Massachusetts Water Resources Authority

MWRA Deer Island Treatment Plant Capital Improvement Program

Ethan Wenger

Deputy Director, Deer Island Wastewater Treatment Plant

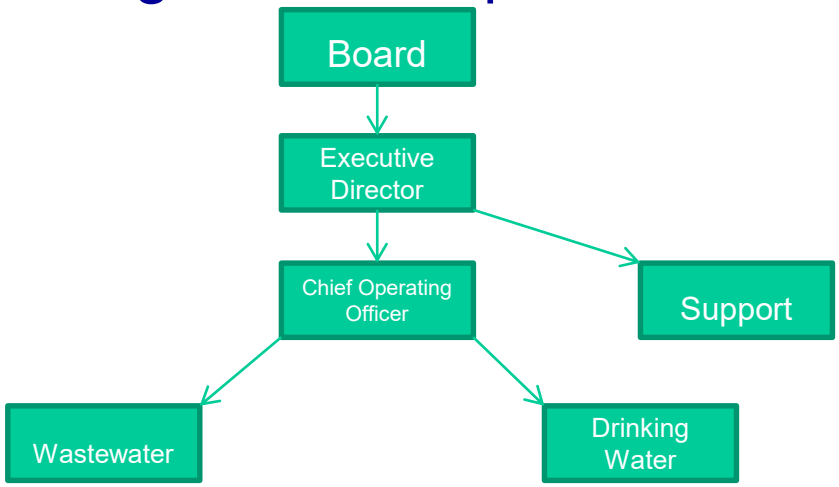
NEWEA 2020

Agenda

- Overview of MWRA and Deer Island
- MWRA's Capital Program
- Deer Island's Construction History
- Asset Management at Deer Island
- Deer Island's Capital Program
- Completed Projects
- Future Projects
- Lessons Learned

MWRA Governance

- 11-member Board of Directors
- Executive Director responsible for entire organization
- Chief Operating Officer responsible for core business



