High Flow Operation of the Deer Island Treatment Plant

NEWEA
CSO/Wet Weather Issues Conference
10/26/15

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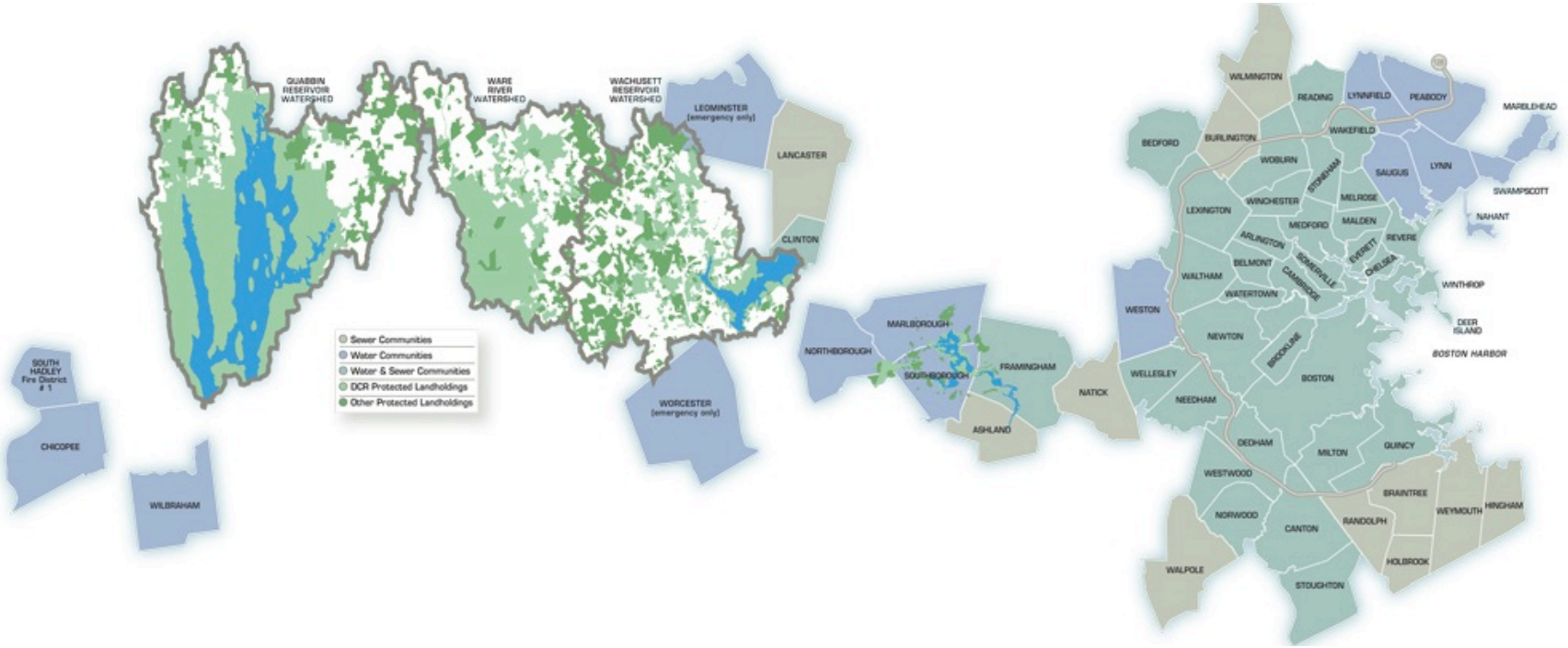
Agenda

- Overview of MWRA and Collection System
- DITP Treatment Process
- Equipment Critical to High Flow Operation
- Wet Weather Process Operation

MWRA Service Area

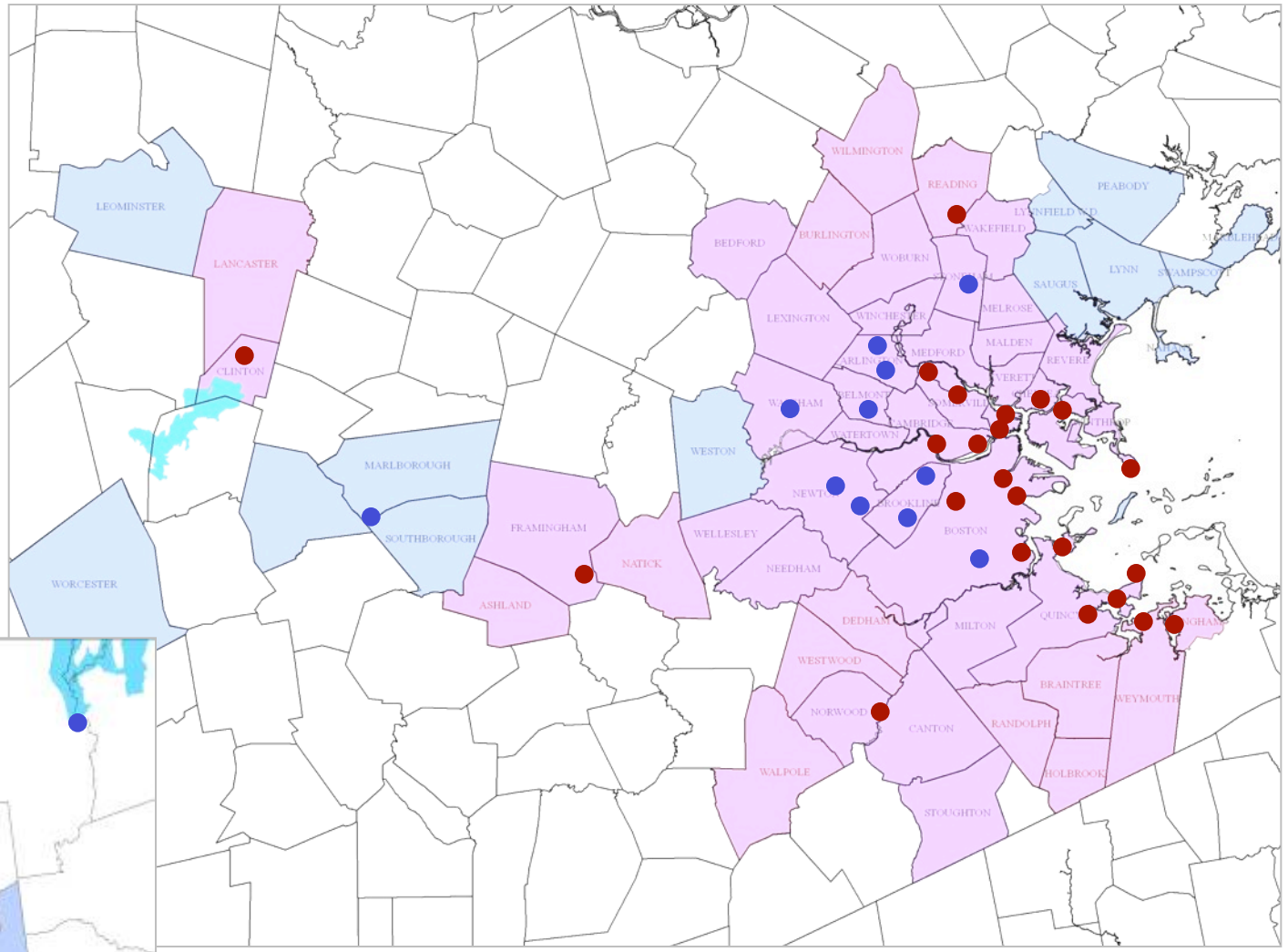
- MWRA provides wholesale water and wastewater services to over 2.5 million customers in 61 communities (34% of population of MA)
- On average, MWRA delivers 215 million gallons per day to its water customers
- MWRA collects and treats an average of 365 million gallons of wastewater per day, with a peak capacity of 1.2 billion gallons

