Alewife Commuter Rail Demand Study

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City of Cambridge

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September 2025

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1 Executive Summary

The Alewife area has experienced notable growth in recent years and both City of Cambridge plans and development proposals indicate that the area will continue to grow. The City aims for the development to be both dense and walkable, making it both easy and necessary for people to use transit to get to and from this location. The Fitchburg Line runs through the Alewife area already but does not stop there, with trains stopping at Belmont just west of Alewife and Porter Square to the east.

Given this context and the existing transit service, the City of Cambridge received funding from the Massachusetts Legislature to study demand for ridership at a potential Alewife Commuter Rail station on the Fitchburg line. The funding was received through an earmark in the Chapter 268 of the Acts of 2022 Economic Development bill. The Massachusetts Bay Transportation Authority (MBTA), as the potential operator of the station, is administering this work in partnership with the City.

This memo outlines the results of an analysis of potential demand, and is meant to be used as an input into the overall decision-making process about a potential new station, which would include factors such as station feasibility, cost, ownership, and more. This study attempts to forecast potential demand, which is only one of many of these potential factors. Further analysis will be required to understand constructability and potential system-wide tradeoffs.

Using an analysis rooted in a simplified travel demand model, the study finds that potential ridership at the station in a projected 2040 future scenario ranges from roughly 800 boardings (people getting on the train at the proposed station) to 2,250 boardings, the high end of which would put the station in the top ten for Commuter Rail boardings (as of Fall 2024). For example, the midpoint of this range is comparable to boardings in 2024 at the Boston Landing station, which opened in 2016, as well as other busy stations such as Providence and Salem. Ultimately, achieving the high-growth demand forecast will require the City of Cambridge to maximize development at Alewife far beyond what exists today. Doing so will require intentional land use decisions, as well as favorable market conditions that support the level of development detailed in this report.

It is challenging to predict ridership at any transit station, as many variables impact the potential outcome, which is why the analysis results in an estimated range of demand. Variables that can impact demand range from larger trends such as regional travel and development patterns to MBTA policy and operational decisions like how much it costs to use the transit line or how frequently the service can run. Changes in any of these would influence how many people are likely to use a given transit service.

The following report outlines the analysis to estimate ridership and its inherent assumptions. These include an overview of the core model, which is the Federal Transit Administration (FTA) Simplified Trips-on-Project Software (STOPS) model. There are also important additional factors and assumptions to consider regarding development in the future, frequency, scheduling needs, and more.

2 Introduction and Project Context

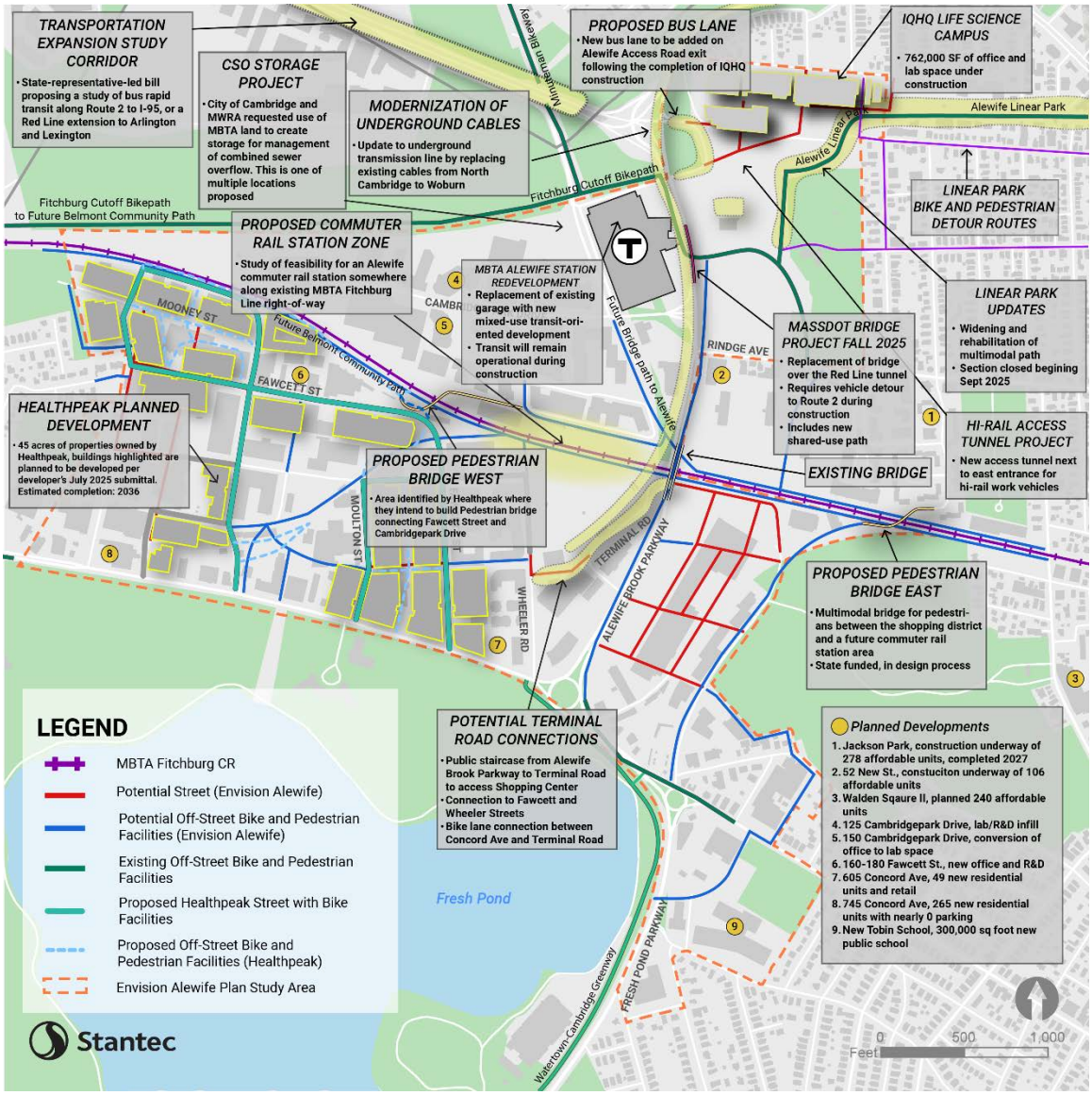
Figure 1: Proposed Alewife Commuter Rail Station Location and Neighborhood Subdistricts

Before understanding potential boardings at an Alewife Commuter Rail station, it is key to understand the context of the neighborhood. That context includes plans for the neighborhood's future, existing transit services available, and how Alewife compares to other neighborhoods served by Commuter Rail.

2.1 Planning Context

The City of Cambridge, MBTA, and other partners are encouraging and planning for dense new residential and commercial growth around the Alewife area, which transit access would support. Today, the neighborhood is in the early stages of transition from a primarily commercial and light-industrial area on the periphery of the city to a vibrant mixed-use neighborhood. The shift has already begun in the "Triangle District", the closest to Alewife Station, where rezoning has led to the construction of new residential, office, and laboratory buildings. Figure 2 provides an overview of the changes planned and/or in development in the area.

Figure 2 Planned Changes in the Alewife Area



Additional key details of specific plans include:

- **Envision Alewife Masterplan**[1]: The City of Cambridge undertook this planning process in 2019. The Masterplan includes strategies to support more sustainable lifestyles, including "last mile" connections to transit such as walkable street grids and shuttles. Specifically, the plan's mobility recommendations include bike and pedestrian bridges to connect the transit hub of Alewife's "Triangle" subdistrict to the "Quadrangle" subdistrict. The benefits of this multimodal connection are complemented by numerous proposed interior road connections made throughout the Quadrangle. The plan also decenters car-related infrastructure through its recommendations for shared parking garages in the Shopping Center subdistrict and a district-wide parking maximum policy.
- **Cambridge Zoning Buildout Analysis.** The City has recently completed plans to update the zoning in the districts around Alewife, and recently conducted an analysis of the potential buildout allowable under the proposed rezoning of the neighborhood.[2] The proposed overlay district allows for increased neighborhood retail, light industrial, and residential use, and permits three stories by right for all residential units, as well as up to 12 stories with a basic Planned Unit Development (PUD) in select residential areas. Overall, the zoning would allow the square footage in the zones around Alewife to reach an estimated maximum of over 21 million square feet. This represents very dense development, which in turn increases the demand for transit.
- **New Pedestrian Bridges** (Figure 3)**.** Following the strategies identified in Envision Alewife, planned future investments in pedestrian bridges will bring residents and jobs near Alewife closer together and closer to transit options. The City has conducted a feasibility study for the eastern bridge, which has also received federal funding. [3] Healthpeak, a private entity, recently submitted plans for significant development in the area, which includes the western bridge. The two proposed bridges will increase the amount of residents and jobs within an easy walk of a potential Commuter Rail station on the Fitchburg Line.

[1] Alewife District Plan: cambridgema.gov/-/media/Images/CDD/Planning/alewifeplanningandzoning/alewifereportbook11_05_19forprint.pdf
[2] Information provided by City of Cambridge November 25th, 2024
[3] Feasibility Study and Design of a Pedestrian & Bicycle Crossing of the MBTA Fitchburg Line in North Cambridge: mbtafitchburglinecrossingfeasibilitystudy_final_20240429.pdf

Figure 3 Two Sites Currently Under Review and Implementation for Pedestrian/Bicycle Bridges

- **Red Line Transit Oriented Development (TOD) Study**. The MBTA is in the process of conducting a study of the potential for TOD at 5 stations on the Red Line, including Alewife. This ridership demand study coordinated with the Red Line TOD work in the development of the future land use scenario used in the modeling effort (see section 4.1). While the overall findings of the study are not yet available at the time of this report's writing, both studies generally align on the need to plan for growth near Red Line stations like Alewife and the MBTA's interest in supporting mixed-use, transit-oriented development near its stations.
- **Alewife Preparedness Plan**[4]**.** The Alewife Preparedness Plan, part of the Climate Change Preparedness and Resilience Plan for Cambridge, provides practical guidance for addressing short- and long-term threats posed by heat, flooding, weather, and sea-level rise. The existence of this plan, which includes the Alewife MBTA station as a priority area, ensures that development in the area can endure for years to come.
- **Preliminary Station Evaluation by City of Cambridge**[5]**.** This preliminary study, completed in 2015 by the City, evaluates the feasibility and infrastructural requirements of a Commuter Rail station. The study includes a review of physical feasibility, noting that the tracks may need to be

[4] Alewife Preparedness Plan: https://www.cambridgema.gov/-/media/Files/CDD/Climate/CCPR/ccpralewifepreparednessplan_cambridge.pdf

[5] Cambridge Quick Analysis: Alewife Commuter Rail Station Analysis Alewife_CommuterRail_CambridgeQuickAnalysis_121715.pdf

realigned and the existing maintenance facility relocated. Finally, the evaluation identifies comparable stations that share similar population and ridership patterns with Alewife, including Forest Hills, Quincy Center, and JFK/UMass, noting that if people used Alewife at similar rates, the station would already be in the top half of all Commuter Rail stations for boardings.

