

Massachusetts Water Resources Authority



Combined Sewer Overflow Control Plan



Annual Progress Report 2012

March 2013

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Cover (counter-clockwise from top):

- CAM004 Wetland Basin, Alewife Brook, Construction Progress September 2012
- Brookline Sewer Separation, Sewer Diversion at Structure No.6, on Beacon Street, June 2012
- Above: Reserved Channel Sewer Separation, 54-inch Storm Drain Installation, K Street, South Boston
- Below: Reserved Channel Sewer Separation, 60-inch by 24-inch Storm Drain Installation, E Street, South Boston
- Brookline Sewer Separation, Outfall MWR010 Cleaning July 2012

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1. INTRODUCTION

The Massachusetts Water Resources Authority (MWRA) files this Combined Sewer Overflow Annual Progress Report for 2012 in compliance with Schedule Seven of the Federal District Court's Boston Harbor Case (U.S. v. M.D.C, et al., No. 85-0489-RGS). Schedule Seven requires annual and quarterly reports on the progress of MWRA's approved plan to control combined sewer overflows (CSO) to surface waters in the metropolitan Boston area (the "Long-Term Control Plan"). The reports describe the progress of work to implement the Long-Term Control Plan relative to milestones in the Court-ordered schedule.

This Annual Report reviews key CSO control accomplishments and design and construction progress in calendar year 2012 and through the quarterly period December 15, 2012, to March 15, 2013, and discusses issues that may affect MWRA's ability to complete the CSO projects on schedule. Like previous annual CSO reports, it also presents updated information on the scope, goals, benefits and costs of the Long-Term Control Plan and its projects, as well as information on plan-wide progress to date and benefits achieved, including reductions in CSO discharges and impacts. In addition, it presents updated general water quality conditions in Boston Harbor and other area waters affected by CSOs.

The Long-Term Control Plan as mandated by the Federal Court comprises 35 wastewater system improvement projects to bring CSO discharges at 84 outfalls in the metropolitan Boston area into compliance with the Federal Clean Water Act and Massachusetts Surface Water Quality Standards. Design and construction milestones for each of the 35 projects are set forth in Schedule Seven. Figure 1 on pages 2-3 maps the locations of the 35 projects and presents the general implementation status of each project. Figure 2 on page 4 summarizes the scope, schedule and predicted benefits of the system-wide Long-Term Control Plan. The court order also requires MWRA to achieve specific, numerical long-term levels of control at each of the CSO outfalls. For certain outfalls, such as the outlet of the Dorchester Brook Conduit (BOS070) and the Charles River Basin outfalls related to MWRA's Cottage Farm CSO Facility (outfalls MWR201, CAM005, CAM007, CAM009 and CAM011), one or more MWRA member communities with CSOs (the "CSO communities") are implementing system improvements that supplement the 35 stipulated projects and are necessary to meet the required levels of control. These are also discussed in this report.

2. CSO CONTROL PROGRESS

2.1 Progress Highlights and Accomplishments

In 2012, MWRA and its CSO communities continued to implement the Long-Term Control Plan and comply with the Federal Court ordered obligations defined in Schedule Seven and in the March 15, 2006, Second Stipulation of the United States and the Massachusetts Water Resources Authority on Responsibility and Legal Liability for Combined Sewer Overflows, as amended by the Federal District Court on May 7, 2008¹ (the "Second CSO Stipulation"). MWRA spent \$42.4 million in 2012 to implement CSO projects and fund the eligible CSO work performed by Boston Water and Sewer Commission (BWSC), the Town of Brookline and the City of Cambridge. Of this total spending amount, \$38.1 million (90%) paid for construction related activities.

The following milestones and progress in CSO control were achieved in 2012:

- Commencement of the City of Cambridge's \$15.4 million construction Contract 8A for the CAM004 sewer separation project, in compliance with Schedule Seven. Contract 8A includes the installation of approximately 13,150 linear feet of new sanitary sewer and storm drain pipe up to 54-inch diameter along and near Huron Avenue and 7,200 linear feet of smaller drain pipe connections in a 68-acre area

¹ The amendment revised the level of control for the Prison Point CSO Facility in accordance with MWRA's letter report, "Proposed Modification of Long-Term Level of Control for the Prison Point CSO Facility, April 2008."





Figure 1
MWRA Approved
CSO Control Plan
and Status of
Implementation
March 2013
Completed Projects are
Labeled in Red

Projects Completed

Complete⁽¹⁾

Somerville Baffle Manhole Separation	1996
Chelsea Trunk Sewer Replacement	2000
Cottage Farm CSO Facility Upgrade	2000
Hydraulic Relief at CAM005 (Cambridge)	2000
Hydraulic Relief at BOS017 (Charlestown)	2000
MWRA Floatables/Outfall Closing Projects	2000
Neponset River Sewer Separation	2000
Constitution Beach Sewer Separation	2000
Chelsea Branch Sewer Relief	2001
CHE008 Floatables Control and Outfall Repair	2001
Prison Point CSO Facility Upgrade	2001
Somerville Marginal CSO Facility Upgrade	2001
Commercial Point CSO Facility Upgrade	2001
Fox Point CSO Facility Upgrade	2001
Pleasure Bay Storm Drain Improvements	2006
Stony Brook Sewer Separation	2006
Charlestown BOS019 Storage Conduit	2007
South Dorchester Bay Sewer Separation	2007
Fort Point Channel Sewer Separation & System Optimization	2007
Union Park Detention/Treatment Facility	2007
Regionwide Floatables Controls	2007
Prison Point Facility Optimization	2008
Morrissey Boulevard Storm Drain	2009
Cottage Farm Brookline Connection and Inflow Controls	2009
Bulfinch Triangle Sewer Separation	2010
East Boston Branch Sewer Relief	2010
Alewife Interceptor Connection Relief / Floatables Controls*	2010
CAM400 Common Manhole Separation*	2011
North Dorchester Bay Storage Tunnel and Related Facilities	2011

In Construction⁽²⁾

Brookline Sewer Separation	2013
CAM004 Outfall and Wetland Basin*	2013
Reserved Channel Sewer Separation	2015
CAM004 Sewer Separation *	2015

In Design

SOM01A Interceptor Connection Relief/Floatables Controls*	2014
MWR003 Gate and Rindge Ave. Siphon Relief *	2015

(1) Actual or Scheduled construction completion

(2) For each project, at least one construction contract is completed or underway

** Part of Alewife Brook CSO Control Plan*

FIGURE 2: Approved Long-Term CSO Control Plan and Benefits



BENEFITS

- 84 CSO Outfalls: 34 Closed
46 Reduced to a Minimal Number of CSO Discharges per year
4 Treated
- Eliminates or Reduces CSO Activations to Achieve a Level of CSO Control Consistent with Water Quality Standards
- Treats More Frequent Discharges
- Controls Floatable Materials at remaining active CSO Outfalls

CSO CONTROL PROJECTS

- Sewer Separation
- Existing CSO Treatment Facility Upgrades
- New CSO Treatment Facility
- CSO Consolidation /Storage Conduits
- Relief Sewers
- Localized Hydraulic Relief
- Outfall Repairs
- Region Wide Floatables Controls
- System Optimization

PROGRAM SCHEDULE

Final CSO Conceptual Plan	Dec 1994
Final Facilities Plan and EIR	Jul 1997
Final Approved Plan	Apr 2006
Design and Construction	1995 - 2015
Assessment Phase	2018 - 2020

COSTS

Planning, Design & Construction
 \$867 Million
 Net Annual O&M
 \$1.5 Million

east of Fresh Pond Parkway. It is one of three planned sewer separation contracts that will remove large volumes of stormwater from the Cambridge and MWRA sewer systems, reduce CSO discharges to Alewife Brook, and allow Cambridge to close Outfall CAM004. Cambridge commenced design of the second contract (Contract 8B) in May 2012 and commenced design of the third contract (Contract 9) in January 2013. Additional discussion concerning schedule and budget challenges with these two contracts (contracts 8B and 9) can be found later in this report.

- Continued progress with the City of Cambridge's \$17.8 million construction contract for the CAM004 stormwater outfall and wetland basin. The project will provide storage, detention and wetlands treatment of the stormwater flows that will be removed from the combined sewer system with the CAM004 sewer separation project. The contract is on schedule for substantial completion in April 2013, in compliance with Schedule Seven.



Community Planting Day at the CAM004 Wetland Basin

- Continued progress with BWSC's design and construction contracts for the \$64.1 million Reserved Channel sewer separation project. In 2012, BWSC attained substantial completion of its \$9.9 million Contract 3A, which separated combined sewers in a 33-acre, primarily residential area of South Boston with the installation of 16,814 linear feet of new storm drain and sanitary sewer. BWSC also commenced construction of its \$9.1 million Contract 4, the last of the major sewer separation contracts for this project, which will separate combined sewers in a 182-acre, primarily commercial and industrial area with the planned installation of 18,820 linear feet of new storm drain and sanitary sewer. Four of the nine BWSC construction contracts are substantially complete, three are well underway, and the remaining two are scheduled to be awarded this year. The project is on schedule for completion in December 2015, in compliance with Schedule Seven.



Installation of 54-inch Storm Drain on K St., South Boston

- Substantial completion of BWSC's \$6.0 million construction contract for the relocation of CSO regulator RE-070/11-2 and the separation of sewers in a portion of the South Bay area of Boston. This project was not included in MWRA's approved Long-Term Control Plan or Schedule Seven, but is necessary to attain the long-term levels of CSO control for the Dorchester Brook Conduit (Outfall BOS070) and the Fort Point Channel.
- Continued progress with the Town of Brookline's \$16.8 million construction contract to complete the \$25.9 million Brookline sewer separation project. The project has removed large volumes of stormwater from the Brookline sewer system tributary to MWRA's Charles River Valley Sewer and is intended to lower CSO discharges at MWRA's Cottage Farm facility. The contract is on schedule for substantial completion by July 2013, in compliance with Schedule Seven.



Special Structure 6, Beacon Street, Brookline, June 2012



Trenching along Beacon Street, Brookline, August 2012

- Substantial completion of MWRA's \$1.1 million contract to remove sediments from CSO Outfall MWR010. The work, mostly on Boston University property, was necessary to ensure that the outfall has adequate hydraulic capacity to convey Brookline's separated stormwater to the Charles River Basin, along with infrequent CSO discharges from MWRA's Charles River Valley Sewer and local BWSC combined sewers.
- Commencement of MWRA's \$1.5 million design contract for the Control Gate and Floatables Control at Outfall MWR003 and MWRA Rindge Avenue Siphon Relief project and the Interceptor Connection Relief and Floatables Control at Outfall SOM01A project, in compliance with Schedule Seven. These are the last two of the 35 projects in the Long-Term Control Plan to move into implementation. The projects have an estimated total capital cost of \$4.3 million and are intended to lower CSO discharges to Alewife Brook, provide adequate sewer system relief in extreme storms, and control the discharge of floatable materials at outfalls MWR003 and SOM01A.

With the work described above, MWRA and the CSO communities installed 34,297 linear feet (6.5 miles) of new storm drain and sanitary sewer in the communities of Boston, Brookline and Cambridge in 2012.

Schedule Seven did not require completion of any project in 2012. As reported last year, 29 of the 35 projects in the Long-Term Control Plan are complete and are achieving their intended benefit. Two of the remaining six projects – CAM004 stormwater outfall and wetland basin and Brookline sewer separation – are scheduled to be substantially complete in 2013, in compliance with Schedule Seven. Two others – Reserved Channel sewer separation and CAM004 sewer separation – are also well into construction.

Since the beginning of MWRA's CSO control planning efforts in the late 1980's, MWRA and the CSO communities have eliminated or virtually eliminated (i.e. 25-year storm level of control) CSO discharges at 37 of the 84 outfalls addressed in the Long-Term Control Plan, more than the number of outfalls recommended for closure in MWRA's plan. No additional CSO outfalls were closed or were scheduled to be closed in 2012. MWRA and the CSO communities have closed all but one of the 34 outfalls recommended

for closure in the Long-Term Control Plan. The remaining outfall, Outfall CAM004 to Alewife Brook, is scheduled to be closed by the City of Cambridge with its completion of the CAM004 sewer separation project in December 2015.

2.2 Court Schedule Compliance

In addition to last year's filing of the annual CSO progress report, Schedule Seven included three CSO project milestones in 2012. On March 30, 2012, MWRA issued the notice to proceed with the design services for the last two Alewife Brook CSO projects, in compliance with two April 2012 milestones. On September 29, 2012, the City of Cambridge issued the notice to proceed with its first construction contract to complete the CAM004 sewer separation project (Contract 8A), in compliance with a September 2012 milestone.

Schedule Seven includes several future construction commencement or completion milestones and requires the last of the projects to be completed by December 2015. Design of MWRA's two Alewife Brook projects is on schedule to comply with construction commencement milestones in September 2013 and June 2014, and MWRA also expects to meet the respective construction completion milestones of August 2014 and October 2015. The Town of Brookline expects to complete the Brookline sewer separation project by July 2013 in compliance with Schedule Seven, and BWSC's various design and construction contracts are on schedule for completion of the Reserved Channel sewer separation project by the December 2015 milestone.

In October 2012, the City of Cambridge notified MWRA that new information gained from its ongoing design of the CAM004 sewer separation project had caused it to be concerned that all of the necessary street by street storm drain and sanitary sewer installation and utility relocation work within its three construction contracts (Contract 8A, 8B and 9) may not be feasible to complete by the December 2015 milestone in Schedule Seven. Specifically, Cambridge raised the concerns that it may not be possible to manage the many construction crews that would need to perform simultaneous work to meet the schedule and that heavy construction occurring simultaneously on Huron Avenue (Contract 8B) and on Concord Avenue (Contract 9) would cause serious regional traffic impacts. In avoiding these impacts, Cambridge estimated that the work may require up to two years additional time.

Following meetings with MWRA, Cambridge agreed to expedite design of contracts 8B and 9, including shortening the duration of ongoing design of Contract 8B and commencing design of Contract 9 by January 2013, one year earlier than it proposed last fall. Cambridge has since taken action to accomplish both, including issuing the notice to proceed with the design services for Contract 9 in January. Cambridge continues to meet the challenges with aggressive scheduling actions intended to maintain compliance with Schedule Seven. Pending the results of these actions, Cambridge is presently not requesting a time extension. These actions include early coordination with private utilities and the sequencing of construction activities within and across contracts 8B and 9 to avoid simultaneous disruptions to traffic on Huron and Concord avenues. It is important to note that Cambridge's recently revised schedule carries considerable risk should problems such as bidding anomalies, unforeseen utility conflicts or severe weather arise before or during construction.

In December 2012, Cambridge also notified MWRA that it may not be able to complete the CAM004 stormwater outfall and wetland basin project by the April 2013 milestone, due to continued delays with the relocation of communication lines and telephone poles by Verizon along Wheeler Street. In response, MWRA facilitated meetings with Cambridge and Verizon officials in December, where plans were made and agreements reached by which Verizon committed to completing its relocation work by January 15 and Cambridge agreed to find ways to accelerate its work, in part by performing certain work on Wheeler Street while Verizon continued with its relocations. Verizon was able to complete its work and move out of the way of the Cambridge contractor ahead of its January 15 commitment. Cambridge's contractor was able to proceed with the expedited construction activities on Wheeler Street and is now following a recovery schedule that allows for substantial completion by April 25, 2013, and keeping MWRA regularly informed of its progress.

2.3 Ongoing Design and Construction Progress

Alewife Brook CSO Control Plan

The Alewife Brook CSO control plan is intended to minimize CSO discharges to the Alewife Brook primarily by separating combined sewer systems in parts of Cambridge to remove stormwater and by upgrading hydraulic capacities at local connections to the MWRA interceptors. The plan also includes a new stormwater outfall and a wetland basin to accommodate the separated stormwater flows, prevent any increase in flooding along Alewife Brook, and provide a level of stormwater treatment. The City of Cambridge manages the design and construction work for four of the six projects that comprise the approved Alewife Brook CSO control plan with MWRA funding pursuant to a Memorandum of Understanding and Financial Assistance Agreement. Cambridge began construction of the CAM004 sewer separation plan in July 1998, in accordance with the recommended plan in the 1997 Facilities Plan/EIR and in compliance with the original set of milestones for this project in a previous court schedule. Cambridge completed all four of the construction contracts it awarded at that time, and the completed work significantly reduced CSO discharges to the Alewife Brook. Pre- and post-construction hydraulic model simulations showed that CSO discharges were reduced from 63 activations and 50 million gallons annual volume in a typical year to 25 activations and 33 million gallons with these early, completed contracts.

In 2000, MWRA and Cambridge suspended further design work and construction contract awards related to the 1997 plan, because new field information showed that conditions in the Cambridge combined sewer system were markedly different from conditions assumed in 1997. MWRA and Cambridge determined that a considerably greater scope of work would be necessary to meet the 1997 CSO control goals for Alewife Brook. In April 2001, MWRA and Cambridge submitted the *Notice of Project Change for the Long Term CSO Control Plan for Alewife Brook* (the “April 2001 NPC”) to the Massachusetts Environmental Policy Act (MEPA) Office for public review, which recommending an expanded and much more costly sewer separation plan. The Secretary of Environmental Affairs’ Certificate on the Notice of Project Change, issued in June 2001, required MWRA and Cambridge to prepare a document responding to all public comments, including comments related to the feasibility of obtaining necessary federal and state permits and other approvals to build the project. In May 2003, MWRA and the City of Cambridge submitted a “Response to Comments” document to MEPA, addressing all public comments. The Response to Comments document and supporting planning and engineering investigations took two years to complete and involved extensive interactions with regulatory agencies, community officials in Arlington, Belmont and Cambridge, the Department of Conservation and Recreation (DCR) and the public.

The Response to Comments document also presented a final project plan that incorporated adjustments made during the public review process to address the various concerns that had been raised. Of greatest significance were adjustments Cambridge made to the proposed stormwater conveyance system and wetland basin to ensure that the stormwater flows generated by the sewer separation work would have no adverse impact on Alewife Brook flood elevations and that the wetland basin would contribute to the ecological and recreational goals in DCR’s Master Plan for the Alewife Reservation. The primary CSO-related purpose of the CAM004 stormwater outfall and wetland basin is to deliver the separated stormwater flows to the Little River and Alewife Brook without causing an increase in flood levels or pollutant loadings. The project involves the construction of a new 4-foot by 8-foot box culvert storm drain to convey the separated stormwater to a new 3.4-acre wetland in the Alewife Brook Reservation.

The wetland basin will provide 10.3 acre-feet of detention storage of stormwater flows and the attenuation of stormwater flow rate to the Little River and Alewife Brook. The basin will also provide a level of control of pollutants associated with urban stormwater by natural treatment processes in the constructed wetland system. In addition to these functional objectives, the design of the basin incorporates other “green technology” attributes that are intended to provide or enhance plant and wildlife habitat, natural flood control, wetlands treatment, and recreational and educational benefits, consistent with DCR’s Alewife Brook Reservation Greenway Master Plan.

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The revised CSO control plan for the Alewife Brook comprises six component projects (Table 1), each with its own design and construction milestones in Schedule Seven (Table 2). Project locations are shown in figures 3 and 4 on pages 10 and 11. Together, these projects are predicted to reduce annual CSO volume to the Alewife Brook by 85% in a typical year, from 50 million gallons in 1997 to 7.3 million gallons. CSO activations in a typical year will be reduced from 63 in 1997 to seven. MWRA hydraulic model and water quality model simulations predict that the recommended control levels will comply with Class B (fishing and swimming) water quality criteria 98.5 percent of the time.

Table 1: Alewife Brook CSO Control Plan - Project Components

Project	Cambridge Contract No.	Benefit
CAM004 Stormwater Outfall and Wetland Basin	12	Convey stormwater flows to wetland system for attenuation and treatment.
CAM004 Sewer Separation ⁽¹⁾	8A, 8B, 9	Remove large quantities of stormwater from the sewer system; eliminate CSO at Outfall CAM004.
CAM400 Manhole Separation	4/13	Remove stormwater from the sewer system; eliminate CSO at Outfall CAM400.
Interceptor Connection Relief and Floatables Control at CAM002 and CAM401B and Floatables Control at CAM001		Upgrade connections between Cambridge and MWRA systems to provide relief; add floatables control.
Control Gate/Floatables Control at Outfall MWR003 and MWRA Rindge Avenue Siphon Relief	MWRA Contracts	Optimize hydraulic conveyance; minimize overflows while controlling system flooding in large storms; provide floatables control.
Interconnection Relief and Floatables Control at Outfall SOM01A		Upgrade connection and provide floatables control.

⁽¹⁾ Also includes initial construction contracts completed by Cambridge in 2002

Table 2: Alewife Brook Project Schedules and Court Milestones

Alewife Brook CSO Project	Commence Design		Commence Construction		Complete Construction	
	Court Milestone	Project Schedule	Court Milestone	Project Schedule	Court Milestone	Project Schedule
Managed by City of Cambridge						
CAM004 Stormwater Outfall and Wetland Basin			Apr 11	Apr 11	Apr 13	Apr 13
CAM004 Sewer Separation	Jan 97	Jan 97	Jul 98	Jul 98	Dec 15	Dec 15
			Sep 12	Sep 12		
Interceptor Connection Relief and Floatables Control at CAM002 and CAM401B and Floatables Control at CAM001	Jul 06	Oct 08*	Jan 10	Jan 10	Oct 10	Oct 10
CAM400 Manhole Separation	Jul 06	Oct 08*	Jan 10	Jan 10	Mar 11	Mar 11
Managed by MWRA						
Control Gate/Floatables Control at Outfall MWR003 and MWRA Rindge Avenue Siphon Relief	Apr 12	Apr 12	Aug 14	Aug 14	Oct 15	Oct 15
Interceptor Connection Relief and Floatables Control at Outfall SOM01A	Apr 12	Apr 12	Sep 13	Sep 13	Jun 14	Jun 14

* Cambridge met reported project schedules that were revised due to citizens' appeals of the wetlands permit for Contract 12.

