

# CHAPTER 5

## THE BICYCLE NETWORK VISION

## OVERVIEW

Providing a bicycle network that is safety-focused, comfortable, connected, and convenient for people of all ages, abilities, and identities will help the City achieve the goals set forth in this plan. The planning team conducted a variety of assessments, as outlined in Chapter 1, in order to gather input from residents and visitors and gauge the existing and future bikeability of the Cambridge's streets and paths. The result of this input and analysis is the Bicycle Network Vision, a selection of streets and paths in the city identified as priorities for high-quality bicycle infrastructure improvements. Priority streets in the Bicycle Network Vision are categorized into one of three types: off-street paths, streets with reduced vehicle speed and/or volume, and streets with increased separation between people biking and motor vehicle traffic.

In order for the City to achieve its bicycling goals and objectives, the Bicycle Network Vision follows three guiding principles:

1. **Safe:** People will be able to bicycle in the city without the threat of real or perceived danger from motor vehicles or other people.
2. **Comfortable:** People of all ages, abilities, and identities will experience a well-designed, low stress, attractive street and path network.
3. **Connected:** People will be able to use the network to make convenient connections both locally and regionally to the places they need to go for work, school, shopping, recreation, and socializing.



*When I first started riding my bike, it was very exciting. I was able to explore areas of my neighborhood that I've never seen before and go to my friends' homes without a ride from my mom. It gave me a lot of independence...Now, I live in Boston and I love biking to work in Cambridge. Traffic and bus schedules make my commute unpredictable, but when I ride, it always takes the same amount of time everyday. This takes a lot of stress out of getting to work. I also love getting a little work out in the morning. When I bike to work, I have more energy and focus throughout the day. Luckily there are lots of great bike lanes in Cambridge so I feel safe.*

– Kathryn Copley, CRLS Teacher

## PUBLIC INPUT

In addition to the network principles, the formulation of the Bicycle Network Vision was based on inputs from the public, the bicycle level of comfort analysis, bicycle count and crash data, and other factors as described throughout this chapter.

Nearly 3,000 members of the public provided input in 2015 and 1,500 provided input in 2020 through a combination of in-person and online forums. Further comments and refinements were received from various representatives, including the Cambridge Bicycle Committee, advocacy groups, businesses, institutions, and city staff.

For the 2020 update, outreach media and feedback included flyers, written or emailed comments, an online user survey, numerous street teams, a public open house hosted at Cambridge Rindge and Latin School, two online mapping programs, and narrated videos explaining the process and how to provide input. Results of user surveys are discussed in Chapter 3.



## ONLINE MAPS

Two map-based online survey tools were used to collect public input. The first was a WikiMap aimed at evaluating existing conditions. Members of the public were able to log onto the WikiMap website and indicate where there are great streets or paths, where corridor or spot improvements are needed, and provide comments on existing bicycling infrastructure. The second goal of the WikiMap was to identify desired changes to the Network Vision map. People identified streets they believed should be added to, removed from, or reclassified in the Network Vision. The first online map was open for comments from June to October 2019.

A second online map (ArcGIS) was active from September to October 2020. This map collected public comments on the Draft Updated Bicycle Network Vision. Members of the public could indicate their support for the additions as shown in the updated version, their preference to change a designation, or identification of additional streets or paths to include.

Approximately 285 people logged onto the two online maps and generated 674 comments. Figure 5.1 shows which places were most frequently identified as “improvement needed”; this input was used during the development of the Bicycle Network Vision to identify locations deemed important by the public.

