STAFF SUMMARY

TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: March 19, 2025
SUBJECT: Report on 2024 Water Use Trends and Reservoir Status

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COMMITTEE: Water Policy & Oversight

X INFORMATION
VOTE

Daniel Nvule, Senior Program Manager
Cory Yarrington, Project Manager
Stephen Estes-Smargiassi, Director, Planning and Sustainability
Preparer/Title

David W. Coppes, P.E.
Chief Operating Officer

RECOMMENDATION:

For information only. At the beginning of each year, staff provide the Board with a review of the previous year's water use data and discuss trends.

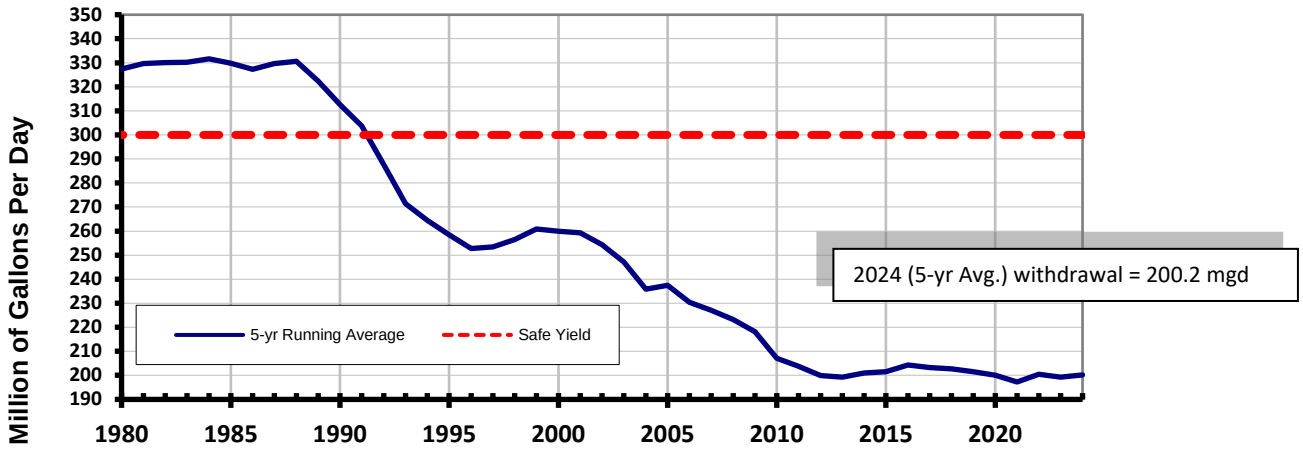
DISCUSSION:

This staff summary provides an overview of water consumption by communities, base and seasonal water use trends, reservoir withdrawals and reservoir status.

Reservoir Withdrawals and Releases

Reservoir withdrawals are the metric used to compare to the 300 million gallons per day (mgd) safe yield of the watershed/reservoir system. Figure 1 below shows five-year averages of withdrawals from 1980 to the present. The five-year averaging reduces the effects of year-to-year variability due to weather and provides a good indication of longer-term trends.

Figure 1. Total Reservoir Withdrawals – Five-Year Running Average 1980 to 2024



Withdrawals include water sold to MWRA communities as well as other non-revenue generating uses in the watershed and MWRA system. With the particularly dry second half of the year, total MWRA water withdrawals increased by 3.6 percent in 2024, from 194.3 mgd in 2023 to 201.2 mgd. The five-year average had a very slight uptick between 2023 and 2024.

The pipeline supplying the McLaughlin Fish Hatchery in Belchertown had an average use of 6.14 mgd. MWRA activated the dedicated hydroelectric station and pipeline in December 2016. Without that withdrawal, total reservoir withdrawals in 2024 would have been 195.1 mgd.

Total reservoir withdrawals have decreased by over 130 mgd since the 1980s, even as the service area has expanded.

Water Consumption by MWRA Communities

Water consumption by all MWRA communities of 187.95 mgd increased by 3.7 percent (6.7 mgd) from 2023, as shown on Figure 2. In addition, Figure 2 illustrates a long-term downward trend with a relative plateau in the last eight years, even with new users.

Figure 2. Total Consumption by MWRA Communities (1980 to 2024)

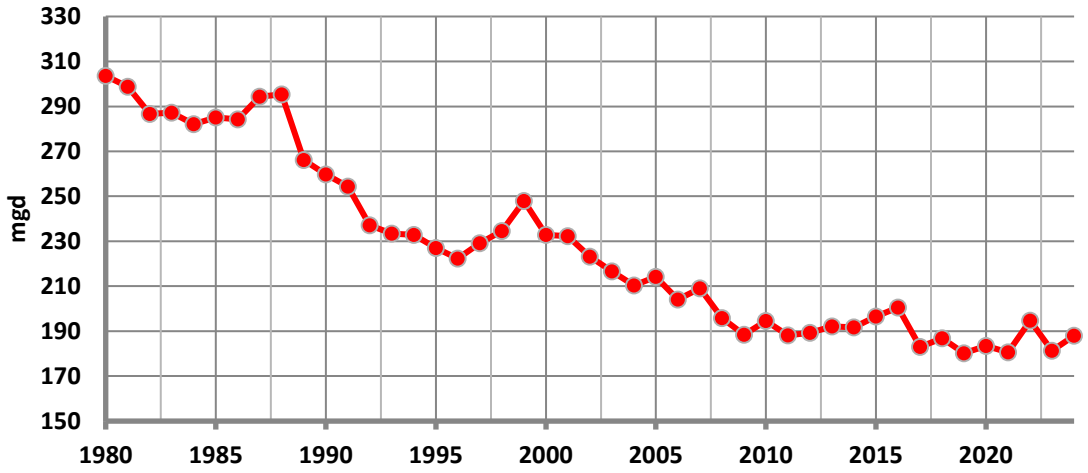
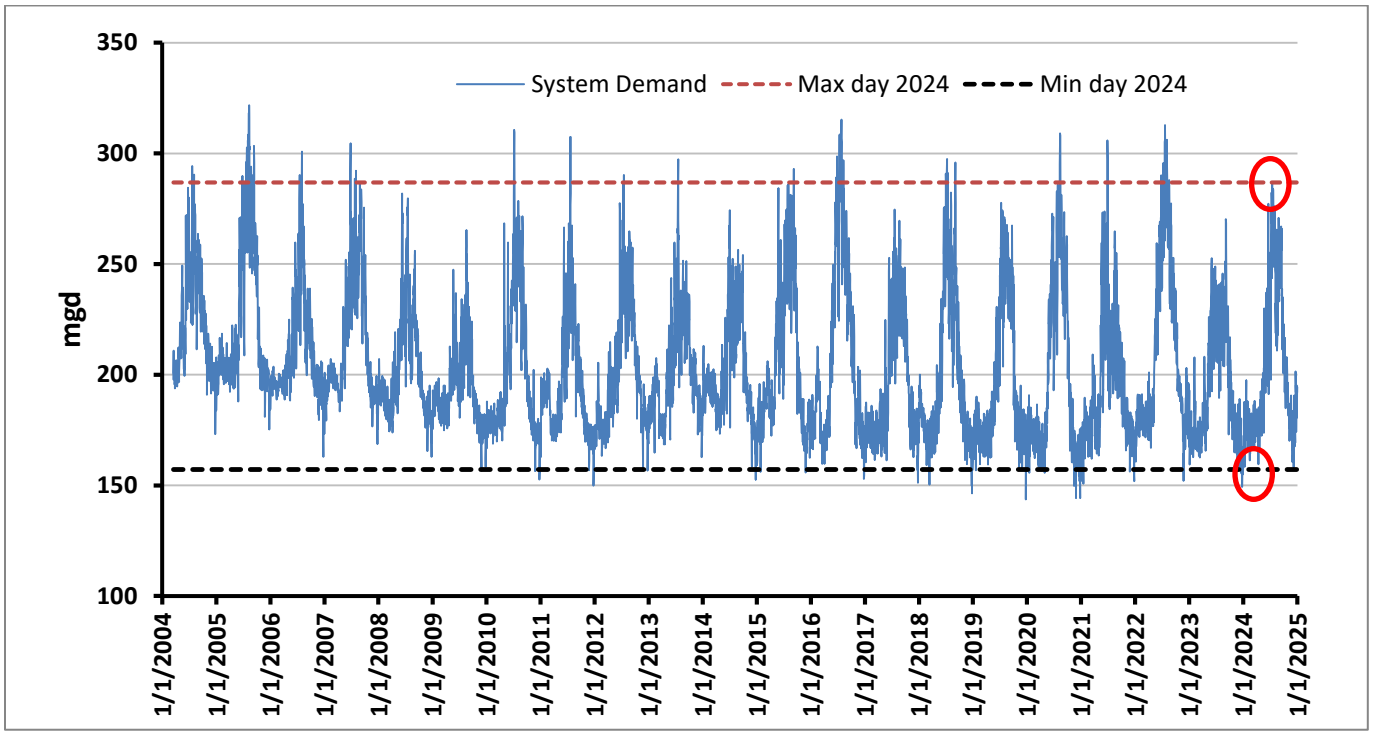


