FINAL DETERMINATION TO EXTEND VARIANCE
FOR COMBINED SEWER OVERFLOW DISCHARGES TO
ALEWIFE BROOK/UPPER MYSTIC RIVER BASIN

FACT SHEET

This document is intended to provide a summary of the activities that have taken place since the Massachusetts Department of Environmental Protection's ("MassDEP") original issuance of the Combined Sewer Overflow ("CSO") Variance for the Alewife Brook/Upper Mystic River Basin (the "Variance") on March 5, 1999, and to provide a frame of reference for MassDEP's decision to extend the Variance for a period not to exceed three years, to August 31, 2019.

I. Background on CSO Control and Variance

Boston Harbor Case

As part of the Boston Harbor Case (D. Mass. C.A. No. 85-0489-RGS), the Massachusetts Water Resources Authority ("MWRA") is required to undertake corrective actions through its approved Long-Term CSO Control Plan (the "LTCP") to reduce or eliminate CSO discharges to Alewife Brook/Upper Mystic River Basin and other Boston area surface waters affected by CSO discharges. MWRA's approved LTCP comprises 35 wastewater system improvement projects that will reduce or eliminate CSO discharges at 84 outfalls in the metropolitan Boston area at a capital cost of $906.7 million. The eight projects in the LTCP that address CSO discharges to the Alewife Brook/Upper Mystic River Basin have a total MWRA cost of $112.6 million (see Table 1). The City of Cambridge is spending a total of approximately $90 million more for work directly related to CSO control for Alewife Brook and for non-CSO infrastructure improvements included in its sewer separation contracts.

MWRA originally presented a recommended region-wide LTCP in its *Final CSO Facilities Plan and Environmental Impact Report, July 31, 1997* (the "1997 Facilities Plan/EIR"). At that time, MWRA estimated the cost for the Alewife Brook and Upper Mystic River Basin portions of the plan at approximately $17.2 million. In August 2005, MWRA recommended revisions to its LTCP, including a revised and much expanded CSO control plan for Alewife Brook. At that time, MWRA had already completed the LTCP projects intended to control CSOs to the Upper Mystic River/Mystic Basin. In March 2006, MWRA reached agreement with the U.S. Environmental Protection Agency ("EPA"), MassDEP, and the United States Department of Justice ("DOJ") on the revised LTCP, along with a new implementation schedule for Alewife Brook. The agreement was filed with the Federal District Court as part of a joint motion to amend the court schedule in the Boston Harbor Case.

As part of the agreement, MassDEP and EPA determined that MWRA's revised LTCP satisfied the requirements for a variance from water quality standards for CSO discharges to the Alewife Brook/Upper Mystic River Basin through 2020, by which time the LTCP would be fully implemented and verification of attainment of the long-term levels of CSO control would be made. Accordingly, MassDEP and EPA agreed that MassDEP would issue, and EPA would approve, five consecutive variance extensions of no more than three-year duration each through

2020, and that each variance extension would be consistent with and limited to the requirements in the LTCP.

Table 1: MWRA Long-Term CSO Control Plan for Alewife Brook/Upper Mystic River Basin

Project	Purpose	Receiving Water	Completed	Cost[1] (million$)
Somerville Baffle Manhole Separation[2]	Remove stormwater from the sewer system; eliminate CSO at outfalls SOM001, SOM006 and SOM007.	Mystic Basin and Alewife Brook	1996	0.4
Somerville-Marginal CSO Facility Upgrade	Improve disinfection; add dechlorination	Mystic Basin	2000	4.0
CAM004 Stormwater Outfall and Wetland Basin[3]	Convey stormwater flows to wetland system for attenuation and treatment.	Alewife Brook	2013	103.7
CAM004 Sewer Separation[3]	Remove large quantities of stormwater from the sewer system; eliminate CSO at Outfall CAM004.		2015	
CAM400 Manhole Separation[3]	Remove stormwater from the sewer system; eliminate CSO at Outfall CAM400.		2011	
Interceptor Connection Relief and Floatables Control at CAM002 and CAM401B and Floatables Control at CAM001[3]	Upgrade connections between Cambridge and MWRA systems to provide relief; add floatables control.		2010	
Interconnection Relief and Floatables Control at Outfall SOM01A	Upgrade connection and provide floatables control.		2013	0.4
Control Gate/Floatables Control at Outfall MWR003 and MWRA Rindge Avenue Siphon Relief	Optimize hydraulic conveyance; minimize overflows while controlling system flooding in large storms; provide floatables control.		2015	4.1
Total				**112.6**

(1) MWRA cost only; from Proposed FY17 Capital Improvement Program. Total MWRA and City of Cambridge cost for design and construction of the Alewife Brook/Upper Mystic River Basin CSO projects totals more than $200 million.
(2) Implemented by City of Somerville with MWRA funding.
(3) Implemented by City of Cambridge with MWRA funding.

In April 2006, the Court allowed the joint motion and issued an Order with a new schedule. Under the Order, MWRA has until the year 2020 to complete the remaining CSO work and a subsequent post-construction monitoring program and system performance assessment to verify that the long-term CSO control goals are achieved. In addition, the United States and MWRA agreed to withdraw the 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 Stipulation that requires MWRA to implement the CSO requirements set forth in the court schedule and to meet the levels of control described in the revised LTCP.

In December 2015, MWRA, with support from its member communities with permitted CSO outfalls, completed construction of the last of the 35 projects in the LTCP, in compliance with the respective project completion milestones in the court schedule. All of the projects are functioning for environmental benefit. The projects completed in 2015 included two of the eight projects benefitting Alewife Brook: Automated Gate and Floatables Control at Outfall MWR003

and MWRA Rindge Avenue Siphon Relief, which MWRA completed in October 2015, and CAM004 Sewer Separation, which the City of Cambridge completed in December 2015. More information about MWRA's LTCP, including descriptions of the 35 projects and the benefits for each receiving water segment, is presented in MWRA's *CSO Annual Progress Report 2015*, March 2016, at: http://www.mwra.com/annual/csoar/2015/2015csoar-r4.pdf.

Long-Term CSO Control Plan for Upper Mystic River

MWRA, in cooperation with the City of Somerville, completed the LTCP projects in the Upper Mystic River in the period 1996 through 2001. In 1996, the City of Somerville eliminated CSO discharges at outfalls SOM006 and SOM007 by separating manholes common to the local storm drain and sewer systems, thereby removing the potential for stormwater to enter the sewer system. In September 2001, MWRA completed construction to upgrade the Somerville Marginal CSO Facility, including replacement and improvement of the disinfection system, addition of a dechlorination system, and improvement of treatment controls. CSO discharges to the Upper Mystic River Basin are now limited to infrequent, treated discharges from the Somerville Marginal facility through the high tide outfall (SOM007A/MWR205A) upstream of Amelia Earhart Dam.

