MWRA at 30: Then and Now

Frederick A. Laskey
Executive Director

July 2015

MWRA Service Area

- MWRA provides wholesale water and wastewater services to over 2.5 million customers in 61 communities
- On average, 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

Make-Up Of MWRA Service Area

- 51 communities that get water service – over 6,000 miles of water pipe
- 43 communities that get sewer service
- Of those, 30 get both water and sewer

  - 39 Towns
  - 20 Cities
  - 1 Fire District

  - 37 Boards of Selectmen
  - 20 Mayors
  - 3 Council Presidents

Violation Of The Clean Water Act

- In 1982 and 1983, civil suits were filed against the MDC and other state agencies claiming that the Massachusetts Clean Waters Act had been violated as a result of discharges of untreated and partially treated sewage from Nut and Deer Islands

A New Agency Was Needed

- MDC was determined to be unable to fulfill its mission
- Comprehensive legislation was ready for consideration by the legislature in 1984
- But over the summer, progress was slowed as lawmakers, regulators, lawyers, environmentalists and citizens wrangled over the details
- A Federal Judge brought the process to a head by declaring a moratorium on new sewer hookups

On July 1, 1985, The MWRA Opened

- MWRA assumed responsibility for the water and sewer infrastructure serving greater Boston, and to end the pollution of Boston Harbor from obsolete treatment plants
- MWRA was created as an independent authority charged with raising its revenue from ratepayers, bond sales and grants
- MWRA had to establish wholesale water and sewer rates to cover all costs, including a massive capital program to repair and upgrade the systems
- MWRA was also charged with promotion and enforcement of water conservation and planning for the future
- In compromise with Western and Central Massachusetts, MDC retained watershed management, but MWRA covers costs

What did we inherit?

Two Obsolete Wastewater Treatment Plants

Raw Sewage Pouring Into Boston Harbor Daily

Dry Weather CSOs

On The Water Side, Things Were Pretty Grim

- Thousands of miles of aging pipelines were leaking millions of gallons of water
- No plans were in place for upgrades to carry the water system into the next century
- And the Northeast Drought of the late 1960s cast doubt on the adequacy of existing sources
- Little covered storage
  - Open reservoirs after treatment
  - Crude and inconsistent disinfection

Gaseous Chlorine

And A Lot Of Leaky, Old Pipes

Neglected Dams And Unprotected Watersheds

And A Lot Of Leaky, Old Pipes

Tuberculated Pipe

And A Lot Of Leaky, Old Pipes

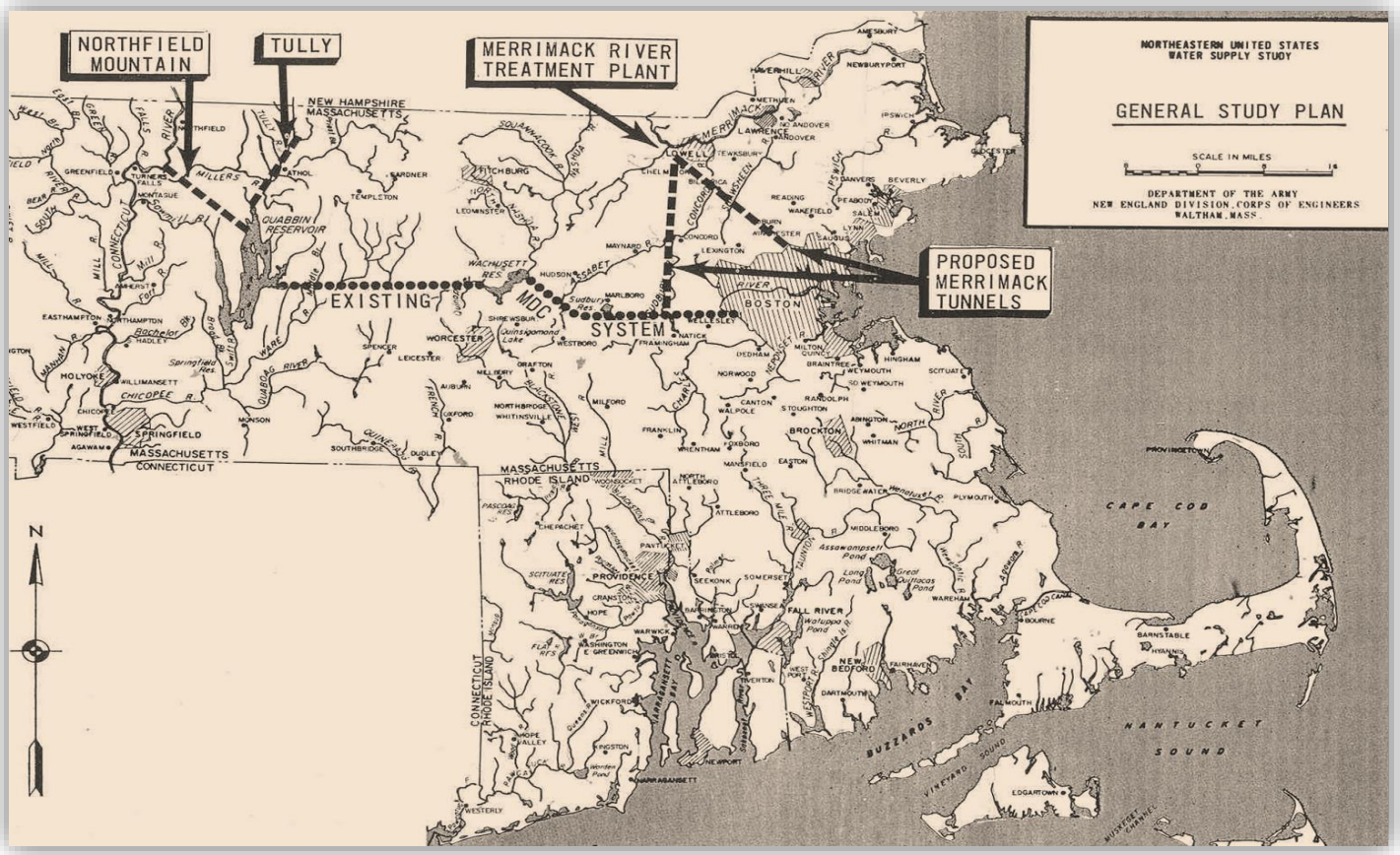
Leaking Valve Assembly

And A Lot Of Leaky, Old Pipes

Water System Demand Exceeded Safe Yield

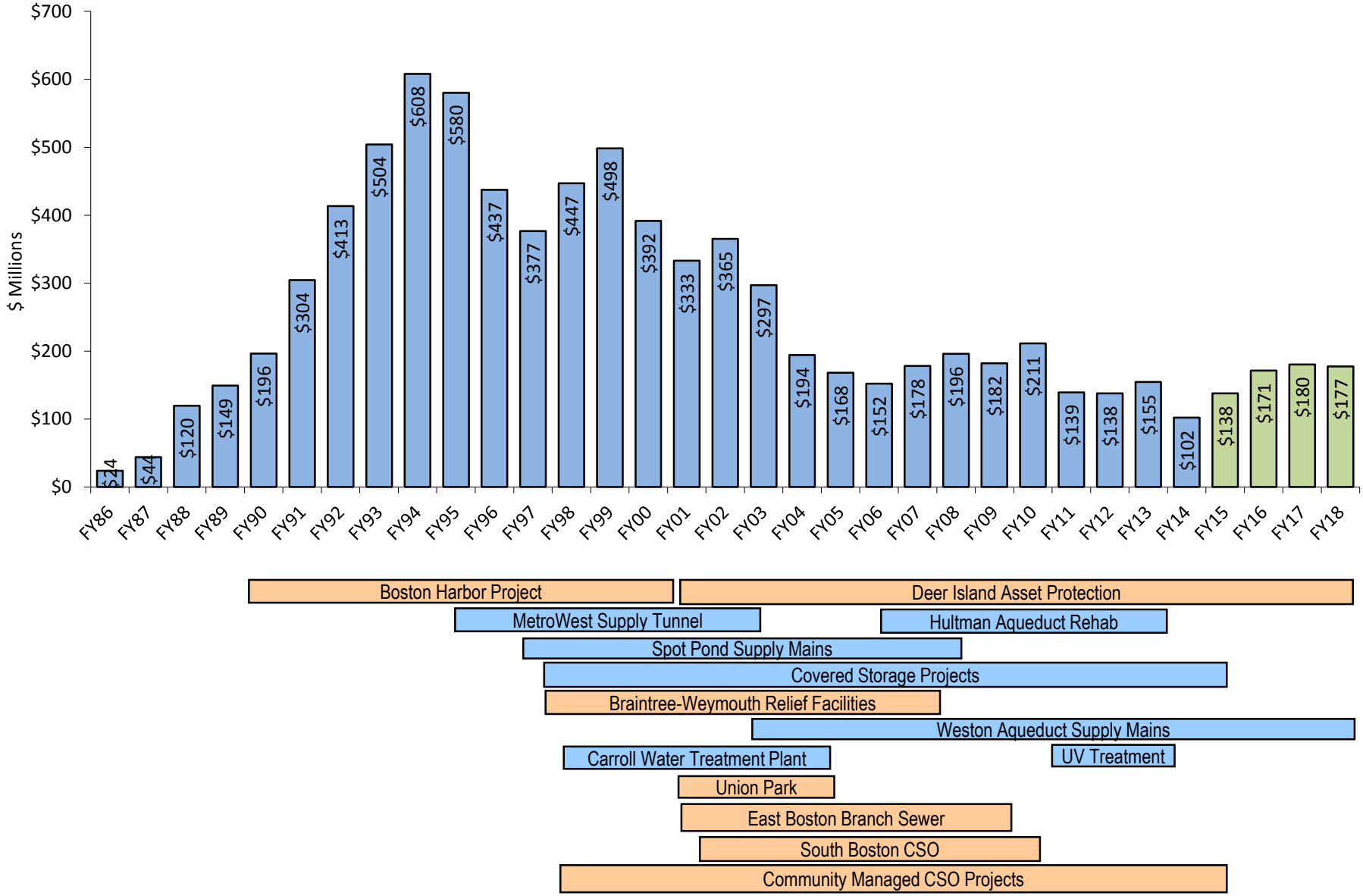
Studies For Alternative Sources

- The Northfield Project was a proposal for skimming Connecticut River spring flood flows and diverting them into the Quabbin Reservoir

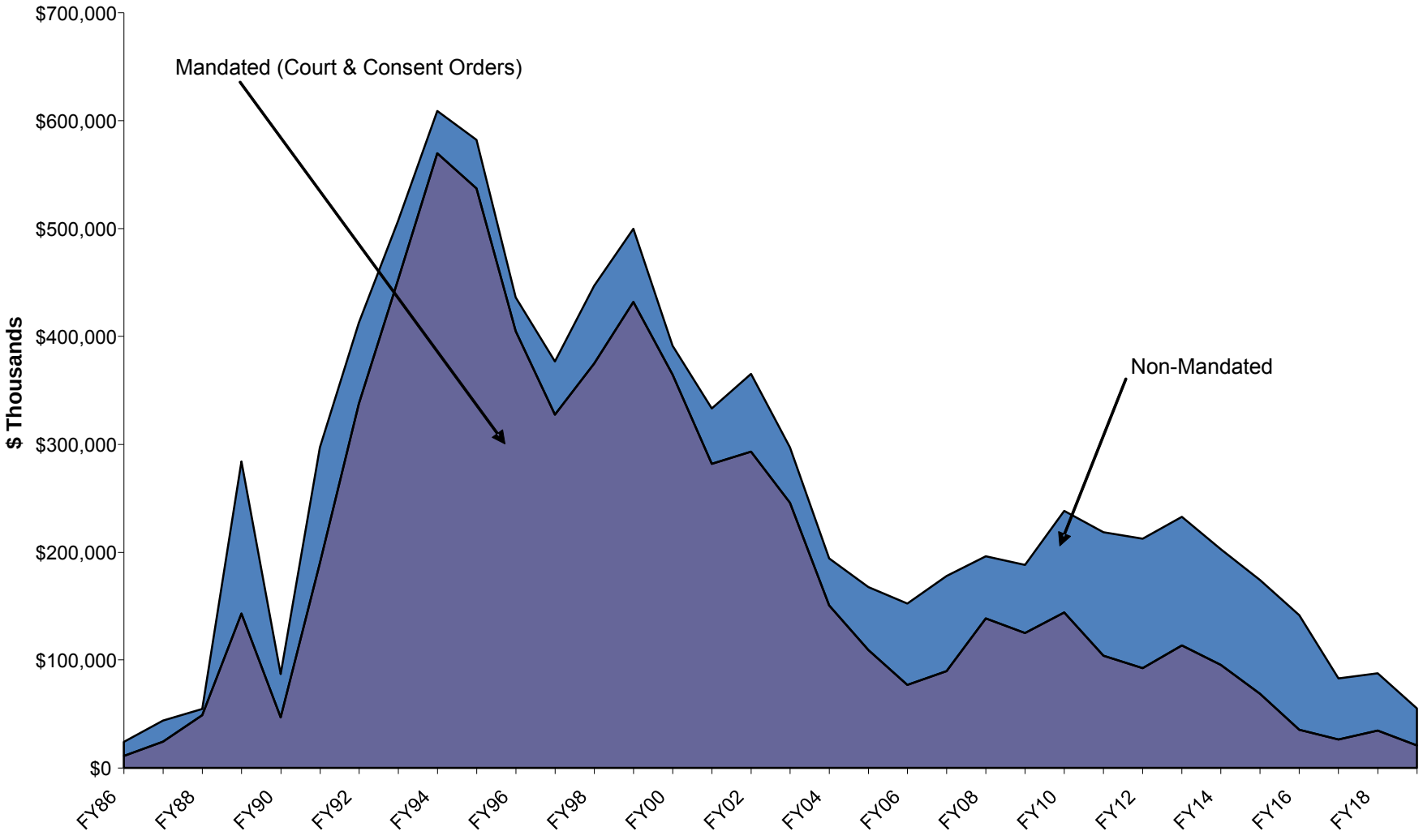


What did we have to do?

