

STAFF SUMMARY


TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: January 16, 2019
SUBJECT: Report on 2018 Water Use Trends and Reservoir Status



COMMITTEE: Water Policy & Oversight

INFORMATION
 VOTE

Carolyn Fiore, Deputy Chief Operating Officer
Daniel Nvule, Senior Program Manager
Stephen Estes-Smargiassi, Director, Planning
Preparer/Title


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

After a steady recovery from the 2016/2017 drought, the Quabbin Reservoir storage bounced back throughout 2018, starting from slightly below normal at the beginning of the year to spilling at the end. Overall system withdrawals were higher by 2.2 percent compared to the previous year.

RECOMMENDATION:

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

DISCUSSION:

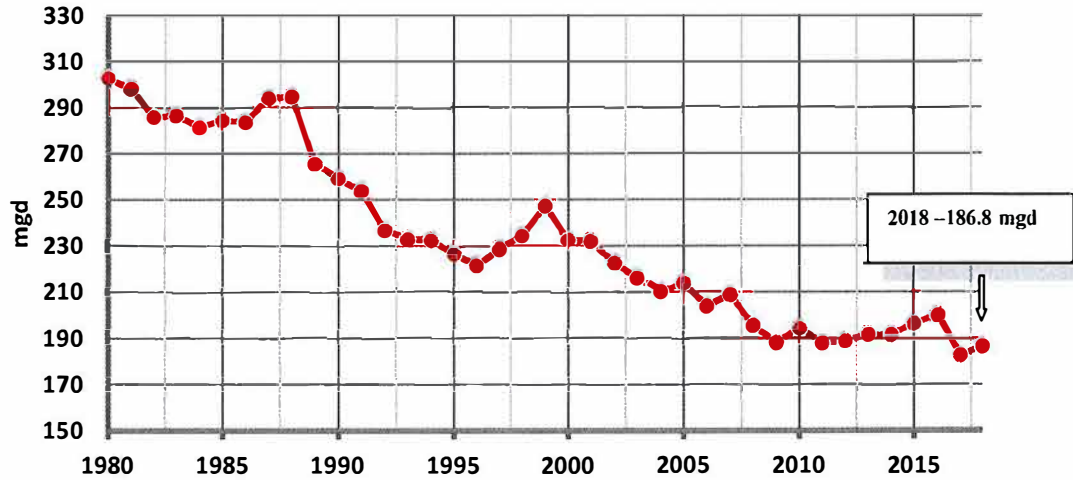
Calendar Year 2018 was a water surplus year. With both a wet spring and a very wet fall, Quabbin Reservoir storage volumes steadily recovered and the reservoir started spilling in mid-October. By the end of the year, it had spilled 10.8 billion gallons and was 100% full. Wachusett Reservoir releases and spills totaled 31.8 billion gallons for the year.

Despite the absence of drought conditions, Calendar Year 2018 water use and reservoir withdrawals were slightly higher than in 2017, likely due to the robust economy.