Long-Term CSO Control Plan for Alewife Brook

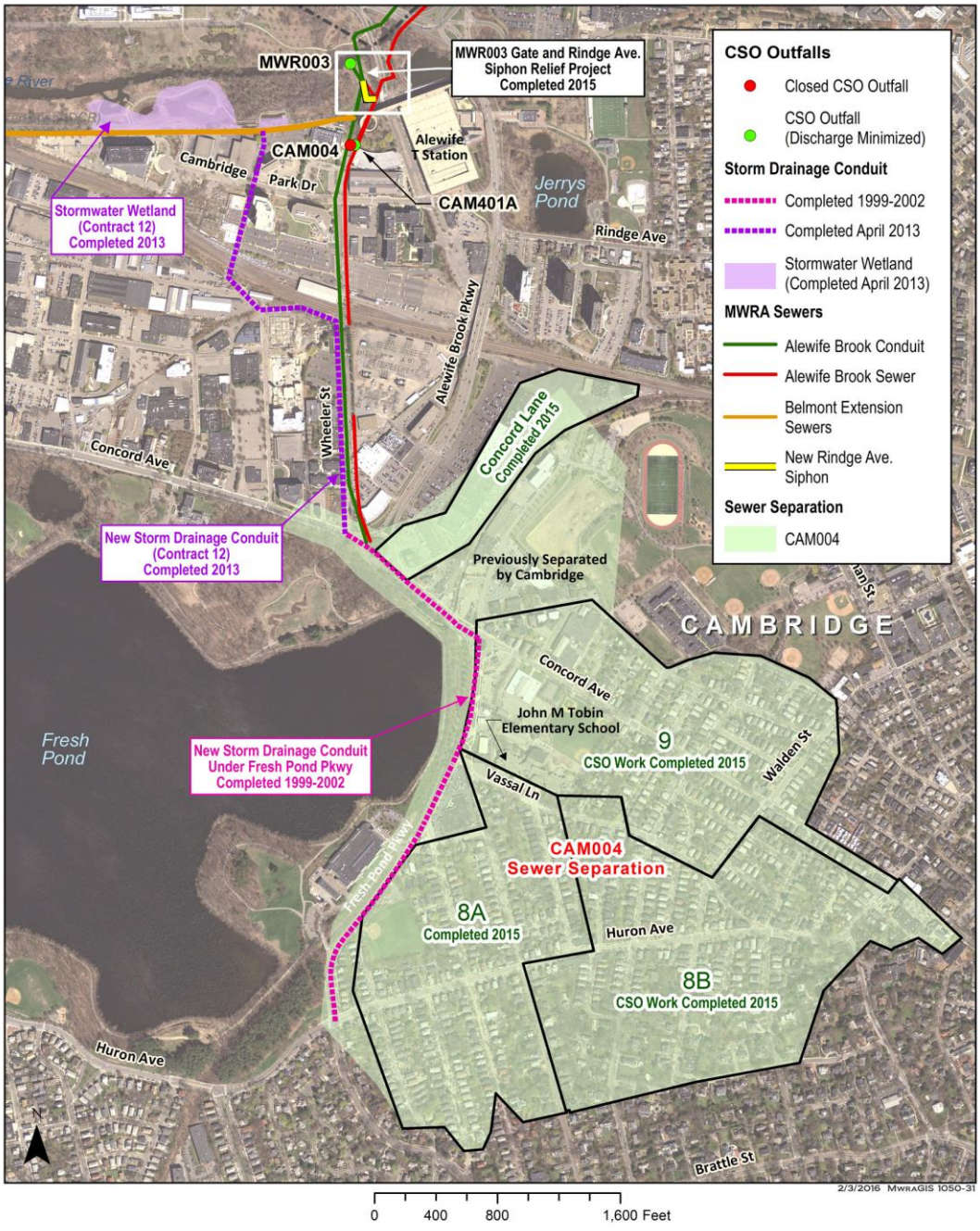
The seven projects in the Alewife Brook CSO control plan, identified in Table 1 and shown in Figures 1 and 2, are intended to minimize CSO discharges to the Alewife Brook primarily by 1) separating combined sewer systems in the Fresh Pond Parkway, Huron Avenue and Concord Avenue areas of Cambridge to remove stormwater from the sewer system and by 2) upgrading hydraulic capacities at certain Cambridge and Somerville connections to the MWRA sewer system. The CSO plan also includes a new stormwater outfall and wetland basin to accommodate the separated stormwater flows, prevent an increase in flooding along Alewife Brook, and provide a level of stormwater treatment. The City of Cambridge managed the design and construction work for four of the seven projects with MWRA funding pursuant to a Memorandum of Understanding and Financial Assistance Agreement.

Cambridge began construction of the CAM004 sewer separation project in July 1998, in accordance with the recommended plan in the 1997 Facilities Plan/EIR and in compliance with the project milestones in the court schedule then in effect. 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.

In 2000, MWRA and Cambridge suspended further design work and construction contract awards related to the 1997 plan, because new field information collected by Cambridge showed that conditions in its combined sewer system were markedly different from conditions assumed in the 1997 plan. MWRA and Cambridge determined that a considerably greater scope of work would be necessary to meet the 1997 CSO control goals for Alewife Brook. In April 2001, MWRA and Cambridge submitted the *Notice of Project Change for the Long Term CSO Control Plan for Alewife Brook* (the "2001 NPC") to the Massachusetts Environmental Policy Act (MEPA) Office for public review, which recommended a greatly expanded sewer separation plan at significantly higher cost.