2.2 Transit and Mobility Context

Today, people have multiple options to get to the Alewife area, but none offer longer transit links like the Commuter Rail, and there is no one-seat access to North Station and its connecting transit options. Important components of the mobility context include:

- **Biking/bikeshare and walking.** A generally complete network of sidewalks and crossings are available. The area is also a hub for regional bicycle pathways, including the Minuteman Commuter Bikeway, Fitchburg Cut-Off Path, Watertown-Cambridge Greenway, and the Alewife Linear Park and Greenway. There are multiple Bluebike bikeshare stations that serve Alewife as well.
- **Driving, including parking and pick up / drop off.** For many, particularly those who are not on the Red Line and are unable to bike or walk, this is the best option to get to Alewife. However, there is significant congestion on Route 2, which is the main arterial into the area.[6]
- **Parking.** Aside from parking at the MBTA Alewife Red Line station, parking in the area is limited and expensive. This parking context elevates transit as an option, either out of necessity (no parking available) or cost (transit is cheaper than parking).
- **Third-Party Shuttle**. There are close to 30 shuttles that serve the Alewife area today at the Red Line station. Some of these serve Waltham and other points west that are along the Fitchburg Line. The presence of such shuttles, even if many serve locations outside of the Alewife area, shows that when given the option to travel to/from/through Alewife via even limited, private transit, people in the region will choose to do so instead of driving.
- **MBTA Red Line.** The Red Line provides service every four to six minutes at peak to Boston's South Station before branching to Braintree or Ashmont. The trip to South Station typically takes 25-30 minutes, with nine stops. Fares range according to the MBTA's fare system, but are generally $2.40 with a CharlieCard. During a typical midweek (Tuesday-Thursday) day in 2023, there were an average of around 5,300 Red Line boardings a day at Alewife Station.[7]
- **MBTA Buses:** 62, 67, 76, 350. These serve Arlington, Lexington, and Burlington, connecting them to the Alewife Red Line station. In aggregate, ridership on these buses is about 900 boardings daily. This demonstrates an interest in transit use in the more suburban areas to the west of Alewife. It is worth noting however that these buses serve different areas than the Fitchburg Line.
- **Transportation Demand Management (TDM).** Cambridge has a nationally recognized TDM ordinance that applies to existing and future developments in the Alewife area. The ordinance requires that residents and commuters alike are offered options for travel beyond the typical free

[6] MassDOT's 2019 *Congestion in the Commonwealth* report identified Route 2 eastbound into the Alewife area at 8:00 am and at 7:00 am as one of the most congested roadways in the state. For more see: https://www.mass.gov/doc/congestion-in-the-commonwealth/download

[7] MBTA Open Data Portal, October 2022 and April 2023 Ridership.

parking. These include many policies and programs that support transit use such as subsidized fares, transit information, and even bicycle parking so it is possible to store a bike and use it to get to transit.

The Fitchburg Line does not currently stop in the Alewife area, but its characteristics are important to understand in contrast to those listed above. In May 2025, average boardings on the Fitchburg Commuter Rail line range between 6,000 and 7,000 per day (both directions), making it the 7th busiest Commuter Rail line of the 13 lines in the MBTA system. [8] Key characteristics include:

- Service approximately hourly on weekdays to Littleton, with fewer trains per day serving the outer five stations (Ayer, Shirley, North Leominster, Fitchburg, and Wachusett).
- Currently, the closest stop on the Fitchburg line to the Alewife neighborhood is at Porter Square, about a mile east of Alewife in Cambridge.
- (Basic) fares ranging from $2.40 to $12.75 (Zone 9), depending on zone of origin and destination.
- Travel time from Belmont (the closest station to the west of the Alewife area) to Boston's North Station is 15 minutes, with one stop in between (Porter Square). A proposed Alewife station would therefore likely offer a much shorter trip to downtown Boston than the Red Line.

3 Alewife Commuter Rail Ridership Estimation Approach

This analysis uses a combination of empirical research and modeling to estimate a range of ridership. The baseline analysis estimates ridership using the FTA's Simplified Trips-on-Project Software (STOPS Version-v2.52). STOPS is an FTA approved software for evaluating proposed transit projects, especially for the New Starts and Small Starts capital investment program. It is a streamlined implementation of the traditional four-step travel demand model catered for modeling transit patterns. It utilizes the Census Transportation Planning Package (CTPP) and an agency's General Transit Feed Specification (GTFS) data to generate and distribute trips and represent system-wide transit network.

The STOPS model developed for this study is closely calibrated for the Alewife region and lines which are affected by a new station near Alewife. Overall, the geographical extent of the STOPS modeling area includes the entirety of Massachusetts and Rhode Island, but the model is only closely calibrated to ridership at Alewife and other connected stations and transit services. The MBTA in collaboration with the Boston Region MPO (often referred to as its staff, the Central Transportation Planning Staff or CTPS) is currently developing a regionwide STOPS model which can be used as a standard in the future.

The decision to forecast Commuter Rail ridership using the STOPS model as a baseline was made in collaboration with MBTA planning and commuter rail staff, as well as City of Cambridge planning staff. Because STOPS is increasingly becoming a standard across the United States for forecasting transit

[8] Transit Matters Covid Recovery Dashboard

ridership, using STOPS for the proposed Alewife Commuter Rail station provides a consistent baseline for future studies, design efforts, and funding applications.

The analysis then builds on STOPS model results to estimate a range of ridership in response to key factors that can impact transit ridership, such as frequency and fares. This analysis draws on industry research linking these factors.

3.1 Key Data Sources

The analysis uses a synthetic STOPS model, which requires a number of datasets as inputs and calibration reference points.[9] Table 1 below summarizes the datasets used in the STOPS model and how each dataset impacts the model results.

[9] For more information on the different types of STOPS models, including synthetic, please see Appendix A.

Table 1: Key Data Sources

Data Item	Source/ Format	Data Year	Transformation Required for STOPS	Use	Why This Matters	Notes
MBTA System Geography	GTFS Feed	2024	For 2040 runs, Edited to include new CR station	Model Input	Tells model what transit trips are possible and time/money costs associated with them- the model needs to be able to make geographic connections between stations in order to model demand.	Data includes timing for scheduled trips only- service that exceeds scheduled frequency or fails to meet scheduled times not reflected in model.
Park and Ride Data	GTFS Feed	2024	No scaling required For 2040 – include changes at Alewife	Model Input	Park and ride locations affect access to stations in the model. The model will allocate drive access trips if there is a park and ride facility nearby.	
Massachusetts Roads Geography /Travel Times	CTPS Mode	2019		Model Input	Tells model the geography of the roadway network and the time/money costs of trips along roadway links.	
Current year jobs and population by Model TAZ	CTPS Model	2019	Interpolated to 2024	Model Input	This data tells the model how many people live and work in origin/destination zones today, and is used to estimate the number of trips that should be modeled for each OD pair (allocated with CTPP OD data described below). This is also used to calculate mode share – transit trips are compared to overall population in a tract.	Data from CTPS model.
Origin-Destination Data by Census Tract	CTPP STOPS data package	2016	None	Model Input	This data informs the model by telling where people are coming from and going to via transit. This data is used instead of the MBTA Rider Census Data due to privacy restrictions on the Rider Census. Also used for calibration: Link between trip purpose and car ownership. Also, output provides access modes, and those can be adjusted (as an input) if they seem inaccurate.	Older, pre-COVID data. STOPS includes adjustments to better reflect current travel patterns, discussed in detail in A.2 STOPS Calibration Process.

Data Item	Source/ Format	Data Year	Transformation Required for STOPS	Use	Why This Matters	Notes
Mode Choice by OD	CTPP STOPS data package	2016		Minor model input	Share of transit compared to auto.	Provides transit share for work trips; non-work trips not included in CTPP; Older, pre-COVID data; STOPS includes adjustments to better reflect current travel patterns, discussed in detail in A.2 STOPS Calibration Process
MBTA System Ridership	MBTA Blue Book	Fall 2024	Bus and Rapid- Fall 2024 APC Counts Commuter Rail – Fall 2024 manual counts	Model Calibration Reference Point	Used to calibrate the model over several runs- tweaking variables to try and match modeled ridership to observed ridership in the base year (2024).	
MBTA System Transfer Rate	MBTA OPMI	Shared by MBTA 2/7/2025	No scaling required	Model Calibration Reference Point	Similarly, we will calibrate the model to match the modeled transfer rate to the observed transfer rates as closely as possible.	
MBTA Passenger Survey	MBTA OPMI	2023	Scaled to 2024 ridership	Model Input	While the travel flows from the survey could not be used for this study, the breakdown of trips by purpose (Home vs Work vs Other), car ownership, and initial station access/egress mode was used as an input for the model.	
Future (2040) jobs and population by Census tract, scenario 1	CTPS Model	2050	Interpolated back to 2040	Future Model Input	This data is the model input used for 2040 scenario 1- and will change how many trips are modelled based on changes in population and employment from the base year.	

Data Item	Source/ Format	Data Year	Transformation Required for STOPS	Use	Why This Matters	Notes
Future (2040) jobs and population by Census tract, scenario 2	MBTA Red Line TOD Study (in progress)	2040	Conversion to jobs/population, geographic distribution to TAZs	Future Model Input	This data determines the context surrounding the proposed station in a high-growth scenario, and will change how many trips are modelled at the station based on the change in jobs/population from the base year.	Growth projections were available for parcels susceptible to change, summarized by zoning district. 90% of projected gross development at selected parcels (estimated to represent total net new development) was added to CTPS existing jobs/population in model base year to yield total gross jobs/population in future year. Further explanation of the TOD study data found in 4.1.1 below.

3.2 Key Assumptions and Caveats

Due to limitations in data availability and quality for various model inputs and calibration factors, the modeling team needed to make several assumptions. Some key assumptions are listed here and were confirmed as reasonable by MBTA staff where applicable. **A comprehensive list of assumptions and caveats in the modeling process can be found in Appendix A.1.**

3.2.1 Fare Zone

The fare is a significant variable impacting whether potential riders take the train; this study assumes that the Alewife Commuter Rail would likely fit within Zone 1A.

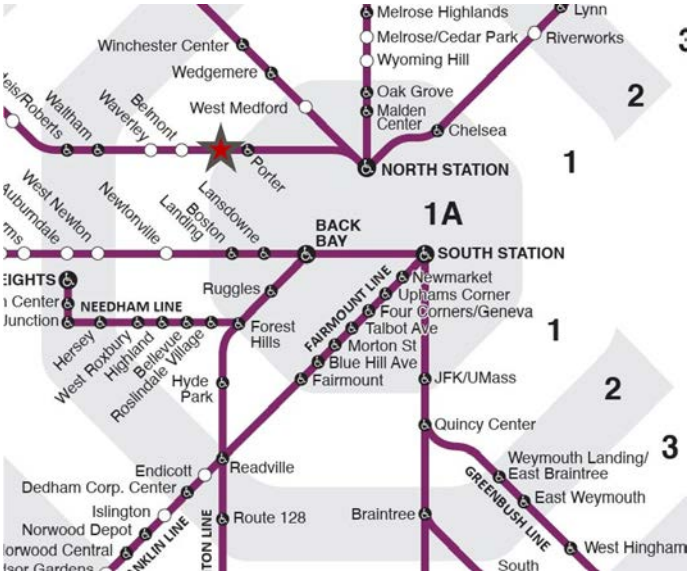


Figure 4: MBTA Fare Zone Map with Potential Alewife Station Highlighted

Alewife is located on the border of Zone 1 and Zone 1A, as seen above in Figure 4, and could feasibly fall into either classification and pricing. Key considerations include:

- All other stations doubling as both Commuter Rail and MBTA rapid stations are in Zone 1A barring Quincy Center, examples of which are Forest Hills, Oak Grove, JFK/UMass, and Malden.
- Alewife is 4.6 miles from the route's terminus at North Station, an identical distance to that between Forest Hills (Zone 1A) and South Station.

- Per the 2020 MBTA Commuter Rail Fare Study, ideal Zone 1A stations are located close to downtown Boston, act both as origins and destinations of trips, and are located in neighborhoods that have high transit use and low vehicle use. Alewife matches these criteria well.[10]

Assuming the station would be in Zone 1A, a rider traveling from North Station to the new station would pay $2.40, and a rider traveling inbound to Alewife from outside of Boston or Cambridge would pay $7.00 from Waltham, or $12.25 from Fitchburg. The STOPS model therefore assumes a fare that makes for cheaper access from riders beginning or ending their journey in Boston, rather than suburban riders. Changes in this fare could impact ridership, as lower fares lead to more transit use.

3.2.2 Scheduling

Adding a new Commuter Rail station at Alewife is assumed to extend the travel time of riders on the Fitchburg Line going into and out of Boston. Because this potential adjustment to travel times was an area of concern, it is important to understand these assumptions. Determining Commuter Rail schedules is a complex exercise, so to estimate additional time in the schedule associated with a new station, the analysis looked at similar distances in the system, i.e.:

- Today, trains take **6 minutes** to get from Belmont Station to Porter Station
- Trains generally take about **3 minutes** to travel the distance between Alewife and Porter (Wellesley Sq to Wellesley Hills, Oak Grove to Wyoming Hill)
- Trains generally take about **4 minutes** to travel the distance between Belmont Station and Alewife (i.e. Brandeis to Kendal Green, North Beverly to Hamilton/Wenham)
- Overall, a train would likely take **3 minutes** to travel from Porter to the proposed Alewife Station, and **3-4 minutes** to travel from the proposed Alewife Station on to Belmont.

