CITY OF CAMBRIDGE
2015 BICYCLE PLAN

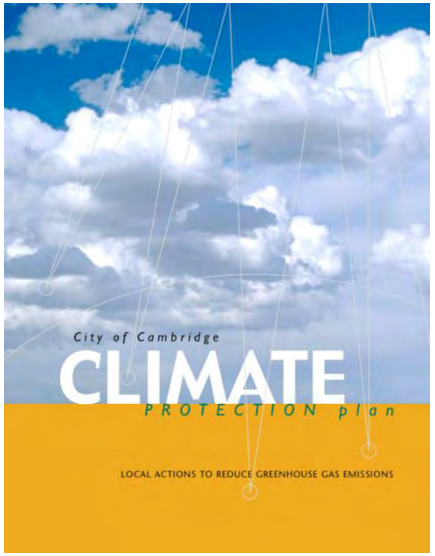
cambridge bicycle plan

TOWARDS A BIKABLE FUTURE

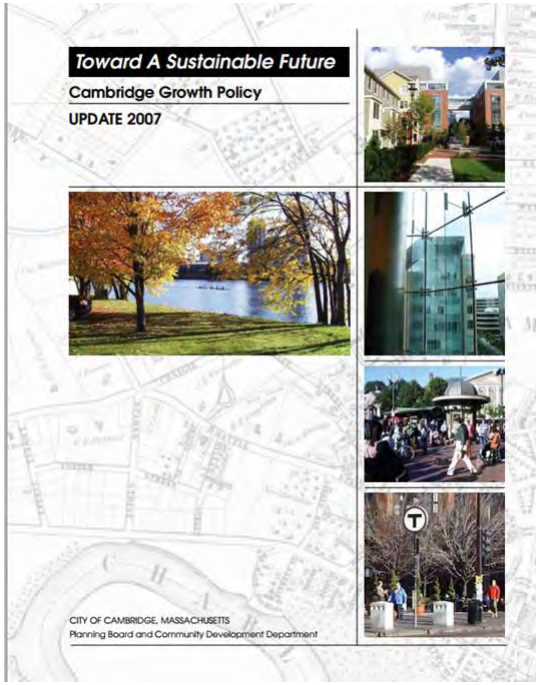
WHICH FUTURE?

CAMBRIDGE MUNICIPAL POLICIES

- 1992: Vehicle Trip Reduction Ordinance
- 1998: Parking & Transportation Demand Ordinance
- 2002: Climate Protection Plan



- 2007: Growth Policy Document Update
- 2013: School Wellness Policy
- 2015: Zoning Ordinance Update



CAMBRIDGE MUNICIPAL POLICIES

2016: Complete Streets

Complete Streets are designed and operated to enable safe access for *all* users – regardless of age, ability, or mode of transportation.

2016: Vision Zero

VISION ZERO CAMBRIDGE

Vision Zero calls for the elimination of fatalities and serious injuries resulting from traffic crashes, and emphasizes that they can and should be prevented.

CAMBRIDGE MUNICIPAL POLICIES

2019: Cycling Safety Ordinance

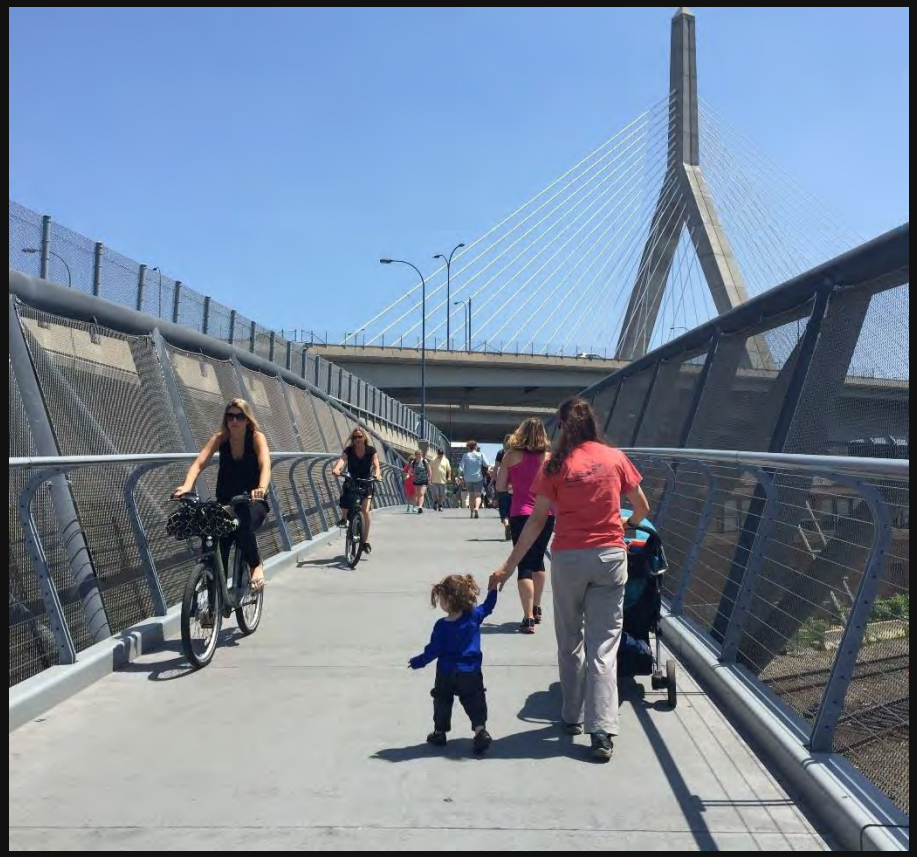
This Chapter seeks to eliminate fatalities and injuries on City streets in accordance with the City's Vision Zero goals through safety improvements and the construction of a connected network of permanent separated bicycle lanes across the City.

Applicability

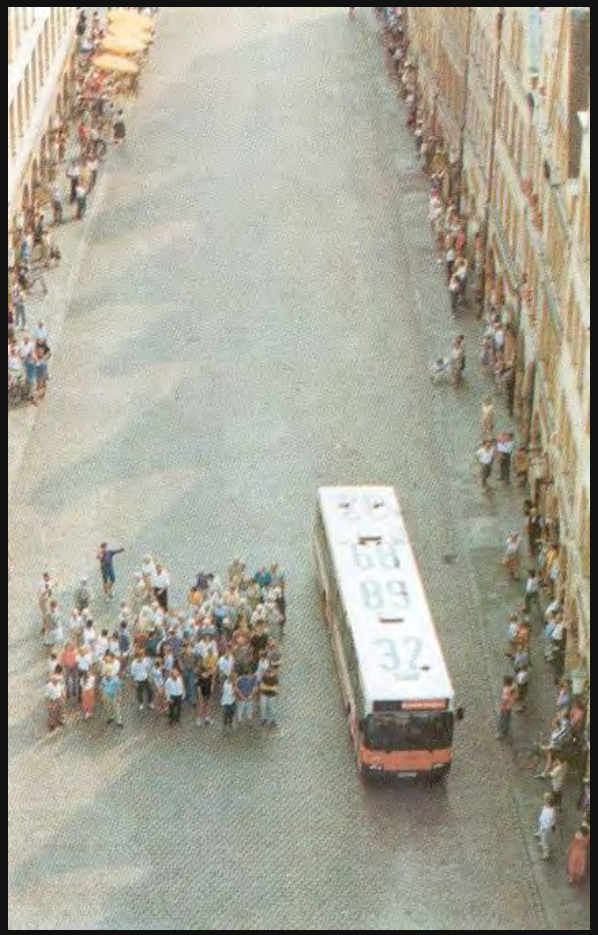
- Streets Reconstructed Under 5-Year Plan
- Streets identified for separation in Cambridge Bicycle Network Vision/Cambridge Bicycle Plan
- Exceptions under rare circumstances: technical feasibility; extreme costs

BICYCLE TRANSPORTATION

WHY BICYCLING IS GOOD POLICY



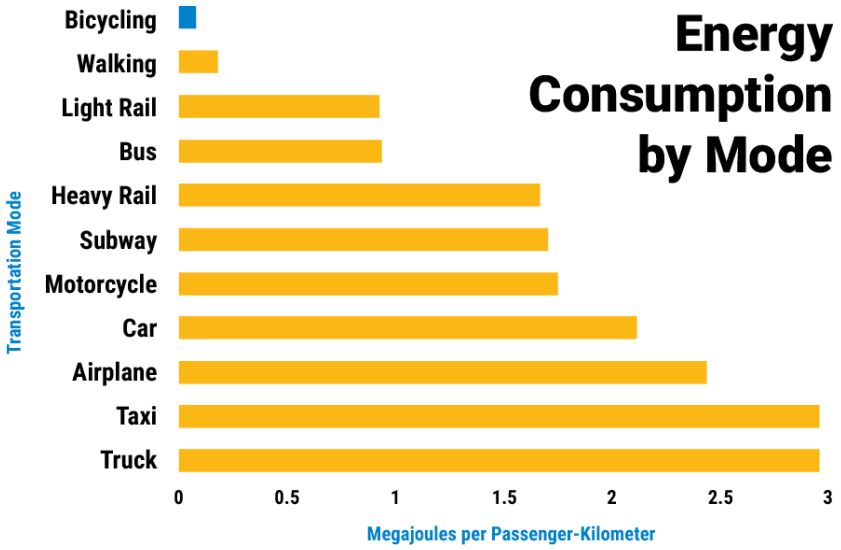
SPACE EFFICIENCY



ENVIRONMENTAL BENEFITS & ENERGY EFFICIENCY

ENVIRONMENTAL BENEFITS

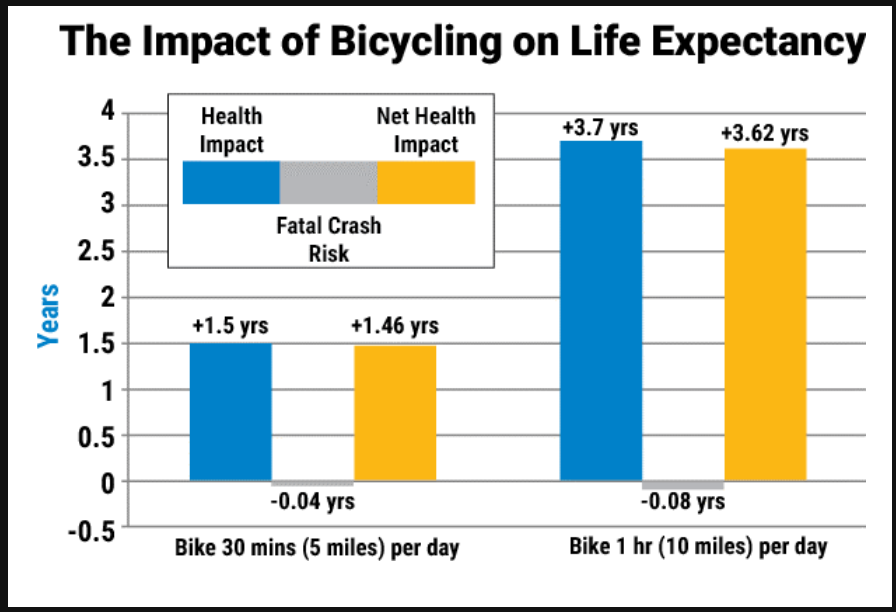
- Reduce greenhouse gas emissions
- Decrease local air pollutants



Bicycling gets equivalent of over 1,000 miles per gallon.

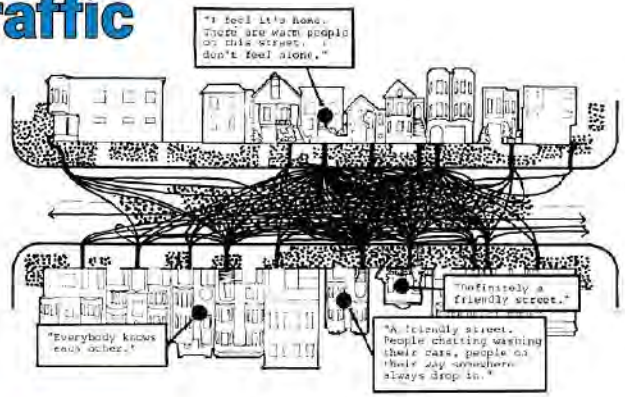
HEALTH BENEFITS

- Reduced air and noise pollution
- Improved health and well-being through regular exercise
- Regular exercise opportunities for children
- People who bike take fewer sick days
- Encourage physical activity among at-risk populations

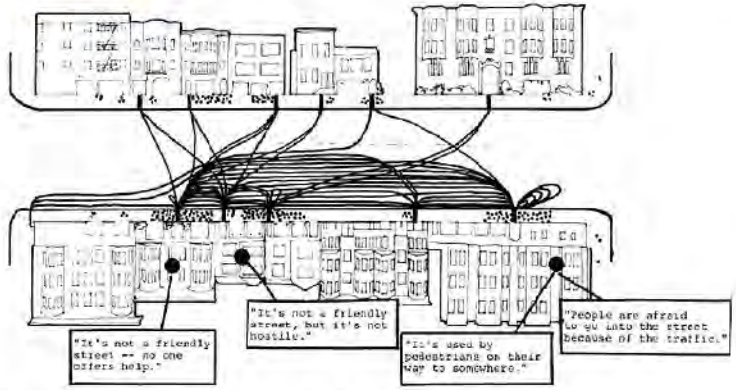


CYCLISTS LIVE LONGER

Light Traffic



Heavy Traffic



* Lines represent social connections

TRAFFIC REDUCES SOCIAL CONNECTIONS

- Light traffic streets (2,000 ADT):
  - 3 friends per person
  - 6.3 acquaintances per person
- Heavy traffic streets (16,000 ADT):
  - 0.9 friends per person
  - 3.1 acquaintances per person

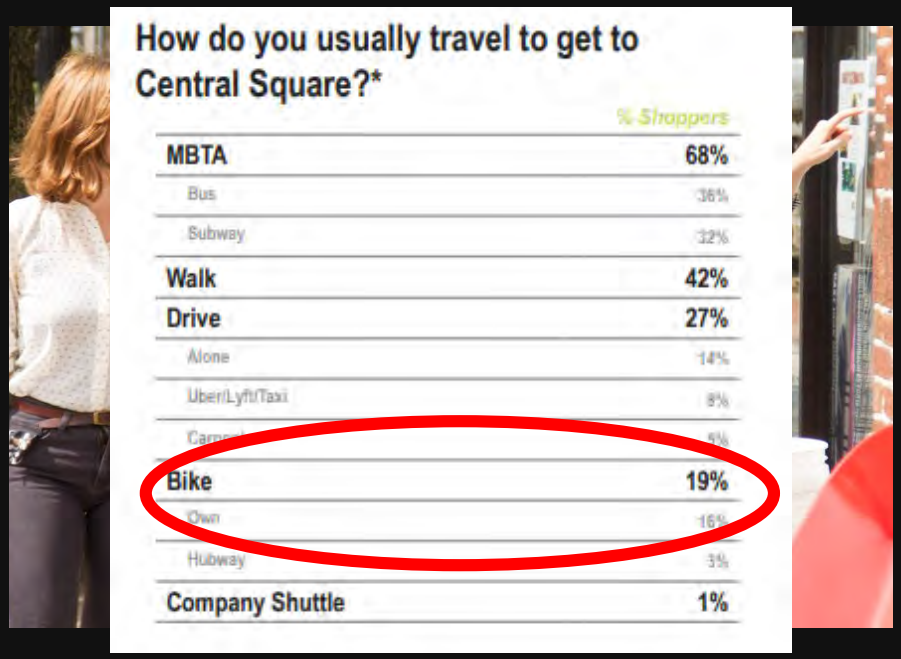
Graphic adapted from original illustration by Betty Drake in "*Livable Streets*" and used with permission from Bruce Appleyard.