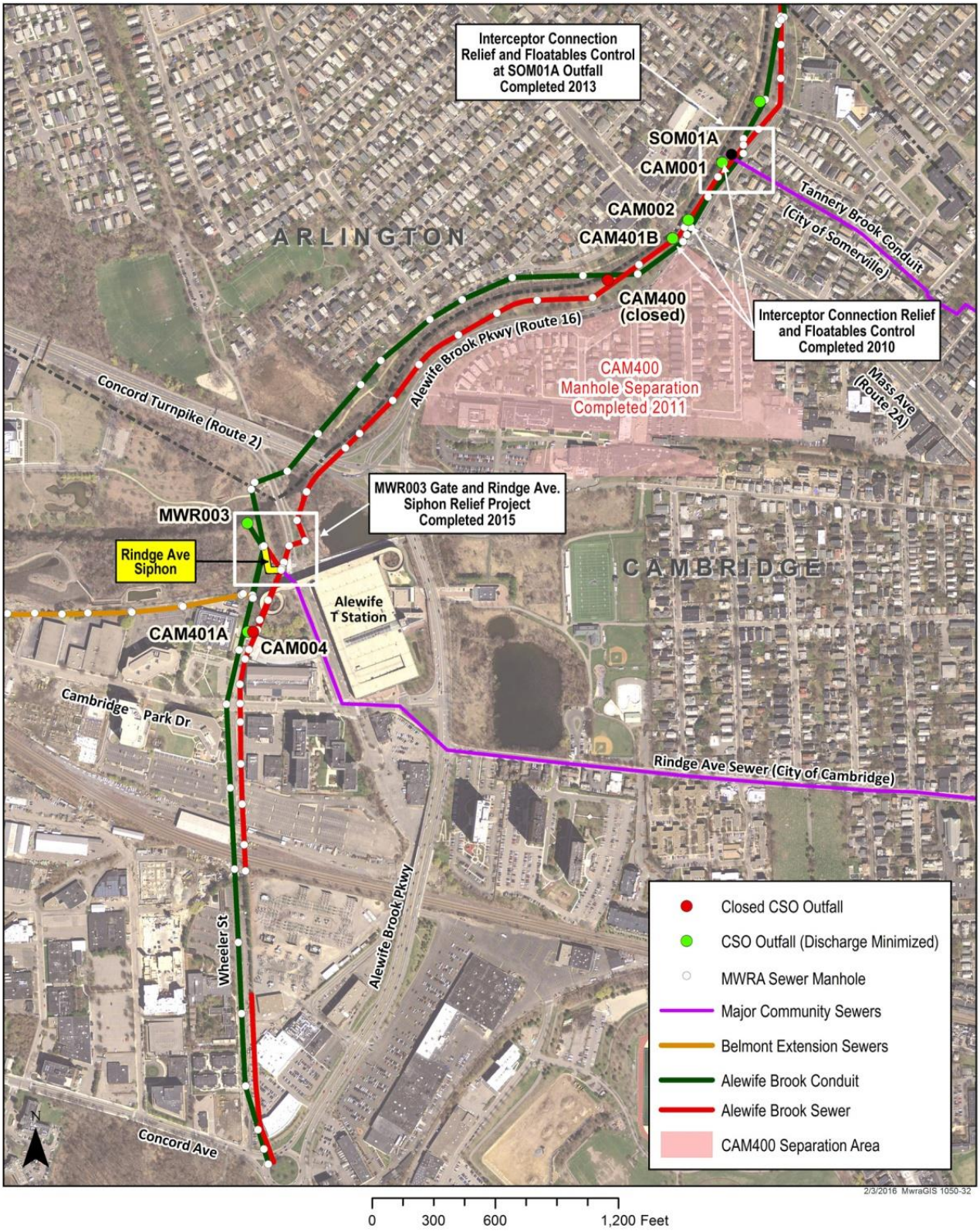
The revised CSO control plan is predicted to reduce CSO discharges to the Alewife Brook by 85 percent in the Typical Year[1], from 50 million gallons in 1997 to 7.3 million gallons.

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



[1] Typical Year rainfall ("Typical Year") was developed by MWRA in 1992 using a 40-year rainfall record and was approved by EPA and MassDEP as a basis for measuring the performance of CSO control alternatives and the water quality impacts of remaining CSO discharges. Level of CSO control in the Typical Year is a key performance objective of the approved Long-Term Control Plan mandated by the Federal District Court Order.

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



CSO activations in the Typical Year will be reduced from 63 in 1997 to 7. MWRA's hydraulic model and water quality model simulations predict that the recommended control levels will comply with Class B (fishable/swimmable) water quality criteria 98.5 percent of the time.

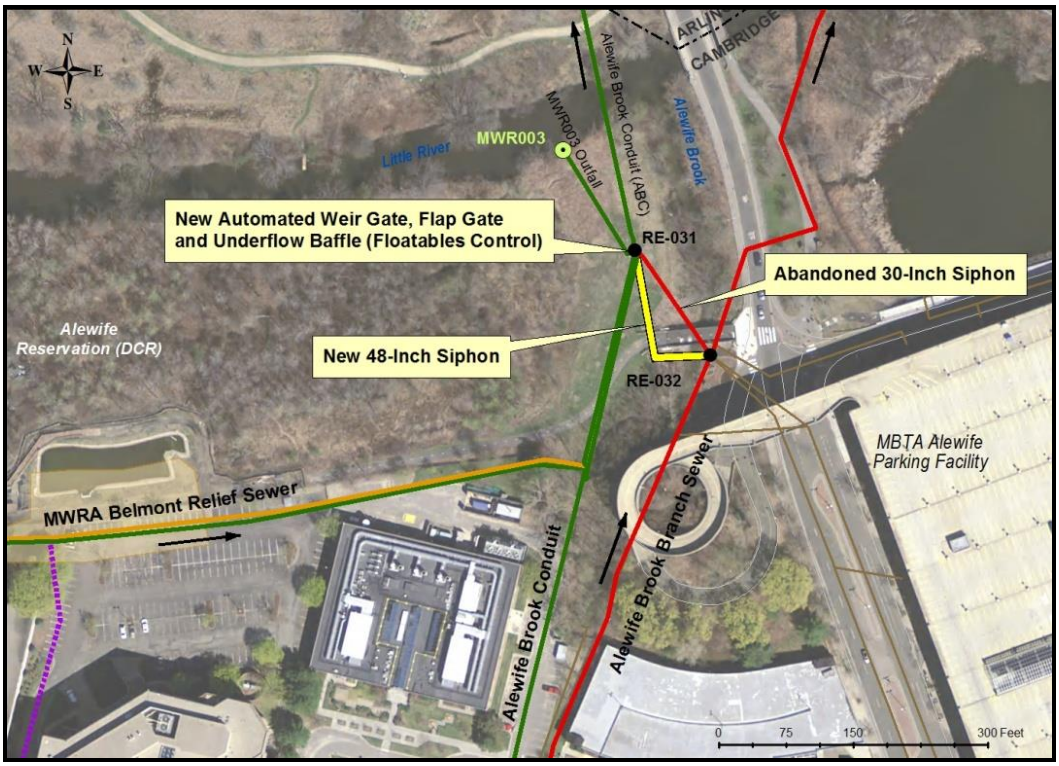
Work Completed during the Current Variance Period (2013-2016)

In 2015, MWRA and the City of Cambridge completed the last two of the seven projects in the revised and approved Alewife Brook CSO control plan, as described below. The seven completed projects have improved wet weather flow conveyance in MWRA's and Cambridge's sewer systems to attain long-term levels of CSO control, reduced sewer system surcharging, maintained or improved service to the tributary communities of Arlington, Belmont, Cambridge and Somerville, and avoided worsening flooding conditions along the Alewife Brook. MWRA and Cambridge are collecting post-construction system performance data that they plan to evaluate to confirm the attainment of the long-term levels of CSO control.

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

On October 28, 2015, MWRA attained substantial completion and beneficial use of the $2.7 million contract for the Control Gate and Floatables Control at Outfall MWR003 and MWRA Rindge Avenue Siphon Relief project (the "MWR003 project"), in compliance with Schedule Seven. All components of the project, shown in Figure 3, including the automated gate and related instrumentation and controls, the underflow baffle for floatables control and the 48-inch replacement siphon, are operating as intended.