The analysis also looked at historic schedules and identified one train (508 on the Worcester line that arrived at South Station at 8:20AM before and after the addition of Boston Landing in 2016) which had a consistent arrival time at North Station on the Worcester Line before and after the addition of Boston Landing in 2016, and that the T pushed that train's departure **3 minutes earlier** to account for the new station.

Based on this review, the analysis adjusted train arrival times by 3 minutes, specifically to stations west of Alewife, to account for the additional travel time while keeping arrival times to North Station consistent.

3.2.3 CTPP Notes

The CTPP package used by the STOPS model (see Table 1) is not a complete encapsulation of all travel patterns. Origin-destination (O/D) data derived from the Census generally captures only how individuals commute to work/school, and only distributes those trips based on the home locations of the individuals

[10] https://cdn.prod.website-files.com/6633ebf7792854e4f20c25f0/6650cd06966282ad121593e5_MBTA%20Commuter%20Rail%20Fare%20Study%20March%202020.pdf

surveyed. In STOPS and transportation planning generally, these trips are referred to as Home-Based-Work (HBW) trips; the trips people make from their homes to work or school, based on the home location. Work-based Home (WBH), Home-Based Other (HBO), and Non-Home Based (NHB) trips are other types of trips not captured in census O/D data.

To address this, the STOPS model includes a methodology for extrapolating travel flows for other types of trips based on this HBW information. Trip rates and distance decay functions (derived from analyses of the past surveys used in the original STOPS methodology) are applied to get HBO and NHB trips. The analysis further adjusts the transit trips by the trip purposes (HBW, HBO and NHB) and information on the car ownership using the overall distribution from the 2023 MBTA Passenger Survey. The trip purpose by car ownership matrix is provided in STOPS as an input. During the calibration process (where the model is run, iteratively, with different parameters), the observed distribution is compared with the model estimated distribution after every run. Further necessary adjustments are made until the results are satisfactory.

Further, the CTPP information is older, specifically representing pre-COVID data, although the calibration process builds on this data to help it better reflect today's reality. Recent travel patterns such as work from home, reduced transit ridership may not be reflected in this baseline dataset. Changes in spatial trip distribution, such as travel to new job centers, may also not be reflected in baseline data. The calibration process, detailed in Appendix A, offers some adjustments to account for this.

3.2.4 Bike Boardings

STOPS identifies potential boardings at a station as originating from one of four modes, which does not explicitly include bicycle access. The four modes are walk, "kiss-and-ride" or drop-off, park-and-ride, or transfers from another MBTA line such as a bus.

Because these modes do not include bike, the model may be under estimating people who arrive by bike, but in other ways over estimating people who walk. "Walk" boardings include trips that originate in CTPP transportation zones (TAZs) within a one-mile radius of the station. Given Alewife's position at the junction of several regional bike paths, more people may choose to bike to the station from further away than the model assumes. At the Alewife Red Line station, an estimated 360 people bike each day.[11] Conversely, the walk radius of 1 mile is larger than the typical rule of thumb for the distance people are willing to walk for transit, which is usually understood to be a half mile. It is therefore possible that the STOPS model may overestimate the typical walk access-shed of a station while underestimating the bike access-shed in an environment like Cambridge.

3.3 Model Calibration

The STOPS model was calibrated via comparison to observed 2024 transit ridership, with specific attention paid to ridership at Alewife Station and at stops connected to Alewife Station. A full description of the calibration process can be found in Appendix A.2.

[11] Stantec Field Observations, June 2023

4 Future Planning Scenario

An important component of determining future ridership is understanding what the land use characteristics of the Alewife neighborhood will be in the future, and this is a key component of the STOPS model. Density of land uses is one of the best indicators of potential transit use. The STOPS model for the future uses projections of population and jobs to estimate potential boardings. Therefore, the analysis had to select a future land use scenario for the area around Alewife.

4.1 Red Line Transit Oriented Development and Assumptions

For a “High Growth” scenario, the modeling used the ongoing Red Line TOD study. The MBTA is currently studying the potential for future TOD at several stations along the Red Line, including Alewife. Although the study is not complete at the time of this report, the Red Line TOD team shared data and growth estimates for use in developing the High Growth potential future scenario used in the STOPS Model. The majority of projected new development in the Red Line TOD study area is located in the Quadrangle and Shopping Center districts; buildout in the Triangle is determined to be near the likely maximum for the next 15 years. The TOD study does not include any projection of development at the Alewife Station site itself.

4.1.1 Red Line TOD Methodology:

The TOD study generated residential buildout estimates through its GIS-based “Susceptibility to Change” (STC) analysis. This process evaluated all parcels within a half-mile radius of the CR station, and generated a score for “Parcel Susceptibility” based on whether a lot was vacant, held buildings from between 1940 and 1980, had a ratio of lot coverage less than 50 percent, had a FAR below 50 percent, and/or had an estimated land value that is greater than any current building’s assessed value. From here, parcels that met 50 percent of these indicators received the classification of “susceptible in the long term,” and parcels that met 75 percent of these indicators received the classification of “susceptible in the short term.” This quantitative analysis was then supplemented with qualitative information, such as planned subdistrict rezoning and current market conditions.

From this analysis, each parcel deemed susceptible to development was estimated to have a future FAR of 3.5 in the Quadrangle and Shopping Center subdistricts, 4.0 in the Triangle subdistrict, and 1.0 in the area outside the Alewife Overlay. The net buildout of gross square footage was assumed to have a ratio of 60 percent residential use and 40 percent commercial use, a necessary assumption because the exact future ratio of residential to commercial development in the Alewife area cannot be completely predicted. Parcels from the “Susceptibility to Change” analysis were combined with parcels in the category of “Pipeline Projects” (parcels containing projects that as of 2025 are already in the public entitlement or approval process). Using the 60-40 land use split, the study projects that the 103 acres of land deemed susceptible to long-term and short-term development will yield between 5,200 and 8,700 new residential units, and between 3,400,000 and 5,600,000 gross commercial square feet.

4.1.2 Red Line TOD Conversion for STOPS Model

To be used in the STOPS model, land use growth projections from the TOD study had to be converted from gross residential/commercial square feet into projected jobs and population in each TAZ. This used the following assumptions:

- Residential units converted to population using a ratio of 2.06 persons/residential unit, the average residential unit occupancy rate for the City of Cambridge[12].
- Commercial square feet converted to employees using a ratio of 303 office square feet/employee.[13].
- Net new development projected by the TOD study was assumed to be equal to 90% of the gross, in coordination with Red Line TOD study team.
- Net new development was added to the CTPS existing land use data to approximate gross development projected in 2040 by Alewife subdistrict.
- The TOD study included projections for minor development just outside of the five Alewife subdistricts (Triangle, Quadrangle, Shopping Center, Jerry's Pond, Fresh Pond). This analysis assumed that that development was within these subdistricts, essentially assuming that people associated with that development could walk to the proposed station.
- In cases where Alewife districts overlapped multiple TAZs, projected growth was applied proportionally based on the existing population distribution in the district.
- Pipeline projects were included in the projections
- The scenario does not include any additional development at the Alewife Station site itself, which means that it could be slightly underestimating development nearby, although this may be somewhat offset by the assumption regarding development outside of the Alewife subdistricts.

After conversion, the Red Line TOD analysis projects a 2040 condition of about 16,900 residents and 24,400 jobs in the overall Alewife study area. This is comparable to what the City estimates for its zoning buildout (see Section 4.2).

4.2 Comparison to Cambridge Zoning and CTPS Projections

In addition to the Red Line TOD study conducted by the MBTA, there are two other sources of land use projections. The first is discussed in Section 2.1, which is the City's estimate of maximum buildout in the area based on zoning. The second is the future land use projections included in the CTPS (the Boston Region MPO) model.

The Cambridge Zoning buildout also had to be converted from square feet to population and jobs. To do this, the team used the factors discussed in Section 4.1.2.

[12] https://www.cambridgema.gov/cdd/factsandmaps/demographicfaq
[13] Institute of Transportation Engineers. *Trip Generation Manual, 11th Edition, Volume 2*, pg. 639. September 2021.

Ultimately, this analysis used the Red Line TOD future for a “High Growth” scenario, and the CTPS model as the “Low Growth” scenario. The Red Line scenario was chosen for this study because it better reflected change that was likely to occur within the study horizon of 2040. By contrast, the Cambridge maximum zoning buildout analysis has no firm time horizon on its projections, and would likely take longer to manifest. A comparison of population and employment projections by CTPS, the Red Line TOD study, and Cambridge’s maximum zoning buildout analysis is below in Table 2.

Table 2: Comparison of Future (Gross) Estimates of Population and Jobs in the Alewife Area

Data	Zone	CTPS 2040 (Low Growth) (Interpolated)	Cambridge Max Zoning Buildout	RL TOD (High Growth)	Cambridge-RL TOD Difference
Future Population	Triangle	2,850	3,600	3,750	-150
	Quadrangle	6,300	7,700	6,700	+1,000
	Shopping	225	4,350	3,300	+1,050
	Jerry’s Pond	1,875	0	2,600	-2,600
	Fresh Pond	175	510	580	-70
	Total	**11,425**	**16,110**	**16,900 (105% of Camb.)**	**-890**
Future Employment	Triangle	1,350	4,600	1,700	+2,900
	Quadrangle	3,975	17,700	13,200	+4,500
	Shopping	825	2,500	6,400	-3,900
	Jerry’s Pond	910	2,500	1,900	+600
	Fresh Pond	830	1,800	1,200	+600
	Total	**7,890**	**29,100**	**24,400 (84% of Camb.)**	**+4,700**

5 STOPS Results

The STOPS model projected boardings for the proposed Alewife Commuter Rail station in both the Low Growth and High Growth future land use scenarios are shown in Table 3 below. The results are broken out by station access mode, i.e. the way that each rider accesses the station. The difference between the two scenarios is about 350 additional walk boardings. These boardings can be assumed to be generated by the additional density of jobs and population added to the Alewife neighborhood in the High Growth scenario. Boardings from other access modes are very low, likely because parking at Alewife has been penalized in

the model to reflect a tightly managed parking environment in the future, with very little parking at the station itself.

Table 3: STOPS Boardings at Alewife Commuter Rail Station by Access Mode

Land Use Scenario	Low Growth (CTPS 2040)	High Growth (RL TOD ~2040)
Walk Boardings	762	1,121
Kiss and Ride (KNR) Boardings	2	2
Park and Ride (PNR) Boardings	6	6
Transfer Boardings	40	40
All Boardings	**810**	**1,169**

More boardings are projected at the outbound platform of the new station than the inbound platform (Table 4), particularly in the High Growth scenario, Those who board the outbound platform are likely mostly residents of Fitchburg line towns who commute to the area for work and are returning home. They could also be Alewife residents commuting out along the Fitchburg line, although based on patterns at other stations which generally show more inbound boardings, this is a smaller market.

Table 4: STOPS Boardings at Alewife Commuter Rail Station by Direction

Boarding Direction	Low Growth (CTPS 2040)	High Growth (RL TOD ~2040)
Outbound	463	771
Inbound	347	398

5.1.1 Trip Origins and Destinations

The STOPS model reports trips produced and attracted by user-defined districts. Figure 5 and Figure 6 show the Alewife Commuter Rail station trips produced and attracted by each zone, respectively. Because the STOPS model is home-based, the trips mapped include both home-to-work commute trips *and* the reverse work-to-home trips. Both trips are considered “produced” by the home location and “attracted” by the work location in STOPS.

