
WATER RESOURCES AUTHORITY
MASSACHUSETTS

Projects on Behalf of the Department of Conservation and Recreation Water Supply Protection Division

October 16, 2019

FY2020 Capital Improvement Program Budget

FY2020 Capital Improvement Program Budget				
	Contract #	**Notice to Proceed**	**Substantial Completion**	**Total Contract Amount**
Quabbin Admin Bldg. Rehab				
QAB Concept Design Report	7569	Oct-20	Oct-21	$200,000
Quabbin Admin Bldg. Rehab Des CA\RI	7564	Mar-22	Mar-27	$2,800,000
Quabbin Admin Bldg. Rehab Construction	7565	Mar-24	Mar-26	$12,000,000
Maintenance Building				
Maintenance Garage/Wash Bay/Storage Bldg. Design/CA/RI	7677	Oct-19	Oct-23	$1,000,000
Maintenance Garage/Wash Bay/Storage Bldg. Construction	7577	Oct-20	Oct-22	$3,900,000
River Rd Improvement -Wachusett *(funded from FY19 Watershed Protection budget surplus)*	7701	Oct-20	Oct-21	$2,000,000
Land Acquisition	7069	Apr-06	Jun-23	$29,000,000
Dam Improvements				
Dam Permits	7346	Jul-18	Dec-21	$1,000
Quinapoxet Dam Removal - Design/ESDC/RI	7347	Jul-20	Dec-23	$200,000 *
Quinapoxet Dam Removal - Construction	7348	Jul-21	Dec-22	$600,000
Quinapoxet Dam Removal REI	7690	Jul-21	Feb-23	$100,000 *
Sudbury/Foss Dam Design/CA/RI	7614	Mar-19	Jun-23	$432,029
Sudbury/Foss Dam Construction	7615	Jul-20	Jun-22	$1,600,000

FY2020 Current Expense Budget

FY2020 Current Expense Budget	
	Amount
Watershed Protection Indirect Expense	
Clinton Crew Headquarters	$1,100,000
Quabbin/Ware road and drainage reconstruction	$125,000
Quabbin Admin Building interim roof repairs	$105,000
Quabbin Admin Building interim water system corrosion control	$150,000
New Salem restoration (gas tank & garage design)	$75,000
Maintenance Budget	
Quabbin Park Cemetery water spigot / irrigation	$15,000
Quabbin Park Cemetery lead abatement	$45,000

Location Map

Quabbin Maintenance Building

Quabbin Maintenance Building

- Replace existing West Garage facility
- Provide approximately 11,000 ft^2 of floor area
- Vehicle fleet maintenance staff and equipment
- Accommodate oversized vehicles and heavy equipment
- Include vehicle wash bay
- MWRA to procure and manage design and construction services

Quabbin Administration Building

Quabbin Administration Building

- Rehabilitation of utilities and support systems, including power and water
- Most of system components exhibiting signs of deterioration:
  - Wiring
  - Plumbing
  - Heating
- Building Code Upgrades:
  - Environmental safeguards (ventilation and hazard abatement)
  - Fire alarms and fire protection
  - Accessible access routes
- Structural Upgrades
- Water supply and septic system replacement

Quabbin Park Cemetery

Administration Building

Maintenance Garage

- Recommend lead abatement and repairs

Quabbin Park Cemetery

Storage Shed

Well Pump House

- Recommend demolishing buildings

Quabbin Park Cemetery

- Administration building and maintenance garage
  - MWRA to procure lead abatement
  - DCR staff repairs
- MWRA to procure demolition of well pump house and storage shed
- MWRA currently procuring contract to drill well into cemetery
- MWRA will procure contract to install piping to watering connection points by Spring 2020

Dam Improvements

- Capital Improvements by MWRA since 2005
- Over $20 million of work completed to date
- Sudbury/Foss Dam Improvements and Repairs
  - Design underway
- Quinapoxet Dam Removal
  - Design contract recently awarded

River Road Improvements

- Primary access road to Wachusett Lower Gatehouse
- Road has experienced two landslides:
  - One in 2008 required substantial repair
  - Recent landslide in November 2018
- Design underway

November 2018 River Road Landslide

Other Projects

- Clinton Crew Headquarters construction
- Quabbin Administration Building
  - Interim roof repairs
- New Salem facility restoration
- Quabbin road and drainage reconstruction

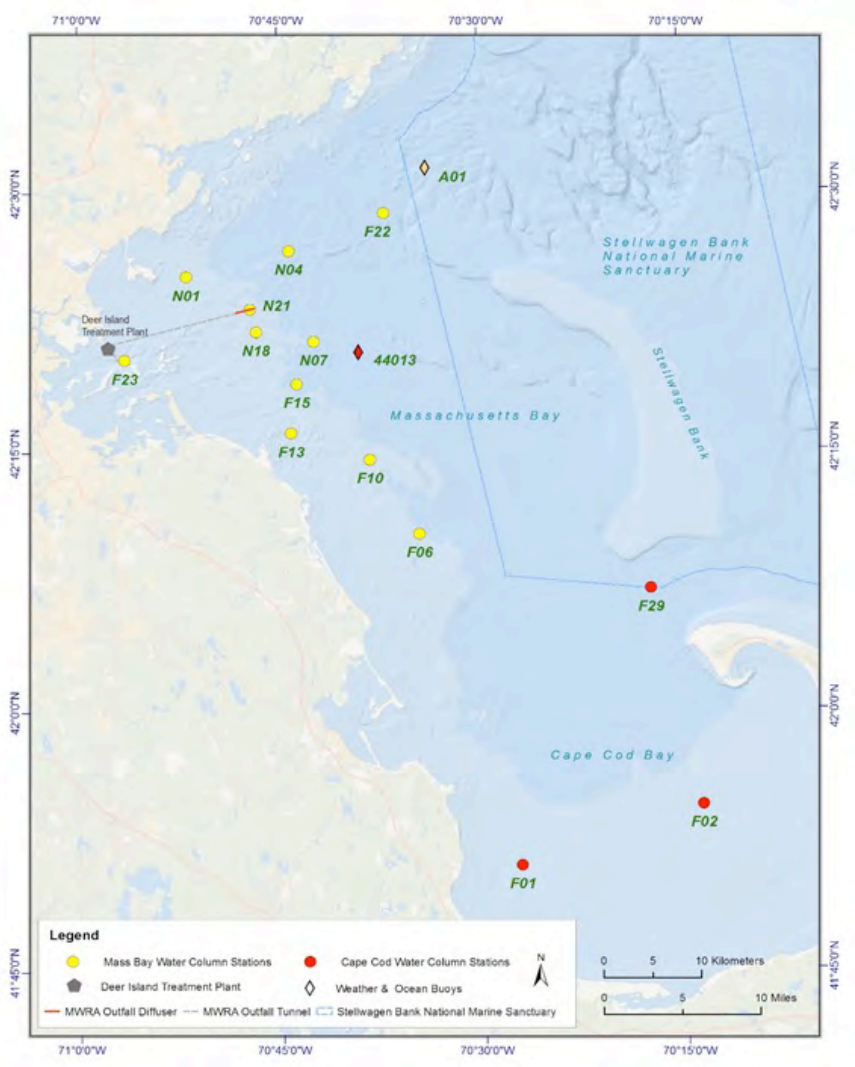

WATER RESOURCES AUTHORITY
MASSACHUSETTS

MWRA's Outfall Monitoring Overview 2018 Results

October 16, 2019

MWRA Ambient Monitoring

- Moving discharge from Boston Harbor initially caused environmental concerns
- Comprehensive baseline monitoring required by regulators (1992-2000)
- Ambient monitoring required by Deer Island 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

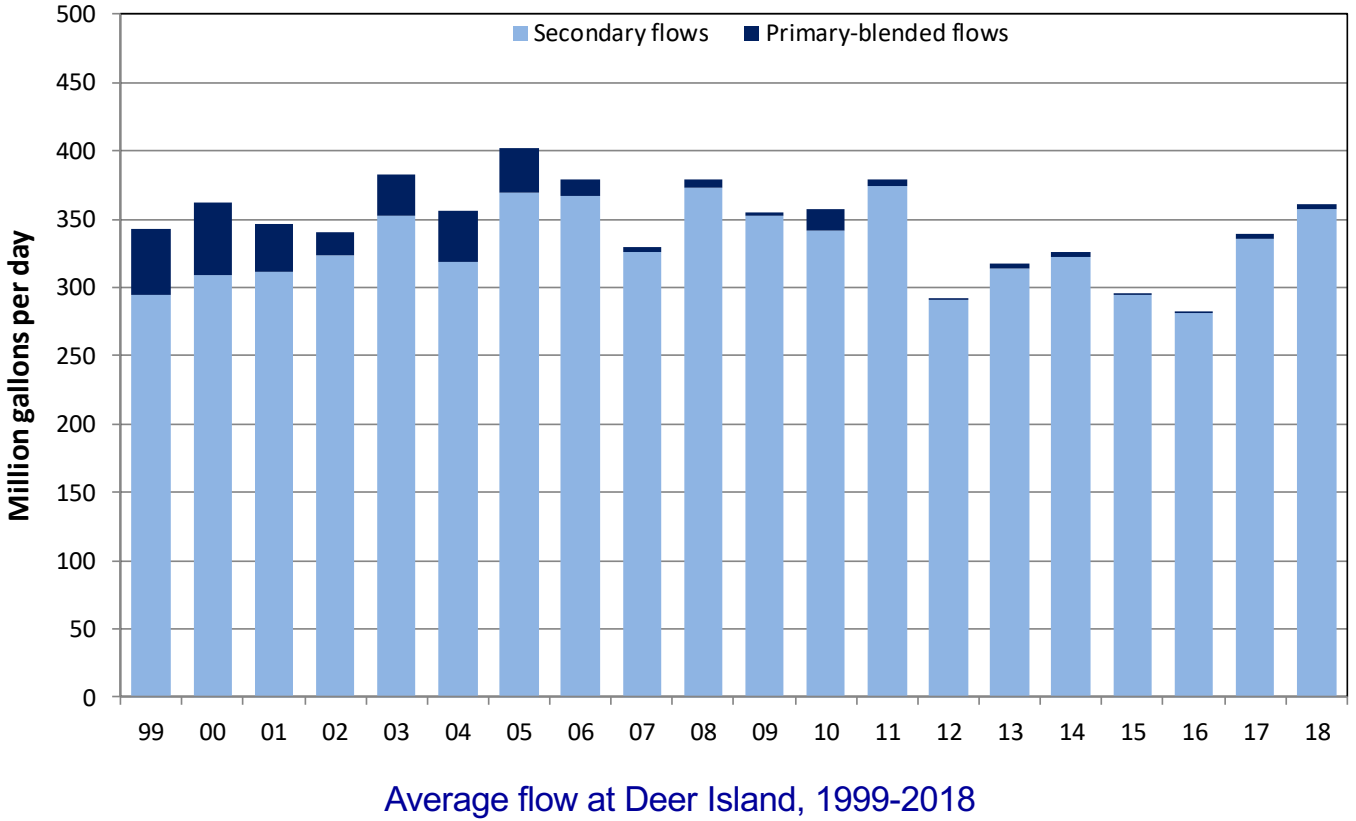


Outfall Monitoring Overview 2018 Highlights

- Effluent quality (Platinum 12 award!)

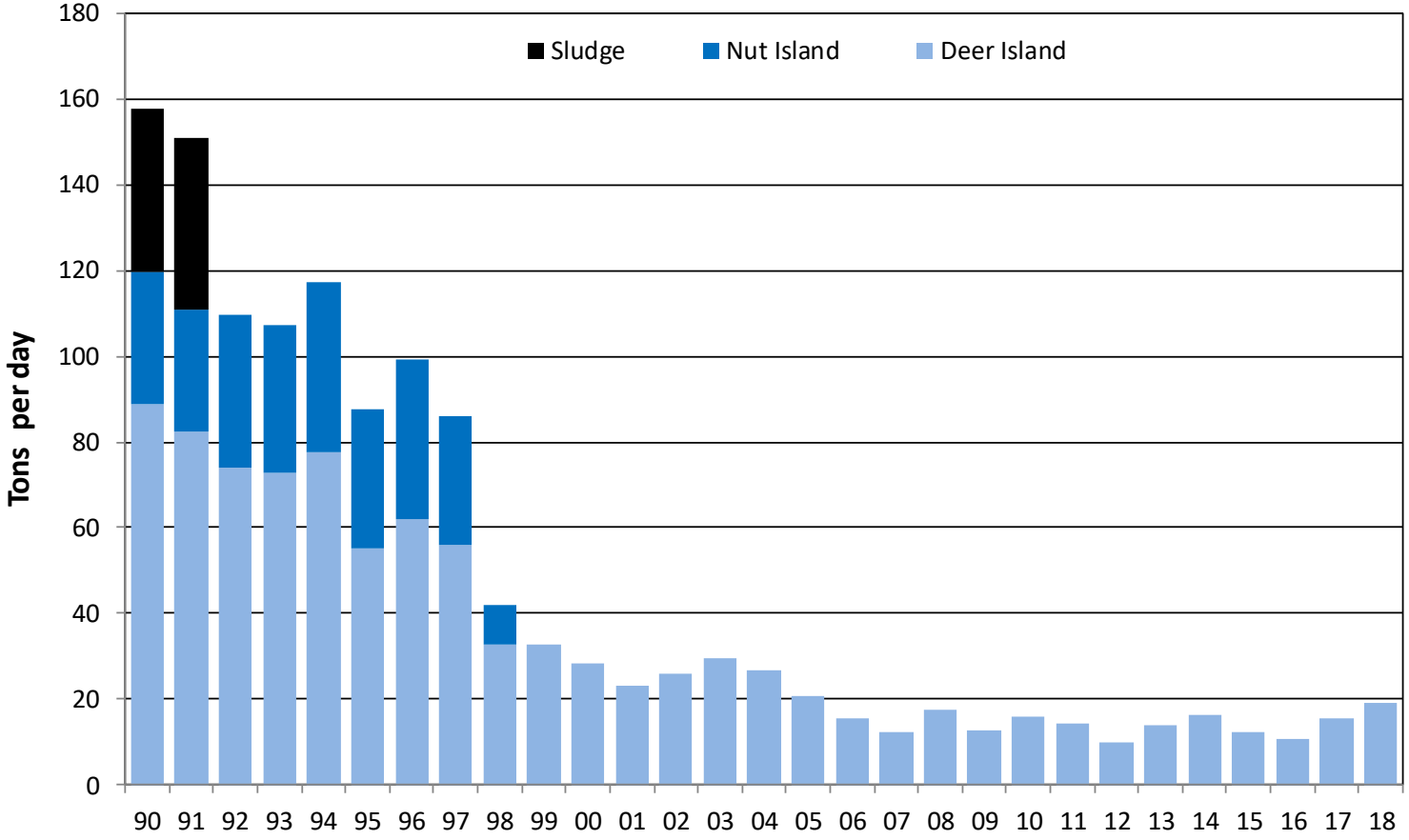
- Outfall Monitoring
  - Water quality good year-round;
  - Sediment animal communities were healthy;
  - Flounder health good; and
  - Fish and shellfish tissue contaminant concentrations were below levels of concern.