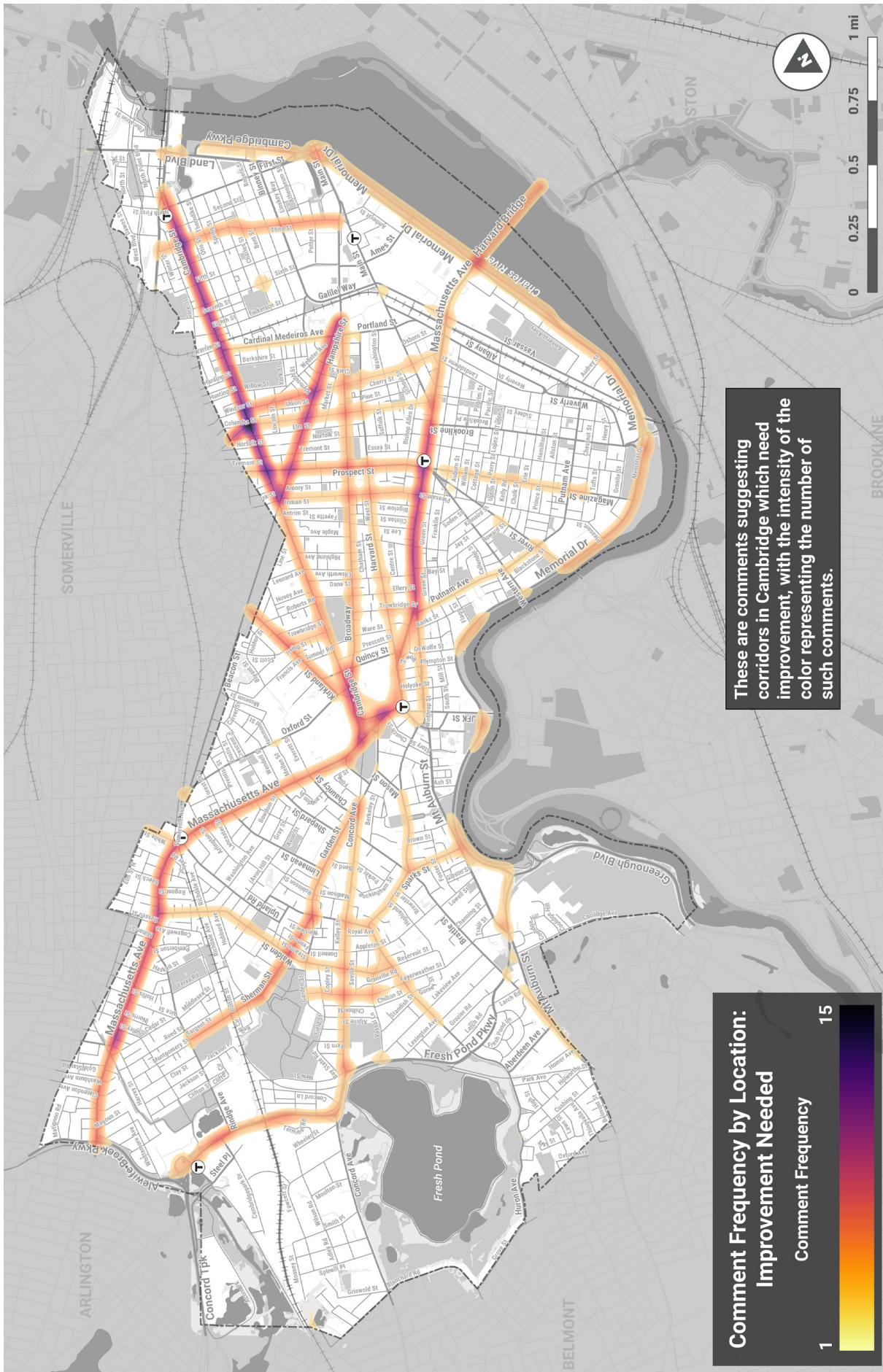


Figure 5.1: WikiMap Comment Frequency by Location: Improvement Needed

## IN-PERSON INPUT

A public open house was held on Thursday, June 13, 2019 at the Cambridge Rindge and Latin School. Approximately 50 people attended the open house. A number of stations were established for visitors to speak with Bicycle Program staff; respond to the online user survey; provide comments on the existing bicycle network and 2015 Network Vision map; discuss potential bicycle facility types; review the Bicycle Level of Comfort Analysis and bicycle crash trends; and discuss programs and projects with staff from the Public Health Department, Police Department, and Department of Public Works.

Additionally, large scale paper maps of the existing bicycle network and 2015 Network Vision were presented at seven public events throughout 2019. Attendees were encouraged to identify and comment on locations in the city where bicycling issues need to be addressed as well as changes they wished to see to the Network Vision. These paper-based comments were then compiled digitally with online map comments to provide a database of needs to be addressed in this Plan.



## INPUT DURING THE COVID-19 PANDEMIC

Due to the COVID-19 pandemic, significant changes were made to the public engagement process in 2020. Planned additional open house events were cancelled and virtual input opportunities were developed. This included a series of narrated videos explaining the plan and key elements. The videos explained how the Network Vision was updated and the process for planning and prioritizing quick-build separated bike lanes. An online user survey (also available in hard copy) was developed to gain a better understanding of what barriers exist to people biking or biking more in Cambridge.

City staff also developed a portable “tabling” toolkit to use at outdoor events like concerts. The toolkit included maps, informational posters, and printed materials that people could take with them. Participants were able to provide input through online or paper surveys. This extended the reach of the project and allowed people to provide input in a manner that followed safety protocols.

Information about the bicycle plan update and how people could participate was publicized in numerous ways. Over 50 lawn signs were prominently displayed in public locations throughout the city, and the information was shared through City e-newsletters, on the city website, and similar outreach mechanisms.



