



# Evaluating the Narragansett Bay Commission CSO Abatement Project

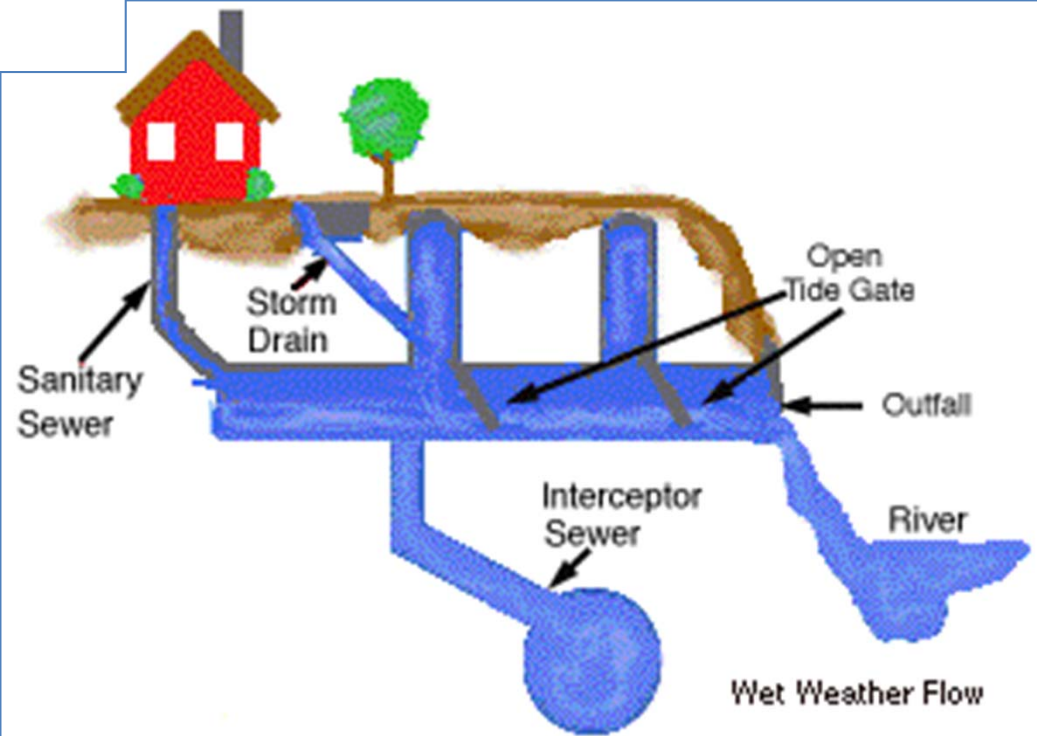
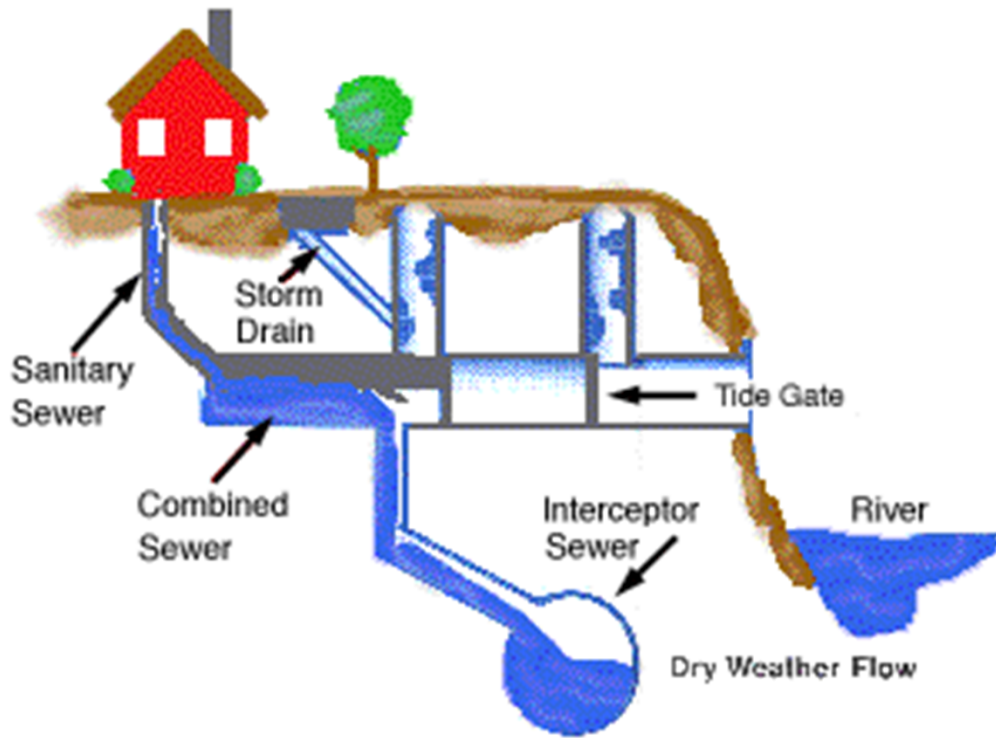
June 16<sup>th</sup>, 2011  
Christine Comeau  
Environmental Scientist  
Narragansett Bay Commission

# Two½ Years and 2.9 Billion Gallons!

## \* Overview of Presentation

- \* Review of tunnel operation and treatment process
- \* Changes we have seen
  - \* Wet Weather treatment events
  - \* Fecal coliform results in Narragansett Bay
  - \* Shellfish Closures
  - \* Beach Closures
- \* A look ahead...

