazardous, and suggested fixes, include:

- 1) **Intersection of the south bank pathway with Cambridge Street** in Boston. This intersection does not have a pedestrian phase or signalhead and has heavy volumes of right-turn traffic that conflict with path users even when the parallel road (Soldiers Field Road access road) has a green (Figure 5). Curb cuts are oddly placed (Figure 6). The recommended fixes are:
 - a) Add a pedestrian signal phased concurrently with the northbound Soldiers Field Road traffic.
 - b) Add new curb cuts on the north side of Cambridge Street aligned with the pedestrian crossing.
 - c) Repaint pedestrian crossings for alignment with new curb cuts.

Figure 5 Crossing With No Pedestrian Signal at Cambridge Street, Boston



Figure 6 Oddly Placed Curb Cut at Cambridge Street, Boston



- 2) **Intersection of the south bank pathway with the western intersection of Western Ave.** (at Birmingham Parkway/Arsenal Street) in Boston (Figure 7). This signal does not have a pedestrian light. Therefore, it is left to the path user to guess when it is safe to cross – a potentially hazardous undertaking, especially as the user needs to contend with right-turning traffic that may turn on any phase. Recommended fixes (diagrammed in Appendix B) include:
 - a) Add a pedestrian signalhead with the walk phase operating concurrently with the parallel traffic green light along Soldiers Field Road;
 - b) Place a stop sign and stop bar in the right turn lane from Soldiers Field Road to Western Ave., short of the crosswalk;
 - c) Install “pedestrian crossing” signs on the approaches (Soldiers Field Road right turn lanes westbound, and Western Ave. right lane eastbound); and
 - d) Widen curb cuts to make it easier and safer for opposing bicycle and pedestrian traffic to maneuver at the intersections.

- 3) **Intersection of the south bank pathway with North Beacon Street** in Boston (Figure 8). Users must cross in two steps – the first across a two-lane free-right that has relatively high-speed traffic, and the second across a signalized intersection that does not have a pedestrian phase. The second step also involves contending with right turns from North Beacon southbound to Nonantum Road westbound. Recommended fixes include (diagrammed in Appendix B):
 - a) A pedestrian signal added to the existing light that would operate concurrently with through westbound traffic from Soldiers Field Road to Nonantum Road, along with a signal in the island facing west, and prohibition of right turns on red for traffic eastbound on North Beacon Street to Nonantum Road westbound;
 - b) A signal for right-turning traffic from Soldiers Field Road to North Beacon that would allow an activated pedestrian-only phase requiring the right-turning vehicles to stop;

- c) If (b) is not feasible in the short term due to cost or other reasons, place a stop or yield sign for right-turn traffic from Soldiers Field Road to North Beacon St. short of the existing crosswalk, along with signs warning of the pedestrian crossing.

Figure 7 Crossing With No Pedestrian Signal at Western Ave./Arsenal Street, Boston



Figure 8 Crossing With No Pedestrian Signal at North Beacon Street, Boston



- 4) **Intersection of the north side path with Farwell Street** in Waltham. Since there are curb cuts but no existing signal, a crosswalk is recommended, along with signs warning motorists of the crossing.
- 5) **Crossing of the path from North Beacon Street to Greenough Boulevard** in Watertown (diagrammed in Appendix B). There is no existing signal here. The road is wide and traffic moves relatively fast, and westbound traffic on North Beacon comes over a blind crest on the bridge over the Charles River. Cyclists and pedestrians crossing North Beacon must also contend with left turning traffic from westbound Greenough Boulevard, which waits for the same gaps as the non-motorized crossers. This intersection is a good candidate for traffic calming features such as bulb-outs/neck-downs at the pedestrian crossings. Recommended short-term, low-cost improvements include:
 - a) Creating another curb cut on the north side of North Beacon Street, to provide bicyclists with better visibility of motorists coming over the bridge from the right. The current curb cut is located so that the bridge parapet obscures the view of approaching traffic.
 - b) Restriping the crosswalk and realigning with the new curb cut.
 - c) Placing signage on both the eastbound and westbound approaches of North Beacon Street alerting motorists to the crossing.

