

## MEMO

**Date:** 6/08/2022  
**To:** CRA Board  
**From:** Cecelia Cobb and Tom Evans  
**RE:** Grand Junction Corridor Transit Study Scope and Budget Proposal

### INTRODUCTION

This memorandum provides a consultant scope for consideration by the CRA Board for the proposed Grand Junction Transit Study. The Grand Junction corridor has long been discussed as a possible transit corridor connecting Allston Yards in Boston, through points in Cambridge (the Massachusetts Institute of Technology (MIT), Kendall Square, and East Cambridge), to the existing corridor's terminus at North Station. Past planning efforts to study potential uses have included various forms of light rail, rapid transit, and a multi-use path. Rail transit service on the Grand Junction Corridor was a central consideration of the Kendall Square Mobility Task Force, the recommendations of which were published in the Transport Kendall document written by the CRA (Attachment A).

Plans for a Grand Junction multi-use path are currently under design by the City of Cambridge to provide an off-street bicycle and pedestrian path, with a one portion of the path previously built in 2016 by the CRA. While the path's design seeks to ensure two track passenger transit service remains feasible, ridership estimates of future rail transit service utilizing the existing rail right-of-way connecting Cambridge and Boston has not been evaluated recently given increased development along the corridor.

As the Eversource Project was undergoing planning and environmental review as part of Amendment 11 of the Kendall Square Urban Renewal Plan (KSURP) and the Infill Development Concept Plan, multiple transportation studies reviewed the impacts of the future growth in the area. While the methodology of these reports differed, both project additional traffic congestion for intersections within and around Kendall Square. The success of Parking and Traffic Demand Management (PTDM) and active transportation facilities as mitigations needs to be supported with the expansion of transit service to Kendall. Thus, as part of the KSURP Development Agreement for the Eversource Project between the CRA and Boston Properties (BXP), BXP has agreed to fund a study to investigate the feasibility of future rail transit service along the Grand Junction. The CRA greatly appreciates BXP's commitment to improving transit service in Kendall Square, and progress has been made to develop a contract so that the Grand Junction Corridor Transit Study may begin.

## STUDY SCOPE AND BUDGET

The Grand Junction Corridor Transit Study is to be conducted by WSP on behalf of the CRA through funding provided by BXP. The study will seek to identify feasible options for a rail transit service along the Grand Junction rail line connecting, at a minimum: Allston/West Station; Cambridgeport; the MIT campus; Area 4/The Port; Kendall Square; North Point; and Allston/West Station. The study will evaluate issues related to corridor right-of-way, service characteristics (vehicle technology, stations served, frequency), and potential ridership estimates. This includes feasibility analysis for three different potential transit modes (commuter rail, urban rail, or light rail/shuttle), as well as assessing various equipment types depending on mode.

The study will conclude with a technical memorandum summarizing each operational alternative and provide approximate “order of magnitude” costs for each option as well as a final report summarizing all findings from the study. The study and any phased deliverables will take place over the course of four months and will not exceed the amount of three-hundred thousand dollars (\$300,000) for completion. (Attachment B)

## CONCLUSION

The CRA staff recommends authorizing the Chair and Executive Director to enter into a professional services contract with WSP to conduct the feasibility study of transit service on the Grand Junction rail corridor for an amount not to exceed three-hundred thousand dollars (\$300,000).

# KENDALL SQUARE MOBILITY TASK FORCE



# Final Report

August 2017



A collaboration between the City of Cambridge and MassDOT

## Introduction



*Source: Cambridge Redevelopment Authority*

### Background on Kendall Square

In the last three decades, Kendall Square has been transformed from a former industrial district to one of the world's leading centers for life science research and innovation. The Square also has seen the growth of hotels, restaurants, and shops that serve the MIT community, new residential developments, the area's cluster of life science and technology firms, and the surrounding neighborhoods. To see an interactive timeline of development and employers coming to the Kendall Square area, visit the website of the Kendall Square Association: <https://www.kendallsq.org/kendall-story/>.

More than 4.5 million square feet of commercial development have been built in Kendall since 2000. Most recently, Kendall Square has been feeling the highest demand for office space appropriate for life science. In addition, there has been a strong demand for living space and increasing amenities. Development has responded to these growing needs even in the last few years at a rapid pace. For example:

- In 2016, there was **10.8 million square feet** of commercial development in Kendall Square with another almost **one million square feet** under construction in Kendall Square.



- In 2016, Massachusetts Institute of Technology (MIT) received approval for NoMa (north of Main Street) and SoMa (south of Main Street), which includes six buildings at over **1.7 million square feet**.
- In 2016, the U.S. General Services Administration selected MIT as the developer for the VOLPE site (the rezoning process for which is still ongoing).
- In 2017, Boston Properties/Cambridge Redevelopment Authority were approved for an additional almost **one million square feet** of infill development, in addition to the previously approved 3.33 million square feet.

Including the development currently underway, in total, the built commercial square footage in Kendall Square has increased by 93% since 2000. In 1979 when the Kendall Square Urban Renewal Plan (KSURP), a major urban mixed-use project on a 24-acre site within the 42-acre Kendall Square Urban Renewal Area, was approved, it was expected that this development would lead to significant growth in daily vehicle trips, and so the City and developers have been working together to mitigate that expected creation of vehicle trips.

The City has established a number of policies that provide a foundation for mitigating the effect of development on traffic, and therefore, on the environment. For example, three Cambridge policies have long been the foundation for work to decrease vehicle trips<sup>1</sup>:

- *Vehicle Trip Reduction Ordinance, 1992*: While the City has pursued programs to mitigate the impact of increasing car ownership and jobs, this ordinance states that “new measures must be implemented by the City and the Commonwealth involving the participation of all sectors of the community on a local and regional basis to make more efficient use of mass transit, bicycling, walking, and other alternatives to trips by single-occupancy vehicles.”
- *Growth Policy Document, 1993, updated 2007*: Defines the planning assumptions and policies guiding the physical planning of Cambridge. Specifically, it requires undertaking reasonable measures to improve the functioning of the city’s street network, without increasing through capacity, to reduce congestion and noise and facilitate bus and other non-automobile circulation.
- *Parking and Transportation Demand Management Ordinance, 1998*: Aims to “reduce vehicle trips and traffic congestion within the City, thereby promoting public health, safety, and welfare and protecting the environment.” The ordinance requires PTDM plans for commercial parking facilities over a specified size and puts in place requirements for monitoring compliance with the PTDM plans.

The City has carried out a number of initiatives to meet the goals of these policies and ordinances. For example, the city:

- has supported and funded the launch of EZRide, a shuttle operated by Charles River Transportation Management Association between North Station and Cambridgeport, serving Kendall Square
- has supported Hubway, a public transportation system by bike, owned by the municipalities of Cambridge, Boston, Brookline, and Somerville

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<sup>1</sup> For a brief description of and links to these policies, see <http://www.cambridgema.gov/CDD/Transportation/programs/strategiesandpolicies>

- has ongoing standing, City Manager-appointed Pedestrian, Transit, and Bicycle Advisory Committees
- developed a Pedestrian Plan, a Bicycle Network Plan, and a Transit Strategic Plan
- engages with developers to have robust conversations about mitigating travel by private automobile
- recently formalized two additional policies, the Complete Streets policy as well as Vision Zero, which aim to accommodate all users and eliminate traffic-related fatalities

The efforts made since the early 90s to lower vehicle miles traveled and transportation emissions have been paying off. Cambridge now leads the nation in walkability and the percentage of residents who get to work without using a car. Bicycling is seen as a viable mode of transportation and the growth in bicycling has been dramatic. This is not only a local initiative, however. The State has also played a role in developing broad-reaching policies to reduce private vehicle use. For example:

- The GreenDOT Policy Initiative<sup>2</sup> established targets for reducing greenhouse gas emissions; promoting the healthy transportation options of walking, bicycling, and public transit; and, supported smart growth development.
- The Healthy Transportation Compact<sup>3</sup> requires state-level transportation decisions to balance the needs of all transportation users.
- The Healthy Transportation Policy Directive<sup>4</sup> requires that all MassDOT projects not only accommodate, but actively promote healthy transportation modes.

As a result of these policies and ongoing efforts by all stakeholders, and consistent investment in pedestrian, bicycle, and transit facilities, as well as the lifestyle of the people that Kendall Square serves, average daily traffic volumes have remained roughly flat since 2000. This does not mean that traffic patterns have not changed dramatically as we continue to transform our transportation network, but it does mean that this significant growth in development has not yielded the predicted vehicular trips because of these other efforts.

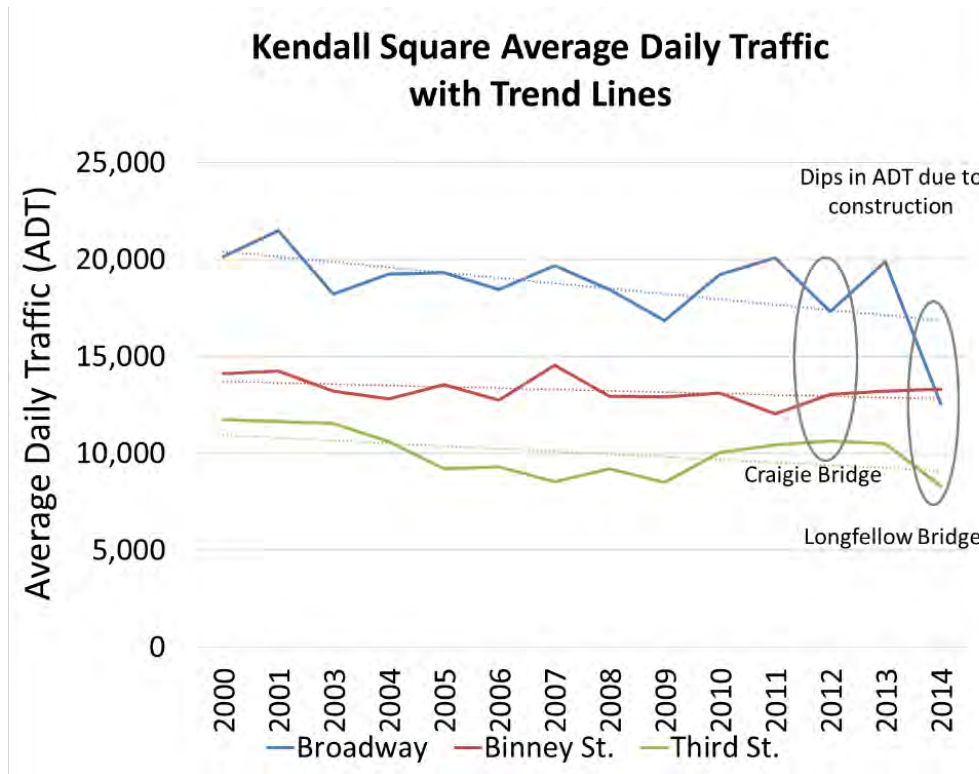
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<sup>2</sup>

<http://www.massdot.state.ma.us/Portals/0/docs/GreenDOT/finalImplementation/FinalGreenDOTImplementationPlan12.12.12.pdf>

<sup>3</sup> <http://www.massdot.state.ma.us/GreenDOT/HealthyTransportation/HealthyTransportationCompact.aspx>

<sup>4</sup> <https://www.massdot.state.ma.us/Portals/0/docs/GreenDOT/DirectiveHealthyTransportation.pdf>



Graph based on Kendall Square Urban Renewal Area Section 61 Findings<sup>5</sup>

Despite this positive outcome, there has been a growing awareness that safety on the streets for cyclists and pedestrians, the capacity limits on the Red Line, and the impact of congestion of bus and shuttle services, and the emergence of new types of transportation services like ride-hailing companies, present a variety of complex and incredibly important mobility challenges, including in Kendall Square.

### Overview of the Kendall Square Mobility Task Force

To address these mobility challenges and enable the Square to continue to grow sustainably, the Kendall Square Mobility Task Force (KSMTF or the Task Force) process was established in 2015 with the goal of developing a set of policy and project recommendations. The stakeholders include a broad range of representatives from agencies (the City, MassDOT, MBTA, Charles River TMA, and Volpe), businesses (including the East Cambridge Business Association), the East Cambridge Planning Team representing residents’ interests, MIT, and advocacy organizations.

<sup>5</sup> For the latest Traffic Update see <https://static1.squarespace.com/static/51f173a6e4b04fc573b07c0c/t/550b2800e4b0e59fc5781328/1426794496377/KSURA+2014+Report+-+Final+%2B+Appendix.pdf>

<b>Kendall Square Mobility Task Force Members</b>			
<b>Co-chairs</b>			
<b>City of Cambridge, Environmental &amp; Transportation Planning Division:</b> Susanne Rasmussen		<b>Kendall Square Association/Cambridge Innovation Center:</b> Brian Dacey	
<b>Agencies</b>			
<b>MassDOT:</b> Scott Hamwey	<b>MBTA:</b> Melissa Dullea	<b>Charles River TMA:</b> Jim Gascoigne	<b>Volpe National Systems Center:</b> Robert Dorer
<b>City of Cambridge, Traffic, Parking, and Transportation:</b> Joe Barr		<b>Cambridge Redevelopment Authority:</b> Tom Evans	
<b>Businesses/Developers</b>			
<b>Biogen:</b> Chris Barr		<b>Boston Properties:</b> Mike O'Hearn	
<b>Institutions/Associations/Advocates/Other</b>			
<b>MIT:</b> Kelley Brown	<b>MIT Investment Management Company:</b> Michael Owu	<b>Livable Streets Co-founder/MIT student:</b> Jeffrey Rosenblum	<b>Friends of the Grand Junction:</b> John Sanzone
<b>East Cambridge Planning Team:</b> Peter Crawley		<b>East Cambridge Business Association:</b> Patrick Magee	

### Task Force Process

In the early stages of their process, the Task Force reviewed existing conditions information and future trip modeling for 2040, and discussed relevant mobility challenges both now and in the future. They developed a set of “Opportunity Statements” and possible actions to guide their work. These are listed below (finalized in July 2016).

