Capital Investment Program

FY2015-FY2019

massDOT
Massachusetts Department of Transportation

Massachusetts Bay
Transportation Authority

3/12/2014

Capital Investment Program

FY2015 — FY2019

How to Use this Book

This book contains a comprehensive overview of all projects that are included in the MBTA's Capital Investment Program (CIP). The book is divided into two sections:

Section I is an overview of the CIP organized by ***Mode*** (in other words, Blue Line, Red Line, Commuter Rail, etc.) and provides a spreadsheet from the CIP Budget listing all the projects within each specified mode.

Section II is an overview of the CIP organized by ***Category*** (in other words, revenue vehicles, maintenance facilities, power, etc.) and provides spreadsheets as well as detailed narrative descriptions of systems and projects.

The user has the option of looking into a project by either Mode or Category. For instance, if you were interested in the upgrade of Orange Line traction power, you could go to the section on the Orange Line listed in Section I, by Mode. There you would find Orange Line Traction Power Upgrade listed as a project on the CIP spreadsheet. In the column, "Type," on the spreadsheet you would see the word "Power" listed, indicating that the narrative for this project is located in the Power chapter (chapter 6) of Section II. You could then flip to chapter 6, "Power," and find the Orange Line Traction Power Upgrade project listed again with a brief narrative.

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TABLE OF CONTENTS

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GLOSSARY

ABS – Absolute Block Signaling
AC/DC – Alternating Current/Direct Current
ADA – Americans with Disabilities Act
AFC – Automated Fare Collection
AG – Massachusetts Attorney General
AITC – Airport Intermodal Transit Connector
ARRA – American Recovery and Reinvestment Act
ATC – Automatic Train Control
Authority: Massachusetts Bay Transportation Authority
AVL – Automatic Vehicle Location

BET – Boston Engine Terminal
BMIP – Boston Marine Industrial Park
BRT – Bus Rapid Transit
BTD – Boston Traffic Department

CAD – Computer Aided Dispatch
CCTV – Closed Circuit Television
CIP – Capital Investment Program
CNG – Compressed Natural Gas
CRASP – Coach Reliability & Safety Program
CSIS – Customer Service Information System
CTPS – Central Transportation Planning Staff

DBE – Disadvantaged Business Enterprise
DEP – Department of Environmental Protection

ECD – Emission-Controlled Diesel
EMS – Environmental Management System
EPA – Environmental Protection Agency

FTA – Federal Transit Administration
FHWA – Federal Highway Administration
FRA – Federal Railroad Administration
Frog – part of a railroad switch at the crossing point of two rails, sometimes called a K-rail for its shape.
FY – Fiscal Year

GHG – Greenhouse Gas
GPS – Global Positioning System
GreenDOT – a comprehensive environmental responsibility and sustainability initiative that will make MassDOT a national leader in "greening" the state transportation system

HRIS – Human Resource Information System
HSIPR – High Speed Intercity Passenger Rail
HVAC – Heating Ventilation Air Conditioning

IER – Independent Engineering Review
ISDN –Integrated Services Digital Network
ITD – Information Technology Directorate
ITS – Intelligent Transportation Systems

LAN – Local Area Network
LED – Light Emitting Diode
LRAP – Light Rail Accessibility Program

MAP-21 – Moving Ahead for Progress in the 21st Century Act, the current federal transportation spending
MassDOT – MA Department of Transportation
MBTA – Mass. Bay Transportation Authority
MBB – Messerschmitt-Bolkow-Blohm
MCRS – Maintenance Control Reporting System
MOW – Maintenance of Way
MPO – Metropolitan Planning Organization

NABI – North American Bus Industries
NRV – Non-revenue vehicle

OCB – Oil Circuit Breakers
OCC – Operations Control Center
OCS – Overhead Contact System (Catenary)

PA – Public Announcement
PCC – Presidents Conference Committee
PCM – Pulse Coded Modulation
PLC – Programmable Logic Controller
PMT – Program for Mass Transportation
PONTIS – bridge management software, from the Latin, *pons,* meaning "bridge."
PTC – Positive Train Control

RIDE – door-to-door paratransit service for elderly/disabled
ROW – Right of Way

S&I – Service & Inspection
SAFETEA-LU – Safe, Accountable, Flexible and Efficient Transportation Equity Act: a Legacy for Users, the prior federal transportation spending authorization
SCADA – Supervisory Control and Data Acquisition
SGR – State of Good Repair
SIP – State Implementation Plan
SONET – Synchronous Optical Network

TIGER – Transportation Investments Generating Economic Recovery
TIGGER – Transit Investments for Greenhouse Gas and Energy Reduction
TPSA – Transit Police Service Area

UTDC – Urban Transportation Development Corporation

WAN – Wide Area Network

KEY MBTA STATISTICS

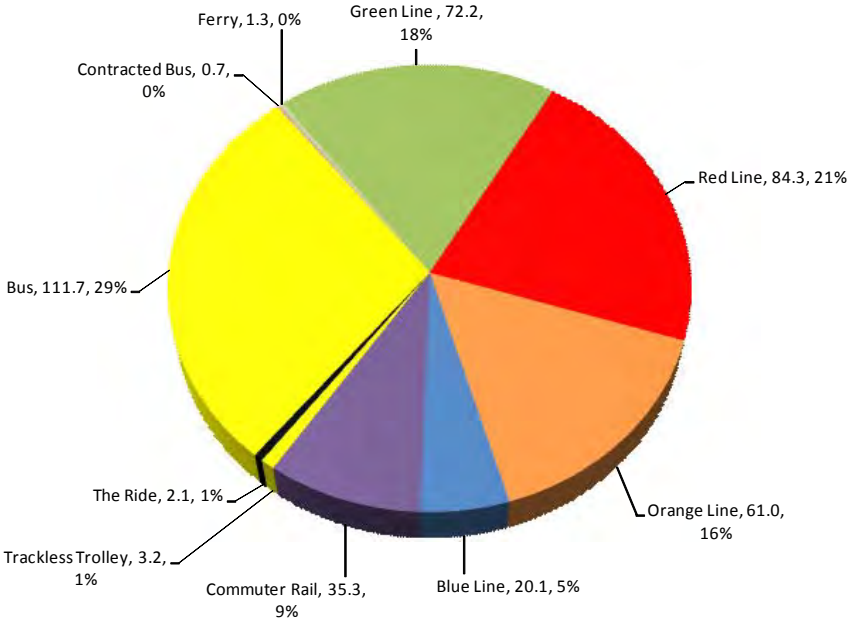
The 2012 edition of the MBTA Ridership and Service Statistics ("The Blue Book") is the main source of information for this segment.

FY2013 Ridership
Unlinked Trips (1)

	Annual Ridership				Typical Weekday Ridership			
		%		%		%		%
Heavy Rail			165,365,009	42.2%			539,141	41.6%
Red Line (1)	84,270,589	21.5%			272,595	21.0%		
Orange Line	61,002,832	15.6%			203,341	15.7%		
Blue Line	20,091,588	5.1%			63,205	4.9%		
Light Rail			72,207,726	18.4%			236,096	18.2%
Green Line	72,207,726	18.4%			226,676	17.5%		
Rubber Tire			114,946,856	29.3%			386,720	29.9%
Bus (2)	111,730,664	28.5%			375,149	29.0%		
Trackless Trolley	3,216,191	0.8%			11,572	0.9%		
Commuter Rail			35,323,276	9.0%			129,075	10.0%
Commuter Rail	35,323,276	9.0%			129,075	10.0%		
Contracted Service			1,959,993	0.5%			6,977	0.5%
Contracted Bus	706,826	0.2%			2,513	0.2%		
Ferry Service	1,253,167	0.3%			4,464	0.3%		
Total Scheduled Service	389,802,860	99.5%	389,802,860	99.5%	1,288,589	99.5%	1,298,009	
THE RIDE	2,108,870	0.5%	2,108,870	0.5%	6,823	0.5%		0.5%
Total MBTA Ridership	391,911,730	100.0%	391,911,730	100.0%	1,295,412	100.0%		100.7%

(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) Includes Silver Line Service.

MBTA Annual Ridership by Mode FY2013 (in millions)



Route Miles and Scheduled Weekday One-Way Trips FY2013

	Route Miles (1)		Schedule Weekday One-Way Trips	
Heavy Rail		38		1,116
Red Line (Ashmont & Braintree)	21		438	
Orange Line	11		324	
Blue Line	6		354	
Light Rail		26		1,503
Green Line (Subway)				
Green Line (Surface)				
Green Line (Subway + Surface)	23		1,177	
Mattapan-Ashmont Trolley	3		326	
Rubber Tire		763		14,429
Silver Line - Washington Street (3)	4		475	
Silver Line Waterfront (2)	8		647	
Bus	740		13,188	
Trackless Trolley	11		119	
Commuter Rail		388		488
Commuter Rail North Side			196	
Commuter Rail South Side			292	
Commuter Rail (North + South Side)	388			
Ferry Service		38		160
Inner Harbor Ferry	1		78	
Commuter Boats	37		82	
Totals	1,253	1,253	17,696	17,696

(1) One-Way, Non-Duplicative.
(2) Route Miles: Silver Line Transit Way Tunnel: 1 mile; Silver Line Waterfront Surface: 7 miles.
(3) Route Miles: Silver Line SL4:2, SL5:2.
Note: 1 mile = 1.609344 km

MBTA Routes (November 2013)

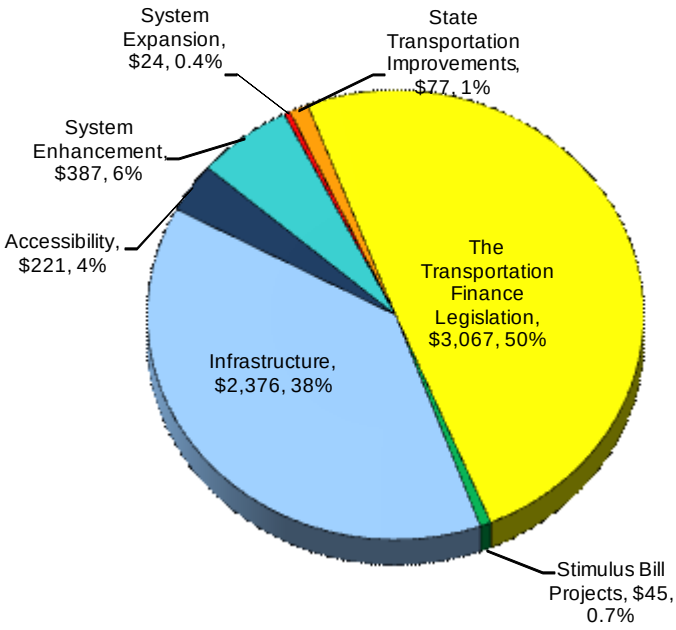
	Routes	
Heavy Rail		4
Red Line (Ashmont & Braintree)	2	
Orange Line	1	
Blue Line	1	
Light Rail		5
Green Line (Subway + Surface)	4	
Mattapan-Ashmont Trolley	1	
Rubber Tire (MBTA)		171
Silver Line - SL1& SL2 (1)	3	
Silver Line - SL4 & SL5	2	
Local, Express, Key, Community, Commuter, Limited Service	163	
Trackless Trolley	3	
Rubber Tire (Contracted)		19
700-Series Private Carrier	4	
Suburban Bus	15	
Commuter Rail		14
Commuter Rail North Side	5	
Commuter Rail South Side	9	
Ferry Service		3
Inner Harbor Ferry	1	
Commuter Boats	2	
Total	216	216

(1) Includes Route #746 Tunnel Shuttle.

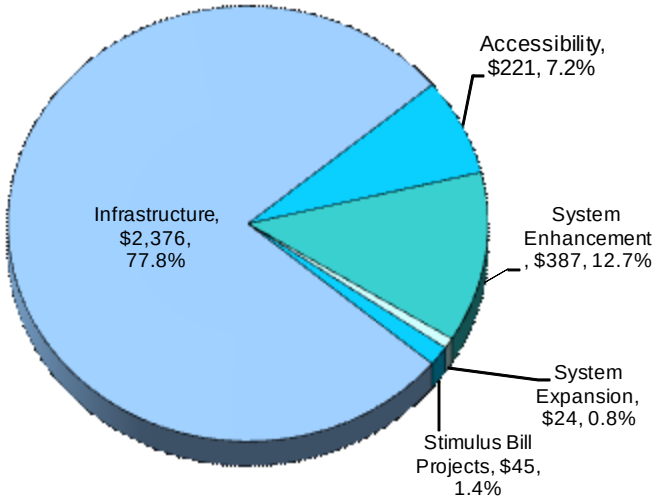
SUMMARY OF FUNDING

The MBTA has programmed $6.2 billion for the FY15-FY19 Draft Capital Investment Program (CIP), of which $3,067 million represent State-funded projects from the Transportation Finance Legislation, $77 million represent State-sponsored projects (Statewide Transportation Improvements), and $45 million are Stimulus Bill Projects (100% federally funded).

All Funding Sources ($ in millions, % of total CIP)



MBTA Funding Only ($ in millions, % of total CIP)



MBTA Capital Investment Program FY15-FY19 ($ in millions)

PROGRAM AREA	PROGRAM OVERVIEW	MODES	FY15-FY19	
			$	%
INFRASTRUCTURE				
Revenue Vehicles	Includes all vehicles used to carry passengers in revenue service.	Subway, Commuter Rail, Silver Line, Bus, Ferry	$1,042.5	16.8%
Non-Revenue Vehicles	Includes vehicles used to maintain the system and to support system administration.	Systemwide	$27.2	0.4%
Track/Right-of-Way	Includes infrastructure within the right-of-way such as track, ties and ballast.	Subway, Commuter Rail	$61.1	1.0%
Signals	Includes all elements of the rail signaling systems.	Subway, Commuter Rail	$140.3	2.3%
Communications	Includes telecommunications, systemwide radios and the Operations Control Center.	Systemwide	$6.7	0.1%
Power	Includes the network to provide traction power to the rail system, as well as lighting and other electrical elements.	Subway, Commuter Rail, Systemwide	$229.7	3.7%
Maintenance Facilities	Includes the rail car houses and bus garages where vehicles are maintained and stored.	Subway, Commuter Rail, Bus, Systemwide	$89.1	1.4%
Stations	Includes the subway and surface stations where passengers board MBTA vehicles.	Subway, Commuter Rail, Silver Line, Bus, Ferry	$173.3	2.8%
Facilities	Includes administrative buildings and other structures needed to support transit services.	Subway, Commuter Rail, Systemwide, Tunnels and Parking facilities	$119.4	1.9%
Bridges	Includes all bridges maintained by the MBTA.	Systemwide	$440.3	7.1%
Fare Equipment	Includes all infrastructure associated with the collection of MBTA revenues.	Systemwide	$18.3	0.3%
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.	Systemwide	$28.5	0.5%
ACCESSIBILITY	Encompasses actions that make accessibility improvements to MBTA stations and vehicles.	Systemwide	$221.1	3.6%
ENHANCEMENTS	Encompasses capital projects that improve existing service and foster increased ridership.	Subway, Commuter Rail, Systemwide, Environmental, Transit Security	$387.0	6.2%
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	$24.0	0.4%
STATEWIDE TRANSPORTATION IMPROVEMENTS	These projects are Commonwealth priorities for transportation funding. Includes non-MBTA funding sources	Systemwide	$77.4	1.2%
THE TRANSPORTATION FINANCE LEGISLATION	This plan funds a decade-long period of statewide capital investment in MBTA state of good repair priorities and projects to promote economic growth.	Systemwide	$3,067.5	49.5%
STIMULUS BILL PROJECTS	The American Recovery and Reinvestment Act of 2009 (ARRA) provides 100% federal funding for a number of state of good repair projects.	Systemwide	$44.6	0.7%
GRAND TOTAL			**$6,197.8**	**100.0%**

MBTA Capital Investment Program (FY15-FY19)

SOURCES OF FUNDS

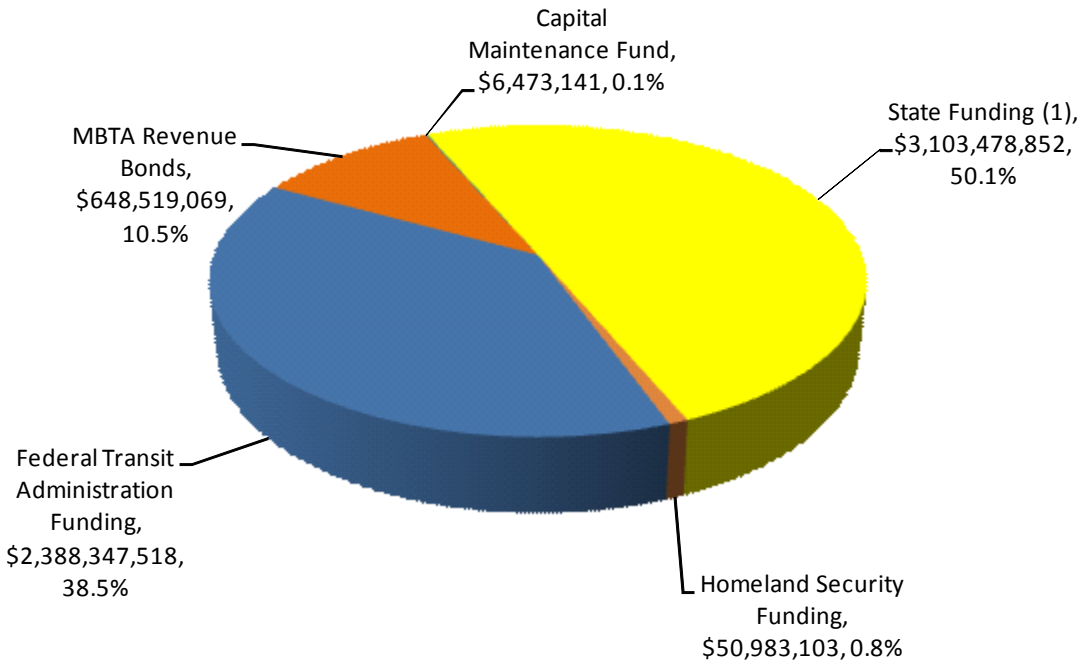
		FY15	FY16	FY17	FY18	FY19	Total FY15-FY19	%
Revenue Bond Program		$13,321,256	$11,109,985	$13,353,564	$13,664,547	$11,123,548	$62,572,900	1%
Federal Formula Funds (1)		$311,453,861	$311,453,861	$311,453,861	$311,453,861	$311,453,861	$1,557,269,306	25%
	Federal Funds (80%)	$249,163,089	$249,163,089	$249,163,089	$249,163,089	$249,163,089	$1,245,815,445	20%
	MBTA Match (20%)	$62,290,772	$62,290,772	$62,290,772	$62,290,772	$62,290,772	$311,453,861	5%
Federal Formula Funds (2)		$298,367,105	$285,394,623	$233,504,691	$220,532,208	$259,449,657	$1,297,248,285	21%
	Federal Funds (80%)	$238,693,684	$228,315,698	$186,803,753	$176,425,767	$207,559,726	$1,037,798,628	17%
	MBTA Match (20%)	$59,673,421	$57,078,925	$46,700,938	$44,106,442	$51,889,931	$259,449,657	4%
Earmarks and Small Starts		$35,174,214	$31,443,606	$8,595,434	$0	$0	$75,213,254	1%
	Federal Funds	$28,139,371	$25,154,885	$6,876,347	$0	$0	$60,170,603	1%
	Local Match	$7,034,843	$6,288,721	$1,719,087	$0	$0	$15,042,651	0.2%
Capital Maintenance Fund		$6,473,141	$0	$0	$0	$0	$6,473,141	0.1%
Grant Anticlpation Notes		$0	$0	$0	$0	$0	$0	0%
State Infrastructure Funds		$0	$0	$0	$0	$0	$0	0%
ARRA Funding		$44,116,341	$446,501	$0	$0	$0	$44,562,842	0.7%
Project Financing		$0	$0	$0	$0	$0	$0	0%
Department of Homeland Security		$21,224,117	$18,980,393	$9,476,093	$1,240,500	$62,000	$50,983,103	1%
State Commitments		$28,405,070	$1,620,000	$5,980,000	$0	$0	$36,005,070	1%
The Transportation Finance Legislation (3)		$533,548,286	$743,539,138	$782,470,544	$618,894,916	$389,020,897	$3,067,473,782	49%
TOTAL		**$1,292,083,391**	**$1,403,988,107**	**$1,364,834,188**	**$1,165,786,033**	**$971,109,964**	**$6,197,801,682**	**100%**

(1) Projected level Federal funding for FY15 thru FY19 (no increase from year to year); assumes $12 million of FTA formula towards preventative maintenance

(2) Carryover Funds; Federal Land Sale Proceeds

(3) Includes over $600 million of exptected FTA New Starts contribution towards the Green Line Extension

Sources of Funds

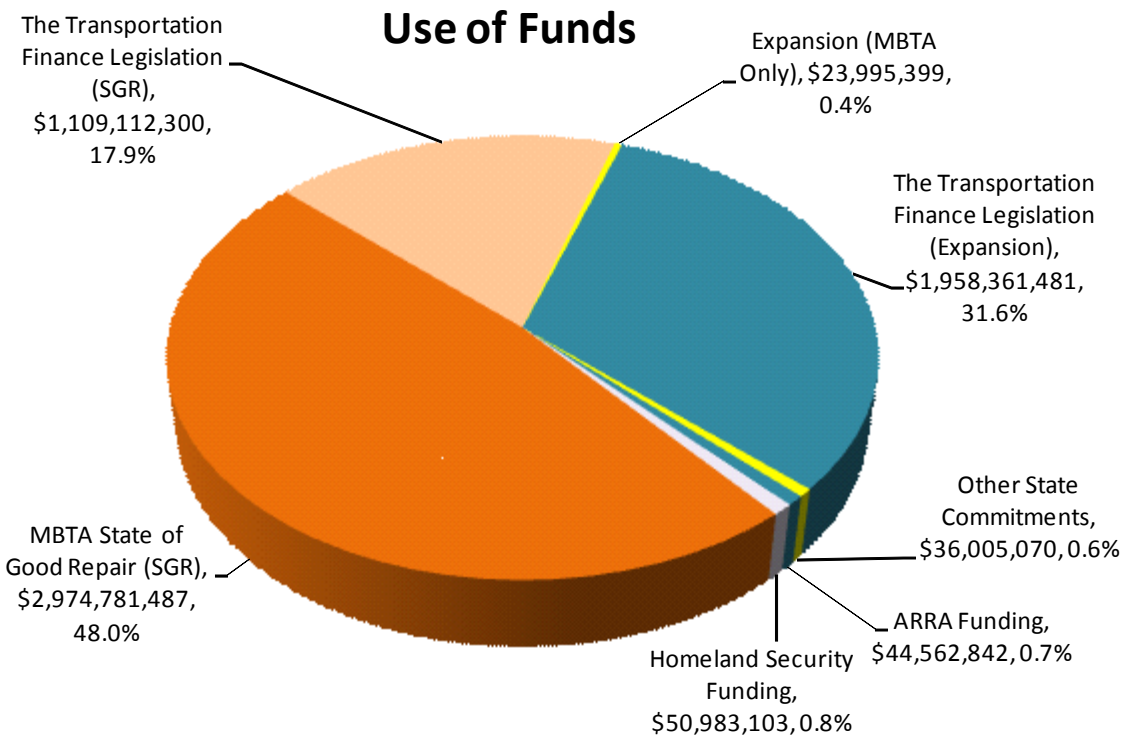


(1) Includes over $600 million of expected FTA New Starts contribution towards the Green Line Extension

MBTA Capital Investment Program (FY15-FY19)

USE OF FUNDS

	FY15	FY16	FY17	FY18	FY19	Total FY15-FY19	%
MBTA State of Good Repair (SGR)	$650,692,472	$633,003,781	$565,407,550	$544,650,617	$581,027,066	$2,974,781,487	48%
The Transportation Finance Legislation (SGR)	$181,749,930	$160,334,306	$176,755,465	$316,909,073	$273,363,526	$1,109,112,300	18%
Expansion (MBTA Only)	$14,097,105	$6,398,294	$1,500,000	$1,000,000	$1,000,000	$23,995,399	0.4%
The Transportation Finance Legislation (Expansion)	$351,798,356	$583,204,832	$605,715,079	$301,985,844	$115,657,371	$1,958,361,481	32%
Other State Commitments	$28,405,070	$1,620,000	$5,980,000	$0	$0	$36,005,070	1%
ARRA Funding	$44,116,341	$446,501	$0	$0	$0	$44,562,842	0.7%
Homeland Security Funding	$21,224,117	$18,980,393	$9,476,093	$1,240,500	$62,000	$50,983,103	1%
TOTAL	**$1,292,083,391**	**$1,403,988,107**	**$1,364,834,188**	**$1,165,786,033**	**$971,109,964**	**$6,197,801,682**	**100%**



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 mode and asset type.

