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PLANNING + DESIGN

Binney/Galileo/Broadway Streetscape Redesign Project

Final Basis of Design – May 2018

By Jason Zogg, CRA / John Hykes, Alta / Mike Repsch, Alta

The following is an outline of the Intent, Assumptions, and Future Analysis associated with the Cambridge Redevelopment Authority's (CRA's) Binney/Galileo/Broadway Streetscape Redesign Project to accompany the 25% construction drawings.

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Introduction

This document is to be used to:

- ***Ensure continuity among developer-driven implementer teams, and alignment with the project consensus achieved during the 25% design process (2016-2018)***
- ***Account for additional scope items that will be the responsibility of the developer-driven implementer teams***

This document is to be used to ensure continuity among all of the developer-driven implementation teams of the Binney/Galileo/Broadway streetscape redesign. Each developer and the associated consultant teams will bring an individual phase or section of the entire plan area from 25% to 100% construction documents over the next 10 years. The Binney/Galileo/Broadway Streetscape Redesign Project ("The Project") consisted of over a year and a half of interdepartmental meetings, email correspondence, discussions, site visits, public engagement, and consultant analysis that led to consensus on multiple decisions that have been documented thoroughly in this Basis of Design memo and associated appendices in order to provide context for future consultant teams and any additional future public engagement efforts.

This document is to be used to account for the items that were not completed by The Project due to scope limitations with the Alta/HDR/McMahon consultant team, which will now be the responsibility of each of the developer-implementers and their future consultant teams to complete during the 25% to 100% construction document phase.

This document also provides the additional analysis required by various departments in the City that were not completed as part of The Project. Additional analysis is the responsibility of each of the developers and the associated future consultant teams to complete in their individual phase or section of the entire plan area from 25% to 100% construction documents over the next 10 years.

NOTE: The items highlighted in bright blue throughout the document denote the additional analysis needed by future developer-implementer teams. This highlighting was done to assist future project teams in quickly referencing and understanding the additional analysis requirements described above, but teams must read this document in full, as there is a large amount of complex and relevant background and detail regarding every aspect of the project, and the highlighting does not cover everything that will be relevant to the work of future project teams.

This document generally includes the following items:

- traffic analysis base assumptions,
- acceptable queue lengths and turn lane lengths,
- transit priority measures,

- variable sidewalk and separated bike lane widths and pinch points,
- snow removal dimensional and material requirements by DPW,
- variable vehicle lane widths across the project,
- dimensions and shape of islands,
- assumptions for underground utility conflicts and general stormwater approach,
- location of on-street parking,
- pedestrian and roadway lighting spacing and placement,
- tree preservation or elimination,
- the phased design of "Little" Binney Street[1] which is dependent on future development,
- unique layouts of Fulkerson and the 6th Street Walkway intersections,
- decisions related to the complex ramping at the protected intersections,
- decisions related to the mature Cottonwood tree near the Fulkerson intersection,
- summary of interdepartmental meetings and public meetings
- other items significant to future implementation of the project area improvements.

Background: About Cambridge Transportation Policy

Cambridge is consistently rated one of the most walkable, transit-rich, and bicycle-friendly cities in North America and has one of the nation's highest bike and walk to work rates. The City has been on the forefront of using progressive street design principles and national best practices to continuously improve the comfort of the pedestrian and bicycle experience as well as the quality, coverage, capacity and speed of public transit service.

- In line with national urban planning best practices, the City of Cambridge's transportation planning and policies are guided by the **Vehicle Trip Reduction Ordinance (VTRO)**, adopted by the City Council in 1992, which outlines strategies to reduce the amount of drive-alone traffic, and mandates a formal and permanent City bicycle and pedestrian program.
- In 1998 the City adopted the Parking and **Transportation Demand Management (PTDM)** Ordinance, which requires preparation of an approved PTDM plan for projects which include the addition of non-residential parking facilities or additions to existing ones. An ongoing reporting requirement is always an element of PTDM plans. The successful implementation of PTDM within Kendall Square is in part responsible for flat-lining SOV trips in Kendall while simultaneously adding millions of square feet of new development.
- City planning is also guided by the 1993 and 2007 **Cambridge Growth Policy** documents. Policies 14-27 in the 2007 Growth Policy document focus on reducing vehicle trips and increasing bicycle, pedestrian and transit trips. Growth policies 14-27 cover land use regulations to encourage non-automobile mobility and focus density around transit stations, invest in the PTDM program, improve MBTA services, improve the safety and functioning of

[1] Throughout this document, Little Binney will refer to the section of Binney between the railroad tracks and Fulkerson Street for the purposes of this project.

roadways for all users while not increasing SOV throughput capacity, and to focus municipal capital investment on biking and walking infrastructure.

- The City of Cambridge **Bicycle Network Plan** was published in October 2015. In determining the final build-out of the network, the plan assessed levels of bicycle friendliness using a Level of Comfort index, safety data, volume, speed, key destinations for trips, and the input of thousands of citizens. Most streets in The Project are part of the Bicycle Network, while Little Binney remains a critical connector between the Network and the Grand Junction Path.

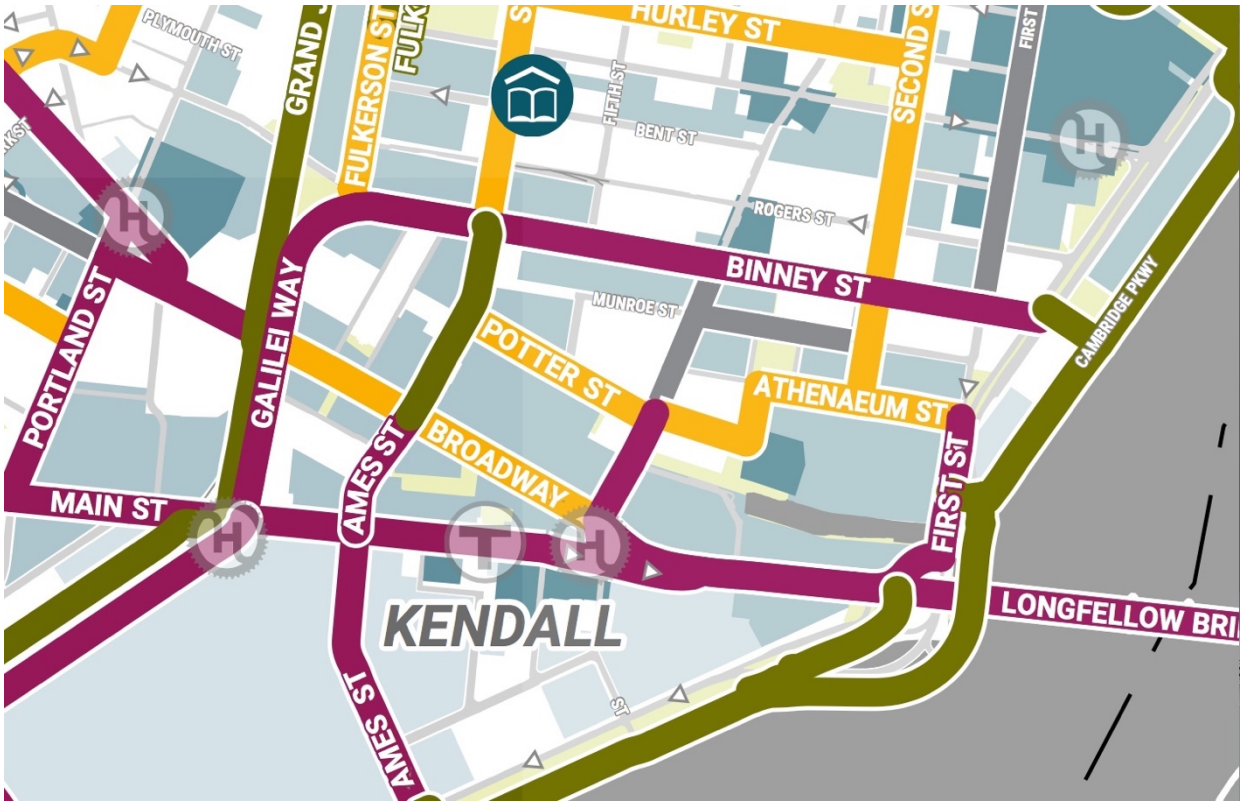


Image A: Screenshot of The Project area from Bicycle Network Plan (purple = separated bike facility; green = off-street path; yellow = lower volume/speed; grey = existing facility not in priority bicycle network)

- On March 21, 2016, the Cambridge City Council unanimously passed resolutions to formally adopt Vision Zero and **Complete Streets** policies. Complete Streets are designed and operated to enable safe access for all users – regardless of age, ability, or mode of transportation. Complete Streets make it safe and easy for everyone to travel between work, school, shops, and other destinations, whether they choose to walk, bicycle, drive, or take transit.
- The **Cambridge Vision Zero Action Plan** was published February 2018. Cambridge is part of a network of cities across the nation and the world adopting Vision Zero policies and action plans. Vision Zero focuses on the three E's: Education, Engineering and Enforcement. Vision Zero is a strategy to eliminate all traffic fatalities and severe injuries, while increasing safe, healthy, equitable mobility for all. Vision Zero acknowledges that there is no such thing as an accident. This approach consists first and foremost of an acknowledgment that crashes are preventable and are a national public health crisis. By examining the factors that cause crashes, from infrastructure to behavior to societal factors, we can make the changes

necessary to eliminate traffic fatalities and serious injuries. Vision Zero embraces Proactive Design instead of Passive Design in engineering. The old Passive engineering approach came from highway design where wide, straight, flat, open travel lanes, clear zones and roadways would be forgiving of any driver error, but in an urban environment this actually is less safe for all *other* road users, induces higher observed speeds and unsafe behaviors. A Proactive engineering approach is more applicable to urban environments, using design elements to affect positive behavior change and lower speeds to make conditions safe for all road users. Vision Zero changes design elements including lighting, markings, signage, signals, dimensions, geometry in a way that makes clear what is expected of all roadway users and where they should be at all times, reduces and stabilizes speeds and thereby reduces serious injuries and deaths for all users in and urban environment.

- In 2000, Cambridge adopted the **City Pedestrian Plan.** The Pedestrian Plan has four goals:
    - To provide policies and guidelines for facilities that will make walking safer, easier, and more attractive.
    - To provide design standards for physical improvements related to the pedestrian realm.
    - To outline steps to encourage walking as an alternative to automobile travel, as beneficial exercise, and as a benefit to the community.
    - To provide an action plan to create an economical and efficient non-automobile transportation network within Cambridge and connecting to other communities and destinations.
- In January 2013, the City launched a two-year public transit strategic planning process. The **Transit Strategic Plan** was published in 2015. The purpose was to develop an action plan for how Cambridge will take a stronger leadership role to improve the quality and expand the capacity of our transit system. The experience of using transit is directly influenced by the City's ability to build and manage roads, sidewalks, signal equipment and timing, and other aspects of the public realm. City staff have also been playing an active role in influencing policy decisions that affect transit. Seven overarching goals and more detailed objectives, are intended to be a guide to selecting and prioritizing projects that will improve the public transportation system in and around Cambridge and help inform the City's budgeting process. The Transit Strategic Plan ends with a work plan containing short-, medium-, and long-term projects to meet these objectives.

Design Analysis & Criteria

1. Traffic Analysis

McMahon Associates completed the Kendall Square Urban Renewal Streetscape Redesign Transportation Analysis Memorandum, June 19, 2017 as provided in Appendix B. The technical memorandum summarizes the transportation planning and engineering associated with the alternatives development process for the Kendall Square Urban Renewal Streetscape Redesign on behalf of the Cambridge Redevelopment Authority (CRA), in Cambridge, MA. The memorandum provides a summary of existing transportation conditions and identification of issues and opportunities to inform design alternatives; operational analysis of study area intersections; and curb use evaluation

for transit stops. The approach to the transportation analysis was developed through collaboration with the CRA, project consultant team, and City of Cambridge staff, particularly TPT.

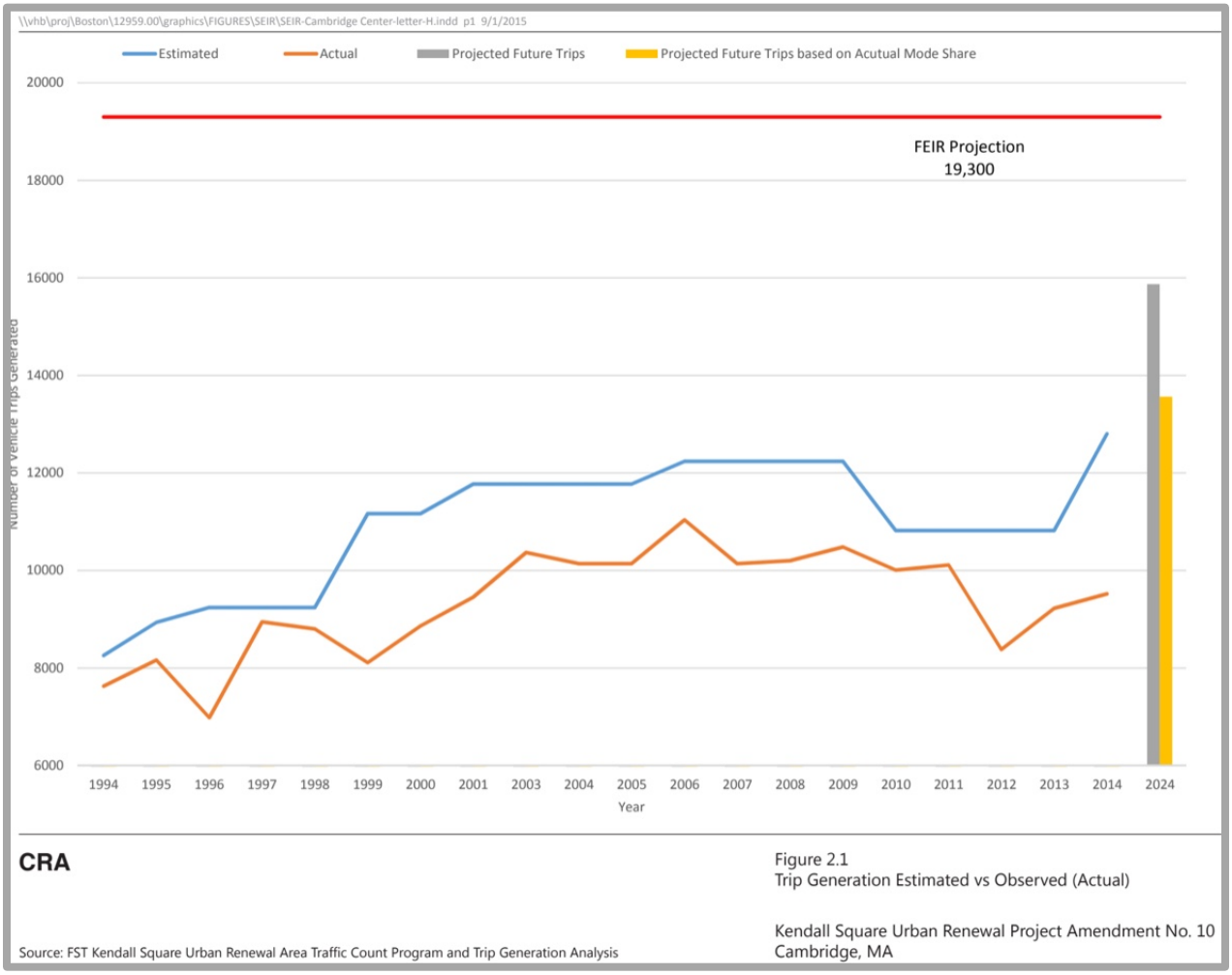
The Kendall Square Urban Renewal Streetscape Redesign promotes multimodal transportation options in the Kendall Square neighborhood of Cambridge. With recent transit-oriented development and some of the city's earliest separated bicycle lanes on Vassar, this project was initiated to better tie together the neighborhood for all transportation modes. The primary roadways, Binney Street/Galileo Galilei Way and Broadway, provide connections for all modes within and beyond Kendall Square. Traffic analysis was completed along these two roadways including the following intersections:

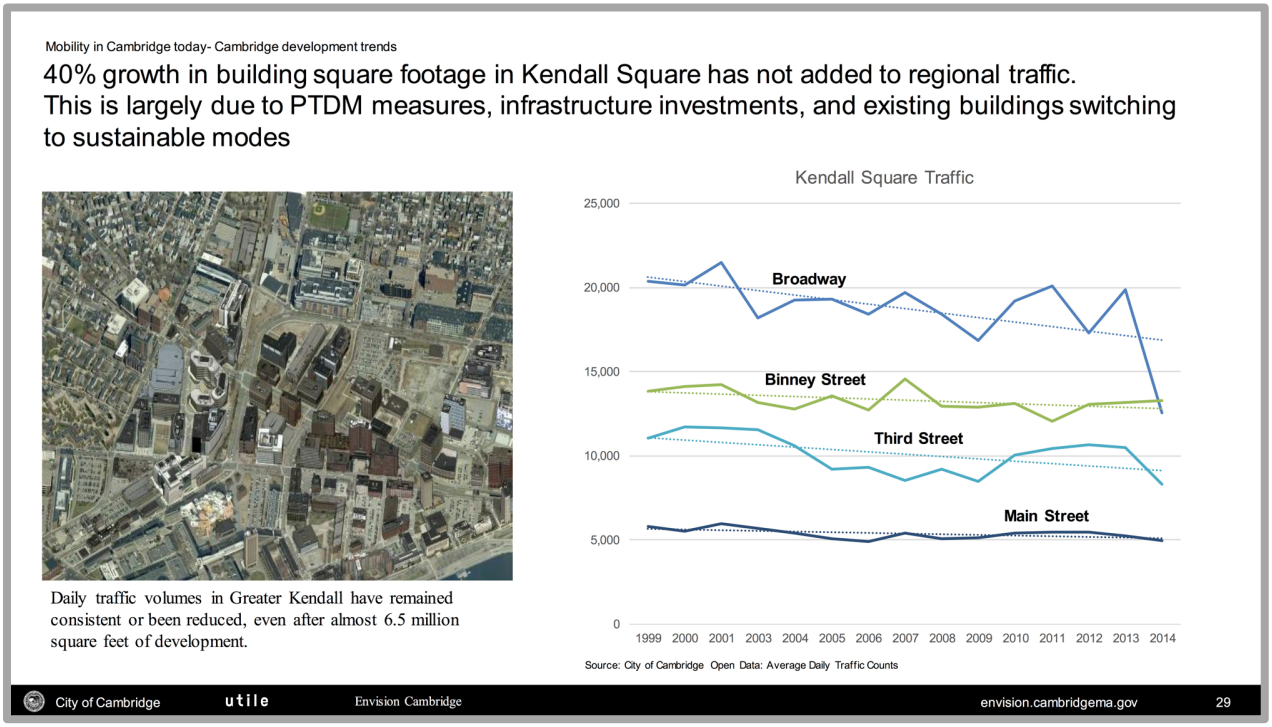
- Main Street/Vassar Street/Galileo Galilei Way
- Broadway/Galileo Galilei Way
- Fulkerson Street/Binney Street/Galileo Galilei Way
- Binney Street/Third Street
- Broadway at Ames Street

Through the conceptual design process, multiple streetscape improvement options were developed along the corridor, primarily focusing on the intersections with Main Street and Broadway. Each alternative required trade-offs between pedestrian and bicycle functionality and safety, and maintaining vehicular operations at an acceptable level. The development of these alternatives is discussed within Appendix B.[2]

Kendall Square has a history of successful mode shift toward sustainable active transportation modes of walking, biking and public transit. This has been achieved through careful transit-oriented urban planning and design, strategic investments by all levels of government and the private sector, and progressive city policies such as PTDM which have all helped increase transportation choices. This entire section on traffic analysis should be viewed through the context of the fact that every year since 1994, the KSURP area has recorded fewer actual trips than trip generation estimates have predicted. The table below proves that Kendall is consistently beating trip generation estimates and with smart mode shift policies and progressive urban planning principles will continue to do so going forward.

[2] *Kendall Square Urban Renewal Streetscape Redesign Transportation Analysis Memorandum, McMahon Assoc., June 19, 2017*


\\vhb\proj\Boston\12959.00\graphics\FIGURES\SEIR\SEIR-Cambridge Center-letter-H.indd p1 9/1/2015
Estimated
Actual
Projected Future Trips
Projected Future Trips based on Acutual Mode Share
FEIR Projection
19,300
Number of Vehicle Trips Generated
20000
18000
16000
14000
12000
10000
8000
6000
1994 1995 1996 1997 1998 1999 2000 2001 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2024
Year
CRA
Figure 2.1
Trip Generation Estimated vs Observed (Actual)
Kendall Square Urban Renewal Project Amendment No. 10
Cambridge, MA
Source: FST Kendall Square Urban Renewal Area Traffic Count Program and Trip Generation Analysis


Mobility in Cambridge today- Cambridge development trends
40% growth in building square footage in Kendall Square has not added to regional traffic.
This is largely due to PTDM measures, infrastructure investments, and existing buildings switching to sustainable modes
Daily traffic volumes in Greater Kendall have remained consistent or been reduced, even after almost 6.5 million square feet of development.
Kendall Square Traffic
25,000
20,000
15,000
10,000
5,000
0
Broadway
Binney Street
Third Street
Main Street
1999 2000 2001 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Source: City of Cambridge Open Data: Average Daily Traffic Counts
City of Cambridge
utile
Envision Cambridge
envision.cambridgema.gov
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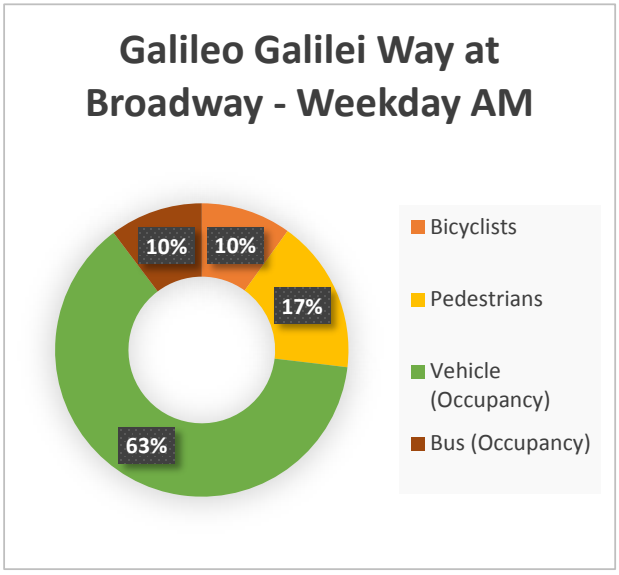
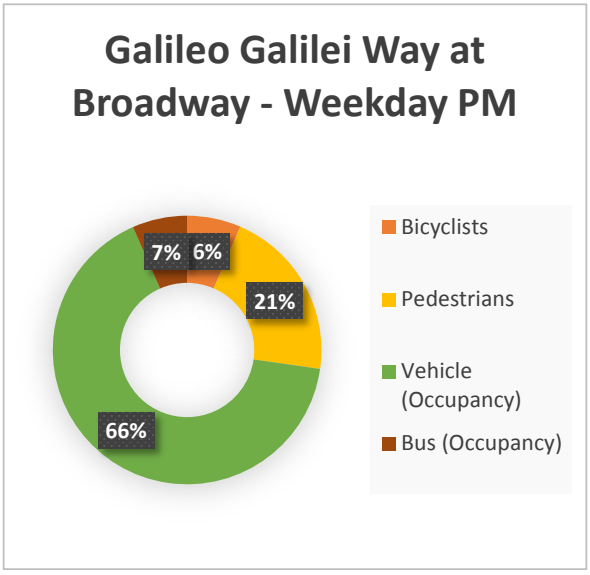
1.1. Goals for development of traffic alternatives

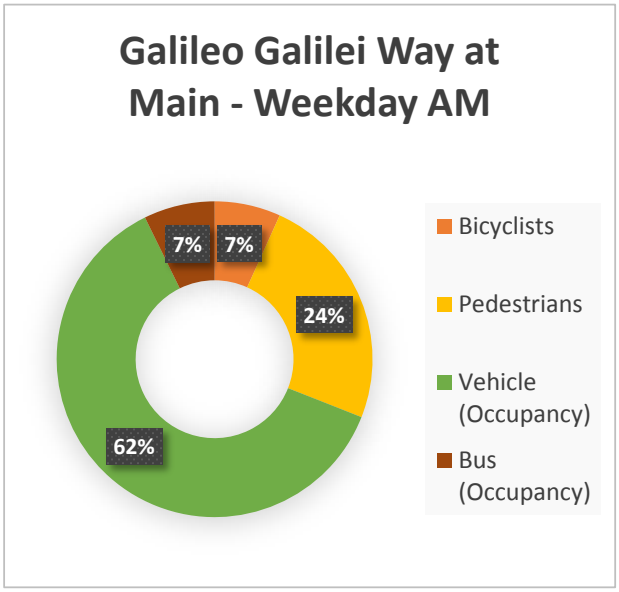
- The CRA established a number of goals for this project. One of the primary goals of the proposed streetscape project is to provide a protected bicycle link from the Vassar Street/Main Street intersection to the Binney Street at Third Street intersection. This was envisioned to be accomplished, in part, through protected intersection treatments in order to improve the safety of bicycles and pedestrians crossing at signalized intersections. In order to meet the project goal of providing protected intersections along the corridor, two forms of protection or separation were considered. The first form, time separation, is already employed at some intersection approaches within the study area and occurs when there are no conflicting vehicular movements allowed across a crosswalk or bicycle lane when they have a crossing indication. The second form is physical separation which is achieved with space that can be created between the turning vehicles and crossing pedestrians or bicyclists to improve visibility in the conflicting areas.
- A guiding purpose of the project is to create both physical and time separation to fully protect the intersections and provide the safest crossings possible. Bicycle facilities along the corridor are to be upgraded to separated bicycle lanes. Creating space for pedestrians and bicycles can sometimes impact movements used by public transit, so these were reviewed carefully in the alternatives selection process.
- The alternatives studied included protected intersections, separated bicycle lanes, signal equipment and timing modifications. The traffic signals included in the initial design alternatives included 90 second cycle lengths in order to balance delay experienced by all modes traveling through the intersection. Additionally, actuated-coordinated signals were considered to improve vehicle operations along the corridor. Consistent throughout the study area corridor are the connection of separated bicycle lanes between protected intersection geometries and the proposed alternatives, as well as connections to the Grand Junction path.

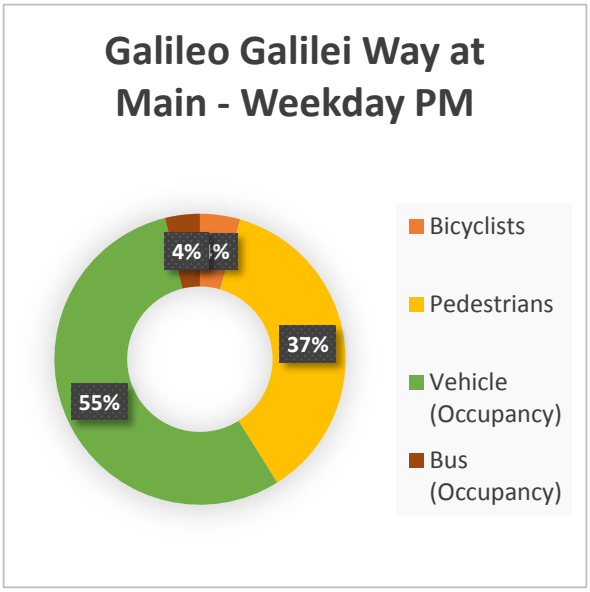
1.2. Existing people-volumes

To evaluate a multimodal intersection, it is important to understand the people that are using the intersection. In order to do that, vehicle occupancy, bus ridership, pedestrian counts, and bicycle counts were aggregated into the total number of people traveling through the intersection. People-volumes for Galileo Galilei Way at Broadway and Main Street are presented in the charts below.









1.3. Baseline assumptions and growth assumptions used in traffic analysis

- *2016 Theoretical Existing Volumes.* Due to the ongoing Longfellow Bridge construction, traffic counts were not collected as part of this study. To determine an "existing condition," the project team and City of Cambridge staff determined that the 2016 Kendall Square Urban Renewal Project Amendment No. 10 (KSURP10 Report) volumes prepared by VHB as part of the Environmental Impact Report would be used for the 2016 Theoretical Existing condition analysis. The volumes are based on 2013 traffic volume counts from when the Longfellow Bridge was open and were then grown

by 0.5% per year to 2016. They are called the "2016 Theoretical Existing Condition Volumes" in the KSURP10 Report. The traffic volumes for the weekday morning and weekday afternoon are shown in Figure 3 and Figure 4 respectively in Appendix B.

- *2026 Future Conditions.* Although the preferred alternative was identified utilizing analysis completed based on the 2016 theoretical peak hour traffic volumes, vehicular operations of the proposed intersection configurations were also reviewed under a future year (2026). A review of the 2026 analyses completed for the preferred 10% design configuration identified through this project is provided in Appendix B.
- *2026 Expected Vehicle Volumes.* In order to quantify potential future operations, vehicular capacity analysis was completed for the preferred alternative under the future year 2026 traffic volumes. The 2026 traffic volumes include the 2016 traffic volumes, KSURP 10 project trips, trips associated with other under construction and permitted real estate developments as identified in the KSURP 10 Report, and an annual background growth of 0.5% per year[3]. The volume was developed in coordination with City of Cambridge staff. The 2026 peak hour traffic volumes are depicted in Appendix B Figure 5 and Figure 6 for the weekday morning peak hour and weekday afternoon peak hour, respective. By using a background growth multiplier, the traffic analysis is conservative estimate, likely higher than reality given the ongoing progress Cambridge and Kendall has made on improving the transit/bike/walk modes split in the past decade, but also helps account for the unknown development likely to happen at Met Pipe and Volpe.