<b>Opportunity Statement</b>	<b>Possible Action(s)</b>
Improve and increase direct bus connections to and from Kendall Square to reduce auto use, as well as improve travel times, reliability, and hours of service	Identify demands for new or improved routes and possible transit priority treatments, including consideration of routing both before and after the construction of the Green Line Extension
Improve operational capacity and reliability of Red Line to meet both current and future demand	Define and prioritize a package of Red Line investments, cost, and expected impacts
Maximize the transportation benefits of the Grand Junction corridor (multi-use path and transit options)	Hold a workshop with KSMTF to update and explore transit options and the interaction with a multi-use path
Improve direct Commuter Rail and Commuter Bus connections to suburban communities to reduce auto use	No new recommendations (due to being identified as out of scope for this process)
Increase bicycle safety	No new recommendations (instead refer to Bicycle Network Plan and Vision Zero policy)



Increase access to ridesharing during peak hours	Develop a draft scope for future project(s) to analyze potential contribution of Transportation Management Associations (TMAs) and private shuttles as well as Transportation Network Companies (TNCs) to mobility in Kendall Square
Develop a vision for Kendall Square mobility to best leverage larger scale public (and developer) investments	Final report (project and policy recommendations) from KSMTF

The Task Force understood that certain opportunities were already being explored in some detail, such as bicycle safety, and others such as Commuter Rail services were considered to be too challenging or regional to explore in the context of this process. The Task Force members decided to focus on transit and transportation network companies (TNCs) or ride-hailing services, with four transportation priority areas:

1. Red Line
2. Grand Junction path and transit
3. Bus
4. Ride-hailing services (Uber, Lyft) and shuttles

The Task Force also worked to keep in mind current available resources. The resources known to be available, or committed but pending, as of the completion of the Task Force in the late spring of 2017 are the following, grouped according to their intended use:

Amount	Purpose	Source	Status	Timeframe for Work
<b>Grand Junction Greenway (multi-use path)</b>				
\$10 million	Design and construction of multi-use path north of Binney Street to the City line	City	Available	Over four years if possible
\$2 million	Design and construction of Binney Park (which will contain a segment of the multi-use path)	Boston Properties (Google Connector mitigation)	Available	Construction to begin in 2018
16,839sf of land	Convey strip of land for Grand Junction multi-use path	Alexandria (399 Binney mitigation)	Pending	Commitment to convey to be made prior to issuance of Building Permit
<b>Kendall Square Studies</b>				
\$50,000	Consulting services related to transit improvements and KSMTF	Boston Properties (88 Ames mitigation)	Available	Mostly complete. About \$40k used for Grand Junction Feasibility and workshop

Amount	Purpose	Source	Status	Timeframe for Work
\$175,000	Transit studies in Kendall Square	MIT (north of Main (NoMa) and south of Main (SoMa) Planned Unit Development (PUD) mitigation)	Pending	Prior to Occupancy Permit for commercial development over 300,000sf GFA
<b>Transit Investments</b>				
\$6 million	Kendall Square Transit Enhancement Program, allocation to be determined by a working group	Boston Properties/Cambridge Redevelopment Authority (CRA) (MXD Infill mitigation)	Pending	Expected to launch in fall of 2017, up to one-third to be allocated in an immediate scope
\$250,000	Transit investment	MIT (NoMa and SoMa PUD mitigation)	Pending	Prior to Occupancy Permit for commercial development over 600,000sf GFA
\$172,000	Improving transit conditions in Kendall Square	Alexandria (399 Binney mitigation)	Pending	Prior to Occupancy Permit
<b>Headhouses</b>				
N/A	Reconstruct inbound (south side) headhouse	MIT (part of NoMa and SoMa PUDs)	Pending	To be completed when Building 5 is constructed
Maximum \$400,000	Improvements to outbound (north side) headhouse and station	Boston Properties (MXD Infill mitigation)	Pending	Work scheduled for 2019

## Recommendations

To guide future investment, collaboration, and policy making, the Task Force developed a set of initiatives for each transportation priority, based on the extensive information gathering done throughout the Task Force process. Those initiatives have been clustered into four “Implementation Plans” related to the four transportation priority areas. A summary of the initiatives, their expected mobility impact, measured outcomes if available (from scenario modeling of modified bus services through the Central Transportation Planning Staff (CTPS) regional travel model), target timeframe, stakeholder lead(s), prioritization, possible resources, and next steps, follows. For more detail on each initiative, including background information relevant to developing these recommendations, please refer to the individual implementation plans included in this report and supporting documentation (a list of which is provided at the end of this introduction). Note that the Task Force intended that work plans for the top priority short-term initiatives be developed near-term and agreed to meet bi-annually to discuss progress on those initiatives and other next steps. Initiatives are numbered according to the “Transportation Priorities” (e.g. 1.1 is the first initiative for the Red Line). Time-frames are defined as short (S), within 1 year; medium (M), 2-5 years; and long (L), 5+ years.

#	Initiative Title	Notes on Expected Mobility Impact	Target Time-frame	Lead(s)	Priority (within category)	Possible Resources
1.1	Review results of ABC analysis of anticipated capacity increase from Red Line car purchase and advocate for additional Red Line capacity improvements	The expected mobility impact of the new Red Line cars is a 50% increase in capacity. The impact of other improvements (e.g. to Alewife, Columbia Junction, and downtown stations) is TBD but are likely very significant	S-M	KSA	1	
1.2	Implement Kendall Square station improvements and behavioral strategies that positively impact operations	Even minor improvements to reduce dwell times could have a significant impact given Red Line frequencies.	S-M	City	2	State/federal and developer mitigation
1.3	Repair the Red Line Longfellow portal and include the Red Line in the MBTA's vulnerability and resiliency assessment	The expected mobility impact will be extremely significant during a severe weather event if the portal is vulnerable.	S-M	City	3	State/federal
2.1	Convene stakeholders to collaborate on implementing the Grand Junction multi-use path	The path is expected to provide an improved facility for all ages to walk and bike and will not move forward without further stakeholder engagement and consensus, including MassDOT.	S	City	1	
2.2	Analyze of benefits of Grand Junction path connections	Need data to demonstrate how it would positively impact access to and from Kendall Square as well as bring about behavioral change.	S	City	1	Existing developer mitigation
2.3	Develop transit conceptual or 25% designs for the Grand Junction corridor	In order to build the multi-use path so that it does not preclude two-track service, some level of design work for transit is needed.	S-M	City	2	City/KSTEP
2.4	Produce new Grand Junction transit demand estimations	The expected long-term impact of Grand Junction transit as well as the impact on path design needs to be better understood through demand estimation.	S	City/CTPS/ CRA	1	State/KSTEP/CRA
3.1	Further study bus priority treatments Lechmere to Kendall Square	The estimated time savings yields the noted increase in ridership along this corridor and improves already crowded conditions on the buses. While priority treatments would likely significantly benefit EZ Ride and any other future services on the corridor, the case for the benefit and tradeoffs still needs further exploration.	M	City/CRA	1	KSTEP

3.2	Implement stop consolidation and signal priority for the common CT2/85 corridor from Union to Kendall	The estimated time savings yields the noted increase in ridership along this corridor and improves the experience for all passengers using these routes. <i>(Note – the CT2 operates out of the Albany garage and the 85 out of the Somerville garage)</i>	M	City/MBTA	3	MBTA/City/KSTEP
3.3	Pilot extended 64/70/70A into Kendall Square	The estimated mobility impact is an increase in ridership of almost 3,000 trips total in the morning and evening peak travel times. <i>(Note – the 64 and 70 operate out of the Somerville garage)</i>	M	MBTA	1	MBTA/KSTEP
3.4	Increase EZRide shuttle service	This ridership estimate is based on time savings realized by the proposed bus priority improvements on First/Binney. However, buses are overcrowded and an increase in service may be justified independent of the bus priority treatments.	M	EZRide/City	3	KSTEP
3.5	Implement new CT4 service	The proposed new CT4 service would draw an estimated ridership of 2,310 trips total in the morning and evening peaks, which is similar to the current CT2 ridership. <i>(Note – the CTs operate out of the Albany garage)</i>	M	All	2	MBTA/KSTEP
4.1	Collect data to better understand ride-hailing services	The impact of ride-hailing services on mobility and vehicle miles traveled (VMT) is not yet fully understood.	S	MAPC/CTPS/University	2	
4.2	Develop policy recommendations related to ride-hailing services	The impact of ride-hailing services on mobility and VMT is not yet fully understood.	M	MassDOT/City	3	
4.3	Explore opportunities for increased efficiency of shuttles	The consolidation of shuttles could decrease congestion, lower costs and make service in Kendall Square more accessible for the public.	S	KSA	1	Developer mitigation Volpe pro-bono research



## Related Regional Initiatives

Many of the Task Force recommendations depend on coordination with other regional and state level processes. Some of the key processes and their relevance to the Kendall Square Mobility Task Force are:

- **Focus40<sup>6</sup>:** Focus40 is the 25-year investment plan to position the MBTA to meet the needs of the Greater Boston region in 2040. Existing conditions analysis defined the state of the current transportation systems including challenges related to each type of system. Some relevant documents referred to for this process include:
  - State of the System reports<sup>7</sup>
  - State of the Red Line report<sup>8</sup>

To develop recommendations, Focus40 will evaluate various proposed and vetted investments such as “urban rail” connections on corridors like the Grand Junction.

- **MBTA Service Plan:** While at the time of this report, the new MBTA service planning process was not finalized or officially announced, the Fiscal and Management Control Board was exploring a phased implementation of service planning that will likely reach Kendall Square bus services within 3 years.<sup>9</sup>
- **Green Line Extension<sup>10</sup>:** This project includes new light rail service northwest of downtown Boston, including moving and expanding Lechmere Station. Service will extend into Union Square and out to Tufts on two branches.
- **Lower Mystic Regional Working Group<sup>11</sup>:** This group is working to develop recommendations for transportation improvements in Boston, Everett, and Somerville given expected development and growth, centered on Sullivan Square as a hub. Some of these improvements may overlap with or need coordination with Kendall Square Mobility Task Force initiatives.
- **Allston I-90 Interchange Improvement Project<sup>12</sup>:** This project has developed concepts for replacing the Allston Viaduct, which include regional path connections, improvements in bus circulation, and consideration of a West Station (a new stop on the Worcester/Framingham Commuter Line), which could connect to future Grand Junction transit service.

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<sup>6</sup> <https://www.mbtafocus40.com/>

<sup>7</sup> <http://www.massdot.state.ma.us/focus40/TheMBTAToday.aspx>

<sup>8</sup> [http://www.mbta.com/uploadedfiles/About\\_the\\_T/Board\\_Meetings/StateOfTheRedLine01252016.pdf](http://www.mbta.com/uploadedfiles/About_the_T/Board_Meetings/StateOfTheRedLine01252016.pdf)

<sup>9</sup> The most up-to-date known presentation can be found at

[http://www.mbta.com/uploadedfiles/About\\_the\\_T/Board\\_Meetings/J.FINAL\\_ServicePlan\\_March272017\\_2.pdf](http://www.mbta.com/uploadedfiles/About_the_T/Board_Meetings/J.FINAL_ServicePlan_March272017_2.pdf)

<sup>10</sup> <http://greenlineextension.eot.state.ma.us/>

<sup>11</sup> <http://lowermysticstudy.org/>

<sup>12</sup> <http://www.massdot.state.ma.us/highway/HighlightedProjects/AllstonI90InterchangeImprovementProject.aspx>

### Additional Resources

The Implementation plans, which summarizes of the Task Force's recommendations, were developed based on detailed analysis of existing data and projections of future challenges. Below is a list of studies and analyses carried out for or utilized in the Kendall Square Mobility Task Force process, as well as a few key additional references.

- Summary of Initiatives and Priorities (July 2017)
- Grand Junction Feasibility Review technical document (January 2017)
- Red Line capacity update, originally presented to the Fiscal and Management Control Board (September 2016)
- Kendall Square Mobility Task Force Modeling (July 2017)
- Methodology and Assumptions of Central Transportation Planning Staff Regional Travel Demand Modeling (July 2017)
- Final list of bus scenarios for modeling future impacts on transportation network (September 2016)
- Technical reports related to bus scenarios (September 2016):
  - Description of Bus Scenarios for CTPS
  - Incremental Bus Operating and Maintenance (O&M) and Vehicle Capital Costs for Kendall Square Mobility Task Force 'Unconstrained' Scenario
  - CT2 Stop Relocation Analysis
  - Route 85 Bus Stop Optimization and Transit Priority Plan
  - Bus Priority Corridor Traffic Review
- Modified, final opportunity statements (July 2016)
- Bus, Red Line, and Grand Junction capacity constraints presentation (November 2015)
- Existing conditions presentation (June 2015)
- KSMTF scope (December 2014)

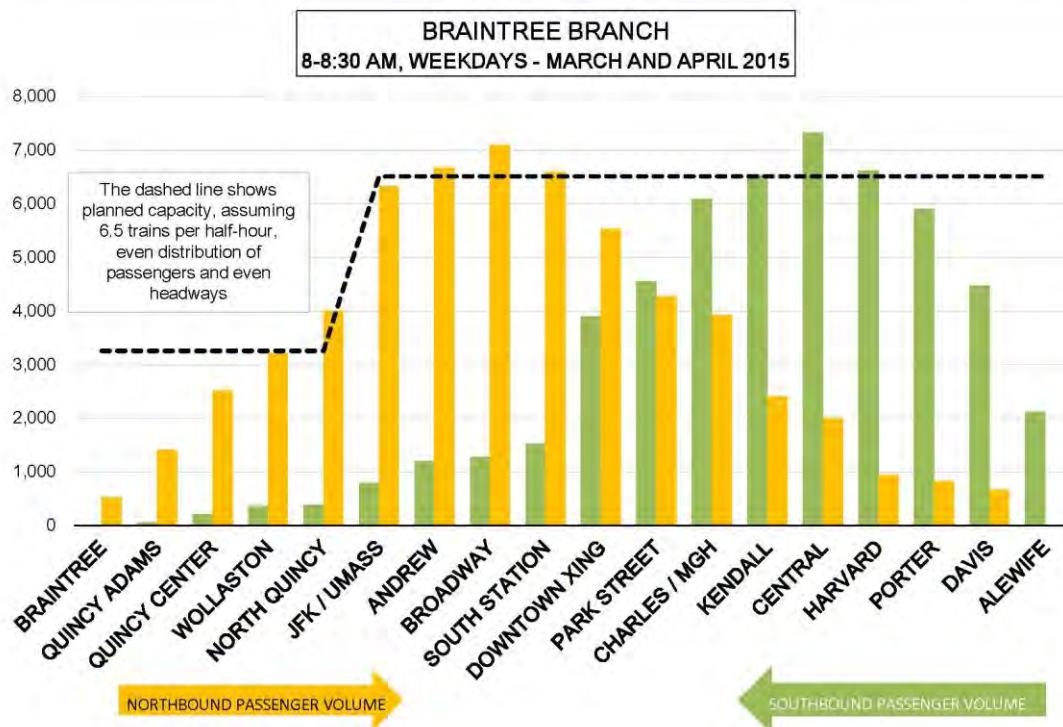
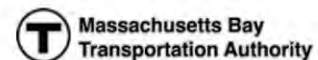
All of these documents, as well as presentations from and summaries of each meeting, can be found on the Kendall Square Mobility Task Force website:

<http://www.cambridgema.gov/CDD/Projects/Transportation/kendallsquaremobilitytaskforce>.

## 1. Implementation Plan: Red Line

The Red Line is the backbone of the Cambridge transit network and the MBTA’s busiest subway line, carrying over 280,000 trips each weekday. The Red Line plays a central role in attracting development to Kendall Square, which has become a thriving hub of research and jobs in Cambridge. In 2015, Kendall Square was the 8<sup>th</sup> busiest station on the entire MBTA system as well as the 5<sup>th</sup> fastest growing station, measured by the number of people entering the station (station entries).<sup>13</sup> Running optimally, the Red Line has the theoretical capacity to handle present-day demand at Kendall. However, as is shown in information below presented by the MBTA, the system is already over capacity at other locations, including Central Square and Porter Square in the AM peak half hour.

