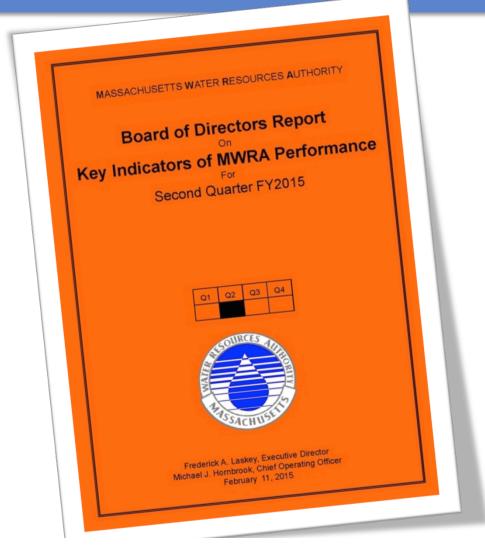
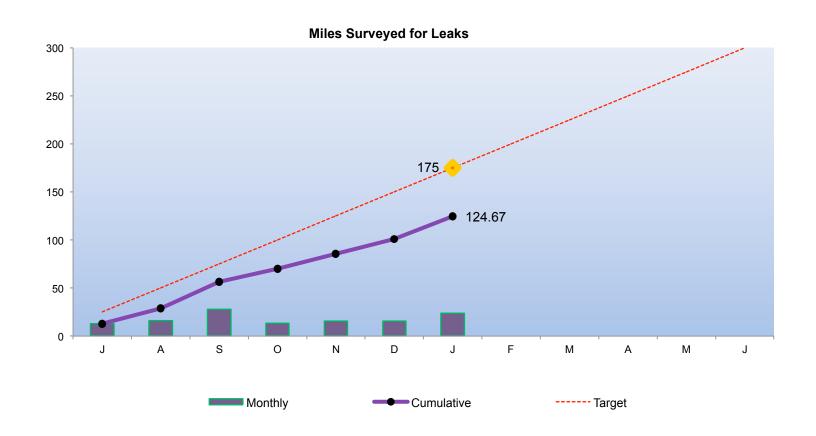


Massachusetts Water Resources Authority



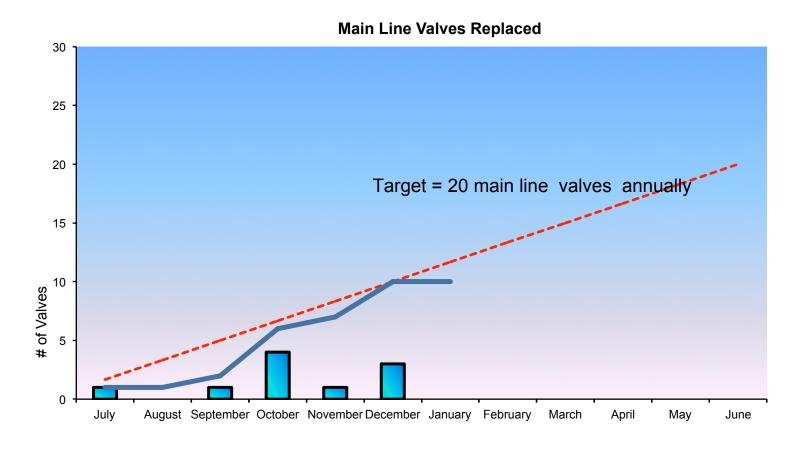


Water Distribution System: Leak Detection



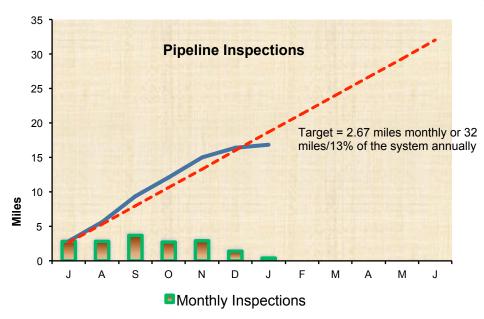


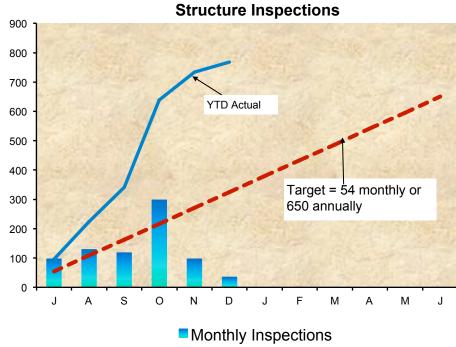
Water Distribution System: Valve Replacement





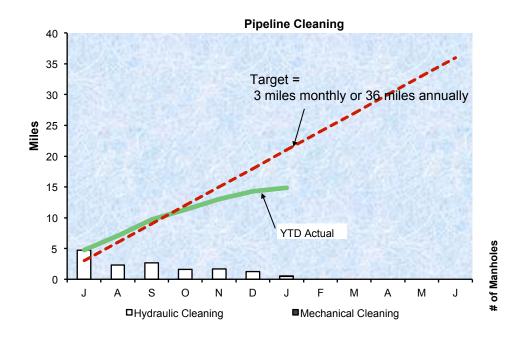
Wastewater Pipeline and Structure Inspections