2018 Was A Wet Year With Almost No Blending

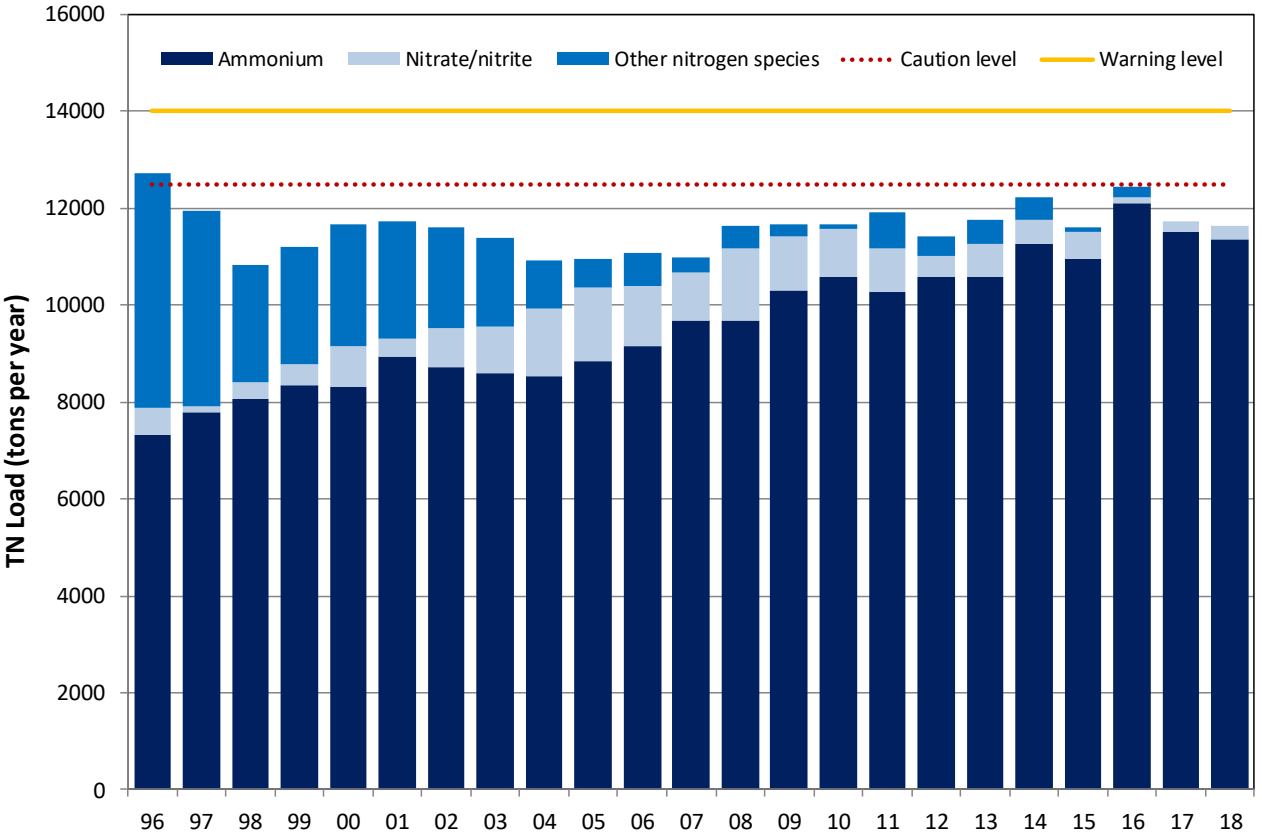


Average flow at Deer Island, 1999-2018

Total Solids Discharged (Tons/Day), 1990-2018



Effluent Nitrogen Levels

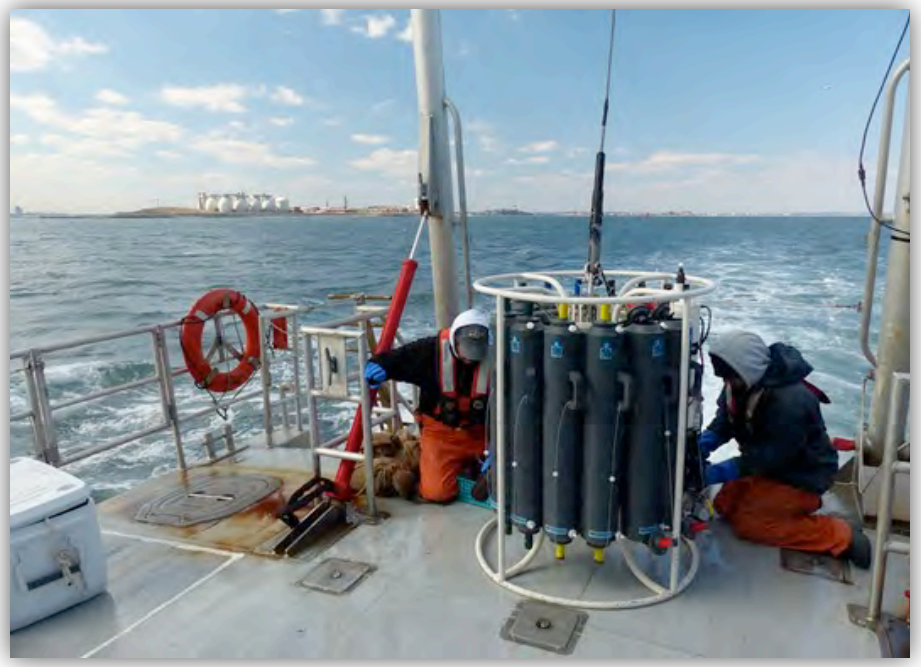


2019 Update: Nitrogen loads

- Nitrogen loads to date in 2019 trending high, exceedance of Caution level Contingency Plan threshold may occur.
- Contingency Plan warning threshold set at 14,000 metric tons/yr.
- Caution threshold of 12,500 metric tons/yr arbitrarily set at about 90% of the warning level.
- Actual loads have been below the warning level projections.
- Water quality modeling projects that loads of 15,000 metric tons/year, or even doubling the current nitrogen loads would have minimal environmental impacts.
- Applying the Buzzards Bay Eutrophication index to Massachusetts Bay indicates current loads are nowhere near levels of concern.

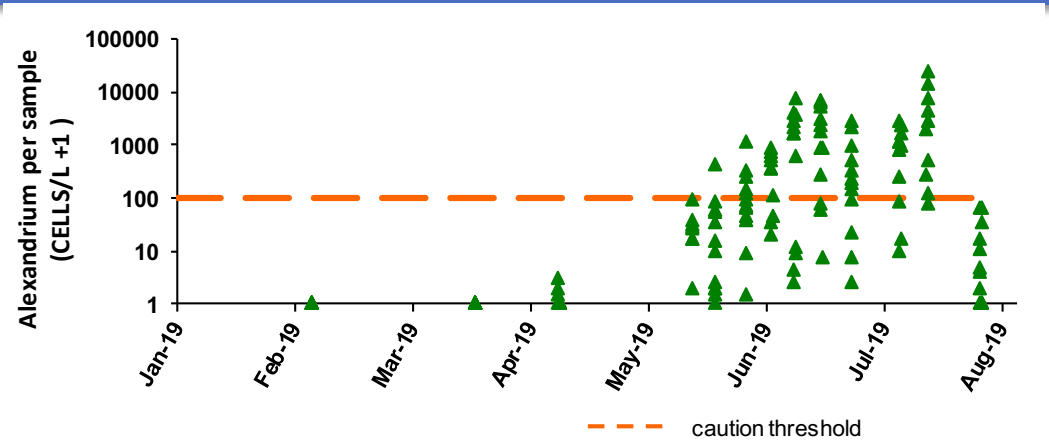
Water Quality Monitoring 2018 Results

- No evidence of adverse outfall impact
- Plankton communities in 2018 were normal, with no large phytoplankton blooms observed
- Dissolved oxygen levels remained normal
- A red tide bloom did occur earlier this year (2019)
- A hypoxic event occurred in southern Cape Cod Bay this fall



Collecting water samples in Massachusetts Bay, 2019

Red Tide: 2019

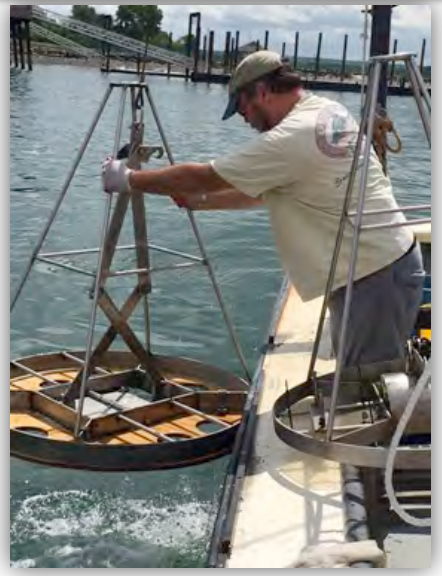


- *Alexandrium* is the algae responsible for red tide and paralytic shellfish poisoning in New England waters.
- Outside scientists projected a mild bloom in 2019, with low cell abundance and unlikely to cause closures in Massachusetts shellfish beds.
- The actual bloom was much stronger, causing closures from NH border to Plymouth.
- Analysis so far indicates high regional nutrients and strong coastal rivers flows may explain regional intensity of bloom.
- Indications are bloom was transported into the Bay from northern waters, as previously observed.

Sediment Monitoring, 2018

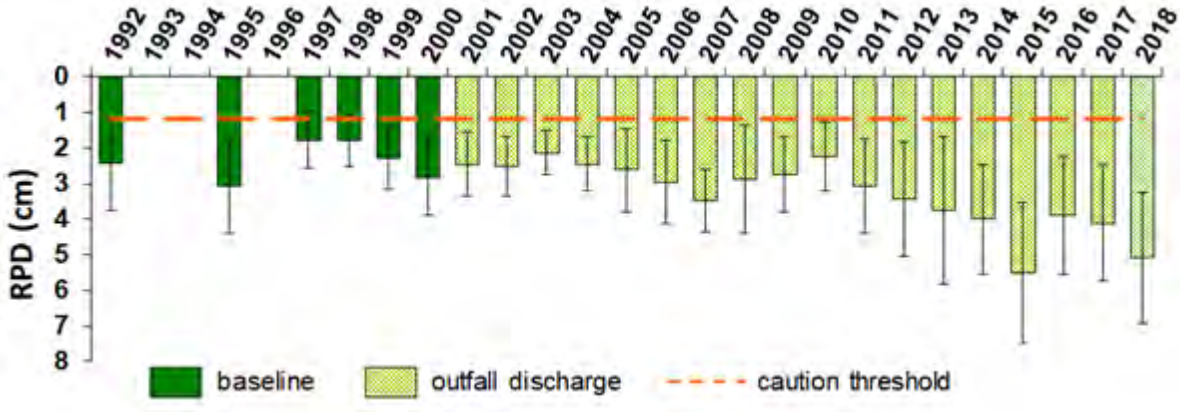
Riser #2, June 2017

- Animal communities living in the sediments near MWRA's outfall remained healthy in 2018.
- Oxygen penetration into Mass. Bay sediments remained deeper than before the discharge moved offshore.
- Rocky sea-floor communities remained diverse and lush in 2017, even on an active outfall riser.
- No Contingency Plan thresholds were exceeded.



