

Massachusetts Water Resources Authority



Combined Sewer Overflow Control Plan



L Street Beach, South Boston, August 12, 2011

Annual Progress Report 2011

March 2012

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1. INTRODUCTION

The Massachusetts Water Resources Authority (MWRA) files this Combined Sewer Overflow Annual Progress Report for 2011 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 2011 and through the quarterly period December 16, 2011, to March 15, 2012, 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, as well as 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 is comprised of 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 maps the locations of the 35 projects and presents the general implementation status of each project. Figure 2 summarizes the scope, schedule and predicted benefits of the system-wide Long-Term Control Plan. MWRA is also required 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 (MWR201, CAM005, CAM007, CAM009 and CAM011), certain 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 AND ACCOMPLISHMENTS

2.1 2011 Progress Highlights

MWRA and its CSO communities continued to implement the Long-Term CSO Control Plan and meet 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"). In 2011, MWRA and the CSO communities attained substantial completion of two of the CSO projects, bringing the total number of completed projects to 29 of the 35 projects in the Long-Term Control Plan. Four of the remaining six projects are well into construction, and the last two projects are scheduled to move into design by April 2012, in compliance with Schedule Seven. Since the beginning of the program, 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. These include several outfalls the CSO communities have closed, or have closed on a test basis, that are in addition to the outfalls

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."



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

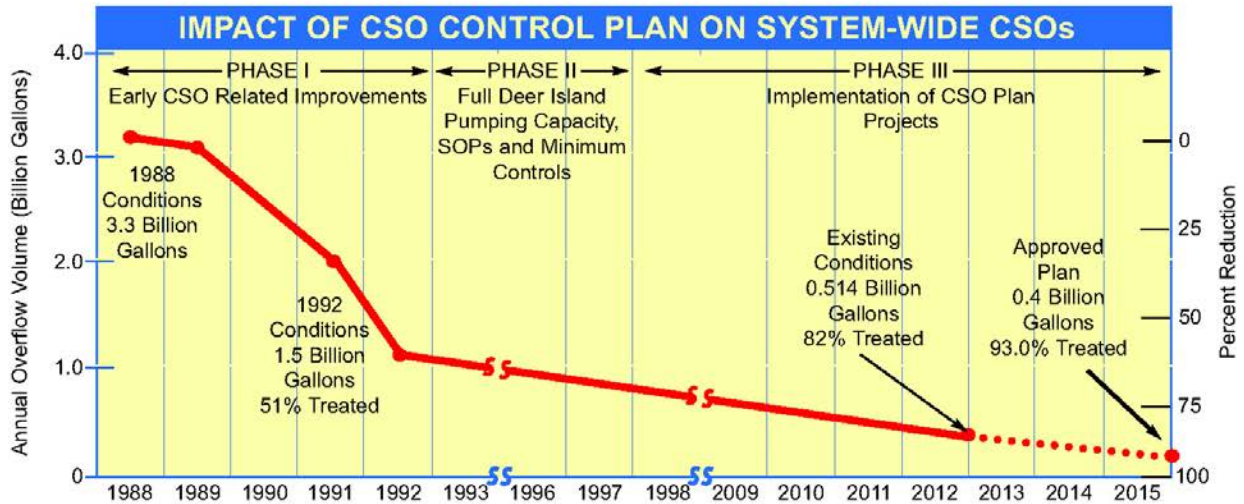
In Construction ⁽²⁾	Complete ⁽¹⁾
Brookline Sewer Separation	2013
CAM004 Outfall and Wetland Basin*	2013
Reserved Channel Sewer Separation	2015
CAM004 Sewer Separation *	2015

Future Start - (2012)	Complete ⁽¹⁾
SOM01A Interceptor Connection Relief/Floatables Controls*	2014
MWR003 Gate, Rindge Ave. Siphon Relief and SOM01A*	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 1
MWRA Approved CSO Control Plan and Status of Implementation
March 2012
Completed Projects are Labeled in Red

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
\$860.7 Million
Net Annual O&M
\$1.5 Million

Note: As of March 15, 2012, CSO discharge has been eliminated at 33 of the 34 outfalls recommended to be closed. One of the 34 outfalls will be closed with completion of the CAM004 sewer separation project, and four additional outfalls have been closed by the BWSC and the City of Cambridge.

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MWRA recommended be closed in the Long Term Control Plan. Projects completed to date have greatly reduced CSO discharge and have contributed to significant water quality improvement for Boston Harbor, the beaches of South Boston and other area waters. MWRA spent \$44.9 million in 2011 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 amount, \$41.3 million (92%) was construction related. Two miles of new pipe, including more than 6,000 linear feet of sanitary sewer and nearly 4,000 linear feet of storm drain in the communities of Boston, Brookline and Cambridge were installed as part of the project work described below.

Highlights of the CSO control progress achieved in 2011 include:

- Completion of the \$270 million North Dorchester Bay CSO storage tunnel and related facilities and commencement of operations on May 4, 2011, prior to the start of last year's swimming season. On June 23, 2011, MWRA commemorated the completion and start-up with elected officials, Federal Court and regulatory authorities, environmental advocates, and South Boston residents, all of whom, through years of hard work and coordination, contributed to the project's successful outcome and long-term environmental protections. Successful operation of the tunnel is the culmination of nearly 20 years of planning, design and construction during which MWRA had to overcome siting, regulatory and construction challenges to now have in place major new infrastructure and wet-weather operating protocols that bring substantial environmental pollution control and water quality improvement to the beaches of South Boston while avoiding long-term impacts to the South Boston community.



Judge Stearns, Mayor Menino, Secretary Sullivan, Senator Hart, members of the Board of Directors and other dignitaries at the opening ceremonies on June 23, 2011

The work involved five major MWRA and BWSC construction contracts, including the 10,830-foot long (2-mile long), 17-foot diameter tunnel and associated CSO and stormwater diversion structures and gates that; the pumping station located at Massport's Conley Terminal adjacent to the downstream end of the tunnel and related 24-inch diameter force main that remove stored flows from the tunnel after each storm; the below-ground tunnel ventilation building behind the State Police Barracks on Day Boulevard, adjacent to the upstream end of the tunnel; the BWSC Morrissey Boulevard storm drain necessary to achieve a 5-year level of stormwater control for the beaches; and the Pleasure Bay storm drain improvements that eliminated stormwater discharges to Pleasure Bay Beach. Since start-up on May 4, the storage tunnel and related facilities have consistently performed as intended for their full environmental function and benefit, preventing 197 million gallons of CSO and separate stormwater from discharging to the Bay during more than 60 rainfall events and sending the stored flows to the interceptor system at the end of each storm, for treatment at Deer Island.

On February 13, 2012, MWRA received a 2012 Operations and Environmental Performance Award from the National Association of Clean Water Agencies (NACWA) for the North Dorchester Bay CSO Storage Tunnel and Related Facilities. NACWA's National Environmental Achievement Awards Program recognizes individuals and agencies for outstanding contributions to environmental protection and the clean water community.



- Completion of the City of Cambridge's \$5.4 million CAM400 Common Manhole Separation project on March 30, 2011. With completion of this project, one of six in MWRA's long-term control plan for the Alewife Brook, the City of Cambridge lowered stormwater flows to its combined sewer system and MWRA's interceptors and closed Outfall CAM400, eliminating approximately 0.6 million gallons of CSO a year.
- Commencement of the City of Cambridge's \$16.1 million construction contract for the CAM004 stormwater outfall and wetland basin. The project, one of six in the long-term control plan for Alewife Brook, will provide detention and wetlands treatment to the stormwater flows that will be removed from the combined sewer system by the CAM004 sewer separation project, for control of CSO discharges to Alewife Brook. The contract is approximately 40% complete.
- Continued progress by Cambridge with final design of the CAM004 Sewer Separation project. Cambridge plans to issue Notice to Proceed with the first of three remaining construction contracts by September 2012, in compliance with Schedule Seven.
- Commencement of the Town of Brookline's \$16.6 million second (and final) construction contract to complete the Brookline sewer separation project. The contract, which is approximately 60%

complete, is intended to reduce CSO discharges at MWRA's Cottage Farm CSO Facility and includes 3,790 linear feet of storm drain and 1,290 linear feet of sanitary sewer by open trench method and 4,550 linear feet of sanitary sewer by microtunneling.

- Substantial completion of two construction contracts associated with BWSC's \$62.3 million Reserved Channel sewer separation project (in addition to a contract BWSC completed in 2010) and continued construction progress with two other Reserved Channel contracts. All construction and design work is on schedule for completion of the project by December 2015, in compliance with Schedule Seven.
- Substantial completion of BWSC's \$6.0 million construction contract for 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. The work is partially funded by MWRA and is intended to lower CSO discharges to BWSC's Dorchester Brook Conduit and help attain the level of CSO control in MWRA's long-term control plan for Fort Point Channel.
- Advertisement of the MWRA contract that will move the last two CSO projects in the Long-Term Control Plan into design: 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. Both projects are part of MWRA's CSO plan for Alewife Brook.
- In April 2011, the Federal District Court allowed MWRA's motion to remove construction of the Charles River Valley/South Charles River Relief Sewer Gate Controls and Additional Interceptor Connections project from the Long-Term Control Plan and Schedule Seven, after MWRA demonstrated to EPA through extensive hydraulic evaluations that the project would not provide additional CSO control for the Charles River and would add a significant risk for system flooding.

2.2 Projects Completed in 2011

For a full listing and description of all completed CSO projects, see Chapter 6.

North Dorchester Bay CSO Storage Tunnel and Related Facilities

On May 4, 2011, MWRA completed the North Dorchester Bay CSO storage tunnel and related facilities (Figure 3), which include the 10,830-foot long (2-mile long), 17-foot diameter tunnel that can hold up to a total 19 million gallons of CSO and stormwater flow; CSO and stormwater diversion structures and gates that direct flows into the tunnel at each outfall; a tunnel-dewatering pump station located at Massport's Conley Terminal adjacent to the downstream end of the tunnel (and related 24-inch diameter force main); a below-ground tunnel ventilation and odor control building behind the State Police Barracks on Day Boulevard, adjacent to the upstream end of the tunnel. BWSC completed another component of the North Dorchester Bay CSO control plan, the Morrissey Boulevard storm drain, in July 2009, pursuant to the CSO Memorandum of Understanding and Financial Assistance Agreement with MWRA, by which BWSC maintains ownership.

MWRA monitors and records water surface elevations within the CSO and stormwater diversion structures and the tunnel. Once each storm ends and flows in the sewer system subside, the pumping station at Conley Terminal pumps the stored flow from the tunnel to the local sewer system for transport to the Deer Island

Figure 3
North Dorchester Bay CSO Storage Tunnel and Related Facilities



Treatment Plant. Since bringing the project on-line on May 4, 2011, the storage tunnel and related facilities have prevented 197 million gallons of CSO and separate stormwater from discharging to the Bay during more than 60 rainfall events. The largest volume of CSO and stormwater stored to date during any single storm was 9.84 million gallons, slightly more than half the design storage volume, during the storm of December 7-8, 2011. With the sole exception of Hurricane Irene on August 27-29, 2011, when separate stormwater flows were allowed to discharge to the Bay and to Savin Hill Cove via the Morrissey Boulevard storm drain, MWRA directed all flows to the tunnel and prevented any discharge of CSO, stormwater or dry weather flow (e.g., groundwater infiltration) from the five remaining outfalls to the South Boston beaches.



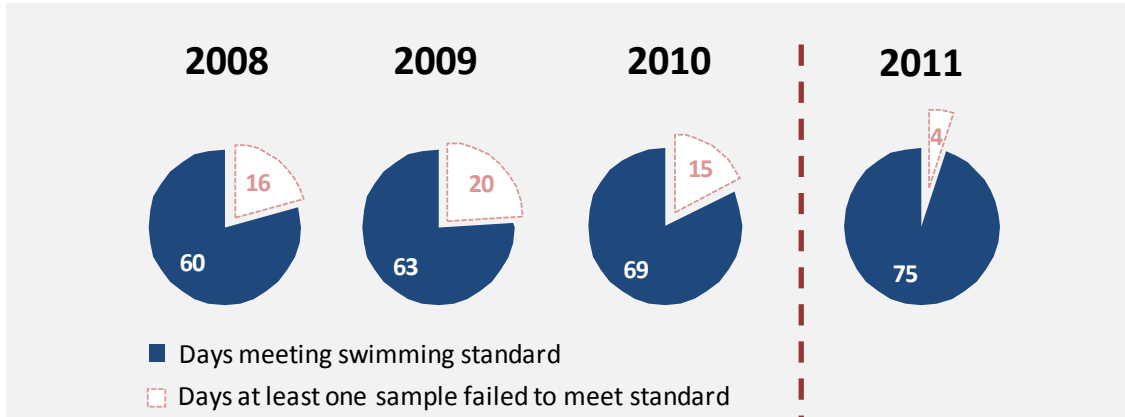
North Dorchester Bay CSO Storage Tunnel Dewatering Pump Station, Conley Terminal, South Boston

Water quality test results (see Figure 4) show markedly improved conditions along the beaches of South Boston. While the 2011 swimming season – the first to benefit from the operating storage tunnel – had a high number of rain events and a high total rainfall amount relative to previous years, the number of days that daily sample results showed a violation of the bacteria standard plummeted from a seasonal average of 17 in years 2008, 2009 and 2010 to 4 in 2011.

