

CITY OF SOMERVILLE, MASSACHUSETTS  
KATJANA BALLANTYNE  
MAYOR  
DEPARTMENT of INFRASTRUCTURE & ASSET MANAGEMENT  
ENGINEERING DIVISION



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Susannah L. King  
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And

Todd J. Borci  
Office of Environmental Stewardship  
US EPA New England  
5 Post Office Square, Suite 100  
Boston, MA 021109-3912

**Re: NPDES Permit No. MA0101982 - 2022 Annual Report**

Dear Ms. King and Mr. Borci,

Enclosed please find copies of the City of Somerville's Annual Report for National Pollutant Discharge Elimination System (NPDES) permit (Permit No. MA0101982) for calendar year 2022.

If you have any questions, please contact me at 617-448-3716 or [lhiller@somervillema.gov](mailto:lhiller@somervillema.gov).

Regards,

*Lucica Hiller*

Lucica S. Hiller, EIT  
Stormwater Program Manager

Attachment: NPDES Permit No. MA0101982- 2022 Annual Report



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**NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
COMBINED SEWER OVERFLOW PERMIT NO. MA0101982  
2022 ANNUAL REPORT**

This report has been prepared in accordance with Part I, Section D of the above referenced permit issued to the City of Somerville Department of Public Works on 11 June 2012. The permit authorizes the City of Somerville to discharge flows from two Combined Sewer Overflows (CSO), one on the Alewife Brook designated as SOM001A, and one on the Mystic River designated as SOM007A.

**1. Activation Frequency and Discharge Volumes**

In accordance with Part I, Section C, Paragraph 4, the City of Somerville (the City) maintains a meter at SOM001A to supply direct measurement of discharges from SOM001A, and utilizes estimates provided by the Massachusetts Water Resources Authority (MWRA) to determine discharges from SOM007A.

SOM001A

SOM001A is located on the Alewife Brook at a location within the City of Cambridge where flow from the western and central portions of Somerville discharges to the MWRA's Alewife Brook Conduit via Somerville's Tannery Brook Conduit. In calendar year 2022, the CSO at this location activated a total of one (1) time, in comparison to the eight (8) activations recorded in calendar year 2021, three (3) activations recorded in calendar year 2020, nine (9) activations recorded in calendar year 2019, and twenty-two (22) activations recorded in calendar year 2018. Table 1 summarizes the duration and estimated of the discharge as measured by the existing permanent meter installation, the cumulative precipitation depth, and the peak 15-minute interval depth.

Somerville utilized a professional metering firm for the installation and maintenance of flow metering equipment and the assessment of CSO activations, volumes, and durations based on the meter data.





Table 1: SOM001A 2022 Metered CSO Discharges

Activation Date	Duration (hours)	Volume (gallons)	Cumulative Precipitation (inch) <sup>(2)</sup>	Peak 15-minute Interval (inch) <sup>(2)</sup>
14-October-2022	0.05	32,000	0.82	0.14

Notes:

1. Metered data are estimates of outfall discharge calculated using data from sensors and considering physical configurations and constraints.
2. Cumulative precipitation and peak interval data acquired from the Somerville DPW Building rain gauge.

### SOM007A

SOM007A, jointly permitted to MWRA as MWR205A, discharges treated effluent from the MWRA Somerville Marginal CSO Screening and Disinfection Facility, together with separate stormwater that enters the facility’s outfall, to a location upstream of the Amelia Earhart Dam in the Mystic River Basin during mid- to high-tide conditions. Under low tide conditions, discharge from the facility is through MWR205 downstream of the dam. While SOM007A is permitted to Somerville under the above referenced permit, MWR205 and MWR205A are permitted to MWRA under Permit No. MA0103284. MWRA provides discharge data for the Somerville Marginal Facility.

Discharges at SOM007A, summarized in Table 2 and detailed in Table 3, have been provided by MWRA. The volumes shown represent both MWRA’s model results and MWRA’s metering data. The metering data indicates a total of four (4) activations and total discharge volume of 3.12 MG in calendar year 2022. The CSO discharge volume at SOM007A/MWR205A is total discharge, comprising of both treated CSO and separate storm water entering the overflow conduit downstream of the CSO facility. Additional information regarding discharges at SOM007A/MWR205A and MWR205 can be found in the MWRA’s 2022 Annual CSO Discharge Report.

