Presentation to

Wastewater Advisory Committee

2022 CSO Annual Report

May 12, 2023

Presenters

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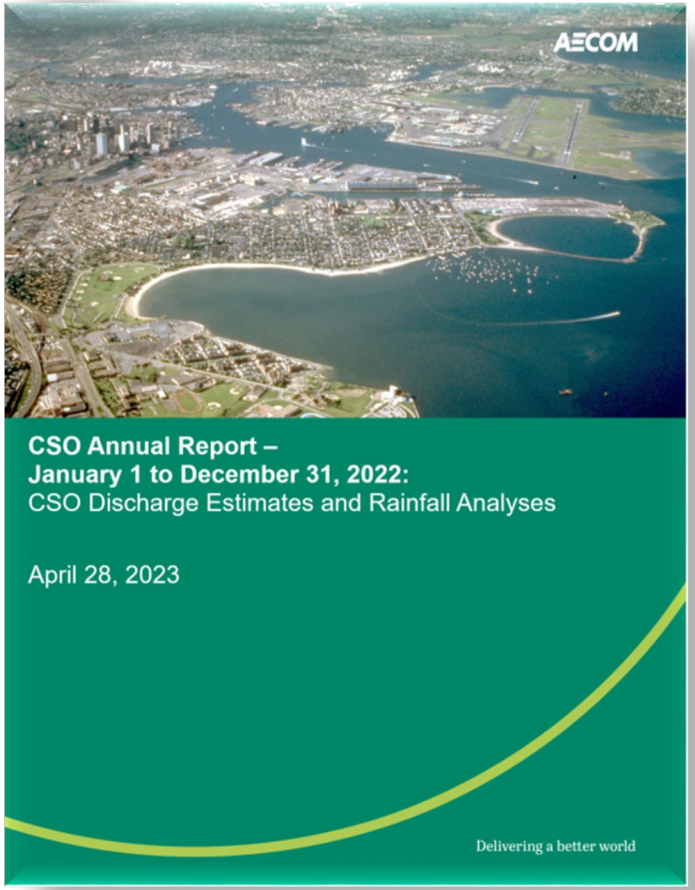
Purpose of 2022 CSO Annual Report



- Second of three reports required by the Court's compliance order which extends until December 2024.
- Summary of 2022 Model Results and Comparison to Meter Data
- Update System Performance Assessment and Comparison with LTCP Levels of Control
- Progress on 16 Sites not meeting LTCP as reported in December 2021

Hydraulic Model Updates

Why is the MWRA updating its hydraulic model?

MWRA, BWSC, Cambridge, Chelsea and Somerville continuously inspect and improve the sewer systems. Including these updates in the MWRA's hydraulic model allows for an accurate comparison of model predictions against meter data.

The updates allow us to also provide updated Typical Year CSO performance results for comparison with the Long-Term Control Plan activation and volume goals.

Location	Summary of Change
CSO Facilities	Updated the Real Time Control (RTC) to include the storm-by-storm operation of the facilities based on facility operation data provided by MWRA.
BOS046, Boston Gate House #1	The model RTC was updated to reflect the actual gate conditions at Gate House #1 during the January 1, 2022 – December 31, 2022 period (the Typical Year version of the model will open the gates in accordance with BWSC's updated SOP's).
East Boston BOS005	Closed regulator RE005-1 (outfall BOS005).
East Boston BOS014	Updated the model to include a new dry weather flow connection at BOS014.
East Boston RE003-2	Closed RE003-2 (discharged to outfall BOS003).
East Boston RE003-7	Closed RE003-7 (discharged to outfall BOS003).
East Boston RE003-12	Updated the configuration of the restricted interceptor connection at RE003-12 by replacing the existing dry weather flow (DWF) connection with 24-inch line and removing a manhole.
Roxbury Canal Sewer (RCS)	BWSC piping configuration for the RCS connection was imported to better represent existing conditions.
MWR018-019-020 Tributary Area	The MWRA's model was updated to include georeferenced subcatchments in the Back Bay and trunk sewers in the Old Stony Brook system to enable further alternative analysis.