Figure 3 shows daily system withdrawals from 2004-2024 with the 2024 highlights of maximum and minimum withdrawals. System-wide, 2024 had a maximum day reservoir withdrawal of 286.8 mgd on July 15 (6.1 percent higher than the 2023 maximum). At the opposite extreme, New Year's Day at 157.2 mgd was the lowest day of the year.

Figure 3. Daily System Withdrawals (2004 to 2024)



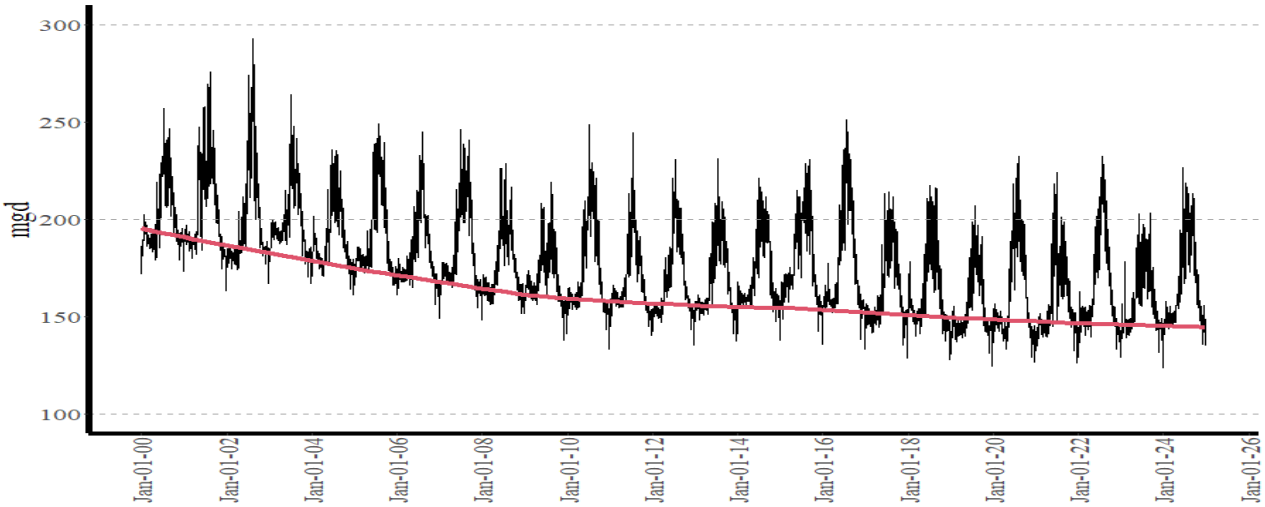
Demand from MWRA's largest customer, the Boston Water and Sewer Commission, was 61.84 mgd, which was higher than last year by 1.53 mgd (2.5 percent). Current Boston demand continues to be lower than demand before 1900, as shown on Figure 4 below. As Attachment A indicates, most communities experienced a slight increase in demand during 2024, primarily due to dry weather and the late season drought.

Figure 4. Boston Water Demand (1900-2024)

Demand – Base Water Use and Seasonal Water Use

Over time, there have been substantial water use reductions in both base (indoor) use, defined as water use from November to March, and outdoor (seasonal) use, defined as the increase over the base demand during the irrigation season from May to September. Average base water use, shown as the red fitted curve line on Figure 5 below, has dropped substantially over the past several decades and continues to decrease due to the improvements in the efficiency of water use in homes and businesses as water-saving technologies continue to increase market share, and consumers react to increases in water, sewer, and energy costs. Water use reductions also reflect the success of MWRA and community leak reduction programs with fewer pipeline leaks. Countervailing pressures include population and employment increases.

Figure 5: Fully Supplied Communities Demand (1999 to 2024)[1]



The impact of the downward trend in base water use partially explains the decreasing demand within the overall system, despite adding new communities as well as an increase in population and employment to the MWRA system. Table 1 lists these community additions and the system withdrawal (five-year average) from that associated year of admission.

Table 1: Communities Admitted to the MWRA Water System

Year	Community	MWRA Withdrawal (5-yr Avg.) at date of admission to MWRA
1993	Bedford	271.4
2002	Stoughton	254.3
2005	Reading	237.4
2005	Dedham-Westwood Water District	237.4
2009	Wilmington	218.1
2016	McLaughlin Hatchery	204.3
2018	Ashland	202.8
2020	Burlington	200.4

[1] Certain analyses can be done only on fully supplied communities where MWRA has information on their daily use available from MWRA's revenue meters. MWRA receives data on monthly total use for partially supplied communities, but not until they provide that data to DEP in their Annual Statistical Reports in March. Fully supplied communities represent almost 90 percent of the total annual demand.

Demand – Seasonal Water Use

Seasonal, or outdoor, water use is more variable than indoor demand and driven in large part by weather during the irrigation season. Factors influencing seasonal use include the total irrigation season precipitation, the number of dry days between rainfall events, temperature, and the total amount of sunshine. During drought conditions, mandatory restrictions or general media exposure to drought messaging will reduce outdoor use over what it would have been, but dry years still tend to have higher demand. Over time, the price of water also influences seasonal use.

Figure 6 shows the variation in seasonal water use in fully supplied communities over time, and the long-term decline in both base and total water use: even the highest recent years are over 130 mgd less than when the MWRA was created. Figure 6 also illustrates the relatively small impact that seasonal demand has on MWRA's total water use.

