





***FY18 Proposed
Capital Improvement Budget***

December 14, 2016



FY18 Proposed CIP

- Last year of five-year capital spending Cap
- FY18 Proposed CIP complies with the Cap requirements
- Focus on Asset Protection and Long-Term Redundancy
- Metropolitan Tunnel Redundancy
- MWRA continues to reduce debt levels



FY18 Proposed CIP - FY14-18 Base-Line Cap

FY14-18 Base-Line Cap		FY14	FY15	FY16	FY17	FY18	Total FY14-18
	Projected Expenditures	\$142.5	\$147.6	\$149.3	\$141.8	\$136.8	\$718.0
Contingency	7.6	9.5	10.1	9.8	9.3	46.1	
Inflation on Unawarded Construction	0.8	4.2	8.4	11.1	13.5	37.9	
Less: Chicopee Valley Aqueduct Projects	(5.0)	(2.2)	(1.4)	(1.3)	(0.4)	(10.3)	
FY14-18 Base-Line Cap	\$145.8	\$159.1	\$166.4	\$161.3	\$159.1	\$791.7	

FY18 Proposed		FY14	FY15	FY16	FY17	FY18	Total FY14-18
	Projected Expenditures	\$102.2	\$103.6	\$95.1	\$142.9	\$169.5	\$613.3
Contingency	0.0	0.0	0.0	7.6	9.8	17.4	
Inflation on Unawarded Construction	0.0	0.0	0.0	0.0	0.0	0.0	
Less: I/I Program	0.0	(17.5)	(13.6)	(18.8)	(19.0)	(69.0)	
Less: Water Loan Program	0.0	1.4	5.3	(3.3)	(7.5)	(4.0)	
Less: Chicopee Valley Aqueduct Projects	(5.6)	(1.2)	(0.4)	(0.1)	(0.7)	(8.0)	
FY18 Proposed FY14-18 Spending	\$96.6	\$86.3	\$86.4	\$128.2	\$152.2	\$549.7	

FY18 Proposed vs. FY14-18 Base-Line Cap		FY14	FY15	FY16	FY17	FY18	Total FY14-18
	Projected Expenditures	(\$40.3)	(\$43.9)	(\$54.2)	\$1.1	\$32.7	(\$104.7)
Contingency	(7.6)	(9.5)	(10.1)	(2.2)	0.6	(28.7)	
Inflation on Unawarded Construction	(0.8)	(4.2)	(8.4)	(11.1)	(13.5)	(37.9)	
Less: I/I Program	0.0	(17.5)	(13.6)	(18.8)	(19.0)	(69.0)	
Less: Water Loan Program	0.0	1.4	5.3	(3.3)	(7.5)	(4.0)	
Less: Chicopee Valley Aqueduct Projects	(0.6)	0.9	1.0	1.2	(0.2)	2.3	
FY14-18 Cap (\$ Change)	(\$49.2)	(\$72.7)	(\$80.0)	(\$33.1)	(\$7.0)	(\$242.0)	



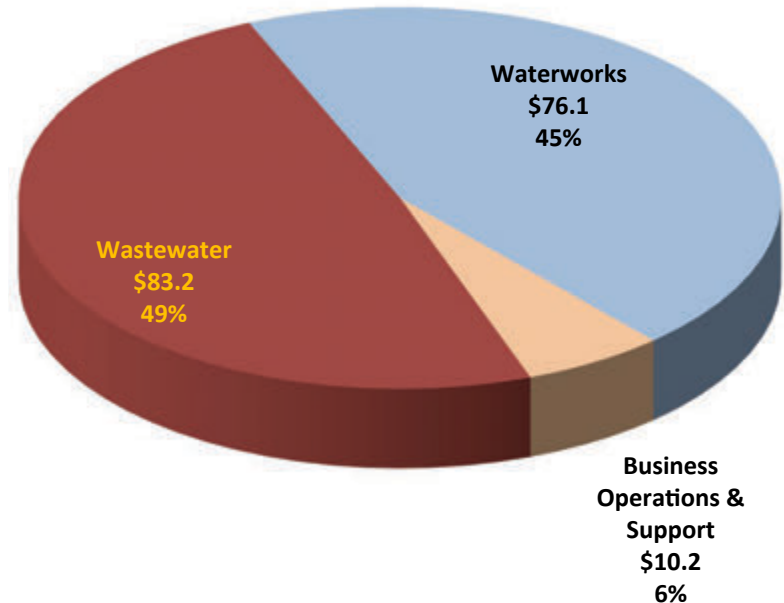
FY18 Proposed CIP

- Proposed Expenditures: \$169.5M
- Proposed Contract Awards: \$203M



FY18 Proposed CIP – Proposed FY18 Expenditures

- Total Proposed FY18 Expenditures: \$169.5 million
 - Wastewater: \$83.2 million
 - Waterworks: \$76.1 million
 - Business and Operations: \$10.2 million





FY18 Proposed CIP – Future CIP Spending and Planning Projections

	FY17 Final Remaining Balance	FY18 Proposed Remaining Balance	\$ Change	% Change
Total Wastewater	\$ 1,216.6	\$ 1,241.2	\$ 24.6	2.0%
Total Waterworks	\$ 1,867.9	\$ 2,027.5	\$ 159.6	8.5%
Business & Operations Support	\$ 45.6	\$ 38.8	\$ (6.8)	-14.9%
Total MWRA	\$ 3,130.2	\$ 3,307.4	\$ 177.2	5.7%

- \$3.3 billion in future CIP spending beginning in FY17
- \$122.5 million in new projects in FY18 Proposed CIP
- \$54.8 million for schedule changes and revised cost estimates



FY18 Proposed CIP – New Projects

Total New Projects Added in FY18: \$122.5 million

- Waterworks: \$85.1 million
- Wastewater: \$37.4 million



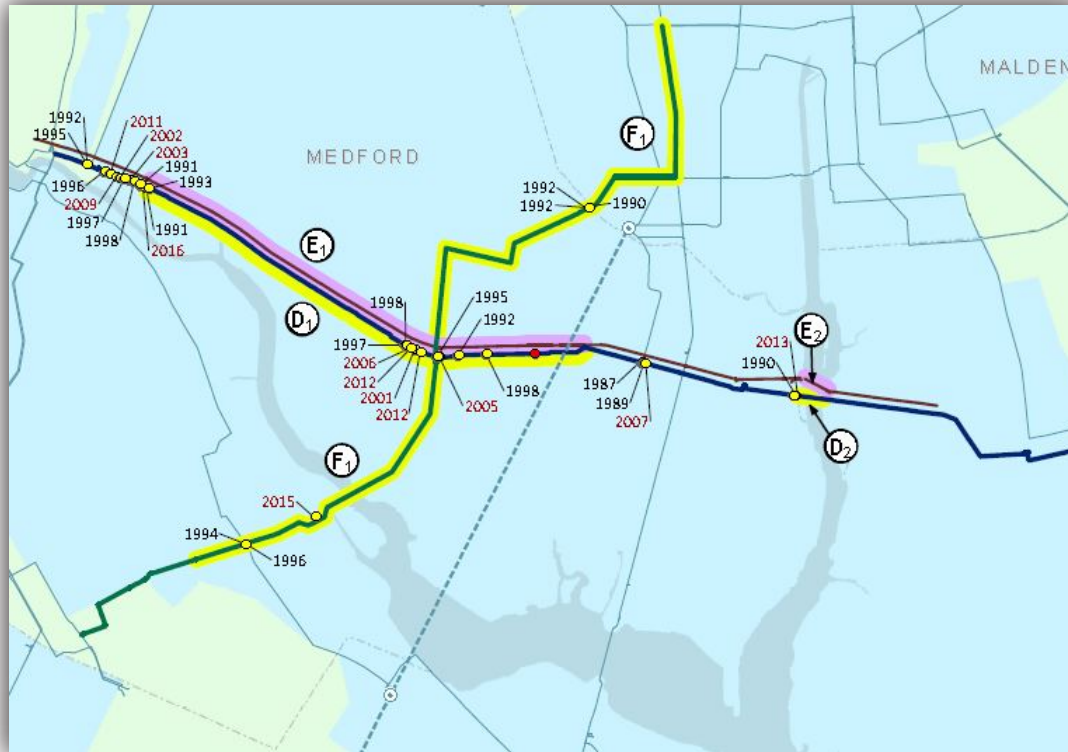
FY18 Proposed CIP – Top New Projects

Section 50 & 57 Water Pipeline and Sections 19/20/21 Sewer Rehabilitation:	\$22.3 million
Chestnut Hill Emergency Pump Station Improvements	\$18.3 million
Quabbin Administration Building Rehabilitation	\$15 million
Nut Island Headworks Odor Control and HVAC Improvements	\$10 million
Tops of Shafts Interim Improvements Construction	\$6.1 million



FY18 Proposed CIP – Top New Projects

- Section 50 & 57 Water Pipeline and Sections 19/20/21 Sewer Rehabilitation: \$22.3 million





