

MAGIC Suburban Mobility Transit Study

April 2011

Council on Aging Link and Ride

Fixed-Route Service
Transportation Hub
Demand Responsive Service
Service Coordination
Commuter Shuttles
Fitchburg Line
Volunteer Drivers
Lexpress
Commuter Shuttles
Multi-Modal Transportation



Minuteman Advisory Group on Interlocal Coordination

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Executive Summary

The Minuteman Advisory Group on Inter-local Coordination (MAGIC), a sub-region of the 101 cities and towns in the Metropolitan Area Planning Council (MAPC) region, requested and funded this study to inventory, analyze and recommend improvements to suburban transit systems in the sub-region. This study builds upon work completed by the Central Transportation Planning Staff (CTPS) in the 2005 “Regionwide Suburban Transit Opportunities Study Phase II” which looked at suburban transit services throughout the entire MAPC region.

Throughout the study process, MAPC coordinated closely with the working group that was established for the study consisting of at least one representative from each of the thirteen MAGIC municipalities. The working group provided valuable information and feedback throughout the study process.

The main objective of the study was to inventory existing services and determine what, if any, recommendations could be made to improve suburban transit services. This study is presented in three phases; an inventory of existing transit services, a needs assessment for each Census Tract in the MAGIC sub-region and a list of recommendations for improving suburban transit services. Each phase built upon the one preceding it, layering information to create a matrix for identifying needs and existing gaps in the transit network.

The overall findings of the study reveal several challenges with providing transit service throughout the MAGIC sub-region. These challenges include:

- Existing development densities in most municipalities are too low to support fixed-route transit service.
- Lower density development patterns and a lack of quality pedestrian infrastructure make it more difficult to connect residential, commercial and employment hubs.
- Diminishing funding sources at the state and federal levels are creating challenges to implementing changes to existing service, as well as providing new service to users.

Although there are challenges to providing fixed-route transit service within the MAGIC sub-region where it does not currently exist, MAPC did recommend a number of potential pilot projects. The potential projects include:

- An extension of the MBTA 62 fixed-route bus line to serve Middlesex Community College.
- Implement a commuter rail shuttle in Concord that connects both commuter rail stations in Concord to Emerson Hospital and other surrounding employers. This service could serve both the reverse commuters and traditional commuters by adding park and ride lots to the route.
- Explore the feasibility of implementing a small transit system in Hudson, and possibly expanding it to include Stow, Acton and Maynard.

A number of recommendations focused on regionalizing existing and future transit services in the MAGIC sub-region. Combining resources among multiple municipalities increases the ridership pool while effectively sharing the costs of the service among multiple funders. Some regional recommendations include:

- Regionalize the Council on Aging services, including better coordination of routes and destinations, as well as a one-stop regional call center.
- Park and Ride/Shuttle van services in the sub-region should be coordinated and expanded to include multiple communities.
- Work with existing Transportation Management Associations (TMA) to expand service to municipalities that are not currently served.
- Explore the feasibility of using existing school buses to provide public transportation services in municipalities.

While there are challenges to providing transit service in suburban settings, MAPC recommends using a combination of small changes to existing service and a regional approach for larger scale service projects. Smaller changes to existing service could begin to address some transit needs in the sub-region while larger scale projects are developed, funded and implemented.

Chapter 1: Introduction

The Minuteman Advisory Group on Interlocal Coordination (MAGIC) sub-region is largely suburban, in some cases rural, with many areas exhibiting patterns of low-density development. The vast majority of trips are taken by automobile, which not only leads to additional traffic congestion, but impedes non-driving populations from easily accessing employment opportunities and daily needs. At the same time, each community throughout the sub-region has varying forms of transit, shuttle and/or van service with different operating structures, coverage areas, and service times. The MAGIC sub-region, which is a sub-region of the 101 cities and towns in the Metropolitan Area Planning Council (MAPC) region, requested and funded a study to inventory, analyze and recommend improvements to suburban transit systems in the sub-region.

Project Scope

The key objective of the suburban mobility study focused on the coordination and maximization of existing transit services, while also developing strategies for enhancement and the piloting of new projects in the sub-region. In order to accomplish this objective, MAPC divided the overall study into three smaller phases which included the following:

1. Phase I: *Inventory of Existing Services* - MAPC developed an inventory of existing transit services including: MBTA commuter rail service, MBTA bus service, local bus service, public and private shuttle service, Council on Aging (COA) services, and services provided by other Regional Transit Authorities (RTAs). The inventory process also included identifying a series of daily trip generators including: major employers, commercial centers, hospitals, colleges/universities, and schools.
2. Phase II: *Needs Assessment* - Based on a methodology used by the Central Transportation Planning Staff (CTPS) in 2005, the MAPC needs assessment analyzed demographic data and the proximity of an area to daily trip generators. The criteria used in the needs assessment identified areas that may benefit from additional transportation options for both commuting purposes and accessing daily service needs. By combining the existing inventory from Phase I and the needs assessment, MAPC was able to identify areas where transit services were lacking or where overlap in services occurred.

3. Phase III: *Recommendations* - A series of recommendations and pilot projects were put forth in the study for the MAGIC sub-region, which focused on both regionalizing transit services, as well as developing new project ideas which could be implemented over time. The identification of potential funding sources was also included in this phase of the study.

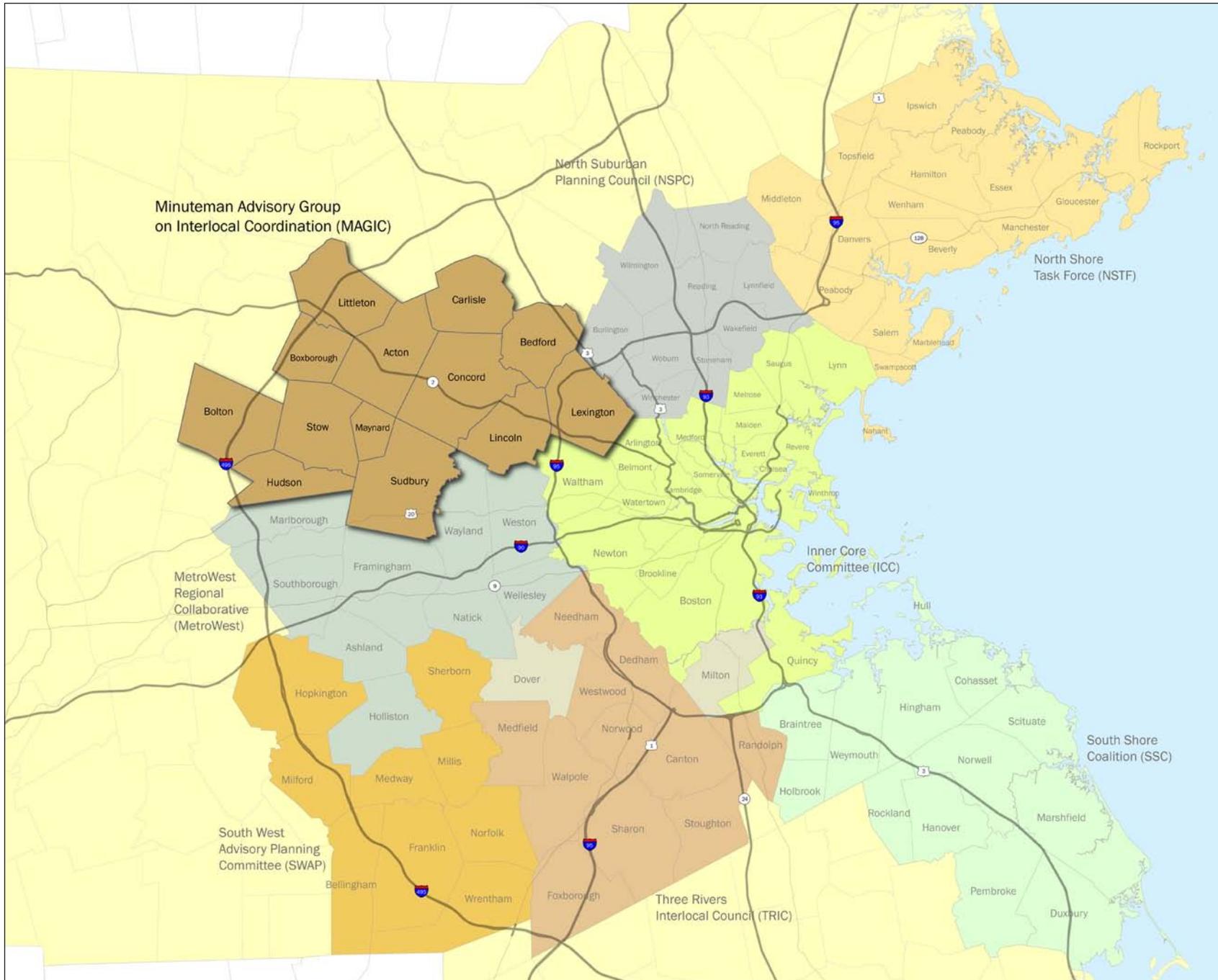
Study Participants

The MAGIC sub-region is made up of thirteen municipalities which stretch from the Route 128/I-95 corridor west to the I-495 corridor. Each municipality participated in this mobility study through a working group. The working group was comprised of at least one municipal representative (i.e. town planner, town administrator, etc.) who provided a working knowledge of municipal transit services and needs. The working group met twice throughout the study process; once to review the inventory and discuss needs and a second time to review MAPC's draft recommendations. A list of municipalities and the corresponding representatives are shown in Table 1.1.

Table 1.1: Working Group Representatives

Municipality	Working Group Member	Title
Acton	Fran Osman	Acton Transportation Advisory Committee
Bedford	Rich Joly	Planning Director
Bolton	Jennifer Atwood Burney	Town Planner
Boxborough	Elizabeth Hughes	Town Planner
Carlisle	George Mansfield	Planning Administrator
Concord	Marcia Rasmussen	Director of Planning and Land Management
Hudson	Jennifer Burke	Planning Director
	Michelle Ciccolo	Director of Community Development and Current MAGIC Chair
Lexington	Gail Wagner	Transportation Services Coordinator
Lincoln	Chris Reilly	Town Planner
Littleton	Keith Bergman	Town Administrator
Maynard	Max Lamson	Planning Board Member
Stow	Karen Kelleher	Town Planner
Sudbury	Jody Kablack	Director of Planning and Community Development

Figure 1.1: MAGIC Sub-Region Location Map



Chapter 2: Inventory

In order to establish a better understanding of what transit resources and services are provided within the MAGIC sub-region, MAPC developed an inventory which identified all transit services, both public and private, and a set of daily trip generators which could be served by current and future transit services.

Transit Service Identification

The first stage of the inventory involved collecting information on existing transit services, both public and private, in each of the thirteen MAGIC municipalities. MAPC identified transit contact persons in each municipality ranging from town planners to Council on Aging (COA) staff and made inquiries as to the services offered. In addition to contacting municipal staff, MAPC also searched online resources for private shuttle services offered by employers and private charter bus companies.

Regional Transit Authorities

A regional transit authority (RTA) is an agency tasked with providing transit service and programs to a group of municipalities under its jurisdiction. Each municipality pays an annual assessment to the RTA in return for the provision of transit services. These transit services may come in the form of fixed-route or demand-responsive service. The municipalities in the MAGIC sub-region are divided among four different RTAs which include: the Massachusetts Bay Transportation Authority (MBTA), the Lowell Regional Transit Authority (LRTA), the MetroWest Regional Transit Authority (MWRTA), and the Montachusett Regional Transit Authority (MART).

While the inclusion of a municipality does provide benefits in terms of transit service, most of the municipalities in the MAGIC sub-region are not receiving fixed-route transit service with the exception of Bedford, Lexington, Lincoln and Littleton who have bus service. Most of the MAGIC municipalities are able to use the RTA to handle demand-responsive services such as COA vans and shuttle services for seniors and

the disabled. Figure 2.1 and Table 2.1 shows each municipality and which RTA they are associated with, if any.

Trip Generators

The second stage of the inventory involved the identification of key trip generators and the mapping of their location in a Geographic Information System (GIS) program. A trip generator refers to a location that is a draw for transportation trips regardless of travel mode. These are also locations that are likely to be served by transit improvements in the future. Trip generators mapped as part of this study included:

- Schools (Public and Private Primary Schools)
- Colleges and Universities
- Major Employers (employing 50 or more people)
- Key Commercial Nodes
- Regional Shopping Malls (i.e., Burlington Mall, Natick Mall, etc.)
- Hospitals
- Recreation and Tourism Destinations

The study's working group also provided up-to-date information on new employers and commercial centers in each of the municipalities.

Representing the Inventory

Maps were developed for each municipality denoting the locations of transit routes and trip generators. These maps were presented to the working group at a meeting on November 30, 2010 where the working group made corrections to the original MAPC inventory. For inventory items that were difficult to represent on a map, such as COA service or RTA membership, a spreadsheet was created and distributed to each municipality. The inventory was organized by commuter rail service, bus service, and shuttle/van service. The maps for each municipality can be seen in Figures 2.2 to 2.14, while the written inventory can be seen in Tables 2.2 to 2.14.

Table 2.1: RTA Membership for MAGIC Municipalities

Municipality	RTA Membership
Acton	Lowell RTA
Bedford	MBTA
Bolton	Montachusett RTA
Boxborough	Montachusett RTA
Carlisle	N/A
Concord	MBTA
Hudson	N/A
Lexington	MBTA
Lincoln	MBTA
Littleton	Montachusett RTA
Maynard	Lowell RTA
Stow	Montachusett RTA
Sudbury	MetroWest RTA

Figure 2.1: RTA Membership for MAGIC Municipalities

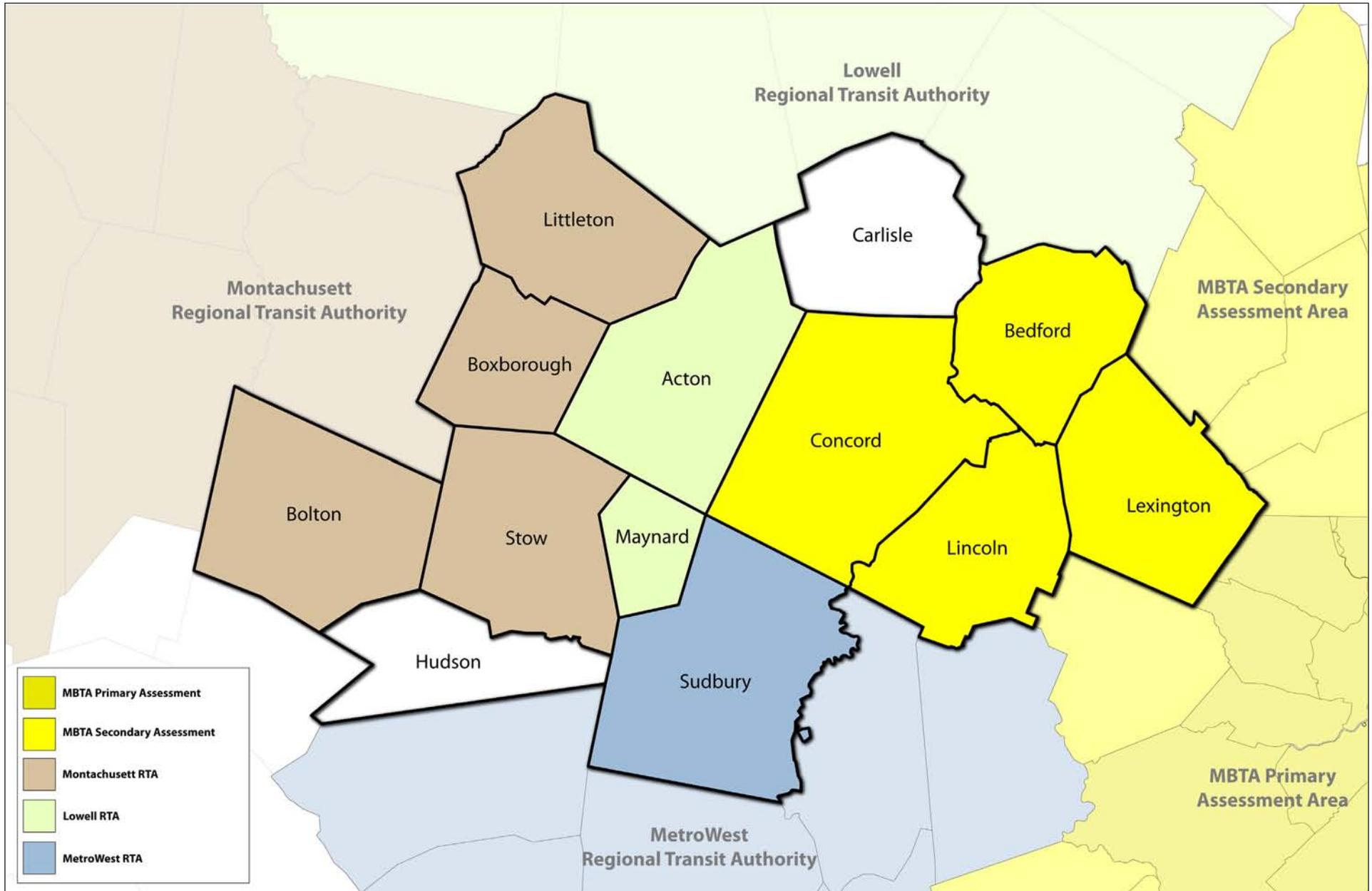


Table 2.2: Acton Services Inventory

Municipality	Transit Choice	Description	Stop Location	Times	Cost
Acton	Commuter Rail	One stop at South Acton Station along the Fitchburg Line.	South Acton	6AM to 11PM	\$6.75/ride
	Bus Service	Yankee Lines provides commuter bus service to Copley Square.	Acton - Colonial Spirits at the intersection of Route 2 and 119	7AM Morning Departure from Acton, 5PM Evening Departure from Copley	\$8.00/one-way ride
	Shuttles/Van Pools	Lowell RTA Road Runner van service which covers Acton, available for elderly over 60 and disabled for shopping, medical, work, or recreational trips.	Acton Township Area	M-F 8AM to 3:30PM	\$1.00 for In-Town rides, \$1.50 for Out-of-Town rides
		Demand-responsive service is operated by the Acton COA. These run.	Acton Township Area	M-F 8AM to 3:45PM with a break from 11:30 to 12:30	\$1.00 for In-Town rides, \$1.50 for Out-of-Town rides
		MinuteVan commuter rail fixed-route park and ride van to the train from a remote lot. Service is operated by Transaction Associates funded by a three-year declining startup grant from the Clean Air and Mobility Program.	West Acton Fire Station to South Acton Commuter Station	M-F 6:45AM to 9:25AM, then 5:10PM to 7:30PM on about 25 min. headways	\$1.00 per one-way ride, \$3.00 per day park n ride, \$200 for resident yearly ride pass, \$250 for resident parking pass and yearly van pass, and \$500 for non-resident park n ride pass
		Dial-A-Ride van service offered by MinuteVan	Acton Township Area	8 to 11AM and 3:15 to 8:15PM	\$2.00 per one-way in Acton, and \$4.00 one-way outside Acton
Clock Tower Shuttle from S. Acton to ClockTower Place	South Acton T Station	M-F 5 pick ups in the AM and 3 drop-offs in the PM	No charge, for businesses in that area, is open to the public as well		

