Better Bus Project

Making transit better together

Longwood Bus Circulation Study

Existing Conditions Report

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Overview

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Overview

The Longwood Bus Circulation Study will create bus route plans and transit-supportive infrastructure needed to operate accessible, reliable, and expanded service in the Longwood Medical Area (LMA). It will recommend specific stops and routings for the MBTA's Bus Network Redesign (BNR) plan and necessary capital projects associated with proposed route alignments.

BACKGROUND

Approximately 14,000 people live in the LMA, and over 15,000 new jobs have been created in just the last decade, totaling nearly 100,000 jobs in the district. The LMA is a major destination for students, patients, and visitors, who travel to area medical facilities and educational institutions. High levels of service throughout the day are important for those traveling to and from the LMA for off-peak shifts at hospitals, classes at medical schools, and appointments at medical institutions facilities throughout the study area.

The 2022 Longwood Medical Area Transportation Framework found that "transit service has not kept up with Longwood's growth," and calls for expanded transit service. The framework notes that since 2000, driving commuters have decreased by 20% while transit and bike/pedestrian travel has increased.

The MBTA's BNR also identified the LMA as a key area for increased transit service. The Existing Conditions analysis, however, shows that travel to and through the LMA is problematic: travel speeds are low, transit can not operate reliability, and most intersections are congested. Adding new service transit service, can help with congestion, if service is reliable. The existing operating conditions demonstrate that transit priority investments are necessary for any new services to be successful. The LMA Bus Circulation Study is focused on identifying route alignments and capital investments to strengthen rider access and transit service operations.

APPROACH

The Existing Conditions report establishes the context for the remainder of the project, including recommendations for transit operations and capital investments in the LMA. The data analyzed includes transit ridership from the MBTA and Longwood Collective, together with travel and traffic data from location-based service (LBS) sources:

- Route and stop-level boardings, alightings, and passenger loads separated by time of day for the ridership analysis.
- Stop-to-stop segment level dwell, delay, speed, and running time data for the speed and reliability analysis.
- Transit trips starting or ending in the study area for the transit origin and destination analysis.
- Traffic pass through for the travel flows analysis.
- Transit travel times to the study area for the transit access analysis.
- Bus stop amenities and PATI compliance for the accessibility and amenities analysis.

The Existing Conditions analysis consists of this report plus two appendices. Appendix A summaries previously conducted, relevant studies. Appendix B includes a series of technical "Corridor Profiles" that document roadway conditions.

Key Takeaways

The LMA is a high-activity area with demand for a variety of transit and transportation services. Travel is high to, from, and within in the LMA, specifically for those traveling to and from the hospitals and medical schools. Travel demand is also robust throughout the day. The MBTA's BNR plan has identified the LMA as a key area to improve transit access, but operating conditions in the study area make transit priority investments essential to increasing service levels.

TRANSIT

The MBTA and Longwood Collective Shuttles offer unique services that operate along numerous overlapping corridors. Each service has different goals; the Longwood Collective Shuttles are designed to serve workers and students making first/last-mile connections from MBTA services and LMA institutions. The MBTA provides longer distance trips, including regional connections and is open to all riders. Ridership is high on both services.

Bus routes through the area operate at speeds less than 10 mph throughout the day, 15 mph slower than posted speed limits in the LMA. Variations in road speeds impact MBTA on-time performance, making the transit unpredictable and potentially frustrating for riders. Low travel speeds reflect traffic and intersection in and around the LMA. There are 27 intersections in the study area with transit signal priority (TSP) capabilities

There are bus stops throughout the LMA. Despite high ridership, 84% of MBTA stops are not compliant with accessibility standards and 42% of bus stops in the LMA do not have amenities, despite most stops (79%) having enough boardings to meet or exceed the MBTA requirements for amenities. Investing in stops and ensuring stops are accessible should be a priority in the LMA, especially where Longwood Collective and MBTA service overlaps.

SAFETY

Safety is a major concern with crashes occurring throughout the study area. Since 2020, 340 crashes have taken place within the LMA, including on major corridors such as Longwood Avenue, Huntington Avenue, and Brookline Avenue. There have not been any crash fatalities in the study area since 2020, but about one-third of the crashes with reported injuries include either a pedestrian or cyclist. Investments in transit infrastructure must keep pedestrians and cyclists in mind.

TRAVEL

Data shows demand for traveling to, from, and through the LMA. The most frequently used roads for traveling through the LMA are on the periphery of the study area, including Huntington Avenue. The internal road network is mostly used by people traveling to destinations in the LMA.

Bus travel to and from the LMA is highest along routes that directly connect into the area. Ridership is highest to the LMA in the morning and out of the LMA in the evening aligning with when service is most frequent. However, travel to and from the LMA is strong throughout the entire day. BNR investments in frequent, consistent service throughout the day will better align with travel patterns.

BNR Routes and the LMA

The MBTA's Bus Network Redesign (BNR) project will create a more efficient, reliable and equitable bus system for Greater Boston. The key goals outlined in the plan include prioritizing riders who depend on bus service, increasing frequency and all-day service, improving connections, simplifying the network and enhancing reliability and accessibility.

BNR is being implemented in phases. The first phase was launched in December 2024; subsequent implementation phases are in planning and development, including bus service enhancements to the LMA. Service improvements included in BNR and targeted towards the LMA include:

- Increasing scheduled bus service to the LMA, so that six routes will operate frequently, offering service at least every 15 minutes throughout the day. The six frequent routes are 12, 22, 28, 39, 47, and 66.
- Update services using a combination of route extensions (Routes 22 and 28), alignment changes (Routes 47, 65 and 66) and introducing a new Route 12.

The Longwood Bus Circulation Study will create an implementation plan for these service improvements, so that they achieve BNR's stated goals. The LMA study will idea bus routing through the LMA, recommend transit-supportive infrastructure investment so MBTA services, including existing and expanded services are safe, accessible, and reliable.

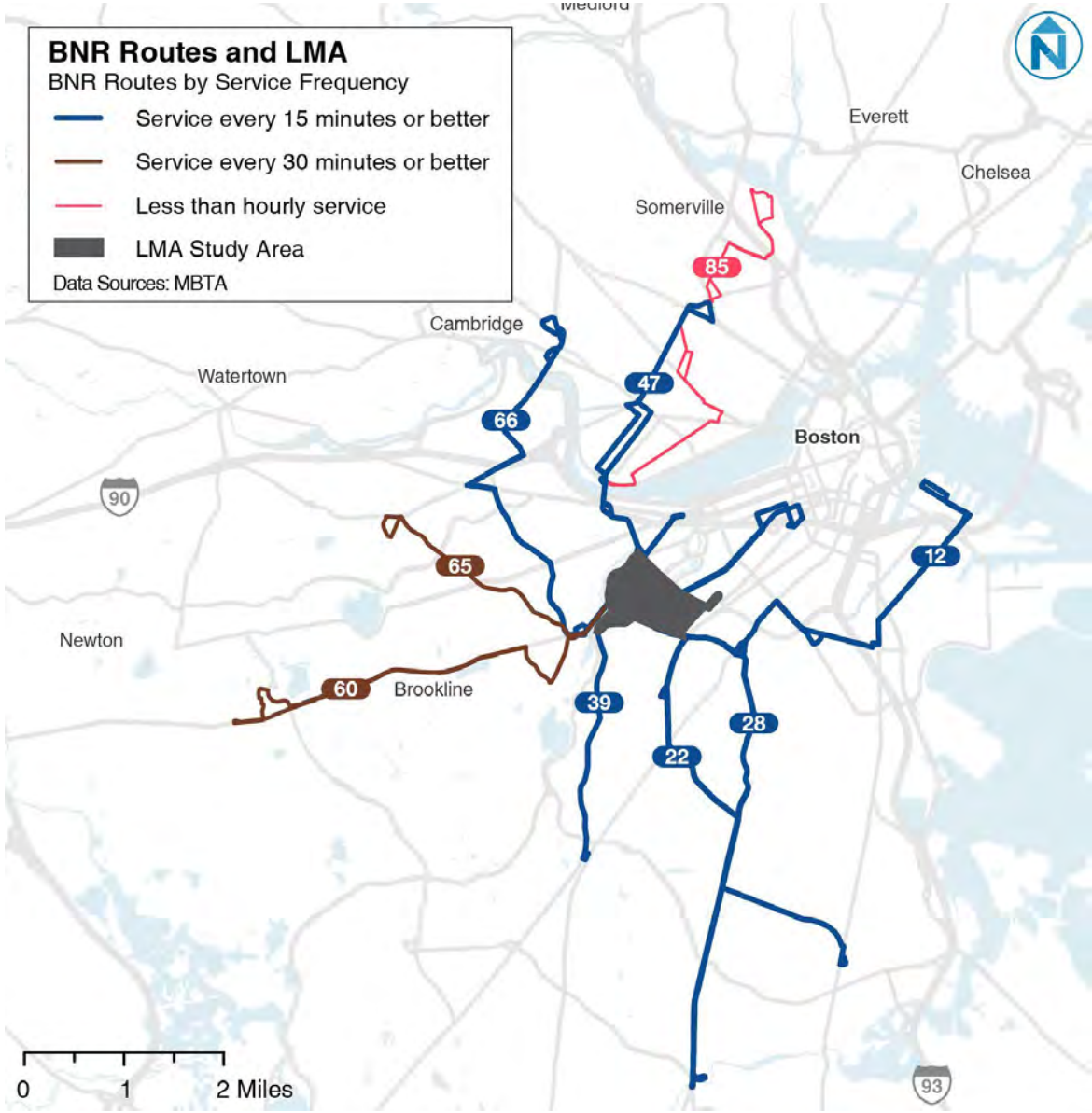

Figure 1 – LMA Study Area

Study Area

The LMA Bus Circulation study is focused on bus service and vehicular traffic in the area, which includes the entire area included within the dotted lines in Figure 1. The study area is larger than the area served by the Longwood Collective, which is generally considered to be the footprint of the Longwood Medical Area, which is shown in grey on Figure 1. The LMA is also the area served by the Longwood Collective's research and planning.

The study area includes Roxbury Crossing and Ruggles Stations – however, the transit component of this research is limited to Green Line stations in the study area along Huntington Avenue, buses, and shuttles only.

Most of the maps throughout the existing conditions report will be shown at this map extent.

Figure 2 – LMA Study Area

Previous / Related Studies

The LMA Bus Circulation Study started with a review of the previous plans and studies relevant to the study area (see Appendix A for a full summary). Three of these studies are completed and are foundational to this ongoing analysis. The LMA team used data and analysis from each of these previously completed pieces of work:

1. **Longwood Collective's Transportation Framework.** The LMA Bus Circulation relied on both data and resource collected from the LC and the Transportation Framework as a major resource to the Existing Conditions analysis. More information on how this study builds on the Transportation Framework is provide on page 9.

2. **The City of Boston's Go Boston 2030 ReVisioned**, which is the City's transportation plan. Go Boston identified a need to improve accessibility and increase travel options to the LMA for the Boston metropolitan area, as well as a specific focus on access from areas south of the LMA, like Mattapan and Southwest Dorchester. Go Boston also led to several specific projects on corridors connecting to and through the LMA.

3. **MassDOT and the MBTA's Urban Ring** project, which focuses on transit investments that connect to jobs and areas of economic growth. This study documented the LMA as underserved by transit, noting that congested regional arterial roads impact patient access to medical care and employee recruitment and retention. The Urban Ring study also cited data that shows LMA institutions spend over $12 million annually on T-passes and shuttles that serve more than 9,500 daily riders.

In addition, there are two ongoing studies that integrated with the LMA Bus Circulation Study. The project teams for the three studies (including the LMA study) are actively working to coordinate community engagement, use similar data to understand development and travel plans and rely on a common set of assumptions regarding transportation infrastructure investment.

1. **Fenway Transportation Action Plan (FTAP).** The LMA study area is part of a larger sub-area that adjacent to the fast- growing Fenway, Kenmore and Mission Hill communities. FTAP is documenting ongoing growth and development in this neighborhood and evaluating the impact on local transportation. Recommendations emerging from the FTAP study will span all transportation modes. The LMA and FTAP teams are collaborating on transportation investment strategies to ensure improvement concepts are consistent and coordinated.

2. **The Huntington Avenue E Branch Accessibility Study.** The E-Branch Study is designing a shared bus and rail transitway on Huntington Avenue, which is part of the LMA study area. Assumptions about when this transitway will be open and its availability to MBTA bus service are critical to the figuring out bus circulation in the LMA.

Spotlight: Longwood Transportation Framework

The Longwood Collective (LC) was originally founded to address transportation challenges in the Longwood Medical and Academic Area (LMA) on behalf of the area's major employers and institutions. It both supports employees commuting to work in the LMA and ensure the area is accessible for visitors, students and other travelers, so Longwood can continue to be a hub of healthcare, research and education (Longwood Transportation Framework). The framework detailed how the LMA has been and continues to be underserved by transit.

The Transportation Framework collected and analyzed data on all modes of transportation, including transit. The LMA Bus Circulation used the Transportation Framework as a starting point, relying on maps, analysis, and findings presented in the plan and data shared by the LC with the LMA team. Some of the information included in the Transportation Framework was used as a starting point, like LC shuttle services and ridership, while other data is incorporated directly into the Existing Conditions report and findings.

Data incorporated into the baseline assumptions of existing conditions in the LMA included (among others):

- Data and analysis of pickup and drop off (PUDO) locations and volumes.
- Ambulance bay and helipad locations and emergency access routes.
- Inventory and assessment of loading docks.
- Curb uses.

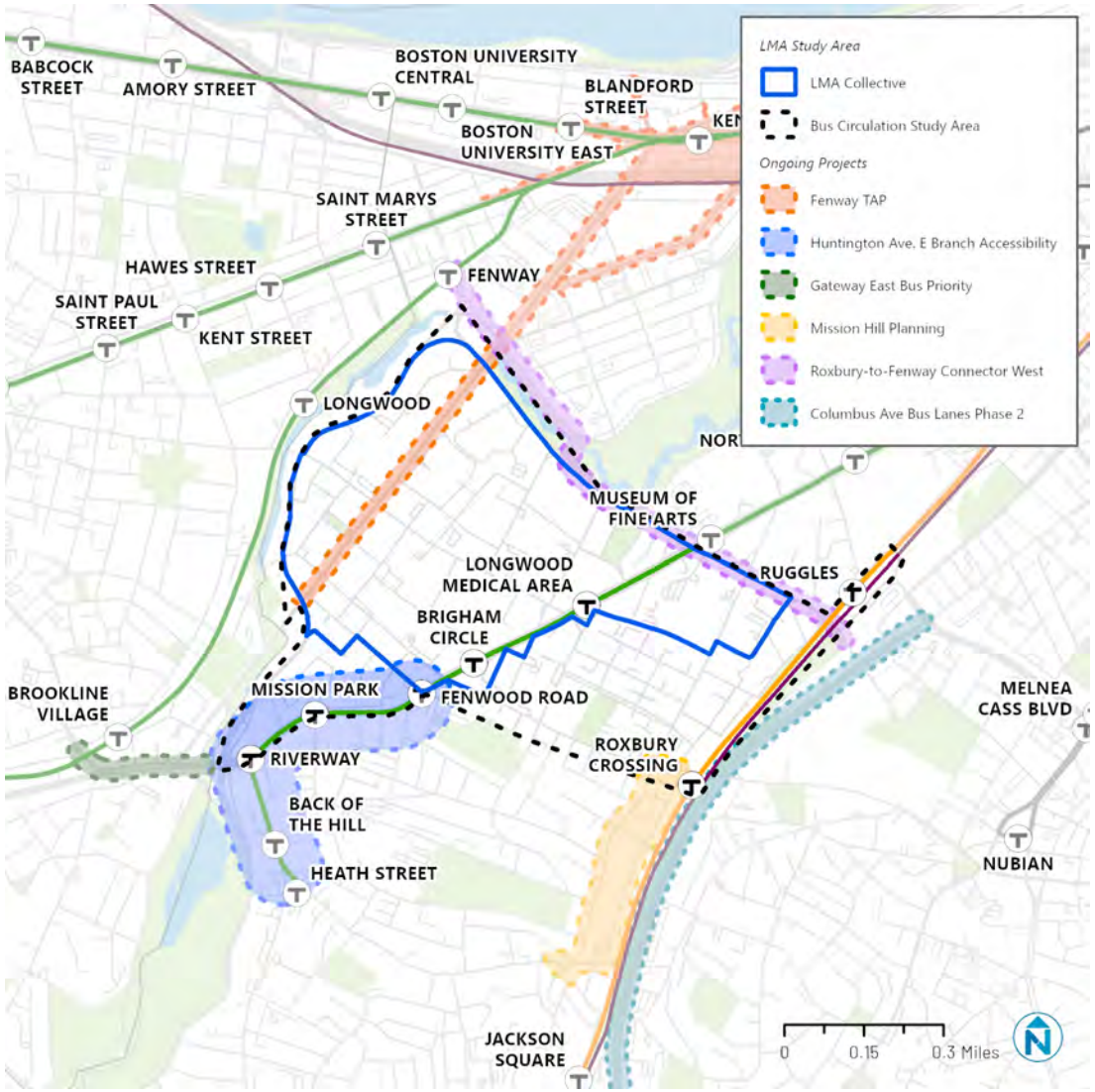

Figure 3 – Ongoing Studies Related to the LMA Bus Circulation (2025)

Article 80 Projects and Future Projects

There is almost 14 million sq. ft. of development planned in the general vicinity of the study area. Some of the more impactful developments include:

- **1 Joslin Place:** proposes wider sidewalks, separated bike lanes, a floating bus stop, changes to street circulation, building setbacks, a new Riverway crosswalk and traffic signal at Netherlands Road, a raised intersection at Longwood Avenue and Pilgrim Road, and a feasibility study for a new Green Line D Branch station at Netherlands Road

- **Longwood Place:** proposes wider sidewalks, a protected bike lane, improved connectivity to the Riverway, updated bus stops, a new street, designated drop-off zones, and building setbacks

- **1400 Boylston Street:** proposes wider sidewalks, protected bike lanes, building setbacks, and safety changes to the intersection of Brookline Avenue, Boylston Street, and Park Drive

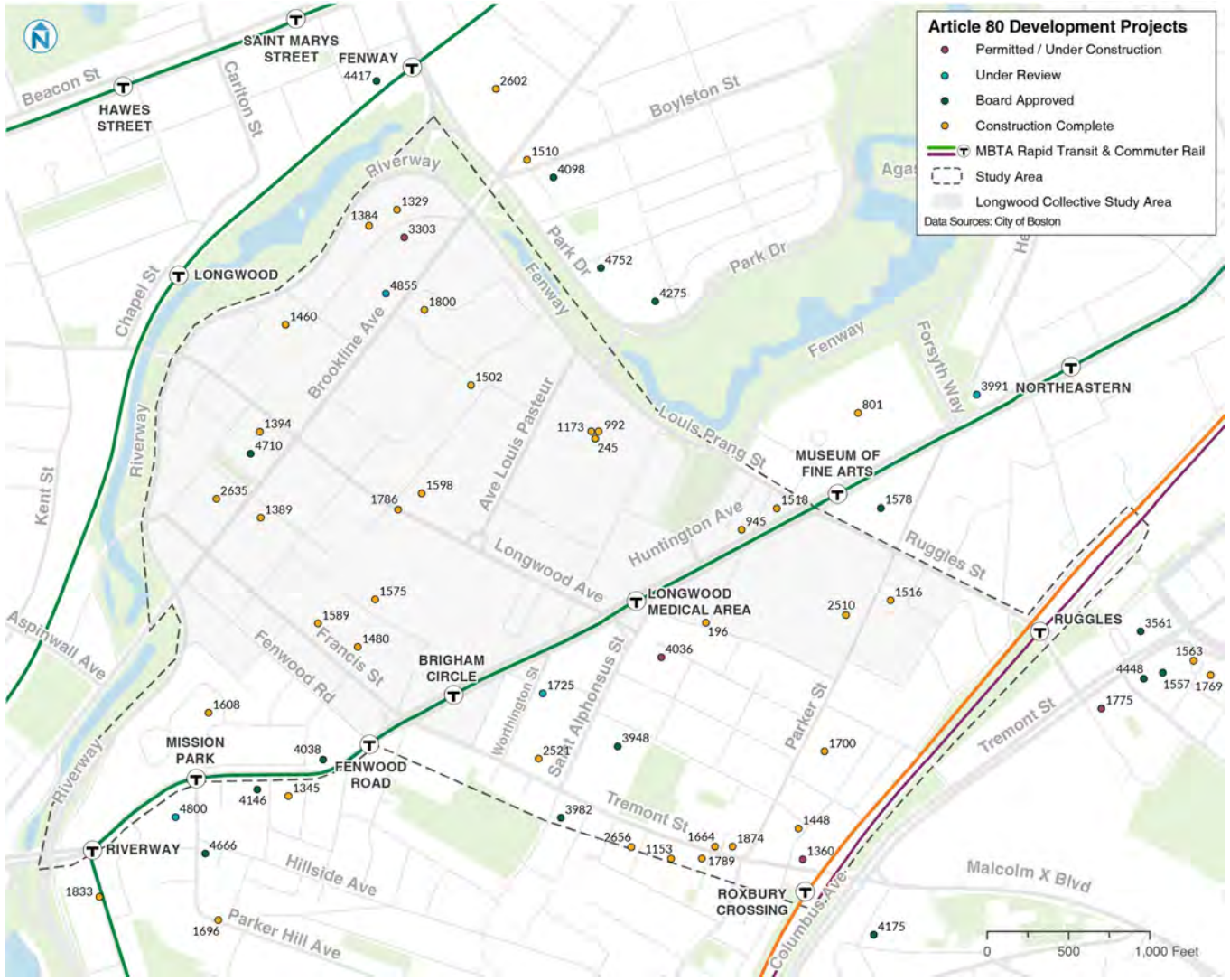

Figure 4 – Article 80 Development Projects

Transit Services, Circulation, and Ridership

2

Introduction

The LMA Bus Circulation study is focused on creating route alignments for expanded bus service and transit infrastructure investments to support this service. The starting point for the analysis involves documenting and evaluating existing bus services, including where current alignments, ridership and bus trip volumes. The Existing Conditions analysis also examined access to the LMA from existing MBTA assets, including Commuter Rail and transfer hubs like Ruggles Station and Roxbury Crossing.

The LMA is currently served by several transit services, including bus routes operated by the MBTA and shuttles operated and funded by the Longwood Collective (LC shuttles) as well as MBTA rapid and commuter rail services. LC shuttles are designed to serve workers and students and provide connections to/from MBTA services and LMA institutions, while MBTA services provide distance trips and regional connections.

Key findings from the transit service inventory includes:

- 21 bus routes (9 MBTA bus routes and 12 LC shuttles) directly serve the LMA. Combined these routes operate 1,400 daily trips.
- Ridership on bus routes serving the LMA is high. MBTA bus routes carry more than 37,000 weekday riders, while LC shuttles carry another 6,500* weekday riders.
- Buses serving the LMA travel on a handful of overlapping corridors (Brookline, Longwood, Louis Pasteur, Louis Prang and Ruggles Street). At peak times, a bus will travel on these roadways at least every 5 minutes.
- Most transit riders travel to the LMA using MBTA rail stations and transfer or travel directly on routes serving the hospitals along Longwood Avenue, Brookline Avenue, and Avenue Louis Pasteur. The highest MBTA stop in the study area is at Ruggles Station and the second highest ridership location are the stops along Huntington Avenue.
- Widespread transfers suggests streamlined and coordinated transfers between services are essential to keeping people on transit.
- Existing volumes of riders and bus trips suggests that increasing bus service on roadways in the LMA and maintaining seamless transfers could be challenging.
- Increasing bus service levels will almost certainly require investments that prioritize bus movements and create safe, comfortable places for people to wait and transfer between transit services.

**Longwood Collective Shuttle Ridership Data from September 2024*

Longwood Collective Shuttles

LC Shuttles provide connections between LMA institutions and the MBTA rail and rapid transit stations. Services are free of charge to LMA employees and students who show an identification card to board. LC's M2 route connects the LMA with Cambridge. This route is available for non-members to ride, but tickets must be purchased in person for $4.00 at one of seven locations throughout the LMA and Cambridge.

Ridership on the LC shuttles has dropped from pre-pandemic levels of 11,000 riders per day prior to 6,500 daily riders in September 2024. Of the five routes, ridership is highest on the Ruggles and M2 routes. The Ruggles route has the highest average daily ridership of about 34 riders per trip, followed by M2, which carries roughly 21 riders per trip.

Shuttles provide access for most of the day but are most frequent during peak periods. The shuttles that provide coverage in Cambridge and Dorchester run at frequencies varying from 10 to 35 minutes, which is lower than those that provide service within the LMA.

Some LC shuttles operate with variants, which means trips go to different places depending on the time of day. The M2, for example, connects the LMA and Harvard Square with a variant that travels directly to Cambridge and a second variant that travels to Harvard Square via Coolidge Corner. The JFK routes extend east into Dorchester but only to Andrew and JFK/UMass Stations and Massachusetts Avenue at Island Street.