FY18 Proposed CIP – Top New Projects

- Chestnut Hill Emergency Pump Station Improvements: \$18.3 million





FY18 Proposed CIP – Top New Projects

- Quabbin Administration Building Rehabilitation: \$15 million





FY18 Proposed CIP – Top New Projects

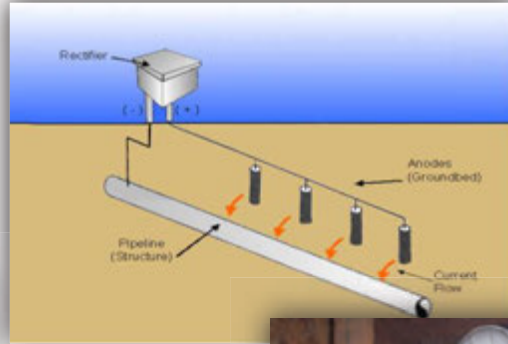
- Nut Island Headworks Odor Control and HVAC Improvements: \$10 million





FY18 Proposed CIP – Top New Projects

- Tops of Shafts Interim Improvements Construction: \$6.1 million





FY18 Proposed CIP – Change from Court-Ordered Mandates to Asset Protection and Water Redundancy

CIP Category	FY09-13	FY14-18	FY19-23
Asset Protection	30.1%	51.2%	62.5%
Carroll WTP	4.7%	2.0%	0.4%
Water Redundancy	16.3%	20.1%	28.1%
CSO	38.2%	10.8%	0.4%
Other	10.7%	15.9%	8.6%
Total	100.0%	100.0%	100.0%

- Substantial completion of court-ordered CSO program
- Asset Protection and Redundancy are the principal drivers of future capital expenditures



Asset Protection and Water Redundancy

- Preserve the condition of assets
 - Asset Protection in CIP
 - Day to Day Maintenance in CEB



FY18 Proposed CIP – Top Construction Projects (\$ in 000s)

Project	Subphase	FY18 Proposed Spending
Facility Asset Protection	Chelsea Creek Headworks Upgrades	\$18,215
Cosgrove Tunnel Redundancy	Wachusett Aqueduct Pump Station	\$15,896
NIH Redundancy & Storage	Section 89 & 29 Redundancy Phase 1C and Phase 2.	\$15,448
SEH Redundancy & Storage	Redundancy Pipeline Section 111 Phase 1, 2 and 3	\$13,146
Facility Asset Protection	Alewife Brook Pump Stn Rehab	\$5,795
DI Treatment Plant Asset Protection	HVAC Equipment Replacement	\$4,978
DI Treatment Plant Asset Protection	NMPS & WTF Butterfly Valve Replacement	\$3,499
DI Treatment Plant Asset Protection	WTF VFD Replacement	\$3,085
Total		\$80,062
% of Total FY 18 proposed MWRA Spending		47.2%



FY18 Proposed CIP – FY18 Top Spenders – Asset Protection

Alewife Brook Pump Station Rehabilitation

FY18 Budget: \$5.8M

Total Contract: \$12.6M

NTP: January 2016

SC: May 2018





Chelsea Creek Headworks Upgrades



\$18.2M

: \$72.9M

er 2016

r 2020



FY18 Proposed CIP – FY18 Top Spenders – Asset Protection

Deer Island Treatment Plant: Top 3 Spenders FY 18 Budget: \$12.6M

- HVAC Equipment Replacement
 - FY 18 Budget: \$5.0M
 - Total Contract: \$29.5M
 - NTP: April 2017
 - SC: August 2020
- North Main Pump Station and Winthrop Terminal Butterfly Valve Replacement
 - FY 18 Budget: \$3.5M
 - Total Contract: \$17.5M
 - NTP: June 2014
 - SC: June 2017
- Winthrop Terminal VFD Replacement
 - FY 18 Budget: \$3.1M
 - Total Contract: \$11.9M
 - NTP: June 2016
 - SC: March 2020





FY18 CIP – FY18 Top Spenders - Redundancy

Wachusett Aqueduct Pump Station:

FY 18 Budget : \$15.9M

Total Contract: \$53.0M

NTP: March 2016

SC: February 2019





FY18 CIP – FY18 Top Spenders - Redundancy

- Northern Intermediate High
Section 89 & 29 Redundancy:
FY 18 Budget: \$15.5M
NTP: December 2016
SC: December 2019





FY18 CIP – FY18 Top Spenders - Redundancy

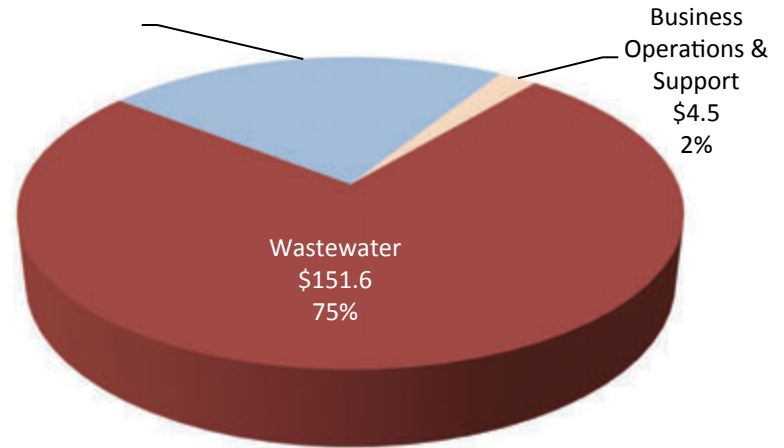
- Southern Extra High
Section 111 Redundancy:
FY 18 Budget: \$13.1M
NTP: July 2016
SC: November 2019





FY18 Proposed CIP – Proposed FY18 Contract Awards

- 49 FY18 Contract Awards
- Total Contract Value: \$203.5 million
 - Wastewater: \$151.7 million
 - Waterworks: \$47.3 million
 - Business and Operations:
\$4.5 million



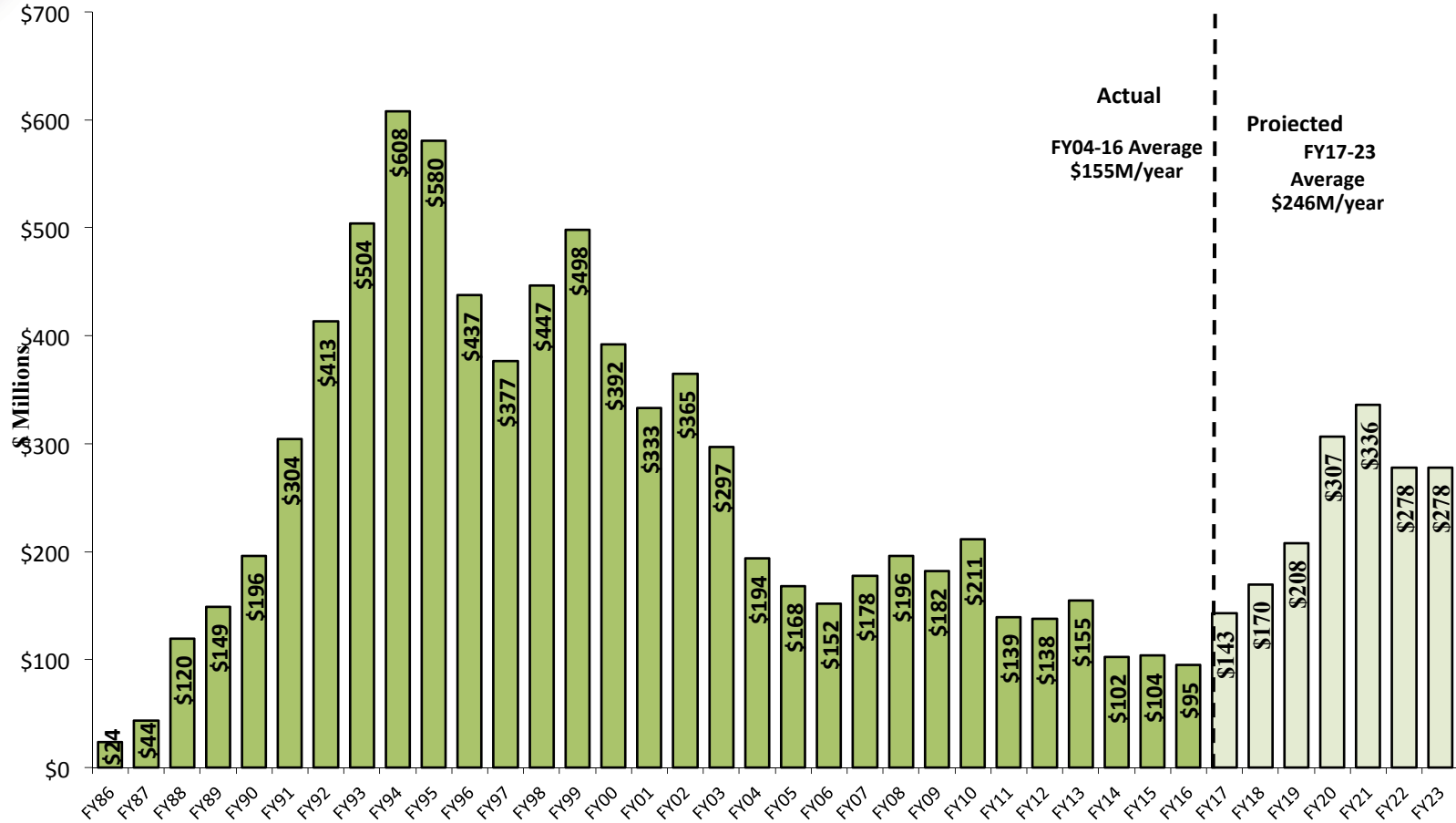


FY18 Proposed CIP - Projected Contract Awards (\$'s in millions)

