

**MEMORANDUM****TO: Transportation Planning and Programming  
Committee****April 1, 2009****FROM: Alicia Wilson****RE: Executive Summary: Alewife Station: Improvements to Feeder Bus  
Routes, Bus Access and Egress, and Route 2/Route 16 Intersection****INTRODUCTION**

On August 2, 2007, the Transportation Planning and Programming Committee of the MPO approved the technical memorandum "Route 2/Route 16 (Alewife Brook Parkway) Eastbound: Traffic Patterns and Alewife Station Garage Survey," which documented Phase I of the present study. In Phase I, staff recorded vehicle license plate numbers at nine roadway locations in the vicinity of the MBTA's Alewife Station and at the garage. Another task was to survey bicyclists who parked at the bicycle parking spaces of the garage. By matching the license plates of observed vehicles between logical survey location sets and to the Registry of Motor Vehicles (RMV) town-of-origin file, staff were able to identify travel patterns through the study area, including the spatial distribution of vehicles by town of origin.

The tasks of the second phase of this study, which is complemented by MAPC's Alewife Bicycle and Pedestrian Access Study, were to:

1. Reevaluate the traffic patterns that emerged from the Phase I license plate survey using the most recent RMV vehicle garage information.
2. Recommend improvements to MBTA feeder bus service to Alewife Station in order to increase feeder bus ridership to the Red Line.
3. Identify improvements to MBTA feeder bus access/egress between the Alewife garage and Route 2.
4. Recommend operational improvements to the Route 2/Alewife Brook Parkway (Route 16) intersection.

Three memos were produced during the course of Phase II:

1. 2006 Alewife License Plate Data Rematching with 2008 RMV Database, February 29, 2008
2. Recommended Improvements to MBTA Feeder Bus Routes to Alewife Station to Increase Feeder Bus Ridership to the Red Line, January 13, 2009

3. Traffic Operations and Bus Access and Egress at the Route 2/Route 16 Intersection and the Alewife MBTA Garage: Existing Conditions and Recommended Improvements, March 19, 2009

They are summarized below and included in the appendix in their entirety.

## **TECHNICAL MEMORANDA SUMMARIES**

### **2006 Alewife License Plate Data Re-matching with 2008 RMV File**

License plate data collected for the Alewife Phase I study<sup>1</sup> at ten locations on November 15, 2006, was initially matched with 2003 Registry of Motor Vehicles (RMV) files to determine the community in which each vehicle is garaged. The plates of 56% of total vehicles were matched with the 2003 file, with location matches ranging from a low of 50% to a high of 61%. (Unmatchable plates such as police, fire, and out-of-state vehicles were not included in the match rate.) A few TPPC members questioned the validity of the results given the age of the RMV file and requested that the data be rematched when new RMV files were received.

CTPS received the 2008 RMV files in February 2008. The plates of 81.8% of total vehicles were matched with this file, with match rates by location ranging from a low of 74.3% to a high of 86.4%. The older file produced fewer matches because, during the intervening years, people moved and registered their vehicles in different communities, and new vehicles were registered.

The margin of error for the 95% confidence level was used for the origin data. This means that for any location, the estimate of the proportion of vehicles originating in any given community falls within the range of plus or minus the margin of error 95% of the time. For example, with the 2003 file, it was estimated that 13% of the vehicles observed southbound on Alewife Brook Parkway at the Fresh Pond Rotary in Cambridge originated in Lexington, and the margin of error for this location is  $\pm 1.5\%$ . Then, 95% of the time, the proportion from Lexington would range between 11.5% and 14.5%. In other words, if this survey were conducted 100 times, 95 of those times the proportion of people from Lexington would be within 1.5 points of the percentage found in this survey. Excluding the "Other Massachusetts" category, the origin tables contain a total of 267 entries. Only six of the entries from the 2008 rematching (shaded in the tables) fall outside the margin of error. Five of the six are only one half of one percent or less outside the expected values, and that degree of difference might be attributable to rounding.

The conclusion is that the new origin tables validate the statistical methods used and indicate that conclusions drawn from using the 2003 RMV files are valid.

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<sup>1</sup> Route 2/Route 16 (Alewife Brook Parkway) Eastbound: Traffic Patterns and Alewife Station Parking Garage Survey, July 19, 2007.