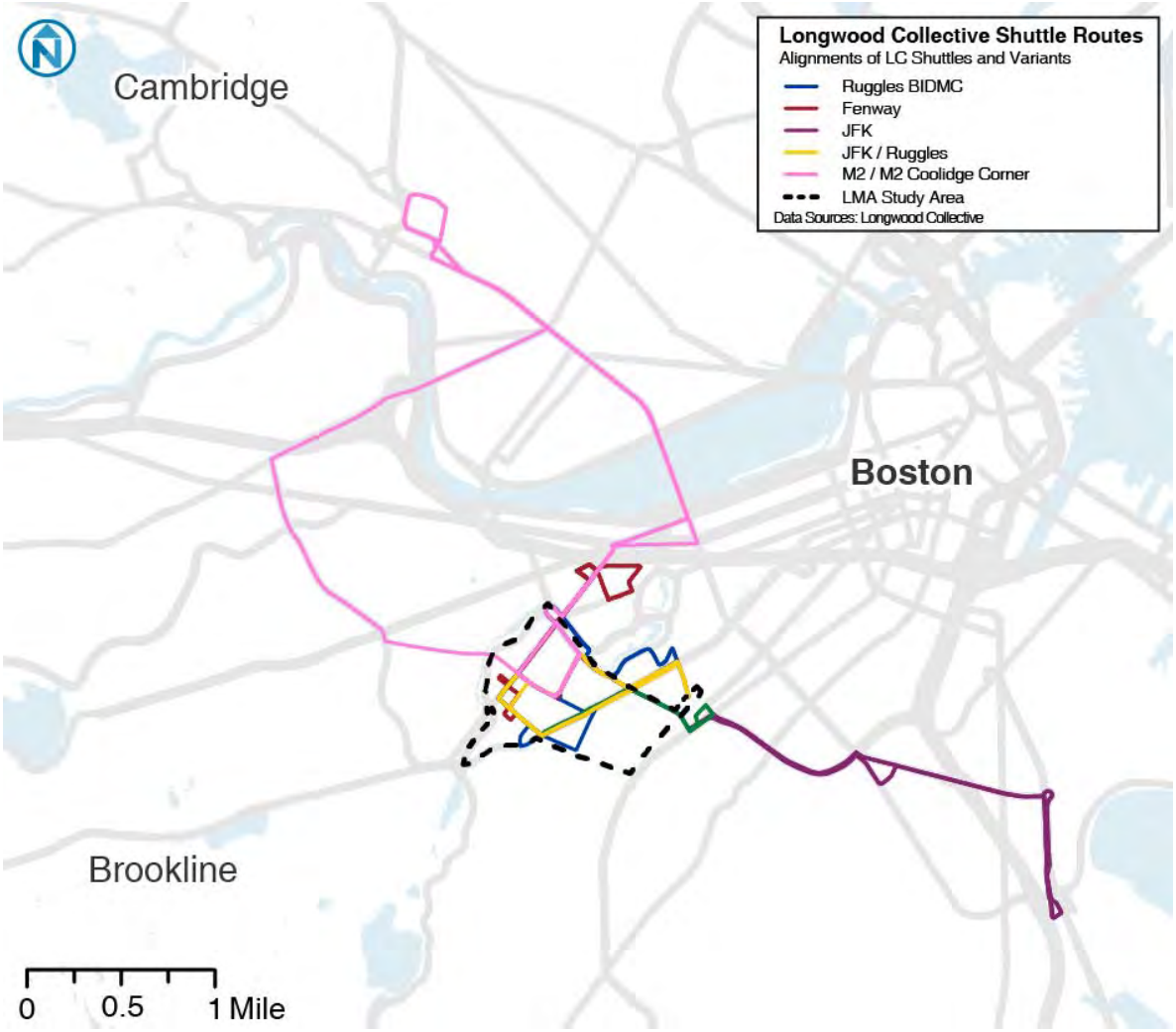

Figure 5 – Longwood Collective Shuttle Routes

Longwood Collective Shuttle Circulation

The LC operates 12 shuttles, most of which use the major corridors in the LMA and serve the major destinations of medical workers, students, and employees. The five shuttle routes operate 464 daily trips combined. Service on the Fenway, JFK, Ruggles, and Renaissance shuttles begins between 5:05 AM and 5:45 AM and ends between 8:30 PM and 8:45 PM. The M2 starts slightly later around 6:40 AM but runs later into the evening to 11:00 PM. The shuttles come frequently throughout their entire service span, with headways as fast as every two minutes on the Ruggles shuttle.

Table 1 – Weekday Trips and Peak Headway for Longwood Collective Shuttle Service

Route	Variants	Destinations Served	Service Span	Peak Headway (min.)	Weekday Daily Trips
Fenway	AM, Midday, PM	Landsdowne Garage, Fenway Garage, Vanderbilt Hall	5:05 AM – 8:45 PM	6	127
JFK	AM, PM, Combo	JFK, Andrew Square, MFA, Brigham Circle	5:45 AM – 8:30 PM	10	53
Ruggles	AM, PM BIDMC, PM BWH	Ruggles, Vanderbilt Hall, BIDMC Campus, Brigham Circle	5:30 AM – 10:00 AM, 2:25 PM – 8:35 PM	2-5	126
Renaissance	AM, PM	Renaissance Garage, Ruggles, Brigham Circle, MFA	5:25 AM – 10:00 AM, 2:30 PM, 8:45 PM	12-15	52
M2	Regular, Coolidge Corner	Harvard Square, Central Square, MIT, Kenmore, Coolidge Corner	6:40 AM – 11:00 PM	10	106

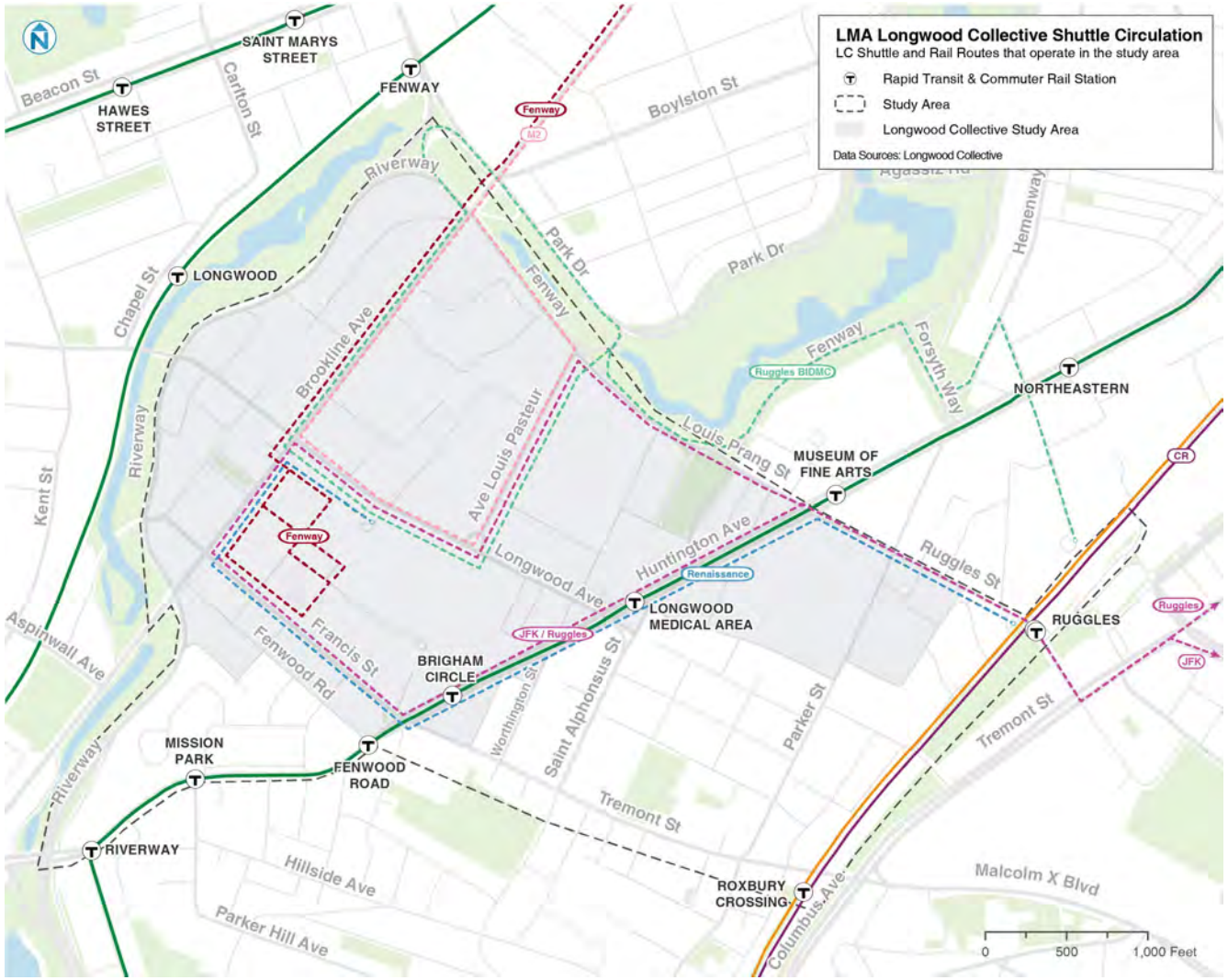

Figure 6 – LMA Longwood Collective Shuttle Circulation

Longwood Collective Shuttle Ridership

Ridership on the LC shuttles is highest along Longwood Avenue (~1,500 average daily boardings across 7 stops), where the main hospitals are in the LMA, and at Ruggles Station (1,187 average daily boardings), where three shuttles offer connections.

Ruggles Station and Vanderbilt Hall are the highest ridership stops in the LC network, with more than double the activity of the 3rd busiest stop (Lamont Library in Cambridge). Vanderbilt Hall is a Harvard Student Residency Building, but the stop outside of the Hall serves the Massachusetts College of Pharmacy and Health Sciences, Harvard University's Boston Campus, the Boston Latin School, and is just a block away from the Boston Children's Hospital.

Table 2 – Top Six LC Shuttle Stops by Total Rider Activity

Stop	Routes Served	Boardings	Alightings
Ruggles	Ruggles, JFK, Renaissance,	1,187	882
Vanderbilt Hall	Ruggles, JFK, M2	824	971
Lamont Library (Cambridge)	M2	477	395
JFK Station	JFK	454	296
435 Brookline Ave (Beth Israel Deaconess Medical Center)	Fenway, Renaissance, JFK / Ruggles	111	625
333 Longwood Ave (Boston Children's Hospital)	Fenway, Renaissance, M2, Ruggles	109	529

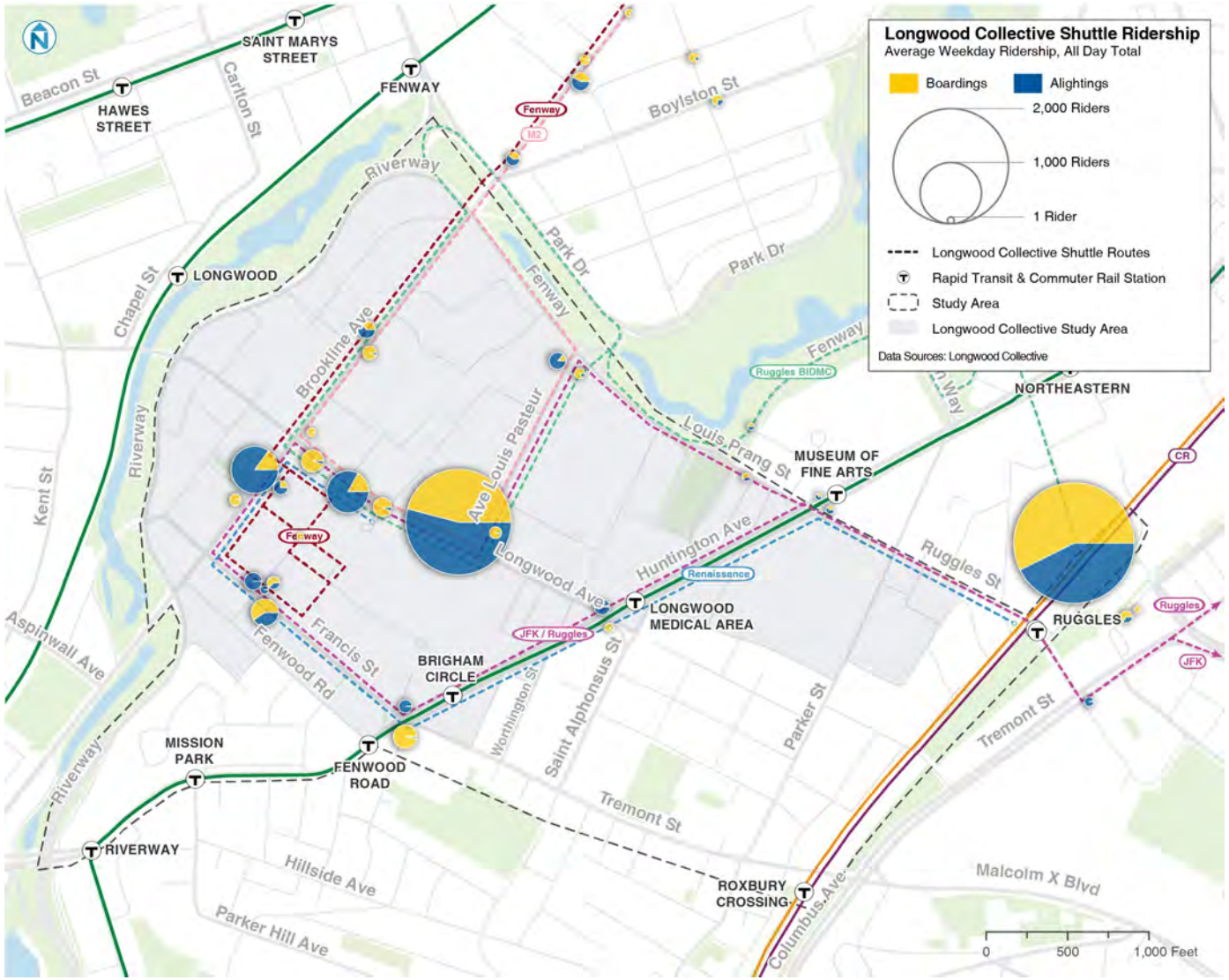

Figure 7 – Longwood Collective Shuttle Ridership – Average Weekday

MBTA & Longwood Collective Shuttle Circulation

The LMA's limited street network means MBTA and LC buses travel on the same streets. It also means several corridors, like Louis Pasteur, Longwood and Brookline have multiple, overlapping routes. In most cases where the MBTA and the LC travel on the same route, they share bus stops, which increases rider convenience.

With multiple services sharing corridors, bus service is frequent. In some cases, a bus will travel on a corridor every 5 minutes for most of the day. Increasing bus service levels on some corridors, therefore, may be challenging without infrastructure investments.

Table 3 – Routes and Trips by LMA Corridor

Corridor	MBTA Routes	Longwood Collective Shuttle Routes	Daily MBTA Bus Trips	Daily LC Shuttle Trips
Brookline Avenue (East of Longwood)	7	3	524	222
Fenway/Louis Prang	4	1	653	285
Francis Street	0	2	0	317
Huntington Avenue	3	2	472	190
Longwood Avenue	5	5	454	337
Ave Louis Pasteur	4	3	561	285
Ruggles Street	5	2	653	231
Saint Alphonsus Street	0	0	0	0
Tremont Street	1	0	277	0

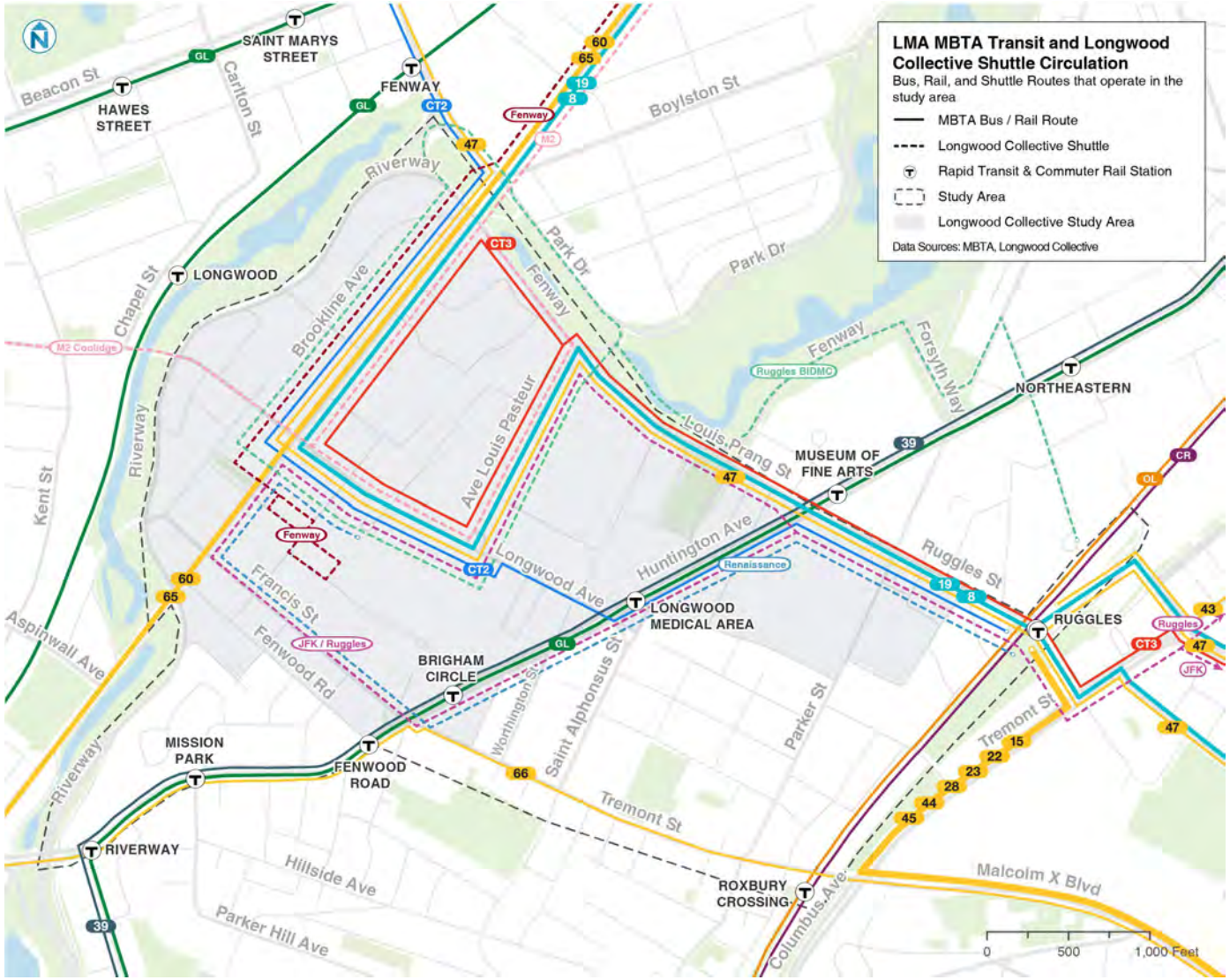

Figure 8 – LMA MBTA Transit and Longwood Collective Shuttle Circulation

MBTA LMA Bus Service

Nine MBTA bus routes – Routes 8, 19, 39, 47, 60, 65, 66, CT2 and CT3 - operate in the LMA study area. These nine routes serve over 37,000 daily riders and make 945 bus trips each day. Most of the bus routes travel within the study area, primarily along Brookline Avenue, Louis Prang/Ruggles Streets, Longwood Avenue, and Huntington Avenue.

About half of the bus routes (Routes 8, 19, 23, 47, CT2 and CT3) connect through Ruggles Stations. These routes primarily travel from areas south, west, and north of the study area and connect to and through the LMA.

MBTA service covers most of the major corridors in the study area. Nine bus routes directly serve the LMA, while eight other routes (Routes 9, 15, 22, 23, 28, 43, 44, and 45) connect from outside of the study area to Ruggles Station.

The primary connection between downtown Boston and the LMA is provided by Green Line rail service, which operates in and on the outside of the study area. The Green Line's the E-Branch runs along Huntington Avenue through the study area, while the D and C Branches operating a few blocks north of the study area boundary.

It is worth noting that Routes 23 and 28 do not show up on fare-based analyses such as linked trips and transfers because these two routes are currently fare-free.

Figure 9 – MBTA Transit Circulation

MBTA Circulation

Of the nine routes that operate in the LMA, Routes 39 and 66 are the only two with headways faster than every 10 minutes during peak service. Routes 19, 60, CT2, and CT3 each have peak frequencies lower than 20 minutes, and each of these routes operate fewer than 65 daily trips. Routes 39 and 66 account for 57% of boardings between these routes. Of the routes that run along Longwood Avenue, Route 47 has the highest ridership, with 4,338 average daily boardings.

Table 4 – Weekday Trips and Peak Headway for Current MBTA Service

Route	Start	End	Peak Headway (min.)	Weekday Daily Trips	Average Daily Boardings
8	Harbor Point	Kenmore	15	77	2,797
19	Fields Corner	Kenmore or Ruggles	20	62	2,681
39	Forest Hills	Back Bay	10	230	8,830
47	Central Square	Broadway	15	103	4,338
60	Chestnut Hill	Kenmore	25	64	945
65	Brighton Center	Kenmore	15	86	2,463
66	Harvard Square	Nubian	5	222	12,458
CT2	Sullivan Square	Ruggles	20	44	1,727
CT3	Beth Israel Deaconess Hospital	Andrew	20	57	910

Figure 10 – LMA MBTA Transit Circulation

MBTA Bus Ridership

The highest MBTA bus ridership stop in the study area is Ruggles Station with 6,320 bus boardings and 6,796 bus alightings each day (40% of all LMA boardings), followed by Roxbury Crossing (7% of all LMA boardings). The stops along Huntington Avenue between Tremont and Ruggles is also a high transit ridership location.

Ridership patterns suggest heavy use by commuters traveling to the LMA institutions. Twice as many people get off the bus in the AM Peak as compared to those who board the bus in the same period, and the reverse occurs in the PM Peak (i.e., boardings doubling alightings). At the hospital stops along Brookline Ave, Longwood Ave, and Ave Louis Pasteur, alightings are five times greater than boardings in the AM Peak, and boardings are five times higher than alightings in the PM Peak.

Table 5 –Stops with the Most Average Daily Boardings in the LMA

Stop	Routes Served (including nearby transfer stops)	Boardings	Alightings	Total
Ruggles	8, 9, 15, 19, 22, 23, 28, 43, 44, 45, 47, CT2, CT3, OL, CR	6,320	6,796	13,116
Roxbury Crossing	15, 19, 22, 23, 28, 44, 45, 66, OL	1,306	844	2,150
Huntington Ave @ Fenwood Rd	35, 39, 66, GL-E	1,034	1,254	2,288
Huntington Ave @ Longwood Rd	28, 35, 39, CT2, GL-E	710	577	1,287
Brookline Ave @ Longwood Ave	8, 9, 19, 47, 60, 65	674	389	1,063

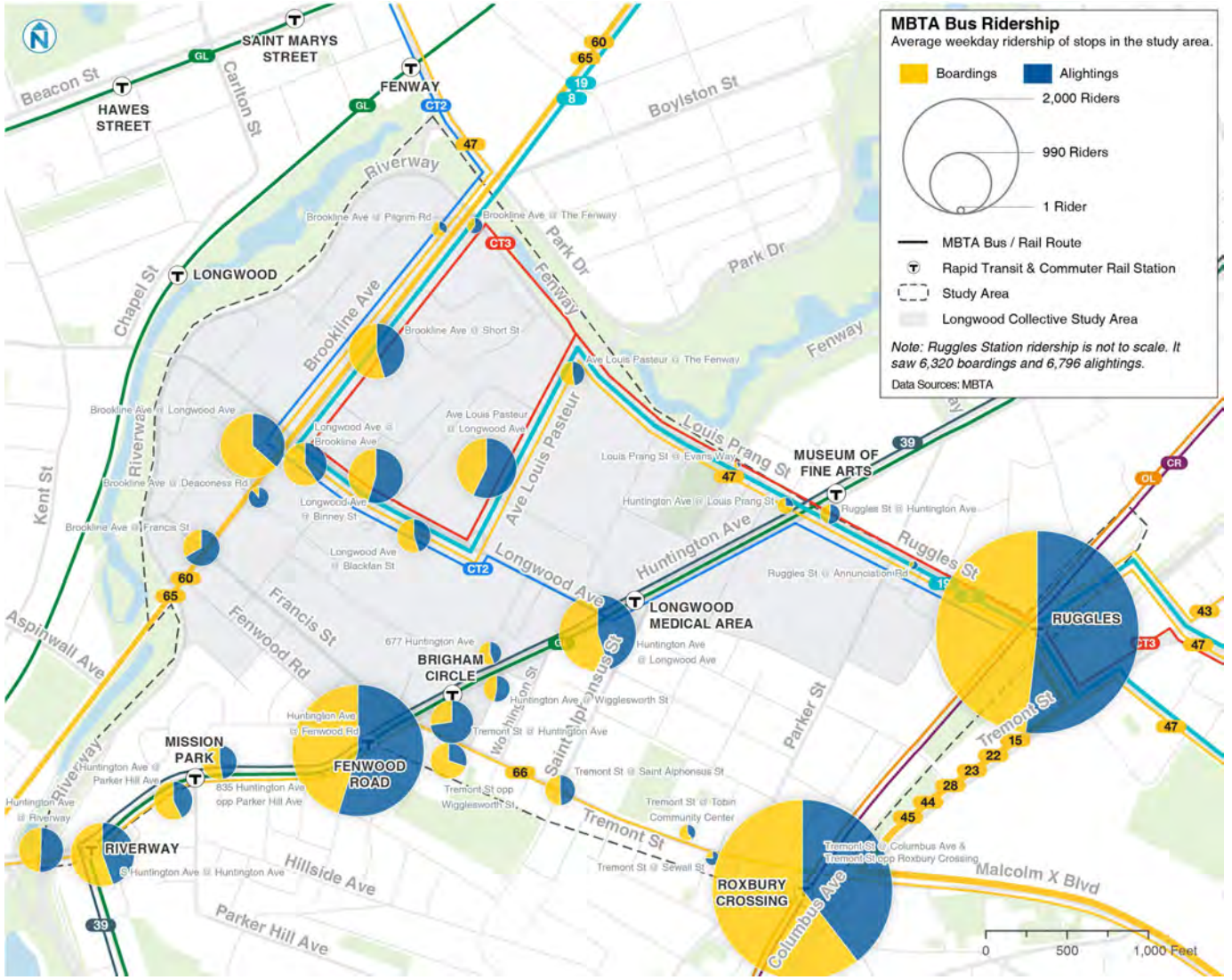

Figure 11 – MBTA Bus Ridership – Average Weekday

MBTA Bus Passenger Loads – All Day

Ridership data shows where riders get on and off the bus, while passenger loads measures the number of people on the bus traveling between stops. It shows where buses are most crowded as well as where passengers are boarding and stay on the bus through an area. The data is useful because it suggests where potential routing changes or speed and reliability improvements would impact the greatest number of riders.