Figure 3: MWR003 Project



The MWR003 project supports the attainment of the long-term levels of control for CSO discharges to Alewife Brook in part by improving the hydraulic performance of MWRA's Alewife Brook interceptor system by enhancing the sharing of flow between the parallel Alewife Brook Sewer and Alewife Brook Conduit through the upgraded Rindge Avenue siphon interconnection. The automated weir gate and upgraded siphon are also intended to mitigate the potential for flooding in tributary community sewer systems by providing extreme storm system relief in conjunction with the closing of nearby Outfall CAM004 in December 2015 and the closing of Outfall CAM400 in 2011.

CAM004 Sewer Separation

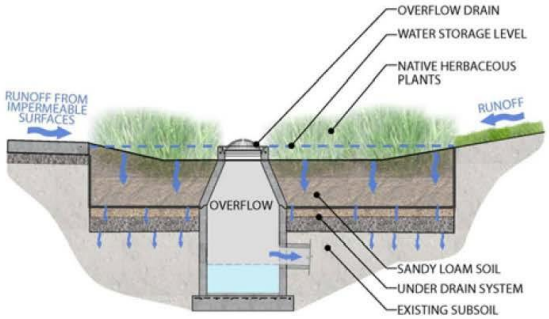
On December 23, 2015, the City of Cambridge attained substantial completion of Contract 9, the last of four construction contracts totaling $100 million (of which $54 million is funded by MWRA) to separate its combined sewer systems tributary to Outfall CAM004 and to permanently close the outfall to CSO discharges. With completion of the last contract, together with the previously completed work of earlier related contracts, including major storm drain trunk work in Fresh Pond Parkway under Cambridge contracts 2A and 2B in 2000-2002, Cambridge has brought the CAM004 sewer separation project into beneficial use for CSO control and associated environmental improvement.

The CAM004 project includes four recently completed sewer separation construction contracts – 8A (Huron A), 8B (Huron B), 9 (Concord) and Concord Lane (shown in Figure 1) – that have separated Cambridge's combined sewer system serving a 211-acre area in the Huron Avenue and Concord Avenue neighborhoods, east of Fresh Pond Parkway. Along with the completion of the work of these contracts in 2015, Cambridge performed an aggressive water quality testing program in its newly constructed storm drain system, as well as related investigations and remediation work, to ensure the absence of any illicit sanitary connections or other sanitary contamination prior to allowing the separated stormwater flows to be removed from the MWRA sewer system and redirected to the Alewife Wetland and the Little River. Once the absence of sanitary contamination was assured, Cambridge's Contract 9 contractor completed structural modifications to the new "Drain Vault 5" in the Concord Avenue rotary that affected the removal of stormwater from the sewer system for all four sewer separation contracts. With completion of the project, the separated stormwater flows now drain to the Alewife Wetland for detention and wetlands treatment prior to discharge to the Little River and Alewife Brook.

The various CAM004 sewer separation construction contracts, though complete for CSO control, also include extensive surface restoration work along the dozens of neighborhood streets affected by the construction. In addition to roadway, sidewalk, driveway entrance and fence repairs and new street markings and lighting, the project also includes "Green Infrastructure" improvements intended to reduce the impacts of stormwater volume and pollutants on downstream storm drain systems and receiving waters. The surface restoration work is scheduled to continue through 2016 and into 2017.

Cambridge has included Green Infrastructure in the various CAM004 sewer separation contracts. The Green Infrastructure technologies consist of porous pavement, "biobasins" with overflow connections to the storm drain system, and new street trees. The biobasins are planted areas that function as part of the stormwater system by intercepting and detaining street runoff to

capture some of the sediments, provide a level of removal of other pollutants such as phosphorus and nitrogen, and potentially reduce the rate and volume of stormwater runoff to the drainage system, in part by allowing some infiltration to groundwater. Remaining runoff will be collected and conveyed to the new stormwater wetland in the Alewife Reservation for further detention and natural treatment before draining to the Little River.



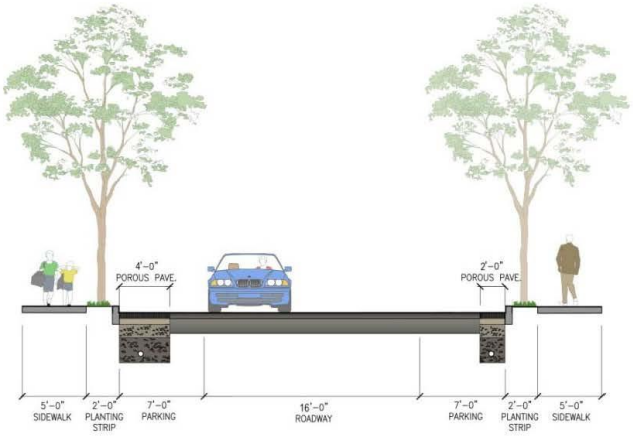
What are Biobasins?

Biobasins are planted areas with an engineered soil layer underneath that is designed to remove pollutants as stormwater runoff from roadway, driveways and walkways passes through it. A small amount of the runoff percolates into the subsoil. The remaining treated water is transported to the City storm drain system through a perforated pipe and catch basin system.

City of Cambridge

What is Porous Paving?

Porous pavement includes a permeable pavement surface with a stone reservoir and filter layer underneath, located in the parking lanes. The purpose of porous pavement is to temporarily store the surface runoff and remove pollutants as runoff passes through the filter layer. Below the filter layer, a small amount of the runoff infiltrates into the underlying soil. The remaining treated water is transported to the City storm drain system through a perforated pipe and catch basin system.



City of Cambridge

CAM004 Stormwater Outfall and Alewife Wetland

MWRA and the City of Cambridge completed the CAM004 stormwater outfall and wetland basin project in April 2013, in compliance with the court schedule. The project included the construction of a 3,300-foot long, 4-foot by 8-foot box culvert storm drain to convey separated stormwater flows to a new 3.4-acre wetland in the Department of Conservation and Recreation's ("DCR") Alewife Brook Reservation. Figure 4 is a rendering of the constructed wetland. Completion of the CAM004 sewer separation project and the closing of Outfall CAM004 to CSO discharges in December 2015 brought the stormwater outfall and Alewife Wetland into full function and intended environmental benefit. The stormwater outfall and the wetland are intended to deliver the separated stormwater flows to the Little River and downstream Alewife Brook without causing an increase in flood levels or pollutant loadings.

The wetland basin provides 10.3 acre-feet of detention storage of the stormwater flows and an attenuation of the rate of stormwater discharge to the Little River and Alewife Brook. The basin also provides a level of removal of pollutants associated with urban stormwater by natural treatment processes in the constructed wetland system.