In addition to these intersection improvements, curb cuts at the following locations would make it easier for users to access the path system:

- 1) South side, opposite 80 California Street in Newton: Curb cut from the path to the street would encourage bicyclists to use the street instead of the very narrow sidewalk.

- 2) North side, opposite Stop and Shop in Watertown along Pleasant Street.

C. Vegetation Encroachment

A number of sections of the pathway suffer from vegetation encroachment, which reduces the usable width of the pathway, reduces sight distances, and in some cases creates a hazard from collisions with overhanging branches. Volunteer groups such as the Charles River Conservancy, supported by private contributions, have diligently worked to assist the DCR in trimming vegetation. However, the needs far outweigh the ability of the DCR and volunteer groups to keep up with vegetation maintenance. Each year, bushes and shrubs along every section of path should be trimmed back in mid-summer, and encroaching trees and overhanging branches should be trimmed at least every five years. Vegetation that may not be a problem in dry weather may nonetheless pose a hazard under rainy or snowy conditions as branches are weighted down.

Areas where vegetation encroachment problems were noted in the June and July 2006 surveys include:

- 1) North side path from the BU Bridge to River Street in Cambridge (overhanging tree branches and encroaching shrubbery) (Figure 9, 10).
- 2) South side path between Arsenal Street and North Beacon Street in Boston (encroaching trees and shrubbery).
- 3) North side path along Greenough Boulevard in Cambridge/Watertown; specifically, two segments just west of Fresh Pond Parkway and slightly farther west adjacent to a section of guardrail that separates the path from the road.
- 4) North side of the path, along Charles River Road in Watertown between North Beacon and Galen Streets; one particular segment in the middle of this stretch.
- 5) North side, west of Galen Street in Watertown.
- 6) South side, east of Chapel Street in Newton.
- 7) South side, west of Newton Street in Waltham.

Figures 9 and 10 Vegetation Encroachment, Cambridge



Over the course of the summer of 2006, vegetation clearing efforts were noted at some of these locations and the DCR and CRC are to be commended for these efforts. As a result, this list may not represent current conditions. However, it is noted that resources for vegetation clearance still appear to fall short of what is needed to maintain safe trail conditions.

D. Drainage and Debris

Poor drainage in a number of locations along the paths has led to the accumulation of sand and debris on the pathway, creating a hazard especially for bicyclists and in-line skaters. Debris accumulation occurs primarily during and after major rainstorms. It can be addressed on a temporary basis by immediate removal of debris in these problem locations following storms, and on a permanent basis through improvement of drainage. Specific locations where large amounts of debris accumulation as a result of poor drainage was noted during the June and July 2006 surveys include:

- 1) North side path in Cambridge across from Magazine Street (Figure 11);
- 2) North side path in Cambridge between Hawthorne St. and Mt. Auburn Hospital;
- 3) South side path in Boston east of North Beacon Street Bridge (across from Staples); and
- 4) North side path underneath the Eliot Bridge (frequent water accumulation here as well) (Figure 12).

Figure 11 Debris Accumulated on Path, Near Magazine Street, Cambridge



Figure 12 Water and Mud Accumulation, Eliot Bridge, Cambridge



E. Signage and Wayfinding

While the path routes are generally obvious east of Watertown Square, west of this point there are some street crossings and path discontinuities that can make following the pathways a challenge for those unfamiliar with the area. Placement of signs at a few key street crossings and other locations would be a simple improvement that would greatly aid in navigating the Charles River paths. For more detailed recommendations on signage in this area, see the Newton Bicycle and Pedestrian Task Force report (Appendix D). In addition to these wayfinding improvements, it would also be helpful to have wayfinding signs at intersections with pedestrian bridges and city streets elsewhere along the paths.

Specific locations for improved wayfinding and signage include:

- 1) South side, at California and Bridge Streets in Newton;
- 2) North side, Bridge Street in Watertown;
- 3) South side, access paths to Calvary Street and Pleasant Street at site of rail trestle bridge and new pedestrian bridge;
- 4) North/south side, path crossing of river via Farwell Street in Waltham;
- 5) South side, Elm Street in Waltham;
- 6) Pedestrian bridges over Storrow Drive, indicating the streets to which the bridges connect.

