

UNITED STATES DISTRICT COURT  
for the  
DISTRICT OF MASSACHUSETTS

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UNITED STATES OF AMERICA,

Plaintiff,

v.

METROPOLITAN DISTRICT COMMISSION,  
et al.,

Defendants.

.....

CONSERVATION LAW FOUNDATION OF  
NEW ENGLAND, INC.,

Plaintiff,

v.

METROPOLITAN DISTRICT COMMISSION,

Defendants.

CIVIL ACTION  
No. 85-0489-RGS

CIVIL ACTION  
No. 83-1614-RGS

MWRA ANNUAL REPORT  
FOR CALENDAR YEAR 2021

The Massachusetts Water Resources Authority (the “Authority” or “MWRA”) submits the following annual compliance report for the period from January 1, 2021 through December 31, 2021, and supplementary compliance information in accordance with the Court's order of December 23, 1985, and subsequent orders of the Court including the Court’s February 18, 2022, Schedule Seven Compliance Order Number 250. (ECF No. 1901).

I. Introduction

On December 30, 2021, the Authority filed with the Court its Final Combined Sewer Overflow Post Construction Monitoring Program and Performance Assessment Report (“Final Assessment Report”). (ECF 1898). Among other key findings, the Authority reported that as of the end of 2021, the Combined Sewer Overflow (“CSO”) Long-Term Control Plan (“LTCP”) goals for average annual CSO activation and volume were met, or materially met, at 70 of the 86 CSO outfalls for which performance targets were defined.<sup>1</sup> The Authority reported that of the 16 remaining CSO outfalls that did not meet the LTCP goals for activation frequency and/or volume by the end of 2021 (the “16 Remaining Outfalls”)<sup>2</sup>, the Authority developed plans to enable six CSO outfalls<sup>3</sup> to meet LTCP goals after 2021. The Authority noted that with respect to the remaining 10 CSO outfalls<sup>4</sup>, it had identified potentially feasible alternatives that may

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<sup>1</sup> As previously reported, included in the 70 outfalls are six (noted with an asterisk in Table 2-2 of the Final Assessment Report) where, while the predicted activation and/or volume exceeds the LTCP goal, the performance has improved since 1992 to a level believed to achieve water quality goals. In each of the six cases, the difference between the Q4-2021 performance and the LTCP goal is relatively nominal, and the inability to precisely meet the activation and/or volume goals at these locations is not considered material. Additionally, for these six outfalls water quality is not impaired by the deviation from the LTCP goals. See, Final Assessment Report at Section 2.1.3.

<sup>2</sup> The 16 Remaining Outfalls are: SOM007A/MWR205A; MWR205; BOS014; CHE008; BOS009; BOS003; MWR201; MWR018; MWR019; MWR020; CAM005; SOM001A; BOS017; BOS062; BOS065; and BOS070.

<sup>3</sup> The six outfalls are: SOM007A/MWR205A; MWR205; BOS014; CHE008; BOS009; and BOS003.

<sup>4</sup> The 10 outfalls are: MWR201; MWR018; MWR019; MWR020; CAM005; SOM001A; BOS017; BOS062; BOS065; and BOS070.

enable four of these outfalls to achieve CSO LTCP volume and activation goals; but at least six CSO outfalls remained particularly challenging.

In February 2022, the Authority reached an agreement with the U.S. Environmental Protection Agency (“EPA”), Massachusetts Department of Environmental Protection (“DEP”) and the Conservation Law Foundation (“CLF”) on a six-part framework to govern any unfinished work. The framework consisted of: (i) submission of the Final Assessment Report; (ii) three-years of additional time for certain system improvements at six of the 16 Remaining Outfalls, and continued investigations as to the remaining 10 outfalls; (iii) annual reporting; (iv) periodic meetings; (v) submission of a supplemental report in December 2024 as to the 16 Remaining Outfalls; and (vi) corresponding additional Schedule Seven compliance milestones for the Authority’s submission of the annual reports and supplemental report.