Figure 4: Rendering of Alewife Stormwater Wetland

In addition to these CSO related 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 and recreational and educational opportunities consistent with DCR's Alewife Brook Reservation Greenway Master Plan. The Oxbow is a constructed open water extension of the Little River intended to provide spawning habitat for migratory fish such as alewife and blueback herring. A mounded amphitheater, boardwalks and boardwalk overlooks in and around the wetland are intended to provide recreational and environmental learning opportunities for students, visitors and conservationists.

Level of CSO Control

The seven Alewife Brook CSO projects, together with the earlier CSO control actions mentioned above, have closed several CSO outfalls (see Figure 5) and are predicted to reduce CSO discharges to the Alewife Brook from 63 activations and 50 million gallons volume in the Typical Year in 1997 to 7 activations and 7.3 million gallons, an 85 percent reduction by volume. MWRA's hydraulic model and water quality model simulations predict that the recommended control levels will bring CSO discharges into compliance with Class B (fishable/ swimmable) water quality criteria 98.5 percent of the time. Levels of CSO control at outfalls on the Alewife Brook for baseline (1997), current (2015) and revised recommended plan (LTCP - 2020) conditions are shown in Table 2.

Figure 5: Alewife Brook and Mystic River CSO Outfalls and Projects

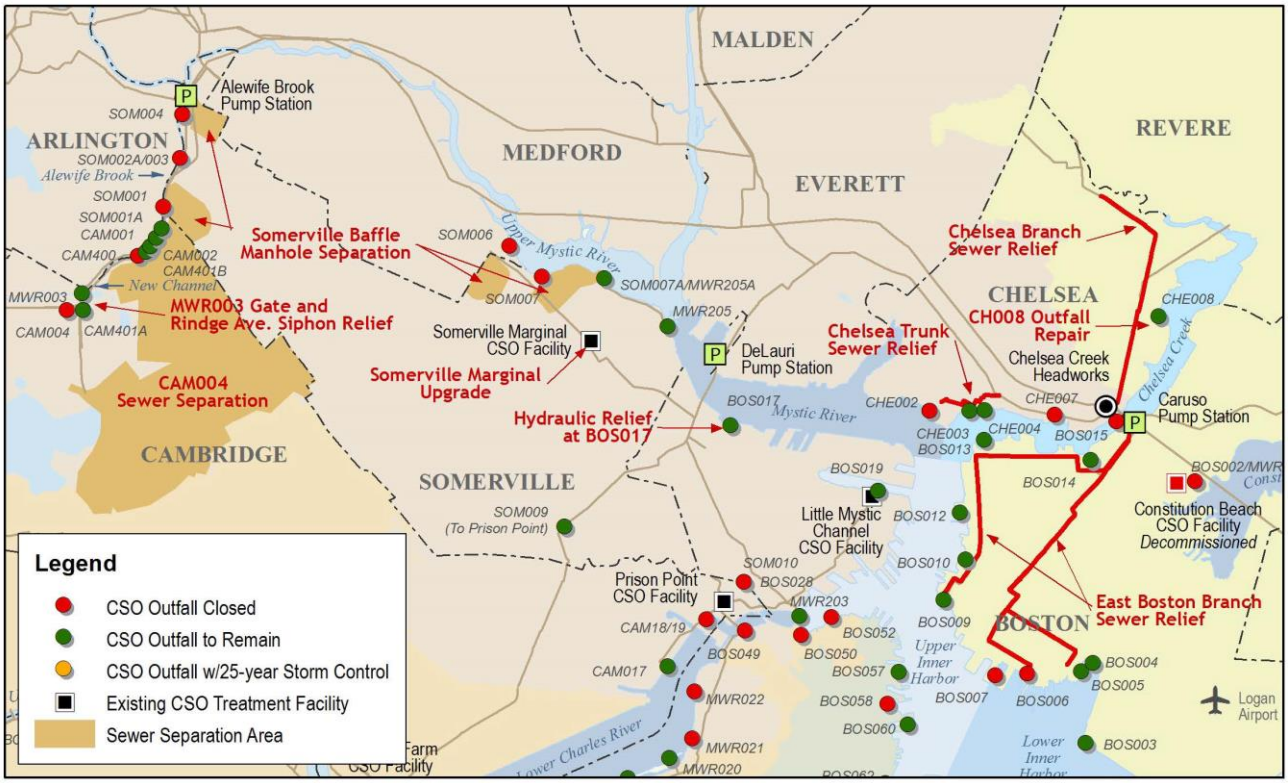


Table 2: CSO Discharges at Alewife Brook/Upper Mystic River Outfalls in the Typical Year

Outfall	Baseline Condition[1]		Current Conditions[2]		Long-term CSO Control Plan[3]	
	Activations	Volume (MG)	Activations	Volume (MG)	Activations	Volume (MG)
CAM001	1	0.01	1	0.04	5	0.19
CAM002	7	1.57	2	0.25	4	0.69
MWR003	1	0.06	4	1.05	5	0.98
CAM004	63	24.10	Eliminated		Eliminated	
CAM400	10	0.80	Eliminated		Eliminated	
CAM401A	7	2.74	2	0.56	5	1.61
CAM401B	25	10.50	4	0.35	7	2.15
SOM01A	10	9.89	5	4.36[4]	3	1.67
SOM001	Eliminated		Eliminated		Eliminated	
SOM002A	Eliminated		Eliminated		Eliminated	
SOM003	Eliminated		Eliminated		Eliminated	
SOM004	Eliminated		Eliminated		Eliminated	
Total Alewife	**63**	**49.70**	**5**	**6.60**	**7**	**7.29**
SOM007A/ MWR205A[5]	11	6.72	3	1.98	3	3.48
SOM007	2	0.04	Eliminated		Eliminated	
Total Upper Mystic	**11**	**6.76**	**3**	**1.98**	**3**	**3.48**

(1) From the April 2001 Notice of Project Change (NPC).
(2) From recent MWRA modeling of 2015 end-of-year system conditions in the Typical Year. Includes the benefits of major improvements to Deer Island transport and treatment systems, implementation of system optimization measures (SOPs) recommended by MWRA in 1993 and 1994, and the CSO control projects in the approved LTCP.
(3) These are the required levels of control. Higher level of control may be achieved at certain outfalls.
(4) MWRA completed construction in 2013 that allows resizing of the interceptor connection between Somerville's Tannery Brook Conduit and MWRA's Alewife Brook Conduit, following completion of the CAM004 sewer separation project (2015) and pending ongoing system performance assessment.
(5) SOM007A/MWR205A is the high tide relief outfall for the Somerville-Marginal CSO Facility. Flows are screened, disinfected and dechlorinated prior to discharge. This outfall is jointly permitted to MWRA and the City of Somerville.