Table 2.3: Bedford Services Inventory

Municipality	Transit Choice	Description	Stop Location	Times	Cost
Bedford	Commuter Rail	None			
	Bus Service	MBTA - Route 62	Multiple	M-F 7AM to 7PM	\$1.25 to \$1.50 per ride
		MBTA - Route 170	Multiple	M-F 6AM-8AM and 4PM-6PM	\$1.25 to \$1.50 per ride
		MBTA - Route 351	Multiple	M-F 6AM-9:30AM and 3PM-7PM	\$1.25 to \$1.50 per ride
		Bedford Local Transit - Offers both fixed-route pick up and drop off rides to designated shopping and medical trip locations. Also offers demand-responsive transit during non-fixed route trip hours. Before 9:45AM and after 3:15PM usually.	Multiple fixed drops/pick-ups, and on-demand service for all Bedford residents when fixed-route service is not running	Times vary depending on the day and trip destination, generally 9:45AM to 3:15PM	\$1.00 for in-town one-way, \$2.00 for out-of-town one-way
	Shuttles/Van Pools	Bedford Local Transit - Operates demand-responsive door-to-door service throughout the municipality.	Bedford Township Area, Emerson Hospital, Burlington Mall, Lahey Clinic	M-F, when fixed-route service is not running	\$1.00 for in-town one-way, \$2.00 for out-of-town one-way
		MART Boston Shuttle	Bedford VA Shuttle Stop	M-F, 8:45AM, 11:45AM, 2:15PM	\$25.00 Round Trip to Boston
		MBTA The RIDE Service	Bedford Township Area	M-F 7AM to 11PM and Sat/Sun 8AM to 5PM	\$2.00 one-way fare
Friendly Drivers - Age 60+, medical appts only, Bedford residents only		Bedford Township Area	M-F 8AM to 3:30PM	No Charge	

Table 2.4: Bolton Services Inventory

Municipality	Transit Choice	Description	Stop Location	Times	Cost
Bolton	Commuter Rail	None			
	Bus Service	None			
	Shuttles/Van Pools	MART provides senior shuttle van	Bolton Township Area	M-Thurs 9AM to 3:30PM	Fee set by Bolton COA

Table 2.5: Boxborough Services Inventory

Municipality	Transit Choice	Description	Stop Location	Times	Cost
Boxborough	Commuter Rail	None			
	Bus Service	None			
	Shuttles/Van Pools	MART provides COA senior shuttle van	Boxborough Township Area	M-Thurs. 9AM to 3PM	\$2.00 round-trip to Boxborough, Acton and Concord; \$10.00 to Burlington; \$30.00 to Brookline and Boston
Volunteer Driver Transportation - Residents over 60 years in age		Boxborough Township Area	M-F, times are flexible	No Charge	

Table 2.6: Carlisle Services Inventory

Municipality	Transit Choice	Description	Stop Location	Times	Cost
Carlisle	Commuter Rail	None			
	Bus Service	None			
	Shuttles/Van Pools	Friendly Drivers - Age 60+, medical appts only, Carlisle residents only	Carlisle Township Area	M-F, 8AM to 3:30PM	No Charge
COA Van Service		Carlisle Township Area	M-F, 9AM to 3PM	In-town is free; within 15 miles is \$2.00; over 15 miles away is \$5.00	

Table 2.7: Concord Services Inventory

Municipality	Transit Choice	Description	Stop Location	Times	Cost
Concord	Commuter Rail	Two stops in Concord along the Fitchburg Line.	Concord Center and West Concord	5:50AM to 11:00PM	\$6.25 per one-way ride
	Bus Service	Yankee Lines provides commuter bus service to Copley Square. Cost is \$8.00 per one way ticket.	Concord - Concord Center Crosby Rd/Sudbury Rd intersection	7:10AM Morning Departure, 5PM Evening Departure from Copley	\$8.00 per one-way ride
	Shuttles/Van Pools	COA Van for medical, shopping, and programs	Concord Township Area	M-F, 8:40AM to 3:20PM	\$2.00 for a round-trip
		MART Boston Shuttle	Emerson Hospital	M-F, 8:30AM, 11:30AM, 2:00PM	\$25.00 Round Trip to Boston
		FISH (Volunteer) - no age restriction	Concord Township Area	M-F, Flexible Times	No Charge
		MBTA The RIDE Service	Concord Township Area	M-F 7AM to 11PM and Sat/Sun 8AM to 5PM	\$2.00 one-way fare
Liberty Ride (tourism service)	Concord/Lexington	May 29-Oct 31, 10AM to 4PM	\$10 for students, \$25 for adults		

Table 2.8: Hudson Services Inventory

Municipality	Transit Choice	Description	Stop Location	Times	Cost
Hudson	Commuter Rail	None			
	Bus Service	None			
	Shuttles/Van Pools	COA Van for senior shuttle service, two vans (one 25 person, and one 9 person)	Hudson Township Area	8:00AM to 3:30PM	Cost set by COA

Table 2.9: Lexington Services Inventory

Municipality	Transit Choice	Description	Stop Location	Times	Cost	
Lexington	Commuter Rail	None				
	Bus Service	MBTA - Route 62	Multiple	7AM to 7PM	\$1.25 to \$1.50 per ride	
		MBTA - Route 76	Multiple	6AM to 7:30PM	\$1.25 to \$1.50 per ride	
		MBTA - Route 170	Multiple	M-F 6AM-8AM and 4PM-6PM	\$1.25 to \$1.50 per ride	
		MBTA - Route 351	Multiple	M-F 6AM-9:30AM and 3PM-7PM	\$1.25 to \$1.50 per ride	
		Lexpress Routes	Multiple	M-F 6:45AM to 6PM	\$1.50 per ride, \$.75 for seniors	
	Shuttles/Van Pools	COA Van for senior shuttle service	Lexington Township Area		Cost set by COA	
		FISH (Volunteer) - no age restriction	Lexington Township Area	M-F, 9AM to 1PM	No Charge	
		MBTA The RIDE Service	Lexington Township Area	M-F 7AM to 11PM and Sat/Sun 8AM to 5PM	\$2.00 one-way fare	
		Alewife Commuter Rail Shuttle	Lexington Businesses	M-F, Multiple Runs	\$2.50 for members, \$4.75 for non-members per ride	
		Hanscom Field/MIT Labs Shuttle	Exit 5 Route 3 in Nashua, NH to Hanscom/Lincoln Labs	M-F	\$125 monthly fee	
		Lahey Clinic Employee Shuttle	Parking Lot to Lahey Clinic	M-F 5AM to 9PM	Free	
Lincoln Labs Shuttle	Lincoln Labs to MIT in Cambridge	M-F, 7AM to 5:10PM	Free			

Table 2.10: Lincoln Services Inventory

Municipality	Transit Choice	Description	Stop Location	Times	Cost
Lincoln	Commuter Rail	One stop at Lincoln along the Fitchburg Line	Lincoln	6:08AM to 11:16PM	\$5.75 per one-way ride
	Bus Service	MBTA - Route 76	Multiple	6AM to 7:30PM	\$1.25 to \$1.50 per ride
	Shuttles/Van Pools	COA Van for senior shuttle service, one shuttle for medical/senior center trips, and one shuttle for monthly trips for shopping and outings	Lincoln Township Area	M-F 8:30AM to 4:30PM, shopping trips are scheduled monthly	No Charge, Donations are Welcome
		LINC Volunteer	Lincoln Township Area	M-F, 9AM to 4PM	No Charge
		MBTA The RIDE Service	Lincoln Township Area	M-F 7AM to 11PM and Sat/Sun 8AM to 5PM	\$2.00 one-way fare

Table 2.11: Littleton Services Inventory

Municipality	Transit Choice	Description	Stop Location	Times	Cost
Littleton	Commuter Rail	One stop at Littleton along the Fitchburg Line	Littleton/495	5:40AM to 10:50PM	\$7.25 per one-way ride
	Bus Service	Lowell RTA - Route 15	IBM in Littleton	6:00AM to 7:45PM	\$1.50 per one-way ride
	Shuttles/Van Pools	MART provides COA senior shuttle van	Littleton Township Area	M-F 9AM to 3PM	\$1.50 for local one-way trip, \$2.00 for out-of-town trips
		IBM Shuttles some employees to and from Alewife	IBM in Littleton		

Table 2.12: Maynard Services Inventory

Municipality	Transit Choice	Description	Stop Location	Times	Cost
Maynard	Commuter Rail	None			
	Bus Service	None			
	Shuttles/Van Pools	COA Van for disabled seniors age 60+, medical, nutrition, shopping, etc.	Maynard Township Area	M-F 7:30AM to 3PM	No charge, ask for donation
		Clock Tower Place shuttle to South Acton Station	Clock Tower and South Acton Station	M-F 5 pick ups in the AM and 3 drop-offs in the PM	No charge, service is only for ClockTower Place employees

Table 2.13: Stow Services Inventory

Municipality	Transit Choice	Description	Stop Location	Times	Cost
Stow	Commuter Rail	None			
	Bus Service	None			
	Shuttles/Van Pools	COA Van for disabled seniors age 60+, medical, nutrition, shopping, disabled to jobs, etc.	Stow Township Area	M-F 8AM to 4PM	No charge

Table 2.14: Sudbury Services Inventory

Municipality	Transit Choice	Description	Stop Location	Times	Cost
Sudbury	Commuter Rail	None			
	Bus Service	Cavalier Bus Line - commuter trips from Sudbury to Boston and Boston to Sudbury one a day in each direction	Sudbury Friendly's and McKinnon Liquors	Departs 7:10AM from Sudbury, and 5:00PM from Boston	\$4.75 one-way to Copley, \$4.90 to South Station
	Shuttles/Van Pools	COA Van Service run by MetroWest RTA - available to seniors	Sudbury Township Area	Tues-Fri, 9AM to 3PM	\$1.00 each way for local trips, \$2.00 for out of town
		FISH (Volunteer) - no age restriction	Sudbury Township Area	M-F, Flexible Times	No Charge