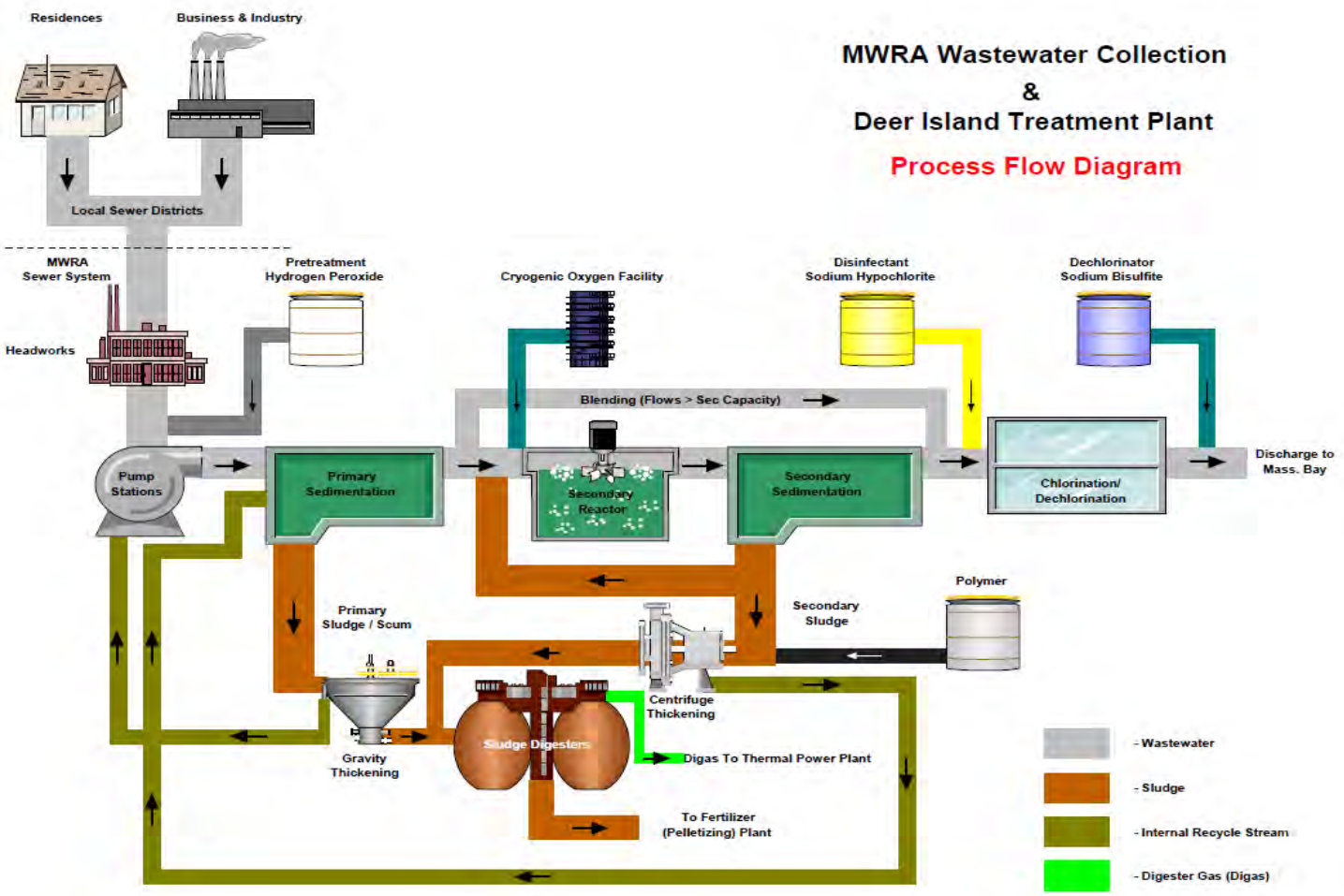
MWRA Service Area

- MWRA provides wholesale water and wastewater services to over 3.1 million customers in 61 communities (34% of population of MA)
- On average, MWRA delivers 200 million gallons per day to its water customers
- MWRA collects and treats an average of 350 million gallons of wastewater per day, with a peak capacity of 1.2 billion gallons

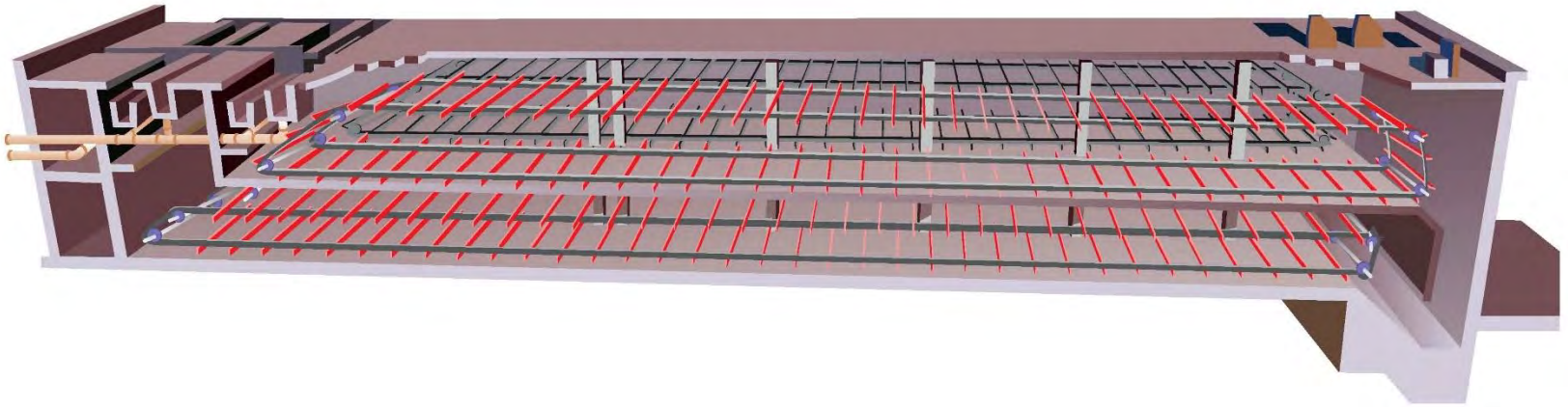
Deer Island Treatment Plant

- $3.8 Billion to Build
- Treatment Capacity:
  - Maximum
    - 1.27 Billion Gal/Day
    - Up to 700 MGD by Secondary Treatment
  - Design Flow
    - 361 MGD

Deer Island Process Flow Diagram



Primary Treatment: Stacked Clarifiers



- 48 Stacked Clarifiers
- 72 Primary Sludge Pumps
- 14 Scum Pumps

Secondary Treatment

- 9 Reactor Trains with 72 Mixers/Aerators
- 54 Stacked Secondary Clarifiers
- Cryogenic Oxygen Plant
- 700 MGD Max Capacity

Anaerobic Digestion

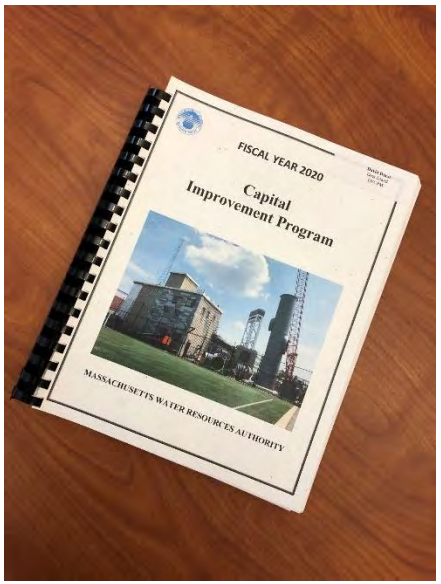
- 12 Egg-shaped Digesters, 8 operated at a time
- 20 day solids retention time
- 3 million gallons each

MWRA Budget Overview

- Two types of budgets
- Current Expense Budget – Operating Budget funded by cities and towns in MWRA service area
- Capital Improvement Program – Construction Budget-funded largely by long term bonds
- Combined Budget for Fiscal Year 2020 is $792 million

Capital Improvement Program (CIP)

- Historically driven by Court-mandated projects
- Based on MWRA's Master Plan (updated in 2018)
- CIP contains list of projects with estimated costs for design and construction
- Available to the public at mwra.com



Deer Island's Construction

Date	
1989	Stopped discharge of scum and floatables
1991	Sludge discharge to ocean halted
1995	Primary Treatment completed
1997	Secondary Treatment began operation
1998	Inter-island tunnel completed. All sewage flow treated at Deer Island
2000	New Outfall completed, allowing discharge of wastewater into deep water of Mass Bay
2003	Tunnel to fertilizer plant completed, allowing sludge to be pumped to Quincy for treatment and halting barge operations.