Figure 3
Alewife Brook CSO Control Plan (1 of 2)

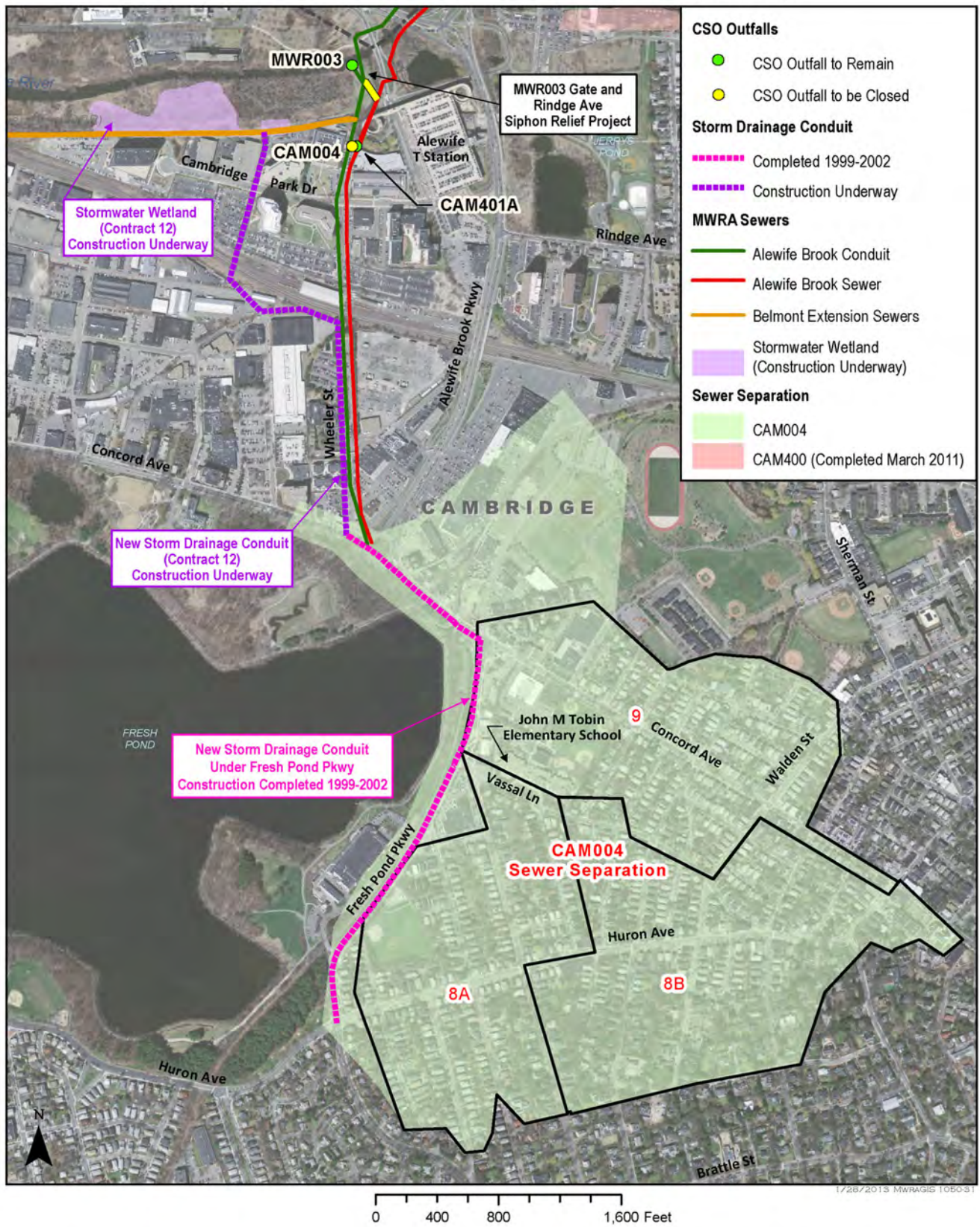
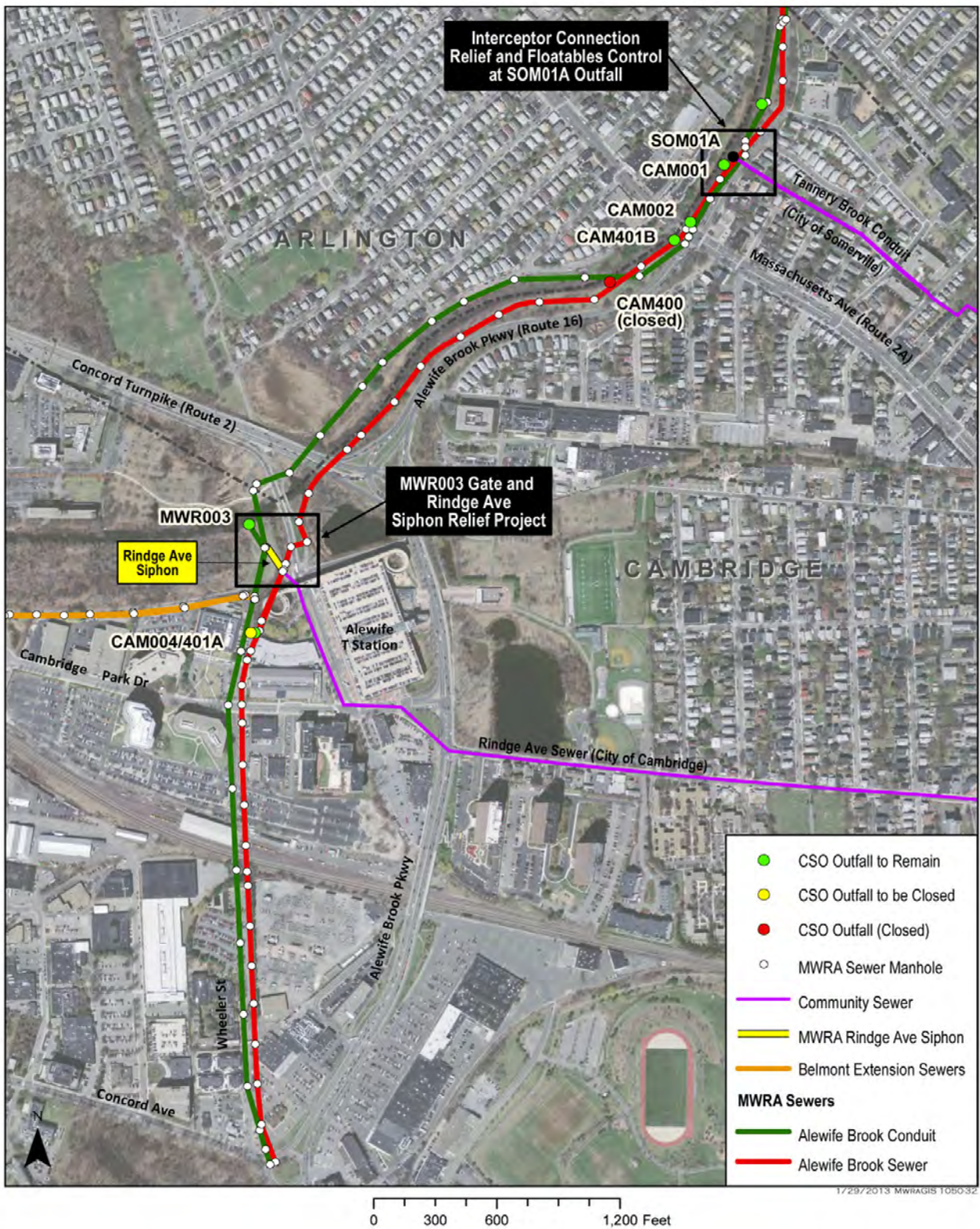


Figure 4
Alewife Brook CSO Control Plan (2 of 2)



For project details, see figures 6 and 7 on pages 17 and 18.

CAM004 Stormwater Outfall and Wetland Basin

The City of Cambridge's construction Contract 12 for the CAM004 stormwater conduit/outfall and wetland basin is 90% complete, and Cambridge expects to attain substantial completion of all CSO-related work by April 25, 2013, in compliance with Schedule Seven. Cambridge's contractor will continue work beyond April and through the summer of 2013 to restore ground surfaces outside the basin area and complete the recreational and environmental education features that are required by DCR's construction approvals and that conform to and are integrated into DCR's Alewife Brook Reservation Master Plan. Cambridge is responsible for maintenance of the wetland basin in the long term, including cleaning and as-needed restoration, pursuant to a Memorandum of Agreement with DCR.

With reference to Figure 5 on the following page, Cambridge's contractor has completed all excavation and grading and most plantings in the main wetland basin, the overflow storage area and the Oxbow. Cambridge held a Community Planting Day on July 14, 2012, during which 1,000 wetland plugs were planted in a 1,000 square foot area of high and emergent marsh. Completed plantings within and surrounding the main basin include dozens of varieties that create deep marsh, emergent marsh, high marsh, shrub thicket and riparian woodland ecologies. All hydraulic elements of the Forebay, the main basin and the Oxbow are also complete, including the berms surrounding and separating these areas, as well as all inlet, outlet and overflow structures. Work continues with construction of the vegetated swale that will carry stormwater flows from the Forebay into the main basin.



Main Wetland Basin, West to East, November 2012



Community Planting Day in Main Wetland Basin, July 2012

The main basin and overflow area will provide the storage, detention, wetlands treatment and attenuated release of stormwater flows to mitigate the impacts of the new stormwater flows on flood levels and water quality in the Little River and Alewife Brook. Stormwater flows that have been removed from the sewer system will enter the Forebay from the new stormwater box conduit. The Forebay will provide a level of storage and will cause sediments that are able to get by an upstream grit chamber recently constructed along the conduit to settle out before reaching the main wetland basin. Cambridge's consultants designed the Forebay to provide an adequate stilling of flows as well as an efficient means for the removal of sediments by Cambridge in the long term.

The Oxbow is a constructed open water extension of the Little River intended to provide spawning habitat for migratory fish such as alewife and blueback herring. The Oxbow is now fully connected to the Little River. Sandbags were removed from the banks in the fall of 2012, allowing the river, fish and ducks to circulate through it. Grading and shaping continues in the wetland meadow (overflow storage area) immediately west of the main basin and south of the Oxbow and in the vegetated swale between the Forebay and main basin. The planting of upland shrubs and trees continues around the Forebay and main basin.

Figure 5: Rendering of Alewife Wetland Basin

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**Oxbow (c), Wet Meadow Overflow Storage (f) and
Oxbow Overlook (c/r), October 2012**



Storm Drain Outfall to Forebay, March 2012

A mounded amphitheater, boardwalks and boardwalk overlooks in and around the wetland are intended to provide recreational and environmental learning opportunities for students, visitors and conservationists. Construction of the boardwalks and overlooks began in the fall of 2012 and will continue, along with construction of the amphitheater, through the summer of 2013.



**Construction of Boardwalk and Vegetated Swale from
Forebay to Main Wetland Basin, December 2012**



Framing of Boardwalk across Main Basin, October 2012



**Looking East across Constructed Wetland,
October 2012**



**Rudbeckia planted on bank of wetland basin,
September 2012**

Cambridge also continues with construction of the new storm drain outfall and associated special structures that will convey separated stormwater flows to the basin. Its contractor recently completed installing the last sections of the 3,300-foot long, 4-foot by 8-foot box conduit and is constructing a connection of the new box conduit to the upstream conduit sections that Cambridge installed in Concord Avenue and Fresh Pond Parkway under a separate contract more than a decade ago. Cambridge also recently completed the special structures along the conduit, including a grit chamber that will provide a level of solids removal prior to the stormwater flows entering the Forebay and a bending weir chamber that will direct stormwater flows to the wetland basin but allow flows exceeding the basin's capacity to be diverted directly to the Alewife Brook. Stormwater will be directed to the basin beginning in late 2013 and continuing through 2015, as Cambridge makes progress with each of the CAM004 sewer separation contracts and removes stormwater from the sewer system.



**Nighttime Construction of Stormwater Box Conduit on
Upper Wheeler Street, February 2012**

CAM004 Sewer Separation

Design and construction efforts for the three remaining construction contracts to complete the CAM004 sewer separation project – Cambridge contracts 8A (Huron Avenue A), 8B (Huron Avenue B) and 9 (Concord Avenue) – are also progressing on schedule. The three contracts will separate combined sewers upstream of Outfall CAM004 in the Huron Avenue and Concord Avenue neighborhoods, encompassing a 211-acre area east of Fresh Pond Parkway (see Figure 3 on page 10).

Cambridge issued the notice to proceed with construction of the \$15.4 million Contract 8A on September 29, 2012, in compliance with Schedule Seven. Contract 8A includes the separation of approximately 13,500 linear feet of sanitary sewer and storm drain pipe up to 54-inch diameter in Huron Avenue and several intersecting streets and 7,200 linear feet of smaller diameter drain pipe for building, catch basin and other connections in a 68-acre area immediately east of Fresh Pond Parkway, from Fresh Pond to Brattle Street. The contract also includes the installation of three large storm drain vaults on Vassal Lane, 45 new or replacement catch basins with hoods and 6-foot sumps, work on private property exterior to 58 buildings within the project area to remove roof runoff and sump pump discharges from the sewer system, and 6,700 linear feet of replacement water main ranging from 6-inch to 12-inch diameter.

Cambridge has also included “Green Technologies” in the contract for stormwater quality improvement and quantity control. The Green Technologies consist of 8,500 linear feet of porous pavement, five “biobasins” with overflow connections to the storm drain system, and 145 new street trees. The biobasins are planted areas that function as part of the stormwater system by intercepting and detaining street runoff to capture some of the sediments, provide a level of removal of other pollutants such as phosphorus and nitrogen, and potentially reduce the rate and volume of stormwater runoff to the drainage system.

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Since commencing work in September 2012, Cambridge's contractor has conducted pre-construction video inspections, installed tree protections and pruned trees, excavated test pits to more accurately locate utilities and other subsurface structures, relocated water mains at Hawthorne Park, Lexington Avenue and Grozier Lane. Cambridge's contractor has also begun sewer and storm drain installations in Grozier Road, Hawthorne Park, Lexington Avenue and Poplar Road. NStar Gas is relocating gas mains and service connections within the contract area ahead of the planned sewer and drain installations. The sewer separation work of Contract 8A is scheduled to be substantially complete in May 2014, and surface restoration work will continue through December 2014.

Cambridge also continues to make progress with design of the two remaining contracts necessary to complete the CAM004 sewer separation project. Contract 8B includes the installation of new sanitary sewers and storm drains in Huron Avenue and several intersecting streets to separate combined sewers in an 83-acre area east of the Contract 8A work area, extending as far east and north as Concord Avenue and as far south as Brattle Street. Cambridge received the 60 percent design submission for Contract 8B in November 2012 and the 90 percent design submission in February 2013. Cambridge plans to issue the notice to proceed for construction of Contract 8B in July 2013.

Cambridge issued the notice to proceed with design of Contract 9 in January 2013. Contract 9 includes the installation of new sanitary sewers and storm drains in Concord Avenue and several intersecting streets to separate combined sewers in a 60-acre area north of Contracts 8A and 8B and extending from Fresh Pond Parkway in the west to the intersection of Concord Avenue and Huron Avenue in the east. At this time, Cambridge plans to commence construction of Contract 9 in January 2014 and substantially complete the sewer separation work of the contract by December 2015 in compliance with Schedule Seven.

As discussed in Section 2.2 of this report, information gained from its ongoing design of the CAM004 sewer separation project has caused Cambridge to be concerned that all of the necessary street by street storm drain and sanitary sewer installation and utility relocation work within its three construction contracts (8A, 8B and 9) and the need to avoid serious impacts to traffic from simultaneous work on Huron and Concord avenues could impact its ability to complete all work by the December 2015 milestone in Schedule Seven. Since that time, Cambridge has taken steps to maintain compliance with the Schedule Seven milestone, while acknowledging that there are remaining design and construction challenges still to be addressed. These steps include expediting design of contracts 8B and 9, accelerating its coordination with private utilities during design, and sequencing construction activities within and across contracts 8B and 9 to avoid simultaneous disruptions to traffic on Huron and Concord avenues.



Water Main Relocation Work Ahead of Sewer and Storm Drain Installation on Lexington Avenue at Huron Avenue

Control Gate and Floatables Control at Outfall MWR003 and MWRA Rindge Avenue Siphon Relief Interceptor Connection Relief and Floatables Control at Outfall SOM01A

While the City of Cambridge is implementing four of the six projects in the Alewife Brook CSO control plan, MWRA is currently designing and will construct the remaining two projects: Control Gate and Floatables Control at Outfall MWR003 and MWRA Rindge Avenue Siphon Relief (the “MWR003/Rindge Ave siphon project”), shown in Figure 6, and Interceptor Connection Relief and Floatables Control at Outfall SOM01A (the “SOM01A project”), shown in Figure 7 on the next page. These two projects, at an estimated total capital cost of \$4.3 million, are the last two of the six projects in MWRA’s Alewife Brook CSO plan and the last two of the 35 projects in MWRA’s regional long-term CSO control plan to proceed into implementation.

As recommended in the April 2001 NPC, the projects’ intended objectives include 1) ensuring sufficient sewer system hydraulic relief capacity through MWRA’s Rindge Avenue overflow siphon to Outfall MWR003 and Alewife Brook in extreme storms, 2) reducing CSO discharges at the City of Somerville’s Outfall SOM01A by increasing the size of the local sewer connection between Somerville’s Tannery Brook Conduit and MWRA’s interceptor system, and 3) providing for the control of floatable materials in the CSO discharges at both outfalls. Providing greater system relief through the Rindge Avenue siphon and Outfall MWR003 in extreme storms is necessary in part to compensate for the loss of system relief with the planned closing of Outfall CAM004 with completion of the CAM004 sewer separation project in 2015.

MWRA issued the notice to proceed with the design services for both projects on March 30, 2012, in compliance with the April 2013 milestone in Schedule Seven. In addition to the April 2001 NPC defined project objectives listed above, the design scope also includes optimization of the overall hydraulic performance of MWRA’s interceptor system to maximize conveyance to downstream MWRA transport and treatment facilities and to minimize overflows to Alewife Brook.

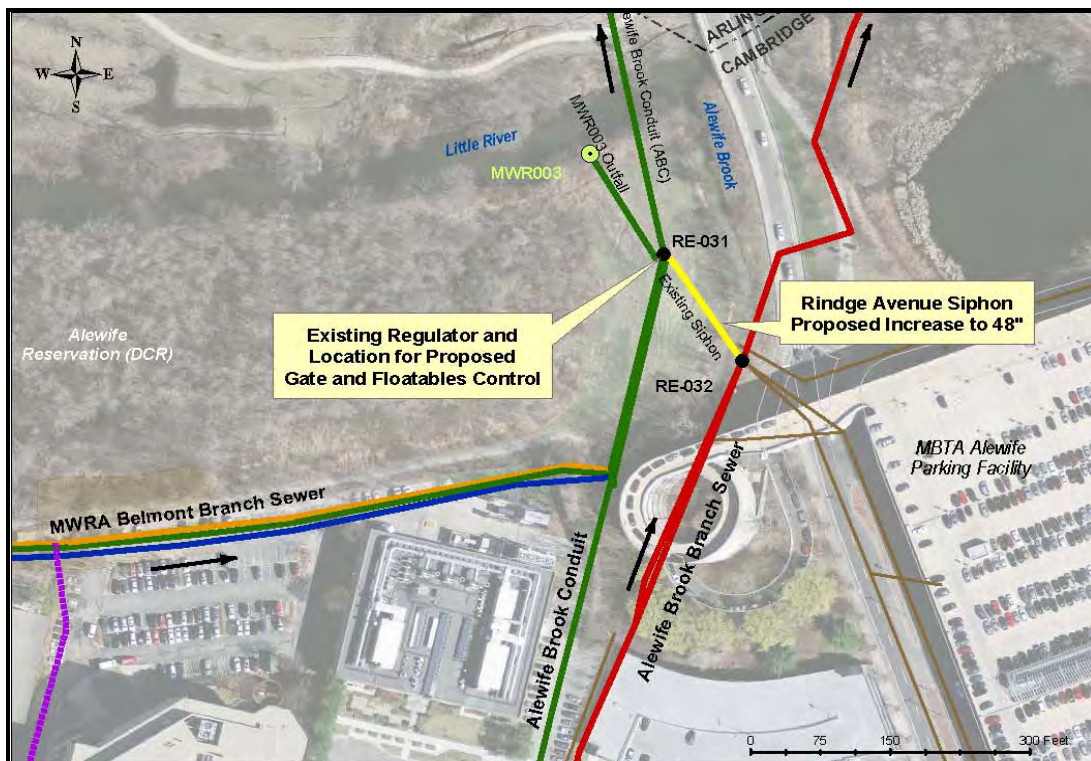
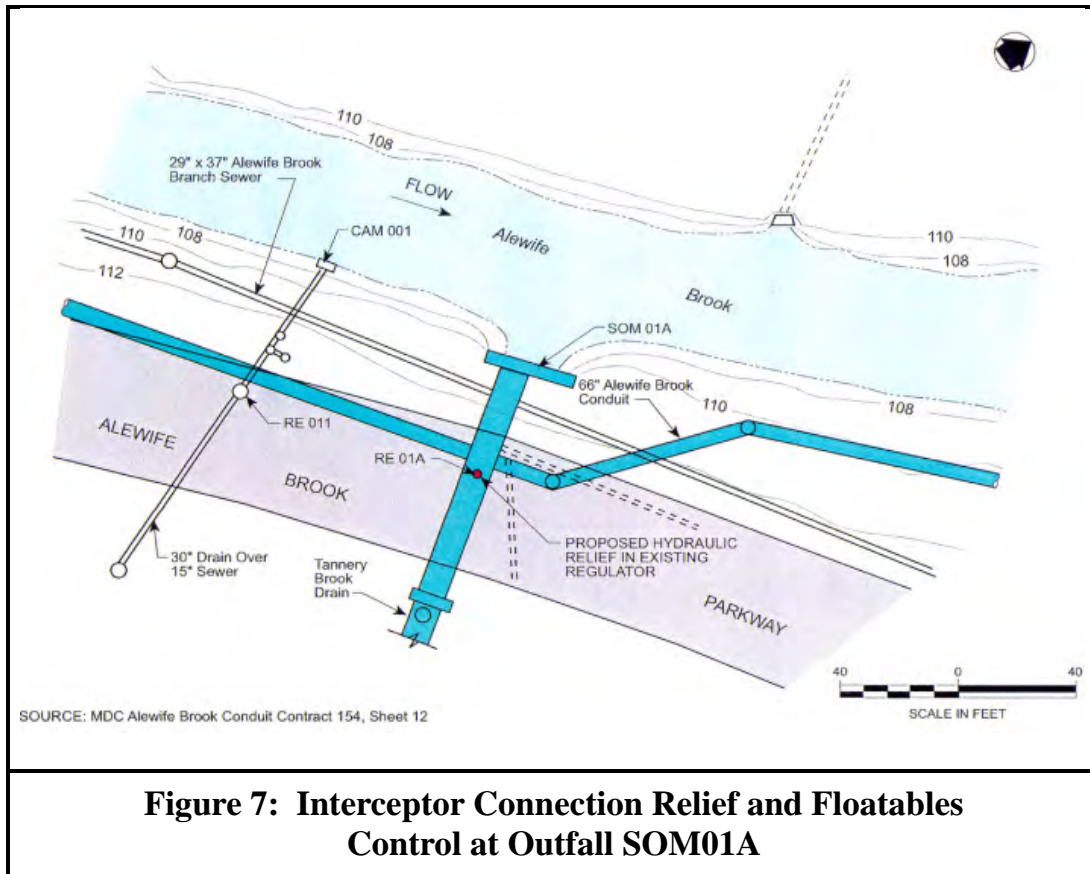