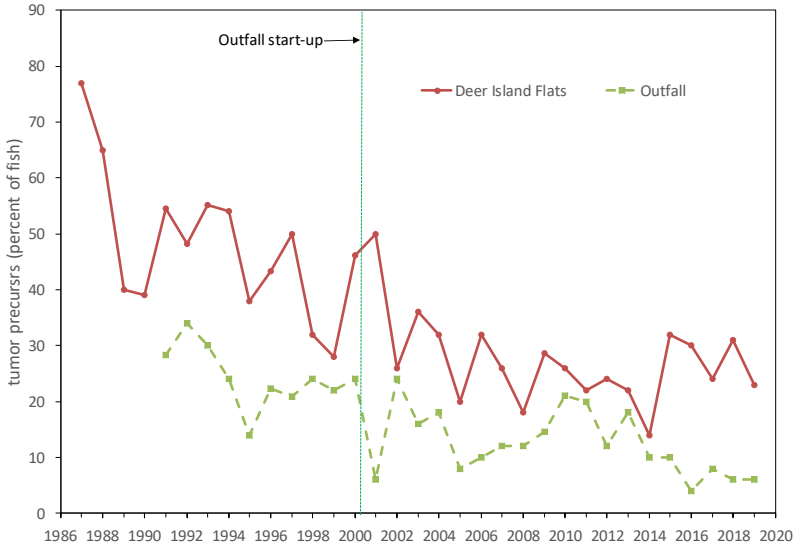
Collecting sediment samples in Boston Harbor

Sediment Oxygen Penetration In 2018 Was Among The Deepest Measured.



- Concerns existed that organic material in effluent would add oxygen demand to nearby sediments or smother seafloor organisms.
- A decrease in the depth of oxygen penetration (RPD) would result.
- Results document that the reverse has occurred, RPDs have deepened in recent years.
- Analyses suggest the deepening may result from long-term increases in storminess in Massachusetts Bay.

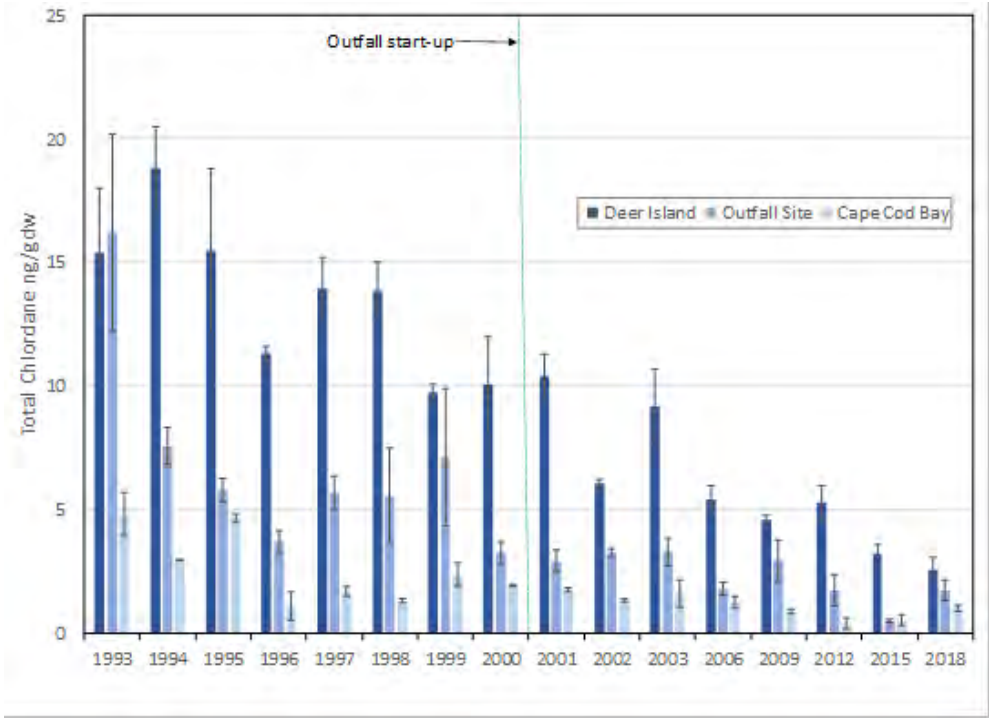
Flounder Health In Boston Harbor And Near Outfall



- 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; and
- Tumor precursors are decreasing near outfall as well.

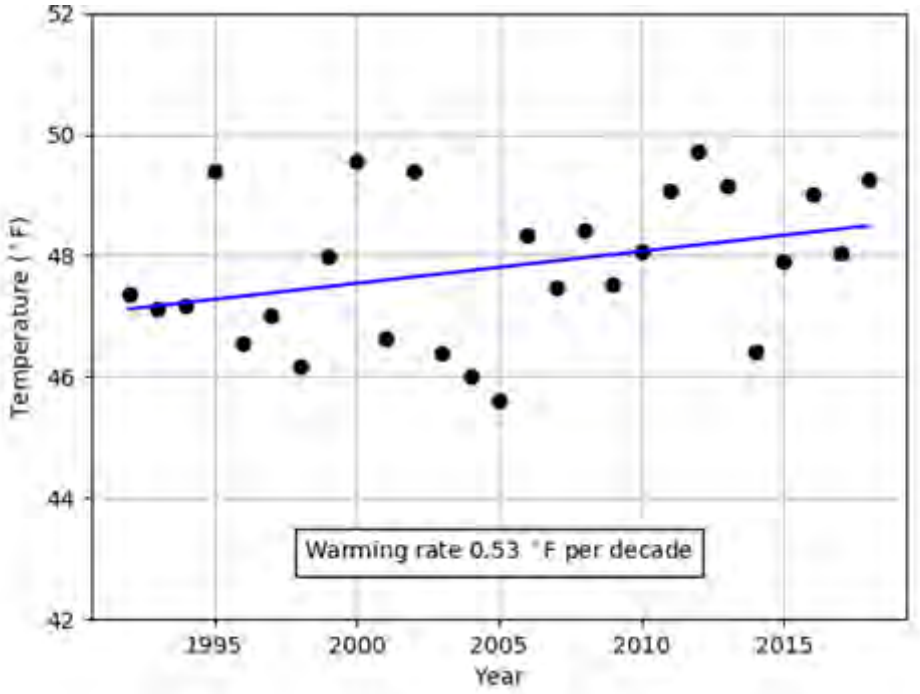
Contaminants In Fish And Shellfish Tissues

- Sampling conducted every third year, including 2018.
- No Contingency Plan exceedances in 2018.
- Concentrations of most contaminants decreasing in Boston Harbor, staying stable or decreasing near outfall.
- Pesticides decreasing in flounder, lobster, and deployed mussels at all sites.
- All available data show recovery in Boston Harbor with no indications of degradation in Massachusetts Bay.



Evaluation Of Long-Term Trends In Monitoring Results

- MWRA's monitoring is longer and more comprehensive than most.
- Can identify long-term trends other studies could not.
- Temperature in Mass. Bay has increased > 1° F since 1991.
- Results also document small (< 0.1 ppm) long-term decreases in Dissolved Oxygen, which may be related to warming.
- Other long-term monitoring data show increases in storm wind and wave intensity.



Ambient Monitoring Symposium

- The Outfall Monitoring Science Advisory Panel (OMSAP) advises regulators on monitoring, supported by the Public Interest Advisory Committee (PIAC).
- Consensus during November 2018 Symposium that the outfall has not adversely impacted the Bay.
- OMSAP is reviewing and identifying revisions for the monitoring program, together with DEP, EPA, PIAC and MWRA.
- MWRA is engaged in several special studies to investigate PFAS/PFOS compounds, CEC's, and microplastics.

- Save the Date -

November 13, 2018
Fort Point Channel Conference Room, Atlantic Wharf
280 Congress St, Boston, MA 02210

2300 Days at Sea:
Monitoring the Impacts
of the Massachusetts Bay Outfall

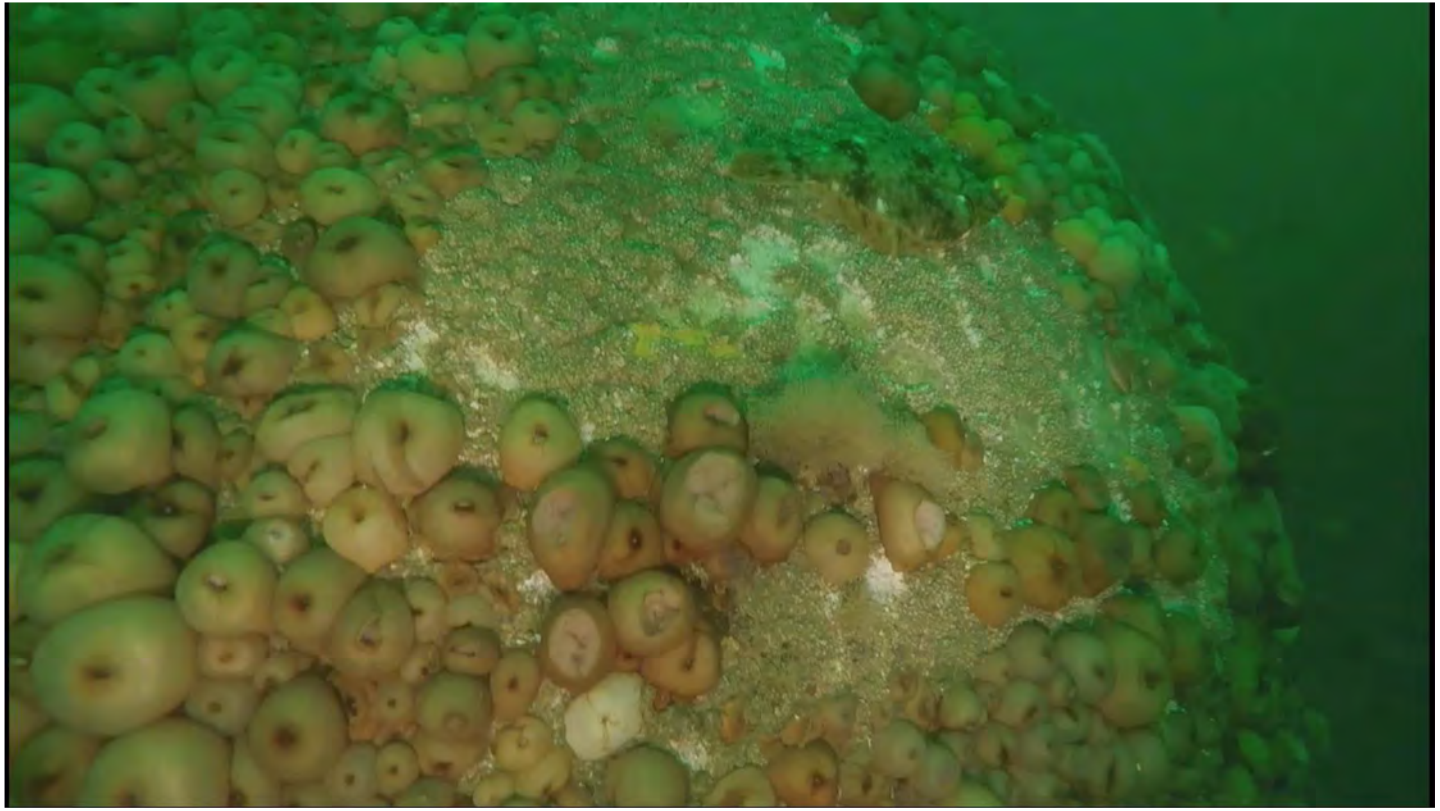
Over 30 years ago, the Massachusetts Water Resources Authority was established to upgrade the Greater Metropolitan Boston wastewater treatment facility, which included moving wastewater discharge to an outfall 9.5 miles into Massachusetts Bay. At the time, the public and regulators were concerned that moving the outfall would transfer environmental degradation from Boston Harbor, dubbed the "Dirtiest Harbor in the Nation," to the cleaner waters of Massachusetts Bay.

To address these concerns, scientists and regulators oversaw the development of a monitoring program. These concerns—human health, seafood safety, aesthetics, and ecosystem health—were translated into questions that framed the monitoring program. Twenty-six years (and 2300 days at sea) later, the monitoring program has documented impacts from the outfall that are minor and within projections, and Boston Harbor appears to be recovering.

This workshop will kick off a process to review MWRA's existing monitoring program. We are seeking input from the public to evaluate whether the current questions are still relevant, and whether other emerging questions or threats related to the outfall discharge should be addressed by the monitoring program. Event information to follow. Please email **Judith Pederson at jpederso@mit.edu** or **Diane Alicea at dvalicea@mit.edu** with questions.

This event is sponsored by:
Massachusetts Bay Outfall Monitoring Science Advisory Panel in conjunction with the Public Interest Advisory Committee, Massachusetts Department of Environmental Protection and U.S. Environmental Protection Agency with generous support from Save the Harbor/Save the Bay and MIT Sea Grant College Program.

Video From Outfall Diffuser




WATER RESOURCES AUTHORITY
MASSACHUSETTS

City of Cambridge Proposal for Partial Sewer Separation

October 16, 2019

Cambridge Proposal for Partial Sewer Separation

The City of Cambridge has proposed to continue to discharge to MWRA's sewer system a portion of separate stormwater, as part of their plan to construct a stormwater outfall to also discharge stormwater to the Charles River.