Water Consumption by MWRA Communities

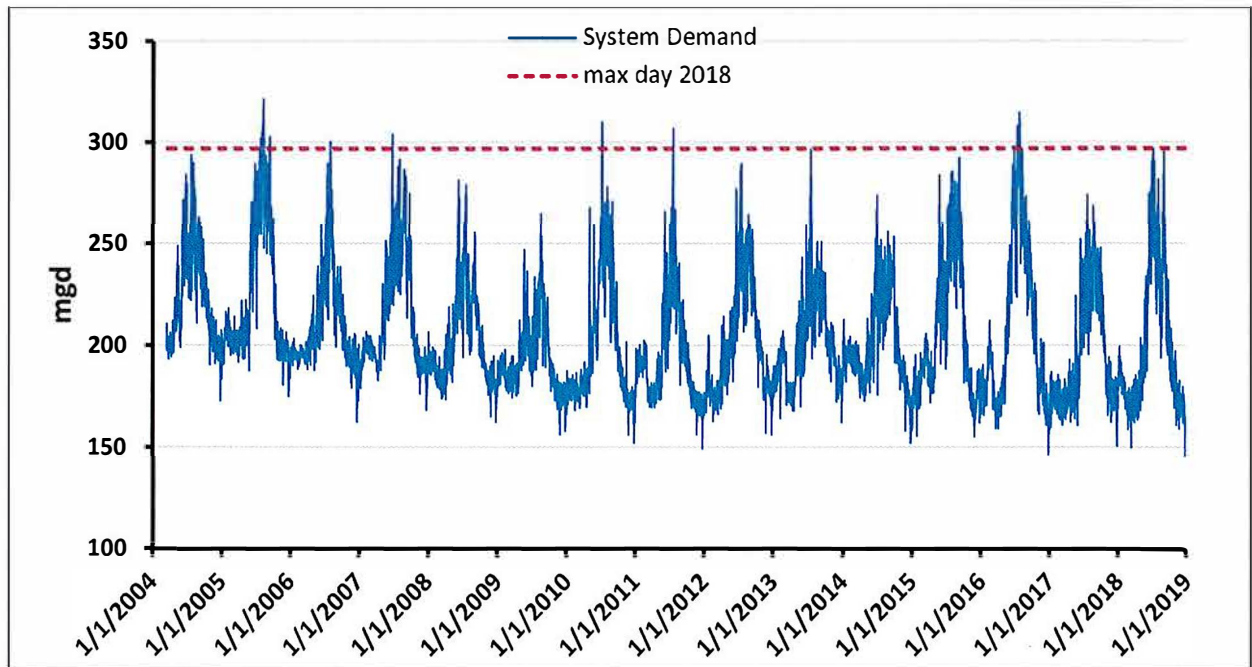
Calendar Year 2018 water consumption by all MWRA communities of 186.8 million gallons per day (mgd) was about 3.9 mgd (2.1 percent) higher than 2017, as shown on Figure 1 on the next page.

Figure 1 – Total Consumption by MWRA Communities (1980 to 2018)



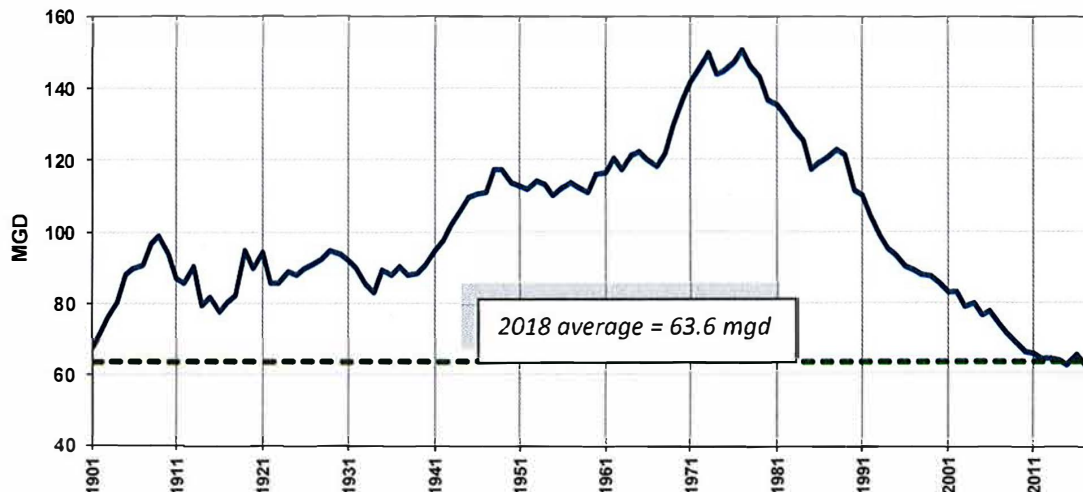
System wide, 2018 had a maximum day demand of 297.5 mgd (8.3 percent higher than 2017) on July 10th. At the opposite extreme, Christmas day had the lowest demand for the year at 146.45 mgd, which was the record for the lowest single day demand since the creation of the MWRA. Figure 2 below shows daily system demand.

Figure 2: Daily System Demand



Demand from MWRA’s largest customer, the Boston Water and Sewer Commission, was 63.6 mgd, which was slightly higher than last year by about 0.9 mgd (1.39 percent). Current Boston demand continues to be lower than demand before 1900, as shown on Figure 3 on the next page.

