1. Key Recommendations

Congestion relief on Route 128 requires not only cooperation among the municipalities, but the support of the business community, state, and federal agencies that recognize the economic and quality of life benefits to improving the corridor. While the local elected officials participating in the Plan's development are not necessarily empowered to change land use policies or allocate transportation funding on their own, they can work to effect change in the short term and plan for change in the long term. Major funding and policy changes will require the consideration and consensus of the local bodies that have planning authority as well as state and federal agencies.

Recommendations

The Route 128 Central Corridor Coalition will prioritize three areas to improve mobility, which focus on areas where the communities can be influential in bringing diverse interests together to achieve lasting change. While there is a list of additional projects, described below are the three areas that the Route 128 Central Corridor Coalition have agreed to work on first:

A. Build on existing public and private transit service in the corridor;
B. Create a new Fitchburg Line/ Route 128 Multi Modal Transit Center;
C. Coordinate and enhance mitigation measures that will reduce traffic congestion;

A. Build on existing public and private transit service in the corridor

The Route 128 Central Corridor Coalition will work with existing public and private transit providers to enhance and expand service, with a focus on rapid bus service along the Route 128 Central Corridor.

Strategies include:

- Work with the business community, existing TMA's, other private and all public service transit agencies to map existing routes, determine schedule overlaps, and strategize to better coordinate existing service;
- Work with the business community and existing TMA's to determine service demand and understand necessary connections;
- Investigate possibilities for instituting express bus service to the corridor from transit hubs;
- Seek state involvement for implementation of northbound and southbound Route 128 express bus service on the shoulder/breakdown lane on both sides. Ensure that any changes to Route 128 access ramps, bridge repair, and road construction is capable of accommodating bus-on-shoulder service.

B. Create a new Fitchburg Line/ Route 128 Multi Modal Transit Center

The Route 128 Central Corridor Coalition will work with private entities to encourage federal and state agencies to analyze the feasibility of a transit center on the MBTA Fitchburg Commuter Rail Line close to Route 128 that can draw cars off of Route 128 and provide feeder bus service to employment centers.

At an estimated cost of $250,000, the study would take about one year and should include:

- Identify potential sites for a station, based on both suitability and train operations issues;
- Define the market for service, including ridership estimates;
- Site assessment, including environmental and traffic issues for this area;
- Potential for serving the site with feeder bus shuttles to employment, housing, and commercial centers;
- Station consolidation and collaboration with the ongoing Fitchburg Commuter Rail Line improvements effort;
- Level of parking needed to make the Transit Center viable.

C. Coordinate and enhance mitigation measures that will reduce traffic congestion

The Route 128 Central Corridor Coalition will work to institute consistent practices that create programs and infrastructure to improve mobility and reduce dependence on single occupant vehicles.

Programs Include:

- Institution of common parking polices in commercial zones that create demand for public and private transit;
- Participation of businesses in Transportation Management Associations (TMA);
- Adopting consistent mitigation measures to fund local infrastructure improvements that implement aspects of this Plan and support TMAs;
- Coordinating reverse commuting options so that residents can use shuttle services to reach transit hubs.

Infrastructure and Operations include:

- Ensuring access roads and service connectors are designed to provide integrated northbound-southbound transit movement;
- Eliminating pedestrian and bicycle barriers by ensuring safe access across Route 128 and along roads servicing commercial areas;
- Establishing consistent land use policies for commercial zones to encourage a mix of uses, such as retail services (dry cleaning, banking, pharmacy) close to office space so
- employees do not need their own cars to conduct routine chores;
- Developing common site design requirements to bring buildings close to service roads and thereby more amenable to pedestrian and shuttle drop-off access.

2. Existing Conditions

The Route 128 Central Corridor Plan covers Route 128 from Route 3 in Burlington to the Massachusetts Turnpike in Weston (the roadway is also designated at I-95 in this area). The Plan area includes the five communities of Weston, Waltham, Lincoln, Lexington, and Burlington as shown in Figure 1, Study Area.

Figure 1 Study Area

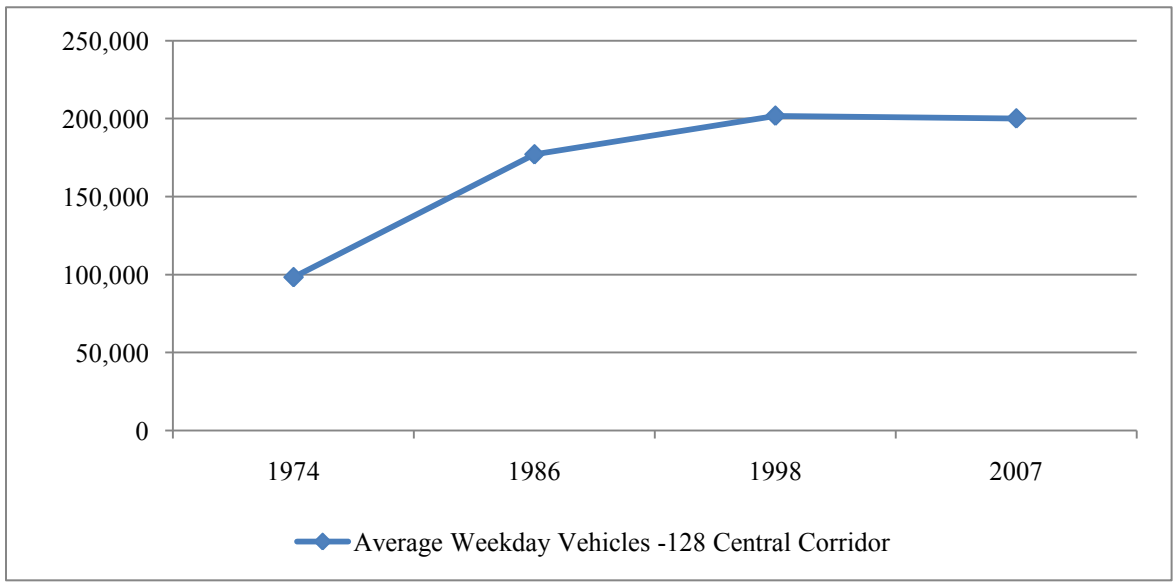
a. Transportation Network

Congestion on Route 128

As the communities along Route 128 developed and the numbers of jobs in the corridor increased greatly, traffic along the corridor also increased. In 1974 on average about 100,000 vehicles (total, both directions) could be found daily along any given segment of the 12.6 mile corridor. By 1986 the number of vehicles had increased by 80% - almost 180,000 vehicles could be counted on any given weekday. Ten years later (1998) daily volumes had continued to increase, to just over 200,000 vehicles. Volumes have held steady, and perhaps even declined slightly, in the first decade of the 21st century. The slight decline can be attributed to the construction of the Central Artery/Tunnel project. But with the area poised for new development, the potential for dramatic new traffic growth looms in the future.

Traffic along the Route 128 corridor greatly exceeded roadway capacity in 2007. Currently regular commuters know that they can encounter congestion during any peak hour trip. Figure 2, Average Weekday Vehicles, Figure 3, Volume to Capacity, and Table 1, Road Segments, provide an in-depth look of vehicular data and congestion along Route 128. Congestion estimates are based on regular, recurring congestion, but congestion due to crashes, breakdowns, or other incidents including inclement weather, can be just as frequent, and is usually more severe. Since the corridor is operating at or near capacity, even minor incidents can cause significant delays as shown in Figure 4, Traffic on Route 128. Incident-related congestion leads to spillover traffic on local roadways.

Figure 2 Average Weekday Vehicles - Route 128 Central Corridor



Source: Historical and Contemporary Traffic Volumes on Limited-Access Highways in the Metropolitan Boston Region, CTPS, 2002. 2007 numbers from CTPS website

Figure 3 Volume to Capacity - Route 128 Central Corridor

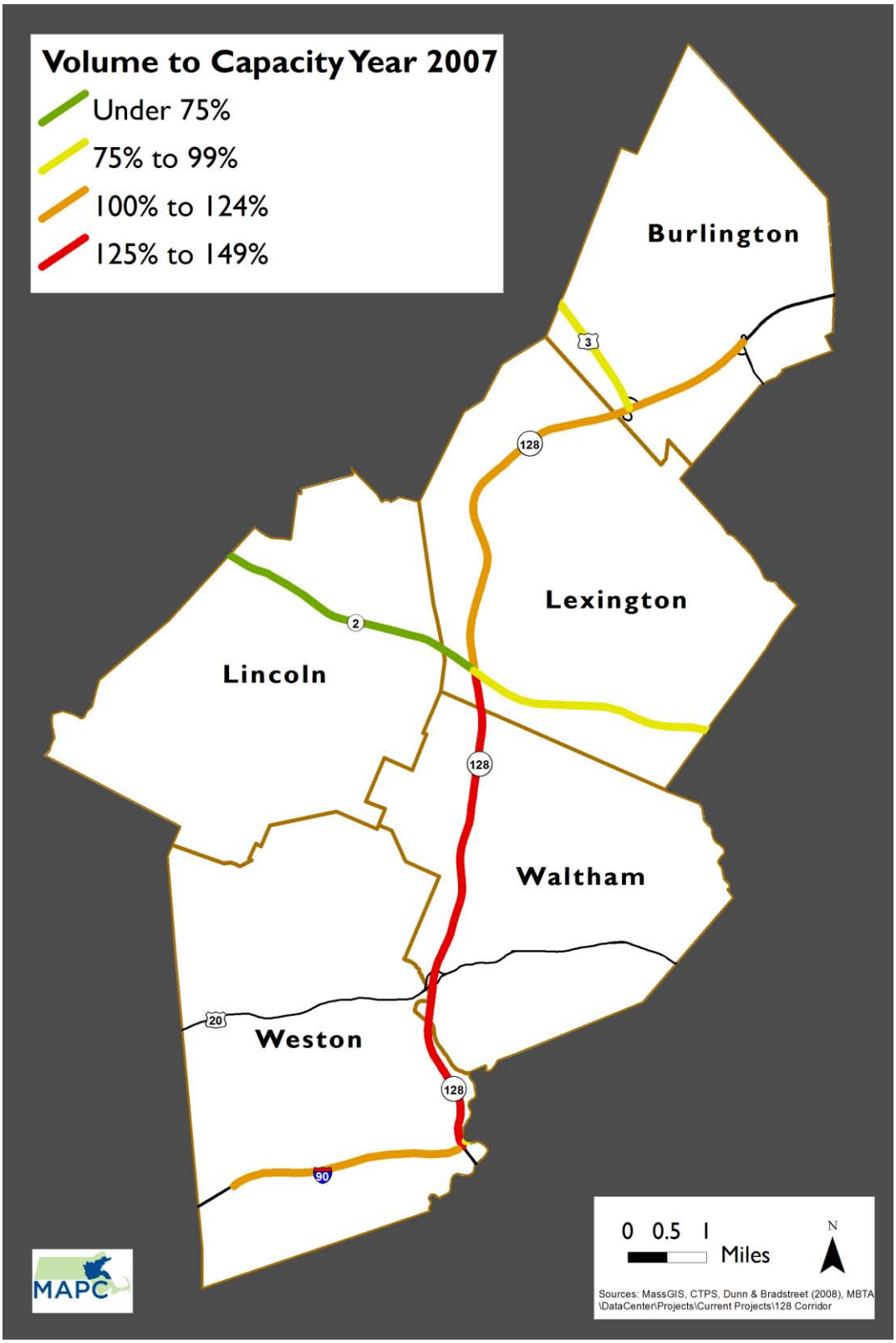


Table 1 Road Segments - 2007

Road Segment	Volume to Capacity	Average Weekly Daily Trips
North of Route 3 and Middlesex Turnpike	122%	195,000
North of Routes 4 and 225	123%	196,500
North of Route 2A	120%	191,500
North of Route 2	122%	195,000
North of Trapelo Road	128%	204,000
North of Totten Pond Road	129%	207,000
North of U.S. Route 20	127%	203,500
North of Massachusetts Turnpike (I-90)	130%	208,000

Safety in the Corridor

Figure 4 Traffic on Route 128

Table 2, Recorded Vehicular Crashes, shows reported motor vehicle crashes in the corridor communities from 2005 through 2007. Between 2005 and 2007, there were slightly fewer than 10,000 motor vehicle crashes in the five communities, an average of about 3,300 crashes a year. Almost half the crashes took place in the City of Waltham. Lincoln had by far the fewest. Twenty six fatalities were reported in the five communities during this three year period. The average number of corridor crashes between 2005 and 2007 represent about six percent of the total number of crashes in the MAPC region. The reported motor vehicle crashes include all types of accidents such as head on collision, rear end collision, as well as those that include pedestrians.

Table 2 Recorded Vehicular Crashes between 2005 and 2007

Municipality	Year			
	2005	2006	2007	TOTAL
Burlington	687	813	710	2,210
Lexington	703	684	652	2,039
Lincoln	100	97	129	326
Waltham	1,433	1,477	1,115	4,025
Weston	484	439	412	1,335
Corridor Total	**3,407**	**3,510**	**3,018**	**9,935**
MAPC Region	55,757	58,370	55,247	169,374
Massachusetts	158,084	149,860	158,084	466,028

Source: MassDOT, Highway Division

Figure 5, Recorded Vehicular Crashes, on the following page shows where vehicular crashes took place in the corridor. More crashes take place at the interchanges on Route 128 than between them, and generally the interchanges with the highest traffic volumes have the greatest numbers of crashes. But the Route 2 interchange has fewer crashes than expected from its volumes, and it's possible that the higher numbers of crashes at Winter Street reflect the ongoing construction at that interchange. Figure 6, Accident on Route 128, depicts a typical accident on Route 128.

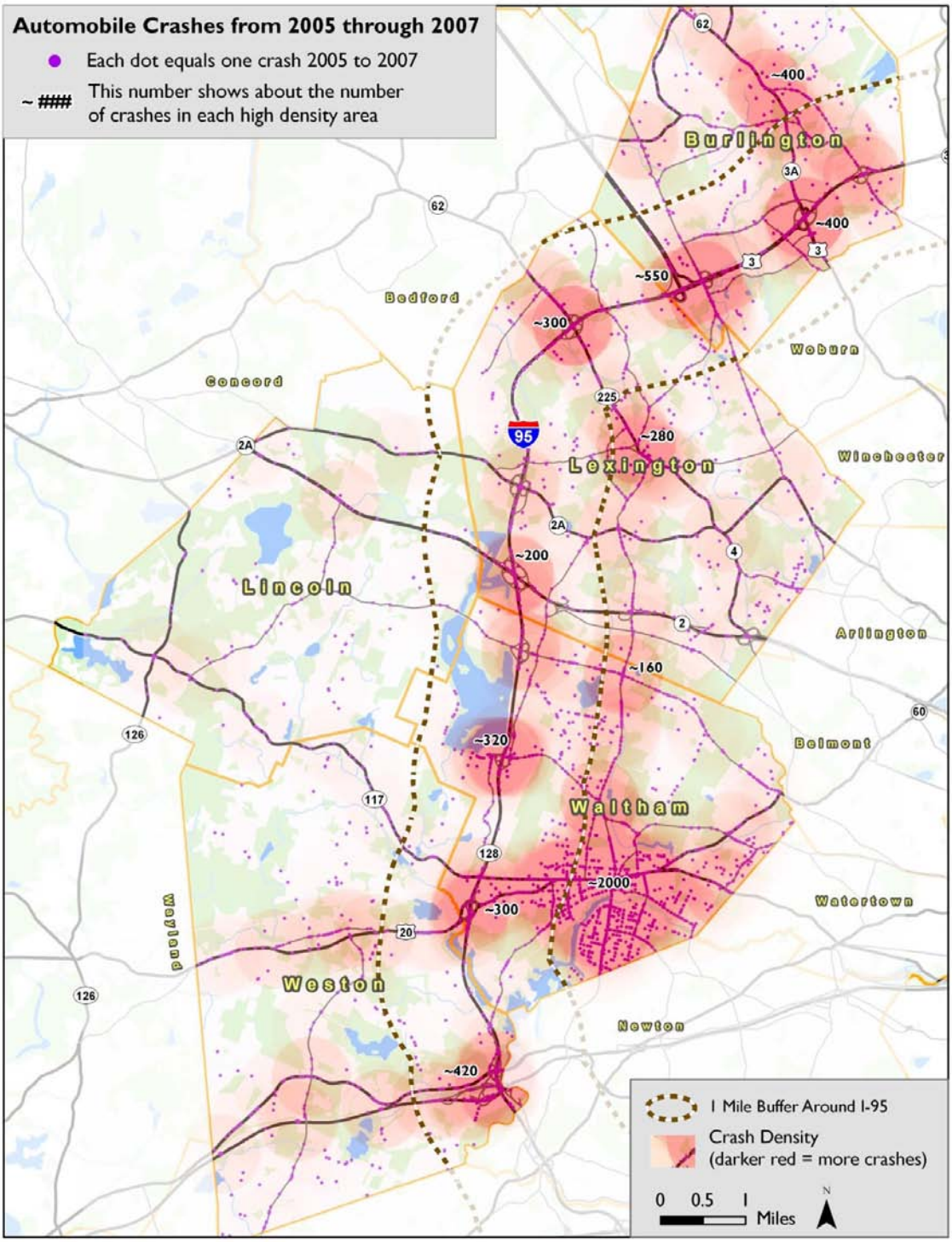
It is noteworthy that more crashes take place off the highway, on other roadways in the communities than on Route 128 itself. This information does not reflect crash severity, which would be expected to be more severe for crashes on high speed facilities.