ECONOMIC BENEFITS

✓People shopping by bike spend **more** than those driving.

✓Businesses sales **increased** after a major streetscape upgrade that included separated bike lanes and parking removal.

✓Business owners overestimate how many customers come by car and underestimate how many came by bicycle.



BICYCLISTS SUPPORT LOCAL BUSINESS

EQUITY BENEFITS

- Bicycling can help lower household transportation costs
- Car reliance disproportionately burdens low income families (Lutz and Lutz Fernandez, 2010)
- Low income households bike for recreation and transportation the most (People for Bikes, 2015)

BICYCLING IS AFFORDABLE FOR ALL INCOME LEVELS

The happiest mode of transportation?

That would be cycling.

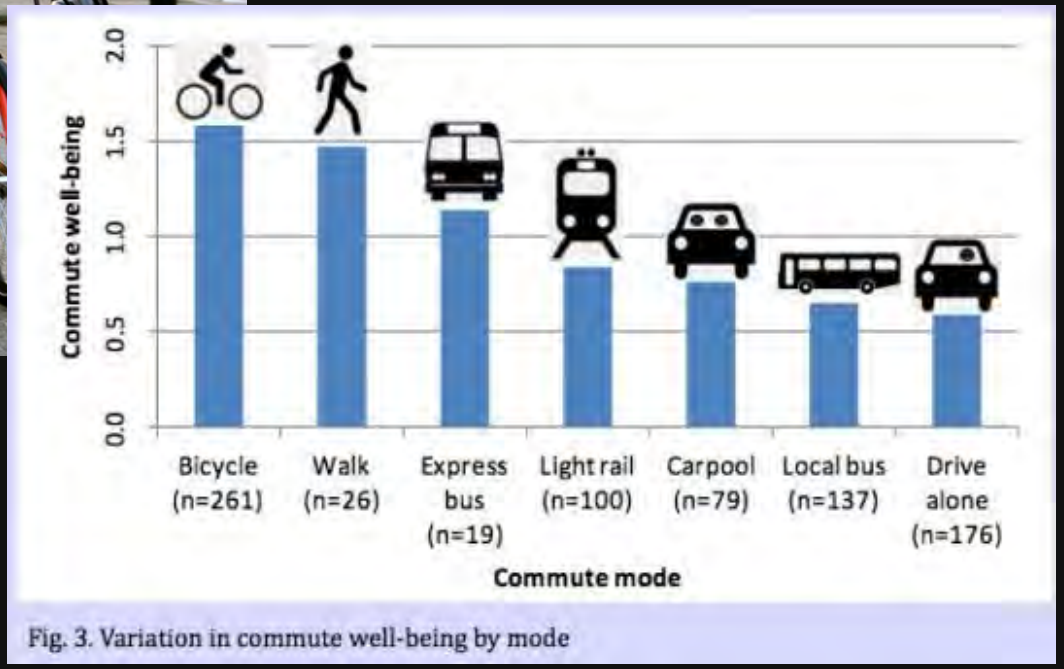


Fig. 3. Variation in commute well-being by mode

PLAN VISION, GOALS & TARGETS

VISION

Cambridge will be a place designed to accommodate bicycling as a mode of transportation **for people of all ages and abilities.**

BICYCLE PROGRAMS: OUTREACH & EDUCATION

COMMUNITY CLASSES & EVENTS

BICYCLE PROGRAMS: OUTREACH & EDUCATION

PUBLIC ENGAGEMENT

RIDES AND EVENTS

SAFE ROUTES TO SCHOOL

- Programs underway in all schools in Cambridge
- Elementary, Upper Schools and CRLS
- In-classroom and on-bike skills training

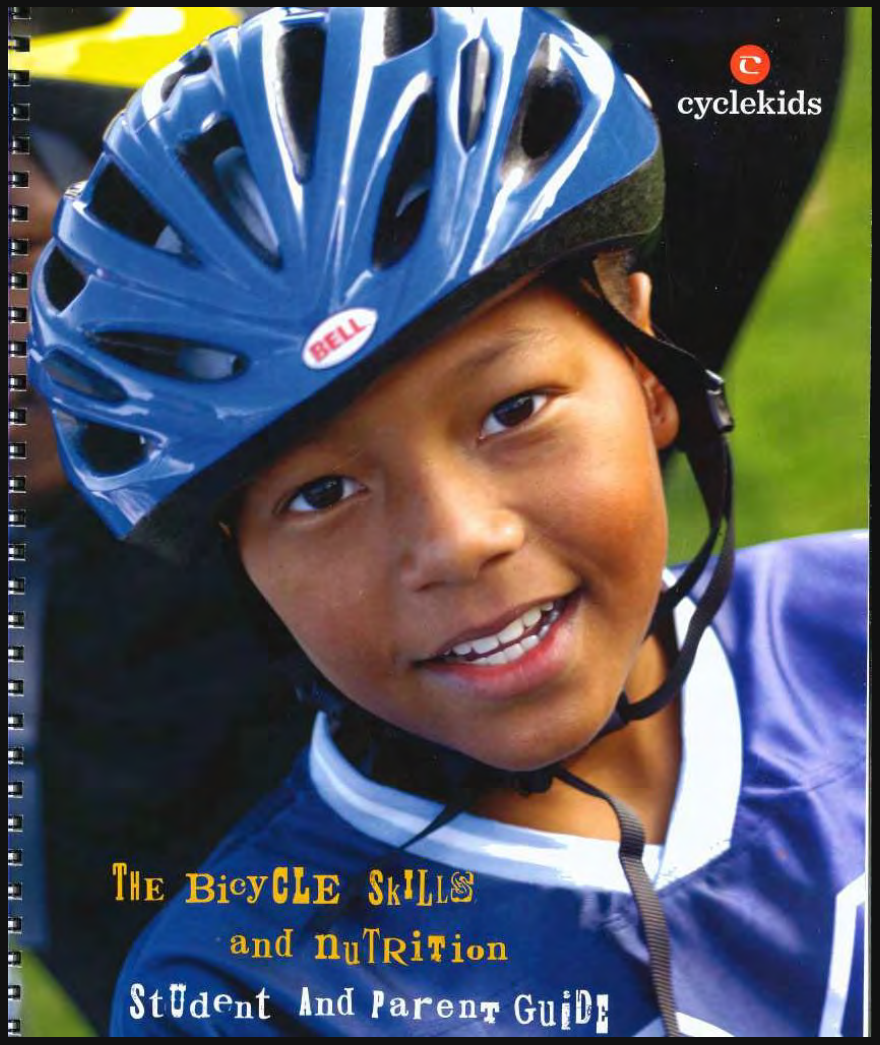
PROMOTING HEALTH AND WELL-BEING FOR STUDENTS

Elementary Ped/Bike Unit

- Annually for all 2nd graders
  - Developed by MassDOT & Walk Boston
  - Taught during regular PE classes
- 3 lessons on pedestrian safety
  1. Why walk? & street vocabulary
  2. Sidewalks, crossing streets, and walking in parking lots
  3. Outdoor session for practice!
- 1 lesson on bike safety
  - ABCs & Basic Maintenance
  - Etiquette & rules of the road
  - Helmets – fit and free giveaway
  - Signals

CYCLE Kids

- Outside of Safe Routes program
- 4th/5th Grade students
- Primarily a Learn to Ride program
- Nutrition
- Bike fleet shared among elementary schools



Upper School On-Bike Training

- 6th grade students
- City-owned fleet of special bikes for a variety of child sizes
- All 5 upper schools in 2019
- Advanced Curriculum
  - Bicycle for more than recreation
  - Intersection strategy
  - Types of bike infrastructure
  - The ‘Street Code’
  - Group ride on city streets

Data Collection

For 2018-2019:

- K-8
  - **35% walk and 5% bike**
- High School:
  - **34% walk and 18.5% bike**

BICYCLE PROGRAMS: OUTREACH & EDUCATION

SAFETY IS THE FOCUS OF ENFORCEMENT

BICYCLE PARKING

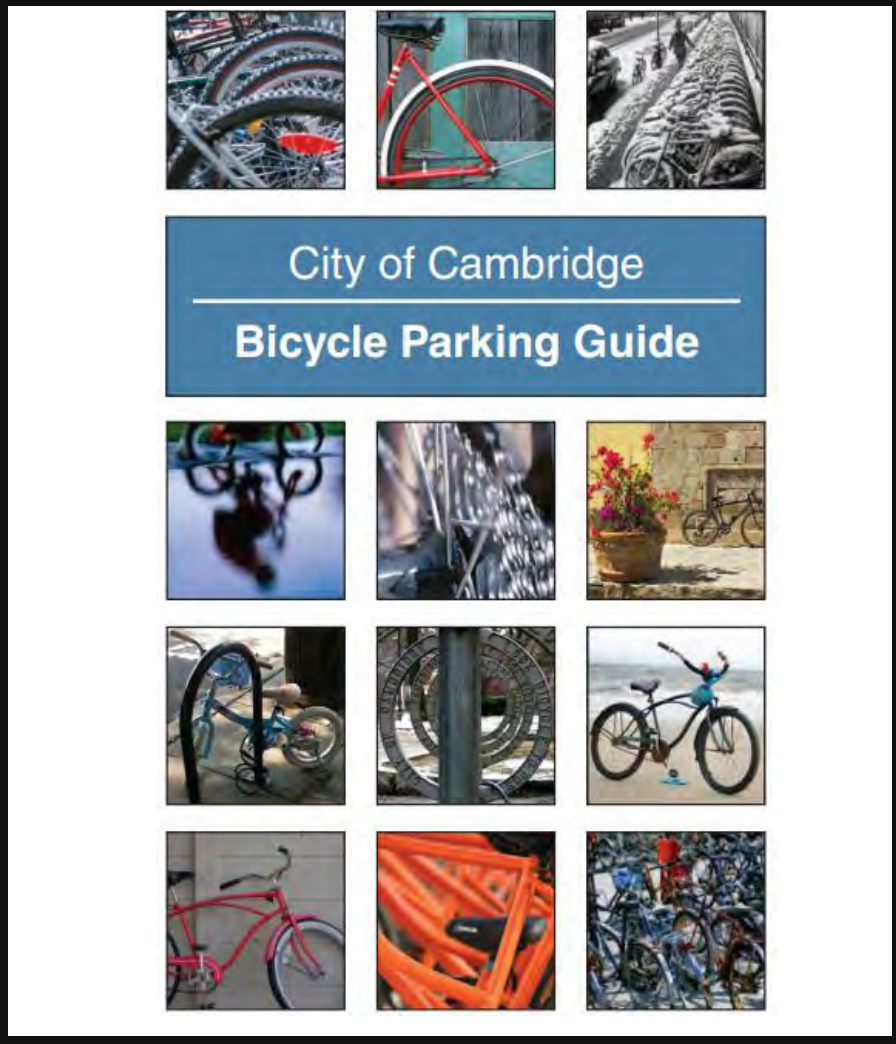
PUBLIC

PRIVATE

BICYCLE PARKING

Zoning

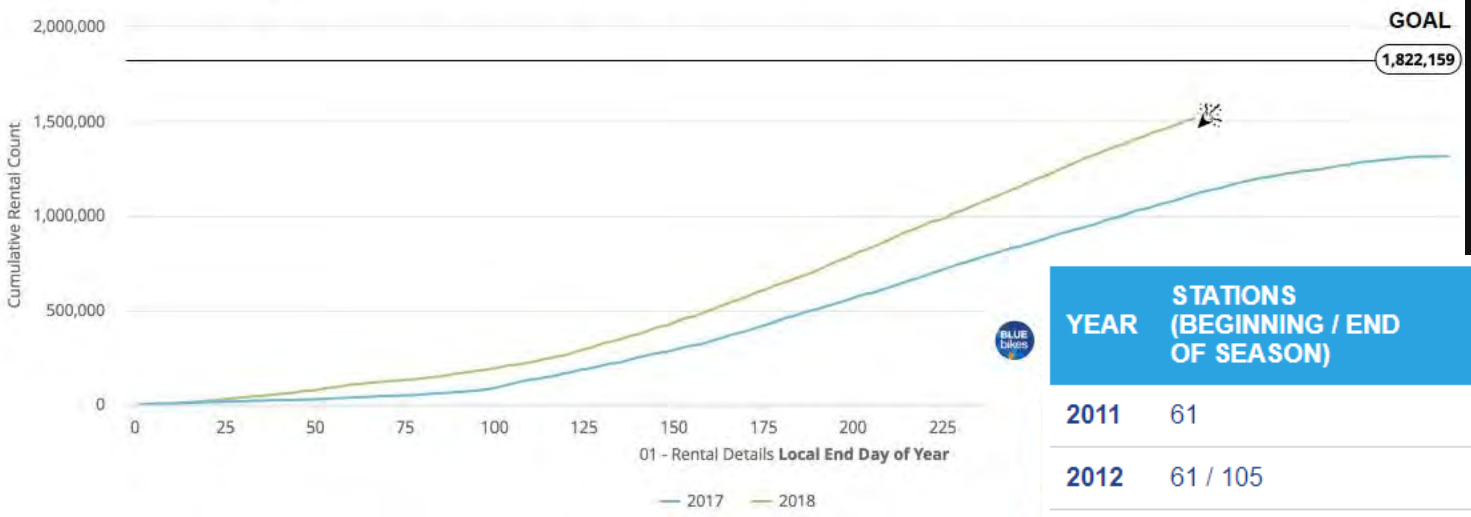
- Cambridge has the most rigorous requirements for bicycle parking in the world (we think)



BLUEBIKES BIKE SHARE

BLUEBIKES BIKE SHARE

As of November 9th, 1.6M trips taken in 2018 vs. 1.3M trips taken the same time last year