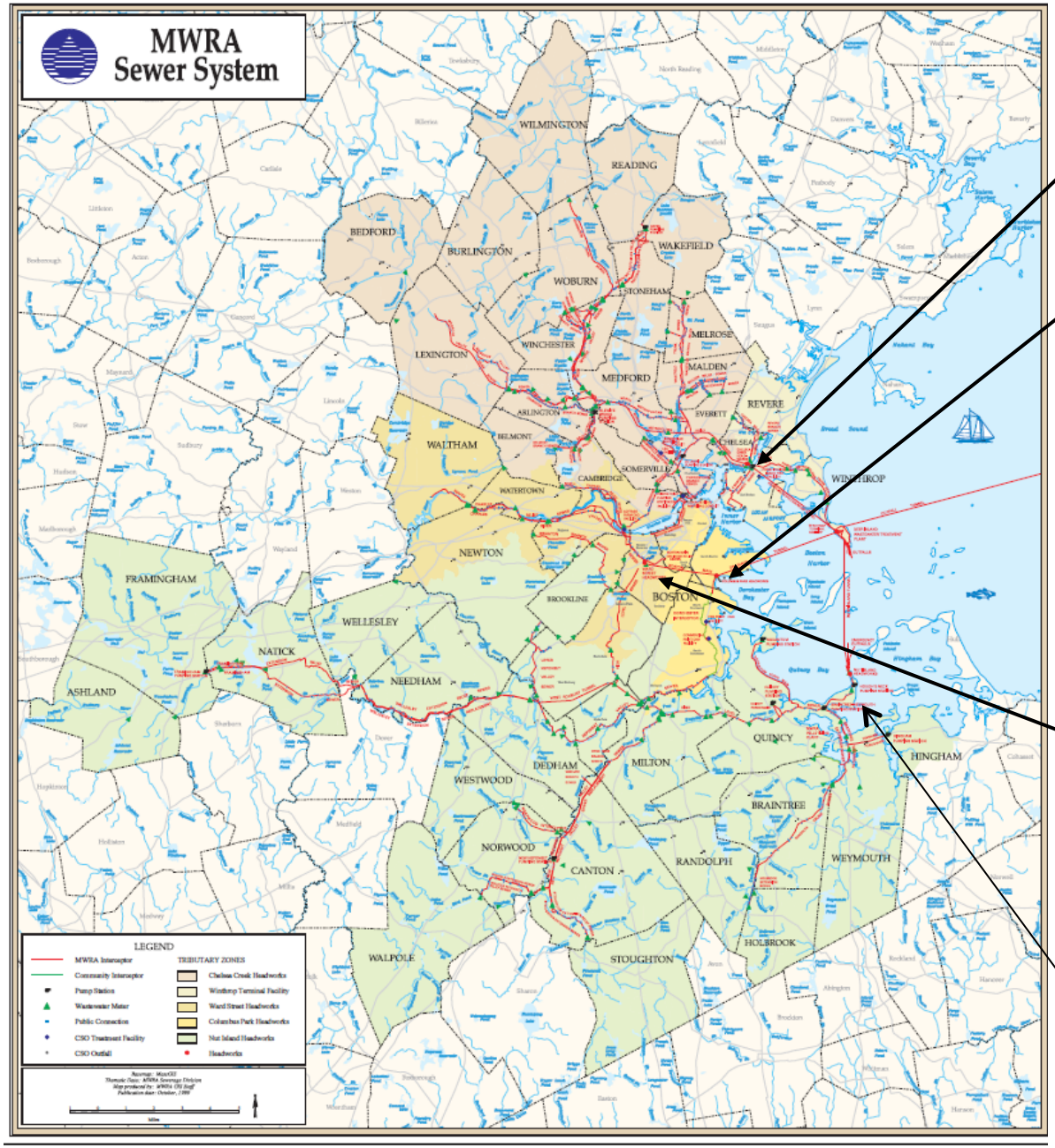


MWRA Facilities

Wastewater
- 2 Treatment Plants
  - Deer Island
  - Clinton
- 12 Pump Stations
- 4 Headworks
- 5 CSO Facilities