### Usage vs. Planned Capacity



*In the AM southbound peak half-hour, passenger loads at Kendall Square for the Braintree branch are at the planned capacity levels. Source: MBTA State of Service: Red Line Heavy Rail, page 8.*

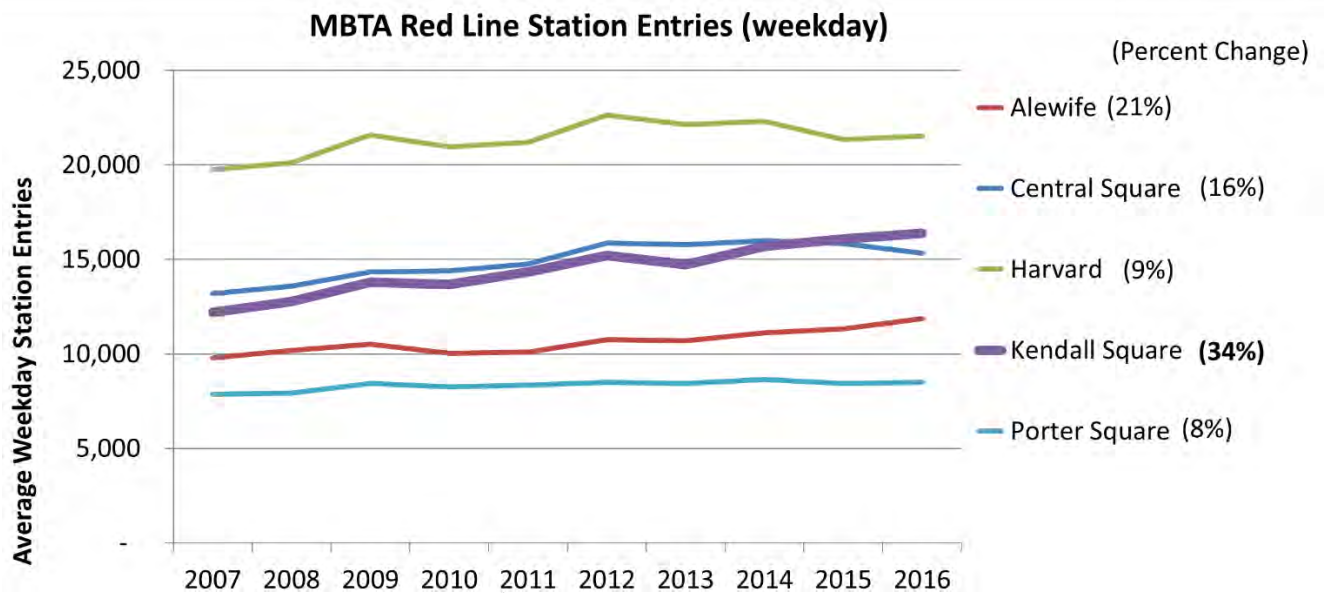
The “scheduled capacity” is based on real frequencies (the actual number of trains in that time period) but assumes that transit come evenly spaced and that people spread themselves out amongst the cars. Real life conditions result in worse capacity for several reasons, including the following:

- Trains do not necessarily come evenly spaced, so some trains may experience overloading while others may be not be full.

<sup>13</sup> January 25, 2015. MBTA State of Service: Red Line Heavy Rail report. [http://www.mbta.com/uploadedfiles/About\\_the\\_T/Board\\_Meetings/StateOfTheRedLine01252016.pdf](http://www.mbta.com/uploadedfiles/About_the_T/Board_Meetings/StateOfTheRedLine01252016.pdf)

- Passengers do not spread themselves out evenly between the cars of the train and so certain cars can be much more crowded than others.
- Any kind of emergency, technical issue, or other kind of delay can seriously disrupt the system.

In these real-world conditions, people can be left behind on the platform during their commute. Further, Red Line ridership is growing. On the Red Line overall, the trend shows steady growth over the years, even with the fare increases (see below). MBTA data show that specifically at Kendall Square station, there has been a 34% increase in station entries from 2007 to 2016. Modeling by the Central Transportation Planning Staff completed for this process indicate that Kendall Station entries will continue to grow in the future, by 100% from 2012 to 2040 in the morning peak commuting time. This estimated growth is based on assumed development projects with no improvements to transit other than the construction of the Green Line Extension.<sup>14</sup>



*Cambridge Red Line station entries are continually increasing, based on MBTA data*

These challenges raise concern over whether the Red Line will be able to meet the growing needs of Kendall Square, which is critical to achieving Cambridge’s and the state’s economic development and sustainability goals related to transportation. Accommodating people on the Red Line helps keep roadway congestion from increasing, especially as we work to make the roadway network better for buses, bicycles, and pedestrians.

During the Kendall Square Mobility Task Force process, the Fiscal and Management Control Board (FMCB) voted to approve the purchase of all new Red Line cars instead of overhauling over a third of the fleet.<sup>15</sup> By doing so, the FMCB ensured that the Red Line fleet would consist of the same technology, and along with some other improvements, this will allow the MBTA to operate the Red Line trains to operate more closely so they can move faster for longer in between stations. MassDOT and the MBTA estimate

<sup>14</sup> See CTPS Technical Memorandum, March 31, 2017, “Kendall Square Mobility Task Force Modeling”.

<sup>15</sup> See <https://blog.mass.gov/transportation/mbta/mbta-purchases-an-additional-120-new-red-line-cars/> for more information.



that this will allow them to run about 50% more trains at rush hour (from 13 to 20 trains) and reduce the time between trains to about 3 minutes (from about 4.5 minutes). At the time of the Task Force process, the MBTA estimated that the cars would all be operating by 2024.

In addition, other planned improvements to the Red Line include developer commitments to reconstruct or contribute to reconstructing the headhouses at Kendall Square. At the very least, this will provide improvements to the amenities and environment for passengers entering and exiting the station.

### **INITIATIVE 1.1: Review results of ABC analysis of anticipated capacity increase from Red Line car purchase and advocate for additional Red Line capacity improvements**

A Better City (ABC) received funding from the Barr Foundation to perform a peer review of the assumptions used to estimate the capacity improvements from the purchase of all new cars. The study will likely explore key concerns related to the roll-out of all new cars. Assuming this ABC study supports that the MBTA-reported capacity gains can be achieved, there are still other system bottlenecks as identified by the MBTA (at Alewife, Columbia Junction where the Ashmont and Braintree lines split, and Park Street) that should be advocated for being addressed.

#### *Resources required:*

- City staff and Kendall Square Association (KSA) time in tracking the ABC analysis

#### *Steps to completion:*

- Follow ABC study process (scope of work not publicly released at the time of this plan)
- Continue to support the timely purchase of new cars and advocate for consideration of key concerns in the roll out of the new cars
- Convene a group to organize and advocate for Red Line improvements

### **INITIATIVE 1.2: Implement Kendall Square station improvements and behavioral strategies that positively impact operations**

As the capacity and demand for the Red Line increases, stations and platforms may be less adequate in accommodating passengers. In addition, some of the platforms and headhouses, including those at Kendall Station, could use improvements for safety and accessibility. As part of development



*Draft rendering of south headhouse reconstruction (Source: MIT)*

commitments, Massachusetts Institute of Technology plans to reconstruct the primary south/inbound Kendall Station headhouse, and Boston Properties (BP) is contributing \$400,000 towards the north/outbound headhouse and station improvements. In addition to these structural and aesthetic improvements, other changes, such as installing screen doors or marking platforms to align with train doors, could have operational benefits such as by allowing passengers to get on and off trains more quickly and reducing dwell times (the time a train is stopped at a station). Finally, there are infrastructure elements associated with the station, such as vents, that may be vulnerable to flooding or other climate change impacts, and could be made more resilient.

*Resources required:*

- City staff time in coordination with the MBTA
- Station improvements require funding, with the source to be determined

*Steps to completion:*

- Coordinate with the MBTA to understand and advocate for station improvements that affect operating efficiency and improve resilience
- Coordinate with Kendall Square stakeholders, the MBTA and others to better understand and identify funding needed to accommodate demand on the platforms

**INITIATIVE 1.3: Repair the Red Line Longfellow portal and include the Red Line in the MBTA’s vulnerability and resiliency assessment**

The Kendall Square portal, where the Red Line transitions from above ground to below ground and vice versa in Kendall Square, is in disrepair. The Kendall Square portal needs to be assessed and strategies developed based on the known needed repairs and future vulnerability to flooding and other impacts of climate change.

Cambridge’s Climate Change Vulnerability Assessment (CCVA) Report<sup>16</sup> identified the Kendall Square Station and portal (where the train goes from above ground to below ground) as particularly vulnerable to flooding.

The MBTA is taking on various resiliency projects to protect its assets from the impacts of climate change. In addition, the MBTA is piloting a vulnerability assessment for the Blue Line, looking at the maintenance facility and storage lines, the most exposed stations, and portals. It is expected that this process will be carried out for other lines, including the Red Line.

Asset	Heat		Precip. Flood		SLR/SS Flood
	2030	2070	2030	2070	2070
Transit					
T.1 Alewife Station (Red Line)					
T.3 Alewife - Davis - Porter (Red Line)					
T.5 Central - Kendall (Red Line)					
T.8 Kendall Station (Red Line)					
T.9 Fitchburg Commuter Rail Line					

Fig. 12 **Most At-Risk Infrastructure Legend**  
 (Source: SLR/SS Risk Assessment, February 2017, compiled with CCVA Part 1 as of November 2015. Kleinfelder for the City of Cambridge.)

*(Source: Climate Change Vulnerability Assessment, February 2017)*

*Resources required:*

- City staff time in coordinating with the MBTA
- Repairs require funding, with the source to be determined

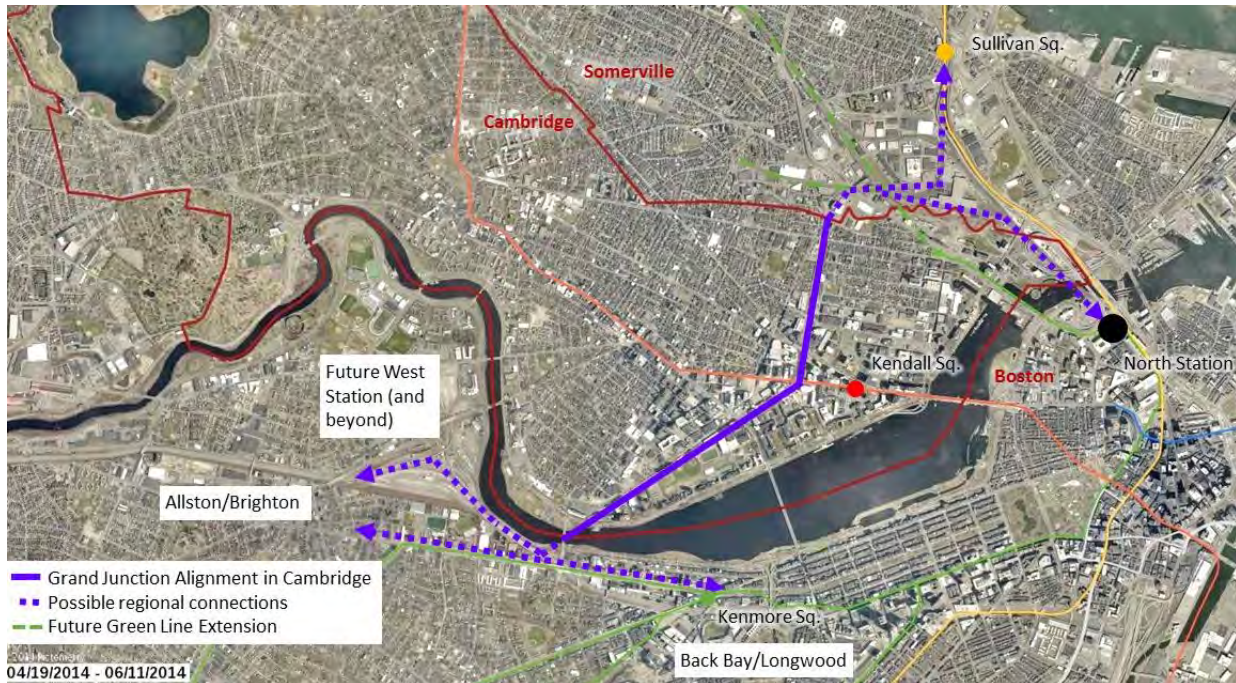
*Steps to completion:*

- Advocate for the state and MBTA to fund repairs and full vulnerability and resiliency assessment of the Red Line portal

<sup>16</sup> <http://www.cambridgema.gov/CDD/Projects/Climate/~~/media/F93208C3B12D4AACBD3E0F3A712F68C7.ashx>



## 2. Implementation Plan: Grand Junction Transportation

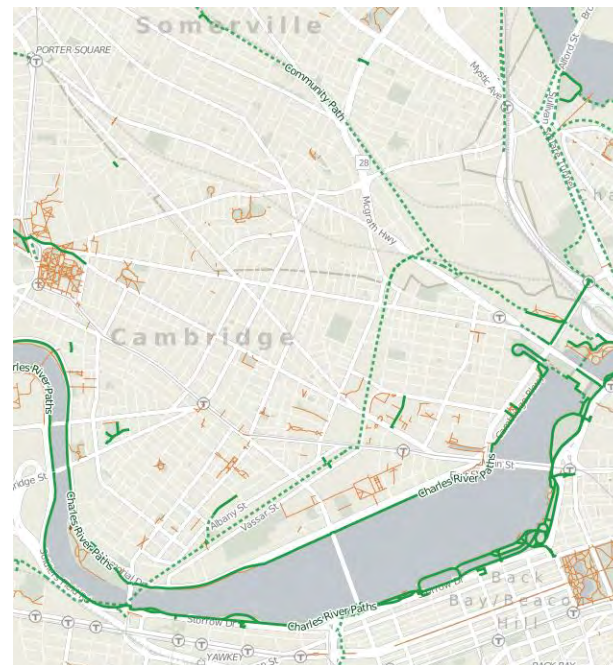


*Segment of the Grand Junction corridor in Cambridge and possible regional connections (Source: Pictometry 2014)*

The Grand Junction alignment in this report refers to the segment of a railroad right of way (ROW) between the rail bridge under the BU Bridge in the southwest to where the rail meets the Somerville border past Cambridge Street in the north. The Grand Junction is the only railroad connection between the north and south 'sides' east of I-495 and is an important potential regional connector for the pathway network. Located within a half-mile of the corridor are 42% (49,000) of the jobs and 31% (33,000) of the residents in Cambridge.

A fully off-street, multi-use path has been identified as an important local and regional use for the corridor. The "Grand Junction Greenway" is used to refer to a multi-use path constructed in a way that doesn't preclude future transit on the corridor. The desired width for the path is 14' with 2' buffers on each side.