MWRA's $7 Billion Capital Improvement Program



80% Of Capital Spending Has Been Mandated



Restore One Of The World's Greatest Water Systems

Quabbin Reservoir

Storage:	412 billion gallons
Depth:	150 feet
Length:	17.9 miles
Width:	3 miles

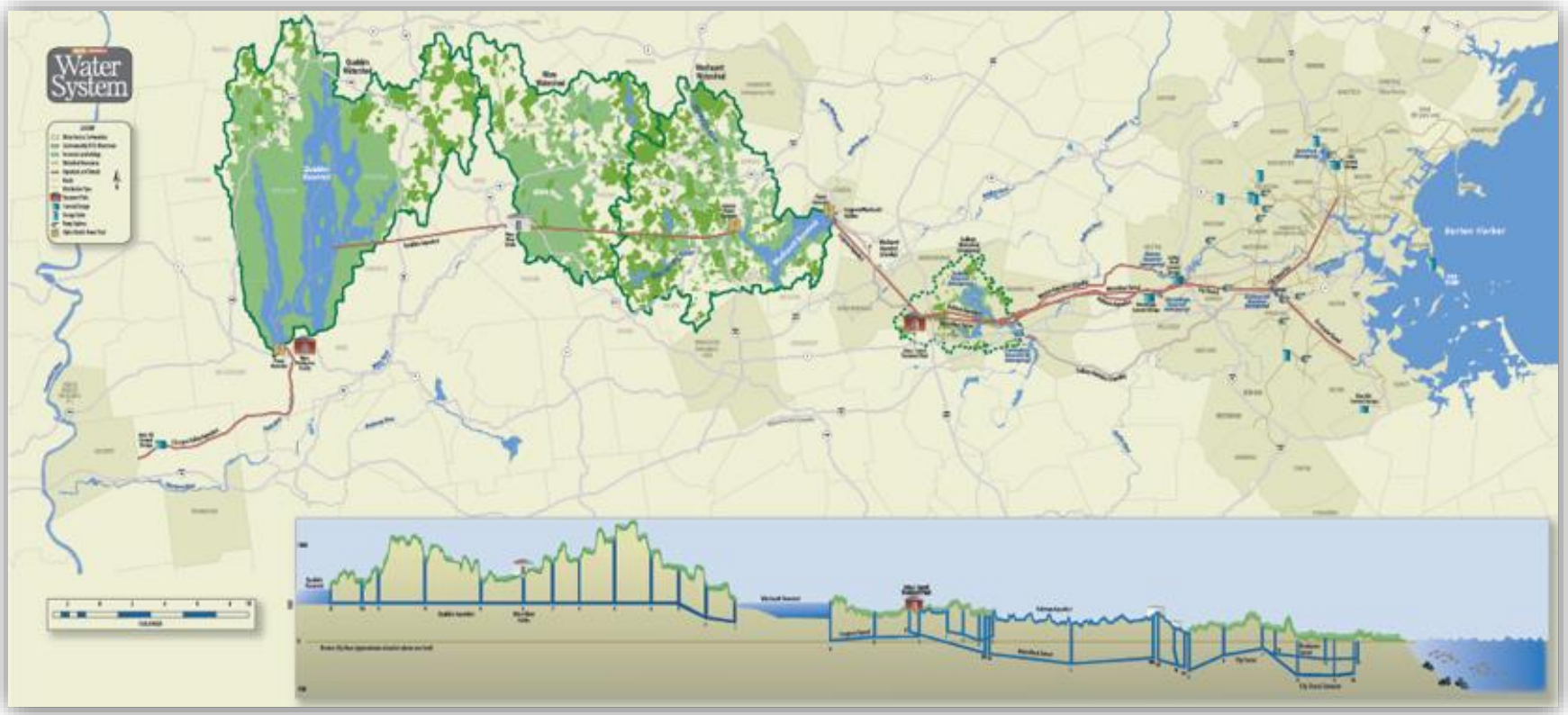
Wachusett Reservoir

Storage:	65 billion gallons
Depth:	129 feet
Length:	8.5 miles
Width:	1 mile

25

An Civil Engineering Marvel

- 102 miles of active transmission mains and tunnels (43 miles on standby)
- 284 miles of distribution mains with over 4,700 valves
- About 85% of the water is delivered by gravity
- 11 pump stations
- 5 years of storage



Words To Live By

"…as we progress and find that we can control the quality of the water by our own acts, we realize it is a wicked thing to turn water containing a large amount of organic matter into a city or town for people to drink – children, invalids and people whose constitutions are too weak to overcome the effects of bad water.
I think we should realize the responsibility that rests on us as superintendents and engineers to do all that we can to raise the standard; to insist that a city or town should have good water and that they should judiciously spend enough to make it good."

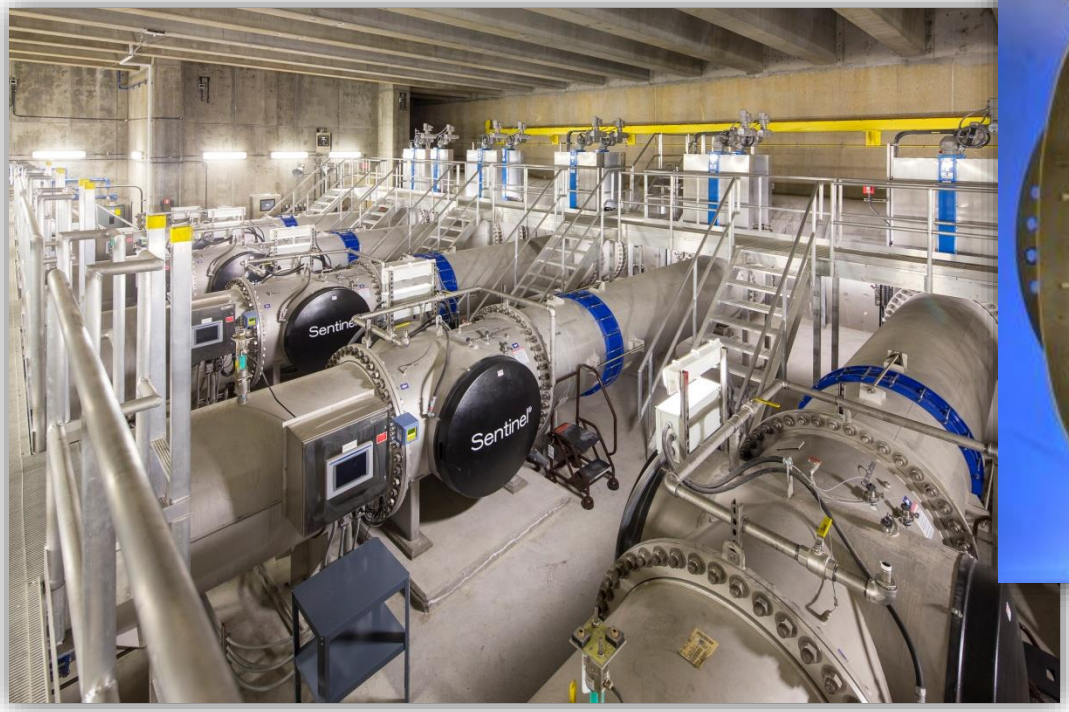
-Desmond Fitzgerald, Boston Water Works
1895 annual meeting of the
New England Water Works Association

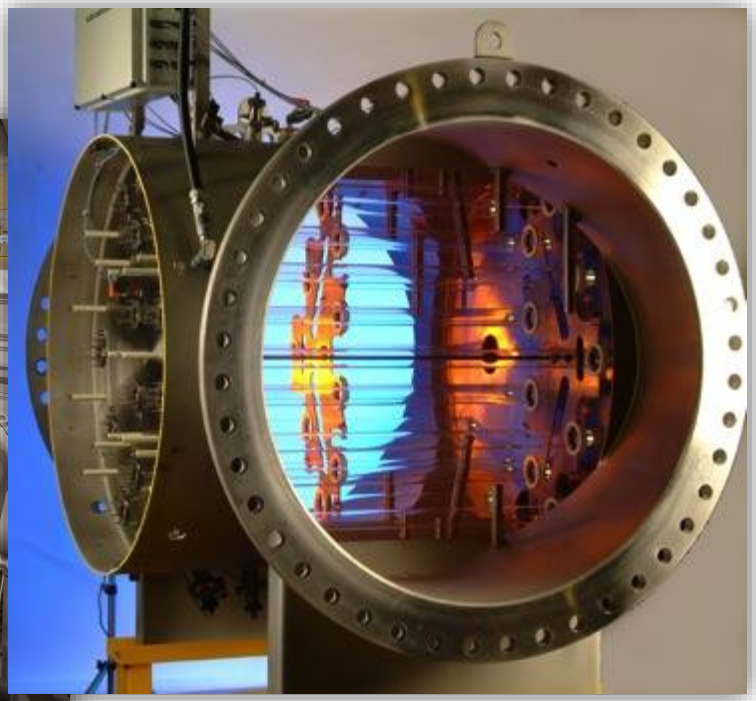
John J. Carroll Water Treatment Plant

- Completed in July 2005
- Treatment Processes:
  - Ozonation for primary disinfection
  - Corrosion control
  - Chloramination for secondary disinfection
  - Fluoridation

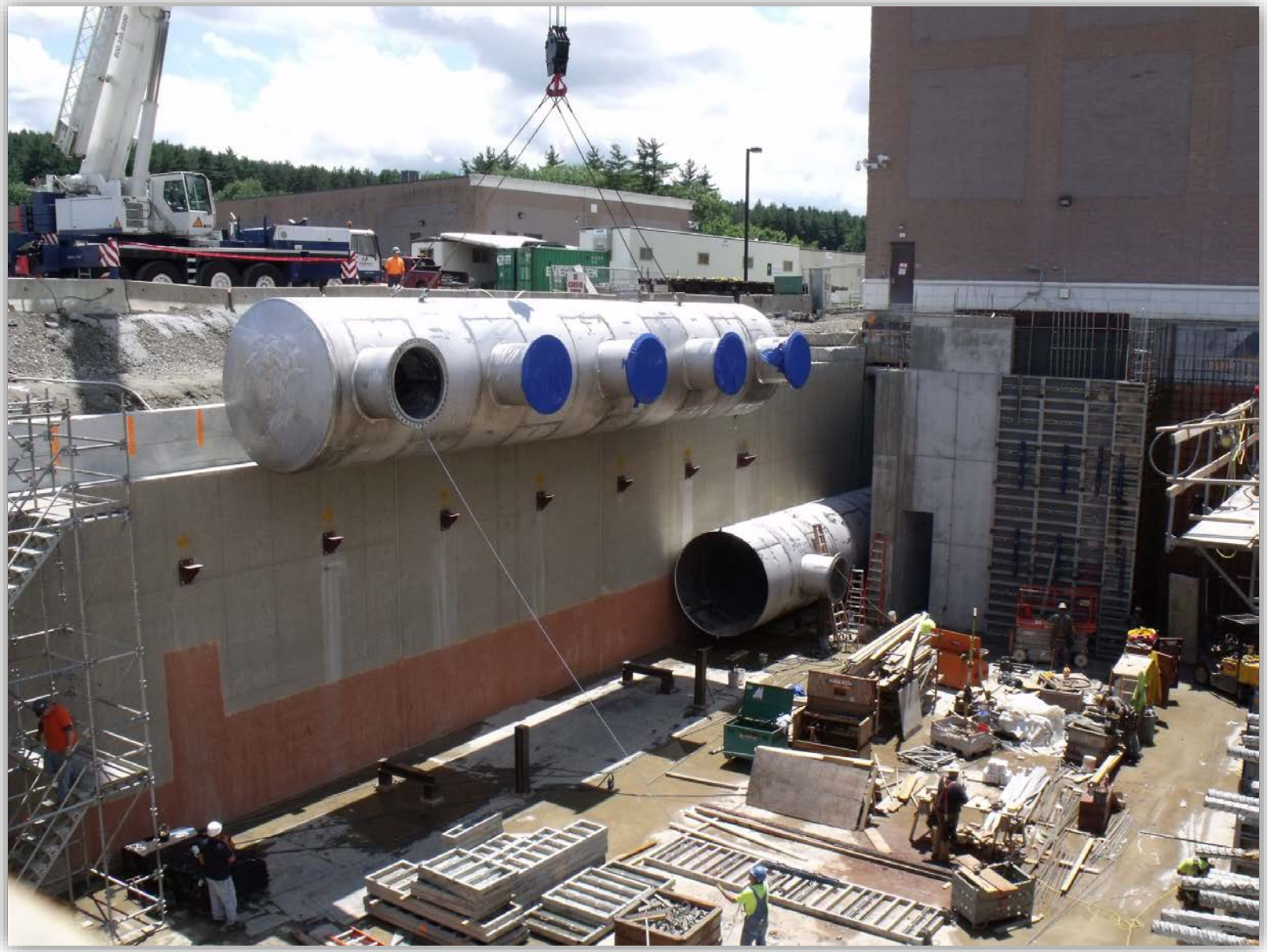
Addition Of Ultraviolet Light Disinfection

- New regulations required that unfiltered systems must have two primary disinfectants, one of which must achieve *Cryptosporidium* inactivation
- UV facilities at the Carroll Treatment Plant came on-line in April 2014