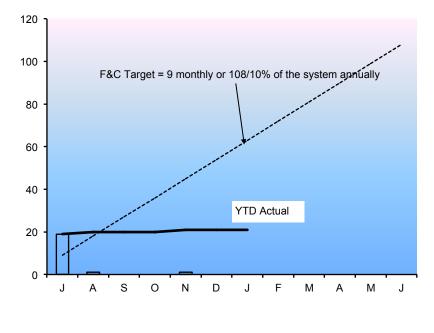




Wastewater Pipeline and Structure Maintenance



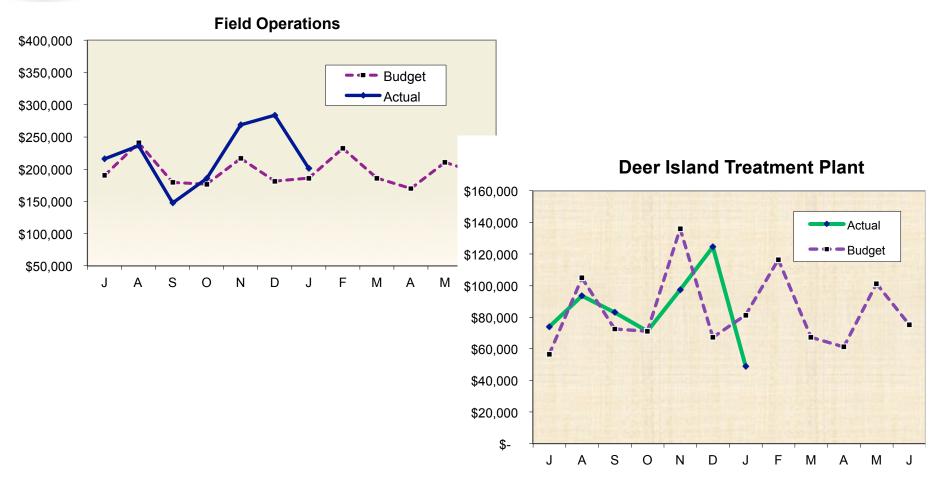
Manhole Rehabilitation



□Monthly Inspections

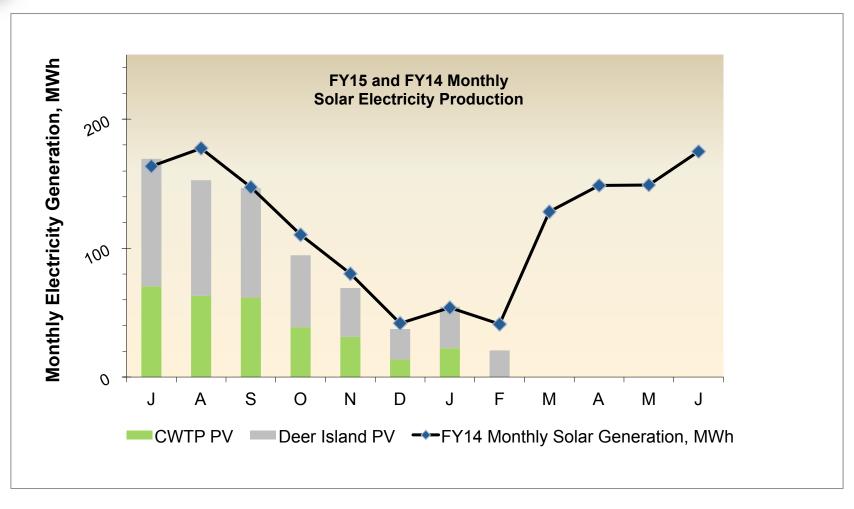


Overtime Through January 2015





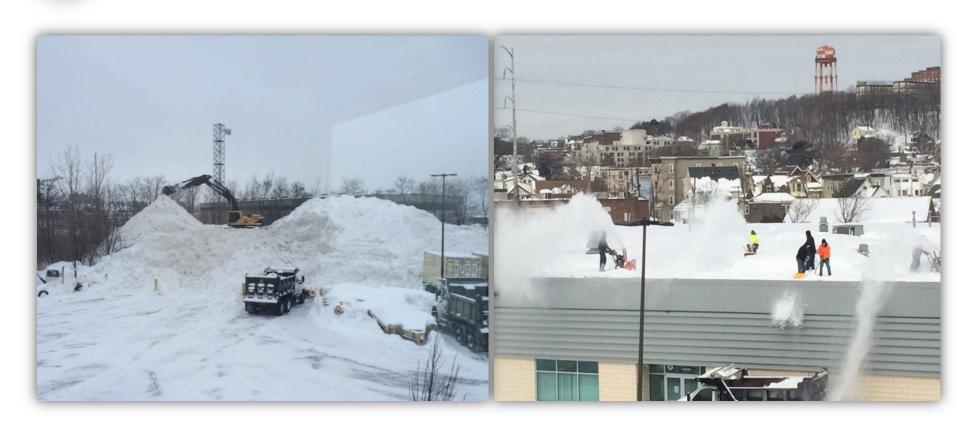
Solar Electricity Production Comparison to Last Year







February 2014 Snow Storms - Chelsea





February 2014 Snow Storms – Deer Island





February 2014 Snow Storms — Charlestown





Spot Pond Tanks – Construction Site







Massachusetts Water Resources Authority

MWRA Fiscal Year 2016 Proposed Current Expense Budget

March 2015

Fiscal Year 2016

Fiscal Year 2016 Year of Milestones

- Bond Resolution Changes become effective Reserves Release
- Pension Fund achieves virtual Full Funding
- Other Post Employment Benefits (OPEB)
- New England Fertilizer Company (NEFCO)



Bond Resolution changes become effective – Reserves Release

- Debt Service Reserves
- Community Obligation and Revenue Enhancement (CORE)
- Renewal and Replacement Reserve (RRR)



Pension Fund achieves virtual Full Funding

- 95% Funded ratio 1/1/2015 anticipated
- Other Post Employment Benefits (OPEB)
 - Staff to recommend OPEB Trust
 - Shift to funding OPEB



New England Fertilizer Company (NEFCO)

- Contract Expires December 2015
- Negotiations are complete
- Over the five-year term, expenses are expected to decrease by \$1.25M

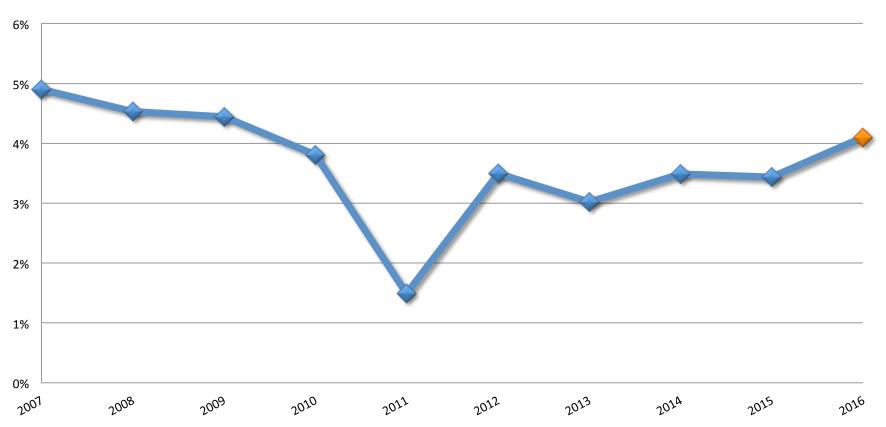


"Sustainable and Predictable"



Mission - Sustainable and Predictable

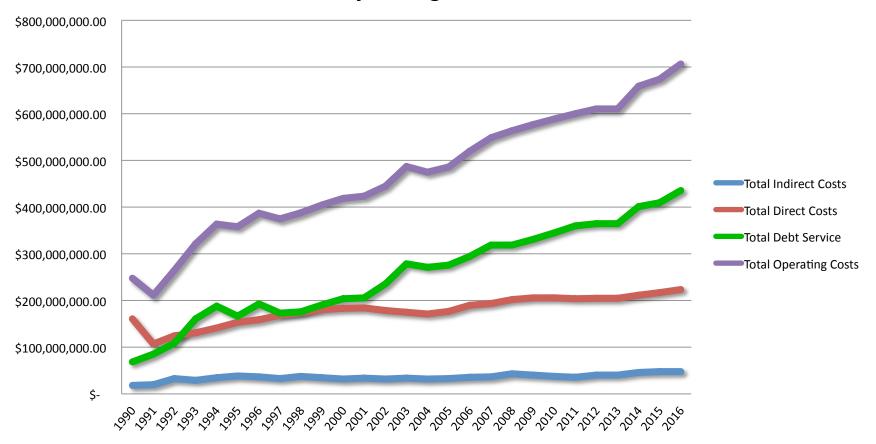
Assesment Increases





Historical Spending Chart

Major Budget Elements





Mission - Sustainable and Predictable

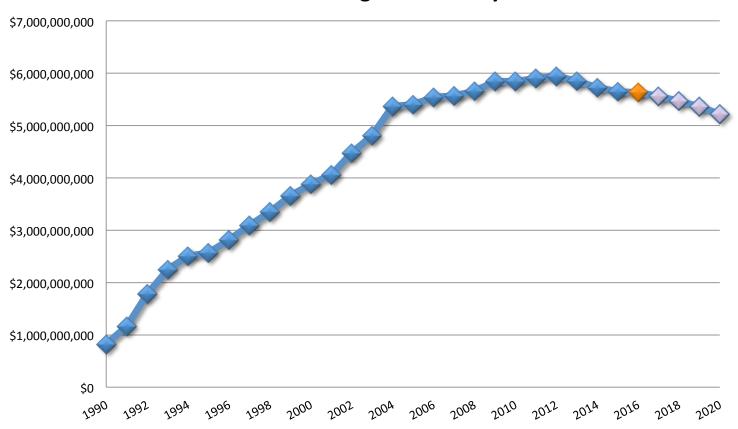
Causes of volatility

- Current Debt Profile
 - Repayment structure aligned with Debt Service Assistance
- Increasing Debt Service

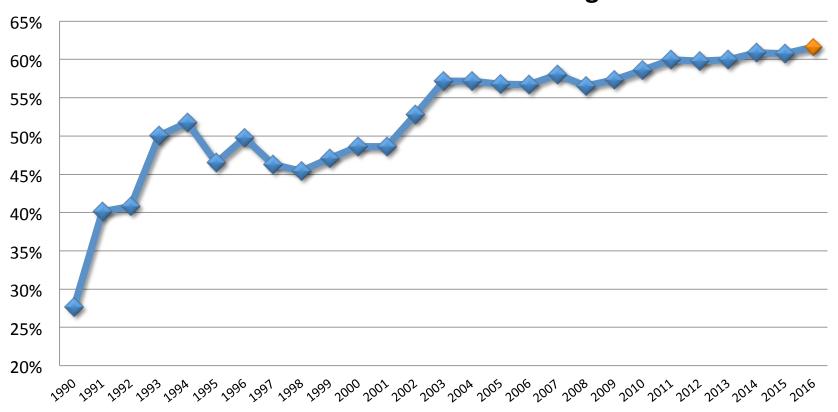
"Debt Management Agency"