Other recommended signage improvements include:

- 1) Warnings to path users of sharp corners and blind turns on path/boardwalk around Sasaki Associates in Watertown;
- 2) Warnings to motorists to watch for bicyclists and pedestrians at crossings;
- 3) Removal of the “bridge closed” sign at the south end of the Thompson pedestrian bridge in Watertown; and
- 4) Amendment of the “**park closed at night signs**” that appear in Boston, for example, on the Arthur Fiedler footbridge to the Esplanade (Figure 14a) to clarify that the path is open (even though the park is closed), which is the official DCR policy.

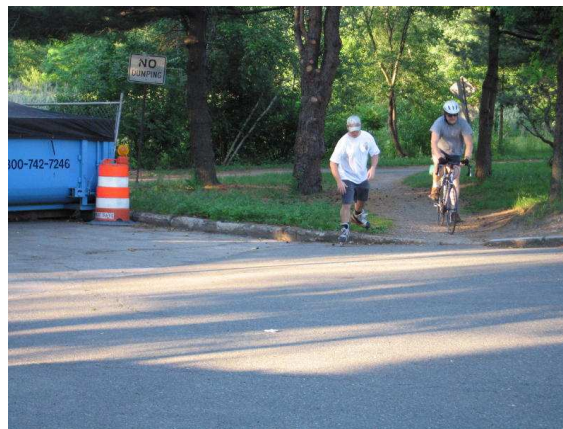
F. Other Miscellaneous Problems

Other miscellaneous problems include:

- 1) **Maintenance equipment placed in the middle of the path.** Dumpsters blocking the path in the parking lot east of Arsenal Street were noted in June 2006 and were still present in August. The blockage is nearly complete, forcing all path users onto a dirt path detour (Figures 13 - 14). This is particularly a problem for inline skaters as well as for bicyclists in wet weather, when the dirt path turns to mud. Examples of leaving equipment, mulch, etc. in the middle of the path also are not uncommon. These problems suggest a potential lack of awareness among some agency staff to the needs of path users and should be addressed comprehensively through adoption of a policy not to block the path, and through internal agency training and education on this policy

- 2) **The entrance to the Charles River Reservation** on the north side of the river at Prospect Street in Waltham is poorly designed, with a granite column partially blocking the entrance and an uneven dirt surface transition to the paved path. This entrance should be at the very least paved and ideally redesigned.

Figures 13 - 14 Dumpsters Blocking Path, East of Western Ave./Arsenal Streets, Boston



IV. Top Priority Projects

The previous section presents a list of identified needs. This section identifies and summarizes the most significant priorities for improvement from this list.

- 1) **Address major pavement problems** such as root heave, expansion cracks, and pavement distress along certain pathway segments. High-priority problem locations include:
 - a) South side, between BU Bridge and River Street Bridge (Boston) – root heave, expansion cracks;
 - b) North side, west of Harvard Bridge across from MIT (Cambridge) – root heave;
 - c) North side, between Larz Anderson and Eliot Bridge (Cambridge) – root heave, expansion cracks, potholes, and drainage issues;
 - d) South side, along Nonantum Road, near Daly Memorial Skating Rink (Boston/ Newton) – root heaves and other pavement distress;

- 2) **Fix major potholes, sinkholes, and other isolated, hazardous bumps.** High-priority problems include:
 - a) South side path in Boston, by the Northeastern Boathouse – sinkhole;
 - b) South side path in Watertown, just downstream from Galen Street/Watertown Square – sinkhole;
 - c) Waltham, near biomedical plant– sinkhole;
 - d) North side path, Cambridge, at railroad overpass near BU Bridge – dangerously large transition between pavement elevations over the bridge.

- 3) **Improve safety at key intersections** by means such as installing pedestrian signals and additional signage, repainting crosswalks, and/or relocating curb cuts. High-priority intersections include:
 - a) South side at Cambridge Street (Boston);
 - b) South side at Western Ave./Arsenal Street Bridge (Boston);
 - c) South side at North Beacon Street Bridge (Boston);
 - d) North side at North Beacon Street (Watertown); and
 - e) North side at Farwell Street (Waltham).