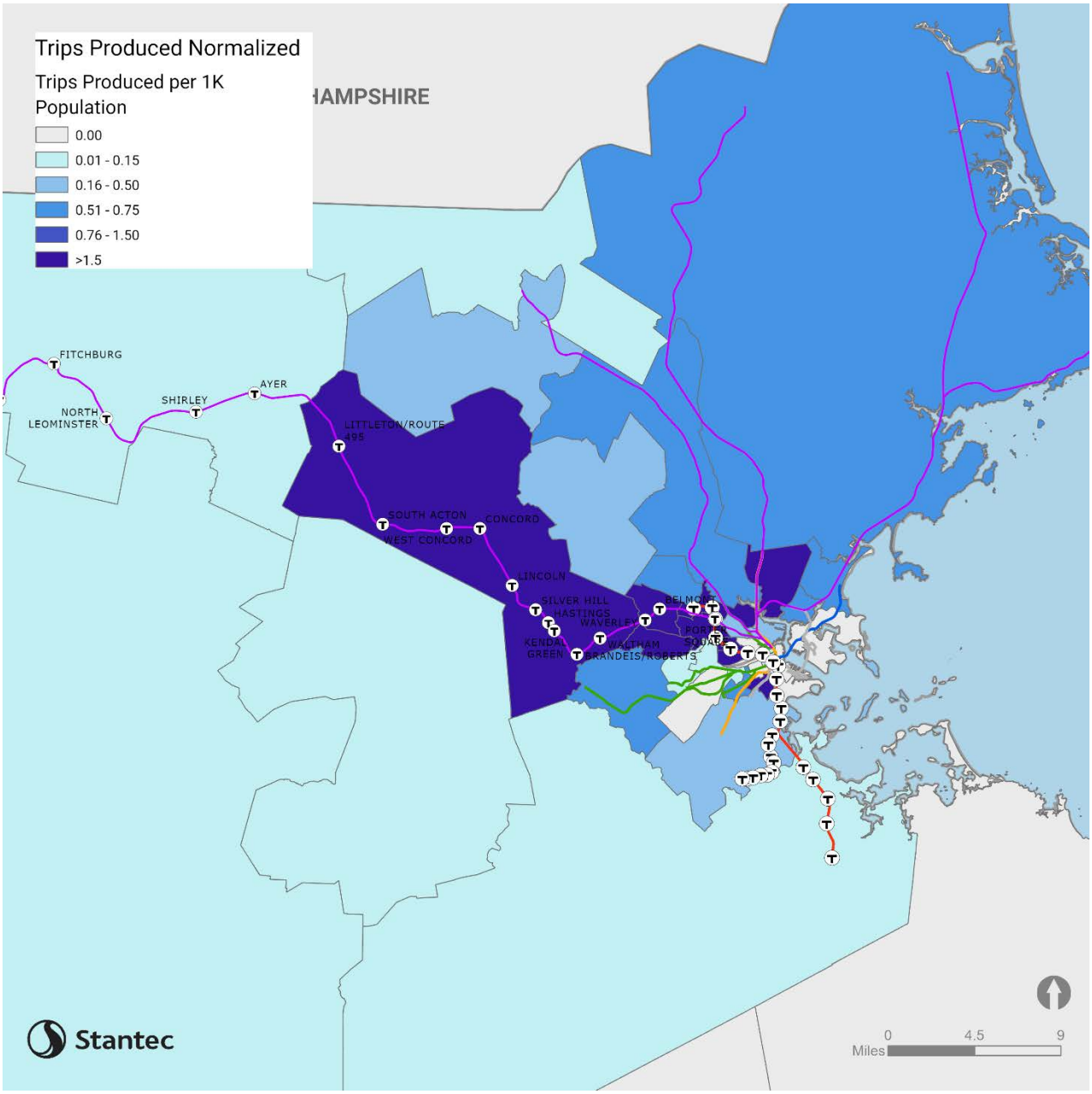


Figure 5: Trips Produced by Summary Zone

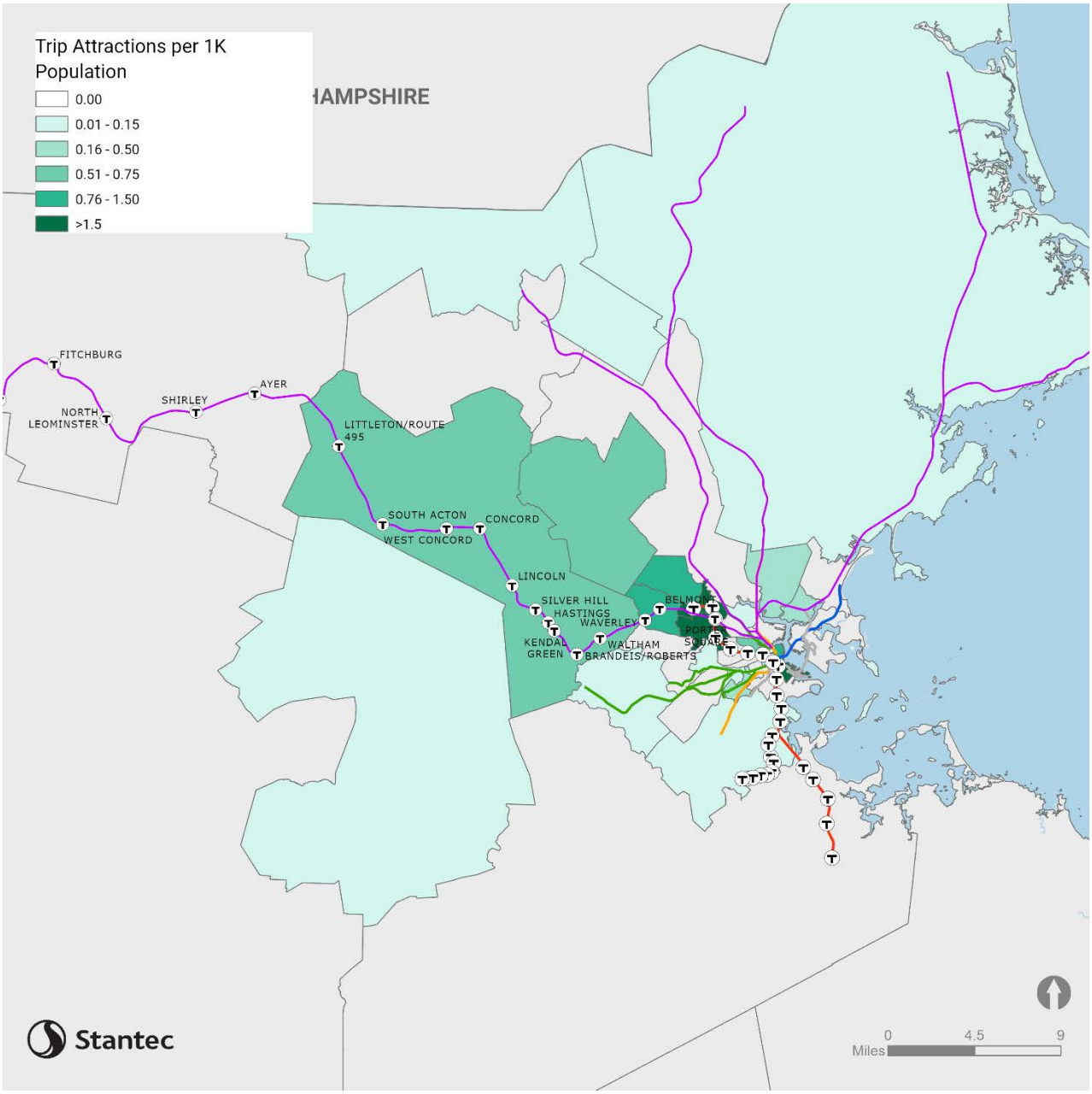


Figure 6: Trips Attracted by Summary Zone

The model predicts that Alewife Commuter Rail trips would come from a wide range of locations, including towns served by the Fitchburg Line, as well as towns along the Haverhill and Newburyport Commuter Rail lines. People who commute to the Alewife neighborhood from towns in Essex County today like Salem face nearly 90 minute rush hour drive times and no viable transit options. An Alewife Commuter Rail station would allow commuters to make a two-seat Commuter Rail trip to Alewife, with potentially lower travel time

depending on transfer windows. The STOPS model projects a significant number of people commuting to Alewife this way, by transferring from Essex County Commuter Rail lines at North Station.

Those using the Alewife Commuter Rail station are primarily traveling to the Alewife neighborhood or the nearby Cambridge neighborhoods. 85% of trips are attracted by those two zones. Some travelers are also performing “reverse commutes” to towns along the Fitchburg line, and a relatively small amount of trips head to downtown Boston, either using the Fitchburg Line or the Red Line.

5.1.2 Impact on other Transit Modes and Stations

The STOPS model results show that much of the ridership at a new Alewife Commuter Rail station would be new transit ridership, rather than riders who previously used other transit options. A benefit of developing a STOPS model that models the entire MBTA network is that the model results also predict the impact of building a Commuter Rail station on other transit services and stations at a planning level. Table 5 below shows the STOPS modeled boardings by transit mode at Alewife station in both future land use scenarios, and in the build and no-build scenarios for the proposed Commuter Rail station. The additional development included as part of the High Growth scenario is modeled to yield an additional 1,100 Red Line boardings even without the construction of the Commuter Rail station. In the High Growth scenario, the construction of the Commuter Rail station at Alewife is predicted to add roughly 30 bus boardings and draw away about 250 Red Line boardings (these would presumably be people who could instead reach their destination more directly/quickly via Commuter Rail).

Table 5: STOPS Boardings at Alewife Station Complex

Land Use Scenario	Alewife CR Station Scenario	Bus Boards	Red Line Boards	Alewife CR Boards	Total Boardings in Alewife Area
Low Growth (CTPS)	No-Build	1,090	7,795	-	8,885
	Build	1,124	7,632	810	9,566
High Growth (RL TOD)	No-Build	1,101	8,895	-	9,996
	Build	1,133	8,640	1,169	10,942

The STOPS model can also predict the impact of the new Commuter Rail station on ridership at other Fitchburg Line stations, and finds that overall the addition of the station is a net gain for the line. Overall, the impacts are relatively small, with no station outside of Zone 1 fluctuating by more than 60 riders. In the High Growth land use scenario, Porter Square and Belmont stations lose about 120 riders each with the presence of an Alewife Commuter Rail station (likely riders whose destinations are more easily accessed from the proposed Alewife station). The STOPS model does not output information about how modeled trips change between runs, so it is impossible to determine the true number of trips that switch to using the

proposed station from another service. That number cannot be higher than the total number of trips lost at Porter, Belmont, and the Alewife Red Line between the Build and No-Build model runs, which is about 520 boardings in the high growth scenario. Therefore, at least 650 boardings, or around 55%, of boardings are definitively new boardings, although the true number of new boardings could be higher. North Station, meanwhile, sees an additional 639 boardings across all Commuter Rail lines, likely a combination of new Fitchburg line boardings and new riders on the Haverhill and Newburyport/Rockport lines as discussed above. Overall, the addition of the Commuter Rail station adds a net of approximately 1,400 boardings to the Fitchburg line in the STOPS model.

6 Contextualized Model Results

This section aims to corroborate the model results through comparison with alternative data sources that can help outline the range of realistic outcomes for the proposed Commuter Rail station.

6.1 Comparable Stations

Precedent infill stations in the MBTA Commuter Rail network are few. The most similar station that was added to the Commuter Rail network in recent years is likely Boston Landing, which was added to the Framingham/Worcester Line in Allston in 2016. Boston Landing is located in a similar context to the proposed Alewife Station, near the periphery of the City of Boston in a decidedly urban context, with a similar number of nearby jobs in both neighborhoods (see Table 6 below). It is also the 8th busiest station in the system. [14] As mentioned in Section 2.1, the City of Cambridge identified other peer stations based on context. Some of these are less busy overall than Boston Landing, but they generally offer ridership patterns that are similar.

Comparing the model results for Alewife to other stations show that the baseline STOPS model estimates for the Alewife Commuter Rail station are generally in line with how peer stations operate today (Table 6). As shown in the table, a comparison index of ridership compared to population and employment within a half mile shows that the modeled results are a similar order of magnitude to other stations. Stations that have higher ridership indices, such as JFK/UMass and Boston Landing, generally offer more service, either in terms of frequency or multiple routes. Boston Landing also does not have a rapid transit option, making the Commuter Rail or bus the only options for accessing the area and potentially concentrating demand.