# BICYCLE LEVEL OF COMFORT

The Cambridge Bicycle Level of Comfort Analysis (BLC) is a planning tool used to quantify the level of comfort that a person bicycling is likely to perceive while riding on any street or path. The analysis correlates comfort with the physical and operational characteristics of roadways and crossings. It is based on the premise that a person's level of comfort on a bicycle increases as separation from vehicular traffic increases and as traffic volume and speed decrease. The result of the analysis is a numerical comfort ranking for every street and path in the city, from greatest comfort (BLC 1) to least comfort (BLC 5).

The BLC Analysis is the starting foundation of the Bicycle Network Vision. It allowed the planning team first to identify existing assets, by determining a network of comfortable streets on which people bicycle, and second to prioritize infrastructure improvements by closing critical gaps in the high-comfort network. This approach recognizes that the city's bicycle network is not just a handful of streets with bicycle-specific infrastructure, but rather every street is a potential route for someone biking and that people have varying tolerances for the stress caused by biking near motor vehicles.



## METHODOLOGY

The BLC Analysis is based on the Mineta Transportation Institute’s pioneering research on Low-stress bicycling and network connectivity.<sup>1</sup> The Cambridge BLC used Mineta’s ranking criteria for Level of Traffic Stress (analogous to BLC) as a baseline for the comfort ranking of each street or path. Roads segments are scored based on their most uncomfortable portions, recognizing that a bicycle route is only as appealing as its least comfortable or highest stress feature.

Following an initial stage of analysis, BLC rankings were vetted by City Staff, the City’s Bicycle Committee, and the public to test the accuracy of the model. This ensured that the results matched with the actual experience of people most familiar with roadway conditions. Based on this feedback, the model was refined using additional criteria specific to Cambridge. This included ranking criteria such as narrow one-way, single-travel-lane streets with parking on two-sides, streets with high- frequency bus routes, and the addition of a fifth level of comfort to address state highways and parkways. For specific ranking criteria see Appendix E. Ultimately, each street or path in the city received a BLC ranking from 1-5, described on the following pages.

<sup>1</sup> Mekuria, M., Furth, P., and Nixon, H., Low-stress bicycling and network connectivity, Mineta Transportation Institute (2012).

It should be noted that a large amount of data about each street was collected from a variety of sources, but certain values had to be assumed due to the unavailability of data. In particular, roadway volume and speed data were not available on many residential/local roadways. Values typical of local roadways were assumed for these streets, resulting in typically low stress rankings. Nevertheless, many of these streets may be less comfortable than the analysis suggests, due to actual volume and speed being higher than assumed.

The BLC analysis attempts to provide a general assessment of bicycling comfort, and as a result does not take into account factors that are of a seasonal or temporary nature. Pavement quality and accumulation of precipitation are not considered in the BLC. While surface quality can be a significant factor in bicycling comfort, it is typically not a permanent feature and often too dispersed along a roadway to affect the comfort of the entire corridor. Additionally, fluctuation in vehicle speed and volume at peak travel hours is not reflected in the analysis. A particular roadway may be comfortable for much of the day, but very uncomfortable during peak hours due to substantial increases in traffic.



## BLC 1

**Who:** Your grandmother who enjoys riding to errands on Sunday afternoons; a young family of four, with the youngest child in a bicycle seat up front followed by his sister riding behind on her first bicycle; or you - enjoying a slow, quiet ride through your neighborhood.

**What:** Places where only people on bicycles or foot are allowed, like off-street paths or separated bicycle facilities; quiet neighborhood streets with only occasional vehicular traffic travelling at low speeds.

**Where:** Brattle Street (Eliot-Mason); Fern Street (shared use path), Minuteman Commuter Bikeway, North Point Park path systems, Kittie Knox Bike Path, Western Avenue cycle track; Spring Street.

## BLC 2

**Who:** Your friends from out of town who have never ridden a bike on city streets; a Bluebikes rider who hasn't been on a bike in years but would like to give it a try; your son, a student at Cambridge Rindge & Latin, who rides to Danehy Park after school for soccer practice.

**What:** Neighborhood streets with some traffic, not travelling too fast; bike lanes against the curb; wide bike lanes on streets without much traffic that make travel predictable for people in cars and on bikes.

**Where:** Sidney Street; Ellery Street; Cambridge Street from Inman Square to Quincy Street; Sixth Street.

## BLC 3

**Who:** Your neighbor, who diligently takes out her bike each morning to make the trip to work; MIT students riding for ice cream after class for a group study session; your friend from Somerville who rides to the supermarket every week for groceries.

**What:** Roads with frequent car traffic that may travel fast at times; bicycle lanes that are often blocked by vehicles – whether trucks making deliveries, cars pulling in and out of parking spaces, or car doors opening into the adjacent bicycle lane; narrow, often one-way, single-lane streets with frequent car traffic that can't pass people biking due to parking on either side.