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. For over a century, 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.

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 1.3 million passengers. To provide service, the Authority maintains 182 bus routes, 4 rapid transit lines of heavy and light rail, 5 bus rapid transit lines, 3 trackless trolley lines, 14 commuter rail lines, 3 ferry routes, and a flexible paratransit service. Its large roster of equipment currently consists of 630 heavy and light rail vehicles, 542 diesel buses, 360 compressed natural gas (CNG) buses, 32 electric/diesel buses, 25 hybrid buses, 28 trackless trolleys, 80 commuter rail locomotives,

426 commuter rail coaches, 12 ferry boats, and 790 vehicles for THE RIDE. Service is provided to more than 250 stations and stops.

The seven-member Board of Directors is appointed by the Governor to oversee the Massachusetts Department of Transportation (MassDOT). This Board is the governing body of both MassDOT and the MBTA, which is part of MassDOT but retains a separate legal existence. MassDOT is administered by a Secretary of Transportation, appointed by the Governor to serve as Chief Executive Officer. 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 over $15,000,000. An Advisory Board, consisting of representatives from the cities and towns constituting the Authority's service district, reviews the Authority's annual operating budget and capital program.

Overview of the MBTA Transportation System

Rapid Transit System

The Authority operates 4 rapid transit lines (the Red, Green, Orange, and Blue Lines) over 38 route-miles of heavy rail routes with 50 stations and 26 route-miles of light rail routes (the Green Line and the Mattapan Line) with 74 stations.

Commuter Rail Service

The Authority operates 80 rail locomotives and 426 coaches. This system provides service to over 50 communities and 134 rail stations on 14 commuter rail lines.

Bus Rapid Transit

The Silver Line Project is a bus rapid transit project that serves Roxbury, downtown Boston, South Boston, and Logan Airport. Silver Line Washington Street has 14 stops and two variations, and operates in an exclusive bus-only lane of traffic on portions of Washington Street and Essex Street. Silver Line Waterfront, which started service in 2004, connects South Station to the South Boston Seaport District and Logan Airport with 3 underground stations and different variations that serve BMIP (Boston Marine Industrial Park) and the airport terminals.

Bus Service

MBTA Bus Operations maintains and operates a fleet of more than 1,000 buses, including compressed natural gas (CNG) buses, diesel buses, and trackless trolleys, which operate on 185 routes that cover approximately 751 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 intra-community 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 790 vehicles in 62 cities and towns and averages over 2.1 million trips every year. This program provides customers with public transportation for work, medical treatment, social functions, shopping, and other activities.

Ferry Service

The MBTA operates ferry service on 3 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 3,000 vehicles, over 250 stations, over 650 shelters, 846 miles of track, 465 bridges, 20 miles of tunnels, and 20 maintenance shops, the MBTA's infrastructure is extensive and has major capital investment needs.

MBTA Capital Investment Program

The MBTA's FY15-FY19 Capital Investment Program authorizes approximately $6.2 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 MBTA developed its first 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 a continuing evolution in CIP development. It strengthens the connection between short- and long-term planning and the programming of funds to address issues raised through planning.

Projects in the CIP are selected through a 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 CIP.

One of the highest priorities for the MBTA is the pursuit of a "State of Good Repair" (SGR). To measure the need for capital expenditures devoted to maintaining and replacing existing infrastructure, transit systems often use the SGR 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, 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 SGR 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 scenarios for capital investment 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 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 criteria:

- **Factor One: Impact on the Environment / Alignment to GreenDOT Objectives.** This criterion is used to assess the impact of the project on the environment including areas of focus as identified in the GreenDOT objectives. Assessments are based on two primary considerations:
    - *Reduce Pollution and Consumption of Natural Resources.* This criterion is used to assess the extent to which the project makes good use of technologies and capital assets that reduce pollution (GHG emissions, local emissions, water quality, or trash generation) and the consumption of natural resources (energy and water). This criterion is not used to assess the financial implications of the resources used, only the environmental implications.
    - *Promote Mode Shift.* This criterion is used to assess the extent to which the project encourages a shift in the mode of transportation utilized by travelers away from private vehicles and to the healthy transportation options (walking, biking, and public transit) identified in the GreenDOT objectives.
- **Factor Two: System Preservation.** This criterion is used to assess the impact of the project on system preservation. Assessments will be based on three primary considerations:
    - *SGR Database Rating.* This criterion is used to assess the extent to which the project is designed to rehabilitate, upgrade, or replace assets that are not in a state of good repair. It uses the quantitative SGR rating from the SGR Database, averaged for all assets that correspond to the project.
    - *Lifecycle Management.* This criterion is used to assess the extent to which a lifecycle management plan and the resources to implement that plan exist for the project. A lifecycle management plan describes the efficient management of assets' whole lifecycle costs and risks to achieve cost savings, improve service reliability, and contribute to customer safety.
    - *Reduce Environmental Vulnerability.* This criterion is used to assess the extent to which the project makes good use of technologies and capital assets that reduce vulnerability to floods, storms, landslides, and drastic temperatures.
- **Factor Three: Financial Considerations.** This criterion is used to assess the impact the project has on factors tied directly to cost and revenue.
    - *Impact on Operating Costs.* This criterion is used to assess the impact the project has on operating costs. Those projects which help reduce operating costs will score higher when they are assessed.
    - *Impact on Operating Revenue.* This criterion is used to assess the extent to which the project has an impact on operating revenue. Those projects that can successfully drive up revenue (as offset by an increase in operating costs) will score higher when they are assessed.

- **Factor Four: Operations Impact.** This criterion is used to assess the extent to which the Project impacts/improves operations. Assessments will be based on four primary considerations:
  - *Improve Customer Experience.* This criterion is used to assess the extent to which the project has the potential to improve the customer experience/maximize customer satisfaction through improvements to service quality, accessibility improvements, providing new services, etc.
  - *Operations "Critical."* This criterion is used to assess the extent to which the assets addressed in the project are critical to operating services.
  - *Number of Riders Affected.* This criterion is used to assess the existing ridership (number of average weekday trips) that would be directly or indirectly affected by the project.
  - *Operational Sustainability.* This criterion is used to assess the extent to which the operational impact/benefits of the project are sustainable in future years. It measures whether the MBTA has the resources (sufficient skills, dedicated personnel, time and the availability of funding) to sustain the assets associated with the project.
- **Factor Five: Legal Commitments.** This criterion is used to assess the extent to which the project affects compliance and the potential consequences and risks of being out of compliance with the following: 1) existing environmental regulations; 2) existing accessibility regulations (such as ADA and other Federal mandates); 3) consent decree; 4) other legal requirements.

The MBTA also considers environmental justice in its capital investment decision-making process. The MBTA has worked with the Central Transportation Planning Staff (CTPS) to 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. The new policy on MBTA expansion is especially timely, since the Commonwealth faces commitments related to its State Implementation Plan (SIP) for the federal Clean Air Act and has committed to provide $3.5 billion in capital investment to the MBTA over the coming decade through the Transportation Finance Legislation.

Legal Commitments

Chief among the projects programmed with non-MBTA funding sources are the 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 in the summer of 2008 and approved by the U.S. Environmental Protection Agency (EPA) for inclusion into the Massachusetts SIP under the Clean Air Act. This regulatory change incorporates the proposal made by the Massachusetts Department of Transportation (MassDOT) 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 these projects, it will play an important role in the design and implementation of these projects. While the Green Line extension is a SIP commitment, it is expected to be funded through a combination of the Transportation Finance Legislation and the FTA New Starts Program.

Funding the MBTA's Capital Investment Program

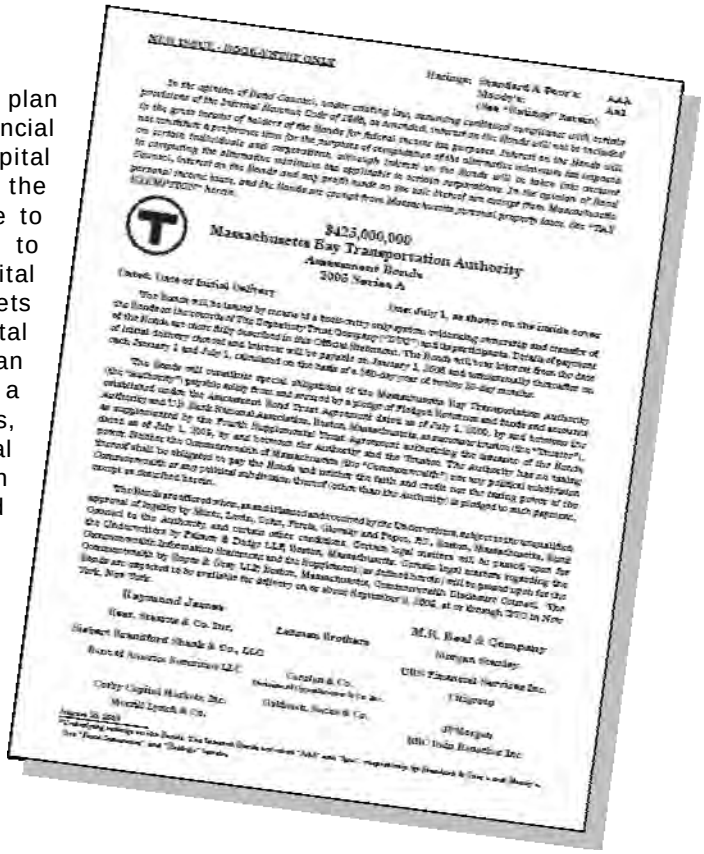
The level of capital funding programmed in this document is guided by and dependent on a number of federal, Commonwealth, and local funding programs.

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 (e.g., 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 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.



$425,000,000
Massachusetts Bay Transportation Authority
Assessment Bonds
2000 Series A

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 and 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 2015-2019, the MBTA anticipates that approximately $2.4 billion of capital expenditures will be funded through federal grants. In addition, approximately $649 million of revenue bonds will be issued to match Federal contributions and fund special capital projects. The Commonwealth supports capital projects for approximately $3.1 billion and the Department of Homeland Security provides $51 million for special security initiatives.

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 two-year authorization, the Moving Ahead for Progress in the 21st Century Act ("MAP-21")(P.L. 112-141), provides funding through the 2014 federal fiscal year. The MBTA assumes funding for federal fiscal years 2015 thru 2019 consistent at the 2014 federal fiscal year level.

The Transportation Finance Legislation

The Transportation Finance Legislation funds an intensive decade-long period of $6.0 billion in MBTA capital investment to be followed by a systematic maintenance program that will save taxpayer dollars and improve the transportation system. The Plan identifies two categories of funding that affect the MBTA: state of good repair and unlocking economic growth in the Commonwealth.

Public Process

To encourage public input, prior to publishing the final CIP, the MBTA held a series of public meetings in conjunction with MassDOT to provide the public with the opportunity to participate in the development of major transportation projects designed by the MBTA.

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. The Operations Directorate has primary responsibility for maintaining safety and vehicle engineering (for overhaul programs and procurement of new vehicles). It also has oversight over track, signals, and the MBTA's electric power generation, transmission and distribution systems. 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.

In recent years 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.

TRANSPORTATION FINANCE LEGISLATION

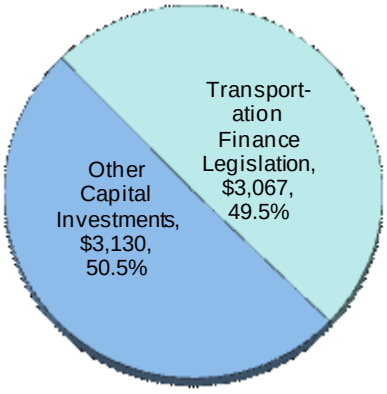
PROGRAM OVERVIEW

The Transportation Finance Legislation provides $6.0 billion in capital investment over 10 years to the MBTA. The Plan identifies two categories of funding that affect the MBTA: state of good repair and unlocking economic growth. This chapter establishes the process for infusing non-MBTA funds into the CIP for the projects in these two categories. Note that all projects included in this chapter are in addition to those listed in other chapters of the CIP which describe the investment of MBTA and other State funds.

MBTA STATE OF GOOD REPAIR PRIORITIES

The Finance Legislation identifies several priorities that will affect the state of repair at the MBTA over the next 10 years. These projects replace or overhaul vehicles, fund critical upgrades and improvements to decades-old infrastructure, and fund the development and piloting of innovative programs to provide better, faster, cleaner, and more efficient public transit. Together, these projects total $1,109 million in the FY15-FY19 CIP and an additional $1,271 million dollars in the following years. The provision of non-MBTA funds through the Finance Legislation for one project[1] in the FY13-FY17 CIP permits the MBTA to use

Transportation Finance Legislation Funding (millions $), % of total CIP



[1] Procurement of 74 Red and 152 Orange Line vehicles.

MBTA funds for other projects. These projects are identified in this chapter as well as in the chapter corresponding to each project's mode and category.

UNLOCKING ECONOMIC GROWTH IN THE COMMONWEALTH

The Finance Legislation highlights several high priority "Mega" projects that involve the expansion of the current MBTA system. Several of these projects were already receiving partial funding from non-MBTA sources as part of the CIP. The commuter rail expansion to New Bedford and Fall River (South Coast Rail) had received state and federal funding authorization for design and engineering activities, and the Green Line Extension had received state and federal commitments to fund construction. The provision of non-MBTA funds through the Plan will permit the full implementation of these projects. Since non-MBTA sources will fund expansions at the Authority, this CIP accommodates the potential for state assistance to advance these projects. Together, these projects total $1,958 million in the FY15-FY19 CIP and an additional $1,389 million dollars in the following years.

FUNDED PROJECTS

MBTA STATE OF GOOD REPAIR PRIORITIES (100% STATE FUNDED)

☑ Procurement of Red and Orange Line Vehicles and Supporting Infrastructure
This project funds the procurement of subway vehicles to replace the Red Line No. 1 fleet and the entire Orange Line fleet, as well as improvements to tracks, signals, and systems.

☑ Procurement of Green Line Cars
This project funds the procurement of 220 Green Line cars.

☑ Bus Procurement
This project funds the replacement of 392 buses with new buses (348 40-foot vehicles and 44 60-foot vehicles). Note that the MBTA is funding a portion of this procurement effort (page 54). The cash flow for the total procurement is listed in the note below the table. State funding will be used to reimburse the MBTA for the revenue bonds it issues in order to finish the procurement according to the project cash flow.

☑ Energy Conservation Program
This project consists of three elements: 3rd rail heaters, switch heaters, and installation of low wattage heating elements. The 3rd rail and switch heaters allow for remote control of the units so that they are turned on only in advance of a winter storm (as opposed to being on all winter) while the low wattage heating elements reduce the electricity amount needed at each individual unit.

☑ Power/Facilities/Various Operations Improvements
These projects fund critical upgrades throughout the system to decades-old electrical service, fuel systems, water pumps, track, tunnel, and other infrastructure that is essential for the reliable operation of trains and buses.

Transportation Finance Legislation: MBTA State of Good Repair Priorities ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Red Line Vehicle Procurement	$ 262.37	$ 12.48	$ 16.91	$ 25.58	$ 30.62	$ 36.55	$ 52.14	$ 161.80	$ 88.09
Orange Line Vehicle Procurement	538.92	25.63	34.73	52.55	62.90	75.07	107.09	332.34	180.95
Red Line Infrastructure	163.29	18.43	40.15	24.46	26.07	42.17	12.02	144.87	-
Orange Line Infrastructure	335.41	37.85	82.46	50.24	53.55	86.62	24.69	297.56	-
Green Line Vehicle Procurement	732.00	-	-	-	1.11	1.51	2.42	5.04	726.96
Bus Procurement	150.00	-	-	-	-	75.00	75.00	150.00	-
Energy Conservation Program	25.00	7.50	7.50	7.50	2.50	-	-	17.50	-
Power and Signal Projects	275.00	-	-	-	-	-	-	-	275.00
MBTA State of Good Repair Priorities	**$ 2,482.00**	**$ 101.89**	**$ 181.75**	**$ 160.33**	**$ 176.76**	**$ 316.91**	**$ 273.36**	**$ 1,109.11**	**$ 1,271.00**
(1) Total Bus Procurement (MBTA + State Funding)	*$ 356.47*	*$ 1.08*	*$ 14.66*	*$ 149.48*	*$ 87.25*	*$ 102.78*	*$ 1.23*	*$ 355.39*	*$ -*

REPLACEMENT PROJECTS WITH MBTA-FUNDS

The provision of non-MBTA funds through the Funding Legislation for one project in the FY13-FY17 CIP permits the MBTA to fund several replacement projects. These additional projects are included in the appropriate chapter for each project's respective mode and category. The following list sums the additional project funding in the current FY15-FY19 CIP by mode and category.

☑ Bridge Program - $220 million
The MBTA Bridge Program contributes to keeping 465 bridges in a state of good repair. This on-going program supports a number of individual efforts that include, but is not limited to, inspection and the rating, design, and rehabilitation of bridges throughout the system (for details about this program see Chapter 10).

☑ Bus Overhaul Program - $80 million
The Bus Overhaul Program supports the on-going overhaul of buses to ensure that all bus units reach the end of their useful lives.

☑ Commuter Rail Vehicle Improvement Program - $47 million
The Commuter Rail Vehicle Improvement Program supports high performance levels for the commuter rail fleet. This program will help to fund the procurement and/or rehabilitation of commuter rail locomotives and coaches, including top-deck and midlife overhaul work and other upgrades to vehicles.

UNLOCKING ECONOMIC GROWTH IN THE COMMONWEALTH (100% STATE FUNDED)

☑ Green Line Extension
This project funds the extension of the Green Line to Union Square in Somerville and College Avenue in Medford from a relocated Lechmere Station. This project includes the procurement of 24 Green Line vehicles. The Green Line Extension finance plan assumes that the Federal Transit Administration will fund half of the total project cost of $1,428,881,124, which would reduce the required state contribution to $714.4 million.

☑ South Station Postal Site Acquisition
This project funds the relocation of the U.S. Postal Service General Mail Facility located on Dorchester Avenue, creating an appropriate adjacent site for expanding South Station.

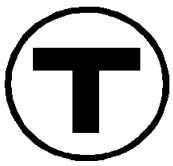
☑ South Coast Rail
This project funds the continued design, permitting as well as "early action" improvements to rail ties, existing signal systems, and grade crossings in the South Coast Region. These early action investments will improve the reliability of existing freight service in the South Coast while contributing to future passenger rail service.

☑ DMU Implementation
This project involves two phases - the first being a pilot program to implement Diesel Multiple Units (DMUs) along the Fairmount corridor, and the second being implementation over 5 other corridors in the metro area.

☑ Silver Line to Chelsea
This project will include the creation of a 1.1-mile busway, the reconstruction/rehabilitation of two bridges, the reconstruction/modernization of the Chelsea Commuter Rail Station, and several station and bus stop improvements.

Transportation Finance Legislation: Unlocking Economic Growth in the Commonwealth ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Green Line Extension	$ 1,428.88	$ 143.25	$ 244.43	$ 428.90	$ 338.01	$ 214.27	$ 54.62	$ 1,280.23	$ 5.40
South Station Postal Site Acquisition	200.00	50.00	20.00	20.00	110.00	-	-	150.00	-
South Coast Rail	1,660.56	4.13	40.98	43.68	60.94	70.45	57.81	273.86	1,382.56
DMU Implementation	194.65	1.26	20.64	59.15	91.68	17.27	3.22	191.96	1.43
Silver Line to Chelsea	62.31	-	25.75	31.47	5.09	-	-	62.31	-
Unlocking Economic Growth	**$ 3,546.40**	**$ 198.64**	**$ 351.80**	**$ 583.20**	**$ 605.72**	**$ 301.99**	**$ 115.66**	**$ 1,958.36**	**$ 1,389.40**



Capital Investment Program

FY2015 — FY2019

BY MODE

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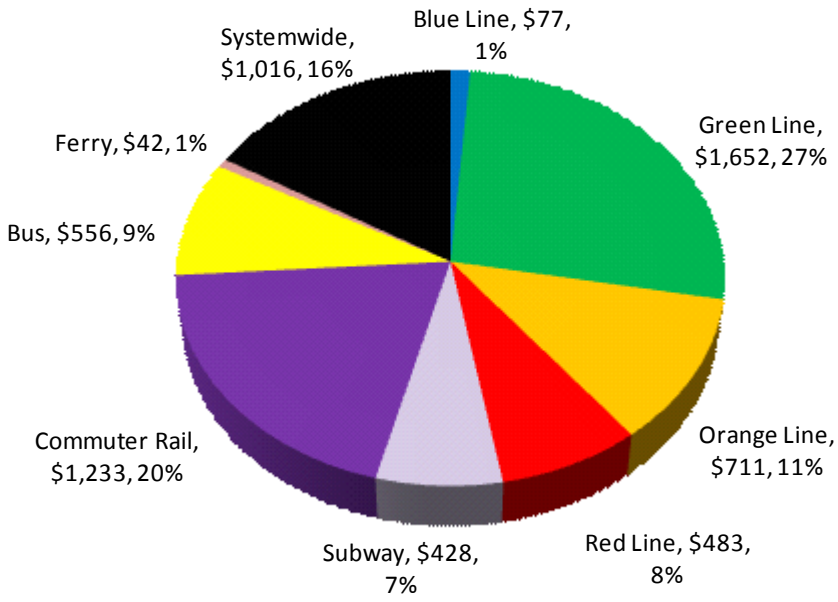
MBTA Capital Investment Program (FY15-FY19)

By Mode



($ in millions, % of total CIP)

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BLUE LINE PROJECTS

BLUE LINE PROJECTS

PROJECT	Type	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Blue Line Car No. 5 - Procurement	Revenue Vehicles	$ 207.35	$ 199.08	$ 8.27	$ -	$ -	$ -	$ -	$ 8.27	$ -
Orient Heights Maintenance Facility Phase 1	Maintenance Facilities	31.00	30.51	0.50	-	-	-	-	0.50	-
Orient Heights Maintenance Facility Phase 2	Maintenance Facilities	20.71	20.38	0.33	-	-	-	-	0.33	-
Orient Heights Maintenance Facility Phase 3	Maintenance Facilities	9.00	5.00	2.00	2.00	-	-	-	4.00	-
Blue Line Orient Heights Station	Stations	50.87	36.83	9.14	3.25	1.65	-	-	14.04	-
Blue Line Maverick Station	Stations	55.02	53.70	1.32	-	-	-	-	1.32	-
Blue Line State St. Station	Stations	104.73	101.97	0.52	2.24	-	-	-	2.77	-
Blue Line Government Center Station	Stations	50.65	9.85	9.91	15.00	15.89	-	-	40.80	-
Blue Line Airport Station	Stations	37.23	36.57	0.66	-	-	-	-	0.66	-
Blue Line Platform Rehab	Stations	15.66	11.23	-	-	-	-	4.44	4.44	-
Orient Heights Track Work	Stimulus Bill Projects	21.07	21.07	-	-	-	-	-	-	-
TOTAL BLUE LINE PROJECTS		**$ 603.30**	**$ 526.17**	**$ 32.65**	**$ 22.49**	**$ 17.54**	**$ -**	**$ 4.44**	**$ 77.12**	**$ -**