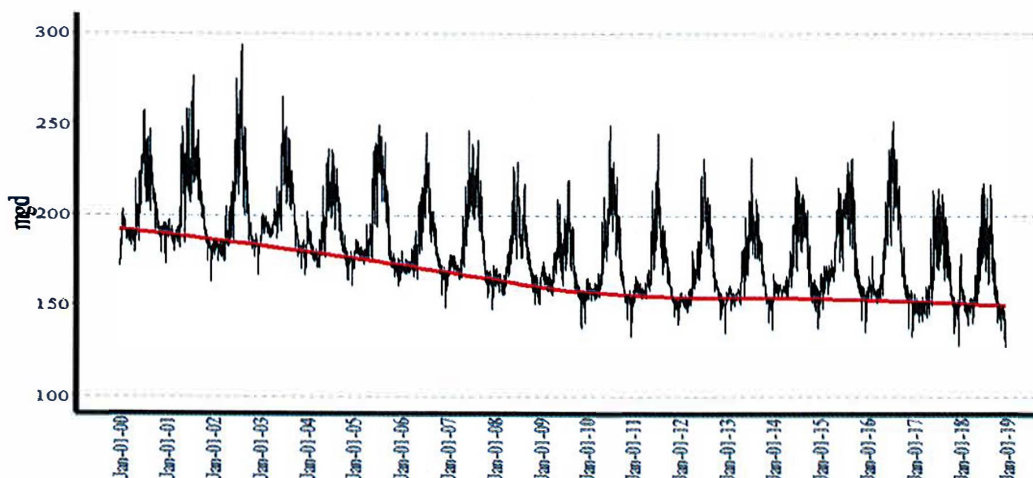
Figure 3: Boston Water Use (1900-2018)



Base or Indoor Demand

Over time, there have been substantial water use reductions in both base (or indoor) use, defined as water use from November to March, and outdoor use (or seasonal use), defined as the increase over the base demand during the irrigation season of May to September. Indoor water use, shown as the red line on Figure 4 below, has dropped substantially over the past several decades 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 price increases (as well as reduced pipeline leaks). Although decreases before the recession of 2008 ranged from around one to two percent per year, it appears that the rate of decreases has slowed after the recession. This is likely due to efficiency gains being counterbalanced by the improving regional economy and population growth. Staff are also evaluating the potential impacts of the major development projects underway in eastern Massachusetts on regional and local water and sewer infrastructure.

Figure 4: Fully-Supplied Communities Demand (1999 to 2018)¹



1 Certain analyses can only be done 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

Seasonal or Outdoor Demand

Seasonal 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 will reduce outdoor use. Over time, water price also influences seasonal use.

Figures 5 and 6 below show the variation in seasonal water use over time, and both the relatively small impact that seasonal demand has on total water use and the longer-term decline in both base and total use. Figure 5 shows that seasonal use in 2018 was about the same as 2017.

*Figure 5: Fully Supplied Communities' Annual Seasonal Demand
(Labels show demand in mgd)*