Figure 6: Control Gate and Floatables Control at Outfall MWR003 and MWRA Rindge Ave. Siphon Relief



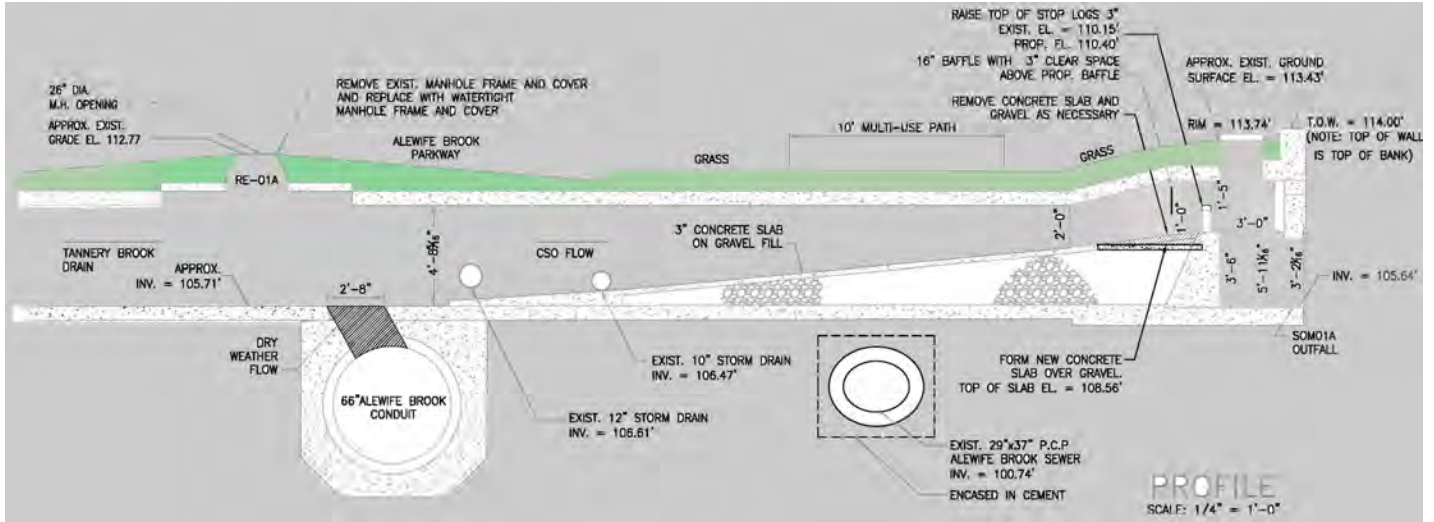
MWRA's interceptor system includes two parallel sewers that generally follow the alignment of Alewife Brook from their downstream ends at MWRA's Alewife Brook Pumping station, located next to DCR's Dilboy Field and the Somerville/Medford line, to their upstream ends in the vicinity of the Fresh Pond Rotary in Cambridge. The Alewife Brook Sewer was constructed in 1893 primarily to serve portions of Arlington, Cambridge and Somerville. In 1949, the Alewife Brook Conduit was constructed primarily to extend sewer service to Belmont and generally increase the hydraulic capacity of the Alewife system. The two interceptors are interconnected at a few locations, generally further downstream, and both interceptors share the overflow at Outfall MWR003, located behind the MBTA Alewife Station.

MWRA has made substantial design progress with both projects, on schedules that provide for compliance with the construction milestones in Schedule Seven. Much of the progress made to date involved upgrading MWRA's hydraulic model for the Alewife Brook interceptor system, updating modeled system performance assessments for existing and future planned conditions, and evaluating various alternatives to accomplish the CSO and conveyance objectives of the two projects. Future planned conditions incorporate the conditions system and system flow conditions resulting from the other projects in the Alewife Brook CSO plan. MWRA's design consultant has also completed topographic, utility and wetlands surveys, baseline traffic control evaluations, and geotechnical and hazardous material investigations and has also performing constructability reviews of select alternatives.

MWRA's design consultant completed the final preliminary design report for the SOM01A project in December 2012, and submitted the construction plans and specifications for MWRA review in January 2013. As shown in Figure 8 on the next page, the project includes 1) increasing the connection between the Tannery Brook Conduit and the Alewife Brook Conduit from the current nominal 24-inch diameter to approximately 36-inch diameter, 2) providing the ability to raise the SOM01A overflow weir by three or six inches, and 3) installing an underflow baffle with the Tannery Brook Conduit just upstream of the SOM01A weir, for floatables control. MWRA has recently approached DCR, the cities of Cambridge and Somerville

and the Cambridge Conservation Commission with these plans. The project schedule calls for MWRA to advertise the construction contract in May 2013 for construction bids. MWRA plans to issue the notice to proceed with construction of the SOM01A project in September 2013, in compliance with Schedule Seven.

Figure 8: Profile of SOM01A Recommended Improvements



MWRA’s design consultant continues to conduct hydraulic modeling evaluations of various system improvement alternatives to meet the project objectives at Outfall MWR003 and the MWRA Rindge Avenue overflow siphon. Preliminary modeling results support the recommendations of the April 2001 NPC, including the need to replace the existing static overflow weir at Outfall MWR003 with an automated gate and increase the hydraulic capacity of the Rindge Avenue siphon to provide sufficient system relief (overflow capacity) in extreme storms. MWRA’s preliminary recommendation is to replace the existing 30-inch diameter siphon with a 48-inch diameter pipe. The results of the modeling evaluations also show that the performance of the Alewife Brook Sewer and Alewife Brook Conduit in terms of conveyance capacity and the control overflows can be improved by providing a better balance of flow between these interceptors. The preliminary recommendation is to accomplish this reallocation by designing the Rindge Avenue siphon replacement to serve both as an overflow conduit and as an interconnection of the two interceptors, allowing some sharing of flow.

The MWR003/Rindge Avenue siphon project schedule calls for completion of the final preliminary design report this spring, completion of construction contract plans and specifications in early 2014, and notice to proceed with construction in August 2014, in compliance with Schedule Seven.

Brookline Sewer Separation

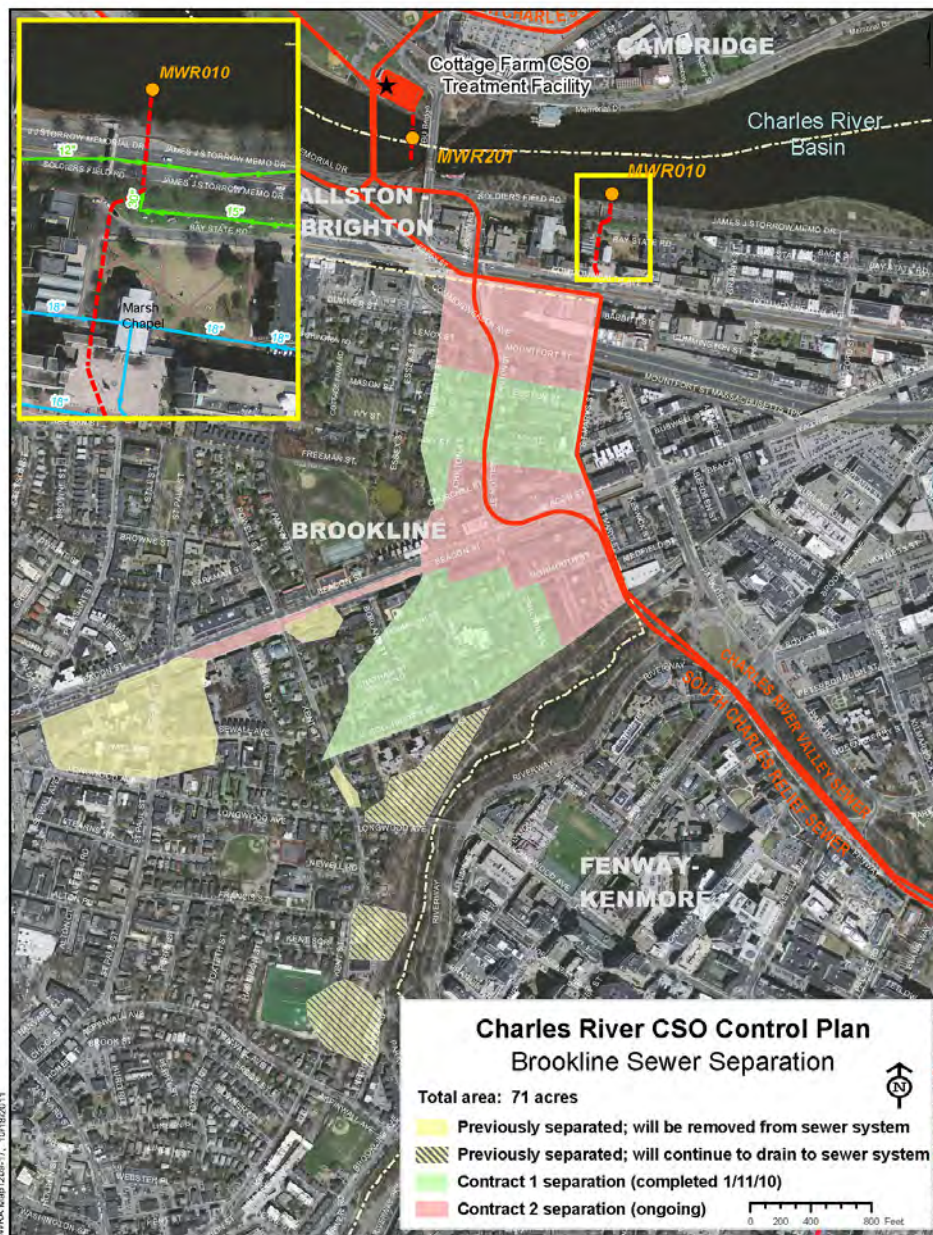
	<u>Court Milestone</u>	<u>Project Schedule</u>
Commence Design	November 2006	November 2006
Commence Construction	November 2008	November 2008
Complete Construction	July 2013	July 2013

The \$25.9 million Brookline sewer separation project includes two construction contracts managed by the Town of Brookline with MWRA funding support and an outfall rehabilitation contract managed by MWRA. The project is providing separate sanitary sewers and storm drains for approximately 72 acres of the Town of Brookline that were served by local combined sewers tributary to MWRA’s Charles River Valley Sewer (see Figure 9 on the next page). The project goal is to reduce treated CSO discharges to the Charles River at

MWRA's Cottage Farm Facility and generally relieve wet-weather hydraulic surcharge conditions in the Town and MWRA systems that can contribute to Charles River CSO discharges at other, untreated outfalls.

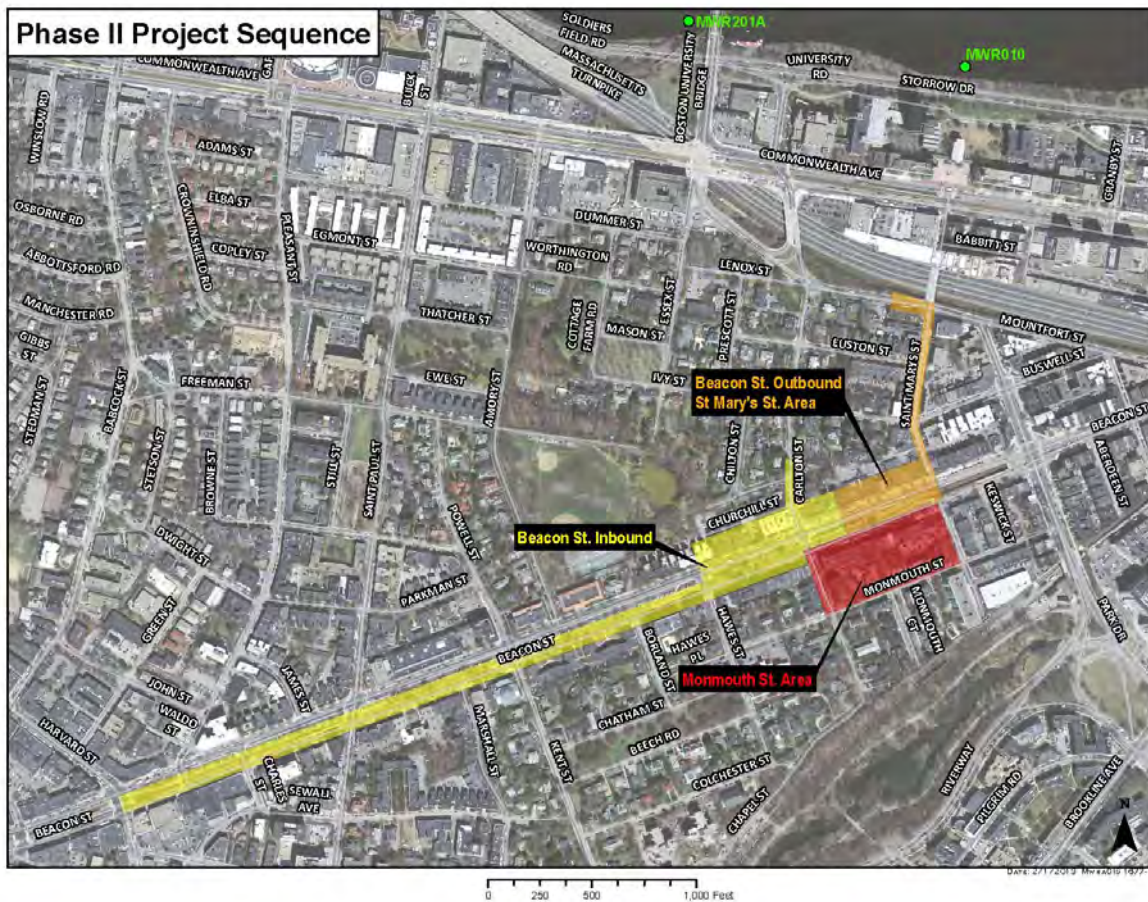
The project was recommended by MWRA and approved by EPA and DEP in March 2006 as part of the broader agreement on the Long-Term Control Plan that proposed to increase the level of CSO control for the Charles River Basin above the level MWRA had recommended in the 1997 CSO Facilities Plan. MWRA and the Town of Brookline executed a CSO Memorandum of Understanding and Financial Assistance Agreement in July 2006 by which Brookline agrees to manage design and construction of the sewer separation work and own the constructed facilities (new sewer and storm drains) and ensure that CSO control goals and other project performance objectives are met. MWRA is funding the Town's design and construction related work pursuant to the eligibility terms of the agreement. MWRA has also completed the cleaning and rehabilitation of Outfall MWR010, which will be used to convey the large volumes of stormwater removed from Brookline's combined sewer system to the Charles River Basin.

Figure 9: Brookline Sewer Separation Project



Brookline completed the \$1.4 million first construction contract (“Phase I”) in January 2010, which involved the installation of 5,658 linear feet of storm drain in secondary streets on the north and south sides of Beacon Street. Brookline issued the Notice to Proceed with the \$16.8 million second construction contract (“Phase II”) on January 19, 2011. Phase II (see project work areas in Figure 10) includes the installation of 3,790 linear feet of new storm drain and 1,290 linear feet of new sanitary sewer by open trench method and 4,550 linear feet of sanitary sewer by microtunneling. The contract involves micro-tunneling large diameter sewers at significant depths along Beacon and Monmouth Streets; installing and/or rehabilitating smaller-diameter sewers along Beacon, Monmouth and St. Mary’s Streets; installing storm drains along the same streets; and converting a large-diameter combined sewer along St. Mary’s Street to a storm drain. As part of this project, Brookline has constructed several large, special structures to connect the new town sewers to existing town laterals and to MWRA’s interceptor system, including MWRA’s Charles River Valley Sewer and South Charles Relief Sewer.

Figure 10: Brookline Sewer Separation Phase II Work Areas



The Phase II contract is more than 95 percent complete. Brookline’s contractor has completed the installation of all main line storm drains and sewers and has connected the side street drains and sewers to them. The contractor also completed Structure No. 1 a large sanitary connection (57-inch) from newly microtunneled Brookline sewer to the MWRA Charles River Valley Sewer and Structure No. 2 a large connection between the existing Brookline 72-inch x 85-inch combined sewer to the newly microtunneled 57-inch sanitary sewer. Structures 3, 4 and 5 were completed in 2011. Also complete is the installation of all building service connections to appropriate new sewers. As of October 2012, all six new sanitary connections to the MWRA Charles River Valley Sewer and MWRA South Charles Relief were complete and operational, while the separated stormwater flows continue to flow from the St. Mary’s Street combined

sewer (being converted to a storm drain) through the longstanding connection to the Charles River Valley Sewer at St. Mary's Street and Commonwealth Avenue. The contractor's ongoing work includes cleaning former combined sewers that have been converted to storm drains and locating and removing any remaining sanitary connections to the storm drains. The contractor is also installing a new service connection and deep 18-inch sewer in St. Mary's Street to provide for continuing service to one Boston University building that posed a special service problem. The contractor also has begun to modify the old CSO regulator structure and connection to MWRA to complete the conversion of the St. Mary's Street combined sewer to a storm drain and allow for the separated stormwater to be removed from MWRA's system and be redirected through Outfall MWR010 to the Charles River. The Town of Brookline expects to attain substantial completion of the sewer separation work by July 2013, in compliance with Schedule Seven.

Outfall MWR010 Cleaning

MWRA issued the notice to proceed with its \$1.1 million contract to clean CSO Outfall MWR010 in April 2012 and attained substantial completion of the contract in August. The cleaning work primarily involved the removal of heavy sediments and was necessary to ensure that the outfall has adequate capacity to convey Brookline's separated stormwater to the Charles River, along with smaller volumes of existing BWSC and Boston University stormwater and infrequent CSO discharges from MWRA's Charles River Valley Sewer and a BWSC CSO regulator. The outfall crosses Boston University property from Commonwealth Avenue, then crosses beneath Storrow Drive and the Esplanade to the Charles River. Remaining work includes removal of a gate at the lower end of outfall pipe, which will be performed by Brookline's sewer separation contractor.



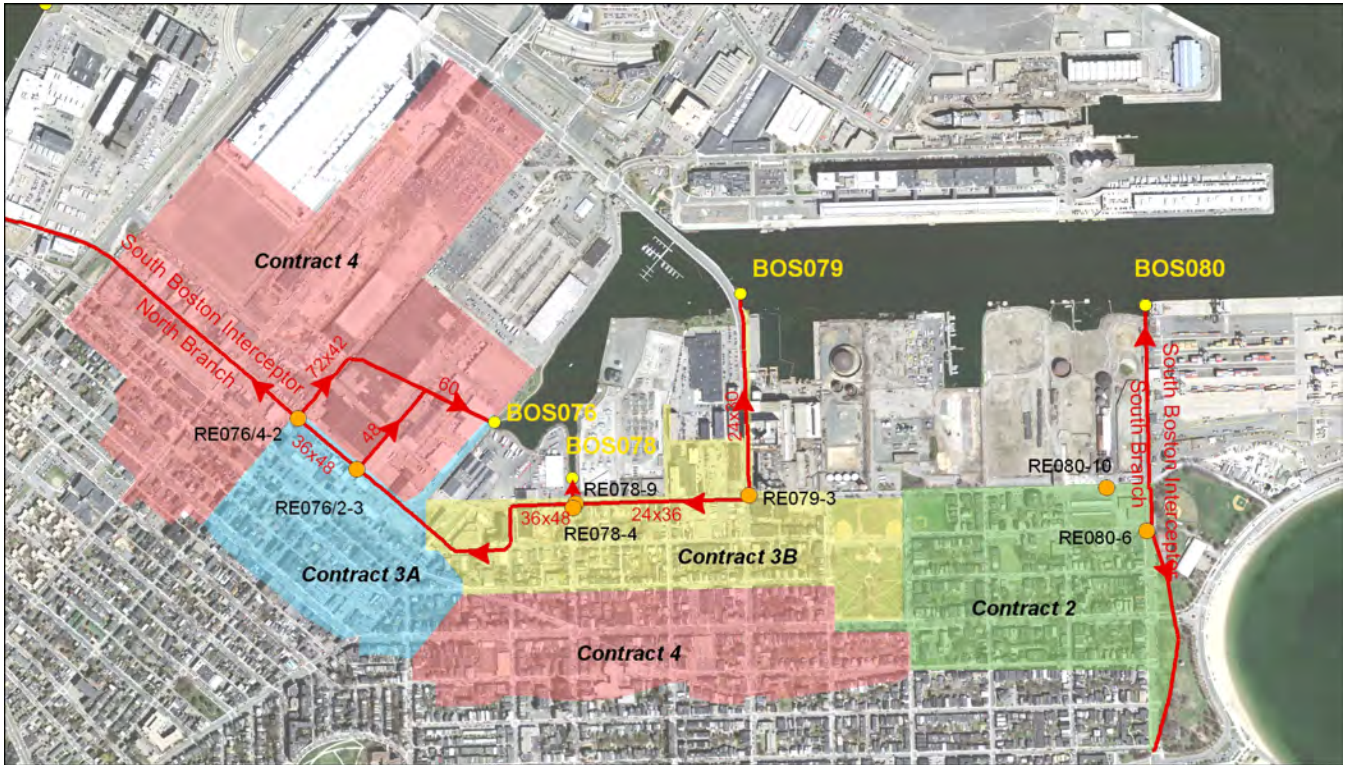
Contractor removing sediment from CSO Outfall MWR010

Reserved Channel Sewer Separation

	<u>Court Milestone</u>	<u>Project Schedule</u>
Commence Design	July 2006	July 2006
Commence Construction	May 2009	May 2009
Complete Construction	December 2015	December 2015

The \$64.1 million Reserved Channel Sewer Separation project is intended to minimize CSO discharges and impacts to the Reserved Channel by separating combined sewer systems in a portion of South Boston tributary to CSO Outfalls BOS076, BOS078, BOS079 and BOS080 (see Figure 11 on the next page). Implementation of the approved sewer separation plan will reduce the number of CSO activations to the Reserved Channel from 37 events to three events in a typical year and reduce total annual CSO volume to the Reserved Channel from 28 million gallons to 1.5 million gallons. The work includes the installation of approximately 42,100 linear feet of new storm drain, along with an additional 6,500 feet of minor drain primarily to connect catch basins to the new storm drains. The work also includes the installation or rehabilitation of 17,300 linear feet of sanitary sewer. To remove enough stormwater inflow from the sewer system and attain the long-term level of CSO control, many building downspout connections and parking lot drains will also be disconnected from the sewer and tied into the new storm drains. The project also includes rehabilitating and/or upgrading the four CSO outfalls to ensure they have the capacity to deliver the separated stormwater flows, as well as remaining, infrequent CSO flows, to the Reserved Channel for the long term.