GREEN LINE PROJECTS

GREEN LINE PROJECTS

PROJECT	Type	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Green Line No. 7 Car Selective Systems Overhaul	Revenue Vehicles	$ 162.45	$ 22.66	$ 44.17	$ 55.60	$ 38.61	$ 1.41	$ -	$ 139.78	$ -
Green Line No. 8 Car Reliability Improvements Program	Revenue Vehicles	39.87	-	14.62	13.79	10.44	1.03	-	39.87	-
Green Line Frog Replacement Program	Track/Right-of-Way	5.00	-	1.00	1.00	1.00	1.00	1.00	5.00	-
Green Line Signals	Signals	43.03	0.24	12.15	11.80	8.73	5.68	4.44	42.79	-
Green Line Power Study	Power	4.11	1.83	1.58	0.71	-	-	-	2.28	-
Highland Branch AC Cable Replacement	Power	13.40	12.17	1.24	-	-	-	-	1.24	-
Green Line Interim Access	Accessibility	4.85	3.79	0.40	0.66	-	-	-	1.06	-
LRAP - Surface Stations	Accessibility	32.70	32.43	0.28	-	-	-	-	0.28	-
LRAP- Park St. & Haymarket	Accessibility	15.15	15.10	0.05	-	-	-	-	0.05	-
LRAP- Govt. Center Station	Accessibility	79.92	14.77	11.58	13.39	28.17	12.01	-	65.15	-
LRAP- Arlington & Copley	Accessibility	65.58	59.60	3.04	2.94	-	-	-	5.98	-
LRAP- Kenmore Station	Accessibility	49.69	45.70	4.00	-	-	-	-	4.00	-
LRAP- Boston College Station	Accessibility	3.29	0.89	0.73	0.65	0.52	0.49	-	2.40	-
LRAP- Brookline Village & Longwood	Accessibility	3.94	3.94	-	-	-	-	-	-	-
LRAP - Phases II & III - Surface Stations (B&C Lines)	Accessibility	5.00	-	0.15	0.34	1.71	1.57	1.24	5.00	-
Symphony/Hynes Access	Accessibility	2.00	0.04	1.96	-	-	-	-	1.96	-
Science Park Accessibility	Accessibility	22.00	19.89	2.11	-	-	-	-	2.11	-
Park St. Eastbound. Crossover	Enhancements	3.90	0.62	0.50	0.93	1.23	0.61	-	3.28	-
Green Line Collision Avoidance Program	Enhancements	2.73	2.32	0.41	-	-	-	-	0.41	-
Green Line Real-Time Tracking System	Enhancements	13.43	7.00	6.42	-	-	-	-	6.42	-
Green Line Extension to Route 16	Statewide Transportation Improvements	38.00	-	-	8.10	29.90	-	-	38.00	-
Green Line Vehicle Procurement	The Transportation Finance Legislation	732.00	-	-	-	1.11	1.51	2.42	5.04	726.96
Power and Signal Projects	The Transportation Finance Legislation	275.00	-	-	-	-	-	-	-	275.00
Green Line Extension	The Transportation Finance Legislation	1,428.88	143.25	244.43	428.90	338.01	214.27	54.62	1,280.23	5.40
TOTAL GREEN LINE PROJECTS		**$ 3,045.92**	**$ 386.23**	**$ 350.80**	**$ 538.81**	**$ 459.43**	**$ 239.59**	**$ 63.72**	**$ 1,652.34**	**$ 1,007.36**

ORANGE LINE PROJECTS

ORANGE LINE PROJECTS

PROJECT	Type	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Orange Line Cars Reinvestment	Revenue Vehicles	$ 15.60	$ 13.27	$ 2.34	$ -	$ -	$ -	$ -	$ 2.34	$ -
Orange Line Traction Power Upgrade	Power	43.27	0.13	7.89	11.92	12.07	10.22	1.03	43.13	-
Orange Line DC Cable Upgrade Ph 1 Back Bay - North Station	Power	21.73	6.03	4.10	6.55	5.05	-	-	15.69	-
Transformer Replacement Program - Phase 1 (Orange Line) [5 units]	Power	15.00	4.17	2.26	2.00	2.00	2.00	2.57	10.83	-
Orange Line Power Infrastructure Improvements	Power	8.00	2.47	1.40	4.13	-	-	-	5.53	-
Southwest Corridor Study	Enhancements	1.00	-	1.00	-	-	-	-	1.00	-
Assembly Square Station	Statewide Transportation Improvements	56.51	53.88	2.63	-	-	-	-	2.63	-
Orange Line Vehicle Procurement	The Transportation Finance Legislation	538.92	25.63	34.73	52.55	62.90	75.07	107.09	332.34	180.95
Orange Line Infrastructure	The Transportation Finance Legislation	335.41	37.85	82.46	50.24	53.55	86.62	24.69	297.56	-
Back Bay Station Lobby Ventilation	Stimulus Bill Projects	1.26	1.26	-	-	-	-	-	-	-
Back Bay Station Re-Roofing Project	Stimulus Bill Projects	1.84	1.84	-	-	-	-	-	-	-
TOTAL ORANGE LINE PROJECTS		**$ 1,038.54**	**$ 146.54**	**$ 138.80**	**$ 127.39**	**$ 135.57**	**$ 173.90**	**$ 135.39**	**$ 711.05**	**$ 180.95**

RED LINE PROJECTS

RED LINE PROJECTS

PROJECT	Type	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Red Line No. 1 Car Reinvestment	Revenue Vehicles	$ 2.16	$ -	$ 1.08	$ 1.08	$ -	$ -	$ -	$ 2.16	$ -
Red Line No. 2 Car Selective Systems Overhaul	Revenue Vehicles	53.46	39.80	7.22	6.44	-	-	-	13.66	-
Red Line No. 3 Upgrade	Revenue Vehicles	8.70	7.06	0.76	0.75	0.13	-	-	1.64	-
Red Line Signal Cable Replacement	Signals	29.00	1.10	3.90	12.00	8.00	4.00	-	27.90	-
Red Line Signals - Columbia Junction	Signals	91.77	53.85	16.15	19.64	2.13	-	-	37.92	-
Red Line Traction Power Upgrade	Power	27.12	11.01	4.01	7.66	2.34	1.00	1.10	16.11	-
Red Line DC Cable Upgrade - Phase 1 [Andrew-Kendall]	Power	28.51	6.22	5.25	8.00	7.93	1.11	-	22.29	-
Red Line - Dorchester Stations	Stations	74.37	74.04	0.33	-	-	-	-	0.33	-
Red Line Ashmont Station - Phase I	Stations	70.09	69.31	0.78	-	-	-	-	0.78	-
Porter Square Station Improvement	Stations	1.30	-	1.30	-	-	-	-	1.30	-
Red Line Floating Slabs (Alewife - Harvard)	Facilities	34.00	34.00	-	-	-	-	-	-	-
Alewife Garage Improvements	Facilities	9.51	5.37	-	1.90	1.46	0.78	-	4.14	-
South Shore Parking Garages Rehab	Facilities	46.34	5.15	8.01	16.70	16.47	-	-	41.18	-
Wollaston Accessibility	Accessibility	7.50	1.03	5.67	0.80	-	-	-	6.47	-
Red Line Vehicle Procurement	The Transportation Finance Legislation	262.37	12.48	16.91	25.58	30.62	36.55	52.14	161.80	88.09
Red Line Infrastructure	The Transportation Finance Legislation	163.29	18.43	40.15	24.46	26.07	42.17	12.02	144.87	-
Ashmont Station Upgrade - Phase II	Stimulus Bill Projects	12.68	12.68	-	-	-	-	-	-	-
North Quincy Station Platform Repairs	Stimulus Bill Projects	2.33	2.33	-	-	-	-	-	-	-
Braintree Station Structural Repairs	Stimulus Bill Projects	2.51	2.51	-	-	-	-	-	-	-
Red Line Floating Slab Work	Stimulus Bill Projects	4.11	4.11	-	-	-	-	-	-	-
TOTAL RED LINE PROJECTS		**$ 931.12**	**$ 360.49**	**$ 111.51**	**$ 125.01**	**$ 95.16**	**$ 85.61**	**$ 65.25**	**$ 482.54**	**$ 88.09**

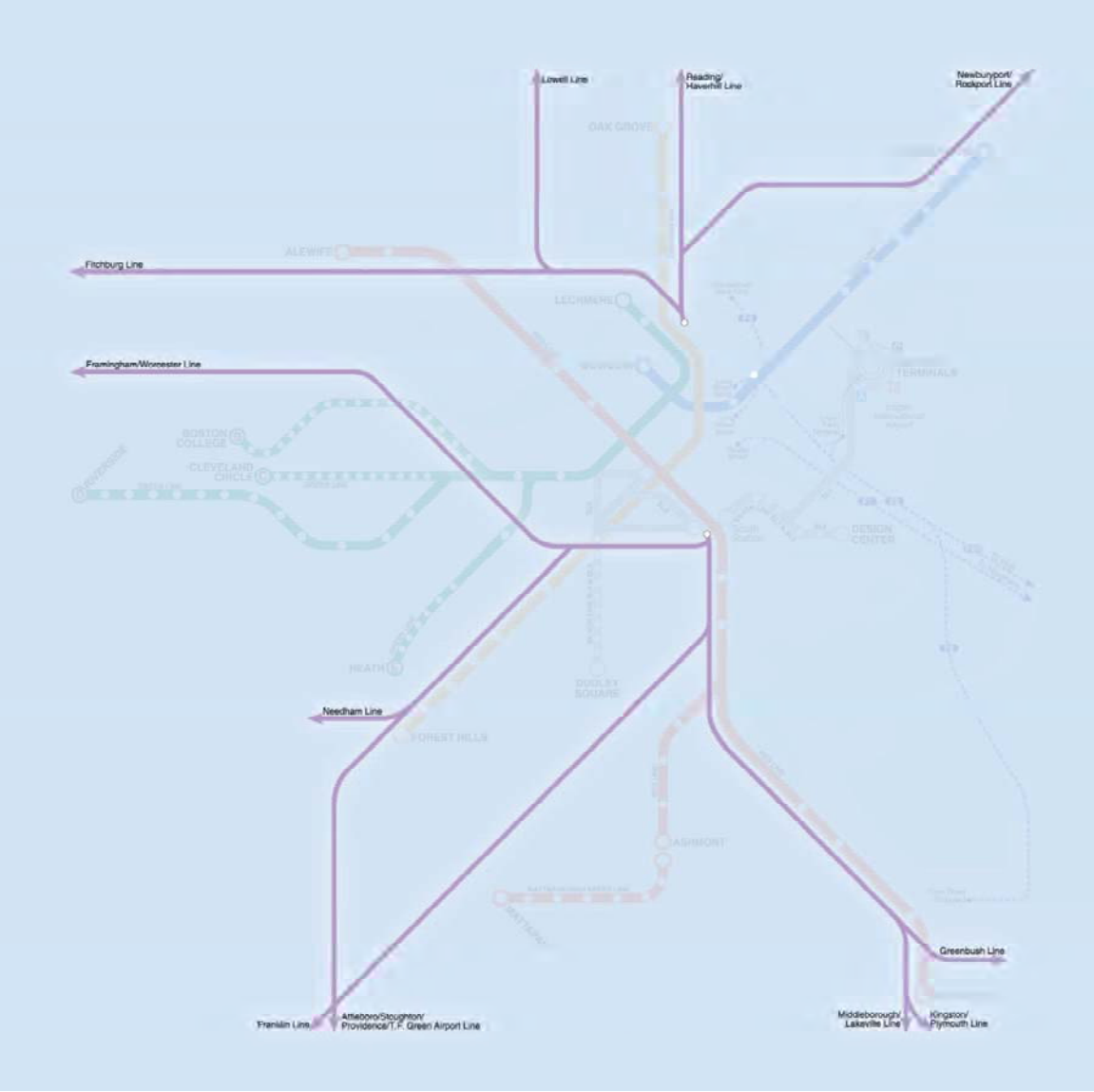
SUBWAY PROJECTS

Note: More than a single mode, but any of the following: Heavy Rail (Blue, Red, and Orange Lines) and Light Rail (Green and Mattapan Lines).

SUBWAY PROJECTS

PROJECT	Type	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Various Subway Vehicle Projects	Revenue Vehicles	$ 76.48	$ 4.57	$ 23.74	$ 29.56	$ 18.61	$ -	$ -	$ 71.91	$ -
Snow Fighting Equipment	Non-Revenue Vehicles	3.58	0.75	-	-	1.00	1.00	0.83	2.83	-
Yard Switch Replacement & Track Reconstruction	Track/Right-of-Way	16.00	-	5.70	4.30	4.50	1.20	0.30	16.00	-
Systemwide Track Upgrades	Track/Right-of-Way	43.52	24.24	4.34	14.94	-	-	-	19.28	-
Systemwide Signal Upgrades	Signals	34.13	12.02	10.62	8.50	3.00	-	-	22.12	-
SWR Subway Installation	Signals	3.00	-	3.00	-	-	-	-	3.00	-
Transformer Replacement Program - Phases 2-4 (All modes)	Power	45.02	1.17	16.71	15.26	11.87	-	-	43.85	-
Unit Substation Upgrades	Power	53.14	33.34	8.97	7.29	3.54	-	-	19.79	-
Power Program	Power	21.66	10.40	6.52	3.59	1.14	-	-	11.25	-
Subway Facility Improvements	Maintenance Facilities	42.59	20.37	14.38	4.38	0.08	3.37	-	22.22	-
Park Street Stairs	Stations	3.76	2.98	0.78	-	-	-	-	0.78	-
Station Platform Improvement Program	Stations	15.71	2.93	2.59	8.19	2.00	-	-	12.78	-
Old South Meeting House Drainage Improvements	Stations	1.39	-	1.39	-	-	-	-	1.39	-
Station Rehabilitation	Stations	64.56	27.37	21.68	6.75	2.00	3.00	3.77	37.19	-
Subway Facilities Improvements	Facilities	21.23	14.07	3.50	1.22	0.85	0.75	0.84	7.16	-
Systemwide Tunnel Lighting	Facilities	8.00	7.00	0.25	0.25	0.25	0.25	-	1.00	-
Tunnel Rehabilitation	Facilities	33.58	10.34	9.78	5.36	3.65	2.19	2.25	23.23	-
Elevator Program	Accessibility	147.43	55.67	6.49	15.87	15.72	15.49	16.17	69.74	22.02
Escalator Program	Accessibility	35.00	11.03	10.35	3.50	3.50	3.50	3.12	23.97	-
PA System /LED Station Sign	Enhancements	29.19	28.60	0.59	-	-	-	-	0.59	-
Energy Conservation Program	The Transportation Finance Legislation	25.00	7.50	7.50	7.50	2.50	-	-	17.50	-
MBTA Tunnel Signage Project	Stimulus Bill Projects	5.02	5.02	-	-	-	-	-	-	-
Emergency Station Lighting Program	Stimulus Bill Projects	1.37	1.37	-	-	-	-	-	-	-
Substation Control Battery Set Replacement Program	Stimulus Bill Projects	3.20	3.20	-	-	-	-	-	-	-
Tunnel Dewatering Pump Station Rehabilitation Program	Stimulus Bill Projects	3.72	3.72	-	-	-	-	-	-	-
TOTAL SUBWAY PROJECTS		**$ 737.27**	**$ 287.68**	**$ 158.88**	**$ 136.46**	**$ 74.21**	**$ 30.75**	**$ 27.27**	**$ 427.57**	**$ 22.02**

COMMUTER RAIL PROJECTS



COMMUTER RAIL PROJECTS

PROJECT	Type	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Top Deck Overhaul of (25) Locomotives	Revenue Vehicles	$ 39.56	$ 15.78	$ 11.68	$ 9.29	$ 2.82	$ -	$ -	$ 23.79	$ -
Locomotive & Coach Maintenance Program (CRASP)	Revenue Vehicles	47.64	37.20	6.10	4.34	-	-	-	10.44	-
Commuter Rail Vehicle Improvement Program	Revenue Vehicles	47.00	-	-	-	10.00	10.00	27.00	47.00	-
Locomotive Procurement	Revenue Vehicles	266.39	97.46	73.07	95.86	-	-	-	168.93	-
Coach Procurement - Hyundai Rotem (75 units)	Revenue Vehicles	232.30	133.45	27.74	29.80	26.00	-	15.30	98.85	-
Coach Overhaul - Kawasaki (75 units)	Revenue Vehicles	125.67	17.36	11.59	20.00	25.00	25.00	15.23	96.82	11.50
Old Colony Line Tie Replacement Project	Track/Right-of-Way	84.33	73.04	11.29	-	-	-	-	11.29	-
Timber Tie Replacement at Interlocking - Attleboro Line	Track/Right-of-Way	0.56	-	0.56	-	-	-	-	0.56	-
Haverhill Double Tracking/Other Track Improvements	Track/Right-of-Way	9.50	0.57	6.79	-	-	-	2.14	8.93	-
Signal System Upgrades - Reading Junction to Fells	Signals	6.50	-	2.00	1.50	1.50	1.50	-	6.50	-
Fitchburg Line Signal Upgrade	Signals	0.11	-	0.11	-	-	-	-	0.11	-
Commuter Rail Maintenance Facilities Upgrades	Maintenance Facilities	2.50	0.64	0.50	0.50	0.50	0.36	-	1.86	-
Winchester Center Station	Stations	1.30	0.32	0.98	-	-	-	-	0.98	-
Ruggles Station Upgrades	Stations	25.00	0.95	10.72	10.83	2.50	-	-	24.05	-
Station Upgrades	Stations	24.26	9.14	3.92	0.70	2.00	3.00	5.50	15.12	-
Woburn Magazine Hill Parking	Facilities	1.43	-	0.88	0.55	-	-	-	1.43	-
Merrimack River Bridge	Bridges	99.43	7.27	39.57	35.99	16.60	-	-	92.17	-
Rehab of 2 Shawsheen River Bridges	Bridges	15.00	12.33	-	2.67	-	-	-	2.67	-
Rehab of Dean Rd. and 2 Neponset River Bridges	Bridges	24.39	11.50	10.16	2.72	-	-	-	12.89	-
Concord, Main St Bridge	Bridges	9.00	5.65	3.35	-	-	-	-	3.35	-
Shoreline Bridge Rehab	Bridges	2.33	1.06	1.27	-	-	-	-	1.27	-
Commuter Rail Positive Train Control	Enhancements	114.20	1.20	100.82	3.18	4.00	3.00	2.00	113.00	-
Fairmount Line Improvements - Phase I	Enhancements	33.92	33.92	-	-	-	-	-	-	-
Fitchburg Line Improvements	Enhancements	153.66	51.50	11.47	48.18	29.87	12.65	-	102.17	-
Commuter Rail Various Upgrades	Enhancements	41.75	28.68	13.02	0.05	-	-	-	13.07	-
Rockport Station Improvements	Enhancements	3.81	1.49	2.31	-	-	-	-	2.31	-
Miller's Outfall Structure	Enhancements	6.00	4.60	0.61	0.47	0.32	-	-	1.40	-
Greenbush Line Construction	Expansion	552.60	538.67	9.03	4.90	-	-	-	13.93	-
Newburyport Extension	Expansion	27.27	26.91	0.36	-	-	-	-	0.36	-
Closeout Expansion Projects/Flexed Funds	Expansion	11.51	1.80	4.71	1.50	1.50	1.00	1.00	9.71	-
Yawkey Station Enhancements	Statewide Transportation Improvements	15.32	14.85	0.48	-	-	-	-	0.48	-
Beverly Parking Garage	Statewide Transportation Improvements	34.11	33.90	0.21	-	-	-	-	0.21	-
Salem Parking Garage	Statewide Transportation Improvements	44.54	36.60	7.94	-	-	-	-	7.94	-
Fairmount Line Improvements - Phase II	Statewide Transportation Improvements	135.00	130.13	4.86	-	-	-	-	4.86	-
Worcester Line Improvements	Statewide Transportation Improvements	26.23	9.36	16.87	-	-	-	-	16.87	-
South Coast Rail	The Transportation Finance Legislation	1,660.56	4.13	40.98	43.68	60.94	70.45	57.81	273.86	1,382.56
Commuter Rail - Various Stations Projects	Stimulus Bill Projects	3.47	3.47	-	-	-	-	-	-	-
Commuter Rail Facilities - Layovers, Environmental, etc.	Stimulus Bill Projects	9.53	9.53	-	-	-	-	-	-	-
Fitchburg Line - Interlocking Project	Stimulus Bill Projects	10.39	10.39	-	-	-	-	-	-	-
Commuter Rail - Bridge Projects	Stimulus Bill Projects	3.52	3.52	-	-	-	-	-	-	-
Haverhill Line - Double Track & Signal Work	Stimulus Bill Projects	19.15	19.15	-	-	-	-	-	-	-
Fitchburg Line - Double Track	Stimulus Bill Projects	41.16	41.16	-	-	-	-	-	-	-
Revere - Wonderland Station Parking Garage	Stimulus Bill Projects	22.70	22.70	-	-	-	-	-	-	-
Wedgemere Station Accessibility	Stimulus Bill Projects	2.20	2.20	-	-	-	-	-	-	-
Fitchburg Line - Wachusett Extension	Stimulus Bill Projects	59.23	28.18	31.06	-	-	-	-	31.06	-
New Bedford Bridges	Stimulus Bill Projects	19.79	19.79	-	-	-	-	-	-	-
Knowledge Corridor - HSIPR	Stimulus Bill Projects	75.05	62.38	12.22	0.45	-	-	-	12.67	-
TOTAL COMMUTER RAIL PROJECTS		**$ 4,190.88**	**$ 1,563.93**	**$ 479.23**	**$ 317.17**	**$ 183.55**	**$ 126.96**	**$ 125.98**	**$ 1,232.89**	**$ 1,394.06**

BUS & THE RIDE PROJECTS

BUS & THE RIDE PROJECTS

PROJECT	Type	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Washington St. Vehicles (Phase I)	Revenue Vehicles	$ 13.22	$ 13.22	$ -	$ -	$ -	$ -	$ -	$ -	$ -
310 ECD New Flyer 40' Buses	Revenue Vehicles	119.51	119.51	-	-	-	-	-	-	-
Bus Overhaul Program	Revenue Vehicles	234.17	166.74	29.86	34.04	3.48	0.07	-	67.43	-
RIDE Vehicle Program	Revenue Vehicles	16.05	1.34	-	-	-	7.00	7.71	14.71	-
Bus Systems Improvements	Revenue Vehicles	1.65	-	-	-	-	-	1.65	1.65	-
MBTA-Funded Bus Procurement (1)	Revenue Vehicles	206.47	1.08	14.66	149.48	41.26	-	-	205.39	-
Trackless Trolley Overhead Replacement	Power	36.70	0.17	9.05	22.92	4.56	-	-	36.53	-
Trackless Trolley Catenary Improvements	Power	4.00	2.85	-	-	-	-	1.15	1.15	-
Arborway Facility	Maintenance Facilities	63.50	30.86	25.01	7.63	-	-	-	32.64	-
CNG Facility Retrofit	Maintenance Facilities	76.03	62.80	7.78	5.46	-	-	-	13.23	-
Bus Facilities Upgrades	Maintenance Facilities	33.43	19.14	8.20	1.90	0.85	1.85	1.49	14.29	-
Bus Stations Improvements	Stations	29.26	14.66	7.60	7.00	-	-	-	14.60	-
Bus Training Simulator	Enhancements	2.00	1.24	0.76	-	-	-	-	0.76	-
Environmental Management System (EMS)	Enhancements	5.45	2.57	1.28	0.40	0.40	0.40	0.40	2.88	-
THE RIDE - Information Management System	Enhancements	0.89	0.74	0.15	-	-	-	-	0.15	-
Silver Line Phase I: Washington St.	Expansion	16.52	16.52	-	-	-	-	-	-	-
Silver Line Phase II: S. Boston Transitway	Expansion	623.24	623.24	-	-	-	-	-	-	-
Silver Line Phase III: Planning and Design	Expansion	50.14	50.14	-	-	-	-	-	-	-
Bus Procurement	The Transportation Finance Legislation	150.00	-	-	-	-	75.00	75.00	150.00	-
Bus Stop and Rt 23 Customer Enhancements	Stimulus Bill Projects	8.13	8.13	-	-	-	-	-	-	-
Silver Line - Phase A&B: Dudley-South Station Enhancements	Stimulus Bill Projects	1.60	1.60	-	-	-	-	-	-	-
The RIDE - Vehicle Procurement	Stimulus Bill Projects	5.58	5.58	-	-	-	-	-	-	-
Dudley Square Station Improvements	Stimulus Bill Projects	0.96	0.96	-	-	-	-	-	-	-
MBTA Bus Facility Rehab & Improvements	Stimulus Bill Projects	16.83	16.83	-	-	-	-	-	-	-
Hybrid Bus Procurement	Stimulus Bill Projects	27.72	27.72	-	-	-	-	-	-	-
Silver Line - Essex St. Ramp Reconstruction	Stimulus Bill Projects	1.46	1.46	-	-	-	-	-	-	-
Key Bus Routes Project	Stimulus Bill Projects	10.00	9.16	0.84	-	-	-	-	0.84	-
TOTAL BUS PROJECTS		**$ 1,754.52**	**$ 1,198.26**	**$ 105.18**	**$ 228.83**	**$ 50.54**	**$ 84.32**	**$ 87.40**	**$ 556.26**	**$ -**

FERRY SERVICE PROJECTS

FERRY SERVICE PROJECTS

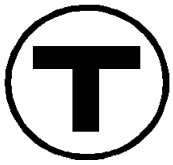
PROJECT	Type	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Ferry System Improvements	Revenue Vehicles	$ 17.10	$ 3.53	$ 0.32	$ 1.58	$ 5.57	$ 4.32	$ 1.77	$ 13.57	$ -
Boat Engine Overhaul Program	Revenue Vehicles	2.91	2.11	0.29	0.50	-	-	-	0.79	-
Catamaran for Quincy Harbor	Revenue Vehicles	13.58	0.11	5.62	7.85	-	-	-	13.46	-
Hingham Shipyard Improvements	Facilities	17.53	3.44	14.09	-	-	-	-	14.09	-
TOTAL FERRY PROJECTS		**$ 51.11**	**$ 9.19**	**$ 20.32**	**$ 9.93**	**$ 5.57**	**$ 4.32**	**$ 1.77**	**$ 41.91**	**$ -**

SYSTEMWIDE PROJECTS

Note: Encompasses projects that serve all modes of transportation across the authority.