1.4. Lane reductions and turning lane setup

The preferred alternative lane configuration of one through lane in each direction, flaring out to a dedicated left, through, and right lane on (almost) every side of the major intersections of The Project are justified by the traffic analysis, further details of how each individual intersection is configured on each side and how the signals are programmed for protection, may be found in Appendix B and Appendix C.

The traffic analysis found little to no difference between the future vehicular traffic operations of these intersections and corridors whether The Project was built or not built in the future. This indicates that any future degradation of vehicular traffic conditions will not be the result of the project lane configurations but due to predicted traffic volumes in the future. One intersection (Ames and Broadway) actually performed better in the traffic analysis when the project was built. With the significant positive improvements for bicycle and pedestrian operations and safety throughout the entire project area, the new configuration is an overall net benefit to people-transportation throughout the corridor, and in line with the City's mode shift goals as described in the introduction. More detail on this is available in Appendix C.

Notably, this single through lane setup has been in place southbound on Galileo Way between Main and Broadway since 2012, and a single through lane setup has been in effect on Galileo northbound between Broadway and Fulkerson since the beginning of construction of the 145 Broadway building in spring 2017. In both of these

[3] *NOTE: 0.5% background growth was only included in order to account for the future development at Volpe and Met Pipe which at that point was undefined, but very likely to happen. Due to Kendall's transit-oriented land use and mode-shift municipal policy, Cambridge typically does not use a background growth multiplier like this.*

circumstances these changes have not had adverse impacts on traffic. This is in part because the volume of vehicles that can go in and out of Kendall Square at rush hour is more related to separating turning movements and the "controlling intersections" on the edges of Kendall and outside Kendall than the number of lanes on streets inside Kendall.

1.5. Traffic configuration for Broadway / Galileo Way

- At the intersection of Galileo Way at Broadway each approach to the intersection includes a right-turn lane, through lane, and left-turn lane. All pedestrian and bicycle crossings at the intersection are protected through the signal phasing, which is able to be achieved through the exclusive turn lanes for each approach.

1.6. Traffic configuration for Main / Vassar / Galileo Way

- The intersection of Galileo Way at Main Street and Vassar Street includes maintaining the existing configuration for the Main Street approaches and the southbound Galileo Way approach and providing for a northbound through lane and exclusive right turn lane for the Vassar Street approach. As part of this preferred alternative, left-turns from Vassar Street onto Main Street are prohibited. Pedestrian and bicycle crossings across Main Street are protected through the signal phasing.

1.7. Truck Route

- The City of Cambridge adopted the recommendations of the Boston Regional Truck Study dated September 2001 in Article 6 of the zoning code. According to section 6.96 of the City of Cambridge Zoning Ordinance, all of the streets in this project are signed and designated truck routes. Hazardous material carriers have not been able to travel through the Prudential Tunnel on I-90 in Boston since 1968, and the Central/Artery Tunnel through downtown Boston since the early 2000's. The signed HAZMAT routes in Cambridge include all of the Posted Truck Routes throughout the City.
- Posted Truck Routes in Kendall Square include: the entirety of Galileo Galilei Way; Binney Street between Galileo Galilei Way and Land Boulevard; Broadway between Galileo Galilei Way and the Longfellow Bridge; and Vassar Street between Main Street and Massachusetts Avenue.

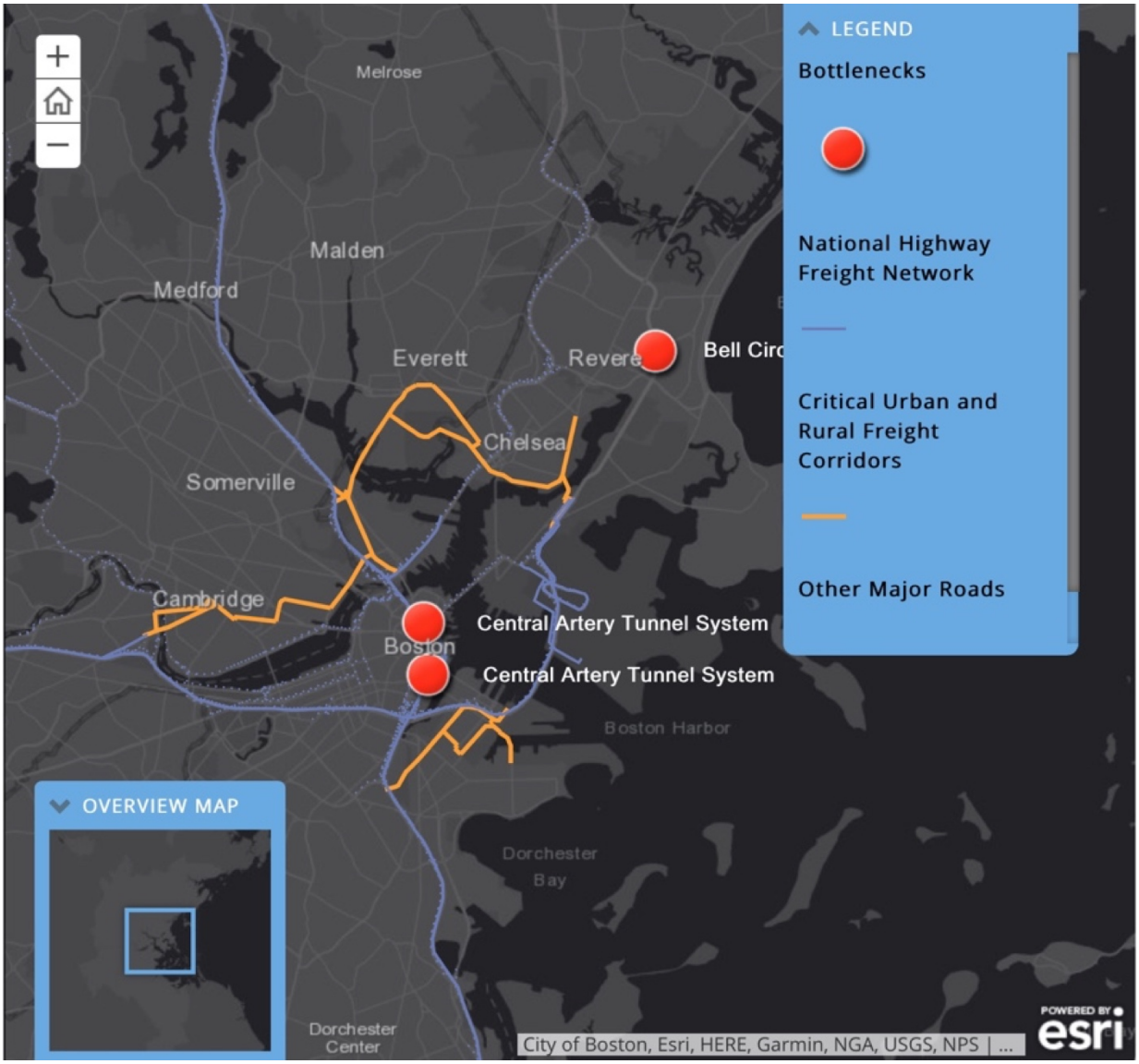
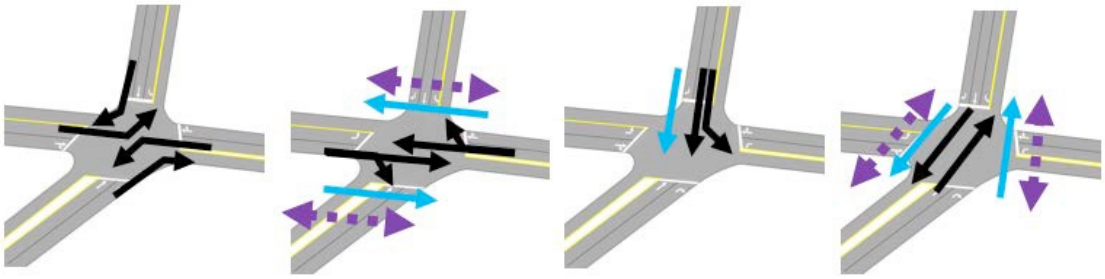


Image B: Binney, Galileo and Vassar are considered critical urban freight corridors in the state-wide Freight Plan (MassDOT, 2018)

1.8. Vassar Left Turn Restriction

- As depicted in the 25% design concept prepared by Alta, provided in Appendix C, the intersection of Galileo Galilei Way at Main Street and Vassar Street will include the configuration as described below. Note that in the traffic model, these restricted turns were re-routed and accounted for at other intersections, see Appendix B for details:
  - Restrict northbound left-turn and modify northbound approach to include a through lane and a right turn lane
  - Eliminate all left turn conflicts
  - Eliminate northbound and southbound right turn conflicts
  - Re-route northbound left turns to the intersection of Galileo Galilei Way and Broadway

- Revise signal phasing to as follows:



- This includes maintaining the existing configuration for the Main Street approaches and the southbound Galileo Galilei Way approach and providing for a northbound through lane and exclusive right turn lane for the Vassar Street approach. As part of this preferred alternative, left-turns from Vassar Street onto Main Street will be prohibited. Pedestrian and bicycle crossings across Main Street would be protected through the proposed signal phasing as described above.

1.9. Binney Street at Third Street Traffic Analysis

- Additional analysis is required for the entire Binney corridor and impacts to Binney Street/Third Street intersection to evaluate the future conditions and related intersection signal timing plans and travel lane queues east to Land Boulevard. Additional traffic analysis, extents and volumes will need to be approved by the City of Cambridge.

- *Westbound Receiving Lanes at Binney & 3rd Street*

Concept plans originally included the reduction of west bound lanes to one through lane on the western side of the Binney/Third intersection. The Binney/Galileo/Broadway Streetscape Redesign Project by the CRA did not have the scope capacity to extend traffic analysis east of the Third Street intersection. Therefore, the Binney Street/Third Street intersection was *not* modified as part of the alternatives analysis process. Only small signal timings and coordination changes were completed to tie it into the proposed changes. Alignment modifications include continuing the separated bicycle lanes east-west through the intersection. As shown in the 25% construction design plans, the roadway on the west side of the intersection is shown with two westbound receiving lanes in order to accommodate the existing two through lanes westbound on Binney Street. The future developer-led implementation team that is responsible for this intersection should include in their scope of work evaluating how signal timing and lane configuration could be adjusted on Binney Street between Third and Land Boulevard in order to accommodate a single receiving lane on the western side of the Binney/Third intersection as originally intended.

1.10. Turning lane queue lengths at each intersection

The length of the proposed turning lanes are based on the traffic analysis projected 50th percentile queue lengths for both turning and through movements. There are instances where the length of the turning lanes are larger than the expected turning queue lengths due to the through lane queue lengths in an effort to avoid the through movement from blocking entry into the turning lanes. Additional information can be found in Appendix B.

2. Transit

2.1.Existing transit routes and stops in the corridor – MBTA and EZ Ride

Kendall Square is home to several transit options, including MBTA subway, MBTA bus, and private shuttle services. The MBTA Red Line Kendall/MIT station anchors the square and is located southeast of the Galileo Galilei Way and Broadway intersection. Four MBTA bus routes, 64, 68, 85, and CT2 are routed on Broadway and serve Kendall/MIT station. The Charles River Transportation Management Association (CRTMA) operates the EZRide shuttle between North Station and CambridgePort, which runs along Binney Street, Broadway, and Main Street. Other shuttle services include the Cambridgeside Galleria free public shuttle between the mall and Kendall/MIT Station, MIT shuttles for students and employees, and a Biogen commuter bus between its office and five outlying locations.

There are two MBTA bus stops directly within the study area: at Kendall/MIT station and east of the intersection of Broadway and Galileo Galilei Way. The EZRide shuttle has four stops in the study area; one at Kendall/MIT station, two on Broadway, and three on Binney Street. The location of the stops, the routes they serve, and other curbside uses are depicted in Figure 2 below, which was part of the traffic analysis, and included in the Appendix B.

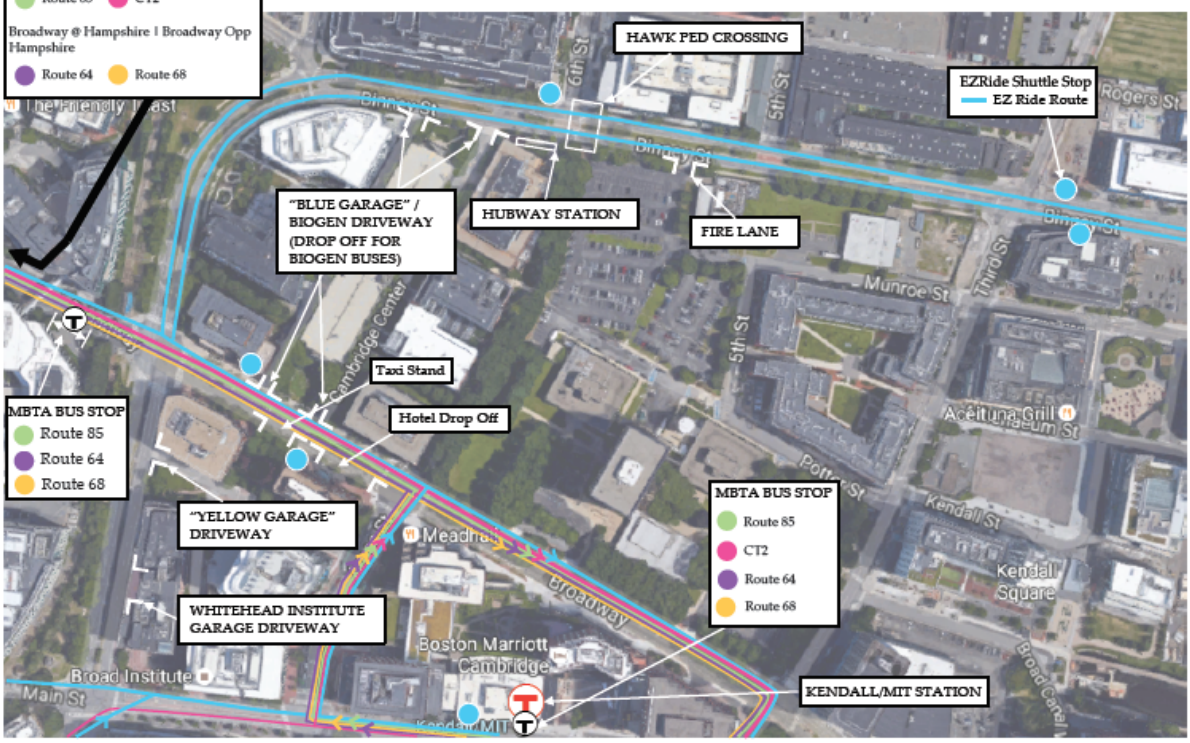
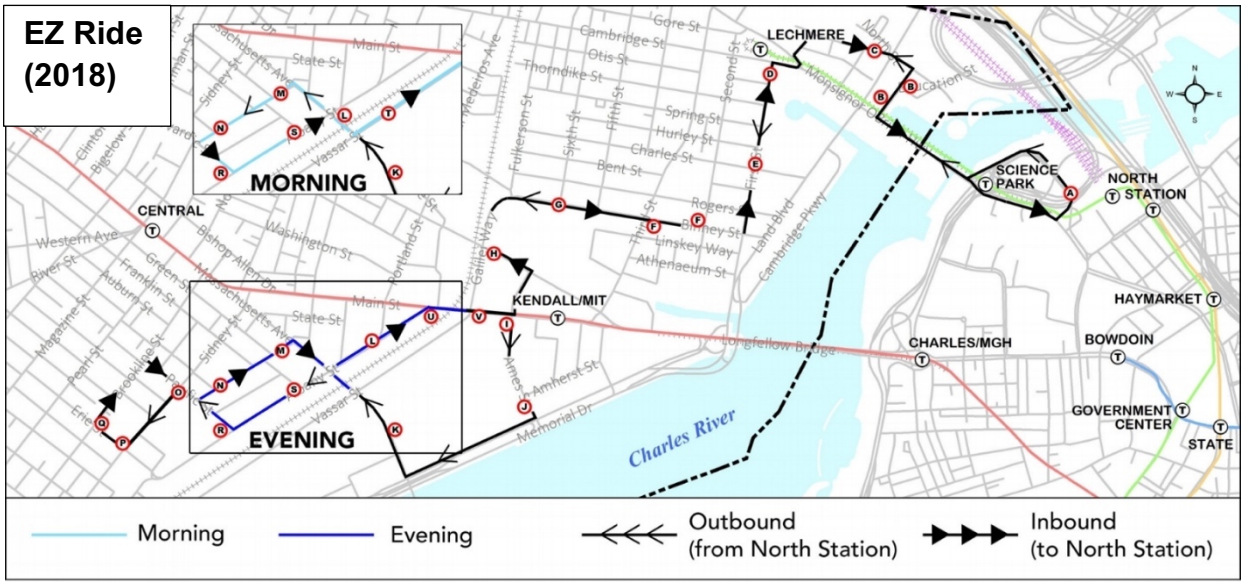