[14] opmidatablog.com/latest-posts/fall-2024-regional-rail-counts

Table 6: Comparable Station Ridership (Source: MBTA Commuter Rail Ridership Fall 2024)

Station Name	Weekday Avg CR Boardings (Inbound / Outbound)	Rank in CR System (Daily Avg. Boardings, Fall 2024)	Population within a half mile	Employment within a half mile	Index: CR Boardings per 'Activity' (Pop. + Emp.)	Commuter Rail Line(s)	CR Line(s) Ridership (Approximate June 2025 Weekday Avg)	~CR Peak Weekday Freq.	Rapid Transit Service
Alewife (Present)	N/A	N/A	11,475	10,439	N/A	N/A	N/A	N/A	Red Line
Alewife (2040)	1,169	#9 (hypothetical)	16,899 (2040)	24,400 (2040)	**.03**	Fitchburg	6,500	**45 mins**	Red Line
Boston Landing	1,266	#8	6,112	13,513	**.06**	Worcester	13,000	**20 mins**	-
Chelsea	365	#66	23,400	5,719	**.01**	Nwbpt/Rockport	10,000	**30 mins**	Silver Line
Forest Hills	521	#35	7,463	987	**.06**	Needham PVD/Stoughton	5,800 21,000	**60 min** **60 min**	Orange Line
JFK/UMass	1,095	#13	13,284	2,763	**.07**	Greenbush Kingston South Coast Rail	5,800 5,600 N/A	**45 mins** **45 mins** **50 min**	Red Line
Quincy Center	801	#19	8,073	7,661	**.05**	Greenbush Kingston South Coast Rail	5,800 5,600 N/A	**45 mins** **45 mins** **50 min**	Red Line
Uphams Corner	364	#67	13,788	3,823	**.02**	Fairmount	4,000	**30 mins**	-
West Medford	415	#56	7,477	876	**.05**	Lowell	7,200	**30 mins**	-

6.2 Travel Market Data

To validate the modeled travel markets, the analysis compared origin and destination data for Alewife travelers from two different sources and finds similar patterns. In comparison to the STOPS model results, both alternative data sources show similar travel patterns, with commuters to the Alewife neighborhood originating from towns along the Fitchburg line, neighboring communities, and towns along Commuter Rail lines to the north. While this comparison alone does not verify the STOPS results, severe misalignment between the trip origins shown in the STOPS model and the alternative data sources above would be cause for suspicion.

6.2.1 Location Based Services Data

The first source is location-based services (LBS) data provided by Replica, which offers insight into the travel patterns and destinations of people in the Alewife area and beyond (Figure 7). [15] Unlike the STOPS model spatial analysis which only looks at home-based trip flows, Replica looks at trip origins and destinations for each trip. Another important difference is that Replica represents existing travel patterns, where the STOPS model results show potential future patterns. However, this analysis still provides a benchmark to understand both where people are coming from and the overall potential market. Key findings from this analysis include:

- Replica data shows the origins of (non-walking) trips bound for Alewife are similar to some of those in STOPS, specifically locations along the Fitchburg Line such as Concord and Littleton as well as further in (Arlington, Belmont, Cambridge).
- Replica does not show demand from Essex County, which appears in the model. This may be because the model is looking at future conditions and that includes a transit connection that is more compelling than making that trip at all today.
- 24% of trips originating in the Alewife neighborhood end somewhere along the Fitchburg Line. This represents the theoretical maximum number of Alewife users who would use the Fitchburg line today. A planning-level review of model results estimates that approximately 2% of trips originating in Alewife would use the Commuter Rail, a number lower than this theoretical maximum and therefore more likely to be representative of real-world conditions. (For more information on this analysis, see Appendix)

[15] Replicahq.com Replica is a synthetic model that agglomerate multiple sources, including LBS data and Census data.

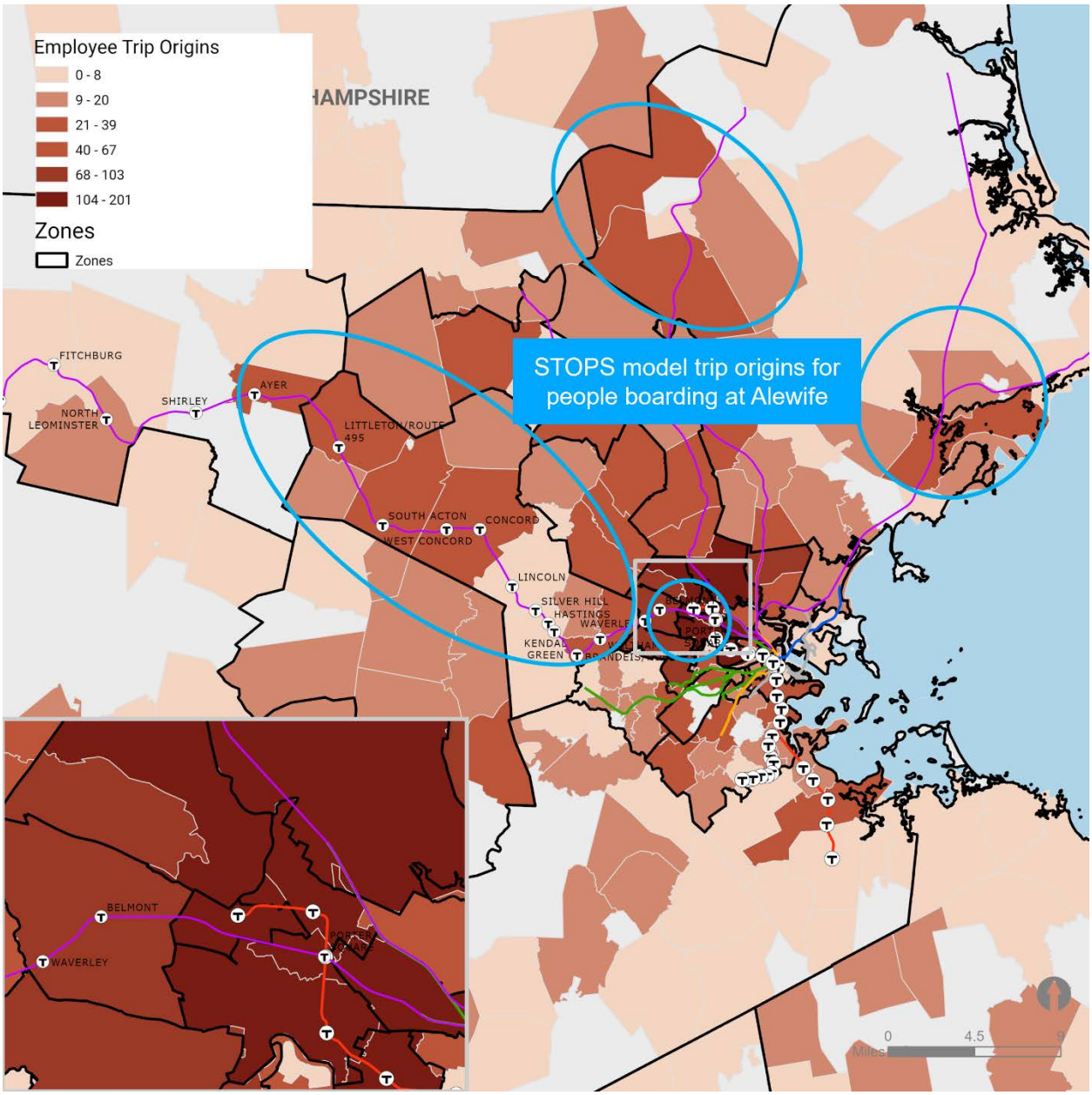
Figure 7 Replica: Trip Origins for Alewife Trips (walk trips removed)

6.2.2 Cambridge PTDM Data

Cambridge's Parking and Transportation Demand Management (PTDM) data provides another benchmark to understand the STOPS model results. The PTDM ordinance requires new developments in the City that meet a certain size threshold to submit data, including data on commute origins, to the city every year. Properties enrolled in the PTDM program send surveys to residents and/or employees asking them about

their commutes either to or from the property. Cambridge made 2023 results of these surveys available to this study, to help understand where employees and residents of Alewife neighborhood buildings live and work. Figure 8 shows trip origins for employees working in the Alewife area.

Figure 8 Alewife Neighborhood Employees' Home Zip Codes (2023)



Key findings from this comparison include:

- Employees in the Alewife neighborhood come from a wide range of places, but are most concentrated in Cambridge itself, as well as neighboring Somerville, Medford, and Arlington.
- Many employees come from locations along other northern commuter rail lines, including Essex County on the Newburyport/Rockport and Haverhill lines. The STOPS model also recognized these locations as generating trips that would use a potential Alewife Commuter Rail station. Essex County does not appear in the Replica data, but does appear here, indicating support for a potential trip pattern where people board these other Commuter Rail lines then transfer at North Station to ride to Alewife.
- Alewife residents responding to the PTDM survey tended to work much closer to Alewife itself, mostly in Cambridge and Somerville, with some residents reporting commuting north to Reading and Andover.

6.2.3 LEHD OnTheMap and Essex County

The STOPS model identified Essex County as a potential generator of trips that would use Alewife Station, which is confirmed by examining data on employee home locations as well as comparing travel times. The US Census Bureau's OnTheMap tool uses data from the Longitudinal Employer-Household Dynamics (LEHD) survey, a survey of employers that gathers spatial jobs and employment data. When mapping the home locations of employees in the Alewife neighborhood, OnTheMap shows nearly 800 employees live in Essex County, the origin location of about 300 boardings at the proposed Commuter Rail station. These findings confirm that there is a potential market of commuters traveling from Essex County to Alewife, who could use the Commuter Rail (with a transfer at North Station), to do so.

Travel times pulled from the CTPS travel demand model also demonstrate the time-saving value of a switch to transit for Essex County commuters. Per Google Maps, traveling from the Salem Commuter Rail station (the busiest in Essex County) to Alewife station by car can take up to 110 minutes during the AM peak rush hour. The same trip by transit today, making three transfers instead of two, is projected to take only 85 minutes during the AM Peak. Although the STOPS model cannot report the transit trip times for a given trip, the best explanation for the prevalence of Essex County in the model results is that the model estimates that transit offers a worthwhile reduction in travel time compared to driving for the considerable number of people who make this specific commute.

6.3 Comparison to Other Growth Projections

The STOPS model results can also be contextualized by comparison to other projections of transit ridership growth at Alewife Station. This analysis uses two sources for projections:

- **MBTA Projections.** The MBTA forecasted that rail ridership would grow 48% between 2023 and 2028, to reach a daily average of 80% of pre-COVID ridership.[16] Additionally, the MBTA projects 1% growth in ridership for every year after 2028.
- **High Growth Scenario Trip Generation.** The transportation industry often forecasts trips using the Institute of Transportation Engineers (ITE) trip generation database. Applying these ITE trip generation factors to forecasted land use growth, then applying a local transit mode share (from PTDM data) provides another way to benchmark model results. This would represent a theoretical buildout year of 2040 (although with increasing density, transit mode share will likely increase).

As summarized in Table 7, the STOPS model predictions for transit service in the area are generally in the same order of magnitude as these two methodologies would predict. The STOPS model is higher than the MBTA projections, but it also represents 2040 rather than 2028. The projected transit boardings using the ITE trip generation analysis are about 1,400 boardings higher than the high-growth STOPS model results, indicating the STOPS model is slightly

Table 7: STOPS Results Comparison to Other Growth Projections

Projection	**MBTA Projections**	**ITE High Growth Scenario Trip Generation**	**STOPS Model Output (2040)**	
Land Use Scenario	N/A	High Growth	High Growth	
CR Station Build Scenario	No-Build	N/A	No-Build	Build
Red Line Alewife Boardings	7,881	N/A	8,895	8,640
Bus Alewife Boardings	1,209		1,101	1,133
Commuter Rail Alewife Boardings	N/A		N/A	1,169
Total Transit Boardings in Alewife Area	**9,090**	**12,319**	**9,996**	**10,942**
Commuter Rail Fitchburg Line Boardings	*8,442*	*N/A*	*9,764*	*11,208*

6.4 Final Adjustments to Model Outputs

The STOPS model results build on specific inputs, and it is important to recognize that many of these may change in the future. Therefore, the team sought to adjust the explore the effects of service frequency on the results of the STOPS modeling exercise. The below provides some detail on its application to the estimated boardings from the STOPS model.

[16] Forecast as of 2025, per MBTA Office of Fare Revenue.

6.4.1 Change in Frequency

Increasing frequency of a transit system is generally associated with elevated ridership, as passengers are attracted to shorter wait times and greater flexibility in departure time. A comprehensive study of 152 regions across the country found that when transit agencies increase service frequency by 10%, researchers observed a 9.32% increase in transit ridership per capita, or that the elasticity of transit ridership is approximately 0.932 with respect to frequency.[17].