**Where:** Cambridge Street from Inman Square to Lechmere, Magazine Street, Pearl Street, Hampshire Street.

## BLC 4

**Who:** The bartender working in Central Square whose bike messenger days are behind him; your cousin who rides to her job in Kendall Square from Arlington, rain or shine.

**What:** Roads that have fast and/or constant motor vehicle traffic and no bicycle lane; streets with steady bus traffic making frequent stops; bicycle lanes that are often blocked by illegal parking.

**Where:** Mount Auburn Street (Fresh Pond Parkway – Belmont Street), Prospect Street; Concord Avenue (Garden Street – Fresh Pond Parkway).

## BLC 5

**Who:** Your coworker who is confident in their abilities, capable of riding fast, and prefers the shortest route possible.

**What:** Roads designed as highways, meant to carry extremely high volumes of very fast moving motor vehicle traffic travelling between cities.

**Where:** Memorial Drive, Fresh Pond Parkway.





Figure 5.2: Bicycle Level of Comfort Criteria and Examples

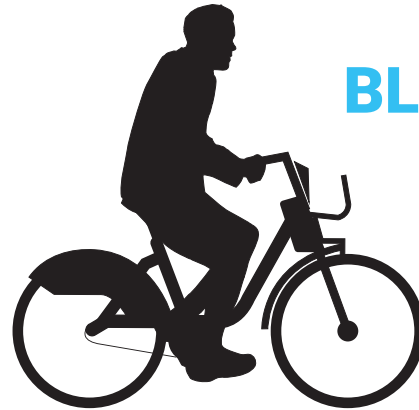
## CURRENT CONDITIONS

1. Shared use paths provide continuous high-quality regional connections, but often only at the edges of the city. Separated bike lanes on Vassar Street, Massachusetts Avenue, and Western Avenue connect paths to commercial, institutional, and employment centers along high-comfort routes. However, there are many parts of the city where it is difficult to find a convenient high-comfort route to and from the paths.
2. BLC 1 and 2 streets/paths represent twice the mileage (appx. 119 miles, including 36.5 miles of paths) of BLC 3, 4, and 5 streets combined (appx. 59 miles). BLC 1 and 2 streets, however, do not form a cohesive network of continuous high-comfort bicycle routes. They are fragmented by low comfort (BLC 3, 4, 5) streets, particularly around commercial and employment centers. Sometimes an otherwise good street has a barrier such as a difficult intersection. Fragmentation is also increased due to many local streets operating in a discontinuous one-way street pattern. High comfort streets that physically connect often do not provide a continuously bikeable route due to frequent changes in the direction of operation.
3. Most primary roads in Cambridge that provide access to commercial, institutional, and employment centers provide a lower comfort biking experience (BLC 3, 4, or 5). These streets, such as portions of Massachusetts Avenue, Broadway, Hampshire Street, and Concord Avenue, are in high demand by all modes of traffic, but may act as barriers for people who are not comfortable riding in such conditions. Often these streets are the only route to major activity centers aside from alternatives that require a significant detour. Finally, these streets and their intersection with other BLC 3-4 streets are also locations with the highest frequency of bicycle crashes.