- 4) **Increase the resources dedicated to vegetation removal** to ensure that the path remains clear of overhanging tree branches and encroaching shrubbery.

- 5) **Clear sand and other debris** from isolated sections with poor drainage immediately following major rainstorms.

- 6) **Improve signage** at street crossings and other path discontinuities on the path sections, especially at:
 - a) California and Bridge Streets in Newton;
 - b) Bridge Street in Watertown;
 - c) Farwell and North Streets in Waltham;
 - d) Elm Street in Waltham; and
 - e) Pedestrian bridges over Storrow Drive.

Appendix A Segment Descriptions and Ratings

The general condition of pavement on individual path segments (between bridges) is described and rated on a three-point scale, and also illustrated in Figure A-1:

- **Good** – Generally smooth, even pavement. A few scattered, minor bumps. Major problems, if any, are isolated and non-typical.
- **Fair** – Pavement surface is rough enough to cause some discomfort, but does not pose a serious safety hazard or require cyclists to slow down significantly. Examples: regular expansion cracks; minor but systematic potholes, rippling, root heave, or other distress.
- **Poor** – Pavement surface is systematically rough enough to cause cyclists to slow down, sometimes significantly, and may pose a safety hazard. Examples: Repeated, significant root heave and/or expansion cracks; severe potholes, rippling, or other unevenness.

Segments rated in “poor” condition are recommended for immediate or near-term attention, either for maintenance or capital improvements.

I. South Side Paths – Museum of Science (Boston) to Galen Street (Watertown)

- a) Museum of Science to Longfellow Bridge (Boston) – No data, path currently closed due to park reconstruction.
- b) Longfellow Bridge to Harvard Bridge (Boston) – Good. No major problems, except for an isolated but severe segment of root heave at the west end of the lagoon.
- c) Harvard Bridge to BU Bridge (Boston) – Good.
- d) BU Bridge to River Street Bridge (Boston) – Fair along Turnpike Extension; poor to River Street Bridge. Significant root heave and other distress in this second sub-segment.
- e) River Street Bridge to Western Ave. Bridge (Boston) – Fair.
- f) Western Ave. Bridge to Larz Anderson Bridge (Boston) – Fair. Some thermal expansion cracks, minor root heave, other minor distress.
- g) Larz Anderson Bridge to Elliot Bridge (Boston) -- Fair. Some thermal expansion cracks, minor root heave, other minor distress.
- h) Elliot Bridge to Arsenal Street Bridge (Boston) – Good (north section of Herter Park); poor to fair (south section). The south section through Herter Park has a number of major cracks, and the approach to Arsenal Street Bridge has an awkward and dangerous drop-off to a concrete “shoulder”.
- i) Arsenal Street Bridge to North Beacon Street Bridge (Boston) – Good to fair, with some significant but isolated root heave on one stretch approaching North Beacon Street.
- j) North Beacon Street Bridge to Galen Street (Boston/Newton) – Fair to poor. Poor from North Beacon Street past Daly Rink, where there is significant and pervasive root heave. Fair beyond that point, with some minor pavement distress and isolated major sinkholes.

II. North Side Paths – Museum of Science (Boston) to Galen Street (Watertown)

- a) Museum of Science to Longfellow Bridge (Cambridge) – Good, except for some minor thermal expansion cracking.
- b) Longfellow Bridge to Harvard Bridge (Cambridge) – Fair to good. Concrete path adjacent to parapet, meaning concrete expansion joints but no major pavement distress.
- c) Harvard Bridge to BU Bridge (Cambridge) – Poor to fair. Fairly significant root heaves and other distress in first section adjacent to MIT. Beyond this to the BU Bridge, some significant edge drops and other isolated problems.