Cost of the Long-term CSO Control Plan

The estimated MWRA cost of the Alewife Brook/Upper Mystic River CSO control plan is $112.6 million in MWRA's Proposed FY17 Capital Improvement Program. This amount includes the design and construction costs incurred by MWRA to implement some of the CSO projects and the funds MWRA is providing to the City of Cambridge for the eligible costs of implementing certain projects, identified in Table 1, pursuant to the Memorandum of Understanding and Financial Assistance Agreement for the Implementation of CSO Control Projects between MWRA and Cambridge. In addition, the City of Cambridge estimates that it will spend a total of approximately $90 million more for CSO related work and for other work, such as non-CSO related infrastructure and street improvements, that Cambridge determined is necessary to include with construction of the major CSO related storm drain and sewer improvements in city streets.

Other Priorities to Ensure Continued Progress

Further water quality improvements in the Alewife Brook/Upper Mystic River watershed will also rely on municipal efforts to locate and remove illegal discharges to storm drains, implement stormwater Best Management Practices, and address other stormwater impacts as they contribute to wet weather issues affecting these watersheds. MassDEP recognizes that progress is continuing to be made by the communities in these areas.

MassDEP also acknowledges the importance of proper operation, maintenance and rehabilitation of MWRA and community sewer and stormwater systems to assure optimized conditions for conveying wastewater flows through the system for treatment at Deer Island and improving stormwater quality. Sewer system repairs and cleaning, as well as optimized operation of the sewer system and facilities during wet weather, have resulted in improved conveyance capacities in a number of locations, removal of localized system flow constraints, and maximum use of in-system storage, all contributing to CSO reduction. MWRA completed interim improvements to the Alewife Brook Pumping Station in 2009, which were estimated to have reduced average annual CSO discharge volume to the Alewife Brook by approximately 30 percent. In April 2016, MWRA issued the Notice to Proceed with the construction contract for long-term improvements to the station that will enhance station reliability. MWRA expects to complete the station improvements in 2018.

II. Water Quality Monitoring in the Alewife Brook and Mystic River

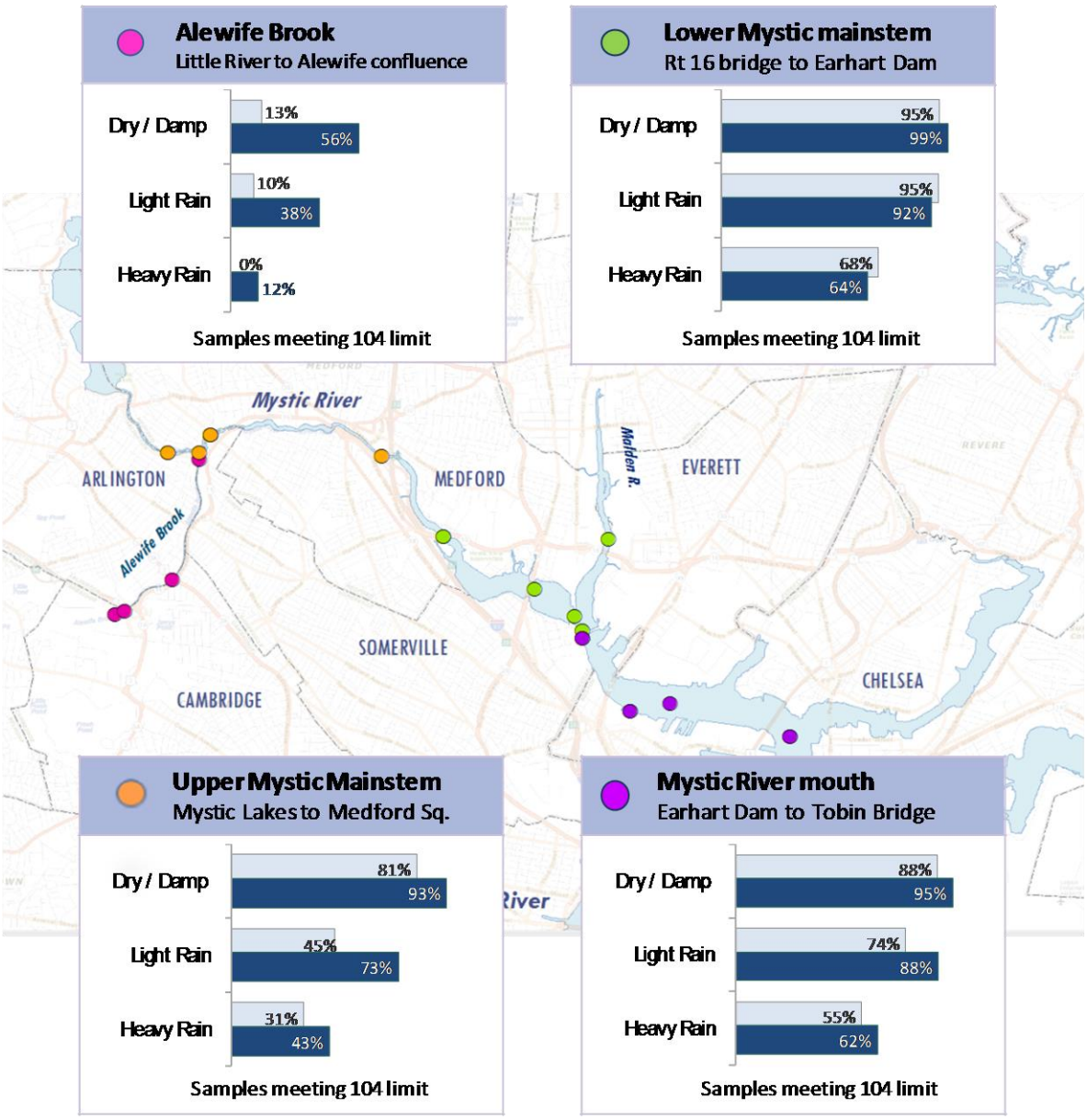
MWRA has been monitoring water quality continuously in the Alewife Brook and the Mystic River since 1989. Studies include measurements of sewage indicator bacteria and nutrients, along with physical measures like dissolved oxygen, Secchi depth and pH. MWRA has submitted reports on the results annually during the full timeframe of the variance. The reports (e.g., *Coughlin K, Wu D. 2015. Summary of CSO Receiving Water Quality Monitoring in Upper Mystic River/Alewife Brook and Charles River, 2014. Boston: Massachusetts Water Resources Authority. Report 2015-06. 47 p. plus appendices*) are available at: http://www.mwra.state.ma.us/harbor/enquad/trlist.html.

Figure 6 shows the bacterial water quality in the Alewife Brook and the Mystic River. The Lower Mystic and Mystic River mouth had the best water quality, meeting water quality limits most of the time, with the majority of bacteria samples meeting the *Enterococcus* swimming limit of 104 MPN/100mL in all weather conditions for 2008 through 2015, and 95% or more of the samples meeting standards in dry weather. While conditions worsen in heavy rain events, these rainfall conditions are relatively infrequent.

