



BLACKSTONE RIVER BIKEWAY

Segments 3, 4, & 5

Blackstone River Valley National Heritage Corridor

2017



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Overview

Created by an act of Congress in 1986, the John H. Chafee Blackstone River Valley National Heritage Corridor is where the industrialization of America began with the first water-powered cotton mill in Pawtucket, Rhode Island. The development of mill villages followed along the Blackstone River and its tributaries, spreading out across the valley in a pattern that can still be seen and experienced today in both Rhode Island and Massachusetts.

The Blackstone River Bikeway is a 48 mile long route connecting Worcester, Massachusetts with Providence, Rhode Island. The Bikeway generally follows along the historic Blackstone River and is a combination of an off-road multi-use path and on-road facility. About 20 miles of the route is in Rhode Island and 28 miles is in Massachusetts. The Bikeway travels an historic region, passing through a variety of historically- and culturally- significant landscapes including rural farmland and mill villages as it flows from Worcester to the Slater Mill in Pawtucket and on to the upper Narragansett Bay.

“I understand you taught us how to spin, so as to rival Great Britain in her manufactures; you set all these thousands of spindles at work, which I have been delighted in viewing, and which have made so many happy, by a lucrative employment.”

- President Andrew Jackson to Samuel Slater (of Slater's Mill)

The 2,900-mile long East Coast Greenway, which stretches from Calais, Maine to Key West, Florida, follows the Blackstone River Bikeway in this area. As of December 2016, approximately 50% of the 48 mile long Bikeway was complete and the remaining segments were in various stages of design and construction.

SCOPE OF STUDY

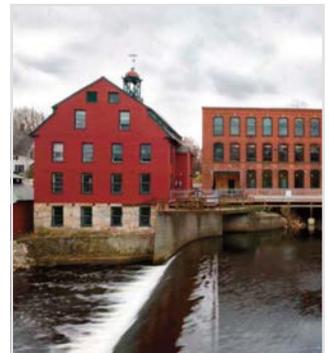
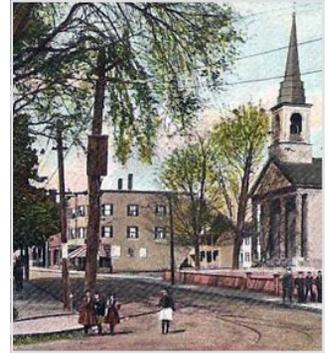
Blackstone Heritage Corridor, Inc. (BHC) is the nonprofit management entity for the John H. Chafee Blackstone River Valley National Heritage Corridor. The Corridor encompasses more than 720 square miles and 25 cities and towns located in south-central Massachusetts and northern Rhode Island. Since the non-profit organization was formed in 2010, BHC has worked with community partners to continue to work to preserve and promote the Valley's historic, cultural, natural and recreational resources for current and future generations. BHC will continue to lead efforts to develop the Blackstone River Bikeway as part of its mission.

Design and construction of the Bikeway has benefitted from strong support of the Corridor's Congressional delegation. The region's Senators and Congressional members have consistently encouraged state agencies to advance the project, and have ensured millions of dollars in federal funding to support the work. In Rhode Island, the Department of Transportation (RIDOT) works cooperatively to design and construct the Bikeway before turning it over to the Department of Environmental Management (RIDEM). Most of the Bikeway in Rhode Island was completed and most remaining segments were in construction and/or nearly ready for construction pending final permitting.

In Massachusetts, the Bikeway was at first marshalled through the Highway Division of the Massachusetts Department of Transportation (MassDOT). Construction of more than 3.5 miles of Bikeway in Millbury and Worcester was mostly completed in 2006 but the off-road portion of this segment had yet to be conveyed to the Department of Conservation and Recreation (DCR). North of this segment, the final stretch into downtown Worcester was designed as a separated "cycle track" and is anticipated to be constructed within the next two to three years.

More recently, MassDOT transferred funding to DCR to support rehabilitation of several bridges along the Southern New England Trunkline Trail in Blackstone, Millville, and Uxbridge. Most of this 4.2 mile-long stretch was completed as an off-road multi-use path late in 2016 and nearly connects the Bikeway to the Rhode Island state line.

The remaining stretch, between the newly-constructed Bikeway in Uxbridge and the section in Millbury, is about 20 miles long in Uxbridge, Northbridge, Grafton, Sutton and Millbury and includes a stretch through the Blackstone River and Canal Heritage State Park. Development of the 13-mile stretch of the Bikeway between the north end of the State Park and the existing path in Millbury, known as a portion of Segment 3 as well as Segments 4 and 5 (Segments 3, 4, and 5), faces many challenges.



For example:

1. **There are numerous areas of wetlands and floodplains, as well as areas of steep topography, which pose permitting, design, and construction challenges.**
2. There is little, if any, of this area that is publicly owned and available for development of the Bikeway.
3. Public funds cannot be applied to projects on private property. Yet the state agencies are reluctant to accept property until there is a design plan showing exactly what land is needed for the project.
4. Even those eager to donate property for the purpose of developing the Bikeway face costs associated with legal and survey work. Again, public funding can be used only after land is publicly owned, so it cannot be used for the work required in order to donate the land.

The purpose of this study is to review existing information and studies in order to provide preliminary recommendations that support development of a Bikeway alignment through an approximately 13-mile portion of the Blackstone River Bikeway corridor in Massachusetts that is known as Segments 3, 4, and 5. The information and recommendations documented herein are intended to assist in conceptual Bikeway design. The alignment recommendations were developed in consultation with personnel in the Planning Departments of the towns where the proposed Bikeway is aligned.

As the design process continues beyond this conceptual planning phase, factors such as landowner negotiations, funding availability, safety, constructability, state **and local permitting, and evolving design standards will result in refinement of the Bikeway alignment.** The resolution of these and other implementation issues will be an iterative process over time to complete the Bikeway and the recommendations documented herein are intended to be potential initial steps to consider to promote progress in that iterative process.

This memorandum is organized with initial sections documenting some best management practices in the layout and design of bike trails. The second section, "Proposed Alignment", outlines some of the challenges and impediments in a potential initial layout of the bike trail with the intent of offering tangible recommendations for actions to further the iterative process of Bikeway implementation. The segments evaluated in this second section run from the area known as Plummer's Landing, at the north end of the Blackstone River and Canal Heritage State Park, north through Northbridge, Grafton, Sutton, and into Millbury where the Bikeway connects with the existing Bikeway, near the Route 122A exit of Route 146. The resulting potential alignment must be reasonably achievable in terms of cost-effectiveness, land rights acquisition, practicality of design geometry and materials, and environmental sensitivity.

Alignment (existing or proposed) of the Blackstone River Bikeway in Massachusetts

State/ Segment	Comment
<p>Massachusetts</p>	<p>The 1+ mile-long section between Union Station and Crompton Park is in design as a cycle track, a designated bike path along the roadways but segregated from automotive travel. South of Crompton Park, ride on-road along Millbury Street to Blackstone River Road.</p> <p>The Quinsigamond Bike Spur now connects the new Visitor Center site with existing bike paths on Blackstone River Road.</p> <p>From Blackstone River Road, ride the existing 2.6 mile off-road path into Millbury.</p> <p>At the edge of Quinsigamond Village, the Blackstone Heritage Corridor Visitor Center at Worcester is in now in construction and BHC is looking to the interpretive and site use possibilities! Stay tuned to the Blackstone Heritage Corridor web page for more information.</p> <p>Blackstone Heritage Corridor Visitor Center at Worcester, located off McKeon Rd. in Quinsigamond Village, Worcester. <i>Theme: The Enduring Legacy</i></p> <p>https://blackstoneheritagecorridor.org/exploring-the-blackstone-river-valley/visitor-centers/</p>
<p>Worcester</p>	<p>This 20-mile section has many challenges and is not yet ready for construction. Since design standards for bikeways have changed over the years, it is no easy thing to locate a path that will meet those requirements without altering the landscape. The MA Dept. of Conservation and Recreation is working to identify opportunities to develop the entire Greenway and hopes to include a variety of trails along the Blackstone River corridor. Additionally, BHC continues to coordinate signage for on-road route for a section of the Blackstone River Bikeway.</p> <p>The on-road route shown here (dashed line) is one of several routes a streetwise rider can take to enjoy the scenery and history along the Blackstone River and throughout the Blackstone River Valley National Heritage Corridor.</p> <p>This section includes the 3.5 mile-long trail along the Blackstone River and Canal system through the Blackstone River and Canal Heritage State Park in Northbridge and Uxbridge. The Visitor Center at River Bend Farm offers interpretive resources and visitor services.</p> <p>Blackstone Heritage Corridor Visitor Center at River Bend Farm, Blackstone River and Canal Heritage State Park, 287 Oak Street, Uxbridge. <i>Theme: From Farm to Factory</i></p> <p>https://blackstoneheritagecorridor.org/exploring-the-blackstone-river-valley/visitor-centers/</p>
<p>Millbury Sutton Grafton Northbridge Uxbridge</p>	<p>This is a 4.2 mile-long section. More than 3.5 miles is in construction and nearly complete!</p> <p>The 3.7 mile multi-use path follows the former railroad line between South Uxbridge, Route 146A, through Millville and to the Blackstone Depot site. The construction project also included work on the incredible Triad Bridge and brings cyclists past the Millville Lock, one of the best remaining examples of the canal and lock system that made the Blackstone so great!</p> <p>The half-mile section connecting the Blackstone Depot to the MA/RI state line is also in evaluation and preliminary design. In the meantime, it's an easy route on-road to connect to the segment in Woonsocket.</p>
<p>Uxbridge, Millville, Blackstone</p>	<p>Websites of Interest</p> <p>www.blackstoneheritagecorridor.org Explore the Blackstone River Valley! Your guide to the National Heritage Corridor.</p> <p>www.exploreri.org - water trail maps for the Blackstone River in Mass. and RI.</p> <p>Key Contacts (MA)</p> <p>Project Manager - DCR</p> <p>Dan Driscoll 617-626-1438 dan.driscoll@state.ma.us</p> <p>Blackstone River Valley National Heritage Corridor, Inc. (BHC) For more information and updates please call us at 508-234-4242 or visit us online at www.BlackstoneHeritageCorridor.org</p>

BIKEWAY AND TRAILS

- Completed Bikeway
- - - Temporary on-road route
- Future Bikeway
- Other long-distance trails

SPECIAL STOPS ALONG THE WAY

- P Parking

BLACKSTONE RIVER BIKEWAY MASSACHUSETTS

The goal of trail building is to create a long-term relationship between humans and nature. This is only possible through a clear understanding of the needs of each trail related agency laced with a healthy dose of day-to-day reality. Planning and responsibility are the keys to success. Learning how to build a trail is an ongoing, never ending process with each section of trail to be constructed a new challenge. The trail designer/constructor learns over time the nuances of the forest, rocks and streams and how important it is to build a sustainable trail that is easy to maintain and becomes a natural part of the landscape.

From "Pathways to Trail Building" by

Tennessee Department of Environment and Conservation

OVERVIEW OF CONCEPTUAL DESIGN PROCESS

Typical of a multi-property Bikeway in the conceptual design phase, the current preferred and alternate alignments for Segments 3, 4, and 5 have many challenges that can be addressed iteratively with continued proactive planning, stakeholder engagement, and creative design. For instance, because design standards for Bikeways have changed over the years, achieving a design that balances current requirements, such as continuous accessibility, with protection of the surrounding landscape warrants careful consideration.

Since the route roughly parallels the river, there are unique natural terrains, including steeply sloping river valleys, which will need to be taken into account. There are also environmentally-sensitive areas, such as wetlands, floodplains, and protected wildlife habitats, as well as historical and archaeological resources. While such challenges must be considered during the design phase, Bikeway proponents should not view them as hurdles that will preclude successful completion. Rather, they should be viewed as opportunities to promote the Bikeway as a viable land use option, and assets which could ultimately enhance the users' experience. In this manner, the Massachusetts DCR is working with BHC to identify opportunities to develop the entire Bikeway and include a variety of trails and settings along the corridor.

Negotiating with property owners is also a challenging but manageable component of the Bikeway design process. Almost all of this approximately 13-mile section is privately owned. Many of the properties are owned by individuals, but there are also large portions under the control of utility companies (National Grid and New England Power Company) and the Genesee & Wyoming (formerly Providence & Worcester) Railroad Company. With railroads running generally along the river, the railroad may want to retain the opportunity for a second track in some locations.

GOALS & OBJECTIVES

One of BHC's key legacy projects is the coordination of efforts in both the State of Rhode Island and the Commonwealth of Massachusetts to ensure development of the Blackstone River Bikeway. This transportation and recreation project will ultimately be approximately 48 miles long and will connect New England's second- and third-largest cities by bicycle, primarily with a fully-accessible, off-road, multi-use path along the Blackstone River.

Best Practices

Trail design is one of the most important factors to ensure that the route offers optimum scenic, geologic, historic, cultural, and natural settings to provide a variety of experiences for the trail user. Trail design is the critical connection to make the Bikeway sustainable and compatible with the natural environment, as well as to minimize future maintenance. Each trail or Bikeway project is unique and design adjustments will be necessary to achieve the best results.

The Forest Service has an effective list of Trail Opportunities and Constraints for consideration when designing an alignment in the Trails Management Handbook (available at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5403600.pdf). Many of these guidelines and requirements are the same as those found in the Massachusetts Department of Conservation and Recreation's Trails Guidelines and Best Practices Manual (DCR Manual), which can also be found online at <http://www.mass.gov/eea/agencies/dcr/services-and-assistance/grants-and-technical-assistance/dcr-guidelines.pdf>.

Some of the considerations from that list that may be applicable to the Blackstone Valley Bikeway Segments 3, 4, and 5 are:

-
- ***Whether a right-of-way is needed across private property to provide the best trail location.***
 - ***Whether additional resources are needed to enforce applicable regulations and restrictions.***
 - ***Whether little-used or deteriorated facilities can be renovated in lieu of new construction to offer the planned trail opportunity.***
 - ***Whether the potential exists to provide supplemental facilities such as trailhead parking, water and sanitation facilities, and educational facilities.***
 - ***Whether adequate resources, such as funds, personnel, and equipment, are available for trail development and maintenance.***
-

The Best Practices mentioned in this document do not investigate management and funding possibilities but focus on the physical design and alignment of the Bikeway.