# CSO 101



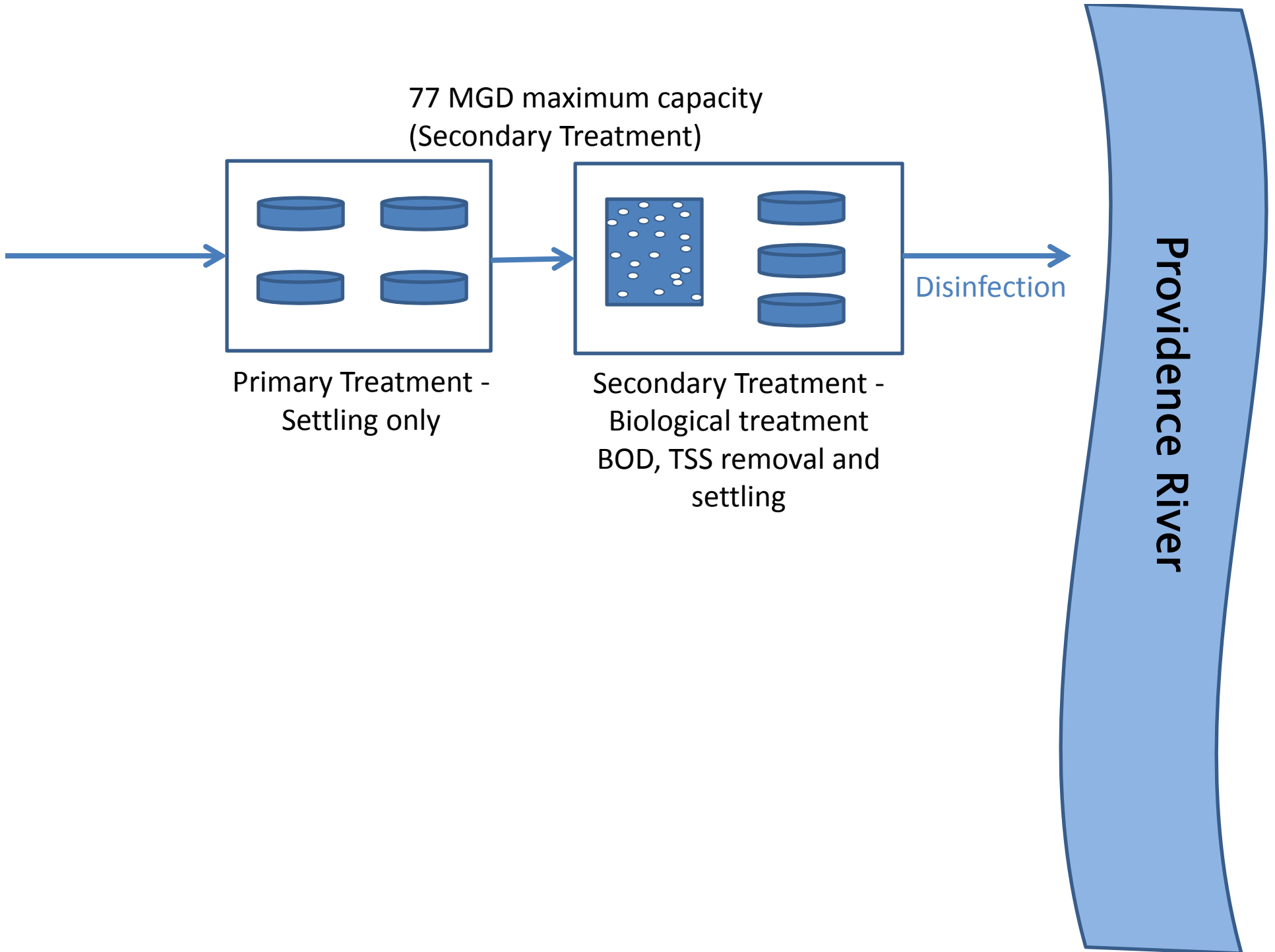
# Purpose of the CSO Abatement Project

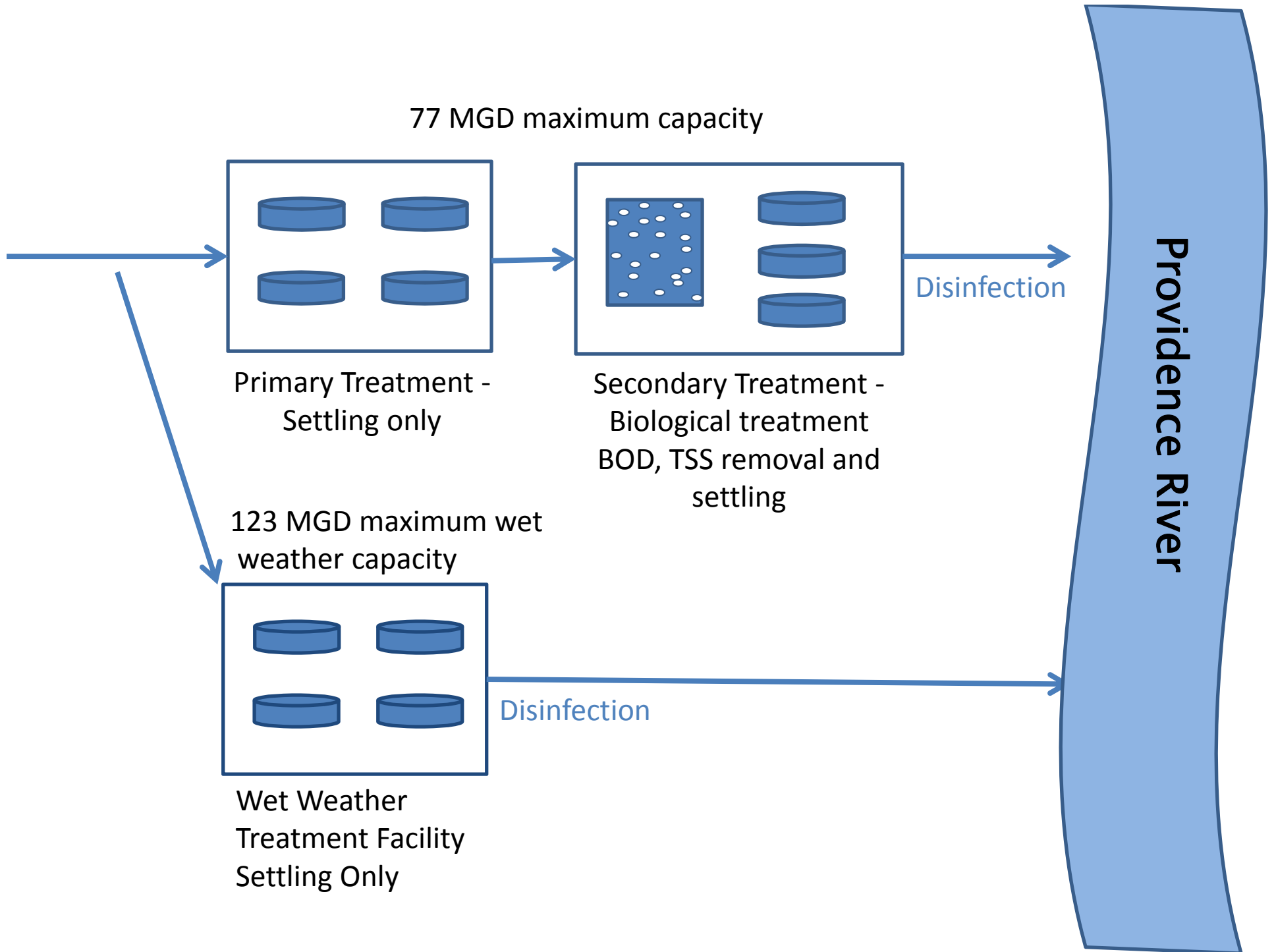
- \* Bacteria a significant cause for shellfishing closures in Upper Narragansett Bay; violation of WQ bacteria standards
  - \* 66 permitted CSOs in NBC service area
  - \* ~2.2 billion gallons of CSO activity in typical year
- \* Prior to abatement project excess interceptor flow into FP was directed to 4 wet weather tanks when flow was too high to be sent through full secondary treatment
  - \* Some solids settling and chlorination
- \* Many rainstorms cause CSOs to discharge to area rivers due to antiquated infrastructure