Figure 2: Existing Transit and Curb Uses
Binney and Galileo Streetscape
Prepared by McMahon Associates



The existing conditions transportation analysis included examining ridership data, trip frequency, and curbside uses within the study area. Bus frequencies and passengers were calculated for the AM and PM peak periods at the intersections of Galileo Galilei and Broadway as well as Main Street at Vassar Street. The data reviewed is summarized in Table 1 and Table 2 below.

Table 1: Galileo Galilei at Broadway Transit Analysis

	AM Peak [8:15 - 9:15 AM]			PM Peak [5:00 - 6:00 PM]		
	Eastbound on Broadway*	Westbound on Broadway	Total	Eastbound on Broadway*	Westbound on Broadway	Total
Number of passengers*	361	81	**441**	67	267	**334**
Number of buses	19	20	**39**	15	14	**29**
Frequency by Route						
85	2	2	**4**	1	2	**3**
CT2	3	4	**7**	3	2	**5**
64	3	3	**6**	2	1	**3**
68	2	2	**4**	2	1	**3**
EZRide	9	9	**18**	7	8	**15**

*EZRide route travels SB on Galileo Galilei/Binney St.

Data Source: MBTA Composite Data (Fall 2015); Charles River TMA EZRide Shuttle Ridership Data (Fall 2014)

Table 2: Main Street at Vassar Street Transit Analysis

	AM Peak [8:15 - 9:15 AM]			PM Peak [5:00 - 6:00 PM]		
	Westbound on Main	Northbound on Vassar	Total	Westbound on Main	Northbound on Vassar*	Total
Number of passengers	137	153	**291**	57	88	**144**
Number of buses	11	13	**24**	3	10	**13**
Frequency by Route						
CT2	3	4	**7**	3	2	**5**
EZRide	8	9	**17**	0	8	**8**

*EZRide route travels EB on Main St. in the PM

Data Source: MBTA Composite Data (Fall 2015); Charles River TMA EZRide Shuttle Ridership Data (Fall 2014)

2.2. Future transit routes and stops

The Kendall Square Mobility Task Force process was established in 2015 to take a comprehensive look at mobility issues in the Kendall Square area of Cambridge. The final report of the Task Force was published in August 2017. In recent years, the City of Cambridge, MassDOT, the MBTA, institutions, and private organizations have documented the need for improved mobility in Kendall Square through a series of studies and initiatives. Special focus was placed on meeting the increasing need for high quality service for pedestrians, cyclists, and transit users. The existing mobility issues, coupled with planned growth in Kendall Square and East Cambridge, has created a need to develop a transportation strategy to address local and regional mobility needs. The Task Force produced a final report in August 2017 outlining policy and project recommendations focused primarily on public transit and shuttles over the short, medium, and longer term time frames. The Task Force included representatives from the City of Cambridge, local institutions, private organizations, and other key stakeholders. The following initiatives reflect selected priorities in Kendall Square particularly relevant to this project: [4]

- *KSMTF INITIATIVE 3.1: Further study bus priority treatments: Lechmere to Kendall Square*

  The Task Force process indicated that the tradeoffs between providing bus priority and traffic impacts as well as parking on Third Street might be too problematic, and that Third Street may or may not be the best routing for buses in the long term.

- *KSMTF INITIATIVE 3.2: Implement stop consolidation and signal priority for the common CT2/85 corridor from Union Square Somerville to Kendall*

  The Task Force process included a study to produce recommendations related to bus stop optimization and potential locations for bus priority measures on the common CT2/85 corridor, including queue jump lanes at five specific intersections and transit signal priority at all intersections. In addition to those changes, the study recommended decreasing the Route 85 peak period headway from 25 to 15 minutes, and the off-peak headway from 30 to 20 minutes.

- *KSMTF INITIATIVE 3.3: Pilot extended 64/70/70A into Kendall Square*

  The KSMTF process resulted in final recommendations to extend two routes all day from Central Square into Kendall Square:

- Operate all of Route 64's 37 weekday trips between Central to Kendall, via Mass Ave, Main St, and Portland, returning via Portland, Albany, Mass Ave, Lansdowne, Franklin, Sidney, and Green. These trips are presently scheduled via Broadway.
- In addition, extend all Route 70/70A trips to Kendall, following the same routing and stops. Combined, the 64 and 70/70A provide 8 buses per hour between Central and Kendall (7.5 min headways) during the peak.

[4] *http://www.cambridgema.gov/CDD/Projects/Transportation/kendallsquaremobilitytaskforce*

- Extending service through Central into Kendall allows for more passengers to make a one-seat ride into Kendall, and results in significant increases in ridership for both the 64 and 70/70A, which would largely come from Allston, Brighton, Watertown, and Waltham. In addition, it could relieve some of the Red Line transfers at Central Square, where the Red Line is already overcrowded during the peak commuting times.

- *KSMTF INITIATIVE 3.4: Increase EZRide shuttle service*

  Recommendations from the scenario modeling included decreasing EZRide's peak period headway from the current 7 minutes to 4 minutes and the midday headway from the current 20 minutes to 15 minutes. The modeling of the benefits (in terms of ridership) was based on an assumption that there would be travel time savings on First and Binney related to the bus priority treatments. The benefits show a modest absolute increase in ridership (350 total for both peaks), which is 18-21% of the current ridership, but it would also help improve current overcrowded conditions. The overcrowded conditions were also aided by the use of new, larger (40') buses in 2017.

  Even with some improvement in travel time from bus priority treatments, decreasing the headways will require more buses, which can't be accomplished without additional funding. Recommendations also include further exploring the concept of running some EZRide service direct from North Station.

- *KSMTF INITIATIVE 3.5: Implement new CT4 service*

  This new route would connect Sullivan and Kenmore via Lechmere and Kendall from Sullivan across a future bridge connection from Inner Belt Road to McGrath Highway. From that point, the route would roughly follow First Street, Binney, Third, Main, Vassar, and Mass Ave towards Kenmore. The proposed headways are: 15 minutes from 5:20 AM – 6:30 AM, 10 minutes from 6:30 AM – 8:00 PM, and 20 minutes from 8:00 PM – 12:40 AM. This service is estimated to carry about a thousand passengers in the morning peak commuting time.

  Note that the estimated benefit depends on a currently non-existent (and unfunded) transit, bicycle, and pedestrian bridge connection from Inner Belt Road to McGrath. However, CTPS performed some iterations of the model to show that even if the CT4 had to operate on the existing street network, taking it further down Washington Street to McGrath, it would likely retain roughly 80% of the estimated ridership of the option with the relatively expensive new infrastructure, making it likely worthwhile to implement without the bridge. Because it would operate on the same corridor as the EZRide on Frist Street and part of Binney, it would benefit from transit priority treatments on those streets.[5]

[5] *Kendall Square Mobility Task Force Final Report*, July 2017

2.3. Transit priority measures including queue jumps and signal priority assessed by this project which need to be evaluated and designed by others in the future

The implementation of transit priority is important, especially at the intersection Galileo Galilei Way at Broadway.[6]

- *Key intersections, turning lanes and turning movements that are most critical to focus transit priority measures*.

The intersection configurations in the 25% drawings provide some opportunity for potential shared turn lane/queue jump lane as well as potential for incorporating transit signal priority. Future designers must explore the opportunities to prioritize existing and proposed future transit at these intersections. Transit priority could be implemented through usage of the dedicated right- turn lanes as queue jump lanes, and through dedicated phasing within the traffic signal cycle. Future designers will also need to consider the types of technology and detection that could be incorporated into the signal equipment in order to prioritize transit when specifying equipment for construction. The Project was unable to fully design these due to scope limitations.

- Broadway @ Galileo: Westbound on Broadway should be evaluated for bus priority features to facilitate both EZ Ride turning right and MBTA going straight
- Broadway @ Galileo: Southbound on Galileo should be evaluated for bus priority features to facilitate EZ Ride turning left onto Broadway
- Broadway @ Galileo: Eastbound on Broadway near railroad tracks should be evaluated for bus priority features to facilitate MBTA going straight
- Vassar @ Main: Northbound on Vassar should be evaluated for bus priority features to facilitate MBTA, MIT Shuttle and EZ Ride turning right off Vassar
- Vassar @ Main: Eastbound on Main Street should be evaluated for bus priority features to facilitate EZ Ride
- Vassar @ Main: Westbound on Main Street should be evaluated for bus priority features to facilitate MBTA buses turning left onto Vassar currently and with potential future routes

2.4. Floating Bus stops

- *Locations, including those considered but removed during the design process, and details regarding unique limitations or challenges for each stop location*

Several alternatives were considered for the EZRide shuttle stops on Broadway and Galileo Galilei Way. The existing westbound bus stop on Broadway is nearside of the intersection of Broadway and Galileo Galilei Way and the existing eastbound stop is midblock opposite Danny Lewin Park. As an alternative, moving the westbound stop to the far side of the intersection on Galileo Galilei Way northbound was considered. This option was not pursued, as pedestrian access to the major origins and destinations of Akamai Technologies, Biogen, and the Residence Inn, are on Broadway. The nearside westbound stop on Broadway is retained in its existing location and will be improved with amenities such as a shelter and bench. There is also the possibility of utilizing the stop as a queue

[6] *Kendall Square Urban Renewal Streetscape Redesign Transportation Analysis Memorandum, McMahon Assoc., June 19, 2017.*

jump lane (QJL) to prioritize bus movements through the intersection of Galileo Galilei Way and Broadway.

The eastbound stop on Broadway is retained as a midblock stop in front of Danny Lewin Park with pedestrian access to the sidewalk. As a midblock stop, it is enhanced to a floating bus stop, allowing the bicycle lane to wrap around the stop and avoid bus-bicycle conflicts. Floating bus island stops are preferred as midblock stops so as not to block traffic from the preceding intersection.

On Binney, the existing stop farside westbound of Sixth Street is retained, and is designed as a floating bus island to provide separation between the bus and bicycle lane. A stop is also placed in the eastbound direction on the farside of the intersection. Farside stop placement is preferable for pedestrian safety, as it encourages passengers to cross behind the bus stop. Both stops will provide an accessible 5-foot by 8-foot ADA accessible landing area, and passenger amenities, including shelters, benches, and trash receptacles.

The eastbound MBTA bus stop, Broadway at Galileo Galilei Way, serving routes 64, 68, and 85, is shared by EZ Ride in front of Danny Lewin Park on the south side of the street. It also provides an opportunity to improve the stop with a separated bicycle lane and additional space for amenities through use of the bus stop island configuration. .[7]

Image C: Example of floating bus stop used on Western Ave with a City-owned and maintained Daytech shelter

[7] *Kendall Square Urban Renewal Streetscape Redesign Transportation Analysis Memorandum, McMahon Assoc., June 19, 2017*

- *Floating Bus Stop Design*

Design based on MassDOT and NACTO guidelines including dimensions, appropriate placement of crossings to the sidewalks. Usage of MBTA bus stop standards or EZ Ride standards. The bus island stops will also provide space for an ADA accessible 5-foot by 8-foot landing area and passenger amenities such as a shelter, bench, and trash receptacle.

- *Shelters*

The City of Cambridge has specified the Daytech Avanti Canopy Shelter to be used in Kendall Square, when a JCDecaux shelter cannot be used, and in cases when the City maintains them or a private entity maintains them. Developer-implementers for The Project are to coordinate with the City of Cambridge to confirm shelter to be specified based on existing agreements with JCDecaux or shelters that are maintained by the City or shelters maintained by a private entity. It is assumed by the City that throughout the project area that developer-implementers who own and maintain property and sidewalks directly adjacent to the shelters will maintain the shelters as well.

3. Sidewalks

NOTE: Please note, due to scope limitations, the Sidewalks Table supersedes any sidewalk widths shown in the drawings. Developer-implementer teams bringing sections from 25% to 100% should work to adjust sidewalk widths to reflect the table found in this Basis of Design document.

3.1. City requirements and guidelines related to sidewalk widths on this project

- There will be variable sidewalk widths all the way around the project. Sidewalks can be thought of as having three zones as shown in the figure below. The “pedestrian travel zone” is defined as a clear, straight, unobstructed continuous path of sidewalk with a reasonable width to serve pedestrian flow. It is the most important area of the street for safe, accessible, and efficient movement of pedestrians. The width depends on the street context. The minimum will be higher on streets with greater pedestrian activities. The “travel zone” plus the “comfort zone” is the total sidewalk pavement width.