Bacteria counts in Alewife Brook (prior to the completion of the major CSO work at the end of 2015) frequently fail to meet swimming limits in both dry and wet weather, and water quality is particularly poor after heavy rain. However, Alewife Brook's influence on downstream water quality conditions in the Mystic main stem is limited, with bacterial conditions downstream showing little influence downstream of the Alewife Brook confluence with the river.

Figure 6: Change in Alewife Brook and Mystic River Water Quality

Graphs show the percent of samples meeting the *Enterococcus* bacteria limit for swimming, 104 counts/100mL, by river reach and weather condition.



Dots are MWRA sampling locations. State swimming standards for *Enterococcus* single sample limit is 104 cfu/100 mL. Rainfall: Heavy Rain is at least 0.5 inches of rain in previous 48 hours; Light Rain is between 0.1 and 0.5 inches of rainfall in previous 48 hours. 2008 – 2015 period is considered current conditions, following substantial completion of infrastructure improvements. Data from intervening years (2000 – 2007) are excluded.

III. CSO Variance

A three-year Variance for CSO discharges to the Alewife Brook/Upper Mystic River Basin was issued by MassDEP on March 5, 1999. The Variance is a short-term modification of the Water Quality Standards issued by MassDEP subject to approval by the EPA. The Variance allows limited CSO discharges from the outfalls along the Alewife Brook/Upper Mystic River permitted to MWRA and the cities of Cambridge and Somerville, subject to specific conditions. Other standards and criteria of the receiving waters' Class B designation are unaffected and remain in force.

The CSO Variance was issued in 1999 to allow time for MassDEP to obtain the information necessary to determine the appropriate long-term water quality standard and level of CSO control for the Basin, while ensuring that recommended CSO controls approved by MassDEP would be implemented. The Variance required the implementation of the cost-effective CSO control actions included in MWRA's 1997 Facilities Plan/EIR and also required other actions necessary to properly assess pollutant loads in the Basin and minimize the impact of CSO discharges.

The March 5, 1999 Alewife Brook/Upper Mystic River Basin Variance included specific conditions on activities of MWRA and the cities of Cambridge and Somerville including the submittal of a Reassessment Report by MWRA summarizing information gathered during the Variance process and reevaluating the costs and benefits of additional CSO controls in the Alewife Brook/Upper Mystic River Basin, up to and including elimination of CSOs. The Reassessment Report was intended to provide the basis for a final determination on the appropriate long-term level of CSO control.

With the variance, MassDEP approved MWRA's LTCP for the Alewife Brook/Upper Mystic River Basin and required MWRA to implement the LTCP, evaluate the potential for infiltration/ inflow (I/I) removal to increase CSO control and benefits, and conduct additional water quality investigations to assess pollutant loadings to these waters. With the new information collected during the variance period, MWRA was required to report on whether additional CSO control measures beyond the LTCP recommendations might be cost effective.

On December 14, 2001, MWRA submitted a request to MassDEP to extend the Alewife Brook/Upper Mystic River Basin Variance for 18 months and defer the requirement for the CSO Reassessment Report until July 1, 2003. After review of public comments on the MWRA request, MassDEP agreed that an extension was reasonable and necessary to complete the data collection and technical reports required under the Variance, and on May 5, 2002, MassDEP extended the Variance to September 5, 2003.

In July 2003, MWRA submitted the Reassessment Report (*Final Variance Report for the Alewife Brook and Upper Mystic River*) to MassDEP and MEPA, which included the evaluation of alternative levels of CSO control and affirmed the recommended alternative and level of control that are now a part of the approved LTCP. MassDEP extended the variance again in 2003 for nine months and in 2004, 2007, 2010 and 2013 for three years each, based on approved new implementation schedules that in part addressed implementation delays due to citizen appeals of the Wetlands Order of Conditions issued by the Cambridge Conservation Commission

and MassDEP for the CAM004 stormwater outfall and Alewife Wetland. Water quality data collection and water quality characterization by MWRA and other parties, including the Mystic River Watershed Association, have continued through these extension periods.

The current variance expires August 31, 2016. Conditions in the current variance require MWRA and the City of Cambridge to implement all elements of the recommended CSO control plan for the Alewife Brook and Upper Mystic River Basin. The variance also requires MWRA, Cambridge and the City of Somerville to continue to implement the CSO Nine Minimum Controls, monitor CSO discharges, report annually on the frequency and volume of CSO discharges to these receiving waters, and respond to any MassDEP comments or questions related to system conditions and CSO control. The current variance also requires MWRA to continue to conduct water quality monitoring in the Alewife Brook and Upper Mystic River.

Water quality data collection and water quality characterization by the Mystic River Watershed Association, MWRA and others has continued, and the implementation, including construction and operational start-up, of MWRA's 35 LTCP projects is now complete. Over the past three decades, MWRA has achieved more than 180 discrete federal court schedule milestones related to CSO control. Two schedule milestones remain: commencement of a three-year post-construction monitoring program and system performance assessment by January 2018, and completion of the assessment and submission of a related report verifying attainment of the long-term levels of control in MWRA's approved LTCP by December 2020.

In compliance with a condition in the Variance, MWRA submits an annual report to EPA and MassDEP by April 30th that includes MWRA's estimates of CSO discharges to the Alewife Brook and Upper Mystic River (and other receiving waters affected by CSOs) during the previous calendar year. The report also includes MWRA sewer system model predictions of CSO discharge frequency and volume at every active outfall for Typical Year rainfall and updated sewer system conditions, and compares the predictions to the level of control in the approved LTCP for each outfall.

IV. Proposed Variance Extension and Next Steps

As part of the agreement on the LTCP reached in March 2006 among EPA, MassDEP, DOJ and MWRA, MWRA requested that the Variance for the Alewife Brook/Upper Mystic River Basin be reissued through 2020 when MWRA must complete the region-wide LTCP and subsequent monitoring to verify that the long-term CSO control goals are achieved. MWRA based this request on the work that was then completed to achieve a high level of CSO control at certain outfalls, the expectation for significant CSO control and water quality improvement with the remaining CSO projects in the Alewife Brook CSO control plan, and the desire to provide a level of financial certainty and stability for its ratepayers.

At that time, MassDEP and EPA determined that MWRA's LTCP satisfied the requirements for a variance from water quality standards for CSO discharges to the Alewife Brook/Upper Mystic River Basin through 2020. As part of this determination, MassDEP and EPA agreed that MassDEP would issue and EPA would approve five consecutive extensions on no more than a three-year duration each through 2020, which would be consistent with and limited to the requirements in MWRA's LTCP.