SYSTEMWIDE PROJECTS

PROJECT	Type	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Systemwide NRV Program	Non-Revenue Vehicles	$ 36.04	$ 11.72	$ 14.14	$ 1.52	$ 0.56	$ 4.25	$ 3.86	$ 24.32	$ -
Systemwide Fire Suppression Systems	Facilities	24.30	5.07	3.63	8.51	7.09	-	-	19.23	-
Operations Facilities Upgrades	Facilities	5.61	3.75	0.32	0.35	0.40	0.46	0.33	1.86	-
Parking System Upgrades	Facilities	9.09	3.00	2.10	1.00	1.00	1.00	1.00	6.10	-
Bridge Program	Bridges	366.79	38.89	79.12	87.88	50.63	47.31	62.96	327.90	-
Station Management Program - Phase I	Fare Equipment	186.78	185.05	1.73	-	-	-	-	1.73	-
AFC Upgrades	Fare Equipment	19.59	3.00	4.44	10.15	2.00	-	-	16.59	-
Misc. Project Closeout Costs	Technology/Other	3.42	2.11	0.20	0.20	0.20	0.20	0.51	1.31	-
Capital Maintenance Improvements	Technology/Other	8.67	-	1.50	2.00	2.00	2.00	1.17	8.67	-
Misc. Capital Projects	Technology/Other	0.59	0.05	0.01	-	-	-	0.53	0.53	-
Computer Tech. Upgrades	Technology/Other	21.14	11.74	9.16	0.25	-	-	-	9.41	-
HR Business Continuity	Technology/Other	0.25	0.08	0.17	-	-	-	-	0.17	-
Bid/Dispatch System	Technology/Other	1.50	-	-	-	-	-	1.50	1.50	-
Independent Engineering Review	Technology/Other	10.48	6.83	-	-	-	-	3.66	3.66	-
Bond Costs	Technology/Other	23.69	22.62	-	-	-	-	1.07	1.07	-
Unified Planning Work Program	Technology/Other	5.17	2.96	0.53	0.53	0.53	0.53	0.11	2.21	-
Wayfinding Program	Accessibility	19.91	4.73	0.92	-	-	6.25	8.00	15.17	-
Accessibility Program	Accessibility	30.30	12.54	6.10	7.84	3.83	-	-	17.77	-
Systemwide Enhancements	Enhancements	67.24	21.36	4.27	14.57	12.04	10.00	5.00	45.88	-
Daily Operations Resource Management (SDMS)	Enhancements	2.20	-	1.40	0.40	0.40	-	-	2.20	-
Train & Bus Arrival Announcement System	Enhancements	6.00	2.64	0.20	1.50	1.65	-	-	3.36	-
Maintenance Facilities Upgrades	Enhancements	3.00	2.00	0.50	0.50	-	-	-	1.00	-
Bicycle Enhancements	Enhancements	3.54	3.54	-	-	-	-	-	-	-
Environmental Compliance Management	Enhancements	43.10	7.74	19.24	6.12	5.84	2.31	1.85	35.36	-
Groundwater Remediation	Enhancements	4.97	1.13	1.40	1.25	1.20	-	-	3.84	-
Remediation Projects	Enhancements	33.51	30.19	0.44	0.56	0.86	0.50	0.96	3.32	-
FY08 Homeland Security Funds [EOPSS]	Enhancements	28.55	22.51	3.99	2.05	-	-	-	6.03	-
FY09 Homeland Security Funds	Enhancements	29.26	12.57	7.41	6.88	2.41	-	-	16.69	-
FY10 Homeland Security Funds	Enhancements	21.14	7.56	6.53	4.30	2.75	-	-	13.58	-
FY11 Homeland Security Funds	Enhancements	10.88	2.88	3.21	2.56	1.92	0.24	0.06	7.99	-
FY12-FY14 Homeland Security Funds	Enhancements	6.69	-	0.09	3.20	2.40	1.00	-	6.69	-
South Station Postal Site Acquisition	The Transportation Finance Legislation	200.00	50.00	20.00	20.00	110.00	-	-	150.00	-
DMU Implementation	The Transportation Finance Legislation	194.65	1.26	20.64	59.15	91.68	17.27	3.22	191.96	1.43
Silver Line to Chelsea	The Transportation Finance Legislation	62.31	-	25.75	31.47	5.09	-	-	62.31	-
Enhanced Bicycle Parking Facilities	Stimulus Bill Projects	6.68	6.68	-	-	-	-	-	-	-
MBTA Systemwide Fencing	Stimulus Bill Projects	3.45	3.45	-	-	-	-	-	-	-
MBTA Operating Assistance	Stimulus Bill Projects	18.07	18.07	-	-	-	-	-	-	-
Renewable Wind Energy Project (TIGGER)	Stimulus Bill Projects	2.73	2.73	-	-	-	-	-	-	-
Revere Transit Plaza	Stimulus Bill Projects	20.00	20.00	-	-	-	-	-	-	-
TOTAL SYSTEMWIDE PROJECTS		**$ 1,616.01**	**$ 598.47**	**$ 244.68**	**$ 275.87**	**$ 306.46**	**$ 93.31**	**$ 95.80**	**$ 1,016.11**	**$ 1.43**



Capital Investment Program

FY2015 — FY2019

BY ASSET CATEGORY

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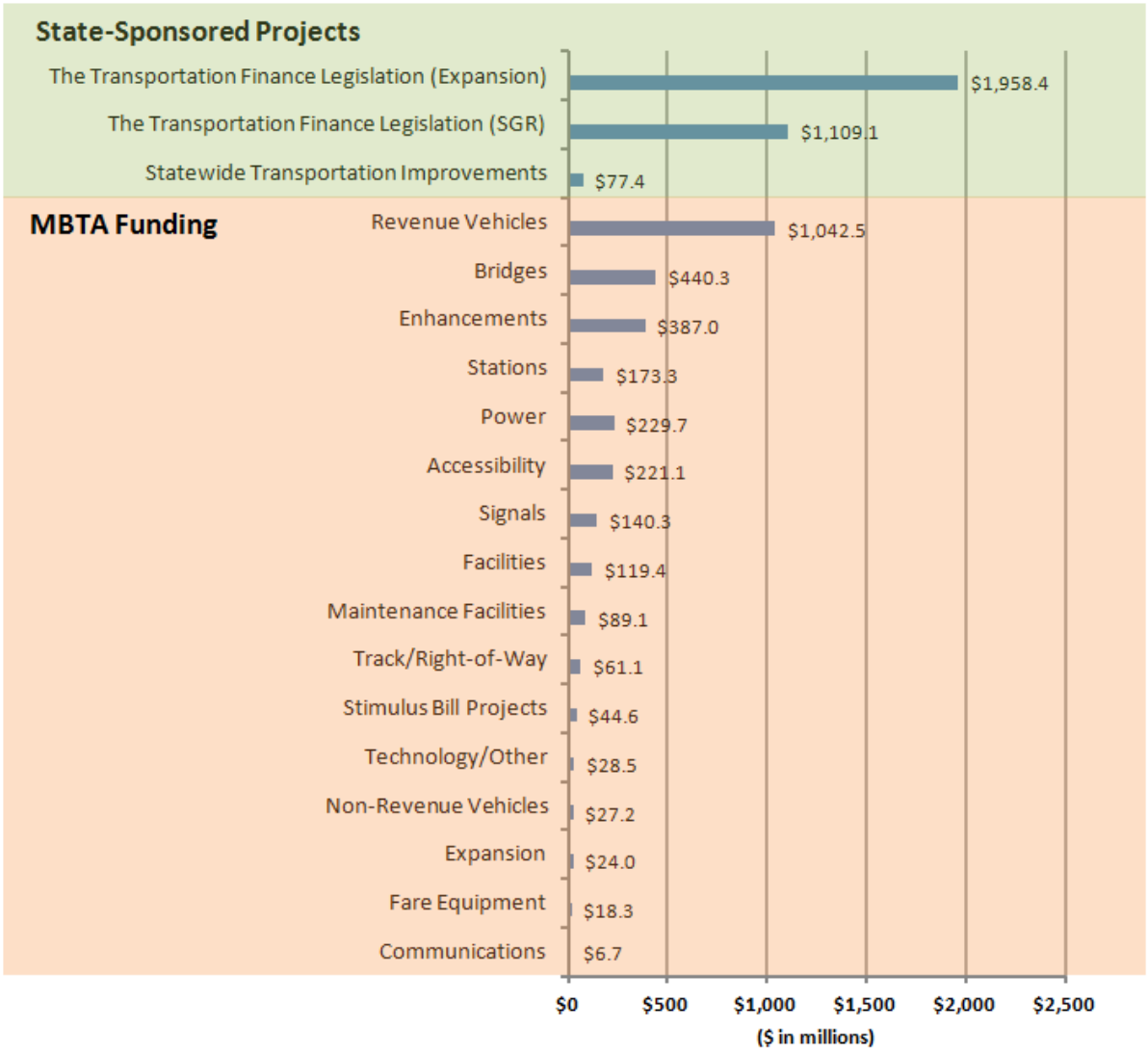
MBTA Capital Investment Program (FY15-FY19)

By Asset Category



Notes:

- Sum of all categories is 100%
- The Transportation Finance Legislation includes MBTA SGR and Expansion projects. The MBTA SGR projects include actions such as the procurement of new vehicles, the rehab of stations and facilities, and upgrades to signals, power and track systems. The expansion projects include South Coast Rail and the Green Line Extension.

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CHAPTER 1

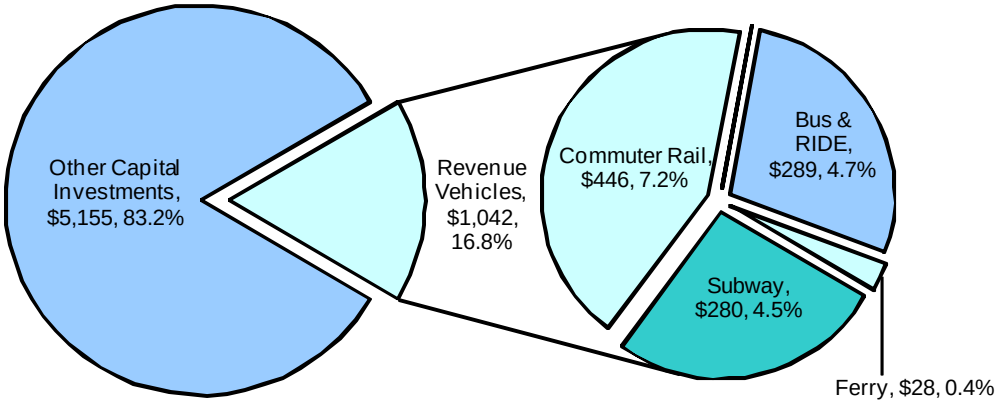
REVENUE VEHICLES

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 more than 3,000 revenue vehicles as detailed below.

The MBTA adheres to a general standard lifecycle of at least 25 years for rapid transit and light rail vehicles, 25 years for commuter rail locomotives, 25 to 30 years for commuter rail coaches, and 12 years for buses. Scheduled major overhauls, maintenance, and planned retirements help these fleets reach their useful life and maintain their reliability by preventing

Revenue Vehicles Funding
($ in millions, % of total CIP)



the unwarranted consumption of resources.

The current program dedicates $1,042 million to revenue vehicles, primarily for fleet procurement and overhaul programs. The revenue vehicle program represents 16.8% 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 commitment to upgrade its bus service, the Authority's most recent procurement of buses was completed in 2009 with the acquisition of 310 ultra low sulfur diesel vehicles and 25 hybrid vehicles. Other efforts in this program also include major component replacements on the Orange and Red Lines. The Authority's most recent procurement of subway vehicles was completed in 2009 with the acquisition of 94 cars for the Blue Line.

Activity within the commuter rail vehicle program includes procurement of new locomotives and coaches as well as midlife overhaul for several locomotive and coach fleets. It is anticipated that the needs of the commuter rail fleet will represent a more significant portion of the Capital Investment Program in the future.

SUBWAY REVENUE VEHICLES

The MBTA subway system consists of 4 transit lines. The Red, Blue, and Orange lines are referred to as heavy rail, while 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 fleets are assigned a number by the MBTA.

The Red Line fleet is made up of 218 cars of three separate fleets. They include 74 Pullman Standard No. 1 cars, 58 UTDC No. 2 cars, and 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.

Up until 2009, the Blue Line fleet was comprised of Hawker-Siddeley No. 4 cars, which are now retired. Between 2007 and 2009 the Authority acquired new Siemens No. 5 cars. The Blue Line currently has a fleet size of 94 No. 5 cars.

The Orange Line fleet consists of 120 Hawker-Siddeley No. 12 series cars. Preventive maintenance inspections on these vehicles occur on a 90-day interval and every 12,000 miles.

MBTA Heavy/Light Rail Revenue Vehicle Fleets

Line	Fleet Name	Service Dates	Rebuilt	Age	Quantity	Qty. by Line
Red Line						
Red	No. 1 Fleet	1968-69	1985-88	45-46	74	218
Red	No. 2 Fleet	1987-88	Ongoing	26-27	58	
Red	No. 3 Fleet	1994	-	20	86	
Blue Line						
Blue	No. 5 Fleet	2007-09	-	5-7	94	94
Orange Line						
Orange	No. 12 Fleet	1979-81	-	33-35	120	120
Green Line						
Green	PCC Cars	1946	1983, '05	68	10	219
Green	No. 7 Fleet	1986-88	Ongoing	26-28	95	
Green	No. 7 Fleet	1997	-	17	19	
Green	No. 8 Fleet	1999-2008	-	6-15	95	
Total Heavy and Light Rail Revenue Vehicles						**630**

As of January 2014

The Green Line fleet is made up of 219 light rail vehicles (LRVs): 114 Kinki-Sharyo No. 7 cars, 95 Breda No. 8 cars, and 10 active Presidents' Conference Committee (PCC) vehicles, which are the oldest fleet on MBTA property.

The useful life of subway rolling stock is at least 25 years or more (depending on the number of miles travelled). 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, HVAC, traction motors and overhead blower motors.

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

FUNDED PROJECTS

The eight projects in the subway vehicle program replace vehicle fleets on the Blue, Red and Orange lines, perform major overhauls and component replacements for 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. Note that all of the projects listed below for the Red and Orange lines reflect investments in existing fleets on these lines prior to the procurement of new fleets through the Transportation Finance Legislation (see page 15). These investments are necessary to ensure that existing fleets remain reliable as the MBTA proceeds with acquiring the new vehicles.

☑ Red Line No. 1 Car Reinvestment

This project performs 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 Selective Systems 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. 7 Car Selective Systems 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.

☑ Green Line No. 8 Cars Car Reliability Improvements Program

This project will fund the upgrade of various components of the low-floor Green Line (No. 8) cars.

☑ Orange Line Cars 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.

☑ Blue Line No. 5 Car Procurement

This project funded the procurement of 94 new Blue Line cars, allowing for six-car train service and increased capacity on the Blue Line. This procurement increased the overall size of the Blue Line fleet and has resulted in better service, passenger comfort, and reliability.

☑ Various Subway Vehicles Projects, including a Dynamic Envelope Study (for the Orange, Red and Green Lines)

With new car designs being developed, including roof mounted HVAC units and gap mitigation devices, builders will need accurate dynamic clearance envelope dimensions to assure compatibility with the infrastructure. The Dynamic Envelop Study project funds a modern approach to right-of-way (ROW) clearance measurement. Also, a model can be provided that will clearly define overhead, sidewall, platform and undercar clearances.

Subway Revenue Vehicles Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Red Line No. 1 Car Reinvestment	$ 2.16	$ -	$ 1.08	$ 1.08	$ -	$ -	$ -	$ 2.16	$ -
Red Line No. 2 Car Selective Systems Overhaul	53.46	39.80	7.22	6.44	-	-	-	13.66	-
Red Line No. 3 Upgrade	8.70	7.06	0.76	0.75	0.13	-	-	1.64	-
Green Line No. 7 Car Selective Systems Overhaul	162.45	22.66	44.17	55.60	38.61	1.41	-	139.78	-
Green Line No. 8 Car Reliability Improvements Program	39.87	-	14.62	13.79	10.44	1.03	-	39.87	-
Orange Line Cars Reinvestment	15.60	13.27	2.34	-	-	-	-	2.34	-
Blue Line Car No. 5 - Procurement	207.35	199.08	8.27	-	-	-	-	8.27	-
Various Subway Vehicle Projects	76.48	4.57	23.74	29.56	18.61	-	-	71.91	-
Total Subway Vehicles	**$ 566.08**	**$ 286.45**	**$ 102.19**	**$ 107.21**	**$ 67.78**	**$ 2.44**	**$ -**	**$ 279.63**	**$ -**

COMMUTER RAIL REVENUE VEHICLES

The commuter rail fleet consists of 426 passenger coaches and 80 locomotive units. Generally, top-deck overhauls are scheduled for locomotives on a 7.5-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 Name	**Service Dates**	**Rebuilt**	**Age**	**Quantity**	**Qty. by Type**
Locomotives					
F40PH-2 Locomotives	1979	1991	35	16	80
F40PH-2C Locomotives	1987	2003	27	25	
F40PHM-2C Locomotives	1991	2004	23	12	
GP40-MC Locomotives	1974	1997-98	40	25	
MP36PH "UTA" Locomotives	2011 (Built in 2009)	-	5	2	
Coaches					
Pullman Coaches	1977	1996	37	57	426
MBB Coaches	1987-1988	-	26-27	67	
Bombardier A Cars	1987	-	27	40	
Bombardier B Cars	1989-1990	-	24-25	106	
Bi-Level Kawasaki Coaches	1990-1991	2013-14	23-24	75	
Bi-Level Kawasaki Coaches	1997	2013	17	17	
Bi-Level Kawasaki Coaches	2000	2014	14	15	
Bi-Level Kawasaki Coaches	2005	-	9	33	
Hyundai Rotem Coaches	2013-2014	-	1	16*	
Total Commuter Rail Vehicles					**506**

**59 additional Hyundai Rotem coaches are scheduled for service in 2014*

As of January 2014

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 (Chapter 15). The overhaul projects represent normal preventive maintenance and will have a neutral impact on the Authority's operating budget.

☑ Commuter Rail Locomotives Top-Deck Overhaul:

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.

☑ Locomotive and Coach Reliability and Safety Program (CRASP)

This project funds the overhaul of key components of the locomotive and coach fleet. 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.

☑ Commuter Rail Vehicle Improvement Program

This project supports high performance levels for the commuter rail fleet. This program will help to fund the procurement and/or rehabilitation of commuter rail locomotives and coaches, including top-deck and midlife overhaul work and other upgrades to vehicles.

☑ Locomotive Procurement (42)

This project funds the procurement of 42 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.

Commuter Rail Revenue Vehicles Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Top Deck Overhaul of (25) Locomotives	$ 39.56	$ 15.78	$ 11.68	$ 9.29	$ 2.82	$ -	$ -	$ 23.79	$ -
Locomotive & Coach Maintenance Program (CRASP)	47.64	37.20	6.10	4.34	-	-	-	10.44	-
Commuter Rail Vehicle Improvement Program	47.00	-	-	-	10.00	10.00	27.00	47.00	-
Locomotive Procurement	266.39	97.46	73.07	95.86	-	-	-	168.93	-
Coach Procurement - Hyundai Rotem (75 units)	232.30	133.45	27.74	29.80	26.00	-	15.30	98.85	-
Coach Overhaul - Kawasaki (75 units)	125.67	17.36	11.59	20.00	25.00	25.00	15.23	96.82	11.50
Total Commuter Rail Vehicles	**$ 758.57**	**$ 301.25**	**$ 130.17**	**$ 159.29**	**$ 63.82**	**$ 35.00**	**$ 57.53**	**$ 445.82**	**$ 11.50**

BUS REVENUE VEHICLES

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 185 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 1,071 active buses: 362 compressed natural gas (CNG) low-floor buses, 503 emission-controlled diesel buses, 121 diesel buses, and 85 alternate power vehicles, which are composed of 28 electric trolley vehicles, 32 dual-mode buses, and 25 hybrid buses. All buses have the ability to provide automatic vehicle location information, via a Global Positioning System (GPS) unit, to 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.

In 2003 the average age of the bus fleet was 14 years. By 2007 the average age of the bus fleet dropped to 5.7 years. As of 2014, the average age of the active bus fleet is 7.7 years. In short, the MBTA's goal is to improve its bus fleet through new equipment, customer service initiatives, and increased reliability.

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.

All 40-foot coaches and CNG vehicles have a 12-year useful life, and trackless trolleys have a 15-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, 790 vehicles for THE RIDE with useful lives of 6-7 years are included in the bus revenue vehicle fleet. The following is a roster of the MBTA's bus fleets:

Compressed Natural Gas (CNG) Buses

2001 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. These low-floor buses are 60-feet long and offer more seats and expanded capacity compared to a traditional 40-foot bus. 21 of these vehicles are used for Silver Line Phase I service.