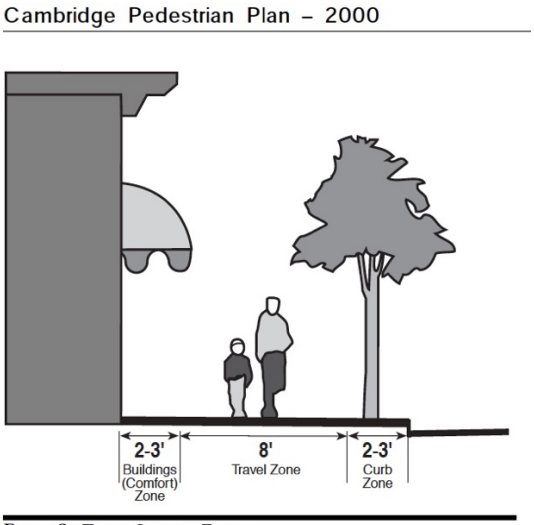
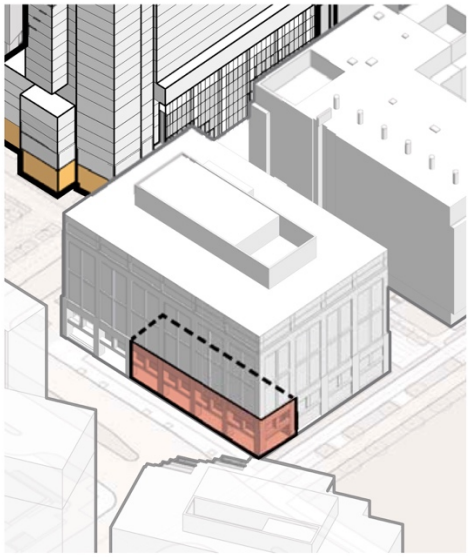
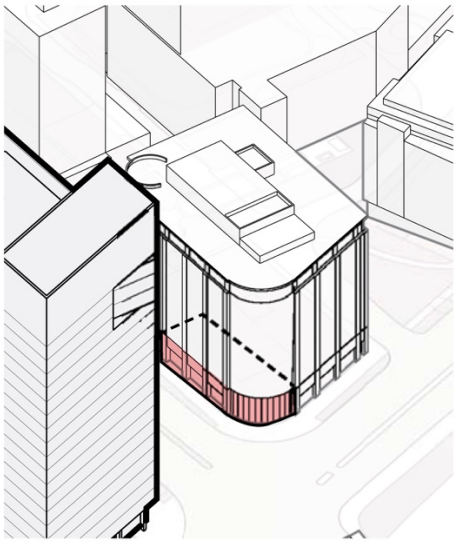


Figure 2: Typical Sidewalk Zones.

- The City's K2 Plan published in 2013, outlines specific streets in Kendall as major streets where ground floor retail should be required on 75% of the ground floor frontage. Those streets are Broadway, Main, Ames, and Third. Broadway is the only major street identified for this 75% retail requirement in the K2 and covered by The Project. Binney, Galileo and Little Binney were not considered as major streets for this 75% retail frontage requirement, however they are designated as major public streets in the K2 Design Guidelines, which are intended to engage a high volume of pedestrian traffic, even without the 75% retail frontage requirement. These streets should provide adequate space along sidewalks to support public activity throughout the day and evening where ground floor activation is anticipated in new buildings.
- In the Project area, the sidewalk pavement width (pedestrian travel + comfort zone width) the minimum desired width is **8'** where there are no major building entries and no retail. See chart on next page for detailed explanations of existing sidewalk widths, minimum desired future sidewalk widths, and known challenges in each component of the project area.
- In The Project, sidewalk pavement width (pedestrian travel + comfort zone width) on streets designated as major streets with active ground floor requirements, and new buildings with active ground floors that are not on major streets with active ground floor requirements the minimum desired width is **14'**. See chart on next page for detailed explanations of existing sidewalk widths, minimum desired future sidewalk widths, and known challenges in each component of the Project area.
- Sidewalk widths adjacent to future buildings will be evaluated by the City on a case-by-case basis with each developer-implementer as this project is designed and constructed, and the following table should be used as the guide for those design decisions. Pinch points for immovable light poles, existing street trees, and other obstructions may be allowed with the permission of the City in future design phases.



POTENTIAL ACTIVE USE AT 105 BROADWAY



FUTURE ACTIVE USE AT 150 BROADWAY

Image D: Future retail uses planned for 105 and 150 Broadway

Table X-1: Project Area Sidewalks		
Location	**Current Sidewalk Width**	**Minimum Desired Future Sidewalk Width** *(note this may not be able to be achieved in all cases due to a variety of factors including existing buildings, trees, utilities, and more. Final widths to be confirmed by the City in future design phases. Generally, the dimensions here should be the pedestrian clear travel zone and not be impeded by obstacles like tree pits with exceptions to be approved by the City.)*
Broadway: ***(This section of street is a commercial and retail corridor. While not all buildings in this area currently have retail on the ground floor, all are designed to accommodate retail in the future. Broadway is also a high pedestrian traffic corridor for people traveling east-west from the Red Line or Charles River toward the One Kendall, Tech Square developments, the Kendall Cinema, and traveling up Broadway and Hampshire Streets. Because Broadway is a major street with the 75% retail frontage requirement, it should be prioritized to have the widest sidewalks.)***		
South side: Ames Street to edge of Danny Lewin Park (Residence Inn)	Varies 17' on either side of the driveway to 8' at the maximum pinch point of the driveway (the 8' was measured from the planter boxes at the building entry columns, if the planter box is removed, the 8' becomes 9')	**17'** on either side of driveway - no change **12'** at maximum pinch point of driveway should be minimum desired condition and must be protected using bollards due to observed encroachment by cars of the flush driveway condition. Removal of the planter boxes at the building entry columns might be required. NOTE: Bollards were not included on drawings, but a preferred product spec was included in Appendix D.
South side: @ Danny Lewin Park	Varies between 18' (where street trees present) and 35' (hardscape for bus stop where no street trees are present)	Exact dimensions vary – **14'** minimum desired clear travel zone should be the minimum desired condition
South side: Broadway to edge of Danny Lewin Park (150 Broadway – old Akamai)	10'	**14'** On the south side of Broadway, in the MXD section, the presumed developer-implementer of this section of roadway should remove the raised planter boxes at 150 Broadway if necessary while planning for future retail in this building in order to accommodate a consistent 14' wide clear travel zone.
South side: Galileo to RR tracks: (GJ Park)	8'	**8'** Due to the proposed separated bike lane approach eastbound as the separated bike lane crosses the railroad tracks, the sidewalk has to move into the CRA's property line, which also pushes the traffic control box further into CRA property. This is acceptable and the traffic control box should be moved in order to maintain 8' wide pedestrian sidewalk in the proposed design.
North side: in front of Blue Garage (South Park)	6' clear travel zone at each tree pit pinch point (11' w/out tree pits)	**14'** clear travel zone is the minimum desired condition, and should be designed this way when the developer designs the new South Park
North side: 6th Street Walkway to East Drive (105 Broadway - Biogen)	5' clear travel zone at each tree pit pinch point (10' w/out tree pits)	**14'** On the north side of Broadway in the MXD section, the presumed developer-implementer of this section of roadway should remove the raised planter box if necessary in order to accommodate a consistent 14' wide clear travel zone, while planning for future retail in this building.
North side: Broadway to edge of South Park (145 Broadway, new Akamai)	Under construction	**14'** clear travel zone is the minimum desired condition, and should be designed this way when the developer finishes final designs for the 145 Broadway building
North side: Galileo to RR tracks (Binney Street Park)	Unknown	TBD

Binney		
South side: from 3rd Street to 6th Street Walkway (Volpe)	8’	**14’** clear travel zone along the length of the former Volpe property
South side: from 6th Street Walkway to Fulkerson (MXD section – 14CC and 17CC)	8’	**8’** – no change, with the exception of when the 14CC building is redeveloped in the future, where a **14’** sidewalk will be required at that project.
North side: from 3rd Street to 5th Street (Lofts at Kendall)	6’	**6’** no change. The pedestrian travel zone exception in this section of street is caused by the Lofts at Kendall historic building. The sidewalk in this area could not be widened due to the preservation of the existing street trees. The sidewalk in this area is also elevated from the grade of the curb due to the mismatching floorplate elevation of the Lofts building.
North side: from 5th Street to 6th Street (Biogen HQ)	Varies 13’-10’ at main building and 8’ at historic building. Appears to be 7’ owned by City of Cambridge based on survey markings, and remainder on private property	**13’-10’ new building, 8’ historic building** – no changes. This building presently has no active use on the ground floor, and is unlikely to be redeveloped in the near future.
North side: 6th Street to Fulkerson (301-320 Binney)	6’	**6’** no change. The pedestrian travel zone exception in this section of street is a result of the large raised planter along the length of the block associated with the 301-320 Binney building. The sidewalk in this area could not be widened due to the preservation of substantial existing street trees. In the future, if this building is redeveloped, it would be requested that the planter be removed and sidewalk widened at that time. Exact dimensions to be determined at that time and dependent upon ground floor use.
Little Binney		
North side: Fulkerson to RR tracks	8.7’	**8’** wide which includes (and would require) a 4’ easement at the Met Pipe future development site.
South side: Fulkerson to RR tracks	7.7’	**8’** The 8’ wide sidewalk existing on the south side of Little Binney must be upgraded in-place due to concerns about damaging roots of the existing Cottonwood tree at the corner of Fulkerson & Galileo, which prohibits changing the back of sidewalk at all.
Galileo		
Northwest side: Fulkerson to Broadway (Binney Street Park)	6’	**8’** This area is not a commercial or retail corridor and has no major building entries, but it is adjacent to a park and a path to destinations such as the movie theatre, and therefore should be brought up to the 8’ standard when reconstructed in the adjacent park project.
Southeast side: Fulkerson to Broadway (MXD section/17CC)	8’	**12’** at the 145 Broadway building due to its active use ground floor status, and **8’** on the remainder of this section which is not a major commercial/retail corridor and has no major building entries.
East side: Broadway to alley (150 Broadway/ old Akamai)	13’-14’	**13’-14’** no change - this area has no building entries and no active uses

East side: alley to Main Street (Whitehead)	8'	**8'** no change – this area has no building entries and no active uses
West side: Broadway to Main Street	No separate sidewalk exists today, just a 14' shared use path	**5'** The west side of the street in this area has a section of the much longer 14' Grand Junction Greenway multi-use path. Therefore, for this block, the under-sized 5' sidewalk this project is introducing on the west side is supplemental and may be used by those pedestrians who want to avoid mixing with bikes and skateboarders.
Vassar		
East side: Main Street to project limit (Stata Center Plaza)	13' per easement with City (does not account for existing tree pit pinch points)	**Exact dimension TBD** When Vassar Street was reconstructed in the mid-2000s, MIT gave a sidewalk easement to the City to accommodate the minimum pedestrian clear travel zone through the edge of the hardscape plaza near the corner of Vassar and Main. From the face of curb to easement is 13'. If this project pushes the sidewalk curb back 2' (in the direction of the plaza) in order to accommodate the protected bike lane, it would be 11' to the edge of the easement from the face of curb. Then, if new trees pits are installed, that leaves 7' for the pedestrian clearway easement, which is adequate given that the easement is in name only and is in reality part of a much larger hardscape zone. Further investigation is required by the developer-led implementation team assigned to this area to determine if utilities would allow for tree pits to be pushed back 2' or not.
West side: Main Street to project limit (Parsons)	8' (measured back of curb to building face)	**8'** The Parsons Research Building is located extremely close to the right-of-way and causes a pinch point for accommodating the vehicular lanes, protected bicycle lanes and pedestrian clearway. This section of the street adjacent to the building has no room for street trees, and minimal room for lighting with low profile bases. Minimum width sidewalks are anticipated here.
Main Street		
North side: Galileo to RR tracks (GJ Park)	5.7' (measured at tree well pinch points)	**12'-14'** – the minimum desired future condition is a sidewalk of 12-14' although this area of sidewalk will be redesigned in conjunction with the future Grand Junction Path project, as this area of connection was never resolved in terms of how the path crosses Main Street and whether it is at the intersection or at the railroad tracks. Existing street trees will need to be maintained, traffic control boxes on the back of sidewalk will need to be moved. This property is owned by the CRA.
South side: Galileo to RR tracks (Parsons)	6' (measured at tree well pinch points)	**12'-14' -** the minimum desired future condition is a sidewalk of 12-14' although this area of sidewalk will be redesigned in conjunction with the future Grand Junction Path project, as this area of connection was never resolved in terms of how the path crosses Main Street and whether it is at the intersection or at the railroad tracks. Existing street trees will need to be maintained.

4. Separated Bike Lanes (aka Cycle Tracks)

In part, the purpose of the project was to create both physical and time separation to fully protect the intersections and provide the safest crossings possible. Bicycle facilities along the corridor are proposed to be upgraded to separated bicycle lanes with protected bicycle intersections, consistent with the Cambridge Bicycle Network Plan.

4.1. Minimum/preferred separated bike lane width and buffer clear of vertical obstructions

- 8' clear minimum width preferred (which may include a combination of more than one hardscape material).
- Width of separated bike lane varies depending on location in relation to the curb line
- Pinch points such as existing trees or required vehicle lane widths resulted in variations in separated bike lane width
- 8’ clear minimum width achieved where possible to allow for 8’ city snow plow blade with no vertical obstructions. Preferred material treatment is asphalt with a concrete buffer edge zone (between back of curb and asphalt for separated bike lane) where necessary, especially when close enough to back of curb to make a planting strip non-viable.

4.2. Separated Bike Lane Transition Detail

The separated bike lane transition detail where the separated bike lane rises from being level with the vehicular traffic utilizes a curbing detail where the granite curbing is angled so the top is flush with the rise of the separated bike lane, allowing a plow to navigate the separated bike lane easily. While the plow may over-hang the granite curbing in this area slightly as it rises from the street level, it is preferred that this area is wide enough for the full blade. See the image below of the preferred detail and dimensions on Western Avenue.

Image E: City of Cambridge’s preferred separated bike lane transition as seen on Western Avenue

5. Vehicle Lanes, Curb to Curb Dimensions & Truck Turning Radii

5.1. Project Lane Widths

- Minimum and maximum lane widths established for this project are 10.5' for turn lanes, 11' for travel lanes.
- This decision is based on the designation of the corridor as a hazardous materials route.
- The 25% design has standardized lane widths throughout the project. Thru lanes, turning lanes, bus stop markings and parking markings shall be consistent.

5.2. 1-ft shoulders

At the request of DPW the project design includes a 1-foot shoulder. This is in part for snow storage purposes.

5.3. Design vehicles and turning movements

Intersections have been designed in order to accommodate all truck turns and design vehicles that are accommodated under the existing conditions. Truck turning movements should be accommodated per exhibit 6-15 from the MassDOT *Project Development and Design Guide,* which allows for turning trucks to use the full width of the approach and departure lanes, but not cross the centerline. The proposed design vehicle is the WB-50 truck except for locations where such turns are not presently feasible. The design accommodates the turning movements between Main Street to the west and Galileo Galilei Way to the north in support of the Hazmat route designation. Minimizing the impacts of the truck turning movements by allowing the vehicles to straddle the approach lanes minimizes the curb radius. This provides safer intersection operations and allows for additional protection for cyclists at the separated bike lane approach and reduced crossing distances for pedestrians.

5.4. Minimum curb to curb requirement surrounding islands for snow plows and emergency vehicles

If an island is present roadway pavement widths shall be 15’ curb to curb (note this is not the same as lane widths).