**BLC 1**



**BLC 2**



**BLC 3**



**BLC 4**



**BLC 5**



Figure 5.3: Bicycle Level of Comfort Sample User Types

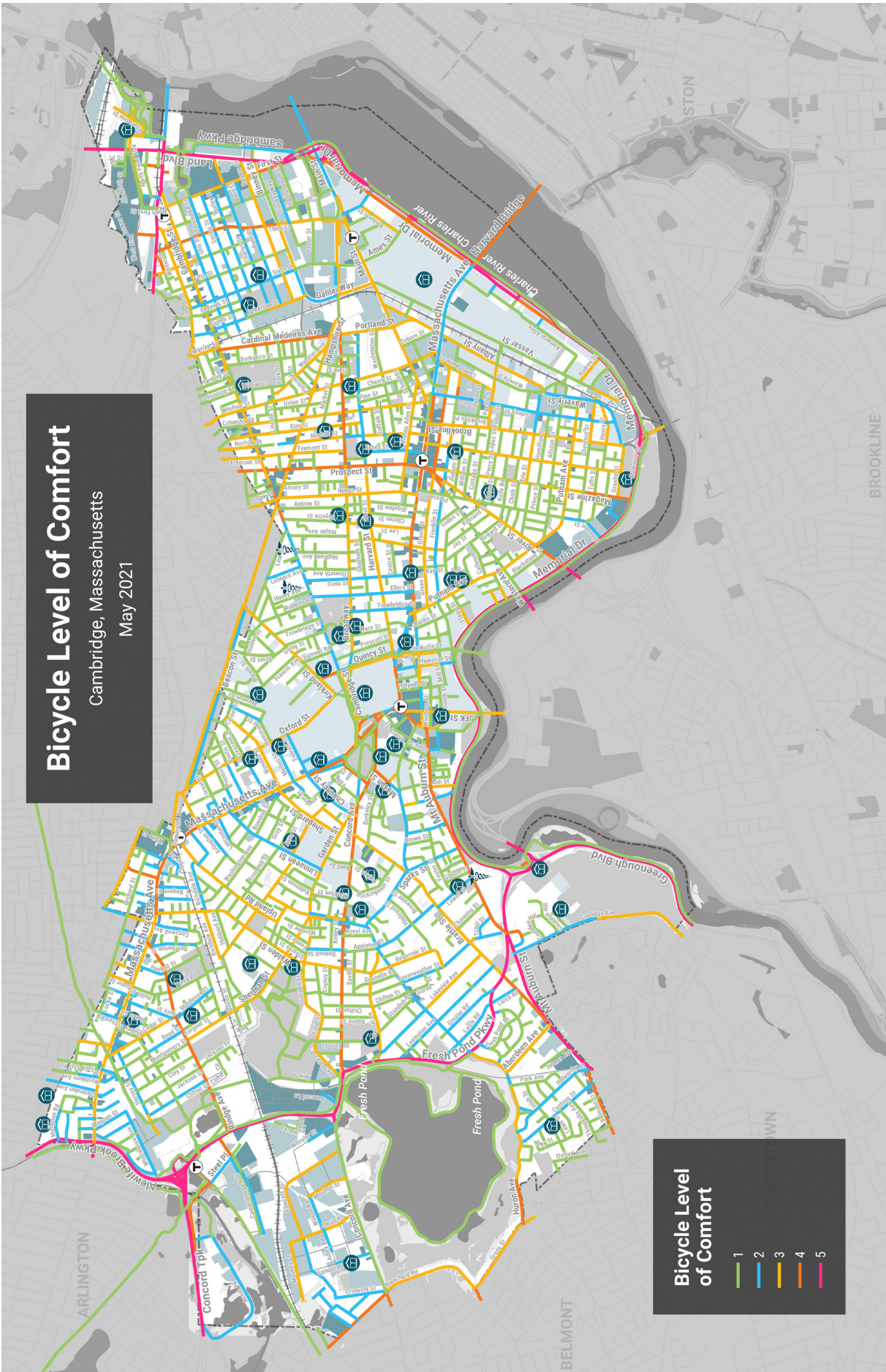


Figure 5.4: Existing Bicycle Level of Comfort (Based on Current Conditions)

## BICYCLE COUNTS AND CRASH DATA

Cambridge conducts biennial bicycle counts and analyzes bicycle crash data collected from the Cambridge Police Department crash reports. Both data sources were used in the development of the Bicycle Network Vision. Details on bicycle counts and crashes are discussed in Chapter 3.

from vehicular traffic and parking in order to provide comfort and safety for all users. Quieter residential streets like Harvard Street often benefit from lowering the speed and/or motor vehicle volume through traffic calming so that people biking are more safe and comfortable sharing the road.

**The proposed levels of accommodations are:**

## LEVEL OF ACCOMMODATION

Infrastructure recommendations in the Bicycle Network Vision take the form of a “level-of accommodation” for each street or path. These recommendations do not propose specific facility type; rather they provide infrastructure goals for each street or path which may be reached through a variety of design treatments. Specific bicycle facility types, as provided in Chapter 4, will be determined through a design process for each street/path which will include public outreach and will be informed by the latest best practices in bicycle infrastructure design at that time.

Since streets have different characteristics and functions, different street types need different levels of accommodation. Busy commercial streets like Massachusetts Avenue typically require separation

- 1. Off-street:** Paths, primarily through parks or open space and along linear corridors such as rail lines and rivers – motor vehicle traffic is prohibited.
- 2. Separated:** Physical separation from traffic with raised bicycle lanes, protected bicycle lanes, or other means which provide a vertical and horizontal barrier between bicyclists and motor vehicles. Separation is required primarily on major through-streets with higher traffic volumes and speeds. These streets often provide access to shopping, jobs, neighboring communities, and regional trails.
- 3. Bicycle Priority Street (also referred to as “Lower volume and/or speed”):** Lower motor vehicle volume and/or speed with bicycle-friendly speed and traffic volume management treatments, primarily on residential and less busy through-streets. These streets often provide access within and between neighborhoods, local parks, or schools.