Figure 6. Fully Supplied Communities Annual Base and Seasonal Demand

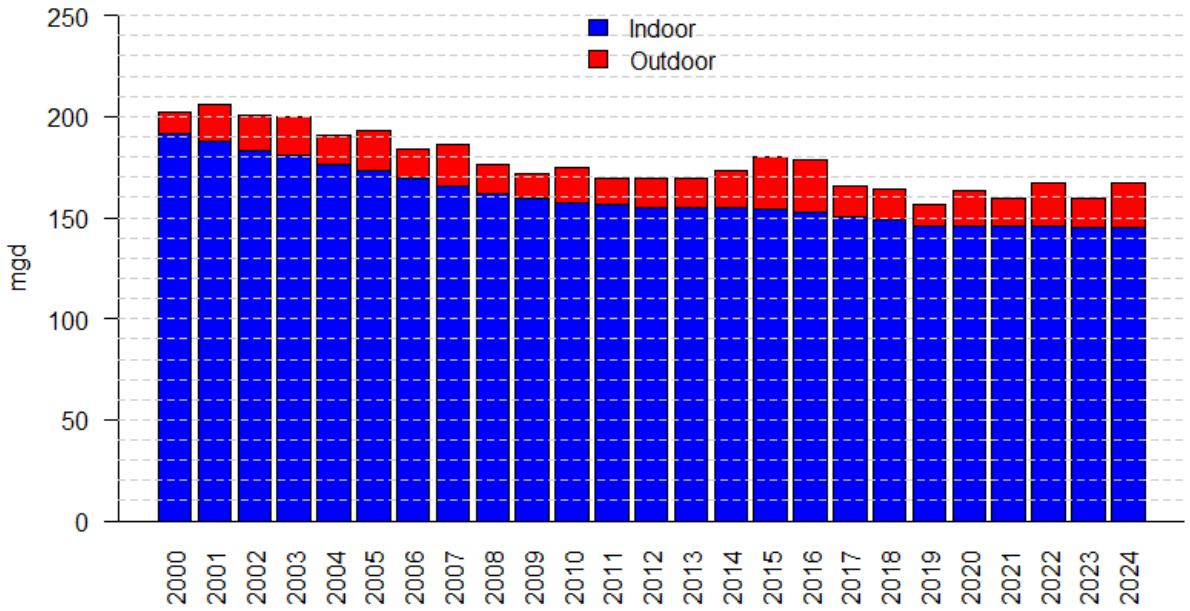
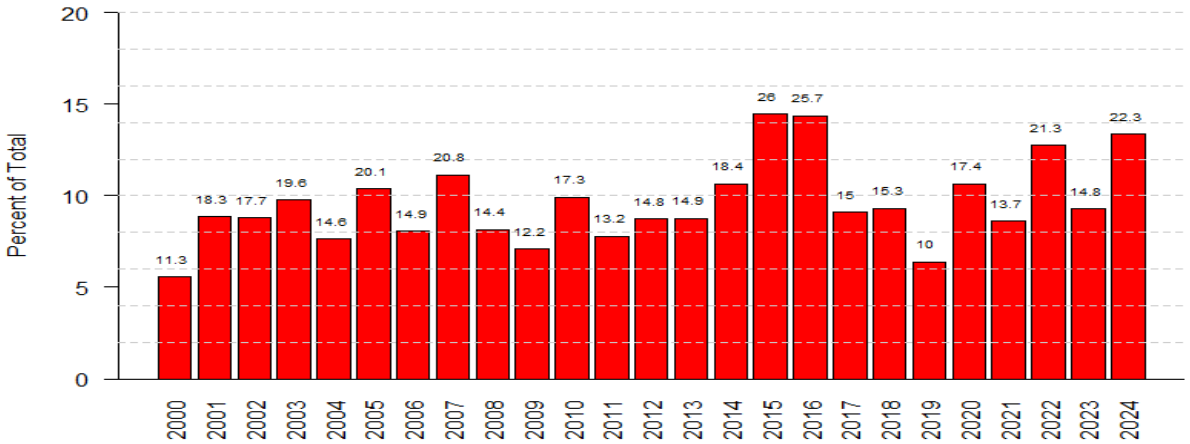


Figure 7 provides a closer look at the seasonal use from 2000-2024. According to a report released by NASA and the National Oceanic and Atmospheric Administration (NOAA), 2024 was the third hottest year on record for Massachusetts.[2] Given the weather pattern and late season drought, 2024's seasonal water use of 22.3 mgd (13.3 percent of the total water use) was the third highest since 2000. (The two higher years were during the 2015-2016 drought.)

2 https://stonelivinglab.org/news-article/2024-was-third-hottest-year-on-record-for-massachusetts-wbur/

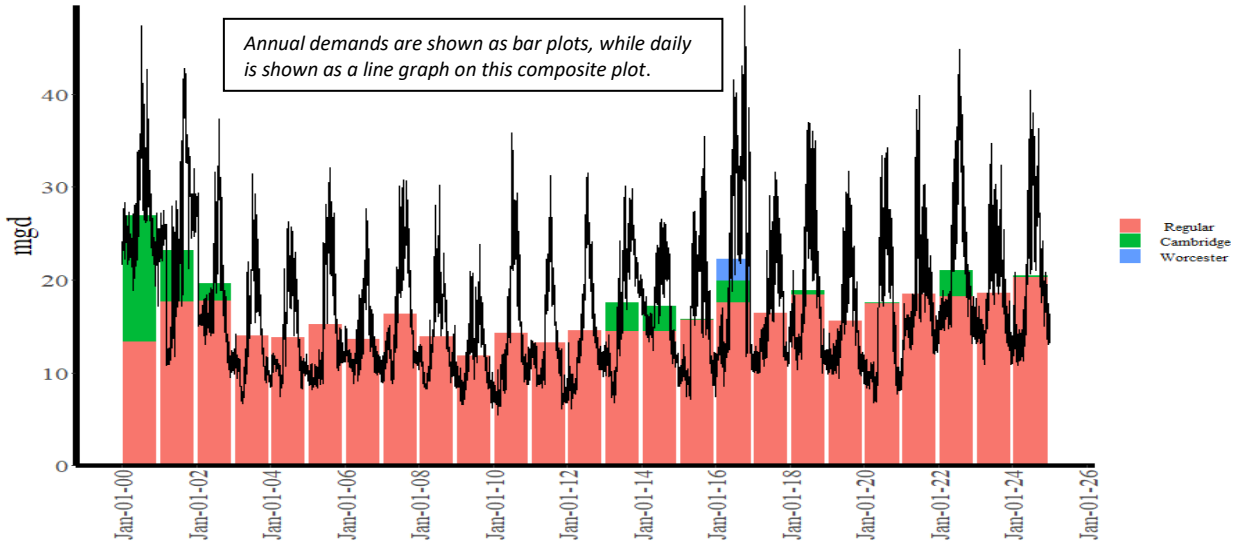
Figure 7. Fully Supplied Communities' Annual Seasonal Demand
(Labels show demand in mgd)



Demand - Partially Supplied Communities

Demand by the partially supplied communities increased by 1.87 mgd (10.0 percent) from 2023 to 2024, as shown in Figure 8. The hot weather and dry conditions experienced in 2024 were largely responsible for this increase, while several communities increased their use due to PFAS issues with their local sources. During the fall, Cambridge and Lynn approached the Authority indicating they might need MWRA water due to low reservoir levels caused by the drought. While the MWRA was prepared to supply them, neither Cambridge nor Lynn needed extra water.

Figure 8. Partially Supplied Communities – MWRA Supplied Demand (Daily and Annual)



Reservoir Status

In addition to routinely exceeding its minimum required releases, Quabbin spilled for 169 days, for a total of 30.3 billion gallons. MWRA transferred 53 billion gallons from Quabbin Reservoir to Wachusett Reservoir between May and December to meet supply and water quality objectives.

Releases from Wachusett to the Nashua River were 31 billion gallons, which was 84 mgd on average.

While the MWRA system remained in Normal Operating range throughout 2024 due to its large multi-year reservoirs with significant storage, the Commonwealth experienced drought conditions over large portions of the state beginning in October, and continuing until now. MWRA has continued to participate in the regular meetings of the state's Drought Task Force, as well as in the weekly meetings of the Drought Mission Group. MWRA staff have provided regular updates to MWRA's website and social media with conservation messaging to support the statewide drought message. Staff also provided technical assistance to communities last fall on managing flushing, leak detection and other municipal demand reduction measures, and depending on conditions, anticipate doing additional outreach later this winter in preparation for spring.

MWRA's current DEP approved drought plan[3] has monthly trigger levels for each drought response plan stage. MWRA's drought plan has six stages: Normal, Below Normal, Drought Warning, and Drought Emergency 1, 2 and 3. On the first of February, the trigger level for 'Below Normal' rises from 80 percent full to 85 percent full. This reflects the replenishment in storage volume typically seen at this time of year. With Quabbin storage at 84.6 percent full on February 1 this year, the system dipped into 'Below Normal' status. While the Below Normal stage does not call for any mandatory actions, MWRA provided additional conservation messaging to the public and our communities.

As of March 1, 2025, Quabbin remains in Below Normal status. Any time the system is below normal operating conditions, staff monitor system operating conditions more closely, do periodic forecasting of potential drought conditions, and ready the Ware River intake in order to take water from the river, if available, without impacting minimum river flow requirements. Table 2 below shows the forecasted potential drought status for the next 12 months.

Table 2: Quabbin Reservoir Status with Varying Reservoir Yield Scenarios Looking Forward from March 1, 2025

	1-Month	3-Months	6-Months	12-Months
Median	Below Normal	Below Normal	Normal	Normal
Dry (75^{th} Percentile)	Below Normal	Below Normal	Normal	Normal
Driest(of Record)	Below Normal	Below Normal	Below Normal	Below Normal

Under most conditions, the system will return to normal operating range within six months, and under no conditions would it drop into Drought Warning during the next 24 months.