2022 Rainfall Analysis

Frequency of Events Table	Total Rainfall (inches)	Total Number of Storms	Number of Storms by Depth				
			Depth	Depth	Depth	Depth	Depth
			< 0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 2.0	≥2.0
			inches	inches	inches	inches	inches
Typical Year	46.80	93	49	14	16	8	6
2022 Average	33.63	93	53	19	13	7	1

- 2022 average of 93 storm events, and an average annual rainfall depth of 33.63 inches
- The Typical Year has 93 storm events and a total rainfall depth of 46.80 inches
- Based on the analysis performed, it is evident that the storms during 2022 were significantly less in depth than those in the Typical Year

Summary of 2022 Modeled and Metered CSO Discharges

	Meter Volume (MG)	Model Volume (MG)
TOTAL UNTREATED	2.58	1.19
TOTAL TREATED	105.26	113.15
GRAND TOTAL	107.84	114.34

Noted differences at: CAM401A, BOS009, BOS003, BOS070/DBC & Union Park

What are the CSO Goals

- Long-term levels of CSO control established in 2006
- Close or 25 year level of control for 30 CSO outfalls
- Activation Frequency & Volume Requirements under Typical Year rainfall for remaining 46 CSO Outfalls

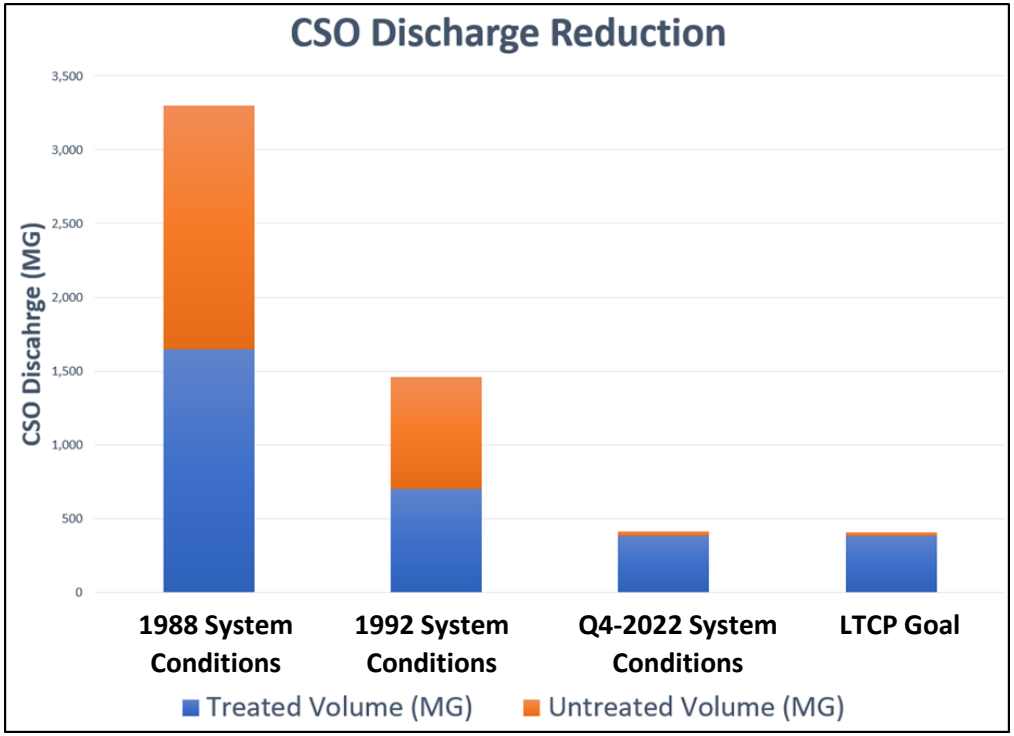
Exhibit B
to Second Stipulation

SUMMARY OF TYPICAL YEAR CSO ACTIVATION FREQUENCY AND VOLUME

OUTFALL	TYPICAL YEAR		REFERENCE (*)
	LONG TERM CONTROL PLAN 2005 (*)		
	Activation Frequency	Volume (MG)	
ALEWIFE BROOK(1)			
CAM001	5	0.19	5
CAM002	4	0.69	5
MWR003	5	0.98	5
CAM004	To be closed	N/A	5
CAM400	To be closed	N/A	5
CAM401A	5	1.61	5
CAM401B	7	2.15	5
SOM001A	3	1.67	5
SOM001	Closed	N/A	
SOM002A	Closed	N/A	
SOM003	Closed	N/A	
SOM004	Closed	N/A	
TOTAL		**7.29**	
UPPER MYSTIC RIVER			
SOM007A/MWR205A (Somerville Marginal)	3	3.48	
SOM007	Closed	N/A	
TOTAL		**3.48**	
MYSTIC / CHELSEA CONFLUENCE			
MWR205 (Somerville Marginal)	39	60.58	
BOS013	4	0.54	6
BOS014	0	0.00	6
BOS015	Closed	N/A	6
BOS017	1	0.02	9