# Field's Point Treatment Process

- \* Average flow is 45 MGD
- \* Primary treatment – removal of heavy solids
- \* Secondary Treatment - removes dissolved and suspended biological matter.
- \* Disinfection – Fecal coliform bacteria killed by chlorination
- \* Wet Weather Tanks – some solids settling and chlorination





# NBC CSO Abatement Project: “The Biggest Project You’ll Never See”

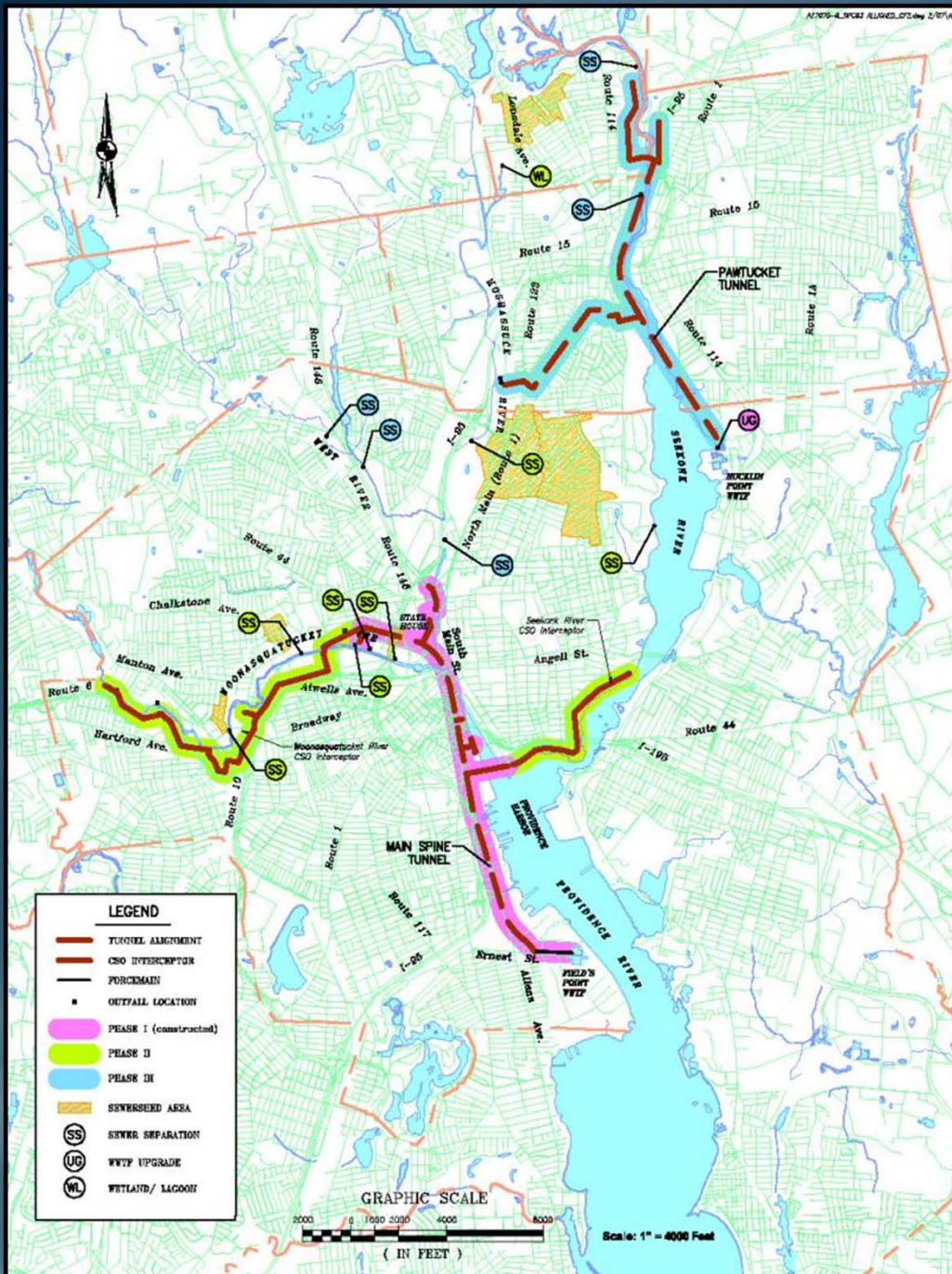
- \* 3 Phases over 20 years
- \* Design storm: 3-month 6-hour, 1.61 inches of rain
- \* Phase 1: 2001 – 2008 (~\$359 million)
  - \* 3+ mile long tunnel; 300 ft. below ground
  - \* 26 ft. finished diameter
  - \* 62 MG design capacity (actual~65 MG)
  - \* 7 drop shafts to divert flow to tunnel
  - \* Collects sewer/stormwater from 12 CSOs in FP area
  - \* 40% of overflow volumes captured