Figure 2.2: Acton Inventory Map

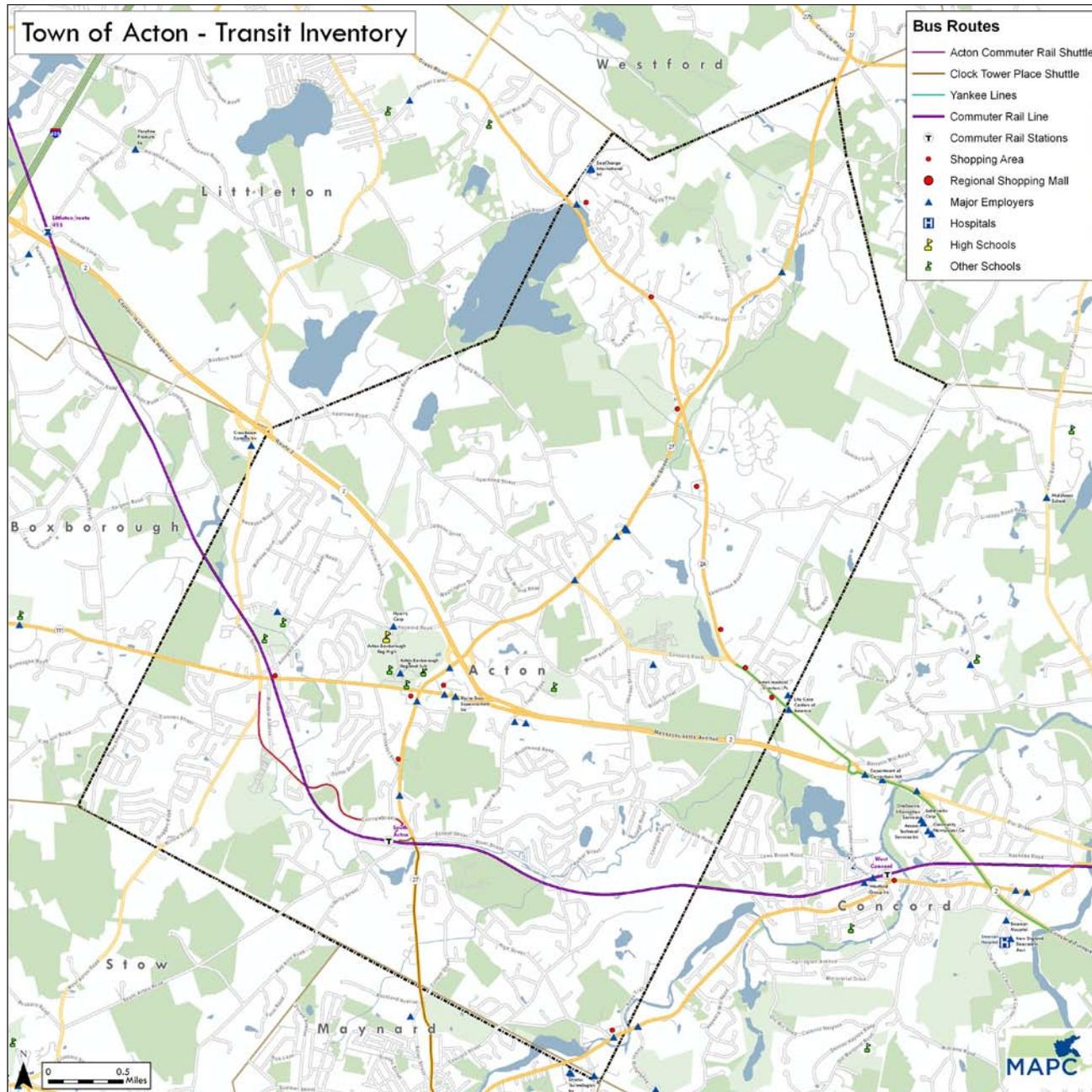


Figure 2.3: Bedford Inventory Map

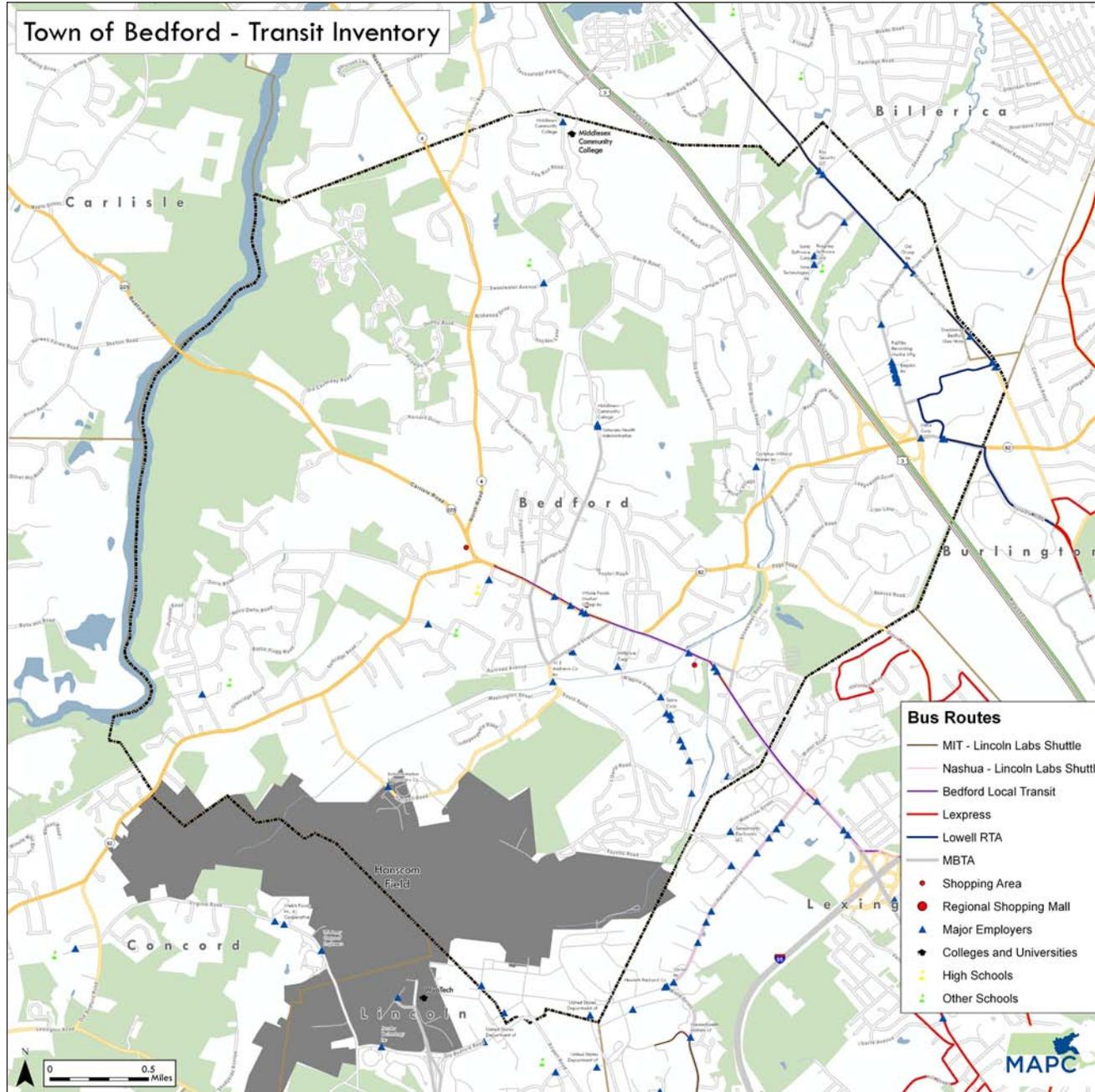


Figure 2.4: Bolton Inventory Map

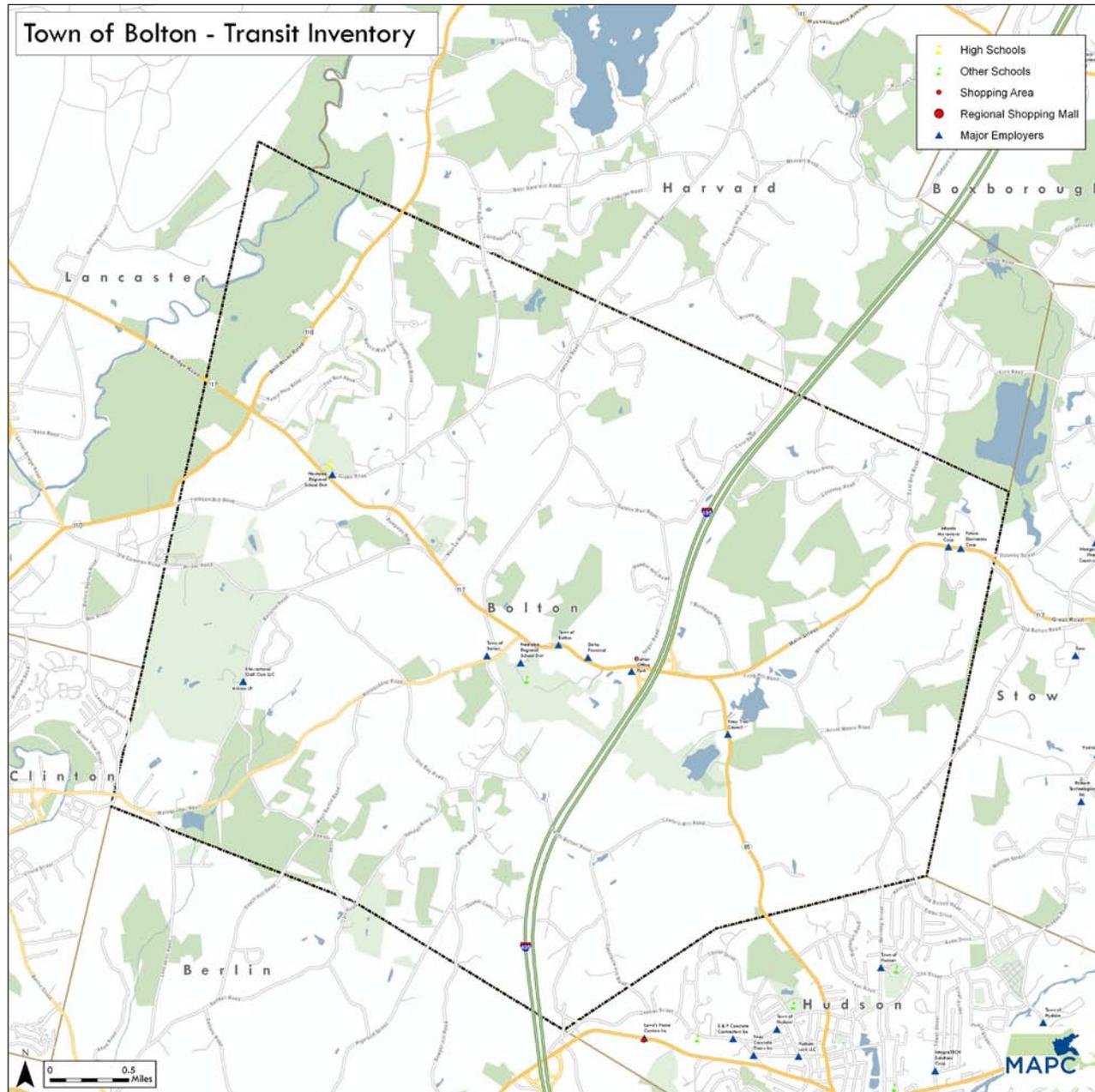


Figure 2.5: Boxborough Inventory Map

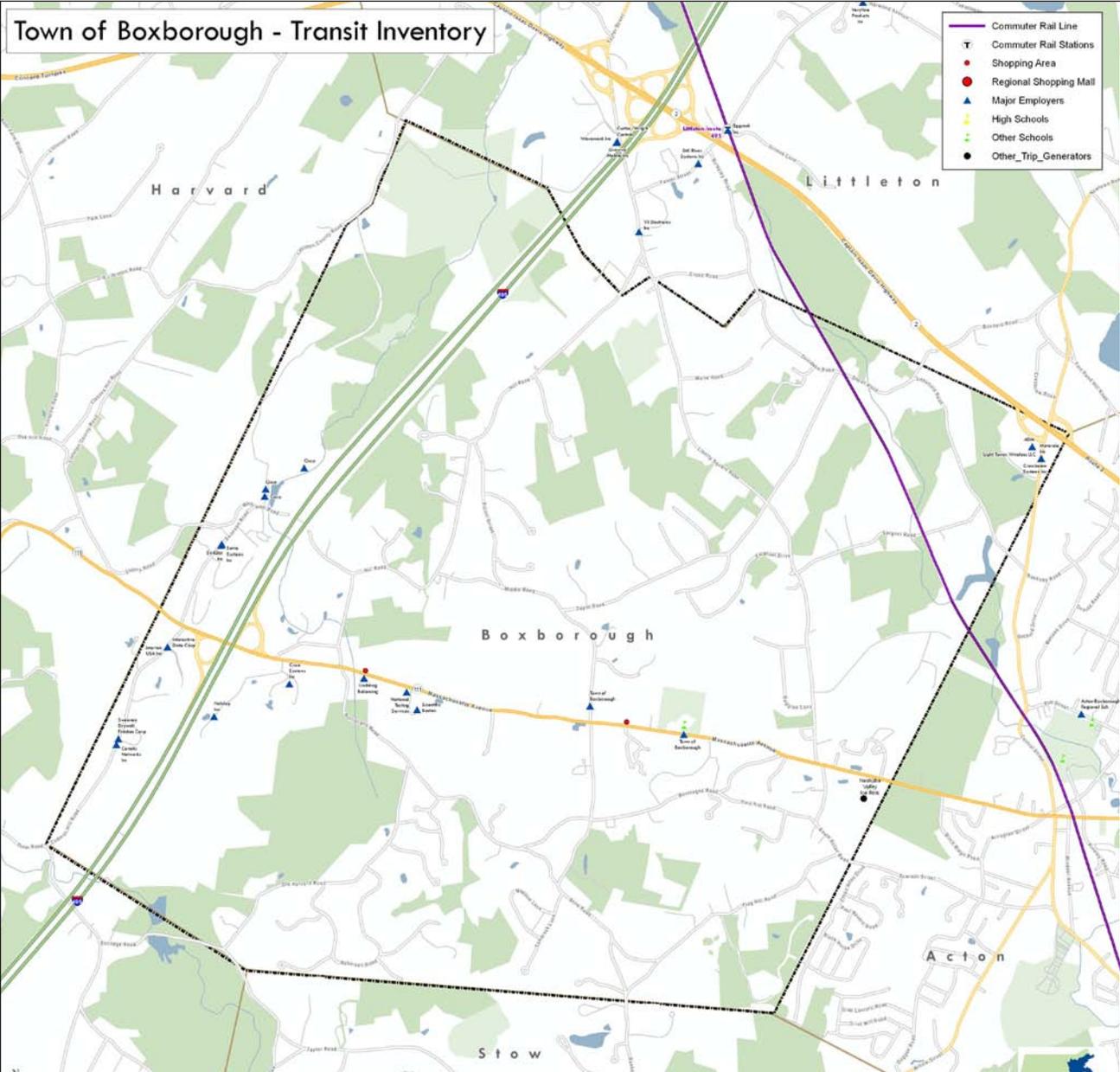


Figure 2.6: Carlisle Inventory Map

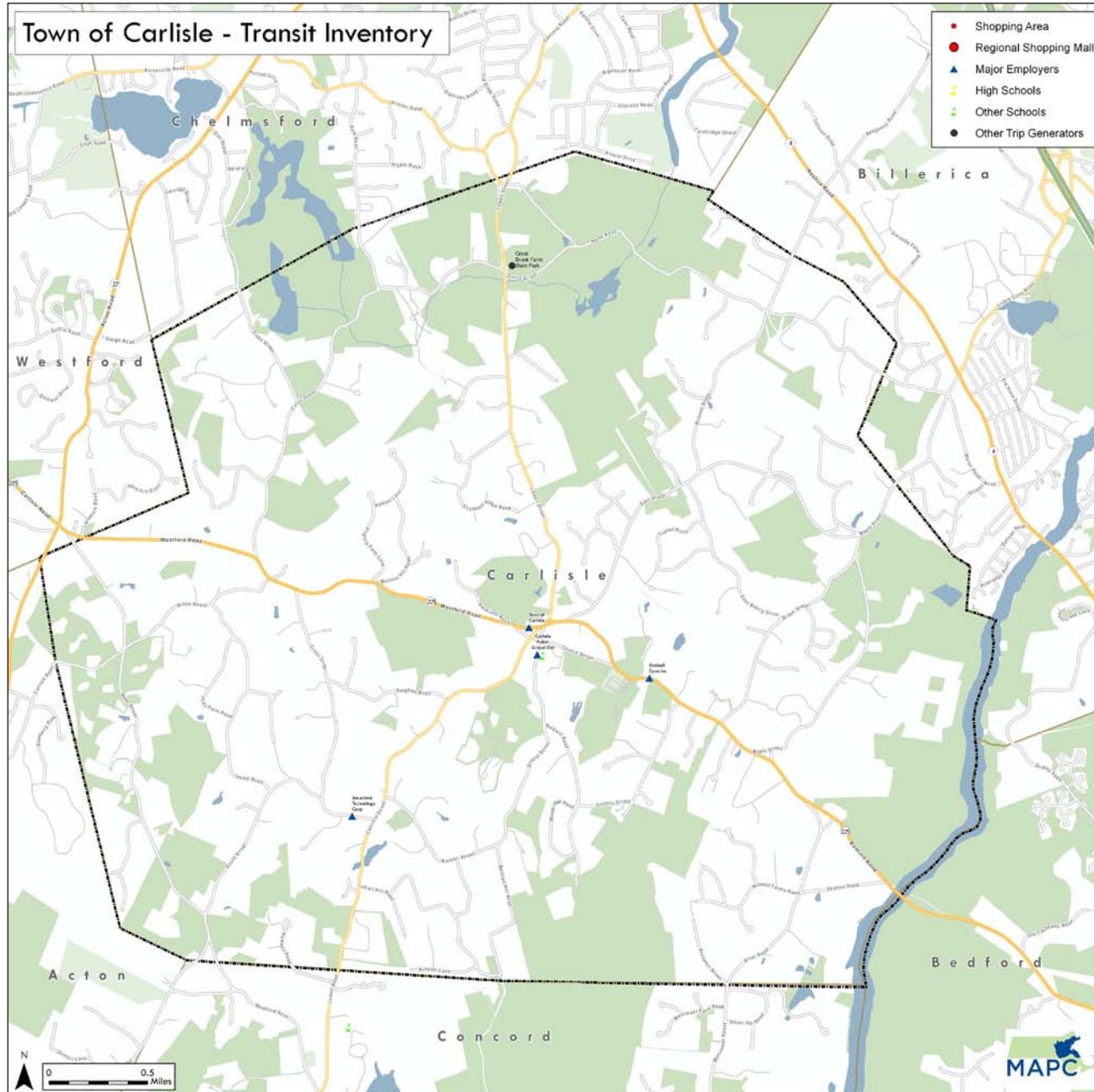


Figure 2.7: Concord Inventory Map

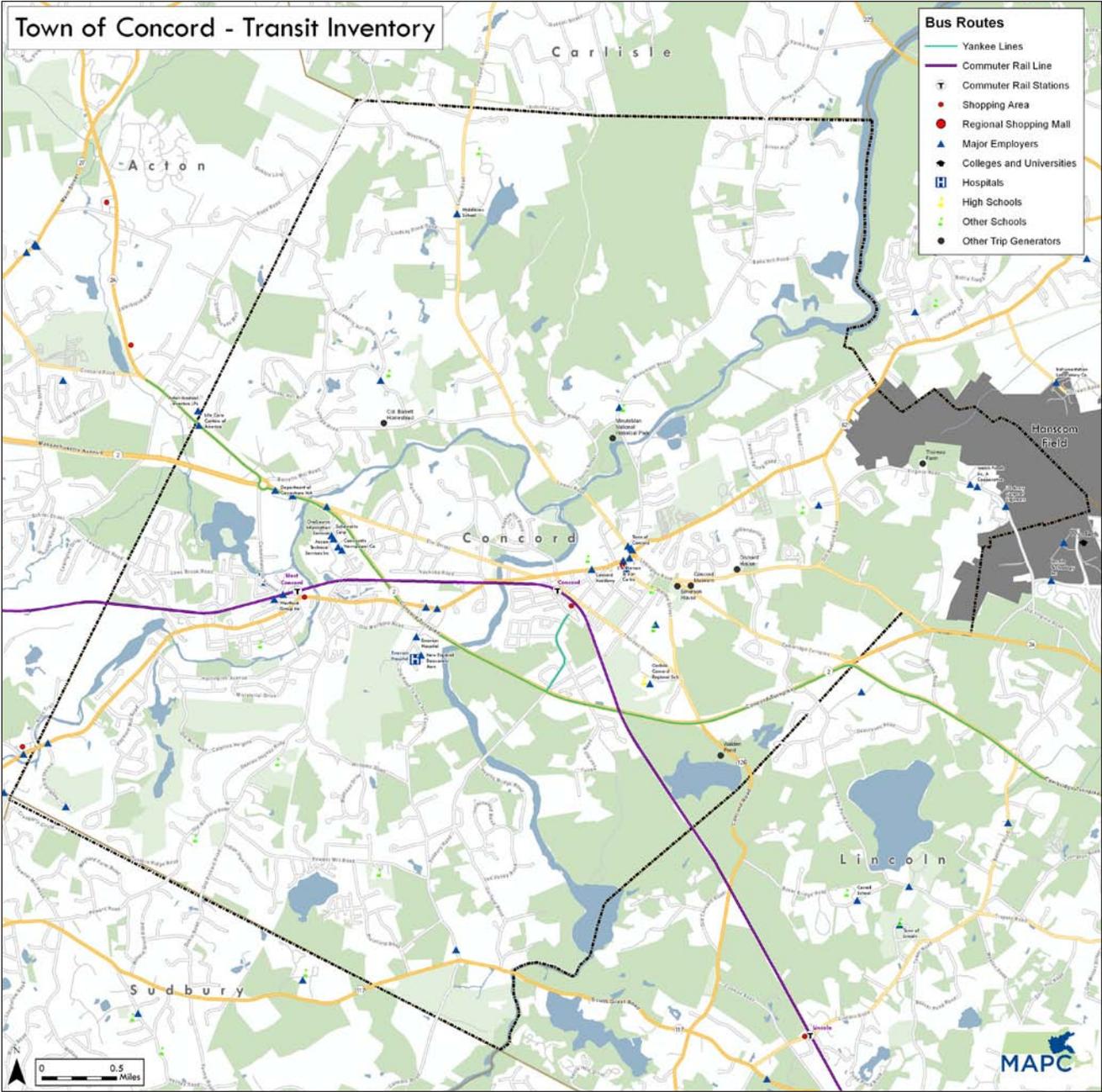


Figure 2.8 Hudson Inventory Map

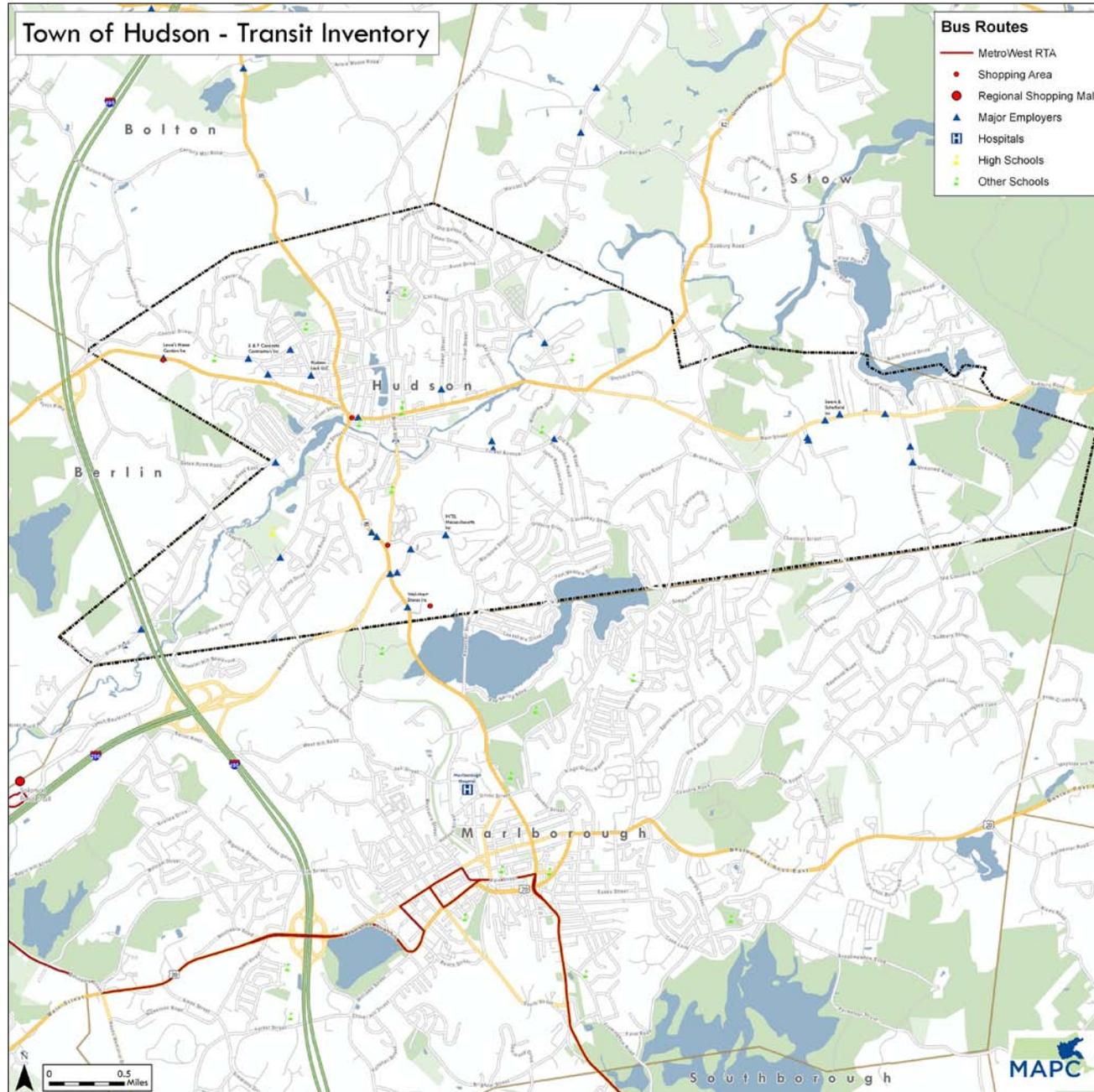


Figure 2.9: Lexington Inventory Map



Figure 2.10: Lincoln Inventory Map

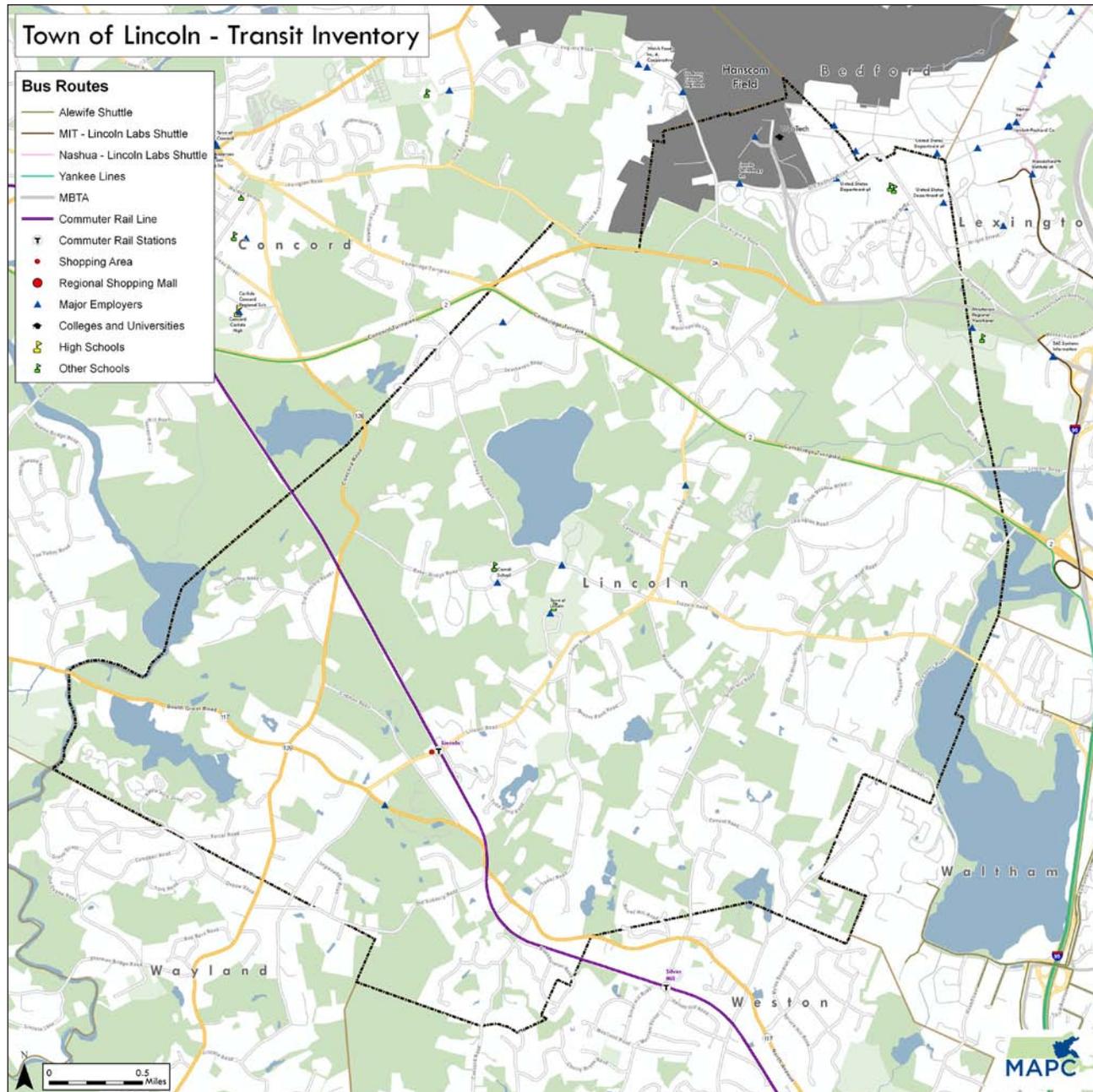


Figure 2.11: Littleton Inventory Map

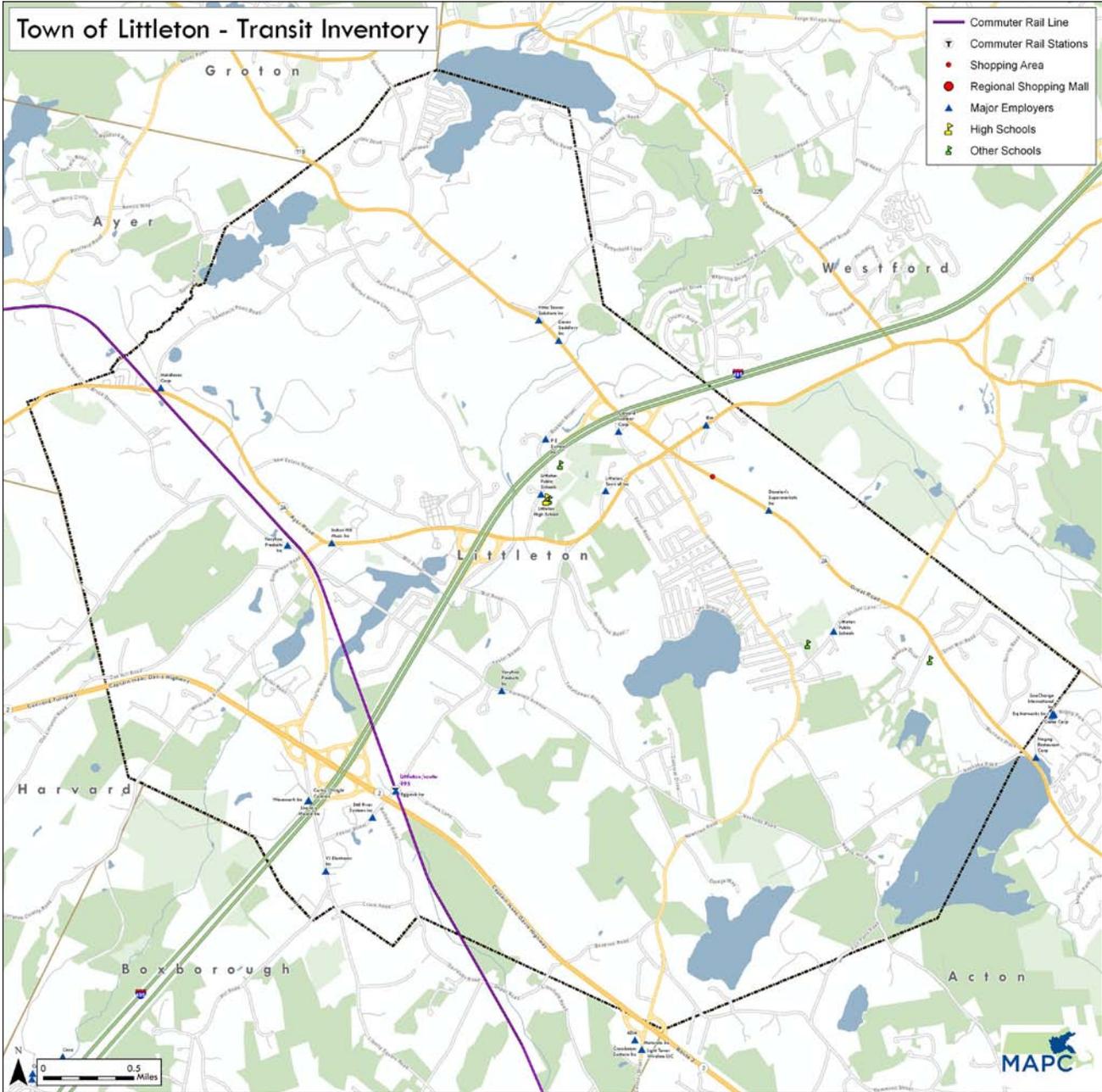


Figure 2.12: Maynard Inventory Map

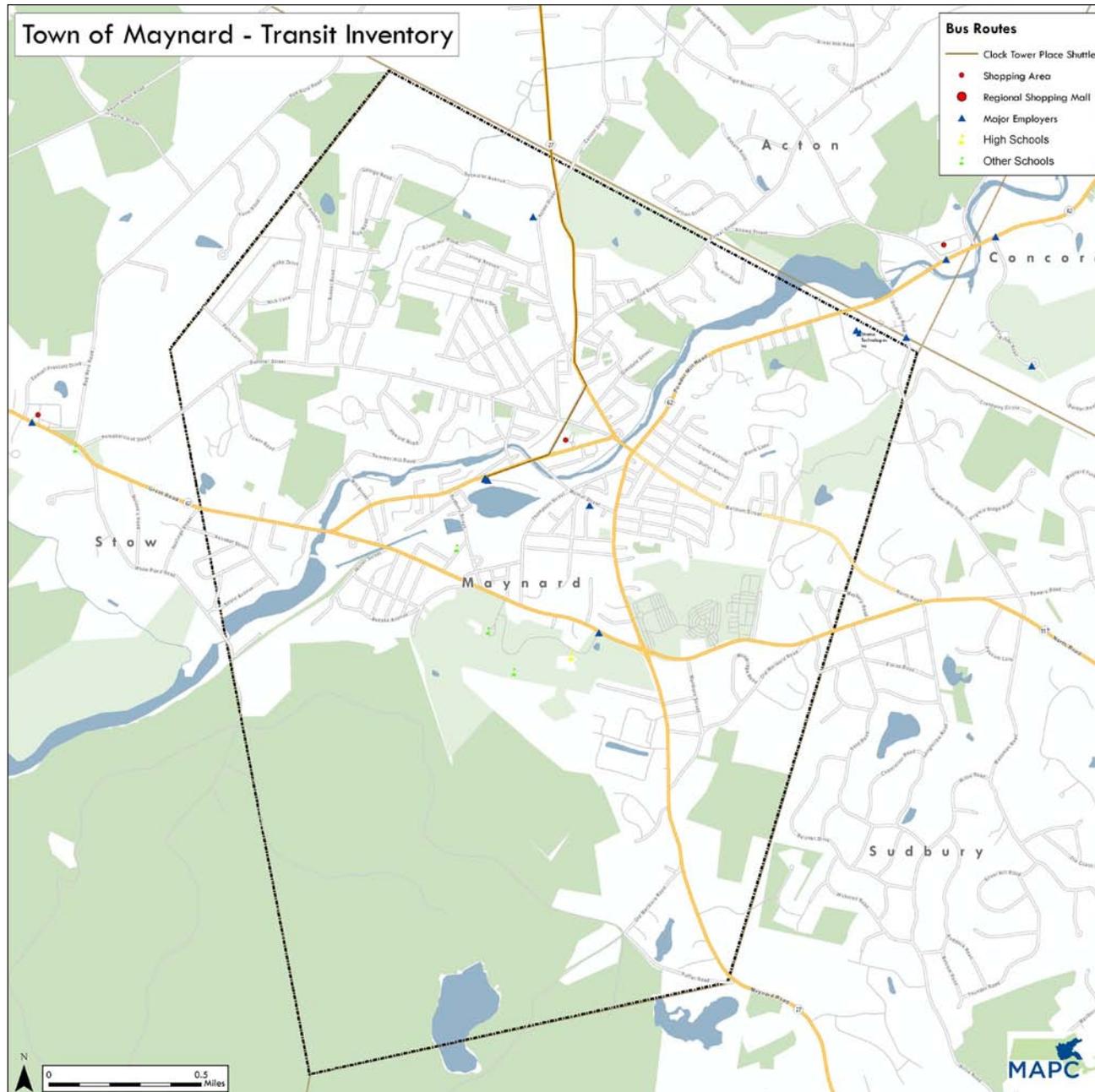


Figure 2.13: Stow Inventory Map

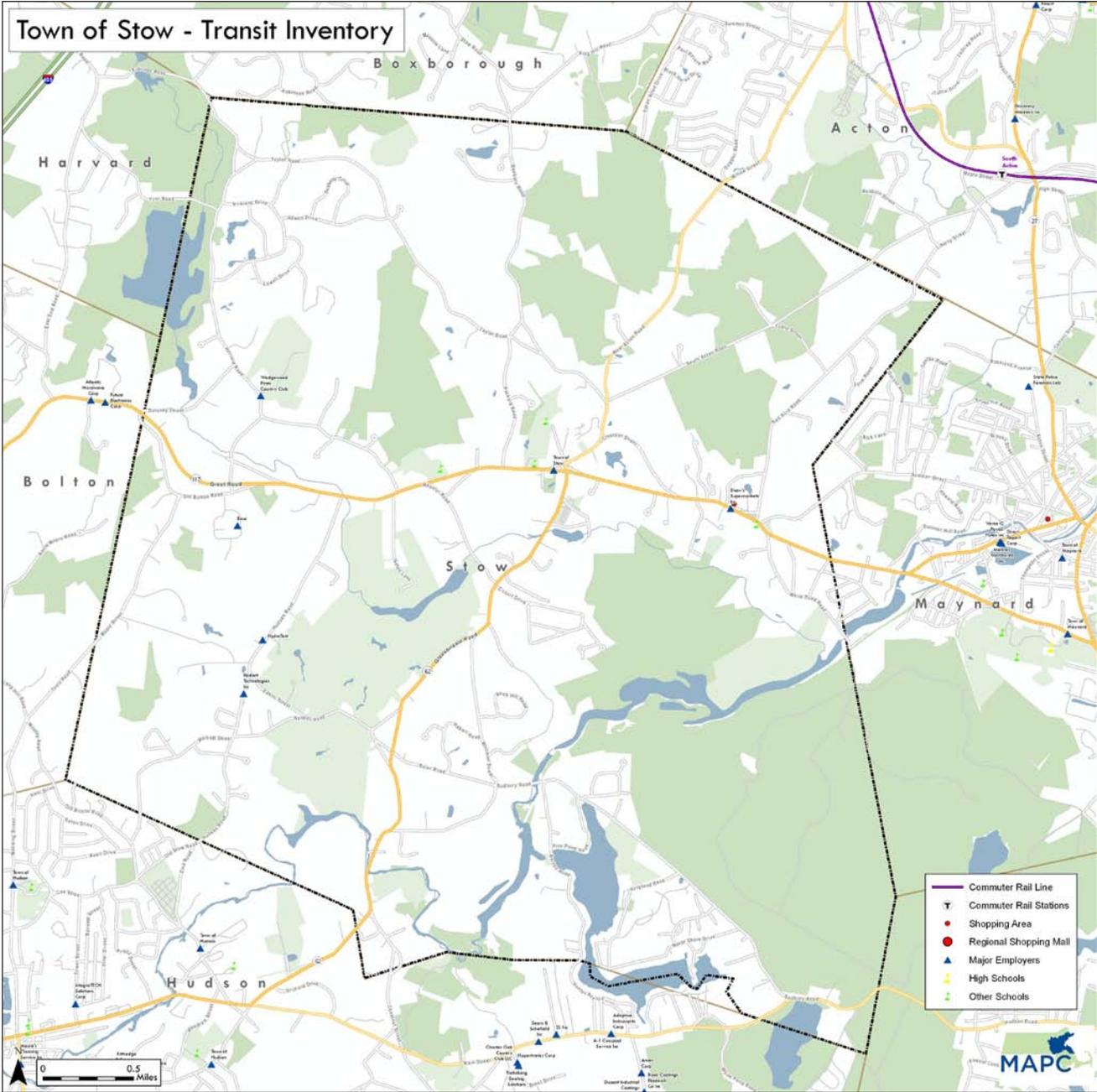


Figure 2.14: Sudbury Inventory Map



Chapter 3: Needs Assessment

To identify areas where existing transit service could be improved or where new types of service may be implemented, MAPC developed a needs assessment for the MAGIC sub-region. The needs assessment technique was based on a “Transit Opportunities Study” completed by the Central Transportation Planning Staff (CTPS) in December 2005. Through the needs assessment process, MAPC was able to identify areas throughout the sub-region where demographic characteristics and the built environment combined to indicate potential locations for transit service improvements. The needs assessment process and outcomes are described below.

Needs Assessment Process

In the CTPS Transit Opportunities Study, a set of screening criteria was developed to rank Census Tracts based on their potential to support different types of transit service. The screening criteria helped to identify potential transit service that fit into four different categories:

1. Reverse Commuting - Boston area commuters traveling into the MAGIC sub-region for employment.
2. Traditional Commuting Patterns - Commuters traveling from the MAGIC sub-region into the Boston area for employment.
3. Suburb to Suburb Commuting - MAGIC commuters traveling to other MAGIC communities for employment.
4. Daily Needs Trips - Travel trips to destinations such as medical appointments, grocery stores, retail shops, restaurants, dry cleaners, daycares, etc. that are typically auto-centric.

These four travel categories represent a majority of the trips that transit may be able to serve in portions of the MAGIC sub-region.

MAPC built upon the screening criteria used in the CTPS study and tailored it to capture the demographic and spatial characteristics representative of the MAGIC sub-region. The screening criteria included a scoring scale for each Census Tract. Commuter data was scored on different scales of based on the variability in the data. The score for each criterion was tallied to produce an overall score for each Tract within the four different travel categories. The screening criteria for each travel category are outlined on the following pages.

Reverse Commute Screening Criteria

1. *Employment Density* - Number of employees per acre. A higher density resulted in a higher rating. (Source: MAPC)

Low (1) Rating - Tracts with fewer than 1.2 employees per acre

Medium (2) Rating - Tracts with 1.21 - 3.9 employees per acre

High (3) Rating - Tracts with more than 3.9 employees per acre

2. *Presence of a Major Employer* - Presence of a major employer in the Census Tract resulted in a higher rating. Major employers are defined as those employing more than 50 people. (Source: Dun and Bradstreet Employment Data)

Low (1) - Tracts with no major employers

High (2) - Tracts with major employer present

3. *Journey to Work Data for Reverse Commuting* - Employees in each MAGIC Census Tract whose work trip originated in Boston, Cambridge, Somerville, or Arlington as a share of the total commuters coming to the sub-region from those four municipalities. A higher share of commuters originating from Boston, Cambridge, Somerville, or Arlington resulted in a higher rating. (Source: 2000 Census Journey to Work Data)

Lowest (1) - Tracts with less than 2.3% of workers coming from Boston/Cambridge/Somerville/Arlington

Low(2) - Tracts with between 2.4% and 8.1% of workers coming from Boston/Cambridge/Somerville/Arlington

Medium (3) - Tracts with between 8.2% and 15.4% of workers coming from Boston/Cambridge/Somerville/Arlington

High (4) - Tracts with more than 15.4% of workers coming from Boston/Cambridge/Somerville/Arlington

4. *Presence of a Major College or University* - The presence of a major college or university within the Census Tract resulted in a higher rating. The presence of these institutions could drive reverse commuting from urban areas to the MAGIC sub-region for students and employees. (Source: MAPC)

Low (1) - Tracts with no major college or university

High (2) - Tracts with a major college or university

Traditional Commute Screening Criteria

1. *Population Density* - Number of people per acre. A higher density resulted in a higher rating. (Source: MAPC)

Low (1) Rating - Tracts with fewer than 1.51 people per acre
 Medium (2) Rating - Tracts with 1.52 - 3.71 people per acre
 High (3) Rating - Tracts with more than 3.71 people per acre
2. *Low-Income Households* - A higher percentage of households with median household incomes below 80% of the Boston MPO region median resulted in a higher rating. The median household income for the MPO area was \$55,800 in 1999. The 80% income was \$44,640. (Source: 2000 Census)

Low (1) - Tracts having between 11% and 20% of households below the 80% median income level
 Medium (2) - Tracts having between 20.1% and 30% of households below the 80% median income level
 High (3) - Tracts having more than 30% of households below the 80% median income level
3. *Vehicles per Household* - A higher percentage of households having less than one vehicle resulted in a higher rating. (Source: 2000 Census)

Low (1) - Tracts where less than 3% of households have less than one vehicle
 Medium (2) - Tracts where between 3.1% and 6.3% of households have less than one vehicle
