



Massachusetts Water Resources Authority

CSO Post-Construction Monitoring and Performance Assessment

**Public Briefing
May 21, 2021**

WebEX Recorded



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Presentation Topics

1. Progress of Post-Construction Monitoring and Performance Assessment
2. Updated Forecasts of Attainment of Long-Term Control Plan (LTCP) CSO Activation and Volume Goals
3. Investigations and recommendations of additional CSO control measures to attain LTCP goals.
4. Progress of Work to Comply with CSO Variance Conditions
5. Receiving Water Modeling – Charles River Basin and Alewife Brook/Upper Mystic River



CSO Performance Assessment Goals

- Verify whether the Long-Term Control Plan goals are attained
 - Closed outfalls (CSO eliminated)
 - South Boston beaches: 25-year storm (CSO effectively eliminated)
 - Typical Year activation frequency and discharge volume goals (“LTCP goals”) at remaining active outfalls
- Verify compliance with WQS; assess the water quality impacts of remaining CSO discharges to CSO variance waters
- Issue a final report in December 2021 in compliance with Schedule Seven
 - CSO Performance Assessment
 - Water Quality Assessment



CSO Performance Assessment Progress Timeline

- Commenced assessment: Nov 2017
- Completed CSO regulator inspections: Winter/Spring 2018
- Commenced collection of rainfall and CSO meter data: Apr 2018
- Completed Hydraulic Model updates and recalibration: Jan 2020



**Task 4: Semiannual CSO
Discharge Report No. 6**
July 1, 2020 – December 31, 2020

CSO Post Construction Monitoring and Performance Assessment
MWRA Contract No. 7572

April 30, 2021

Project number: 60569027



CSO Performance Assessment Progress to Date (cont.)

- Continued to conduct rainfall data collection and analyses and CSO metering
- Modeled current (Q1-2021) Typical Year Performance and compared to LTCP goals
- Conduct site-specific overflow activity investigations: Ongoing
- Developed and calibrated receiving water models of Lower Charles River and Alewife Brook/Upper Mystic River: Nov 2020
- Issued Draft WQ Assessment Report: Apr 2021



Task 4: Semiannual CSO Discharge Report No. 6 July 1, 2020 – December 31, 2020

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Verifying Attainment of LTCP Goals

- CSO discharges are eliminated or “effectively eliminated” at 40 of the 86 discharge locations active in the late 1980’s.
- South Boston Tunnel provides 25-year storm level of CSO control (“effective elimination”) and 5-year capture of separate stormwater along the beaches.



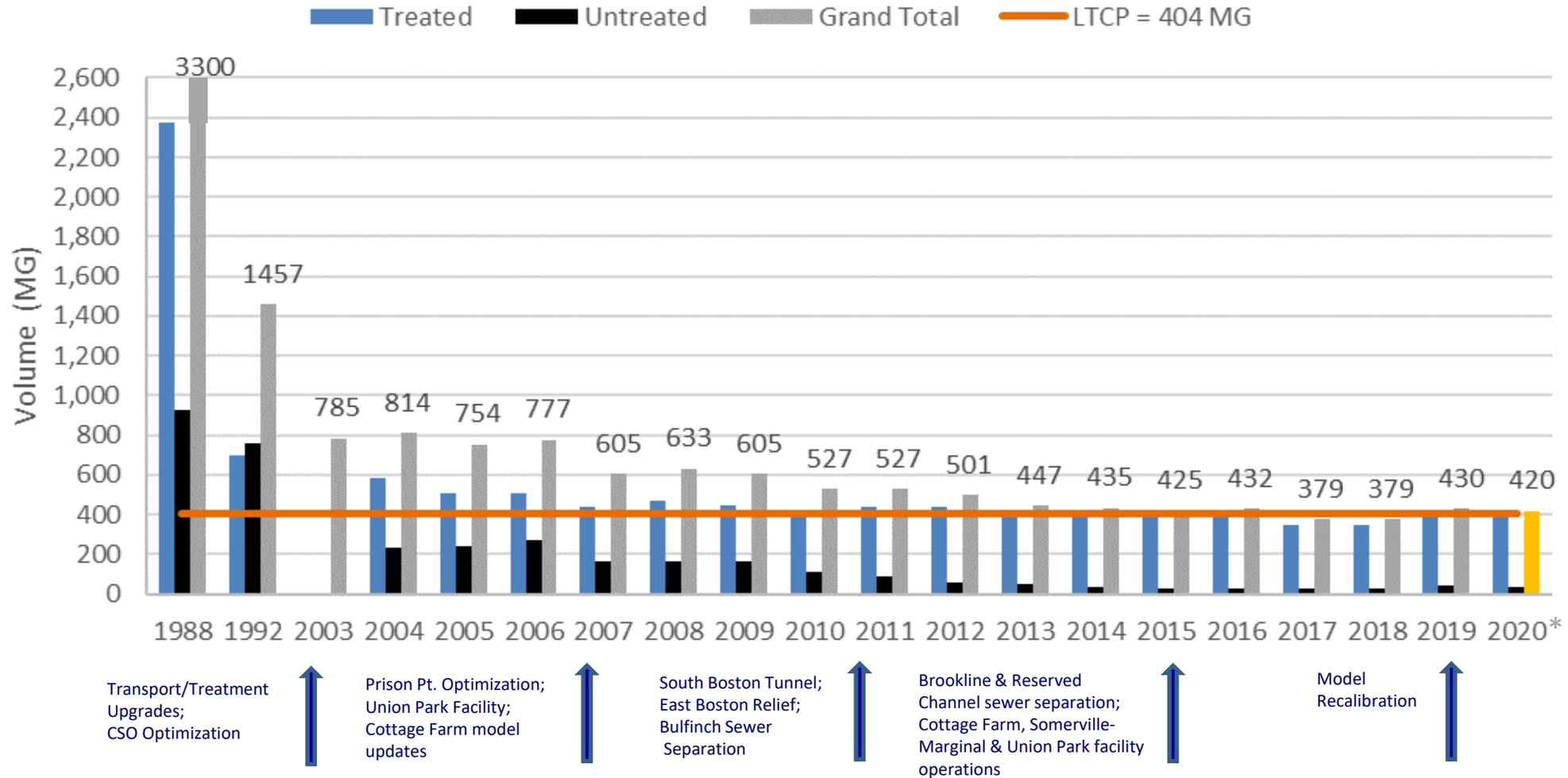
CHE002 Overflow Sealed in 2014





Tracking Attainment of LTCP Goals: Typical Year Performance

Grand Total, Treated & Untreated
1988, 1992 & 2003-2020 Typical Year Simulation Results vs LTCP





Forecasting Attainment of LTCP Goals: Typical Year Performance

Table 1-5. Typical Year Performance: Baseline 1992, Current (Q1-2021) and LTCP (1 of 3)

Outfall achieves LTCP activation and volume goals.			Outfall is forecast to achieve LTCP goals after Dec 2021.			
Investigations continue for forecast of LTCP attainment potential			Model prediction is greater than LTCP value.			
OUTFALL	1992 SYSTEM CONDITIONS ⁽¹⁾		Q1-2021 SYSTEM CONDITIONS		LONG TERM CONTROL PLAN ⁽²⁾	
	Activation Frequency	Volume (MG)	Activation Frequency	Volume (MG)	Activation Frequency	Volume (MG)
ALEWIFE BROOK						
CAM001	5	0.15	1	0.02	5	0.19
CAM002	11	2.73	0	0.00	4	0.69
MWR003	6	0.67	3	0.61	5	0.98
CAM004	20	8.19	Closed	N/A	Closed	N/A
CAM400	13	0.93	Closed	N/A	Closed	N/A
CAM401A	18	2.12	5	0.66	5	1.61
CAM401B			4	0.50	7	2.15
SOM001A	10	11.93	8	4.47	3	1.67
SOM001	0	0.00	Closed	N/A	Closed	N/A
SOM002	0	0.00	Closed	N/A	N/I ⁽³⁾	N/I ⁽³⁾
SOM002A	0	0.00	Closed	N/A	Closed	N/A
SOM003	0	0.00	Closed	N/A	Closed	N/A
SOM004	5	0.09	Closed	N/A	Closed	N/A
TOTAL		26.81		6.26		7.29
UPPER MYSTIC RIVER						
SOM007A/MWR205A	9	7.61	5	4.50	3	3.48
SOM006	0	0.00	Closed	N/A	N/I ⁽³⁾	N/I ⁽³⁾
SOM007	3	0.06	Closed	N/A	Closed	N/A
TOTAL		7.67		4.50		3.48