Water
- 2 Treatment Plants
  - CWTP
  - Quabbin
-10 Pump Stations





Chelsea Creek Headworks

Peak Flow 350 MGD

Columbus Park Headworks

Peak Flow 182 MGD

Ward Street Headworks

Peak Flow 256 MGD

Nut Island Headworks

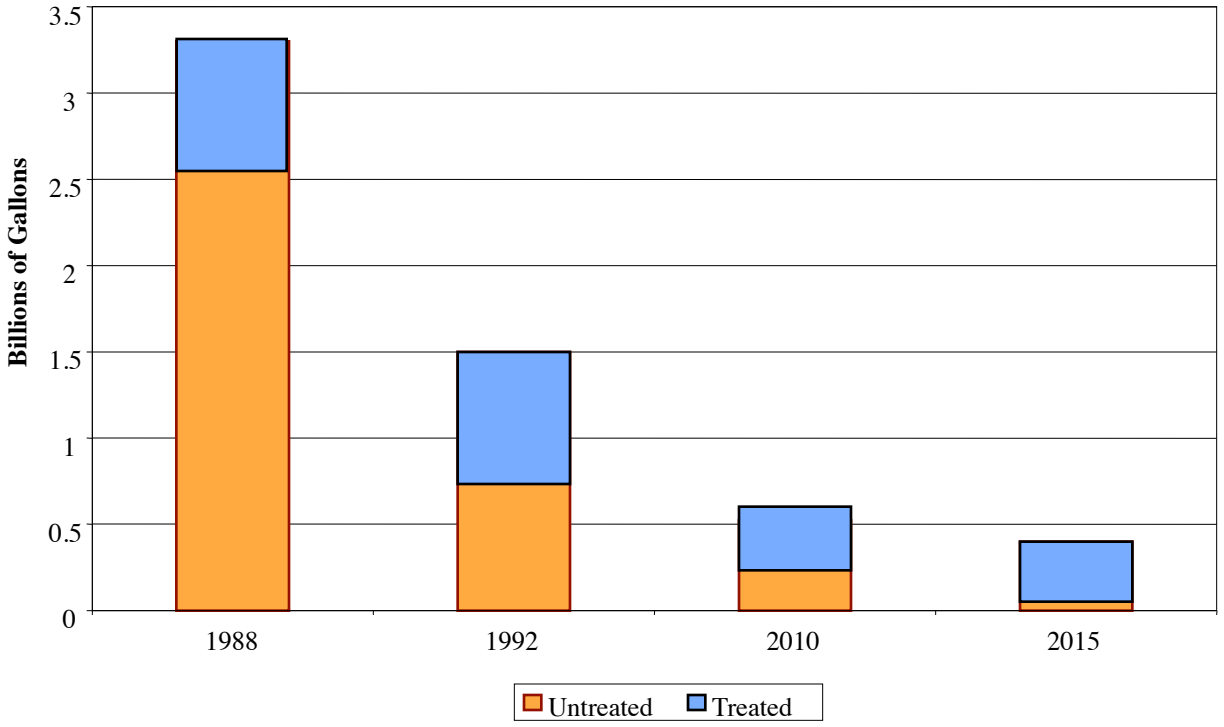
Peak Flow 360 MGD

Combined Sewer Overflow Control Program

- Combined Sewer Communities
- Boston
- Cambridge
- Chelsea
- Somerville

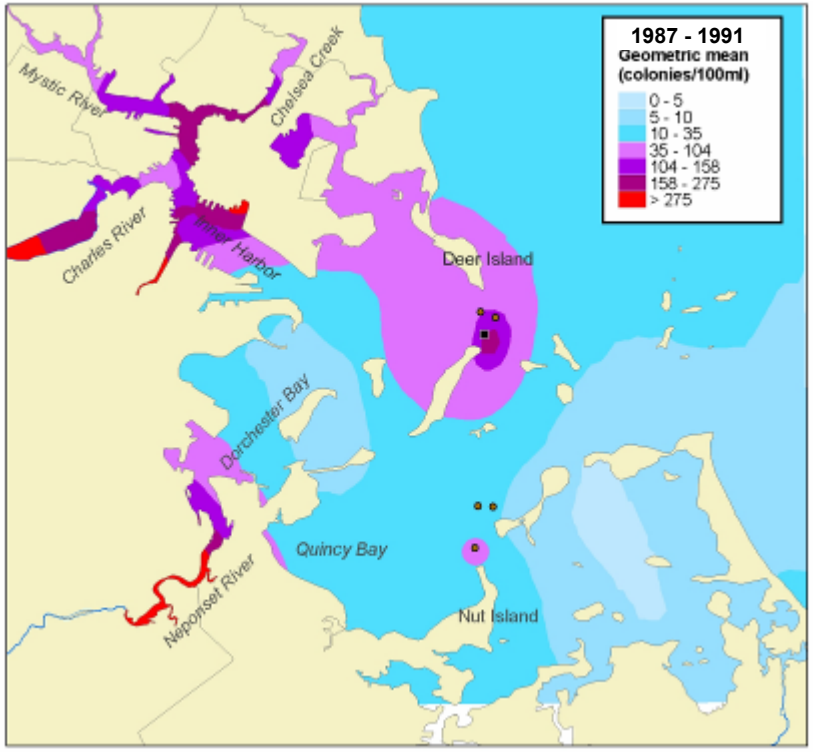
Annual CSO Volume Has Been Reduced Dramatically

- 32 of 35 projects have been completed to date
- Annual CSO volumes have already been reduced by 2.7 billion gallons
- Approximately 90% of the remaining CSO flows are treated

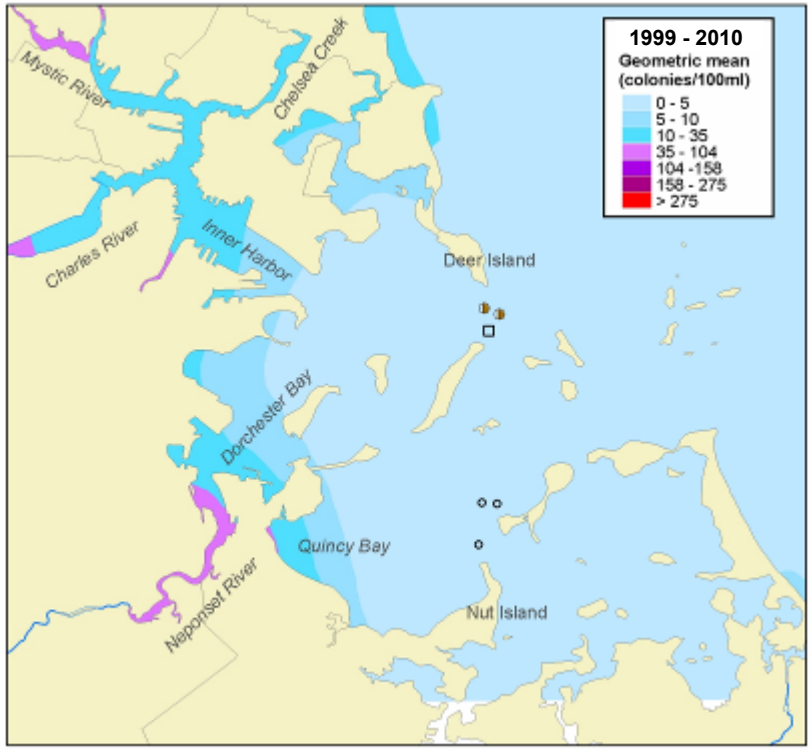


Dramatic Improvements In Bacterial Water Quality

1987-1998 (Before Secondary Treatment and South System transfer)