6. On-Street Parking Areas

6.1. Former four metered parking spaces on Broadway

The 4 on street parking spaces on the Broadway section of this project on the south side of the roadway closest to the Galileo intersection were eliminated during the 145 Broadway construction project in 2017 and will not return. These 4 spaces had been initially introduced in late 2014 or early 2015 after a road diet for the eastbound lanes of Broadway.

6.2. Former four-space taxi stand on Broadway

An existing signed curb area for 4 taxi cabs in front of the Residence Inn was evaluated. The project team had discussions with the Residence Inn management and through observations

revealed that it was acting primarily as overflow parking for the main Kendall Square taxi stand at the Marriott hotel on the other side of the intersection. Given that there is a much larger much busier taxi stand at the Marriott on the other side of the intersection (as well as at the Kendall T Station on Main) and given the recent well-documented drop in taxi demand, as well as the need to create a floating island bus stop in this area, this small taxi stand was not included as part of The Project.

6.3. Two new loading areas on Binney

Two new on-street parking areas were included in this project – one in front of the Biogen Headquarters building on the north side of Binney Street and one in front of the Lofts at Kendall apartment building on Binney Street. These were created after the project team observed significant compliance issues with pickup/dropoff activities as well as increasing reports to the Cambridge Police Department of pickup/dropoff conflicts at both buildings. Additionally, as part of The Project, TPT will also consider re-signing spaces on 6th Street near the intersection of Binney as a pickup/dropoff zone. The developer-implementer team responsible for this area should check-in with TPT on this topic at that time. 5th Street in the block that connects to Binney is actually a private road. Signage should be placed in front of the apartment building by the developer-implementer of this area on Binney directing moving vans and additional pickup drop off around to the 5th Street side of the apartments on the private road. (NOTE: This signage was not included in the 25% design drawings due to scope limitations, but should be designed as part of this section of street.)

Specific Intersections & Streets

7. 6th Street Walkway @ Binney Intersection

The intersection of Binney Street at Sixth Street is depicted as a fully signalized intersection in the 25% design plans prepared by Alta. The intersection was ***not*** analyzed as part of The Project due to scope limitations. Due to the significant changes expected along that segment of the corridor, and the need for a separate bike signal, future design efforts will need to design and coordinate this signal and identify any potential impacts to the flow of Binney Street.

7.1. Crossing of the new 6th Street Walkway two way separated bike path

A new signal is proposed at this intersection, with the signal design and coordination with adjacent signals is to be done by future developer-implementer teams. The proposed signal must have a dedicated bicycle/pedestrian phase to safely move users across Binney Street.

7.2. Full signal at Binney Street & 6th Street

The existing HAWK signal is to be changed to full signal as shown in the 25% drawings. The signal design and coordination with other signals is to be done by future developer-implementer teams.

7.3. Ramping and snow removal issues at this intersection

All efforts have been made to allow for 8’ wide clearance for snow plow. This is a total width of hardscape which may be a mix of materials. Per City direction, the plans have been developed to maintain and preserve all trees which results in some exceptions for snow plow clearance.

7.4. Tree preservation, bus stop, loading zone parking, and curb cut issues at and immediately surrounding this intersection

- All efforts have been made to preserve existing trees in this area and only existing median trees are being removed.
- There is a westbound far side bus stop proposed at this intersection and an eastbound bus stop 200 ft east of the intersection.
- A westbound loading zone is proposed to the east of the intersection near the entrance to the Biogen Headquarters building
- Curb cuts associated with the Volpe / GSA property in the area of this intersection should be discussed with all of the relevant City departments especially TPT and DPW.

Image F: Existing Conditions at 6th Street Walkway & Binney Street (2017)

8. Little Binney (between Fulkerson & RR Tracks)

8.1. Binney Street Park utility access point

- Binney Street Park will have a maintenance access point with a curb cut or chamfered curb on the south side of Little Binney near the railroad tracks, just east of the Grand Junction Greenway shared use path. This is to access subsurface Verizon

telecommunications vaults within the park near the back of sidewalk and to provide DPW vehicle access for park maintenance. The design of the south side bike lane specifically accommodates this.

8.2. Binney Street Park Cottonwood tree root encroachment concern

- An investigation of the root system of the Cottonwood tree at the eastern point of Binney Street Park at the intersection of Fulkerson/Binney/Galileo found that critical roots near the surface went straight to the back-of-sidewalk. Major surface-visible roots would have to be cut if the curb line and back-of-sidewalk were moved into the park along Binney Street. Additional subsurface roots were suspected to have grown within the grass area bounded by the existing sidewalk, which would have to be cut back around the north and east side of the tree. The City Arborist, Community Development Department, Binney Street Park landscape architecture team and the Alta team responsible for the street project decided to hold the existing granite curb and back-of-sidewalk in place. This decision means both protected bike lanes and vehicular traffic lanes need to be accommodated north of the existing curb line. See section regarding sidewalk widths for more information regarding the sidewalk on the north side of Little Binney at the Met Pipe development site.

Image G: Cottonwood Tree at Little Binney & Fulkerson

8.3. Grand Junction Path temporary transition to street & future crossing

- The current plans for Binney Street Park call for a zebra stripe crosswalk with an extra-wide ADA ramp as a temporary measure which will be re-evaluated and replaced when the full path is completed north to Somerville in the future.

8.4. Little Binney responsibilities and phasing

- The concrete sidewalk on the south side of Little Binney will be reconstructed in place as part of the Binney Street Park construction project in late 2018-2019. The separated

bike lane on the south side only will also be constructed at that time by Cambridge DPW. In order to accommodate this, the Little Binney turning lane will likely be removed and pavement markings updated at that time.

- It is expected that the north side of the street will be the responsibility of the Met Pipe redeveloper, including the sidewalk, separated bike lane, curb adjustment, signage, signal adjustments, pavement markings, crossing for the Grand Junction Path, sidewalk easement, etc. It is unknown at this point where the parking garage access point for the Met Pipe redevelopment will be located. A traffic and signals analysis will need to be performed to determine whether signal timing needs to be adjusted. The traffic analysis may consider re-introducing the dedicated right turning lane eastbound if there is space without adjusting the curb and sidewalk near the Cottonwood tree, and maintaining raised separated bike lanes on both sides of the street.

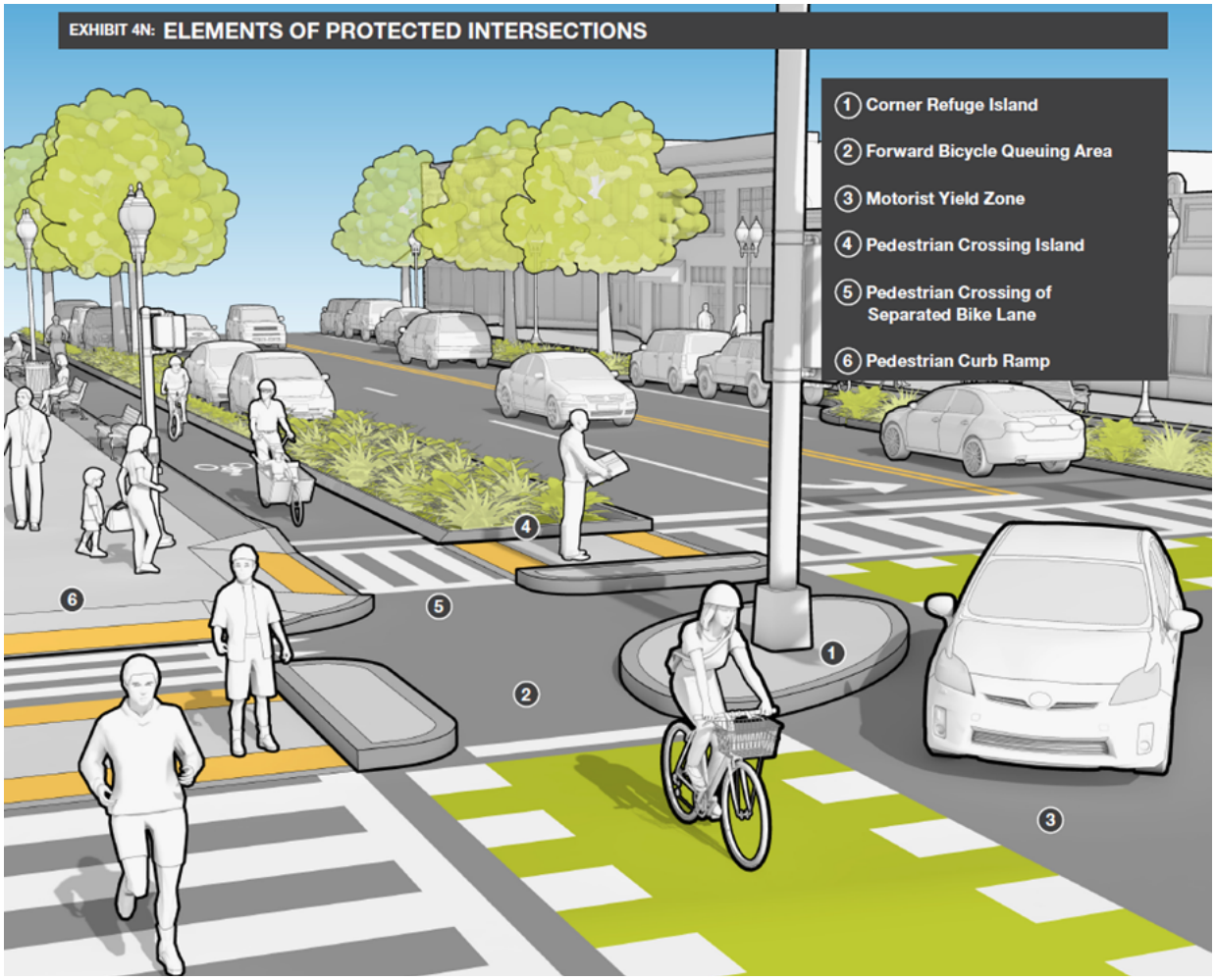
Design Details and Features

9. Ramping, Transition, Accessibility Details

9.1. Summary

In general, the protected intersection treatments which are included in the design involve bringing bicyclists down to roadway-level grade at the intersections. This treatment facilitates bicycle turns in all directions, and provides desirable separation between bicycles and pedestrians, minimizing conflicts between these modes. The treatment is also consistent with protected intersection designs found in MassDOT, NACTO, and other relevant design guides, although it has been slightly modified, as described below, to align with City of Cambridge operational requirements for snow plowing and pavement sweeping.

The typical major elements provided at a protected intersection are shown on Exhibit 4N of the MassDOT *Separated Bike Lane Planning & Design Guide*, which is reproduced below.



The purpose of some of these major elements is briefly stated below, and additional detailed discussion of each element is found in Chapter 4 of the MassDOT Design Guide. Also included in the descriptions below, are comments describing considerations or challenges related to incorporating these design elements into the Binney/Galileo/Broadway project specifically.

9.2. Corner and Median Pedestrian Refuge Islands

When in the corner, physically separates bicycles and vehicles at the intersection crossing point and protects cyclists from right-turning vehicles. When in a median at a crosswalk, provides physical protection and a stopping point for pedestrians crossing a roadway.

- *Considerations:* Raised corner islands are provided at all project intersections, although there are a number of locations where the specific intersection geometry, and the need to accommodate truck turns, results in corner islands which are smaller than optimal, thus limiting their effectiveness. The MassDOT *Design Guide* suggests consideration of mountable truck aprons to visually enlarge the refuge islands in such cases. The City has used such treatments in the past with mixed results in terms of actual compliance by drivers. In addition,

the introduction of another material into the vehicular travel way can result in maintenance issues such as differential settlement, water infiltration/freeze-thaw, cracking, etc. It is recommended that truck aprons be discussed case-by-case between the City and final design teams. If used, it is anticipated to be limited to areas where a medium to large apron can be accommodated. When used, the material will be a MassDOT standard corrugated ripple effect concrete. (Spec provided in Appendix D.)

- The larger refuge islands at intersections corners and median crossings should be utilized for landscaping rather than hardscaping in order to provide a pedestrian benefit due to the fact that this project takes away pedestrian space at several intersections. Landscaping should be considered at refuge islands that are 4' or greater across. If the refuge is along a private property that already or will in the future maintain the back of curb plantings per special permit requirements or otherwise, that property owner will be expected to take care of the landscaping in the refuge island as well. Confirm maintenance obligation for refuge islands with DPW prior to construction documents.

9.3. Forward Bicycle Queuing Area

Provides protected space, optimally adjacent to a fully raised corner refuge island, for stopped cyclists to wait for a signal in full view of motorists who are also on the same approach.

- *Considerations:* The forward queueing area is recommended to be at least 6 feet long in order for stopped cyclists to be clear of other conflicting bicycle movements. As noted above, the specific geometry of the project area intersections will make it infeasible to achieve this 6-foot length in a number of locations. See 25% drawings for more detail.

9.4. Pedestrian Crossing Island

Space where pedestrians may wait between the separated bike lane and the street.

- *Considerations:* It appears feasible to provide this feature, with the recommended minimum width of 6', at all project intersections. The MassDOT *Design Guide* recommends that there be a raised median separating the Crossing Island from the Forward Bicycle Queuing Area. The City of Cambridge recommends not providing this raised median, as it will complicate snow removal operations, thus rendering the protected intersection and connecting bicycle facilities less usable for a greater length of time following snow events. See 25% drawings for more detail.

9.5. Pedestrian Curb Ramp

The City's standard suite of ADA and Mass AAB compliant curb ramp types should be used at each intersection. As in any intersection project, the ramp type to be deployed will be dependent on geometry, sidewalk width, and other factors. For this project, it appears sufficient space exists at most intersection corners to use perpendicular type ramps. [8]

[8] *MassDOT Separated Bike Lane Planning & Design Guide Chapter 4: Intersection Design*

10. Center Islands & Truck Turning Aprons

10.1. Removal of medians

The decision to remove the medians was primarily related to making the most efficient use of the ROW as well as to meet fire truck passing requirements on boulevards. In a January 2017 meeting with the Cambridge Fire Department, it was indicated that new boulevards with medians that only have one lane in each direction of travel would need 18' minimum curb to curb - 10' travel lane to accommodate 10' fire trucks inclusive of mirrors, with an 8' shoulder to pass a stopped vehicle. This is also necessary for staging a fire truck operation adjacent to a building because the outriggers span a 16' width rectangle around the truck. This requirement does not apply on streets without a median because the total curb to curb is more than 18' and there is plenty of room to pass stopped vehicles on two-way streets, or setup an outrigger system for a fire truck. The Fire Department indicated that short islands for pedestrian refuge or to block undesirable turning movements do not need to meet this requirement – only medians of a substantial distance (full blocks for example). Therefore, the most efficient use of the ROW available was to eliminate the median altogether and avoid the need for unusable and excessive paved shoulders.

10.2. Justification/reasoning for each center island, fire department crossings at center islands

- *Whitehead:* The center island at the Whitehead Institute loading dock is necessary in order to prevent both trucks from the loading dock and cars exiting from the Whitehead's basement parking garage from attempting to turn left from the Whitehead across multiple through lanes and turning lanes.