On February 4, 2022, the Authority filed a motion, with the assent of EPA, DEP, and CLF, to amend Schedule Seven consistent with the proposed framework. On February 18, 2022, the Court issued Schedule Seven Compliance Order Number 250, which allowed the request to amend Schedule Seven. (ECF No. 1901).<sup>5</sup>

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<sup>5</sup> In its Compliance Order, the Court also noted that it reserved the right to order reports with respect to work being performed on specific outfalls.

II. Schedule Seven

On December 30, 2021, the Authority met the Schedule Seven milestone for submitting the Final Assessment Report to the Court, EPA, and DEP. The report was filed with MWRA's Notice of Filing Final Assessment Report and Interim Update as of December 30, 2021 (ECF 1898), and posted on MWRA's website.

The filing of the attached Annual Report for Calendar Year 2021 (Attachment A)(the "Annual Report") is intended to satisfy the Schedule Seven milestone for the submission of an annual report by April 2022. This Annual Report has also been posted on MWRA's website. Below is a summary of specific components of the Annual Report required by the Court's Schedule Seven Compliance Order No. 250, as well as additional noteworthy updates since the Authority's last report.<sup>6</sup>

III. Summary of Annual Report for Calendar Year 2021

A. Typical Year Performance of All Outfalls As Compared To 1992 System Conditions and the LTCP

The Final Assessment Report included a complete accounting of the 86 CSO outfalls active in the late 1980s. For the 46 remaining active CSO outfalls, the Final Assessment Report provided discharge estimates using MWRA's recently calibrated hydraulic model run under Typical Year rainfall conditions. The hydraulic model configuration was set to represent the system conditions at

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<sup>6</sup> The specific components of the Annual Report are reordered in this summary for convenience.

the end of 2021. These results were compared against the 1992 system conditions as well as the LTCP goals. The Final Assessment Report noted that 35 CSO outfalls had been closed (10 more than required under the Second Stipulation)<sup>7</sup> and five outfalls along the South Boston Beaches were effectively closed (*i.e.*, achieving a 25-year level of control in 2011). No collection system alterations have been made by MWRA or its CSO member communities since the submittal of the Final Assessment Report that would change the CSO activation frequency or volume estimates provided.

B. For the 16 Remaining Outfalls, Summary Of Any Improvement Work Completed Since The Prior Report, And Update On MWRA's Investigative Work and Analysis

As previously reported, the Authority has identified projects that it believes will bring CSO outfalls SOM007A/MWR205A, MWR205, CHE008, BOS014, BOS009, and BOS003 into compliance with the LTCP goals. Since the submittal of the Final Assessment Report, progress has been made towards implementing these projects. The Boston Water and Sewer Commission's ("BWSC") current sewer separation project in East Boston (Contract No. 3), partially funded through a financial assistance agreement with MWRA (up to \$2,181,667), is currently in construction; the reconfiguration of the BOS014 regulator structure was completed in early 2022. As a result, BOS014 is predicted to meet its LTCP

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<sup>7</sup> See, Second Stipulation of the United States and the Massachusetts Water Resources Authority on Responsibility and Legal Liability for Combined Sewer Overflow Control (March 15, 2006) (ECF 1636)(the "Second Stipulation").

goal. Further work on the project continues, and is expected to be completed by June 30, 2023. Remaining work includes sewer separation of the approximately 31 acres and upgrading the interceptor connection at RE003-12, which is expected to yield reductions in overflows at BOS009 and BOS003.

Design work to increase the connection size from the CHE008 regulator structure to the MWRA sewer is nearly complete, and the construction contract is expected to be advertised next month. Bids will be solicited with an award anticipated in summer of 2022.

