

STAFF SUMMARY

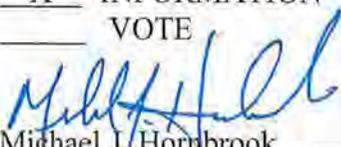
TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director
DATE: January 14, 2015
SUBJECT: Report on 2014 Water Use Trends



COMMITTEE: Water Policy & Oversight

INFORMATION
 VOTE

Daniel Nvule, Senior Program Manager
Stephen Estes-Smargiassi, Director, Planning
Preparer/Title


Michael J. Hornbrook
Chief Operating Officer

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:

The 2014 data show a reduction in the downward indoor water use trend and a slight bump up in the five-year running average demand. Staff believe this is due to a combination of weather and economic factors. Seasonal water use was approximately the same as 2013. Improvement in the regional economy may also have contributed to slowing the downward trend in indoor demand.

Water Consumption by MWRA Communities

Calendar Year 2014 water consumption by all MWRA communities of 191.7 million gallons per day (mgd) was approximately the same as 2013, as shown on Figure 1 on the following page. Consumption was boosted by higher outdoor use during the significantly dryer summer and by 3.21 mgd provided to Cambridge and Hudson¹. If the Cambridge and Hudson uses are netted out, consumption in 2014 would have been 188.5 mgd, slightly lower than the net amount for 2013. Water consumption by MWRA's fully-supplied communities increased slightly. Data for the last five years shows that the decline in indoor use has slowed down when compared to the long-term as discussed on page 3.

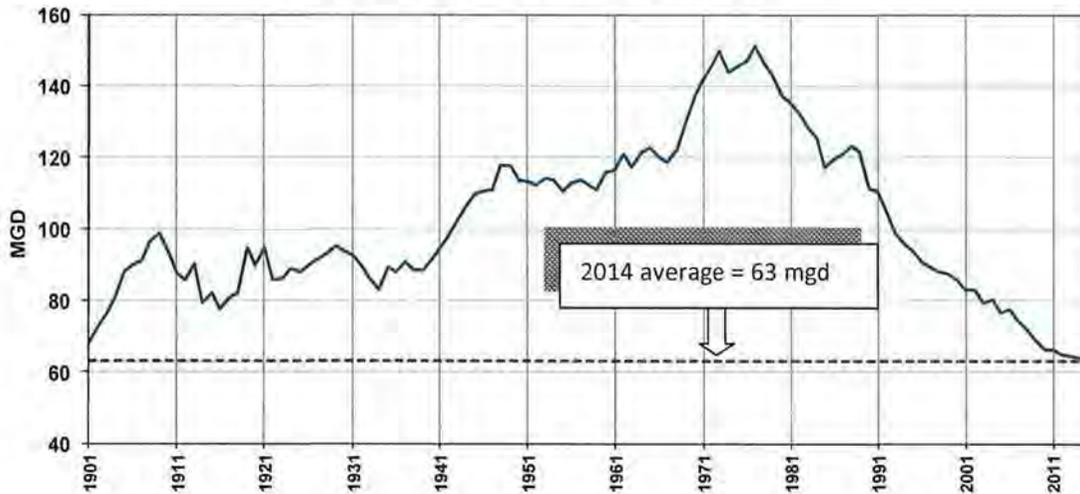
¹ A series of MWRA and Cambridge construction projects limited Cambridge's ability to use its own sources, resulting in the need to be supplied by MWRA. Cambridge stopped using MWRA water on 6/11/2014. In 2014, Cambridge use averaged 2.78 mgd; 3.08 mgd was used in 2013. Hudson requested emergency supply through Marlborough to allow construction of improvements to its treatment system. That supply stopped on 12/29/2014. In 2014, Hudson's use averaged 0.43 mgd, compared with 0.22 mgd for 2013.

Figure 1 – Total Consumption by MWRA Communities (1980 to 2014)



Demand from MWRA's largest customer, Boston Water and Sewer Commission (BWSC), was 63 mgd, slightly lower than last year and still at pre-1900 levels (See Figure 2 below).

