MWRA Reservoir Water Withdrawals vs Deer Island Wastewater Flows

Comparison of 2014 Flows

Water Supply Citizens Advisory Committee
Wastewater Advisory Committee

February 16, 2016
• MWRA provides wholesale water and wastewater services to over 2.5 million customers in 61 communities

• MWRA delivers an average of 200 million gallons per day to its water customers, with a peak demand of 350 million gallons

• MWRA collects and treats an average of 350 million gallons of wastewater per day, with a peak capacity of 1.2 billion gallons
MWRA Water System

51 Customer Communities

2.2 Million People Served

200 MGD Average Flow
MWRA Reservoir Withdrawals 2014 – 203 MGD Average

MWRA Reservoir Withdrawals

Rainfall
Reservoir Withdrawals
MWRA Sewer System

43 Customer Communities

2.2 Million People Served

350 MGD Average Daily Flow
Deer Island Plant Flow

Deer Island Flow 2014 – 326 MGD Average

Rainfall
Official Plant Flow
Difference between Reservoir Withdrawals and Water Sales

• Average Difference = 11 MGD

• MWRA Water Use for Maintenance and Construction
  – Pipeline Dewatering and Disinfection
  – Tank Draining and Disinfecting

• Leaks in MWRA Distribution System

• Potential Metering Differences
  – Metering at Carroll Water Treatment Plant and CVA Transmission
  – 175 Community Water Rates Meters
Deer Island Flow and Metered Community Flow 2014

- Deer Island Flow
- Metered Community Flow

Graph showing the flow in MGD from January 2014 to December 2014, with separate lines for Rainfall, Official Plant Flow, and Metered Community Flow.
Difference between Deer Island Flow and Metered Community Flow

• Average Difference = 17 MGD

• Subtraction of Infiltration into MWRA Interceptors
  – Mathematical Proration (using inch-miles) for portion of MWRA Interceptors upstream of Community Sewer Rates Meters

• Potential Metering Differences
  – Metering at 3 Deer Island Facilities (North Main PS, South System PS, Winthrop Terminal HW)
  – 189 Community Sewer Rates Meters
Water Sales and Metered Wastewater Flow 2014

- **Water Sales**
- **Metered Community Flow**

**Axes:**
- Y-axis: MGD
- X-axis: Months from January 2014 to December 2014

**Legend:**
- Rainfall
- Water Sales
- Metered Community Flow
Five Customer Community Groupings
Group 1 - Blue

Fully Supplied Water and Full Sewer Communities

Arlington  Milton
Belmont     Newton
Boston      Norwood
Brookline   Quincy
Chelsea     Reading
Everett     Revere
Framingham  Somerville
Lexington   Stoneham
Malden      Waltham
Medford     Watertown
Melrose     Winthrop
Group 1 Water Sales and Metered Wastewater Flow

MGD

Jan-14  Feb-14  Mar-14  Apr-14  May-14  Jun-14  Jul-14  Aug-14  Sep-14  Oct-14  Nov-14  Dec-14

Rainfall  Group 1 Water Sales  Group 1 Metered Wastewater Flow
Group 1 Water Sales - Estimated Seasonal Use

- Estimated Winter Water Use
- Estimated Seasonal Water Use
- Rainfall
- Group 1 Water Sales
Group 1 Metered Wastewater Flow - Estimated Seasonal Flows

MGD:
- Group 1 Sanitary Flow
- Group 1 I/I
- Rainfall
- Group 1 Metered Wastewater Flow

Months:
- Jan-14
- Feb-14
- Mar-14
- Apr-14
- May-14
- Jun-14
- Jul-14
- Aug-14
- Sep-14
- Oct-14
- Nov-14
- Dec-14

Flow Rates:
- 0.00
- 4.00
- 8.00
- 12.00
- 16.00
- 20.00

Seasonality Overview:
- Group 1 Metered Wastewater Flow shows peak usage in Dec-14 with a significant increase from Jan-14 to Dec-14.
- Sanitary and I/I flows are depicted in a different context, focusing on inflow and infiltration impacts.
- Rainfall spikes are evident, especially in Jul-14 and Aug-14, showing increased water intake due to weather conditions.
Group 1 Estimated Winter Water Use vs Sanitary Flow

- MGD
- Jan-14 to Dec-14
- Rainfall
- Group 1 Water Sales
- Group 1 Sanitary Flow
- Group 1 Metered Wastewater Flow
- Group 1 Winter Water Use
Group 2 - Green

