



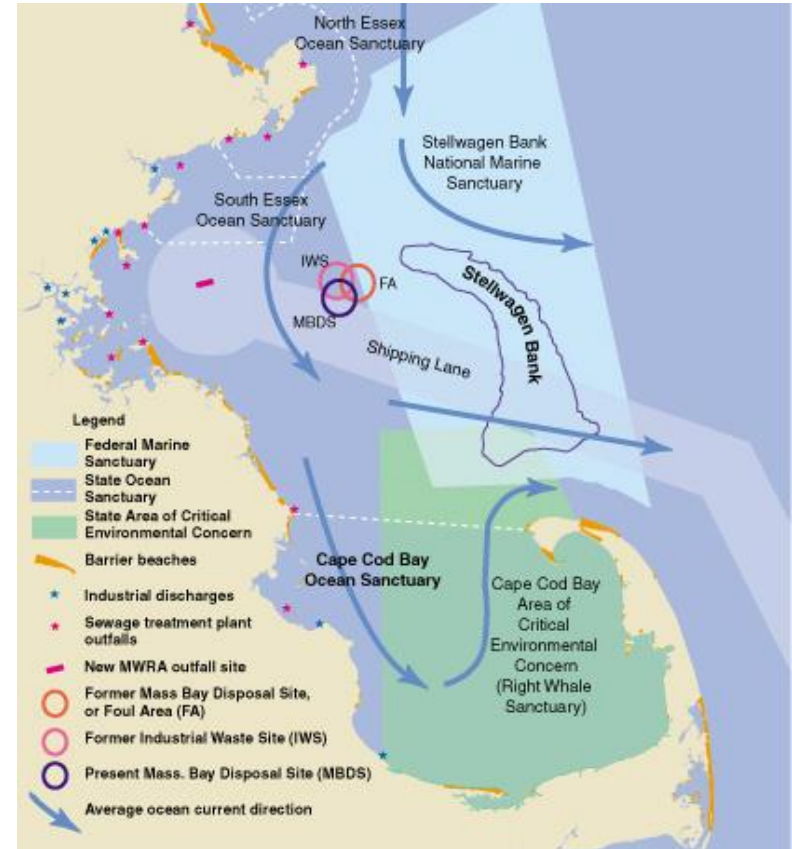
***MWRA's Outfall Monitoring Overview
2016 Results***

October 18, 2017



MWRA Ambient Monitoring

- Moving discharge from Boston Harbor initially caused environmental concerns
- Comprehensive baseline monitoring required by regulators (1992-2000)
- Ambient monitoring required by DITP Permit (2000+)
- Major programmatic reviews in 2003 and 2009-10 led to reduced Ambient Monitoring requirements
- Monitoring focuses on studies of effluent, receiving water, sediment quality, and fish and shellfish





Outfall Monitoring Overview 2016 Highlights

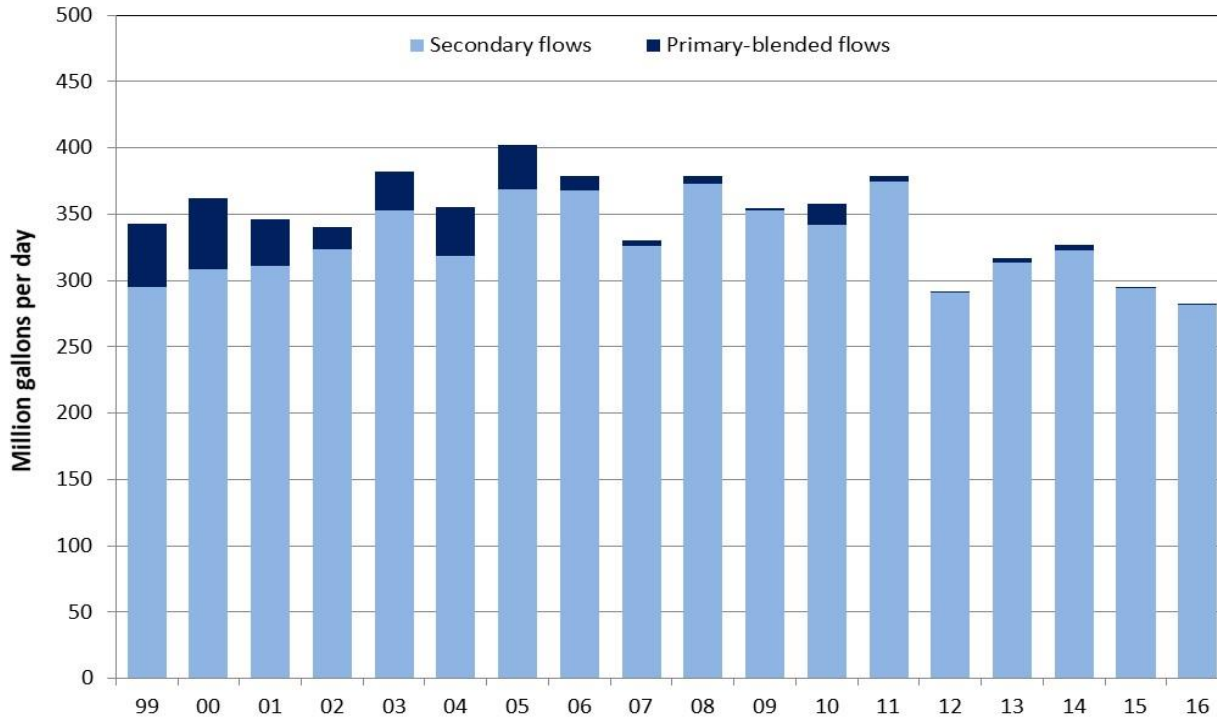
- Effluent quality (Platinum 10 award!)
- Outfall Monitoring
 - Water quality good year-round
 - Sediment animal communities were healthy
 - Flounder health good



*Sampling near Deer Island,
2016*



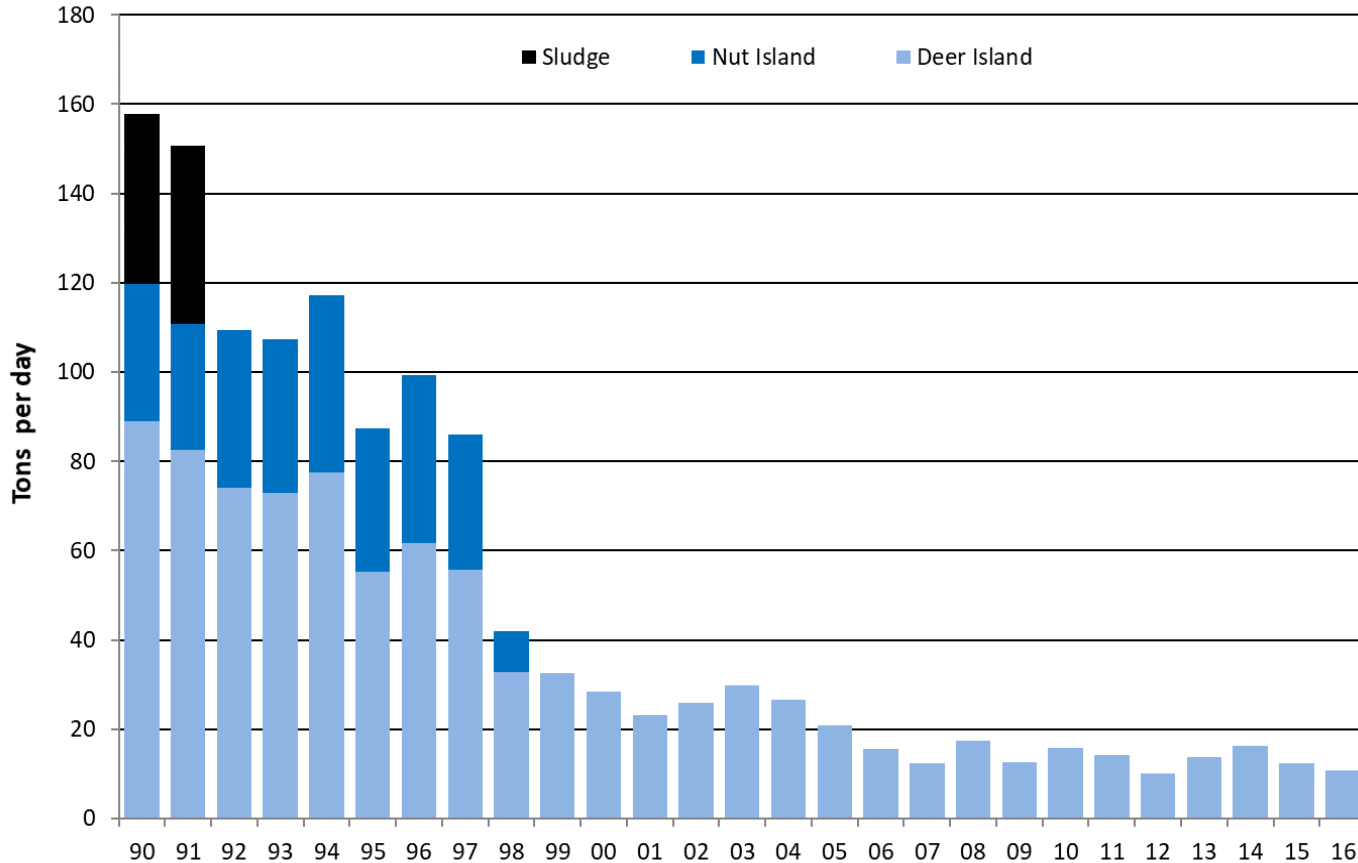
2016 Was A Very Dry Year With Almost No Blending