Outstanding Debt History



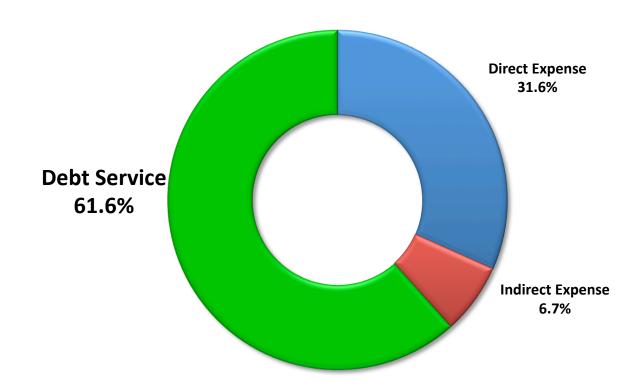
Debt Service as % of Total Budget





FY16 Proposed Current Expense Budget (CEB)

FY16 Current Expense Budget





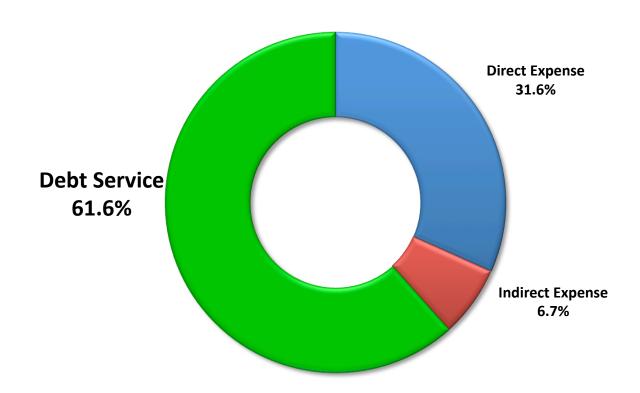
Ways to address the Debt Service challenge

- Defeasance
- Use of Bond Resolution Reserves Release
- Use of Reserves
 - Rate Stabilization Fund
 - Bond Redemption Fund
- Tactical Issuance Repayment Structure
- Control Capital Spending



FY16 Proposed Current Expense Budget (CEB)

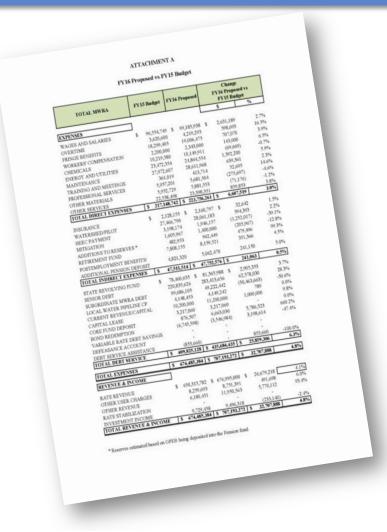
FY16 Current Expense Budget





CEB Budget Structure

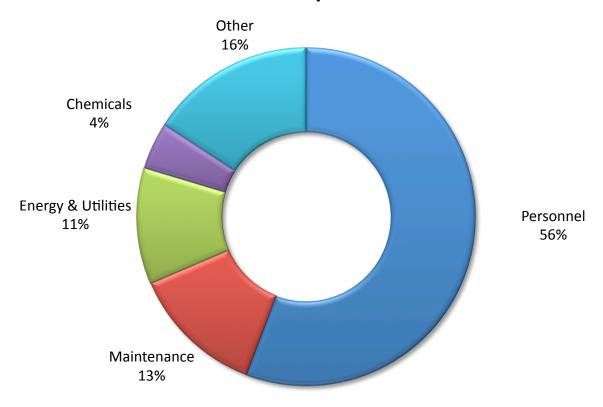
- Direct Expenses
- Indirect Expenses
- Debt Service Expenses





CEB Budget Structure

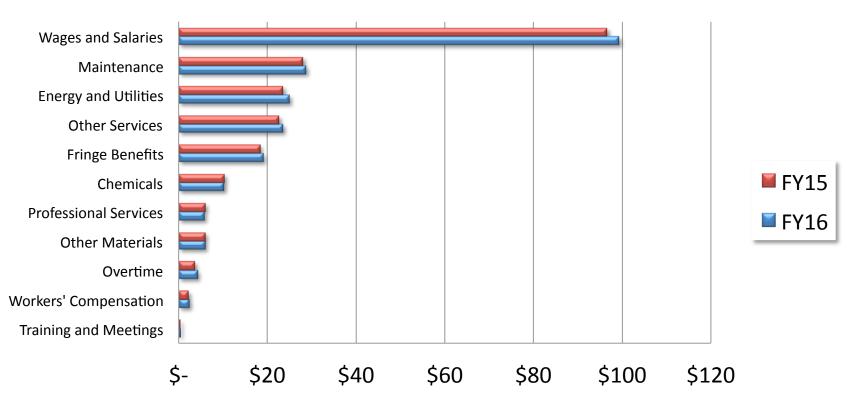
Direct Expenses





Direct Expenses Comparison FY15 -FY16

\$ in Millions





FY16 Proposed Current Expense Budget (CEB)

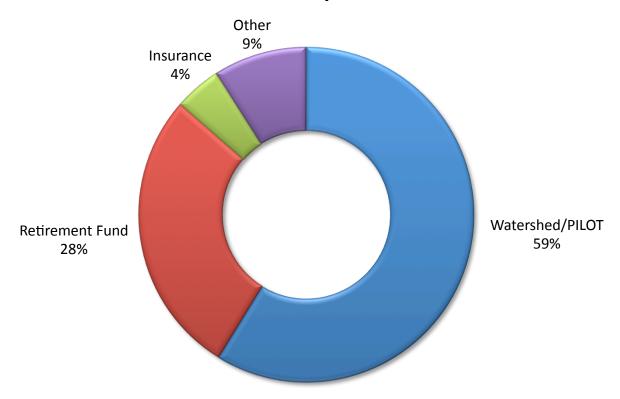
Highlights – Direct Expenses

- Wages and Salaries \$99.2M Budgeted Positions: 1,170; 5 fewer than FY15;
- Maintenance \$28.6M in line with FY14 Actual Spending;
- Utilities \$24.9M increases for electricity pricing;
- Other Services \$23.4M mainly for NEFCo contract and Leases; and
- Fringe Benefits of \$19.0M mainly for Health Insurance.



CEB Budget Structure – Indirect Expenses

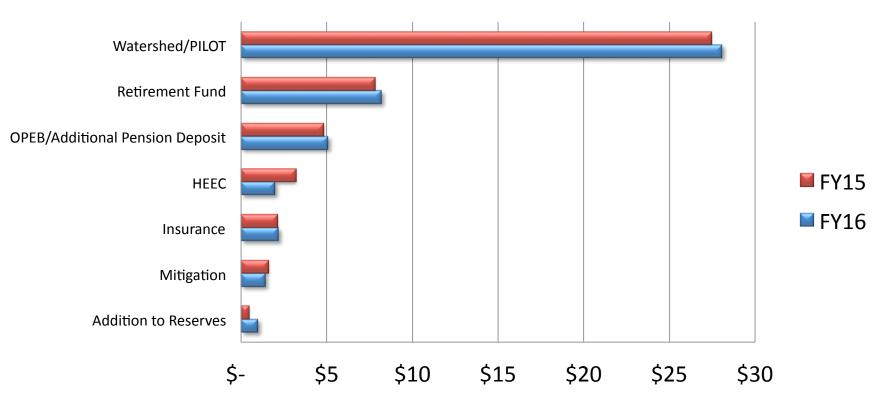
Indirect Expenses





Indirect Expenses Comparison FY15 -FY16







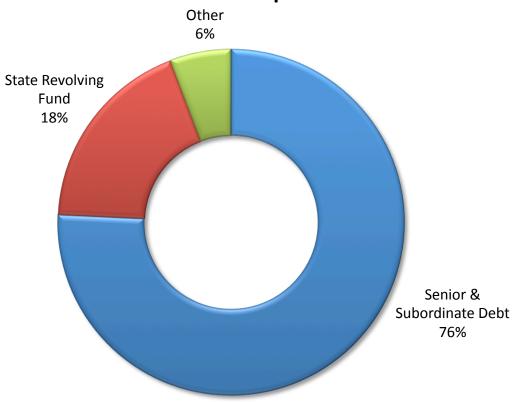
FY16 Proposed Current Expense Budget (CEB)

Highlights – Indirect Expenses

- Watershed Program for operating, PILOT and debt \$28.1M;
- Pension Fund required contribution \$8.2M;
- Additional Payment to Pension (OPEB) \$5.1M;
- HEEC contract \$1.9M; and
- Addition to Operating Reserve Fund \$962K.