The LMA Bus Circulation Study evaluated passenger loads and mapped corridors with large volumes of passenger loads, shown by the thickness of the line. The analysis reflects MBTA data only.

Bus routes carrying the largest volume of riders is along Huntington Avenue near Fenwood Road and Mission Park where Routes 39 and 66 overlap, on the southwest corner of the study area. Over 4,600 passengers each weekday are riding the bus through these segments.

Ruggles Street, Louis Prang Street, Longwood Ave, and Brookline Avenue north of Longwood Avenue also have high loads. Individual segment of these corridors carry between 1,600 and 2,600 passengers on weekdays. Morning and evening loads follow similar patterns to the all-day loads, but the morning loads show increased travel away from Ruggles and the evening shows increased travel towards Ruggles, mirroring expected commuter travel patterns (see maps on the next page).

Figure 12 – Passenger Loads – All Day

MBTA Bus Passenger Loads – AM and PM Peak

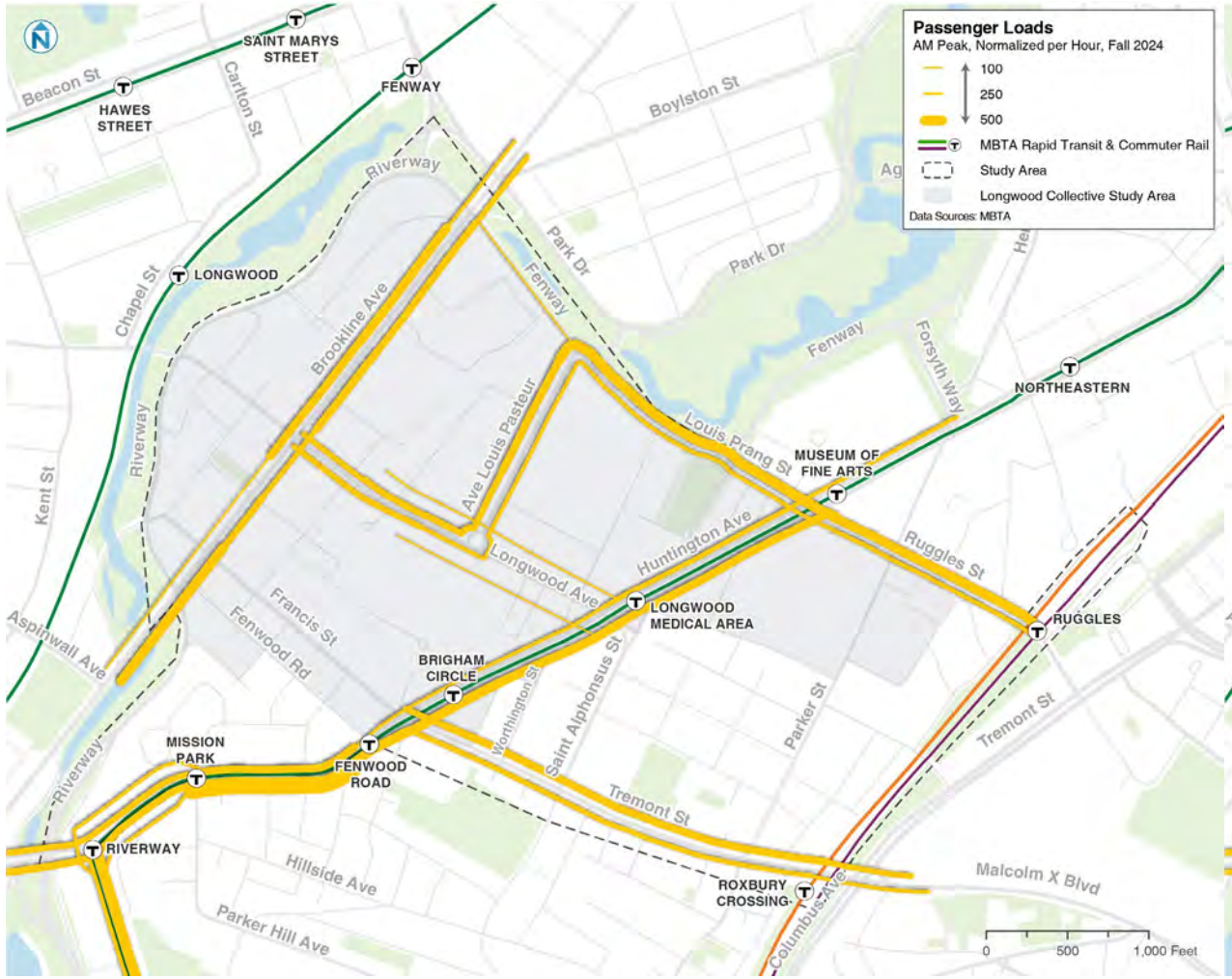

Figure 13 – Passenger Loads – AM Peak

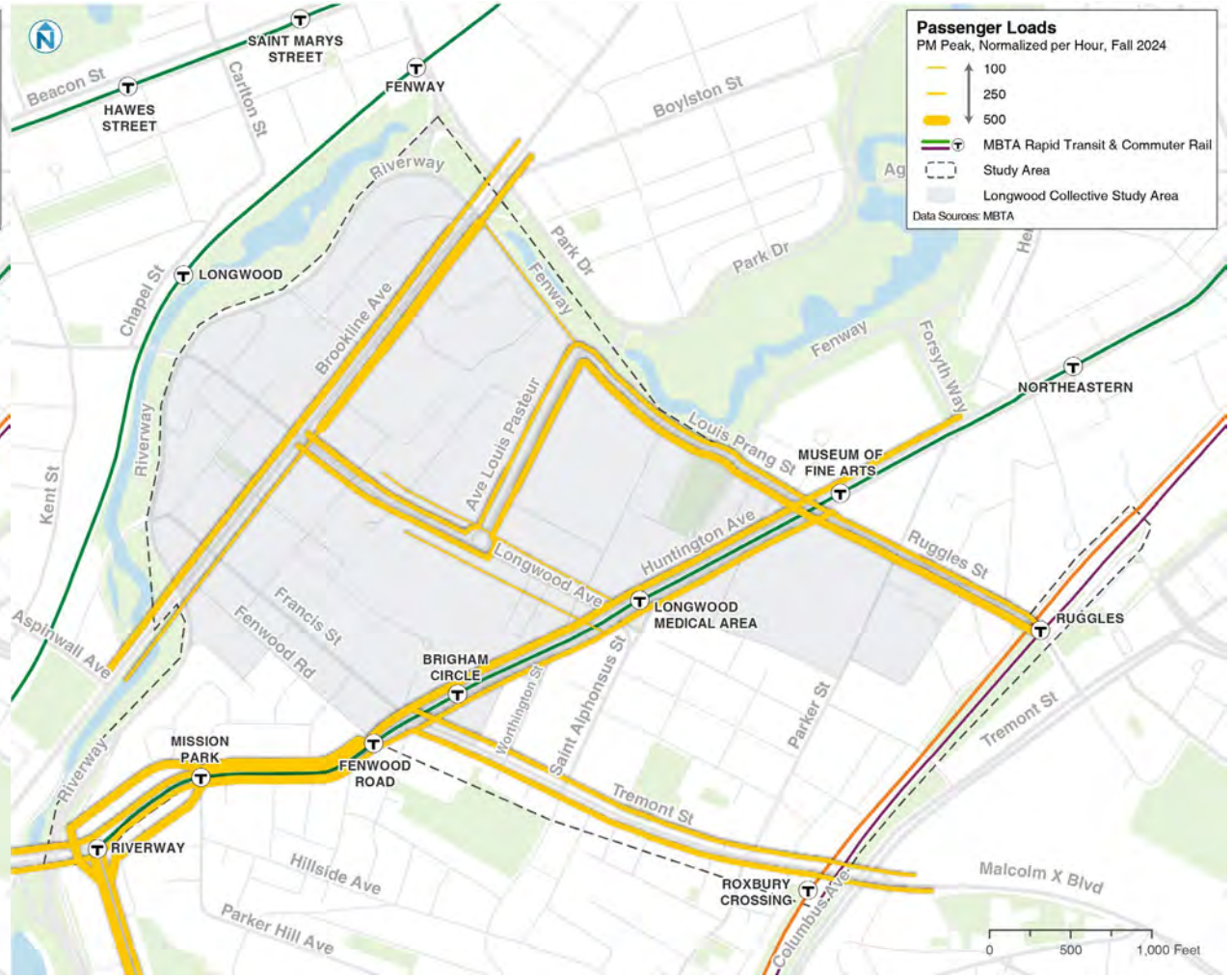

Figure 14 – Passenger Loads – PM Peak

Transit Trip Origins and Destinations

Another way to understand MBTA ridership is to evaluate where people start and end their trips. Using data collected from MBTA fare payments, the LMA team examined where riders started and ended their journey to/from the LMA. Data shows riders start and end their journeys outside of the LMA and travel along specific rapid transit lines (Green, Orange) and bus routes that go to the LMA. Trips to and from the LMA are mostly based out of Boston, Cambridge, and Brookline. Boston accounts for approximately 80% of trips, Cambridge accounts for approximately 10% of trips, and Brookline accounts for approximately 4% of trips.

MBTA bus routes 39, 47, 65, and 66 are notable for travel related to the LMA. Route 39 runs between Forest Hills Station and Back Bay Station in Downtown, traveling through the LMA via Huntington Avenue. Route 47 runs from Central Square in Cambridge to Broadway Station, traveling through the center of the LMA study area. Route 65 runs from Brighton Center to Kenmore Station via Brookline Avenue in the LMA. Route 66 runs from Harvard to Nubian Station, passing through the LMA via Huntington Avenue and Tremont Street.

Routes 8, 19, 22, 60, and CT3 include riders traveling to the LMA, although not as many as other routes. Routes 23 and 28 connect to Ruggles and have assumed high rider activity connecting into Ruggles, but do not show up on this map because transfers and LC shuttles are fare-free. Commuter rail data is not included in this dataset, so cannot be analyzed. As a result, while both Forest Hills Station and Ruggles have high trips according to this dataset, it is less clear where these trips begin or end.

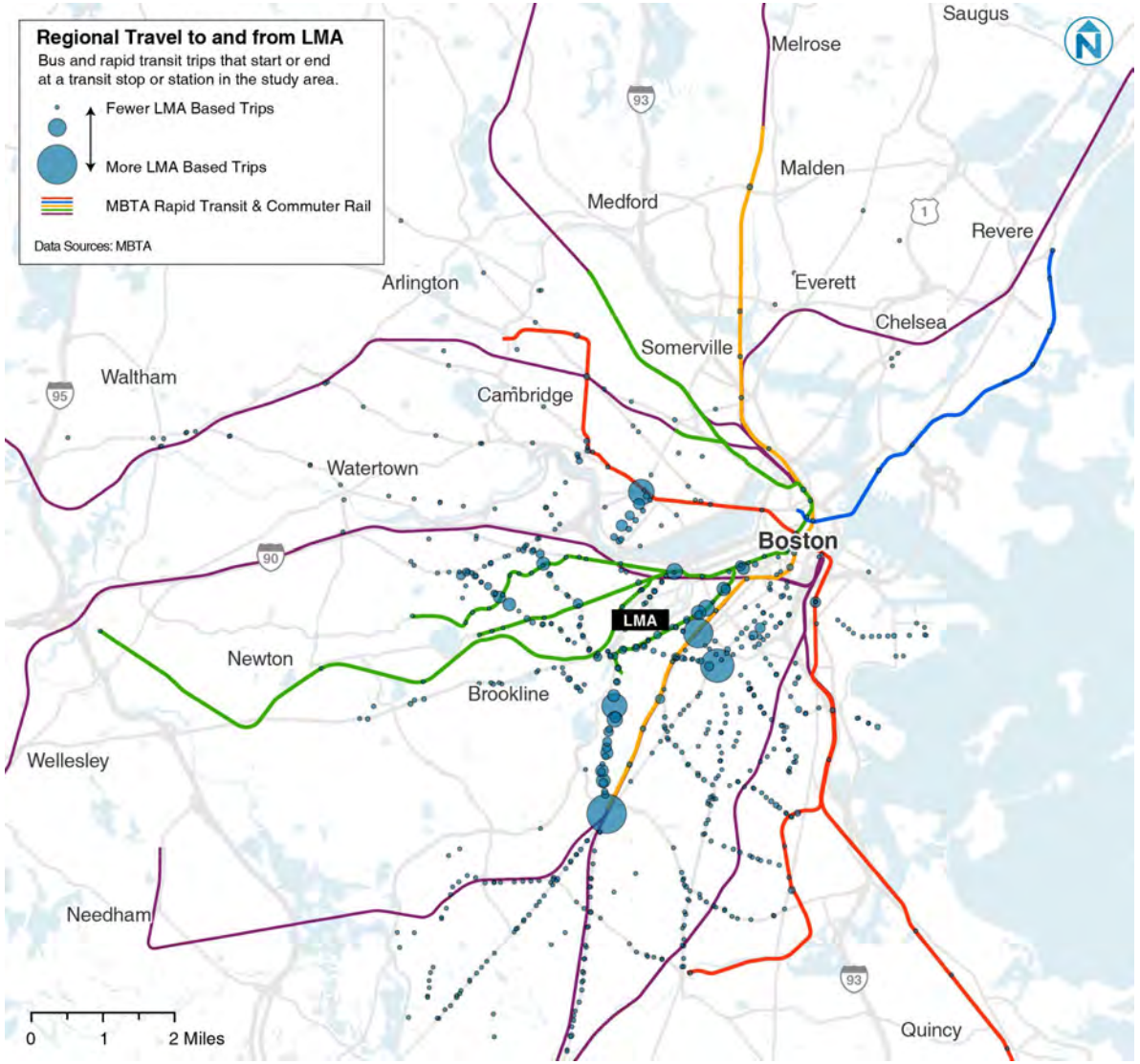

Figure 15 – Regional Travel to and from LMA

MBTA Bus Transfers: Ruggles and Roxbury Crossing

Transfer locations are where transit riders use a stop (or station) as a connecting point, rather than an end point. Reliability to/from transfer location is critical because missing a connection could result in wait times of up to 30 minutes, depending on the connection. Understanding what locations function as transfer hubs can impact expected route alignments and amenities at bus stops. Stations that function as transfer hubs are often equipped with the facilities to be a successful transfer hub, however, it is important to note which stations act as transfer hubs when assessing route alignments to ensure that transfer pairs are able to be transferred to/from in that or other locations. None of the bus stops in the LMA function as major transfer hubs, but some transfers occur at stops served by multiple routes. In most cases, volumes are not high enough to warrant further analysis.

There are two major transfer locations for riders of LMA-based routes: Ruggles Station and Roxbury Crossing.

- **Ruggles Station** has the most transfers in the study area with roughly 5,000 weekday transfers. Riders use Ruggles to transfer to/from the Orange Line as well as to/from MBTA Routes 47, 8, 19 and CT3. Routes 15, 22 and 44 connect into Ruggles from Roxbury and Dorchester, but riders must make a second transfer to reach the heart of the LMA . Most riders (around 1,750 trips) transfer to/from the Orange Line.

- **Roxbury Crossing** has the second highest number of boardings in the study area with about 2,500 daily transfers. Route 66 is the only route where a transfer from Roxbury Crossing goes directly to the LMA. Nearly 1,000 riders transfer to Route 66, but some riders likely travel to destinations outside of the LMA, like Allston, Brookline, Cambridge, or Roxbury.

On-time arrivals to/from Ruggles and Roxbury Crossing will make it easier to travel to and from the LMA. Transfers are less appealing than a one-seat ride, so optimizing transfers between services will lower the total travel time and increases convenience and accessibility.

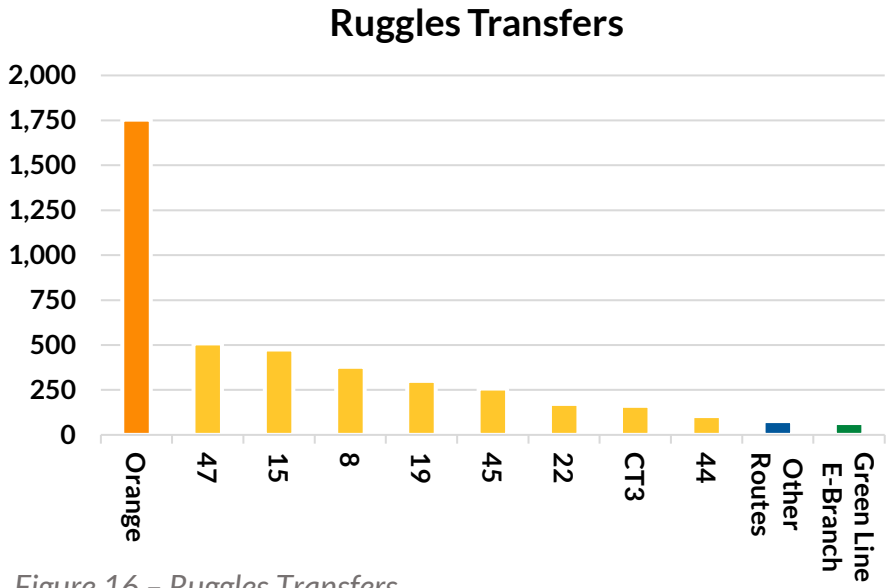

Figure 16 – Ruggles Transfers

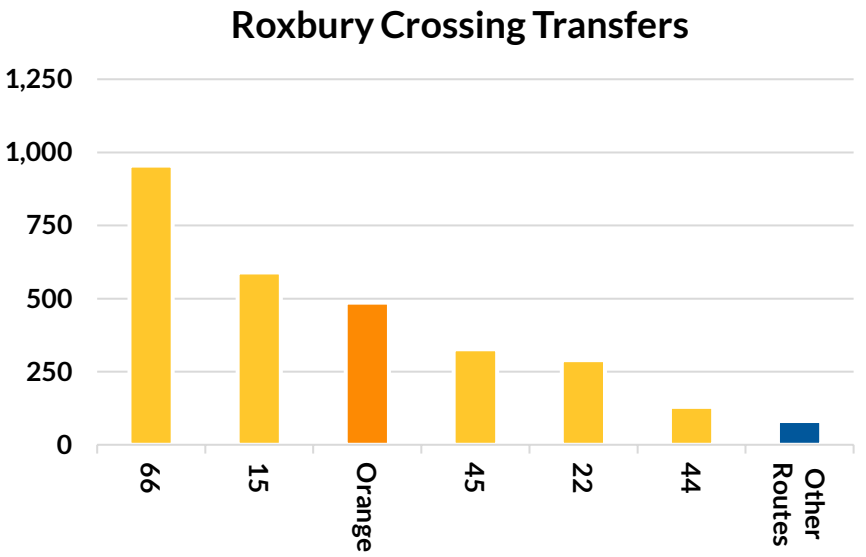

Figure 17 – Roxbury Crossing Station Transfers

MBTA Commuter Rail Ridership

Like other transfer locations, seamless, reliable connections between LMA shuttles and MBTA commuter rail stations will increase access to the LMA. MBTA Commuter Rail riders get direct access to the bus and shuttle routes in the LMA from Ruggles Station, creating an opportune transfer environment. MBTA buses and LC shuttles provide connections between the LMA and two other Commuter Rail Stations: Landsdowne and JFK/UMass. Commuter rail ridership at these three stations is highest in the peak periods, with the highest proportion of riders arriving in the AM Peak period between 6 AM – 9 AM (40%) and leaving in the PM Peak period from 2 PM – 6 PM (46%).

Riders are probably more likely to transfer at Ruggles Station as compared with the JFK / UMass and Lansdowne stations. Ruggles has 6,170 total boardings and alightings throughout the day, nearly three times ridership at Lansdowne (2,657) and JFK/UMass (2,187). While the highest commuter rail station, boardings are less than half at the Ruggles bus stop.

Table 6 – LMA Connecting Commuter Rail Station Ridership

Station	All Day			AM Peak			PM Peak		
	Ons	Offs	Total	Ons	Offs	Total	Ons	Offs	Total
Ruggles	3,166	3,013	6,179	312	991	1,303	1,335	325	1,660
Lansdowne	1,348	1,309	2,657	196	565	761	737	215	952
JFK/UMass	1,095	1,092	2,187	93	614	707	390	91	481

**Because of the way fares are collected, it is not possible to link Commuter Rail trips to transfers onto bus or rapid transit.*

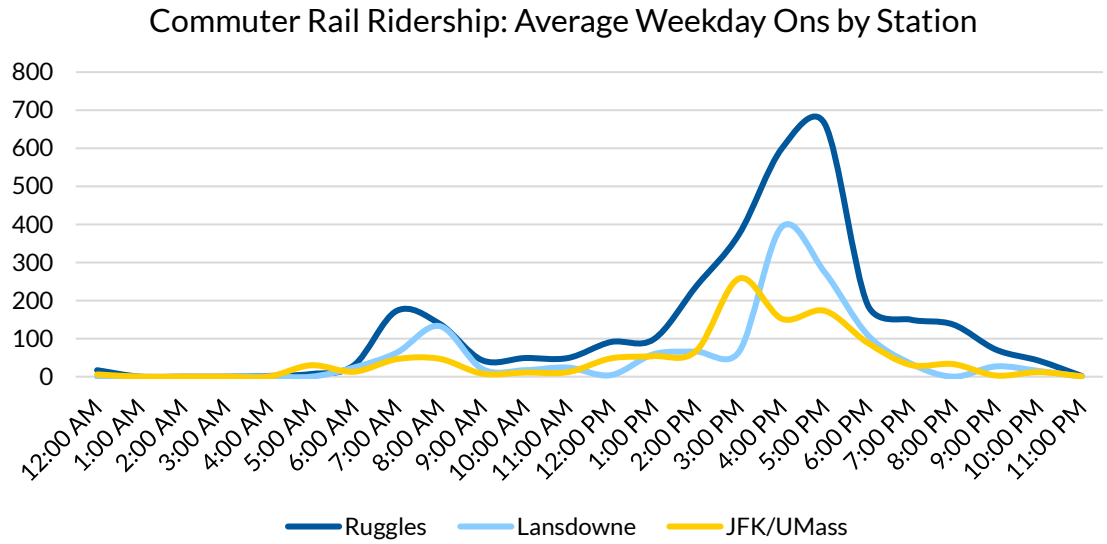

Figure 18 – Commuter Rail Ridership – Average Weekday Ons by Station

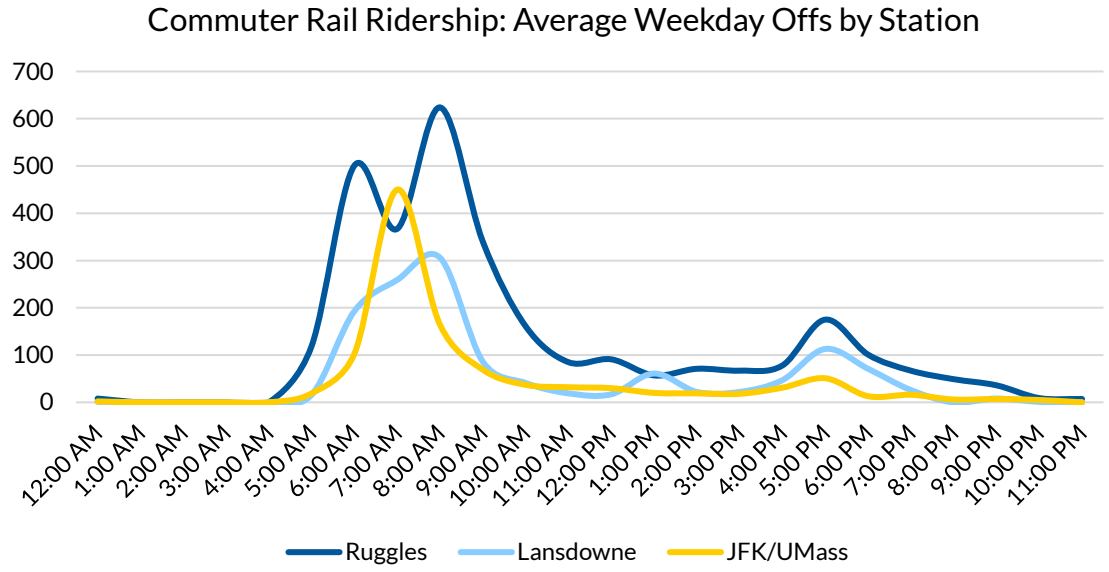

Figure 19 – Commuter Rail Ridership – Average Weekday Offs by Station

Service Quality: Bus Speed, Reliability, and On-Time Performance

3

Introduction

High quality transit service is safe, comfortable and reliable. This section of the Existing Conditions analysis focuses on service reliability (safety and comfort are addressed in subsequent sections). Operating reliable service means that riders can count on getting to their destination at the time shown on the schedule. Reliability is especially important to travelers like people traveling to the LMA (workers, students and patients) who count on transit to get them to work, class and appointments on-time.