Average flow at Deer Island, 1999-2015

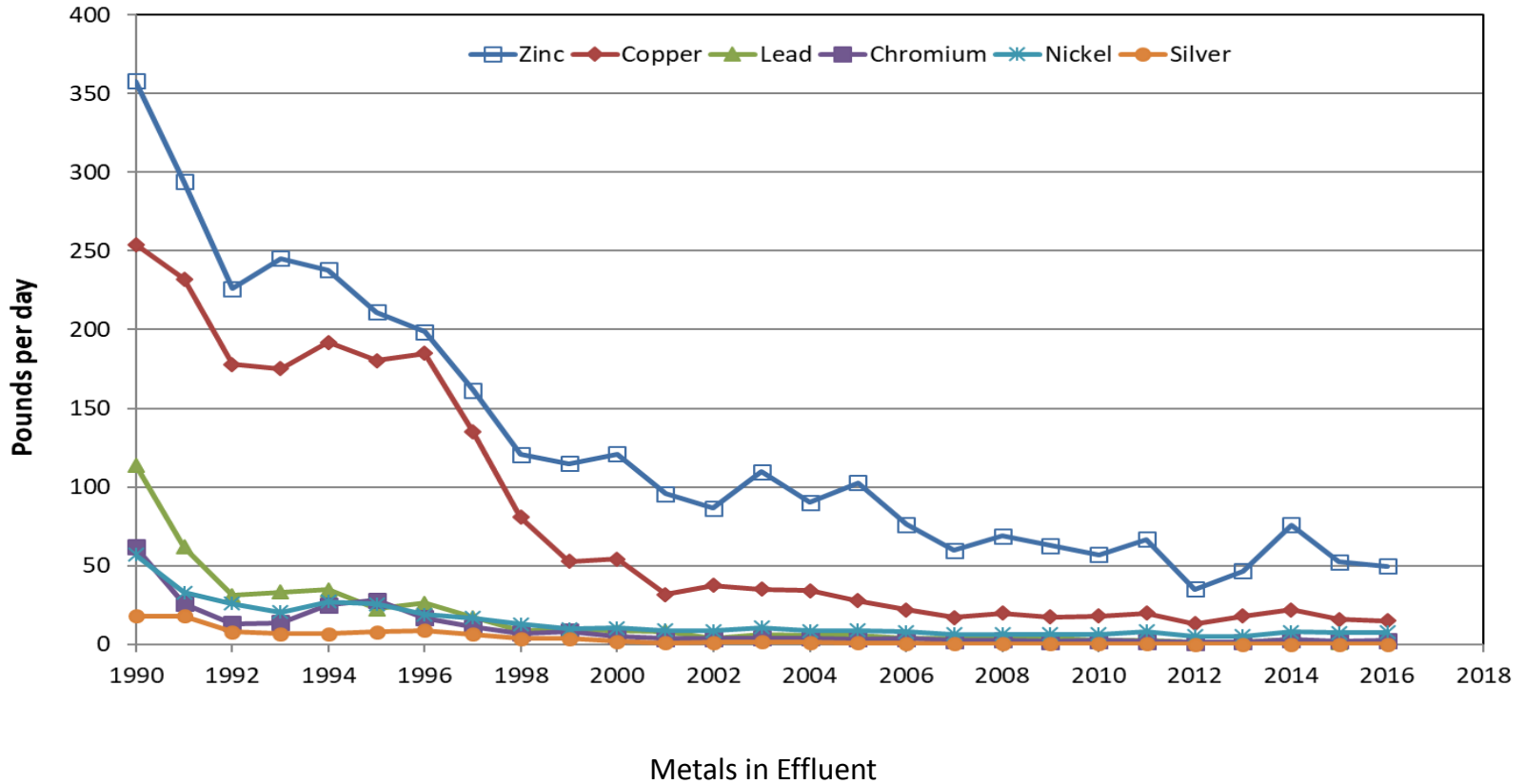


Total Solids Discharged (Tons/Day), 1990-2016



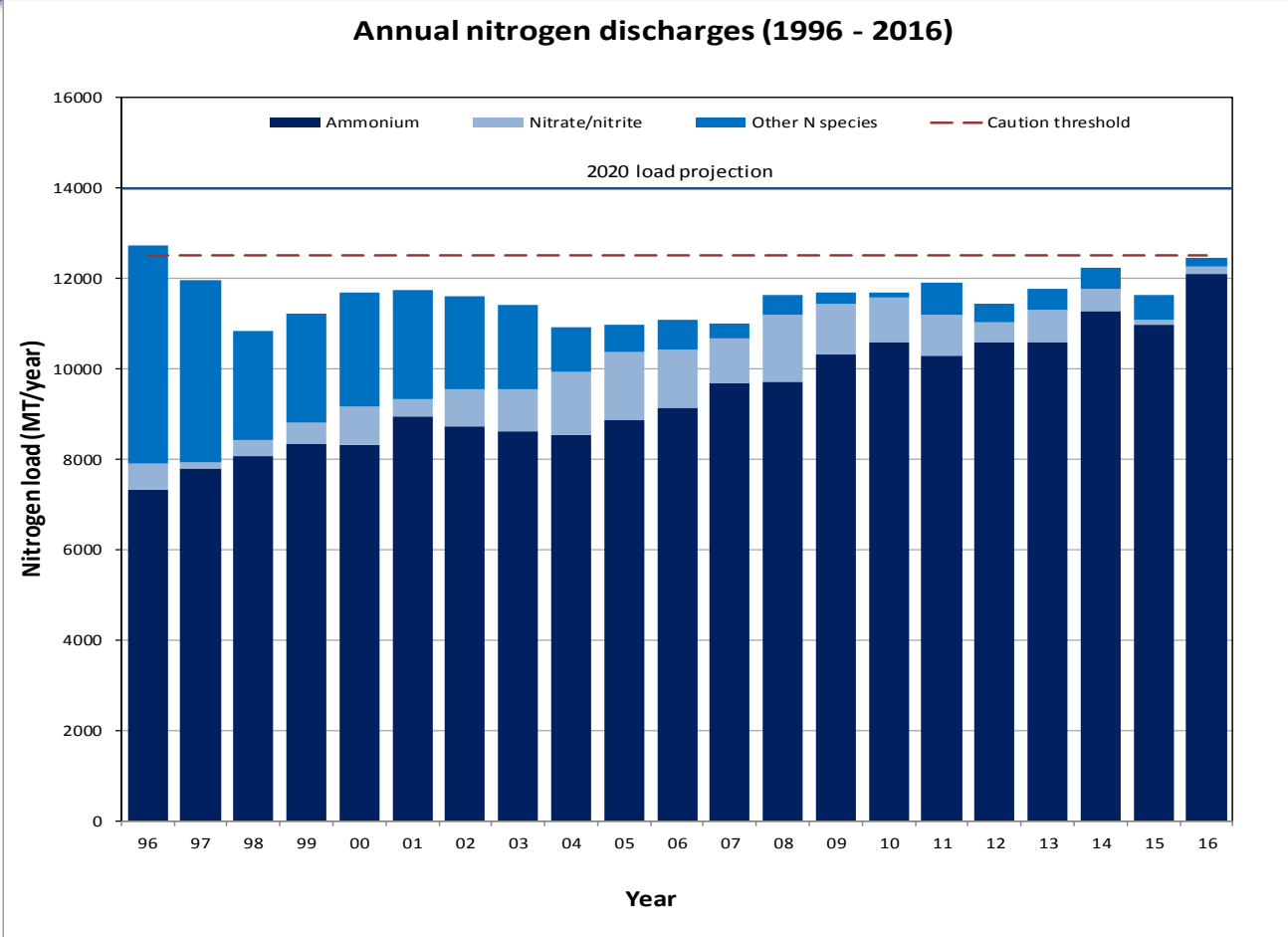


Contaminants In Deer Island Effluent





Effluent Nitrogen Was High In 2016





Water quality monitoring 2016 results

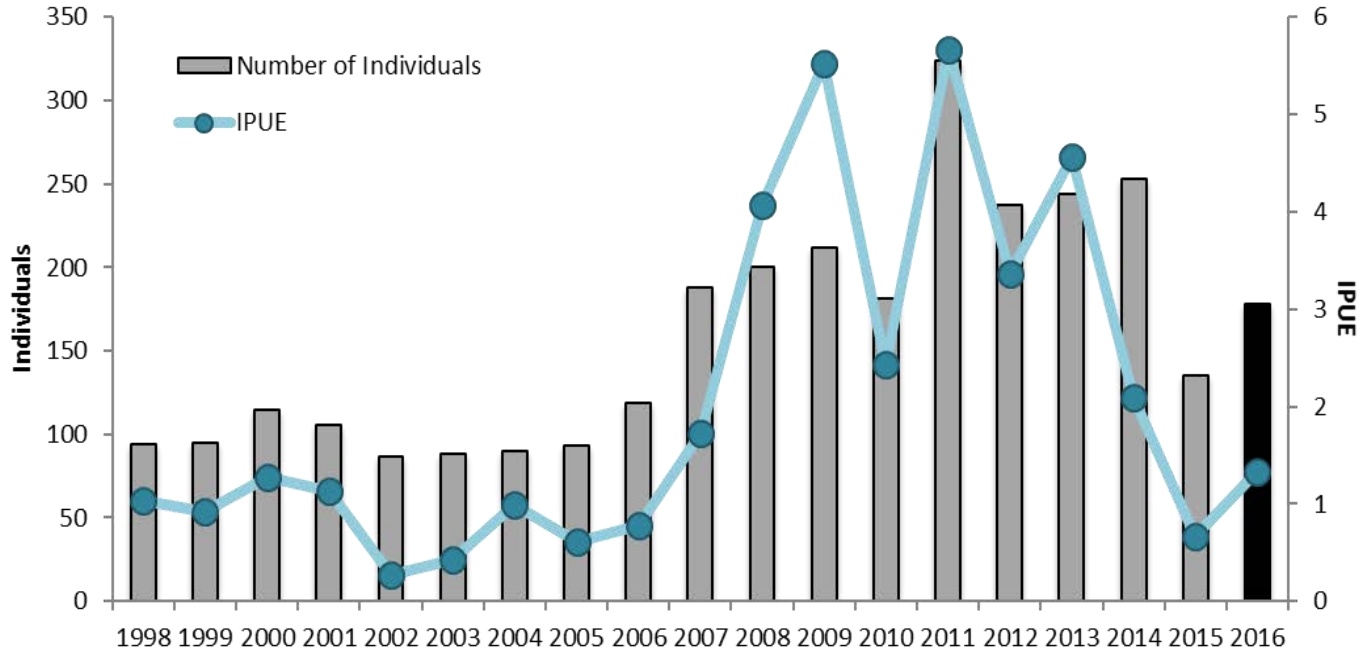
- No evidence of adverse outfall impact
- Dissolved oxygen in bottom waters stayed at healthy levels all year, despite relatively warm, salty water
- Minor red tide bloom in 2016
- Low abundances of a nuisance algae in May resulted in Contingency Plan threshold exceedance



Collecting water samples in Massachusetts Bay.



Monitoring by Center for Coastal Studies





Boston Harbor Bacterial Water Quality

Before Improved treatment and Infrastructure



Most Boston Harbor projects completed



Average *Enterococcus* counts in Boston Harbor in wet weather

The lighter the blue, the better



Sediment Monitoring In Boston Harbor And Massachusetts Bay

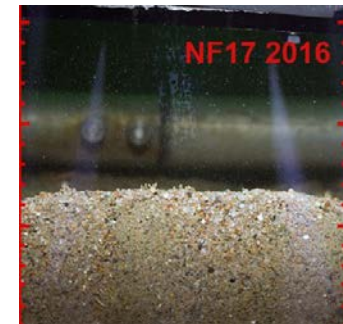
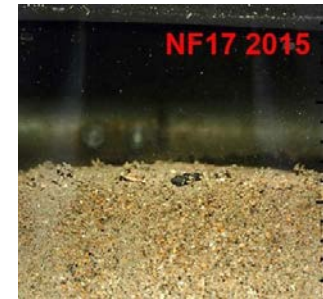
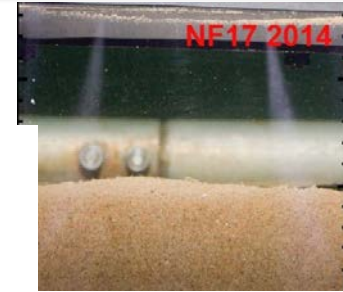
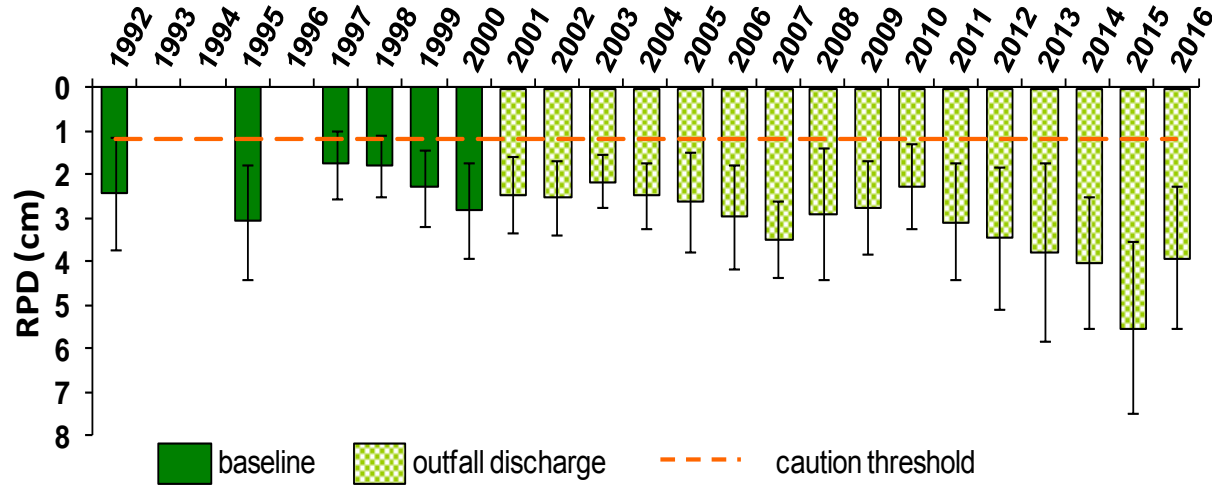


Collecting sediment profile images in Mass. Bay



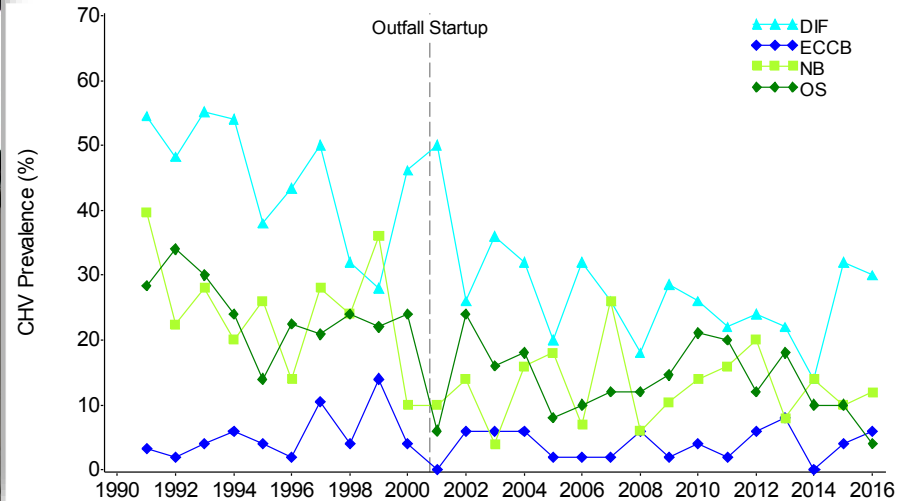


Sediments In Massachusetts Bay Remain Healthy





Flounder Health In Boston Harbor And Near Outfall

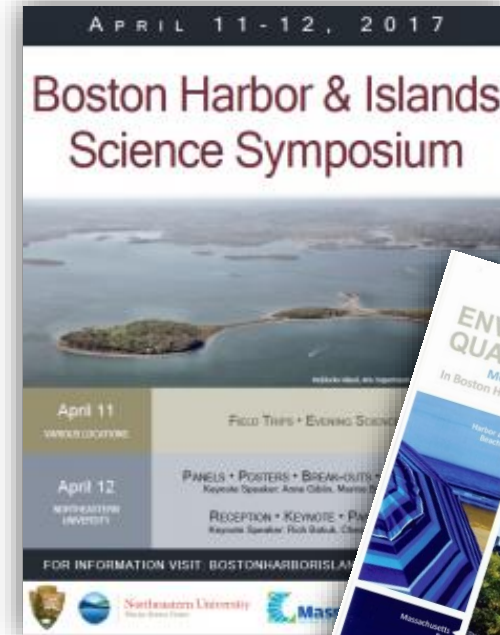


- Diseased flounder were one cause of Boston Harbor being termed “Dirtiest in the Nation”
- Liver tumors were last observed in 2004
- Prevalence of liver tumor precursors has decreased substantially in Boston Harbor
- Tumor precursors are decreasing near outfall as well; 2016 levels were the lowest yet observed