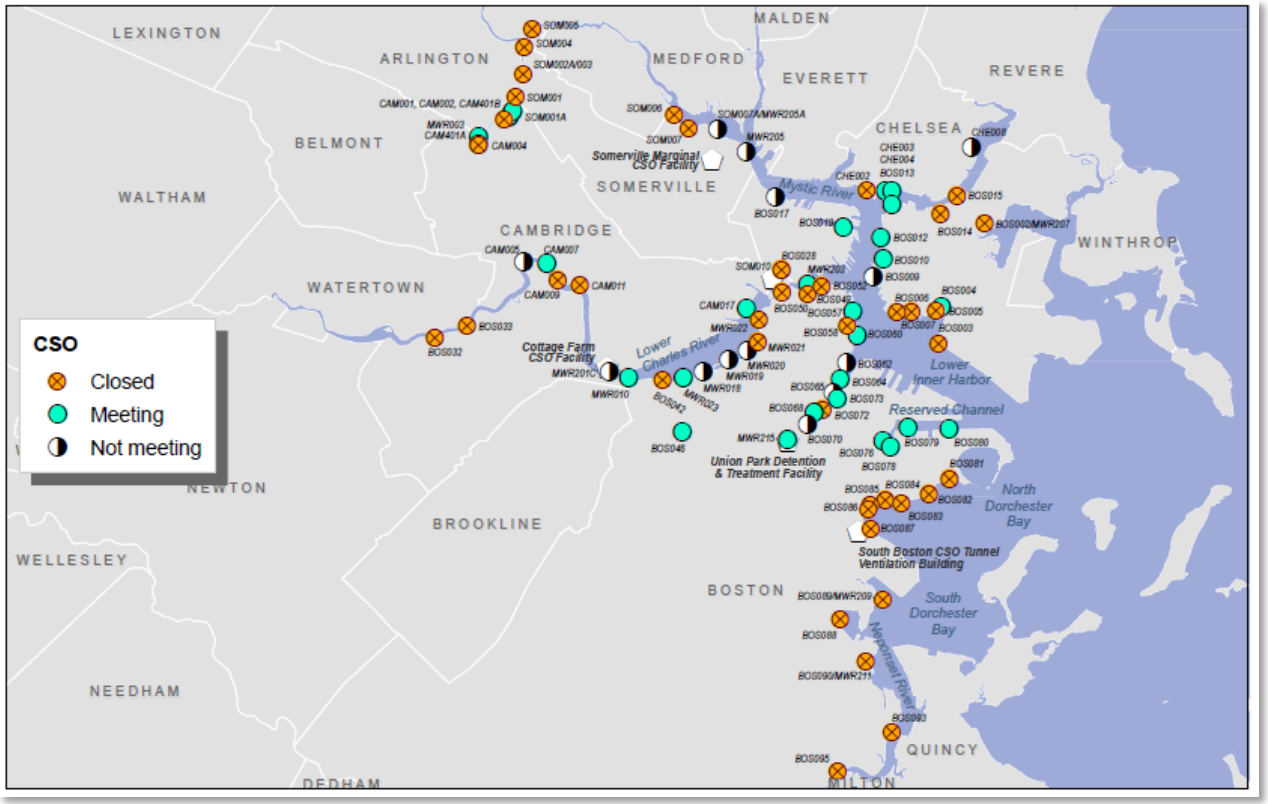
2022 Typical Year CSO Performance Results

- Annual CSO volume system wide reduced by 2.9 billion gallons, a reduction of 88%
- Meeting the Program goal of 88% reduction
- Current 396 MG (375 MG or 95% treated)
- LTCP Goal 404 MG
  (381 MG or 94% treated)



Results of Performance Assessment
Activation Frequency and Volume by Outfall

- 86 outfalls identified in LTCP
- 36 outfalls closed including 11 outfalls not required to be closed by LTCP (*BOS005 closed in 2022*)
- 72 of the 86 outfalls meet LTCP goals for activation frequency and volume as of the end of 2022 (*was 70 - BOS003 & 014 now meet*)
- 8 CSO have projects under designs or construction with projected completions by the end of 2024 (*was 10 - BOS003 & 014 complete*)
- Investigations nearing completion at 6 particularly challenging CSOs