3 Recent changes to the state's Water Management Act regulations allow systems like MWRA's with multi-year reservoir storage to develop and submit system specific drought management plans (with requirements as stringent as the state drought plan), but triggered by system-specific storage conditions, rather than the state regional drought triggers. MWRA will submit an updated MWRA-specific Drought Management Plan in April, based substantially on MWRA's current DEP approved plan, reflecting the substantial changes that have occurred in the system and in water use in the MWRA service area since the current plan's development in 1989.

Summary

System withdrawals increased slightly during 2024, while the five-year average stayed around 200 mgd, well below the system safe yield of 300 mgd. Quabbin Reservoir stayed in its Normal Operating range during 2024, while both the Swift and Nashua Rivers received substantial releases from the reservoirs, well above their minimum requirements. MWRA's large multi-year reservoirs provide the storage needed to manage inflows during wet years, capturing excess yield for use during extended dry periods. While the system has recently dropped into Below Normal status, MWRA's resilient supply system continues to provide a reliable supply of safe water to our customers, economic vitality to the region, and to be an option for communities struggling with water quality or source reliability issues.

Massachusetts Water Resources Authority

MWRA Water Supplied

Reporting Period: December 2024 (REVISED 01/28/25)

ALL DATA SUBJECT TO CHANGE OR ADJUSTMENT PENDING ADDITIONAL MWRA AND COMMUNITY REVIEW

	Monthly (MG)			YTD (MG)			YTD System Share			Prior Year-End Totals 2023	
	Dec		Flow	YTD		Flow	Flow Share [1]		% Change in YTD	Annual	Flow
Metro-System (Fully Served)	2024	2023	Change	2024	2023	Change	2024	2023	Flow Share	Flow (mg)	Share [1]
Arlington	92.1	91.7	0.4%	1,216.1	1,142.1	6.5%	1.88%	1.83%	2.8%	1,142.1	1.83%
Belmont	48.6	48.2	0.7%	720.9	653.1	10.4%	1.11%	1.05%	6.5%	653.1	1.05%
Boston (BWSC)	1,756.8	1,721.3	2.1%	22,537.8	22,012.9	2.4%	34.80%	35.22%	-1.2%	22,012.9	35.22%
Brookline	133.2	112.4	18.5%	1,795.3	1,677.7	7.0%	2.77%	2.68%	3.3%	1,677.7	2.68%
Chelsea	101.4	91.5	10.8%	1,238.8	1,172.5	5.7%	1.91%	1.88%	2.0%	1,172.5	1.88%
Everett	112.3	108.0	4.0%	1,412.9	1,373.7	2.9%	2.18%	2.20%	-0.7%	1,373.7	2.20%
Framingham	148.8	149.1	-0.2%	2,037.2	1,942.1	4.9%	3.15%	3.11%	1.2%	1,942.1	3.11%
Lexington [2]	92.8	100.7	-7.8%	1,728.2	1,689.5	2.3%	2.67%	2.70%	-1.3%	1,689.5	2.70%
Lynnfield W.D.	10.0	9.5	4.7%	189.3	184.3	2.7%	0.29%	0.29%	-0.9%	184.3	0.29%
Malden	157.8	165.0	-4.3%	1,846.5	1,902.9	-3.0%	2.85%	3.04%	-6.3%	1,902.9	3.04%
Marblehead	38.3	36.5	4.7%	638.3	609.9	4.7%	0.99%	0.98%	1.0%	609.9	0.98%
Marlborough	106.8	115.5	-7.5%	1,454.5	1,478.6	-1.6%	2.25%	2.37%	-5.1%	1,478.6	2.37%
Medford	129.9	125.7	3.4%	1,675.6	1,611.2	4.0%	2.59%	2.58%	0.4%	1,611.2	2.58%
Melrose	53.9	58.9	-8.4%	751.7	774.4	-2.9%	1.16%	1.24%	-6.3%	774.4	1.24%
Milton	56.7	54.6	3.8%	858.0	810.7	5.8%	1.32%	1.30%	2.1%	810.7	1.30%
Nahant	7.1	6.4	11.5%	110.1	113.6	-3.1%	0.17%	0.18%	-6.5%	113.6	0.18%
Newton	216.8	200.8	7.9%	3,116.8	3,056.3	2.0%	4.81%	4.89%	-1.6%	3,056.3	4.89%
Northborough	24.6	25.1	-1.9%	321.2	310.6	3.4%	0.50%	0.50%	-0.2%	310.6	0.50%
Norwood	70.4	68.7	2.4%	967.3	948.8	1.9%	1.49%	1.52%	-1.6%	948.8	1.52%
Quincy	241.1	240.6	0.2%	3,105.8	2,939.0	5.7%	4.80%	4.70%	2.0%	2,939.0	4.70%
Reading	41.1	41.4	-0.6%	617.2	572.0	7.9%	0.95%	0.92%	4.1%	572.0	0.92%
Revere	111.2	109.2	1.9%	1,367.9	1,313.4	4.2%	2.11%	2.10%	0.5%	1,313.4	2.10%
Saugus	76.0	89.2	-14.8%	1,070.2	1,074.7	-0.4%	1.65%	1.72%	-3.9%	1,074.7	1.72%
Somerville	167.1	174.8	-4.4%	2,207.7	2,142.7	3.0%	3.41%	3.43%	-0.6%	2,142.7	3.43%
Southborough	23.1	20.8	10.9%	356.4	327.2	8.9%	0.55%	0.52%	5.1%	327.2	0.52%
Stoneham	51.5	53.5	-3.8%	803.0	735.5	9.2%	1.24%	1.18%	5.4%	735.5	1.18%
Swampscott	32.4	34.5	-6.1%	485.4	500.2	-2.9%	0.75%	0.80%	-6.3%	500.2	0.80%
Waltham	189.0	193.5	-2.3%	2,678.9	2,602.1	3.0%	4.14%	4.16%	-0.6%	2,602.1	4.16%
Watertown	68.6	69.5	-1.3%	936.6	918.3	2.0%	1.45%	1.47%	-1.6%	918.3	1.47%
Weston	24.5	23.9	2.8%	586.4	493.4	18.9%	0.91%	0.79%	14.7%	493.4	0.79%
Winthrop	31.3	43.8	-28.7%	409.0	426.2	-4.0%	0.63%	0.68%	-7.4%	426.2	0.68%
Subtotal Metro-System (Fully Served)	**4,415.0**	**4,384.2**	**0.7%**	**59,241.1**	**57,509.3**	**3.0%**	**91.5%**	**92.0%**	**-0.6%**	**57,509.3**	**92.02%**
Metro-System (Partially Served)											
Ashland (P)	-	-	0.0%	-	-	0.0%	0.00%	0.00%	0.0%	-	0.0%
Burlington (P)	24.7	11.3	117.9%	514.1	528.4	-2.7%	0.79%	0.85%	-6.1%	528.4	0.8%
Canton (P)	25.3	38.7	-34.5%	537.5	550.1	-2.3%	0.83%	0.88%	-5.7%	550.1	0.9%
Dedham-Westwood W.D. (P)	29.1	18.5	56.8%	346.5	182.3	90.1%	0.54%	0.29%	83.4%	182.3	0.3%
Leominster (P)	-	-	0.0%	-	-	0.0%	0.00%	0.00%	0.0%	-	0.0%
Lynn (LWSC) (P)	5.5	6.1	-10.0%	24.2	32.8	-26.1%	0.04%	0.05%	-28.6%	32.8	0.1%
Needham (P)	16.2	1.9	740.0%	354.9	243.0	46.0%	0.55%	0.39%	40.9%	243.0	0.4%
Peabody (P)	47.6	14.3	231.9%	389.2	465.6	-16.4%	0.60%	0.74%	-19.3%	465.6	0.7%
Stoughton (P)	1.8	1.5	14.1%	19.2	19.6	-2.4%	0.03%	0.03%	-5.8%	19.6	0.0%
Wakefield (P)	51.9	53.3	-2.5%	736.3	662.1	11.2%	1.14%	1.06%	7.3%	662.1	1.1%
Wellesley (P)	21.8	34.5	-36.8%	741.3	653.6	13.4%	1.14%	1.05%	9.5%	653.6	1.0%
Wilmington (P)	7.7	8.2	-6.4%	220.3	97.1	126.9%	0.34%	0.16%	119.0%	97.1	0.2%
Winchester (P)	28.4	20.8	36.7%	481.5	407.6	18.1%	0.74%	0.65%	14.0%	407.6	0.7%
Woburn (P)	65.0	46.2	40.5%	1,150.6	1,145.1	0.5%	1.78%	1.83%	-3.0%	1,145.1	1.8%
Subtotal Metro-System (Partially Served)	**325.0**	**255.5**	**27.2%**	**5,515.5**	**4,987.1**	**10.6%**	**8.5%**	**8.0%**	**6.7%**	**4,987.1**	**8.0%**
Subtotal Metro-System (Full & Partial)	**4,740.0**	**4,639.8**	**2.2%**	**64,756.5**	**62,496.5**	**3.6%**	**100%**	**100%**		**62,496.5**	**100%**
Chicopee Valley Aqueduct											
Chicopee	131.2	136.4	-3.9%	1,849.4	1,940.4	-4.7%	69.60%	71.64%	-2.85%	1,940.4	71.6%
South Hadley FD #1	25.4	25.0	1.8%	391.5	360.1	8.7%	14.73%	13.30%	10.80%	360.1	13.3%
Wilbraham	23.5	25.0	-5.9%	416.2	407.8	2.0%	15.66%	15.06%	4.01%	407.8	15.1%
Subtotal CVA System	**180.1**	**186.4**	**-3.4%**	**2,657.1**	**2,708.3**	**-1.9%**	**100%**	**100%**		**2,708.33**	**100%**
Other Revenue Supply											
Cambridge (P)	-	-	0.0%	48.5	0.03	177413%				0.027	
Clinton [3]	47.4	50.3	-5.6%	611.5	577.5	5.9%				577.5	
Worcester (P)	-	-	0.0%	-	-	0.0%				0.0	
Other Revenue Customers [4]	50.9	44.4	14.7%	596.3	506.1	17.8%				506.1	
Subtotal Other Revenue Supply [5]	**98.3**	**94.6**	**3.9%**	**1,256.2**	**1,083.6**	**15.9%**				**1,083.6**	
Total Water Supplied											
Fully Supplied Metro Communities	**4,415.0**	**4,384.2**	**0.7%**	**59,241.1**	**57,509.3**	**3.0%**				**57,509**	
CVA Communities	**180.1**	**186.4**	**-3.4%**	**2,657.1**	**2,708.3**	**-1.9%**				**2,708**	
Partially Supplied Communities	**325.0**	**255.5**	**27.2%**	**5,515.5**	**4,987.1**	**10.6%**				**4,987**	
Other Revenue Customers	**98.3**	**94.6**	**3.9%**	**1,256.2**	**1,083.6**	**15.9%**				**1,083.6**	
Total Water Supplied [6]	**5,018.5**	**4,920.8**	**2.0%**	**68,669.8**	**66,288.4**	**3.6%**				**66,288.4**	

