



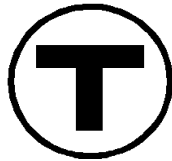
Capital Investment Program

FY2010 - FY2014



Massachusetts Bay Transportation Authority
Driven by Customer Service

(5/1/09)



Capital Investment Program

FY2010 – FY2014

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CIP FY10-FY14

PREFACE

Special Note Concerning the Authority's Financial Condition

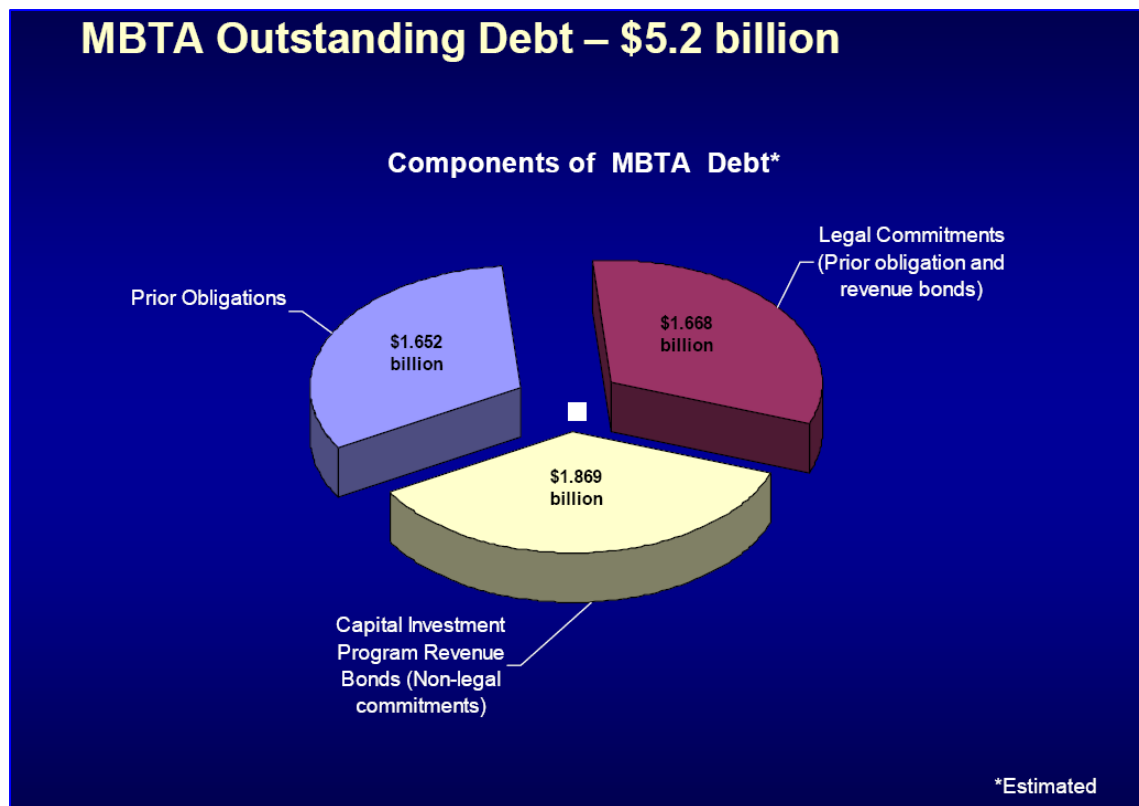
This document presents the MBTA's Capital Investment Program for 2010-2014. In light of the significant financial challenges the MBTA is currently facing, specifically its tremendous debt burden, current and anticipated wage and benefit costs, and the precipitous decline in the receipt of projected and dedicated revenues since the inception of Forward Funding, the MBTA's financial condition is precarious and not sustainable at current levels of operating and capital commitments. As a result, the Capital Investment Program is at a crossroads. Without legislation providing new revenue or debt relief the Authority may not be able to afford to invest funds in many of the projects described in this document. Further, due to existing and already significant pressures on the Authority's operating budget, any planned extension of the transit system should not be funded unless new sources of revenues are identified and dedicated to support the ongoing operation and maintenance costs associated with such extensions.

The MBTA's Capital Investment Program ("CIP") is fiscally constrained, as dictated by its enabling legislation. (In other words, the Authority needs to have the financial resources available to fund the capital spending required under this program.) For the first time, the 2010-2014 CIP is contingent upon sufficient funds being made available (as they are not currently) to support the investments contained within the program. Further, the Authority's long-standing commitment to fully fund state of good repair projects (\$470 million annually) is in jeopardy. The MBTA faces a minimum \$160 million operating budget deficit in FY2010, with

PREFACE

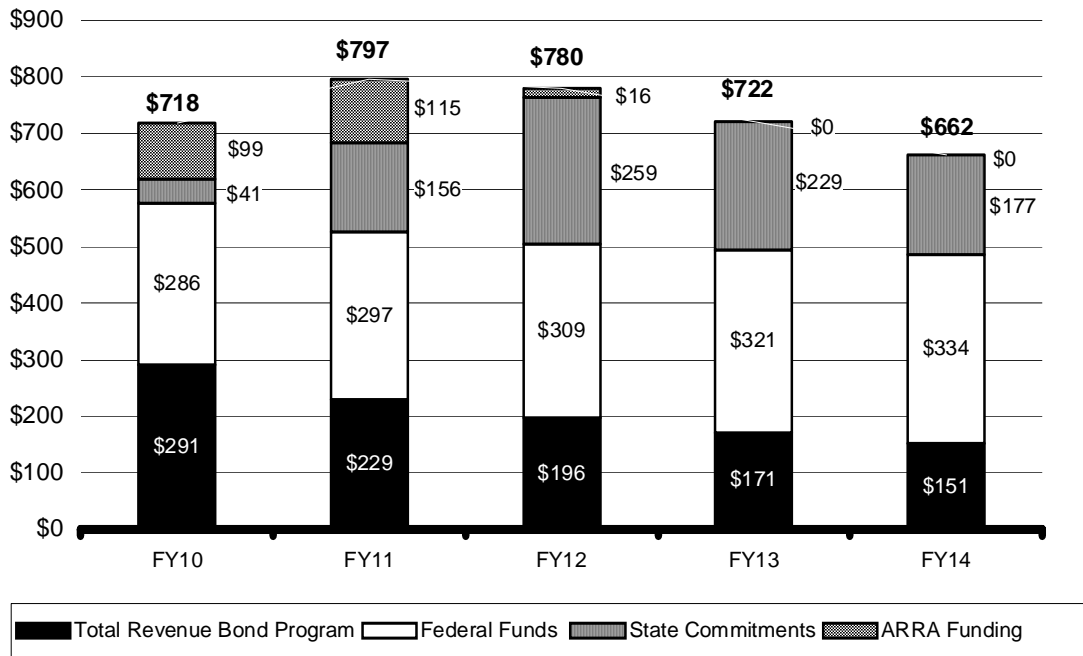
the certainty, absent new funding sources, of growing deficits in future years. Exacerbating its already depleted reserve funds, approximately 27 cents of every dollar is utilized to pay for the costs of existing debt.

The FY 2010 operating budget contains a dramatic jump in principal and interest payments as the bill on the Authority's \$5.2 billion in outstanding debt comes due. This \$5.2 billion in outstanding MBTA debt originates directly from three sources: "prior obligation debt" inherited by the MBTA at the onset of Forward Funding in 2000, projects required to be built and funded by MBTA as legal commitments associated with the Central Artery project, and the Authority's commitment to act as a good steward of the system and fund at least \$470 million per year in capital investment necessary to maintain the current \$2.7 billion dollar backlog in much needed state of good repair projects. The Authority strongly believes that this state of good repair investment is critical to the continued viability of the transit system. The Authority's share of this capital investment continues to be drawn from bond funds due to the persistent lack of growth in sales tax revenues and the corresponding scarcity of available pay-as-you-go capital. The following chart summarizes the components comprising the MBTA's outstanding debt.

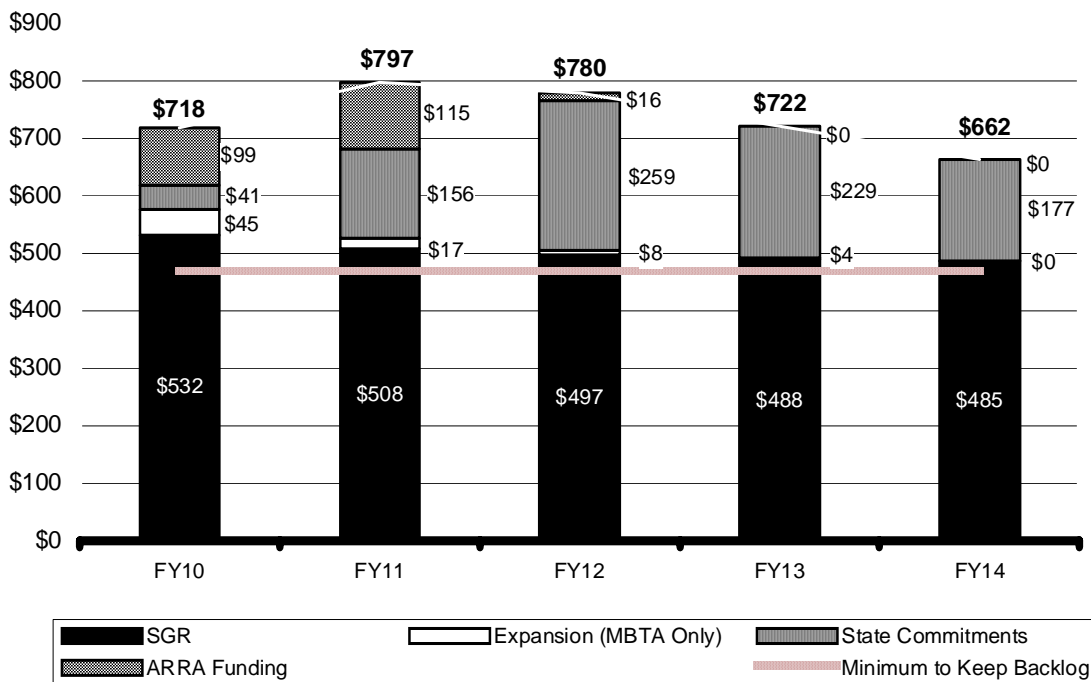


Although the Massachusetts legislature is considering transportation reform and a variety of options to raise revenue, the source and amount of net new revenue dedicated to the MBTA, if any, is highly uncertain at this time. Without net new revenue or substantial debt relief the Authority may not be able to fund the projects in this CIP. Borrowing the \$1.0 billion required to fund many of this 2010-2014 CIP is not affordable within the constraints of existing available revenue, and would not be prudent in the face of projected increasing deficits. The following charts present the proposed capital funding sources and allocation for the FY2010 – FY 2014 CIP.

FY10-FY14 Capital Investment Program – Funding Sources (\$ in millions)



FY10-FY14 Capital Investment Program – Funding Allocation (\$ in millions)



PREFACE

Since Forward Funding commenced on July 1, 2000, the Authority has experienced a cumulative and serious underperformance of the sales tax – its primary revenue source – and in the current fiscal year, no increase in this revenue source at all. While new revenue sources from the Commonwealth are not a certainty at this date, the Authority elected to include a new revenue source in the fiscal year 2010 budget in order to close the projected operating deficiency of \$160 million.

The Authority's financial situation in the current fiscal year is dire – without additional funds being made available, the MBTA will likely be unable to invest the required amounts to fund the CIP and the following consequences are likely to result:

- Without available Authority local matching funds, \$1.5 billion in federal formula funding would be in jeopardy
- Laying off temporary employees working on certain capital projects
- Possible violation of the terms of the commuter rail contract
- Inability to progress or complete projects required as legal commitments
- Potential liquidated damage payments if the Authority does not complete contracted projects currently under construction
- Deferred maintenance degrading the reliability of the transit system

INTRODUCTION

The Massachusetts Bay Transportation Authority (MBTA, or the Authority) Capital Investment Program (CIP) is a guide to the MBTA's five-year capital budget. The CIP is a strategic planning document that authorizes funds over a five-year period to meet the MBTA's operational objectives within its financial capacity. The document describes the MBTA's infrastructure and the capital needs to maintain the system, outlines ongoing and programmed capital projects, and details planned projects to expand the transportation network. Unlike the Program for Mass Transportation (PMT) and other planning documents, the CIP is financially constrained - only capital projects the MBTA can afford are included in the "Funded Projects" sections of this document. To provide the reader with an easy-to-follow resource guide to the MBTA's capital program, this CIP document classifies capital efforts into programmatic areas by asset type and mode.

In 1897, America's first subway was constructed between the Park and Boylston Street stations. This half-mile section of subway is still operated today by the MBTA, making the MBTA the oldest continuously operating subway system in the country. In the 110 years since this service opened, the Massachusetts public transportation system has remained a critical part of the city, and has grown dramatically in response to an ever-increasing demand for transit. The MBTA now serves 175 communities, providing transit alternatives to a population of almost 4.7 million people over an area of 3,200 square miles.



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The MBTA is currently the fifth largest mass transit system in the United States as measured by ridership. The Authority serves a daily ridership of approximately 1.24 million passengers. To provide service the Authority maintains over 182 bus routes, 4 rapid transit lines of heavy and light rail, 5 bus rapid transit line, 4 trackless trolley lines, 14 commuter rail lines, 3 ferry routes, and a flexible paratransit service. Its large roster of equipment currently consists of 432 heavy rail vehicles, 217 light rail vehicles, 628 diesel buses, 360 compressed natural gas (CNG) buses, 32 electric/diesel buses, 2 prototype alternative fuel buses, 33 trackless trolleys, 80 commuter rail locomotives, 410 commuter rail coaches, 12 ferry boats, and 568 vehicles for THE RIDE. Service is provided to more than 255 stations.

A nine-member Board of Directors manages the affairs of the Authority. The Secretary of the Executive Office of Transportation and Public Works (EOTPW) of the Commonwealth serves as the Chairman of the Board. The Governor of the Commonwealth appoints the other eight directors. The Board has the power to appoint and employ a General Manager and other officers. The Board approves this Capital Investment Program and also authorizes all capital program actions of \$500,000 or above. An Advisory Board, consisting of representatives from each of the cities and towns constituting the Authority's service district, approves the Authority's annual operating budget and reviews the capital program.

Overview of the MBTA Transportation System

Rapid Transit System

The Authority operates four rapid transit lines (the Red, Green, Orange, and Blue Lines) over 38 route-miles of heavy rail routes and 44 stations. Service is also provided by streetcars and light rail vehicles on 26 miles of additional rail routes (the Green Line and the Mattapan Line), serving 70 stations.

Commuter Rail Service

The Authority operates 80 rail locomotives and 410 coaches. This system provides commuter service to and from 131 outlying rail stations and downtown Boston on 13 commuter rail lines. Commuter rail service is provided throughout much of the MBTA's service area and to over 50 communities outside the area.



Bus Rapid Transit

The Silver Line Project is part of the three-phase bus rapid transit project that serves Roxbury, South Boston, and Logan Airport. Phase I of this project uses 17 buses powered by compressed natural gas (CNG). It has 14 stops and operates in an exclusive bus-only lane of traffic on portions of Washington Street. Silver Line Phase II, which started service in 2004, connects South Station to the South Boston Seaport District and Logan Airport. Silver Line Phase II links 3 stations with 32 dual-mode (electric/diesel) articulated buses.

Bus Service

MBTA Bus Operations maintains and operates a fleet of 1,055 buses, including compressed natural gas (CNG) buses, diesel buses, and trackless trolleys, which operate on 186 routes that cover approximately 761 route-miles. In addition to local services in the urban core areas, the Authority operates a frequent schedule of express buses to and from downtown Boston and surrounding communities. The Authority also manages six local service subsidy programs that provide intracommunity and feeder services.



THE RIDE - Paratransit

To complement traditional fixed route service, the Authority has a door-to-door demand-response ADA paratransit program designed to serve people with disabilities and special needs. This program, known as THE RIDE, operates 568 vehicles in 62 cities and towns and averages over 132,000 trips every month. This program provides customers with public transportation for work, medical treatment, social functions, shopping, and other activities.

Commuter Boat

The MBTA operates commuter boat service on three routes between Boston, various points in the inner Boston Harbor, and three terminals on the South Shore. Two of the operating ferry boats are owned by the Authority, while the rest are provided by outside service contractors. Ferry terminals are located at Pemberton Point in Hull, Hewitt's Cove in Hingham, Fore River Shipyard in Quincy, Logan Airport, Charlestown Navy Yard, and Rowes Wharf and Long Wharf in Boston.



With over 2,500 vehicles, 258 stations, 885 miles of track, almost 500 bridges, 20 miles of tunnels, and 19 maintenance shops, the MBTA's infrastructure is extensive and has major capital needs.

MBTA Capital Investment Program

The MBTA's FY09 - FY14 Draft Capital Investment Program authorizes approximately \$3.79 billion in capital spending to reinvest in its transportation infrastructure and to build expansion projects. Various departments in the Authority, with strategic oversight from senior managers, have responsibility for the day-to-day functions of the capital program. The larger principles guiding the programming of funds are based on the MBTA's enabling legislation and the Authority's State of Good Repair standards.

Priorities and Decisions in the Capital Program

The Massachusetts Bay Transportation Authority (MBTA) developed its first Capital Investment Program (CIP) in 2001. This new program was created by the Legislature when it rewrote the Authority's enabling act as part of *Forward Funding*. The CIP has proven to be a valuable tool both for interested parties and for the Authority itself. However, this CIP reflects an evolution in CIP development. It begins to strengthen the connection between short and long term planning and the programming of funds to address issues raised through planning.

Projects in the Capital Investment Program are selected through an ongoing prioritization process that strives to balance capital needs across the entire range of MBTA transit services. Given the Authority's financial limitations, its vast array of infrastructure, and the need for prudent expansion, the number of capital needs identified each year usually exceeds the MBTA's capacity to provide capital funds. Therefore, the Authority engages in an annual prioritization and selection process to select the highest priority needs for funding and inclusion in the Capital Investment Program.

One of the highest priorities for the MBTA is the pursuit of a "State of Good Repair." The Authority needs to spend approximately \$470 million per year to maintain the current "State of Good Repair" backlog which is approximately \$2.7 billion. To measure the need for capital expenditures devoted to maintaining and replacing existing infrastructure, transit systems often use the State of Good Repair standard, wherein all capital assets are functioning at their ideal capacity within their design life. While few transit systems are likely to achieve this ideal,

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the standard does identify a level of ongoing capital needs that must be addressed over the long-term for the existing infrastructure to continue to provide reliable service.

To assist in this, the MBTA employs a State of Good Repair database to help guide its capital decisions. Based on an inventory of all existing MBTA capital assets, the model allows the MBTA to track the capital investment needs for the Authority's existing infrastructure, and to develop a capital investment program to maintain the system in a state of good repair.

Prioritization of projects to be included in the CIP is based on the following criteria, as defined in the MBTA's enabling legislation: the impact of the project on the effectiveness of the Commonwealth's transportation system, service quality, the environment, health and safety, the state of good repair of MBTA infrastructure, and the Authority's operating costs and debt service. Projects that receive the highest priority are those with the greatest benefit and the least cost, as prioritized by the following five criteria:

- **Factor One: Safety, Health, and the Environment.** Proposed projects must correct an existing deficiency for passengers and/or employees in safety, health, and/or the environment.
- **Factor Two: State of Good Repair.** This criterion measures the degree to which the proposed project improves the condition of the Authority's existing infrastructure (see above).
- **Factor Three: Cost/Benefit.** Projects receive scores based on the number of passengers affected by the proposed project, its net operating cost, and the debt service necessary to support its capital cost.
- **Factor Four: Operational Impact.** This measures the extent to which proposed projects are deemed operationally critical, as well as projects' ability to improve the effectiveness of the Commonwealth's transportation network in general.
- **Factor Five: Legal Commitments.** To qualify for points in this area, projects must demonstrate a legal obligation for the MBTA, such as fulfilling the Authority's Key Station Plan in compliance with the Americans with Disabilities Act (ADA).



The MBTA also considers environmental justice in its capital investment decision-making process. The MBTA has worked with the Central Transportation Planning Staff (CTPS) and the Boston Metropolitan Planning Organization (MPO) to ensure that minority and low-income regions are treated equitably regarding the delivery of transportation services.

Expansion of MBTA Services

Since the implementation of the "Forward Funding" legislation, financial support for the Authority's expansion projects relies primarily on non-MBTA sources. Accordingly, the Commonwealth is committed to fund the system's future expansion beyond the Greenbush and Silver Line Phase III projects. The new policy on MBTA expansion is especially timely, since the Commonwealth faces three existing commitments related to its State Implementation Plan (SIP) for the federal Clean Air Act.

Legal Commitments

Chief among the projects programmed with non-MBTA funding sources are the State Implementation Plan (SIP) projects, which are Commonwealth priorities for transportation funding. In November 2006, the Department of Environmental Protection (DEP) issued final amendment to the transit regulation 310 CMR 7.36. As adopted, this regulatory change was reviewed and in Summer 2008 approved by the U.S. Environmental Protection Agency (EPA) for inclusion into the Massachusetts State Implementation Plan (SIP) under the Clean Air Act. This regulatory change incorporates the proposal made by the Executive Office of Transportation and Public Works (EOTPW) to DEP to formalize SIP transit commitment projects as the following: Green Line extension beyond Lechmere to Somerville/Medford; Fairmount Line Improvements including new stations; and 1,000 new transit commuter parking spaces in the Boston region. Although the MBTA will not pay for any of these projects, it will play an important role in the design and implementation of these projects.

Funding the MBTA's Capital Investment Program

The level of capital funding programmed in this document is dependent on a number of funding factors including sales tax revenues, assessment revenues from the 175 cities and towns in the MBTA district, fare revenues and non-fare revenues, including advertising, real estate, and parking.

Forward Funding

In 2000, the Commonwealth repealed and restated parts of the MBTA's enabling legislation, dramatically changing the way the state provides financial assistance to the MBTA. Beginning on July 1, 2000, the Authority no longer received Net Cost of Service or Section 28 Assistance. Instead, under the Enabling Act, the Authority now receives a dedicated revenue stream consisting of assessments paid by the 175 cities and towns in the new MBTA district established in accordance with the Enabling Act (the Assessments) and the greater of the amount raised by a 1% statewide sales tax, which equals 20% of the existing statewide 5% sales tax, or \$645 million, in either case to be funded from existing sales tax receipts, subject to upward adjustment under certain circumstances set forth in the Enabling Act (the Dedicated Sales Tax and, together with the Assessments, the Dedicated Revenues). The Enabling Act and the new financing mechanism for the MBTA have been referred to as "Forward Funding" to reflect the fact that the MBTA's costs will no longer be funded in arrears. In addition, the Authority has other funding streams, such as, fare revenue and non-fare revenue (i.e., parking and rental income).



MBTA Finance Plan

The Authority has a long-range finance plan with a stated goal of balanced financial operations and a sustainable capital program. This finance plan maximizes the value of the revenue streams available to the MBTA under its new Enabling Act to minimize the Authority's cost of capital and to provide access to capital markets even under adverse economic or capital market conditions. The finance plan supports the Authority's CIP by using a combination of sources of capital funds, including revenue bonds and federal grants. The purpose of the finance plan is to establish a fiscally sound and sustainable transit system that has the financial capacity to fund operations, maintenance and necessary capital replacement.

INTRODUCTION

The MBTA's finance plan identifies the capital resources available to fund the CIP. Based on output from the SGR database and using the State of Good Repair standard, the MBTA prioritizes its limited resources to fund projects related to SGR activity first, and to expansion activities second.

Capital Program Funding

The MBTA's capital program is funded by federal grants, revenue bonds, state infrastructure funds, pay-as-you-go capital, project financing, and other sources. Prior to Forward Funding, the MBTA's non-federal portion of the capital program was funded by General Transportation System Bonds issued by the MBTA and backed by the Commonwealth Guaranty. Under Forward Funding, the MBTA's share of the non-federal portion of its capital program is primarily funded by revenue bonds secured by the Dedicated Revenues under the two separate credits (Assessments and Sales Tax). The Assessment bonds are generally secured by the Assessments paid by the 175 cities and towns dedicated Sales Tax Revenues received by the Authority.

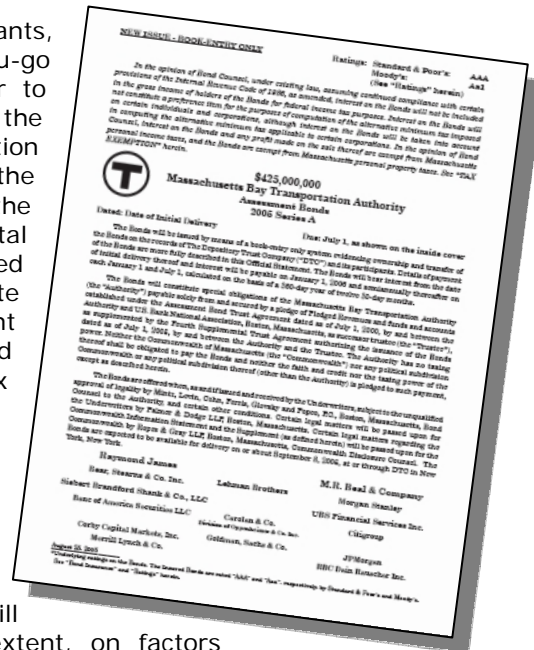
This enabling legislation places well-defined financial limits on the MBTA. Taking this into consideration, the MBTA's goal is to transition from a high reliance on debt financing to greater use of pay-as-you-go financing of capital projects. The transition from debt financing to pay-as-you-go capital funding will take time and discipline and depends, to some extent, on factors beyond the MBTA's control, such as ridership trends, and the growth in sales tax collections. The MBTA has been dramatically affected by the economic downturn over the last several years.

For the fiscal years 2010-2014, the MBTA anticipates that approximately \$1.5 billion of capital expenditures will be funded through federal grants, approximately \$1.0 billion of revenue bonds will be issued to fund MBTA capital expenditures, and the balance of capital expenditures will be funded with state funds, pay-as-you-go capital funding, project financing as well as funds from the American Recovery and Reinvestment Act of 2009.

Federal Program

Federal funding is a major component in determining the level of capital investment the Authority is able to program. Federal aid for transit programs has historically been provided pursuant to multi-year authorizations. The most recent multi-year authorization, the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users ("SAFETEA-LU"), provides funding through the 2009 federal fiscal year. Under SAFETEA-LU, the Authority was able to increase its federal investment through a projected increase in our formula apportionment.

Upon approval of the FY2010 federal apportionments, the MBTA intends to submit grant applications to the Federal Transit Administration (FTA) for federal grants. These funds, which are estimated to total over \$280 million in FY2010, will be used for various capital projects. The three major program areas are: accessibility, enhancement, and infrastructure reinvestment. The accessibility program includes the continuation of the Light Rail Accessibility Program ("LRAP" includes the following stations: Arlington, Copley, Government Center,



Science Park and Kenmore). The enhancement program includes funding for public address systems, LED signage and systemwide intelligent transportation systems. System reinvestment projects include Blue Line modernization, systemwide power improvements, Orange and Blue Line signal upgrades, the bridge and tunnel program, replacement of elevators and escalators, as well as the procurement various types of vehicles including Blue Line cars, Commuter Rail coaches and Emission-Controlled Diesel (ECD) buses.

Public Process

To encourage public input, prior to publishing the final CIP, the MBTA holds public meetings throughout its service district. These meetings provide the public with the opportunity to give valuable input for the development of the capital investment program. This year, the Authority held four workshops and one public hearing throughout the months of February and March 2009.

Managing the MBTA's Capital Program

Responsibility for management of the capital program is dispersed throughout the Authority. The Design and Construction Directorate oversees the construction of stations, tracks, signals, communications, bridges, tunnels and other infrastructure projects. The Environmental Department ensures conformity with environmental and land use regulations, while the Planning & Environmental Directorate is responsible for studying capital infrastructure needs to maintain the existing system over the long-term and enhancement concepts. The Operations Directorate has primary responsibility for maintaining safety, vehicle purchases, track, signals, and the MBTA's electric power generation, transmission and distribution system. The Financial Directorate manages cash flows, grant applications, and debt issuance and expenditure tracking. Various administrative departments share responsibility for the balance of the capital program.



Since FY06 the General Manager has expanded senior staff participation by including them in the CIP process. The inclusion of senior staff affords them increased opportunities to advocate and provide input for their projects at meetings with the General Manager. Senior staff responsibilities include the prioritization of capital projects under their jurisdiction and project management within the authorized budget. The Authority's goal is to maintain the transit infrastructure in a state of good repair and to provide for prudent expansion of service. This document codifies and presents the Authority's plans to achieve these goals within the existing financial constraints.

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KEY MBTA STATISTICS

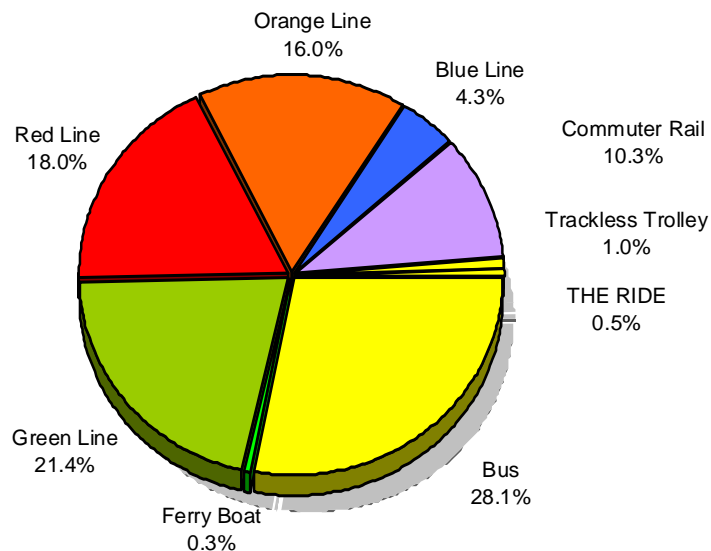
The 2008 edition of the MBTA Ridership and Service Statistics ("The Blue Book") is the main source of information for this segment.

MBTA Ridership FY2008 (in thousands) Unlinked Trips (1)

	Annual Ridership				Typical Weekday Ridership			
		%		%		%		%
Heavy Rail			145,876,390	38.4%			481,500	38.2%
Red Line (2)	68,560,569	18.0%			241,962	19.2%		
Orange Line	60,969,412	16.0%			181,349	14.4%		
Blue Line	16,346,409	4.3%			58,189	4.6%		
Light Rail			81,181,603	21.4%			255,910	20.3%
Green Line - Subway	55,488,289	14.6%			170,348	13.5%		
Green Line - Surface (3)	25,693,314	6.8%			78,878	6.3%		
Mattapan - Ashmont Trolley (4)					6,684	0.5%		
Rubber Tire			109,736,843	28.9%			366,567	29.1%
Bus (5)	105,881,740	27.9%			352,655	28.0%		
Trackless Trolley	3,855,103	1.0%			13,912	1.1%		
Commuter Rail			38,816,100	10.2%			142,360	11.3%
Commuter Rail	39,207,425	10.3%			142,360	11.3%		
Contracted Service			2,411,898	0.6%			8,599	0.7%
Contracted Bus	1,116,502	0.3%			4,109	0.3%		
Ferry Boat	1,295,396	0.3%			4,490	0.4%		
Total Scheduled Service	378,414,159	99.5%	378,022,834	99.5%	1,254,936	99.5%		
THE RIDE	1,764,066	0.5%	1,764,066	0.5%	5,748	0.5%		
Total MBTA Ridership	380,178,225	100.0%	379,786,900	100.0%	1,260,684	100.0%		

- (1) Passengers are counted every time they board a vehicle no matter how many vehicles they use to travel from their origin to their destination.
- (2) Excludes Mattapan-Ashmont Trolley.
- (3) Annual Ridership includes Mattapan-Ashmont Trolley Service.
- (4) Re-opened Dec 2007.
- (5) Includes Silver Line Service.

MBTA Ridership by Mode FY2008



Route Miles and Scheduled Weekday One-Way Trips (FY08)

	Route Miles (1)		Schedule Weekday One-Way Trips	
Heavy Rail	38		1,106	
Red Line (Ashmont & Braintree)	21		426	
Orange Line	11		312	
Blue Line	6		368	
Light Rail	26		1,529	
Green Line (Subway)	4			
Green Line (Surface)	19			
Green Line (Subway + Surface)			1,227	
Mattapan-Ashmont Trolley	3		302	
Rubber Tire	761		14,684	
Silver Line - Washington Street	2		336	
Silver Line Waterfront (2)	8		649	
Bus	740		13,035	
Trackless Trolley	11		664	
Commuter Rail	394		491	
Commuter Rail North Side			198	
Commuter Rail South Side			293	
Commuter Rail (North + South Side)	394			
Ferry Boats	38		162	
Inner Harbor Ferry	1		78	
Commuter Boats	37		84	
Totals	1,257	1,257	17,972	17,972

- (1) One-Way, Non-Duplicative (August 2008).
- (2) Route Miles: Silver Line Transit Way Tunnel: 1 mile; Silver Line Waterfront Surface: 7 miles.