Project	Subphase	Anticipated Contract Amount
DI Treatment Plant Asset Protection	Clarifier Rehabilitation Phase 2 - Construction	\$80.0
DI Treatment Plant Asset Protection	Gravity Thickener Rehabilitation	\$14.5
Metropolitan Redundancy Interim Improvements	Metropolitan Redundancy Interim Design Construction Administration/ Resident Inspection	\$10.4
DI Treatment Plant Asset Protection	Switchgear Replacement - Construction	\$8.0
Metropolitan Tunnel Redundancy	Conceptual Design Environmental Impact Report	\$7.5
Wastewater Central Monitoring	Wastewater Supervisory Control and Data Acquisition System (SCADA)/ Program Logic Controller (PLC) Upgrades	\$7.0
Northern Low Service Rehab Section 8	Sec 57 Water & 21/20/19 Sewer Design/Engineering Services During Construction/Resident Inspection	\$4.8
DI Treatment Plant Asset Protection	Future South System Pump Station Variable Frequency Drives Replacements - Design	\$4.8
Application Improvements Program	Enterprise Content Management	\$4.0
Winsor Station Pipeline Improvements	Winsor Power Station Final Design/Construction Administration/Resident Inspection	\$3.6
Top Ten Awards for FY18		\$144.6
49 Contract Awards Planned for FY18		\$203.5