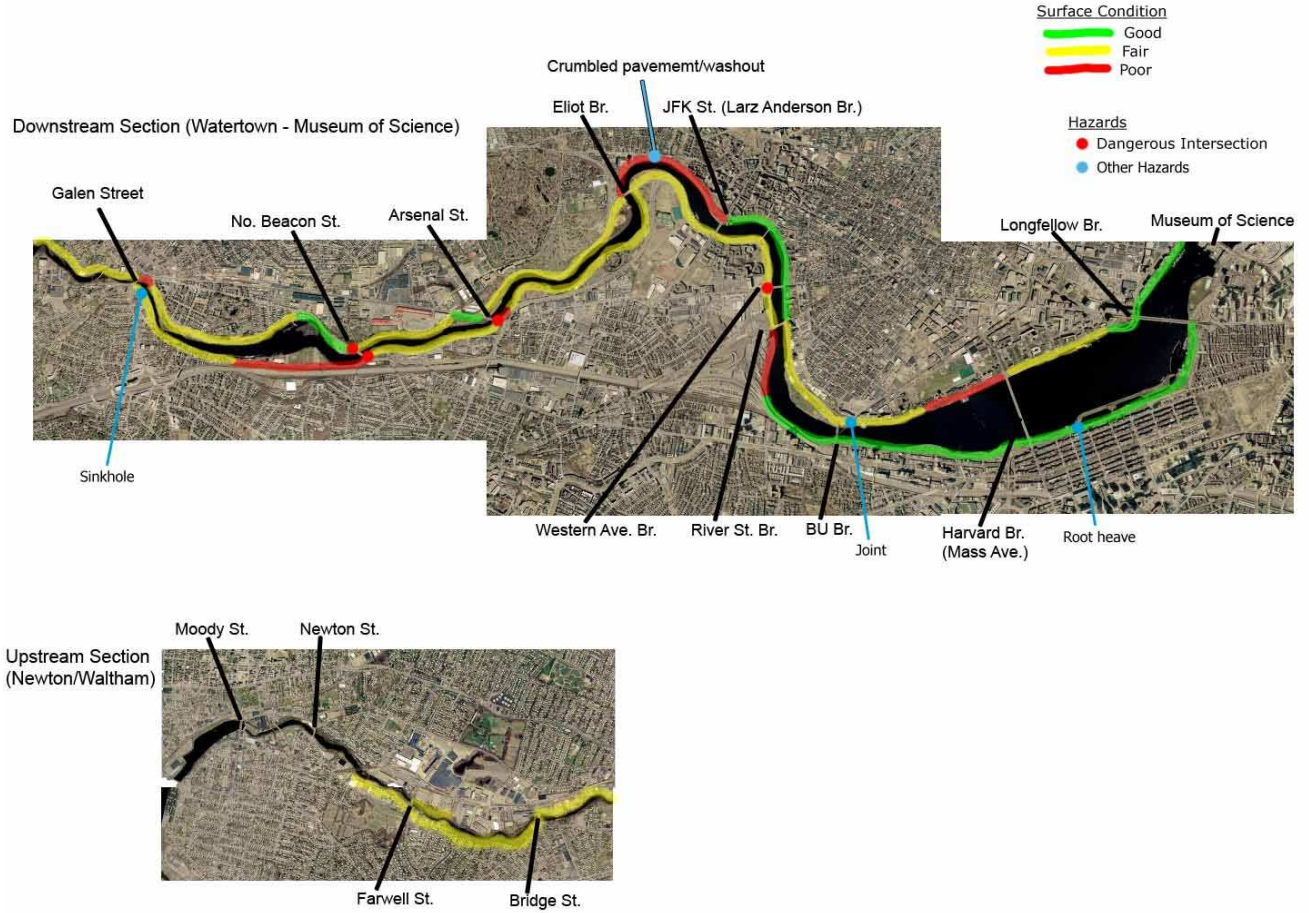
- d) BU Bridge to River Street Bridge (Cambridge) – Fair. Some moderate pavement distress and some isolated more severe problems, including rough driveway transitions at entrances to Magazine Beach.
- e) River Street Bridge to Western Ave. Bridge (Cambridge) – Good.
- f) Western Ave. Bridge to Larz Anderson Bridge (Cambridge) – Good,
- g) Larz Anderson Bridge to Elliot Bridge (Cambridge) – Poor. Major expansion cracks, potholes, and other pavement distress; major edge drops; significant root heave approaching Elliot Bridge.
- h) Elliot Bridge to Arsenal Street Bridge (Cambridge/Watertown) – Fair. Rippling, uneven pavement in many places.
- h1) Arsenal Street segment (Watertown) – Good.
- i) Arsenal Street to North Beacon Street Bridge (Watertown) – Fair to good. Minor rippling along most of path; a few root heaves.
- i1) North Beacon Street segment (Watertown) – Good.
- j) North Beacon Street to Galen Street (Watertown) – Fair. Some isolated but significant bumps on eastern segment, adjacent to lightpoles. Short stretch of rough pavement on steep hill through woods. Another short stretch of very rough pavement (major expansion cracks) at Watertown Square.
- k) Galen Street to Bridge Street (Watertown) – Fair. Generally in good shape but some segments with root heave.