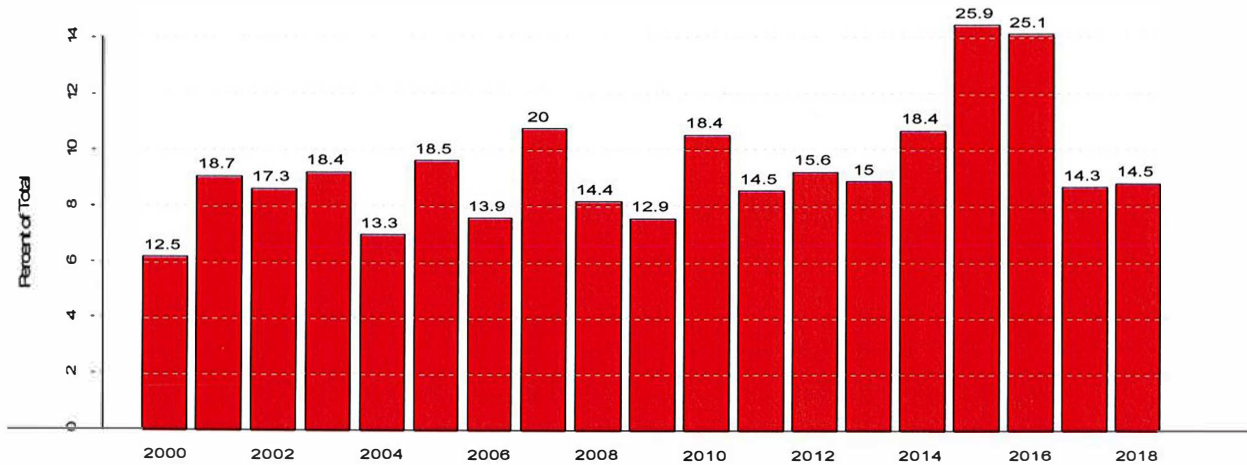
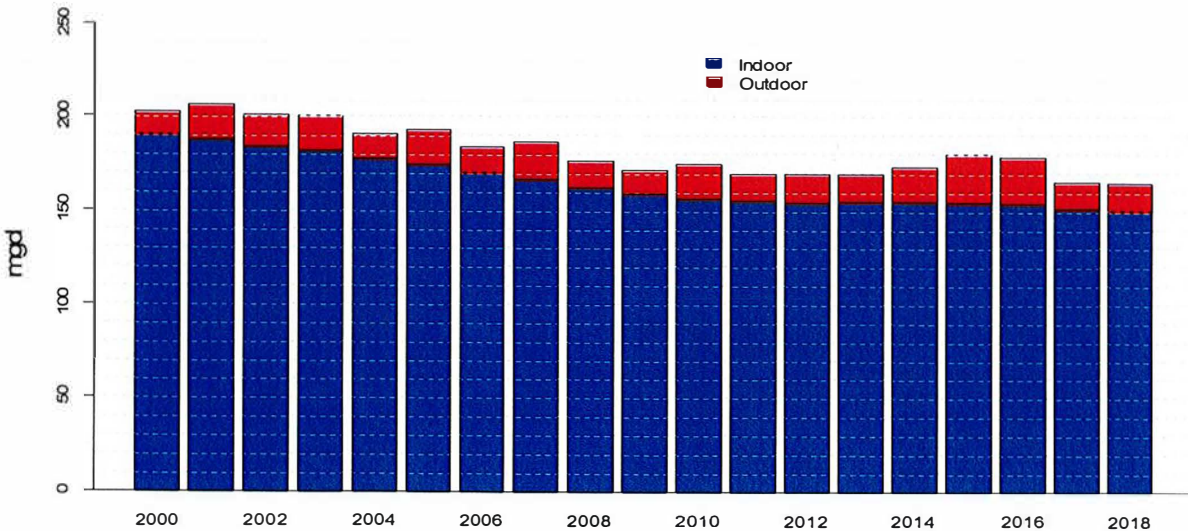


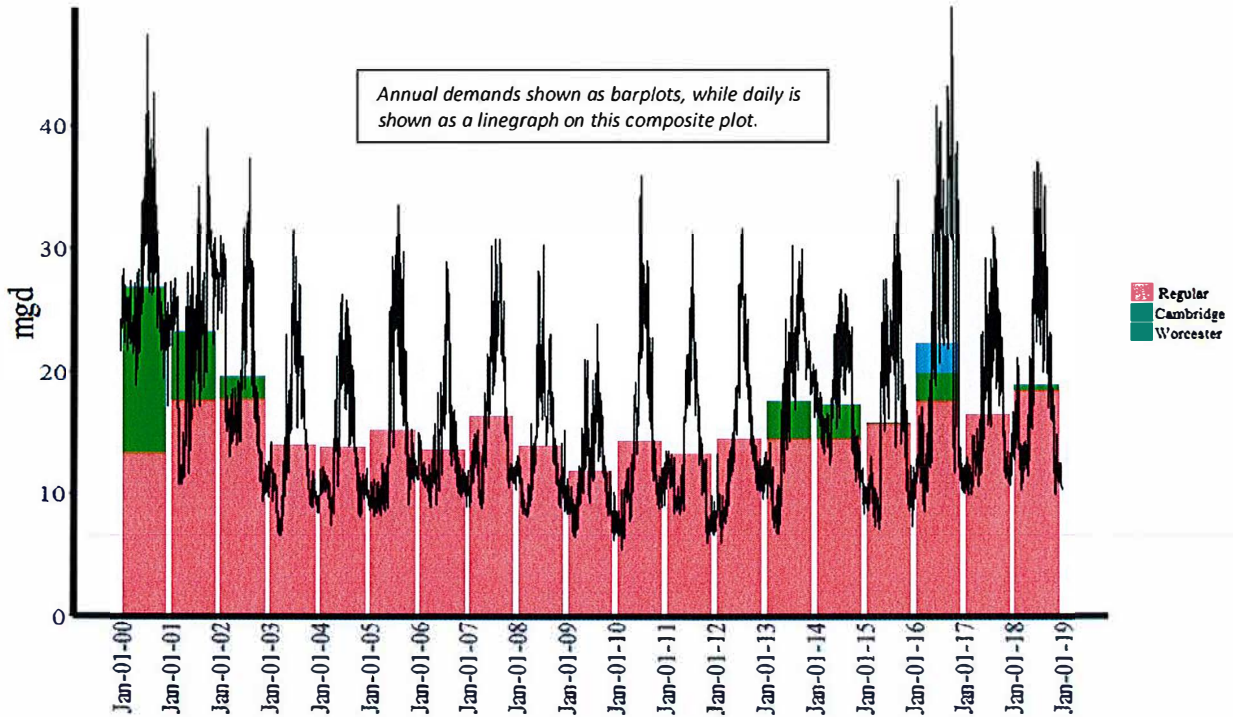
Figure 6: Fully-Supplied Communities Annual Base and Seasonal Demand