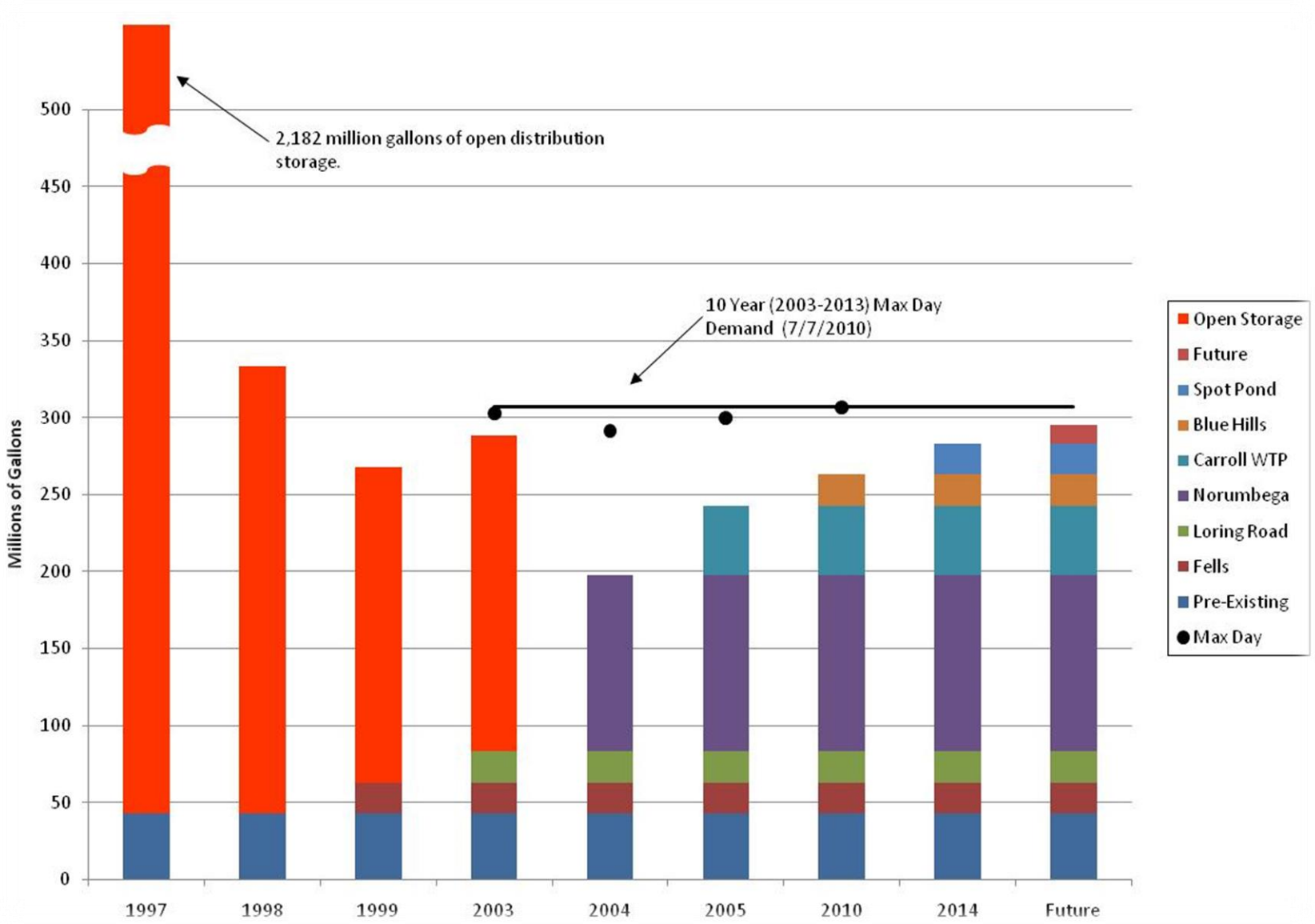




UV Header Pipe

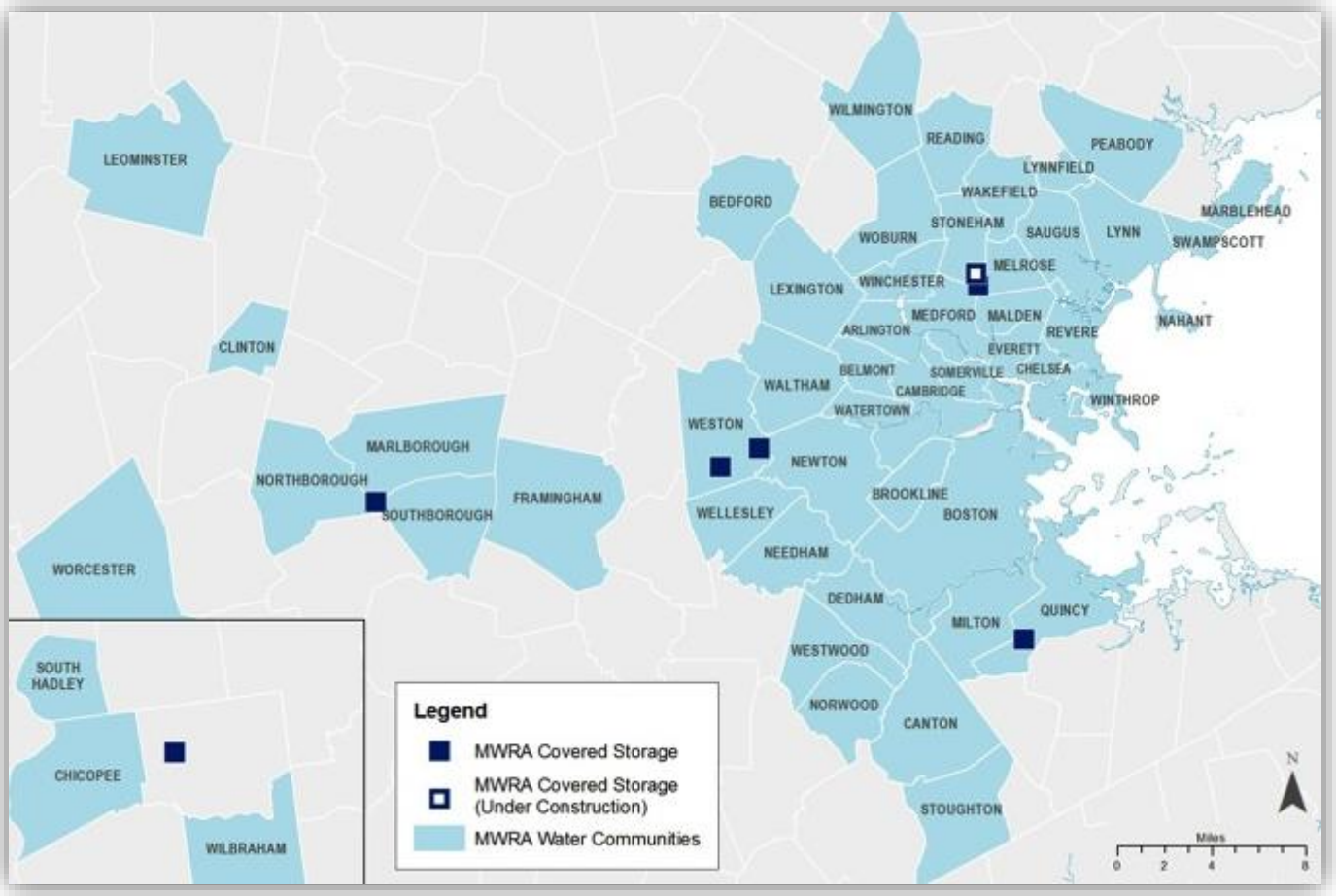


MWRA Metropolitan Area Storage Capacity Over Time



Covered Storage Projects

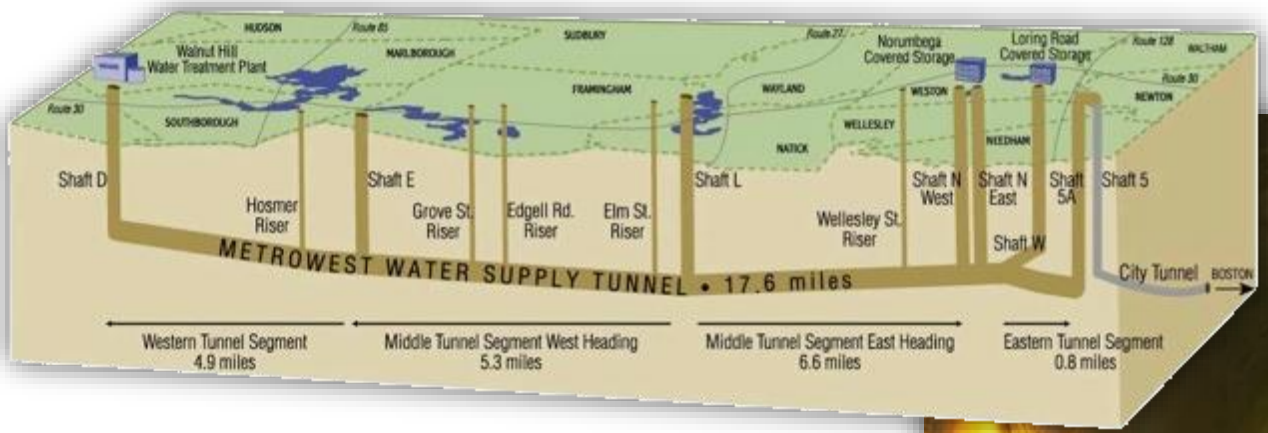
- MWRA has built six new covered storage tanks to replace all open reservoirs
- The last one is just about complete



Spot Pond Covered Storage And Pump Station

MetroWest Water Supply Tunnel

- The MetroWest Water Supply Tunnel was brought on-line in November 2003
- By March 2004, the Tunnel was being fully utilized allowing the shutdown of the Hultman Aqueduct for repair

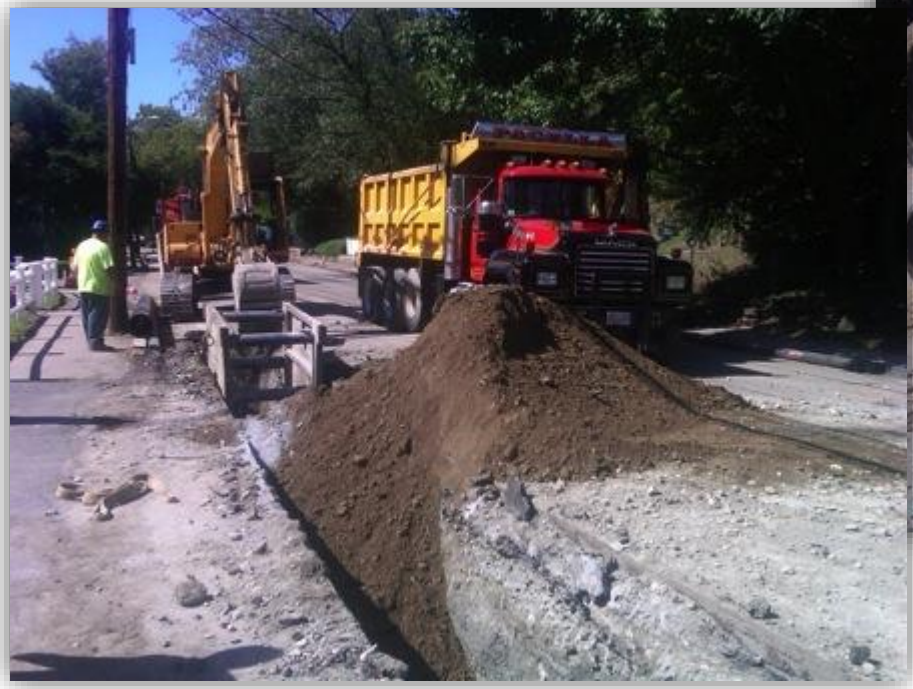


Hultman Aqueduct Rehabilitation

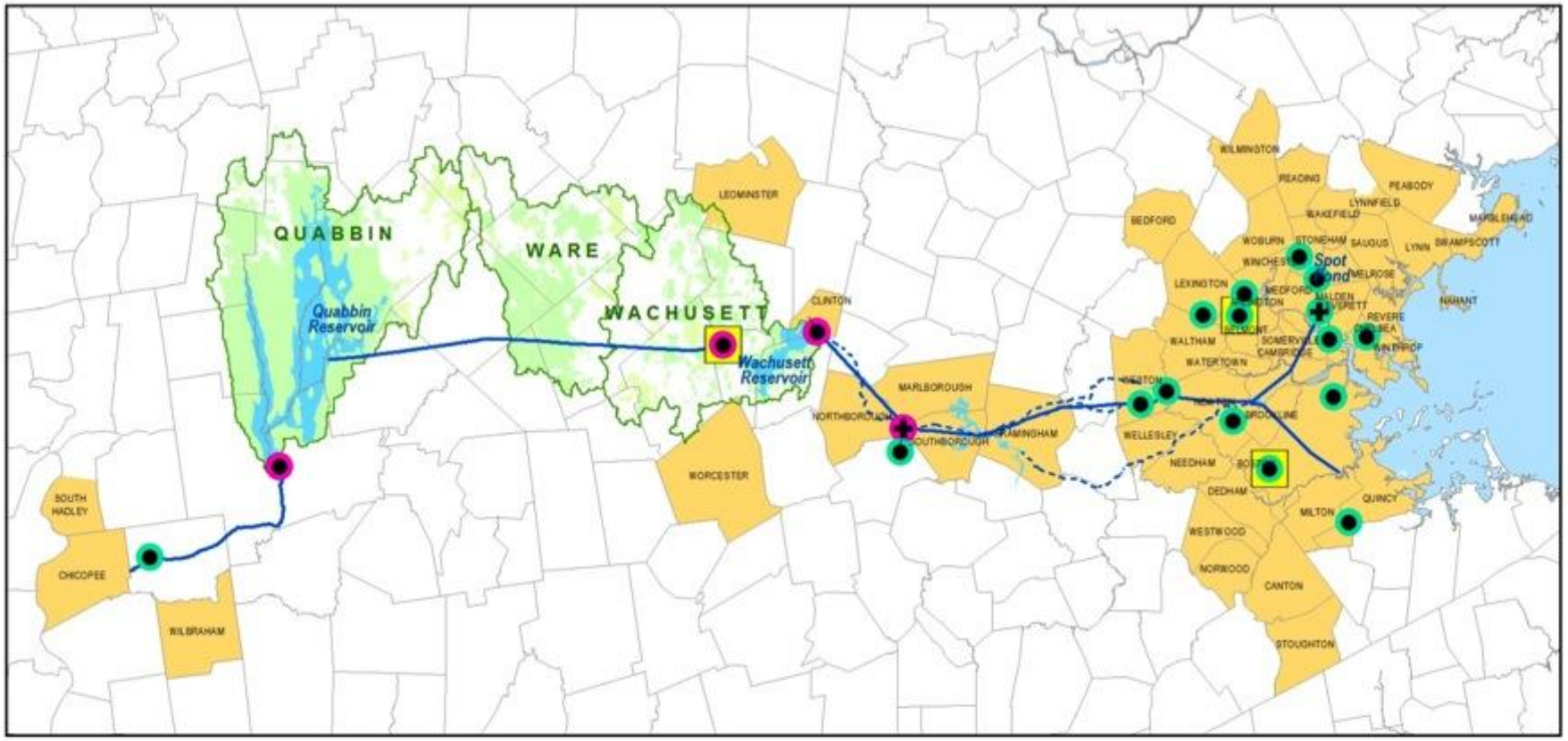
- Since 2013, for the first time since originally planned in the 1930s, the Metropolitan Water System has redundancy for the Hultman Aqueduct from Marlborough to Weston

Water Pipeline Rehabbed Or Replaced

- 81 miles of MWRA-owned pipeline
- 474 miles of community-owned pipeline



State-Of-The-Art Monitoring System



Monitoring and Event Detection
Monitoring Only
FINISHED
RAW
Under Installation
MWRA Water Communities

s::can Parameters Monitored At 18 Locations

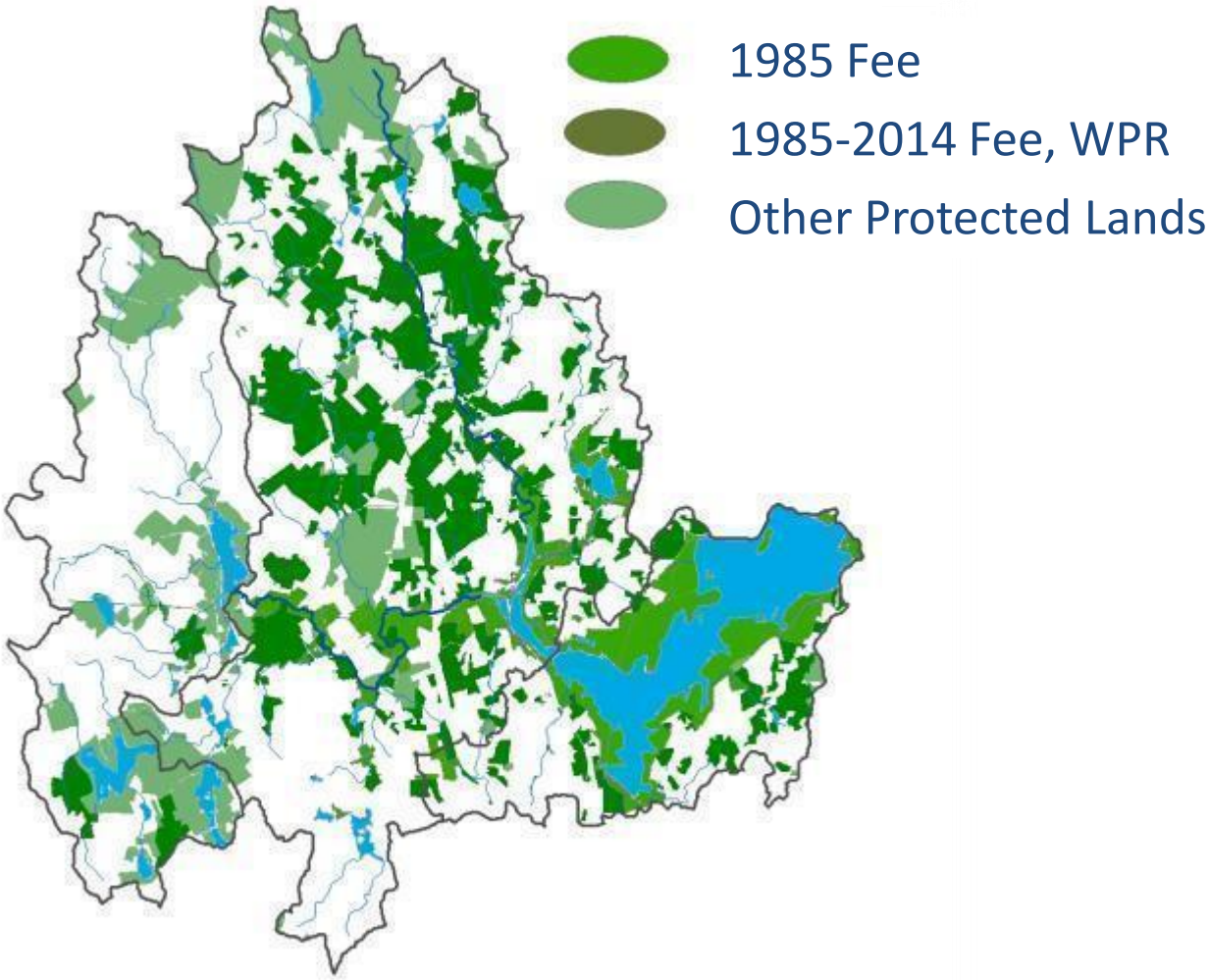
- pH
- Temperature
- Conductivity
- Turbidity
- Dissolved Organic Carbon
- Total Organic Carbon
- Nitrate-N
- UV 254
- Oxidation-Reduction Potential
- Monochloramine
- Free Chlorine
- Total Dissolved Solids