YEAR	STATIONS (BEGINNING / END OF SEASON)	BICYCLES (BEGINNING / END OF SEASON)
2011	61	610
2012	61 / 105	610 / 1050
2013	105 / 130	1050 / 1200
2014	130 / 140	1200 / 1300
2015	140 / 155	1300 / 1500
2016	155 / 180	1500 / 1800
2017	180 / 190	1800
2018	190 / 262	1800 /2500+

OPERATIONS & MAINTENANCE

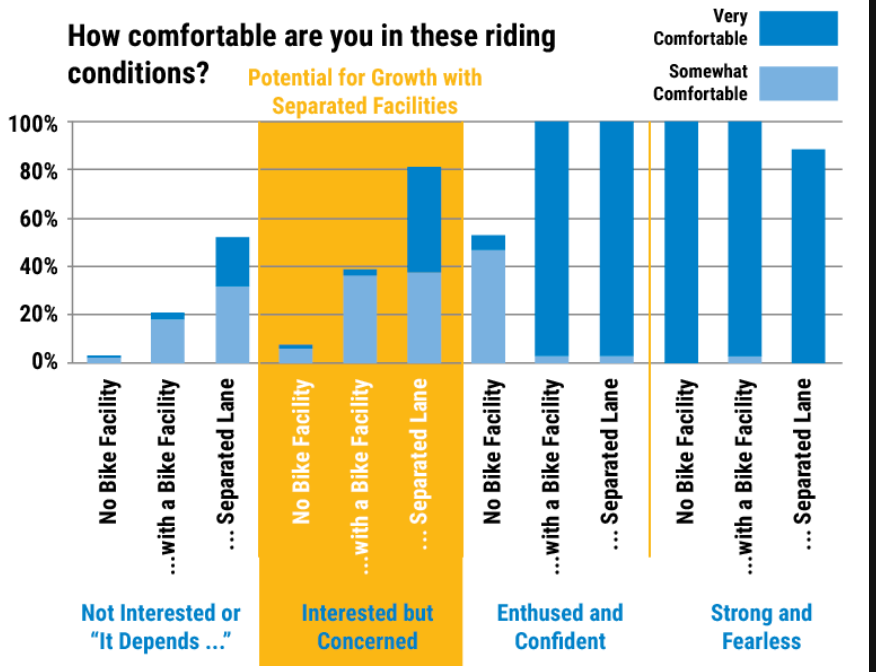
PAVING, MARKING, SNOW, ETC.

DEVELOPING THE PLAN

- Surveys
- Street Teams
- WikiMap
- Open Houses
- Bicycle Committee
- Technical Evaluation

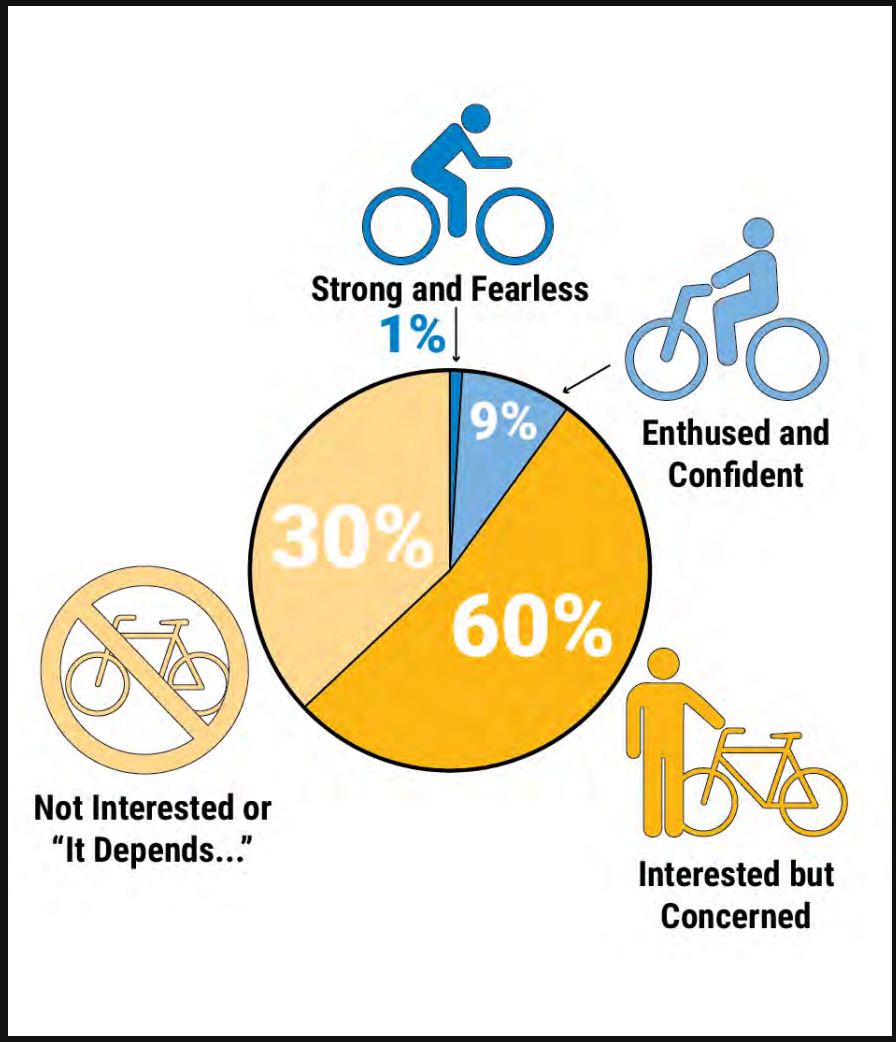
Network Vision Input

HOW PEOPLE RELATE TO BICYCLING



Source: Dill, J. (2012). Categorizing Cyclists: What Do We Know? Insights from Portland, OR.

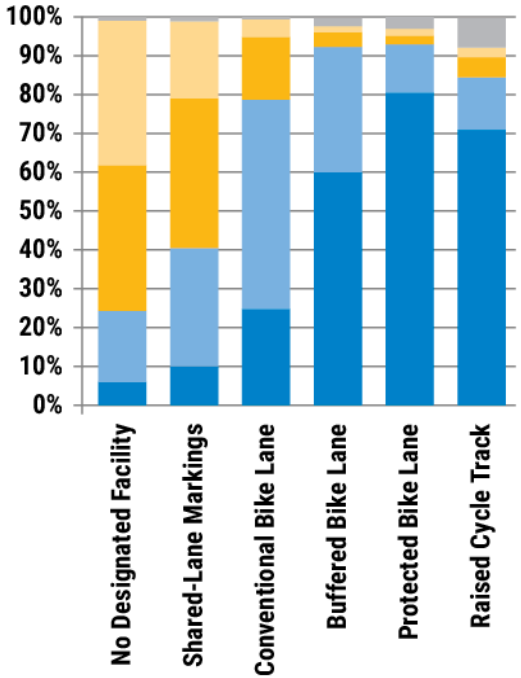
MOST PEOPLE WANT TO RIDE



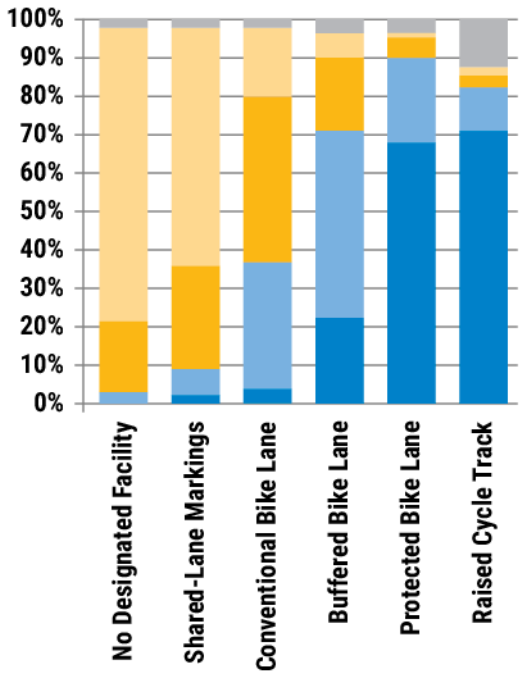
CAMBRIDGE COMMUNITY SURVEY

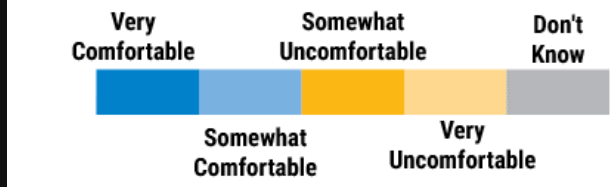
How comfortable do you feel with these bicycle facilities on busy, commercial streets?

All Respondents



"Concerned" group





Over 90% of people prefer and feel comfortable bicycling on separated bicycle facilities.

WHAT IS NEEDED TO SUPPORT PEOPLE OF ALL AGES AND ABILITIES?

INCREASE SAFETY, COMFORT AND SEPARATION

- Separated bicycle facilities on major streets
- Low volume, low speed local streets
- Off-street paths

SEPARATED BIKE LANE TOOLBOX

Sidewalk Level

Street Level

Plastic Flexposts

Concrete Buffer

Landscaping

VOLUME AND SPEED REDUCTION TOOLBOX

Full Traffic Diverter

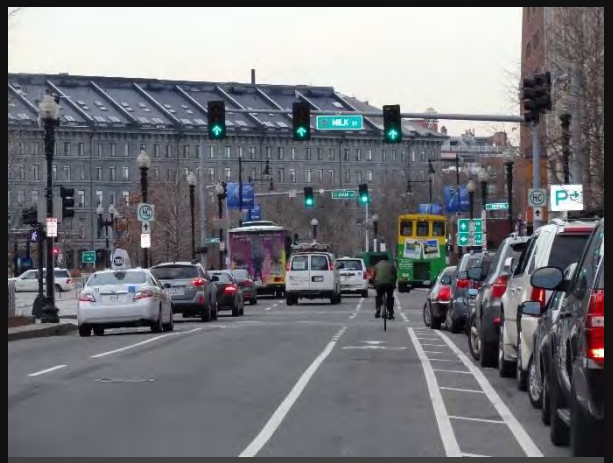
Mini Traffic Circles

Half Traffic Diverter

Raised Intersections

Landscaped Chicanes

FACILITY TOOLBOX



Buffered Bike Lanes

Advisory Bike Lanes

Standard Bike Lanes

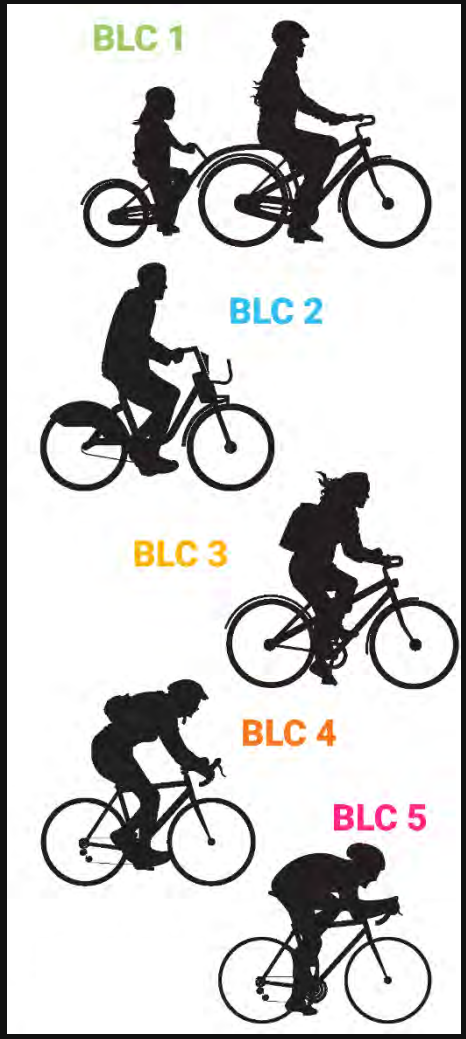
Contra-Flow Bike Lanes

Shared Lane Markings

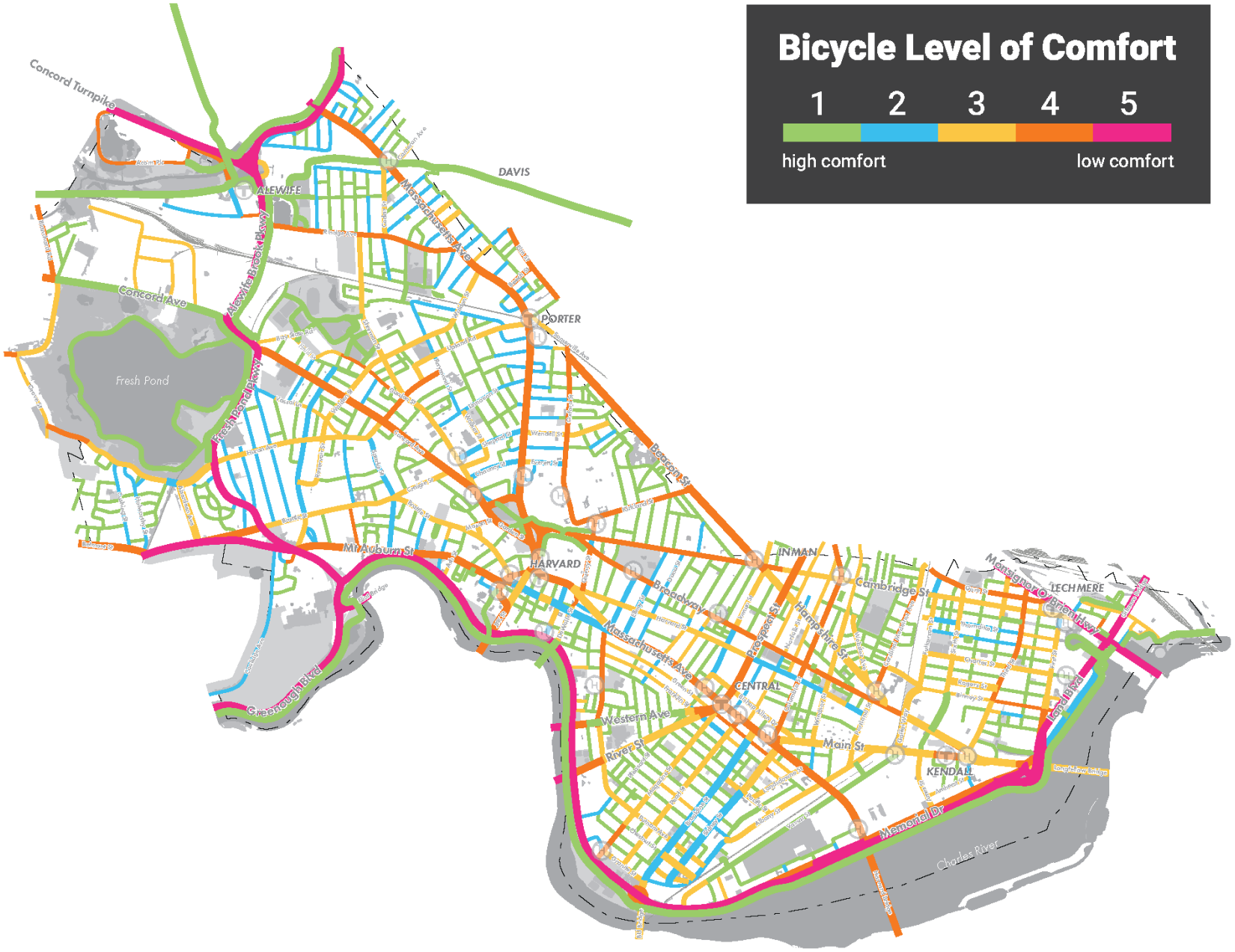
CREATING A BICYCLE NETWORK VISION

BICYCLE LEVEL OF COMFORT ANALYSIS

- People have varying levels of tolerance for traffic stress created by volume, speed, proximity of adjacent traffic and on-street parking.
- Tolerance may vary by time of day or trip purpose.
- A Based on the Mineta Transportation Institute's pioneering research on Low-stress bicycling and network connectivity.
- Modified for local conditions through stakeholder input