The MBTA understand the importance of service reliability. The BNR identified improving bus service reliability, frequency and connectivity as key goals. The MBTA also has a clear focus on service reliability and provides public updates on reliability via its performance dashboard.

Transit service reliability is measured and understood using a handful of metrics and analyses:

- Reliability – the consistency and predictability of travel times between destinations.
- Bus travel speed - how quickly vehicles travel through the study area.
- On-time performance (OTP) – measures the reliability of individual bus routes in terms of arrival times at individual bus stops.
- Passenger delays - identifies locations where the largest volumes of bus riders are delayed.

Findings show:

- Bus speeds in the LMA are low. Most buses travel at speeds of less than 11 mph (all-day average) and can be as low as 7 mph. These speeds are less than half the average posted speed limit (25 mph) in the LMA. As a reference, the average walking speed for adults in 3 mph.
- Travel speeds that fluctuate in unpredictable ways impact travel reliability. Speeds are generally lower in the AM and PM peak periods than they are during midday or all-day (which includes early morning, evening, and night), due to higher levels of roadway congestion.
- The on-time performance (OTP) of MBTA bus routes traveling through the LMA is low; none of the MBTA bus routes traveling through the LMA meet the MBTA's OTP standard.
- Delays and ridership volumes show several locations where delays impact a lot of people. Riders traveling on the segment on Longwood Avenue between Binney St and Brookline Ave, for example, experience a combined 2,017 minutes of delay each weekday on this segment alone, which is only one-tenth of a mile long, or roughly 500 feet.
- Increasing bus service levels without addressing issues related to on-time performance and service reliability will have impacts on service quality and operating costs.

Bus Speed

Bus speeds in the LMA are low, with travel speeds on most streets less than 11 mph (all-day average). Some streets have average speeds of less than 7 mph. These speeds are less than half the average posted speed limit (25 mph) in the LMA. Time when the bus is stopped is not factored into the speed calculation, so slow speeds are reflective exclusively of the actual time traveling.

How fast buses travel directly impacts how long riders' trips take. People make decisions on how, when, and even if to travel based on how long the trip will take. Therefore, bus speeds directly impact ridership.

Speeds are generally lower in the AM and PM peak periods than they are during midday or all-day (which includes early morning, evening, and night), due to higher levels of roadway congestion. Speeds by time of day are explored further in this section.

Figure 20 - Transit Speed and Reliability – All Day

Bus Reliability

Transit reliability is measured as a ratio between the slowest travel time to the median travel time. The measure captures where travel has the most variable and unreliable service. When travel times vary greatly, it is difficult for passengers to plan travel, leading to frustration at a minimum. Unreliable service may also cause missed appointments, being late to work, and/or travelers abandoning transit for another mode.

Even if a segment has higher speeds, reliability can be lower since the least efficient trips are much slower than the typical median trip time. On the map on the right, reliability is represented by the thickness of the line segment, with lower reliability being thicker.

Congestion and other factors impact bus reliability. The data shows four corridors: Ruggles Street, Ave Louis Pasteur, Brookline Avenue, and westbound on Longwood Avenue as having the lowest reliability in the central part of the LMA.

There are a handful of intersections where turning movements cause delay, such as the right-hand turn from Avenue Louis Pasteur onto Longwood Avenue, where reliability is lower relative to other segments nearby. This is also a location where transit ridership and on-board loads are high, meaning the low reliability is impacting many riders.

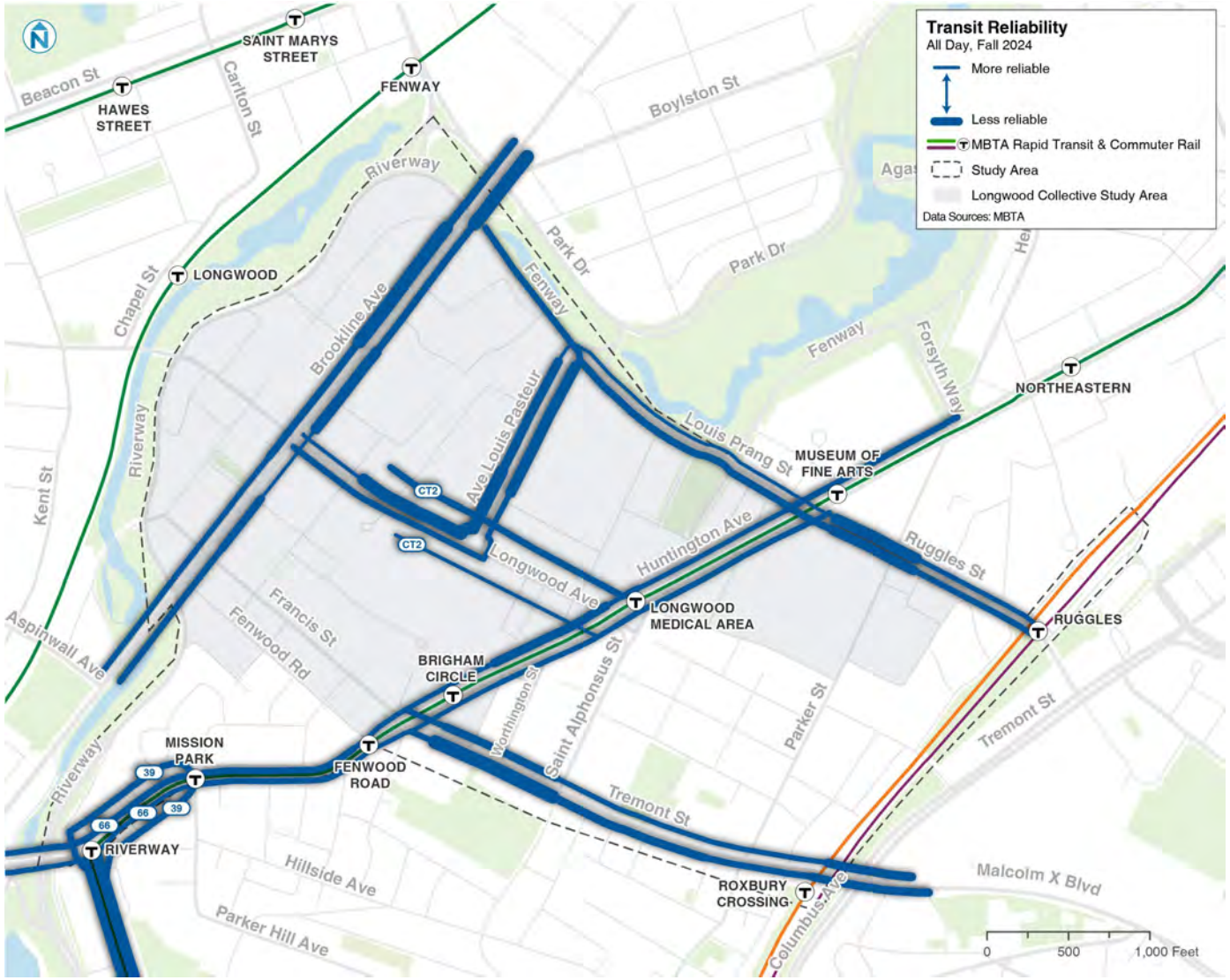

Figure 21 – Transit Speed and Reliability – All Day

Bus Speed & Reliability by Time of Day

When bus speed and reliability are considered together, they tell a story of how long a bus trip will take, and how variable that time is. Segments that are both slow and unreliable cause the biggest negative impacts on riders and are also areas where transit priority can have the most impact.

Route 39 currently operates in bus lanes starting at Brigham Circle to the eastern edge of Huntington Avenue. These segments have some of the best reliability in the study area throughout the day and never drop to the very low speeds (<7 mph) seen by other segments. This demonstrates the value of bus lanes in improving transit operations and performance.

AM Peak

Speeds are lower in the AM Peak as compared to the Midday but still higher on average than the PM Peak. Higher AM speeds (compared with all day) translate to better reliability on numerous corridor segments, including Longwood, Brookline, and Ruggles. This compares with Louis Pasteur, where reliability is especially low during the AM Peak, with some of the longest trips taking three times as long as the median travel time. Speeds along Longwood Avenue and Brookline Avenue west of Longwood Avenue are lower than most other areas, averaging only 5-6 mph.

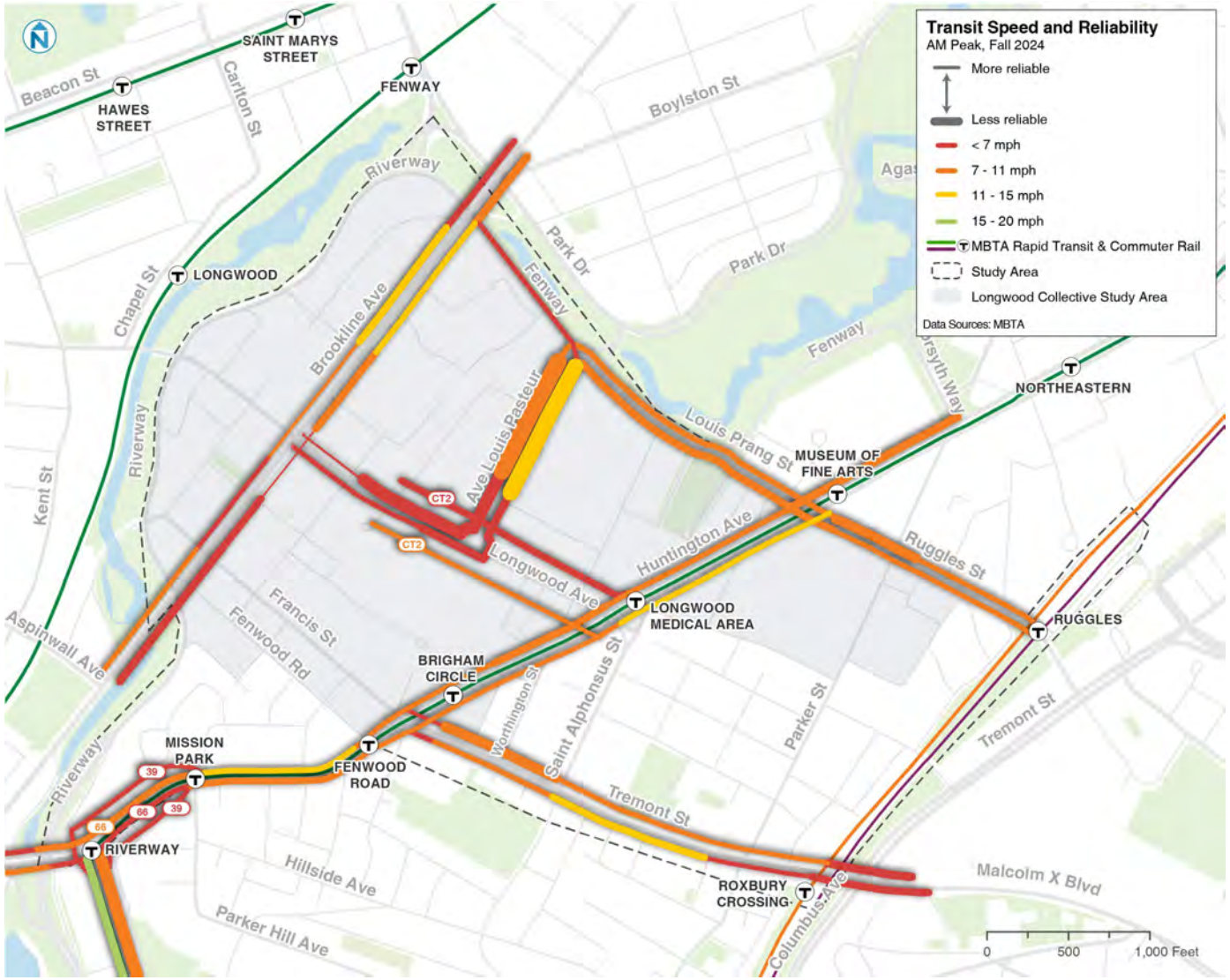

Figure 22 – Transit Speed and Reliability – AM Peak

Bus Speed & Reliability by Time of Day: Midday

Speeds are low in the midday but are generally higher than speeds measured during the AM and PM peak periods. Most corridor segments have speeds lower than 11 mph, with only nine segments exceeding 11 mph, and only one of those nine segments exceeding 15 mph.

Reliability throughout the study area generally improves in the midday as compared to the AM peak. Of the six segments with notably poor reliability in the AM or PM Peak (scored 2 or higher), five have reliability below 2 in the midday. The segment heading northeast on Louis Pasteur has lower Midday reliability than PM reliability.

The improved reliability and speeds during the midday are likely due to reduced traffic and trip volumes during that period. With BNR set to increase midday service, maintaining or improving midday service speed and reliability will be essential to attracting riders with high quality service.

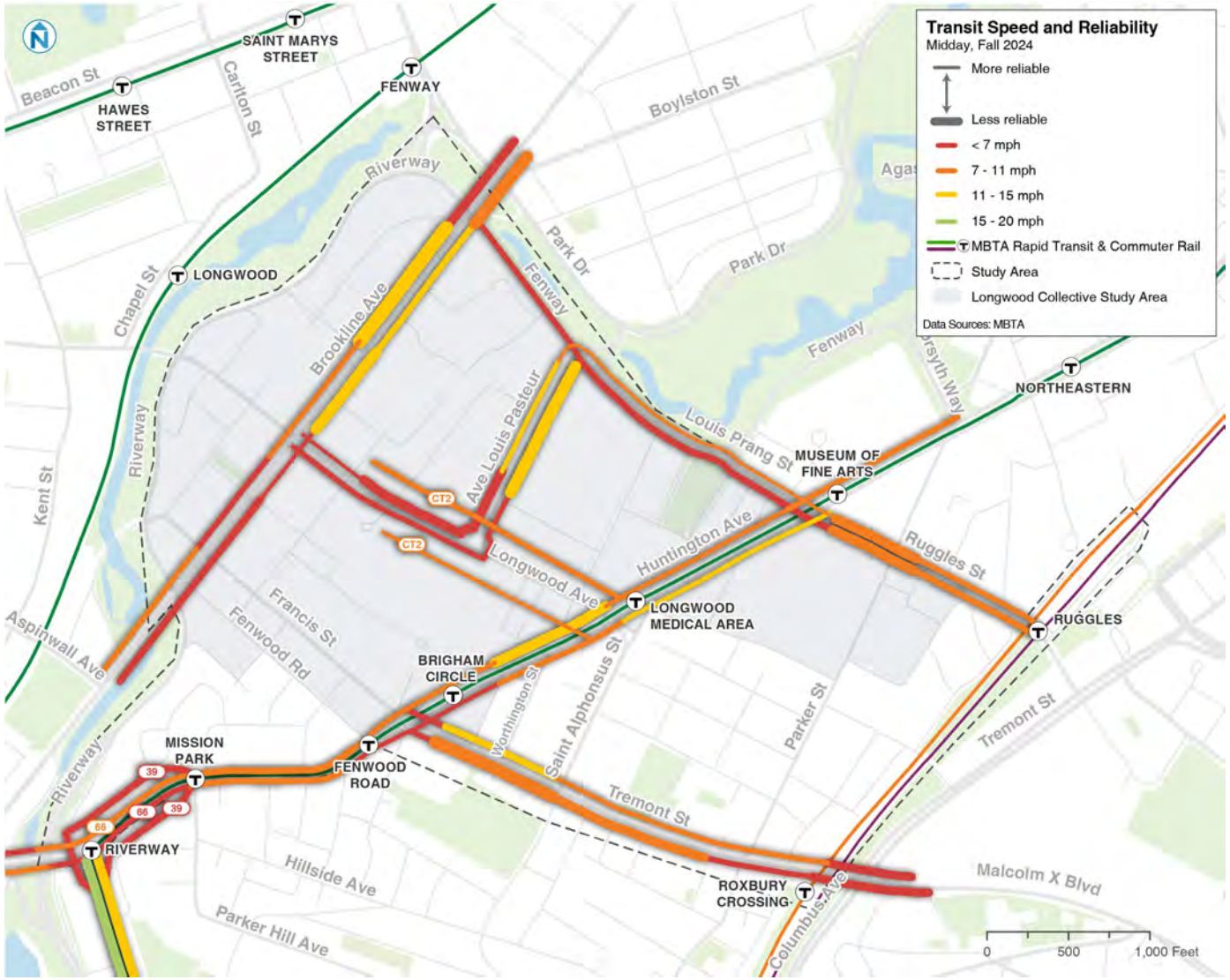

Figure 23 – Transit Speed and Reliability – Midday

Bus Speed & Reliability by Time of Day: PM Peak

The PM Peak period has more drastic speed and reliability fluctuations compared to service in other time periods. Speeds remain low throughout the area, including along Ruggles Street, Louis Prang Street, Tremont Street, and Brookline Avenue. The segment heading southeast on Fenway/Louis Prang has a PM Peak speed of 3.8 mph, and the southeast segment on Tremont Street has a sped of 4.2 mph.

Reliability is the lowest during the PM peak and varies throughout the study area, with the most unreliable segments seeing slowest travel times of more than three times the median travel times.

Brookline Avenue heading southwest, Longwood Avenue heading southeast, Ruggles Street heading southeast, and Tremont Street heading southeast all have reliability scores higher than 2. It's noteworthy that all of these unreliable segments are heading south, or away from the LMA.

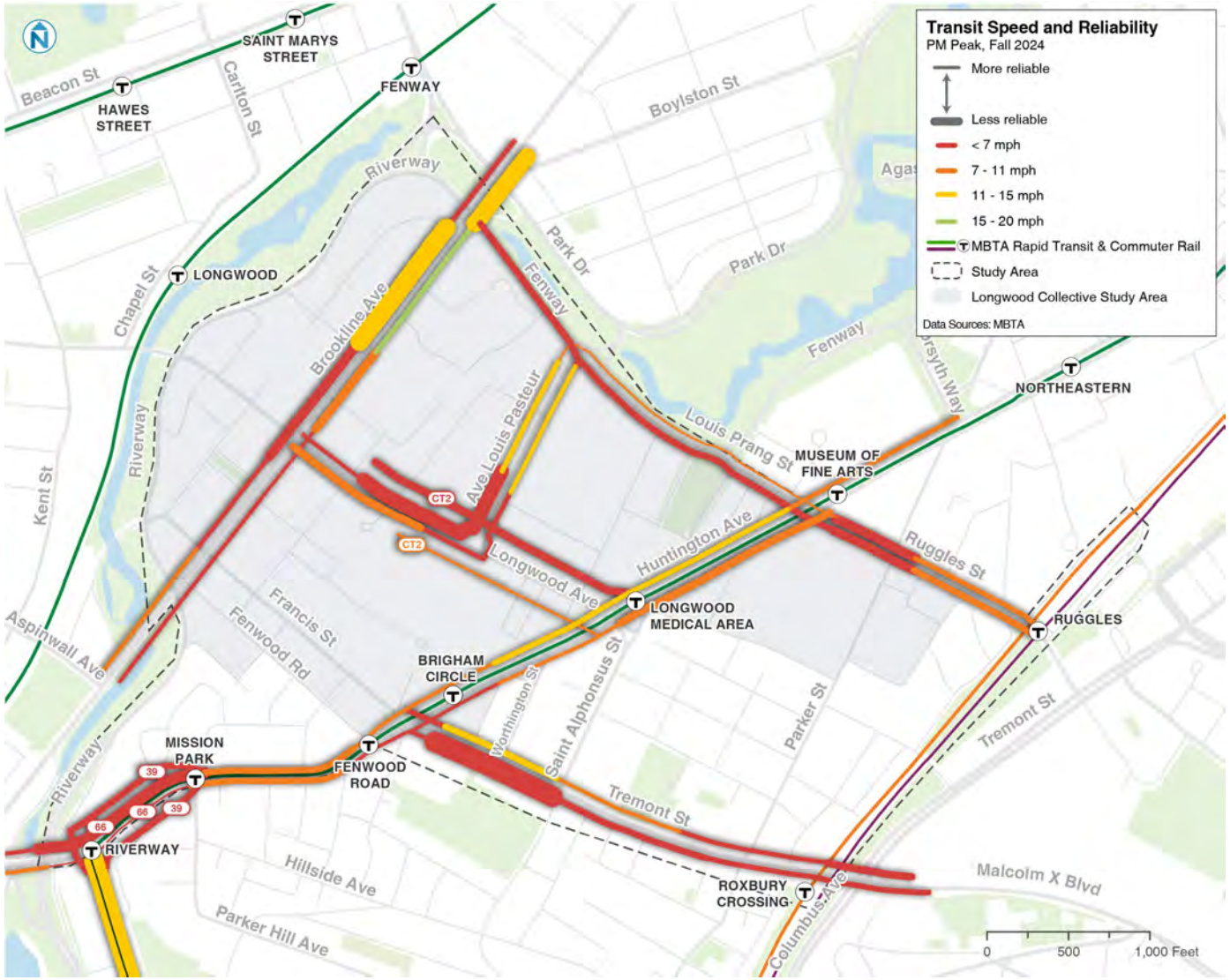

Figure 24 – Transit Speed and Reliability – PM Peak

Bus Speed & Reliability

Table 7 summarizes speeds and reliability measures by corridor direction and time of day. Locations where speeds are especially low (less than 6.5 mph) are highlighted in blue. Locations where reliability is especially low (2.0 or more) are highlighted in green.

- Travel speeds in the LMA are low. This is true on most corridors and at all times of the day.
- Travel in the LMA is not reliable; there are no corridors where the slowest trip doesn't take at least 50% more time than the median. However, reliability does vary by corridor and time of day.
- In most cases, speed and poor reliability are not correlated. Corridors with low speeds are consistently low, making travel more reliable.
- Avenue Louis Pasteur has the highest median speeds across all time periods but is the most unreliable street in the study area during the AM Peak.
- Longwood Avenue has low speeds all day. It is also the street with the most transit service in the area.
- Huntington Avenue between Tremont Street and Ruggles/Louis Prang Streets has relatively good speed (7-15 mph) and reliability throughout the day.

Table 7 – Transit Median Speed and Reliability on Key Corridors – AM Peak, Midday, PM Peak

Key Corridor	Direction	AM Peak Median Speed	AM Peak Reliability	Midday Median Speed	Midday Reliability	PM Peak Median Speed	PM Peak Reliability
Brookline	NE	6.2	1.8	6.4	1.8	6.6	1.8
Brookline	SW	8.5	1.7	7.8	1.8	7.1	2.0
Fenway/Louis Prang	NW	8.7	1.7	9.5	1.5	8.0	1.4
Fenway/Louis Prang	SE	8.9	1.9	5.9	1.8	3.8	1.9
Huntington	NE	8.5	1.7	8.5	1.7	7.7	1.7
Huntington	SW	8.3	1.8	9.1	1.7	8.4	1.8
Longwood	NW	5.3	1.5	5.9	1.5	5.7	1.6
Longwood	SE	6.8	1.8	6.7	1.7	6.9	2.0
Louis Pasteur	NE	12.9	2.9	13.7	2.3	14.7	1.7
Louis Pasteur	SW	10.5	3.0	13.5	1.6	13.7	1.8
Ruggles	NW	9.8	1.8	9.5	1.7	8.0	1.8
Ruggles	SE	8.9	1.7	8.1	1.9	6.3	2.0
Tremont	NW	5.9	1.8	6.4	1.7	6.3	1.8
Tremont	SE	7.6	1.7	6.5	1.9	4.2	2.1

Passenger Delay

Passenger delay is measured by estimating passenger minutes of delay, or the combination of passenger loads (how many people are on the bus) and minutes of delay (how long they are delayed compared to their scheduled travel time) on a corridor segment. Locations where large volumes of passengers are delayed, or behind the projected schedule, shows where infrastructure investments can have the greatest return on investment.