Investments In Watershed Protection

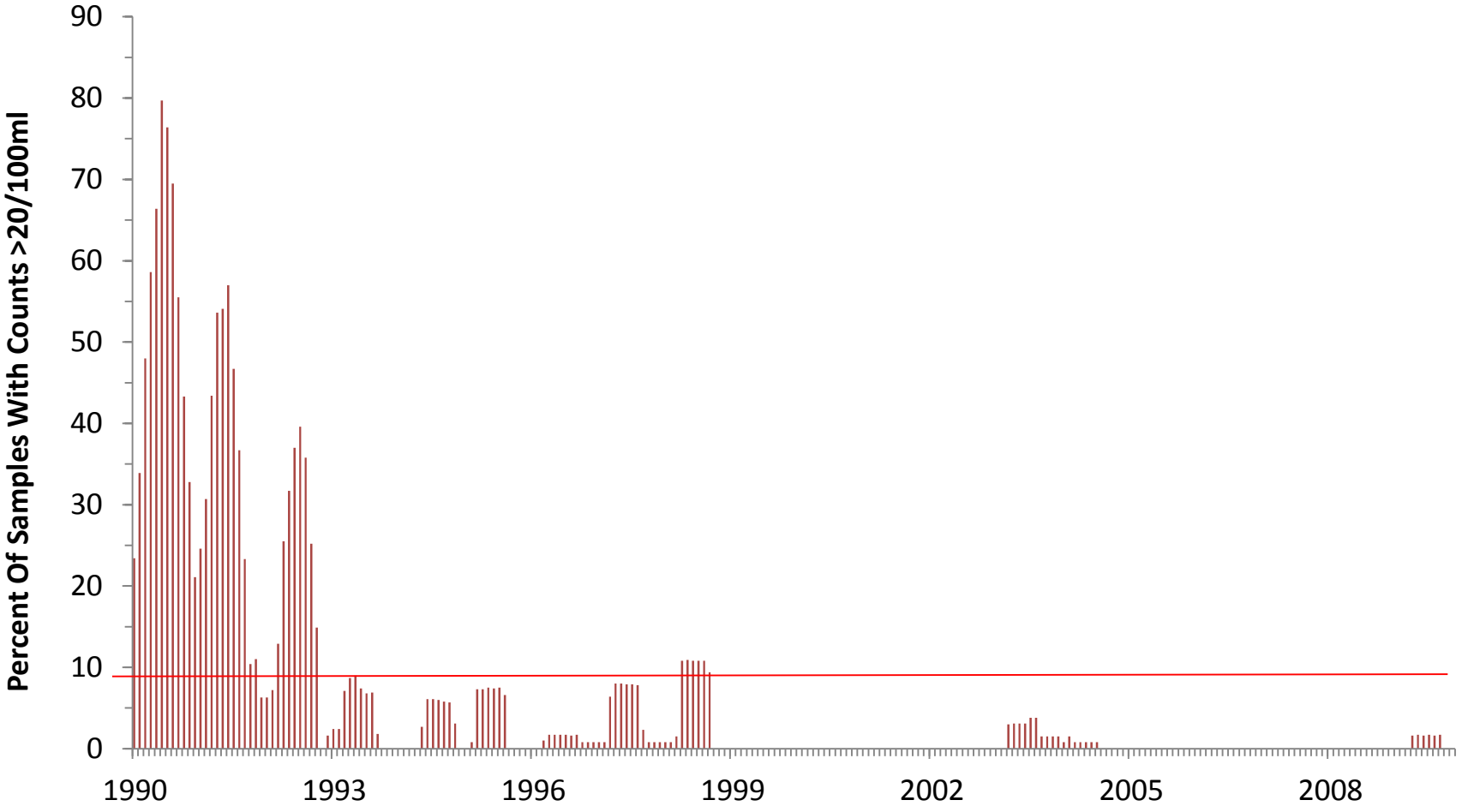
- Since 1985, $133 million has been invested in land preservation
- So well protected, the Safe Drinking Water Act requires only disinfection

Watershed	% of Watershed
Wachusett Reservoir	56%
Ware River	62%
Quabbin Reservoir	80%

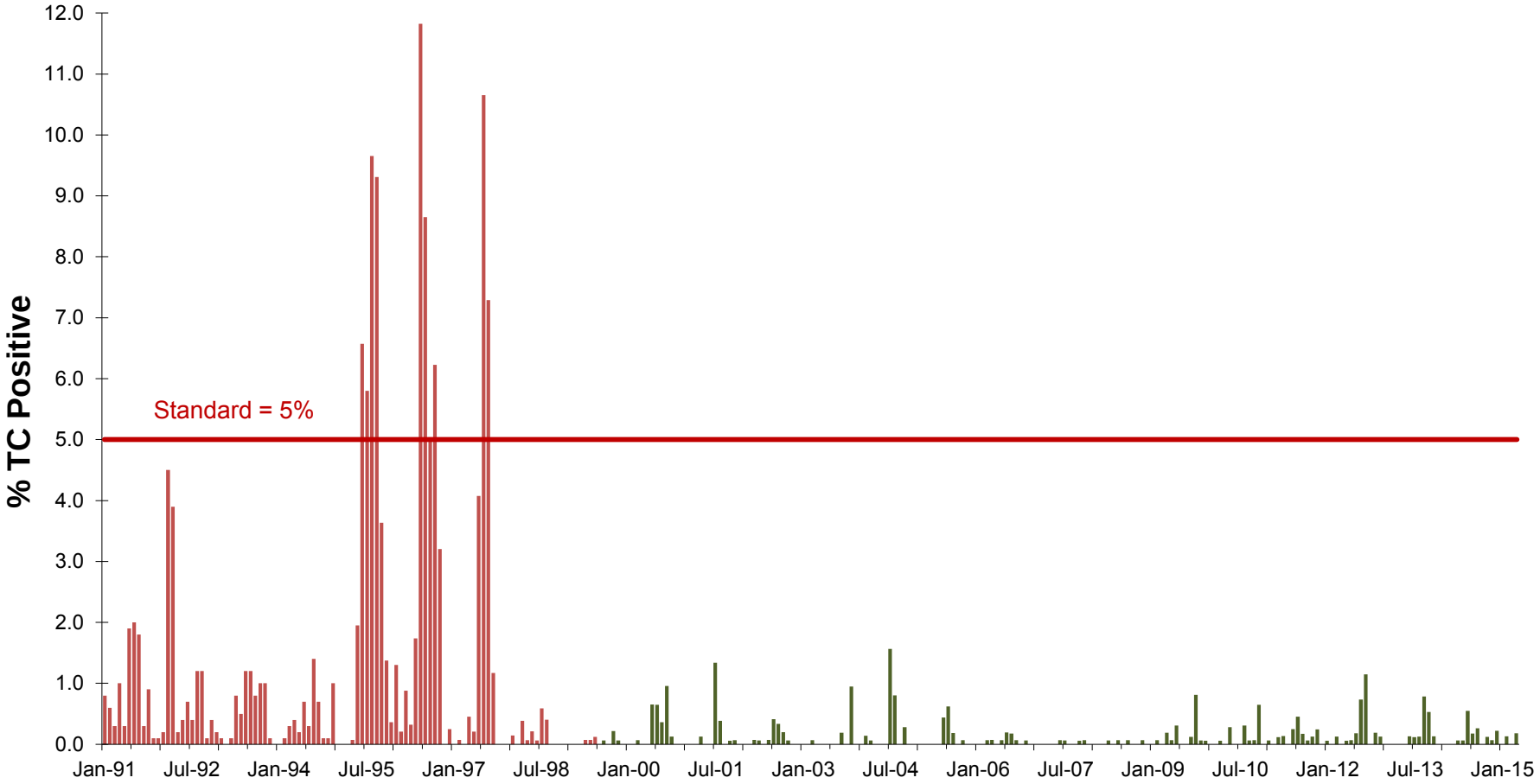
Wachusett Watershed Protected Land: 1985 - 2014



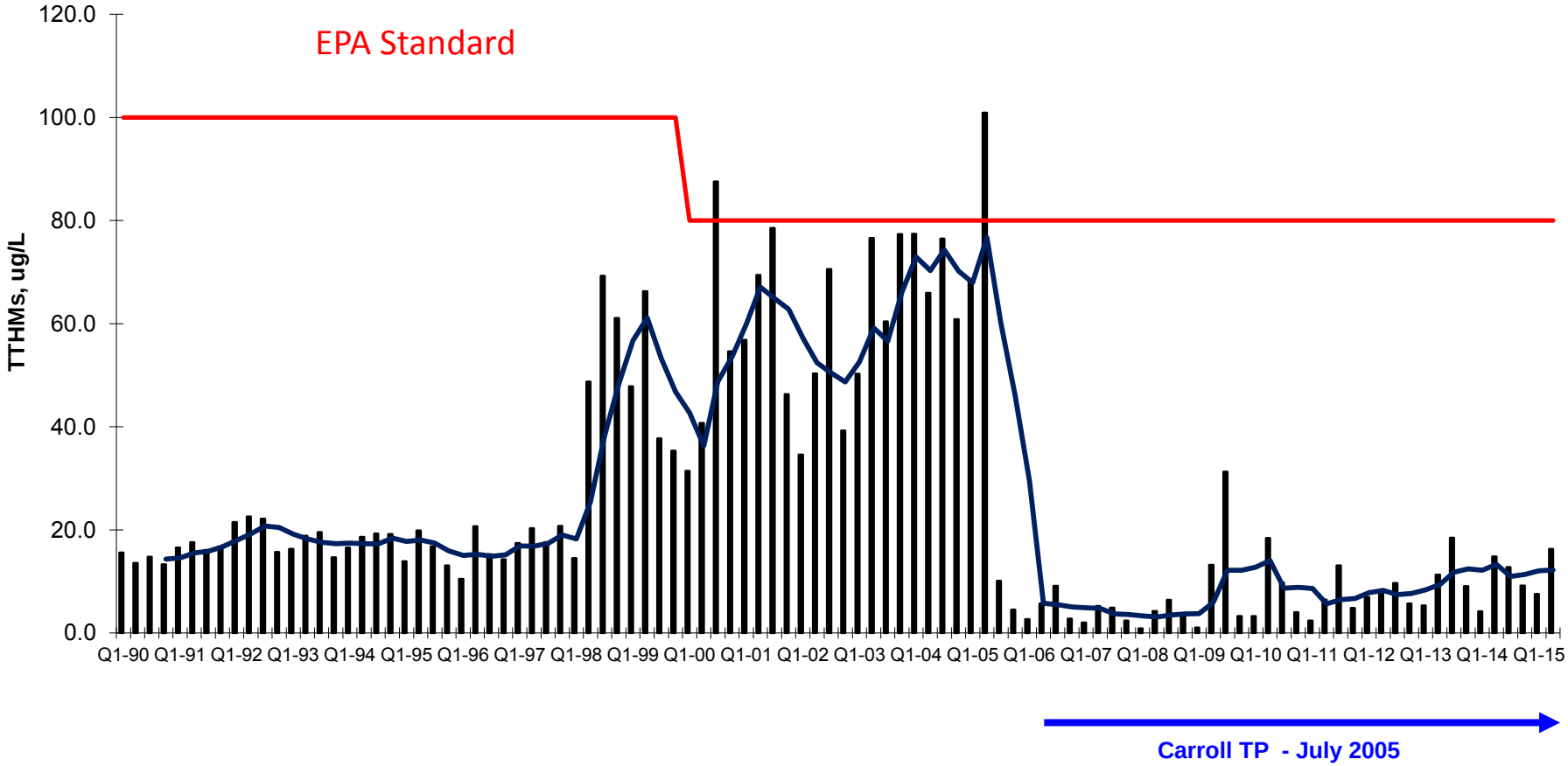
Fecal Coliform Sampling Results At Wachusett Reservoir



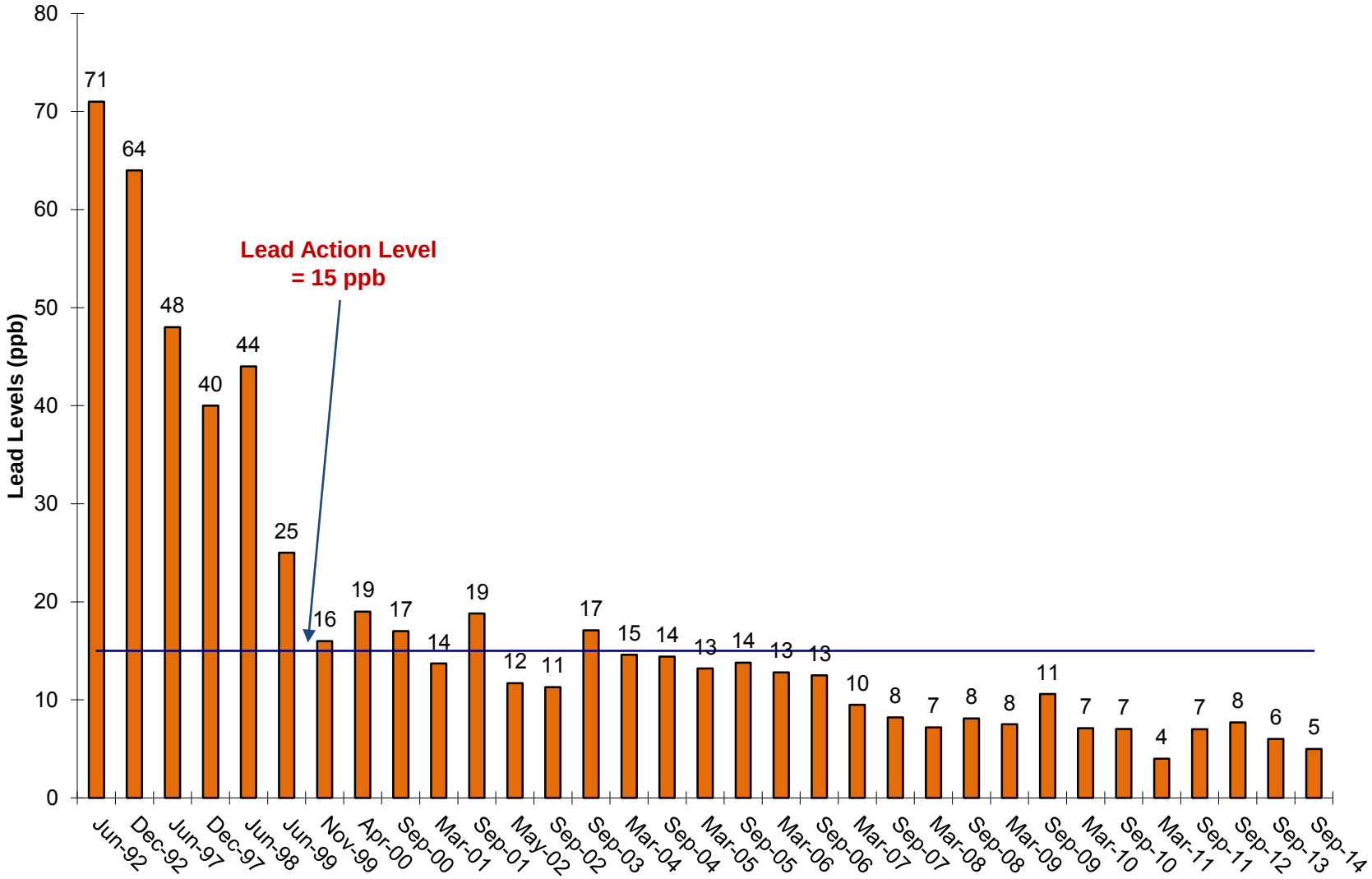
Community Total Coliform Rule Compliance