Recent/current efforts include

- Harbor and Islands Science symposium
- Presentations at industry, environmental science conferences
- Presentations and discussions at watershed associations, school groups, universities
- Development of brochure summarizing bacterial monitoring





Ambient Monitoring Confirms Massachusetts Bay Is Healthy





Video From Outfall Diffuser





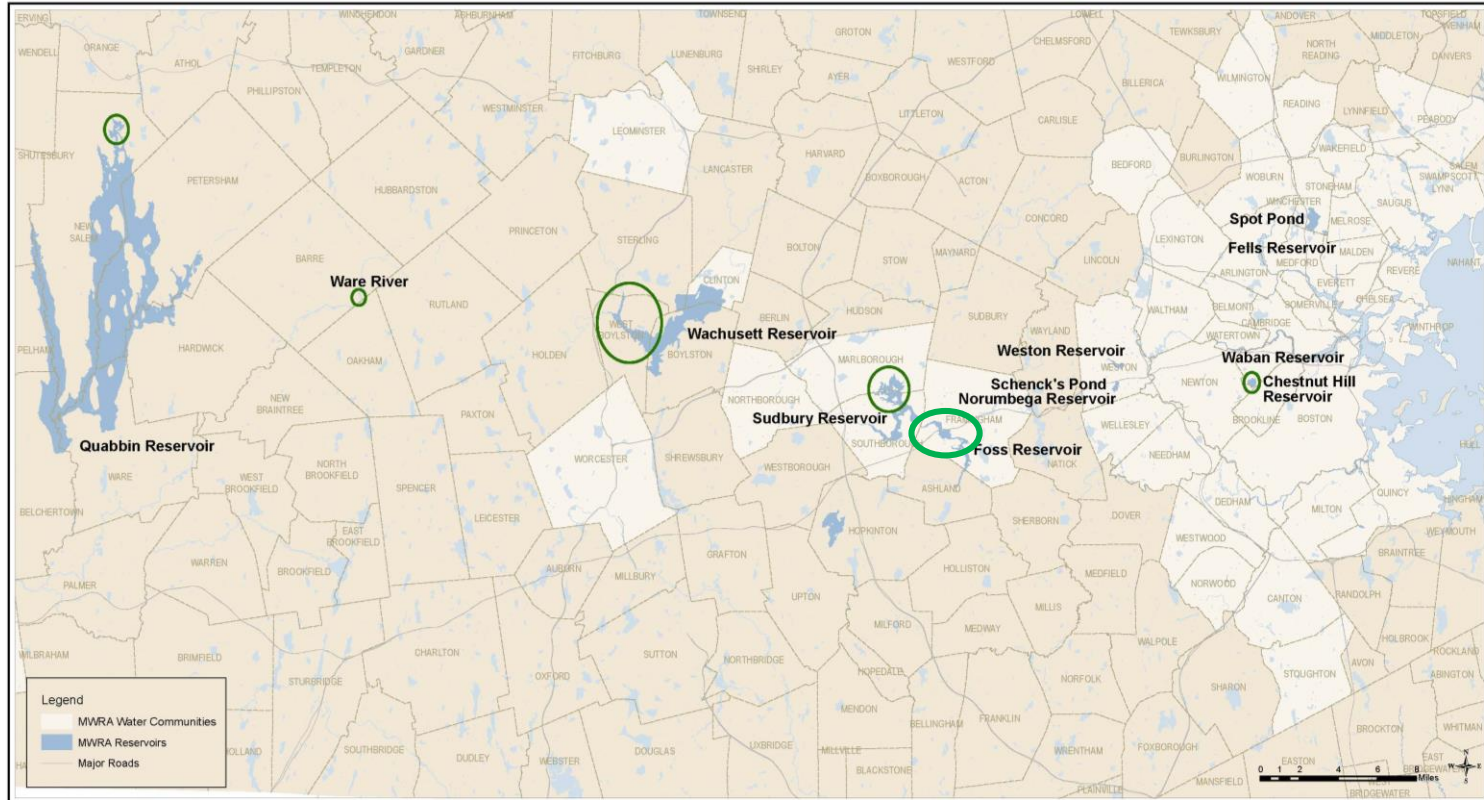
***Update on Invasive Aquatic Plant Management
at MWRA Reservoirs***

October 18, 2017



Geographic Spread of Aquatic Invasives across Reservoir System

MWRA/DCR Reservoirs with Invasives Control Projects





These Four Plants Are The Main Concerns For Our Reservoirs Now



Eurasian Watermilfoil



Fanwort



Variable Leaf Milfoil



Water Chestnut

Spread by roots, seed and fragments

Spread by seed



Program Locations For Aquatic Invasive Plants Management

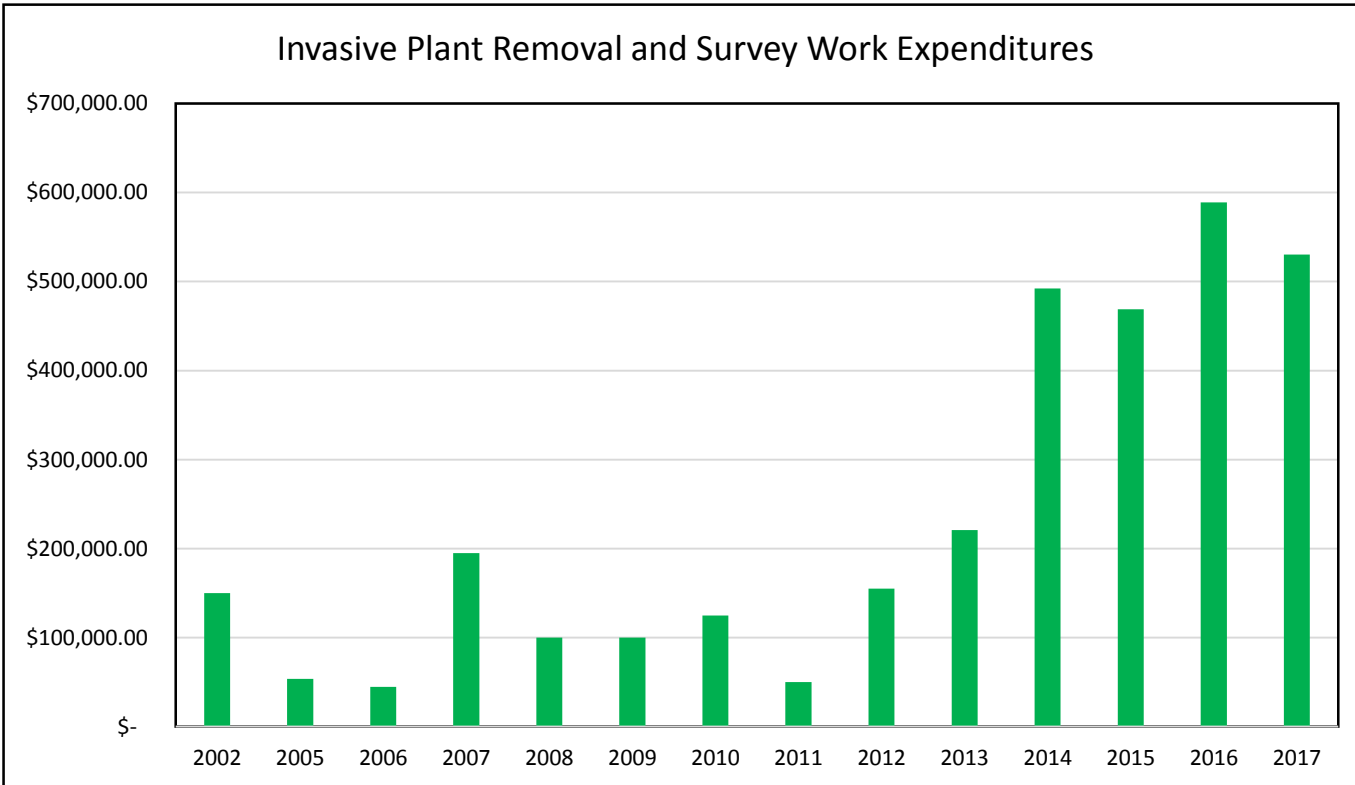
Updates to be provided for locations shown in green

- Quabbin - No known Aquatic Invasives in main reservoir. Non-native Variable Leaf Milfoil in upstream settling basins
- Ware River
- Wachusett
- Sudbury
- Foss
- Norumbega - One pioneering colony of EWM discovered and removed in 2015
- Weston - No known Aquatic Invasives
- Chestnut Hill
- Fells - No known Aquatic Invasives
- Spot Pond - No known Aquatic Invasives





Aquatic Invasive Removal And Plant Survey Spending Since 2002





Ware River Shaft 8 Intake Pool



Intake Pool at drawdown with exposed milfoil





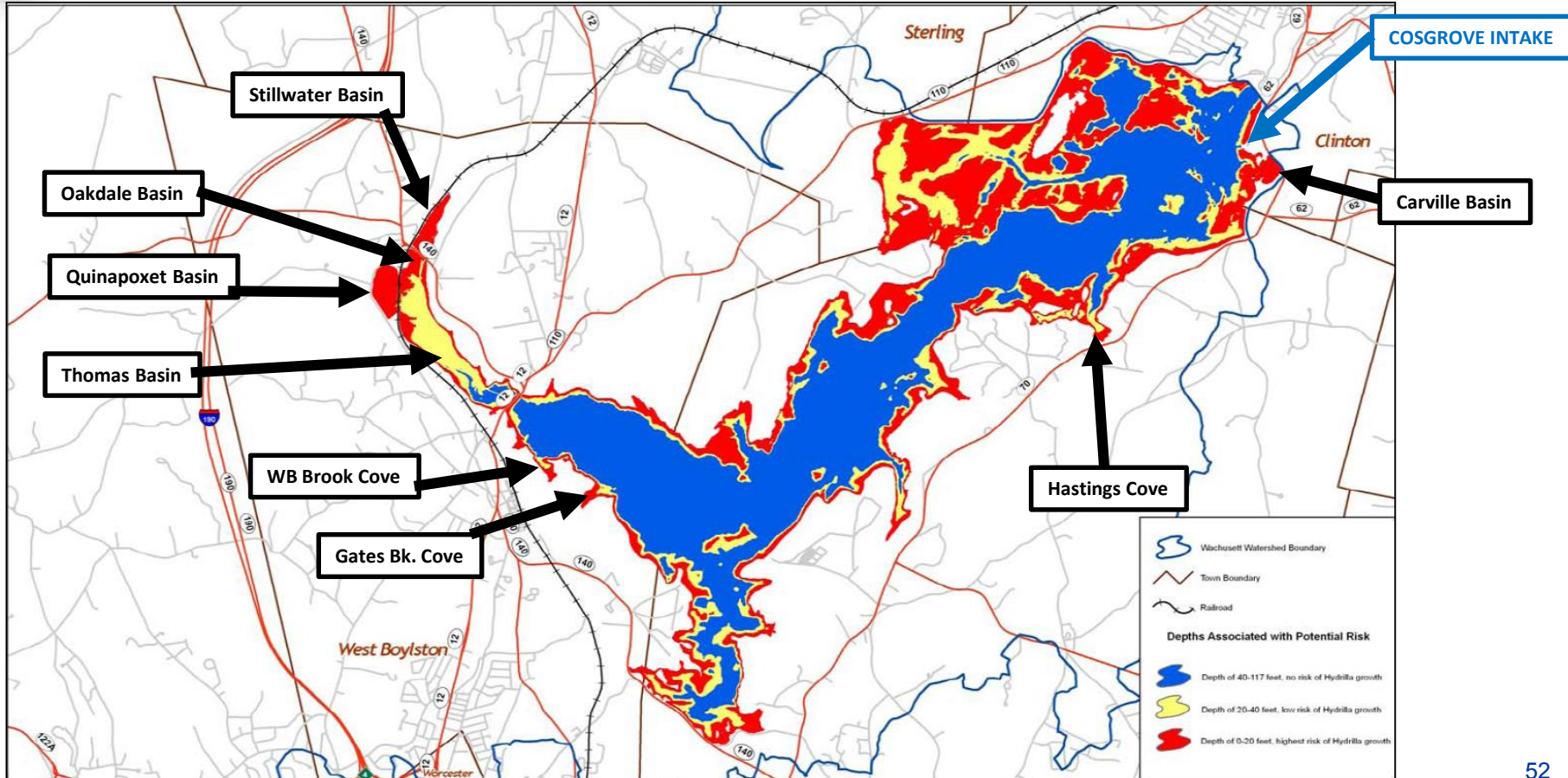
Ware River Variable Leaf Milfoil harvest