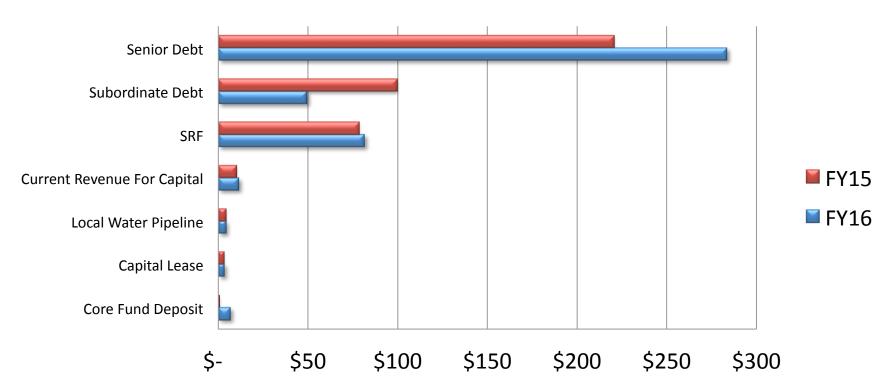
Debt Service Expenses





Debt Services Expenses Comparison FY15 -FY16

\$ in Millions





FY16 Proposed Current Expense Budget (CEB)

Highlights – Debt Service Expenses

- Variable Rate Debt Assumption 3.25%;
- Required CORE Fund Deposit \$6.7M;
- Bond Redemption \$3.5M; and
- No Debt Service Assistance.



FY16 Proposed Current Expense Budget (CEB)

Revenue

- Non Rate Revenue
- Investment Income
- Rate Revenue Requirement (Assessments)



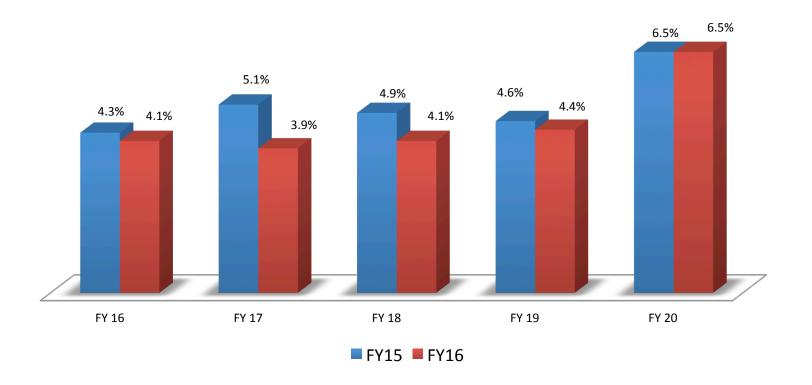
Planning Estimate Assumptions

Assumptions

- Direct Expenses Inflation
- Indirect Expenses Inflation
- Capital Spending Levels
- Variable and Fixed Debt Interest Rates
- Investment Income Interest Rates
- Level of Pension/OPEB Funding
- Use of Reserves



Assessment Increase Forecast Comparison





FY16 Proposed Current Expense Budget (CEB)

Challenges / Opportunities

- Short-Term Market Rates
 - Variable Rate Debt
 - Investments
- Regulatory Changes
- System Expansion
- Utility Pricing



FY16 Current Expense Budget Next Steps

- Transmit Proposed Budget to Advisory Board for 60 day review
- Reconvene Long-Term Rates Management Committee
- Public Hearings
- Staff will present Draft Final Budget in June



FY16 Current Expense Budget Closing

Thank You





MWRA Annual CSO Progress Report 2014

Massachusetts Water Resources Authority



Combined Sewer Overflow Control Plan



Annual Progress Report 2014

March 2015

This is the 19th annual report.

Report includes:

- Progress in 2014 and Q1 2015
- CSO control achievements and benefits to-date
- Remaining activities and court/ regulatory requirements
- Spending, updated costs and schedules.



MWRA's Approved Long-Term CSO Control Plan

- 35 projects address site specific conditions
- \$898 million total capital cost (Prop. FY16 CIP)
- 20-year implementation schedule (1996-2015)
- >100 CSO milestones in federal court order require full implementation by 2015 and performance assessment by 2020



Summary of Achievements to Date

- √ 32 of 35 projects in the CSO plan are complete.
- ✓ Last 3 projects are well into construction.
- ✓ CSO is eliminated at 38 of 84 CSO outfalls.
- ✓ Average annual CSO volume is reduced by 86%.
 (3.3 billion gallons in 1988 to 0.45 billion gallons today)
 Goal is 0.40 billion gallons.
- √ 89% of the remaining volume is treated at MWRA's four CSO facilities.

Goal is 93% treated.



Construction Progress

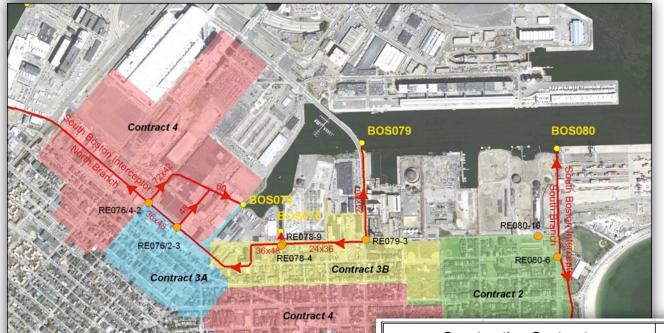
- MWRA spent \$22.1 million on CSO projects in calendar year 2014.
- 47,550 linear feet (9 miles) of drain and sewer pipe in 2014.
- 497,500 linear feet (94.2 miles) of drain and sewer pipe since 1996.







\$69M BWSC Reserved Channel Sewer Separation



3 of 4 major sewer separation contracts are substantially complete.

Contract 4 complete this month.

Remaining work on schedule for completion by Dec 2015 court milestone.

ruction Contracts	% Complete	Construction Dates
Outfall Rehabilitation	100%	2010-2011
Sewer Separation	100%	2009-2011
Sewer Separation	100%	2010-2012
Sewer Separation	100%	2011-2014
Sewer Separation	95%	2012-2015
Sewer Cleaning/Lining	On-going	2014-2015
Downspout Disconnections	On-going	2015
Paving	100%	2010-2012
Paving	50%	2012-2015
	Outfall Rehabilitation Sewer Separation Sewer Separation Sewer Separation Sewer Separation Sewer Separation Sewer Cleaning/Lining Downspout Disconnections Paving	Outfall Rehabilitation 100% Sewer Separation 100% Sewer Separation 100% Sewer Separation 100% Sewer Separation 95% Sewer Cleaning/Lining On-going Downspout Disconnections On-going Paving 100%

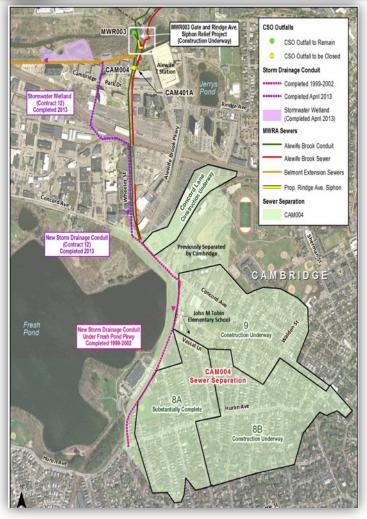


\$2.7M Outfall MWR003 Gate and Siphon Relief





\$94M Cambridge CAM004 Sewer Separation

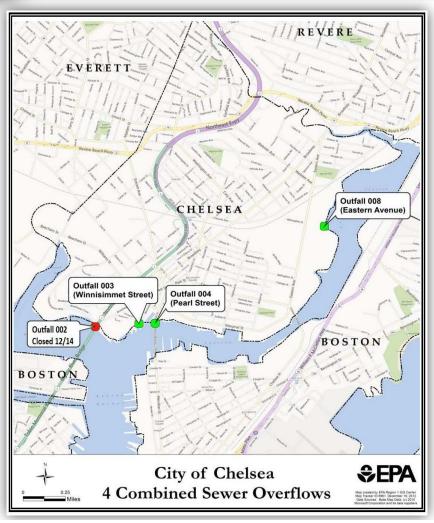


04/19/2014

All work on schedule for completion by Dec 2015 court milestone.