# CSO PROGRAM PHASES

The LOUIS BERGER GROUP, INC



**NARRAGANSETT BAY  
COMMISSION  
Combined Sewer Overflow  
Control Facilities Program**













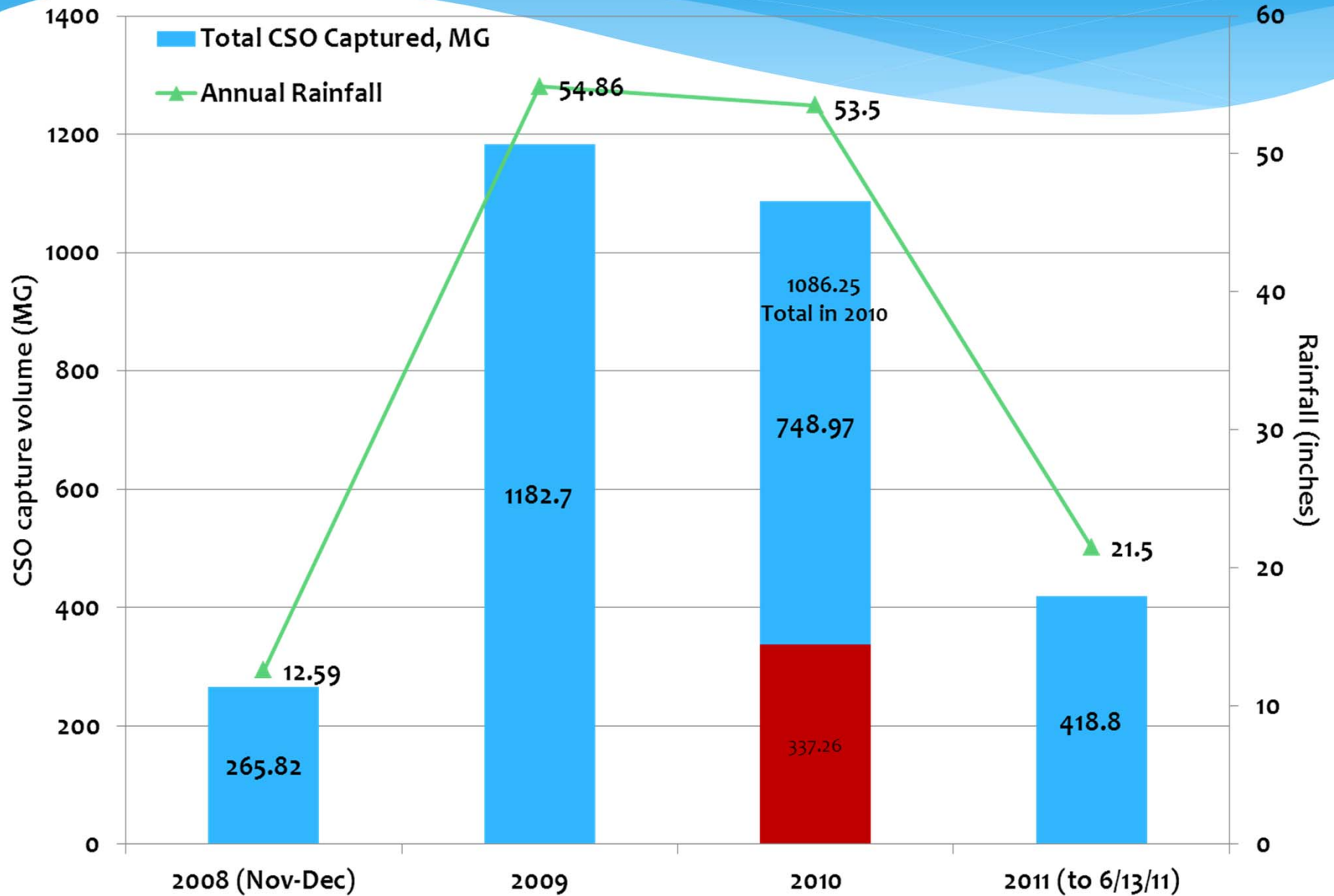




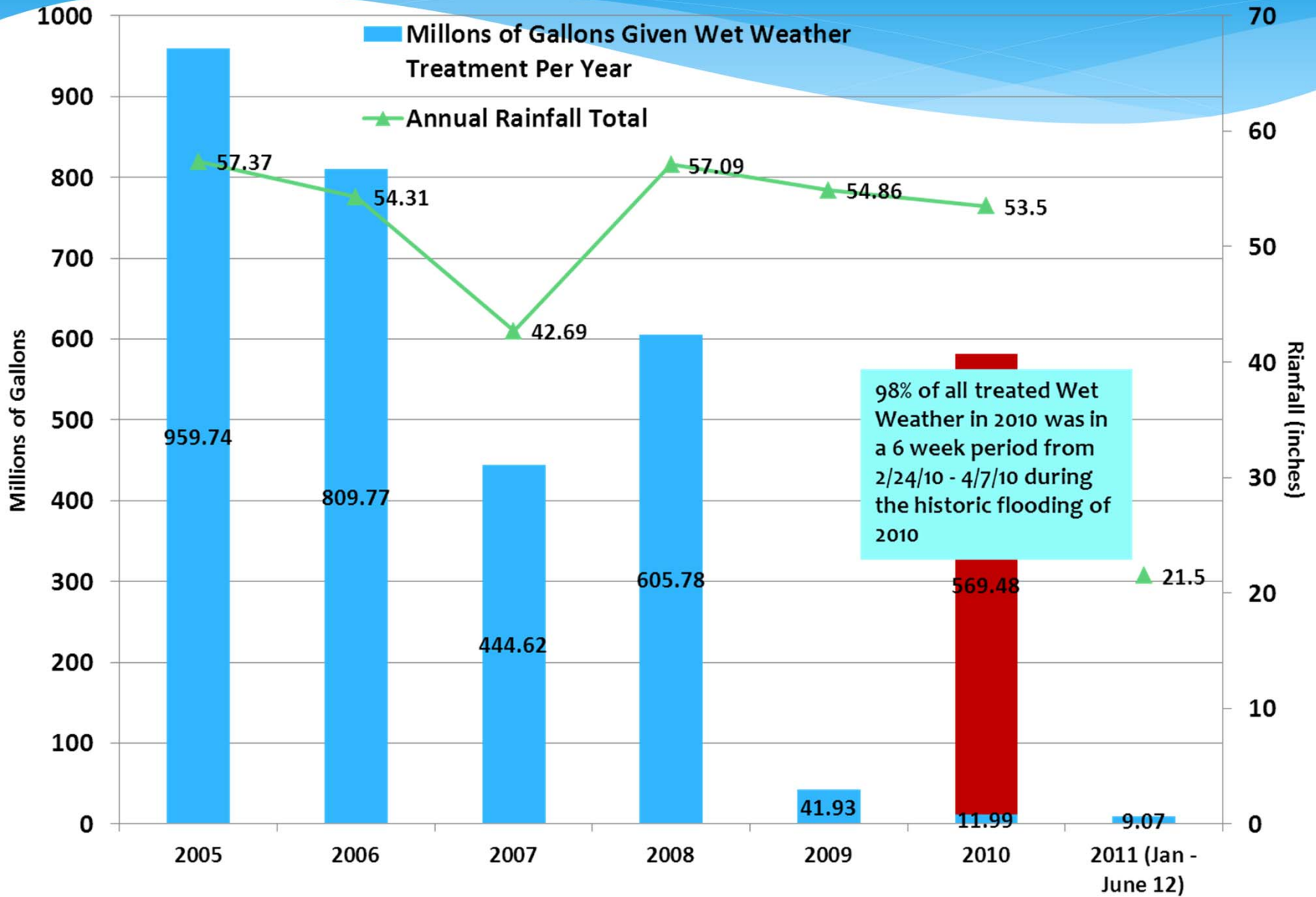
# What happens during wet weather

- \* Gates to dropshafts are opened to allow CSO and excess interceptor flow into tunnel
  - \* Most storms are fully contained in the tunnel.
- \* If tunnel fills (65 MG), gates are closed and excess flow is released via existing CSO outfalls
  - \* Interceptor flow up to 200 MG can go to FP
- \* Excess flow into plant (>77 MG) is diverted to wet weather tanks (123 MG capacity).