Note: 1 mile = 1.609344 km

MBTA Routes (August 2008)

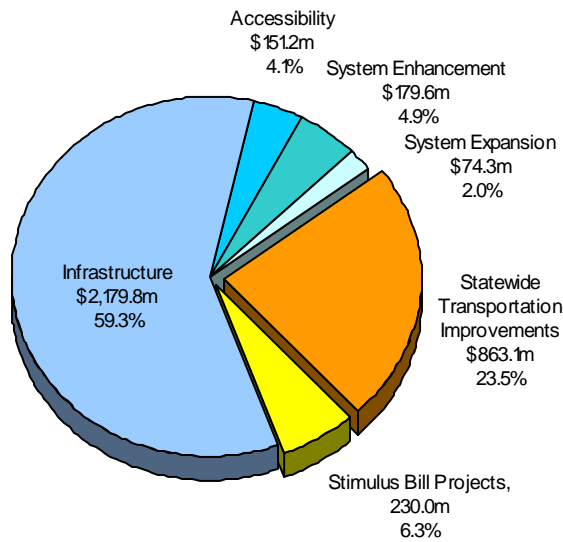
	Routes	
Heavy Rail	4	
Red Line (Ashmont & Braintree)	2	
Orange Line	1	
Blue Line	1	
Light Rail	5	
Green Line (Subway + Surface)	4	
Mattapan-Ashmont Trolley	1	
Rubber Tire (MBTA)	191	
Silver Line - Washington Street	1	
Silver Line Waterfront (2)	4	
Local, Express, Community, Limite Service	175	
Crosstown (Four route segments advertised as CT1, 2, & 3)	3	
Trackless Trolley	4	
Other	4	
Rubber Tire (Contracted)	11	
700-Series Private Carrier	4	
Suburban Bus	7	
Commuter Rail	14	
Commuter Rail North Side	5	
Commuter Rail South Side	9	
Ferry Boats	3	
Inner Harbor Ferry	1	
Commuter Boats	2	
Total	228	228

- (1) Includes Route #476 Tunnel Shuttle.

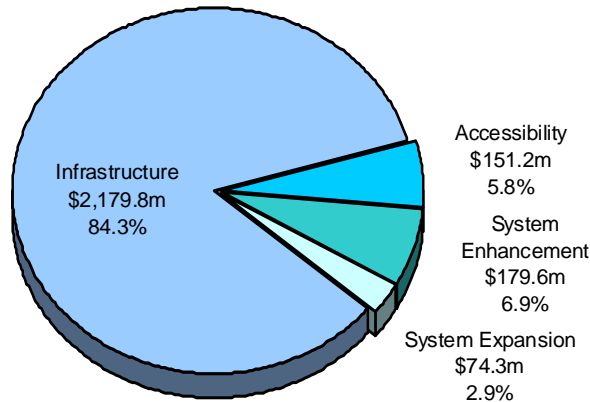
SUMMARY OF FUNDING

The MBTA has programmed \$3.68 billion for the FY10-FY14 Capital Investment Program (CIP), of which \$863 million represent State-sponsored projects (Statewide Transportation Improvements), and \$230 million are Stimulus Bill Projects (100% federally funded). The CIP is structured in the following four major programmatic areas: 1) reinvestment in the existing infrastructure; 2) accessibility improvements; 3) enhancement to existing services; and 4) system expansion efforts.

All Funding Sources



MBTA Funding Only



SUMMARY OF FUNDING

MBTA Capital Investment Program FY10-FY14 (\$ in millions)

PROGRAM AREA	PROGRAM OVERVIEW	MODES	FY10-FY14	
			\$	%
INFRASTRUCTURE				
Revenue Vehicles	Includes all vehicles used to carry passengers in revenue service.	Subway, Commuter Rail, Silver Line, Bus	\$1,111.6	30.2%
Non-Revenue Vehicles	Includes vehicles used to maintain the system and to support system administration.	Systemwide	\$17.5	0.5%
Track/Right-of-Way	Includes infrastructure within the right-of-way such as track, ties and ballast.	Subway, Commuter Rail	\$107.5	2.9%
Signals	Includes all elements of the rail signaling systems.	Subway, Commuter Rail	\$150.1	4.1%
Communications	Includes telecommunications, systemwide radios and the Operations Control Center.	Systemwide	\$9.6	0.3%
Power	Includes the network to provide traction power to the rail system, as well as lighting and other electrical elements.	Subway, Commuter Rail, Systemwide	\$81.0	2.2%
Maintenance Facilities	Includes the rail car houses and bus garages where vehicles are maintained and stored.	Subway, Commuter Rail, Bus, Systemwide	\$50.5	1.4%
Stations	Includes the subway and surface stations where passengers board MBTA vehicles.	Subway, Commuter Rail, Silver Line, Bus	\$376.9	10.2%
Facilities	Includes administrative buildings and other structures needed to support transit services.	Subway, Commuter Rail, Systemwide, Tunnels	\$31.5	0.9%
Bridges	Includes all bridges maintained by the MBTA.	Systemwide	\$106.3	2.9%
Fare Equipment	Includes all infrastructure associated with the collection of MBTA revenues.	Systemwide	\$42.1	1.1%
Technology/Other	Includes the technological and informational infrastructure needed to support the provision of MBTA service, as well as other services that support the capital program.	Information Technology, Systemwide	\$95.1	2.6%
ACCESSIBILITY	Encompasses actions that make accessibility improvements to MBTA stations and vehicles.	Systemwide	\$151.2	4.1%
SYSTEM ENHANCEMENT	Encompasses capital projects that improve existing service and foster increased ridership.	Subway, Commuter Rail, Systemwide, Parking, Environmental, Transit Security	\$179.6	4.9%
SYSTEM EXPANSION	Encompasses the development, conceptual planning, design and construction of any effort to expand the scope of MBTA services.	Subway, Commuter Rail, Silver Line, Bus, Studies/Planning	\$74.3	2.0%
STATEWIDE TRANSPORTATION IMPROVEMENTS	Includes non-MBTA funding sources	Systemwide	\$863.1	23.5%
STIMULUS BILL PROJECTS	Includes 100% federal funding	Systemwide	\$230.0	6.3%
GRAND TOTAL			\$3,677.9	100.0%

CHAPTER 1

REVENUE VEHICLES

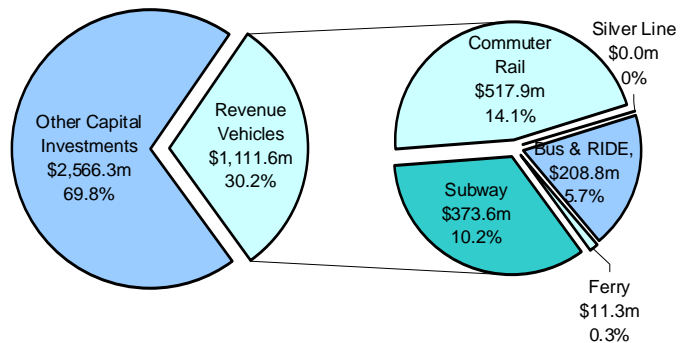
PROGRAM OVERVIEW

The revenue vehicle fleet is one of the most visible and important components of the MBTA service network. These are the trains, buses, ferries and other vehicles that passengers board every day. The MBTA's fleet is composed of approximately 2,500 revenue vehicles as detailed below.

The MBTA adheres to a general standard lifecycle of 35 years for rapid transit and light rail vehicles, 25 years for commuter rail locomotives, 25 to 30 years for commuter rail coaches, and 15 years for buses. Scheduled major overhauls, maintenance, and planned retirements help these fleets reach their useful life, and prevents the unwarranted consumption of resources to maintain their reliability.

The current program devotes \$1,111.6 million to revenue vehicles, primarily for fleet procurement and overhaul programs. The revenue vehicle program represents 30.2% of the total Capital Investment Program, the largest share of any programmatic area, and is composed primarily of reinvestment in subway, commuter rail and bus fleets. In keeping with the MBTA's

Revenue Vehicles Funding



REVENUE VEHICLES

commitment to upgrade its bus service, the Authority is taking delivery of 155 ultra low sulfur diesel vehicles. Other efforts in this program also include major component replacements on the Green, Orange, and Red Lines. Furthermore, the procurement of 94 new cars for the Blue Line will contribute to modernize and expand the subway fleet.

Activity within the commuter rail vehicle program includes midlife overhaul for large portions of the locomotive and coach fleets. It is anticipated that the commuter rail fleet needs will represent a more significant portion of the Capital Investment Program in the future.

REVENUE VEHICLES – SUBWAY

The MBTA subway system consists of four transit lines. The Red, Blue, and Orange lines are referred to as Rapid Transit, whereby the Green Line is Light Rail. Each of the lines has a distinct fleet of vehicles (in some cases more than one fleet per line). These individual fleet are assigned a number by the MBTA.



The Red Line fleet is made up of two hundred and eighteen (218) cars of three separate fleets. They include seventy-four (74) Pullman Standard No. 1 cars, fifty-eight (58) UTDC No. 2 cars, and eighty-six (86) Bombardier No. 3 cars. Preventive maintenance inspections occur every 8,500 miles for the No. 1 and No. 2 cars, and every 15,000 miles for the No. 3 cars.

The Blue Line fleet is comprised of seventy (70) Hawker-Siddeley No. 4 cars. Most of these cars are scheduled for retirement. The Authority is now receiving the new Siemens No. 5 cars. This process is expected to last through 2009, at which point the Blue Line will have a fleet size of one hundred and twelve (112) vehicles consisting of ninety-four (94) No.5 cars and eighteen (18) No. 4 cars.

The Orange Line fleet consists of one hundred twenty (120) Hawker-Siddeley No. 12 series cars. Preventive maintenance inspections occur on a 90-day interval.

MBTA Heavy/Light Rail Revenue Vehicle Fleets				
Line	Fleet Name	Service Dates	Qty	Qty by Line
Red Line				
Red	No. 1 Fleet	1969	74	218
Red	No. 2 Fleet	1988	58	
Red	No. 3 Fleet	1994	86	
Blue Line				
Blue	No. 4 Fleet	1978-80	70	94
Blue	No. 5 Fleet	2007-08	24	
Orange Line				
Orange	No. 12 Fleet	1981	120	120
Green Line				
Green	PCC Cars	1945-1946	10	217
Green	No. 7 Fleet	1986-88, 1997	112	
Green	No. 8 Fleet	2000-2006	95	
Total Heavy and Light Rail Revenue Vehicles				649

As of August 2008

The Green Line fleet is made up of two hundred and seventeen (217) light rail vehicles (LRVs) with two separate fleets: one hundred and twelve (112) Kinki-Sharyo No. 7 cars, and ninety-five (95) Breda No. 8 cars. The Green Line also maintains ten (10) active Presidents' Conference Committee (PCC) cars, which is the oldest fleet on MBTA property.

The useful life of subway rolling stock is 35 years or more. The MBTA subscribes to a philosophy of on-going preventive maintenance for light rail and heavy rail vehicles. This approach keeps the vehicles safe and reliable at a reasonable cost. Preventive maintenance will be needed for repairing major components such as floors, pantographs, couplers, or overhead blower motors.

The major part of the subway vehicle capital program has been designated for the procurement of new fleets for the Green, Blue and Orange Lines. In addition, the Orange, Red, and parts of the Green Line fleets are undergoing major capital component replacements and overhauls.

FUNDED PROJECTS

The ten approved projects in the subway vehicle program replace vehicle fleets on the Green Blue and Orange lines, perform major overhauls and component replacements for four vehicle fleets, and supply the remaining fleets with minor component overhauls and preventive maintenance. All of the projects listed below (with the exception of the procurement efforts) represent preventive maintenance and will have a neutral effect on the operating budget. The No. 8 procurement has increased the Green Line fleet by 20% and the new Blue Line car procurement will increase the Blue Line fleet by 35%, resulting in higher operating and maintenance costs.

Red Line No. 1 Car Reinvestment

This project, currently in process, is performing a component exchange on the Red Line No. 1 cars to ensure continued vehicle reliability and to extend vehicle service life.

Red Line No. 2 Car Overhaul

The purpose of this project is to perform a full midlife overhaul of the No. 2 vehicles. This program will maintain major systems in a state of good repair and ensure the vehicle fulfills its useful life.

Red Line No. 3 Car Upgrade

This project funds the procurement, removal, and reinstallation of lithium batteries, including the replacement of the controller circuit cards and related software. In addition, the project will replace the monitoring terminal units (MTUs) in control cars. The main objective of this project is to ensure the reliability of the No. 3 vehicle fleet.

Green Line No. 8 Cars (Low Floor) Procurement

This project encompasses the procurement of 85 new low floor Green Line (No. 8) cars with spares. This investment also includes the modification of the existing No. 7 fleet to allow the No. 7 and No. 8 cars to operate together. This effort improves the Green Line accessibility for disabled passengers and increases the overall size and capacity of the fleet.

Green Line No. 9 Car Procurement

This project will fund the procurement of new Green Line vehicles for service expansion. The State EOT is currently underway with planning/environmental impact assessment for this SIP commitment project extending the Green Line to Somerville and Medford. Upon completion of planning phase activities, the line expansion will be designed and constructed using funds provided by the Commonwealth (see page 127). To provide service beyond Lechmere while maintaining the current level of service the Authority will have to procure additional vehicles for the Green Line.

REVENUE VEHICLES

Green Line No. 7 Car Midlife Overhaul

This project encompasses a number of component repair and replacement efforts for the Green Line No. 7 fleet. The scope includes replacing and adjusting the obstruction-sensing system on the car doors, modifying the wheel profile to minimize wear on the track, upgrading and repairing the coupler support rods and spherical bearings, reengineering and upgrading the brake actuators, and replacing vehicle roofs. This project is an expansion of the No 7 Fleet modification program.

Orange Line No. 12 Car Capital Reinvestment

This project funds the overhaul of the suspension system and the replacement of the propulsion cam controllers for the entire Orange Line fleet. This will ensure continued vehicle reliability and allow the vehicles to reach their full service life.

Orange Line No. 12 Car Rebuild—Phase II

This project involves a component overhaul for the No. 12 cars, including a structural sill repair effort that will ensure continued vehicle reliability. The project also examines a long-term strategy for maintaining the Orange Line fleet in a state of good repair.

Blue Line No. 5 Car Procurement

This project includes the procurement of 94 new Blue Line cars, allowing for six-car train service and increased capacity on the Blue Line. This procurement will increase the overall size of the Blue Line fleet and will offer better service, passenger comfort, and reliability.

Orange Line No. 14 Car Procurement

This project will fund the design of the next generation vehicle for the Orange Line. The procurement of new cars will be needed to allow the retirement of the No. 12 fleet. In addition, the Authority expects to use elements of this design for the procurement of the vehicles that will replace Red Line No. 1 cars.

Subway Revenue Vehicles Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Red Line No. 1 Car Reinvest.	\$24.30	\$11.48	\$6.44	\$6.37	\$0.00	\$0.00	\$0.00	\$12.82	\$0.00
Red Line No. 2 Car Overhaul	65.50	2.00	9.50	29.00	22.54	2.46	0.00	63.50	0.00
Red Line No. 3 Upgrade	2.34	2.00	0.34	0.00	0.00	0.00	0.00	0.34	0.00
Green Line Low Floor Cars	237.00	230.60	6.40	0.00	0.00	0.00	0.00	6.40	0.00
Purchase Green Line Vehicles	15.00	0.00	0.00	0.00	0.00	0.00	15.00	15.00	0.00
Green Line No. 7 Car Mod.	88.70	19.17	3.71	6.00	12.80	31.01	16.00	69.53	0.00
Orange Line Cars Reinvest.	11.80	9.70	0.60	0.75	0.75	0.00	0.00	2.10	0.00
Orange Line Cars Rebuild II	8.37	5.97	2.40	0.00	0.00	0.00	0.00	2.40	0.00
Blue Line Fleet Procurement	215.87	151.33	45.74	10.00	8.80	0.00	0.00	64.54	0.00
Orange Line Fleet Procurement	137.00	0.00	3.00	12.00	30.00	45.00	47.00	137.00	0.00
Total Subway Vehicles	\$805.88	\$432.26	\$78.14	\$64.12	\$74.89	\$78.47	\$78.00	\$373.62	\$0.00

ANTICIPATED FUTURE NEEDS

To date, the MBTA has identified the following subway vehicle projects as future needs.

Red Line No. 1 Replacement Fleet

New cars will be needed to allow the retirement of No. 1 cars. It is the intention of the Authority to be consistent with the procurement of the new Orange Line fleet. Coordinating these two efforts the Authority will be able to save on maintenance and inventory costs, as well as on personnel training.

Red Line No. 2 Replacement Fleet

New cars will be needed to allow the retirement of No. 2 cars, which were acquired in 1988.

REVENUE VEHICLES – COMMUTER RAIL

The commuter rail fleet consists of 410 passenger coaches and 80 locomotive units. The revenue locomotive fleet is composed of 80 units of four major types:

- 18 model F40PH-2 locomotives (1978, 1980); this fleet was upgraded in 1989-90.
- 25 model F40PH-2C locomotives (1987-88); a midlife overhaul was completed in 2003.
- 12 model F40PHM-2C locomotives (1991, 1993); a midlife overhaul was completed in 2004.
- 25 model GP40-MC locomotives (1997-98); a midlife overhaul is in progress.

There are four series of coaches: the Pullman Standard fleet, the MBB fleet, the Bombardier fleet, and the Kawasaki fleet. The coach fleets are detailed below:

- 57 Pullman coaches (1979); this fleet was over-hauled in 1995-96.
- 67 Messerschmitt-Bolkow-Blohm (MBB) coaches (1987-88). These coaches are equipped with toilet facilities. It is MBTA policy for every trainset to include one car with a functioning toilet system.
- 146 Bombardier cars (1987, 1989-90).
- 140 Kawasaki bi-level coaches (1990-91, 1997, 2002).

Locomotives and coaches are typically considered to have a useful life cycle of 25 to 30 years. Generally, top-deck overhauls are scheduled for locomotives on a 6 to 6.5 year schedule. Vehicle midlife overhauls are usually conducted at 12.5 years and are designed to enable the vehicles to reach their full service life in terms of power performance and dependability. Locomotives and coaches are typically scheduled for replacement after the vehicles have reached their 25 to 30-year life expectancy.

MBTA Commuter Rail Revenue Vehicle Fleets			
Fleet Type	Service Dates	Qty	Totals
Locomotives			
F40PH-2 Locomotives	1978, 1980	18	80
F40PH-2C Locomotives	1987-1988	25	
F40PHM-2C Locomotives	1991, 1993	12	
GP40-MC Locomotives	1997-1998	25	
Coaches			
Pullman Coaches	1979	57	410
MBB Coaches	1987-1988	67	
Bombardier A Cars	1987	40	
Bombardier B Cars	1989-1990	106	
Bi-level Kawasaki Coaches	1990-91, 1997, 2002 2005-2006	140	
Total Commuter Rail Vehicles			490

As of August 2008

FUNDED PROJECTS

Capital projects for commuter rail vehicles include procurement and overhaul of locomotives and coaches. Procurements of new coaches for the Greenbush Commuter Rail project are listed in the System Expansion section of this document. The overhaul projects represent normal preventive maintenance and will have a neutral impact on the Authority’s operating budget.

Commuter Rail Locomotives Midlife Overhaul:

F40PH-2C Midlife Overhaul (25)

This effort funded a standard midlife overhaul for 25 F40PH-2C locomotives. The overhaul, which was completed in 2003, reconditioned the fleet for passenger safety and efficiency.

F40PHM-2C Midlife Overhaul (12)

This effort funded a standard midlife overhaul of 12 F40PH-2M locomotives. The overhaul, which was completed in 2004, reconditioned the fleet for passenger safety and efficiency.

Commuter Rail Locomotives Top-Deck Overhaul:

F40PH-2 Locomotives (18)

This project funded a top-deck overhaul program for 18 F40PH-2 locomotives. The program, which was completed in 2004, reconditioned these vehicles for passenger safety and efficiency.

GP40-MC Locomotives (25)

This effort funds the overhaul of 25 GP40-MC locomotives. Work consists of replacing rotating equipment such as power assemblies, turbochargers, camshafts, fuel injectors, pump compressors and fans. The completion of this overhaul will improve the service reliability of these units, help maintain on-time performance standards, and increase operating efficiency by reducing the number of failures.

Coach Reliability and Safety Program (CRASP)

This project funds the overhaul of key components of the coach fleet. To be included in this overhaul program are important safety components such as trucks, brakes, couplers, and draft gears, in addition to others such as air conditioning systems and toilets. The program encompasses approximately 270 coaches of the coach fleet.



Locomotive Procurement (28)

This project funds the procurement of 28 locomotives, which will replace portions of the existing fleet while reducing emissions.

Coach Procurement (75)

This project funds the procurement of 75 bi-level coaches. This project will allow the Authority to retire a portion of the coach fleet while increasing commuter rail passenger capacity.

CTC, BTC-4 Kawasaki Coach Overhaul (75)

This project funds the full midlife overhaul of 75 bi-level Kawasaki coaches acquired in 1990-91. The overhaul work includes replacing and reconditioning trucks, couplers, HVAC system, electrical system, batteries and battery chargers, some interior fixtures and safety-emergency equipment.

GP40-MC Locomotive Equipment Procurement (25)

This project funded the procurement of 25 GP40-MC locomotives. These locomotives have been in service since 1997, however contract warranty payments were part of the capital program until fiscal year 2007.

Commuter Rail Revenue Vehicles Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Locomotive Midlife Overhaul	\$43.54	\$40.80	\$2.74	\$0.00	\$0.00	\$0.00	\$0.00	\$2.74	\$0.00
Locomotive Top Deck Ovrl.	20.38	7.49	9.82	6.25	0.00	0.00	0.00	16.07	0.00
Pass. Coach Mntce. Prgm.	37.64	29.10	8.54	0.00	0.00	0.00	0.00	8.54	0.00
Locomotive Procurement	186.00	0.00	5.00	37.00	47.00	47.00	50.00	186.00	0.00
CR Coach Procurement	232.00	19.00	31.50	20.00	51.00	43.00	61.50	207.00	0.00
Kawasaki Coach Overhaul	99.00	1.50	3.00	12.50	20.00	40.00	22.00	97.50	0.00
New Locomotive Proc.	32.49	32.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Commuter Rail Vehicles	\$651.05	\$130.38	\$60.60	\$75.75	\$118.00	\$130.00	\$133.50	\$517.85	\$0.00

ANTICIPATED FUTURE NEEDS

New procurements to support planned system expansions such as the Greenbush Line are not included in this program, however, they are incorporated into the System Expansion section of this document. Several efforts have been identified as commuter rail fleet future needs.

□ F40PH-2C Locomotives Top-Deck Overhaul (25)

A top-deck overhaul is recommended for 25 F40PH-2C locomotives. Work consists of replacing rotating equipment such as power assemblies, turbochargers, camshafts, fuel injectors, pump compressors and fans. The completion of this overhaul will improve the service reliability of these units, help maintain on-time performance standards, and increase operating efficiency by reducing the number of failures.

□ F40PHM-2C Locomotives Top-Deck Overhaul (12)

A top-deck overhaul is recommended for 12 F40PHM-2C locomotives. Work consists of replacing rotating equipment such as power assemblies, turbochargers, camshafts, fuel injectors, pump compressors and fans. The completion of this overhaul will improve the service reliability of these units, help maintain on-time performance standards, and increase operating efficiency by reducing the number of failures.

□ BTC-4A Kawasaki Coaches Midlife Overhaul (17)

A midlife overhaul for seventeen (17) option coaches of the Kawasaki fleet acquired in 1997 is anticipated. If this project is executed as planned these seventeen options coaches are expected to be kept passenger-service worthy until the year 2022.

□ BTC-4B Kawasaki Coaches Midlife Overhaul (15)

A midlife overhaul for fifteen (15) option coaches of the Kawasaki fleet acquired in 2001-02 is anticipated. If this project is executed as planned these fifteen options coaches are expected to be kept passenger-service worthy until the year 2026.

□ GP40-MC Locomotives Midlife Overhaul (25)

This effort would fund a midlife overhaul for 25 GP40-MC locomotives. The overhaul would recondition the fleet for passenger safety and operational efficiency until an expected retirement date in the year 2022.

□ BTC-4C Kawasaki Coaches Midlife Overhaul (33)

A midlife overhaul for thirty-three coaches of the Kawasaki fleet acquired in 2005 is anticipated. If this project is executed as planned these thirty-three coaches are expected to be kept passenger-service worthy until the year 2030.

REVENUE VEHICLES

REVENUE VEHICLES – BUS

One of the MBTA's priorities is to improve bus service. This priority is reflected in the magnitude of current capital investment in bus fleets. By the end of 2006, almost two-thirds of the bus fleet had been replaced with 631 new vehicles. Hundreds of diesel buses from the 1980s had been retired, and the remaining fleets are undergoing a thorough overhaul. This program includes vehicles in the MBTA's bus, trackless trolley and paratransit services (THE RIDE). The MBTA's bus and trackless trolley service operations consist of 186 routes. THE RIDE, a demand-responsive service for individuals with mental and physical disabilities, provides accessible service to 62 cities and towns in the MBTA service district.



The MBTA's bus fleet currently consists of 1055 active buses: 360 compressed natural gas (CNG) low-floor buses, 503 emission-controlled diesel buses, 125 ultra low-sulfur diesel buses, 28 trackless trolley vehicles, 2 prototype alternative fuel buses, and 32 dual mode articulate buses. In addition, 5 trackless trolleys procured in 1976 are used to support the 28 new Electric Trolley Buses. New buses procured since 2001 include features such as low floors for easy boarding, "smart" bus location message signs and audio announcements, and environmentally-friendly propulsion systems to reduce emissions. The average age of the bus fleet, 14 years in 2003, dropped to 5.7 years of age by 2007. In short, the MBTA's goal is to improve its bus fleet through new equipment, customer service initiatives, and increased reliability.

All 40-foot coaches and CNG vehicles have a 15-year useful life, and trackless trolleys have a 20-year useful life. All new buses operate on clean compressed natural gas or emission-controlled ultra-low sulfur diesel (ECD) engines, which are the most cost-effective and environmentally friendly propulsion technologies for the MBTA fleet. In addition, 568 vehicles for THE RIDE with useful lives of 6-7 years are included in the bus revenue vehicle fleet. Below is a roster of the MBTA's bus fleets:

COMPRESSED NATURAL GAS (CNG) BUSES

2002 New Flyer CNG Buses

These 17 40-foot buses were initially deployed on Phase I of the Silver Line. Today these buses are used on standard bus routes.

2003 NeoPlan 60-foot Articulated CNG Buses

This 44-bus fleet entered service in 2003 and 2004. These low-floor buses are 60 feet long and offer more seats and expanded capacity compared to a traditional 40-foot bus.

2004 North American Bus Industries (NABI) CNG Buses

This fleet of 299 buses, which entered service in 2004, are fueled by clean-burning compressed natural gas, are air-conditioned, and will offer low floors for easy boarding. These vehicles have allowed the Authority to replace hundreds of 1980s-vintage diesel buses.

DIESEL BUSES

1994-1995 "Zero-Series" TMC/Nova RTS

This 40-foot series is composed of 125 vehicles, which are equipped with both wheelchair lifts and air conditioning. The fleet is reaching the end of its 15-year useful life.

2004 NeoPlan Emission-Controlled Diesel (ECD) Buses

This group of 193 buses also entered service in 2004, completing the retirement of buses purchased in the 1980s. This fleet is fueled by efficient engines running on ultra-low sulfur diesel fuel. Based on initial success of these buses, the Authority increased the initial 175 units by exercising its option for an additional 18 buses for a total of 193 low floor ECD buses.

2006/2007 New Flyer Emission-Controlled Diesel (ECD) Buses

This group of 155 buses entered service in 2006 and 2007. This fleet is fueled by engines running on ultra-low sulfur diesel fuel.

ALTERNATIVE POWER BUSES

1976 Flyer Trackless Trolleys

The trackless trolley fleet includes 5 electric trolley buses procured in 1976. These trolleys are used to provide support to the fleet of 28 electric trolley buses (below).

2003 Prototype Alternative Fuel

In 2003, the Authority procured two (2) buses to test new propulsion technology. Bus Operations is proposing to convert the two buses for use as instruction and training buses.

MBTA Bus Revenue Fleets			
Fleet Type	Service Dates	Qty	Qty by Type
Compressed Natural Gas (CNG) Vehicles			
New Flyer CNG 40-ft	2001-2002	17	360
NeoPlan CNG 60-ft (a)	2003	44	
NABI CNG 40-ft	2004	299	
Diesel Vehicles			
"Zero-Series" 40-ft	1994-1995	125	628
NeoPlan ECD 40-ft	2004	193	
New Flyer ECD 40-ft	2006-2008	310	
Alternative Power Vehicles			
Flyer Trackless Trolleys	1976	5	67
Prototype Alternative-Fuel	1999	2	
Electric Trolley Buses	2004	28	
Dual Mode Articulate 60-ft (b)	2005-2006	32	
Total Number of Vehicles			1,055

As of August 2008

- (a) 17 of the 44 NeoPlan CNG 60-ft vehicles are used for Silver Line Phase I service.
- (b) All 32 vehicles are used for Silver Line Phase II service.

2004 NeoPlan Electric Trolley Buses

This new fleet of 28 new trackless trolleys incorporates the new technology of smart bus features, a propulsion system powered by overhead catenary wires, and a low-floor design to accommodate all riders.

2004/2005 NeoPlan 60ft Dual-Mode Articulated Buses

This new fleet of 32 vehicles is in service supporting Phase 2 of the Silver Line's Transitway and Airport Intermodal Transit Connector (AITC) with the Logan Airport facilities. The Authority, under FTA's guidance, entered a joint procurement arrangement with Massport for 8 of the 32 vehicles, to provide service to Boston's Logan Airport. The Authority will perform maintenance and operations of the vehicles under a separate agreement with Massport.

Each of these buses are powered by two 161 Hp Skoda Energo AC traction motors. Electrical power is provided from 600 vdc overhead wires in the transitway tunnel, and from a 746 kW Kaman Generator when on surface streets. The generator is driven by an emissions

REVENUE VEHICLES

controlled, 500 Hp, Detroit Diesel, Series 60 Engine running on ultra low sulfur diesel fuel with a diesel particulate filter.

The MBTA's maintenance strategy for the bus program is characterized by continuous and frequent preventive maintenance inspections, along with immediate, complete repairs of all defects using new parts. Part replacement is on a programmed schedule to prevent complete component failure. Power train overhauls are completed every 250,000-300,000 miles. This effort maximizes vehicle and component utilization by employing advanced preventive maintenance practices.

THE RIDE

As of December 2007, the Authority's paratransit program, THE RIDE, had a fleet of 216 sedans and 313 lift-equipped vans. The MBTA owns 73% of the fleet, which consists of 193 sedans (with a useful life of 6 years) and 224 vans (with a useful life of 7 years). The remaining 151 vehicles or 27% of the fleet are owned and maintained by four private firms.



As of December of 2007

THE RIDE Vehicle Fleets				
Ownership	Type of Vehicle	Qty	Totals	%
MBTA-owned	Sedans	193	417	73%
	Vans	224		
Contractor-owned	Sedans	23	151	27%
	Vans	89		
	Taxis	39		
Total RIDE Vehicles			568	100%

FUNDED PROJECTS

The majority of spending in the nine approved projects in the bus program is for the purchase of new buses and trackless trolleys. While most of these projects, including emission-controlled diesel buses, will have a neutral impact on operating costs, the CNG buses will have a negative impact on operating costs due to increased fuel and required maintenance costs.

27 NeoPlan 60-foot Articulated CNG Buses

These vehicles are in service, and at the moment the project represents close out costs. This project funded the procurement of 27 60-foot articulated CNG-fueled buses. These buses, which began entering service in 2003, offer expanded seating capacity, high quality service, and run on environmentally-friendly low emissions technology.

310 New Emission-Controlled Diesel (ECD) Buses

This project funds the procurement of 310 ECD vehicles to continue the programmatic replacement of MBTA buses.

Bus Replacements Phase IV: 85 New Emission-Controlled Diesel (ECD) Buses

This new project will procure an additional fleet of up to 85 vehicles to continue the programmatic replacement of MBTA buses in future years.