2003 North American Bus Industries (NABI) CNG Buses
This fleet of 299 buses, which entered service in 2003, is fueled by clean-burning compressed natural gas and offers 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 121 vehicles, which are equipped with both wheelchair lifts and air conditioning. The fleet has reached the end of its useful life.

2004 Neoplan Emission-Controlled Diesel (ECD) Buses
This group of 193 buses 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.

2006-2009 New Flyer Emission-Controlled Diesel (ECD) Buses
155 buses from this group entered service in 2006 and 2007. This package included an option for 155 additional buses delivered in 2008 and 2009. This option brought the total number of vehicles to 310 units. This fleet is fueled by engines running on ultra-low sulfur diesel fuel.

Alternative Power Buses

2004 Neoplan Electric Trolley Buses
This fleet of 28 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.

2004-2006 Neoplan 60-foot Dual-Mode Articulated Buses
This 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 controlled, 500 Hp, Detroit Diesel, Series 60 Engine running on ultra-low sulfur diesel fuel with a diesel particulate filter.

2009 Hybrid Buses
25 New Flyer Hybrid buses were procured in 2009. 3 of these buses are used for the Phase I portion of the Silver Line.

MBTA Bus Revenue Fleets					
Fleet Name	**Service Dates**	**Rebuilt**	**Age**	**Quantity**	**Qty. by Type**
Compressed Natural Gas (CNG) Vehicles					
New Flyer CNG 40-ft	2001	-	13	17	362
NeoPlan CNG 60-ft **(a)**	2003	-	11	44	
NABI CNG 40-ft	2003	2012-12	11	299	
Diesel Vehicles					
"Zero-Series" 40-ft	1994-1995	2000	19-20	121	542
NeoPlan ECD 40-ft	2004	Ongoing	10	193	
New Flyer ECD 40-ft	2006-2009	-	5-8	310	
Alternative Power Vehicles					
Electric Trolley Buses	2004	-	10	28	85
Dual-Mode Articulated 60-ft	2004-2006	Planned	8-10	32	
New Flyer Hybrid 60-ft	2009	-	5	25	
Total Number of Vehicles					**1,071**

As of January 2014

THE RIDE REVENUE VEHICLES

As of August 2013, the Authority's paratransit program, THE RIDE, had a fleet of 488 sedans and taxis and 302 lift-equipped vans. The MBTA owns 65% of the fleet, which consists of 212 sedans (with a useful life of 6 years) and 300 vans (with a useful life of 7 years). The remaining 278 vehicles, or 35% of the fleet, are owned and maintained by three private firms. All preventative maintenance is performed by the three RIDE contractors.

THE RIDE Vehicle Fleets				
Ownership	**Type of Vehicle**	**Quantity**	**Qty. by Type**	**% by Type**
MBTA-owned	Sedans	212	512	65%
	Vans	300		
Contractor-owned	Sedans	276	278	35%
	Vans	2		
Total RIDE Vehicles			**790**	**100%**

As of August 2013

FUNDED PROJECTS

The majority of spending in the five approved projects in the bus program is for the procurement of new buses. The existing fleet is also receiving substantial funding for overhaul programs.

☑ 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 Overhaul Program

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 Systems Improvements

This effort includes a number of projects aimed at improving bus operational efficiency including the CNG fuel efficiency project and the "No Start" Failure in Service reduction effort.

☑ Bus Procurement

This project funds the replacement of 392 buses with new buses (348 40-foot vehicles and 44 60-foot vehicles). Note that the State is funding a portion of this procurement effort through the Transportation Finance Legislation (page 17). The cash flow for the total procurement is listed in the note below the table.

Bus Revenue Vehicles Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
310 ECD New Flyer 40' Buses	$ 119.51	$ 119.51	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Bus Overhaul Program	234.17	166.74	29.86	34.04	3.48	0.07	-	67.43	-
RIDE Vehicle Program	16.05	1.34	-	-	-	7.00	7.71	14.71	-
Bus Systems Improvements	1.65	-	-	-	-	-	1.65	1.65	-
MBTA-Funded Bus Procurement (1)	206.47	1.08	14.66	149.48	41.26	-	-	205.39	-
Total Bus and RIDE Vehicles	**$ 577.85**	**$ 288.66**	**$ 44.51**	**$ 183.52**	**$ 44.73**	**$ 7.07**	**$ 9.36**	**$ 289.19**	**$ -**
(1) Total Bus Procurement (MBTA + State Funding)	*$ 356.47*	*$ 1.08*	*$ 14.66*	*$ 149.48*	*$ 87.25*	*$ 102.78*	*$ 1.23*	*$ 355.39*	*$ -*

SILVER LINE REVENUE VEHICLES

The Silver Line, a Bus Rapid Transit (BRT) system, provides service from Dudley Square, through downtown, South Station, the South Boston Seaport District, and to 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 21 60-foot Neoplan articulated Compressed Natural Gas (CNG) buses (out of a total fleet size of 44 buses) currently provides service to Phase I of the Silver Line between downtown and Dudley Square, along the exclusive bus-only portions of Washington Street. These vehicles, acquired in 2003, are expected to have a useful life of 12 to 15 years (depending on the number of miles travelled). They are powered by clean-burning compressed natural gas, equipped with low floors for easy boarding, and are air-conditioned.

2004-2006 NeoPlan 60-foot 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**.**

2009 Hybrid Buses
3 of the 25 New Flyer Hybrid buses procured in 2009 are used for the Phase I portion of the Silver Line.

MBTA Silver Line Fleets			
Fleet Type	**Silver Line Phase**	**Service Dates**	**Quantity**
NeoPlan CNG 60-ft	Phase I	2003	21
Dual Mode Articulated 60-ft	Phase II	2004	32
New Flyer Hybrid 60-ft	Phase I	2009	3
Total Number of Vehicles			**55**

As of January 2014

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 the purchase of 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 Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Washington St. Vehicles (Phase I)	$ 13.22	$ 13.22	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Silver Line Vehicles	**$ 13.22**	**$ 13.22**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

Courthouse Station (Silver Line)

FERRY SERVICE REVENUE VEHICLES

The MBTA operates ferry service on 3 routes between Boston, various points in the inner Boston Harbor, and 3 terminals on the South Shore. Two of the vessels 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 Ferry Service Revenue Vessels					
Vessel	**Service Date**	**Length**	**Pass. Capacity**	**Route**	**Qty.**
MBTA Owned					
Flying Cloud	1996	76'	149	F2/F2H	2
Lightning	1996	76'	149	F2/F2H	
Contracted Service					
Rookie	1979	57'	112	F4	6
Rita	1982	58'	149	F4	
Clare	1983	61'	128	F4	
Massachusetts	1988	88'	346	F1	
Asteria	1998	110'	400	F1	
Aurora	1999	122'	400	F1	
Back-up Vessels					
James Doherty	1996	100'	348	F1	4
Salacia	2000	155'	600	F1	
Cetecea	1999	83'	250	F1/F2/F2H	
Nathanial Bowditch	1994	80'	149	F2/F2H	
Total Number of Vessels					**12**

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

As of November 2013

FUNDED PROJECTS

The spending in the approved projects is for the overhaul of engines, replacement of vessels and enhancement of docks, buildings and other supporting infrastructure.

☑ 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 costs 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 FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Ferry System Improvements	$ 17.10	$ 3.53	$ 0.32	$ 1.58	$ 5.57	$ 4.32	$ 1.77	$ 13.57	$ -
Boat Engine Overhaul Program	2.91	2.11	0.29	0.50	-	-	-	0.79	-
Catamaran for Quincy Harbor	13.58	0.11	5.62	7.85	-	-	-	13.46	-
Total Ferry Boats	**$ 33.58**	**$ 5.75**	**$ 6.23**	**$ 9.93**	**$ 5.57**	**$ 4.32**	**$ 1.77**	**$ 27.82**	**$ -**

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CHAPTER 2

NON-REVENUE VEHICLES

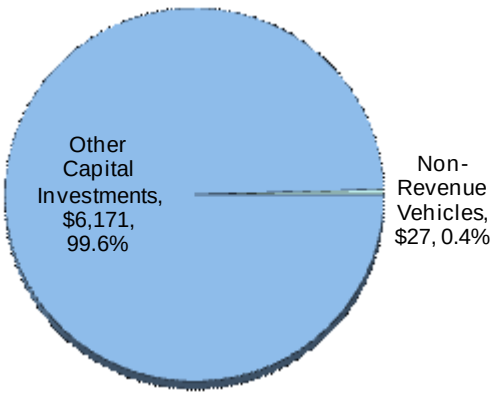
PROGRAM OVERVIEW

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 vary greatly, and include rail-mounted and rubber-tired cars, trucks, sedans, police cruisers, snow plows, track geometry cars, brush cutters, and spreaders. Maintenance-of-way equipment includes 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 $27 million in non-revenue vehicles. This represents 0.4% of the total Capital Investment Program

Non-Revenue Vehicles Funding
($ in millions, % of total CIP)



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 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 more than 1,000 systemwide non-revenue vehicles and equipment.

☑ Snow Fighting Equipment
This project funds the replacement of aging snow-fighting equipment.

Systemwide Non-Revenue Vehicles Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Systemwide NRV Program	$ 36.04	$ 11.72	$ 14.14	$ 1.52	$ 0.56	$ 4.25	$ 3.86	$ 24.32	$ -
Snow Fighting Equipment	3.58	0.75	-	-	1.00	1.00	0.83	2.83	-
Total System Non-Revenue Vehicles	**$ 39.61**	**$ 12.47**	**$ 14.14**	**$ 1.52**	**$ 1.56**	**$ 5.25**	**$ 4.69**	**$ 27.15**	**$ -**

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CHAPTER 3

TRACK/RIGHT-OF-WAY

PROGRAM OVERVIEW

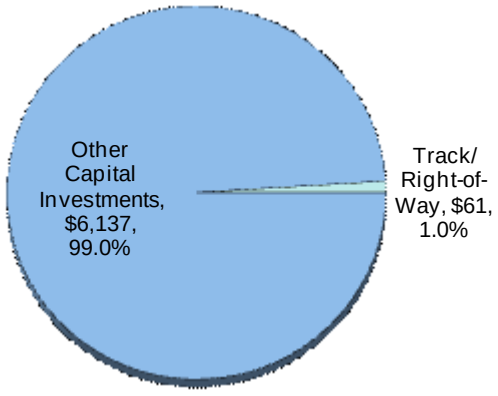
The MBTA currently operates light and heavy rail transit on 191 miles of track. The commuter rail system is operated on 655 miles of track. On each rail line, replacement efforts are programmed for different segments based upon geographic location or type of track construction.

The right-of-way (ROW) generally consists of the actual steel rails of the track, rock or dirt ballast that act 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 $61 million towards track/right-of-way, which represents 1.0% of the total Capital Investment 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
($ in millions, % of total CIP)



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 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 (Chapter 4).

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 Mattapan-Ashmont Trolley segment of the Red Line is powered by overhead wire.

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, 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 three 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.

☑ Green Line Frog Replacement Program

The project will include the survey, design and fieldwork necessary to replace existing frogs (to enable crossovers between tracks) throughout the Green Line. This includes the central subway, surface line and the Highland Branch.

☑ Switch Replacement and Track Reconstruction

The project will fund replacement of mechanical switches and track segments 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 FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Green Line Frog Replacement Program	$ 5.00	$ -	$ 1.00	$ 1.00	$ 1.00	$ 1.00	$ 1.00	$ 5.00	$ -
Yard Switch Replacement & Track Reconstruction	16.00	-	5.70	4.30	4.50	1.20	0.30	16.00	-
Systemwide Track Upgrades	43.52	24.24	4.34	14.94	-	-	-	19.28	-
Total Subway Track/ROW	**$ 64.52**	**$ 24.24**	**$ 11.04**	**$ 20.24**	**$ 5.50**	**$ 2.20**	**$ 1.30**	**$ 40.28**	**$ -**

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 655 miles of track, 1.5 million timber crossties and switch timbers, 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.

RECENTLY FUNDED PROJECTS

It is expected that the commuter rail track projects listed below will have a neutral impact on the operating budget.

☑ Old Colony Line Tie Replacement Project

This project will fund the replacement of railroad ties along the Old Colony corridor.

☑ Timber Tie Replacement at Interlocking - Attleboro

This project will fund the replacement of railroad ties at Interlocking in the Attleboro line.

☑ 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 FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Old Colony Line Tie Replacement Project	$ 84.33	$ 73.04	$ 11.29	$ -	$ -	$ -	$ -	$ 11.29	$ -
Timber Tie Replacement at Interlocking - Attleboro Line	0.56	-	0.56	-	-	-	-	0.56	-
Haverhill Double Tracking/Other Track Improvements	9.50	0.57	6.79	-	-	-	2.14	8.93	-
Total Commuter Rail Track/ROW	**$ 94.39**	**$ 73.61**	**$ 18.64**	**$ -**	**$ -**	**$ -**	**$ 2.14**	**$ 20.78**	**$ -**

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CHAPTER 4

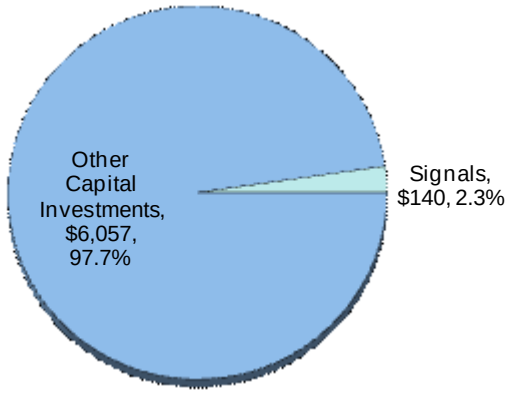
SIGNALS

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 to maintain 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 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

Signal Projects Funding
($ in millions, % of total CIP)



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 $140 million for signals. The signal program represents 2.3% 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.

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) 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.

- 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.

- 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 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.

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 in Chapter 5).

FUNDED PROJECTS

Currently, there are five 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.

☑ SWR Subway installation
This project will fund a variety of enhancements related to the subway signal system.

☑ Red Line Signal Cable Replacement
This effort will fund the replacement of signal cables on various segments along the Red Line network.

☑ Green Line Signal System Upgrades
This effort provides improved signalization at a number of locations along the Green Line.

☑ 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.

Subway Signals Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Systemwide Signal Upgrades	$ 34.13	$ 12.02	$ 10.62	$ 8.50	$ 3.00	$ -	$ -	$ 22.12	$ -
SWR Subway Installation	3.00	-	3.00	-	-	-	-	3.00	-
Red Line Signal Cable Replacement	29.00	1.10	3.90	12.00	8.00	4.00	-	27.90	-
Green Line Signals	43.03	0.24	12.15	11.80	8.73	5.68	4.44	42.79	-
Red Line Signals - Columbia Junction	91.77	53.85	16.15	19.64	2.13	-	-	37.92	-
Total Subway Signals	**$ 200.94**	**$ 67.22**	**$ 45.81**	**$ 51.93**	**$ 21.86**	**$ 9.68**	**$ 4.44**	**$ 133.72**	**$ -**

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 bungalows/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 PROJECTS

There are two commuter rail signal projects. These projects do not have a direct impact on the operating budget.

☑ Signal Systems Upgrades – Reading Junction to Fells
This project will upgrade the signal system between Reading Junction and Fells.

☑ 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 FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Signal System Upgrades - Reading Junction to Fells	$ 6.50	$ -	$ 2.00	$ 1.50	$ 1.50	$ 1.50	$ -	$ 6.50	$ -
Fitchburg Line Signal Upgrade	0.11	-	0.11	-	-	-	-	0.11	-
Total Commuter Rail Signals	**$ 6.61**	**$ -**	**$ 2.11**	**$ 1.50**	**$ 1.50**	**$ 1.50**	**$ -**	**$ 6.61**	**$ -**

CHAPTER 5

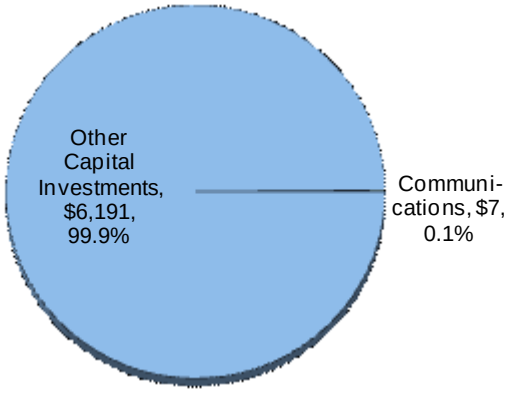
COMMUNICATIONS

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 Center (OCC). Given the rapid evolution of technology, since these systems have been acquired and developed over time, they vary significantly in age and condition.

The current program dedicates $7 million to funding for communications programs. This represents 0.1% of the total Capital Investment Program.

Communications Programs Funding ($ in millions, % of total CIP)



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, heavy rail, 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

The systemwide radio system incorporates a digital trunking radio system. This radio system incorporates 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
- Network Management Software

Through ongoing efforts, the Communications Department is expanding the WAN to all facilities within the Authority. This provides 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. The 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, 381 two-line electronic (LED) variable message signs provide a visual component of the audio broadcasts.

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 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, a single funded communications projects is underway. The systemwide radio project will generate savings for the Authority's 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.

Communications Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Systemwide Communications Enhancements	74.71	68.00	5.55	1.16	-	-	-	6.71	-
Total Systemwide Communications	**$ 74.71**	**$ 68.00**	**$ 5.55**	**$ 1.16**	**$ -**	**$ -**	**$ -**	**$ 6.71**	**$ -**

CHAPTER 6

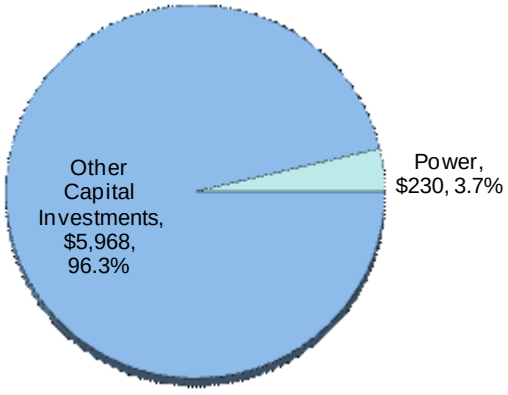
POWER

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, switchboards, switch heaters, manholes, and ductiles (as well as storage facilities for cable and power equipment). 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.

Power Projects Funding
($ in millions, % of total CIP)



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 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 $230 million toward power. Investment in power programs represents 3.7% of the Capital Investment Program.

SUBWAY POWER

Subway power covers all aspects of the Authority's heavy 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: 16 on the Red Line, 10 on the Green Line, 18 on the Orange Line, 4 on the Blue Line, and 2 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 High Speed 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 heavy and light rail systems. These systems provide power and offer protection for customers, Authority equipment, and the system overall. Low voltage switchgears feed power to the subway signal system, pump rooms, car houses, escalators, elevators, fire alarm systems, Amtrak and

subway signal systems, ventilation, 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 Traction Power Upgrades
The project involves a complete refurbishment of five traction power substations on the Red Line: Columbia, Tenean, Wollaston, North Quincy, and Quincy Center. In addition, the project replaces two open-faced/elevated DC breakers on the Red Line. This will improve safety for MBTA personnel and service reliability for passengers.

☑ Red Line DC Cable Upgrade Phase I Andrew-Kendall
This project will fund the replacement of 110,000 feet of 600V DC cables from Andrew Square Station to Kendall Station.

☑ Orange Line AC & DC Breaker Upgrade
This project will entail major refurbishment of AC and DC traction power equipment in four substations that supply power to the Orange Line north of Haymarket Station.

☑ Orange Line DC Cable Upgrade Ph 1 Back Bay - North
This effort will focus on the replacement of 110,000 feet of 600V DC cables from Back Bay Station to North Station.

☑ Green Line Power Study
The project funds a study of power needs and capacity on the Green Line based on use of the No. 8 car.

☑ Traction Power Substation Phase 1
This project will include the rehabilitation or replacement of traction power substations throughout the Orange Line, which have exceeded their useful life.

☑ Traction Power Substation Phases 2-4
This project will include the rehabilitation or replacement of traction power substations throughout the system (except for those along the Orange Line), 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.

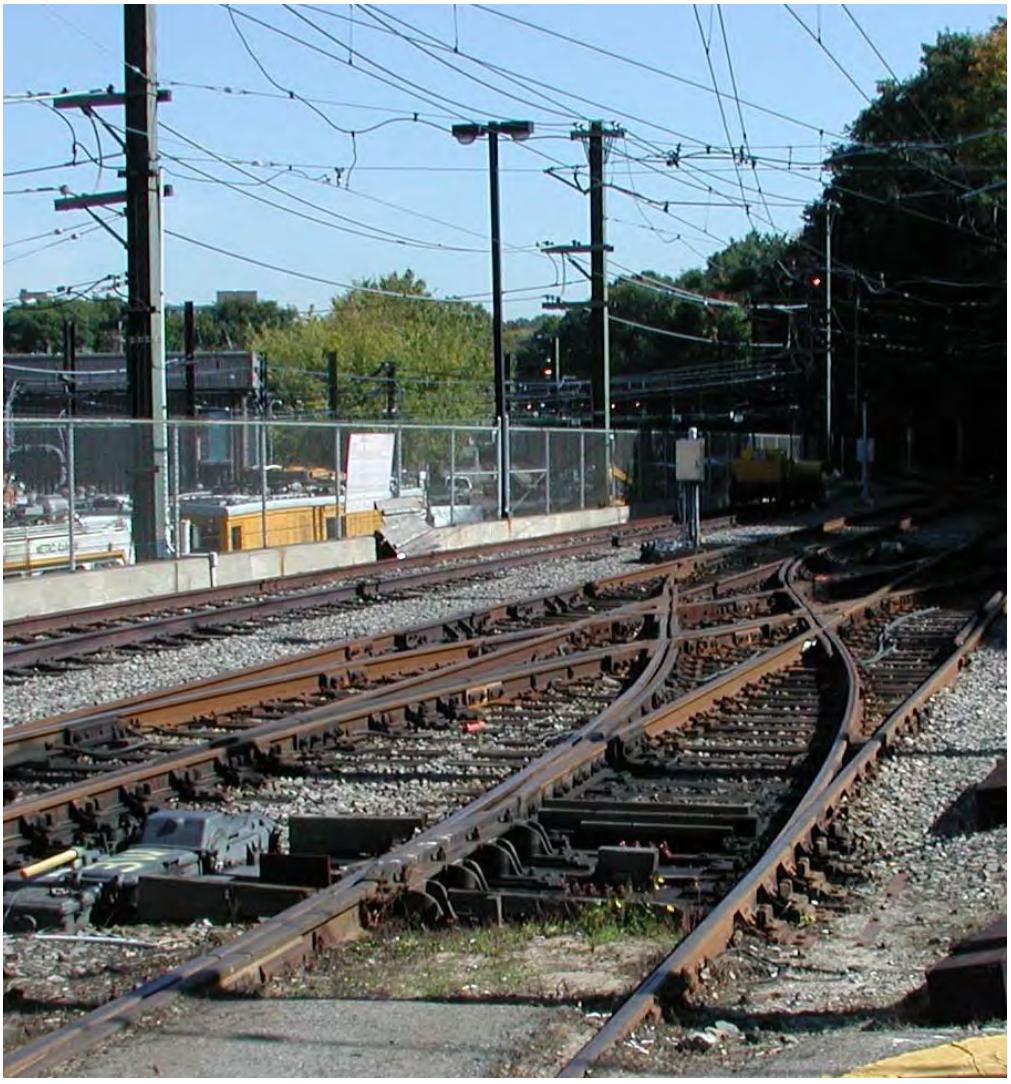
☑ Unit Substation Upgrades
This program includes upgrades to unit substation in the Red Line (Alewife to Harvard) and the Green Line.