During the swimming season (approximately 85 days from early June into September), the Massachusetts Department of Conservation and Recreation (DCR) 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. Notwithstanding the four days in the 2011 swimming season when one or more beach locations were posted, water quality conditions along all beaches are generally excellent. Daily water quality samples collected in the 2011 swimming season met the swimming standard 95% of the time at Pleasure Bay Beach, 97% of the time at I Street Beach, and 99% of the time at McCormack Bathhouse, M Street Beach and City Point 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.

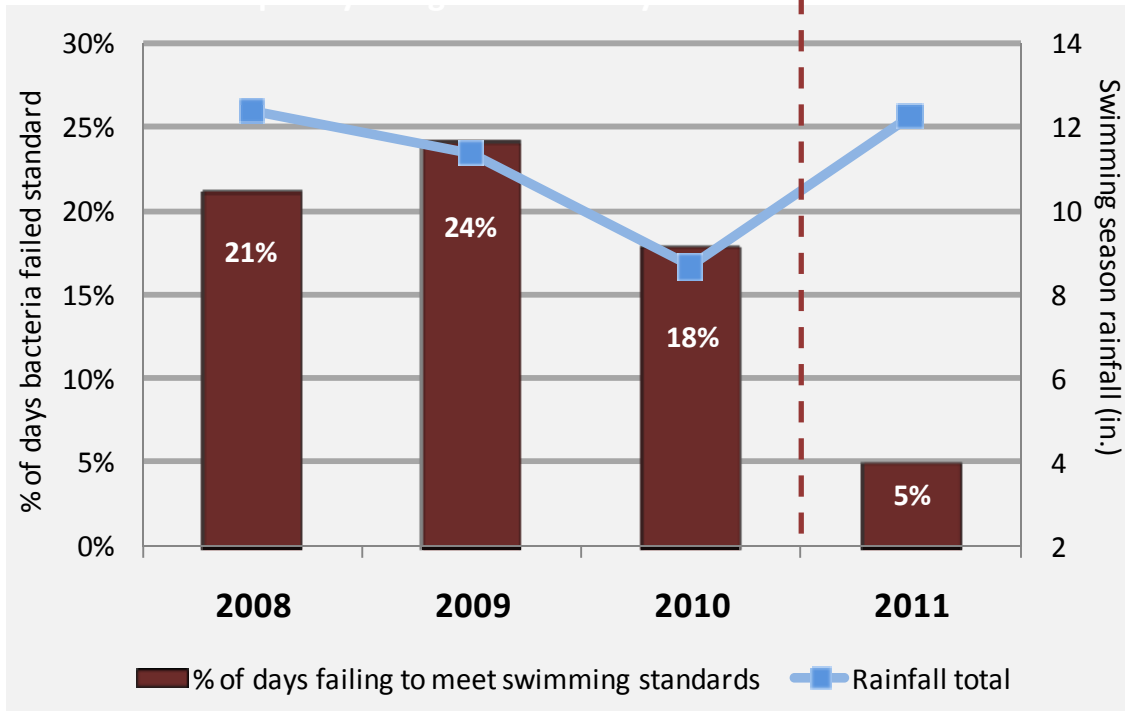
Figure 4
Change to South Boston Beaches Water Quality Following Tunnel Start-Up

More beach days were suitable for swimming in 2011



**TUNNEL START-UP
 MAY 2011**

Fewer high-bacteria beach days in 2011, despite more rain

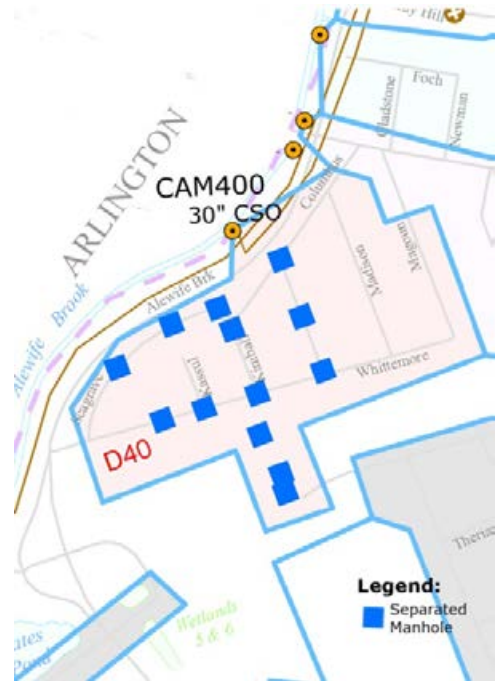


Results from DCR swimming seasons for the years 2008–2011, including daily bacteria samples that meet or failed to meet the posting limit of 104 cfu/100 mL *Enterococcus*. Rainfall totals limited to beach monitoring season only, from Logan NWS rain gauge.

CAM400 Common Manhole Separation

On March 30, 2011, the City of Cambridge attained substantial completion of the \$3.9 million construction contract that included two of the six projects that comprise the long-term CSO control plan for Alewife Brook: the CAM400 common manhole separation project and the project that included interceptor connection relief and floatables controls at CAM002 and CAM401B and floatables control at CAM001, which the contractor substantially completed in October 2010 in compliance with an interim contract milestone. Cambridge included both projects in one construction contract in part because the projects were located in the same general area near the intersection of Alewife Brook Parkway and Massachusetts Avenue and involved similar sewer and storm drain work.

The CAM400 manhole separation work was performed in the residential area 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. While this area was already primarily served by separated storm drain and sanitary sewer pipes, Cambridge's contractor replaced 13 manholes that historically provided common access to these systems with separate storm drain and sanitary sewer manholes, removing the ability for flows in one system to enter the other system, especially in large storms. The work also included a limited amount of new storm drain and sanitary sewer installation and rehabilitation. With the systems fully separated, Cambridge was able to permanently close the sole regulator that had allowed mixed sanitary and stormwater flows to be discharged to Alewife Brook through Outfall CAM400, which now serves as a separate stormwater-only outfall.



2.3 Ongoing Design and Construction Progress

Alewife Brook CSO Control Plan/Cambridge Sewer Separation

The Alewife Brook CSO control plan is intended to minimize CSO flows to the Alewife Brook primarily by separating combined sewer systems in parts of Cambridge, while also upgrading hydraulic capacities at local connections to the MWRA interceptors. Cambridge is also constructing 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 design and construction work for four of the six projects that comprise the approved Alewife Brook CSO control plan is managed by the City of Cambridge with MWRA funding under 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 completed contracts.

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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 a Notice of Project Change to the Massachusetts Environmental Policy Act (MEPA) Office for public review 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 (Figure 5) 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 Alewife Brook 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 10.3 acre-foot wetland in the Alewife Brook Reservation.

Figure 5: Rendering of Alewife Wetland Basin



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The basin will provide detention storage and the control of pollutants associated with urban stormwater by natural 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.

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). The location of projects is shown in Figure 6. 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	Capital Cost ⁽¹⁾ (millions)	Cambridge Contract No.	Benefit
CAM004 Stormwater Outfall and Wetland Basin	\$25.3	12	Convey stormwater flows to wetland system for attenuation and treatment.
CAM004 Sewer Separation ⁽²⁾	78.2	8A,8B, 9	Remove large quantities of stormwater from the sewer system; eliminate CSO at Outfall CAM004.
CAM400 Manhole Separation	5.0	4/13	Remove stormwater from the sewer system; eliminate CSO at Outfall CAM400.
Interceptor Connection Relief and Floatables Control	3.5		Upgrade connections between Cambridge and MWRA systems to provide relief; add floatables control.
MWR003 Control Gate and Rindge Ave. Siphon Relief	3.1	MWRA Contracts	Optimize hydraulic conveyance; minimize overflows while controlling system flooding in large storms.
SOM01A Connection with Floatables	1.1		Upgrade connection and provide floatables control
Total Cost	\$116.2		

⁽¹⁾ Includes MWRA and City of Cambridge cost shares, based on latest design and construction cost estimates.

⁽²⁾ Also includes initial construction contracts completed by Cambridge by 2002.

Revised Project Schedules and New Court Milestones

Design and construction milestones for the revised Alewife Brook projects were added to the court schedule in 2006 in accordance with and as part of the agreement MWRA reached with the U.S. Environmental Protection Agency, Region 1 (EPA) and Massachusetts Department of Environmental Protection (DEP) on a revised regional long-term CSO control plan (see Chapter 5). MWRA and Cambridge were unable to meet the new milestones due to a citizens' appeal of a Superseding Order of Conditions issued pursuant to the Wetlands Protection Act by DEP for the CAM004 stormwater outfall and wetland basin. The appeal process commenced in April 2005 and concluded in May 2009.

Although the appeal was still ongoing in October 2008, Cambridge resumed design of CAM004 stormwater outfall and wetland basin and commenced design of CAM400 common manhole separation and interceptor connection relief and floatables control at CAM002 and CAM401B, and floatables control at CAM001. Cambridge was able to move forward with the single construction contract that combined the CAM400 manhole separation project and the interceptor relief and floatables controls at CAM002 and CAM401B and floatables control at CAM001 project in January 2010, and completed all work in March 2011.

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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 (Contract 12)			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.

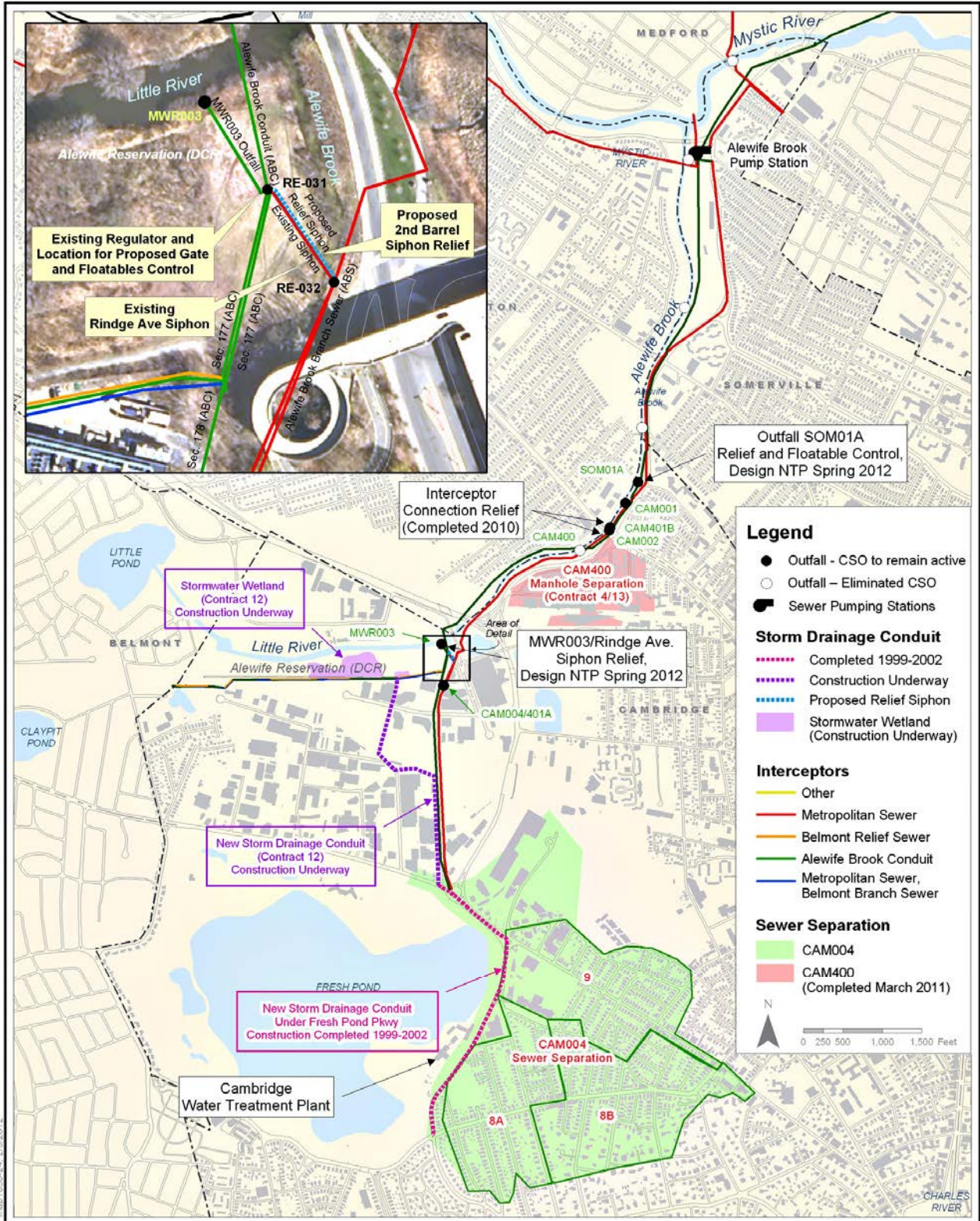
However, Cambridge was unable to proceed with construction of the CAM004 wetland basin and stormwater outfall due to difficulties in obtaining easements and rights of entry from private and public land owners. Cambridge was able to issue a Limited Notice to Proceed with construction on April 26, 2011, which authorized the contractor to proceed with all work of the contract except the work on the parcels where easements and rights of entry had not yet been secured. After obtaining fully executed easements and rights of entry for the remaining properties on May 5, 2011, Cambridge was able to issue the full notice to proceed with construction of CAM004 stormwater outfall and wetland basin on May 23, 2011.