# Tools for Creating Off-Street Paths

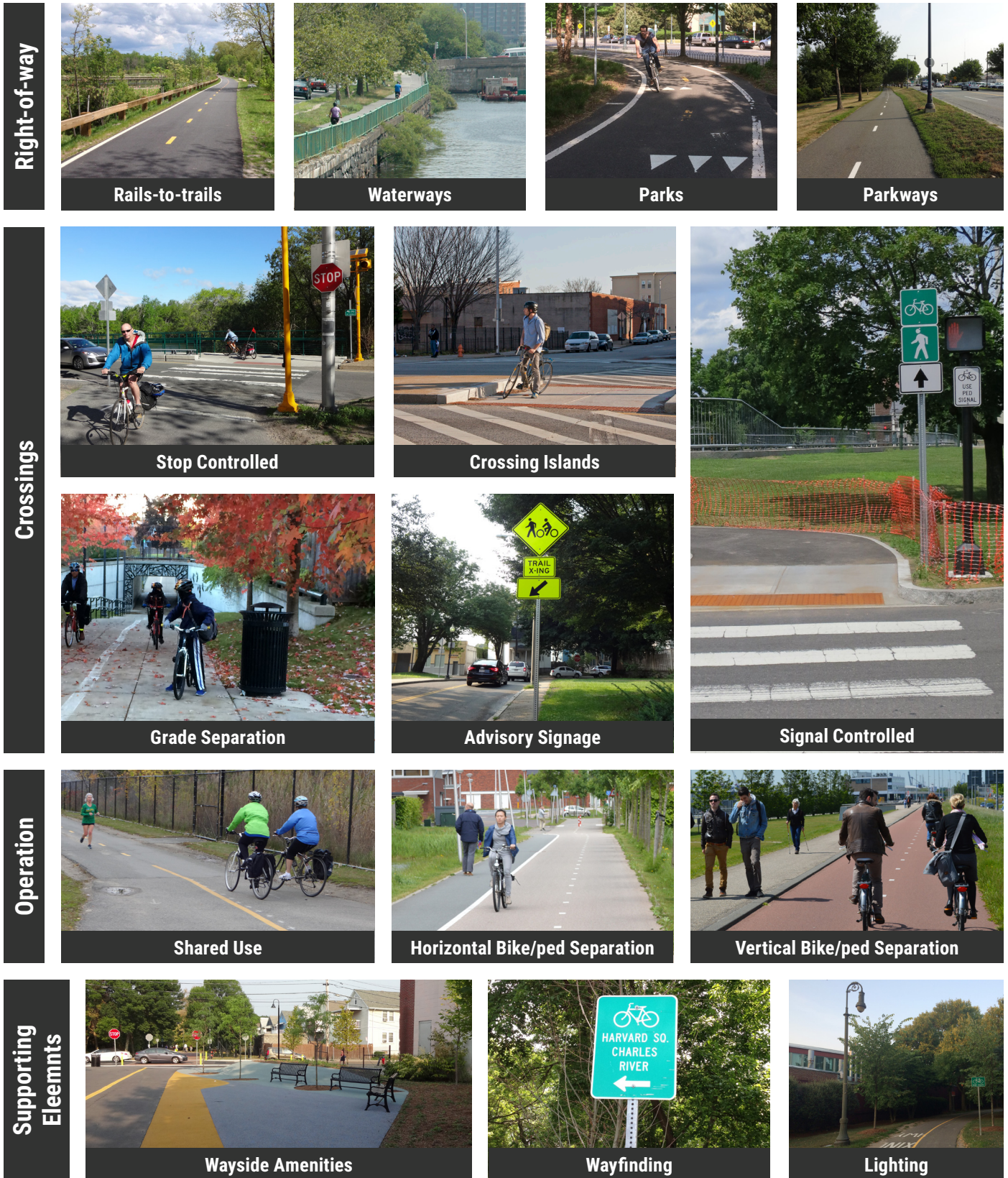


Figure 5.5: Level of Accommodation Example for Off-Street Paths

# Tools for Creating Separation



Figure 5.6: Level of Accommodation Example for Separated Bike Lanes

# Tools for Creating Bicycle Priority Streets

## with Lower Volumes or Speeds



Figure 5.7: Level of Accommodation Example for Bicycle Priority Streets

# BICYCLE NETWORK VISION

The 2015 plan established a 115-mile Bicycle Network Vision to guide bicycle facility implementation. In this 2020 plan update, the 2015 Network Vision was assessed for its ability to create comfortable connections for biking to key destinations including jobs, shopping, open space, and schools. Land use, public comments, the BLC analysis, crash data, and other roadway conditions were used to identify potential additions and changes. This resulted in the updated 130-mile Bicycle Network Vision that focuses on providing high-comfort routes between all major origins and destinations in the city.