Cambridge Proposal for Partial Sewer Separation

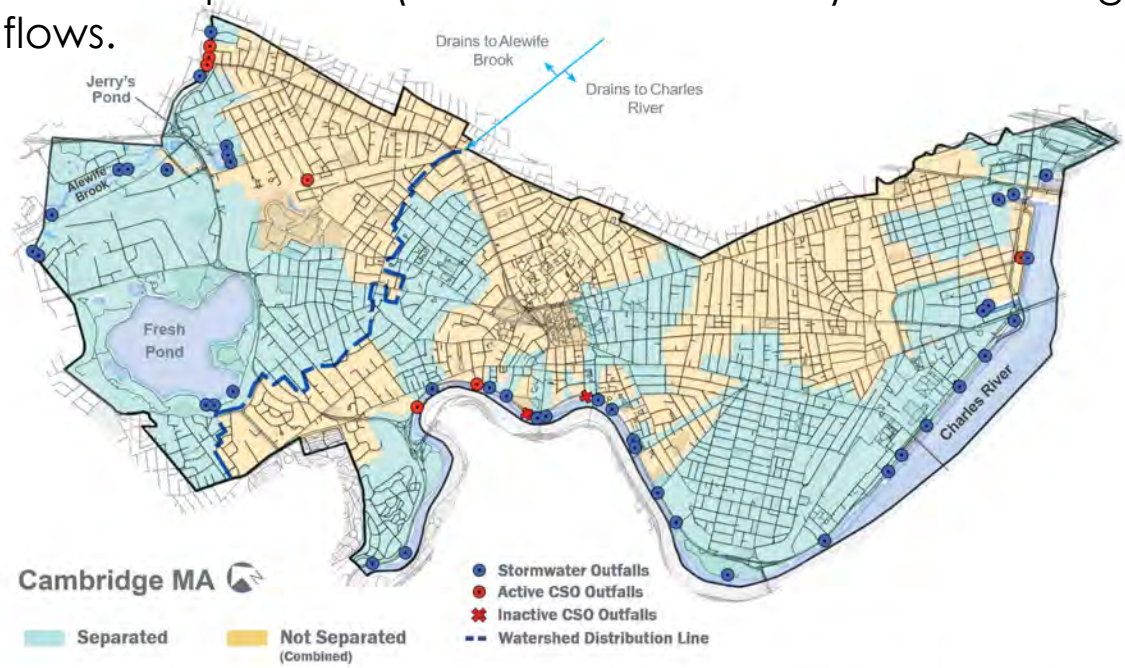
- Consistent with Plans to Meet Goals in MWRA's CSO Long Term Control Plan
- Proposal Presented to Advisory Board Operation Subcommittee on October 1, 2019
- Proposal Presented to DEP and EPA on October 9, 2019, who have both provided support of proposal
- Proposal Presented to Advisory Board Executive Committee on October 11, 2019
  - Vote of support for trial proposal, on condition that it provides a clear benefit to MWRA, Results in No Future Cost, and is implemented at a location currently discharging combined flows to MWRA's system
- Asking Board of Directors for vote of approval for Trial Evaluation Period of 12 months

The following slides are from Cambridge's presentation on the Partial Sewer Separation Request

Cambridge combined sewer community (45%). MWRA and Cambridge are collectively in the stormwater business.

Sewer Separation – traditional approach.

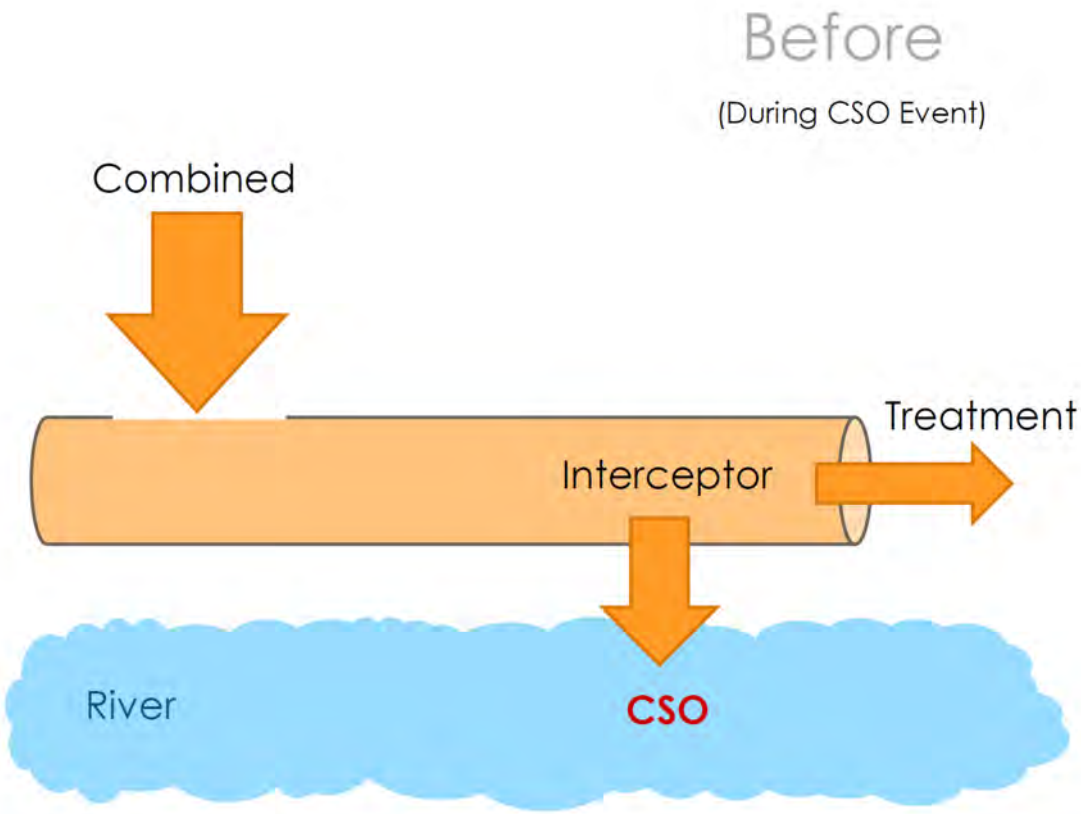
Partial Sewer Separation (stormwater overflow) focus on larger storm flows.



This map shows the areas of Cambridge's sewer system that are separated and are not separated and the active city-owned outfall locations. The City is 55% separated and 45% not yet separated.

How does combined sewer system currently work during larger storms?

All sewage and stormwater is combined and goes to the MWRA system until there is a CSO activation.



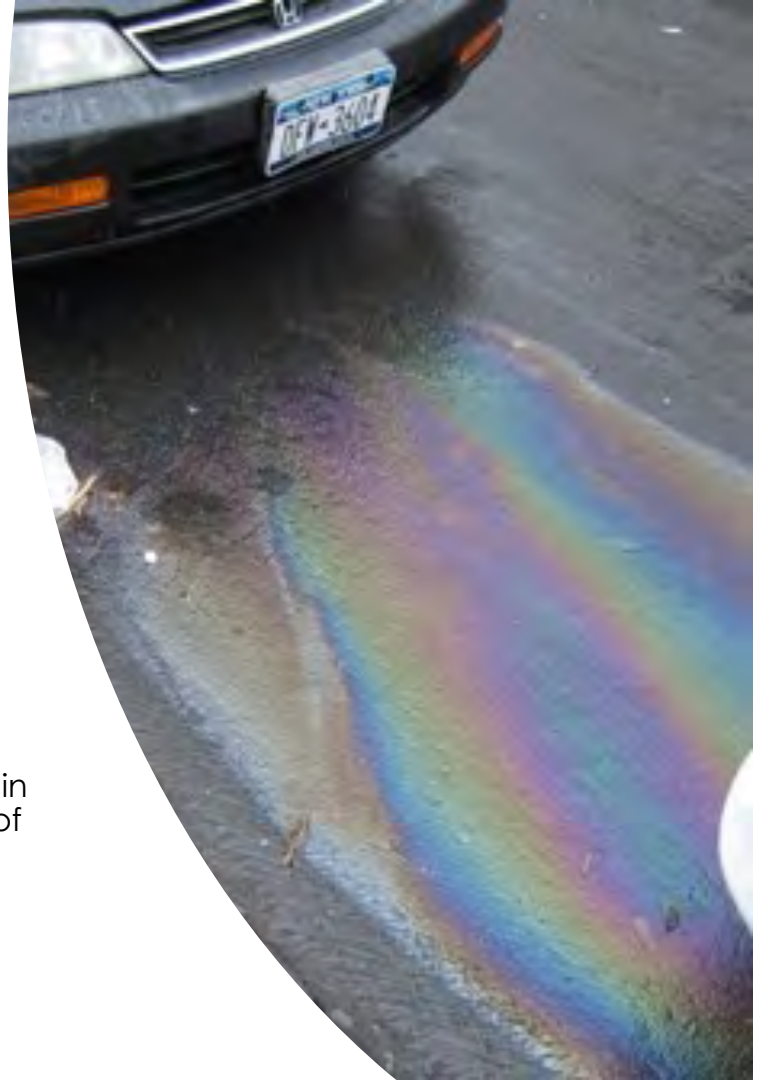
Full Sewer Separation

All stormwater goes to the receiving water bodies.

Reduces CSOs.

Increases phosphorous and other nutrients.

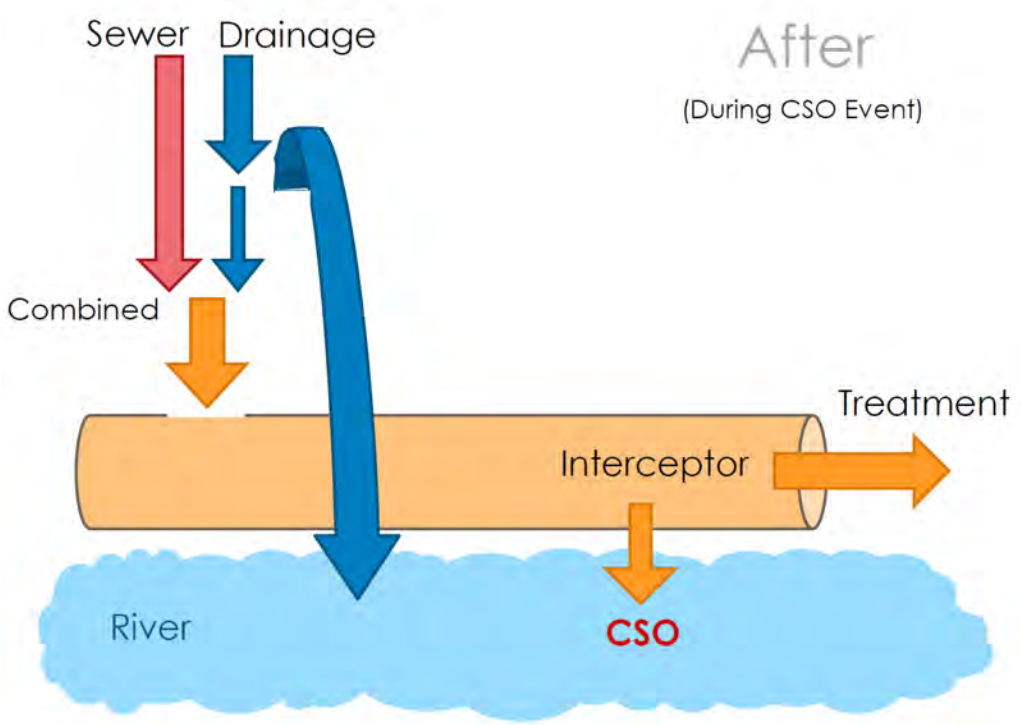
Not consistent with Phosphorous TMDL in the Charles River and impaired status of Alewife Brook.



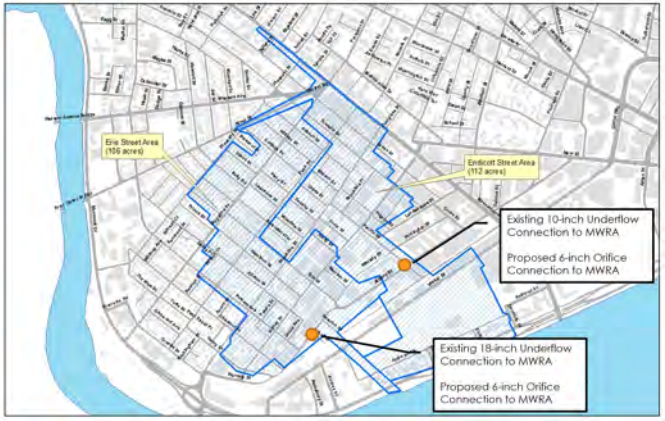
How would system work with partial sewer separation?

During smaller storm events the stormwater stays connected to the MWRA system; reducing the impact of phosphorous and other nutrients on the river.

During larger storm events, stormwater is diverted to the river; reducing the frequency and volume of CSOs.



Cambridgeport – Talbot Street Outfall

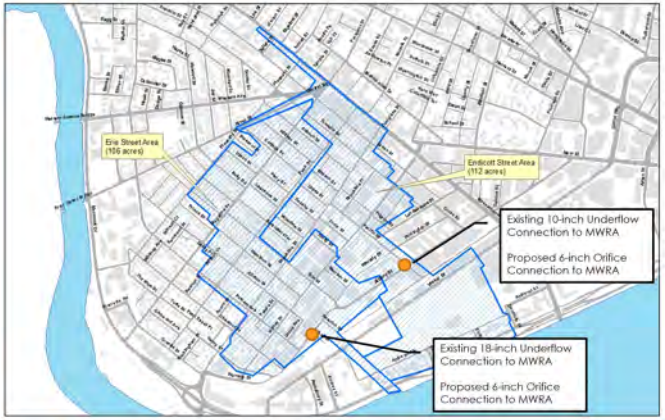


Consistently identified by the MWRA as critical to reducing the CSO volumes at Cottage Farm to under the LTCP of 6.30 MG. But the MWRA has not committed funding to this project.

The $12M to $15M+ partial sewer separation in the Cambridgeport area (Talbot Street outfall) is being constructed with no MWRA Funding.

With Partial Sewer Separation – stormwater during larger CSO storm events is directed to the Charles River, which is why ***the typical year CSO activations are the same under full sewer separation and partial sewer separation.***

Cambridgeport – Talbot Street Outfall



The project reduces the existing 10" and 18" connections from the Cambridge drainage system to the MWRA sewer system to 2 - 6" connections (shown in orange in the map above).

This project is critical for the MWRA to meet the level of CSO control required at Cottage Farm.