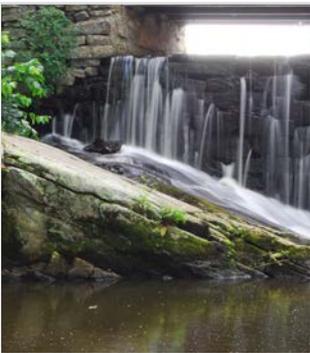


DESIGN AND ALIGNMENT

With the Blackstone River Bikeway already identified in general alignment, many of the design and alignment recommendations for Segments 3, 4, and 5 discussed herein are more detailed. The National Heritage Corridor is rich with important historic features and the river provides extensive natural beauty so the alignment should take advantage of and, where practical, provide access to these resources.

Incorporating Points of Interest

The best trail and bikeway designs take into consideration the historic and cultural assets that are associated with the region and make it unique. Given the rich history of the Blackstone River Valley, there are plenty of man-made cultural and historic elements throughout the Corridor. Many of these have already been identified on the maps of the current alignment, but the specific views and approaches will need to be revisited as the Bikeway design is refined or re-aligned. At old bridge sites, abutments are good features. At historic mill or home sites, care is required around wells or cisterns, while avoiding active farmland is very important. Educational and interpretive signage will also be necessary.



Natural features should be the initial consideration during the design process given that the Bikeway alignment should follow the Blackstone River as closely as possible. All bodies of water are part of a larger interconnected web; an action on the River can potentially influence downstream water quality. Therefore, when developing a bikeway adjacent to surface waters, maintaining water quality and mitigating erosion are paramount.



Hydrological features such as ponds, lakes, cascades, or waterfalls are good points of interest along the Bikeway. While creating conditions that must be considered in the design and material selection, streams should be considered valuable natural assets. The moisture in riparian environments supports many plants and wildlife species not found in the surrounding upland areas. Advantage should be taken of natural terraces running adjacent to streams and the river. However, high moisture conditions can make the Bikeway muddy so use of well-drained surface materials or boardwalk structures may be appropriate at low-lying areas. Building a bikeway in a wetland or on conservation land can provide fascinating features and a unique experience. Yet, protection of flora and fauna that comprise these sensitive habitats will be critical.



Geologic features, such as bluffs or bedrock outcroppings, are also good points of interest, along with sand beds and glacial deposits. More commonplace landscapes, such as large-growth woodlands and wildflower meadows, can also provide points of interest. It is recommended that areas infested with exotic species such as privet, bush honeysuckle, kudzu, and multiflora rose be avoided. As landscape is seasonal, if features such as flowers are used, then it is also important to consider how the location will appear when the particular plant is not in bloom.

While not truly “Points of Interest”, it is also important to incorporate facilities and supporting uses as part of the Bikeway design. Bathroom facilities, picnic areas, and simple rest stops should be located at appropriate intervals to accommodate a variety of bikeway users. This should include providing changing tables in **bathrooms. Identification of nearby food stores and restaurants should also be considered** as part of the Bikeway mapping. Highlighting these amenities should be coupled with encouraging the business proprietors to provide bicycle parking.



Leveraging Existing Terrain

The alignment should mirror the topography along the river, so the Bikeway will naturally meander. However, there may still be long straight sub-segments where the alignment parallels the railroad. Since straight trails are not as aesthetically pleasing, designing slight right and left curves into the Bikeway will be necessary to avoid a highway effect. It is generally recommended that sight distance should be 150 feet ahead of the Bikeway user.

To protect the natural resources along the Bikeway, there should be horizontal separation between the edge of water bodies or environmentally sensitive areas. The DCR Manual reminds trail developers that activities occurring within 200 feet of a perennial stream or river and within 100 feet of an inland wetland are subject to the Wetlands Protection Act. Trail building is also subject to review by the Massachusetts Natural Heritage and Endangered Species Program and the Massachusetts Historic Commission.



Steep areas present situations where careful Bikeway location and design is essential. When possible, avoid locating Bikeway routes on steep slopes. However, where soils are deep and side slopes are not excessive (greater than 25%), well-designed and constructed Bikeways should have few problems and provide opportunity for varied terrain. For example, instead of following the ridge crest, the Bikeway should meander from one side to the other to add variety to the user experience. Furthermore, when approaching cliffs or steep banks, it is more interesting to route the Bikeway 50-100 feet back away from the edge, and identify nearby scenic overlook opportunities with signage. These signs should also alert the trail user of the high cliffs.



Efforts should be made to avoid switchbacks. However, where space is limited or obstacles are present, switchbacks may be necessary. Ideally, switchbacks are located in dense brush or through other obstacles to prevent Bikeway users from shortcutting the switchback. It is considered best to avoid short switchback sections of less than 500 feet and grades can be increased for short distances entering and exiting the switchback to increase the elevation change and broaden the distance between the upper and lower Bikeways.

Accessibility

While not specifically applicable to bikeways, the Massachusetts Department of Conservation and Recreation’s Trails Guidelines and Best Practices Manual refers to the Forest Service Trails Accessibility Guidelines (FSTAG) for guidance regarding accessibility. This guidance can be found at <http://www.fs.fed.us/recreation/programs/accessibility/FSTAG.doc>. As an addition to those guidelines, there is **further clarification found in the Architectural Barriers Act Accessibility Guidelines; Outdoor Developed Areas** (effective November 25, 2013) found online at <http://www.access-board.gov/attachments/article/1500/outdoor-rule.pdf>, and the Massachusetts Architectural Access Board Rules and Regulations found online at <http://www.mass.gov/eopss/consumer-prot-and-bus-lic/license-type/aab/aab-rules-and-regulations-pdf.html>. While it is good practice to incorporate as much accessibility into the design as possible, these guidelines only apply to trails with a designed use of Pedestrian/Hiker or at trailheads and developed areas.



technicalities [tek-ni-kal-i-tees]

noun (pl). **petty formal points arising from a strict interpretation of rules, etc.**



TECHNICAL DESIGN ELEMENTS

Dimensions

Trail designers often look to the American Association of State Highway and Transportation Officials' (AASHTO) design guidelines as the standard for multi-use trail widths. AASHTO recommends a minimum of 10 feet for multi-use trails; however, where heavy use is anticipated, a 12- to 14-foot width is recommended. For solely pedestrian-use trails, the clear tread width of trails should be 36 inches minimum and an accessible trail requires 60 inches wide. Occasionally, providing separate, parallel paths (or treads) for different users may be desirable. For example, a primary, hard-surfaced path can be provided exclusively for bicyclists, with softer shoulders set aside for pedestrians. AASHTO also provides recommendations for minimum horizontal curve radii. Using the average design speed of 18 mph for recreational bicyclists, a minimum radius of 60 feet is recommended in Table 5-2 of the guidelines.



A vertical clearance of at least 8 feet, with 10 feet needed for overpasses and tunnels, is preferred. Natural elements such as tree branches are not required to comply with the technical requirements for protruding objects in the Architectural Barriers Act Accessibility Guidelines. However, trail managers should maintain the vertical clearance along the trail, as well as any resting intervals or passing spaces, to provide a minimum of 80 inches of vertical separation between tree branches and the ground. Additional vertical clearance may be called for in specific cases, such as when passing beneath electrical transmission or distribution lines.



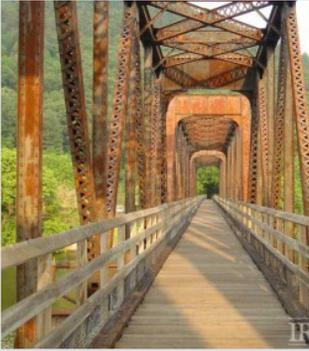
Slopes & Crossings

Ideal grades, over long distances, are less than 3% (typical for former railroad corridors), although up to 5% is acceptable. Mountain bikers are considered a separate user group, as they tend to seek out more challenging trails with steeper grades and uneven surfaces. The cross-slopes (transverse slopes) of trails are recommended by both AASHTO and FSTAG to be less than 1:48 (2%). Where the surface is other than asphalt, concrete, or boards, cross slopes not steeper than 1:20 (5%) are permitted when necessary for drainage.



As mentioned in the preceding Accessibility section, FSTAG do not apply but the recommendations do provide good goals. The slopes and distances allow no more than 30% of the total trail length to exceed a trail grade of 1:12 (8.33%). In sloped sections, a trail grade of up to 1:12 (8.33%) is permitted for distances up to 200 feet (61 m). The trail then transitions from the sloped sections to flatter resting intervals. Steeper grades are allowed for shorter distances: grades of up to 1:10 (10%) are permitted for up to 30 feet, and as high as 1:8 (12.5%) for up to 10 feet with resting intervals at the same respective distances.

Careful location of road crossings is extremely important. Visibility for crossings with heavy traffic should be a minimum of 500 feet in both directions. All crossing locations should be checked with the local managing agencies, such as departments of public works or the MassDOT, depending on the legal ownership of the right-of-way.



One of the advantages of a railroad right-of-way is that it provides a dedicated corridor that minimizes interactions with vehicles and un-signalized intersections.

Bridges are among the most challenging and expensive elements of multi-use trail design and development but can also be points of interest. The River and Stream Continuity Partnership of the University of Massachusetts, The Nature Conservancy, American Rivers, and the Massachusetts Division of Ecological Restoration also have River and Stream Crossing Standards that include span width recommendations and construction best practices. There are also general recommendations from a variety of sources specifically for trail bridge widths. These include the recommendation that bridges should, at a minimum, match the width of the trail with typical railing heights of 42 to 48 inches. In cases where the bridge crosses a roadway or railroad, a high, protective screening or fence (72 to 96 inches) should also be provided. Also, stream flows are subject to fluctuations, sometimes over 10 feet in height. Therefore, finding the best location for the bridge is very important. The lowest part of the bridge should be at least 5-10 feet above the highest flood level to allow the safe passage of water and debris during severe flood events.



Trail Heads

A trailhead is simply an access point to the trail or Bikeway. While visibility is important to encourage use of the Bikeway, environmental sensitivity and local character should also be considerations. An access point should be designed with naturally-appearing grading and site drainage and can be a point of interest if sited at hillside edges, among trees and rocks, or behind landforms rather than out in the open. Arrival sequences should be considered from the arriving visitor's viewpoint, often by car to the parking area, and the trail user's view, in passing or on return. Parking should be in a convenient area without distracting from the visual quality of the trail entry experience or other site uses. Directional signs will be needed so the visitor can easily identify and reach the trailhead.



Parking is one of the key elements at a trailhead, particularly where a point of interest or other attraction creates a destination that is not easily accessible except by long approaches from other access points. Look for opportunities or techniques that can be used to minimize the impact of parking including re-purposing existing disturbed areas, adopting low-impact and green infrastructure techniques, limiting parking spaces to a number that is appropriate for the location, using multiple small lots instead of one large lot, installing landscape screening, and preserving natural features. Overflow parking or shared parking with nearby properties should be considered as a way to minimize the impacts and costs associated with new construction. At some locations, parking or access for oversized vehicles may be necessary to accommodate construction, maintenance, or emergency response. Site circulation must be studied and bicycle racks should be located conveniently, but in a manner that minimizes bicycle/pedestrian/vehicle conflicts.



Additional facilities might be appropriate at some of the larger and potentially more popular trailheads. These decisions should not be made on a "space available" or site plan viewpoint alone because many of the ancillary components of the trailhead require more management and maintenance. Potable drinking water,



picnic tables, and trash containers require management. Lighting, if provided, should remain minimal, relate to site structures and context, and follow “dark sky” principles, which advocates minimizing light pollution and protecting ecosystems by using specific types of light fixtures and operating guidelines.

Construction Materials

There is a wide variety of materials available for trails and Bikeways, so the designated use will be the deciding factor, along with costs and constructability concerns.

Crushed stone is popular as a trail and Bikeway surface because it drains well and is durable under heavy use. It can also complement the aesthetic of the natural landscape and accommodate many trail users if crushed and compacted properly. Because crushed stone can be made of nearly any type of rock, including limestone and sandstone, it is one of the most readily accessible trail surface types. Whenever possible, local materials should be used for construction.



Soil cement is a mixture of pulverized native soil, Portland cement and water, rolled and compacted into very dense surface. It is cheaper than asphalt, but implementation of measures to allow adequate drainage is very important to prevent erosion and deterioration of the trail.

Asphalt is another, smoother option, but may need to be repaired frequently due to freeze/thaw cycles, and it retains heat in the summer. Constructing an asphalt path with a deep base and a course below finished grade may improve its durability.



Concrete is the best surface for withstanding flood conditions, especially with transverse saw cuts to relieve pressure. However, the advantage comes at a high price; concrete paths are the most expensive trail surface to install and repair. The cost of surfacing a trail with asphalt or concrete may be prohibitive in the beginning stages of trail building. A viable approach to Bikeway construction and improvement over time may include starting from a softer surface like soil or crushed stone, and then adding a harder surface like asphalt or concrete once the amount of trail use is observed and funding is available.

In settings where decking is necessary, such as on bridges or boardwalks, the spaces between the boards should not allow passage of a sphere more than 1/2 inch in diameter. The openings should also be placed so that the long dimension is perpendicular, or as close to perpendicular as possible, to the dominant direction of travel. The decking surface should be durable and non-slip; avoid steel grating because it is very slippery for bicycles when wet.

SUMMARY

Much of the information in this document may be familiar to project proponents given the length of time since the Blackstone River Bikeway was conceived.



“It were happy if we studied nature more in natural things, and acted according to nature, whose rules are few, plain, and most reasonable.”