The rail is currently primarily used for MBTA commuter rail and some Amtrak 'equipment

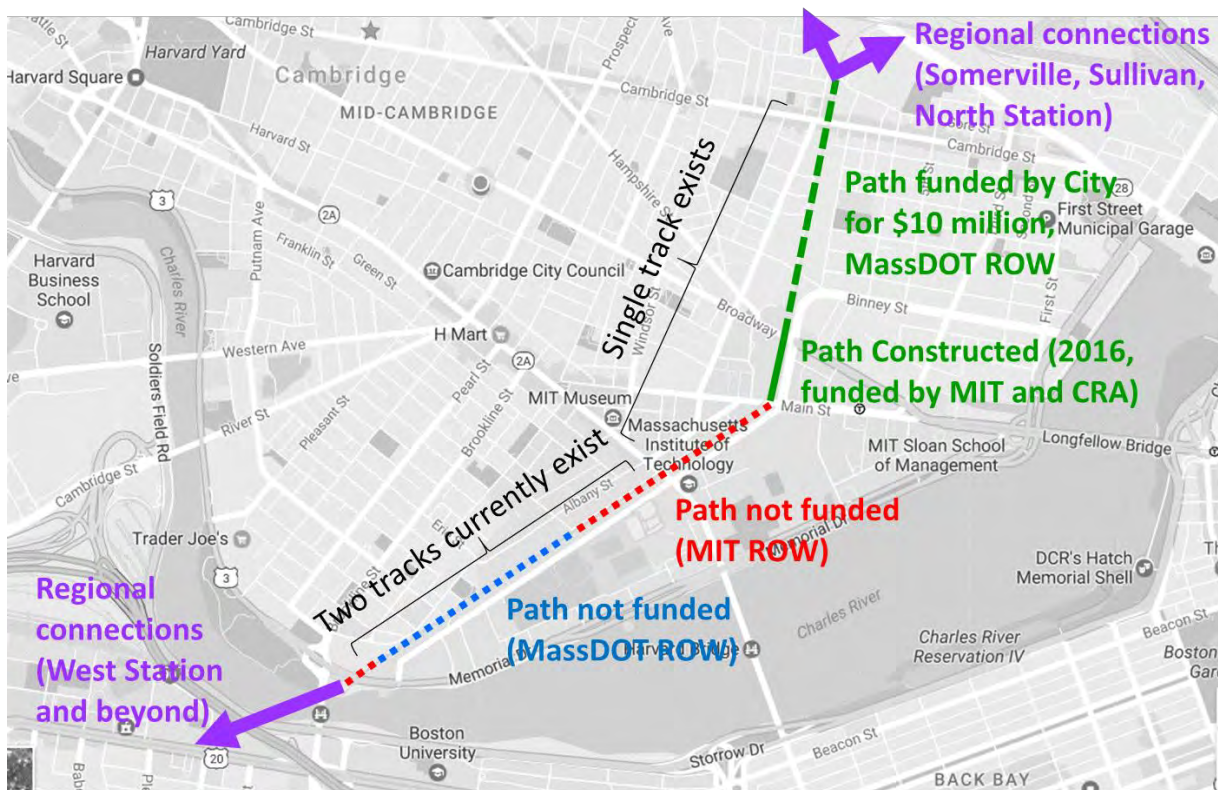


*Metropolitan Area Planning Council's map of paths, showing the Grand Junction alignment as a planned connection between Boston and Somerville. Source: <http://trailmap.mapc.org/>*



moves' between North and South Station (approximately 3-5 per day, mostly in the evenings). A single weekday local freight train has been using the Grand Junction to reach two local customers from Framingham. The future of the freight service is uncertain, but even if the freight service is discontinued, at least a single track must remain on the Grand Junction corridor to handle the MBTA commuter rail and Amtrak equipment moves. Based on current federal policy, any vehicle that shares the single track must either comply with Federal requirements for crash energy management or be strictly separated in time from trains that do comply. There are also advanced temporal separation options that require expensive technology solutions.

There are various owners along the Grand Junction right-of-way (see below), including MassDOT and MIT, which grants an easement to MassDOT and the freight carrier CSX for its use. Adjacent to the rail right-of-way are multiple property owners, ranging from larger ones like MIT and owners of commercial properties to owners of smaller residential properties.



*Grand Junction Right-of-Way: status of path, ownership, and existing tracks (Source for base map: Google Maps)*

To address the question of future transportation on the Grand Junction corridor, the Task Force engaged a consultant to perform technical analysis, the results of which are summarized in a separate technical report, and facilitate a Grand Junction mobility workshop to help the Task Force better understand technical issues and discuss the needs for the corridor.<sup>17</sup>

<sup>17</sup> Reports and presentations can be found at the KSMTF website:  
<http://www.cambridgema.gov/CDD/Projects/Transportation/kendallsquaremobilitytaskforce>



MassDOT has not made a determination to support either a multi-use path or transit in the Grand Junction right-of-way, but has agreed to work with the City of Cambridge to evaluate appropriate future uses for the Grand Junction corridor, including potential pedestrian and bicycle accommodations. The City is committed to working with MassDOT to realize a rail-with-trail facility in the Grand Junction that supports the realization of transit in the corridor in the future as demand is demonstrated and funding becomes available.

### **INITIATIVE 2.1: Convene stakeholders to collaborate on implementing the Grand Junction multi-use path**

Both wide-spread local support and a significant amount of funding are already in place for the implementation of the Grand Junction multiuse path. In 2006 the City completed a study, which established the feasibility of implementing the path, and provided technical and operational details needed to inform the design. In 2014, MIT released a feasibility study for the portion owned by MIT.<sup>18</sup> The first portion of the path has been constructed as part of the Grand Junction Park, funded by MIT and the Cambridge Redevelopment Authority (CRA) on property owned by the CRA. The second portion is being designed and constructed by the City, also on property owned by the CRA that will be transferred to the City. In 2016, the City funded the construction of the northern portion of the path from Binney Street to the Cambridge City Line.



*Example rail-with-trail paths*

Stakeholders should be convened to advance the implementation of the path in three segments.

1. The first, from Main Street to Binney Street is either constructed or under design. These segments have already been designed as 14' paths with buffers, and have left enough of an off-set from the existing tracks to allow for two track service in the future.
2. The second, from Binney Street to the Cambridge-Somerville city line, has been funded for design and construction by the City in an amount of \$10 million, but there are still various issues for a stakeholder group to discuss and develop solutions for.
3. The third, from Main Street south to the Boston city line, has not been funded nor have a detailed design been developed. This was the area of focus for the MIT feasibility study.

In addition, stakeholders need to work together to consider the regional connections to the path network and possibly in the future, a transit network. The most adjacent regional connections include

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<sup>18</sup> Both feasibility studies can be accessed at the city's project website, <http://www.cambridgema.gov/CDD/Projects/Transportation/GrandJunctionPathway>

both the funded Green Line Extension<sup>19</sup> including the Community Path extension, as well as the I-90 Interchange Project and proposed West Station<sup>20</sup> with path connections.

This stakeholder group would be established to work with the City and its consultants to:

- Clearly define the goals for the design of the path related to transit
- Work with the City to engage MassDOT in supporting the rail-with-trail treatment
- Identify and resolve next steps in the design and construction of the remainder of the path from Binney Street to the City line (the second segment)
- Engage with stakeholders to move the third segment towards implementation
- Provide input on the path design process as well as Initiatives 2.2, 2.3, and 2.4 below, including a parallel conceptual or 25% design process for transit on the corridor
- Address challenges associated with and further advocate for completion of the multi-use path through Cambridge and regional connections into Boston and Somerville, particularly in the context of the I-90 Allston Interchange and Green Line Extension projects
- Develop a strategy for improvements needed on the Grand Junction Railway Bridge for path and transit connections

*Resources required:*

- City staff time to manage both a stakeholder group and consultants carrying out the design and construction of the path

*Steps to completion:*

- Launch the stakeholder group in the fall of 2017Continue to meet as planned throughout the design process

## **INITIATIVE 2.2: Analyze the benefits of Grand Junction path connections**

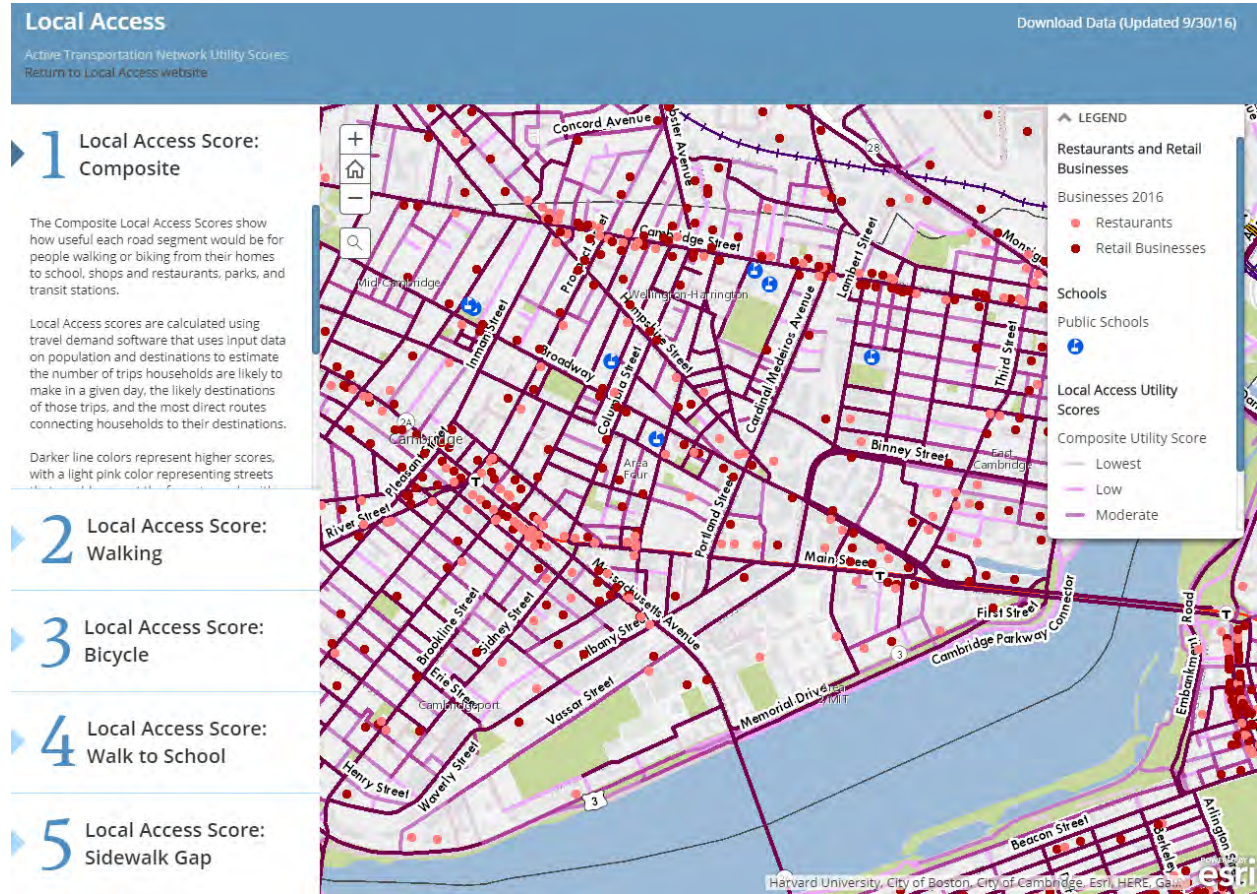
Further understanding the need for and clarifying the benefits of a multi-use path with regional connections strengthens the case for funding and constructing the Grand Junction path. As an example, Metropolitan Area Planning Council (MAPC) has developed a Local Access Score for assessing the utility of a path connection to help planning efforts related to creating a region-wide path network.<sup>21</sup> A methodology could be developed to demonstrate how the Grand Junction multi-use path would positively impact access to and from Kendall Square as well as bring about behavioral change in terms of shifting trips from driving automobiles to using the multi-use path. Such an analysis could also explore the potential economic benefits that such a path could bring Kendall Square based on other case studies done for similar path connections.

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<sup>19</sup> <http://greenlineextension.eot.state.ma.us/about.html>

<sup>20</sup> <http://www.massdot.state.ma.us/highway/HighlightedProjects/AllstonI90InterchangeImprovementProject.aspx>

<sup>21</sup> <http://localaccess.mapc.org/assets/pdfs/Technical.pdf>



Online Local Access Tool produced by MAPC (Source: <http://localaccess.mapc.org/>)

**Resources required:**

- Consultant or agency (e.g. MAPC) effort for analysis (amount and source of funding to be determined)
- City staff time in managing analysis

**Steps to completion:**

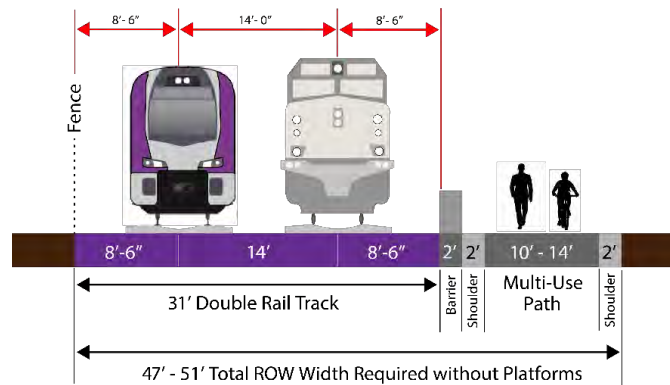
- Develop a scope and timeframe
- Identify funding source
- Engage consultant
- Communicate results

**INITIATIVE 2.3: Develop transit conceptual or 25% designs for the Grand Junction corridor**

While there is currently no commitment from MassDOT to consider future transit on the corridor, many stakeholders, including Cambridge, are interested in considering options for passenger transit in the future. To not preclude future transit service during a time when resources are limited, a conceptual or 25% design should be developed laying out an option for a two-track version of passenger service in the future. This design would be based on the assumption developed during the Task Force process that an intermediate (8-15min) service would likely be sufficient to serve needs in the corridor. There are many remaining questions, such as what types of vehicles will be used, which are affected by policy, technical,



and financial factors that could change over time. In the meantime, providing for two-track passenger service (which would also accommodate the current freight and equipment needs) and at least one station would both allow the path to be constructed without precluding such an option, as well as provide a working plan which could be used in the future if more resources become available for expanding transit service. It would be likely be beneficial to develop these plans in conjunction with the creation of new transit demand estimations (see Initiative 2.4), but they are listed as separate initiatives due to the more urgent needs to define two-track service so that the multi-use path design and construction can move forward.



*Proposed width to reserve for future two-track service and multi-use path*

*Resources required:*

- Consultant effort (amount and source of funding to be determined)
- City staff time in managing consultant

*Steps to completion:*

- Develop a scope and timeframe
- Identify funding source
- Engage consultant
- Stakeholder engagement

**INITIATIVE 2.4: Produce new Grand Junction transit demand estimations**

The current understanding of the need for transit service along the Grand Junction corridor is based on out-of-date demand analysis performed for a different process (MassDOT's Urban Ring<sup>22</sup> project). The state's Focus40<sup>23</sup> process, the 25-year capital planning process for the MBTA, is currently underway and will consider the need for "urban rail" transit service on this corridor along with others in the region. Urban rail is a more general term that refers to various possible types of service, ranging from light rail (like the Green Line), to heavy rail (like the Red Line or Commuter Rail), to cable cars or even guided bus. As the concept of transit on the Grand Junction advances in the state processes, the City should work with MassDOT to develop new demand estimates to better understand the level of need for this connection.

*Resources required:*

- City staff time coordinating with MassDOT
- MassDOT engagement of and management of consultant

<sup>22</sup> <https://www.massdot.state.ma.us/theurbanring/>

<sup>23</sup> <https://www.mbtafocus40.com/>

*Steps to completion:*

- Identify funding source
- Participation in Focus40 process (ongoing)
- Coordination with MassDOT in its various capital and service planning processes (Capital Investment Plan<sup>24</sup>, Focus40, MBTA service planning, etc.)
- Stakeholder engagement

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<sup>24</sup> <https://www.massdot.state.ma.us/InformationCenter/CapitalInvestmentPlan.aspx>

### 3. Implementation Plan: Bus

Buses are a critical piece of the MBTA network – more than one-third of all MBTA trips take place on buses, and buses tend to serve more lower income and transit dependent populations than the rest of the system. However, buses are exposed to a wide variety of challenges including delay from on-street congestion. As a result, bus service often does not measure up to the MBTA’s own service standards.<sup>25</sup>

Thirty-two MBTA bus routes pick up or drop off 80,000 riders in Cambridge based on 2014 ridership statistics. A number of bus routes serve Kendall Square and it is a busy bus layover and transfer areas. Twenty-two percent of all transit trips to the Kendall study area arrive on buses with the most on:

- MBTA Route 1 (Boston) – 6% (1,250 trips)
- EZRide – 6% (1,225 trips)
- MBTA Route 64 – 4% (775 trips)
- MBTA Route 85 – 3% (625 trips)

Of those bus trips, about 19% of passengers entering Kendall Square are transfers to the Red Line. The other 81% have destinations in or around Kendall or are potentially transferring to another service. According to a survey that employers carry out as part of the City’s Parking and Transportation Demand Management requirements, the greatest concentration of surveyed employees come from Cambridge, Boston, Somerville, and Arlington. Employees living reasonably close to the Red Line are likely taking it, but many parts of these municipalities are not necessarily near the subway.