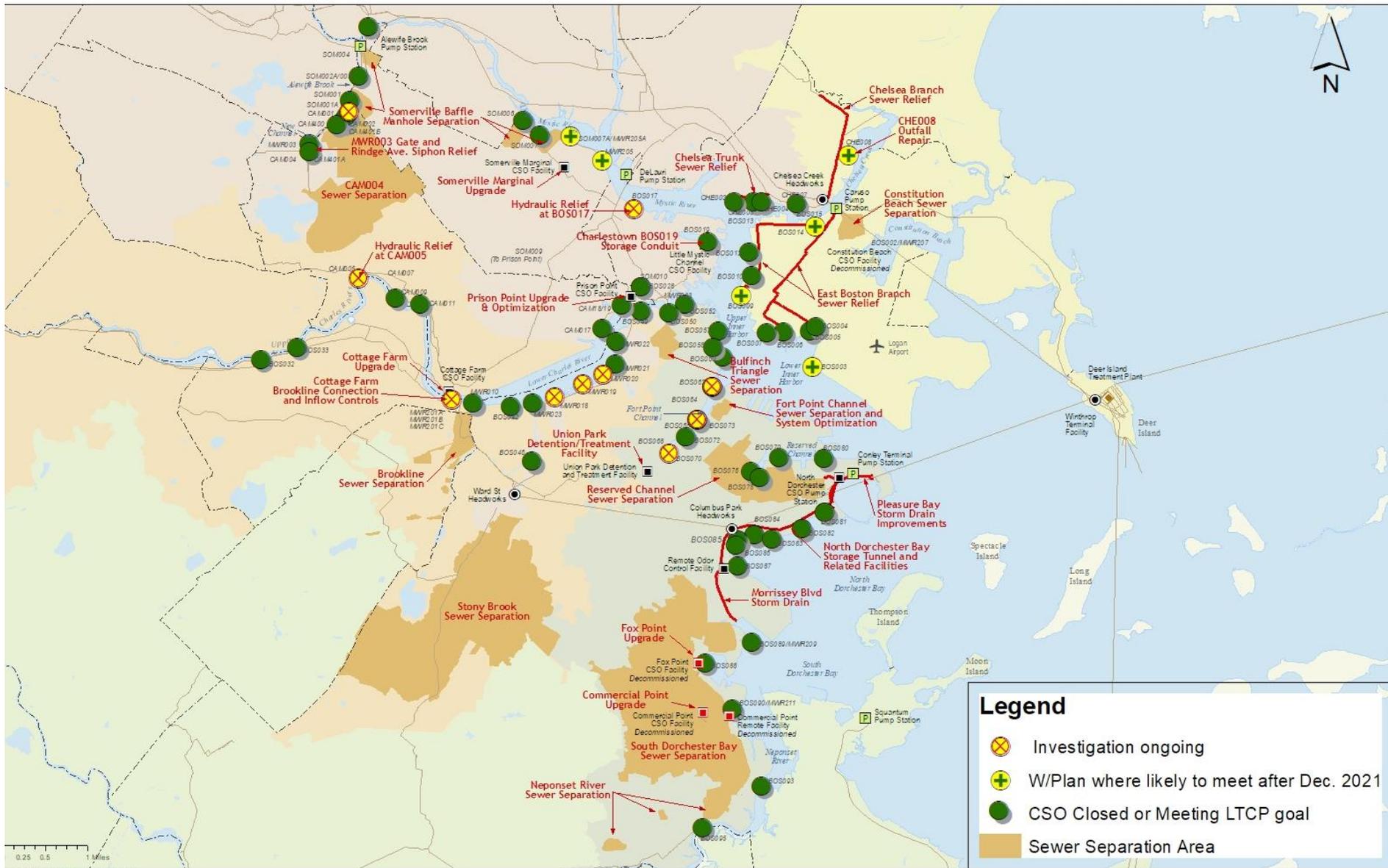
Forecasting Attainment of LTCP Goals

46 of the original 86 discharge locations remain active, in accordance with the LTCP. Of these:

- 30 locations attain LTCP activation and volume goals.
- MWRA and the CSO communities are pursuing additional system improvements which MWRA forecasts will attain LTCP goals at 6 additional discharge locations after December 2021.
- At 10 locations, MWRA and the CSO communities continue to identify and evaluate measures to reduce CSO toward LTCP goals.

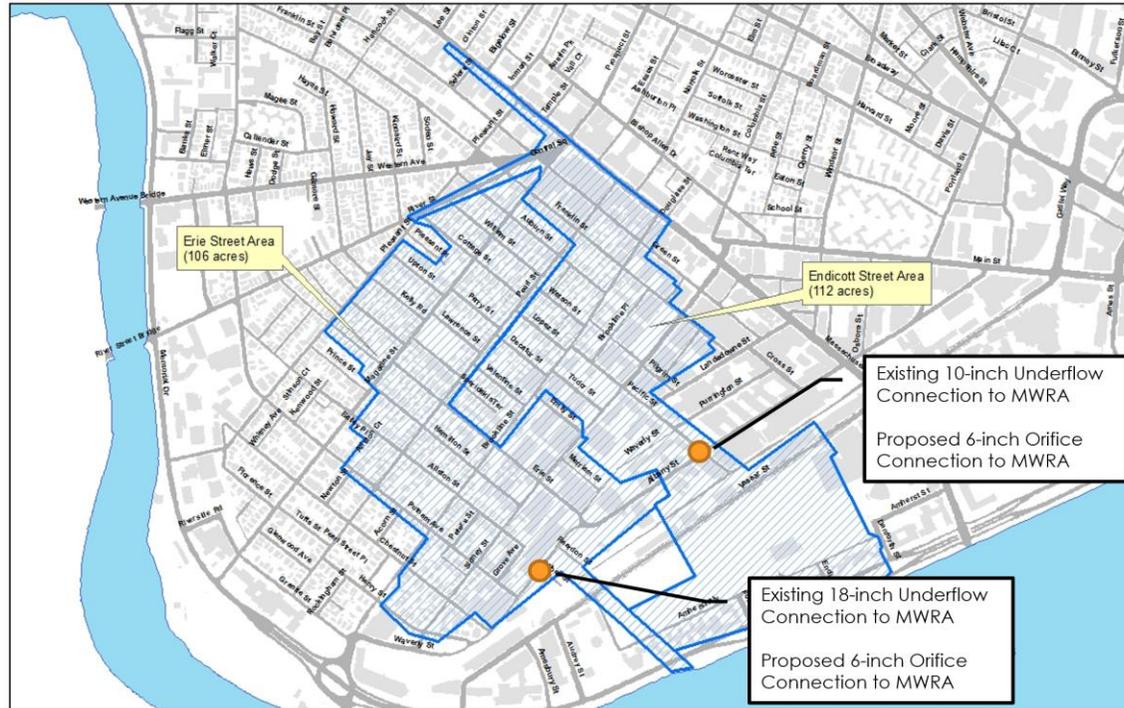


Forecast of Attainment of LTCP Activations and Volume Goals





Recently Completed Work: Cambridge Partial Sewer Separation



Location		Model Predictions for Typical Year Rainfall								LTCP	
		1992 System Conditions		Mid-2020 System Conditions		With Partial Sewer Separation (Aug 2020)		With Full Sewer Separation			
		Activation Frequency per Year	Annual Volume (MG)	Activation Frequency per Year	Annual Volume (MG)	Activation Frequency per Year	Annual Volume (MG)	Activation Frequency per Year	Annual Volume (MG)	Activation Frequency per Year	Annual Volume (MG)
Cottage Farm	Treated Discharge	18	214.1	4	12.64	2	8.9	2	8.7	2	6.3



Recently Completed Improvements and CSO Benefits

IMPROVEMENT	COMPLETED	CSO BENEFIT	RECEIVING WATER
BWSC completed East Boston Sewer Separation Contract 1	Apr 2020	Reduced CSO activations and volume at outfalls BOS012 and BOS013 to LTCP goals	Upper Inner Harbor
BWSC raised the overflow weir at East Boston Outfall BOS010	Feb 2021	Along with Contract 1 sewer separation, reduced CSO activations and volume at Outfall BOS010 to LTCP goals	Upper Inner Harbor
Cambridge completed Partial Sewer Separation in Cambridgeport	Aug 2020	Reduced Cottage Farm treated CSO activations and volumes	Lower Charles River
Cambridge completed sediment removal downstream of Outfall CAM401A	Mar 2021	Reduced CAM401A CSO activations and volume to LTCP goals	Alewife Brook
Chelsea raised the overflow weir at Outfall CHE004	Dec 2020	Reduced CHE004 CSO activations and volume to LTCP goals	Mystic/Chelsea Confluence
MWRA modified gate closing setting at Somerville Marginal Facility	Jun 2020	Provides small reduction in treated CSO discharge volume	Upper Mystic River and Mystic/Chelsea Confluence
MWRA trimmed the connection protrusion at Outfall CHE008	Oct 2020	Reduced CHE008 CSO activations and volume	Chelsea Creek