Figure 11: Reserved Channel Sewer Separation Contracts



Construction Contracts		% Complete	Construction Dates
Contract 1	Outfall Rehabilitation	100%	2010-2011
Contract 2	Sewer Separation	100%	2009-2011
Contract 3A	Sewer Separation	100%	2010-2012
Contract 3B	Sewer Separation	50%	2011-2014
Contract 4	Sewer Separation	25%	2012-2014
Contract 5	Sewer Cleaning/Lining		2013-2014
Contract 6	Downspout Disconnections		2013-2014
Contract 7	Paving	100%	2010-2012
Contract 8	Paving	30%	2012-2015

The project area encompasses approximately 365 acres of South Boston that comprise the drainage areas tributary to the four Reserved Channel outfalls. This area is an urban mix of residential properties and extensive commercial, industrial and recreational land uses primarily along or close to the channel. East First Street is the primary roadway through the project area and is characterized by heavily congested utilities and truck traffic primarily associated with transportation of containers from Conley Terminal.

MWRA and BWSC added this project to their CSO Memorandum of Understanding and Financial Assistance Agreement in June 2006. BWSC is responsible for managing design and construction of the project and ensuring that CSO control goals and other project objectives are met, and it will own the new storm drains and upgraded sewers. MWRA is funding design and construction costs pursuant to the

eligibility terms of the agreement. BWSC commenced design in July 2006, in compliance with Schedule Seven. The design work and construction contracts for the Reserved Channel sewer separation project follow an approach similar to the South Dorchester Bay and Stony Brook sewer separation projects, with multiple design packages and construction contracts sequenced over several years.

BWSC proposes nine, phased construction contracts for this project, including four sewer separation contracts (BWSC Contracts 2, 3A, 3B, and 4), an outfalls rehabilitation contract (BWSC Contract 1), a sewer cleaning and lining contract (BWSC Contract 5), a downspout disconnection contract (BWSC Contract 6), and two final paving contracts (BWSC Contracts 7 and 8). By the end of 2011, BWSC had attained substantial completion of the \$4.0 million Contract 1, which involved the rehabilitation of the four Reserved Channel CSO outfalls to accommodate the stormwater flows being removed from the sewer system, provide the outfalls long-term structural integrity, and provide protection to the Reserved Channel shoreline at each discharge location. BWSC had also completed the \$6.9 million Contract 2, which involved the installation of 8,380 linear feet of storm drain, approximately 3,960 linear feet of minor drain (up to 8-inch diameter), and 3,370 linear feet of sanitary sewer to separate combined sewers in a 55-acre area of South Boston approximately bounded by East First Street, Farragut Road, East Fourth Street and N Street. The work removed stormwater from the local sewers tributary to the upstream end of BWSC's South Boston Interceptor, South Branch ("SBI-SB"), with the benefits of 1) reducing CSO overflows to the Reserved Channel at Outfall BOS080 and 2) reducing surcharging within the SBI-SB and 3) reducing CSO discharges from the SBI-SB, which are now captured by the North Dorchester Bay CSO storage tunnel.

BWSC has continued to make substantial progress with design and construction activities on a schedule that calls for completion of all work by December 2015, in compliance with Schedule Seven. The following describes the progress of the construction contracts that were underway in 2012 or continue to be in design.

- BWSC attained substantial completion of the \$9.9 million Contract 3A in December 2012. Contract 3A involved sewer separation in a 33-acre area tributary to outfall BOS076 bounded approximately by West First Street, G Street, West Broadway and E Street. It includes the installation of 9,000 linear feet of storm drain, 3,375 linear feet of sanitary sewer, 8,650 linear feet of replacement water main to avoid conflicts with the planned storm drains, and 22 new storm drain catch basins, as well as the reconnection of 76 existing catch basins from the existing sewer system to the new storm drains.
- BWSC continued to make progress with construction of the \$10.9 million Contract 3B for sewer separation in a 66-acre area of South Boston approximately bounded by East First Street, N Street, East Third Street and Dorchester Street, and including Elkins Street and Summer Street to the edge of the Reserved Channel. Contract 3B includes 10,730 linear feet of new storm drain and 4,240 linear feet of new sanitary sewer to separate the combined sewers in a 66-acre area tributary to outfalls BOS078 and BOS079, as well as 10,900 linear feet of replacement water main to remove conflicts with the planned



Special Manhole B at E. First St. and K St. (Contract 3B)



Storm Drain Installation on E. First St. (Contract 3B)

storm drains. Fourteen new catch basins will be installed, and 120 existing catch basins will be disconnected from the sewer system and reconnected to new storm drains. BWSC has completed major storm drain installations in East First Street between Dorchester and K Streets, as well as storm drain and sewer installations on several of the side streets between East First Street and East Second Street. Ongoing work involves the installation of water mains and storm drains in East Third Street. The work in East Third Street is extensive and will take several months to complete. Contract 3B is approximately 50% complete, and BWSC expects to attain substantial completion of this contract in December 2014.

- In May 2012, BWSC attained substantial completion of the \$1.3 million Contract 7, the first of two planned pavement restoration contracts. The contractor placed more than 18,700 square yards of pavement for permanent trench repair and more than 16,400 linear feet of pavement markings.
- BWSC issued the notice to proceed with construction of the \$9.1 million Contract 4 on October 1, 2012. Contract 4 is the last of the major Reserved Channel sewer separation contracts. The work will occur in two areas totaling 182 acres tributary to outfalls BOS076, BOS078 and BOS079. One of the two areas lies south of the Reserved Channel and is approximately bounded by G Street, East Third Street, N Street, Emerson Street and East Fourth Street. The second area lies west of the Reserved Channel, close to the Boston Convention and Exposition Center (“BCEC”), and is approximately bounded by the Reserved Channel, West Broadway, G Street and the BCEC. Construction activities to date include the installation of water mains and storm drains in West First, Cypher and C Streets and the installation of storm drains in B Street. Contract 4 has a completion date of August 2015.



Installation of 36-inch Storm Drain on E St. (Contract 4)

- BWSC also issued the notice to proceed with construction of the \$6.8 million Contract 8 on October 1, 2012. Contract 8 is the second of two pavement restoration contracts that follow the work of the various sewer separation contracts (contracts 3A, 3B and 4) as sections of work are completed. Paving work in the Contract 3A area is complete. Paving work under Contract 8 will continue to follow the sewer separation work of Contracts 3B and 4 through 2015.

BWSC also made progress with design of the two remaining contracts – the \$5.0 million Contract 5 (existing sewer cleaning and lining), which BWSC plans to advertise for construction bids in May 2013, and the \$725,000 Contract 6 (downspout disconnections), which BWSC advertised on February 20, 2013. All design and construction work for the Reserved Channel sewer separation project is on schedule for project completion in December 2015, in compliance with Schedule Seven.

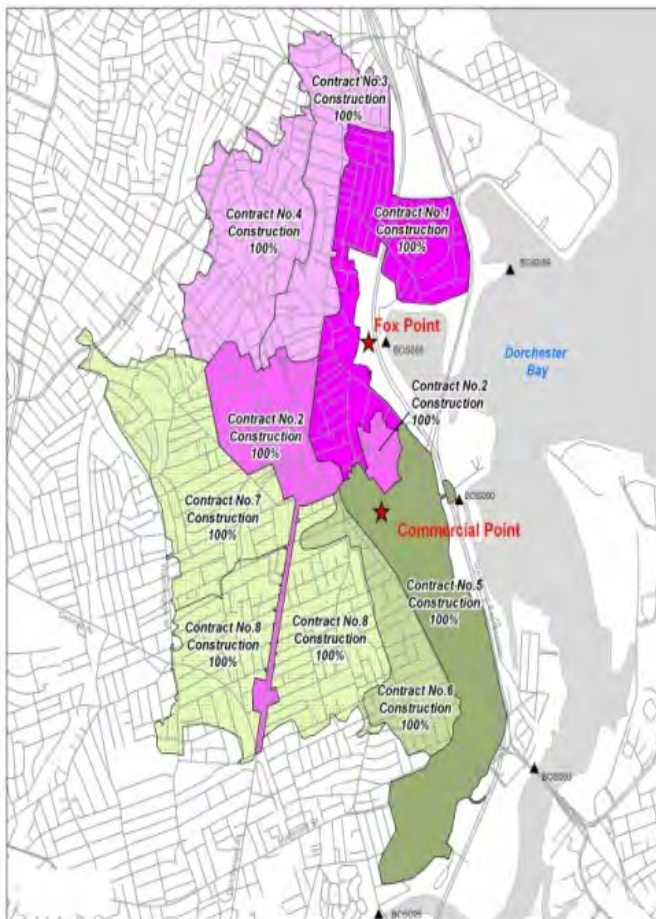
2.4 Other CSO Control Improvements

In addition to the ongoing work to complete the remaining six of 35 projects in the Long-Term Control Plan and Schedule Seven, MWRA and the CSO communities are performing related work to help bring CSO discharges into compliance with the approved long-term levels of control, further improve system wet-weather performance, and/or gain additional CSO control.

South Dorchester Bay Inflow Removal

BWSC continues to investigate whether additional stormwater removal (i.e. disconnection of undocumented sources of inflow/infiltration) can be achieved in sewer systems tributary to the Dorchester Interceptor. These investigations follow BWSC's substantial completion of the \$119.0 million South Dorchester Bay Sewer Separation project in 2007. The purpose of the work is to mitigate the remaining risks of sewer system surcharging in large storms as a result of the closing of all CSO regulators that previously provided hydraulic relief to the Dorchester Interceptor by sending excess flows to the outfalls. The sewer separation project eliminated CSO discharges to the Commercial Point and Fox Point CSO treatment facilities and the beaches of South Dorchester Bay, allowing MWRA to decommission the two facilities in November 2007.

BWSC continues to investigate alternatives for removing additional stormwater inflow. BWSC has conducted flow metering and additional hydraulic modeling and system analysis to evaluate system performance in extreme storms to determine preferred hydraulic relief solutions if warranted. BWSC plans to issue an interim report on the results of this analysis in early 2013 and a final report with recommendations by spring 2013. Flow monitoring and field investigations performed under the Dorchester Interceptor Inflow Relief Project have detected numerous locations of stormwater inflow into sanitary sewers. The majority of these sources involve catch basin laterals. BWSC crews are currently sealing those locations that can be eliminated by trenchless methods. In January 2013, BWSC advertised a \$625,000 construction contract expects for the relocation of seventeen remaining catch basin connections from the sanitary sewer system to the new storm drain system.

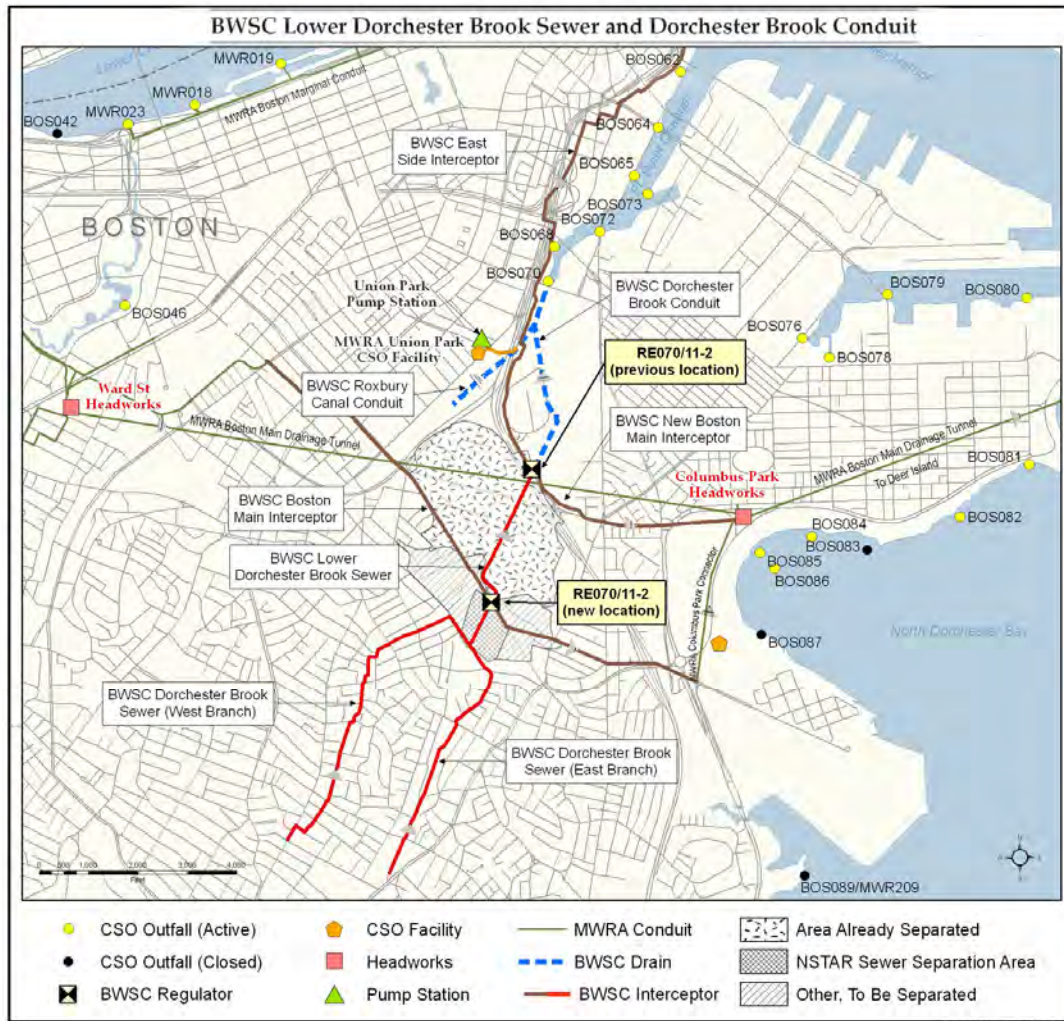


BWSC continues to locate and remove stormwater inflow in South Dorchester Bay sewer separation areas.

Lower Dorchester Brook Sewer Separation

BWSC attained substantial completion of its \$6.5 million construction contract for Lower Dorchester Brook sewer improvements (see Figure 12 on the next page), which included the relocation of CSO regulator RE-070/11-2 and sewer separation in a portion of the South Bay area associated with BWSC's Lower Dorchester Brook Sewer ("LDBS"). The work was partially funded by MWRA and is intended to lower CSO discharges to BWSC's Dorchester Brook Conduit and help attain the planned level of CSO control in MWRA's long-term control plan for Fort Point Channel. BWSC's LDBS carried a combination of sanitary and stormwater flow to a connection with BWSC's New Boston Main Interceptor ("NBMI") at CSO regulator RE-070/11-2. In addition to directing the LDBS flows into the NBMI for eventual transport to MWRA's Columbus Park Headworks in South Boston, the regulator allowed flows exceeding the capacity of the interceptor system to overflow to BWSC's Dorchester Brook Conduit, which conveys large stormwater flows to the Fort Point Channel along with combined sewer overflows from several BWSC regulators in large storms.

Figure 12: Lower Dorchester Brook Sewer Regulator Relocation and Sewer Separation



BWSC’s recently completed construction contract included the relocation of CSO regulator RE-070/11-2 and its associated interceptor connection from the NBMI to a point further up the LDBS where it crosses BWSC’s (old) Boston Main Interceptor (“BMI”). The BMI also conveys flow to the Columbus Park Headworks. At its new location, the regulator now directs the LDBS flows into the BMI and continues to allow overflows to the Dorchester Brook Conduit and Fort Point Channel, but at a reduced overflow frequency and volume. Connections to the LDBS between the old and new regulator locations carried separate stormwater flow, only, from drainage areas totaling about 125 acres (all of the sanitary flows to the LDBS enter further upstream). These stormwater flows placed significant burden on the interceptor system and contributed to the frequency and volume of overflows. With the regulator now moved upstream and the connection to the NBMI now permanently closed, the separate stormwater flow entering the LDBS between the regulator locations is no longer connected to the interceptor system and instead drains directly to the Dorchester Brook Conduit and Fort Point Channel, thereby relieving the interceptor system. The portion of the LDBS between the old and new regulator locations now serves as a storm drain.

The construction contract also included sewer separation in a 25-acre area near the NStar property adjacent to Massachusetts Avenue. With the relocation of the regulator, this separated stormwater, like the stormwater from the previously-separated 125-acre area mentioned above, can now drain directly to the Dorchester Brook Conduit and no longer impacts the interceptor system.

2.5 MWRA CSO Spending in 2012

MWRA spent \$42.4 million in 2012 to implement the CSO projects and fund the eligible CSO work of BWSC, Cambridge and Brookline. Of this amount, \$38.1 million (90%) was for construction and construction-related services.

Capital Spending by MWRA on CSO Control in 2012

Construction:	\$28.8 million
Engineering Services During Construction:	9.3 million
<i>Subtotal Construction Related:</i>	<i>\$38.1 million</i>
<u>Design:</u>	<u>4.3 million</u>
Total CSO Capital Spending in CY11:	\$42.4 million

Spending in 2012 brought MWRA's total capital expenditure for the CSO control program to \$818.1 million, 94% of the \$867.0 million CSO budget in the Proposed FY14 Capital Improvement Program (CIP). With only five of the 35 projects not yet completed, CSO program activity and spending will continue to slowly wind down from the highest calendar year spending of \$128.1 million in 2008. The Proposed FY14 CIP estimates fiscal year spending on CSO control of \$35.7 million in FY13 (July 1, 2012 thru June 30, 2013), \$17.0 million in FY14, \$7.1 million in FY15, and \$4.0 million in FY16 when the last of the CSO projects is scheduled to be completed.

3. STATUS OF PLAN IMPLEMENTATION AND BENEFITS ACHIEVED

3.1 Completed Work and Level of CSO Control

With the cooperation of its CSO communities, MWRA has completed 29 of the 35 CSO projects, 4 projects are currently in construction; and the remaining two projects are in design (see Figure 1 on pages 2-3 and Table 3 on page 29). Since 1987, when MWRA assumed responsibility for developing and implementing a regional CSO control plan, improvements to MWRA's wastewater transport and treatment systems have produced huge reductions in CSO discharges and dramatic improvement in water quality in many areas. These wastewater system improvements included MWRA's \$3.8 billion investment in the new Deer Island Treatment Plant and associated conveyance systems and the 29 CSO projects completed to date. As shown in Figure 13 on page 30, estimated average annual volume of CSO discharge has dropped from 3.3 billion gallons in 1988 to 0.50 billion gallons today (an 85% reduction), with 88% of the current discharge volume receiving treatment at MWRA's four long-term CSO facilities. Figure 14 on page 30 shows this reduction for each receiving water segment. See Figure 15 on page 31 for an identification of the water segments currently or formerly affected by CSO.

CSO discharges have been eliminated or virtually eliminated (i.e. 25-year storm level of control) at 37 of the 84 outfalls addressed in the Long-Term Control Plan. One of the outfalls recommended to be closed in MWRA's Long-Term Control Plan remains active. Outfall CAM004 is scheduled to be closed with completion of the CAM004 sewer separation project in December 2015.

The 37 closed outfalls include several the CSO communities have eliminated, or have closed on a test basis, that are in addition to those recommended for closure in the Long-Term Control Plan. These include two outfalls BWSC eliminated in East Boston (outfalls BOS006 and BOS007). The City of Cambridge continues to evaluate hydraulic conditions associated with two additional outfalls (Charles River Basin outfalls CAM009 and CAM011) it closed in 2007 on an interim basis pending the outcome of hydraulic impact evaluations.