A more detailed safety analysis will be needed as follow up to this Plan in order to determine whether there are design changes and other infrastructure improvements needed to reduce the number and severity of crashes. Corridor changes which reduce congestion and reduce the number of auto trips made overall will also result in safety improvements in the corridor.

Figure 5 Accident on Route 128

Source: Truck Accidents360.com

Figure 6 Recorded Crashes between 2005 and 2007



Transit Service in the Corridor

There are 36 public and private routes operating along the 128 Central Corridor as shown in Table 3. These services need to be better coordinated. The land that comprises an estimated half mile buffer along Route 128 is approximately 19 percent of the total land area of the five municipalities. Many residents and jobs are within a 10 minute walk of transit, but a very small percentage of the travel in the corridor is currently made by transit. In order to be effective, transit use requires good connections to desired destinations, with walking access to and from the stops, as well as trip times and costs comparable to driving. To improve service, it's necessary to change the transit service characteristics in the area as well as the land use patterns, but also ensure their compatibility.

Table 3 Number of Public and Private Routes in the 128 Central Corridor

Number of Routes	Type of Operation
13	MBTA Bus Routes
3	128 Business Council Shuttles
1	Lowell RTA Shuttle
4	Employer Shuttles
3	Community Shuttles/Buses
1	Residential Development Shuttle
1	Private Bus
9	Hotel Shuttles
1	Commuter Rail Line

Figure 7 128 Business Council Shuttle

Source: www.mit.edu

Appendix A, Transportation and Employment in the Central Corridor, is a map depicting all MBTA bus routes and other bus and shuttle services within the Route 128 Corridor Communities. In addition to the MBTA, bus services include Lexpress, the Burlington B, and the Lowell RTA. Lexpress connects to the Burlington B and the Lowell RTA. The Route 128 Businesss Council runs the Alewife and Waltham Shuttles an example of which is shown in Figure 7, 128 Business Council Shuttle. Broadly speaking, these services cover Burlington, Lexington and Waltham. Lincoln and Weston are served, but to a much lesser extent.

These transportation services provide pick up and drop services to major employers or areas with concentrated employment. An example of an MBTA bus is shown in Figure 8. The Lahey Clinic, Hanscom Air Force Base and MIT Lincoln Labs run their own commuter shuttles. Appendix B, Transportation Services in the Central Corridor, shows that the majority of transportation services are public and that a large component are for commuters. Most of these services provide access outside of the corridor (e.g., to Alewife Station), are fixed routes and offer weekday service.

Figure 8 MBTA Bus

Source: 128 Business Council

Table 4, Number of Public and Private Routes Operating inthe 128 Central Corridor, summarizes the number of public and private routes operating along the Corridor. Shuttle Trips Operating in the Route 128 Study Corridor, there are over 800 inbound and outbound bus and shuttle trips taking place throughout the corridor on an average weekday. The shuttle and bus routes in this table are the same as those in Appendix B. The number of AM and PM peak trips are basically the same with fewer trips taking place Mid-Day. The lowest number of trips is during the Off-Peak period.

Table 4 Number of Bus and Shuttle Trips in the Route 128 Central Corridor

		Departures									
		AM Peak (6am - 10:59am)		Mid-Day (11am - 3pm)		PM Peak (3:01pm -7pm)		Off-Peak (7:01pm - 5:59am)		Total Number of Trips	
	Days of Service	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Shuttle Route											
128 Business Council - Alewife Shuttle	Weekday (Mon. - Fri.)	0	11	0	0	14	0	2	0	16	11
128 Business Council - Waltham Shuttle	Weekday (Mon. - Fri.)	0	3	0	0	3	0	0	0	3	3
128 Business Council - Windsor Village	Weekday (Mon. - Fri.)	10	0	0	0	0	7	0	1	10	8
Avalon Shuttle	Weekday (Mon. - Fri.)	6	6	0	0	8	8	1	1	15	15
Bedford Local Transit	Thursday Only	0	1	1	0	0	0	0	0	1	1
Lahey Clinic Employee Shuttle	Five shuttles are run on a continuous service between parking lot and Lahey Clinic from 5am to 9pm.										
MIT Lincoln Labs Shuttle	Weekday (Mon. - Fri.)	2	2	2	2	2	2	2	2	6	6
Shire Pharmaceuticals Shuttle	Weekday (Mon. - Fri.)	3	3	3	3	3	3	4	4	13	13
Bus Route											
62	Weekday (Mon. - Fri.)	8	7	4	5	6	8	3	2	21	22
	Saturday	3	4	4	4	4	4	1	0	12	12
70	Weekday (Mon. - Fri.)	15	15	10	11	15	15	15	15	55	56
	Saturday	7	10	18	18	18	18	15	13	58	59
	Sunday	5	7	12	13	13	14	11	8	41	42
70A	Weekday (Mon. - Fri.)	8	8	4	4	7	7	1	1	20	20
	Saturday	4	5	5	6	6	6	2	0	17	17
76	Weekday (Mon. - Fri.)	8	8	4	4	7	7	4	3	23	22
170	Weekday (Mon. - Fri.)	0	2	0	0	2	0	0	0	2	2
350	Weekday (Mon. - Fri.)	10	2	4	4	10	10	5	4	29	30
	Saturday	5	6	4	4	4	4	4	5	17	19
	Sunday	3	3	4	5	4	4	0	0	11	12
351	Weekday (Mon. - Fri.)	0	6	0	0	7	0	0	0	6	7
352	Weekday (Mon. - Fri.)	8	0	0	0	0	11	0	3	8	14
505	Weekday (Mon. - Fri.)	20	12	0	0	11	16	1	1	32	29
553	Weekday (Mon. - Fri.)	7	6	4	4	4	4	0	1	15	15
	Saturday	5	5	4	4	4	4	0	0	13	13
554	Weekday (Mon. - Fri.)	5	5	4	4	4	4	1	1	14	14
	Saturday	4	5	4	4	4	4	1	0	13	13
556	Weekday (Mon. - Fri.)	7	5	4	4	4	5	1	0	16	14
558	Weekday (Mon. - Fri.)	4	3	2	3	5	4	0	0	11	10
Burlington B-Line	Weekday (Mon. - Fri.)	0	20	0	21	0	16	0	0	0	57
Cavalier Coach Trailways	Weekday (Mon. - Fri.)	11	7	0	0	1	11	7	2	19	20
Hanscom Field/Lincoln Labs Subscription Line	Weekday (Mon. - Fri.)	2	0	0	0	0	2	0	0	2	2
Lexpress	Weekday (Mon. - Fri.)	0	24	0	27	0	18	0	0	0	69
Lowell RTA - Route 14 'Burlington/Lahey'	Weekday (Mon. - Fri.)	4	4	5	5	4	3	0	0	13	13
	Saturday	2	2	2	3	2	1	0	0	6	6

Appendix B shows that the bus and shuttle services in the Route 128 Central Corridor are for both commuter and residential needs. Many of the buses and shuttles provide service outside the Route 128 Corridor and service Alewife Station. The majority of the services are provided by the MBTA for the public. A few services are to major employers such as the Lahey Clinic, Hanscom Field and Lincoln Labs. Most of the services are in Burlington, Lexington or Waltham. Only one service accesses Weston. With the exception of Lexpress, which has a flagged route component, all routes are fixed routes.

The existing shuttles and buses servicing the Route 128 Corridor could be better coordinated and there is potential for service consolidation. Developing point-to-point express shuttles that enhance capacity from activity hubs to centers of employment, transit or shopping as well as evaluating the demand for serving reverse commutes should be evaluated. Aggressive marketing and moderate fares will contribute towards long-term use of shuttle and bus routes. Subsidies from area employers and the state would enable moderate fares. Providing incentives to purchase monthly passes instead of single one-way or round-trip rides would be a factor in long-term shuttle and bus usage.

The length of time for a one-way trip varies greatly. A one-way trip can be as short as 5 minutes or as long as 70 minutes. In general, trips take about 30-50 minutes. The majority of the buses and shuttles provide service between Monday through Friday. The majority of bus and shuttle fares range between $1.00 to $1.50. Only two services are free, the Lahey Clinic Employee Shuttle and the MIT Lincoln Labs Shuttle. The more expensive services, the 128 Business Council's Windsor Village's daily pass and Cavalier Coach Trailways, range between $4.00 to $6.00.

MBTA Buses

According to Table 5, Weekday Boardings, there are 13 MBTA bus routes that provide service within and through the Route 128 Corridor Plan area. At over 4,600 weekday boardings, Route 70 has the highest ridership. Route 70 provides service between Cedarwood, Waltham and Central Square, Cambridge. Routes with heavy ridership also include Route 70A (North Waltham to University Park, Cambridge), Route 350 (North Burlington to Alewife Station), and Route 62 (Alewife to the Bedford VA Hospital). Riders on Route 553 can directly access the Brandeis/Roberts station stop and riders on routes 70, 70A, 170, 505, 553, 554, 556, and 558 can directly access the Waltham station stop on the Fitchburg Line at Moody Street or Roberts.

Table 5 Weekday Boardings for MBTA Bus Routes within Corridor Communities

Route #	Route	Weekday Boardings	Saturday Boardings	Sunday Boardings
62	Alewife to Bedford VA (Lexington)	1,122	-	-
62/76	Alewife to Bedford VA via Hanscom AFB (Lexington)	-	459	-
70	Cedarwood (Waltham) -Central Sq, Cambridge	4,654	4,030	2,847
70A	North Waltham to University Park, Cambridge	2,032	1,347	-
170	Oak Park to Dudley Station (Burlington, Waltham)	27	-	-
350	North Burlington – Alewife Station (Burlington)	1,344	731	361
351	Oak Park to Alewife Station (Burlington)	145	-	-
352	Burlington to State Street	377	-	-
505	Waltham Center to Federal and Franklin Sts.	896	-	-
553	Roberts (Waltham) to Federal and Franklin Sts.	662	244	-
554	Waverly Square to Federal & Franklin Sts. (Waltham)	659	195	-
556	Waltham Highlands to Federal and Franklin Sts.	462	-	-
558	Riverside to Federal and Franklin Sts (Waltham)	332	-	-

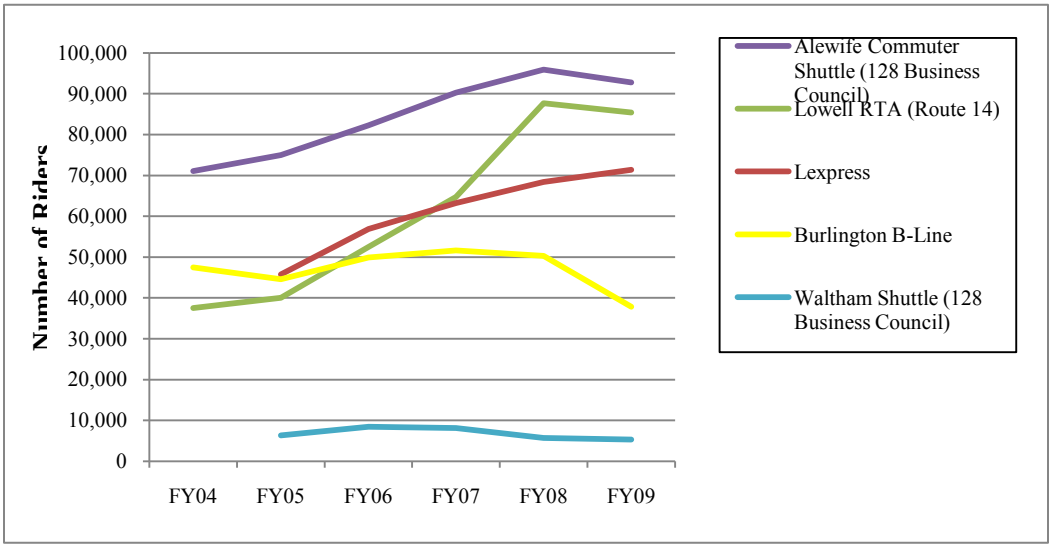
Source: MBTA Ridership and Service Statistics, Twelfth Edition, 2009.

Other Transit Services

In addition to the MBTA, there are other bus and shuttle services in the Route 128 Corridor Plan area. The Route 128 Business Council runs the Waltham and Alewife Commuter Shuttles. The Towns of Lexington and Burlington operate Lexpress and the Burlington B-Line respectively. The Lowell Regional Transit Authority (RTA) runs 'Burlington/Lahey' Route 14. In fiscal year 2009, over 292,700 riders utilized these services.[1] Although there was some decline in ridership between fiscal years 2008 and 2009, total ridership increased by about 38 percent between fiscal years 2005 and 2009. The Lowell RTA's 'Burlington/Lahey' Route 14 had the most significant increase (113 percent) during this time period. The ridership for these services is shown in Figure 9, Annual Ridership of Transportation Services in the Route 128 Corridor.

[1] A Fiscal Year is defined as June 30 to July 1.

Figure 9 Annual Ridership of Transportation Services in the Route 128 Corridor



The 128 Business Council operates on a calendar year. For consistency, Fiscal Year numbers (June 30 to July 1) were used. Boardings are not available in FY04 for Lexington Lexpress and the Waltham Shuttle.

Other transportation services in the Route 128 Corridor Plan area include:

The Bedford Local Transit (BLT)

The Bedford Local Transit (BLT) is the Town of Bedford's public transportation service. The BLT offers scheduled fixed runs to stops in Burlington.

Route 128 Business Council Shuttles

The Route 128 Business Council also runs shuttle services from Windsor Village in Waltham to Alewife Station in Cambridge.

Cavalier Coach Trailways

In January 2009, Cavalier Coach Trailways started a Northborough to Boston via Route 20/Boston Post Road (Marlborough, Sudbury, Wayland and Weston) as a demonstration project. An average of 40-50 daily riders use this route. The future plans of Cavalier Coach are uncertain and there is a possibility that the company may consolidate with its other route (Marlborough to Boston).

Hanscom Field/Lincoln Labs Subscription Bus

Departing from Exit 5 on Route 3 from Nashua, New Hampshire, the Hanscom Field/Lincoln Labs Subscription Bus stops at MIT Lincoln Labs and Hanscom Field. This system went on-line in February 2009. Average daily ridership is about 40 riders. Employees subscribe to this service which is about $200 per month. The service is reimbursed by Commuter Checks which are, in turn, reimbursed fully by the Hansom Air Force Base shown in Figure 9. MIT Lincoln Labs contributes $75. The level of ridership will determine whether this service will continue.

Table 6 Hanscom Air Force Base

Source: http://www.ll.mit.edu

Lahey Clinic Employee Shuttle

The Lahey Clinic Medical Center in Burlington is the largest employer in the study area. There are an estimated 2,200 – 2,500 day shift employees at the Lahey Clinic's main campus at 41 Mall Road. The Lahey Clinic provides its own shuttle service for employees that utilize a 400-space off-site parking lot leased from Northeastern University on South Bedford Street.

MIT Lincoln Labs Shuttle

There is a daily shuttle that provides service between MIT Lincoln Labs in Lexington and MIT in Cambridge. This shuttle is available to employees, students, sub contractors and families, but not the general public. This service has seen a steady increase in ridership. Ridership in Fiscal Year 2009 was almost 33,000, an increase of sixty-six percent from Fiscal Year 2005.[2]

Hotel Shuttles

The majority of the large hotels in the study area provide complementary shuttle services. Generally, shuttle services are for guests within a 3-5 mile radius of the hotel. The hotels with the greatest number of rooms and employees are located in Burlington and Waltham with a concentration on Winter Street in Waltham. Most of the shuttle trips are to and from area businesses or office parks. In addition, starting in the summer of 2010, the City of Waltham's trolley is utilized to connect the downtown with area hotels on Thursdays, Fridays and Saturdays.