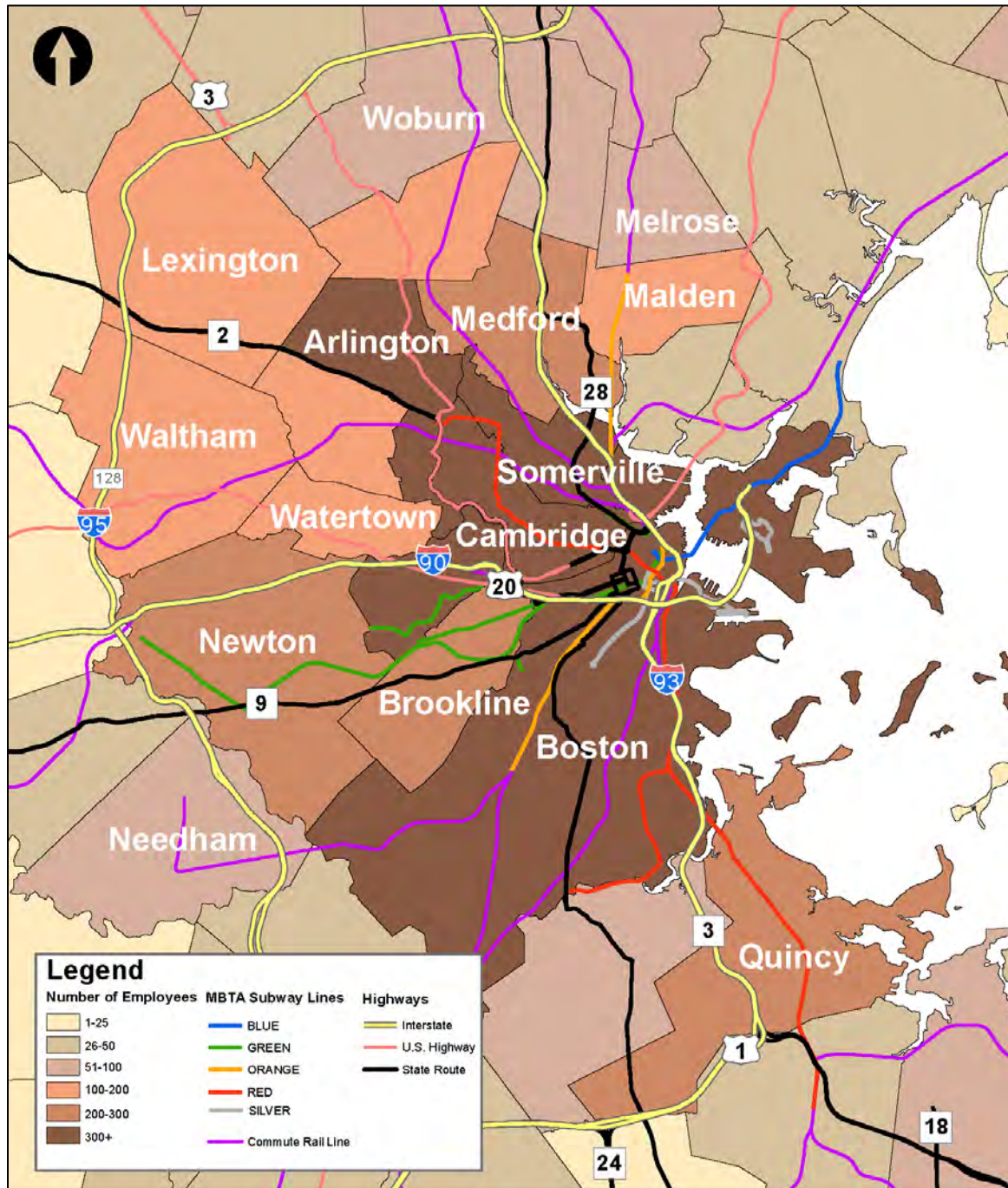
To meet the demand for and improve connections to Kendall Square, the Task Force focused on a few key problems for buses:

- Service planning for buses has not occurred for over eight years
- There are gaps in connectivity to Kendall Sq. (Allston/Brighton and Back Bay)
- Connectivity is inadequate (slow, indirect) to other areas (North Station, other parts of Cambridge, Somerville)

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<sup>25</sup> See the MBTA’s “State of the System: Bus” report at <https://www.massdot.state.ma.us/Portals/49/Docs/Focus40BusReport.pdf>





*Kendall Square employee origins (by zip code) from PTDM survey data*

To address these challenges, The Task Force explored opportunities to improve service for buses going into and out of Kendall Square through routing changes, increases in frequency, and priority treatments for buses. The Task Force developed two scenarios, described in the table below, and Central Transportation Planning Staff (CTPS) used the regional travel demand model to analyze ridership and other impacts from those scenarios. The “constrained” scenario assumes that no new resources are available, and any change would have to be revenue neutral. The unconstrained scenario assumes that

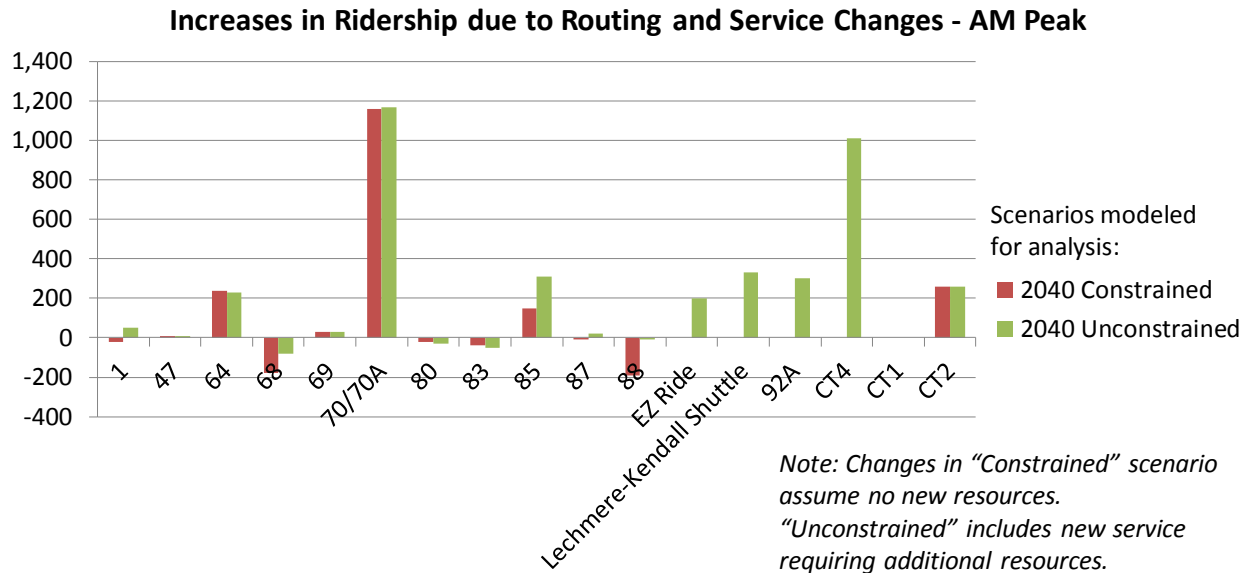
additional resources are available. Both scenarios assume that the Green Line Extension is built, and were compared in 2040 to the 2040 “no-build”, which includes growth in development and trips, but assumes no changes in the transportation infrastructure.

Improvement Type	Route	Proposed Scenario - Constrained	Proposed Scenario - Unconstrained
<i>Description</i>		<i>Assume GLX is in place. These could be implemented in the shorter term, but will be modeled in 2040 for comparison purposes.</i>	<i>Assume GLX is in place. These could be implemented whenever funding or resources are identified, but will be modeled in 2040.</i>
Connections to Charlestown	92	N/A	Create a "92A" (similar to 92, but different service entirely): Add 22 weekday peak trips in each direction between Assembly (serve station) and Kendall via EZRide routing (headway ~ 15 min).
Connections to Somerville/Medford	88	Reroute all trips each way to/from Kendall instead of Lechmere via Columbia and Windsor, similar to CT2, and only making stops that the CT2 makes south of McGrath. Frequency would be reduced (about 30%) to adjust for increased cycle time (from about every 16 minutes in the peak to every 21 minutes). Off-peak headways would remain the same.	Reroute all trips each way to/from Kendall instead of Lechmere via Columbia and Windsor, similar to CT2, and only making stops that the CT2 makes south of McGrath. Frequencies would match the present service (about every 16 minutes in the peak).
Connections to Somerville/Medford	87	Reroute all trips each way to/from Kendall instead of Lechmere via Columbia and Windsor, similar to CT2, and only making stops that the CT2 makes south of Union Square. Frequency would be reduced (about 15%) to adjust for increased cycle time (from about every 21 minutes to every 25 minutes in the peak). Off-peak headways would increase by 5 minutes.	Reroute all trips each way to/from Kendall instead of Lechmere via Columbia and Windsor, similar to CT2, and only making stops that the CT2 makes south of Union Square. Frequencies would match the present service (about every 21 minutes in the peak).
Operational improvements	85	Stop consolidation and TSP at key intersections	Stop consolidation and TSP per 'constrained' scenario. Decrease peak period headway from 25 to 15 minutes, and off-peak frequency from 30 to 20 minutes.
Connections to Cambridgeport/Allston/Brighton	70/ 70A	Extend 13 trips per direction per weekday peak period trips to Kendall, via Mass Ave, Main St, and Portland, returning via Portland, Albany, Mass Ave, Lansdowne, Franklin, Sidney, and Green. This is allowed in the constrained scenario by the elimination of 68 service.	Extend all trips to Kendall, following the same routing and stops as the constrained scenario from Central. Combined, the 64 and 70/70A provide 8 buses per hour between Central and Kendall (7.5 min headways) during the peak.

Re-allocate service	68	Eliminate service (in favor of extending the 70/70A). Please note that the City does not endorse removal of this service, which is being done for the purposes of modeling tradeoffs in the constrained scenario.	Same as current service.
Connections to Cambridgeport/Allston/Brighton	64	Reroute 16 peak period trips ONLY each way between Kendall and Central (~ every 15 min) 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.	Operate all 37 weekday trips to Kendall, following the same routing and stops as the constrained scenario from Central. Combined, the 64 and 70/70A provide 8 buses per hour between Central and Kendall (7.5 min headways) during the peak.
Connections Sullivan-Back Bay or Longwood	CT4	N/A	This route will connect Sullivan and Kenmore via Lechmere and Kendall from Sullivan across a future connection from Inner Belt Road to McGrath Highway, First Street, Binney, Third, Main, Vassar, and Mass Ave towards Kenmore. Headways: 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.
Connections Lechmere-Kendall	Lechmere-Kendall Shuttle	N/A	This route will connect Lechmere and Kendall in the peak only, via First Street, Binney, and Third, looping via Main and Broadway. Headways: 15 minutes in the AM peak, with the first trip departing at 6:30 AM and the last at 9:00 AM, and 15 minutes in the PM peak, with the first trip leaving at 3:30PM and the last at 6:00 PM.
Connections North Station-Kendall	EZ Ride	N/A	Decrease peak period headway from the current 7 minutes to 4 minutes. Decrease midday headway from the current 20 minutes to 15 minutes. Assumes a reduction in travel time due to possible transit priority treatments on First and Binney.

Some changes proposed in the scenarios, such as the modified 87 and 88 routes, were intended to respond to the new network resulting from the Green Line Extension. The changes were only explored because of their specific potential relevant to Kendall Square; more detailed service planning is needed to adjust bus routes in response to the new Green Line service. The Task Force supports the MBTA carrying out this effort.

CTPS used the regional model to estimate ridership changes from the routing and service changes for the routes in each scenario.<sup>26</sup> These ridership estimates are based on implementing the entire set of changes for each scenario, so the potential interaction between the proposed changes was discussed. The absolute change in ridership for one of the peaks is shown below, and analysis and discussion of these results led to the initiatives described in this section.



*Absolute ridership changes for two scenarios compared to the "no-build" 2040 base case, estimated from the CTPS regional model*

The Task Force also explored potential bus priority treatments (both bus lanes and signal priority) on First Street, Binney Street, and Third Street, and the model incorporated assumptions of travel times changes for the affected routes. The process included analyses to estimate traffic and curb use impacts for implementing the priority treatments. Multiple options for how the bus lanes could be laid out were considered, since on First and Third it is not possible to have a full bus lane in each direction while retaining the current two-way general traffic lanes and bicycle facilities. Rough concepts were produced to show how a priority treatment could fit into the existing cross-section of each roadway, along with proposed bus stop locations and next steps for further analysis.



*Example of a bus priority treatment (bus only lane)*

<sup>26</sup> See CTPS Technical Memorandum, March 31, 2017, "Kendall Square Mobility Task Force Modeling".



During the Task Force process, the Fiscal and Management Control Board began exploring more comprehensive options for systematic service planning<sup>27</sup> and the Task Force hopes the ideas presented in this plan are considered. It is possible that the FMCB will approve a system-wide service planning approach with recommendations that are implemented in stages by garage. The routes included in these recommendations are based in the Charlestown (Route 92), Somerville (Routes 64, 68, 70/70A, 85, 87, 88), and a new CT route (CT4) could possibly be operated out of the same garages as the other CT routes (Albany). According to the presentation to the FMCB, these garages would likely be included in the first four out of six in a rolling plan. ***The initiatives described in this implementation plan only reflect selected priorities in Kendall Square resulting from this process and do not represent an overall strategy or prioritization for bus service in the city.***

### **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 unappealing, and that Third Street may or may not be the best routing for buses in the long term.

In order to advance a viable concept for the bus priority treatments on First and Binney, further work needs to be done to develop a case for the benefits. Part of making this case will include better understanding the implications for current curb uses or other space that might be reallocated for bus priority. This effort should be carried out before completing a more detailed design that safely incorporates bicycle facilities. In conjunction with this effort, other complimentary bus priority treatments, such as on Broadway, as well as other improvements like moving and consolidating bus stops, are being explored as part of the Binney Street design process.

While the Task Force considered this an important effort, upcoming developments such as the Volpe site, which has been purchased by MIT, will have a significant impact on the roadway network, and it will be difficult to make more progress before the concepts for the modified road network are explored further.