The Bicycle Network Vision includes existing and planned high-comfort bicycle facilities, separated bike lanes identified in the Cycling Safety Ordinance, existing and proposed off-street paths, and lower volume and/or speed streets that create primary connections to destinations.

The resulting network is a long term vision for a safe, comfortable and connected network of streets and paths that seamlessly links key destinations throughout the city.

While all streets in Cambridge are used by people biking, the Bicycle Network Vision will prioritize the funding, redesign, reconstruction, and maintenance of projects to promote the completion of a connected high-comfort network (BLC 1 & 2) that provides a bicycling option for people of all ages, abilities, and identities. Improvements will continue to be made to other streets as opportunities arise.

**The continued development of a comfortable, safe and connected bicycle network is an important priority for Cambridge.**

For example, buffered bike lanes are planned for Belmont Street (which is not on the Bicycle Network Vision) which will raise the street from a BLC 4 to a BLC 3. The Bicycle Network Vision will be a living document, updated regularly as new ideas and opportunities emerge.

***My wishlist for pro-biking infrastructure and policy in Cambridge is long only because I truly believe that the city has the bones and resources to become a true haven for bikers. While I understand that biking is not an accessible mode of transport for everyone, I do think that we should do everything in our power to make biking safe and accessible for those who DO want to start or maintain the practice. Promoting biking is also an invaluable piece of the climate action puzzle-- the easier it is to bike, the fewer cars will be in the road. Cambridge should be a leader when it comes to bike infrastructure and policy! Every member of the community stands to benefit.***