Improvements Underway

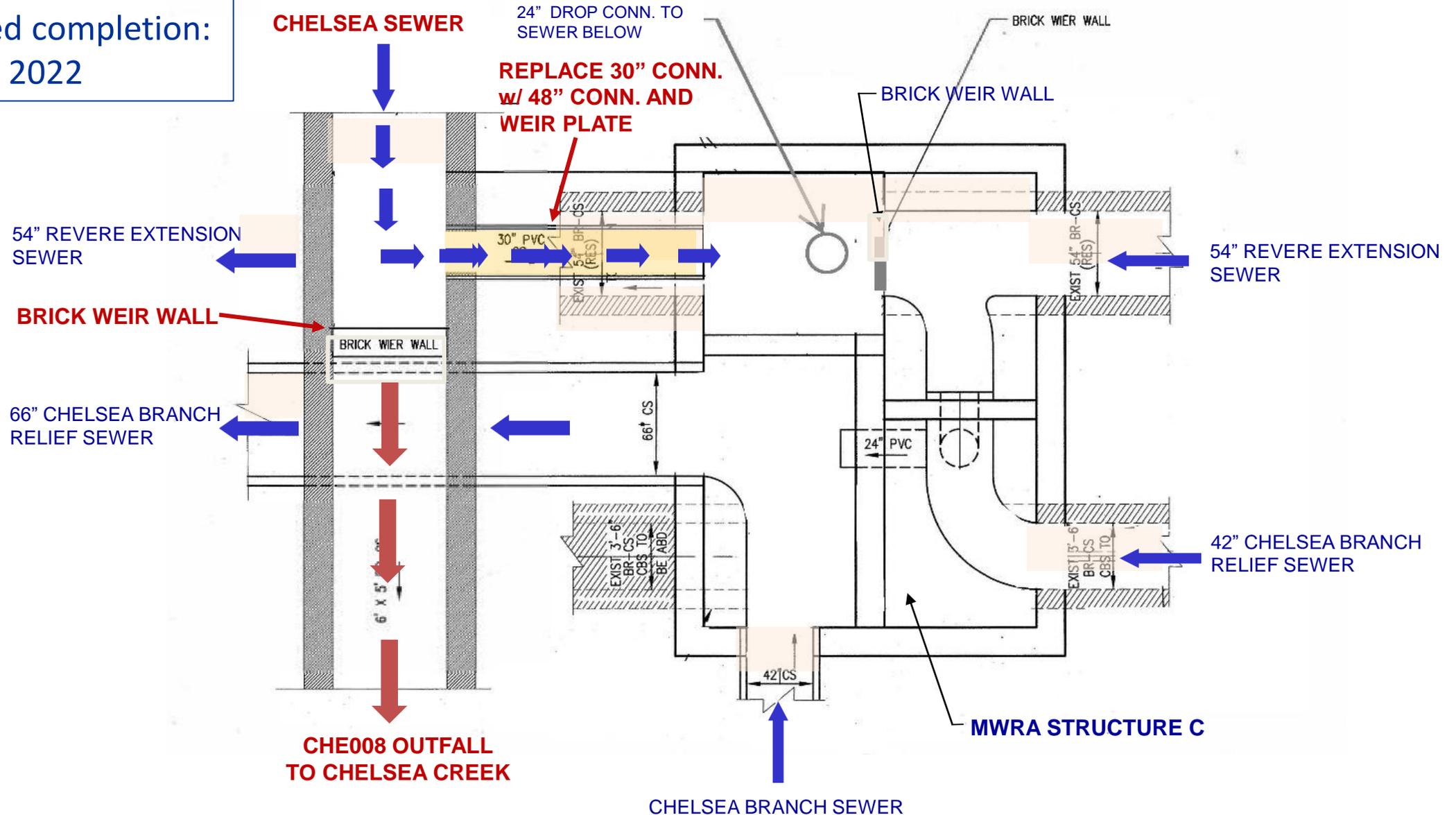
MWRA and the CSO communities are pursuing additional system improvements that will bring 6 more outfalls into attainment with LTCP goals:

- Chelsea's outfall CHE008
- BWSC's East Boston outfalls BOS003, BOS009 and BOS014
- MWRA's treated outfalls MWR205 and SOM007A/MWR205A



Upgrade CHE008 Interceptor Connection from 30" to 48"

Estimated completion:
Summer 2022





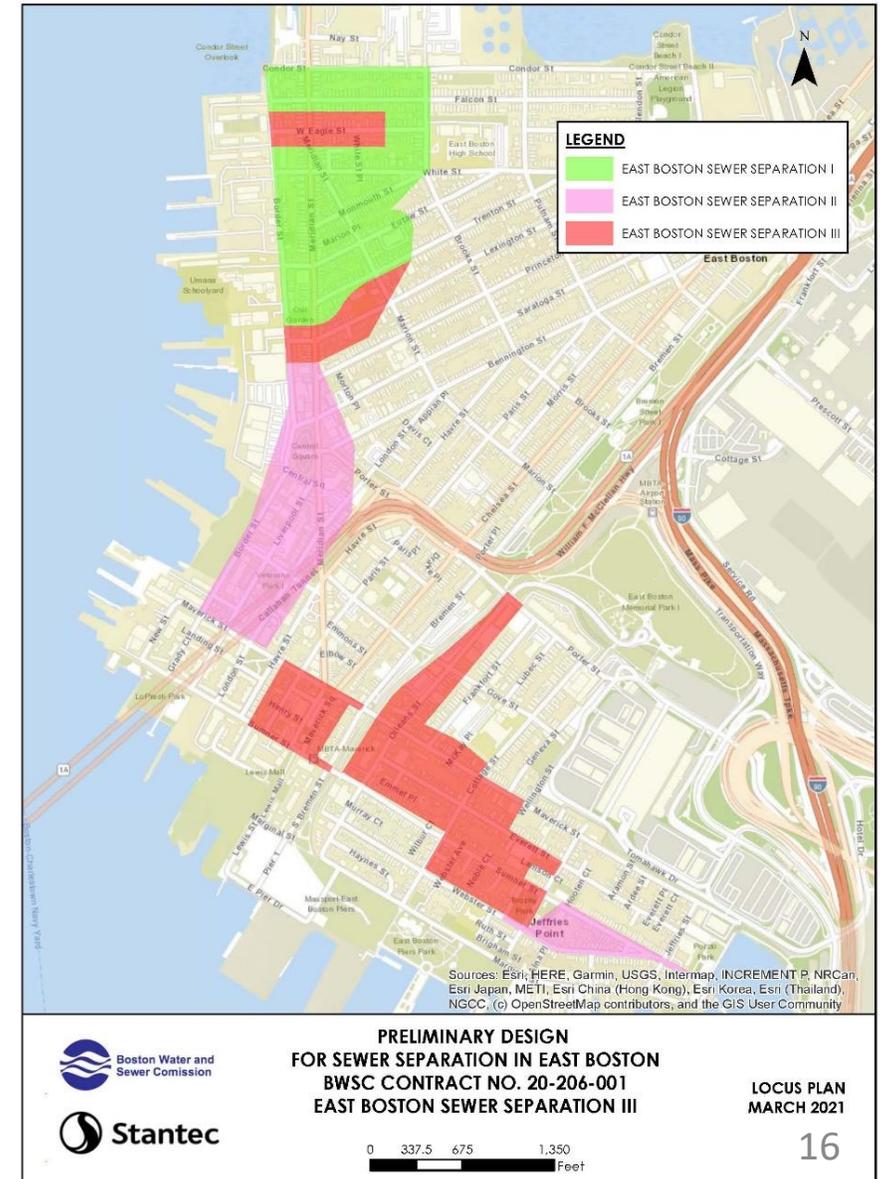
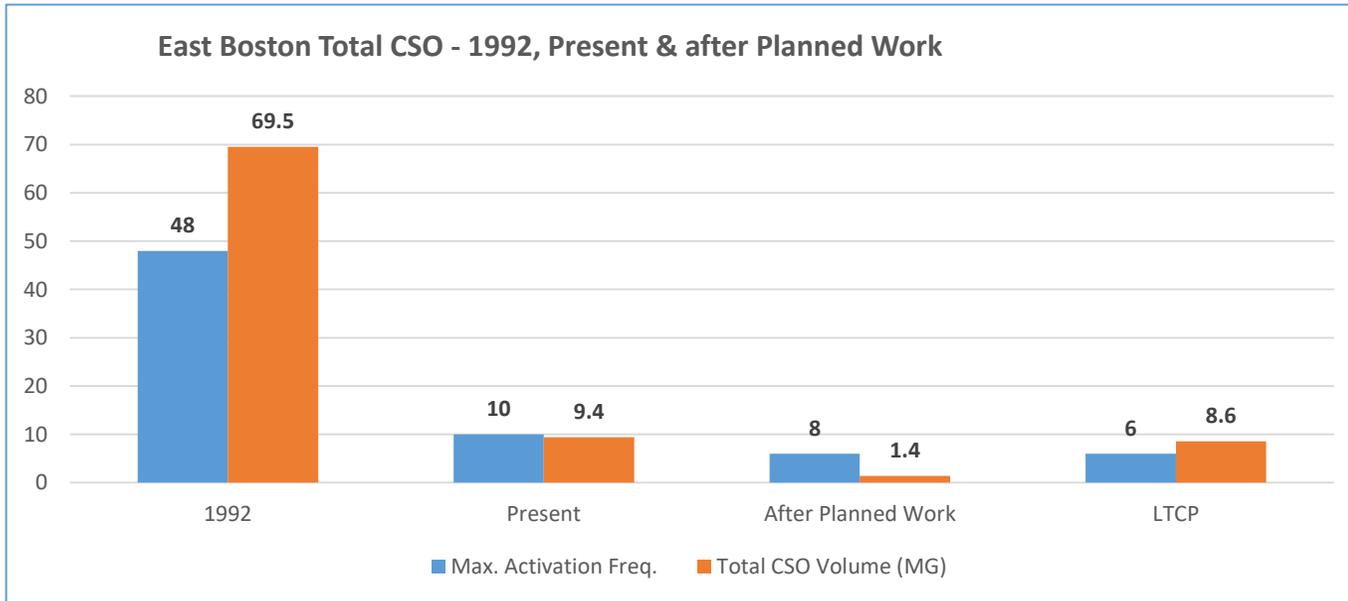
East Boston Sewer Separation and Other CSO Improvements

The three phases of BWSC Sewer Separation and other CSO Improvements (together with the MWRA project completed in 2010) will result in all 8 active outfalls in East Boston meeting LTCP goals.