Progress on 10 of 16 CSOs not meeting as of December 2021 Report

OUTFALL	LOCATION	SYSTEM IMPROVEMENT(S)*	TO BE IMPLEMENTED BY	TENTATIVE SCHEDULED COMPLETION
MWR205	Somerville Marginal CSO Facility	Construct new connection from the facility influent conduit to the interceptor and replace tide gate. Project is currently in the design phase. The project is being coordinated with several other MassDOT projects in the area. The project is scheduled to bid in fall 2023, completed in Fall 2024.	MWRA	2024
SOM007A/ MWR205A				
BOS003 (Complete)	East Boston	Complete BWSC Sewer Separation Contract 3, including upgrade of interceptor connection at regulator RE003-12. Construction began in August 2021 and is ongoing. As of March 1, 2023, separation is complete for approximately 92% of the area to be separated. Regulators RE003-2 and RE003-7 were closed in May of 2022. The reconstruction of the restricted interceptor connection at regulator RE003-12 was completed in May of 2022. Remaining separation work is expected to be completed in Winter of 2023.	BWSC	2023
BOS009				
BOS014 (Complete)		Construct new interceptor connection as part of BWSC Sewer Separation Contract 3. New connection has been completed and was brought online January 24, 2022.		
CHE008	Chelsea Creek	Replace/upgrade interceptor connection. Final design is complete and the construction contract was awarded in December 2022. Construction is scheduled to begin in April 2023 and be completed in Summer of 2023.	MWRA	2023
BOS017	Mystic/Chelsea Confluence	Modify existing siphon structure. Design is in progress. Construction is estimated to be completed in 2024.	BWSC	2024
BOS062	Fort Point Channel	Modify existing regulator structure. Design is in progress. Construction is estimated to be completed in 2024.	BWSC	2024
BOS065		Modify existing regulator structure. Design is in progress. Construction is estimated to be completed in 2024.	BWSC	2024
BOS070		Construct a new relief pipe parallel to the BMI. Design is in progress. Construction is estimated to be completed in 2024.	BWSC	2024

