

**Developing Strategies for Resource-Constrained Transit Growth through  
Increased Private Sector Involvement**

by

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## **Abstract**

Many transit agencies are facing budgetary, institutional, physical infrastructure, and vehicle constraints, which all tend to restrict agency service growth. This research proposes strategies that allow transit agencies to ease these constraints to enable growth through increased private sector involvement. It suggests that the primary attractiveness of engaging the private sector is not to provide the same service at a lower cost, but to significantly increase service capacity and quality while facing these constraints.

In the recent past, U.S. advocates of private production of transit services have generally promoted contracting primarily as a cost saving method. However, any immediate savings may or may not continue into the long-term, during which the public agency also loses the capacity to produce the service in-house. The alternate view presented here is that the real value of increasing private sector involvement in public transit stems from the substantial improvements in service quality, effectiveness and speed of implementation, and the ability to secure private partners who become new stakeholders and who support funding for increased levels of service.

Transit growth is particularly necessary in cities with rapidly growing areas. In these cases, continued development requires increasing levels of transit service. The Boston metropolitan area has multiple districts where new development is surging. Meanwhile, Boston's Massachusetts Bay Transportation Agency faces numerous constraints that will limit its ability to grow its agency-operated service to the extent desired to allow for rapid development. In spite of this, Massachusetts needs to take advantage of new development in the Boston area in order to reach its economic growth objectives and statewide target of tripling the non-auto modal share by 2030.

This thesis presents the conceptual foundation of operating and funding new service through the private sector, and better coordinating with existing private operators. After suggesting strategies for transit growth through increased private sector involvement, it applies these strategies to opportunities in the resource-constrained Boston region. These ideas could also be easily applied to similar opportunities in resource-constrained agencies across the U.S and internationally.

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# 1 Introduction

Public transit historically began largely as a private profit-making endeavor operated under public regulation, particularly for fares. Over time, as inflation pushed up costs and negotiated fares did not keep pace, profits shrank and losses developed. Governments then shifted transit provision into the public realm in order to maintain services and shape the systems toward meeting public goals. But, in the last few decades, systems throughout the world have developed varying degrees of public-private cooperation and interactions regarding the provision of transit. Some of the major European systems, for example, have gradually shifted transit operations to the private sector through contracting conducted by a public agency (e.g., London now contracts its entire bus system to private companies). Meanwhile, the major transit systems in the United States are still predominately owned and operated by public agencies.

Many transit agencies are facing resource constraints in various forms. Most are facing financial constraints limiting service growth. In Boston, public transit growth is limited not only by funding, but also by numerous institutional and physical constraints, particularly in regards to maintenance facility capacity and fleet size. This thesis will examine the use of various forms of public-private partnerships and funding mechanisms in the context of transit growth, based on the concept that transit growth is necessary (whether publicly or privately provided) to support and enable continued economic growth in high-density locations.<sup>1</sup> It will consider lessons learned from existing public-private partnerships to suggest strategies for transit growth, and will apply these strategies to the resource-constrained Boston region.

## 1.1 Motivation

Although many agencies nationwide likely face similar issues, this thesis is specifically motivated by the capacity constraints faced by the Massachusetts Bay Transportation Authority (“MBTA”) in the Boston region.

### 1.1.1 Boston Transit History

Public transit in the Boston metropolitan area has a rich history. Stagecoaches operated throughout the cities prior to 1800, and as early as the 1820s, omnibuses began to operate along

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<sup>1</sup> This concept relates public transit usage and land-use densities (Zupan & Pushkarev, 1976). This is discussed further in Section 1.1.2.

assigned routes (Sanborn, 1993). Horsecars (streetcars) followed; the Dorchester and Roxbury streetcar line was the first to receive a charter from the Massachusetts Legislature, and was granted the ability to “construct, maintain, and use a railway or railways” along a specified route between Dorchester and Roxbury (Hager, 1892, pp. 14-15). The Cambridge Railroad Company received a charter soon thereafter to operate between Boston and Cambridge, and was actually the first company to operate a streetcar in the Boston area, beginning in March 1856 (Boston Elevated Railway Company, 1938). Other companies were then granted charters for operation along specified locations in Boston and the surrounding areas.<sup>2</sup>

These charters were generally granted without charge, due to belief in the state Legislature and in the City Council of Boston that increased competition would improve service throughout the community (Boston Elevated Railway Company, 1938). It appears as though fees for construction were only required in rare instances, such as a fee imposed by the City of Boston on the Cambridge Railroad of \$30 per year per car using Craigie’s Bridge; or for the Middlesex Railroad’s extension to Dock Square, which required a fee to the City of Boston to compensate for street changes.

Limited regulation led to duplication of existing services and unregulated fares, issues that the General Court of Massachusetts attempted to solve with the West End Consolidation Act in 1887 by consolidating these lines into a single entity, the West End Street Railway Company (“West End Company”) (Hager, 1892; Sanborn, 1993).<sup>3</sup>

Electrification soon followed the consolidation, beginning in 1889 (Sanborn, 1993). The Thomson-Houston Electric Company electrified a line between Bowdoin Square and Harvard Square and provided 20 cars (operated and maintained at their own expense) during a six-month test period. At this point, the West End Company bought 600 motors and was granted pole rights for the entirety of their system (Hager, 1892). The West End Company then purchased land and built a central power station to provide the needed power for the system (Hager, 1892; Boston Elevated Railway Company, 1938). At the time, this power station was state-of-the-art and was the largest power station in the world (Boston Elevated Railway Company, 1938). This

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<sup>2</sup> These companies included the Metropolitan Railroad, Cambridge Railroad, Union Railway, Middlesex Railroad, Broadway Railroad, South Boston Railroad, Dorchester Railway, Dorchester Extension Railway, Suffolk Railroad, Winnisimmet Horse Railroad, Lynn and Boston Horse Railroad, Winthrop Railroad, Chelsea and East Boston Railway, Brookline and Back Bay Railway, The Highland Street Railway, and Charles River Railroad (Hager, 1892).

<sup>3</sup> The West End Consolidation Act refers to the Acts of 1887, Chapter 413.



early introduction to electricity for transit would become important in introducing electricity to the consumer market. Eventually, in 1948, Boston's Metropolitan Transit Authority ("MTA") and Boston Edison would begin cooperatively sharing electric power, allowing for each system to have a backup and for load sharing during peak periods (Clarke, 2003). Eventually, this shift in power provision would be completed, and electricity provision for the MBTA now relies exclusively on outside electric providers.

Shortly after the beginning of transit's electrification in Boston, in 1891, the Boston mayor created the Commission to Promote Rapid Transit for the City of Boston and Its Suburbs in order to develop a transportation plan for the city of Boston. Included in this Commission's 1892 report was a recommendation for what would become the Tremont Street Subway, an idea proposed five years earlier by the president of the West End Company (Most, 2014). In 1894, the Massachusetts Legislature created the Boston Transit Commission and incorporated the privately-owned Boston Elevated Railway Company ("BERY"). The Boston Transit Commission solicited bids for the subway, which would be built in eleven sections, each by a different contractor (Most, 2014). The estimated cost was about \$5 million: \$1.5 million for land acquisition and \$3.5 million for construction (Most, 2014). This would be paid through the issuance of city bonds (Most, 2014). In 1897, the Tremont Street Subway was completed and opened as North America's first subway (Sanborn, 1993; Clarke & Cummings, 1997). The Commission entered into a 20 year lease with the West End Street Railway Company for use of the subway in December 1896, prior to the subway's opening.<sup>4</sup> The lease gave the West End Company exclusive rights to the tracks in exchange for 4.875% of the operating costs of the system; the contract also required five-cent fares and free transfers (Most, 2014).

Meanwhile, the BERY was charged with building elevated lines in the city. In 1897, the BERY entered into a 24-year lease with the West End Street Railway Company for all of its property, allowing for a more unified system (Sanborn, 1993; Clarke & Cummings, 1997). This gave the BERY control of the Tremont Street Subway, allowing it to construct elevated lines that could connect to and use the subway to traverse Boston.

Following construction of the Tremont Street Subway, in 1906 the City of Cambridge authorized the BERY to build a subway or subways in Cambridge and to connect the Cambridge

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<sup>4</sup> The initial term of the lease was for 20 years, with an annual rate of 4.875% of the cost (which was capped at a cost of \$7 million, and turned out to be approximately \$4.2 million) (Clarke & Cummings, 1997).

subway(s) to Boston (Boston Elevated Railway Company, 1938). Unlike in Boston, where the subways were constructed by the City of Boston and leased to the railroad company, the BERY was responsible for constructing the Cambridge subway, with stations at Kendall, Central, and Harvard Squares (Boston Elevated Railway Company, 1938). However, the connection on the Boston side was provided by the City of Boston and leased to the BERY in 1911 at a rate of 4.875% of the net cost of construction and acquisition (Boston Transit Commission, 1911). Opening in 1912, the total construction cost for the BERY was \$10.4 million, while the City of Boston spent only \$1.3 million for a connecting tunnel under Beacon Hill from Charles Street to Park Street (Cheney, 2002). In the face of financial difficulties for the BERY, it was sold to the Commonwealth of Massachusetts in 1920 for over \$7.8 million (Boston Elevated Railway Company, 1938). Although the private BERY took the initial construction risk, the public sector helped bail it out when facing financial difficulties.

The BERY was also responsible for constructing the East Cambridge viaduct between the Tremont Street subway and Lechmere in Cambridge, with service on the viaduct beginning in 1912 (Boston Elevated Railway Company, 1938). This was the same year that the International Association of Car Men backed the formation of the local union of Boston Elevated employees and won important new labor bargaining rights, which led to a higher cost structure and financial stress. Meanwhile, publicly-funded projects undertaken in Boston included the Boylston Street Subway, the East Boston tunnel extension, and the Dorchester tunnel (each leased in 1911 to the BERY at 4.5% per year of the net cost of acquisition and construction) (Boston Transit Commission, 1911; Boston Elevated Railway Company, 1938).<sup>5</sup>

Both the BERY and The West End Street Railway Company had some other basic public responsibilities in the early years. According to the former President of the West End Street Railway Company, Henry M. Whitney, the Company was responsible for paving the part of the street covered by their tracks, which amounted to \$7000-8000 per mile (Hager, 1892). Prentiss Cummings, Esq. further noted in an address that the annual cost of paving maintenance to the West End Company was \$150,000 per year (Hager, 1892). Similarly, the BERY would later be responsible for snow removal, even losing \$1 million in its second winter due to snow. Over

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<sup>5</sup> Note that the East Boston Tunnel had also been originally built by the Boston Transit Commission, with the BERY operating service in the tunnel (Cheney, 2004).

time, the BERY would make efforts to improve its equipment to lessen the impact of Boston's weather on operating costs (Boston Elevated Railway Company, 1938).

Public interests came to the forefront with the Public Control Act of 1918, which provided for public management and operation of the BERY, including both subsidy and setting fares (Commonwealth of Massachusetts, 1918). This resulted largely from the requirement for the BERY to have 5-cent fares, which did not allow for the type of high-quality transportation system desired by the region (Boston Elevated Railway Company, 1938). Inflation following World War I increased labor costs, which also conflicted with the fare regulation in place. The Act also required an initial stock issue to raise \$3 million, of which \$1 million would be put into a reserve fund (Commonwealth of Massachusetts, 1918). The company would contribute annual operating profits (defined as positive income minus cost of service) to the reserve fund, and the reserve fund would be used to pay any annual net losses (Commonwealth of Massachusetts, 1918). In instances in which the company's annual net loss was greater than the amount in the reserve fund, the Commonwealth of Massachusetts would be obligated to contribute the difference. The Commonwealth could procure that money through borrowing (Commonwealth of Massachusetts, 1918). This Act represented a marked shift in public involvement in transit service in Boston.

After the Public Control Act of 1918, the public was also responsible for numerous other large capital expansions in the early part of the 20<sup>th</sup> century. The City of Boston paid for a double-track right-of-way to Harrison Square and Shawmut, a section that belonged to the New Haven Railroad. The city also paid for the accompanying construction, totaling over \$12 million between construction and right-of-way acquisition, with the line opening in 1928 (Boston Elevated Railway Company, 1938). The Kenmore extension cost the Boston Transit Department \$5 million, and opened in 1932 (Boston Elevated Railway Company, 1938). From 1937-1941, the Boston Transit Department constructed the Huntington Avenue Subway, which was one of the first major projects to be funded federally (through the Works Progress Administration) (Clarke & Cummings, 1997). At a cost of just over \$2 million, the City of Boston paid 38% and the federal government paid 62% (Boston Elevated Railway Company, 1938).

Boston's public transportation was in this way privately owned and operated, with various public contributions, until 1947. In 1947, however, the Massachusetts Legislature created the Metropolitan Transit Authority as an entity to absorb all of the properties and assets

of the BERY.<sup>6</sup> The MTA initially served 14 towns in the Boston region, and signaled a shift in transit provision in the city to public ownership and operation.<sup>7</sup> This shift arose partially due to a political issue existing from the private ownership and public control: local property tax assessments were used to fund BERY operating deficits, with payments partially used to pay dividends to BERY shareholders. Over time, public opposition grew against this arrangement due to the view that the BERY was a private monopoly serving a public purpose – public opinion approved more of public ownership in order to avoid paying dividend payments to shareholders (Clarke, 2003).

BERY and MTA debt was combined and issued to the Boston Metropolitan District.<sup>8</sup> In 1949, the District then assumed responsibility from the City of Boston and the Boston Transit Department (formerly the Boston Transit Commission). The Boston Metropolitan District subsequently transferred to the MTA this responsibility for the City's subways, tunnels, and rapid transit facilities in exchange for over \$40 million of bonds (Clarke & Cummings, 1997).<sup>9</sup> All MTA debts, liabilities, and obligations were then transferred to the MBTA with its creation in 1964.<sup>10</sup> The MBTA is the current transit authority of the Boston region. The MBTA has a long history with different funding approaches, which will be discussed in detail in Chapter 4.

Boston's commuter rail has a varying history with regulation. From 1872 – 1882, any railroad companies meeting minimum standards could take land for routes and stations through eminent domain; these routes were only changed if local officials objected (Humphrey & Clark, 1986). In 1882, the law changed so that lines were only built where the Board of Railroad Commissioners determined that there was a public need, or alternatively, through proposed changes approved by the Board of Railroad Commissioners (Humphrey & Clark, 1986). Regulation then passed through various governing bodies, including the Interstate Commerce Commission and Massachusetts Department of Public Utilities, until 1964, when the MBTA gained regulatory power over commuter rail (Humphrey & Clark, 1986).

Beginning in 1958, interstate railroads no longer needed to get service cuts approved by state railroad commissions, but could instead ask the Interstate Commerce Commission to allow

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<sup>6</sup> This was written into the Acts of 1947, Chapter 544 (Commonwealth of Massachusetts, 1994).

<sup>7</sup> The 14 cities and towns include: Boston, Cambridge, Arlington, Belmont, Brookline, Chelsea, Everett, Malden, Medford, Milton, Revere, Somerville, and Watertown.

<sup>8</sup> This was written into the Acts of 1947, Chapter 544, Section 7A(c) (Commonwealth of Massachusetts, 1994).

<sup>9</sup> This was written into the Acts of 1948, Chapter 572 (Commonwealth of Massachusetts, 1994).

<sup>10</sup> This was written into the Acts of 1964, Chapter 563 (Commonwealth of Massachusetts, 1994).

service cuts (Duke University School of Law, 1970). Partially as a result, public subsidy of commuter rail first occurred in Boston in 1958, a year and a half after the New Haven & Hartford Railroad threatened to shut down service on the former Old Colony Railroad lines (Humphrey & Clark, 1985).<sup>11</sup> While court injunctions kept continuous service during that year and a half, legislation ultimately provided for the cities and towns served by the line to pay a one-year, \$900,000 subsidy to the New Haven Railroad (Humphrey & Clark, 1986). The subsidy was not continued beyond the first year for various reasons, including public distrust of railroad management and the belief that other projects would provide better alternatives, such as the Southeast Expressway and rapid transit extension to Braintree (Humphrey & Clark, 1986).

A different method was taken in 1958, when the MTA acquired the title to the Newton Highlands branch of the Boston & Albany Railroad in order to gain control to that service. By 1959, the MTA had converted the branch to use PCC trains (Sanborn, 1993). MTA funded the construction through a bond issue authorized by the Massachusetts Legislature (Humphrey & Clark, 1986). This branch is still in operation on the MBTA today as the Green Line D – Riverside branch.

The more traditional approach to commuter rail subsidization quickly became more standard. In 1959, the Commonwealth of Massachusetts created the Mass Transportation Commission (“MTC”) to coordinate transportation planning and land use. The MTC then conducted a study on service and fare levels, ultimately recommending increased frequency and lower fares, and in turn requiring subsidization from the MTA (Humphrey & Clark, 1986). The MTA could then choose to either extend rapid transit along the commuter rail lines, subsidize the lines, or abandon the lines. This led to the creation of the MBTA in 1964, which had jurisdiction to operate (either directly or contracted) service in the 78 towns of the Boston Metropolitan Statistical Area (Humphrey & Clark, 1986).

In 1965, the Boston & Maine Railroad was allowed to drop nearly all of its Boston service, with the MBTA funding service as a replacement (through signed agreements with the included communities). Similarly, the New Haven Railroad eliminated most of its passenger service, with the MBTA continuing service on those lines beginning in 1966 (Humphrey & Clark, 1986). Subsidization on the Old Colony line came too slowly, and service was discontinued, as discussed above.

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<sup>11</sup> The New Haven Railroad had leased the Old Colony system beginning in 1893 (Humphrey & Clark, 1985).

Subsidization of commuter rail changed over time. From 1967-1973, state appropriations paid 90-100% of subsidies (with local funding providing the difference), but this was cut back to 50% in 1974. Throughout the 1970s, the Commonwealth and the MBTA acquired many of the commuter rail right-of-ways from the private companies (Humphrey & Clark, 1986). Then, in 1976, the MBTA entered into its first multi-year contract for commuter rail operations, a 5-year contract with the Boston & Maine Railroad, and operations on all trains were contracted to Boston & Maine by 1977 (Humphrey & Clark, 1986). Both of Boston's commuter rail hubs are entrenched in this public-private history. As described below, South Station and North Station were both originally built by private interests before transferring to public control later in the century.

South Station was built by the Boston Terminal Company, a group initially consisting of five of the major railroad companies in the region. The companies involved funded the project using bond sales and stock purchases, while the City of Boston paid for supplementary improvements in the area surrounding the station, with the station ultimately opening in 1899 (EOP-South Station L.L.C.).

The Boston Redevelopment Authority ("BRA") bought South Station in 1965 for \$6.9 million (Beacon So. Station Assocs. LSE, a/k/a EOP-South Station, LLC vs. Board of Assessors of the City of Boston, 2013). After a few years and due to its abandonment and dilapidation, the BRA began demolition in 1970, only to be stopped in order to historically preserve the station (Beacon So. Station Assocs. LSE, a/k/a EOP-South Station, LLC vs. Board of Assessors of the City of Boston, 2013). In 1979, the BRA sold South Station to the MBTA for a sum estimated between \$4.4 and \$6.1 million, and the MBTA has owned it since then.<sup>12,13</sup> The MBTA became interested in using public-private partnerships to renovate the station and to provide to customers improved options for food and incidental services, and leased the station to EOC-South Station LLC in 1988. The lease called for EOC-South Station LLC to pay the MBTA a minimum of \$330,000 per year or a formulated amount based on its net income, whichever is greater, and provided that the MBTA pay 50% of building space operating expenses and 75% of railroad space operating expenses (but 0% of private space operating expenses). The lease now expires

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<sup>12</sup> The transfer fee was specified at \$4.4 million by Commonwealth of Massachusetts, Appellate Tax Board (Beacon So. Station Assocs. LSE, a/k/a EOP-South Station, LLC vs. Board of Assessors of the City of Boston, 2013). The transfer fee was specified at \$6.1 million by EOP-South Station L.L.C. (EOP-South Station L.L.C.).

<sup>13</sup> BRA retained air rights over the track (Personal Communication, 2014-2015a).

in 2024, with lessee options for two 15-year extensions (Beacon So. Station Assocs. LSE, a/k/a EOP-South Station, LLC vs. Board of Assessors of the City of Boston, 2013).

Originally, Boston's North Station was built in 1893 and financed mainly by the Boston & Maine Railroad (although it served numerous other railroads as well) (Amtrak; Liljestrand, 2003). This was damaged by fire, and in 1928, the Boston & Maine Railroad opened a new North Station (Liljestrand, 2003). North Station was then sold from the Boston & Maine Railroad to the MBTA in 1976 as part of the Boston & Maine's bankruptcy and reorganization (Massachusetts Bay Transportation Authority, 1976; Personal Communication, 2014b). North Station was also expanded and renovated in 2006 through legislation which required cooperation between the MBTA and Delaware North Companies, which owns the TD Garden, a sports arena above North Station (Massachusetts Bay Transportation Authority, 2006).

In addition, beginning in 1977, Massachusetts regional transit authorities ("RTA" or "RTAs") played a part in commuter rail funding. The RTAs had access to federal operating funds that local communities did not have access to, and as a result, by the end of 1979 only a single town still contracted individually instead of through a RTA (Humphrey & Clark, 1986).

Massachusetts RTAs have had a significant history enveloping both the public and private sectors. The RTAs were set up in 1973 as multiple political subdivisions of the Commonwealth (M.G.L. §161B). Each RTA was charged with the responsibility of financing and contracting transit operations for their administrative district, and in fact was not authorized (and is still not authorized) to provide directly operated transit service (M.G.L. §161B). Moreover, the funding for any positive net cost of service was specified to come from the Commonwealth, which would assess that cost against the cities and towns included in the RTA proportional to the losses attributable to the routes in each town (M.G.L. §161B). This service was initially supported by federal subsidization of 50% of operating costs, which was later discontinued. Now, the Commonwealth has the option to provide contract assistance, i.e., to fund up to 50% of the net cost of service, lessening the burden on the local cities and towns (M.G.L. §161B). This relationship between public ownership and private operations for the Massachusetts RTAs is important to consider in the Boston context, where the majority of the services are publicly operated. This issue will be further developed in later chapters.

### 1.1.2 Boston Population Growth

The Metro Boston area is currently home to approximately 4.5 million people, and as demonstrated in Table 1-1, is expected to grow by 6.6% - 12.6% in the next 30 years.<sup>14</sup> Some areas in particular have significant development plans that will require increased transit service. For example, the South Boston Seaport district is expected to add over 20 million square feet of new development, 15,000 new residents, and 35,000 new jobs from 2008 to 2030 (A Better City, 2008a; A Better City, 2008b). Some of this development has been completed in the past few years, and traffic congestion in the area has already become a problem (Gu, Kladeftiras, Mohammad, & Xuto, 2014).

Year*	Population Scenario		Labor Force Scenario	
	Status Quo	Stronger Region	Status Quo	Stronger Region
2010	4,457,728	4,457,728	2,515,509	2,515,509
2020	4,558,017	4,662,241	2,542,797	2,616,337
2030	4,683,118	4,887,880	2,508,775	2,642,502
2040	4,750,296	5,018,578	2,526,326	2,690,308
Change 2010-2040	6.6%	12.6%	0.4%	6.9%

**Note:** Values for 2010 are actual, while values for 2020-2040 are predicted.

**Table 1-1. Metro Boston Regional Population and Labor Force Projections**

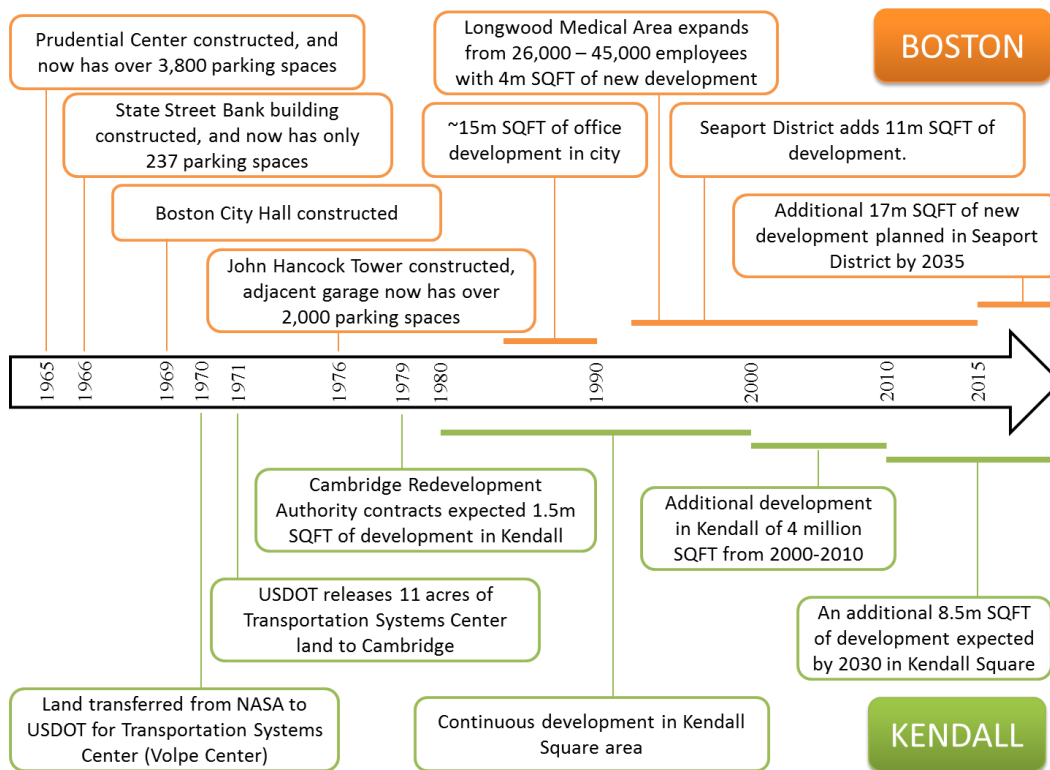
*Source: (Metropolitan Area Planning Council, 2014)*

Although the MBTA provides bus and Silver Line service through the Seaport, according to recent work, 14 private shuttle routes operate between the Seaport district and Boston to offer an alternative to the MBTA routes that are approaching capacity during the peaks (Gu, Kladeftiras, Mohammad, & Xuto, 2014). This need for increased transit capacity in the Seaport District has also been identified by the South Boston Waterfront Sustainable Transportation Plan, which is sponsored in part by public entities that include the City of Boston, Massachusetts Department of Transportation (“MassDOT”), Massachusetts Port Authority (“Massport”), and the Massachusetts Convention Center Authority (VHB et al., 2015).

The top panel of the timeline in Figure 1-1 demonstrates the significant amount of building development in Boston area that has occurred since 1965. Notable in this timeline is the recent and future development in the Longwood Medical Area, Seaport District, and Kendall Square (Cambridge).

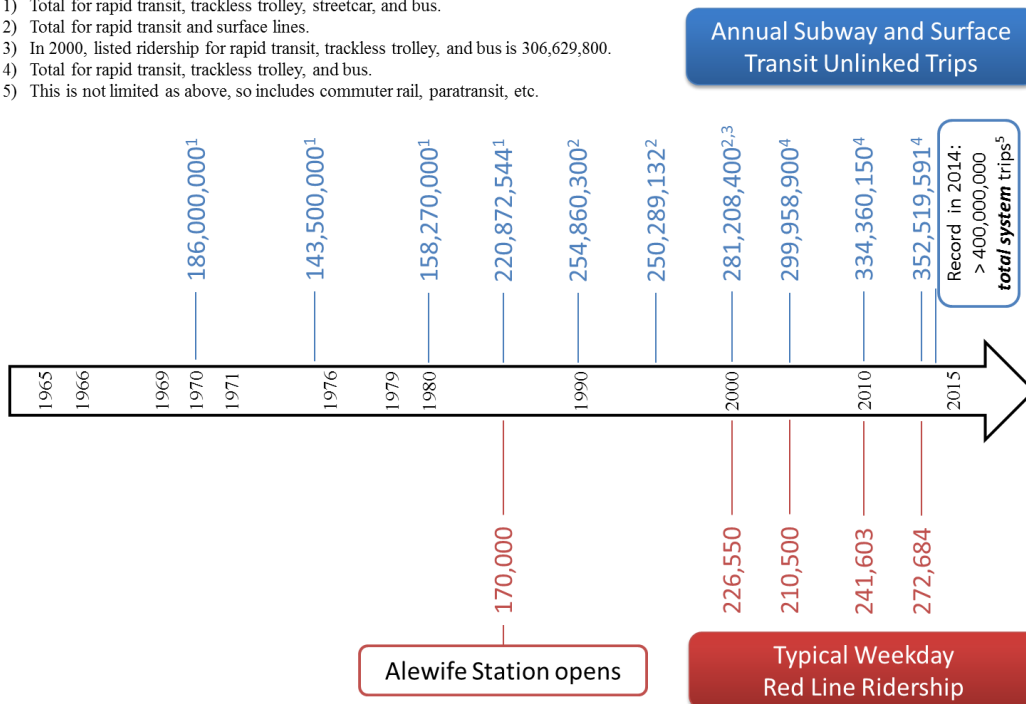
<sup>14</sup> 6.6% growth is predicted in the “status quo” scenario and 12.6% in the “stronger region” scenario in the Boston regional planning council’s growth projections for 2010-2040. For more information, see (Metropolitan Area Planning Council, 2014).





**Notes:**

- 1) Total for rapid transit, trackless trolley, streetcar, and bus.
- 2) Total for rapid transit and surface lines.
- 3) In 2000, listed ridership for rapid transit, trackless trolley, and bus is 306,629,800.
- 4) Total for rapid transit, trackless trolley, and bus.
- 5) This is not limited as above, so includes commuter rail, paratransit, etc.



**Figure 1-1. Timeline of Development in Boston and Kendall Square, and MBTA Ridership, 1965-Present<sup>15</sup>**

<sup>15</sup> For timeline sources and more details, please see Appendix A.

The bottom panel of Figure 1-1 provides the corresponding levels of MBTA ridership along this timeline. The number of unlinked trips has increased considerably since 2000, and most recently has surpassed 400 million annually across the entire system. Specific to the Red Line, typical weekday ridership has grown by over 100,000 trips since the opening of Alewife Station. This is particularly notable for Kendall Square, as the Red Line is increasingly approaching its capacity limit and will need additional capacity to allow for the proposed development. Recent trends for MBTA service are discussed in Section 1.1.3, and MBTA constraints limiting additional growth are discussed in Chapter 4.

Increased transit service is necessary in both the Seaport District and Kendall Square, but these are just a few examples of the need for transit growth in the Boston area. This need is not alone in the Boston context, and Boston is not unique among its peer cities nationally. Many other metropolitan areas and other agencies are facing similar issues.

The idea that increasing density of development requires a disproportionate increase in transit service is developed in the work of Pushkarev and Zupan (1976). Pushkarev and Zupan consider the relationship between land-use densities and public transit usage, noting the association between higher density development and increasing levels of transit usage, and the relationships between different levels of development and different types of transit service. In particular, they comment that “as total destinations per square mile exceed those which can be taken care of by auto, the surplus is handled by public transit. It is largely because of this phenomenon that the higher the density of a downtown area, the greater the proportion of trips that go there by transit” (Zupan & Pushkarev, 1976, p. 82). This idea is particularly applicable to the context of this research, and to parts of the Boston area as mentioned above.

### **1.1.3 MBTA Service: Current and Recent Trends**

In 2012, Massachusetts Secretary of Transportation Richard Davey stated the goal of tripling the statewide mode share of bicycling, transit, and walking by 2030 (Massachusetts Department of Transportation, 2012a). This goal was formalized in the GreenDOT Implementation Plan in December 2012 and the Healthy Transportation Policy Directive of September 2013 (Massachusetts Department of Transportation, 2012b; Massachusetts Department of Transportation, 2013). These policy initiatives supported the state’s goal that established target reductions of GHG emissions from 1990 levels of 25% by 2020 and 80% by

2050 (Commonwealth of Massachusetts, 2008; Massachusetts Department of Energy and Environmental Affairs). But in many ways, these environmental objectives could be equally well reasoned as economic imperatives to support economic growth and densification through increasing levels of transit service.

Because Boston is the main urban center in the state, much of the modal shift will need to come from the Boston area. One MassDOT document projected that meeting the GreenDOT target mode shift would require transit passenger miles traveled to increase from 1.83 billion to 5.93 billion from 2010 to 2030, an increase of 224%, or 4.1 billion passenger miles traveled (Massachusetts Department of Transportation, 2014a). As described in Table 1-1, the Boston population could grow by over twelve percent in the “Stronger Region” regional planning council prediction, with the labor force also growing by over six percent in that scenario.

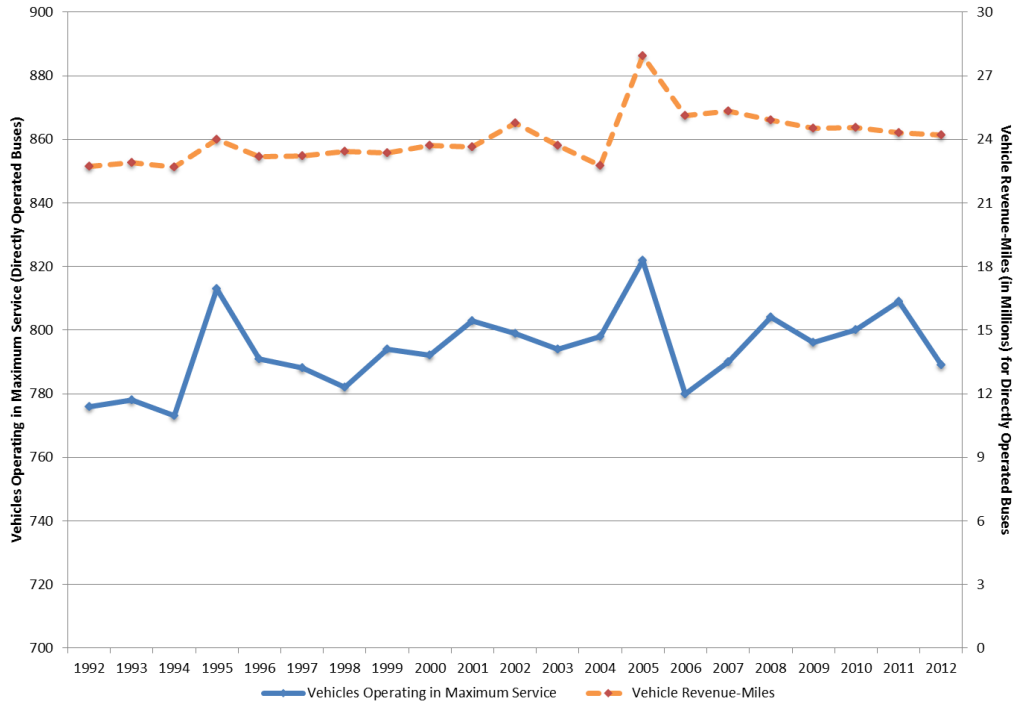
In contrast to these targets, the MBTA has been at or approaching bus capacity in its maintenance facilities and depots since the early 1990s. Various MBTA bus service measures are shown in Table 1-2 (including data for the Silver Line and trolley buses, which is not readily separable):

<b>Year</b>	<b>Vehicles Operating in Maximum Service</b>	<b>Vehicle Revenue-Miles</b>	<b>Vehicle Revenue-Hours</b>	<b>Unlinked Passenger Trips</b>	<b>Passenger Miles Traveled</b>
1992	776	22,723,426	2,241,692	95,096,574	217,961,347
2002	799	24,773,399	2,366,154	110,725,884	275,690,451
2012	789	24,184,591	2,422,811	118,618,285	305,909,089
<b>Percent Change</b>					
1992-2002	3.0%	9.0%	5.6%	16.4%	26.5%
2002-2012	-1.3%	-2.4%	2.4%	7.1%	11.0%

**Table 1-2. Change in Directly Operated Bus Service Provided by MBTA, 1992-2012**

*Source: (Federal Transit Administration, 2014)*

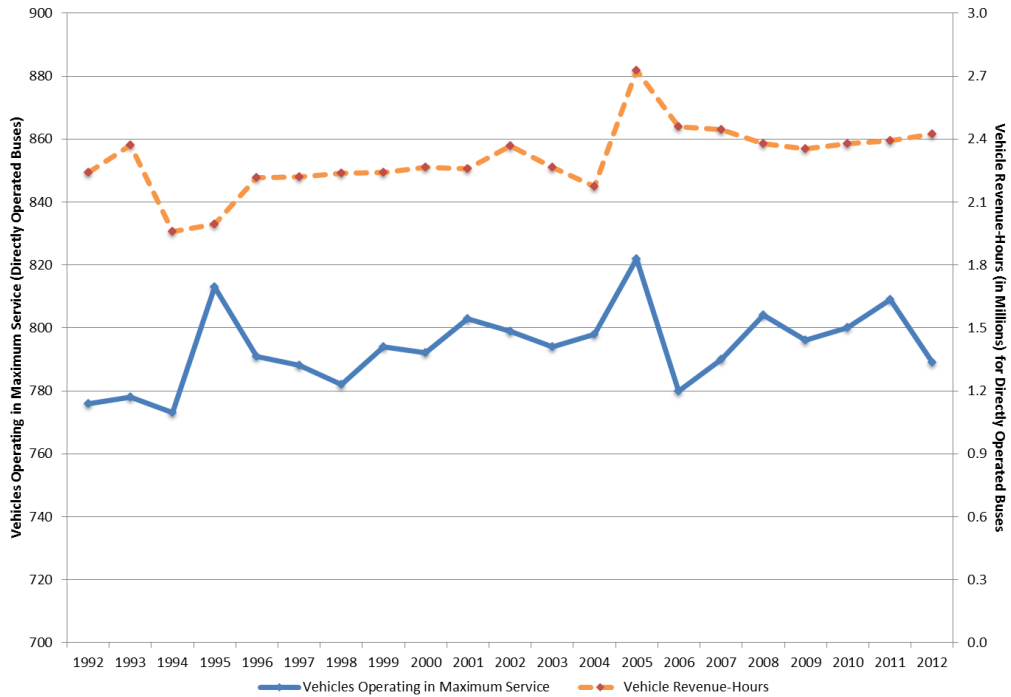
In the two decades from 1992 to 2012, there were small increases in vehicles operating in maximum service (“VOMS”), vehicle revenue miles (“VRM”), and vehicle revenue hours (“VRH”). However, these increases are due to the first half of that period, as the number of buses operating in maximum service and bus revenue miles actually decreased between 2002 and 2012. This is especially concerning considering that data appears to include the Silver Line and has a large spike in 2005 when the SL1 and SL2 began service, implying even larger decreases for non-Silver Line buses from 2002-2012. The annual data is illustrated in Figure 1-2 and Figure 1-3:



Note: Directly Operated service includes both motorbuses and trolley buses.

**Figure 1-2. MBTA Annual Directly Operated Bus Service Trends: VOMS and VRM**

Source: (Federal Transit Administration, 2014)



Note: Directly Operated service includes both motorbuses and trolley buses.

**Figure 1-3. MBTA Annual Directly Operated Bus Service Trends: VOMS and VRH**

Source: (Federal Transit Administration, 2014)

As Figure 1-2 and Figure 1-3 demonstrate, while the number of buses operated in maximum service varies year-to-year, there is not a noticeable increasing trend across the period as a whole. Similarly, outside of the spike in 2005, the annual number of bus revenue miles and bus revenue hours directly operated by the MBTA has more or less flat-lined in the last two decades. This demonstrates that the MBTA has limited resources available to allow for system growth, a difficult proposition for a region reliant on increased transit to support economic growth, as discussed above.

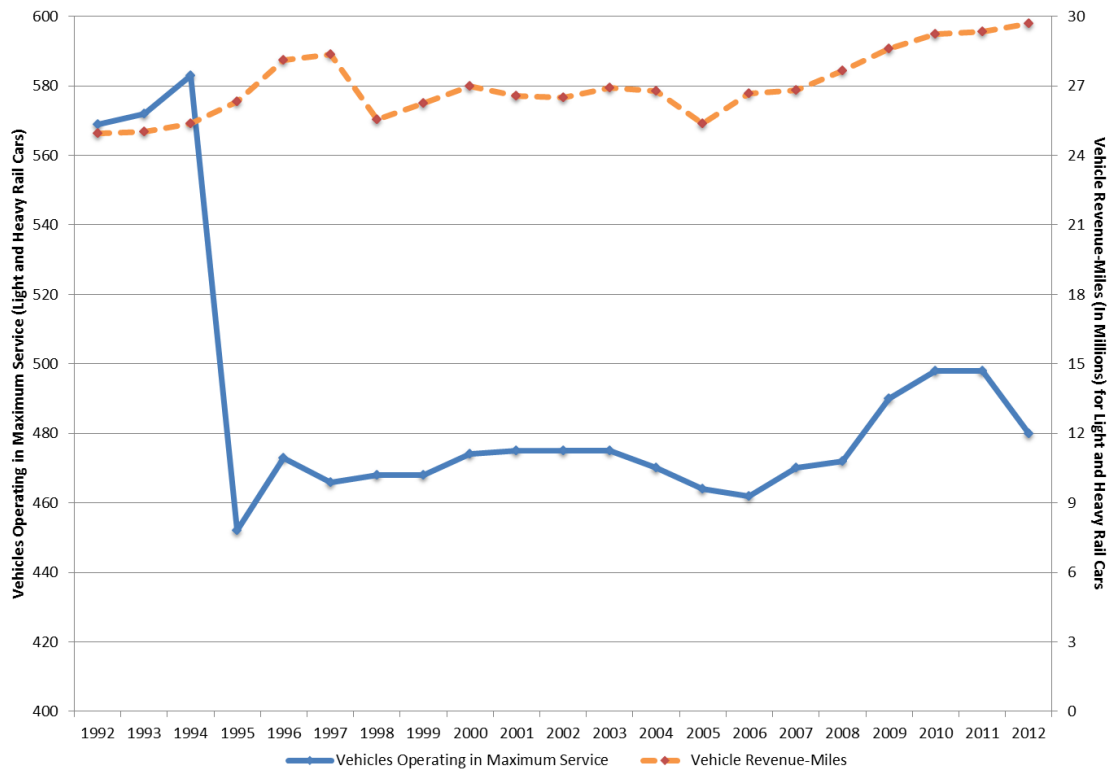
Even with limited service increases, the MBTA has been able to increase bus ridership as shown in Table 1-2. This implies that either the MBTA has realized increased efficiency with its existing service, has witnessed increasing levels of crowding on its existing service, or has had some combination of these two factors. With the trend of increasing bus ridership, it is essential that the MBTA continue to grow service to serve both the existing and latent demand.

The rail rapid transit trends are similar for the MBTA, as demonstrated in Table 1-3 and Figure 1-4. The system has seen only marginal growth in heavy and light rail vehicles operating in maximum service and vehicle revenue miles since 1995.<sup>16</sup> Note that these measures consider a vehicle to be an individual train *car*, not an entire train *consist*. Meanwhile, unlinked passenger trips and passenger miles traveled have increased considerably in that period, leading to increased levels of crowding. For example, peak hour passengers on Red Line trains are frequently denied boarding at heavy load points.<sup>17</sup> It should be noted that there was a steep drop in 1995 in vehicles operating in maximum service, which was largely due to the retirement of active vehicles on the Red Line (which had been fully replaced by the end of 1994) and as such was not a real service decrease. Because of this, a discussion of trends should consider 1995 as the starting point to account for this non-real decline in 1995.

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<sup>16</sup> The data published in the National Transit Database for vehicle revenue hours appears to be calculated from the vehicle revenue miles based on an assumed average speed for the period from 1994-2004 (exactly 22.0 miles per hour for heavy rail and 15.0 miles per hour for light rail). As such, this data may not accurately represent the number of vehicle hours operated during that period (for example, in the other years from 1991-2012 for which data was available, MBTA heavy rail speeds ranged from 14.6 to 20.1 miles per hour, with the assumed speed of 22.0 miles per hour lying outside of this range). Because of this apparent flaw in the data, information related to vehicle revenue hours for light and heavy rail has not been included.

<sup>17</sup> For example an average of 244 passengers were unable to board trains during the AM Peak at Central station in the southbound direction on five weekdays in July and September (July 29, July 31, September 19, September 23, and September 25, 2013). Denied boarding is known to be a problem in both directions along the Red Line during both peak periods. Crowding is also a concern along portions of the Orange Line and much of the Green Line.