With an assurance of the construction schedule for the CAM004 stormwater outfall and wetland, MWRA filed a motion with the Court on July 13, 2011, proposing new court milestones for the Alewife projects. The Court allowed the motion on July 14, 2011, and incorporated the milestones into Schedule Seven on September 15, 2011.



DCR Alewife Brook Reservation

Figure 6
 Alewife Brook CSO Control



In Schedule Seven, the construction milestones for the CAM004 stormwater outfall and detention basin (Contract 12 – commence construction April 2011; complete construction April 2013) maintains the original two-year construction duration. The construction schedule for CAM004 sewer separation (commence construction September 2012; complete construction December 2015) maintains the December 2015 completion date for the Alewife Brook long-term CSO control plan. The schedules for the MWRA-managed control gate/floatables control at Outfall MWR003 and MWRA Rindge Avenue Siphon relief project and the interconnection relief and floatables control at Outfall SOM01A project (commence design April 2012; commence construction August 2014/September 2013; complete construction October 2015/June 2014) allow MWRA to incorporate into the design of these projects the final design and early construction information from the CAM004 sewer separation project.

Progress in 2011 and Ongoing Work

The City of Cambridge issued a Limited Notice to Proceed with construction of the CAM004 stormwater outfall and wetland basin on April 26, 2011, and a Full Notice to Proceed on May 23, 2011. In the area where the stormwater wetland basin is to be constructed, Cambridge’s contractor completed the placement of an 8-inch gas line, a 36-inch electric bundle, three 4-inch telecommunication conduits and City of Cambridge 10-inch water main and 12-inch sewer force main. The contractor also cleared the 3.4-acre area to be used for the wetland basin, commenced excavation of the basin, and completed the wetland basin outlet structure, the perimeter berm surrounding the basin and the French drain system. Deeper excavation and shaping of the basin is in progress.



Launching Electric Bundle into Pit



Perimeter Berm at Future Wetland Basin



Stormwater Diversion Structure

The contractor also continues with construction of the new storm drain box conduit and associated special structures that will ultimately convey separated stormwater flows to the basin. The contractor has completed major sections of the box conduit, including the section that crosses beneath MBTA's high speed commuter rail tracks and sections on and near Fawcett Street. Construction of a large concrete stormwater diversion structure, the relocation of an 18-inch sewer behind 70 Fawcett Street, and the relocation of water mains and sanitary sewers on Wheeler Street are all complete. The Contractor expects to complete a special structure that allows the conduit to pass over existing MWRA interceptor sewers, along with the connection from this structure to the forebay of the wetland basin, this month. Further south, the Contractor will soon commence installation of the box conduit section between the railroad tracks and Cambridge Park Drive. Overall, the contract is approximately 40% complete.

In the meantime, work on the design of the remaining three construction contracts to complete the CAM004 sewer separation project (Cambridge contracts 8A, 8B and 9) is also progressing. The project involves the separation of sewers upstream of Outfall CAM004 in the Huron Avenue and Concord Avenue neighborhoods, east of Fresh Pond. The removal of large volumes of stormwater from the Cambridge sewers upstream of Outfall CAM004 will greatly reduce CSO discharges (greater than 85% annual volume reduction) at the several outfalls along Alewife Brook and will allow Cambridge to close Outfall CAM004.

In December 2011, Cambridge's design consultant submitted a report on the intensive field investigations it conducted for these contracts. Final design of Contract 8A is approximately 60% complete, and Cambridge plans to advertise the construction contract for bids in early summer 2012 and issue the Notice to Proceed with Contract 8A by September 2012, in compliance with Schedule Seven. Cambridge also plans to commence final design of contracts 8B and 9 in March 2012 and March 2013, respectively, and issue notices to proceed with the construction contracts sequentially thereafter, on a schedule that will enable all sewer separation work to be complete by December 2015, in compliance with Schedule Seven. Cambridge plans to conduct community outreach and field investigations, such as TV inspection and pipeline assessment, specific to the Contract 8B area this spring.

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 will design and construct the remaining two projects. These projects include an automated hydraulic relief gate at the overflow weir associated with MWRA's Outfall MWR003 and floatables control for this outfall, along with relief of the 30-inch diameter MWRA siphon associated with Outfall MWR003, and hydraulic relief and floatables control for the City of Somerville's Tannery Brook connection to MWRA's interceptor system at Outfall SOM01A (see Figure 6, page 15). The design of these two projects will consider updated system performance conditions, the level of stormwater inflow removal that is planned to be achieved from Cambridge's CAM004 sewer separation project, now in design, and the remaining hydraulic performance needs of the MWRA's Alewife Brook interceptor system.

MWRA plans to award one design contract that will include both projects. On November 2, 2011, MWRA advertised the Request for Qualifications and Proposals with a detailed engineering scope for design and engineering services during construction. MWRA is reviewing the several proposals that were submitted by interested firms by the deadline of January 13, 2012. MWRA plans to award the design contract and issue Notice to Proceed by April 2012, 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 \$25.4 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 7). 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.

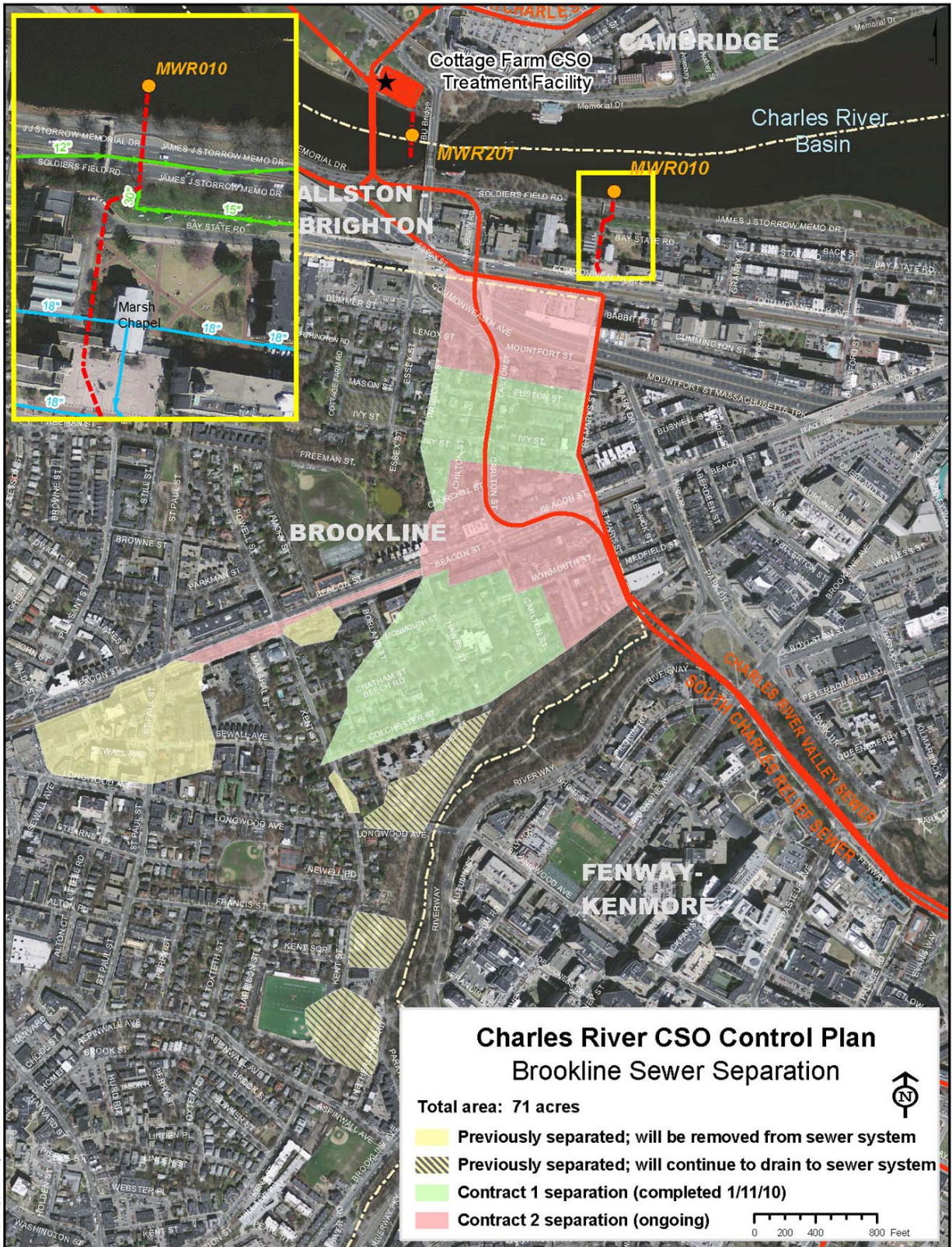
The project was recommended by MWRA and approved by EPA and DEP in March 2006 as part of a broader agreement on the Long-Term Control Plan that proposed to increase the level of CSO control for the Charles River Basin above the level MWRA had recommended in the 1997 CSO Facilities Plan. MWRA and the 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 is also managing 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.

Progress in 2011 and Ongoing Work

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 \$16.6 million second construction contract (“Phase II”) on January 19, 2011. Phase II (see project work areas in Figure 8) includes the installation of 3,790 linear feet of storm drain and 1,290 linear feet of 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 is constructing several large, special structures that will 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.

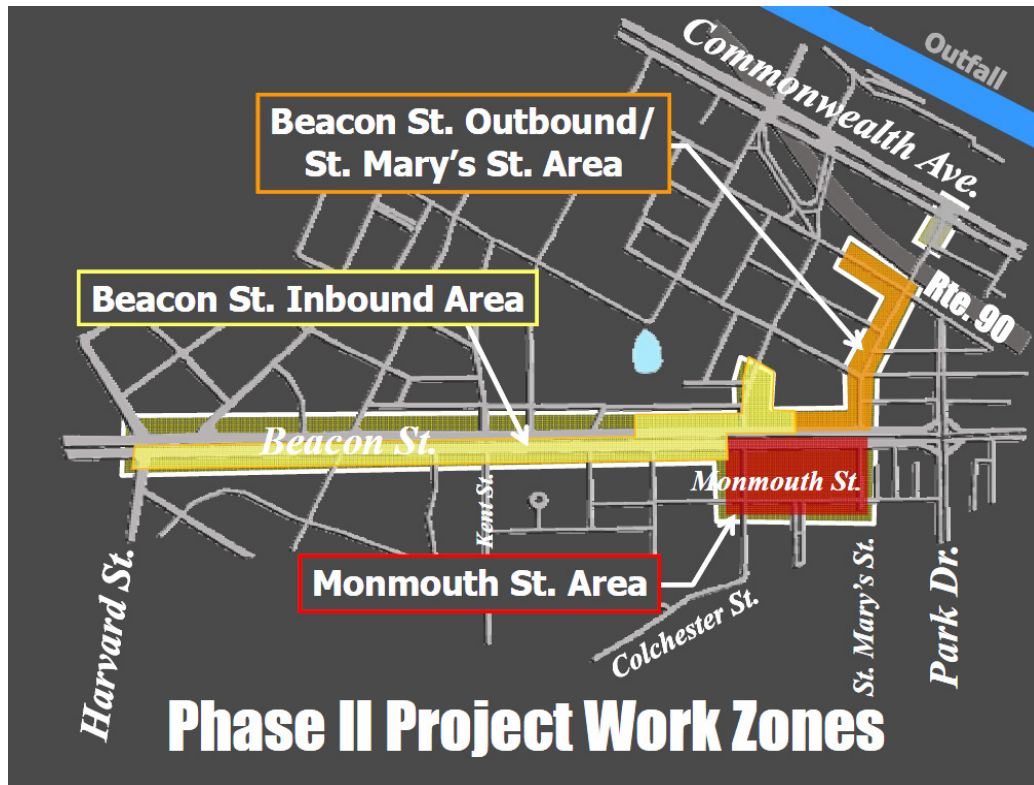


Figure 7: Brookline Sewer Separation Project



MWRA Map1209-17, 10/18/2011

Figure 8: Brookline Sewer Separation Phase II Project Areas



Phase II is approximately 60 percent complete. Brookline's contractor completed both the 490-foot long microtunneling portion and the 180-foot long open cut portion of a new 57-inch diameter sewer on Monmouth Street, as well as the microtunneling installation of 1,480 linear feet of 18-inch diameter sanitary sewer along St. Mary's Street and along Beacon Street from Carlton Street to St. Mary's Street. More recently, the contractor completed the microtunneling installation of 2,240 linear feet of 48-inch diameter sanitary sewer on Beacon Street between Carlton and Kent streets and the open-cut installation of 90 linear feet of 12-inch diameter drain in Carlton Street between Beacon and Churchill streets. The contractor completed the 140 linear feet of 48-inch sewer micro tunneling under the MBTA tracks on Beacon Street at Carlton Street, while keeping the MBTA C-line trains under normal operation, this required significant coordination with the MBTA. The contractor has also completed the installation of 650-linear feet of 42-inch diameter storm drain on Beacon Street (inbound) between Carlton and St. Mary's streets and has commenced the installation of a 12-inch diameter sewer and 30-inch diameter storm drain in St Mary's Street from Beacon to Monmouth streets.



