Town of Arlington Minuteman Bikeway Planning Project

Chapter 1

EXISTING CONDITIONS

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Prepared for:

Town of Arlington Department of Planning and Community Development

Town of Arlington Community Preservation Act Committee

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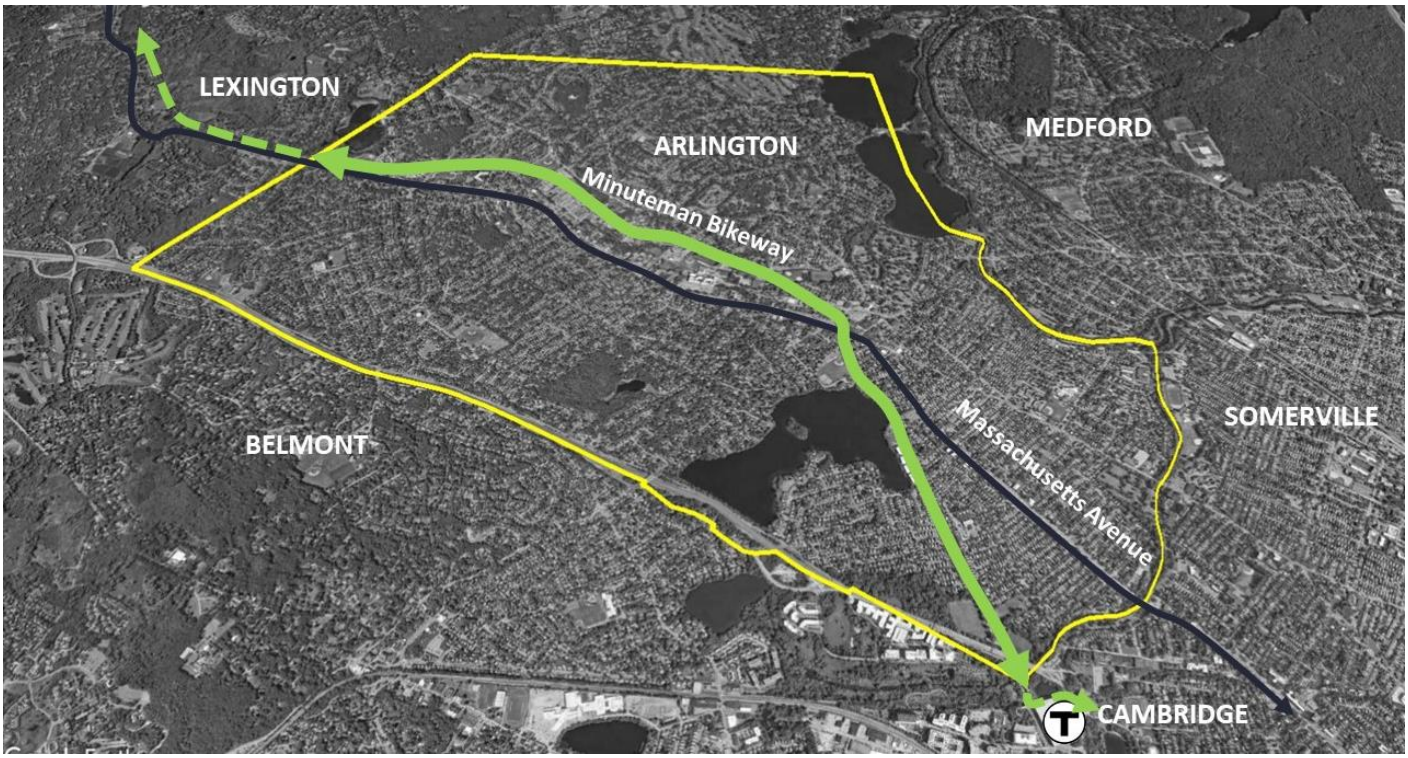
INTRODUCTION

The Minuteman Commuter Bikeway (Bikeway) is a ten-mile, regional shared-use path extending through Bedford, Lexington, and Arlington and connecting to the Alewife MBTA station in Cambridge. The Bikeway was built in 1993 along disused Massachusetts Bay Transportation Authority (MBTA) rail right-of-way. The Town of Arlington leases the property for the 3.6 miles within its boundaries from the MBTA (**Figure 1**) and is responsible for the maintenance and upkeep of the Bikeway. Roughly paralleling Massachusetts Avenue, which is the primary transportation and commercial corridor through the town, the Bikeway is a critical, off-street transportation and recreation facility that is heavily used by people of all ages and abilities, using different modes, and with different needs and speeds.

Figure 1: Minuteman Bikeway Extents



Among its many benefits, the Bikeway in Arlington provides a safe route across Town, allowing residents and commuters from neighboring communities to choose walking or biking to key destinations instead of driving. Because the Bikeway parallels Massachusetts Avenue, it is a logical means to access businesses and municipal facilities located along the arterial and the three main commercial districts of Arlington Heights, Arlington Center, and East Arlington. **Figure 2** shows the parcel-level commercial and mixed land uses throughout Arlington, highlighting the concentration of destinations and opportunities accessible via the Bikeway. The path provides direct access to multiple schools, including Arlington High School, which abuts the path, and Hardy Elementary School. It also connects to a number of open space and recreational facilities, including Hurd Field, Ed Burns Arena, Buzzell Field Park, Spy Pond, and Magnolia Park/Thorndike Field. The Low- and Moderate-Income Census Block Groups in Arlington (**Figure 3**) largely border Massachusetts Avenue and the Bikeway; the Bikeway is an important transportation corridor that connects the Town's most vulnerable populations to key destinations safely and affordably. Furthermore, the Bikeway itself is a destination, granting path users access to green space, trees, and public art, separated from vehicle stress, noise, and pollution.

Figure 2: Key Destinations in Arlington

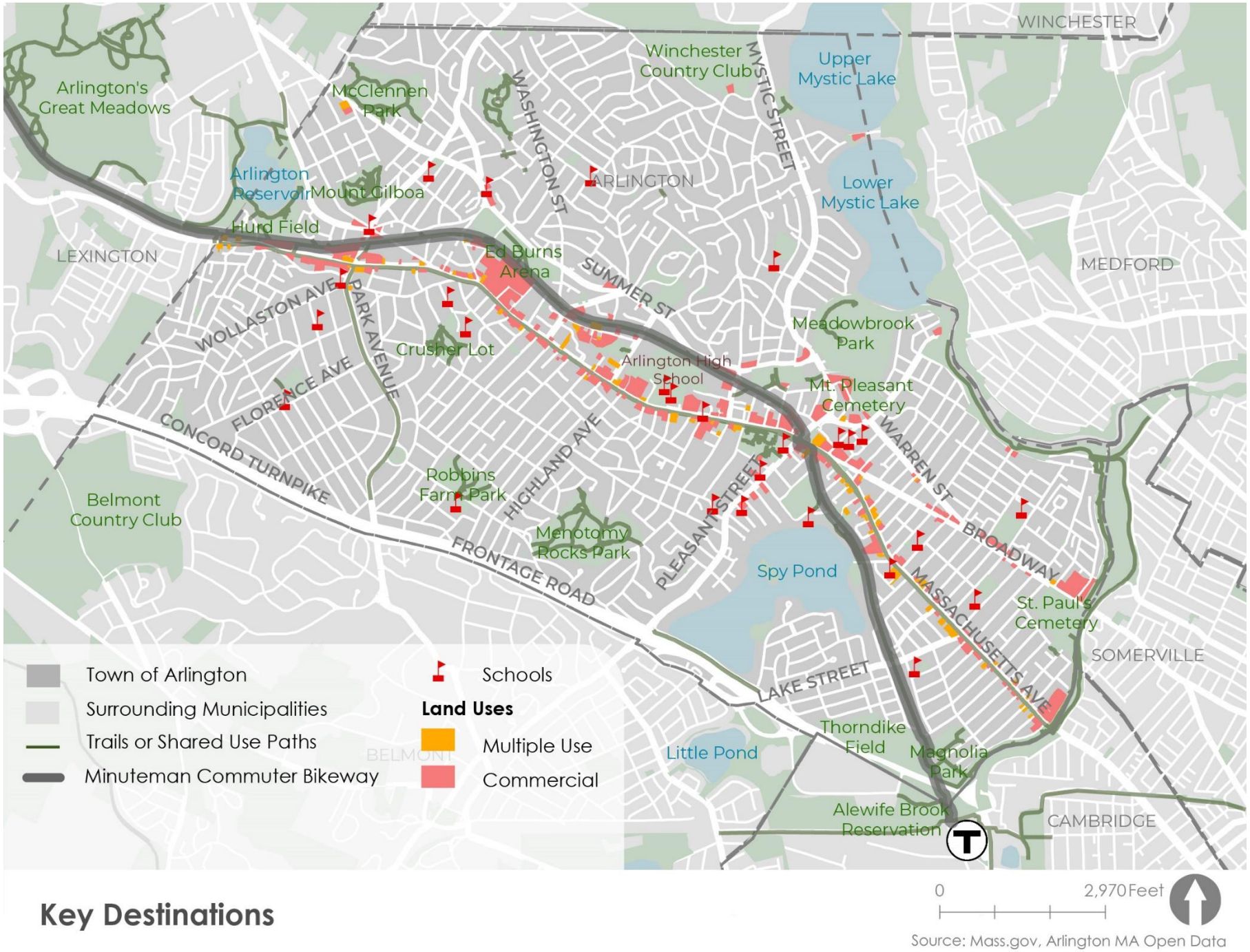
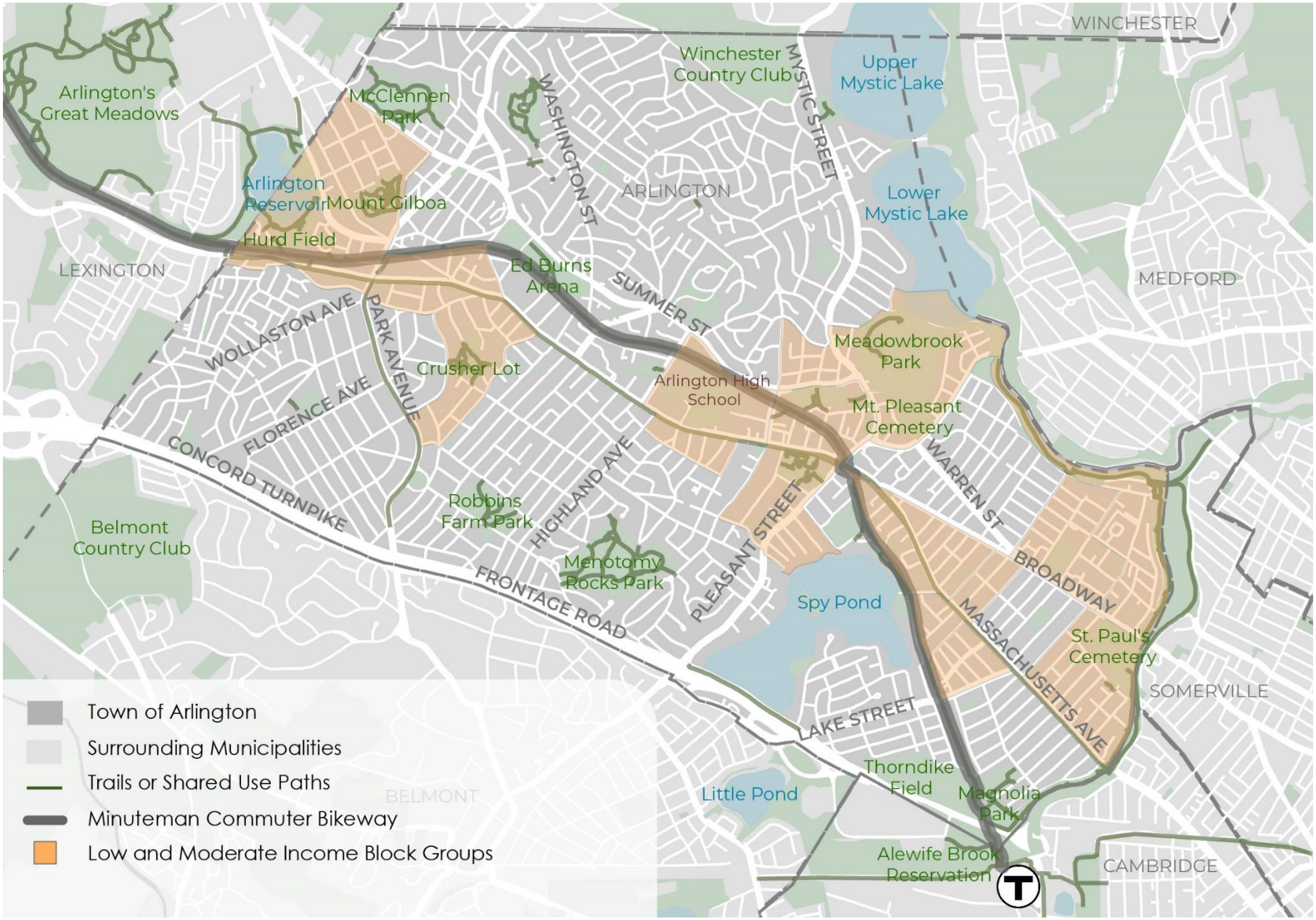


Figure 3: Low- and Moderate-Income Census Block Groups



The Minuteman Bikeway in Arlington is a highly utilized and much-loved facility. However, it faces challenges due to its success, including crowding and speed disparities between users. Although the Bikeway is more comfortable than riding in or walking alongside vehicle traffic, the density of users leads to discomfort and safety concerns. At-grade roadway crossings also present challenges for safety and comfort. While sections have been rehabilitated, the Bikeway has not been fully repaved since its construction and faces on-going maintenance challenges. Over time, the Bikeway has accumulated a patchwork of design interventions, placemaking elements, and maintenance, leading to an inconsistent and unpredictable experience. This study reviews and assesses the key challenges facing the Bikeway throughout its extents in Arlington to understand how to keep the Bikeway safe and accessible to all types of users and to plan for future investments.