Progress in 2014: City of Chelsea Closes Outfall CHE002

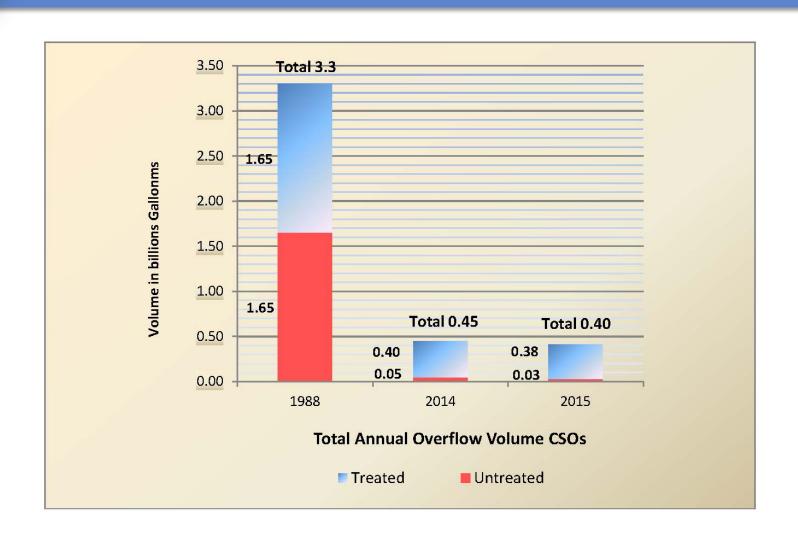








Lower CSO Discharges Since 1988





CSO Program Cost and Spending

FY15 CIP: \$892.4 M Prop. FY16 CIP: \$898.3 M

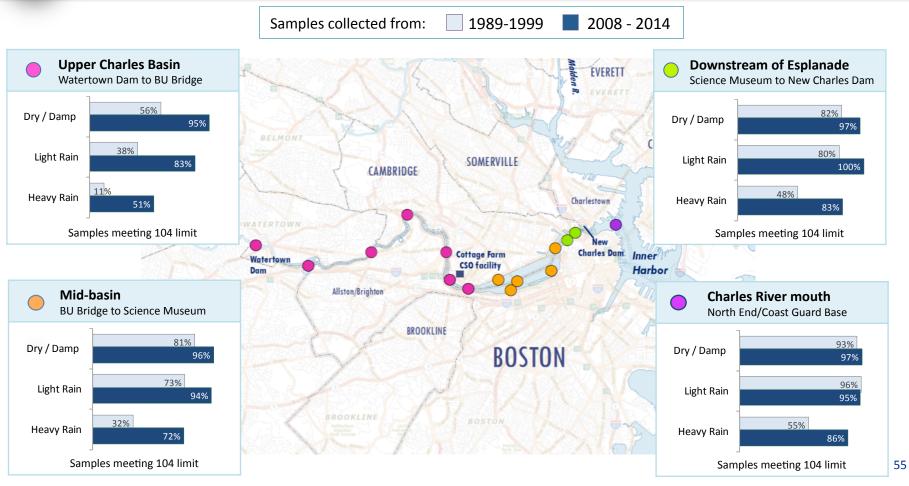
	<u>Total CSO Program</u>	Community Projects
Prop. FY16 CIP Budget	\$ 898.3 M	\$ 413.6 M
Spent thru Jan 2015	\$ 867.1 M	\$ 386.1 M
Remaining to be spent	\$ 31.2 M	\$ 27.5 M

Remaining Work:

- Complete last three CSO projects in 2015.
- Close out construction contracts and perform final eligibility reviews.
- Continue to comply with Charles R. and Alewife/Upper Mystic R. CSO variances.
- Assess system performance and verify attainment of long-term levels of control by Dec 2020.



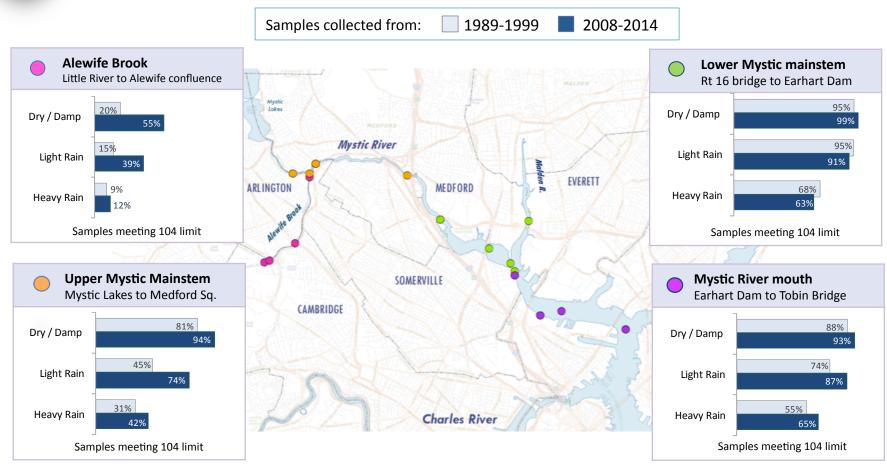
Change in Charles River Water Quality Over Time



Graphs show the percent of samples meeting the Enterococcus bacteria limit for swimming, by river reach.



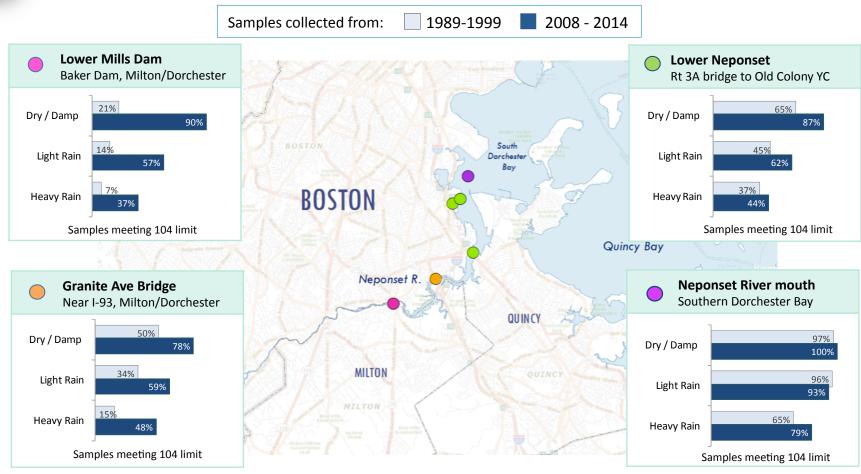
Change in Mystic River Water Quality Over Time



Graphs show the percent of samples meeting the *Enterococcus* bacteria limit for swimming, by river reach.



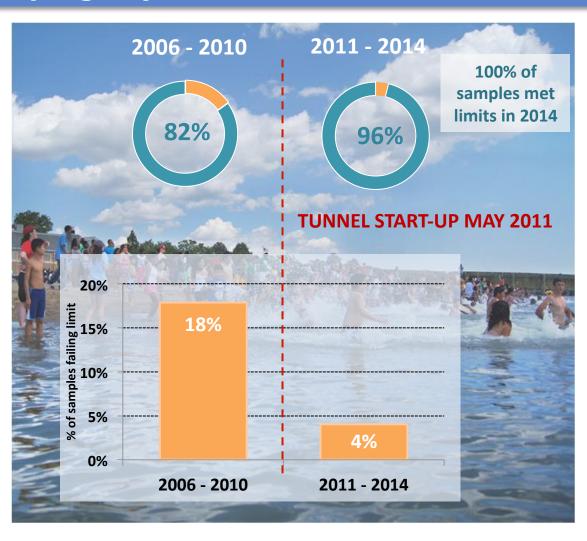
Change in Neponset River Water Quality Over Time



Graphs show the percent of samples meeting the *Enterococcus* bacteria limit for swimming, by river reach.