The contractor has essentially completed special structures 3, 4 and 5, with only invert construction remaining, which the contractor plans to perform this spring. In the meantime, the contractor has backfilled these structures. Structures No. 1 and 2 will be constructed later in the contract schedule. Work on the contract was temporarily suspended during the winter of 2012, but is scheduled to resume in mid-March with new pipe installation along the southern end of St. Mary's Street (near Beacon Street), as well as the lining of a 48-inch sewer on Beacon Street between special structures 3 and 4. Brookline expects the contractor to substantially complete Phase II, and therefore the overall sewer separation project, ahead of the July 2013 milestone in Schedule Seven.



Sewer separation work typically involves miles of pipe installation along all or most streets in a community or neighborhood, in both residential and commercial areas. The pipe sizes can be large, and deep excavations are sometimes required to install the new pipes low enough to be able to tie building sewers or storm drain laterals into them. Because the areas of Brookline being separated are primarily at the downstream end of the Town's sewer system, the new pipes must be installed even deeper, as deep as 30 feet. To mitigate the impacts that open-cut trench work would have on car, trolley and pedestrian travel and commercial parking along Brookline's busy commercial streets, most notably Beacon Street, Brookline chose to perform much of the pipe installation with the microtunneling method, as MWRA had done with the East Boston Branch Sewer Relief project.

A detailed description of the microtunneling operation on the Brookline sewer separation project (along with the photo at right) can be found in the January 20, 2012 issue of *Trenchless Technology* magazine, at <http://www.trenchlessonline.com/index/webapp-stories-action/id.2072/title.microtunneling-in-brookline,-mass>.



MWRA continues to move forward with cleaning of CSO Outfall MWR010 to ensure that the outfall has adequate capacity to convey Brookline's separated stormwater to the Charles River Basin. The outfall, a CSO discharge location permitted to MWRA, will also continue to carry some BWSC stormwater and infrequent CSO discharges from MWRA's Charles River Valley Sewer and BWSC combined sewers. The outfall crosses Boston University property from Commonwealth Avenue, then crosses beneath Storrow Drive and the Esplanade to the Charles River. MWRA received construction bids for the cleaning on February 23, 2012, and plans to award the contract in March. By agreement with Boston University, MWRA plans to issue Notice to Proceed with the construction contract in June 2012. MWRA expects the contract work to be substantially complete by August 2012, in advance of the Town of Brookline's completion of sewer separation.

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

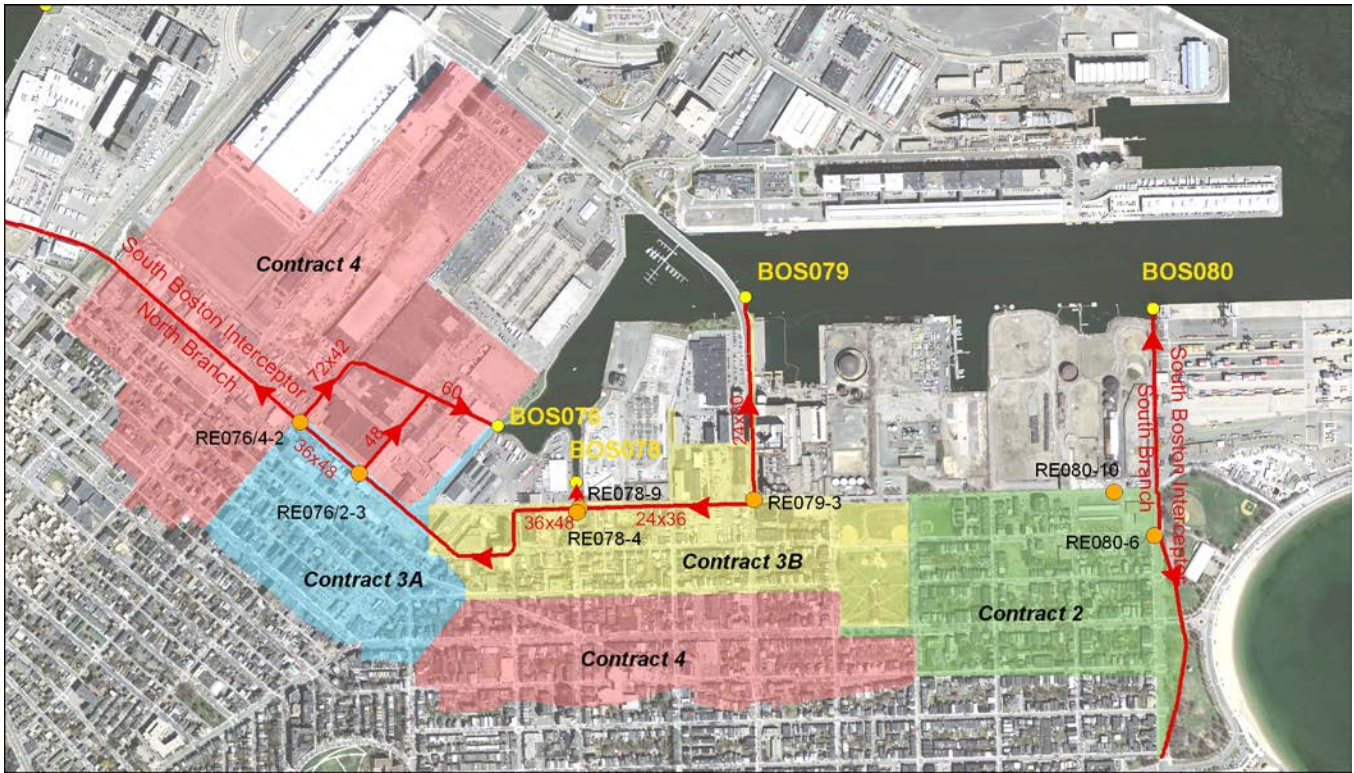
The \$62.3 million Reserved Channel Sewer Separation project is intended to minimize CSO discharges and impacts to the Reserved Channel by separating combined sewer systems in a portion of South Boston tributary to CSO Outfalls BOS076, BOS078, BOS079 and BOS080 (see Figure 9). Implementation of the approved 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.

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). In October 2010, BWSC attained substantial completion of the \$6.9 million first construction contract, 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.

Figure 9. 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	55%	2010-2012
Contract 3B	Sewer Separation	20%	2010-2013
Contract 4	Sewer Separation		2012-2014
Contract 5	Sewer Cleaning/Lining		2013-2014
Contract 6	Downspout Disconnections		2012-2014
Contract 7	Paving	100%	2010-2012
Contract 8	Paving		2012-2015

Progress in 2011 and Ongoing Work

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 each construction contract.

- In December 2011, BWSC attained substantial completion of the \$4.0 million second construction contract (Contract 1), with only punch list items and site restoration work remaining, including the installation of bar racks at the outfalls. Contract 1 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

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shoreline at each discharge location. The work varied at the outfalls, as-needed, and primarily included outfall pipe repair and cleaning, installation of large-diameter storm drain connections from the new storm drains in East First Street to the outfalls, installation of new tide gates, and construction of new headwalls and other shoreline protection. The contract also includes extensive surface restoration work.



Placement of tidegate chamber at Outfall 076 on Papas Way



Bridge guard rail and outfall headwall construction on Papas Way



Completed Rehabilitation of Outfall BOS078

- BWSC issued Notice to Proceed with the \$9.9 million Contract 3A in December 2010, and the contract is approximately 55% complete. It involves sewer separation in a 33-acre area of South Boston approximately bounded by West First Street, G Street, West Broadway and E Street. Contract 3A includes the installation of 9,000 linear feet of storm drain and 3,375 linear feet of sanitary sewer to separate combined sewers in an area tributary to Outfall BOS076, as well as 8,650 linear feet of replacement water main to remove conflicts with the planned storm drains. The contract also includes the installation of 22 new catch basins and the disconnection of 76 existing catch basins from the sewer system and reconnection to the new drains. The contractor has completed Special Drain Manhole A at West First and E streets, as well as 3,300 linear feet (79%) of the planned large storm drains and sewers (24-inch to 84-inch diameter). The contract completion date is July 31, 2013.

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42" sewer and 16" water main installation on West First Street



Installation of Special Manhole C at West First Street and F Street

- On April 1, 2011, BWSC issued the Notice to Proceed with 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, and the contract is approximately 10% complete. 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 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. While most of the completed work to date has involved the relocation of water mains, the contractor has commenced work to install 860 linear feet of 60-inch storm drain, Special Structure A, and new sewer manholes in East First Street. The contract completion date is December 30, 2014.
- BWSC has attained substantial completion of the \$1.2 million Contract 7, the first of two planned pavement restoration contracts in April 2012. 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 has completed design work for the estimated \$12.9 million Contract 4, the last of the major sewer separation contracts for this project, and expects to issue Notice to Proceed by August 2012. Contract 4 will separate sewers in a large area west of Reserved Channel that is tributary to Outfall BOS076, and in a large area south of Reserved Channel, along and near East Broadway that is tributary to Outfall BOS 078. The contract estimated completion date is December 2014.
- BWSC has completed design work for the estimated \$11.3 million Contract 8, the second of the two pavement restoration contracts, and expects to issue Notice to Proceed by June 2012. The paving contract will encompass the Contract 3A, 3B, and 4 areas and will be completed in 2015.

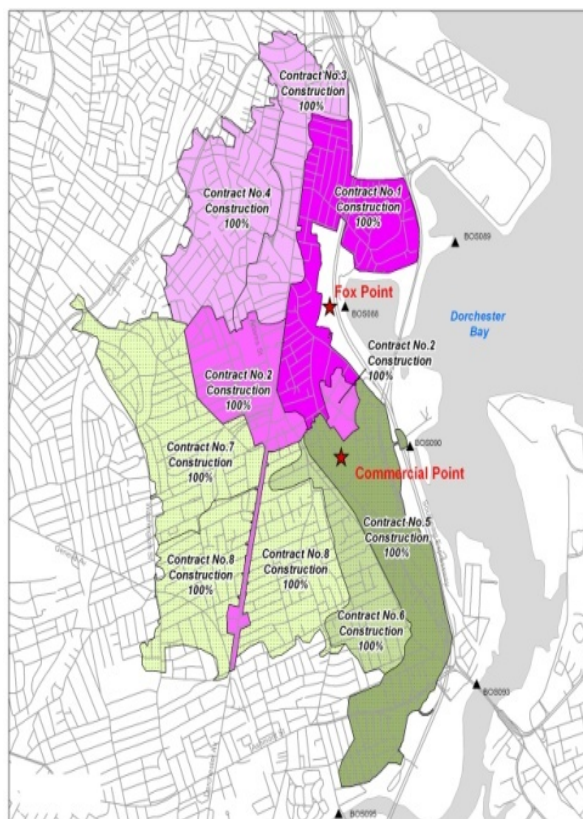
BWSC has had to redesign portions of work within contracts 3A and 3B to avoid utility conflicts found during construction. BWSC is coordinating with NStar, National Grid, Verizon and Comcast to resolve the conflicts and expects to issue associated change orders to the two construction contracts. BWSC also continues work on the remaining project design activities. BWSC plans to award the remaining three construction contracts for this project (Contract 5 – sewer cleaning and relining, and Contract 6 – downspout disconnections, in 2013 and complete all work by 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, or gain additional CSO control.