In 2016 harvest totaled 4,170 gallons of Variable Leaf Milfoil
In 2017 harvest totaled 2,940 gallons of Variable Leaf Milfoil representing ~30% reduction



Wachusett Has The Most Intensive Activities And Highest Risk

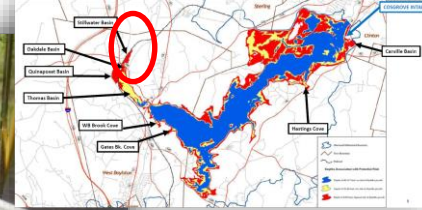




Control Efforts By Diver Assisted Suction Harvesting (DASH) – Stillwater Basin



Suctioned plants emerge on screen

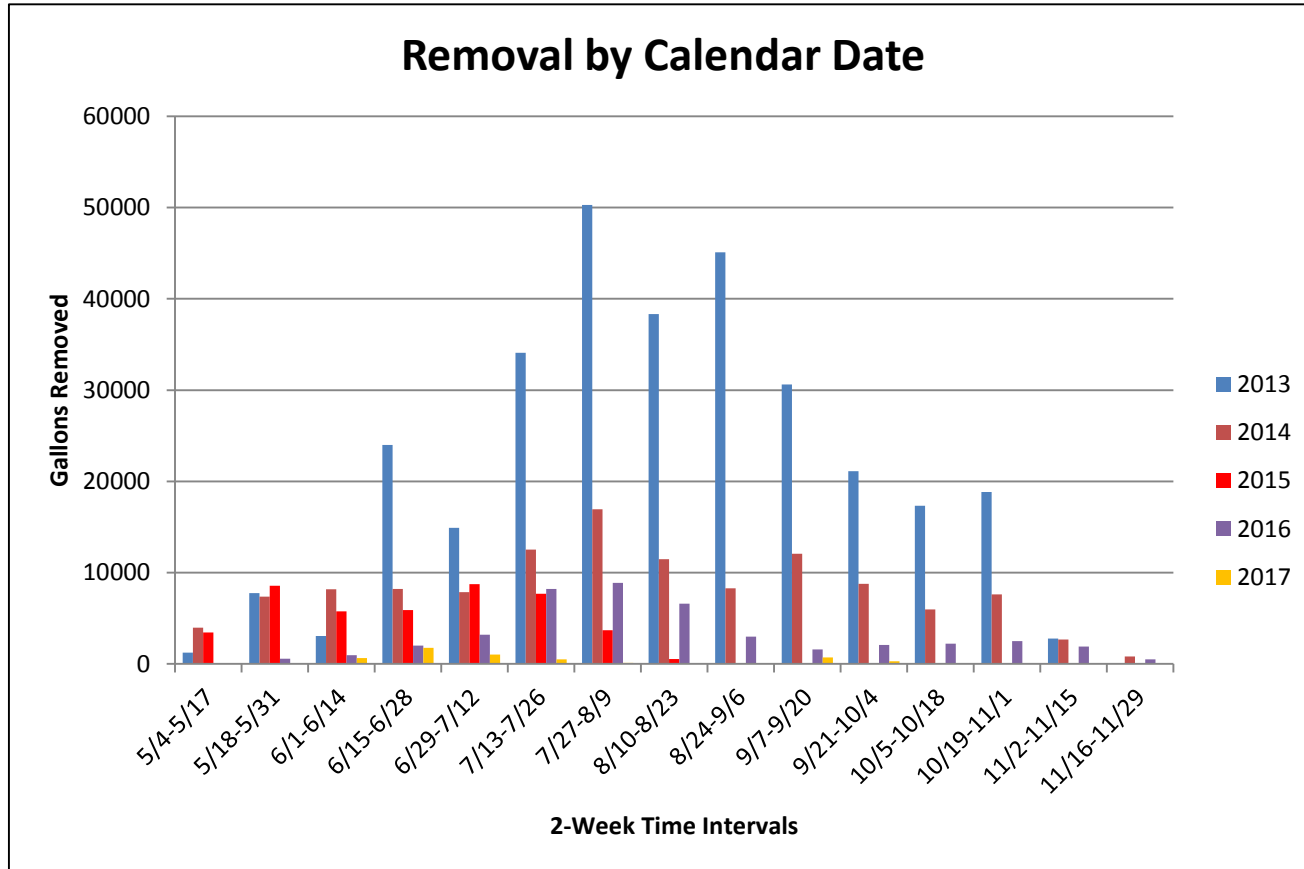


Suctioned plants include roots





Stillwater Basin DASH: Overall 5-Year Comparison





Native Plants Are Returning To Stillwater Basin In The Dash-cleared Areas

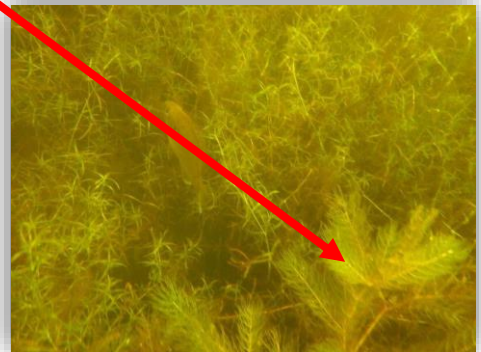
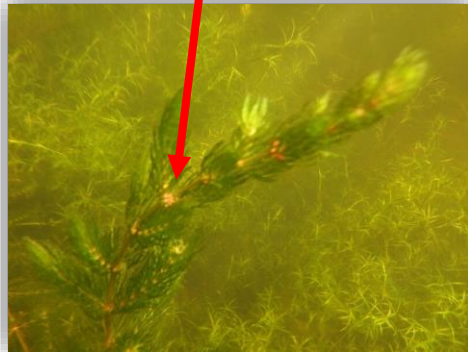
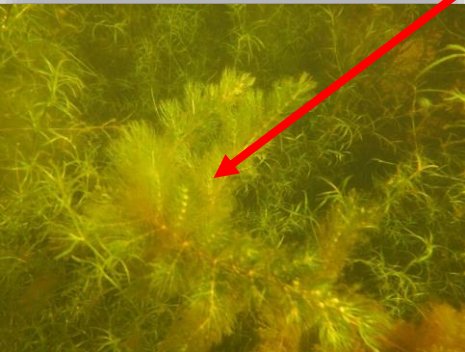


Native Urticularia (bladderwort) and native naiad

Its getting harder to find the invasive plants among abundant returned native plants.

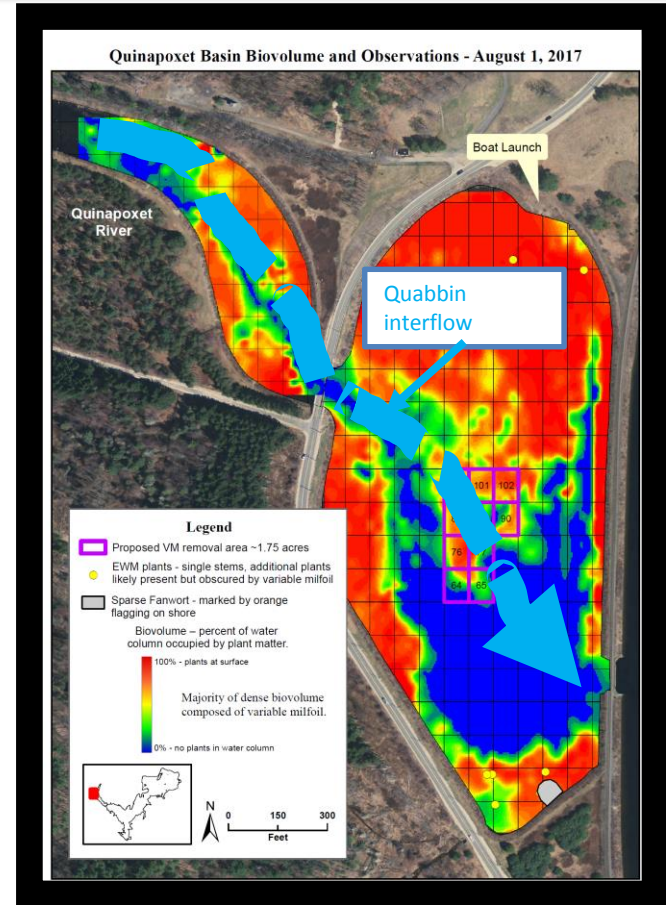
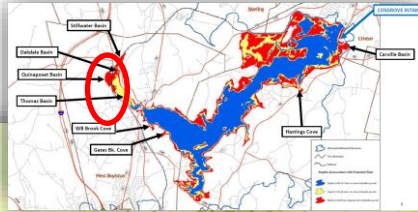


Native P. robbinsii (front), native Naiad (back)





Quinapoxet Basin Variable Leaf Milfoil





What's Next: Wachusett Program

1. Continue DASH in Stillwater Basin; modify scope to account for less growth
2. Continue DASH in lower basin and coves. Begin larger-scale removal of Variable Leaf Milfoil in Quinapoxet Basin
3. Continue to deploy the QA/QC diver to verify the work is complete and thorough