Phase 1: Complete (BOS004, BOS005, BOS012, BOS013)

Phase 2: In construction; complete Oct 2021 (BOS010)

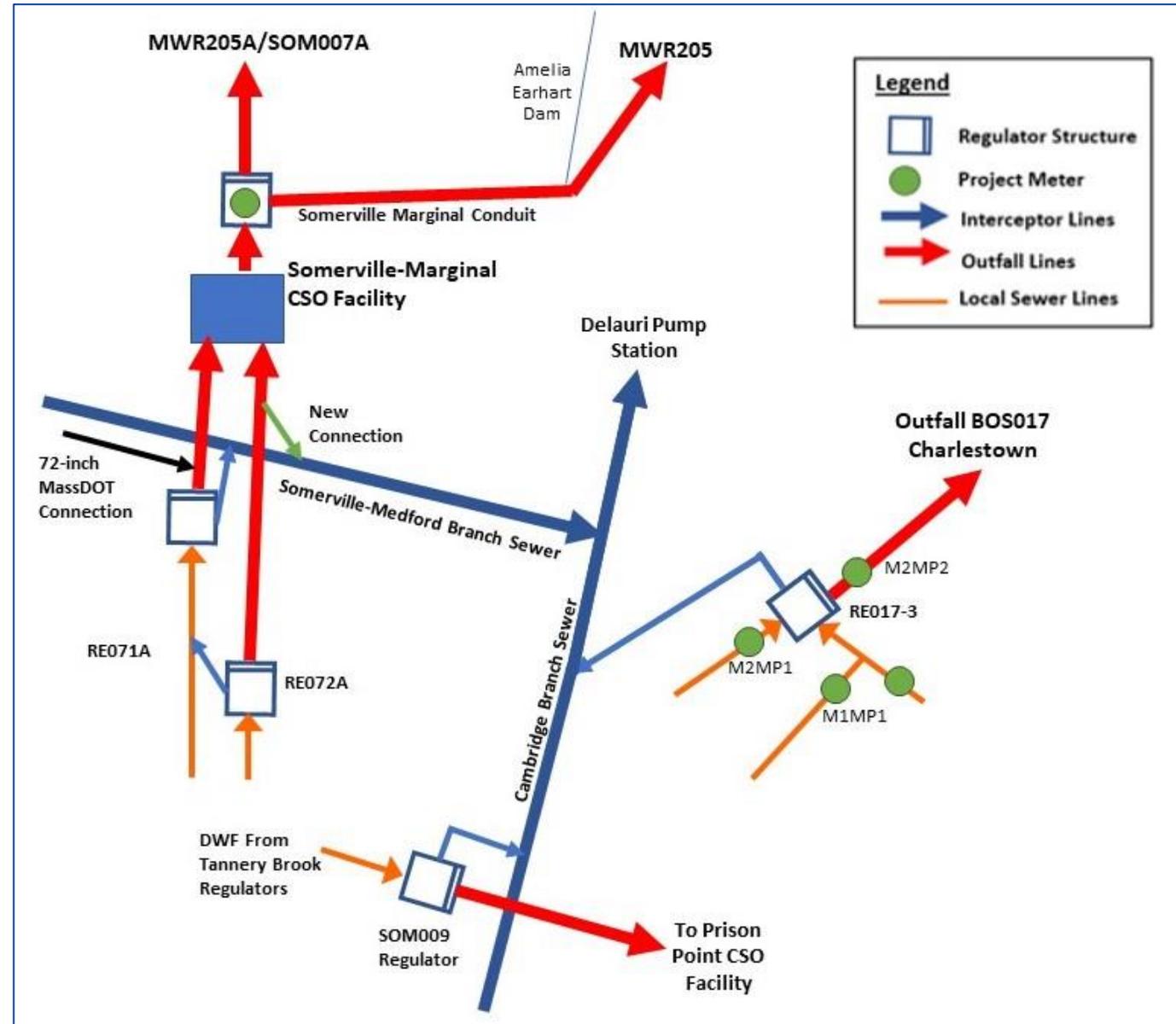
Phase 3: Jun 2021–Jun 2023 (BOS003, BOS009 and BOS014)





Somerville Marginal CSO Facility Improvements Under Evaluation

- Increase hydraulic capacity of Somerville's connection to MWRA's Somerville-Medford Branch Sewer.
 - Include hydraulic control to avoid downstream system impacts in larger storms.
- Remove separate stormwater upstream of Somerville's connection.
 - Ten Hills
 - I-93/Mystic Ave.
- In addition, MWRA modified the gate closing setting and will soon replace the outfall's leaky tide gate.





Other Important Community Projects

- **South Boston Sewer Separation** - Contract 1 (2022 completion), Contract 2 (2024 completion): Modeling shows contracts 1 and 2 will result in eight of the nine regulators tributary to BOS070/DBC attaining LTCP goals. Additional BWSC sewer separation contracts are planned.
- **Cambridge Sewer Separation** - Willard St. (possible CAM005 benefits), Agassiz & Plympton St. (possible Cottage Farm benefits)
- **Somerville** - Union Square storm water storage conduit and Poplar St. pump station (possible Prison Point benefits)
- **Chelsea Sewer Separation** – City’s Master Plan calls for long-term sewer separation to reduce or eliminate CSO from Chelsea’s three outfalls.



Outfalls Currently Not Forecast to Attain LTCP Activation and/or Volume Goal

OUTFALL	Q1-2021 SYSTEM CONDITIONS MODEL		LONG TERM CONTROL PLAN		POTENTIAL ACTION PLAN(S)
	Activation Frequency	Volume (MG)	Activation Frequency	Volume (MG)	
ALEWIFE BROOK					
SOM001A	8	4.47	3	1.67	<ul style="list-style-type: none"> Identify potential upstream flow controls
MYSTIC/CHELSEA CONFLUENCE					
BOS017	6	0.34	1	0.02	<ul style="list-style-type: none"> Raise weir Add weir wall to direct flow to interceptor upstream of regulator
FORT POINT CHANNEL					
BOS062	5	1.26	1	0.01	<ul style="list-style-type: none"> Raise weir Relieve interceptor connection
BOS065	1	0.62	1	0.06	<ul style="list-style-type: none"> Raise weir Relieve interceptor connection
BOS070/DBC	7	6.14	3	2.19	<ul style="list-style-type: none"> South Boston Sewer Separation Contracts 1 and 2 (most regulators attain LTCP by 2024) Evaluate regulator modifications at RE070/7-2



Outfalls Currently Not Forecast to Attain LTCP Activation and/or Volume Goal (continued)

OUTFALL	Q1-2021 SYSTEM CONDITIONS MODEL		LONG TERM CONTROL PLAN		POTENTIAL ACTION PLAN(S)
	Activation Frequency	Volume (MG)	Activation Frequency	Volume (MG)	
CHARLES RIVER					
MWR201 (Cottage Farm)	2	8.95	2	6.30	<ul style="list-style-type: none"> • Further optimize Cottage Farm facility operations • Separate upstream areas as currently being planned by Cambridge
CAM005	7	0.66	3	0.84	<ul style="list-style-type: none"> • Remove pipe obstructions • Raise weir • Separate upstream areas as currently being planned by Cambridge
MWR018	2	1.14	0	0.00	<ul style="list-style-type: none"> • Raise weirs
MWR019	2	0.51	0	0.00	<ul style="list-style-type: none"> • Lower localized BMC head loss
MWR020	2	0.57	0	0.00	<ul style="list-style-type: none"> • Redirect upstream BWSC separate storm drains



CSO Variance Required Project Evaluations

- **Alewife Brook P.S. Optimization**
 - Modified pump settings for improved wet weather pump performance
 - No significant CSO benefit at upstream outfalls on Alewife Brook
 - Final report submitted to EPA/DEP on April 27, 2021
- **Somerville Marginal CSO Facility**
 - Evaluation of Somerville connection hydraulic relief underway
 - Evaluation of separate stormwater removal underway
 - Final report due to EPA/DEP by December 2021
- **CSO Optimization: CSO regulators tributary to Charles River and Alewife Brook/Upper Mystic River**
 - Evaluations underway
 - Final Report due to EPA/DEP in December 2022



Public Notification of CSO Activations

- Real Time monitoring at all MWRA CSO outfalls
- Rapid Notification of CSO discharges via text or email
- Subscriber based system
- Updated interactive web pages
- Cambridge and Somerville also have subscriber based systems in place
- BWSC and Chelsea update their webpages with CSO activations

MWRA CSO Discharge Community CSO Sites

Discharges from MWRA CSOs and Storage Facilities

Treated discharge (last 2 days)	Untreated discharge (last 2 days)	No Recent Treated discharge	No Recent Untreated discharge

Mouse over each map symbol below for the CSO number and other information.
Data for CSOs are preliminary; MWRA publishes final data in the CSO Annual Report.