1) System share for each rate revenue community is the community's share of total MWRA water use for all rate revenue communities. System share for each Chicopee Aqueduct Valley (CVA) community is each CVA community's share of total MWRA water supplied to the CVA system. Water assessments for revenue communities are calculated by allocating the total annual water rate revenue requirement based on each community's share of flow. Water assessments for CVA communities are calculated by allocating the annual CVA rate revenue requirement based on each CVA community's share of CVA flow.

2) Lexington supplies Bedford with partial MWRA water service.

3) The Town of Clinton receives up to 800 million gallons of water per year free of charge and is charged a flat wholesale rate per million gallons for water in excess of 800 million gallons per year.

4) Other Revenue Customers: D.C.R. (Parks & Pools), DCR Blue Hills Ski Area, Stone Zoo, Deer Island WWTP, and the Town of Wayland emergency use.

5) Other Revenue Customers are charged a wholesale rate per million gallons of water supplied.

6) This report includes only water supplied for which revenue is collected in accordance with exisitng user agreements. It does not include water utilized for system maintenance, or water provided to the McLaughlin Fish Hatchery.

(P) Community is partially supplied by MWRA. Marlborough & Northborough are temporarily being fully supplied.

Question's regarding water supplied can be directed to Tim Beaulieu @ (617) 660-7680 or Leo Norton @ (617) 788-2256.