Figure 2: Boston Water Use 1900-2014

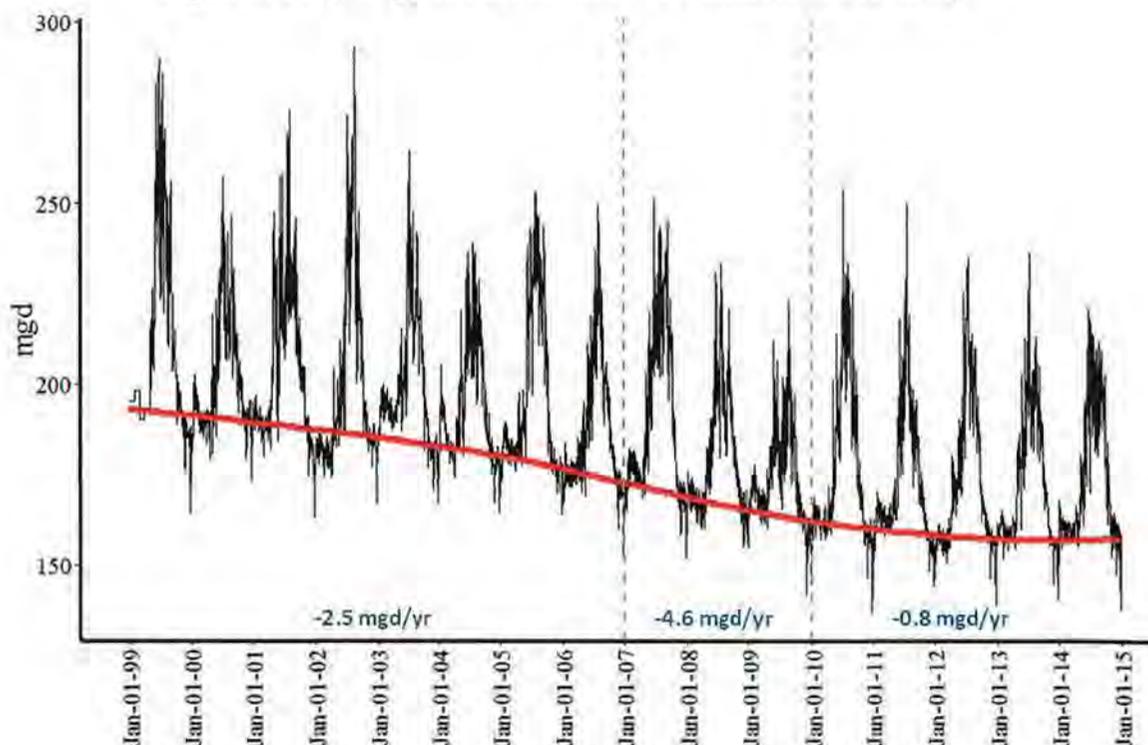


Over time, water use reductions have been in both base use, defined as water use from November to March, and outdoor use (or seasonal use), defined as the increase over the base demand during the irrigation season of May to September. In previous reports, base use was shown as decreasing 1.8% (3 mgd) per year from 1999 to 2013. This year, staff have refined the methodology for estimating base use in order to lessen the bias of older data². As can be seen on Figure 3 on the following page, the results now show three decline regimes: 1999 to 2006, 2007 to 2009 (steepest decline, corresponding to the economic recession), and 2010 to present (lessening of decline corresponding to the economic recovery). The long-term trend of

² A local regression (LOESS) method was used that assigns less weight to data that is further away from the local point.

reductions in base use is generally due to increases in the efficiency of water use in homes and businesses as water-saving technologies continued to increase market share and consumers reacted to price increases, as well as reduced pipeline leaks. The underlying regional economic activity also impacts base demand. As reported last year, this downward trend in water use is seen in many other communities nationwide. A recent USGS Report³ reported a 5% decline in public-supply withdrawals in the US between 2005 and 2010. By comparison, in MWRA's fully-supplied communities, the reduction in base use between those years was 8.1%.

Figure 3: Fully-Supplied Communities Demand (1999 to 2014)⁴



Seasonal water use is more variable 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. Over time, water price also influences seasonal use.

During the past 16 years, seasonal use in the fully-supplied communities has varied from a low of 12 mgd (7% of total use) in 2009 to 20 mgd (11%) in 2007, with an average of approximately 16.3 mgd (8.7%). In 2014, the very dry summer resulted in a seasonal use estimate of 16.4 mgd (approximately the same as 2013) for the fully-supplied communities.