To refresh the web page for the latest CSO event information, press **Ctrl + F5** in Windows or **Shift + ⌘ + R** in Mac. For mobile devices, clear the browser cache first and then refresh.

Map Satellite CSO Base Map

MWR205: Somerville Marginal CSO Treatment Facility Outfall (marine discharge)

CSO Active within past 2 days
The Somerville Marginal facility's marine outfall discharges treated combined sewage to the Mystic River mouth, downstream of the Amelia Earhart Dam in Somerville.

Start Time: 4/1/2021 04:41 AM
Stop Time: 4/1/2021 06:12 AM

Map data ©2021 Terms of Use



What We Know About Water Quality

Non-Variance Waters

**Mystic/Chelsea Confluence
Boston Harbor
Fort Point Channel
Reserved Channel**

- Monitoring program since 1989
- Under all weather conditions
- Report Card (by MyRWA method):
 - Inner Harbor;
 - A to A+
 - Mystic/Chelsea Confluence
 - B to A+
 - Fort Point Channel
 - Head = D
 - Mouth = B+
 - At Inner Harbor = A

Variance Waters

**Lower Charles/Charles Basin
Alewife Brook
Upper Mystic River Basin**

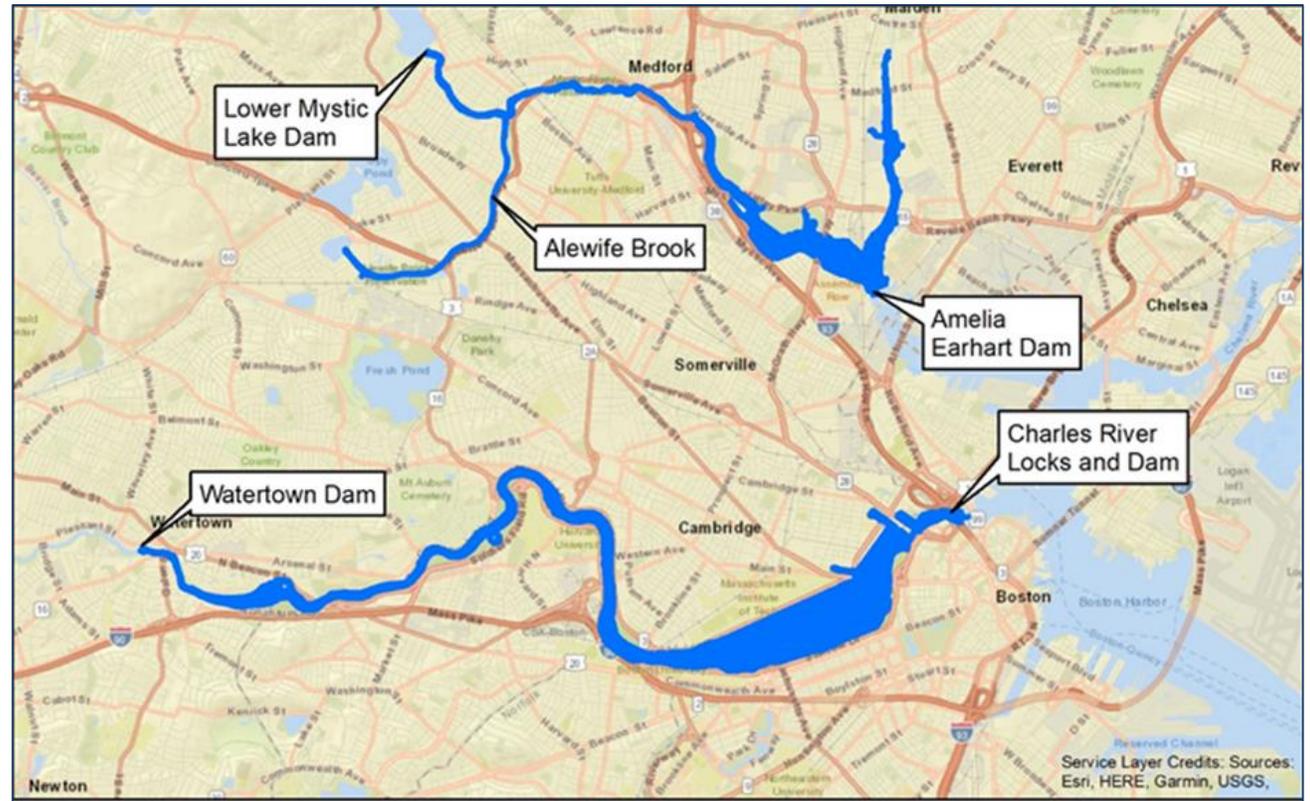
- Original receiving water quality models updated
- Identifies bacterial contributions
- Distinguish CSO from Non-CSO/Stormwater
- Accounts for upstream boundary sources



Receiving Water Models

The receiving water models allow us to:

- ✓ Evaluate individual bacteria contributions
- ✓ Track movement downstream
- ✓ Determine Typical Year WQ
- ✓ Determine duration of exceedance





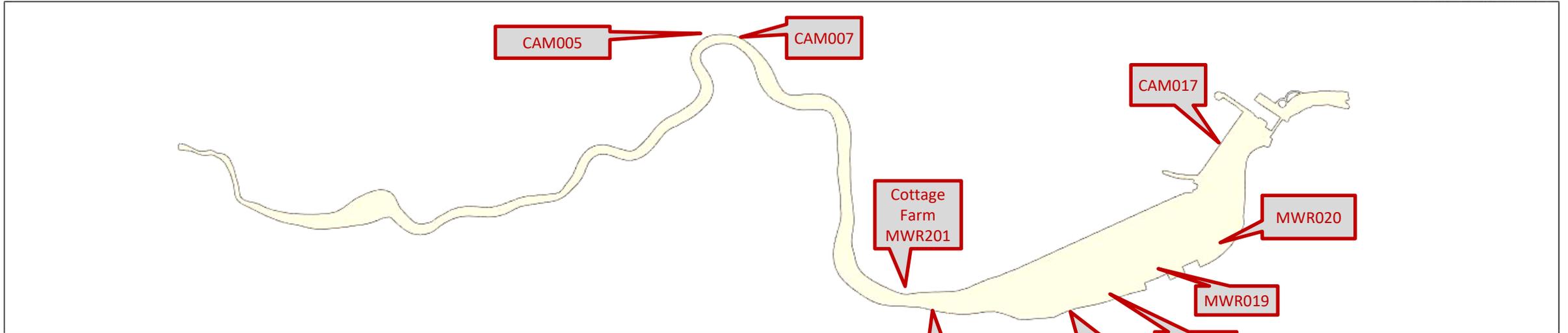
Percent Compliance with Water Quality Standards

	<i>E. Coli</i> Single Sample Maximum Criterion (235 MPN/100 mL) Percent Annual Compliance – Typical Year		
	Charles River	Mystic River	Alewife Brook
All Sources	48%	45%	39%
Non-CSO Sources Only	48%	45%	39%
Stormwater Only	64%	47%	41%
Dry Weather Sources Only	100%	100%	100%
Boundaries Only	59%	87%	NA
CSOs Only	99.6%	95.8%	98.6%

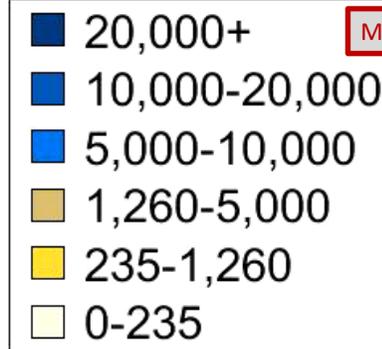


Charles River *E. coli*, 1 year storm, all sources

Sep-23-1992 00:00 *E. coli* Count (#/100mL)