South Boston Beaches Meet Bacteria Limits on More Sampling Days

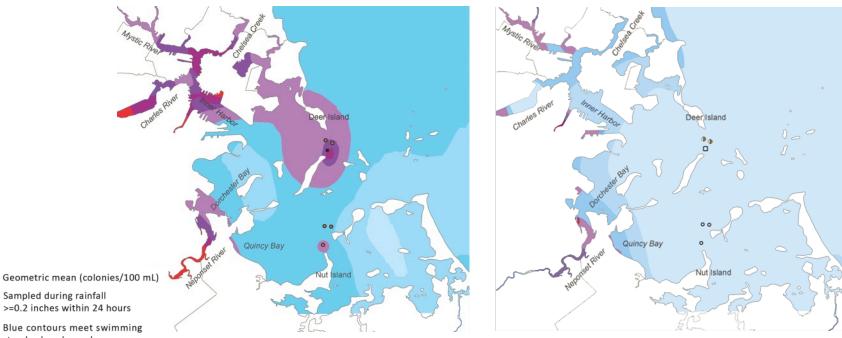




Changes in Boston Harbor Bacteria Levels in Wet Weather







>=0.2 inches within 24 hours Blue contours meet swimming standard, red-purple

contours exceed swimming standard



Contours show the geometric means of Enterococcus data collected when more than 0.2 inches of rain fell in the previous day. Blue areas meet the EPA geometric mean swimming standard and red-purple areas exceed the standard. First panel shows data from 1989 to 1991, second panel shows data for 2008 - 2013.



Remaining Federal Court Milestones (Schedule Seven)

October 2015: Complete construction of Gate, Siphon Relief and

Floatables Control at Outfall MWR003

December 2015: Complete construction of CAM004 Sewer Separation

Complete construction of Reserved Channel Sewer

Separation

March 2016: Submit annual progress report (for 2015)

January 2018: Commence 3-year performance assessment, including

post-construction monitoring

December 2020: Submit results of 3-year performance assessment to

demonstrate attainment of long-term levels of CSO

control



Massachusetts Water Resources Authority

Presentation to

MWRA Board of Directors

Agreement for Operation and Maintenance of the Fore River Pelletizing Plant with New England Fertilizer Company

March 11, 2015



MWRA Pellet Plant located in Quincy, MA

- Located in Fore River Shipyard
- Designed, Constructed & Owned by MWRA
 - Phase I \$88 M
 - Phase II \$45 M
 - Total cost \$133 M



- Since Day 1, has been a Contract Operation
 - Contract 1: 1991 2001 Competitive Bid NEFCo
 - Contract 2: 2001 2015 Competitive Bid NEFCo



Pellet Plant - Contract O&M Since 1991 (cont.)

- Current contract S345 15-year (2001-2015)
- Process liquid sludge from DITP
 - Receive digested sludge
 - Dewater with centrifuges
 - Dry with thermal dryers
 - Produce Class A Fertilizer Pellet
 - In CY14:
 - Processed 100 dtpd
 - Paid NEFCo \$14.1M

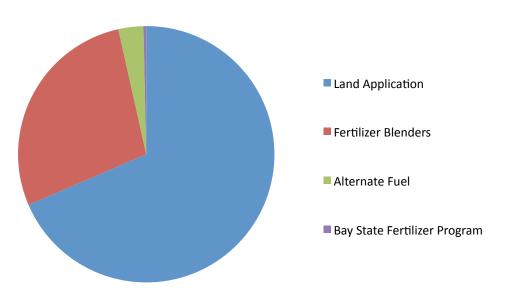




Pellet Plant - Contract O&M Since 1991 (cont.)

- Contractor is responsible for developing & maintaining Diverse Markets for beneficial reuse for all sludge sent to the Pellet Plant
 - Land Application
 - Fertilizer Blenders
 - Alternate Fuels
 - Bay State Fertilizer Program
- Maintain Facility & Equipment

 Responsible for returning a fully operable plant at the end of the contract to MWRA.





Pellet Plant – Contract Renewal Preparation

Step 1: Condition Assessment

- Facility is in excellent condition
 - 20+ year life remaining with no major capital (with continued maintenance)

Step 2: Residuals Technology Assessment

- Recommendations at DITP
 - May impact quality & quantity of sludge to FRSA
- Recommendations at Pellet Plant
 - Limited to energy efficiency gains given condition of facility





Pellet Plant – Contract Renewal Preparation Step 2 (cont.)

Technology Assessment Recommendations (cont.)

- Consider larger, more efficient Dryer Trains
 - Implemented at Philadelphia & soon Detroit
- Evaluate impacts of co-digestion programs at DITP
- Given long remaining life, any capital expense decisions must rely on payback



- Recommend 5-year extension to quantify impacts
 of pilots and new dryer ops
- Suggested next long-term contract 15 years



Pellet Plant – Existing Contract with NEFCo

Current Contract Cost Structure

• Fixed Fee first 90 dtpd (~\$400/ton)

Excess Quantity Fee >90 dtpd (~\$280/ton)

- Fixed yearly capital dollar value (pre-determined)
- No pass-throughs for utilities
 - Includes adjustments for inflation
- FY14 Avg ~\$380/ton



Fixed Fee

Excess Quantity Fee

Pellet Plant – NEFCo Contract Extension

Contract Cost Structure – Sludge Processing

Original Contract

first 90 dtpd (32,850 tons/yr)

>90 dtpd

Contract Extension Change

first 92.5 dtpd, same price* (33,762.5 tpy)

> 92.5 dtpd, same price

• CY2014 Total contract expenses \$14,090,654

\$13,582,354 for sludge processing

- \$12,574,468 base +
- plus \$1,007,886 excess qty

+ \$508,300 capital expenses

\$13,334,464 if on extension = same base + plus \$759,996 excess qty Savings of \$247 K in year.



Pellet Plant –NEFCo Contract Extension – Capital Program

- Capital Program \$7.0 Million cap
 - \$6.087 K project awards subject for future Board approvals
 - NEFCo designs all capital projects paid 15% of awarded project
 - NEFCo responsible for capital costs in excess of \$7.0 M cap
 - Must return a fully operational plant at end of contract
 - Drum replacement not included in cap if completed.



Pellet Plant – NEFCo Contract Extension Summary

- Reduced Price for Sludge Processing (\$1.25 M savings over extension)
- Revised Capital Program Structure
 - Retains NEFCo liability (must return fully operating plant at end of contract)
- Extension negotiated for 5-years
- Provide MWRA sufficient time to:
 - ✓ Evaluate potential energy efficiency improvements (large dryer technology)
 - ✓ Stabilize future sludge quantities (co-digestion)
 - ✓ All for increased competition



Massachusetts Water Resources Authority

Presentation to

Board of Directors

MWRA's Dam Safety Program 2005 - 2015

March 11, 2015



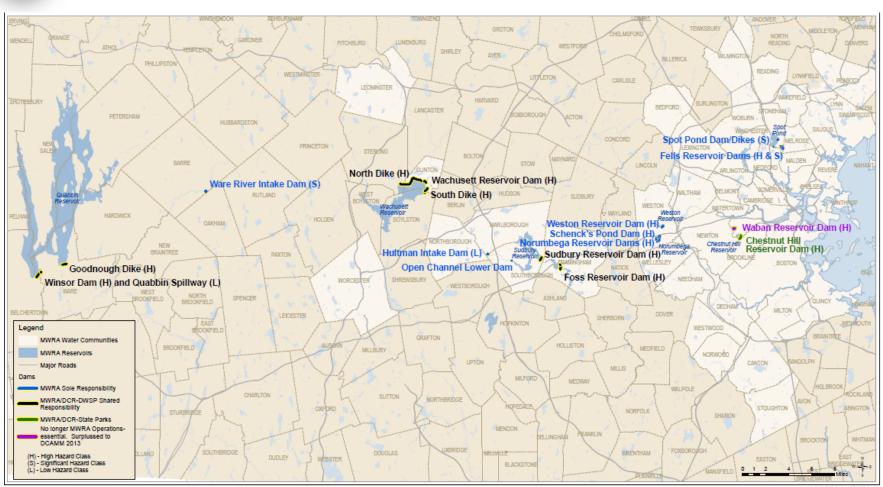
Dams and Dikes By The Numbers

27 Individual Structures

- Spread across 18 geographic locations
- Representing:
 - 17 High Hazard Class dams
 - 8 Significant Hazard Class dams
 - 2 Low Hazard Class dams
- Dams range in age (149 60 years old)