**Figure 1-4. MBTA Annual Rapid Transit Service Trends: VOMS and VRM**

*Source: (Federal Transit Administration, 2014)*

<b>Year</b>	<b>Vehicles Operating in Maximum Service</b>	<b>Vehicle Revenue-Miles</b>	<b>Unlinked Passenger Trips</b>	<b>Passenger Miles Traveled</b>
1995	452	26,335,479	185,009,269	565,132,409
2002	475	26,490,747	235,045,364	734,893,315
2012	480	29,705,524	241,777,112	778,164,041
<b>Percent Change</b>				
1995-2002	5.1%	0.6%	27.0%	30.0%
2002-2012	1.1%	12.1%	2.9%	5.9%

**Table 1-3. Change in Rapid Transit Service Provided by MBTA, 1992-2012**

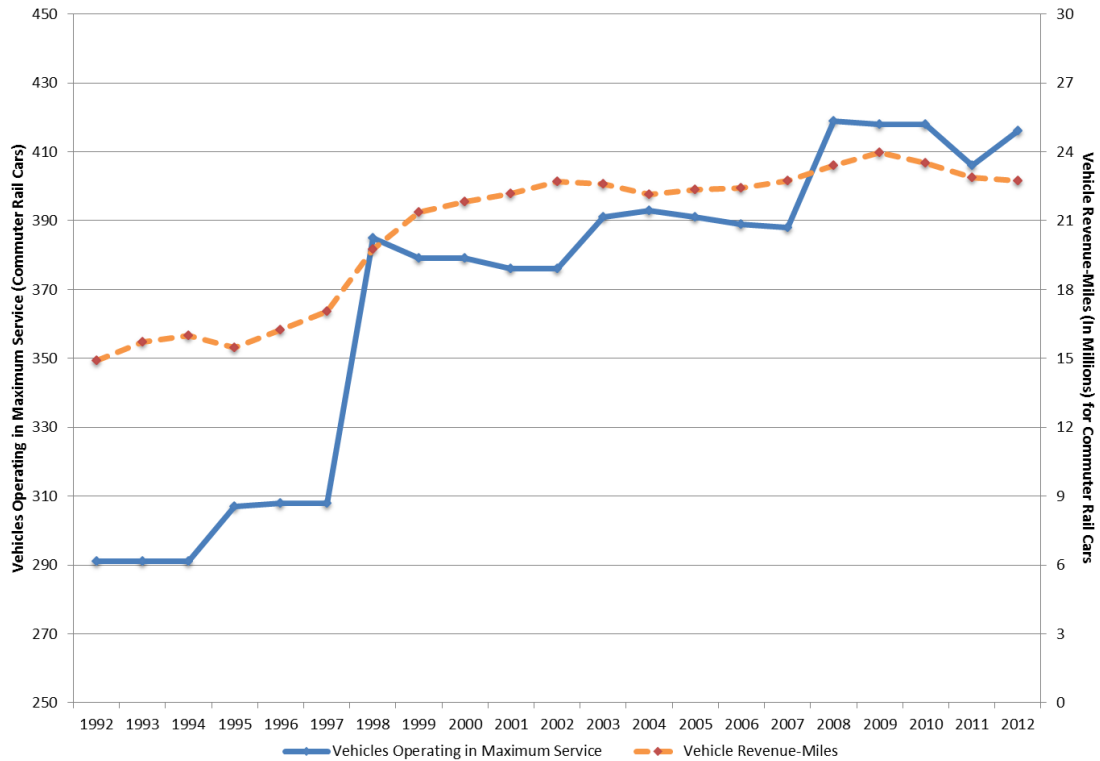
*Source: (Federal Transit Administration, 2014)*

Meanwhile, commuter rail has seen a very different trend, as demonstrated in Table 1-4, Figure 1-5, and Figure 1-6. The number of vehicles operating in maximum service has increased over each of the last two decades, and the number of vehicle revenue miles and vehicle revenue hours increased quite significantly over the period (although much of this growth occurred two decades ago). Unlinked passenger trips and passenger miles traveled have also increased, to an even greater extent.

Year	Vehicles Operating in Maximum Service	Vehicle Revenue-Miles	Vehicle Revenue-Hours	Unlinked Passenger Trips	Passenger Miles Traveled
1992	291	14,898,400	501,841	19,949,255	368,607,011
2002	376	22,694,155	692,927	39,266,885	764,774,597
2012	416	22,724,599	769,961	36,083,946	729,727,617
<b>Percent Change</b>					
1992-2002	29.2%	52.3%	38.1%	96.8%	107.5%
2002-2012	10.6%	0.1%	11.1%	-8.1%	-4.6%

**Table 1-4. Change in Commuter Rail Service Provided by MBTA, 1992-2012**

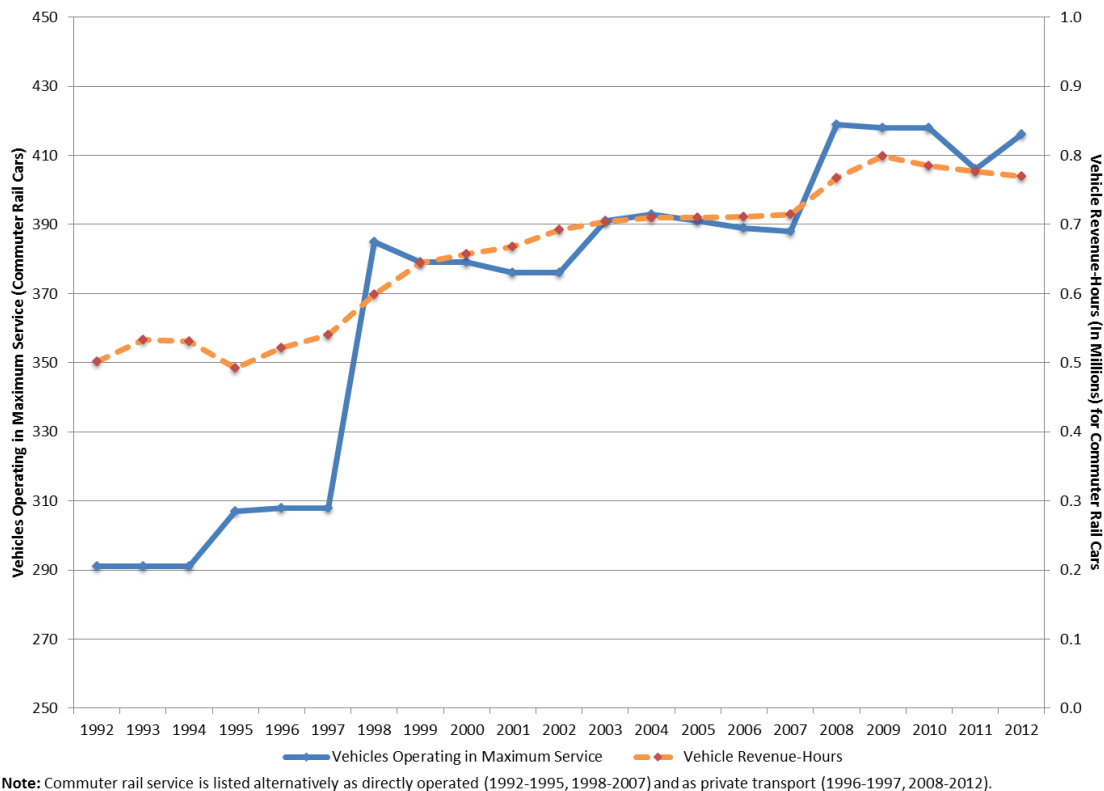
*Source: (Federal Transit Administration, 2014)*



**Note:** Commuter rail service is listed alternatively as directly operated (1992-1995, 1998-2007) and as private transport (1996-1997, 2008-2012).

**Figure 1-5. MBTA Annual Commuter Rail Service Trends: VOMS and VRM**

*Source: (Federal Transit Administration, 2014)*



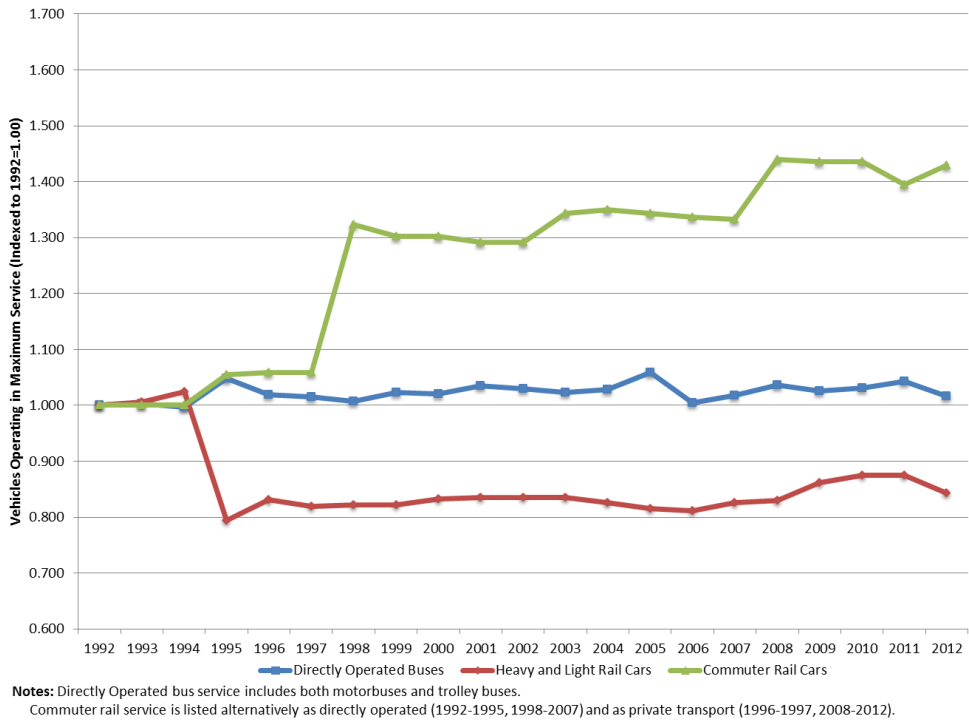
**Figure 1-6. MBTA Annual Commuter Rail Service Trends: VOMS and VRH**

*Source: (Federal Transit Administration, 2014)*

It is notable that for each of these modes, the growth in passenger miles traveled is greater than the growth in unlinked passenger trips. This is likely due to a lack of affordable housing in central areas and/or a mode shift from auto to transit in outer areas in response to rising congestion, a trend that might continue without significant policy changes.

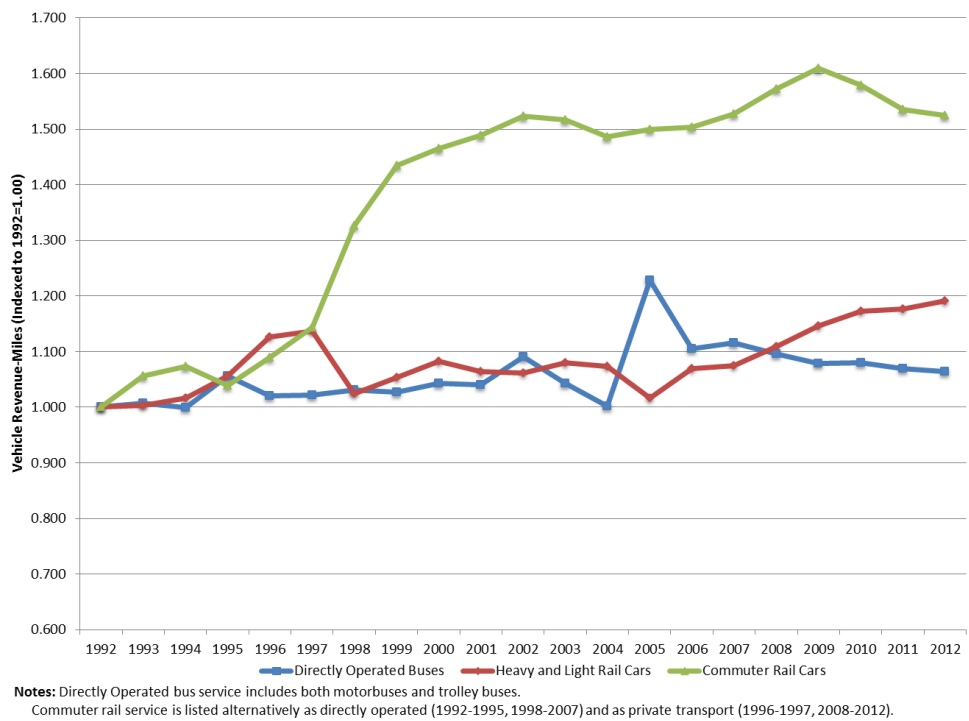
A comparison of the growth in different modes can be seen in Figure 1-7 and Figure 1-8. These charts use the given values in 1992 as an index value of 1.00, with the values in all other years compared to the 1992 value. As these figures reiterate, commuter rail has experienced significantly greater service growth than the more urban rapid transit systems, and bus service has remained largely unchanged over the past two decades. Although commuter rail ridership has also increased considerably as a percent change over the past two decades, it is important to note that it still has a much smaller ridership than rail or bus. In 2012, for example, there were 118.6 million unlinked bus trips, 241.8 million unlinked light and heavy rail trips, and only 36.1 million unlinked commuter rail trips. Because of the disparity in total ridership, commuter rail’s growth in service and ridership does not significantly impact transit’s modal share.





**Figure 1-7. MBTA Growth in Vehicles Operating in Maximum Service for Various Modes, 1992-2012**

*Source: (Federal Transit Administration, 2014)*



**Figure 1-8. MBTA Growth in Vehicle Revenue Miles for Various Modes, 1992-2012**

*Source: (Federal Transit Administration, 2014)*

## **1.2 Research Approach**

This research will have a two-pronged approach. It will extensively examine the previous experiences of various cities regarding public-private partnerships of differing forms. Based on the theoretical basis for public-private partnerships, legislation in place, and literature discussing various examples, this research will develop strategies for public-private partnerships going forward. The research will consider public-private partnerships both in regards to funding and to operating service expansions. It will then apply these lessons and ideas to service growth opportunities in the Boston context.

For the Boston applications, different methods of growing transit through public-private partnerships will be considered. It is necessary to understand the specific constraints that exist in this context, so these constraints will be thoroughly detailed. Each of the applications will address transit growth in relation to these constraints, and outline the tradeoffs for the major actors involved. Understanding these institutional interactions between the major stakeholders is necessary to develop implementation strategies for each of the plans.

Ideally, this research would also be able to reflect on each of the strategies developed as they are implemented. However, that is neither fully in the timeframe nor the scope of this work. Additional conversations with the parties involved helped to better understand the intricacies of each scenario and develop a foundation for implementing the strategies in the future.

A distinction is made in this research between contracting to reduce the costs of service and contracting to increase the level of service. This thesis proposes that increased private sector involvement can do the latter. As discussed briefly in Chapter 2, considerable research has addressed the former. Focusing on contracting for growth instead of contracting for costs presents opportunities for working within the Pacheco Law in Massachusetts (see Sections 4.3.2 and 7.2), and in a broader context, considers the importance of upholding labor fairness.

## **1.3 Thesis Organization**

The thesis is organized into seven chapters. These chapters will be grouped into two main sections: one section presents the theoretical basis behind the research, and a second section develops specific strategies for alleviating constraints to allow for increased transit growth in the Boston region. The chapters are detailed below.

A series of chapters presenting the literature and theoretical foundation of this work follows the introduction. This begins in Chapter 2, which presents the theory behind public-private partnerships. Chapter 2 discusses the literature relating to the benefits and costs of public and private provision of services, and how public-private partnerships can develop to take advantage of the benefits of both the public and private. It also examines some of the government programs in place related to private sector involvement in public transit, and considers both domestic and international experiences with public-private partnerships in transit. Chapter 3 then applies the lessons from Chapter 2 to develop a theoretical understanding of how private sector involvement can allow for transit system growth in a resource-constrained environment. This chapter focuses on identifying various types of constraints and understanding how public-private partnerships could theoretically alleviate these constraints. It considers the balance between costs, funding, and growth, and how public-private partnerships can influence this balance. It also discusses Baumol's Cost Disease and its relationship to transit growth.

Chapter 4 serves as a bridge between the first and second series of chapters in this research. It presents the current state of transit in Boston. It also depicts in more detail the various constraints facing the MBTA (such as funding constraints, equipment and infrastructure capacity limitations, and the Pacheco Law) and other issues affecting public, private, and public-private services in the Boston region.

The two chapters following Chapter 4 exhibit strategies that could be implemented to increase the ability to grow transit usage in the Boston region. Chapter 5 examines opportunities for better coordinating with existing privately operated routes. These opportunities include increasing public access on existing privately operated routes, developing a new private route between the MBTA's Sullivan, Lechmere, Kendall, and Kenmore stations as part of the mitigation efforts required due to the delay of the Green Line Extension, and considering more public-private coordination in the Seaport District through shuttle consolidation and alternative funding mechanisms. Chapter 6 discusses other mechanisms for using public-private partnerships for transit growth, including reassigning existing vehicle usage, developing an urban variant of an existing Massachusetts public-private partnership program, and contracting only a heavily-constrained aspect of bus operations.

Finally, Chapter 7 concludes this research with a summary of the ideas presented throughout the research and presents future research that could continue to build on these ideas.

It also considers each of the opportunities presented in Chapters 5 and 6 in relation to the Pacheco Law, one of the main constraints facing the MBTA, and considers the relationship between the Pacheco Law, increased private sector involvement, and future system growth.

## **2 Public-Private Partnerships: Theory and Experience**

There is significant literature discussing the advantages and disadvantages of contracting services through the private sector. This literature consists of theoretical work and detailed case study examinations of private involvement.

A robust base of research has been developed regarding contract structure and incentivization. More recently, an extensive amount of work has discussed public-private partnerships (“PPP” or “PPPs”) in relation to infrastructure provision. A breadth of research has also considered alternative mechanisms for financing and funding public transit expansions (especially in regards to infrastructure). This thesis will attempt to combine the lessons learned from each of these areas with current system contracting practices to understand how contracting out and public-private partnerships (considered beyond the traditional perspective of large infrastructure provision) can enhance opportunities for transit system growth.

This chapter will introduce the theory behind public-private partnerships to understand the benefits and costs of working with the private sector. It will then build on this theory to discuss different types of public-private partnerships currently used in transit for financing and operations.

### **2.1 Benefits and Costs of Working with the Private Sector**

Much of the literature related to working with the private sector revolves around the cost efficiencies of doing so. However, it is important to consider not only the monetary cost and benefits of doing business with the private sector, but also the wide array of other costs and benefits that develop from this relationship, in particular the effectiveness in achieving strategic objectives including timely implementation and changes in service quality. There is a wide spectrum of opinion on contracting, ranging from the pro-contracting ideology that postulates that contracting will create business opportunities without any impact on labor conditions, to the opposite ideology that would state that contracting damages labor conditions and unfairly favors business ownership. This thesis examines a middle ground between these two extremes to consider when contracting may be the most appropriate mechanism for growth.

### 2.1.1 Competition

Both general and case-specific literature has centered around the monetary cost savings from working with the private sector. The idea is that increasing the level of competition beyond a government-operated monopoly introduces incentives for companies to reduce the cost and/or improve the quality of their bid in order to win the contract. Competition is one of the primarily cited reasons for why contracting would reduce costs in the private sector, as competitive contracting could lead to lower costs (De Bettignies & Ross, 2004). Improved quality and quantity, and increased innovation are also less explored but possibly more important results of competitive contracting (De Bettignies & Ross, 2004; Cox, 1999; Cox & Love, 1991; Nicosia, 2001).<sup>18</sup>

Interestingly, one study finds that both the actual and expected number of bidders had negative associations with the cost of service for bus contracting in London (Amaral, Saussier, & Yvrande-Billon, 2013). The logic behind this is that if the bidders *expect* more competition, they will submit lower bids than they would at lower levels of competition. Another study supports this idea by noting that it is the threat of competition and not the actual levels of competition that keep prices down (Hakim, Seidenstat, & Bowman, 1996).

According to case studies of Adelaide and Perth, the cost of retendering increased by up to 15% in real terms from the previous costs. This is consistent with findings stating that subsequent rounds of tendering have price increases over the initial round because a well-entrenched incumbent can deter competition and lead to a higher bid price (Wallis, Bray, & Webster, 2010). A lack of available competitive capacity is also a major potential concern with competitive contracting, as such a scenario may either lend itself to not contracting at all or lend itself to negotiations. The objective of lowering costs in a static market through competitive contracting might therefore be unachievable.

Beyond affecting the cost, competition can also increase service quality, especially in cases where the winning bidder is selected using additional criteria beyond price. In cases with high expected competition, an existing contractor also has a significant incentive to perform at a high level of service quality in order to affirm their reputation and secure future contracts.

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<sup>18</sup> Nicosia found statistically significant cost savings due to contracting in a six-year panel study of 319 public transit firms in the United States (Nicosia, 2001).

In order for the contracting to be effective, it must create some net benefit to society. From this perspective, the importance of competition is the possibility of increasing the quality of service, the quantity of service, or the speed at which the service can begin or reach its target levels. If the improvements made through contracting are lower costs solely reached by driving down wages, then contracting would function more as a transfer of welfare than as a net benefit. In this sense, it would transfer welfare from the workers to the business owners and/or agency without necessarily improving conditions for society as a whole. Some studies have in fact found this to be the case, with lower costs from contracting coming at the expense of employee wage rates, or alternatively, from worsening performance (Frick, Taylor, & Wachs, 2006).<sup>19</sup> It is thus essential to consider other ways that contracting can affect service in order to create a societal net benefit, and ensure that contracting is in the public interest and not just in the interests of the contractors. For example, in the context of expansion, contractors can be attracted by growth potential and thereby increase competition, leading to both reduced average cost and increased achievement of multiple societal goals through that expansion.

### **2.1.2 Economies of Scale**

Beyond competition, private firms might also be able to drive down costs by achieving economies of scale that public agencies cannot as the private firms can take on similar projects across numerous agencies while the individual agency is limited to its own experience (De Bettignies & Ross, 2004).<sup>20</sup> For example, a national transit operator could achieve economies of scale by working in multiple markets to generate a higher volume of business than would be possible in a singular metropolitan area for directly operated service. Similar logic applies whether this is a construction firm working on a large infrastructure project or an operating firm operating and maintaining buses. This concept could also apply on a regional level, with a regional operator generating economies of scale from as few as two systems.

Similarly, private companies could use economies of scale to implement performance improvements. For example, experience and technology could be used across different systems to increase the service quality beyond what an individual system might be able to do. However,

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<sup>19</sup> Frick, Taylor, and Wachs provide a summary of some of the research in related areas – describing, for example, research related to changes in cost, cost decreases at the expense of labor wage rates, and changes in service quality resulting from contracting out service.

<sup>20</sup> This concept is proposed in relation to construction projects, but could also work more generally (De Bettignies & Ross, 2004).

it is also possible that agencies could achieve greater economies of scale than private companies because a contracted firm would only operate a portion of the agency's service. Because of this, it may not be able to achieve economies of scale within a region to the same extent that an agency directly operating 100% of its service would be able to do.

It is notable that in the context of growth in the metropolitan area, the economies of scale for either public or private operators would include increasing the utilization rate of passengers per service mile. If growth does attract increasing levels of competition and in turn results in improved service through the private sector, the improved service could lead to increased ridership and economies of scale for the private sector firm, creating a cycle encouraging additional competition going forward.

### **2.1.3 Labor**

Literature has suggested that contracting can lower costs because of more flexible workforces, more part-time employees, and lower insurance costs (United States Government Accountability Office, 2013). In addition to the labor flexibility and ability to use part-time labor, cost savings from contracting might come from lower labor compensation, more efficient vehicle maintenance, and more streamlined management and administration (Transportation Research Board - Committee for a Study of Contracting Out Transit Services, 2001).

Issues related to labor and contracting include union opposition due to the perception of governments shifting jobs towards lower wage and lower quality private firms, a lack of transparency and accountability, and issues stemming from poor project design (De Bettignies & Ross, 2004). One study notes that any union labor concerns must be addressed early in the process in order to garner the necessary support (Eno Center for Transportation, 2014). Another study also reported that labor unions cite reduced wages and benefits, and a potential decline in safety and service as a drawback in contracting (United States Government Accountability Office, 2013).

It is important to note that there are some labor protections in place to prevent worsening conditions when contracting. This is common in construction, for instance, where prevailing wage rate laws and Davis-Bacon wage determinations apply to labor wages, and United States Department of Labor – Occupational Safety and Health Administration (“OSHA”) regulations apply to protect worker safety. The Pacheco Law as written, which will be discussed in Section



4.3.2, similarly protects existing public employees. Additional regulations, such as Section 13(c), which will be discussed further in Section 4.3.1, can help protect labor conditions when contracting out operations.

In this sense, labor relates heavily to both the potential pros and cons of contracting. Much of the literature considers the labor impact of hiring private firms. Due to the unionized labor strength and unique legal structure surrounding unionized labor in Massachusetts, this issue will be at the forefront of any attempts to contract for the MBTA. Labor issues related to Boston and to the MBTA will be discussed in additional detail in Section 4.3.

#### **2.1.4 Administration**

Public advantages of PPPs beyond the traditionally cited advantages (risk transfer, innovation, and value for money) include enhancing the focus and coordination of administrative processes and transparency in the process, among others (Schneider, 2004).

However, administering contracting programs can potentially increase the costs to the government agency. Contracting requires additional staff to negotiate and review contracts, and can also have high monitoring costs for the contracting agency. Increasing the level of detail in a contract can help assure a given level of service quality, but in turn then increases the monitoring costs. In general, the net benefits of contracting are highly dependent on the contract language and negotiations and require advanced skill in the agency staff in order to effectively contract service to private organizations that likely have significant experience working with the contract language and with negotiation.

In addition, the agencies must consider the shift in leverage that occurs when contracting: during the bidding process, agencies have a considerable amount of leverage (when there is competition). However, after contracting the service, the leverage shifts to the private company because the agency is then heavily dependent on that company to provide the desired service.

Transaction costs affiliated with contracting should also be considered. These transaction costs can include contract development and marketing, transition costs such as vehicle and depot repairs, contract preparation, and the “handover process” (Wallis, Bray, & Webster, 2010, p. 97). This can affect a system both financially and non-financially. For example, changing operators at the end of a contract can affect the service quality immediately after the change due to the knowledge transfer required and the time it might take to get the appropriate systems in place.

### **2.1.5 Service Improvement**

In terms of growth, one study noted that transit agencies found one advantage of contracting to be “when starting or expanding services in order to avoid start-up costs—such as the large capital cost of acquiring new vehicles and hiring new staff” (United States Government Accountability Office, 2013). In this study, 43% of transit agencies surveyed considered “starting new service” to be a top factor when deciding to contract bus service (with expected larger values for heavy/light rail and commuter rail at 67% and 83% respectively). The top four cited reasons for contracting bus service in this study were listed as reducing costs, improving efficiency, starting new service, and allowing for more flexible service (United States Government Accountability Office, 2013).

According to the aforementioned study, contracting when starting new service can help with start-up costs, vehicle procurement, facility acquisition, and staff acquisition (United States Government Accountability Office, 2013). An example provided is the Nashville Regional Transportation Authority, which contracts its commuter rail service due to a lack of maintenance facilities and depots (United States Government Accountability Office, 2013). Results from a different survey demonstrate highly similar reasons for contracting – namely, starting new services, reducing operating costs, and improving cost efficiency (Transportation Research Board - Committee for a Study of Contracting Out Transit Services, 2001). This facet of contracting, which is less discussed in the contracting literature, will be the focus of this thesis. It can be assumed that existing labor standards, similar to those mentioned in Section 2.1.3, can be used to alleviate any labor equity issues.

### **2.1.6 Stakeholder Analysis of Private Involvement**

It is necessary to consider the impacts of increased private sector involvement in public transit on both the public and private sectors. For increased private sector involvement to work, the public sector goals must align with the private sector’s ability to increase profits.

On the private side, benefits of PPPs can include increased project speed due to the government involvement, increased investment security from partnering with a public entity closer to the planning decision making, and ultimately, either increased profits or earlier profits (Schneider, 2004).

For private sector firms, operating service independently of the government agency is often not an option. Fundamentally, most services are unprofitable without government subsidization. This could be due to legal measures preventing competition with the government agency along certain routes. Consequently, the private firms are often dependent on this government subsidization to operate some of these services at a profit. Additionally, the private firms might be able to eliminate some of their operating risk by guaranteeing a specified level of profit or revenue from agency payments (discussed further in Section 2.1.7).

By including the private sector, the public agency must be concerned with a loss of control over operations. As was discussed in Section 1.1.1, the history of transit in the United States included a shift away from private involvement partially due to the desire for the public to control how services were offered, even if this was done with a net operating loss. In contracting with private agencies, the public agency would often like to retain control over a number of service measures. This can be written into the contract, but again requires the know-how to do so within the agency in addition to future monitoring of the private firm in order to ensure that agency objectives and agency standards are met. Additionally, excessive amounts of detail can reduce the management flexibility of the private operator and undermine its profitability, leading to reduced levels of competition.

### **2.1.7 Contracting and Risk Allocation**

Working with the private sector can allow for improved risk allocation strategies, which to a large extent is the focus of the literature discussing PPPs. The idea behind this is that the private sector may be better equipped to minimize some of these risks, especially through well-designed incentives (De Bettignies & Ross, 2004). Incentivizing this risk can improve the management of the risk and lower the project cost (Eno Center for Transportation, 2014).

One of the most important operating risks to consider is the revenue risk involved in working with the private sector. Contracts can be designed in two main ways, with numerous variations: gross cost contracts or net cost contracts. In gross cost contracts, the agency takes the revenue risk and operators are paid irrespective of farebox revenue; meanwhile, in net cost contracts, the agencies compensate operators based on their net costs, so operators are concerned with revenue.

The underlying concept behind net cost contracts is that operators will attempt to increase ridership or reduce fare evasion to improve net costs (especially if fares are set by the agency), and consequently, will improve service quality as a means to increase ridership. However, if the agency specifies both fares and service requirements, an operator might require a subsidy or floor on its ROI to agree to operate the route, leaving some of the risk to the agency (Chin Blakey, 2006). A concern with net cost contracts is that ridership is also largely dependent on factors outside of contractor control, such as fare policy or the economy. Both net cost and gross cost contracts have numerous variations, including the incorporation of quality incentives, revenue risk caps, and revenue sharing (Barrett, Dehne, & McCormick, 2007). For example, in gross cost contracts where the government agency keeps the revenue risk, it may choose to monitor operator revenue collected or tie an incentive to revenue, since revenue is related to fare levels, service quality, and fare evasion (Chin Blakey, 2006).

Other issues related to contracting and incentivization have been heavily discussed in the literature. Much of this literature has been presented at the Thredbo International Conference Series on Competition and Ownership in Land Passenger Transport. This research was largely summarized at the 12<sup>th</sup> Thredbo conference, covering topics such as contract duration, maintaining a competitive environment, using the threat of competitive tendering, the role of incentives, end of contract arrangements, and other issues related to contract design (Bray & Mulley, 2013). General contracting literature will not be extensively reviewed in this thesis, with more of a focus instead on specific components that contribute to how contracting can enable increased transit growth.

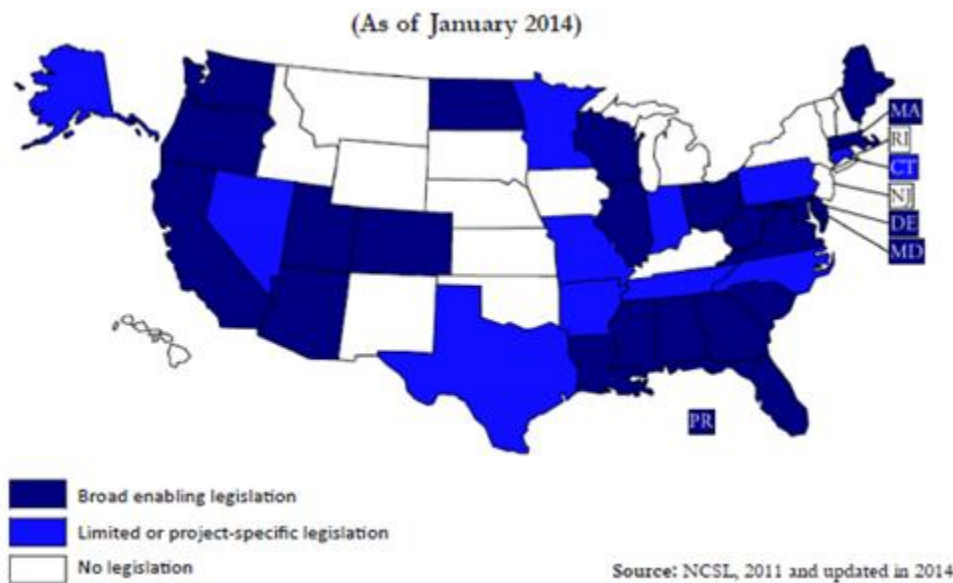
Ideally, contracts should be structured to place risks mainly with the entity that is more able to control for them. For example, an agency providing vehicles to a private operating company might specify conditions in the contract that requires the vehicles to be returned in a certain condition, leaving the maintenance risk largely with the operator in control of the usage and condition of those vehicles. This is similar to the ideas related to revenue risk discussed above.

An example of this in the Boston context occurred in the 1980s, when the MBTA contracted installation and maintenance of a new signal system for the Orange Line heavy rail. This work was traditionally done with in-house labor, which opposed contracting the work even though it was with a private company that used the same labor union. The choice to contract

both the installation and maintenance of the system gave the private company full accountability to design the system to last, since they were responsible for its maintenance. This can be directly contrasted with an earlier installation of the MBTA’s Red Line heavy rail signal system in the 1970s, which was privately installed but publicly maintained. This did not give the private company the maintenance risk, and also required a transfer of knowledge for the public maintenance, which ultimately resulted in worse performance on the Red Line signal system than on the Orange Line (Personal Communication, 2014-2015a). Identifying and assigning risks through the contract structure is clearly an important component of public-private partnerships.

## 2.2 Government Programs Encouraging Growth through Increased Private Sector Involvement

Research has shown that enabling legislation is important for the provision of infrastructure PPPs, and as illustrated in Figure 2-1, this legislation varies considerably by state (Eno Center for Transportation, 2014).



**Figure 2-1. States with Transportation PPP Enabling Legislation**

*Source: Reproduced from (Eno Center for Transportation, 2014, p. 21)*

Yet this enabling legislation applies largely to PPPs in the traditional sense. Legislation enabling systems to contract services is also largely state-specific, and even within states, is largely system-specific. For example, in Massachusetts, the Regional Transportation Authorities (“RTA” or “RTAs”) are required to contract with private companies for operations, while the

MBTA is largely inhibited from contracting due to legal constraints. This will be discussed further in Chapter 4.

This section will take a closer look at some of the federal, state, and local programs that encourage either transit growth or public-private partnerships.

### **2.2.1 Federal Programs Encouraging Transit System Growth**

The federal funding of operating costs was approved in the 1974 Urban Mass Transportation Administration (“UMTA”) authorization bill, but was then discontinued in 1997 with the passage of the Transportation Equity Act for the 21<sup>st</sup> Century (“TEA-21”) (Lyons, 2013).

One of the main groups of programs for transit expansion consists of the federal New Starts, Small Starts, and Very Small Starts programs. These programs allow transit systems to apply for federal funds for building new or expanded fixed-guideway transit (United States Government Accountability Office, 2012). Systems are allowed to apply for this category of federal funding only for rail (commuter, heavy, and light), streetcar, and BRT projects. The Small Starts program can also fund projects that do not have a separated right-of-way, but do represent a substantial investment in a corridor and emulate some of the features of a fixed-guideway system (United States Government Accountability Office, 2012).

The federal Transportation Investment Generating Economic Recovery (“TIGER”) program also now provides low levels of funding (average award of \$10-20 million) for projects that generate long-term transportation and economic benefits and stimulate additional economic activity (Transportation for America, 2002). TIGER projects require a 20% local match, and grants are competitively awarded (United States Department of Transportation, 2015). The primary selection criteria for TIGER projects include factors based on state of good repair, economic competitiveness, quality of life, environmental sustainability, and safety (United States Department of Transportation, 2015).

### **2.2.2 Federal Programs Encouraging Private Sector Involvement**

When considering federal programs involving the private sector, it is essential to recognize the impact of lobbying power on creating the systems that are in place today. Legislation is heavily affected by lobbying from both public sector unions and private providers, and their competing interests can shape the legislative policies. This concept will be further

discussed in relation to Boston and the MBTA in Chapter 4, but is also important to consider in the next few sections.

The FTA developed the Public-Private Partnership Pilot Program (“Penta-P”) in 2007 to look at the advantages of traditional PPP provision. As part of this program, the FTA selected three projects to use in the pilot. One of the projects was the Oakland Airport Connector automated guideway, a 3.2 mile project linking Oakland International Airport to the rest of the Bay Area Rapid Transit District (“BART”) system, at a total project cost of \$484 million (Lin II, 2014). The second project is in Houston, where the Metropolitan Transit Authority of Harris County (“METRO”) North Corridor LRT (estimated capital cost of \$756 million for the 5.2 mile project) and Southeast Corridor LRT (estimated capital cost of \$823 million for the 6.4 mile line) were part of Penta-P (Federal Transit Administration, 2012a; Federal Transit Administration, 2012b; United States Department of Transportation, Federal Transit Administration, and Metropolitan Transit Authority of Harris County, Texas, 2010). The third project is the Eagle P3 project by Denver’s Regional Transportation District (“RTD”). This \$2.2 billion project is the largest of the three, encompassing multiple lines totaling 40.2 miles, estimated to open in 2016 (Regional Transportation District, 2014a). Details regarding this project are discussed further in Section 2.4.3. Because each of these are new services, there are no directly threatened incumbent operators on either the public or the private sides, exemplifying one way in which service expansion can help avoid tension with existing operators. Although this thesis does not focus on the traditional large-scale infrastructure PPP, it is important to note this program as it demonstrates the federal interest in exploring increased private sector involvement in public transit and looks at the costs and benefits associated with doing so.

The FTA notes that potential benefits of contracting may include lower costs of service and increased speed when expanding service (Federal Transit Administration, n.d.). Federally funded programs allowing for contracting with the private sector include the Urbanized and non-Urbanized Area formula programs, the Elderly Individuals and Individuals with Disabilities Program, the Intercity Bus Transportation Program, the Over-the-Road Bus Program, and the Job Access and Reverse Commute Program (Federal Transit Administration, n.d.). The programs used in Massachusetts are discussed in Section 2.2.3.

### 2.2.3 Massachusetts Programs

Massachusetts uses numerous sources of transit funding, including those listed above. Also important are funds from the federal State of Good Repair program and the Bus and Bus Facilities program.

As part of a larger transportation reform in 2009, the Massachusetts Legislature created the Public-Private Partnership Oversight Commission. This Commission was charged with reviewing PPP opportunities specifically for transportation infrastructure projects and facilitating the use of PPPs in Massachusetts (Massachusetts Department of Transportation, 2015b).

One program currently in place encouraging increased private sector involvement is the BusPlus program. The first stage of the BusPlus program was funded by a FTA State of Good Repair grant. This program began accepting applications in 2013. The idea behind BusPlus was to provide capital assistance for intercity bus services, and to replace Massachusetts' previous Intercity Bus Capital Assistance Program (Massachusetts Department of Transportation - Rail & Transit Division, 2015b).

In the first stage of the BusPlus program, private for-profit carriers applied for regional buses from MassDOT in exchange for introducing a regional service improvement (Massachusetts Department of Transportation - Rail & Transit Division, 2015b). Although the state provided the capital, the private firms had responsibility for all maintenance and operating costs related to the service (Massachusetts Department of Transportation - Rail & Transit Division, 2015b). The private firms were able to use the vehicles on any type of regularly scheduled line run service, with only a few exceptions.<sup>21</sup>

The program was structured so that the private carriers can identify improvements, through a competitive award process with the objective of securing the maximum increase in regional bus service (Massachusetts Department of Transportation - Rail & Transit Division, 2015b). The highest level of prioritization for capital funding was the creation of a new route or reestablishment of a previously existing route, followed by route expansion, and then by increased frequency on a route (Massachusetts Department of Transportation - Rail & Transit Division, 2015b).

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<sup>21</sup> Operators could not use vehicles on express service between Boston and New York, services that did not either originate or end in New England, or services traveling beyond New York City or New Jersey. The buses also could not be used for charter services, including regularly scheduled charter services to casinos (Personal Communication, 2015c)



MassDOT also alleviated some of the risk by using a trial period followed by a long-term agreement: the operator operates the route for a trial period of two years, after which a positive evaluation by each side will result in successive 2-year renewals (with optional bilateral negotiation) until a 12-year period has been completed. If at any time the operator cancels the contract, it must pay a penalty of the difference between the bus purchase price and the current market value; additionally, at the end of the 12-year period, the operator can either purchase the bus at market value or return it to MassDOT to be auctioned (Massachusetts Department of Transportation - Rail & Transit Division, 2015b).

The first stage of the program resulted in approximately 30 BusPlus buses in service by the end of 2014. Each of these buses was federally funded, with the private operators paying the operating costs. Since the original contracts were entered, there have been three contract renegotiations, but each renegotiation has continued to meet the required level of service specified in the original parameters (Personal Communication, 2015c). Now that the federal trial period has ended, MassDOT has considered the program a success and has put forth plans to continue the program using state funding.

In the second phase of the BusPlus program, MassDOT has chosen to specify the desired routes and service improvements (Massachusetts Department of Transportation - Rail & Transit Division, 2015a). Of the four specified service improvements, three are intercity routes outside of the Boston area, and one is a commuter service within the Boston area (between Downtown Boston and Marlborough, MA).<sup>22</sup> Each of the four services would require the contractor to operate two round-trips per day (Monday-Friday for the Boston commuter route and every day for the other three routes) (Massachusetts Department of Transportation - Rail & Transit Division, 2015a).

The second phase contracts would be similar to the first phase contracts in having an initial term of two years, with subsequent two year options up to a total of 12 years and service beginning in July 2015 (Massachusetts Department of Transportation - Rail & Transit Division, 2015a). MassDOT retained the sole option to exercise the additional years, and similar contractual terms applied for bus repurchase or payments at the end of the 12 years

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<sup>22</sup> The routes are as follows: Worcester, MA – Fitchburg, MA – Amherst, MA – Northampton, MA; Springfield, MA – Greenfield, MA – North Adams, MA – Troy, NY – Albany, NY; Boston, MA – Keene, NH – Bellows Falls, VT – Rutland, VT; and the Boston commuter route of Marlborough, MA – Boston, MA (Massachusetts Department of Transportation - Rail & Transit Division, 2015a).

(Massachusetts Department of Transportation - Rail & Transit Division, 2015a). Like in the first phase, MassDOT will provide buses to the operators to use on each of the services (one for the Boston commuter service and three for each of the other three services) (Massachusetts Department of Transportation - Rail & Transit Division, 2015a). MassDOT also provides the schedule and fares for each of the services, with the exception of the Boston commuter service, for which the operator will be able to set the fares (Massachusetts Department of Transportation - Rail & Transit Division, 2015a). Operators are responsible for maintaining and storing the vehicles (Massachusetts Department of Transportation - Rail & Transit Division, 2015a).

Also notable is the form of revenue sharing specified in the second stage of the BusPlus program. MassDOT plans to include operating subsidies for the carriers on a per revenue mile basis, and operators can keep up to a maximum of 10% of the operating cost as an administrative fee for the service (exact amount to be specified in bids) (Massachusetts Department of Transportation - Rail & Transit Division, 2015a). Ticket revenue will directly pay for this administrative fee, and the operator will split the remaining ticket revenue equally with MassDOT (Massachusetts Department of Transportation - Rail & Transit Division, 2015a). The operator is thus directly incentivized to increase ridership. Meanwhile, MassDOT can in turn use this revenue towards its operating subsidy on the route (Massachusetts Department of Transportation - Rail & Transit Division, 2015a).

Because MassDOT provides operators with buses and subsidizes operations, it gives the agency the freedom to specify service and fares and still retain private interest in operating the services. The subsidy and administrative fee can encourage private operators to enter the market and earn a profit. MassDOT benefits by filling a service need and incentivizing increased ridership, and by leaving operating risk, maintenance issues, and storage requirements to the private operator.

Additionally, as noted in Chapter 1, the Massachusetts RTAs use the various sources of funding described in Sections 2.2.1 and 2.2.2 to contract operations to private companies, which is discussed further in Section 2.4.2. The MBTA also contracts a few smaller routes along with its paratransit service, THE RIDE; both are discussed further in Section 2.4.1.

#### **2.2.4 Local Programs**

Some localities contract with private operators through transportation management associations (“TMA” or “TMAs”). Traditionally, TMAs are non-profit organizations set up in a local area with contributions from businesses, institutions, and other organizations. TMAs can be set up to develop and manage contracts and deal with day-to-day operating issues (Peterson, 2012). TMAs can also be charged with working with the public agencies in the contributors’ interests, advocacy, and marketing transportation demand management programs (Mass Commute). The TMAs can be used both to meet environmental sustainability goals and to attract workers by improving the transportation access to the area (Peterson, 2012). Since these are funded at a local level, increased growth in an area can directly lead to more funding for transit in the area, and consequently, a growth in transit service provided.

There are numerous TMAs in Massachusetts. Included in these are multiple TMAs in the Boston and Cambridge area. Of particular note are the Charles River TMA (Cambridge), Seaport TMA (South Boston Waterfront/Seaport District), A Better City (“ABC”) TMA (Downtown Boston, Back Bay, Financial District), and MASCO (Boston Longwood Medical Area and Cambridge). These will be discussed in more detail in later chapters.

### **2.3 Financing Transit Service: For Growth and Public-Private Partnerships**

Transportation can be paid for in four main ways: the user pays, the beneficiary pays, everyone pays, or nobody pays (deficit spending) (Salvucci, 2014). One study considers the “ideal” scenario and argues that the beneficiary principle is the ideal way to pay for transit – that the beneficiaries of transit should proportionally pay its costs (Antos, 2007). In a sense, this is similar to the TMA mechanism, where the beneficiaries contribute to fund the service. This section will examine some of the existing funding and financing mechanisms and their applicability to increasing private sector involvement as a mechanism for transit growth.

For each of the funding mechanisms discussed below, contracting can enhance the credibility and accountability by clearly separating the additionality of service. If the funding were to be levied to fund a publicly operated service, there may be concern among those paying that the money would be grouped into general agency funding, without a clear correspondence with new service. Meanwhile, if the payments fund contracted service with a clear contract specifying what that service will be, how much it costs, how it will be monitored, etc., then the

public may be more likely to support the payment to generate the necessary funding. This concept can be applied to the ideas in the following sections.

### **2.3.1 Special Assessment and Benefit Assessment Districts**

One funding source that could be used for transit growth is the special assessment district. Special assessment districts can increase the property tax rate for a specific type of property (e.g. commercial) or can do so for all properties, at the same or at varying rates. They can be used to fund different types of transit as well, including bus service. Increasing the property tax rate allows the special assessments to capture part of the current value along with a portion of the increase in a property's value (MacCleery & Peterson, 2012). Some methods that special assessment districts can use include but are not limited to assessing benefits based on property value increase ("benefit assessment district"), zones based on distance, frontage adjacent to improvement, acreage within district boundaries, and distance factors (University of Minnesota Center for Transportation Studies, 2009a).

Special assessments have been used heavily in Portland, Oregon in the past, and recently in Washington, D.C. for WMATA's Silver Line construction (MacCleery & Peterson, 2012). In the case of the Silver Line, the assessment provided a funding source to help assure delivery of the Silver Line, which in turn allowed upzoning and the consequent increases in property value (MacCleery & Peterson, 2012). Another example is Atlanta, which used a special assessment on some of the city's commercial properties to fund part of the construction and operating costs of a streetcar project (MacCleery & Peterson, 2012).