 High (3) - Tracts where more than 6.3% of households have less than one vehicle
4. *Journey to Work Data for Traditional Commuting* - Number of employees in each MAGIC Census Tract whose work trip originated in the MAGIC sub-region and ended in either Boston, Cambridge, Somerville, or Arlington as a share of the total commuters originating in MAGIC and ending in those four municipalities. A higher share of commuters originating from the MAGIC sub-region resulted in a higher rating. (Source: 2000 Census Journey to Work Data)

Lowest (1) - Tracts with less than .9% of workers commuting to Boston/Cambridge/Somerville/Arlington
 Low (2) - Tracts with between 1.0% and 2.3% of workers commuting to Boston/Cambridge/Somerville/Arlington
 Medium (3) - Tracts with between 2.4% and 4.7% of workers commuting to Boston/Cambridge/Somerville/Arlington
 High (4) - Tracts with more than 4.7% of workers commuting to Boston/Cambridge/Somerville/Arlington
5. *Proximity to a Commuter Rail Station* - Census Tracts which have close proximity to commuter rail stations received a higher rating. (Source: MAPC analysis)

Low (1) - Tracts that have their geographic center more than 5 miles from a commuter rail station
 Medium (2) - Tracts that have their geographic center between 3 and 5 miles from a commuter rail station
 High (3) - Tracts that have their geographic center less than 3 miles from a commuter rail station
6. *Presence of a Minority and/or Non-English Speaking Population* - Census Tracts with high proportions of both minority and non-English speaking populations ranked higher than those with only one or none. The 2003 Boston MPO Environmental Justice criteria were used to determine the threshold for minority populations. No Tracts qualified as “high” for non-English speaking populations in the MAGIC area. (Source: MassGIS)

Low (1) - Tracts that have neither a high minority population or a high non-English speaking population
 Medium (2) - Tracts that have either a high minority population or a high non-English speaking population
 High (3) - Tracts that have both a high minority population and a high non-English speaking population

Suburb to Suburb Commute Screening Criteria

1. *Population Density* - Number of people per acre. A higher density resulted in a higher rating. (Source: MAPC)

Low (1) Rating - Tracts with fewer than 1.51 people per acre

Medium (2) Rating - Tracts with 1.52 - 3.71 people per acre

High (3) Rating - Tracts with more than 3.71 people per acre

2. *Employment Density* - Number of employees per acre. A higher density resulted in a higher rating. (Source: MAPC)

Low (1) Rating - Tracts with fewer than 1.2 employees per acre

Medium (2) Rating - Tracts with 1.21 - 3.9 employees per acre

High (3) Rating - Tracts with more than 3.9 employees per acre

3. *Journey to Work Data for Intra-MAGIC Commuting* - Number of employees in each MAGIC Census Tract whose work trip originated in the MAGIC region and ended in the same town or adjacent town within the MAGIC region as a share of the Census Tract's total commuting population. A higher share of workers commuting to an adjacent town results in a higher rating. (Source: 2000 Census Journey to Work Data)

Lowest (1) - Tracts with less than 43.7% of workers commuting within the same town or to adjacent towns

Medium (2) - Tracts with between 43.8% and 49.7% of workers commuting within the same town or to adjacent towns

High (3) - Tracts with more than 49.7% of workers commuting within the same town or to adjacent towns

4. *Low-Income Households* - A higher percentage of households with median household incomes below 80% of the Boston MPO region median resulted in a higher rating. The median household income for the MPO area was \$55,800 in 1999. The 80% income was \$44,640. (Source: 2000 Census)

Low (1) - Tracts having between 11% and 20% of households below the 80% median income level

Medium (2) - Tracts having between 20.1% and 30% of households below the 80% median income level

High (3) - Tracts having more than 30% of households below the 80% median income level

5. *Vehicles per Household* - A higher percentage of households having less than one vehicle resulted in a higher rating. (Source: 2000 Census)

Low (1) - Tracts where less than 3% of households have less than one vehicle

Medium (2) - Tracts where between 3.1% and 6.3% of households have less than one vehicle

High (3) - Tracts where more than 6.3% of households have less than one vehicle

6. *Residents with Disabilities* - Census Tracts which have a high percentage of disabled residents received a higher rating. (Source: Census 2000)

Low (1) - Tracts that have between 2.2% and 7.6% of their population classified as disabled

Medium (2) - Tracts that have between 7.7% and 11.8% of their population classified as disabled

High (3) - Tracts that have more than 11.8% of their population classified as disabled

7. *Presence of a Minority and/or Non-English Speaking Population* - Census Tracts with high proportions of both minority and non-English speaking populations ranked higher than those with only one or none. The 2003 Boston MPO Environmental Justice criteria were used to determine the threshold for minority populations. No Tracts qualified as "high" for non-English speaking populations in the MAGIC area. (Source: MassGIS)

Low (1) - Tracts that have neither a high minority population or a high non-English speaking population

Medium (2) - Tracts that have either a high minority population or a high non-English speaking population

High (3) - Tracts that have both a high minority population and a high non-English speaking population

8. *Presence of a Major College or University* - The presence of a major college or university within the Census Tract resulted in a higher rating. The presence of these institutions could drive reverse commuting from urban areas to the MAGIC area for students and employees. (Source: MAPC)

Low (1) - Tracts with no major college or university

High (2) - Tracts with a major college or university

9. *Presence of a Shopping Center* - A tract which has its geographic center less than one mile from a shopping center received a higher rating. (Source: MAPC analysis)