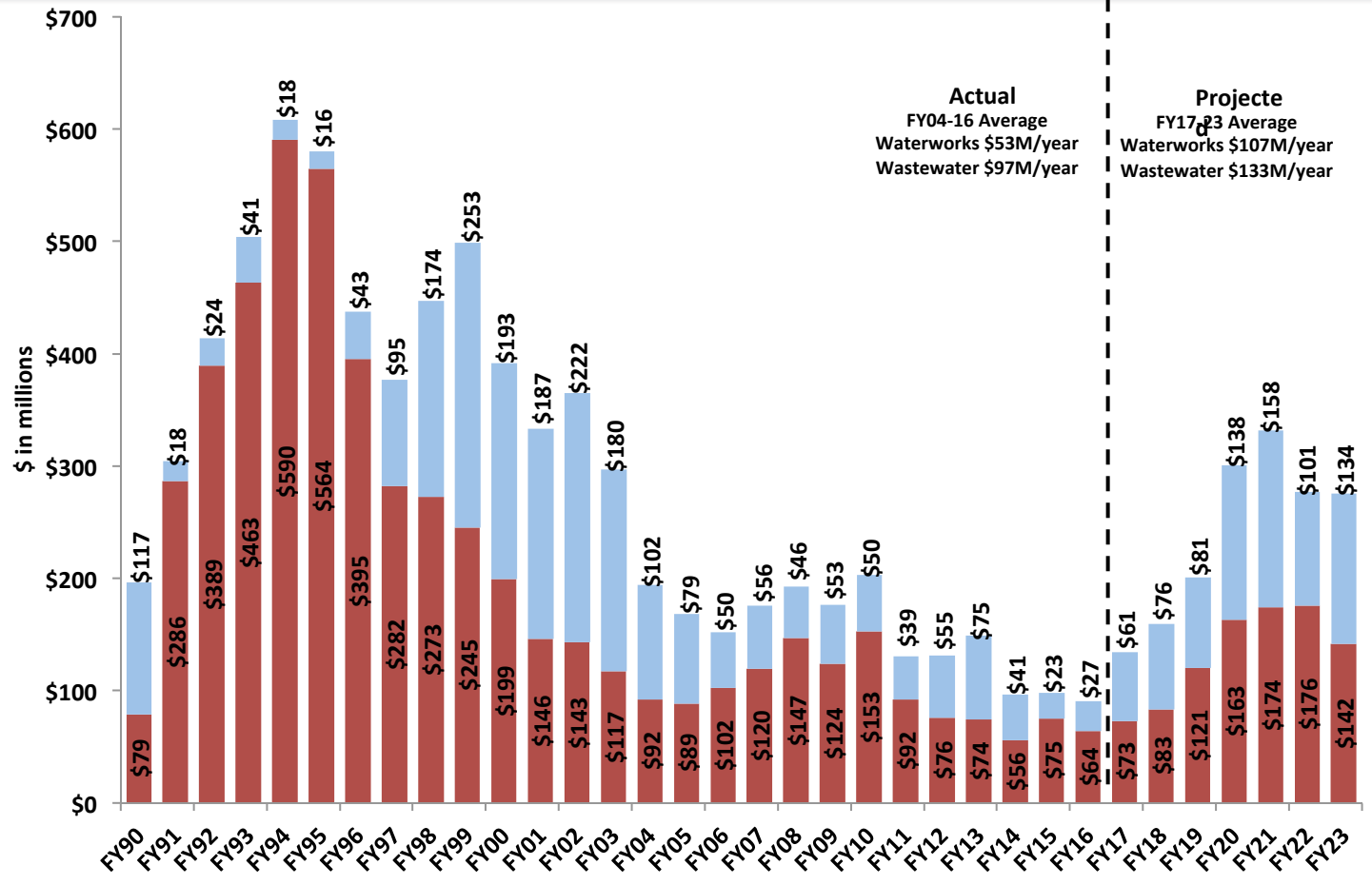


Historic and Projected Capital Improvement Spending



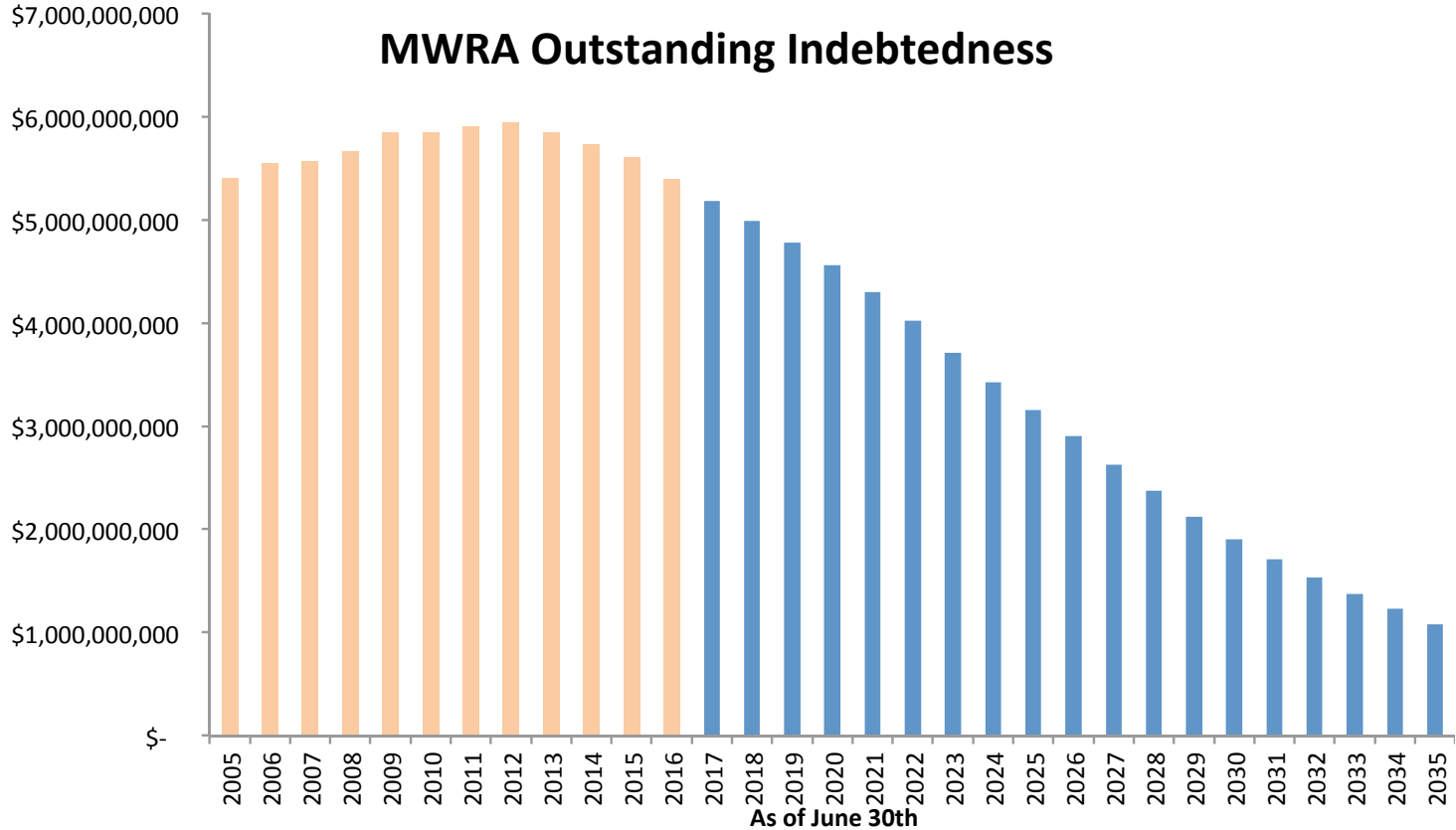


Historic and Projected Capital Improvement Spending by Utility



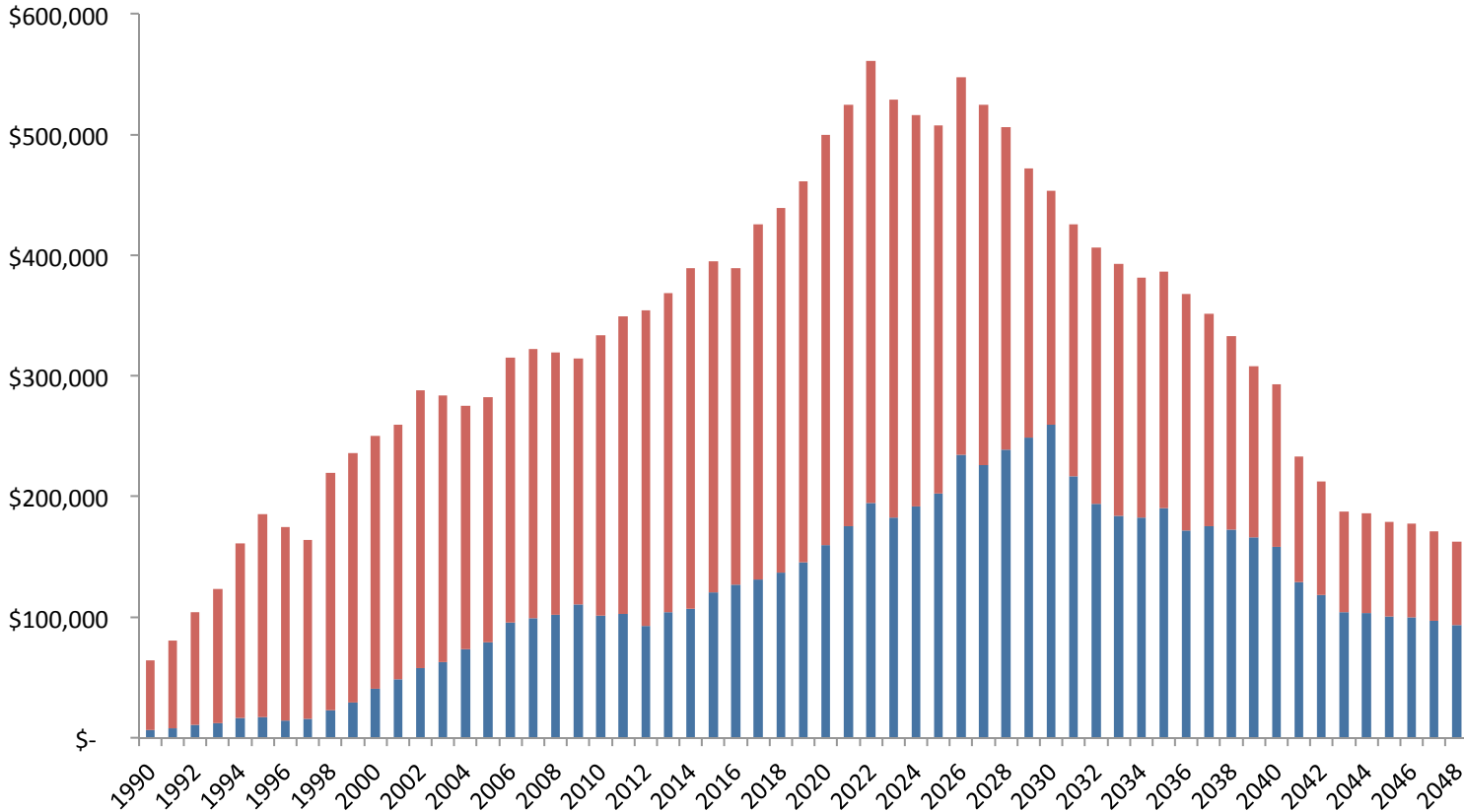


Level of MWRA Indebtedness





Debt Service by Utility





Looking Ahead – FY19 CIP

- FY 19-23 is the next five-year CIP Cap period
- Master Plan Development
- Metropolitan Tunnel Redundancy



Next Steps

- Work with the Advisory Board
- Finalize FY18 CIP
- Submit FY18 Final CIP to Board of Directors for approval in June 2017



FY18 Proposed CIP



Thank You





***Sewer Sections 4, 5, 6, and 186 Study
Contract 7423***

December 14, 2016



Services to be Provided

- Manned pipeline inspection, core samples
- Multisensor/ 3D Inspection
- Manhole Inspections
- Traffic and Environmental Assessments
- Hydraulic Capacity and Corrosivity
- Final Report outlining rehabilitation needs and recommended plan for rehabilitation including limits of work, flow handling, access points, costs



Procurement Process

- 1 Step RFQP
- 2 Proposals
- Selection Committee Recommends Hazen and Sawyer, P.C.
- \$1,213,973.97
- December 2016 – March 2018