#### *Resources required:*

- Consultant effort (amount and source of funding to be determined)
- City staff time in managing consultant

#### *Steps to completion:*

- Determine scope, cost and timeframe
- Identify funding source
- Engage consultant
- Ongoing coordination with design of relevant streets (e.g. Binney Street) to incorporate or not preclude transit priority treatments as appropriate
- Public and stakeholder engagement

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<sup>27</sup> See the March 2017 presentation to the Fiscal and Management Control Board:  
[http://www.mbtta.com/uploadedfiles/About\\_the\\_T/Board\\_Meetings/J.FINAL\\_ServicePlan\\_March272017\\_2.pdf](http://www.mbtta.com/uploadedfiles/About_the_T/Board_Meetings/J.FINAL_ServicePlan_March272017_2.pdf)

### **INITIATIVE 3.2: Implement stop consolidation and signal priority for the common CT2/85 corridor from Union 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.

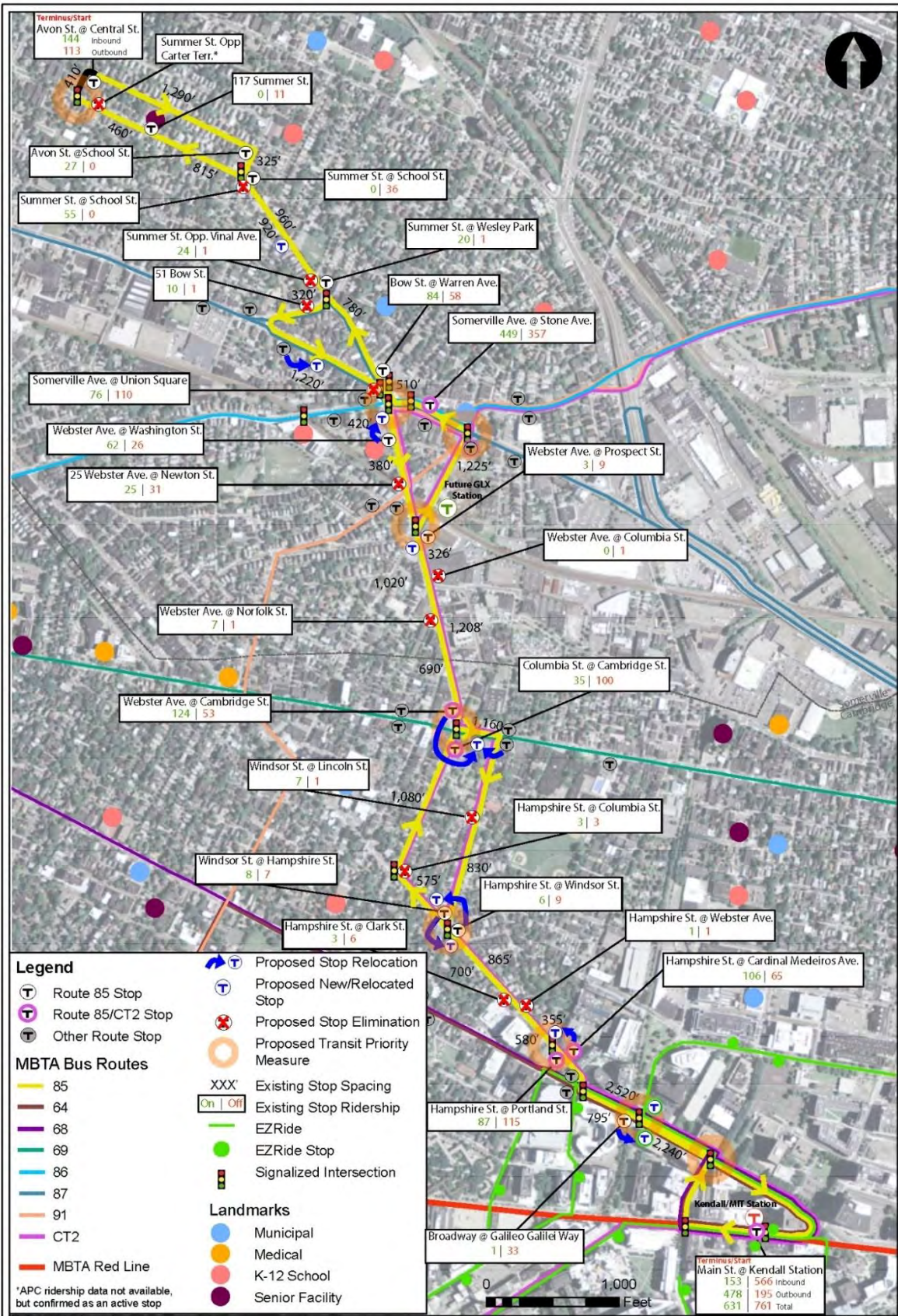
#### *Resources required:*

- The estimated incremental O&M costs for the MBTA to increase the Route 85 service given these capital improvements is about \$420,000
- The amount of the capital costs and source of funding are to be determined

#### *Steps to completion:*

- Share results with Somerville for locations in those municipal boundaries and coordinate regarding the Union Square reconstruction
- City staff to review recommendations for stop relocations and Transit Signal Priority and coordinate with MBTA on implementation, including any public process required
- Identify where capital investment will be required to make proposed new stops accessible
- Engage consultant in further analysis and design of recommended queue jump locations





Kendall Square Mobility Task Force  
 Figure 2  
 Route 85 Proposed Bus Stop Optimization Plan  
 Draft 9/23/16



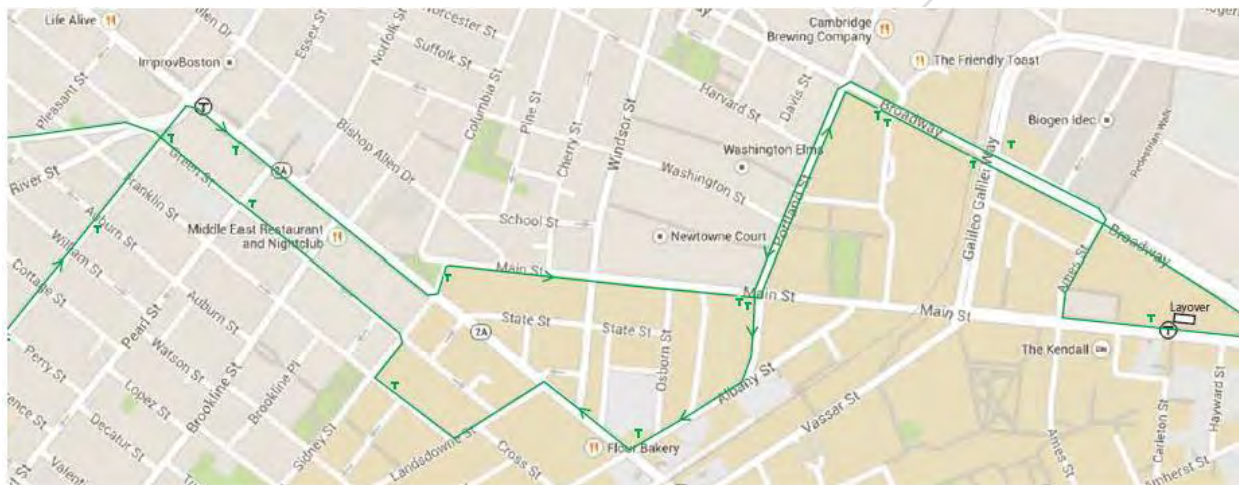


### INITIATIVE 3.3: Pilot extended 64/70/70A into Kendall Square

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.

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.



*Recommended common corridor for Routes 64 and 70/70A between Central and Kendall*

#### *Resources required:*

- The estimated incremental O&M costs for the MBTA to extend both the 64 and 70/70A into Kendall at these frequencies is about \$1.36 million

#### *Steps to completion:*

- Coordinate with the MBTA and its service planning process, including any public process required

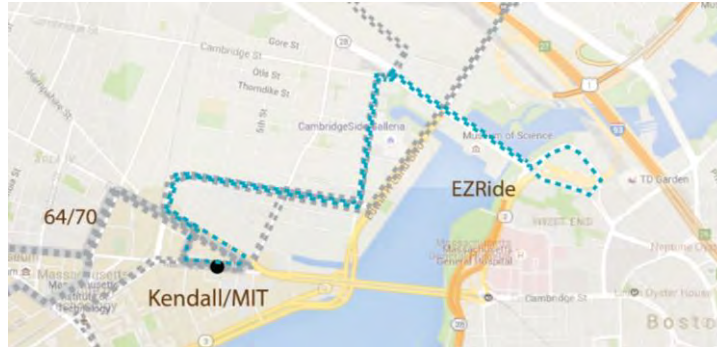
### INITIATIVE 3.4: Increase EZRide shuttle service

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 times 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.



*Proposed direct EZRide routing*

*Resources required:*

- Additional resources (amount and source of funding to be determined) will be needed to operate additional EZRide service
- Consultant effort (amount and source of funding to be determined) to analyze the impact of some trips providing direct service from North Station to Kendall

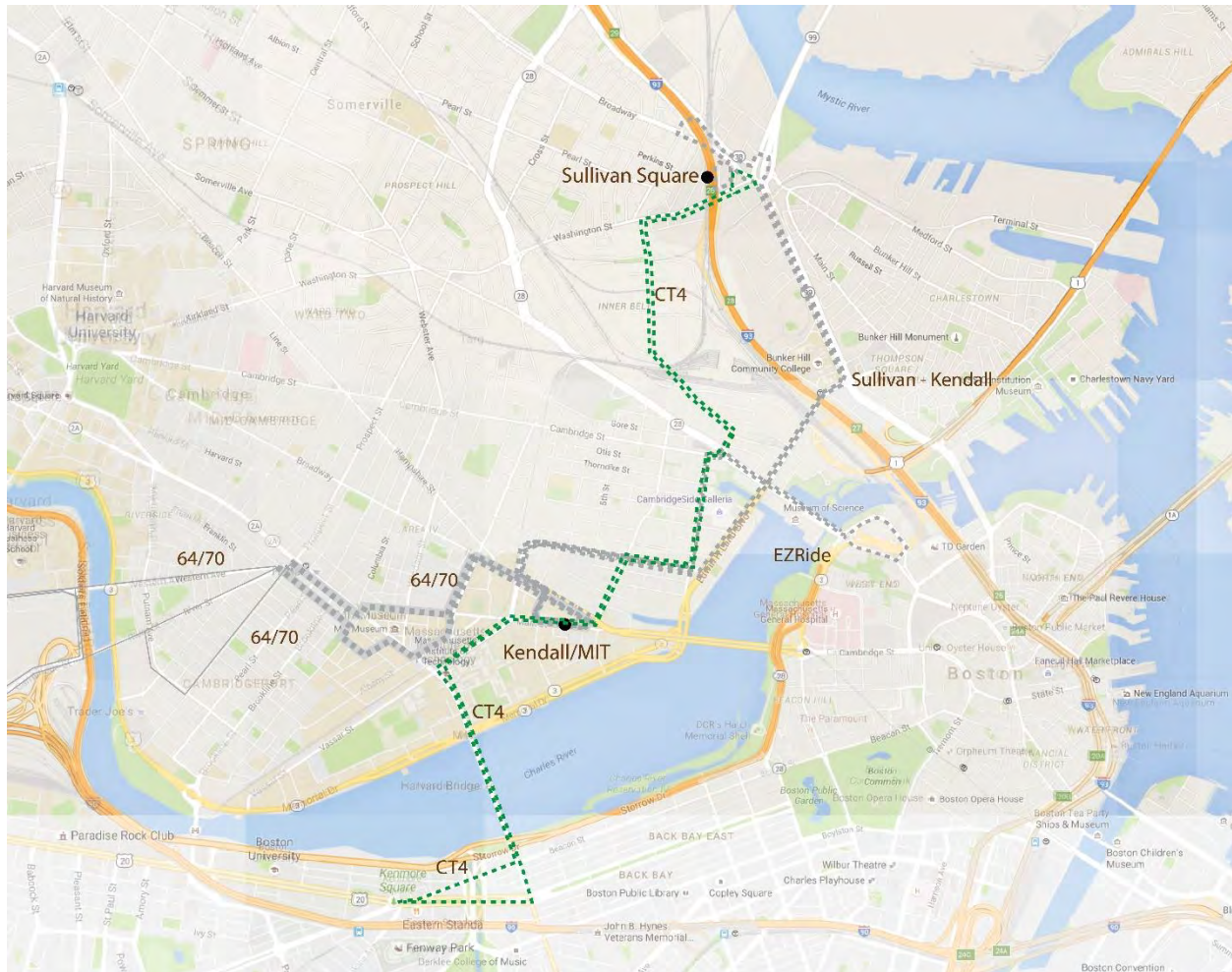
*Steps to completion:*

- Charles River TMA to determine operational and financial opportunities for service expansion

**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 (see map below). 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.



*Proposed new Route CT4 routing*

**Resources required:**

Operating new service requires significant resources in terms of capital (e.g., vehicles) and ongoing operations and maintenance (O&M) (e.g., drivers and vehicle maintenance). At the moment, there is no commitment for MBTA to take on new routes as part of their service. If so, another avenue for providing the service would have to be explored, and the amount and source of funding would be to be determined.

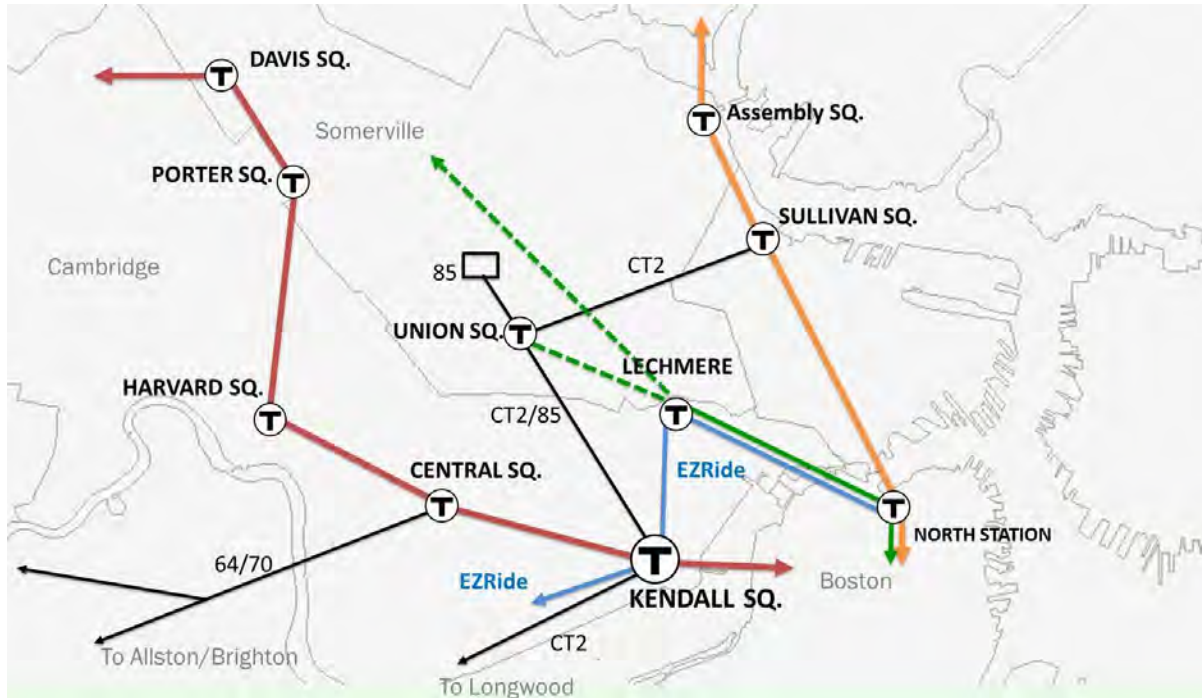
- The estimated incremental O&M costs for the MBTA to provide the new CT4 service is over \$5million
- Capital costs and source of funding to be determined