Partially/Emergency Supplied MWRA Water (and locally supplied water) and Full Sewer Communities

Bedford
Cambridge (Emergency)
Canton
Dedham-Westwood Water District
Needham
Stoughton
Wakefield
Wellesley
Wellesley
Wilmington
Wellesley
Winchester
Woburn
Five Customer Community Groupings
Group 2 Water Use - Estimated Seasonal Use

- Estimated Winter Water Use
- Estimated Seasonal Water Use
- Rainfall
- Group 2 Water Use
Group 2 Estimated Winter Water Use vs Sanitary Flow

- MGD
- Group 2 Estimated Winter Water Use
- Group 2 Sanitary Flow
- Group 2 Metered Wastewater Flow
- Group 2 Water Use
- Rainfall

<table>
<thead>
<tr>
<th>Jan-14</th>
<th>Feb-14</th>
<th>Mar-14</th>
<th>Apr-14</th>
<th>May-14</th>
<th>Jun-14</th>
<th>Jul-14</th>
<th>Aug-14</th>
<th>Sep-14</th>
<th>Oct-14</th>
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X-axis: Months from Jan-14 to Dec-14
Y-axis: MGD

Legend:
- Rainfall
- Group 2 Water Use
- Group 2 Sanitary Flow
- Group 2 Metered Wastewater Flow
- Group 2 Winter Water Use
Group 3 - Red

Full Sewer Only Communities (Locally Supplied Water)

Ashland
Braintree
Burlington
Hingham
Holbrook
Natick
Randolph
Walpole
Weymouth
Five Customer Community Groupings
Group 3 Water Use- Estimated Seasonal Use

- Estimated Winter Water Use
- Estimated Seasonal Water Use
- Rainfall
- Group 3 Water Use
Group 3 Metered Wastewater Flow - Estimated Seasonal Flows

- Group 3 Sanitary Flow
- Group 3 I/I
- Rainfall
- Group 3 Metered Wastewater Flow
Group 3 Estimated Winter Water Use vs Sanitary Flow

- MGD (Million Gallons per Day)
- Jan-14 to Dec-14
- Group 3 Winter Water Use
- Group 3 Sanitary Flow
- Group 3 Metered Wastewater Flow
- Group 3 Water Use
- Rainfall

Graph illustrates the water use and sanitary flow of Group 3 from January 2014 to December 2014.
Group 4 - Orange

Fully Supplied Water Only Communities

Chicopee (CVA Water)
Clinton (Raw Water)
Lynnfield Water District
Marblehead
Nahant
Saugus
South Hadley F.D. #1 (CVA Water)
Southborough
Swampscott
Weston
Wilbraham (CVA Water)
Five Customer Community Groupings
Group 4 Water Use - Estimated Seasonal Use

- Estimated Winter Water Use
- Estimated Seasonal Water Use
- Rainfall
- Group 4 Water Use

Graph showing water usage trends from January 2014 to December 2014.
**Fully Supplied Water Only Communities**

<table>
<thead>
<tr>
<th>Community</th>
<th>Wastewater Treated By</th>
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<tbody>
<tr>
<td>Chicopee (CVA Water)</td>
<td>Chicopee WWTP</td>
</tr>
<tr>
<td>Clinton (Raw Water)</td>
<td>MWRA Clinton AWWTP</td>
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<tr>
<td>Lynnfield Water District</td>
<td>Local Septic Systems</td>
</tr>
<tr>
<td>Marblehead</td>
<td>South Essex Sewer District WWTP</td>
</tr>
<tr>
<td>Nahant</td>
<td>Lynn WWTP</td>
</tr>
<tr>
<td>Saugus</td>
<td>Lynn WWTP</td>
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<tr>
<td>South Hadley F.D. #1 (CVA Water)</td>
<td>South Hadley WWTP</td>
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<tr>
<td>Southborough</td>
<td>Local Septic Systems</td>
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<tr>
<td>Swampscott</td>
<td>Lynn WWTP</td>
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<tr>
<td>Weston</td>
<td>Local Septic Systems</td>
</tr>
<tr>
<td>Wilbraham (CVA Water)</td>
<td>Springfield WWTP</td>
</tr>
</tbody>
</table>
Group 5 - Purple

Partially/Emergency Supplied MWRA Water Only Communities
And Other Water Revenue Customers