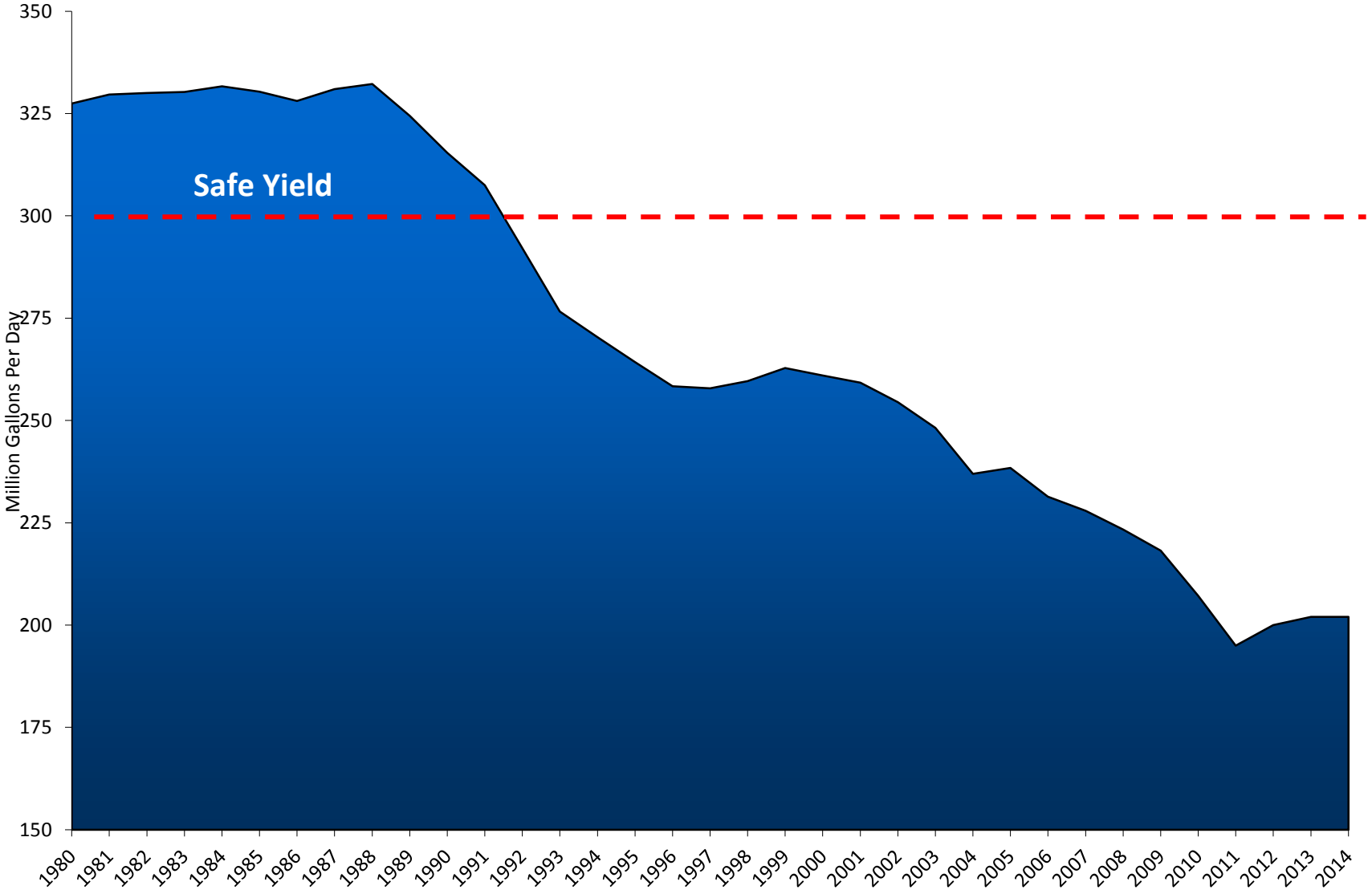
Disinfection By-Products



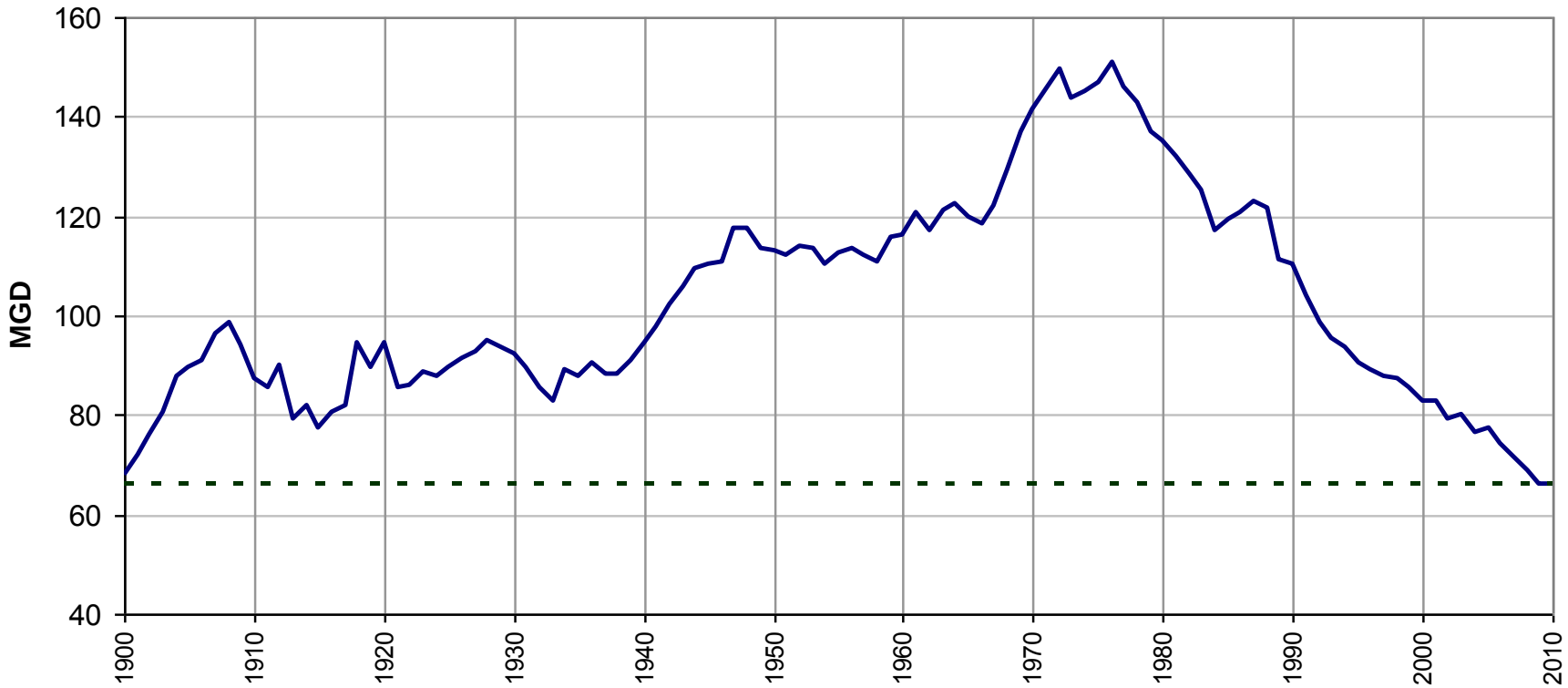
Lead Levels In MWRA Communities



Water Conservation Worked



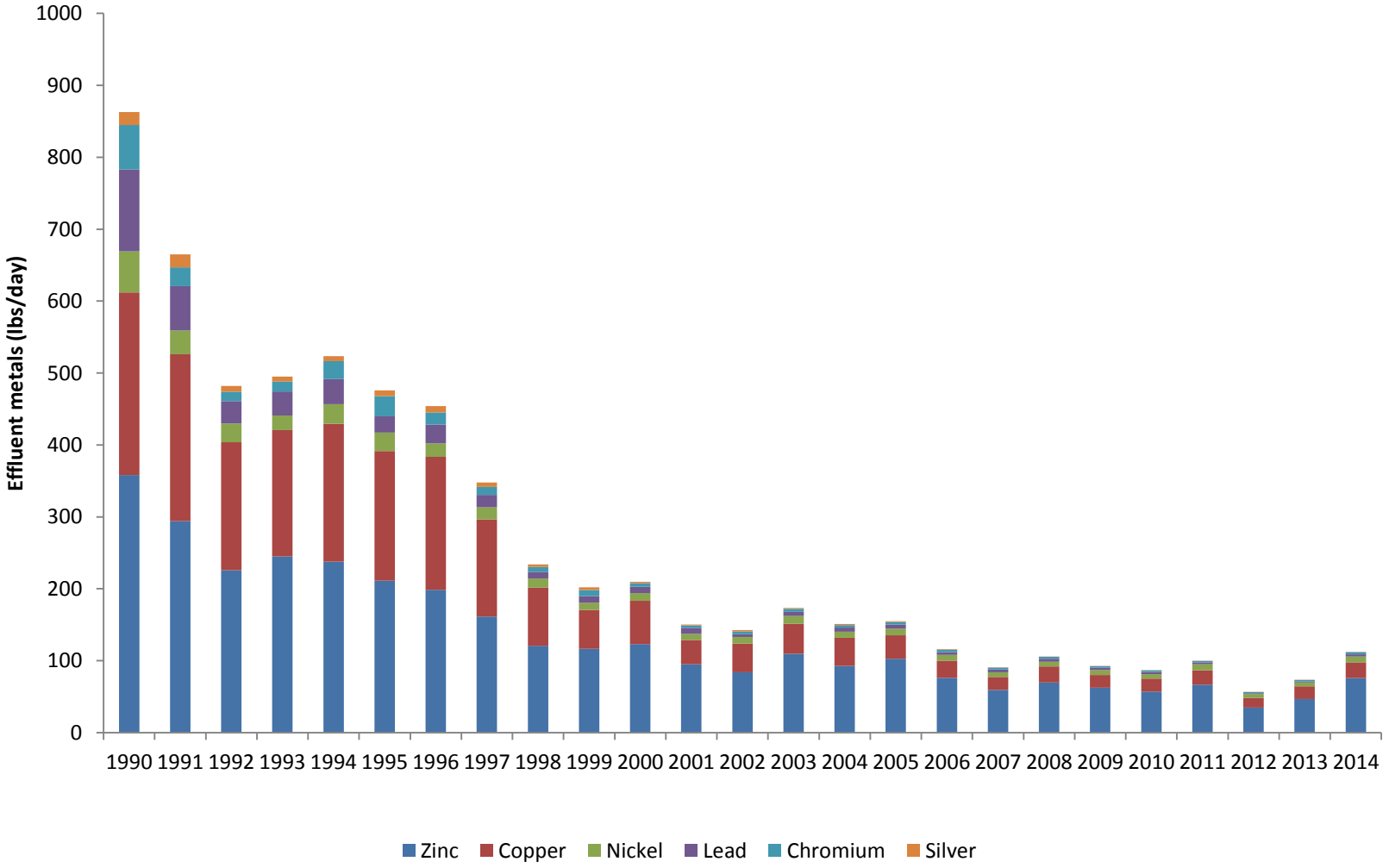
Boston's Usage Is At A 110-Year Low



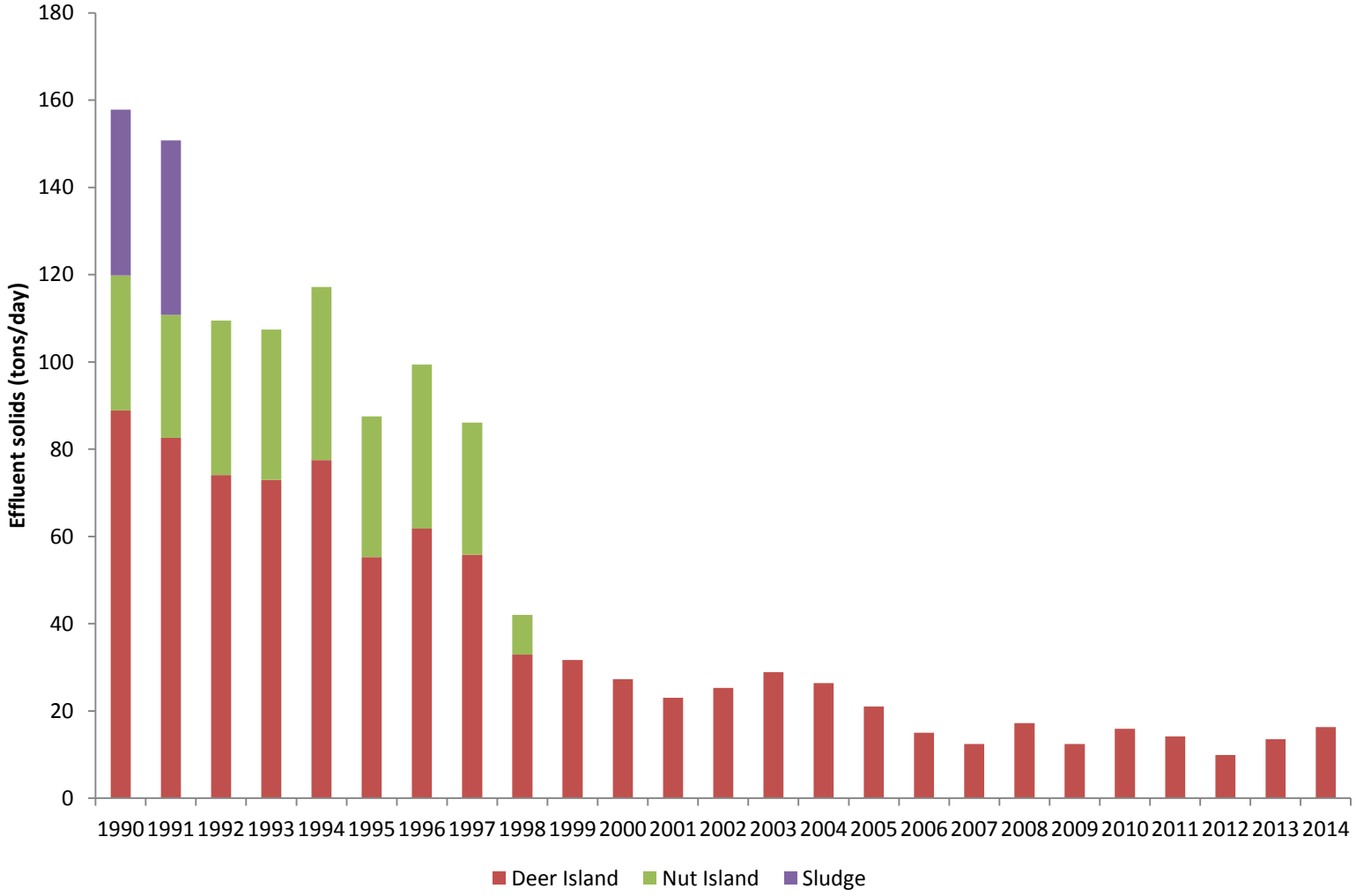
On The Wastewater Side

- The 15-year, $3.8 billion Boston Harbor Project was completed in 2001
- About 380 million gallons of wastewater is treated at the new Deer Island Treatment plant every day, with a peak capacity of 1.2 billion gallons
- Treated wastewater is discharged 9.5 miles out into the deeper waters of Massachusetts Bay