Low (1) - Census tract with a geographic center between 3 and 5 miles from a shopping center

Medium (2) - Census tract with a geographic center between 1 and 3 miles from a shopping center

High (3) - Census tract with a geographic center less than 1 mile from a shopping center

Daily Needs Trips Criteria

1. *Population Density* - Number of people per acre. A higher density resulted in a higher rating. (Source: MAPC)

Low (1) Rating - Tracts with fewer than 1.51 people per acre

Medium (2) Rating - Tracts with 1.52 - 3.71 people per acre

High (3) Rating - Tracts with more than 3.71 people per acre

2. *Elderly Population* - Tracts with a higher elderly population (over 65 years of age) received a higher rating. (Source: 2000 Census)

Low (1) Rating - Tracts with less than 8.5% of the population over 65

Medium (2) Rating - Tracts with between 8.6% and 14.3% of the population over 65

High (3) Rating - Tracts with more than 14.3% of the population over 65

3. *Low-Income Households* - A higher percentage of households with median household incomes below 80% of the Boston MPO region median resulted in a higher rating. The median household income for the MPO area was \$55,800 in 1999. The 80% income was \$44,640. (Source: 2000 Census)

Low (1) - Tracts having between 11% and 20% of households below the 80% median income level

Medium (2) - Tracts having between 20.1% and 30% of households below the 80% median income level

High (3) - Tracts having more than 30% of households below the 80% median income level

4. *Vehicles per Household* - A higher percentage of households having less than one vehicle resulted in a higher rating. (Source: 2000 Census)

Low (1) - Tracts where less than 3% of households have less than one vehicle

Medium (2) - Tracts where between 3.1% and 6.3% of households have less than one vehicle

High (3) - Tracts where more than 6.3% of households have less than one vehicle

5. *Presence of a Minority and/or Non-English Speaking Population* - Census Tracts with high proportions of both minority and non-English speaking populations ranked higher than those with only one or none. The 2003 Boston MPO Environmental Justice criteria were used to determine the threshold for minority populations. No Tracts qualified as “high” for non-English speaking populations in the MAGIC area. (Source: MassGIS)

Low (1) - Tracts that have neither a high minority population or a high non-English speaking population

Medium (2) - Tracts that have either a high minority population or a high non-English speaking population

High (3) - Tracts that have both a high minority population and a high non-English speaking population

6. *Residents with Disabilities* - Census Tracts which have a high percentage of disabled residents received a higher rating. (Source: Census 2000)

Low (1) - Tracts that have between 2.2% and 7.6% of their population classified as disabled

Medium (2) - Tracts that have between 7.7% and 11.8% of their population classified as disabled

High (3) - Tracts that have more than 11.8% of their population classified as disabled

7. *Presence of a Shopping Center* - A tract which has its geographic center less than one mile from a shopping center received a higher rating. (Source: MAPC analysis)

Low (1) - Census tract with a geographic center between 3 and 5 miles from a shopping center

Medium (2) - Census tract with a geographic center between 1 and 3 miles from a shopping center

High (3) - Census tract with a geographic center less than 1 mile from a shopping center

8. *Presence of a Major Medical Center* - A tract which has a major hospital located within its boundaries. (Source: MassGIS)

Low (1) - Census tract without a hospital

Medium (2) - Census tract with a hospital having fewer than 250 beds

High (3) - Census tract with a hospital having more than 250 beds

Needs Assessment Results

The first round of selections based on the screening criteria yielded around six to eight potential Census Tracts under each of the four categories. The tracts selected through the initial screening process were evaluated on the basis of demographic and socioeconomic characteristics which often provided a base for suburban transit services. The selected tracts were then compared to existing suburban transit service to determine where service currently exists, if there are gaps in service, or if there is a complete absence of service.

After additional analysis of residential and employment densities, many of the tracts that lacked transit service do not have the residential densities typically needed to support fixed-route service. An investment in dedicated fixed-route service in many of the municipalities may not be feasible at this time because of the lower-density and suburban to rural development patterns. In some areas of the MAGIC sub-region, distances between trip generators and housing developments and a lack of safe pedestrian facilities make connecting users to transit services difficult.

While new fixed-route transit service may not be a feasible solution in many parts of the sub-region, there are changes that could be incorporated into existing transit service which would facilitate better transit access. The MBTA currently runs fixed-route bus service in Bedford, Lexington and Lincoln and has commuter rail stations in Lincoln, Concord, Acton, and Littleton. While access to commuter rail stations via MBTA bus routes within the sub-region have not been established, MBTA bus routes connecting employment centers to rapid transit stations like Alewife are currently in service.

The needs assessment for each of the four categories of transit service primarily focus on small changes to existing transit service within the sub-region. There are some areas where new smaller scale service is also recommended. For communities where new transit service or changes to existing service are not recommended, there are recommendations made in the pilot projects section which outline a number of regional initiatives that could be undertaken to improve transit services in the sub-region.