With the exception of the Westin Hotel in Waltham, hotels either do not keep a formal record of the number of trips and passengers or will not disclose this information. However, all hotels indicate that their shuttle service is frequently utilized. The Westin Hotel estimates their shuttle provides service to about 800 guests on a weekly basis. Table 7, Hotels Providing Shuttle Services, lists the hotels surveyed that provide shuttle services.

Table 7 Hotels Providing Shuttles in the Route 128 Corridor

Hotel Name	Address	Rooms
Holiday Inn Express	385 Winter St, Waltham	108
Marriott Courtyard	387 Winter Street, Waltham	117
Hyatt Summerfield Suites	54 Fourth Ave, Waltham	135
Hyatt Summerfield Suites	2 Van De Graaff Drive, Burlington	150
Hilton Garden Inn	5 Wheeler Road, Burlington	179
Aloft and Element (Starwood)	727 Marrett Road, Lexington	260
Doubletree Guest Suites	550 Winter Street, Waltham	275
Westin Hotel	70 3rd Ave, Waltham	346
Marriott	1 Mall Road, Burlington	412

Source: Dun and Bradstreet database and phone calls to hotels in November 2009 and May 2010.

[2] A Fiscal Year is defined as September 30 to October 1.

Fitchburg Line

As seen in Figures 10 and 11, the Fitchburg Line is the one commuter rail line that traverses through the Route 128 Corridor Plan Area. Approximately one-third of the Fitchburg Line stops are in the study area. The Fitchburg Line traverses east to west through Lincoln, Weston and Waltham in the southern end of the Route 128 Corridor study area. Brandeis/Roberts Station in Waltham and Kendal Green Station in Weston are the two closest station stops in proximity to Route 128.

Figure 10 Fitchburg Rail Line

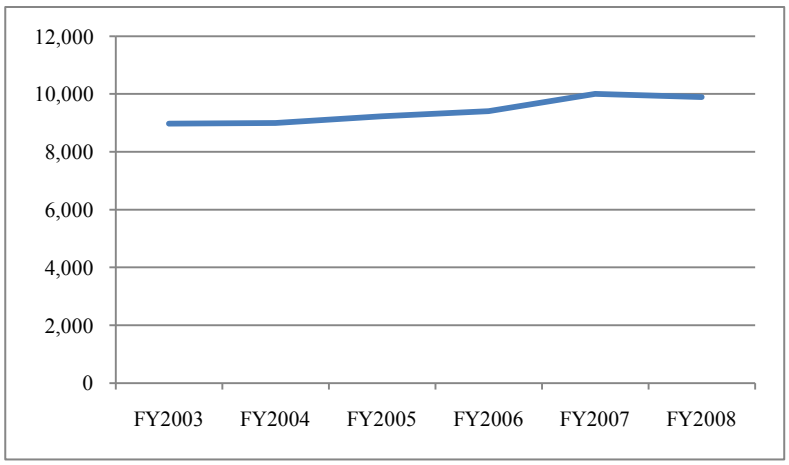
Source: woodlandestates.com

Figure 11 Waltham Commuter Rail Station

Source: wikipedia.com

Overall ridership on the Fitchburg Line has steadily increased between FY2003 and FY2008. According to Figure 12, Fitchburg Rail Boardings, there were an estimated 9,900 weekday boarders in FY2008, a ten percent increase from FY2003.

Figure 12 Fitchburg Rail Boardings (Typical Weekday, By Route) Total



[1] Fiscal Year is June 30 to July 1.
[2] A Boarding is the sum of inbound and outbound trips.

Source: MBTA Ridership and Service Statistics, Twelfth Edition, 2009 and Eleventh Edition, 2007.

Consistent with the Fitchburg Line weekday service, station stop boardings has also steadily increased in the study area. Although the station stop boardings in the study area comprise approximately 25 percent of the total line service, the total inbound weekday boardings vary for each line. At approximately 630 and 560 boardings respectively in FY2008, the Brandeis/Roberts and Waltham stops are the two lines with the greatest number of weekday boardings. Silver Hill and Hastings have the lowest number of weekday boardings at 15 and 40 respectively. Tables 8 and 9 and Figure 13 illustrate the boarding trends of the Fitchburg Rail Line.

Table 8 Fitchburg Rail Boardings - Annual Average (Typical Day, By Route)

	Weekday			Saturday			Sunday		
	Inbound	**Outbound**	**Total**	**Inbound**	**Outbound**	**Total**	**Inbound**	**Outbound**	**Total**
FY2008	5,020	4,878	**9,898**	1,450	1,472	**2,922**	1,093	1,106	**2,199**
FY2007	5,088	4,921	**10,009**	1,548	1,597	**3,145**	1,333	1,241	**2,574**
FY2006	4,867	4,540	**9,407**	1,410	1,449	**2,859**	1,267	1,150	**2,417**
FY2005	4,769	4,462	**9,231**	1,550	1,522	**3,072**	1,234	1,100	**2,334**
FY2004	4,572	4,423	**8,995**	1,677	1,643	**3,319**	1,324	1,247	**2,571**
FY2003	4,494	4,477	**8,970**	1,644	1,634	**3,279**	1,279	1,237	**2,516**

FY or Fiscal Year is June 30 to July 1.
Table 6 is based on an Annual Average whereas Table 7 and Figure 13 is based on data collected in a single month. As a result, Weekday Inbound boarding numbers will not exactly match.

Source: MBTA Ridership and Service Statistics, Twelfth Edition, 2009.

Table 9
Typical Weekday Station Boardings (Inbound) at Fitchburg Line Commuter Rail Stations within the Corridor Communities

	Feb 2001	**Feb 2002**	**Feb 2003**	**Feb 2004**	**Feb 2005**	**April 2006**	**June 2007**	**Feb 2008**
Lincoln	284	318	300	219	226	273	251	275
Silver Hill	19	15	13	13	6	6	10	15
Hastings	34	33	25	29	43	22	22	38
Kendal Green	106	107	80	70	98	140	139	165
Brandeis/Roberts	434	406	474	447	437	481	504	629
Waltham	521	513	542	397	437	513	526	556
Study Area Total	**1,398**	**1,392**	**1,434**	**1,175**	**1,247**	**1,435**	**1,452**	**1,678**
Fitchburg Line Total	**4,113**	**4,268**	**4,045**	**3,660**	**4,345**	**4,938**	**5,583**	**5,827**

Table 6 is based on an Annual Average whereas Table 7 and Figure 13 is based on data collected in a single month. As a result, Weekday Inbound boarding numbers will not exactly match.

Source: MBTA Ridership and Service Statistics, Twelfth Edition, 2009.

Figure 13
Typical Weekday Station Boardings (Inbound) at Fitchburg Line Commuter Rail Stations within the Corridor Communities

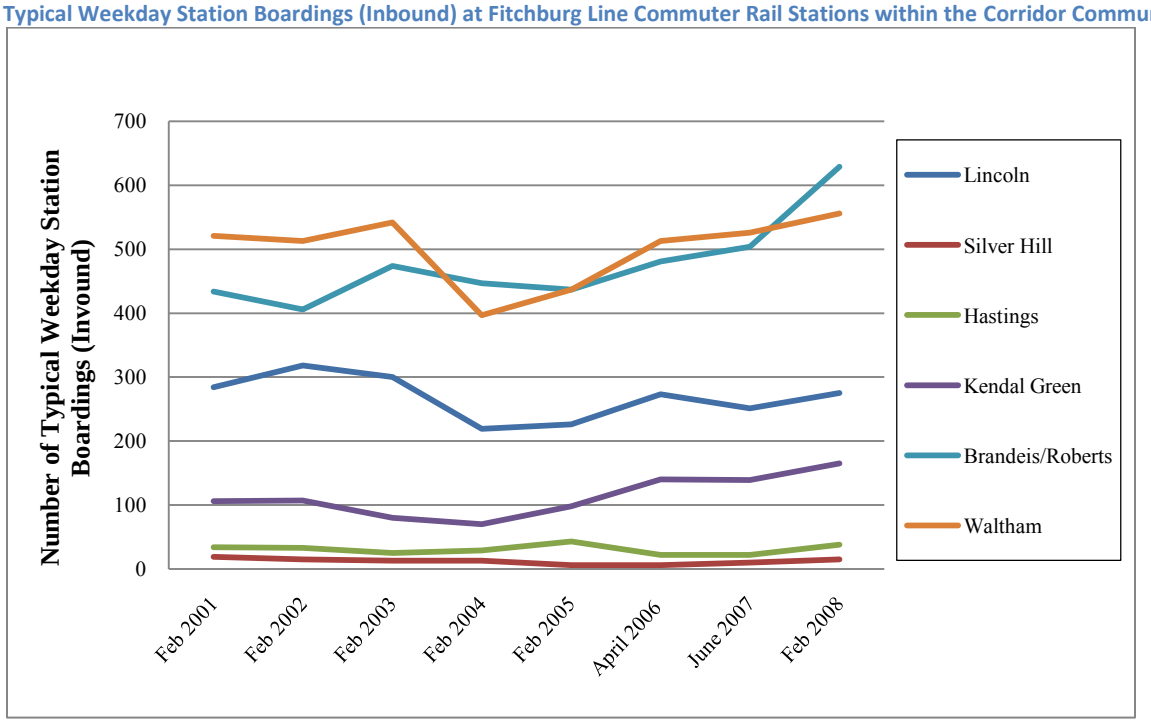


Table 8 is based on an Annual Average whereas Table 8 and Figure 13 is based on data collected in a single month. As a result, Weekday Inbound boarding numbers will not exactly match.

Source: MBTA Ridership and Service Statistics, Twelfth Edition, 2009.

According to the MBTA's North Side Commuter Rail Parking Inventory conducted in August 2008, there are over 340 auto parking spaces along the 6 stops. Of these parking facilities, 70 are owned by the MBTA at the Brandeis/Roberts stop and the remainder is commuter parking spaces. At 161, the Lincoln stop has the highest amount of commuter parking spaces.

b. Corridor Travel Patterns

In order to get some idea of travel patterns in the corridor, Journey-to-Work information from the 2000 Census was examined. Journey to Work provides a snapshot of how and where residents traveled to work in April 2000. Information is sorted by residence, and by workplace. Unfortunately, more recent data is not available (comparable Journey-to-Work data will not be collected for the 2010 Census, and the new survey that collects comparable information, the American Community Survey , does not yet have a large enough sample size to provide a comparable level of intercommunity detail). However, commuting patterns have not changed dramatically over the past decade.

Based on the 2000 snapshot, many people who live in the five corridor communities work in the corridor as well (35.6%), but **most of those who work in the corridor live outside (79.5%)**. Since there were many more workers (118,864) than working residents (68,423) in the 5 corridor communities it is not surprising that most workers need to come from outside the corridor, and this need to travel long distances is reflected in the high traffic volumes on Route 128 and its connecting roadways. Compared to other regions with high employment in Massachusetts, workers commute long distances to the Route 128 Central Corridor.

Journey to Work patterns are summarized in the tables below by corridor communities and travel corridors (the patterns for each community are shown in Appendix C, Community Level Journey to Work Data).

Table 10, Where Residents Worked and Where Employees Came From, shows where residents of the five corridor communities worked in 2000. Almost 36% of the working residents of the corridor worked in one of the five communities, with more than half of those working in Waltham. The rest of the workplace locations have been organized by travel corridors, based on the nearest major highway, or, inside Route 128, whether MBTA rail transit would be available in the workplace community. Outside the corridor, workplaces are scattered all around Massachusetts, with the area served by Route 128 South, including all of southeastern Massachusetts, Cape Cod, and Rhode Island accounting for the most auto-oriented workplaces at just over 11 percent.

Table 10 also depicts where employees in the five corridor communities come from, again organized by communities and travel corridors. The number of employees in the five communities (118,864) is much greater than the number of resident workers (68,423) so many employees travel to work in the corridor from all around Massachusetts and neighboring states. Only 20.5% of workers live in one of the corridor communities. Over 16% come from communities to the north and east using Route 128 to the north, and more than 10% of workers access the area using Route 3 north, Route 128 to the south, and the Turnpike from the west. Despite their proximity, very few workers come from Bedford or Wayland.

Table 10 Where Residents Worked and Where Employees Came from in 2000

	Where Residents in the Corridor Worked		Where All Employees in the Corridor Came From	
Workplace Community/Corridor	**Residents**	**Percent**	**Workers**	**Percent**
Burlington	4,781	6.99%	4,270	3.59%
Lexington	4,679	6.84%	4,875	4.10%
Lincoln	650	0.95%	864	0.73%
Waltham	12,919	18.88%	12,790	10.76%
Weston	1,354	1.98%	1,584	1.33%
5 Corridor Communities - Total	**24,383**	**35.64%**	**24,383**	**20.51%**
Bedford	2,552	3.73%	1,206	1.01%
Wayland	230	0.34%	831	0.70%
Route 3 North	2,792	4.08%	13,475	11.34%
Route 128 North	5,678	8.30%	19,602	16.49%
Route 128 South	8,075	11.80%	17,135	14.42%
MA Turnpike West	3,551	5.19%	12,151	10.22%
Route 2 west	1,870	2.73%	6,116	5.15%
Route 2 east	1,006	1.47%	4,106	3.45%
Within Route 128 – (transit available)[1]	17,790	26.00%	18,491	15.56%
Other	496	0.72%	1,368	1.15%
Total	**68,423**	**100.0%**	**118,864**	**100.0%**

[1] Transit available communities include Boston, Brookline, Cambridge, Chelsea, Everett, Malden, Medford, Melrose, Newton, and Somerville.

Most of the jobs and residences in the corridor are accessible only by car, and in 2000 only about 8% of all residents traveled to work by transit (84% drive). Burlington residents were the most likely to drive (more than 90%) and the least likely to take transit (around 3%), while 10% of Waltham's residents took transit to work and "only" 80% of Weston's residents drove (they had the largest percentage of working at home).

However, twenty six percent of residents of the corridor worked in communities in 2000 that they could access by transit. Since the residences of corridor workplaces are more spread out, less than sixteen percent of those who worked in the corridor lived in communities with good transit services that they could use to travel to their jobs.

Appendix A, Transportation and Employment in the Central Corridor, illustrates areas with the highest number of jobs. Regions that have high concentrations of employees are all located close to Route 128. Downtown Waltham has concentrated employement. Corridors with concentrated employment include Route 3 and the Middlesex Turnpike in Burlington, Hartwell Avenue and Hayden Avenue in Lexington as well as Spring, Winter and Lexington Streets in Waltham. The widespread distribution of employees and workplaces in Burlington, Lexington and Waltham indicates there is a need for bus and shuttle services throughout the Route 128 Corridor Communities.

According to the Dunn and Bradstreet business information database, there are approximately 9,100 employers in the five communities. The largest employer in the Route 128 Corridor Plan study area is the Lahey Clinic, Inc. in Burlington with approximately 4,500 employees followed by MIT Lincoln Labs in Lexington with an estimated 2,500 employees. Burlington and Waltham have the most jobs, followed by Lexington. Much of the newer employment in Waltham, Lexington and Burlington is in planned industrial and office parks located close to Route 128.

Zip Code Map of 128 Central Corridor

To better understand 128 Corridor commuting characteristics, over 8,000 residential zip codes of employees who work in the 128 Corridor Study Area were obtained and mapped. The residential zip codes represent 18 major employers in the 128 Corridor Study area. To keep employer information confidential, the residential zip codes were mapped as a composite of all 18 employers. Table 11 lists the names of the employers and the percentage of residential zip codes comprising the total.

Figure 14, Place of Residence of Employees who Work in the 128 Central Corridor, illustrates that employees within the 128 Corridor come from all locations in Massachusetts, but are primarily within the 495 belt. A heavy concentration of residents are northerly-oriented, a significant number residing in Billerica, Burlington, Chelmsford, Bedford, Worburn, Reading and Acton. Almost 11 percent of employees in the 128 Corridor commute from southern New Hampshire, the majority from the Nashua area, also consistent with the northerly-oriented pattern. Employers in the 128 Corridor also reside in other New England states with concentrations in York, Maine, Woodstock, CT, as well as the Woonsocket and Kingston areas of Rhode Island. Slightly more than nine percent of employees who work in the 128 Corridor reside in the corridor.