The project team assessed existing conditions on the Bikeway. The assessment included a review of existing documents and policies, field visits and observations, data analysis, and a public survey. The team documented and evaluated the existing conditions of the following elements:

- Planning documents, bikeway use policies, use agreements, zoning, and new development
- Path volumes
- Crash history
- Entry and access points
- Waysides and Trailheads
- Signage
- Artwork
- Intersections
- Maintenance practices
- Bridges
- Drainage
- Width and Engineering Constraints for Widening

DOCUMENT REVIEW

The project team reviewed past planning efforts, use policies and agreements, and upcoming project information to understand existing policies related to the Bikeway and to review what has already been planned, proposed, or recommended for the corridor. This section summarizes relevant findings from this review.

Past Planning Efforts

Navigating the Minuteman Commuter Bikeway (2014)

Navigating the Minuteman Commuter Bikeway is a plan that recommends infrastructure improvements, programs, and policies to ensure the Bikeway retains its attractiveness as a commuter bikeway and continues to accommodate new users in the future. The plan includes recommendations for wayfinding and signage, intersection improvements, trailhead and waysides, partnerships, community outreach, policing and public safety, maintenance, and future improvements. The plan covers the Bikeway in Arlington, Lexington, and Bedford, and outlines corridor-wide consistency recommendations. However, it does not go into specific detail for each town.

Arlington Master Plan (2015)

The *Arlington Master Plan* is a comprehensive plan adopted by the Arlington Redevelopment Board. The plan considers a range of topics that contribute to civic connections, encourage social interaction, and foster a sense of community within the town. The following issues, opportunities, and recommendations identified in the plan are relevant to the Bikeway:

- The plan identifies several redevelopment opportunity areas close to the Bikeway, including Massachusetts Avenue and the Mill Brook district.
- The plan acknowledges the difficulties of certain crossing locations of the Bikeway and the impacts on congestion, traffic circulation, and safety. These locations include the intersections with Massachusetts Avenue (Arlington Center), Mill Street, and Lake Street.
- The plan acknowledges that the Bikeway does not have lighting, which may deter users in the winter months when the sun sets before the end of the workday, and that some segments have worn pavement and edge erosion. In addition, there is a lack of physical and cultural connections between the Bikeway and commercial establishments.
- Recommendation: Improve conditions, access, and safety for bicyclists on the Minuteman Bikeway and on local streets. Strengthen connections between the Minuteman Bikeway and commercial districts to increase customers without increasing a need for on street parking.
- Proposed Action: Address ADA requirements and improve lighting, signs and signalization at street crossings for the Minuteman Bikeway to give more visibility to pedestrians and bicyclists and control traffic speeds.

> 2. **Massachusetts Avenue has the capacity for growth**. It can support mixed-use development commensurate with its function as Arlington's primary commercial corridor. Massachusetts Avenue is accessible to neighborhoods throughout the town, it has frequent bus service, bicycle routes, and good walkability. Increased density through greater building heights and massing would benefit the corridor from an urban design perspective and benefit the town from a fiscal perspective.

Capacity for growth on Massachusetts Avenue, including transit and improved multimodal access, is a key recommendation from the *Arlington Master Plan*.

- Proposed Action: Provide safe connections between the Minuteman Bikeway and the three main commercial centers (Arlington Heights, Arlington Center, and East Arlington). Equip corridors with wayfinding signage to direct path users between the path and the commercial centers, including a map directory of local businesses along the path.

These recommendations are expanded upon in *Connect Arlington* (see below) and demonstrate that the Bikeway continues to be a critical point of concern and planning.

Arlington Net Zero Action Plan (2021)

Arlington's Net Zero Action Plan was endorsed by the Select Board in August 2021 as a roadmap to reduce the Town's greenhouse gas pollution to net zero by 2050. This plan outlines the Town's motivation for achieving "net zero" and the roadmap for implementation, including measures related to buildings, mobility, and clean energy supply. The Bikeway is acknowledged as an important component of existing and future progress toward zero emissions mobility.

Connect Arlington (2021)

Connect Arlington is the Town's sustainable transportation plan, endorsed by the Select Board in July 2021. This plan outlines a 20-year strategy to ensure that Arlington's residents, workers, business owners and visitors are provided a safe, reliable, and multimodal transportation network that meets the needs of people of all ages and abilities. The following strategies identified in the plan are relevant to the Bikeway:

- Complete the Minuteman Bikeway Study and implement recommendations that increase access to and capacity and safety on the pathway to ensure that it remains a comfortable active transportation facility for all active transportation users – recreational or commuter – including bicyclists, runners and walkers.
    - Prioritize opportunities to separate bicyclists from pedestrians to expand capacity and enhance comfort and safety.
    - Develop and implement comprehensive wayfinding and user safety program for the Bikeway.
    - Install lighting to increase visibility and safety along the pathway at night.
    - Improve and add additional neighborhood connections.
- Develop educational programs that promote safe travel behaviors by ALL users.
    - Share the Path - The Minuteman Bikeway is a heavily used multiuse path. Developing a comprehensive safety program through enhanced signage, pavement markings, separated use, and other user information would help to inform those not versed in how to successfully share the path. The Town has provided Community Preservation Act (CPA) funding to study potential safety improvements along the Minuteman Bikeway.

Rapid Recovery Plan (2021)

The Local Rapid Recovery Planning program provided grant funding to communities across Massachusetts to assess impacts from COVID-19 and develop actionable, project-based recovery plans tailored to the unique economic challenges in downtowns, town centers, and commercial districts. Arlington, Bedford, and Lexington jointly applied for assistance from the program to promote recovery in the Arlington Heights, Bedford Center, and East Lexington Business Districts, with emphasis on capitalizing on the Minuteman Bikeway, a common asset among these three areas. The plan acknowledges that the Bikeway provides insufficient wayfinding, resulting in missed

opportunities to attract Bikeway users to businesses, and that physical and visual issues affect access to and from the Bikeway. The following recommendations address these issues:

- Design and install wayfinding signage and other elements to encourage Bikeway users to patronize the Business Districts
- Connect the Bikeway to the Districts via designated access way improvements (e.g., pavement markings, design elements), especially at Bow Street, Park Ave, and Depot Park to the Narrow Gauge Rail Trail.
- Create a well-marked public "at-grade" accessway from the Bikeway through the parking lot at 30 Park Ave.
- Create a mural program (especially for public locations and businesses adjacent to the Bikeway).

Bikeway Projects

Arlington Center Safe Travel Project (2016)

The *Arlington Center Safe Travel Project* was a project led by MassDOT with construction beginning in April 2016. An important goal of this effort was to provide a safe connection for the Bikeway across Massachusetts Avenue and through Arlington Center. As a result of this project, bicycle lanes and a two-stage left-turn box were installed on Massachusetts Avenue. Additional components included improving pedestrian safety and sidewalk infrastructure, and upgrading signal equipment, phasing, and timing.

Lake Street/Bikeway Intersection Design Project (2020)

As a result of the Lake Street Corridor Project, the Arlington Transportation Advisory committee recommended pursuing a new signal at Lake Street and the Bikeway crossing to improve traffic delay and to provide a more orderly, predictable crossing for both Bikeway and Lake Street users. Construction of a new traffic signal, including a bicycle signal for path users, and improved path entrances and crossing markings concluded in Fall 2020.

Bikeway Use Policies in Arlington

- The Tri-Town Bike Committee is made up of volunteer representatives from Arlington, Lexington, and Bedford Bicycle Advisory Committees and typically meets twice a year to discuss issues related to the Bikeway. Although there is no official guidance at the time of writing, the committee has been considering various use policies including a non-regulatory speed limit, a suggested passing distance, stopping and/or yielding behavior at intersections, electric bicycle allowances, and the use of other personal mobility devices such as e-scooters or Onewheels.
- Guidelines for Event Use of the Donald R. Marquis Minuteman Trail (Minuteman Commuter Bikeway) (2013)
    - This document outlines principles which the Town Manager may consider when responding to requests for special uses/events on the Bikeway, including safety, transparency, and consistency in policies and decision-making. This policy was developed to protect the unimpeded use of the Bikeway for travel use and to provide guidelines consistent with those in the Lexington portion of the Bikeway. The policy also outlines detailed guidelines for special event permit requests, which are required for any event where a group of more than 35 participants are using the Bikeway. This policy is currently unofficial and has not been explicitly approved.

- Memorandum: Proposed Speed Limit for the Minuteman Bikeway (2020)
    - At the request of the Lexington Bicycle Advisory Committee (LBAC), the Arlington Department of Planning and Development explored the installation of a non-regulatory speed limit (15 mph) on the Arlington section of the Bikeway. The goal of this speed limit would be to reduce the speeds of bicyclists that were making lower-speed users uncomfortable and creating hazardous conditions for all users of the Bikeway. Based on a review of the potential benefits and disadvantages of such a policy, the Department recommended that a speed limit on the Bikeway was not appropriate at that time.
- Bikeway Operating Hours (2020)
    - The Arlington Bicycle Advisory Committee worked with the Arlington Police Department on a proposal to amend the operating hours of the Bikeway, which previously mirrored that of all parks in town (5 AM – 9 PM). At a Special Town Meeting in Fall 2020, a substitute motion passed which removed all hours of usage from the bikeway.

Use Agreements

- In September 1988, the Town of Arlington acquired land known as the "Alewife Reservation – Minuteman Bikeway Line" using funds granted by the Massachusetts Urban Self-Help Program. This agreement authorized the Town to develop, manage, maintain, and operate the project (the Bikeway) on this land. Additional land was acquired via eminent domain for the use of the Bikeway in November 1988. These agreements require that the Town uses the land only for the park, recreation, or conservation purposes.
- In June 1997, the Town of Arlington entered into a License Agreement with the Massachusetts Bay Transportation Authority (MBTA) in which the MBTA agreed to license the Town in the right and privilege to use a segment of the line of railroad known as the Lexington Branch between the Cambridge/Arlington boundary line and the Arlington/Lexington boundary line. In this agreement, the Town agreed to use this segment as a "bikeway" established for the "passage of bicycles without motive power." This agreement requires that all construction in the Bikeway be granted written approval by the MBTA's Chief Engineer of Railroad Operations. In addition, Arlington may be required to remove any construction not so approved. This License Agreement shall continue unless and until MBTA shall give notice to Arlington that it intends and elects to terminate the license on the grounds that the line segment is required for MBTA for mass transit extension or that regulations or orders of appropriate regulatory authority require such termination.
- An Order of Conditions pertaining to the Massachusetts Wetlands Protection Act and the Arlington Bylaw for Wetlands Protection was issued in 2000 to Metromedia Cable. This was in relation to a parallel right-of-way to the Bikeway that the Town leased to Metromedia for a conduit containing fiber optics cables.
- An MBTA Railroad Operations Directorate from August 2014 outlines specific guidelines and procedures for construction on MBTA railroad property, which includes the property on which the Bikeway is situated. All proposed construction on or accessing the Bikeway must follow these guidelines.

Zoning

The Town of Arlington Zoning Bylaw was adopted by Town Meeting in February 2018. The Bikeway is zoned as a Transportation District. This document includes bylaws related to the installation, location, use, and maintenance of signs. Bylaws pertaining to non-accessory signs, or those that are not related to the lawful use of the lot upon which the sign is located, are most applicable to the

Bikeway. This document also outlines details related to the provision and installation of bicycle parking. Bicycle parking spaces which are required for development subject to Environmental Design Review have additional stipulations that may not apply to bicycle parking installed in relation to the Bikeway. Construction or reconstruction for specific uses on a site abutting the Bikeway will require a special permit granted by the Arlington Redevelopment Board.

New Development & Access

Two private developments adjacent to the Bikeway are in process at the time of writing.

- 1165R Massachusetts Avenue: The proposed development is a 124-unit multi-family residential rental project located south of the Bikeway near the intersection of Massachusetts Avenue and Forest Street. The developer received a Comprehensive Permit and the Arlington Zoning Board of Appeals has granted a waiver for the design standards imposed to buildings along the Bikeway.
- Thorndike Place: The proposed development is a 124-unit age-restricted independent living residence and six duplex buildings with 12-units total, together with a preservation of approximately 11 acres of conserved land. The development site is located west of the Bikeway just north of the Cambridge/Arlington line. The Zoning Board of Appeals has approved a Comprehensive Permit application for the proposed development.

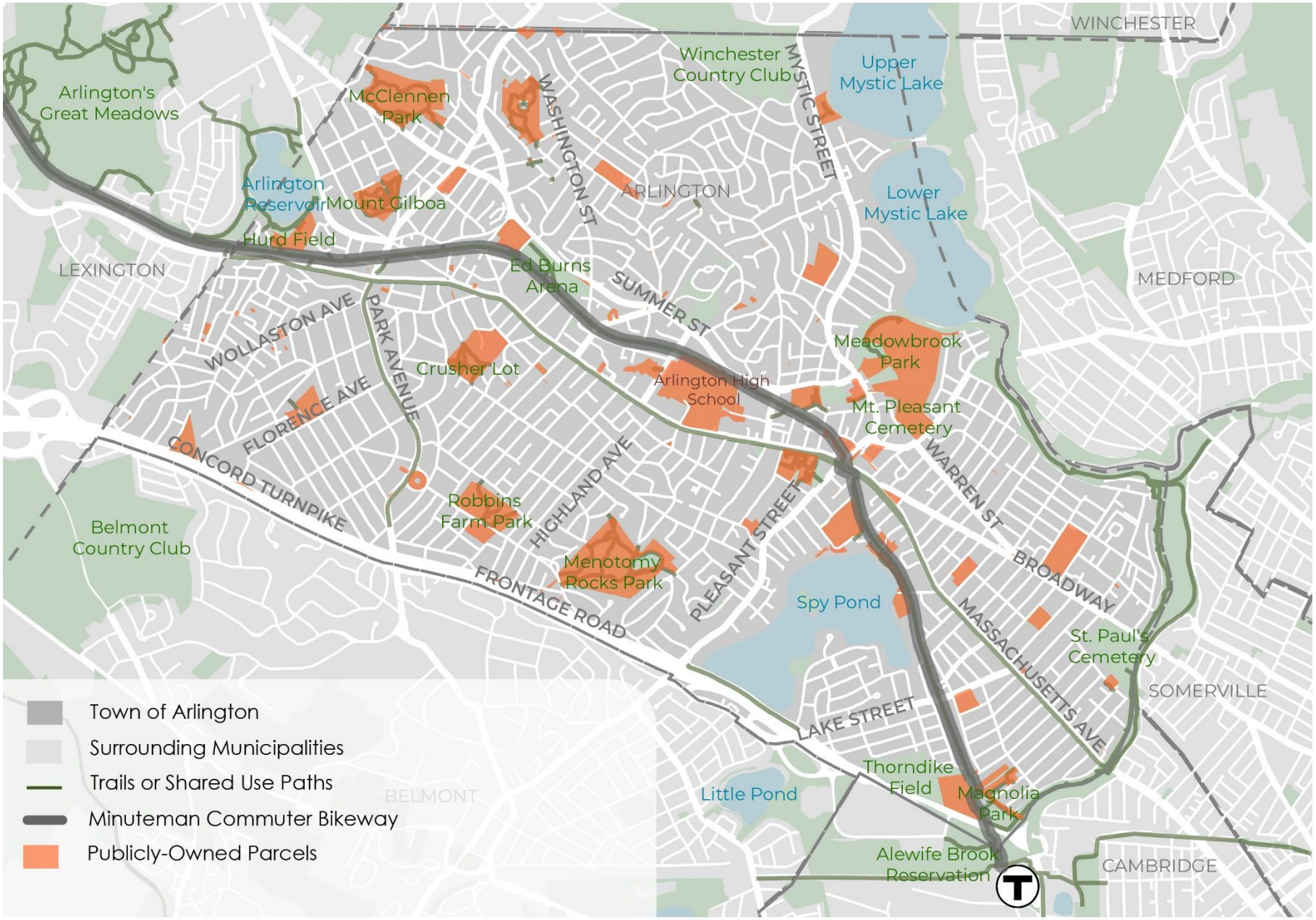
Three new access points to the Bikeway are being proposed at the time of writing.