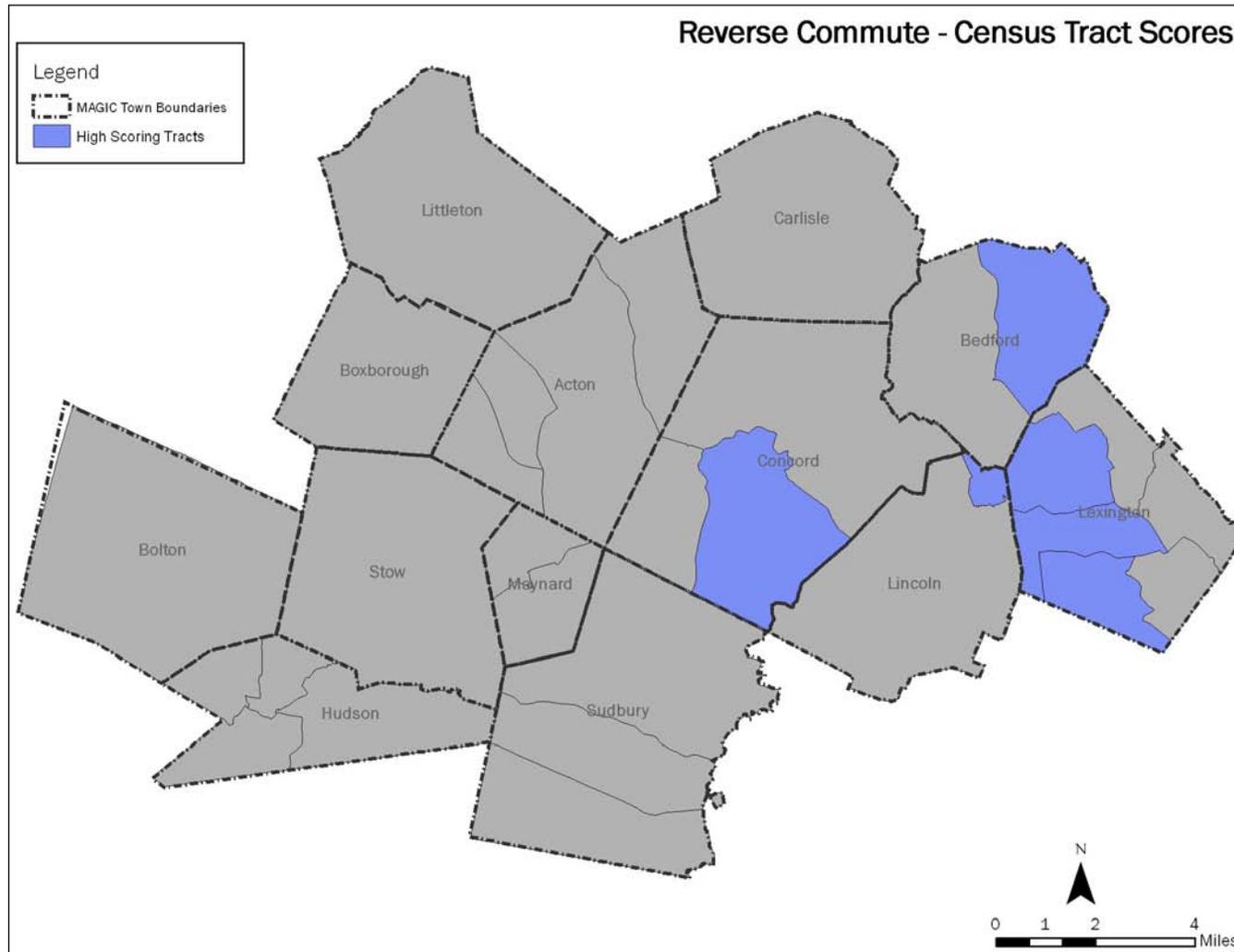
The following pages highlight the results of the needs assessment and provide recommendations for potential service improvements in the sub-region.

Reverse Commute Needs Assessment Results

The travel patterns associated with reverse commuting place emphasis on access to major fixed-route services such as MBTA commuter rail lines or MBTA fixed-route bus service. The larger transit systems have the ability to move more people from the Boston area out to employment destinations in the MAGIC sub-region. This should not discount the importance of smaller services like rail shuttles which provide the “last mile” connection between a fixed-route service and the destination point of a commuter.

The needs assessment identified six high scoring tracts through the first round screening process. During the second round screening process, which looked at existing services, densities and connectivity, two of the six tracts were identified as having potential for service improvements. Figure 3.1 shows the six tracts identified by the first round of screening.

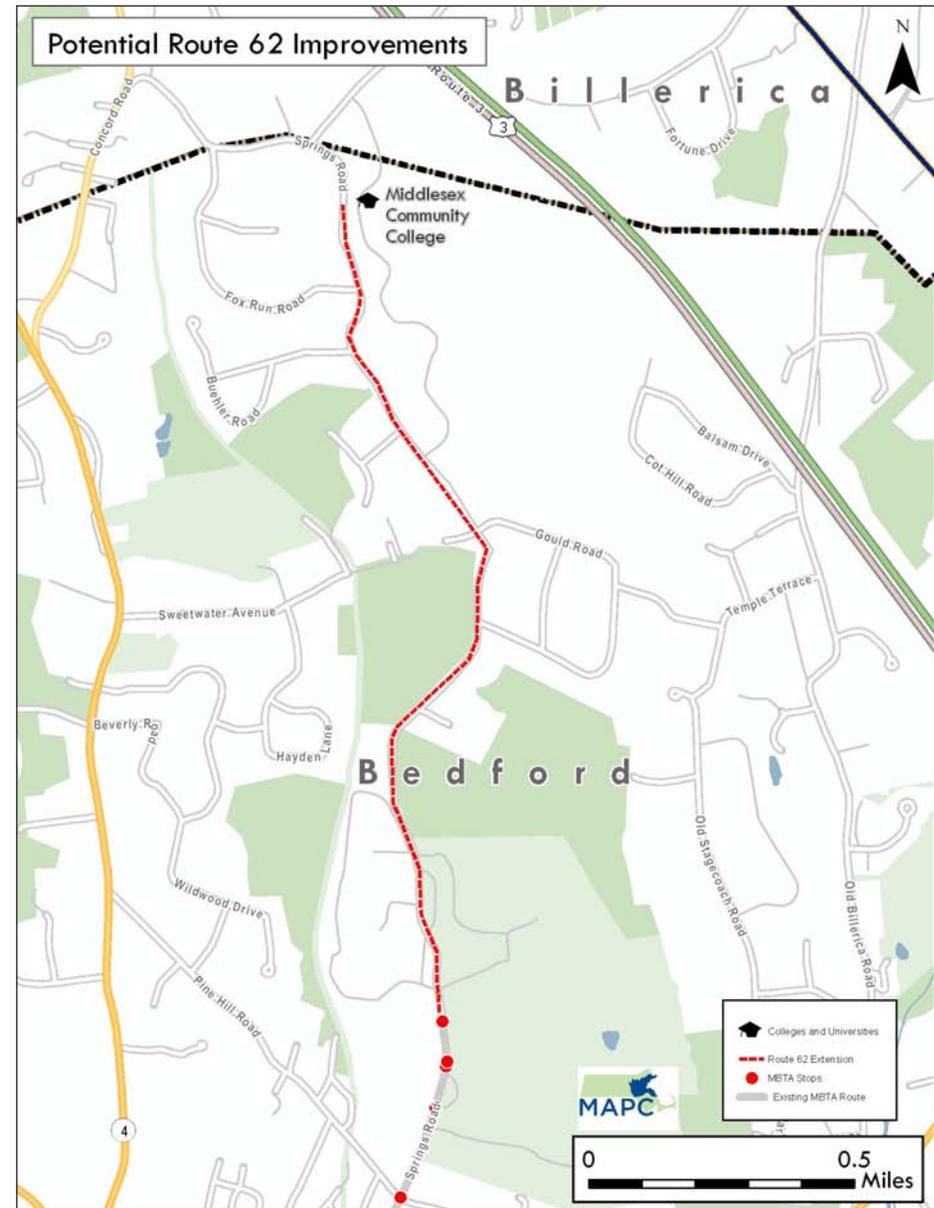
Figure 3.1: Reverse Commute Tract Scores



Four tracts, three in Lexington and one in Lincoln, did not have high potential for additional reverse commute transit services. Lexington is already well served by MBTA routes to the Red Line rapid transit station at Alewife and Lexpress transit routes which service the township. The Lincoln tract is also within close walking distance to MBTA fixed-route service to and from Alewife.

The two tracts identified as having high reverse commute potential that could support improvements to transit service were located in Concord and Bedford. The Bedford tract (359100) has existing MBTA fixed-route bus service through the 62 and 351 routes which serve employment centers along Routes 3 and 225. These transit routes provide service within walking distance of an estimated 15,000 jobs. The 62 and 351 routes also provide a direct connection from Alewife to Bedford. The current schedules for these two MBTA routes align well with commuting hours providing headways in both the AM and PM peak periods. One potential for service improvement along the 62 route would be to extend it to provide service to Middlesex Community College. The extension would add an additional two miles of travel north along Springs Road from its current terminus at the Bedford V.A. hospital. The recommended extension of the 62 route is shown in Figure 3.2.

Figure 3.2: MBTA Route 62 Extension



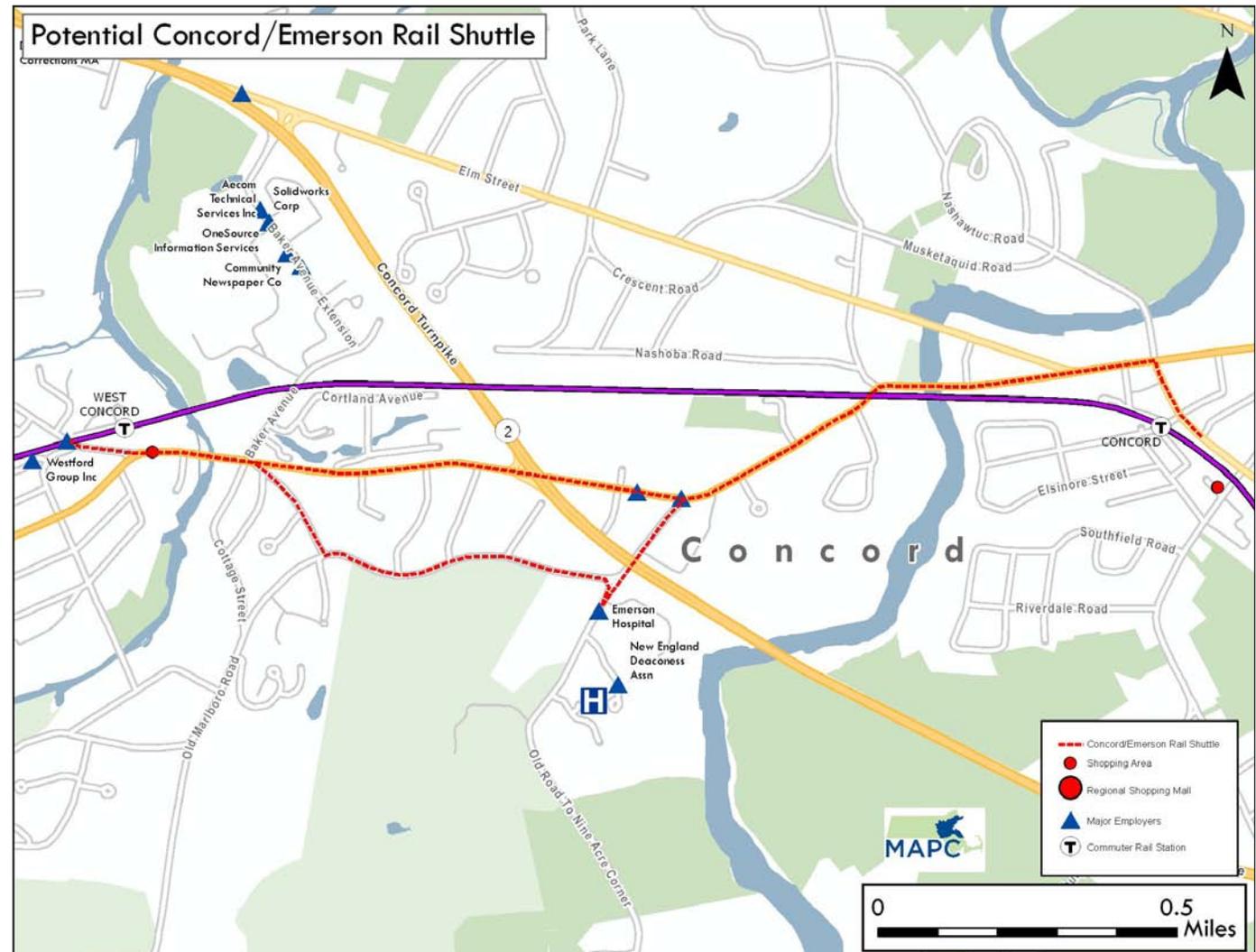
The second tract identified as having reverse commute potential is located in Concord. The Concord tract (361100) has two existing MBTA commuter rail stations, Concord and West Concord. Emerson Hospital, the major regional medical facility in the MAGIC sub-region, is approximately halfway between these two stations. Establishing a rail shuttle route accessing both commuter rail stations and connecting to Emerson Hospital could create a transit-based reverse commute option in the area. The potential shuttle route is shown in Figure 3.3 and could run along Route 62/Main Street between the two commuter rail stations and loop along Old Bridge and Old Marlboro Roads to access Emerson. There are other employers along this route, shown in Figure 3.3, that could also benefit from this rail shuttle.

After reviewing the headways of the commuter rail and the travel time of the shuttle between stations, there is about 5 minutes of driving time for the shuttle between stations and 6 minutes of travel time for the commuter rail train. Factoring in loading time for passengers and any traffic on the roadways, it is possible that passengers at the West Concord station would have to wait a few minutes for the rail shuttle to arrive after departing the train.

Prior to implementing this rail shuttle service, additional analysis would need to be completed to better understand the commuting patterns of employees at Emerson and other businesses in the area to determine the feasibility of implementing this service. This service could serve both a reverse and traditional commute population since the trains are servicing both inbound and outbound commuters. Additional analysis could also determine if other businesses in the area may benefit by signing on to this service.

This service could be completely funded by private businesses or through a public/private partnership between businesses and the Town of Concord. Between peak commuting hours, the shuttle could be used for senior services, medical or shopping trips to generate additional revenue.

Figure 3.3: Concord/Emerson Rail Shuttle Connection



Traditional Commute Needs Assessment Results

The travel patterns associated with traditional commuting also place emphasis on access to major fixed route services such as MBTA commuter rail lines or MBTA fixed-route bus service. Similar to reverse commuting patterns, larger transit systems are able to move more people from the MAGIC sub-region to employment destinations in the Boston area. Given the employment draw and number of jobs within the Boston area, more people are commuting from MAGIC to Boston than are doing the reverse.

The needs assessment identified five high scoring tracts through the first round screening process. During the second round screening process, which looked at existing services, densities and connectivity, it was determined that only one of the selected tracts had high potential for service improvements. Figure 3.4 shows the six tracts identified by the first round of screening.

Four of the five tracts identified through the initial screening process already have some existing transit services. The three tracts in Lexington are served by both MBTA and Lexpress transit routes and the tract in Maynard has shuttle service from Clocktower Place to the Acton commuter rail station. The only tract without bus/shuttle service is in Concord. This tract does border the two commuter rail stations in Concord.

As mentioned in the Reverse Commute Assessment, the potential Concord/Emerson shuttle service could be used for traditional commuters as well as reverse commuters. Since the shuttle could serve both commuter rail stations in Concord, the establishment of a park and ride facility along the route could provide an option for commuters who would normally drive to the commuter rail stations. The benefits of a park and ride to commuters is a competitive parking rate compared to the commuter lots and a guaranteed parking space each day. Given the high utilization rates of the parking lots at each commuter rail station, a guaranteed space in a park and ride lot could deter some commuters from driving to Alewife or all the way into the Boston area. This is especially true at the Concord station where parking utilization is around 99%.