South Dorchester Bay Inflow Removal

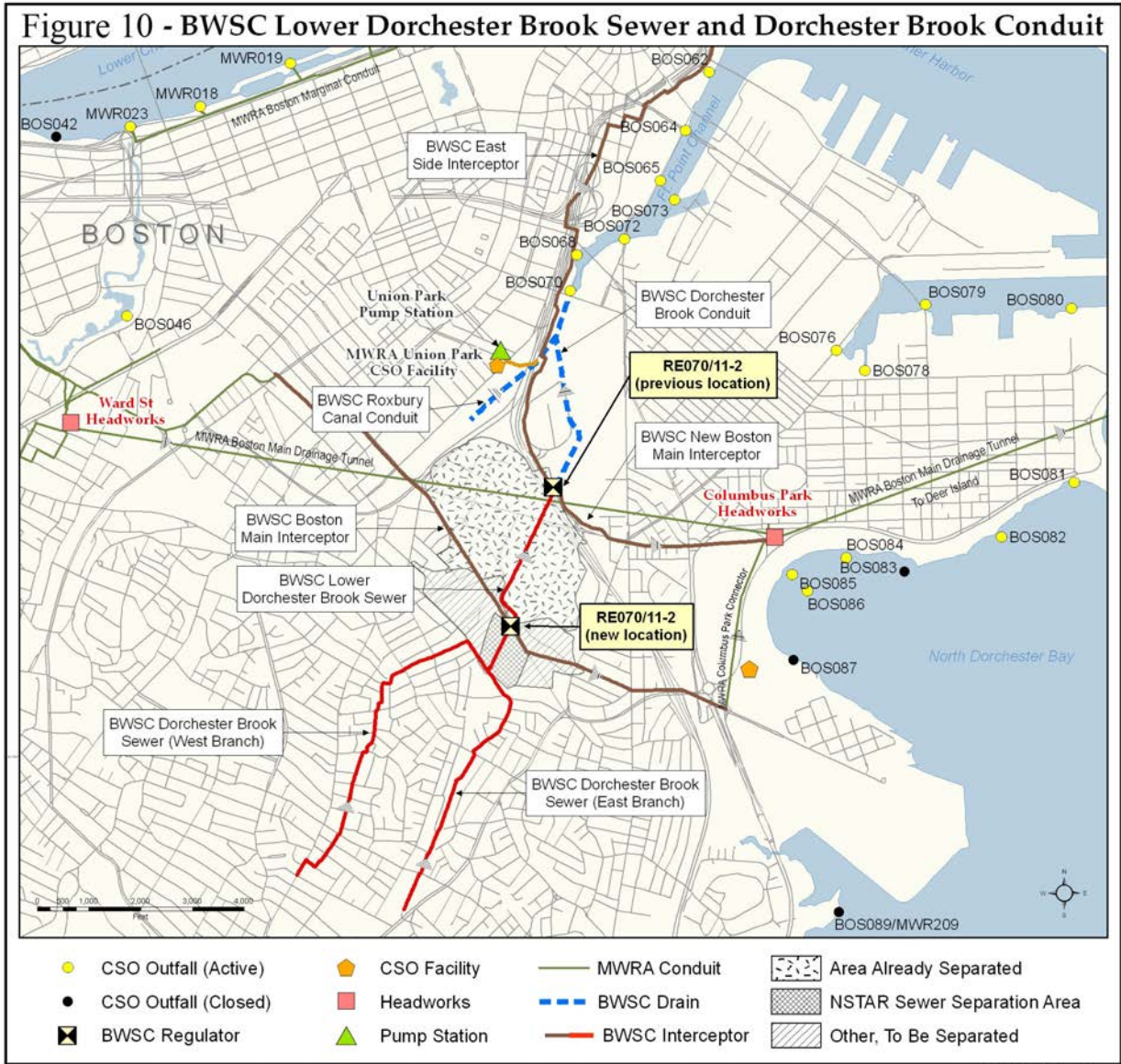
BWSC continues to investigate whether additional stormwater removal (i.e. disconnection of undocumented sources of inflow/infiltration) can be achieved in sewer systems tributary to the Dorchester Interceptor. These investigations follow BWSC's substantial completion of the \$118.7 million South Dorchester 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. In November 2010, BWSC awarded a design contract to identify sources of stormwater inflow/infiltration in the Dorchester Interceptor system through a combination of record plan reviews and field investigations, including a flow metering program. BWSC expects to receive a report in 2012 with the results of these investigations and the consultant's conclusions and recommendations. BWSC and MWRA will coordinate in reviewing these findings and with the goal of setting a construction plan and schedule for implementation.



Lower Dorchester Brook Sewer Improvements

On August 16, 2010, BWSC issued Notice Proceed with a \$6.0 million construction contract for 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 (see Figure 10). The work is partially funded by MWRA and is intended to lower CSO discharges to BWSC's Dorchester Brook Conduit and help attain the level of CSO control in MWRA's long-term control plan for Fort Point Channel. The work includes relocating CSO regulator RE-070/11-2 and separating combined sewers in a limited area tributary to the new regulator. Relocating the regulator will allow stormwater flows in already separated drainage systems that now tie back into the sewer system to be redirected to the Dorchester Brook Conduit and Fort Point Channel, providing relief to the combined sewer system and reducing CSO discharges. Completion of the work was delayed due to structural problems that were found along an upstream section of the Lower Dorchester Brook Sewer, which feeds flows to the regulator. With completion of the repair work, the contractor made the final pipe connections from the Lower Dorchester Brook Sewer to the new regulator chamber, permanently sealed the

old regulator, and attained substantial completion in February 2012. BWSC is now developing a post-construction flow monitoring program that will help confirm the remaining level of CSO discharge to the Dorchester Brook Conduit and Fort Point Channel and whether long-term levels of control have been met.



East Boston Sewer Separation

In 2006, EPA and DEP approved a revised recommended level of control for CSO discharges to Boston Inner Harbor and the Chelsea Creek at outfalls BOS003-014 along the East Boston waterfront. At the same time, EPA and DEP approved a revised schedule for the East Boston Branch Sewer Relief project, which was subsequently accepted by the Federal Court and incorporated as revised design and construction milestones in Schedule Seven. At that time, MWRA reported that BWSC intended to pursue a long-term, phased program of sewer separation in East Boston that was expected to close additional CSO outfalls and achieve higher levels of control. MWRA’s Long-Term Control Plan did not specifically account for this sewer

separation and had assumed that these outfalls would remain active. In 2009, BWSC completed sewer separation projects in portions of East Boston and permanently closed outfalls BOS006 and BOS007 to CSO discharges (see Figure 1 on page 2 for outfall locations). MWRA completed construction of the East Boston Branch Sewer Relief project in July 2010.

BWSC recently completed an additional sewer separation project in the area tributary to Outfall BOS004. The project has resulted in the removal of substantial quantities of stormwater from the area combined sewers and has reduced CSO discharges at Outfall BOS004. BWSC and MWRA plan to perform additional hydraulic analyses to determine whether Outfall BOS004 can be closed.

Other Community System Improvements

The CSO communities have planned or are currently implementing other infrastructure improvements that are expected to reduce CSO discharge quantity or improve discharge quality. While these projects contribute on the local level to flood control and service improvement, they also provide some relief to the combined sewer interceptor system that is expected, over time, to help reduce CSO discharges. The following are a few examples.

- In addition to the work in East Boston, BWSC is planning sewer separation work in other areas of the City, including projects in the Fenway, the South End and Roxbury.
- The City of Cambridge continues to make progress implementing the phased construction contracts that involve separation of sewers and common manholes in the Cambridgeport area, together with the installation of new storm drain outfalls to the Charles River Basin. This work will remove large quantities of stormwater from the city sewers that convey flows to MWRA's North Charles Relief Sewer and contribute to overflows to MWRA's Cottage Farm Facility in large storms. Cambridge also continues to pursue sewer separation work in other areas tributary to the MWRA's Charles River interceptors and Cottage Farm, which the City has been performing in phases for many years. The work allowed Cambridge to close outfalls CSO outfalls CAM009 and CAM011 several years ago.
- The City of Chelsea recently completed sewer separation work tributary to MWRA's Chelsea Branch Relief Sewer, which should reduce overflow to the Chelsea Creek at Outfall CHE008, and has plans to continue phased sewer separation that should reduce burdens on the MWRA interceptors and further relieve overflow conditions at CHE008. Within the drainage area tributary to Outfall CHE008, Chelsea has completed sewer separation work along Crescent Avenue, is 95% complete with sewer separation along Washington Avenue, and will soon commence design work to separate combined sewers along Broadway.
- The City of Somerville is currently pursuing the rehabilitation of sewers in the area of Assembly Square, in response to the discovery of sewer pipe structural problems that posed a potential threat to the quality of discharges to the Mystic River from MWRA's Somerville-Marginal Conduit.

2.5 MWRA CSO Spending in 2011

MWRA spent \$44.9 million in 2011 to implement CSO projects and fund the eligible CSO work of BWSC, Cambridge and Brookline. Of this amount, \$41.3 million (92%) was related to construction activities, including \$12.6 million to complete the North Dorchester Bay tunnel and related facilities, and \$16.3 million for Brookline sewer separation, \$10.0 million for Reserved Channel sewer separation and \$6.3 million for Cambridge sewer separation at Alewife Brook.

Capital Spending on CSO Control in 2011

Construction:	\$33.4 million
Engineering Services During Construction:	7.1 million
Land/Easement/Permits (for construction):	0.8 million
Subtotal Construction Related:	\$41.3 million
<u>Design:</u>	<u>3.6 million</u>
Total CSO Capital Spending in CY11:	\$44.9 million

Spending in 2011 brought MWRA's total capital expenditure for the CSO control program to \$776 million (90%) of the \$860.7 million CSO budget in the Proposed FY13 Capital Improvement Program (CIP). With only six 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 FY13 CIP estimates fiscal year spending on CSO control of \$50 million in FY12 (July 1, 2011 thru June 30, 2012), \$29 million in FY13, \$20 million in FY14, \$4.6 million in FY15 and \$1.2 million in FY16, during which the last of the CSO projects are scheduled to be completed.

3. STATUS OF PLAN IMPLEMENTATION AND BENEFITS ACHIEVED

3.1 Completed Work and Associated CSO Control

Through 2011, MWRA spent \$776 million of the total MWRA budget of \$860.7 million for CSO control in the Proposed FY13 CIP. With the cooperation of its CSO communities, MWRA has completed 29 of the 35 CSO projects, and 4 projects are currently in construction or design (see Figure 1 on pages 2-3 and Table 3). 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. Estimated average annual volume of CSO discharge has dropped from 3.3 billion gallons in 1988 to 514 million gallons today (an 84% reduction) with 82% of the current discharge volume receiving treatment at MWRA's four long-term CSO facilities. Figure 11 shows this reduction for each receiving water segment (see Figure 12 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. Only one outfall 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.

With completion of the CAM400 common manhole separation project in March 2011, the City of Cambridge closed Outfall CAM400 at Alewife Brook to CSO discharges and converted it to a stormwater-only outfall. With completion of the North Dorchester Bay CSO storage tunnel and related facilities in May 2011, MWRA permanently closed two of the seven CSO outfalls that were active and eliminated CSO discharges at the remaining six outfalls up to the 25-year storm. CSO discharges to the Neponset River (and Tenean Beach), South Dorchester Bay (and Malibu and Savin Hill beaches), and Constitution Beach were eliminated several years ago with completion of CSO projects in those areas.

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Table 3: Status of CSO Project Implementation, March 15, 2012

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	Start 4/12		
Interceptor Connection Relief/Floatables at SOM01A		Start 4/12		
Region-wide Floatables Control and Outfall Closings				X

* In 1997-2002, Cambridge completed design and construction of four initial contracts to separate the CAM004 tributary area.

Figure 11
Predicted Typical Year CSO Discharge Volumes 1988-2015

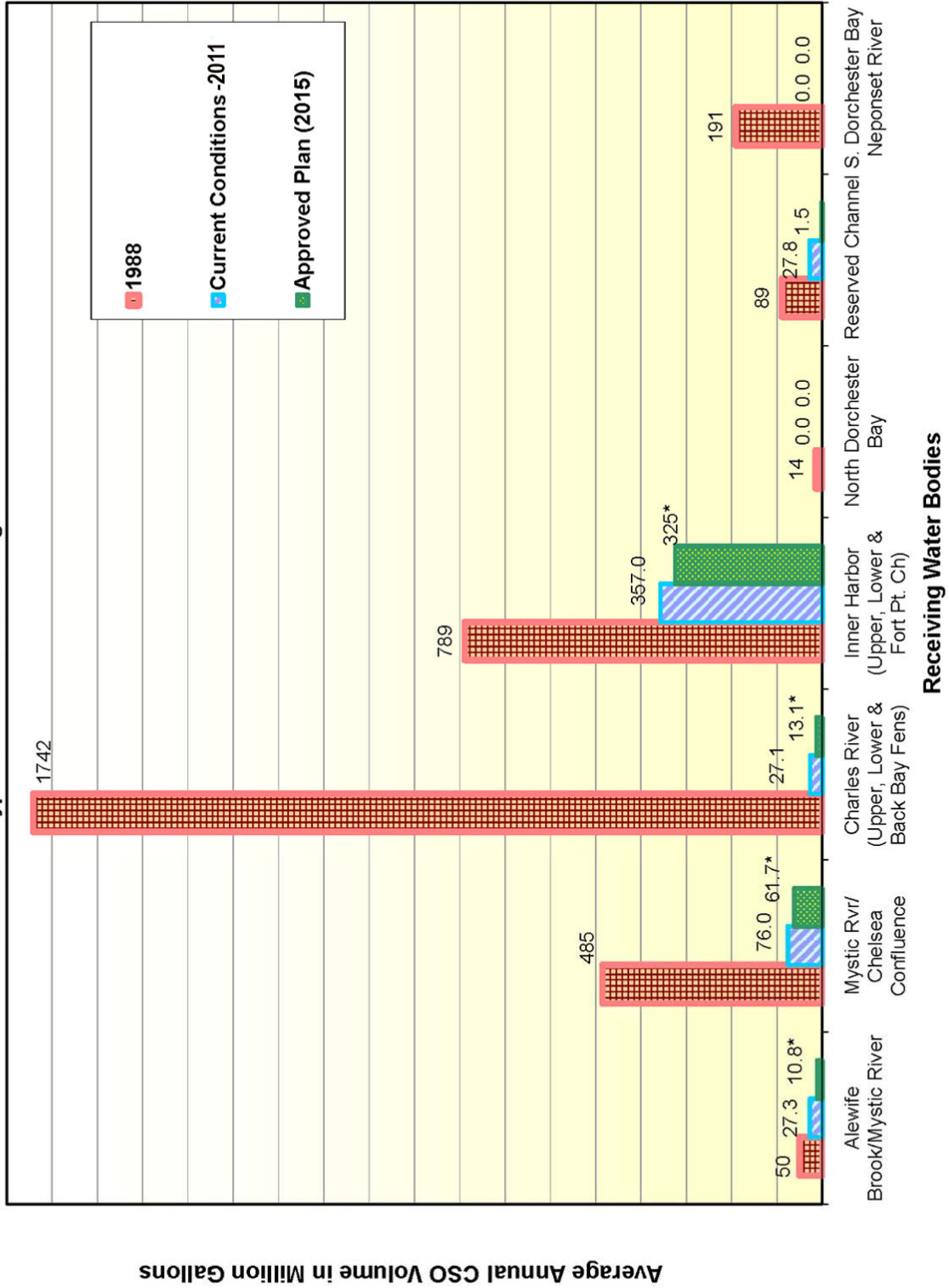


Figure 12: Boston Harbor and its Tributaries



The 37 closed outfalls include several the CSO communities have eliminated, or have closed on a test basis, that were in addition to those recommended for closure in MWRA's 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.