Massachusetts Water Resources Authority
 Combined Sewer Overflow Control Plan
 Annual Progress Report 2012

Table 3: Status of CSO Project Implementation, March 15, 2013

MWRA CONTRACT	CSO PROJECTS IN SCHEDULE SEVEN	IN DESIGN	IN CONSTRUCTION	COMPLETE
MWRA Managed Projects				
N. Dorchester Bay Tunnel	N. Dorchester Bay CSO Storage Tunnel and Related Facilities			X
N. Dorchester Bay Facilities				
Pleasure Bay Storm Drain Improvements				X
Hydraulic Relief Projects	CAM005 Relief			X
	BOS017 Relief			X
East Boston Branch Sewer Relief				X
BOS019 CSO Storage Conduit				X
Chelsea Relief Sewers	Chelsea Trunk Sewer Relief			X
	Chelsea Branch Sewer Relief			X
	CHE008 Outfall Repairs			X
Union Park Detention/Treatment Facility				X
CSO Facility Upgrades and MWRA Floatables	Cottage Farm Upgrade			X
	Prison Point Upgrade			X
	Commercial Point Upgrade			X
	Fox Point Upgrade			X
	Somerville-Marginal Upgrade			X
MWRA Floatables and Outfall Closings				X
Brookline Connection and Cottage Farm Overflow Interconnection and Gate				X
Optimization Study of Prison Point CSO Facility				X
Community Managed Projects				
South Dorchester Bay Sewer Separation				X
Stony Brook Sewer Separation				X
Neponset River Sewer Separation				X
Constitution Beach Sewer Separation				X
Fort Point Channel Sewer Separation and System Optimization				X
Morrissey Boulevard Storm Drain				X
Reserved Channel Sewer Separation		X	X	
Bulfinch Triangle Sewer Separation				X
Brookline Sewer Separation			X	
Somerville Baffle Manhole Separation				X
Cambridge/Alewife Brook Sewer Separation	CAM004 Outfall and Wetland Basin		X	
	CAM004 Sewer Separation	X	X	
	CAM400 Manhole Separation			X
	Interceptor Connection Relief/Floatables at CAM001, CAM002, and CAM401B			X
	MWR003 Gate and Rindge Ave. Siphon Relief	X		
Interceptor Connection Relief/Floatables at SOM01A		X		
Region-wide Floatables Control and Outfall Closings				X

Figure 13: Region-wide CSO Reduction and Goal

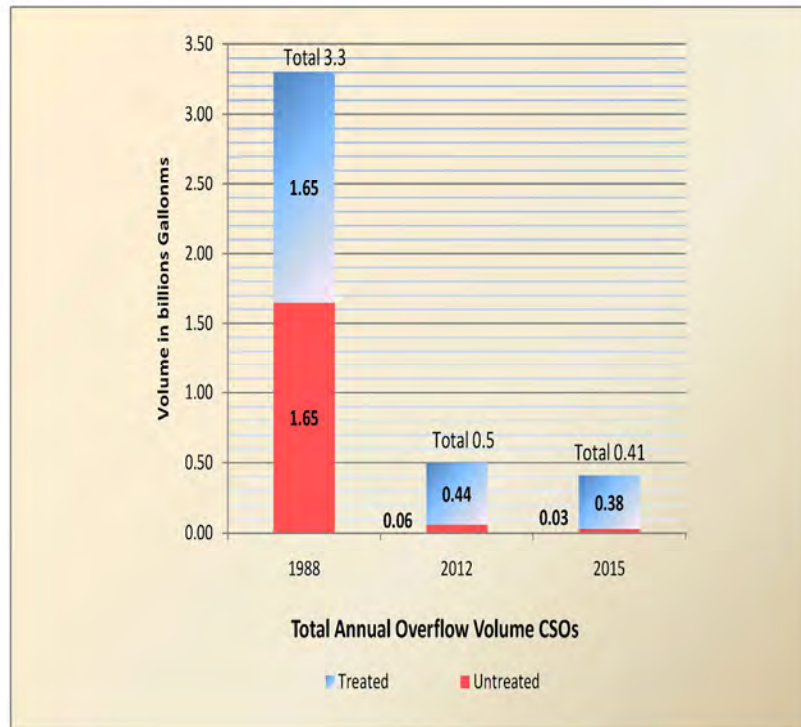


Figure 14: CSO Volume Reduction by Receiving Water

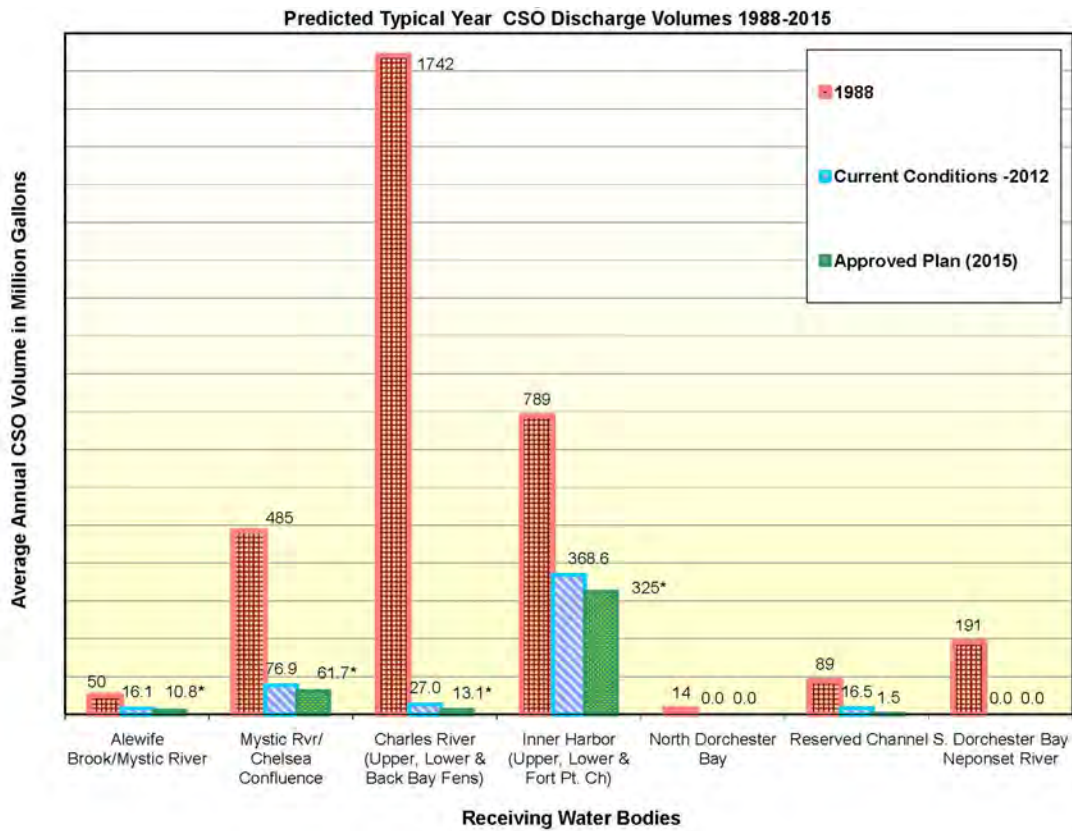


Figure 15: Boston Harbor and its Tributaries



3.2 Water Quality Improvement

MWRA's major improvements to its collection and treatment systems and its completed CSO control projects have been joined by community efforts to control pollutant loadings in separate urban stormwater discharges. Together, these programs have the potential to effect significant water quality improvement that in turn will enhance environmental conditions and promote safe public use. The benefits of these complementary pollution control programs are most evident in the Charles River. Tremendous water quality improvement has been observed and measured in the Charles River Basin, where average annual CSO discharge has been drastically cut from about 1.7 billion gallons in 1988 to 27 million gallons today, a greater than 98% reduction. Approximately 85% of this remaining overflow is treated at MWRA's Cottage Farm CSO facility.

These improvements are the result of major wastewater system projects, most notably the new Deer Island Wastewater Treatment Plant and related conveyance and pumping systems, as well as the CSO control projects completed to date. MWRA and the CSO communities along the Charles River completed a set of improvements in the late 1980s that eliminated dry weather sewage overflows at CSO outfalls. They also completed a set of system optimization projects in the mid-1990s that maximized the existing system's hydraulic performance and lowered CSO discharges. MWRA and the communities have also completed six CSO control projects along the Charles River: Cottage Farm Facility Upgrade (2000), CAM005 Hydraulic Relief (2000), Independent Floatables Controls and Outfall Closings Project (2001), Stony Brook Sewer Separation (2006), Cottage Farm Brookline Connection and Inflow Controls (2009) and Bulfinch Triangle Sewer Separation (2010).

In the same period, communities along the Charles River have continued programs aimed at reducing pollution in separate stormwater discharges, including identifying and removing illicit sewer connections or cross connections to their storm drain systems. The CSO and stormwater related improvements, together with sanitary sewer overflow control programs in upstream communities (above the Watertown Dam), have resulted in significant and steady water quality improvement to the Charles River Basin during dry and wet weather conditions, as shown in Figure 16 on the next page.

In the Mystic River, Figure 17 on page 34 shows the Mystic mainstem and Mystic River mouth have the best water quality, meeting state swimming standards in dry weather. In light rain, the Mystic mainstem and Mystic River mouth meet water quality standards most of the time. Bacterial water quality in the Upper Mystic is also good, with the majority of locations meeting bacteria standards in dry or damp weather and light rain. While conditions worsen in heavy rain events, these events and conditions are less frequent than dry or damp weather and light rain.

Bacteria counts in Alewife Brook, where major CSO control work will be underway through 2015, consistently fail to meet state swimming standards in wet and dry weather, and water quality is particularly poor after heavy rain. Alewife Brook's influence on downstream water quality conditions in the Mystic mainstem is limited.

Figure 18 on page 35 shows the spatial variability of dry and wet weather water quality in the Mystic in more detail. With the exception of Alewife Brook, all segments of the river meet the *Enterococcus* geometric mean limit of 33 cfu/100 mL. The lower Mystic Basin has the best water quality under dry and light rainfall conditions and even surpasses the Mystic River mouth on the marine side of the dam. In dry weather, the Upper Mystic meets the single sample *Enterococcus* standard of 104 cfu/100 mL 95% of the time. In heavy rain, the river mouth has the best water quality relative to other segments; tidal flushing and dilution likely play a role in moderating the impact of wet weather discharges. CSO discharges from MWRA's Somerville Marginal facility are treated, and thus contribute only minimally to bacterial loading to the river mouth in wet weather. The Alewife meets the state swimming standard for *Enterococcus* only 42% of the time in dry weather, and only 6% of the time in heavy rain and is the focus of MWRA's remaining CSO control efforts in the Mystic watershed.

Figure 19 on page 36 shows similar water quality (i.e. average bacteria concentration) improvement over time in the Neponset River. CSO discharges were eliminated in 2000 with completion of the Neponset River sewer separation project. Prior to the project, CSO flows were discharged at two BWSC outfalls in the Granite Street area. Water quality data show improvement after 2000 in the Granite Avenue area, but also in the stretch of the river immediately upstream. Average bacteria level continues to meet water quality standards at the mouth of the Neponset River, where there is considerable dilution with the waters of South Dorchester Bay.

Improvement in the quality of Boston Inner Harbor waters is also seen in the changes to *Enterococcus* bacteria counts over the period 1989 to 2010, shown in Figure 20 on page 37. Improvement was greatest in the Upper Inner Harbor and in Chelsea Creek, which had more serious wet weather pollution problems. Bacteria data in Figure 21 on page 38 indicate that water quality conditions improved greatly with the significant increase in wastewater transport and treatment capacity (delivery to the Deer Island Treatment Plant) in the period 1989 to 1991. This increase in delivery capacity greatly reduced CSO discharges at most outfalls. Since then, wet-weather water quality continues to improve in Boston Harbor and its tributary rivers, but at a slower pace, due in part to diminishing returns on wastewater pollution investments and the dominance of other sources of pollution, including urban stormwater.

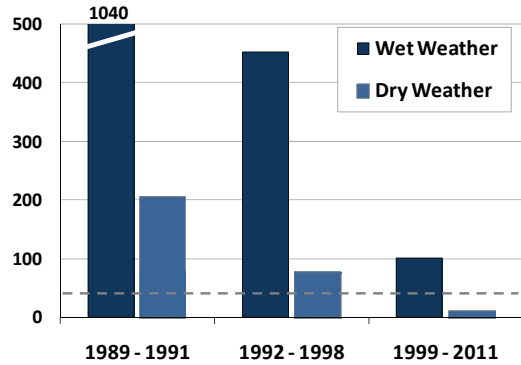
Figure 16

Change in Lower Charles River Water Quality Over Time

Enterococcus bacteria counts, 1989 - 2012

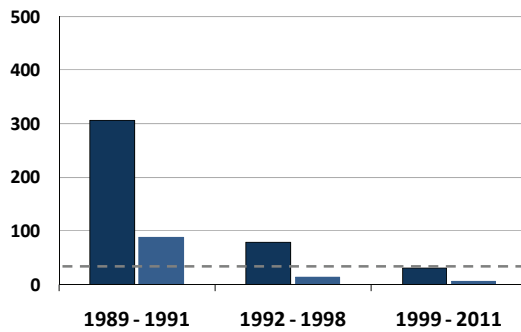
Upper Basin

Watertown Dam to upstream of Cottage Farm



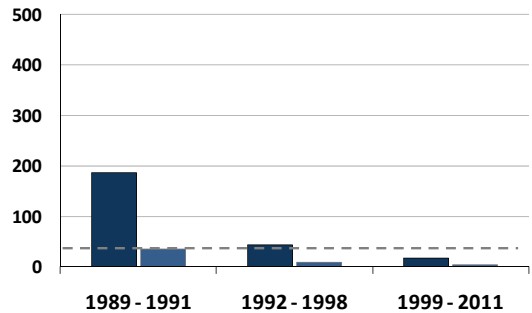
Mid-Basin

Cottage Farm to Science Museum



Downstream of Basin

Science Museum to New Charles Dam



Dotted lines are *Enterococcus* swimming standard for freshwater, 33 cfu/100 mL. Column values are *Enterococcus* geometric means. Dry weather is no rain for day of sampling and two previous days; wet weather is >0.5 inches rainfall within two previous sampling days. Other weather conditions are excluded. Results for MWRA stations 001 - 012, 144 and 145, grouped by region.

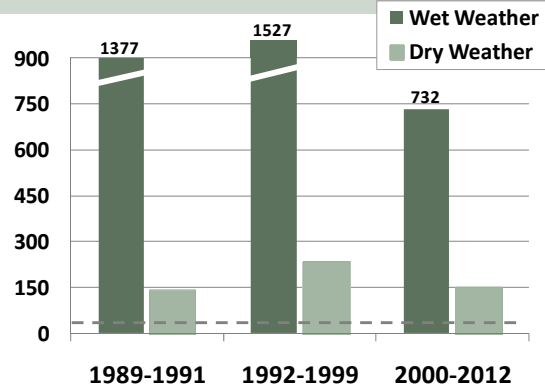
Figure 17

Change in Mystic River Water Quality Over Time

Enterococcus bacteria counts, 1989 – 2012. Note changes in scale.

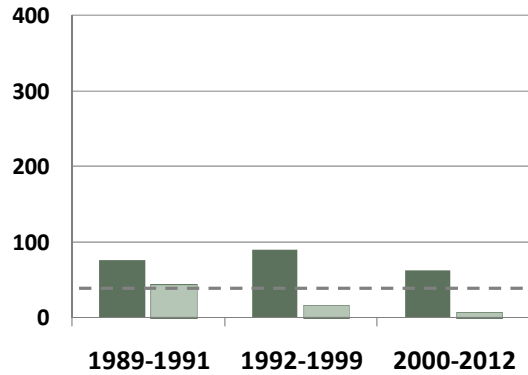
Alewife Brook

Downstream of Little River to Mystic confluence



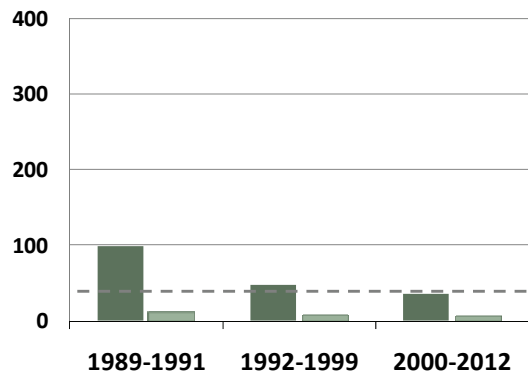
Mystic Mainstem

Downstream of Mystic Lakes to upstream of Amelia Earhart Dam



Mystic River mouth (marine)

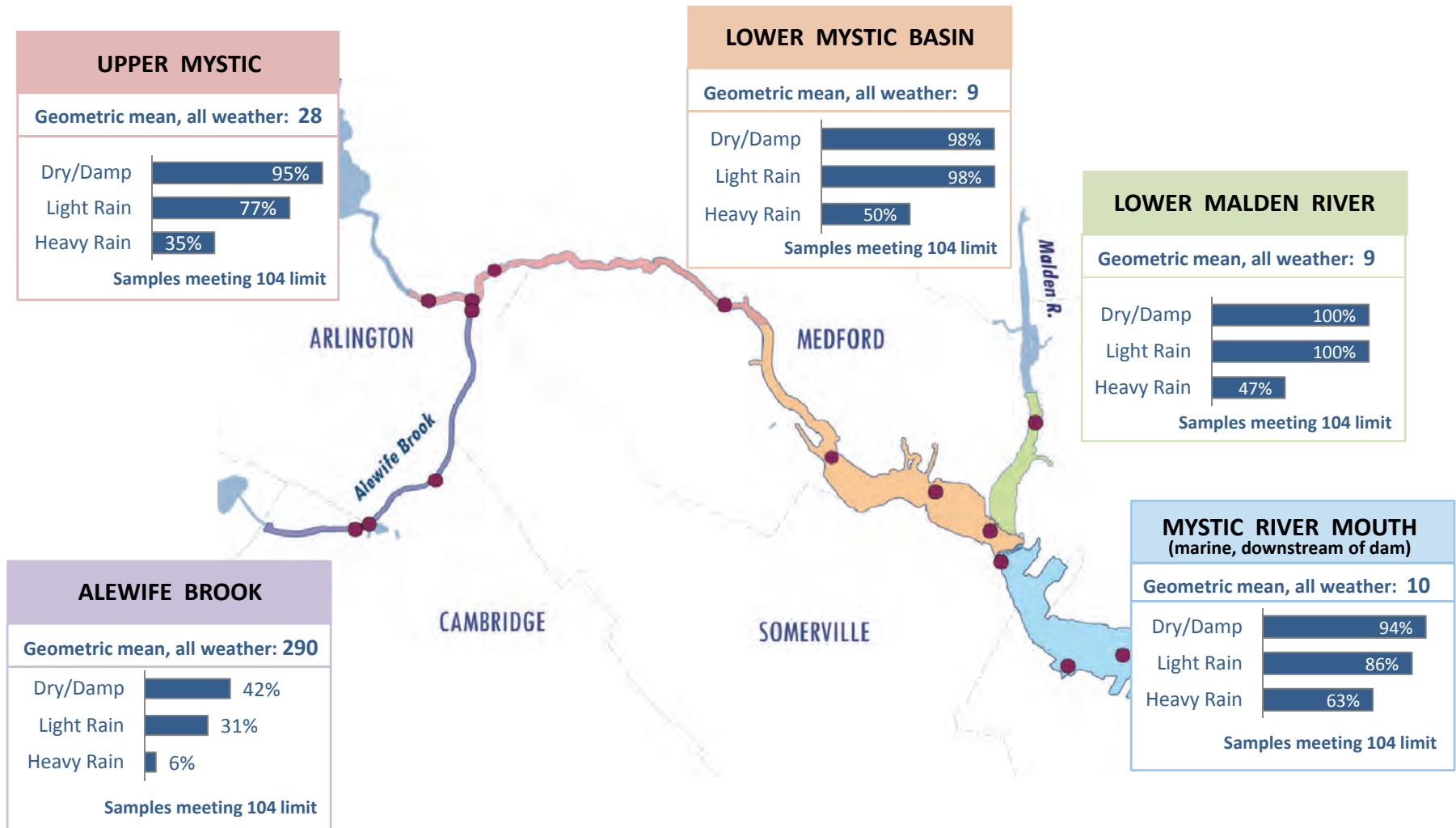
Downstream of Amelia Earhart dam to Tobin Bridge



Dotted lines are *Enterococcus* swimming standard: 33 cfu/100 mL in freshwater and 35 cfu/100 mL in marine water. Column values are *Enterococcus* geometric means. Dry weather is no rain for day of sampling and two previous days; wet weather is >0.5 inches rainfall within two previous sampling days. Other weather conditions are excluded. Results for MWRA stations 137, 069, 052, 167, 059, 176, 177, 056, 057, 083, 070, 172, 074, and 174, grouped by region.

Figure 18

Mystic River: *Enterococcus* by river segment
 Geometric means and percent of samples meeting State swimming standards, 2010-2012



Dots are sampling locations. State swimming standards for *Enterococcus*: geometric mean limit is 33 cfu/100mL (freshwater) or 35 cfu/100 mL (marine water); single sample limit is 104 cfu/100 mL. Rainfall: Heavy Rain is at least 0.5 inches of rain in previous 48 hours; Light Rain is between 0.1 and 0.5 inches of rainfall in previous 48 hours.