MWRA/DCR Dams under MA Office of Dam Safety Jurisidiction





Dam Safety Regulations

- Administered by DCR- Office of Dam Safety (ODS)
- Requires biennial inspections
- Modeled on Federal Regulations:
 - US Army Corps of Engineers
 - FEMA

MWRA-DCR MOU

- 2004 MOU specified roles of MWRA and DCR on dams:
 - DCR Routine Maintenance and Smaller Dams
 - MWRA Capital Maintenance/Improvements Large Dams



Emergency Inspections 2005 – "*laundry list" of dam issues*

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Inspections Determine Dam Needs

Required Studies:

- Hydrology and Hydraulics (H&H)
- Seepage and Stability (S&S)
- Safety Inspections (Phase I's)
- Emergency Action Plans

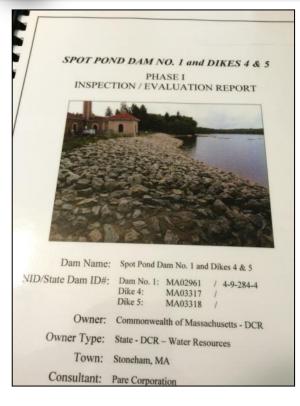
Led to Major Improvements at:

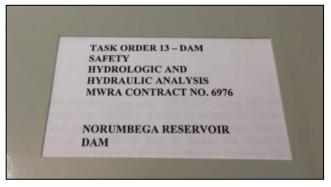
- Spillways
- Earthworks
- Masonry needs
- Tree Clearing

OP-228 (incl inspections)	\$	166,500.00
OP-160 (incl inspections)	\$	172,017.00
Emergency Action Figure Opulates	Ą	34,000.00
Emergency Action Plans Updates	\$	54,000.00
Dams Inundation Mapping	ς ,	17,912.00
Sudbury Spillway Insp. + weepholes	ς ς	15,000.00
H&H Analyses	\$ \$ \$ \$	60,011.00
T.O. for Fells Dam seeps analysis	٠ ,	12,955.00
T.O. Dam Safety Inspections 2006	ب خ	66,135.00
Dam Safety Tech Assist Consulting Emergency Inspections 2005	\$	50,000.00
Dam Safatu Tash Assist Consulting		
Foss Dam Stump removal	\$	12,531.00
Quabbin Spillway Fence Rehab	\$	400,000.00
Goodnouh Dike Tailwater Analysis	\$	28,650.00
Norumbega Trees	\$	135,900.00
Fells Trees 2	\$	42,173.00
Fells Trees 1	\$	129,310.00
Blue Hill Dam Repairs	\$	88,800.00
Foss Dam Tree Removal 2	\$	70,000.00
Foss Dam Tree Removal 1	\$	60,000.00
North Dike Tree Removal	\$	395,000.00
South Dike Tree Removal 2	\$ \$ \$ \$ \$ \$ \$ \$ \$	100,000.00
South Dike Tree Removal 1		352,950.00
Quabbin Spillway Repointing	\$	157,827.00
Dams Major Maintenance Projects		
Dam Safety Mods (5 dams):	\$	3,443,440.00
Wachusett Dam Face - PCB	\$	4,300,000.00
Wachusett Dam Promenade - PCB	\$ \$	2,220,000.00
Crest Gate	\$	5,400,000.00
Dams Capital Projects		
Dams Improvements 2005 - 2015		

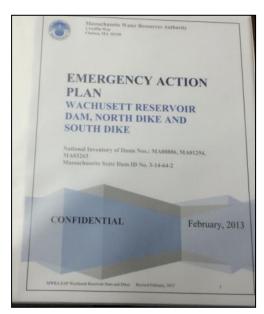


Inspections Identify Required Studies, Which Reveal Needs







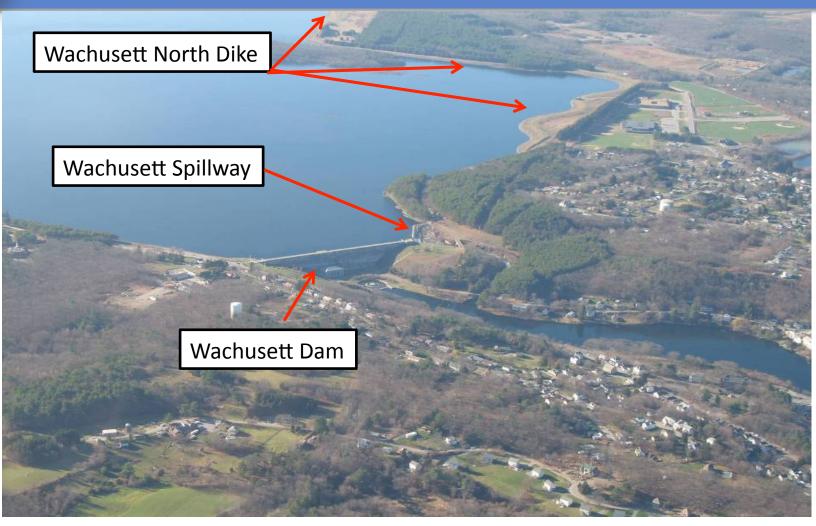




Major Spillway Projects

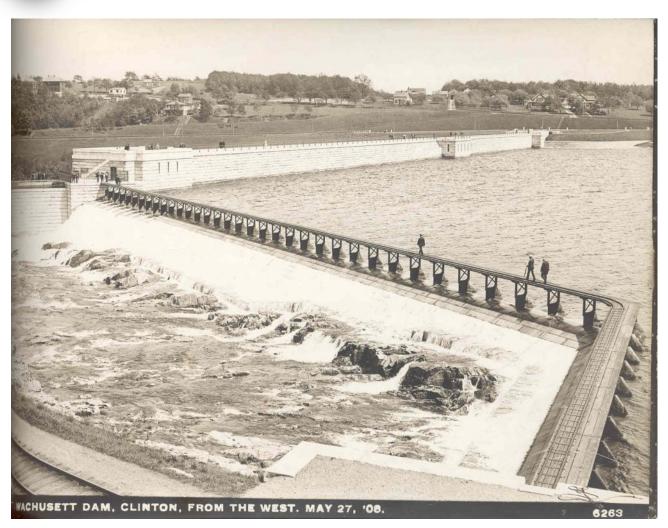


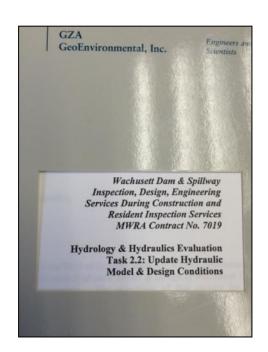
Wachusett Reservoir, Dam and Spillway





Wachusett Dam 1908





Updated H&H 2007



Wachusett Spillway Dismantling and New Sill











Wachusett Spillway Crest Gate Installed













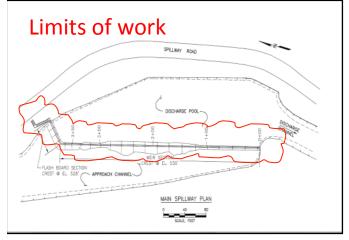
Wachusett Auxiliary spillway under construction



Wachusett spillway east berm construction



Quabbin Spillway Repointing and Grouting

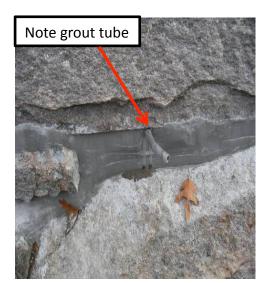








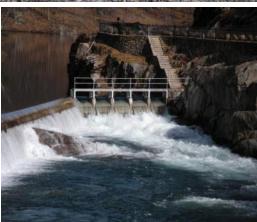






Quabbin Spillway Repointing and Grouting





Downstream crest after





Wachusett Open Channel Lower Dam - Substantial mortar loss and offset training wall stones



Before





After





Major Earthwork Projects



North Dike Structural Stabilization of Historic Failure Zone



Before

1907 STATIC LIQUEFACTION FLOW FAILURE OF THE NORTH DIKE OF WACHUSETT DAM

By Scott M. Olson, Student Member, ASCE, Timothy D. Stark, William H. Walton, Members, ASCE, and Gonzalo Castro, Fellow, ASCE

ABSTRACT: A static liquefaction flow failure occurred in the upstream slope of the North Dike of Wachusett Dam near Clinton, Massachusetts on April 11, 1907 during the first reservoir filling. The fine sands of the upstream filks shell liquefied and flowed approximately 100 m horizontally into the reservoir. This paper presents a description of the construction of the North Dike, failure of the upstream slope, and the results of stability analyses that were conducted to estimate the shear strength mobilized in the liquefied soils during failure. Analyses of the postfailure geometry, the prefailure geometry, and an analysis incorporating the kinetics of failure were conducted. The back-calculated shear strength considering the kinetics of failure is in agreement with other liquefaction flow failure case histories published in the literature. As a result, it recommended that the kinetics of failure be considered to determine the shear strength mobilized during a liquefaction flow failure.