III. Upstream of Galen Street (Watertown, Waltham, and Newton) – Most sections of these paths are relatively new and are therefore in fair to good condition. However, root heave problems do exist in a number of locations. Also, a few locations on the south side where there are dirt paths experienced some washout in the heavy rains of May and June 2006.

Figure A-1 – Path Condition Ratings and Other Hazards, Museum of Science to Galen Street (Watertown Square)

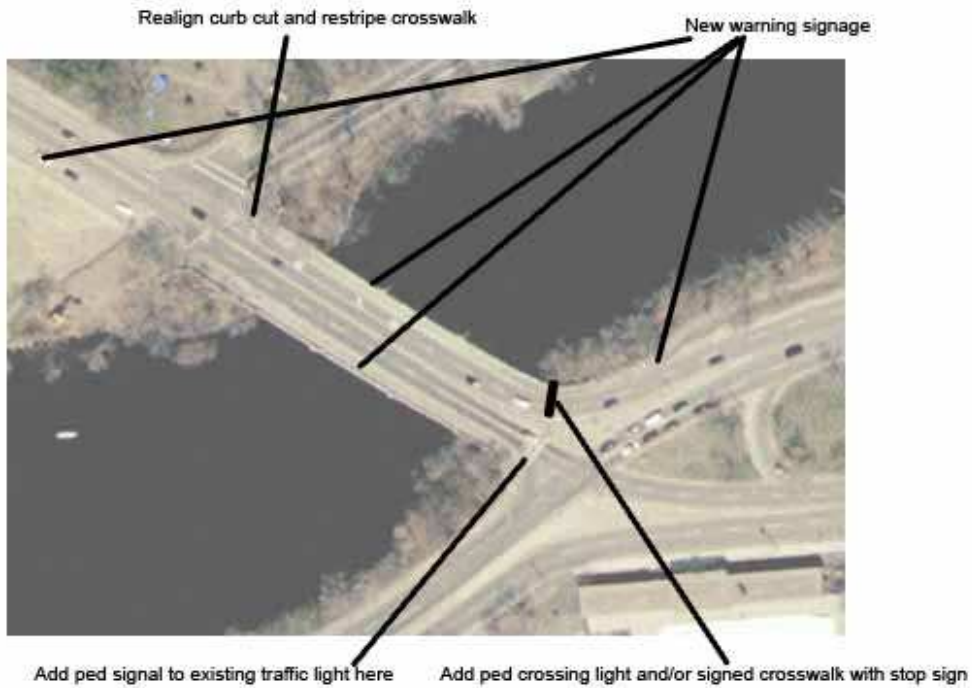
Note: Paths upstream of Galen Street were not fully surveyed for condition ratings. Most are in fair to good condition, with the exception of isolated root heave on asphalt portions and washouts on dirt portions.