In the LMA, the segment with the most passenger minutes of delay on a per-mile basis is the segment from Longwood Ave @ Binney St to Brookline Ave @ Longwood Ave. Riders experience a combined 2,017 minutes of delay each weekday on this segment alone, which is only one-tenth of a mile long, or roughly 500 feet.

Table 8– Passenger Delay on Key Corridors

Corridor	Average Passenger Minutes of Delay Per Mile
Brookline Avenue (East of Longwood)	3,868
Fenway/Louis Prang	7,057
Huntington Avenue	4,768
Longwood Avenue	7,854
Ave Louis Pasteur	5,174
Ruggles Street	5,270
Tremont Street	8,983

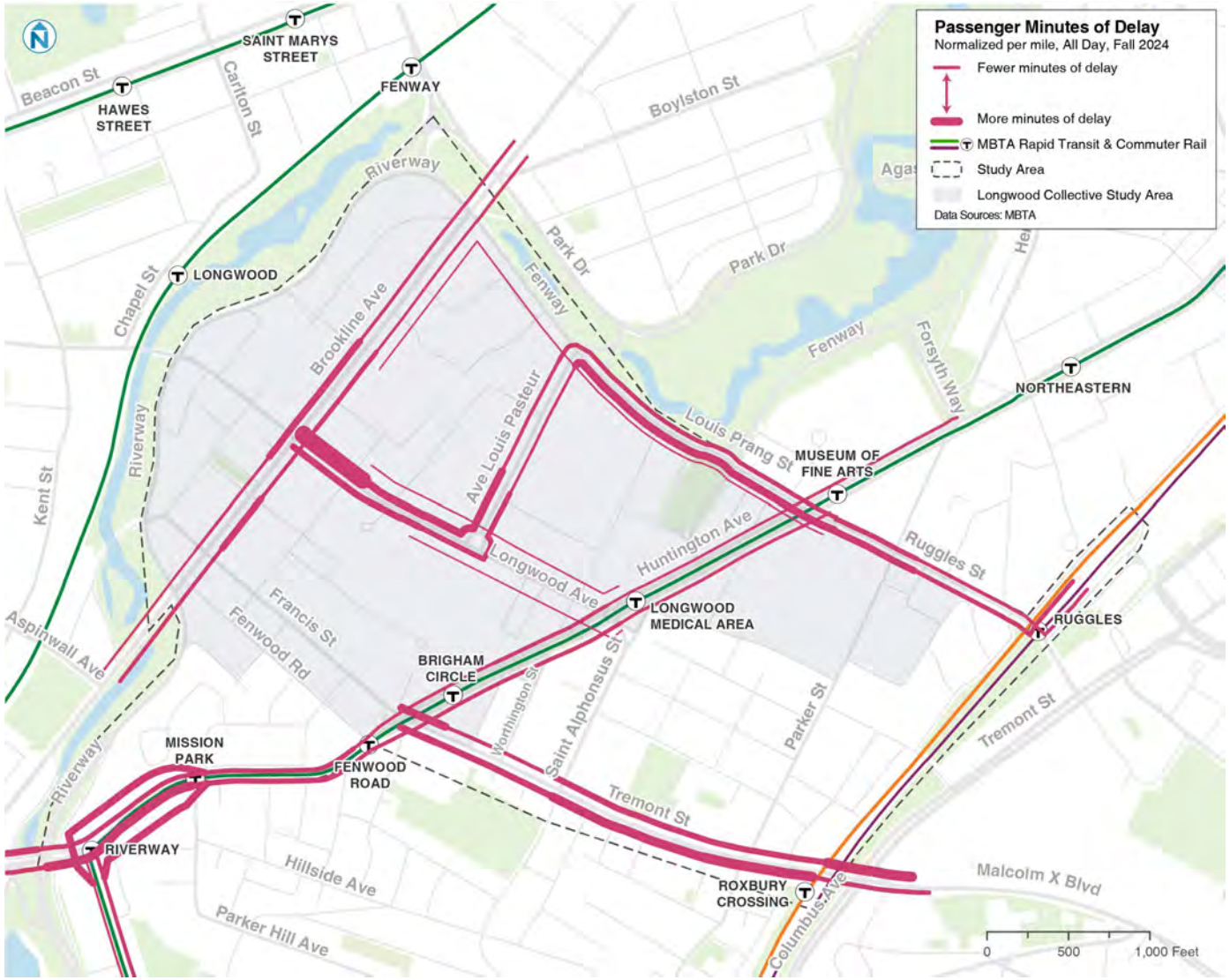

Figure 25 – Passenger minutes of Delay

On-Time Performance

Transit agencies measure on-time performance (OTP) by comparing the actual times a bus departs from a time point or bus stop with the scheduled time. OTP is typically measured as a percentage and can be broken down into categories of on-time, early, and late. A bus is on-time if it arrives at a timepoint (mid-route) between 1 minutes ahead of the scheduled time and up to 6 minutes after the scheduled time, or if the bus departs from the stop within that time window (-1 and + 6 minutes), it is considered on time.

The MBTA's current OTP standard as stated in their Service Delivery Policy is 70% on-time. Of the routes that run through the study area, Routes 39 and 66 are close to the MBTA's standard, at 64% and 62% respectively. Routes 8 and 19 have OTP ratings that are below 50%, meaning that the bus is not arriving at or departing timepoint stops on time a majority of the time on both routes.

Bus schedules try to account for typical traffic volumes, but unpredictable congestion is usually the primary driver of on-time performance issues.

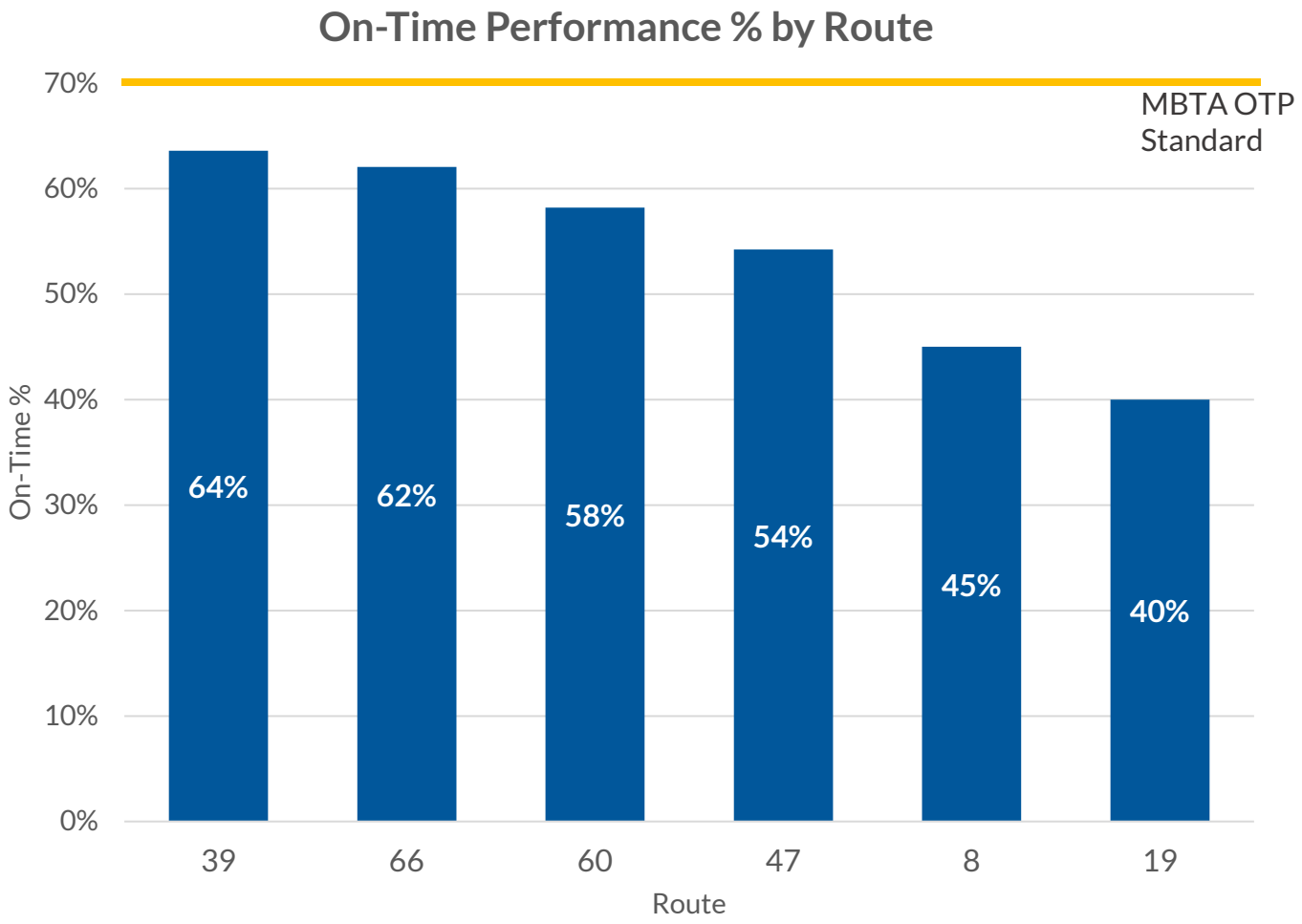

Figure 26 – On-Time Performance by Route

Bus Stop Accessibility and Amenities

4

Introduction

Bus stops provide safe and comfortable places for riders to board and alight from the transit services. They are also important locations for riders to learn about transit services and navigate to/from their final destinations. Bus stop accessibility, including ramps, space for people with wheelchairs and other factors, is essential for riders with disabilities. Given the LMA is a medical services center that serves a high number of people seeking medical care, the number of casual visitors is high as is the potential for higher levels of comfort and safety.

The Existing Conditions analysis inventoried and evaluated bus stops in the LMA to understand if, how and where bus stops may need additional investments to accommodate changes in route alignments or increases in services. The analysis focused on MBTA bus stops only, in part because the MBTA publishes clear guidance and standards for bus stop accessibility and amenity investments. These standards were used as a benchmark to compare available infrastructure and identify needs and gaps in existing passenger amenities.

Bus circulation strategies also needs to consider locations where buses layover or wait between trips. An ideal layover location provides a place close to the bus route, but not in the direct alignment and offers facilities for transit operators taking a break. Mapping bus layover locations in the LMA is challenging in part because locations vary by trip and time of day. Data about the quality and availability of operator facilities in the LMA was available. This data was compared with MBTA guidelines for transit operator facilities and facilities available to support operators at bus layover spaces, including access to restrooms.

The analysis suggests:

- Bus stop accessibility is an area for improvement. Given many travelers to the LMA are seeking medical care, ensuring stops meet accessibility standards is critical.
- Given the volume of transit riders, there is an under-investment in bus stop amenities in the LMA, including shelters but also seating and benches.
- With a handful of exceptions (less than 5%), existing layover facilities meet the MBTA standard for operator restrooms. This means that changes to the layover location will need to ensure restroom access is available.

Bus Stop Accessibility

The MBTA includes accessibility standards in their Bus Stop Design Guidelines. The MBTA conducted a bus stop accessibility audit on all its stops as part of their Plan for Accessible Transit Infrastructure (PATI) work; this work was conducted in 2017.

The PATI standards evaluate sidewalk width, curb ramp quality accessible path of travel, curb height, location of front and back door landing areas, among other factors. The MBTA's analysis shows a high number (84%) of bus stops do not meet the MBTA's accessibility standards, with most stops along Huntington Avenue and Longwood Avenues as well as Tremont and Ruggles Street as falling short of the standard. Bus stops that do meet the standard are concentrated on Brookline Avenue, especially the intersection of Brookline and Longwood Avenues.

Table 9 – PATI Priority Categories and LMA Stops

Compliance Status	Total Stops	% of Stops
Compliant	7	16%
Medium PATI Priority	30	70%
Low PATI Priority	6	14%

Figure 27 – Bus Stop Accessibility Compliance

Bus Stop Amenities

The MBTA publishes Bus Stop Design Guidelines that set standards and expectations to guide investment in individual stops, such as shelters and benches. The Bus Stop Design Guidelines were updated in 2025 as part of the broader BNR effort. According to these standards, for a bus stop to qualify for a shelter, for example, the standards set the minimum number of average weekday boardings at 70. To quality for seating, the guidelines set criteria for average weekday boards for a bench at 50.

Given high ridership at the LMA, a larger number qualify for amenities such as shelters and benches. However, only a small proportion of the qualifying bus stops are equipped with such features. For example, 32 stops that qualify for seating and a shelter, but only 17 are currently equipped with these amenities, suggesting an opportunity for increased investment. This study will identify bus stop locations, improvements, and amenities.

Table 10 – Amenity Types and Existing and Qualifying Stops

Amenity Type	Total Stops by Amenity	% of All LMA Stops	Stops that Qualify	% of Stops That Should be in Each Amenity Category
No Amenities	18	42%	9	21%
Bench Only	8	19%	2	5%
Shelter with Bench	17	30%	32	74%

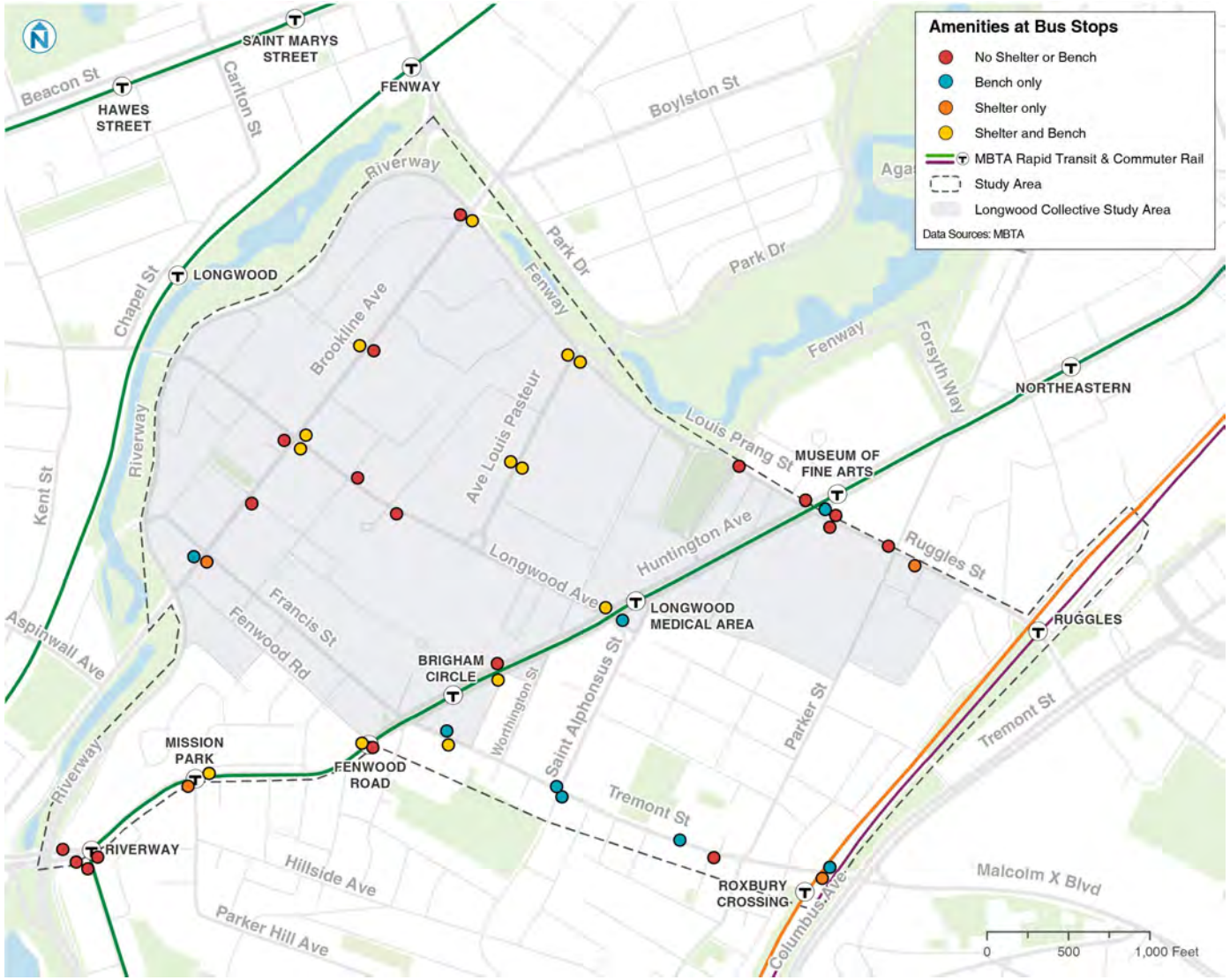

Figure 28 – Amenities at Bus Stops

Operator Restrooms and Layover Locations

The MBTA also sets standards and guidelines for operator restroom locations and has been focused on improving restroom locations in advance of BNR service implementation.

Data on bus operator restroom locations associated with existing layover spaces shows that most locations have adequate restroom access. Only an estimated 4% of all systemwide are at layover locations with inadequate restroom access. According to the guidelines an area is inadequate based on a handful of criteria including layover time and quality, as well as the quality and availability of facility, and permission of use if not owned by the MBTA.

Of trips with inadequate restroom access (4% equates to 2,966 trips), only 3%, or 95 trips are within the LMA. All of the locations with inadequate restroom access are trips that layover on Avenue Louis Pasteur near the Boston Latin Academy. The MBTA has identified this location as a potential challenge with BNR implementation. Changes to bus circulation through the LMA, including bus layover locations, must consider access to restrooms and ideally, will rectify challenges with the existing location. All other restrooms in the LMA are adequate for existing and future BNR service.

Figure 29 – Bus Operator Restroom Locations

Travel Patterns and Roadway Conditions

5

Introduction

Buses and shuttles in the LMA operate on city streets, sharing road space with other vehicles. The diversity of land uses in the LMA leads to a diversity of vehicle types on the roadway, including private vehicles, delivery trucks, transportation network companies (TNCs), as well as emergency vehicles, like ambulances.

Given the relationship between bus movements and other vehicle movements, the Existing Conditions inventoried and described the travel conditions for vehicles – and people - moving through the LMA. The analysis evaluated several factors related to roadway conditions, including data collected and analyzed by the Longwood Transportation Framework and the Corridor Profiles developed in conjunction with this report (see Appendix B):

- Overall travel volumes, including measures of vehicles traveling to the LMA as compared with vehicles passing through the study area.
- Crashes as a metric to identify locations where safety has been a persistent challenge and the type of conflicts recorded.
- Intersection information, including user volumes and analysis at key intersection locations. The intersection analysis to be used as a baseline for potential transit priority improvements.
- Curb space and the allocation of space to on-street parking, loading docks and delivery trucks, and pick up and drop off locations used by passengers and food delivery services.

Data confirms high traffic volumes and roadway congestion overall, with most major intersections at capacity for vehicle movements at key times of the day. Taken together, the data suggests a handful of key findings:

- A high volume of people travel to the LMA and through the LMA. Traffic patterns for each traveler groups are different with through traffic primarily using the outer roadway and staying outside of the LMA core.
- Intersections in the LMA, like roadways, are congested, with most at capacity according to traditional traffic engineering measures, like level of service.
- Several intersections in the study area are equipped with technology to prioritize transit vehicle movements.
- 282 crashes with injuries have been reported in the LMA study area since July 2020. 38% of these crashes involve a motor vehicle colliding with a pedestrian or bicyclist.
- The lack of active curb management contributes to congestion, slow speeds and unreliable travel times. Challenges include a lack of enforcement and in some cases, no clear designations for users.

LMA Transit and All Modes Trips

The LMA accommodates trips across all modes. Replica—a platform that offers various applications and datasets for traffic data analysis, including total trip volumes—was used to conduct an all-mode trip analysis.

Starting around 6:00 AM, total trip volumes are high, exceeding over 10,000 trips per hour, and remain at this level through 7:00 PM, not lowering below those volumes until around 8:00 in the evening.

Travel in the LMA remains high throughout the day rather than having distinct AM and PM peaks, most likely due to employees varying shift times, varying student schedules, and patient appointment times which occur throughout the day. Trips among all modes are highest during the PM peak, however the highest amount of transit service occurs during the AM peak and is much lower during midday and evening.

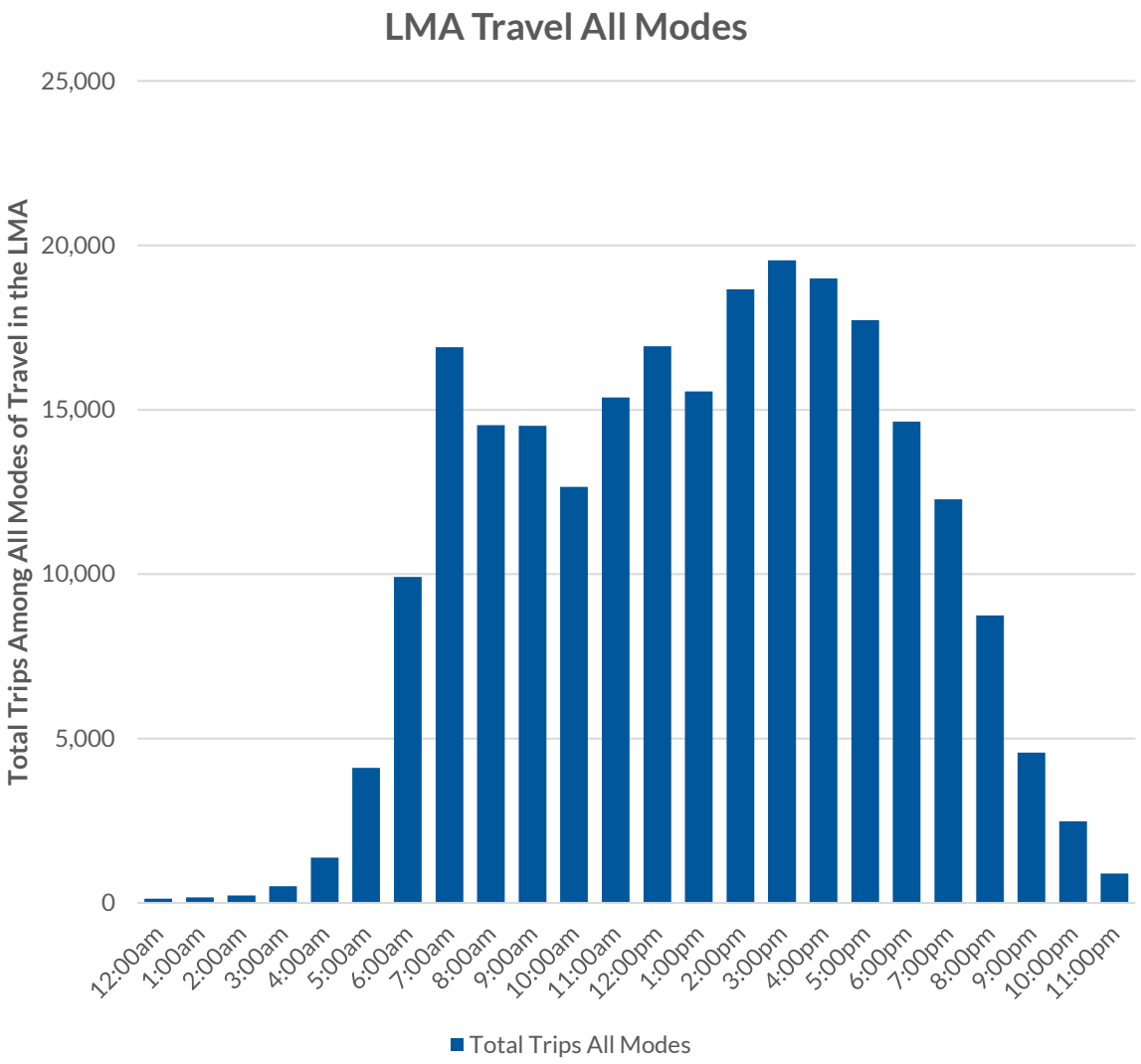

Figure 30 – LMA Travel, All Modes

Travel Patterns and Passthrough Trips

Passthrough traffic trips are trips that do not begin or end at the LMA. A Replica-based passthrough trip analysis was used for this analysis, which illustrates the roads that people use to travel through the area when their origin and destination are beyond the study area. This analysis is based on non-transit traffic only.

The roads that have the highest usage for passthrough are mostly on the periphery of the study area, except for Huntington Avenue, which cuts directly through the study area.

Longwood Avenue, Brookline Avenue, and Avenue Louis Pasteur, roads that have some of the highest transit activity, have lower passthrough rates (20% or less). This means that drivers passing through the LMA are avoiding these roads and opting for larger roadways, like Riverway and Huntington Avenue. Francis Street, which is under consideration for transit service in this study, has higher passthrough traffic (between 41-60%), but lower total volumes. Longwood Avenue and Brookline Avenue, despite having lower passthrough volumes still have a lot of vehicular traffic.