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 benefit of these complementary pollution control programs is 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 86% 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 13.

The Charles River Watershed Association (CRWA) has been the primary steward of water quality improvement since before the early days of CSO planning. Since 1965, CRWA has figured prominently in major clean-up and watershed protection efforts, working with MWRA, other government agencies and officials, and citizen groups from 35 Massachusetts watershed towns from Hopkinton to Boston. These initiatives have helped guide the last four decades of water quality improvement in the watershed and fundamentally change approaches to water resource management. From the benefits achieved through the leadership of CRWA and the pollution control efforts of MWRA and watershed communities, the Charles River was selected the 2011 winner of the Theiss International Riverprize by the International River Foundation. CRWA accepted the award, which is the largest and most prestigious environmental prize in the world. The CRWA press release noted "the Charles River is now safe for boating 90 percent of the time due to the dramatic improvements in water quality, and well over a million people enjoy the river and its parklands each year."

Figure 14 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.

CSO discharges to South Boston beaches were cut almost in half with the improvements to pumping capacity at Deer Island from 1989 to 2000. 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 15. Improvement was greatest in the Upper Inner Harbor and in Chelsea Creek, which had more serious wet weather pollution problems.

Bacteria data in Figure 16 show 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. The time periods shown in Figure 16 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.

Figure 13
Change in Lower Charles River Water Quality Over Time
Enterococcus bacteria counts, 1989 – 2011

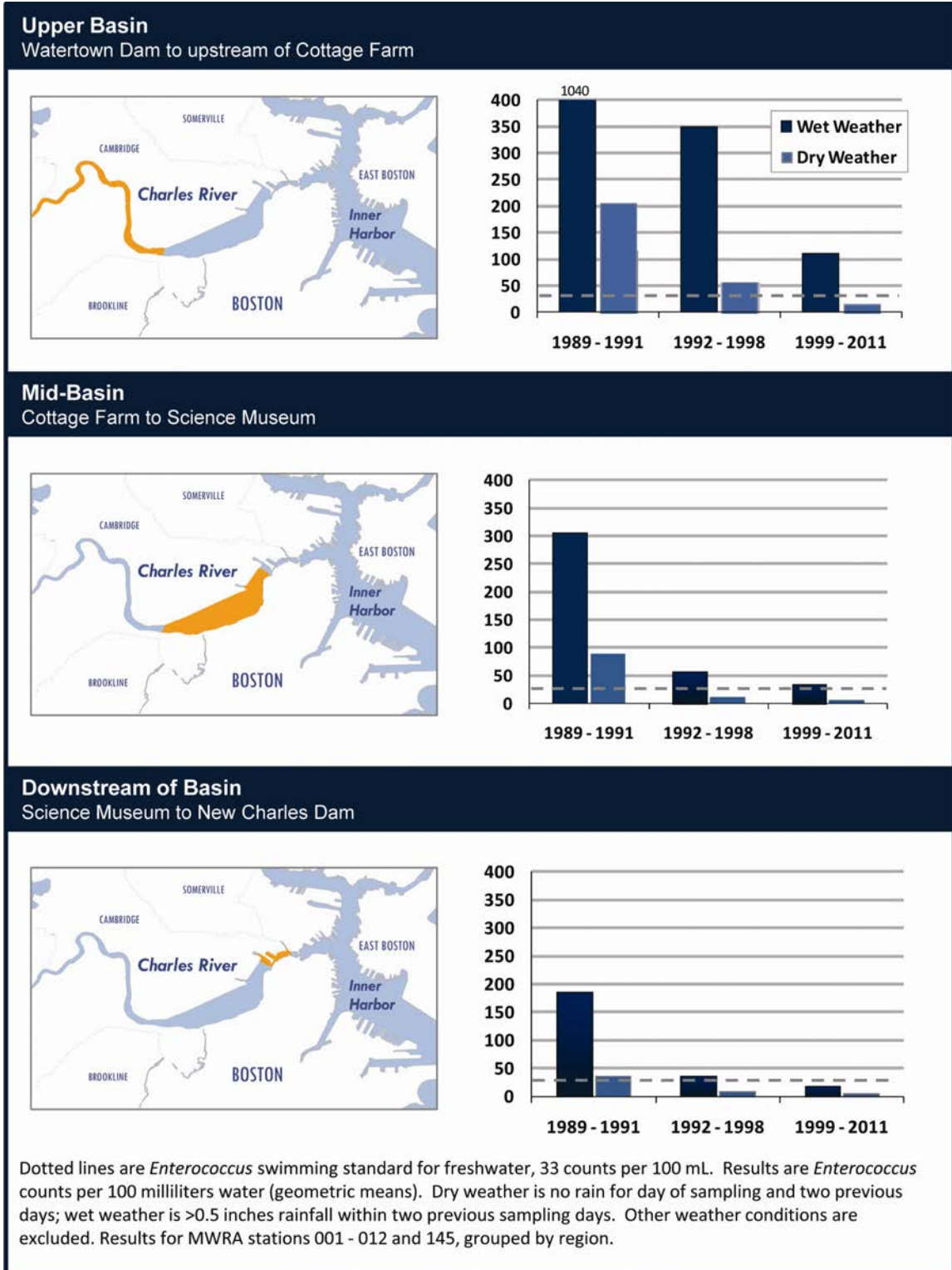


Figure 14
Change in Lower Neponset River Water Quality Over Time
Enterococcus bacteria counts, 1991 - 2011

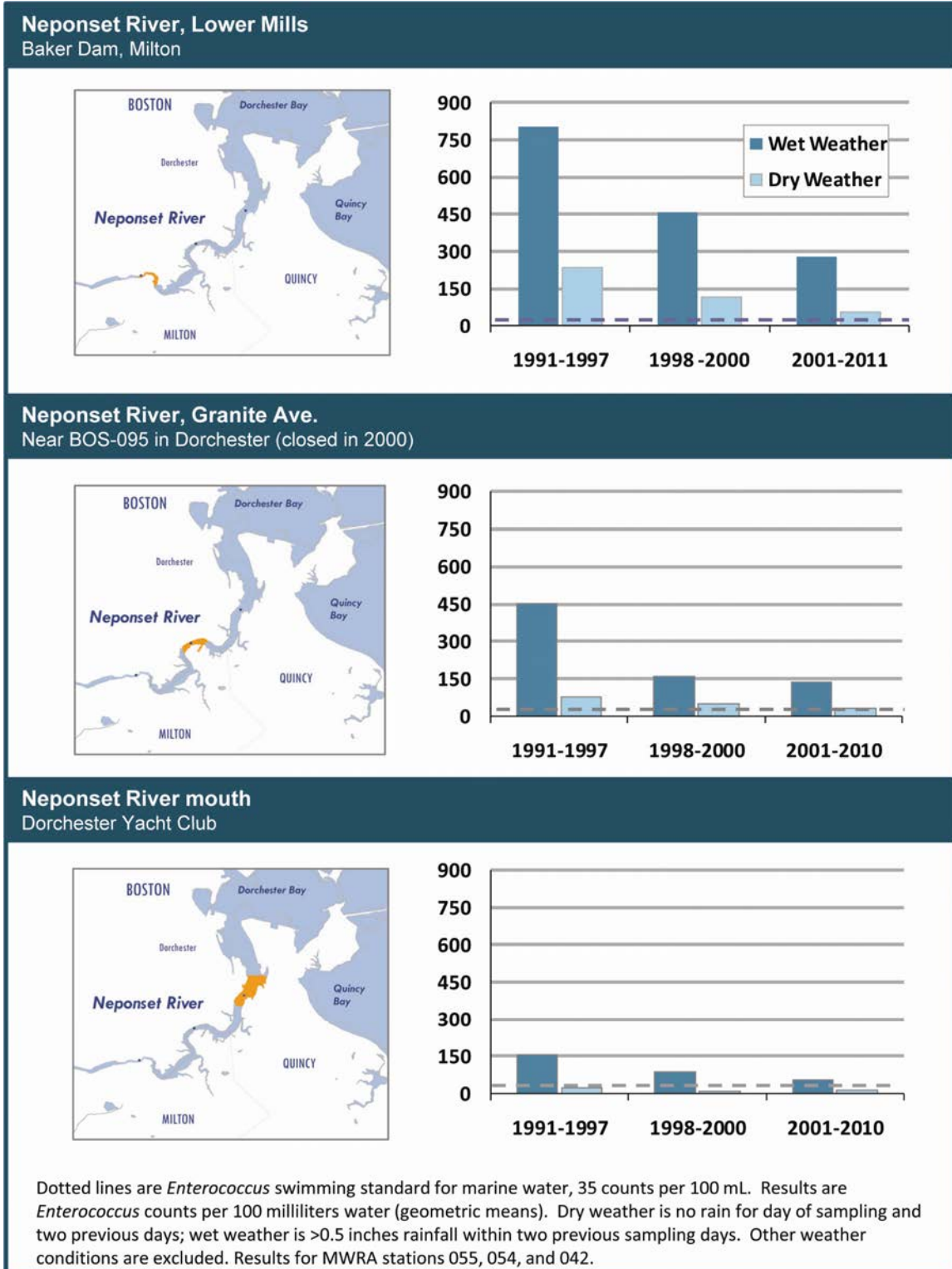


Figure 15
Change in Inner Harbor Water Quality Over Time
Enterococcus bacteria counts, 1989 – 2011