Figure 19

Change in Neponset River Water Quality Over Time

Enterococcus bacteria counts, 1991 - 2012

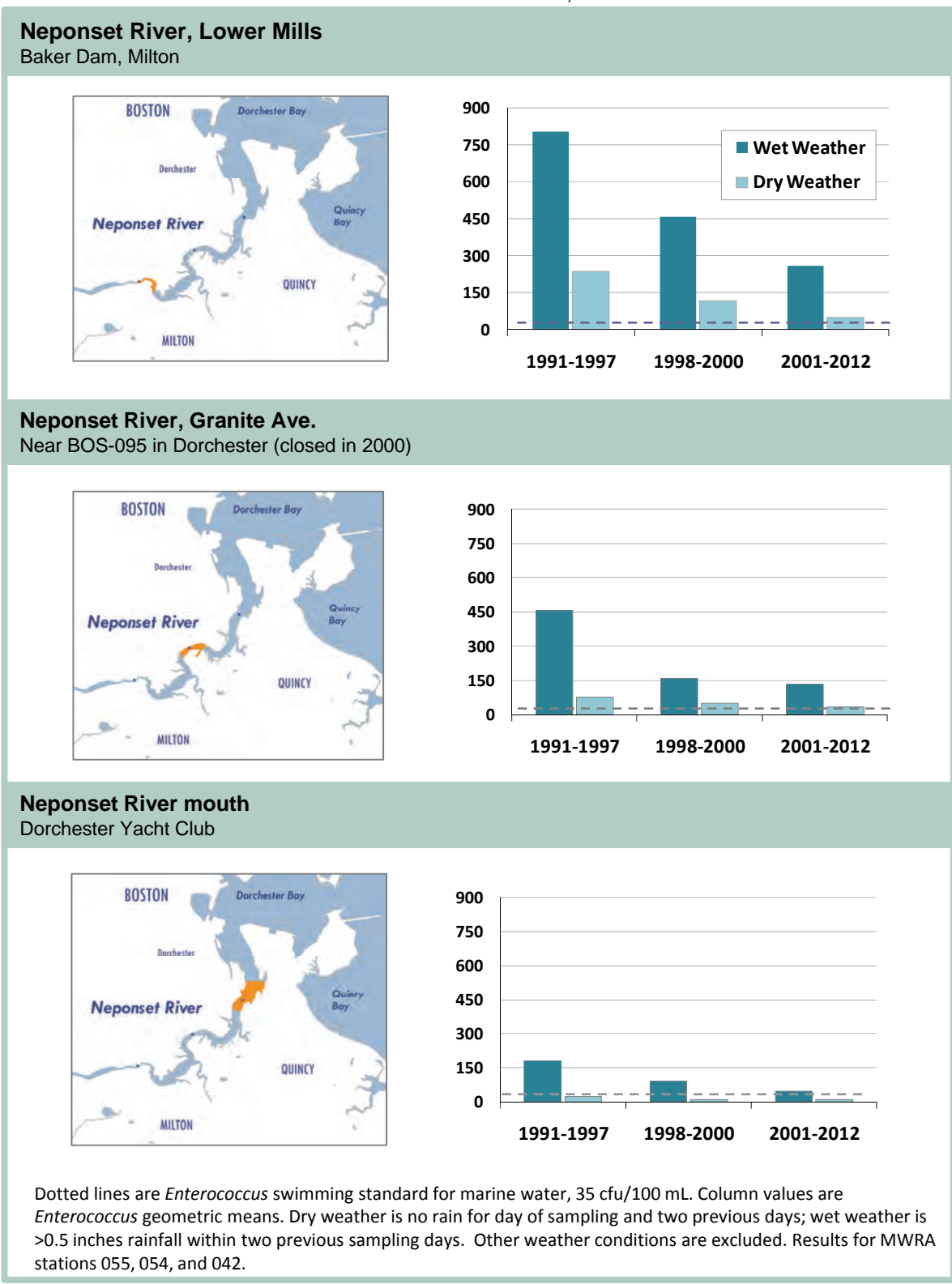


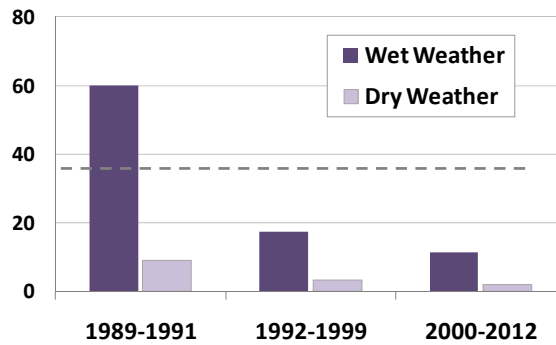
Figure 20

Change in Inner Harbor Water Quality Over Time

Enterococcus bacteria counts, 1989 - 2012

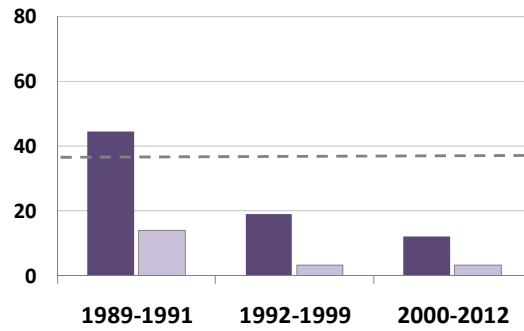
Chelsea Creek

Chelsea Creek Headworks to Mystic Confluence



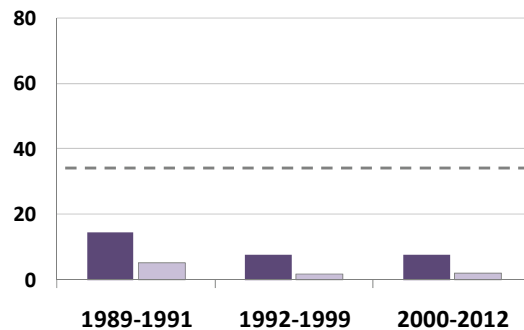
Upper Inner Harbor

Charlestown Navy Yard/Coast Guard Station



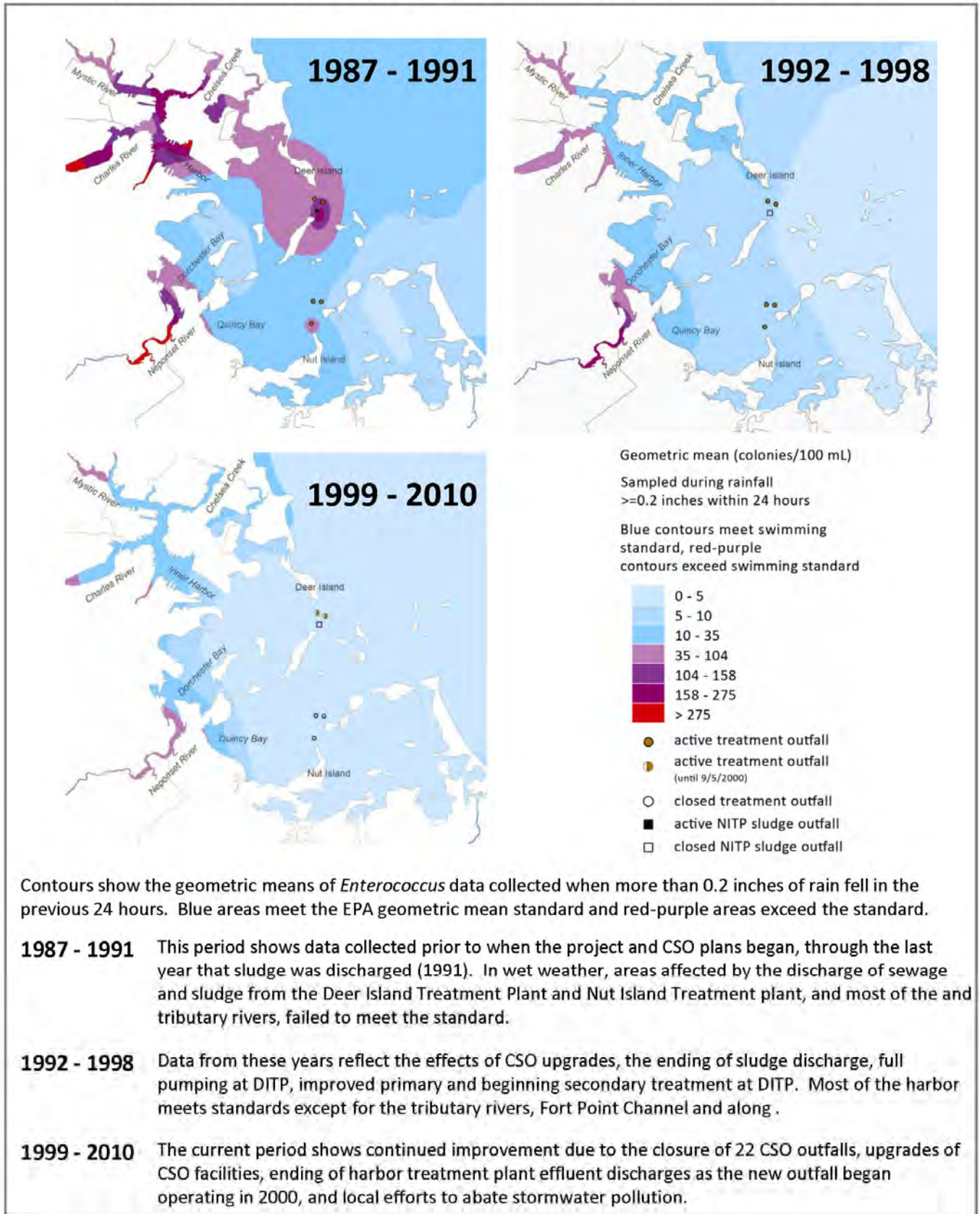
Lower Inner Harbor

Between Falcon Terminal and Logan Airport



Dotted lines are *Enterococcus* swimming standard for marine water, 35 cfu/100 mL. Column values are *Enterococcus* geometric means. Dry weather is no rain for day of sampling and two previous days; wet weather is >0.5 inches rainfall within two previous sampling days. Other weather conditions are excluded. Results for MWRA stations 015, 027; 014, 138, 019; 022 and 024, grouped by region.

Figure 21: Changes in Boston Harbor *Enterococcus* Counts in Wet Weather



The time periods shown in Figure 21 correspond to improvements in MWRA's wastewater transport and treatment systems and the implementation of CSO controls that could affect water quality in the Inner Harbor, as follows.

1987-1991: In this period, MWRA and the CSO communities were eliminating dry weather overflows and implementing other early pollution controls at CSO outfalls. MWRA was completing the "fast-track" pumping improvements at Deer Island and other major wastewater transport improvements that greatly increased the rate and reliability of wet weather flow conveyance to the Deer Island Treatment Plant. Reliable pumping capacity at MWRA's North Main Pump Station on Deer Island increased from about 450 million gallons per day (mgd) in 1988 to more than 700 mgd in 1991. MWRA also ceased the discharge of scum and sludge to Boston Harbor in 1989 and 1991, respectively.

1992-1998: MWRA and the CSO communities implemented the CSO Nine Minimum Controls, including system optimization projects (primarily raising overflow weirs) at more than 100 CSO regulators, and also improved inspection and maintenance programs.

1999-2010: MWRA completed several CSO control projects that reduced or eliminated CSO discharges at outfalls to Boston Inner Harbor and its tributaries, Charles River, Mystic River and Chelsea Creek (see Figure 1, on pages 2-3). In the same period, efforts were underway by many communities along these waters to control separate urban stormwater pollution.

South Boston Beaches

The results of water quality sampling along the beaches of South Boston (Figure 22 on the next page) show markedly improved conditions following start-up operation of the CSO storage tunnel on May 4, 2011, just prior to the 2011 swimming season. The number of days that daily sample results showed a violation of the bacteria standard at one or more beaches in South Boston plummeted from a seasonal average of 17 for years 2008, 2009 and 2010, before the storage tunnel was placed into operation, to 4 in 2011 and 3 in 2012. Since start-up in May 2011, the storage tunnel has captured 331 million gallons of CSO and stormwater, and there has been no discharge of CSO and only one discharge of stormwater, during Hurricane Irene in August 2011.

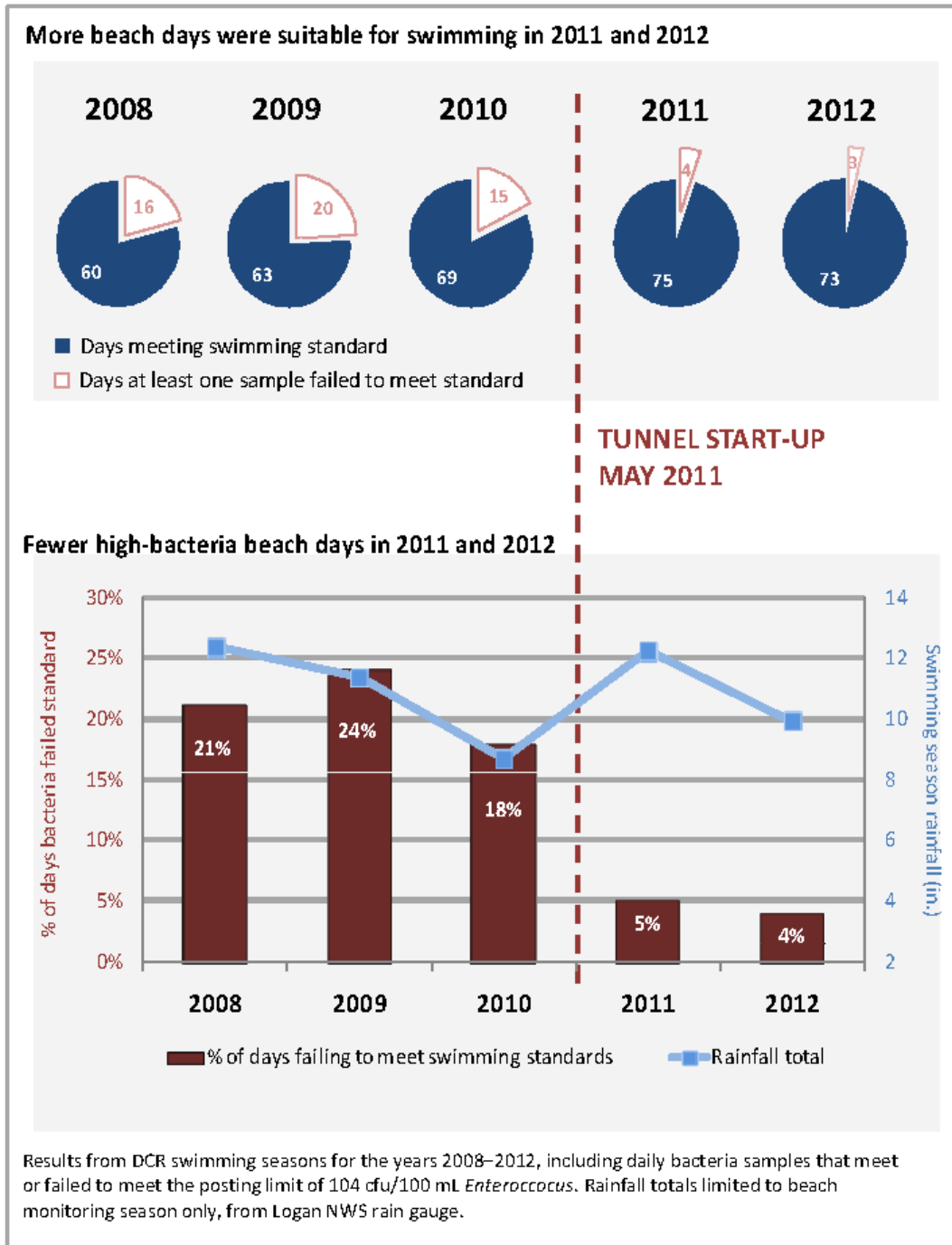
During the swimming season (approximately 85 days from early June to early September), the Massachusetts Department of Conservation and Recreation performs daily water quality sampling at five locations along the South Boston beaches (McCormack Bathhouse, I Street, M Street, City Point and Pleasure Bay), and an exceedance of the bacteria standard triggers a site-specific beach posting. While a South Boston beach may be posted due to an elevated bacteria count at one sampling location, simultaneous samples at the other South Boston beaches may meet bacteria limits, allowing those beaches to remain open for safe swimming.



Carson Beach, with its long distance view of the Deer Island Wastewater Treatment Plant

Water quality conditions at all of the South Boston beaches were excellent in 2012. Daily water quality samples collected in the 2012 swimming season met the swimming standard 100% of the time at City Point Beach and 99% of the time at McCormack Bathhouse and I Street Beach (together, “Carson Beach”), M Street Beach and Pleasure Bay Beach. The causes of the few remaining bacteria exceedances are unknown (overland runoff, bird and dog feces, and boat or other illicit discharges are just a few of the possible suspects), but the high counts can no longer be attributed to the CSO and stormwater outfalls.

Figure 22: Water Quality Improvement at South Boston Beaches



4. REGULATORY AND COURT SCHEDULE COMPLIANCE ACTIVITY

4.1 Regulatory Compliance Activities

In 2012, MWRA continued to respond to the CSO-related requirements and conditions in its NPDES Permit and in the CSO variances for the Alewife Brook/Upper Mystic River and the Lower Charles River Basin (see Section 5.1 for more information about CSO variances). Examples of MWRA's compliance responses include:

- In compliance with the Alewife Brook/Upper Mystic River variance, every April MWRA and the cities of Cambridge and Somerville issue a CSO press release that is also distributed to watershed advocacy groups, local health agents, and the owners of property in the Alewife Brook flood plain. The press release includes updated information describing CSOs, potential health risks of exposure to CSO discharges, locations of CSO discharges, and the status of MWRA's CSO abatement program for the Alewife Brook.
- In compliance with the Lower Charles River Basin variance, MWRA issues notice of a CSO discharge at the Cottage Farm facility to local regulatory agencies, health agents, community rowing and boat houses within 24 hours of the start of a discharge. While MWRA has reduced the average annual frequency of Cottage Farm facility discharges from approximately 22 times per year in 1997 to approximately 5 times per year today, Cottage Farm remains the most active CSO outfall on the Charles River and, therefore, an appropriate indicator of CSO impacts from other, untreated outfalls.
- In compliance with the Alewife Brook/Upper Mystic River variance, the City of Cambridge issues notice of CSO discharge to the Alewife Brook within 24 hours of a discharge, as measured by a city meter at the most active outfall (CAM401B).
- MWRA continued to conduct its harbor and river water quality sampling and testing program in all waters affected by CSO, collected water quality data throughout the year, and reported the results to EPA and DEP.
- By April 30 each year, MWRA reports its estimates of CSO discharge at every active outfall for all storms in the previous calendar year (see Section 4.2).

4.2 Annual CSO Discharge Reporting and Performance Tracking

In compliance with its NPDES permit and the CSO variances for the Charles River and Alewife Brook/Upper Mystic River, each year MWRA performs a review of facility operation records, meter data and other system performance indicators, updates its collection system hydraulic model, and produces estimates of CSO activations and discharge volume at all active outfalls during the previous calendar year. MWRA submitted the CSO discharge estimates for 2011 to EPA and DEP on April 30, 2012. The 2011 discharge report included estimates of the number of activations and discharge duration and volume for each of the outfalls that were potentially active that year. MWRA has commenced the model updates for the calendar year 2012 discharge estimates and plans to model the 2012 storms and report the CSO discharge estimates by April 30, 2013.

MWRA incorporates completed sewer system improvements, such as completed CSO projects, other significant system or operational changes and any other new information about system conditions into the model. Information from facility records is used to configure the facility operational assumptions in the model for each modeled storm event. Meter data and other system performance indicators are used to compare measured conditions to the model results for selected storms. Where field measurement of overflows exists, such as at MWRA's four CSO treatment facilities, activation and volume records are compared to the model results. From a comparison of the data to the model predictions, MWRA is able to

gain an assurance of the model’s accuracy prior to modeling all of the actual storms in the previous calendar year.

For 2011, MWRA modeled each of the 93 rainfall events that year, as recorded at MWRA, community and USGS rainfall gages. Data from MWRA and community rainfall gages are used to create geographical rainfall inputs to the model. The discharge estimates reported to EPA and DEP are based on the model predictions, except at CSO treatment facilities, where MWRA uses measurements from the facility records in lieu of the model predictions. The report includes the number of CSO activations and the total discharge volume for the year at each outfall.

In addition to modeling all of the actual rainfall events for the previous calendar year, MWRA also models the “typical year” with the updated model conditions. This allows MWRA to compare the updated system performance against the levels of control in the Long-Term Control Plan and to track progress toward the CSO control goals, which are based on the typical year that was approved by EPA and DEP for CSO performance measurement. Of course, no year is “typical.” Every year is either wetter (more rainfall events, higher total rainfall amount or higher rainfall intensities) or a drier than the typical year. To be able to understand and explain the estimated discharges for each calendar year, which can vary greatly from typical year predictions, MWRA performs a detailed review of the storms to be able to compare the characteristics of the year’s actual storms to the characteristics of the storms in the typical year.

4.3 Compliance with Remaining Court Milestones

Schedule Seven in the Federal Court Order includes five CSO milestones in 2013 and 10 CSO milestones in 2014 and beyond. The last CSO milestone date in the Federal Court Order is December 2020, and the last project construction completion milestone is December 2015. Table 4 lists the remaining milestones and summarizes MWRA’s plans for compliance.

Table 4: Remaining Schedule Seven Milestones

Milestone Date	Milestone Description	Project Schedule
2013		
Mar 2013	Submit Annual Report	MWRA expects to file the Annual Report for 2012 with the Court on March 15, 2013, and plans to file annual reports by March 15 each year through 2016.
Apr 2013	<i>MWRA, in cooperation with Cambridge, to complete construction of CAM004 stormwater outfall and detention basin.</i>	The City of Cambridge expects to attain substantial completion of construction on April 25, 2013.
Jul 2013	<i>MWRA, in cooperation with BWSC, to complete construction of Bulfinch Triangle sewer separation.</i>	BWSC completed construction of the Bulfinch Triangle sewer separation project in July 2010.
	<i>MWRA, in cooperation with Brookline, to complete construction of Brookline sewer separation.</i>	The Town of Brookline expects to attain substantial completion of construction by July 2013.
Sep 2013	<i>MWRA to commence construction of interceptor connection relief and floatables control at outfall SOM01A.</i>	MWRA’s design services are on schedule for commencement of construction by September 2013.

Continues on next page.

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Milestone Date	Milestone Description	Project Schedule
2014		
Mar 2014	Submit Annual Report	See Mar 2013
Jun 2014	<i>MWRA to complete construction of interceptor connection relief and floatables control at outfall SOM01A.</i>	MWRA's construction schedule for this project calls for substantial completion by June 2014.
Aug 2014	<i>MWRA to commence construction of control gate and floatables control at outfall MWR003, and MWRA Rindge Avenue Siphon relief.</i>	MWRA's design services are on schedule for commencement of construction by August 2014.
2015		
Mar 2015	Submit Annual Report	See Mar 2013
Oct 2015	<i>MWRA to complete construction of control gate and floatables control at outfall MWR003, and MWRA Rindge Avenue Siphon relief.</i>	MWRA's construction schedule calls for substantial completion by October 2015.
Dec 2015	<i>MWRA, in cooperation with Cambridge, to complete construction of CAM004 sewer separation.</i>	The City of Cambridge is making every effort during ongoing design and construction to be able to attain substantial completion of all three construction contracts by December 2015.
	<i>MWRA, in cooperation with BWSC, to complete construction of Reserved Channel sewer separation.</i>	BWSC plans to complete the last of nine construction contracts for this project by December 2015. Four construction contracts are substantially complete, and three are well underway. BWSC plans to issue notices to proceed with construction of the remaining two contracts in 2013.
Beyond 2015		
Mar 2016	Submit Annual Report	See Mar 2013
Jan 2018	<i>MWRA to commence three-year performance assessment of its Long-Term CSO Control Plan. The assessment shall include post-construction monitoring in accordance with EPA's Combined Sewer Overflow (CSO) Policy, 59 Fed. Reg. 18688 (Apr. 19, 1994).</i>	MWRA's Capital Improvement Program includes a three-year performance assessment of its Long-Term Control Plan beginning in January 2018.
Dec 2020	<i>MWRA to submit results of its three-year performance assessment of its Long-Term CSO Control Plan to the EPA and DEP. MWRA to demonstrate that it has achieved compliance with the levels of control (including as to frequency of CSO activation and as to volume of discharge) specified in its Long-Term CSO Control Plan.</i>	MWRA's Capital Improvement Program includes preparation of a report on the results of a three-year performance assessment of its Long-Term Control Plan, to be submitted to EPA and DEP by December 2020.