Partially Supplied Communities

Despite the lack of drought conditions, demand for the partially supplied communities, shown on Figure 7 below, was up by 2.47 mgd (15%) when compared to 2017.

Figure 7: Partially Supplied Communities – MWRA Supplied Demand (Daily and Annual)



Reservoir Withdrawals and Releases

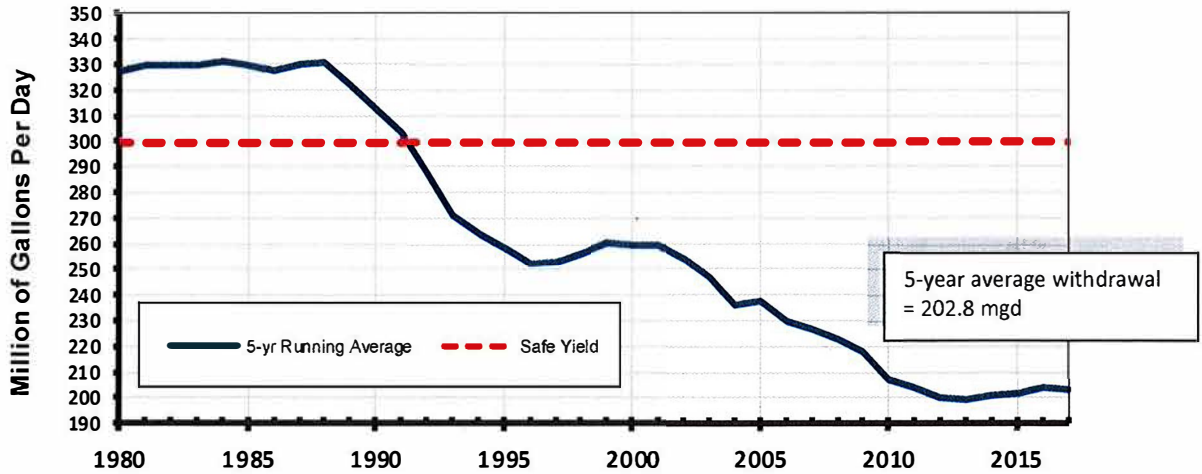
Reservoir withdrawals are the metric used to compare to the 300 mgd safe yield of the watershed/reservoir system². Withdrawals include water sold to MWRA communities, as well as other non-revenue generating uses in the watershed and MWRA system. Total MWRA water withdrawals increased by 2.2 percent in 2018, from 195.64 mgd in 2017 to 199.98 mgd.

The pipeline supplying the McLaughlin Fish Hatchery was in service for the entire year, with an average withdrawal of 6.21 mgd. Without that withdrawal, total reservoir withdrawals in 2018 would have been about 193.8 mgd.

Figure 8, on the next page, shows five-year averages of withdrawals from 1980 to 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. The average shows a slight decrease from 2017. Staff will monitor any changes in water use, to see if the longer-term downward trend resumes.