Current Construction – CHE008

Bypass pumping equipment

Traffic control devices

Six Challenging Sites

Alewife Brook

SOM001A

Upper Charles River

CAM005

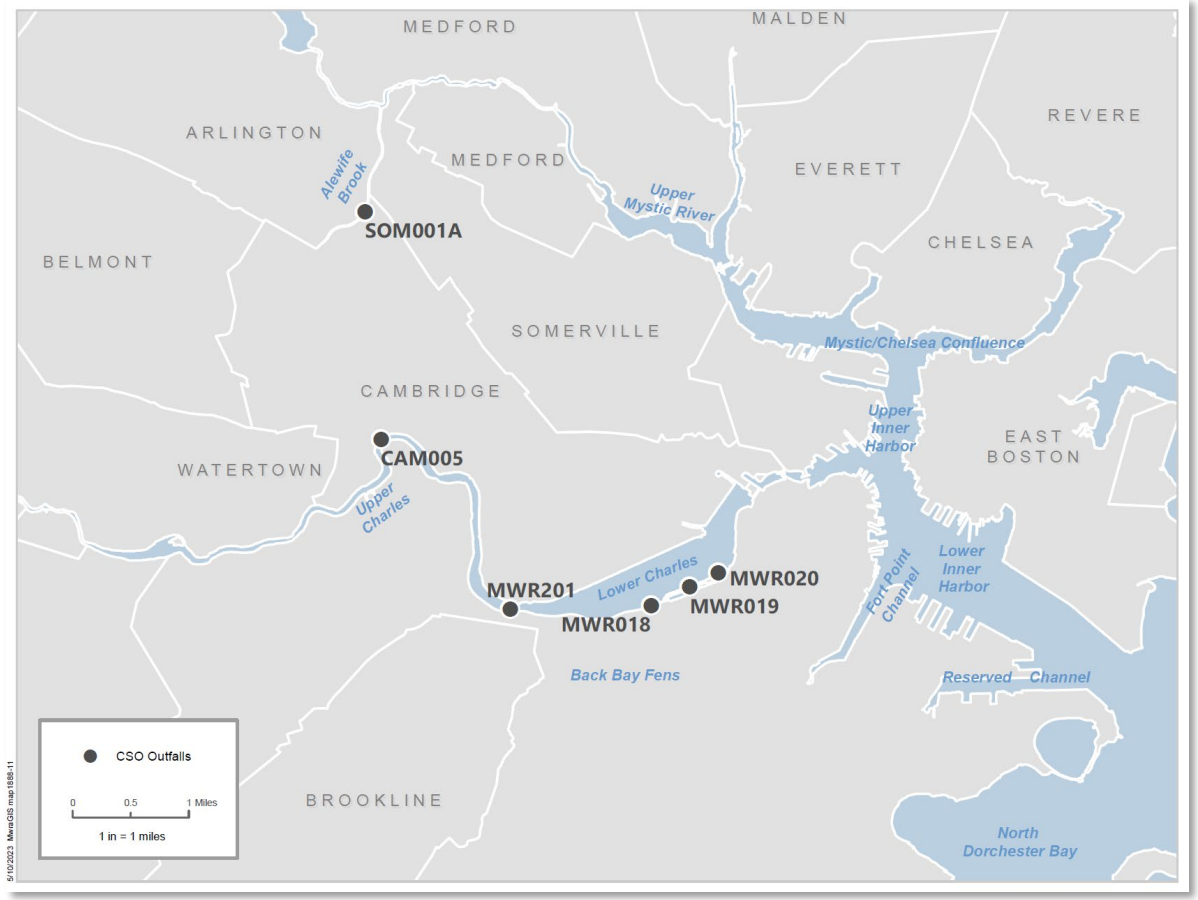
Lower Charles River

Cottage Farm

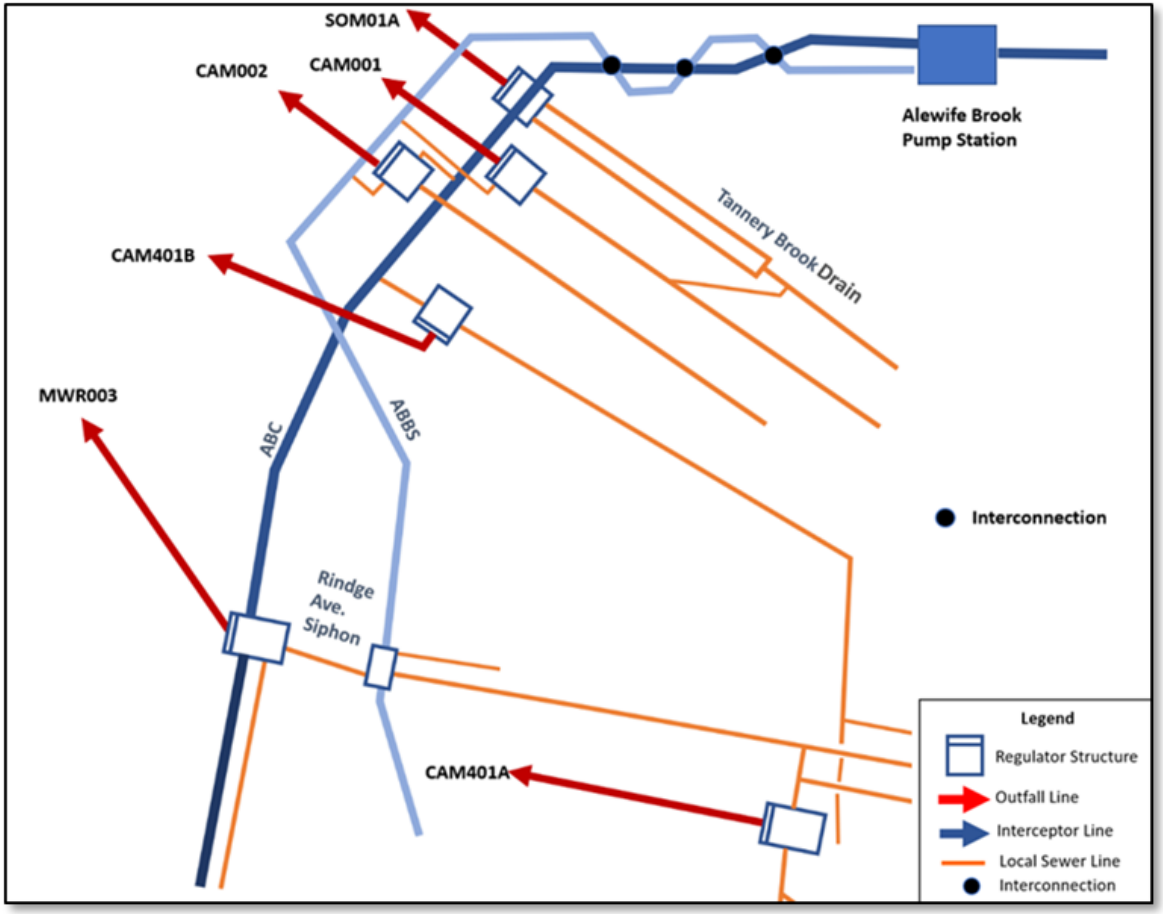
MWR018

MWR019

MWR020



SOM001A Schematic



SOM001A

OUTFALL	TYPICAL YEAR			
	Q4-2022 SYSTEM CONDITIONS MODEL		LONG TERM CONTROL PLAN	
	Activation Frequency	Volume (MG)	Activation Frequency	Volume (MG)
SOM001A	**8**	**4.47**	**3**	**1.67**