Typically, special assessment districts can either be proposed by local governments and approved by a majority of property owners, or alternatively, proposed by a majority of property owners in an area through a petition (University of Minnesota Center for Transportation Studies, 2009b). This method was used in Los Angeles for a 4.4 mile metro segment, with the benefit assessments providing about 10% of the project's total cost (Schneider, 2004). It was also used in Seattle to help fund a streetcar expansion project (Metropolitan Area Planning Council, 2013). It has also been used to fund bus transportation to shopping centers, and to finance and maintain a bus lane along a main Denver shopping street (Schneider, 2004).

In Massachusetts, betterment and special assessments can be levied at the state, county, city, town, or district level. The necessary criteria for the assessment are that certain property

receives a benefit or advantage (beyond that of the community) from the construction of a public improvement. Assessments are subject to a vote by the board of officers of the entity creating the assessment (Massachusetts Department of Revenue - Division of Local Services, 2001). Because the assessments are related to property taxes, the implications of Prop 2½ on using special assessments in Massachusetts will be discussed in Section 4.1.2.

In a sense, special assessments and benefit assessments can be similar to TMA contributions, where employers “contribute” (albeit not voluntarily) via the special assessment in exchange for improved transportation service in the area. Because the interaction is more indirect and generally more widespread than TMA contributions, the affected parties also have less policy control and influence over the design of the improvements resulting from a special assessment than they would working with a TMA. However, the contributing entities could see an added benefit in that the improvements resulting from a special assessment might be more integrated with the larger transportation network than they would be if generated through a self-limited, participant-directed TMA.

An additional benefit of an assessment district (similar to a business improvement district, as discussed in Section 2.3.2) is that it can help with the free rider problem that TMAs would face. Depending on the transparency within the TMA, the contributions across the various parties may or may not be fairly apportioned. Moreover, a contributor threatening to leave the TMA may disrupt the balance within the TMA. Meanwhile, assessment districts can deal with these free rider issues by developing a clear structure of how each party is assessed.

### **2.3.2 Business Improvement Districts**

In business improvement districts (“BID” or “BIDs”), property owners assess themselves to provide funding for improvements within the district (Metropolitan Area Planning Council, 2013). BIDs have been widely used nationally, with over 1,000 in place in the United States (Keaveny, 2013).

In Massachusetts, the requisite approval for the BID to qualify is 60 percent of property owners and 51 percent of the district’s valuation (M.G.L. §§400-3). BID assessments cannot exceed 0.5% of the total assessed value within the BID district (Metropolitan Area Planning Council, 2013). In rapidly growing areas with high property values such as the Seaport District or Longwood Medical Area in Boston, 0.5% of the assessed value can be a high amount of

additional revenue and should not be a limiting factor in supporting significant transportation improvements, an example of which is provided for the Seaport in Section 5.3.4.

It is also noteworthy that according to the Metropolitan Area Planning Council: “To date BIDs have not been used to support major infrastructure improvements” (Metropolitan Area Planning Council, 2013). Because BIDs are not property taxes, Prop 2½ in Massachusetts should not apply to BIDs, as will be discussed in Section 4.1.2.

Additionally, BIDs have the possibility of including nonprofits such as universities and hospitals, even though tax exempt properties could also be exempted from fees by the municipality if desired (M.G.L. §§400-6). For example, in Massachusetts, the Downtown Boston Business Improvement District (“Downtown Boston BID”) lists Suffolk University in its directory and has a representative from Suffolk University on its Board of Directors (Downtown Boston Business Improvement District, 2015). Meanwhile, the Amherst Downtown BID notes: “Both UMass and Amherst College, in fact, are represented on the BID’s board and contribute both financially and in-kind to the BID’s operations” (Amherst Downtown BID, 2015). Similarly, the Hyannis Main Street Business Improvement District lists Cape Cod Hospital in its directory (Hyannis Main Street Business Improvement District, 2015). This ability to include nonprofits is an important consideration when considering the possibility of using a BID in areas where nonprofit stakeholders control a significant portion of the land.

The Downtown Boston BID serves as an example BID, with a membership of over 500 commercial properties (Keaveny, 2013). The Downtown Boston BID has an annual budget of \$2.9 million but largely focuses on issues outside of transportation (Keaveny, 2013).

### **2.3.3 Transit Impact Fees**

Transit impact fees are another source of funding, in which developers contribute to funding new transit services. This method was used in San Francisco to help fund a number of BART stations (Schneider, 2004). San Francisco’s updated version of the Transit Impact Development Fee (“TIDF”), the Transportation Sustainability Fee (“TSF”), requires land use projects to “pay the TSF commensurate with their net new impact on the transportation system” and is expected to generate \$630 million over 20 years and generate \$820 million in other transportation revenues (San Francisco Municipal Transportation Agency - Board of Directors, 2012). This will allow San Francisco to fund \$1.4 billion of transit improvements, focused on

headway improvements, service expansions, and reliability improvements (San Francisco Municipal Transportation Agency - Board of Directors, 2012). Transit impact fees require high levels of governmental and agency institutional involvement, and a clear connection between the transportation improvement and land value increase (Los Angeles County Metropolitan Transportation Authority, Planning and Programming Committee, 2012).

Approximately 20 states have authorized impact fee usage for transit construction (Johnson, Esq., 2008). However, impact fee usage in Massachusetts in general has been highly restricted by the state judicial system, and has not frequently been for transit funding (Metropolitan Area Planning Council, 2013).

#### **2.3.4 Tax Increment Financing**

Tax increment financing (“TIF” or “TIFs”) siphons off part of expected property tax revenues above the existing level to help finance transit improvements. TIFs are directly leveraging future economic growth against a transit improvement. With this method, property tax contributions to the locality are frozen at the current level (or current level plus inflation). Meanwhile, part of the growth in property tax revenues (due to increased property values and increased development from a transit improvement) can be used to pay for the transit improvement. Frequently, this incremental portion is used as a dedicated revenue stream for interest and principal payments, which can lower the risk of those payments and reduce the initial financing costs. Opposition to TIFs can be strong because the incremental tax revenue could otherwise be used for other purposes, such as education or other municipal endeavors.

TIFs have been used for the construction of transit infrastructure. However, according to a recent study by the City of Austin, there are currently no states that use TIFs to fund transit operating and maintenance costs (City of Austin - Financial Services Department, 2013). TIFs are more commonly used to help fund community development improvements and sometimes for transit capital costs. However, a bill was proposed recently in Minnesota that would allow TIF authorities (for commuter rail, heavy rail, streetcar, and BRT lines) to spend TIF revenues on a wide variety of purposes, including operating, maintenance, or capital costs; transit stations; and paratransit or circulator systems (Minnesota Department of Revenue, 2013).

In Massachusetts, tax increments from development can be allocated in three ways: (1) exemption, (2) payment, and (3) payment of a betterment fee to finance related infrastructure

(Commonwealth of Massachusetts, Executive Office of Housing and Economic Development). The first option can be used to attract businesses and stimulate job growth, while the third option serves as the “traditional” TIF linking development and infrastructure. Because TIFs are increments built into property taxes, the implications of Prop 2½ on using TIFs in Massachusetts will be discussed in Section 4.1.2. The District Improvement Financing (“DIF” or “DIFs”) program is a program in Massachusetts that functions similarly to a TIF, and allows municipalities to use incremental tax revenues to pay for improvements (Commonwealth of Massachusetts, Executive Office of Housing and Economic Development). Municipalities can apply for DIFs, with final approval given by the Economic Assistance Coordinating Council (“EACC”) (Commonwealth of Massachusetts, Executive Office of Housing and Economic Development). This is an attractive possibility for lumpy high growth districts like Kendall Square, the Seaport District, and Longwood Medical Area, where service needs might otherwise tighten funding for service in older areas.

TIFs could also be used to gain support for future tax increases from the public, politicians, and businesses. Because taxes do not increase until the improvements have been made (or are about to be made, in the case of speculative activity), it removes some of the time lag and uncertainty regarding benefits associated with other forms of taxation. The public and businesses might be more willing to support a TIF knowing that they aren’t paying now to benefit five years later. Additionally, politicians might be more apt to support a TIF knowing that they will be responsible for the improvement but might hold a different office when the increased taxes go into effect.

It is important to note that TIFs can lead to problems if not carefully thought through. Transparency here is crucial. Rules for a district should be clear and consistent, in order to allow for the affected parties to understand them. Additionally, TIFs could result in actual revenues below expected revenues, leaving an additional burden on the municipality to meet the difference. Because of this, it is important to consider the long term instead of the short term.

If a municipality can give up early revenue streams to a developer to entice a developer to build in the municipality, it should similarly be able to give a portion of the later revenue streams from development to transit. From the municipality’s perspective, forgoing revenue on the front end can lead to more development, and similarly, forgoing later revenues to transit in the form of



a TIF partially dedicated to transit can allow for the necessary development to take place in the first place.

### **2.3.5 Summary of Alternative Financing Methods in Massachusetts**

Special assessments and business improvement districts could be appropriate ways to fund increased transit service through private operators. Each of these methods would create an assessment on top of the existing tax rates in areas benefiting from the service improvement. Special assessments could have the benefit of applying to all types of properties; however, in areas with high future business development as a proportion of total development, BIDs would not necessarily leave significant funding on the table. BIDs do have a lower limit of potential assessment (0.5% of total assessed value), but in areas of high development, would still generate significant revenue. It is important to note that both of these could be tied tightly to specific improvements; as such, contracting these improvements could allow for a transparency that would be difficult to provide if publicly operated – in a sense, the contracted services could be a part of a larger system while maintaining a degree of separation.

Impact fees have been highly restricted in Massachusetts. These have faced numerous challenges in the courts limiting their use (Friedman & Wodlinger, 2004). Furthermore, impact fees can discourage the prospective investment by adding cost from the outset. As such, while the mechanism could theoretically enable a strong linkage between development and funding improvements, it may not be a viable alternative in the local context even though it could be a useful funding mechanism in high growth districts elsewhere in the country.

Tax increment financing, on the other hand, could be a potentially useful tool to use to generate additional funding for transportation improvements. The DIF program is in place, and has the advantage of being a municipal-level decision. It does not burden the taxpayers of the DIF with additional taxation, but instead siphons future incremental tax revenues to pay for the improvements that helped create those additional revenues. This could help fund major service improvements to a district if this additional revenue is truly used as additional funding (i.e., other funding is not decreased as a result). Again, if the incremental DIF revenues are used to contract private service, it would add a layer of transparency ensuring that existing service is not directly affected, while new service is added.

## 2.4 Experiences with Transit Service Provision through the Private Sector

### 2.4.1 Boston

A further introduction of the MBTA and the development of restrictions on contracting service will be provided in Chapter 4. However, this section will detail some of the MBTA's existing service operations through the private sector.

The MBTA currently provides operating assistance for bus service provided by private carriers in 14 towns and municipalities.<sup>23</sup> These services include four numbered MBTA bus routes and other local services.<sup>24</sup>

These routes are contracted largely for historical reasons. Some of these routes were operated privately prior to the MBTA's involvement. Others were started as a service competition in which towns designed and proposed routes, to be town-managed, with the winning routes earning partial MBTA subsidization (Personal Communication, 2014-2015b; Personal Communication, 2014-2015a).

The MBTA numbered routes are treated differently from the other contracted routes in that the MBTA routes accept Charlie Tickets with MBTA passes on them. None of the privately operated buses have the equipment required to enable passengers to use Charlie Cards or stored value tickets. Future possibilities for related changes in fare payment mechanisms for MBTA-contracted routes will be discussed in Section 5.1.2.

Massport also recently added a Logan Express shuttle from Boston's downtown Back Bay area to Logan International Airport. This differs from the other MassDOT services, which largely serve suburban areas far removed from the inner core. It began partially as an alternative for Green Line passengers who had previously traveled to Logan via a transfer to the Blue Line at Government Center, which is now closed for a multiyear construction project. The Back Bay Logan Express is the only one of the Logan Express routes to accept Charlie Tickets with printed passes in a similar manner as the MBTA numbered contracted routes. The number of passengers using Charlie Tickets is recorded by the driver so that the private operator can submit this

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<sup>23</sup> Private buses operate in Bedford, Beverly, Boston, Burlington, Canton, Dedham, East Boston, Hingham, Hull, Lexington, Mattapan, Medford, Milton, and Winthrop (Massachusetts Bay Transportation Authority, n.d.).

<sup>24</sup> The MBTA numbered routes are #710 (North Medford – Medford Square, Meadow Glen Mall, or Wellington Station), 712/713 (Point Shirley – Orient Heights), 714 (Pemberton Point, Hull – Station Street, Hingham), and 716 (Cobbs Corner – Mattapan Station).

information to the MBTA. A more sophisticated system would be preferred for future contracted routes, as will be discussed in Section 5.1.2.

Like many other agencies, MassDOT also contracts the operations for its Boston-area paratransit service (“THE RIDE”). MassDOT updated its procurement process in 2014, designing the RFP for THE RIDE to minimize risk and maximize competition based on national best practices (Lambert, 2014). Ultimately, THE RIDE used a competitive bidding foundation followed by negotiations to select its service operators (Lambert, 2014).

An interesting aspect of THE RIDE is that a portion of the fleet is owned by the MBTA while the remainder of the fleet is privately owned. This provides THE RIDE with a source of flexibility. In past ridership downturns, contractors have been able to move the excess vehicles away from servicing THE RIDE towards other private uses, such as taxi service. Meanwhile, in ridership upswings, THE RIDE has been able to increase the number of vehicles in service from the private operators. This has allowed THE RIDE to set service level targets in procurement without major facility limitations, and expand while limiting the risks (Personal Communication, 2014-2015c).

Boston’s commuter rail is also contracted to a private operator. Historically, the commuter rail was operated by the Boston and Maine (“B&M”) Railroad. When the B&M changed management and ensuing labor disputes led to service disruption, the MBTA switched operations to Amtrak, which given limited competition was the main alternative (Personal Communication, 2014-2015a). Since then, there have been two major bids with limited levels of competition (Personal Communication, 2014-2015b; Personal Communication, 2014-2015a). For example, in the most recent bid process, only two teams qualified to submit contract proposals (Massachusetts Bay Transportation Authority, 2015a). Partially because of the limited levels of bid competition, the contracts have not led to lower costs.

In July 2014, the commuter rail contract switched from the Massachusetts Bay Commuter Rail Co. (“MBCR”) to Keolis Commuter Services (“Keolis”). MBCR and Keolis were the only two teams to bid on the procurement (Massachusetts Bay Transportation Authority, 2015a). MBCR had contracted the service from the MBTA for the previous decade, and the contract with Keolis is for eight years with options for four additional years (Massachusetts Bay Transportation Authority, 2015a). The contract included a 30-month procurement process for the MBTA (Massachusetts Bay Transportation Authority, 2014a).

The new contract with Keolis contains provisions for penalties but does not allow for incentive payments. The penalties are based on performance measures such as on-time performance, cleanliness, and passenger comfort, and could be on a magnitude as high as four times the maximum penalty limit under the previous contract (Massachusetts Bay Transportation Authority, 2014a). The new contract provides scheduled maintenance requirements from the private operator.

It is also important to note that Keolis is required to hire commuter rail employees from the previous provider. It will continue to pay the union employees based on the employees' job classifications or positions under the previous provider, with equivalent benefits (Massachusetts Bay Transportation Authority, 2014a). The foundation of these labor provisions relate to Section 13(c), which will be further discussed in Section 4.3.1.

A lack of competition could be a source of problems for the Keolis contract. Because Keolis and MBCR were the only two bidders on the contract, Keolis had a significant amount of leverage. Moreover, because the contract was for at least eight years and was completed in the final year of the Governor Patrick administration, Governor Baker and the governor in the following term will be working under a contract from a previous administration. In this sense, Keolis also has the incentive to convince Governor Baker that any issues are the fault of the previous administration. This creates a tension between the short-term and long-term. In the short-term at the time of contracting, Keolis had some leverage because of limited competition; however, in the longer term, Keolis' leverage increases significantly because there is a limited possibility of substitutability away from Keolis, along with a potential disconnect between governing administrations. This idea of tension between the short-term and the long-term is discussed further in Section 3.4.

## **2.4.2 Massachusetts RTAs**

Unlike the MBTA, the 15 Massachusetts RTAs are legally obligated to contract out service (M.G.L. §161B). These 15 RTAs serve communities outside of Greater Boston, and are funded through four major sources: state contract assistance, FTA funds, local assessments, and farebox revenue (Massachusetts Department of Transportation, 2011).

The RTAs have at times had issues inducing competition during procurement. It has been fairly common for the incumbent to win the competitive bidding. RTA contracts are

structured more as management contracts, not service contracts. Contract terms are such that the RTAs pay the required cost to operate the system to the operator along with a management fee (the profit component for the private operator) (Personal Communication, 2015c). Because of this, the agencies face most of the cost risks, not the contractors. The RTAs own the depots and maintenance facilities. Contracts are structured so that the RTA determines fare and service policies, and the private companies employ the mechanics and drivers. This structure can allow for innovative service delivery; for example, one Massachusetts RTA started a new demand-responsive flex service in 2014 and might expand the service to other areas.

An influx of additional funding from the Transportation Finance Act of 2013 allowed many of the RTAs to expand service (Mares & Pecci, 2014). For example, the Pioneer Valley Transit Authority (“PVRTA”) received an additional \$4.2 million in 2014, which allowed them to implement six new routes.

It is important to note that the strong relationships between the RTAs, MassDOT, and the MBTA would enable collaboration on a future increase in private sector involvement in transit operations in the Boston area if desired. With the RTAs, THE RIDE, and the Boston-area commuter rail all operating under contracted service, knowledge transfer should not present a significant barrier.

### **2.4.3 Denver**

Denver has been active in working with the private sector both for infrastructure development and for operating services. As one of the FTA’s Penta-P projects, the Eagle P3 has been a domestic showcase for understanding infrastructure PPPs. Similarly, as one of the larger systems to contract out service operations, RTD has become a domestic leader in that regard as well.

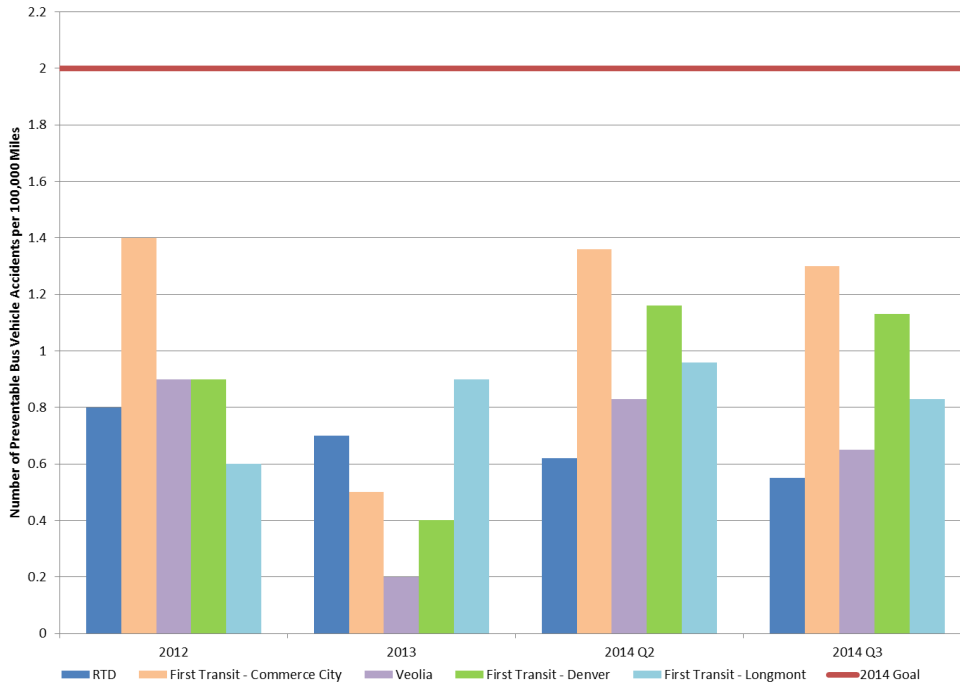
The Eagle P3 in Denver was developed by the Denver RTD. It was the first major transit infrastructure PPP in the United States. The project was one of three pilot projects in the federal Penta-P program, which allowed for an expedited New Starts program review process (Eno Center for Transportation, 2014). RTD was financed partially through a sales tax, of which 0.4% goes towards the RTD FasTracks program. Overall, the Eagle P3 project was funded through private equity, the FTA, and RTD (Eno Center for Transportation, 2014).

One issue with the Eagle P3 was that the farebox recovery ratio was well under 100% (a common problem for transit PPPs). As such, the concessionaire required payments from RTD to take on the project. The project was structured so that the concessionaire received both scheduled construction and annual performance payments, which were backed by the RTD sales tax revenues (Eno Center for Transportation, 2014).

Colorado's institutional culture includes prior experience with contracting. In 1988 the state of Colorado legislatively required RTD to contract at least 20% of its service. This figure increased to 35% in 1999 (Gulibon, 2007). As of August 2014, RTD contracted 55.9% of bus services with the private sector, including 44.7% of its fixed route bus services (and 100% of Access-a-Ride and Call-a-Ride services) (Washington P. A., 2014). Statutorily, RTD is allowed to contract a maximum of 58% of its bus services (Washington P. A., 2014). This maximum has been developed over time, with the previous requirement being a floor of 50% contracted service. The 58% maximum was developed partially to ensure that RTD maintained enough of a directly operated presence to allow for it to step in when necessary if private operation failed (Washington A. M., 2007). It is also possible that the private operators in turn perform better than they would if service were fully contracted, because they fear the public capacity to take over the services.

RTD has found that contracting provides some flexibility in terms of starting new services and adjusting existing services. It can allow for different types of routes. For example, a contractor could provide a shuttle or circulator route with a type of specialty vehicle that RTD might not have ready access to. Contracting also allows RTD to experiment with new routes (Personal Communication, 2014a).

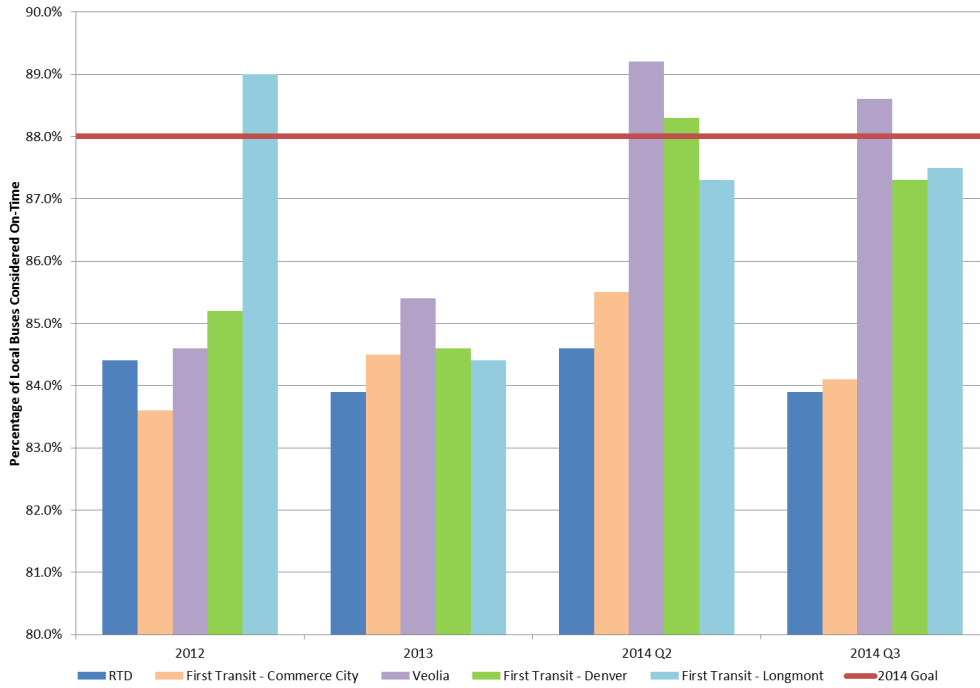
As Figure 2-2-Figure 2-4 show, RTD service has not suffered as a result of contracting. In fact, the performance measurements for contracted bus service are similar to those for directly operated service, using the available data (2012, 2013, and 2014 Q2 and Q3). As Figure 2-2 shows, both directly operated service (in dark blue) and contracted services (all other colors) outperformed the vehicle accident target, with fairly similar results.



**Figure 2-2. RTD Preventable Bus Vehicle Accidents per 100,000 miles**

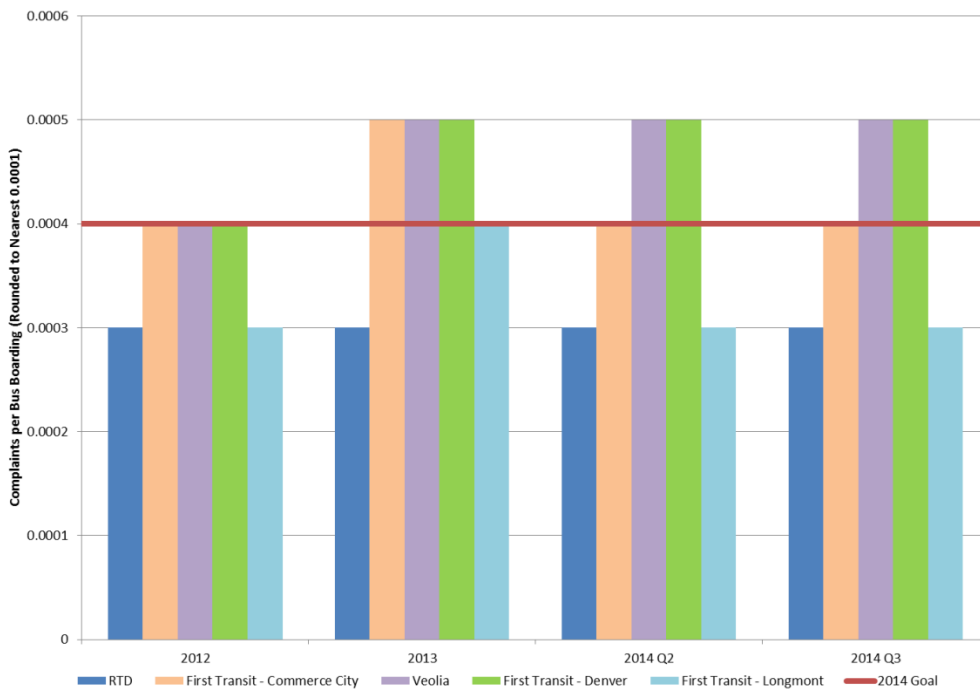
*Source: (Regional Transportation District, 2014b)*

Outside of safety, on-time performance (Figure 2-3) was also fairly similar between contracted and directly operated service, although the only four cases in which an operator exceeded the target on-time performance were contracted. Finally, customer satisfaction as measured by passenger complaints (Figure 2-4) was also high across both directly operated and contracted service, with a maximum difference of 0.0002 complaints per bus boarding between RTD and any of the operators. However, RTD did always meet the target while the contracted operators did not always do so. The private operators were not significantly distant from the targets, so it is possible that the financial costs of reaching the target were not worth it to the private operator; this balance of ethics and reputations against cost motivations is something that must always be considered, with contracts aimed at aligning these different motivations.



**Figure 2-3. RTD On-Time Performance: Local Bus Service**

*Source: (Regional Transportation District, 2014b)*



**Figure 2-4. RTD Passenger Complaints per Bus Boarding**

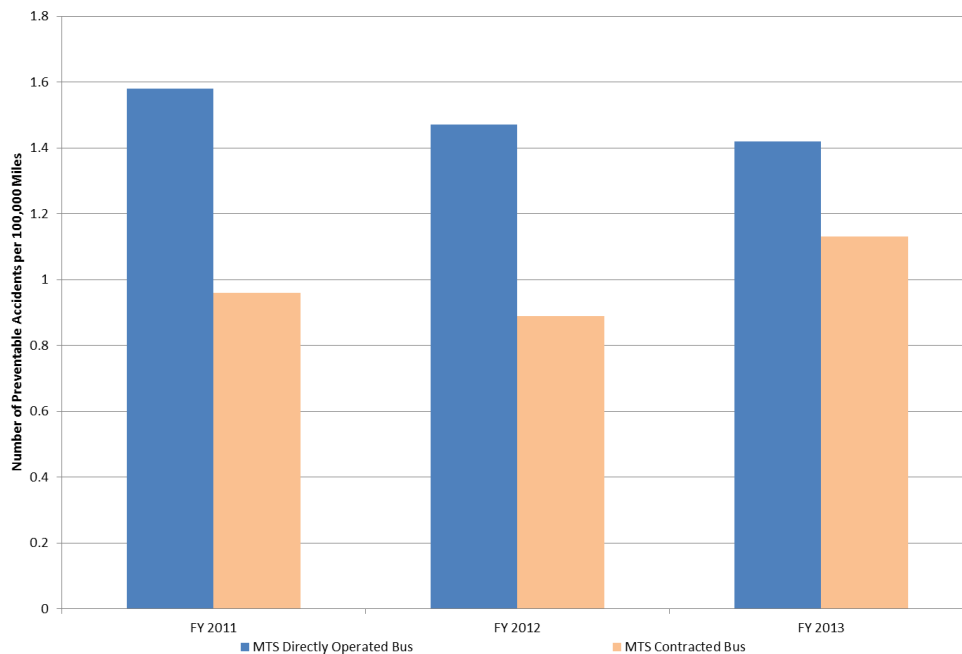
*Source: (Regional Transportation District, 2014b)*



#### 2.4.4 San Diego

In San Diego, service had been provided by the public monopoly operator San Diego Transit until 1979, when some jurisdictions chose to competitively tender services following a labor agreement for San Diego Transit. After the Metropolitan Transit Development Board (“MTDB”) gained authority for transit policy, it began converting services to competitive contracting, but within the employee rate of attrition in order to avoid layoffs (Cox & Duthion, 2001). Between 1979 and 2000, there was a 47% increase in vehicle-kilometers, a 2% increase in operating and capital costs, and a 60% increase in ridership (Cox & Duthion, 2001). As of 2000, contracted costs were 42% lower than directly operated costs (Cox & Duthion, 2001).

The performance metrics for San Diego’s Metropolitan Transit System (“MTS”, renamed from MTDB in 2005) tell a similar story to those from Denver’s RTD. As Figure 2-5 demonstrates, although contracted bus services perform slightly better than directly operated bus services in terms of safety, both have had fewer than two preventable accidents per 100,000 miles for each of the last three years of data.

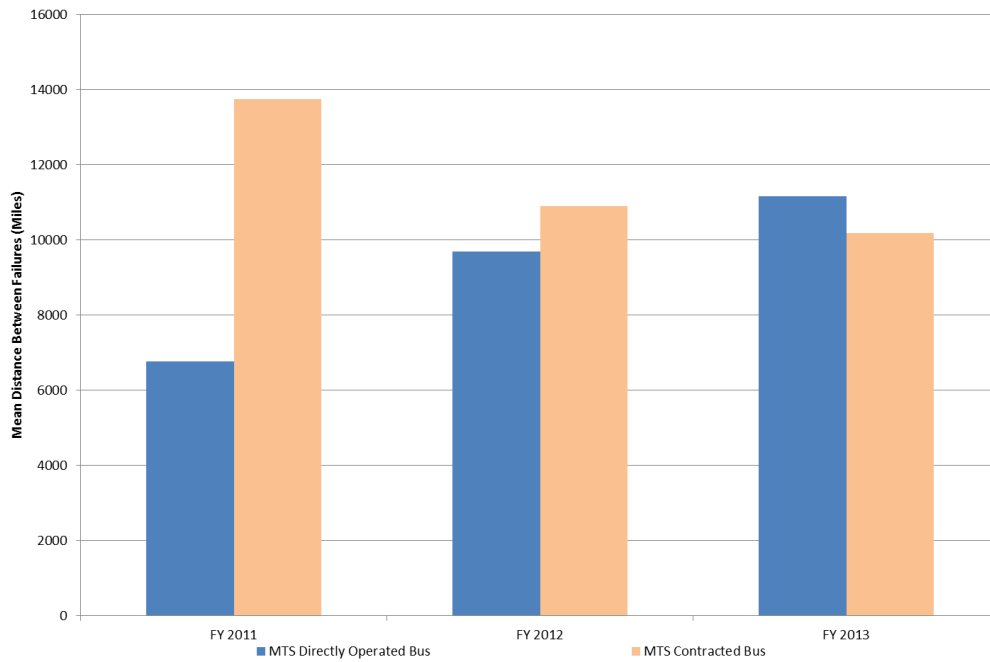


**Figure 2-5. MTS Preventable Accidents per 100,000 Miles**

*Source: (Metropolitan Transit System, 2013)*

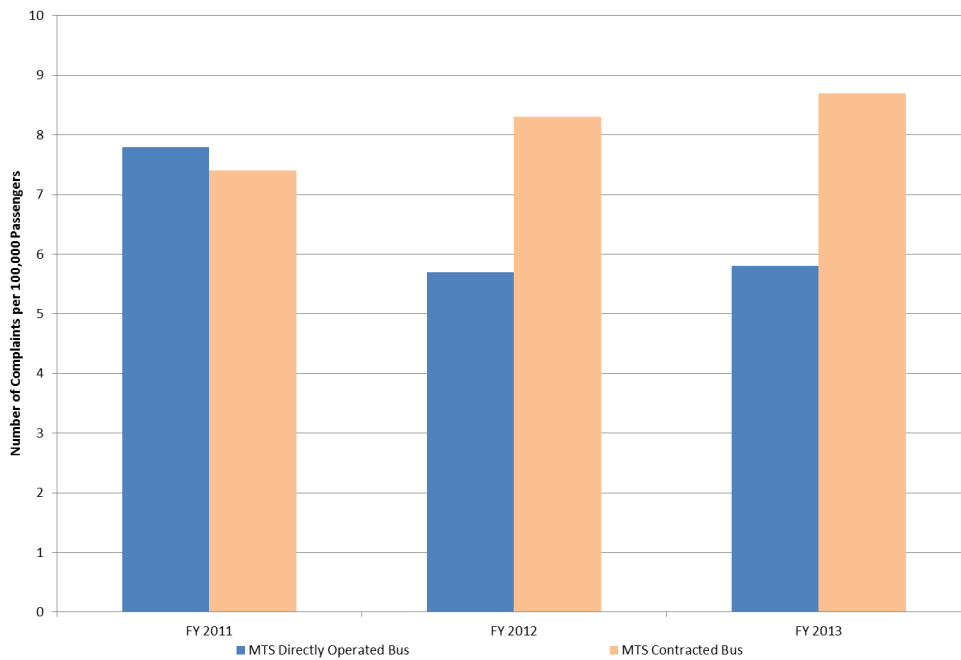
As Figure 2-6 demonstrates, the mean distance between failures was much higher (better) for contracted service in FY 2011, but was highly similar between directly operated and contracted service in FY 2012 and FY 2013. Meanwhile, directly operated service had slightly

higher customer satisfaction (fewer complaints per 100,000 passengers) in FY 2012 and FY 2013 as exemplified in Figure 2-7.



**Figure 2-6. MTS Mean Distance between Failures**

*Source: (Metropolitan Transit System, 2013)*



**Figure 2-7. MTS Complaints per 100,000 Passengers**

*Source: (Metropolitan Transit System, 2013)*

### 2.4.5 Maryland

Maryland is in the process of planning a Purple Line light rail project that would connect to three Washington Metropolitan Area Transit Authority (“WMATA”) Metrorail lines, Maryland Area Regional Commuter (“MARC”) commuter rail, Amtrak services, and local buses. The project would be a public-private partnership in the traditional sense in that the private concessionaire would design, build, operate, and maintain the line. Maryland hoped to finance the Purple Line project with a federal loan, private activity bonds, and \$500-900 million of private investment (out of a total estimated cost at the time of \$2.2 billion) (Maloof, 2014). Projected costs have since increased to \$2.45 billion, up from the initial estimates in 2007 of only \$1 billion. This increase is largely due to the higher land acquisition and financing costs than were originally anticipated (Watts, 2014). Of the public money, an expected \$900 million will be from New Starts funding, with between \$360 million and \$760 million of state funding (Watts, 2014). The state would pay for the private construction costs, but would leave the private firm with additional costs due to delay or overrun (Shaver, 2013). Once constructed, the state will subsidize the private firm’s operations of the line with \$100-200 million annually for 30-35 years (Shaver, 2013).

As of January 2014, four teams were shortlisted to bid on the Purple Line PPP. Each of these teams was comprised of multiple individual private firms (Maryland Transit Administration, 2014a). The RFP was released in July 2014, with proposals due in January 2015 and partner selection expected to occur in 2015 as well (Maryland Transit Administration, 2014b). The contract selection will weight the financial and technical criteria equally, with the final recommendation based on which contract would provide the “best value” (Maryland Department of Transportation and Maryland Transit Administration, 2014, p. 48). The technical criteria include operations, project management, design and construction, maintenance, and systems integration (Maryland Department of Transportation and Maryland Transit Administration, 2014). The financial evaluation is based almost entirely on the projected net present value of the project (Maryland Department of Transportation and Maryland Transit Administration, 2014).

#### 2.4.6 London

The British Parliament passed legislation to convert the entire London bus system to competitive contracting. According to Transport for London (“TfL”), London’s regulated contracting system has “lead to increased service levels, improved quality of services and significant increases in patronage” (Transport for London, 2008, p. 3).

London Buses manages the contracts with operators, tendering routes individually with 15-20% of system bus routes tendered annually (Údarás Náisiúnta Iompair (National Transport Authority), 2013). Historically, the London Regional Transport Act of 1984 brought London Transport under government control and required that competitive tendering be used where appropriate economically (Transport for London, 2008). London Transport then began contracting through its Tendered Bus Division beginning in 1985, with 60% of the initial contracts awarded to the London Transport subsidiary London Buses Limited (Transport for London, 2008). London Buses Limited created 13 subsidiaries to allow for the eventual sale of all the publicly-owned entities to the private sector (in 1994), entirely eliminating public bus operation in London (Transport for London, 2008). Planning decisions related to buses are now made by London Bus Services Ltd (“London Buses”), a part of the Surface Transport division of TfL, which replaced London Transport in 2000 (Transport for London, 2008).

London used gross cost contracts from 1985-2000, net cost contracts from 1995-1998, and quality incentive contracts (“QICs”) since 2000 (Transport for London, 2008). London switched away from net cost contracts after a 1998 London Buses analysis found that net cost contracts had higher administrative costs and did not improve operational performance (Butcher, 2012).

Under the quality incentive contracts, operators are paid similar to a gross cost model, but with additional incentives related to service quality (Transport for London, 2008). The operator has limited incentivization, however, related to fare collection. Under the quality incentive system, bidding operators must submit a compliant bid but also have the option to include alternatives that would benefit either passengers or London Buses (Transport for London, 2008). This could potentially allow for service growth via operator innovation.

Quality incentive contracts are awarded based on numerous criteria, including but not limited to price, ability, vehicles, depots, staff, finances, schedules, safety records, and competitive impact (Transport for London, 2008). A study conducted by the London Assembly

Transport Committee in 2006 found that service increases through TfL's quality incentive program had achieved "value for money," largely due to its reliability standards and ability to maintain a competitive market (London Assembly Transport Committee, 2006). The study found that the QICs not only kept costs down, but also increased reliability and reduced the scheduled kilometers lost due to staff shortages, a measure related to operator performance that may have positively affected reliability (London Assembly Transport Committee, 2006).

It is also noteworthy that with London's 2003 congestion charge, a significant amount of revenue has been reinvested in public transportation. Of the £1.2 billion raised from the congestion charge between 2003 and 2014, £960 million was reinvested in the bus network (Transport for London, 2014a), providing a clear case where public policy was coordinated with private sector involvement (contracted bus operators) in order to ease congestion and improve public transportation in the city.

Another significant example of contracting occurred in London recently with the Docklands Light Rail expansion prior to the London 2012 Olympics. The contract was awarded to a Skanska – GrantRail joint venture in 2007 and included a connection to Stratford International Airport (Transport for London, 2007). The project was completed in 2011, well before the start of the Olympic Games (Transport for London, 2011). Docklands Light Rail had historically been operated by a different firm, Serco, since 1997 (Transport for London, 2014b). Serco's contract was renewed in 2006 and extended to end in 2014 to allow for increased focus on service during the Olympics, and Keolis Amey Docklands was selected as the new operator at that point (Transport for London, 2014b).

#### **2.4.7 Stockholm**

Stockholm converted all of its bus and rail system to competitive contracting. From 1991 to 1999, there was a 16% increase in vehicle-kilometers and a 7% decrease in operating and capital costs (Cox & Duthion, 2001). Stockholm first started restructuring to tender service in 1991, and operating costs for the in-house operator dropped by 30% prior to contracting simply due to the threat of competition (Jansson & Pyddoke, 2010). In 1998, the Stockholm agency considered both cost and quality for the first time in a tender, and consequently introduced quality incentives into their gross-cost contracts (Nordstrand, 2005). By 2004, the public agency AB Storstockholms Lokaltrafik ("SL") no longer had a majority stake in any of the operating

companies (Public-Private Infrastructure Advisory Facility, 2005). In the current system, the bus companies are responsible for providing the buses and retain ownership of the buses (Public-Private Infrastructure Advisory Facility, 2005).

## **2.5 Summary of Theory and Experience of Private Sector Involvement**

The theory of increasing private sector involvement in transit historically includes a discussion centered around cost, but should also consider ways in which government programs and financing mechanisms can work with the private sector to increase growth capabilities. Because of the problem of lumpy service in transit that has existed since its early history, the growth period can be particularly difficult to navigate politically. There is a need to continue to operate existing service, while also increasing service to rapidly growing areas. This growth provides an opportunity for contracting service that is clearly linked to increased levels of funding from the beneficiaries of the increased service. This idea will be developed further in the upcoming chapters.

## **3 Using Contracting for System Growth**

This chapter develops ways in which contracting can help a public transit system grow when facing various constraints. In Section 3.1, different types of constraints are presented, along with ways in which contracting can alleviate those constraints. Then, Section 3.2 examines how costs are rapidly increasing in the transit sector, how Baumol's Cost Disease can explain this, and ways in which contracting service can help public agencies face the issues driven by Baumol's Cost Disease. In Sections 3.3 and 3.4, these ideas are then reframed under the contexts of costs, funding, and growth, and short-term vs. long-term issues.

### **3.1 Description of Constraints Affecting System Growth**

There are a number of constraints that can affect transit system growth. These include, but are not limited to, infrastructure, equipment, institutional, and financial constraints. Each of these types of constraints is described in more detail in the following subsections.

#### **3.1.1 Infrastructure Constraints**

One of the major constraints systems face when attempting to grow service is their existing infrastructure capacity and the ability to increase that capacity. This is certainly an issue in dense cities with limited land available near the urban core. In particular, increasing bus service is generally regarded as the quickest and most flexible way to expand service. In terms of increasing bus service, there is generally the incremental cost of the bus procurement and the additional costs from operating and maintaining the bus. However, this is entirely dependent on an agency having the capacity to store and maintain the additional buses.

Without this capacity (i.e., if all existing maintenance facilities and storage depots are full), an agency faces the expensive and unpopular proposition of establishing an additional maintenance facility or storage depot. This requires a major commitment to additional service to warrant the new facility – for example, a system is unlikely to open a new 100-bus storage facility to increase the system bus capacity by 20 buses. The benefits of working with the private sector when facing these infrastructure constraints are multifold. First, contracting with the private sector can allow for a more incremental increase in service provided. Second, it may be advantageous to work with the private sector in order to finance the construction of the new

facilities. Third, the private sector may be more agile and resourceful in addressing the political implications and time required to build new facilities.

As the example above demonstrates, there could be times when an agency wishes to expand its facility capacity but not to the extent that would warrant a new facility. In these cases, contracting with private operators would allow for the desired incremental increase in capacity without the need to construct a new facility. There are three options here: (1) to work with a single operator that has the desired capacity in its existing facilities; (2) to work with multiple operators that combined have the desired capacity in their existing facilities (e.g. if two new routes are desired, contract the two routes to different contractors, which each have adequate capacity to operate one route but not both routes); or (3) to work with operators willing to develop a new facility to accommodate the capacity. The first two of these three options would clearly be appealing both to the agency, which could then expand quickly through contracting, and to contractors, who could more fully utilize their existing facilities.

The third option would also be attractive to an agency because it would require a lower financial output than constructing the depot entirely through agency and public funds, and it could provide the agency with future flexibility. Including options such as facility turnover to the agency at a future date could also allow for future agency growth.

There are also practical implications of working with the private sector to increase depot and maintenance facility capacity. While a public agency would have to go through an extensive review process to build such a facility, and would likely face political opposition from residents around potential locations, a private company might not face the same level of political pressure. Private taxpaying companies may more quickly be able to purchase the necessary land and build on it as private entities, or may have capacity at existing facilities. As a comparison, municipal governments might be more inclined to oppose the construction of tax-exempt maintenance facilities from public agencies. Considering this difference in the speed of implementation is important when developing plans for rapid service growth.

Meanwhile, the third option could attract a contractor aware of other potential services that it does not have the existing capacity to operate. In this case, the additional service contracted by the agency could make a new facility financially feasible for the operator when combined with these other potential services. This would also lower the cost to the agency. The



third option could also appeal to a contractor if the agency would agree to contract with that operator for a “base” level of ongoing operations from the new facility for a given period.

Larger infrastructure PPPs (such as Denver’s Eagle P3 mentioned in Section 2.4.3) have historically been used to provide infrastructure growth through cooperation with the private sector. These PPPs have often given the private sector a stake in the future of these projects, with the private sector sometimes responsible for operations and/or maintenance. While these larger infrastructure PPPs are not the focus of this thesis, it is important to note their presence to demonstrate that agencies are currently working with the private sector on large scale projects to improve and expand public infrastructure.

Another advantage of contracting expansion in relation to infrastructure constraints is that it is less threatening to public employees than contracting existing service. In this sense, contracting new service and new infrastructure can avoid political problems associated with that threat. The BusPlus program discussed in Section 2.2.3 exemplifies a way to relax infrastructure constraints through the private sector. In the first version of the program, MassDOT provided buses to private operators that enacted a service improvement; meanwhile, in the second version, MassDOT specified the desired service gaps that could be filled by private operators in exchange for public vehicle procurement on the route. In this case, the preexisting private operator often has an advantage of economies of scale in providing an increase in services. An example of this type of program will be discussed in Section 6.2. Section 6.3 will then explore the possibility of working through the private sector to relieve infrastructure constraints while continuing public vehicle operations.