299 North American Bus Industries 40-foot Compressed Natural Gas Buses

This major project has funded the procurement of 299 CNG-fueled buses, which are already in service.

☑ 175 NeoPlan 40-foot Emission-Controlled Diesel (ECD) Buses

Under this bus procurement effort the Authority acquired 175 new ECD 40-foot buses.

☑ "Zero Series" Bus Midlife Overhaul

The bus fleets purchased in 1994 and 1995, also known as the "zero-series" buses, are receiving thorough overhauls and strict maintenance as they remain in active service during a staggered phase-out and replacement. This project provides funding for midlife overhaul of the buses in the fleet, consisting of a full component overhaul or lighter structural work, depending on vehicle condition and need. The rehabilitation is performed to improve vehicle structure, mechanical systems, wheelchair lifts, electrical systems and bodywork with the intent to improve service reliability and passenger comfort.

☑ Bus Capital Initiatives

Bus Capital Initiatives includes programmatic replacement of various bus components in the "zero" series fleet and the installation of ultra capacitors on the remaining fleet.

☑ 2004-2005 Bus Fleet Rehab

This project will fund the overhaul of all buses procured through 2005.

☑ THE RIDE Vehicle Program

Under this category the Authority has the option to allocate capital funds to procure a fleet of accessible paratransit vans and sedans.

Bus Revenue Vehicles Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
NeoPlan 60-ft CNG Buses	\$17.70	\$17.70	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Procure 310 buses	124.50	103.00	21.50	0.00	0.00	0.00	0.00	21.50	0.00
Replacement Buses - Ph. 4	73.80	0.00	0.00	1.00	10.00	30.00	32.80	73.80	0.00
NABI 40-ft CNG Buses	105.03	105.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NeoPlan 40-ft ECD Buses	67.62	67.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00
"Zero-Series" Overhaul	52.16	52.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bus Capital Initiatives	7.50	7.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004/2005 Bus Fleet Rehab	98.75	0.00	12.00	25.00	25.00	26.75	10.00	98.75	0.00
RIDE Vehicle Program	16.05	1.30	4.70	4.00	6.05	0.00	0.00	14.75	0.00
Total Bus and RIDE Vehicles	\$563.11	\$354.31	\$38.20	\$30.00	\$41.05	\$56.75	\$42.80	\$208.80	\$0.00

ANTICIPATED FUTURE NEEDS

Given the age of the existing fleet, current bus purchases will result in a large influx of new vehicles. In the future, however, the MBTA intends to program bus vehicle purchases to allow the Authority to receive a small number of buses at a constant rate. This strategy will reduce the Authority's mechanical dependency on a single class of vehicles, and will keep the average bus age relatively constant over time. The following projects have been identified as anticipated future needs.

☐ Continue "Zero-Series" Fleet Replacement

In the long term, additional new buses beyond the purchases programmed in the current capital program are anticipated. This effort will support the retirement of the fleet of "zero-series" buses, which are currently undergoing a program of midlife overhaul, maintenance, and replacement. It is anticipated that the MBTA will continue to purchase these buses gradually to complete a staggered phase-out of the fleet over several years in conjunction with the ongoing overhaul effort, and based on the need and condition of the remaining fleets.

REVENUE VEHICLES

REVENUE VEHICLES – SILVER LINE

The Silver Line, a new Bus Rapid Transit (BRT) system, provides service from Dudley Square, through downtown, South Station, the South Boston Seaport District, and to Logan Airport. When complete, the Silver Line will provide connections between Roxbury and job centers in downtown, South Station, South Boston, and Logan Airport. Phase I, with service along Washington Street from Dudley Square in Roxbury to downtown Boston, opened in July 2002. Phase II, with service from South Station to the South Boston Seaport District, Logan Airport, the new convention center, and the Boston Marine Industrial Park via a tunnel under Fort Point Channel, opened in December 2004.



The following is the roster of MBTA's Silver Line vehicles:

2003 NeoPlan 60-foot Articulated CNG Buses

A fleet of 17 60-foot NeoPlan articulated Compressed Natural Gas (CNG) buses currently provides service to Phase I of the Silver Line between downtown, along the exclusive bus-only portions of Washington Street, and Dudley Square. These vehicles, acquired in 2003-2004, are expected to have a useful life of 12 to 15 years. They are powered by clean-burning compressed natural gas, equipped with low floors for easy boarding, and are air-conditioned. These vehicles have the ability to provide automatic vehicle location information, via a Global Positioning System (GPS) unit, to onboard passengers and to the Bus Operations Control Center to ensure frequent service and proper spacing between vehicles. In addition, they are equipped with "smart" location message signs and audio announcements, capable of informing passengers of their location, the destination of the bus, the next station stop, intermodal transfers, and other useful information.

2004/2005 NeoPlan 60ft Dual-Mode Articulated Buses

The Phase II portion of the Silver Line operates 32 dual-mode, diesel-electric, 60-foot articulated buses in the tunnel from South Station to South Boston and Logan Airport. This new fleet is in service supporting Phase II of the Silver Line's Transitway and Airport Intermodal Transit Connector (AITC) with the Logan Airport facilities. The Authority, under FTA's guidance, entered a joint procurement arrangement with Massport for 8 of the 32 vehicles, to provide service to Boston's Logan Airport. The Authority will perform maintenance and operations of the vehicles under a separate agreement with Massport.

Each vehicle is powered by two 161 Hp Skoda Energo AC traction motors. Electrical power is provided from 600 vdc overhead wires in the transitway tunnel, and from a 746 kW Kaman Generator when on surface streets. The generator is driven by an emissions controlled, 500 Hp, Detroit Diesel, Series 60 Engine running on ultra low sulfur diesel fuel with a diesel particulate filter.

MBTA Silver Line Fleets			
Fleet Type	Silver Line Phase	Service Dates	Qty
NeoPlan CNG 60-ft	Phase I	2003-2004	17
Dual Mode Articulate 60-ft	Phase II	2005-2006	32
Total Number of Vehicles			49

As of August of 2008

FUNDED PROJECT

The only project in the Silver Line revenue vehicles program funded the procurement of vehicles for the Washington Street portion (Phase I) of the Silver Line. This project has been completed and had a neutral impact on the Authority’s operating budget.

Washington Street Replacement Vehicles (Phase I)

This procurement project funded 17 CNG powered 60-foot articulated, low floor accessible vehicles to provide Silver Line service between Dudley Square and downtown Boston. These vehicles are already in service, and at this point the project has been closed.

Silver Line Revenue Vehicles Project (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Wash. St. Vehicles (Ph I)	\$13.30	\$13.30	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total Silver Line Vehicles	\$13.30	\$13.30	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

ANTICIPATED FUTURE NEEDS

The Authority anticipates the following additional vehicle procurements and maintenance projects for Silver Line.

Silver Line Phase I Vehicle Midlife Overhaul

The MBTA anticipates programming a midlife overhaul for the 17-vehicle fleet currently operating on Phase I of the Silver Line.

Silver Line Phase II Vehicle Midlife Overhaul

The MBTA anticipates programming a midlife overhaul for the 32-vehicle fleet currently operating on Phase II of the Silver Line.

Silver Line Phase III Vehicles

After the completion of the Silver Line System, additional vehicles may be needed to provide extended service.



Courthouse Station (Silver Line)

REVENUE VEHICLES

REVENUE VEHICLES – FERRY BOATS

The Authority will continue focus on system reinvestment, which includes the replacement of vessels that operate the MBTA Harbor Express service. The MBTA operates commuter boat service on three routes between Boston, various points in the inner Boston Harbor, and three terminals on the South Shore. Two of the ferry boats are owned by the Authority, while the remaining 10 are owned by outside service contractors. Ferry terminals are located at Pemberton Point in Hull, Hewitt's Cove in Hingham, Fore River Shipyard in Quincy, Logan Airport, Charlestown Navy Yard, Rowes Wharf and Long Wharf in Boston.

MBTA Water Transportation Revenue Vessels						
Vessel	Service Date	Length	PAX Capacity	Route	Qty	
MBTA Owned						
Flying Cloud	1996	76'	149	F2/F2H	2	
Lightning	1996	76'	149	F2/F2H		
Contracted Service						
Bostonian II	1979	57'	149	F4	10	
Edward Rowe Snow	1982	58'	190	F4		
Anna	1983	61'	149	F4		
Massachusetts	1988	88'	346	F1		
Matthew J. Hughes	1990	111'	348	F1		
Nora Vittoria	1998	110'	400	F1		
Aurora	1999	122'	400	F1		
Voyager III	1999	96.1'	325	F2/F2H		
Back-up Vessels						
James Doherty	1996	100'	348	F1		
Salacia	2000	155'	600	F1		
Total Number of Vessels					12	

As of August 2008

Ferry Boat Routes	
F1	Hingham – Boston
F2	Quincy – Boston
F2	Quincy – Logan
F2H	Hull – Boston
F4	Charlestown - Boston



FUNDED PROJECTS

The spending in the approved projects is for the procurement or replacement vessels and enhancement of ferry service.

Ferry System Improvements

This project funds a variety of efforts aimed at improving ferry services including docking facility refurbishment.

Boat Engine Overhaul Program

This project funds labor cost and the procurement of parts for ferry engine overhauls.

High-speed Ferry Procurement for MBTA Harbor Express Service

This project funds the procurement of a high-speed catamaran for MBTA Harbor Express serving Quincy, Hull, Boston and Logan Airport.

Ferry Revenue Vehicles Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Ferry System Improvements	\$5.69	\$0.75	\$1.23	\$1.00	\$1.00	\$1.00	\$0.70	\$4.93	\$0.00
Boat Engine Overhaul Program	2.85	0.75	0.50	0.50	0.50	0.50	0.60	2.10	0.00
Catamaran for Quincy Harbor	4.27	0.00	3.67	0.60	0.00	0.00	0.00	4.27	0.00
Total Ferry Boats	\$12.80	\$1.50	\$5.40	\$2.10	\$1.50	\$1.50	\$1.30	\$11.30	\$0.00

CHAPTER 2

NON-REVENUE VEHICLES

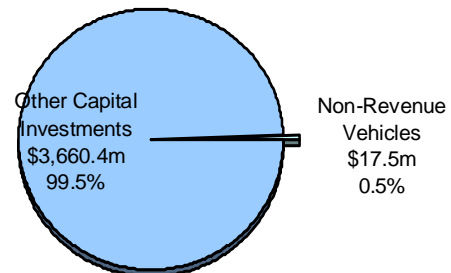
PROGRAM OVERVIEW

To respond to emergencies, perform maintenance work, keep the system safe for passengers, and to engage in major construction work, the MBTA operates a large fleet of vehicles and work equipment not used to transport passengers. Maintenance service calls, safety-critical situations, field supervision, revenue collection, repair projects, and system upgrade efforts occur throughout the MBTA's service district and metropolitan Boston. Non-revenue vehicles and equipment support the entire range of Authority operations.

The Authority owns a fleet of over 1,000 non-revenue vehicles. The types of non-revenue vehicles varies greatly, and includes rail-mounted and rubber-tired cars, trucks, sedans, police cruisers, snow plows, track geometry cars, brush cutters, and spreaders. Included in the maintenance-of-way category are crane, bucket, cable, platform, and snow fighting trucks. Rubber-tired construction equipment includes front-end loaders, backhoes, cranes, and other vehicles.

In addition to vehicles, the MBTA also owns and maintains non-revenue equipment. These include loaders, trailers, pumps, tractors, air compressors, portable light plants, and other equipment. Under the current capital program The Authority plans to invest \$17.5 million in non-revenue vehicles.

Non-Revenue Vehicles Funding



NON-REVENUE VEHICLES

SYSTEMWIDE NON-REVENUE VEHICLES

Non-revenue vehicles used to maintain the infrastructure supporting the MBTA's transit services, rights-of-way, signals, power, and other equipment include rail-mounted (or on-track) machines such as GLP (generator, lift, and pump) cars, emergency response vehicles, track geometry cars, dump cars, wire cars, flat cars, cranes, tampers, box cars, ballast regulator cars, tie handlers, brush cutters, and clearance cars. These vehicles have various service lives, ranging from 7 years to 20 years. The ability to perform maintenance, respond quickly to service problems, and to react to safety issues is critical, and the condition of the fleet that supports these activities is a major component for success.



Rapid Transit Work Cars

MBTA operations and maintenance personnel employ 46 assorted rapid transit work cars: box cars, re-railing cars, clearance cars, cranes, flat cars, snow plows, and wire cars. The useful life of these cars ranges from 7 to approximately 40 years.

Commuter Rail Work Cars

The Authority's commuter rail service provider, Massachusetts Bay Commuter Rail, operates 333 non-revenue vehicles, including hi-rail trucks, snow plows, and pickup trucks, as well as maintenance-of-way equipment.

Bus Operations, Construction, and Systemwide Vehicles

Bus Operations maintains a pool of 570 assorted vehicles for signal crews, power maintenance personnel, track crews, and administrative functions. In addition, this pool includes heavy construction machinery used by the Design and Construction Directorate, and bus tow trucks capable of towing 40- and 60-foot buses.

MBTA Police Department Vehicles

The MBTA Police Department utilizes a fleet of approximately 100 police cruisers, motorcycles, and other safety equipment.

FUNDED PROJECTS

Given the size and complexity of the non-revenue vehicle and equipment inventory, the Capital Investment Program allocates funds to a systemwide plan for programming the normal replacement of equipment over its life cycle. These funded projects represent normal replacement of assets and will have a neutral impact on the operating budget.

Systemwide Non-Revenue Vehicle Program

Based on a comprehensive fleet plan that prioritizes future ongoing replacement needs for all modes, this project provides funding for the fleet of nearly 1,000 systemwide non-revenue vehicles and equipment.

Subway Operations Non-Revenue Equipment Procurement

This effort funds the procurement of non-revenue subway equipment, including re-railing trucks for the Orange and Red Lines and a wheel profiler for the Green Line.

Systemwide Maintenance Improvement Equipment

This project funded the procurement of a production tamper, which allows the Authority to maintain and increase system reliability.

Snow Fighting Equipment

This project funded the replacement of aging snow fighting equipment.

Police Fleet Modernization

This effort provides funds for the MBTA Police Department to replace police cruisers and other safety equipment to maintain its capital infrastructure in a state of good repair.

Systemwide Non-Revenue Vehicles Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Systemwide NRV Program	\$8.26	\$0.45	\$0.00	\$0.50	\$2.00	\$2.00	\$3.31	\$7.81	\$0.00
Subway Ops. Equipment	2.26	1.30	0.96	0.00	0.00	0.00	0.00	0.96	0.00
SMI Equipment	1.80	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Snow Fighting Equipment	3.80	0.24	0.00	0.00	1.00	1.00	1.56	3.56	0.00
Police Fleet Modernization	5.13	0.00	0.00	0.00	1.13	2.13	2.00	5.13	0.00
Total System Non-Rev Veh	\$21.25	\$3.79	\$0.96	\$0.50	\$4.13	\$5.13	\$6.87	\$17.46	\$0.00

ANTICIPATED FUTURE NEEDS

The ability of the Authority to maintain the transit system, respond to service problems, and to react to and correct safety issues is critical, and the condition of the fleet that supports these activities is a major component for success. The current fleet is composed of some vehicles that have reached their service lives and are due for replacement. These needs will be prioritized and addressed within the systemwide non-revenue vehicle fleet program.

Systemwide Non-Revenue Vehicle Needs

This project would continue funding efforts under the systemwide fleet plan to meet ongoing needs.

Commuter Rail Non-Revenue Vehicle Needs

The replacement of six aging non-revenue vehicles and light trucks used by the MBTA staff in the inspection of commuter rail equipment is anticipated. The replacement of approximately 45 maintenance-of-way (MOW) work vehicles will also need to be programmed.

Replacement of MOW Work Equipment

Replacement of maintenance-of-way work cars and equipment is anticipated as they reach or exceed their useful life. This equipment will support tie replacement, snow removal, brush cutting, track geometry inspection, excavating and other maintenance activities.



NON-REVENUE VEHICLES

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CHAPTER 3

TRACK/RIGHT-OF-WAY

PROGRAM OVERVIEW

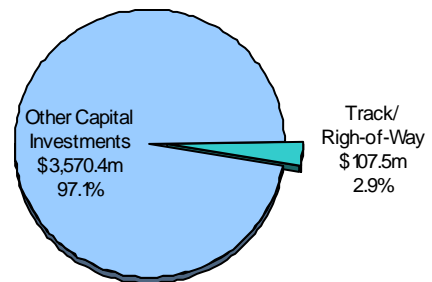
The MBTA currently operates light and heavy rail transit on 191 miles of track. The commuter rail system is operated on 650+ miles of track. On each rail line, replacement efforts are programmed for different segments based upon geographical location or type of track construction.

The right-of-way generally consists of the actual steel rails of the track, rock or dirt ballast that acts as the flat foundation for the track, and concrete or timber ties running perpendicular to the rails. In general, this infrastructure has a useful life of 25 years.

Grade crossings, where automobile roads and pedestrian walkways intersect rail lines at the same level, have special maintenance and replacement needs, and are typically replaced as part of a stand-alone program.

The current program invests \$107.5 million towards Track/R.O.W, which represents 2.9% of the total capital program. The majority of capital funds are directed towards systematic maintenance of subway rights-of-way, while a smaller portion is allocated to replacement of rails and ties on the commuter rail system.

Tracks/Right-of-Way Funding



TRACK/RIGHT-OF-WAY

SUBWAY TRACK/RIGHT-OF-WAY

The MBTA subway system operates on 191 miles of track with a wide variety of construction types, rail ties, and overhead catenary systems. The track network includes 131 miles of revenue track and an additional 60 miles of non-revenue track within rail yards and other service areas. The right-of-way (ROW) for heavy rail subway track often includes a highly electrified third rail running along the tracks through which subway cars receive traction power to move. These third rails have special maintenance needs, and are included in the Subway Signals program of this document.

The Red Line operates over 45 miles of revenue track. Types of track construction vary from standard wood tie track to concrete floating slab, with variations of the two. The line includes timber tie track, concrete dual block tie track, direct fixation, and concrete floating slab track. The entire line is powered by third rail.



The Green Line (Light Rail) has a total of 46 revenue track miles. Although the track type varies throughout the Green Line, the majority of the line is a wood tie and ballast unit with some monoblock concrete tie track as well. The running rail on the line consists of both "T" rail and girder rail. The entire line is powered by overhead catenary.

The Orange Line operates over 22 miles of revenue track. The type of track construction varies. The track consists of timber tie track, direct fixation, and concrete floating slab track. The entire line is powered by third rail.

The Blue Line operates over 12 miles of revenue track. The type of track construction is primarily timber tie; however, sections of the track are monoblock concrete tie track. Throughout the Blue Line a combination of overhead catenary lines and third rail power the line.

Streetcar grade crossings have a useful life ranging from 12 to 15 years. Since portions of the Green Line are at street level and cross automobile traffic, there are 64 grade crossings along the Green Line and other crossings within MBTA maintenance facilities. The subway fleets operate over 1 million feet of mainline-ballasted track and over 400,000 feet of yard-ballasted track. The MBTA has approximately 560 mainline turnouts (sections of track which "turn out" from the main line), which have useful lives ranging from 4 to 25 years. There are 675 total yard turnouts and equipment, whose useful lives range from 8 to 25 years. The majority of the funding is programmed for systemwide work throughout the rapid transit system.

MBTA Subway Track & Right-of-Way					
Line	Power Source	Route* Miles-Km		Revenue Track Length	
		Miles	Km	Miles	Km
Red	Third Rail	21	34	45	72
Red (a)	Overhead Wire	3	5	6	10
Green	Overhead Catenary	23 (b)	37	46	74
Orange	Third Rail	11	18	22	35
Blue	Overhead Catenary and Third Rail	6	10	12	19
Total		67	108	131	211

* One way, non duplicative.

(a) Mattapan-Ashmont Trolley Segment.

(b) Route miles distributed as follows: B-Line: 4, C-Line: 3, D-Line: 9, Outer E-Line: 2, Inner E-Line: 1, Subway: 4.

Note: 1 mile = 1.609344 km.

FUNDED PROJECTS

Currently, funding is available for six projects in this capital program for the Subway Track/ROW program. These projects will have positive impacts on the operating budget; conversely, failure to complete these projects will have a negative impact on the Authority's operating budget.

Highland Branch (D-Line) Track Upgrade

This effort funds the replacement of ties, ballast, and, in some areas, a full-depth reconstruction of the right-of-way along the Highland Branch. The objective of this five-year program is to replace 50,000 ties.

Green Line Grade Crossing and Track Reconstruction

The project is rebuilding 7 Green Line grade crossings and track on the B-Line: 2 on Beacon Street and 5 on Commonwealth Avenue. This project will provide improved performance and more reliable service.

ROW Assessment

This project will fund a study to identify and assess capital needs to enhance system reliability, such as, Green Line signal system, interlocking signal system in Ashmont Yard and the floating slabs on the Red Line.

E Line Track Replacement

This project funded track replacement between Brigham Circle and South Huntington Avenue to allow for revenue operation of No. 8 Cars

Switch Replacement

The project will fund replacement of mechanical switches for the subway system.

Systemwide Track Maintenance Program

This project represents funding that has been set aside to address on-going subway track infrastructure needs.

Subway Track/ROW Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Highland Branch	\$23.06	\$22.37	\$0.69	\$0.00	\$0.00	\$0.00	\$0.00	\$0.69	\$0.00
Green Line Track Improvmnts	8.18	8.09	0.09	0.00	0.00	0.00	0.00	0.09	0.00
ROW Assessment	5.00	0.00	0.00	0.00	0.00	2.00	3.00	5.00	0.00
E Line Track Improvements	3.50	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Switch Replacement	16.00	0.00	0.00	0.00	5.00	5.00	6.00	16.00	0.00
Systemwide Track Maintnce.	179.95	94.19	13.96	17.90	17.30	14.40	22.20	85.76	0.00
Total SMI Capital Initiatives	\$235.69	\$128.15	\$14.74	\$17.90	\$22.30	\$21.40	\$31.20	\$107.54	\$0.00

ANTICIPATED FUTURE NEEDS

Most of the rapid transit and light rail lines need continuous maintenance and repair work. The Systemwide Track Maintenance project may encompass future upgrade and repair projects. The periodic renewal and replacement of track performed in a timely manner reduces daily operating and life cycle costs, and increases reliability and safety. To keep the track system in a state of good repair the Authority needs to keep in place a continual rail-replacement and tie-renewal program. The following projects have been identified as future track needs.

Track Design Standards

This project would develop track design standards and specifications.

□ Green Line Grade Crossing Reconstruction

There are 37 Green Line grade crossings that are expected to need reconstruction and rehabilitation work in the coming years.

□ Green Line Tie Renewal Program

A tie renewal program to install new wood ties is anticipated along the B and C Lines.

□ Red Line Surface Tamper/Mainline Thermit Weld/Continuously-Welded Rail

The project involves the surfacing and tamping of track, and the thermit welding of the rail to improve the quality of service on the Red Line.

□ Red Line Floating Slab Alignment Repair

This effort would rebuild sections of the floating slab track between Harvard and Alewife.

□ Red Line Ashmont Line Rail Program

A program to replace the existing 150-pound type third rail with new 85-pound type third rail is anticipated for the Ashmont line. This project would combine lighter type third rail and improved electrical technology to deliver third rail power and to improve traction on this section of track.

□ Red Line Clayton Street Curve Reconstruction

This project involves the reconstruction of this section of track, and will allow the elimination of several speed restrictions.

□ Red Line Fully Guarded Switches

This project involves the deactivation of switches that do not meet track standards.

□ Orange Line Third Rail Upgrade

This program would replace concrete support pedestals that support the third rail on the Orange Line with 4,000 new blocks of treated wood. A program to replace approximately 2,000 feet of third rail in station areas is also anticipated.

□ Orange Line Special Track Work: Rebuild Wellington

Programs to rebuild track structures and replace yard turnouts in Wellington Yard are anticipated.

□ Blue Line Special Trackwork

This is a special trackwork renewal program to replace turnouts.

□ Blue Line Orient Heights Track Rebuild

The project involves the rebuilding of the track in the Orient Heights Facility.

□ Blue Line Rail & Tie Changing

A rail changing program is anticipated to replace worn rail, bolted rail, and ties from Bowdoin to Orient Heights stations.

□ Systemwide Track Charts

This effort would create track charts for the remaining lines to allow the MBTA to use systemwide track charts.

COMMUTER RAIL TRACK/RIGHT-OF-WAY

Commuter rail rights-of-way consist of rail, wooden crossties, grade crossings, and fencing. The commuter rail system operates on a vast network of over 650 miles of track, 1.5 million timber ties, and 295 grade crossings stretching across eastern Massachusetts.

Rail on the commuter rail system can be expected to last approximately 40 years, although curved rail has a shorter life span due to increased friction from vehicles. The MBTA commuter rail system includes over 1,300 miles of metal rail.

Approximately 1.5 million timber crossties and switch timbers support the track network. Railroad crossties are renewed on a cyclical schedule that prevents failed ties from imposing speed restrictions and delaying trains. Railroad crossties usually have a life span of 25 to 30 years depending on a variety of mechanical and environmental factors. These crossties also require a renewal of approximately 48,000 crossties and 5,000 switch timbers annually.



Grade crossings are the most prominent fixtures of the commuter rail system. The Authority has 295 grade crossings on the commuter rail system, requiring a replacement program averaging 21 crossings per year. The crossings ensure safety for both commuter rail passengers and highway motorists where roads and railroad tracks intersect. Grade crossings have a life expectancy of 12 years. The automatic protection equipment is maintained under the signal program.

A significant amount of commuter rail track maintenance is performed under the MBTA's commuter rail management contract and is primarily funded through the operating budget.

MBTA Commuter Rail Tracks		
	Revenue Track Length	
	Miles	Km
North Lines		
Newburyport/Rockport	92	148
Haverhill	55	89
Lowell	51	82
Fitchburg	90	145
South Lines		
Greenbush	17	27
Plymouth/Kingston	32	51
Middleborough/Lakeville	47	76
Attleboro/Stoughton	116	187
Fairmount	19	31
Franklin	34	55
Needham	13	21
Worcester	89	143
Total	655	1,054

Note: 1 mile = 1.609344 km.

TRACK/RIGHT-OF-WAY

RECENTLY FUNDED PROJECT

The commuter rail track project listed below had a neutral impact on the operating budget.

Haverhill Double Tracking

This project funded a study to evaluate the possibility of double tracking segments of the Haverhill Line.

Commuter Rail Track/ROW Project (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Haverhill Double Tracking	\$1.00	\$1.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total Commuter Rail Track/ROW	\$1.00	\$1.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

ANTICIPATED FUTURE NEEDS

The condition of commuter rail tracks throughout the system varies. Four lines are in fair to acceptable condition, four are in good condition, and three are new and in excellent condition. Systemwide, there are maintenance issues that apply to several or all of the rail lines. Performing periodic renewal and replacement programs in a timely manner reduces daily operating costs, reduces life cycle costs, and increases reliability and safety. The MBTA has identified the following projects as future needs for commuter rail track.

Lowell Junction/Frey Double Track

This project would add double track to the Haverhill Line between Lowell Junction and Frey. The objective of this effort is to reduce delays and to improve the flexibility of scheduling of both passenger and freight trains.

Winchester-Mishawum Rail Replacement

This effort would replace a few miles of 112-pound and 115-pound type rail on track between Winchester and Mishawum, a track segment used by both the Lowell and Haverhill Lines.

Fitchburg Main Line Rail Replacement

This project would involve the replacement of 18.4 miles of 112-pound type, non-control-cooled rail on the Fitchburg Main Line between Willows and Fitchburg.

Rail Inventory Purchase

This project would include the purchase of additional head-hardened 132-pound rail to replenish inventory and replace rails.

Elimination of Bleachery Interlocking

This project encompasses numerous tasks: the relocation of Guilford's train operations from Lowell to Lawrence, the removal of crossovers between the MBTA's New Hampshire Main Line operations and Guilford's Lowell Branch, the relocation of one crossover, and the removal of four other crossovers. By moving a large amount of track and signaling equipment beyond the Lowell commuter rail station, redundancies would be eliminated and the rail line would be improved.

South Acton Station Double Track

This project would extend the double tracked portion of the Fitchburg Line west through the station at South Acton. The extension of the double track would allow trains turning at South Acton to be held clear of passing trains, and subsequently reduce delays.

□ Reading Station Double Track

This project would extend the Haverhill Line double track north through Reading Station. The extension would allow trains turning at Reading to be held clear of passing trains, thus reducing delays and freight conflicts.

□ Station Upgrade Approach

This project involves the installation of approach tie pads at the expansion joints at several drawbridges.

□ Systemwide Commuter Rail Fencing

The installation and maintenance of fencing along the rights-of-way is important to safely operate trains, protect railroad property, and to prevent trespassing and illegal dumping of trash and contaminated materials on railroad property.

□ Montvale Yard Rehabilitation

This project would provide for the rehabilitation of the entire Montvale facility on the Lowell Line.

□ Future Systemwide Tie Replacement/Renewal Program

A systemwide replacement and renewal program for defective ties will enable continued reliable commuter rail usage.

□ Systemwide Grade Crossing Renewal

This project would provide funds for the renewal of grade crossings on the commuter rail system.

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CHAPTER 4

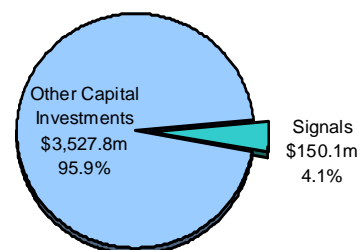
SIGNALS

PROGRAM OVERVIEW

Train control is critical to providing service in a complex rail system. The signal system's primary responsibility to control trains for efficient spacing makes it an integral part of a transit system. The signal system's goal is maintaining train separation while attempting to minimize headways and running times. To maintain proper train separation principles for route integrity, speed control and broken rail protection are employed in the design.

These signal system aspects are thoroughly tested as part of the installation process and require ongoing maintenance. The MBTA employs two basic types of signal design philosophies: Absolute Block Signaling (ABS), as installed on the Blue and Green lines, and Automatic Train Control (ATC), as installed on the Red and Orange Lines. The ABS system uses alternating current (AC) circuits. On the Blue Line, train

Signal Projects Funding



SIGNALS

separation is maintained by the use of trip stops while on the Green Line, the operator has sole responsibility for adhering to signal aspects. The ATC system, in use on the Red and Orange Lines, uses audio frequency track circuits. This system allows the transmission of the maximum allowed speed to a semi-intelligent carborne subsystem. Maximum allowed speed is determined by civil restrictions as well as track conditions and is enforced by the wayside signal system in conjunction with the carborne subsystem.

With regard to implementation, signal systems use vital relays and processors that operate in a "fail-safe" mode. Non-vital systems act as an interface between the dispatcher and the vital systems. This equipment is housed in Central Instrument Rooms/Houses (CIR/H) and wayside cases or bungalows. This equipment, in turn, controls wayside equipment such as train approach lights, signals, switches, trip stops, and heaters.

This significant piece of MBTA infrastructure is absolutely crucial in supporting the safe and efficient operation of trains systemwide. The current program invests \$150.1 million for signals. The signal program represents 4.1% of the total capital program. The following section details some of these components and equipment.

Signal Systems Components (Shared by Commuter Rail and Subway)

Switches, Crossovers, and Switch Heaters

Switches and crossovers are incorporated in the track system to reroute trains. Both electric and hand throw switches are used. Switches that are used infrequently normally have a useful life of around 25 years. However, high-use switches that are thrown many times in daily operations have a useful life of 10 to 15 years. Switch heaters, which prevent freezing and keep switches functioning during the winter months, have a useful life ranging from one to five years, depending on location and frequency of use.

Signals/Wayside Lights

Wayside lights display a combination of signal aspects to communicate the status of the next track segment to the train operator. Signal housings have a useful life of approximately 20 years, while the bulbs inside last for only a few years. Future use of LED lamps will increase this life expectancy by up to 10 years, and will lower maintenance costs.

Track Circuits

The track circuit is the most vital part of the signal system and consists of a power source, a transformer or transmitter circuit, and a receiver or relay end. AC track circuits are used on the Blue and Green Lines as well as on all interlocking areas. Audio frequency track circuits, composed of a transmitter and receiver end, are used on the Red and Orange Lines. With intensive monthly maintenance, track circuits are expected to have a 20-year useful life.

Grade Crossing Signals

Grade crossing signals are used on the commuter rail network to warn automobile and pedestrian traffic of oncoming trains in locations where roads and highways cross railroad rights-of-way. The capital equipment at these intersections has a useful life of 20 years.



Signal System Components (Subway Only)

Train Stops and Train Stop Heaters

Train stops are utilized on the rapid transit lines to ensure compliance with restrictive conditions and have a useful life of 20 years. Train stop heaters allow the train stops to function normally in winter weather conditions and have a useful life of up to 5 years.