☑ Orange Line Infrastructure Improvements
This program provides funding for various power 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.

Subway Power Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Red Line Traction Power Upgrade	$ 27.12	$ 11.01	$ 4.01	$ 7.66	$ 2.34	$ 1.00	$ 1.10	$ 16.11	$ -
Red Line DC Cable Upgrade - Phase 1 [Andrew-Kendall]	28.51	6.22	5.25	8.00	7.93	1.11	-	22.29	-
Orange Line Traction Power Upgrade	43.27	0.13	7.89	11.92	12.07	10.22	1.03	43.13	-
Orange Line DC Cable Upgrade Ph 1 Back Bay - North	21.73	6.03	4.10	6.55	5.05	-	-	15.69	-
Green Line Power Study	4.11	1.83	1.58	0.71	-	-	-	2.28	-
Transformer Replacement Program - Phase 1 (Orange Lin	15.00	4.17	2.26	2.00	2.00	2.00	2.57	10.83	-
Transformer Replacement Program - Phases 2-4 (All mod	45.02	1.17	16.71	15.26	11.87	-	-	43.85	-
Highland Branch AC Cable Replacement	13.40	12.17	1.24	-	-	-	-	1.24	-
Unit Substation Upgrades	53.14	33.34	8.97	7.29	3.54	-	-	19.79	-
Orange Line Power Infrastructure Improvements	8.00	2.47	1.40	4.13	-	-	-	5.53	-
Power Program	21.66	10.40	6.52	3.59	1.14	-	-	11.25	-
Total Subway Power	**$ 280.95**	**$ 88.95**	**$ 59.92**	**$ 67.11**	**$ 45.94**	**$ 14.33**	**$ 4.70**	**$ 192.00**	**$ -**



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.

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 2 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 in Chapter 5), 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. A substation is 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 PROJECTS

There are two funded projects under systemwide power. These projects will have a positive impact on the operating budget.

☑ Trackless Trolley Overhead Replacement
This effort funds the complete rebuilding of the Authority's Trackless Trolley Overhead System (OCS). Most of the work needed will take place in Cambridge, Watertown, and Belmont.

☑ 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 and the programmed replacement fleet of new Electric Trolley Buses in the future.

Systemwide Power Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Trackless Trolley Overhead Replacement	$ 36.70	$ 0.17	$ 9.05	$ 22.92	$ 4.56	$ -	$ -	$ 36.53	$ -
Trackless Trolley Catenary Improvements	4.00	2.85	-	-	-	-	1.15	1.15	-
Total Systemwide Power	**$ 40.70**	**$ 3.02**	**$ 9.05**	**$ 22.92**	**$ 4.56**	**$ -**	**$ 1.15**	**$ 37.68**	**$ -**

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CHAPTER 7

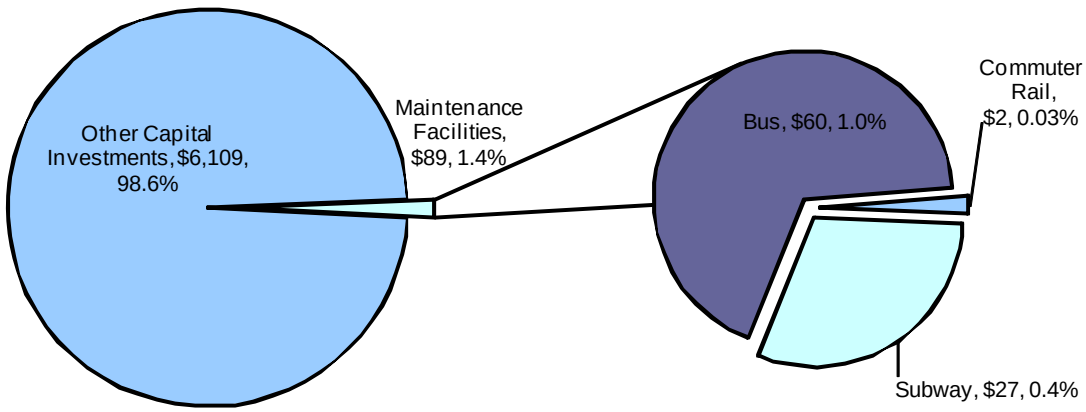
MAINTENANCE FACILITIES

PROGRAM OVERVIEW

Maintenance facilities, yards and shops, are the sites for regularly scheduled maintenance and emergency repairs of the revenue and non-revenue vehicle fleets. The Authority maintains 4 rapid transit yards and shops, 4 light rail, 3 commuter rail, 9 bus facilities, and one bus/subway repair shop. There are also 17 smaller general maintenance facilities throughout the system. 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 has placed additional

Maintenance Facilities Funding
($ in millions, % of total CIP)



demands on the personnel and facilities that maintain, repair, refuel, and service the vehicles. New fueling equipment, engine equipment designed for CNG buses, and maintenance and support equipment for longer 60-foot buses is required. Low-floor technologies on the No. 8 Green Line cars and incoming bus fleets have special needs as well.

The current program dedicates $89 million to maintenance facilities. 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 (Chapter 15).

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 (since it is light rail, the Mattapan High Speed Line is operated by the Green Line)
- 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 four 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 [Phases I, II and III]

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 6-car trains, new capacities and functions are needed at this facility.

Orient Heights Maintenance Facility (Blue Line Service)

☑ Maintenance Facilities Improvements:

Various facilities improvements include, but are not limited to the following:

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 Maintenance Facility.

Subway Maintenance Facilities Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Orient Heights Maintenance Facility Phase 1	$ 31.00	$ 30.51	$ 0.50	$ -	$ -	$ -	$ -	$ 0.50	$ -
Orient Heights Maintenance Facility Phase 2	20.71	20.38	0.33	-	-	-	-	0.33	-
Orient Heights Maintenance Facility Phase 3	9.00	5.00	2.00	2.00	-	-	-	4.00	-
Subway Facility Improvements	42.59	20.37	14.38	4.38	0.08	3.37	-	22.22	-
Total Subway Maintenance Facilities	**$ 103.30**	**$ 76.26**	**$ 17.20**	**$ 6.38**	**$ 0.08**	**$ 3.37**	**$ -**	**$ 27.04**	**$ -**

Wellington Maintenance Facility

COMMUTER RAIL MAINTENANCE FACILITIES

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

Boston Engine Terminal

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

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 Maintenance 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 FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Commuter Rail Maintenance Facilities Upgrades	$ 2.50	$ 0.64	$ 0.50	$ 0.50	$ 0.50	$ 0.36	$ -	$ 1.86	$ -
Total Comm. Rail Maintenance Facilities	**$ 2.50**	**$ 0.64**	**$ 0.50**	**$ 0.50**	**$ 0.50**	**$ 0.36**	**$ -**	**$ 1.86**	**$ -**

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 rehabilitation of existing bus facilities. These investments allow the maintenance of Compressed Natural Gas (CNG) and Emission-Controlled Diesel (ECD) 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 three 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.

☑ Arborway Bus Facility

This project involves the design of a bus maintenance and storage facility at the Arborway Yard. The use of this space since 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.

☑ 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.

Bus Maintenance Facilities Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Arborway Facility	$ 63.50	$ 30.86	$ 25.01	$ 7.63	$ -	$ -	$ -	$ 32.64	$ -
CNG Facility Retrofit	76.03	62.80	7.78	5.46	-	-	-	13.23	-
Bus Facilities Upgrades	33.43	19.14	8.20	1.90	0.85	1.85	1.49	14.29	-
Total Bus Maintenance Facilities	**$ 172.97**	**$ 112.80**	**$ 40.98**	**$ 14.99**	**$ 0.85**	**$ 1.85**	**$ 1.49**	**$ 60.16**	**$ -**

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.

CHAPTER 8

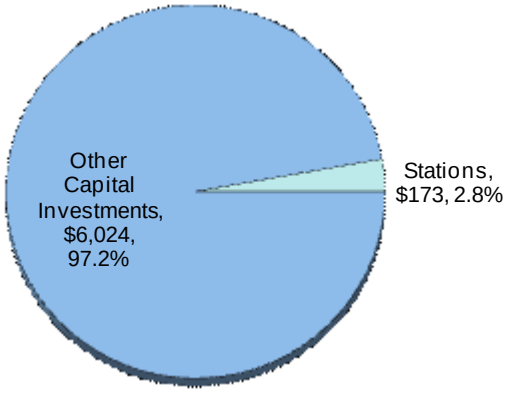
STATIONS

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 locations, 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 of this document (Chapter 11).

Stations Program Funding
($ in millions, % of total CIP)



The majority of this $173 million program is devoted to renovation of subway stations. 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 2.8% of the current Capital Investment Program. Most of the funding is invested in subway stations, particularly work to modernize Blue Line stations to allow for 6-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 13). New stations on the Silver Line and the Greenbush commuter rail line construction are covered under the System Expansion section (Chapter 15).

RAPID TRANSIT STATIONS

The MBTA has a total of 65 rapid transit stations and 63 light rail surface stations. The rapid transit stations includes 6 shared subway 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	14	
Red Line	20	
Light Rail		
Green Line	11	11
Subway Intermodal Stations		
Heavy and Light Rail	6	6
Silver Line		
Washington Street **(a)**	1	4
Waterfront **(b)**	3	
Total		**65**

(a) Dudley Square Station.
(b) 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
Central Line	9	2	
B-Line		18	
C-Line		13	
D-Line		13	
E-Line	2	9	
Mattapan Line		**8**	8
Total			**74**

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

Airport Station (Blue Line)

FUNDED PROJECTS

There are 13 funded subway station projects under the current plan. Five of these involve Blue Line station renovations and platform lengthening for 6-car trains. These 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 6-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 6-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.

☑ 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 funded improvements to the Fields Corner station by building a new street level headhouse, lowering the busways, and making the station fully accessible. The project allows easier access for all patrons, provides better service, and enhances bus-to-subway transfers.

Shawmut Station
The scope of this project consisted of waterproofing the station, making it fully accessible and renovating the headhouse. The project enhanced the comfort and convenience of the riding public.

☑ Red Line Ashmont Station Modernization
This effort funded 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 improved the efficiency of the station and provided riders with a more secure and comfortable environment.

Ashmont Station Rendering by Cambridge Seven Associates, Inc.

☑ Park Street Stair Replacement
This project funded the replacement of the steel staircase structures leading to the upper level of Park Street station.

☑ Station Platform Improvement Program
This project will fund repairs and upgrades to platforms at various subway stations, including the replacement of yellow tactile strips.

☑ Porter Square Station Improvements
This project will fund structural waterproofing work, including the replacement of pipes and the repair of drainage at upper platform areas.

☑ Old South Meeting House
This project will fund the remediation of leaks along the north wall of the Old South Meeting House caused by construction of an entrance to the State Street Station.

☑ Midlife Station Rehabilitation Upgrades
This effort provides new lighting, painting, signage, Customer Service Agent booth repairs, and other similar elements systemwide at various heavy rail, 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 FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Blue Line Orient Heights Station	$ 50.87	$ 36.83	$ 9.14	$ 3.25	$ 1.65	$ -	$ -	$ 14.04	$ -
Blue Line Maverick Station	55.02	53.70	1.32	-	-	-	-	1.32	-
Blue Line State St. Station	104.73	101.97	0.52	2.24	-	-	-	2.77	-
Blue Line Government Center Station	50.65	9.85	9.91	15.00	15.89	-	-	40.80	-
Blue Line Airport Station	37.23	36.57	0.66	-	-	-	-	0.66	-
Blue Line Platform Rehab	15.66	11.23	-	-	-	-	4.44	4.44	-
Red Line - Dorchester Stations	74.37	74.04	0.33	-	-	-	-	0.33	-
Red Line Ashmont Station - Phase I	70.09	69.31	0.78	-	-	-	-	0.78	-
Park Street Stairs	3.76	2.98	0.78	-	-	-	-	0.78	-
Station Platform Improvement Program	15.71	2.93	2.59	8.19	2.00	-	-	12.78	-
Porter Square Station Improvement	1.30	-	1.30	-	-	-	-	1.30	-
Old South Meeting House Drainage Improvements	1.39	-	1.39	-	-	-	-	1.39	-
Station Rehabilitation	64.56	27.37	21.68	6.75	2.00	3.00	3.77	37.19	-
Total Subway Stations	**$ 545.33**	**$ 426.76**	**$ 50.40**	**$ 35.43**	**$ 21.54**	**$ 3.00**	**$ 8.20**	**$ 118.58**	**$ -**

Forest Hills Station (Orange Line)

COMMUTER RAIL STATIONS

There are five commuter rail lines on the northside system, which terminate at North Station. The southside system has nine 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 14 commuter rail lines, as detailed in the chart below.

Ashland Station (Worcester Line)

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.

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

The Authority has two projects:

☑ Winchester Center Station
This project entails the design work for a project that eventually will include a number of improvements at the Winchester Center Commuter Rail station. Future work might incorporate: replacement of access ramps and upgrade to current ADA standards, new station lighting and signage, repainting of existing steel bridge and steel structures, and miscellaneous improvements to grounds and sidewalks.

☑ Ruggles Station Upgrades
This project addresses longstanding commuter rail capacity needs at Ruggles Station by adding an additional platform. This will allow a greater number of inbound trains to stop at the station.

☑ Station Upgrades
This project entails the upgrade and renovation of commuter rail stations.

In addition, 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).

Commuter Rail Station Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Winchester Center Station	$ 1.30	$ 0.32	$ 0.98	$ -	$ -	$ -	$ -	$ 0.98	$ -
Ruggles Station Upgrades	$ 25.00	$ 0.95	$ 10.72	$ 10.83	$ 2.50	$ -	$ -	$ 24.05	$ -
Station Upgrades	24.26	9.14	3.92	0.70	2.00	3.00	5.50	15.12	-
Total Commuter Rail Stations	**$ 50.56**	**$ 10.41**	**$ 15.61**	**$ 11.53**	**$ 4.50**	**$ 3.00**	**$ 5.50**	**$ 40.15**	**$ -**

BUS STATIONS, STOPS & FERRY SERVICE DOCKS

The MBTA operates 185 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 over 650 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 service docks.

Ferry Service 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 a neutral impact on the Authority's operating budget.

☑ Bus Stations Improvements
This effort will fund improvements to enhance customer service at heavily used bus stations.

Bus Stations Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Bus Stations Improvements	29.26	14.66	7.60	7.00	-	-	-	14.60	-
Total Bus Stations	**$ 29.26**	**$ 14.66**	**$ 7.60**	**$ 7.00**	**$ -**	**$ -**	**$ -**	**$ 14.60**	**$ -**

CHAPTER 9

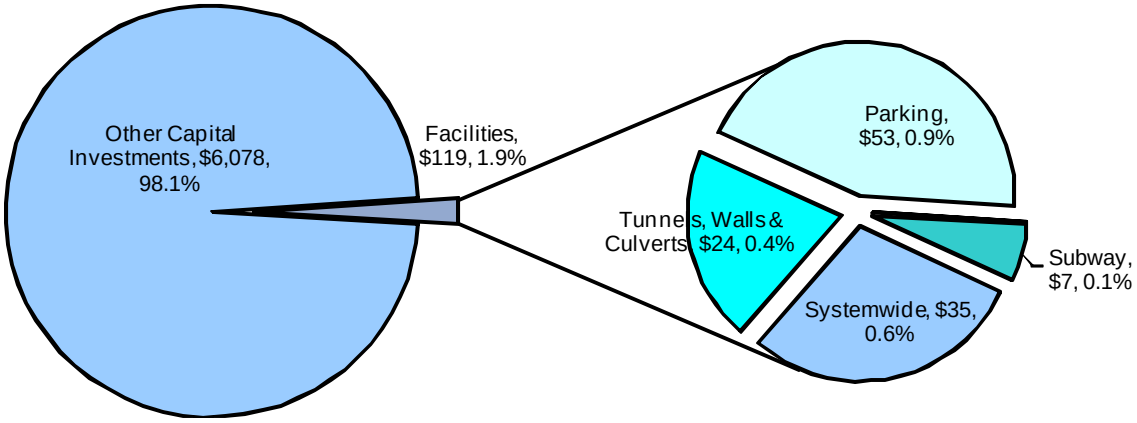
FACILITIES

PROGRAM OVERVIEW

Facilities include administrative buildings, operators' lobbies, vent buildings, storage buildings, noise walls, tunnels, culverts, retaining walls, layover facilities, parking garages, and parking lots.

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 system. Typically, facilities

Facilities Funding
($ in millions, % of total CIP)



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 $119 million toward facilities.

The facility program represents approximately 1.9% of the total Capital Investment Program for the next five years.

SUBWAY FACILITIES

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

FUNDED PROJECT

☑ Subway Facilities Improvements
This effort will encompass a number of efforts to improve subway facilities.

Subway Facilities Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Subway Facilities Improvements	$ 21.23	$ 14.07	$ 3.50	$ 1.22	$ 0.85	$ 0.75	$ 0.84	$ 7.16	$ -
Total Subway Facilities	**$ 21.23**	**$ 14.07**	**$ 3.50**	**$ 1.22**	**$ 0.85**	**$ 0.75**	**$ 0.84**	**$ 7.16**	**$ -**

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 to 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.

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, all of which will have a neutral impact on the Authority's operating budget.

☑ Systemwide Fire Suppression Systems
This effort will encompass a number of efforts to improve safety throughout the system's facilities, including the installation of fire-alarm and sprinkler systems.

☑ 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 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.

Systemwide Facilities Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Systemwide Fire Suppression Systems	$ 24.30	$ 5.07	$ 3.63	$ 8.51	$ 7.09	$ -	$ -	$ 19.23	$ -
Operations Facilities Upgrades	5.61	3.75	0.32	0.35	0.40	0.46	0.33	1.86	-
Hingham Shipyard Improvements	17.53	3.44	14.09	-	-	-	-	14.09	-
Total Systemwide Facilities	**$ 47.43**	**$ 12.26**	**$ 18.03**	**$ 8.85**	**$ 7.49**	**$ 0.46**	**$ 0.33**	**$ 35.17**	**$ -**

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 heavy rail 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 over 600 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

The following three projects scheduled for funding will have a neutral impact on the operating budget.

☑ Red Line Floating Slabs (Alewife – Harvard)
This project involves performing repairs to the floating slabs found between the Alewife and Harvard stations on the Red Line.

☑ Systemwide Tunnel Lighting
This project involves the renovation of all electric and lighting systems within the tunnels.

☑ 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 FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Red Line Floating Slabs (Alewife - Harvard)	$ 34.00	$ 34.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Systemwide Tunnel Lighting	8.00	7.00	0.25	0.25	0.25	0.25	-	1.00	-
Tunnel Rehabilitation	33.58	10.34	9.78	5.36	3.65	2.19	2.25	23.23	-
Total Tunnels, Walls, Culverts	**$ 75.58**	**$ 51.34**	**$ 10.03**	**$ 5.61**	**$ 3.90**	**$ 2.44**	**$ 2.25**	**$ 24.23**	**$ -**

PARKING FACILITIES

MBTA parking facilities include both open surface parking lots and enclosed parking garages. MBTA riders have access to over 47,000 MBTA-owned parking spaces as well as over 4,000 non-MBTA-owned spaces (see table).

MBTA Parking Spaces				
	MBTA	**Non-MBTA***	**Total**	**%**
Red Line	7,253	0	7,253	14%
Mattapan Line	298	0	298	1%
Orange Line	2,720	0	2,720	5%
Blue Line	3,713	0	3,713	7%
Green Line	2,019	0	2,019	4%
Bus	200	0	200	0.4%
Ferry	2,441	0	2,441	5%
Commuter Rail	28,548	4,358	32,906	64%
Totals	**47,513**	**4,358**	**51,871**	**100%**

**Parking facilities that are shared with local municipalities*

As of November 2013

Future Beverly Depot Parking Garage

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 parking spaces were built on stations along the Greenbush commuter rail line.

FUNDED PROJECTS

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

☑ 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.

☑ Alewife Parking Garage Rehab
The Alewife parking garage is being rehabilitated to ensure continued parking capacity and passenger comfort.

☑ 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.

☑ Parking System Upgrades
This effort helps fund general parking system upgrades.

Parking Facilities Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Woburn Magazine Hill Parking	$ 1.43	$ -	$ 0.88	$ 0.55	$ -	$ -	$ -	$ 1.43	$ -
Alewife Garage Improvements	9.51	5.37	-	1.90	1.46	0.78	-	4.14	-
South Shore Parking Garages Rehab	46.34	5.15	8.01	16.70	16.47	-	-	41.18	-
Parking System Upgrades	9.09	3.00	2.10	1.00	1.00	1.00	1.00	6.10	-
Total Parking Facilities	**$ 66.37**	**$ 13.52**	**$ 10.99**	**$ 20.15**	**$ 18.93**	**$ 1.78**	**$ 1.00**	**$ 52.85**	**$ -**

Alewife Station Parking Garage

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CHAPTER 10

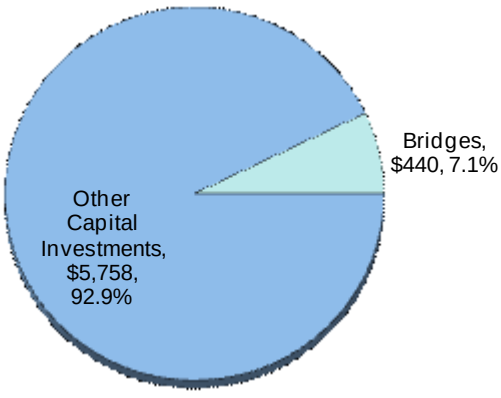
BRIDGES

PROGRAM OVERVIEW

Systemwide, the MBTA owns and maintains 465 bridges: 290 railroad, 57 transit, 78 highway and 40 pedestrian bridges. In addition to these bridges, 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 the rehabilitation/reconstruction of the bridges.

Bridge Projects Funding
($ in millions, % of total CIP)



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**	**Pedestrian**	**Total**
Blue Line	5	2	8	**15**
Red Line	26	35	11	**72**
Green Line	19	12	1	**32**
Orange Line	24	8	5	**37**
Commuter Rail	4	290	15	**309**
Totals	**78**	**347**	**40**	**465**

As of August 2013

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.

This program area totals $440 million and represents 7.1% of the total Capital Investment Program.

FUNDED PROJECTS

There are six active bridge projects. The majority of bridge reconstruction projects entail complete structure replacement. These efforts will have a neutral impact on the operations budget. The bridge projects that are part of the Fairmount Corridor Improvements Project are included in the System Enhancement section of this document (Chapter 14).

☑ 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, is in need of bearing work, steel repairs, and timber deck replacement.

☑ Rehabilitation of Two Shawsheen River Bridges
This project will fund the rehabilitation of two 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.

☑ 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.

☑ Shoreline Bridge Rehab
The project includes the rehabilitation and replacement of the entire superstructure, rehabilitation of existing substructures or construction of new support structures for the girders and trusses, rehabilitation of existing abutment and pier supports, and new retaining walls, etc.

☑ 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.