WILLIAM PENN Some Fruits of Solitude, 1693

While materials and construction technologies may change over time, there are some basic sustainability principles that all Bikeway segments must follow:

- Support current and future use with minimal impact to the area’s natural systems.
 - Produce negligible soil loss or movement while allowing vegetation to inhabit the area.
 - **Recognize that pruning or removal of certain plants may be necessary for proper trail construction and maintenance.**
 - Avoid adversely affecting the area’s wildlife.
 - Accommodate existing use while allowing only appropriate future use.
 - Require little rerouting and minimal trail maintenance.
- From the National Park Service, Rocky Mountain Region, January 1991

A trail should always respect the environment in which it is located, from design and construction through long-term use. Sensitive design considerations can improve the **aesthetics, usability, and maintenance of a trail**. As the design is finalized and constructed, careful decisions must be made regarding the use of recycled materials versus natural materials. While aesthetics can be an important factor, the long-term durability and maintenance requirements must also be balanced. Recycled materials offer design versatility, often have a long life span, and require less long-term maintenance than similar products constructed from natural materials but may be more expensive to initially purchase and install.

This section is an overview of best practices for the elements involved in trail design. There are numerous additional sources for more in-depth information and design development standards, some of which are listed below:

- <https://americantrails.org/resources/railtrails/index.html>
- <http://www.railstotrails.org/build-trails/trail-building-toolbox/trail-building-and-design/>
- Guide to the Development of Bicycle Facilities. American Association of State Highway Transportation Officials (AASHTO), 2012.
- **2009 Manual on Uniform Traffic Control Devices (MUTCD)**. U. S. Department of Transportation, Washington, DC, updated 2012.
- Federal Trail Data Standards - <http://www.nps.gov/gis/trails/>
- American Trails <http://www.americantrails.org/resources/planning/index.html>
- Federal Highway Administration - Bicycles and Pedestrian Program - http://www.fhwa.dot.gov/environment/bicycle_pedestrian/overview/
- Rails-to-Trails Conservancy - www.railtrails.org
- U.S. Department of Transportation - <http://www.pedbikeinfo.org/>
- United States Access Board - <http://www.access-board.gov/>
- Trails for the Twenty-First Century: Planning, Design, and Management Manual for Multi-Use Trails Revised Edition by Charles Flink (Author), Kristine Olka (Author), Robert Searns (Author), Rails to Trails Conservancy (Author), David Burwell (Foreword)



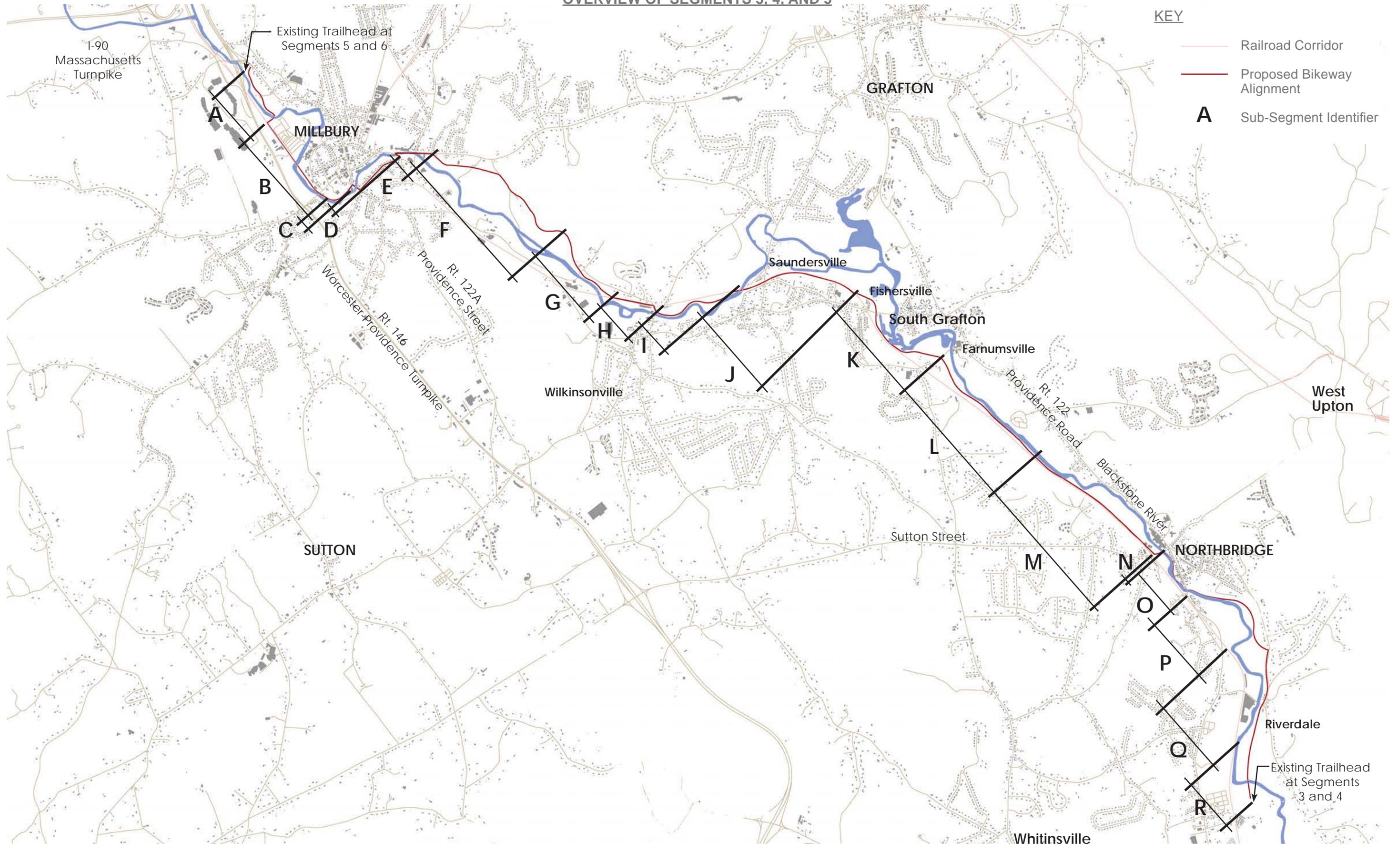
Proposed Alignment

This document shows the Bikeway alignment in an ideal yet realistic location but without an evaluation of property rights acquisition issues. There are no commitments or obligations secured at this time regarding property rights and the exploration of specific property issues will inform the iterative implementation of the project over time.

The proposed alignment incorporates previously-described design concepts, but considers the existing topography and points of interest in more detail. While much of the alignment crosses private property, the design team has not initiated negotiations with any property owners as of the date of this document, but has collaborated with the Town Planners of each municipality in developing this initial potential alignment.

The Bikeway description presented herein has been written primarily from the perspective of a south-bound Bikeway user to simplify the narrative. However, northbound travel is discussed at several critical points, notably where an intersection of the Bikeway with the road network necessitates careful consideration of safety of northbound users.

OVERVIEW OF SEGMENTS 3, 4, AND 5



SUB-SEGMENTS OVERVIEW

For ease of reference, the length of Segments 3, 4, and 5 have been divided into sub-segments. These sub-segments are generally identified as lengths of trail between significant crossings and are labelled alphabetically from north to south.

The overall route with a key to the sub-segments is shown on the next pages. Individual sub-segment maps with additional information are also provided.

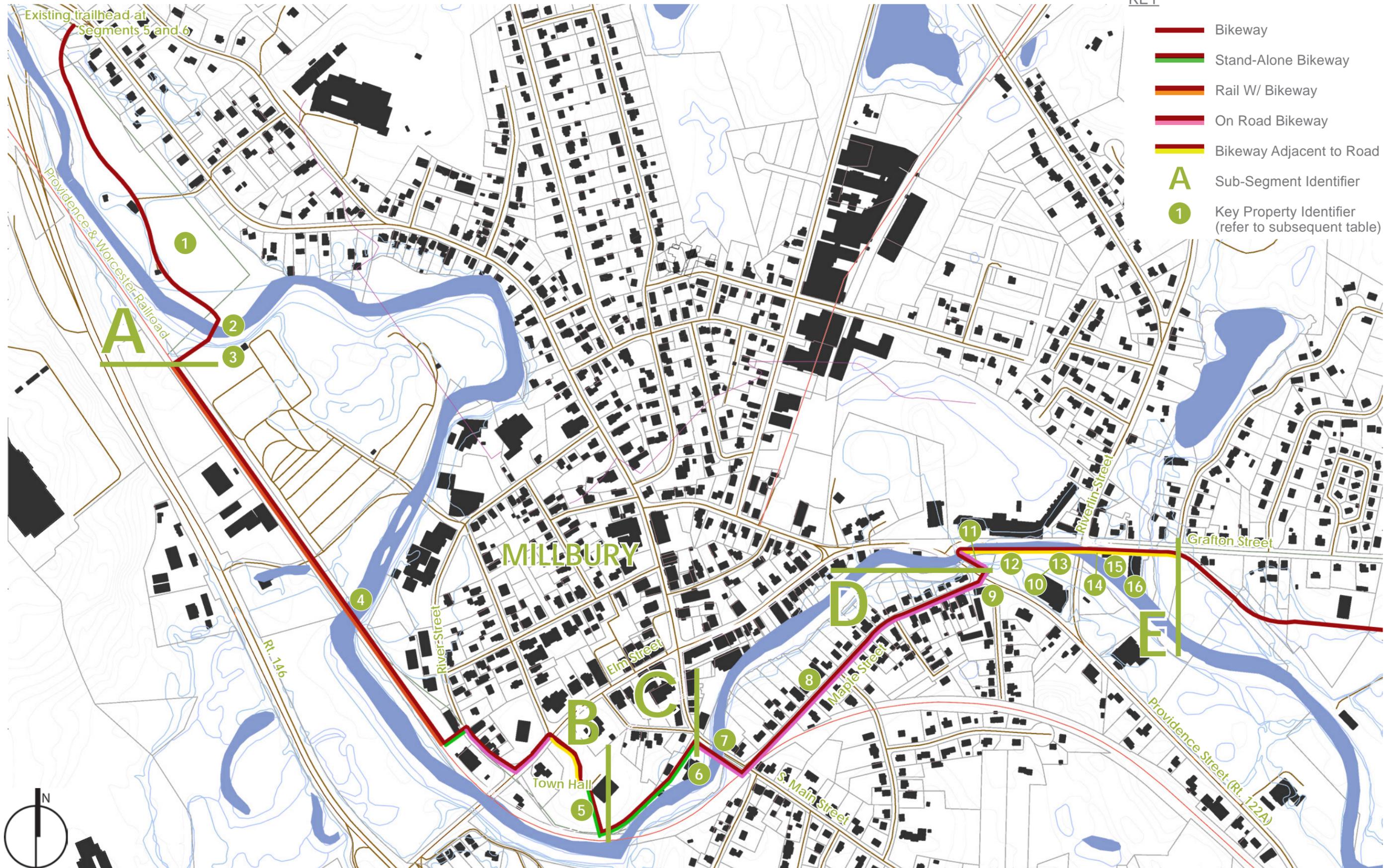
Sub-segments A, B, C, D, & E

Millbury

The northernmost point of these sections of the Blackstone River Bikeway would begin at the existing trailhead and parking lot near the intersection of Routes 146 and 122A in Millbury. The existing Bikeway ends in the driveway aisle of the parking lot and would need to be realigned to avoid using the parking lot as a portion of the route. The proposed route heads south from this point through the Aquarion Water Company (Key #1) property to a river crossing near the end of the segment where a new Bikeway bridge would need to be constructed. A bridge over the Blackstone River would be required for the Bikeway to access the town-owned property on the west side of the river, which is occupied by St. Brigid's Cemetery. The new bridge (Key #2), which would lie at the junction of sub-segments A and B, should be placed at the narrowest possible stretch of river to minimize construction costs and alterations of wetland habitat. The cost of bridge construction may be off-set by the advantages of this alignment, including the creation of a point of interest at the bridge and access to the town-owned cemetery (Key #3), without the need to secure easements along private property along the east side of the river.

Once across the new bridge, the alignment of sub-segment B could either join the railroad right-of-way (as shown) or follow a route parallel to the tracks on the cemetery property. The alignment would need to re-join the railroad to take advantage of the existing bridge which crosses the river to the south of the cemetery. If there is sufficient width available on the town property between the cemetery and the railroad right-of-way,

PROPOSED ALIGNMENTS FOR SUB-SEGMENTS A THROUGH E



it is preferable to locate the Bikeway within the town property. Doing so would avoid the need to obtain use easements from the railroad and construct safety barriers between the Bikeway and the tracks. Alignment within the town-owned land would also result in greater safety and a more aesthetically-pleasing experience for Bikeway users. In its present condition, the existing railroad bridge (Key #4) is not wide enough to accommodate the Bikeway alignment on the east side. The existing bridge should be inspected by a structural engineer to determine if it is capable of supporting a cantilevered bridge or whether a separate crossing would be necessary.

South of the river crossing (Key #4), the Bikeway should stay within the railroad right-of-way, then follow an out-of-use spur within the railroad land that provides access to River Street just north of the Millbury Senior Center. The River Street connection is preferred because the railroad corridor at the Elm Street bridge is not wide enough to safely accommodate a Bikeway between the railroad tracks and the bridge wall. However, the transition from the off-road Bikeway to River Street must be well-designed to make this trailhead readily distinguishable and safe. The paved parking lots on the railroad property between the Senior Center and IBA Print Shop to the north would require a separate designated Bikeway, **landscaping, and signage to avoid conflicts between vehicle traffic and Bikeway users.** In addition, River Street does not have an adequate shoulder to accommodate bike lanes and widening the travel lanes may not be possible within the available right-of-way and constraints of existing utilities and adjacent buildings. Shared lane markings, which are also referred to as “sharrows”, could be employed where space is **not sufficient to install bike lanes as a way to indicate the legitimacy of bicycles as a mode of travel along the Bikeway route.**

From River Street, the route would then cross Elm Street at existing crosswalks to reach the south side of the street. The curve radius of River Street on the northeast side of this intersection is extremely large, likely to accommodate large trucks that access the commercial and industrial **uses further north. This configuration results in a very long Bikeway crossing at the intersection of River Street and Elm Street.** The large curve radius, although often necessary for large trucks, tends to increase the turning speeds of smaller vehicles making a right turn onto River Street at the intersection. The intersection should be evaluated with respect to truck turning movements, vehicle speeds along Elm Street, and truck trip counts to determine whether reduction in the curve radius is possible. Reducing the radius of the curve would reduce the width of the road at the intersection, thereby improving pedestrian and biker safety by reducing the crossing distance. Alternatively, south- and north-bound Bikeway **traffic could be directed to cross Elm Street at the southwest side of the River-Elm Streets intersection to avoid vehicles turning onto River Street at a higher speed.** Additional improvements at the intersection, such as advance warning crossing signage, crossing signage, and lighting (which is currently inadequate for the Bikeway) should be evaluated to enhance the visibility of pedestrians and bikers at this intersection.