Third Rail Heaters

Third rail heaters are used to prevent the third rails from icing during winter months. The Authority utilizes over 540,000 feet of third rail heaters. All third rail heaters have a useful life of 2 to 5 years. In addition, there are 43,990 third rail heater insulators, which typically have a useful life of 5 years.

Train Approach Lights

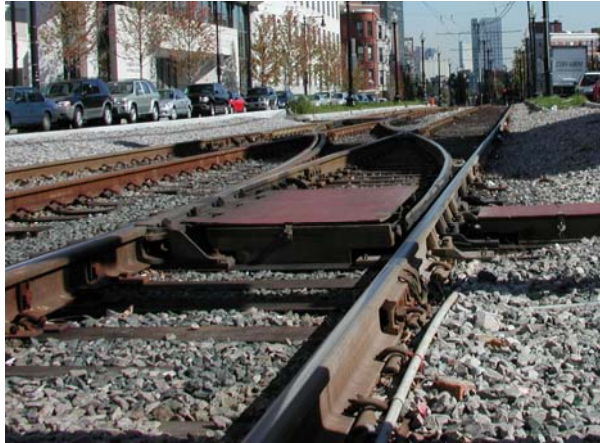
Train Approach Lights are deployed on the rapid transit lines as a safety indicator for operations personnel on the right-of-way. With thorough maintenance, these lights can be expected to have a useful life of 20 years.

SIGNALS

SUBWAY SIGNALS

The Authority's subway signal program consists of two types of control systems: the Absolute Block Signaling (ABS) and the Automatic Train Control (ATC). The Red and Orange Lines use an Automatic Train Control (ATC) system while the Blue and Green Lines utilize an Absolute Block Signal (ABS) type system. Each line consists of mainline and yards segments.

- The Red Line signal system consists of several yards and mainline segments. It is an ATC system, using vehicle systems and wayside controls to regulate train movement. There are a total of 135 switches, 210 signals, 16 instrument houses, 355 track circuits, 1,632 third rail heaters, 68 switch heaters, 2 train stop heaters, 2 train stops, 12 train approach lights, and 16 instrument houses. A large portion of the Red Line is above ground and exposed to the elements; consequently, a significant number of third rail heaters are needed on this line.
- The Green Line signal system is equipped with the ABS signal system; however, it does not utilize train stops. A total of 91 switches, 497 signals, 497 track circuits, and 40 switch heaters operate on the Green Line. Portions have been upgraded following the flood of 1996, including the segments from Brookline Village to Hynes Auditorium. The equipment between Haymarket and North Station has just been upgraded as part of the North Station Superstation project in the System Enhancement section of this document. Science Park to Lechmere signals work is underway and near completion
- The Orange Line utilizes a combination of ATC and wayside block signal systems. This line has a total of 107 switches, 199 wayside signals, 245 track circuits, 457 third rail heaters, 101 switch heaters, 34 train stop heaters, 17 train stops, 48 train approach lights, and 12 instrument houses. The signal system to the north from Chinatown to Oak Grove is about 25 years of age and is currently being replaced.
- The Blue Line has a total of 86 switches, 154 signals, 181 track circuits, 12 third rail heaters, 43 switch heaters, 145 trip stops each with two heaters, 74 train approach lights, and 8 instrument houses. The Blue Line is equipped with ABS and train stops and does not utilize on-board subsystems for train movement. Wonderland and Orient Heights along with the Main Line are being reconfigured to fit 6 car trains.



The signal equipment that interfaces with the Operations Control Center (OCC), bungalows/central instrument locations, wayside systems, and yard systems, are universal along the subway system. Each has a useful life of 25 years, with the exception of the OCC. The useful life of the OCC is based on availability of spare parts for computers, which have a life cycle of 5 years (for more information on the OCC, see the Communications section of this document).

FUNDED PROJECTS

Currently, there are six funded subway signal projects underway. All signal projects listed below will have a positive impact on the Authority's operating budget by reducing the signal components' mean time between functional failures. With newer systems, equipment, and redundancy, the mean time to repair a failure will be substantially reduced. By keeping the number of failures and time needed for repairs low, overtime by operations personnel to

facilitate revenue service will be minimized. These benefits are somewhat offset by deferred replacements on the oldest portions of the signal systems, with the potential for outages increasing over time.

Systemwide Signal Maintenance Program

This project represents funding that has been set aside to address subway signal infrastructure needs. The project will maintain and replace third rail heaters, signal lights, track circuitry, and cable plant across the subway system.

Red Line Signal/Cable Upgrades

The purpose of this project was to replace Generation One Track Modules and associated hardware and wiring on the Red Line. Generation Five Track Modules were installed at 6 locations along the Red Line.

Green Line Lechmere Station Signalization

This effort provides improved signalization at the proposed Lechmere Station.

Columbia Junction

This project funds the installation of new switches, cables and track modules, which will increase service reliability at this critical junction on the Red Line.

Orange Line North Signal System Upgrade

The scope of this project encompasses the design and installation of a state-of-the-art Automated Train Operating (ATO) system on the Orange Line from Chinatown to Oak Grove with interfaces at Wellington Yard and Chinatown. The new ATO system is compatible with the existing ATO system on the Southwest Corridor and the Orange Line fleet's ASC. This project incorporates a new communications link to the Operations Control Center (OCC). The project is currently under construction, and should last two more years. Service diversions are in place on some weeknights to allow this project to be completed.

Blue Line Signal Upgrade

The scope of this project includes a study and upgrades to the signal system along the Blue Line to accommodate six-car train service. The signal upgrades are performed in conjunction with the Blue Line Modernization effort.

Subway Signals Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Systemwide Signal Maint.	\$107.44	\$48.81	\$11.18	\$11.40	\$11.40	\$14.25	\$10.40	\$58.63	\$0.00
Red Line Signal/Cable Upg.	5.17	5.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Green Line Lechmere Signals	9.90	0.51	0.69	6.00	1.70	0.00	1.00	9.39	0.00
Columbia Junction	65.00	0.00	3.00	5.00	25.00	25.00	10.00	65.00	0.00
Orange Line North Sgnl Upg.	80.20	70.40	9.80	0.00	0.00	0.00	0.00	9.80	0.00
Blue Line Signal Upgrade	30.00	22.70	7.30	0.00	0.00	0.00	0.00	7.30	0.00
Total Subway Signals	\$297.71	\$147.58	\$31.97	\$22.40	\$38.10	\$39.25	\$21.40	\$150.12	\$0.00

ANTICIPATED FUTURE NEEDS

Regular maintenance for all signaling components is needed to maintain safety and reduce operational breakdowns. New signaling technology should also be considered to improve safety and operations, as well as to decrease maintenance costs. The following projects have been identified as future efforts for subway signal needs.

Red Line JFK/UMass/North Quincy

This project would consolidate the cable plant and signal houses at the JFK/UMass and North Quincy stations.

□ Red Line Signaling Standardization

Long-term issues include signaling standardization using Generation Five Track Modules.

□ Evaluation of Future Technology Study

The Signal Division is considering the use of Communication-Based Train Control (CBTC) for both the Green and Blue Lines.

□ Green Line Systemwide Signal Improvements

The overall condition of signal equipment including interlocking logic, track circuits signaling and switch heater controls must be addressed incrementally. Technology updates are needed, including replacement of most systems with technology updates, interlocking logic, track circuits signaling and switch heater controls. Specific technologies to be used will be identified through the Evaluation of Future Technology Study mentioned above.

□ Highland Branch Wayside Signal Replacement

The project involves the replacement of signals on the Highland branch and would include the Reservoir Yard. The technology will be identified through the Evaluation of Future Technology Study mentioned above.

□ Third Rail Heater Central Control

This project involves the design and implementation of a systemwide third rail heater control system to provide automated on/off regulation from the Operations Control Center.

COMMUTER RAIL SIGNALS

The Authority’s commuter rail signal system consists of over 480 miles of signalized track, 190 miles of aerial pole line, 80 interlockings, 10 train control machines, over 1,000 signal heads, 476 electric switches, and 200 grade crossings with automatic protection equipment. There are 35 bungalows and 52 bungalow/houses in the commuter rail signal system. These systems have a useful life of 25 years. Two systemwide signal units are the wayside system, and the OCC signal equipment. Both systems have a 25-year useful life.

Annual replacement of underground signal cable, aerial signal cable, electric switch machines and electric grade crossing mechanisms is required to assure a safe, reliable signal system with an efficient life cycle cost.



Signal maintenance is performed under the commuter rail management contract and is primarily funded by the operating budget.

FUNDED PROJECT

There is one commuter rail signal program. This project had a neutral impact on the operating budget.

Fitchburg Line Signal Upgrade

This project replaced the existing open-wire, telephone-based relay system on the Fitchburg commuter rail line from Willows to Fitchburg with a modern microprocessor-based code system. This project eliminated many of the signal-related delays on this line.

Commuter Rail Signals Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Fitchburg Line Signal Upg.	\$0.11	\$0.11	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total Commuter Rail Signals	\$0.11	\$0.11	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

ANTICIPATED FUTURE NEEDS

The future commuter rail signal program will focus on the replacement of outdated technologies with newer equipment that enhances flexibility. Older code systems (which provide signal control from remote locations) are currently in use, as are older coded track circuits that require high maintenance. Open wire pole lines are susceptible to wind and ice damage, creating maintenance and safety concerns. The following projects have been identified as future needs for the commuter rail signal system.

Haverhill Line West Route: Signal Improvements

The scope of this project is to enhance train throughput on the West Route Main Line. Other tasks include the design and installation of a power switch at Ash Street in Reading and the redesign of Wilmington Junction Interlocking as a universal crossover between the Wildcat branch and the Haverhill Line tracks.

West Street Bridge Cable Replacement

This project involves the replacement of cable along the West Street Bridge.

□ Fitchburg Line Waltham Tower Elimination

The purpose of this work is to eliminate the Waltham Tower by replacing field code units with units compatible with the new Computer Dispatch Center.

□ Haverhill Line Andover/Rosemont Signal Upgrade

The project involves upgrading the signal system to a modern bi-directional Centralized Traffic Control System (TCS) on the Haverhill Line from Andover Street to Rosemont.

□ Gloucester Branch Signal Upgrade

The purpose of this project is to improve the reliability of the Gloucester branch signal system through a series of tasks: replacement of the track code system, installation of a power switch, elimination of the pole line, and upgrading the crossing warning systems.

□ Newburyport Line Signal Upgrade

This project will provide signal upgrades from Beverly Junction to Chelsea.



□ Lowell Line Wilmington and Shop Interlocking/Bi-directional Signals

The scope of this project is to complete the Traffic Control System (TCS) signal system upgrade on the Lowell Main Line between Wilmington Interlocking and Shop Interlocking.

□ Lowell Line Somerville/Winchester Bi-directional Signals

The purpose of this project is to complete a Traffic Control System (TCS) signal system upgrade on the Lowell Line between Somerville Junction and Winchester.

□ South Bay Track & Signal—Phase II

The first phase of this effort was completed in the 1990s. Remaining scope includes the design and installation of three additional signal interlockings and minor track work leading into the Storage & Inspection facility in South Boston. This work will support additional system expansion on the southside.

□ Worcester Signaling Improvements

The project will fund improvements to the signal system along the Framingham/Worcester Rail Corridor.

□ Fitchburg Signal Work

The project will fund major improvements to the signal system on the Fitchburg/South Acton Line.

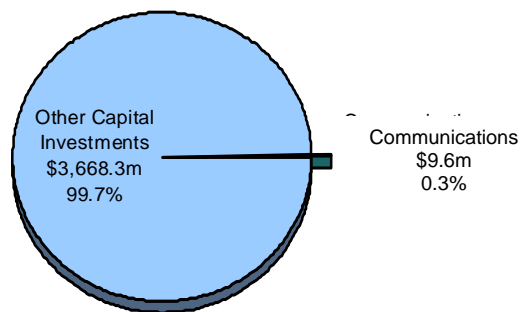
CHAPTER 5

COMMUNICATIONS

PROGRAM OVERVIEW

The MBTA Communications Department is responsible for a variety of low voltage systems. These responsibilities include maintaining an extensive inventory of equipment and overseeing contract preventative and corrective maintenance services for telecommunications, the Wide Area Network (WAN), two-way radio system, microwave links, emergency intercoms, public address systems, Light-Emitting Diode (LED) variable message signs, fire alarm systems, security systems, closed circuit television (CCTV) systems, Hub Monitoring and Control System (HMCS), and the Supervisory Control and Data Acquisition (SCADA II) system. The MBTA communications system also includes the Operations Control

Communications Programs Funding



COMMUNICATIONS

Center (OCC). Since these systems have been acquired and developed over time and technology continues to evolve rapidly, they vary significantly in age and condition.

The Operations Control Center (OCC)

The OCC is one of the most automated transit control centers in the world. The OCC consists of proven state-of-the-art computer-based technology that allows real-time monitoring and supervisory control of the signal and communication systems for all four transit lines. The Bus Radio System Network is also integrated into the OCC communication system. The OCC has a useful life of 25 years.



Telephone Equipment and Services

The control equipment has an average useful life of 12 years, while office equipment has an average useful life of 4 years. The various components of these equipments include:

- Electronic key telephones, analog telephones, and ISDN telephones
- PENTA voice communications switch (controlling audio services for the subway and bus dispatchers)
- A wayside/emergency telephone network (pump rooms, emergency exits, vent shafts, bungalows, etc.)
- An elevator intercom system that provides elevator passengers with emergency communications within each elevator cab and at each elevator landing
- An emergency Police call box system that provides passengers direct communications with the Transit Police
- A voice messaging system
- A network of special service circuits for communications applications
- A network of copper and fiber optic cables that connect every transit station (except street stops on the Green Line B,C, and E Branches)
- Over 4,500 voice and data leased telecommunications circuits

SCADA II

The SCADA II system monitors and controls life safety and mission critical equipment (emergency ventilation fans, fire alarms, generators, pump rooms, etc.) at remote locations via a programmable logic controller (PLC) based system. The PLC system has a useful life of 10 to 20 years, and includes:

- A main and a standby central processor
- Remote Control and Monitoring Workstations
- Programmable Logic Controllers (PLCs)
- Various routers, modems, switches, and hubs
- Remote control terminal cabinets

Systemwide Radio

The current two-way radio system is an analog system. This system is currently programmed for replacement with a new digital system. All such radios have a useful life of 7 years, with the exception of base stations and support equipment, which have a useful life of 25 years. The current system components include:

- Revenue vehicle radios (bus, rapid transit, and light rail)
- Non-revenue vehicle radios, including Transit Police vehicles

- Portable radios
- Base stations, antenna network, leased antenna sites, and support equipment
- Audio Recorders

A replacement project for the systemwide radio is in progress. This new system shall incorporate a digital trunking radio system that will replace the existing stationary, mobile, and portable radio equipment. The new radio system will incorporate computer aided dispatch (CAD) and automated vehicle location (AVL) systems for Bus Operations.

Wide Area Network

The Wide Area Network (WAN) provides a network of interconnected fiber optic and copper cables that is the communications medium between electronic devices throughout the MBTA's transit service district. The WAN also provides the hardware, known as edge equipment, to interface individual electronic devices into the network. Typical components include:

- Synchronous Optical Network (SONET) based transmission equipment;
- Global Positioning System (GPS) based timing system;
- Pulse Coded Modulation (PCM) channel banks; and
- Network Management Software

Through ongoing efforts, the Communications Department is expanding the WAN to all facilities within the Authority. In the first quarter of 2008 the Communications Department installed fiber optic cable along the Mattapan High Speed Line to Ashmont Station. This will provide the communications medium for the CCTV and public address / electronic sign systems at those stations.

Public Address/Electronic Sign System

The public address system is comprised of two major components. First is the Public Address/Electronic Sign System Head End located at the Operations Control Center. The Public Address / Electronic Sign System Head End provides the user interface between the personnel located at both the OCC and the Bus OCC and the station public address systems. The Public Address / Electronic Sign System Head End performs live, pre-recorded, and ad-hoc audio and visual broadcasts.

The second component is the field public address systems. Each station has its own public address system that is comprised of station control units, power supplies, amplifiers, mixers, graphic equalizers, local microphones, and loud speakers. In an effort to enhance the intelligibility of public address announcements the Communications Department performed speech intelligibility tests. With this information, acoustical studies were performed and a program was implemented to upgrade all of the transit station public address systems.

In addition to upgrading the audio portion of the public address system, 125 two line electronic (LED) variable message signs have been procured and installed to provide a visual component of the audio broadcasts. An additional 256 electronic (LED) variable message signs are on order with scheduled delivery dates in the second quarter of 2008.



Fire Alarm, Security, and Closed Circuit Television (CCTV) Systems

The Communications Department maintains extensive Fire Alarm, Security, and Closed Circuit Television (CCTV) systems that consist of static and pan/tilt/zoom cameras, digital video recorders, encoders, decoders, magnetic locks, proximity card keyless entry, motion detectors, graphic annunciator panels, central reporting stations, and fire suppression systems located at transit stations and facilities. The CCTV system utilizes the Wide Area Network to

COMMUNICATIONS

provide live video images to the OCC, Bus OCC, Transit Police, and Hub Centers. Through a Memorandum of Understanding the Bus OCC can view images provided by the City of Boston Traffic Department (BTD), Mass Highway, and Massachusetts State Police.

FUNDED PROJECTS

Currently, there are six funded communications projects underway. Most projects involve upgrading the Authority's radio communication with new state-of-the-art digital technology. The systemwide radio project will generate savings for the Authority's operating budget, while the remaining projects will have a neutral impact on the operating budget.

Systemwide Radio Communications Project

This major project seeks to expand and overhaul the entire existing radio system and to replace the tunnel antenna system. The project deploys an upgraded digital system, taking advantage of 20 channels licensed by the Federal Communications Commission.

Bus OCC Installation

This effort funded the construction of a new Bus Operations Control Center including voice and data wiring, consoles, computers, Automatic Vehicle Locator equipment and programming associated with the operations of a Bus OCC. This project is complete and operational.

SCADA II /C-Cubed Police Talkback Box Replacement

This project involves the purchase and installation of assistance telephones and ancillary equipment at existing police talkback locations. This equipment will fully comply with the Americans with Disabilities Act.

Station Management Portable Radios

This project procures 300 new digital portable radios that will be required for the Customer Service Agents in the near future as part of the Station Management Project.

Customer Care Center

This project funds the procurement of equipment inclusive of software, to create a call center, which is intended to act as central point of contact for the Authority's customers.

Customer Service Phone Installation

This effort funds the installation of an upgraded customer service phone system to handle the 1.6 million phone calls the Authority receives annually. In addition, this upgrade will reduce the cost of developing passenger, vehicle and employee schedules and provide for a greater flow of accurate information including enhanced service for hearing impaired customers.

Communications Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Systemwide Radio Project	\$60.27	\$51.90	\$8.37	\$0.00	\$0.00	\$0.00	\$0.00	\$8.37	\$0.00
Bus OCC Installation	18.93	18.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Police Talkback Boxes	0.38	0.28	0.10	0.00	0.00	0.00	0.00	0.10	0.00
Station Mngmnt. Radios	1.22	0.63	0.59	0.00	0.00	0.00	0.00	0.59	0.00
Customer Care Center	2.00	1.47	0.53	0.00	0.00	0.00	0.00	0.53	0.00
Customer Svce. Phone Sys.	2.00	1.97	0.03	0.00	0.00	0.00	0.00	0.03	0.00
Total Communications	\$84.80	\$75.17	\$9.62	\$0.00	\$0.00	\$0.00	\$0.00	\$9.62	\$0.00

ANTICIPATED FUTURE NEEDS

To improve safety and operations throughout the system, several communication upgrades are anticipated, including the procurement of mobile radios and the installation of a single mode fiber optic along the Green and Red Lines. Without system upgrades, the communications program would experience operational and maintenance inefficiencies, which could increase future maintenance costs.

□ Field Radio Procurement

This project would purchase portable radios to ensure personnel safety along the MBTA right-of-way.

□ Installation of Systemwide Emergency Wayside Telephones

This project would replace existing wayside emergency telephones at locations along the Orange, Red and Green Lines.

□ Communication Rooms Refurbishment

This project would rehabilitate or replace power, lighting, HVAC units and structural problems at various communication rooms throughout the subway system.

□ Fiber Optic Cable Network

This project would involve the installation of single mode fiber optic cable along the Red and Green Lines.

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CHAPTER 6

POWER

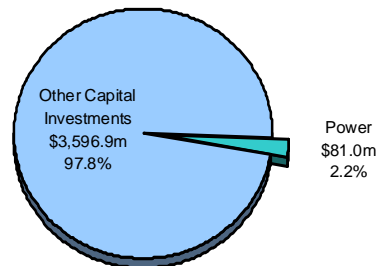
PROGRAM OVERVIEW

The MBTA's power program maintains one of the most complex, important, far-reaching, and expensive systems in the transportation network. Using power supplied by an outside utility, the MBTA transforms and distributes electricity over its own system to power the entire network of subway, trackless trolley, and light rail lines. This large and complex power system, complete with its own backup generation capabilities in a full-scale switching station in South Boston, includes millions of feet of cables, many substations, circuit breakers, switch boxes, switch heaters, manholes, ductiles (as well as storage facilities for cable and power equipment), switchboards, and circuit breakers. The power program also includes the catenary systems for the Green and Blue lines, and the trackless trolley system.

The power program is also responsible for lighting at the ferry facilities located at Lovejoy Wharf, Hingham Shipyard, World Trade Center, Long Wharf, and the Charlestown Navy Yard. The commuter rail electrical network provides lighting and power for signal systems, communication systems, lift bridges, buildings, stations, parking lots, maintenance facilities, layover facilities, and grade crossings.

The capital equipment in this power program is absolutely essential to operations: it supplies to subway trains and trolleys the traction power they need to move, to the signal systems the power needed to control the trains, and to the passengers and stations the power needed to turn on the lights and operate the

Power Projects Funding



POWER

elevators and escalators. The MBTA's power program, arguably one of the least visible elements to passengers, is one of the most complex, important, far-reaching, and expensive systems for the MBTA to maintain. The current program dedicates \$81 million toward power. Investment in power programs represents 2.2% of the Capital Investment Program.

SUBWAY POWER

Subway power covers all aspects of the Authority's rapid transit and light rail power needs.

Power Substations

The subway power division maintains substation equipment to convert 13.8kV AC transmission level power down to 600 volt DC distribution level power to feed third rail subway loads and 480-volt AC distribution power for passenger stations, vent shafts, and signal bungalows. This equipment is expected to last 30 years. In addition, the Green Line has track switch equipment, which has a useful life of 15 years.

Unit Substations

Details on unit substations vary widely depending on location and context, but all include systems necessary for transportation, specifically the signal feeds, and other systems that protect both customers and transit infrastructure alike. There are 50 unit substations along the subway/transitway system: 16 on the Red Line, 10 on the Green Line, 18 on the Orange Line, and 4 on the Blue Line. There are two unit substations on the Transitway. All substations are required to be within close proximity of the equipment they power and are exposed to severe environmental conditions. Components of substations include load break switches, 115kV oil circuit breakers (OCB), vacuum breaker conversion units, transformers, and distribution equipment. The useful life of a unit substation is 20 years.

Traction Power Substations

There are a total of 48 traction power substations throughout the subway system: 25 on the Red Line, 9 on the Green Line, 7 on the Orange Line, and 7 on the Blue Line. Traction power stations have a useful life of 20 years.

Cable

The MBTA has over 3 million feet of AC cable distributed along the four subway lines. All AC cable has a useful life of 40 years, except along the Green Line, where the useful life is 15 years. The Orange Line has over 600,000 feet of DC feeder cable, which has a useful life of 20 years. Also, there are 18 SWC MODs and cable on the Orange Line and these cables have a useful life of 15 years. The Green Line has about 750,000 feet of DC feeder cable. The useful life of the DC cable is 30 years.



Overhead Contact Systems (OCS)

Overhead Contact Systems (OCS) are located along the Green and Blue Lines, and on the Mattapan Highspeed Line. These systems have a useful life of 20 years.

Passenger Station Low Voltage Switchgears

There are 54 passenger station low voltage switchgears along the rapid transit and light rail systems. Low voltage switchgears feed power to the subway signal system, pump rooms, car houses, escalators, elevators and other various areas of the Authority where power is required. These systems offer protection for customers, Authority equipment, and the system overall. Along the Red and Orange Lines, these systems also feed fire alarm systems, Amtrak

and subway signal systems, ventilation, elevators, escalators and a variety of other equipment. Passenger low voltage switchgears have useful lives ranging from 20 to 30 years.

FUNDED PROJECTS

The Authority has eleven funded projects under the subway power program. These projects will have a neutral impact on the Authority's operating costs.

☑ Red Line Substation Improvements: DC Breaker Upgrade

This project replaces two open-faced/elevated DC breakers on the Red Line. This will improve safety for MBTA personnel and service reliability for passengers.

☑ Green Line Power Study

The project funds a study of power needs and capacity on the Green Line based on expansion of the fleet with the introduction of the No. 8 car.

☑ Blue Line Negative Returns

This project encompasses the replacement of negative return cables between Maverick Station and Orient Heights Station. This will increase reliability and reduce maintenance costs.

☑ Blue Line Overhead Catenary System (OCS) Repairs

This project will replace the headspan support and feeder taps on the Blue Line's overhead catenary system. This equipment has attained its useful life, and the replacement will ensure the continued safe and reliable operation of Blue Line service.

☑ Traction Power Substation

This project will include the rehabilitation or replacement of traction power substations throughout the system, which have exceeded their useful life.

☑ Highland Power Upgrade

This project funds the replacement of power cables along the Highland Branch as part of the track upgrade project.

☑ Mattapan Power Line Improvements

This project funds the replacement of defective power lines and support poles on the Mattapan High Speed Line. This effort will ensure pantograph operation and improved service reliability.

☑ Substation Control Batteries

This project funds the replacement of the batteries that power the control board at 41 traction power substations on all subway lines. The batteries are crucial to ensuring continuous delivery of power for service in the event of power reroutings, power section problems, or failures.

☑ Orange Line Power Improvements

This project will identify and fund power improvement projects and other infrastructure work, necessary for the operation of the next generation Orange Line vehicles.

☑ Power Program

This project will fund the overhaul of the jet engines at the South Boston power generation plant and other critical components.

POWER

Rectifier Transformer Replacement

The scope of this project includes the removal and disposal of 10 critical transformers and installation of their replacements. This will increase the reliability of the power system and will lower maintenance costs for the Authority.

Subway Power Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Red Line Subst. Breakers	\$12.00	\$4.70	\$7.30	\$0.00	\$0.00	\$0.00	\$0.00	\$7.30	\$0.00
Green Line Power Study	4.93	1.74	3.18	0.00	0.00	0.00	0.00	3.18	0.00
Blue Line Negative Returns	3.32	2.99	0.32	0.00	0.00	0.00	0.00	0.32	0.00
Blue Line OCS	0.51	0.00	0.51	0.00	0.00	0.00	0.00	0.51	0.00
Traction Power Substation	33.82	0.00	0.00	0.00	2.00	10.00	21.82	33.82	0.00
Highland Power Upgrade	11.50	6.74	4.76	0.00	0.00	0.00	0.00	4.76	0.00
Mattapan Line Catenary	7.60	7.21	0.39	0.00	0.00	0.00	0.00	0.39	0.00
Substation Control Batteries	4.19	2.30	1.89	0.00	0.00	0.00	0.00	1.89	0.00
Orange Line Infra Improvements	8.00	0.00	1.00	2.00	5.00	0.00	0.00	8.00	0.00
Power Program	7.85	0.00	0.00	3.95	3.91	0.00	0.00	7.85	0.00
Rectifier Transformer Repl.	15.00	2.50	3.00	5.00	4.50	0.00	0.00	12.50	0.00
Total Subway Power	\$108.71	\$28.19	\$22.35	\$10.95	\$15.41	\$10.00	\$21.82	\$80.52	\$0.00

ANTICIPATED FUTURE NEEDS

The power system regularly needs replacement of cables, circuit breakers, manholes, ductiles, and unit substations, as well as storage facilities for cable and power equipment. It is necessary to inspect and repair the exhaust stacks on the gas turbine generator engine (the MBTA's emergency generator) in South Boston, update the engine contacts with the latest technology and safety devices, conduct periodic maintenance on aging equipment, and refurbish old and overloaded substation buildings. The following projects have been identified as future needs for the subway power program.

Orange Line Power Improvements

This project will identify and fund power improvement projects and other infrastructure work, necessary for the operation of the next generation Orange Line vehicles.

Red Line Northwest Extension Cable Upgrade

The project involves the replacement of 480 high-voltage AC cables with surface mounted systems at Harvard, Davis, and Alewife stations.

Red Line Cabot DC Breaker Replacement

This project involves the replacement of DC breakers at Cabot switch houses.

Blue Line Power Upgrade

This project involves the replacement of the passenger station unit substations (one substation being done as part of Blue Line modifications).

Blue Line Yard Catenary

This project encompasses the complete replacement of the OCS system in the Orient Heights Yard, as well as other areas along the line.

Blue Line Power Supply (Wonderland)

This project's scope of work includes the installation of two AC cables from Orient Heights substation to Wonderland substation. In addition, all substation buildings would be refurbished and all the internal operating equipment replaced.

Orange Line Substation Improvements

This project would refurbish the substation buildings and replace all the internal operating equipment for substations at Wellington, Malden, and Oak Grove. Passenger

station upgrades are needed at Oak Grove, Malden, Wellington, Wellington Shop, Sullivan Square, Community College, and North Station.

□ Orange Line Cable Upgrade

This project would replace and remove from the manholes all manhole cable switches on the Southwest Corridor.

□ Orange Line Negative Return System Upgrade

This project involves the installation of negative return cables from substations to track along the Orange Line.



□ Orange Line Power Improvements

This project involves the installation of AC cable and DC breakers along the Orange Line.

□ Green Line Substation Improvements

This project would refurbish the substation buildings and replace all the internal operating equipment at Riverside, Reservoir, and internal operating equipment only at 45 High Street. A substation upgrade is anticipated at Riverside.

□ Green Line Catenary Replacement

This project would completely replace the overhead catenary system on Commonwealth Avenue, the Lake Street Yard near Boston College, Lechmere, the Reservoir Yard, and Huntington Avenue. The highest priority would be the Boston College B-Line of the Green Line.

□ Green Line Cable Upgrade

Two AC cables would be installed from Coolidge substation to Reservoir substation. Also, track switches, controls and heaters would be replaced along the Green Line, the DC cable feed from Oak Square to Watertown Square would be upgraded.

□ Green Line Vent Shaft Upgrade

The purpose of this project would be to upgrade all vent shaft AC cables to accommodate increased loading.

□ Green Line Government Center Substation Replacement

The project would replace the existing BECO equipment and substation that power tunnel ventilation fans, Blue and Green Line signals, the pump room and station lighting in the vicinity of Government Center station.

□ Orange Line/Green Line Negative Return Cable

The purpose of this effort would be to upgrade the DC negative return system on the Orange and Green Lines.

□ Green Line/Blue Line Section Insulator Replacement

This project would remove the existing heavy section insulators and replace them with new, lightweight, state-of-the-art design double-beam section insulators on the entire Green Line and in Orient Heights Yard.

□ Emergency Lighting Systems Replacement

This project would replace all 125-volt DC emergency lighting systems at 10 stations on the Blue and Red Lines.



COMMUTER RAIL POWER

The commuter rail's electrical system provides lighting and power for signal systems, communication systems, bridges, buildings, stations, parking lots, maintenance facilities, layover facilities, and grade crossings. This system also provides redundant power at critical facilities and cables to operate mechanical power on the Beverly Drawbridge.

Signal Systems

The commuter rail power programs are responsible for maintaining 366 switch heaters and 24 gas switch heaters. The projected useful life for both switch and gas switch heaters is approximately 20-years.

Layover Facilities

Each layover facility control center, typically located at the end of commuter rail lines, has a 20-year useful life.

FUNDED PROJECTS

Currently, the Authority has not programmed capital projects for the commuter rail power program.

ANTICIPATED FUTURE NEEDS

Improvements and upgrades to the electrical system are anticipated to avoid train delays and service interruptions. All outdated equipment including navigation lights, direct buried cable, control components, circuits, and transformers will be replaced. All switches associated with the 4160-volt power distribution system will be disconnected. This corrective action would enhance system reliability and prevent power failures. Periodic inspections and maintenance would continue on all power equipment and electrical units. The following projects have been identified as future needs for commuter rail power.

□ Commuter Rail Systemwide Electrical Infrastructure Enhancements

This project involves the upgrade of electrical controls for the Beverly Drawbridge, passenger information signs, and electrical data from stations, parking lots and facilities.