Bridge Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Merrimack River Bridge	$ 99.43	$ 7.27	$ 39.57	$ 35.99	$ 16.60	$ -	$ -	$ 92.17	$ -
Rehab of 2 Shawsheen River Bridges	15.00	12.33	-	2.67	-	-	-	2.67	-
Rehab of Dean Rd. and 2 Neponset River Bridges	24.39	11.50	10.16	2.72	-	-	-	12.89	-
Concord, Main St Bridge	9.00	5.65	3.35	-	-	-	-	3.35	-
Shoreline Bridge Rehab	2.33	1.06	1.27	-	-	-	-	1.27	-
Bridge Program	366.79	38.89	79.12	87.88	50.63	47.31	62.96	327.90	-
Total System Bridges	**$ 516.95**	**$ 76.70**	**$ 133.48**	**$ 129.27**	**$ 67.24**	**$ 47.31**	**$ 62.96**	**$ 440.25**	**$ -**

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CHAPTER 11

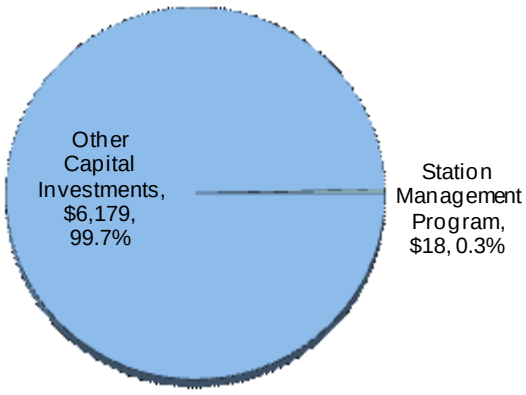
STATION MANAGEMENT PROGRAM

PROGRAM OVERVIEW

The Station Management Program 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, and 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, AFC equipment was deployed and functional at most stations throughout the system. This equipment allowed 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 distinctive uniforms for easy identification as they assist customers to increase convenience. AFC also introduced magnetic tickets and smart cards with more flexible fare structures and advanced customer service options. Electronic payment processing

Station Management Program Funding
($ in millions, % of total CIP)



allows for patrons to pay with cash, credit, or debit.

- **Hub Stations:** Six Hub Stations exist in the subway system at South Station, North Station, Airport, Back Bay, Downtown Crossing, and Government Center stations. Hub Stations enhance station management and safety through the monitoring of elevators, escalators, and fire and AFC-system alarms using closed circuit television (CCTV). 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 has installed 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 renovated Bus and Green Line garages with a new cash box receiver system and the Revenue Collection Facility with new AFC equipment for encoding smart cards and magnetic stripe tickets. In addition, the Authority purchased 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 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 Station Management Program is fully implemented, it will have a positive impact on the operating budget.

☑ Station Management Program – Phase I
The Station Management Program 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 Upgrades
This project will enable the MBTA to replace hardware that that has reached the manufacturers established "end-of-life", provide upgrades to critical software, and to continue its compliance with the Payment Card Industry Data Security Standard (PCI DSS).

Station Management Project ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Station Management Program - Phase I	$ 186.78	$ 185.05	$ 1.73	$ -	$ -	$ -	$ -	$ 1.73	$ -
AFC Upgrades	19.59	3.00	4.44	10.15	2.00	-	-	16.59	-
Total Station Mgmt. Program	**$ 206.37**	**$ 188.05**	**$ 6.18**	**$ 10.15**	**$ 2.00**	**$ -**	**$ -**	**$ 18.32**	**$ -**

CHAPTER 12

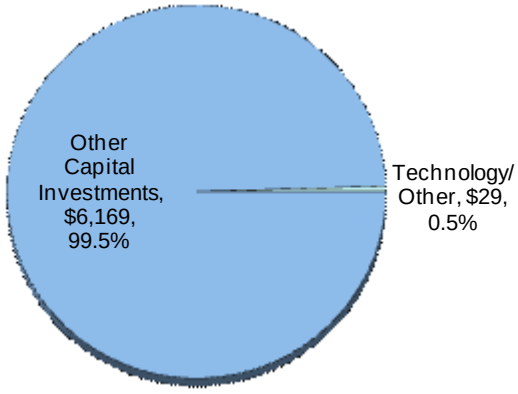
TECHNOLOGY / OTHER

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 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 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.

Technology / Other Funding
($ in millions, % of total CIP)



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: the ability to write recommendations, complaints, suggestions, and requests; the ability to report subway station cleaning or maintenance issues; the opportunity to learn about accessibility services for persons with disabilities ranging from elevators to kneeling buses, commuter rail access, and THE RIDE program. The MBTA's 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 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.

FUNDED PROJECTS

There are nine funded projects for the 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.

☑ 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 (local area network) to remote locations, purchase additional servers, and continue to replace administrative computers on a regular basis to conduct 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.

☑ Human Resource Business Continuity
This effort helped digitize critical information, such as benefits and employment history, which 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

[1] The International Academy of Digital Arts and Sciences is regarded as the Internet version of the Oscars, the Webbys honor excellence in innovation and comprehensiveness.

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, to perform subsurface testing, soil borings and archeological surveys, and audits, and to 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.

☑ Unified Planning Work Program
This program funds various planning efforts regarding development of the MBTA system in coordination with various outside planning agencies.

Technology / Other Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Misc. Project Closeout Costs	$ 3.42	$ 2.11	$ 0.20	$ 0.20	$ 0.20	$ 0.20	$ 0.51	$ 1.31	$ -
Capital Maintenance Improvements	8.67	-	1.50	2.00	2.00	2.00	1.17	8.67	-
Misc. Capital Projects	0.59	0.05	0.01	-	-	-	0.53	0.53	-
Computer Tech. Upgrades	21.14	11.74	9.16	0.25	-	-	-	9.41	-
HR Business Continuity	0.25	0.08	0.17	-	-	-	-	0.17	-
Bid/Dispatch System	1.50	-	-	-	-	-	1.50	1.50	-
Independent Engineering Review	10.48	6.83	-	-	-	-	3.66	3.66	-
Bond Costs	23.69	22.62	-	-	-	-	1.07	1.07	-
Unified Planning Work Program	5.17	2.96	0.53	0.53	0.53	0.53	0.11	2.21	-
Total System Technology/Other	**$ 74.92**	**$ 46.40**	**$ 11.56**	**$ 2.98**	**$ 2.73**	**$ 2.73**	**$ 8.55**	**$ 28.53**	**$ -**

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CHAPTER 13

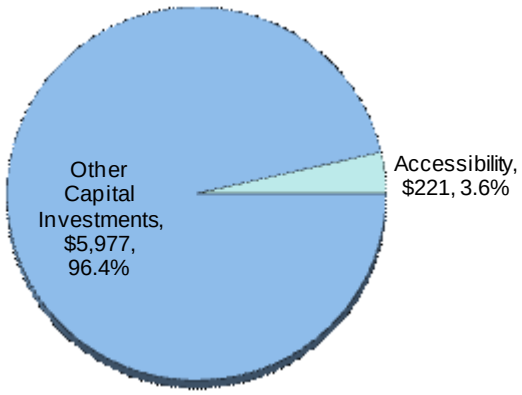
ACCESSIBILITY

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. Title II in the ADA prohibits public transportation systems from discriminating against persons with disabilities. The Federal 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. Of the 80 stations identified in the Key Station Plan, the MBTA has made 79 stations accessible. In addition, the Authority has allocated construction funds for the remaining station (Government Center Station), and has begun making dozens of non-key stations accessible as part of station modernization projects. Altogether, ongoing capital projects are bringing new accessibility benefits to MBTA passengers every day in the form of ramps, entrances, and elevators.

Accessibility Projects Funding
($ in millions, % of total CIP)



The MBTA has programmed $221 million toward accessibility. This represents 3.6% of the total Capital Investment Program. The largest category of accessibility funding is devoted to the Light Rail Accessibility Program (LRAP) for the Green Line to modernize stations,

install elevators, and raise platforms. Other capital projects included in the Stations and System Enhancement sections of this document also contribute substantial accessibility improvements to the MBTA system.

FUNDED PROJECTS

There are 16 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 the 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 includes 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, a new electrical substation, the installation of a new elevator, LED signage and accessible fare collection equipment, and 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, new headhouses, the installation of elevators, escalators, a new public address system, signage, and accessible fare collection equipment, 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.

☑ 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, and installing shelters, lighting, tactile edging, and pedestrian crossings.

☑ LRAP: Brookline Village and Longwood Stations
Scope for this project included the reconstruction of platforms for ADA accessibility and the installation of shelters, lighting, tactile edging, and pedestrian crossings.

☑ LRAP: Phases II & III – Surface Stations
This Project will fund the design and construction of selected Green Line surface stations along the B and C Lines.

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

☑ Symphony and Hynes Accessibility
This project funds the design of accessibility improvements for Symphony and Hynes Stations.

☑ Science Park Accessibility
This project funded design and accessibility upgrades for Science Park Station.

☑ Wollaston Accessibility
This project funds the design of accessibility improvements for Wollaston Station.

☑ Elevator Replacement and Modernization
This program provides funding for the replacement/modernization of elevators throughout the system.

☑ Escalator Replacement and Modernization
This program provides funding for the replacement/modernization of escalators throughout the system.

☑ Accessibility Program
The effort includes funding for accessibility improvements at various locations. Under this program there is funding for conceptual design work and preliminary engineering for the rehabilitation and accessibility upgrades of the Auburndale commuter rail station.

Accessibility Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Green Line Interim Access	$ 4.85	$ 3.79	$ 0.40	$ 0.66	$ -	$ -	$ -	$ 1.06	$ -
LRAP - Surface Stations	32.70	32.43	0.28	-	-	-	-	0.28	-
LRAP- Park St. & Haymarket	15.15	15.10	0.05	-	-	-	-	0.05	-
LRAP- Govt. Center Station	79.92	14.77	11.58	13.39	28.17	12.01	-	65.15	-
LRAP- Arlington & Copley	65.58	59.60	3.04	2.94	-	-	-	5.98	-
LRAP- Kenmore Station	49.69	45.70	4.00	-	-	-	-	4.00	-
LRAP- Boston College Station	3.29	0.89	0.73	0.65	0.52	0.49	-	2.40	-
LRAP- Brookline Village & Longwood	3.94	3.94	-	-	-	-	-	-	-
LRAP - Phases II & III - Surface Stations (B&C Lines)	5.00	-	0.15	0.34	1.71	1.57	1.24	5.00	-
Wayfinding Program	19.91	4.73	0.92	-	-	6.25	8.00	15.17	-
Symphony/Hynes Access	2.00	0.04	1.96	-	-	-	-	1.96	-
Science Park Accessibility	22.00	19.89	2.11	-	-	-	-	2.11	-
Wollaston Accessibility	7.50	1.03	5.67	0.80	-	-	-	6.47	-
Elevator Program	147.43	55.67	6.49	15.87	15.72	15.49	16.17	69.74	22.02
Escalator Program	35.00	11.03	10.35	3.50	3.50	3.50	3.12	23.97	-
Accessibility Program	30.30	12.54	6.10	7.84	3.83	-	-	17.77	-
Total Accessibility Program	**$ 524.27**	**$ 281.14**	**$ 53.83**	**$ 46.00**	**$ 53.44**	**$ 39.31**	**$ 28.52**	**$ 221.10**	**$ 22.02**

Courthouse Station (Silver Line)

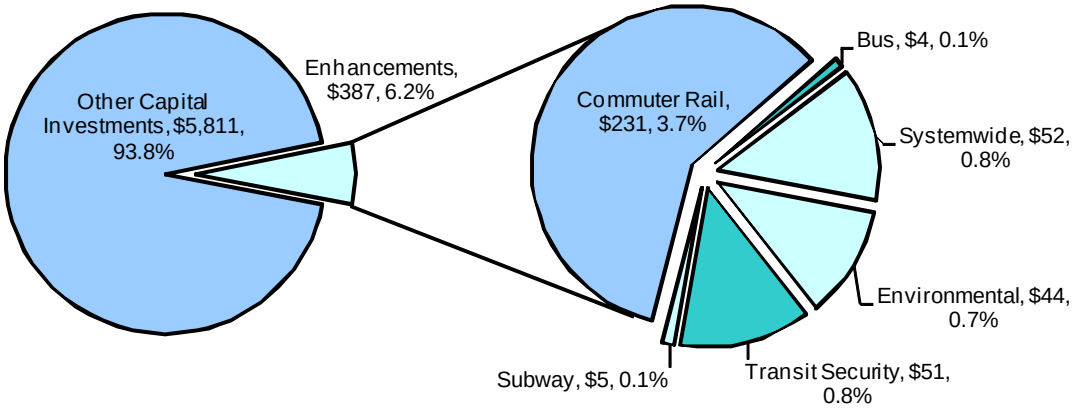
CHAPTER 14

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 effort under the enhancement program is the Fairmount Corridor Improvements project. This project will improve and revitalize an underutilized route through the neighborhoods of Dorchester, Mattapan, and Hyde Park. 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 system for all. Finally, this section also encompasses pilot programs and the evaluation of new technologies and equipment that may lead to the application of new methodologies and the construction of new infrastructure to enhance MBTA service in the future.

Enhancement Projects Funding
($ in millions, % of total CIP)



This program area totals $387 million and represents 6.2% of the total Capital Investment Program.

SYSTEM ENHANCEMENT—SUBWAY

FUNDED PROJECTS

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

☑ New Systemwide Public Address System / LED Signage
This project funded the installation of new public address equipment and fiber optic links for all subway stations. Existing voice storage units and control systems were upgraded or replaced. This project encompassed 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, 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.

☑ Southwest Corridor Study
This effort will fund a study that is aimed at evaluating infrastructure investments needed to improve service reliability along the Southwest Corridor of the Orange Line.

☑ Green Line Collision Avoidance Program
The purpose of this project is to identify technologies that can improve safety by reducing/eliminating collisions under current operating conditions.

Subway Enhancement Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
PA System /LED Station Sign	$ 29.19	$ 28.60	$ 0.59	$ -	$ -	$ -	$ -	$ 0.59	$ -
Park St. Eastbound. Crossover	3.90	0.62	0.50	0.93	1.23	0.61	-	3.28	-
Southwest Corridor Study	1.00	-	1.00	-	-	-	-	1.00	-
Green Line Collision Avoidance Program	2.73	2.32	0.41	-	-	-	-	0.41	-
Total Subway Enhancement	**$ 36.82**	**$ 31.54**	**$ 2.50**	**$ 0.93**	**$ 1.23**	**$ 0.61**	**$ -**	**$ 5.28**	**$ -**

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 five enhancement projects with neutral impact on the Authority's operating budget.

☑ Commuter Rail Positive Train Control (PTC)
The purpose of this project is to upgrade the commuter rail communications system.

☑ 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 Fairmont Corridor. (For information on this project's Phase II see Chapter 16.)

☑ Fitchburg Commuter Rail Line Upgrade
SAFETEA-LU (Safe, Accountable, Flexible and Efficient Transportation Equity Act: a Legacy for Users, the prior federal transportation spending authorization) 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. In addition, this project funds key track improvements along the Fitchburg Line.

☑ Commuter Rail Various Upgrades
This project funds general upgrades to various commuter rail systems (including track, signals and communication systems).

☑ 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.

Commuter Rail Enhancement Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Commuter Rail Positive Train Control	$ 114.20	$ 1.20	$ 100.82	$ 3.18	$ 4.00	$ 3.00	$ 2.00	$ 113.00	$ -
Fairmount Line Improvements - Phase I	33.92	33.92	-	-	-	-	-	-	-
Fitchburg Line Improvements	153.66	51.50	11.47	48.18	29.87	12.65	-	102.17	-
Commuter Rail Various Upgrades	41.75	28.68	13.02	0.05	-	-	-	13.07	-
Rockport Station Improvements	3.81	1.49	2.31	-	-	-	-	2.31	-
Total Comm. Rail Enhancement	**$ 347.35**	**$ 116.79**	**$ 127.62**	**$ 51.41**	**$ 33.87**	**$ 15.65**	**$ 2.00**	**$ 230.55**	**$ -**

SYSTEM ENHANCEMENT—BUS

This program authorizes enhancements for bus operations.

FUNDED PROJECTS

The following four projects will have a neutral impact on the Authority's operating budget.

☑ 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, Attorney General (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.

☑ THE RIDE – Information Management System
This effort funds an upgrade of THE RIDE information management system.

Bus Enhancement Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Bus Training Simulator	$ 2.00	$ 1.24	$ 0.76	$ -	$ -	$ -	$ -	$ 0.76	$ -
Environmental Management System (EMS)	5.45	2.57	1.28	0.40	0.40	0.40	0.40	2.88	-
THE RIDE - Information Management System	0.89	0.74	0.15	-	-	-	-	0.15	-
Total Bus Enhancement	**$ 8.34**	**$ 4.54**	**$ 2.19**	**$ 0.40**	**$ 0.40**	**$ 0.40**	**$ 0.40**	**$ 3.79**	**$ -**

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 five projects under systemwide enhancement. These efforts will have a neutral impact on the Authority's operating budget.

☑ Systemwide Enhancements
This line item supports various system enhancement efforts throughout the Authority, including an engineering study for commuter rail/subway service improvements at Ruggles Station.

☑ Daily Operations Resource Management System
To improve operational efficiency, this project will fund the implementation of a Daily Operations Resource Management System.

☑ Train and Bus Arrival Announcements
This project funds the necessary infrastructure and software improvements to provide MBTA customers with next train and countdown arrival time information.

☑ Maintenance Facilities Upgrades
This effort funds various upgrades to maintenance facilities across the system.

☑ Bicycle Enhancements
This effort funds the installation of a bike cage adjacent to Forest Hill Station and other bicycle enhancements.

Systemwide Enhancement Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Systemwide Enhancements	$ 67.24	$ 21.36	$ 4.27	$ 14.57	$ 12.04	$ 10.00	$ 5.00	$ 45.88	$ -
Daily Operations Resource Management (SDMS)	2.20	-	1.40	0.40	0.40	-	-	2.20	-
Train & Bus Arrival Announcement System	6.00	2.64	0.20	1.50	1.65	-	-	3.36	-
Maintenance Facilities Upgrades	3.00	2.00	0.50	0.50	-	-	-	1.00	-
Bicycle Enhancements	3.54	3.54	-	-	-	-	-	-	-
Total Systemwide Enhancement	**$ 81.98**	**$ 29.54**	**$ 6.37**	**$ 16.97**	**$ 14.09**	**$ 10.00**	**$ 5.00**	**$ 52.43**	**$ -**

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. The Environmental Department 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 four funded projects under the environmental compliance program. These projects will have a neutral impact on the Authority's operating budget.

☑ 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.

☑ Remediation Projects
This project will fund various MBTA remediation projects. One of these projects is the Readville Facility Remediation. The Authority has completed the site assessment and risk characterization. This assessment determined the level and extent of remediation that will be required for the ultimate use of the property. The majority of solid waste and the discarded railroad ties and other railroad-related equipment have been removed from the site.

Environmental Compliance Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Miller's Outfall Structure	$ 6.00	$ 4.60	$ 0.61	$ 0.47	$ 0.32	$ -	$ -	$ 1.40	$ -
Environmental Compliance Management	43.10	7.74	19.24	6.12	5.84	2.31	1.85	35.36	-
Groundwater Remediation	4.97	1.13	1.40	1.25	1.20	-	-	3.84	-
Remediation Projects	33.51	30.19	0.44	0.56	0.86	0.50	0.96	3.32	-
Total Environmental Compliance	**$ 87.59**	**$ 43.66**	**$ 21.69**	**$ 8.40**	**$ 8.21**	**$ 2.81**	**$ 2.81**	**$ 43.92**	**$ -**

SYSTEM ENHANCEMENT—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 TPSA substations, with a 30-year useful life, serve as headquarters with space for personnel, equipment, and resources, which allows 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 five Transit Security programs underway involving upgrades to the Authority's police equipment, the installation of new communications technology, and new anti-terrorism initiatives.

☑ FY08 Homeland Security Funds
Every year the Authority receives Homeland Security funds, which are programmed to enhance system efforts already underway.

☑ FY09 Homeland Security Funds
Every year the Authority receives Homeland Security funds, which are programmed to enhance system efforts already underway.

☑ FY10 Homeland Security Funds
Every year the Authority receives Homeland Security funds, which are programmed to enhance system efforts already underway.

☑ FY11 Homeland Security Funds
Every year the Authority receives Homeland Security funds, which are programmed to enhance system efforts already underway.

☑ FY12-FY14 Homeland Security Funds
Every year the Authority receives Homeland Security funds, which are programmed to enhance system efforts already underway.

Transit Security Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
FY08 Homeland Security Funds [EOPSS]	$ 28.55	$ 22.51	$ 3.99	$ 2.05	$ -	$ -	$ -	$ 6.03	$ -
FY09 Homeland Security Funds	29.26	12.57	7.41	6.88	2.41	-	-	16.69	-
FY10 Homeland Security Funds	21.14	7.56	6.53	4.30	2.75	-	-	13.58	-
FY11 Homeland Security Funds	10.88	2.88	3.21	2.56	1.92	0.24	0.06	7.99	-
FY12-FY14 Homeland Security Funds	6.69	-	0.09	3.20	2.40	1.00	-	6.69	-
Total Transit Security	**$ 96.51**	**$ 45.52**	**$ 21.22**	**$ 18.98**	**$ 9.48**	**$ 1.24**	**$ 0.06**	**$ 50.98**	**$ -**

CHAPTER 15

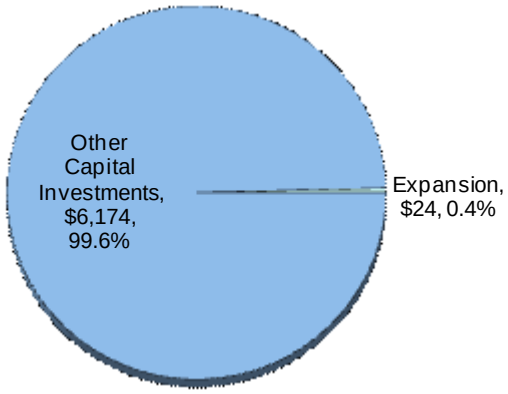
SYSTEM EXPANSION

PROGRAM OVERVIEW

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. Consequently, the Authority works closely with MassDOT to plan and implement future cost-effective service expansions to accommodate the increasing travel demands within the region (for future expansion efforts see Chapter 16). 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, and expanded service is now provided to Roxbury, South Boston, downtown Boston and Logan Airport

Expansion Projects Funding
($ in millions, % of total CIP)



through the implementation of two phases of the Silver Line project. In addition, the Greenbush Line has extended rail service to Boston's south shore.

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 has been discontinued. The third phase of the Silver Line program was expected to fund the construction of a tunnel linking the first phases between Washington Street and South Station. Instead, a surface variation of the Silver Line operates between Dudley Station and South Station using a dedicated busway on Essex Street.

SYSTEM EXPANSION—SUBWAY

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

NOTE: *The Green Line expansion beyond Lechmere is sponsored by the Commonwealth and is listed in the section for the Transportation Finance Legislation, starting on page 15.*

SYSTEM EXPANSION—COMMUTER RAIL

The funding devoted toward commuter rail expansion is for closeout efforts of past projects, which include the Worcester, Greenbush, Newburyport, and Old Colony 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 three funded projects for commuter rail system expansion. All four projects 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
The scope of work of this project included the rehabilitation and preparation of the Old Colony Greenbush Line for full commuter rail service to South Station in Boston. The scope included 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 project has been completed and now offers transportation services to the towns of Weymouth, Braintree, Hingham, Cohasset, and Scituate. The funding in place is for a few closeout line items.

☑ 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.

Commuter Rail Expansion Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Greenbush Line Construction	$ 552.60	$ 538.67	$ 9.03	$ 4.90	$ -	$ -	$ -	$ 13.93	$ -
Newburyport Extension	27.27	26.91	0.36	-	-	-	-	0.36	-
Closeout Expansion Projects/Flexed Funds	11.51	1.80	4.71	1.50	1.50	1.00	1.00	9.71	-
Total Comm. Rail Expansion	**$ 591.38**	**$ 567.38**	**$ 14.10**	**$ 6.40**	**$ 1.50**	**$ 1.00**	**$ 1.00**	**$ 24.00**	**$ -**

SYSTEM EXPANSION—SILVER LINE

Silver Line – Washington Street began revenue operation in July 2002. Two variations now operate – one from Temple Place in Boston and the other from South Station – with both variations serving Dudley Square Station in Roxbury.

Silver Line – Waterfront began Revenue Operations in December 2004 and serves patrons from South Station to South Boston with 3 underground stations and different variations that serve BMIP and the Airport terminals.