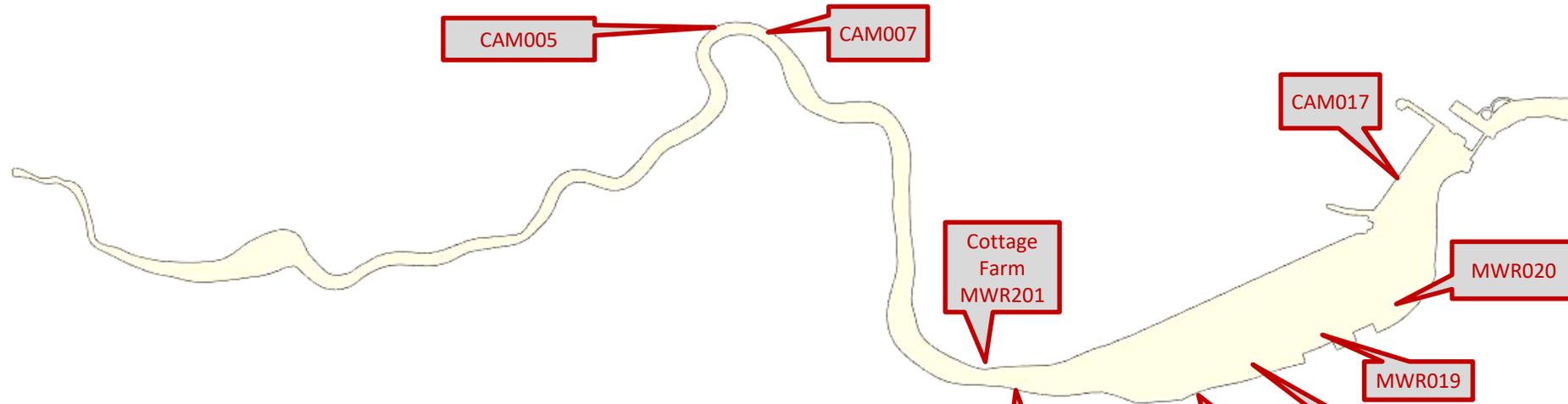
Rainfall (WSHW)	
Initial period	9/22 9:00 – 10:15
Gap with no rain	9/22 10:30 – 23:15
Start of main event	9/22 23:15
Peak of storm	9/23 5:15 – 6:00
End of event	9/23 21:15



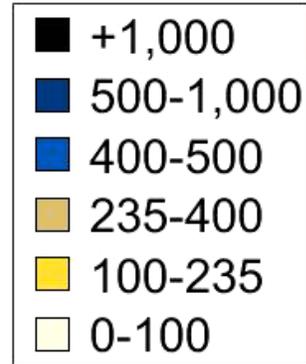


Charles River *E. coli*, 1 year storm, CSO only

Sep-23-1992 00:00 *E. coli* Count (#/100mL)

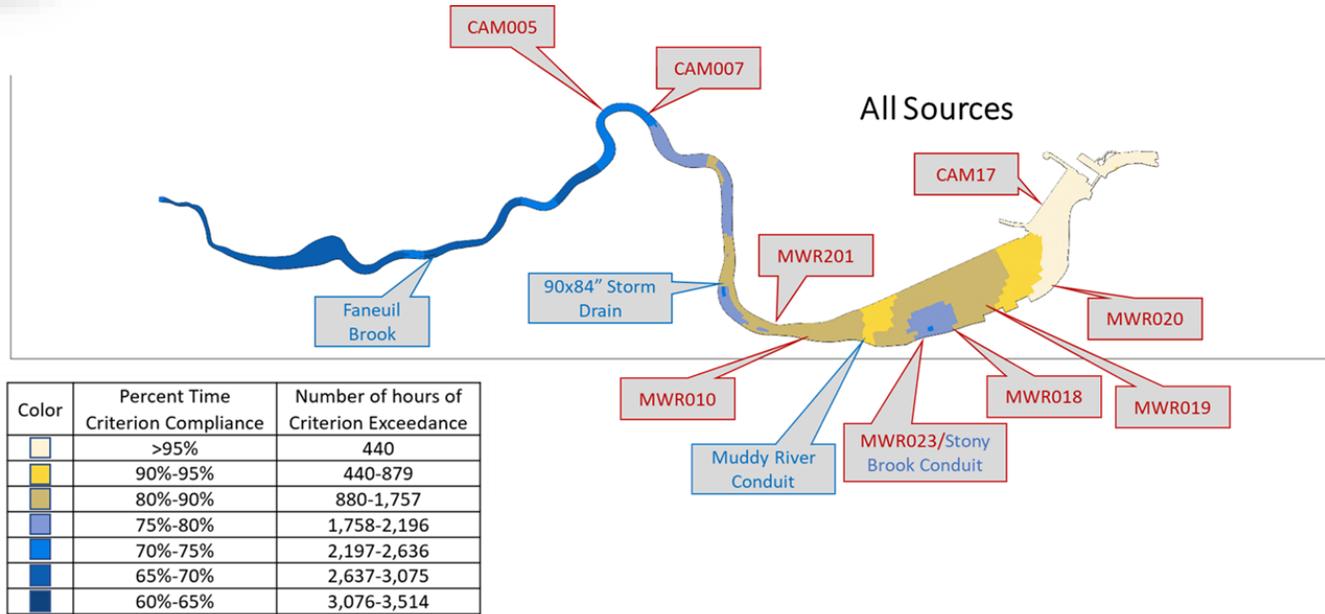


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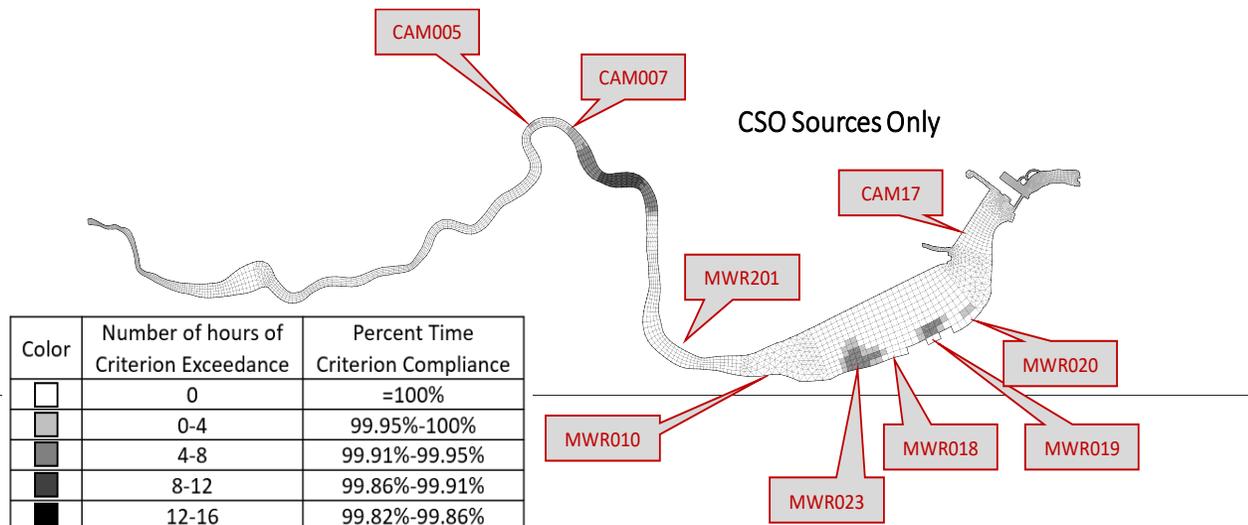
Percent Compliance with Water Quality Standards



Charles River Percent Annual Compliance with Single Sample Max Criterion at Most Affected Location – Typical Year