The Bikeway would then continue easterly along Elm Street for approximately **300 feet, until reaching the Millbury Municipal Offices property.** This segment of Elm Street may be able to accommodate a bike lane on the south side of the road. From the intersection of Elm Street and the **Municipal Offices driveway, the Bikeway should follow an alignment** adjacent to the driveway, then depart as a stand-alone Bikeway to the edge of the railroad right-of-way and the end of Sub-Segment B (Key #5). From this point, the beginning of Sub-Segment C of the Bikeway **should cross through the Municipal Offices property and Fidelity Bank parcel (Key #6) to join South Main Street.** Ideally, the alignment should **follow along the river to minimize interaction with Bikeway users and bank patrons** while providing a stronger connection to the river and enhance the user experience. This may be a challenge due to the steep slopes and wetlands, but should be the objective if possible.

The alignment of Sub-Segment D, which begins at South Main Street, would consist of an on-road Bikeway at the South Main Street bridge (Key #7) to Maple Street. The bridge is narrow and accommodates only one travel lane in each direction, narrow paved shoulders, and a single sidewalk adjacent to the northbound lane. Widening the bridge or attaching a cantilevered Bikeway, which would be necessary to provide a dedicated bike lane, would require an engineering analysis to determine the best and most cost-effective approach. The recommended viable short-term solution would be to install sharrows within the vehicle travel lanes. Dedicated bike lanes could be provided when the bridge is either replaced or reconstructed in the future.

As a residential street, Maple Street (Key #8) has relatively low vehicular **traffic volumes, and both the character and construction of the street right-of-way** are conducive to an on-road Bikeway. Maple Street has sidewalks along both sides except for a small segment near the intersection with South Main Street where the railroad parallels Maple Street. Sharrows and signage should be implemented along this length of Maple Street to distinguish the route and establish an awareness of the Bikeway for cyclists and motorists. Improvements to the intersection of Maple and South Main Streets would be necessary for the Bikeway crossing and should be studied carefully to avoid a constricted or dangerous route near the intersection of the two streets and the railroad crossing, where **stopped and turning traffic may be concentrated.**

Beginning at the end of Maple Street, the alignment of Sub-Segment E would cross Providence Street (Route 122A, Key #9), turn left to proceed on the north side of the street for a short distance, then turn right onto the south side of Canal Street to follow the bank of the Blackstone River. **The complexity of the road network at the unsignalized intersections of Canal, Providence, and Maple Streets does pose unique challenges** for the north-bound bicyclist which must be considered during the design phase. Use of pavement markings to direct the north-bound bicyclist to the center of the west-bound travel lane of Canal Street at the intersection **with Providence Street/Rte. 122A should be considered.** This configuration would allow north-bound Bikeway users to travel parallel with vehicles making left-hand turns from Canal Street onto Rte. 122A, without interfering with vehicles that are making right-hand turns. Given the complexity of the intersection and the relatively high number of directions of vehicle travel, **use of bicycle traffic signals and/or signage will be particularly**

important to raise awareness of the presence of bicyclists and to direct Bikeway users safely through the intersection and onto Maple Street.

The alignment through this developed area of Millbury would take advantage of a riverfront route, views of the Cordis Mills buildings, access to nearby Windle Field, and connection to Millbury Veterans Memorial Park at the intersection of Canal and Providence Streets (Key #11). There **may be insufficient land along a portion of the adjacent riverbank to accommodate an off-road, stand-alone Bikeway without altering wetlands or constructing a retaining wall to provide a level Bikeway section.** Therefore, the Bikeway would likely need to be on-road or adjacent to



KEY

- Bikeway
- 1 Key Property Identifier (refer to preceding table)

Aerial photograph showing Maple Street to Canal Street connection. (Key #9-13)

the road for some or all of Sub-Segment E (See aerial photograph below). **The Bikeway alignment would cross Riverlin Street, which is a signalized intersection, and continue along the south side of Grafton Street.** The Bikeway would then cross Dorothy Brook via an existing bridge until opposite Bellevue Lane, then veer off-road to the south at the end of Sub-Segment E. The preferred alignment for Sub-Segment E is a separated

Bikeway adjacent to the road due to the higher traffic volumes on Canal/Grafton Street and the likelihood of median vehicle speeds exceeding the posted limit of 30 miles per hour. Several adjacent land uses (Key #12 – vacant land; Keys #10 and 13 – supermarket and parking lot; Keys #14 and 15 – condominiums; Key #16 – manufacturing) and the cost to adapt the bridge crossing may preclude a separated Bikeway initially, but it should remain the primary goal. An alternative is to install bike lanes along the Grafton Street portion of the Bikeway.

This sub-segment poses some challenges to Bikeway users due to the transitions from the off-road and residential street portions of the prior sub-segments to the collector street portions of Sub-Segment E, **which include higher traffic volumes (Canal/Grafton Street), and busy intersections (Providence Street and Riverlin Street).** Use of signage and **pavement markings could ease wayfinding through these areas,** while also improving the visibility and awareness of cyclists at intersections. Additional improvements, such as adding a pedestrian signal crossing at the intersection Riverlin and Grafton Streets, should be implemented as funding allows or when the signal is up for replacement.

Summary of Key Advantages and Challenges :

Advantages

- One primary property owner (Aquarion Water Co.) with whom to negotiate acquisition (Sub-Segment A; Key#1)
- Presence of Town-owned land occupied by the cemetery, accessed via a new bridge which could serve as a point of interest (Sub-Segment A; Keys #2 and 3)
- **Potential for existing railroad bridge to be modified to accommodate bikeway (Sub-Segment B; Key #4)** to greatly reduce river crossing costs
- Option to either overlap the railroad right-of-way or run adjacent to it through the Town-owned cemetery (Sub-Segment B)
- **Relatively low volume and speed of traffic along residential Maple Street (Sub-Segment D; Key#8)**
- Potential for riverfront views and access to nearby points of interest including Windle Field, Cordis Mills, and Veterans Memorial Park (Sub-Segment E)

Challenges

- Potential need for a new, dedicated bridge to cross the river (Sub-Segment A; Key #2)
- Limited space along River Street to add designated bike lanes (Sub-Segment B)
- Steep slopes and wetlands in the vicinity of the Millbury municipal **offices (Sub-Segment C; Key #5)**
- Narrow bridge at Main Street and potential for constricted route (Sub-Segment D; Key #7)
- Complex intersection at Maple, Providence, and Canal Streets (Sub-Segments D and E; Keys #9-13)
- **High traffic volume and speeds of Canal-Grafton Street corridor (Sub-Segment E)**

Sub-segment F

Millbury

To avoid wetlands close to the river, Sub-Segment F would leave Grafton Street in a southeasterly direction as a dedicated off-road facility, travelling across several private properties (Key #17, 19, and 20) and several large parcels (Key #18, 21, 22, and 23) owned by utility companies (Massachusetts Electric Company and New England Power Company), before joining and following an alignment adjacent to a portion of Cross Street. Due to safety concerns associated with high tension transmission lines and distribution sub-stations on these properties, negotiations with the utility companies should begin early in the project development phase. In addition to securing permission to construct the Bikeway, these discussions should focus on identifying suitable alignments which **don't conflict with utility operations or pose dangers to Bikeway users**. The alignment through these properties should also avoid disturbance of the wetland areas that extend to the border with the Town of Sutton.

Summary of Key Advantages and Challenges :

Advantages

- Limited number of property owners (utility companies) with whom to negotiate acquisition
- **Potential for significant stretches of stand-alone Bikeway in natural settings**

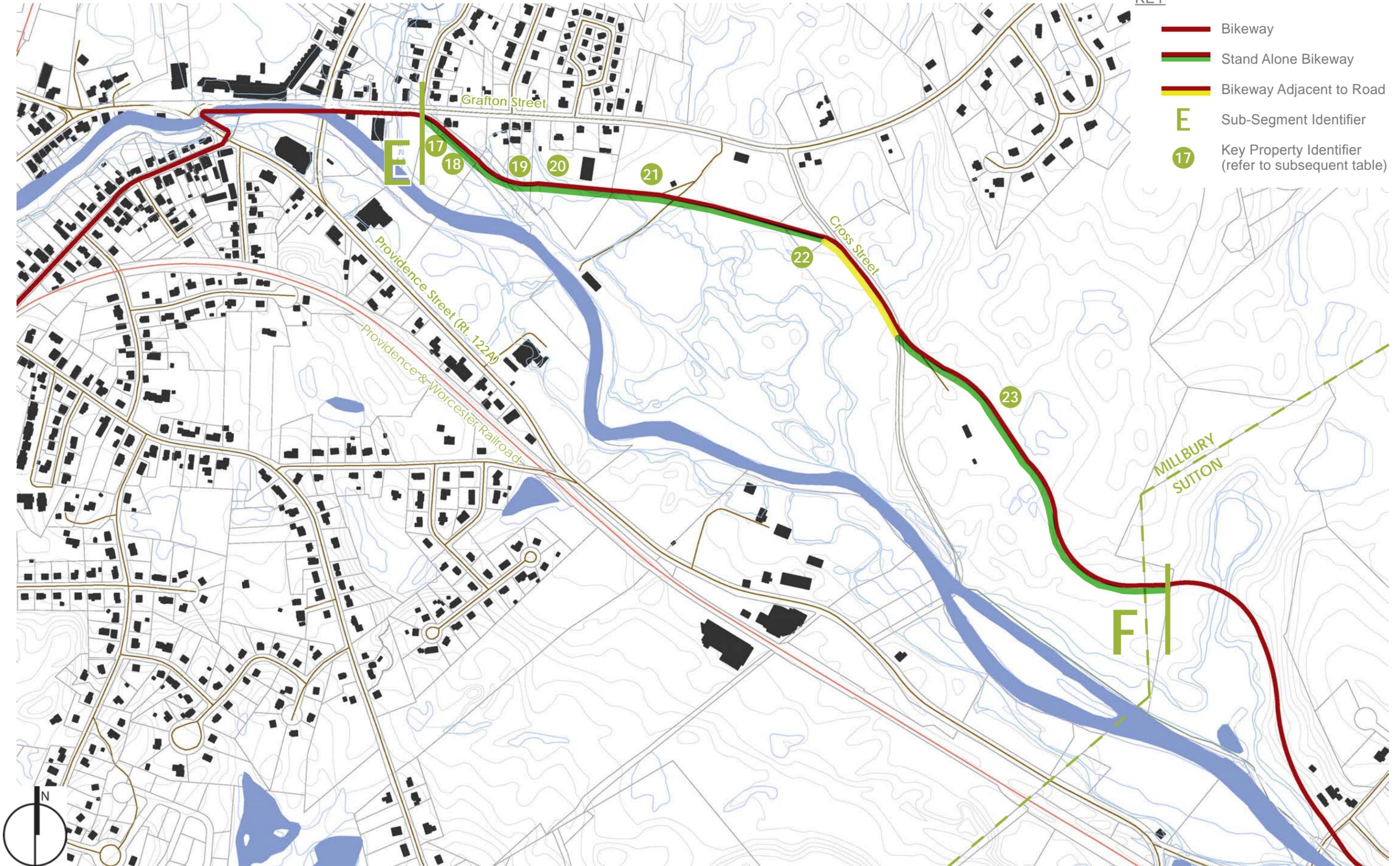
Challenges

- **Need to evaluate potential conflicts associated with interaction of Bikeway and utility operations**
- Relatively large areas of wetlands on utility lands

PROPOSED ALIGNMENTS FOR SUB-SEGMENT F

KEY

-  Bikeway
-  Stand Alone Bikeway
-  Bikeway Adjacent to Road
-  Sub-Segment Identifier
-  Key Property Identifier (refer to subsequent table)





Power transmission lines at Cross Street in Millbury just North of where the bikepath and street will join.



Aerial photograph showing maintained powerline corridors that may be shared by the trail. (Key #22)

Sub-segments G, H, & I

Sutton & Grafton

This section of the Bikeway offers a picturesque contrast to the more urban industrial portions of Sub-Segment E with more woods and a former farm at the end of Chase Road (Key #24 and #25). Where the recommended alignment for Sub-Segment F, immediately to the north, is on land owned by utility companies, the Bikeway in Sub-Segment G would proceed in a southeasterly direction toward the intersection of Chase Road and Blackstone Street, along the east bank of the Blackstone River. In contrast to Sub-Segment F, Sub-Segment G would be a stand-alone Bikeway that passes through privately-owned property, rather than property owned by electric utilities. The parcels on the west and east sides of Chase Road (Key #24 and 25, respectively) appear to be owned by members of the same family. Therefore, there may be opportunity to engage with the parcel owners jointly to simplify negotiations and ensure consistency of the alignment through this area.

The nearby Singing Dam at the Blackstone Street Bridge offers an interesting stop for Bikeway users. The dam is adjacent to the Tri-Centennial Park and a canoe portage pathway on the west side of the river. A small parking lot that serves the park may offer a parking option for Bikeway users and serve as a trailhead. Although the shared-use parking approach **would be an efficient use of land and resources, coordination with the Town is essential to avoid conflicts regarding the displacement of Sutton residents from a Town park by Bikeway users and a fair allocation of long-term maintenance costs.**

The Bikeway would then move closer to the river and cross two privately-held properties (Key #26 and #27) before rejoining the east side of the railroad right-of-way at the end of Sub-Segment G.