□ Passenger Station Generator Purchase

This project involves the purchase of a 200kW generator that would allow emergency operation of passenger stations.

□ Switch Heater Replacement

This project involves the installation of 2 sets of switch heaters, including operation test locations for the switch heaters.

□ Newton Lighting Fixtures

This project entails the replacement of 60 pole-mounted lighting fixtures at three stations in Newton.

□ Emergency Lighting Tower Purchase

This project involves the purchase of 2 towable emergency lighting towers with generators.

POWER

□ Mystic Junction

This project consists of the installation of a transformer containment yard at Mystic Junction.

□ Fitchburg Commuter Rail Layover Facility Power

This project would entail the installation of a complete power system and new track layout at the Fitchburg layover facility.

□ Layover Unit Substations Fans & Vents Installation

This project would install ventilation fans at the Worcester, Kingston, Middleborough, and Newburyport layover facilities.

SYSTEMWIDE POWER

Systemwide power includes the main distribution system as well as the backup generators for all MBTA transit services. This section also covers the catenary system for the trackless trolley routes.

South Boston Power Complex Gas Turbines

The MBTA owns and maintains 2 emergency backup generators in South Boston. They exist primarily to provide power to the Authority's power grid if the power from the outside utility 115kV lines is lost. The jet turbine units and switch stations were built in the 1980s and provide backup power to 80% of the MBTA's transportation system. Each unit has a useful life of 25 years.

Supervisory Systems

The Power division maintains two supervisory control systems, which allow for continuous remote monitoring and control of all power facilities. The primary system, called SCADA (see more detailed description in the Communications section of this document), employs two central computers that constantly poll all traction substations and present the received information on four workstation consoles located at Power Control. The backup system, called "One on One," employs a simplified system of point-to-point communication between microprocessors located at the Cabot Control Center and the field sites. The received data is mapped onto an array of lamps that are read by dispatch personnel. The system has a useful life of 25 years.

Substation Equipment

Traction power substation equipment is used to convert 13.8 kV AC transmission level power both to 600 volt DC distribution level power to feed third rail subway loads, and to 480 volt AC distribution power level for passenger stations, vent shafts, and signal bungalows. The equipment used in the process consists of 15 kV rated AC switchgear, rectifier transformers, DC rectifiers, 750 volt rated DC switchgear, unit power transformers, station batteries, and supervisory control units. Well-built and well-maintained substation equipment has a useful life of 25 to 30 years.

Unit Substations

There are 67 unit substations (USS) throughout the Authority. The substations are generally located in the subway station or facility it supports. Unit substations provide power to lights, vents, and fans. The USS loads vary widely and include systems necessary for transportation, specifically the signal feeds, and other systems that protect both the customers and the transportation system alike. Substations are required to be in close proximity of the equipment they power and as a result are exposed to adverse environmental elements. The useful life of a unit substation is 20 years.

FUNDED PROJECT

There is one funded project under systemwide power. This project will have a positive impact on the operating budget.

Trackless Trolley Wire Improvements

This project funds the replacement of all corroded and undersized poles, worn out switches, crossings, and wire throughout the trackless trolley network in Cambridge, Belmont, and Watertown. The upgraded wire system will enhance the performance and reliability of both the existing trackless trolleys, as well as the programmed replacement fleet of new Electric Trolley Buses in the future.

POWER

Systemwide Power Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Trackless Trolley Catenary	\$4.00	\$3.52	\$0.48	\$0.00	\$0.00	\$0.00	\$0.00	\$0.48	\$0.00
Total Systemwide Power	\$4.00	\$3.52	\$0.48	\$0.00	\$0.00	\$0.00	\$0.00	\$0.48	\$0.00

ANTICIPATED FUTURE NEEDS

The following future efforts have been identified as needs for the systemwide power program.

□ Systemwide Power Upgrades

The supervisory control systems controlling the power operation would be replaced, and an overhaul of the OCBs at the South Boston Switching Station is anticipated.

□ Power Vehicle Replacement Program

This program would replace the wire car currently used for all OCS maintenance.

□ Systemwide AC Cable Replacement Program

This project would rehabilitate AC unit substations and complete the vacuum conversion of the AC circuit breakers.

□ Charlestown Cable Storage Facility

This project would involve the conversion of an MBTA-owned property in Charlestown into a facility for cable storage.

□ Employee Facility Training Program

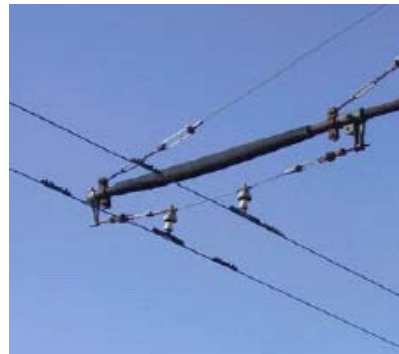
This would construct training facilities for power division employees.

□ Systemwide Power Cable Replacement Program

This would allow for the provision of storage facilities for cable and power equipment, help replace worn out cable handling vehicles and aging AC and DC cable lengths. Additional cables would be installed to accommodate increased system loading.

□ Systemwide Unit Substation Ventilation

A program to build substation ventilation equipment throughout the system is recommended.



CHAPTER 7

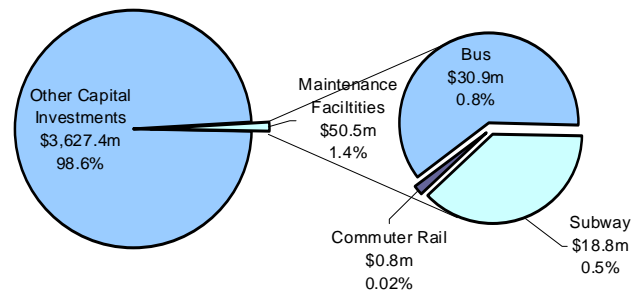
MAINTENANCE FACILITIES

PROGRAM OVERVIEW

Maintenance facilities, or yards and shops, are the sites for regularly scheduled maintenance and emergency repairs on MBTA vehicle fleets. The Authority maintains 4 rapid transit yards and shops, 4 light rail, 3 commuter rail, and 9 bus facilities, including one bus repair shop. There are also 17 smaller general maintenance facilities throughout the system. A new facility was constructed to maintain Silver Line vehicles and CNG buses. Each facility generally includes a basic building structure with a mechanical plant and shop equipment. The expected life cycle of each of these facilities is 50 years.

The arrival of large fleets of vehicles equipped with new technologies will place additional demands on the personnel and facilities that maintain, repair, refuel, and service the vehicles. New fueling equipment and engine equipment designed for CNG buses, and maintenance and support equipment for longer 60-foot buses will be needed. Low-floor technologies on the new Green Line subway cars and incoming bus fleets will have special new needs as well.

Maintenance Facilities Funding



MAINTENANCE FACILITIES

As a result of higher infrastructure costs of special facilities for CNG buses, a large portion of the current \$50.5 million program is devoted to new construction or renovation of existing bus facilities to serve CNG buses. The maintenance facilities program represents 1.4% of the total Capital Investment Program. The funding of a new maintenance facility for Silver Line service was included under the System Expansion section of this document.

SUBWAY MAINTENANCE FACILITIES

Maintenance facilities for rapid transit and light rail fleets include:

- A Red Line facility at Cabot
- An Orange Line facility at Wellington
- A Blue Line facility at Orient Heights
- Green Line facilities at Boston College, Riverside, Reservoir, and Mattapan Yard (the Mattapan High Speed Line is operated by the Green Line since it is light rail)
- A main subway repair facility in Everett

All maintenance facilities have useful lives of 50 years. Basic structures at each of these facilities include roofs, electrical systems, and major maintenance equipment such as lifts and hoists.

FUNDED PROJECTS

There are currently six projects relating to subway maintenance facilities. The first effort, the rehabilitation and expansion of the 1950s-era Orient Heights Car House, is related to the Blue Line modernization project to accommodate a larger fleet of six-car trains. The other projects involve smaller-scale repairs to Everett and Cabot and other facilities. All of these projects will have a neutral impact on the Authority's operating budget.

Blue Line Orient Heights Car House

This project is being performed as part of the Blue Line Modernization effort. The project involves renovating the maintenance facility, adding new storage and maintenance tracks for larger fleets, and making preparations for six-car trains. To operate six-car trains, new capacities and functions are needed at this facility.



Orient Heights Maintenance Facility (Blue Line Service)

Capital Spares Warehouse

This project funds the construction of a facility to house spare parts for vehicles and other capital needs.

Maintenance Facilities Improvements:

Everett Subway Building Roof Repair

The replacement of the roof at Building #2 at Everett Shops will ensure worker safety, protect recent capital investments in the facility, and ensure productivity and efficiency in heavy maintenance for all subway lines.

Wellington Maintenance Facility

The project involves improvements to the spray paint booth to ensure the Orange Line vehicles meet their useful life.

Cabot Maintenance Facility

The project funds the replacement of car hoists at the Cabot RTL Maintenance Facility.

Riverside Carhouse Improvements

This project is intended to replace critical carhouse maintenance equipment such as lathes, lifts and hoists.

Systemwide Carwash Facilities Replacement

This project funds the replacement of vehicle washing systems throughout the various maintenance facilities. All wash equipment will be modified to accommodate a water stripper system.

Cabot Floor Rehabilitation

This project funded structural repair work to the concrete slab flooring at the Cabot subway facility. Work under this project helped reinforce the stability of the floor on which heavy rail vehicles are hoisted, and improve safety for maintenance workers.

Subway Maintenance Facilities Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Orient Hgts. Carhouse	\$49.21	\$42.26	\$6.95	\$0.00	\$0.00	\$0.00	\$0.00	\$6.95	\$0.00
Capital Spares Warehouse	1.25	0.97	0.28	0.00	0.00	0.00	0.00	0.28	0.00
Facility Improvements	6.46	1.96	0.00	0.50	1.00	3.00	0.00	4.50	0.00
Riverside CH Improvements	7.23	1.00	1.93	2.80	1.50	0.00	0.00	6.23	0.00
Carwash Replacement	1.80	1.00	0.80	0.00	0.00	0.00	0.00	0.80	0.00
Cabot Floor Rehabilitation	0.78	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Subway Maintenance Facilities	\$66.72	\$47.96	\$9.96	\$3.30	\$2.50	\$3.00	\$0.00	\$18.76	\$0.00

ANTICIPATED FUTURE NEEDS

The following projects have been identified as future needs for subway maintenance facilities.

Red Line

This project would fund various enhancements at the Cabot facility, including expansion of the existing shop, as well as improvements to office and staff facilities.

Orange Line

This effort would renovate the Wellington facility. It would also add a second rinse unit and construct a separate storage facility for non-revenue vehicles.

Green Line

This project would replace and overhaul doors and overhead doors at the Reservoir facility on an as-needed basis. In addition, this project would fund repairs for the brick exterior.

MAINTENANCE FACILITIES

COMMUTER RAIL MAINTENANCE FACILITIES

Commuter rail maintenance facilities include the Boston Engine Terminal (BET) in Somerville, the Service and Inspection facility (S&I) in South Boston, and the Light Inspection facility in Readville.

The Boston Engine Terminal is a new state-of-the-art facility constructed in 1997 and consists of over 8 acres under one roof. The building, located about one mile northwest of North Station, consists of areas for service and inspection, periodic maintenance, wheel truing, coach repair and locomotive repair along with allied shops.



Boston Engine Terminal

The Southside Service and Inspection facility is a two-track structure located at Wydett Circle in South Boston, approximately one mile south of South Station. This facility can accommodate two 9-car trains and has fueling and sanding capabilities as well as the ability to perform running repairs.

The Readville Light Inspection facility was constructed in the same time period as the BET. This facility consists of three tracks and has the capacity to hold six coaches. It is dedicated to special projects such as retrofits, wheel truing, and other related maintenance.

Commuter rail maintenance facilities, including the basic structure, roof, and critical internal maintenance equipment, have useful lives of 50 years.

FUNDED PROJECT

The current program funds one commuter rail maintenance facility project.

Commuter Rail Facilities Upgrade

This effort funds work for various commuter rail facility needs, including fire alarm upgrades, fan and vent installation, and environmental and safety improvements. This project will have a neutral impact on the MBTA's operating costs.

Commuter Rail Maintenance Facilities Project (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Commuter Rail Fac. Upgrades	\$2.50	\$1.65	\$0.85	\$0.00	\$0.00	\$0.00	\$0.00	\$0.85	\$0.00
Total Comm. Rail Maintenance Facilities	\$2.50	\$1.65	\$0.85	\$0.00	\$0.00	\$0.00	\$0.00	\$0.85	\$0.00

ANTICIPATED FUTURE NEEDS

The following projects have been identified as future needs for commuter rail maintenance facilities.

□ Maintenance Facility Upgrade Program—Readville

An upgrade program for replacement of the Readville facility is anticipated.

□ Maintenance Facility Upgrade Program—S&I Facility

A future upgrade program is anticipated for the Service and Inspection facility. Included within this program is the installation of new vandal-proof stations with features required for enhanced fire alarm service, and the installation of two new firefighter service panels with all-control wiring.

□ Midday Layover Facility

This project would involve the design, acquisition, and construction of additional midday storage for trains used in southside operations.



MAINTENANCE FACILITIES

BUS MAINTENANCE FACILITIES

The Authority maintains several bus garages and one central bus repair shop. Bus maintenance facilities have a useful life of 50 years. Basic structures at each of these facilities include roofs, electrical systems, and major maintenance equipment such as lifts and hoists. The majority of the funding in this program is for the design and construction of a new bus facility at the Arborway, and the retrofit of existing bus facilities to service CNG vehicles. These investments allow the maintenance of recently acquired CNG vehicles.



Bus Facilities	Type/Use	Year Built *
Albany Street	Bus Garage	1941
Arborway	Bus Garage	2004
Bartlett	Closed in 2004	1931
Cabot	Bus Garage	1975
Charlestown	Bus Garage	1979
Fellsway	Bus Garage	1925
Lynn	Bus Garage	1936
North Cambridge	Bus Garage	1950
Quincy	Bus Garage	1930
Southampton Street	Bus Garage	2004
Everett Central	Major Repair Shop	

* To ensure the continuous operability of older facilities, in recent years the Authority has funded various capital projects aimed at improving these buildings.

FUNDED PROJECTS

There are seven projects under bus maintenance facilities. The majority of this funding is to construct new and modernize existing bus facilities throughout the system, primarily driven by work required to accommodate CNG buses. Most of these projects are expected to have a neutral impact on the Authority's operating budget.

Southampton Street Bus Facility

This project has been completed and the amount left represents close out costs. This project funded the design and construction of a new CNG bus maintenance and storage facility in South Boston. This facility serves the Silver Line as well as CNG buses employed in standard bus operations. The project funded the majority of the cost to construct the bus facility, while the remainder of the construction cost funded part of the Silver Line Phase II project (see the Silver Line Expansion section).

Arborway Bus Facility

This project involves the design of a bus maintenance and storage facility at the Arborway Yard. This facility, which opened in 2004, has permitted the aged and undersized Bartlett garage to be shuttered.

CNG Facility Retrofit Construction

This project involves the conversion and retrofit of existing facilities (Cabot, Charlestown, and Everett) to fuel, store and maintain CNG buses. This includes all work to construct new fueling stations, upgrade structural capacity, replace roof structures, and install all necessary sprinkler, fire, and security systems. In addition, the project equips the Everett automotive shop with new dynamometers that allow service personnel to test bus engines, transmissions, and chassis, increasing the engines' serviceability and reliability.

Cabot Bus Facility Upgrade

This project allowed the conversion of the Cabot bus garage to a CNG facility. This effort funds repairs and installation of equipment such as bus lifts, washer system, overhead doors and compressed air and lubrication systems.

Miscellaneous Bus Facilities Upgrade

This project encompasses a wide range of modernization, component upgrades, CNG compliance efforts, normal capital maintenance, and safety improvements at the bus garages. The program will substantially modernize these aging garages and prepare them to service the new bus fleets. The scope of work includes:

- replacing garage bay doors and lift hoists at Lynn, Quincy and Charlestown
- repairing the roof structures at Charlestown, Lynn and Cabot
- making minor repairs to the bus wash system at Fellsway
- purchasing cleaning equipment at Lynn and Charlestown
- installing emergency lighting at Quincy
- upgrading sprinkler systems systemwide
- installing gas-fired heaters at Lynn

The project has recently completed the installation of a new fuel distribution system at Quincy. Facilities systemwide will receive new bus wash air curtains, overhead cranes, and fall restraints. These efforts have a neutral or positive effect on the MBTA's operating budget.

Systemwide Roof Rehabilitation

This project provided funding for the replacement and rehabilitation of roofs and other infrastructure at various bus facilities.

Bus Facility Needs Assessment

This project is a master planning study of future bus maintenance facility needs. The project is assessing the needs of the bus fleet over the long term, and it provides the studies necessary in the first step towards building a new bus facility. The proposed facility could provide expanded space and equipment for the housing and maintenance of the MBTA bus fleet in the future.

Bus Maintenance Facilities Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Southampton St. Facility	\$60.64	\$59.49	\$1.15	\$0.00	\$0.00	\$0.00	\$0.00	\$1.15	\$0.00
Arborway Facility	29.00	27.00	0.50	0.50	0.50	0.25	0.25	2.00	0.00
CNG Facility Retrofit	64.80	45.31	5.00	6.50	7.00	0.99	0.00	19.49	0.00
Cabot Bus Facility Upgrade	2.31	1.90	0.41	0.00	0.00	0.00	0.00	0.41	0.00
Bus Facilities Upgrade	10.75	5.78	2.02	2.95	0.00	0.00	0.00	4.97	0.00
Systemwide Roof Rehab	1.60	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bus Facility Analysis	5.35	2.45	1.20	1.70	0.00	0.00	0.00	2.90	0.00
Total Bus Maintenance Facilities	\$174.45	\$143.52	\$10.29	\$11.65	\$7.50	\$1.24	\$0.25	\$30.93	\$0.00

ANTICIPATED FUTURE NEEDS

There are two future bus facility projects anticipated. In addition, due to the aging of bus facilities, various exterior structural projects are also anticipated.

Charlestown Compressor Systems Replacement

This project involves the replacement of existing compressors with new compressors and air dryers at the Charlestown Bus Repair Garage.

Bus Washer Upgrades

The Authority anticipates making several improvements to the bus washing systems at several garages in the future.

MAINTENANCE FACILITIES

SYSTEMWIDE MAINTENANCE FACILITIES

Systemwide maintenance facilities include structures and buildings used by the Authority for various tasks and purposes. There are 17 systemwide maintenance facilities as follows:

- Cabot Heating Plant
- Auto Repair Facility
- Signal Repair Facility
- MOW Training and Backup Facility
- Testing Lab
- Materials Storehouse
- Watertown Carhouse
- Campbell's Gate MOW
- Everett Shops (systemwide)
- Arborway
- Truck Storage and Repair
- Rail Bending Shop
- Light Maintenance Shop
- Heavy Maintenance Shop
- Pipefitter's Building
- Rice Buildings
- Salt Sheds

Most systemwide maintenance facilities have a useful life of 50 years.

FUNDED PROJECTS

Currently, the Authority has not programmed capital projects for the systemwide maintenance facilities program.

ANTICIPATED FUTURE NEEDS

The projects listed below have been identified as future needs for systemwide maintenance facilities.

□ Charlestown Heating Plant

This project would involve the installation of a new gas-fired boiler system at Charlestown buildings No. 2 and No. 3.

□ Charlestown Roof Replacement

This project would involve replacing the rooftop and air conditioning system at Charlestown.

CHAPTER 8

STATIONS

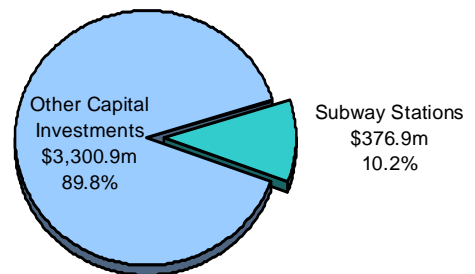
PROGRAM OVERVIEW

MBTA stations are one of the most visible components of the transit system. This program includes all MBTA heavy rail, light rail, commuter rail, Silver Line, and bus stations. There are over 250 stations in the MBTA transit system. This section also includes major bus transfer stations, bus stops, and shelters.

Stations are composed of the basic structure, roofs, platforms, lights, shelters, elevators and escalators. The Authority owns and maintains 142 elevators and 168 escalators. Elevators and escalators have an average useful life of 20 years. Fare collection equipment and collector booths are included in the fare equipment section (Chapter 11) of this document.

The majority of this \$376.9 million program is devoted to renovation of subway stations and systemwide replacement of escalators and elevators. Extensive station renovation work is being completed on the Red and Blue Lines at stations serving communities in Dorchester, Mattapan, East Boston, and downtown Boston. The total investment in stations represents 10.2% of the current Capital Investment Program. Most of the funding is invested in subway stations,

Stations Program Funding



STATIONS

particularly work to modernize Blue Line stations to allow for six-car trains, and to complete the renovation of five stations along the Dorchester branch of the Red Line.

Other significant levels of work and funds are devoted indirectly to stations. Description of indirect funding is in other sections of this document. For example, station improvement projects driven by accessibility concerns and the Key Station Plan, which may include other modernization work in addition to accessibility, appear under the Accessibility section of this document (Chapter 12). New stations on the Silver Line and the Greenbush commuter rail line construction are covered under the System Expansion section (Chapter 14). Finally, improvements to North Station and several other stations are included as part of programmed enhancement projects, which are in the System Enhancement section of this document (Chapter 13).



Airport Station (Blue Line)

RAPID TRANSIT STATIONS

The MBTA has a total of 124 rapid transit and light rail stations, which include 6 shared intermodal stations (North Station, Haymarket, State Street, Government Center, Park Street, and Downtown Crossing). Subway stations typically have a useful life of 50 years.

Rapid Transit Stations		
	Stations	Total
Heavy Rail		
Blue Line	10	44
Orange Line	15	
Red Line (a)	19	
Light Rail		
Mattapan Line	8	70
Green Line	62	
Subway Intermodal Stations		
Heavy and Light Rail	6	6
Silver Line		
Washington Street (b)	1	4
Waterfront (c)	3	
Total		124

(a) It includes South Station which provides service to Silver Line Waterfront.

(b) Dudley Square Station.

(c) It excludes South Station, which is listed under Red Line service.

Light Rail Stops & Stations			
	Subway Stations	Surface Stations	Total
Green Line	11	55	66
<i>Central Line (a)</i>	9	2	
<i>B-Line</i>		18	
<i>C-Line</i>		13	
<i>D-Line</i>		13	
<i>E-Line</i>	2	9	
Mattapan Line		8	8
Total			74

(a) It includes 4 shared intermodal stations, Hynes/ICA and Kenmore.

Subway Intermodal Stations				
	Red Line	Green Line	Blue Line	Orange Line
Park Street	✓	✓		
Downtown Crossing	✓			✓
North Station		✓		✓
Haymarket		✓		✓
Government Center		✓	✓	
State Street			✓	✓

FUNDED PROJECTS

There are 19 funded subway station projects under the current plan. Eight of these involve Blue Line station renovations and platform lengthening for six-car trains, five involve the complete reconstruction of Red Line stations in Dorchester and South Station, and the remaining five projects represent repair and upgrade work to stations systemwide. Although the Blue Line renovations are largely driven by the need to accommodate six-car trains, the

projects will also make the line fully accessible through new elevators and entrances. These efforts will have a neutral impact on the Authority's operating budget.

☑ Blue Line Modernization: Orient Heights Station

This project will complete platform lengthening and station renovation at Orient Heights to facilitate six-car trains along the Blue Line. At the moment, this project is in its design phase.

☑ Blue Line Modernization: Maverick Station

This project funds the modernization of the Maverick station to facilitate six-car trains along lengthened platforms, as well as accessibility improvements and surface area upgrades. This project is currently in its design phase.

☑ Blue Line Modernization: State Street Station

This project will modernize this busy downtown station by lengthening platforms, increasing passenger capacity, building a new street-level entrance, and relocating existing utility infrastructure. The project began preliminary construction phases in mid-2004.

☑ Blue Line Modernization: Government Center Station

In conjunction with accessibility-related work being done at this station, this project will renovate the Blue Line section of the station by lengthening the platforms, rebuilding the existing headhouse with a new glass and steel structure, and constructing a new entrance and headhouse on City Hall Plaza. This project is currently in design phases. The result will be a thoroughly modernized, fully accessible station.

☑ Blue Line Modernization: Airport Station

The project involved the design and construction of an entirely new station approximately 500 feet closer to Wood Island Station to serve Logan Airport. The station opened for service in mid-2004.

☑ Blue Line Platform Repairs

The edges of the platforms at Wood Island, Beachmont, Revere and Wonderland Stations, including the yellow tactile strips, will be repaired.

☑ Blue Line Station Infrastructure Improvements

This will provide for additional infrastructure modifications and upgrades for the Blue Line stations.

☑ Red Line Dorchester Stations Modernization:

Savin Hill Station

This project funded the reconstruction of the Savin Hill station. As part of this project, the headhouse and platforms were replaced. The station provides easier access for the riding public and a more comfortable and secure environment for passengers.

Fields Corner Station

This project funds improvements to the Fields Corner station by building a new street level headhouse, lowering the busways, and making the station fully accessible. The completion of the project will allow easier access for all patrons, provide better service, and enhance bus-to-subway transfers.

Shawmut Station

The scope of this project consists of waterproofing the station, making it fully accessible and renovating the headhouse. The project will enhance the comfort and convenience of the riding public.

STATIONS

Red Line Ashmont Station Modernization

This effort funds the reconstruction of the Ashmont station including new entrances, platforms, roofs, new bus and trolley ways, furniture, and an improved traffic circulation pattern. The project will improve the efficiency of the station and provide riders with a more secure and comfortable environment.



Ashmont Station Rendering by Cambridge Seven Associates, Inc.

South Station Improvements

The MBTA's Silver Line Phase II project added new underground Silver Line service at South Station between the lobby and Red Line levels. This project funded the renovation of the Red Line area of the station, including platforms, stairs, and elevators. South Station is now a modern intermodal facility serving customers that use bus, the Red and Silver lines and Commuter Rail.

Mattapan Station Improvements

Improvements at the Mattapan station are designed to encourage transit-oriented development. The scope of this project includes new canopies, lighting, raised platforms, accessible ramps, and a new building with a customer service center. This project is contingent upon the receipt of state funds.

Red Line North Quincy Platform Repairs

The edges of the platforms at North Quincy, including the yellow tactile strips, will be repaired.

Park Street Stair Replacement

This project funds the replacement of the steel staircase structures leading to the upper level of Park Street station.

Back Bay Roof

The roof of the Back Bay station is twenty years old and it is beyond repair. This project will fund the rehabilitation of the station's existing roof.

Orange Line Platform Improvements

This project will fund repairs to the edges of the platforms at various Orange Line stations along the Southwest Corridor, including the yellow tactile strips.

Fenway Station Stairs

This project funded the construction of a staircase structure at Fenway Station.

Porter Square Station Improvements

This project will fund the replacement of pipes & repair of drainage at upper platform and structural waterproofing work.

Elevator & Escalator Replacement and Modernization

This program will result in the replacement/modernization of all of the Authority's elevators and escalators.

Midlife Station Upgrade

This effort provides new lighting, painting, signage, collector booth repairs, and other similar elements systemwide at various subway, light rail, and bus stations. This project will enhance the comfort and convenience of MBTA stations for passengers.

Subway Stations Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Blue Line Orient Heights Sta.	\$40.00	\$0.20	\$1.59	\$14.42	\$16.00	\$7.80	\$0.00	\$39.80	\$0.00
Blue Line Maverick Station	56.00	41.50	12.06	2.44	0.00	0.00	0.00	14.50	0.00
Blue Line State St. Station	85.00	55.37	17.63	12.00	0.00	0.00	0.00	29.63	0.00
Blue Line Govt. Center Sta.	50.65	2.50	3.20	5.00	9.00	15.00	15.95	48.15	0.00
Blue Line Airport Station	36.93	36.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Blue Line Platform Rehab	11.68	0.90	8.18	2.60	0.00	0.00	0.00	10.78	0.00
Blue Line Station Imprvmnts	3.47	0.00	0.00	0.00	3.47	0.00	0.00	3.47	0.00
Red Line - Dorchester Stas.	74.19	69.86	2.34	2.00	0.00	0.00	0.00	4.34	0.00
Red Line Ashmont Station	70.18	47.02	18.86	4.30	0.00	0.00	0.00	23.16	0.00
Red Line South Station	13.00	13.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Red Line Mattapan Station	11.00	9.69	1.31	0.00	0.00	0.00	0.00	1.31	0.00
Red Line Platform Repairs	5.50	0.00	0.50	2.00	3.00	0.00	0.00	5.50	0.00
Park Street Stairs	2.62	0.69	0.84	1.10	0.00	0.00	0.00	1.93	0.00
Back Bay Roof	1.10	0.00	1.10	0.00	0.00	0.00	0.00	1.10	0.00
Orange Line Platform Improve	5.00	0.00	0.00	1.00	2.00	2.00	0.00	5.00	0.00
Fenway Station Stairs	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Porter Square Sta Imp	1.30	0.60	0.70	0.00	0.00	0.00	0.00	0.70	0.00
Elevator/Escalator Repl	168.07	8.00	13.14	14.00	30.00	44.00	58.93	160.07	0.00
Station Rehabilitation	58.25	30.74	12.12	7.49	7.90	0.00	0.00	27.51	0.00
Total Subway Stations	\$694.43	\$317.49	\$93.55	\$68.35	\$71.37	\$68.80	\$74.88	\$376.94	\$0.00

ANTICIPATED FUTURE NEEDS

There are two projects anticipated as future needs for subway stations.

Green Line Park and Boylston Stations Kiosks – Interior (Phase II)

The project would restore the interior of historic headhouses (two at Park Street Station, and two at Boylston Street Station).

Systemwide Platform and Expansion Joint Program

The Authority anticipates making improvements to platform edges and expansion joints at subway stations systemwide.



Forest Hills Station (Orange Line)

STATIONS

COMMUTER RAIL STATIONS

There are five commuter rail lines on the northside system, which terminate at North Station. The southside system has eight lines terminating at South Station. Four of the southside lines also provide service to Back Bay station. The MBTA currently has 134 commuter rail stations on these 13 commuter rail lines, as detailed in the chart below.

While the complexity and size of commuter rail stations vary greatly, they have useful lives ranging from 35 to 70 years, depending upon structure type. Commuter rail stations generally consist of a low-level platform with lights, shelters, and other components.

Mini-high platforms are provided at most stations and full high-level platforms are found along the Old Colony lines, the downtown terminals and at Worcester station. Commuter rail station improvements are also made as part of parking enhancement projects.



Ashland Station (Worcester Line).

MBTA Commuter Rail Stations		
	Number of Stations	Total
North Lines		
Fitchburg Line	17	55
Lowell Line	7	
Haverhill Line	13	
Newburyport/Rockport Line	18	
South Lines		
Worcester Line	15	75
Needham Line (a)	10	
Franklin Line (b)	12	
Providence/Stoughton Line (c)	11	
Fairmount Line	4	
Middleborough/Lakeville Line (d)	9	
Plymouth/Kingston Line (e)	7	
Greenbush (f)	7	
Central and Other Stations		
North Station	1	4
Back Bay Station	1	
South Station	1	
Foxboro Station	1	
Grand Total		134

(a) It includes Ruggles and Forest Hill.

(b) It excludes Ruggles.

(c) It excludes Ruggles.

(d) It includes JFK/UMASS, Quincy Center and Braintree.

(e) It excludes JFK/UMASS, Quincy Center and Braintree.

(f) It excludes JFK/UMASS and Quincy Center.

FUNDED PROJECTS

Currently, the Authority has programmed capital funding for platform, concourse or access improvements to the following stations: Yawkey, North Station, Uphams Corner, Rockport, Attleboro, Littleton, Waltham and Morton Street. These projects are in varying levels of design or construction phase services (see chapters on Accessibility, System Enhancement, and Statewide Transportation Improvements).

ANTICIPATED FUTURE NEEDS

The following project has been identified as a future commuter rail station need.

□ Station Resurfacing Program

This effort will provide funding for a program to resurface commuter rail station platforms.

STATIONS

BUS STATIONS, STOPS & FERRY BOAT DOCKS

The MBTA operates over 190 bus and trolley routes which serve 8,343 bus stops. Commonly, capital components found at bus stops include only bus stop signage. The bus network has 675 bus shelters of various kinds, 160 of which are owned by the Authority. Some bus stops are also equipped with benches. Several major bus terminals (e.g. Harvard Square, Ruggles, Ashmont, Haymarket, Forest Hills) adjoin subway stations, consequently, most structures, with the exception of the South Station Transportation Center and the Dudley Bus Station, are considered intermodal subway stations. Typically bus stations have useful lives of 50 years, while shelters have useful lives of 15 years.