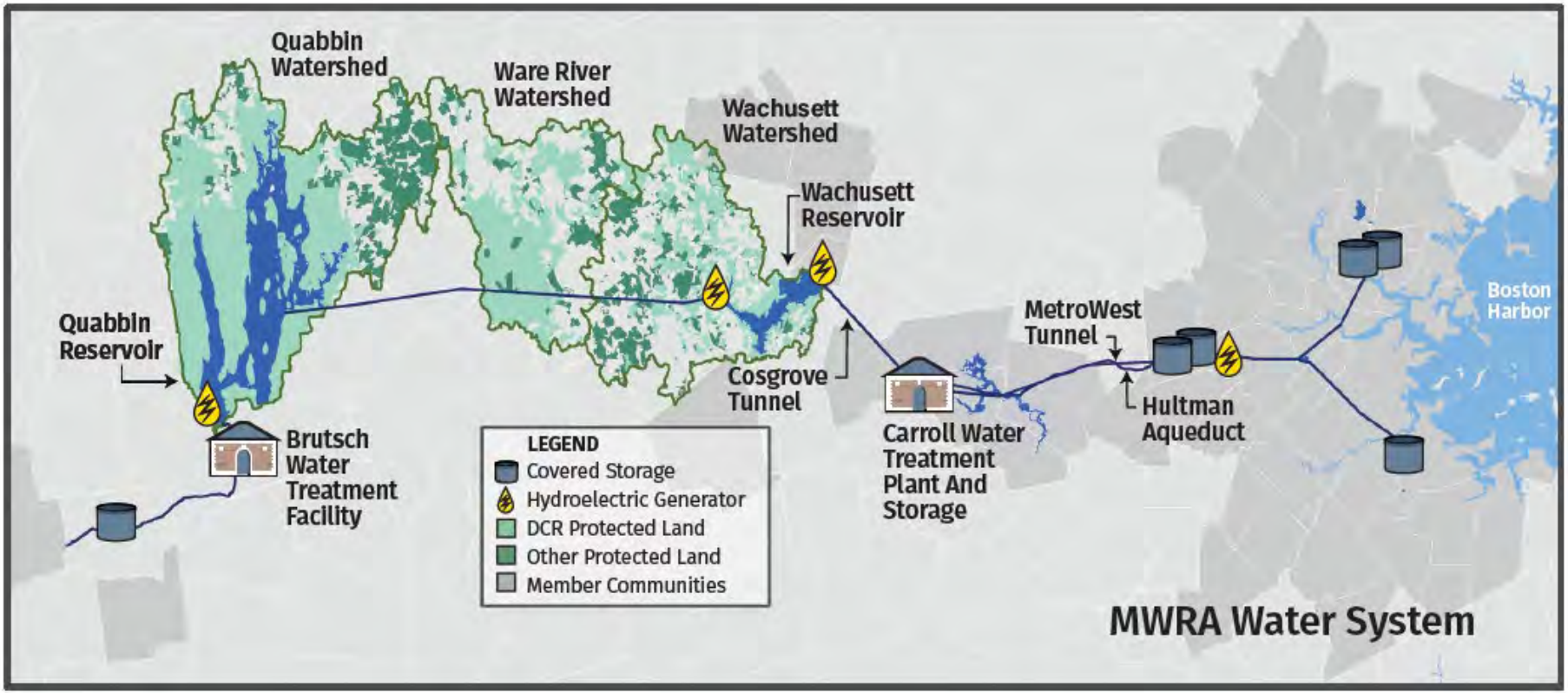
Presentation to

MWRA Board of Directors

Report on 2024 Water Use Trends and Reservoir Status

March 19, 2025

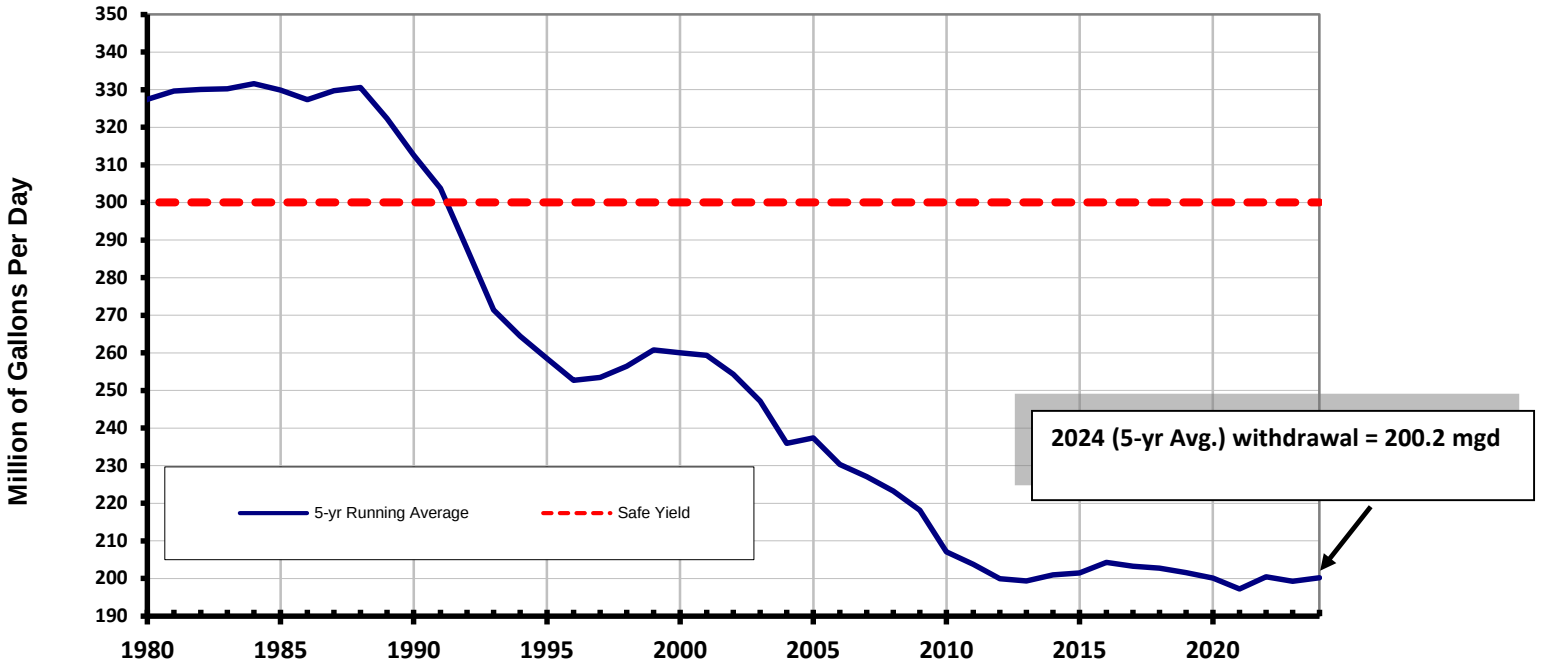
MWRA Source– Quabbin + Ware + Wachusett



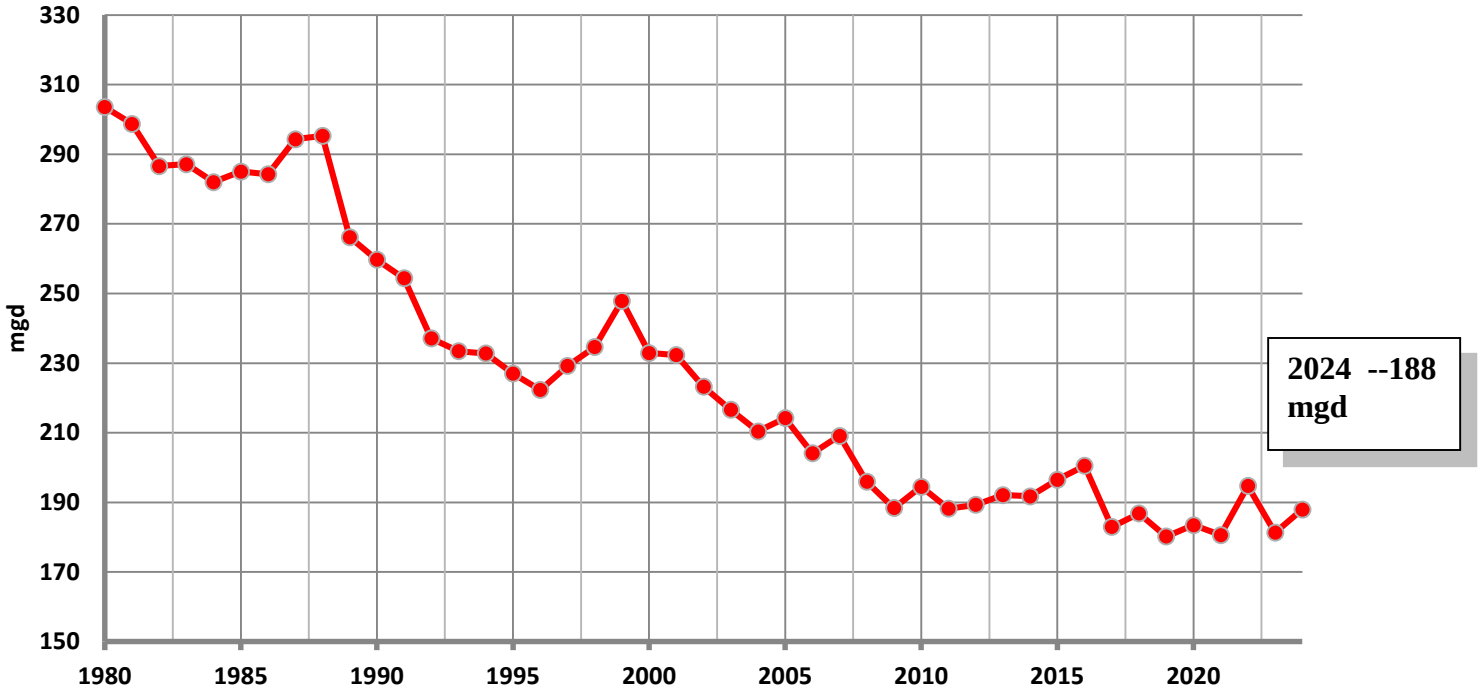
Safe Yield

- Quantity of water that can be reliably supplied over a period that includes a critical drought
- For MWRA -- the multi-year drought of the 1960's
- The combined safe yield of all three sources = 300 mgd