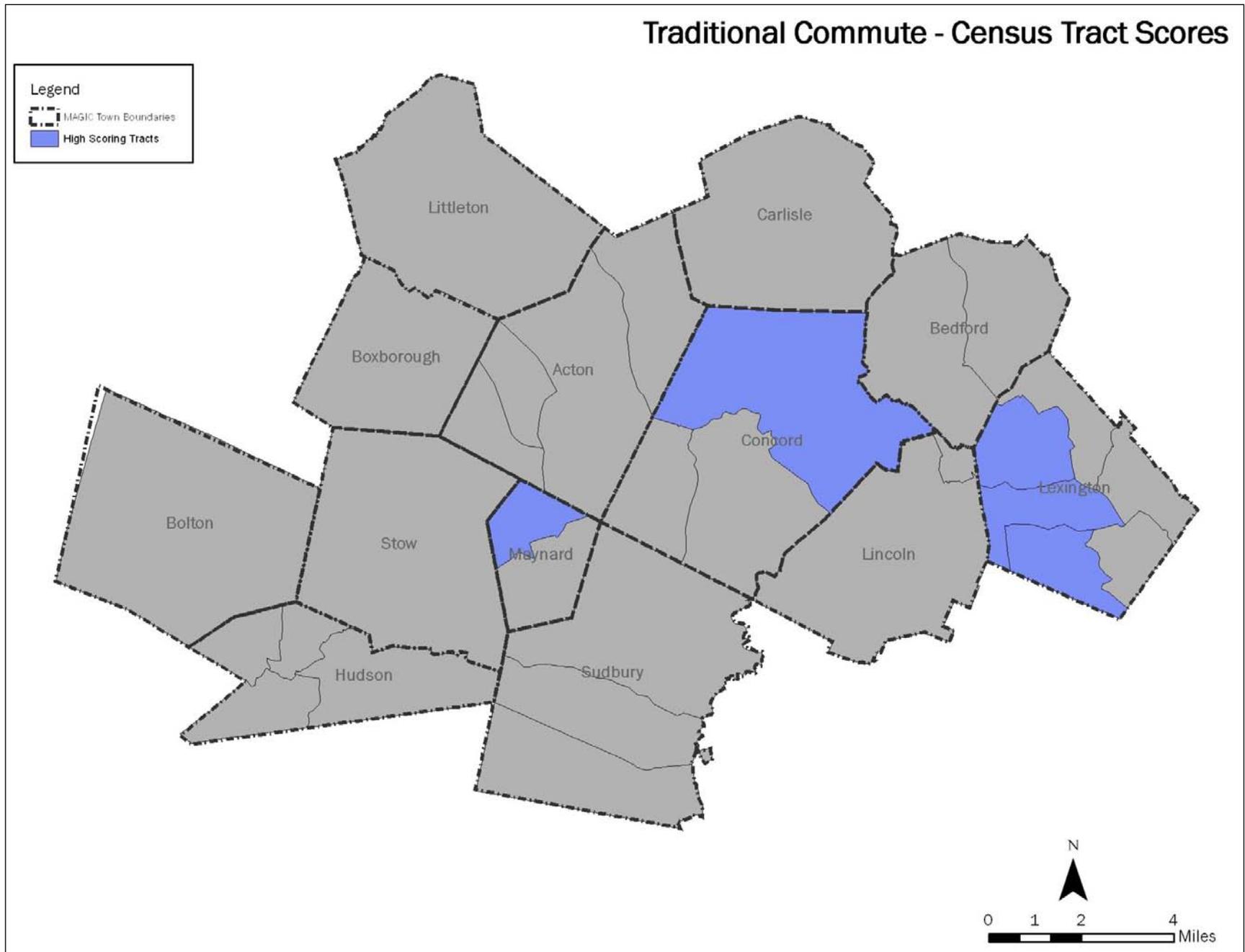
The areas around both Concord commuter rail stations have higher population densities than other areas in Concord. A location along Route 62 northeast of the Concord commuter rail station could serve higher density residential

locations in the area as well as a pocket of employers along Route 62 and in the Monument Square area.

The three tracts in Lexington are served by both MBTA fixed-route bus service and by local Lexpress bus service. The MBTA bus service provides a direct connection to Alewife taking commuters into the Boston area. The Lexpress offers local transit service providing additional transit connectivity around Lexington.

In Maynard, an employer sponsored shuttle service runs between Clocktower Place and the South Acton commuter rail station. This service brings employees to and from the commuter rail station, is privately funded and primarily serves reverse commuters. While Maynard did rank high for population density, low-income households and zero-vehicle households, it did not have a high number of commuters traveling from Maynard to the Boston area. Only about 2% of the commuters traveling from the MAGIC sub-region to the Boston area were coming from Maynard.

Figure 3.4: Traditional Commute Tract Scores



Suburb to Suburb Commute Needs Assessment Results

It is important to not only look at the commuting patterns of workers who are traveling to and from the Boston area, but also to look at commuting patterns among the MAGIC towns and Census Tracts themselves. The suburb to suburb commuting patterns take into account different demographic and development factors which affect trip generation within each MAGIC town.

The needs assessment identified seven high scoring tracts through the first round screening process. During the second round screening process, which looked at existing services, densities and connectivity, it was determined that three of the selected tracts had potential for service improvements. Figure 3.5 shows the six tracts identified by the first round of screening.

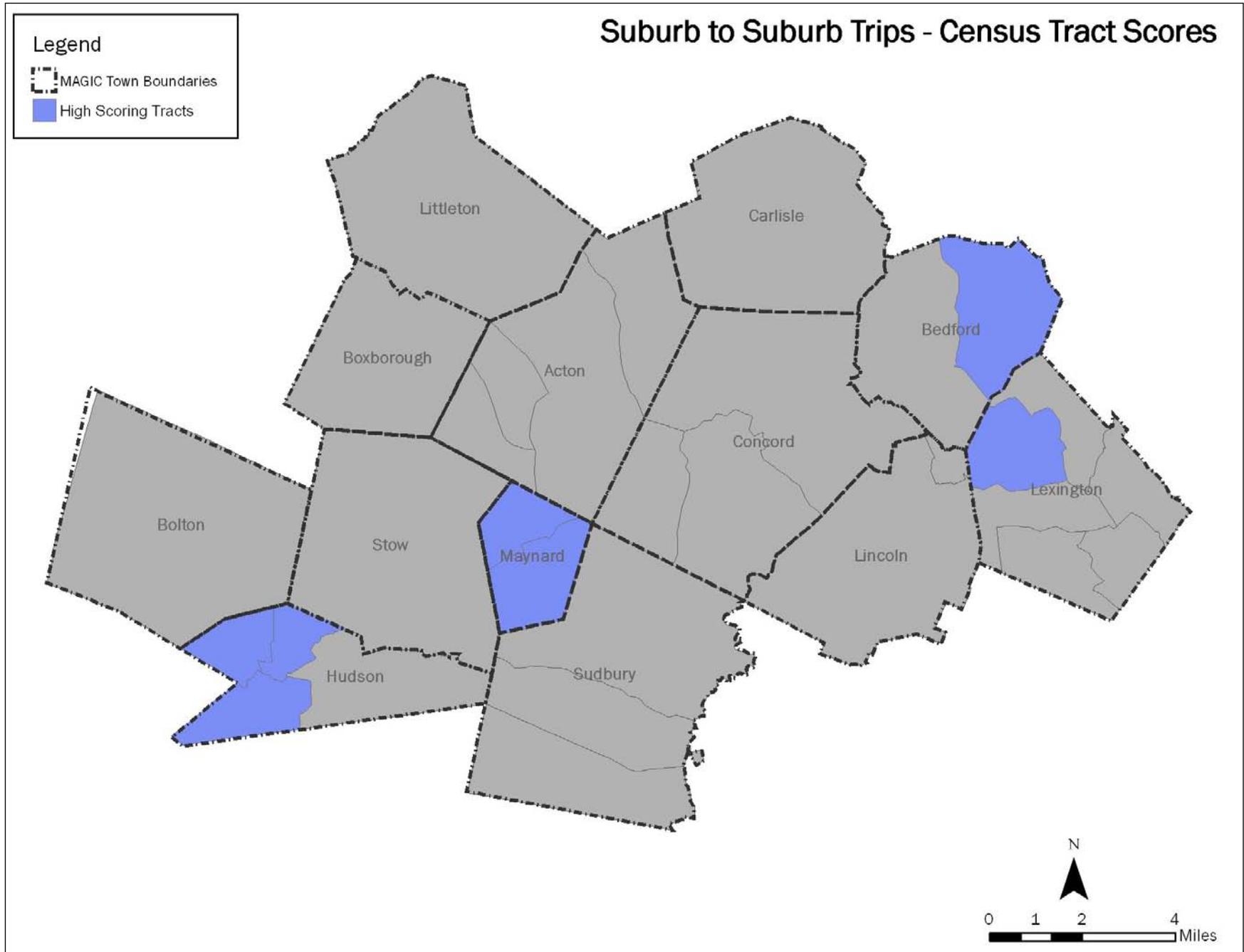
Two of the seven tracts identified through the initial screening process already have some existing transit services. The tracts located in Lexington and Bedford are currently served by MBTA fixed-route bus service. When looking at suburb to suburb commuting patterns in these two towns, a majority of the commuting trips are actually occurring between Lexington and Bedford and few trips have destinations in other adjacent MAGIC towns. Given the existing MBTA and local transit system coverage (Lexpress and BLT) these two communities are well-connected and could support suburb to suburb commuting.

The two tracts making up the Town of Maynard also ranked high in the initial screening process. A majority of the intra-MAGIC commuting trips originating in Maynard have destinations in Stow, Acton and within Maynard itself. While Maynard does have higher population and employment densities than some of the towns surrounding it, Maynard does not seem to be a stand-alone candidate for fixed-route transit service. Since many commuting trips have end destinations in Acton and Stow, a more feasible solution may be to look at a combined service that provides transit options to all three towns to capture a higher ridership pool and share costs across municipalities.

Finally, three tracts in Hudson were identified in the initial screening process as having high potential for service improvements. Hudson also has higher population and employment densities than many of the other MAGIC towns in the sub-region. Many commuting trips originating in Hudson have end destinations also in Hudson. Stow is also a popular destination for workers

living in Hudson. Looking closer at the data gathered through the needs assessment, Hudson has higher proportions of zero-vehicle households, low-income households and persons with disabilities. A smaller fixed-route or variable route transit system, similar to Lexpress or Bedford Local Transit, may be feasible in Hudson. The Town may also want to explore a more regional service which could include Stow, Maynard and Acton since these four towns form a commuting cluster for intra-MAGIC commuting trips.

Figure 3.5: Suburb to Suburb Tract Scores



Daily Needs Trips Needs Assessment Results

The daily needs trip category is different from the previous categories which focused on commuter trip origins and destinations. Daily needs trips often occur during the course of a weekday and also occur frequently on weekends as opposed to commuter trips which are typically taken on weekdays during the AM and PM peak hour. Trips to destinations such as the grocery store, retail stores, daycare, dry cleaners, restaurants, etc. are often associated with daily needs. While these trips do occur during the morning or evening commute as workers are returning home and stop at a grocery store or daycare center, they are also occurring during the day between commuting hours by those who are not working, retired populations and workers with variable schedules.

The needs assessment identified nine high scoring tracts through the first round screening process. The screening process identified demographic characteristics of populations who need access to daily service needs but may have difficulty. These include, but are not limited to, the elderly, zero-vehicle households and low-income households. The screening process also identified tracts with shopping centers of varying size in and around each tract. During the second round screening process, which looked at existing services, densities and connectivity, it was determined that three of the selected tracts had potential for service improvements. Figure 3.6 shows the nine tracts identified by the first round of screening.

Four of the nine tracts identified through the initial screening process already have existing transit services. The three tracts in Lexington are served by both MBTA and Lexpress transit routes which provide transit coverage to a majority of the Town of Lexington. The two MBTA routes with stops in Lexington, Routes 62 and 76, provide both weekday and weekend (Saturday) service to portions of Lexington. The 76 Route provides a connection to the center of Lexington and to the Depot where the hub for Lexpress is located. The Lexpress routes connect residential areas to daily service needs across the Town and also provide a connection to the Burlington Mall. While Lexpress does provide service from 7AM to 6PM Monday through Friday, it does not provide any weekend service. Additional analysis should be performed to determine the feasibility of offering a weekend route to Burlington Mall on the Lexpress Route 5 since this is likely one of the larger daily needs trip generators in the area.

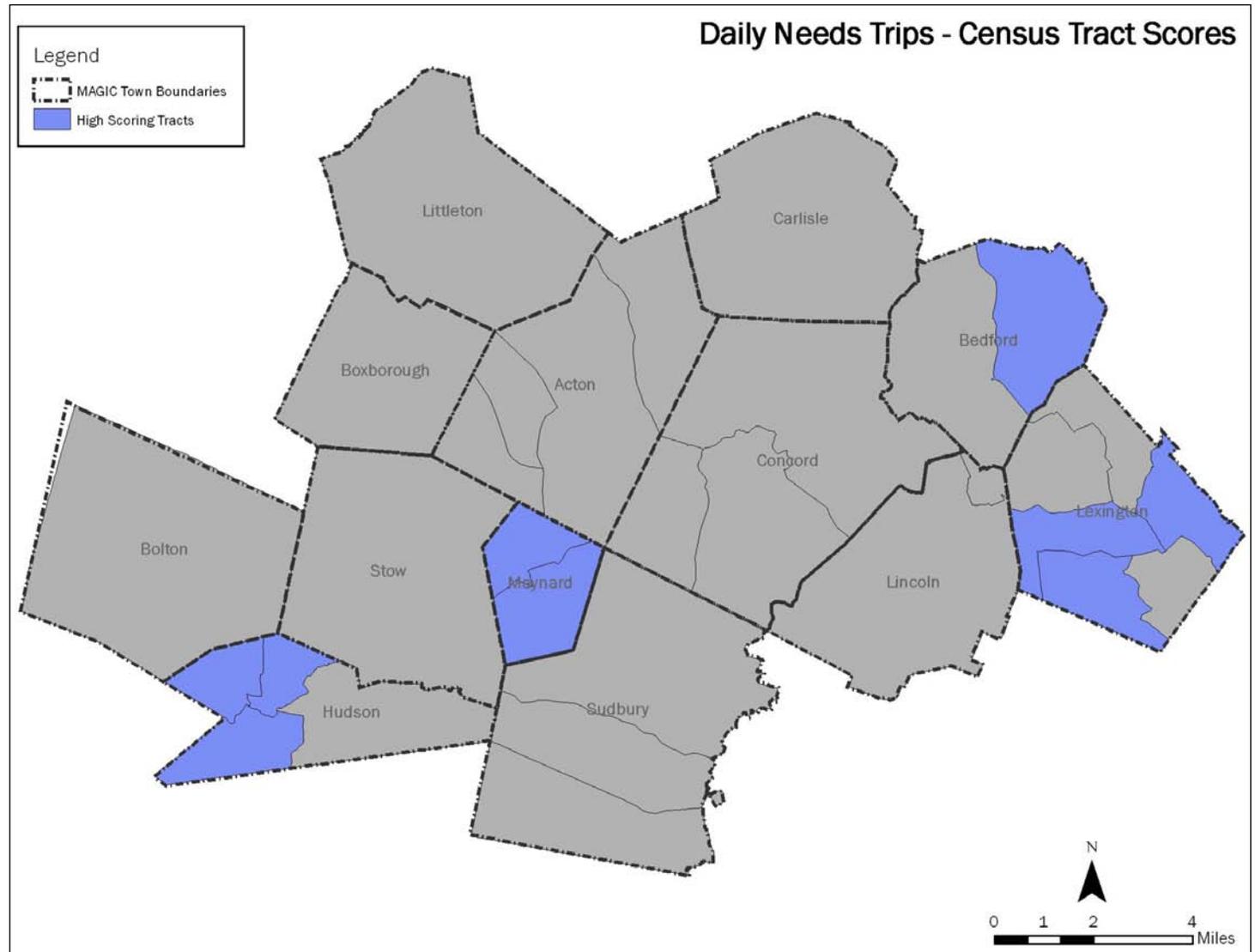
The tract in Bedford identified in the initial screening process as having potential for service improvements is similar to the tracts in Lexington. Portions of the tract are already served by existing MBTA bus routes, including the 62 Route which has Saturday service. The 62 Route also serves some of the more densely populated areas of Bedford and areas along Route 225 that have trip generating daily needs services. Bedford also has the Bedford Local Transit (BLT) service which is a combination fixed-route and demand-responsive transit service. Monday through Friday the BLT has fixed-routes which provide access to shopping and daily service destinations in Bedford, Billerica and Burlington. BLT will also provide demand-responsive service if appointments are booked in advance. Service coverage is fairly comprehensive in Bedford and additional service changes are not recommended at this time.

The two Census tracts that make up the Town of Maynard were identified in the initial screening process as having potential for service improvements. When compared to other MAGIC municipalities, the Town of Maynard has a higher proportion of low-income households and disabled residents as well as a higher elderly population and zero-vehicle households. After additional analysis of densities and land use in Maynard, it does not appear that a traditional fixed-route system within the Town would be feasible. There may be opportunities for coordinated transit services with other towns located near Maynard, like Acton and Stow, to increase the market and share the cost.

Finally, the three tracts identified in the Town of Hudson also exhibited characteristics conducive to supporting transit service for daily needs. Hudson, similar to Maynard, has a higher proportion of low-income households, disabled residents, elderly residents, and zero-vehicle household than many other MAGIC towns. Hudson also has a number of larger commercial centers located within these three tracts, particularly along Routes 85 and 62. After additional analysis, Hudson may be a candidate for a smaller fixed-route transit system similar to Lexpress or BLT. Hudson has the highest gross residential densities of any of the MAGIC communities, around 4 dwelling units to the acre.

Although the scale of a transit system in Hudson may be smaller than the Lexpress or a similar RTA service, they still have high annual costs. The Lexpress service has an annual operating cost of over \$400,000. While fare revenue does pay for some of the operating costs, parts are still subsidized by the town. In this regard, it is important to further analyze the potential ridership of a town-wide system and weigh it against the costs and benefits of working to establish a more regional system.

Figure 3.6: Daily Needs Census Tract Scores



Chapter 4: Recommendations

The Needs Assessment chapter looked at Census Tracts throughout the MAGIC sub-region to determine which tracts, if any, had the potential of supporting improvements to existing transit service or the development of new service. The recommendations identified in the needs assessment are listed in this chapter.

There are additional recommendations for transit service and potential pilot projects that cross-cut among each of the categories identified in the needs assessment. A number of these recommendations require additional analysis and in some cases, policy research to identify the feasibility and practicality to municipalities in the MAGIC sub-region. Recommendations in this chapter are listed by topic area.

Recommendations from the Needs Assessment

Listed below are the 5 recommended improvements to transit that could improve service based on the four categories discussed in the needs assessment chapter.