Metals In Deer Island Effluent



Solids In Deer Island Effluent



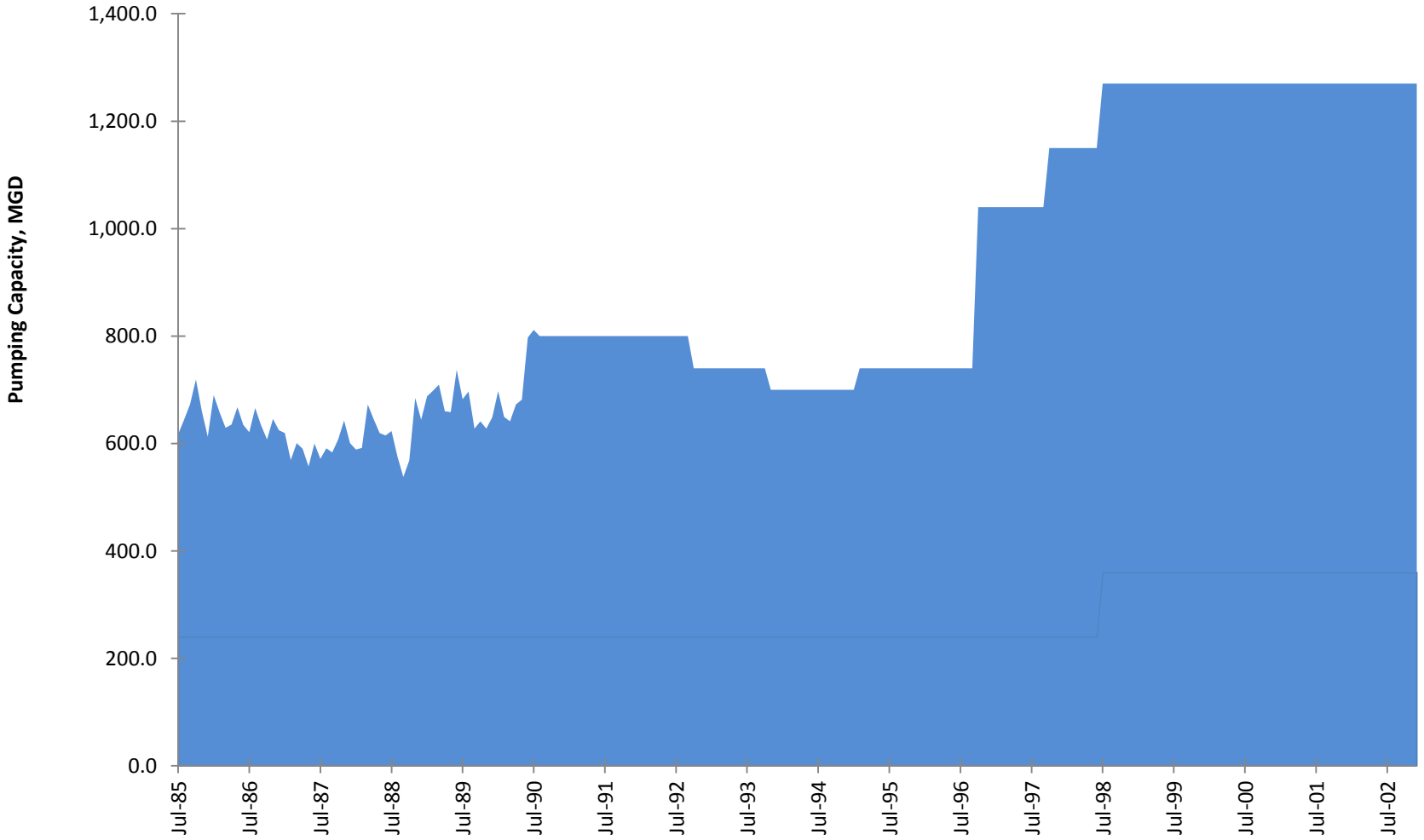
The Harbor Continues To Recover

- Water quality in Boston Harbor continues to improve dramatically
  - Sewage solids discharged from Deer Island have been reduced by 85%
  - Toxic pollutants have been reduced by 90%
  - Water is three times as clear

Deer Island Construction

Deer Island Construction

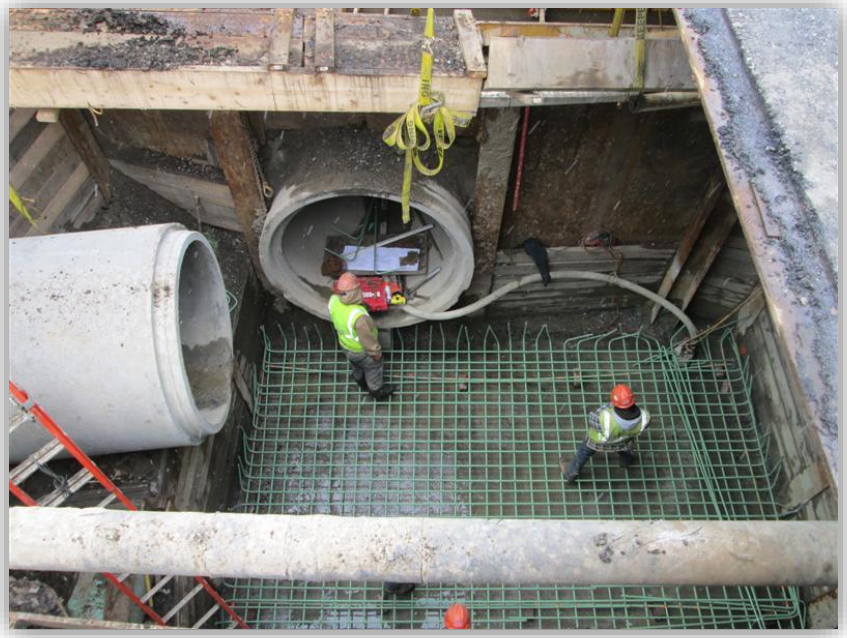
Sewer System Pumping Capacity



Combined Sewer Overflow Control Program

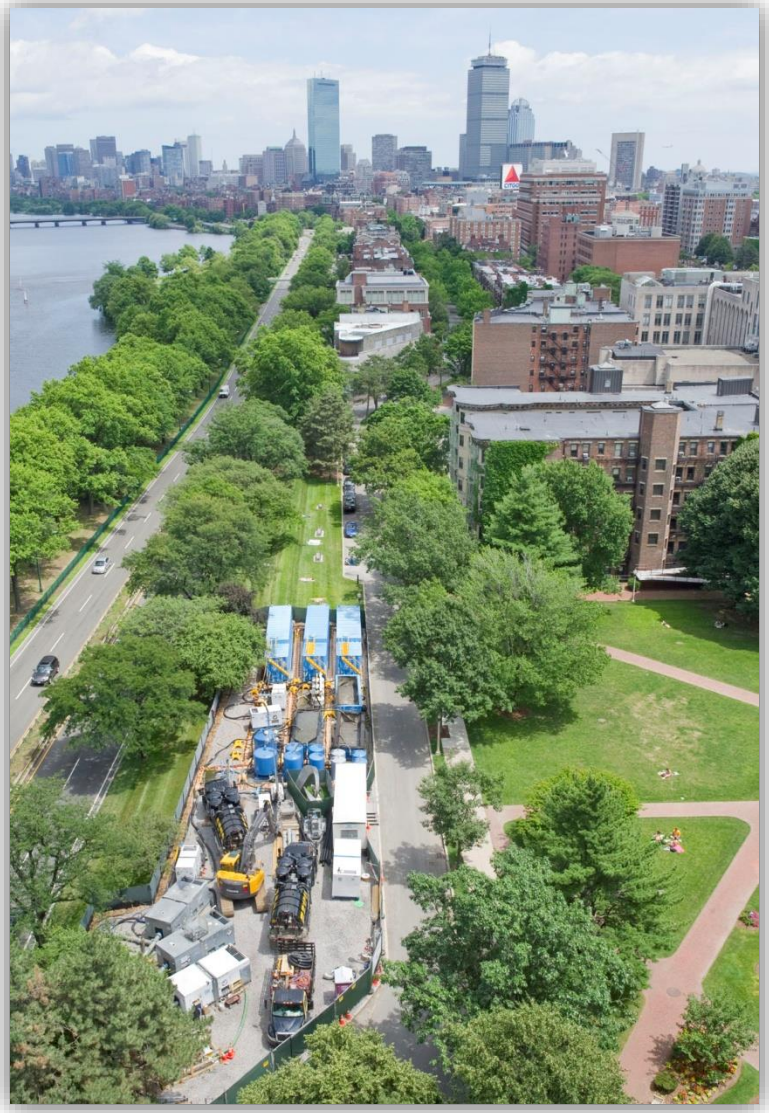
- Five communities - Boston, Brookline, Cambridge, Chelsea and Somerville - have combined sewer systems that connect to MWRA's sewer system

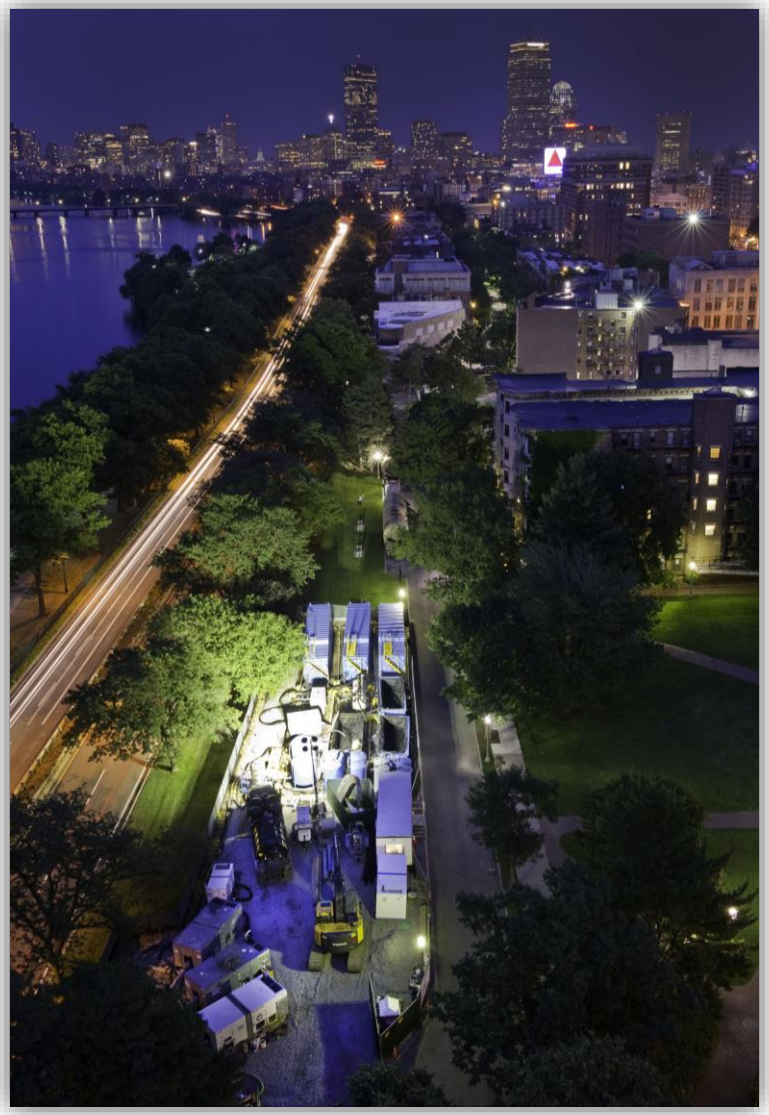
- Since 1996, 94 miles of new storm drains and sanitary sewers have been installed



South Boston CSO Tunnel

Brookline Overflow Conduit



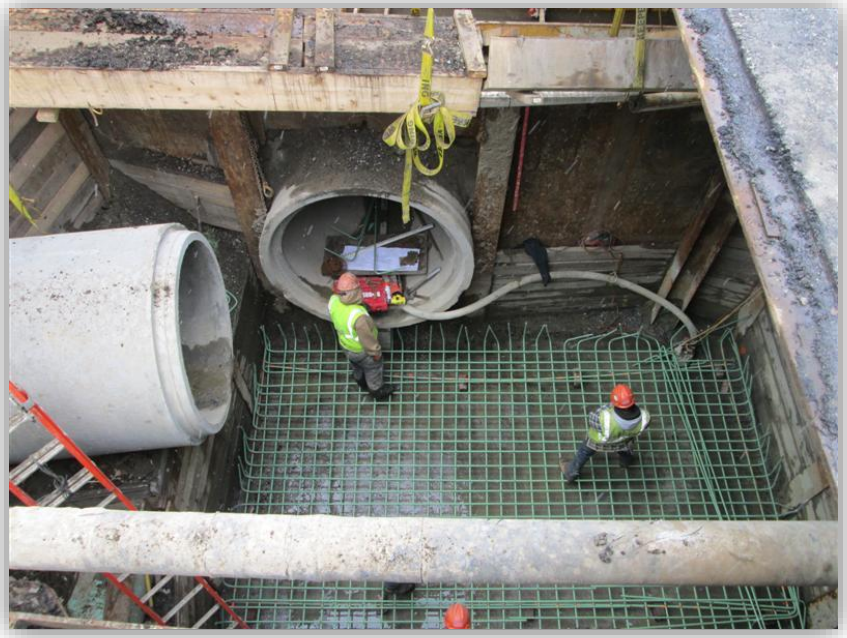


Union Park Detention/Treatment Facility

Combined Sewer Overflow Control Program

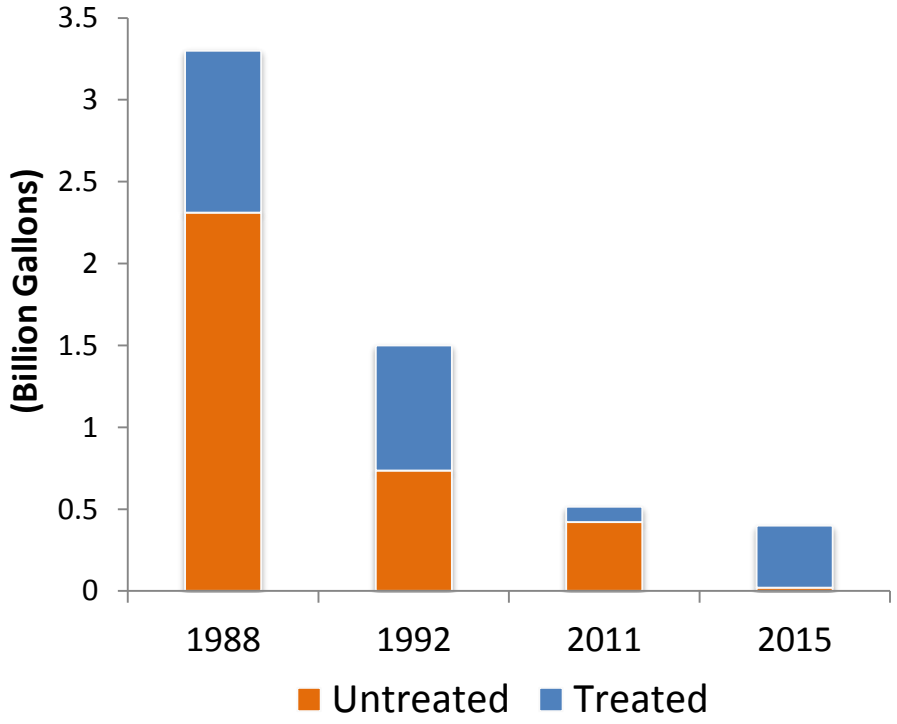
- Five communities - Boston, Brookline, Cambridge, Chelsea and Somerville - have combined sewer systems that connect to MWRA's sewer system

- Since 1996, 100 miles of new storm drains and sanitary sewers have been installed



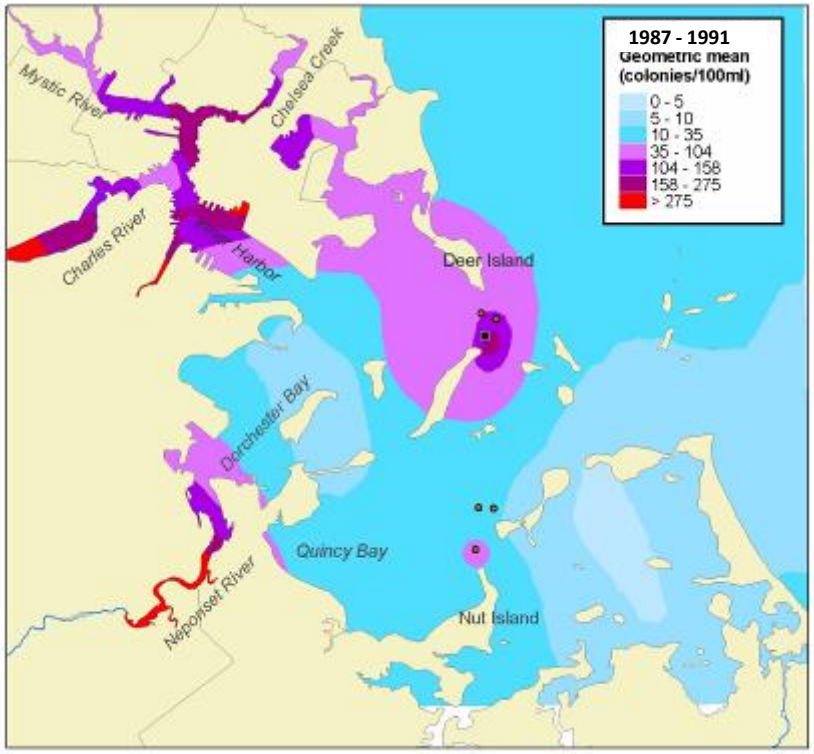
Annual CSO Volume Has Been Reduced Dramatically