  - \* Now only occurs after tunnel has filled
- \* Once WWTF has returned to normal capacity volume stored in tunnel is pumped back to FP for full secondary treatment

# Total CSO Tunnel Capture by Year



# Field's Point Wet Weather Treatment 2005 - 2011



# NBC Facilities

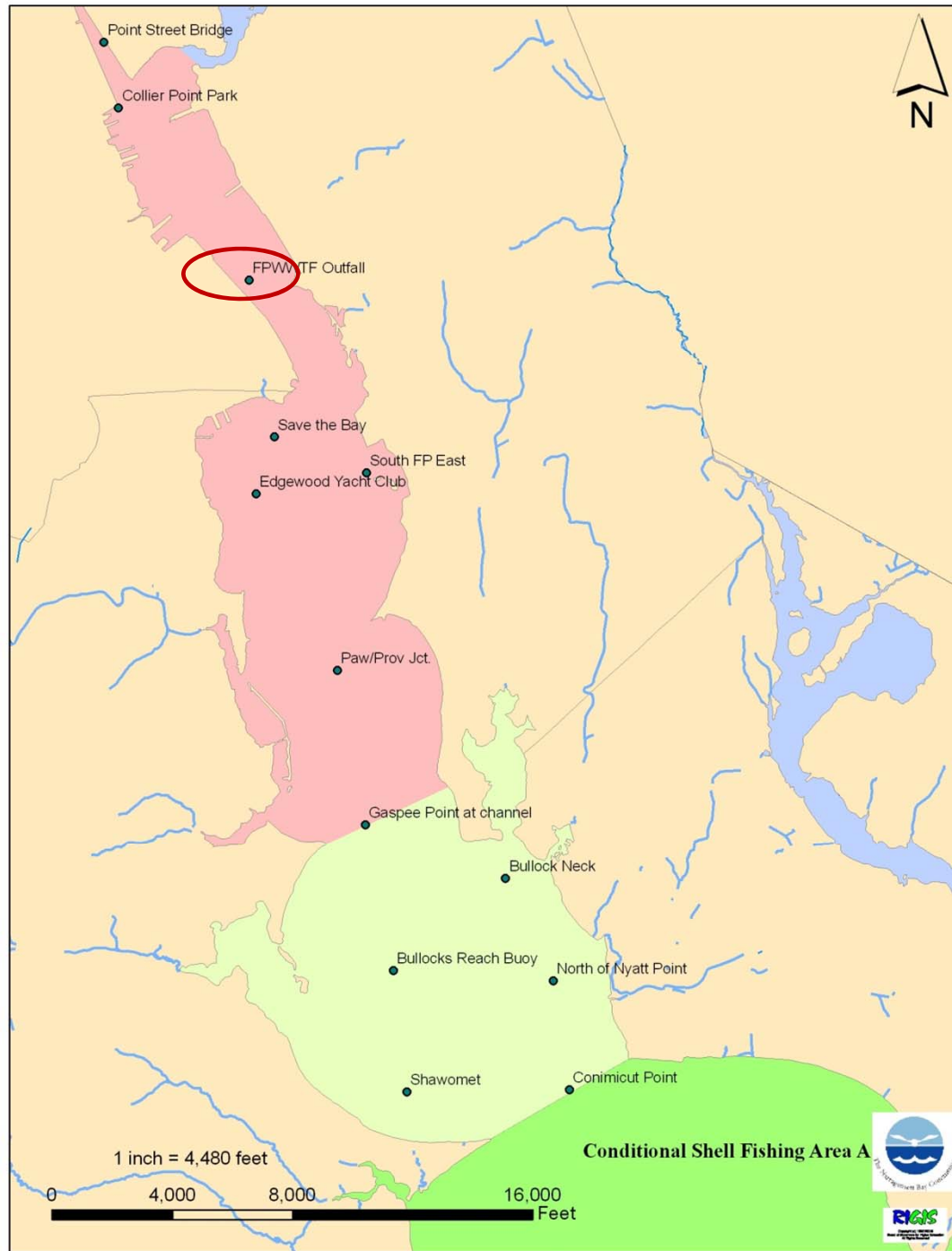
- \* Tunnel currently collects 12 CSOs from Field's Point (FP) service area
- \* Prior to tunnel operation FP accounted for ~ 77% of all wet weather treatment from NBC facilities; BP = 23%
- \* Now FP is 44% of total NBC facility wet weather treatment and BP is 56%
- \* 73% reduction in wet weather treatment since tunnel went into operation at FP.