Existing Conditions – 7.29 MG

Long Term Control Plan – 6.30 MG

Full Sewer Separation – 4.71 MG

Partial Sewer Separation – 4.71 MG

Analysis from March 1, 2019 Letter from the City of Cambridge to the MWRA, includes Cottage / Lopez improvements (using 2017 Cambridge Model).

Summary of Total Phosphorous (TP) Reduction for Talbot Street Outfall (Using MWRA Typical Year)

2-Underflows	Total TP In Stormwater	Total TP Removed	Total Volume Existing	Total Volume To MWRA	Total Volume To River
6-inch	126 kg	90 kg / 71%	167 MG	119 MG	48 MG

Summary of I/I Removal for Talbot Street Outfall (Using 1-year 6-hour storm)

Condition	I/I Removed
Full Sewer Separation	4.45 MG
Partial Sewer Separation	3.98 MG (89%)

Summary of Typical Year CSO Activations for Talbot Street Outfall (Using MWRA Typical Year)

Condition	Cottage Farm Activations / Volume	CAM 005 Activations / Volume	CAM 007 Activations / Volume
Existing Conditions	9 / 7.29 MG	5 / 0.65 MG	1 / 0.03 MG
Full Sewer Separation (1)	2 / 4.71 MG	2 / 0.49 MG	1 / 0.03 MG
Partial Sewer Separation (1)	2 / 4.71 MG	2 / 0.49 MG	1 / 0.03 MG

(1) Both the Full Sewer Separation and the Partial Sewer Separation reduce the Typical Year activations at Cottage Farm to 4.71 MG, which is under the LTCP of 6.30 MG.

Partial Sewer Separation Request

Reduces stormwater going to the MWRA system and is for **combined sewer areas only**.

Critical to the MWRA meeting the Long Term Control Plan and continuing to improve the level of CSO control, however, **sewer separation cannot continue without considering and mitigating the water quality impacts of sending additional stormwater to the receiving waters**.

Develop designs that reduce CSOs and improve water quality (phosphorous) controls.

These projects **significantly benefit the MWRA system** by reducing flows to the system and reducing CSO activations and volumes.

No cost to the MWRA and will result in a **better performing MWRA system for all communities**.


WATER RESOURCES AUTHORITY
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Charles River Valley Sewer Rehabilitation Sections 191 and 192

MWRA Contract 7643

October 16, 2019

Charles River Valley Sewer Rehabilitation - Sections 191 and 192

Section 192

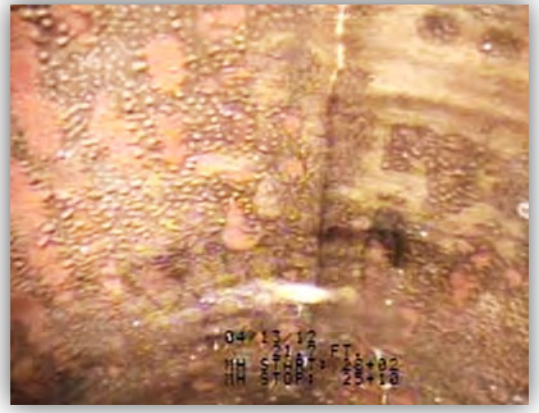
Section 192 CIPP liner

Previously rehabilitated section due to collapsed sewer in 1990

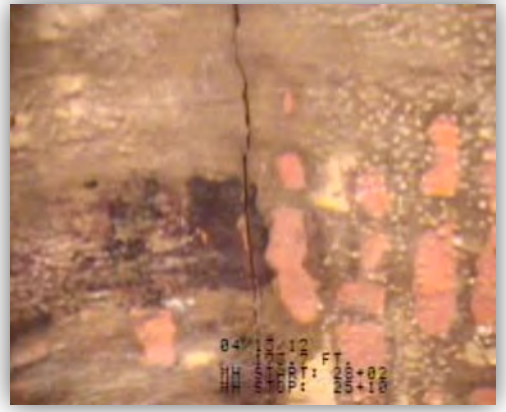
Section 191

Section 191 CIPP liner

Cracking At Crowns Of Section 191 and 192



Section 191 Crown Crack



Section 191 Crown Crack

Section 192 Crown Crack and Missing Brick

Section 192 Crown Crack

Bid Results

- Bids Opened October 2, 2019

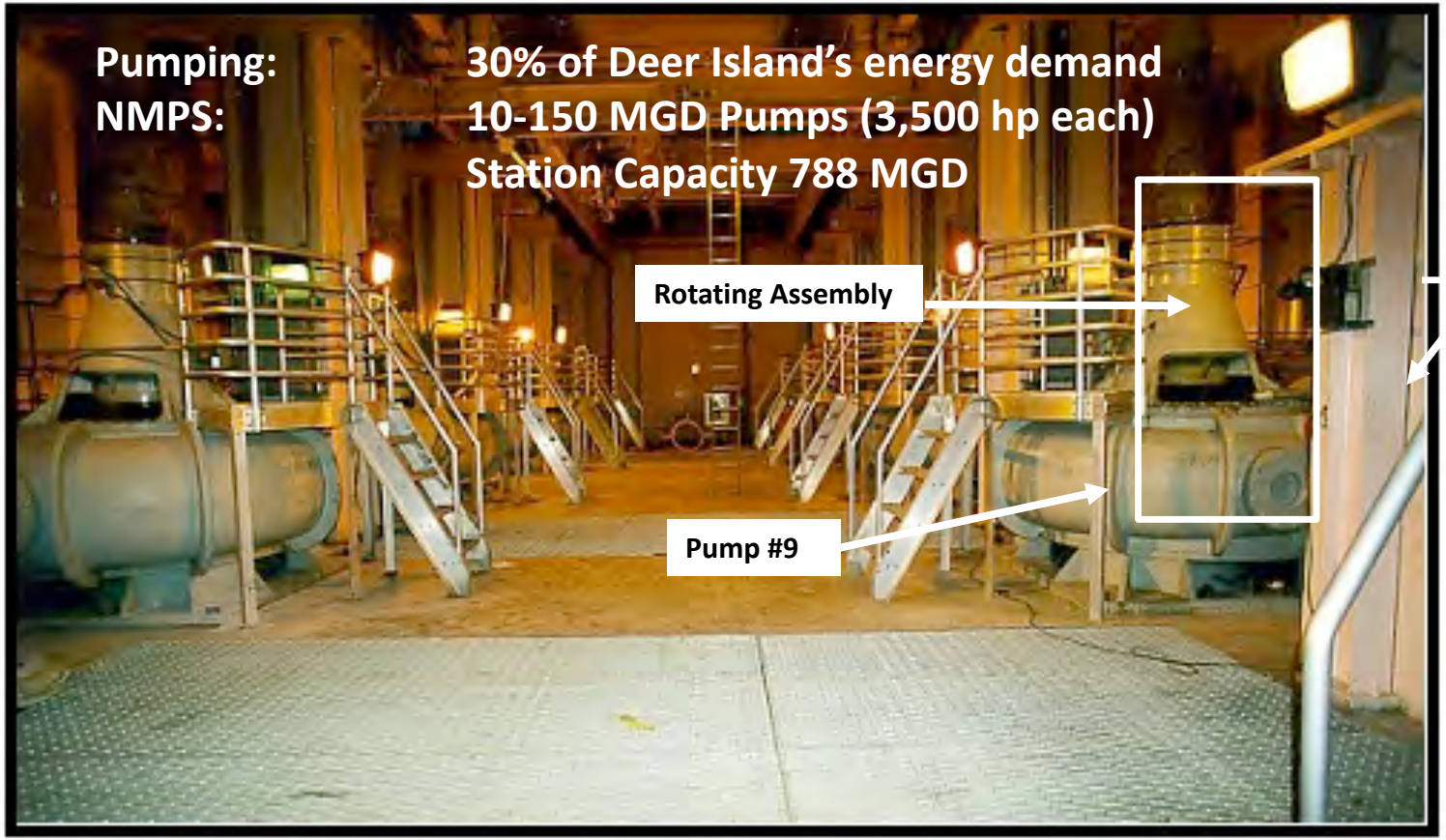
Bidders	Bid Amount
Green Mountain Pipeline Services	**$1,619,380**
RJV Construction Corp.	$1,764,000
Engineer's Estimate	*$1,900,000*


WATER RESOURCES AUTHORITY
MASSACHUSETTS

Deer Island Treatment Plant
Pump Refurbishment
Contract S581, Change Order 1

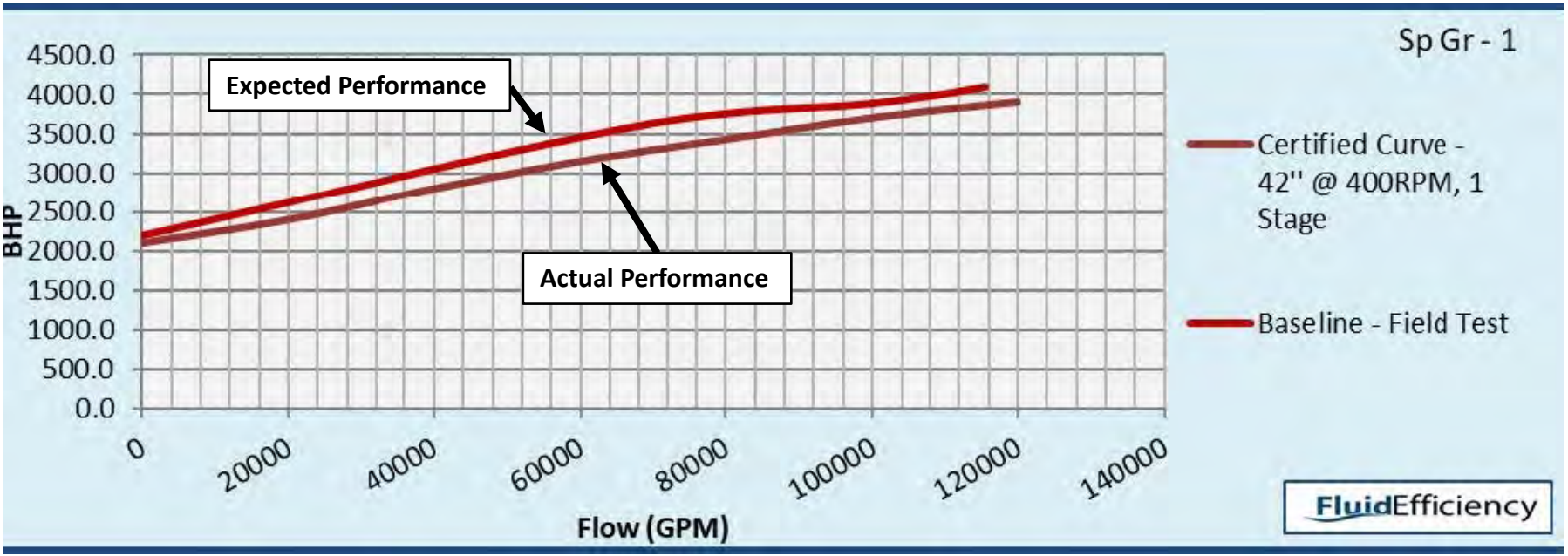
October 16, 2019

Contract S581, NMPS Pump 9 Refurbishment



Pump Efficiency Testing – NMPS Pump 9

- 11% efficiency gain expected from refurbishment
- Expected savings - 235,820 kWh or $20,045 savings annually



Similar Repairs: Winthrop 1 Before / After

	Pump Volute	Pump Impellor
Before:		
After:		

Change Order 1

Original Contract:	$98,976
Change Order:	Not to exceed $77,814
Adjusted Contract:	Not to exceed $176,790
Eversource Incentive:	$58,955
Net cost:	Not to Exceed $117,835
Annual Energy Savings:	$20,045
Payback:	3-5.8 years


WATER RESOURCES AUTHORITY
MASSACHUSETTS

Metropolitan Tunnel Redundancy Program Update

October 16, 2019

Procurement Schedule – Preliminary Design Engineering

• Issued Request for Qualifications	10/2/2019
• Qualifications Statements Due	11/1/2019
• Issue Request for Proposals to Finalists	12/2/2019
• Proposals Due	2/14/2020
• Recommend Award to Board	April 2020
• Notice to Proceed	May 2020