In application, this study would indicate that an increase in Commuter Rail frequency from 60-minute intervals to 45-minute intervals (33% increase in frequency) could expect a corresponding 30% increase in ridership, and a change from 60 minutes to 30 minutes (or a doubling of frequency) would have a corresponding 93% ridership increase. This is not an unrealistic scenario as the MBTA embarks on its Regional Rail Modernization Program, which aims to increase frequency on all Commuter Rail lines.

6.4.2 Final Estimates of Boardings

Combining the STOPS model results with potential adjustments to service frequency provides a broader range of potential Alewife boardings, overall finding that the potential station would fall within the top 10 Commuter Rail stations by number of boardings as of Fall 2024. While the model results are an important baseline in determining the feasibility of constructing the station, the actual boardings at the station, if constructed, could vary considerably if changes are made to Commuter Rail service. Table 9 below shows the effect on projected boardings of changes in frequency, using empirical research of similar changes applied to similar transit systems. While ~1,200 daily boardings is the baseline, potential boardings at the proposed Alewife Commuter Rail station could range up to 2,250 if the example service changes were implemented.

It is worth noting that the MBTA plans on increasing frequencies across several of its lines in the near-, medium-, and long-term. As a result, future ridership– and the MBTA's highest ridership stations – will likely look different in 2040 in comparison to today.

Table 8: Impact of Example Service Changes on STOPS Boardings (High Growth Scenario)

Measure	Example Change	Change from Baseline (High Growth Scenario)	Result (Alewife CR Boardings, High Growth Scenario)
Frequency	Doubled frequency, i.e. train every 30 min instead of every hour (+100% of service)	+1,080	2,250

These results would put a potential Alewife Commuter Rail station in the top 10 of all Commuter Rail stations in the system for 2024 (see Table 10). The MBTA has train- and station-level counts for the entire commuter rail system from 2018 and 2024. 2024 represents an overall 23% decrease from 2018. As noted

[17] Lyons, Torrey, Reid Ewing, and Guang Tian. "Coverage vs frequency: Is spatial coverage or temporal frequency more impactful on transit ridership?." *Journal of Transport Geography* 122 (2025): 104058.

earlier, the STOPS model is calibrated to 2024, so it follows that as overall Commuter Rail ridership continues to recover, ridership at a potential Alewife Commuter Rail station would likely also grow. It is, however, worth noting that the upper limit of the overall Alewife Commuter Rail ridership estimate, with increased frequency, would also be within the top 10 stations for 2018.

Table 9 Top 10 Commuter Rail Stations by Ridership[18]

Rank	Station	2018 Ons	Station	2024 Ons
1	South Station	28,416	South Station	22,467
2	North Station	18,427	North Station	11,186
3	Back Bay	8,103	Back Bay	6,786
4	Ruggles	2,640	Ruggles	3,166
5	Salem	3,326	Salem	1,739
6	Providence	2,091	Providence	1,462
7	Mansfield	1,966	Lansdowne	1,348
8	Route 128	1,721	Boston Landing	1,266
9	Attleboro	1,547	Attleboro	1,220
10	Lowell	1,522	Mansfield	1,143

6.5 Additional Factors

There are numerous factors that could impact potential boardings at a future Alewife Commuter Rail station, and not all were directly included in this assessment. However, there are several, particularly related to local land uses and TDM decisions, that are notable and relevant to the potential use of an Alewife Commuter Rail station.

6.5.1 Potential Impact of Increased Transit Time

Because it is already built into the STOPS model and published transit research does not indicate a strong link between travel time changes and ridership, the analysis did not include an extra factor to account for any additional increase in travel time on the Fitchburg line associated with the Alewife Commuter Rail station. The STOPS model includes three minutes of additional travel time on the Fitchburg Line associated with the addition of the Alewife Commuter Rail station. The model does not currently include the recently closed Hastings stop in either the build or no build condition, so adding the Alewife stop would still add time to the schedule. Within the STOPS model, increased travel times would only affect ridership if the additional minutes would make the overall time/money cost of a given trip higher than an alternative route using a different transportation mode. Although it is possible for individual trains to deviate from the schedule, it is assumed that this fluctuation would not be significantly outside of the estimated three minutes. Additionally,

[18] https://www.opmidatablog.com/latest-posts/fall-2024-regional-rail-counts

multiple research studies have found that increases in travel time do not have significant impacts on ridership. Other factors like reliability and crowding proved more significant.[19]

6.5.2 Parking Availability and Management

Parking availability is an enormous factor in determining transit ridership. If parking at a destination is cheap/free and abundant, people will often choose driving over transit.

In the Alewife area (and the city in general), the City of Cambridge has systematically worked to develop an environment where parking is tightly managed, which in turn encourages people to choose options like transit, walking, and biking. For example, the Envision Alewife Master Plan enumerates action items to remove and repurpose surface parking. Further, the Cambridge PTDM ordinance and other city processes require that property managers take steps to limit travel by single occupancy vehicle, including charging for parking. This means that people traveling in this environment will have a high propensity to use transit.

6.5.3 Walkability

Walkability is an important component of transit access and corresponding use, and the walkability of the Alewife area will increase significantly as various plans are put into practice (see Section 2.2). Walkability can refer to many qualities, the simplest of which is having a connected network so that one's path to and from transit is direct. Key future changes in the area that will enhance walkability include:

- **Two bridges over the Commuter Rail tracks.** These bridges will connect the Quadrangle area to the Triangle as well as Danehy Park to the neighborhoods south of Rindge Avenue. These new connections will bring people living and working south of the tracks closer by foot to a potential Commuter Rail station at Alewife.
- **Envision Alewife street grid enhancements.** Envision Alewife includes plans to add additional streets and/or pedestrian and bicycle connections in the Shopping Center and Quadrangle area, all of which will make it simpler and more direct to walk to/from the potential station.

6.5.4 Development Density

The existing and planned density of the Alewife area is a very transit-supportive environment. Transit stations located in more dense areas are often associated with higher rates of ridership.[20] The City's zoning and future zoning direction will support an increase in the amount of people coming to work and live in what is a relatively small area. This means that densities of both residents and jobs will be high. The existing recent development in the Triangle is evidence of this, with many five and six-story buildings.

[20] This is a connection that has been made in many studies, including: Mattson, Jeremy. "Relationships between density, transit, and household expenditures in small urban areas." *Transportation Research Interdisciplinary Perspectives* 8 (2020): 100260.

7 Challenges and Benefits

7.1 Operational Challenges

It is important to note that adding a Commuter Rail station at Alewife would add time to the Fitchburg Line operations, and that could have a negative impact for others using this or even other services. This study assumes that the required adjustments to train schedules would be around 3 minutes at stations outbound of Alewife. Potential additional impacts to consider include:

- Fluctuations in boardings, particularly if it is a busy station, that impact train schedules
- Longer trips for riders at stations outside of Alewife
- Necessary adjustments to transfer windows
- Necessary adjustments to non-revenue movement of rail vehicles
- Larger impacts on scheduling throughout the system
- Increased operating costs, such as those associated with longer cumulative working hours of train operators, station maintenance, and/or additional fuel required

STOPS reports the modeled change to ridership at other MBTA stations brought about by the presence of an Alewife Commuter Rail station. The change in boardings between the no-build and build station scenarios at all Fitchburg Line Commuter Rail stations is shown in Table 11 below.

Table 10: STOPS Boardings at Fitchburg Line Stations, Build and No-Build, High Growth Scenario

Stop Name	Direction	2040 No-Build	2040 Build	Difference Between Build – No Build
Alewife	Outbound	0	772	772
North Station	Outbound	11442	12081	639
Alewife	Inbound	0	397	397
Waltham	Inbound	779	833	54
Littleton	Inbound	173	224	51
West Concord	Outbound	67	91	24
Waverley	Inbound	354	371	17
Porter	Outbound	476	493	17
South Acton	Inbound	344	353	9
Brandeis/Roberts	Inbound	309	318	9
Fitchburg	Inbound	548	554	6
Wachusett	Inbound	262	266	4
North Leominster	Outbound	63	66	3
Shirley	Outbound	38	40	2

Stop Name	Direction	2040 No-Build	2040 Build	Difference Between Build – No Build
Concord	Inbound	137	137	0
Silver Hill	Outbound	0	0	0
Ayer	Outbound	35	35	0
Concord	Outbound	34	33	-1
Lincoln	Outbound	16	15	-1
South Acton	Outbound	16	15	-1
Brandeis/Roberts	Outbound	287	285	-2
Waverley	Outbound	330	328	-2
Silver Hill	Inbound	73	71	-2
Littleton	Outbound	37	35	-2
Shirley	Inbound	124	122	-2
Lincoln	Inbound	192	189	-3
Kendal Green	Inbound	114	111	-3
Ayer	Inbound	322	319	-3
North Leominster	Inbound	333	330	-3
Kendal Green	Outbound	81	76	-5
West Concord	Inbound	265	233	-32
Waltham	Outbound	515	482	-33
Belmont	Outbound	193	146	-47
Belmont	Inbound	362	295	-67
Porter	Inbound	1106	985	-121

Demand at other Fitchburg Line stations does not change significantly with the presence of an Alewife station, with a few exceptions. Boardings at North Station are modeled to increase significantly. Some of these boardings are likely the result of new trips to Alewife from Boston via the Fitchburg Line, as well as new transit trips that transfer to Alewife from the Newburyport and Haverhill Lines (and have to board at North Station to go back out along those lines) as discussed in Section 5.1.1 above. Boardings are modeled to decrease at Belmont Station (both directions) and Porter Square (inbound). Most of these trips were likely originating or ending in the Alewife neighborhood, and can now use the new Commuter Rail station for a more direct route.

There is also the possibility of the new Commuter Rail station at Alewife absorbing some ridership from the Red Line at Alewife. Anecdotally, this was a concern when Boston Landing opened in Allston, and riders switched from using the Green Line to using the Commuter Rail. These new boardings, from the point of view of the transit provider, are not actually completely new transit trips. Instead they are trips that would have been made on other MBTA services that have merely switched to the newly available Commuter Rail. The STOPS model estimates that approximately 250 fewer people would use the Red Line in a future scenario with a new Alewife Commuter Rail station.

7.2 Potential Positive Impacts

If the City of Cambridge maximizes the Alewife area's development potential, a Commuter Rail station can serve as a valuable transit option for both future residents and employees that work in the area. This study's high-growth forecasts paint a positive picture of future ridership. In turn, good transit ridership with strong transit options provide a strong foundation for economic development. However, achieving this report's forecasts will require thoughtful land use decisions and favorable medium- and long-term market conditions.

This study also revealed potential origin-destination pairs that have not been studied, particularly those originating and terminating in Essex County. While this desire line requires further vetting, it potentially illustrates an unmet transit demand. It is worth noting that not all data sources – specifically Replica LBDS – showed demand from Essex County. Nevertheless, it may be fruitful for future demand studies of the Alewife area to further study this.

8 Conclusions

The Alewife Commuter Rail Demand Study found that the Alewife neighborhood is uniquely positioned to benefit from expanded transit access via a new Commuter Rail station along the Fitchburg Line, with projected boardings comparable to some of the MBTA's busiest Commuter Rail stations. Specifically, the analysis finds that daily boardings at a future Alewife Commuter Rail station could place Alewife among the top ten stations in the MBTA's Commuter Rail system. At the lowest end, with limited change in land use and no changes to frequency, boardings at the station would be around 800. At the high end, boardings could be as high as 2,250. The middle range of these numbers is comparable to busy stations like Salem, Lansdowne, Boston Landing, and Providence.

This projected demand is underpinned by several important factors, beginning with context. The Alewife area is undergoing significant transformation, with City plans and zoning changes supporting dense, mixed-use development, some of which is built or underway. The Envision Alewife Masterplan, planned new pedestrian bridges, and transit-oriented development initiatives are all designed to foster walkability and sustainable growth in the area directly adjacent to the proposed station. These investments will bring thousands of new residents and jobs to the area, amplifying the need for reliable commuter rail service.

The study used a combination of approaches to estimate this potential ridership, using an FTA model and adjusting its results to account for potential changes in frequency. The FTA STOPS model is a simplified version of a traditional "4-step" model, which calculates demand based on existing travel markets from the Census and calibrated via local data. The team compared the model results to peer stations and other real-world data to validate the findings as a beginning point for the analysis. Subsequent analysis applied factors for potential changes in frequency to understand how ridership could change as a result, particularly considering that the MBTA is investing in changes to the Commuter Rail via its Rail Modernization Program. Although not estimated, it is worth noting that the existing network of bicycle trails that converge on Alewife would allow people to comfortably bike to the station, and this is not well captured in the model.