The alignment of Sub-Segment H would remain parallel to the railroad tracks, passing a plastics manufacturing building, the Sutton/Grafton municipal boundary, and Blackstone and Follette Streets at the beginning of Sub-Segment I. The parcel between the streets (Key #29) is currently used as a gravel surface parking lot. It may be possible to negotiate an agreement with the parking lot owner, Genesse & Wyoming Railroad Company, for use of the parking lot or establishment of a trailhead with

facilities. While the immediate vicinity of this potential trailhead would not be considered an ideal public space due to adjacent industrial land use and the large opening of the parking lot to Blackstone Street, the parking lot is located less than a quarter mile from the center of the village of Wilkinsonville. Moreover, relatively inexpensive improvements can be made to enhance the aesthetics and functionality of the parking lot and adjacent street. These may include adding contextual and informational signage, narrowing the driveway opening, and adding street trees.

The alignment of Sub-Segment I would leave the railroad, still on the eastern side of the river, to take advantage of higher ground, a large **field (Key #30), a Town-owned parcel (Key #31), and woods, before** returning to the railroad right-of-way near the end of the sub-segment. While a portion of this alignment is within private property, the location would afford a change in scenery and elevation away from the railroad. Easements through these properties should include provisions to retain **some of the character of the privately-owned field (Key #30) by including** natural buffers to protect against the effects of future land development. If easements for the privately-owned parcel cannot be obtained, permission from Genesee & Wyoming to align the Bikeway within the railroad right-of-way may be pursued. This alignment would pass through a band of **woods bordering the field and into the larger, Town-owned forested area** for the remainder of the sub-segment. The Bikeway could then rejoin the railroad right-of-way to cross the Blackstone River at the railroad bridge just beyond the southern terminus of Sub-Segment I.

Summary of Key Advantages and Challenges

Advantages

- Two of three private land owners are from the same family, which may streamline negotiations (Sub-Segment G; Keys #24 and 25)
- Potential for trailhead and parking at Tri-Centennial Park (Sub-Segment G)
- Potential for trailhead and parking at Blackstone-Follette Streets (Sub-Segment I; Key #29)
- Access to nearby Wilkinsonville Village Center (Sub-Segment I)
- Presence of Town-owned land (Sub-Segment I; Key#31)

Challenges

- Relatively large areas of wetlands on east side of river (Sub-Segment G)
- Industrial land use and extensive pavement at Blackstone-Follette Streets (Sub-Segment I; Key #29)

PROPOSED ALIGNMENTS FOR SUB-SEGMENTS G, H, AND I

KEY

-  Bikeway
-  Stand Alone Bikeway
-  Rail W/ Bikeway
-  Potential Trail Head
-  Sub-Segment Identifier
-  Key Property Identifier (refer to subsequent table)





Railroad bridge in Grafton near Canal Street (Key # 32; from: <http://freepages.history.rootsweb.ancestry.com/~history/grafton/BlackstoneCanalPhotos.html>)



Saundersville Dam above as it remains and historic photo of the Saundersville Mill



KEY

-  Bikeway
-  Potential Parking/Trailhead Site



Aerial photograph showing possible location for shared parking spaces or a future trailhead. (Key #29)

Sub-segments J & K

Grafton

The beginning of Sub-Segment J would cross the river adjacent to the railroad bridge near Elmwood and Canal Streets (Key #32) and enter the Saundersville village of Grafton. It may not be feasible to adapt the existing railroad bridge to accommodate a Bikeway due to its form of construction. The preferable alternative may be to create a separate wood bridge as a safer, more aesthetic Bikeway crossing over the river without the complexity of modifying the existing railroad bridge. The railroad and Bikeway would cross Pleasant Street at-grade (Key #33) and remain together until the Bikeway alignment moves farther north toward the Blackstone River near the end of Sub-Segment J.

The portions of Sub-Segments J and K that are north of the Fisherville village of Grafton would enter private property at 15 Rear Sunnyside Terrace (Key #34), the ownership of which is not currently known. Alignment through this parcel has great potential for showcasing a wooded, wetland habitat, plants, and wildlife. Because ownership is unknown, a title search and potentially complex land acquisition process will be necessary. However, passing through this unique natural setting will enhance the Bikeway experience. Furthermore, applying low-impact design principles and requiring best management practices during construction would facilitate efforts to obtain environmental permits **for construction within the wetland and floodplain resource areas that characterize this parcel.**

Sub-Segment K of the Bikeway would continue in a southerly direction off-road across private land, past Fisherville Pond to the east, intersecting with Main Street (Route 122A) near the Fisherville village center. Signage should be added to the alignment through Fisherville to direct Bikeway users to the populated centers of Fisherville and South Grafton, the **South Grafton Elementary School's athletic fields and parking facilities (Key #35)**, and the cultural attractions of the Fisherville Pond & Dam (Key #36) and **Mill Villages Park (east of the private land identified as Key #37).**

Access to the elementary school and Mill Villages Park would be to the north and south, respectively, via Main Street. Bikeway users traveling north of the Bikeway along Main Street toward Saundersville would pass through an attractive streetscape of street trees, concrete sidewalks, and historical architecture on paved roadway shoulders. Traveling south toward Fisherville would direct Bikeway users to Mill Villages Park. Streetscape improvements along the portion of Main Street south of the Bikeway are recommended to extend the aesthetic rhythm that exists towards the north, and create a safe, attractive public realm that will encourage

people to visit both Mill Villages Park and the Bikeway. Increasing the width of the paved shoulders by modifying existing pavement markings to reduce travel lanes, replacing asphalt sidewalks with concrete and installing street trees would improve the streetscape and enhance the viability of a potential trailhead at Mill Villages Park.

Mill Villages Park is currently open to the general public and may be reserved for special functions through the Grafton Town Administrator's office. **The potential for expansion of the park facilities to include a trailhead for the Bikeway should be explored.** It is possible to align these goals with the Town's Mill Villages Advisory Committee, which is charged **by the Board of Selectmen with "identifying, prioritizing and assisting** in the implementation of programs and projects which enhance the historical, cultural, environmental, and economic development potential of South Grafton's historic Mill Villages of Saundersville, Fisherville, and Farnumsville."

From Main Street, the Bikeway alignment should continue southeast toward Farnumsville on private land and remain off-road between the **canal and the railroad.** **Due to seasonal and storm-related fluctuations of water levels in the river, canal, and ponds through the southern portion of this sub-segment, the Bikeway design within this alignment should be resilient to flooding.** **The alignment would then depart away from the railroad, heading east on private land to Depot Street in order to avoid the passing between the foundation walls of the Depot Street bridge and the railroad tracks.** Ideally, the Bikeway would remain on the 6 Depot Street private parcel (Key #38) until reaching Depot Street at the end of Sub-Segment K. In addition to avoiding a potentially unsafe alignment close to the railroad, the Bikeway's location on this parcel would allow passage along the Blackstone Canal and past the Old Dawes Pond Preserve on the south side of Depot Street in Sub-Segment L.

Summary of Key Advantages and Challenges

Advantages

- Potential for relatively large stretch of Bikeway through a unique natural setting (Sub-Segments J and K; Key #34)
- Access to nearby village centers, attractive streetscapes, Mill Villages Park, and athletic fields (Sub-Segment K; Key #35)
- Potential for trailhead and parking at Mill Villages Park (Sub-Segment K; Key #37)

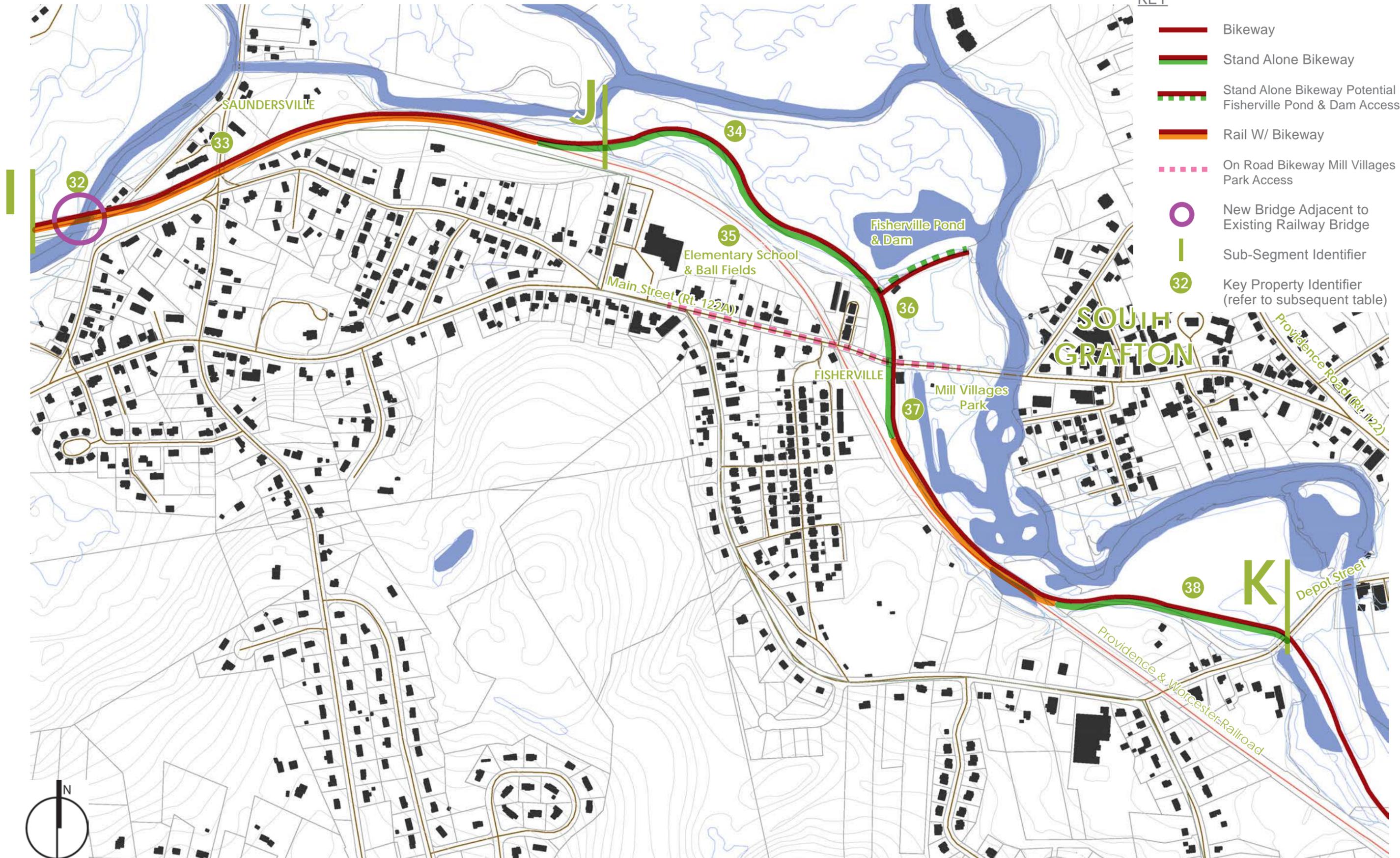
Challenges

- Potential need for a new, dedicated bridge to cross the river (Sub-Segment J; Key #32)
- Relatively large areas of wetlands on west side of river (Sub-Segments J and K; Key #34)
- Need to incorporate low-impact design elements and best management practices to facilitate permitting, construction, and flood resilience (Sub-Segments J and K)

PROPOSED ALIGNMENTS FOR SUB-SEGMENTS J AND K

KEY

-  Bikeway
-  Stand Alone Bikeway
-  Stand Alone Bikeway Potential
Fisherville Pond & Dam Access
-  Rail W/ Bikeway
-  On Road Bikeway Mill Villages
Park Access
-  New Bridge Adjacent to
Existing Railway Bridge
-  Sub-Segment Identifier
-  Key Property Identifier
(refer to subsequent table)





“My advice is: Be a part-time fanatic. Saving the world is only a hobby. Get out there and enjoy the world... Climb mountains, run rivers, enjoy life, do whatever you want to do while you can...”

EDWARD ABBEY, environmental advocate, 1927-1989



Blackstone Canal in Fisherville

Sub-segment L

Grafton

At the northern end of Sub-Segment L (Key #39), signage should be provided to inform Bikeway users of Farnumsville Pond and the mill dam as points of interest less than one-tenth of a mile to the east. The Depot Street bridge over the Blackstone River offers views of historic Farnumsville Mill buildings, the dam and falls, and mill raceways. The Bikeway alignment from Depot Street would cross through the Grafton Land Trust's Old Dawes Pond Preserve (Key #40) then a privately-held parcel (Key #41) to take advantage of river and canal views while remaining off-road and off-rail.