BICYCLE LEVEL OF COMFORT	TYPICAL CRITERIA	EXAMPLES		
1	Protected/Separated or Shared with ADT <2K or Shared with Speed <30 mph	 Pemberton Street	 Community Path	 Vassar Street
2	Wide/Buffered Bike Lane or Bike Lane w/out Parking adjacent or Shared with ADT 2-4K or Shared with Speed <30 mph	 Richdale Avenue	 Broadway	
3	Bike Lane adjacent to Parking or Shared with Speed 30 mph or Shared with ADT 4-6K or Narrow Operating Space	 Magazine Street	 Main Street	
4	Shared with Speed 30+ mph or Shared with ADT 6-15K or High Frequency Bus Route	 Massachusetts Avenue	 Broadway	
5	Shared with Speed 35+ mph or Shared with ADT 15+K and No Parking and 2+ Travel Lanes per direction	 Land Boulevard	 O'Brien Highway /Route 28	


Bicycle Level of Comfort
1
2
3
4
5
high comfort
low comfort
Concord Turnpike
ALEWIFE
DAVIS
Massachusetts Ave
Alewife Brook Pkwy
Concord Ave
Fresh Pond
Fresh Pond Pkwy
PORTER
Beacon St
Mt Auburn St
HARVARD
INMAN
Broadway
Prospect St
Cambridge St
Hampshire St
MASSACHUSETTS AVE
LECHMERE
Memorial Dr
Western Ave
River St
CENTRAL
Main St
KENDALL
Charles River
Greenough Blvd

BICYCLE NETWORK VISION

The Bicycle Network Vision creates an aspirational concept for a complete system, enabling people of all ages and abilities to travel more safely and comfortably throughout the city. It is intended to be used as a guide and reference for long, medium, and short term infrastructure projects undertaken in the city including projects that are part of the City's Five Year Plan for Street & Sidewalk Reconstruction.

Bicycle Network Vision

1. Green Lines

- Off-Street Paths
- Primarily through parks and open space and along linear corridors such as rail lines and rivers

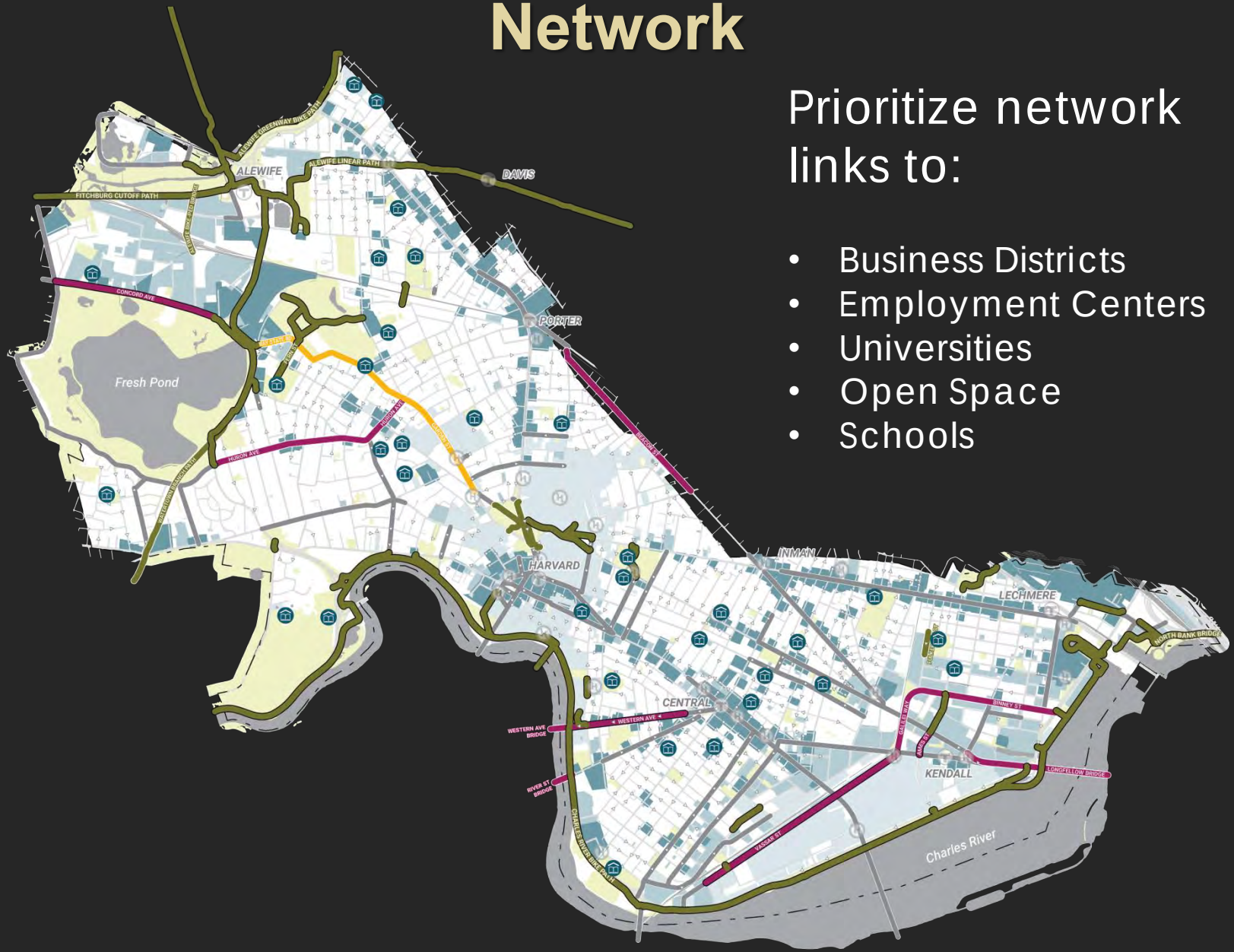
2. Purple Lines

- Bicycle comfort through increased separation from traffic with protected bike lanes, cycle tracks, etc.
- Primarily along major through street streets with higher traffic volumes and speeds
- Focus on providing access to shopping, jobs, neighboring communities, regional trail network

3. Orange Lines

- Bicycle comfort through lower vehicle volume and/or speed with bicycle-friendly traffic calming, priority crossing treatments at major streets, etc.
- Primarily along residential and less busy through streets
- Focus on providing access within and between neighborhoods and to local parks and schools

Bicycle Network Vision: Building the Network

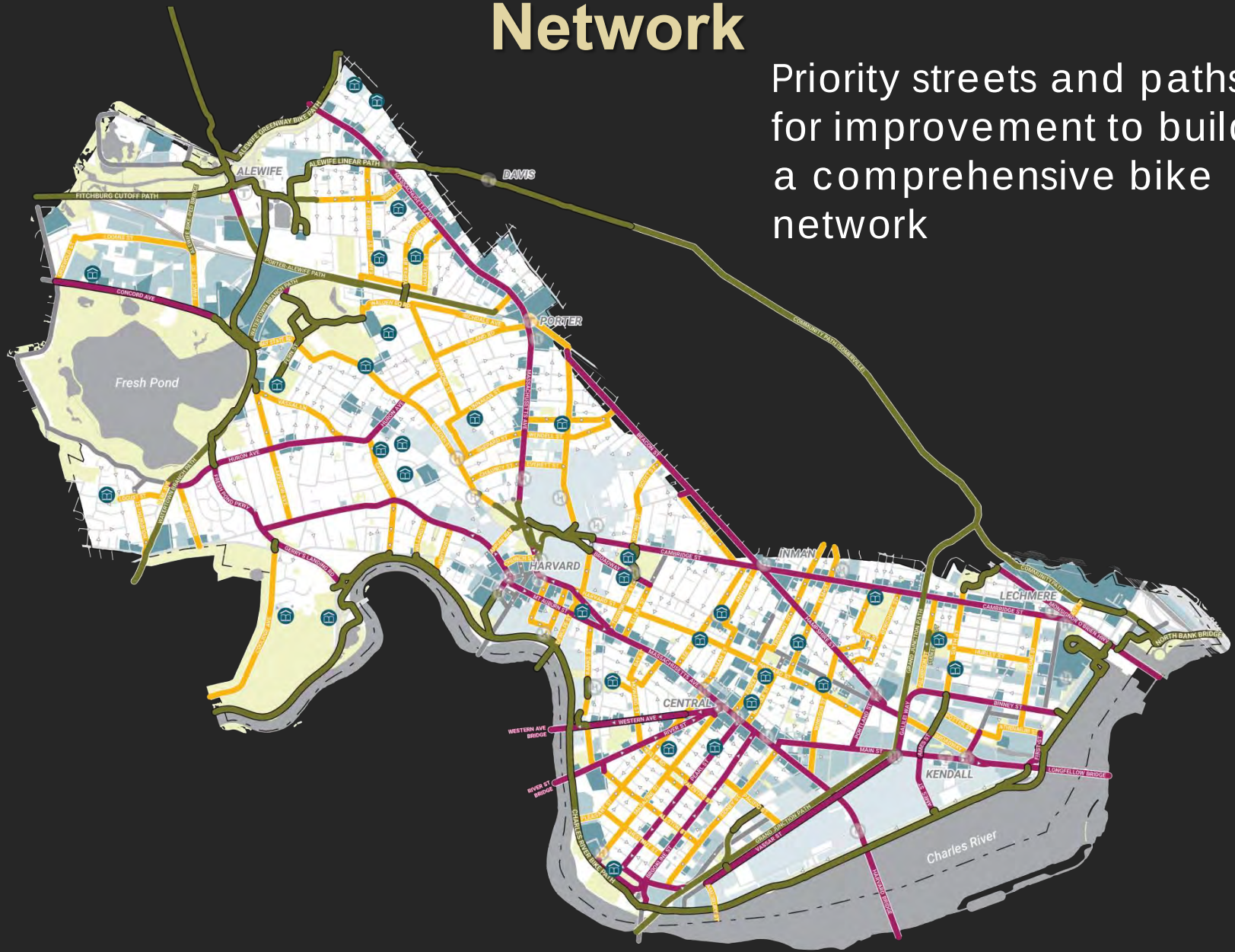


Prioritize network links to:

- Business Districts
- Employment Centers
- Universities
- Open Space
- Schools

Bicycle Network Vision: Building the Network

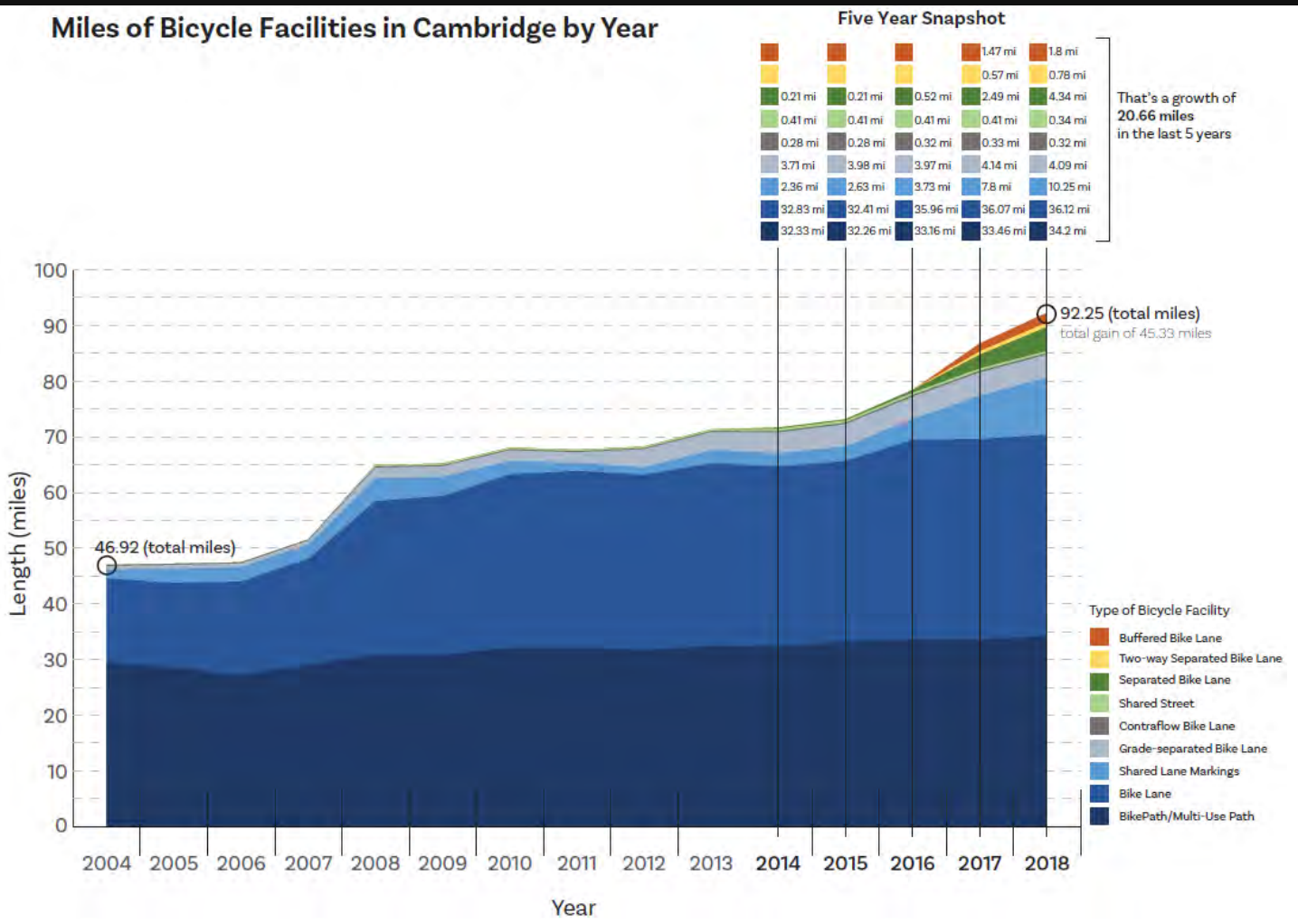
Priority streets and paths for improvement to build a comprehensive bike network



IT'S COMPLICATED

PROCESS

BIKE FACILITIES IN CAMBRIDGE



IMPLEMENTATION

PROJECTS

- 5-year Plan for Sidewalk and Street Construction
- Prioritize new facilities based on Bicycle Network Vision
- Quick-Build Projects
- Development Mitigation
- Capital Projects

CAPITAL PROJECTS

Western Ave.