- Arlington Reservoir Connection: The Town of Arlington received grant funding through MassTrails to design and engineer an ADA-compliant pathway connecting the Bikeway to the Arlington Reservoir through Hurd Field. This pathway was one of many recommendations that resulted from the Arlington Reservoir Master Plan, released in 2018.
- Mystic River Path Connection: The Town of Arlington received grant funding through MassTrails to connect the Mystic River path and the Bikeway via the Mystic Valley Parkway along the south side of lower Mystic Lake and along Summer Street in Arlington.
- Arlington High School (AHS) Connection: A pathway connection between the Bikeway and Arlington High School has been designed as part of the reconstruction of AHS. This connection will be completed via a bicycle and pedestrian ramp north of the W. A. Peirce Field and is expected to start construction in 2024.
- 19R Park Avenue Connection: A pathway connection between the 19R Park Avenue affordable housing development and the Bikeway was approved by the Arlington Redevelopment Board and is seeking funding and design approval.

Parcel Ownership

The Bikeway corridor is owned by the MBTA. Adjacent parcels are a mix of private and public land. **Figure 4** illustrates parcels adjacent to the Bikeway that are publicly owned and that may provide opportunities for waysides, path widening, or other integrations of the Bikeway into the adjacent properties.

Figure 4: Publicly-Owned Parcels



Publicly-Owned Parcels

Source: Mass.gov, Arlington MA Open Data

PATH VOLUMES

Volunteers for the Town of Arlington collect manual bicycle and pedestrian counts on the Bikeway annually. These are provided to the Central Transportation Planning Staff (CTPS), which manages a regional bicycle and pedestrian count database.

2600 Average Daily Path Users

In addition to these manual counts, continuous (periods of 15 minutes) path user volume data is collected by an automated counter along the Bikeway near Swan Place. This data is available from June 26, 2019, through the present. During the period from July through October 2019 (pre-pandemic), the median number of path users was 2,620, with 56% of path users biking, and 44% walking. During weekends for this period, the Bikeway occasionally had over 4,000 trips. In the same time frame of July through October during 2021 (during the COVID-19 pandemic), the median daily volume of path users decreased to 1,944, or by 26%, with 62% percent of path users biking and 38% walking.[1] This decrease can most likely be attributed to the reduction in commuting trips, which make up a large proportion of trips on the Bikeway. And while the Bikeway has been an essential opportunity for outdoor recreation during the COVID-19 pandemic, crowding may have discouraged some people from frequenting the Bikeway due to social distancing considerations. **Figure 5** and **Figure 6** show the daily path use near Swan Place during these time periods.

[1] Due to hardware malfunctions, the data collected from the counter is sometimes incomplete or missing for periods of several weeks. Days with incomplete count data were removed from the summary.

Figure 5: Daily Path Users, July - October 2019

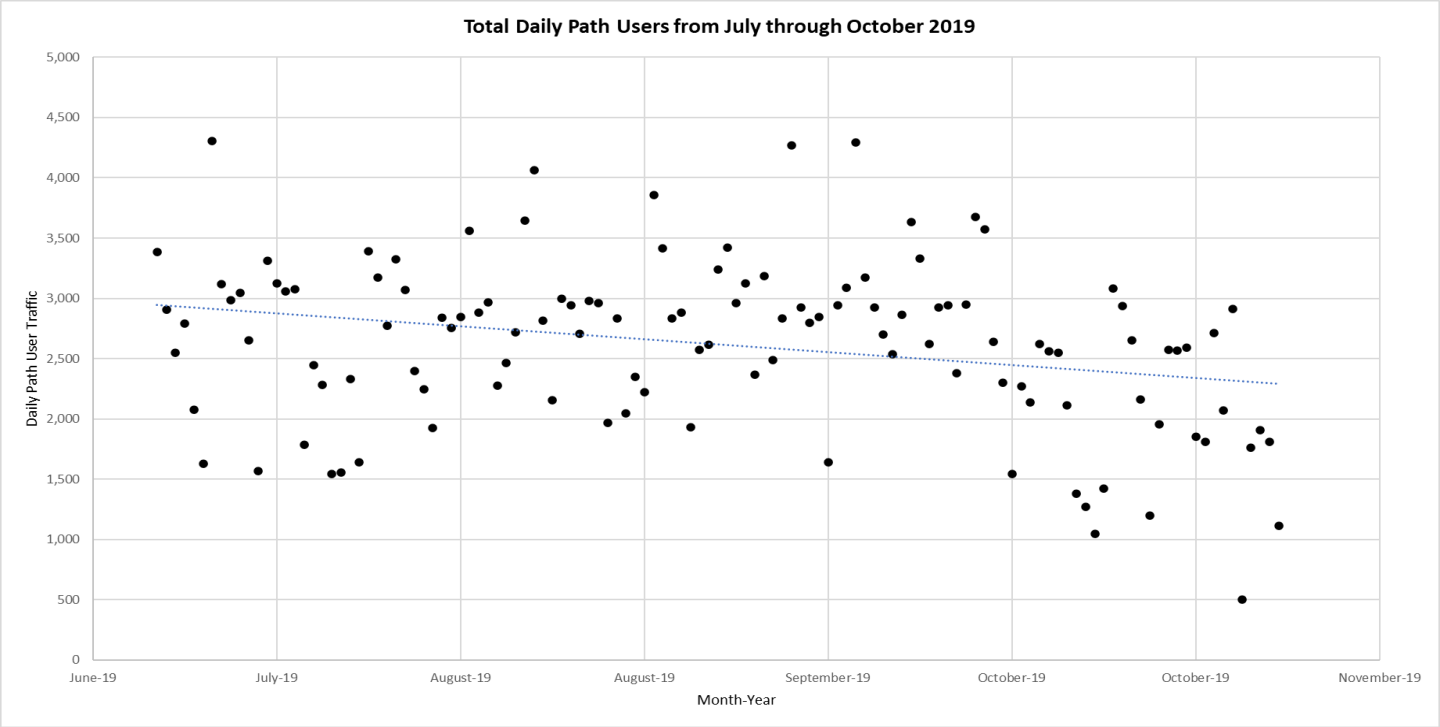
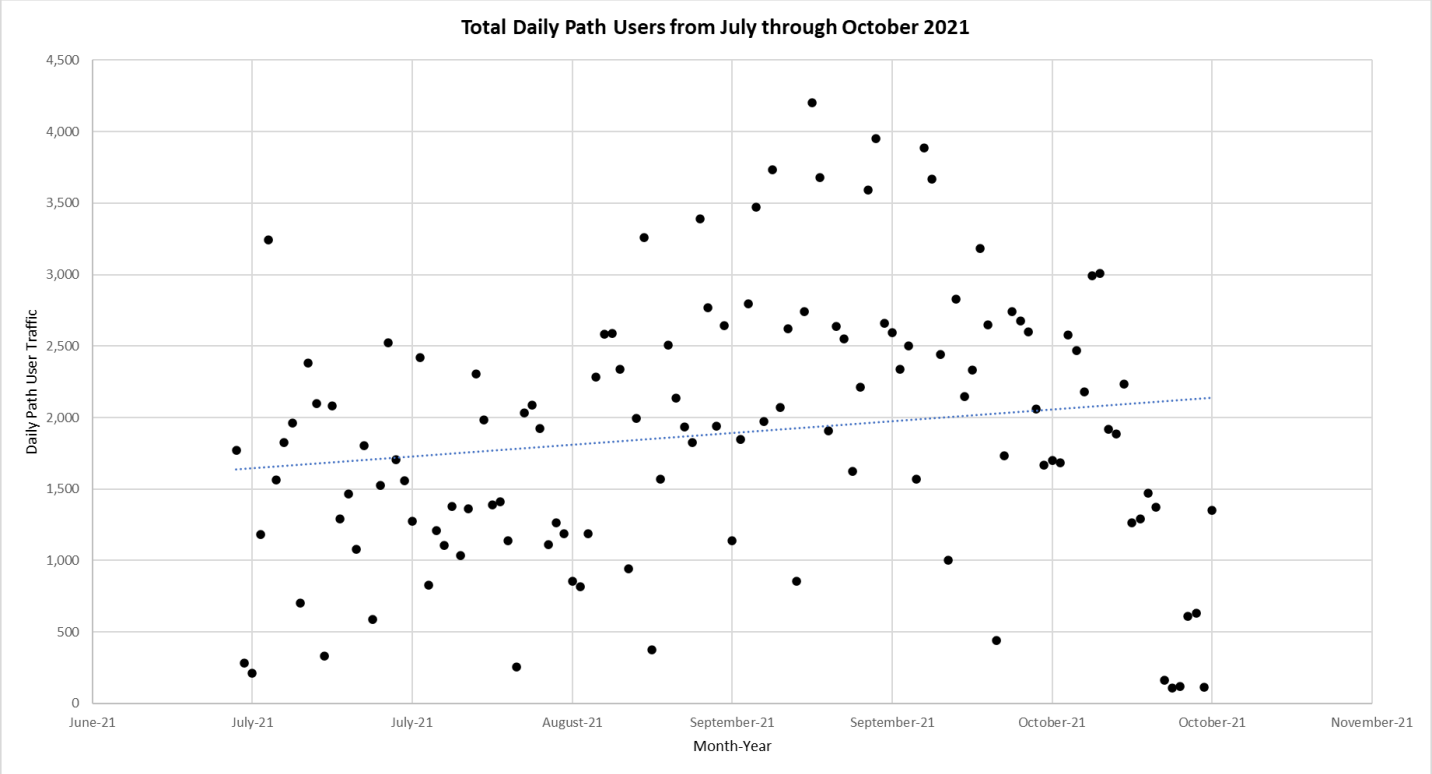


Figure 6: Daily Path Users, July - October 2021



East Arlington Livable Streets (EALS) also conducts annual seasonal counts during the morning peak (7:00am to 9:00am) and evening peak (4:30pm to 6:30pm) hours at Thorndike Dog Park. A summary of these counts is shown below in **Table 1**.

Bicyclist volumes tend to decrease in the winter months while pedestrian volumes are more consistent throughout the year.

Table 1. East Arlington Livable Streets Annual Counts

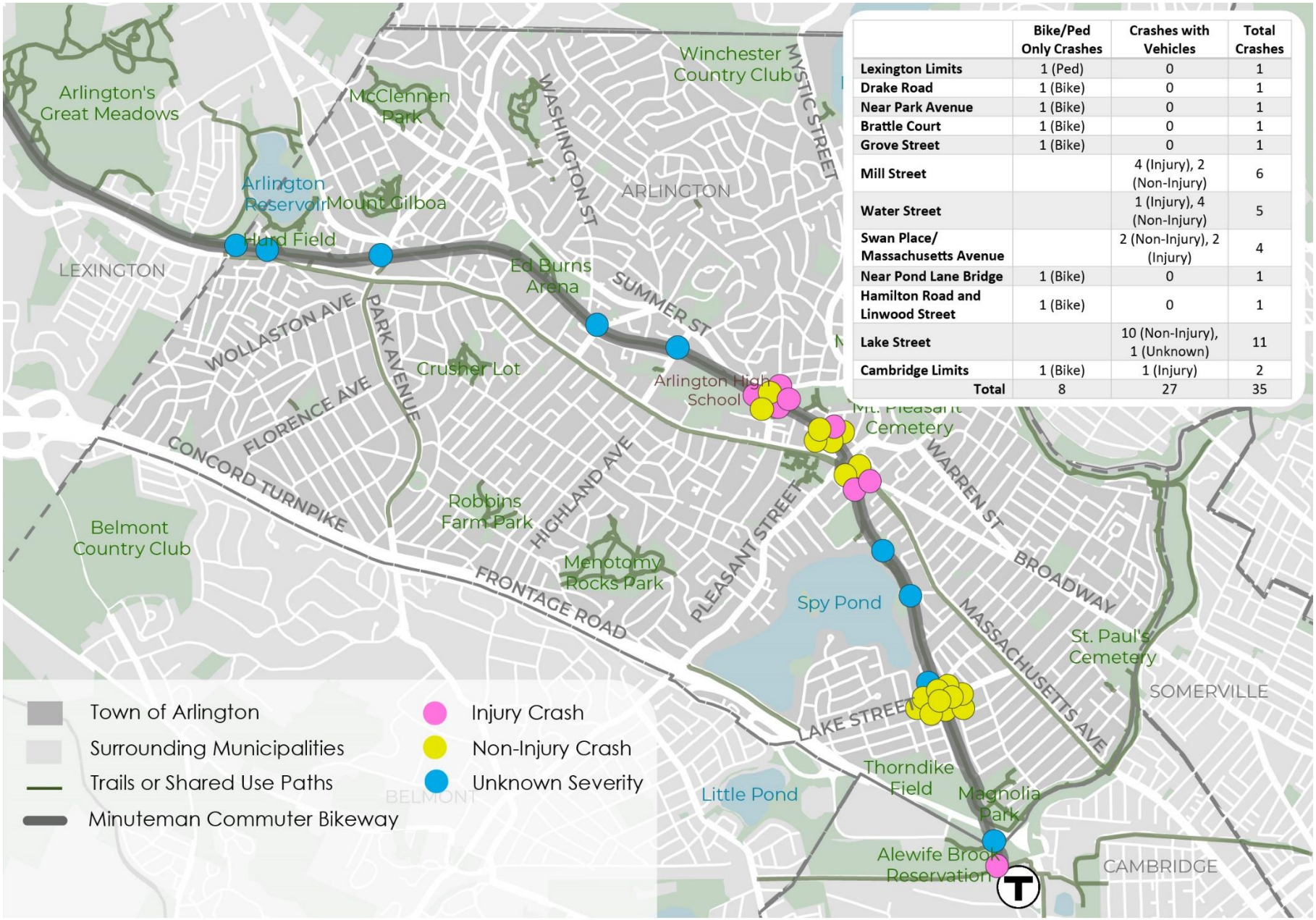
Season	Date	Morning Peak Volumes	Evening Peak Volumes
Winter (pre-pandemic)	Tuesday, January 30, 2018	698	692
Fall (pre-pandemic)	Wednesday, September 18, 2019	1,535	1,359
Fall (post-pandemic)	Tuesday, September 15, 2020	496	854