³ Maupin M. A, Kenny J.F., Hutson S.S, Lovelace J.K., Barber N.L, and Linsey K.S. Estimated Use of Water in the United States in 2010. Circular 1405. US Department of the Interior, US Geological Survey. November 2014.

⁴ 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% of the total annual demand.

System wide, 2014 had a maximum day demand of 274.3 mgd (7.8% lower than 2013) on July 2nd. Once again, Christmas was the lowest demand day at 152.6 mgd (6.2% lower than 2013).

Figure 4 below shows the variation in seasonal water use over time, and Figure 5 shows 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 4: Fully-Supplied Communities' Annual Seasonal Demand (labels show demand in mgd)

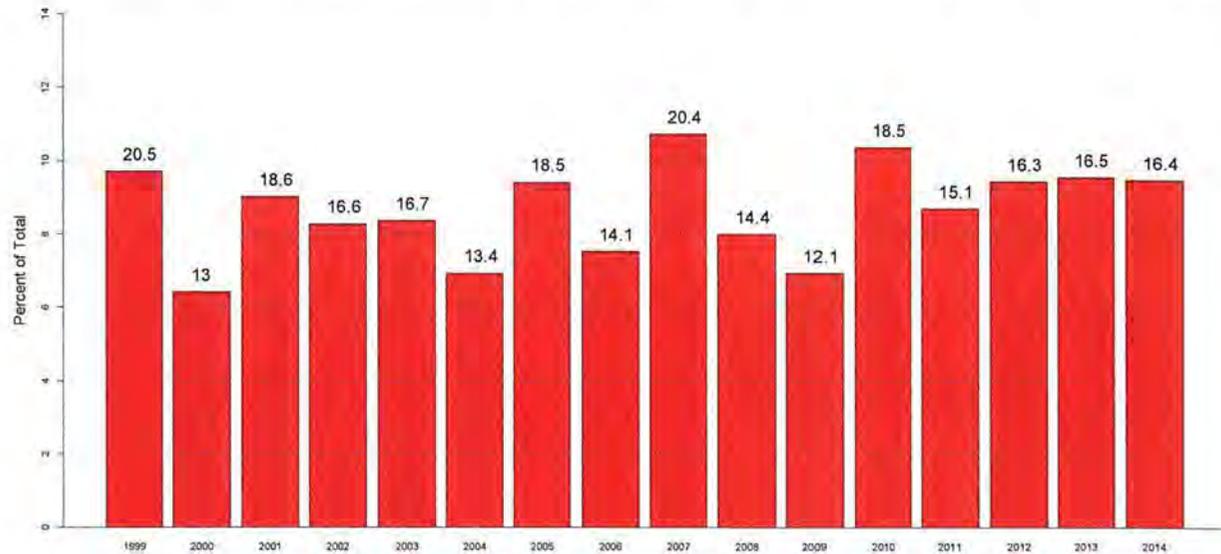
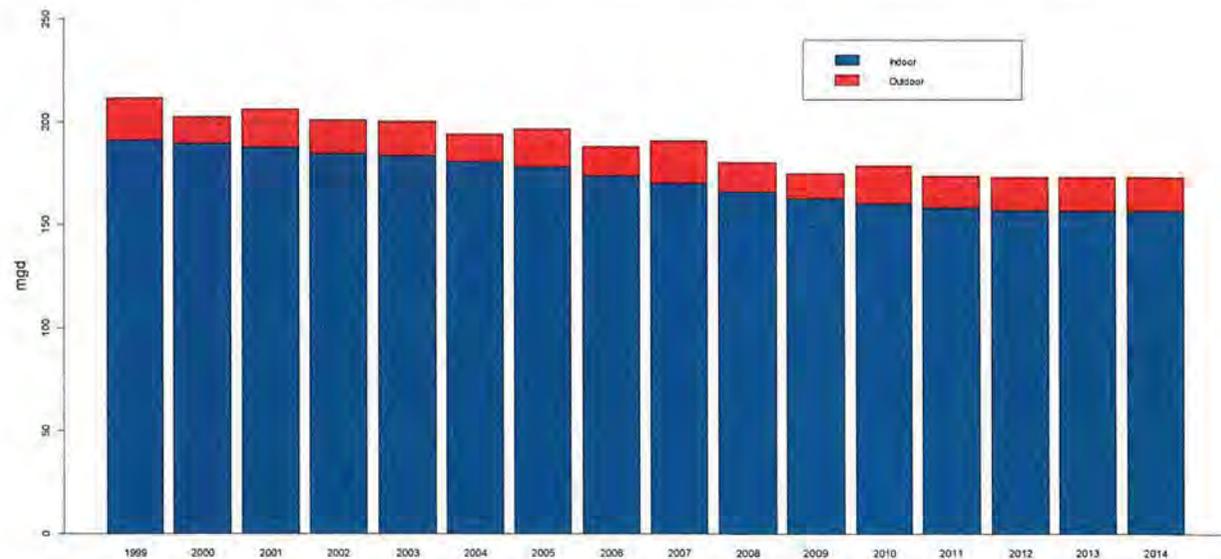