Sudbury Water Chestnut: 2008 To Present



In 2008 dense mats and mature plants with many nuts



2017 – scattered small immature plants

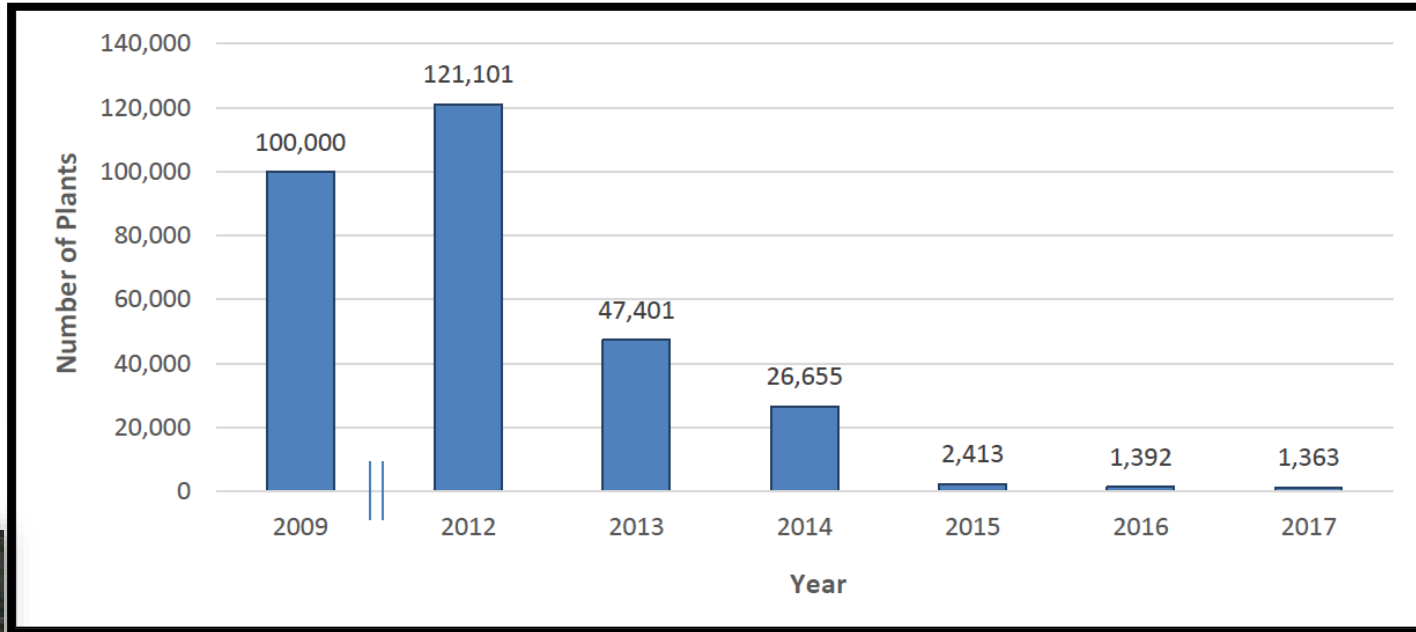




Sudbury Water Chestnut Control History



2011 heavy infestation



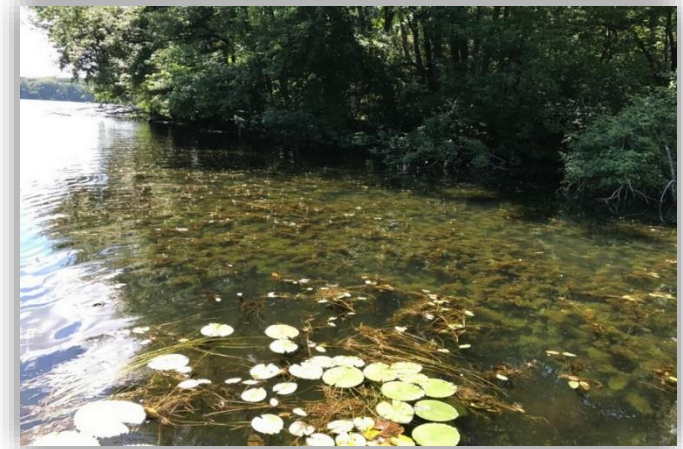
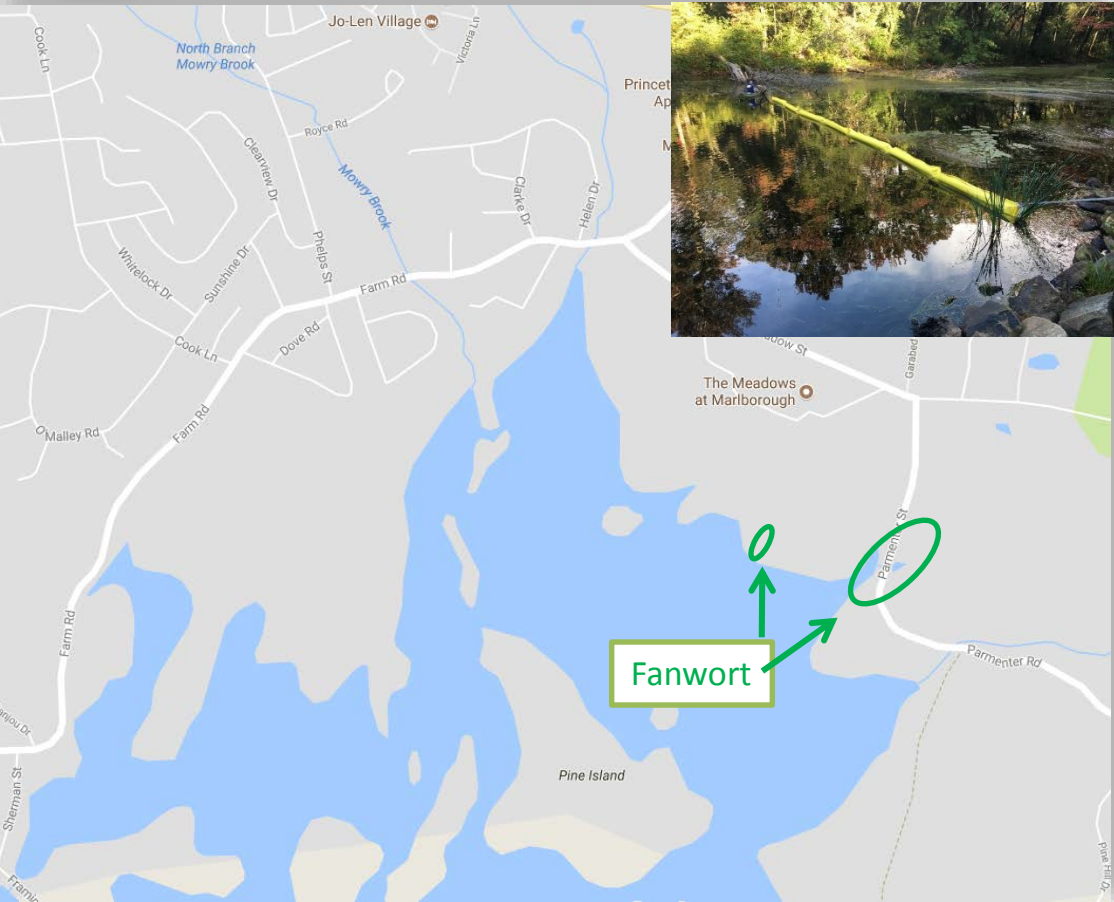
Transition from mechanical harvesting to hand harvesting as extent of water chestnut decreases



Mechanical harvester



2017 - New 0.5-Acre Fanwort Infestation Discovered At Sudbury Reservoir



½ acre dense infestation discovered early August 2017

Removed ~6,600 gallons of plants by late August

Installed fragment barrier to contain

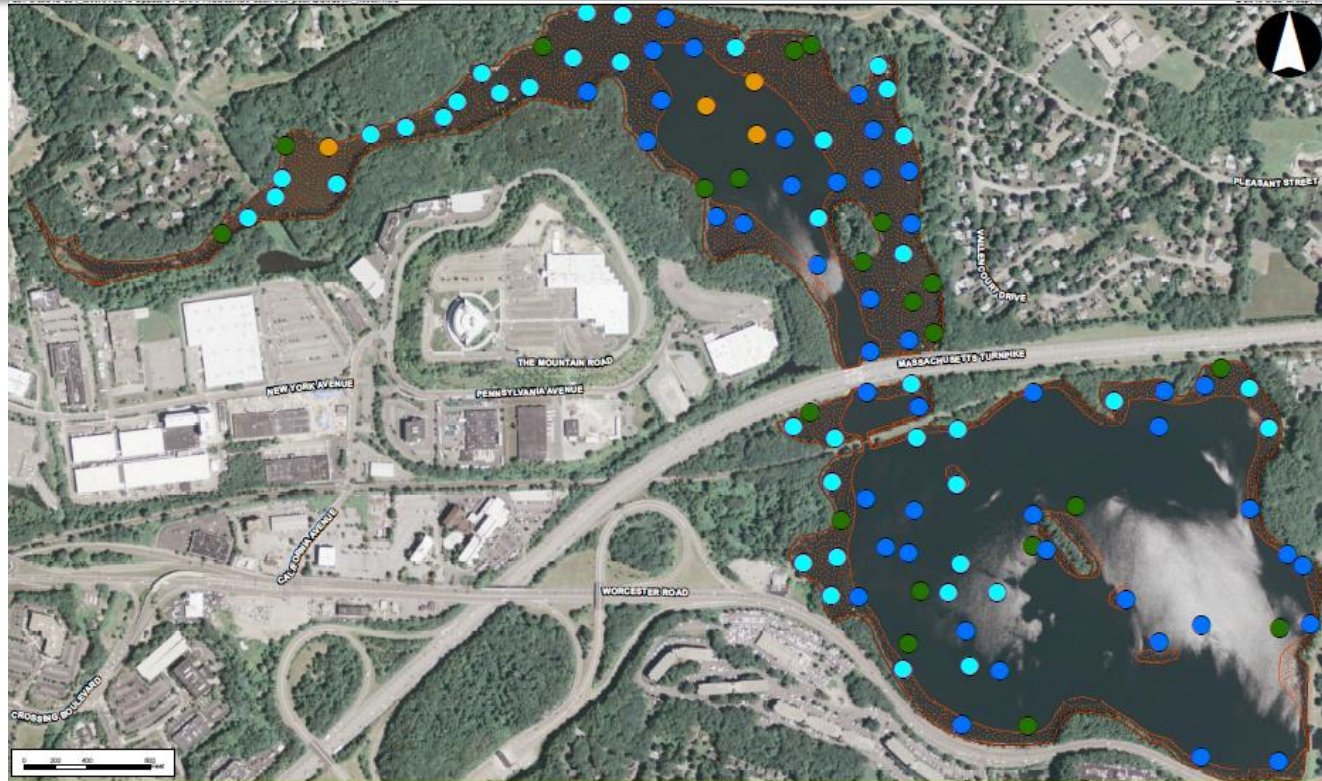


Foss Reservoir 2015/2016 Winter Drawdown Was Effective

Blue tones represent areas where some control of milfoil was achieved. Most of the points are **Blue**.

Green represents no measurable effect in milfoil growth.

Orange represents areas of new milfoil growth (confined mainly to deeper areas of north basin).




MWRA Aquatic Macrophyte Mapping Foss Reservoir - Framingham, Massachusetts

1 inch = 800 feet

Source: 1) USDA, NAIP Imagery, 2015
2) MassGIS, Major Roads, 2003
3) EDD, GPS Locations, 2016

- Full Control - 45 points
- Reduced Density - 40 points
- No Change (Milfoil Present) - 21 points
- New Growth - 4 points

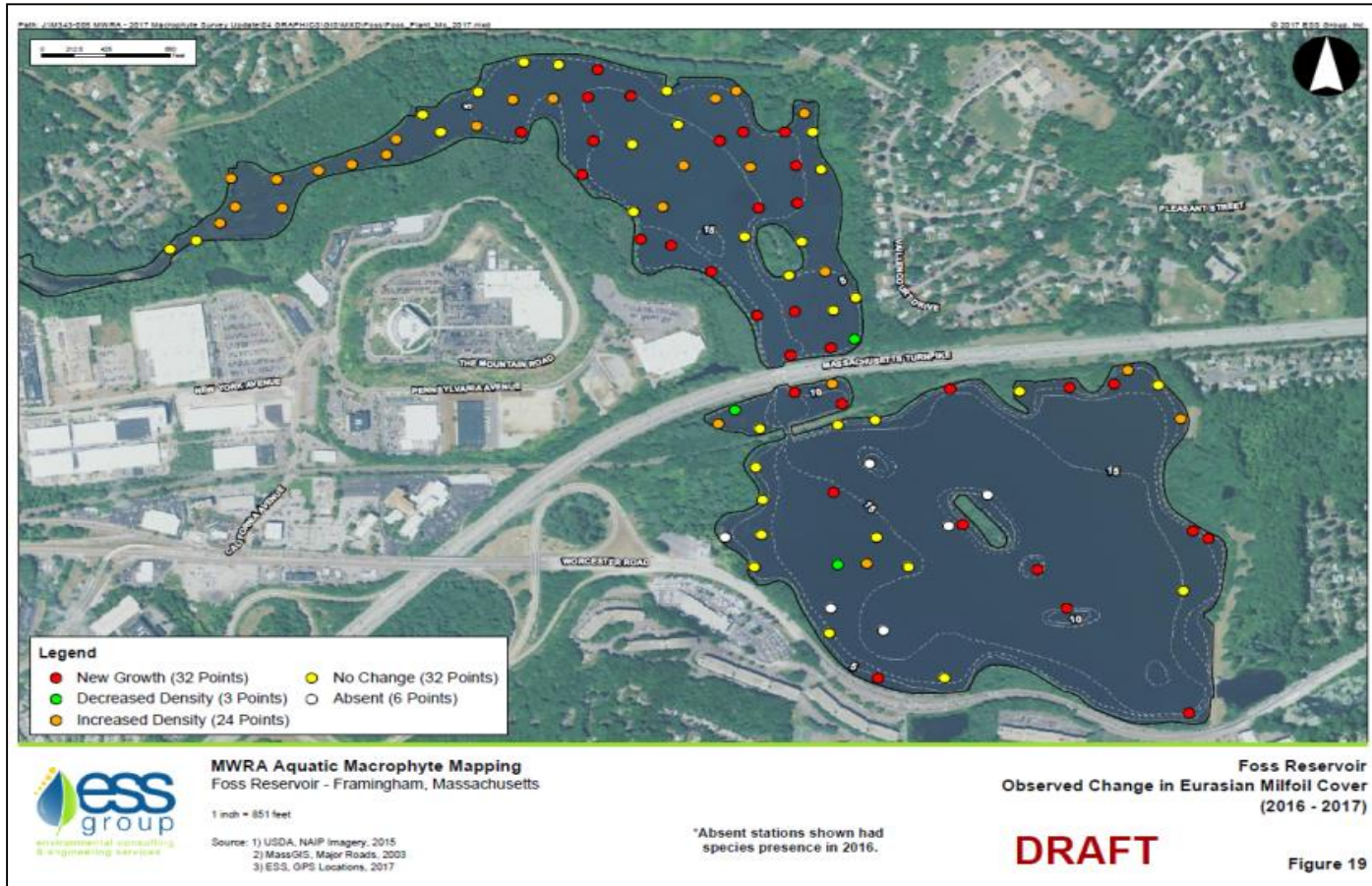
 Exposed Sediments with 10 foot drawdown (87.1 acres)*
* Anticipated stream flow within the upper basin not shown.