5. LONG-TERM CONTROL PLAN AND UPDATED COST

5.1 Regulatory Background

Long-Term Control Plan Approval

In 1987, through a stipulation entered in the Boston Harbor Case (U.S. v. M.D.C., et al., No. 85-0489 MA), MWRA accepted responsibility for developing a control plan to address the discharges from all CSOs hydraulically connected to the MWRA sewer system, including outfalls owned by its member communities. Under a Court-ordered schedule, MWRA recommended a CSO Conceptual Plan in 1994 that included 25 site-specific CSO projects located in Boston, Cambridge, Chelsea and Somerville. The CSO Conceptual Plan was later refined in the 1997 Facilities Plan/EIR.

In March 2006, MWRA reached an agreement with the United States and DEP on the scope and schedule for additional CSO projects, which was filed with the Court as part of a joint motion to amend the Court Schedule. In April 2006, the Court allowed the joint motion and issued an Order with a new schedule. As a result, MWRA's Long-Term Control Plan now includes 35 projects. Under the Order, MWRA has until 2020 to complete the remaining CSO work and subsequent system performance assessment which will be used to verify that the Long-Term Control Plan goals are achieved.

The United States and MWRA also agreed to withdraw their February 27, 1987 Stipulation of the United States and the Massachusetts Water Resources Authority on Responsibility and Legal Liability for Combined Sewer Overflows and replace it with a second CSO stipulation that would require MWRA to implement the CSO requirements set forth in the Court Schedule and to meet the levels of control described in MWRA's Long-Term Control Plan. The documents that recommend MWRA's Long-Term Control Plan, including the 1997 Final CSO Facilities Plan/EIR as amended by subsequent notices of project change and supplemental plans, are identified in the March 15, 2006 Second Stipulation of the United States and the Massachusetts Water Resources Authority on Responsibility and Legal Liability For Combined Sewer Overflows, amended on May 7, 2008.

Variations to Water Quality Standards

On August 26, 2010, DEP issued Final Determinations to extend the CSO-related variances to the water quality standards for Alewife Brook/Upper Mystic River and the Lower Charles River/Charles River Basin. The variance extensions have three-year terms ending in 2013. The variances apply only to the permitted CSO outfalls to these receiving waters and do not otherwise modify Class B water quality standards. In accordance with the variances, CSO discharges from permitted outfalls are not required to meet effluent limits based on the Class B criteria when flow in the collection system exceeds the system's conveyance capacity as a result of precipitation or snow melt. Through its continued implementation of the Nine Minimum Controls, MWRA maintains the conveyance capacity of its collection system and has improved the handling of wet weather flows through system optimization efforts, most recently through improvements to the operation of influent gates at the Prison Point and Cottage Farm CSO treatment facilities implemented in the last few years. The variances require continued implementation of CSO long term control measures consistent with MWRA's Long-Term Control Plan.

Federal and state approval of the 2010-13 variance extensions acknowledged that it would not be feasible to fully attain the Class B bacteria criteria and associated recreational uses for these receiving waters within that three-year period. The agreement reached by EPA, DEP and MWRA in March 2006 included re-issuances of three-year variance extensions to 2020. This agreement was based in part on the determination that implementation of controls necessary for full attainment of the Class B bacteria criteria and associated use would result in substantial and widespread economic and social impact. MWRA expects that DEP will reissue and EPA will approve the variance extensions through 2020 in accordance with the agreement. At that time, with information MWRA is required to provide to verify the level of CSO control attained by

MWRA's completed Long-Term Control Plan, MWRA expects that DEP will assess the feasibility of attaining Class B uses and may make long-term water quality standards determinations for these receiving waters.

The current CSO variances for the Alewife Brook/Upper Mystic River and the Lower Charles River/Charles River Basin expire on September 1, 2013, and October 1, 2013, respectively. MWRA will submit a request to DEP to extend the variances for another 3 years, to 2016, as MWRA and the CSO communities continue to implement the approved Long-Term Control Plan and track benefits.

5.2 Scope, Benefits and Cost of the Approved Plan

The approved Long-Term Control Plan for each receiving water segment is identified in Table 5 on the next page. The CSO control costs by receiving water segment and the total plan cost of \$867.0 million (in December 2013 dollars)² are from MWRA's Proposed FY14 CIP.

MWRA's Long-Term Control Plan is predicted to reduce annual CSO discharge volume in a typical year from 3.3 billion gallons in 1988 to 0.4 billion gallons in 2015, an 88% reduction. Of the remaining discharge volume, 93% will receive treatment at MWRA's four CSO facilities: Cottage Farm, Prison Point, Somerville Marginal and Union Park. The overall performance goals of this approved plan measured as average annual volume of CSO discharge to each receiving water segment are presented in Table 5 on page 46 and in Figure 14 on page 30. The Long-Term Control Plan also calls for closing 34 of the 84 CSO outfalls addressed in the plan (33 of these are now closed), and 4 other outfalls have been closed by BWSC and the City of Cambridge.

Schedule Seven requires MWRA to undertake a three-year, system-wide performance assessment commencing in January 2018 to verify attainment of the level of CSO control at every outfall in accordance with the plan and in compliance with water quality standards. Schedule Seven also requires MWRA to submit a report on the results of the performance assessment by December 2020. It is at that time that EPA and DEP propose to make final decisions regarding water quality standards for the Charles River and Alewife Brook.

If additional CSO control beyond the levels of control in MWRA's long-term plan is deemed by EPA and DEP to be warranted at any outfall, remediation will be the individual responsibility of the respective discharge permittee: MWRA, BWSC, Cambridge or Somerville.

5.3 Current Cost Risk

The approvals MWRA secured from EPA and DEP in 2006 on the revised Long-Term Control Plan, along with the associated changes to the Court Order, provide MWRA more certainty of the scope of its CSO obligations and related capital program revenue need, borrowing calculations, and determination of future rate increases. However, the remaining projects will continue to carry cost and schedule risk until they are completed. This is in part due to the engineering complexities that are faced in the historical and densely urban areas and waterfront environments in which they must be constructed. Subsurface conditions, including soil and groundwater characteristics, soil and groundwater contamination, utilities and other subsurface obstructions, and traffic management, are the key contributors to a continuing level of risk during construction.

Other factors that weigh heavily in defining the necessary level of construction and associated cost are the number and type of individual building sewer and storm drain lateral connections to the existing combined sewer systems and the density of existing utilities that may pose a conflict in planned sewer separation areas.

² MWRA's Proposed FY14 CIP anticipates a total spending for CSO control of \$871.7 million, including escalation to the midpoint of construction and contingency, to complete the plan on schedule.

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Table 5: Long-Term CSO Control and Cost by Receiving Water Segment

Receiving Water	CSO Discharge Goals (typical rainfall year)		Projects ⁽¹⁾	Capital Cost ⁽²⁾ (\$ million)
	Activations	Volume (million gallons)		
Alewife Brook/Upper Mystic River	7 untreated and 3 treated @ Somerville Marginal	7.3 3.5	<ul style="list-style-type: none"> • Cambridge/Alewife Sewer Separation • MWR003 Gate and Rindge Siphon Relief • Interceptor Connections/Floatables • Connection/Floatables Control at Outfall SOM01A • Somerville Baffle Manhole Separation • Cambridge Floatables Control (portion) 	70.3
Mystic River/Chelsea Creek Confluence and Chelsea Creek	4 untreated and 39 treated @ Somerville Marginal	0.6 60.6	<ul style="list-style-type: none"> • Somerville Marginal CSO Facility Upgrade • Hydraulic Relief at BOS017 • Chelsea Trunk Sewer Replacement • Chelsea Branch Sewer Relief • CHE008 Outfall Repairs • East Boston Branch Sewer Relief (portion) 	77.7
Charles River (including Stony Brook and Back Bay Fens)	3 untreated and 2 treated @ Cottage Farm	6.8 6.3	<ul style="list-style-type: none"> • Cottage Farm CSO Facility Upgrade • Stony Brook Sewer Separation • Hydraulic Relief at CAM005 • Cottage Farm Brookline Connection and Inflow Controls • Charles R. Interceptor Gate Controls (study only) • Brookline Sewer Separation • Bulfinch Triangle Sewer Separation • MWRA Outfall Closings and Floatables Control • Cambridge Floatables Control (portion) 	91.1
Inner Harbor	6 untreated and 17 treated @ Prison Point	9.1 243.0	<ul style="list-style-type: none"> • Prison Point CSO Facility Upgrade • Prison Point Optimization • BOS019 Storage Conduit • East Boston Branch Sewer Relief (portion) 	61.8
Fort Point Channel	3 untreated and 17 treated @ Union Park	2.5 71.4	<ul style="list-style-type: none"> • Union Park Treatment Facility • BOS072-073 Sewer Separation and System Optimization • BWSC Floatables Control • Lower Dorchester Brook Sewer Modifications 	62.5
Constitution Beach	Eliminate		<ul style="list-style-type: none"> • Constitution Beach Sewer Separation 	3.8
North Dorchester Bay	Eliminate		<ul style="list-style-type: none"> • N. Dorchester Bay Storage Tunnel and Related Facilities • Pleasure Bay Storm Drain Improvements • Morrissey Blvd Storm Drain 	256.2 ⁽³⁾
Reserved Channel	3 untreated	1.5	<ul style="list-style-type: none"> • Reserved Channel Sewer Separation 	64.1
South Dorchester Bay	Eliminate		<ul style="list-style-type: none"> • Fox Point CSO Facility Upgrade (interim improvement) • Commercial Pt. CSO Facility Upgrade (interim improvement) • South Dorchester Bay Sewer Separation 	126.8
Neponset River	Eliminate		<ul style="list-style-type: none"> • Neponset River Sewer Separation 	2.4
Regional			<ul style="list-style-type: none"> • Planning, Technical Support and Land Acquisition 	50.3
TOTAL Treated		413.3 384.8		867.0

(1) Floatables controls are recommended at remaining outfalls and are included in the listed projects and capital budgets.

(2) From MWRA's Proposed FY14 Capital Improvement Program.

(3) Not including approximately \$9 million for land, easements and permits, carried in the budget for "Planning, Technical Support and Land Acquisition," below.

To achieve the level of stormwater removal necessary to close CSO outfalls or attain a high level of CSO control, a sufficient number of storm drain lateral connections must be removed and redirected, which can be a daunting and costly effort, especially where work into private properties is necessary. These hurdles and their associated costs have been uncovered with the City of Cambridge's design progress on the CAM004 sewer separation project.

In February 2013, Cambridge submitted updated cost estimates to MWRA for the Alewife Brook CSO projects. The new cost estimates include recent and anticipated change orders to the construction contract for the CAM004 stormwater outfall and wetland basin (Contract 12), a higher award amount for the first of three construction contracts for the CAM004 sewer separation project (Contract 8A), and new cost estimates for design and construction of the two remaining CAM004 sewer separation contracts (Contracts 8B and 9). With the new estimates, MWRA's cost share for the Alewife Brook projects could be as much as \$21 million more than the Proposed FY14 CIP budget for these projects. Cambridge's share of cost for these projects has also increased substantially. MWRA and Cambridge are already bearing some of the higher costs with ongoing completion of Contract 12, ongoing construction of Contract 8A, and ongoing design of contracts 8B and 9. MWRA is awaiting more detailed design information and cost estimates from Cambridge as the City's design efforts progress, to more accurately determine the revised cost to complete the Alewife Brook CSO projects and the impact on MWRA's total cost share.

5.4 Project Schedules

Most of the CSO projects are complete, and the remaining projects are on schedules intended to meet the milestones set forth in Schedule Seven. Table 6 on the next page presents MWRA's and the CSO communities' schedules for implementing the 35 projects in the Long-Term Control Plan. For more information about ongoing project progress and project schedules relative to the remaining milestones in Schedule Seven, see the project reports in Section 2.3.

5.5 Capital Budget and Spending Projections

As shown in Figure 23 on page 49, the total cost of the CSO plan (planning, design and construction) rose from \$398 million when MWRA issued the Final CSO Conceptual Plan in 1994, to \$487 million when EPA and DEP approved the Final CSO Facilities Plan and Environmental Impact Report in 1997, to \$867 million in MWRA's Proposed FY14 CIP (December 2013 dollars). With escalation of the CIP budget estimate to the mid-point of construction and contingency, MWRA projects in its Proposed FY14 CIP that it will spend a total \$867.0 million to complete the plan on its current schedule. As shown in Figure 24 on page 49, MWRA's annual spending on CSO control peaked in FY08 at \$110.5 million and will continue to wind down as the few remaining CSO projects are completed.

MWRA met the qualification requirements for federal stimulus funding for four CSO Program contracts: North Dorchester Bay pumping station and force main, North Dorchester Bay ventilation building, East Boston Branch Sewer Relief Contract 3, and Reserved Channel Sewer Separation Contract 2. The federal stimulus funding is provided to MWRA through the State Revolving Fund (SRF) program, which is administered by the Massachusetts Pollution Abatement Trust and DEP. With the stimulus funding, MWRA received \$13.8 million in forgiveness of the principle on the SRF loans for these four construction contracts.

CSO spending is scheduled to continue through FY21, when MWRA will complete a sewer system performance assessment verifying attainment of the long-term levels of CSO control. CSO spending will be minor after December 2015 when the last two CSO projects, BWSC's Reserved Channel sewer separation and Cambridge's Alewife Brook CAM004 sewer separation, are scheduled to be complete.

Massachusetts Water Resources Authority
 Combined Sewer Overflow Control Plan
 Annual Progress Report 2012

Table 6: CSO Project Cost and Schedules

Shading indicates completed project.

Project		Cost ⁽¹⁾ (\$million)	Commence Design	Commence Construction	Complete Construction
North Dorchester Bay Storage Tunnel and Related Facilities		220.2	Aug-97	Aug-06	May-11
Pleasure Bay Storm Drain Improvements		3.2	Sep-04	Sep-05	Mar-06
Hydraulic Relief Projects	CAM005 Relief	2.3	Aug-97	Jul-99	May-00
	BOS017 Relief			Jul-99	Aug-00
East Boston Branch Sewer Relief		85.6	Mar-00	Mar-03	Jul-10
BOS019 CSO Storage Conduit		14.3	Jul-02	Mar-05	Mar-07
Chelsea Relief Sewers	Chelsea Trunk Sewer Relief	29.8	Jun-97	Sep-99	Aug-00
	Chelsea Branch Sewer Relief			Dec-99	Jun-01
	CHE008 Outfall Repairs			Dec-99	Jun-01
Union Park Detention and Treatment Facility		49.6	Dec-99	Mar-03	Apr-07
CSO Facility Upgrades and MWRA Floatables Control	Cottage Farm Facility Upgrade	22.4	Jun-96	Mar-98	Jan-00
	Prison Point Facility Upgrade			May-99	Sep-01
	Commercial Point Facility Upgrade			Nov-99	Sep-01
	Fox Point Facility Upgrade			Nov-99	Sep-01
	Somerville-Marginal Fac. Upgrade			Nov-99	Sep-01
	MWRA Floatables and Closings			Mar-99	Mar-00
Cottage Farm Brookline Connection & Inflow Controls		3.0	Sep-06	Jun-08	Jun-09
Charles River Interceptor Gate Controls (Design)		0.7	Jan-08	(2)	(2)
Prison Point CSO Facility Optimization			Mar-06	Mar-07	Apr-08
South Dorchester Bay Sewer Separation		118.9	Jun-96	Apr-99	Jun-07
Stony Brook Sewer Separation		44.3	Jul-98	Jul-00	Sep-06
Neponset River Sewer Separation		2.4		Apr-96	Jun-00
Constitution Beach Sewer Separation		3.8	Jan-97	Apr-99	Oct-00
Fort Point Channel Conduit Sewer Separation		12.0	Jul-02	Mar-05	Mar-07
Morrissey Boulevard Storm Drain		32.9	Jun-05	Dec-06	Jul-09
Reserved Channel Sewer Separation		64.1	Jul-06	May-09	Dec-15
Bulfinch Triangle Sewer Separation		10.0	Nov-06	Sep-08	Jul-10
Brookline Sewer Separation		25.9	Nov-06	Nov-08	Jul-13
Somerville Baffle Manhole Separation (3)				Apr-96	Dec-96
Cambridge / Alewife Brook Sewer Separation	CAM004 Outfall and Wetland Basin	13.5		Apr-11	Apr-13
	CAM004 Sewer Separation	45.0	Jan-97	Sep 12	Dec-15
	CAM400 Manhole Separation	4.6	Oct-08	Jan 10	Mar-11
	Interceptor Connection Relief/Floatables	2.9	Oct-08	Jan 10	Oct-10
	SOM01A Connection with Floatables	1.1	Apr-12	Sep-13	Jun-14
	MWR003 Gate and Rindge Ave. Siphon	3.1	Apr-12	Aug-14	Oct-15
Region-wide Floatables Control and Outfall Closings		1.1	Sep-96	Mar-99	Dec-07
Planning & Support		50.3			
Total Cost		867.0			

(1) From MWRA Proposed FY14 Capital Improvement Program.

(2) Construction of this project was deleted from the CSO Plan and Schedule Seven in April 2011.

(3) Costs in "Planning & Support," below.

Figure 23: MWRA CSO Capital Budget History

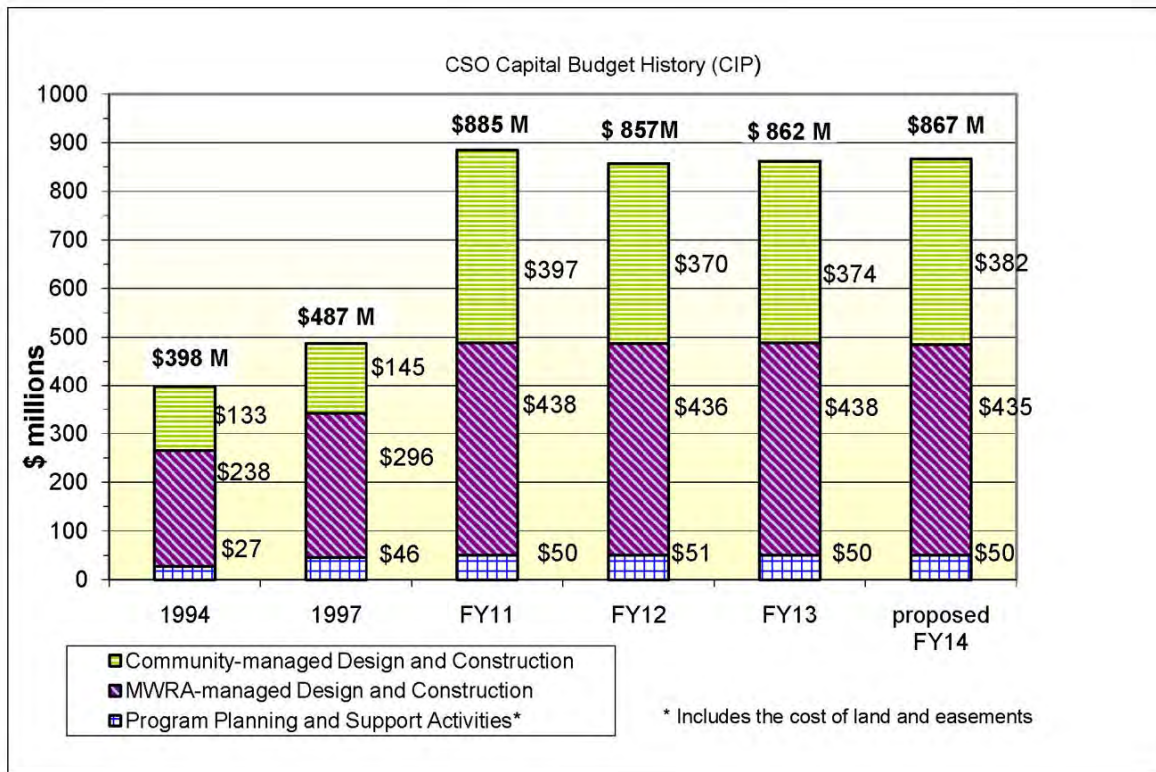
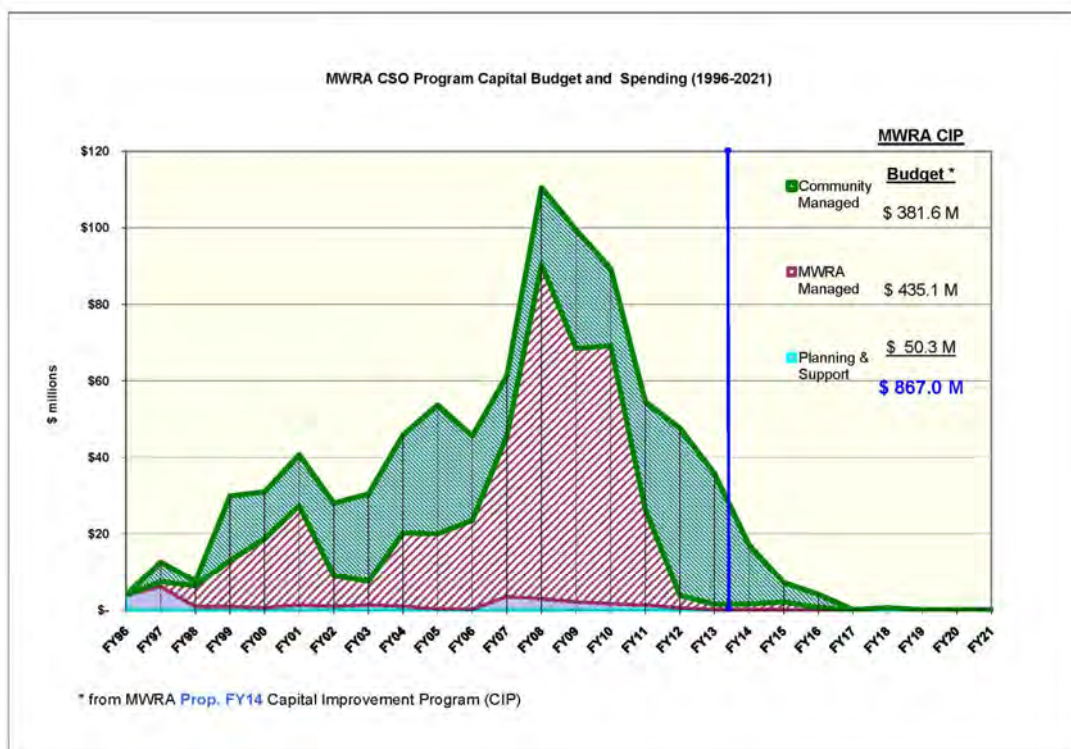




Figure 24: MWRA CSO Program Capital Spending



6. COMPLETED CSO PROJECTS

1. SOMERVILLE BAFFLE MANHOLE SEPARATION		
	<p>Receiving Water: Alewife Brook, Upper Mystic River</p> <p>Completed: 1996</p> <p>Capital Cost: \$400,000</p> <p>Description: Separated common manholes connecting local sewer and storm drain systems. City of Somerville performed design and construction with MWRA financial assistance.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Eliminated CSO discharges at three City of Somerville outfalls.</p> <p>CSO Outfalls: SOM001, SOM006, SOM007</p> <p>Frequency of Discharge (typical year): Before project: 2 With project: Eliminated</p> <p>Annual Discharge Volume (typical year): Before project: 0.04 million gallons With project: Eliminated</p> <p>CSO Reduction by Volume: 100%</p>

2. CONSTITUTION BEACH SEWER SEPARATION		
 <p style="font-size: small; margin-top: 5px;">MWRA decommissioned its Constitution Beach CSO Facility after CSO flows were eliminated by BWSC sewer separation.</p>	<p>Receiving Water: Boston Harbor/Constitution Beach</p> <p>Completed: 2000</p> <p>Capital Cost: \$3,769,000</p> <p>Description: Installed 14,000 linear feet of storm drain to separate the combined sewer system, remove stormwater flows from area sewers, and eliminate CSO discharges to Constitution Beach, allowing MWRA to decommission the Constitution Beach CSO treatment facility.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Eliminated CSO discharges to Constitution Beach to comply with Class B water quality standards.</p> <p>CSO Outfalls: MWR207(BOS002)</p> <p>Frequency of Discharge (typical year): Before project: 16 (treated) With project: Eliminated</p> <p>Annual Discharge Volume (typical year): Before project: 1.35 million gallons With project: Eliminated</p> <p>CSO Reduction by Volume: 100%</p>

Completed CSO Projects (continued)

**3. HYDRAULIC RELIEF AT OUTFALL CAM005
 4. HYDRAULIC RELIEF AT OUTFALL BOS017**



Receiving Water:

CAM005: Upper Charles River Basin
 BOS017: Mystic River/Chelsea
 Creek Confluence

Completed:
 2000

Capital Cost:
 \$2,295,000

Description:

CAM005: In Cambridge, relieved the 40-foot long, 24-inch diameter dry weather connection between the CAM005 regulator and MWRA's North Charles Metropolitan Sewer with a 54-inch additional connection.