E. coli 235 MPN/100 mL

All Sources	60.0%
CSOs Only	99.9%



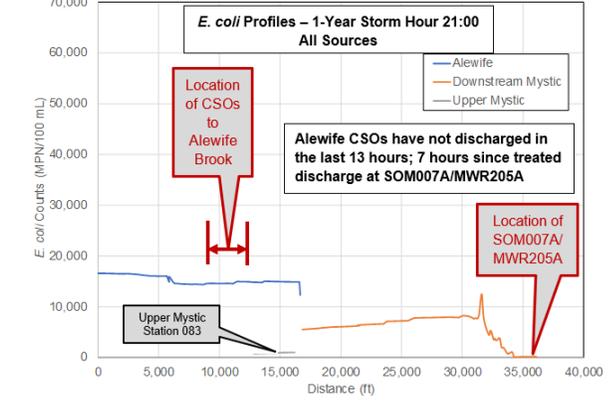
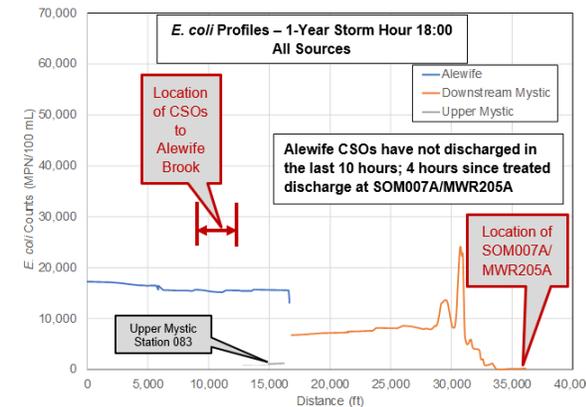
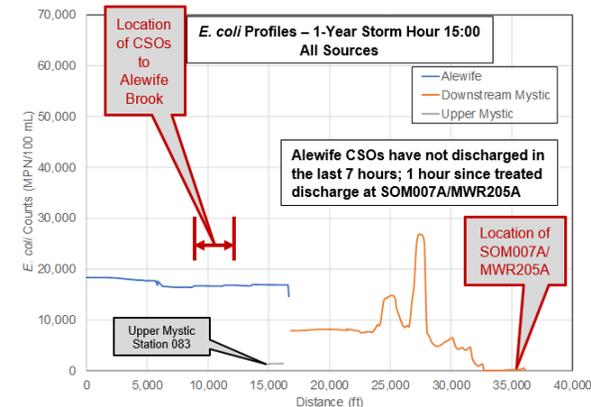
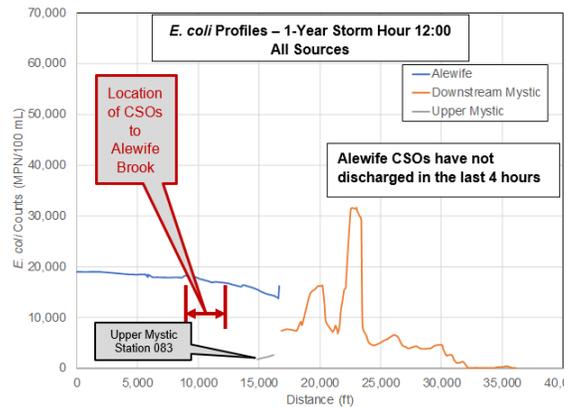
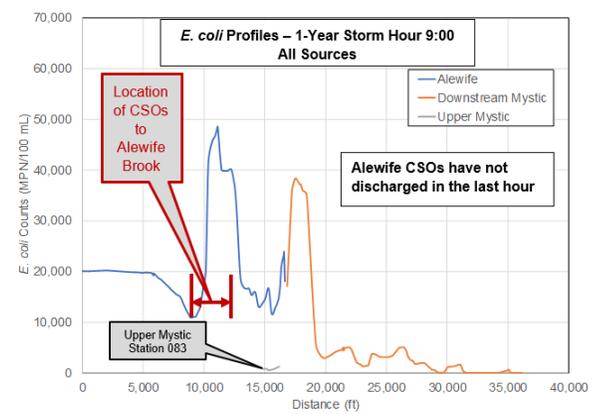
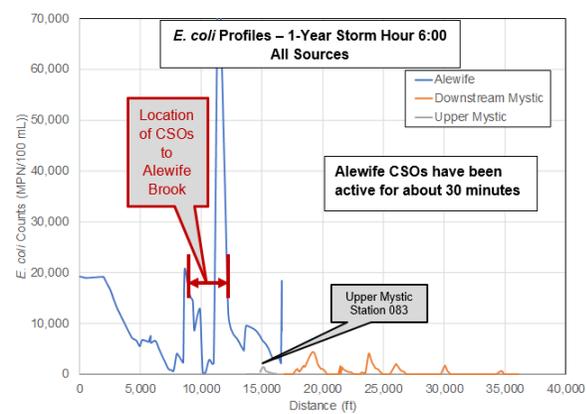
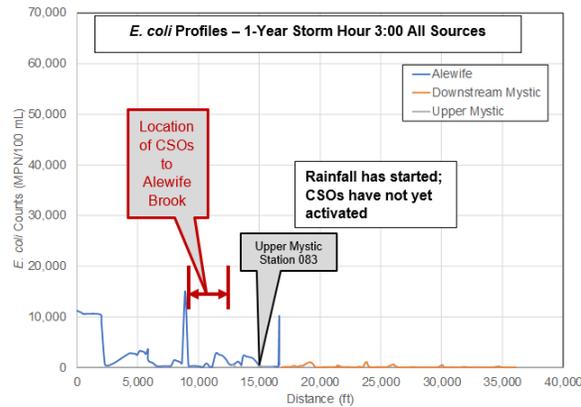
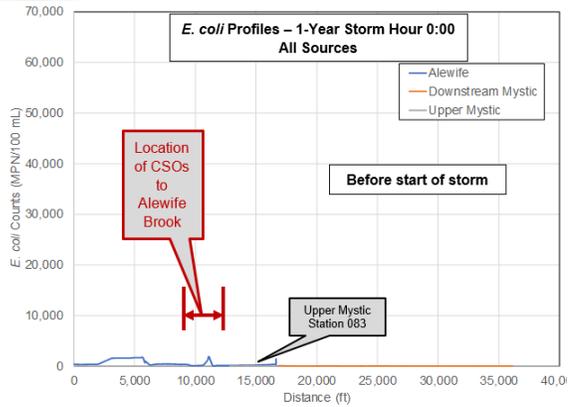


Sensitivity Analysis – Charles River (Typical Year)

Charles River				
	Count Multiplier/ Percentile	Value (# / 100 mL)	<i>E. Coli</i> (Single Sample Maximum Criterion = 235 #/100 mL)	
			Hours of Exceedance	Percent Compliance
Stormwater Only	1.0	14,000	3,121	64%
	0.5	7,000	2,305	74%
	0.2	2,800	1,491	83%
	25 th Percentile	1,110	935	89%
Boundary Only	1.0	Based on Boundary Condition Model	3,612	59%
	0.5		2,727	69%
	0.2		1,502	83%
CSO Only	1.0	Variable	37	99.6%
	2.0	Variable	67	99.2%

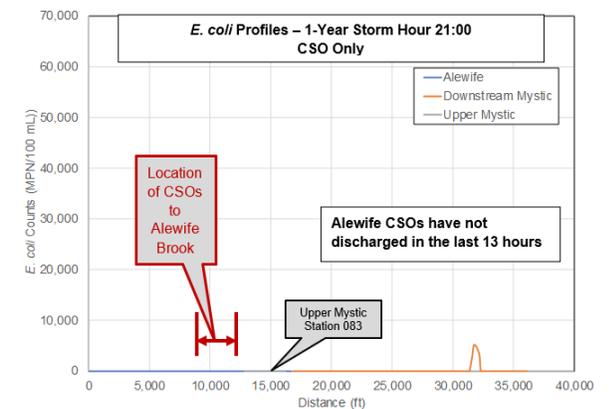
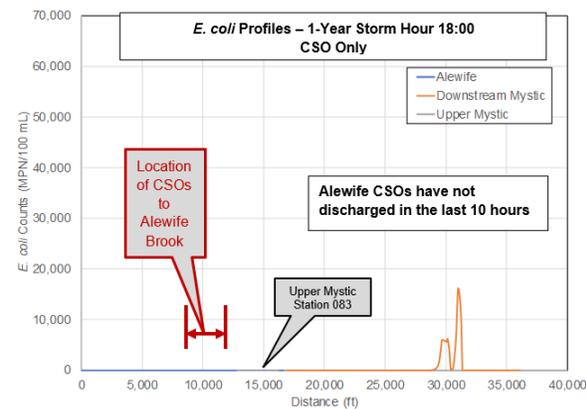
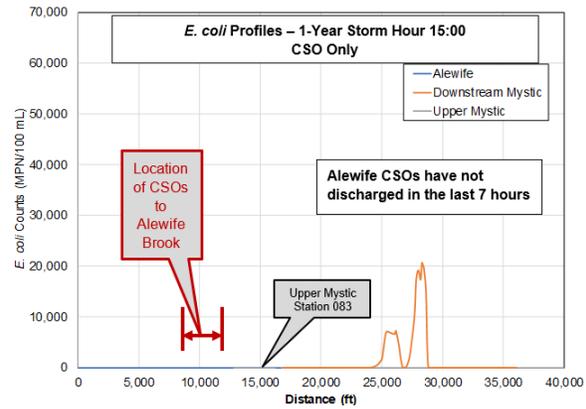
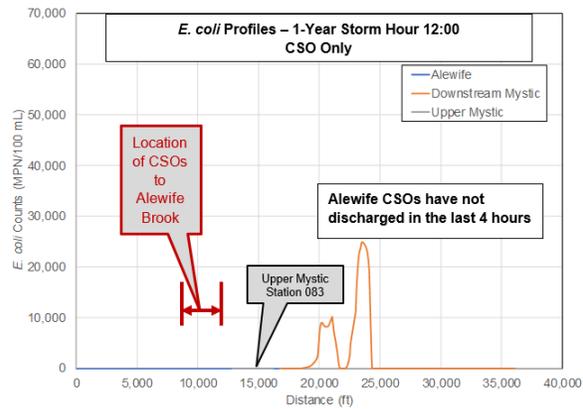
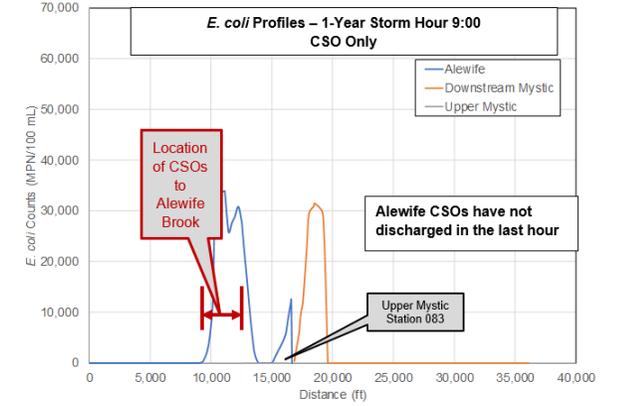
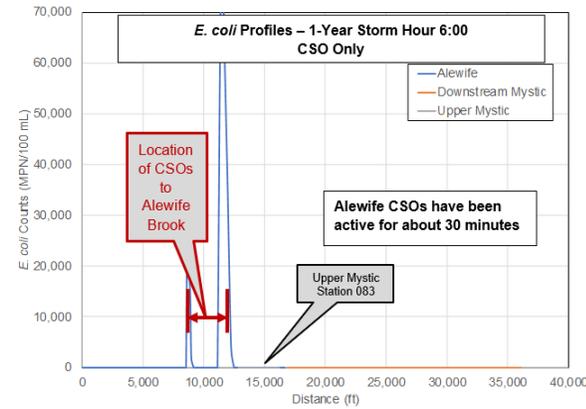
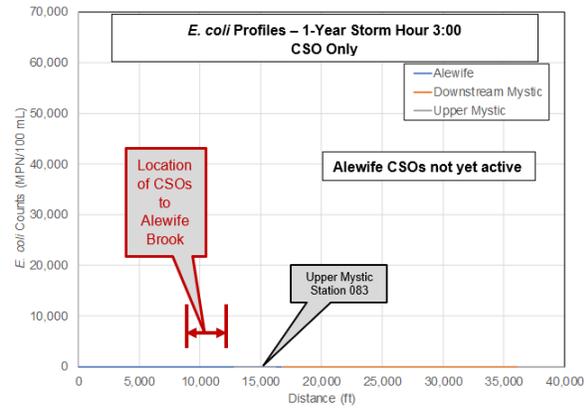