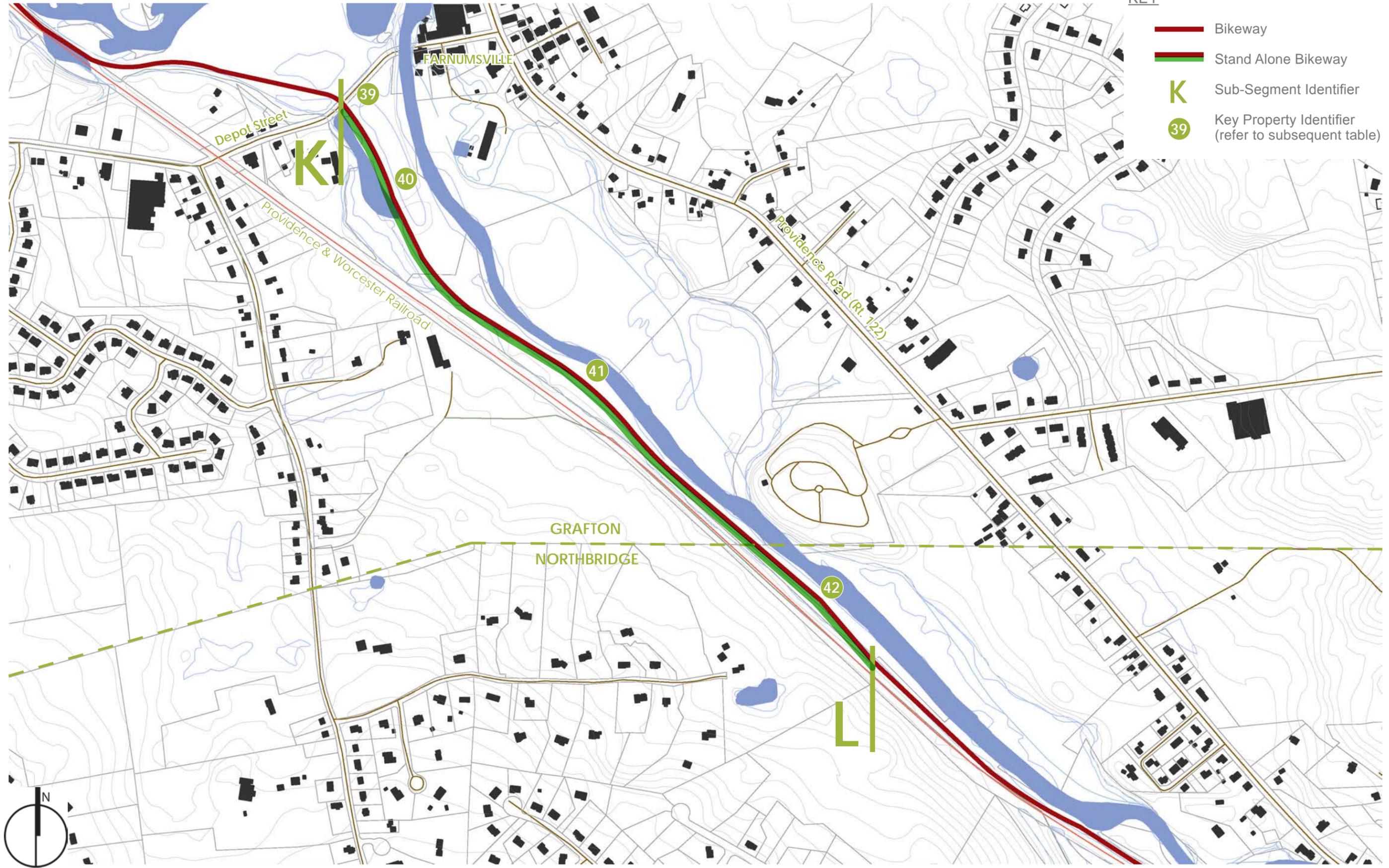
The Bikeway alignment should remain between the railroad and the canal as it crosses the Grafton/Northbridge municipal boundary through private property (Key #42). At the end of Sub-Segment L, the Bikeway should rejoin the railroad alignment because of the constraints of steeper riverbank topography and the proximity to the river.

Summary of Key Advantages

Advantages

- Access to several points of interest including Farnumsville Mill, pond, dam and falls
- Potential alignment through Old Dawes Pond Nature Preserve
- River and canal views from stand-alone Bikeway

PROPOSED ALIGNMENTS FOR SUB-SEGMENT L



- KEY
-  Bikeway
 -  Stand Alone Bikeway
 -  Sub-Segment Identifier
 -  Key Property Identifier (refer to subsequent table)





Farnumsville Mill

Sub-segments M & N

Northbridge

From the end of Sub-Segment L, the Bikeway alignment could proceed within railroad right-of-way for the full length of Sub-Segment M. However, the feasibility of aligning the Bikeway within the adjacent parcel owned by Rockdale Properties LLC (Key #43) should be evaluated during the design phase. While there could potentially be enough useable land for the Bikeway to be separated from the railroad, this parcel does contain **a pond, wetlands, and floodplain**. **If there is sufficient upland area, the Bikeway could depart from the railroad and follow an alignment closer to the river within this privately-owned parcel until the sub-segment's terminus at Sutton Street in the village of Rockdale in Northbridge.**

The final section of Sub-Segment M to Sutton Street would be constrained by buildings on private property adjacent to the railroad right-of-way and the railroad itself. Although large enough to provide adequate separation between the Bikeway and the adjacent railroad and commercial use, the railroad property includes an expanse of gravel, pavement, parking, stored materials, and truck trailers without any trees or landscaping. Likewise, the property on the opposite side of Sutton Street also owned by Rockdale Properties LLC, includes a gravel lot used for parking and storage of truck trailers. Improving the aesthetic appeal of the proposed alignment in this area should include landscaping improvements to clearly demarcate and buffer the Bikeway from these uses.

A potential alternative alignment may exist through a narrow corridor of land between the commercial buildings and the river. However, the viability of this alternative alignment will be based on several key factors: **First, securing an easement from the private property owner will be necessary; Second, there must be sufficient distance between the buildings and river to allow safe travel of Bikeway users; Lastly, the steepness of this corridor must not preclude construction of the Bikeway.**

Sub-Segment N would be a short on-road section along Sutton Street near the Rockdale Mill. Because the road shoulder is used for on-street parking, installation of sharrows may be a viable alternative to bike lanes at this location. Sub-Segment N ends just east of the Sutton Street bridge over the Blackstone River (Key #44).

Summary of Key Advantages and Challenges

Advantages

- Potential to align a stand-alone Bikeway through one property, thereby streamlining acquisition negotiations (Sub-Segment M)

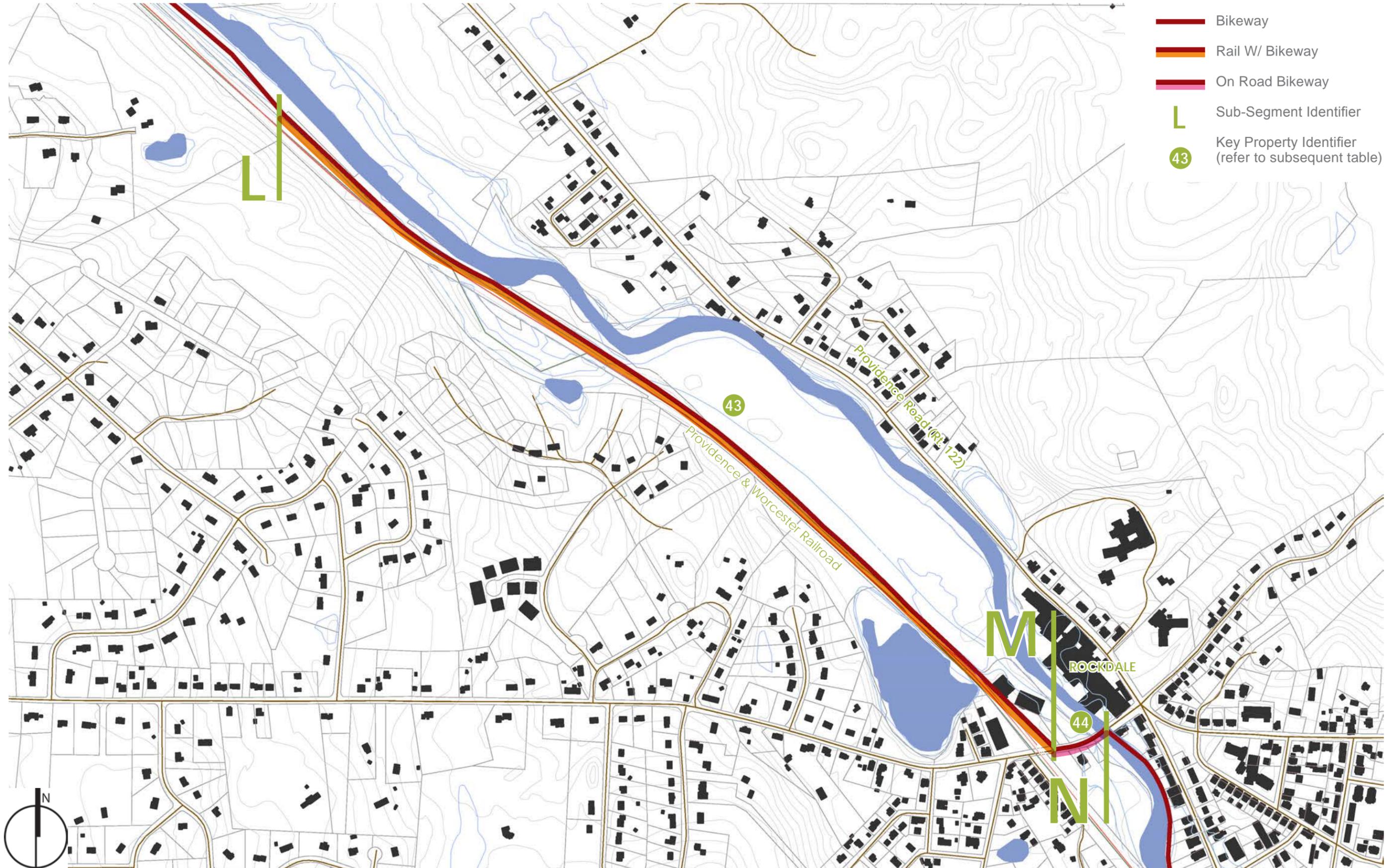
Challenges

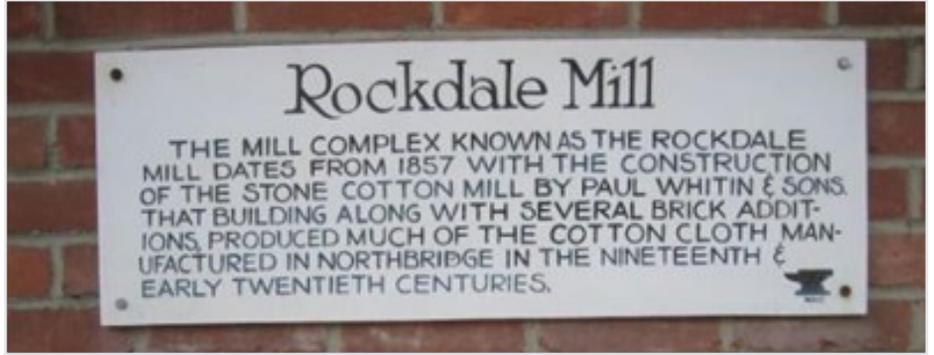
- **Potential lack of sufficient upland to accommodate Bikeway on privately-owned property (Sub-Segment M)**
- Lack of aesthetic appeal of properties owned by railroad and Rockdale Properties LLC (Sub-Segment M)

PROPOSED ALIGNMENTS FOR SUB-SEGMENTS M AND N

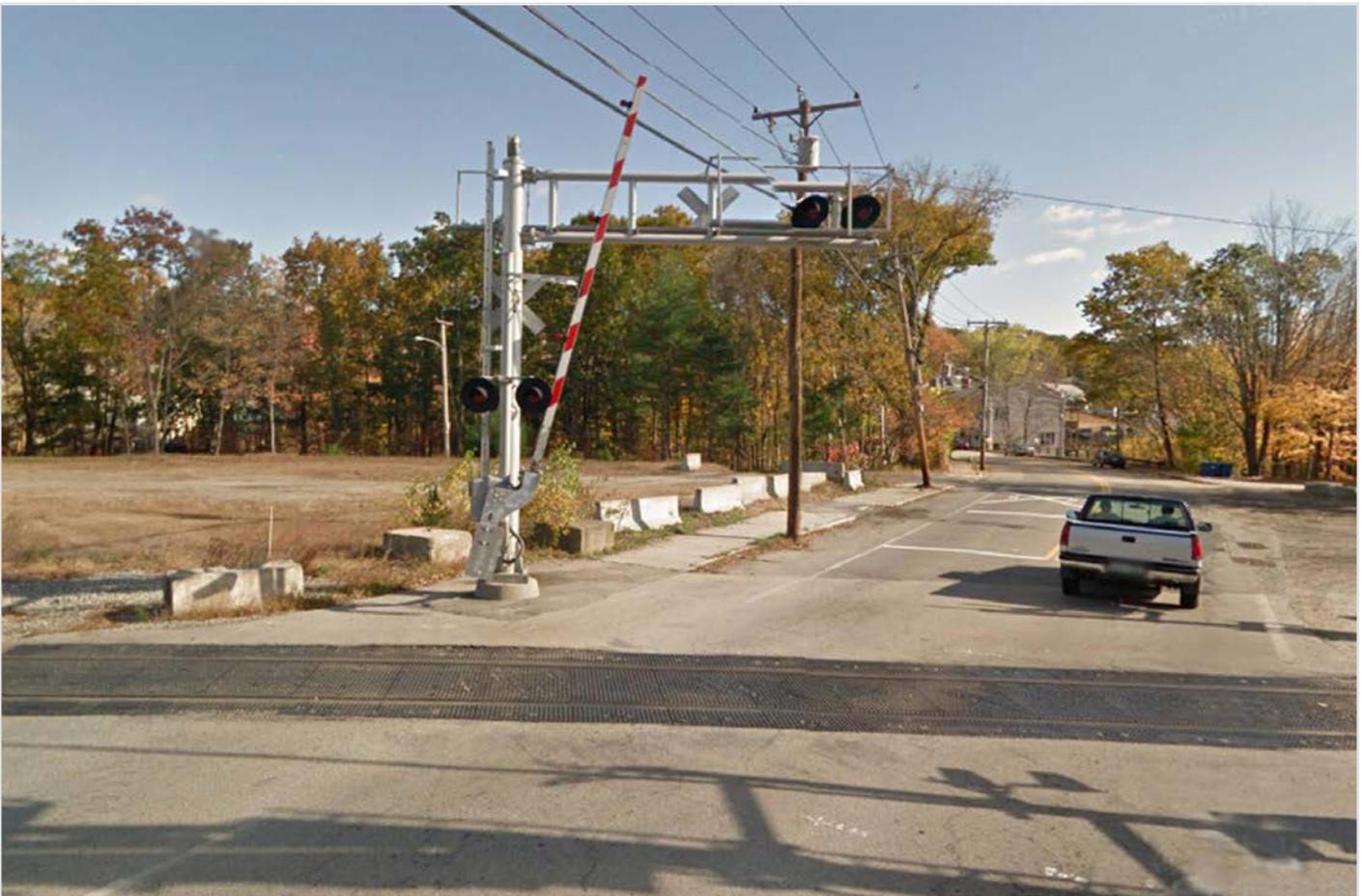
KEY

-  Bikeway
-  Rail W/ Bikeway
-  On Road Bikeway
-  Sub-Segment Identifier
-  Key Property Identifier (refer to subsequent table)





Older stone part of Rockdale Mill (left) and informational sign (above)



Sutton Street in Northbridge, looking east, where the trail leaves the railroad ROW and heads east to cross the river. (Sub-Segment N and #44)

Sub-segments O & P

Northbridge

From the northern start point of Sub-Segment O, the Bikeway would leave Sutton Street and continue off-road along the east bank of the river, at 11-21 Sutton Street (Key #45) in Northbridge. The preferred alignment for the Bikeway would pass between the river and an adjacent building, **but there is a significant change in elevation from the road to the land.** A structural solution should be explored that would allow this connection **point to be utilized while providing grades that comply with accessibility requirements.** The Bikeway along Sub-Segment O from Sutton Street to Providence Road would pass along the rear yards of many private properties along the river. These properties are a mix of commercial, governmental, and residential uses; incorporation of a hedgerow and/or fencing may help alleviate concerns about privacy and security.