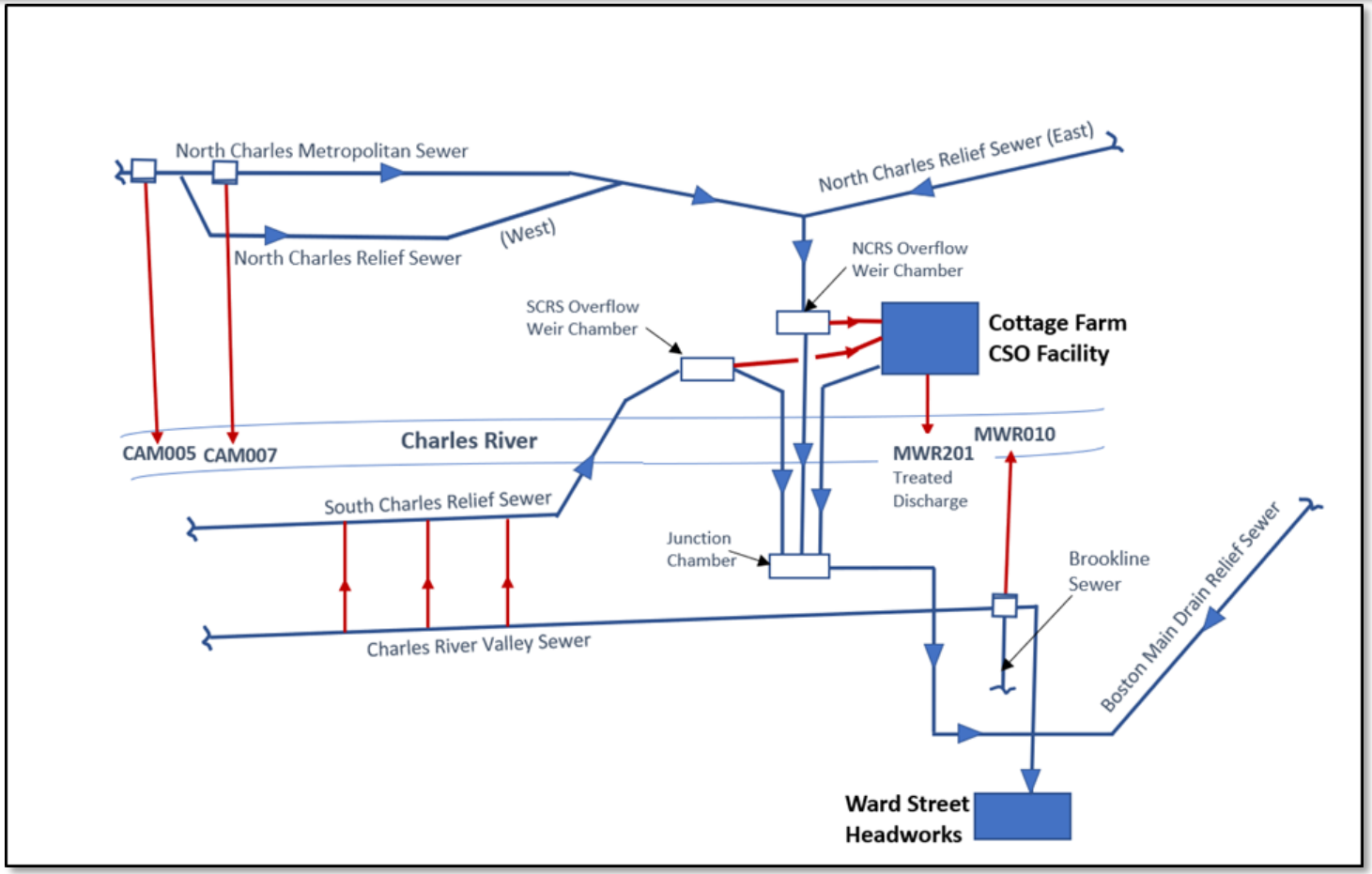
Alternative identified that would meet the LTCP goals but causes MWR003 to exceed goal by 0.11MG.