Post-Drawdown
Observed Change in
Variable-leaf Milfoil Growth
(2016)

Figure 1



Eurasian Water Milfoil Rebounded After 2016/2017 Drawdown Was Suspended Due To Drought

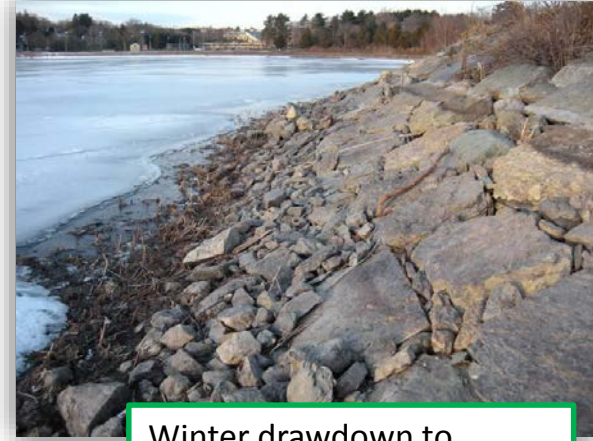




Chestnut Hill – Dual Approach Has Resulted In Reduction Of Invasives



Mechanical harvest of dense EWM



Winter drawdown to freeze and desiccate plants and roots. Suspended in 2016/2017 due to drought





Chestnut Hill Reservoir Cyanobacteria (a/k/a *Bluegreen algae*)

- Cyanobacteria bloom in 2014. Performed alum treatment to bind with phosphorus (a nutrient for blooms)
- Cyanobacteria bloom returned in June 2017. Signs posted.
- Alum treatment planned for spring 2018
- Nutrient study underway to guide future actions





Summary of Continuing Invasives Control Program

- Quabbin - No known Aquatic Invasives in main reservoir
- Ware River - Continue annual Variable Leaf Milfoil removal
- Wachusett - DASH Aquatic Invasives removal including Quinapoxet basin
- Sudbury - Continue Water Chestnut removal as needed
- Foss - Winter drawdown planned
- Norumbega - One pioneering colony of Eurasian Water Milfoil discovered and removed in 2015
- Weston - No known Aquatic Invasives
- Chestnut Hill - Winter drawdown and spring alum treatment planned
- Fells - No known Aquatic Invasives
- Spot Pond - No known Aquatic Invasives



***CSO Post-Construction Monitoring and
Performance Assessment
Contract 7572***

October 18, 2017



Remaining Federal Court Milestones

Jan 2018: Commence 3-year CSO post-construction monitoring and performance assessment

Dec 2020: Submit results of 3-year performance assessment to demonstrating compliance with:

- frequency of CSO activations and volumes of discharges specified in the Long-Term CSO Plan and
- Water Quality Standards



Court-Mandated CSO Control

In compliance with the Court Order:

34 of the 84 CSO outfalls are closed

Annual (Typical Year) activation frequency and discharge volume are reduced to mandated levels at each of the 45 outfalls that remain active

OUTFALL	TYPICAL YEAR	
	ACTIVATION FREQUENCY	VOLUME (MG)
ALEWIFE BROOK		
CAM001	5	0.19
CAM002	4	0.69
MWR003	5	0.98
CAM004	Closed	-
CAM400	Closed	-
CAM401A	5	1.61
CAM401B	7	2.15
SOM001A	3	1.67
SOM001	Closed	-
SOM002A	Closed	-
SOM003	Closed	-
SOM004	Closed	-
TOTAL		7.29
UPPER INNER HARBOR		
BOS009	5	0.59
BOS010	4	0.72
BOS012	5	0.72
BOS019	2	0.58
BOS050	Closed	-
BOS052	Closed	-
BOS057	1	0.43
BOS058	Closed	-
BOS060	0	0.00
MWR203 (Prison Point)	17	243.00
TOTAL		246.04
NORTH DORCHESTER BAY		
BOS081	0 / 25 year	-
BOS082	0 / 25 year	-
BOS083	0 / 25 year	-
BOS084	0 / 25 year	-
BOS085	0 / 25 year	-
BOS086	0 / 25 year	-
BOS087	0 / 25 year	-
TOTAL		0.00
SOUTH DORCHESTER BAY		
BOS088	Closed	-
BOS089 (Fox Point)	Closed	-
BOS090 (Commercial Point)	Closed	-
TOTAL		0.00



Coordination With Regulatory Agencies

Draft work plan to EPA and DEP on May 1, 2017

- Comments received from EPA, DEP, CRWA and MyRWA
- Adjustments made; coordination continues





Procurement Process

- One-step Request for Qualifications Statements/Proposals (RFQ/P)
- Four Proposals Received

First-Ranked Firm: AECOM Technical Services, Inc.

Contract Value: \$2,924,295

Notice to Proceed: November 2017

Term: Through March 2021



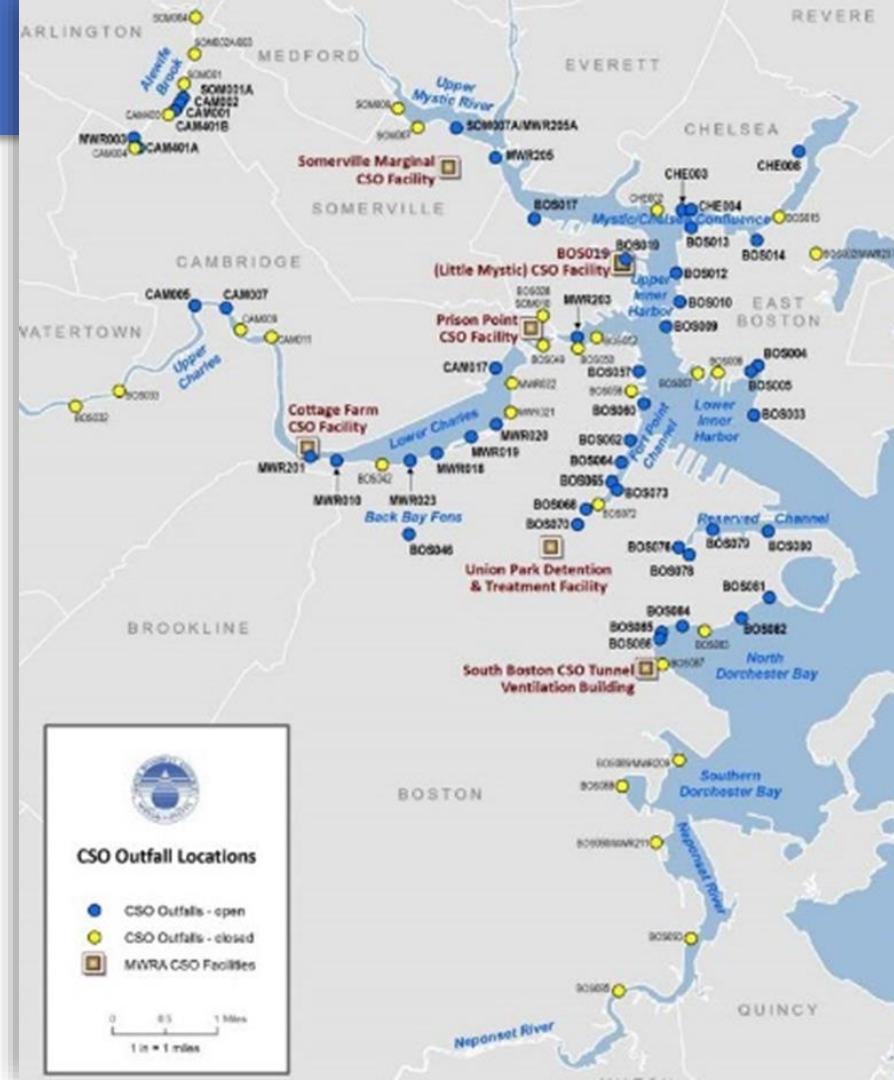
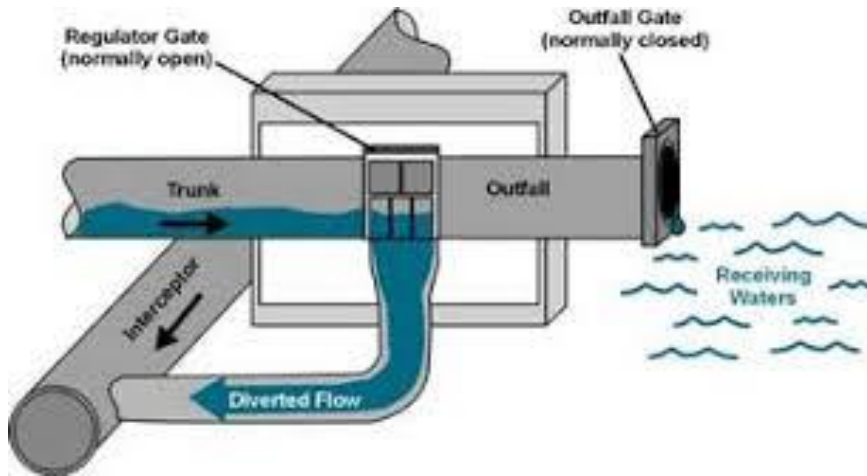
Major Scope Items:

- CSO Inspections
- CSO Metering
- Wastewater System Hydraulic Modeling
- Water Quality Analyses
- System Performance Assessments



CSO Inspections

- Conduct inspections at all 68 active and 41 closed CSO regulators





CSO Metering Plan

45 active CSO outfalls
- 68 active CSO regulators

16 CSO regulators are currently metered by MWRA or a CSO community

Consultant will install temporary meters at the other regulators

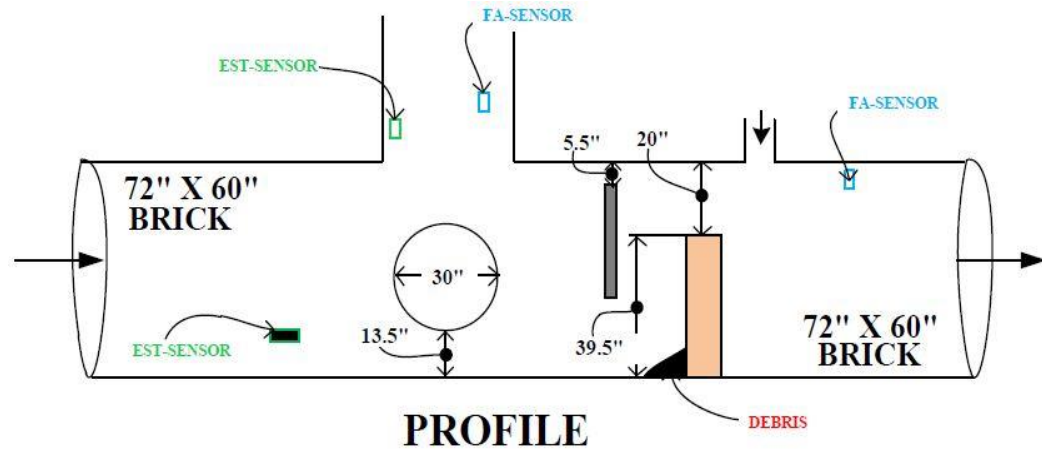
MWRA's consultant will:

- Finalize the metering approach and plan
- Install and maintain new, temporary meters
- Collect and utilize data from existing MWRA and community meters



CSO Metering

- Collect overflow data (existing MWRA and community meters and temporary meters installed/managed by the consultant)
- Quantify CSO discharges using verified data (accurate data that make sense)
- Validate field-measured CSO discharges (correlate to rainfall and system conditions)
- Use field-measured discharges to improve the calibration of MWRA's hydraulic model, evaluate system performance, and support water quality impact assessments