Substantial and Widespread Social and Economic Impact

MassDEP has emphasized cost-effectiveness for CSO long-term control plans, to ensure that financial resources for pollution abatement actually provide improvements in water quality. The principles of cost-effectiveness and water quality benefits have been a major factor used by MWRA in the development of its present $906.7 million CSO abatement plan.

Implementation of the revised recommended plan will reduce CSO discharges to the Alewife Brook to a level that will allow attainment of Class B water quality standards 98.5 percent of the time. In accordance with MassDEP's CSO Guidance, cost-effectiveness, protection of sensitive uses, and the financial capability of CSO permittees are all important factors in making determinations on the appropriate level of CSO control.

In 1997, MWRA submitted data related to MassDEP's finding of "substantial and widespread economic and social impact," the basis for its issuance of a Variance (See 314 CMR 4.03(4)(f)). MassDEP reviewed updated financial data submitted by MWRA for each of the variance and variance extension determinations since then, and also reviewed a report by Robert N. Stavins, *Assessment of the Economic Impact of Additional Combined Sewer Overflow Controls on Households and Communities in the Massachusetts Water Resources Service Area*, dated March 17, 2004. MassDEP also reviewed the Affordability Analysis Worksheets included in Appendix G of the *Final Variance Report for Alewife Brook and the Upper Mystic River*, dated July 2003, which were based on EPA's Interim Economic Guidance for Water Quality Standards. During the current variance period, MWRA also updated its affordability analyses, specifically comparing updated household water and sewer rates to updated median household income by member community. EPA determined that the updated affordability analyses supported MassDEP's issuance of the variance extension to August 31, 2016.

MassDEP's conclusions from its review of the documents submitted by MWRA and determination in support of the Variance Extension request have not changed. MassDEP has reviewed updated information regarding the scope, status, predicted benefits, achieved benefits, costs and cost impacts of MWRA's LTCP, and has determined that additional controls beyond those recommended in the MWRA CSO Plan would not be cost-effective or affordable at this time.

Based on these important considerations, MassDEP has determined that proceeding at this time with controls beyond those included in the MWRA Long-Term CSO Control Plan would result in substantial and widespread social and economic impact as specified in 314 CMR 4.03(4)(f), and that an extension to the CSO Variance is appropriate at this time. Issuing of the CSO Variance Extension in the Alewife Brook/Upper Mystic River watershed is consistent with EPA Guidance: *Coordinating CSO Long-Term Planning with Water Quality Standard Reviews (July 31, 2001)*, which asserts that longer term variances and renewal of variances are warranted given the extended duration necessary for implementation of LTCPs.

Determination to Extend Variance

MassDEP makes the following determinations:

- The MWRA CSO control plan for the Alewife Brook/Upper Mystic River, which includes projects to optimize sewer system performance and remove stormwater inflow through sewer separation, is responsive to the conditions and intent of the Variance and will achieve substantial CSO control benefits.

- MWRA has completed numerous analyses since the late 1980s evaluating alternatives for eliminating CSOs from the collection system tributary to the Deer Island Wastewater Treatment Plant. Among these are the 1997 FEIR, the April 30, 2001 Alewife Brook Notice of Project Change, and the July 2003 Alewife Brook and Upper Mystic River Final Variance Report. MWRA's revised LTCP incorporates all cost-effective and feasible CSO abatement projects for this watershed. At this point in time, it does not appear technically feasible to eliminate all CSO outfalls to this watershed given the engineering and infrastructure constraints in the MWRA interceptor system, headworks, conveyance tunnels, the Deer Island Wastewater Treatment Plant, and the ocean outfall.

- Progress to date in implementing the LTCP for Alewife Brook and Upper Mystic River has greatly reduced CSO discharges to Alewife Brook, eliminated CSO discharges at several outfalls along Alewife Brook and Upper Mystic River, and improved treatment at MWRA's Somerville Marginal CSO Facility.

- Per MWRA's 2006 variance agreement with EPA and MassDEP, MWRA's implementation of its CSO control plan will be unchanged and remain consistent with and limited to the projects identified in MWRA's LTCP and further made part of Court Schedule Seven. However, MWRA shall modify its current water quality monitoring and reporting to address EPA's comments during the last renewal in 2013, and develop a water quality monitoring plan essential for MassDEP to render a determination on the water quality standard for Alewife Brook and the Upper Mystic River:

  MWRA shall modify its water quality sampling program to support long-term water quality decisions for the Alewife Brook/Upper Mystic River Basin, with a particular focus on wet weather impacts. The modifications will enhance MWRA's existing substantial water quality and wastewater operations historical data to support comparative evaluations of water quality conditions during wet weather events—with and without CSO discharges. Since several additional years of monitoring are needed to provide a robust analysis, this information will aid MassDEP and EPA in water quality evaluations following MWRA's submission of its three-year CSO performance assessment to the Court in December 2020.

  MWRA will add an appendix of raw data to the annual water quality report that is already required by the Alewife Brook/Upper Mystic River Basin Variance. The added information will include sample location, date/time, precipitation and time since last CSO discharge, as modeled and/or measured.

MWRA shall develop a scope of work for this effort in consultation with MassDEP, and submit the completed scope to MassDEP for review on or before December 1, 2016.

- MWRA is required to commence a three-year post-construction monitoring program and system performance assessment in January 2018. MWRA will prepare a scope of work for submittal to MassDEP on or before May 1, 2017. MassDEP will make the scope of work available for public comment.

- MWRA will add a CSO public notification webpage to its website, which will report and provide information on recent Somerville-Marginal CSO treatment facility activations. Somerville-Marginal is the most active CSO in the Mystic River Watershed.

- Proceeding at this time with controls beyond those presently included in the revised LTCP would result in substantial and widespread social and economic impact as specified in 314 CMR 4.03(4)(f).

MassDEP concludes that extension to the CSO Variance for the Alewife Brook/Upper Mystic River watershed is appropriate at this time, and proposes to extend the CSO Variance for MWRA and the cities of Cambridge and Somerville to August 31, 2019. A determination on the highest feasible level of CSO control and associated water quality standard is deferred until the LTCP is implemented and the associated benefits are verified in December 2020, in compliance with Schedule Seven.

Future Actions

(1) The Variance for CSO discharges to the Alewife Brook/Upper Mystic River Basin will be extended by a period of 3 years (to August 31, 2019).

(2) MWRA, the City of Cambridge and the City of Somerville shall implement all elements of the LTCP as defined in the Second CSO Stipulation and in accordance with Schedule Seven.

(3) MWRA, the City of Cambridge, and the City of Somerville shall continue to implement the Nine Minimum Controls and report on CSO activations and volumes.

(4) Following MassDEP review, MWRA shall implement a modified receiving water monitoring program in the Alewife Brook/Upper Mystic River Basin watershed.

(5) MWRA will prepare a scope of work for a three-year post-construction monitoring program and system performance assessment that will commence in January 2018.