² The 300-mgd safe yield is based on the drought of the 1960s. Use of a less conservative 20-year recurrence drought, as allowed by DEP, would result in a safe yield as high as 350 mgd. MWRA's Water Management Act registration is for 312 mgd.

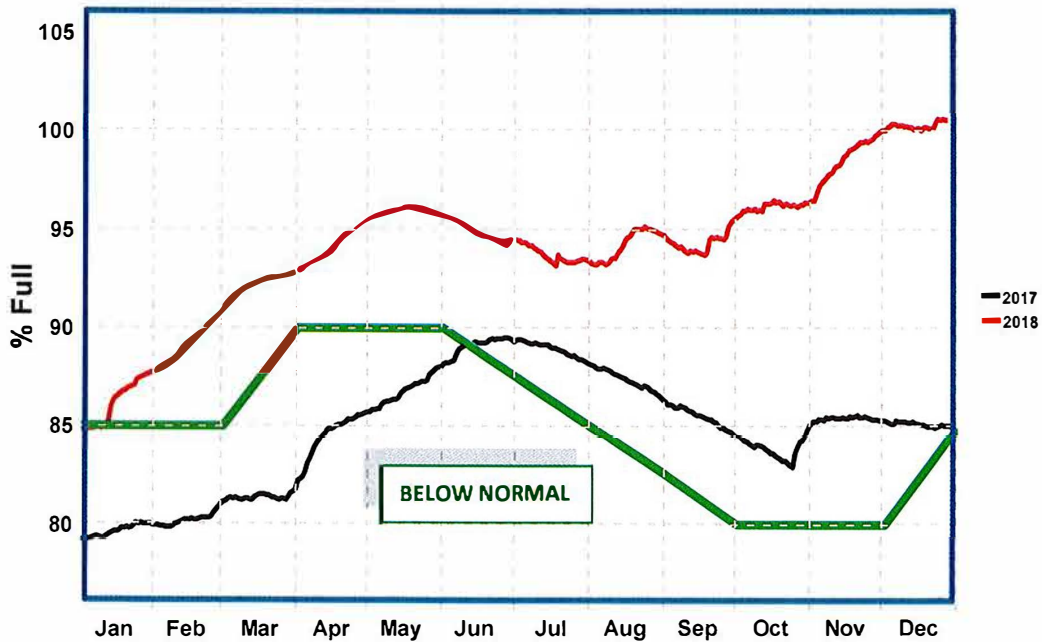
Figure 8: Total Reservoir Withdrawals – Five-Year Running Average 1980 to 2018



Drought Outlook

By the end of September 2018, all the state’s drought-monitoring regions were in normal status. The drought had ended and Quabbin was recovering. Figure 9 below shows a comparison of Quabbin volume levels between 2017 and 2018. The green line on the Figure shows the variation of the limits of normal levels.

Figure 9: Quabbin Reservoir Volumes for 2017 to 2018



Quabbin did begin to spill on October 12, the first time since a brief period of spilling in April and May in 2015. Figure 10 below shows Quabbin spilling at the end of the year. The increase in Quabbin storage is more noteworthy, when considering that to maintain water quality, 35.6 billion gallons of the higher quality Quabbin water was transferred to Wachusett Reservoir during 2018. The transfer was equivalent to about 56% of Wachusett capacity. To maintain Wachusett Reservoir in its normal narrow operating band, MWRA released 16 billion gallons and spilled another 16 billion gallons to the Nashua River, as well as transferred 4.1 billion gallons to Sudbury Reservoir.