The private properties in this area along the river are small parcels that **are prone to flooding. There is an opportunity to negotiate with these owners by teaming on grant applications for funding to mitigate the flood risks while building the Bikeway.** The Environmental Protection Agency (EPA) and the Federal Emergency Management Agency (FEMA), along with the National Resources Conservation Service (NRCS) and the U.S. Fish & Wildlife Service, have funding and technical assistance programs **for river bank stabilization. Massachusetts Department of Environmental Protection (DEP) and DCR personnel could assist with determination of the ecological risks versus public benefits and could likely provide more detailed information regarding State and Federal programs.** Another approach, which may provide additional funding sources through stormwater programs, is to work with the town's public works department **to evaluate stormwater issues in the area. Since flooding often affects public infrastructure as well as private property, a symbiotic approach to development of stormwater and Bikeway infrastructure could provide substantial benefits for the town and the Bikeway.**

In the short-term, a temporary alignment could remain on Sutton Street and then turn right (south) onto Providence Road (Route 122), southbound. The on-road route would not provide interaction with the river but would provide access to a resting place in Rockdale Park, retail establishments, **and the historic center of the Rockdale village. If the privacy, flooding, and grade challenges associated with the preferred alignment through the private properties cannot be feasibly resolved, improvements to Providence Road that are specifically targeted to bicyclists would facilitate an on-road Bikeway as an alternative long-term Bikeway option.** The current street section is relatively narrow and includes intermittent on-street parking on alternating sides of the street and periodic curb bump outs

PROPOSED ALIGNMENTS FOR SUB-SEGMENTS O AND P

KEY

-  Bikeway
-  Stand Alone Bikeway
-  On-Road Short Term Potential Spur / Alternate Alignment
-  Sub-Segment Identifier
-  Key Property Identifier (refer to subsequent table)



KEY PROPERTIES FOR SUB-SEGMENT O

Property		Address	Owner	Land		Buildings			Total Value	Last Sale		Identification	
Key#	Subsection			Acres	Zoning	Use & Type	Stories	Built	2015 Assessment	Date	Price	Map_Parcel	Property ID
45	O	11-21 SUTTON ST	FLANAGAN & COMOLLI CONSTR. INC	0.19	B1	Apartments (4-8 d.u.)	2	1906	\$349,400	08.01.00	\$71,000	22A-171	F_614910_2881160
46	O	SUTTON ST	ROCKDALE PROPERTIES LLC	0.48	B1	Parking lot			\$60,000	09.02.11	\$1,270,000	22A-175	F_614996_2881124
47	O	2305 PROVIDENCE RD	TOWN OF NORTHBRIDGE	0.19	B1	-	1	1940	\$219,800	01.01.54	\$0	22A-177	F_615095_2881053
48	O	2297-99 PROVIDENCE RD	BOWKER, PETER R & S MOURADIAN, TR	0.12	B1	Apartments (4-8 d.u.)	2.75	1890	\$260,000	10.23.01	\$100	22A-178	F_615123_2881000
49	O	2293-95 PROVIDENCE RD	BOWKER, PETER R & S MOURADIAN, TR	0.12	B1	Two-family residential	1.75	1902	\$200,200	10.23.01	\$100	22A-179	F_615158_2880947
50	O	2285-91 PROVIDENCE RD	BOWKER, CHERI A & MARIE MOURADIAN	0.12	B1	Apartments (4-8 d.u.)	1.75	1902	\$261,900	10.23.01	\$100	22A-180	F_615186_2880889
51	O	2279-83 PROVIDENCE RD	DION, CLARA E	0.13	B1	Two-family residential	2	1937	\$317,100	01.13.47	\$0	22A-181	F_615210_2880829
52	O	2265 PROVIDENCE RD	DION, CLARA E	0.32	B1	303 (Intentionally left blank)			\$98,200	11.18.39	\$0	22A-183	F_615238_2880717
53	O	2259 PROVIDENCE RD	LAWRENCE, NORMAN F	0.22	B1	Three-family residential	2	1870	\$199,800	08.16.79	\$0	22A-186	F_615266_2880638
54	O	2251-55 PROVIDENCE RD N	DION, CLARA C	0.27	B1	Apartments (4-8 d.u.)	2	1900	\$300,100	04.14.41	\$0	22A-188	F_615278_2880577
55	O	2249 PROVIDENCE RD	LESCO, RONALD	0.54	B1	Apartments (4-8 d.u.)	3	1900	\$255,400		\$0	22A-190	F_615291_2880498
56	O	2239-47 PROVIDENCE RD	DION, CLARA	0.30	B1	Apartments (4-8 d.u.)	3	1921	\$389,900	01.13.74	\$0	22A-191	F_615311_2880427
57	O	2227 PROVIDENCE RD	DINEEN, WILFRED J	0.40	B1	Apartments (4-8 d.u.)	2	1900	\$454,700	12.17.79	\$0	22A-205	F_615296_2880326
58	O	2223-2225 PROVIDENCE RD	SOUTH MIDDLESEX NON PROFIT	0.41	B1	Single-family residential	3	1920	\$497,000	12.31.93	\$0	22A-207	F_615355_2880260
59	O	2211-13 PROVIDENCE RD	SOUTH MIDDLESEX NON-PROFIT	0.36	B1	Apartments (4-8 d.u.)	3	1900	\$285,400	12.31.93	\$0	22A-210	F_615415_2880190
60	O	2205-07 PROVIDENCE RD	SOUTH MIDDLESEX NON-PROFIT	0.24	B1	Apartments (4-8 d.u.)	2.75	1880	\$303,100	12.31.93	\$100	22A-211	F_615461_2880132
61	O	2201 PROVIDENCE RD	PABLA, GURMIT	0.11	B1	Single-family residential	2	1900	\$260,100	06.25.04	\$360,000	22A-212	F_615495_2880085
62	O	2191 PROVIDENCE RD N	JACOBS, MICHAEL N	0.07	B1	Single-family residential	1.75	1920	\$138,600	04.22.05	\$198,000	22A-214	F_615522_2880051
63	O	2195 PROVIDENCE RD	LAFLASH, WILLIAM F	0.07	B1	Two-family residential	2.5	1919	\$191,000	06.18.84	\$0	22A-213	F_615564_2879992
64	O	2187 PROVIDENCE RD	ARIS GROUP, INC	0.12	B1	Single-family residential	2	1900	\$156,800	02.26.09	\$100,000	22A-215	F_615598_2879931
65	O	2177 PROVIDENCE RD	MOORGHEN, RIVANEN	0.00	B1	Condominium	1	1890	\$128,700	05.02.06	\$161,900	22A-216	F_615614_2879895
66	O	2177 PROVIDENCE RD	VERNON, SHEILA M	0.00	B1	Condominium	1	1890	\$126,700	10.11.05	\$159,000	22A-216	F_615614_2879895
67	O	2177 PROVIDENCE RD	BARNEY, SHAWN D	0.00	B1	Condominium	1	1890	\$128,700	04.28.05	\$159,500	22A-216	F_615614_2879895
68	O	2171 PROVIDENCE RD	HOLLAND, NANCY L	0.13	B1	Three-family residential	3	1810	\$187,100	08.15.96	\$92,200	22A-217	F_615646_2879845



Detailed depiction of small flood-prone properties along Providence Road. **KEY**

- Bikeway
- On-Road Short Term / Alternate Alignment



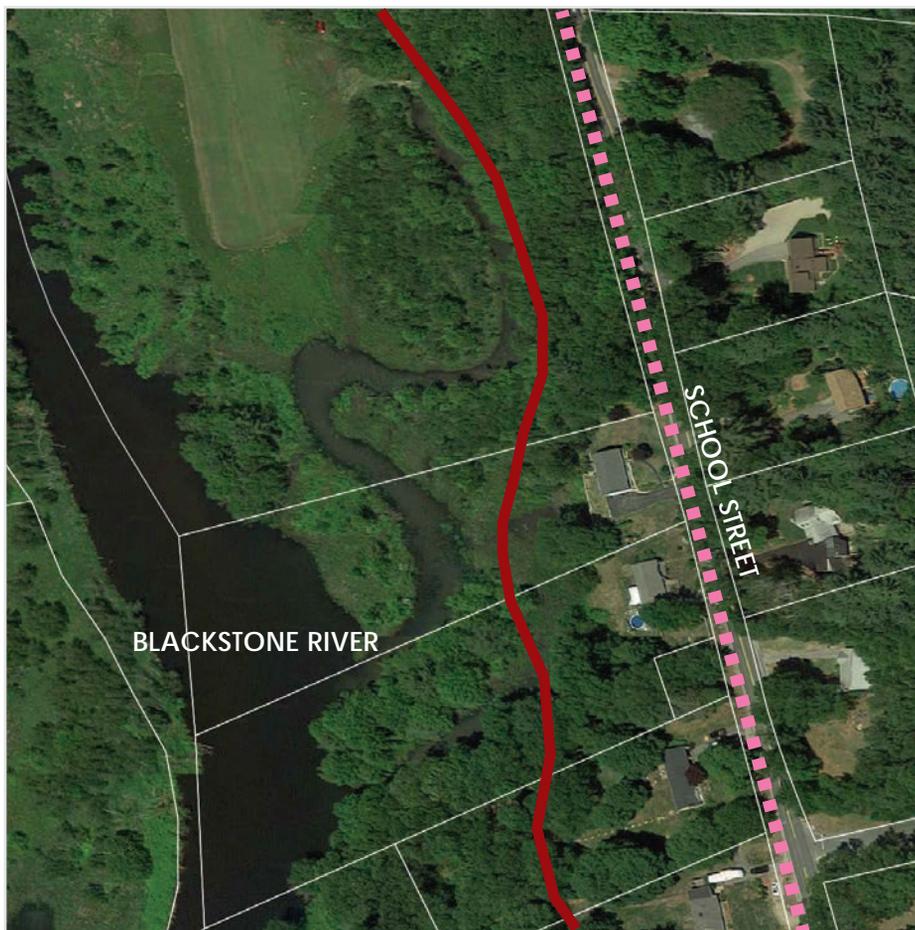
An example of river bank stabilization adjacent to a trail



View of flood-prone property at the Providence Street / Rte. 122 bridge in the Rockdale section of Northbridge, looking northwest (Key #68)

along the southbound travel land. These features were recently installed as calming measures to reduce vehicle speeds but require bicyclists and automobiles to share the travel lane. Incorporation of sharrows, signals, and/or signage would help notify motorists of the use of the travel lane for bicycling and thus enhance the safety and comfort level of bicyclists who may not be accustomed to roadway travel, including families and children. North-bound bicyclists sharing the travel lane on Providence Road should be directed northward, up to the north side of the intersection of Providence, Sutton, and Upton Streets. They should then be directed to turn left through the existing crosswalk, crossing Providence Street and **entering Sutton Street**. **Directing north-bound bicycle traffic toward the northern side of the intersection** would reduce interference with vehicles turning onto and off of School Street and help enhance safety.

Both the primary and alternative alignments of Sub-Segment O end at the Providence Road bridge (Key #69) with an on-road crossing of the Blackstone River. Recent improvements to the bridge by MassDOT ensured **that the bridge would be sufficient to accommodate travel by bicycle**. After the bridge, in order to return to a more natural setting closer to the river, Sub-Segment P should cross Massachusetts Electric property (Key



KEY

-  Bikeway
-  On-Road Short Term / Alternate Alignment
-  Property Boundaries



Seasonal fluctuations of water levels may require boardwalk construction (#73 and #74) or relocate the alignment of Sub-Segment P to School Street.

#70) and private property (Key #71). The private parcels with frontage on Church Avenue and School Street (Keys #71 and 72) are relatively large (greater than 10 acres) and contain some wetland areas along the river. Given the available land to buffer the Bikeway from residences, these owners may be amenable to providing easements at the edge of their land for the Bikeway.

The recommended alignment of Sub-Segment P would provide opportunity for easy access to Rockdale Park, which abuts a privately-owned parcel (Key #71). There may be an opportunity to negotiate a shared parking agreement with the town's Playground and Recreation Committee, potentially making the playground an attractive trailhead option.

The alignment would travel through two smaller, privately-owned residential parcels at the south end of this sub-segment (Keys #73 and 74) before connecting with School Street via a larger privately-owned undeveloped parcel (Key #75) at the end of Sub-Segment P. However, these parcels include large areas of wetlands and regulatory constraints may pose a challenge for this route due to the need for wetland alterations and construction within the floodplain. **An elevated Bikeway or boardwalk-type construction may be a design option which mitigates these concerns but can be costly. An alternative that aligns an on-road Bikeway along School Street, bypassing the parcels identified as Keys #72 through 75, could be considered.**

Summary of Key Advantages and Challenges

Advantages

- Potential to fund and execute Bikeway construction concurrently **with flood mitigation, stormwater, riverbank stabilization, or other public works/infrastructure projects (Sub-Segment O)**
- Alternative alignment provides access to park and retail establishments (Sub-Segment O)
- Recent improvements allow Providence Road bridge to accommodate bicycle travel (Sub-Segment P)
- Access to nearby Rockdale Park and potential for parking and trail head (Sub-Segment P)

Challenges

- Rapid grade change from Sutton Street to land on eastern riverbank (Sub-Segment O)
- Privacy and security concerns with alignment in close proximity to dense residences on small parcels (Sub-Segment O)
- Need for sharing travel lane among Bikeway users and cars under alternative alignment (Sub-Segment O)
- Potential need for elevated Bikeway construction due to presence of wetlands (Sub-Segment P)

Sub-segment Q

Northbridge

Sub-Segment Q would be an on-road Bikeway alignment that follows School Street and Quaker Lane adjacent to two privately-owned parcels (Key #s 76 and 78) and one town-owned property (Key #77). The main limitations to the on-road alternative along School Street are the lack of paved shoulders, an uphill slope along the east side of the road, and a **steel guardrail along the west side of the road, which is characterized by a steep wooded slope.** Safety improvements to the road would be needed to provide an adequate bike lane including widening the road, **significant grading, and possibly constructing retaining walls.**

A separate, off-road option is preferred if one can be constructed on the steep downhill slope between School Street/Quaker Lane and the Blackstone River. The relative costs and feasibility of these two alternatives (on-road vs. stand-alone off-road Bikeway) should be evaluated **to determine the final alignment. The sub-segment would end at the intersection of Quaker Lane and the eastern abandoned segment of Riverdale Street (Key #79).** At this point, there is a foot-bridge spanning the Blackstone River which provides safe access to the historic and active Riverdale Mill.