The Forest Hills Station provides service to commuter rail, bus and subway customers.

Bus & Rapid Transit Shelters			
MBTA Asset	Owner	Qty	Total
Shelters	MBTA-owned	160	675
	Wall USA-owned	280	
	Cemusa USA-owned	165	
	Other-owned	70	

The Authority provides water transportation service from eight ferry boat docks.

Ferry Boat Docks		
Dock	Maintenance & Ownership	Location
Pemberton Point	Non-MBTA	Hull
Hewitt's Cove	MBTA	Hingham
Fore River Shipyard	MBTA	Quincy
Logan Airport	Non-MBTA	East Boston
Charlestown Navy Yard	Non-MBTA	Charlestown
Rowes Wharf	Non-MBTA	Boston
Long Wharf (North)	MBTA	Boston
Long Wharf (South)	Non-MBTA	Boston

Table excludes George Island Dock, which is seasonal.

FUNDED PROJECT

There is one programmed bus station project. The project has been completed and had a neutral impact on the Authority's operating budget.

Systemwide Bus Shelter Installation

This project funded the installation of 300 bus shelters throughout the urban core of the bus network and along busy routes.

Bus Stations Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Systemwide Bus Shelters	\$0.45	\$0.45	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total Bus Stations	\$0.45	\$0.45	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

ANTICIPATED FUTURE NEEDS

Currently, the Authority has not identified future needs for the bus station program.

CHAPTER 9

FACILITIES

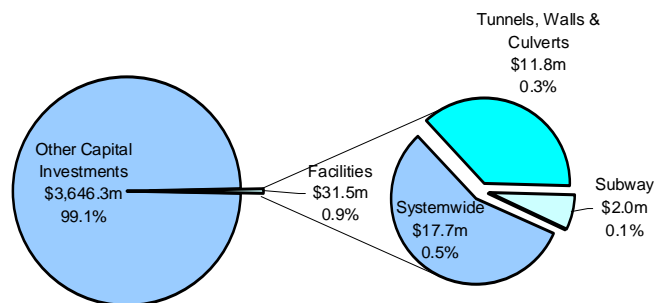
PROGRAM OVERVIEW

Facilities include administrative buildings, operators' lobbies, ferry terminals, vent buildings, storage buildings, noise walls, tunnels, culverts, retaining walls, parking garages, parking lots, escalators and elevators.

MBTA-owned administrative buildings include: 45 High Street, 500 Arborway, Charlestown (Buildings 2 and 3), the Cobble Hill commuter rail operations facility, the Quality Control Facility on Freeport Street, and the MBTA Police Headquarters on Southampton Street. The remaining facilities under this program are located throughout the transit and commuter rail systems. Typically facilities have a useful life of 50 years.

In addition, fencing, which prevents trespassers from gaining access to tracks and fast-moving trains, is also included in this section. Fencing has a considerable impact on maintenance costs, particularly on the commuter rail system. The current program devotes \$31.5

Facilities Funding



FACILITIES

million toward facilities. The facility program represents approximately 0.9% of the total Capital Investment Program spending.

SUBWAY FACILITIES

Subway facilities include administrative buildings and operators' lobbies on each of the lines, ventilation structures and other miscellaneous structures.

FUNDED PROJECT

There is one project under the subway facilities program. The project will have a negative impact on the Authority's operating budget but will improve safety.

Red Line Ventilation Improvements—Phase I

This project consists of the construction of an emergency ventilation shaft on the Red Line subway tunnel in downtown Boston. In addition, the project is reconfiguring and rehabilitating a power unit substation to provide power to the vent shaft fans.

Subway Facilities Project (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Red Line Vent Shafts (Ph. I)	\$17.34	\$15.34	\$2.00	\$0.00	\$0.00	\$0.00	\$0.00	\$2.00	\$0.00
Total Subway Facilities	\$17.34	\$15.34	\$2.00	\$0.00	\$0.00	\$0.00	\$0.00	\$2.00	\$0.00

ANTICIPATED FUTURE NEEDS

There is one project identified as a future need for subway facilities.

Red Line Ventilation Improvements—Phase II

Based on designs from phase I of this project, this effort would continue construction funding for additional vent shafts along the Red Line subway tunnel between Broadway and Charles/MGH.



COMMUTER RAIL FACILITIES

Commuter rail facilities include all structures or facilities at the 12 outlying layover points, five maintenance buildings, and five storage buildings throughout the system. The facilities program also includes the administrative facility operation center at Cobble Hill.

Layover Facilities

Located at or near the end of commuter rail lines, layover areas are where trains are stored and serviced overnight. Repair equipment and facilities are located here to service and clean the trains, prevent cold weather damage, perform maintenance, and eliminate idling. All layover facilities have a useful life of 50 years. The Authority has 12 layover facilities at the following locations:

- Rockport
- Newburyport
- Bradford
- Middleborough
- Fitchburg
- Needham
- Franklin
- Pawtucket
- Kingston
- Lowell (presently inactive)
- Worcester
- Greenbush

Maintenance and Storage Facilities

All maintenance storage facilities have useful lives of 50 years. The MBTA owns the following maintenance facilities: Readville Mechanical, Readville MOW, Abington MOW, Wilmington MOW, and Roland Street MOW. In addition, the Authority owns equipment storage facilities at Lowell, Attleboro, Franklin, Rockport, and Wilmington.

Fencing along the commuter rail is used to prevent trespassers, and protect pedestrians and MBTA property. It is necessary to keep trespassers from interfering with fast-moving trains, and also to prevent illegal dumping of trash and contaminated materials.

FUNDED PROJECTS

The current capital program does not have funds allocated to commuter rail facilities.

ANTICIPATED FUTURE NEEDS

The projects listed below have been identified as anticipated future needs for commuter rail facilities.

☐ Kingston Layover Cable Extension

This project consists of the extension of cables at the Kingston layover facility to allow for proper positioning of trainsets on layover tracks.

☐ Fitchburg Roundhouse – Demolition

This project will demolish and remove building materials in the roundhouse at the Fitchburg layover facility. This would occur following the abatement of asbestos at Fitchburg, which is discussed in the Environmental Compliance section of this document.

FACILITIES

□ Rockport Layover Facility

This project would provide funding for the construction of a commuter rail layover facility in Rockport (see page 114).

SYSTEMWIDE FACILITIES

Systemwide facilities include administrative buildings, and other miscellaneous structures owned by the MBTA. These may include inactive structures, noise walls, office buildings or systemwide support facilities. MBTA-owned administrative buildings include 45 High Street, 500 Arborway, Charlestown, the commuter rail operations facility at Cobble Hill, the Quality Control Facility on Freeport Street, and the MBTA Police Headquarters. The MBTA facility program also includes the ferry pier at Hingham. Other ferry facilities are leased.

FUNDED PROJECTS

There are three projects scheduled for systemwide facilities, both of which will have a neutral impact on the Authority’s operating budget.

Operations Facilities Upgrade:

45 High Street 25-Ton AC Unit (7th Floor)

This project funds the procurement and installation of a 25-ton air conditioning unit for the 7th floor operations, due to increased failure rates of the building’s HVAC system.

45 High Street Chilled Water System Modifications

The project involves the installation of 6 to 8 valves and related piping to main-chilled water heaters at 45 High Street.

Systemwide Sprinkler System Upgrade

This effort will upgrade additional MBTA facilities to a dry type sprinkler system and improve other elements of the MBTA sprinkling system.

Systemwide Fire Alarms

This effort will upgrade fire alarm systems at MBTA facilities on an as-needed basis.

Systemwide Pump Room Improvements

This will involve upgrading MBTA pump rooms at Medford Underpass, South Cove, Red Line North and other locations to reduce flooding.

Hingham Shipyard Improvements

This project will make infrastructure improvements, such as lighting, to the Hingham Shipyard. This project is funded with federal funds and a local match provided by the project sponsor.

Operations Control Center Power Supply Upgrade

This project replaces the existing emergency backup power supply at the Authority’s Operations Control Center facility at 45 High Street. With a new system, the MBTA will preserve its ability to maintain central communications and train control systems in the event of a power outage.

Systemwide Facilities Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Operations Facilities Upgrade	\$12.29	\$3.24	\$2.45	\$2.50	\$2.00	\$2.10	\$0.00	\$9.05	\$0.00
Hingham Shipyard Improve	9.41	1.00	1.00	2.41	3.00	2.00	0.00	8.41	0.00
OCC Power Supply Upgrade	1.35	1.11	0.24	0.00	0.00	0.00	0.00	0.24	0.00
Total Systemwide Facilities	\$23.04	\$5.35	\$3.69	\$4.91	\$5.00	\$4.10	\$0.00	\$17.69	\$0.00

FACILITIES

ANTICIPATED FUTURE NEEDS

The following projects have been identified as future needs for systemwide facilities.

□ 45 High Street-HVAC Chiller Replacement

The project would involve the installation of a 200-ton rooftop mounted HVAC chiller tied into the existing cooling tower system.

□ Parking Lots and Garages

Increasing parking capacity over the past 10 years has created a future need for striping, resurfacing, and surface patching of parking lots. The concrete decks and ramps at parking garages will require future patching.

□ Systemwide Paving Program

A program is anticipated to maintain and replace deteriorated pavement for facilities throughout the system.

TUNNELS, WALLS, CULVERTS

Tunnels, walls, and culverts are located throughout the system. Tunnels are mainly on the core subway system and in several locations in the commuter rail network. The rapid transit system operates within 14 miles of tunnels. The light rail system operates within 5 miles of tunnels. The Transitway tunnel is approximately 1.5 miles long. Tunnels generally have a useful life of 100 years, but require periodic maintenance of interior surfaces. The MBTA also maintains an extensive network of 767 culverts along the commuter rail, 16 culverts on the subway system, and many retaining walls (all of which have a useful life of 50 years).



FUNDED PROJECTS

Both projects scheduled for funding will have a neutral impact on the operating budget.

Tunnel Inspection and Inventory

This project provides funds to perform a detailed inventory and comprehensive inspection to determine levels of rehabilitation required in the future.

Tunnel Rehabilitation

This project involves performing repair and rehabilitation of tunnel walls and ceiling slab on various tunnel sections.

Tunnels, Walls, Culverts Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Tunnel Insp. & Inventory	\$3.00	\$2.50	\$0.50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.50	\$0.00
Tunnel Rehabilitation	14.74	3.40	4.00	4.00	3.34	0.00	0.00	11.34	0.00
Total Tunnels, Walls, Culverts	\$17.74	\$5.90	\$4.50	\$4.00	\$3.34	\$0.00	\$0.00	\$11.84	\$0.00

FACILITIES

ANTICIPATED FUTURE NEEDS

The following tunnel needs are anticipated:

□ Commuter Rail Culverts and Retaining Walls Repair Program

A culvert and retaining wall program is anticipated to inspect these structures using a standardized method for consolidating different sizes and materials into a simple condition rating, which will help establish priorities for repair.

□ Back Bay Station Tunnel Improvements

Ventilation, radio communication, and egress emergency improvements are anticipated in the Back Bay tunnel. This effort will lead to increased customer comfort in the tunnel system at Back Bay Station.

□ Needham Heights Retaining Wall Rehabilitation

The retaining wall behind the mini-station platform at Needham Heights station has reached its useful life.

CHAPTER 10

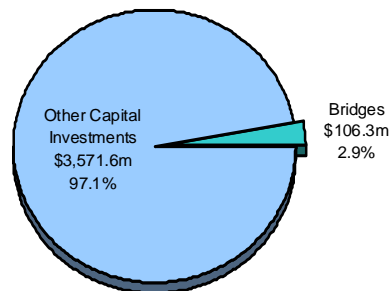
BRIDGES

PROGRAM OVERVIEW

The MBTA owns and maintains 476 Systemwide Bridges, comprising of 288 railroad, 58 transit, 86 highway and 44 pedestrian bridges. The Authority also owns and maintains 610 culverts on various Commuter Rail Lines. In addition to these bridges listed in the database, MBTA owns several bridges used for Freight Services. Railroad and transit bridges typically have a useful life of 70 years, while highway and pedestrian bridges have a useful life of 50 years.

In an effort to upgrade and maintain these bridges, the Authority has customized the FHWA Bridge Management Program, known as the PONTIS program, incorporating inspection forms for transit and railroad bridges, loadings for transit and railroad cars and other relevant information pertaining to transit and railroad bridges. This program is used to evaluate the condition of each bridge based on the results of inspection and live load rating analysis. These reports are then used to establish a priority list for

Bridge Projects Funding



BRIDGES

the rehabilitation/reconstruction of the bridges. A bridge inspection program is tailored to ensure that all the bridges receive adequate attention. The frequency and type of inspection for each bridge depends on the structural condition of the bridge. For instance, Routine and Fracture Critical Inspections are done every 24 months, Posted Bridges and bridges with Condition Rating values less than 4 are inspected every 12 months and bridges that are prone to collision damages are inspected every 6 months. Live Load Rating is performed every 10 years. A priority listing for the maintenance of bridges (rehabilitation/replacement) is then established based on the inspection and rating values.



MBTA Bridges					
	Highway	Transit	Railroad	Pedestrian	Total
Blue Line	5	2	0	9	16
Red Line	33	36	0	13	82
Green Line	19	12	0	1	32
Orange Line	24	8	0	5	37
Commuter Rail	5	0	288	16	309
Totals	86	58	288	44	476

As of October 2007

The PONTIS program enables the Authority to maintain an up-to-date database of all Authority-owned bridges. It contains information on the year built/rebuilt, frequency of inspection for each bridge, and detailed structural information such as the bridge description, dimensions, and the conditions of the deck, superstructure and sub-structural elements. The database also contains inventory and operating values of each bridge, which indicate the load carrying capacity of the structure. The program contains important bridge records such as the Structure Inventory and Appraisal Form for individual bridges, Condition Rating Values for Commuter Rail, Transit and Highway bridges for the present and past inspections and Scheduling Reports for future inspections.

FUNDED PROJECTS

There are twelve active bridge projects. The majority of bridge reconstruction projects entail complete structure replacement. These efforts will have a neutral impact on the operations budget. Other bridge projects are included in the Fairmount Corridor Improvements Project in the System Enhancement section of this document.

Merrimack River Bridge Rehabilitation

This project involves the design and rehabilitation of the Merrimack River Bridge. The bridge, which currently carries Haverhill commuter rail trains, freight trains, and Amtrak trains. The bridge is in need of bearing work, steel repairs, and timber deck replacement.

☑ Rehabilitation of Three (3) Shawsheen River Bridges

This project will fund the rehabilitation of three Shawsheen River bridges. One of the bridges will require the rehabilitation of the structure by providing a new steel liner and grouting the annular space between the arch and the new liner.

☑ Dean Road and Two Neponset River Bridges

The project includes the replacement of the entire superstructure, rehabilitation of existing substructures or reconstruction of new support structures for the girders, rehabilitation of existing retaining walls along the right-of-way, new retaining walls, etc. as stipulated in the contract drawings.

☑ Beverly Draw Bridge

The Beverly Draw Bridge project includes the rehabilitation of the entire super and substructure and existing approach super and substructures.

☑ Concord Main Street Bridge Repair

This project funds the reconstruction and repair of the bridge that carries the Fitchburg Line commuter rail trains over Route 62 in Concord.

☑ Lechmere Viaduct Rehabilitation

During the temporary shutdown of Green Line service on the viaduct between North Station and Lechmere, the MBTA is performing structural, deck, signals, and cable work on this bridge.

☑ Drawbridge No. 1 Mechanical Repairs

This project will perform repair work to the drawbridge bearings, electrical systems, and timber decks of the pair of drawbridges adjacent to North Station.

☑ Drawbridge Repairs

This project will fund the replacement of critical components of various drawbridges, including timber deck, frogs, and pads. This project will fund work for drawbridges in Gloucester, Manchester, Beverly and Saugus.

☑ Bridge Program

This project will fund the design and rehabilitation of selected bridges throughout the MBTA system based on the recommendations of latest inspections and rating reports.

☑ Green Line Bridge Reconstruction Program

This effort consists of the replacement of superstructures, rehabilitation of the bridge abutments and the installation of new catenary wires for bridges in Newton and Brookline, including replacement of utility lines. This project includes the reconstruction of Hyde Street and Langley Road Bridges on the Green Line.

☑ Red Bridge Replacement

This bridge which is located by the Boston Engine Terminal in Somerville will be completely reconstructed. Upon completion of the project speeds will increase on the Fitchburg Line and mid-day storage capacity will be expanded.

☑ Bridge Inspection Program

This program provides funding for the ongoing inspection and rating of bridges throughout the MBTA's commuter rail system.

BRIDGES

Bridge Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Merrimack River Bridge	\$18.43	\$3.50	\$6.00	\$8.93	\$0.00	\$0.00	\$0.00	\$14.93	\$0.00
Rehab of 3 Shawshen River Bridges	15.00	0.00	6.00	5.00	4.00	0.00	0.00	15.00	0.00
Rehab: of Dean Rd. and 2 Neponset River Bridges	10.00	0.00	10.00	0.00	0.00	0.00	0.00	10.00	0.00
Beverly Draw Bridge	8.55	0.00	2.00	3.00	3.55	0.00	0.00	8.55	0.00
Concord, Main St Bridge	9.00	1.40	1.60	4.00	2.00	0.00	0.00	7.60	0.00
Lechmere Viaduct	4.77	3.79	0.98	0.00	0.00	0.00	0.00	0.98	0.00
Drawbridge No. 1	4.73	0.00	0.00	0.20	2.00	2.53	0.00	4.73	0.00
Drawbridge Repairs	3.63	0.60	0.00	0.00	1.00	1.00	1.03	3.03	0.00
Bridge Program	28.00	0.00	3.00	3.00	8.00	10.00	4.00	28.00	0.00
Green Line Bridges	5.65	4.80	0.85	0.00	0.00	0.00	0.00	0.85	0.00
Red Bridge Replacement	12.00	0.00	0.00	2.00	8.00	2.00	0.00	12.00	0.00
Bridge Inspection Prgrm.	8.00	7.40	0.60	0.00	0.00	0.00	0.00	0.60	0.00
Total Bridges	\$127.76	\$21.48	\$31.04	\$26.13	\$28.55	\$15.53	\$5.03	\$106.28	\$0.00

ANTICIPATED FUTURE NEEDS

Many of the MBTA-maintained bridges throughout eastern Massachusetts, which is the MBTA service area, are reaching or have attained their life expectancies. While many of these bridges are in good structural condition, others are anticipated to need repairs. Using structural integrity and deck ratings established under the Bridge Management Program, the MBTA prioritizes bridge needs based not only on useful life but on a variety of factors, including safety implications, service impacts, and the potential to disrupt service. Below are the bridge projects the MBTA expects will need capital investment in the future.

□ Highway Bridges

Throughout the system, there are several bridges that are anticipated for future repair or replacement because of their age and condition.

□ Railroad Bridges

A number of MBTA railroad bridges will be a priority for future replacement and rehabilitation to improve the long-term structural integrity of the bridges. These include West Street, Talbot Avenue, and Woodrow Avenue.

□ Transit Bridges

Several transit bridges have been identified as future candidates for rehabilitation, including the Savin Hill Underpass.

CHAPTER 11

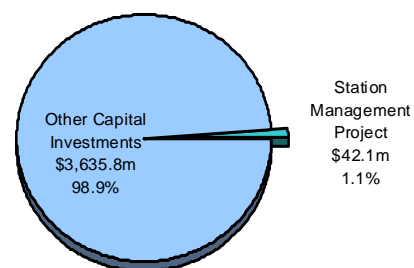
STATION MANAGEMENT PROGRAM (SMP)

PROGRAM OVERVIEW

SMP is a comprehensive series of initiatives that will revolutionize how the MBTA does business. The project impacts each and every customer through new station management functions and innovative ways to purchase fare media and gain access to the system. In addition, new communication infrastructures, customer service improvements, back office and money management systems, as well as enhanced station and employee management structures will be developed and deployed through this project.

- **Automated Fare Collection (AFC) Equipment:** The Station Management Program has funded the procurement of new fare vending machines, fare gates, fare validators and fareboxes. As of November 2006, new AFC equipment has been deployed and functional at most stations throughout the system. This new equipment allows the phasing out of tokens and the deployment of Customer Service Agents (CSAs) throughout the system. CSAs provide on-site aid and answers to MBTA-related questions. They are dressed in new distinctive uniforms for easy

Station Management Program Funding



STATION MANAGEMENT PROGRAM (SMP)

identification as they assist customers to increase convenience. AFC allows also for the introduction of new magnetic tickets and smart cards with more flexible fare structures and advanced customer service options. New electronic payment processing allows for patrons to pay with cash, credit or debit.

- **Hub Stations:** Six Hub Stations will be constructed in the subway system at South Station, North Station, Airport, Back Bay, Downtown Crossing, and Government Center stations. As of October 2005, three Hub Stations are online and operational. These are South Station, North Station, and Airport. Hub Stations enhance station management and safety through the monitoring of closed circuit television (CCTV), elevator, escalator, fire and AFC system alarms. Hub Station Monitors will also be able to respond to customer call boxes and dispatch CSAs and other MBTA personnel as needed.
- **Wide Area Network:** The MBTA is constructing a fiber optic-based wide area network (WAN) throughout its subway system. The WAN is a critical component of the communications infrastructure necessary for the AFC equipment, CCTV cameras and other systems and alarms.
- **Back Office Systems:** The MBTA will renovate its existing Bus and Green Line garages with a new cash box receiver system and its Revenue Collection Facility with new AFC equipment for encoding smart cards and magnetic stripe tickets. In addition, the Authority is purchasing new equipment for its ticket sales offices and for retail sales outlets. Finally, the MBTA is developing new web-based systems for purchase of fare media and other optional customer services including electronic payments for one-time and recurring online-purchases. Eventually, optional 'autoload' programs will allow for patrons to automatically have their smart cards updated with new passes and value, just by tapping their smart card at any station or farebox. Customers will also have the option to enroll for balance protection by registering their smart card. If a card is lost or stolen, it can be "turned-off" and a new card issued with the balance at the time the loss was reported.

FUNDED PROJECTS

When the SMP project is fully implemented, it will have a positive impact on the operating budget.

Station Management Project (SMP)

The SMP project funds the procurement and installation of new fare equipment, Hub Stations and fiber optic network. This equipment is expected to have a useful life of 20 to 25 years.

Automated Fare Collection – Phase II

This project will allow to rollout the CharlieCard system on Commuter Rail and Ferry service. In addition, this project will support Green Line revenue by identifying technology that will allow for proof of payment system.

Station Management Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Station Management Project	\$202.68	\$193.56	\$2.12	\$7.00	\$0.00	\$0.00	\$0.00	\$9.12	\$0.00
Station Management Project - Phase II	33.00	0.00	3.00	5.00	18.00	7.00	0.00	33.00	0.00
Total Station Mgmt. Project	\$235.68	\$193.56	\$5.12	\$12.00	\$18.00	\$7.00	\$0.00	\$42.12	\$0.00

CHAPTER 12

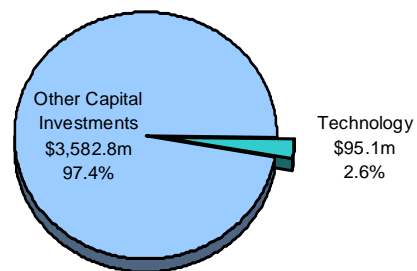
TECHNOLOGY/OTHER

PROGRAM OVERVIEW

Utilizing technology, the Authority delivers exceptional customer service in meeting the strategic goal of delivering safe, accessible, dependable, clean, and affordable transportation. The Information Technology Directorate (ITD) develops, implements, and manages technical solutions to core transit business needs in partnership with departments throughout the Authority. ITD provides technical support on multi-discipline project teams for the development and implementation of systems such as a new maintenance control reporting system (MCRS); automated fare collection (AFC); Hub station management system; enhanced PeopleSoft HRIS system; PeopleSoft Financial system; and the development of an enhanced Authority Wide Area Network (WAN).

ITD provides on-going technical solutions to the Operations Control Center (OCC) support staff, as well as assisting with the Authority's Intelligent Transportation

Technology/Other Funding



TECHNOLOGY/OTHER

Systems initiative (ITS); Customer Service Information System (CSIS); and web-based trip planning. In addition, ITD renders technical assistance to the Authority's Police Department headquarters, fourteen station kiosks and the police academy.

The MBTA is a national leader in the use of internet technologies to connect with customers for enhanced customer service and effective problem resolution. The Authority's website www.mbta.com offers: direct access to all subway, rail, and bus route superintendents (Write to the Top); the ability to write recommendations, complaints, suggestions and requests (Customer Feedback); the ability to request a complimentary fare if service is delayed (Customer Bill of Rights); the ability to report subway station cleaning or maintenance issues directly to the cleaning supervisors (Cleaning Between the Lines); the opportunity to learn about accessibility services for persons with disabilities ranging from Call-A-Lift buses, to elevators, kneeling buses, commuter rail access, and THE RIDE program. The MBTA's new website, launched in early 2007, has been named the Best Government Website by the International Academy of Digital Arts and Sciences.¹

Information technology services are provided on a 24-hour/ 7-day a week basis for over 2,000 users at over 70 Authority locations. Authority employees are offered technology training that enhances their knowledge thereby increasing productivity and efficiency across the Authority. Technical support is rendered for the Authority and its key service providers such as the Office of Transportation Access, THE RIDE, and the Massachusetts Bay Commuter Railroad Company.

FUNDED PROJECTS

There are fourteen funded projects for Technology/Other program. These efforts will have a positive impact on the Authority's operating budget. Many of these projects will allow the MBTA to operate more efficiently and effectively, thus reducing costs and allowing the Authority to provide better service throughout the system.

PeopleSoft Financial Software

This project funds the replacement of the FMS Financial Software with a new PeopleSoft system. Included in this project are software and hardware costs and consulting support to install and implement the software, including essential business modifications.

Miscellaneous Project Closeouts

This project represents a group of past completed capital projects that have yet to incur their final closeout costs.

Capital Maintenance Improvements

This effort provides funding for new, discrete capital projects throughout the MBTA for all transportation modes and general administration programs on an as-needed basis.

Miscellaneous Capital Projects

This is a general grant composed of multiple projects throughout the Authority that are mostly complete. Included in this grant are allocations for truck lifts, wheel truing machines, and other support equipment.

Computer Technology Upgrades

The Authority needs to increase its data storage capacity, upgrade its software environment, expand the WAN/LAN to remote locations, purchase additional servers, and continue to replace administrative computers on a regular basis to conduct

¹ The International Academy of Digital Arts and Sciences is regarded as the Internet version of the Oscars, the Webby's honor excellence in innovation and comprehensiveness.

business. These efforts reflect increasing demand for electronic data interchange and demand for broader access to data across the Authority as the result of new and upgraded programs and ongoing network access expansion.

☑ Executive Office of Transportation (EOT) Transit Program

This project has been completed. This effort supported the transit program managed by EOT.

☑ Human Resource Business Continuity

This effort helped digitize critical information, such as, benefits, employment history, that is on file in the Human Resource Department.

☑ Schedule Fulfillment System (Bid/Dispatch)

This effort funds a technology initiative for the implementation of an advanced scheduling system as well as additional systems required to support it.

☑ Independent Engineering Review (IER)

This task order contract represents various planning and construction tasks that will be utilized accordingly by the Authority. The FTA requires that a value engineering study be performed for all the major projects that are federally funded. Other task orders include: a task order contract used to comply with Massachusetts Building Code; and a task order contract used to produce survey maps to support in-house design efforts, perform subsurface testing, soil borings and archeological surveys, audits, and develop data for conservation commission submissions.

☑ Bond Issuing Costs (including DBE)

This effort represents the Authority's cost of bond issuance. In addition, this effort provides funding for various support programs for minorities, women, and disadvantaged organizations.

Technology/Other Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
PeopleSoft Fin. Software	\$21.25	\$18.06	\$0.00	\$1.50	\$1.69	\$0.00	\$0.00	\$3.19	\$0.00
Misc. Project Closeout Costs	2.50	1.72	0.47	0.20	0.11	0.00	0.00	0.78	0.00
Capital Maintenance Impr.	13.84	1.87	2.66	2.31	7.00	0.00	0.00	11.97	0.00
Misc. Capital Projects	8.87	8.69	0.18	0.00	0.00	0.00	0.00	0.18	0.00
Computer Tech. Upgrades	18.99	12.00	3.29	3.20	0.50	0.00	0.00	6.99	0.00
EOT Transit Program	15.80	15.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HR Business Continuity	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bid/Dispatch System	1.50	0.00	0.00	0.00	0.75	0.75	0.00	1.50	0.00
Indep. Engineering Review	6.67	5.15	0.91	0.61	0.00	0.00	0.00	1.52	0.00
Bond Costs	18.00	17.70	0.22	0.08	0.00	0.00	0.00	0.30	0.00
Audit Costs	1.00	0.50	0.23	0.27	0.00	0.00	0.00	0.50	0.00
Capitalization Initiatives	111.58	44.14	16.50	16.00	12.94	11.50	10.50	67.44	0.00
2008 Prog for Mass Transit	0.30	0.15	0.15	0.00	0.00	0.00	0.00	0.15	0.00
Unified Planning Work Prgm.	4.13	3.60	0.30	0.23	0.00	0.00	0.00	0.53	0.00
Total Technology	\$224.68	\$129.62	\$24.91	\$24.41	\$22.99	\$12.25	\$10.50	\$95.06	\$0.00

☑ Audit Costs

This effort represents and classifies the pool of ongoing audits of all contracts under the Authority's administration in the capital program. This project will have minimal cost to the capital program and will result in more efficient and cost-effective administration.

☑ Capitalization Initiatives

This effort supplies capital materials and component parts for ongoing preventive maintenance throughout the MBTA transit system.

TECHNOLOGY/OTHER

2008 Program for Mass Transit

This project will provide funds to update the Program for Mass Transit in 2008 as required under Forward Funding Legislation.

Unified Planning Work Program

This program funds various planning efforts regarding development of the MBTA system in coordination with various outside planning agencies.

ANTICIPATED FUTURE EFFORTS

The following projects have been identified as future needs for technology and other efforts.

Value Engineering Services

This project will provide value-engineering services as needed for various capital projects throughout the system.

Schedule Fulfillment System (Bid/Dispatch) – Phase II

This phase will identify the systems initiatives needed to implement all or part of the process and specifications required to support them.

Data Storage Capacity Upgrade

This project will upgrade the Authority's disk storage equipment by replacing outdated equipment with current technology, thereby increasing data storage capacity. It will also support technology needs of ongoing MBTA efforts such as the PeopleSoft system and the Station Management Project (SMP).

Intranet Web Portal

This project will enable users to access applications and Internet resources through a single customizable desktop window and provide users with current relevant information.

Internet Expansion Project

The scope of this project is to continually enhance the MBTA's website capabilities, including e-Commerce and other web functions made possible through continued developments in technology.

Systemwide Surveys and Planning

This funds miscellaneous efforts to support the development of system expansion projects. Included are ridership forecasts, passenger counts and other studies. The data received from these projects will provide the Authority with information for determining the benefit of future expansion efforts. The Authority will rely on Section 5303 funds for these efforts.

CHAPTER 13

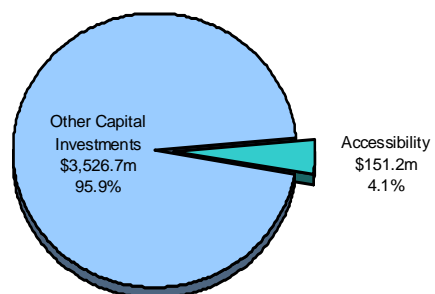
ACCESSIBILITY

PROGRAM OVERVIEW

In response to the Americans with Disabilities Act (ADA) of 1990, the Authority developed and approved the Key Station Plan as an initial step in making one of America's oldest public transit systems accessible to all. The ADA, a Title II Public Services Act, prohibits public transportation systems from discriminating against persons with disabilities. The Department of Transportation has established specific requirements for developing systemwide program accessibility, including the need to work with the community of people who have disabilities to determine key stations.

Since 1990, the Authority has rapidly become a leader in efforts to achieve station accessibility on one of America's oldest transit systems. Of the 80 stations identified in the Key Station Plan, the MBTA has made 74 stations accessible. In addition, the Authority has allocated construction funds for the remaining 6 stations, and has begun making dozens of non-key stations accessible as part of station modernization projects. Altogether,

Accessibility Projects Funding



ACCESSIBILITY

ongoing capital projects are bringing new accessibility benefits to over 300,000 MBTA passengers every day in the form of ramps, entrances, and elevators.