Deer Island Asset Management

- Continual reinvestment required
- Small repairs typically done internally through CEB
- Reliability Centered Maintenance (RCM) used to monitor, evaluate, and maintain all equipment
- All equipment tracked using MAXIMO software
- Assessments performed on equipment to determine whether repair/replacement appropriate

Deer Island CIP

The Deer Island Asset Protection Project is a large on-going CIP project with numerous phases. A sample of projects completed is shown below. Total projects to date total $250 million.

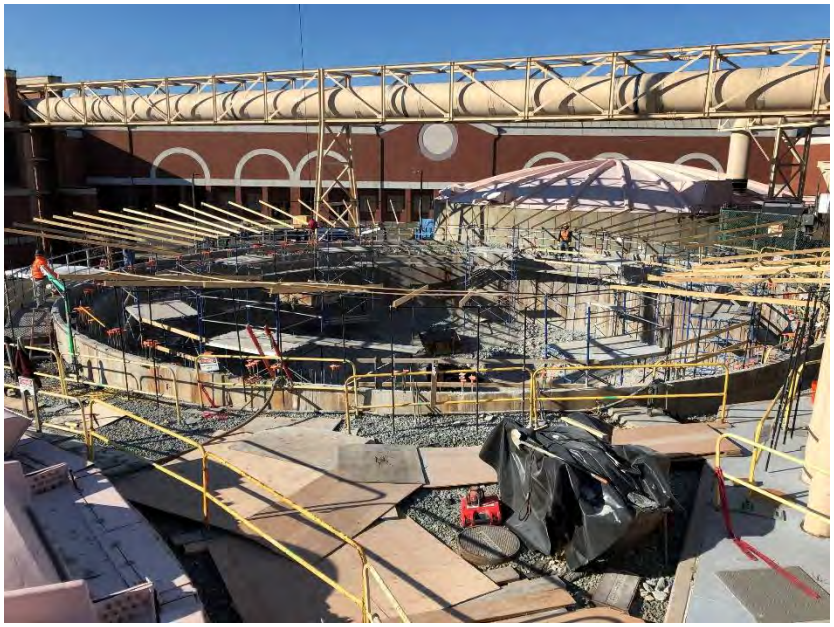
Date	Project
2005	Installed new screening systems
2013	Clarifier Rehabilitation – Phase 1
2013	North Main Pump Station motor control center replacement
2014	Digester piping replacement
2016	North Main Pump Station Motor and VFD Replacement
2017	Valve Replacement Project (facility-wide)
Ongoing	Winthrop Terminal Motor Replacement
Ongoing	Gravity Thickener Rehabilitation

Gravity Thickener Rehabilitation

- Six Gravity Thickeners on Deer Island – used to thicken primary sludge to 5% to 7% solids prior to digestion
- Mechanical equipment failing due to harsh atmosphere

Gravity Thickener Improvements

- Some process changes added – improved scum removal
- Walsh Construction doing $20 million project scheduled for 2021 completion



Future Projects

	Tentative Design Start	Estimated Project Cost, $million
Clarifier Rehabilitation Phase 2	Design in progress	143
South System Pump Rehabilitation	2020	20
Combined Heat and Power Project	2021	80
Odor Control Rehabilitation	2021	30

Clarifier Rehab

- 48 stacked primary clarifiers
- 54 stacked secondary clarifiers
- Influent gate/valve replacement
- Channel aeration system replacement
- Concrete coating reapplied
- Regulatory notifications required

South System Pump Rehab

- Replace motors, pumps, and valves
- Challenging to isolate system due to valves and gates not holding
- Work will be weather dependent

Odor Control Rehab

- Replace fans and valves in five odor control facilities
- 13 wet scrubbers and 28 carbon adsorbers
- Project will examine alternative technologies

Combined Heat and Power Study

- Deer Island powered by cross-harbor cable
- Study will examine alternatives for future power
- One possibility is a combined heat and power plant utilizing gas turbines or engines

- Preliminary estimates show that a gas turbine plant could potentially supply 75% of Deer Island's electricity using digester gas

Lessons Learned

- Start planning early for large projects.
- Maximize the amount of work in a given contract
- Allow extra time for continuous operation during construction

Acknowledgements

- Thanks to:
- Richard Adams --- Manager of Engineering Services
- David Duest – Director, Deer Island Treatment Plant

Questions