Design of the supplemental connection and control gate upstream of the Somerville Marginal CSO facility, which is expected to significantly reduce CSO discharges from MWR205 and SOM007A/MWR205A and further optimize system capacity, continues. The survey work is completed, and geotechnical borings are being scheduled and coordinated with the Massachusetts Department of Transportation. Design of this project is expected to be completed in late 2022, with construction starting in spring 2023.

Finally, MWRA, in coordination with BWSC, has made progress on certain other system modifications at BOS017, BOS062, BOS065, and BOS070, as detailed in Table 9 of the Annual Report, which hydraulic modeling predicts will mitigate CSO discharges and bring activations and volumes to (or closer to) LTCP goals at these locations.

With respect to the remaining six outfalls (MWR201, MWR018, MWR019, MWR020, CAM005, and SOM001A), MWRA will continue its investigations and review and report any initial findings and conclusions in the next annual report.

C. Analysis Of Prior Year's Rainfall in Comparison to the Typical Year

The Annual Report presents the rainfall data measured during the period from January 1, 2021, through December 31, 2021. It also describes the analysis of the rainfall data used to characterize the return period of each storm event and compares measured rainfall for the 2021 period to the rainfall included in the Typical Year.<sup>8</sup> Rain events during the summer of 2021 greatly exceeded those within the Typical Year. During the period of July through mid-September 2021, 24.75 inches of rain fell at MWRA's Ward Street Headworks rain gauge, centrally located within the CSO collection system, with 12.74 inches measured in the month of July alone. The rainfall in that two-and-a-half month period equaled approximately half of the total annual rainfall in the Typical Year. The Northeast Regional Climate Center declared July 2021 the wettest July on record in Massachusetts with a state-wide rainfall average of 10.38 inches, which was 6.55 inches above the normal average. This extreme wet weather period exacerbated CSO discharges.

The analysis of 2021 rainfall in comparison to the Typical Year includes the following observations:

- In 2021, the rain gauges recorded an average of 95 storm events, with an average annual rainfall depth of 58.10 inches, compared to 93 storm events and an average annual rainfall depth of 46.80 inches for the Typical Year.

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<sup>8</sup> In response to a suggestion from DEP in connection with the variances, MWRA is using a more recent approach to classifying storm events -- NOAA Atlas 14 instead of Technical Paper 40. Using NOAA Atlas14 does not affect the conclusions regarding compliance of past completed CSO control projects nor efforts currently underway to achieve the LTCP goals for the 16 Remaining Outfalls.

- In general, the breakdown of numbers of storms by rainfall depth categories for 2021 was relatively close to the values for the Typical Year, except for storms in the 1-2 inch category, where 2021 averaged twelve versus eight for the Typical Year.
- In terms of larger storms, while the average number of storms with greater than 2 inches of total rainfall across all gauges in 2021 matched the Typical Year (6 storms), each of the gauges evaluated had two storms with total rainfall greater than the largest storm in the Typical Year.
- The largest storm in 2021 included 5.15 inches of rainfall in 17.25 hours at the Columbus Park rain gauge, while the largest storm in the Typical Year includes 3.89 inches of rainfall in 50 hours. A storm with an additional 1.26 inches of rain occurring in about a third of the duration emphasizes the significant deviation of 2021 from the Typical Year.
- The number of storms with peak intensities greater than 0.40 inches of rainfall per hour ranged from eleven to fourteen for the four rain gauges where more detailed evaluations were performed, compared to nine for the Typical Year. These gauges had between two and four storms with a peak intensity greater than 1.0 inches of rainfall per hour, with peaks as high as 1.66 inches of rainfall per hour. In comparison, the Typical Year peak had one storm with an intensity of 1.08 inches of rainfall per hour with the remaining eight storms having peak intensities between 0.75 and 0.42 inches of rainfall per hour.