- Major Sewer Separation Infrastructure
- Full Depth Reconstruction
- Key travel corridor on bike plan

TRAFFIC CALMING

Oxford St.

- Street Reconstruction
- Shared Street Environment
- Speed reduction tools
- Key travel corridor on bike plan

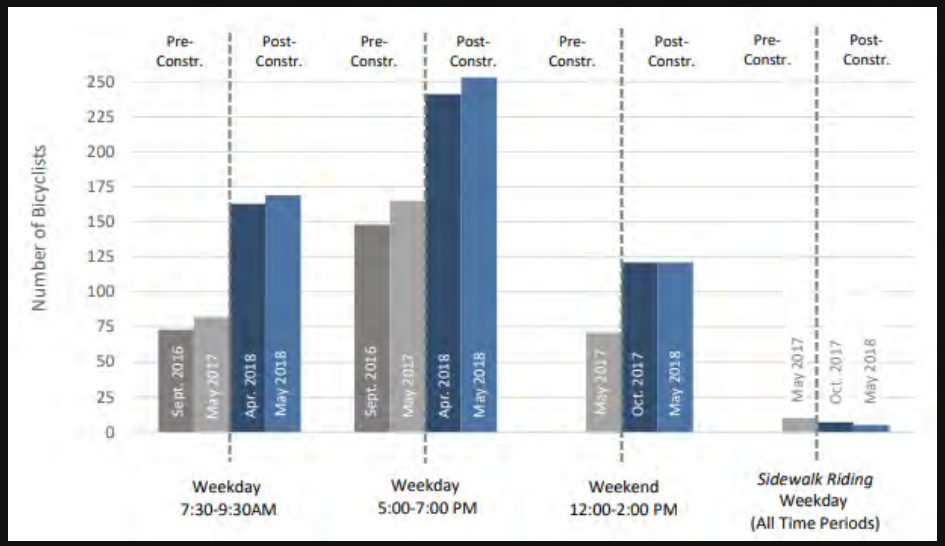
DEVELOPMENT FUNDED

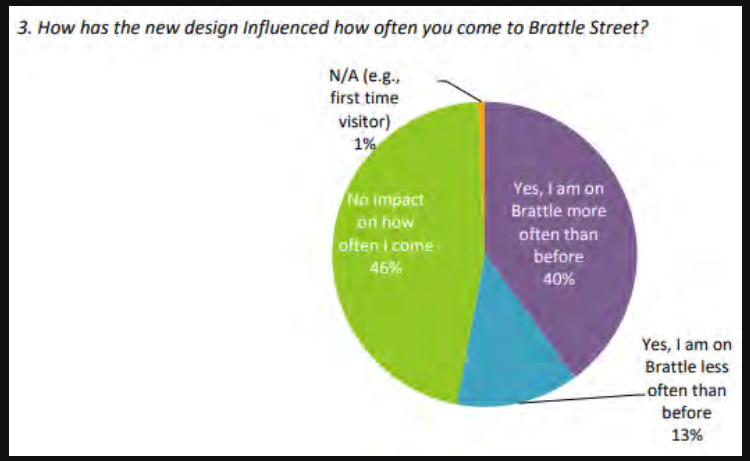
Binney St.

- Major Roadway
- “Extra” roadway width
- Key travel corridor on bike plan
- Design complete; construction phased with development projects

PARTICIPATORY BUDGET FUNDING

Brattle St.

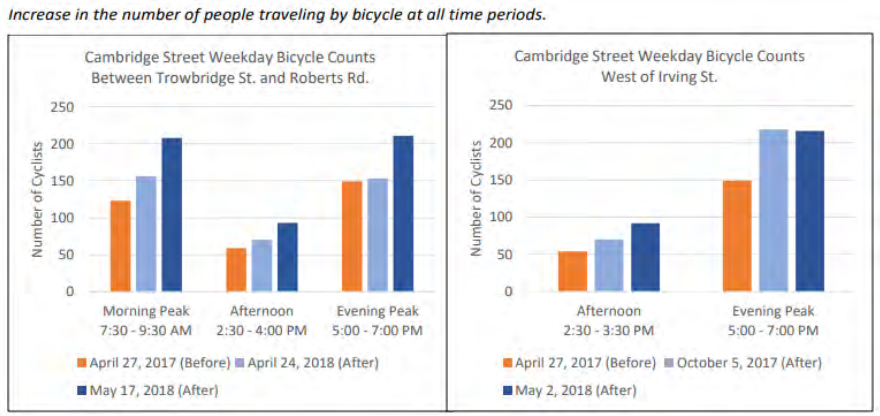




DEMONSTRATION PROJECT

Cambridge St.

Increase in the number of people traveling by bicycle at all time periods.

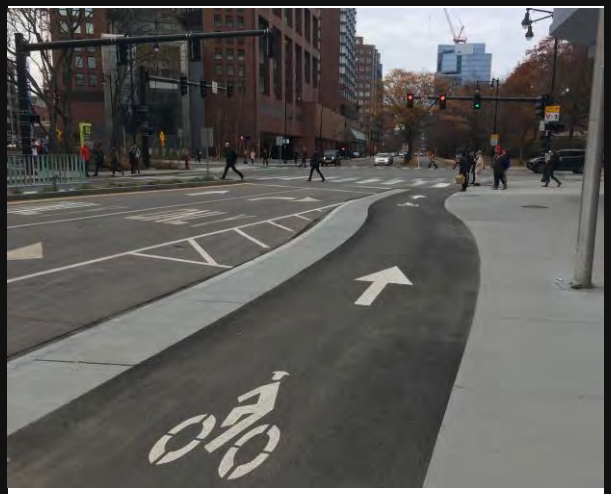


QUICK BUILD PROJECTS

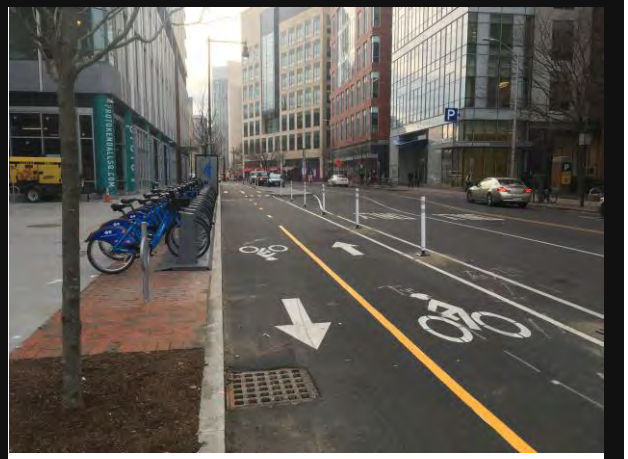
S. MASS. AVE

- Highest bike travel corridor in Commonwealth
- Mass/Vassar high crash rate location
- City capital funds
- Bus lane
- Separated bike lanes
- Bike signals

But that's not all …



Main & 3rd



Ames Street

Kittie Knox Bike Path

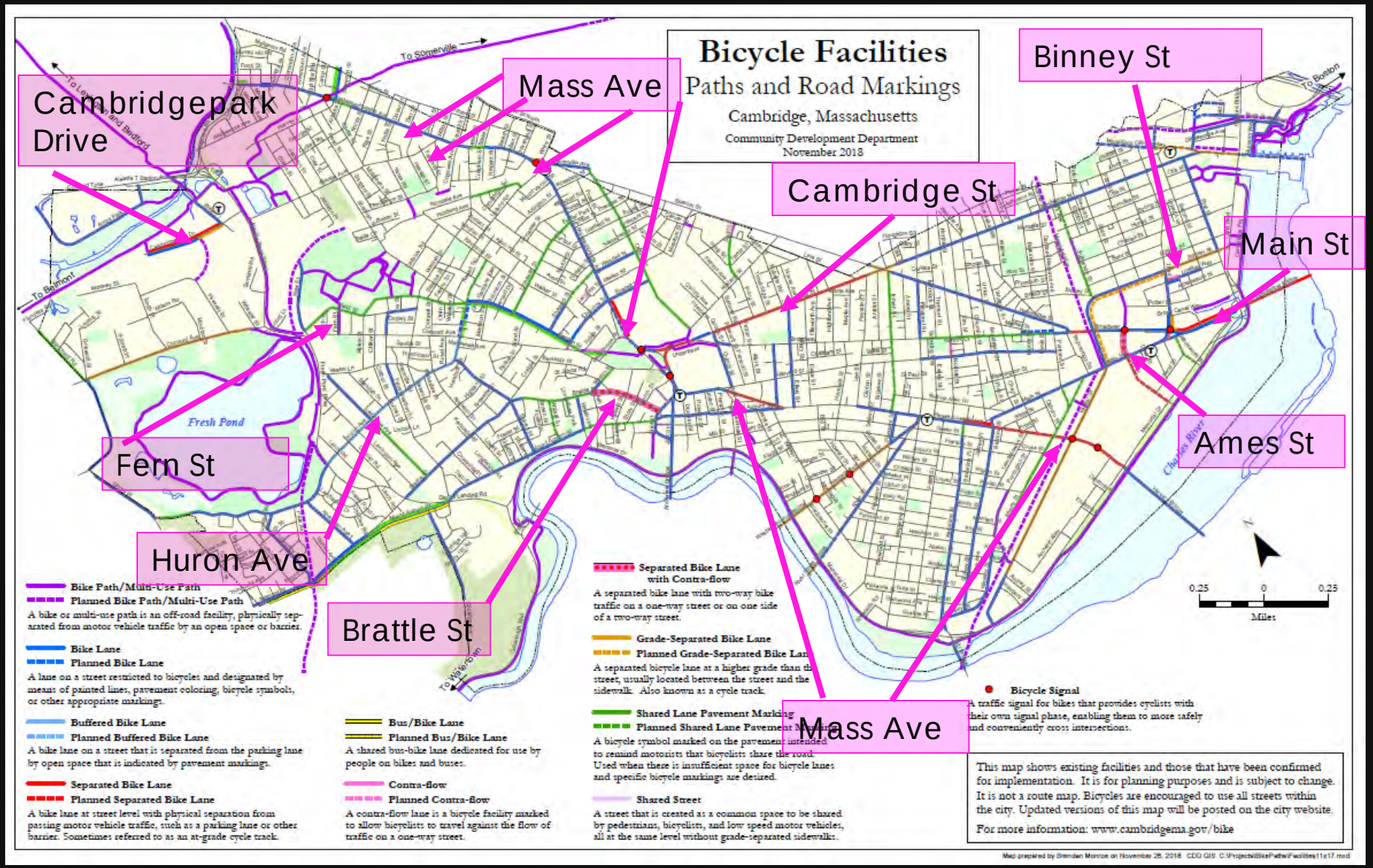
CambridgePark Dr.