Table 11 Major Employers in the 128 Corridor and Percentage of Total Residential Zip Codes

Employer	Company Type	Street	Municipality	Zip	Source	Year of Information	Percentage of Zip Codes
Adobe	computer software	21 Hickory Drive	Waltham	02451	MAPC Survey	2010	1
AstraTech	dental implants and medical devices	590 Lincoln Street	Waltham	02451	128 Business Council	2010	2
Astra Zeneca	pharmaceutical	35 Gatehouse Lane	Waltham	02451	128 Business Council	2010	5
Fersenius Medical Care	kidney dialysis services	920 Winter Street	Waltham	02451	128 Corporate Alliance	2010	10
Hanscom Air Force Base	US Air Force Base and supports companies related to the Department of Defense	border of Bedford, Lexington, Lincoln	Bedford, Lexington, Lincoln	01731	TransAction	2008	16
ImmunoGen, Inc.	pharmaceutical	830 Winter Street	Waltham	02451	128 Corporate Alliance	2010	2
Intuit	computer software	100 Fifth Avenue	Waltham	02451	128 Business Council	2010	1
Lahey Clinic	medical facility	41 Mall Road	Burlington	01803	MAPC Survey	2010	12
MassMedical	medical oversight	860 Winter Street	Waltham	02451	MAPC Survey	2010	2
MIT Lincoln Labs	defense research	244 Wood Street	Lexington	02420	TransAction	2010	12
Multi Plan	health care organization	1100 Winter Street	Waltham	02451	128 Business Council	2010	5
National Grid	public utility	40 Sylvan Road	Waltham	02451	128 Corporate Alliance	2010	13
Perkin Elmer	pharmaceutical	940 Winter Street	Waltham	02451	128 Corporate Alliance	2010	2
QuinetiQ/North America	defense technology and security	350 Second Avenue	Waltham	02451	128 Corporate Alliance	2010	9
Sun Mircrosystems	computer software	45 Network Drive	Burlington	01803	TransAction	2008	7
Synta Pharmaceuticals, Corp	pharmaceutical	45 Hartwell Avenue	Lexington	02421	TransAction	2008	1
Varian Vacuum Technologies	scientific instruments	121 Hartwell Avenue	Lexington	02421	TransAction	2008	1
Westin Waltham	hotel	70 Third Avenue	Waltham	02451	128 Corporate Alliance	2010	2

Commutershed Analysis

MAPC's Commutershed Analysis in the128 Central Corridor depicts a higher population of residents coming from outying areas to work in this corridor compared to other corridors in Massachusetts. The number of high skilled and high wage jobs in the corridor is a main factor that attracts employees from various locations in the state. Within the 128 Central Commutershed centers of major employment are dispersed as seen in Figure 15, 128 Central Corridor Commutershed. For comparative purposes, Appendix D, Commutersheds in Massachusetts, contains the commutersheds, or areas from which a workforce commutes to, for the nine employment clusters in Massachusetts.

Figure 14 Place of Residence of Employees who Work in the 128 Central Corridor

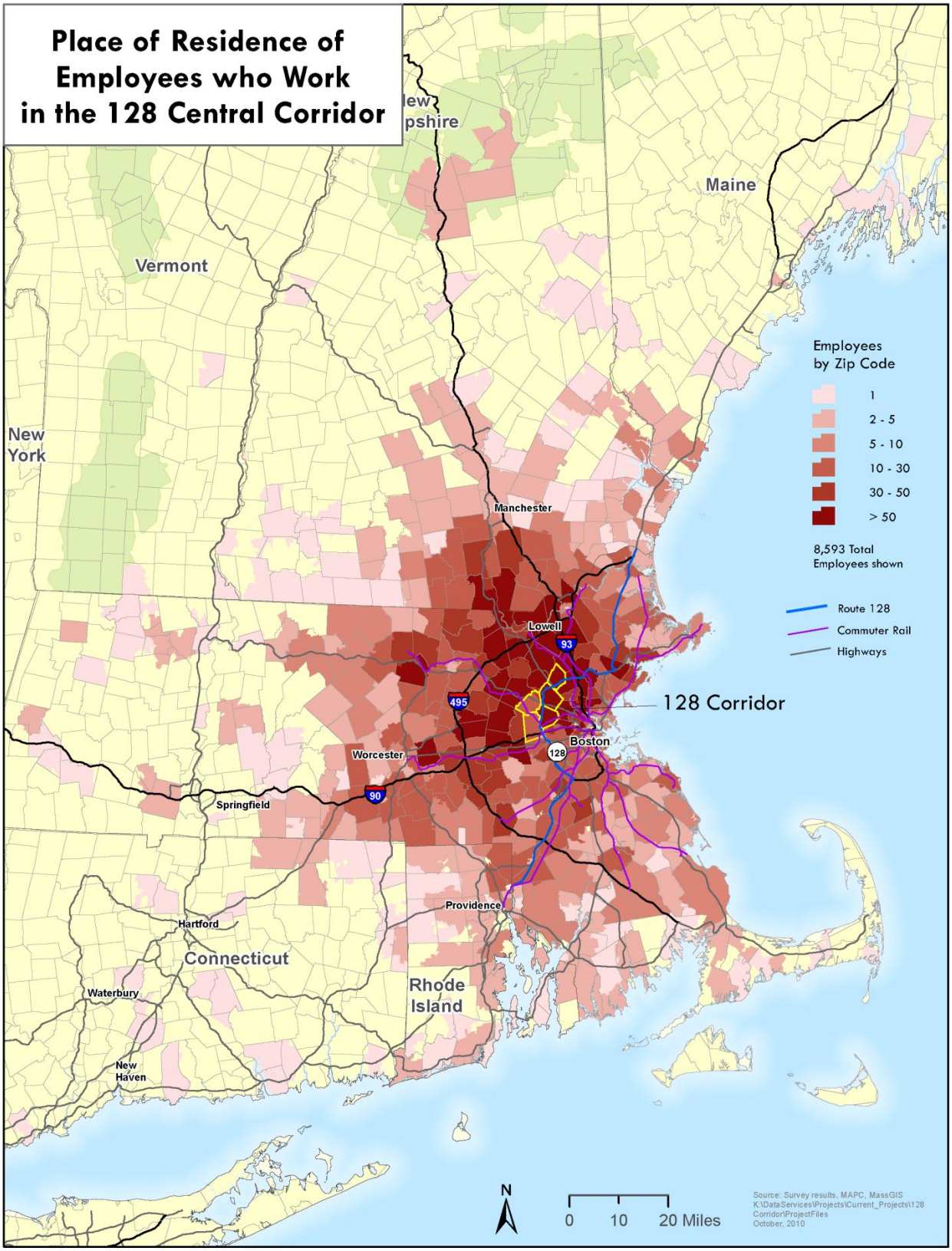
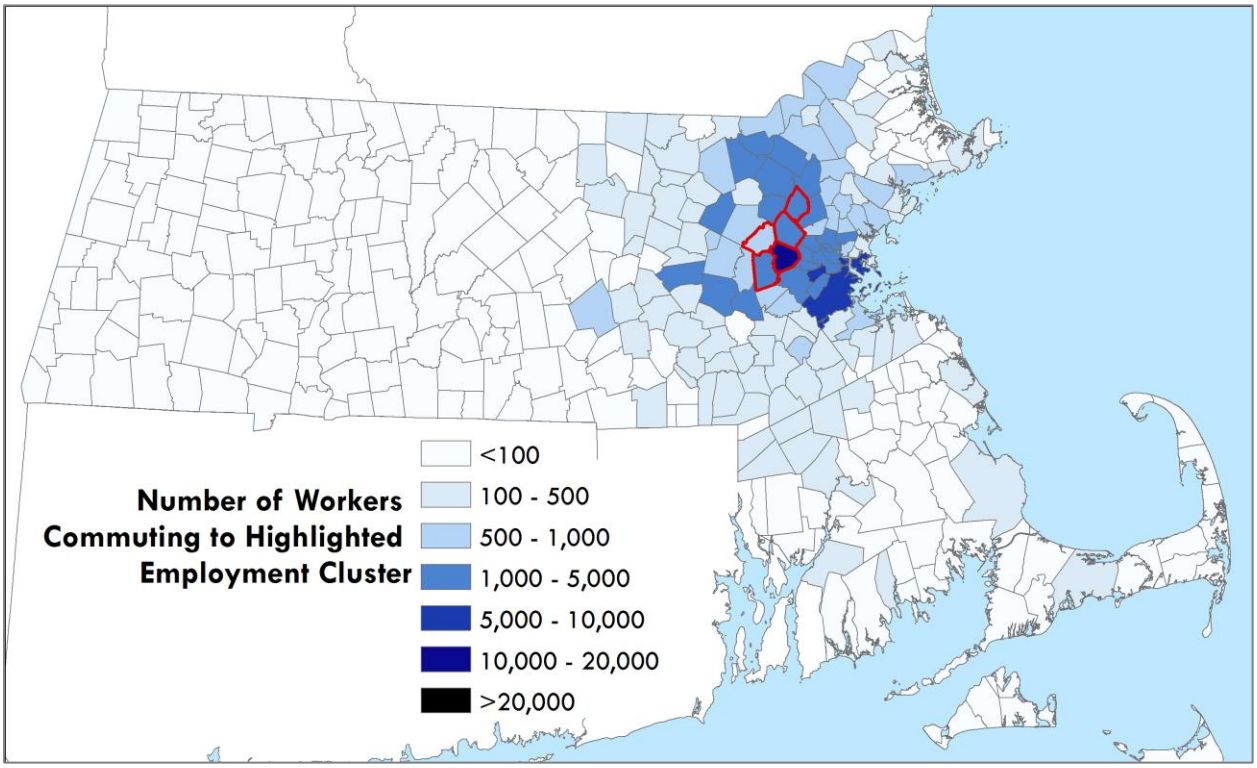


Figure 15 128 Central Corridor Commutershed



Source: Metropolitan Area Planning Council (MAPC), Data Servives, June, 2010.

Table 12, Vehicle Miles Traveled and Commuting Distances, shows that among the corridor communities, Waltham has the highest number of total daily passenger miles (1,064,224), yet has the lowest vehicle ownership per household (1.5) and daily VMT per household (46 miles). Waltham's residents have the shortest average commute distances (8.7 miles). On the other hand, workers who drive to Waltham have among the higher commute distances (15.7 miles). Weston and Burlington have the highest levels of vehicular ownership per household (2.2 and 2.1 respectively) as well as the highest VMT per household (69 and 64 miles respectively). Burlington residents who commute drive the shortest distances (10.5 miles) whereas commuters to Burlington drive the furthest (19.6 miles).

At 1.9 vehicles per household, the corridor average exceeds that of the MAPC region (1.5) and Massachusetts (1.6). Daily VMT per household (58 miles) in the corridor also exceeds that of the MAPC region and the state (47 and 54 respectively). Alternatively, the average commute distance for residents and commuters for the corridor average is comparable to the MAPC region and Massachusetts.

Table 12 Vehicle Miles Traveled and Commuting Distances

Municipality	Total Daily Passenger Miles	Households 2000[1]	Vehicles per Household	Daily VMT per Household	Average Commute Distance (residents)	VMT per Auto Commuter (residents)	Average Commute Distance (workers)	VMT per Auto Commuter (workers)
Burlington	542,484	8,289	2.1	64	10.5	9.9	19.6	19.0
Lexington	639,197	11,110	1.9	57	12.1	11.2	15.7	15.4
Lincoln	151,010	2,790	1.7	55	12.4	12.0	10.3	10.9
Waltham	1,064,224	23,210	1.5	46	8.7	8.1	15.7	16.1
Weston	257,700	3,718	2.2	69	17.4	16.6	12.5	11.6
Corridor Average	**530,923**	**9,823**	**1.9**	**58**	**12.2**	**11.6**	**14.8**	**14.6**
MAPC Region	55,694,008	1,192,224	1.5	47	11.1	11.3	14.0	14.2
Massachusetts	130,698,706	2,433,185	1.6	54	13.1	13.0	13.5	13.3

Source: MassGIS Analysis of RMV data and US Census; MAPC analysis of Census 2000.

[1] As defined by the U.S. Census Bureau, a household includes all the people who occupy a housing unit as their usual place of residence.

Route 128 Commuter Survey

Starting in the spring of 2010, employees in the Route 128 Central Corridor study area were asked to complete an on-line internet survey. The survey questions were designed to get a better understanding of commuting patterns along the Route 128 Corridor and how commuters can be encouraged to use public transportation. The on-line survey mirrored the questions employers with 250 or more commuters are legally required to complete and file with the Massachusetts Department of Environmental Protection (MassDEP). This information is used part of an overall program by MassDEP to develop plans and set goals for reducing commuter drive-alone trips. Results from the on-line survey and reports submitted to MassDEP were consolidated resulting in a dataset of ten companies with over 3,200 responses. The companies with the highest participation rates were MIT Lincoln Labs (41 percent), National Grid (19 percent), and Sun Microsystems (16 percent). The details of the survey information are contained in Appendix E, Commuter Survey.

The vast majority of employees (43 percent) start work in the morning between 8am and 9am. The times leaving work are less concentrated and range between the hours of 4pm – 7pm. Most employees (22 percent) responded leaving work between 5pm and 5:30pm. Overall, employees have a fair amount flexibility in their work hours as 52 percent stated they vary their work hours by more than 30 minutes 1-2 days each week. In being able to choose the time to start work, 24 percent reported that they have an hour or more and 34 percent reported having no set time. Employees in the 128 Corridor work full

work weeks. Ninety percent of employees are scheduled to work between 31-45 hours each week and 62 percent are scheduled to work between 36-40 hours per week.

Employees in the 128 Corridor have long commutes, both in distance and in time. One a typical day, 77 percent of employees commute between 16 to 60 minutes one-way. Fifteen percent reported traveling over 60 minutes one-way. Thirty percent of the survey takers reported commuting between 21 to 40 miles one-way.

The vast majority, 94 percent, of the commuters responded that they commute by driving alone. At 3 percent, riding in a 2-person carpool is the second-most frequent way employers commute to work.[3] When asked why they have chosen their commuting method, 42 percent responded that they have done so because of convenience and 36 percent because they have no other commuting option. Cost does not appear to be a significant factor in choosing a commuting method as only 12 percent employees selected this survey response. The primary reasons employees give for driving alone are irregular hours (16 percent), transit schedules/ routes not working (13 percent), needing a car for errands before/after work or during day (13 percent), driving alone taking less time (11 percent), and enjoyment of privacy/preference to drive alone (10 percent).

Eighty-five percent of employees reported that they use an on-site parking lot to park their vehicle. Almost half of the employees reported parking in privately owned lots with permission. Employees also park on public streets (18 percent) or in state Park-and-Ride lots (17 percent). Once parked, cars are rarely used, 71 of employees reported not using their own cars for work-related business during the day.

Overall travel time from home to work (21 percent) and roadway congestion (21 percent) are the primary concerns for employees who drive to work. Although there is heavy reliance on drive alone trips, **survey takers did indicate that if there was availability of nearby transit (31 percent) and frequent service (15), they could be encouraged to commute by public transit**. Commuters also expressed concerns about lack of traffic predictability, personal time and the provision of daycare facilities. The commuters who currently take public transit to get to and from work primarily use the Red Line (25 percent) followed by the commuter rail (15 percent).

c. Land Use Patterns and Zoning

Communities

The five communities that comprise the Route 128 Corridor Plan include a unique mix and dynamic system of adjacent land uses (residential, commercial, retail, office, research and development, as well as nearby colleges). The potential for more intensely developed commercial and industrial areas within the corridor has raised concerns about increased traffic impacts on an already congested highway corridor and the roads leading to the highway interchanges.

Situated primarily along the eastern border of Route 128, Burlington is characterized by its large office and industrial parks. A principal economic center in the region, the town has a diverse range of employment sectors that include professional and technical services, health care, and retail.

[3] Commuters who reported using the bus utilized various routes that include: 43, 47, 57, 70A, 76, 78, 89, 90, 170, 350, 351, 426, 465, 554, and 556.

A mature suburb, Lexington consists of small neighborhood commercial centers, and lower density residential development outside of its centers. Lexington also has highway oriented research and development areas and scattered protected open spaces.

The City of Waltham has a significant number of small to medium-sized high-technology firms as well as an older, dense downtown commercial area. One of the primary economic engines of metropolitan Boston, Waltham is highly developed with commercial, industrial and residential uses and has little new developable land. Growth in Waltham will come from redevelopment of existing sites at higher densities.

Situated beyond the western border of Route 128, the towns of Lincoln and Weston do not have a large base of businesses or industries. Weston has a small commercial center. Considered to be semi-rural, both towns are characterized by low-density residential development and open space. Route 128 in Weston is depicted in Figure 16.