Figure 5: Fully-Supplied Communities Annual Base and Seasonal Demand



Reservoir Withdrawals and Releases

Reservoir withdrawals are the metric used to compare to the 300 mgd safe yield of the watershed/reservoir system⁵. Withdrawals include water sold to MWRA communities, as well as other uses in the watershed and MWRA system. Total MWRA water withdrawals increased slightly in 2014, from 202 mgd in 2013 to 202.6 mgd. Netting out the unusual use by Cambridge and Hudson, withdrawals would have been 199.4 mgd, slightly higher than last year's net figure of 198.6 mgd. Worcester's withdrawals from its reservoirs in the portion of the Wachusett watershed that it shares with MWRA were slightly higher in 2014 than 2013, 5.5 mgd vs. 3.3 mgd, likely due to the dry summer. Over the past five years, total withdrawals have bounced around from 195 to 206 mgd, averaging approximately 200 mgd.

Figure 6 below 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 increased by 1.65 mgd, effectively interrupting the downward trend that started in 1988. As the economy stabilizes over the next few years, staff will monitor any changes in water use, to see if the longer-term downward trend resumes.

Figure 6: Total Reservoir Withdrawals – Five-Year Running Average 1980 to 2014

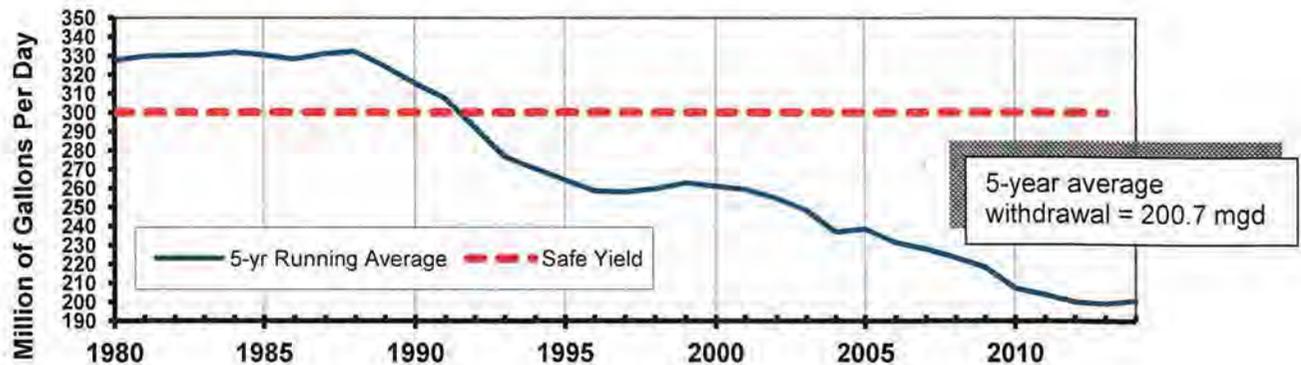


Figure 7 on the following page shows Quabbin elevations and the amount of water spilled for the past 16 years. Quabbin spilled small quantities of water in 2000, 2001, and 2004. Significant spills occurred with the reservoir more than full for extended periods each year between 2005 and 2010 with the largest spills in 2006. With the generally wet spring conditions in 2014, Quabbin spilled for 55 days for a total of approximately 2.6 billion gallons (an annual average of 7.1 mgd). In 2014, releases over the Wachusett Reservoir spillway totaled 3.3 billion gallons (an average of 9 mgd). As can be seen from Figure 7, since 2013, a portion of the yields was simply stored leading to an increase in net storage and reduced spills. This resulted in an upward trend for the end-of-the-year storage.