Charles River Paths: Condition Assessment and Major Hazards

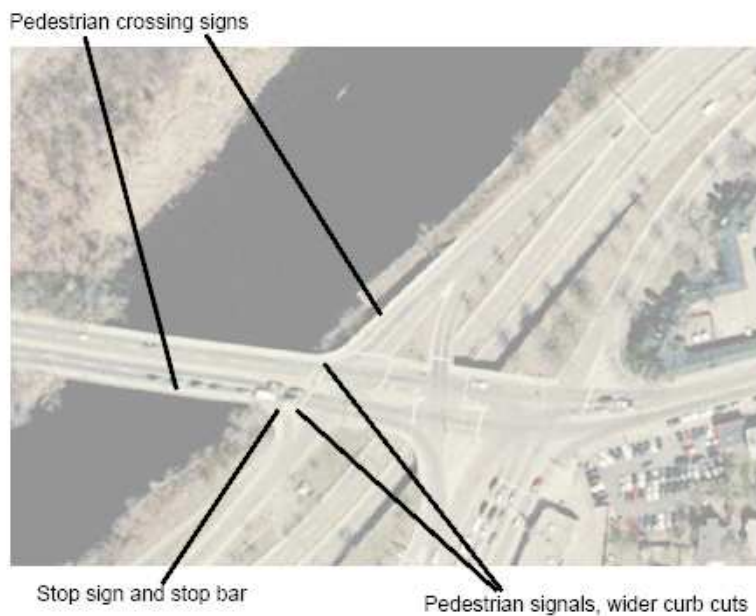


Appendix B Intersection Diagrams

Crossing of the path from North Beacon Street to Greenough Boulevard
& Intersection of the south bank pathway with North Beacon Street



Intersection of the south bank pathway with the western intersection of Western Ave.
(Arsenal St. Bridge)



Appendix C Cambridge Inventory

Nearest downriver cross street	GPS coordinates		Camera #/ ID #s of photos	Type					Severity L[ow]/ M[oderate]/ S[evere]	Extent Part way across path	All the way across	Other/Comments (pavement markings needed, traffic signal issues, drainage...)
	Lat (42: __)	Long (-71: __)		Low/intruding tree branch	Tree root under paving	Other paving drop/bump/ crack	Dirt/plants/ etc narrowing path	Uneven concrete tiles/surface				
Near Museum of Science	22:02.2	04:26.6	1, 2							x	Need connection from path to path	
Between Museum of Science and Longfellow Bridge	21:51.0	04:37.1	7704	x						x	All the way along section	
Longfellow Bridge			3	x						x		
Longfellow Bridge			4, 5, 6, 7			x	x			x		
Longfellow Bridge			8							x	Drainage issues	
Mass Ave	21:38.3	04:50.9	9, 10							x	Drainage issues	
Mass Ave	21:36.9	04:58.0	11, 12, 13			x				x	Cracks in concrete sidewalk - various locations (example)	
Mass Ave			14	x			x				Overhanging vegetation - various locations (example)	
BU Bridge	21:23.1	05:09.5	17, 18, 19, 7711		x						Various locaions	
BU Bridge past MIT boathouse	21:17.6	05:55.7	20, 21, 22			x					Angled path; uneven stone and path	
BU Bridge	21:16.6	06:02.7	23, 24		x					x	End section of major root heave to Harvard Bridge	
BU Bridge	21:12.2	06:19.1	25, 26, 27, 28, 29, 30								Drop off at edge of path	
BU Bridge near MIT boathouse	21:11.8	06:26.0	31	x			x					
BU Bridge near MIT boathouse	21:12.4	06:33.0	7718, 7719					x			Bridge over tracks, difference in elevation	
BU Bridge											Overgrowth blocking sightline	
Magazine St	21:19.7	06:48.2	36, 37, 38				x			x		
At Magazine St	21:22.8	06:52.1	39, 40					x			At crosswalk, rough transition, sediment, and water	
Pleasant St	21:26.2	06:55.0	41, 42, 43					x			Drop off along path	
Pleasant St near Riverside Boathouse	21:59.5	06:56.4	44, 45, 46, 47							x	Drainage	
Flagg St	22:01.9	06:58.5	48, 49				x			x	Dirt across path: begin	
JFK St	22:11.1	07:16.1	50, 51				x			x	Dirt on path: end	
Fresh Pond Pkwy/Eliot St	22:24.3	07:36.5	52, 53			x				x	Large sink hole	
Fresh Pond Pkwy/Eliot St	22:26.8	07:41.7	54, 55, 56, 57, 58							x	Eroding and drop-off	
Fresh Pond Pkwy/Eliot St	22:24.1	07:59.6	59, 60, 61, 62, 63, 64		x					x	Root upheaval - some major	
Under Eliot St Bridge	22:18.0	08:00.9	65, 66, 67, 68, 69, 70							x	Drainage	
Arsenal St/ Grove St	22:07.9	08:05.0	71, 72				x					