SLMs - Multiple

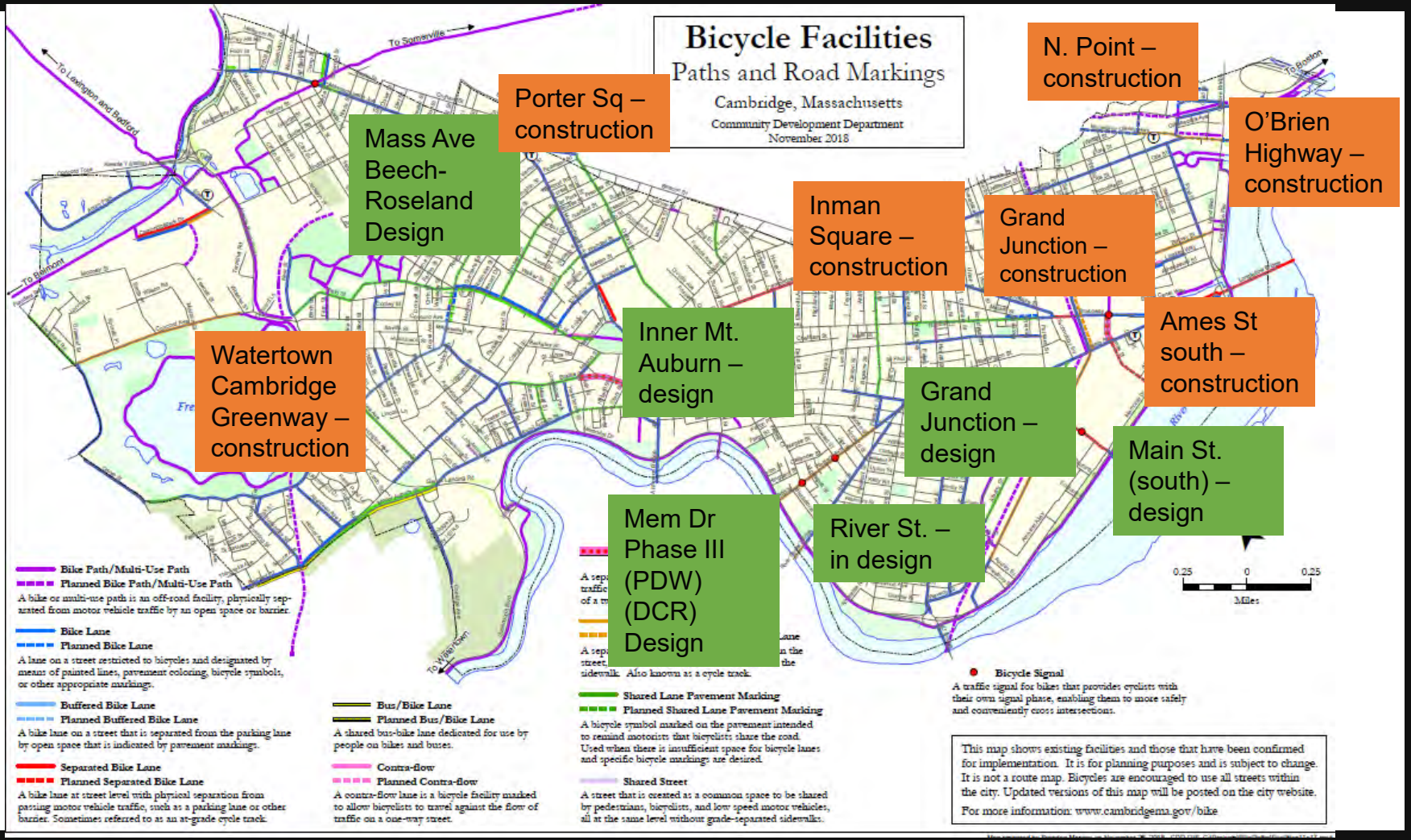
Intersections - Many

Bike Lanes – Several

SOME HIGHLIGHTS SINCE 2015

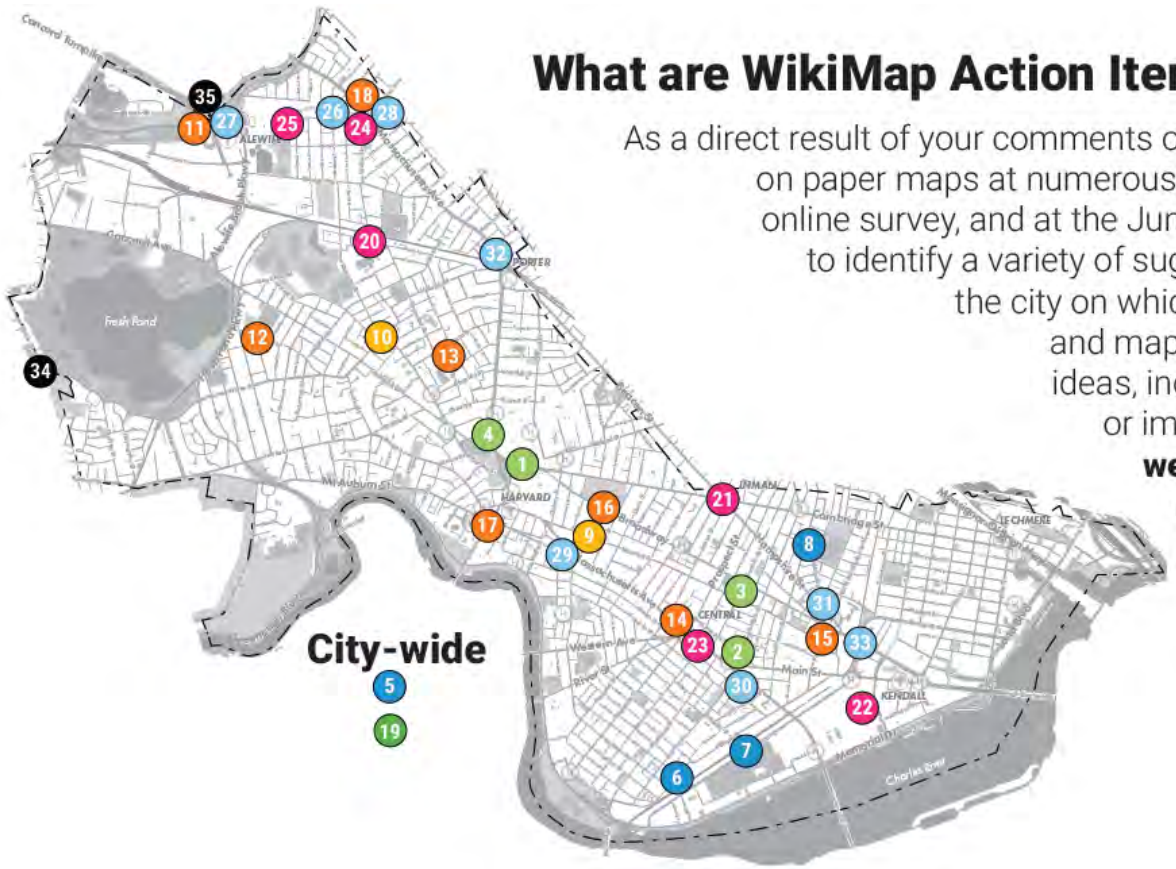


MAJOR PROJECTS UNDERWAY



BICYCLE PLAN 2020

UPDATES SINCE 2015 PLAN

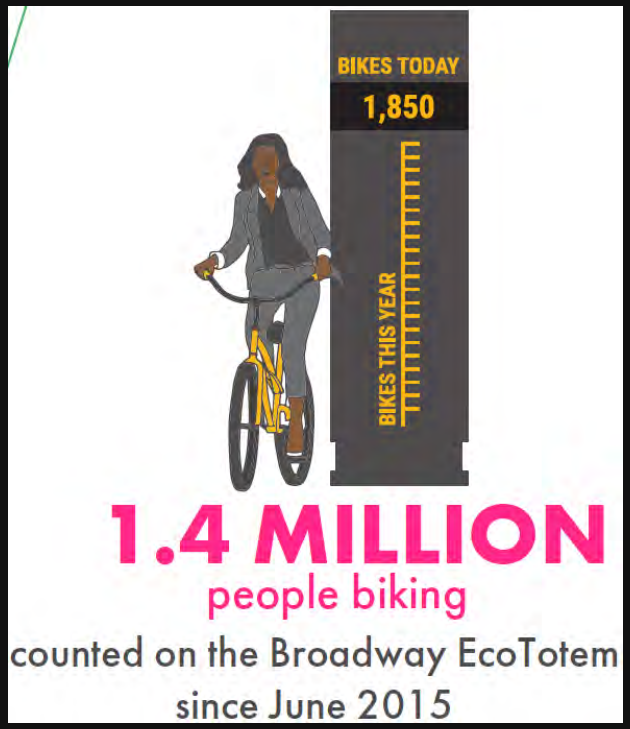


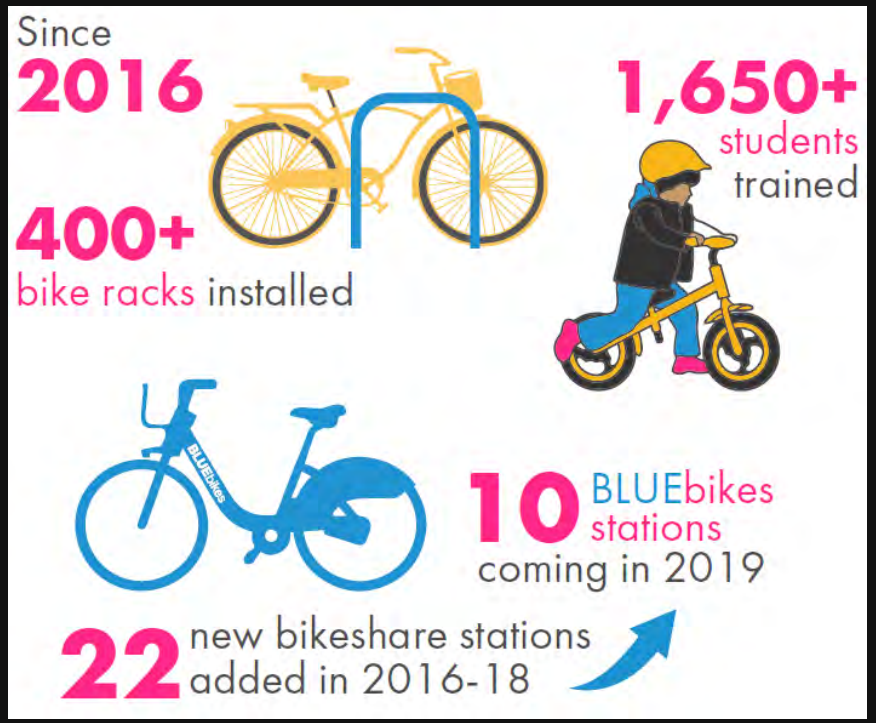
What are WikiMap Action Items?

As a direct result of your comments on the Spring 2014 online WikiMap, on paper maps at numerous public input sessions, through the online survey, and at the June 2014 Open House, we were able to identify a variety of suggested improvements throughout the city on which action could be taken. The table and map below identify many of your great ideas, indicating the status of investigation or implementation. **In the past 4 years, we have completed or programmed nearly 3/4 of these Action Items. Check out the status of your ideas in the list below!**

UPDATES SINCE 2015 PLAN

The 2015 Cambridge Bicycle Network Plan identified a number of 'Next Steps' to improve biking in Cambridge. Here are the highlights:





2020 BIKE PLAN UPDATE

Technical/ Informational

- Data Analysis
  - Volumes
  - Crash analysis
- Current Facility Network
- Updated Bicycle Level of Comfort Map
- Toolbox additions
  - Quick Build
  - Protected Intersections
  - 2-way travel on one-way streets
- Vision Zero Policies

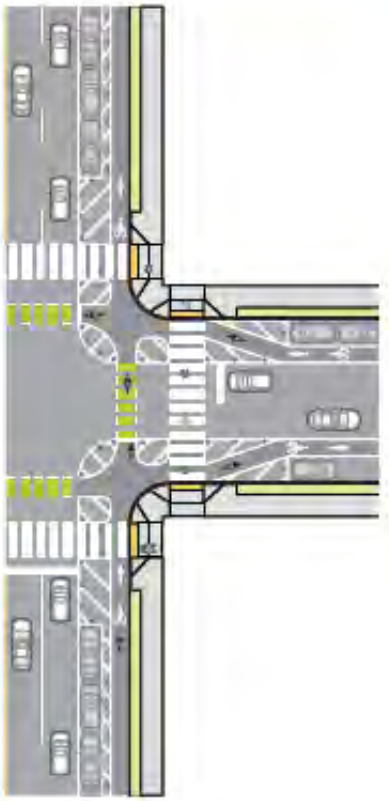
QUICK-BUILD PROTECTED INTERSECTIONS

Quick-build protected intersections are striped extensions of existing curblines that provide bicyclists with vertical and horizontal separation from motor vehicles through an intersection. These facilities are implemented on an accelerated schedule in response to conditions of safety or connectivity that require priority action. As such, quick-build protected intersections use temporary materials such as pavement markings to delineate horizontal buffers, and flexible bollards, planter boxes, or other elements to provide vertical barriers between bicyclists and motor vehicles. Quick-build protected intersections may be designed for use with conventional bike lanes or quick-build separated bike lanes. They are sometimes developed as interim facilities that allow the City to test new street designs until a street can be fully reconstructed.

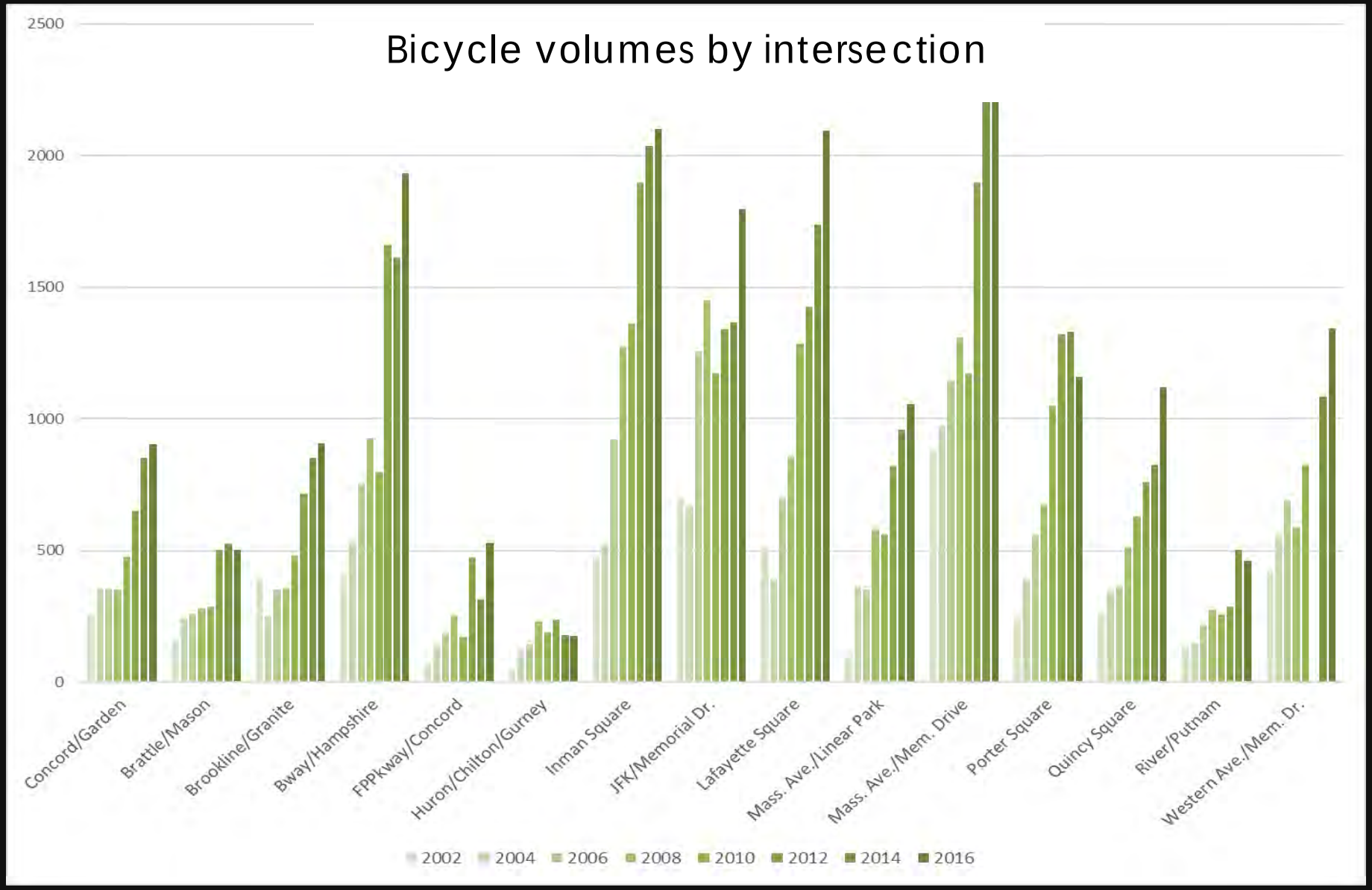
Design considerations:

- Should be considered at large intersections with long crosswalks, long pedestrian exposure to vehicle traffic, and sweeping turns for vehicles
- Quick-build materials, such as pavement markings and flexposts, can be used to outline a curb extension at intersection corners, reducing curb radii, and preventing vehicle encroachment
- Queuing space should be allocated for bicyclists to wait before proceeding through the intersection.
- Protected intersection should be clear of parked vehicles at least 20' prior to crosswalks
- Consider operational requirements for street sweeping and snow plowing