### **3.1.2 Equipment Constraints**

Another major type of constraint facing public transit agencies is related to equipment. Equipment constraints differ slightly for rail and for bus.

Although a number of rail equipment constraints could be detailed, this thesis will focus largely on bus service and as such will examine bus equipment constraints. With the near-unlimited resource of public road space, the main equipment constraint in relation to bus capacity is the number of buses available to the system. This number is unconstrained by a signal system, as there could be a near-unlimited number of buses running along an individual route without the same type of safety concerns that are present in rail systems.

Both buses and rail vehicles face aging concerns – in which the existing vehicles break down more and require higher levels of maintenance. This not only increases the agency costs associated with the vehicles as the vehicle age increases, but also decreases the level of service quality associated with those vehicles due to worsening reliability. This is a major concern for public agencies.

It is possible to work with the private sector to relax the equipment constraints. Understanding how the private sector can help with each of these equipment constraints is a motivator of this thesis, and will be further considered in the examples presented in Chapters 5 and 6.

In particular there are three ways in which private sector involvement can help relax equipment constraints:

- 1) *Contracting with an existing private route within the public agency's service area, which can add to a system's capacity.* In this case, the public agency could work with the private contractor to operate the route as part of the public system. The public agency could benefit from such an arrangement because it would eliminate or mitigate some of the risks in starting a new route – the operations are already in place and the existing revenue is known (although future revenue may still differ from existing revenue). The private operator could benefit from the public involvement as well. Even if revenue were to remain the same, the public may partially subsidize the route for inclusion on the public network. Moreover, the route's integration with the larger public network is likely to increase ridership on the route. On the other hand, the private operator could need to work around institutional constraints when integrating a route into the public system, as previous funding partners and riders may have priorities that conflict with the new arrangement (e.g. comfort associated with lower-ridership routes). Variations on this mechanism for relaxing a public agency's equipment constraint include collaborating to expand an existing private route, and consolidating multiple private services in a single area to improve public access to the area. These types of arrangements are considered in more detail in Chapter 5.

- 2) *Private operators may be able to operate different types of vehicles than the public agency would be able to operate.*<sup>25</sup> For example, a private operator may have experience operating and maintaining smaller vehicles than the public agency, so private provision of lower-ridership routes might be able to take advantage of this experience and ability. This is also related to the infrastructure constraints discussed in Section 3.1.1, as a private operator may have capacity to maintain different types of vehicles than the public agency. For example, an agency that only operates full-size buses must continue to do so on lower-ridership routes and periods; consequently, it might choose to eliminate services on routes or during periods that do not justify operating the full-size buses. Purchasing smaller buses would require additional training for both operations and maintenance, and could require entirely different maintenance equipment. However, contracting smaller-vehicle service through a private operator could allow the public agency to operate services that it would not be able to otherwise provide. It could do this either by opening new lower-ridership routes using smaller vehicles, or by operating smaller vehicles on existing routes and moving the buses previously used to operate those routes to serve higher-ridership routes instead. In each situation, contracting service that the agency is unable to provide can allow the agency to more appropriately allocate service and grow service accordingly. This type of scenario will be further examined in Section 6.1.
- 3) *Private operators may be able to more quickly provide the necessary increase in vehicles than an agency would otherwise be able to provide.* This could allow the public agency to use extra vehicles available to the private operators. This scenario could arise if the private operator keeps extra vehicles on hand (either from a previous contract, or as flexibility for procuring future contracts). It could also happen if the private operator has fewer obstacles and a more streamlined process for vehicle procurement, in which case the public agency could subsidize that procurement. If the private operator does have extra vehicles on hand or can more quickly procure those vehicles, the public agency benefits from the increased speed, while the private operator benefits from higher usage. Moreover, if the public agency subsidized private vehicle procurement, they could incentivize the private operators to make a service improvement in exchange for the

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<sup>25</sup> This idea has been previously proposed as an alternative for the MBTA to pursue (Pioneer Institute of Public Policy Research - Editorial Staff, 2015).

public agency taking a share of the capital costs (similar to the BusPlus program discussed in Chapter 2.2.3). An example opportunity related to the private sector helping to relax an agency's equipment constraint through vehicle provision is discussed in Section 6.3, in which the private sector provides the public with vehicles to be operated by the public agency but stored and maintained by the private sector.

### **3.1.3 Institutional Constraints**

Institutional constraints can also hinder system growth for public agencies. These institutional constraints can come from the agency itself (e.g., in-house agency labor), or from outside the agency (e.g., cities and towns, area employers). Understanding the motivations of the various stakeholders involved is essential to enabling system growth. This will be a major focus of the examples presented in later chapters. Ideally, system growth can take advantage of relationships with labor, municipalities, and employers in order to generate system support and even additional funding.

Labor has negotiated numerous protections in transit. Notable among these is Section 13(c), which applies to transit employees in systems with federal funding.<sup>26</sup> Section 13(c) essentially states that employees' situations must not be worsened by federal funding. It is essential to work with labor when attempting to grow the system, especially if this is done through contracting. With contracting, labor may find its position threatened by impending competition and will likely prefer to keep services as much in-house as is possible. This can be mitigated to some extent if the private party also uses unionized labor (especially if both the public and private workers belong to the same unions).

Ultimately, service growth should benefit labor. If contracting is only done for new work, while existing service remains under public control, the existing public labor situation should remain unchanged. In this case, the public agency is creating more jobs without removing existing jobs. The Pacheco Law is a labor constraint of this type in Massachusetts, which will be further discussed in Section 4.3.2. Under this constraint, the public agency must meet the service cost, service quality, and labor standards presented in the Pacheco Law in order to contract services that had been provided previously by public employees. In this case, any growth that meets the requirements of the Pacheco Law should meet more limited labor

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<sup>26</sup> Section 13(c) is located at (49 U.S.C. § 5333(b)). For more information about Section 13(c), *see* (United States Department of Labor - Office of Labor-Management Standards, 2014).

resistance. Ultimately, *service growth will create jobs and should be supported by labor*. Labor's position regarding example service expansions will be discussed in Section 7.2.

Municipalities are also significant stakeholders in any proposed transit service expansion. To varying extents, the municipalities fund the public agencies in exchange for service through the municipality for the municipality's residents, employees, and visitors. For this reason, engaging with the affected municipalities is critical for increases in service. Earning the support of municipalities for the service improvements could allow for increased funding or other arrangements related to those improvements (e.g. priority lanes that could increase capacity by shortening cycle times and increasing frequency).

Municipalities have a number of competing interests, however. First and foremost, they want to ensure that any increase in funding or preferential transit improvement will truly benefit their interest groups. For example, a municipality might agree to contribute additional funding towards a new route, but would want to ensure that (a) the funding will go towards increasing service beyond what the agency would otherwise provide along that route, and (b) that increasing service on the new route would not result in a corresponding decrease in service on other routes serving the municipality. Furthermore, powerful individuals within a municipality might have differing and possibly competing interests.

Municipalities do have significant power in determining what transit service is allowed to serve the municipality. They can influence which transit services can operate in which locations, and specify which types of vehicles can operate on which streets, for example. This ultimately results in detailed conversations with the public agency and existing operators. However, it is important to remember that the municipality can serve as an effective bridge between the public agency and existing private operators due to this power. In cooperation with the private operators and public agencies, and with sufficient financial and institutional support, municipalities can help shape their transit service and can be a major influencer of increasing service.

Major employers are also stakeholders in the transit system and system expansions. Employers have much to gain in improving transit access, including increased access to new employees, lower parking costs, better commutes (and happiness) for existing employees, and improved connection to the city as a whole. Public agencies should view employers as a potential source of support (both for political purposes and financial purposes), and can work

with employers to improve service to their areas. This is particularly true in areas with high employment density and high growth, such as Kendall Square and the Seaport District in Boston. Examples applicable to these two areas, and to employers' roles in improving transit access, will be considered in Chapters 5 and 6.

Employers are often willing to contribute to increased transit service in an area. This is evidenced where there are employer-funded private shuttles in an area. For a transit agency with a goal of increasing service in that area, it is useful to consider how to gain employer support for how, and whether to transition those services to the agency. In order to support the agency, employers will require a similar level of service (e.g. frequency, performance, comfort) at a lower or equal cost to them. This should be possible – if public funding is available, the public agency can take advantage of employer contributions to the service while the employers can take advantage of a public subsidy. This service can even continue to be operated privately under the public umbrella. As described further in Section 3.2.4, contracting the service to a private operator might even increase the employer willingness to continue to contribute funding due to the transparency involved with doing so.

One additional concern for employers in transitioning a service to public control, however, is that contributing to this public service would differentiate the employers from others who do not contribute to publicly operated service. The employers could perceive a free rider problem in which the non-contributing public would benefit from a service that the contributing employer helps to provide. This could be addressed by providing the employers with an additional benefit beyond what the general public receives, such as free unlimited-use employee passes.

These types of institutional constraints are highly interwoven with the infrastructure, equipment, and financial constraints mentioned in this Section 3.1. In a sense, institutional cooperation can allow agencies to mitigate each of the other constraints. To the extent that some of the players involved are familiar working with private transit services, incorporating private operations into public agencies can allow for increased support and service expansions. The ways in which each of the major stakeholders are affected by and can contribute to service expansions are discussed in Chapters 5 and 6, as are the differences to these stakeholders in expanding through public vs. private operations.

### **3.1.4 Financial Constraints**

There is a balance between costs, funding, and the level of service, which will be discussed further in Section 3.3. With a forward funding mechanism such as that at the MBTA (detailed in Section 4.1), there is supposed to be a pre-determined level of funding given to the agency to provide service. Interacting with the private sector can ease financial constraints in numerous ways. For example, one way it can do this is by adjusting the timing of payments so that a financially constrained system can enjoy increased service now that it pays for in a later period.

There are also ways to involve the private sector through alternative funding mechanisms that can help provide improvements benefitting the public sector. For example, the special and benefit assessment districts, transit impact fees, business improvement districts, and tax increment financing discussed in Section 2.3 could all serve as funding sources that lean heavily on the private sector to help fund transportation improvements. These methods vary in the degree to which the funding is derived from the private sector.

It is important to differentiate these revenue sources from the regular funding mechanisms that are more generally used to set a financial constraint, and instead use them as an option to loosen that financial constraint in order to allow for system growth. These mechanisms are only occasionally used as a main revenue source for operating existing service, but could be potentially useful sources of revenue to expand service. One of the main benefits of these types of funding sources is the strength of the link between the beneficiary and the increase in operating costs. Because of this, a service expansion would not need to draw on the general funding to the same extent that existing service does. Instead, it could be funded largely from the beneficiaries seeking an improvement. For example, increased development in the Seaport area of Boston or Kendall Square in Cambridge could help fund an increase in service to those areas. This would avoid threatening service elsewhere, while instead allowing for a net growth in service.

### **3.1.5 Summary of Constraints Affecting System Growth**

The previous sections consider how contracting can ease infrastructure, equipment, institutional, and financial constraints. If this is the case, it is possible, even likely, that

contracting service growth is a more acceptable way to contract service than contracting existing service. This is for numerous reasons, as described below.

First, legislative requirements protect labor so that the positions of existing workers cannot be worsened by contracting service. It is possible to work around this requirement to contract existing service by shifting service to the private sector within the employee rate of attrition, similar to what was done in San Diego (see Section 2.4.4).

However, even without the labor requirement, it might be beneficial to increase contracting by growing service rather than shifting existing service to be contracted. In the scenario in which the public agency does not have the resources (e.g. infrastructure, equipment) to expand service, even the risk accompanied with contracting would be more acceptable than the alternative of no action by the agency. Even individuals opposed to contracting due to the risks involved with giving up some level of public control would be hard-pressed to oppose contracting when it is the singular option for transit growth. This idea of contracting as an option of last resort could still render the argument for contracting for growth valid in agencies with highly constrained resources.

## 3.2 Issues of Increasing Transit Cost and Baumol's Cost Disease

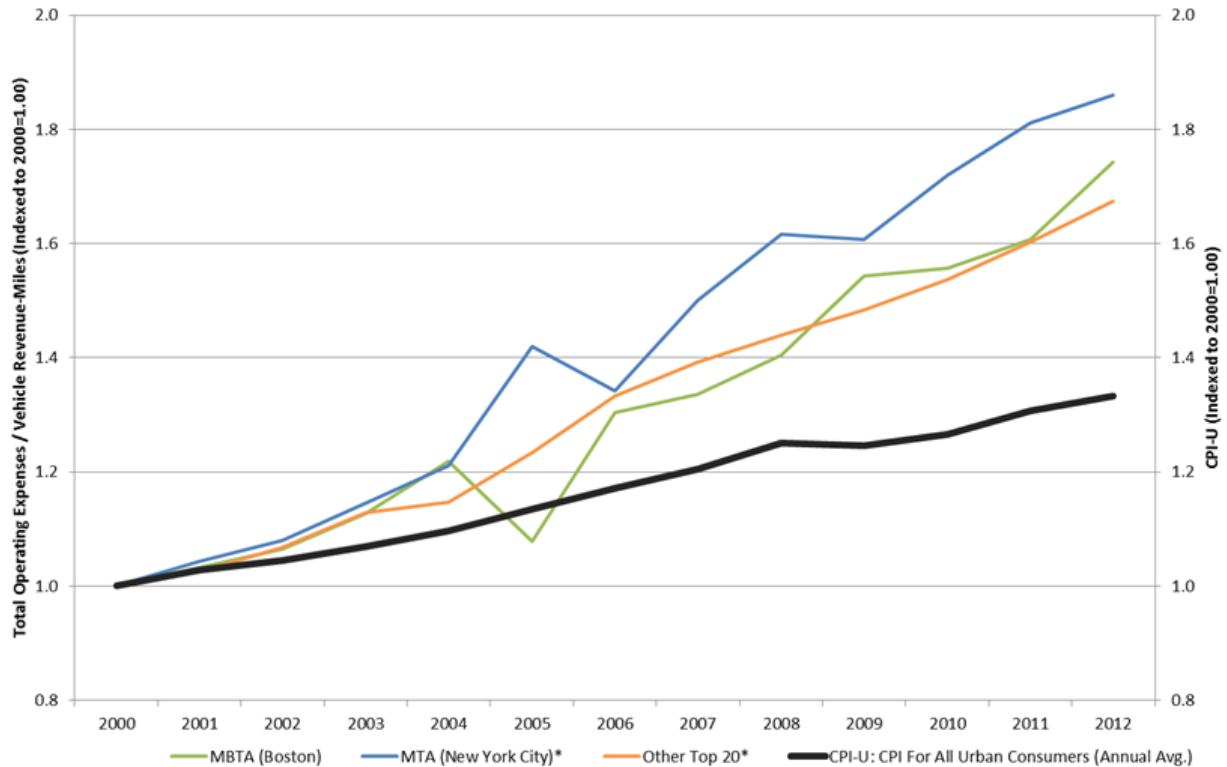
In the United States, transit costs have increased at a rate faster than inflation while revenues have risen at a rate slower than inflation. Although this may have occurred for a multitude of reasons, one possible explanation is examined in this section. First, this section will look at transit costs in the United States. Then, it will more closely consider Baumol's Cost Disease as a possible explanation for why transit costs have increased at a faster rate than inflation. Finally, it will examine how contracting services can help alleviate the constraints caused by Baumol's Cost Disease.

### 3.2.1 Evidence of Transit Costs Increasing Faster than the Rate of Inflation

There is significant evidence that transit operating costs have increased at a rate exceeding inflation in the United States. **Error! Reference source not found.** examines this phenomenon, as the black line represents the increase in the CPI-U (indexed to 2000), and the colored lines represent the corresponding increases in directly operated bus operating expenses per vehicle revenue mile indexed to 2000 (Federal Transit Administration, 2014; United States Department of Labor - Bureau of Labor Statistics, 2014, December). More specifically, the



orange line depicts this change for the top 20 systems in the United States, ranked in terms of vehicle revenue miles in 2012. This group excludes two systems in the top 20: the MBTA (depicted separately as the green line because it is the focus system of this research), and the Metropolitan Transportation Authority (“New York MTA”) in New York City (depicted separately as the blue line because it is overwhelmingly the largest system in the United States and would have contributed disproportionately to the top 20 statistics).<sup>27</sup>



**Notes:** Data shown are for directly operated bus service (Mode = "MB"; other types of bus service were not included). Data from MTA New York City Transit and MTA Bus Company (a subsidiary) were combined. "Other Top 20" includes the top 20 bus systems based on 2012 Vehicle Revenue Miles (excluding the MTA and MBTA, which were #1 and #11, respectively).

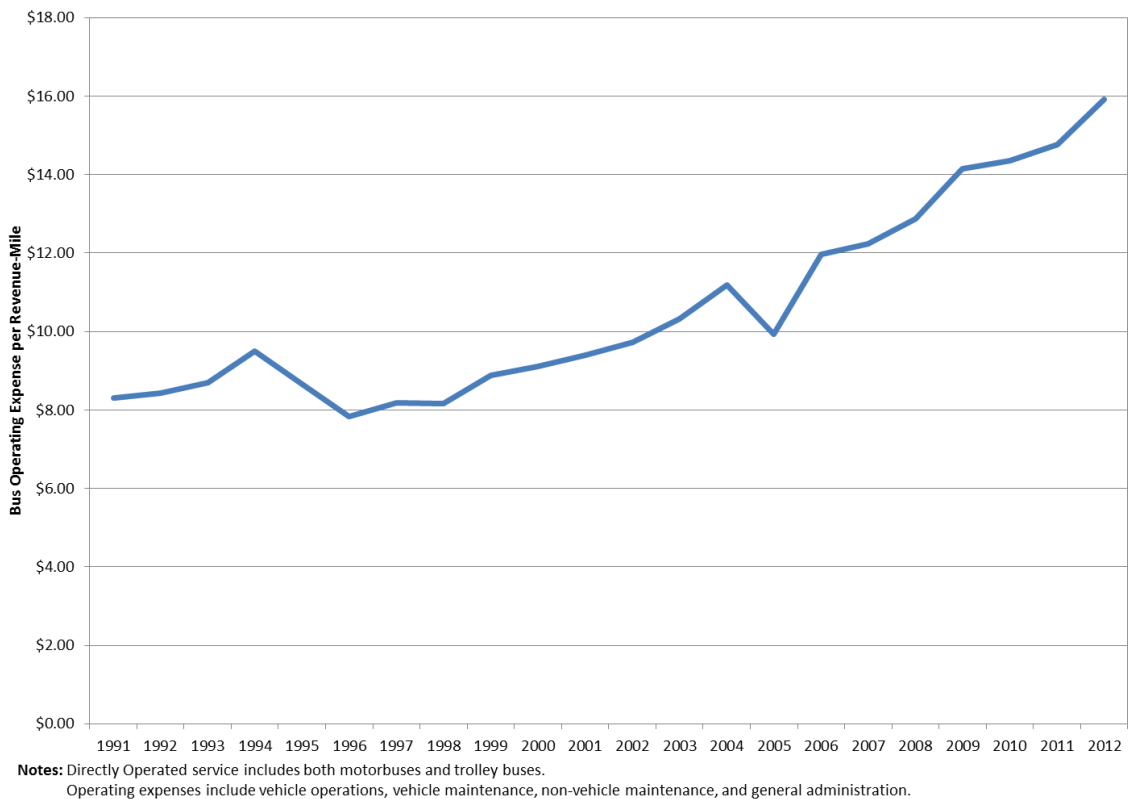
**Figure 3-1. Change in Directly Operated Bus Operating Costs per Bus Revenue Mile in the U.S., Since 2000**

Source: (Federal Transit Administration, 2014; United States Department of Labor - Bureau of Labor Statistics, 2014, December)

<sup>27</sup> The “Other Top 20” group excludes the MBTA and New York MTA. The 18 systems that are included are as follows: New Jersey Transit Corporation; Los Angeles County Metropolitan Transportation Authority dba: Metro; Chicago Transit Authority; Southeastern Pennsylvania Transportation Authority; Washington Metropolitan Area Transit Authority; King County Department of Transportation - Metro Transit Division; Miami-Dade Transit; Dallas Area Rapid Transit; Metropolitan Transit Authority of Harris County, Texas; Metropolitan Atlanta Rapid Transit Authority; Metro Transit; VIA Metropolitan Transit; Tri-County Metropolitan Transportation District of Oregon; Maryland Transit Administration; Port Authority of Allegheny County; Bi-State Development Agency of the Missouri-Illinois Metropolitan District, d.b.a.(St. Louis) Metro; Pace - Suburban Bus Division; and Alameda-Contra Costa Transit District.

Overall, it is clear that operating costs per bus revenue mile in the United States have risen at a rate faster than inflation. In fact, only two of the twenty systems included in this analysis (Dallas Area Rapid Transit and St. Louis Metro) had directly operated bus operating costs per vehicle revenue mile increase at a rate slower than the CPI-U from 2000-2012, and these differences were marginal (22% and 27% increases respectively, compared to the 33% increase in the CPI-U from 2000-2012). It is noteworthy that the rate of increase at the MBTA (74%) has been in line with that of other agencies during this period (although slower than the rate of increase at the New York MTA).

Meanwhile, Figure 3-2 focuses on the MBTA’s growth in operating expenses per bus revenue mile over the last two decades:

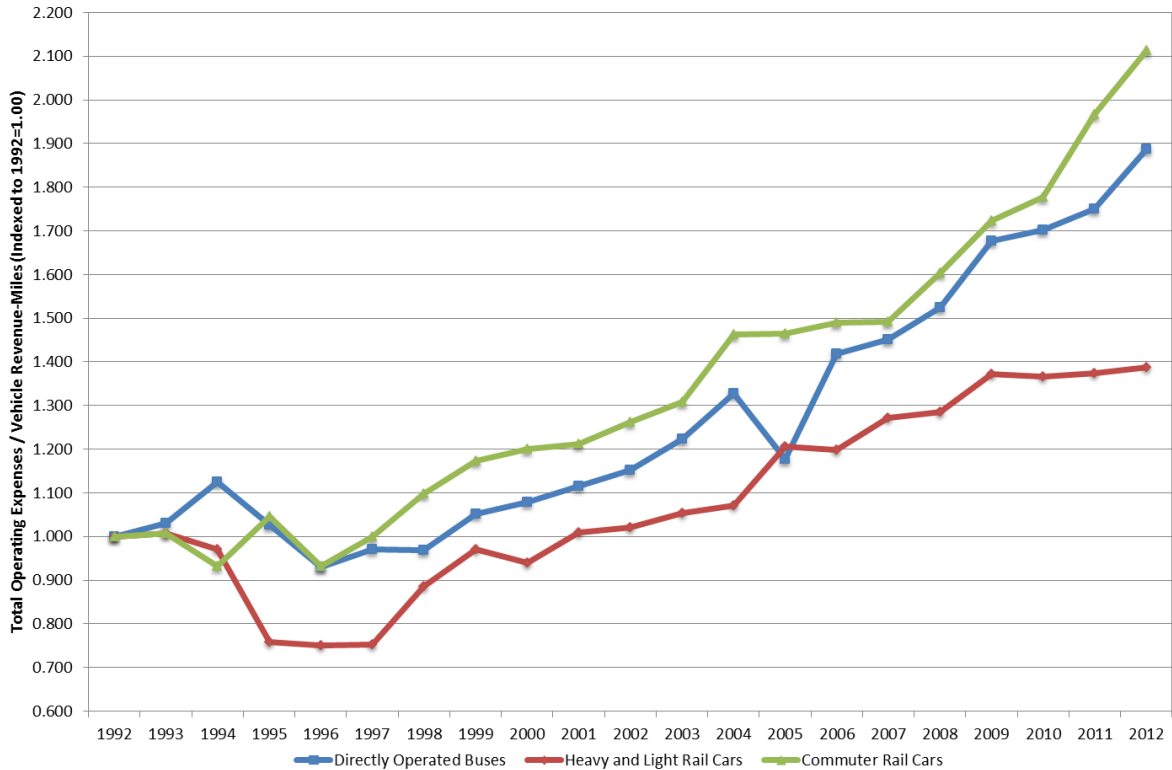


**Figure 3-2. MBTA Annual Bus Operating Expenses per Revenue Mile**

*Source: (Federal Transit Administration, 2014)*

The MBTA’s directly operated bus total operating expenses per revenue mile have nearly doubled in the last two decades (although did so more slowly in the first half of the period). For a sake of comparison, Figure 3-3 depicts the change in annual total operating expenses per revenue mile for different modes of the MBTA during the period of 1992-2012 (indexed with the

1992 value for each mode = 1.00). As this figure demonstrates, the changes in commuter rail unit operating costs and directly operated bus unit operating costs over this period were highly similar, with both higher than the corresponding change in rapid transit unit costs.

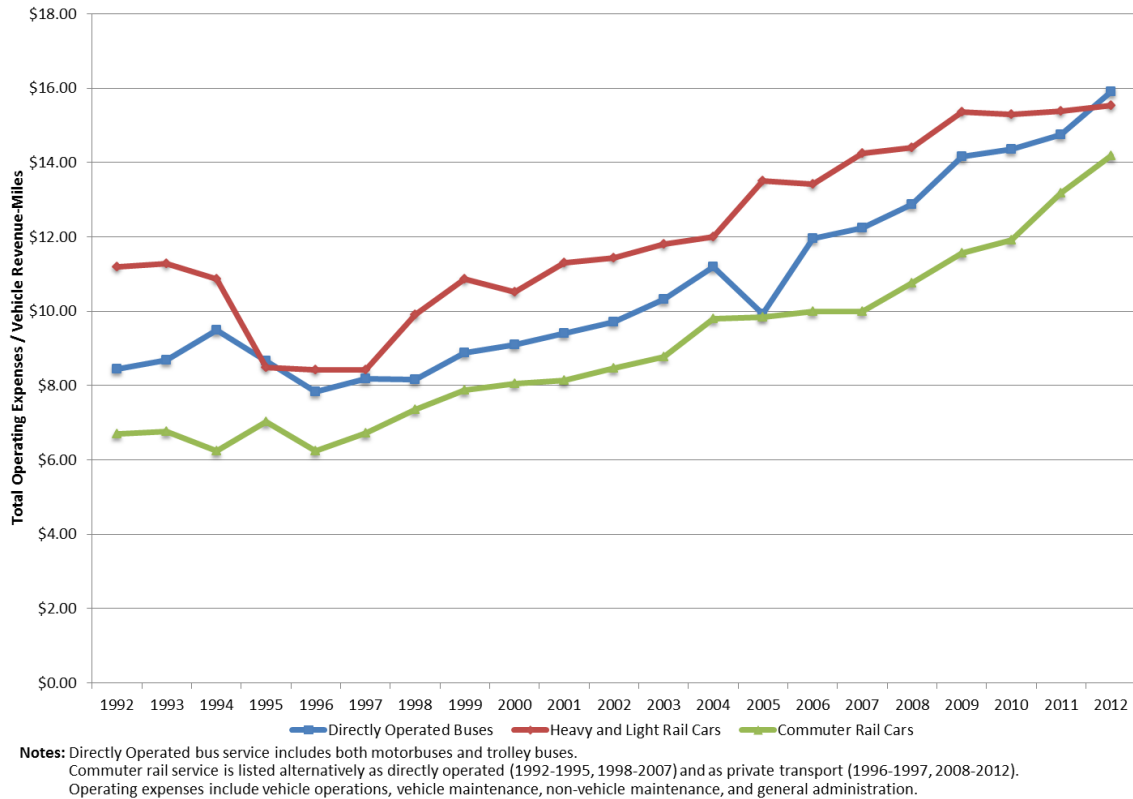


Notes: Directly Operated bus service includes both motorbuses and trolley buses.  
 Commuter rail service is listed alternatively as directly operated (1992-1995, 1998-2007) and as private transport (1996-1997, 2008-2012).  
 Operating expenses include vehicle operations, vehicle maintenance, non-vehicle maintenance, and general administration.

**Figure 3-3. Change in MBTA Total Operating Expense per Revenue Mile, for Different Modes**

*Source: (Federal Transit Administration, 2014)*

The absolute unit costs during this period across modes are then compared in Figure 3-4. Commuter rail has the lowest absolute unit operating costs in the period (partially due to the high-distance nature of the service), while rapid transit has generally had the highest unit operating costs. This higher baseline value for heavy and light rail unit costs partially explains the smaller percentage increase in unit costs over time, as the absolute changes across modes show fairly similar trends.

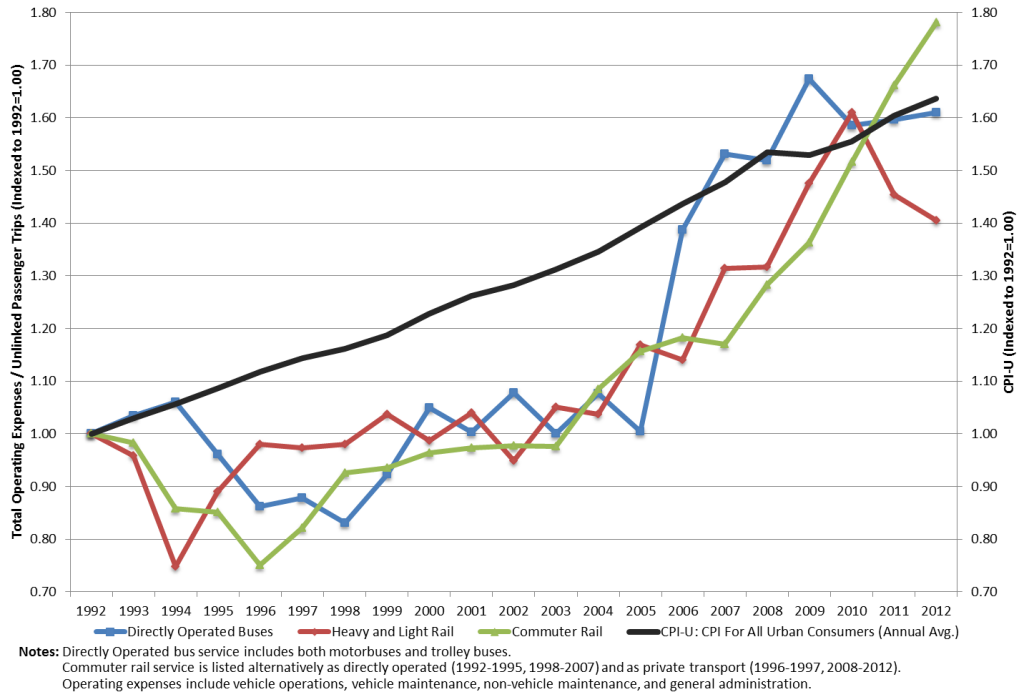


**Figure 3-4. MBTA Total Operating Expense per Revenue Mile, for Different Modes**

*Source: (Federal Transit Administration, 2014)*

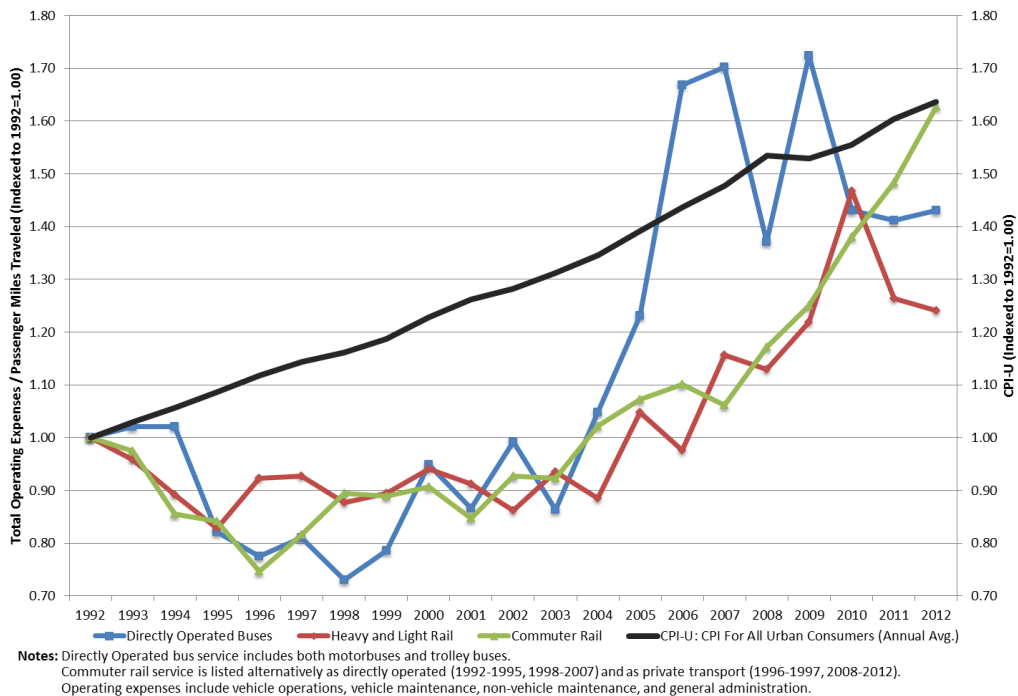
From the passenger perspective, the service trends at the MBTA differ (again, due to increasing levels of crowding). Figure 3-5 and Figure 3-6 demonstrate the rate of change in operating cost per unlinked passenger trip and operating cost per passenger mile traveled, respectively, compared to the rate of inflation. Although the unit costs increased below the rate of inflation in the first decade shown in the charts for both measures, they have risen considerably faster than inflation in the last decade.

The rapidly increasing costs and minimally increasing funding leave the MBTA with a difficult dilemma for growing transit’s mode share towards the state’s 2030 targets. Transit growth requires either an increase in funding or a decrease in costs used to fund existing service so that excess funds can be used to grow service. The next sections describe one theory for why decreasing transit costs are highly unlikely; consequently, it follows that increasing revenues and funding in combination with improved efficiency will be crucial to transit’s future.



**Figure 3-5. Change in MBTA Operating Expenses/Unlinked Passenger Trips, for Different Modes, 1992-2012**

Source: (Federal Transit Administration, 2014; United States Department of Labor - Bureau of Labor Statistics, 2014, December)



**Figure 3-6. Change in MBTA Operating Expenses/Passenger Miles Traveled, for Different Modes, 1992-2012**

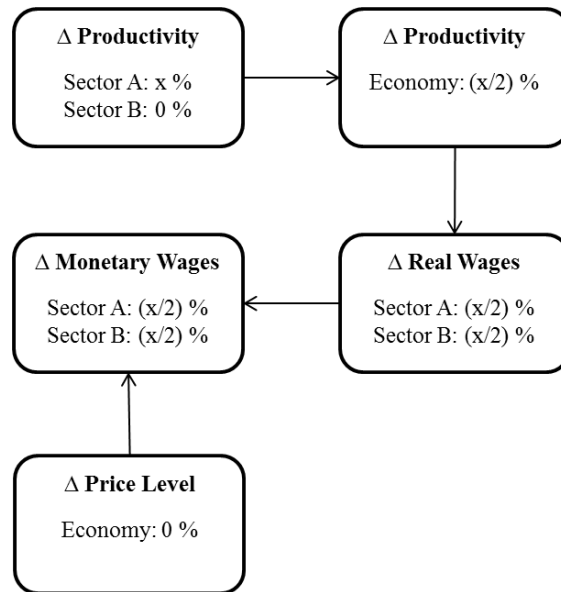
Source: (Federal Transit Administration, 2014; United States Department of Labor - Bureau of Labor Statistics, 2014, December)

### 3.2.2 Description of Baumol's Cost Disease

Initially introduced in reference to the performing arts sector, Baumol and Bowen explained the effects that differential growth rates in productivity can have on industries (this concept, outlined below, is referred to in this thesis as it is in much of the literature: “Baumol’s Cost Disease”) (Baumol & Bowen, 1964). Baumol and Bowen give the example of an economy with only two sectors. These two sectors have the following characteristics:<sup>28</sup>

- Sector A: Benefiting from technological improvements, this sector sees an output growth of  $x$  percent per year.
- Sector B: Lacking similar technological improvements, productivity remains stable.

As a result, if the example economy productivity growth is considered equally weighted from Sectors A and B, it will be equal to  $(x/2)$  percent per year.<sup>29</sup> In the simplified case where labor can move freely between Sectors A and B, the real wage rate must also increase at  $(x/2)$  percent per year to maintain the equilibrium. Baumol and Bowen then note that if price levels are kept stable, the monetary wages in each sector will also increase at a rate of  $(x/2)$  percent per year. This process is depicted in Figure 3-7, with the effects of this process explained following Figure 3-7.



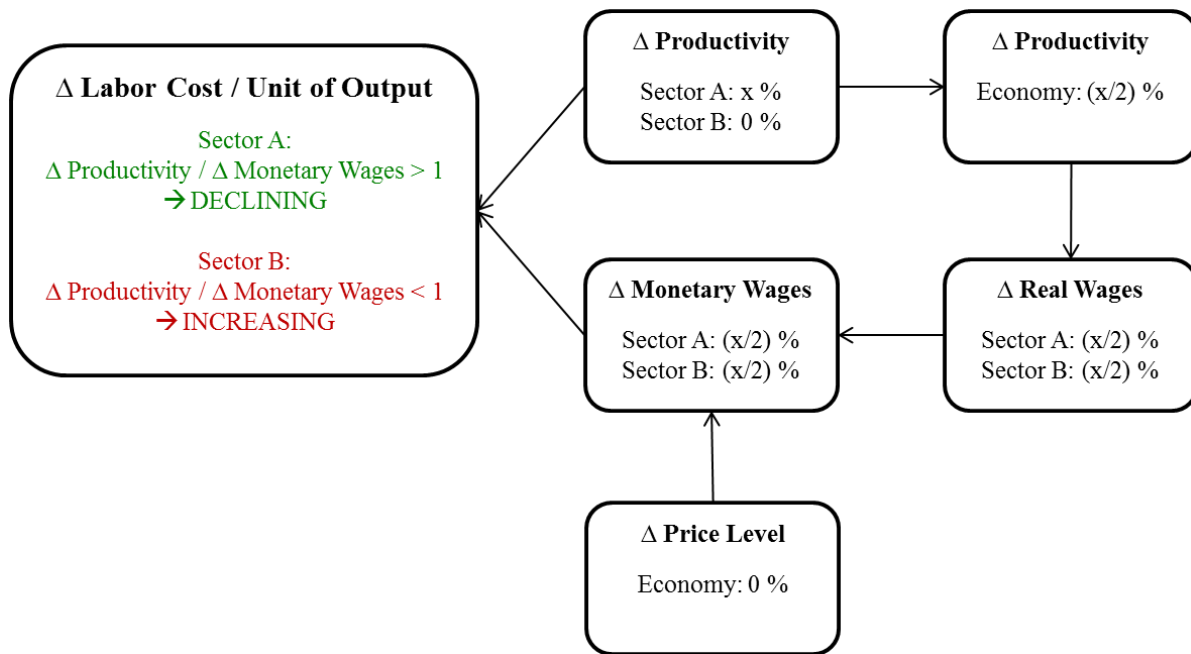
**Figure 3-7. Initial Forces Contributing to Baumol's Cost Disease<sup>30</sup>**

<sup>28</sup> This example is adapted from (Baumol & Bowen, 1964). Baumol and Bowen use a numeric example of 4% in the increasing wage sector.

<sup>29</sup> Adapted from (Baumol & Bowen, 1964).

<sup>30</sup> This figure is based on the example presented in (Baumol & Bowen, 1964).

Baumol and Bowen then compare the productivity increase to the cost increase in the two sectors. Since the change in productivity is greater than the change in wages in Sector A, there will be declining unit labor costs in Sector A; conversely, since the change in monetary wages is greater than the change in productivity in Sector B, there will be increasing unit labor costs in Sector B (Baumol & Bowen, 1964). Adapted from their example, we could add to Figure 3-7 to include the change in unit labor costs. The impact on unit labor costs is included in Figure 3-8:



**Figure 3-8. Impact of Baumol’s Cost Disease on Labor Costs per Unit of Output<sup>31</sup>**

Based on this description, the idea behind Baumol’s Cost Disease is that costs in one sector are highly dependent on the differential rates of productivity increase between that sector and the economy as a whole (in the simplistic case where labor markets are highly mobile throughout the economy, or alternatively, between that sector and other sectors with which the labor force is mobile). Importantly, Bowen and Baumol note that it is this differential over time that creates a long-term cost problem (Baumol & Bowen, 1964). Bowen and Baumol also describe methods to combat the increasing cost nature demonstrated above: eliminating inefficiencies, decreasing wages, allowing for quality deterioration, and increasing prices – noting that the latter two options likely oppose the (arts) organization’s goals of serving a wide audience with a high-quality product (Baumol & Bowen, 1964).

<sup>31</sup> This figure is based on the example presented in (Baumol & Bowen, 1964).

### 3.2.3 Transit and Baumol's Cost Disease

As described by Zureiqat, Sector B could represent transit in the example from Section 3.2.2 (Zureiqat, 2007). He explains that this is the case because transit has limited potential technological innovation when compared to other sectors, and because there is limited input and import substitutability in transit services (giving the example that one bus will always need one local driver) (Zureiqat, 2007, p. 4). Paradoxically, because transit has come to rely on subsidy, the cost of labor can continue to increase through the political strength of the union. Yet transit is also affected by fare increases below the rate of inflation, partially due to the goal of serving low-income passengers, and partially due to the political challenges accompanying fare increases. Similarly, although Baumol describes the stagnant sectors of education and health care, many of his implications can be carried over to transit as well. Baumol, referencing the previous work of David Bradford, noted that consumers can have more of every good and service when productivity is growing in every sector; however, doing so requires transferring inputs and income to the stagnant sectors (Baumol W. J., 1993).

Applied to transit as a stagnant sector, increasing growth then requires increasing transit subsidization (Zureiqat, 2007). This in turn requires increased awareness from the general public regarding Baumol's Cost Disease, along with an understanding and acceptance of costs increasing above inflation in transit. Baumol writes about this explanation to the public: "And an indispensable task it is, for without it effective budgetary reorientation along the lines described will undoubtedly be politically impossible in a democratic society" (Baumol W. J., 1993, p. 26). If the public deems that transit is necessary, transit costs will in turn need to account for a larger percentage of the budget over time. Generally, however, the public does not understand this, leading to the alternative of cutting service. In this sense, Baumol's Cost Disease creates a complexity for transit that must be resolved.

Another way of thinking about Baumol's Cost Disease is that increasing ridership is a partial remedy. Ridership growth can occur by improving the quality of service, or alternatively, through land-use changes and transit-oriented development. This can result in a virtuous cycle. Growth in transit service can allow for transit-oriented development. The increased transit service allows for the growth in development, which can in turn increase ridership and further allow improved service, restarting the cycle.



In this example, however, the benefits related to the development growth accrue largely outside of the transit agency that provides for that growth. The agency receives additional fare revenue, but third parties such as developers and local governments capture a large portion of the development benefits. The agency could alleviate Baumol's Cost Disease through increased ridership. Increased ridership can result from transit-oriented development and increased transit service allowing for that development. But without capturing a greater portion of the economic benefits related to the transit-oriented development, there is a disconnect between the agency's incentives and local incentives.

To give a Boston-area example of the above, consider the MBTA and Kendall Square. Kendall Square is approaching a threshold where further development requires increased transit service.<sup>32</sup> The MBTA has limited capacity available on the Red Line heavy rail serving the area. An increase in transit capacity would allow for increased transit-oriented development and greater MBTA ridership and productivity; however, the MBTA would only capture the benefits of increased service through additional fare revenue. A much larger portion of the development benefits would accrue to third parties outside of the MBTA, such as developers, the city, and state tax yields. Consequently, the MBTA has a more limited incentive to pursue increasing Red Line capacity to the extent required for greater levels of transit-oriented development.

In the example above and more generally, better connecting the private development benefits with the public service required to achieve them could lead to providing that service, allowing for that development, and enabling greater productivity growth. Transit system growth needs to match development growth, so may require increasing levels of cross-subsidization from third parties outside of the public agency. This type of cross-subsidization between the private sector and public agency is proposed in Section 5.3, in the context of Boston's Seaport District.

### **3.2.4 How Contracting Can Help with Baumol's Cost Disease**

As developed in Sections 3.2.2 and 3.2.3, the implications of Baumol's Cost Disease are that transit will likely need either perpetual increases in subsidization or decreases in service over time. As discussed in Chapter 2, some have argued that contracting services can allow for a

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<sup>32</sup> The idea of density reaching a threshold that requires increasing levels of transit service to account for additional trips is developed in (Zupan & Pushkarev, 1976). This idea applies to Kendall Square and other parts of Boston. Increasing the area's density requires increasing levels of transit service to the area.

decrease in costs relative to public provision of services and can therefore alleviate the need for increased subsidization or service cuts; however, as previously mentioned, this thesis does not focus specifically on this cost decrease for contracting. An alternative way to view contracting is that it could allow for increased subsidization due to possible public acceptance of “bid” costs as actual costs by directly linking service costs to service provision. This could be applicable in particular when linking development benefits to transit improvements, as a portion of the development benefits could be explicitly linked with a contract for increasing levels of transit service. An example of this type is presented in the Seaport District context in Section 5.3.

In the case where a transit agency procures a service through competitive bidding, and there is a reasonable level of competition (or a reasonable *expected* level of competition), the competing firms are likely to submit bids that approach their actual costs of providing the service with the lowest acceptable profit margin. In this case, the private operator bid price can approximate the “actual” cost of providing a given service. It more directly links the service cost to the service provision. The transparency involved here is essential. If the service were operated by a public agency, the public may not trust that the agency’s stated costs of service are the actual costs of providing that service; however, by contracting, the agency aligns itself with the public in seeking to provide service as close as possible to the actual cost of providing the service. Thus, the public acceptance of “bid” costs as actual costs might encourage the public to increase subsidization under the perception that the increased subsidy will be used more effectively than if publicly operated (even if the agency had previously been operating at the “actual” cost), and the subsidized bid cost will be directly associated with an increase in service.

In addition, if the public is frustrated with existing service, it might still allow for increased subsidization of future service with the understanding that the provider of that service will change. In this sense, the agency has more options when contracting than when directly providing the service. For example, if an agency operated a poorly performing bus route, the public support for that bus route might wane because of the understanding that the route will continue to be agency-operated. On the other hand, if a contractor operated a poorly performing bus route, the public support for that bus route might not change under the understanding that the agency can terminate the underperforming contractor and hire a different (and hopefully better performing) operator. This conceptual difference might allow for greater public subsidization with contracted than with agency-operated services.