- $900 million program
- All 35 projects have been completed to date
- Annual CSO volumes have been reduced by 3 billion gallons
- Since December 2015, 93% of the remaining CSO flows are treated

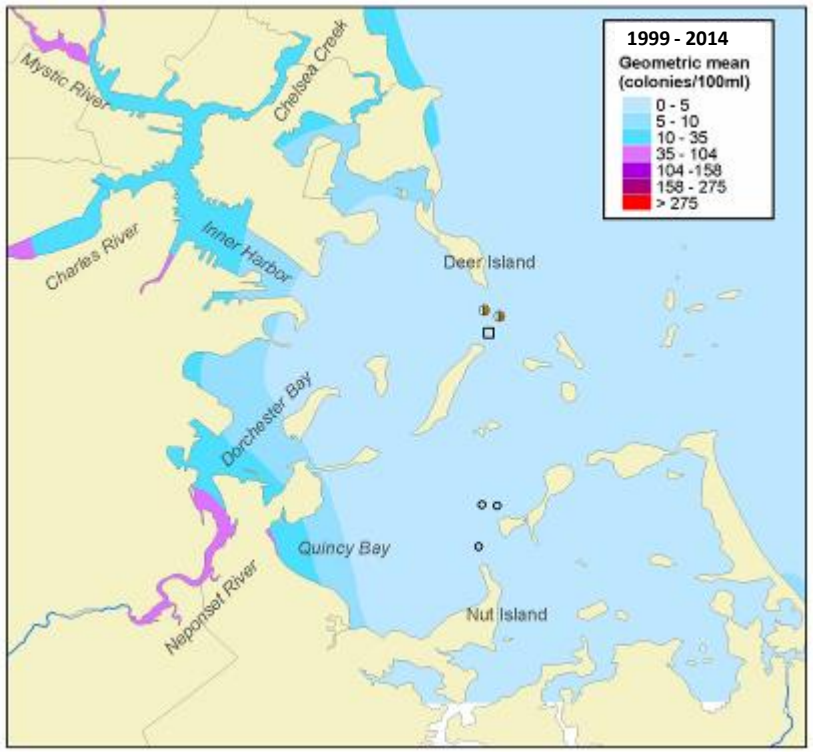


Dramatic Improvements In Water Quality – Even In Wet Weather

1987-1998 (Before Secondary Treatment and South System transfer)



1999 - 2014 (After Secondary Treatment and New Outfall)



Average *Enterococcus* counts in Boston Harbor in wet weather

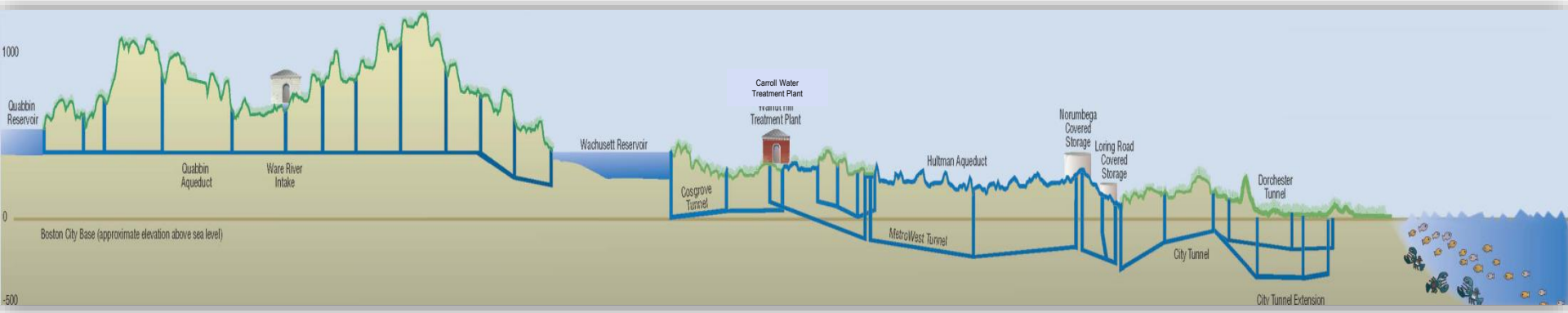
The lighter the blue, the better

And We Love Being Green!

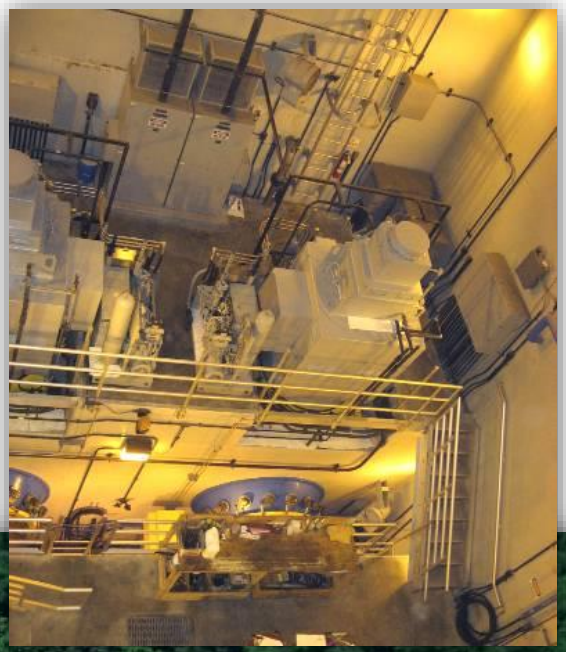
- Of our $40 million annual energy budget, $22 million comes from renewable sources

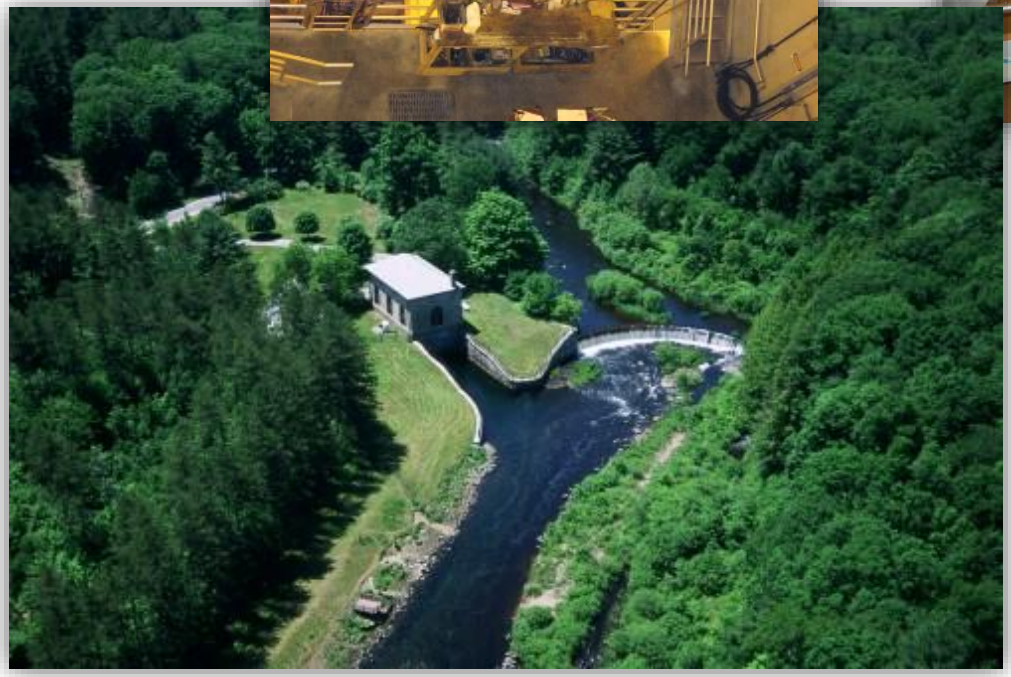
Water System Profile

- About 85% of the water is delivered by gravity



Hydroelectric Power





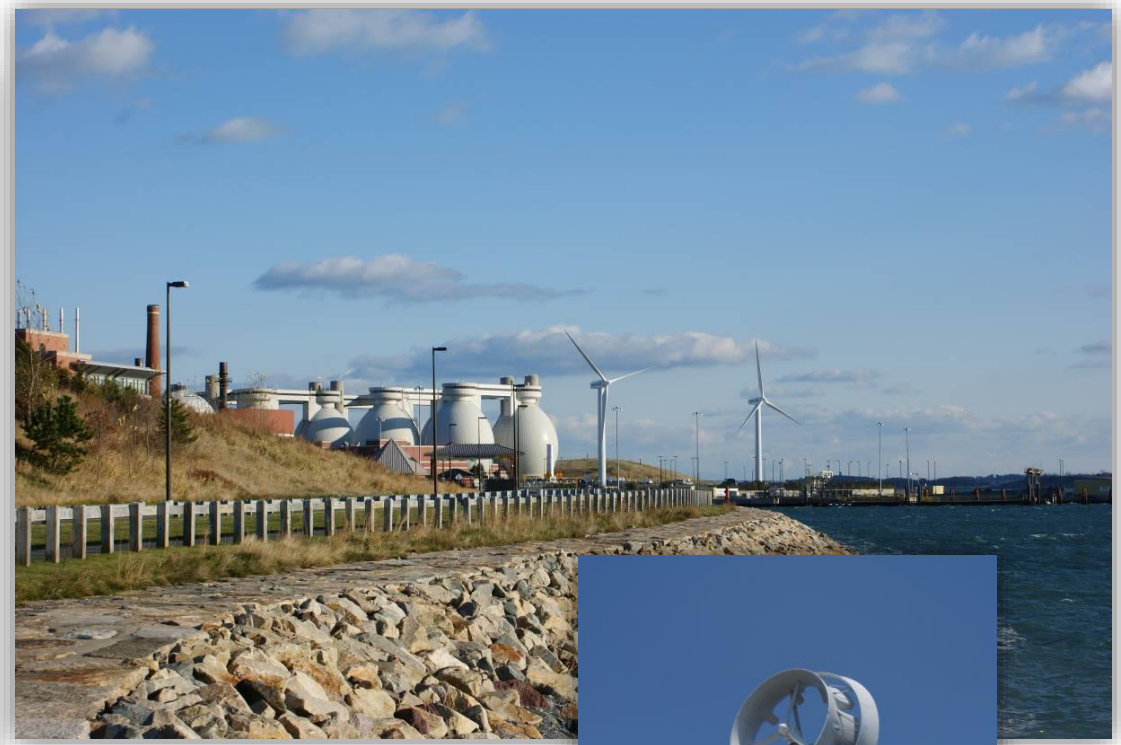
63

Methane Utilization At Deer Island

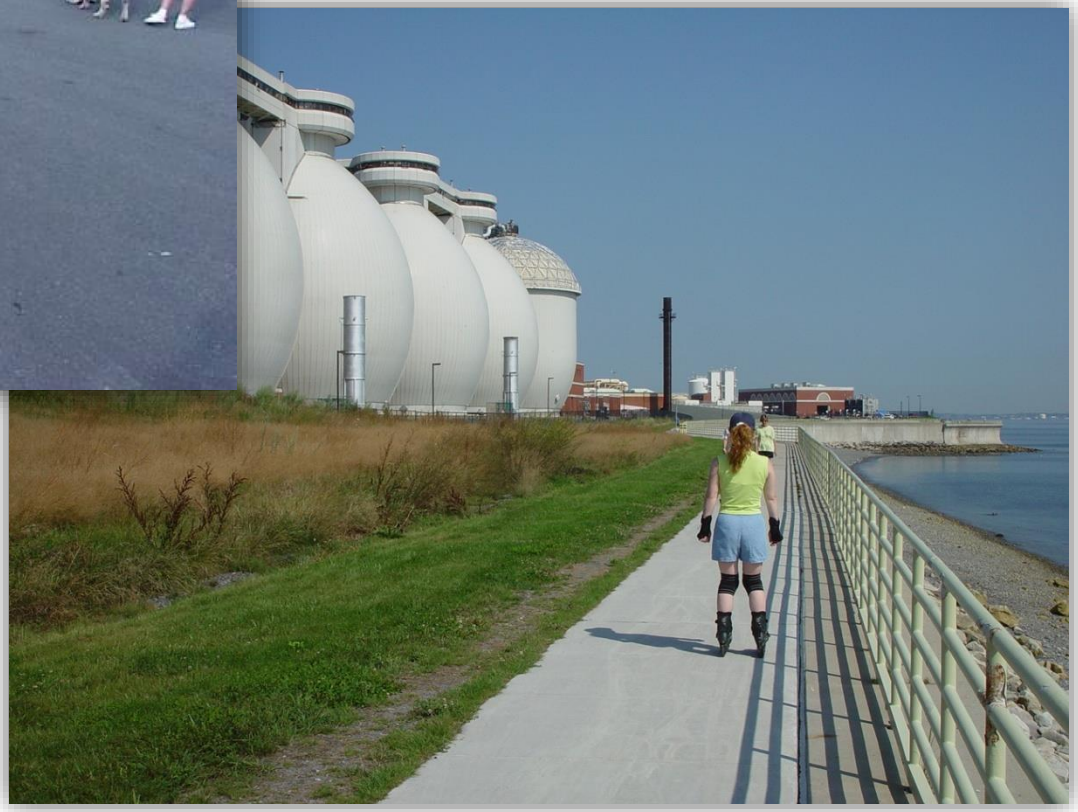
- 98% of methane is utilized

Solar Power

Wind Power

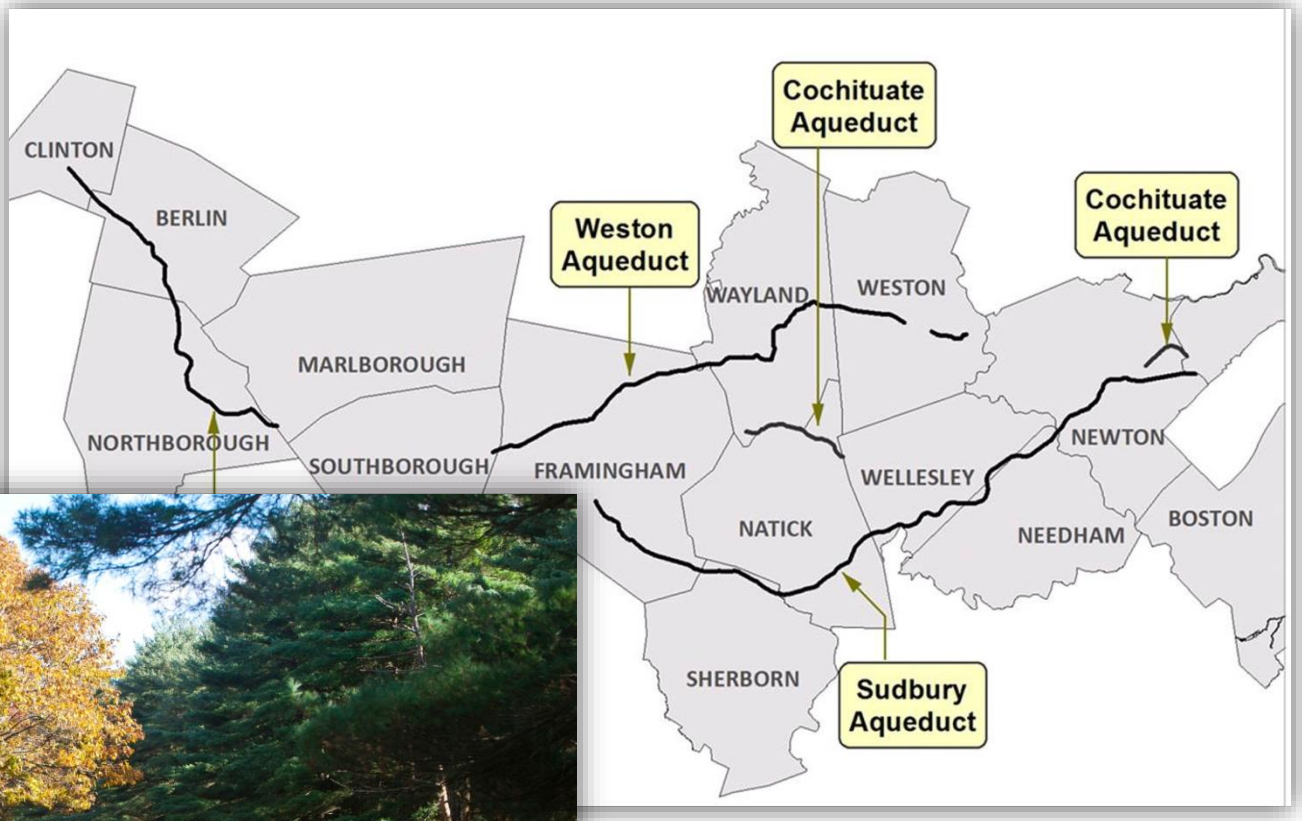


Public Access



Alewife Stormwater Wetland

Aqueduct Trails



Creative Construction Technologies

- Means and methods
- New technologies are developed all the time
- Need to choose the right tool for the job
- If it seems too good to be true, it probably is