- Contract Duration: 3.5 years

Major Tasks Associated with the Preliminary Design and Engineering Contract

- **Project Management, Regulatory Agency, and Stakeholder Coordination**

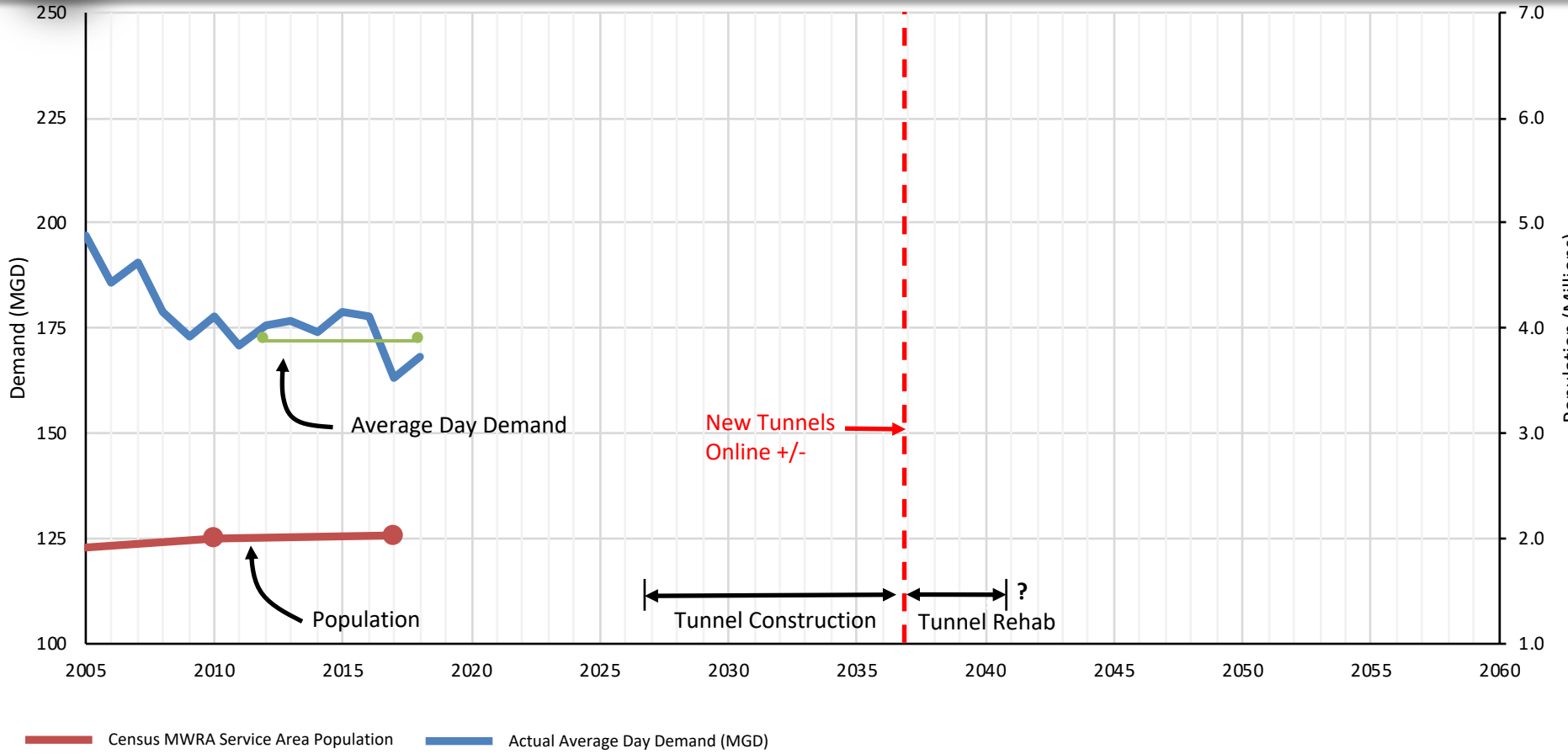
- **Evaluation of Alternatives** - Massachusetts Environmental Policy Act
  - Review Existing Information
  - Alternatives Screening Report - Environmental Notification Form
  - Tunnel Alignment Alternatives Evaluation – Draft Environmental Impact Report

- **Environmental Impact Report** – Massachusetts Environmental Policy Act
  - Environmental Analysis
  - Section 61 Findings
  - Wetlands Delineations

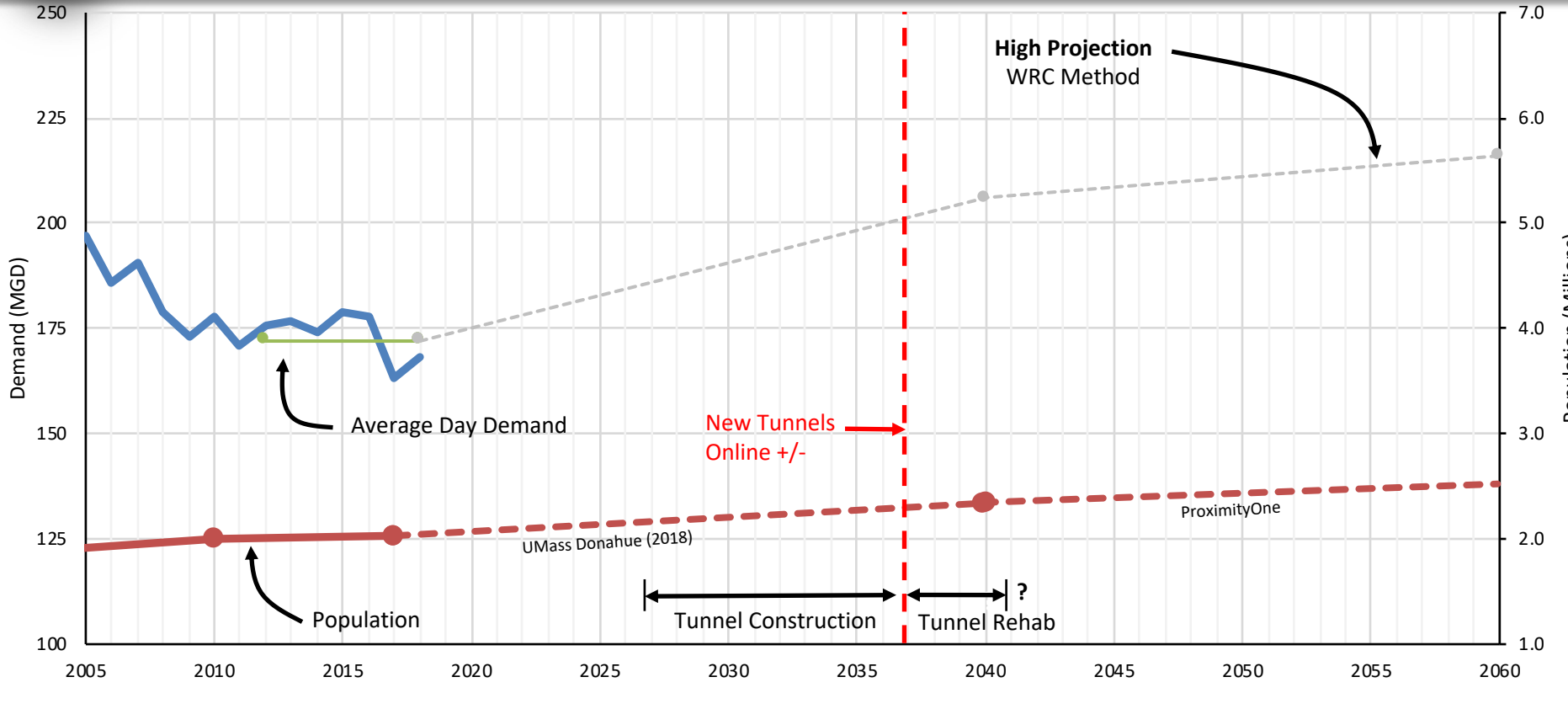
Major Tasks Associated with the Preliminary Design and Engineering Contract

- **Geotechnical and Hazardous Materials Investigation and Evaluation**
  - Subsurface investigation
  - Geotechnical Database
  - Geotechnical Material Storage Management
- **Base Mapping and Survey**
  - Base Map Technical Memorandum
  - Easement and Records Research
  - Geotechnical Borings
- **Preliminary Design**
  - Hydraulic analysis of preferred alternative
  - Preliminary Design report and drawings
  - Program guide specifications

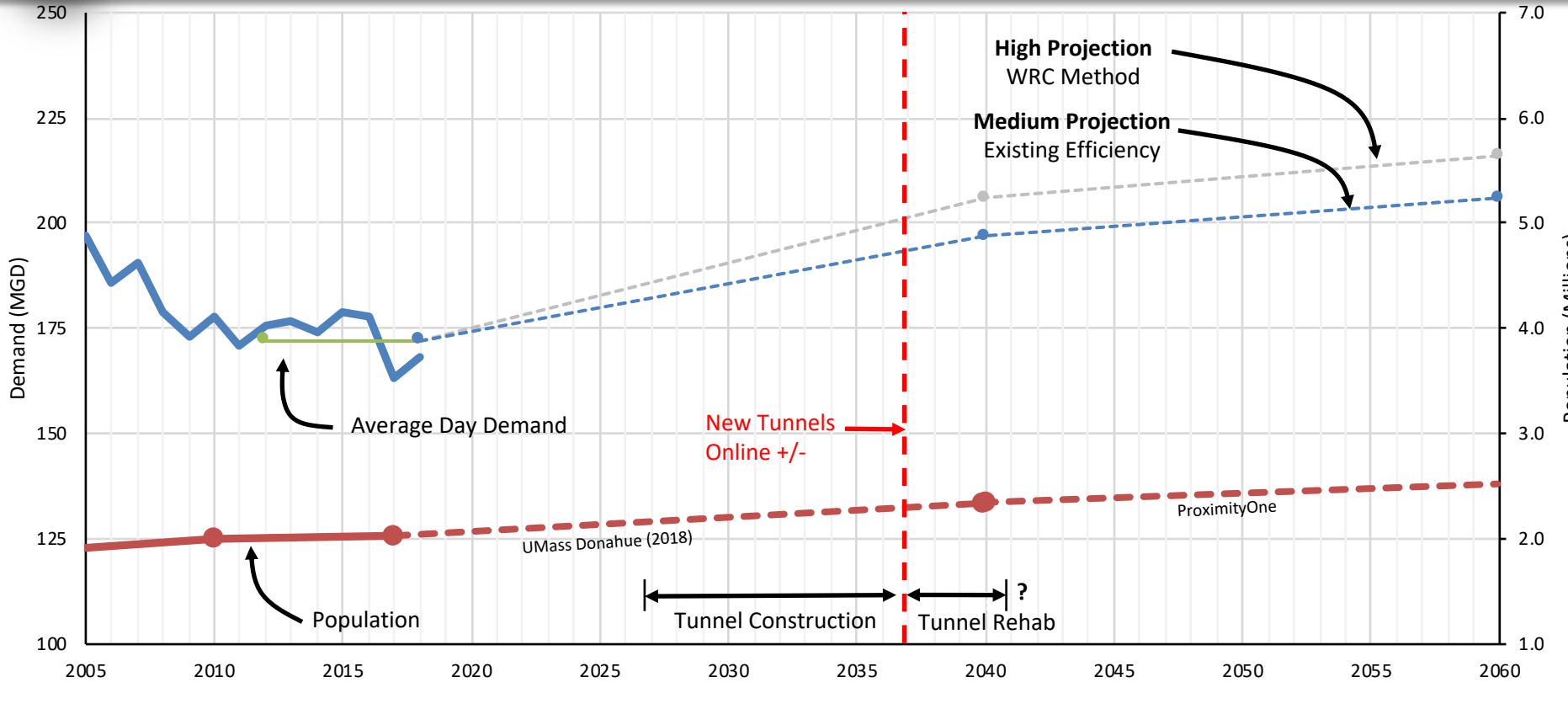
Average Day Water Use Projections - East of Norumbega



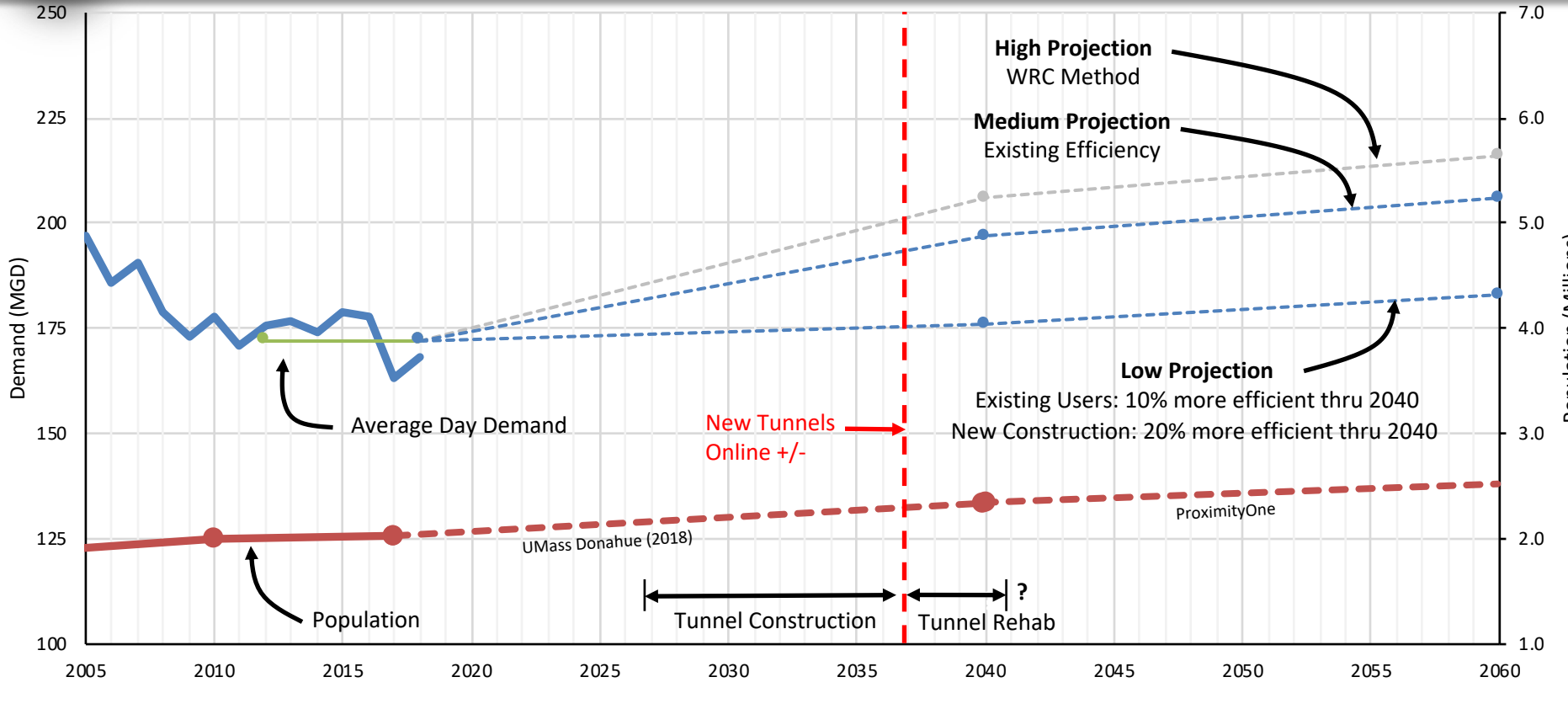
Average Day Water Use Projections - East of Norumbega