### **3.3 Balance between Costs, Funding, and Growth**

There is a natural tension between reducing cost and improving the quality of service (reflected in frequency, reliability, cleanliness, etc.). For a given level of service quality, there is generally a minimum attainable level of cost associated with providing that service quality. Attempting to reduce costs below that level will necessarily require decreasing the quality of service. Alternatively, improving the quality of service will necessarily require increased costs. Contracting has the ability to provide for incremental improvements in service quality in ways that providing service directly cannot. It can do this by either decreasing the cost associated with the service increase or by generating increased funding for the service increase. Both of these ideas have been discussed in previous sections and thus will not be reiterated here.

The way in which contracts are written can also affect this balance between costs, funding, and growth. A typical contract might specify a cost to the agency for increased service in the future. However, contracts can also be written to defray initial costs through private involvement (e.g. with private-provided vehicles, for example) and could shift some of the agency costs to later years. Generating additional funding in later years could be a more feasible option for the agency. The balance between costs, funding, and growth depends heavily on the relationship between short-term and long-term issues, as detailed in the following section.

There is also a relationship between growth and contracting that is important to consider. In areas where transit expansion is necessary to allow for additional development, this expansion can create an attractive opportunity for contractors because of the potential for a significant amount of future revenue accompanying the development growth and service increase. This attractive opportunity then creates competition, which makes the venture worth contracting. The competition can in turn result in improved service quality, which then enables additional development. Again, if the benefits of development can be partially captured and contributed to transit improvements, then this virtuous cycle can continue.

### **3.4 Short-Term and Long-Term Issues**

It is important to consider what happens after the initial contracting cycle, including potential transition costs that exist if the contractor is changed. As described in Chapter 2, there may not be cost savings after the initial contracting period. Contractors may bid low in order to win the initial contract, but increase costs in a future negotiation or bid. In the short term, the

contractor might be willing to provide the service at low cost to the agency, but after the contract is signed, leverage shifts from the agency (competition for the contract) to the contractor (agency reluctance to change contractors). This can eventually lead to political anger at the private companies, for example, the public and political reaction to Keolis' problems in the recent Boston winter weather. The leverage shift is largely due to the operator and agency transition costs inherent in any contract. The transition costs include monitoring adjustments for the agency, and more importantly, knowledge transfer between the private operators. This knowledge transfer can be costly in both time and resources.

These transition costs reflect the change from the short term to the medium term in contracting, but the real difference between the short-term and long term develops from the need for sustainability. In the short term, contracting can result in savings from reducing pay and benefits (due to competition and more lenient regulations for private operators). In the long term, however, the agency requires sustainable performance and reasonable labor standards. Achieving these reasonable labor standards in the long term can negate some of the short term "benefits" of contracting. As such, the long term benefits of contracting should focus not only on immediate cost savings, but also on working with the private sector to alleviate constraints and allow for increased transit service growth. Some of the ideas discussed in Sections 3.1 and 3.2, such as contracting vehicle maintenance and storage, increasing access to existing private routes, and developing alternative funding mechanisms through the private sector, demonstrate how agencies can work with the private sector to shift cost responsibilities and increase funding.

## 4 Constraints Affecting Boston's MBTA

The MBTA faces a number of constraints, some of which have been mentioned briefly in previous chapters. These constraints are related to financial, physical, and institutional areas, and are detailed in the sections below.

### 4.1 Funding

#### 4.1.1 History

The MBTA has had a complex funding history. Beginning with its incorporation in 1964, 90% of the non-federal share of capital funding was through the state (Massachusetts Bay Transportation Authority, 1965). Meanwhile, 100% of operating expenses were funded through assessments on the cities and towns served by the MBTA (Massachusetts Bay Transportation Authority, 1965). In 1973, the operating funding shifted to assess only 50% of the cost on the cities and towns in the service district, while the remaining 50% came from the state (Massachusetts Bay Transportation Authority, 1973).

In 1981, Proposition 2½ (“Prop 2½”) passed and limited the increase in the local assessments to 2.5% per year. Since operating costs often increased at rates above 2.5%, this required an increasing share of funding to come from the state each year (Massachusetts Bay Transportation Authority, 1982).

In 2000, the funding mechanism changed again, this time to “forward funding.” In doing this, the Commonwealth shifted from paying the MBTA its net cost of service after the service was provided to instead setting the amount paid to the MBTA prior to service operations and requiring the MBTA to budget accordingly (Conservation Law Foundation and Northeastern University, Kitty and Michael Dukakis Center for Urban and Regional Policy, 2010). As part of the forward funding legislation, the Commonwealth dedicated one cent of the five cent per dollar sales tax to be the state’s portion of MBTA funding (Conservation Law Foundation and Northeastern University, Kitty and Michael Dukakis Center for Urban and Regional Policy, 2010). The Commonwealth also transferred \$3.3 billion of debt to the MBTA as part of the forward funding legislation (Kane, 2009). But, the Massachusetts sales tax did not grow at the expected rate estimated when forward funding was introduced. From the MBTA’s FY 2001 to FY 2009, the sales tax grew at an average rate of only 1% per year (Kane, 2009). This led the

state to be unable to sustainably fund the state's contribution to the MBTA, and did not allow for continued MBTA system growth.

In 2009, the funding system changed again, allowing for multimodal use of MassDOT's Commonwealth Transportation Fund ("CTF") (Transportation for Massachusetts, 2011). As a result, the MBTA not only received its dedicated portion of the sales tax, but also an appropriation of the tax revenue entering the CTF (Transportation for Massachusetts, 2011).

Finally, the Transportation Finance Act of 2013 passed to raise an expected \$600 million per year on average over five years, dedicated to transportation in Massachusetts (Mares & Pecci, 2014). Of this money, \$390 million per year would come from new taxes dedicated to transportation, and an additional \$210 million per year would come from other MassDOT and MBTA revenue sources (Mares & Pecci, 2014). This act raised additional revenue for MassDOT and the MBTA through a three-cent increase in the gas tax, proposed MBTA station naming rights, and a fare increase; meanwhile, other measures also increased funding for non-transit transportation needs and for parts of Massachusetts outside of the Boston area (Mares & Pecci, 2014). In addition, the bill limited future MBTA fare increases to an average of five percent every two years, and moved operating expenses off the capital budget (Mares & Pecci, 2014). It is important to note, however, that this act merely begins to close the transportation funding gap in Massachusetts (which had been estimated at over \$1 billion per year), and that more work and legislation will be necessary going forward (Mares & Pecci, 2014).

#### **4.1.2 Implications of Current Funding System on Constraining System Growth**

In light of the constraints on the MBTA's funding, it is important to remember that ridership has been steadily increasing (from annual ridership of over 158 million in 1980 to approximately 255 million in 1990, 281 million in 2000, and 334 million in 2010), driven by rapid development in portions of the city. This trend was presented in Section 1.1 and Figure 1-1, but is also relevant to this chapter.

As indicated above, the MBTA's current financial system, with very small and unsustainable built-in funding growth, will make system growth difficult. With the dedicated source of tax revenues failing to provide the expected funding, and a heavy debt load and increasing deficit, the MBTA will likely struggle simply to maintain and update the existing equipment and infrastructure.

Moreover, the decreasing local funding as a percentage of operating costs has shifted a higher funding burden to the state. This results in a difficult political situation, as the state must balance interests outside the Boston area with those of the MBTA. Increasing state funding for the MBTA to allow for system growth can face political opposition from areas not served by the MBTA. This political opposition could be avoided by increasing the local share of MBTA funding; however, it will likely continue to decrease as a share of the total subsidy constraints due to Prop 2½.

It is important to note that the funding mechanisms proposed in Section 2.3 should be able to work with the constraints related to Prop 2½. For example, businesses and building owners would elect to contribute to a BID, and as such should be able to designate a portion of that contribution to fund MBTA service. The municipality may be involved with the collection of the contribution, but is otherwise uninvolved with the BID. As such, any additional funding from a BID to the MBTA should not be included in the local assessment.

Dedicating a portion of a TIF to fund MBTA improvements might be more difficult, as MBTA local assessments are limited to a 2.5% increase due to Prop 2½. It is possible that Prop 2½ would preclude municipalities from contributing beyond their dedicated assessment; however, if this is the case, alternative mechanisms, such as contracting new service through a TMA and integrating it with MBTA service, would be possible. In this sense, TIFs could still be used to raise the revenue necessary to improve transit service. One other consideration related to TIFs and Prop 2½ would be related to the community's willingness to increase individual property owner assessments above 2.5%. If the municipalities are already increasing property assessments by the maximum allowed value of 2.5%, further increases through a TIF would require an override, which would be possible through voter approval. Overrides can specify an additional amount and purpose (e.g. \$2,000,000 for the purposes of bus service between Point A and Point B) (Massachusetts Department of Revenue - Division of Local Services, 2008). However, the override procedure would be on an individual town basis and would be challenging to implement on a large scale, making it a likely option only for binary negotiations between the MBTA and individual municipalities. Additionally, because special assessments are additional property taxes, similar reasoning would apply.

## 4.2 Equipment and Infrastructure

The MBTA faces both infrastructure and equipment constraints. Both the rail and bus systems suffer from overcrowding during the weekday commuting peak hours.

### 4.2.1 Rail

The Green Line Extension has been delayed from its original schedule, and is now estimated to fully open by 2020 (Massachusetts Department of Transportation, 2015a). Although this will expand the system, it will likely worsen instead of relieve the congestion on the central subway system. There are not any planned expansions for the heavy rail system, although the MBTA is in the process of procuring new vehicles for the Orange and Red Lines. The MBTA has contracted this procurement to CNR MA, which will build the vehicles in Springfield, Massachusetts. CNR MA won the bid (based on experience, past performance, quality assurance, and price) with the lowest bid price out of four qualified companies, at \$556.6 million (Massachusetts Bay Transportation Authority, 2014e).

CNR MA is expected to replace the entire fleet of 152 Orange Line vehicles between 2018 and 2021, and to replace 74 Red Line vehicles between 2019 and 2021 (Massachusetts Bay Transportation Authority, 2014e). The MBTA also holds an option to purchase an additional 58 Red Line cars (for a total of 132 of the existing 218 cars). Former MBTA General Manager Dr. Beverly Scott expected that the new vehicles will help “reduce travel and wait times, increase capacity and improve accessibility, security and the overall experience for our customers” (Massachusetts Bay Transportation Authority, 2014e). But these improvements will not improve capacity significantly, and the contract does not address major signal system upgrades that would provide a further increase in capacity along the heavy rail lines.

### 4.2.2 Bus

This thesis is more focused on options available to increase bus service, so this subsection will examine the existing bus infrastructure and vehicles in use by the MBTA.

The MBTA operates nine bus garages and one main repair facility.<sup>33</sup> Although there is not any publicly available information relating to the capacity of these garages, it is believed that

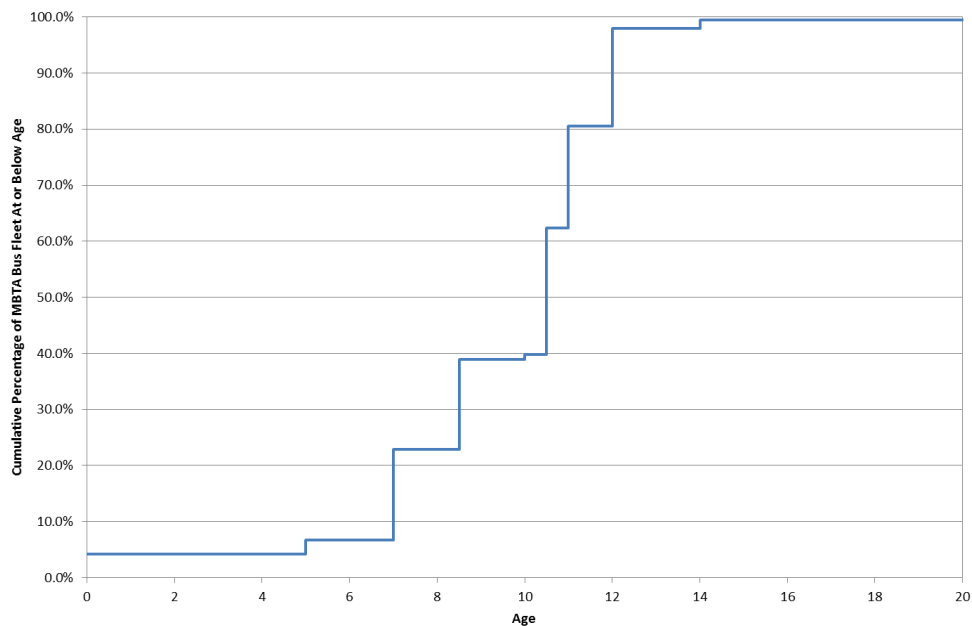
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<sup>33</sup> The garages are the Albany St., Arborway, Cabot, Charlestown, Fellsway, Lynn, North Cambridge, Quincy, and Southampton St. Garages. The main maintenance facility is located in Everett, where the MBTA conducts overhauls, repairs, and heavy maintenance (Massachusetts Bay Transportation Authority, 2010a).



they are either approaching or at capacity and would not have space to serve a significant increase in the bus fleet. The MBTA bus fleet currently consists of 963 active vehicles, of which 785 are required daily for the weekday AM Peak period.<sup>34</sup>

The target average age for the bus fleet is 7.5 years (Massachusetts Bay Transportation Authority, 2010a). However, as shown in Figure 4-1, less than 25% of the bus fleet was younger than 7.5 years as of the publication of this thesis. The MBTA recently purchased 40 new buses to replace the 1994-1995 fleet at a cost of \$37.9 million, of which 80% was funded federally (Massachusetts Bay Transportation Authority, 2014b). These buses entered service in February 2015 (Massachusetts Bay Transportation Authority, 2014b). It is important to note, however, that they were purchased as a replacement for other buses instead of as an expansion in the active bus fleet (Personal Communication, 2015b). As noted in Section 1.1.3, the MBTA has failed to grow bus service over time, as measured in bus revenue miles and bus revenue hours.



Notes: For bus purchases listed in a single year, assumed purchase in May of that year (e.g. a 2007 purchase would have an age of 8).  
 For bus purchases listed across two years, assumed purchase in November of the first listed year (e.g. a 2006-2007 purchase would have an age of 8.5).  
 The 40 New Flyer Diesel-Electric Hybrid Buses instated in February 2015 are assumed to replace the 40 oldest buses that had been in service.

**Figure 4-1. Cumulative Percentage of MBTA Bus Fleet at or below Specified Ages**

Source: (Massachusetts Bay Transportation Authority, 2014c; Massachusetts Bay Transportation Authority, 2014b)

Based on the limited capacity in the maintenance facilities and storage depots, and the aging fleet, the MBTA may need to consider other ways to fund the purchase and operations of

<sup>34</sup> This does not include the 28 active trackless trolley vehicles used on Routes #71, 72, and 73, which would bring the total to 991. It also does not include buses used for non-passenger service (e.g., police, historic, ice-cutter work, etc.) See (Massachusetts Bay Transportation Authority, 2014c).

additional new buses to accommodate regional growth. Increasing bus service could be the fastest and most flexible way to increase transit service to the region, but doing so might require contracting bus operations to the private sector as a means to relax the constraints faced by the MBTA.

### 4.3 Labor

The MBTA has a heavily unionized labor force. Labor negotiations are an important factor in many MBTA decisions, and any shift towards increasing private sector involvement will likely face union resistance. Consequently, it is critical to understand the regulations in place relating to labor in order to be able to develop growth strategies within those regulations. Furthermore, it is essential for the long-term sustainability that any initiatives proposed ultimately benefit labor so as to attract more people to the labor force instead of reducing total numbers of operating personnel. With this in mind, it is necessary to reiterate that the intent of increasing private sector involvement proposed by this thesis is not to drive down wages and decrease costs, but instead to allow for increasing transit service growth.

#### 4.3.1 Section 13(c)

Section 13(c) is a federal labor standard protecting public transit employees affected by federal funding (such as those working for the MBTA).<sup>35</sup> It provides numerous protections, including:

- “(A) the preservation of rights, privileges, and benefits (including continuation of pension rights and benefits) under existing collective bargaining agreements or otherwise;
- (B) the continuation of collective bargaining rights;
- (C) the protection of individual employees against a worsening of their positions related to employment;
- (D) assurances of employment to employees of acquired public transportation systems;
- (E) assurances of priority of reemployment of employees whose employment is ended or who are laid off; and
- (F) paid training or retraining programs.”<sup>36</sup>

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<sup>35</sup> Section 13(c) is located at (49 U.S.C. § 5333(b)).

<sup>36</sup> See (49 U.S.C. § 5333(b)(2)).

Through the protections offered by Section 13(c), employees are assured that their working position, including wages, will not worsen if a public agency were to contract private service. Furthermore, Section 13(c) requires that an employee losing his/her job or facing decreasing wages is given a “a displacement or dismissal allowance to the employee for a period equal to the employee's length of service, not to exceed six years” (United States Department of Labor - Office of Labor-Management Standards, 2014). This allowance ensures that the employee will continue to receive his/her full previous wage in case of displacement or dismissal (United States Department of Labor - Office of Labor-Management Standards, 2014).

It is important to reference Section 13(c) because it guarantees that an increase in contracting at the MBTA must continue to follow the federal standards in place, which are designed to maintain labor’s position. It would require continued collective bargaining and training, and maintain wages, for example. Any potential subsequent transitions between private companies for specific contracts would be equally assured a continuation of employee standards under Section 13(c). It is important to note that since Section 13(c) is a federal regulation, it has guided labor decisions not only for the MBTA, but also other transit systems that have contracted a higher proportion of service, and has not prevented those systems from continuing to do so.

### **4.3.2 Pacheco Law**

It is important to remember that lobbying from both public sector unions and private providers can affect legislation, and the competing interests of these groups can shape legislative policies. Each side presents an argument with some truth, and this is essential when considering both the history and the future of the Pacheco Law.

The Pacheco Law, passed in 1993, is a Massachusetts law regulating contracted services that had been previously provided by the public sector.<sup>37</sup> The basic premise of the Pacheco Law is that “the total cost to perform the service by contract will be less than the in-house cost and at least of equal quality,” and that wages and benefits must be fair (Commonwealth of Massachusetts, Office of the State Auditor Suzanne M. Bump, 2012).

The full text of the Pacheco Law is provided in Appendix B. The foundation of the cost aspect of the law is that any service that is contracted must be done at a lower cost than “the costs of regular agency employees’ providing the subject services in the most cost-efficient

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<sup>37</sup> The Pacheco Law can be found at M.G.L. Part I, Title II, Chapter 7, Sections 52-55.

manner” (M.G.L. §§7-52-55). It should be noted that the cost comparison is made to the most efficient cost possible instead of to the actual cost of public service provision. This cost is determined through a management study and can allow for feasible changes in service delivery that would lead to this estimate (and should be detailed enough to allow for the eventual adoption of this most efficient cost service delivery method) (Commonwealth of Massachusetts, Office of the State Auditor Suzanne M. Bump, 2012). It is further specified that the in-house cost used for comparison is the avoidable cost that would be eliminated with contracting – this is based on the fully allocated marginal costs but is generally lower than these costs due to the overhead costs that are maintained within the agency even with contracting (Commonwealth of Massachusetts, Office of the State Auditor Suzanne M. Bump, 2012).

Moreover, the Pacheco Law moderates competition on the basis of wages by requiring that the private employees be paid “the lesser of step one of the grade or classification under which the comparable regular agency employee is paid, or the average private sector wage rate for said position” (M.G.L. §§7-52-55). Private companies must also meet specified insurance requirements, and must offer available jobs to terminated but qualified former agency employees.

Included in the contracted cost to the private firm are “the costs of transition from public to private operation, of additional unemployment and retirement benefits, if any, and of monitoring and otherwise administering contract performance” (M.G.L. §§7-52-55). It is important to note that the contracted cost can also be reduced in certain ways, including a gain on asset disposal, other revenues gained due to contracting, and savings resulting from contracting (Commonwealth of Massachusetts, Office of the State Auditor Suzanne M. Bump, 2012).

The Pacheco Law defines the restrictions of contracting private sector services to include only those in excess of \$500,000 (as of 2009, plus annual indexed increases) (M.G.L. §§7-52-55; Commonwealth of Massachusetts, Department of the State Auditor). There are various other exclusions as well, including on “legal, management consulting, planning, engineering or design services” (M.G.L. §§7-52-55). Under the Pacheco Law, contracts are limited to a maximum term of five years (M.G.L. §§7-52-55). This term limitation could constrain the MBTA in contracting bus services, as the contract term would not match the bus life cycle (e.g., the five-year limitation would not match a contractor’s desire to use a bus for ten years, likely either

detering competition for contracts or requiring the MBTA to provide some remedy for this limitation).

In order to contract service under the Pacheco Law, it is necessary to have a lower contracted cost than the estimated cost of public provision as described in the previous paragraphs, and also to meet the necessary quality standards. All contracts must then be reviewed by the state auditor for final judgment before going into effect (M.G.L. §§7-52-55).

The MBTA made multiple attempts to contract service in the years following the passage of the Pacheco Law, but these attempts were met with resistance from unions and ultimately from the state auditor. Across all sectors, 12 of 15 contracting attempts have passed the requirements of the Pacheco Law, although two of the three failed attempts were for MBTA contracts (Bump, 2015). Paradoxically, as the Pacheco Law has come under heavier scrutiny in recent years, there has been more reluctance to contract service, possibly because of the public awareness of the law resulting from this debate.

In 1995, the MBTA attempted to contract with a private firm to install bus shelter advertising; however, the bid also specified that the contractor would be responsible for the cleaning and maintenance of existing shelters and the installation of new shelters – work previously performed by public employees (*Massachusetts Bay Transportation Authority vs. Auditor of the Commonwealth, 1999-2000*). The state auditor objected to the contract in August 1996 and subsequently rejected a revised proposal in December 1996 (*Massachusetts Bay Transportation Authority vs. Auditor of the Commonwealth, 1999-2000*). The objection was due to both the cost component and the contractor’s historical compliance (*Massachusetts Bay Transportation Authority vs. Auditor of the Commonwealth, 1999-2000*). The MBTA then pursued court review of the constitutionality of the Pacheco Law, but the courts ruled that the MBTA “does not have standing to challenge the constitutionality of a State statute” (*Massachusetts Bay Transportation Authority vs. Auditor of the Commonwealth, 1999-2000, p. 784*).

In 1997, the MBTA sought to contract out the maintenance and operations of the bus routes of the Charlestown and Quincy garages (DeNucci, 1997). The MBTA claimed savings of over \$2.7 million for the Charlestown contracting and over \$0.9 million for the Quincy contracting (DeNucci, 1997). The state auditor stated that it objected to the proposals “due to the MBTA’s continuing failure to comply with several of the substantive requirements contained in

Section 54(7)-namely, cost, quality, compliance with the public interest requirement, and compliance with the privatization law. We find the MBTA’s certification in each of these areas to be incorrect” (DeNucci, 1997, p. 2).

These failed attempts have made the agency generally reluctant to continue to try to contract service because of its difficulty in proving the cost savings of doing so. However, as noted above, 12 of 15 Pacheco Law reviews have been approved (Bump, 2015). As previously mentioned, this thesis considers contracting as a mechanism for growth instead of simply a way to save costs – as such, the previous failures of the MBTA’s contracting should not impact future attempts to contract service. It is in this vein that the MBTA has successfully contracted service historically. In 2012, for example, the MBTA was able to contract a major mid-life bus reconstruction “because of temporary insufficiency of in-house manpower capacity to meet maintenance schedule demands, an exception in the law” (Sullivan, 2013, p. 3).

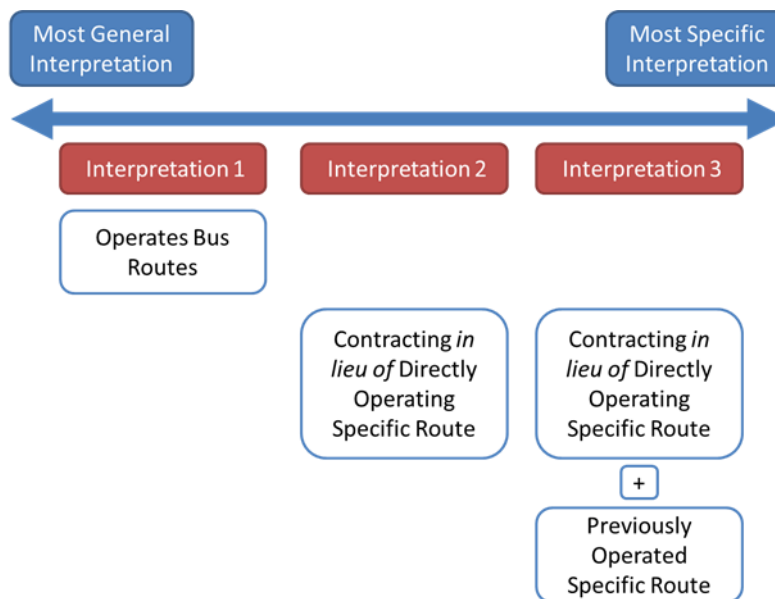
The aforementioned example must be one of the reasons that will help drive any further contracting proposals. In lieu of the law being repealed, the MBTA will need to find ways to work within the Pacheco Law framework. To the extent that the MBTA does not have the capacity to expand through public provision of services, the Pacheco Law should not limit it from doing so through the private sector. In order to understand how the MBTA can contract service with the Pacheco Law in place, it is necessary to more closely examine the language of the Pacheco Law.

The spirit of the Pacheco Law is to avoid using the private sector to cut costs at labor’s expense for what is traditionally public sector work. The first sentence of the legislation states, “The general court hereby finds and declares that using private contractors to provide public services formerly provided by state employees does not always promote the public interest” (M.G.L. §§7-52-55). The word “formerly” is critical to the applications proposed in this thesis. This research emphasizes using the private sector to promote *growth*; i.e., services not *formerly* in existence.

The Pacheco Law definition of a privatization contract refers to services “which are substantially similar to and in lieu of, services theretofore provided, in whole or in part, by regular employees of an agency” (M.G.L. §§7-52-55). This restriction could be interpreted with varying levels of flexibility. Applied to a bus route for example, interpretations could include:

- 1) A public agency must go through a Pacheco Law review for any contracted bus route *if it operates any other bus routes*. This restriction would involve the most liberal interpretation of services that are similar to and previously provided by the public agency and would be the most limiting to any contracting initiatives.
- 2) A public agency must go through a Pacheco Law review for any contracted bus route *if it is contracting the bus route in lieu of directly operating the bus route*. This restriction more carefully considers the phrase “in lieu of.” This interpretation states that the Pacheco Law would not apply if the agency would not choose to directly operate the services without private sector involvement. This is directly applicable to the MBTA, which might not have the capacity to directly operate a service that it intends to contract.
- 3) A public agency must go through a full Pacheco Law review for any contracted bus route *if it is contracting the bus route in lieu of directly operating the bus route and has previously operated that bus route*. This restriction would consider “services theretofore provided” as the specific services provided by the public agency: in this case, a specific bus route. The interpretation is that public employees may operate bus service but have never done so for a route connecting Point A to Point B (or a variant thereof).

A summary of the above interpretations is provided in Figure 4-2.



**Figure 4-2. Spectrum of Pacheco Law Interpretations**

Both interpretations (2) and (3) would leave the MBTA with significant room to maneuver while meeting the requirements of the Pacheco Law. The Pacheco Law will be further discussed in relation to specific opportunities in Section 7.2.

It is important to note that regardless of the language in the Pacheco Law, efforts to increase private sector involvement may meet labor resistance and encounter Pacheco Law challenges from labor. Ultimately, regulatory authorities responsible for enforcing legislation are heavily affected by the lobbying power of unions, and in particular, by public sector unions vs. private providers. The opportunities described in Chapters 5 and 6 would serve as a first step in increasing the presence of the private sector legitimately under the Pacheco Law without hurting the situations of MBTA employees; however, leveraging these opportunities as pilots for future growth through the private sector will necessarily require significant discussions with the involved labor unions and the state auditor to set a path forward.

As of the writing of this research, a panel commissioned by Governor Baker to make recommendations to reform the MBTA and the laws governing it proposed that the MBTA be exempt from the Pacheco Law: “The Legislature should free the MBTA from the constraint of the Pacheco Law, and other limits placed on its use of modern procurement, where beneficial and cost-effective” (MBTA Special Panel, 2015, p. 31) Governor Baker then acted on this proposal through legislation, proposing that “Section 53 of chapter 7 of the General Laws, as so appearing, is hereby amended by striking out, in line 5, the words: – the Massachusetts Bay Transportation Authority” (Baker, 2015). This proposal would remove the MBTA from the definition of “Agency” in the Pacheco Law and would in turn make the Pacheco Law inapplicable to the MBTA. Even if this proposal succeeds, there is still the risk of labor action if contracting out is extreme, making discussions with labor unions even more important. With this understanding, Section 7.2 not only considers the relationship between the Pacheco Law and the opportunities presented in this research, but also proposes additional discussion centered on the Pacheco Law’s purpose and applicability going forward, including the possibility of developing a pre-approved structure for contracting more quickly within the Pacheco Law.

#### **4.4 Other Legalities**

The MBTA service area includes a large number of individual cities and towns. There is a core group of 14 cities and towns, and a secondary group of 51 cities and towns, along with



other communities (M.G.L. §161A).<sup>38,39</sup> This multi-municipality jurisdiction affects funding decisions and requires a significant level of coordination between the towns.

According to the MBTA statutes, the MBTA has the right to contract with private transportation companies (M.G.L. §161A). The idea that the MBTA has the right to contract service was reinforced in what is commonly referred to as the “Management Rights” legislation, which among other issues gave the MBTA the “inherent management right” to “determine whether goods or services should be made, leased, contracted for, or purchased on either a temporary or permanent basis” (Commonwealth of Massachusetts, 1980). The Pacheco Law superseded this legislation, limiting but not eliminating what had been defined as part of the MBTA’s “management rights.”

Furthermore, the MBTA is restricted from competing with an existing private route if the MBTA does not already operate a similar route in that it must either provide the existing private operator with monetary compensation or offer it a service contract (M.G.L. §161A). This is especially important as the MBTA considers growing in places that may already have a large amount of private shuttle service currently operating.

## **4.5 Recent Events Affecting MBTA Service Growth**

There are two other major recent occurrences that significantly influence the MBTA’s abilities for growth going forward.

### **4.5.1 Winter Weather of January and February 2015**

Winter storms in January and February 2015 brought Boston unprecedented levels of snow and cold. Although the MBTA only suspended operations completely on a few occasions during the multi-week, multi-storm stretch, operating at other times during this period caused equipment damage that will take a considerable amount of time to recover from. As such, the subway lines were operating at limited frequency for multiple weeks. According to former

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<sup>38</sup> The “fourteen cities and towns” are defined as Arlington, Belmont, Boston, Brookline, Cambridge, Chelsea, Everett, Malden, Medford, Milton, Newton, Revere, Somerville and Watertown (M.G.L. §161A).

<sup>39</sup> The “51 cities and towns” are defined as Bedford, Beverly, Braintree, Burlington, Canton, Cohasset, Concord, Danvers, Dedham, Dover, Framingham, Hamilton, Hingham, Holbrook, Hull, Lexington, Lincoln, Lynn, Lynnfield, Manchester-by-the-Sea, Marblehead, Medfield, Melrose, Middleton, Nahant, Natick, Needham, Norfolk, Norwood, Peabody, Quincy, Randolph, Reading, Salem, Saugus, Sharon, Stoneham, Swampscott, Topsfield, Wakefield, Walpole, Waltham, Wellesley, Wenham, Weston, Westwood, Weymouth, Wilmington, Winchester, Winthrop and Woburn (M.G.L. §161A).

MBTA General Manager Dr. Beverly Scott, the storm “crippled our infrastructure and our vehicle fleet” (Pattani & Lee, 2015).

Because of these storms, the MBTA needed to use shuttle buses to replace service along multiple heavy and light rail lines. In doing so, Massachusetts Governor Charlie Baker and Massachusetts Secretary of Transportation Stephanie Pollack also called in extra support from the private sector to help increase service levels; Peter Pan Bus Lines planned to support the MBTA with more than 40 buses along the Red Line – Braintree heavy rail branch where shuttle buses had replaced rail service (Pattani, 2015). Similarly, three other contractors provided an additional 16 buses to supplement MBTA shuttles along the Red Line – Ashmont heavy rail branch, and 10 vehicles from Yankee Bus supplemented shuttles along the MBTA’s Orange Line heavy rail, between Sullivan and Oak Grove (Pattani, 2015). This exemplifies three issues related to contracting and growth for the MBTA: first, that the MBTA does not have the capacity in-house to grow service; second, that it would be able to do so quickly through the private sector; and third, that it should be able to grow through the private sector when there is not the possibility of doing so within the agency.

The transportation issues during the winter weather have also created a public environment that is more amenable to contracting services. Since the winter storms, Governor Baker created a panel “to make recommendations to improve the MBTA’s governance, structure, financials, and operations in both the short and long terms” (MBTA Special Panel, 2015). Following the recommendations of this panel, Baker has since proposed the removal of the Pacheco Law, as discussed in Section 4.3.2, and because of public sentiment following the winter weather, might have the political support needed to enact this legislation. In addition, the idea of increasing coordination with the private sector, especially by increasing public access to existing routes (as discussed in Section 5.1), could allow for improved supplemental service in periods of lower than usual MBTA service.

#### **4.5.2 Boston 2024 Olympics Bid**

Boston has won the United States Olympic Committee’s approval to develop a bid to host the 2024 Olympic and Paralympic Games. Boston will now represent the United States in bidding to the International Olympic Committee, with the winning city not determined until

2017. Now that the city has progressed to the international bidding stage, it will begin to make more detailed plans for transportation improvements that would be necessary by 2024.

Since it is largely expected that the transportation component of Boston's bid will rely heavily on walking and public transportation, the MBTA and MassDOT will need to consider how the public transportation system could grow to the extent necessary in a relatively short period of time. This is especially the case in light of the recent weather-related issues discussed in Section 4.5.1. Contracting service to the private sector is something that should be carefully considered when taking into account the Olympic bid, as it would enable a larger and more rapid increase in public transportation capacity than would otherwise be possible within the agency alone.

#### **4.6 Summary of Constraints Affecting MBTA**

As described in the above sections, there are a number of different types of constraints facing the MBTA. Its complex history of funding has resulted in the currently high annual debt payments, increasingly limited local contributions, and funding growth increasing at a lower rate than operating costs. When combining these funding pressures with the limited, aging infrastructure and equipment available to the MBTA, the difficulty involved in growing service through the traditional methods used by the MBTA becomes clearer.

Meanwhile, the Pacheco Law has historically inhibited the MBTA from contracting service. A closer examination of the Pacheco Law and the MBTA statutes finds that this does not need to continue to be the case. It should be possible to work within the boundaries set by the Pacheco Law and still grow service through contracting. Opportunities to do so will be discussed in the following chapters.



## **5 Coordinating with Existing Private Service**

This chapter is divided into three sections, with each section progressively increasing the proposed level of public-private coordination to expand public access to transit service. Section 5.1 will consider increasing public access on existing private routes by integrating these routes better with the public system to fill service needs. Possible Boston region examples for this would include the EZRide and MASCO M2 shuttles (discussed in Sections 5.1.3 and 5.1.4, respectively). Section 5.2 then examines an opportunity where further coordination with EZRide could allow for route expansion in the Sullivan – Kenmore corridor. This could serve as a pilot for other system expansions through private operators in the metropolitan area, with one of the largest such opportunities, the Seaport District, discussed in Section 5.3.

### **5.1 Increasing Public Access on Existing Private Routes**

#### **5.1.1 Theory Revisited**

For the public sector, the main advantage of increasing public access on existing private routes is that it can add capacity to the public system quickly and with minimal public risk. If the route is already in existence, the private entity already knows the ridership and revenue, so an agreement can be negotiated using that ridership and revenue as a starting point.

This method of service growth takes advantage of existing private capacity. It allows the agency to effectively increase its service without requiring an increase in agency maintenance or storage capacity. This increase in service can essentially occur overnight, a stark contrast to the heavy investment in time that would be required for an agency to procure additional vehicles to operate, or in the case of the MBTA, to build or restore additional facilities.

The private operator can benefit from working with the public agency for multiple reasons as well. Integrating the route with the public network will likely increase the route's ridership by providing access to new riders and new connections. Negotiating a share of the revenue from this increased ridership will in turn increase the private firm's revenue. Furthermore, if allowing public access requires an increase in the level of service, the private route's existing riders will benefit from the resulting increase in frequency on the route.

However, the private operator might face opposition from its existing riders and financial supporters when increasing public access. This is most likely to occur if existing riders use the

route because of the exclusivity it provides. This “exclusivity” can include numerous components. It can include, for example, a high level of comfort due to low levels of crowding. It can also include the idea that contributing employers only want their employees to benefit from it – possibly even using the service as a competitive advantage in recruiting talent to the company.

Because of these costs to the private operator, it is likely that the public agency will need to compensate the private operator in the form of an operating subsidy. Ideally, this subsidy would:

- (1) Compensate the private operator for the additional cost of any service increases;
- (2) Compensate the private operator for any value decrease or cost increase of existing services to the private operator (e.g. lower comfort, additional wear and tear); and
- (3) Subtract the additional benefits accrued to the operator in the form of increased ridership and increased frequency.

As discussed earlier in Chapter 2, there are many different types of contracts that could be negotiated, such as gross cost contracts or net cost contracts. Depending on the type of contract used, the agency and private operator may need to determine how to account for revenue; for example, one possibility would be for the private operator to retain all revenue up to its baseline prior to increasing service, and a share of any additional revenue beyond that baseline. There are many possibilities for this, and improved technology can assist with implementing the necessary accounting procedures. This technology will be further discussed in Section 5.1.2.

Ultimately, the considerations above must be negotiated with the operator, leaving open the possibility that the public agency will either pay more or less than what it considers a “fair” amount; however, it is important to remember that this method of service growth can allow for much faster, lower-risk growth than the alternative of directly providing the necessary facilities and vehicles to operate a route.

### **5.1.2 Technology**

Technology can help solve the free rider problem discussed in Section 2.3. It could allow private routes to know the ridership from each source (e.g., ridership from each company using an employer-funded service), and could then lead to appropriate subsidization from each of the

ridership sources. This also makes the operator (either public or private) more accountable in that better service can lead to increased ridership and further increased subsidization.

An improvement in the available technology would also allow for easier coordination between the MBTA and private operators. Currently, there is limited integration between the payment system of the MBTA and those of other operating companies or systems. The MBTA accepts various forms of payments on its different modes; however, subway and bus payments are done predominantly through cash, CharlieCard, and CharlieTicket (A Better City, 2015).

The CharlieCard is a transit smart card, and the CharlieTicket is a magnetic stripe ticket. Both the CharlieCard and CharlieTicket can hold stored value or passes.<sup>40,41</sup> These payment mechanisms are largely unaccepted for other transit providers in the area, with a few exceptions, as noted below.

- (1) There are 10 RTAs that accept CharlieCards.<sup>42</sup> Five other RTAs do not. None of the RTAs accept CharlieTickets (A Better City, 2015).
- (2) The MBTA lists 14 towns that have contracted bus service associated with the MBTA. Of these, services through eight towns accept CharlieTickets with printed pass information.<sup>43</sup> The printed pass information can be visibly inspected, and does not require a balance adjustment (A Better City, 2015). These services are MBTA-numbered bus routes, as previously described in Section 2.4.1.<sup>44</sup> It is noteworthy that these services still do not accept CharlieCard passes or stored value, or CharlieTicket stored value (A Better City, 2015). The contracted services through the other six towns do not accept any MBTA fare media (A Better City, 2015).
- (3) The Massport Logan Express – Back Bay shuttle accepts passes on both CharlieCards and CharlieTickets (A Better City, 2015).

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<sup>40</sup> The CharlieCard also has the ability to hold both stored value *and* passes, while the CharlieTicket can only hold one or the other (A Better City, 2015).

<sup>41</sup> Stored value is shared across systems, while passes are unique to individual systems (Personal Communication, 2015a).

<sup>42</sup> Five of these RTAs accept CharlieCards with stored value only (Cape Ann, Cape Cod, Lowell, Merrimack Valley, MetroWest), while five of these RTAs accept CharlieCards with either stored value or passes (Berkshire, Brockton Area, Montachusett, Southeastern, Worcester) (A Better City, 2015).

<sup>43</sup> These towns are Canton, East Boston, Hingham, Hull, Mattapan, Medford, Milton, and Winthrop (A Better City, 2015).

<sup>44</sup> The MBTA numbered routes are #710 (North Medford – Medford Square, Meadow Glen Mall, or Wellington Station), 712/713 (Point Shirley – Orient Heights), 714 (Pemberton Point, Hull – Station Street, Hingham), and 716 (Cobbs Corner – Mattapan Station).

Currently, in order for contracted bus services to accept the CharlieCard, they would need to install electronic fareboxes to do so (A Better City, 2015). However, MassDOT is considering the possibility of a unified payment system for transportation services (A Better City, 2015). One possibility proposed would be to do this in two phases, first through the implementation of CharlieCard usages throughout Massachusetts transportation services, and second to increasingly use near field communications mobile phone payments and/or contactless credit card and debit card payments; this methodology would have a later implementation date, with the target of 2019 at the earliest (A Better City, 2015).

It is therefore important to note that there are existing, short-term, and long-term solutions for the technology barrier currently in place. The next few paragraphs will examine these options for existing privately operated routes, with the possibility of extending these ideas to the other types of privately operated routes discussed in the remainder of Chapters 5 and 6.

Increasing public access to existing privately operated routes could be done *immediately* for passengers with CharlieTicket passes, at a minimum. This system is already in place on some contracted service, and would just require additional visual inspection by the bus operators. As the Logan Express Back Bay currently does, the number of riders using the MBTA passes could be manually recorded. This could in turn inform subsidization negotiations between the MBTA and the private operator going forward. Using this system would not have any additional technological costs for either the private operator or the MBTA.

In the *short-term*, the MBTA could install electronic fareboxes or equivalent technology on the private buses. This could be an expensive intermediate step, but would allow for a significant increase in public access to these existing private routes. In these cases, the private operators could still accept their own forms of payment, but would also eliminate the barrier to MBTA riders using their services. Moreover, using a farebox would allow the MBTA to collect detailed information to inform future subsidization negotiations.

In lieu of installing full fareboxes on the private services, it could be possible to mount a Charlie reader near the bus entrance (A Better City, 2015). This would be a lower-cost alternative (with an estimated cost of around \$2000-3000 for the necessary equipment and installation of each reader), and although it would not provide quite the same capabilities, it would allow for basic functionalities such as reading passes, deducting stored value, and transfer coordination (Personal Communication, 2015a).



The steps mentioned above would allow for rapidly eliminating any technological barriers to increasing public access to privately operated routes. The *long-term* possibility of creating a unified payment system for Massachusetts transportation services would provide an even higher level of integration. Using a single account for payment of the majority of transportation services would make it easier to increase public access to private routes while providing the necessary data to inform revenue settlements and negotiations (A Better City, 2015).

There are therefore multiple methods that would allow the MBTA to increase public access on existing private routes without technological obstruction, ranging from immediate to long-term solutions. As such, the remainder of this thesis will focus on the opportunities for growth through increased private sector involvement without significant additional discussion of the technological limitations involved in these service expansions.

### 5.1.3 MASCO M2

The Medical Area and Scientific Community Organization (“MASCO”) is a group of 22 organizations that includes medical institutions, museums, educational institutions (including some of the schools at Harvard University), other medically-affiliated organizations, and a temple.<sup>45</sup> Part of MASCO’s mission includes area planning and development services, along with parking and transportation services (Medical Academic and Scientific Community Organization, n.d.-a). MASCO is affiliated with the Longwood Medical Area (“LMA”), as it “improves access to the LMA through advocacy, area planning and direct service,” including a shuttle service providing LMA connections (Medical Academic and Scientific Community Organization, n.d.-a).

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<sup>45</sup> As of February, 2015, MASCO’s member organizations were the following: Beth Israel Deaconess Medical Center, Brigham and Women’s Hospital, Children’s Hospital Boston, Dana-Farber Cancer Institute, Emmanuel College, Harvard University Medical School, Harvard University School of Dental Medicine, Harvard University School of Public Health, Isabella Stewart Gardner Museum, Joslin Diabetes Center, Judge Baker Children’s Center, Massachusetts College of Art and Design, Massachusetts College of Pharmacy and Health Sciences, Massachusetts Mental Health Center, Simmons College, Temple Israel, Wentworth Institute of Technology, Wheelock College, The Winsor School, Massachusetts Eye and Ear Infirmary (Associate Member), Merck Research Laboratories (Associate Member), and New England Baptist Hospital (Associate Member) (Medical Academic and Scientific Community Organization, n.d.-d).

MASCO offers ten shuttle routes, with a fleet of 37 vehicles.<sup>46</sup> The total ridership on these ten routes is about 12,500 riders per day (Medical Academic and Scientific Community Organization, n.d.-e). Service is operated by Paul Revere Transportation, LLC (“Paul Revere”) (Medical Academic and Scientific Community Organization, n.d.-e). Paul Revere also operates a number of other shuttle services, including the EZRide shuttles discussed in Section 5.1.4, Massport Logan Express service, MBTA route #712/713, and a Mohegan Sun casino shuttle, in addition to charter services (Paul Revere Transportation, LLC). Paul Revere operates a 168-vehicle fleet, which includes buses, shuttle vans, and coaches (Paul Revere Transportation, LLC).

Harvard University contributes heavily to operating the M2 Cambridge-Harvard Shuttle (“M2 Shuttle”) (Personal Communication, 2014-2015a). However, MASCO also recently worked with MassDevelopment, the finance and development authority for the Commonwealth of Massachusetts, to finance a large bus and van purchase. MassDevelopment issued a \$13.48 million tax-exempt lease to JP Morgan on behalf of MASCO; this lease works in a similar way to installment loans, and requires MASCO to make periodic fixed-rate payments (MassDevelopment, 2013). This demonstrates some level of previous public-private coordination with MASCO.