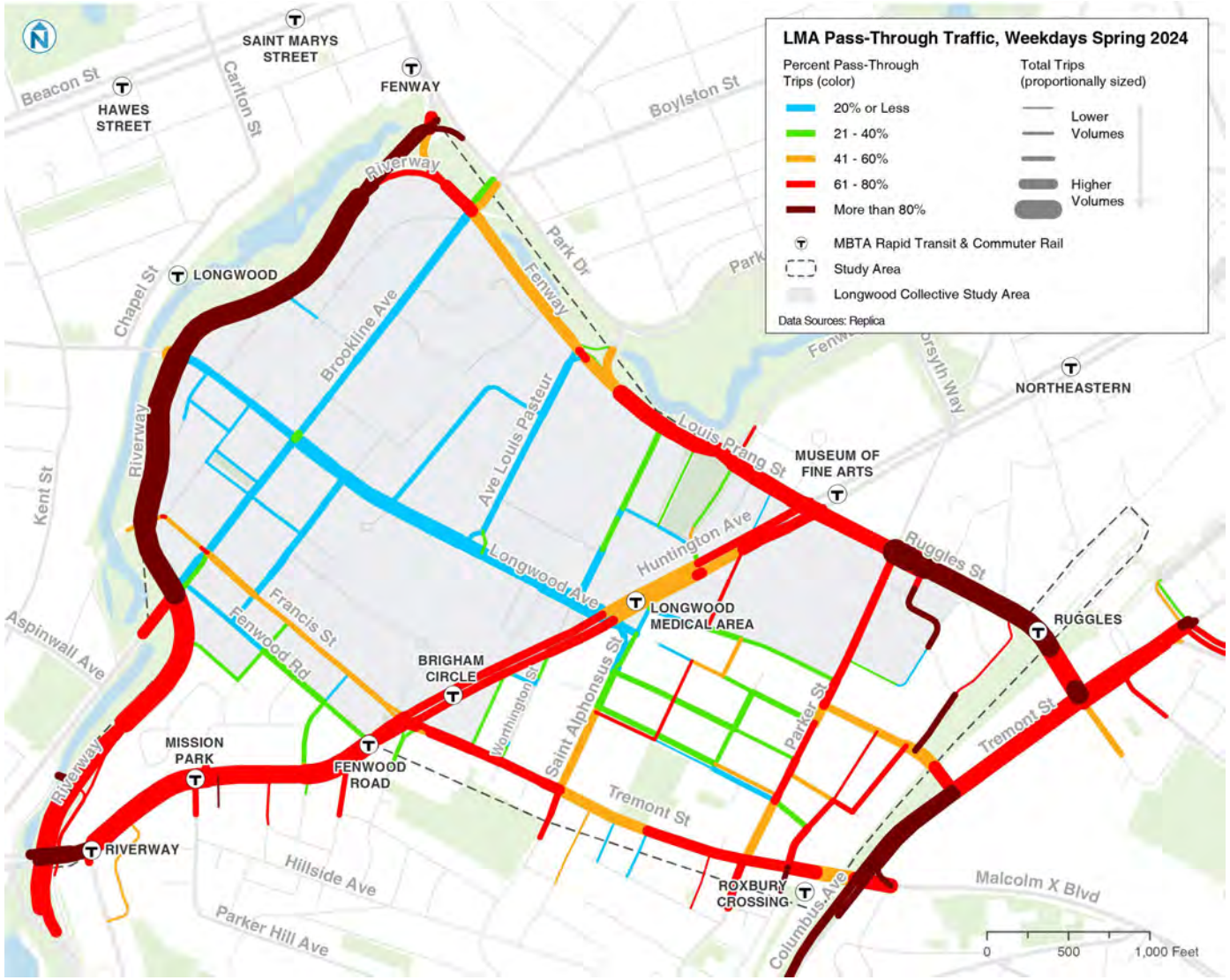

Figure 31 – LMA Pass-Through Traffic – Weekdays

Crashes

282 crashes with injuries have been reported in the LMA study area since July 2020. Of these crashes, 62% are motor vehicle only crashes, 23% involved a motor vehicle and pedestrian, and 15% have involved a motor vehicle and bicycle. The data does not include details on the potential involvement of a bus or shuttle.

Pedestrian crashes happen throughout the study area but are concentrated along the quadrant of Longwood Avenue, Brookline Avenue, Francis Street, and Huntington Avenue; approximately 20% of all study area pedestrian crashes have occurred in this quadrant.

The section of Huntington Avenue within the study area alone accounts for 20% of all pedestrian crashes.

Table 11– Total Crashes by Corridor

Key Corridor	Total Crashes	% of Study Area Crashes
Brookline	54	19%
Fenway/Louis Prang	10	3%
Francis	17	6%
Huntington	54	19%
Longwood	42	15%
Louis Pasteur	10	4%
Ruggles	20	7%
St Alphonsus	12	4%
Tremont	39	14%

Table 12– Total Crashes by Mode

Crash Type	Total	%
Motor Vehicle	176	62%
Bicycle	42	15%
Pedestrian	64	23%

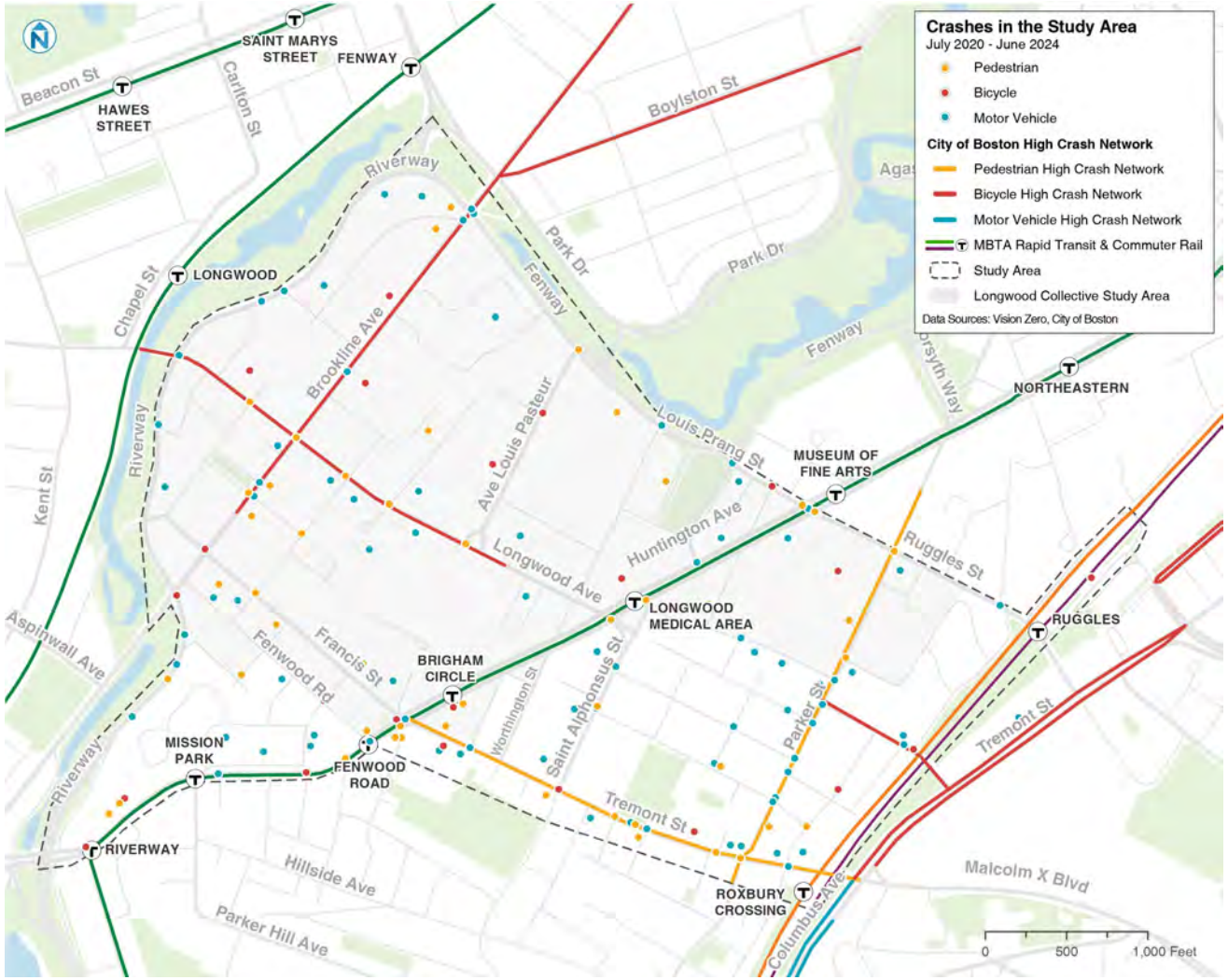

Figure 32 – Crashes in the Study Area

Signalized Intersection Data & Capacity Analysis

The LMA benefits from an array of on-going transportation data collection and analysis efforts providing available data from:

- Local area development filings
- Ongoing agency infrastructure projects
- Historic BTD traffic data

Available data includes intersection user counts between 2018 and 2023 and Synchro modeling information like signal timings and phasing. Utilizing the data and signal information from the available resources, weekday morning and weekday afternoon peak hours were reviewed within the study area.

The LMA Bus Circulation study identified signalized intersections for detailed analysis . The locations were selected based on available data and locations of anticipated modification to support future transit improvements within the study area. Capacity analysis was conducted utilizing Synchro software to estimate overall existing operations for vehicles including intersection capacity utilization and levels of service for vehicles.

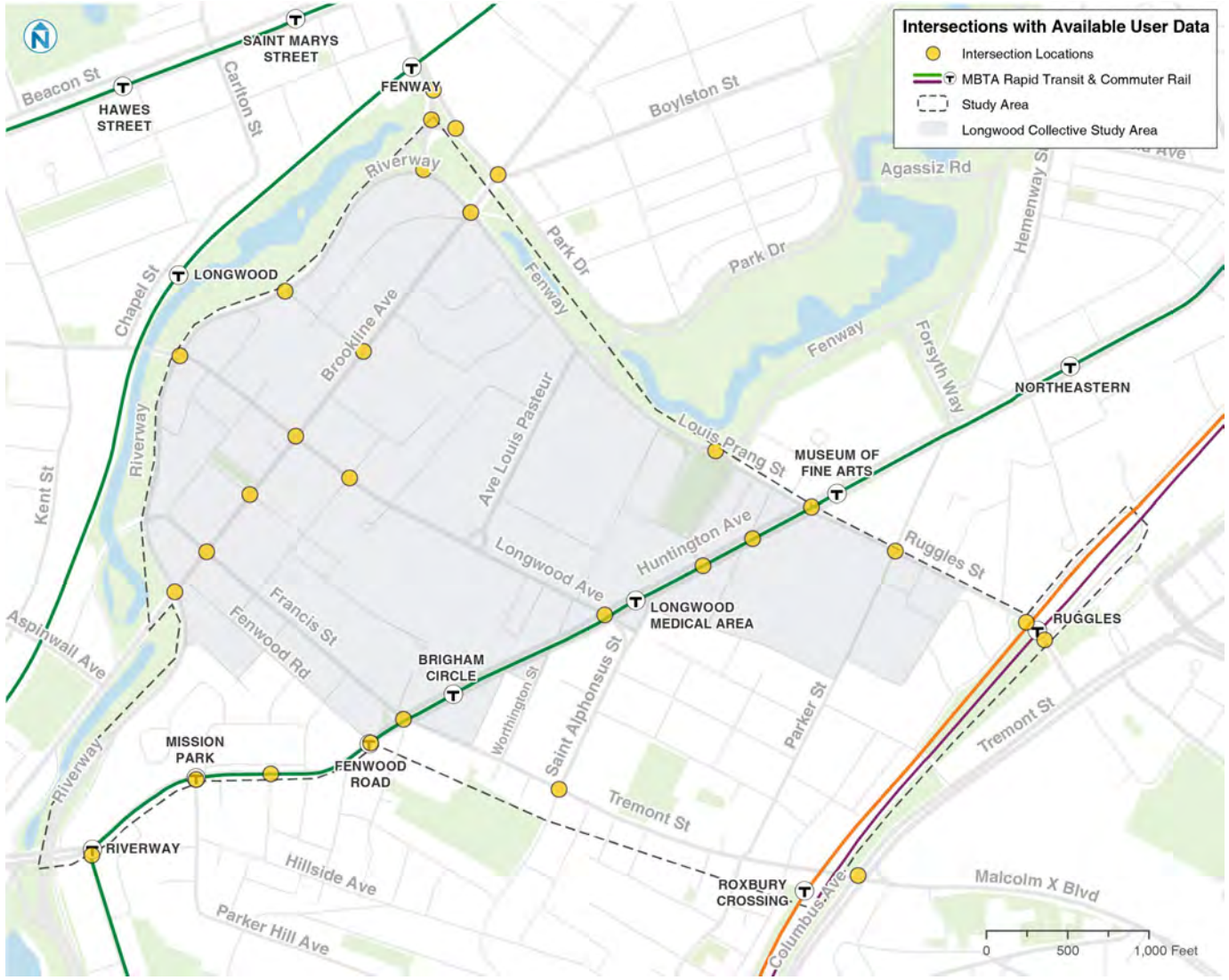

Figure 33 – Available Intersection Data

Vehicular Overall Level-of-Service

Vehicular Level-of-Service (LOS) is a traditional performance measure used in traffic engineering to evaluate the quality of service of elements of the transportation system. At the intersection level LOS is based on average vehicle delay for all vehicles using the intersection. LOS ranges from A to F, with LOS A representing intersections that operate with less than 10 seconds of delay per vehicle and LOS representing locations with delay exceeding 80 seconds per vehicle at signalized intersections.

Vehicular LOS is a useful tool for evaluating intersections; however, it only measures vehicle delay and doesn't consider elements such as safety, other roadway users, and various other factors in a comprehensive multimodal analysis.

In the study area, six intersections operate at overall LOS E or worse during at least one of the peak hours.* The intersections are clustered along the Riverway, Brookline Avenue, and Huntington Avenue.

Figure 34 – Intersection Level of Service

**Longwood Bus Circulation Study intersection count data is from October 2024, which may differ from intersection count data used in the Fenway and Park Drive Feasibility Study (April 2025).*

Signals and TSP Capability

A potential strategy that will be considered as part of the LMA Bus Circulation study is transit signal priority (TSP), which can improve transit speed and reliability. TSP works by creating a connection between buses and traffic signals that allows the signals to react to buses approaching the intersection. The technology can either extend green lights to allow an incoming bus to get through the light before turning red or shorten the duration of a red light while a bus is waiting to go through the intersection.

Twenty-seven signals in the study area and along the project's key corridors are capable of TSP and are on Boston's signal network, meaning that the City could implement transit signal priority. There are five signals on Riverway and Brookline Avenue that are capable of TSP and are on Department of Conservation and Recreation's (DCR) signal network.

MBTA and City of Boston recently announced a partnership to improve bus reliability by expanding transit signal priority city-wide after successful testing along Brighton Avenue.

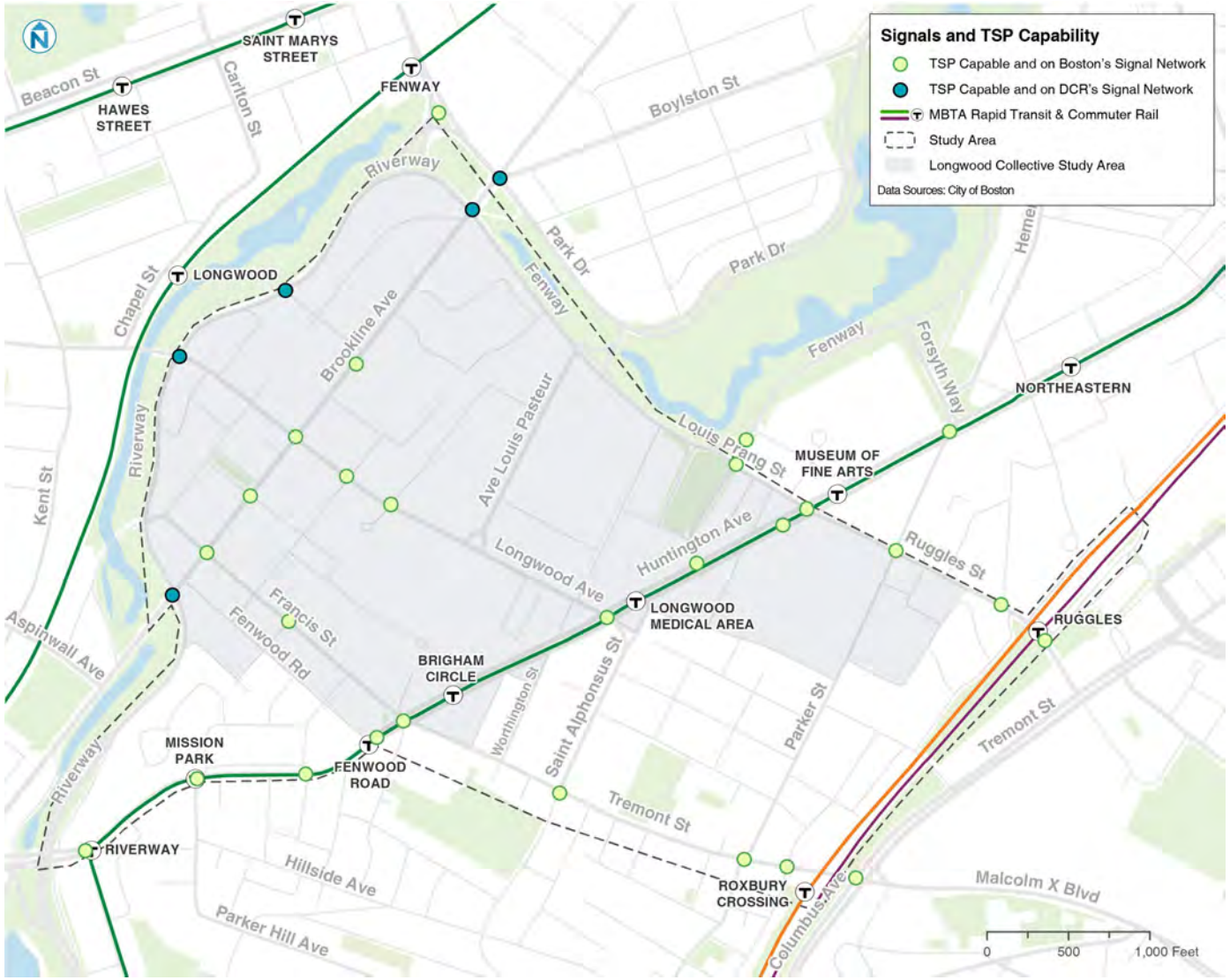

Figure 35– Signals and TSP Capability

Insights from the LMA Employee Survey

Longwood Collective Survey Results – BNR Familiarity

Understanding the attitudes and experiences of people traveling to/from the LMA can inform better bus service design. The LMA Bus Circulation study benefitted from a recent survey (Spring 2025) conducted by the LC with LMA employees and commuters.

The LC survey collected 2,392 responses, including from transit riders and non-riders comprised of 2,083 were full-time employees and 309 part-time employees or students. It included 33 questions, primarily focused on employee commutes like mode used on different days and about changes that might influence their commute behavior.

One of key questions asked in the survey was familiarity with the BNR effort (see Figure 34). The survey showed that 20% of all respondents were familiar with BNR. Familiarity increased to 26% for people who identified themselves as frequent bus riders, while awareness among non-riders was 18%.

These two numbers indicate that a vast majority of respondents, even bus riders, do not know about BNR, even though the first phase of BNR was implemented in December 2024 with a large outreach effort. This number indicates that outreach to existing LMA employees, especially those that are regular bus riders, about future changes to the bus network is required before implementation.

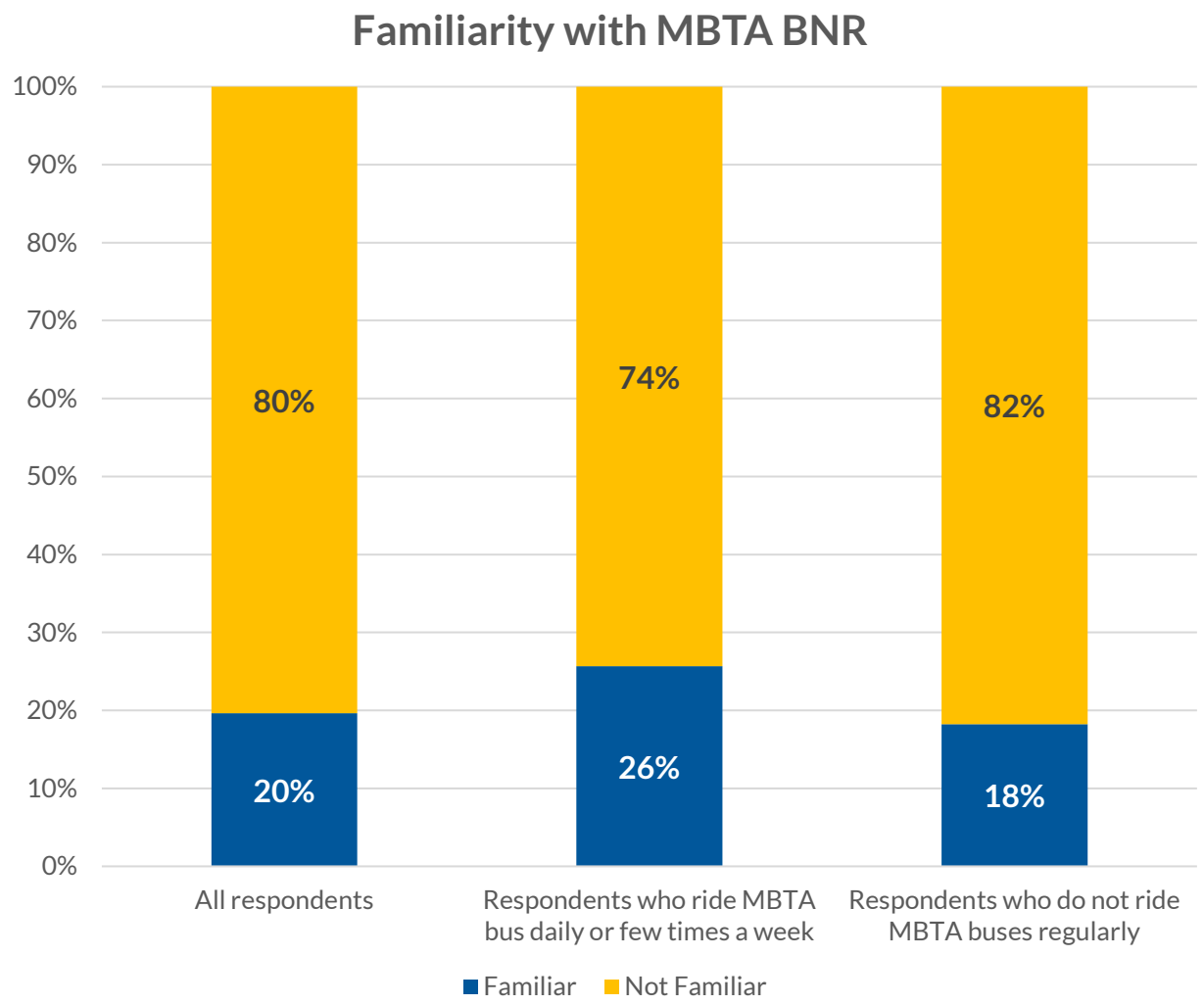

Figure 36 – Familiarity with MBTA BNR

Longwood Collective Survey Results – Bus Rider Characteristics

The survey also found different characteristics between respondents who are regular bus riders and all respondents. This can aide outreach to employees most likely to take buses to the LMA.