Based on the analysis performed, it is evident that the storms during the two-and-a-half month period from July, 2021 through mid-September, 2021 were significantly greater in volume, intensity, and frequency. This time period included Tropical Storm Elsa, the remnants of Tropical Storm Fred, Tropical Storm Henri, and Hurricane Ida. Three storm events (7/1/2021, 7/8/2021, and 9/1/2021) included rainfall characteristics that were substantially greater than rainfall in the Typical Year and are further evaluated and broken out in the report as extreme events.



D. Summary Of Measured Overflows from MWRA Treated and Untreated CSO Discharges

Measured activations and volumes for all 46 active CSO outfalls are provided in Table 5 of the Annual Report with comparison to modeled predictions. Further discussion on the measured overflows is provided in Section E., below.

E. Comparison of MWRA Meter and Model Data to Community Meter Data for Those Outfalls Where It Exists

For the entirety of 2021, MWRA and its member CSO communities (Boston, Cambridge, Somerville, and Chelsea) have utilized meters in their collection systems to determine when a CSO discharge is occurring and to calculate and estimate volume for each CSO discharge. The Annual Report compiles these activation frequency and measured CSO discharge volume estimates for all 46 active CSO outfalls in Table 5.<sup>9</sup>

Measuring the velocity of flows in CSO outfalls to determine discharge volumes is inherently difficult given: (i) the complex hydraulics in the CSO infrastructure (turbulence, air entrainment, rapidly changing flows, *etc.*); and (ii) the challenges to calibrating velocity sensors in locations that are mostly dry. For these reasons, CSO volume estimates sometimes require the use of techniques other than velocity and depth sensors to estimate flowrates and

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<sup>9</sup> MWRA, Cambridge, and Somerville, per variance requirements, have implemented a CSO Notification system, through which subscribers are notified within 4-hours of a CSO activation and estimated volumes are posted to public-facing websites within five business days. Under recent state legislation, Boston will be required to provide a similar notification system by July 6, 2022, while Chelsea's existing notification system will need to be modified to reduce its notification time.

ultimately volumes, including the use of hydraulic equations using only depth measurement and, for more complex locations, the use of more advanced calculations to reflect the complex hydraulics between upstream and downstream depth measurement. With several extreme events during 2021 triggering overflows that had very little prior data, MWRA observed some significant differences between the measured CSO estimates and the model predictions. These differences warranted further investigation of how the field measurements could be better used to calculate CSO volumes. After close evaluation, MWRA and its CSO Consultant (AECOM) determined that that certain adjustments to the values previously reported were warranted, as documented in Table 4 of the Annual Report. Details regarding the adjustments and the basis for MWRA's future measured CSO volumes are included in Section 2.4 of the Annual Report. Adjustments have been made to MWR003, MWR018, MWR019, MWR020, and MWR023. The number of activations and their durations did not require adjustment.

With the appropriate adjustments made to the measured CSO volume estimates, the measured CSO activations and volumes for calendar year 2021 are included for all 2021 storms events in Table 5, as well as for three extreme events during the summer in Table 7. As shown in Table 5, the total measured CSO volume in 2021 was 1,006 million gallons ("MG"), of which 81% are treated CSO discharges. This is in comparison to 569 MG as shown in Table 7, measured from the three extreme storm events in the summer of 2021, of which

75% are treated CSO discharges. The three extreme storm events contributed 57% of the total CSO in 2021 and 52% of the treated overflow in 2021.

For 2021, MWRA used two modeling configurations to simulate the storm events from January 1 – June 30, 2021 and July 1 - December 31, 2021, respectively. The Annual Report includes documentation regarding system changes that were incorporated into the hydraulic model and a few changes to the model incorporated for the second half of 2021. The MWRA's hydraulic model was run using various rain gauges throughout the service area as input to the hydrodynamic portion of the model, which computes the rainfall runoff that is directed into the hydraulic model for routing, along with sanitary and infiltration flows through the complex combined sewer network.