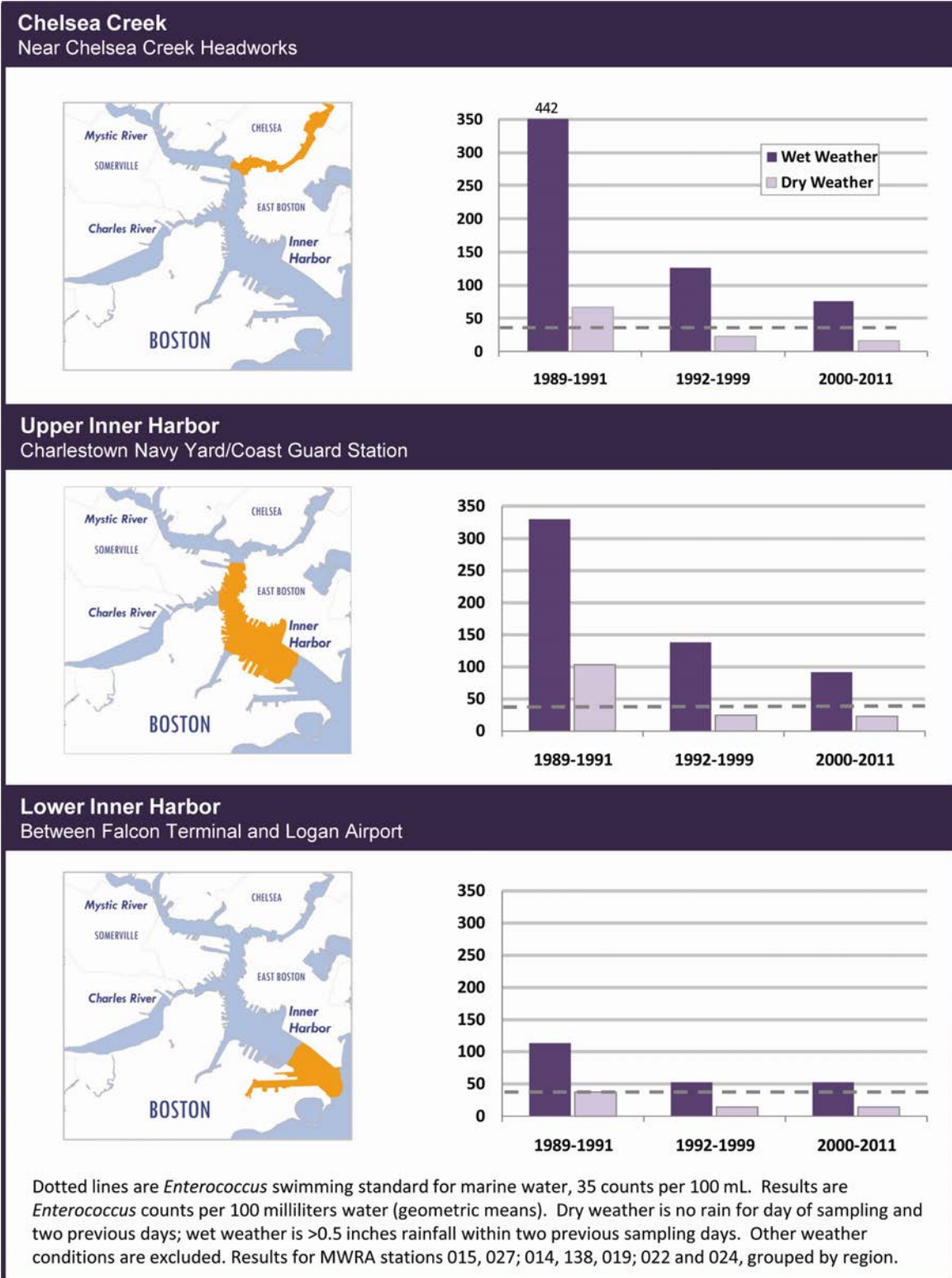
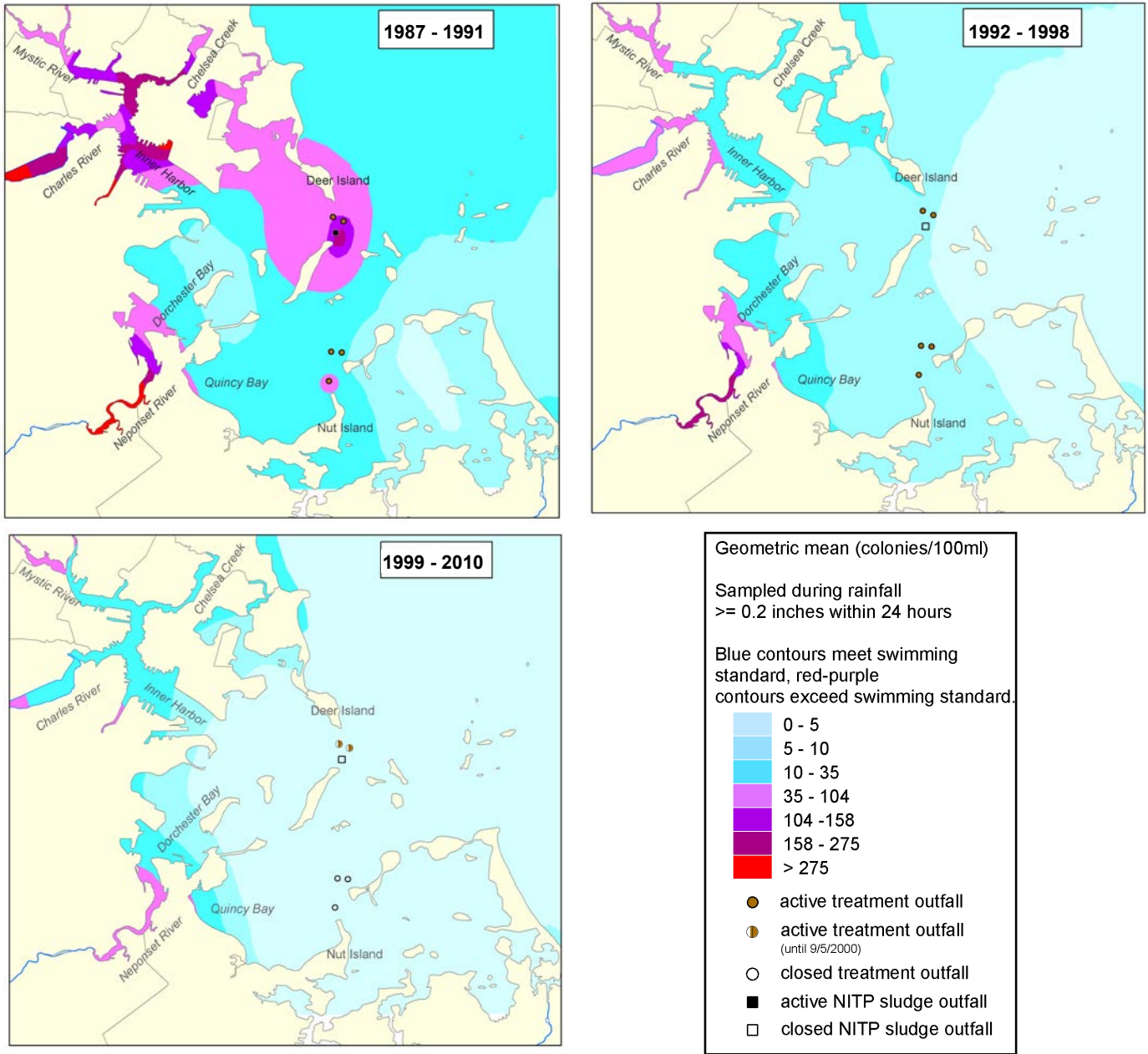


Figure 16
Changes in Boston Harbor *Enterococcus* Counts in Wet Weather



Contours show the geometric means of *Enterococcus* data collected when more than 0.2 inches of rain fell in the previous 24 hours. Blue areas meet the EPA geometric mean standard and red-purple areas exceed the standard.

- 1987 - 1991** This period shows data collected prior to when the Boston Harbor project and CSO plans began, through the last year that sludge was discharged (1991). In wet weather, areas affected by the discharge of sewage and sludge from the Deer Island Treatment Plant and Nut Island Treatment plant, and most of the Inner Harbor and tributary rivers, failed to meet the standard.
- 1992 - 1998** Data from these years reflect the effects of CSO upgrades, the ending of sludge discharge, full pumping at DITP, improved primary and beginning secondary treatment at DITP. Most of the harbor meets standards except for the tributary rivers, Fort Point Channel and along Wollaston Beach.
- 1999 - 2010** The current period shows continued improvement due to the closure of 22 CSO outfalls, upgrades of CSO facilities, ending of harbor treatment plant effluent discharges as the new outfall began operating in 2000, and local efforts to abate stormwater pollution.

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.

1999-2011: 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.

4. REGULATORY AND COURT SCHEDULE COMPLIANCE ACTIVITY

4.1 Regulatory Compliance Activities

In 2011, 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 a 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 a discharge. In compliance with the Alewife Brook/Upper Mystic River variance, the City of Cambridge issues a notice of CSO discharge to the Alewife Brook within 24 hours of an activation, 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 impacted by CSO, collected water quality data throughout the year, and reported the results to EPA and DEP.
- MWRA reported its estimates of CSO discharges at every active outfall during calendar year 2010 (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 and updates its collection system hydraulic model and produces estimates of CSO activations and discharge volume at all active outfalls for the previous calendar year. MWRA submitted the CSO discharge estimates for 2010 to EPA and DEP on May 11, 2011. For 2010, estimates were reported at the 56 outfalls that were active that year. MWRA has commenced the model updates for calendar year 2011 estimates and plans to model the 2011 storms and report the CSO discharge estimates by April 30, 2012.

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 the comparison of 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 2010, MWRA modeled each of the 95 rainfall events that occurred that year, as recorded at MWRA 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 four CSO milestones in 2012 and 15 CSO milestones in 2013 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.

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Table 4: Remaining Schedule Seven Milestones and Corresponding Compliance Plans

Milestone Date	Milestone Description	Project Schedule
2012		
Mar 2012 (and every March thru Mar 2016)	<i>MWRA to submit annual report which describes progress in planning, design, and construction of each CSO project, and identifies any issues which may interfere with timely completion of any project.</i>	MWRA filed the Annual Report for 2011 with the Court on March 15, 2012, and plans to file annual reports by March 15 each year through 2016.
Apr 2012	<i>MWRA to commence design of control gate and floatables control at outfall MWR003, and MWRA Rindge Avenue Siphon relief.</i> <i>MWRA to commence design of interceptor connection relief and floatables control at outfall SOM01A.</i>	MWRA issued the Notice to Proceed with the single design contract that includes the control gate and floatables control at outfall MWR003, the MWRA Rindge Avenue Siphon, and interceptor connection relief and floatables control at outfall SOM01A on March 31, 2012.
Sep 2012	<i>MWRA, in cooperation with Cambridge, to commence construction of CAM004 sewer separation.</i>	The City of Cambridge's design activities are on schedule for commencement of the first of three planned construction contracts for CAM004 sewer separation by September 2012.
2013		
Mar 2013	Submit Annual Report	See Mar 2012
Apr 2013	<i>MWRA, in cooperation with Cambridge, to complete construction of CAM004 stormwater outfall and detention basin.</i>	The City of Cambridge's construction activities are on schedule for substantial completion of the CAM004 stormwater outfall and basin by April 2013.
Jul 2013	<i>MWRA, in cooperation with BWSC, to complete construction of Bulfinch Triangle sewer separation.</i> <i>MWRA, in cooperation with Brookline, to complete construction of Brookline sewer separation.</i>	BWSC completed construction of the Bulfinch Triangle sewer separation project in July 2010. The Town of Brookline's construction activities are on schedule for completion of the sewer separation project by July 2013.
Sep 2013	<i>MWRA to commence construction of interceptor connection relief and floatables control at outfall SOM01A.</i>	MWRA's design contract (see Apr 2012) calls for commencement of construction of the SOM01A work by September 2013.
2014		
Mar 2014	Submit Annual Report	See Mar 2012
Jun 2014	<i>MWRA to complete construction of interceptor connection relief and floatables control at outfall SOM01A.</i>	MWRA's design and construction schedules for this project call 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 contract (see Apr 2012) calls for commencement of construction of the outfall MWR003 and Rindge Avenue Siphon work by August 2014.
2015		
Mar 2015	Submit Annual Report	See Mar 2012
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 design and construction schedules for this project call for substantial completion by October 2015.

Continued, next page.

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Milestone Date	Milestone Description	Project Schedule
Dec 2015	<i>MWRA, in cooperation with Cambridge, to complete construction of CAM004 sewer separation.</i>	The City of Cambridge's design and construction schedules for this project call for substantial completion 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. Three construction contracts are substantially complete and two are well underway.
Beyond 2015		
Mar 2016	Submit Annual Report	See Mar 2012
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. DESCRIPTION OF THE LONG-TERM CONTROL PLAN

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 variance extensions acknowledges that it is not feasible to fully attain the Class B bacteria criteria and associated recreational uses for these receiving waters within the next three-year variance 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.

5.2 Scope, Benefits and Cost of the Approved Plan

The approved Long-Term Control Plan is identified in Table 5 for each receiving water segment. The CSO control costs by receiving water segment and the total plan cost of \$860.7 million (in December 2012 dollars)² are from MWRA's Proposed FY13 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 and in Figure 11 on page 31. The Long-Term Control Plan also calls for closing 34 of the 84 CSO outfalls addressed in the plan (33 are now closed, one remains to be closed, and 4 others have been closed by BWSC and the City of Cambridge).

² MWRA's Proposed FY13 CIP anticipates a total spending for CSO control of \$867 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 • Relief Connection/Floatables Control at Outfall SOM01A • Somerville Baffle Manhole Separation • Cambridge Floatables Control (portion) 	61.5
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) 	77.8
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) 	90.5
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 	62.6
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 	260.8 ⁽³⁾
Reserved Channel	3 untreated	1.5	<ul style="list-style-type: none"> • Reserved Channel Sewer Separation 	62.3
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 	50.5
TOTAL		413.3		860.7
Treated		384.8		

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

(2) From MWRA's Proposed FY13 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.

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 Project Schedules

Most of the CSO projects are complete, and the remaining projects are on schedules that are in accordance with the milestones set forth in Schedule Seven. Table 6 presents the schedules for implementing the 35 projects in the Long-Term Control Plan. Comparisons of the schedules of projects not yet completed to respective milestones in Schedule Seven are included within the project reports in Section 2.4.

5.4 Capital Budget and Spending Projections

As shown in Figure 17, 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 \$860.7 million in MWRA's Proposed FY13 CIP (in December 2012 dollars). With escalation of the CIP budget estimate to the mid-point of construction and contingency, MWRA projects that it will spend a total \$867.0 million to complete the plan on its current schedule.