**Steps to completion:**

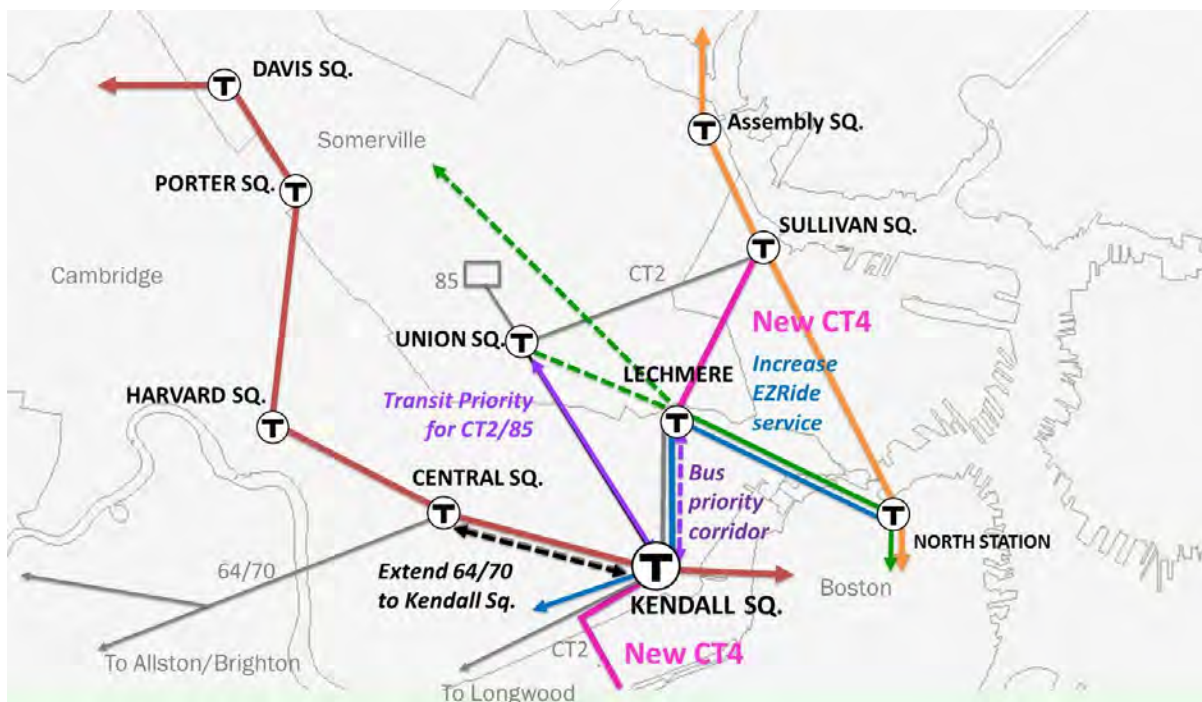
- Include service in MBTA service planning process, including any public process required
- Explore alternative options for operating and funding service outside of the MBTA service planning process, if required



Simplified Graphic Demonstrating Bus Service Initiatives (as presented at February 2017 public meeting)



Existing Conditions (including planned Green Line Extension in dashed green)



Proposed Improvements

## 4. Implementation Plan: Ride-hailing services and shuttles

Recently, we have seen an increase in the availability of new kinds of transportation services, particularly what are called Transportation Network Companies (TNCs) or ride-hailing services.<sup>28</sup> These services have existed for less than ten years and typically involve non-commercial vehicles that connect drivers directly to passengers through mobile phone applications to provide point to point transportation. They can also involve combining trips with other passengers to lower the cost of the service. They utilize dynamic pricing, with peak times being more expensive than off-peak. The largest and most widely known of these companies include Uber and Lyft.

Since these services are still relatively new, there is a not yet consensus on approaches and the degree to which services should be regulated. Cambridge, among other cities, is thinking about the opportunities and challenges presented by these services now, as well as what they might be in the future, particularly as they could incorporate coming technology, such as autonomous vehicles. The fast-changing nature of the industry makes it challenging to plan for.



*Uber and Lyft are the two largest and best known Ride-hailing companies in the U.S.*

While it is generally acknowledged that these services can fill important gaps in transit service and potentially decrease the need for individual vehicle ownership, many questions remain about the services' impact on the urban transportation system and environmental concerns like vehicle miles traveled and greenhouse gas emissions. Up to this point, it has been challenging to gather information needed to address such questions.

Over the last few years Bridj, a service that lies somewhere between a usual transit service and a ride-hailing service, serving the Kendall Square area was launched and failed. It called itself "pop-up mass transit", using branded vans instead of buses to provide service that was purported to be more on-demand. It allowed riders to select where they want to go using a smart phone app and then pooled them with other riders at a larger scale than Uber and Lyft because of the use of larger vehicles. While the service only operated a few routes connecting Boston and Cambridge, it was more adaptable and changeable than traditional fixed route transit service.

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<sup>28</sup> For a good background on these services see NACTO's 2016 paper called "Ride-hailing Services: Opportunities and Challenges for Cities", <http://nacto.org/wp-content/uploads/2016/06/Policy-Ride-Hailing-Services-2016.06.pdf>





*Former Bridj routing. Source: <http://www.bridj.com/greater-boston-service-area>*

Finally, Kendall Square is also served by a large number of shuttles. One of these, the Charles River Transportation Management Association’s EZ Ride shuttle, provides high frequency service between North Station and Cambridgeport on weekdays during the peak and is open to the public. Other shuttles serve one or more private companies and only employees are able to board. In total, analysis done for the KSMTF process estimated that these shuttles could be providing more than 350 vehicle trips in and out of Kendall each weekday.

#### **INITIATIVE 4.1: Collect data to better understand ride-hailing services**

The co-chairs of the Kendall Square Mobility Task Force were each able to meet with a representative from the two largest ride-hailing services, Uber and Lyft. At these meetings, challenges and opportunities related to the services were discussed, and data were requested from the ride-hailing companies. Uber provided some anonymized data aggregated to show where trips start and end when coming to and leaving Kendall Square. This showed concentrations of trips come from Harvard, Central, and Back Bay to Kendall (among other locations) and well as from Kendall to Back Bay, downtown, and the airport.

##### *Resources required:*

- City staff time
- Amount needed and source of funding for further study to be determined

##### *Steps to completion:*

- City staff to coordinate with City Licensing Commission
- Coordinate with regional entities to launch a more comprehensive data collection effort
- Continue to meet with service providers to understand challenges and opportunities, and gather more information

**INITIATIVE 4.2: Develop policy recommendations related to ride-hailing services**

The NACTO report referenced provides us with a number of relevant regulatory questions related to safety, data and analysis, leveling the playing field between competitors from a regulatory perspective, equity and accessibility. While some of these questions may be best answered at a regional or state-wide level, many of the questions need to be explored at the municipal level. At some point, Cambridge will need to develop recommendations on how to address both ride-hailing services and emerging technologies like autonomous vehicles from a regulatory and policy perspective to ensure that these services and technologies contribute to creating a more sustainable multi-modal transportation system.

*Resources required:*

- City staff time

*Steps to completion:*

- Participate in regional conversations to develop policy recommendations

**INITIATIVE 4.3: Explore opportunities for increased efficiency of shuttles**

Increasing the efficiency of shuttle services would likely help decrease congestion and greenhouse gas emissions in Kendall Square. A study should be carried out to explore possibilities for making shuttles more efficient, including possibly consolidating shuttles, such as what is being explored in Boston's Seaport area.

*Resources required:*

- Consultant effort (amount and source of funding to be determined)
- Joint effort between city staff and groups like Kendall Square Association to manage consultant

*Steps to completion:*

- Develop a scope and timeframe
- Identify funding source
- Engage consultant



June 6, 2022

Ms. Cecelia Cobb  
Project Manager  
Cambridge Redevelopment Authority  
255 Main Street  
Cambridge, MA 02142

**Subject: Grand Junction Corridor Transit Study  
Scope and Budget Proposal**

Dear Ms. Cobb:

WSP USA, Inc. (WSP) has prepared the attached scope and budget for conducting an evaluation of engineering feasibility and potential ridership demand for a new transit service that would operate on the Grand Junction Railroad corridor through Cambridge and the Allston and North End neighborhoods of Boston.

WSP has provided a scope of work below. Our proposal covers the following principal tasks:

- Existing Conditions Analysis
- Alternatives Development
- Transit Demand Analysis
- Infrastructure Needs and Operational Analysis
- Final Report
- Project Management and Coordination

WSP proposes to deliver these services on a time-and-materials basis up to a limit of \$299,950. Upon execution of an agreement, we are prepared to begin work immediately, and to deliver the study analysis and deliverables over the course of four months.

Please contact me at 617-960-4861 or [rachel.burckardt@wsp.com](mailto:rachel.burckardt@wsp.com) with any questions.

Kind regards,

Rachel Burckardt, PE  
Project Manager

Encl.  
cc: J. Grenier, D. Baker, WSP



# Grand Junction Transit Study

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## OVERVIEW & OBJECTIVE

Identify feasible options for a rail transit service along the Grand Junction rail line connecting, at a minimum, Allston/West Station, Cambridgeport, the Massachusetts Institute of Technology (MIT), Area 4/The Port, Kendall Square, North Point, and North Station. or nearby location The Study would evaluate issues related to corridor right-of-way, service characteristics (vehicle technology, stations served, frequency), and potential ridership.

## TASK 1 – EXISTING CONDITIONS

### 1.1 KICKOFF MEETING

Prepare agenda and set up initial Kickoff Meeting.

### 1.2 DATA ACQUISITION

While WSP has many documents related to the Grand Junction line (e.g., track charts, VAL plans), other relevant information and current data to be gathered includes:

- Aerial mapping (MassGIS)
- Property plans (Cambridge Assessor’s on-line)
- Recent traffic data for major cross streets:
  - Massachusetts Avenue
  - Main Street
  - Broadway
  - Binney Street
  - Cambridge Street
  - Gore Street/Medford Street
- Relevant portions of MBTA Rail Vision related to the Grand Junction
- Reports and planning for the Grand Junction Multi-Use Path
- Transit ridership data, including MBTA data and relevant private services if available (e.g., EZ Ride shuttle)
- Data from the Kendall Square Business Association, including land use, residents, employees, travel patterns, etc.
- Travel data for study corridor
  - Pre-mode choice model Origin – Destination data from the Central Transportation Planning Staff (CTPS), including latest data from the Allston Interchange study
  - Any additional Origin – Destination survey or analysis for the study corridor

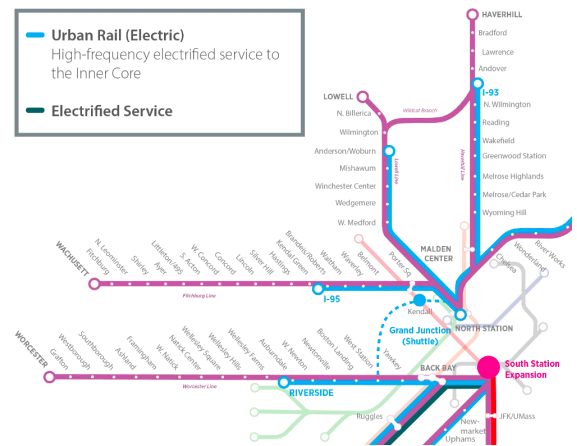


Figure 1: Grand Junction in Context of RailVision Study

### 1.3 SUMMARY OF EXISTING CONDITIONS

Prepare brief technical memorandum summarizing existing conditions on the Grand Junction, using maps and diagrams.

- Transportation system
  - Rail network
    - Current rail operations
    - Current track configuration
    - Grade Crossings
    - Longitudinal utility occupancies
  - Multimodal transportation network
    - Roadways
    - Public transit infrastructure and services
    - Bicycle and pedestrian network
- Adjacent land uses
- Geotechnical data
- Environmental data:
  - Wetland Resource Areas (associated with Charles River)

### 1.3 SUMMARY OF PREVIOUS STUDIES

Prepare brief technical memorandum with a high-level summary of existing operations, proposals for transit service on the Grand Junction, and other relevant planning and development efforts.

- Grand Junction Multi-Use Path – Feasibility Study
- MassDOT proposal for commuter rail (Worcester to North Station)
- Grand Junction shuttle (e.g., “Brain Train”, North Station – West Station Shuttle, etc.)
- Allston Interchange/West Station – including current Allston Interchange study
- Massachusetts Bay Transportation Authority (MBTA) Rail Vision
- Kendall Square Mobility Task Force Reports including the Grand Junction Feasibility Study
- Grand Junction Railroad shared use path studies
- Various TIS and MEPA documents from development projects near the study corridor

## TASK 2 – ALTERNATIVES DEVELOPMENT

The Study will examine up to three (3) operations alternatives that represent a set of feasible approaches to providing passenger rail service on the Grand Junction.

## 2.1 UNIVERSE OF OPERATIONS ALTERNATIVES

WSP will identify a wide variety of potential approaches to a transit service in the Grand Junction Railroad corridor. This universe of alternatives can be described by a range of values for the relevant service parameters that comprise the following service characteristics:

- Mode
- Equipment
- Service Route(s)
- Headway
- Station amenities

### 2.1.1 MODE

WSP will evaluate a range of transit modes that would be feasible for operation on the Grand Junction:

- **Commuter rail:** included for “completeness” since it was considered in a previous MassDOT feasibility study. However, that study revealed that this mode is not well suited for the operating environment of the Grand Junction.
- **Urban rail:** a hybrid using equipment compatible with commuter rail operations but operated on rapid transit headways. This could be a through transit line or a shuttle (West Station to North Station) as described in the MBTA RailVision Study (See Figure 1 on page 4.)
- **Light rail:** using equipment similar to the Green Line, this could be a branch of the Green Line or a shuttle (as described in the MBTA RailVision Study) , or possibly a ring system providing multiple connection points.

### 2.1.2 EQUIPMENT

Equipment alternatives correspond to mode. We recommend consideration of the following equipment alternatives:

	EMU <sup>a</sup>	Battery/Electric	Diesel-Hauled
Commuter Rail <sup>1</sup>	X	X	X
Urban Rail	X	X	X
Light Rail	X	X	
<sup>a</sup> EMU – Electric multiple unit self-propelled vehicles			

<sup>1</sup> Commuter rail is included for the sake of thoroughness, as it was considered in a previous MassDOT feasibility study. However, that study revealed that this mode is not well suited for the operating environment of the Grand Junction.

This section would include a discussion of the FRA's regulatory role in passenger rail operations on freight lines, as well as the issues related to FRA-compliant and non-compliant vehicles. For the purposes of this study, *only FRA-compliant vehicles will be considered.*

### 2.1.3 SERVICE ROUTE(S)

#### PRIMARY SERVICE CORRIDOR

WSP will evaluate service connections on the **Primary Service Corridor** that runs from **Allston/West Station** through Cambridge and connecting to **North Station** in Boston.