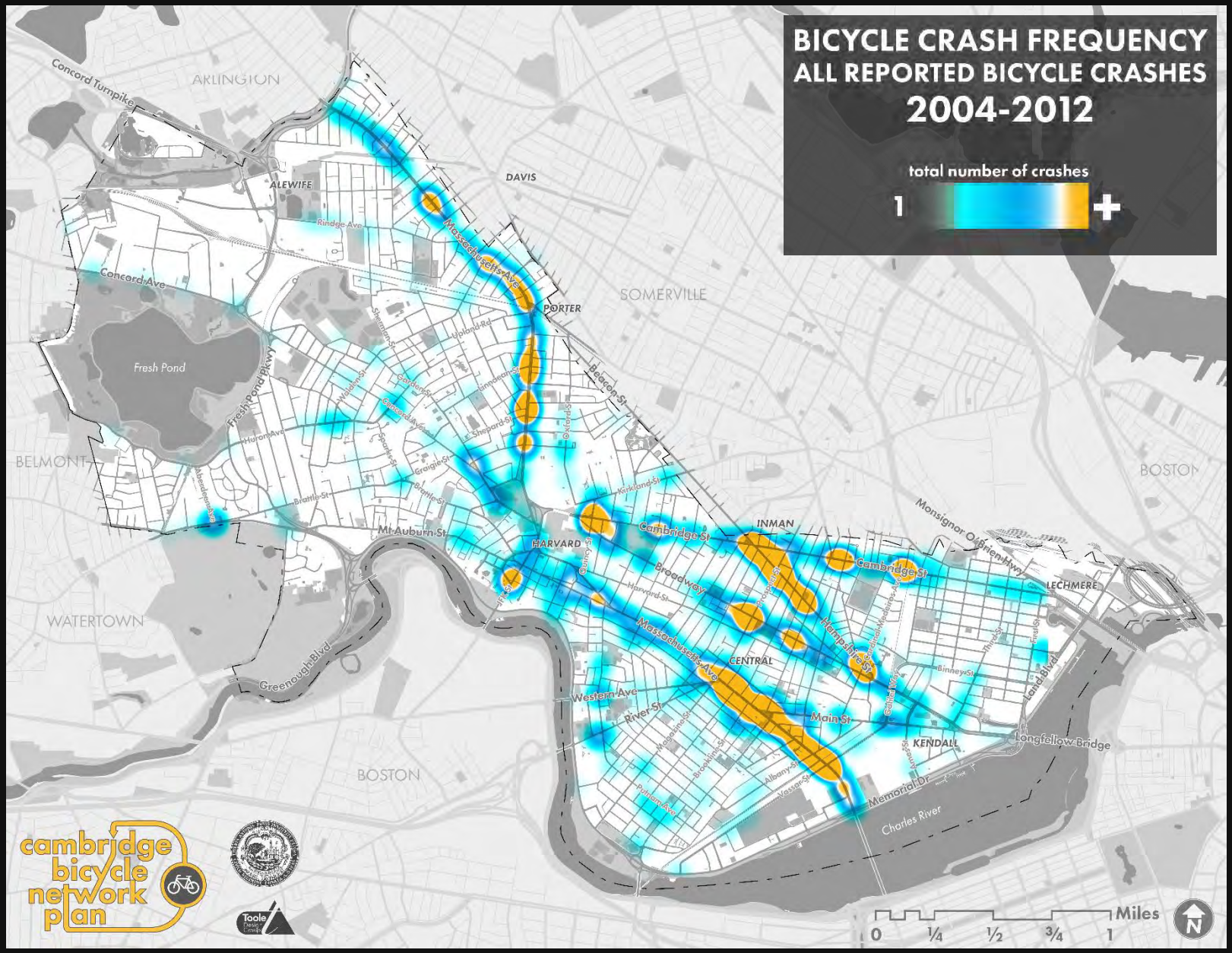
- For additional design guidance, refer to the **MassDOT Separated Bike Lane Planning & Design Guide.**



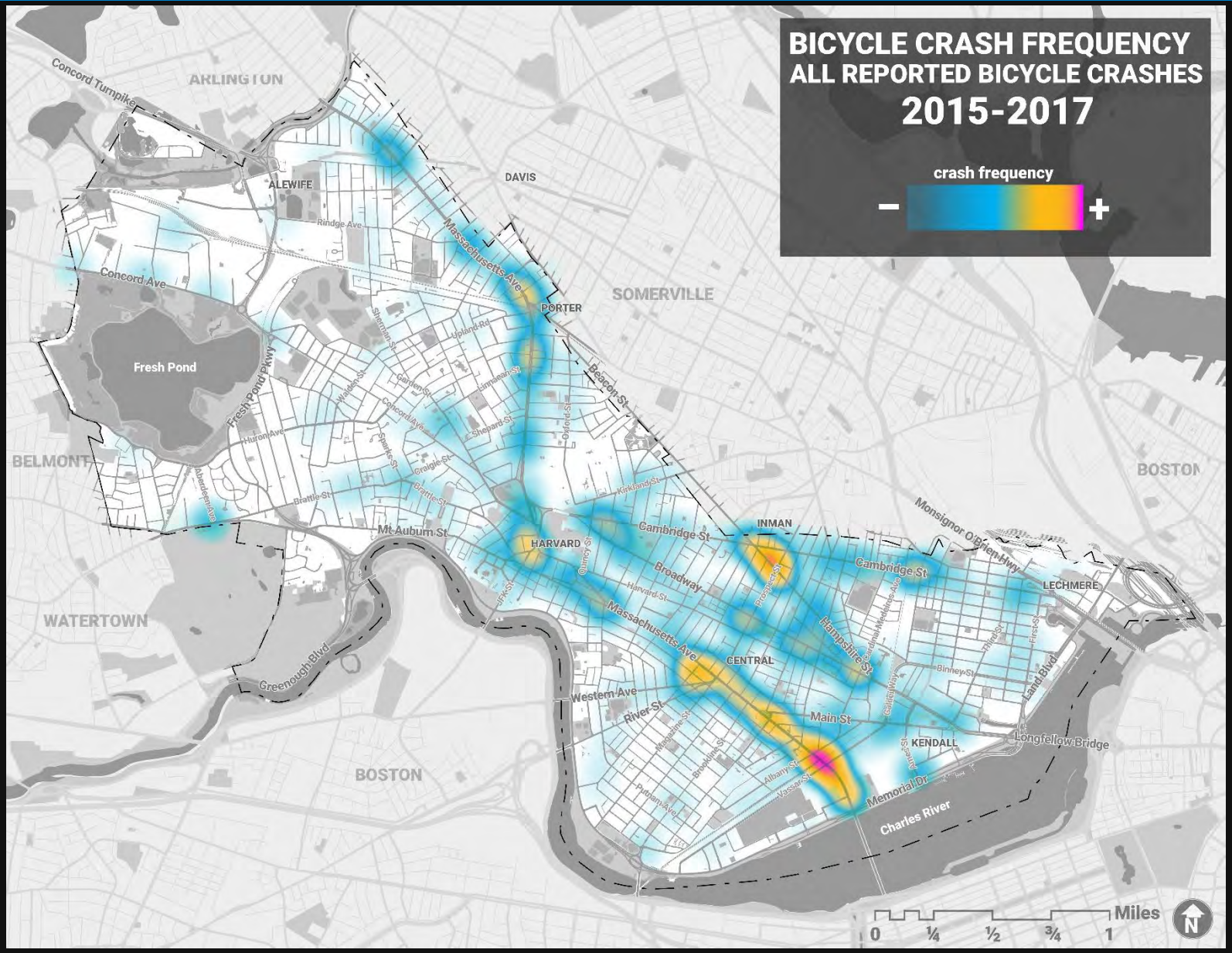
DATA UPDATES

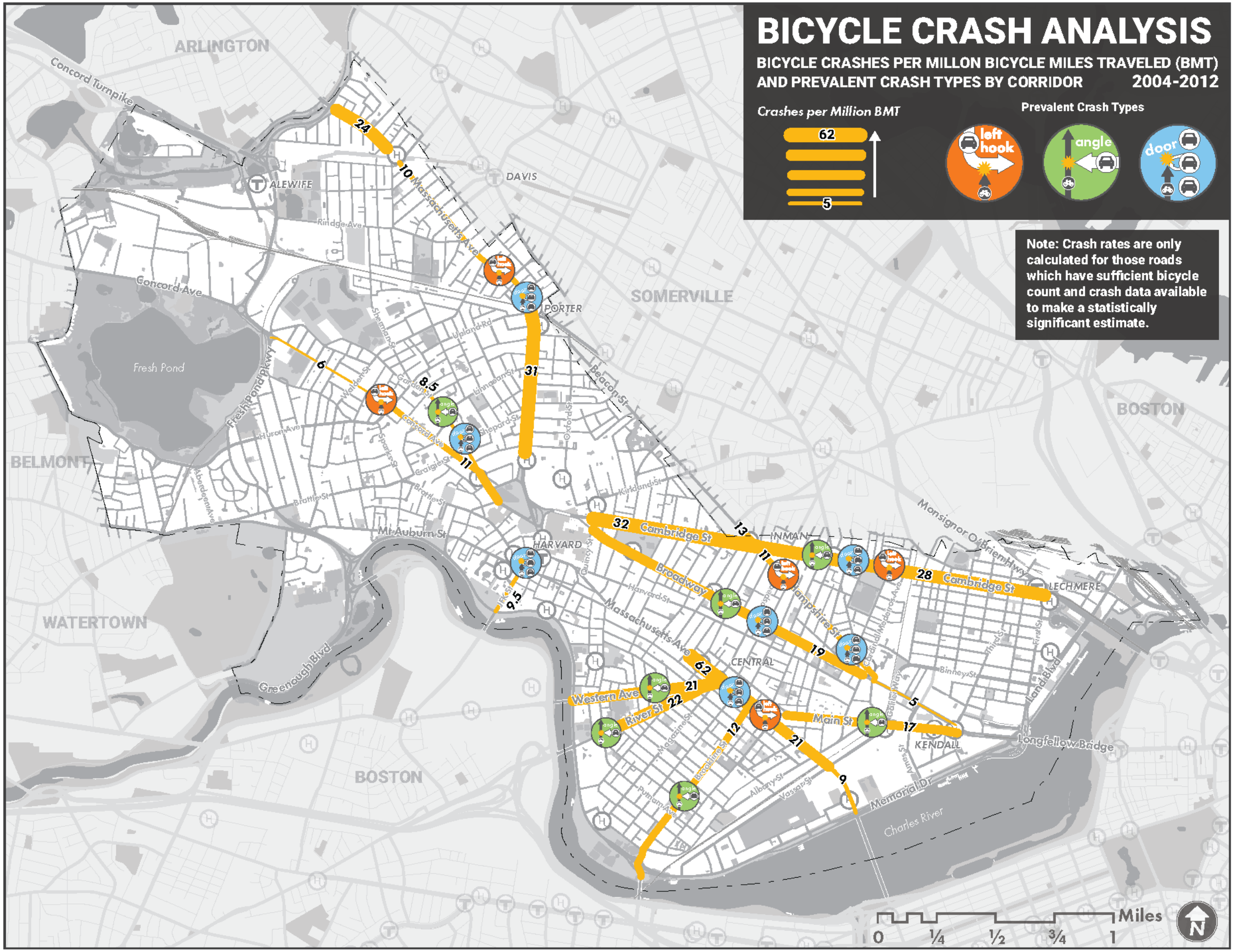


DATA UPDATES



DATA UPDATES





BICYCLE CRASH ANALYSIS
BICYCLE CRASHES PER MILLON BICYCLE MILES TRAVELED (BMT) AND PREVALENT CRASH TYPES BY CORRIDOR 2004-2012
Crashes per Million BMT
62
5
Prevalent Crash Types
left hook
angle
door
Note: Crash rates are only calculated for those roads which have sufficient bicycle count and crash data available to make a statistically significant estimate.
ARLINGTON
SOMERVILLE
BELMONT
WATERTOWN
BOSTON
BOSTON
ALEWIFE
DAVIS
PORTER
HARVARD
INMAN
CENTRAL
KENDALL
LECHMERE
Fresh Pond
Charles River
Concord Turnpike
Concord Ave
Massachusetts Ave
Cambridge St
Broadway
Hampshire St
Main St
Western Ave
River St
Mt Auburn St
Memorial Dr
Longfellow Bridge
Monsignor O'Brien Hwy
Greenough Blvd
Beacon St
Miles
0
¼
½
¾
1

DATA ANALYSIS

Crash Rate

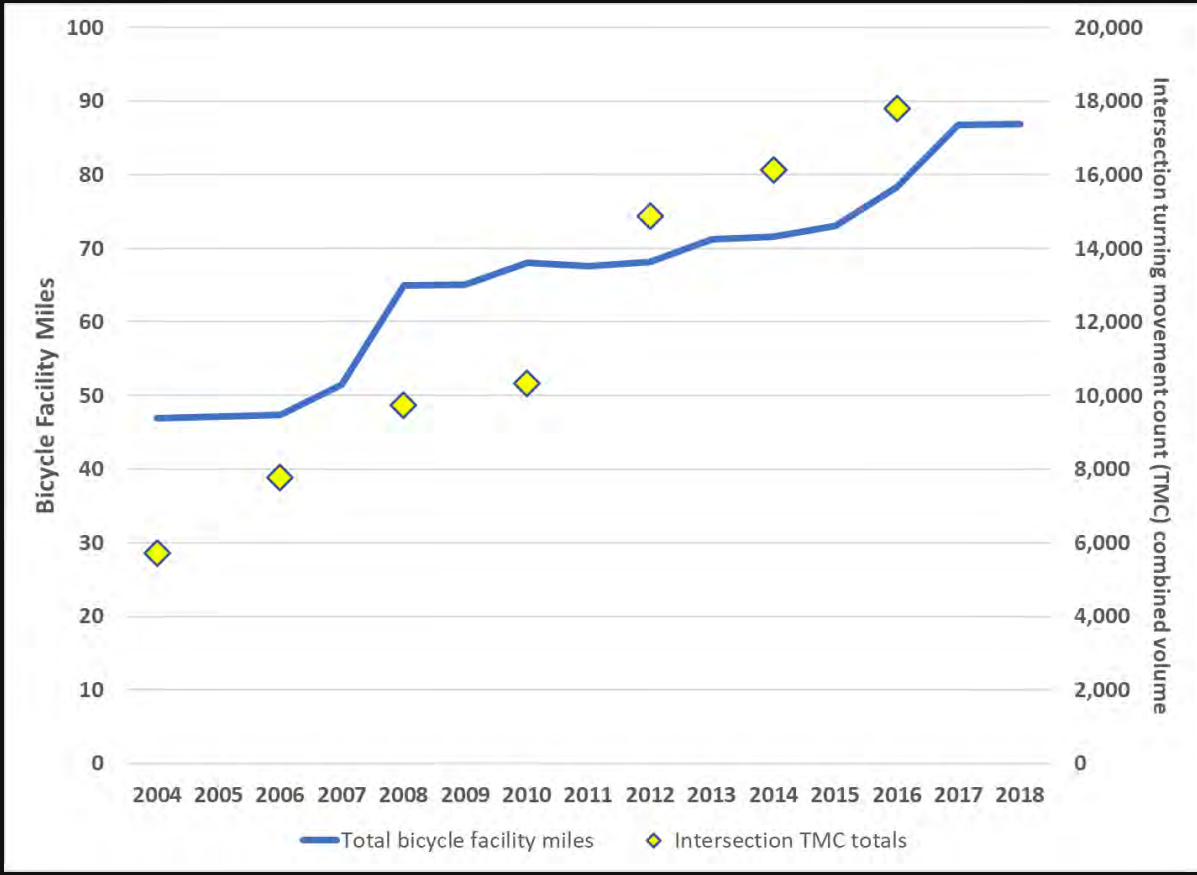
Volumes were used to calculate bicycle miles traveled (BMT) and crash rates