- *6th and 5th Streets:* The center island at 6th Street is designed to prevent traffic from cutting through the residential neighborhood streets to go north toward Obrien Highway. The 5th Street intersection is designed with a left turn pocket in anticipation of a future roadway in the Volpe site that mimics the old 5th Street. At the time of this redesign project, it was the intention of both TPT and the Volpe redeveloper to create a condition where there could be no through traffic between the Volpe site to and from 5th Street. At both intersections it doubles as a pedestrian refuge island. The 6th Street and 5th Street islands need to have chamfered curbing to allow a fire truck to cross over without damaging tires. Fire trucks have substantial clearance, this does not need to be a flush condition, but generally should not be more than 2"-3". The Fire Department has requested that the area of the island allowing a truck to pass over is not softscape, but some type of hardscape. Cambridge fire trucks in this area are 10' wide including mirrors and weigh about 40 and a half tons.

- *Fulkerson:* The center island condition at the Fulkerson/Binney/Galileo intersection mimics the current condition which restricts certain movements. It also acts as a pedestrian refuge island on certain crosswalks.

10.3. Curb reveal height, material specs for fire truck mountable curb design and surface material in center islands

All curb reveal is at 6" except at fire department island crossings it is 2-3" (see paragraph above regarding center islands for further detail). Scored ripple effect concrete pavement, standard concrete pavement or paver maybe used as hardscape in fire department crossings at the islands.

10.4. Truck Turning Aprons at Vassar/Main, Broadway, Fulkerson intersections

Truck turning aprons are provided as necessary at each protected intersection in order to channel passenger vehicles while still allowing larger vehicles to turn when needed. The truck turning apron materials, surface finish, and design conform to the standard MassDOT Scored Cement Concrete Pavement Ramp detail. The "rippled" finish extends one inch above the normal top of pavement elevation. See Appendix D for spec. See Section 9 above for more information regarding the protected intersection design details.

11. Mountable Curb Areas (chamfered/beveled curbing)

11.1. Mountable curb locations throughout the project area

- *MIT/Stata*: Several mountable curbs exist on Vassar Street adjacent to the Stata Center. These should be preserved in the future design by the developer-implementer team responsible for this section of the project scope.
- *6th Street Walkway at Binney and Broadway*: The ends of the 6th Street Walkway at both Binney and Broadway need a detail for a chamfered/beveled curb due to the use of the concrete walkway being used for emergency vehicles and weekly trash pickup trucks by DPW.
- *Little Binney*: A chamfered/beveled curb is needed at the utility access point on the south side of Little Binney for access to Verizon subsurface vaults inside the new Binney Street Park. This is described in an earlier section.
- Appropriate portions of the *islands at 6th & 5th Streets* where the fire department crosses over. (See additional detail in prior section.)

Image H: Example of existing beveled curb area on Vassar section of The Project near Main Street

12.Raised Crosswalks

There is only one "modified raised" crosswalk in The Project area – the 5th Street intersection on the north (and eventually south) sides. The City of Cambridge uses this modified raised crosswalk on crosswalks that cross side streets along (parallel to) major streets. However, it is not used at signal-controlled intersections. This is why it was not used at the 6th Street Walkway intersection because that will be signal controlled. The developer-implementer of the section of The Project with the 5th Street intersection should anticipate a modified raised crosswalk both on the north and south sides of the intersection when advancing the 25%-100% drawings. A standard detail drawing for Modified Raised is included in the Appendix D.

Image I: Example of a Cambridge Modified Raised Crosswalk on Western Ave

13.Green/Blue Infrastructure

Green/Blue Infrastructure (G/BI) offers an environmentally-friendly approach to managing urban stormwater, and if installed in appropriate locations and maintained over time, can be a viable supplement to or replacement of conventional stormwater drainage infrastructure. Green/Blue infrastructure systems are designed to slow, absorb, and filter stormwater at or near its source, thus decreasing the quantity and improving the quality of urban stormwater runoff.

13.1. Project-wide G/B Infrastructure

Green/Blue Infrastructure, which includes infiltration planters, are manmade depressions in the landscape that slow, filter, and infiltrate stormwater. Infiltration planters are designed to collect water from a discrete, local source, such as a rooftop, driveway, or street corner. Infiltration planters can be planted with perennials, grasses, shrubs, and/or trees and provide a great opportunity to improve streetscape aesthetics.

13.2. Placement

Placement of green/blue infrastructure has been designed based on existing storm drain infrastructure already in place on the corridor. Modifications are intended to take advantage the location of storm drains allowing for short connections to existing catch basins. The G/BI's in The Project are to be implemented between the vehicular travel lane and separated bike lane.

13.3. Function

Green/blue infrastructure can be designed as infiltration-based systems where native soils are sufficiently permeable. If infiltration is not feasible, they can be designed as flow-through systems that are contained within an impermeable liner and use an underdrain to direct treated runoff back to the collection system. Infiltration-based G/BI's should only be considered in areas where native soils have a minimum permeability rate of 0.5 inches per hour and where the high-water table and bedrock are at least 4 feet below the bottom of the facility. Flow-through systems with an underdrain may be used in soils with lower infiltration rates.

13.4. G/BI NOTE

Final designers will be responsible for assessing suitability of site conditions and adjusting the City's standard design or considering other G/BI techniques accordingly.

14.Lighting

Lighting improves visibility for pedestrians, cyclists and motorists particularly at intersections. Appropriately scaled lighting provides a safer, more visible, and more inviting environment for all roadway users. Pairing pedestrian-scaled lighting with other improvements, such as street trees, helps various user groups see each other.

14.1. Roadway lighting Specification and Spacing

Lamp fixtures should be placed at a height of 24-30 feet and poles should be spaced approximately 50-100 feet apart on roadways, depending on the results of photometric calculations which the final designer will be responsible for. Lamp fixtures should project light downward in order to provide sufficient illumination of the sidewalk while limiting excess light pollution. Illumination should be warm and moderate, rather than dim or glaring, and should provide a balanced coverage of the corridor and surrounding area for comfort and security. Cambridge Electrical Department will need to review the photometrics plan for any section of the project area at the 75% design phase.

ROADWAY LIGHT **(NOTE: current lighting standards and specifications shall be verified with Cambridge Electrical department as part of final design.)**
Niland Cambridge 17 Series (1 Light) - CAMBRIDGE 17
SERIES CAST IRON CLAM SHELL-TAPERED SMOOTH
STEEL SHAFT-28' 8" POLE HEIGHT-SINGLE 6' CAMBRIDGE
ARM WITH SCROLL-BC LED PENDENT
FIXTURE-NILAND OSRAM SYLVANIA LED UNIT-4000

KELVIN-125 ACTUAL WATTS-250 WATT 0-10V DIMMING
DRIVER EQUIVALENT-VOLTAGE RANGE-TYPE
III REFRACTOR-GFI RECEPTACLE WITH WEATHERPROOF
COVER-GLOSS BLACK NEMA TWIST LOCK
PHOTOCELL - GLOSS BLACK
http://www.nilandco.com/

Refer to the Kendall Square Landscape Vision Plan (Appendix A and Appendix D) for more information.

14.2. Pedestrian lighting Specifications & Spacing

Pedestrian-scale lighting fixtures, typically 12 to 15 feet high, illuminate pedestrian-only walkways and provide supplemental light for the sidewalk. Activity Zones should experience separate lighting from the rest of the site to enhance the spaces while also making them unique. Lighting opportunities can arise around public art, fountains, play spaces, or public plazas. Provision of power connections within the activity zones will also be important, for seasonal displays and to broaden the types of activation opportunities available.

PEDESTRIAN LIGHT **(NOTE: current lighting standards and specifications shall be verified with Cambridge Electrical department as part of final design.)**
Saturn Cutoff LED - CAST ALUMINUM HOUSING
BLACK FINISH, FORMED SPECULAR ALUMINUM
REFLECTOR, LAMINATED GLASS ENCLOSURE
WITH CLEAR SECTION BELOW LEDS. LED SINGLE
MOUNTED LG3700 700MA@65W TYPE III DISTRIBUTION
5000K 0-1 OV DIMMING DRIVER. STEEL
POLE 14' HIGH W/DUPLEX GFI RECEPTACLE MTD@
13'AFG
www.selux.us/en.html

Refer to the Kendall Square Landscape Vision Plan (Appendix A and Appendix D) for more information.

14.3. Bollard Lights

Waist high lighting can illuminate secondary paths leading to primary paths and spaces. This more dramatic and lower light is good for highlighting areas outside of businesses, restaurants, street lounges, playgrounds, plazas, and residential areas. In this plan, bollard lights will be utilized at the Residence Inn driveway, and may be used in other locations especially the seating lounges, playscapes and future restaurant patios dependent on how the design evolves in 25-100% construction documents.

BOLLARD LIGHT
Meteor Wayfinding Bollards- MODEL: SP010
HOUSING: EXTRUDED ALUMINUM
FINISH: BLACK
LENS: ONE PIECE .45" THICKNESS GLASS
SOLAR LEDS. LED SINGLE
SURFACE MOUNTED
4S (MOTION SENSOR)
www.meteor-lighting.com

Refer to the Kendall Square Landscape Vision Plan (Appendix A and Appendix D) for more information.

14.4. Lighting Plan Design Development

All efforts have been made to locate light fixtures on the 25% streetscape plans to avoid conflicts and meet spacing requirements. However, additional design and analyses are required to further develop the streetscape lighting plan for both roadway lights, pedestrian lights and potential bollard lights. Lighting should be kept at least 10' from trees. A photometric study must be conducted after the 25% submittal. All lighting should also be designed to mitigate light pollution - refer to the city's draft Lighting Ordinance regarding color temperature, illumination levels, glare and shielding.

15.Street Furniture

Site furnishings are critical components of creating a socially and economically vibrant streetscape and accommodating a wide range of needs and activities. A consistent aesthetic and design language in street furnishings can help to tie the entire streetscape and district together. Providing benches at key rest areas and viewpoints encourages people of all ages to use the walkways by ensuring that they have a place to rest along the way. Bike racks accommodate bicyclists traveling to their destinations. Trash and recycling receptacles promote cleanliness and sustainability and should be placed at key locations where people congregate or stop such as near benches, bus stops, near food establishments and at street corners. Landscaped planters and movable furniture also offer aesthetic and placemaking benefits to the sidewalk.

Street Furniture in the project has been located conceptually in the 25% design plans to illustrate the intent behind the activity zones and landscape areas along the corridor. Preferred materials and furniture product specification sheets have been included in the Kendall Square Landscape Vision Plan document located in Appendix A and in Appendix D. Final street furniture locations and details will need to be confirmed by City departments as the design progresses.

16.Trees

Trees provide many environmental and urban design benefits in the City of Cambridge. They have the ability to uptake CO2, reduce urban heat island effects, and slow stormwater by intercepting rainfall in their leaves and branches and to reduce the volume of stormwater by absorbing water through their root systems. Trees also enhance pedestrian amenity and safety and provide aesthetic beauty and a sense of enclosure to the streetscape. In urban areas, street trees are often confined

to planters, which significantly constrain the amount of space, water, and air available to a tree's root system. In particular, soil compaction is a major threat to tree survival in urban areas.

16.1. Tree Selection

Table X-1: Street Tree Palette & Location		
STREET TREE	SPECIES	LOCATION
Red Oak	Quercus rubra	GALILEO GALILEI WAY
Hybrid Elm*	Ulmus x sp.-	BINNEY
Littleleaf Linden	Tilia cordata	BROADWAY

Refer to the Kendall Square Landscape Vision Plan (Appendix A) for more information

16.2. Tree removal and replacement throughout project area

Table X-2 Curb Side Tree Removals		Table X-3 Median Tree Removals	
Binney from 3rd to Fulkerson:	2	Binney from 3rd to Fulkerson:	13
Little Binney:	0	Little Binney:	N/A
Galileo from Fulkerson to Broadway:	0	Galileo from Fulkerson to Broadway:	8
Galileo from Broadway to Vassar/Main:	0	Galileo from Broadway to Vassar/Main:	9
Broadway from RR tracks to Ames Street:	1	Broadway from RR tracks to Ames Street:	8
Vassar:	2	Vassar:	N/A
Fulkerson:	0	Fulkerson:	N/A

Table X-4 New/Added Street Trees			
Curb Running		Median	
Binney from 3rd to Fulkerson:	19	Binney from 3rd to Fulkerson:	0
Little Binney:	0	Little Binney:	N/A
Galileo from Fulkerson to Broadway:	15	Galileo from Fulkerson to Broadway:	0
Galileo from Broadway to Vassar/Main:	3	Galileo from Broadway to Vassar/Main:	N/A
Broadway from RR tracks to Ames Street:	7	Broadway from RR tracks to Ames Street:	N/A
Vassar:	0	Vassar:	N/A
Fulkerson:	0	Fulkerson:	N/A

A significant goal of this project is to maintain, in good health, the existing curb-side street trees, and to strategically provide additional curb-side trees where the proposed roadway narrowing makes this feasible. This design intent must be incorporated by all developer-led implementing teams as individual design segments move forward.

The project does propose the removal of the existing trees within the medians of Galileo/Binney and Broadway, as the medians themselves are to be removed. Staff from CRA have made informational presentations to the City's Committee on Public Planting (CPP) regarding the proposed tree removals and additions (most recently on March 8, 2017). CPP members were in general agreement that several of the median trees were in declining health and somewhat difficult to maintain, and that the plan to enlarge plantable areas and provide additional trees at the outside edges of the roadway would provide a better long-term public benefit to pedestrians.

Public trees are protected by the Massachusetts General Laws Chapter 87 and the City of Cambridge Tree Ordinance, and the removal of healthy public trees requires an advertised public hearing. At the hearing, the proposed removals and mitigation will be described, and public comments will be heard. If no written objections are received, the City Arborist may grant permission for tree removals at the close of the hearing. If written objections are received, the City Arborist will make a recommendation to the City Manager, who will have the final decision.

This project will occur in a phased manner with multiple project parties performing final design, but the ultimate coherence and success of the project depends on a consistent outcome from the tree removal hearing process. Therefore, the City, through the Department of Public Works, intends to serve as the project proponent for a single tree removal hearing, which will cover all anticipated removals including those which will ultimately be performed by private developers. As part of this process, the City will commit that no approved trees will be removed until related construction in the relevant segment of the project is in progress.

16.3. Tree Pits, Soils, and Spacing

Tree wells shall be at least 16 square feet, 8'x2' or as directed by the City Arborist. Tree well and structural soil details by DPW are included in Appendix D attached to this document. A tree spacing of 20'-30' should be utilized throughout the project area. Confirm tree spacing with City Arborist at DPW prior to finalizing construction drawings.[9]

16.4. Structural soils under the sidewalk or under bike lane (deep root zones)

Street trees require well-treated and well-nourished soil in order for trees to grow large and healthy. Good soil makes a big difference when it comes to planting large tree specimens in an urban environment. It is common for street trees in urban conditions to gather insufficient water and suffer from soil compaction due to a poor growing environment along the street. A system of structural soils should be used to ensure healthy soil by supporting traffic loads, reducing soil compaction and granting a quality volume of stormwater for trees along the street. 'Structural soil' is a designed medium which can meet or exceed pavement design and installation requirements while remaining

[9] Further details regarding street trees are found on DPW's website https://www.cambridgema.gov/theworks/ourservices/urbanforestry

root penetrable and supportive of tree growth. This system can also prevent the roots lifting pavers as the tree grows. Such a system was installed on Main Street in Kendall Square in 2016.