Table 2: SOM007A/MWR205A/MWR205 2022 CSO Activation Summary Table

Activation Frequency Period	Metered Activations	Metered Volume (MG)
2022	4	3.12





Table 3: SOM007A/MWR205A 2022 CSO Activations by Storm

Activation Dates	Metered Volume (MG)	Metered Duration (hours)
17-Jan-22	0.36	2.00
19-Apr-22	0.04	0.15
30-Nov-22	0.24	0.33
16-Dec-22	2.48	3.33

### 3. MWRA Model Comparison

The comparison of metered estimates and MWRA modeled CSO discharges from January 1, 2022 to December 31, 2022 for the 2022 rainfall is summarized in Table 4.

The Q4-2022 system conditions model was used to simulate the storm events from January 1, 2022 to December 31, 2022. Somerville and MWRA have been collecting meter data at each of the outfalls listed in the LTCP as part of the CSO Notification Program. These meter data were used to tabulate the CSO activation frequency and volume for the January 1, 2022 to December 31, 2022 period. Calculating CSO discharges from meter data for the purpose of developing volume estimates is inherently difficult and can be inaccurate given complex hydraulics, difficulty in proper calibration given normal dry conditions, etc.

The model was able to replicate the storm responses for the majority of storm events in the 2022 period. However, it was not possible to match all of the modeled and metered activations for every meter and storm event. These differences may be attributed to various conditions or combination of conditions, including rainfall data quality and rainfall spatial variation, unknown transient conditions in the collection system, and the accuracy of overflow metering data.

Table 4: SOM001A and SOM007A/MWR205A CSO Volume & Frequency for Metered and Modeled Events

Outfall	Regulator	January 1, 2022 – December 31, 2022			
		Meter		Model	
		Activation Frequency	Volume (MG)	Activation Frequency	Volume (MG)
SOM001A <sup>(1)</sup>	RE-01A	1	0.03	1	0.10
SOM007A/MWR205A <sup>(2)</sup>		4	3.12	4	5.00

Notes:

1. The meter data reported for SOM001A is the data from the City of Somerville permanent meter installation.
2. Outfall SOM007A/MWR205A is a side-outlet relief off outfall MWR205, downstream of the Somerville Marginal Facility. This outfall can activate, and discharge treated flow during storm events when high tides restrict the discharge from outfall MWR205. The MWRA Q4-2022 system conditions model was used to simulate the storm events from January 1, 2022 to December 31, 2022.





## 4. Hydraulic Model Updates

In 2022, the City of Somerville completed the Citywide Drainage and Water Quality Improvements Plan, which included many hydraulic model pipe refinements and flow calibration in all of the sewersheds. This Master Planning effort identified 22 conceptual projects to reduce CSOs in the combined system areas, mitigate localized flooding, and evaluate potential water quality features.

During this same year, the City started the development of the CSO Control Plan Update as required by the Alewife Brook/Mystic River CSO Variance. The City is working with Cambridge and the MWRA to unify their hydraulic models as they are also subject to the same CSO Variance. The models were merged into one so that CSO reduction alternatives can be evaluated at a regional scale and their impacts well understood beyond the borders of a specific community or entity. This model integration process consisted of stitching the most up to date, existing conditions models from all three entities and then testing the model performance by comparing the flow and CSO results for metered events as well as for the typical rainfall year, which has been used to date to assess compliance with the CSO Long-Term Control Plan. During the integration process several small changes were necessary such as:

- Adding a new, small connection between regulator RE-071A upstream system and the Somerville-Medford MWRA interceptor via a common manhole.
- Adjusting base flows in the SOM007A and SOM009 tributary areas to better match recent meter data. The number of activations and volumes of CSO during the typical rainfall year were also checked and a very close match was attained after model integration.

## 5. CSO Abatement Work Report

### Sewer Inspection, Cleaning, and Rehabilitation

The City has continued pipeline inspections, including cleaning, CCTV inspection, and flow isolation work throughout 2022. These activities are informing the City's pipe rehabilitation efforts to further reduce Infiltration and Inflow (I/I). The City rehabilitated 6,785 LF of pipe during 2022.

The City utilized CCTV review to select candidate sites for an approximately \$4.5 million sewer rehabilitations project that is expected to be constructed through Calendar Year 2024. The rehabilitation work will include approximately 14,800 linear feet of CIPP lining and approximately 2,300 linear feet of gravity sewer pipe excavation and replacement. The completion of design and bid of this project is expected in Spring 2023, with construction to follow.

Additionally, the City plans to implement a fourth phase of CCTV inspections and cleaning of approximately 170,000 linear feet of sewer and combined sewer pipes in Calendar Year 2023.