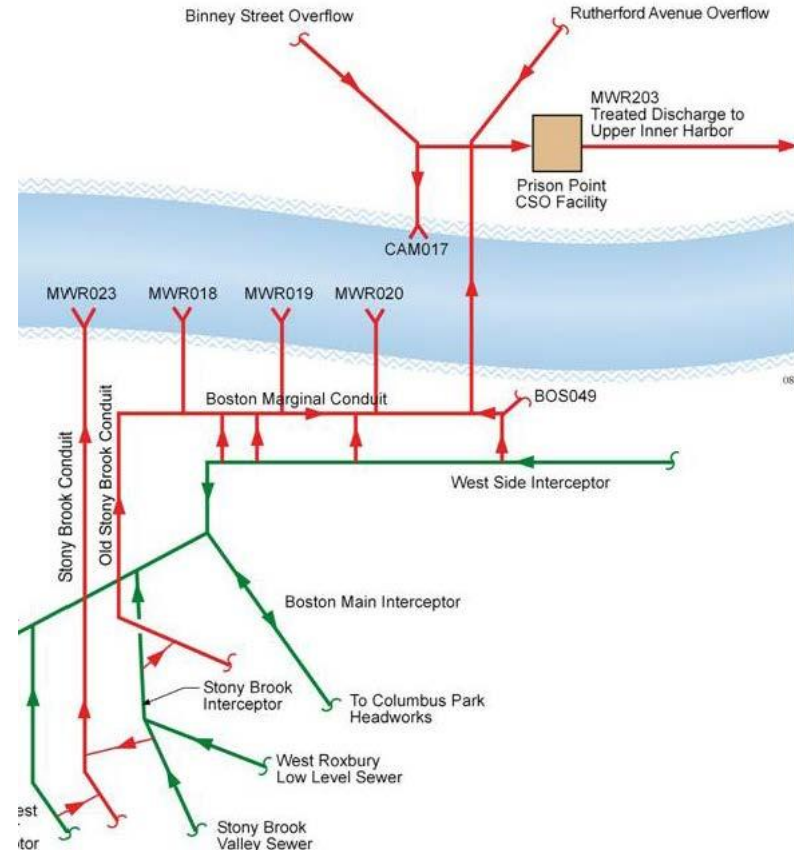




MWRA Hydraulic Model

Consultant will:

- Continue model updates
- Perform storm simulations
- Verify model predictions against meter data
- Calibrate model predictions
- Perform Typical Year simulations to verify compliance with LTCP levels of control



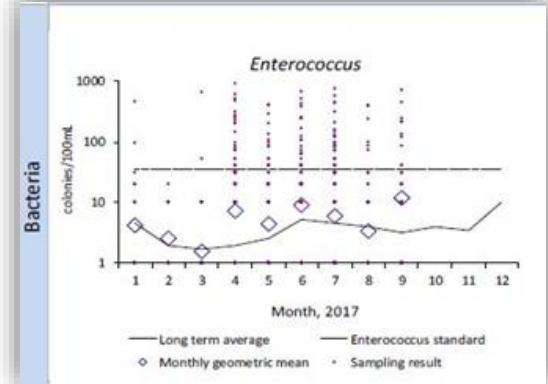


- Evaluate system performance
- Recommend and evaluate physical or operational minor adjustments to improve performance
- Prepare CSO performance reports
 - Semiannual CSO discharge reports
 - Receiving Water Quality Analysis Report – December 2020
 - Post Construction Compliance Monitoring Report – December 2020



Receiving Water Quality Assessments

- MWRA staff will continue to collect and test receiving water samples, with emphasis on the Charles and Alewife/Mystic
- Consultant will perform statistical analyses of MWRA data to evaluate/characterize water quality conditions and remaining CSO impacts





Water Quality Standards Compliance

Receiving Water	Water Quality Standard	Required Level of CSO Control	MWRA's Progress to Attainment
North Dorchester Bay	SB	CSO Prohibited	Achieved - CSOs eliminated
South Dorchester Bay	SB	CSO Prohibited	Achieved – CSOs eliminated
Neponset River Estuary	SB	CSO Prohibited	Achieved – CSOs eliminated
Constitution Beach	SB	CSO Prohibited	Achieved – CSOs eliminated
Boston Inner Harbor	SB _(CSO)	Approved LTCP*	Control plan is fully implemented.
Muddy River	B _(CSO)	Approved LTCP*	
Charles River Basin	B _(variance)	Approved LTCP**	
Alewife Brook/Upper Mystic River	B _(variance)	Approved LTCP**	

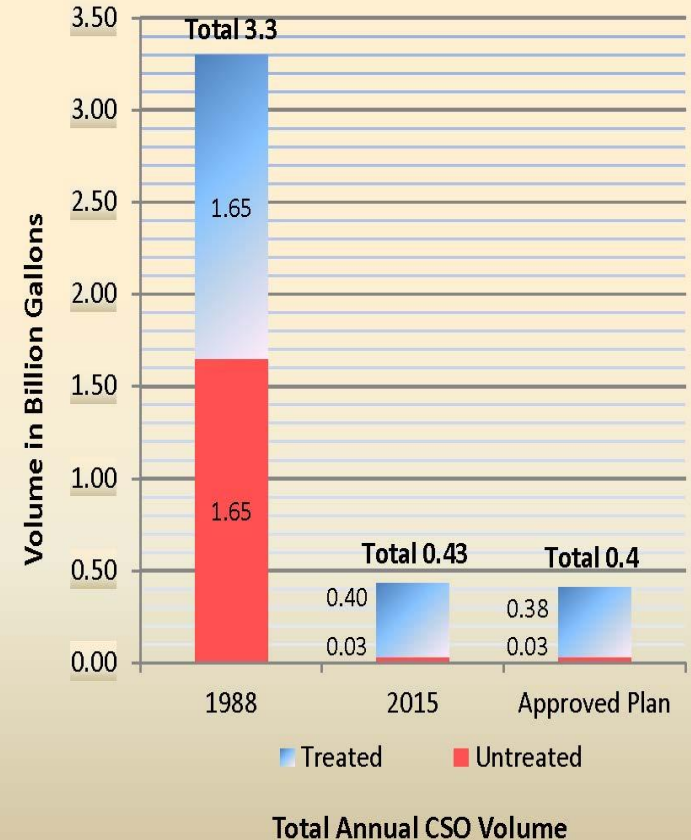
* Approved Level of Control. Remaining CSO discharges will comply with Class B or SB (“fishable/swimmable”) standards at least 98% of the time (Typical Year).

** Minimum Level of Control. Remaining CSO discharges will comply with Class B or SB (“fishable/swimmable”) standards at least 98% of the time (Typical Year).



Progress Updates and Communications

- MWRA Board Updates
- Court Reports (June 15 and December 15)
- Semiannual CSO Discharge Reports (Web Posting)
- Annual Regulatory Public Briefings
- Annual Water Quality Reports (July 15)





***Chelsea Creek Headworks Upgrade
Contract 7161 - Change Order 5***

October 18, 2017



Chelsea Headworks Upgrade: Girt Framing Modifications



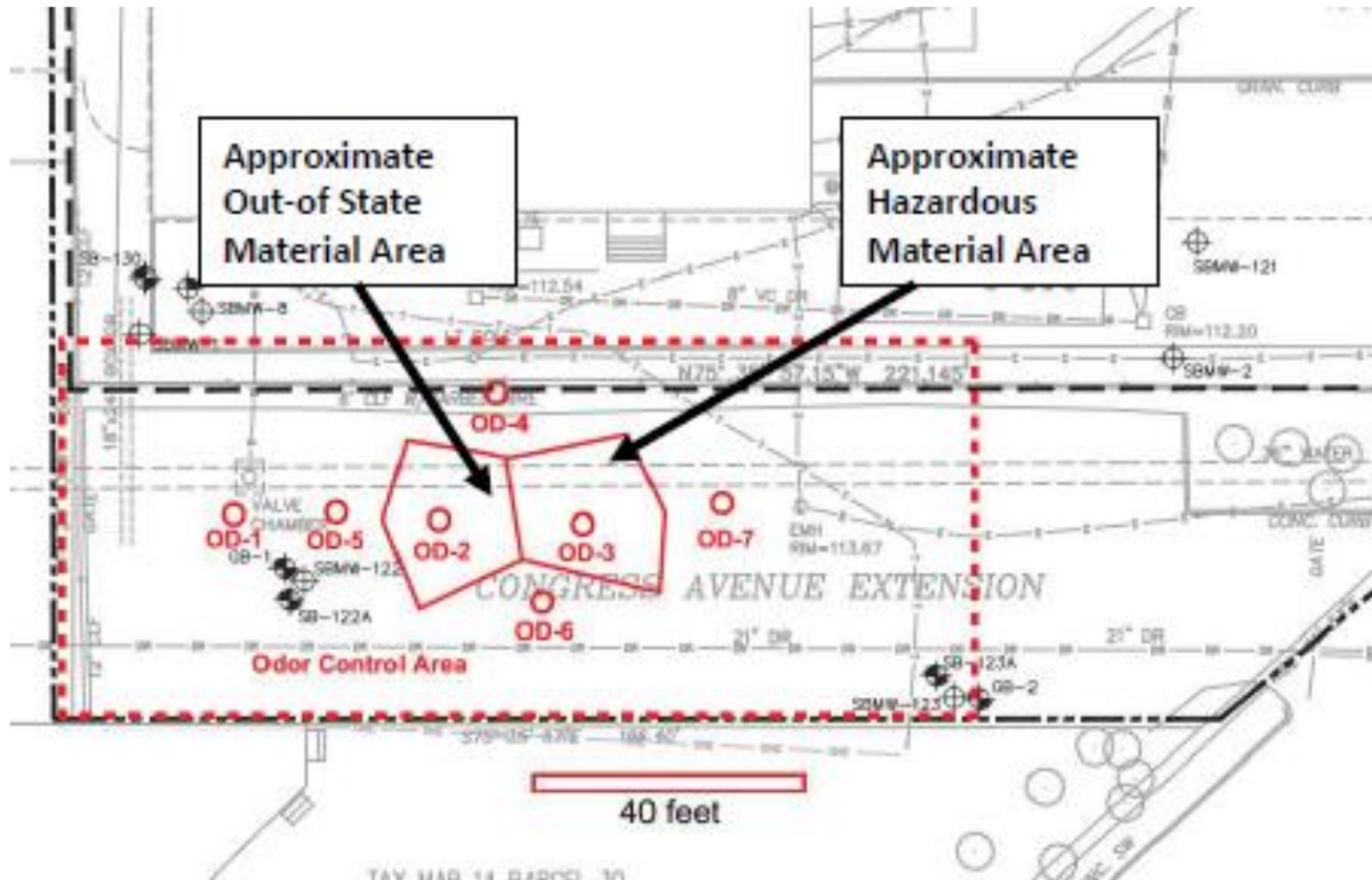


Chelsea Headworks Upgrade: Girt Framing Modifications





Chelsea Creek Headworks: Contaminated Soil





Chelsea Creek Headworks: PCB Contaminated Soil





Chelsea Headworks Upgrade: Contaminated Soil





Chelsea Creek Headworks: PCB Encapsulation





Chelsea Headworks Upgrade: Electrical And Mechanical Rooms





Chelsea Headworks Upgrade: New Electrical Service





Chelsea Creek Headworks: Microwave Tower Demolition





***Southern Extra High and Northern Intermediate
High Pipeline Redundancy Projects***

October 18, 2017



Southern Extra High - Section 111 (Boston)

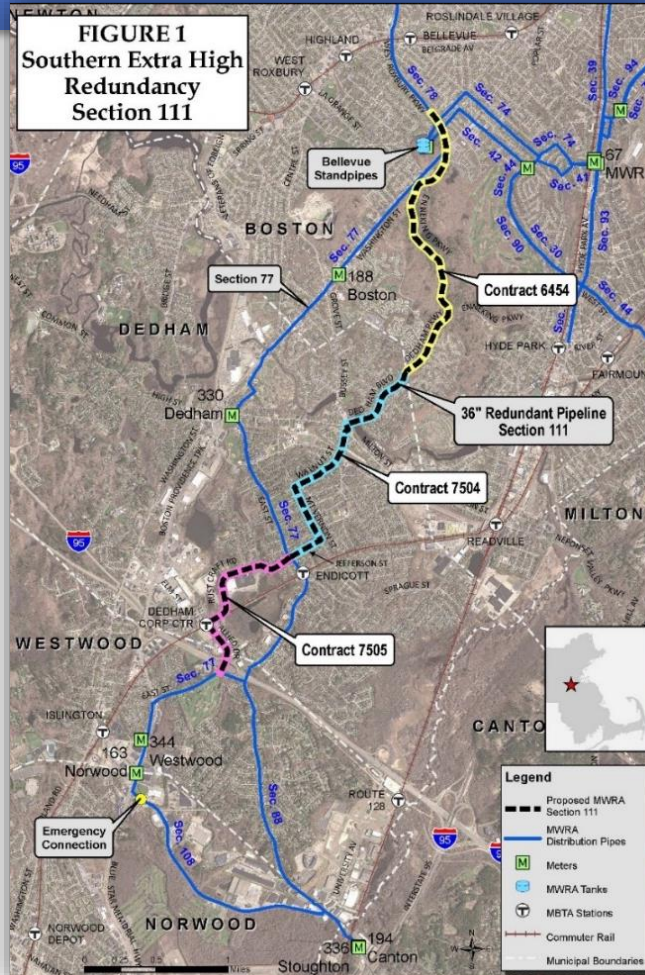
Contract 6454

Contract Award: P. Gioioso & Sons, Inc.