- Raising the weir in the SOM001A regulator 3-inches
- Increasing the size of the orifice connection to the Alewife Brook Conduit (ABC) from 32x32-inch to 56x32-inch with a modulating gate to restrict the opening during large storms to prevent system flooding.
- Relining the ABC and Alewife Brook Branch Sewer (ABBS) from approximately the location of SOM001A to the Alewife Brook Pump Station to slightly increase the conveyance capacity

Next Steps

- *Developing cost estimate.*
- *Working with the City of Somerville to evaluate whether flood mitigation alternative will also support CSO control.*
- *Assess the cost/benefit of further work at this time.*

CAM005 and MWR201 Schematic



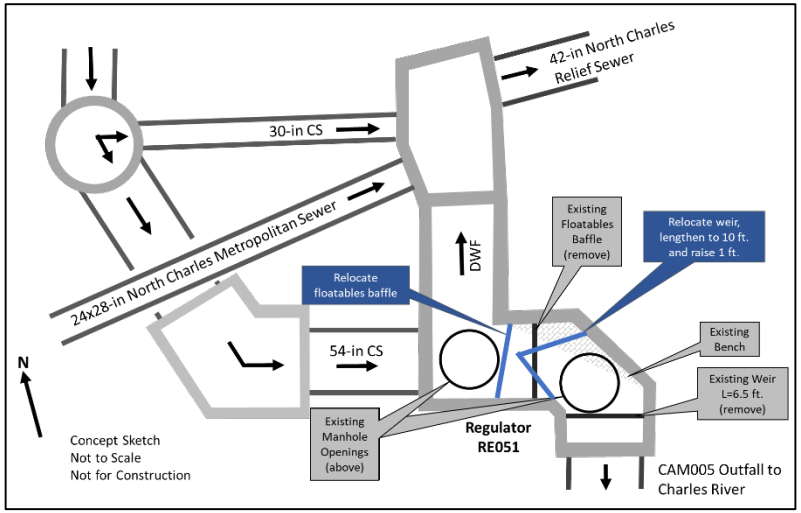
CAM005

OUTFALL	Q4-2022 SYSTEM CONDITIONS MODEL		LONG TERM CONTROL PLAN	
	Activation Frequency	Volume (MG)	Activation Frequency	Volume (MG)
CAM005	**8**	**0.75**	**3**	**0.84**

Alternative identified of raising and lengthening the CAM005 weir brings the outfall closer to meeting the LTCP goal for activations. (5 Activations, 0.68 MG)

Next Steps

- Cambridge completing outfall cleaning
- Determine weir constructability
- Evaluating green infrastructure and sewer separation with weir alterations.
- Further develop the concept design to include optimal configuration and materials
- Develop cost estimates
- Assess the cost/benefit of further work at this time



Cottage Farm (MWR201)

OUTFALL	TYPICAL YEAR			
	Q4-2022 SYSTEM CONDITIONS MODEL		LONG TERM CONTROL PLAN	
	Activation Frequency	Volume (MG)	Activation Frequency	Volume (MG)
MWR201 (Cottage Farm)	**2**	**7.81**	**2**	**6.30**