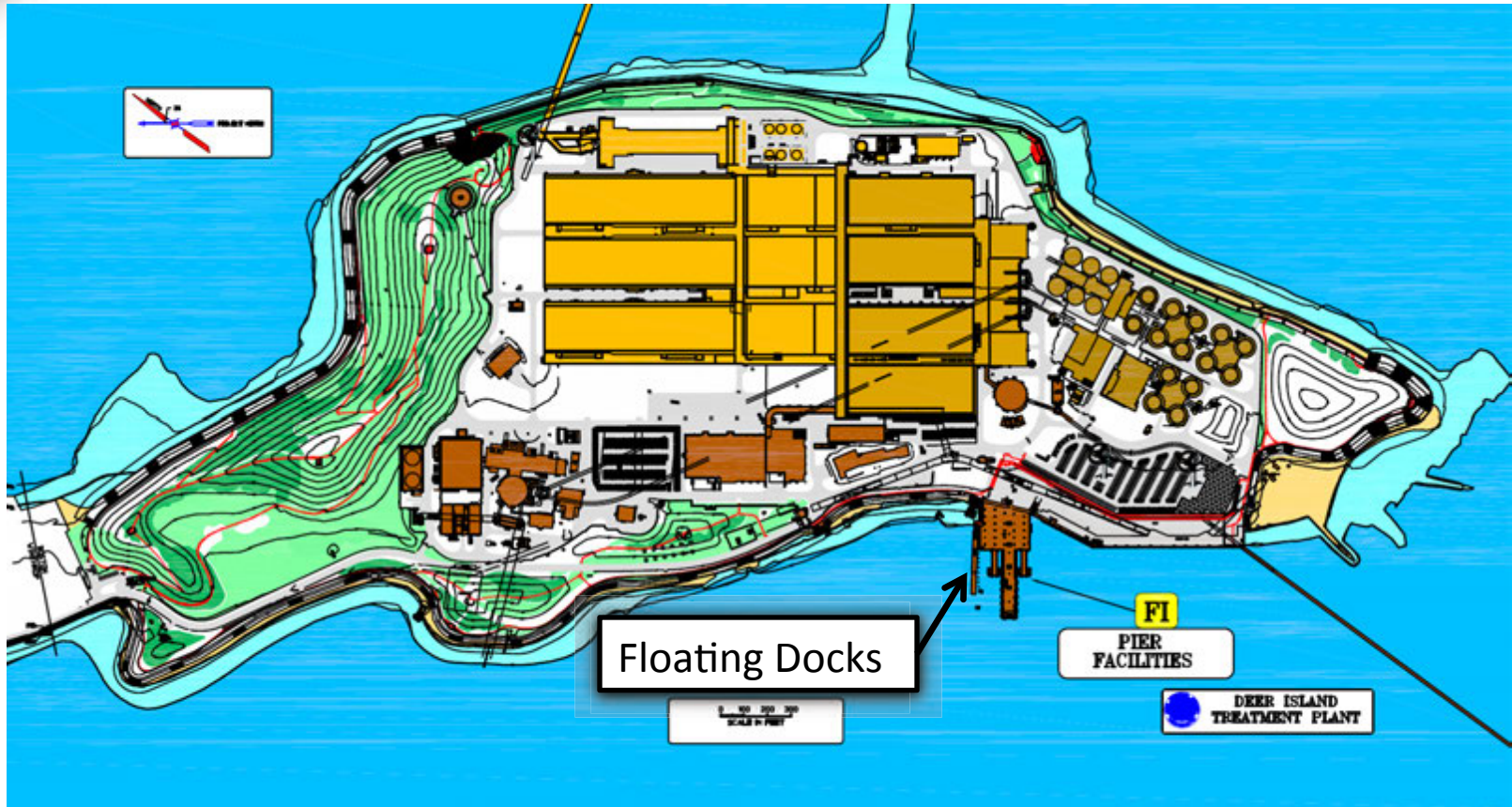


***Deer Island Personnel Dock Rehabilitation
Contract 7168***

December 14, 2016



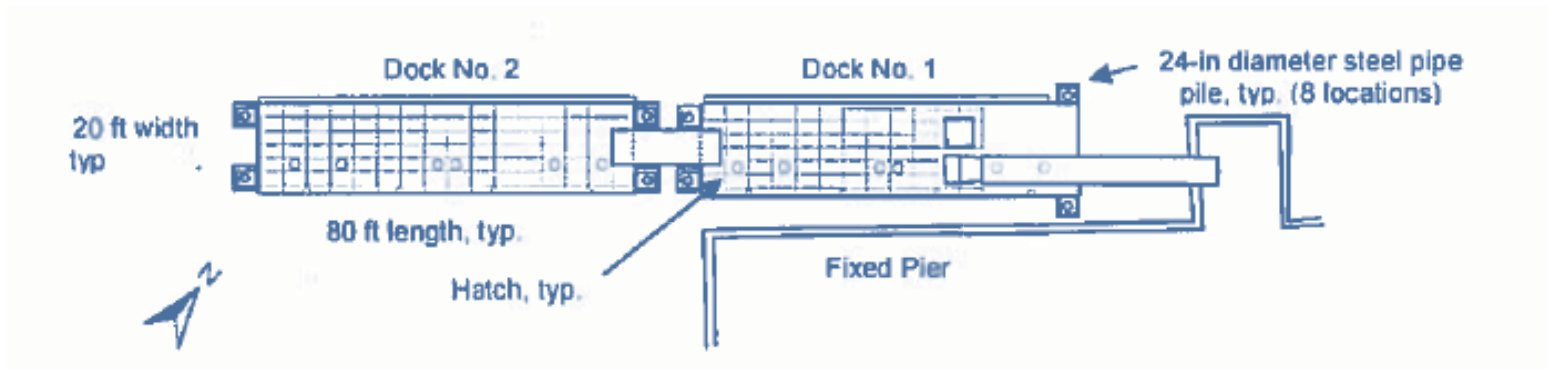
Personnel Dock Location





Overview of the Floating Docks

- Originally 3 Floating Docks were in service during the Boston Harbor Clean-up and used to dock ferries transporting construction staff to/from Deer Island
- Currently 2 Floating Docks are in service used to dock Coast Guard boats, Spill Response, MWRA boats for Laboratory Staff use and Public Tour Ferries
- Temporary repairs occurred in the Summer of 2015 to patch holes on the deck





Floating Personnel Docks





Public Tour Ferry Docked



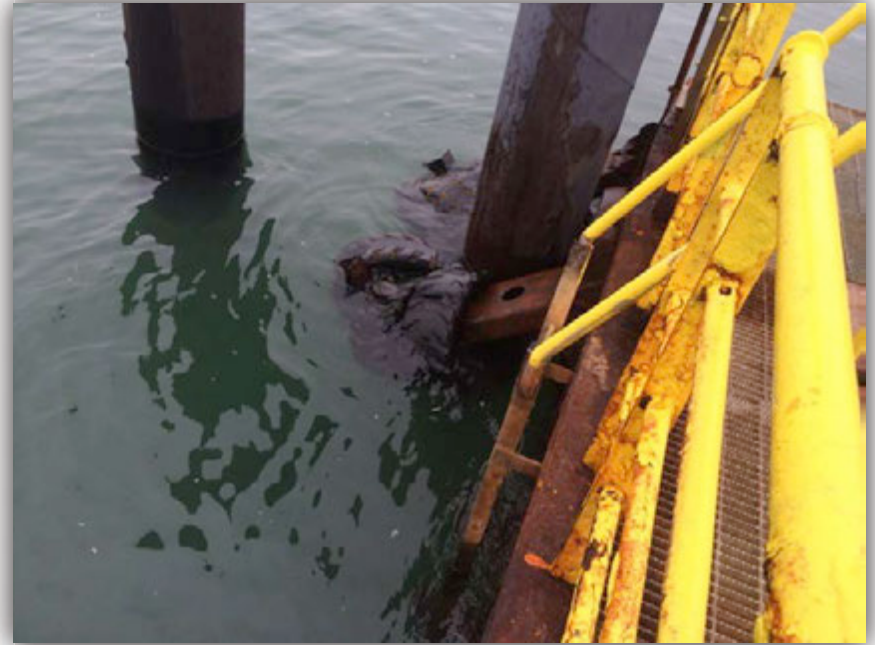
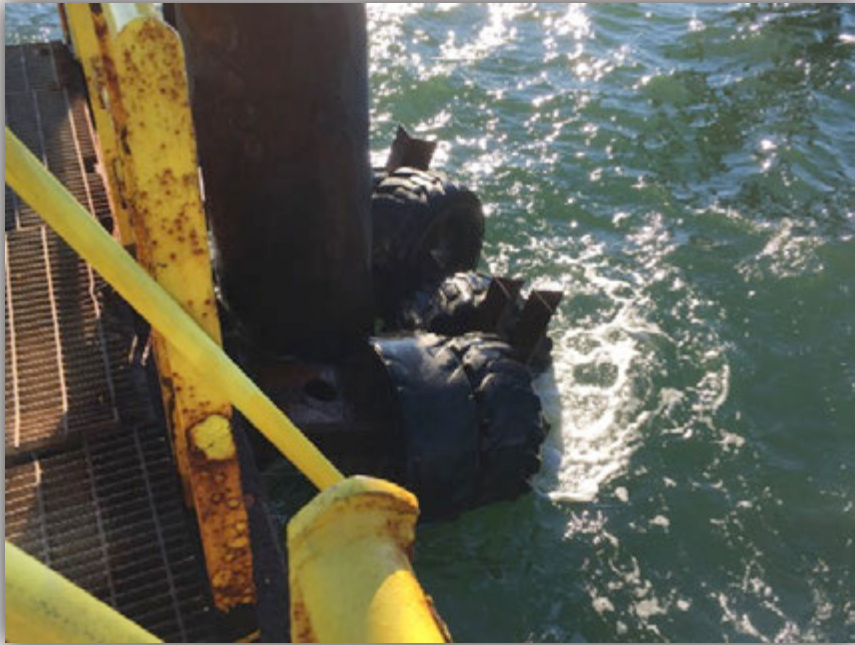


Overview Issues

- Floating docks are steel constructed with six air tight compartments. The deck is topped by a galvanized steel grating used as a walkway and includes handrails
- Due to the severe conditions the following issues have developed over time:
 - Severe deterioration of the steel deck and handrails
 - Steel collars attaching the docks to the pile guide are approaching failure



Steel Collar





Deck



Prior to summer of 2015 repair



Deck





Scope of Work

- Cost of the project is \$1,294,524.00
- Scope of work consist of:
 - Pressure wash, sand blast and coat the hull and deck
 - Replace hull and deck steel as determined by ultrasonic testing.
 - Replace the following: steel collars, handrails, walkway grating, rubber fender, hatches to compartments, gangway rails and light
 - Coat the existing pile guides
 - Replacement of flap gates nos. 9 and 10
 - Work to occur Jan-May 2017