CRASH HISTORY

The project team reviewed crashes involving non-motorists in the vicinity of the Bikeway for the period between January 2017 and September 2021. The crash reports were collected from both the Massachusetts Department of Transportation and the Arlington Police Department. During this time, 35 crashes involving at least one person walking or biking occurred on the Bikeway or at intersections of the Bikeway and local roads (**Figure 7**). Of these crashes, 27 involved vehicles and eight solely involved path users. Eight crashes resulted in injuries to at least one involved party. The most common crash locations were the intersections of the Bikeway and Lake Street (11), Mill Street (6), Water Street (5), and Massachusetts Avenue (4). A majority of crashes (21) occurred during the afternoon and evening and over three-quarters of the crashes (27) occurred between the months of May and October, when the weather is typically ideal for walking and biking activity. During this same time period, 84 citations were issued at the intersection of the Bikeway and Lake Street – information on whether citations were given to path users or drivers was not included. These citations were often issued in clusters, with several on the same day, so it can be assumed they were likely part of a focused patrol effort preceding the Fall 2020 intersection improvements.

A fatal crash between two bicyclists on the path in Lexington in 2019 is not within the study area but has highlighted the need for safety and travel demand management improvements along the corridor as a whole.

Figure 7: Crashes on Bikeway and at Roadway Crossings



	Bike/Ped Only Crashes	Crashes with Vehicles	Total Crashes
Lexington Limits	1 (Ped)	0	1
Drake Road	1 (Bike)	0	1
Near Park Avenue	1 (Bike)	0	1
Brattle Court	1 (Bike)	0	1
Grove Street	1 (Bike)	0	1
Mill Street		4 (Injury), 2 (Non-Injury)	6
Water Street		1 (Injury), 4 (Non-Injury)	5
Swan Place/ Massachusetts Avenue		2 (Non-Injury), 2 (Injury)	4
Near Pond Lane Bridge	1 (Bike)	0	1
Hamilton Road and Linwood Street	1 (Bike)	0	1
Lake Street		10 (Non-Injury), 1 (Unknown)	11
Cambridge Limits	1 (Bike)	1 (Injury)	2
Total	8	27	35

Crash Severity (2017-2021)

Source: Mass.gov, Arlington MA Open Data, Arlington Police Department, MassDOT

ENTRY AND ACCESS POINTS

There are several official entry and access points to the Bikeway, including the beginning of the path at Alewife Station, the gateways at Swan Place and Mystic Street, and the five intersections between the Bikeway and local streets. There are also a significant number of unimproved paths and connections that have been created over the years because of consistent use or the actions of private property owners and adjacent businesses. Since the rail corridor outside of the Bikeway is under the domain of the MBTA, the addition or alteration of entry and access points requires clear coordination with the MBTA's Real Estate Division.

The project team reviewed the existing entry and access points to the Bikeway in the field and recorded the location, causes of obstruction (if any), sight distance (if obstructed), ADA compliance, and photographs of the access point. A total of 45 entry and access points were identified. These access points are not distributed evenly across the length or between sides of the Bikeway. Notable gaps include those areas where the Bikeway is grade separated from the surrounding roadway network, such as the area near the Grove Street overpass. **Table 2** summarizes the primary issues observed in the field at these access points. Each of these primary issues can pose problems for path users with disabilities and most instances are not compliant with ADA regulations. Relevant photos are referenced in **Table 3** and a summary of observed access point locations are shown in **Figure 8**. A segment-by-segment summary of the access points can be found in **Appendix A.**

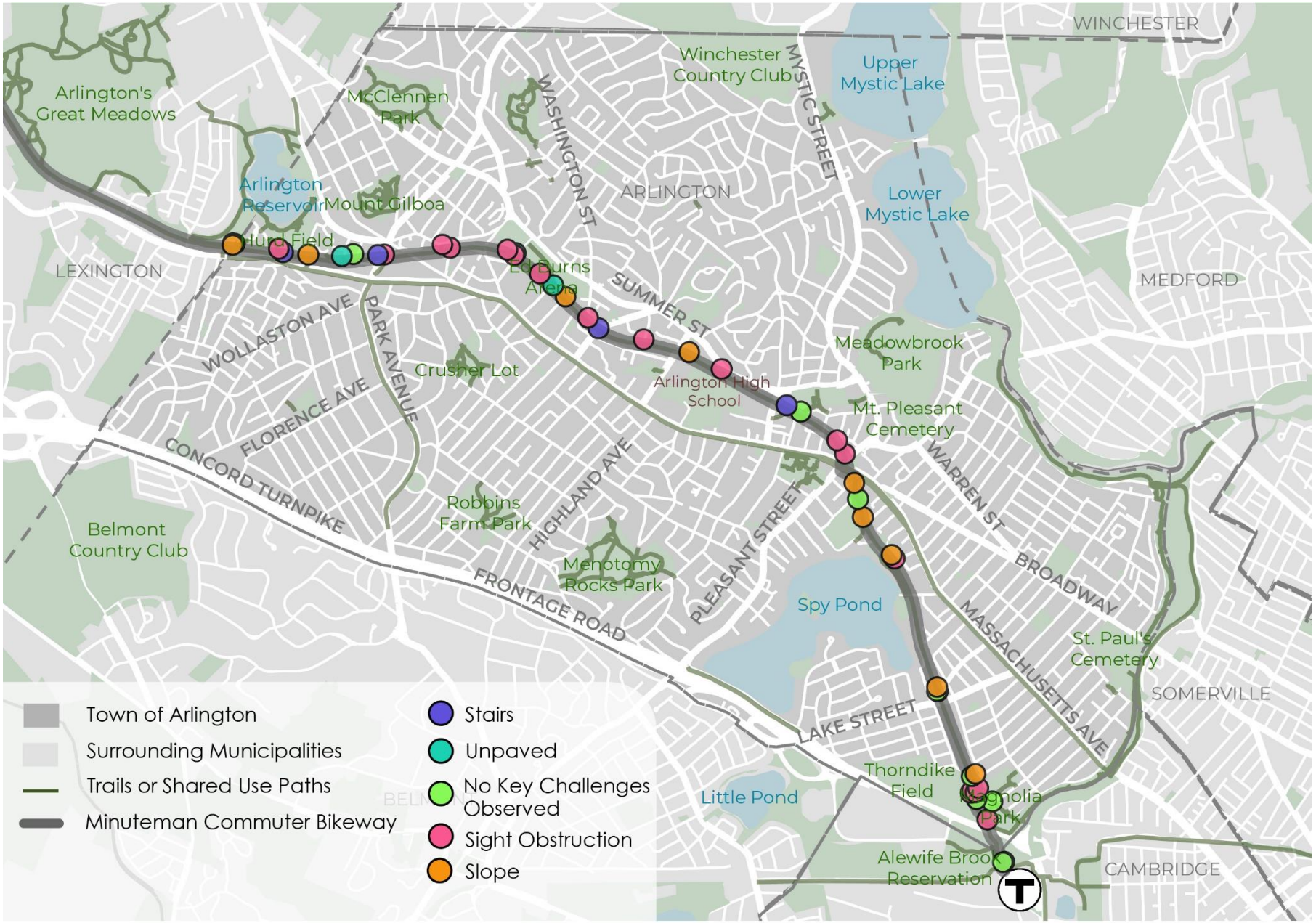
Table 2. Primary Issues with Existing Entry and Access Points

Primary Issue Category	Description	# of Access Points Assigned to Category
Unpaved	Unpaved access points are inaccessible to many path users including wheelchair users and typically are not flush with the Bikeway pavement (i.e., do not meet at the same grade). Improvement requires simple fine grading and paving of a small area (typically less than 100 S.F.). Due to the low cost of the solution and relatively low impact of the issue to most path users, only access points not demonstrating issues in other categories were assigned "unpaved" as their primary issue (1A-1B).	3
Sight obstruction	Sight obstructions at access points along the Bikeway include vegetation, structures, and alignment of the path and access point intersection. Of the 17 points with sight obstruction, 11 involved sight obstruction due to vegetation. Typically, these obstructions require trimming of light vegetation and do not involve tree trunks or large branches (2A). Seven of these access points have obstructed sight lines due to a skewed alignment or nearby curve in the Bikeway (2B).	17
Slope	Access points with a noticeably steep slope that is likely inaccessible to assistive mobility devices and/or bicycles are assigned to the "slope" category. In most cases (6 of 9), access points under this primary issue category are unpaved as well (3A). Additionally, these unpaved points with slope issues are typically dirt with virtually no vegetation in the path due to wear by path users (3B).	9
Stairs	The "stairs" primary issue is assigned to access points with only stairs and no ramp or level alternative. Stairs are entirely inaccessible to wheelchair users and many other people with mobility impairments. Additionally, stairs are inaccessible to many people with bikes. Any locations with stairs are given this designation regardless of the surface material, slope, or sightlines of the connection between the stairs and Bikeway (4A-4B).	5
No Key Challenges Observed	Any access points to which none of the four primary issue categories above are applicable are assigned to the "not applicable" category. These sites are all paved, level, and absent of stairs and sight obstructions (5A-5B).	11

Table 3: Access Point Photos

	1. Unpaved Surface	2. Sight Obstruction	3. Slope	4. Stairs	5. No Key Challenges Observed
A					
B					

Figure 8: Key Challenges at Bikeway Access Points



Access Points

Source: Mass.gov, Arlington MA Open Data

WAYSIDES AND TRAILHEADS

Waysides and trailheads are locations that serve a mix of utilitarian and recreational purposes in support of the Bikeway. When applied at logical locations - such as path or roadway intersections, vistas and views, locations where users are expected to want to rest, or at regular intervals along the corridor - waysides and trailheads provide amenities and treatments that create a sense of place, orientation, and comfort. While similar in many ways, waysides are defined for the purpose of this study as locations along the side of a shared use path or trail corridor where people can stop to rest, regroup, immerse, or recreate.

Trailheads may serve these same purposes but are located at key multimodal access points where path users transition from other facilities or the street network into the Bikeway. Trailheads should include information such as maps, rules, policies, and path user etiquette expectations to orient people as they enter the facility. They should also include infrastructure that assists in transitioning between networks such as vehicle parking or bike rental stations.

The table below (**Table 4**) provides examples of the types of components that might be found at a wayside, trailhead, or both. Minor access points may be more appropriately categorized as waysides or neither if no amenities or placemaking are provided. **Table 5** summarizes the waysides and trailhead components observed along the trail.

Table 4: Wayside and Trailhead Example Components

Component Purpose	Example Components	Wayside	Trailhead
Access and orient	Informational signs or kiosks with maps, rules, and policies		X
	Vehicular parking		X
	Bike rental stations		X
	Bike repair stations	X	X
Rest, and regroup	Seating	X	X
	Views and vistas	X	
	Landscaping and plantings	X	X
	Pull offs for pausing out of the way of path traffic	X	
	Trash receptacles	X	X
	Bike parking	X	X
Immerse	Public art	X	X
	Cultural, historical, or educational exhibits	X	X
	Natural areas	X	X
Recreate	Multi-use fields	X	X
	Sports and exercise equipment	X	X
	Playgrounds	X	X
	Secondary paths	X	

Table 5: Existing Waysides and Trailheads

			Points of Interaction	Points of Access	
Location	**Features**	**Observations**	**Wayside**	**Trailhead**	**Minor Access**
Lexington border	Benches	De-facto trailhead to Arlington. Major access point to Bikeway.		X	
Hurd Field	Parking, soccer fields, baseball fields, habitat garden, walking paths	Seasonal restrooms, connection to Arlington Reservoir. Major access point to Bikeway.		X	
Trader Joe's	Bike rack		X		
Walgreens	Bench		X		
Park Avenue	Stairway with bike rail	Grade Separated, Lack of maintenance.			X
Summer Street Sports Complex	Lighted baseball fields (Robillard and Buck Field), multi-purpose fields, basketball court, playground, benches, bike racks, bocce courts, picnic area	Direct connection off path. Seasonal restrooms at fields.		X	
Ryder Street	Parking	At-grade crossing. Ryder Street dead ends either side of path. Major access point to Bikeway.		X	
Burns Arena	Ice rink, bathrooms, snack bar, vending machines, parking.	Restrooms and food.		X	
Hill's Hill	Secondary trails	Minimal improvements.	X		
Brattle Street	Stairway, paved path to Washington St.				X
Mill Street		At-grade crossing. No improvements.			X
Buzzell Field Park	Two baseball fields (1 lighted), playground, basketball court.	Direct connection off path.		X	
Water Street		At-grade crossing. No improvements.			X

Uncle Sam Plaza	Benches, bike parking, historical info, landscaping, overhead banner sign	Direct connection off path. Overhead sign at Mystic Ave still relates to old alignment.		X	
Whittemore Park	Benches, bike racks, cultural heritage site and landscape design	Direct connection off Massachusetts Avenue WB bike lane.	X		
Swan Place	Overhead Banner Sign, bike rack, tire pump	Limited space.		X	
Spy Pond Park	Spy Pond field, playground, shore path, benches, tables, vehicle and bicycle parking.	Poor access or visual connection from path.		X	
Linwood Street	Blue Bike Station, kiosk, vehicle parking.			X	
Scannell Field	Portable toilets, baseball diamond.	Direct connection off path. Seasonal restrooms.	X		
Lake Street	Benches, bike rack, Little Free Library			X	
Varnum Street		At-grade crossing. No improvements			X
Thorndike Field/Magnolia Field (Parking Lot area)	Multi-use fields, vehicle parking lot, bike parking, benches, Blue Bike Station, community garden.	Direct connection off path.		X	
Thorndike Street	Bike repair station.	At-grade connection.			X
Thorndike Dog Park	dog park, benches, kiosk		X		

LIGHTING

Lighting along the Bikeway is generally sparse. Notable lighting along or adjacent to the Bikeway is found at the following locations in **Table 6**. Relevant photos are referenced in **Table 7**. Existing lighting density is illustrated in **Figure 9**, which shows lighting density along the path from sparse to densely lit areas. Minimally lighted segments are large stretches of the path where no adjacent lighting was observed or adjacent lighting may be present but illuminance (amount of light striking a surface, such as pavement) is minimized by vegetation, topography and other trailside features.