## **Recommended Improvements to MBTA Feeder Bus Service to Alewife Station in Order to Increase Feeder Bus Ridership to the Red Line**

Phase I analysis revealed that almost one-third of vehicles observed parked at the Alewife MBTA station are garaged in Arlington and Lexington, both of which have bus service to the MBTA station. One of the tasks of the Phase II study was to examine the coverage of the bus routes to the garage to determine whether changes are needed to maximize their ridership potential.

Analyses revealed that MBTA bus routes generally operate on major roads in Arlington and Lexington; however, several routes do run on local roads in each community. Current routing of MBTA bus service through the study area seems to be appropriate. There is more service in densely populated neighborhoods. Block groups with the lowest level of vehicle ownership generally have the largest proportions of Boston/Cambridge commuters who live within one-quarter mile of an MBTA bus stop; have lower levels of single-occupancy-vehicle trips to Boston and Cambridge; and generally have fewer vehicles parked in the Alewife garage. In addition, bus service seems to effectively serve those with lower incomes, as 81% of those who have household incomes below the MPO median live within one-quarter mile of a bus stop.

### **Traffic Operations at the Route 2/Route 16 Intersection in Cambridge and Bus Access/Egress from the Alewife Garage**

The intersection of Route 2 and Route 16 in Cambridge currently experiences long delays and queues during the morning and the evening peak periods, with roadway segment travel speeds consistently ranging from less than 10 mph to about 30 mph. These delays and queues also significantly impact MBTA bus travel times and possibly bus ridership. The two roadways fall under two different jurisdictions, MassHighway and the Department of Conservation and Recreation (DCR), with the traffic signal being operated by DCR.

In addition to the Route 2/Route 16 intersection, bus access to Alewife Station from Route 2 is provided along a service road, Alewife Station Service Road, which exits directly from Route 2 eastbound approximately 1,400 feet prior to the intersection. This service road also provides access to Acorn Park. Entrance to the ramp leading from Route 2 eastbound to the service road is often blocked by traffic queued at the Route 2/Route 16 intersection.

In May 2008, Massachusetts State Senator Stephen Tolman's office organized a working group to examine traffic operations in the Alewife area and at the intersection of Cambridgepark Drive and Route 16 in particular. The group included representatives from state, regional, and local agencies, as well as from the private sector. Several improvement options beyond the scope of the Alewife Phase II project were modeled and analyzed.

The options listed below are a comprehensive list developed within the context of this study and from the work of the Alewife Working Group. Some options were analyzed quantitatively using the microsimulation software VISSIM<sup>2</sup> or the software SYNCHRO,<sup>3</sup> and others were analyzed qualitatively. Of the eight options, the first four are low- to medium-capital-investment options; the last four are high-capital-investment options.

1. Optimize signal timings
2. Replace existing left-turn lane from Route 2 eastbound to Route 16 northbound with a double left-turn lane
3. Eliminate Route 2 eastbound left turns and divert traffic to Alewife Station Road
4. Add a third lane along Route 2 westbound from the Alewife Station Access Road approach to just past the Minuteman Bike Path overpass
5. Construct a fly-over from Route 16 northbound to Route 2 westbound
6. Replace intersection with conventional roundabout
7. Replace intersection with roundabout, including right-turn slip ramps
8. Replace intersection with roundabout, including a fly-over for traffic from Route 16 northbound to Route 2 westbound.

## IMPROVEMENT RECOMMENDATIONS

### Bus Service

The following are route modifications that would be expected to encourage more commuters to ride buses to Alewife Station. Possible difficulties are also mentioned.

- The MBTA does not have a service standard pertaining to the spacing of bus route stops. (The MBTA is working on a draft standard.) Local communities generally dictate placement and spacing of stops. The literature reveals that bus stop spacing affects demand by impacting access and travel time. “In general, there is a tradeoff between closely spaced, frequent stops with a shorter walking distance but more time on the vehicle and stops spaced further apart with a longer walking distance, but less time on the vehicle.”<sup>4</sup> DC Metro officials indicate that bus service would be 20-30% faster in limited-stop corridors. After introducing skip stop service, which combines both local stop and limited-stop sections, Dallas Area Rapid Transit (DART) officials indicate that ridership increased by 12.3% and speed increased by 10% during a one-year period.<sup>5</sup> A CTPS memorandum indicates that a bus route strategy in a selected corridor that includes fewer bus stops would bring about reductions in peak hour average bus travel time that are in the range of those observed by D.C. Metro and DART.<sup>6</sup> With community input

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<sup>2</sup> *Vissim Version 5.0*, PTV America, 2007

<sup>3</sup> *Synchro/SimTraffic Version 6*, Trafficware Corporation, 2003.