Vehicle procurement for Silver Line Phase I and Phase II is included in the revenue vehicle section of this document (Chapter 1).

FUNDED PROJECTS

The Authority has funded three efforts related to the Silver Line. The Silver Line represents higher costs for operations and maintenance, and has 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 multi-year project opened for service in December 2004. The scope of this project included 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 Southampton Street for Silver Line vehicles was also funded by this line item. This major expansion project included 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.

Courthouse Station

☑ Silver Line Phase III: Conceptual Planning and Design
This effort provided funding for conceptual planning, design and engineering for a project that would connect Silver Line phases I and II via a new tunnel (i.e., Washington Street to South Station).

Silver Line Expansion Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Silver Line Phase I: Washington St.	$ 16.52	$ 16.52	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Silver Line Phase II: S. Boston Transitway	623.24	623.24	-	-	-	-	-	-	-
Silver Line Phase III: Planning and Design	50.14	50.14	-	-	-	-	-	-	-
Total Silver Line Expansion	**$ 689.90**	**$ 689.90**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

SYSTEM EXPANSION—BUS

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

SYSTEM EXPANSION—STUDIES AND PLANNING

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 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.

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CHAPTER 16

STATEWIDE TRANSPORTATION IMPROVEMENTS

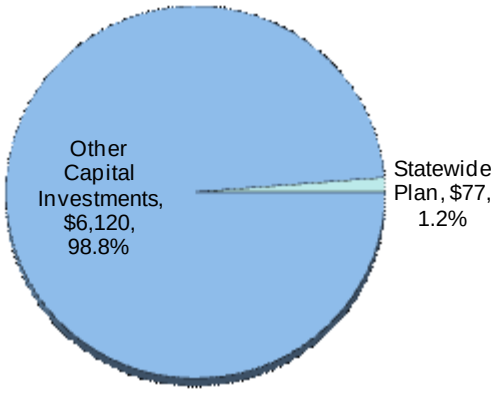
PROGRAM OVERVIEW

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.

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 a final amendment to the transit regulation 310 CMR 7.36. This regulatory change was reviewed and formally approved by the U.S. Environmental Protection Agency (EPA) for inclusion into the Massachusetts SIP under the Clean Air Act in 2009. This regulatory change substitutes for the remaining original SIP projects and requires MassDOT to proceed with a Green Line extension beyond Lechmere, new stations on the Fairmount Line, design of the Red/Blue

Statewide Transportation Plan Funding ($ in millions, % of total CIP)



Connector, and 1,000 new transit parking spaces in the Boston metropolitan area. Since non-MBTA sources will fund the SIP projects, this CIP accommodates the potential for state assistance to advance these projects. While the Green Line extension is a SIP commitment, it is funded through the Transportation Finance Legislation; therefore, this project is included in the section for the Transportation Finance Legislation, starting on page 15.

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

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 expansion of the transit system, the MBTA must play a critical role in the planning, design, and implementation stages whether these efforts originate with the Legislature, SIP, or Commonwealth. This CIP has been developed to allow the MBTA to play such a role once non-MBTA funds are secured.

PROJECTS WITH EARMARKS OR OTHER DEDICATED FUNDING

☑ Green Line Extension to Route 16
This project extends the Green Line beyond its planned terminus location at College Avenue in Medford to Route 16/Mystic Valley Parkway.

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

☑ Assembly Square Station
The Commonwealth is providing funding, along with a $25-million New Starts Program authorization and a $15-million developer contribution secured by the City of Somerville, which would go towards the addition of an Orange Line station at Assembly Square that will be coordinated with the proposed Assembly Square mixed-use development.

☑ Beverly Commuter Rail Station Parking Garage
This effort will provide parking improvements at the Beverly commuter rail station. This project is being funded with federal, state, and MBTA funds.

☑ Salem Commuter Rail Station Parking Garage
This effort will provide parking improvements at the Salem commuter rail station. This project is being funded with federal and state funds.

☑ Fairmount Line Improvements/Stations Expansion – Phase II
The State Implementation Plan includes a 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 (now MassDOT) to design the first of those stations, a new station in the Four Corners area. (See chapter 14 for information on Phase I of this project.)

☑ Green Line Real-Time Tracking System
Project covers both a consolidated real-time prediction and alerts system and a full CAD/AVL system for the Green Line.

☑ Worcester Line Improvements
Project includes track and signal improvements on the Worcester Line between Boston and Worcester.

Statewide Plan Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Green Line Extension to Route 16	$ 38.00	$ -	$ -	$ 8.10	$ 29.90	$ -	$ -	$ 38.00	$ -
Yawkey Station Enhancements	15.32	14.85	0.48	-	-	-	-	0.48	-
Assembly Square Station	56.51	53.88	2.63	-	-	-	-	2.63	-
Beverly Parking Garage	34.11	33.90	0.21	-	-	-	-	0.21	-
Salem Parking Garage	44.54	36.60	7.94	-	-	-	-	7.94	-
Fairmount Line Improvements - Phase II	135.00	130.13	4.86	-	-	-	-	4.86	-
Green Line Real-Time Tracking System	13.43	7.00	6.42	-	-	-	-	6.42	-
Worcester Line Improvements	26.23	9.36	16.87	-	-	-	-	16.87	-
Total Systemwide Alt Financed Enh	**$ 363.14**	**$ 285.72**	**$ 39.42**	**$ 8.10**	**$ 29.90**	**$ -**	**$ -**	**$ 77.42**	**$ -**

Funding for Statewide Plan Projects ($ in millions)

Project	Authorized Budget	State Funding	Total CIP Funding	State CIP Funding
Green Line Extension to Route 16	$38.00	$7.60	$38.00	$7.60
Yawkey Station Enhancements	$15.32	$15.32	$0.48	$0.48
Assembly Square Station	$56.51	$21.50	$2.63	$2.63
Beverly Parking Garage	$34.11	$25.20	$0.21	$0.00
Salem Parking Garage	$44.54	$38.27	$7.94	$6.52
Fairmount Line Improvements	$135.00	$134.19	$4.86	$4.86
Green Line Real-Time Tracking System	$13.43	$13.43	$6.42	$6.42
Worcester Line Improvements	$26.23	$15.00	$16.87	$7.50
Total	**$363.14**	**$270.51**	**$77.42**	**$36.01**

Note: Non-State funding sources include Federal funds, revenue bonds, and local contributions.

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CHAPTER 17

STIMULUS BILL PROJECTS

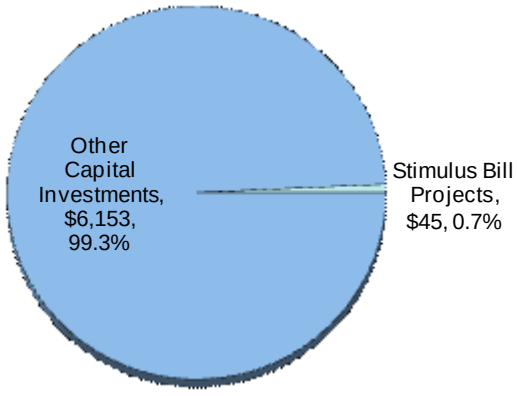
PROGRAM OVERVIEW

The American Recovery and Reinvestment Act of 2009 (ARRA) provides a unique opportunity for the MBTA to enhance its annual capital reinvestment program through a one-time infusion of federal funds. Although an opportunity, this program also provides unique challenges for programming the CIP, since actual funding levels (e.g., discretionary programs) are adjusted over time. The Authority recognizes the need for flexibility, as final ARRA 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 ARRA funds into the CIP, based on existing knowledge of the program.

BACKGROUND

ARRA is intended to stimulate the economy and save or create jobs through both federal tax cuts and increased spending – including for highway and transit infrastructure. 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 received $232.2 million in ARRA formula funding, within the following grant programs:

Stimulus Bill Funding
($ in millions, % of total CIP)



- Section 5307 (Urbanized Area Formula Grants) - $180.7 million
- Section 5309 (Fixed Guideway Modernization) - $51.5 million

In addition, the MBTA has received ARRA funds through a "TIGGER" (Transit Investments for Greenhouse Gas and Energy Reduction) discretionary grant program and through the "flex" of highway ARRA funds to transit. Currently, this includes the following:

- "TIGGER Grant" Funds for Renewable Wind Energy Projects - $2.7 million
- Highway ARRA Funds "Flexed" to the MBTA for Transit - $39.0 million

The MBTA is also expected to receive $172 million in ARRA funding (either directly or indirectly) under two other discretionary grant programs: "TIGER" (Transportation Investments Generating Economic Recovery) and "HSIPR" (High-Speed Intercity Passenger Rail):

- TIGER funding from FTA for a Wonderland Transit Plaza - $20.0 million
- TIGER funding from FTA for Fitchburg Line extension to a new Wachusett Station - $59.2 million
- TIGER funding, through MassDOT and Federal Railroad Administration (FRA), for the reconstruction of New Bedford freight line bridges - $20.0 million
- HSIPR funding, through MassDOT and FRA, for rehabilitation of the Knowledge Corridor - $72.8 million

In total, the MBTA anticipates receiving about $448.5 million in ARRA funds. $45 million, or 0.7% of the total Capital Investment Program, is expected to be spent through the end of federal fiscal year 2016. Stimulus projects can be 100% federally funded; no MBTA or local match is required. However, the funding is subject to all federal requirements - e.g., project inclusion in the State Transportation Improvement Program (STIP) and 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 ARRA formula funds needed to 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, there were restrictions on what could be programmed for stimulus funding.

MULTI-PHASED APPROACH TO STIMULUS FUNDING

The ARRA funds were made available to the MBTA in stages, based on legislative requirements and the timing of the discretionary grant programs.

As discussed above, the MBTA received about $232.2 million in Stimulus Bill formula funding. At least 50% of this was 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 programmed $164.2 million of "Phase 1" projects in the STIP. The Boston Metropolitan Planning Organization (MPO) initially approved this list on February 26, 2009, following a public review and comment period. All of the "Phase 1" projects were approved by FTA as of July 2009 and are either completed or in process.

The remaining "Phase 2" Stimulus Bill funds, requiring obligation within one year, were initially approved by the Boston MPO on November 19, 2009, following a public review and comment period. The grants were approved by FTA on March 5, 2010.

The "TIGGER" grant was approved by FTA on March 5, 2010, and the "highway flex" grants were approved during June 2010. The FRA "TIGER" grant for the New Bedford bridges was awarded to MassDOT on September 8, 2010, and the MBTA will be reimbursed for project

costs by MassDOT, from the ARRA funds. The FRA "HSIPR" grant for Knowledge Corridor was awarded to MassDOT on July 1, 2011, and, similarly, the MBTA will be reimbursed for project costs by MassDOT from these ARRA funds. The other FTA "TIGER" grants were awarded to other entities but funds are provided directly to the MBTA: the Fitchburg Line Wachusett Extension on November 10, 2010 (to the Montachusett RTA), and the Wonderland Transit Plaza on December 17, 2010 (to the City of Revere).

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 $116 million of the Stimulus Bill funds (i.e., $232 million x 50%) needed to be obligated by September 1, 2009. The remaining funds needed to be obligated by March 5, 2010. Both milestones were achieved; as of March 5, 2010, 100% of the ARRA formula funds had been obligated.

STIMULUS BILL – PHASE 1

Legislatively, only $116 million of the ARRA formula funds needed to be obligated within 180 days (subject to the "use it or lose it" provisions). However, all grantees were 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, the Authority initially programmed $164 million of "Phase 1" projects - or about 70% of the total $232 million. These "Phase 1" stimulus projects, approved by FTA in June and July of 2009, are summarized below.

FUNDED PROJECTS – PHASE 1

☑ Bus Stop and Customer Enhancements
$8.13 million for bus stop amenities (e.g., shelters, benches, signage, pavement markings, ADA improvements) and improvements to the Route 39 and 23 bus corridors, between Back Bay and Forest Hills Stations and Ruggles and Ashmont Stations, respectively.

☑ Back Bay Station Lobby Ventilation
This $1.26 million project will help to improve ventilation and air quality within the lobby area of Back Bay Station (e.g., roof units, fans, door systems).

☑ Silver Line – Phase A&B: Dudley-South Station Enhancements
$1.6 million for a dedicated Silver Line bus lane between Chinatown and South Station, traffic signal priority, and a new bus shelter with real-time arrival system.

☑ Enhanced Bicycle Parking Facilities
$6.68 million for construction of enhanced bicycle parking facilities at transit stations (where feasible, parking cages with lighting and security).

☑ The RIDE – Vehicle Procurement
$5.58 million provides funding for 108 vans for The RIDE, the Authority's demand-response ADA paratransit program, by procuring the vehicles through an existing MassDOT contract. This helped the MBTA to achieve its goal to increase the level of MBTA-owned vehicles, thus reducing annual operating costs associated with operator-owned vehicles.

☑ MBTA Systemwide Fencing
This effort provides $3.45 million for replacing and repairing fencing along right of way and MBTA property.

☑ Commuter Rail – Various Stations Projects
$3.47 million for various commuter rail station projects, systemwide (e.g., platform pavement replacement, lighting, signage).

☑ Dudley Square Station Improvements
$0.96 million for construction of a 2-officer kiosk at Dudley Square Station, including video monitors, CCTV, telephones, etc. Lighting, signage and other customer enhancements are also included.

☑ MBTA Tunnel Signal Project
$5.02 million for fabrication and installation of signage within MBTA tunnels. This is a safety initiative that benefits both customers and employees.

☑ Commuter Rail Facilities – Layovers, Environmental
$9.53 million for commuter rail facilities, including layover facility upgrades and various facility repairs (e.g., roof replacement/repairs, fire protection systems).

☑ Fitchburg Line – Interlocking Project
$10.64 million for interlocking work, which will provide improved reliability and on-time performance for the Fitchburg Line.

☑ Commuter Rail – Bridge Projects
$3.52 million for various bridge repairs. This project anticipates the need for timber/tie replacements at about 10 bridges.

☑ Haverhill Line – Double Track & Signal Work
$18.91 million for Haverhill Line double tracking project (about 6 miles, from Andover to Lawrence), including signal improvements and new interlockings.

☑ MBTA Bus Facility Rehab & Improvements
$16.83 million for various bus facility improvements (e.g., bus washing equipment, pavement repairs, bus lifts) as well as repairs/upgrades to heating, cooling and lighting systems at 9 bus garages.

☑ Fitchburg Line – Double Track
$41.16 million for "stand alone" Fitchburg double tracking project between West Acton and Ayer, including Littleton Station work.

☑ Hybrid Bus Procurement
$27.72 million for the procurement of 25 articulated 60' hybrid buses. The primary purpose was to replace aging buses; this project will also help to expand capacity on busy routes.

☑ Silver Line – Essex St. Ramp Reconstruction
$1.46 million to reconstruct Essex Street ramps/areaways in association with providing Silver Line service to South Station.

Stimulus Bill "Phase 1" Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Bus Stop and Rt 23 Customer Enhancements	$ 8.13	$ 8.13	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Back Bay Station Lobby Ventilation	1.26	1.26	-	-	-	-	-	-	-
Silver Line - Phase A&B: Dudley-South Station Enhancem	1.60	1.60	-	-	-	-	-	-	-
Enhanced Bicycle Parking Facilities	6.68	6.68	-	-	-	-	-	-	-
The RIDE - Vehicle Procurement	5.58	5.58	-	-	-	-	-	-	-
MBTA Systemwide Fencing	3.45	3.45	-	-	-	-	-	-	-
Commuter Rail - Various Stations Projects	3.47	3.47	-	-	-	-	-	-	-
Dudley Square Station Improvements	0.96	0.96	-	-	-	-	-	-	-
MBTA Tunnel Signage Project	5.02	5.02	-	-	-	-	-	-	-
Commuter Rail Facilities - Layovers, Environmental, etc.	9.53	9.53	-	-	-	-	-	-	-
Fitchburg Line - Interlocking Project	10.39	10.39	-	-	-	-	-	-	-
Commuter Rail - Bridge Projects	3.52	3.52	-	-	-	-	-	-	-
Haverhill Line - Double Track & Signal Work	19.15	19.15	-	-	-	-	-	-	-
MBTA Bus Facility Rehab & Improvements	16.83	16.83	-	-	-	-	-	-	-
Fitchburg Line - Double Track	41.16	41.16	-	-	-	-	-	-	-
Hybrid Bus Procurement	27.72	27.72	-	-	-	-	-	-	-
Silver Line - Essex St. Ramp Reconstruction	1.46	1.46	-	-	-	-	-	-	-
ARRA Projects - Phase 1	**$ 165.92**	**$ 165.92**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

STIMULUS BILL – PHASE 2

FTA grants for the following "Phase 2" projects were approved by FTA on March 5, 2010.

FUNDED PROJECTS – PHASE 2

☑ Ashmont Station Upgrades – Phase II
$12.68 million for "phase II" upgrades, including final wall, ceiling and walkway finishes. (Project included in initial grant application but removed prior to approval; added back per grant amendment on March 5, 2010.)

☑ MBTA Operating Assistance
Under the Supplemental Appropriations Act of 2009 (H.R. 2346), transit agencies could use up to 10% of 5307 ARRA funds for operating assistance. $18.07 million of the funds were used in fiscal year 2009.

☑ Orient Heights Track Work
$21.1 million to rebuild 11,000 feet of track; replace thirty 50-year old turnouts; replace the negative return power cable; prepare yard for new No. 5 Blue Line cars and operation of 6-car trains.

☑ Emergency Station Lighting Program
$1.37 million for the installation of 600VDC lighting systems in transit stations with only one source of AC power, to enhance safety and sustain lighting during a power outage. This work is a continuation of a previous effort.

☑ Substation Control Battery Set Replacement Program
$3.2 million for the replacement of traction power substation control batteries (primary source of operational control for power system's AC & DC breakers).

☑ Tunnel Dewatering Pump Station Rehabilitation Program
$3.69 million to replace and upgrade dewatering equipment (pumps, motors, valves, piping, alarms) within transit tunnel pump rooms.

☑ Back Bay Station Roofing Project
$1.84 million to repair deteriorating Back Bay Station roof; work associated with ARRA Phase 1 lobby ventilation project.

☑ North Quincy Station Platform Repairs
$2.33 million for structural repairs to the existing concrete platforms at North Quincy station.

☑ Braintree Station Structural Repairs
$2.51 million for structural repairs to the Braintree Station platform.

Stimulus Bill "Phase 2" Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Ashmont Station Upgrade - Phase II	$ 12.68	$ 12.68	$ -	$ -	$ -	$ -	$ -	$ -	$ -
MBTA Operating Assistance	18.07	18.07	-	-	-	-	-	-	-
Orient Heights Track Work	21.07	21.07	-	-	-	-	-	-	-
Emergency Station Lighting Program	1.37	1.37	-	-	-	-	-	-	-
Substation Control Battery Set Replacement Program	3.20	3.20	-	-	-	-	-	-	-
Tunnel Dewatering Pump Station Rehabilitation Program	3.72	3.72	-	-	-	-	-	-	-
Back Bay Station Re-Roofing Project	1.84	1.84	-	-	-	-	-	-	-
North Quincy Station Platform Repairs	2.33	2.33	-	-	-	-	-	-	-
Braintree Station Structural Repairs	2.51	2.51	-	-	-	-	-	-	-
ARRA Projects - Phase 2	**$ 66.79**	**$ 66.79**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

ARRA PROJECTS – DISCRETIONARY "TIGGER" AND HIGHWAY "FLEX"

Funding for the following projects originates from both a discretionary ARRA grant program (Transit Investments for Greenhouse Gas and Energy Reduction, or "TIGGER") and from ARRA highway funds flexed over to transit by MassDOT.

FUNDED PROJECTS – DISCRETIONARY AND HIGHWAY "FLEX"

☑ Renewable Wind Energy Project (TIGGER)
Installation of 2 wind energy turbines at MBTA layover facilities: in Kingston (100kW) and Bridgewater (up to 600 kW). $2.73 million approved through competitive TIGGER grant program.

☑ Key Bus Routes Project
$10 million for bus stop amenities and other customer service enhancements, focusing on 13 key bus routes.

☑ Revere – Wonderland Station Parking Garage
$22.7 million provides partial funding for the construction of a parking garage at Wonderland Station (in conjunction with other state and federal funding sources).

☑ Red Line Floating Slab Work
This $4.11 million effort will fund a number of improvements on the Red Line floating slab between Alewife and Harvard Square stations.

☑ Wedgemere Station Accessibility
This $2.2 million effort is aimed at improving accessibility at this commuter rail station.

Discretionary "TIGGER" and Highway "Flex" Projects ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Renewable Wind Energy Project (TIGGER)	$ 2.73	$ 2.73	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Key Bus Routes Project	10.00	9.16	0.84	-	-	-	-	0.84	-
Revere - Wonderland Station Parking Garage	22.70	22.70	-	-	-	-	-	-	-
Red Line Floating Slab Work	4.11	4.11	-	-	-	-	-	-	-
Wedgemere Station Accessibility	2.20	2.20	-	-	-	-	-	-	-
ARRA Projects - Discretionary and Highway "Flex"	**$ 41.74**	**$ 40.90**	**$ 0.84**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 0.84**	**$ -**

ARRA PROJECTS – DISCRETIONARY "TIGER" AND "HISPR"

Funding for the following projects is made available through discretionary ARRA grant programs: "TIGER" (Transit Investments Generating Economic Recovery) and "HSIPR" (High-Speed Intercity Passenger Rail). As noted below, funding for two of the grants will be received through reimbursements from MassDOT, who will be the direct recipient of the ARRA funds.

FUNDED PROJECTS – DISCRETIONARY "TIGER" AND "HSIPR"

☑ Revere Transit Plaza (TIGER)
Construction of a new public transit plaza adjacent to Wonderland Station and a footbridge to connect the plaza to the beach and parkland areas. This $20 million FTA grant was awarded to the City of Revere on December 17, 2010. Through an agreement with FTA and the City, the MBTA is the direct recipient of the TIGER funds and is managing the construction project.

☑ Fitchburg Line Extension to Wachusett Station (TIGER)
This $59.23 million project will extend the Fitchburg commuter rail line about 4.5 miles, with a new Wachusett station and layover facility. This FTA grant was awarded to the Montachusett RTA on November 10, 2010. Through an agreement with FTA and the RTA, the MBTA is the direct recipient of the TIGER funds and is managing the construction project.

☑ Fast Track New Bedford – Bridges (TIGER)
This $19.79 million project will complete replacement of three insufficient freight rail bridges on the New Bedford/Fall River Freight Line. FRA awarded this grant to MassDOT on September 8, 2010. MBTA will manage and fund the construction project and be reimbursed for all costs by MassDOT.

☑ Knowledge Corridor (HSIPR)
This $75.05 million project will rehabilitate the existing Connecticut River rail line in western Massachusetts, which will allow for rerouted Amtrak Vermonter service to Northampton and Greenfield. FRA awarded the grant to MassDOT on July 1, 2011. MBTA will manage and fund the construction project and be reimbursed for all costs by MassDOT.

Discretionary "TIGER" and "HSIPR" Programs ($ in millions)

PROJECT	Authorized Budget	Proj. Spending thru FY14	FY15	FY16	FY17	FY18	FY19	Total FY15-19	BEYOND FY19
Revere Transit Plaza	$ 20.00	$ 20.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Fitchburg Line - Wachusett Extension	59.23	28.18	31.06	-	-	-	-	31.06	-
New Bedford Bridges	19.79	19.79	-	-	-	-	-	-	-
Knowledge Corridor - HSIPR	75.05	62.38	12.22	0.45	-	-	-	12.67	-
ARRA Projects - Discretionary "TIGER" and "HISPR"	**$ 174.07**	**$ 130.35**	**$ 43.28**	**$ 0.45**	**$ -**	**$ -**	**$ -**	**$ 43.73**	**$ -**

Massachusetts Bay Transportation Authority

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