Importantly, the study recognizes that the addition of a Commuter Rail station for the Alewife neighborhood will have system-wide impacts. Adding a station will introduce operational challenges, including schedule adjustments and potential increased operating costs. The net effect on the Fitchburg Line and the MBTA system as a whole is likely an increase in riders—adding approximately 1,400 boardings across the whole Fitchburg Line (in the High Growth scenario, before the impact of service adjustments). However, the model estimates modest shifts in ridership from nearby stations such as Belmont and Porter, as well as a few hundred riders switching from the Red Line to the Commuter Rail at Alewife.

Further work is necessary to determine feasibility, including understanding site feasibility, costs, and systemwide impacts. The City has identified some concept-level designs for the station, which is a starting point. Boston Landing provides some insights into infill stations in terms of operational changes and systemwide impacts, and further study of its impact could yield important lessons.

In summary, the Alewife Commuter Rail Demand Study suggests that the Alewife area is poised to become a major transit hub, delivering substantial benefits to riders, the local community, and the broader MBTA system. As decision-makers consider next steps, this study provides an important window into the feasibility of a Commuter Rail station, demonstrating that demand for a station here is in line with the existing system.

Appendix A

A.1 Comprehensive Modeling Assumptions

Synthetic Model: There are four methods of STOPS model implementation: Synthetic, Incremental, Special Market and Type 2 Special Market. Only Synthetic or Incremental would have been applicable implementations for the Alewife Commuter Rail station. The Synthetic model uses data from the Census Transportation Planning Products (CTPP) package to evaluate traveler behavior in the modeled area, while the Incremental model uses transit passenger survey data, when available. Within the scope of this study, access to linked trip origin-destination (OD) flow data from the 2023 MBTA Passenger survey was restricted due to data privacy limitations. Therefore, this study uses the Synthetic model approach. The most recent CTPP passenger flow data usable in the Synthetic model is from 2016. To adjust the model to better reflect post-COVID-19 travel behavior, trip purpose and access/egress mode distribution from 2023 MBTA Passenger survey were utilized during calibration. Key data sources used for the model are listed in Section 3.4. Section 3.5 highlights the assumptions made for developing STOPS model and precautions to be taken when analyzing the model results and its application. Section 3.6 details the final calibration settings and results.

Linked Trips Matrix: The linked trips matrix breaks down trips on the MBTA system by trip purpose and trip origin (Home-based work, Work-based home, and Home-based other trips). We assume that transfer rates (the percentage of trips that include a transfer between MBTA services) across all trip types are the same. The MBTA reported that the average transfer rate for trips across the entire system is 27%, meaning that the linked/unlinked trips ratio (an input in the STOPS model) is 0.73.

Value of Time: The STOPS model evaluates fare price by converting fares into time spent using a value-of-time (VOT) factor. In this version of the model, the value of time was set at $18/hour. This means that, within the model, travelers are generally willing to spend $18 to save an hour of travel time on their trip. Put another way, the MBTA standard rapid transit fare price of $2.40 is considered equivalent to an additional 8 minutes of travel time when comparing trip routes. This value was chosen via calibration of park-and-ride rates throughout the MBTA system, so that park and ride lots would see usage similar to real life while keeping parking pricing similar to real rates.

Schedules: Adding a new Commuter Rail station at Alewife is assumed to extend the travel time of riders on the Fitchburg Line going into and out of Boston. The STOPS model therefore altered the existing time tables west of Alewife to account for additional travel time, without altering arrival times at North Station.

Table 11: AM Commuter Arrival Times with and without an Alewife Stop[21]

Station	Inbound Arrival Times Prior to Alewife Station Addition	Inbound Arrival Times After Alewife Station Addition	Outbound Arrival Times After Alewife Station Addition	Outbound Arrival Times After Alewife Station Addition
Wachusett	7:15AM	7:12AM	9:06AM	9:10AM
Fitchburg	7:23AM	7:20AM	8:55AM	8:59AM
North Leominster	7:30AM	7:27AM	8:47AM	8:51AM
Shirley	7:38AM	7:35AM	8:38AM	8:42AM
Ayer	7:43AM	7:40AM	8:33AM	8:37AM
Littleton/Route 495	7:51AM	7:48AM	8:25AM	8:29AM
South Acton	7:57AM	7:55AM	8:18AM	8:22AM
West Concord	8:01AM	7:58AM	8:13AM	8:17AM
Concord	8:05AM	8:02AM	8:09AM	8:13AM
Lincoln	8:11AM	8:08AM	8:04AM	8:08AM
Silver Hill	8:13AM	8:10AM		
Kendal Green	8:18AM	8:15AM	7:59AM	8:03AM
Brandeis/Roberts	8:22AM	8:19AM	7:55AM	7:59AM
Waltham	8:26AM	8:23AM	7:52AM	7:56AM
Waverley	8:31AM	8:28AM	7:47AM	7:51AM
Belmont	8:33AM	8:30AM	7:45AM	7:49AM
Alewife	*	8:35AM	*	7:44AM
Porter	8:39AM	8:39AM	7:40AM	7:40AM
North Station	8:54AM	8:54AM	7:30AM	7:30AM

Ridership Data: Model calibration is performed by comparing modeled boardings at stations throughout the system with observed boardings data. This model used boardings data from Fall 2024 published on the MBTA Open Data Portal. Assumptions and caveats involving the ridership data are as follows:

- Recent ridership data is unavailable for the Ferry and Mattapan High-Speed Trolley. These services were judged to have low impact on modeled results for Alewife Station ridership. The model was not calibrated to match ridership for these services.
- Wednesday, February 12th, 2025 was chosen as the "Model Date." This date was chosen because it represented a typical midweek service day with no diversions or station closures that would significantly affect trips at Alewife Station. Trips were modeled for all stops that received scheduled service on this date according to the MBTA GTFS Feed.
- The MBTA GTFS feed includes separate route/trip information for the four Green Line branches (B, C, D, E). The publicly available ridership data treats all Green Line branches as one route. Green line ridership was allocated to each branch according to the distribution of boardings at single-

[21] Fitchburg Line | Commuter Rail | MBTA

branch Green Line stops. For example, 26% of single-branch Green Line boardings occurred at stations only served by the B branch, so 26% of Green Line Boardings at stations served by all four branches were assigned to the B branch for model calibration purposes. During calibration, observed Green Line ridership was treated with lower confidence than ridership on other lines.

- Several bus routes (including routes 15, 33, 39, and 57) run extended early morning service to alternate destinations for which ridership data is not available. Several bus routes run service combined with other nearby routes during off-peak hours, including the 62/67, 40/50, 441/442, and 89/93. Ridership data is not available for these combined routes. The lack of ridership data means we were unable to calibrate the model specifically to best represent these bus routes. The only one of these bus routes that serves the Alewife area is the 62/67 bus, which only runs during off-peak hours. Because the bus represents a small portion of overall bus ridership at Alewife, the lack of calibration data is unlikely to impact the model results.
- Approximately 50 stops (out of the 7,300 stops serviced on the Model Date) were unable to be matched to available ridership data for unknown reasons not listed above. The most likely cause is that ridership data was not collected for these stops or combinations of stops and routes, if for example a stop is only served by a route infrequently or on weekends. The lack of ridership data for these 50 stops is unlikely to have a major impact on the model calibration, because the calibration process is targeted to focus on stops that most directly serve Alewife and have high ridership.

STOPSTYPE Field: The STOPS Stations shapefile which contains spatial data for the transit stations used in the STOPS model includes a field called STOPSTYPE. Stations are assigned a STOPSTYPE based on two factors: 1) the grade level of the station (at-grade, 1 level above/below, 2 levels above/below, etc.), and 2) the presence of a park-and-ride (PNR) lot at the station. The STOPS Model adds 30 seconds of additional access/egress time to a station per level above/below grade. PNR presence allows the station to accept PNR boardings. To avoid excess manual editing of data, STOPSTYPE was assigned en masse to stations using the following criteria:

- Bus: assumed at-grade; assigned PNR present if PNR found in MBTA's GTFS facilities file
- Rapid Transit (Red, Blue, Orange): Assumed 1 level below/above grade; assigned PNR present if PNR found in MBTA's GTFS facilities file
- Commuter Rail: Assumed at grade; assigned PNR present if PNR found in MBTA's GTFS facilities file
- Green Line/Mattapan Trolley: Assigned at grade/1 level below grade based on reality on the ground; assigned PNR present if PNR found in MBTA's GTFS facilities file
- Ferry: Assumed at-grade

Additional Transfer Information: The project team received the following data points from MBTA OPMI for use in model calibration:

1. The average transfer rate for the entire MBTA system is 27%
2. 52% of Fitchburg Line riders make a transfer (before or after the Fitchburg line trip)
3. **On an average weekday at Alewife in October 2024**:
    a. Between 476 and 718 people transferred from bus to rail.

b. Between 544 and 820 people transferred from rail to bus[22]

Bus Transfer Penalties: The following STOP_IDs are given a very high bus transfer penalty to reflect the fact that they are drop-off only stops at the time of ridership data collection (Fall 2024):

- 76127 (Harvard Lower Busway)
- 52720 (Wellington Drop-off Only)
- 29004 (Sullivan Drop-off Only)
- 74617 (South Station SL Exit-Only)
- 15800 (Wonderland Drop-off Only)

Build Scenario: The following edits were made to the STOPS model inputs to create the Build Scenario:

- The new Commuter Rail station at Alewife is represented by two station points, with IDs FR-0044-01 (outbound platform) and FR-0044-02 (inbound platform)
- Transfer times from existing MBTA Red Line to new Alewife Commuter rail platforms were estimated from Google Maps walk times, 9 minutes from the bus loop and 11 minutes from the Red Line platform to the Commuter Rail platform
- The new station is placed in fare zone 1A (see 3.2.1)
- The new Alewife Station is added to the GTFS schedule (in the stop_times.txt file) of all Fitchburg line trips except those that are express to/from Porter Square (one inbound morning trip and one outbound evening trip in February 2025).
- Each included train stops at Alewife 4 minutes before/after it stops at Porter Square, depending on the train's direction.
- The Fitchburg Line schedule was adjusted to account for the addition of Alewife Station. These adjustments were selected based on an analysis of the time between stops with spacing similar to Alewife and the nearest existing Fitchburg Line stops:
    - Today, trains take **6 minutes** to get from Belmont to Porter
    - Trains usually take about **3 minutes** to travel the distance between Alewife and Porter (Wellesley Sq to Wellesley Hills, Oak Grove to Wyoming Hill)
    - Trains usually take about **4 minutes** to travel the distance between Belmont and Alewife (i.e. Brandeis to Kendal Green, North Beverly to Hamilton/Wenham)
    - One train (the 508 on the Worcester line) arrived at South Station at 8:20AM before and after the addition of Boston Landing in 2016. The MBTA pushed that train's departure **3 minutes earlier** to account for the new station.
    - Based on this review, the following adjustments were made to the Fitchburg Line schedule:
        - Stations west of Alewife should be adjusted by **3 minutes** to account for the additional travel time while keeping arrival times to North Station consistent
        - Trains serving Alewife should be scheduled to arrive **4 minutes** before/after the Porter scheduled arrival time'
        - Trains serving Alewife should be scheduled to arrive **5 minutes** before/after the Belmont scheduled arrival time

[22]Gilman, Timothy. Email correspondence, February 7th, 2025.

- This approach was confirmed in email correspondence by Brad Woodworth, Director of Rail Modernization Planning at the MBTA[23].

Districting

To assist in calibration, CTPP zones (which in this case are same as census tracts) are grouped into districts. The district shapefile was created using the following boundaries/rules (Figure 9):

- In the Fitchburg Line corridor and broad service area, districts were drawn based on the 9 distinct travel sheds created as part of the 2023 MBTA Garage Deconstruction Feasibility Study.
- In Downtown Boston and Somerville, zones not already grouped via (a) above were assigned districts based on ZIP code
- Within Suffolk and southern Middlesex counties, zones not already grouped via (a) and (b) above were assigned districts based on municipality
- Outside of Suffolk and Middlesex counties, zones not already grouped via (a), (b), or (c) above were assigned districts based on county.
- Zones west of Worcester county were grouped with Worcester County, and zones in Rhode Island were assigned to a Rhode Island district.