# Pollutant Removal

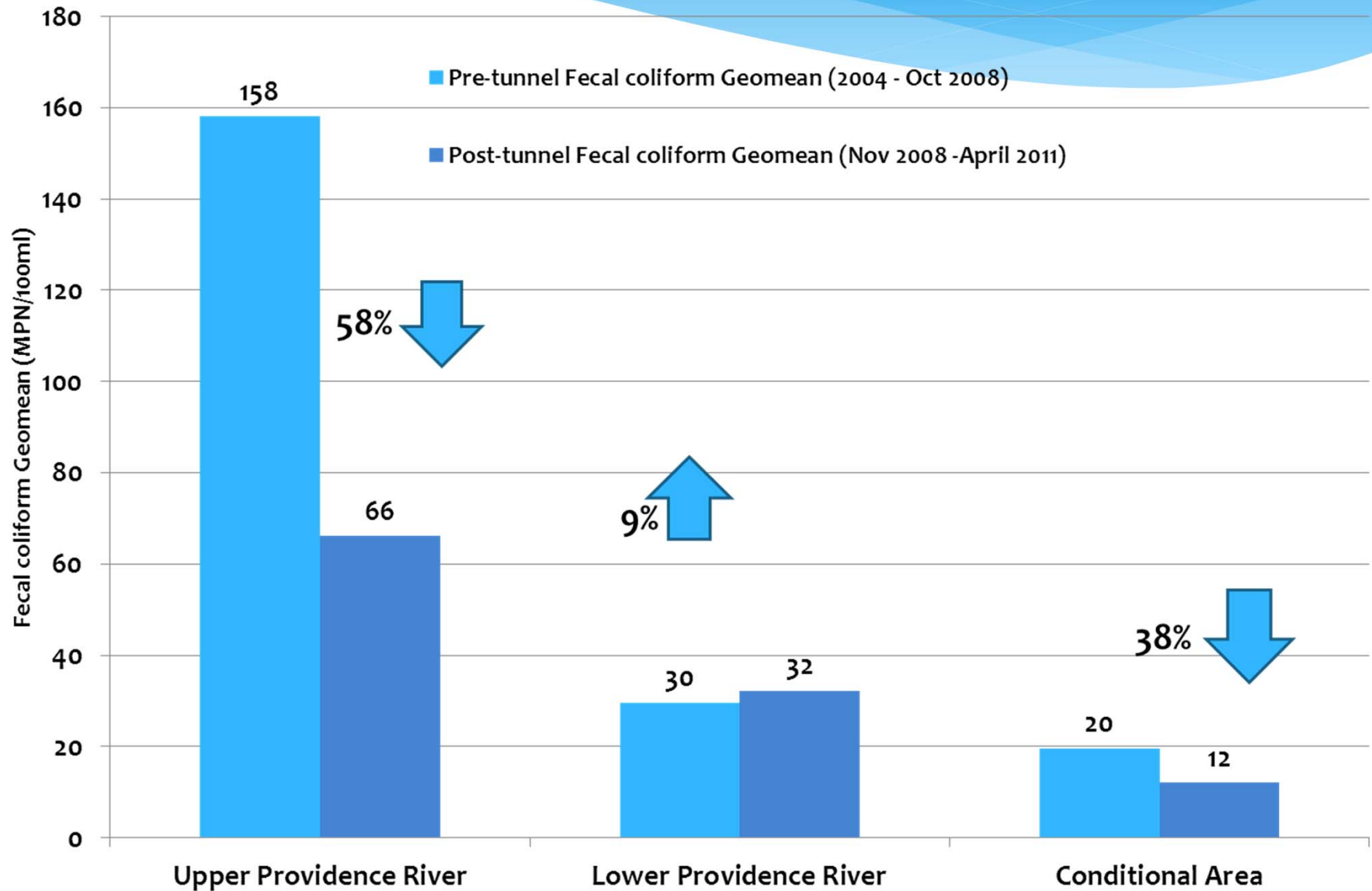
- \* Since the tunnel went on-line, 2.9 billion gallons has been collected and received full secondary treatment.
- \* As a result, estimate that these pollutants have been removed at the Field's Point facility and prevented from being discharged into the Bay through the CSOs.