– Resident, Mid-Cambridge





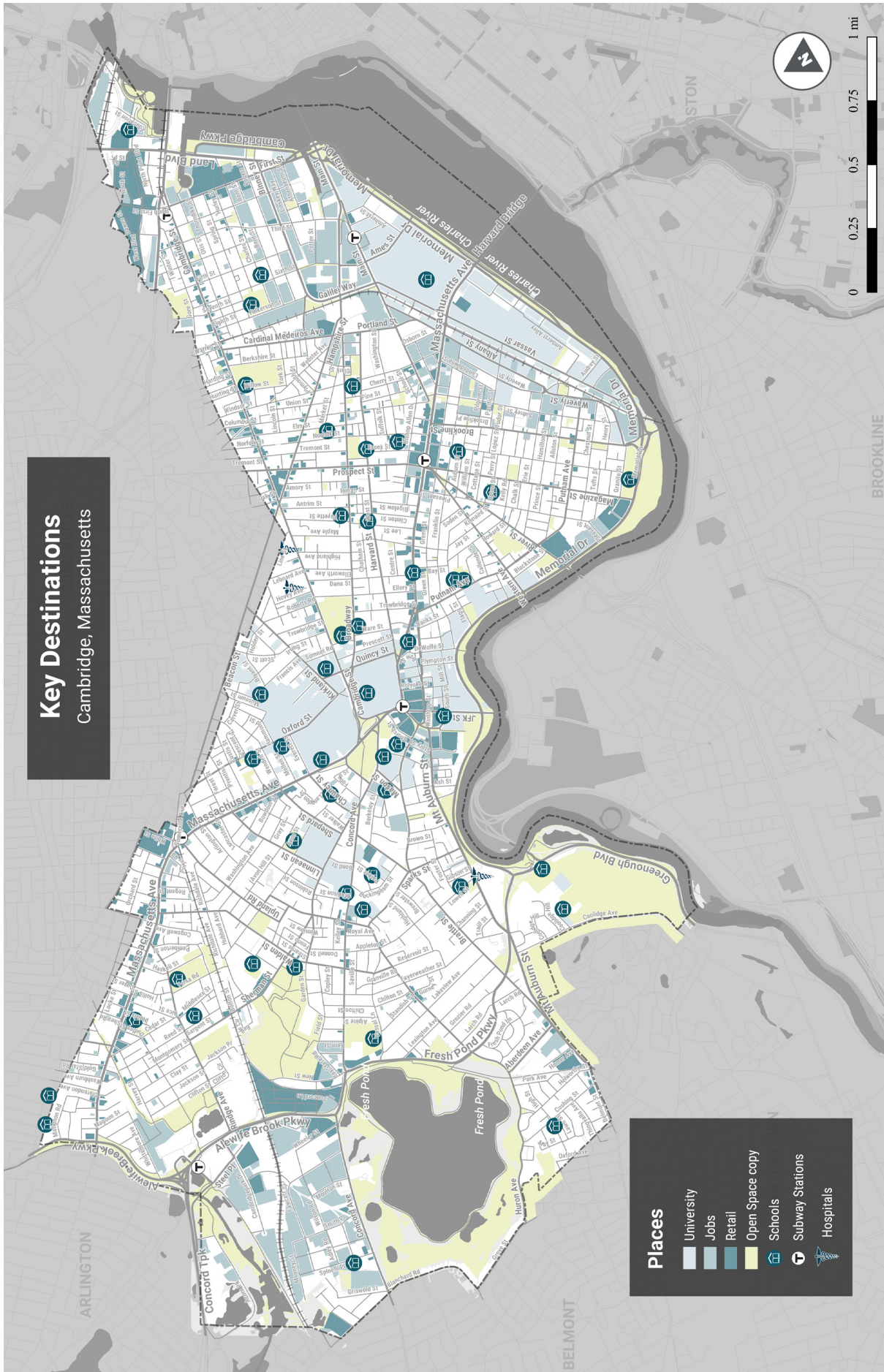


Figure 5.8: Key Destinations in Cambridge

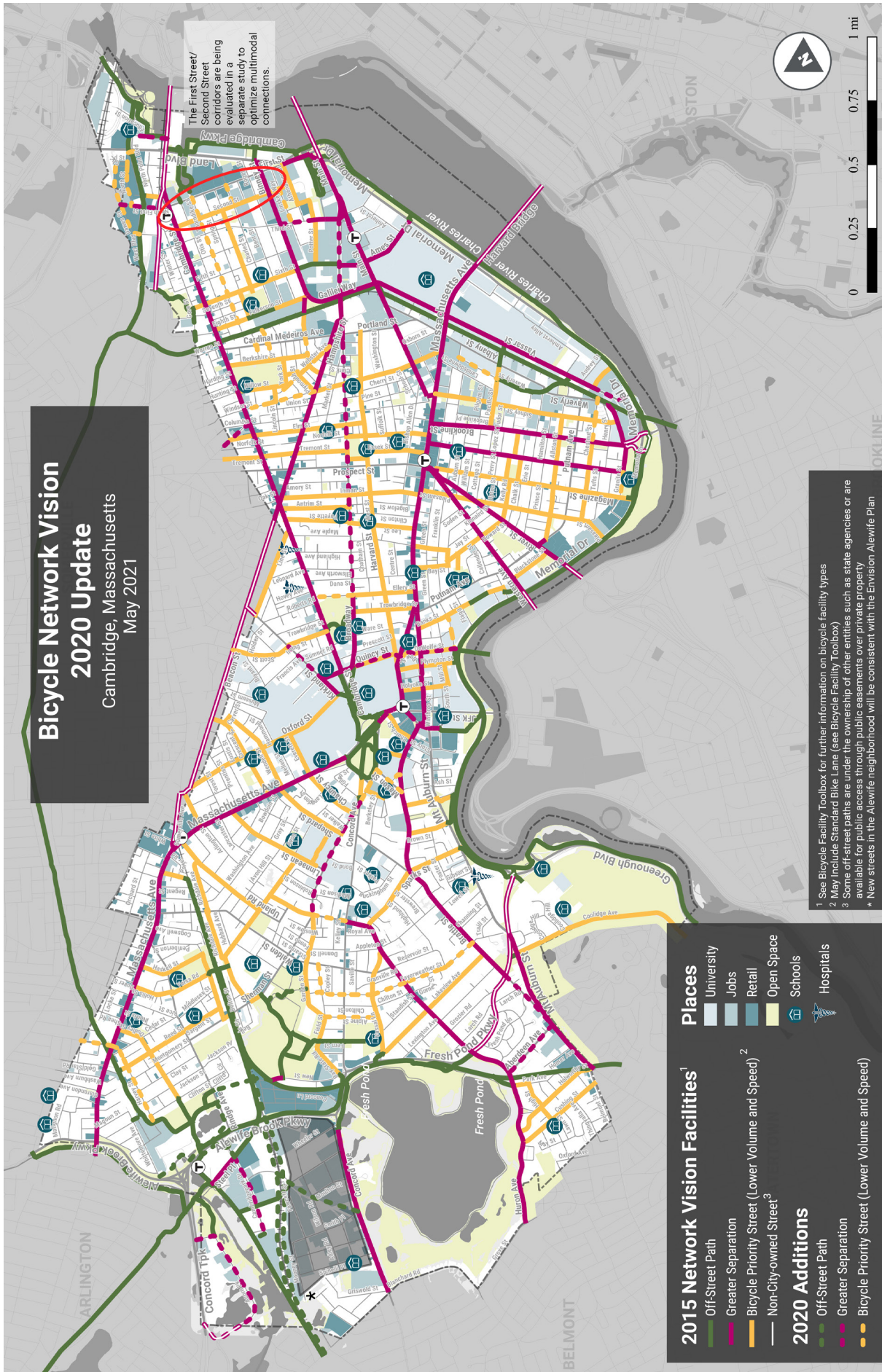


Figure 5.9: Bicycle Network Vision