[23] Woodworth, Bradford. Email Correspondence, June 24th, 2025.

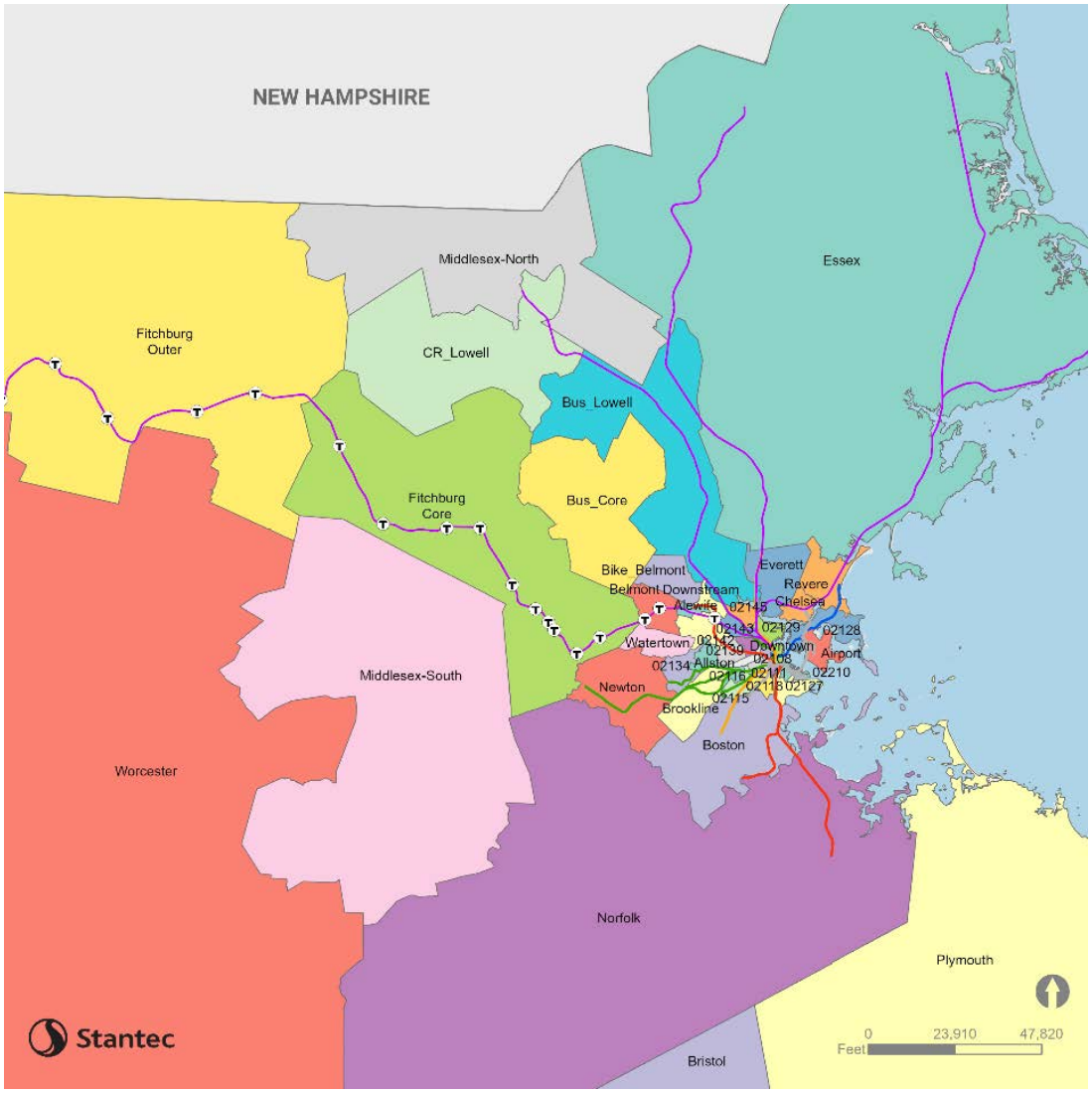


Figure 9: Map of STOPS Model Summary Districts

A.2 STOPS Calibration Process

This section summarizes the important adjustments made to calibrate the 2024 base model scenario to the observed transit patterns. The final model was a synthetic model which was run by setting the Census Transportation Planning Package (CTPP) Calibration Approach to the STOPS default of “00 (none selected)”. The Group Calibration Approach was configured as '00-none selected,' indicating that the model was not calibrated explicitly based on station grouping.

The Boston Region’s Travel Demand Model (TDM23.1.0), developed and maintained by the Central Transportation Planning Staff (CTPS), was used for generating some of the inputs to the model such as Traffic Analysis Zones (TAZ), base and future year zone-to-zone travel times and distances, and socio-

economic data. In absence of zone-to-zone transit flows from survey, the person flows from CTPP data were used to generate the transit flows by trip purposes and car ownership. It was further calibrated to match the breakdown calculated from 2023 MBTA Passenger survey. The Passenger Survey contains linked trips broken out by trip purpose and household vehicle ownership, which are important inputs for the STOPS model. The survey somewhat overrepresents typical daily trip counts on subway and light rail compared to the MBTA's published ridership data in 2023, so factors were added to make bus trips more attractive to riders to counterbalance. Table 13 below shows the observed and final transit trips by trip purposes and car ownership.

Table 12 Linked Trips by Trip Purpose and car ownership from scaled MBTA Survey

Car ownership	Home-Based Work	Home-Based Other	Non-Home-Based
0	175,160	70,480	25,811
1	166,370	56,063	22,864
2 or more	85,802	29,267	15,420
Total	**427,332**	**155,810**	**64,095**

Table 13 Linked Trips by Trip Purpose and car ownership from calibrated STOPS model estimate

Car ownership	Home-Based Work	Home-Based Other	Non-Home-Based
0	171,532	70,354	25,760
1	165,820	55,948	22,817
2 or more	85,625	29,207	15,388
Total	**422,977**	**155,509**	**63,965**

Table 14 Delta Linked Trips by Trip Purpose and car ownership (Model - Survey)

Car ownership	Home-Based Work	Home-Based Other	Non-Home-Based
0	**-2%**	**0%**	**0%**
1	**0%**	**0%**	**0%**
2 or more	**0%**	**0%**	**0%**
Total	**-1%**	**0%**	**0%**

The initial base year run provided considerably less ridership on fixed guideways. Therefore, the visibility factor for both Full and Partial Guideway were increased to 1.3 and 1.1 respectively. Correspondingly, the initial model run overestimated transfers between lines, therefore a transfer penalty of 1.9 (default is 1.0) was set to reduce the model transfer rate to 72%.

Table 15 Observed vs Model Ridership by Route Type

Route Type	2023 MBTA Survey (Scaled to 2024)	STOPS Estimate	Delta	% Delta
Light Rail	183,483	184,207	724	0%

Subway	471,789	447,091	(24,698)	-5%
Commuter Rail	138,077	133,236	(4,841)	-4%
Bus	83,162	110,148	26,986	32%
Ferry	Not Available	280		
Total (no Ferry)	**876,510**	**874,682**	**(1,828)**	**0%**

This synthetic model does not have the walk, park-and-ride (PNR) and kiss-and-ride (KNR) access connectors separately coded. It uses the zone-to-zone travel times and distance to create the PNR and KNR paths. For the walk trips, it uses straight-line connectors to calculate distance and time. As a result, it overestimates the walk trips especially in the areas with highways, waterways, bridges and other barriers. Therefore, walk penalties were added to certain stations with overestimated walk trips. To address the bridge and highway connection near the Alewife station, the walk penalty of 35 mins and 28 mins were added on Alewife Rail and Bus stations, respectively. To account for the faster walk access due to the new walk bridge, this walk penalty was reduced by 20 minutes on all Alewife stations in future year. Furthermore, the model also overall overestimated the PNR and KNR transit trips. Therefore, the PNR and KNR penalties were added on all stations to represent the congestion and inconvenience. Furthermore, the parking cost for Alewife station was also adjusted to calibrate the PNR rider count. Table 17 below shows the observed and modeled ridership by access mode and route type.

Table 16 Observed vs Model Ridership Share by Route Type and Access Mode

% Ridership Share	2023 MBTA Survey (Scaled)	STOPS Estimate	Delta (Estimate – Survey)
Commuter Rail			
WALK	66%	66%	0%
KNR	27%	27%	0%
PNR	7%	8%	1%
Light Rail			
WALK	95%	94%	-1%
KNR	4%	4%	0%
PNR	1%	2%	1%
Subway			
WALK	90%	90%	0%
KNR	8%	7%	-1%
PNR	2%	3%	1%
Bus			
WALK	95%	96%	1%
KNR	4%	4%	0%
PNR	0%	0%	0%

Table 18 provides a list of important statistics obtained from the scaled 2023 MBTA Passenger survey and 2024 MBTA Blue Book which were used during calibration process. It is important to note that the model may be overpredicting bus ridership into the Alewife area, but the numbers are relatively low overall, so the impact on results is likely not significant.

Table 17 Final Observed vs Model Estimates Comparison

Important Statistics	Observed Data	STOPS Estimate	Delta	% Delta
Overall Statistics				
Unlinked Transit Trips	886,626	886,626	0	0%
Linked Transit Trips	647,237	642,451	-4,786	-1%
Transfers = Unlinked/Linked	1.37	1.38	0.01	1%
Main Study Routes (Ridership)				
Red	209,801	215,207	5,406	3%
CR-Fitchburg	9,043	9,090	47	1%
62	493	864	371	75%
67	122	440	318	261%
76	159	315	156	98%
350	441	1,102	661	150%
Green	183,482	184,207	725	0%
Orange	167,640	167,918	278	0%
Alewife Stations				
Total Bus Boardings	891	927	36	4%
Total Red Line Boardings	5,931	6,161	230	4%
Total Walk trips	2,411	2,368	-43	-2%
Total KNR Trips	651	1,002	351	54%
Total PNR Trips	1,851	1,902	51	3%
Total Transfers	1,018	889	-129	-13%

A.3 Sources not used

Survey Data

The original intention of the study was to use the incremental calibration method for the STOPS model. Unlike the synthetic model, the incremental model uses trip origin-destination (O/D) flows derived from survey data collected by a transit agency. While the MBTA has conducted a passenger travel survey and collected data that could be used in an incremental model, the MBTA's data privacy policy prevents person-level survey data from being distributed. The study team decided to instead use the synthetic model, which uses O/D flow data derived from the CTPP census data package instead.

Pedestrian Network Data

The study team also originally intended to model pedestrian links to stations via a pedestrian facilities shapefile. This would allow the model to be edited to reflect planned additional pedestrian links over the Fitchburg Line train tracks in the 2040 scenario (see Figure 2). During the calibration process, the modeling team found that the pedestrian facilities shapefile acquired from MassGIS yielded dramatically low counts of walking trips to transit stations. Running the model using zone-to-zone straight line walking links (the STOPS default) yielded much more accurate results for walk trips. The improvements to walk access to Alewife Station provided by the planned pedestrian bridges were instead added to the model via manual adjustments to the walk times between traffic analysis zones (TAZs) south of the Fitchburg Line tracks and Alewife Station.

A.4 Trip Generation Modeling Analysis

To provide an alternative point of comparison for the results of the STOPS model, the number of trips generated by the Alewife neighborhood in the 2040 high-growth scenario was modeled using the ITE Trip Generation Manual, 12th edition. Estimated land use quantities for residential and commercial (general office) uses were pulled from the MBTA Red Line TOD study. The resulting trips produced were assigned modes based on the mode share present in the Cambridge PTDM dataset (see Section 6.2.2).

Overall, the ITE-based model estimated that the neighborhood would produce about 87,000 trips per day in 2040. However, 23% of these trips would actually be remote work trips, so the resulting actual trips taken in the neighborhood would be lower. 29% of the total trips were estimated to be transit trips, meaning that about 24,600 transit trips were projected to be produced per day in Alewife. Because the trips produced represent both transit boardings and alightings, it is assumed that half of the transit trips produced in a day are transit boardings. As a result, the trip generation analysis estimates that the high-growth land use scenario would produce about 12,000 transit boardings per day at Alewife.