Pollutant	Pounds
TSS	723,420
BOD	646,880
Total Nitrogen	67,745
Aluminum	4,975
Cadmium	42
Chromium	160
Copper	220
Cyanide	109
Iron	23,363
Lead	188
Nickel	70
Silver	68
Zinc	564

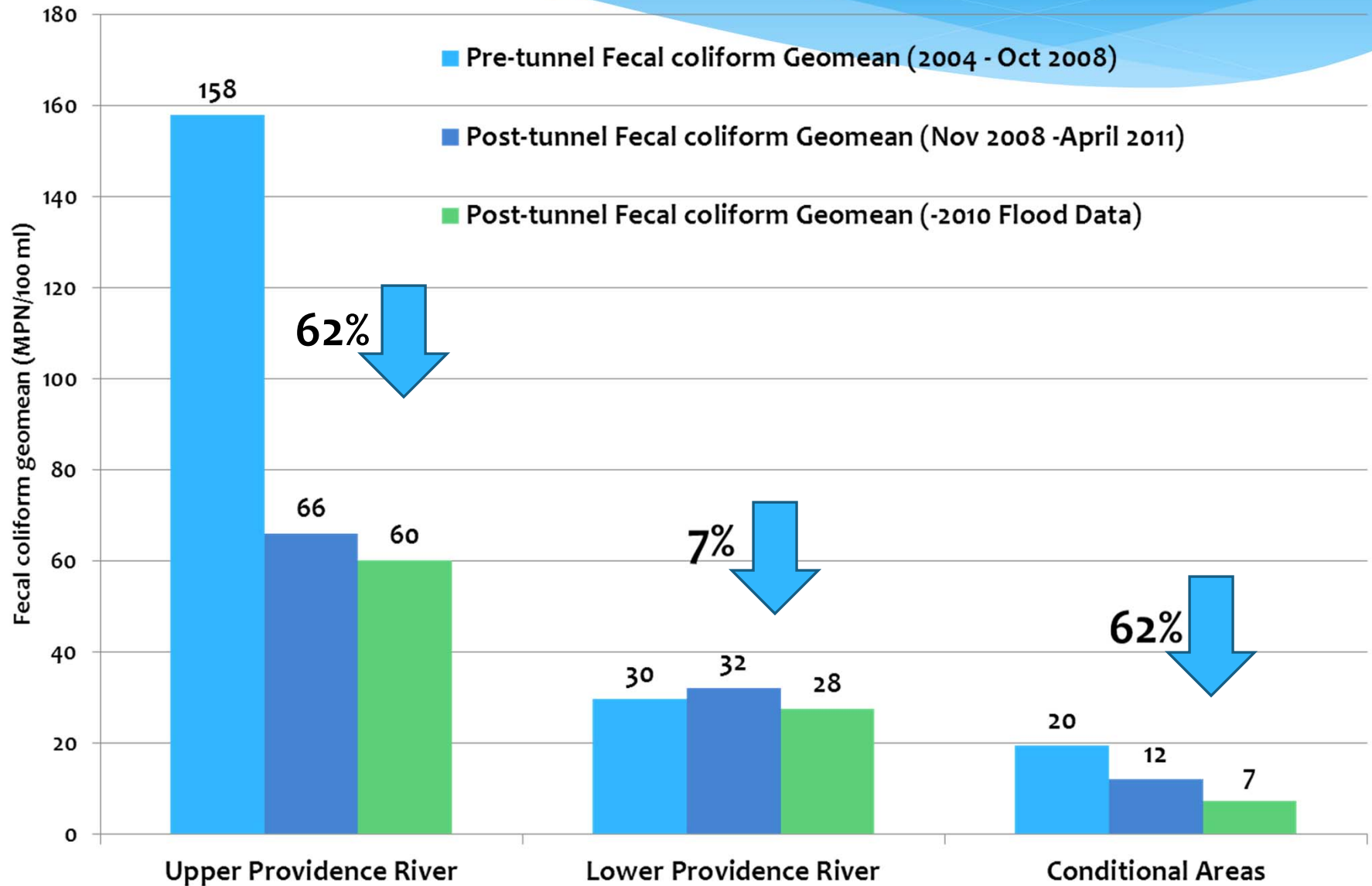
Data up until March 2011