⁵ 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 7: Quabbin Elevation with Quabbin Spill Volumes⁶

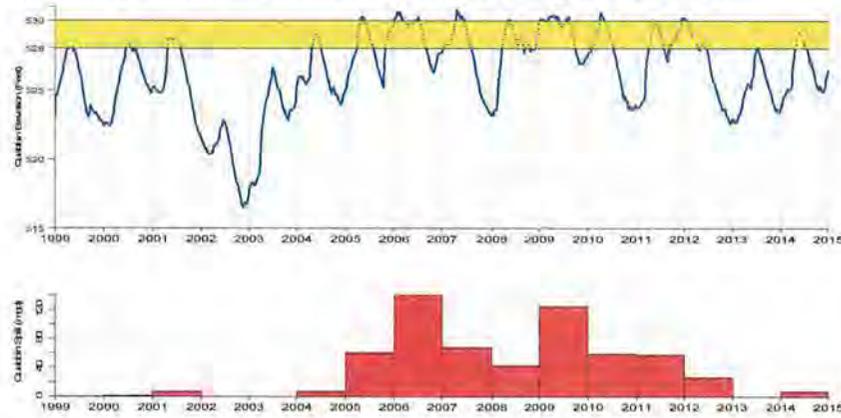
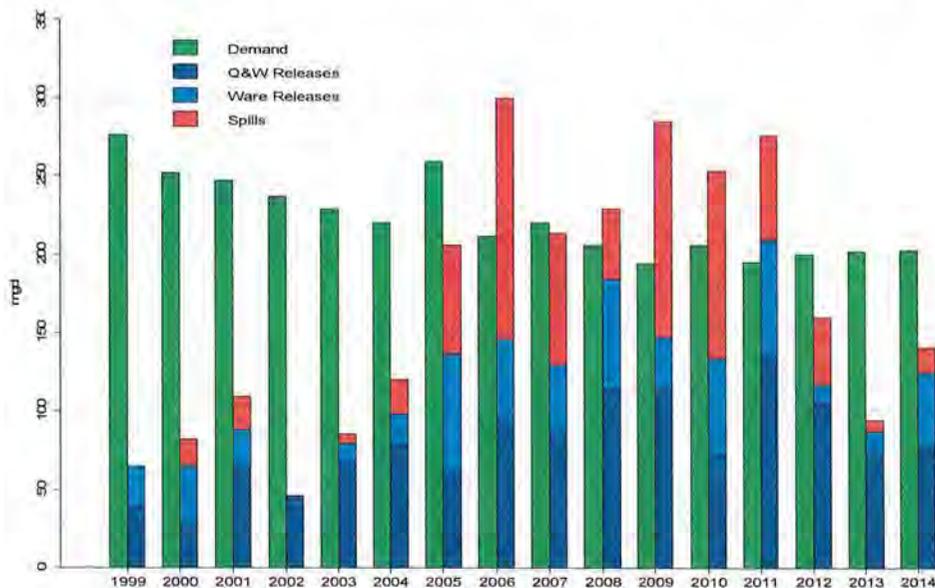


Figure 8 below compares the amount of water withdrawn to supply customer demand to the total amount of water spilled and released, including the spills at Quabbin shown earlier in Figure 7, water spilled or released to the Nashua River from Wachusett Reservoir, water released from Wachusett Reservoir to the Sudbury River through the Wachusett Aqueduct, and Ware River water, which could have been transferred to Quabbin but was not due to lowered demands. MWRA’s annual average releases and spills from the reservoir system have exceeded the amount of water withdrawn for water supply purposes five times in the last 16 years: 2006, 2008, 2009, 2010, and 2011. In 2014, with slightly higher demand and significantly lower run-off from the watersheds into the reservoirs, demand was higher than reservoir spills and releases.

Figure 8: Withdrawals, Spills and Releases (Quabbin, Wachusett and Ware)



⁶ Quabbin spills can occur at elevations between 528 and 530 depending on stop-log use.