The implementation of this design should utilize the City's standard sand-based structural soil mix.

NOTE: It is expected that each of the developer-implementer teams will be responsible for fully designing structural soils for tree planting in their responsible sections.

17. Plant Palette & Irrigation

17.1. Planting Palette

Utilizing plants where space is available will grant ecological benefits by increasing biodiversity, as well as beautify the public realm. Refer to the Kendall Square Landscape Vision Plan (Appendix A and the landscape drawings in Appendix C) for the plant palette list.

17.2. Requirements for salt-tolerant species directly adjacent to curbing

Streetscape plantings along the back of curb will be exposed to de-icing and salt contamination. The selection of streetscape landscape plans should consider salt tolerance, and plantings at the back of curb are required to select salt-tolerant species. Plant species vary in their tolerance to salt exposure and plants that are tolerant of salt grow as well in saline soils as they do under normal conditions. Many herbaceous plants such as grasses adapt fairly readily to high salt levels. Among woody plants, tolerance varies with the species. Plant species with waxy foliage or scaled, protected buds are generally more tolerant of salt spray. Select salt tolerant plant material in areas that might receive wintertime salt applications (roads and parking lots). Refer to DPW's Best Management Practices Section 1.2 Snow Removal and Deicing and Section 9 Plant Lists (Table 9-5 Salt Resistant Trees and Shrubs) for more information. [10]

17.3. Irrigation

The establishment of new lawns, understory plantings, and trees will require the installation of an irrigation system throughout the project area. All of the developer-implementer teams will need to design and build irrigation systems for the landscaping in their respective sections, as that was not part of the scope of this 25% design process. Selection of understory plantings should consider watering needs and heat resistance of species selected along roadways for planting. Plant material selection should account for performance in the highly urban environment of Cambridge, including drought tolerance and hardiness often in full sun. Plant species selected for planting should be adapted to soil and microclimate conditions.

18. Public Art

Public Art is important to a city's cultural, social, and economic value. It is accessible to anyone, grants a view into the past, present, and future of a city, and represents the inner culture of a community to outsiders. The reaction towards public art embeds itself into visitors and effects how

[10] *City of Cambridge Department of Public Works DRAFT Best Management Practices Fact Sheet*

they think, feel, and act. For cities, public art can be iconic landmarks that a city can be remembered by or frequently visited, or can be wayfinding / placemaking elements that enhance the public realm. Public art should cause people to think, reflect, question, converse, change, play and bring joy. The art captures a spirit of the people who created it and enhances the sense of place in an area. All developer implementers should consider and propose opportunities for permanent public art installations and design in the necessary infrastructure to support it, especially types of public art mediums that relate most closely to Kendall Square such as technology related art mediums (lighting, projection, interactive, non-static, etc). This may be coordinated with the Cambridge Arts Council Public Art program and should be informed by the *Cambridge Play in the Public Realm Report of 2014*.[11] Refer to the Kendall Square Landscape Vision Plan (Appendix A) for more information. Public art designs or commissions were not part of The Project due to scope limitations.

19.Permanent Counting Systems

The integration permanent counting systems for vehicles, pedestrians, and bicycles should be designed and installed by each of the developer-implementer teams for their respective scope sections. Permanent counters will greatly benefit future transportation planning and design efforts in Kendall Square – providing a much more efficient, precise and longitudinal dataset for making investment decisions. Any systems will need to provide sufficient anonymity and be approved by staff at CRA and TPT. Ownership and operation of the permanent devices will be determined at that time. These were not included in the 25% drawings due to scope limitations.

[11] http://www.cambridgema.gov/CDD/parks/osplanning/healthy.aspx

Administrative, Procedural & Implementation Details

20.Survey Issues

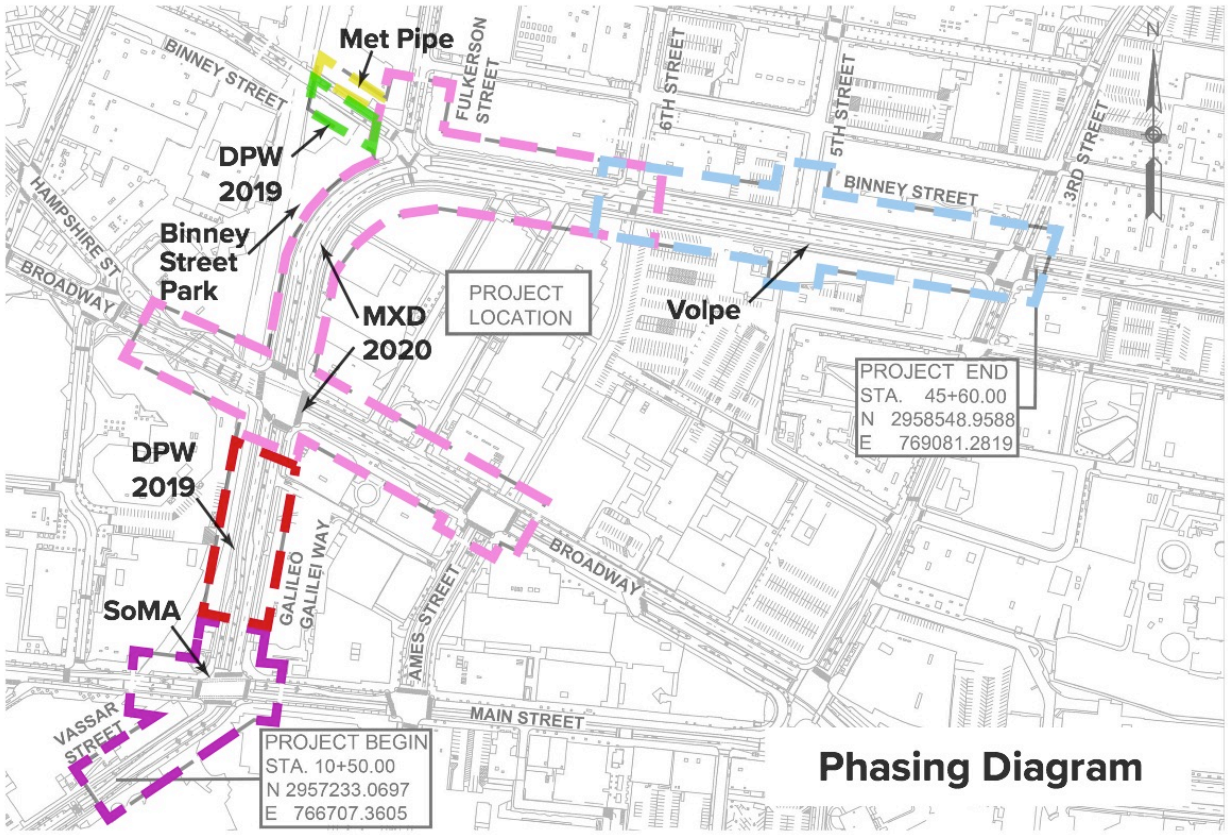
The project area survey was conducted by SMC Surveying in fall 2016 and early 2017.

- The project assembled half a dozen recent surveys from 2016. However, each survey was from a different survey company, were done with different levels of detail, different datums, different symbology, and wording standards.
- The compiled survey is missing certain survey details or survey adjustments. An additional survey will need to be conducted prior to development of construction documents to capture current site construction that has commenced since 2016. The Alta team did not have budget and scope to convert symbology and text to a common format.
- Detailed right of way and property owner information will also be necessary, including formal easements either permanent or temporary, acquisitions and right of way plans.

21.Phasing Plan Interim Conditions Details

Each developer-implementer project team should design suggestions for interim conditions at each of the limits of work found in the phasing plan, since this project was not able to support the cost of designing interim condition details, and at the time of writing the exact date order of the phases was not settled because they are based on many unresolved variables. The phasing plan diagram is attached below, and in Appendix G.

Important note about 6th Street @ Binney intersection: The phasing diagram shows an overlap between the MXD section and the Volpe section at the 6th Street @ Binney intersection. It is unlikely that both sections will be constructed at the same time, and therefore an interim condition at the 6th Street @ Binney intersection would need to be designed. Section 7 of this document described how the signal at this intersection was not designed as part of this project due to scope limitations and will need to be designed by one of the developer-implementer teams. The Volpe section will likely have impacts on the details of this intersection and its floating bus stops due to the proximity of a proposed driveway curb cut for the anticipated new federal building on Binney Street. Because not enough information was known at the time of publication about the Volpe redevelopment or the federal building, as well as a lack of scope to develop a series of interim condition concepts, the responsibility for this intersection was not fully determined. It may be that both developer-implementer teams need to touch this intersection at two different times in some way, but the order of magnitude of responsibility for each is unclear. CDD, TPT, DPW, and CRA hope to resolve this unsettled issue through discussions with the two developer implementer teams in the near future.



22. Summary of Permitting Process for Implementation

22.1. MXD section

For the MXD section of streetscape which needs to be brought to 100% CDs as a condition of the Certificate of Occupancy for the first commercial building in the Infill Development Concept Plan (IDCP), the design process will continue to the 100% CD level with the existing CRA-CDD-TPT-DPW[12] working group that followed this 25% design project to completion. The construction of this section is required as a condition of the Certificate of Occupancy of the second commercial building in the IDCP.

22.2. SoMA section at Vassar

For the SoMA section of the streetscape redesign (Vassar/Main/Galileo intersection and signals) which needs to be constructed prior to the CofO of commercial development over 300k GFA, the design process will continue to the 100% CD level with the existing CRA-CDD-TPT-DPW working group that followed this 25% design project to completion.

22.3. Met Pipe / Little Binney and Volpe / Binney sections

In the case of the Met Pipe development site as well as the Volpe development site, design reviews and approvals may be part of the Planning Board Special Permitting Process, and ultimately the Building Permit process for those building projects. Building permit stage is

[12] CRA = Cambridge Redevelopment Authority; CDD= Community Development Department; TPT = Traffic, Parking, Transportation Department; DPW = Department of Public Works

when DPW, TPT and CDD would do the most detailed review of the proposed streetscape designs associated with individual building development projects where reconstruction of the roadway adjacent to the building is part of the building design itself. These two sections would also benefit from convening the same CRA-CDD-TPT-DPW working group.

22.4. Construction permitting for all sections

Construction permitting will be required per Cambridge DPW's standard process, which can be found at https://www.cambridgema.gov/theworks/permitsanddocuments/Permits. City permits typically required for streetscape reconstruction include, but are not limited to: Crane and Boom Permit; Discharge and Dewatering Permit; Excavation and Trench Permit; Manhole Opening and Entry Permit; Sidewalk Obstruction Permit; Stormwater Control Permit; and Pole and Conduit Permit.

Any development of elements in the construction drawings that will require the eventual upkeep and maintenance of built streetscape by the Cambridge Department of Public Works will need to be reviewed by DPW and Ellen Coppinger at DPW.

23.Public Process 2016-2017

The CRA public engagement process for this 25% design project is summarized as follows:

- **October 2016:** CRA launched a comprehensive website for this project with detailed information including history/background, purpose, design priorities, scope map, project documents, and many informational links including an explanatory video about bicycle protected intersections. The website was featured on the home page of the CRA's website for about a year, but continued as a project page found via pull-down menus. The website was updated with an FAQ page and PDF documents as they became available.
- **11/9/2016:** CRA presentation and feedback session at Cambridge Bicycle & Pedestrian Committees
- **12/1/2016:** CRA presentation and feedback session at KSA Transportation Committee
- **12/7/2016:** CRA presentation and feedback session at Cambridge Transit Committee
- **2/8/2017:** CRA presentation and feedback session at Cambridge Bicycle & Pedestrian Committees
- **2/15/2017:** Progress presentation at CRA February monthly public Board Meeting, with public comment
- **2/22/2017:** CRA presentation and feedback session at ECPT
- **3/8/2017:** CRA informational presentation and feedback session Cambridge Public Planting Committee
- **Spring 2017:** CRA staff put together an FAQ page based on the feedback and questions from the prior public meetings and posted on the CRA website project page.

24.Property Owner & Transit Operator Engagement 2016-2017

The CRA met with property owners and transit operators on several occasions to provide information and solicit feedback:

- 10/6/2016: EZ Ride
- 11/9/2016: Boston Properties (BP)

- 11/17/2016: BioMed Realty
- 12/6/2016: Alexandria Real Estate (ARE)
- 2/2/2017: EZ Ride
- 2/2/2017: BP
- 2/10/2017: MIT Investment Management Company (MITIMCO)
- 2/17/2017: EZ Ride
- 2/28/2017: Lofts at Kendall (Equity Residential)
- 3/1/2017: Biogen
- 3/7/2017: Residence Inn
- 4/12/2017: MBTA / EZ Ride
- 5/24/2017: MBTA / EZ Ride
- 6/6/2016: Whitehead Institute
- 6/15/2017: MIT Shuttle
- 7/26/2017: BP
- 9/11/2017: MITIMCO

25.Interdepartmental Process 2016-2018

The CRA formed an interdepartmental working group to help shepherd the design project, providing detailed technical assistance along the way. This working group typically had at least one or more persons from each of the following: TPT, DPW, CDD's Transportation Division, CDD's Community Planning Division, and CRA. Starting on 1/1/2018, members of this working group were defined as: Cara Seiderman, CDD; Patrick Baxter, TPT; Suzannah Bigolin, CDD, Jerry Friedman, DPW, Jason Zogg, CRA.

- 11/15/2016
- 12/21/2016
- 1/10/2017 (this was with CRA and the Fire Department only)
- 2/3/2017
- 4/12/2017
- 5/24/2017
- 6/22/2017
- 11/7/2017
- Bi-weekly between 1/1/2018 and 5/2/2018

Appendix of supporting documentation

NOTE: Due to the volume of individual files, all of the appendices are provided in electronic form, organized into separate file folders for each appendix and can be either downloaded from CRA's Dropbox account via links on CRA's website (www.cambridgeredevelopment.org) or provided by contacting CRA for a flash drive copy.

Appendix A: Binney/Galileo/Broadway Streetscape Redesign: Landscape Vision Plan April 2018

Appendix B: Kendall Square Urban Renewal Streetscape Redesign Transportation Analysis Memorandum, McMahon Assoc., June 19, 2017 (with queue diagrams)

Appendix C: 25% Construction Documents: Binney/Galileo/Broadway Streetscape Redesign Project, May 2018

Appendix D: Product Cut Sheets / Specifications / Standard Detail Drawings

Appendix E: MIT NoMA/SoMA Mitigation Summary from TPT dated 5/9/2016 (annotated)

Appendix F: Planning Board Notice of Decision for Boston Properties, date of filing 3/20/2017 (annotated)

Appendix G: Phasing Diagram

Appendix H: Cost Estimate

Appendix I: Policy and Planning Reference Documents