1999 - 2010 (After Secondary Treatment and New Outfall)

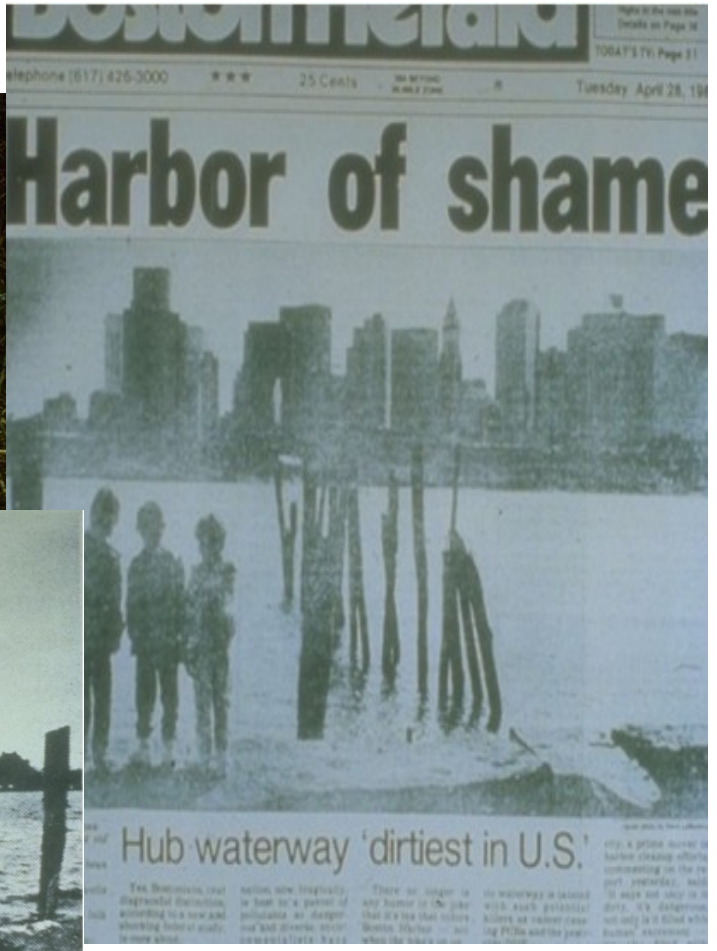


Average *Enterococcus* counts in Boston Harbor in wet weather

The lighter the blue, the better

Overview of Deer Island Treatment Process

Deer Island Project History

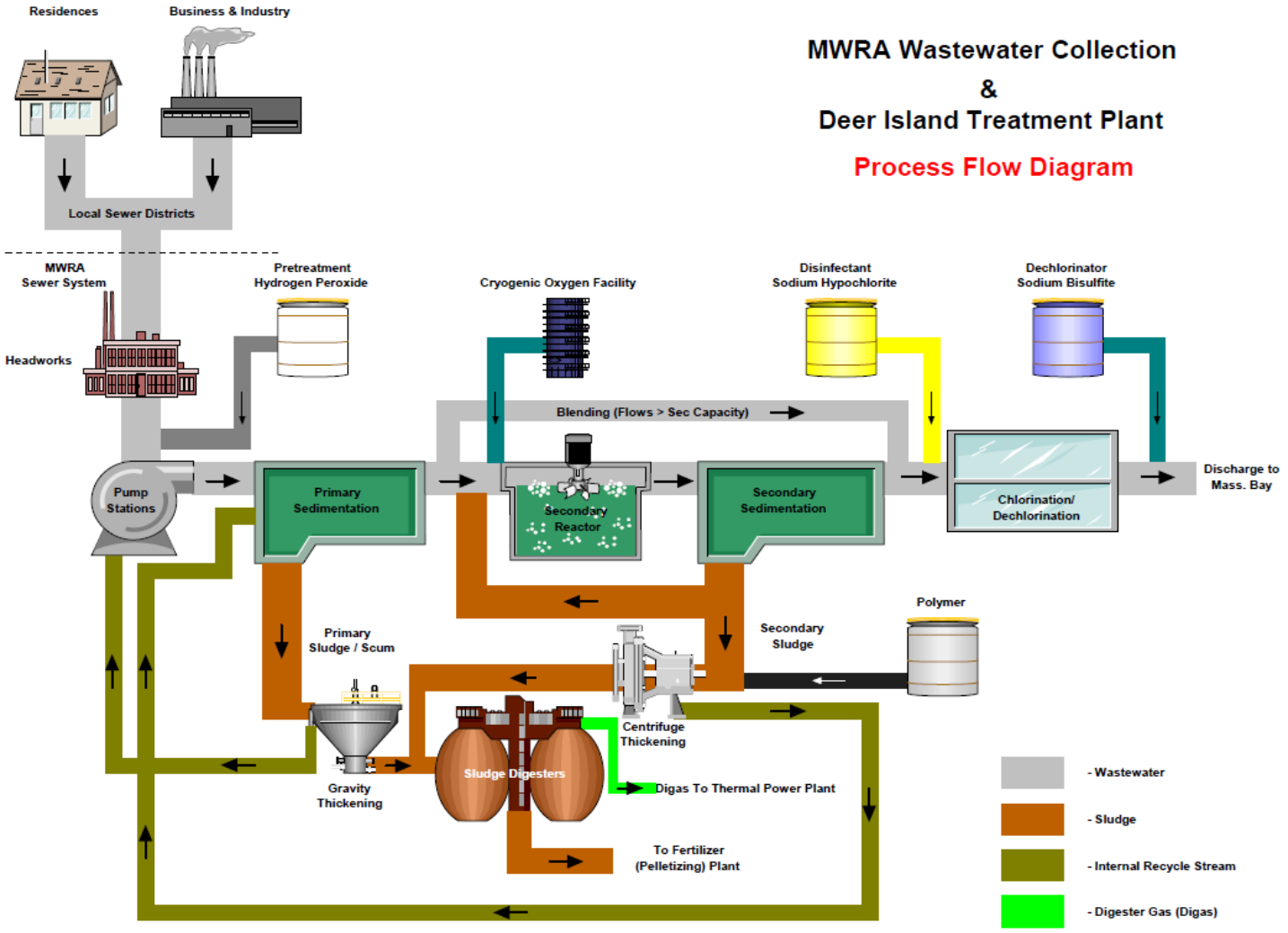


Deer Island Project History

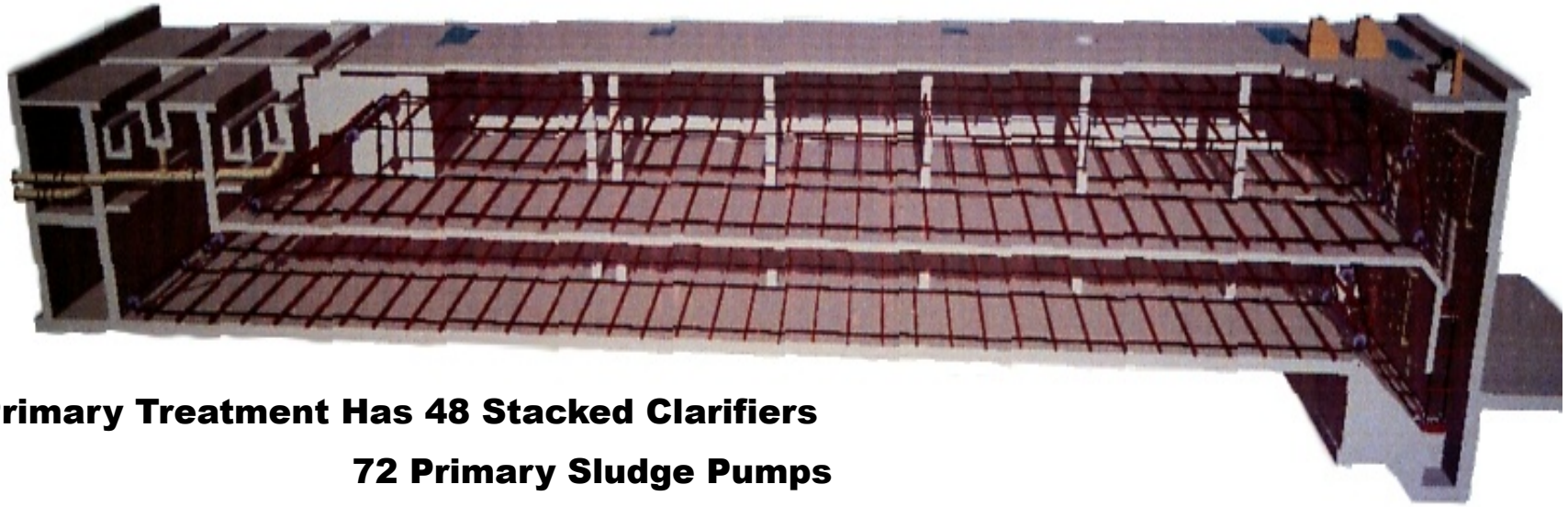
Deer Island Treatment Plant

- $3.8 Billion to Build
- Treatment Capacity:
  - Maximum
    - 1.3 Billion Gal/Day
    - Up to 700 MGD by Secondary Treatment
  - Average Daily Flow:
    - 350 MGD

Deer Island Process Flow Diagram



Primary Stacked Clarifiers



Primary Treatment Has 48 Stacked Clarifiers

72 Primary Sludge Pumps

14 Primary Scum Pumps

Each Clarifier: **1.4 Million Gallons (15,252 sq ft)**

Five Chain Collector Mechanisms

Process Requires 42 Out Of 48 Always Available

Challenges: **Covered & Stacked**

Most work requires confined space entry

Secondary Process

Biological Treatment - Activated Sludge (Pure O2)

Over 900,000 Square Feet Facilities (1/3 Covered)

Pure Oxygen Generation Facility

Odor Control - Carbon Adsorption

Secondary Clarifiers

Secondary Treatment Has 54 Stacked Clarifiers

Each Clarifier:

1.36 Mgal, 14,350 sqft

Six Collectors