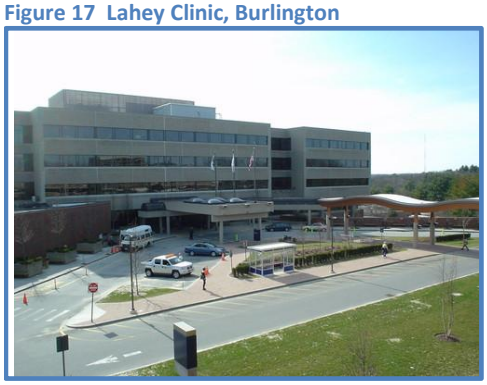
Figure 16 Route 128 in Weston

Source: google.com

Route 128 Corridor

Similar to the communities as a whole, the Route 128 Corridor includes a range of land uses. In Burlington, from the Burlington border traveling south to where Route 128 intersects with Cambridge Street, land is primarily zoned single family residential (between 15,000 - 40,000 square feet)[4]. Continuing westward, between Cambridge Street and Route 3, land north and south of Route 128 is mostly zoned for commercial use. This stretch in Burlington contains the Lahey Clinic (a major medical center depicted in Figure 17), the Burlington Mall (a regional shopping center shown in Figure18) as well as a range of large office and industrial parks.

Figure 17 Lahey Clinic, Burlington



Source: panoramio.com

[4] Massachusetts GIS Database, August, 2007.

Figure 18 Burlington Mall, Burlington

Lexington is predominantly zoned as single family residential (between 15,500 - 30,000 square feet). North of Route 128 to the west of Bedford Street, there is a concentration of land zoned for industrial use. From the intersection of Route 128 and Marrett Road to the Lexington/Waltham border, there are some sizable parcels zoned for commercial use. Lexington's Transportation Component of its 2003 Comprehensive Plan identified Bedford Street/Route 128 as an area with excellent regional highway access but 'significantly underdeveloped' given its location and access. It is an area identified as having significant untapped potential.

Source: www.google.com

Located at the intersection of Route 128 and Route 2, Lexington Technology Park is a regional hub for biotech and technology companies. In late 2009, the Town of Lexington endorsed a plan to expand the Park by 380,000 square feet of space on two development-ready sites. Lexington has a proposed Transportation Management Overlay District (TMOD) along Hartwell Avenue. The TMOD will allow Lexington to collect fees from developers to help fund implementation for infrastructure improvements. Infrastructure improvements do not necessary need to be within the geographic limits of Hartwell Avenue but should have a positive impact on traffic in Hartwell Avenue.

The City of Waltham has commercial use in close proximity to Route 128. An example of commercial development in Waltham, Prospect Hill Park, in Waltham is shown in Figure 19. Areas zoned for commercial use contain a significant number of small to medium-sized high-technology firms. Residentially zoned land is primarily single family (between 5,000-15,000 square feet) and multi-family low density. Where Route 128 traverses the southeastern area of Weston, land is zoned for commercial in the north and single family residential (40,000 – 80,000 square feet) in the south. Although Route 128 does not directly pass through Lincoln, the vast majority of this municipality's land is zoned for residential (80,000 square feet or greater) or agricultural use.

Figure 19 Prospect Hill Park in Waltham

Source: www.google.com

Tables 13 and 14, Current Land Uses and Residential Land Use Categories, depict the breakdown of land use types and land use categories shown in Appendix F, Land Use, both by municipality and within a half-mile buffer along Route 128. An estimated 66 percent of land in the study area can potentially accommodate additional development or redevelopment.

Table 13 Current Land Uses (in acres)

Municipality	Developed; redevelopment or infill possible[1]	Developed; no further development likely[2]	Vacant; potentially developable[3]	Vacant; protected or otherwise undevelopable[4]	Total
Burlington	4,213	420	1,910	1,047	7,589
Lexington	5,046	545	2,646	2,412	10,648
Lincoln	1,439	249	3,212	4,691	9,591
Waltham	5,211	571	1,266	1,760	8,808
Weston	2,860	436	4,045	3,736	11,077
Grand Total	**18,769**	**2,221**	**13,078**	**13,646**	**47,714**
½ mile buffer along Route 128	3,784	967	2,054	2,224	9,029

1 – Examples can include residential, commercial and industrial.
2 – Examples can include highway or cemetery.
3 – Examples can include forest, farmland, or unprotected open space.
4 – Examples can include natural features, wetlands, permanently or protected open spaces.
Tables are not mutually exclusive.
Source: MassGIS, 2005

The residential land in the five communities is primarily zoned for either medium density residential (43 percent) or low density residential (27 percent). Half of the residentially zoned land is within either Lexington or Waltham. Only fourteen percent of the land within a half mile buffer of Route 128 is zoned for residential use.

Table 14 Residential Land Use Categories

Municipality	Multi Family Residential	High Density Residential (lot size < 1/4 acre)	Medium Density Residential (lot size 1/4 - 1/2 acre)	Low Density Residential (lot size 1/2 - 1 acre)	Very Low Density Residential (lot size > 1 acre)	Total
Burlington	121	10	2,602	118	12	2,863
Lexington	222	406	2,812	609	33	4,082
Lincoln	93	0	0	962	346	1,401
Waltham	922	1,648	544	41	13	3,168
Weston	63	0	215	2,165	441	2,884
Grand Total	**1,421**	**2,064**	**6,173**	**3,895**	**844**	**14,397**
½ mile buffer along Route 128	192	327	1,097	406	32	2,053

Tables are not mutually exclusive. Data is based on land use by acreage, not zoning.
Source: MassGIS, 2005

It is important that sustainable land use strategies that support economic development be developed and that mitigation of impacts associated with new development be managed for the Route 128 Central Corridor. The varying Route 128 landscape is depicted in Figures 20-23.

Figure 20 Intersection of Routes 128 and 3 in Burlington

Photo Courtesy of Jon Sachs

Figure 21 Route 128 Approaching Route 20 in Waltham

Source: www.google.com

In addition Burlington and Lexington are designated as Economic Target Areas (ETAs). An Economic Target Area (ETA) is three, or more contiguous census tracts, in one or more municipalities, meeting one of eleven statutory criteria for economic need. ETAs have established partnerships with the Commonwealth and private enterprises to develop economic programs to attract new business.

Figure 22 Route 128 in Burlington

Photo Courtesy of Jon Sachs

Figure 23 Route 128 in Lexington

Photo Courtesy of Jon Sachs

d. Existing Municipal Mitigation Programs

There is a larger concern about how to manage growth and mitigation commitments for associated impacts on a regional basis. A key factor in the ability to accommodate additional commercial and industrial growth in the corridor is developing a mechanism to manage the implementation of impact mitigation. As stated earlier, a goal of this plan is to propose transportation investments and development regulations that support economic growth, while improving multi-modal transportation, reducing traffic congestion and improving mobility in the corridor. This plan proposes recommendations for an equitable procedure for assessing, collecting and utilizing transportation mitigation measures on a regional basis.

The goal of a mitigation program is not simply to address the impacts of development on a reactive project-by-project basis but to both define and mitigate the cumulative impacts of multiple projects and to make infrastructure investments that enable economic development to occur with acceptable impacts in a corridor-wide setting.

A successful corridor-wide mitigation program will need to address measuring impacts on a multi-project basis and developing a fair, transparent and efficient structure for determining project mitigation.

In fall 2009, the town planners of Burlington, Lexington, Lincoln, Waltham and Weston were contacted by phone and asked a series of questions regarding their mitigation requirements. The following is a brief summary. A more detailed write up is included in Appendix G, Mitigation.

Are there procedures in place that require mitigation for developments?
With the exception of Lexington, the municipalities comprising the Route 128 Corridor do not have formal procedures in place to require mitigation from developments. Mitigation for developments is triggered by level of service (LOS) in Lexington.

Are developers required to implement physical improvements (i.e.: sidewalks, signals) for projects of a certain size?
With the exception of Weston, requesting physical improvements is not driven by project size. In Lexington, implementing physical improvements is based on the project's forecasted traffic impact, not project size.

Are businesses required to be members of a Transportation Management Association (TMA)? If so, does the business need to be a certain size or have a specific number of employees?
The requirement of businesses to be members of a TMA varies among the five municipalities. The Waltham City Council may require membership in the Route 128 Business Council only if the project needs a special permit. Membership will be required by the Town of Weston on a project specific basis.

Are developers required to contribute funds for projects of a certain size? If so, how are these funds received and managed?
With the exception of Lincoln, the municipalities do require developers to contribute funds for projects. The Waltham City Council may require a developer to contribute to the City's Traffic Safety and Infrastructure Maintenance Fund. Burlington will encourage developers to make physical improvements rather than receiving funds.

Are there enforcement mechanisms to require developers to implement agreed-upon mitigation?
In Burlington and Weston, a Certificate of Occupancy will not be issued until mitigation has been implemented. In Lexington, developer agreements for large projects are monitored by a traffic study after five years. There will be a penalty if traffic conditions are not met according to the study.

How is by-right development, special permits and local permits distinguished?
The distinction between by-right development, special permits and local permits varies among the municipalities. For example, in Lexington, developments 10,000SF or greater will generally require special permits. The Waltham City Council's Legislative Master Plan details the square footage that can be done by-right and by special permit.

3. Future Development – Potential Increase in the Demand for Travel

The overall scale of employment and population projections is a primary driver of transportation demand. Estimates of where new employment and housing is expected to occur are important to estimating the level of traffic that will need to be accommodated by the corridor.

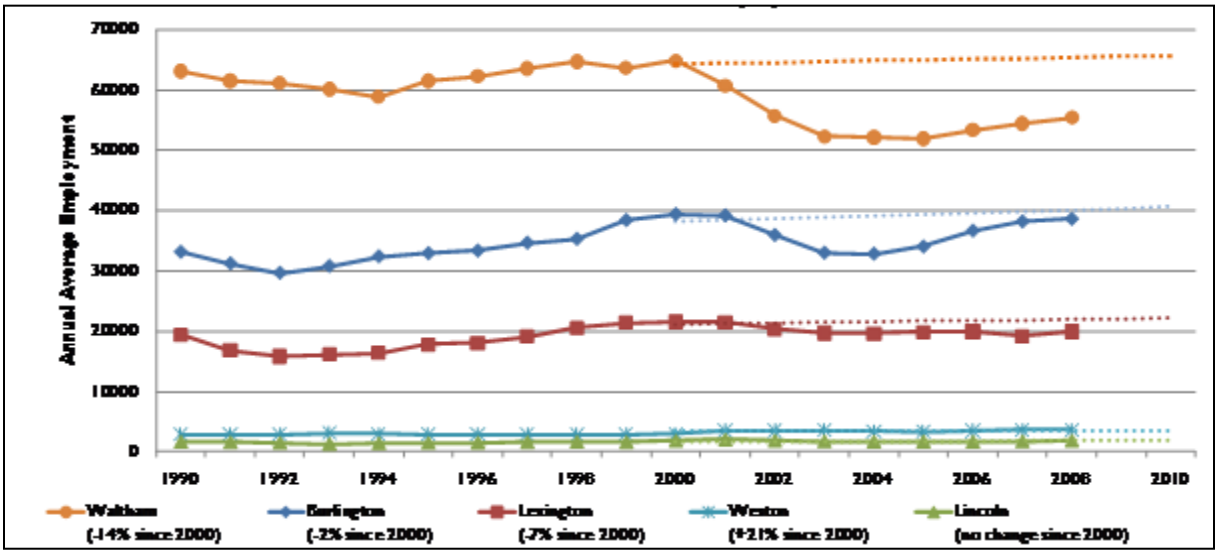
MAPC analyzed data from the Executive Office of Labor and Workforce Development to quantify jobs by sector from the period 2001 – 2009, based on ES-202 data. With the exception of Weston, four of the five municipalities experienced net job losses over that 8-year period. Municipal-level job losses by sector were allocated to the TAZ level pro-rata based on each TAZ's share of total municipal employment in each sector (e.g., a TAZ with 10% of the town's retail employment in year 2000 would be assigned 10% of the estimated retail job losses from 2001 – 2009). Where large employment losses could be assigned to a specific TAZ (e.g., Polaroid closure and resulting loss of 2,000 manufacturing jobs), these were removed from the pro-rata assignment.

MAPC has forecasted corridor traffic based on updated population and employment projections. In order to generate these projections, MAPC distributed a Project Reporting Form to each municipality which solicited information about projects planned, under construction, or recently completed. Information requested in the form included project size, square footage, estimated number of jobs/job losses, and type of employment. The form also included information about MAPC's projections, by Traffic Analysis Zone (TAZ), as well as information on recent employment trends by North American Industry Classification System (NAICS) sector. All five municipalities returned their forms and provided updates in summer 2010.

Adjustments to each TAZ's projections were created by summing community comments, the estimated job losses by TAZ, and known employment losses. These adjustments were applied to the initial projections by sector to yield adjusted projections. Projections for TAZs with community comments were generally adjusted upwards to accommodate anticipated or recent development. Projected growth for most other TAZs was adjusted lower to account for significant job losses since 2000.

The adjusted projections for the Route 128 Corridor are forecast to increase by about ten percent to 2030. These employment projections are depicted in Figure 24, Annual Average Employment, 1990-2008 and Table 15, Adjusted Employment Projections. MAPC reviewed the information on the project reporting forms and amended it where necessary. Such amendments included estimating the number of new jobs and job losses associated with new development and redevelopment; estimating the type of employment (basic, service, retail), and a time frame for the development. Anticipated developments still in the planning or permitting phase were discounted (generally by 50%) to account for market uncertainty.

Figure 24 Annual Average Employment, 1990-2008 Projections



Source: EOLWD, ES-202 data, MAPC projections

Table 15 Adjusted Employment Projections

Municipality	Year 2000 Employment	Adjusted Projections
	Total Employment 2000	Adjusted Total Employment Change 2000-2030
Burlington	38,172	5,565
Lexington	21,194	1,720
Lincoln	1,720	225
Waltham	64,265	689
Weston	3,455	438
Corridor Total	**128,806**	**8,637**

Employment 2010, 2020 and 2030 by sectors are updated upon 11/07 adjustments.
Adjusted in May 2010 to accommodate Community Comments about recent/anticipated developments and employment change since 2000.

Projected long term population and household data for the corridor communities are shown in Table 16, Population and Household Projections for 2030. These are partially based on past trends and do not fully include all information on potential development projects. Population and households are expected to increase by 10 and 18 percent respectively for the entire corridor. As a whole, the pace of household growth is forecast to exceed that of the population. Burlington has the fastest projected population (13%) and household (36%) increase by 2030.

Table 16 Population and Household Projections for 2030

Municipality	Population, 2000	Households, 2000[1]	Projected Population, 2030	Population Change, 2000-2030
Burlington	22,876	8,289	25,908	3,032
Lexington	30,356	11,110	32,908	2,552
Lincoln	8,056[2]	2,790[3]	8,862	806
Waltham	59,684	23,210	65,675	5,991
Weston	11,471	3,718	12,590	1,119
Corridor Total	**132,443**	**49,117**	**145,943**	**13,500**

[1] As defined by the U.S. Census Bureau, a household includes all the people who occupy a housing unit as their usual place of residence.
[2] Of the 8,056 residents, 5,152 are in the Town of Lincoln and 2,904 reside at Hanscom Air Force Base.
[3] Of the total housing units, approximately 70 percent are in the Town of Lincoln and 30 percent are on Hanscom Air Force Base.

Under current conditions, the corridor cannot support additional vehicles. Based on the adjusted projections for the Route 128 Corridor and using the Institute of Transportation Engineers Trip Generation Manual, between 100,000 – 200,000 new daily auto trips could be added to Route 128 in the near future. **Assuming full build-out of all the proposed developments in the five communities, more than 155,000 new daily auto trips would be added, increasing auto trips along Route 128 by 77 percent.** Since the Route 128 Corridor is operating at over capacity, it is not able to absorb additional traffic generated whether some or all of the proposed developments are constructed.

The map in Appendix H, Developments and Projected Average Daily Traffic, highlights locations where the forecasted increase in auto trips is anticipated to take place along the corridor. Over 155,000 average daily trips are forecast for 47 projects that are completed, conceptual, permitted or under construction. Specifically, significant increases in traffic are projected to occur along Route 128 in the City of Waltham and where Route 128 and Route 3 converge in Burlington. Of the average daily trips forecasted, 86 percent of these trips are in either Burlington or Waltham, where almost all of the developments are located.

Of the developments listed in Appendix H, almost half are complete. The status of the remaining developments remains equally divided among conceptual or permitted projects and those that are under construction. The developments represent a variety of building types ranging from office, residential, restaurant and retail. As a whole, office developments are concentrated in Waltham, Burlington has a mix of office and residential developments, and residential developments are sited in Lexington and Weston.

The table in Appendix H, Developments and Projected Average Daily Traffic, depicts the potential full build-out of all development projects in the five communities that comprise the Route 128 Corridor. If communities want to retain and add additional jobs, new and creative ways to efficiently move people around the corridor need to be developed. This plan identifies many creative solutions.

4. Route 128 Central Corridor Infrastructure

As mentioned previously, a more comprehensive study of the Route 128 Central Corridor is recommended to further develop the right mix of roadway improvements, systems management techniques, additional public transit, land use changes, and ways to fund these measures. The ideas presented in this chapter form the starting point for this analysis and offer a menu of options to manage travel demand.