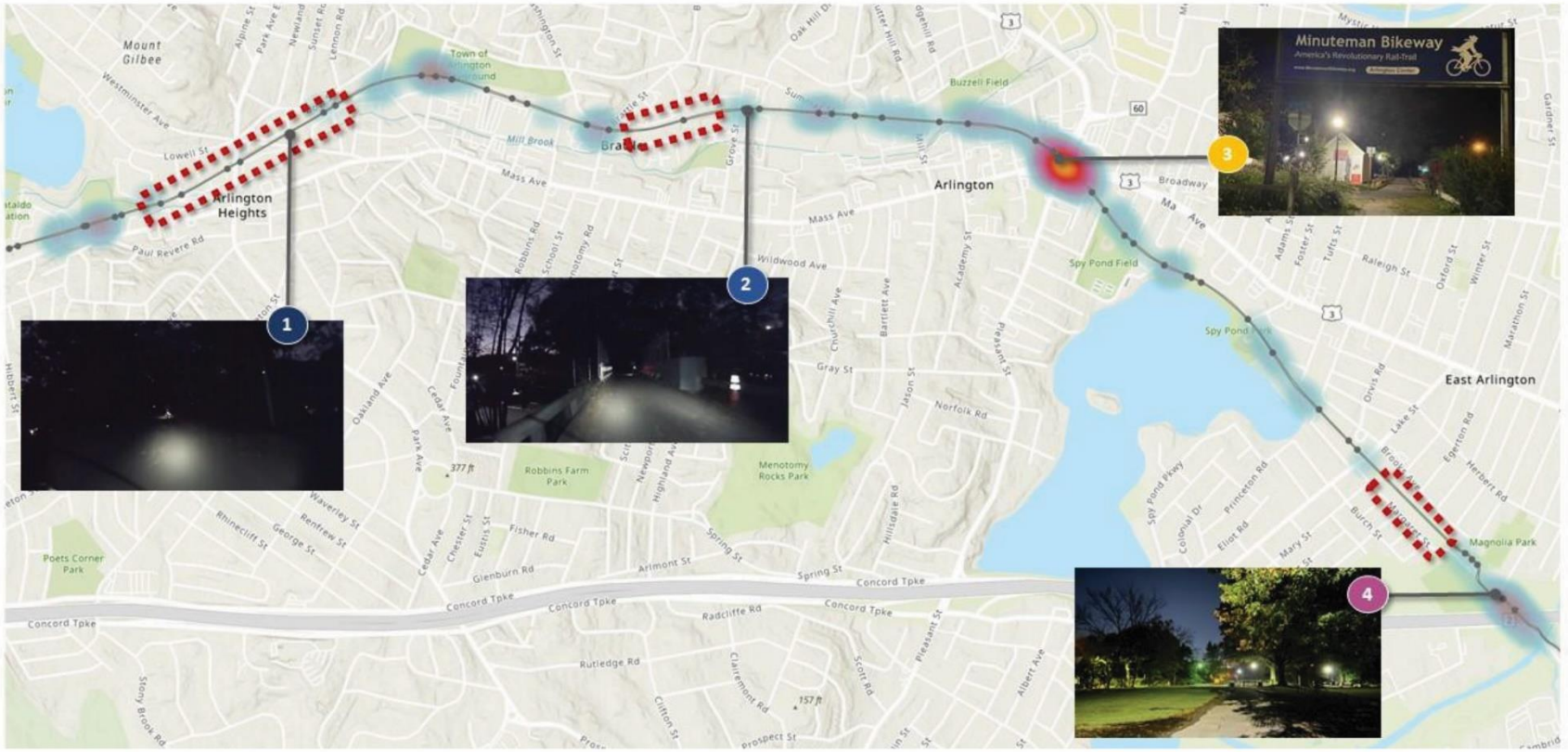
Table 6: Existing Lighting Locations

Location	Type	Observations
Alewife Station Access Road	Cobra head (2A)	Street lighting - Pole mounted (aluminum), running parallel to trail (far side of street)
Route 2 Underpass	Area light (5A)	Under lights - mounted to bridge beams
Route 2 to Thorndike Park	Cobra head (1A)	Path lighting - pole mounted (aluminum)
Thorndike Dog Park	Decorative acorn (3A)	Park lighting - pole mounted (steel), pedestrian height
Thorndike Street	Cobra head (2A)	Street lighting - pole mounted (utility pole)
Thorndike Park Parking Area	LED shoebox (2B)	Parking lights - pole mounted (utility pole)
Lake Street	LED shoebox (2A)	Street lighting - pole mounted (utility pole)
Hamilton Road	Cobra head (1B)	Street lighting - pole mounted (utility pole), running parallel to trail (near side of street)
Linwood Street	LED shoebox (2A)	Street lighting - pole mounted (utility pole)
Pond Lane	LED shoebox (2A)	Street lighting - pole mounted (conc. pole)
Whittemore Street	LED shoebox (2A)	Street lighting - pole mounted (utility pole)
Swan Place	Shoebox	Street lighting - pole mounted (utility pole)
Mystic Avenue & Mass Avenue	LED shoebox (2A), Decorative acorn (3B), building lights	Street lighting - pole mounted (aluminum), Sidewalk lighting - pole mounted
Uncle Sam Plaza	Decorative acorn (3C)	Plaza lighting - pole mounted (steel), pedestrian height, running parallel to trail
5/11 Water Street	Decorative acorn (3D)	Parking lighting - pole mounted (steel), pedestrian height, running parallel to trail
Water Street	LED shoebox (2A)	Street lighting - pole mounted (utility pole)
Mill Street	LED shoebox (2A)	Street lighting - pole mounted (utility pole)
Summer Street	LED shoebox (2A)	Street lighting - pole mounted (utility pole), running parallel to trail (near side of street)
Peirce Field	High Mast (4A)	Adjacent athletic field lighting
Grove Street	LED shoebox (2A)	Street lighting - pole mounted (utility pole)
Hill's Hill	High Mast (4A)	Adjacent athletic field lighting
Ryder Street	Cobra head (2A)	Street lighting - pole mounted (utility pole)
Summer Street Park	High Mast (4A)	Adjacent athletic field lighting
Forest Street	LED shoebox (2A)	Street lighting - pole mounted (utility pole)

Table 7: Trailhead Photos

	1.Path Lighting	2. Street Lighting	3. Decorative	4.High Mast	5. Area Light
A					
B					
C					
D					

Figure 9: Existing Lighting Density



Source: Mass.gov, Arlington MA Open Data

Existing Lighting Density (October 2021)
Minuteman Bikeway Planning Project

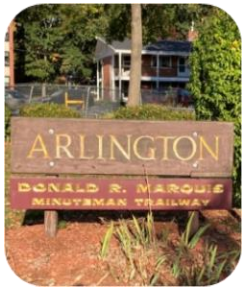
SIGNAGE

Table 8 summarizes the types of signs along the Bikeway, their typical application, and the consistency of use. Relevant photos are referenced in **Table 9**. In general, there are several different sign types used on the Bikeway, ranging from regulatory and warning signs to wayfinding and path use guidance signs. The application of signs is not consistent along the Bikeway or at entry points. All signage on the Bikeway should comply with town zoning bylaws and is under the purview of the Arlington Redevelopment board.

Table 8. Types of Signs on the Bikeway

Type of Sign	Typical Application & Consistency
Informational	Informational signs and exhibits are positioned along the Bikeway at points of interest to provide context and historical information to path users. These include bulletin boards (1A), on which people can post announcements and other information, exhibits in areas with historical or environmental significance (1B), such as those at Spy Pond and Arlington Center, and recognition plaques (1C), which recognize the Bikeway as a member of the Rail-Trail Hall of Fame at limited locations along the route.
Gateway	Gateway signs typically mark the entrance to a roadway or path. The Bikeway features two large gateway signs on either side of the Massachusetts Avenue and Mystic Street intersection (2A). The sign on Mystic Street is no longer oriented across the Bikeway because the path was relocated as part of the Safe Travel Project. A gateway sign also welcomes path users to Arlington and the Donald R. Marquis section of the Minuteman at the Lexington/Arlington town line (2B).
Wayfinding	Wayfinding signs help direct path users to points of interest, historic sites, and nearby streets. These signs can also help direct people walking and biking on intersecting streets to the Bikeway. These include official guide signs, such as "Bike Route" signs placed in view of drivers at most major intersections (3A), as well as more informal signs orienting path users to streets and destinations in their vicinity (3B-3D). Street signs are relatively consistent along the Bikeway but other informal wayfinding signs are not consistent in their frequency, installation, or branding.
Regulatory	Regulatory signs are used to indicate or reinforce traffic laws, regulations, or requirements. Along the Bikeway, these include stop signs (4A), requiring path users to stop before proceeding across intersections; yield signs (4B), positioned at locations where two paths converge; and "No Motor Vehicles" signs (4C), typically installed in view of drivers at intersections. Stop signs are consistently installed at locations where the Bikeway intersects with a street. The use of yield signs and "No Motor Vehicles" signs at access points and intersections is sporadic.
Warning	Warning signs call attention to unexpected conditions or alert users to conditions that might require a reduction of speed. Along the Bikeway, these include signs alerting path users to a traffic signal or stop sign ahead (5A-5B), typically placed in advance of an intersection, and signs highlighting the presence of pedestrians (5C), typically placed in areas with high walking traffic, such as the access point for Trader Joe's supermarket. The use of warning signs is not consistent, likely due to the fact that intersection control varies along the Arlington section of the Bikeway.
Path Use	Various signs provide guidance to path users on the proper behavior and expected use on the Bikeway. These are often installed at prominent access points, following major intersections, or where the path design requires additional user guidance, such as at the Lake Street intersection. These signs typically provide a preferred use or code of conduct (6A-6C), with the exception of one sign, which references a Town of Arlington statute that prohibits riding bicycles on the sidewalk (6D). While these signs are generally consistent in their messaging, they vary in their design, placement, and frequency. Depending on where a user accesses the Bikeway, they may never encounter a path use sign.

Table 9: Existing Sign Types

	1. Informational	2. Gateway	3. Wayfinding	4. Regulatory	5. Warning	6. Path Use
A						
B						
C						
D						

ARTWORK

Pathways: Art on the Minuteman was launched in 2017. The Arlington Commission for Arts and Culture commissions art displays along the trail with approval from the Town Manager (see below hyperlink for additional details). There are currently four displays between Linwood Street and Swan Place. The displays at these locations and additional displays near Park Avenue/Bow Street/Ryder Street and Summer Street Park are summarized in **Table 10** and **Table 11** respectively and relevant photos are referenced in **Table 12.** The locations of existing art installations along the Bikeway are shown in **Figure 10**. Over the years, there have been other unsanctioned "guerilla" installations along the Bikeway, which are typically removed by the Town.

Table 10: Arlington Commission for Arts and Culture Displays

Location	Exhibit Name	Type	Observations
South of Linwood Street	Dots and Dashes (1A)	Brightly colored discs	Spaced along the embankment across the path from Hamilton Road.
Linwood Street to Swan Place	Persistence (1B)	Crocheted plastic yarn sculptures	Cabled to trees throughout the tree canopies. Geared toward raising awareness about plastics in the environment.
Pond Lane	ExtraOrdinary Birds (1C)	Painted portraits of birds	Postcards hung in plastic sleeves on the bridge screen.
Linwood Street	Colony II and Colony III (1D)	Wood and paint	Detailed "village" of bird houses.

http://artsarlington.org/programs/pathways-art-on-the-minuteman-bikeway/

Other artworks observed along the project corridor includes the following.