MBTA Riders tend to be/have:

- 18 to 44 years old
- Household income between $25k and $75k
- Varying levels of educational attainment between less than a bachelor's degree and an advanced degree
- Own one or no vehicles
- Have worked at the LMA for less than 5 years

Non-MBTA Riders have mostly opposite characteristics:

- 30 to 59 years old
- Household income of higher than $75k
- Own one or two vehicles
- Have advanced degrees

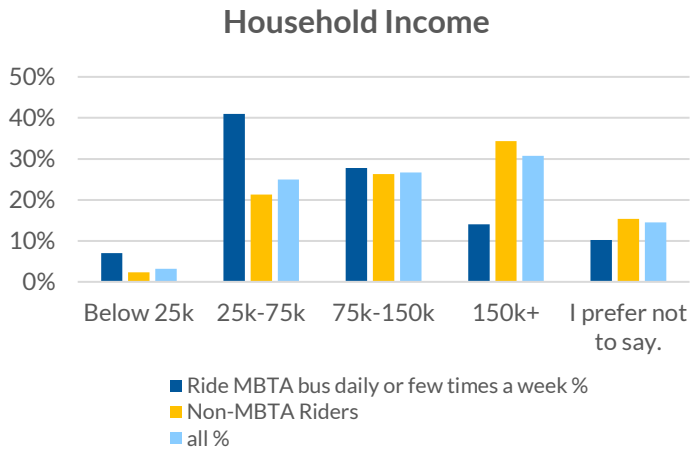

Figure 37 – Household Income

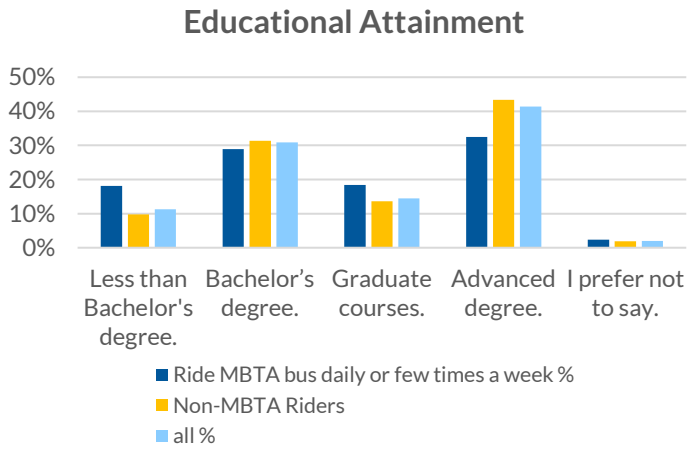

Figure 38 – Educational Attainment

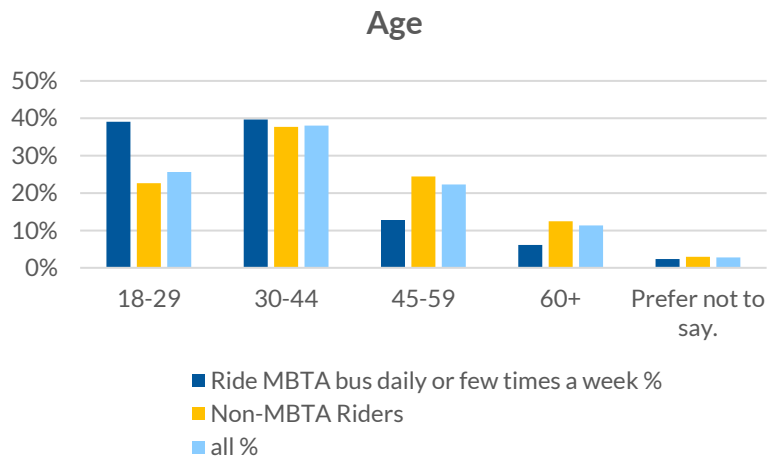

Figure 39 – Age

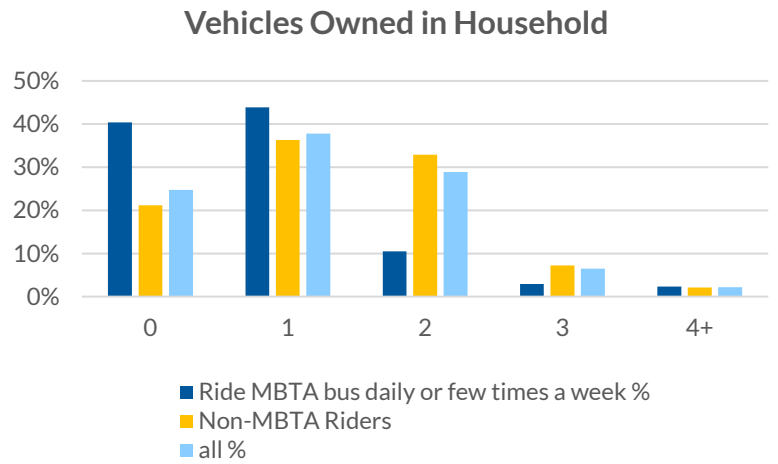

Figure 40 – Household Vehicles

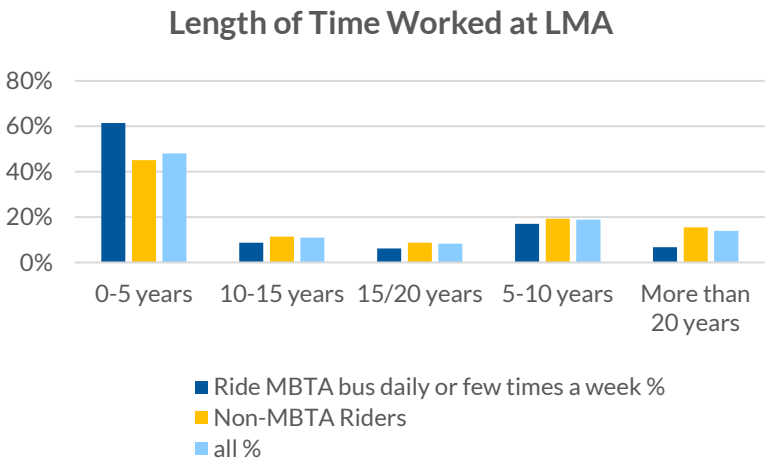

Figure 41 – Length of Time Worked at LMA

Longwood Collective Survey Results – Incentives to Shift Modes

BNR seeks to increase frequency throughout the day to and within the LMA. Many additional riders will also have increased access to one-seat rides into the LMA. This study also seeks to identify possible speed and reliability improvements to bus service.

For those respondents who definitely or probably would shift their preference from driving to another mode, between 66 and 77 percent identified more frequent service, designated road space for buses, improved/extended routing, and improved speed/reliability as worthwhile incentives. Almost 60 percent of respondents said better information would influence their mode preference.

The most popular mode shift incentives can each be linked to improved bus infrastructure. Improved speed and reliability, frequent service, and improved routing can each be improved with designated road space for buses.

Ultimately, the most important factor in switching modes is the quality of the bus service. More convenient and reliable service would have the greatest likelihood to incentivize non-riders to switch their mode of travel.

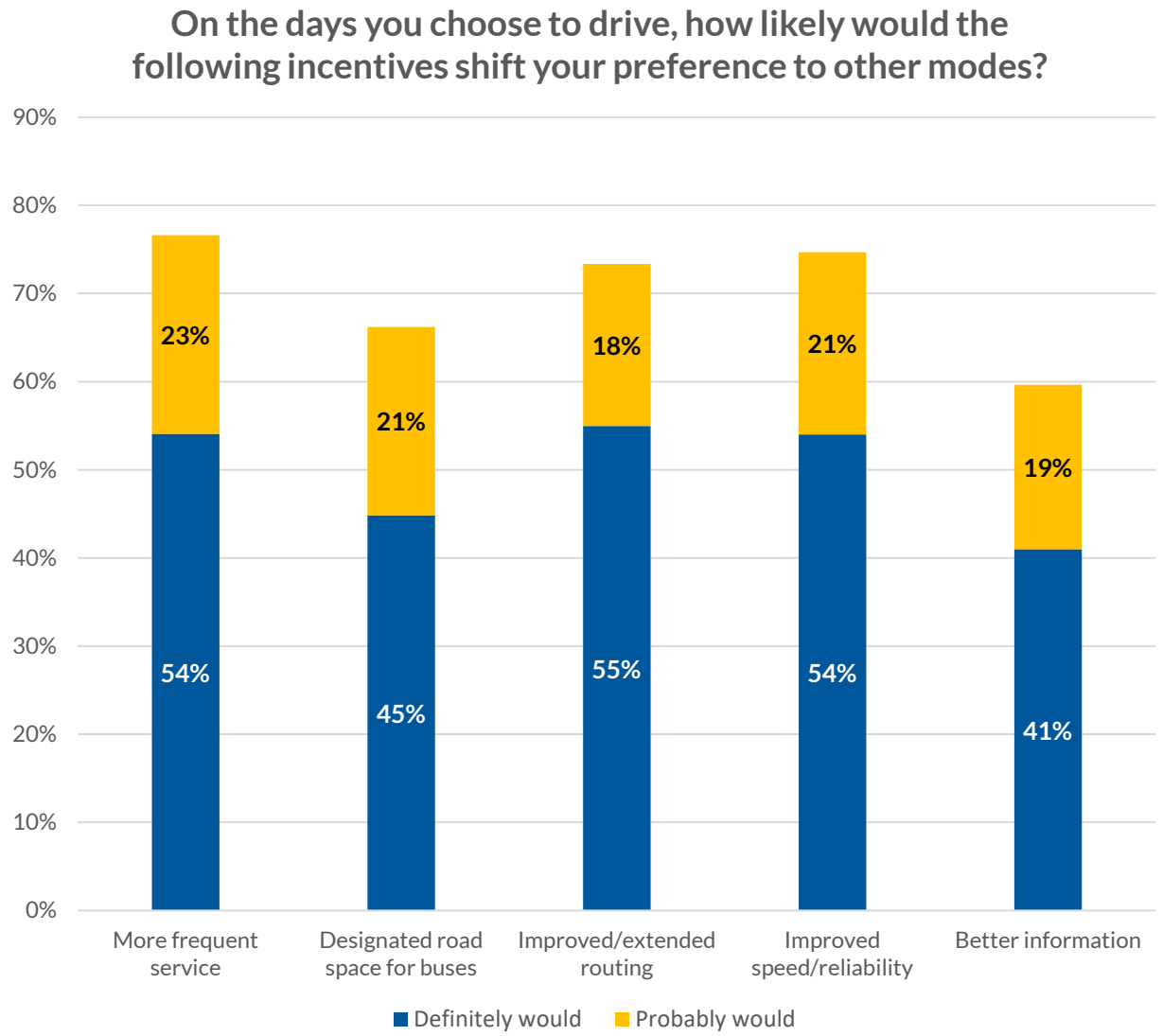

Figure 42 – Incentives for Shifting Modes

Implications for BNR

7

Introduction

The LMA Bus Circulation Study is part of the MBTA's implementation of its Bus Network Redesign effort, which is designed to improve bus service by prioritizing riders who rely on it, offering more frequent and more all-day service, connecting new places, simplifying the network and enhancing reliability and accessibility. The Existing Conditions analysis confirms the relevance and value of the MBTA's planned expansion of transit service in the LMA.

The analysis also identifies potential challenges associated with expanding transit service, underscoring the importance of bus circulation and transit priority in meeting those goals.

- Proposed service investments by the MBTA align with travel patterns and needs and will make getting to the LMA more convenient for many riders.
- Investments in midday bus service align with LMA travel patterns. Data show that travel to the LMA is high during peak periods and remains high throughout the day. Adding bus service between 10:00 AM and 2:00 PM will make the study area more accessible to more riders.
- More riders will be able to travel to the LMA directly, without transferring between modes. Connections are improved for riders traveling from the west, south and north (see One-Seat Ride analysis).
- An analysis of the transit catchment area, as measured by the area and number of people who can reach the LMA within 30, 45 and 60 minutes shows significant improvements, especially during the midday, which shows a 55% increase in the number of people who can reach the LMA in 30 minutes or less.
- Intersections in the LMA, like roadways are congested, with most at capacity according to traditional traffic engineering measures, like level of service.
- Several intersections in the study area are equipped with technology to prioritize transit vehicle movements.
- The lack of active curb management contributes to congestion, slow speeds and unreliable travel times. Challenges include a lack of enforcement and in some cases, no clear designations for users.

LMA Transit and All Modes Trips

The LMA accommodates trips across all modes. Starting around 6:00 AM, total trip volumes are high, exceeding over 10,000 trips per hour, and remain at this level through 7:00 PM, not lowering below those volumes until around 8:00 in the evening.

BNR service will greatly increase MBTA service in the LMA throughout the day. Currently, service peaks around 6:00 AM and decreases throughout the middle of the day, until it peaks in the afternoon from 2:00 – 6:00 PM where there are between 87-100 bus trips each hour. With BNR service, the AM peak service sees the smallest service increase with only 18 more trips at the start of the AM peak, but service levels throughout the rest of the day all see much larger increases, such as a 46-trip increase at 12:00 PM.

Longwood Collective Shuttles are peak-oriented, with more than 40 hourly trips running during the morning and evening commuter periods. This results in a large drop-off in trips between 10:00 AM and 2:00 PM, with only 8-13 hourly trips. This may best match some travel like commuter rail schedules but does not reflect overall travel demand in the area. However, the LC Shuttles provide service for those that work or are in school in the LMA at an LC associated location and this level of service may sufficiently meet the demands of that rider group.

Trips among all modes are highest during the PM peak as opposed to the AM peak for transit service, however, trips remain high throughout the day, most likely due to employees varying shift times, varying student schedules, and patient appointment times which occur throughout the day. BNR service levels will match the travel demand in the LMA much closer than the current service levels.

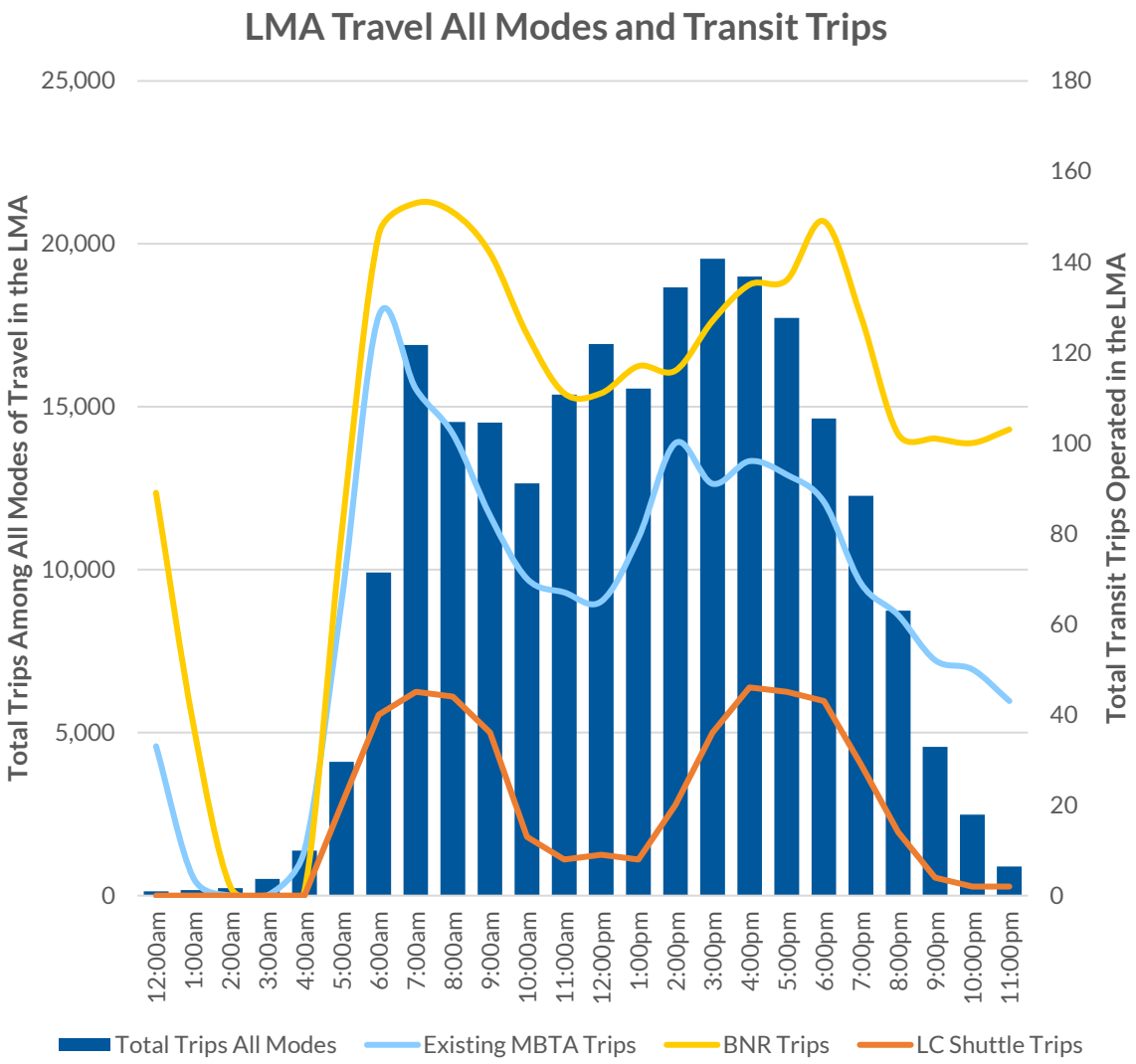

Figure 43 – LMA Travel, All Modes and Transit Trips

One-Seat Transit Rides to LMA

One-Seat Ride analysis displays the areas where travel to the LMA is possible via transit without transferring. BNR implementation will affect which areas can access the LMA with a one-seat ride. In general, more residents, especially low-income and minority residents, will gain a one-seat ride, including in South Boston, near Assembly Station, and parts of Roxbury, Dorchester, and Mattapan. Black residents in particular have a significant improvement in one-seat ride access, increasing by 43%.

Notable areas that lose one-seat rides are in the South End, near JFK/UMass Station, and Fields Corner Station. However, the amount of time it takes to travel between these neighborhoods and the LMA is largely unchanged (see Transit Access Analysis).

Table 13 - Existing Service vs. BNR One-Seat Ride Comparison

Measurement	Existing One-Seat Rides	BNR One-Seat Rides	Change
Routes that Provide One-Seat Rides	8, 19, 39, 47, 60, 65, 66, CT2, CT3, Green D, Green E	12, 22, 28, 39, 47, 60, 65, 66, 85, Green D, Green E	Gained: 12, 22, 28 Lost: 8, 19, CT2, CT3
Total Population	384,789	423,696	+38,906, 10%
Zero-Vehicle Households	63,669	69,703	+6,035, 9%
Income Less than $50,000	50,048	56,258	+6,210, 12%
Minority Households	183,444	213,474	+30,030, 16%

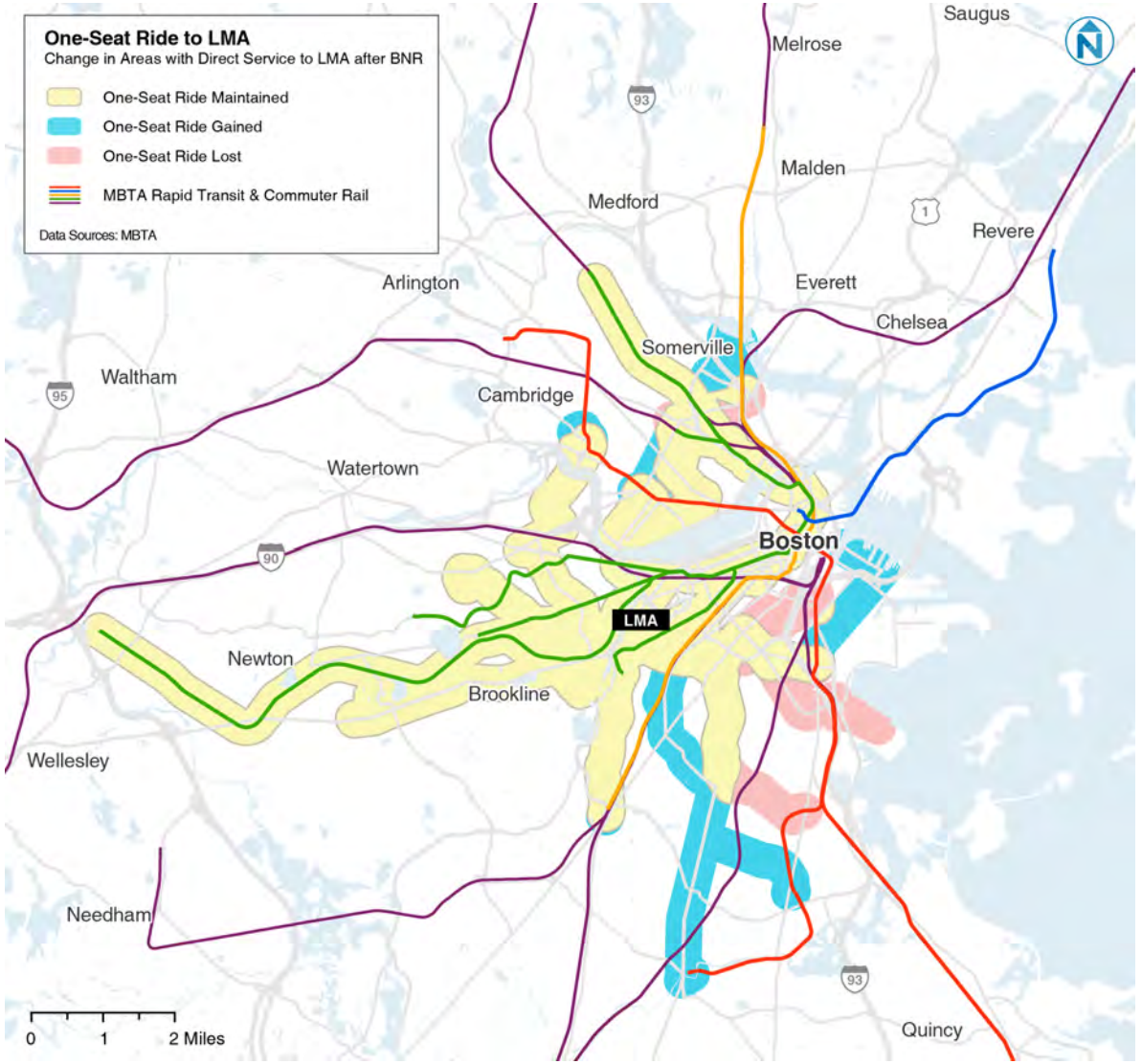

Figure 44 – Change in One-Seat Ride after BNR

Transit Access to LMA – Existing Service vs. BNR Service

Transit access is measured by the number of people who can access a given location using transit. In this case, the analysis is done using the LMA as the location and assessing how many people could use transit to travel to the LMA in 30 minutes or less, 45 minutes or less, and 60 minutes or less by time period of AM Peak, Midday, and PM Peak.

Areas with that can reach the LMA via transit within an hour span include 150 sq. miles around the greater Boston area. This coverage fluctuates slightly throughout the day as service levels change, specifically with commuter-heavy routes lowering frequencies or stopping service during the off-peak hours.

At all hours of the day, nearly the entire City of Boston has access to the LMA on transit within 45 minutes, with much of this being 30 minutes or better. The subway and commuter rail corridors add the most coverage, as riders can take routes to nearby stations and transfer to a line that will bring them to the LMA.

Transit Riders in the AM Peak have the most existing coverage for accessing the LMA within 30, 45, and 60 minutes, with over 100,000 more riders having 60-minute access in the AM peak than the Midday and PM peak. BNR service increases the service in the LMA during the Midday and PM Peak, which improves 30-minute transit access by 55% during the midday and 24% in the PM Peak. There is no time period or travel time threshold (30, 45, or 60 minutes) that has reduced coverage with BNR. Maps on the next 3 pages show difference in access between these three time periods.

BNR will increase the areas that will have access to the LMA within 30 and 45 minutes—29% increase for 45-minute midday access and 17% increase for PM Peak 45-minute access. As a result, some areas that lose a one-seat ride have the same level of transit access to the LMA.

This means that although some might lose a direct route, they will still be able to travel to the LMA within the same amount of time that it takes them on the existing service.

Workers, students, and patients that travel to and from the LMA have shifts and class times that operate outside of the typical 9 AM – 5 PM commuter time windows, as do patients accessing care all day. Knowing this, it is critical to have consistent transit access to the LMA throughout the day, so the BNR improvements in the midday and afternoon will greatly help those that are not commuting during typical commuter hours.

BNR will increase the amount of all-day frequent routes and one-seat rides to the LMA, making transit service more appealing to more people in more areas.