Bid Amount:	\$11,770,000.00
Notice to Proceed:	July 26, 2016
Contract Completion:	September 10, 2018
Project Work Includes Approx:	11,000 ft of 36" Tie in to Sections 42, 74 & 77

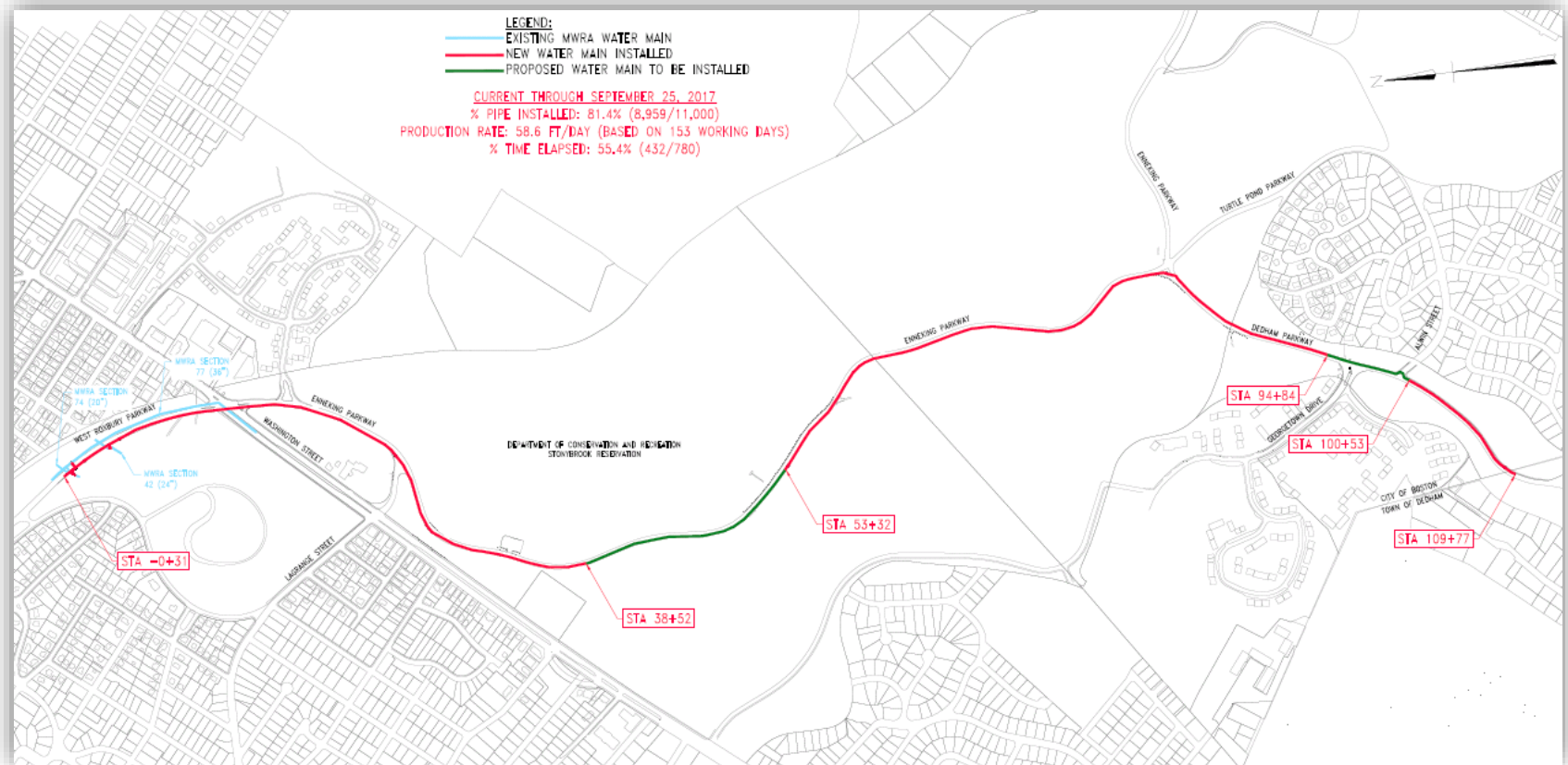


Southern Extra High - Section 111 (Boston)





Pipeline Route





Installing Pipe And Tee On West Roxbury Parkway





Connection to Section 74





Installing Excavation Support At Section 77 Tapping Location





Gate Valve Vault And Bypass On Enneking Parkway





Installing Valve Vault For 36-Inch Gate Valve At 53+62





Blasting Charges Set On Enneking Parkway





Ledge Removal And Pipe Installation On Enneking Parkway





Hydraulic Ramming On Enneking Parkway





Inspecting Excavation On Enneking Parkway





Northern Intermediate High: West Street Transmission Main

Contract 7066

Contract Award: P. Caliacco Corp.

Bid Amount: \$1,565,357.00

Notice to Proceed: June 25, 2014

Contract Completion: May 1, 2015

Project Work Includes Approx: **2,400 ft of 36" DIP**
Tie in to Section 110



Installation Of 36-Inch Water Main On West Street, Reading





Installation Of 36-Inch Water Main On West Street, Reading





Excavation To Install 36-Inch Water Main On West Street, Reading





Installing 36-Inch Water Main, West Street, Reading





Installing 36-Inch Water Main, Town Line





Northern Intermediate High: Section 110 Reading & Woburn

Contract 7471

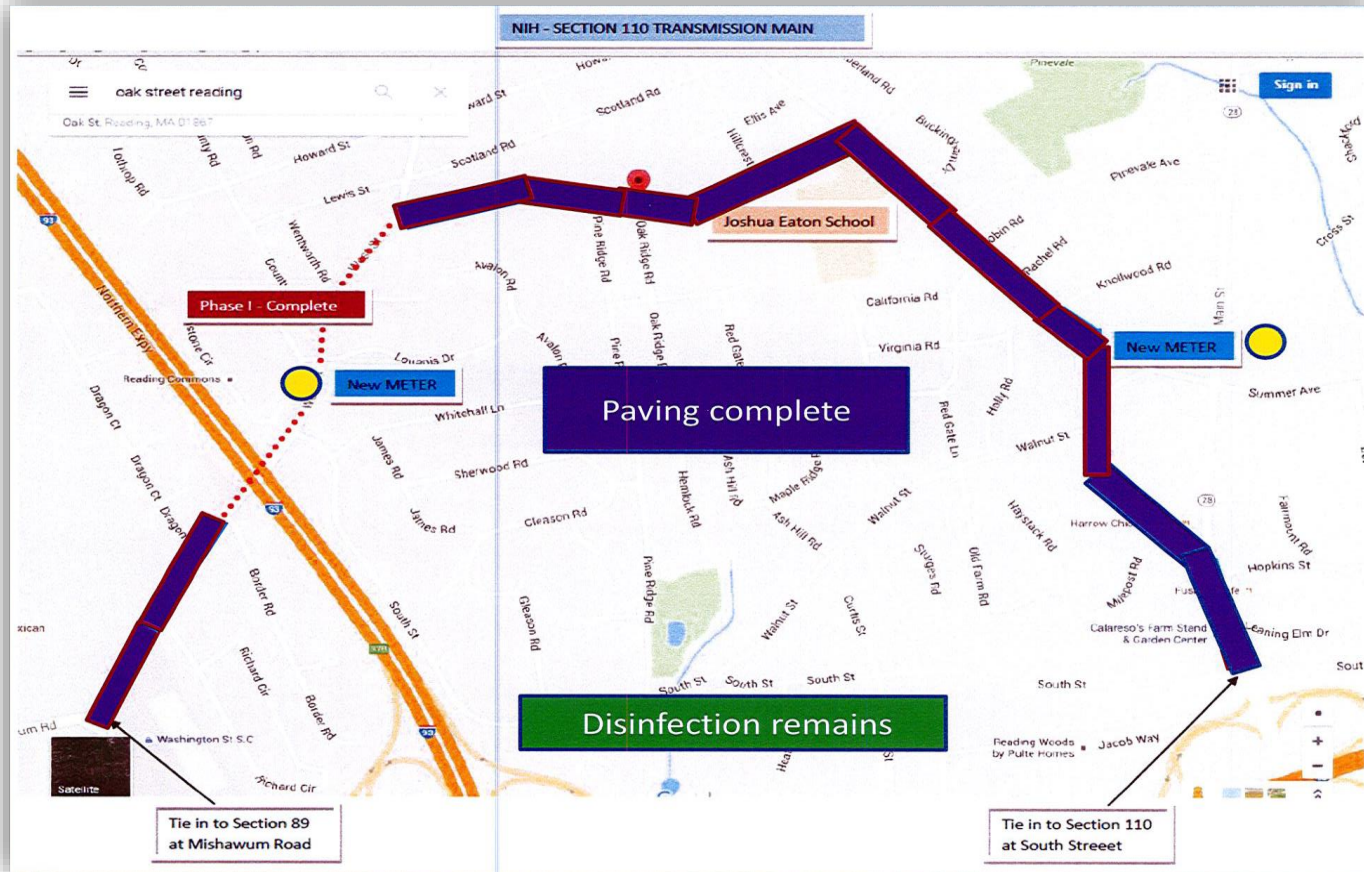
Contract Award: Albanese D&S, Inc.

Bid Amount:	\$9,888,000.00
Notice to Proceed:	January 12, 2016
Contract Completion:	March 30, 2018

Project Work Includes Approx: **8,800 ft of 36" DIP**
Tie in to Section 110



Construction: Phase 2



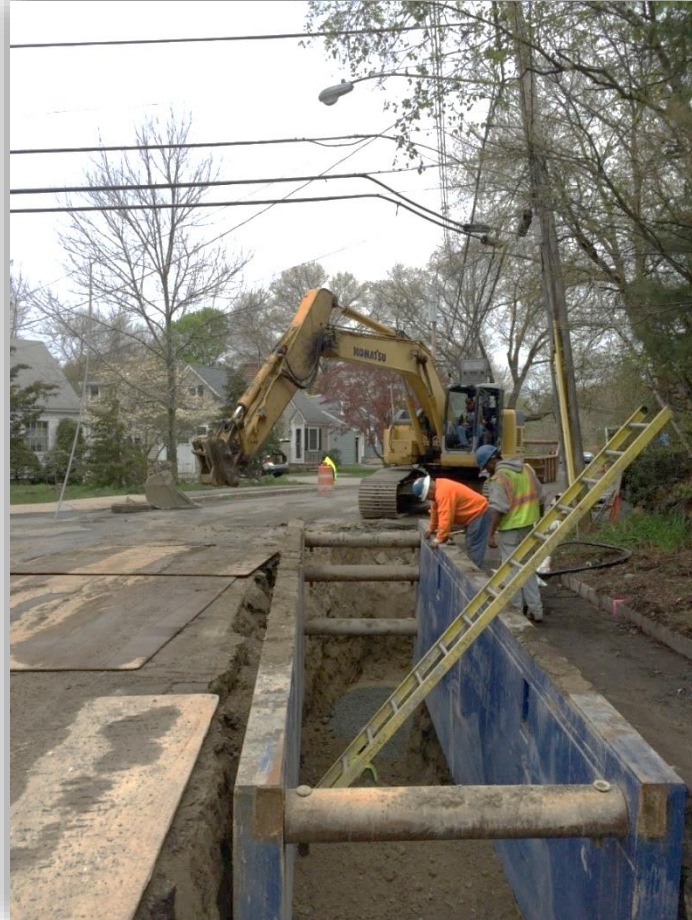


Hydraulic Rock Splitter Attached To Backhoe To Break Ledge On Hopkins Street





Installing 12-Inch Drain Line On Hopkins Street, Reading





Excavation To Install 36-inch Water Main On Summer Street





Installation Of 36-Inch Water Main On Summer Street





Installation Of 36-Inch Water Main On Oak Street, Reading





Installation Of Large Concrete Valve Vault At Leach Park





New Town Of Reading Meter Chamber On Louanis Road





Contract 7478

Contract Award: Albanese D&S, Inc.

Bid Amount: \$17,817,999.00

Notice to Proceed: January 12, 2017

Contract Completion: April 12, 2018

**Project Work Includes Approx: 9,500 ft of 48" DIP
Tie in to Section 110**



Contract 7478: Stoneham And Wakefield





Taking Probes To Precharacterize Soil For Disposal On North Street, Reading





Installation Of Cured In Place Liner In Adjacent Utilities Prior To Construction





Installation Of 48-Inch Water Main On North Street, Stoneham





Installation 48" X 36" Reducer On Oak Street





Overseeing Installation Of 48-Inch Pipe On Oak Street





Installation Of 48" Pipe On Oak Street, Stoneham





Installation Of MWRA Meter At Wakefield/Stoneham Town Line





Culvert Crossing On Oak Street, Stoneham





Installation Of 48-inch Steel Water Pipe On Williams Street





48-Inch Pipe Before Installation