The MBTA has programmed \$151.2 million toward accessibility. This represents 4.1% of the total Capital Investment Program. The majority of accessibility funding is devoted to the Light Rail Accessibility Program (LRAP) for the Green Line to modernize stations, install elevators, and raise platforms. In addition, other capital projects included in the Stations and System Enhancement sections of this document contribute with substantial accessibility improvements to the MBTA system.



FUNDED PROJECTS

There are 17 funded projects under Accessibility, all of which will have a neutral impact on the Authority's operating budget.

Green Line Interim Accessibility Improvements

This program funds the construction of temporary platforms and lifts at several Green Line stations. This enables the MBTA to service passengers with handicaps and disabilities in the period leading up to accessibility.

Green Line Light Rail Accessibility Program (LRAP)

Surface Stations (B, C, & E Lines)

In compliance with ADA, the work for surface stations includes raising platforms, installing new kiosks, benches, signage and other necessary improvements to make these stations accessible to the public.

LRAP: Park Street and Haymarket Stations

Work for these two stations include platform raising, accessible fare collection equipment, new station lighting and other improvements and station finishes. This project is in its final stages.

LRAP: Government Center Station

Modifications for this station will include a new headhouse on City Hall Plaza, new raised platforms, and the installation of a new elevator, LED signage and accessible fare collection equipment, new electrical substation, lighting, and other station finishes. This project is in design phases, and will be coordinated with the Blue Line modernization efforts also taking place at that station.

LRAP: Arlington and Copley Stations

Combined work for these stations will include platform raising, installation of elevators, escalators, a new public address system and signage, accessible fare collection equipment, new headhouses, and other station necessities and finishes.

☑ LRAP: Kenmore Station

Work for Kenmore Station includes elevator and escalator installation, platform raising, landscaping, street lighting, a new MBTA bus canopy and a kiosk entrance (see page 131).

☑ LRAP: Boston College Station

This project will make accessibility modifications and improvements to conform to ADA guidelines and will include relocating the station to the median of Commonwealth Avenue, constructing two new raised platforms, shelters, lighting, tactile edging, and installing pedestrian crossings.

☑ LRAP: Brookline Village and Longwood Stations

Scope for this project includes the reconstruction of platforms for ADA accessibility, the installation of shelters, lighting, tactile edging, site work, and pedestrian crossings.

☑ Wayfinding Program

This project will provide funds to fabricate and install signage, path of travel, visual aids, and doors, throughout the system to assist ADA customers and enhance overall accessibility.

☑ LRAP: Phase II – Surface Stations

This Project will fund the design and construction of selected Green Line surface stations along the B, C, D and E Lines.

☑ Symphony and Hynes Accessibility

This project will fund the design of accessibility improvements for the Symphony and Hynes Stations.

☑ Science Park Accessibility

This project will fund the design and construction of accessibility improvements for the Science Park Station.

☑ Wollaston Accessibility

This project will fund the design of accessibility improvements for the Wollaston Station.

☑ Orange Line Malden Station Accessibility

The scope of this project includes the design and construction for accessibility improvements at Malden Center station. Accessibility improvements included both the Orange Line and Commuter Rail portions of this station.

☑ Red Line Charles/MGH Station Reconstruction

The MBTA is in the last phases of rebuilding and modernizing Charles/MGH station for complete accessibility. In conjunction with funds from Partners/MGH, this project reconstructed the station, including barrier-free access and gates, the addition of elevators and/or ramps, accessible path of travel, and improved signage.

☑ Systemwide Elevator Accessibility Upgrades

This effort funded upgrades for MBTA elevators. New equipment will include intercom devices, emergency rescue features and a variety of other accessible equipment.

☑ Auburndale Station Improvements Study

This project allocates funds for conceptual design work and preliminary engineering for future rehabilitation and accessibility upgrade of the Auburndale commuter rail station.



ACCESSIBILITY

Accessibility Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Green Line Interim Access	\$4.85	\$3.73	\$0.96	\$0.16	\$0.00	\$0.00	\$0.00	\$1.12	\$0.00
LRAP - Surface Stations	36.20	35.13	1.07	0.00	0.00	0.00	0.00	1.07	0.00
LRAP- Park St. + Haymarket	15.42	15.41	0.02	0.00	0.00	0.00	0.00	0.02	0.00
LRAP- Govt. Center Sta.	47.60	7.27	4.72	10.39	9.21	16.00	0.00	40.33	0.00
LRAP- Arlington + Copley	65.58	32.67	23.89	5.00	4.01	0.00	0.00	32.91	0.00
LRAP- Kenmore Station	44.73	28.49	13.56	2.68	0.00	0.00	0.00	16.24	0.00
LRAP- Boston College Sta.	3.29	0.00	0.00	1.97	1.31	0.00	0.00	3.29	0.00
LRAP- Brookline Vill. & Longwood	3.81	3.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wayfinding Program	20.00	4.13	1.00	4.00	5.00	5.00	0.87	15.87	0.00
LRAP - Phase II - Surface Sta	5.00	0.00	0.00	0.50	3.00	1.00	0.50	5.00	0.00
Symphony/Hynes Access	2.00	0.00	0.50	1.50	0.00	0.00	0.00	2.00	0.00
Science Park Accessibility	22.00	0.75	3.00	12.75	5.50	0.00	0.00	21.25	0.00
Wollaston Access	1.50	0.00	0.75	0.75	0.00	0.00	0.00	1.50	0.00
Orange Line- Malden Ctr. Sta.	10.15	10.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Red Line- Charles/MGH Sta.	49.38	46.42	2.96	0.00	0.00	0.00	0.00	2.96	0.00
Systemwide Elev. Upgrade	0.75	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Auburndale Station Study	7.85	0.23	0.70	3.92	3.00	0.00	0.00	7.62	0.00
Total Accessibility Program	\$340.10	\$188.94	\$53.13	\$43.63	\$31.04	\$22.00	\$1.37	\$151.16	\$0.00



Courthouse Station (Silver Line)

CHAPTER 14

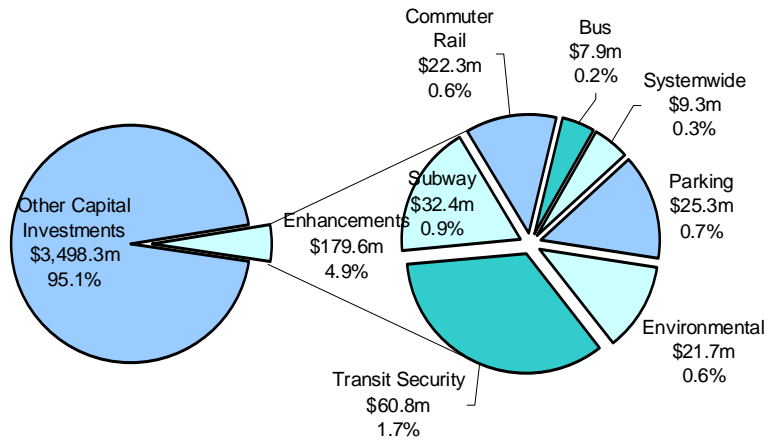
SYSTEM ENHANCEMENT

PROGRAM OVERVIEW

The system enhancement program includes projects that make investments in the existing system to enhance service for riders as well as to attract more riders to the system. The most significant efforts under the enhancement program are the North Station Superstation project, the Fairmount Corridor Improvements project, and new parking initiatives. The North Station project reconfigured the Green and Orange Line areas at North Station with underground access to the commuter rail.

The Fairmount project will improve and revitalize an underutilized route through the neighborhoods of Dorchester, Mattapan, and Hyde Park. Various parking projects systemwide will attract new riders, generate new revenues, and offer better services to existing commuters. Also, environmental programs enhance the safety and well-being of both MBTA customers and employees, and the new program for Transit Security protects passengers and improves safety on the transit

Enhancement Projects Funding



SYSTEM ENHANCEMENT

system for all. Finally, this section also encompasses pilot programs and evaluation of new technologies and equipment that may lead to the application of new methodologies and infrastructure to enhance MBTA service in the future.

This program area, which totals \$179.6 million, includes projects that both enhance service for existing riders and attracts new riders to the system. System Enhancements account for approximately 4.9% of the MBTA capital program.

SYSTEM ENHANCEMENT—SUBWAY

The majority of this effort is invested in the construction of the North Station Transportation Center, serving the Orange and Green Lines. The useful life of stations can be found under the Subway Stations section of this document.

FUNDED PROJECTS

Currently, there are seven funded projects underway for subway system enhancement.

Green & Orange Lines North Station Transportation Center—Phases III & IV

This effort represents the final phases of the North Station Transportation Center project, which features a new Superstation to serve the Orange and Green Lines with underground access to the commuter rail terminal. The Green and Orange Line portions of the station have opened for service. The elevated Green Line structure over Causeway Street has been demolished as the Green Line now operates underground. The project includes a new tunnel under the TD Banknorth Garden, a new portal near Science Park station, and a pedestrian access tunnel from the Green and Orange Lines under Causeway Street directly to the commuter rail lobby. This project has a neutral impact on operating costs.

Friction Modifier System

This project funds the installation of a high-tech system to deliver a modifier/lubricant to the rails and wheels on the Green Line. This innovative solution would reduce the friction and wear between the wheel and rails, with dramatic savings in maintenance costs for both components. This project will have a positive impact on operating costs.

New Systemwide Public Address System/LED Signage

This project funds the installation of a new PA equipment and fiber optic links for all subway stations. Existing voice storage units and control systems would also be upgraded or replaced. This project encompasses the installation of automatic light-emitting diode (LED) signage on the station platforms and in the lobby areas of subway stations. These signs, through a new connection to head-end equipment at the operations control center, will provide customers with notices of delays and train arrival information.

Park Street Station Eastbound Crossover

This effort will fund the modification of the track scheme and power sectionalization on the Green Line at Park Street. By creating a short track connecting the two eastbound tracks, the project will dramatically increase eastbound service, eliminate that station as a major bottleneck and source of standing time delays, and allow greater operational flexibility. This project will significantly increase service speed and reliability for Green Line passengers, and have a slightly negative impact on operating costs.

Wonderland Transit-Oriented Development Improvements

This effort will make improvements to the area surrounding Wonderland station on the Blue Line to encourage transit-oriented development. This project will advance contingent upon receipt of state funds for construction.

Green Line Positive Train Control

The purpose of this project is to identify technologies that can improve safety by reducing/eliminating collisions under current operating conditions.

Forest Hill Bike Cage

This effort will fund the installation of a bike cage adjacent to the Forest Hill station.

Subway Enhancement Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
North Station Transp. Center	\$255.70	\$253.55	\$2.15	\$0.00	\$0.00	\$0.00	\$0.00	\$2.15	\$0.00
Friction Modifier System	0.85	0.68	0.17	0.00	0.00	0.00	0.00	0.17	0.00
PA System /LED Station Sign	29.40	16.10	9.78	3.52	0.00	0.00	0.00	13.30	0.00
Park St. Eastbnd. Crossover	3.28	0.00	0.00	0.50	1.00	1.78	0.00	3.28	0.00
Wonderland T.O.D.	13.65	1.19	5.46	5.98	1.02	0.00	0.00	12.45	0.00
Positive Train Control	1.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00
Forest Hill Bike Cage	0.15	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Subway Enhancement	\$304.04	\$271.68	\$18.55	\$10.00	\$2.02	\$1.78	\$0.00	\$32.36	\$0.00

ANTICIPATED FUTURE EFFORTS

There is one anticipated enhancement project for the subway system.

Green Line Auto Vehicle Identifier (AVI)

This project would add AVI technology to Green Line vehicles and tie into the Operations Control Center (OCC). The implementation of this project would allow the OCC more control over the spacing, flow, and speed of Green Line trains.

SYSTEM ENHANCEMENT

SYSTEM ENHANCEMENT—COMMUTER RAIL

This segment of the system enhancement program funds projects to provide commuter rail infrastructure upgrades and improvements.

FUNDED PROJECTS

The program includes seven enhancement projects with neutral impact on the Authority's operating budget.

Fairmount Corridor Improvement – Phase I

The Phase I of this project has been completed. This project represents the beginning of the reconstruction of Fairmount Line through the neighborhoods of Dorchester, Mattapan, and Hyde Park. Improvements included work on several bridges, the signal system, and several stations, including Morton Street and Upham's Corner. This effort provided the necessary funds for the restoration of infrastructure while improving safety and service reliability, and allowing options for development opportunities along the Fairmount Corridor. (For information on this project's Phase II see page 136.)

Layover Facility Analysis

This project will fund a *Layover Facility Location and Capacity Analysis* which will identify the most favorable strategic locations for train layover facilities as based upon projected ridership demand, corresponding line schedules and train deployment characteristics. Additionally, this study will examine the capital and operations cost implications resulting from the creation of new layover facilities.

Coach Emergency Lighting Project

Commuter rail coaches will be outfitted with low-location exit path marking systems to assist passengers in potential evacuations of commuter rail trains.

Commuter Rail Next Stop Announcement

This project will fund necessary hardware and software improvements in order that the light emitting diode signs along the commuter rail right of way can display next train arrival information.

Fitchburg Track Improvements

This project funds key track improvements along the Fitchburg Commuter Rail Line (see page 92).

Rockport Station Improvements Study

This project provides funding for preliminary design work for a future rehabilitation and accessibility upgrade of the Rockport commuter rail station and layover facility (see page 88).

Salem/Beverly Commuter Rail Station Improvements

This effort funds the design to upgrade Salem and Beverly stations in preparation of adding approximately 1,150 parking spaces, bus drop-off and pickup areas, and an accessibility platform extension (at Salem).

Commuter Rail Enhancement Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Fairmount Line Improvements - Phase I	\$37.31	\$37.31	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Layover Facility Analysis	0.10	0.00	0.10	0.00	0.00	0.00	0.00	0.10	0.00
Coach Emergency Lights	1.87	0.96	0.92	0.00	0.00	0.00	0.00	0.92	0.00
CR Next Stop Announcement	10.20	5.00	5.20	0.00	0.00	0.00	0.00	5.20	0.00
Fitchburg Track Improvements	8.05	6.70	1.35	0.00	0.00	0.00	0.00	1.35	0.00
Rockport Station Improvements	10.12	0.85	2.27	6.00	1.00	0.00	0.00	9.27	0.00
Salem/Beverly Station Impr.	9.26	3.81	3.64	1.81	0.00	0.00	0.00	5.45	0.00
Total Comm. Rail Enhancement	\$76.91	\$54.63	\$13.47	\$7.81	\$1.00	\$0.00	\$0.00	\$22.28	\$0.00

ANTICIPATED FUTURE EFFORTS

There is one anticipated enhancement project for commuter rail service.

- Active Train Summary System – Commuter Rail OCC (CROCC) Enhancement**
This project would extend the Real Time Active Train Summary at the current CROCC to include trains on line segments dispatched by Guilford and Amtrak, allowing one system to encompass virtually the entire commuter rail system, and minimize signaling and scheduling conflicts between MBTA commuter rail trains and freight trains.

SYSTEM ENHANCEMENT—BUS

This program authorizes enhancements for bus operations.

FUNDED PROJECTS

The following eight efforts will have a neutral impact on the Authority's operating budget.

- "Smart Bus" Technology Enhancement**
This project allows the Authority to outfit existing buses with "smart bus" technology to provide automated announcements to passengers. This technology, called Public Announcement/Variable Message System (PA/VMS), uses a bus-borne global positioning system (GPS) device to tell passengers the next stop, the direction of the bus, intermodal transfer information, and other information through audio and visual announcements.
- Systemwide Bus Signage**
This project funds a crew and materials to improve bus stop signage throughout the bus system.
- Bus Rapid Transit Development Study**
This effort supported the conceptual development of bus rapid transit systemwide.
- South Station Bus Terminal ITS Kiosks**
This effort funds the installation of interactive kiosks at the South Station Bus Terminal. The kiosks incorporate Intelligent Transportation System technology.
- Bus Training Simulator**
This project funds the procurement of two bus simulators for the training of bus operators in an effort to reduce vehicle accidents.
- Environmental Management System (EMS)**
Recent settlement agreements with the EPA, AG and DEP require the implementation of an Environmental Management System. This project will expand the implementation of the existing Maximus Maintenance System (MCRS2) to operate within the Operations Support and Environmental Affairs Departments. This project will allow the participant departments to simultaneously monitor environmental performance, maintenance and repair activities.
- Automated Passenger Counters**
This project will fund the purchase of Automated Passenger Counters (APCs) for about 12% of the MBTA bus fleet. APCs are a proven technology and a valuable tool for service planning and scheduling. APCs have been used in the transit industry for 30

SYSTEM ENHANCEMENT

years, but only recently with the integration of GPS, they have become a solid and reliable source of passenger activity data.

Bicycle Racks

This pilot project funds the installation of bicycle racks on buses.

Bus Enhancement Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Smart Bus Technology	\$4.60	\$3.81	\$0.80	\$0.00	\$0.00	\$0.00	\$0.00	\$0.80	\$0.00
Systemwide Bus Signage	1.73	1.56	0.07	0.09	0.00	0.00	0.00	0.16	0.00
Bus Rapid Transit Devel.	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
South Station ITS Kiosks	2.12	1.49	0.30	0.33	0.00	0.00	0.00	0.63	0.00
Bus Training Simulator	2.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00
Environmental Mgt System	4.86	2.33	1.63	0.90	0.00	0.00	0.00	2.52	0.00
Automated Passenger Counters	2.63	0.00	0.30	2.33	0.00	0.00	0.00	2.63	0.00
Systemwide Bus Racks	0.26	0.13	0.13	0.00	0.00	0.00	0.00	0.13	0.00
Total Bus Enhancement	\$18.30	\$10.43	\$4.22	\$3.65	\$0.00	\$0.00	\$0.00	\$7.88	\$0.00

ANTICIPATED FUTURE EFFORTS

There is one anticipated enhancement project for bus operations.

Expand the Maintenance Control Reporting System (MCRS) Deployment to Include Facility Maintenance

This project would expand the scope of the current MCRS effort to include maintenance facilities.

SYSTEM ENHANCEMENT—SYSTEMWIDE

This section represents enhancement efforts that affect the entire system. It also includes the evaluation of new technologies to enhance systemwide services.

FUNDED PROJECTS

There are a total of ten projects under systemwide enhancement. These efforts will have a neutral impact on the Authority's operating budget.

☑ Station Signage Program

This project provides new and updated system and neighborhood maps and signs at various stations throughout the MBTA's rapid and light rail system.

☑ Systemwide Wide Area Network (WAN) Security

This effort funds preliminary design for the wide area network system.

☑ Passenger Straps and Seats

This effort funded the procurement of passenger straps and replacement seats for rapid transit vehicles.

☑ Mattapan Line Study

This effort will fund a study of the Mattapan Line to identify enhancements and steps to increase accessibility.

☑ MBTA "Protects" Program

This effort was created as a pilot program to evaluate the usage of chemical/biological detection systems throughout the MBTA. The initial implementation at South Station has been completed.

☑ Train and Bus Arrival Announcements

This project will fund the necessary infrastructure and software improvements to provide MBTA customers with next train and countdown arrival time information.

☑ Operational Enhancements

This effort will support efforts throughout the Authority to increase service reliability and enhance service for our customers.

☑ CharlieCard Initiatives

This effort will identify and implement other applications for the CharlieCard.

☑ Systemwide Art Program

The art program provided funds to various reconstruction projects, usually involving stations, for the inclusion of pieces of art and other enhancements in their scope.

☑ Systemwide System Enhancements

This effort supports various system enhancement efforts throughout the Authority.

SYSTEM ENHANCEMENT

Systemwide Enhancement Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Station Signage Program	\$0.95	\$0.77	\$0.18	\$0.00	\$0.00	\$0.00	\$0.00	\$0.18	\$0.00
Systemwide WAN Security	2.62	2.54	0.08	0.00	0.00	0.00	0.00	0.08	0.00
Passenger Straps and Seats	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mattapan Line Assessment	1.10	0.00	0.00	0.60	0.50	0.00	0.00	1.10	0.00
MBTA "Protects" Program	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Train & Bus Arrival Announcements	6.00	0.00	0.07	3.93	2.00	0.00	0.00	6.00	0.00
Operational Enhancements	1.00	0.25	0.00	0.00	0.75	0.00	0.00	0.75	0.00
CharlieCard Initiatives	1.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00
Systemwide Art Program	1.13	1.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Systemwide Enhancements	0.43	0.25	0.00	0.18	0.00	0.00	0.00	0.18	0.00
Total Systemwide Enhancement	\$16.24	\$6.94	\$1.34	\$4.72	\$3.25	\$0.00	\$0.00	\$9.31	\$0.00

ANTICIPATED FUTURE EFFORTS

Currently, the Authority has not identified future capital needs for this area.

SYSTEM ENHANCEMENT—PARKING

MBTA parking facilities include both open surface parking lots and enclosed parking garages. MBTA riders have access to 47,000+ MBTA-owned parking spaces as well as 17,000+ non-MBTA owned spaces (see table below).

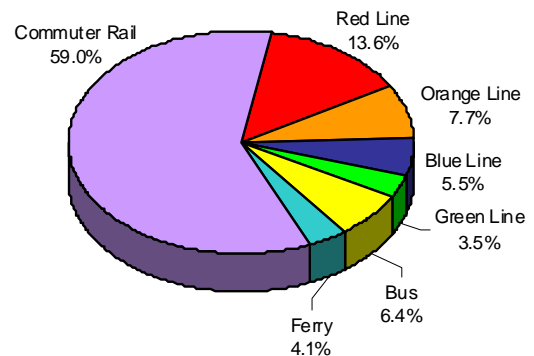


In 1991, as part of commitments made under the Central Artery and State Implementation Plan (SIP), the state committed to building 20,000 new spaces. With the MBTA’s contribution of more than 21,000 spaces to date, this commitment is complete. However, the Authority continues with the program to add needed parking to the system to attract riders and boost revenues. Over 3,000 new parking spaces have been built on stations along the new Greenbush commuter rail line.

MBTA Parking Spaces			
	MBTA	Non-MBTA	Total
Red Line	8,723	115	8,838
Mattapan Line	288	13	301
Orange Line	2,663	2,374	5,037
Blue Line	2,185	1,427	3,612
Green Line	2,011	0	2,011
Bus	4,193	0	4,193
Ferry	2,497	191	2,688
Commuter Rail	25,332	13,138	38,470
Total	47,892	17,258	65,150

As of October 2007

Parking Share by Mode



FUNDED PROJECTS

There are currently ten parking projects in various stages. These projects will have a neutral or positive impact on the Authority’s operating budget.

New Parking Initiatives

This item was used to fund new projects and activities to expand the MBTA’s parking capacity systemwide.

Quincy Ferry Terminal

The MBTA will improve the parking lot at the Quincy Ferry Terminal, including grading and a net increase of around 100 parking spaces.

Lynn Garage Waterproofing

Under this project the MBTA provided waterproofing and other minor repairs to ensure that the Lynn parking facility meets its useful life.

SYSTEM ENHANCEMENT

☑ System Park and Ride Support

This grant funds support activities necessary to initiate and advance parking expansion projects. Activities include appraisals and conceptual designs.

☑ Lawrence Station

The MBTA is participating in a project to construct a multilevel parking facility and a new station platform at Lawrence.

☑ Alewife Parking Garage Rehab

The Alewife parking garage is being rehabilitated to ensure continued parking capacity and passenger comfort.

☑ Woburn Park & Ride

This project budget represents the match to the federal funds approved for the design and construction of 100 parking spaces at Magazine Hill.

☑ Newburyport Enhancements

SAFETEA-LU includes funding set-aside of \$1.67 million for design and construction of a Newburyport transportation intermodal facility.

☑ South Shore Parking Garage Rehabilitation

The project funds the design and rehabilitation of multi-level parking facilities along the South Shore Branch on the Red Line, which include Braintree, Quincy Adams and Quincy Center.

☑ Gloucester Station

This effort helps fund the construction of 100+ parking spaces at Gloucester Station.



Alewife Station Parking Garage

Parking Enhancement Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
New Parking Initiatives	0.54	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Quincy Ferry Terminal	2.70	1.74	0.96	0.00	0.00	0.00	0.00	0.96	0.00
Lynn Garage Waterproofing	0.30	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00
System Park+Ride Support	11.35	11.06	0.29	0.00	0.00	0.00	0.00	0.29	0.00
Lawrence Station Project	9.03	6.34	2.69	0.00	0.00	0.00	0.00	2.69	0.00
Alewife Improvements	5.11	2.84	1.72	0.55	0.00	0.00	0.00	2.27	0.00
Woburn Park & Ride	0.34	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Newburyport Enhancements	0.38	0.00	0.38	0.00	0.00	0.00	0.00	0.38	0.00
Parking Garage Rehab	20.00	1.50	3.00	7.00	8.00	0.50	0.00	18.50	0.00
Gloucester Intermodal Fac.	3.73	3.54	0.19	0.00	0.00	0.00	0.00	0.19	0.00
Total Parking Enhancements	\$53.48	\$28.20	\$9.23	\$7.55	\$8.00	\$0.50	\$0.00	\$25.28	\$0.00

ANTICIPATED FUTURE EFFORTS

The following project has been identified as a future parking enhancement effort.

Systemwide Parking

Project designed to increase parking availability throughout the system.

SYSTEM ENHANCEMENT

SYSTEM ENHANCEMENT—ENVIRONMENTAL COMPLIANCE

The MBTA understands the importance of performing in a safe, healthy environment. While the public transportation services that the Authority provides reduce congestion and automobile emissions, the MBTA is also committed to providing those services in an environmentally sound and responsible manner. To that end, the MBTA Environmental Department works cooperatively with the Design and Construction, Development, Real Estate, Legal and Operating Departments to identify the potential environmental impacts of its operating facilities, construction projects and improvements to infrastructure. EMD oversees the management of underground storage tanks, the handling and disposal of hazardous materials, storm water and wastewater management, air quality issues, and any other regulated environmental matters. It conducts regular comprehensive environmental audits of facilities to identify non-compliance issues and to develop strategies and schedules for bringing the facilities into compliance. Standard operating procedures for environmental issues are established for all facilities.

The environmental compliance program includes the identification, design and implementation of environmental mitigation measures, as necessary and appropriate throughout the MBTA system. The Authority also responds to environmental cleanup requirements as required under federal and state regulations. Finally, the Authority manages a noise mitigation program.



FUNDED PROJECTS

There are nine funded projects under the environmental compliance program. These projects will have a neutral impact on the Authority's operating budget.

Cabot Yard Cleanup

In conjunction with the Massachusetts Department of Environmental Protection, the MBTA has successfully contained a leaking underground storage tank. This project provided the funds to build a groundwater remediation plant on the site and implement a permanent solution.

Lynn Bus Garage Remediation

This project provides for the removal and cleanup of an underground storage tank in the basement of the MBTA's bus facility in Lynn.

Bus Wash Upgrades

In compliance with the Clean Water Act, the Authority installed new washing equipment in all bus garages.

South Boston Power Plant Phase II—Demolition

This project involves significant asbestos abatement work, cleanup, and the demolition of the South Boston Power Plant. In cooperation with the Massachusetts Attorney General's Office, all asbestos and hazardous materials have been removed from the site, environmental monitoring efforts are continuing, and demolition is nearing completion.

Miller's Outfall Structure

The project involves the repair of outfall piping that leads into the Charles River. The Authority is currently involved in discussions with other public agencies to determine if the Authority is the appropriate agency to pay for the repairs.

Environmental Compliance Management Efforts

The project involves the preparation of environmental remediation response documents and design remediation for oil and/or hazardous waste releases throughout the Authority, and provides environmental consulting services to audit and fix non-compliant matters.

Groundwater Remediation

This project will study and potentially remediate groundwater issues in the City of Boston.

Readville Facility Remediation

The MBTA is completing the site assessment and risk characterization for the Readville Facility. This assessment will determine the level and extent of remediation that may be required for the ultimate use of the property. The majority of the solid waste and the discarded railroad ties and other railroad-related equipment have been removed from the site.

Systemwide Noise Mitigation Program

The funding for this project was set-aside to implement noise mitigation efforts with the construction of noise walls and other sound barriers.

Environmental Compliance Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Cabot Yard Cleanup	\$8.04	\$8.04	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Lynn Bus Fac. Remediation	5.00	4.48	0.52	0.00	0.00	0.00	0.00	0.52	0.00
Bus Wash Upgrades	1.86	1.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S. Boston Power Plant	23.90	21.63	1.38	0.89	0.00	0.00	0.00	2.26	0.00
Miller's Outfall Structure	6.00	0.00	0.50	3.50	2.00	0.00	0.00	6.00	0.00
Enviro. Compliance Mgmt.	25.28	21.11	1.63	2.54	0.00	0.00	0.00	4.17	0.00
Groundwater Remediation	4.97	1.76	1.00	1.00	1.21	0.00	0.00	3.21	0.00
Readville Facil. Remediation	7.38	1.84	0.77	1.27	3.50	0.00	0.00	5.54	0.00
Systemwide Noise Mitigation	3.05	3.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Environmental Compliance	\$85.48	\$63.78	\$5.80	\$9.19	\$6.71	\$0.00	\$0.00	\$21.70	\$0.00

ANTICIPATED FUTURE EFFORTS

Although the Authority currently has not identified future capital projects for the environmental compliance program, the MBTA intends to comply with all applicable regulatory requirements.

TRANSIT SECURITY

Transit Security is an essential aspect of ensuring a safe environment throughout the transit system. The MBTA strives to make continuous improvements in safeguarding lives and property within the Authority, reducing fear and promoting the confidence of the riding public, and upholding the constitutional rights of all commuters. The MBTA Transit Police, the Assistant General Manager for Safety, and the Operations Control Center are the primary parties that supervise and monitor Transit Security efforts. They are responsible for monitoring and maintaining a standard level of security and safety while preventing and preparing for responsiveness during an emergency. To perform their tasks, the MBTA maintains a range of capital assets to ensure passenger safety and security throughout daily operations.

MBTA Transit Police

The Transit Police force includes 250 police personnel who patrol and serve the 175 communities in the MBTA service district. To strengthen their presence and visibility, 15 police reporting stations are located along the transit system. Capital funding will provide the Transit Police Department with five Transit Police Service Area (TPSA) substations in accordance with the MBTA Transit Police Plan of Action and the Transit Police Service Area concept.



Transit Police Service Areas

Recognizing that community-based policing is an effective strategy for enhancing security on the transit system, the MBTA Transit Police Plan of Action divides the police district into five geographic areas with a police substation in each region to better integrate the police force into the neighborhoods they serve. With their designated districts, the commanding officers are charged to focus and concentrate on improving their specific area by working with the local communities. These new TPSA substations, with a 30-year useful life, will serve as a headquarters with space for personnel, equipment and resources, which will allow the Transit Police to proficiently perform their functions away from the main headquarters.

Specialty and Anti-Terrorism Vehicles

The Transit Police Department maintains a fleet of eight specialty vehicles, which have a 5- to 10-year useful life, including a Special Operations Team (SOT) vehicle, a bomb disposal truck, radar units, and an incident command vehicle. The incident command vehicle is outfitted with up-to-date computer and telecommunications equipment necessary for the coordination of a multi-agency, multi-disciplined response to a public safety event or emergency.

Secure Stations Initiative

In accordance with the State Homeland Security Strategy, the MBTA is improving its communications and security systems to enhance safety and security systemwide. The transit system is equipped with a wide range of infrastructure to collect and disseminate information in the event of an emergency:

- Wide-scale deployment of closed circuit television (CCTV) systems
- Public Address (PA) and signage systems
- Security intrusion detection and alarm systems
- Fire alarm systems
- Police/public call boxes
- Silver Line Phase II Security Program

All new construction, particularly station reconstruction and maintenance facility upgrade projects, involves the complete overhaul or reinstallation of security and fire alarm systems, police call boxes, and communications and public address systems.

The communications enhancements also include a police mobile data terminal upgrade.

FUNDED PROJECTS

Currently, there are twelve Transit Security projects underway involving upgrades to the Authority's police equipment, the installation of new communications technology, and new anti-terrorism initiatives.

☑ Police Improvements

Transit Police Service Area (TPSA) Facility Improvements

This project would construct and establish five new TPSAs in accordance with the MBTA Police Plan of Action. This funding will construct or lease offices to provide space for 25 officers per station, equipment, resources and administration forces to perform law enforcement duties.

Bomb Detection Equipment

This involves the purchase of portable and stationary equipment and K-9 units to inspect and detect potentially harmful explosive devices on the transit system.

☑ Emergency Exits Program

This project provides funding to enhance and upgrade emergency exits at subway stations systemwide. The project involves vandal-resistant lighting, enhancements to the doors and lock mechanisms, signage, and path-of-travel safety improvements.