22 Field Instruments

70HP 3000GPM Return Sludge Pump

Process Requires 50 Out of 54 Always Available

Challenges:

Stacked

Confined Space Entry

Anaerobic Digestion

12 - 3 MGal Digesters Heated to 98 deg F

8 digesters operated at any given time

Wet Weather Process Control

- Put on more primary clarifiers
- Put on more pumps
- Adjust Secondary Process (wasting rate)
- Put on backup power (severe storms)
- Pay extra attention to chlorine dosing

NPDES Permit Parameters

Parameter	Permit Limit	Typical Values
Total Suspended Solids	45 mg/L (weekly) 30 mg/L (monthly)	10 mg/L
Carbonaceous Biochemical Oxygen Demand	40 mg/L (weekly) 25 mg/L (monthly)	6 mg/L
pH	6-9 S.U.	6.5 S.U.
Total chlorine Residual	<0.63 mg/L (daily) <0.45 mg/L (monthly)	<0.04 mg/L <0.04 mg/L
Fecal Coliform	<14,000/100 mL	<5/100 mL

Wet Weather Infrastructure

- North Main Pump Station
- South System Pump Station
- Flow Control Gate
- Outfall Tunnel

North Main Pump Station

Maximum Capacity - 788 MGD

A Former DITP Facility - Upgraded With New Pumps & Motors

Complex Construction Due To Continuous Operation

North Main Pumps

- Manufactured by Fairbanks-Morse
- Centrifugal Pumps
- Capacity of 110 MGD
- Total head of 150 ft
- 3500 HP Motor
- 10 pumps installed