#### CONSIDERATION OF EXTENSIONS TO PRIMARY CORRIDOR

While our focus will be on the Primary Service Corridor, WSP will also consider potential connections beyond the primary corridor. WSP will review previous studies that have looked at additional connections, such as:

- West Station – Kendall Square (for light rail, this includes Main St. spur)
- West Station – Everett/Chelsea
- West Station – Lynn (or Salem or Beverly) via Kendall Square
- Riverside – North Station (includes stops at the Newtons)
- Riverside – Lynn (includes stops at the Newtons)
- Back Bay/Lansdowne – North Station (via “completing the wye” between the Grand Junction and Worcester mainline)

The review of potential extensions to the Primary Service Corridor will be focused on the access and mobility benefits from these services for both existing demand (that would shift from other modes or transit services) as well as incremental ridership from new development in and around the corridor. For example, a possible extension to Everett, Chelsea, Revere and Lynn could provide improved connectivity and transit travel times for existing riders of other services, as well as new connection to areas where development potential exists. This would add the benefit of transit connectivity to Kendall Square (as a technology hub) while also providing an incremental increase in ridership.

### 2.1.4 HEADWAY

WSP will review potential service frequencies and headways (time interval between trains) and develop a set of alternatives that represent different approaches to service frequencies. We will consider three headway scenarios:

- Urban Rail (similar to Fairmount Line) headways of 20 minutes at peak periods and 30 minutes otherwise.
- Rapid Transit, Branch Service (similar to the Red Line Braintree Branch or Green Line surface branch) headways of 8 to 10 minutes at peak periods and 15 to 20 minutes otherwise.
- Rapid Transit (similar to the Orange Line or Red Line) High-frequency service with 5-minute headways from morning peak (6 am) through the day and evening peak (to 7 pm) and lesser headways (7 to 15 minutes) otherwise.

## 2.2 SHORT LIST OF OPERATIONS ALTERNATIVES

Based on the parameters described in Task 2.1, WSP will identify up to three (3) service alternatives for further consideration. The selection process will entail two (2) workshops with the client team.

## 2.3 STATIONS

### 2.3.1 STATION SIZES

For each short-listed alternative mode (i.e., urban rail, light rail), WSP will define typical station parameters such as minimum platform length and width. For this level of planning, station siting and design will be at a conceptual level. Nevertheless, station siting and design will reflect MBTA criteria for Americans with Disabilities Act (ADA) accessibility, including ADA accessible vertical circulation and platforms that are level with the floor of the vehicle for the “full length” (i.e., have a length equivalent to the length of the train).

### 2.3.2 POTENTIAL STATION LOCATIONS

WSP will identify potential location for stations based on the following parameters:

- Length of the corridor
- Appropriate station spacing for the transit mode and vehicle technology
- Adjacent land uses and activity centers
- Surrounding roadway infrastructure, buildings, and access points
- Platform length and width
- Feasibility of platform siting
- Consideration of major known utilities (i.e., steam line, communications line)

Station locations may include:

- Cambridgeport
- Massachusetts Avenue
- Kendall Square
- Cambridge Street/Gore Street vicinity
- North Point/Cambridge Crossing vicinity

### 2.3.3 STATION AMENITIES

Define typical station amenities including canopies, seating, signage, audible notification systems, lighting, security, etc.

## 2.4 SUMMARY MEMORANDUM

WSP will develop a summary memorandum which defines the service alternatives and the characteristics of each.

## TASK 3 – TRANSIT DEMAND ANALYSIS

WSP will develop an estimate of ridership demand for three service plans.



### 3.1 RIDERSHIP PROJECTIONS

WSP will develop projections of anticipated ridership. Primary categories of riders that are expected will include:

- Local travel between Kendall Square, MIT campus and Allston Landing (area including the expanding Harvard campus in Allston)
- Commuter travel making connections at North Station and West Station:
  - Commuters from Boston and Brookline transferring from the Green or Orange Lines at North Station
  - Commuters from North Side commuter rail lines transferring at North Station
  - Commuters from the Worcester/Framingham commuter rail transferring at West Station.

Ridership in each of these categories will depend on the extent and characteristics of the rail service – including frequency, travel time and transfer time – as well as the relative competitiveness of rail versus alternative modes. (i.e., existing transit options, driving, rideshare, bicycle, walking).

The analysis will build upon available ridership and travel data. to be supplemented with evaluation using one additional simple ridership models.

The ridership projections will use a variety of data and ridership projections. The data will include land use and travel demand projections developed by the CTPS, but the analysis will not depend solely on CTPS data. The ridership projections will also take into account actual ridership for comparable transit services and will reflect travel demand growth generated by ongoing and planned development (residential and commercial) where trips will have one O-D link to the planned stations served by a Grand Junction passenger operation.

- Existing Ridership Model Results. Estimates of potential ridership will be generated by interpolating from ridership projections already developed for similar service types, adjusting mode splits for travel in well-defined origin-destination (O-D) markets based on changes in relative frequency, time and cost, and direct travel market size and rail share estimates for markets that are less well defined but where comparable service choices are available for other local O-D pairs.
- Supplemental Ridership Models. One supplemental modeling tool will be used to generate alternate ridership projections. This will enable an evaluation of the potential range of ridership for this corridor and the sensitivity of ridership modeling results to type of modeling tool and modeling assumptions. Potential models that may be used include the following:
  - Simplified Trips-on-Project Software (STOPS), a federal modeling tool. This is a relatively new, simplified four-step travel demand modeling tool. It has limited application for mature dense urban areas, such as the Grand Junction rail corridor, but we will investigate the potential for its applicability.
  - FBEST, a simplified ArcGIS-based transit modeling tool that was recently released by the Florida Department of Transportation (FDOT) and the Center for Urban Transportation Research (CUTR).
  - Elasticity-based analysis of existing MBTA services. There are established elasticities that the MBTA uses to predict ridership changes from modifications to frequencies and travel times.

- Other potential “sketch” modeling approaches can be evaluated for their applicability to the Grand Junction corridor.

## 3.2 SUMMARY MEMORANDUM

WSP will develop a summary memorandum on the ridership forecasting process and findings.

## TASK 4 – INFRASTRUCTURE NEEDS AND OPERATIONAL ANALYSIS

WSP will complete an assessment of infrastructure needs and an operational analysis for each of the short list of three (3) operations alternatives. The infrastructure and operational evaluations will be conducted in concert, because the two issues are interdependent. Given the commitment of MassDOT and the City of Cambridge for a two-track Grand Junction, all analyses will consider only a two-track facility between the Charles River crossing and the Fitchburg Mainline rail corridor approaching North Station.

### 4.1 DEFINITION OF RAIL INFRASTRUCTURE IMPROVEMENTS

The existing Grand Junction is a “dark,” FRA Class 1 railroad, meaning it currently has no signal system and operations are limited to 10 mph for freight and 15 mph for passenger. Any proposal to add passenger rail operations will assume infrastructure improvements to track and signals (including mandatory positive train control, or PTC), as well as traction power if electric-powered vehicles are used.

#### 4.1.1 TRACK IMPROVEMENTS

This section will evaluate track improvements including:

- Additional track construction to create a two-track corridor
- Replacing obsolete infrastructure such as jointed rail with continuously welded rail (CWR)
- Modifications to the interlocking (the facility of switches and signals enabling trains to safely proceed from one track to another) connecting to the Fitchburg Mainline and the Worcester/Framingham Line, other interlocking locations as necessary.
- Feasibility of and identification of capacity enhancements to the Fitchburg Mainline between the Grand Junction and North Station location.
- Interlocking and crossovers to support the proposed operations.
- Bridge upgrades across the Charles River at the BU Bridge and North Station

#### 4.1.2 SIGNAL IMPROVEMENTS

This section will address adding a train control system to the line, suitable to the technology evaluated. At a minimum, this would include a Positive Train Control (PTC) overlay for the commuter and urban rail modes. Options to provide comparable train separation for Light Rail operation will be evaluated.

While consideration of ATO (automatic train operation) could be considered, to date, ATO is limited to “closed” systems without grade crossings or the opportunity for pedestrian intrusions. ATO technology is under development and being tested for automobiles and truck, as well as long-haul freight operations. At this time, the technology is not yet proven and there is public and official concern with regard to the ability

of vehicle based ATO alone to adequately detect pedestrian and vehicle intrusions and assure proper rail vehicle response.

### 4.1.3 TRACTION POWER IMPROVEMENTS

Traction power would need to be added to support electric-powered operations (e.g., electric locomotive-hauled trains, EMUs, typical LRVs, and charging for battery/electric trains). This section will describe the elements of the infrastructure (e.g., substations, distribution, catenary systems, and charging stations for battery/electric trains).

### 4.1.4 GRADE CROSSING IMPROVEMENTS

Grade crossing improvements would be anticipated with the introduction of passenger rail service on the Grand Junction; specific equipment and system improvements will be guided by the preferred vehicle technology. Presently, most grade crossings only have flashers and not gates. Furthermore, the timing for flasher/gate activation is based on 10 mph operations and must be modified to accommodate faster operating trains. It may also include upgrades such as “intrusion detection” (e.g., detection of a stalled vehicle on a grade crossing, which would cause the train to stop automatically to avoid a collision).

### 4.1.4 OTHER MITIGATION

Consideration will be given to the need for noise and vibration mitigation (e.g., noise barriers, ballast mats). Safety and security systems will also be considered. This evaluation will be qualitative and not include any quantitative analysis of comparing existing measurements to anticipated levels.

## 4.2 OPERATIONS SIMULATION

The purpose of this task is to identify run times and an assessment of the capacity of the line as well as the minimum feasible headway.

### 4.2.1 OPERATIONAL SIMULATION

WSP will utilize a spreadsheet-based suite of products for analysis and simulation of proposed operations to develop a useful assessment of operational impacts and requirements of each alternative. The analyses would identify typical trip times and train meets (less critical with a double track commitment), platform occupancies, equipment / staffing requirements and compilation of service metrics. WSP will include use of train graphic space/time diagrams (referred to as String Lines) to help assess overall operations performance. The analysis assumes a “green light” railroad where there are no delays introduced to assess late-train operation. However, late operations scenarios will be considered during development of the service plans.

Note: WSP can also conduct a more detailed rail operations simulation using dynamic simulation software to develop string-line diagrams of each alternative. These analyses would account for signal system logic, train-to-train conflicts, engineering-related work outages, issues related to grade crossings (e.g., synchronizing train crossings with street traffic signal systems), etc. This analysis would be more costly and provide a level of precision that is likely not necessary nor appropriate at this level of analysis.

The task would determine for which alternatives would require fully double tracking the Grand Junction line. Currently, the line is mostly single tracked with a section of double track between Massachusetts Avenue and Memorial Drive.

This task will also determine if the existing limited operations (namely, MBTA and Amtrak passenger equipment moves) would impose any constraints on the proposed Grand Junction service options.

#### 4.2.2 SIGNALIZATION AND MINIMUM FEASIBLE HEADWAYS

This task will include a consideration of the headways of similar operations on the MBTA and other transit properties. This will include a consideration of up to three (3) signal systems and how they would impact minimum headways:

- Line of sight
- Block signals without enforcement
- Proximity warning
- Positive train control (PTC)

This task would also discuss the federally mandated requirement for PTC for passenger rail operations, and how that would be applied to a passenger operation on the Grand Junction.

The purpose of this analysis is to establish feasible headways and also estimate the passenger-carrying capacity of the line.

#### 4.2.3 MAINLINE OPERATIONS

The operations modeling will consider current and as envisioned through Rail Vision scheduled operations on the Fitchburg Mainline between the Grand Junction and North Station as well as on the Worcester Line. This will be particularly critical for the high frequency headway option, where track assignments will be considered to ensure that the two services do not result in delays to one another, particularly where one or both may be running “off schedule.”

Consideration will be given to the need for a third Fitchburg Mainline track or a dedicated track for the Grand Junction service, subject to right-of-way constraints. It is likely that this would not be possible in the highly constrained areas where the Green Line Extension is parallel to the Fitchburg Mainline but may be feasible between Red Bridge and Draw 1 at the Charles River. Alternative alignments will be considered in the event it is determined use of the Fitchburg Line infrastructure is not feasible.

The drawbridge operations at “Draw 1” (the Charles River crossing adjacent to North Station) may also affect service operations. Currently, there are two bascule bridges, each with two tracks for a total of four tracks. The MBTA’s Draw 1 replacement project, which is currently in design, is considering increasing this to a total of six tracks (either with two bridges of three tracks each or three bridges of two tracks each). The added tracks would augment the arrival/departure capacity of North Station and provide access to the two unused tracks at the terminal.

#### 4.2.4 NORTH STATION AND ALLSTON TERMINAL OPERATIONS

The operations modeling will consider current terminal operations at North Station or possibly nearby alternate location, and West Station at Allston Landing or nearby alternate location in the event use of either North or West Stations is determined infeasible.

- This model would evaluate the feasibility and use of one platform (2 tracks) at North Station for the Grand Junction rail transit service. All other commuter rail and Amtrak *Downeaster* service would be relocated from that platform.
- It is assumed that WSP will obtain a base terminal operations model for North Station from the Massachusetts Department of Transportation (MassDOT). MassDOT is currently working on a design for a replacement bridge for the Draw 1 drawbridge north of North Station (see above); WSP assumes that the consultant for that design has developed a rail operations model of terminal operations or terminal parameters that would be made available for WSP's use on this project.
- WSP will prepare new, spreadsheet-based, sketch-level terminal operations models for North Station and West Station in Allston. These models will reflect baseline conditions (per the information from the MassDOT terminal operations model).
- WSP will undertake String Line analyses of the North Station and West Station terminal operations for the three Grand Junction scenarios. These analyses will include evaluation of the infrastructure and service capabilities and limitation for the two terminals under the three scenarios.

#### 4.2.5 TRAFFIC EVALUATION FOR GRADE CROSSINGS

With six grade crossings in Cambridge, traffic operations at grade crossings are a key consideration in the operational analysis. The task would include:

- Summary of current active warning systems (AWSs) (i.e., flashers, gates) at the grade crossing.
- Operation of the AWSs (trains approach the crossing at 10 mph or less, sometimes stop, and wait for the flashers and crossing to engage.)
- Consideration of upgraded grade crossing active warning systems to minimize delay to train operations
- Consideration of impacts to cross street traffic
- Interaction of grade crossing AWSs with traffic control for multi-use path

### 4.3 IMPLEMENTATION SCENARIOS

Develop up to three (3) implementation scenarios that consider alternative procurement methods, alternative operational governance, and alternative implementation time frames including one scenario that focuses on an early implementation (e.g., prior to West Station and the Allston viaduct reconstruction).

The implementation scenarios will also consider the Grand Junction line as one part of an Urban Rail network as proposed by RailVision.



#### **4.4 CONCEPTUAL COST ESTIMATE**

Prepare a conceptual opinion of approximate “order of magnitude” costs for each of the three (3) alternatives. The costs would assume construction by a public entity such as the MBTA.

#### **4.5 SUMMARY MEMORANDUM – OPERATIONS & INFRASTRUCTURE**

Prepare a technical memorandum summarizing each operational alternative, including a comparison of the alternatives. For each alternative, a summary of the infrastructure improvements will be included.

The alternative analysis would compare the relative feasibility of each.

### **TASK 5 – FINAL REPORT**

Using the technical memoranda as input, summarize the study findings in a Final Report. The goal of the report is to create a document that frames the next steps including the MEPA/NEPA processes.

### **TASK 6 – PROJECT MANAGEMENT AND COORDINATION**

- Provide ongoing management of the project and staff.
- Provide monthly invoicing
- Arrange for periodic Coordination Meetings with the Client Team (assume every 2 to 3 weeks)
- Prepare for, attend and produce meeting notes from a limited number of stakeholder meetings with entities including developers, the City of Cambridge, and others. We assume up to five (5) stakeholder meetings.