Leominster (Raw Water)
Lynn (G.E. Plant only)
Marlborough
Northborough
Peabody
Worcester (Raw Water/Emergency)

Other Water Revenue Customers
- DCR Parks and Pools
- Stone Zoo
- Deer Island WWTP

Group 5 2014 Average Water Sales = 7 MGD
(4% of Total Sales)
Five Customer Community Groupings
Summary/Metered Community Wastewater Flow

Total Metered Community Flow - Groups 1 through 3

- Total Metered Community Flow
- Group 1 Wastewater Flow
- Group 2 Wastewater Flow
- Group 3 Wastewater Flow
Long Term Wastewater Flow Trends
Long-Term Regional Wastewater Flow

The graph demonstrates the fluctuation of wastewater flow over the years, with notable peaks and valleys. The lower bar chart shows the corresponding rainfall in inches for each year.
Five Year Running Average Regional Wastewater Flow
2015 Water Use Trends

WAC/WSCAC Presentation
February 16th, 2016
Where MWRA Started From, And Where We’ve Ended up

MWRA Demand

- Historical Use
- WFA Projection
- Actual Use

Year

Demand (mgd)

1840 1860 1880 1900 1920 1940 1960 1980 2000
Demand Declining Despite Steady or Increasing Population

MWRA System Water Demand vs. Population

- Demand Declining Despite Steady or Increasing Population
2015 Water Consumption By Communities: 4.8 mgd (2.5%) higher than last year.

[Graph showing water consumption from 1980 to 2015, with 2015 consumption at 196.5 mgd.]
MWRA Water Use Comparison 2014 and 2015

Legend
- More than 5% Decrease
- 1%-5% Decrease
- 1% Decrease - 1% Increase
- 1%-5% Increase
- More than 5% Increase
City of Boston Water Use 1900-2015

2015 average = 65 mgd
Computation of Base Use
Fully Supplied Communities Demand 2000-2015
Daily Demand with Base Use Estimate
Unaccounted for Water

AWWA Water Balance

<table>
<thead>
<tr>
<th>Year</th>
<th>Fully Supplied</th>
<th>City of Boston</th>
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<tbody>
<tr>
<td>1987</td>
<td>32.0%</td>
<td>34.0%</td>
</tr>
<tr>
<td>1995</td>
<td>17.3%</td>
<td>20.8%</td>
</tr>
<tr>
<td>2014</td>
<td>16.0%</td>
<td>8.5%</td>
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</table>
2015 Had Unseasonably Cold Winter Temperatures

Boston's Weather in 2015

Temperature in Fahrenheit
Data represents average daily temperatures. Accessible data dates back to January 1, 1938.
2015 Had Unseasonably Cold Winter Temperatures

Boston's Weather in 2015

Temperature in Fahrenheit

Data represents average daily temperatures. Accessible data dates back to January 1, 1938.
Cold Temperatures Led to Higher Usage
Logan Airport Daily Cumulative Rainfall

Long-term (1936 to 2014) average

2015 Cumulative Total

Inches

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Unseasonably Cold Winter Temperatures and Dryer Summer Impacted Demand

Winter temperatures caused an extra 1.92 mgd in Feb, Mar and April when compared to 2014.

Higher demands can be seen during the outdoor use season.
Fully Supplied Communities Seasonal Use
(Labels show demand in mgd)
Fully Supplied Communities Annual Demand Components

[Bar chart showing annual demand components from 2000 to 2015, with indoor and outdoor demand indicated by different colors.]

Indoor

Outdoor
Five-Year Running Average Total Reservoir Withdrawals
Slight Increase

- 5-year average withdrawal = 201.5 mgd
Demand Has Dropped Dramatically, Even with New User Communities

[Graph showing water demand in Million of Gallons Per Day from 1980 to 2014. Key cities mentioned: Bedford, Dedham/Westwood, Stoughton, Reading, Wilmington.]
2014 Demand

Cold Winter: 1.92
Outdoor: 3.08
Cambridge: -2.78
Hudson: -0.43
City of Lynn: 0.5
Other: 1.85

2015 Demand: 206.7

mgd
Quabbin Reservoir Still In Normal Operations Band

- Normal
- Below Normal
- Below ~55% Drought Emergency Stage 1
- Below 38% Drought Emergency Stage 2
- Below 25% Drought Emergency Stage 3
Withdrawals, Spills and Releases
(Quabbin, Wachusett and Ware)