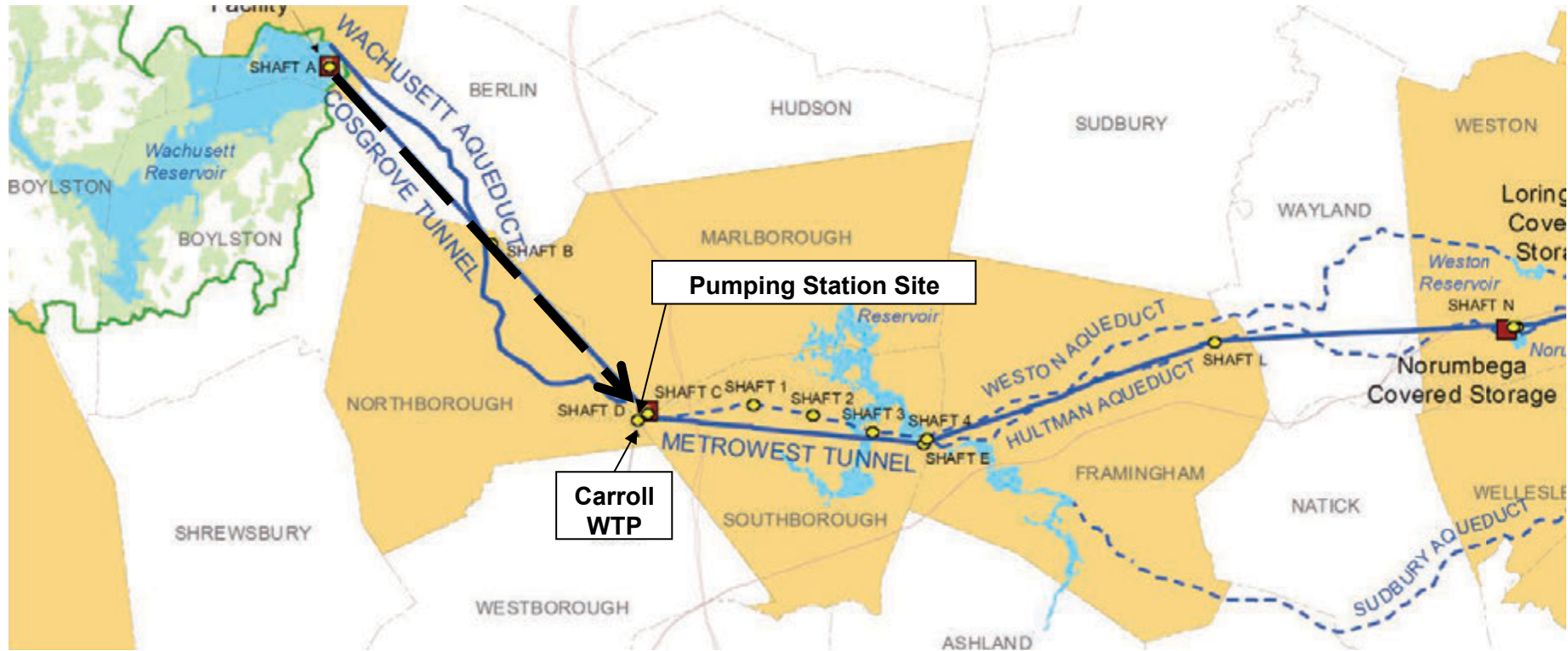


***Wachusett Aqueduct Pumping Station
Contract 7156, Amendment 3***

December 14, 2016



Wachusett Aqueduct Pumping Station Location Plan





Wachusett Aqueduct Pumping Station





Wachusett Aqueduct Pumping Station Construction

- Pumping station construction is on-going





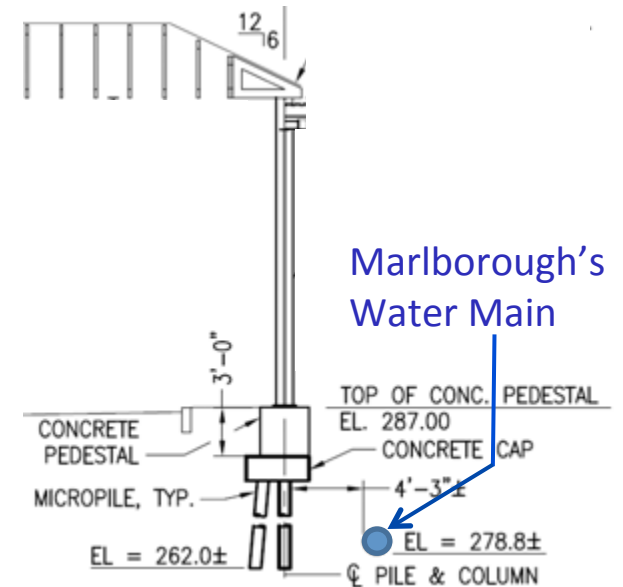
John J. Carroll Water Treatment Plant Guard House





Amendment 3 – New Work Includes:

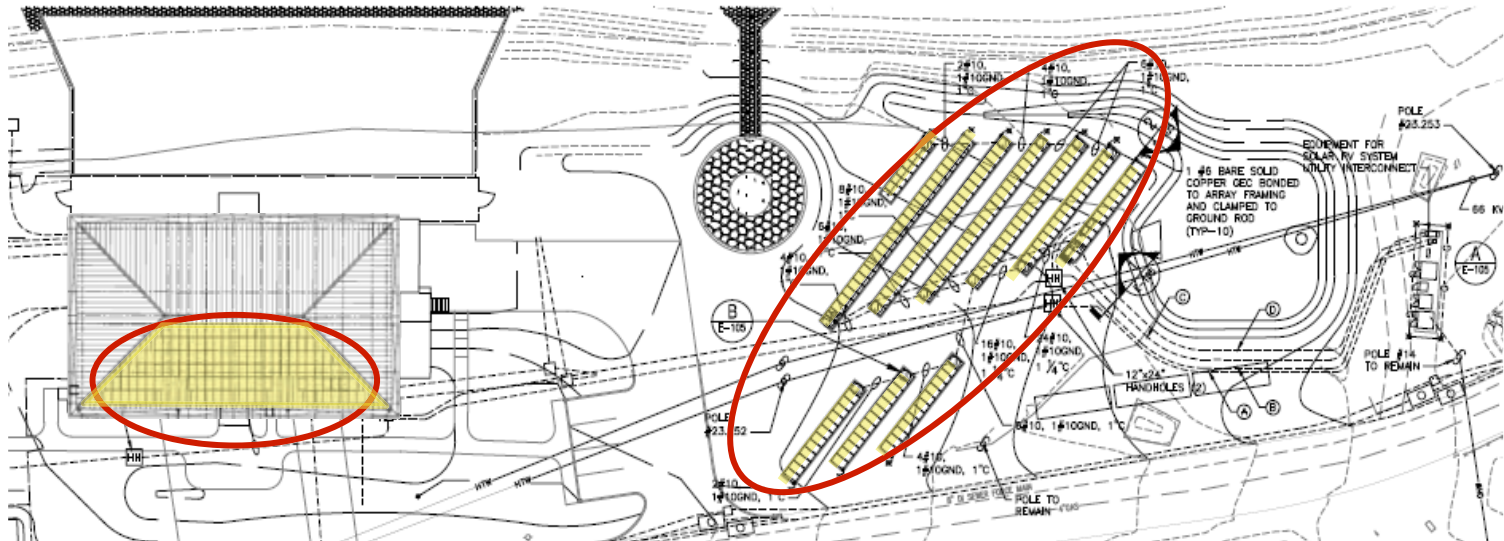
- Change from secant pile to sheet pile support of excavation resulted in a credit, but required additional engineering time to evaluate and monitor installation
- Front gate canopy design changes were required by the City of Marlborough to provide additional protection to the City's water main





Amendment 3 – New Work Includes:

- Change to photovoltaic system switchgear design was required by National Grid
- Power will now be used by the John J. Carroll Water Treatment Plant and will not be exported
- Review and additional permitting for soil disposal on Carroll Plant site
- Slab design review and changes due to H-pile alignment
- Pipe gallery dehumidification improvements





Amendment 3 – New Work Summary

Change in Support of Excavation	\$161,110
Change to the Carroll WTP Front Gate Canopy	\$115,715
Change to the Photovoltaic System	\$21,487
Other Changes: <ul style="list-style-type: none">• Soil disposal• Slab design for H-piles• Pipe gallery dehumidification	\$51,430
Total	\$349,742

Saved \$1.1 m in construction and six months





***Wachusett Aqueduct Pumping Station
Contract 7157, Change Order 5***

December 14, 2016



Change Order No. 5 - Front Entrance Modifications



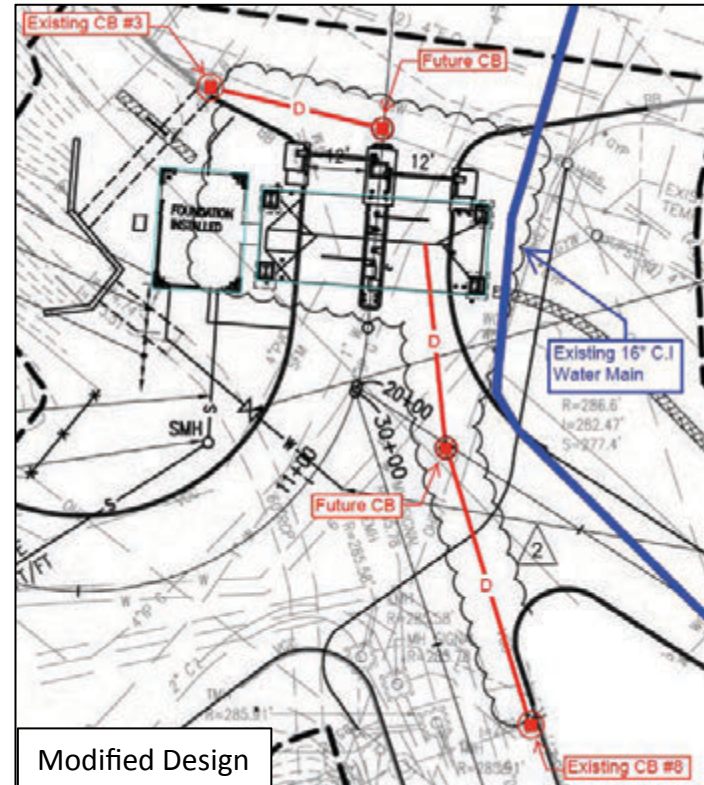
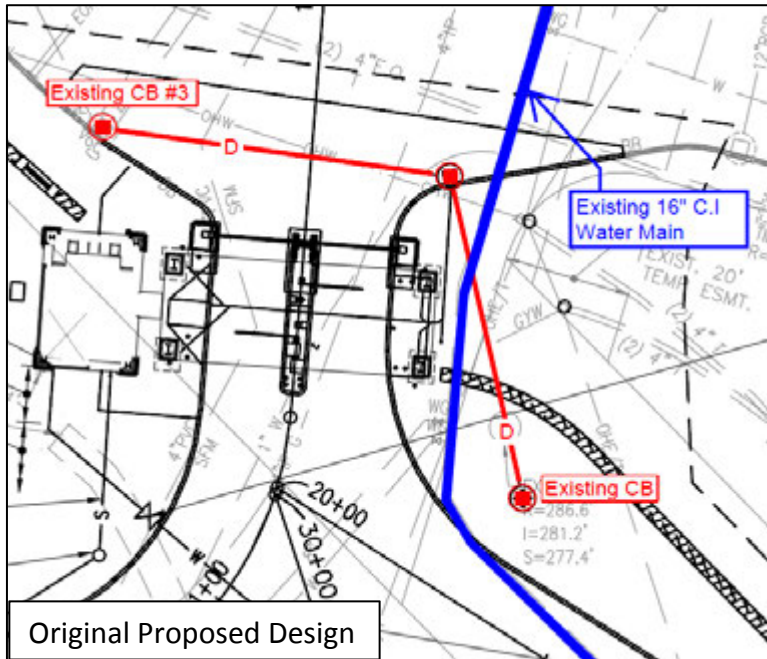