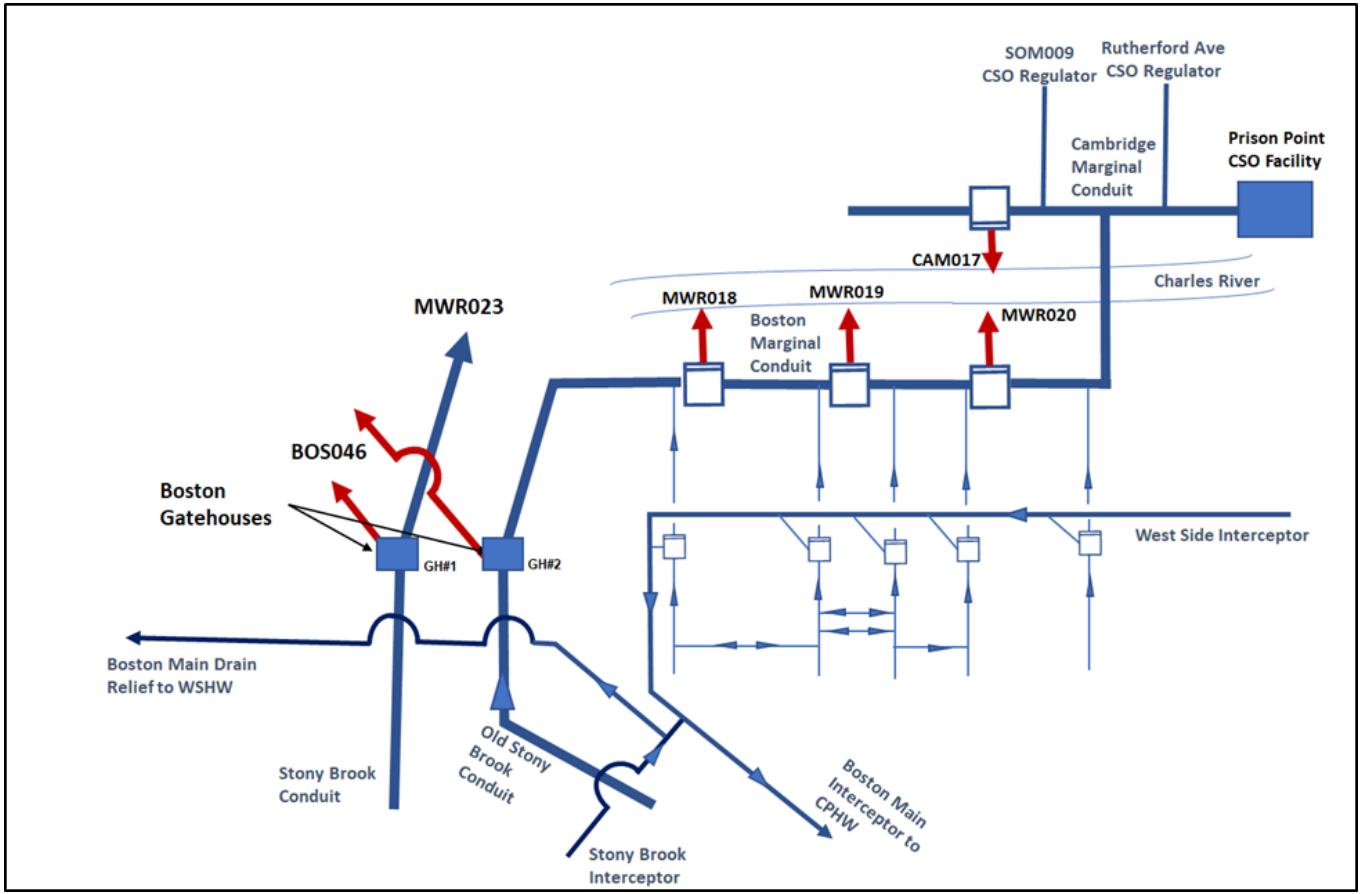
Investigations into alternatives that could reduce the volume at the Cottage Farm CSO Facility have included

- Upstream sewer separation and targeted groundwater infiltration removal
- Facility operation optimization
- CSO storage (*only viable alternative*)

Next Steps:

- *Develop layout and costs associated with CSO storage sized to reduce the Typical Year discharge to meet the LTCP goal*
- *Assess the cost/benefit of further work at this time*

MWR018, 019, 020 Schematic



MWR018/019/020

OUTFALL	Q4-2022 SYSTEM CONDITIONS MODEL		LONG TERM CONTROL PLAN	
	Activation Frequency	Volume (MG)	Activation Frequency	**Volume (MG)**
MWR018	2	0.42	0	**0.00**
MWR019	2	0.16	0	**0.00**
MWR020	**2**	**0.05**	**0**	**0.00**

Investigations into alternatives that could reduce the activation frequency and volume at outfalls MWR018/019/020 have included:

- Sewer separation
- Separate stormwater removal from the collection system
- Green infrastructure/subsurface stormwater infiltration

Next Steps

- *Develop combinations and costs of sewer separation, stormwater removal and green infrastructure to meet LTCP goals.*
- *Assess the cost/benefit of further work at this time*

Summary

- 2022 discharged only 114 MG or 29% of current TY estimates (396 MG).
- Total CSO discharge is now below the LTCP goal by 8MG (404MG vs. 396MG in TY)
- The MWRA and its CSO partners continue working to bring CSO in-line with LTCP goals with:
  - 2 CSO additional CSO now meeting LTCP goals
  - 8 CSO with projects advancing forecast to meet by end of 2024
  - 6 CSO where investigations and cost development are progressing to help in accessing cost/benefit for further work
  - Projects with reduce total CSO volumes even further below the total LTCP goals
- In addition, the CSO communities continue to pursue work that further reduce CSO discharges beyond 2024.

Questions?