Table 5 of the Annual Report compares the results for all metered and modeled CSO activation and volume estimates for the 46 active CSO outfalls. For calendar year 2021, 1,006 MG of CSO was measured in comparison to 964 MG of CSO predicted using MWRA's hydraulic model. Notable differences for individual overflows are discussed in Table 6. In addition, Table 7 of the Annual Report breaks out the three extreme events recorded in the summer of 2021. Metered and modeled CSO activation and volume estimate totals are provided separately for these three extreme storm events (July 1<sup>st</sup>, July 8<sup>th</sup>, and September 1<sup>st</sup>, 2021). For these three extreme events alone, the total CSO volume measurement was 569 MG in comparison to the modeled volume of 527 MG. Overall, the metered CSO volume estimates and model predictions are comparable for even these extreme events, suggesting that the model can be used

to estimate CSO volumes for storms larger than the Typical Year and for storms larger than those used in the calibration period.

IV. Additional Update of Events Since Prior Report

Since the submittal of the Final Performance Assessment, the Authority has kept an open dialogue with interested parties and stakeholders and has continued required work under the variances. This has included the following meetings, presentations, and submittals:

- On January 31, 2022, the Authority submitted to DEP and EPA and published on its website an *Annual Report on Progress of Additional CSO System Optimization Measures Charles River and Alewife Brook/Upper Mystic River watersheds*.
- A meeting was held on February 14, 2022, with Arlington Town Officials and members of a newly formed watershed advocacy group to review the findings of the Final Performance Assessment, respond to questions and gain a better understanding of concerns relating to CSO discharges and level of control to the Alewife Brook.
- A public briefing on the Final Assessment Report was provided on February 17, 2022. The briefing included 90+ participants with approximately an hour-long presentation, followed by approximately an hour and a half of questions and answers.
- The first quarterly meeting required under the February 18, 2022 Schedule Seven Compliance Order Number 250 was held on March 28, 2022, with EPA, DEP, and MWRA. Representatives from the cities of Cambridge and Somerville joined the meeting. The group reviewed accomplishments and progress on the 16 Remaining Outfalls and discussed expectations for future work required under the variances.
- A meeting with representatives of the local watershed advocacy groups was held on March 31, 2022. The meeting was an open dialogue to hear and better understand the concerns of these groups.
- On April 1, 2022, the Authority submitted to DEP and EPA and published on its website an *Updated CSO Control Plan – Draft Scope of Work and Schedule*.

- A Joint Public Press Release was issued on April 12, 2022, which included general information on CSOs, the location of outfalls in the Alewife Brook/Upper Mystic River watershed and the Charles River watershed, and potential health risks posed by exposure to receiving waters during CSO events.

V. Conclusion

Calendar year 2021 was exceptional for rainfall in comparison to recent and historic years. The result was CSO discharges that well exceeded those in recent years or those in MWRA's LTCP for a Typical Year. However, a single year's CSO discharges should not detract from or diminish the significant accomplishments achieved over the past 36 years of documented CSO control improvements and water quality benefits. This past year also highlights the importance of system relief points that existing CSOs are designed to provide. The existing treated and untreated outfalls continue to protect public health to the greatest extent possible by minimizing flooding of streets and homes with wastewater during these extreme events, allowing MWRA and the CSO communities to work to further improve the combined sewer system under their charge.

The Authority continues to work with its community partners, the watershed advocacy groups, and the regulatory agencies to find solutions based on hydraulics, engineering, and science that are economically feasible and commensurate with the water quality improvements that may be achieved.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that a true and accurate copy of this document, which was filed via the Court's ECF system, will be sent electronically by the ECF system to the registered participants as identified on the Notice of Electronic Filing (NEF) and electronic copies will be sent to those indicated as non-registered participants (excluding Christopher Little of Pierce Atwood, who has retired from the practice of law, Lawrence Liebesman and Joseph McGovern, who no longer work at the U.S. Department of Justice, and Edward J. DeAngelo, who no longer works at the Attorney General's Office) on April 29, 2022.

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Dated: April 29, 2022