The M2 runs between Harvard Square and Vanderbilt Hall, a residence hall of Harvard Medical School and Harvard School of Dental Medicine that is located in the LMA (Medical Academic and Scientific Community Organization, n.d.-c; Harvard Medical School). The shuttle runs from Harvard Square along Massachusetts Avenue, and then through Kenmore Square and the Fenway area before reaching the LMA. It runs a similar route in the opposite direction, although bypassing Kenmore Square to instead serve other parts of the Fenway area. A detailed map of the M2 service is shown in Figure 5-1. As demonstrated in Figure 5-2, both the M2 and the MBTA bus route #1 use the Massachusetts Avenue corridor and its bus stops in Cambridge and into Boston.

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<sup>46</sup> Note that seven of the ten routes serve the LMA area, while the other three appear to serve only the Harvard Campus but not the LMA (Medical Academic and Scientific Community Organization, n.d.-b; Medical Academic and Scientific Community Organization, n.d.-e).

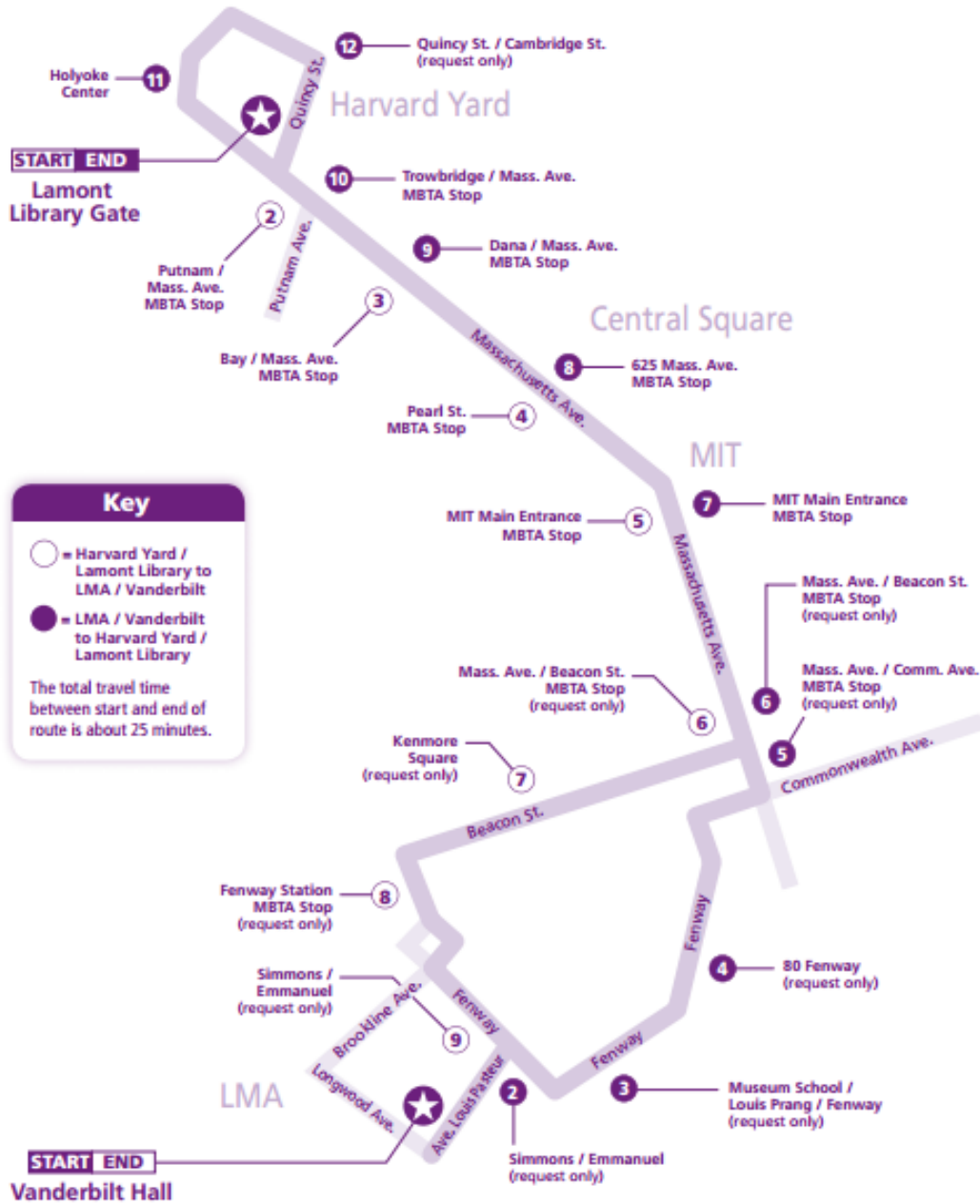
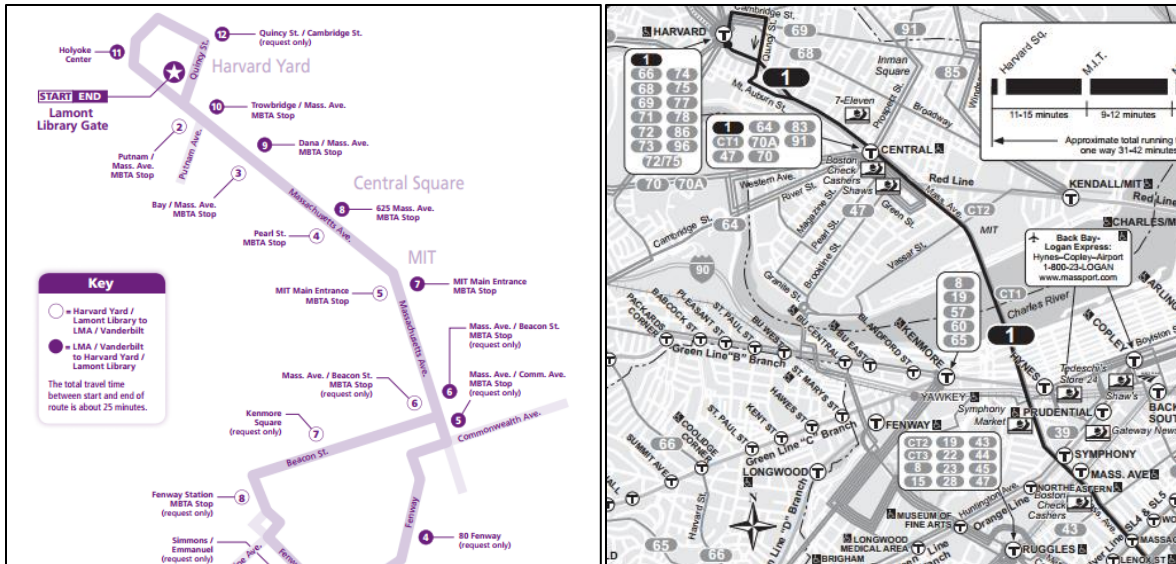


Figure 5-1. Map of MASCO M2 Shuttle Route

Source: Reproduced from (Medical Academic and Scientific Community Organization, 2014)



**Figure 5-2. Similarities between M2 Shuttle and MBTA Route #1**

*Source: Reproduced from (Medical Academic and Scientific Community Organization, 2014; Massachusetts Bay Transportation Authority, 2015b)*

Although the M2 route is open to the public, it is largely inaccessible to those outside of Harvard University. Students and staff at various Harvard University schools can ride for free using their University ID cards.<sup>47</sup> All others must pay the \$3.25 fare using either Crimson Cash or tickets purchased at M2 ticket offices; cash fares are **not** accepted (Medical Academic and Scientific Community Organization, n.d.-c). While this is fairly easy for other Harvard students and staff, who can load Crimson Cash onto their University IDs, it is more difficult for the general public, who must also go to a ticket office to receive a Crimson Cash card (Medical Academic and Scientific Community Organization, n.d.-c). Ticket offices are located both at Harvard University and at various locations in the LMA (Medical Academic and Scientific Community Organization, n.d.-c). This makes the service significantly less accessible to the general public than to Harvard University students and staff, as the public first needs to be aware of where to purchase tickets and then needs to travel to those locations in advance to do so. This inability to pay on the bus or at the stop is further combined with differences in relative affordability when compared to the MBTA (which sets bus fares at \$1.60 with a CharlieCard and

<sup>47</sup> The service is free to students at Harvard Medical School, Harvard T.H. Chan School of Public Health, Harvard School of Dental Medicine, Graduate School of Arts and Sciences, Harvard Division of Medical Sciences, and Harvard Business School, and to Faculty of Arts and Sciences (Medical Academic and Scientific Community Organization, n.d.-c).

\$2.10 with a CharlieTicket). General public access on the M2 Shuttle comprises less than two percent of total ridership (Personal Communication, 2015d).

Based on previous analysis using data from 2011, integrating the M2 Shuttle into the MBTA system (using MBTA fares and MBTA fare payment media) would result in estimated daily ridership increases of about 2,200 passengers at M2 locations and 1,650 passengers in the full Boston transit system (an estimated 0.4% increase) (Rosen, 2013). The change in system ridership would be lower than the change in M2 ridership because approximately 550 passengers (2,200 – 1,650) would have previously used a different part of the transit network (Rosen, 2013).

Both the MBTA and MassDOT would therefore benefit from increasing public access to the M2 Shuttle through integration with the MBTA's systems. The benefit here would come from the resulting ability to fill a gap in the network and ease capacity limitations. The estimated demand indicates that there would be added system ridership. This increase in system ridership would help MassDOT progress toward its modal shift goal. Integrating the M2 would have the additional benefit of allowing MBTA riders to have shorter wait times and in turn, shorter trips (both through the increased effective frequency along the Massachusetts Avenue corridor, and through the decreased probability of denied boardings due to the capacity increase). This route could serve as a pilot in order to determine the effectiveness of similar actions on other privately operated routes going forward.

MASCO and Harvard University would also benefit from this opportunity. The expected increase in ridership would increase the usage of existing buses, and would increase the revenue generated per bus. MASCO would likely negotiate an agreement with the MBTA to keep a substantial portion of this new revenue as a fee for improving the public access to the bus. This new revenue could counteract the negative implications of increasing crowding on the M2.

It is the possible crowding effect on the M2 that would likely raise institutional resistance from Harvard and MASCO. The payment methodologies currently allowed on the M2 have made it into a fairly exclusive service, and it would lose this exclusivity under this proposal. However, it would do so with compensation, and negotiations would need to determine what the adequate compensation would be to allow for this service change. Additional subsidization from the MBTA or MassDOT could allow for operating increased service. This could be done through a program similar to the BusPlus program, for example, as will be discussed in Section 6.2, or through operating subsidies. Either way, MASCO would be likely to engage in this

opportunity if the MBTA or MassDOT were to provide a level of subsidy that would increase or at least maintain its existing net cost.

It is also important to consider that the City of Cambridge could have a role to play in this if they so desired. The M2 Shuttle operates on one of the most congested Cambridge streets – this is a privilege granted by Cambridge and not an inherent right, and Cambridge could use that negotiating power as an opportunity to provide better transit service to the non-Harvard affiliated general public.

The recommendation to provide MASCO with a share of the revenue may in turn result in a short-term loss of revenue for the MBTA, as current riders of Route #1 would instead use the M2 Shuttle. This loss in revenue would likely be worth the significant increase in customer satisfaction that would result from decreased crowding, fewer denied boardings, and shorter expected trip times along the corridor. The decrease in crowding could also reduce dwell times to expedite cycle times, allowing the MBTA to operate more reliable service, possibly at shorter headways.

The following Section 5.1.4 will consider a second example similar to the one presented here, but will focus on the EZRide route.

#### **5.1.4 EZRide**

EZRide is a privately operated service organized and owned by the Charles River TMA and operated under contract to Paul Revere (Charles River Transportation Management Association, n.d.-b). EZRide operates service Monday through Friday, from 6:20 AM to 8:00 PM (Charles River Transportation Management Association, n.d.-d). Morning and evening services run between Cambridgeport and North Station in Boston via MIT, Kendall Square, and Lechmere, while a shorter midday route operates between Cambridgeport and Kendall Square via MIT (Charles River Transportation Management Association, n.d.-d). Maps of each of the routes are shown in Figure 5-3. As these maps illustrate, EZRide morning and evening services connect the MBTA's Commuter Rail north side services (North Station) with the East Cambridge, MIT campus, and Kendall Square areas of Cambridge. These services also connect to the Orange Line (North Station), Green Line (North Station and Lechmere), and Red Line (Kendall/MIT).

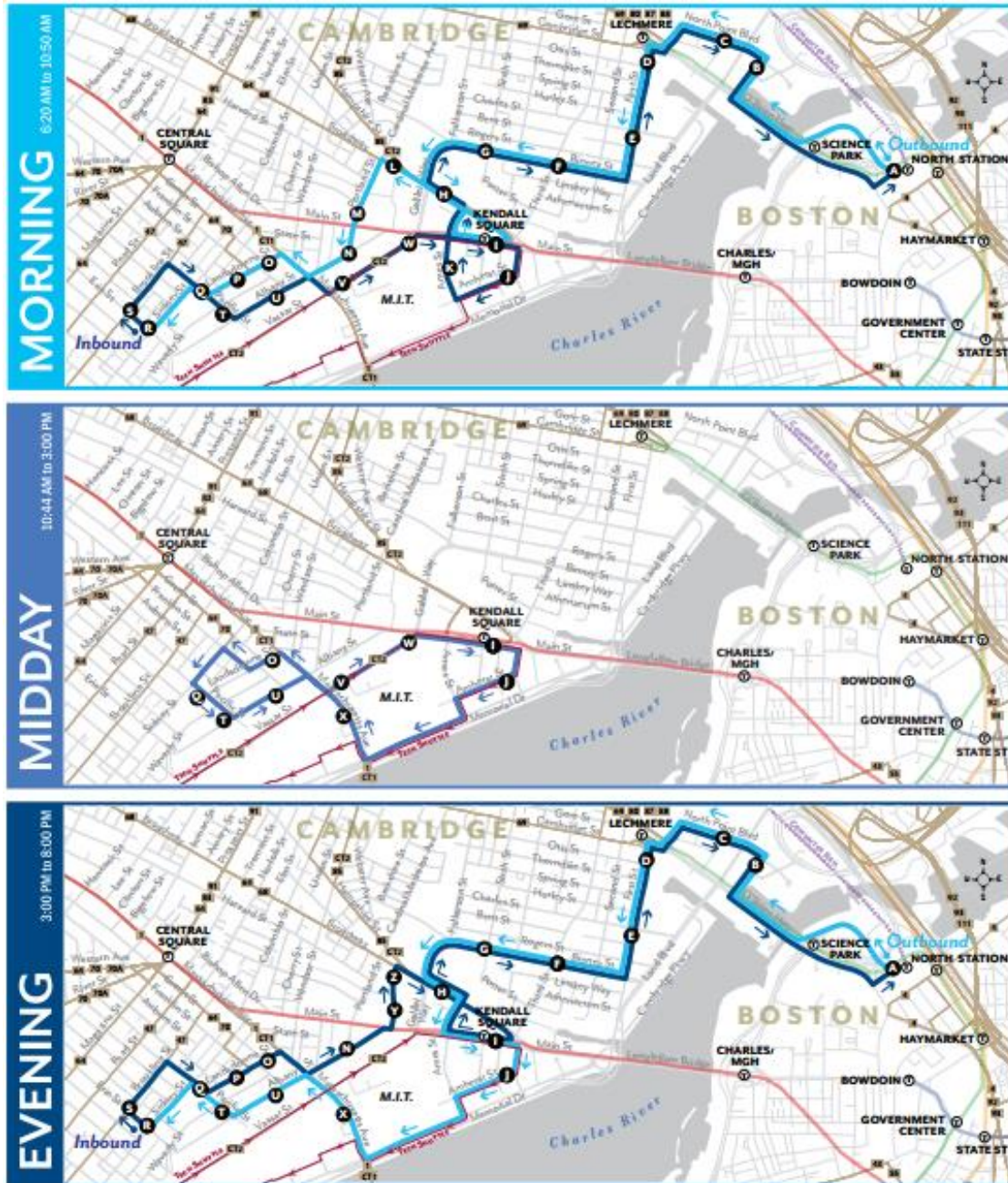
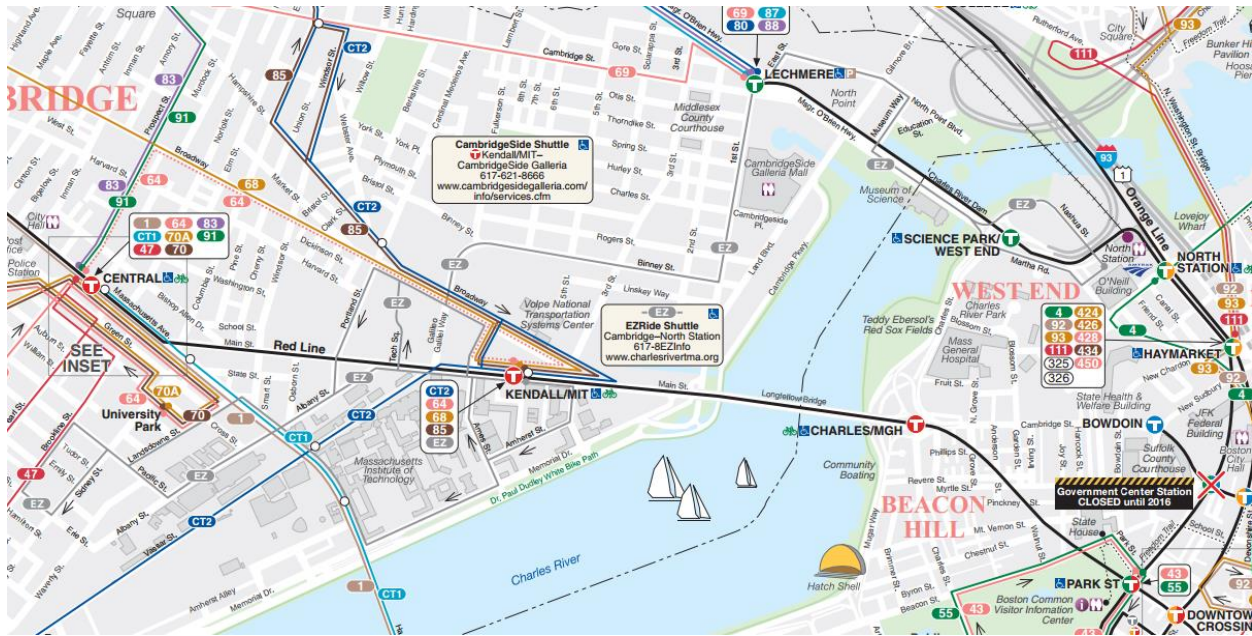


Figure 5-3. EZRide Shuttle Routes for Morning, Midday, and Evening Service

Source: Reproduced from (Charles River Transportation Management Association, n.d.-d)

As Figure 5-4 shows, the MBTA does not have a service similar to that of EZRide. In particular, EZRide provides a convenient connection from North Station and Lechmere to Kendall, which would otherwise require multiple transfers. Integrating this route with the MBTA network would provide more convenient connections to the rapidly growing Kendall Square area.



**Figure 5-4. MBTA Routes Serving Area near EZRide**

*Source: Reproduced from (Massachusetts Bay Transportation Authority, 2014f)*

In the AM Peak, EZRide schedules a 58-minute cycle time for its route with a 7-minute headway, using an estimated fleet of 9 buses (based both on calculations and vehicle tracking information). In the PM Peak, EZRide schedules a 60-minute cycle time and 8 minute headway, using an estimated fleet of 8 buses.

Member institutions, particularly in East Cambridge, fund EZRide through the Charles River TMA. A full list of member institutions is provided in Appendix C. There are approximately 15-20 members (some with multiple locations) that contribute to EZRide (Charles River Transportation Management Association, n.d.-a). Employees of these member institutions can ride EZRide for free, as can anybody with a MIT ID card (Charles River Transportation Management Association, n.d.-c). All other passengers can use EZRide either by paying a cash fare, or by using tickets after purchasing a multi-ride ticket book (Charles River Transportation Management Association, n.d.-c). Like with the M2 Shuttle, this group of passengers comprises only about two percent of total ridership (Personal Communication, 2015d).

In 2013, EZRide averaged over 1,900 riders per day, and ridership in 2014 increased year-over-year from 2013 for each of the nine months for which data was available (Gascoigne, 2015). Based on previous analysis using data from 2011, integrating the EZRide into the MBTA system (using MBTA fares and MBTA fare payment media) would result in estimated increases



in daily ridership of about 2,300 passengers at EZRide locations and 1,700 passengers in the full Boston transit system (an estimated 0.4% increase) (Rosen, 2013). The change in system ridership would be lower than the change in EZRide ridership because approximately 600 passengers (2,300 – 1,700) per day would have previously used a different part of the transit network (Rosen, 2013).

Both the MBTA and MassDOT therefore have an incentive to increase public access to EZRide through integration with the MBTA's systems. As mentioned above, the MBTA would be able to provide its riders with an easier connection and would better serve the Kendall area. This would not only serve to benefit existing MBTA riders, but would also allow the MBTA to provide service to an existing network gap. Similar to with the M2 example, the increase in system ridership would help MassDOT progress toward its modal shift goal. Integration on this route could serve as another pilot to help determine the effectiveness of similar actions on other privately operated routes going forward.

The Charles River TMA would also benefit from this opportunity for numerous reasons, similar to how MASCO could benefit in the opportunity described in Section 5.1.3. The expected increase in ridership would increase the usage of existing buses, and would increase the revenue generated per bus. Integrating fare payments with the MBTA would also likely require an increase in frequency to accommodate a potentially necessary increase in capacity to serve the new ridership. This in turn would require some form of additional subsidization from the MBTA or MassDOT in exchange for operating increased service. As previously mentioned, this could be done through a BusPlus type of program, which will be further discussed in Section 6.2, or through operating subsidies. Either way, the TMA would be likely to engage in this opportunity if the MBTA or MassDOT were to provide a level of subsidy that would decrease or at least maintain the TMA's existing net cost.

Of course, this would then come at a cost for the MBTA (or more likely, MassDOT). However, that cost would result in a desired increase in transit usage. It would also add service usable to MBTA riders at a substantially reduced cost because the subsidy would likely cover only the incremental cost necessary to increase the frequency for EZRide's service (or some negotiated amount based on this incremental cost).

Increasing public access to the EZRide route might concern the contributing employers in the Charles River TMA. The employers could still provide free rides to their employees either

through a MBTA pass or a shuttle-specific pass (which could be an option to continue on the service), but the employees might now face increased crowding levels on the service. However, increasing the frequency should compensate for increased crowding to a certain extent, and could even be done to maintain existing crowding levels. Beyond crowding, the employers and the Charles River TMA might not like to continue to partially pay for service that would be increasingly available to MBTA riders while employees of other companies use the service without their employers contributing. Again, it would be worth noting to those employers that the service would have a much lower frequency without their contributions, and that their employees would be able to continue to use the service for free.

This opportunity should also be supported by the City of Cambridge and the City of Boston for many of the same reasons as discussed above. There would be increased connectivity and integration with the MBTA, which would allow for increased transit ridership, a step towards decreasing road congestion in otherwise heavily congested areas.

This section examined increasing public access on the existing EZRide service. Section 5.2 will further consider the EZRide service in the context of route expansion and the Green Line Extension project delay mitigation.

### **5.1.5 Summary of Ways to Increase Public Access on Existing Private Routes**

Improved technology could make it easier to integrate existing private routes with the MBTA's systems to allow for improved public access on those routes. There are short-term solutions that would allow for such integration. Increasing access on existing private routes could allow MassDOT and the MBTA to increase their system coverage while taking advantage of the existing private capacity that is available. There are opportunities to do so that could avoid lengthy Pacheco Law reviews. This section examined this idea in more detail and considered improving public access on two private routes, EZRide and the M2. The next section will consider the possibility of an even greater increase in private sector involvement for MassDOT and the MBTA by looking at the possible expansion of an existing private route in order to improve cross-town service in a rapidly developing corridor.

## **5.2 Green Line Extension Mitigation Opportunity: Develop Route between Sullivan – Lechmere – Kendall – Kenmore**

The first section in this chapter considered ways for an agency to expand service by working with existing privately operated routes to increase public access. This section will go one step further, examining an opportunity to coordinate with and expand the existing EZRide route discussed in Section 5.1.4. First, background will be provided on the Green Line Extension project and its accompanying mitigation requirements. This serves as a foundation for the Sullivan-Lechmere-Kendall-Kenmore route opportunity. Possible operating plans will then be suggested, and the institutional and financial implications of the route will be addressed.

### **5.2.1 GLX Background and Mitigation Requirements**

The Green Line Extension (“GLX”) was put forth as part of the Massachusetts State Implementation Plan (“SIP”). The project will extend the Green Line from Lechmere through Somerville along two branches, one ending in Union Square in Somerville, and the other at College Avenue in Medford (Massachusetts Department of Transportation).

As required by 310 CMR 7.36 and its subsequent amendments,

*“Before December 31, 2014, construction of the following facilities shall be completed and opened to full public use:*

- 1. The Green Line Extension from Lechmere Station to Medford Hillside; and*
- 2. The Green Line Union Square spur of the Green Line Extension to Medford Hillside” (Commonwealth of Massachusetts, Department of Environmental Protection; Commonwealth of Massachusetts, 2012).*

Failing completion by this date, further delay is acceptable by meeting certain criteria. According to the amended SIP, MassDOT “shall implement interim emission reduction offset projects or measures during the period of delay” (Commonwealth of Massachusetts, 2012). These emission offsets must be greater than or equal to the emissions reductions that the GLX would have spurred if completed by the target date (Commonwealth of Massachusetts, 2012). For the GLX, the amended 310 CMR 7.36 required that any mitigation projects “shall be within the municipalities of Boston, Cambridge, Somerville and Medford” (Commonwealth of Massachusetts, 2012).

With the estimated completion date of the project pushed back to 2020, MassDOT submitted a Petition to Delay to the Commonwealth of Massachusetts Department of Environmental Protection (“DEP”) in July 2014 (Massachusetts Department of Transportation, 2014b). The Petition to Delay included the following components:

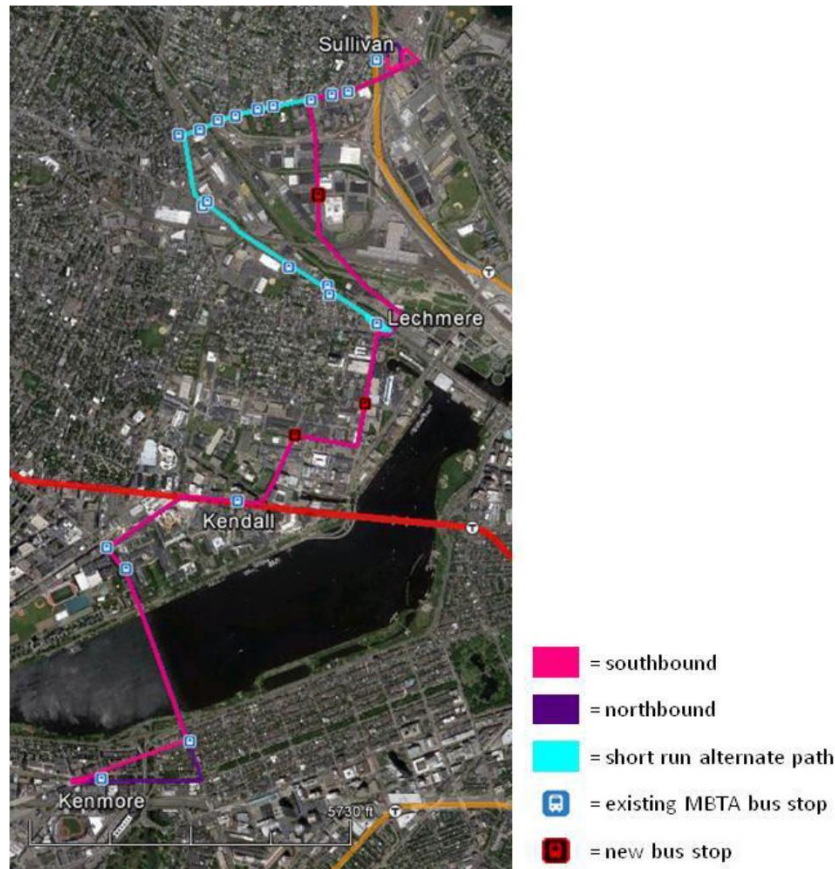
- 1) *Increasing off-peak bus service in the GLX corridor on existing MBTA routes.* Off-peak service on routes #80, 88, 91, 94, and 96 would increase by 20%;
- 2) *Increasing off-peak Green Line service by 20%;*
- 3) *Purchasing new electric vehicles for THE RIDE.* This purchase of 142 new vehicles would decrease emissions through an accompanied retirement of older vehicles; and
- 4) *Increasing the number of Park and Ride spaces at two locations.* This proposal would add 374 and 378 spaces to the Salem and Beverly commuter rail garages, respectively (Massachusetts Department of Transportation, 2014b).

Although MassDOT noted that the above measures would meet the necessary emission reduction criteria, they were likely to meet with resistance for multiple reasons. First, meeting the emissions reductions was the mitigation criteria specified by the SIP, but the methods proposed do not improve transit service quality to GLX corridor residents to a similar extent as the GLX would have if completed without delay. This is especially true for commuters, as the service increase is during the off-peak period. Second, critics have noted that it is likely that the additional Park and Ride spaces would have been constructed with or without the required GLX mitigation (Massachusetts Bay Transportation Authority, 2014d). Third, critics including the Conservation Law Foundation have also noted that THE RIDE fleet should be replaced as the vehicles outlive their useful lives; as such, only the difference between the purchase of a standard vehicle and an electric vehicle should count towards the emissions (Massachusetts Bay Transportation Authority, 2014d).

As of yet there has not been official legal action taken against the Petition to Delay, but MassDOT would be well served by strengthening its mitigation measures in order to prevent legal action and ensure that the Petition to Delay meets the full legal requirements. The route proposed in this section is considered in this context. As the following sections will describe, the route could contribute to and strengthen the GLX mitigation efforts proposed by MassDOT by operating within the municipalities specified above and by decreasing emissions through an increase in transit trips.

### 5.2.2 Proposed Sullivan Station – Kenmore Station Route

The route shown in Figure 5-5 was proposed in previous work by Jamie Rosen as a service mitigation proposal for the GLX (Rosen, 2013).<sup>48</sup> Based on this proposal, the route could run between Sullivan and Kenmore (via Lechmere and Kendall) using the following headways: 15 minutes from 5:30 – 6:30 AM, 10 minutes from 6:30 AM – 8:00 PM, and 20 minutes from 8:00 PM – 12:40 AM.<sup>49</sup>



**Figure 5-5. Proposed Sullivan – Lechmere – Kendall – Kenmore Route**

*Source: Reproduced from (Rosen, 2013, p. 123)*

Rosen estimates that establishing the route based on her proposed headways, in combination with improved frequency in Green Line service to Lechmere, would increase transit system ridership by 2.2%, helping to offset the air quality effects of the Green Line Extension delay (Rosen, 2013). It would also provide new direct transit connections for the population in the corridor affected by the Green Line Extension delay, and improve access to the growing

<sup>48</sup> Note that this route was based on similar proposals by the City of Cambridge, MASCO, and A Better City.

<sup>49</sup> For details on specific routing and calculations, see (Rosen, 2013).

Kendall Square area both from the northern parts of the region and from the Kenmore Square area of Boston. Access could be improved even further by reopening consideration of a Commuter Rail stop at Sullivan Station, as was originally proposed as part of the Urban Ring project.<sup>50</sup>

### 5.2.3 Route Implementation – Full Operation

Using the full schedule proposed in previous work, the Sullivan – Lechmere – Kendall – Kenmore route would operate with 15 minute headways during the Early Morning period from 5:30 AM – 6:30 AM, 10 minute headways from 6:30 AM through 8:00 PM, and 20 minute headways from 8:00 PM until the end of service at 12:40 AM (Rosen, 2013).

This research re-estimates the cycle times using a different methodology from the original research. The original research estimated the cycle times through the use of comparable routes, the MBTA #87 and #88 routes, and resulted in estimated cycle times of 64-65 minutes (Rosen, 2013). The original analysis was done as follows:

- 1) Dwell time per stop for the comparable routes was estimated as the difference between the Google Maps travel time and the median running time, divided by the number of stops on each route.
- 2) Recovery time for the comparable routes was estimated as the difference between the 90<sup>th</sup> and 50<sup>th</sup> running time percentiles. This was converted to a percentage of the median running time.
- 3) The estimated dwell time per stop calculated for the comparable routes was then multiplied by the number of new route stops and added to the Google Maps Travel time for the new route. This provided the estimated running time.
- 4) The estimated cycle time was then calculated by applying the recovery time percentage from comparable routes to the estimated running time for the new route.

This analysis was conducted for both the AM Peak and PM Peak periods, and for average and maximum values from the comparable routes. The cycle time is re-estimated in this research for two reasons. First, because the area is rapidly developing, congestion has increased even in the limited time since the original proposal, and it is likely that this has caused travel times to

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<sup>50</sup> This proposed station would serve the Newburyport/Rockport and Haverhill Lines, and would link these Commuter Rail lines to the Orange Line and various bus routes (including the proposed route). *See* (Massachusetts Executive Office of Transportation and U.S. Department of Transportation - Federal Transit Administration, 2008).

increase. Second, because traffic levels vary so widely in the Boston area, this research uses specific route segments as comparable segments in an attempt to better approximate the travel conditions on the route.

Various travel time statistics were calculated for the Sullivan – Vassar / Mass Ave segment on Route #CT2 and for the Hynes – MIT segment on Route #1. These segments were chosen to approximate the travel conditions on the proposed route. A summary of travel speeds on these comparable segments is presented in Table 5-1.

Speed (miles per hour)	Route # 1 Inbound:			Route #CT2 Inbound:		
	MIT - Hynes			Sullivan - Vassar / Massachusetts Ave.		
	AM Peak	Midday Base	PM Peak	AM Peak	Midday Base	PM Peak
Average	9.8	9.7	5.3	7.1	9.0	7.9
10th Percentile	13.3	12.9	9.1	8.6	11.1	10.0
50th Percentile	10.1	10.0	5.5	6.9	9.3	8.0
90th Percentile	7.5	7.5	3.6	6.0	7.5	6.5
95th Percentile	6.9	7.0	3.2	5.8	7.0	6.3
99th Percentile	6.1	5.8	2.8	5.6	6.4	5.9

Speed (miles per hour)	Route #1 Outbound:			Route #CT2 Outbound:		
	Hynes - MIT			Vassar / Massachusetts Ave. - Sullivan		
	AM Peak	Midday Base	PM Peak	AM Peak	Midday Base	PM Peak
Average	10.5	9.7	9.9	9.7	9.8	7.0
10th Percentile	17.0	14.0	17.6	10.9	11.2	8.4
50th Percentile	11.5	10.4	11.2	9.7	9.9	7.3
90th Percentile	6.6	6.7	6.8	8.7	8.6	5.7
95th Percentile	6.1	6.1	5.9	8.3	8.4	5.3
99th Percentile	4.7	4.8	3.7	7.1	7.5	4.8

**Table 5-1. Travel Speeds by Period on MBTA Route Segments Comparable to Proposed Route**

Although the 90<sup>th</sup> percentile speeds have a fairly narrow range in each period, there is enough of a difference between the segment travel times that it is worth considering which comparable route best approximates the new route. It is then possible to use these comparable 90<sup>th</sup> percentile speeds, in combination with the distance of the new route, to estimate a cycle time for the new route.

Because the Route #CT2 segment from Sullivan – Vassar St. / Massachusetts Ave. is representative of the majority of the new route in terms of road type and level of congestion, it is appropriate to use to estimate cycle time for the majority of the new route. However, as the Route #1 Inbound PM Peak time exemplifies, the congestion and delay across the Massachusetts Ave. bridge from Cambridge into Boston is unique and should be considered separately. As such, this research uses the Route #1 as a comparable route for travel along Massachusetts Ave.

Using the 90<sup>th</sup> percentile speeds from Table 5-1, in conjunction with segment distances, produces the results of the estimated cycle times in Table 5-2. Notable in these results is that the estimated cycle time is significantly greater in the PM Peak than in the other periods, due to both the lower speed in the inbound direction across the Massachusetts Ave. bridge, and to the lower speeds elsewhere along the route in the outbound direction during the PM Peak. Based on these results, estimated cycle times of the proposed route would be 78 and 94 minutes during the AM and PM Peaks, respectively (and 70 minutes in other periods, based on “Midday Base” speeds).

Segment	Direction	Distance	AM Peak		PM Peak		Other	
			Speed	Time	Speed	Time	Speed	Time
All, Excluding Massachusetts Ave.	IB	3.81	6.0	38.0	6.5	35.0	7.5	30.4
Massachusetts Ave.	IB	0.71	7.5	5.7	3.6	11.8	7.5	5.7
All, Excluding Massachusetts Ave.	OB	3.81	8.7	26.3	5.7	40.0	8.6	26.7
Massachusetts Ave.	OB	0.85	6.6	7.7	6.8	7.5	6.7	7.6
<i>Total</i>		<i>9.18</i>	<i>7.1</i>	<i>77.7</i>	<i>5.8</i>	<i>94.4</i>	<i>7.8</i>	<i>70.3</i>

**Table 5-2. Estimated Cycle Times by Period on Proposed Route**

These cycle times can then be applied to proposed headways to estimate the fleet size required to operate the route throughout the day. Although it is possible that EZRide could shift spare buses to the route, the calculations in the remainder of this chapter will assume that the current EZRide fleet is fully utilized and as such, it would be necessary to procure a new fleet to operate the Sullivan – Kenmore route.

As detailed in Table 5-3, operating with the specified frequencies and an estimated operating cost of \$95 per bus-hour and 250 operating days per year, the route would cost approximately \$13,000 daily and \$3.27 million annually. It would require the acquisition of ten new buses. The options proposed in Section 5.2.4 operate with more limited schedules and as such require smaller vehicle fleets and have lower costs; these could serve as good intermediate phases with the goal of building the fleet over time to allow for the full implementation as described in this section.

Period	Time	Headway	Buses Required	Daily Op. Cost	Annual Op. Cost
Early Morning	5:30 AM - 6:30 AM	15	5	\$475	\$118,750
AM Peak	6:30 AM - 9:00 AM	10	8	\$1,900	\$475,000
Midday	9:00 AM - 3:30 PM	10	8	\$4,940	\$1,235,000
PM Peak	3:30 PM - 6:30 PM	10	10	\$2,850	\$712,500
Evening	6:30 PM - 8:00 PM	10	8	\$1,140	\$285,000
Late Night	8:00 PM - 12:40 AM	20	4	\$1,773	\$443,333
<i>Total</i>	<i>5:30 AM - 12:40 AM</i>	<i>10 - 20</i>	<i>10</i>	<i>\$13,078</i>	<i>\$3,269,583</i>

**Table 5-3. Detailed Headway, Fleet, and Cost Information for Original Proposal**



#### 5.2.4 Route Implementation – Phased Operations

For options with more limited resources, it is possible to look at the level of service that could be provided by adding  $x$  buses on the new route, and limiting service to the same periods as the existing EZRide shuttle (Morning: 6:20 AM – 10:50 AM; Midday: 10:44 AM – 3:00 PM; Evening: 3:00 AM – 8:00 PM).

There are four strategies for adding buses to the new route if contracting with EZRide:

- (1) EZRide could continue operating its existing service at the same frequencies by procuring new vehicles for the new route;
- (2) EZRide could continue operating its existing service at the same frequencies by assigning previously unassigned vehicles from its fleet to the new route;
- (3) EZRide could shift vehicles operating on its existing route to the new route, which would require lower frequencies on the non-overlapping segments of the existing route; and
- (4) A mixture of the above strategies, with EZRide shifting some buses from the existing route to the new route while also adding new buses to the new route (either through procurement or through the use of unassigned vehicles).

This proposal will focus on the first strategy, although similar calculations could be produced if the other options were preferred. Service on the new route could be increased over multiple phases depending on vehicle availability and financial resources. An example multi-phase operation is presented below.

***Phase #1. Procure four buses to operate on new route.*** If EZRide were to procure four new buses, it would not affect service on the existing EZRide route. Furthermore, it would decrease the headways on the Lechmere-Kendall segment during the Morning and Evening periods due to the overlap between the existing and new routes, and provide service in that segment during the Midday when the EZRide route does cover it. This increased frequency at Lechmere (although minimal in this phase) serves two purposes: first, it benefits passengers in the GLX corridor for mitigation purposes; second, it develops usage patterns for future GLX passengers that will become increasingly important when the GLX begins passenger service.

However, service in the non-overlapping segments of the new route would have lower frequencies than desired. The estimated operating cost for this scenario would be approximately

\$5,200 per day and \$1.31 million per year, based on assumptions of a \$95 operating cost per bus hour, and service on 250 days per year. The summary of this option is presented in Table 5-4.

Period	Time	Headway			Change in Operating Cost	
		Non-Overlapping		Non-Overlapping	Daily	Annual
		New Route	Lechmere - Kendall	EZRide		
Morning	6:20 AM - 10:50 AM	20	6	7	\$1,710	\$427,500
Midday	10:44 AM - 3:00 PM	18	18	20	\$1,621	\$405,333
Evening	3:00 PM - 8:00 PM	24	6	8	\$1,900	\$475,000
Total	6:20 AM - 8:00 PM	-	-	-	\$5,231	\$1,307,833

**Table 5-4. Operating Summary with Four New Buses Available**

*Phase #2. Procure an additional three buses (total of seven buses) to operate on new route.* With similar logic as presented in the first phase, Table 5-5 examines what would happen if a total of seven new buses were available. Again, in this phase, the existing EZRide route operations would remain unchanged from the status quo. Because of the increase of three buses from the previous phase, frequencies increase closer to the desired levels. This does come at an additional cost, with the new route now expected to increase Charles River TMA’s operating costs by approximately \$9,100 daily and \$2.29 million annually.

Period	Time	Headway			Change in Operating Cost	
		Non-Overlapping		Non-Overlapping	Daily	Annual
		New Route	Lechmere - Kendall	EZRide		
Morning	6:20 AM - 10:50 AM	12	5	7	\$2,993	\$748,125
Midday	10:44 AM - 3:00 PM	11	11	20	\$2,837	\$709,333
Evening	3:00 PM - 8:00 PM	14	6	8	\$3,325	\$831,250
Total	6:20 AM - 8:00 PM	-	-	-	\$9,155	\$2,288,708

**Table 5-5. Operating Summary with Seven New Buses Available**

In addition to the two phases proposed above, there are a number of intermediary options that would be possible, including using some of the other strategies described at the beginning of this section. This research suggests a few alternatives, but it would be fairly straightforward to calculate the effects on costs and frequencies for any of the strategies.

It should also be stressed that these phases could serve as sequential implementation phases in building up to or beyond the service proposed in Section 5.2.3. For example, one phased alternative would be to: (1) purchase four buses for the new route; (2) purchase an additional three buses so that the new route has seven new buses; (3) purchase an additional three buses (for a total of ten) to provide the full level of service as identified in the original proposal in Section 5.2.3, but only operate during the existing EZRide span of service; (4) further expand

service to the MBTA's span of service as identified in the original proposal in Section 5.2.3; and (5) continue service expansion as desired.

### **5.2.5 Institutional and Financial Considerations**

As mentioned previously, the heavy rail system is approaching capacity. This is especially true on Red Line trips going to Kendall in the AM Peak and originating at Kendall in the PM Peak. The roads in the Kendall area are also heavily congested during the peaks, with limited opportunity for growth in road capacity. It is clear that any significant increases in the capacity of the transportation network around Kendall Square will need to come from transit in order to allow for continued growth. Although the Red Line vehicle procurement will help marginally alleviate the capacity constraint, the vehicles are not due until 2019 at the earliest (see Section 4.2.1 for more details). A similar description applies to Sullivan and the Orange Line, even with a small increase in capacity once new vehicles are delivered. Kenmore and the Green Line central subway are also approaching capacity, with limited operational improvements likely in the near future since peak vehicle throughput is already near its maximum level with the current signal system in place. In the interim, this route can provide a necessary increase in capacity while also improving service for those affected by the GLX delay. In the longer term, more significant measures will be needed for continued growth. This proposal addresses the immediate need while also providing a pilot for future similar types of system growth.

Because it will improve service for passengers affected by the GLX delay, the route could use GLX mitigation funding, which would be granted through the state. The GLX mitigation is a state obligation, so if it needs to be strengthened, this route is a viable contributor at moderate cost. Moreover, if the route is funded through GLX mitigation funding, the MBTA would not need to reduce service elsewhere, since the funding source would be outside of the agency. This is important, as the goal of the route is not to shift resources dedicated to transit service, but to increase resources dedicated to transit service.

Furthermore, contracting the route through MassDOT might limit MBTA labor concerns. It would, in a sense, further remove the contract from the MBTA's operations and consequently further remove the operations from similarities to services previously provided by MBTA employees. As discussed further in Section 7.2.1, the route should not warrant a Pacheco Law challenge, but perception is nonetheless important and therefore contracting the route through

MassDOT might be more appealing than contracting it through the MBTA. The MBTA labor unions' high levels of cooperation in the aftermath of the January-February 2015 storms also suggests that the current unions might not oppose contracting a service that they would not otherwise have the capacity to provide directly. This route could serve as a test to see if contracting routes through MassDOT would be a feasible way to grow service going forward.

The Charles River TMA currently contracts the EZRide route through Paul Revere, and this route would also serve the Kendall Square area where many of the Charles River TMA employers are located. The route would provide significant additional service to the employers of the TMA, and as such should be well received by them. The Charles River TMA would likely only face a cost increase if it is necessary to hire additional staff to manage the additional routes; however, this would be unlikely if MassDOT were to fund the route.

It is also possible that the area employers would contribute to improve the level of service on the route in a similar way as they have with EZRide. Although the employers have demonstrated that they would not fund the route without any additional subsidization, it is possible that they would be willing to fund a portion of the route so that it has an adequate level of service. For example, if MassDOT were to fund the operation of seven buses, it is possible that area employers would fund the operation of another three buses to achieve ten-minute headways and make the route a high-frequency service. MassDOT should not depend on area employers to entirely fund the route, but the additional benefits (e.g., improved access to employees, decreased parking costs, etc., as described in Chapter 3) should make it worthwhile to allow for some level of employer contributions. In exchange for partial subsidization of the new route, the employers could be given employee passes for the route or for the system. Or alternatively, if the state provided the capital for buses, EZRide might be able to operate the increased service without an operating subsidy, an idea discussed further in Section 6.2.