Figure 10: Quabbin Reservoir Spilling at the end of 2018



Attachment: Community Water Use Data

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Massachusetts Water Resources Authority MWRA Water Supplied (MGD)

Reporting Period: December 2018

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

	Monthly (MGD)			YTD (MGD)			YTD System Share			Prior Year-End Totals	
	Dec		Flow Change	YTD		Flow Change	Flow Share ¹		% Change in YTD Flow Share	Ave. Flow mgd	Flow Share ¹
	2018	2017		2018	2017		2018	2017			
Metro-System Customers											
Arlington	3.287	3.356	-2.0%	3.698	3.600	2.7%	2.1%	2.1%	0.5%	3.600	2.1%
Belmont	1.687	1.693	-0.3%	2.045	1.987	4.0%	1.2%	1.1%	1.7%	1.967	1.1%
Boston (BWSC)	56.404	57.225	-1.4%	63.615	62.740	1.4%	36.0%	36.2%	-0.8%	62.740	36.2%
Brookline	4.191	4.001	4.7%	4.974	4.866	2.2%	2.8%	2.8%	0.0%	4.866	2.8%
Canton (P)	1.355	0.824	64.5%	1.456	1.296	12.4%	0.8%	0.7%	9.9%	1.296	0.7%
Chelsea	3.033	3.132	-3.2%	3.365	3.339	0.8%	1.9%	1.9%	-1.4%	3.339	1.9%
Dedham-Westwood W.D. (P)	0.134	0.017	709.1%	0.124	0.107	16.3%	0.07%	0.06%	13.8%	0.107	0.1%
Everett	3.544	3.648	-2.8%	3.777	3.779	-0.0%	2.1%	2.2%	-2.2%	3.779	2.2%
Framingham	5.016	4.941	1.5%	5.756	5.673	1.5%	3.3%	3.3%	-0.7%	5.673	3.3%
Leominster (P)	0.000	0.000	0.0%	0.000	0.000	0.0%	0.0%	0.0%	0.0%	0.000	0.0%
Lexington ²	3.771	3.772	-0.0%	5.122	4.928	3.9%	2.9%	2.8%	1.7%	4.928	2.8%
Lynn (LWSC) (P)	0.382	0.199	91.5%	0.345	0.221	55.8%	0.19%	0.13%	52.4%	0.221	0.13%
Lynnfield W.D.	0.347	0.393	-11.9%	0.546	0.525	3.9%	0.31%	0.30%	1.7%	0.525	0.30%
Malden	4.946	4.870	1.6%	5.146	4.922	4.6%	2.9%	2.8%	2.3%	4.922	2.8%
Marblehead	1.230	1.354	-9.1%	1.755	1.750	0.3%	1.0%	1.0%	-1.9%	1.750	1.0%
Marlborough (P)	3.354	3.519	-4.7%	4.003	4.024	-0.5%	2.3%	2.3%	-2.7%	4.024	2.3%
Medford	4.197	4.334	-3.2%	4.530	4.468	1.4%	2.6%	2.6%	-0.8%	4.468	2.6%
Melrose	1.924	1.805	6.6%	2.028	2.003	1.3%	1.1%	1.2%	-0.9%	2.003	1.2%
Milton	1.855	2.259	-17.9%	2.391	2.445	-2.2%	1.4%	1.4%	-4.3%	2.445	1.4%
Nahant	0.238	0.247	-3.6%	0.312	0.343	-9.2%	0.18%	0.20%	-11.1%	0.343	0.20%
Needham (P)	0.385	0.005	8219.1%	0.962	0.592	62.6%	0.5%	0.3%	59.1%	0.592	0.3%
Newton	7.294	6.895	5.8%	8.668	8.351	3.8%	4.9%	4.8%	1.6%	8.351	4.8%
Northborough (P)	0.841	0.825	2.0%	0.894	0.879	1.8%	0.5%	0.5%	-0.4%	0.879	0.5%
Norwood	2.349	2.336	0.5%	2.701	2.810	-3.9%	1.5%	1.6%	-6.0%	2.810	1.6%
Peabody (P)	0.811	2.970	-72.7%	2.971	2.878	3.2%	1.7%	1.7%	1.0%	2.878	1.7%
Quincy	7.403	7.467	-0.9%	7.981	8.295	-3.8%	4.5%	4.8%	-5.9%	8.295	4.8%
Reading	1.335	1.370	-2.5%	1.615	1.588	1.7%	0.9%	0.9%	-0.5%	1.588	0.9%
Revere	3.376	3.427	-1.5%	3.585	3.585	0.0%	2.0%	2.1%	-2.1%	3.585	2.1%
Saugus	2.487	2.599	-4.3%	2.876	2.777	3.6%	1.6%	1.6%	1.3%	2.777	1.6%
Somerville	5.291	5.250	0.8%	5.744	5.569	3.2%	3.2%	3.2%	0.9%	5.569	3.2%