<sup>4</sup> *DC Metro May Increase Bus Stop Spacing to Improve Service*, The Urban Transportation Monitor, June 13, 2008, p. 1.

<sup>5</sup> *Ibid.*, p2.

<sup>6</sup> “MBTA Transit Signal Priority Study: Arborway Corridor,” draft memorandum, CTPS, July 11, 2008, p. 13.

and an awareness of local characteristics, consideration should be given to modifying the spacing of stops on some or all of the bus routes in the study area.

- Route 67 runs along the border of an Arlington block group that has one of the lowest levels of accessibility to bus service in Arlington, and the route also has a spur (now inactive until redevelopment in the area is complete) into that block group. Forty-seven percent of commuters from this block group to Boston and Cambridge live within one-quarter mile of this bus route, which appears to be routed through an area with less dense development near the former Symmes Hospital. The number of vehicles from this block group parked at the Alewife garage falls in the highest category of vehicles parked. Perhaps more of these commuters would use the bus if the bus were routed through the denser areas of the block group. However, the hilly terrain in this area is a possible impediment to rerouting buses here.
- At one point, the Route 67 bus extended from Turkey Hill in Arlington into a section of Lexington that has LEXPRESS service, but that portion of the route was discontinued. Perhaps the feasibility of reinstating the extension could be explored. However, the existing route already operates on a loop. Lengthening the distance and increasing the headway could affect existing ridership.
- Better coordination between LEXPRESS and MBTA services, particularly in Lexington Center, might attract some additional commuters; however, people generally dislike bus-to-bus transfers, and they would also have to pay fares on both the LEXPRESS buses and the MBTA buses. Coordinating services might add to LEXPRESS operating costs. Several LEXPRESS routes have sections in common with MBTA Routes 62/76. Since LEXPRESS stops on demand outside Lexington Center, riders can be encouraged to transfer to MBTA routes to Alewife.
- Under the Boston Region MPO's Suburban Mobility Program, the Town of Lexington could apply for funds for a peak period shuttle to Alewife. If the shuttle were to prove that there is ridership, perhaps the MBTA could offer service.

### **The Route 2/Route 16 Intersection and Bus Access/Egress to Alewife Station**

Based on the quantitative and qualitative analyses of the various options and strategies for improving traffic operations at the Route 2/Route 16 intersection and for improving access to and egress from Alewife Station, staff have the following recommendations, made in conjunction with the Alewife Working Group.

- Adding a third westbound lane (Option 4) for a short distance between the Alewife Station Access Road approach (jug-handle) and the Minuteman Bike Path overpass is effective in reducing delays and queues at this intersection. The additional lane capacity frees up traffic signal green time for reallocation to other approaches, including the Alewife Station Access Road, resulting in shorter queues and delays

on all approaches. Right-of-way is available for the portion of the third lane within the intersection. Right-of-way also appears to be available for the lane segment between the intersection and the Minuteman Bike Path overpass; however, the additional roadway width would have to be secured from an existing (possibly unused) sidewalk. The availability of right-of-way between the point where the Route 16 northbound approach meets Route 2 westbound and the overpass needs to be investigated further, including the need for a pedestrian corridor north of Route 2. Extending the third lane to Lake Street is not required in the short term but should be considered in the longer term.

- Reconstructing the Route 2 eastbound left-turn lane to Route 16 north into a double left-turn lane (Option 2 and also part of Option 4) would further benefit this intersection, as it would help reduce eastbound queuing on Route 2.
- Reconstructing the Alewife Station Access Road (jug-handle) into two lanes for as far back as possible would allow for bus and vehicle storage and for a priority bus lane with traffic signal priority for the buses.
- Following all above reconstruction, the traffic signal design would have to be reconsidered, including new equipment for demand-responsive operation and detectors/sensors for bus priority.

Excluding design and right-of-way, cost estimates for the recommended Route 2/Route 16 intersection improvements range between \$200,000 and \$400,000.

Potential implementation issues and opportunities include:

- The usefulness and purpose of the sidewalk along Route 16 southbound needs to be investigated.
- There are multiple stakeholders (DCR, MassHighway, City of Cambridge, Town of Arlington) that need to be consulted, with opportunities for cooperation and partnerships.
- Informing the general community in the area and seeking its support and cooperation are very important.
- Opportunities for regional programming or MassHighway and DCR standard maintenance could be sought for implementation of some of these improvements.
- Opportunities for development mitigation for some of these improvements need to be sought by the City of Cambridge.

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## **APPENDIX**