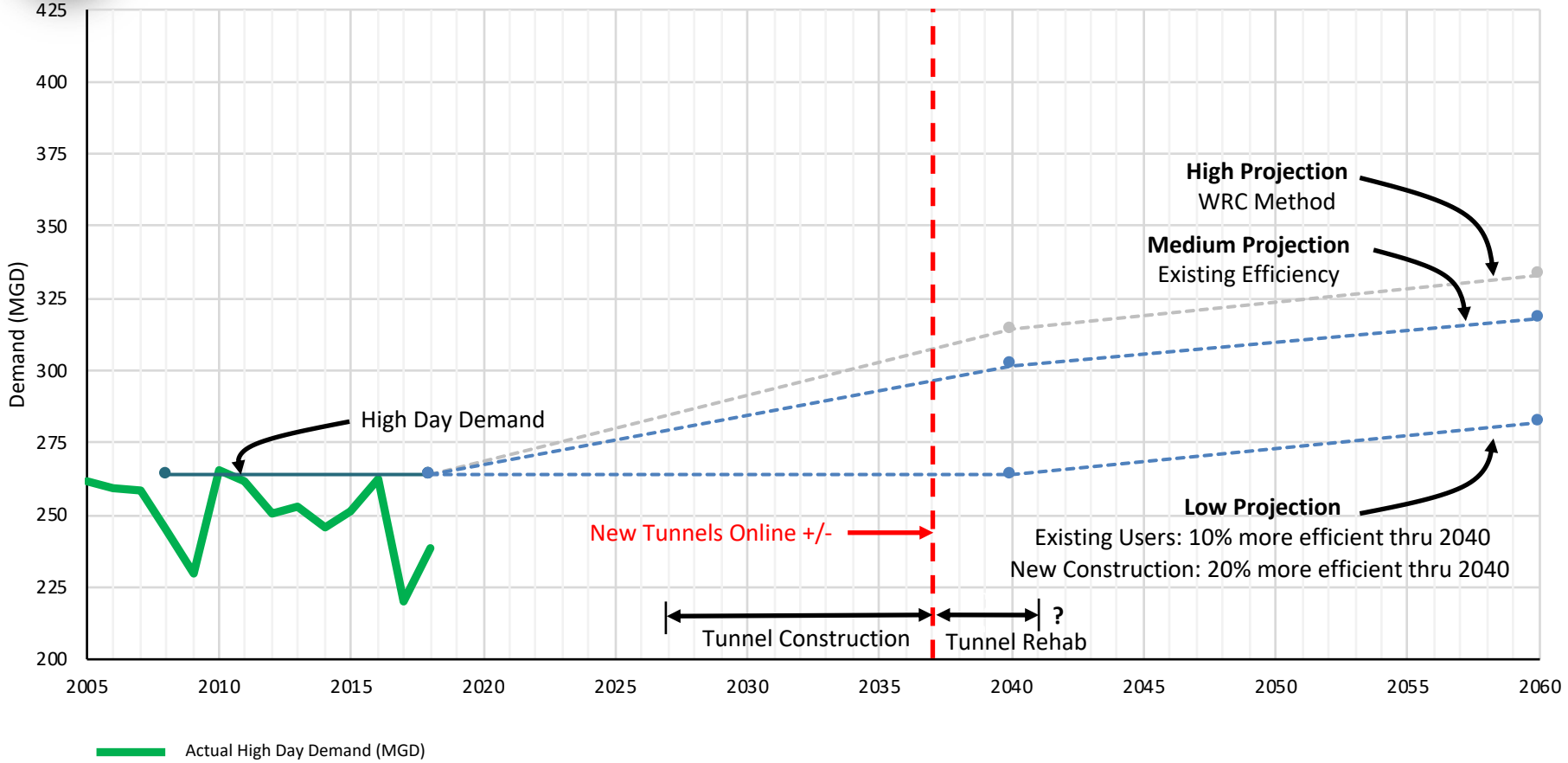
Average Day Water Use Projections - East of Norumbega



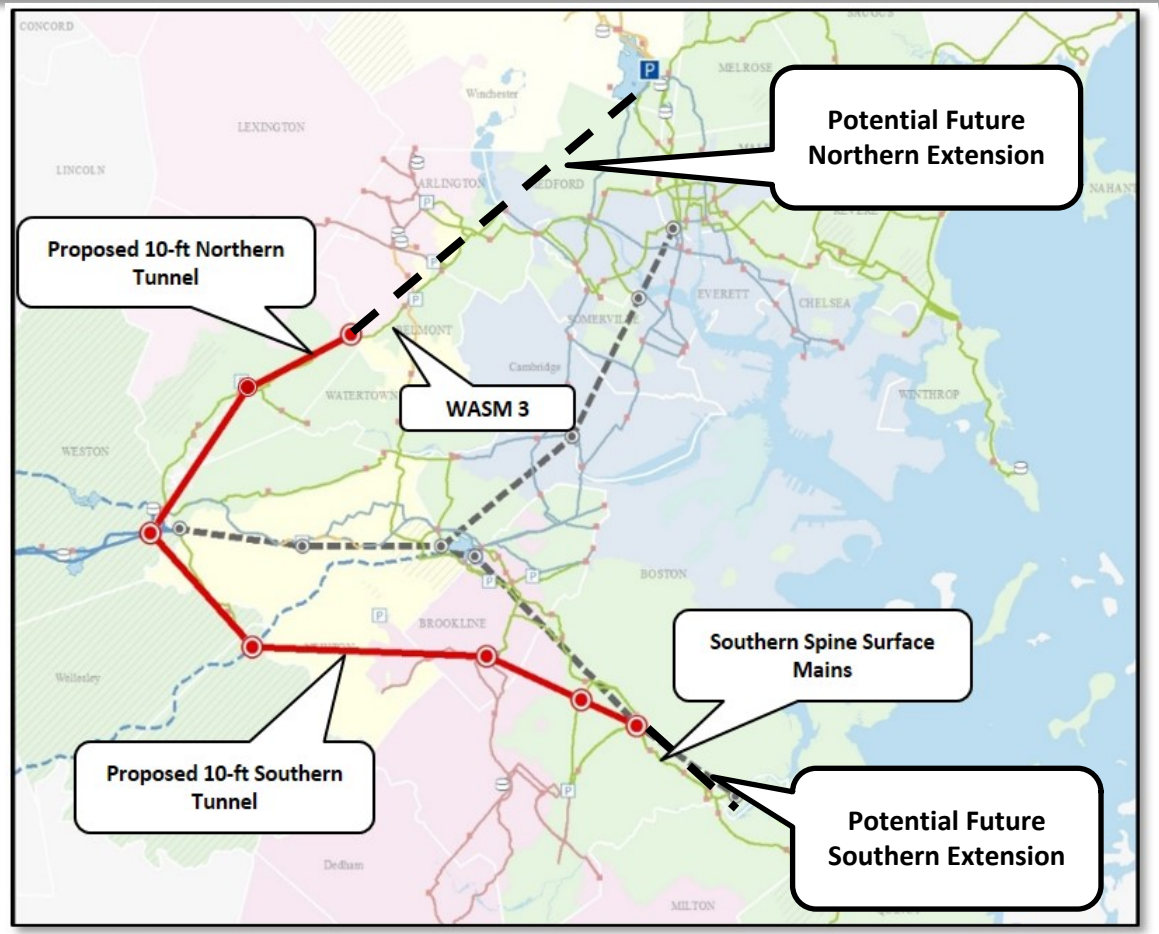
Average Day Water Use Projections - East of Norumbega