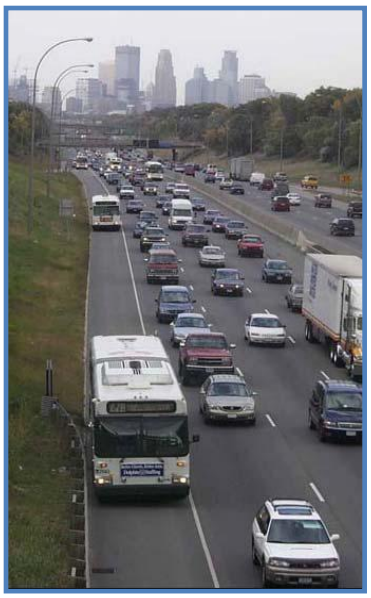
a. Improvements to the Existing Roadway System

After roadway reconstruction improvements are made, Route 128 still needs to be "managed" to ensure a safe and efficient flow of traffic. From providing traveler information to changing speed limits, the options mentioned in this section make the operators of the roadway and the drivers of the vehicles full partners in achieving potential benefits. As the freeway lanes move more vehicles and travelers some traffic should divert from local streets, improving quality of life. In Seattle, England, and Germany many of these ideas fit under the umbrella of "Active Traffic Management". In the Bay Area, a similar program is called the Freeway Performance Initiative. In the Albany area and elsewhere they are called Managed Lanes. It might also be useful to 'brand' these improvements for Route 128.

All of the ideas below could be implemented independently, but almost all could be used together to get the maximum safe throughput on Route 128.

Express Bus on Shoulder (BOS) Service

Figure 25 Example of Bus on Shoulder Service



Run Express Bus service on the shoulder/breakdown lane, serving the new transit center plus a few other stops. HOT lanes don't necessarily give a large time advantage to buses, especially since the bus would need to weave across the (potentially congested) lanes of general traffic to exit or enter the highway. A better option to ensure fast, reliable travel times for transit would be "Bus-on-Shoulder". Express buses, and local shuttle buses perhaps, would be allowed to use the new, improved Route 128 shoulder, which needs to be widened sufficiently to allow safe passage. This bus lane might only operate during peak hours, and any breakdown, crashes, or enforcement would have to be moved to the pull-out areas as quickly as possible. For safe operation, the buses would travel at less than the normal speed limits (hence the usual operation only during congested periods) and would have to be in direct contact with a Traffic Operation Center to be warned of problems ahead. Using bus on shoulder would also ease their access on/off Route 128. Bus-on-shoulder is currently used extensively in the Twin Cities metropolitan area, in the Washington, DC area, and has been recommended along the I-93 north corridor between Boston and Manchester, NH. Bus on Shoulder Service (BOS) is shown in Figure 25 in Minneapolis, Minnesota.

Reconstruction and Improvements

It appears that for the majority of the corridor length, there is sufficient width to implement a Bus on Shoulder program and at those bridges where there is currently insufficient width for a full shoulder lane, busses could merge into the right travel lane. However, the bases of many of the non-interchange bridges may need to be widened for a more effective Bus-on-Shoulder transit system. It will be necessary to check all roadway sections to ensure available width as well as the sufficiency of bridge clearances, and the areas around the on/off ramps may need to be reconfigured or reconstructed to allow entering/exiting vehicles to safely merge with buses operating in the shoulder.

It is also necessary to check all roadway sections to ensure available width as well as the sufficiency of bridge clearances such as in Figure 26, Minuteman Bikeway Overpass in Lexington. In addition, all the areas around the on/off ramps will need to be reconfigured or reconstructed to allow entering/exiting vehicles to safely merge with buses operating in the shoulder.

Figure 26 Minuteman Bikeway Overpass in Lexington

Source: www.google.com

Improvements should also include a continuation of the highway service connector road from Totten Pond Road to Routes 117/20. In Waltham, improving access to and from Green Street and the Polaroid parcel should also be considered. Since the Route 117 crossing of Route 128 may be the first to be redesigned and reconstructed, any changes at this location must widen the bridge sufficiently to allow Bus on Shoulder to operate if that option is implemented.

A recently-proposed development of a large site on Main Street (Route 117) in Waltham included the private funding of the Route 20 interchange and the Route 117 crossing of Route 128. This and all other proposed improvements to Route 128 and its crossing bridges should consider Bus-on-Shoulder transit, the Fitchburg line/ Route 128 transit stop and other traffic mitigation measures proposed in this plan in their designs.

Crash reports should also be investigated to determine if there are safety problems caused by roadway geometric designs that could be fixed as part of this reconstruction. The reconstruction will have safety

benefits, and set the stage for operational improvements to come. Any reconstruction and geometric improvements along 128 needs to discourage commuters from utilizing neighborhood streets.

Redesign of Interchanges to Improve Safety

More detailed examination of the crash records should also include a search for any safety problems related to the geometrics of the on and off ramps. Existing interchanges should be redesigned as necessary to eliminate weaving areas, and to lengthen acceleration or deceleration lanes. Replacing cloverleaf interchanges with roundabouts and single on/off ramps would be one design option[5]. All on-ramp designs should be sufficient to allow safe ramp metering operation.

Express Lanes

Install Express Lanes on Route 128, separating thru traffic from those entering or exiting in the corridor. This will reduce congestion and improve safety by reducing lane changing and weaving, particularly just upstream from off ramps. Initially this would be implemented with the Variable Message Signs (VMS), with the leftmost lane(s) designed thru-only but no physical separation. If voluntary compliance is low it will be necessary to physically separate the lanes and this possibility needs to be built into the design of the reconstructed roadway.

Dynamic Messaging

Route 128 should be reconstructed, with a fiber-optic network installed underneath. As part of this reconstruction there should be sensors to measure the volume and speed of traffic above, and overhead cameras to detect crashes, congestion, and breakdowns. Variable Message Signs (VMS) should be installed overhead at frequent intervals to provide information on conditions to users and should be visible to all drivers at all times. The shoulder/breakdown lane should also be reconstructed in this project to allow it to be used as a full travel lane, and vehicle pull-off areas should be installed at least once a mile to allow for breakdowns and enforcement.

Dynamic messaging uses real-time message signs to warn motorists of queues and directs through-traffic to alternate lanes. Travel time estimates, alternate route information, and information about special events, weather conditions, or other incidents are also provided. Dynamic Messaging needs to be highly responsive to current conditions. Dynamic Messaging mitigates congestion by diverting traffic to alternate routes and by helping to prevent new incidents.

Variable Speed Limits

Initiate Variable Speed Limits on Route 128 in the corridor during peak traffic periods. Variable speed limits automatically slow traffic approaching areas of congestion, accidents, or special events before queuing begins. The intent of variable speed limits is to maintain smooth traffic flow and reduce the risk of collisions.

Congestion on a highway comes initially not from too many vehicles but from too many drivers trying to move faster than conditions allow. Using Variable Message Signs, a Variable Speed Limit program (also sometimes called Speed Harmonization) will reduce speed limits as traffic volumes increase to the speed

[5] A cloverleaf interchange is a two-level interchange in which left turns are handled by loop roads or ramps.

that will allow the maximum number of vehicles to use the roadway safely (ultimately probably down to the 30 to 40 MPH range). Automatic enforcement of speeding violations is also frequently part of this program, since any significant number of drivers ignoring the speed limit will destroy the effectiveness of the program.

Variable speed limits have been used successfully in England, Germany, and elsewhere in Europe. It is presently done on I-35W in Minneapolis and STR-520 in Seattle. Variable speed limits have been used in many other states in construction zones and in response to highway incidents or weather conditions.

Enhanced Incident Management Program

The enhanced monitoring equipment should be connected to a Traffic Operations Center. An enhanced Incident Management program should be implemented to detect problems, with roving and on-call vehicle assistance vans and tow trucks, and the Variable Message Signs (VMS) used to warn and divert drivers. Diversion routes in communities along Route 128 should be developed between MassDOT, and state and local police. If a major incidents require diversions to local roadways, state and local police should work together to minimize local impacts. It is estimated that a good incident management program can reduce congestion by 25%, can reduce the number of crashes (particularly secondary crashes), and can even impact their severity (by getting EMTs involved faster).[6]

Real Time Traveler Information

In addition to all the traffic information available to travelers already using Route 128, information on conditions on Route 128 should also be directly available to future users for planning their trip departure times and routes. Both a corridor web site and direct texting of incidents should be among the information options available. The MassDOT 511 system is a good first step in this direction, but much more detailed information, targeted to a specific route, would be more helpful. This would allow users to change the timing of their trip or its route, or to divert to another mode. To discourage drivers using local streets as alternative routes, the detailed information on current traffic conditions will also need to include information from the local street network.

Using technology that enables drivers to obtain traffic information before they travel will influence individual decisions to use a car for a given trip. Real-time traveler information will affect drivers' mode, departure time, route, destination choice and has the potential of reducing or even eliminating travel. Travelers can obtain real-time traveler information through technologies such as the internet and cell phones.

Freight Movement

MassDOT is in the midst of preparing a State Freight and Rail Plan. The findings and recommendations will be based on a comprehensive evaluation of the Commonwealth's freight and rail transportation system, their operations and effect on economic development and quality of life. The Plan will examine the freight and rail infrastructure and operations in the Commonwealth and evaluates the trade-offs between different modes as well as intermodal options (transportation by more than one mode, e.g. truck and rail) in its analysis and recommendations. The final outcome of the Plan will be a set of

[6] Benefits of Traffic Incident Management. National Traffic Incident Management Coalition. http://www.transportation.org/sites/ntimc/docs/Benefits11-07-06.pdf

findings and recommendations based on a high-level overview of the current and projected key issues facing the freight and rail industry in Massachusetts. With the completion of this plan, a broad understanding of existing and forecasted freight and rail patterns in the Route 128 Central Corridor will be available.

b. Improvements to the Local Street Network

Develop Local Roadway Design Guidelines

Each community should develop a set of local design guidelines that apply to all roadway projects going forward. New development would have to apply these guidelines for any mitigation that is applied. These guidelines would be intended to facilitate mobility in the corridor and to discourage "cut-thru" traffic. The guidelines might allow for improved vehicle thruput on roadways closest to Route 128, to get vehicles on and off the highway as quickly as possible and reduce the temptation to consider local streets as an alternative to Route 128. Further away, roadways could be more oriented to local needs, and would serve pedestrians, bicyclists, and transit users equally with motorists. Resident's needs would be considered to be at least equal with those of commuters, which generally means getting across arterials should be equally important to throughput on arterials – signal timings should be set accordingly, for example. Traffic calming, roundabouts, new signals and timing, and complete streets are examples of design elements and principles that might be included.

New Signal Equipment with Regional Operations Center

Signals located in close proximity to Route 128 should be connected to a regional operations center controlled by MassDOT. The regional operations center will synchronize and control the traffic signals and traffic signal equipment during peak traffic periods. The coordination of ramp meters will also be under the purview of the regional operations center. Procedures that protect travel options on local roads will be established.

c. Fitchburg Line/128 Transit Center

A new Fitchburg Line/128 Transit Center should be built at the former Massachusetts Broken Stone site along the Weston/Waltham border shown below in Figure 24. The center will become a stop on the Fitchburg commuter rail line. The goal of the Fitchburg Line/128 Transit Center would be to draw cars off of Route 128 and provide feeder bus and shuttle service to employment centers along the corridor.

Developing a feasibility study is an initial step to determine both the size and location of a station and how successful is would be at reducing congestion. One or more of the existing stops in Weston could be consolidated concurrently. The Fitchburg Line/128 Transit Center would include direct connections to Route 128 north and southbound, via a redesigned Route 20 interchange, and other connections to the corridor communities via Route 117. The station would need good access to both Route 20 and Route 117, and adjacent properties on both sides of the railroad tracks. Since a waterway separates the existing tracks from Route 117 access, and water also limits the places for access from Route 20, connections from one direction might have to be limited to pedestrians and bicyclists. If a new interchange is added to serve the new multimodal center it should allow for direct access/egress from Route 128 northbound and southbound to the station. Expanding Green Street and aligning Bear Hill Road with a direct connection could also improve access to the multimodal center.

There could also be a multi-level parking garage, accessed only via the Route 128 ramps. Existing and new bus service would also serve the site, and there would also be access via the Mass Central Rail Trail. The parking garage will remove cars from the road and encourage the use of public transportation. Although the exact location of the Fitchburg Line/128 Transit Center still needs to be determined, it would be sited within the boundary indicated in Figures 27 and 28.

Figure 27 Area of Proposed Fitchburg Line/128 Transit Center – Far View

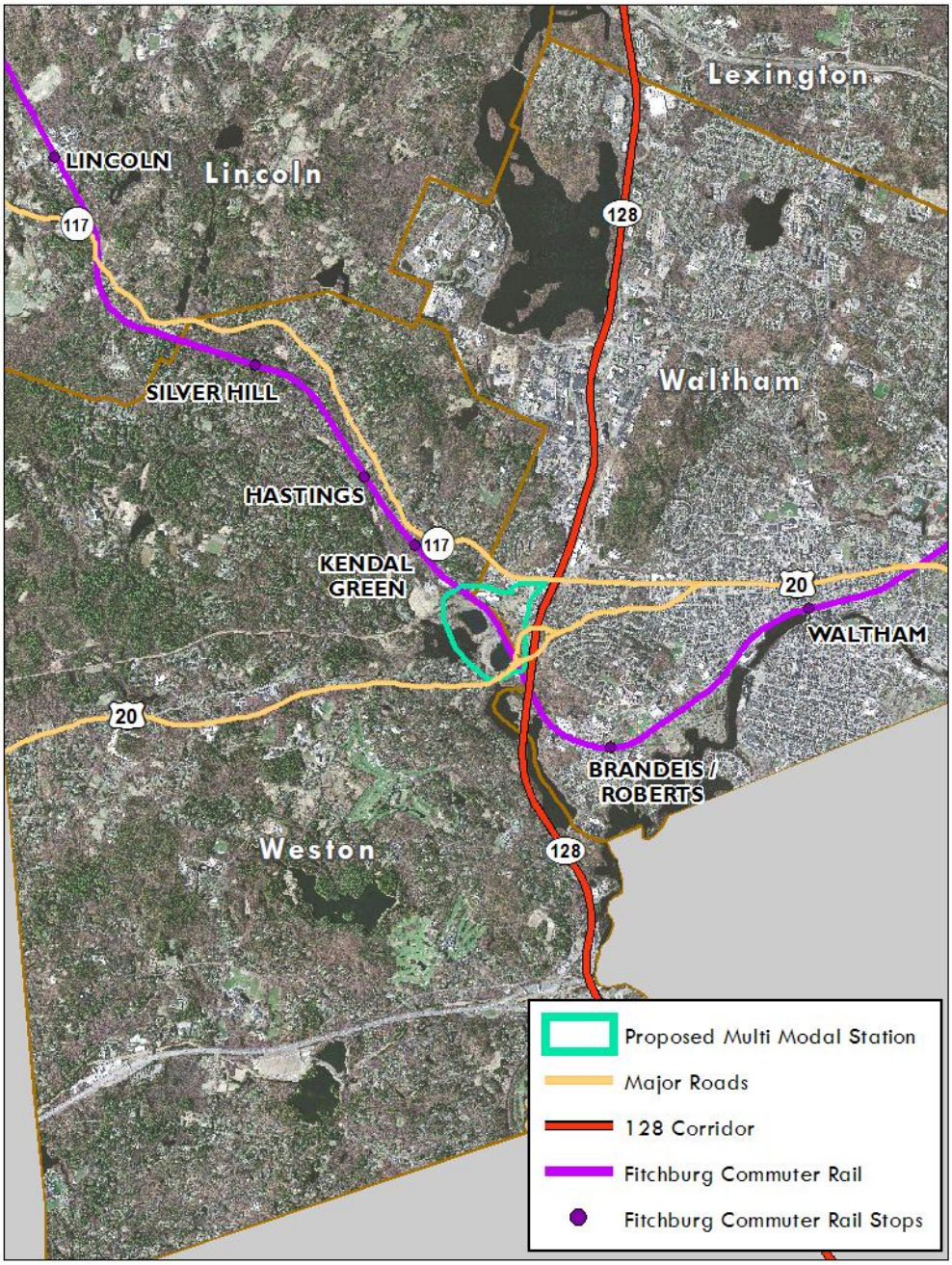
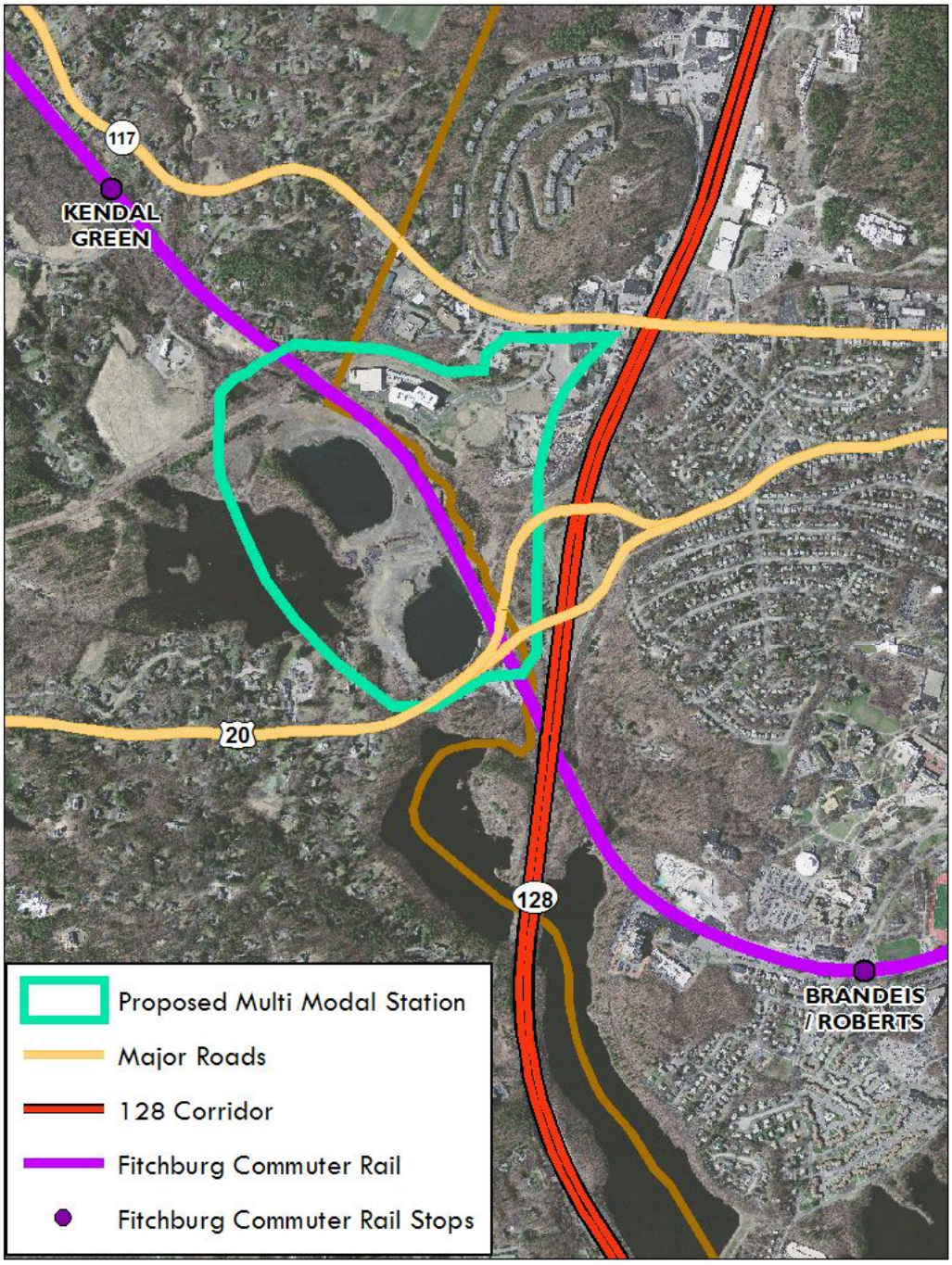