### **5.2.6 Summary of GLX Mitigation Route Opportunity**

As described in the sections above, a route between Sullivan and Kenmore via Lechmere and Kendall could enhance GLX delay mitigation measures and provide valuable links between important nodes in the MBTA system that are not currently connected. Because it is not currently publicly provided, and because the MBTA is approaching capacity for its bus operations, this route could be contracted out to the private sector, possibly through MassDOT.

Charles River TMA would be a logical choice of contractors, as it currently operates the EZRide route in the area through Paul Revere Transportation. This route would enhance the existing EZRide service and could enable further growth in the Kendall area. If funding or equipment limitations arise, additional service could be phased in over time, as described in Section 5.2.4.

This route could serve as a pilot case in growing service through contracting. This collaboration with the private sector to develop a private route meeting a public need could then be replicated and enriched in other parts of the city where existing MBTA service does not meet the public's need for transit, and where private operators are filling that gap. Section 5.3 will further expand this concept in regards to Boston's Seaport district.

### **5.3 Consolidating and Increasing Service in the Seaport District**

The Seaport District in South Boston is one of the fastest growing areas in the Boston region, as it is in the midst of a transformation into a major business district. The MBTA currently connects the Seaport to downtown Boston through a variety of routes, including a number of buses and the partially grade-separated Silver Line. However, MBTA service to the district is already approaching capacity and will not handle or enable the significant growth expected in the district. This contrast between the existing service and the expected growth in the Seaport is further examined in Section 5.3.1.

Meanwhile, there are a significant number of employer-funded private shuttles operating in the Seaport District to supplement the existing MBTA service. These shuttles could be consolidated to improve transportation options to the Seaport, and could also offer increased public access through greater integration with the MBTA system. The remainder of this section examines how this integration could occur, and what role the private sector can play in this integration and in improving transportation to the Seaport District.

#### **5.3.1 MBTA Motivation: Seaport Growth vs. Existing Service**

As mentioned above, Boston's Seaport district is rapidly growing. Due to this expected growth in both jobs and housing, peak transit trips are expected to increase by 64% from 2013 to 2035, and by 106% from 2013 to full build out. As shown in Table 5-6, this predicted increase in trips would merely maintain the existing 27% transit mode share.

Mode	Total AM and PM Peak Period Trips					
	Existing Conditions 2013 <sup>1</sup>		Future Base 2035 <sup>1</sup>		Future Build-out <sup>2</sup>	
	Person-Trips	Mode Share	Person-Trips	Mode Share	Person-Trips	Mode Share
Vehicle	38,600	46%	49,100 (+27%)	36%	58,500 (+52%)	34%
Transit	22,800	27%	37,400 (+64%)	27%	46,900 (+106%)	27%
Walk <sup>3</sup>	20,600	24%	45,900 (+123%)	33%	61,600 (+199%)	35%
Bike <sup>3</sup>	2,300	3%	5,100 (+122%)	4%	6,800 (+196%)	4%
Total	84,300	100%	137,500 (+63%)	100%	173,800 (+106%)	100%

1. Total three hour peak period based on CTPS regional travel demand model output.  
2. Estimated by VHB based on CTPS regional travel demand model with balance of the BRA pipeline land use projections (i.e. beyond 2035).  
3. Walk and bicycle mode shares based on Boston data from the American Commuter Survey 2008-2013.

**Table 5-6. Seaport District Expected Trip Growth**

*Source: Adapted from (VHB et al., 2015, p. 88)*

Although the walking mode share is expected to increase, it is also essential for the transit share to increase in order to work towards MassDOT’s goal of tripling the transit-walk-bicycle mode share across the state. Perhaps more compelling for business interests, excessive automobile use to the Seaport District threatens to cause congestion on Interstates 90 and 93, so better transit is essential to support economic growth without causing gridlock. Because the Seaport is growing so quickly and already has highly congested roadways, it provides an opportunity for transit to capture a larger share of new trips.

However, the transit system is also facing serious capacity constraints. As demonstrated in Table 5-7, the Silver Line routes that have the greatest capacity to serve the district already have demand exceeding capacity in the peak hour and direction.

Route	Critical Peak Hour	Peak Direction	Demand	Seated Capacity	Demand/ Seated Capacity	Max Capacity	Demand/ Max Capacity
Route 4	AM	Inbound	126	195	65%	275	46%
Route 7	AM	Inbound	654	585	112%	880	74%
Route 11	AM	Inbound	486	390	125%	550	88%
SL1	PM	Inbound	268	228	118%	318	84%
SL2	AM	Outbound	971	564	172%	792	123%
SLW	AM	Outbound	837	564	148%	792	106%
Route 448	PM	Outbound	63	78	81%	110	57%
Route 449	AM	Inbound	57	78	73%	110	52%
Route 459	AM	Inbound	16	39	41%	55	29%

Source: MBTA

**Table 5-7. MBTA Existing Capacity and Demand in Peak Hour and Direction**

*Source: Adapted from (VHB et al., 2015, p. 55)*

Estimated assignment of the increase in transit trips to the routes serving the Seaport District further reinforces that the transit routes as currently operated will not be able to support

this growth. Table 5-8 demonstrates that by 2035, the Silver Line routes in particular would approach or exceed demand that is 200% of the maximum capacity in the peak hour and direction. Demand for the three other main bus routes serving the district would also closely approach or exceed the capacity of those routes in the peak hour and direction with service as currently operated.

Route	Critical Peak Hour	Peak Direction <sup>1</sup>	Existing (2013) Demand	Seated Capacity	Max. Capacity	2035 Growth	Estimated Demand	Demand/Max Cap
Route 4	AM	Inbound	126	195	275	114%	270	98%
Route 7	AM	Inbound	654	585	880	26% <sup>2</sup>	826	94%
Route 11	AM	Inbound	486	390	550	29% <sup>2</sup>	629	114%
Silver Line 1 (741) <sup>3</sup>	PM	Inbound	269	228	318	53%	412	140%
Silver Line 2 (742) <sup>3</sup>	AM	Outbound	971	564	792	73%	1,670	211%
Silver Line Way (746) <sup>3</sup>	AM	Outbound	837	564	792	73%	1,448	183%

1. Per MBTA directionality (i.e., Inbound is typically toward downtown)  
 2. Based on CTPS regional growth model; growth for individual routes based on daily trip ends  
 3. Potentially additional Silver Line trunk service capacity with introduction of Silver Line Gateway

**Table 5-8. MBTA Capacity and Predicted Demand in Peak Hour and Direction**

*Source: Reproduced from (VHB et al., 2015, p. 90)*

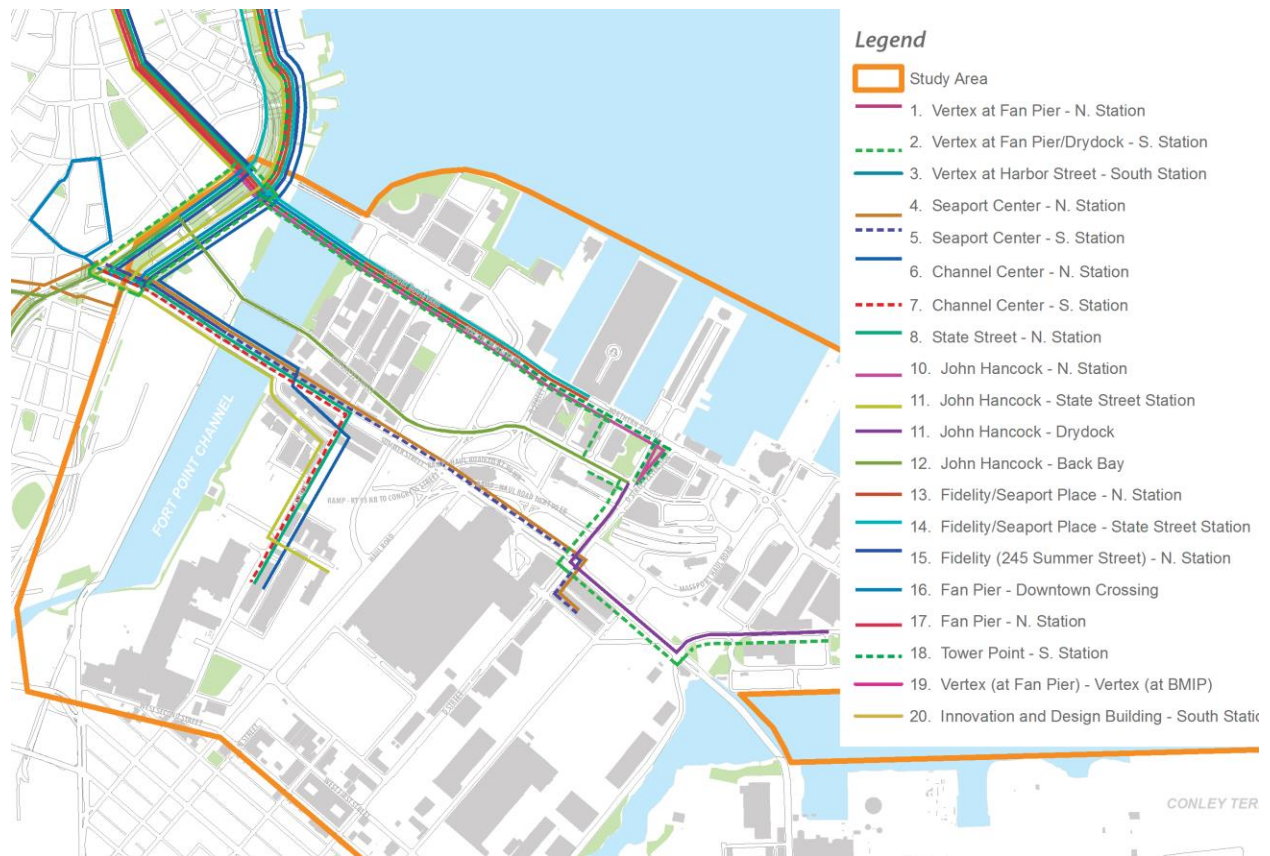
Because the existing MBTA capacity and service is inadequate to meet the full transit demand to the Seaport District, there are currently a number of private shuttles operating between the Seaport and Boston. These shuttles, illustrated in Figure 5-6, connect the Seaport to North Station, South Station, and other parts of downtown (VHB et al., 2015). In the peak hour, 43 shuttles per hour operate through the Seaport, providing a similar level of capacity as the existing MBTA bus service (VHB et al., 2015). As demonstrated in Table 5-9, this peak shuttle demand is also expected to grow considerably by 2035.

	Morning Peak (7AM to 10AM)			Evening Peak (4 PM to 7 PM)		
	Existing <sup>1</sup>	Growth <sup>2</sup>	Projected 2035	Existing	Growth <sup>2</sup>	Projected 2035
North Station	625	65%	1,031	518	65%	855
South Station	228	73%	394	288	57%	452

1. Existing ridership based on counts conducted by VHB on June 19, 2014.  
 2. Based on CTPS regional travel demand model.

**Table 5-9. Existing and Expected Peak Seaport Shuttle Demand**

*Source: Reproduced from (VHB et al., 2015, p. 90)*



**Figure 5-6. Private Shuttles Operating in Seaport District**

*Source: Reproduced from (VHB et al., 2015, p. 58)*

Since the roadway and transit systems are both at or approaching capacity, the future growth in the Seaport District is threatened. Transit to the area must significantly improve in order to support that growth. Failure to do so could put at risk this future development, which from 2013 to 2035 has been estimated at an additional 17.4 million square feet, 9,190 residents, and 22,930 jobs; by full build-out, these numbers increase to an additional 26.9 million square feet, 15,870 residents, and 35,210 jobs (VHB et al., 2015). This would represent increases of 112%, 146%, and 96% in building square feet, residents, and jobs, respectively, from the current situation to the full build-out (VHB et al., 2015). This development is considered critical to strengthen the economies of Boston and Massachusetts. The MBTA cannot support that development through its current services and available resources. Consequently, the MBTA must consider not only how to coordinate service increases through the private sector going forward, but also how to improve the Silver Line capacity through various means (not limited to vehicle procurement but also including infrastructure improvements such as grade separation at



the D Street intersection). With these types of improvements, it has been estimated that Silver Line capacity could nearly double.<sup>51</sup> It is important to emphasize here that the extent of the growth and development in this region is likely to require *both* public and private solutions instead of simply one or the other.

### 5.3.2 Consolidation Implementation

The proliferation of private shuttles has been identified as a transportation issue that the Seaport could address through consolidation (VHB et al., 2015; Gu, Kladeftiras, Mohammad, & Xuto, 2014). Consolidation could provide numerous benefits, including increased frequencies, lower system costs, and decreased congestion (VHB et al., 2015).

Previous research has carefully identified multiple options for consolidation in the short term (Gu, Kladeftiras, Mohammad, & Xuto, 2014). This research examined alternatives for each of the different route segments. An abbreviated set of alternatives are summarized in Figure 5-7. The recommended implementation from this previous research is as follows (Gu, Kladeftiras, Mohammad, & Xuto, 2014):

The consolidated shuttle routes should connect the Seaport District with (1) North Station, Aquarium, and South Station, and (2) Boylston, Chinatown, and South Station. These two sets of connections would each have two variants in the peak periods (for a total of four routes), which would serve different loops within the Seaport District. During the midday, the connections with (1) and (2) above would each have a single loop within the Seaport District (for a total of two routes operating) (Gu, Kladeftiras, Mohammad, & Xuto, 2014).

More specifically, the previous research proposes to operate the A1+C2 and B2+C2 routes (circled in orange in Figure 5-7) from 7:00 AM – 9:00 AM and from 5:00 PM – 7:00 PM. The A1+C1 and B2+C1 routes would be operated from 9:00 AM – 5:00 PM and after 7:00 PM (Gu, Kladeftiras, Mohammad, & Xuto, 2014). The Seaport loop separation during the peak periods would allow for more direct service and increased capacity, while the singular Seaport loop during the off-peak periods would improve circulation within the Seaport District (Gu,

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<sup>51</sup> This is with a number of improvements and operational adjustments, including eliminating the SL2 in favor of increasing service between South Station and Silver Line Way, and replacing SL2 service with surface bus service. This scenario, for example, would increase Silver Line capacity to 3,730 passengers per hour at the peak load point. Other scenarios could result in even greater estimated capacities (e.g., not including the desired Silver Line route to Chelsea, which would allow additional buses to be used in the South Station – Silver Line Way corridor). See (Gu, Kladeftiras, Mohammad, & Xuto, 2014).

Kladefiras, Mohammad, & Xuto, 2014). The total estimated cost of operating this service at \$145/hour and for 250 days per year would be \$4.2 - \$4.6 million (Gu, Kladefiras, Mohammad, & Xuto, 2014). For sake of comparison, estimated existing private shuttle costs are around \$9.3 million with a private operating cost of \$95/hour for 250 days per year, with estimated service levels of over 390 private bus-hours per day.<sup>52</sup>

Alternatives	Service Area	Public transport Access	Stops	Cycle Time	Headway	Fleet size	Projected Demand	Capacity
<b>North Station Connection</b>								
A1+C1	Full seaport area		North Station, Aquarium, South Station, Vertex, WTC, Design Center, John Hancock, Channel Center	60 min	5 min	12	533	636
A1+C2 (Northern loop)	North Sub-area	North Station, South Station Commuter Rails, Blue Line, Orange Line north and Green Line north	North Station, Aquarium, South Station, Vertex, WTC, Design Center, John Hancock	50 min	7.5 min	7	368	424
A1+C2 (A Street loop)	A Street Corridor		North Station, Aquarium, South Station, Channel Center, Point Channel	40 min	10 min	4	165	318
<b>Back Bay &amp; Copley Connection</b>								
B3+C1	Full seaport area	Red Line, Green Line south, Orange Line south, Back Bay area	Broadway, Copley, Back Bay, Channel Center, Point Channel, John Hancock, Design Center, WTC, Vertex	70 min	7 min	10	400	454
<b>Boylston-Chinatown Connection</b>								
B2+C1	Full seaport area		Boylston, Chinatown, South Station, Vertex, WTC, Design Center, John Hancock, Channel Center	60 min	6 min	10	400	530
B2+C2 (Northern loop)	North Sub-area	Red Line, Green Line south, Orange Line south	Boylston, Chinatown, South Station, Vertex, WTC, Design Center, John Hancock, Channel Center	50 min	8 min	7	300	398
B2+C2 (A Street loop)	A Street Corridor		Boylston, Chinatown, South Station, Channel Center, Point Channel	40 min	15 min	3	100	212

**Figure 5-7. Summary of Seaport Shuttle Consolidation Alternatives**

*Source: Adapted from (Gu, Kladefiras, Mohammad, & Xuto, 2014, p. 148)*

Moreover, operating a consolidated service (of two to four routes) would make it significantly easier to coordinate technological integration with the MBTA. With a fleet size of just over twenty vehicles, and with at most four (but likely one or two) operators, this integration would be very similar to what was previously discussed in Section 5.1.2. The MBTA or MassDOT would be able to work with one (or a few) operator(s) to integrate these routes in a similar fashion to what has been proposed with the M2 Shuttle and EZRide in sections 5.1.3 and 5.1.4. Technological integration could even be established as part of any contract criteria for the shuttle consolidation.

<sup>52</sup> For estimates of daily privately operated bus-hours, see (Gu, Kladefiras, Mohammad, & Xuto, 2014, p. 85).

### 5.3.3 Institutional Stakeholders

A number of different stakeholders would be interested in increasing transit service through private operators in the Seaport. Among these would be the MBTA, MassDOT, Massport, Commonwealth of Massachusetts, City of Boston, district employers, and existing private operators. The interests of each of these stakeholders are discussed in more detail below.

The MBTA and MassDOT have considerable interest in what occurs in the Seaport district. As described above, it is clear that increased transit service to the district will be necessary. Since the MBTA has limited capacity to increase the size of its bus fleet using existing facilities, expanding through the private sector would allow the MBTA to use any available bus fleet capacity for maintaining and increasing service elsewhere. Moreover, it would allow for a sizable service increase at a more rapid pace than if the MBTA were to do so itself. In addition, the separation inherent in contracting through private operators would allow MassDOT to more easily develop alternative funding for these services through the other stakeholders involved. Beyond the motivations specified in Section 5.3.1, the Seaport District also provides MassDOT with an opportunity to significantly increase the transit modal share towards the statewide GreenDOT targets.

Massport is also a significant stakeholder in the Seaport District, and partially funded the South Boston Waterfront Sustainable Transportation Plan in conjunction with MassDOT, the Commonwealth, and the Massachusetts Convention Center Authority (VHB et al., 2015). Massport owns a considerable amount of land in the Seaport, “including the Conley Container Terminal, Cruiseport Boston, and the Boston Fish Pier” (VHB et al., 2015, p. 147). In addition, Massport operates Logan Airport, and depends on the Silver Line (SL1) to transport passengers between downtown and Logan through the Seaport. In summary, improved transit to the Seaport District would not only increase Massport property values, but also improve circulation in the District, which could in turn benefit Massport freight and passenger operations.

Governmental entities are also large stakeholders in the Seaport District’s transit service. Both the Commonwealth of Massachusetts and the City of Boston are expecting the high level of growth in the Seaport and the influx of tax revenues that this growth will provide. If the Seaport is unable to grow, it is unlikely that the employers and residents involved in that growth would choose to relocate elsewhere in Boston, or for that matter, elsewhere in Massachusetts. The employers moving to the Seaport, also known as the “Innovation District,” would be more likely

to expand to other innovation hubs, such as New York City or California. Because of this, both the city and the state have considerable incentives to enable and encourage this development by providing a transit system that has the necessary service and capacity to the Seaport. Failure to do so will result in considerable unrealized increases in tax revenue (for example, the Seaport Square development was expected to generate upwards of \$35 million annually in property taxes alone).<sup>53,54,55</sup> Because of this, the top priority for both the state and city should be to ensure that there is adequate transit serving the district, be it through public or private provision of that service.

Meanwhile, both existing and future employers have a stake in transit service to the district. As the roadways become increasingly congested, employers will need dependable transit to the area in order to be able to recruit employees. Driving will not be a desirable option for many urban employees, and a particular appeal of the Seaport location to perspective employees could be its transit access.

Both existing and future employers would also benefit from their employees taking transit because of the costs of providing employee parking. As the Seaport District grows, the cost of building new parking will continue to increase, and subsidizing parking will become increasingly more expensive than subsidizing transit usage. Financially, both existing and future employers are therefore incentivized to increase their share of employees using transit, and could in turn benefit from improved transit service to the district.

Existing employers can be further categorized into two groups: those that currently contract private shuttle services, and those that rely entirely on the MBTA's services for transit access to the Seaport.

Employers that currently contract private shuttle services do so because they have found the need to supplement the MBTA's transit service for their employees. As described in Section 5.3.2, these employers could benefit financially from consolidating shuttle service with other

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<sup>53</sup> These tax revenues are estimated at \$35 million in property taxes (local), \$3.5 million in hotel occupancy taxes (state), and \$3.7 million in local occupancy taxes (Epsilon Associates, Inc., 2010).

<sup>54</sup> A draft report also estimated the development would generate \$31 million in state sales taxes (Epsilon Associates, Inc.).

<sup>55</sup> Massachusetts Convention Partnership outlines the *annual* economic impact of a new 1000-room headquarters hotel (which could be a small portion of future development in the Seaport District): \$228.1-\$237.9 million in spending, \$3.6-\$4.3 million in income taxes (state), \$5.9-6.8 million in sales taxes (state), \$4.4 million in property taxes (local), \$9.8-10.6 million in occupancy taxes (state and local), over 3,000 construction jobs, and over 1,700 post-construction jobs (Massachusetts Convention Partnership, 2011, p. 033).

employers. This financial incentive is necessary in order for the employers to acquiesce to shuttle consolidation and further integration with the MBTA. Because these employers have willingly funded supplemental transit service for their employees, it would be reasonable to expect that they would continue to willingly contribute to transit service in order for it to be provided at a satisfactory level. The key to shuttle consolidation and public system integration will be to negotiate a balance that satisfies the existing employers' desires for level of service while improving the value of their financial contributions to the shuttle service.

Existing employers that do not participate in private shuttle services would have a different motivation for contracting additional service. Employees of these companies rely heavily on the MBTA for their transit needs, and consequently, will face increasingly difficult commutes as the Seaport develops and crowding on the MBTA worsens. Employees of these companies would benefit from improved public access on transit to the Seaport District. Since these employers do not currently contribute to private shuttle services, they likely have a lower willingness (or ability) to pay for transit improvements than the companies that do contract with private shuttles. In the cases where these employers currently pay for MBTA benefits for their employees, it is possible that they would be willing to contribute to increase the value of those benefits (e.g., a company offering a MBTA pass as a benefit might be more likely to contribute to improve service on privately operated shuttles that are integrated with the MBTA to improve the value of the MBTA pass benefit, even if they may not be willing to independently contract private shuttles themselves).

Future employers could join either of the above groups. However, it is important to note one distinction: existing employers have the opportunity to set requirements for transit contributions of future employers joining the district. Concepts such as a business improvement district or tax increment financing could be instituted by existing employers and apply to future employers. The existing employers have a unique opportunity to directly shape transit's role in future development by leveraging that future development to raise transit contributions and improve transit service in the area. This idea and its applicability to contracted service will be discussed further in Section 5.3.4.

Finally, the existing private operators will be major stakeholders in any consolidation and expansion efforts. With consolidation, operators could face more concentrated competition for

fewer, but more lucrative, contracts. The contractors would also clearly support the idea of service growth through contracting, as doing so would increase their potential revenues.

#### 5.3.4 Financial Possibilities

This section builds on the ideas presented in Section 2.3. Two possible methods to generate funding for transit expansion in the Seaport District would be to create a business improvement district, or to institute tax-increment financing. For both of these, contracting can enhance the credibility and accountability of the additionality of the funding. Each of these mechanisms will each be discussed below:

***Business Improvement District.*** As noted in Section 2.3.2, 60 percent of property owners and 51 percent of the property valuation must approve of the proposed business improvement district in order to create it (M.G.L. §§40O-3). Moreover, the assessed value of the BID cannot exceed 0.5% of the total assessed value within the BID district (Metropolitan Area Planning Council, 2013). In order to raise the \$4.2-\$4.6 million annually required to operate the consolidate routes proposed in Section 5.3.2, the total assessed value in the district would need to be at least \$840-920 million. With over 24 million square feet of development existing in 2013, and an estimated 51 million square feet of development by full build out, the total assessed valuation would be many times this valuation, which would allow for the creation of a BID (VHB et al., 2015).

For example, the built out square footage limited to Office / Research and Development, Retail, Industrial / Manufacturing, Marine Industrial / Manufacturing, Hotel, and Convention land are estimated to constitute about 38.95 million square feet (VHB et al., 2015). To raise \$4.6 million annually would cost only \$0.12 per square foot. For comparison purposes, the property tax on 6.34 million square feet of development for Seaport Square was expected to be about \$35 million annually, or \$5.52 per square foot (Epsilon Associates, Inc., 2010).<sup>56</sup> As this example shows, instituting a BID to raise the funds necessary for the above consolidation would require minimal contributions (as low as an additional 2% of property tax assessments) from

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<sup>56</sup> Note that the Seaport Square development includes a larger proportion of residential development than the rest of the district as a whole. Since residential property is taxed at a significantly lower rate than commercial property in Boston, the property tax per square foot on BID-qualifying properties is likely even higher than \$5.52 per square foot. This also assumes similar property value rates across the district, which may or may not be accurate since the Seaport Square properties are closer to the city. Based on these tradeoffs, the stated amount would appear to be a fair approximation.

participating businesses. With the commercial and industrial property tax assessment rate at about 3% of assessed value in the City of Boston, this would call for BID contributions of only 0.06% of total assessed value, well under the 0.5% threshold.<sup>57</sup>

Instituting a BID would require support from the existing businesses. Companies that currently contract private shuttles would find the minimal contributions to be less than their current costs to contract service. Meanwhile, companies that do not contract service might be more willing to do so at this low shared cost. Another advantage to existing companies of creating the BID is that it would lock in contributions from companies moving to the Seaport in future years. The BID would not only be able to fund the entire consolidated shuttle service proposed in Section 5.3.2, but could also support increasing levels of transit improvements.

For example, based on the aforementioned 38.95 million built-out square feet of total non-residential development, and the estimated assessment rate of \$5.52 per square foot developed above, estimated property taxes would generate about \$215 million annually. A BID that generated an additional 5% on top of this, for example, could spend \$10.75 million annually – which would allow for over \$6 million of improvements beyond the consolidation proposed in this section. Again, increasing private sector involvement can help improve the Seaport District, but should be considered *in conjunction* with other improvements that could be made.

Furthermore, if the BID were to fund increased transit service and shuttle consolidation, labor would have only weak Pacheco challenges. Because there would be considerable (or full) private funding, it would be a clear separation from service that would otherwise be provided by public employees. It would not be service provided *in lieu of* publicly provided service, rather, it would be service provided as an *extension* of publicly provided service.

Because the BID would raise money specifically to provide increased transit service to the area, contracting this service through MassDOT, the MBTA, or Massport (i.e., in a similar role as the Charles River TMA with EZRide) could allow the service to be integrated with the MBTA while maintaining a clear relationship between the funding and the service offered. As discussed in Section 4.1.2, using a BID should not be constrained by Prop 2½ because of the BID's differentiation from a property tax.

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<sup>57</sup> The FY 2015 property tax rate for commercial, industrial, and personal property in the City of Boston was \$29.52 per \$1000 total value, or approximately 3% (City of Boston, 2015).

***Tax Increment Financing.*** Tax increment financing could raise the funds to support the system from expected future property tax revenues. Although this development is already planned, the TIF could be based on the argument that the new development (or a portion of it) would not happen without transit improvements. Because of that, even if the transit improvements were to lead to small incremental increases in property tax valuations and assessments on existing properties, the entire valuation of the new development (or the portion that would not be supported without transit improvements) would count towards the tax increment. In this way, the tax burden would not increase on the existing employers, but would instead guarantee that revenues from future development would be used to support transit in the Seaport (instead of different improvements that might be in other parts of Boston). Because of that, this option may be favored by existing employers.

Similar to with the BID, \$4.4 million in annual operating costs would require only a small portion of a tax increment in the development that improved transit would generate. Larger revenues from TIF could be used to allow for even greater transit improvements and increased frequencies.

If using this option, the additional money would likely need to go through MassDOT in order to avoid increasing Boston's assessment to the MBTA by more than the allowed 2.5%. Similar to the situation with the BID above, MassDOT could use this additional revenue to contract service integrated with the MBTA, instead of operating it through the MBTA (which would not meet the legal requirements). It should also be noted that using a TIF might require an override, as discussed in Section 4.1.2.

## **5.4 Summary of Possible Ways of Increasing Coordination with Existing Private Service**

This chapter built increasing levels of public-private coordination for expansion of public access to transit in Boston. Because the MBTA is at or approaching capacity, increasing coordination with existing private service would allow for increased service levels on transit accessible to the public. The first section of this chapter examined how this could occur through simple integration of existing private routes such as EZRide and the M2 Shuttle; the second section proposed a new route similar to the existing EZRide route that could be operated in conjunction with it; and finally, the third section proposed route development through a full



private shuttle consolidation in the Seaport, which could also continue to be funded through the private sector or through future economic growth. Furthermore, the increasing levels of cooperation with the private sector proposed in this chapter would allow for incremental increases in private sector involvement.



## **6 Other Opportunities to Expand through Increased Private Sector Involvement**

### **6.1 Vehicle Size Restrictions**

Another way that the private sector can help public transit systems expand is by operating different types of vehicles than the public agency is able to operate. One example of this applies when an agency operates only full-size buses, but could better serve the public by operating some lower-capacity vehicles on routes with lower ridership. Although this idea was proposed in Section 3.1.2, it is presented in more detail in this section. First, this research will examine the theory behind this idea; second, it will apply this theory to an example opportunity for the MBTA to contract the use of smaller vehicles from a private operator.

#### **6.1.1 Theory Revisited**

The idea of contracting operations of private vehicles through private operators in order to better serve the public is not unique to this research. As previously mentioned in Section 2.4.3, agencies such as RTD in Denver have contracted with the private sector to provide service on smaller vehicles than the agency would normally operate. Locally, this idea has also been suggested by a public policy research group in a proposal containing numerous ideas to reform the MBTA. Among the reforms, the group proposed bus service restructuring: “The T should have the flexibility to engage small vehicle private operators to ensure that those who need service can get it without engaging a full bus at the full cost of an MBTA driver” (Pioneer Institute of Public Policy Research - Editorial Staff, 2015).

Although the above quotation references the benefits of contracting smaller vehicles in terms of costs, this section examines the other benefits in doing so. In an agency such as the MBTA, where all buses are full-size vehicles, the experience and facilities are both geared towards those full-size vehicles. As such, a private operator might be more experienced than the public agency with operating smaller vehicles and have the facilities needed to maintain and store them.

Because the MBTA only has the facilities and experience with operating full-size buses, it necessarily operates full-size buses even on routes or during periods that do not have the ridership to justify the use of full-size buses. Buses from these routes and periods could be used

to support high-ridership “key bus routes” and increase service frequency on these routes. Meanwhile, service on the lower-ridership routes could be replaced by increased frequency delivered from smaller vehicles.

Another important facet of this vehicle assignment adjustment is the concept that the MBTA is at or approaching the capacity of its maintenance facilities and storage depots. It is unlikely that the MBTA has the capacity in the short-term for additional buses that would increase service frequency on the high-ridership routes. Reassigning vehicles from existing low-ridership to high-ridership routes could provide this increased frequency on the high-ridership routes. In order to then provide a similar or improved level of service on the low-ridership routes, the agency could contract the service from private operators. This reallocation of resources allows the agency to more appropriately provide service and expand where necessary.

### **6.1.2 Example Pilot Opportunity: Seaport Routes #4 and #7**

The opportunity suggested in this section can build off of the ideas developed in Section 5.3 regarding improving transit service to the Seaport District. As mentioned in Section 5.3, transit service in the Seaport is rapidly approaching capacity, which may hinder the proposed growth in the district. In addition to the private shuttles previously discussed and the Silver Line service, the MBTA does offer two bus routes through the Seaport: Routes #4 and #7.

As illustrated in Figure 6-1, Route #4 runs between North Station and the Seaport. In the AM service, trips from North Station pass near South Station before serving the Northern Avenue corridor in the Seaport. Return trips from the Seaport to North Station use the Summer Street corridor, and provide direct service to South Station and Aquarium en route to North Station. During PM service, this pattern is reversed (e.g., the PM outbound trip from the Seaport to North Station uses a route similar to the AM inbound trip). Because of these trip patterns, the route is mainly designed as a North Station – Seaport commuter route. The route is essentially a loop that reverses the loop direction in the AM and PM, which could cause confusion for customers and contribute to the low levels of ridership. Service is also fairly irregular, as it is provided only during the peak periods (with ten AM trips from 6:25 – 9:23 AM, and nine PM trips from 3:30 – 6:51 PM). Headways range from 12 – 24 minutes.

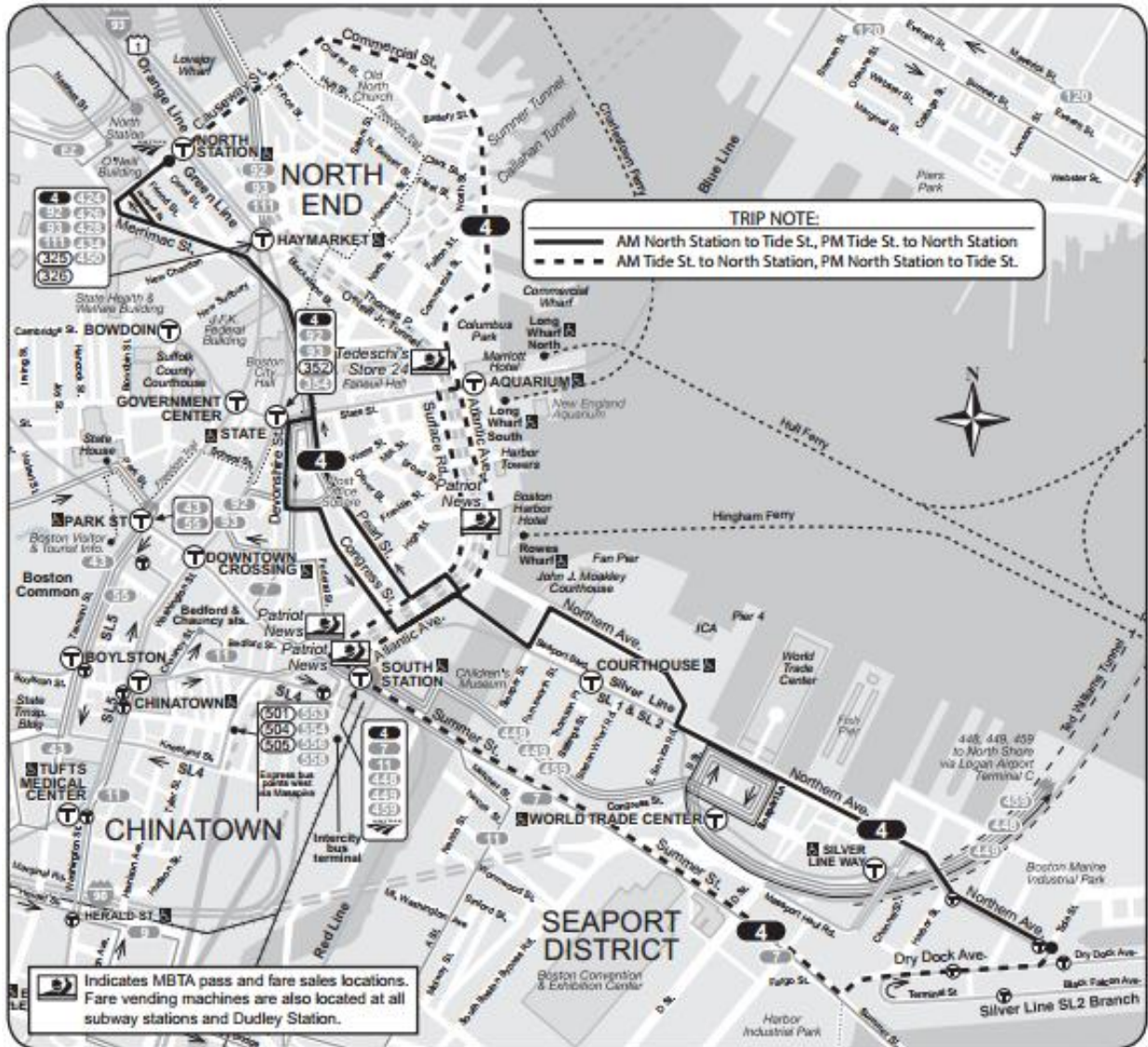


Figure 6-1. Map of MBTA Route #4 Service

Source: Reproduced from (Massachusetts Bay Transportation Authority, 2015c).

On the other hand, Route #7, illustrated in Figure 6-2, provides high-frequency service between South Station and City Point (South Boston) via the Seaport’s Summer Street corridor. During the AM periods, this route has a higher frequency in the inbound direction from City Point to South Station than it does in the outbound direction, and has more equal service between the two directions in the PM periods. For example, in the period from 7:00 – 9:00 AM, 32 trips depart City Point for South Station (an average of 3.8 minute headways), while 22 trips depart South Station for City Point (an average of 5.5 minute headways). In the period from 4:30 –

6:30 PM, 18 trips depart City Point for South Station and 19 trips depart South Station for City Point (an average of 6.7 and 6.3 minute headways respectively).

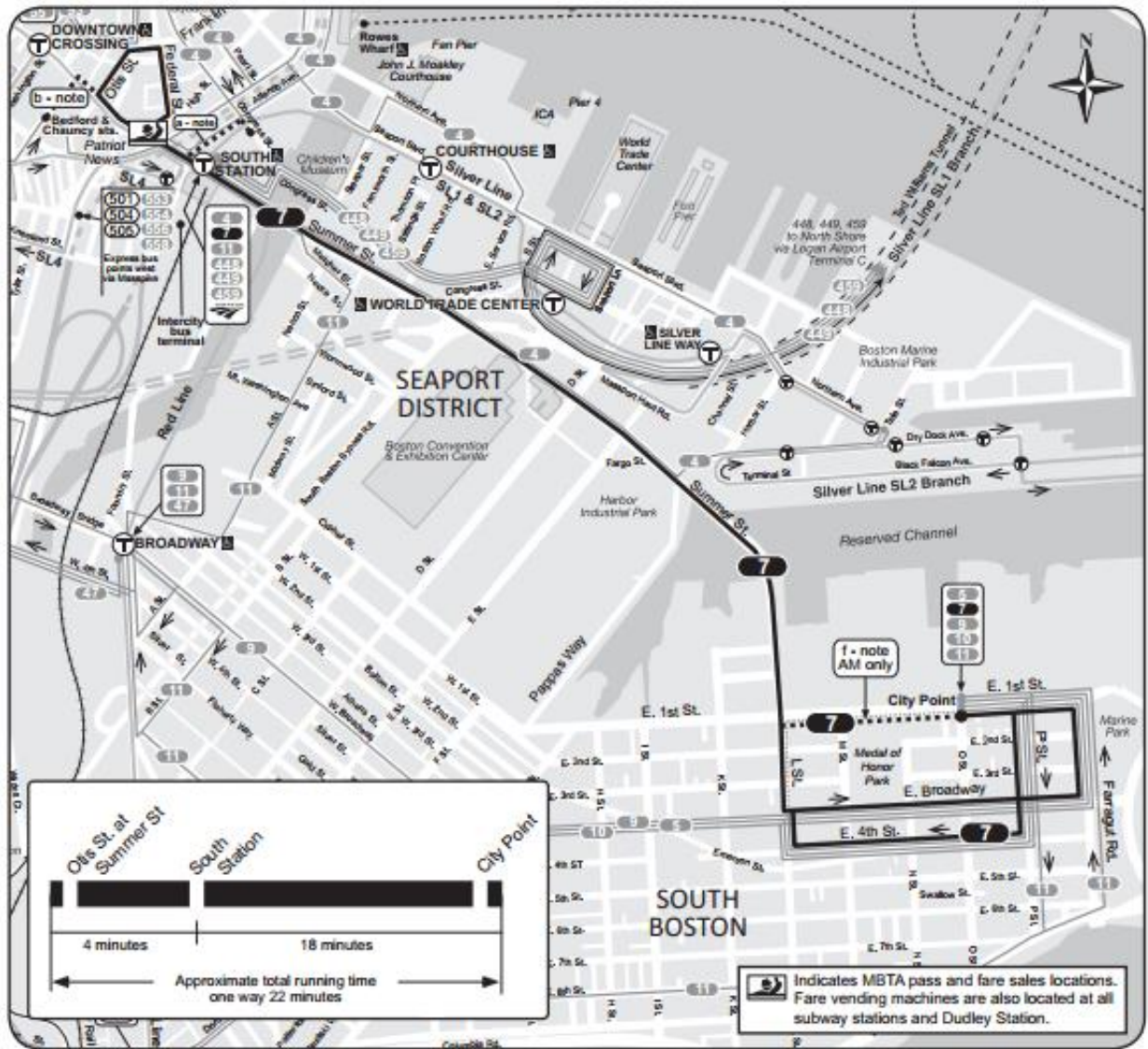


Figure 6-2. Map of MBTA Route #7 Service

Source: Reproduced from (Massachusetts Bay Transportation Authority, 2015d)

As previously demonstrated in Table 5-8, Route #7 currently has demand of 112% its seated capacity and 74% of its maximum capacity in the peak hour between South Boston and the Seaport (VHB et al., 2015). Route #4, meanwhile, has demand of only 65% of its seated capacity and 46% of its maximum capacity in the peak hour and direction.

This leaves an opportunity for the MBTA to provide service on Route #4 using smaller vehicles, as even peak demand is less than half of the routes' maximum capacity. The full-size

vehicles currently serving the route could be shifted to accommodate passengers on Route #7 and increase the capacity on that route.

Scheduled running times on Route #7 are a maximum of 33 minutes during the AM Peak (22 minutes inbound and 11 minutes outbound), and a maximum of 34 minutes during the PM Peak (16 minutes inbound and 18 minutes outbound). Based on these scheduled running times, a conservative cycle time estimate would be 45 minutes. In the peak of the peak, the MBTA operates three buses on Route #4 concurrently. A rough calculation of using these three buses on route #7 with estimated cycle times of 45 minutes leads to increased Route #7 service of four buses per hour.

In the two-hour period from 7:00 – 9:00 AM, this increase in frequency of four buses per hour could result in an increase in eight trips serving the Seaport. This would decrease average headways during the period from 5.5 minutes to 4 minutes in the South Station – City Point direction, and from approximately 3.8 minutes to 3 minutes in the City Point – South Station direction. Similar calculations for the PM period of 4:30 – 6:30 PM would result in an increase from 18 to 26 City Point – South Station trips (with a decrease from 6.7 to 4.6 minute average headways) and 19 to 27 South Station – City Point trips (with a decrease from 6.3 to 4.4 minute average headways).

In terms of capacity, an increase of four buses per hour would provide an additional 156 passengers of seated capacity and 220 passengers of maximum capacity per hour.<sup>58</sup> This would increase the peak hour – peak direction totals for Route #7 to a seated capacity of 741 passengers per hour and a maximum capacity of 1100 passengers per hour.<sup>59</sup> This would more comfortably accommodate the existing peak demand of 654 passengers per hour, and would even accommodate the estimated demand in 2035 of 826 passengers per hour (at 75% of maximum capacity) (VHB et al., 2015).

For Route #4, private shuttles could operate with three vehicles and maintain at least the same frequencies as the existing MBTA route. To operate the three vehicles over the same span

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<sup>58</sup> Route #4 is operated out of the Cabot garage, which largely operates NABI CNG buses with seated capacity of 39 passengers and planning capacity of 54 passengers. Based on the South Boston Waterfront capacity estimates, an estimated five peak hour / peak direction trips on Route #4 resulted in a seated capacity of 195 and maximum capacity of 275, implying a maximum capacity of 55 passengers per bus. For consistency, this figure of 55 passengers per bus is used for the maximum capacity calculations (Massachusetts Bay Transportation Authority, 2014c; VHB et al., 2015).

<sup>59</sup> For estimates of existing capacity, *see* (VHB et al., 2015, pp. 55-56).

of service as the existing Route #4 would cost just over \$1800 daily, and about \$451,000 annually (assuming service over 250 weekdays), at a cost of \$95 per bus-hour. This level of service would equal that provided by the MBTA during the peak periods, and would improve on the level of service outside of the peak periods (when the MBTA uses fewer than three vehicles to operate the route). Moreover, it would be possible to contract this service under the Pacheco Law cost threshold to avoid a Pacheco Law review. Doing so would require an unusual contract structure, however, such as a one-year term (likely with the agency providing the vehicles).

Furthermore, operating Route #4 as a contracted shuttle could serve as a transition to the shuttle consolidation proposed in Section 5.3. It would allow for existing MBTA ridership to adjust to the idea of contracted service and smaller vehicles before the full implementation of consolidation.

From the contractor perspective, this opportunity might not be significant enough to warrant a bid. Although it would give a private operator the chance to provide service prior to consolidation (and could in turn provide insight to operating a consolidated service in the area), the contract would still be fairly small to the operator. If this becomes an issue, the MBTA could group the contract with similar opportunities in other areas to increase the size of the contract and increase the level of competition for the contract.

Overall, this opportunity would allow the MBTA to reassign vehicles from a low-ridership route to a high-ridership route while maintaining a similar level of service on the less utilized route (at a minimum). It also provides the MBTA with additional flexibility going forward to adjust the level of service on the low-ridership route. Contracting the route would allow the operator to adjust the route to remove the loop and rationalize it from the passenger perspective. It could also allow for more flexibility, with possible further pilots testing alternative routing (e.g., continuing to Andrew Square for a connection with the southern portion of the Red Line)

This opportunity could serve as a transition to future shuttle consolidation in the Seaport District. Future consolidation would likely produce a similar route and would lead to significantly increased service on that route. As discussed in Section 5.3, this consolidated route could have a strong level of agency involvement with significant agency funding, or could maintain a higher level of independence while still integrating with the MBTA to allow for increased public access.