High Day Water Use Projections - East of Norumbega

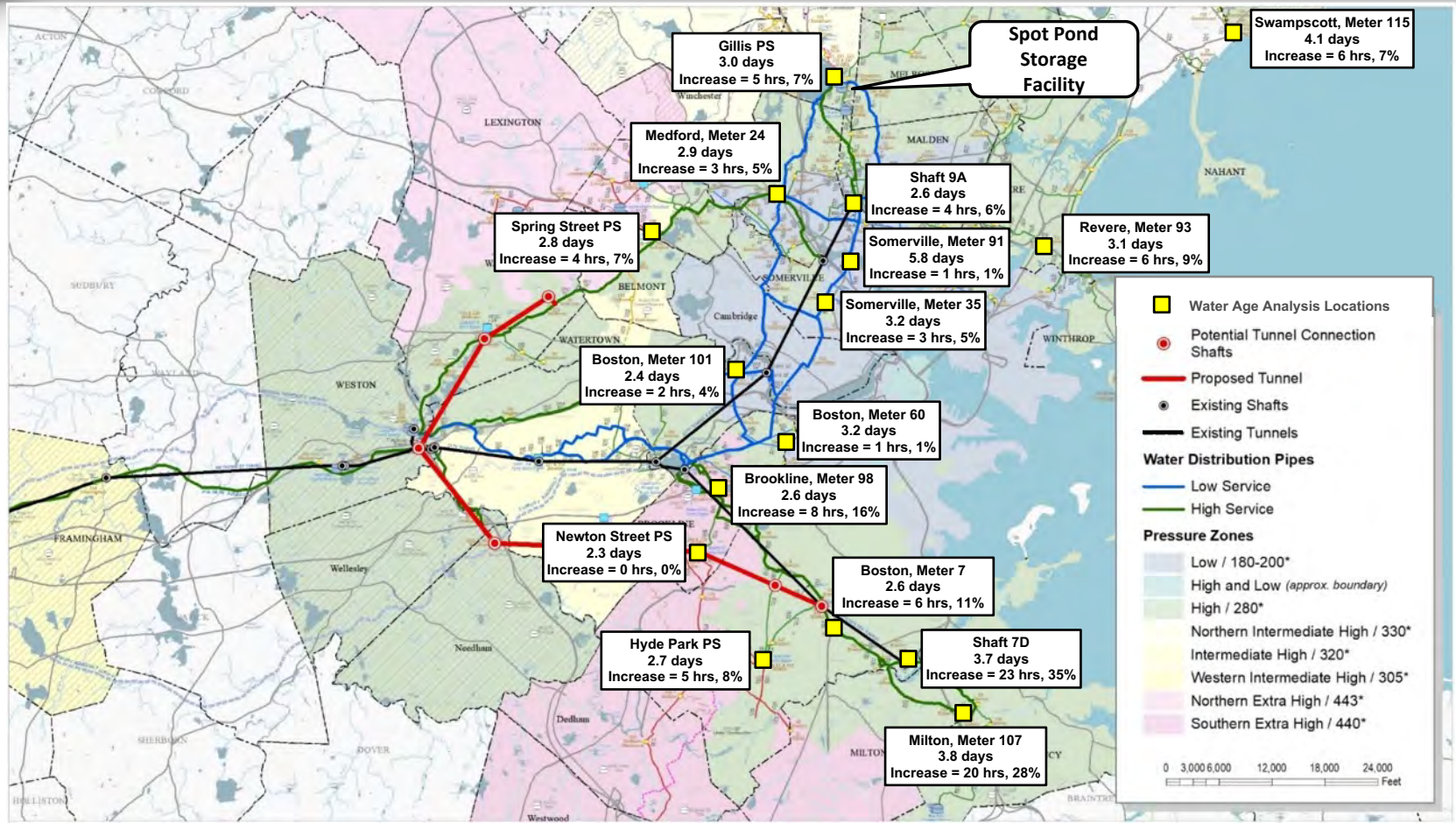


Potential Future Tunnel Extensions



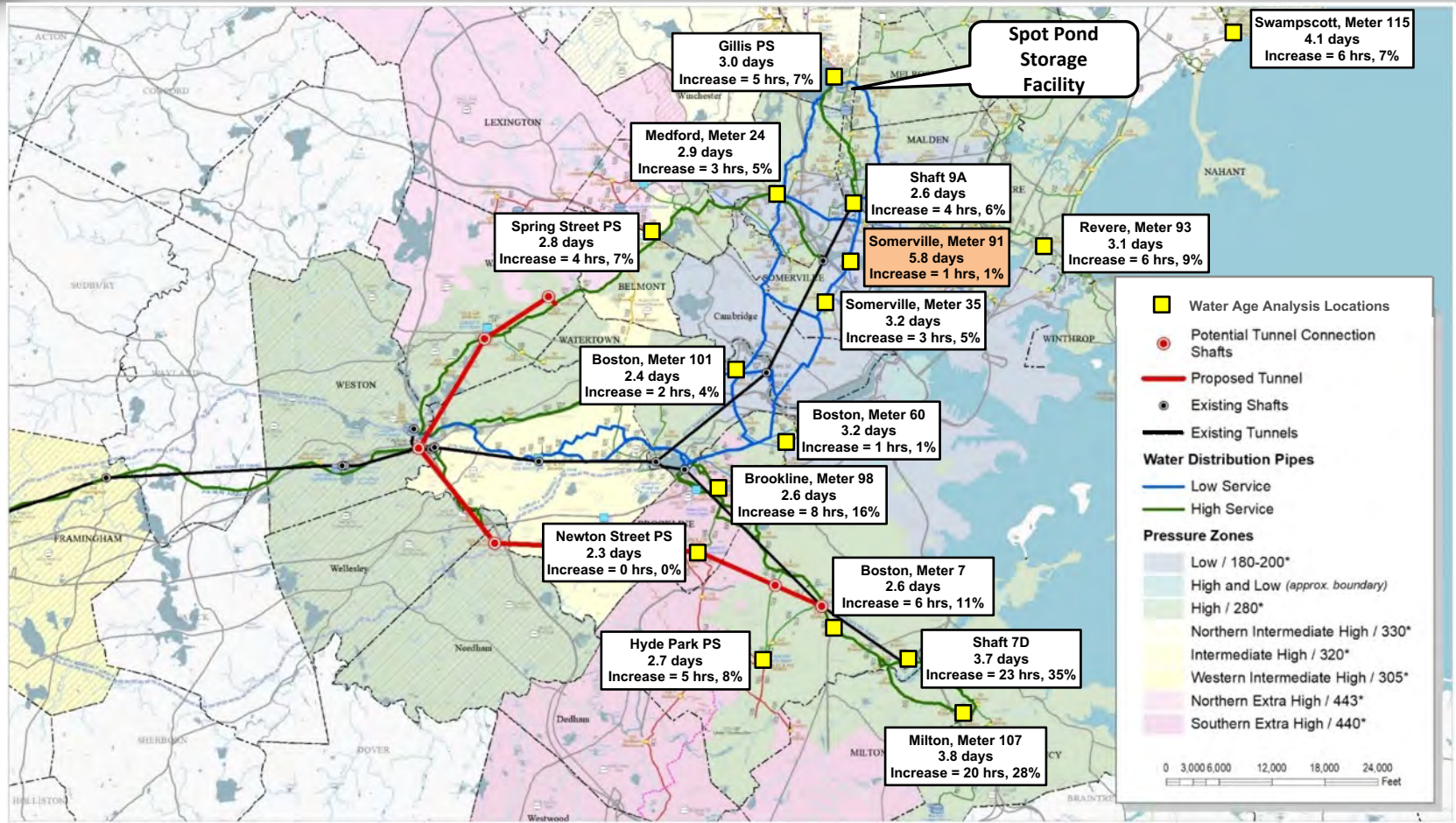
Water Age Analysis from Carroll Treatment Plant

Average Day Demand



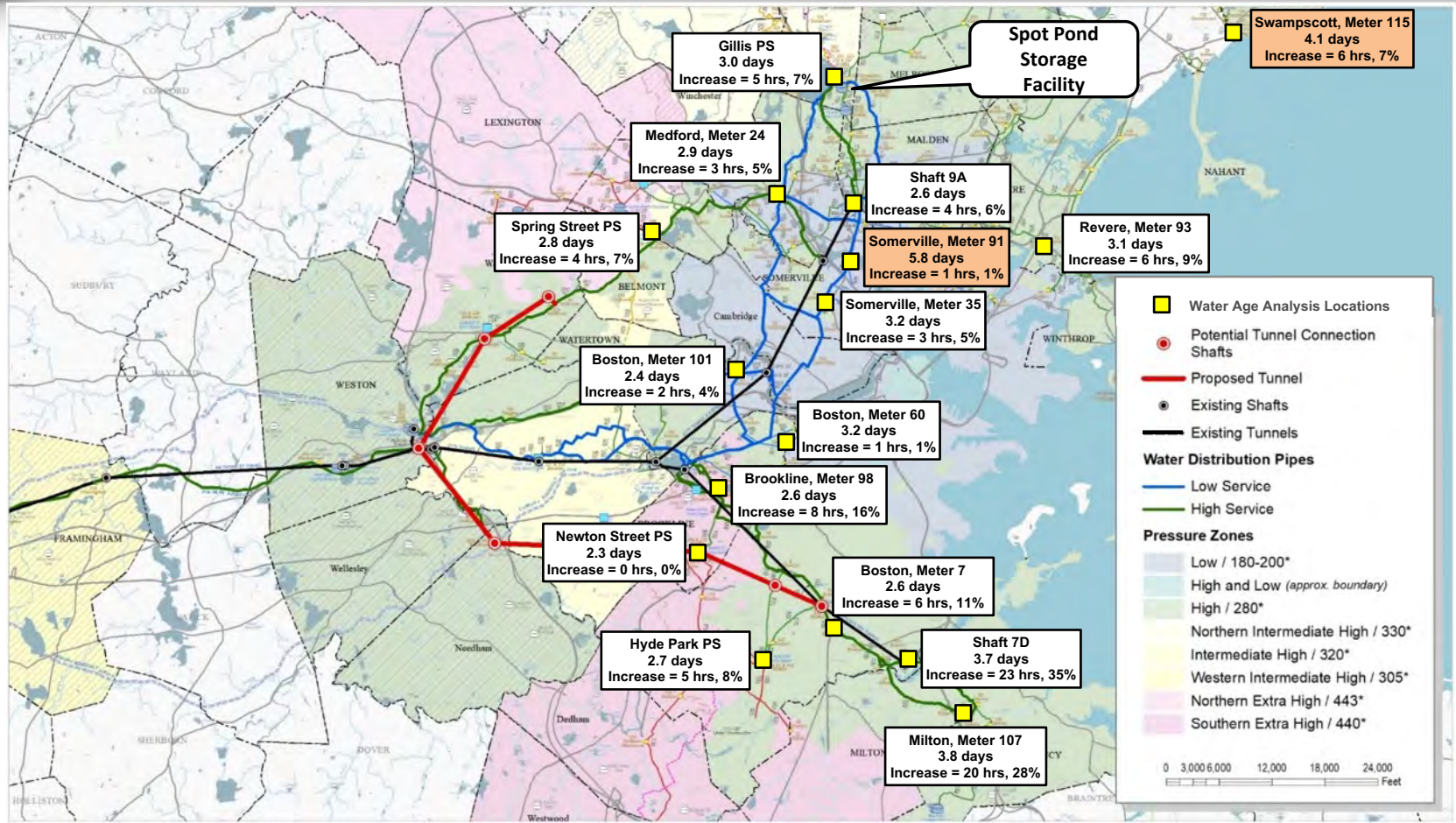
Water Age Analysis from Carroll Treatment Plant

Average Day Demand



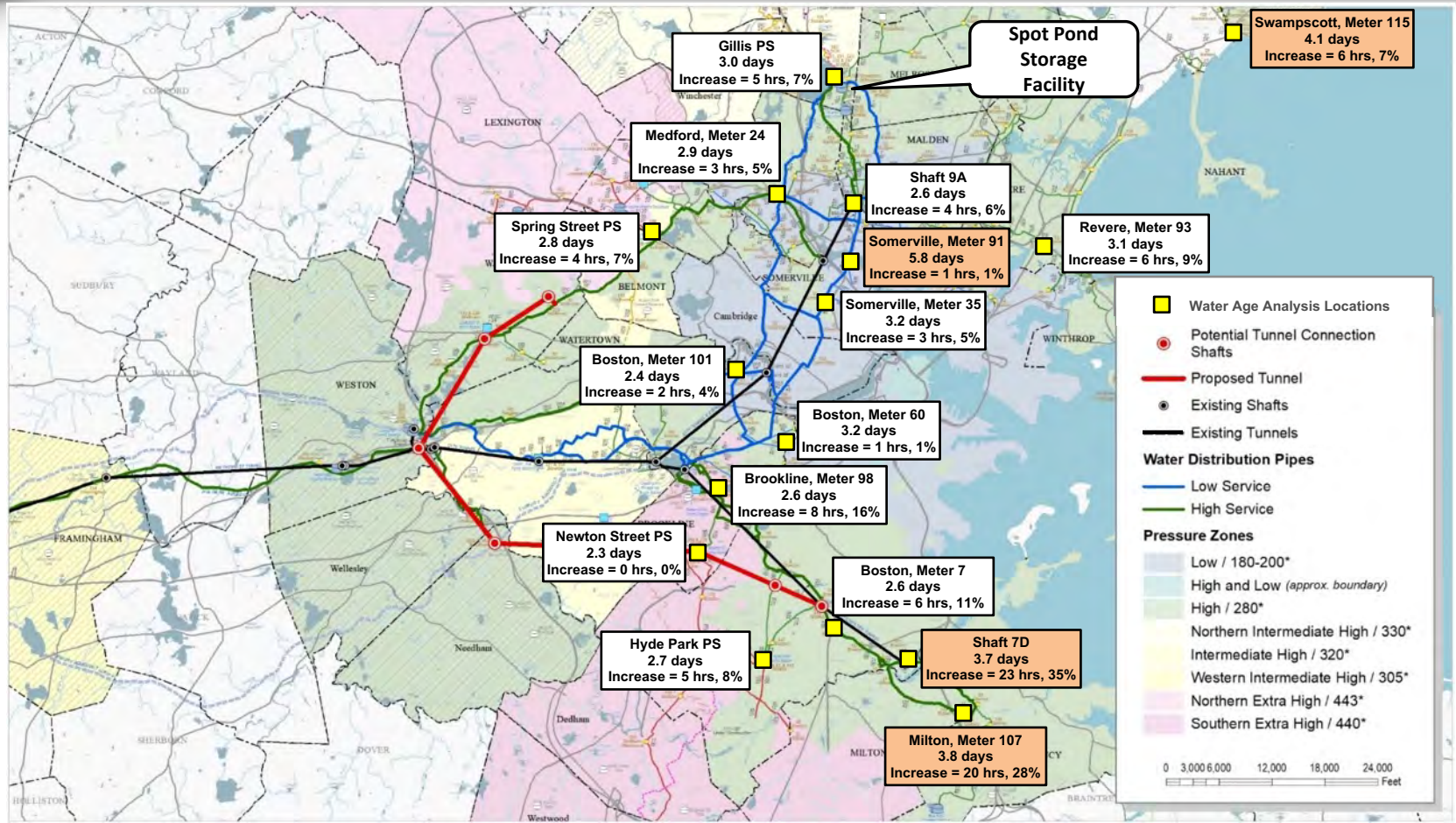
Water Age Analysis from Carroll Treatment Plant

Average Day Demand



Water Age Analysis from Carroll Treatment Plant

Average Day Demand



Expert Review Panel

- Risk Mitigation
- Communications
- Program Management
- Tunnel Design and Construction
- National and Local Experts
- Panel Workshops at Key Program Milestones

Expert Review Panel

- Richard Fox – Owner, Mega Program Management, MWRA
  - Adjunct Faculty, Merrimack College
  - CDM Smith
  - MWRA
- Michael McBride – Tunnel Construction Management, MWRA, Owner
  - Gilbane
  - HDR
  - Allston Development Group
  - MWRA
- Erika Moonin – Owner, Mega Tunnel Program Management
  - Project Manager – Lake Mead Intake No. 3, Southern Nevada Water Authority
- Gary Brierley – Tunnel Boring Machine / Local Geology
  - “Dr. Mole”
  - Brierley Associates
  - Haley & Aldrich
- Gayln Rippentrop – Underground Construction / Tunnel Contractor
  - Frontier-Kemper
  - Kewit


WATER RESOURCES AUTHORITY
MASSACHUSETTS

Northern Intermediate High Project

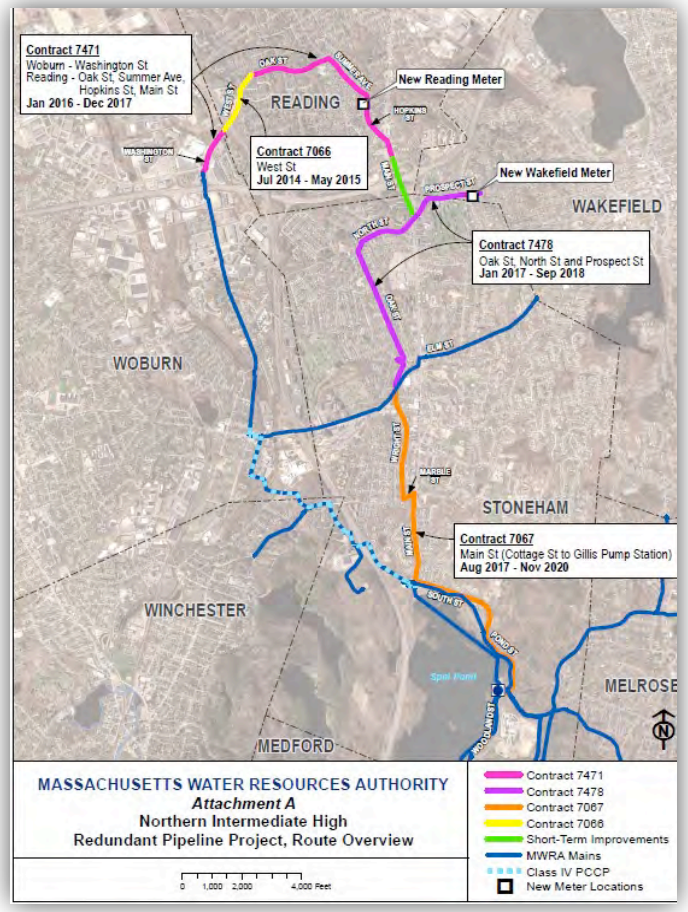
October 16, 2019

Contract 7067 South Street Drain Line

Contract 7067 Main Street and South Street

Contract 7067 NIH Section 110 and 112 - Project Location

- Over 32,000 linear feet of new pipeline installed through Woburn, Reading, Wakefield and Stoneham.
- 13,200 LF of 48-inch diameter DI pipe on 7067 project.
- Pipeline portion was completed last week.
- Substantial Completion June 2020



Crossing Montvale Avenue

Pond Street – Assembling Pipe

Ledge Requiring Blasting

- Drilling, Dynamite & Blasting

South Street

Overlay Paving And Restoration - Stoneham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