Street	From	To	Est. annual bicycle miles traveled (BMT)	Crashes per million BMT: within corridor
Broadway	Hampshire St	Third St	368,363	2.7
Broadway	Quincy St	Portland St	473,362	38.0
Cambridge St	Inman Square	O'Brien Hwy	400,240	37.5
Cambridge St	Quincy St	Inman Square	171,665	29.1
Hampshire St	Inman Square	Broadway	553,834	16.3
JFK St	Memorial Dr	Harvard Square	166,540	12.0
Massachusetts Ave	Vassar St	Memorial Dr	118,950	42.0
Massachusetts Ave	Sidney St	Vassar St	243,658	32.8
Massachusetts Ave	Somerville Ave	Harvard	242,538	24.7
Massachusetts Ave	Cameron Ave	Somerville Ave	437,958	11.4
Vassar St	Main St	Massachusetts Ave	143,868	0.0
Vassar St	Massachusetts Ave	Memorial Dr	282,967	0.0
Total			3,603,943	

DATA ANALYSIS

Facilities vs Volume

Bicycle volume is increasing as miles of bicycle facility miles increase



* Data for 2018 not included

NEW TO 2020 UPDATE

- Feasibility Analysis for corridors identified in the Bike Network Plan
- Concept Designs
- Planning level costs and project coordination
- Evaluation metrics for projects
- Prioritize future projects

2020 BIKE PLAN UPDATE

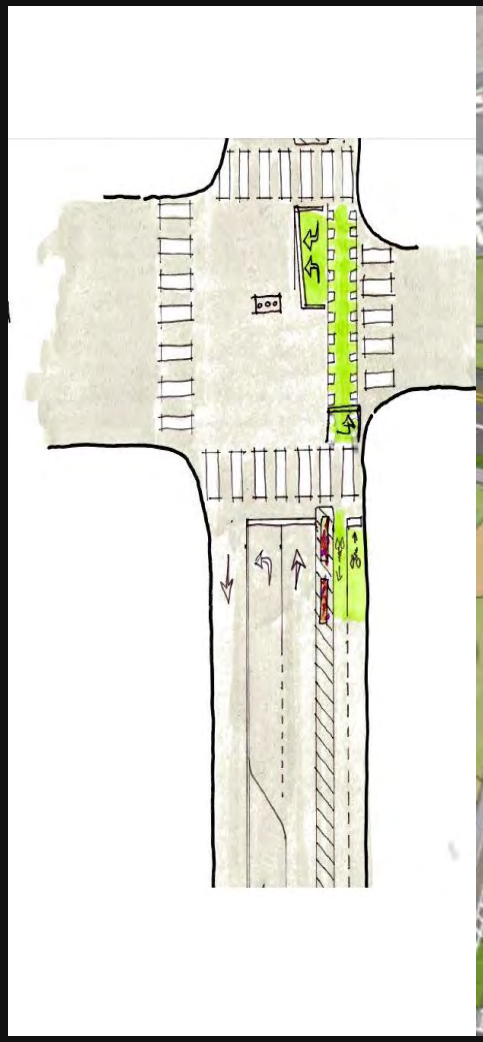
NEW SECTIONS

- Feasibility Assessment
  - Physical and use analysis
  - Alternatives Analysis
- Implementation Framework
  - "Quick-Build"
  - 5-Year and 10-Year Plans
  - Development-Related
  - Longer-term

2020 BIKE PLAN UPDATE

NEW SECTIONS

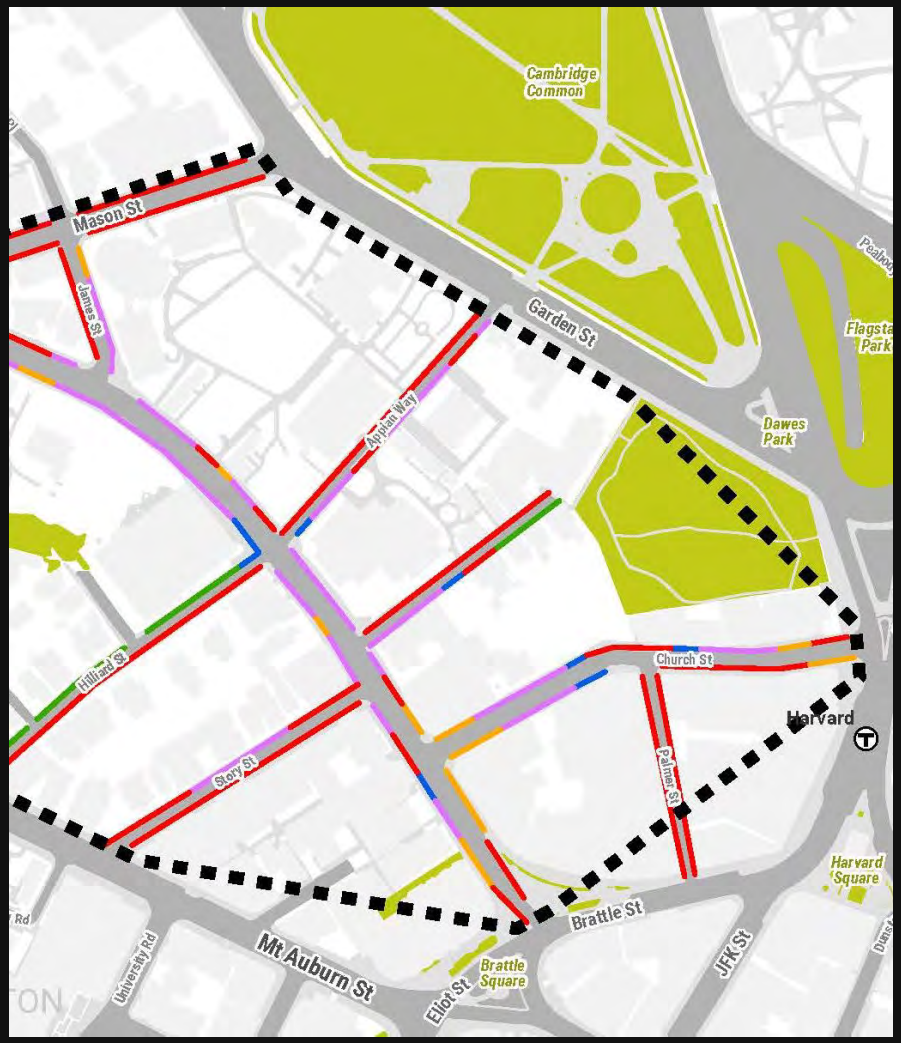
- Concept Designs
  - Conceptual Level
  - Cost Estimates
  - Project Coordination



2020 BIKE PLAN UPDATE

NEW SECTIONS

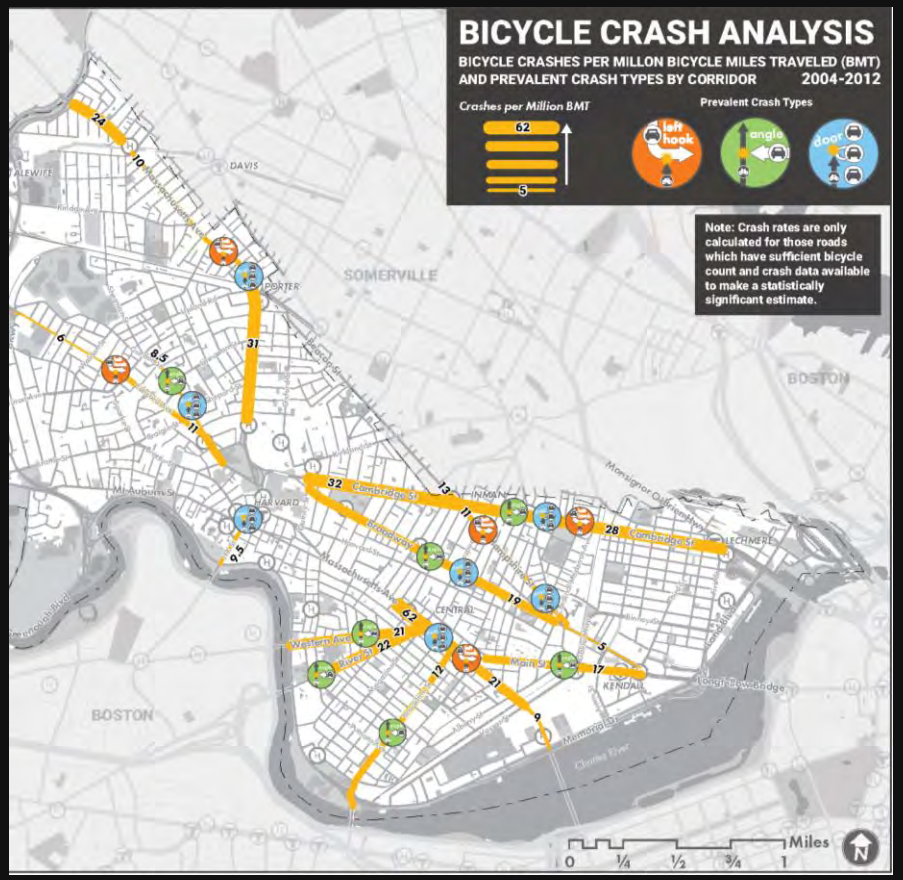
- Evaluation Metrics
  - Metrics such as volume and speed data, public feedback, crash reporting
  - Similar to analysis for city projects such as Brattle St, Cambridge St, and South Mass Ave, as well as traffic calming projects and larger undertakings like Binney Street
  - Create framework for consistency across future projects



2020 BIKE PLAN UPDATE

NEW SECTIONS

- Prioritization factors
  - Safety/Crash rates
  - Missing links to otherwise complete corridor
  - Key route in SRTS
  - Key route to job center or community amenity
  - Equity metric
  - Project readiness
  - Public input



2020 BIKE PLAN UPDATE

Bicycle Level of Comfort

- Update map to reflect current conditions
- Assess accuracy of ratings
- Consider modifications as needed

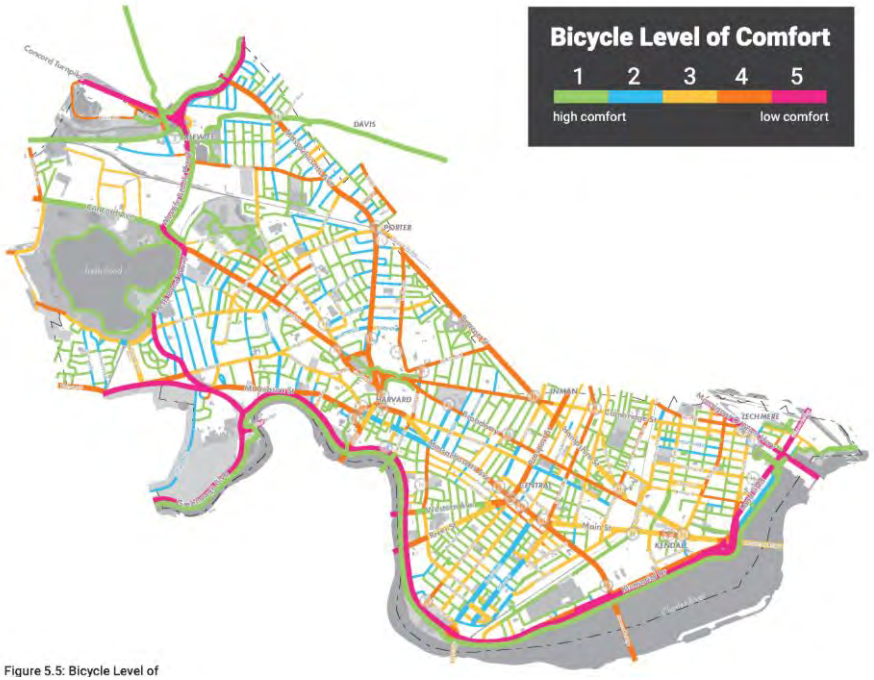


Figure 5.5: Bicycle Level of

BICYCLE LEVEL OF COMFORT	TYPICAL CRITERIA	EXAMPLES		
1	Protected/Separated or Shared with ADT <2K or Shared with Speed <30 mph	 Pemberton Street	 Community Path	 Vassar Street
2	Wide/Buffered Bike Lane or Bike Lane w/out Parking adjacent or Shared with ADT 2-4K or Shared with Speed <30 mph	 Richdale Avenue	 Broadway	
3	Bike Lane adjacent to Parking or Shared with Speed 30 mph or Shared with ADT 4-6K or Narrow Operating Space	 Magazine Street	 Main Street	
4	Shared with Speed 30+ mph or Shared with ADT 6-15K or High Frequency Bus Route	 Massachusetts Avenue	 Broadway	
5	Shared with Speed 35+ mph or Shared with ADT 15+K and No Parking and 2+ Travel Lanes per direction	 Land Boulevard	 O'Brien Highway /Route 28	

2020 BIKE PLAN UPDATE

Bicycle Network Vision

- Create overlay map to reflect current conditions
- Identify any gaps in network
- Identify any new key destinations
- Consider modifications as needed

2020 BIKE PLAN UPDATE

GREATER DETAIL

- Wayfinding strategies
- Addressing spot improvements
- Bicycle priority street design

2020 BIKE PLAN UPDATE

NEW SECTIONS

- Feasibility Assessment
  - Physical and use analysis
  - Alternatives Analysis
- Implementation Framework
  - "Quick-Build"
  - 5-Year Plan
  - Cost Estimates

2020 BIKE PLAN UPDATE PROCESS

- Underway Spring 2019
- Approx. 18 months
- 2020 completion

- Surveys
- Street Teams
- WikiMap
- Open Houses
- Bicycle Committee
- Technical Evaluation

DRAFT SCHEDULE