Microtunneling East Boston Branch Sewer

Pipebursting East Boston Branch Sewer

Soft-ground Tunneling South Boston

Slurry Walls For South Boston Pump Station

Horizontal Directional Drilling The Fore River Siphon

Horizontal Directional Drilling Mill Cove Siphon

Wachusett Aqueduct Pumping Station

But No Matter How Well You Plan…

…things can go wrong

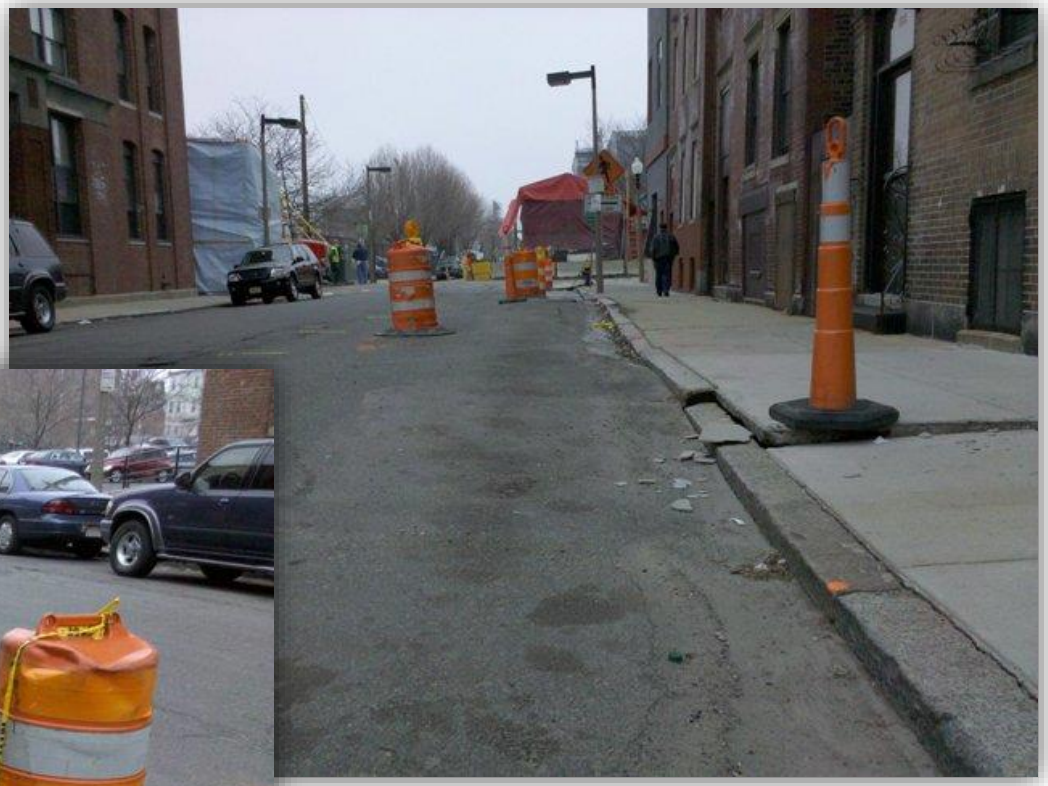
A Water Main Break

A Geyser

A Sinkhole

Another Sinkhole

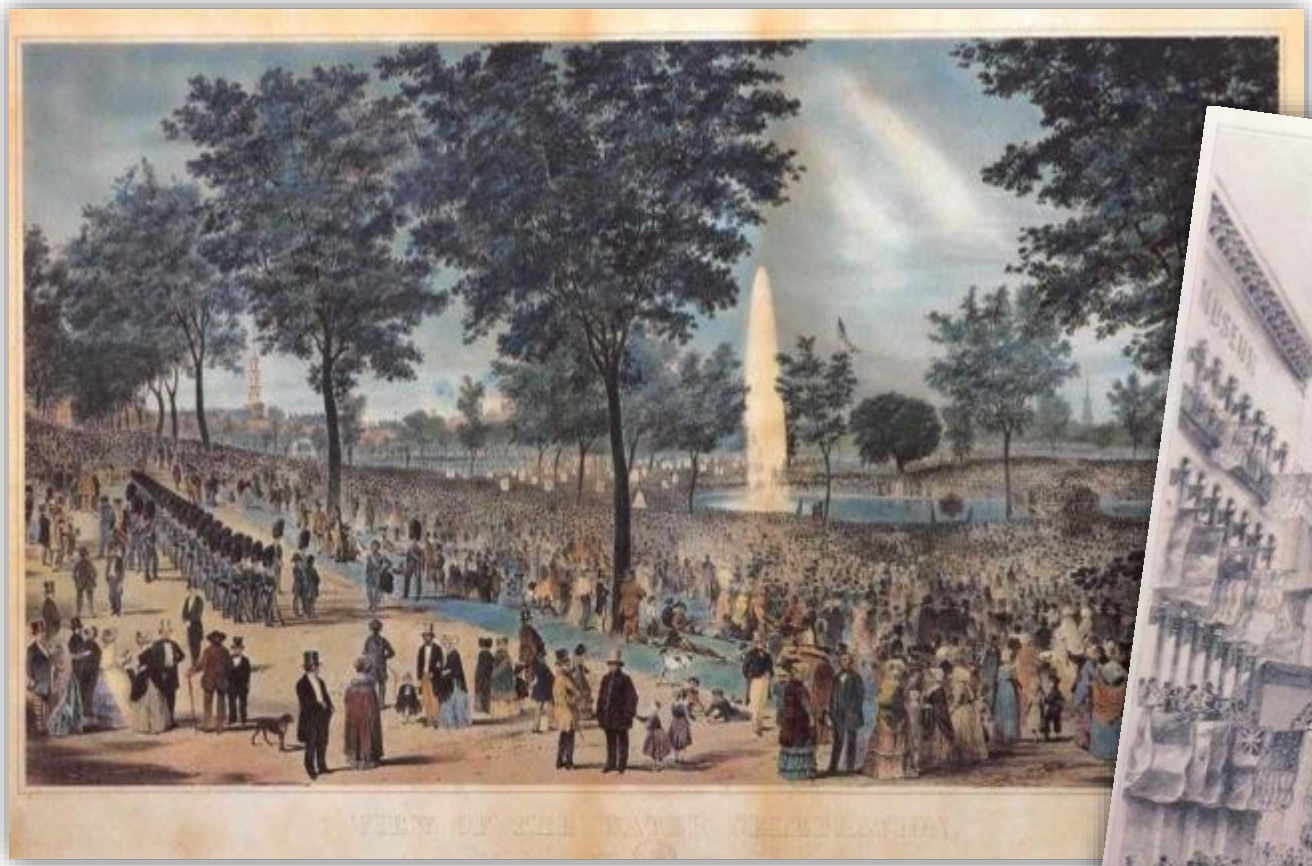
A Heave In The Street

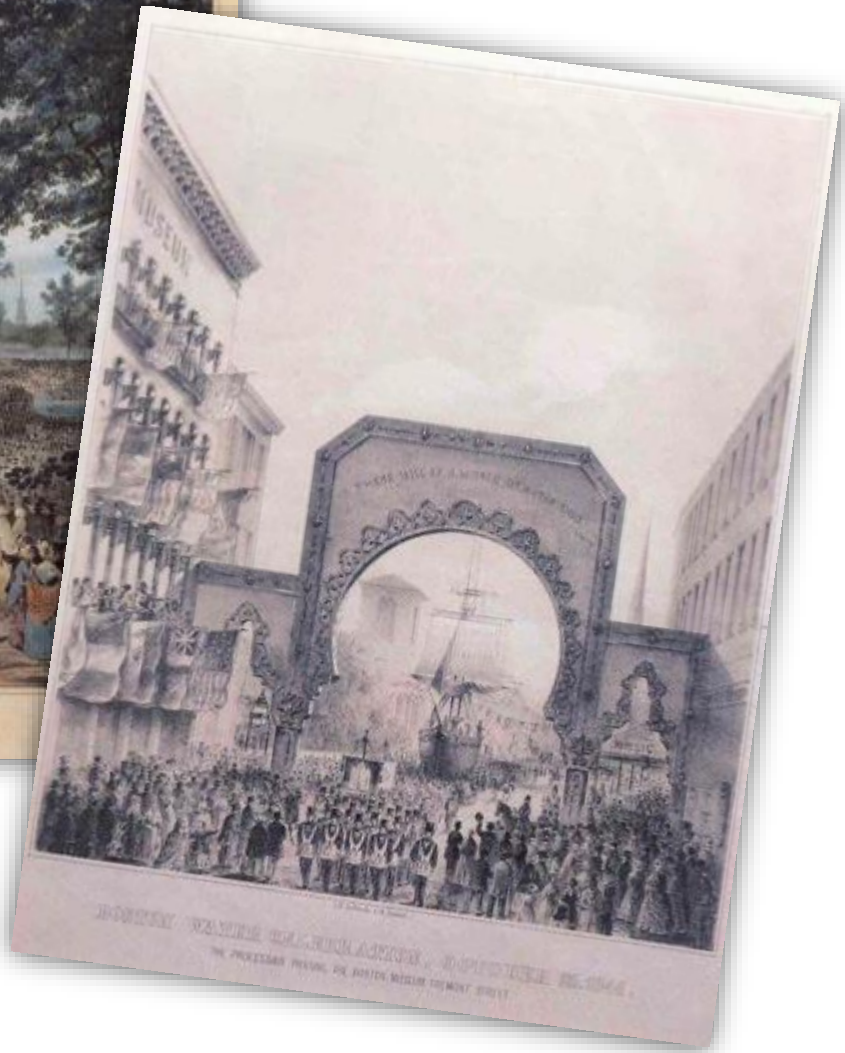


A Pipeline Collapse

In the 1890s, buildings reflected the high esteem in which water was held

1848: Water Celebration On Boston Common





1897: Wachusett Aqueduct

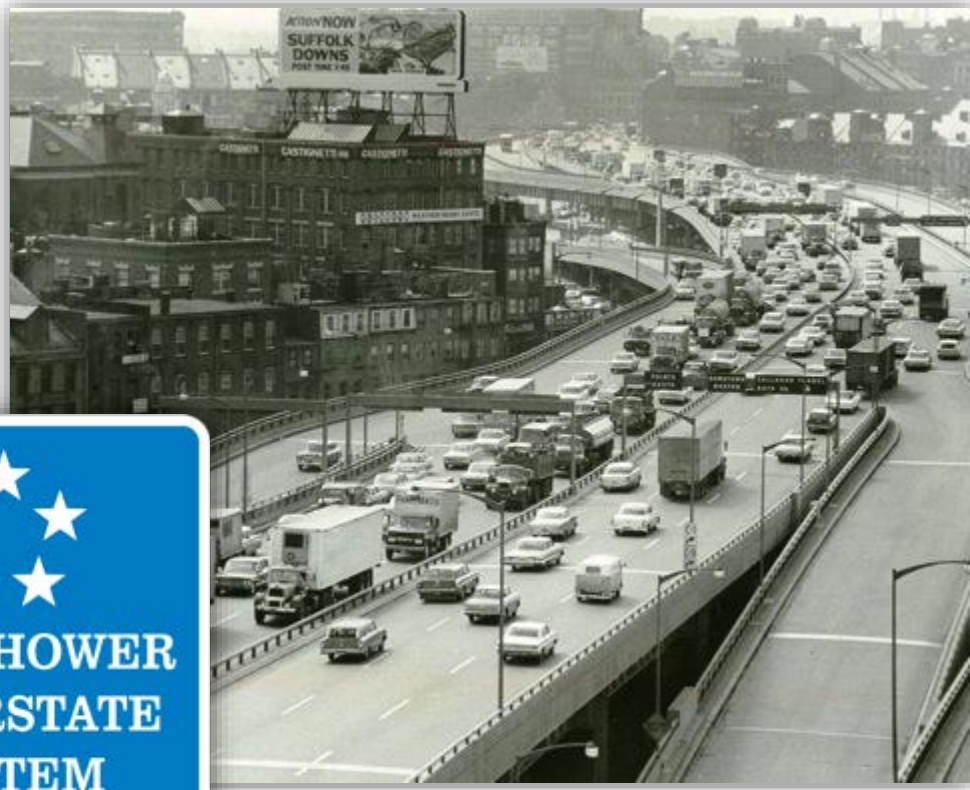
1898: Rosemary Brook Siphon

1899: Chestnut Hill High Service Pump Station

1899: Sudbury Aqueduct Terminal Chamber

1900: Chestnut Hill Low Service Pump Station

But After WWII, Highways Were King And Water Was All But Forgotten



The Mass Pike Interchange Took The Area For The Second Barrel

And the buildings got more utilitarian…

1969: Cosgrove Intake

1971: Cottage Farm CSO Facility

1967: Ward Street Headworks

1967: Chelsea Creek Headworks

1991: Commercial Point CSO Facility

We've tried to bring some of that sense of pride back into these critical facilities

2003: Squantum Pumping Station

2005: Intermediate Pumping Station

2008: Braintree-Weymouth Pump Station

2005: Carroll Water Treatment Plant

Hopefully, the next 30 years will be as successful

Deer Island Received Its 5th Platinum Award

No permit violations for 9 years in a row!

Clinton Just Received A Gold Award

No permit violations in 2015!

Charles River Gets High Marks

- In its latest annual report card, the EPA has given the Charles River a grade of B+ for water quality

Boston Now Has Some Of The Cleanest Urban Beaches In The Country

The Boston Globe

Michael Levenson - Globe Staff | May 23, 2015

Report gives Boston-area beaches high marks

Says Boston region's waters are cleaner than Waikiki's

Beach-goers at Revere, and in many places elsewhere in the state, enjoy clean water,

88 percent of the time in 2014.

On the national stage, the report found South Boston's beaches had cleaner water than the beaches in Virginia Beach, Va., Coney Island, N.Y., Santa Monica Beach, Calif., and, yes, Waikiki and South Beach. The finding was based on comparable water quality testing data taken between 2012 and 2014 by local officials in those states and then reported to the Environmental Protection Agency.

"These beaches [in the Boston-area], from best to worst, are significantly better than they were 20 years ago, and they're significantly better than most of the urban beaches in the country," said Bruce Berman, director of strategy, communications and programs at Save the Harbor/Save the Bay. "We should be really proud."

Boston's Waterfront Is The Region's Fastest Growing Zip Code

"Best Drinking Water" In The Country


BOSTON Herald

www.bostonherald.com

WEDNESDAY, JUNE 11, 2014 • $1.00 ($1.50 OUTSIDE OF METRO BOSTON)

Hub's tap water deemed best in taste test

1 2 3 4 5

(Boston, MA, 06/10/14) Water taste test at the American Water Works Association Annual Conference and Exposition at the Boston Convention and Exhibition Center. Judges for the contest were from left to right: Roy Desrochers from Woburn, MA , Peter Howe from New England Cable News, Matthew Tolcher from Norcross, Georgia and James Naylor from Fort Worth Texas.. Tuesday, June 10, 2014. Staff photo by Ted Fitzgerald


30
MWRA
1985-2015