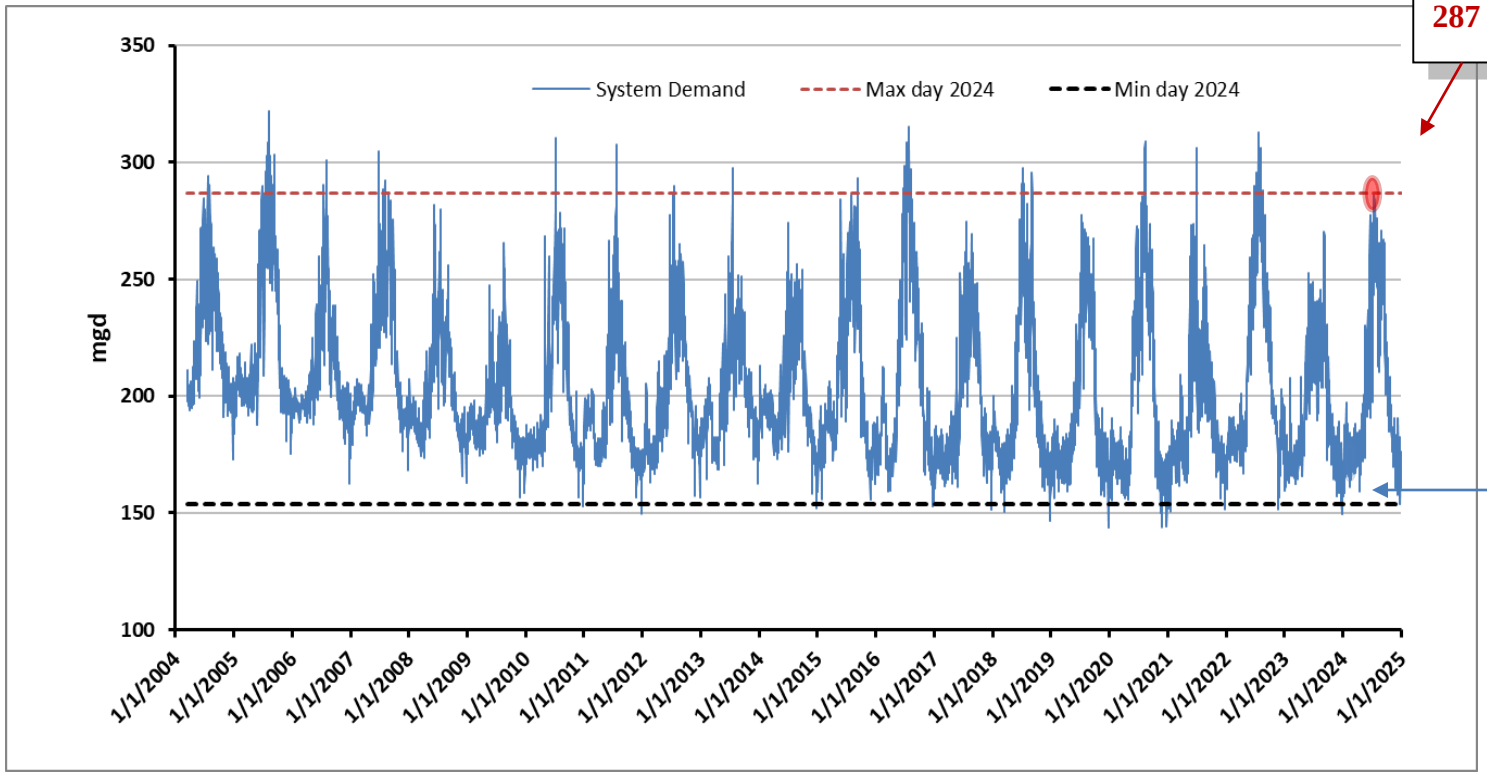
Reservoir Withdrawals Dropped Substantially Since 1980's



Total Consumption by MWRA Communities (1980 to 2024)