☑ Tunnel Vent Security Upgrade

This project funds enhanced security of tunnel ventilation fan rooms at 55 locations. This effort ensures that the central controls for vent fans systemwide continue to function reliably so that the impacts of a potential fire, chemical or biological emergency in the subway tunnels can be mitigated.

☑ Secured Station Initiative

This effort provides funds for the installation of closed-circuit television security systems, intrusion detection systems, card key access to monitor and protect system infrastructure on the subway system

☑ FY07 Homeland Security Funds

In FY07 the Authority received Homeland Security funds which have been programmed to enhance system efforts already underway.

☑ FY08 Homeland Security Funds

Every year the Authority receives Homeland Security funds which is programmed to enhance system efforts already underway.

☑ FY09 Homeland Security Funds

Every year the Authority receives Homeland Security funds which is programmed to enhance system efforts already underway.

☑ Tunnel Security Upgrade

This effort will locate Closed Circuit Television Cameras at locations in the underground tunnel system.

SYSTEM ENHANCEMENT

Station Security

This effort funds systemwide installation of new door locks to critical station areas.

Security Training Center

This effort will create an exercise and training facility that will simulate tunnel and station environments. This will allow regional first responders to drill in a realistic environment without impacting MBTA customers.

Ferry Security Enhancements

This project will identify and prioritize investment to enhance security for the Authority's Ferry Boat service.

Security Systems at Yards

This effort provides the funds to install closed-circuit television security systems to monitor and protect vehicles and personnel at 13 yard and shop areas throughout the subway system.

Transit Security Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Police Improvements	\$1.66	\$1.17	\$0.46	\$0.03	\$0.00	\$0.00	\$0.00	\$0.48	\$0.00
Emergency Exits Program	1.51	0.96	0.55	0.00	0.00	0.00	0.00	0.55	0.00
Tunnel Vent Security Upg.	0.50	0.37	0.13	0.00	0.00	0.00	0.00	0.13	0.00
Secured Station Initiative	11.53	8.34	3.19	0.00	0.00	0.00	0.00	3.19	0.00
FY07 Homeland Security Funds	16.68	0.00	7.50	7.50	1.68	0.00	0.00	16.68	0.00
FY08 Homeland Security Funds	28.38	0.00	0.00	3.00	9.00	9.00	7.38	28.38	0.00
FY09 Homeland Security Funds	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tunnel Vent Security Upg.	5.44	0.00	2.00	3.44	0.00	0.00	0.00	5.44	0.00
Station Security	10.00	6.54	3.46	0.00	0.00	0.00	0.00	3.46	0.00
Security Training Ctr	1.50	0.00	0.75	0.75	0.00	0.00	0.00	1.50	0.00
Ferry Security Enhancements	0.78	0.00	0.30	0.48	0.00	0.00	0.00	0.78	0.00
Security Systems at Yards	0.42	0.21	0.21	0.00	0.00	0.00	0.00	0.21	0.00
Total Transit Security	\$78.40	\$17.59	\$18.55	\$15.19	\$10.68	\$9.00	\$7.38	\$60.81	\$0.00

ANTICIPATED FUTURE NEEDS

The MBTA's capital program will continue to maintain and improve the safety and security of its passengers. Planning for safety and security related investments will be made in close coordination with the MBTA Police Department, local communities, emergency management agencies, and the Commonwealth of Massachusetts Executive Office of Public Safety—Homeland Security Division.

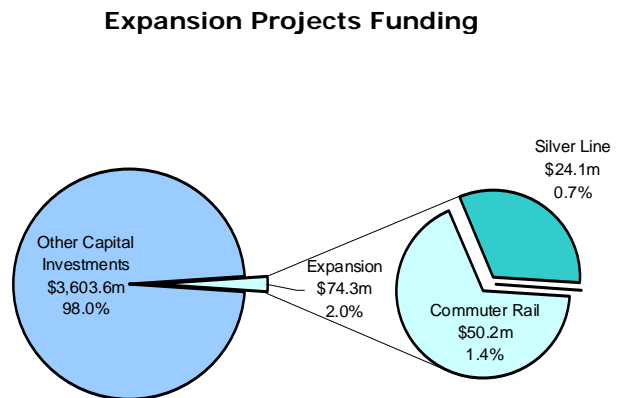
CHAPTER 15

SYSTEM EXPANSION

PROGRAM OVERVIEW

The Authority is working with the Massachusetts' Executive Office of Transportation (EOT) to plan and implement cost-effective service expansions to accommodate the increasing travel demands within our region. Expansion plans are tempered by financial constraint realities and the Authority's strategic focus in addressing long-deferred maintenance needs to bring our core system infrastructure into a state of good repair. Most of the system expansion work underway now is included as mitigation under the State Implementation Plan (as developed under the Clean Air Act) or under the Central Artery administrative consent order.

Since 1985, the Authority has significantly increased the number of revenue miles operated annually through major expansion projects. Much of this is due to historical large-scale system expansions including new commuter rail service to Worcester, Middleborough, Plymouth and Newburyport, as well as extensions to the Red Line and the reconstruction of the Orange Line. Over the last few years, new commuter rail stations have opened along the Worcester Line and the Old Colony Line at JFK/UMass station. The current capital program for expansion primarily focuses on two projects: the Silver Line and the Greenbush commuter rail line. The full Silver Line will provide new service within Boston's urban areas to Roxbury, South Boston, and downtown, while the Greenbush Line has extended rail service to Boston's south shore.



SYSTEM EXPANSION

In July of 2002, the MBTA opened the Washington Street (Phase I) service of the Silver Line, with new service between Dudley Square in Roxbury and Downtown Crossing. Phase II opened in late 2004, providing new service between South Station, the South Boston Seaport District, the new Boston Convention and Exhibition Center, and the South Boston residential area. Phase III, a tunnel linking the first phases between Washington Street and South Station, is currently in design and subject of continued planning regarding alignment and portal locations. In addition, the Greenbush commuter rail line is now has started revenue service serving seven new stations to communities south of Boston. System expansion funding also encompasses conceptual plans and preliminary design for other future expansion projects.

SYSTEM EXPANSION—SUBWAY

Currently, the Authority has not programmed capital funds for subway expansion.

SYSTEM EXPANSION—COMMUTER RAIL

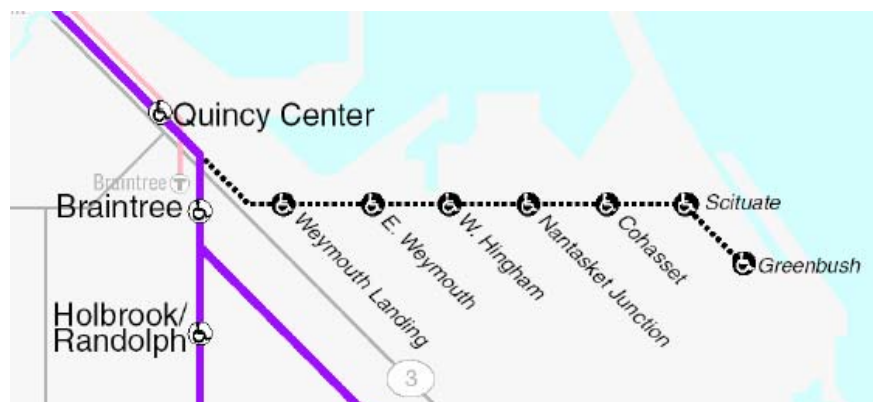
The majority of the funding devoted toward commuter rail expansion is for the Greenbush project, and other closeout efforts of past projects, which include the Old Colony, Newburyport, and Worcester lines. The useful lives of both stations and track work can be found in the Station and Track sections of this document, respectively.

FUNDED PROJECTS

There are five funded projects underway for commuter rail system expansion. The Greenbush project is a major expansion project currently in full-scale construction, and the other three represent closing costs of past expansion projects. As the Authority continues its efforts to meet increasing demand for its services, operating costs will increase for operations and maintenance. Therefore, these efforts will have a negative impact on the Authority's operating budget.

Greenbush Commuter Rail Line

This large expansion project, currently underway, consists of the rehabilitation and preparation of the Old Colony Greenbush Line for full commuter rail service to South Station in Boston. The scope includes construction of 17.1 miles of track, seven stations, a layover facility, a tunnel through historic Hingham Square, the purchase of necessary passenger coaches, and personnel training costs. This commuter rail line serves the towns of Weymouth, Braintree, Hingham, Cohasset, and Scituate.



Worcester Commuter Rail Extension Closeout

This project has been completed. Remaining expenditures relate to closeout costs. Completed work included five new stations at Grafton, Ashland, Westborough, Southborough and Worcester, a layover facility, reconstruction of the Route 85 Bridge, traffic mitigation and Conrail track and signal work.

Newburyport Extension

This project supports the final efforts of the Ipswich to Newburyport commuter rail extension, which opened in October 1998. Work to be completed includes punchlist and environmental items, as well as access improvements to the Newburyport station platforms and the station building.

Closeout Expansion Projects

This represents the completion of final elements in support of Worcester and Newburyport Rail Extensions.

Old Colony Closeout

This represents the completion of final elements in support of the Old Colony lines that were reconstructed and opened for service in 1997.

Commuter Rail Expansion Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Greenbush Line Construction	\$532.47	\$492.03	\$32.34	\$8.10	\$0.00	\$0.00	\$0.00	\$40.44	\$0.00
Worcester Extension	102.70	101.99	0.71	0.00	0.00	0.00	0.00	0.71	0.00
Newburyport Extension	27.27	27.20	0.07	0.00	0.00	0.00	0.00	0.07	0.00
Closeout Expansion Projects	6.00	0.00	1.00	2.00	3.00	0.00	0.00	6.00	0.00
Old Colony Closeout Costs	6.20	3.25	2.00	0.95	0.00	0.00	0.00	2.95	0.00
Total Comm. Rail Expansion	\$674.64	\$624.48	\$36.12	\$11.05	\$3.00	\$0.00	\$0.00	\$50.16	\$0.00

ANTICIPATED FUTURE EFFORTS

One project has been identified as an anticipated future effort for commuter rail expansion.

T.F. Green Airport Service

The project involves the potential of full-time commuter rail service to T.F. Green Airport in Rhode Island.

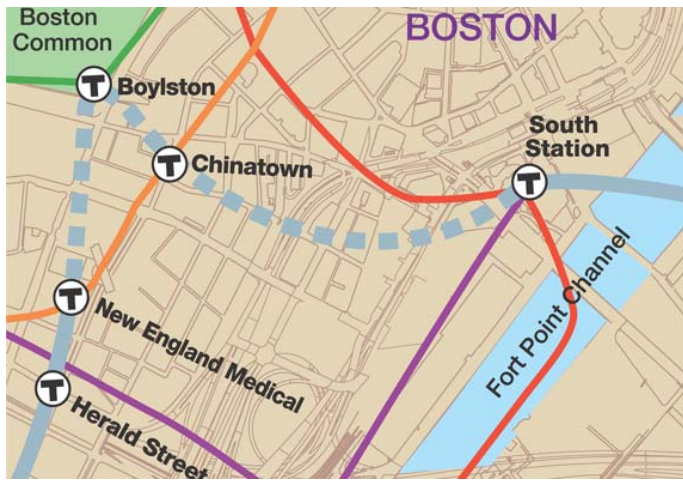
SYSTEM EXPANSION

SYSTEM EXPANSION—SILVER LINE

The MBTA Silver Line Phase III is the third and final phase of a bus rapid transit system that will connect Silver Line – Washington Street to Silver Line – Waterfront.

Silver Line – Washington Street began Revenue Operation in July 2002 which serves patrons from Temple Place in Boston to Dudley Square Station in Roxbury with 14 stops along Washington Street.

Silver Line – Waterfront began Revenue Operations in December 2004 which services patrons from South Station to South Boston with 3 underground stations and services routes to BMIP, City Point and the Airport terminals. Vehicle procurement for Silver Line Phase I (Washington Street) can be located under the Revenue Vehicle section of this document.



The majority of this effort is devoted to Phases II and III of the Silver Line. The useful lives of both stations and tunnels can be found in the Station and Facilities portions of this document, respectively.

FUNDED PROJECTS

There are four efforts currently related to the Silver Line. The Silver Line will lead to higher costs for operations and maintenance, and will have a negative impact on the Authority's operating budget.

Silver Line Phase I: Closeout Costs

This effort funded Silver Line Phase I service to Dudley Square.



Silver Line Phase II : South Boston Transitway

This project includes a one-mile long tunnel extending from South Station to the South Boston Pier area with three stations: South Station, Courthouse Station, and World Trade Center Station. A portion of the costs for the maintenance facility at Southamptton Street for Silver Line vehicles is also funded by this line item. This major expansion project includes design and construction of the tunnel from South Station and under the Fort Point Channel, electrical and communications systems systemwide, new vehicles fueled by electric catenary and ultra-efficient diesel fuel, and a new maintenance and storage facility for the vehicles. This multi-year project opened for service in December 2004.



Courthouse Station

Silver Line Phase III : Conceptual Planning and Design

Phase III of the Silver Line will connect Washington Street to South Station and Logan Airport via a new tunnel connecting the first two Silver Line phases. Funding allocated here will initiate Phase III design and perform other engineering activities.

Silver Line and Beyond

This project includes the planning for BRT improvements on the transit corridor between Mattapan/Ashmont and South Station, via Dudley/Ruggles.

Silver Line Expansion Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Ph I: Washington St.	\$13.53	\$13.53	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Ph. II: S. Boston Transitway	652.97	631.97	7.00	5.00	5.00	4.00	0.00	21.00	0.00
Ph. III: Planning and Design	47.23	44.33	1.50	1.40	0.00	0.00	0.00	2.90	0.00
Silver Line & Beyond	0.20	0.00	0.20	0.00	0.00	0.00	0.00	0.20	0.00
Total Silver Line Expansion	\$713.92	\$689.82	\$8.70	\$6.40	\$5.00	\$4.00	\$0.00	\$24.10	\$0.00

ANTICIPATED FUTURE EFFORTS

The following project has been identified as possible future effort under Silver Line expansion.

Silver Line Phase III - Construction

This effort will continue the design and construction of Phase III initiated above. The completion of this third phase will allow the Silver Line to offer a one-seat ride from Dudley Square in Roxbury, through downtown and South Station, to South Boston and beyond to Logan Airport, with connections to the Orange, Green and Red Lines. This project's future is contingent upon the MBTA's successful receipt of federal New Starts funds.

SYSTEM EXPANSION

SYSTEM EXPANSION—BUS

Currently, the Authority has not programmed capital funds for bus expansion.

STUDIES AND PLANNING FOR SYSTEM EXPANSION

The Authority is continually investigating the feasibility, the costs and benefits of a variety of potential future expansion projects. These efforts may include large scale alternatives analyses and Draft Environmental Impact Statements/Reports in accordance with federal planning requirements. Work may also be smaller and more localized studies to determine the impacts of initiatives such as a new station. This section also includes the systemwide modeling and planning efforts conducted to identify and prioritize expansion needs.

FUNDED PROJECTS

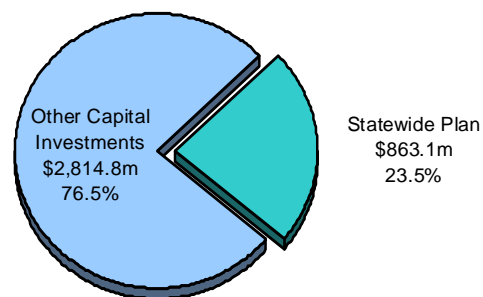
Currently, there are no system expansion projects under study and/or development.

CHAPTER 16

STATEWIDE TRANSPORTATION IMPROVEMENTS

The Authority is primarily reliant on non-MBTA sources to fund expansion projects. This dynamic provides an interesting challenge for programming the CIP, since funding for these projects may not be finalized at the time of the MBTA's annual development of the CIP. However, the Authority recognizes the need for flexibility if funds are identified during the course of a fiscal year. This chapter establishes the process for infusing non-MBTA funds into the CIP for system enhancements and expansion projects.

Statewide Transportation Plan Funding



State Implementation Plan (SIP) Commitments

Chief among the projects programmed with non-MBTA funding sources are the State Implementation Plan (SIP) projects, which are Commonwealth priorities for transportation funding. In December 2006, the Department of Environmental Protection (DEP) issued final amendment to the transit regulation 310 CMR 7.36. As adopted, this regulatory change is under review by the U.S. Environmental Protection Agency (EPA) for inclusion into the Massachusetts State Implementation Plan (SIP) under the Clean Air Act. This regulatory change substitutes for the remaining original SIP projects and requires the Executive Office of Transportation to proceed with a Green Line extension beyond Lechmere, new stations on the Fairmount Line, design of the Red/Blue Connector and 1,000 new transit parking spaces in the Boston metropolitan area. Based on the most recent SIP regulation, which needs to be approved by the EPA and is subject to the public process agreed to in the Transit Commitment Litigation Agreement, the Authority no longer intends to allocate funds for the Arborway Restoration project. Since non-MBTA sources will fund the SIP projects at the Authority, this CIP accommodates the potential for state assistance to advance these projects.

Other Statewide Plan Projects

The Commonwealth's statewide transportation plan highlights several high priority "Mega" projects that involve the expansion of the current MBTA system. Projects in this category include:

- Increased Worcester service
- Improved Fitchburg service
- Commuter rail expansion to New Bedford and Fall River
- Urban Ring Phases 1 and 2
- Blue Line to Lynn

All of these projects are in the planning stages, and several require additional funds to complete the necessary analysis. Since non-MBTA sources will fund expansions at the Authority, this CIP accommodates the potential for state assistance to advance these projects.

Federal and State Legislative Initiatives

A similar programming challenge occurs regarding funding by the U.S. Congress and the Massachusetts General Court. Through the annual CIP, the MBTA must be able to access earmarked appropriations dedicated for specific projects through either the Commonwealth's operating budget or the federal appropriations process. These projects are often less predictable than "Mega" or SIP projects. Earmarked projects must be included in the adopted Program for Mass Transportation (PMT). Additional funds may prove critical to advancing many of these projects/initiatives, and the Authority must have the flexibility to access these funds.

CIP Funding Approach

As the agency that will operate any additional expansion, the MBTA must play a critical role in the design and implementation of any service expansions whether they are Legislative, SIP or "MEGA" projects. This CIP has been developed to allow the MBTA to play such a role once non-MBTA funds are secured. Prior to the issuance of the Statewide Plan, the MBTA has expended funds to advance many of these projects and the amounts are referenced in this chapter.

PROJECTS WITH EARMARKS or OTHER DEDICATED FUNDING

☑ Green Line Extension Beyond Lechmere

The State EOT is currently underway with planning/environmental impact assessment for this SIP commitment project extending the Green Line to Somerville and Medford. Upon completion of planning phase activities, the line expansion will be designed and constructed using funds provided by the Commonwealth.

☑ North Shore Major Investment Study (MIS)

This Major Investment Study (MIS) provides a comprehensive look at the transportation needs of the North Shore Corridor.

☑ Fall River New Bedford

This project includes proposed state funds and federal funding authorization for implementation activities required for extension of commuter rail service into the Southcoast area.

☑ Fitchburg Commuter Rail Line Upgrade

SAFETEA-LU includes federal earmark authorizations to implement a Rail Line upgrade program designed to improve travel time and service reliability of the Fitchburg corridor rail service (see page 106).

☑ Worcester Line Commuter Improvements

Federal SAFETEA-LU legislation includes a \$9 million earmark for construction of rail freight corridor improvements between Boston and Worcester.

☑ Yawkey Station Improvements

The Commonwealth is providing funding for station improvements that would facilitate accessibility and full-service commuter rail operations at Yawkey Station.

☑ Kenmore Station Surface Improvements

The Commonwealth and the Federal Transit Administration are providing funding for surface improvements as part of the MBTA project underway at Kenmore Station (see page 105).

☑ Fenway Area Improvements

The MBTA, with funds appropriated by the State Legislature, will implement a program of enhancements and access improvements at (and around) Fenway station.

☑ Assembly Square Station

SAFETEA-LU includes a \$25 million New Starts Program authorization that would go toward addition of an Orange Line station at Assembly Square. The City of Somerville has secured a developer contribution of \$15 million toward planning, design and construction of the station project that would be coordinated with the proposed Assembly Square mixed use development.

☑ Bradford Layover Facility

This project funds the relocation of an existing layover facility on the Haverhill Line. The new facility will allow more efficient train operations and reduce environmental impact on surrounding communities.

STATEWIDE TRANSPORTATION IMPROVEMENTS

☑ 1,000 Additional Parking Spaces

Approximately \$26.6 million dollars will be needed to design and build new parking spaces under this Commonwealth commitment. The MBTA is currently evaluating several parking projects, but need more funding to complete early design work. The Authority anticipates \$2.0 million in funding needs to complete designs for potential parking expansion projects.

☑ Fairmount Line Improvements/Stations Expansion – Phase II

The State Implementation Plan includes Commonwealth commitment to design and build four new stations and other improvements on the Line. In 2006 the MBTA received \$650,000 through the Executive Office of Transportation (EOT) to design the first of those stations, a new station in the Four Corners area. This work will enable the Commonwealth to meet its commitment to the Four Corners area station final design completion date of 12/31/07 as detailed in Administrative Consent Order Number ACO-BO-00-7001-Amendment # 2, signed on January 26, 2005. (See page 114 for information on Phase I of this project.)

Statewide Plan Projects (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Green Line Extension	607.50	0.87	3.00	46.00	147.70	155.00	134.93	486.63	120.00
North Shore Major Study	4.12	3.79	0.33	0.00	0.00	0.00	0.00	0.33	0.00
Fall River/New Bedford	9.00	1.50	3.00	4.50	0.00	0.00	0.00	7.50	0.00
Fitchburg Line Improvements	150.00	0.00	6.60	35.00	38.40	40.00	30.00	150.00	0.00
Worcester Line Improvements	11.25	0.00	0.00	7.00	4.25	0.00	0.00	11.25	0.00
Yawkey Station Enhancements	11.73	1.73	8.00	2.00	0.00	0.00	0.00	10.00	0.00
Kenmore Surface Improvements	5.00	2.50	2.50	0.00	0.00	0.00	0.00	2.50	0.00
Fenway Improvements	3.25	0.20	1.25	1.80	0.00	0.00	0.00	3.05	0.00
Assembly Square Station	40.00	0.00	0.00	10.00	18.00	12.00	0.00	40.00	0.00
Bradford Layover Facility	10.00	0.00	0.50	5.00	4.50	0.00	0.00	10.00	0.00
1,000 Parking Space Initiative	26.60	1.00	3.00	9.90	11.40	1.30	0.00	25.60	0.00
Fairmount Line Imp- Phase II	135.00	18.80	13.10	35.00	35.00	21.00	12.10	116.20	0.00
Total Alt Financed Enh	\$1,013.45	\$30.39	\$41.28	\$156.20	\$259.25	\$229.30	\$177.03	\$863.06	\$120.00

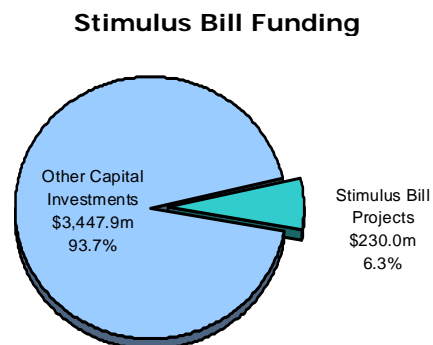
Source: Executive Office of Transportation

CHAPTER 17

STIMULUS BILL PROJECTS

(Updated March 10, 2009)

The American Recovery and Reinvestment Act of 2009 (referred to here as the “Stimulus Bill”) was approved by Congress and signed by President Obama on February 17, 2009, and serves as a key component of the President’s economic recovery plan for the nation. This bill provides a unique opportunity for the MBTA to enhance its annual capital reinvestment program through a one-time infusion of federal funds. Although a great opportunity, this program also provides unique challenges for programming the CIP, since actual funding levels (e.g., discretionary programs) and federal guidelines have not yet been finalized. The Authority recognizes the need for flexibility, as final Stimulus Bill funding levels and requirements will dictate the amount and types of projects the MBTA will be able to fund through this program. This chapter establishes the process for infusing federal Stimulus Bill funds into the CIP, based on existing knowledge of the program.



Background

The American Recovery and Reinvestment Act of 2009 (ARRA) is intended to stimulate the economy and save/create jobs through both federal tax cuts and increased spending – including for highway and transit infrastructure. The ARRA was approved by Congress and signed by President Obama on February 17, 2009. On March 5, 2009, transit funding apportionments for states and urbanized areas were published in the Federal Register, along with initial guidelines for accessing the funds. Based on these apportionments, the MBTA is expected to receive about \$230 million in ARRA funding, within the following formula grant programs:

- Section 5307/5340 (Urbanized Area Formula Grants), and
- Section 5309 (Fixed Guideway Modernization)

Stimulus projects can be 100% federally funded; no MBTA or local match will be required. However, the funding is subject to all federal requirements - e.g., project inclusion in State Transportation Improvement Program (STIP), federal environmental and procurement rules.

In addition, there are several restrictions on use of the funding, intended to ensure that it is used quickly to help stimulate the economy and create jobs. For example, at least 50% of the stimulus funds must be obligated within 180 days, with the remaining 50% (maximum) obligated within one year. There are also “use it or lose it” provisions that require funds not obligated within these timeframes be withdrawn and redistributed to other states. As a result, only “ready to go” projects can be programmed for the stimulus funding.

Two-Phased Approach to Stimulus Funding

As discussed above, the MBTA currently expects about \$230 million in Stimulus Bill funding, with at least 50% of this required to be obligated within 180 days (referred to here as “Phase 1” of the stimulus program). For initial planning purposes, and to provide some flexibility given the “use it or lose it” provisions, the Authority has programmed on the STIP \$198.7 million of “Phase 1” projects. The Boston Metropolitan Planning Organization (MPO) approved this list on February 26, 2009, following a public review and comment period. The goal is to move forward as many of these as projects as possible during “Phase 1.”

The remaining Stimulus Bill funds, requiring obligation within one year, will be programmed in the near future.

Implementation and Timeline

Funding apportionments for FTA formula grant programs were published in the Federal Register on March 5, 2009. This effectively “started the clock” on the 180-day requirement for obligating the first 50% of funding for “Phase 1” projects. As a result, at least \$115 million of the Stimulus Bill funds (i.e., \$230 million x 50%) need to be obligated by September 1, 2009. The remaining funds need to be obligated by March 5, 2010.

Stimulus Bill - Phase 1

Legislatively, only \$115 million of the stimulus funds need to be obligated within 180 days (subject to the “use it or lose it” provisions). However, all grantees are encouraged to spend the monies as soon as possible, in order to achieve the program goals of creating jobs and stimulating the economy. Toward this goal, and to provide some flexibility, the Authority has initially programmed \$198.7 million on the STIP - or about 86% of the total \$230 million. In the event some projects are delayed and miss the 180-day threshold, this provides a level of cushion above the 50% minimum. “Phase 1” stimulus projects, as programmed on the STIP in February 2009, are summarized below.

FUNDED PROJECTS – PHASE 1 **Commuter Rail Rolling Stock**

The Authority initially plans to procure 10 locomotives through another transit agency's bid (for approximately \$32 million) and has programmed an additional \$6 million for various commuter rail rolling stock repair and rehabilitation projects.

 The RIDE – Vehicle Procurement

\$5.5 million provides funding for 108 vans for The RIDE, the Authority's demand-response ADA paratransit program - procuring the vehicles off an existing EOT contract. The Authority's goal is to increase the level of MBTA-owned vehicles, thus reducing annual operating costs associated with operator-owned vehicles.

 Track and Right of Way Improvement Program

\$6.2 million is provided for track rehabilitation along the Grand Junction Line, with another \$3.8 million set aside for repairing and replacing fencing along the Authority's right of way and property.

 Signal and Grade Crossing Improvement Program

\$18.0 million is provided for various signal and grade crossing improvements along the commuter rail system. Priority projects include the Fitchburg Line (interlockings and grade crossings) and the Haverhill Line.

 Commuter Rail Double Track Initiative

\$37.0 million in funding is provided for double tracking projects along the Fitchburg and Haverhill Lines.

 MBTA Station Upgrade Program

\$55.0 million is provided for upgrading passenger stations along both the commuter rail and subway system. Although specific projects and funding are not yet finalized, it is initially anticipated that this will include the following: \$5.2 million for commuter rail stations systemwide; \$14.0 million for final wall, ceiling and walkway finishes at Ashmont Station; \$3.0 million for improving lobby ventilation and air quality at Back Bay Station; \$0.3 million to construct a police officer kiosk at Dudley Square Station; \$5.0 million for enhanced bicycle parking facilities at up to 25 subway stations; and \$6.5 million for safety signage within MBTA tunnels.

 Positive Train Control – Light Rail Pilot Program

\$0.5 million in funding to implement a positive train control pilot program on the Mattapan Line, in order to evaluate the technology and potential benefits of expanded use on the light rail system.

 MBTA Facility Upgrade Program

\$21.0 million anticipated to fund \$8.0 million of commuter rail facility upgrades (e.g., layover facilities, environmental projects) and \$13.0 million for bus facilities (e.g., bus washing equipment, pavement repairs, heating and lighting systems).

 Commuter Rail Bridge Program

\$3.0 million is set aside for repairing bridges along the commuter rail system.

STIMULUS BILL PROJECTS

South Boston Gas Turbine Replacement & Fuel Conversion Study

\$1.0 million is initially programmed for design and engineering work associated with the replacement of two diesel-powered jet turbines at the South Boston backup power facility.

Bus Service and Customer Enhancements

\$9.7 million is provided for various bus stop amenities systemwide (e.g., shelters, benches, signage, pavement markings, ADA improvements), corridor improvements to Route 23 bus service between Ashmont and Ruggles Station, and enhancements to existing Silver Line service.

Stimulus Bill "Phase 1" Projects as of 3/20/2009 (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Commuter Rail Rolling Stock	\$38.00	\$0.00	\$19.00	\$19.00	\$0.00	\$0.00	\$0.00	\$38.00	\$0.00
The RIDE - Vehicle Procurement	5.50	0.00	2.75	2.75	0.00	0.00	0.00	5.50	0.00
Track and Right of Way Improvement Progr	10.00	0.00	5.00	5.00	0.00	0.00	0.00	10.00	0.00
Commuter Rail Double Tracking Initiative	37.00	0.00	18.50	18.50	0.00	0.00	0.00	37.00	0.00
Signal and Grade Crossing Improvement Pr	18.00	0.00	9.00	9.00	0.00	0.00	0.00	18.00	0.00
MBTA Station Upgrade Program	34.00	0.00	17.00	17.00	0.00	0.00	0.00	34.00	0.00
Positive Train Control Upgrade Initiative	0.50	0.00	0.25	0.25	0.00	0.00	0.00	0.50	0.00
MBTA Facility Upgrade Program	21.00	0.00	10.50	10.50	0.00	0.00	0.00	21.00	0.00
Commuter Rail - Bridge Program	3.00	0.00	1.50	1.50	0.00	0.00	0.00	3.00	0.00
South Boston Turbine Replacement (Engin	1.00	0.00	0.50	0.50	0.00	0.00	0.00	1.00	0.00
Four Corners Station - Fairmount Line	21.00	0.00	10.50	10.50	0.00	0.00	0.00	21.00	0.00
Bus Service and Customer Enhancement	9.70	0.00	4.85	4.85	0.00	0.00	0.00	9.70	0.00
Total Stimulus Bill Projects - Phase 1	\$198.70	\$0.00	\$99.35	\$99.35	\$0.00	\$0.00	\$0.00	\$198.70	\$0.00

Stimulus Bill - Phase 2

The Authority is currently working through the state and urbanized area apportionments included in the Federal Register, and is finalizing the "split letter" that will be used to distribute stimulus funds among transit agencies within the Boston urbanized area. Until this is finalized, the Authority is estimating a total of \$230 million for the MBTA. Assuming all \$198.7 million of "Phase 1" funds are obligated within 180 days, this leaves an additional \$31.3 million for "Phase 2" projects. The STIP and CIP will both be amended in the future to incorporate specific "Phase 2" projects at appropriate levels.

Stimulus Bill "Phase 2" Projects as of 3/20/2009 (\$ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY09	FY10	FY11	FY12	FY13	FY14	Total FY10-14	BEYOND FY14
Stimulus Bill Projects Phase 2	\$31.30	\$0.00	\$0.00	\$15.65	\$15.65	\$0.00	\$0.00	\$31.30	\$0.00
Total Stimulus Bill Projects - Phase 2	\$31.30	\$0.00	\$0.00	\$15.65	\$15.65	\$0.00	\$0.00	\$31.30	\$0.00