In the Proposed FY13 CIP, projected spending on the CSO control plan in FY12 and beyond totals \$106.0 million, which is 5% of total projected capital spending by MWRA and 10% of wastewater related capital spending. As shown in Figure 18, annual spending on CSO control escalated greatly several years ago due mainly to higher construction activity and peaked in FY08 at \$110.5 million. With only six projects remaining to be implemented, CSO program activity and spending will continue to wind down over the next several years. CSO capital spending is estimated to be \$50 million in FY12, \$29 million in FY13, \$20 million in FY14, and \$4.6 million in FY15 and \$1.2 million in FY16, the year in which the last of the CSO projects are scheduled to be complete.

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.

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Table 6: CSO Project Cost and Schedules

Shading indicates completed project.

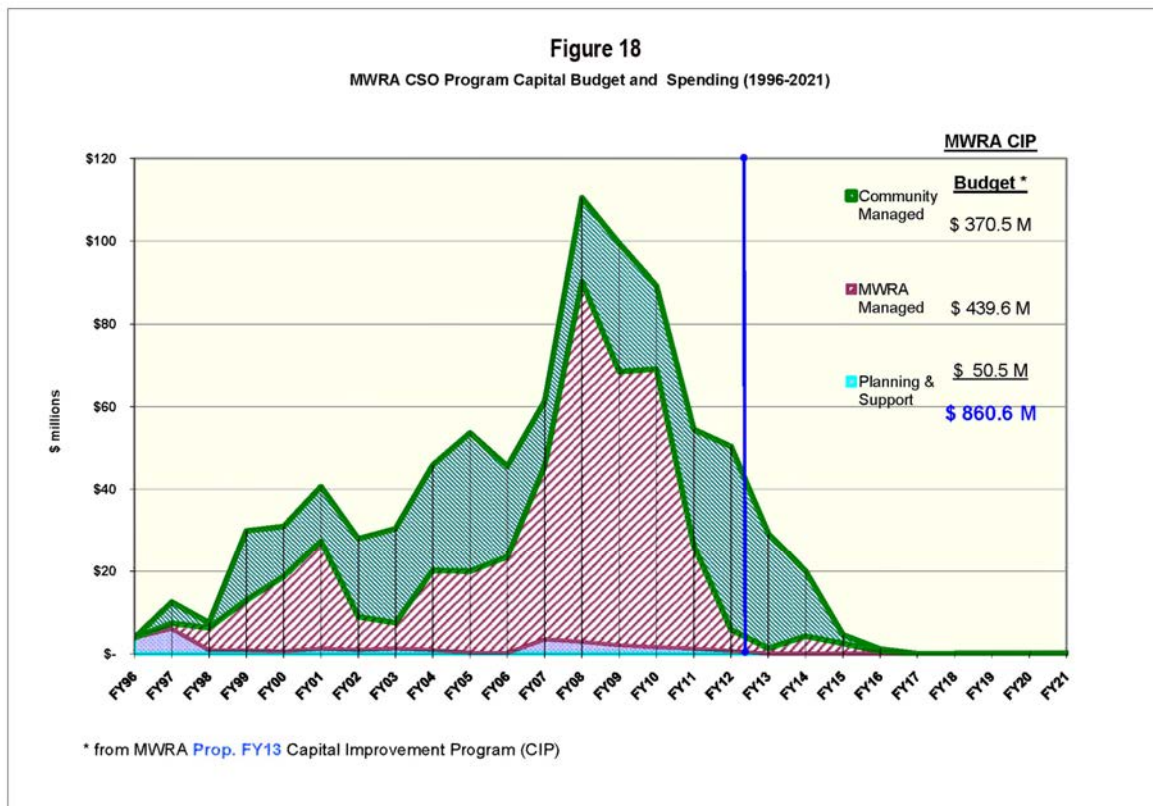
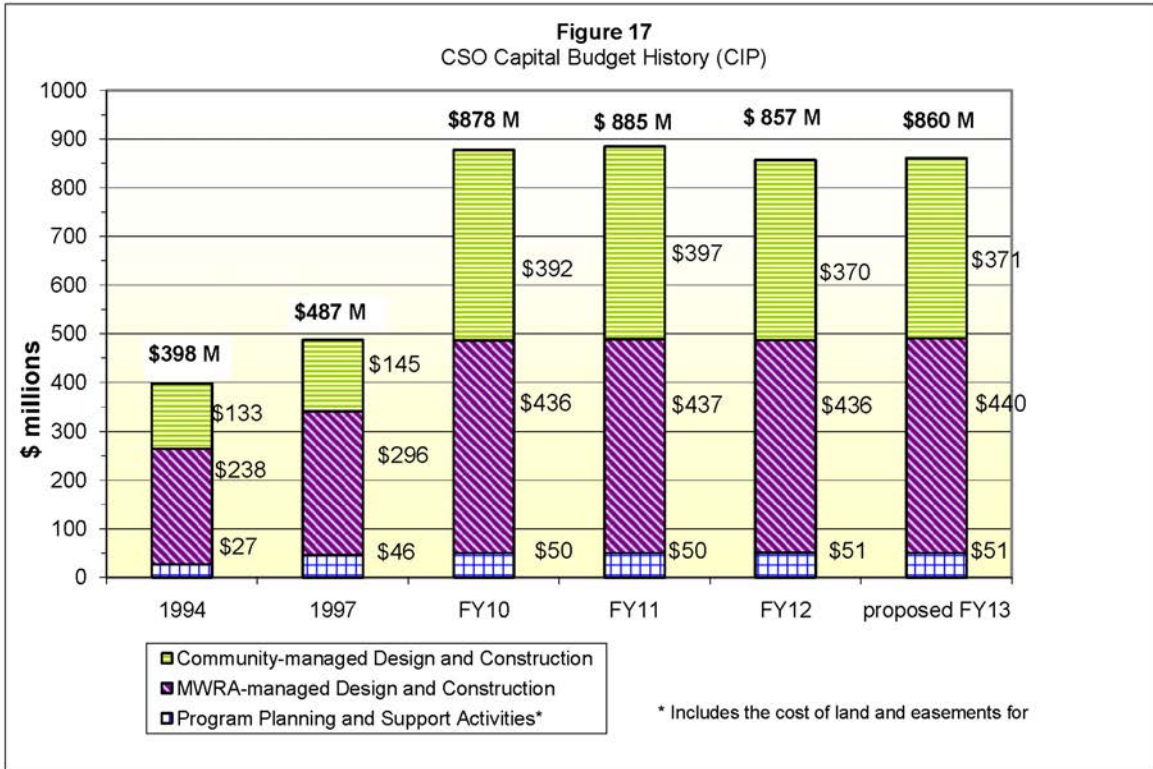
Project	Cost ⁽¹⁾ (\$million)	Commence Design	Commence Construction	Complete Construction	
North Dorchester Bay Storage Tunnel and Related Facilities	224.7	Aug-97	Aug-06	May-11	
Pleasure Bay Storm Drain Improvements	3.2	Sep-04	Sep-05	Mar-06	
Hydraulic Relief Projects	CAM005 Relief	2.3	Aug-97	Jul-99	May-00
	BOS017 Relief		Jul-99	Aug-00	
East Boston Branch Sewer Relief	85.7	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	<0.1	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	62.3	Jul-06	May-09	Dec-15	
Bulfinch Triangle Sewer Separation	10.0	Nov-06	Sep-08	Jul-10	
Brookline Sewer Separation	25.4	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	12.4		Apr-11	Apr-13
	CAM004 Sewer Separation	38.0	Jan-97	Sep 12	Dec-15
	CAM400 Manhole Separation	3.3	Oct-08	Jan 10	Mar-11
	Interceptor Connection Relief/Floatables	3.5	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	50.5				
Total Cost	860.7				

(1) From MWRA Proposed FY13 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.

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5.5 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 complexities presented 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, and utilities and other subsurface obstructions, and traffic management, are the key contributors to a continuing level of risk during construction.


Subsurface conditions and related engineering requirements are not known until detailed subsurface exploration programs have been conducted, usually during preliminary design. Utilities and utility conflicts are also determined when the layout of new facilities and pipelines is set. For sewer separation projects, the quantity and specific sources of stormwater inflow that must be removed from the existing combined sewer system and carried in a new storm drain system are determined only with intensive field investigations and hydraulic modeling evaluations. These kinds of design investigations are continuing with the BWSC Reserved Channel sewer separation project and will also be underway over the next few years by the City of Cambridge for the CAM004 sewer separation project and by MWRA for the Outfall MWR003, MWRA Rindge Avenue Siphon relief, and Interconnection Relief and Floatables Control at Outfall SOM01A project.

On the construction side, there is cost risk associated with the Reserved Channel Sewer Separation and Brookline Sewer Separation contracts, because subsurface conditions, including utility conflicts and the need for protection of utilities, weigh heavily in construction progress.



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):

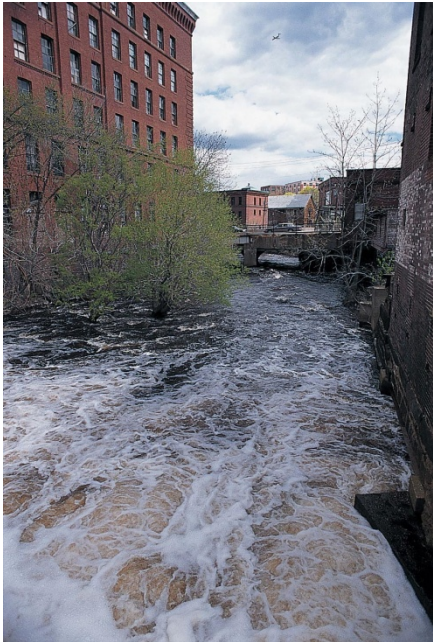
Before project: 18
With project: 1

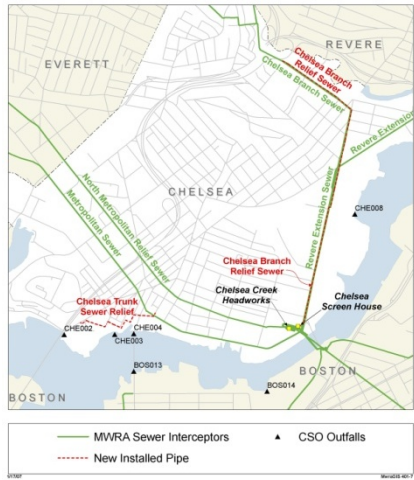
Annual Discharge Volume (typical year):

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>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>CSO Control</p>
<p>Water Quality Benefit: Eliminated storm water discharges to Pleasure Bay Beach.</p>		


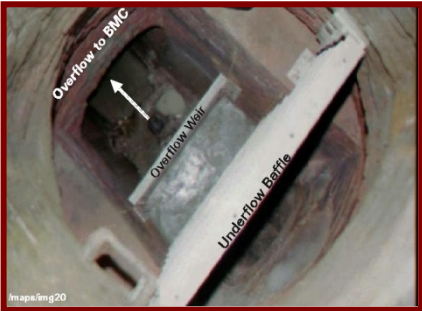
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Completed CSO Projects (continued)


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>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #e0f7fa;">CSO Control</th> </tr> </thead> <tbody> <tr> <td> <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> </td> </tr> </tbody> </table>	CSO Control	<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>
CSO Control				
<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>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #e0f7fa;">CSO Control</th> </tr> </thead> <tbody> <tr> <td> <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> </td> </tr> </tbody> </table>	CSO Control	<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>
CSO Control				
<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 style="text-align: center;">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>

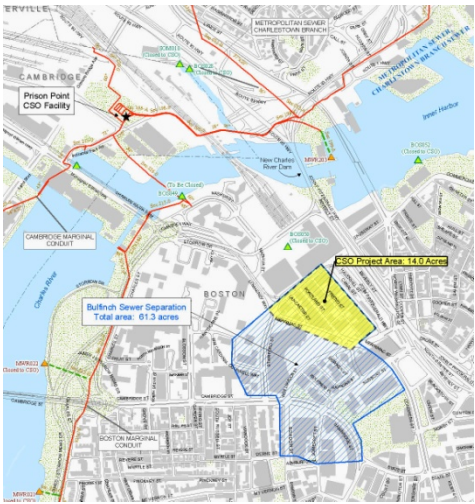
23. COTTAGE FARM BROOKLINE CONNECTION AND INFLOW CONTROLS		
	<p>Receiving Water: Lower Charles River Basin</p> <p>Completed: 2009</p> <p>Capital Cost: \$3,000,000</p> <p>Description: Optimizes the combined conveyance capacity of the two MWRA sewers that carry flows across the Charles River by interconnecting 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 style="text-align: center;">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 MWR 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>Legend: ■ Separated Manhole</p>	<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>Labels on map: 15 mgd Pump Station for Tunnel Dewatering Dewatering Force Main to BWSG Sewer System 17-Foot Diameter Tunnel Completed Nov 2009 Below Ground Ventilation Building Morrissey Blvd Storm Drain Completed July 2009</p>	<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>