Figure 28 Area of Proposed Fitchburg Line/128 Transit Center - Close View



If a new Fitchburg Line/128 Transit Center, existing shuttle services to area businesses should be adjusted to arrive at the Center in time to drop off and pick up passengers to meet scheduled trains and the Express Bus service. The Fitchburg Line/128 Transit Center would connect with the maximum number of transit and transportation options possible, including auto pick-up and drop-off, shuttles, taxis, commuter rail, as well as pedestrian and bicycle access. Various transportation modes would converge at the Fitchburg Line/128 Transit Center and passengers would be able to transfer from one

mode to the other easily and safely. If effectively designed, the Fitchburg Line/128 Transit Center could be a strong transit-oriented development (TOD) site, creating additional jobs and tax revenue.

d. Additional Transportation Demand Management Options

Travelers are increasingly expecting more choices and better information. With limited funding for large-scale capacity projects, traveler concerns can be addressed through better traffic management and operations by both the state and the corridor communities. Integrating Travel Demand Management, or TDM, can influence travel before choices are made and make more efficient use of existing facilities. As a result, reliability and system performance can be improved, the need for capacity expansion can be prolonged, and the life of new investments can be lengthened. These strategies are relatively low cost and easy to implement.

TDM are policies and programs that focus on reducing transportation demand and providing alternative means of travel to driving alone in a car. TDM policies and programs are intended to provide travel options and to reduce the demand for roadway improvements by reducing automobile travel, especially commuter trips during peak travel periods. TDM is about smarter mode, destination, route, time, and lane choices.

TDM programs support and encourage ridesharing, transit use, walking, and bicycling. To be successful, the selection of appropriate components of a TDM program for area businesses must be tailored to the origins and travel habits of employee commuters. For the success of such programs, mechanisms must be implemented to promote and organize TDM programs. For example, employers along the Route 128 Corridor should be well informed of the 128 Business Council and MassDOT's MassRIDES programs. The 128 Business Council and MassRIDES both assist employers with establishing vanpool programs, coordinating carpool directories as well as providing incentive programs among employers and employees. MassRIDES has eight partners in the 128 Central Corridor and the 128 Business Council has 25 members.

There are many TDM strategies that influence travel behavior by mode, cost, time, or route in order to reduce SOV travel. TDM strategies are often applied to achieve public goals such as reduced traffic congestion, improved air quality, and decreased reliance on energy consumption. Employers often implement TDM strategies to reduce overhead costs and enhance productivity. The most effective financial incentives to reduce driving are employer-driven.

More detailed descriptions of TDM programs and current programs the corridor communities are implementing are in Appendix G, Mitigation. The list below is recommended TDM programs for the Route 128 Corridor Plan area to consider implementing:

Express Bus

Express Bus Routes from the north and west would operate on the roadway shoulder during peak periods. There should be two routes, one from the north on Route 3, another further north on Route 128. The routes would collect passengers at a few existing or new park-and-ride lots on Route 3 and Route 128 north, and drop off passengers at a few large commercial concentrations with good access to Route 128 (for example, Middlesex Turnpike, Hartwell Ave, Winter Street). The Routes would terminate at the multimodal station, and should operate at 15 to 30 minute headways. A similar service could operate on Route 128 south of the corridor after the Add-a-Lane project is completed, with a terminus at Riverside on the Green Line. It's also possible that a Riverside stop on these northern routes also makes sense. It may be appropriate to operate these routes as Bus on Shoulder outside the corridor (to

save additional time), and in those areas additional modifications to the shoulders will likely be necessary.

Express Train

To better serve the work commute trips in the area some express train service should be scheduled to the multimodal center. Low use stops would be skipped on the express runs. Additional service in the reverse commute direction (outbound from South Station in the morning, inbound in the evening) should also be scheduled if the multimodal center is to provide a good travel alternative for work trips in the area.

Municipal Transit

Burlington and Lexington currently provide transit service within their communities. For example, the Burlington B-Line is shown in Figure 29. With the addition of the multimodal center, there should be a demand to extend a few of these trips to the center, using Route 128 and the BOS if available. The bus service providers should also participate in revisions to local design standards to insure that new designs are transit friendly. And they should take advantage of new communications technology that will make advanced scheduling and vehicle tracking information readily available, which should make transit use more predictable and therefore attractive.

Figure 29 Burlington B-Line

Source: Suburban Transit Opportunities Study, CTPS.

Park and Ride

A few new park-and-ride lots will need to be, near/at existing interchanges, to provide places for customers to park their cars. Existing park-and-ride lots with easy access to the interstate system may be appropriate, like the Anderson Regional Transportation Center in Woburn[7]. The North Billerica commuter rail lot off Route 3 could be expanded. New lots could also be built within the existing right-of-way (at Routes 3 and 128, for example). An ideal, but expensive, solution would be several parking garages located directly above Routes 128 or 3, with easy on/off to park, where the express buses would stop to pick up and drop off passengers. Most riders on a successful express bus route will drive to their origin bus stop, and sufficient parking must be available to accommodate potential customers.

Ramp Metering

Another idea is to install Ramp Metering in the corridor wherever they will be effective and wherever they will not result in additional backups on local streets. Ramp Metering uses traffic signals installed at freeway entrance ramps to control the rate at which vehicles enter a freeway. Ramp meters are used in metropolitan areas all across the United States (although not in Massachusetts), and have been for over a half century. The purpose of ramp meters is to smooth the flow of traffic entering a freeway from a ramp, allowing more efficient use of existing freeway capacity. While the driver of the entering vehicle

[7] Anderson Station and existing park-and-ride lots with easy access to the interstate system were not studied in detail since both are outside the study area scope.

will probably be delayed, Route 128 will operate more efficiently and more safely (refer to Appendix I, The Benefits of Ramp Metering). In the United States, there are examples of ramp meters being used for interchanges with other limited access highways (for example Route 3, Route 2, and the Turnpike could be ramp metered in this corridor), and they should be evaluated on how well they would work at those locations. An example of a ramp meter in Milwaukee, Wisconsin is shown in Figure 30.

Figure 30 Example of a Ramp Meter in Milwaukee, Wisconsin

Source: wikimedia.org

Parking Cash Out

Parking Cash Out is a program where commuters who are offered subsidized parking are also offered the cash equivalent if they use alternative travel modes such as transit, biking, walking or carpooling to work. Employers establish rules that employees must observe to quality for financial benefits. For example, an employer may require participating employees to sign an agreement that specifies the number of days per month that they may drive to work and still qualify for a Parking Cash Out bonus. Parking Cash Out is a state law in California.

Employees who take advantage of Parking Cash Out programs experience increased affordability and equity due to use of alternative modes. Studies have shown that with Parking Cash Out programs, travel shifts primarily to transit and walking in densely populated areas and shifts more to ridesharing, telecommuting and cycling in suburban areas. Parking Cash Out programs reduce traffic congestion and over the long term, these programs can enable employers to use the parking spaces for other purposes such as constructing buildings or providing green space.

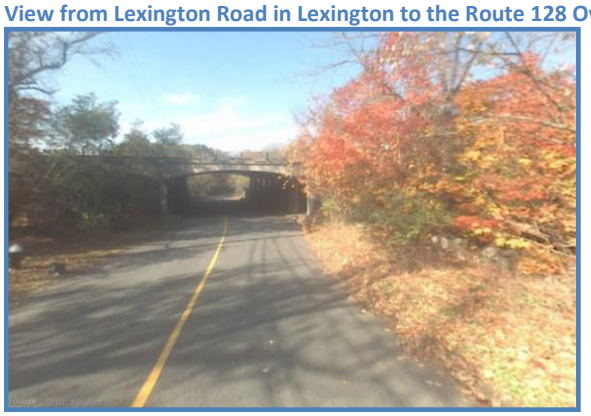
The City of Atlanta's Cash for Commuters is a similar program which provides commuters a cash incentive for using an alternative mode of transportation. Sponsored by The Clean Air Campaign, the cash incentive provides individuals three dollars per day for up to 90 days. In 2002, 1,800 prior drive alone commuters switched modes and 71 percent continued using their new mode of transportation after the incentive period. It was estimated that 1,300 daily trips were reduced and 30,000 miles of travel[8].

Expansion of the Route 128 Business Council Membership

TMAs are non-profit organizations of private corporations and public agencies dedicated to achieving reductions in traffic congestion, improving mobility and air quality, and educating employers and their employees about transportation alternatives. TMAs leverage public and private funds to increase the use of ridesharing and other commuting alternatives that reduce traffic congestion and improve air quality across the state. By requiring mandatory membership in the Route 128 Business Council which is the area-based TMA, ongoing funding will be provided as well as giving employers the tools they need to implement agreed-upon TDM programs.

[8] FHWA and MassDOT Managing Travel Demand workshop held on June 25, 2010.

Figure 31
View from Lexington Road in Lexington to the Route 128 Overpass



Source: www.google.com

Adding hotels to the membership would add an underserved market and opportunities for off-peak service. Additional routes will make sense with new development and the other transportation improvements that are part of this plan. To the extent that shuttle trips are available to the public, subsidies from the revenue sources identified here could expand the reach of transit service available in the communities.

HOV lane on Route 128 – An HOV lane, in the center lanes or perhaps even on the Bus Shoulder (if volumes are not too high that the Express Buses will be delayed), could be developed for use during peak hours. This could potentially provide a significant advantage to carpool or vanpool in the corridor during congested periods.

Improved Transit and Development Coordination

Acting as a consortium, there should be an entity that coordinates all public and private transit and shuttle services in the corridor. The 128 Business Council, working in close concert with the MBTA, could be this entity. In addition, an Overlay District or establishing development incentives that will allow for and encourage smart growth could be established in the 128 Corridor. Special development rules, consistent among the communities, would apply in this district. Funding would be obtained by consistent mitigation practices throughout the five communities. The Town of Lexington's recently adopted Hartwell Avenue Transportation Mitigation Overlay District (TMOD) could be used as a model. A development project in the Hartwell Avenue TMOD allows Lexington to collect traffic mitigation fees from developers to fund infrastructure improvements in the Hartwell Avenue area and will also require developers to implement Parking and Travel Demand Management Programs.

Figure 32 View from Route 30 in Weston to Route 128

Source: www.google.com

e. Pedestrians and Bicyclists

Currently Route 128 is a barrier for almost all pedestrian and bicycle travel across the corridor. Most residents on one side of Route 128 cannot walk or bike from their homes to jobs, restaurants, and any use on the other side, no matter how close the actual distance. Truly reducing auto trips and vehicle miles traveled requires that people be able to make the short trips (less than a mile) by walking, and that bicycle use be an option for all who would chose it. Improved pedestrian and bicycle infrastructure can facilitate access to bus/shuttle stops and encourage bicycling and walking to work. Further analysis would be required to gauge the impact of the reduction in vehicular traffic with increased investment in bike lanes and crossings.

Table 17, Current Pedestrian and Bicycle Crossings, shows the current pedestrian and bicycle crossings possible. In this plan, as interchanges or bridges across Route 128 are rebuilt (except for the limited access crossings at Routes 3, 2, and the Turnpike) the new designs should allow pedestrians to cross safely, and bicyclists to use the roadways. These accommodations are not just a state responsibility however, as the corridor communities must also insures that there are safe bicycle and pedestrian connections on either side of the bridges. Examples of existing connections to Route 128 are shown in Figures 31 and 32.

Table 17 Current Pedestrian and Bicycle Crossings

Crossing*	Current Accommodations and Conditions	Distance to Next North Crossing	Land Uses Either Side
Middlesex Turnpike, Burlington	No way to walk, only a few disconnected pieces	---	Mostly retail, with a few offices, and hotels
Grove Street, Lexington	Existing sidewalk on one side, connections to sidewalks along Grove, no special bicycle accommodations	1.2 miles	Low density residential
Bedford Street (Routes 4/225), Lexington	Sidewalk on one side, poor condition, limited connections	0.4 miles	Low density residential to east, mostly offices and hotels to west
Minuteman Bikeway, Lexington	Pedestrians and bicyclists can cross safely	0.3 miles	Low density residential
Massachusetts Avenue, Lexington	Sidewalk one side only, few connections, no bicyclist accommodations	1.6 miles	Low density residential east, hotel and high school west
Marrett Rd (Route 2A), Lexington	Sidewalk one side only, poor condition, no connections	0.3 miles	Low density residential east, hotel, high school, offices west
Middle Rd/Lincoln Street, Lexington	Connection under Route 128, no sidewalks or bicycle accommodations anywhere in the area	0.5 miles	Low density residential
Trapelo Road, Waltham	Sidewalk on one side, good condition, with pedestrian signals, and bicycle accommodations/signal actuation in the roadway – except on the east on/off ramps, where all accommodations are lost for 100 yards	1.4 miles	Low density residential and office both sides, nursing home? just east
Wyman Street NB side, no crossing, Waltham	There are no sidewalks on Wyman Street, and no way to cross the on/off ramps		Office and hotels nearby, low density residential north of interchange
Winter Street, Waltham	Interchange being reconstructed. It appears there will be some new sidewalks, ways to cross ramps unknown, good sidewalks on both sides to the east, few, unconnected sidewalks west	1.3 miles	All commercial (retail, hotels, offices)
Route 117, Waltham	Sidewalks exist and the bridge is minimally walkable, with connections to both sides. New design should improve walkability	1.5 miles	Residential and commercial (apartments to west)
Route 20, Waltham/Weston	Existing sidewalks, in very poor condition, with no way to cross ramps. No good connections, but new sidewalk to new Broken Stone development	0.4 miles	Low density residential, with commercial proposals

Only one of these existing interchanges, at Trapelo Road in Waltham, has adequate provisions to allow pedestrians to safely cross the on/off ramps, and even here it's only on the west side of Route 128. None of the existing sidewalk designs provides any separation between pedestrians and the adjacent high speed vehicle traffic. Since the on/off ramps are under MassDOT jurisdiction, any changes to the sidewalks will require state approval. More information about Trapelo Road is in Appendix J, A Walk along Trapelo Road.