More generally, agencies can take advantage of contracting service from private operators to provide a similar or greater level of service with smaller vehicles on lower ridership routes. For systems approaching maintenance and storage facility capacity, this then provides an opportunity to reassign existing vehicles to higher ridership routes to better serve those routes.

## **6.2 Funding Private Operator Vehicle Procurement (Urban BusPlus)**

The BusPlus program provides another model that MassDOT and the MBTA could use to increase transit service through private contractors. Although the existing BusPlus model applies to service contracted by MassDOT for non-urban areas, a similar model could be used in urban areas. This section will more closely examine both phases of the existing BusPlus model, and consider how it could be applied to urban service.

### **6.2.1 Understanding the Initial BusPlus Program**

The BusPlus program began in 2013 as a replacement of the Intercity Bus Capital Assistance Program (Massachusetts Department of Transportation - Rail & Transit Division, 2015b). Funded by a FTA State of Good Repair grant, private operators applied to MassDOT for the provision of regional buses. MassDOT provided this capital and in return received a regional service improvement from the private operators, which also took full responsibility for operating and maintenance costs (Massachusetts Department of Transportation - Rail & Transit Division, 2015b). The first stage of the program resulted in approximately 30 new BusPlus vehicles in service by the end of 2014.

This program structure allowed MassDOT to secure transit improvements in exchange for capital costs. MassDOT prioritized its selections based on the quality of improvement: creating a new route or reestablishing a previously existing route was prioritized above route expansion, which was prioritized above increased route frequency (Massachusetts Department of Transportation - Rail & Transit Division, 2015b).

Contract terms called for a trial period with successive 2-year renewals for a total of 12 years. MassDOT is protected from capital loss in the sense that an operator that cancels the contract prior to the conclusion of the 12-year period must pay the difference between the bus purchase price and the current market value. Then, at the end of the 12 years, the bus is either returned to MassDOT to be auctioned or purchased by the operator at market value (Massachusetts Department of Transportation - Rail & Transit Division, 2015b).

Technologically, the program also required that operators provide General Transit Feed Specification (“GTFS”) data, along with the use of smartphone ticketing applications. Both of these requirements could make such a program more easily able to integrate with existing MBTA systems.

The BusPlus program was structured in such a way that the state could receive a service improvement over an extended period of 12 years at the one-time capital cost of purchasing the vehicles. The competitive nature of the program was intended to allow for the state to receive the maximum level of improvement that operators were willing to provide in exchange for a bus. The operators, however, may have identified improvements below their maximum willingness if they believed that these smaller improvements would be sufficient to obtain a bus from MassDOT.

MassDOT has since adjusted the BusPlus model, with further details and discussion of the adapted program in Section 6.2.2.

### **6.2.2 The BusPlus Program Continuation**

MassDOT chose to continue the BusPlus program in 2015. Since federal money was no longer available for the program, it will fund the improvements using state money (Massachusetts Department of Transportation - Rail & Transit Division, 2015a). A significant change in the program is that MassDOT has now specified its desired improvements and the number of buses that an operator would receive for each improvement (Massachusetts Department of Transportation - Rail & Transit Division, 2015a). Furthermore, MassDOT decided to fund not only capital costs, but also operating costs in this second phase of the BusPlus program. Operators are still responsible for vehicle maintenance and storage (Massachusetts Department of Transportation - Rail & Transit Division, 2015a). The changes in the program are worth further discussion in Section 6.2.3 when applying the BusPlus program to an urban setting.

MassDOT specified four service improvements, of which only one is a commuter improvement in the Boston area (Massachusetts Department of Transportation - Rail & Transit Division, 2015a):

- 1) Worcester, MA – Fitchburg, MA – Amherst, MA – Northampton, MA
- 2) Springfield, MA – Greenfield, MA – North Adams, MA – Troy, NY – Albany, NY

- 3) Boston, MA – Keene, NH – Bellows Falls, VT – Rutland, VT
- 4) Marlborough, MA – Boston, MA

The first three routes would each receive three coaches from MassDOT, while the Marlborough – Boston commuter route would receive a single coach from MassDOT. MassDOT also required that operators have two daily scheduled round-trips on each of the routes, for weekdays only on the Marlborough – Boston commuter route and for all days on the other three routes (Massachusetts Department of Transportation - Rail & Transit Division, 2015a).

In addition to providing the schedule, MassDOT specifies the fares for each of the first three services, with only the Marlborough – Boston commuter route operator able to specify fares (Massachusetts Department of Transportation - Rail & Transit Division, 2015a).

Similar to the first phase, BusPlus contracts have two-year terms with MassDOT options for subsequent two-year terms up to 12 years in total (Massachusetts Department of Transportation - Rail & Transit Division, 2015a). Similar terms regarding bus purchase at the end of the period apply as in the first phase. In this phase of the BusPlus program, MassDOT will fully subsidize all operating costs for the service improvements on a per revenue mile basis (Massachusetts Department of Transportation - Rail & Transit Division, 2015a). In addition, MassDOT will provide an administrative fee to the operator, which can total up to 10% of the proposed operating costs (Massachusetts Department of Transportation - Rail & Transit Division, 2015a). MassDOT and the operator then split evenly any ticket sales revenue that exceeds the agreed upon administrative fee (Massachusetts Department of Transportation - Rail & Transit Division, 2015a).

The shift to subsidize operations is an important distinction from the first phase of the program. The strategies from both phases could be useful for future applications to the Boston area, but subsidizing operations could be required in an urban application. This mechanism increases private interest due to the increased subsidization, which allows the government to specify operations on a route that might not otherwise be profitable.

The revenue sharing arrangement proposed in the second phase of the BusPlus program further links the operator incentives to those of the agency. One of the agency's main stated goals is to increase ridership in order to work towards the GreenDOT targets. By providing the

operator with a full 50% of revenues above the administrative fee (which is at most 10% of operating costs), the operator is highly incentivized to increase ridership.

Finally, the program relieves MassDOT from maintenance and storage issues, as the operator is fully responsible for providing an acceptable level of maintenance (subject to MassDOT inspection) and for vehicle storage. This is significant in that it allows MassDOT to increase service through vehicle procurement and subsidization, even when MassDOT does not have the maintenance and storage capacity available to increase service. This could be particularly applicable to an urban application of the BusPlus program, as described in Section 6.2.3.

### **6.2.3 BusPlus Concept Applied to an Urban Variation**

There are a few ways that the BusPlus program could be applied to an urban context. First, there is the idea that MassDOT could provide capital funding in exchange for operating a service improvement. This could be done through either a MassDOT-specified service improvement or through an operator-proposed service improvement. Second, there is the concept that MassDOT could have greater flexibility in specifying service improvements by combining capital subsidies with operating subsidies in order to entice private companies to operate the specified route. It is important to consider the effects of each of these options.

It is also important to note that any urban BusPlus program should be integrated with the MBTA system. There should be a technological requirement in place that BusPlus operators install the necessary equipment to allow riders to use MBTA fare media. There could also be fare integration – for example, requiring that the fare on the privately operated routes be set equal to the standard MBTA bus fare.

An urban BusPlus program could be highly desirable for MassDOT, especially if private operator demand allows MassDOT to specify urban service and a complete operating plan. Since service in urban corridors would likely have greater ridership and revenue potential than the non-urban regional routes from the BusPlus program, it is reasonable to expect that the program would develop this demand from the private operators because of the possible private operator profit.

In other cases, providing only a capital subsidy could allow private operators to identify and fill gaps in service that would allow them to earn a profit. Because the Central

Transportation Planning Staff (“CTPS”) has a regional transportation model, it could potentially incorporate new routes into that model in order to estimate the ridership effects of the new routes. This could then create an opportunity where MassDOT could competitively select proposals based on the estimated increase in system ridership (along with other factors that could be negotiated, such as a revenue share for MassDOT). This would allow MassDOT to progress towards its GreenDOT modal share target.

There would be clear benefits in each of these options in that MassDOT could grow quickly through the private sector without needing to find maintenance or storage facility space. There could be further benefits in allowing for operator innovation in specifying a service, although MassDOT would lose some control in doing so. If more control over the system is desired, then specifying service improvements might be necessary, although it might require including some level of operations subsidization in order to attract private operator demand. It is also possible that a combination of MassDOT-specified and operator-proposed service could be beneficial in order to allow for innovation in route development while also meeting MassDOT goals in specified locations.

In each of these instances, MassDOT could negotiate a revenue share if there is adequate operator demand to participate in the program. One format, for example, could be similar to the operating subsidy given by MassDOT in the regional BusPlus program. In this example, MassDOT could recoup  $x\%$  of revenues above an operator’s proposed operating costs and administrative fee. This could offset some of the capital costs associated with the bus purchases or the operating subsidies if they are given to private operators. This is important in that it could offset the main disadvantage of contracting these routes for MassDOT, which would be losing all route revenues to the private sector. This is especially true on higher ridership routes. It is essential to reemphasize that regardless of how this revenue is shared between the operator and MassDOT, a BusPlus type of program applied to an urban setting would allow MassDOT to encourage service improvements without the ability or the necessary facilities to operate that service itself.

### **6.3 Contracting Vehicle Maintenance and Storage while Continuing to Directly Operate Vehicles**

A final idea to consider is for the agency to continue to operate vehicles while contracting to a private company the maintenance and storage of those vehicles. This could be attractive to agencies with strong labor unions, such as the MBTA. The main concept behind this is that it would provide a compromise with labor by allowing for continued agency labor growth while alleviating facility capacity constraints.

In regards to the storage and maintenance facility capacity constraints, this proposal would have similar benefits to some of the methods mentioned in previous sections. It would allow an agency without the facility capacity for growth to avoid that issue by working with the private sector. Although this could still trouble labor unions comprised of maintenance staff, this is a necessary step for rapid continued growth at facility-constrained agencies such as the MBTA.

The benefit of this method is that it limits what work is issued to the private sector. This allows for increased growth for labor unions as the number of operators required to operate the system increases. Take, for example, two imagined scenarios:

- 1) An agency with minimal maintenance and storage facility capacity, which would allow for a 20-vehicle increase over the next five years. This could in turn result in an additional 20 maintenance staff (or possibly no additional maintenance staff, only heavier workloads on the existing maintenance staff) and an additional 60 operators, for a total increase of 80 employees; or
- 2) An agency with minimal maintenance and storage facility capacity that contracts new maintenance and storage responsibilities to a private operator, which would allow for a 100-vehicle increase over the next five years. These vehicles will be maintained and stored by the private company, and the only staff increase to the agency is the operators driving these vehicles. However, this could be an increase in union membership of 300 operators (if using the same 3 operators per 1 vehicle rate as in scenario 1).

In the above example, the second scenario would result in an increase in union membership almost four times greater than in the first scenario. Because of this, unions might support contracting maintenance and storage facility work when an agency is at capacity, as it

could lead to an overall greater increase in labor union membership. It is important to consider, however, that maintenance and operating personnel are often in different unions, and these different union interests are important to consider. Although the numbers in this example are not specific to a real-world case, they are a representative example based on the idea that an agency contracting maintenance and storage to a private firm should be able to operate a larger number of vehicles than if maintenance and storage were provided within the agency, and this increase in fleet size might in turn increase union membership.

From the MBTA's perspective, this arrangement would remove one of its main constraints for growth by allowing the agency to grow as quickly as private companies can provide facility space. The MBTA could acquire maintenance and storage facility capacity through these private companies without the need to go through a lengthy public process. A contract could also guarantee to the MBTA that  $x$  privately-maintained buses would be available to it to operate every day (e.g., with the private company responsible for providing  $x$  functional buses, shifting risk related to spare vehicle requirements onto the private company as well).

There would be further benefits to the MBTA in its ability to integrate service better with other MBTA operations. Having MBTA operators on the privately stored vehicles would give the MBTA more flexibility in operations – for example, the MBTA might be able to interline between routes where appropriate.

This model would also be highly sustainable in that the MBTA would not need to become highly dependent on specific private companies for its operations. If one private company were to fail to properly store or maintain the vehicles, there would inevitably be other private companies that could take their place. By keeping daily operations within the agency and outsourcing only maintenance and storage, the MBTA would limit the amount that it depends on the private sector and would allow for significant substitutability between private firms (and therefore higher levels of competition). It is important to note, however, that once this opportunity is taken, it might be difficult to contract out operations. To avoid this, it might be good to simultaneously offer some full-service contracts instead of solely contracting maintenance and storage.

Because the private companies would not be operating the buses, they might require a greater profit margin on the maintenance and storage component. This could occur since the vehicles are taking up private facility space that could otherwise be used for maintenance,

storage, *and* operations. On the other hand, the high level of substitutability (discussed in the previous paragraph) could create competition that would nullify this effect. Either way, this provides an option for the MBTA to increase service in spite of facility capacity constraints.

Although this research proposes increased private sector involvement in multiple phases of operations, this method could serve as an intermediate step in increasing private sector involvement. It minimally affects existing public employees, retains significant public control, and continues to allow for growth. While it may not be the most desirable outcome in the long-term because of the additional benefits offered by some of the previously discussed strategies, it could serve as a useful step while transitioning towards even greater private sector involvement in public transit service in Boston and elsewhere.



## 7 Conclusion

### 7.1 Summary of Contracting for Growth

In Chapter 1, this thesis introduced the motivation, research approach, and organization of the research. Chapter 2 presented background information on public-private relationships in public transportation, including information related to literature, government programs, financing, and experiences both domestically and internationally. Because this thesis is focused on how the private sector can help constrained public transit agencies grow, Chapter 3 then described ways in which the private sector can alleviate some of these constraints, including those related to infrastructure, equipment, institutions, finance, and costs.

The following chapters began to apply these ideas to the MBTA and public transit in the Boston area. Chapter 4 examined more closely constraints specific to the MBTA in order to better understand how the private sector can help growth in Boston. Concrete ideas were then presented in Chapter 5 related to better coordinating service with existing private operators. These ideas included various degrees of private sector involvement, from increasing public access on existing private routes to the larger variation of consolidating existing private shuttles to supplement MBTA service in a rapidly growing region. Finally, Chapter 6 presented other opportunities to expand through the private sector, including operating smaller shuttles through the private sector, creating an urban variant of the Massachusetts BusPlus program, and contracting only vehicle maintenance and storage.

Again, this research does not propose increased private sector involvement for cost purposes as has traditionally been the subject of debate, although cost benefits may also be realized. Instead, it views contracting as a means for growth when an agency is facing various constraints.

This view is particularly relevant to physical constraints, including those related to infrastructure and equipment. In the case discussed in this research, the MBTA has historically contracted only an extremely limited amount of service to the private sector, but now faces physical constraints such as limited capacity at maintenance and storage facilities along with increasing levels of crowding on agency vehicles.

As described in the second half of the thesis, the MBTA has opportunities to increasingly work with the private sector to alleviate these constraints and continue to grow. This is

especially important in rapidly growing parts of the city, such as the Seaport District and Kendall Square, although it is also applicable to service throughout the city. Although the MBTA also faces significant financial and institutional constraints, such as high levels of debt and limiting labor legislation, contracting service would present opportunities financially and institutionally in ways that agency-operating service would not.

Coordinating with existing private service could allow the MBTA to work more closely with major area employers in growth districts. It could be possible, for example, to institute a business improvement district or tax increment financing in the Seaport District if employers in the Seaport would approve such a measure. This could allow for the MBTA to contract private service in order to provide higher levels of transit service for those employers at a lower cost than the status quo. The MBTA could also integrate technologically with these private routes to increase its effective network size and provide improved public access across the existing transit network.

## **7.2 Massachusetts' Pacheco Law Revisited**

One of the major institutional constraints facing the MBTA is the Pacheco Law, as described in Section 4.3.2. The Pacheco Law limits agency contracting to cases where the MBTA can prove that service could be provided privately at equal quality and at a lower cost than the most efficient public cost of public provision. The opportunities addressed in previous chapters have differing degrees of Pacheco applicability and concern, which is addressed in Section 7.2.1.

### **7.2.1 Application to Cases Discussed**

The language of the Pacheco Law should allow for the MBTA to work with existing services in order to increase public access. Per the explanation in Section 4.3.2, the MBTA could contract for bus operations without a Pacheco Law review if the MBTA had not previously operated a directly similar route.

In the case where the MBTA is contracting to gain access with an existing private route, as described in Section 5.1, it is likely doing so because it is unable to (a) add service to a similar route, or (b) develop a similar route. In this case, increasing the level of public access to the existing private route through integration with the MBTA is a service improvement that the

MBTA does not have and would not otherwise pursue, and as such, should not be challenged under the Pacheco Law.

Specific to adding service to the M2 route, discussed in Section 5.1.3, the Pacheco Law should not apply because the route is a pre-existing private route that has not been publicly operated and likely would not be publicly operated. The M2 route differentiates itself from the MBTA #1 route by serving the Kenmore Square, Fenway, and Longwood areas, while Route #1 instead serves the Massachusetts Avenue corridor in Boston, Boston Medical Center and Dudley areas. The M2 route would further differentiate itself from existing MBTA service in its express nature – the MBTA service along the corridor stops far more frequently than the M2; categorizing the M2 as an “express” bus could therefore provide an additional level of differentiation.

Similar arguments can be made for increasing public access to the existing EZRide route, discussed in Section 5.1.4. The Pacheco Law should not apply because the route is a pre-existing private route that has not been publicly operated and likely would not be publicly operated. It is important to note, however, that MBTA labor might still object to EZRide integration with the MBTA. It is possible that would be only a minor objection, eased in part by the EZRide operator, Paul Revere Transportation, already working with unionized labor (albeit, different unions). MBTA unionized labor might still be unhappy with the increase in contracted service. In spite of this objection, it is important to note that there would be no loss in MBTA unionized employment as a result of pursuing this opportunity – again, the opportunity is targeted at increasing service and not cutting costs at labor’s expense. Integrating services would be unlikely to significantly affect MBTA labor; it would also provide connected MBTA services with more revenue and ridership, leading eventually to more MBTA union jobs. Because of this, the route would be a good place to start with increasing private sector involvement.

The MBTA also does not currently offer service similar to the Sullivan – Kenmore route proposed in Section 5.2. The MBTA does connect Sullivan to Kendall on the bus route #CT2 but does not do so via Lechmere. It also connects Lechmere to Kenmore on the Green Line, but does not do so via Kendall. As such, the Pacheco Law should not apply, because this route was never *previously* provided by public employees and was not included in the Petition to Delay as a recommended agency-operated route. Moreover, as described in Section 4.4, if the MBTA were

to operate the route, it might need to compensate EZRide for any lost ridership on the Lechmere – Kendall portion of the trip, because EZRide is the only well-established route in that corridor.

Meanwhile, in the Seaport district, shuttle consolidation alone could potentially be done without any public sector involvement. However, significant benefits would come from integrating the consolidated private shuttles with the public system. With this consolidation and integration in place, further expansion of the privately operated shuttles could allow for service expansions in the Seaport District. This is where lessons learned from the Sullivan – Kenmore route presented in Section 5.2 could inform this larger service expansion. This expansion would also be a greater test of the applicability of the Pacheco Law.

The resistance from MBTA labor in regards to increasing service through contracting is likely to be greater in the Seaport District example than it would be in the examples discussed in Sections 5.1 and 5.2. Because the district is expanding so rapidly, a shift towards increasing private transit provision might lay the groundwork towards an even greater amount of private contracting in the future – a situation that contrasts with MBTA labor’s goals.

As such, considering this route from a Pacheco Law perspective is essential. Based on the interpretations of the Pacheco Law presented in Section 4.3.2, this route could require a Pacheco Law review under the interpretation that the MBTA has operated bus service along similar routes (Route #4 between North Station and the Seaport District via Aquarium and South Station, Route #7 and the Silver Line between South Station and the Seaport District). However, as developed in Section 4.3.2, the Pacheco Law could also be interpreted to apply only if privately-operated service is considered *in lieu of* publicly-operated service.

In this case, the public agency could argue that it would be unable to increase bus or Silver Line capacity to the desired extent. The Silver Line requires specially-designed vehicles that would be difficult to procure in a timely fashion, so this consolidated route could serve as an intermediate solution at a minimum until Silver Line capacity could be adequately increased. Meanwhile, as described in previous sections, the bus system is already at capacity. Because of this, it is entirely possible that contracting service would not occur *in lieu of* publicly operating the service; rather, it would occur together with increased public-operated service.

Although this is the start of the conversation that would be necessary to have with the MBTA’s labor unions, it will still require a commitment from either the MBTA or MassDOT to pursue this route. Because of the proposed magnitude of future service expansion, avoiding a

Pacheco Law challenge will likely require some level of discussion with the labor unions. This type of negotiation is discussed further in Section 7.2.2.

Additionally, the way in which a service increase is funded could drive its reviewability under the Pacheco Law. If the privately-operated service continues to be funded largely through private institutions and increased local contributions as proposed in Section 5.3.4, it would create an even greater degree of differentiation from the existing agency-operated services. This differentiation would further weaken potential Pacheco Law challenges.

Although the case presented in Section 6.1 related to contracting the use of smaller vehicles on lower ridership routes and reassigning MBTA vehicles to higher ridership routes might not exceed the Pacheco Law threshold required to trigger a Pacheco Law review, other similar cases might not fall within this threshold. In these cases, the agency would be contracting services that had been previously provided by public employees, and replacing those services with smaller vehicles. The employees previously operating those routes would be shifted to work other routes, as this proposal is for a reallocation of existing resources, accompanied by growth through the private sector. Similar to the first Seaport example, labor may be concerned about setting a precedent even if jobs are not lost as a result of the service reallocation. Possibly more feasible under the Pacheco Law would be using a similar idea to contract the MBTA's late night service (which until recently has not been a service offered by the MBTA) that could operate with smaller vehicles (which would be generally available from private companies that use them mostly during peak hours). Again, as Section 7.2.2 details, it may be necessary to discuss this type of opportunity further with labor and the Attorney General to avoid a Pacheco Law challenge in this case. Meanwhile, the opportunities presented in Sections 6.2 and 6.3 might also require additional discussion related to the Pacheco Law, which is discussed further in Section 7.2.2.

### **7.2.2 Proposal for Further Discussion on the Pacheco Law**

As previously mentioned, the MBTA's labor unions have been considerate of the system's needs during the recent storms, and the MBTA has been able to rapidly contract with private operators in order to provide a more acceptable level of service when the agency itself could not directly operate its full array of services.

This thesis proposes varying degrees of increased private sector involvement, with the concept of starting small and working up towards larger changes and larger contracts. Although many of the opportunities presented in this chapter could occur with either limited Pacheco resistance or some form of labor negotiations, this is not a sustainable method. Going forward, these ad hoc negotiations with private operators need to lead to more uniform principles. There should eventually be some degree of structure in place to allow the public transit system to grow in the Boston area through the increased use of private sector services.

There have been numerous opinions published since the Pacheco Law passed both in favor of and in opposition to the law. This has included a number of opinions suggesting that the law be removed, citing the MBTA's inability to grow with the law in place as a main reason for doing so. As mentioned in Section 4.3.2, Governor Baker has recently proposed legislation that would exempt the MBTA from the Pacheco Law. Although this would remove one of the constraints affecting MBTA growth, eliminating the Pacheco Law would require a significant change in policy by state legislators.

As the final decision-maker regarding Pacheco Law cases, the state auditor of Massachusetts also has an important role to play in its future applications, and in opposition to its removal. As an elected official, the state auditor must consider not only his or her personal beliefs about the law, but also the needs of the represented constituency in order to maintain support going forward. Because this constituency may include labor unions, the state auditor must consider how future contracting would affect labor. For example, in this case, the state auditor might oppose the MBTA's exemption of the Pacheco Law, or support it only if future contracts offered wages, benefits, insurance, etc. at the MBTA's prevailing rates. The state auditor has stated her belief that the Pacheco Law is not an "obstacle to the goal of a more efficient, less costly mass transit system for the Commonwealth" (Bump, 2015, p. 1). The state auditor also commented: "In the interest of accountability, the Pacheco Law ensures that taxpayers and consumers of government services benefit from privatization" (Bump, 2015, p. 3).

Since the future of the Pacheco Law is unclear, with existing proposals to either permanently or temporarily exempt the MBTA from it on the table, it is important to consider three scenarios: (1) the Pacheco Law continues to exist as currently written; (2) the Pacheco Law continues to exist but with modifications easing the restrictions on the MBTA; and (3) the Pacheco Law is eliminated, or exempts the MBTA from regulation under it.

Should the Pacheco Law continue to exist, the MBTA and MassDOT must consider how service growth can occur within its guidelines. Instead of avoiding service contracting because of past failures under the Pacheco Law, it is important to remember in part why some of those failures occurred. The goal of the Pacheco Law is to protect labor from the agencies attempting to cut labor costs through privatization. Past failures have at times attempted to do just that: for example, attempting to contract operations and maintenance for all routes out of two existing bus garages. This contracting would have come at the cost of MBTA employees. But contracting service in the future does not need to do this. In fact, the MBTA might not be interested in a “race to the bottom” in terms of driving down wages if doing so leads to a failure to retain talented employees. It might be interested in creating a competitive labor supply, but one in which fair wages and benefits continue to allow it to attract and retain top workers. In this sense, the Pacheco Law or some of its components can still have a place in the future Massachusetts regulatory environment, as a way to allow for contracting while still ensuring some minimum level of labor relations.

In lieu of removing the Pacheco Law, a broad based Pacheco Law negotiation could make future contracting work for both the MBTA and MBTA labor. For example, the MBTA could commit to expand with MBTA labor by  $x\%$  per year for a set number of years. Any supplemental expansion above that  $x\%$  could then be contracted out to private operators. This would allow for guaranteed growth for the labor unions, while also giving the MBTA the ability to expand as needed beyond the capacity of what it could do solely with agency-operated service. If desired, the negotiations could also include further clauses addressing other labor issues. This could be particularly important to labor should the Pacheco Law be modified or removed, as it would provide labor protections in those cases and make less essential the creation of a law similar to the Pacheco Law going forward.

Additional restrictions could also be put in place, e.g., guaranteeing that the growth in contracted service could only occur on *new* routes. It is important that the restrictions on contracting be negotiated prior to any bidding process, and that approval for contracting is also granted prior to the bidding process. The possibility of litigation after the award of a route would be damaging to the MBTA in attracting future bidders, and would limit competition and its potential benefits. This idea of prior approval would also be important should the MBTA decide to bid multiple routes together as a package to allow for greater competition.

The Urban BusPlus program discussed in Section 6.2 could provide an opportunity to develop a program in this model. The program would contract new routes that have not been previously operated by public employees. Contracting these routes through MassDOT could provide even greater separation from MBTA unions, and could serve to create a dichotomy where the MBTA focuses on operating its existing service and continuing its pattern of x% growth each year, while MassDOT would provide the additional incremental growth necessary to fill service gaps (either identified by the public agency or privately). This would assure existing labor unions of their current levels of growth but would shift supplemental growth to private operators.

The goal of such an agreement (either with the Urban BusPlus program or more generally) would be to honor the spirit of the Pacheco Law without limiting the growth of the public transit system that is necessary to allow for continued development in the Boston region. This type of agreement would ensure that labor rights would not be compromised, but would also allow the MBTA to grow beyond its current constraints (e.g. agency-operated depots, agency-operated maintenance facilities). While ad hoc negotiations with labor for the opportunities discussed in previous sections could work for a short time period, for the private sector to sustainably have increased involvement with the public transit system in Boston going forward, it will be necessary to reach some form of structured larger agreement with labor.

This will also serve to inform other systems considering or already using contracting, nationwide and even internationally. Although the Pacheco Law is unique to Massachusetts, it is possible that similar legislation could pass elsewhere (or return in some form if the MBTA is exempted from the current legislation). Understanding the background of the Pacheco Law and using it to inform future labor agreements is an important step both in Massachusetts and elsewhere. Fair labor treatment can and should exist with contracting – it is just important to have the standards in place to allow for it and to consider contracting as a mechanism for growth instead of a means to cut costs at the expense of labor. Other places might be able to use the MBTA's situation as an example to adjust principles related to contracting and improve agency-labor relationship stability going forward.



### 7.3 Recommendations

Discussed in more detail in previous sections, this research makes the following recommendations:

- 1) Increase public access to existing privately operated routes in order to better integrate the public system with other services. This recommendation is in the spirit of providing expanded service to the public regardless of who provides it. This could be done in Boston on routes such as the EZRide and M2 shuttles, which would fill gaps in the MBTA's service and alleviate capacity constraints on existing high-ridership MBTA routes. Technological solutions can further enable integration between the existing privately operated routes and the MBTA. These two opportunities could quickly enable increased access through the private sector, and could provide insight to expand access on other routes and in other ways going forward.
- 2) Work with the private sector to expand existing routes or consolidate existing service to better serve the public. Although this may require additional public assistance to do so, there are opportunities to work with the private sector to expand service in ways and places that public agencies cannot do through agency-operated service. This research recommends two such scenarios in the Boston area. First, a privately operated route connecting Sullivan – Lechmere – Kendall – Kenmore would fill gaps in MBTA service and could supplement service improvements mitigating the delay of the Green Line Extension. Second, consolidating the numerous privately operated shuttles in the Seaport District could improve circulation, and increasing public access to these shuttles would alleviate crowding on existing MBTA routes serving the area. The consolidated shuttle service could be funded through a business improvement district or tax-increment financing. Both of these opportunities would enable continued development that might not be possible without improved transit service. Although these specific cases are proposed in the Boston area, they could serve as pilots for similar opportunities going forward.
- 3) Work with the private sector to provide different types of service than the public agency is able to provide through agency-operated service. For example, contracting operations of smaller vehicles could allow the agency to better serve lower ridership routes while using available physical resources to simultaneously improve service on

- higher ridership routes. In Boston, this could be done on routes serving similar areas: for example, contracting more frequent service on a route similar to the MBTA's low-frequency, low-ridership Route #4 serving the Seaport District, while shifting those buses to the MBTA's high-frequency, high-ridership Route #7. Grouping multiple opportunities of this type could be contracted as a single package.
- 4) Take advantage of private sector capacity to alleviate growth constraints; for example, contracting vehicle maintenance and storage when those agency facilities are at capacity, even if agency employees continue to operate the vehicles. The MBTA could do this to enable continued expansion despite limited capacity at maintenance facilities and storage depots. It is recommended that the MBTA pursue this as an option for growth beyond the current agency capacity while continuing to increase the size of the labor force by maintaining agency operation of the additional vehicles.
  - 5) Develop an urban program modeled on the existing BusPlus program in Massachusetts in order to allow for increased transit service growth in the Boston area. Based on the size of the existing BusPlus program, a similar increase in fleet size of 10 vehicles per year would be an appropriate target and would allow for competitive expansion through the private sector.
  - 6) Continue the discussion on the Pacheco Law. Exempting the MBTA from the Pacheco Law might not create stability in the long-term; the Pacheco Law exists for a reason and it is important to consider the motivation behind it. The pursuit of contracting for the purposes of growth requires fair labor treatment, and the Pacheco Law can help inform a future agreement that allows for service contracting agreeable to all involved stakeholders, including labor. Such an agreement could establish a set amount of growth in agency service and agency labor based on capacity constraints, with growth beyond that threshold contracted to the private sector through an expedited process, subject only to contractors paying prevailing wages. Additionally, it is suggested that the MBTA work with labor, the state auditor's office, and other relevant stakeholders to create a memorandum of understanding of the type of service that can be contracted to the private sector on an expedited, preapproved basis, which would further encourage the MBTA to solicit contract proposals where appropriate.

## 7.4 Future Work

There is a wide variety of future research that could come out of this work. The primary related future research would analyze the above opportunities through implementation and following implementation. Additional research could consider similar opportunities in other parts of Boston, or address the possibility of increasing private sector involvement with rail.

Ideally, the opportunities presented in Chapters 5 and 6 would progress quickly to implementation in at least some of the cases, and future research could study the implementation of these opportunities. Much could be learned from understanding what works and what doesn't in each of these opportunities. An analysis of the implementation could propose adjustments to the strategy of increasing public access to existing routes, for example, or use lessons from this implementation to inform consolidation of private shuttles elsewhere. This type of research could improve public-private interactions for increasing transit system growth going forward.

Specific to Boston, further research on specific proposals in the Seaport District could build on what has already been proposed for that area and integrate this research. Other high business growth areas such as the Longwood Medical Area and the Alewife Business District could also be considered for increased private sector involvement in the future, based on existing service already filling gaps in those areas and additional growth expected in the future.

Additionally, although this research looked principally at bus operations because of the need for rapid growth at the MBTA, future research could also consider increased private sector involvement in rail systems. For example, one research component could examine if including the private sector could allow for signal system upgrades to increase capacity on a rail line such as the MBTA's Red Line. For this example, it would also be interesting to examine if financial arrangements discussed in this thesis, such as a BID or TIF, could fund the signal system upgrade, possibly even with the procurement of the remaining one-third of the Red Line vehicle fleet that would need to be replaced. In this case, future research could consider how the institutional constraints of working across multiple municipalities would affect the opportunity.

## 7.5 Conclusion

The MBTA is not unique in facing such severe constraints to system growth. This is a problem that is faced by many other systems and will become more of an issue as urban populations grow. It is crucial to the economic health and livability of these cities to have

expansive and dependable public transit systems. In Massachusetts, this goal is developed through the GreenDOT initiative, intended to shift the state modal share towards transit and other sustainable modes. In building the transit systems that our cities need, it is critical that the debate not end at public vs. private when neither alone can meet society's needs, but instead to understand the advantages that each brings to the table and how increasing cooperation between the two sectors can allow for the transit system growth necessary to meet urban goals.

## Appendix A: Boston Development Timeline Notes and Sources

The development portion of the timeline was based on information from: (The Shops at Prudential Center; Oxford Properties Group; Friends of Boston City Hall; Boston Properties; Avault, Leonard, & Lewis, 2004; Pollack, 2012; VHB et al., 2015; Cambridge Redevelopment Authority).

The MBTA ridership portion of the timeline was partially based on information from MBTA annual reports. Note that each annual report contained ridership data for the given year (Massachusetts Bay Transportation Authority, 1970; Massachusetts Bay Transportation Authority, 1975; Massachusetts Bay Transportation Authority, 1980; Massachusetts Bay Transportation Authority, 1985).

The MBTA ridership portion of the timeline was also based on information from MBTA Ridership and Service Statistics publications (“Blue Books”). Note that Edition 8 (2001) was used for MBTA ridership in 1990 and 1995, Edition 10 (2005) was used for MBTA ridership in 2000 and 2004, Edition 13 (2010) was used for MBTA ridership in 2010, and Edition 14 (2014) was used for MBTA ridership in 2013. Also note that Edition 10 contained two ridership figures for the year 2000. The listed number is for surface and rapid transit lines (used in earlier years in the timeline), while the total for rapid transit, trackless trolley, and bus (used in later years in the timeline) was 306,629,800 (Massachusetts Bay Transportation Authority, 2001; Massachusetts Bay Transportation Authority, 2005; Massachusetts Bay Transportation Authority, 2010b; Massachusetts Bay Transportation Authority, 2014c).

Finally, note that MBTA ridership increased above 400,000,000 annual unlinked trips for the *total system* in 2014 (Dungca, 2015). This includes ridership on modes not included in ridership totals for previous years in the timeline (e.g. commuter rail, paratransit).



## Appendix B: Full Text of the Pacheco Law

Massachusetts General Laws, Part I, Title II, Chapter 7, Section 52-55:

**Section 52.** The general court hereby finds and declares that using private contractors to provide public services formerly provided by state employees does not always promote the public interest. To ensure that citizens of the commonwealth receive high quality public services at low cost, with due regard for the taxpayers of the commonwealth and the needs of public and private workers, the general court finds it necessary to regulate such privatization contracts in accordance with sections fifty-three to fifty-five, inclusive. The general court does not intend to restrict the use of community facilities to provide care for clients of state agencies, if any privatization contract relating to such facilities otherwise complies with the provisions of said sections fifty-three to fifty-five, inclusive.

**Section 53.** As used in sections fifty-two to fifty-five, inclusive, the following words shall have the following meanings:—

“Agency”, an executive office, department, division, board, commission or other office or officer in the executive branch of the government of the commonwealth, the Massachusetts Bay Transportation Authority, the Massachusetts Turnpike Authority, the Massachusetts Department of Transportation, the Massachusetts Port Authority and the Woods Hole, Martha’s Vineyard and Nantucket Steamship Authority.

“Business day”, any calendar day excluding Saturdays, Sundays, and legal holidays.

“Dependent”, the spouse and children of an employee if such persons would qualify for dependent status under the Internal Revenue Code or for whom a support order has been or could be granted under chapter two hundred and eight, two hundred and nine, or two hundred and nine C.

“Privatization contract”, an agreement or combination or series of agreements by which a nongovernmental person or entity agrees with an agency to provide services, valued at \$500,000, but as of January 1 each year, the amount shall increase to reflect increases in the consumer price index calculated by the United States Bureau of Labor Statistics for all urban consumers nationally during the most recent 12 month period for which data are available or more, which are substantially similar to and in lieu of, services theretofore provided, in whole or in part, by regular employees of an agency. Any subsequent agreement, including any agreement resulting from a rebidding of previously privatized service, or any agreement renewing or extending a privatization contract, shall not be considered a privatization contract. A contract for information technology services shall not be considered a privatization contract if an employee organization recognized under chapter 150E, as the exclusive representative of an affected employee, as determined by the secretary of administration and finance, agrees to the terms of the contract in writing. An agreement solely to provide legal, management consulting, planning, engineering or design services shall not be considered a privatization contract.

**Section 54.** No agency shall make any privatization contract and no such contract shall be valid unless the agency, in consultation with the executive office for administration and finance, first complies with each of the following requirements:—

(1) The agency shall prepare a specific written statement of the services proposed to be the subject of the privatization contract, including the specific quantity and standard of quality of the subject services. The agency shall solicit competitive sealed bids for the privatization contracts based upon this statement. The day designated by the agency upon which it will accept these sealed bids shall be the same for any and all parties. This statement shall be a public record, shall be filed in the agency and in the executive office for administration and finance, and shall be transmitted to the state auditor for review pursuant to section fifty-five. The term of any privatization contract shall not exceed five years. No amendment to a privatization contract shall be valid if it has the purpose or effect of avoiding any requirement of this section.

(2) For each position in which a bidder will employ any person pursuant to the privatization contract and for which the duties are substantially similar to the duties performed by a regular



agency employee or employees, the statement required by paragraph (1) shall include a statement of the minimum wage rate to be paid for said position, which rate shall be the lesser of step one of the grade or classification under which the comparable regular agency employee is paid, or the average private sector wage rate for said position as determined by the executive office for administration and finance from data collected by the division of employment and training and the division of purchased services. Every bid for a privatization contract and every privatization contract shall include provisions specifically establishing the wage rate for each such position, which shall not be less than said minimum wage rate as defined above. Every such bid and contract shall also include provisions for the contractor to pay not less than a percentage, comparable to the percentage paid by the commonwealth for state employees, of the costs of health insurance plans for every employee employed for not less than twenty hours per week pursuant to such contract. Such health insurance plans shall satisfy the requirements of the fifth paragraph of section nine of chapter one hundred and eighteen F, and shall provide coverage to the employee and the employee's spouse and dependent children. Each contractor shall submit quarterly payroll records to the agency, listing the name, address, social security number, hours worked and the hourly wage paid for each employee in the previous quarter. The attorney general may bring a civil action for equitable relief in the superior court to enforce this paragraph or to prevent or remedy the dismissal, demotion or other action prejudicing any employee as a result of a report of a violation of this paragraph.

(3) Every privatization contract shall contain provisions requiring the contractor to offer available employee positions pursuant to the contract to qualified regular employees of the agency whose state employment is terminated because of the privatization contract and who satisfy the hiring criteria of the contractor. Every such contract shall also contain provisions requiring the contractor to comply with a policy of nondiscrimination and equal opportunity for all persons protected by chapter one hundred and fifty-one B, and to take affirmative steps to provide such equal opportunity for all such persons.

(4) The agency shall prepare a comprehensive written estimate of the costs of regular agency employees' providing the subject services in the most cost-efficient manner. The estimate shall include all direct and indirect costs of regular agency employees' providing the subject services,

including but not limited to, pension, insurance and other employee benefit costs. For the purpose of this estimate, any employee organization may, at any time before the final day for the agency to receive sealed bids pursuant to paragraph (1), propose amendments to any relevant collective bargaining agreement to which it is a party. Any such amendments shall take effect only if necessary to reduce the cost estimate pursuant to this paragraph below the contract cost pursuant to paragraph (6). Such estimate shall remain confidential until after the final day for the agency to receive sealed bids for the privatization contract pursuant to paragraph (1), at which time the estimate shall become a public record, shall be filed in the agency and in the executive office for administration and finance, and shall be transmitted to the state auditor for review pursuant to section fifty-five.

(5) After consulting any relevant employee organization, the agency shall provide adequate resources for the purpose of encouraging and assisting present agency employees to organize and submit a bid to provide the subject services. In determining what resources are adequate for this purpose, the agency shall refer to an existing collective bargaining agreement of a similar employee organization whose members perform the subject services, if available, which agreement provides similar resources in the same or other agencies; provided, however, that if no such collective bargaining agreement exists, the agency shall refer to any existing collective bargaining agreements providing such resources, and shall provide such resources at the minimum level of assistance provided in said agreements. The agency shall consider any such employee bid on the same basis as all other bids. An employee bid may be made as a joint venture with other persons. Subclause (h) of clause Twenty-sixth of section seven of chapter four shall apply with respect to all employee bids. Sections four, five and six of chapter two hundred and sixty-eight A shall not apply to the activities of agency employees conducted pursuant to this paragraph.

(6) After soliciting and receiving bids, the agency shall publicly designate the bidder to which it proposes to award the contract. The agency shall prepare a comprehensive written analysis of the contract cost based upon the designated bid, specifically including the costs of transition from public to private operation, of additional unemployment and retirement benefits, if any, and of monitoring and otherwise administering contract performance. If the designated bidder proposes

to perform any or all of the contract outside the boundaries of the commonwealth, said contract cost shall be increased by the amount of income tax revenue, if any, which will be lost to the commonwealth by the corresponding elimination of agency employees, as determined by the department of revenue to the extent that it is able to do so.

(7) The head of the agency and the commissioner of administration shall each certify in writing to the state auditor, that:

(i) he has complied with all provisions of this section and of all other applicable laws;

(ii) the quality of the services to be provided by the designated bidder is likely to satisfy the quality requirements of the statement prepared pursuant to paragraph (1), and to equal or exceed the quality of services which could be provided by regular agency employees pursuant to paragraph (4);

(iii) the contract cost pursuant to paragraph (6) will be less than the estimated cost pursuant to paragraph (4), taking into account all comparable types of costs;

(iv) the designated bidder and its supervisory employees, while in the employ of said designated bidder, have no adjudicated record of substantial or repeated willful noncompliance with any relevant federal or state regulatory statute including, but not limited to, statutes concerning labor relations, occupational safety and health, nondiscrimination and affirmative action, environmental protection and conflicts of interest; and

(v) the proposed privatization contract is in the public interest, in that it meets the applicable quality and fiscal standards set forth herein.

A copy of the proposed privatization contract shall accompany the certificate transmitted to the state auditor.

No provision of this section shall apply in any circumstance to the extent that the provision is inconsistent with section thirty-nine M of chapter thirty or sections twenty-six to twenty seven H, inclusive, or sections forty-four A to forty-four J, inclusive, of chapter one hundred and forty-nine.

**Section 55.** (a) An agency shall not make any privatization contract and no such contract shall be valid if, within thirty business days after receiving the certificate required by section fifty-four, the state auditor notifies the agency of his objection. Such objection shall be in writing and shall state specifically the state auditor's finding that the agency has failed to comply with one or more requirements of said section fifty-four, including that the state auditor finds incorrect, based on independent review of all the relevant facts, any of the findings required by paragraph (7) of said section fifty-four. The state auditor may extend the time for such objection for an additional period of 30 business days beyond the original 30 business days by written notice to the submitting agency stating the reason for such extension.

(b) For the purpose of reviewing the agency's compliance and certificate pursuant to said section fifty-four, the state auditor or his designee may require by summons the attendance and testimony under oath of witnesses and the production of books, papers and other records relating to such review. All provisions of law relative to summonses in civil cases, including the manner of service, the scope and relevance to such review, and the compensation of witnesses who are not state employees, shall apply to such summonses. Such summonses shall be enforced pursuant to section ten of chapter two hundred and thirty-three.

(c) The state auditor may adopt regulations and prescribe forms to carry out the provisions of this section and section fifty-four.

(d) The objection of the state auditor pursuant to subsection (a) shall be final and binding on the agency, unless the state auditor thereafter in writing withdraws the objection, stating the specific reasons, based upon a revised certificate by the agency and by the commissioner of administration and upon the state auditor's review thereof.

## Appendix C: List of EZRide Participating Members

The following list provides those members of the Charles River TMA participating in the EZRide Shuttle (Charles River Transportation Management Association, n.d.-a). This list is not inclusive of all members of the Charles River TMA . Also note that some members only have specific participating locations, which are *italicized* (Charles River Transportation Management Association, n.d.-a).

- Alexandria Real Estate Equities: *150 Second Street, 300 Third Street, Technology Square*
- Amgen
- Avalon Bay NorthPoint
- Biogen-Idec
- Biomed Realty Trust: *270 Albany Street, 320 Bent Street, 301 Binney Street, Kendall Square Corp (Includes 500 Kendall St., 650 East Kendall St., 675 West Kendall St.), Fort Washington Research Park (Includes 270 Albany St., 21 Erie St., 40 Erie St., 200 Sidney St., & 130 Waverley St.)*
- Boston Properties/Cambridge Center
- Cambridgeside Galleria
- City of Cambridge
- Draper Laboratory
- Forest City Enterprises/University Park at MIT
- Massachusetts Institute of Technology
- Microsoft
- MITIMCo / Colliers: *17 Tudor Street, 130 Brookline Street, 610/700 Main Street / Osborn Triangle, 640 Memorial Drive*
- Novartis Institutes for Biomedical Research
- One Rogers Street/One Charles Street
- Pfizer
- Regatta Riverview Residences
- Sierra+Tango (NorthPoint)



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