PROPOSED ALIGNMENTS FOR SUB-SEGMENT Q

KEY

-  Bikeway
-  On Road Bikeway
-  Sub-Segment Identifier
-  Key Property Identifier (refer to subsequent table)



Summary of Key Advantages and Challenges

Advantages

- Access to the active Riverdale Mill via existing footbridge over river

Challenges

- Physical limitations (slope to the east, guardrail to the west, lack of paved shoulder) to aligning Bikeway along School Street



Intersection of Quaker Lane and abandoned segment of Riverdale Street in Northbridge looking west across the river and toward Riverdale Mill - the trail remains on the east side of the river continuing southward from this intersection.

Sub-segment R

Northbridge

Sub-Segment R would begin at the intersection of Quaker Lane and the abandoned segment of Riverdale Street and continue onto private properties (Keys #80 and 81). The Knott family owns multiple parcels along School, Riverdale, and Quaker Streets (Keys #72, 75, 76, 80, and 81, and the abutting Riverdale Mill parcel). If the owner is willing, easements for the Bikeway alignment through these parcels in Sub-Segments P, Q, and R should be negotiated at the same time.

There is an existing trail through the private property (Key #81) that follows a southerly course along a pond and near wetland areas. The Bikeway alignment should follow this existing path to take advantage of land already cleared and to avoid wetland alterations. The Bikeway would still cross wetlands and the Blackstone River at the southern end of this sub-segment. A bridge would be necessary to cross the river and provide access to the end of the existing canal towpath trail (Key #82) and the Blackstone River and Canal Heritage State Park (northern limit of Park at Key #83). There is adequate distance to construct the Bikeway and bridge while maintaining an accessible slope.

In the near term, the Bikeway could either be located on Quaker Street to the east of the river or within the railroad right-of-way to the west. The Quaker Street alternative is not without challenges; the roadway is posted at 35 MPH, there are sections with guardrails, **occasional retaining walls, busy rush hour traffic, and narrow paved shoulders**. These conditions create an uncomfortable environment for all but the most experienced bicyclist. The alternative near term alignment, along the railroad, is constrained in the available width of land between the railroad tracks and the bank of the river. For the purposes of the temporary short-term alignment, the Quaker Street alignment is preferred but should include improvements to enhance the safety of bicyclists until the long-term alignment through the privately-owned parcels can be implemented.

Summary of Key Advantages and Challenges

Advantages

- One family ownership of several parcels of land may streamline negotiations
- Presence of existing path which could streamline permitting and construction
- Access to existing state park

Challenges

- Need for a newly-constructed bridge to cross the river at the southern end
- Need for safety improvements along Quaker Street as part of the alternate or temporary route

PROPOSED ALIGNMENTS FOR SUB-SEGMENT R



KEY

- Trail
- Stand Alone Trail
- New Bridge
- Sub-Segment Identifier
- Key Property Identifier (refer to subsequent table)

Implementation

Developers of trails and Bikeways commonly strive to streamline the easement acquisition process by seeking to align through public lands. However, continuity among trails and access to water bodies is sometimes not possible if access routes are restricted solely to publicly-owned land. Therefore, trails of any length will likely need to connect through private land.

Historically, many trails crossed private lands, often on farm and forest roads and usually through informal arrangements among neighbors. But as both our physical (natural, cultural, and scenic resources) and legal landscapes have changed, arrangements for securing land for trails have more formal. Because many public lands are managed for specific purposes and are not open to all public uses, even Bikeway segments which traverse public lands should be secured through dedication of trail easements. Furthermore, negotiation with private land owners or other entities (utility companies, railroad companies, institutions, commercial businesses, etc.) to secure permission for Bikeway construction through non-public lands should begin as early in the planning stage as possible. The following sections describe various approaches for acquisition of land for Bikeway construction.



implementation [im-pluh-muh n-tey-shuh n]*noun. the act of implementing, or putting into effect; fulfillment***ACQUISITION METHODS**

Ownership of public lands and water bodies is held by federal, state and local governmental entities. Federal land that is generally accessible to the public includes national parks, forest service lands, and national wildlife refuges. The federal government also owns water rights in certain designated lands such as national parks, wildlife refuges, and national forests, and also has some jurisdiction over water bodies which meet "navigability" standards. Some uses of rivers, streams, wetlands, and other small waterbodies are also controlled through the U.S. Army Corps of Engineers permitting processes.

Throughout the nation, municipalities and trail agencies are exploring ways to **use privately-owned property for the benefit of the community as a whole**. Some of the methods that have been used in pursuit of this goal include adjusting tax assessment upon certain lands, conservation easements, public purchase of **easements or rights-of-way**, incentive zoning, or even authorizing the transfer of development rights (TDRs) in highly populated areas.

Acquisition options include:

1. fee simple purchase;
2. split fee or partial purchase (such as purchase of an easement);
3. negotiated exchange or trade;
4. acceptance of grants, gifts, or donations;
5. dedication through platting;
6. lease;
7. option to purchase; and
8. exercising the powers of eminent domain.

It is important to note that, regardless of the acquisition method, costs will be incurred for steps commonly associated with land transactions. These may include for example, boundary survey, metes & bounds description, environmental assessment, property appraisal, title/lien search, and legal representation.

1. Fee Simple Purchase

Parcels for use as part of a publicly-accessible Bikeway or trail can be purchased **outright by either a nonprofit or a public entity**. This option may be the simplest, but it is also typically the most expensive since the purchasing entity would need to provide the market-based fee for the entire parcel. It would also require reaching **agreements with dozens of landowners, as would be the case with the alignment of the Blackstone River Bikeway recommended herein**.

2. Partial Purchase

Property may also be acquired through a partial fee. This method has been most successful when there is no immediate development pressure and where the public use does not affect the existing use. Partial rights to a property might be purchased





if the landowners have no intention or perhaps little opportunity to develop their property, in which case the landowner receives an unexpected near-term benefit. If sections of property are purchased, rather than an entire parcel, negotiations should consider the need for access for Bikeway construction and maintenance purposes.

3. Negotiated Exchange

This term refers to the sale/purchase of property at less than the fair market value. The method is well-suited for scenarios when there is no development pressure on the site or when property owners are particularly supportive of a proposal, such as development of the Blackstone River Bikeway. The additional benefit to this method is that the difference between a reduced sale price and fair market value often qualifies as a tax-deductible charitable contribution. This allows individual property sellers to avoid paying high capital gains taxes and enables the purchasing entity to negotiate a much lower price.



4. Donations

A landowner can donate property to an agency or organization for a public use. In addition, tax credits may be available for land donated for conservation purposes. There will be the customary costs associated with the ownership transfer even though there is no cost for the property.

5. Easements

In general terms, an easement is a right to use another person's real estate for a specific purpose. Easements can be negotiated with private landowners as well as with commercial entities, such as a utility company. The cost is typically less than purchasing the property as ownership does not change, however there will be legal and other property acquisition costs incurred. There are different approaches to easement negotiations, and a few are outlined below in order of permanency.

- a. **Formal written permission** allows continuous use of private property under written permission from the property owner that does not develop into an actual easement (see MGL Chapter 187, Section 2).
- b. A **License** is a revocable written agreement between an owner and trail group that permits trail access. It is not permanent or binding on future landowners. A license can be a useful tool, superior to verbal and written permission, as it can stipulate conditions of use and management agreements.
- c. A **Trail easement** is a perpetual legal agreement that allows others to use someone's land in a manner defined within the easement. An easement can restrict when and under what conditions access is provided - for example, restricted to users for hiking or bicycling only.
- d. A **Conservation restriction** allows someone who does not own the land to prevent the owner from using the land in a manner that is not consistent with the intended purpose of conservation. This type of agreement facilitates preservation of the land in its natural state and protection of wildlife habitat,





scenic views, forests and meadows, water quality, trail connections, and other similar natural features. A Conservation Restriction that is intended to be perpetual must be signed by the Massachusetts Secretary of the Executive **Office of Energy and Environmental Affairs**. For examples of Conservation Restrictions, refer to the “Conservation Restriction Handbook” from the **Massachusetts Executive Office of Energy and Environmental Affairs (2008 edition)**.

6. Land Lease

In these cases, the land is rented from the landowner for a set amount of time. Leases can be negotiated with a variety of ownership entities, including railroads, utility companies and public entities that are long term owners. Leasing land from a private individual may not provide guaranteed access for the Bikeway as a lease would not have to be renewed or required to continue with future owners.



7. Option to Buy

An **Option to Buy** is a legal document giving an individual or organization a first right to purchase property if and when it is put up for sale. The document outlines the required price and applicable period, and is typically executed for a fee (often 10 percent of land value). If the property is bought, the fee is deducted from the purchase price; if the purchase does not proceed, the fee is nonrefundable. This option may be a good approach in cases where there is interest in purchasing land but a need to raise funds first.



8. Eminent Domain

Property, or parts of property, can be compulsorily taken from the landowner for use by the general public. This method is rarely used for trails and should be considered only in absence of other viable options because it can create resentment toward the Bikeway by the former landowners. In addition, the acquirer, usually a **municipality or non-profit non-governmental agency**, is still required to pay fair market value for the property.





TAX INCENTIVES

Tax incentives are granted by municipal or state governments and can be used to encourage the dedication of trails and access easements for Bikeway development **by offering a type of financial compensation.** An example of a widely-used tax incentive is the reduction or elimination of property taxes applicable to the portion of land under public use. The property tax break can be either for a limited term or perpetual. In addition, delinquent property tax debt may be waived in exchange for the long-term or permanent dedication of land for public access.



LEGAL RESPONSIBILITIES

For circumstances where the Bikeway will be aligned through privately-owned lands, an understanding of the legal obligations that will be borne by the property owner will be critical to facilitating transparent acquisition negotiations. Massachusetts General Law (Chapter 21, Section 17C) limits a landowner's exposure to lawsuits that may come about as a result of the presence of the Bikeway. While anyone could sue a landowner, including a Bikeway user, the owner's liability is limited by law to circumstances of "unlawful", "wanton", and "reckless" conduct.

The above-referenced law states that "any person having an interest in land . . . who **lawfully permits the public to use such land for recreation, conservation, scientific, educational, environmental, ecological, research, religious, or charitable purposes without imposing a fee . . . shall not be liable for personal injuries or property damage sustained by such members of the public, including without limitation a minor, while on said land in the absence of willful, wanton, or reckless conduct by such person.**" Willful conduct is an intentional act or failure to act with knowledge (facts that a reasonable person would know) that creates unreasonable risk of bodily harm to another, and involves a high degree of probability that it will be substantial harm. It is highly recommended that appropriate legal counsel be sought prior to initiating acquisition negotiations to ensure that the legal obligations of both the entity acquiring the Bikeway land and the property owner are well understood, and that any monetary incentives associated with the agreement do not nullify the protections provided by MGL Chapter 21, Section 17C.



CONCLUSION

Short-term measures that can be taken to build momentum for construction of Segments 3, 4, and 5 should include outreach to land owners that have expressed to municipal planning offices support for the Bikeway and a willingness to engage in negotiation regarding land acquisition. This should include municipalities who own land along the proposed alignment and would likely share an appreciation of the community benefits of the Bikeway. By initially securing the support of cooperative land owners, momentum for the alignment builds with relatively low effort on the part of stakeholders.

This momentum can be carried toward longer-term negotiations with land owners who may be less sympathetic to the Bikeway or may have unique land use challenges, such as railroad and utility companies, that will impact the alignment. Particular attention should be paid to individual land owners or families who own relatively large areas of land within the proposed alignment. Garnering support and cooperation from these types of owners could have significant impact in terms of the extent of Bikeway that could be secured through negotiation. In all cases, involvement of municipalities in the negotiation process will be necessary to identify incentives they are willing to grant to facilitate the Bikeway.

As the support from land owners falls into place, progress of the design phases of the Bikeway project will take on increasing importance. At stretches of the Bikeway that will be within undeveloped settings, natural constraints such as wetlands, topography, and river crossings will warrant careful consideration to ensure an alignment that can be feasibly permitted and constructed. These elements will have substantial impact on the cost, schedule, and footprint of the Bikeway and should thus be accounted for early in the design process.

Stakeholder engagement will be a particularly critical component of the design and permitting process for Bikeway stretches that are slated for more developed areas. Bikeway proponents should continue efforts to engage local stakeholders such as businesses, neighborhood groups, and civic committees (i.e. conservation, recreation, parks, safety, etc.) who may be impacted by or have an interest in construction and operation of the Bikeway. This outreach should focus on understanding the concerns of these stakeholders as well as promoting the benefits of the Bikeway and perhaps energizing citizens to become involved.

Outreach to state and local officials who lead transportation and infrastructure projects should also be prioritized. This should focus on longer-term public works projects that may be in the planning stages and could overlap the proposed Bikeway project. Such coordination could have synergistic benefits of shared resources, concurrent design, and mutual understanding of project objectives.

“Let us leave a splendid legacy for our children... let us turn to them and say, this you inherit: guard it well, for it is far more precious than money... and once destroyed, nature’s beauty cannot be repurchased at any price.”

ANSEL ADAMS, US photographer, 1902-84



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