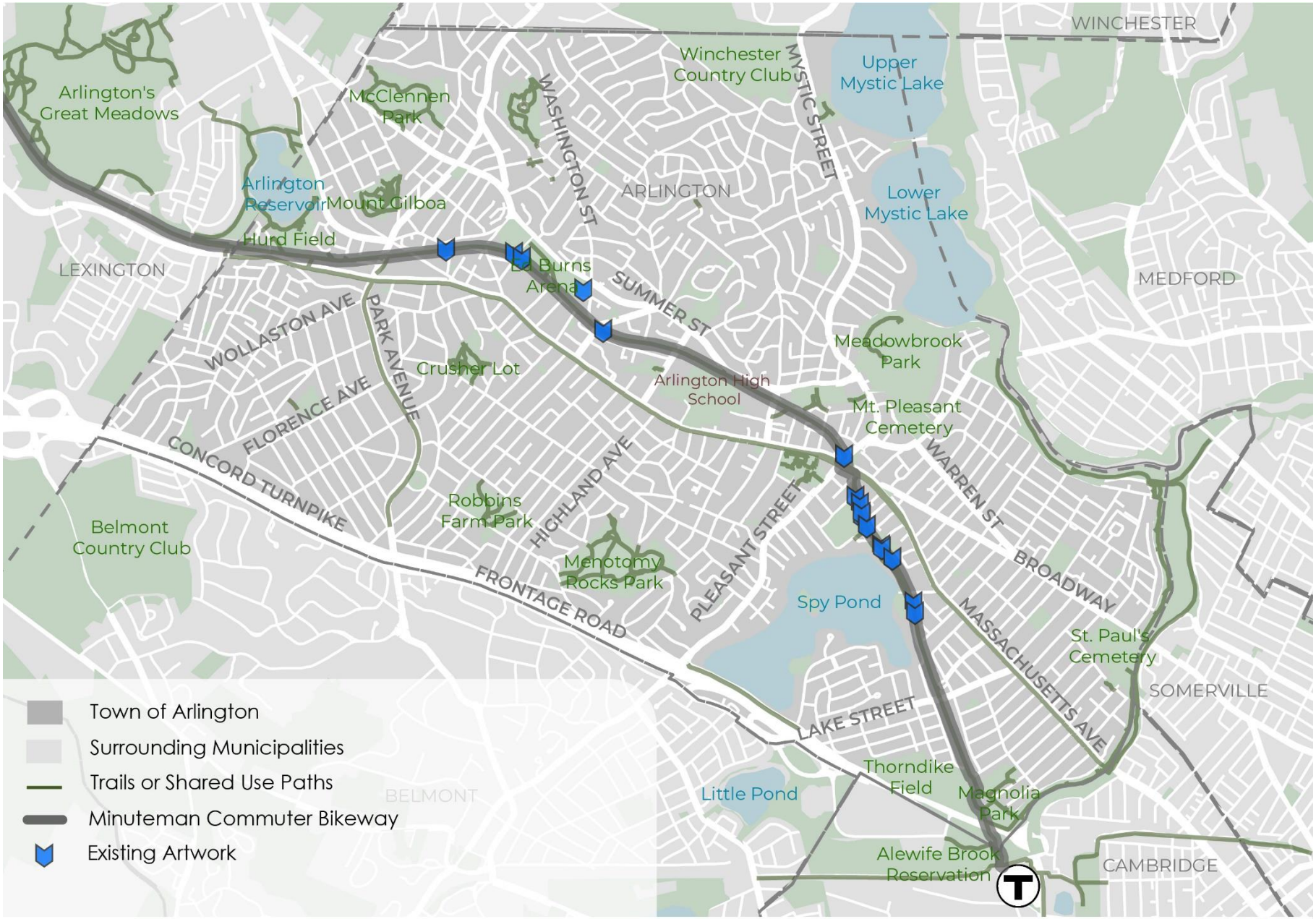
Table 11: Additional Art Displays

Location	Exhibit Name	Type	Observations
Park Ave/ Bow Street/Ryder Street	Unknown (2A)(2B)(2C)(2D)	Image transfer on steel sign	Approx. ½ dozen small 12"x12" ocean images on aluminum signs. Not particularly obvious mixed with other signs.
Summer Street Park	Go Out Doors-Arlington (3A)	Painted door	Promotion for healthy outdoor activity. Refer to the below hyperlink for more information.

Table 12: Existing Art Displays

	1. Art along the Pathway	2. Unknown	3. Go Out Doors
A			
B			
C			
D			

Figure 10: Artwork Locations Along the Bikeway



Existing Artwork

Source: Mass.gov, Arlington MA Open Data

INTERSECTIONS

The Bikeway intersects five streets as it runs through the Town of Arlington. These intersections vary in their traffic control, the typical vehicle volumes, and ease of crossing. **Table 13** summarizes the existing conditions, observations, and issues at each intersection. Relevant photos are referenced in **Table 14**.

Table 13. Intersection Existing Conditions, Observations, and Issues

Intersection	Existing Conditions	Observations	Issues
Lake Street	• Pedestrian and bicycle signals control crossing for path users (1A) • On each approach, the Bikeway widens to include sidewalks and a splitter island (1B), directing people walking to the outer edge of the path to either turn from the Bikeway onto Lake Street or to cross at the crosswalk. People biking are directed to continue riding straight across Lake Street along a bicycle crossing marked with green pavement • When a sensor detects people biking toward the intersection, a sign lights up with the message "WAIT FOR GREEN" (1C) • Pedestrian signals direct people walking on Lake Street to stop and wait while people are biking and walking across Lake Street (1D) • Lake Street is a minor arterial with a school zone speed limit of 20 mph. Trucks are excluded.	• Path users generally follow the signal when crossing Lake Street • People walking do not always shift to the widened sidewalk area as intended • The bicycle detection system is accurate in detecting people waiting to cross Lake Street	• Drivers are known to mistake the Bikeway for a vehicular roadway and turn onto it ○ This may be due to the large, vehicle-scale infrastructure at this crossing • People walking along Lake Street tend to miss or ignore the pedestrian signals for the Bikeway crossing • Detectable warnings are installed both at the entrances to the roadway crossing and the Bikeway crossing, which may lead to confusion for visually impaired path users
Linwood Street	• Path is stop-controlled in both directions with stop sign and stop line (2A) • Faded "STOP" pavement markings precede the stop lines on the path (2B)	• Path users do not stop at stop line and sign before crossing, but many slow their speed as they approach the intersection • Low visibility between path users traveling from the east and vehicles on Linwood Street	• No advance warning sign or pavement markings for westbound drivers and no instruction to yield for drivers in both directions • Use of stop sign at low vehicle-volume crossing encourages noncompliance by path users

	• Solid yellow center line is on Bikeway on both approaches to crossing • Faded pavement markings on Linwood Street read "SLOW" with a bicyclist symbol • Detectable surfaces on the eastern side of the intersection where the sidewalk crosses the Bikeway • Bluebikes station behind sidewalk west of crossing (2C) • Linwood Street is a local street		• No detectable warning at either ramp to cross Linwood Street (2D) o Crossing is inaccessible to blind pedestrians

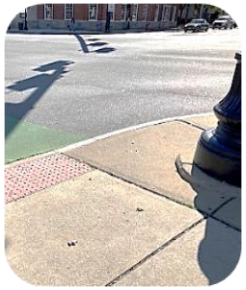
Swan Place/Massachusetts Avenue/Mystic Street	• Stop sign and stop line controls at approach to Swan Place
	• Bicycle signal directs people biking north on Massachusetts Avenue across Mystic Street.
	• Pedestrian signal and a two-stage left-turn box directs people biking eastbound on the Bikeway across Massachusetts Avenue and toward the Swan Place connection (3A).
	• Sharrows and a "[BIKE] MAY USE FULL LANE" regulatory sign on Swan Place define connection toward Massachusetts Avenue (3B)
	• Traditional, unprotected bike lanes provide connection to the Bikeway along Massachusetts Avenue in both directions
	  o Bicycling crossing markings guide people biking through the intersection (3C)
	• "BIKE ROUTE" guide signs are installed between Mystic Street and Swan Place to direct path users
	• Solid yellow center line is on bikeway on both approaches
		• High vehicle speeds and volumes are consistent at Massachusetts Avenue & Mystic Street
		  o Road noise is quite loud
		• During many signal cycles, southbound cyclists often do not fit in the two-stage left-turn box and spill into the intersection or travel lane
		• Northbound bicyclists often cross Mystic Street in crosswalk instead of in bicycle crossing to avoid riding on left side of ramp near signal pole pinch point (3D)
		• Pedestrians and cyclists come into conflict at the northern corner of Massachusetts Avenue and Mystic Street as the Bikeway transitions into the sidewalk and cyclists must navigate the crossing
		• Southbound cyclists sometimes travel in northbound crossbike and bike lane or ride on the sidewalk instead of crossing Massachusetts Avenue and using two-stage left-turn box. Sometimes this is done to continue from heading westbound on Minuteman to northbound on Mystic Street
			• Wayfinding for path users is ineffective, despite many signs
			  o "BIKE ROUTE" signs are quite small and far from cyclist and pedestrian facilities along Massachusetts Avenue
			• The northbound bicycle crossing across Mystic Street leads to a traffic signal pole and transition curb piece with partial curb face reveal (3D)
			• Pavement markings separate northbound bicycle and pedestrian crossings, but users must negotiate a mixing zone on the north side of the crossing
			• Bikeway connection does not offer sufficient comfort and safety for bicyclists who must travel in parking-adjacent and curbside unprotected bike lanes
			• Insufficient space for cyclists and pedestrians to queue and for pedestrians to pass the queue on sidewalk
			• Orientation of "[BIKE] MAY USE FULL LANE" on signal pole at

	• Swan Place is a local street • Massachusetts Avenue and Mystic Street are principal arterials	• Northbound vehicles regularly make an illegal right on red	northern corner of Massachusetts Avenue and Mystic Street and lack of clear wayfinding may contribute to confusion and people riding southbound in northbound bike lane
Water Street	• Path is stop-controlled in both directions with stop sign and stop line • Faded "STOP" pavement markings precede the stop lines on the path (4A) • Hybrid W11-1/W11-2 sign and "TRAIL X-ING" plaque are posted for northbound and southbound drivers approaching crossing (4B) • Solid yellow center line is on bikeway on both path approaches to crossing • "BIKE ROUTE" guide sign and two-way arrow plaque are posted for both Water Street approaches to crossing • Water Street is a local street • "NO MOTOR VEHICLES" regulatory signs are posted at each path ramp facing the roadway (4B) • Reflective yellow strip is installed on east-side sign post to delineate between parking lot entrance (Russel Terrace) and path (4C) • Crosswalk paint is slightly faded (4D)	• Path users regularly approach and cross without stopping at stop line and/or stop sign • During the AM peak period, vehicles traveling southbound on Mystic Street use Russel Street and private alley to bypass Mystic Street/Massachusetts Avenue intersection[2] • Challenging sightlines for vehicles turning onto Water Street from private alley as well as on Bikeway	• No detectable warning for path users crossing Water Street or the Bikeway (4A) • Use of stop sign at low vehicle-volume crossing encourages noncompliance by path users
Mill Street	• Path is stop-controlled in both directions with stop sign, stop line, and flashing red beacon (5A)	• Path users do not comply with stop control when drivers are not present on Mill St	• "YIELD HERE TO [PEDESTRIAN]" sign is not supplemented with yield line on pavement (5B)

[2] Arlington Transportation Advisory Committee *Water Street/Minuteman Bikeway Intersection Recommendations,* 2018.

	○ RRFBs and "YIELD HERE TO [PEDESTRIAN]" regulatory signs alert drivers on Mill Street to crossing path users and direct them to yield (5B) ○ RRFBs and flashing red beacons are passively activated • Faded "STOP" pavement markings precede the stop lines on the path (5C) • Solid yellow center line is on Bikeway on both path approaches to crossing • Detectable warning panels are present for both path ramps (Photo 5C) • Mill Street is a minor arterial	• Passive activation of RRFBs generally detects path users reliably but continued maintenance is needed • Southbound vehicles queuing for flashing beacon spill back onto Summer Street	• Priority and right-of-way is ambiguous at this crossing due to combination of stop control for path users and yield control for drivers on Mill Street • Motion sensors detect path users only when they are in close proximity to the crossing and could be added and/or angled to detect path users earlier

Table 14: Target Intersections

	1. Lake Street	2. Linwood Street	3. Massachusetts Avenue	4. Water Street	5. Mill Street
A					
B					
C					
D					

MAINTENANCE PRACTICES

According to the License Agreement between the Town of Arlington and the MBTA, the Town is responsible for maintaining the Bikeway in good and safe condition and appearance and free from rubbish and obstructions. The MBTA has no responsibility for maintenance repair or the condition of the Bikeway. The Town is also required to provide security and fire protection along the Bikeway. While the MBTA is responsible for maintaining the structural integrity of any overpasses or bridges which they maintained prior to the agreement with the Town, it is the Town's responsibility to maintain the surfaces of these structures, including general cleanliness, appearance, alterations required for use as part of the Bikeway.

While there is no formal maintenance policy or program for the Bikeway, the Town Manager oversees the maintenance of the Bikeway and approves changes on the property. Tasks such as mowing, patching asphalt, and vegetation pruning are carried out by the Department of Public Works on an as-needed basis. The Bikeway is maintained and plowed similarly to roadways in the town.

Changes to the Bikeway beyond the existing path layout must be approved by the MBTA Real Estate Division. Furthermore, changes to the Bikeway at crossings affecting the public right-of-way must be approved by the Arlington Select Board. The following entities and stakeholders are frequently or occasionally involved in issues related to the Bikeway:

- Town Manager
- Arlington Bicycle Advisory Committee (ABAC)
- Transportation Advisory Committee (TAC)
- Arlington Select Board
- Tree Committee
- Open Space Committee
- Parks and Recreation Commission
- Community Preservation Act Committee
- Capital Planning Committee
- Arlington Commission for Arts and Culture (ACAC)
- MBTA Real Estate Division
- Department of Public Works (DPW)
- Conservation Commission
- Arlington Recreation

Maintenance challenges along the corridor can broadly be categorized as issues related to the bikeway surface, vegetation, drainage, and bridge decks. **Table 15** lists observations from the field and considerations. Existing conditions related to drainage and bridges are described in more detail in the following sections.

Table 15: Maintenance Field Observations

Category	Observations	Considerations
Bikeway Surface	Uneven asphalt path surface due to heaves (root or otherwise).	Uneven surfaces become more hazardous at night when lighting is limited.
	Asphalt patching creates a bumpy surface.	
	Transitions between surface materials have become hazards such as at the bridge across Alewife Brook and the Arlington/Cambridge Line granite pavers.	Uneven transitions can have safety and ADA implications.
Vegetation	Vegetation crowding sight lines at access points and narrowing effective width of path along corridor.	Property beyond Bikeway is maintained by the MBTA.
	Invasive plants including Japanese Knotweed, garlic mustard, and black swallowwort.	
	Falling branches during severe weather events.	
Bridge Deck	Most bridges along the Bikeway are level, former rail overpasses or water crossings. For these structures, the Bikeway's asphalt surface continues uninterrupted.	
	The bridge across Alewife Brook has a prefabricated wood surface. The surface deck and railing are decaying. At either entrance to the bridge, the bases for former bollards present a hazard – the bases are often covered with traffic cones.	MBTA is responsible for all structural maintenance of bridges they previously maintained.
		The decaying wood surface creates a slippery surface when wet.
Drainage	Standing water was observed in some locations adjacent to the Bikeway, such as under the Lowell Street Bridge and near the Thorndike Dog Park. Near the Thorndike Dog Park, country drainage effectiveness is inhibited by knotweed.	Standing water along the edges of the Bikeway limits the ability of path users to use the shoulders.
	Standing water sheeting on the Bikeway has been observed at locations such as adjacent to Thorndike Field and between Lake Street and Linwood Street.	During winter months, water sheeting across the Bikeway presents an ice hazard.