Front Entrance Design Mitigation

- Redesign of Canopy Footings adjacent to the water main
- Vacuum Extraction for concrete pedestals and Concrete Cap
- Micro Piles
- Redesign of drainage to eliminate water main crossing
- Redesign of Verizon duct bank from underground to overhead
- Construction during low demand periods starting in March 2017

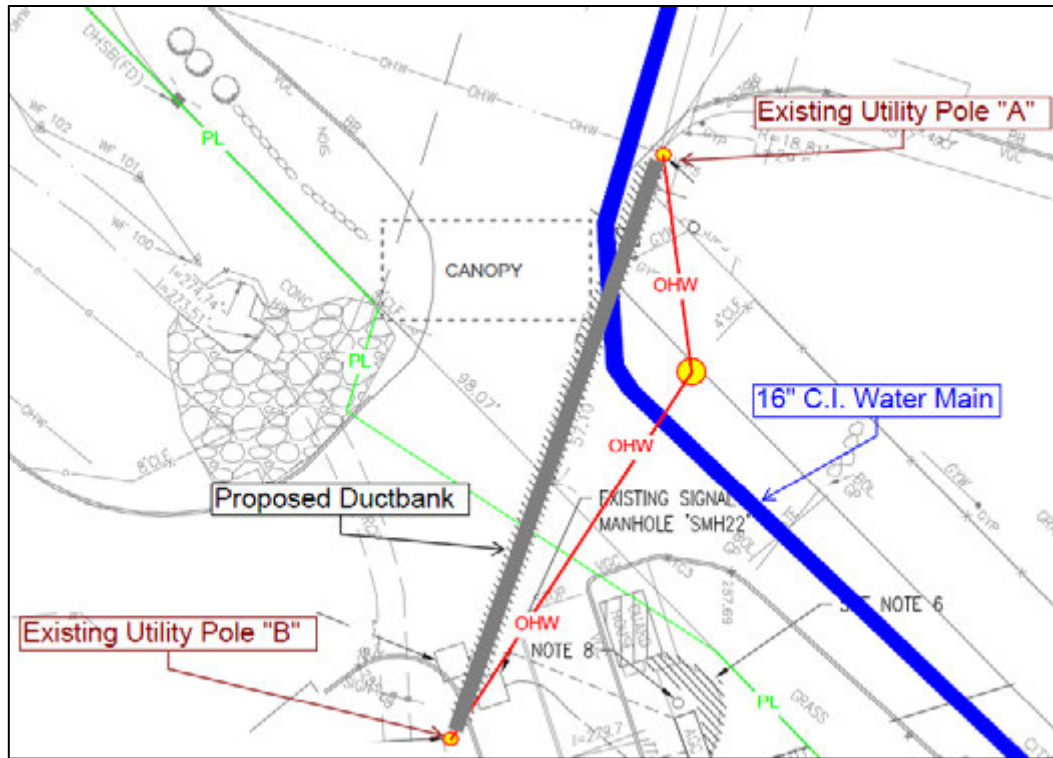


Change to the Proposed Drainage



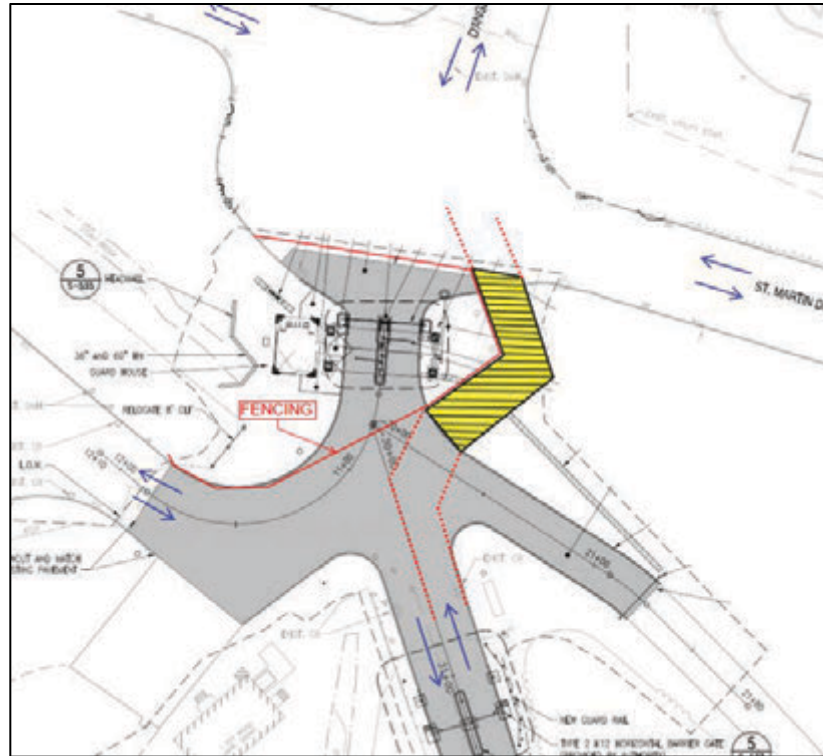


Verizon Duct Bank Elimination





Winter Access Driveway





Change Order No. 5 – New Work Summary

Micro Piles	\$257,892
Change to the Proposed Drainage	\$41,465
Winter Access Driveway	\$37,521
Verizon Duct Bank Elimination	(\$8,839)
Total	\$328,039





***MWRA's Climate Change Strategy:
Adapting to the Impacts of Climate Change
and Sea Level Rise***

December 14, 2016



Water System Not Threatened

- All MWRA dams, dikes, spillways and appurtenances are inspected routinely by licensed dam safety engineers and are in good condition
- Since 2006, MWRA has spent over \$21 million on dam safety projects
- Quabbin and Wachusett spillways have been improved to be able to discharge the probable maximum flood (1 in 1000 years)
- All drinking water pump stations and storage tanks above flooding elevation



Examples of Dam Improvements: Wachusett Spillway



Wachusett Spillway capacity increased by lowering it 2 feet



Examples of Dam Improvements: Wachusett New Crest Gate



Installation of a crest gate greatly enhances discharge operations



Examples of Dam Improvements: Wachusett Auxiliary Spillway



New Wachusett Auxiliary Spillway constructed to pass flood discharge

MWRA COASTAL FACILITIES



Legend

- FEMA 100YR Flood Zone
- MWRA Facilities
 - Administration
 - Sewer
 - Water



Benchmarks For Evaluating Facilities

- 100 year flood as determined by FEMA (current regulatory requirement)
- 100 year flood + 2.5ft (NYC DEP, BHA)
- Hurricane flooding levels as determined by FEMA's SLOSH model (current evacuation planning recommendation) were reviewed
- Wave action (for facilities adjacent to FEMA Hazard Zone VE) was reviewed



How Do Facilities Measure Up?