Appendix D Watertown/Waltham/Newton Inventory

Item	Location	Observation	Recommendation
1	California and Bridge Streets in Newton, south side of Charles.	No signs pointing way to path on either side of Bridge Street. Yellow "Blue Heron tracks" are a nice touch, but too faint and possibly ambiguous to many users of the path.	Erect signs where path emerges onto sidewalk directing users to the next entry onto the path. See item 14, below.
2	Entrance to/exit from path on California Street opposite end of Chapel Street, south side.	No direct curb cut from California Street.	Add curb cut directly in front of path to accommodate users approaching from or leaving to California Street.
3	Opposite Victory Field, Newton, south side.	Rambunctious dogs, even when playing with owners. might run onto path, interfering with bicyclists and pedestrian users.	Erect low fence parallel to path and several yards from it to deter animals (and children?) from running onto path.
4	A few hundred yards east of Chapel Street (Newton/Watertown?), south side.	"Root heaves", bush branches intruding on pathway.	Remove roots or at least paint them for visibility; trim weeds and branches to path border and 8-10 feet above the path.
5	Opposite 80 California Street, south side.	No curb cut to path from street; path goes to sidewalk which is too narrow for safe use by bicyclists and pedestrians.	Add curb cut directly in front of path to accommodate users approaching from or leaving to California Street.
6	South end of Thompson pedestrian bridge.	Sign advising that bridge will be closed in May 2004.	Remove sign.
7	Just east of Thompson bridge, south side.	Unpaved path to left offers alternative route for bicyclists closer to river bank.	Direct bicyclists off sidewalk to unpaved path to increase safety on sidewalk. Others can use path if they choose.
8	Galen Street bridge near Watertown Square, Watertown, both sides.	There are no directions for safely crossing Galen Street in either direction or on either side of the river.	Signs directing riders (or walkers) to the most appropriate crosswalk(s) and possibly signs alerting auto drivers to pedestrian activity.
9	North side, just west of Galen Street, Watertown.	Root heaves, narrow, weed trimming needed.	Remove roots or at least paint them for visibility; trim weeds and branches to path border and 8-10 feet above the path.
10	North side, Sasaki Associates deck and bridge.	No signs to warn of sharp right and left blind turns in path.	Post signs warning of blind turns and need to reduce speed.
11	North side, Thompson pedestrian bridge, municipal swimming pool.	Bike path diverts left onto unpaved track with drop from pavement.	Grade the transition from the paved to the unpaved path. Post sign directing bicycles to unpaved path to avoid requirement to walk bicycles on direct paved path past pool.
12	North side, west of municipal swimming pool.	Root heaves, narrow, weed trimming needed.	Remove roots or at least paint them for visibility; trim weeds and branches to path border and 8-10 feet above the path. Trim at turns to increase sight lines.
13	North side, "River Loft" offices.	Root heaves, narrow, weed trimming needed. Roots also about one-quarter mile further west.	Remove roots or at least paint them for visibility; trim weeds and branches to path border and 8-10 feet above the path.
14	North side, Bridge Street.	No signs pointing way to path on either side of Bridge Street. Yellow "Blue Heron tracks" are a nice touch, but too faint and possibly ambiguous to many users of the path.	Erect signs where path emerges onto sidewalk directing users to the next entry onto the path. See item 1, above.
15	South side, unpaved path west of Bridge Street.	Some washing out of dirt path, presumably from recent heavy rains.	Refill and compact ruts from time to time to prevent uncomfortable or dangerous conditions.
16	South side, westbound at site of MDC (DCR) work site trailer at end of Fessenden Road (Schofield Drive? - check which one).	Entrance to path is unrestricted to motor vehicles, cluttered with small stones, coarse gravel, and pieces of equipment.	Clean up and narrow entrance to path or close off entrance (less desirable!).
17	North side (west of Blue Heron bridge) access from Stop and Shop parking lot, Watertown.	No curb cut from parking lot to sidewalk coming from Pleasant Street, making bicycle access less easy.	If property rights allow, construct curb cut from parking lot to sidewalk from Pleasant Street.