Retrofit existing development to provide accommodations for bicyclists and pedestrians –When there are connections across the bridges there will need to be walkable and bikeable streets to connect to. There are some streets with sidewalks, most not. Two examples:

- Summer St/River Street, Weston is an example of a more rural design – Summer Street has no sidewalks but appears to have low traffic volumes. Walkers, bicyclists, and drivers could all potentially share the road if the speed limits were lowered (to 20 or 25 MPH) – currently there are posted speed limits of 20, 25, and 30 mph in different areas – and if there were frequent share the road and watch out from pedestrians/bicyclists signs. River Street is wider and recently paved, suitable for sharing with good bicyclists but not safe for pedestrians.

- The roadway network south of Winter Street, Waltham, is a largely commercial area where almost all travel will be via auto but where the potential for walk and bike trips exists. There are almost no sidewalks on Third Avenue, a few on Fourth and Prospect Hill, all disconnected pieces. Second Avenue on the west side of Route 128 has sidewalks on one side of the road, but never two, for most of its length, but no way to safely cross the roadway anywhere. Almost all of the existing pieces of sidewalk will allow only the able to walk safely and comfortably, and almost none of the existing properties have been designed to allow or encourage walking. Bicycling may be possible but no accommodations have been made, there are no shoulders and most of the roadway surfaces are in poor condition. Areas like this need a transportation network design that includes pedestrians and bicyclists as well as cars and trucks, and a plan for retrofitting the existing roadways. The cooperation of MassDOT is required to provide pedestrian safety improvements in the vicinity of highway on and off ramps

Communities should designate priority areas to make improvements, where there may be existing possibilities for walking and biking, but no accommodations. Mitigation funds should be used to pay for these improvements where no new development is expected.

Pedestrian/bicycle access to all new development – most new developments now seem to be required to provide sidewalks and crosswalks within their site, and along their roadway frontage to their property lines. But connections to any useful pedestrian or bicycle network are infrequent. It is common practice to require developers to make roadway improvements off site, and this requirement should be extended to the entire transportation network. New sidewalks should be required to be built within the existing right-of-way until they connect with an existing sidewalk network, along with crosswalks, and pedestrian signals if appropriate. Mitigation to accommodate pedestrian and bicyclists needs should be considered equally important with accommodating drivers. And site designs should encourage bike/peds by minimizing the distance to the street and to adjacent uses.

Mass Central Rail Trail – the Mass Central Rail Trail goes just north of the Fitchburg Line/128 Transit Center and will cross Route 128 on the Route 117 bridge. The design of the station and the trail need to

make a connection between both, and a completed trail, with connections to trails east and west of Route 128, provides a critical bicycle and pedestrian link within and across the corridor.

f. Encourage Walking, Bicycling and Transit

While the construction of Route 128 has had significant economic development impacts on the region, the dispersed nature of development along the circumferential corridor west of the urban core has made it challenging for transit and non-automobile forms of transportation to be successful. Furthermore, many of the developments are at the end of commercial access roads, located off frontage roads with long driveways, or have vast parking lots in front of the building; characteristics that make shuttle bus service and pedestrian access very difficult.

However, the Route 128 Central Corridor has enough people living and working in it to accommodate public transit. As of the 2000 census, 132,443 people lived and 128,806 worked in the 5 corridor communities. According to MAPC MetroFuture projections, 145,943 people will live and 140,865 will work in the corridor by 2030. Yet almost all of the current travel is by automobile. Land use patterns are designed to facilitate auto trips whereas transit, cycling, and walking trips are challenged. Changing that orientation is a local responsibility.

There are a number of modifications in local land use practices that could be adopted. In addition to supporting transit, cycling and walking, these practices will need to preserve community character and the economic development potential of all the corridor communities.

g. Consistent Community Zoning Requirements

Parking Requirements

Minimums to Maximums – Minimum parking standards can often lead to an oversupply of parking. Instead, parking maximums should be established to limit the number of off-street parking spaces. These requirements will encourage transit use and other alternatives to single-occupant automobile use.

Shared Parking means that parking spaces are shared by more than one user, which allows parking facilities to be used more efficiently. A type of parking management, Shared Parking takes advantage of the fact that most parking spaces are only used part time by a particular motorist or group (e.g.; churches tend to need parking on Sundays and offices require parking during the weekday), and many parking facilities have a significant portion of unused spaces, with utilization patterns that follow predictable daily and weekly cycles. Efficient sharing of spaces can allow parking requirements to be reduced significantly. *Access Management* balances access to developed land while ensuring a safe, efficient transportation system. Access Management techniques include managing the location of signals, use of medians, use of turn lanes and use of supportive local ordinances.

A common driveway is generally a driveway jointly owned by the owners of the properties it gives access to. Common driveways can be used in regional shopping centers and office parks and will reduce the need to drive to adjacent properties.

Transportation Demand Management (TDM) Programs

Explore incorporating TDM (Transportation Demand Management) programs such as ridesharing, transit friendly development, staggered work hours and telecommuting into land use regulations, such as provisions in zoning and parking ordinances. As a result, the transportation system can be improved and the density, diversity and design of development can be influenced.

Transit Oriented Development (TOD) Principles

Transit Oriented Development (TOD) principles can be helpful in this setting. TOD is characterized by compact/dense development, high quality walking environments, and proximity and orientation to a transit station. If successful, travel choices will be promoted, the economic competitiveness of the area will be enhanced and existing communities will be supported. Station area design must take into account transportation and circulation issues, urban design and placemaking. The station area needs to support both local visions and efficiently serve the regional transit network.

Inclusion of the following key principles will guide the successful design and implementation of TOD at the new station[9]:

- Maximize Ridership through Appropriate Development
  Plans should understand the market demands for higher density housing and employment. Where appropriate, first floor retail should be considered.

- Manage Parking Effectively
  The appropriate amount and location of parking facilities for transit rides needs to be determined.

- Generate Meaningful Community Involvement
  Engage in open and honest discussion of issues and community concerns.

- Design Streets for All Users
  Plan for the safe mobility for all users with priority given to non-automobile modes where possible.

- Create Public Spaces
  The public spaces around the station should be inviting and usable to encourage transit use and TOD.

- Maximize Neighborhood and Station Connectivity
  Include a network of key pedestrian corridors, accommodate bicycles, and connect with buses and shuttles.

Site Design Requirements

Cities and towns should establish site design requirements for pedestrian mobility in their zoning and building codes, land-use plans, and subdivision regulations for both residential and commercial developments. Where appropriate, responsibility for sidewalk construction should be placed on individual developers.

[9] Reconnecting America, TOD Toolkit: Station Area Planning, Oakland, CA, 2007.

Use Mitigation to Encourage Compact, Mixed-Use, and Walkable Development

Placemaking
Integrate transportation with "placemaking," or designing an area to make it more attractive to and compatible with the people who use it.

5. Funding the Implementation of the Corridor Plan

In Massachusetts there is currently an unmet need for transportation infrastructure investments and maintenance programs. A 2006 report by the Transportation Finance Commission has concluded that the cost to maintain the state's transportation system far exceeds the states anticipated resources available. This does not even address system expansions or enhancements.

Therefore, implementing transportation improvements from the corridor plan is highly dependent upon communities working together and in concert with state and federal officials to obtain funding. This chapter identifies key funding opportunities that may be appropriate to advance the recommendations in this corridor plan from Local, State and Regional, and Federal sources. A description of the funding source and web links to more information are provided for each program.

The Chapter 90 Program

Under Massachusetts General Laws Chapter 90, Section 34, each year the state budget makes funds available to all communities for approved local road construction, preservation, and improvement projects that create or extend the life of their transportation infrastructure. Chapter 90 funds consist of state revenues appropriated through the Massachusetts Legislature as part of the Transportation Bond Bill and through supplemental budget agreements.

The vast majority of local road projects are funded using monies available through the Chapter 90 Program. This locally administered funding source is used for maintenance, resurfacing, sidewalk repair, traffic signal and other local improvements. Chapter 90 projects are not approved by the Metropolitan Planning Organization (MPO) and are not included in the Transportation Improvement Program (TIP).

Chapter 90 projects are approved by MassDOT district offices before they begin and municipal costs are reimbursed. Chapter 90 projects are strongly encouraged to follow the provisions in MassDOT's Project Development and Design Guidebook. It is the community's responsibility to prioritize the use of Chapter 90 funds.

Private Sector Support

The private sector, whether it is property owners, businesses that rent space in building, or developers, gain tremendously from transportation improvements. Working in coordination with the private sector to help fund corridor projects is one source of local funding.

Massachusetts Department of Transportation Planning

MassDOT's Office of Transportation Planning develops transportation plans, programs, and projects to advance the transportation policies and objectives of the Secretary of Transportation and to ensure compliance with federal and state transportation and environmental laws and regulations so that federal funding to Massachusetts continues. One of the principal activities are performed to accomplish this mission includes developing multimodal and modal-specific Statewide transportation plans, and project-specific transportation improvement programs. The Department of Transportation Planning can support, obtain funding for, and assist in implementing regional corridor initiatives.

State Transportation Bond Bill

Enacted in April 2008, the State Transportation Bond Bill is a $3.5 billion bill that will invest in road and bridge projects across the Commonwealth over three years. A statewide economic stimulus measure, the Transportation Bond Bill is intended to both improve road and bridge infrastructure and create jobs.

Highlights of the bill include:

- $2.4 billion in federal matching dollars for rebuilding roads and bridges over a three-year period;
- $150 million annually to fund Chapter 90 transportation grants to cities and towns; and
- $10 million for mass transit planning projects that support economic growth and promote geographic equity.

In August 2008, the Governor approved a second Transportation Bond Bill authorizing $1.45 billion for road and bridge projects and other transportation-related capital investments. It is likely the Massachusetts Legislature will advance a new Transportation Bond Bill in 2011.

Transportation Improvement Program

The Transportation Improvement Program and Air Quality Conformity Determination (TIP) is an intermodal program of transportation improvements produced annually by the MPO.

The TIP serves as the implementation arm of the MPO´s long-range Transportation Plan by incrementally programming funding for improvements over a four-year period. It programs federal-aid funds for transit projects, and state and federal-aid funds for roadway projects. The MPO can only include projects for which funds are expected to be available in the TIP.

The TIP document includes a summary of the TIP evaluation process, chapters detailing projects programmed in each federal fiscal year, the region´s air quality conformity determination, the status of the previous fiscal year´s projects, a listing of the universe of projects from which the programmed projects were chosen, and the MPO´s process for collecting information on projects and evaluating them.

An MPO-endorsed TIP is incorporated into the State Transportation Improvement Program (STIP), which is distributed to the Federal Highway Administration, Federal Transit Administration, and Environmental Protection Agency for certification before the end of each federal fiscal year (September 30).

Clean Air and Mobility Program

The Boston MPO has launched the Clean Air and Mobility Program (CLAMP) in order to fund a wider variety of projects that improve air quality and mobility, and reduce congestion in the region using federal Construction Mitigation and Air Quality (CMAQ) funds. The objectives of the program are to support new transit services in areas un-served or underserved by the existing transit system as well as serve as a funding source for implementing small-scale roadway, intersection, bicycle, and pedestrian facilities that are recommended in MPO evaluations and studies. Infrastructure investments that increase bicycle and pedestrian mode share such as bike lanes, sidewalks, signs, curb ramps, signals, crosswalks, and crosswalk technology are part of the CLAMP program.

Job Access Reverse Commute (JARC)

The Job Access and Reverse Commute (JARC) program was established to address the unique transportation challenges faced by welfare recipients and low-income persons seeking to obtain and maintain employment. Many new entry-level jobs are located in suburban areas, and low-income individuals have difficulty accessing these jobs from their inner city, urban, or rural neighborhoods. In addition, many entry level-jobs require working late at night or on weekends when conventional transit services are either reduced or non-existent. Finally, many employment related-trips are complex and involve multiple destinations including reaching childcare facilities or other services.

States and public bodies are eligible designated recipients. Eligible sub recipients are private non-profit organizations, State or local governments, and operators of public transportation services including private operators of public transportation services.

Capital, planning and operating expenses for projects that transport low income individuals to and from jobs and activities related to employment, and for reverse commute projects.

The MassWorks Infrastructure Program

Providing a one-stop shop for municipalities and other eligible applicants seeking public infrastructure funding to support economic development, the MassWorks Infrastructure Program represents an administrative consolidation of six grant programs:

- Public Works Economic Development (PWED) Grants
- Community Development Action Grant (CDAG)
- Growth District Initiative (GDI) Grants
- Massachusetts Opportunity Relocation and Expansion Program (MORE)
- Small Town Rural Assistance Program (STRAP)
- Transit Oriented Development (TOD) Grant Program

The MassWorks Infrastructure Program provides grant funding for publicly owned infrastructure including, but not limited to sewers, utility extensions, streets, roads, curb-cuts, parking facilities, site preparation, demolition, pedestrian walkways, streetscape, and water treatment systems. The MassWorks Infrastructure Program is centrally administered by the Executive Office of Housing and Economic Development, in cooperation with the Department of Transportation and Executive Office for Administration and Finance.

Congressional Earmark

A Congressional earmark is an appropriation of government spending that directs approved federal funds to be spent on specific projects and programs. In the legislative appropriations process, Congress is required, by the limits specified under Article 1, Section 9 of the United States Constitution, to pass legislation directing all appropriations of money drawn from the U.S. Treasury. This provides Congress with the power to earmark funds it appropriates to be spent on specific named projects. The earmarking process is a regular part of the process of allocating funds within the federal government and is given out on a merit base system under the direction of Congress. The federal Office of Management and Budget maintains an Earmarks Database.

Federal Transit Administration Small Starts Program

The federal transportation funding Act, SAFETEA-LU, has authorized $600 million of funding for the set-aside of 'Small Starts', major transit capital projects costing in total less than $250 million, and requiring less than $75 million in Small Starts resources. Grants are for capital projects associated with new fixed guideway systems, extensions, and corridor improvements. Non-fixed guideway corridor improvements, such as Bus Rapid Transit, are also allowed under small starts. The Fitchburg Line/128 Transit Center could be a candidate for a 'Small Starts' grant.

TIGER Discretionary Grants (Transportation Investment Generating Economic Recovery)

The TIGER program is dedicated to transportation projects that will preserve/create jobs and promote economic recovery. The American Recovery and Reinvestment Act appropriated $1.5 billion, available through September 30, 2011, for Supplementary Discretionary Grants for a National Surface Transportation System. These grants are awarded on a competitive basis for capital investments in surface transportation projects that will have a significant impact on the Nation, a metropolitan area, or a region. This funding source is referred to as 'TIGER Discretionary Grants' (Transportation Investment Generating Economic Recovery). It is anticipated that there will be a future round of grant solicitations under this program.

Access to Jobs Program

The Access to Jobs Program provides competitive grants to local governments and non-profit organizations to develop transportation services to connect welfare recipients and low-income persons to employment and support services. Programs must be approved by a transit agency. Project selection is made by states in communities under 200,000 and MPOs in urban areas with populations greater than 200,000. The Federal share for Access to Jobs projects is 50%. The Access to Jobs Program is administered by the Massachusetts Department of Transitional Assistance (DTA).

Future User Fees

While User Fees like an increase to the gasoline tax or a Vehicles Mile Traveled (VMT) fee would require approval from the state legislature, many states devote these kinds of levies to fund transportation infrastructure.

In fact some states direct regional or county taxes to fund specific transportation improvements in those smaller geographical areas. Voters often support these kinds of tax increases because they know the benefits will stay in their region.

In Massachusetts, the gasoline tax is 23.5 cents per gallon and has not been increased since 1991. Over that time the fuel efficiency of automobiles has eroded the value of the state gas tax. A comprehensive look at different types of user fees should be conducted statewide. User fees address the long term threats facing the gasoline tax such as a decline in revenue as vehicular fuel efficiencies increase. User fees can also be structured to encourage drivers to maximize efficient use of the roadway system.