Alewife/Mystic: *E. coli* Profiles, 1-Year Storm, All Sources



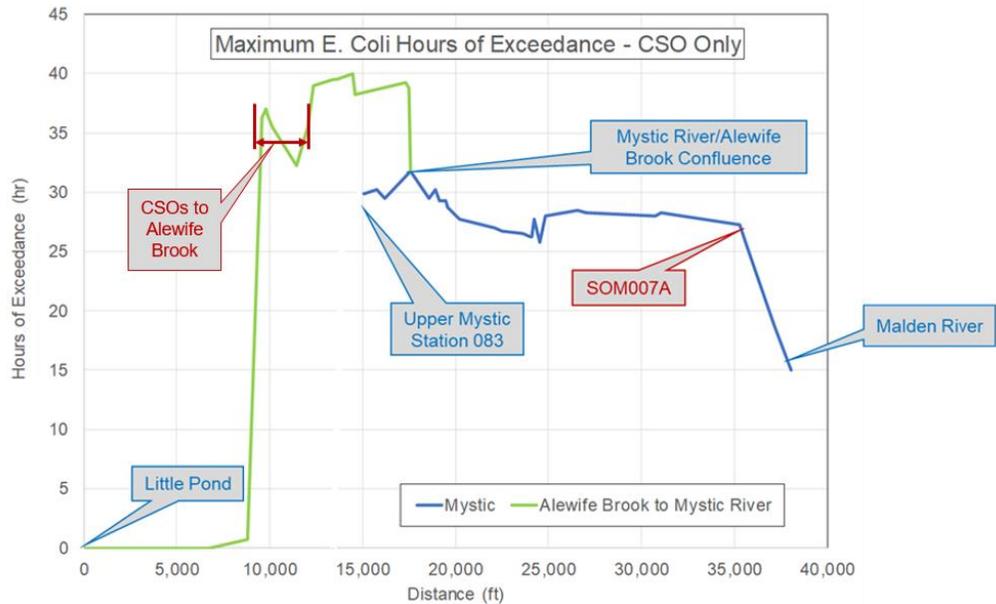
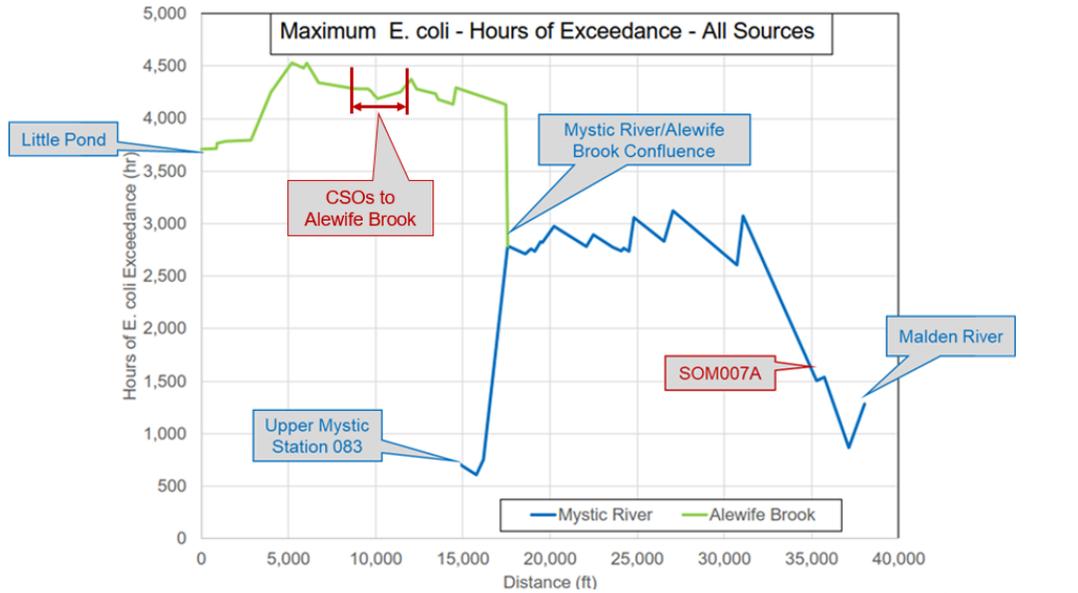


Alewife/Mystic: *E. coli* Profiles, 1-Year Storm, CSO Only





Percent Compliance with Water Quality Standards



Percent Annual Compliance with Single Sample Max Criterion at Most Affected Location – Typical Year

E. coli 235 MPN/100 mL

	Mystic River	Alewife Brook
All Sources	65%	49%
CSOs Only	99.6%	99.5%



Sensitivity analysis – Alewife Brook/Upper Mystic River

Alewife Brook / Upper Mystic River				
	Count Multiplier / Percentile	E. Coli Count (#/100 mL)	<i>E. Coli</i> (Single Sample Maximum Criterion = 235 #/100 mL)	
			Hours of Exceedance	Percent Compliance
Stormwater Only	1.0	25,000	5,352	39%
	0.5	12,500	4,789	45%
	0.2	5,000	4,061	54%
	25 th Percentile	1,110	2,177	75%
Boundary Only	1.0	Reduced from SW = 50,000 SS = 3,000	970	89%
	0.5		390	96%
	0.2		45	99%
CSO Only	1.0	Time varying using mass balance	440	95%
	2.0		503	94%



Water Quality Next Steps: Alternatives Evaluations

- Additional simulations will be conducted to evaluate different bacterial loading reductions
- New baseline based on Q1 2021 conditions (reductions at CAM401A, MWR018-020, Cottage Farm)
- Potential additional sensitivity runs



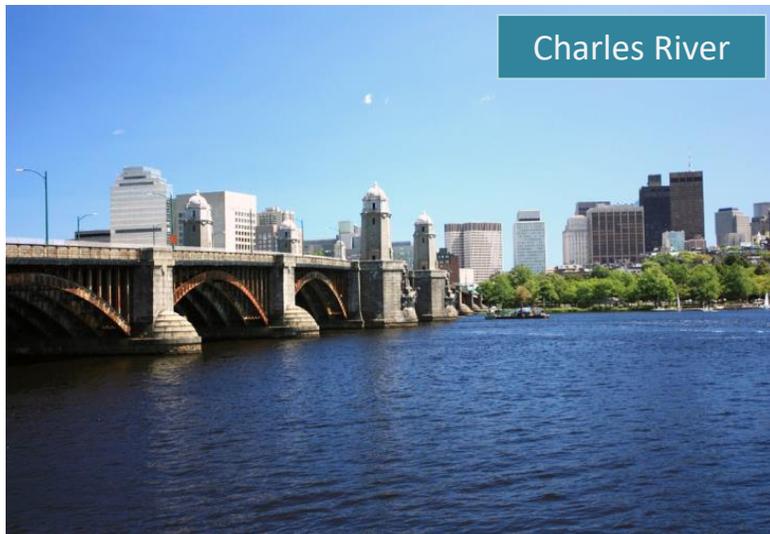
CSO Performance Assessment Remaining Work

- Continue to collect and analyze rainfall and CSO meter data
- Continue to quantify and compare CSO discharges from meter data and model predictions
- Continue to pursue recommended additional system improvements
- Continue site-specific overflow activity investigations; implement measures that help meet LTCP goals



CSO Performance Assessment Remaining Work (cont.)

- Complete water quality assessments: Sep 2021
- Conduct water quality alternatives simulations: Fall 2021
- Issue CSO Performance Assessment and Water Quality Assessment reports: Dec 2021





For More Information

- Semiannual Progress Reports
- CSO Annual Discharge Estimates and Rainfall Analyses (April 30)
- Annual Water Quality Monitoring Summary Reports (July 15)

All are posted on MWRA.com



MWRA CSO Performance Assessment