Other areas for regular maintenance include leaf litter and debris removal, snow plowing, edge mowing, amenities upkeep, sign replacement, and trash removal.

BRIDGES

The Minuteman Bikeway crosses over seven bridges within the project limits (**Table 16**).

Table 16: Bikeway Bridge Crossings

Location	Clear Width/Type	Issues	Observations
Whittemore St. (1A)	12'/Concrete	No shoulder space	Width restricted by deck construction. Abutment is wider than superstructure.
Pond Lane (1B)	12'/Concrete	No shoulder space	Width restricted by deck construction. Abutment is wider than superstructure.
Forest Street (2A)	10'/Steel & Concrete	No shoulder space	Width restricted by thru-girder configuration of old rail bridge. Abutment is wider than superstructure.
Brattle Street (2B)	12'/Steel & Concrete	No shoulder space	Width restricted by configuration of old rail bridge. Abutment is wider than superstructure.
Grove Street (2C)	10'/Steel & Concrete	No shoulder space	Width restricted by thru-girder configuration of old rail bridge. Abutment is wider than superstructure.
Alewife Brook (3A)	10'/Prefab wood	Deck and rail decay, no shoulder space	Width restricted by bridge configuration. See Bridge Assessment in **Appendix B** and prefabricated standard specifications in **Appendix C**.
Mill Brook (4A)	12'/Concrete	No shoulder space	Crosses over Mill Brook

The Minuteman Bikeway passes under three roadway bridges (**Table 17**). Relevant photos of both types of bridge crossings are referenced in **Table 18**.

Table 17: Bikeway Underpasses

Location	Clear Width/Type	Issues	Observations
Drake Road (5A)	24'/ Concrete	None Observed	
Park Avenue (5B)	27'/ Concrete	None Observed	Stream passes thru box culvert built into bridge abutment.
Lowell Street (5C)	13'-2"/ Concrete	Undermining of path edge	Path shares underpass with an adjacent stream.

Table 18: Bridge and Underpass Crossings

	1.Path over Road - Concrete Deck	2. Path over Road - Concrete & Steel	3. Path over Water – Timber	4.Path over Water – Concrete Deck	5. Path under Road
A					
B					
C					

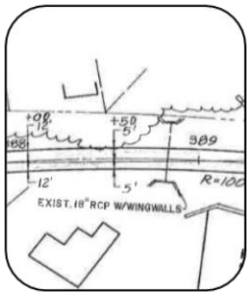
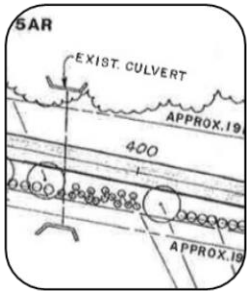
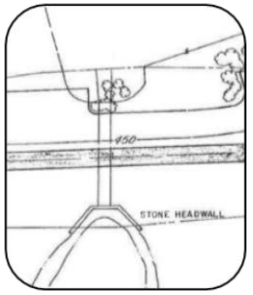
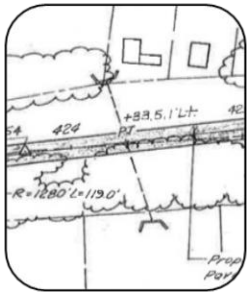
DRAINAGE

Formal drainage along the Bikeway is limited and a variety of treatment approaches are used. **Table 19** summarizes the typical drainage treatments used along the Bikeway. Relevant photos of drainage are referenced in **Table 20.**

Table 19: Typical Drainage Applications

Type of Feature	Typical Application & Consistency
Country Drainage	A majority of the trail has no curbs or any closed drainage systems (1A)(1B)(1C). Water sheds off the trail and disperses into the surrounding landscape. Country drainage is considered a low impact form of stormwater management.
Swales	A prominent swale is located on the eastern side of the trail from Nourse Street to the proximity of Bow Street/Mill Lane where it goes underground towards the Mill Brook (2A) (2B) (2C). The path shares space with this watercourse at the Lowell Street underpass.
Cross Culverts	The original design plans show approximately five cross culverts: • Between Park Ave and Lowell St. - behind 30 Park Ave. (3A) • Near Forest St. (3B) • Between Ryder and Brattle St. (3C) • Between Brattle Pl and Grove St. (3D)
Stone Box Culvert	There is a granite box culvert built into the base of the eastern abutment at Park Avenue. (4A)
Catch Basins	A handful of catch basins were observed along the trail, including north of Lake Street and at the Park Avenue underpass. (5A) (5B)
Waterways	The path crosses the Alewife Brook and twice crosses the Mill Brook (6A)(6C)(6D). A small tributary that passes beneath the Lowell Street bridge goes underground at a headwall near Bow Street. (6B)

Table 20: Drainage Field Observations

	1. Country Drainage	2. Swales	3. Cross Culverts	4. Stone Box Culvert	5. Catch Basins	6. Waterways
A						
B						
C						
D						

WIDTH AND ENGINEERING CONSTRAINTS FOR WIDENING

Due to the high path volumes observed on the Bikeway, the project team assessed the feasibility of widening the Bikeway to accommodate the high usership, to increase space for passing, and to provide room for slower users to travel or rest. Based on the Shared-Use Path Level of Service Calculator, published by the Federal Highway Administration, the Bikeway would require an additional six feet of width to improve the level of service from B to A[3]. However, adding any increment of width would still be valuable to trail users, even if only provided on select, strategic segments.

The feasibility of widening depends on several factors. Primarily, as mentioned previously, the ability to widen within the MBTA right of way depends on coordination with and approval by the MBTA. Feasibility is also dependent on existing barriers, such as grade-separated crossings like bridges or underpasses, water features, adjacent property lines, and grading. Depending on the unique characteristics of these barriers, they may be more or less of an obstruction to widening. For example, if the existing paved Bikeway is constrained by adjacent property that belongs to the Town, widening in that direction may be feasible. A summary of the main types of barriers is provided in **Table 21**. Relevant photos are referenced in **Table 22**. The locations of barriers to widening are shown in **Figure 11.** A segment-by-segment summary of the barriers and locations can be found in **Appendix A.**

[3] Table 12. Shared-use path level of service look-up table, typical mode split (https://www.fhwa.dot.gov/publications/research/safety/pedbike/05138/05138.pdf)

Table 21. Types of Barriers to Widening

Types of Barriers	General Locations and Considerations
Grade-Separated Crossings	The Bikeway traverses six bridges and four underpasses as it passes through Arlington. These structures place constraints on the width of the Bikeway and already serve as significant pinch points today (1A-1C). The MBTA is responsible for maintaining the structural integrity of these overpasses and bridges while the Town only has purview over the surfaces. However, as described in the Bridges section, some of these structures have abutments that are wider than the superstructure.
Water Features	In some areas, water features, such as marshes and streams, create obstacles to widening the Bikeway. In at least two locations, small streams or rivers directly abut the Bikeway (2A-2B) and in other locations, marshlands would necessitate additional engineering considerations (2C).
Constrained Right of Way	The Bikeway runs adjacent to private property, open space parcels, and other property boundaries along much of the Arlington stretch. In many cases, fences (3A-3B), private parking lots (3C), or other structures mark the divide between private parcels and the MBTA right of way. In general, the paved path is situated approximately in the middle of the MBTA right of way, but in a few locations, the Bikeway runs closer to the edge of property lines.
Grading	Natural topography represents a barrier to widening in many locations. Several stretches of the Bikeway are marked by steep downward slopes beyond the edge of the paved width, likely due to the historical use as a railbed (4A-4B). In other locations, the land slopes steeply upward next to the Bikeway (4C).

Table 22: Photos of Barriers to Widening

	1. Grade-Separated Crossings	2. Water Features	3. Constrained Right of Way	4. Grading
A				
B				
C				

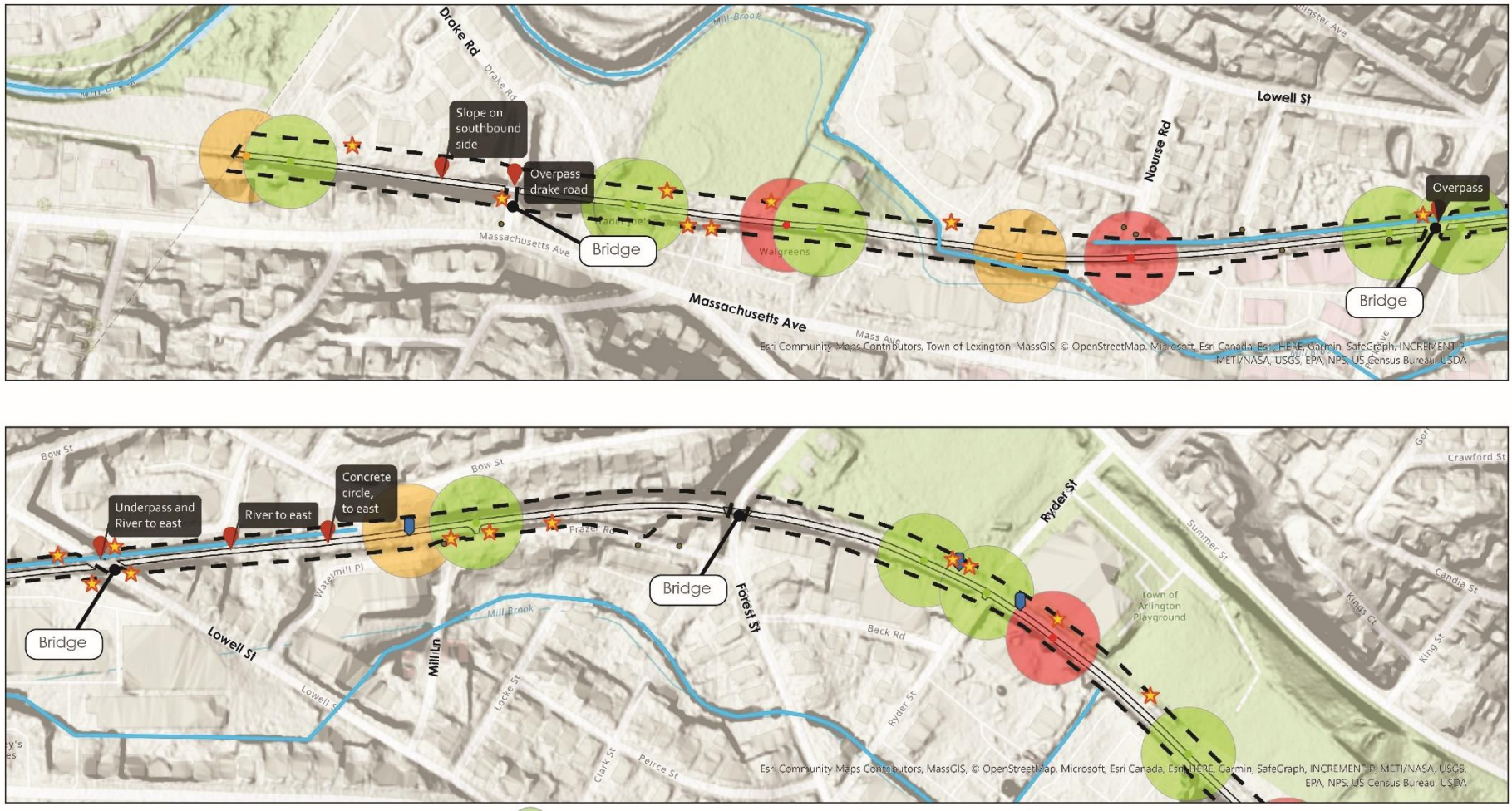
Figure 11: Barriers to Widening

Barriers to Widening

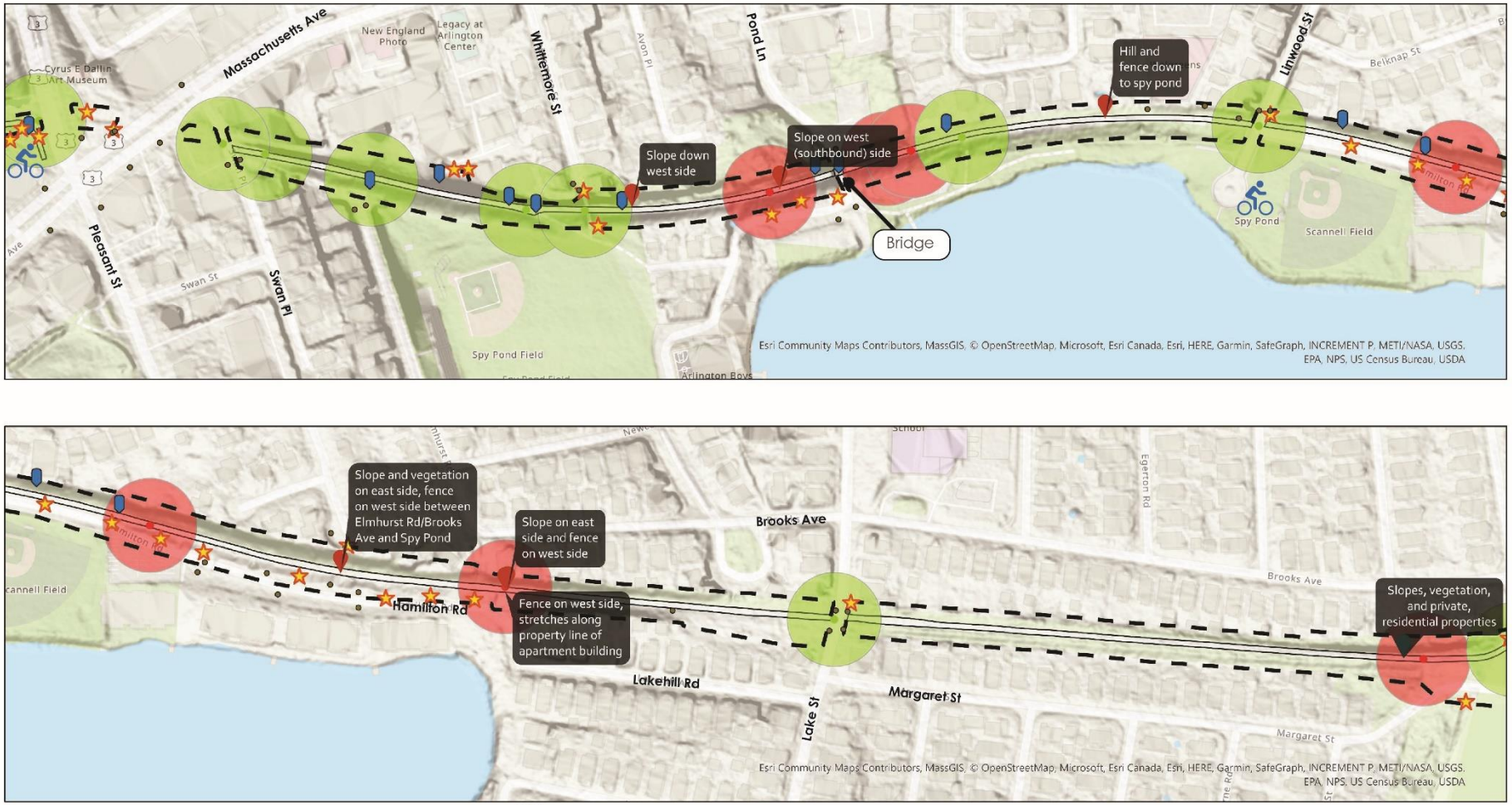
Source: Mass.gov, Arlington MA Open Data