Southborough	0.604	0.619	-2.4%	0.923	0.908	1.7%	0.5%	0.5%	-0.5%	0.908	0.5%
Stoneham	1.582	1.879	-16.8%	2.057	2.147	-4.2%	1.2%	1.2%	-6.3%	2.147	1.2%
Stoughton (P)	0.046	0.137	-66.3%	0.100	0.112	-10.4%	0.1%	0.1%	-12.4%	0.112	0.1%
Swampscott	1.284	1.196	7.4%	1.473	1.398	5.4%	0.8%	0.8%	3.1%	1.398	0.8%
Wakefield (P)	1.334	1.284	3.9%	1.759	1.475	19.2%	1.0%	0.9%	16.7%	1.475	0.852%
Waltham	5.325	5.225	1.9%	6.556	6.437	1.8%	3.7%	3.7%	-0.4%	6.437	3.7%
Watertown	2.309	2.292	0.7%	2.656	2.555	3.9%	1.5%	1.5%	1.7%	2.555	1.5%
Wellesley (P)	0.394	0.094	318.3%	1.006	1.027	-2.0%	0.6%	0.6%	-4.1%	1.027	0.6%
Weston	0.874	0.860	1.6%	1.645	1.724	-4.6%	0.9%	1.0%	-6.6%	1.724	1.0%
Wilmington (P)	0.036	0.186	-78.2%	0.499	0.348	43.4%	0.28%	0.20%	40.3%	0.348	0.20%
Winchester (P)	0.904	0.502	80.2%	1.180	1.273	-7.3%	0.7%	0.7%	-9.2%	1.273	0.7%
Winthrop	1.238	1.148	7.9%	1.259	1.174	7.2%	0.7%	0.7%	4.9%	1.174	0.7%
Woburn (P)	1.051	1.822	-42.3%	2.806	2.196	27.8%	1.6%	1.3%	25.0%	2.196	1.3%
Subtotal Metro-System	149.430	151.956	-1.7%	176.905	173.091	2.2%	100%	100%		173.091	100%
Chicopee Valley Aqueduct											
Chicopee	4.158	4.636	-10.3%	4.998	5.026	-0.6%	70.3%	70.7%	-0.6%	5.026	70.7%
South Hadley FD #1	0.773	0.799	-3.3%	1.003	1.012	-0.8%	14.1%	14.2%	-0.9%	1.012	14.2%
Wilbraham	0.769	0.784	-1.9%	1.106	1.068	3.6%	15.6%	15.0%	3.6%	1.068	15.0%
Subtotal CVA System	5.699	6.219	-8.4%	7.108	7.106	0.0%	100%	100%		7.106	100%
Other Revenue Supply											
Cambridge (P)	0.000	0.000	0.0%	0.025	0.000	#DIV/0!				0.000	
Clinton ³	1.178	1.225	-3.9%	1.374	1.409	-2.5%				1.409	
Worcester (P)	0.000	0.000	0.0%	0.000	0.000	0.0%				0.000	
Other Revenue Customers⁴	1.524	1.453	4.9%	1.409	1.363	3.4%				1.363	
Subtotal Other Revenue Supply⁵	2.702	2.678	0.9%	2.809	2.772	1.3%				2.772	
Total Water Supplied											
Fully Supplied Metro Communities	138.402	139.592	-0.9%	158.799	156.665	1.4%				156.665	
CVA Communities	5.699	6.219	-8.4%	7.108	7.106	0.0%				7.106	
Partially Supplied Communities	11.028	12.364	-10.8%	18.131	16.427	10.4%				16.427	
Other Revenue Customers	2.702	2.678	0.9%	2.783	2.772	0.4%				2.772	
Total Water Supplied	157.832	160.853	-1.9%	186.821	182.969	2.1%				182.969	

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), D.C.R. Blue Hills Ski Area, Stone Zoo, Deer Island WWTP and Department of Youth Services.

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

6) This report includes only water supplied for which revenue is collected in accordance with existing user agreements. It does not include water utilized for system maintenance.

(P) Community is partially supplied by MWRA.

Question's regarding water supplied can be directed to David Liston @ (617) 305-5853 or Leo Norton @ (617) 788-2256.

9-Jan-19