Table 14 – Total Population with Access to the LMA on Transit by Service Period

Time on Transit to the LMA	Existing AM	BNR AM	Existing Midday	BNR Midday	Existing PM	BNR PM
30 min.	392,905	442,596 (+13%)	279,895	432,963 (+55%)	343,182	426,838 (24%)
45 min.	963,879	991,899 (+3%)	771,115	991,879 (+29%)	844,493	991,862 (+17%)
60 min.	1,553,309	1,568,093 (+1%)	1,406,224	1,534,743 (+9%)	1,447,193	1,530,599 (+6%)

Residents with AM Peak Access to the LMA within 30 min. increases by 13%

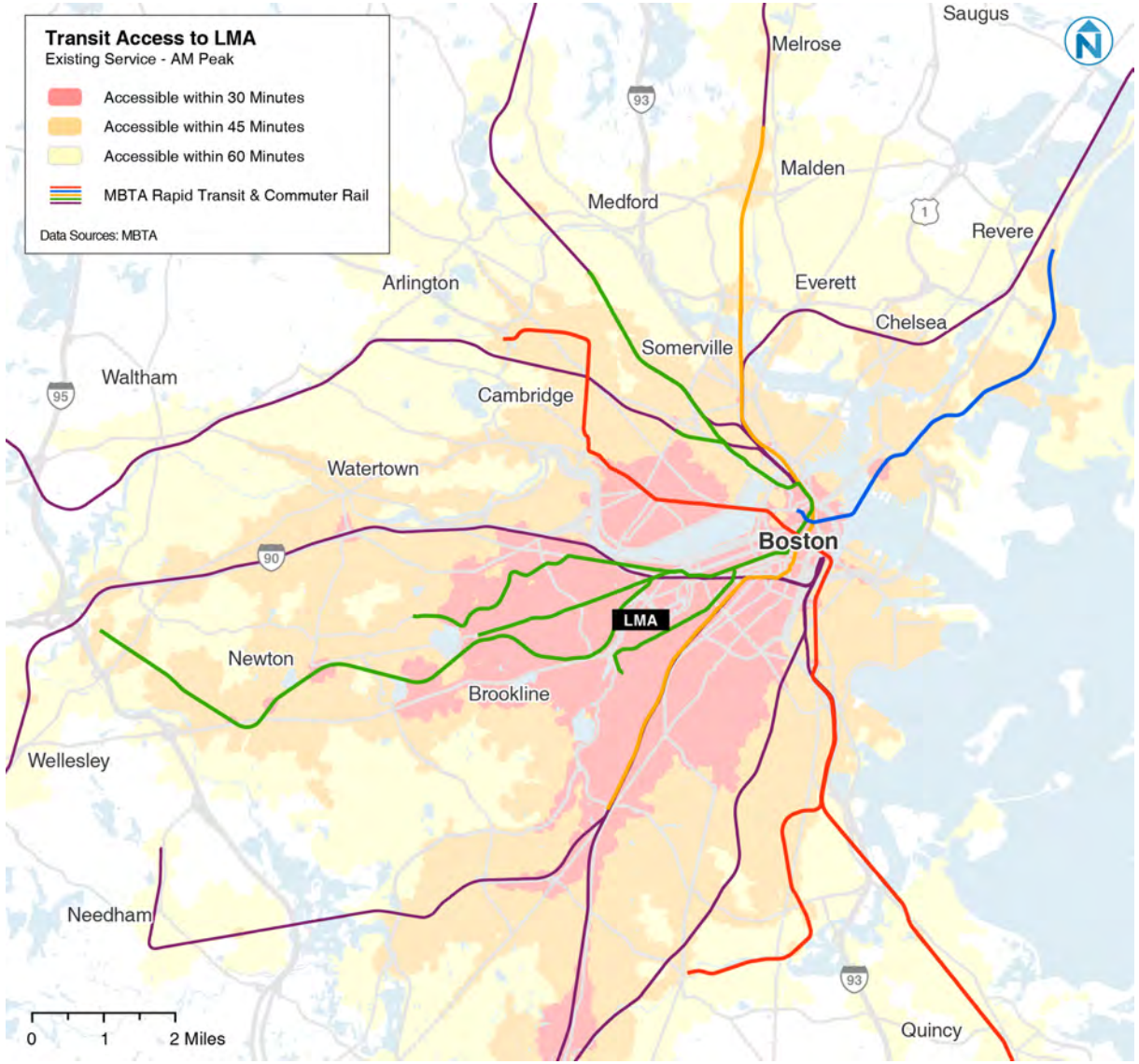

Figure 45 – Transit Access to LMA – Existing Service – AM Peak

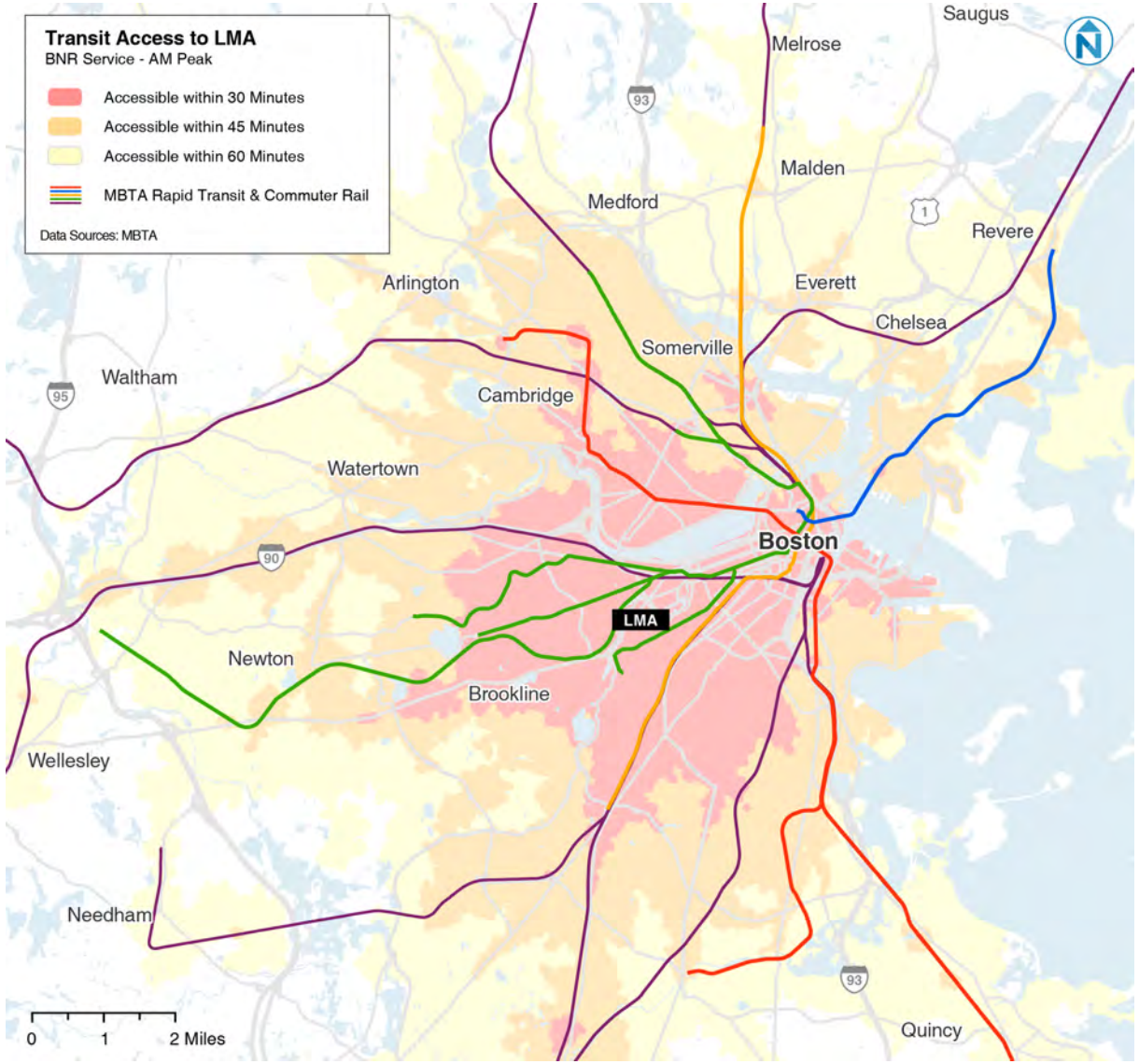

Figure 46 – Transit Access to LMA – BNR Service – AM Peak

Residents with Midday Access to the LMA within 30 min. increases by 55%

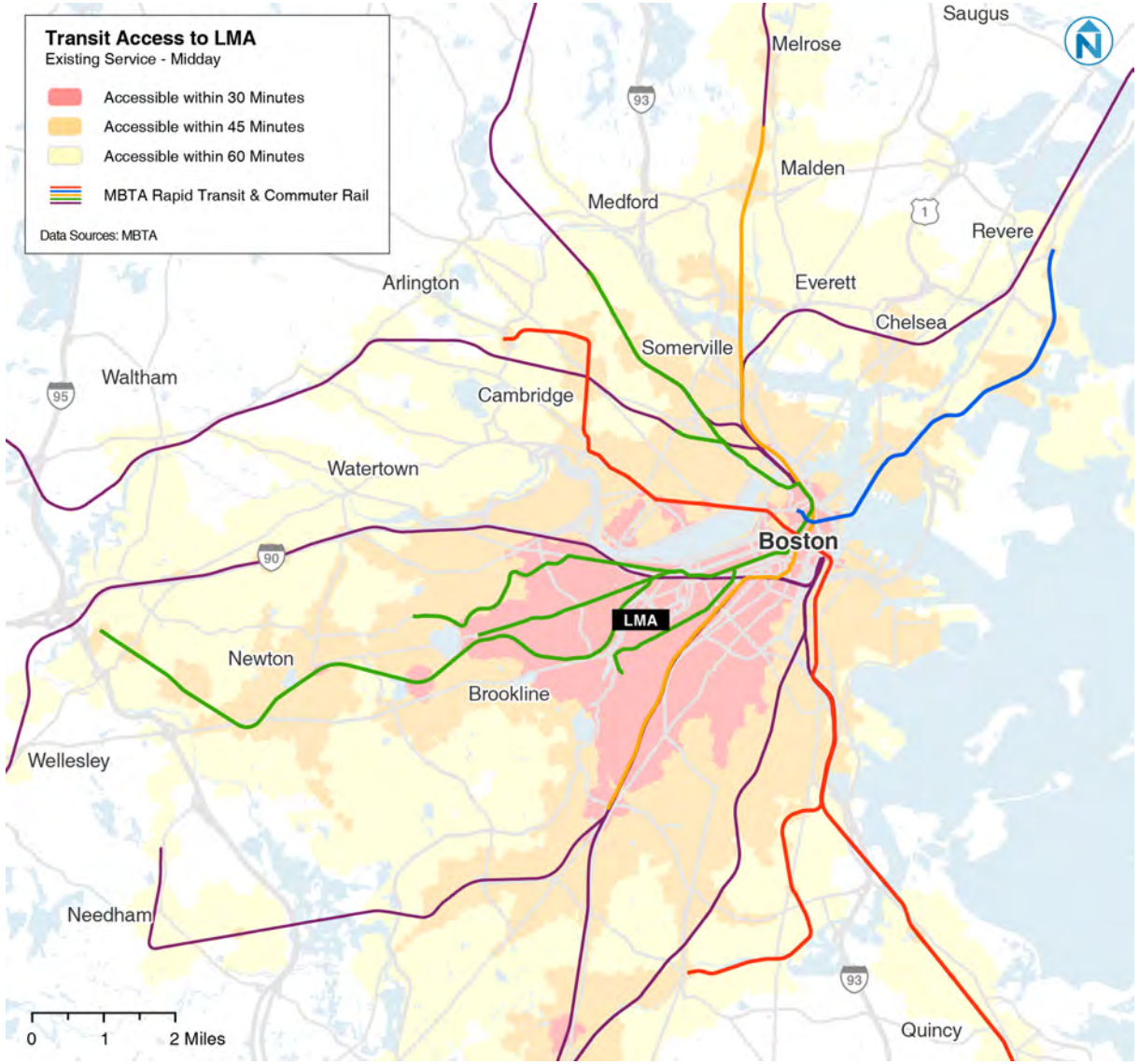

Figure 47 – Transit Access to LMA – Existing Service – Midday

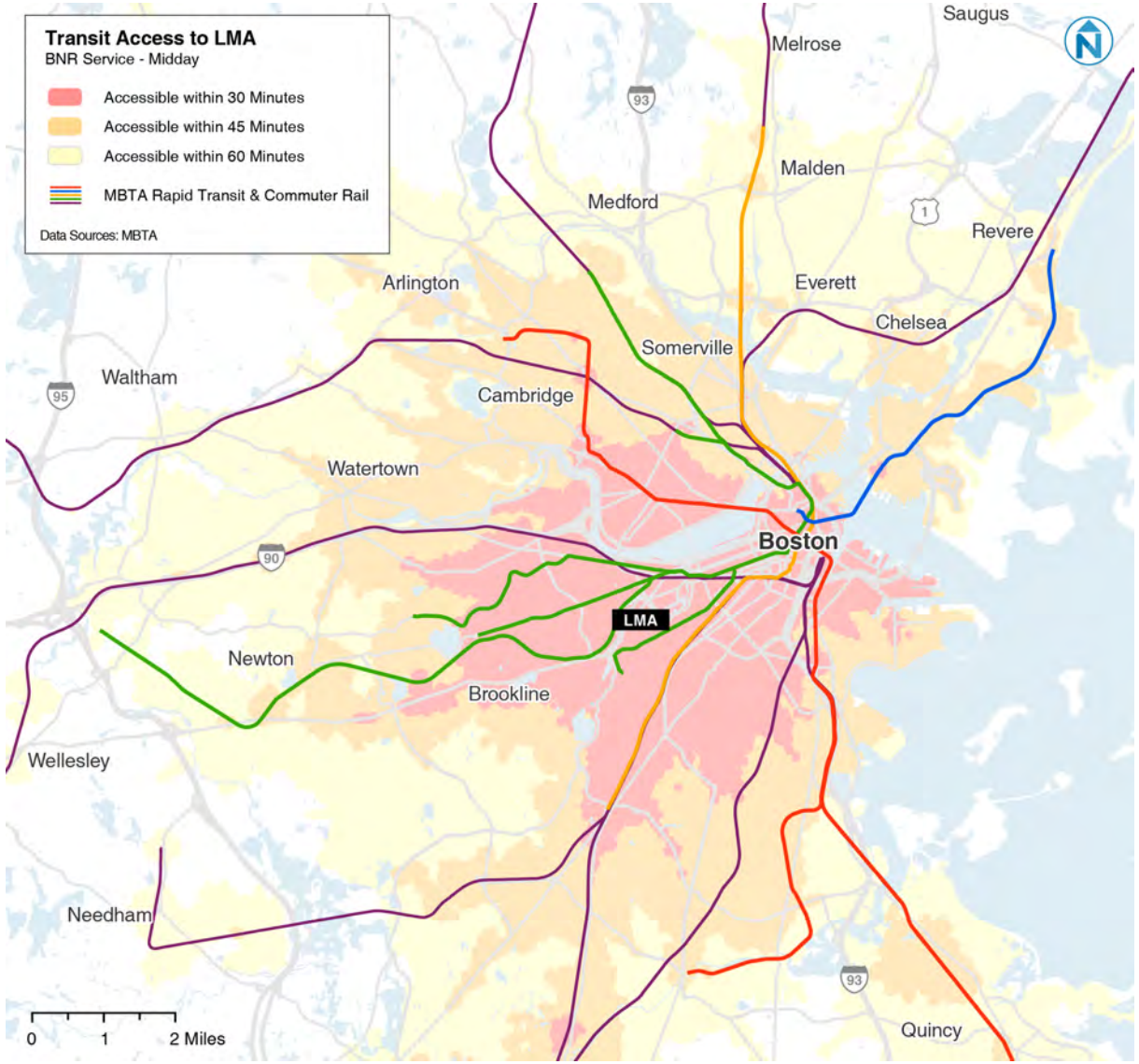

Figure 48 – Transit Access to LMA – Existing Service – Midday

Residents with Evening Access to the LMA within 30 min. increases by 24%

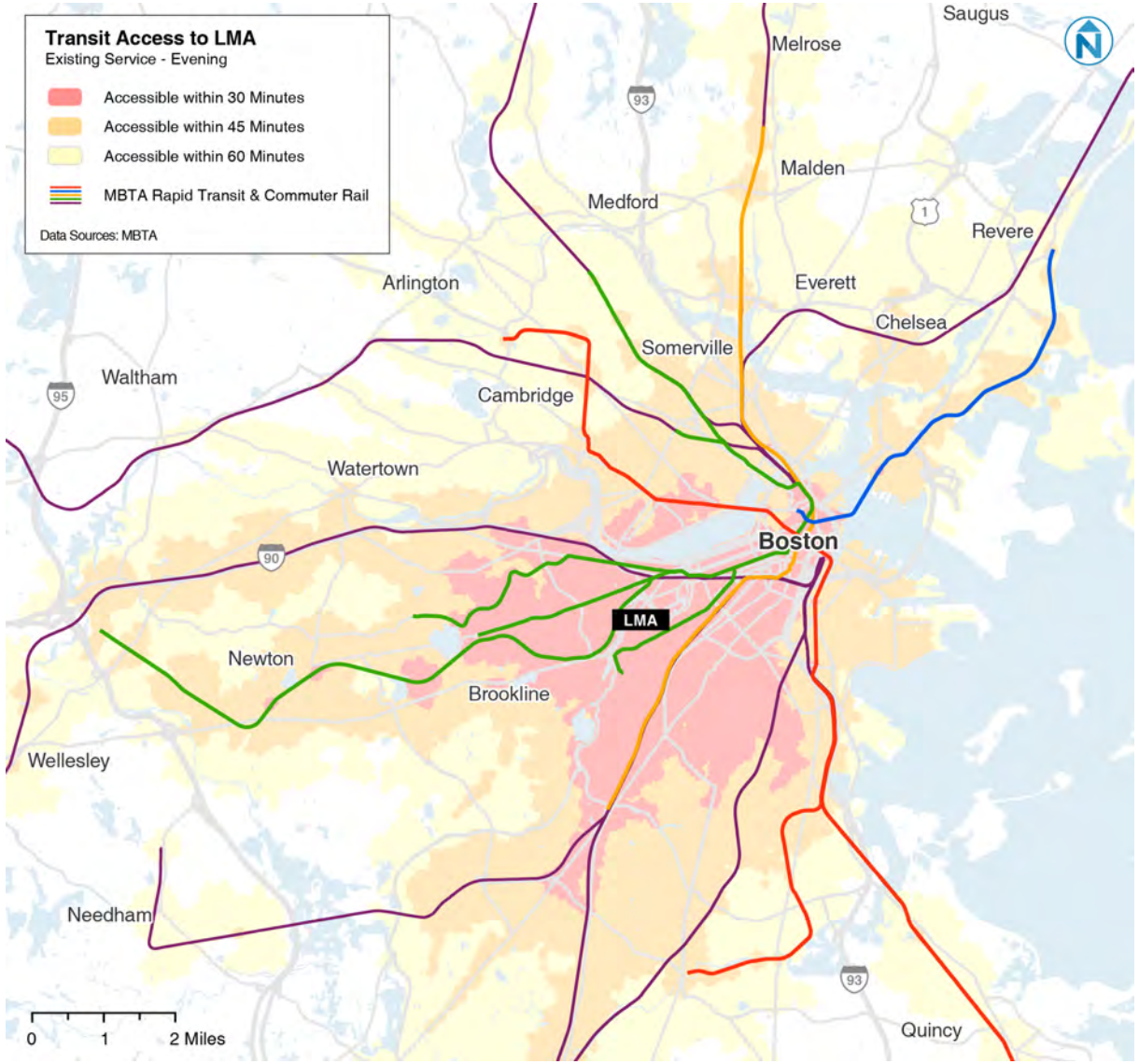

Figure 49 – Transit Access to LMA – Existing Service – Evening

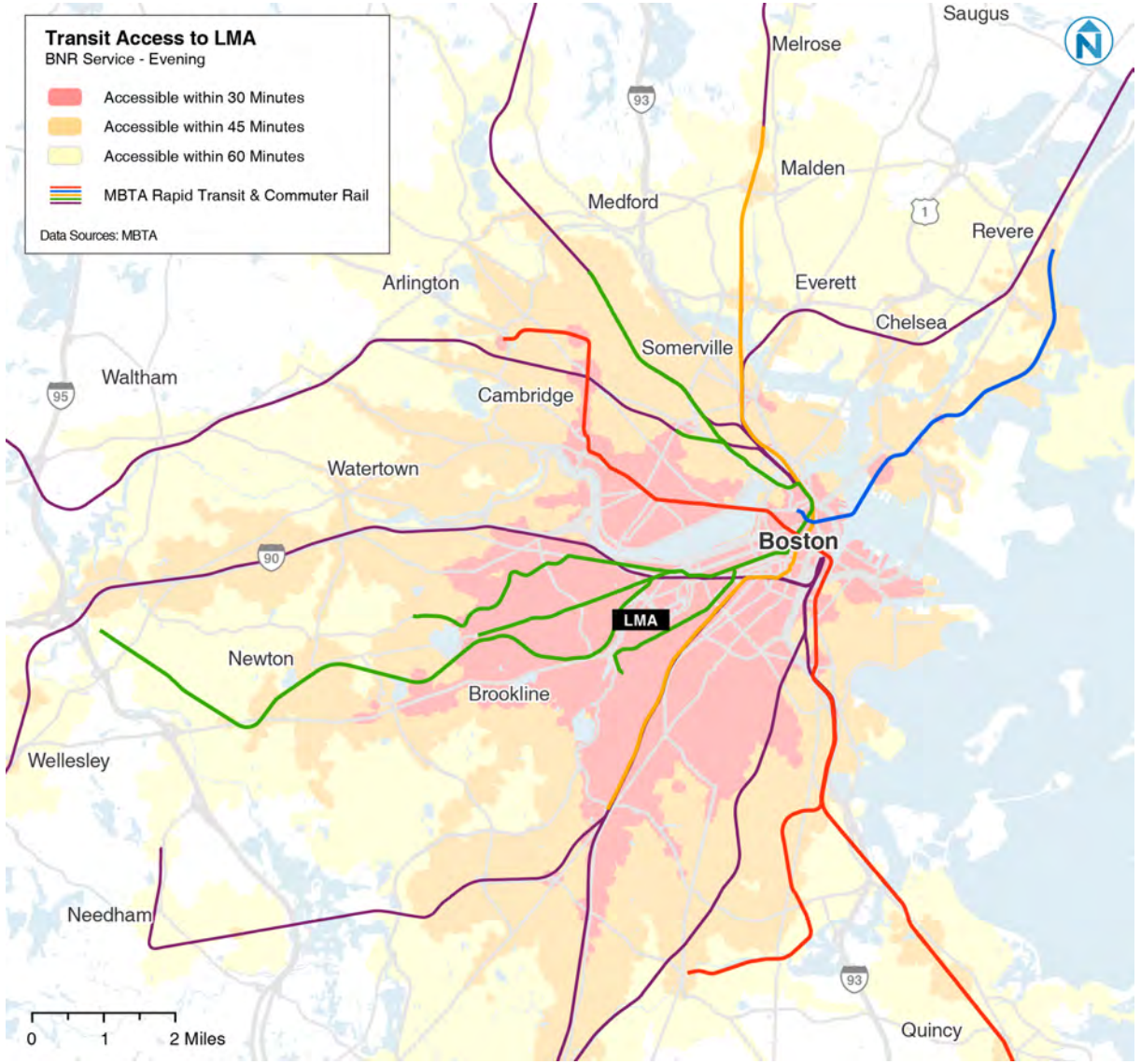

Figure 50 – Transit Access to LMA – Existing Service – Evening

Conclusion & Next Steps

8

Conclusion

The LMA is a major destination for a variety of people such as students (K-12 and higher education), medical professionals, service workers, and patients. Travel to and through the LMA, however, is challenging for all travelers for numerous factors.

- Travel speeds are low, and most major intersections experience significant congestion.
- Traffic safety is an issue for all modes in the study area, as all key corridors have had crashes with vulnerable road users and several roads are on the City of Boston's High Crash Network.
- Parking and curb management is inconsistently enforced and causes conflicts for bus operations.

These factors contribute to a suboptimal operational environment with impacts beyond bus - including emergency vehicles, private vehicles, cyclists, and people walking or rolling to or through the LMA.

Looking forward, BNR proposes a 75% increase in bus service from today's network, which means more off-peak and weekend service and an increase in one-seat rides to the LMA. While today's transit service levels - and ridership - are high , BNR service levels will better match the travel demand to the LMA.

Today's transit speed and reliability data shows that bus speeds are slow on nearly every corridor, all day. Today, all MBTA bus routes are failing the MBTA's service standards due to congestion and delays.

Without addressing the current operational challenges in the LMA, the MBTA cannot increase service reliably or safely. The service increases in BNR provide an opportunity to address existing challenges and develop an operational bus circulation plan for safe, reliable, and improved bus service to the LMA.

OPPORTUNITIES/CONSIDERATIONS

- The LMA is a major destination for a variety of people, such as students of all levels from high school to advanced degrees, medical professionals, service workers, and more.
- Travel to and through the LMA, however, is challenging for all travelers. Travel speeds are slow, bus services struggle to stay on time and most major intersections experience significant congestion.
- Transit service levels – and ridership - are high now and service levels will increase with BNR implementation.
- Transit speed and reliability data shows that bus speeds are slow on nearly every corridors, at all times of day. Travel reliability is also a major issue, with all MBTA bus routes failing the MBTA’s operations standards due to congestion and delays.
- BNR investments align with travel demand that is high all day, not just during morning and afternoon peak periods.
- Safety is an issue for all modes in the study area as all the key corridors have had crashes involving vulnerable road users.
- Parking and curb management is inconsistently enforced.
- Emergency vehicles can have difficulty navigating congested corridors.

Next Steps and Timeline

The LMA Bus Circulation Study commenced in January 2025 and is scheduled to wrap up in Winter, 2026. The study includes two rounds of stakeholder and community engagement. The first round is focused on existing conditions and the second round will share draft alternatives and options.

As of October 2025, the first round of engagement has been completed, consisting of several focus groups and pop-ups that took place in June. Input from these meetings will be combined with this analysis as a starting point for developing preliminary bus circulation and capital investment alternatives. Draft alternatives will be available for stakeholders to review in Fall 2025; they will be shared with the broader community in Winter 2026, after the New Year holidays.