Daily System Demand

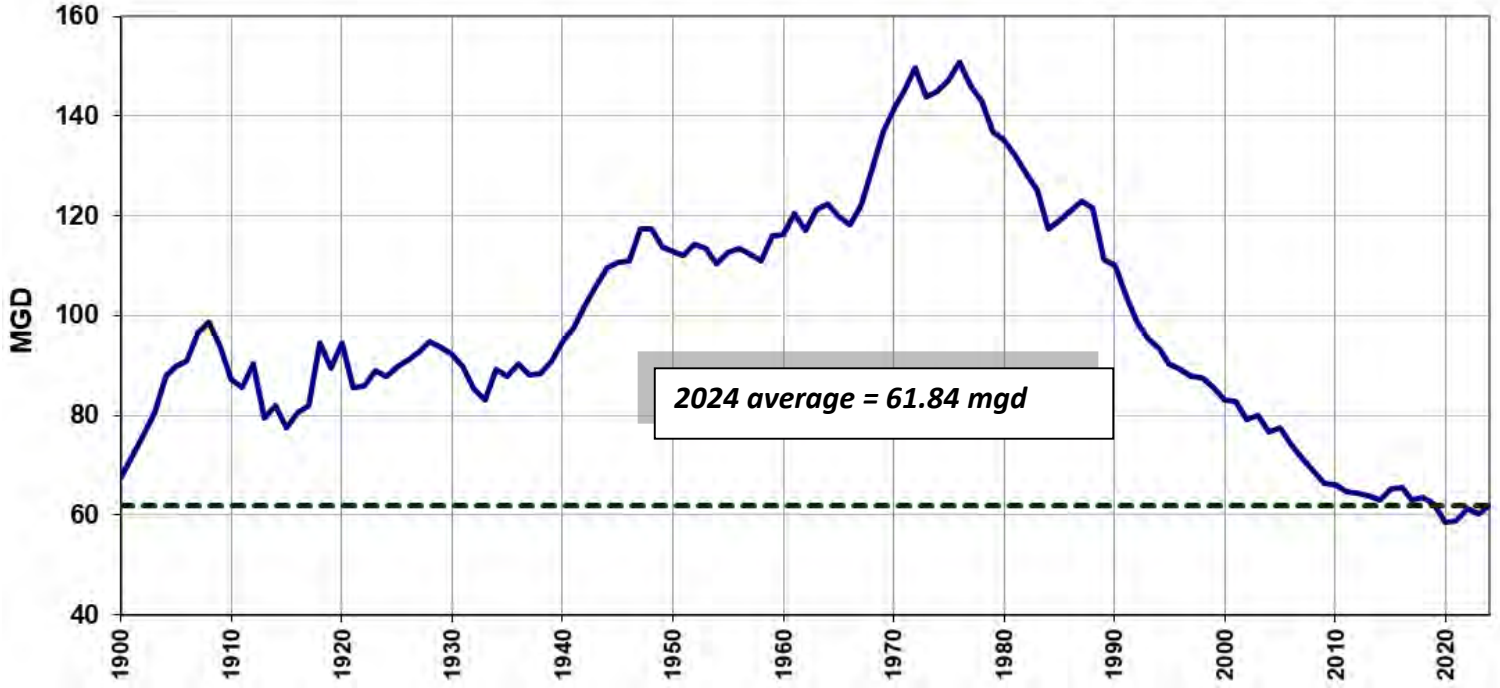


Max Day on July 15, 2024
287 mgd

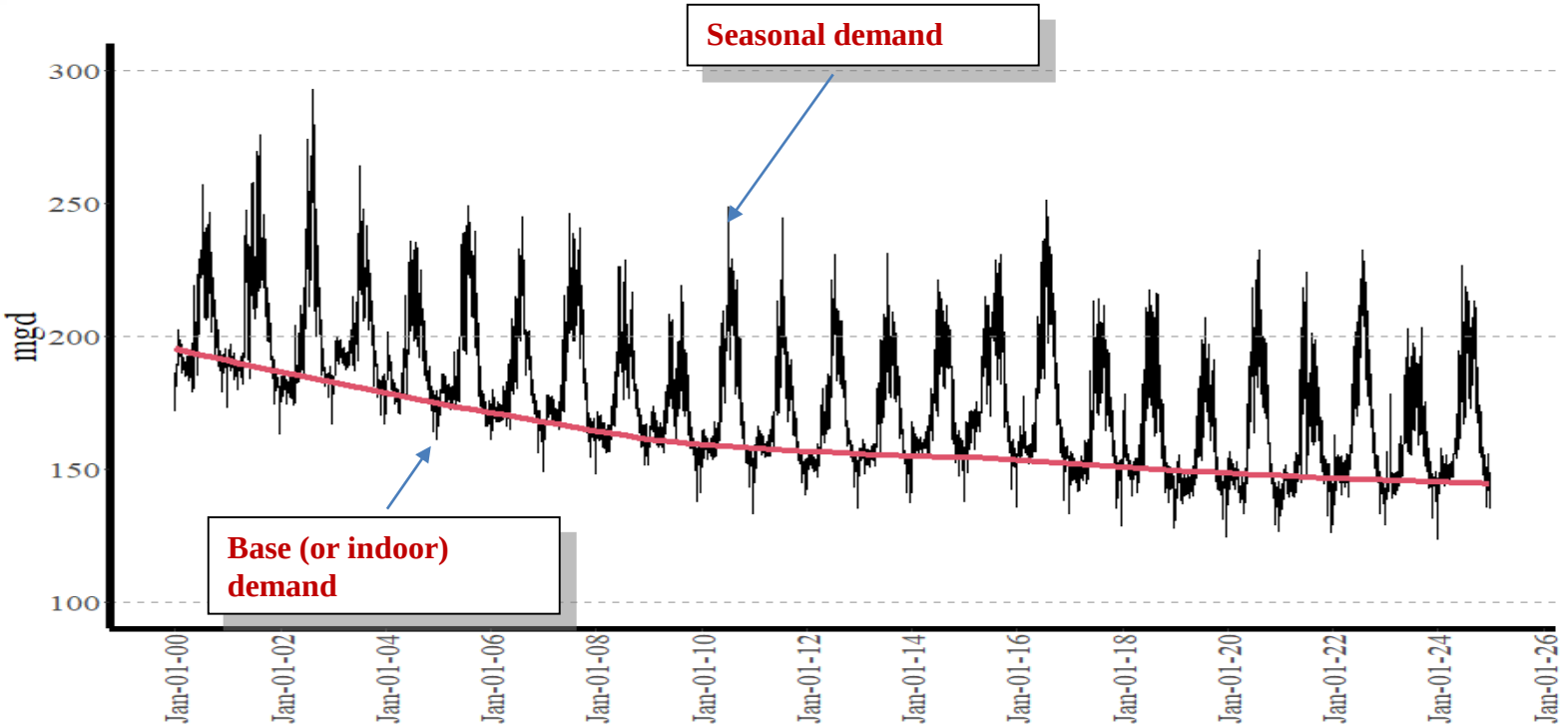
Lowest on New Year's Day 2024

157 mgd

Boston Water Use (1900 to 2024)

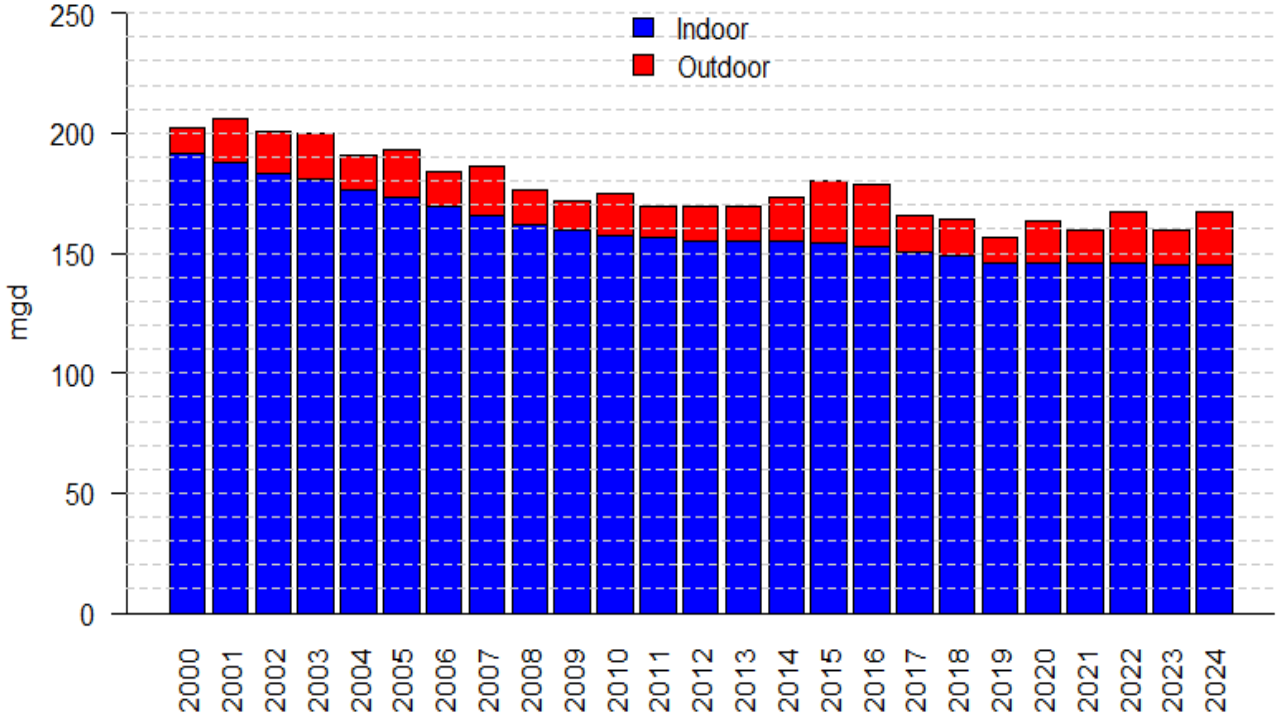


Base (Indoor) Demand vs. Seasonal Demand

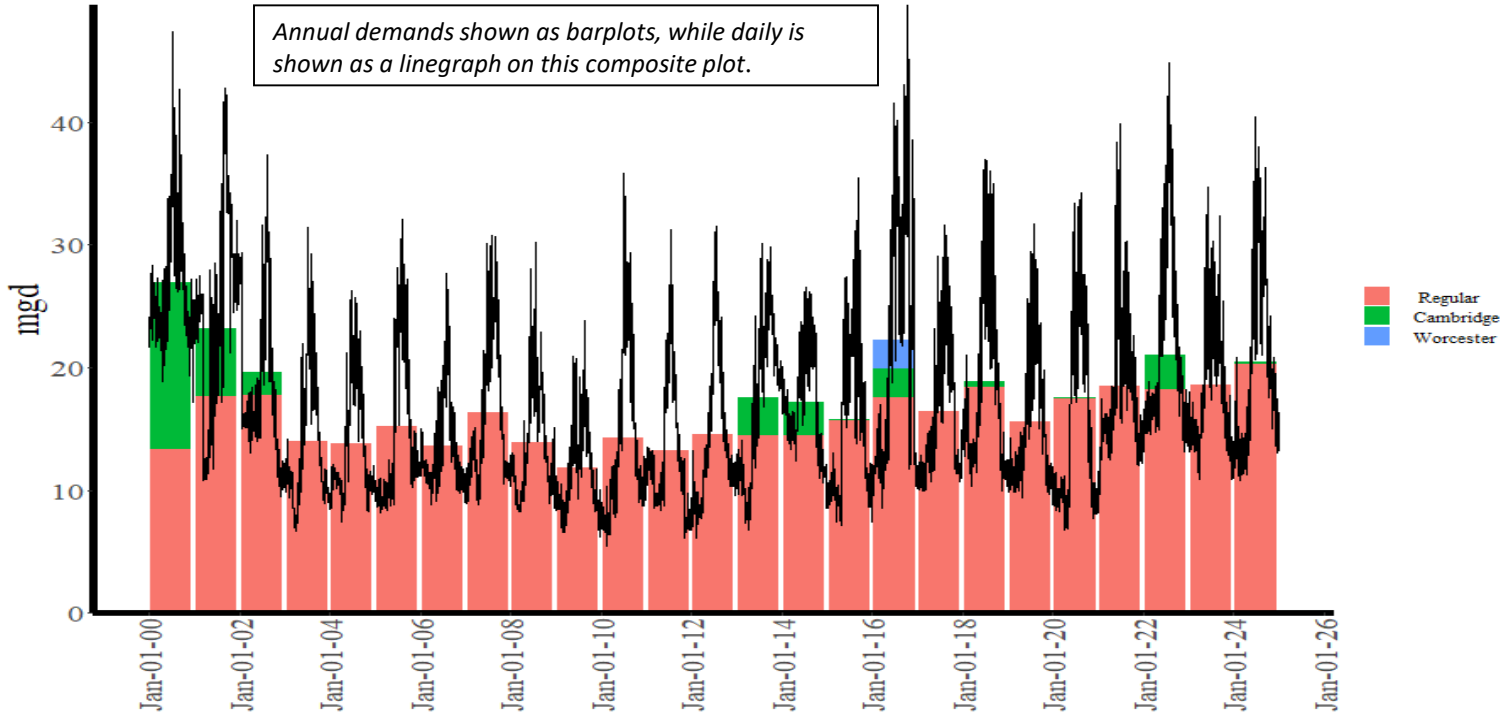


Based on daily demand from fully supplied communities (2000 to 2024)

Fully Supplied Communities (Annual Base and Outdoor Use)



Partially Supplied Communities Have More Variable MWRA Demand



Quabbin stayed within Normal Operating Range during 2024