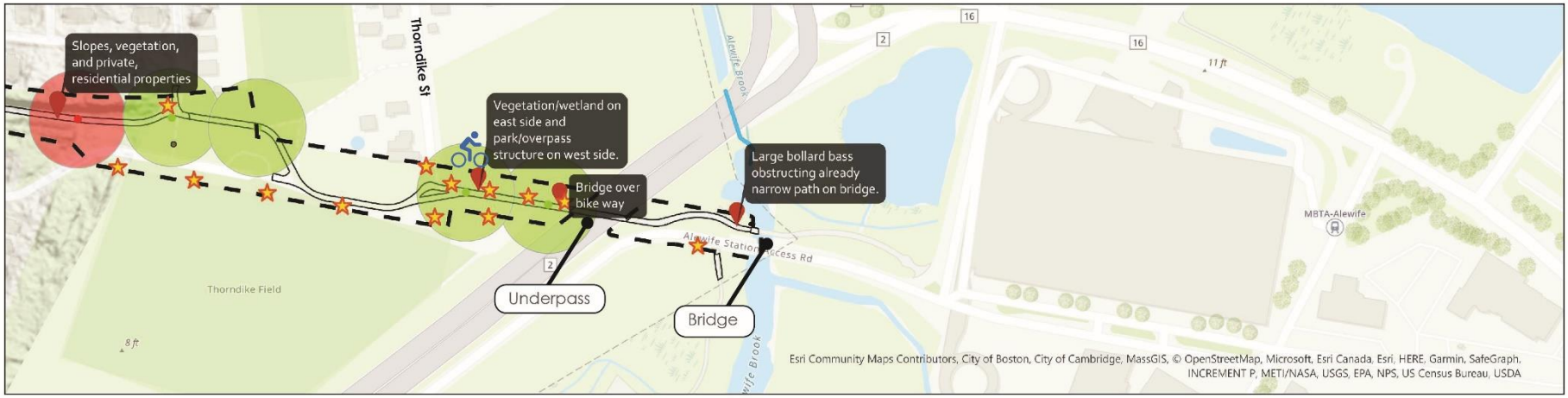
Appendix A
Existing Conditions

APPENDIX A: EXISTING CONDITIONS




Slope and fences
Washington St
Brattle St
Brattle Ter
Brattle Dr
Slope on northbound side
West side, slope north of grove st
Slope
Bridge
Bridge
Dudley St
Grove St
Wellington Park
Esri Community Maps Contributors, MassGIS, © OpenStreetMap, Microsoft, Esri Canada, Esri, HERE, Garmin, SafeGraph, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA
Slope
Fence and slope along west side north of mill st
Summer St
Slope down to Mill Brook on southbound side
Northbound side bounded by bushes and parking
Retaining wall on west side near water street
Parking lots from MA-60 to Water St
RW Shattuck
Mill St
Water St
Central St
Mill Brook
Millbrook Dr
Bacon St
Symmes Mini-Mart
Merle Norman
Mass Ave
Esri Community Maps Contributors, MassGIS, © OpenStreetMap, Microsoft, Esri Canada, Esri, HERE, Garmin, SafeGraph, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA
Minuteman Bikeway Layout
MBTA Right-of-Way
Waterline
MassGIS LiDAR Hillshade
Improved Access Point
Semi-Improved Access Point
Unimproved Access Point
Improved Access Point - 100 ft buffer
Semi-Improved Access Point - 100 ft buffer
Unimproved Access Point - 100 ft bufer
Existing Art
Catch Basin
Barrier to Widening
Town Lighting
BlueBike Station
0 100 200 400 Feet
Existing Conditions (Ed Burns Arena to Mystic Street)


Massachusetts Ave
New England Photo
Legacy at Arlington Center
Whittemore St
Avon Pl
Pond Ln
Linwood St
Belknap St
Cyrus E Dallin Art Museum
Pleasant St
Swan St
Swan Pl
Spy Pond Field
Arlington Boys
Spy Pond
Scannell Field
Slope down west side
Slope on west (southbound) side
Bridge
Hill and fence down to spy pond
Esri Community Maps Contributors, MassGIS, © OpenStreetMap, Microsoft, Esri Canada, Esri, HERE, Garmin, SafeGraph, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA
Slope and vegetation on east side, fence on west side between Elmhurst Rd/Brooks Ave and Spy Pond
Slope on east side and fence on west side
Fence on west side, stretches along property line of apartment building
Hamilton Rd
Brooks Ave
Egerton Rd
Lakehill Rd
Lake St
Margaret St
Slopes, vegetation, and private, residential properties
Esri Community Maps Contributors, MassGIS, © OpenStreetMap, Microsoft, Esri Canada, Esri, HERE, Garmin, SafeGraph, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA
Minuteman Bikeway Layout
MBTA Right-of-Way
Waterline
MassGIS LiDAR Hillshade
Improved Access Point
Semi-Improved Access Point
Unimproved Access Point
Improved Access Point - 100 ft buffer
Semi-Improved Access Point - 100 ft buffer
Unimproved Access Point - 100 ft bufer
Existing Art
Catch Basin
Barrier to Widening
Town Lighting
BlueBike Station
0 100 200 400 Feet
Existing Conditions (Mystic Street to Thorndike Field)



Minuteman Bikeway Layout
MBTA Right-of-Way
Waterline
MassGIS LiDAR Hillshade

Improved Access Point
Semi-Improved Access Point
Unimproved Access Point

Improved Access Point - 100 ft buffer
Semi-Improved Access Point - 100 ft buffer
Unimproved Access Point - 100 ft bufer

Existing Art
Catch Basin
Barrier to Widening

Town Lighting
BlueBike Station

0 100 200 400 Feet

Existing Conditions (Thorndike Field to Cambridge)

Appendix B
Bridge Over Alewife Brook Assessment

APPENDIX B: BRIDGE OVER ALEWIFE BROOK ASSESSMENT

General Notes

- Plans were obtained from MassDOT. The bridge was built around 1995 (per the plans). Since it was a prefabricated structure to be designed by the contractor, there are limited dimensions and details provided on the plans.
- The bridge was designed for 4.1 kpa (85 psf) per the plans. This is an acceptable design in line with current standards.
- The bridge is a prefabricated timber bridge: The Fairway model by Enwood Structures
- 2012 specifications for the Fairway model bridge by Enwood Structures were obtained through an internet search. Shop drawing could not be obtained. See **Appendix C** for specs.
- In general, the bridge is in satisfactory condition.
- Decking is in poor to fair condition. There are numerous checks and soft spots, creating a rough, uneven ride. The deck condition creates trip hazards. The underside of the decking is covered in mildew and water stains. The decking is nearing the end of its service life.
- The structural curb/girders, floorbeams, and stringers are all in satisfactory to good condition and suitable for reuse based on a visual inspection (although underside inspection was limited to the ends of the bridge because of the soft stream bed). Holes from attached decking may cause the stringers to be unusable to attach new decking.
- Railings are in fair condition. Railings are slightly out of plumb leaning outwards. They have a few soft spots. There are numerous missing nuts on the carriage bolts. Railings appear to be ADA compliant.
- The bridge pathway is 10' wide and the approach pavement is 11' wide. Current design standards would require the bridge pathway to equal the pavement + shoulders width.
- Settlement has caused bumps at the transitions from bridge to pavement.

Field Measured Dimensions:

- Railing posts spaced 8'-2"
- Railings are 2.75x3.875 and spaced at 8" +/- (4" gap), total height top of deck to top rail is 54".
- 5 rails each side
- Pipe handrails @ 8.5" and 34" +/- from top of deck
- Decking Boards are 6" nominal (5.5" wide). The depth could not be measured. The boards span full width.
- The curb beams are the main structural girders. They are 8.5"Wx36"D with a 15.5" curb reveal. The floor beams are supported by the curb beams with joist hangers and carriage bolts.
- Rakers to stabilize the curb beams spaced @ 14' +/-.
- 8.5"Wx10"D floor beams spaced @ 7'-9" +/- support the stringers
- 2 exterior stringers 3"Wx7"D
- 4 interior Stringers 5"Wx7"D
- Stringer spacing: 22" exterior spaces, 24" interior spaces

Recommendations:

- Replace the decking. The decking is near the end of its useful life. Structurally the decking is still ok and safe but provides a poor quality of ride and is a trip hazard. On average a deck made of pressure treated pine would be expected to last 15 to 20 years. This deck is approximately 25 years old.
- Since the floor beams and stringers have been shielded by the decking and kept relatively dry, they are still in fair to good condition and could be reused, but the decking appears to be fastened to the stringers using lag bolts or screws. The top side of the stringers may have too many holes once the decking is removed to reuse. The town should also anticipate replacing the stringers if they replace the decking or an alternative way to attach the decking (such as steel brackets).
- The railings are in fair condition and could be reused, but the timber is 25 years old and has soft areas. If funding is acquired to replace the deck and stringers, it would be a good idea to replace the railings too.
- If railings are not replaced, missing nuts, bolts and washers attaching to the posts should be installed.
- The approaches have settled and could be repaved to provide a smooth transition to the bridge.
- Overgrown vegetation around the bridge should be trimmed.
- The path is heavily used. If the bridge is rehabilitated an alternate crossing should be considered during construction, such as taking a portion of the alewife station access road.
- Although the bridge structural framing is in satisfactory condition for reuse, the expected life of the timber components would be another 15-25 years. If funding is available as part of a larger path project the town should evaluate bridge replacement. A new bridge would have an expected life of 75-100 years.

Appendix C
Standard Specifications for the Fairway Model Pedestrian & Light Vehicular Bridge

APPENDIX C: STANDARD SPECIFICATIONS FOR THE FAIRWAY MODEL PEDESTRIAN & LIGHT VEHICULAR BRIDGE

Standard Specifications

Pedestrian & Light Vehicular Bridges

THE FAIRWAY

Manufacturer: Bridge shall be designed and furnished by Enwood Structures, Raleigh, NC.

Bridge Design: Bridge design system shall be THE FAIRWAY.

Manufacture: Manufacture of the structural glued laminated wood components shall conform to the manufacturing requirements of the American Institute of Timber Construction Standards and Standard
Specifications for Glued Laminated Timber, AITC 117. Quality control shall be provided in accordance
with ANSI/AITC A190.1- latest edition and AITC inspection manual, AITC 200. AITC quality marks shall be used for identification. An AITC certificate of conformance shall be furnished upon request.

Manufacturer's and Fabricator's Certification: Bridge's manufacturer, and fabricator, shall be a member of, and hold full certification from, The American Institute of Timber Construction (AITC).

Manufacturer and Fabricator: The manufacturer and fabricator of the shelter's laminated wood components and the shelter's steel connectors shall be one in the same, to assure quality fit of all connections.

Quality Control: Quality Control shall be provided in accordance with ANSI/AITC A190.1-latest edition, American National Standard for Wood Products- Structural Glued Laminated Timber, and the American
Institute of Timber Construction Inspection Manual AITC-200.

Lumber: Laminating lumber shall be kiln-dried, with 15% moisture content, Southern Yellow Pine graded
to meet the requirements of Standard Specifications for Structural Glued Laminated Timber, AITC 117. Lumber combination shall be determined by the design requirements for each component and designated
on the fabricator's shop drawings.

Appearance Grade: Laminated components shall be per AITC architectural appearance grade. Solid
sawn lumber for decking shall be Southern Yellow Pine graded in accordance with SPIB.

Preservative treatment: The preservative treatment for glulam components shall consist of pressure treated laminated lumber (treated prior to gluing) with CCA (chromated copper arsenate) in accordance
with AITC 109 Standard. Exterior stringers shall be .6 pcf or .3 pcf retention and all other glulam components shall be .3 pcf retention. Solid sawn decking shall be pressure treated in accordance with
AITC 109 Standard

Adhesives: Adhesives shall be wet-use (waterproof) complying with ANSI/AITC A190.1- lasted edition.

Hardware: All connecting steel and hardware shall be furnished by the manufacturer. Material shall be
hot dipped galvanized.
Note: Anchor bolts/leveling plates are supplied by others.

Penetrating Sealer: All glulam materials to receive one factory applied coat of clear penetrating sealer.
Optional factory staining is available.

Foundations: The purchaser shall secure all necessary information about the site and soil conditions. Information as to the bridge support reactions, anchor bolt location and placement will be supplied by the
fabricator. Actual design and construction of the bridge supporting foundation (abutments, pier or footings) shall be the responsibility of the purchaser.
Enwood Structures can provide foundation designs as an option if all pertinent soil data is supplied.

Storage and Erection: The client or installer is responsible for protection of materials after arrival at destination. If materials are stored temporarily, they should be placed on blocks well off the ground and
separated with wood strips so air can circulate between members. Cover top and bottom with moisture
resistant paper. Use non-marring slings when handling the materials.

Shop Drawings: A complete set of shop drawings shall be furnished by the fabricator detailing all member sizes and connections.