### SOM001A

For SOM001A, the MWRA hydraulic model predicted that the typical year activations and discharge volumes are not meeting the LTCP goals as of December 31, 2021. The City and MWRA have been





working together on field inspections, modeling, and the reevaluation of system conditions to explain and attempt to mitigate higher CSO activity. MWRA has modified the Alewife Brook Pumping Station wet weather operation strategy as recommended in the MWRA Alewife Brook Pumping Station Optimization Evaluation Report (April 27, 2021). The modified pumping strategy improves pumping operation, even it results in only minor CSO discharge reduction at upstream Alewife Brook outfalls, including at SOM001A.

MWRA has investigated a range of alternatives to potentially reduce the activation frequency and volume and work towards achieving the LTCP goals. One promising alternative included raising the weir in the SOM001A regulator, increasing the conveyance of flow between the SOM001A regulator and the interceptor system, and diverting upstream flows away from the Tannery Brook Drain. This alternative has been evaluated but a feasible plan to meet the LTCP goals has not yet been identified. The City of Somerville's model estimates significant flooding in Davis Square when this alternative is considered. For this reason, Somerville and MWRA continue to work together to investigate additional alternatives that might provide CSO reduction benefits, including the conceptual projects identified in the Citywide Drainage and Water Quality Improvements Plan.

### SOM007A

For SOM007A, the most recently updated and calibrated MWRA hydraulic model predicts that the typical year activations and discharge volumes will meet the LTCP goals after December 31, 2021.

MWRA is currently in the design phase of constructing a new connection from the facility influent conduit to the interceptor and replace tide gate. Survey has been conducted and borings needed to design the connecting structure and gate chamber are being coordinated with MassDOT. Project is scheduled to bid in Fall 2023 and be completed in Fall 2024.

The City has completed the rehabilitation of the Marginal Sewer Interceptor, which is the most downstream sewer collecting flow from the City and conveying it to the Somerville-Medford Branch Sewer or for treatment at the Somerville Marginal CSO Facility in larger storms.

### Large Capital Infrastructure Projects

The City is continuing investment in updating and upgrading the sewer, stormwater, and drinking water infrastructure. The Spring Hill Sewer Separation Project includes installing new storm drains that separate stormwater from the existing combined sewer, installing green stormwater infrastructure system, planting new trees, and improvements to the streetscape. Construction is ongoing, with underground utility work and green stormwater infrastructure installations expected throughout 2023 and surface and streetscape restoration expected to be complete in 2024.

The Poplar Street Pump Station will collect the stormwater from the newly separated Spring Hill project and future sewer separation projects in the Union Square area and store it in a 4 MG underground stormwater tank for pumping into the MBTA drain that eventually discharges into the Millers River. The pump station and accompanying underground storage tank will fundamentally change the way stormwater drainage is managed for approximately 60% of the city. It represents a major investment in modernizing





the City's stormwater management infrastructure and increasing preparedness for extreme weather events. The project broke ground in Winter of 2023 and is expected to be completed late 2025- early 2026.

The benefits of these two projects include reducing flooding in the larger Union Square area, improving water quality, reducing wet weather flow to the MWRA Cambridge Interceptor, and ultimately reducing CSO discharges at Prison Point.

### Regulator RE097

The regulator at the intersection of Day and Elm Street, located inside sewer manhole CA-2400, consists of a weir wall structure that diverts some of wet weather flows away from the SOM009 regulator to the Tannery Brook conduit, which discharges into the MWRA Alewife Brook Conduit, and during high intensity storms, can discharge untreated CSOs into the Alewife Brook through the SOM001A outfall.

During regular maintenance of the permanent meter installation at this location, the back side of the weir wall was observed broken, which allowed dry weather flows to discharge in the Tannery Brook conduit and system. Work to repair the weir wall was planned during 2022 and completed on November 15, 2022 by a third-party contractor. Subsequent investigation of the regulator structure in March of 2023 revealed that the work done in November of 2022 consisted of complete blockage of the regulator structure and the overflow connection. Work to re-open the overflow connection was completed on April 5th, 2023. Based on the metered and modeled activation and volume data presented in Table 4, the impact from the weir damage appears to be minimal in term of CSO discharges at SOM001A.

The City started a review of rain events that could have potentially triggered CSO discharges at SOM001A since the overflow connection has been blocked in November 2022. The City estimates that a CSO discharge would have activated at SOM001A on March 14, 2023. A more detailed review of the rain events, including modeling estimates for discharge volumes and durations is currently ongoing and will be detailed in the Somerville 2023 CSO Annual Report.