South System Pump Station

New Pump Station With Dry/Wet Well Design

Serving Separated System Must Be 100% Reliable

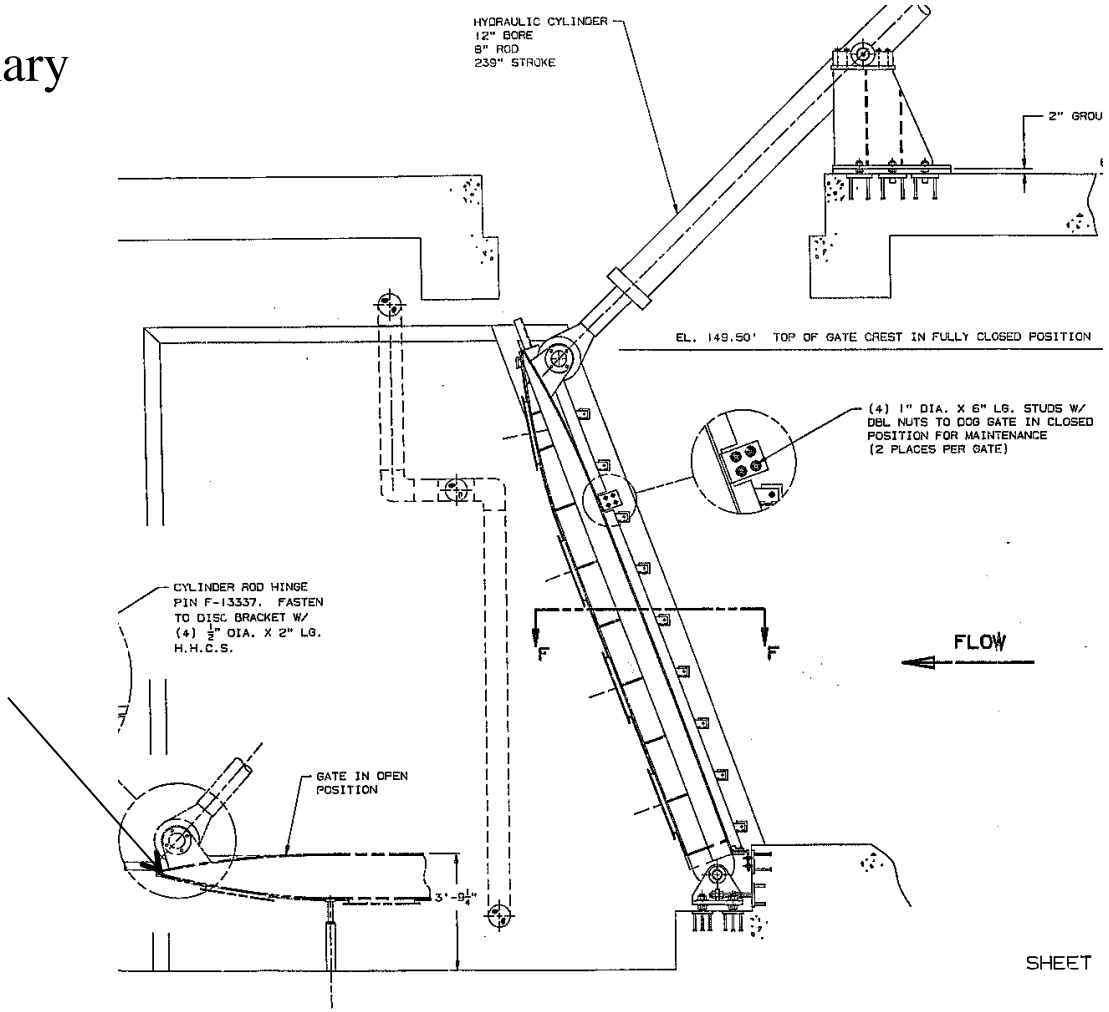
South System Pumps

- Manufactured by Worthington
- Vertical, Non-clog Centrifugal Pumps
- Capacity of 65 MGD
- Total Head of 90 ft
- 1250 HP Motor
- 8 Pumps Installed in 1995, online in 1998.