	Rank	Facility Name	Mitigation Actions Comments
Likely Affected By 100 Yr Storm	1	PELLETIZING PLANT	Barrier around backup generator and transformers erected. (*)
	2	HOUGHS NECK PUMP STATION	Stop plank barriers installed in entryways. (*)
	3	SQUANTUM PUMP STATION	Stop plank barriers installed in entryways. (*)
	4	ALFORD ST FACILITY	Sand bags will be used for flood protection. Future work under review.
	5	QUINCY PUMP STATION	Stop plank barriers installed in entryways. (*)
	6	CHELSEA CREEK SCREENHOUSE	Installed retaining wall to protect generator and main power panel; stop log barriers at all doors and roll-up doors; sump pumps inside building; two isolation gates to protect facility; raised ventilation louver above required elevation; ded panels to protect all windows to required elevation; all new electrical installed above required elevation where feasible
	7	BRAINTREE-WEYMOUTH PUMP STATION	Stop plank barriers installed in entryways. (*)
	8	SOUTH BOSTON CSO TUNNEL VENTILATION BLDG	Flood protection plan drafted, flood protection specs designed, requisition for materials purchase submitted.
Likely Affected By Storm Within 1 ft below a 100 Yr Storm	9	SOUTH BOSTON CSO PUMP STATION	Flood protection design specs from vendor being reviewed in-house.
	10	CHARLESTOWN NAVY YARD FACILITY	MIS equipment and staff moved to upper floors.
	11	ALEWIFE BROOK PUMP STATION	Contractor installing flood protection system. Moving most critical equipment above flood level.
	12	CHELSEA CREEK HEADWORKS	Construction contract in progress to add stop log barriers at all doors including overhead coiling doors. Openings in façade being filled and moved above EL 119. Escape hatches, loading hatch and shaft opening being protected to EL 119. Valves being added to ductwork on mezzanine to isolate shafts upstream of influent gates.
	13	UNION PARK DETENTION & TREATMENT FACILITY	Operating Contractor designing specs which call for using sand bags at entry ways and isolating facility if required.
Likely Affected By a 100yr+2.5ft	14	MYSTIC RIVER GATEHOUSE	No adverse impact if flooded.
	15	CHELSEA ADMINISTRATION FACILITY	Flood protection plan drafted, flood protection specs designed, material specs out on street for quote Flood protection design specs from Vendor being reviewed in-house and modified due to requirement changes.
	16	CHELSEA MAINTENANCE FACILITY	Flood protection plan drafted, flood protection specs designed, material specs out on street for quote Flood protection design specs from Vendor being reviewed in-house and modified due to requirement changes.
Likely Affected By a	17	DEER ISLAND TREATMENT FACILITY	Plant processes designed to withstand a Category 3 Hurricane to allow uninterrupted facility operation. Some support facilities and access may be impacted.
	18	WIGGINS PUMP STATION	Will include flood plain protection in upcoming capital replacement project.
	19	COTTAGE FARM CSO FACILITY	
Very Unlikely To be Affected	20	DELAURI PUMP STATION	
	21	CARUSO PUMP STATION	
	22	PRISON POINT CSO FACILITY	
	23	SOMERVILLE MARGINAL CSO FACILITY	
	24	COLUMBUS PARK HEADWORKS	
	25	SOMERVILLE SAMPLING BUILDING	
	26	WARD STREET HEADWORKS	
	27	INTERMEDIATE PUMP STATION	
	28	LITTLE MYSTIC CHANNEL CSO FACILITY	
	29	HINGHAM PUMP STATION	
	30	NUT ISLAND HEADWORKS	

Projects have been prioritized from the top of the chart (most immediate risk) down through the rankings.

* In some cases specifications are being revised due to more recent updates to the FEMA flood maps. Future modifications to protection measures will be made as necessary.



Facilities Impact Summary



- 8 Sewer Facilities Likely Affected by a 100 Year Event
- 4 Sewer and 1 Administration Facilities Within One foot of a 100 Year Event
- 3 Sewer Facilities Affected by 100 plus 2.5 ft Event
- 3 Sewer Facilities Likely Affected by Hurricane Flooding
- 11 Sewer Facilities Unlikely Affected
- **No Water Facility At Risk of Service Disruption**



Flood Elevations At Chelsea Creek Headworks





Braintree-Weymouth Replacement Pump Station High Tide





Chelsea Administration and Maintenance Facilities

FEMA 100 Year Flood Elevation



FEMA 100 Year Flood Elevation + 2.5ft





LiDar Based Simulated Inundation of the Chelsea Area at 100 Year Plus 2.5 Feet Flood Level





Past Practice

- Low-lying facilities are protected with sandbags and pumps
- Mobile generators are deployed in advance of storms
- Increased staffing





Emergency Action Plan

- Back-up water and wastewater operations control center created at Carroll Treatment Plant in Marlborough
- Staff and equipment redeployed to pre-determined locations in advance of storms
- Install temporary flood barriers
- Purchased additional large, portable pumps
- Long-term capital rehabilitations include flood protection



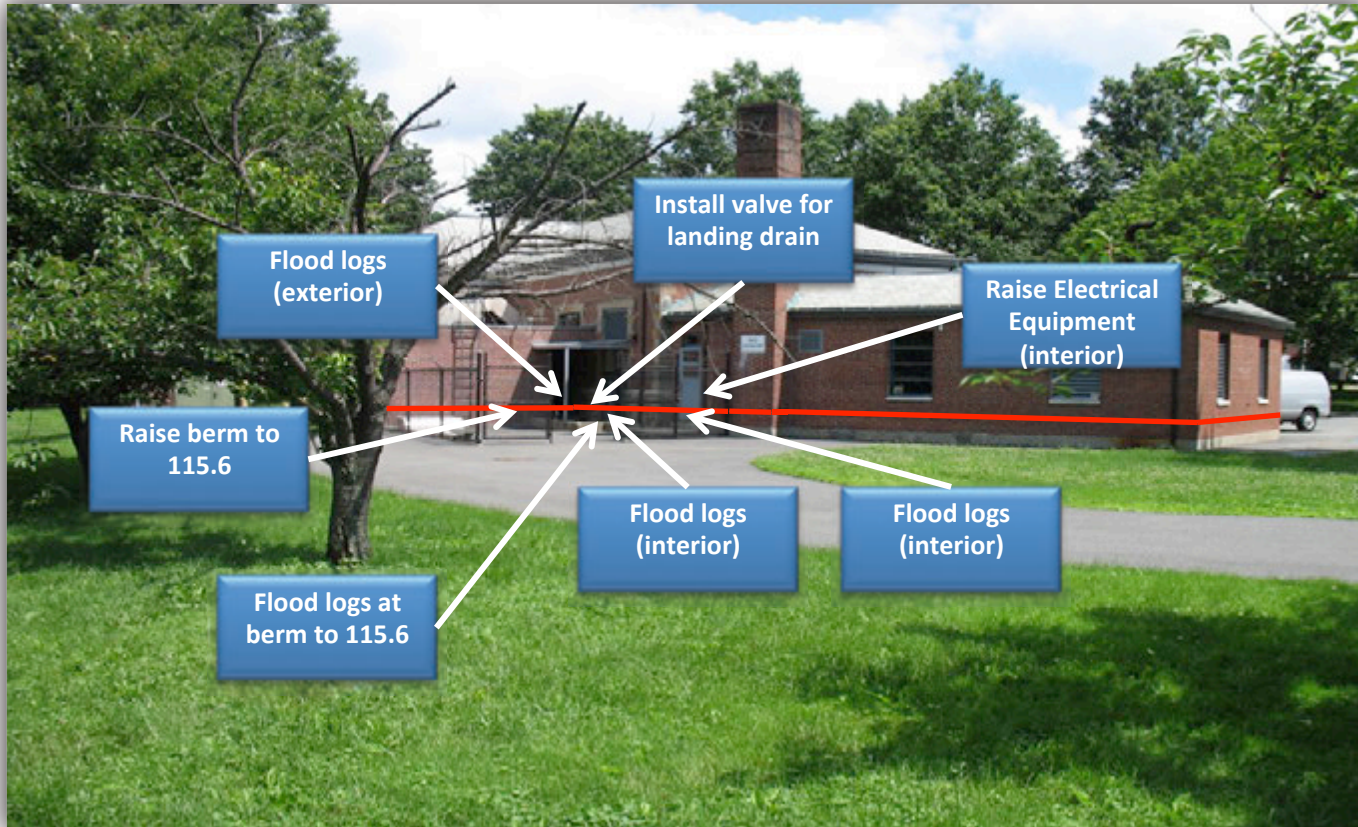


MWRA Approach Going Forward – Long Term

- Will continue to monitor the latest science and predictions
- On average, we rehabilitate our facilities every 15 or 20 years
- Every future rehabilitation contract will take sea level rise into account
- Three significant rehabilitation projects were under design
 - Alewife Brook Pump Station
 - Chelsea Creek Headworks
 - Chelsea Screenhouse
- Amended each design to account for 2.5 feet of sea level rise



Alewife Brook Pump Station – Envelope Flood Protection Measures





Alewife Screen Room





Chelsea Screenhouse Generator





Chelsea Screenhouse MCC room





Chelsea Screenhouse Screen room





MWRA Approach Going Forward – Short Term

- At-risk buildings fitted with temporary flood barriers
- Move electrical/computer equipment off the floor





Chelsea Admin Building SCADA Building





Braintree Weymouth Generator Louvers





Braintree Weymouth Side Entrance





Brantree Weymouth Hatch to Screen room





Quincy Pump Station Pump Room





Squantum Pump Station Main Entrance





Hough's Neck Pump Station Main Entrance





Flood Barrier Stop Plank Storage Cabinet





Big Bag Sand Bag System (Bags on-site)





Flood Panel Barrier (Demo at MWRA)





Tiger Dam (Demo at MWRA)





MegaSecur Watergate





Passive Flood Protection





MWRA is a Partner in the Metro Mayors Climate Mitigation Commitment







DANIEL O'CONNELL'S SONS INC.
MWRA #6899 Deer Island Primary & Secondary Clarifier Rehab
11-30-11 November Progress Photo #28- 449
Secondary Clarifier A-12 Upper South Bay Looking West
TROUTRUN INC. N. ATTLEBORO, MA



DANIEL O'CONNELL'S SONS INC.
MWRA #6899 Deer Island Primary & Secondary Clarifier Rehab
11-30-11 November Progress Photo #28- 455
Secondary Clarifier A-12 Upper South Bay Bull Sprocket
TROUTRUN INC. N. ATTLEBORO, MA