Spot Pond Dam Armoring — in-house project











Chestnut Hill Dam Improvements











Major Masonry Projects



Wachusett Dam Promenade PCB Demo/rebuild









Wachusett Dam PCB remediation and power washing





Cleaned

Uncleaned efflorescence



After



Wachusett Dam Improvements





Dam face cleaned and repointed







Foss Reservoir Spillway - repointing







Foss Dam Gatehouse interior masonry grouting/repointing





Leakage through stone joints

Repointing and Injection grouting

Steel plate for protection against erosion of mortar



Weston Reservoir Dam Parapet Wall











Sudbury Dam/Spillway Masonry Repointing











Sudbury Spillway Inspection and Weep Hole Maintenance







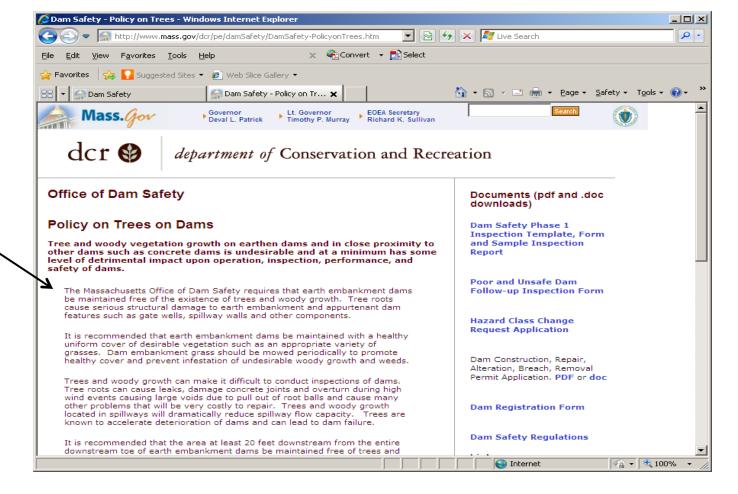
Chestnut Hill Dam riprap improvements – left abutment





Major Tree Work

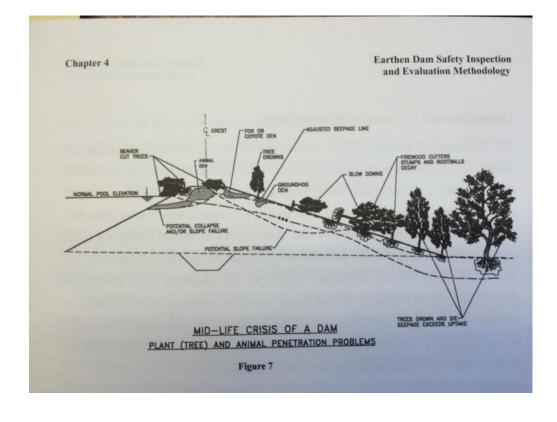






Tree Roots are bad for Earthen Dams







Proper Stumping/backfill Critical to the Integrity of the Dam











Weston Reservoir Dam



















10.04.11

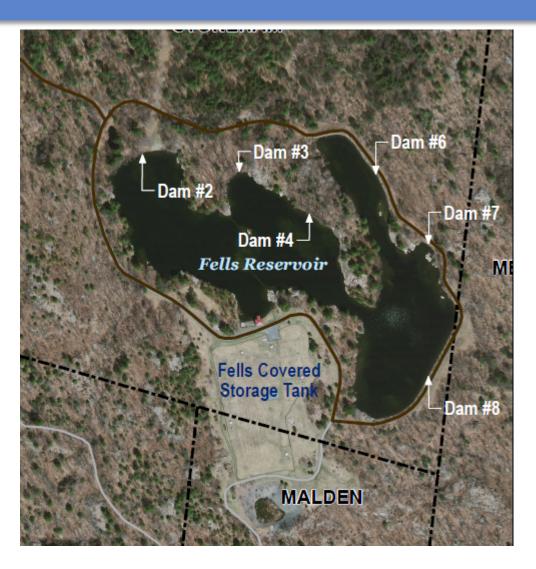








Fells Dams, Stoneham





Fells Reservoir Dam #8 Tree Removal











Fells Reservoir Dam #6, #7 tree and riprap work



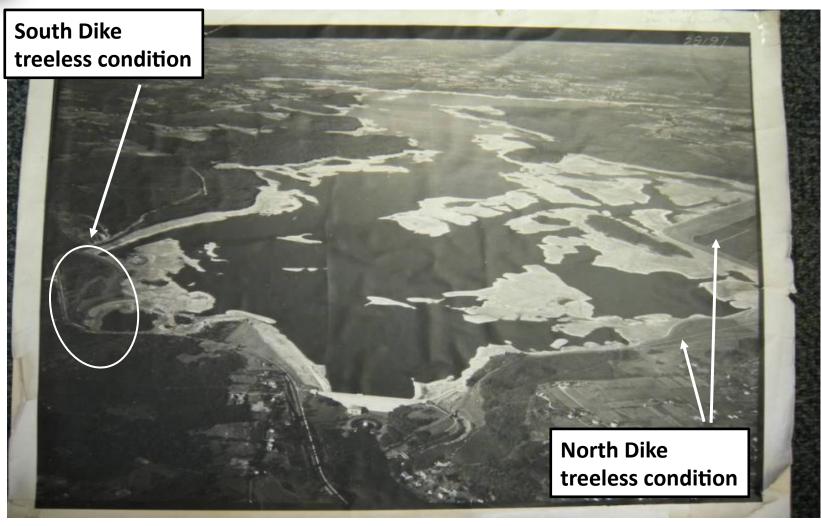


After





Wachusett Reservoir circa 1930 drought





South Dike Comparison



Rock outcrop. Note dense tree cover





South Dike Comparison



Crest – note dense tree cover





South Dike 2010 – Tree Removal Zones and in 2011



Completed

2015 project – remove remaining trees



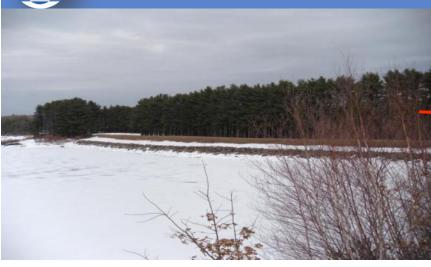


















South Dike Final Grading and Hydroseed







North Dike Tree Removal







North Dike Tree Clearing









Norumbega Dam/Dikes Tree Removal



After Norumbega Reservoir Norumbega Reservoir, Weston, MA 02493, USA



MWRA Dam Improvements

MWRA /DCR Dam Condition Ratings

- Significant Rehabilitation/Upgrades Completed
- 2006- Dams Ranged from "Fair Satisfactory"
- 2014, Dams upgraded. Now range from "Satisfactory Good"



What's next on the Horizon for Dam Safety Needs

- Foss Reservoir Spillway increase capacity and/or armor the earthen embankment. Pending ODS review on options.
- Install new piezometers at earthen dams lacking them: (North Dike and South Dike, Weston, Fells, Norumbega, Ware Diversion, Foss, Schencks, Chestnut Hill).
- Continue to meet ODS Biennial Phase I safety inspections' schedule.



Wachusett el. 396.07' on 04.01.10 @1.6 BGD









Quabbin Spilling @ 0.6 BGD on 04.05.10







Sudbury System Dams Under High Inflows



Sudbury in spill 03.29.10 @ 200 MGD





Foss in spill @ 250 MGD



Thank you.