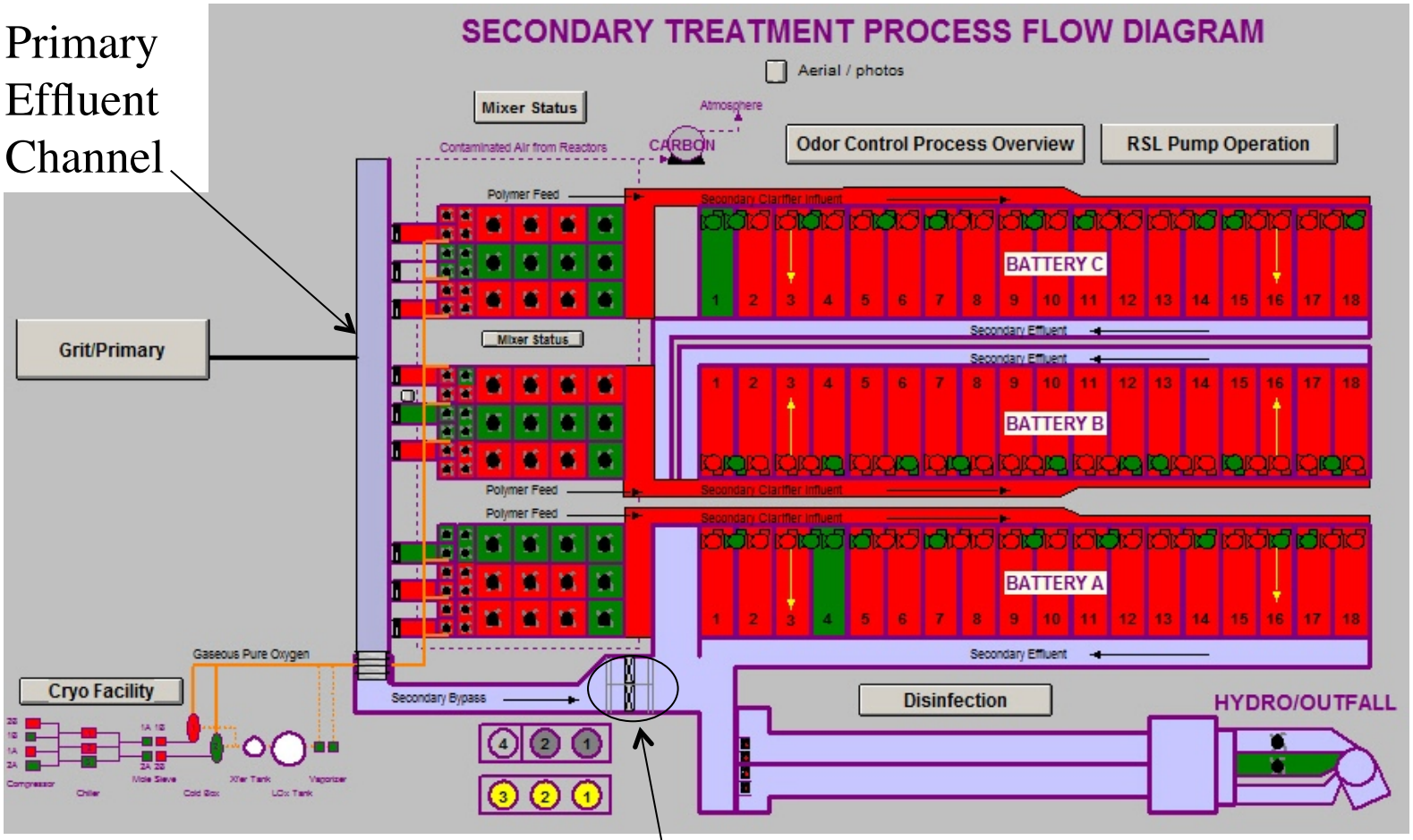
Flow Control Gate

Delivers Primary Effluent to Disinfection

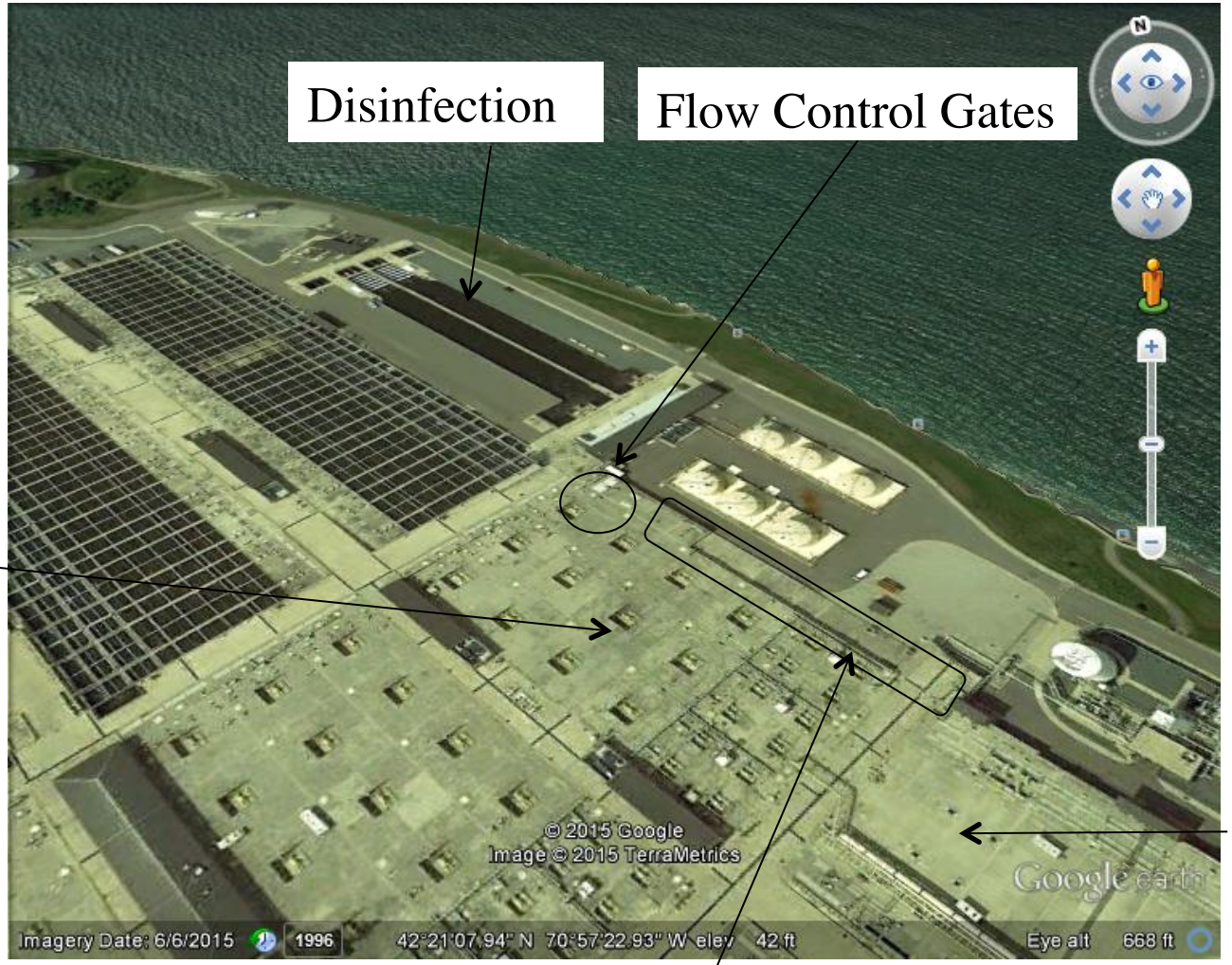
Gate Fully Lowered



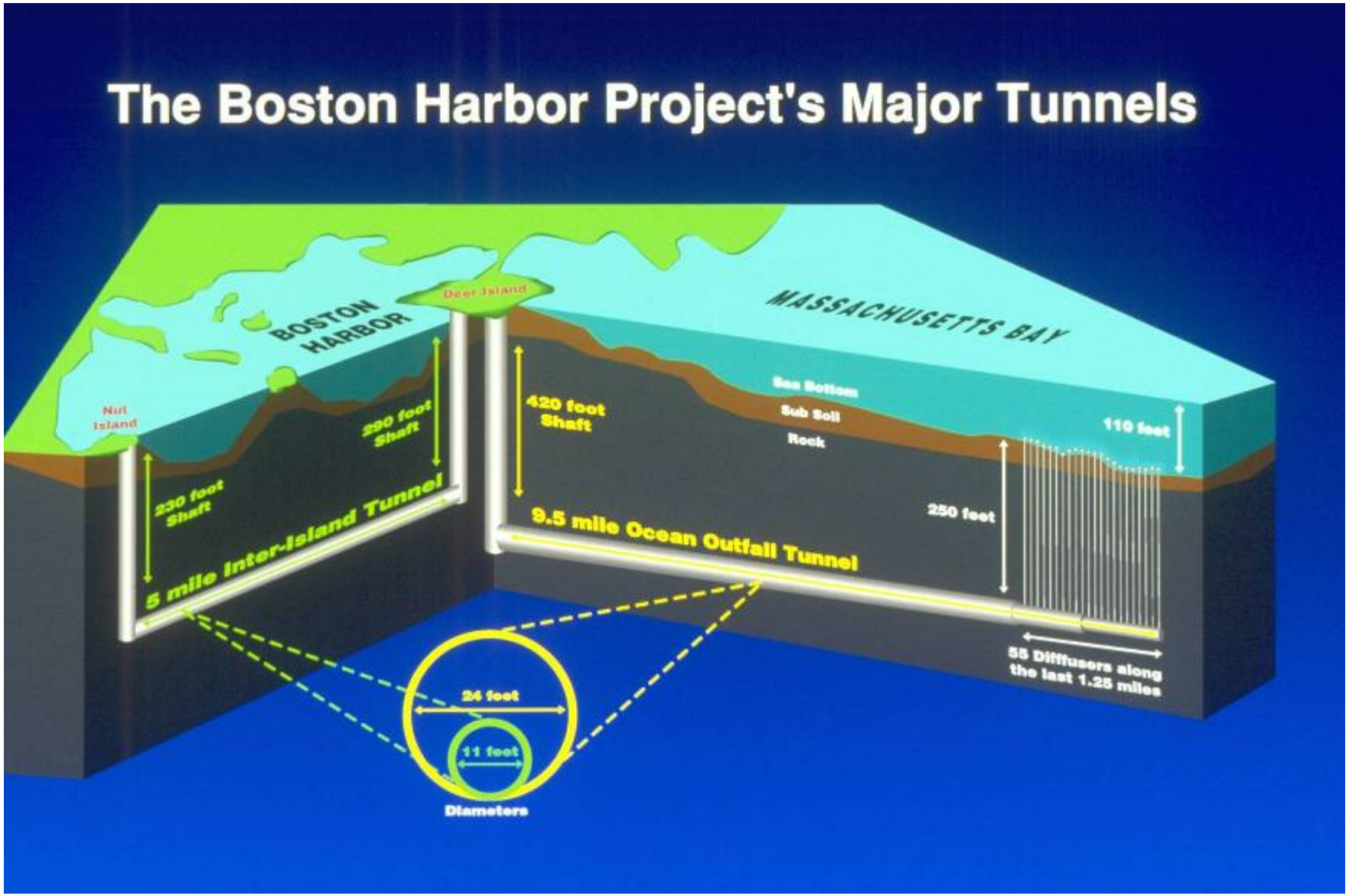
Secondary/Disinfection Layout



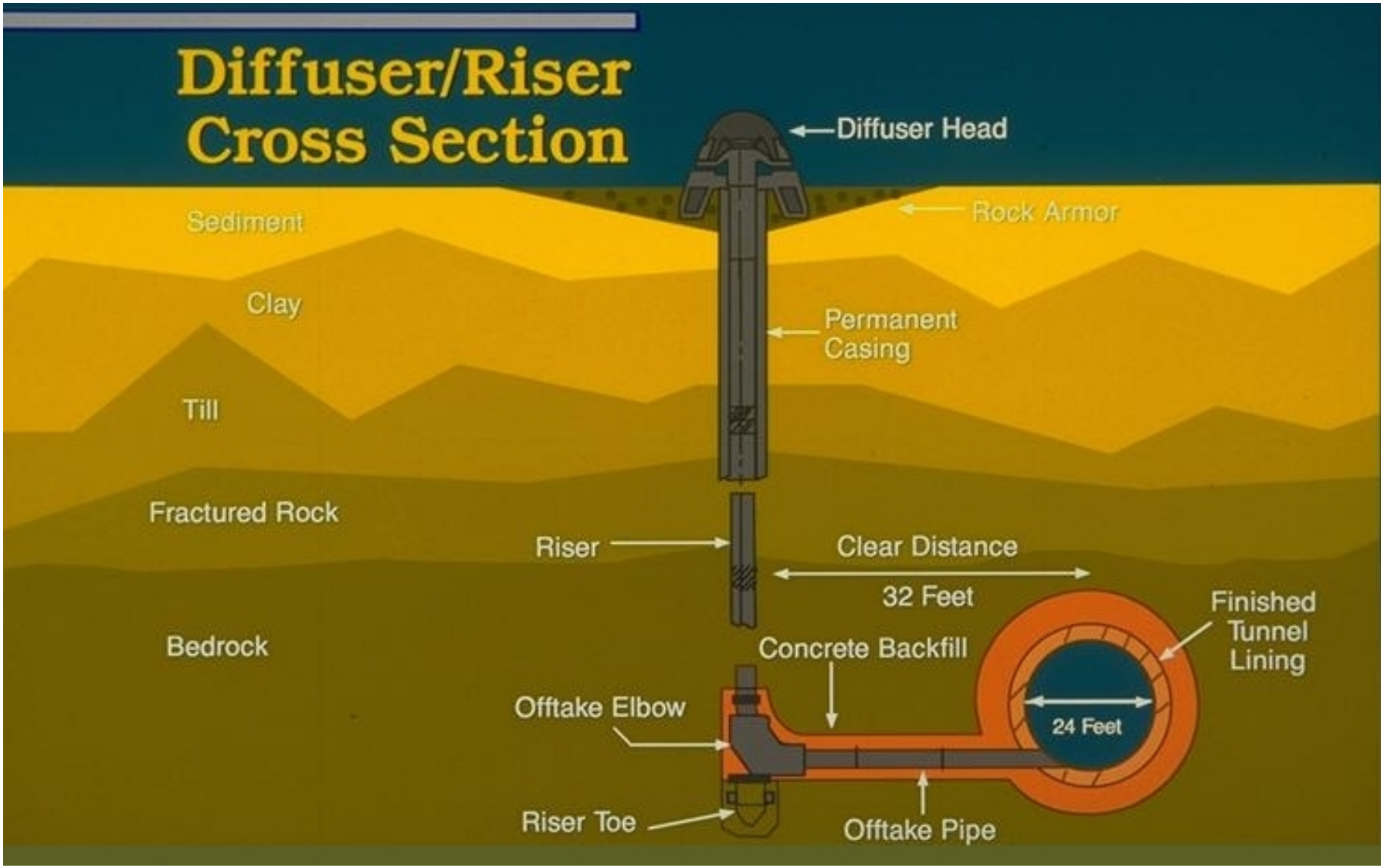
Sea Gull's Eye View



Deer Island Construction – Tunnels



Deer Island Construction – Outfall Tunnel Diffusers



Summary

- Wet Weather Operation at DITP is challenging but effective
- No NPDES permit violations for 8 years
- Continuing improvement in reducing CSO activations
- Dedicated Team of Wastewater Professionals is Key to Success

Secondary Clarifier Weirs at Max Flow condition

Acknowledgements

- Mike Hughes, Senior Shift Manager
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Thank you!

Questions?

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