BOS017: In Charlestown, installed 190 feet of 36-inch diameter pipe in Sullivan Square to divert two local (BWSC) combined sewers to a direct connection with MWRA's Cambridge Branch Sewer. In addition, eliminated a 10-foot long restriction between the Charlestown and Cambridge Branch Sewers, adjacent to Sullivan Square.

CSO Control

Water Quality Benefit:

Minimized CSO discharges to meet B(cso) water quality standards (>95% compliance with Class B).

CSO Outfalls:

CAM005, BOS017

CAM005:

Frequency of Discharge (typical year):

Before project: 11
With project: 3

Annual Discharge Volume (typical year):

Before project: 3.8 million gallons
With project: 0.84 million gallons

CSO Reduction by Volume: 78%

BOS017:

Frequency of Discharge (typical year):


Before project: 18
With project: 1

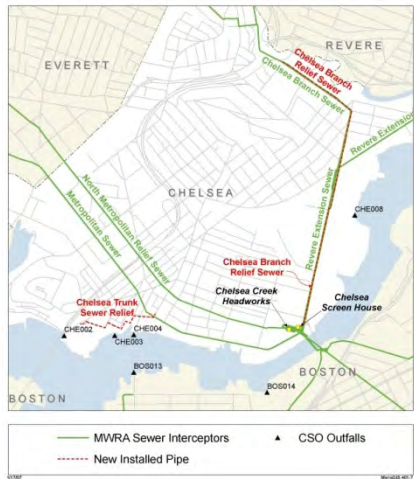
Annual Discharge Volume (typical year):

Before project: 2.5 million gallons
With project: 0.02 million gallons


CSO Reduction by Volume: 99%


Completed CSO Projects (continued)

5. NEPONSET RIVER SEWER SEPARATION		
	<p>Receiving Water: Neponset River</p> <p>Completed: 2000</p> <p>Capital Cost: \$2,445,000</p> <p>Description: Installed 8,000 linear feet of storm drain to separate the combined sewer system, remove stormwater flows from area sewers, and close CSO regulators, eliminating CSO discharges at the two remaining CSO outfalls to the Neponset River.</p>	<p>CSO Control</p>
	<p>Water Quality Benefit: Eliminated CSO discharges to Neponset River to comply with Class B water quality standards and protect South Dorchester Bay beaches (Tenean Beach).</p> <p>CSO Outfalls: BOS093, BOS095</p> <p>Frequency of Discharge (typical year): Before project: 17 With project: Eliminated</p> <p>Annual Discharge Volume (typical year): Before project: 5.8 million gallons With project: Eliminated</p> <p>CSO Reduction by Volume: 100%</p>	

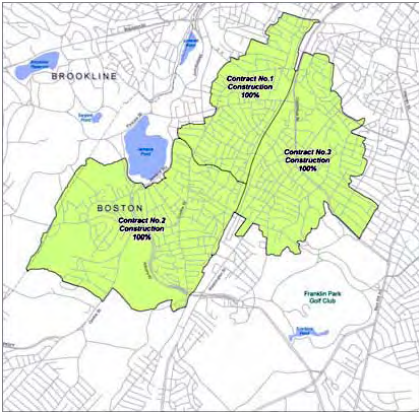
6. CHELSEA TRUNK SEWER REPLACEMENT 7. CHELSEA BRANCH SEWER RELIEF 8. CHE008 OUTFALL REPAIRS		
	<p>Receiving Water: Mystic River/Chelsea Creek Confluence Chelsea Creek</p> <p>Completed: 2000-2001</p> <p>Capital Cost: \$29,778,000</p> <p>Description: Replaced 18-inch diameter city-owned trunk sewer with 30-inch pipe, relieved MWRA's Chelsea Branch and Revere Extension Sewers with 48-inch to 66-inch diameter pipe, rehabilitated Outfall CHE008, and installed underflow baffles for floatables control at all outfalls.</p>	<p>CSO Control</p>
	<p>Water Quality Benefit: Minimized CSO discharges to meet B(cso) water quality standards (>95% compliance with Class B).</p> <p>CSO Outfalls: CHE002, CHE003, CHE004, CHE008</p> <p>Frequency of Discharge (typical year): Before project: 8 With project: 4</p> <p>Annual Discharge Volume (typical year): Before project: 9.0 million gallons With project: 0.6 million gallons</p> <p>CSO Reduction by Volume: 93%</p>	

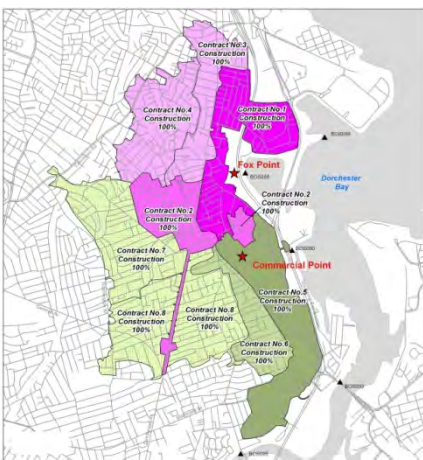
Completed CSO Projects (continued)

<p>9. UPGRADE COTTAGE FARM CSO FACILITY 10. UPGRADE PRISON POINT CSO FACILITY 11. UPGRADE SOMERVILLE MARGINAL CSO FACILITY 12. UPGRADE FOX POINT CSO FACILITY 13. UPGRADE COMMERCIAL POINT CSO FACILITY</p>		
	<p>Receiving Water: Lower Charles River Basin Upper Inner Harbor Upper Mystic River Mystic River/Chelsea Creek Confluence South Dorchester Bay</p> <p>Completed: 2001</p> <p>Capital Cost: \$22,261,000</p> <p>Description: Upgraded chlorine disinfection systems, added dechlorination systems, process control and safety improvements.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Upgrade treatment to meet Class B water quality criteria, including residual chlorine limits.</p> <p>CSO Outfalls: MWR201 (Cottage Farm Facility) MWR203 (Prison Point Facility) MWR205, MWR205A(SOM007A) (Somerville Marginal Facility) MWR209(BOS088/BOS089) (Fox Point Facility) MWR211(BOS090) (Commercial Point Facility)</p> <p>These projects improved treatment performance, with no effect on discharge frequency or volume.</p>

<p>14. PLEASURE BAY STORM DRAIN IMPROVEMENTS</p>		
	<p>Receiving Water: North Dorchester Bay</p> <p>Completed: 2006</p> <p>Capital Cost: \$3,195,000</p> <p>Description (cont): Constructed a new storm drain system to relocate stormwater dischargers from Pleasure Bay to Reserved Channel.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Eliminated storm water discharges to Pleasure Bay Beach.</p>

Completed CSO Projects (continued)

15. STONY BROOK SEWER SEPARATION		
	<p>Receiving Water: Lower Charles River Basin</p> <p>Completed: 2006</p> <p>Capital Cost: \$44,332,000</p> <p>Description: Installed a total of 107,175 linear feet of storm drain and sanitary sewer to remove stormwater from local sewers serving a 609-acre area in Jamaica Plain, Mission Hill and Roxbury, and disconnected an already-separated storm drain system serving an adjacent 548-acre area from the sewer system.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Minimizes CSO discharges to meet B(cso) water quality standards (>95% compliance with Class B).</p> <p>CSO Outfalls: MWR023 (Stony Brook Conduit)</p> <p>Frequency of Discharge (typical year): Before project: 22 With project: 2</p> <p>Annual Discharge Volume (typical year): Before project: 44.5 million gallons With project: 0.13 million gallons</p> <p>CSO Reduction by Volume: 99.7%</p>


16. SOUTH DORCHESTER BAY SEWER SEPARATION		
	<p>Receiving Water: South Dorchester Bay</p> <p>Completed: 2007</p> <p>Capital Cost: \$118,913,000</p> <p>Description: Installed a total of 150,000 linear feet of storm drain and sanitary sewer to remove stormwater from local sewers serving a 1,750-acre area in Dorchester. Closed all CSO regulators, allowing MWRA to decommission its Fox Point and Commercial Point CSO facilities.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Eliminated CSO discharges to Savin Hill, Malibu and Tenean beaches, in compliance with Class B water quality standards.</p> <p>CSO Outfalls: MWR209 (BOS088/BOS089) MWR211 (BOS090)</p> <p>Frequency of Discharge (typical year): Before project: 20 (treated) With project: Eliminated</p> <p>Annual Discharge Volume (typical year): Before project: 30 million gallons With project: Eliminated</p> <p>CSO Reduction by Volume: 100%</p>


Completed CSO Projects (continued)

17. FORT POINT CHANNEL SEWER SEPARATION		
	<p>Receiving Water: Fort Point Channel</p> <p>Completed: 2007</p> <p>Capital Cost: \$12,047,000</p> <p>Description: Installed 4,260 feet of storm drain and 4,300 feet of sanitary sewer to remove stormwater from local sewers serving 55 acres in the Fort Point Channel area. Raised overflow weirs at outfalls BOS072 and BOS073. Replaced tide gates and installed underflow baffles for floatables control at both outfalls.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Minimizes CSO discharges to meet B(cso) water quality standards (>95% compliance with Class B).</p> <p>CSO Outfalls: BOS072, BOS073</p> <p>Frequency of Discharge (typical year): Before project: 9 With project: 0</p> <p>Annual Discharge Volume (typical year): Before project: 3.0 million gallons With project: 0.0</p> <p>CSO Reduction by Volume: 100%</p>


18. REGIONWIDE FLOATABLES CONTROL 19. MWRA FLOATABLES CONTROL AND OUTFALL CLOSING PROJECTS		
	<p>Receiving Water: Region-wide</p> <p>Completed: 2007</p> <p>Capital Cost: \$1,216,000</p> <p>Description: Installed underflow baffles for floatables controls and closed several regulators and outfalls.</p> <p>In March 2000, MWRA closed Outfalls MWR021 and MWR022 to CSO discharges.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Complies with EPA Policy Nine Minimum Controls requirement to control solid and floatable material. Eliminated CSO discharges at certain outfalls.</p> <p>CSO Outfalls: Various outfalls system-wide.</p> <p>CSO Control: The floatables controls do not affect CSO discharge frequency or volume.</p>


Completed CSO Projects (continued)

20. UNION PARK DETENTION/TREATMENT FACILITY		
	<p>Receiving Water: Fort Point Channel</p> <p>Completed: 2007</p> <p>Capital Cost: \$49,584,000</p> <p>Description: Added CSO treatment facility to existing BWSC Union Park Pumping Station with fine screens, chlorine disinfection, dechlorination, and 2 million gallons of detention storage.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Provides treatment of Union Park pumping station discharges to Fort Point Channel to meet Class B water quality criteria, including residual chlorine limits, and lowers discharge frequency and volume with on-site detention basins.</p> <p>CSO Outfall: BOS 070</p> <p>Frequency of Discharge (typical year): Before project: 25 (untreated) With project: 17 (treated)</p> <p>Annual Discharge Volume (typical year): Before project: 132.0 million gallons With project: 71.4 million gallons/year</p> <p>CSO Reduction by Volume: 46%</p>


21. BOS019 CSO STORAGE CONDUIT		
	<p>Receiving Water: Upper Inner Harbor (Little Mystic Channel)</p> <p>Completed: 2007</p> <p>Capital Cost: \$14,288,000</p> <p>Description: Installed twin-barrel 10'x17' box conduit to provide 670,000 gallons of off-line storage, between Chelsea St. and the Mystic Tobin Bridge, Charlestown. Included above-ground dewatering pump station.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Minimizes CSO discharges to meet B(cso) water quality standards (>95% compliance with Class B).</p> <p>CSO Outfall: BOS019</p> <p>Frequency of Discharge (typical year): Before project: 13 With project: 2</p> <p>Annual Discharge Volume (typical year): Before project: 4.4 million gallons With project: 0.6 million gallons</p> <p>CSO Reduction by Volume: 86%</p>


Completed CSO Projects (continued)

22. PRISON POINT CSO FACILITY OPTIMIZATION		
	<p>Receiving Water: Upper Inner Harbor</p> <p>Completed: 2008</p> <p>Capital Cost: \$50,000</p> <p>Description: Minimizes treated CSO discharges to the Inner Harbor by optimizing the operation of existing facility gates and pumps to maximize in-system storage and convey more flow to Deer Island</p>	<p>CSO Control</p> <p>Water Quality Benefit: Reduces treated CSO discharges to Upper Inner Harbor.</p> <p>CSO Outfall: MWR203 (Prison Point Facility)</p> <p>Frequency of Discharge (typical year): Before project: 30 (treated) With project: 17 (treated)</p> <p>Annual Discharge Volume (typical year): Before project: 335 million gallons With project: 243 million gallons</p> <p>CSO Reduction by Volume: 27% (with Bulfinch Triangle Sewer Separation)</p>


23. COTTAGE FARM BROOKLINE CONNECTION AND INFLOW CONTROLS		
	<p>Receiving Water: Lower Charles River Basin</p> <p>Completed: 2009</p> <p>Capital Cost: \$3,000,000</p> <p>Description: Optimizes the combined conveyance capacity of the two MWRA sewers that carry flows across the Charles River by interconnecting overflow chambers outside the Cottage Farm CSO facility; increases this conveyance capacity by bringing into service a parallel, previously unutilized 54-inch diameter sewer (the "Brookline Connection").</p>	<p>CSO Control</p> <p>Water Quality Benefit: Minimizes treated CSO discharges from the Cottage Farm CSO Facility to the Lower Charles River Basin.</p> <p>CSO Outfall: MWR201 (Cottage Farm Facility)</p> <p>Frequency of discharges (typical year): Before project: 7 (treated) With project: 7 (treated)</p> <p>Annual Discharge Volume (typical year): Before project: 44.5 million gallons With project: 24.0 million gallons</p> <p>CSO Reduction by Volume: 46%</p>


Completed CSO Projects (continued)

24. MORRISSEY BOULEVARD STORM DRAIN		
	<p>Receiving Water: North Dorchester Bay</p> <p>Completed: 2009</p> <p>Capital Cost: \$32,899,000</p> <p>Description: Installed 2,800 linear feet of 12-foot by 12-foot and 8-foot by 8-foot box conduit for stormwater conveyance, with gated connection to North Dorchester Bay CSO Storage Tunnel at upstream end, new outfall to Savin Hill Cove, and pollution prevention measures.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Maximizes level of stormwater control along the South Boston beaches by redirecting some stormwater to Savin Hill Cove in large storms.</p>


25. EAST BOSTON BRANCH SEWER RELIEF		
	<p>Receiving Water: Boston Harbor and Chelsea Creek</p> <p>Completed: 2010</p> <p>Capital Cost: \$85,709,000</p> <p>Description: Upgraded MWRA's 115-year-old interceptor system serving most of East Boston, using a combination of construction methods: microtunneling, pipe-bursting, open-cut excavation and pipe relining.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Minimizes CSO discharges to meet B(cso) water quality standards (>95% compliance with Class B).</p> <p>CSO Outfalls: BOS003, BOS004, BOS005, BOS009, BOS010, BOS012, BOS013, BOS014 (BOS006 and BOS007 closed by BWSC)</p> <p>Frequency of discharges (typical year): Before project: 31 With project: 6</p> <p>Annual Discharge Volume (typical year): Before project: 41.0 million gallons With project: 8.6 million gallons</p> <p>CSO Reduction by Volume: 79%</p>


Completed CSO Projects (continued)

26. BULFINCH TRIANGLE SEWER SEPARATION		
	<p>Receiving Water: Boston Inner Harbor and Lower Charles River Basin</p> <p>Completed: 2010</p> <p>Capital Cost: \$9,986,000</p> <p>Description: Installed a total of 5,290 feet of storm drain and sanitary sewer to remove stormwater from local sewers in a 14-acre area of Bulfinch Triangle/North Station, allowing already-separated storm drains serving an additional 47-acre area of Government Center to be removed from the sewer system, as well. Closed Outfall BOS049 to CSO discharges.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Reduces treated CSO discharges from the Prison Point CSO Facility to Boston Upper Inner Harbor. Eliminated CSO discharges at Outfall BOS049 to Lower Charles River Basin.</p> <p>CSO Outfalls: MWR203 (Prison Point Facility) and BOS049</p> <p>Frequency of discharges (typical year): Before project: 18 (treated) With project: 17 (treated)</p> <p>Annual Discharge Volume (typical year): Before project: 281.5 million gallons With project: 243.0 million gallons</p> <p>CSO Reduction by Volume: 14%</p>

27. INTERCEPTOR CONNECTION RELIEF AND FLOATABLES CONTROL AT CAM002 AND CAM401B AND FLOATABLES CONTROL AT CAM001		
 <p>CAM 002A & B inlet structure-baffle is visible in front of CAM 002A outlet with a steel plate (temporary condition) bolted on the left hand wall on the CAM 002B outlet.</p>	<p>Receiving Water: Alewife Brook</p> <p>Completed: 2010</p> <p>Capital Cost: \$3,500,000</p> <p>Description: Upgraded the hydraulic capacities of City of Cambridge connections to MWRA interceptors and installed underflow baffles for floatables control.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Together with other Alewife Brook CSO projects (not yet complete), minimizes CSO discharges and their impacts to meet 98% compliance with Class B water quality standards.</p> <p>CSO Outfalls: CAM002, CAM401B, CAM001</p>

Completed CSO Projects (continued)

28. CAM400 COMMON MANHOLE SEPARATION		
	<p>Receiving Water: Alewife Brook</p> <p>Completed: March 2011</p> <p>Capital Cost: \$3,300,000</p> <p>Description: Replaced common storm drain and sewer manholes with separate manholes and associated piping in the local, mostly residential streets bounded by Alewife Brook Parkway, Massachusetts Avenue, Magoun Street and Whittemore Avenue, as well as a portion of the WR Grace property off Whittemore Avenue</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Eliminated CSO discharges to Alewife Brook at Outfall CAM400.</p> <p>CSO Outfalls: CAM400</p> <p>Frequency of Discharge (typical year) Before project: 8 After project: 0</p> <p>Annual Discharge Volume (typical year) Before project: 0.63 million gallon After project: 0</p> <p>CSO Reduction by Volume: 100%</p>

29. NORTH DORCHESTER BAY STORAGE TUNNEL & RELATED FACILITIES		
	<p>Receiving Water: North Dorchester Bay</p> <p>Capital Cost: \$237,241,000 (not including the cost of Morrissey Boulevard storm drain (Project 24))</p> <p>Completed: May 2011</p> <p>Description: Constructed a 10,832-ft., 17-ft. diameter soft-ground tunnel, drop shafts and CSO and stormwater diversion structures along outfalls BOS081-BOS087; 15-mgd tunnel dewatering pump station at Massport's Conley Terminal; 24-inch force main; and below-ground tunnel ventilation and odor control facility at the upstream end of the tunnel. Eliminated outfalls BOS083 and BOS087.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Eliminated CSO and separate stormwater discharges up to the 25-year storm and 5-year storm, respectively.</p> <p>CSO Outfalls: BOS081 BOS083 BOS085 BOS087 BOS082 BOS084 BOS086</p> <p>Frequency of Discharge (typical year) CSO: Before project: 17 After project: 0 Stormwater: Before project: 93 After project: 0</p> <p>Annual Discharge Volume (typical year) CSO: Before project: 8.6 million gals After project: 0 Stormwater: Before project: 144 million gals After project: 0</p> <p>CSO Reduction by Volume: 100% Stormwater Reduction by Volume: 100%</p>



The End