Reverse Commuting

Two projects were identified under the reverse commuting category:

1. Extension of the MBTA 62 fixed-route bus line to serve Middlesex Community College.
2. Implementation of a commuter rail shuttle service in Concord which could connect the Concord and West Concord commuter rail stations to Emerson Hospital and surrounding employers.

Traditional Commuting

1. Implementation of a commuter rail shuttle service in Concord which could connect the Concord and West Concord commuter rail stations to Emerson Hospital and surrounding employers. This service, in addition to serving reverse commuters, could be developed in conjunction with a park and ride facility to support traditional commuters accessing the two commuter rail stations.

Suburb to Suburb Commuting

1. Explore the feasibility of implementing a small transit system in the Town of Hudson, and possibly expanding service to adjacent towns like Stow, Acton and Maynard. Many intra-MAGIC commuting trips are taking place among these four communities.

Daily Needs Trips

1. Explore the feasibility of implementing a small transit system in the Town of Hudson similar to what is in place in Lexington or Bedford.

Additional Recommendations and Pilot Projects

In addition to the recommendations resulting from the needs assessment, MAPC developed other options for increasing transit service in the MAGIC sub-region. These recommendations are listed below and grouped by category.

Regionalizing Service

Providing traditional transit service in suburban and rural areas can be challenging, especially when population densities and land use patterns are more conducive to driving. Many of the communities in the MAGIC sub-region have low population densities that would not support traditional transit services making a regional approach to service more important. Regionalizing transit services creates a larger pool of potential users and distributes costs across multiple funders. Developing regional partnerships can also enhance grant applications and show potential funders the importance of suburban transit in the sub-region by applying with multiple partners. Listed below are some potential regional transit recommendations that could promote the sharing of services and increase the efficiency of transit in the sub-region.

1. *Council on Aging Services* - Each municipality in the sub-region is providing transportation services for the elderly through their Council on Aging. In some cases the service is provided by the municipality itself which has purchased small vans for transporting seniors to a variety of activities or daily service needs throughout the region. In other cases, the service is contracted through one of the regional transit authorities. Given the limited number of trip destinations that the Council on Aging vans are actually servicing throughout the sub-region, there are many daily trips that are duplicated between each of the Councils on Aging. For instance, many municipal Councils on Aging are making medical trips to

Emerson Hospital in Concord during the day. The vans are most likely taking similar travel routes creating an overlap of service. Overlapping service between each Council on Aging van trip is creating additional vehicles on the roadway, additional fuel requirements and additional greenhouse gas emissions.

For many communities in this sub-region, it may make sense to look into regionalizing the Council on Aging van services to create regional trips with multiple pick-ups all headed to the same end destination. Regionalizing the service would allow one van to make a single trip to an end destination, but carry passengers from multiple jurisdictions. This would free up other Council on Aging vans which were previously making similar trips, and could now be used to serve other areas of the sub-region. Freeing up capacity by redistributing these vehicles could help serve the ever-growing elderly population in a more efficient manner and help serve more end destinations in and around the sub-region.

This strategy is not without challenges. Some municipalities have Council on Aging vans that were purchased with funds from the Friends of the Council on Aging or a similar fundraising/volunteer organization. In this situation, the organization tends to make the decisions about how the vans are used and who the service can be used by. It will be important to make sure these groups are included in regional discussions pertaining to elder services. In other cases, RTAs are providing the Council on Aging services. RTAs may also be reluctant to join a regional service option as they already have their own dispatching and scheduling services which could conflict with a more regional approach.

Cost could also be a limiting factor. A regional service such as this would require a regional dispatching office that would schedule rides for seniors and create the schedules for the vans and the drivers. An agreement would also have to be formulated by the participating municipalities to determine the cost sharing structure, maintenance contracts, insurance, drivers, etc. that are commonly assumed by each individual municipality.

2. *Park and Ride/Shuttle Vans* - The MAGIC sub-region is fortunate to have the Fitchburg commuter rail line running through the center of the sub-region providing a public transit option for those wishing to travel east and west for commuting or other purposes. The recently approved improvements to the Fitchburg line are going to increase the frequency of headways at many stations in the sub-region and potentially increase the attractiveness of the service for both the traditional and reverse commuting populations. As demand for the service increases over time, the need for parking at and around each commuter rail station will also increase. With existing high parking utilization rates at stations in Acton and Concord, the lack of parking during the AM commuting hours will only be compounded as service is improved in the future.

This issue does draw upon the importance of having a regional approach to park and ride commuter shuttles. The sub-region currently has one operating commuter shuttle in Acton that runs between a park and ride lot and the South Acton commuter rail station. While the service is still in its first year of operation, utilization is still less than desired. One way to help solve the parking issue and the lower utilization of the shuttle is to bring in additional markets. Towns surrounding Acton, such as Boxborough, Stow and Maynard, do not have commuter rail stations but still have residents who use the Fitchburg line to commute to work. If the Acton shuttle were to either expand its route to other park and ride lots or expand its marketing to other communities, there could be a more regional draw for the commuter shuttle. Including multiple municipalities in a more regional system could help to bring the overall cost of the service down and spread remaining costs across multiple funders.

Boxborough is closing in on launching its own park and ride shuttle which would take Boxborough residents from a parking lot in their town east to the South Acton commuter rail station. This shuttle is traveling a similar route to the Acton shuttle and making a case for shared services in the future between Acton and Boxborough. Other commuter services could be established between multiple towns which have commuters traveling similar routes. Interest for these services have also been expressed by Sudbury and Bolton in addition to the towns listed above.

3. *Transportation Management Association* - Portions of the MAGIC sub-region are currently served by two Transportation Management Associations (TMAs): the 128 Business Council and the MetroWest/495 TMA. Currently, the 128 Business Council provides service to employers in Lexington and the Metrowest TMA provides services in Hudson and Sudbury. The existing TMAs are only providing services in three of the thirteen MAGIC communities, leaving a significant portion of the employers in the sub-region without support systems for alternative commuting services.

After conversations with both TMAs, the 128 Business Council expressed interest in working more closely with MAGIC communities that are located adjacent to Route 128. These would include Bedford and Lincoln, as well as expanding the existing working relationship with Lexington. The Town of Bedford contains a number of large employers who could benefit from services provided by the 128 Business Council. These services could include links to the Alewife Red Line station or links to existing MBTA fixed-route services running in Bedford. Similar services could be provided for employers in Lincoln as well. The 128 Business Council is already working with Lexington, but has expressed interest in further coordination to link TMA shuttles to the existing Lexpress routes. MAGIC communities along the 128 corridor should reach out to the 128 Business Council leadership to determine the feasibility of beginning service in their communities.

The Metrowest/495 TMA is interested in expanding services to other towns in the MAGIC sub-region, especially those that are adjacent to 495 and contain large employers. Unfortunately, at this time staffing funding constraints limit the TMA's ability to expand new services to additional MAGIC communities. Although funding is not available at the present time, dialogue must continue between the TMA and interested communities to keep the lines of communication open and prepare potential pilot projects for the future should funding and staffing become available.

Since the two existing TMAs in the area would most likely not be able to serve the communities of Concord, Acton, Stow, Maynard, Carlisle, Littleton, and Boxborough, one option could be to study the feasibility of starting another TMA in the MAGIC region. This TMA could cover the

communities in the central and northern portion of the sub-region. Additional research and analysis would be required to determine the need for these services, the anticipated participation by employers in the area and the process for creating a TMA in the Commonwealth.

4. *School Buses as Public Transit* - An innovative approach to addressing gaps in suburban transit that has worked in other communities across the United States is utilizing public school buses for both the transport of students to school and the general public to destinations along a fixed route. Public school buses have already been purchased to transport children to and from school at certain time periods of the day and typically sit idle between the two peak demand periods in the morning and afternoon. While this concept has worked in a few communities, there are significant hurdles that must be crossed such as handicap accessibility for all riders on the vehicles, insurance coverage, safety belt requirements for school children, and the ability to convince parents to allow adults and children to share space on the same bus. This concept could be useful in suburbs looking to add a fixed-route component to their transit system. The initial investments if starting and running a busing system have already been absorbed by the school districts, eliminating most of the up-front costs. Funding would be needed for any retrofits to the buses, changes in insurance, hiring of additional staff, etc. to make the service functional for typical fixed-route transit. This concept could be explored in more detail if communities in the sub-region thought this might be a viable alternative to traditional fixed-route service.

Investments in Technology

The ability to link users to transit services through the use of technology is helping to shrink the wait time, expedite the scheduling process and make certain forms of demand-responsive transit service more efficient. As technology becomes more advanced and greater numbers of transit users are connected to the system via both hard wired and mobile devices, transit service will become faster and easier to use. There are some technological investments that the MAGIC sub-region could utilize to improve both existing and future transit service.

1. *Deviated Fixed-Route Service* - The Clean Air and Mobility sub-committee of the Boston Metropolitan Planning Organization (MPO) recently recommended funding for the 128 Business Council to invest in both hardware and software to support a deviated fixed-route technology that would automatically re-route their shuttle vans to pick up customers within a certain distance of the existing fixed-route. This new test system would use GPS tracking devices to determine where the shuttle van is located at a given point in time relative to the request for a ride that is received at the dispatching office. The new technology would determine if it is feasible for the driver to deviate from the fixed-route to pick up the waiting passenger. If the trip is possible, the GPS locator will re-route the van and pick up the passenger. If it is not possible to pick up the passenger in a timely manner without delaying the ride of users already on the van, the system will notify the passenger that the ride cannot be accommodated at that time.

This system is unique in that it automatically re-routes the driver's GPS unit in the vehicle without distracting the driver with the use of cellphone or radio communication with the dispatch office. This system also notifies the waiting passenger in advance of the ride as to how long the wait is expected to be before the shuttle van arrives. The use of GPS technology allows the service to perform in real-time providing accurate estimates of wait times for the passenger.

The 128 Business Council anticipates rolling out this new technology on some of their shuttle vans and also providing the technology to Lexpress as a test case for fixed-route suburban transit service in a community. If successful, the software will be available for other transit providers to implement along their routes.

2. *Online Transit Inventory* - Through this project, an inventory of all known transit services large and small was compiled for the MAGIC sub-region. This information is currently available in this report in a written format, but not easily accessible to the public. A recommendation of this study is to develop an online searchable database of all the known transit services in the sub-region. This listing could provide added transparency for users who are searching for services in their community that can connect them to destinations both inside and outside the sub-region. This database should include information on the type of service,

schedule of service, cost per ride, eligibility requirements, etc. A database of transit services would not only help the public identify available transit options, but would also allow service providers to see what other agencies in the area are doing and how they could better align routes and schedules to create more efficient systems for their users.

3. *Online Surveys* - The ability to survey residents and transit users in the sub-region has become easier and less cost prohibitive with the improvements made to online survey providers. Free online surveys can be developed and distributed to capture the changing needs of a community and its residents. MAPC recommends that a survey be developed and distributed to each of the MAGIC communities to help capture residents needs and interest in suburban transit services. Through the survey it would be possible to gauge community interest and support of various transit options, funding mechanisms, key travel destinations, and travel purpose. The survey could then be used to help inform future decisions either in an individual community or at the regional level.

Continued Coordination

The coordinated approach taken with this study resulted in the formation of a comprehensive working group consisting of at least one representative from each of the thirteen MAGIC communities. In order for suburban transit to be successful in this sub-region, coordination among municipalities and service providers must continue after the completion of this study. MAPC recommends that the working group develop a regular meeting schedule and set of agenda items to work toward at both the community and region-wide scale.

Chapter 5: Potential Funding Sources

At a time when national, state and local initiatives are focused on increasing access to public transportation services, funding levels are being reduced inhibiting the good work of agencies and municipalities in continuing down a path to a more sustainable future. The uncertainty of federal funding sources moving forward is of great concern to transportation providers, and the lack of a new federal transportation bill raises questions as to the source and level of future federal funding. This section provides a listing of potential federal, state and local funding sources that may be used in implementing the recommendations listed in the report.

Federal and State Funding Sources

Job Access and Reverse Commuting Funding (JARC)

JARC funding is available through a competitive grant program process solicited each year by MassDOT requesting transportation providers to develop applications for new transit services improving access to jobs or facilitating reverse commuting services. This funding is available to service providers who can show how the proposed service increases job access opportunities.

New Freedom Funding

New Freedom funding is also a federal formula grant program in which MassDOT solicits applications from service providers who wish to create new services which provide additional tools to overcome existing barriers for Americans with disabilities seeking integration into the workforce and full participation in society. The lack of adequate public transportation is a key barrier preventing disabled individuals from fully participating in the workforce. New Freedom funding helps transit providers integrate services which improve mobility for the disabled beyond what is required through the Americans with Disabilities Act (ADA).

Clean Air Mobility Funding

The Boston Metropolitan Planning Organization sets aside money each year for a competitive grant process and solicits projects which help improve air quality and mobility in the MPO region. Projects can be related to easing automobile congestion, supporting new or improved transit services or increasing mode shift to walking and/or biking. Projects involving transit

service must demonstrate a significant local or regional benefit and improve both air quality and mobility for people in the region. Funding under this program has been allocated to a variety of projects supporting both new and existing transit services.

Transportation Improvement Program Funding (TIP)

The Boston Metropolitan Planning Organization also oversees the programming of TIP funding over a four year period in the region. Municipalities and organizations can come forward to the MPO and suggest potential projects that should receive funding through the TIP. These are typically large scale infrastructure projects, but could potentially be applied to suburban transit projects.

Local Funding Sources

Municipal Funding

Transit projects that are specifically benefitting one or more MAGIC communities may want to seek funding internally from municipal sources. Depending on the scale of the project, it may be faster or easier to work through municipalities to fund certain initiatives. Regionalizing services could be an especially beneficial solution to funding since the cost could be spread amongst multiple partners with the benefit of better service provided to a larger pool of users.

Current Municipal Transit Funding

As part of this study, MAPC contacted municipal finance officials in each of the thirteen MAGIC towns to get an estimate of how much money is currently being spent on transit by each town in the sub-region. Eleven of the thirteen municipalities are paying annual assessment funds to an RTA in return for transit services. In Massachusetts, a municipality can choose who they pay their annual assessment funding to. Chapter 2 of this report provided an overview of which municipalities are paying assessment funds to an RTA, and which RTA they are paying it to. Table 5.1 shows the funding spent in fiscal year 2010 on various transit services in the sub-region.

The total funding spent in FY 2010 in the MAGIC sub-region was about \$5.3 million dollars. A large majority of that funding went to the MBTA for

assessment payments which support the commuter rail, fixed-route services and The RIDE. Compared to the MBTA, the other three RTAs did not receive nearly as much in annual assessment funding but they also provide less in terms of service to the MAGIC sub-region. The annual operating costs provided by municipalities is largely reflective of the money spent on Council on Aging services with the exception of the “other” category. The staffing and driver costs associated with transit services is much higher than what is spent on maintenance and fuel costs. The “other” category includes the full cost of operating Lexpress service in Lexington since that full cost could not be broken down into categories.

This table is important because it shows that significant funds are being spent on transit in the sub-region and yet, service is still limited. Transit is a very costly service to run and typically never self-sustained purely through ridership revenue. This does not mean that transit services cannot be enhanced in the sub-region. Municipalities should examine what services they are paying for through their assessments and determine what the best use of assessment dollars are.

Table 5.1: MAGIC Transit Costs (FY 2010)

Annual Operating Costs	
Line Item	Annual Cost
Maintenance of Vehicles	\$28,009
Gas for Vehicles	\$60,867
Staffing and Driver Costs	\$425,012
Other (Depreciation, Insurance, Inspection, etc.)	\$489,112

Annual Transit Assessments Paid	
Regional Transit Authority	Dollar Amount Paid
MBTA Assessment	\$4,158,020
LRTA Assessment	\$90,281
MART Assessment	\$102,615
MWRTA Assessment	\$19,622
Other (Please Indicate to Who)	\$0

Public/Private Partnerships

Employers and businesses in the sub-region could be one of the biggest assets to leveraging additional funds to support transit service in the sub-region. Municipalities should explore partnerships with private entities to determine how the needs of each could be aided by expanding transit service to capture ridership and share common costs. Working through the TMAs in the area could also be an avenue for connecting to businesses in each community that are looking for additional transportation options for their employees.

Mitigation Funding

Municipalities in the sub-region could require mitigation funding from new development which generates additional automobile traffic in the area. Mitigation could come in multiple forms including: a payment in lieu of improvements, an agreement to initiate transportation demand management strategies to reduce automobile trips or an agreement to join one of the TMAs in the area for a set period of time. Since many municipalities in this sub-region are expected to have some growth in both population and employment over the next 25 years, it is important to determine what affect future development will have on traffic patterns and to assess proper mitigation for these developments.

Conclusion

As the cost of driving continues to rise, the need for more viable public transportation systems grows. Sustainability and livable communities are at the forefront of planning ideals, at a time when municipalities and states are faced with unprecedented funding challenges. Providing suburban transit systems in areas that are designed for the automobile creates a unique challenge which needs to be addressed at both a local and regional scale. Low population densities and the sprawling nature of suburban development makes fixed-route transit difficult. Regionalizing services across multiple communities can help provide the needed ridership base while easing the cost burden by sharing expenses among multiple partners. Municipalities in the MAGIC sub-region should use this process to continue dialogue at a regional level and pool resources to develop a suburban transit system that addresses the needs of residents, visitors, employees, and businesses.