## Upper Narragansett Bay Fecal coliform Geomeans Pre and Post Tunnel Operation

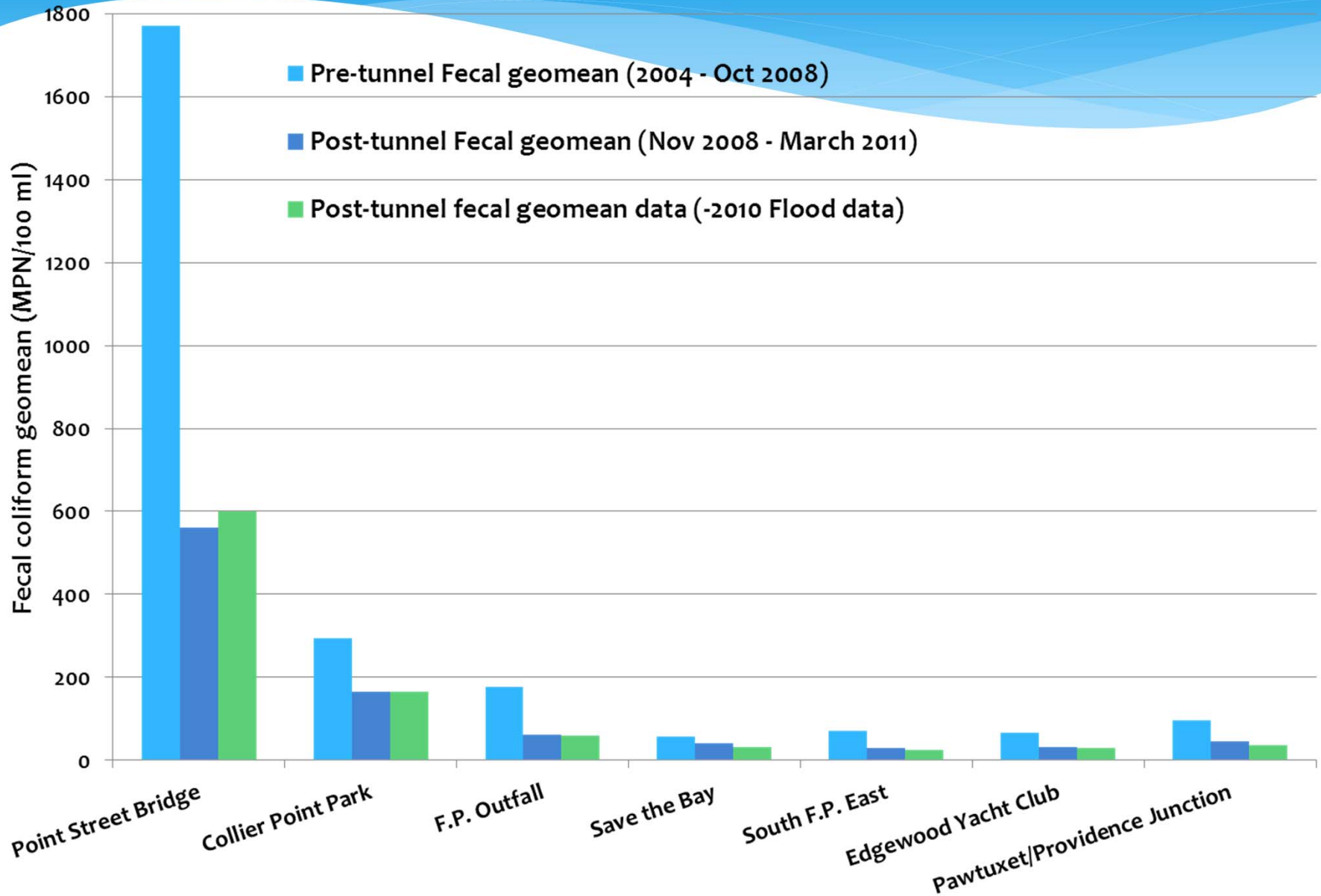


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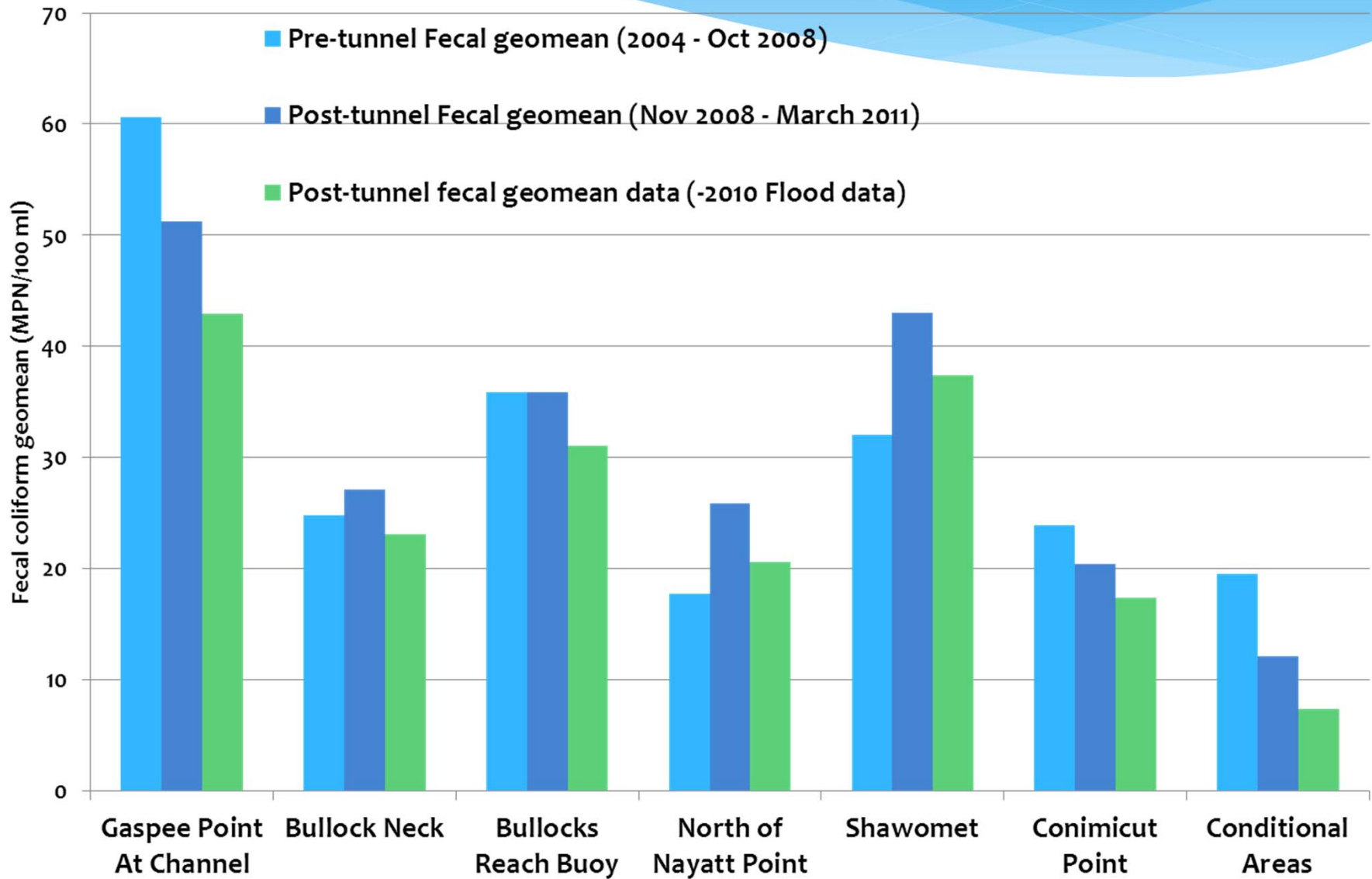




# Upper Providence River Fecal coliform Geomean Pre and Post Tunnel

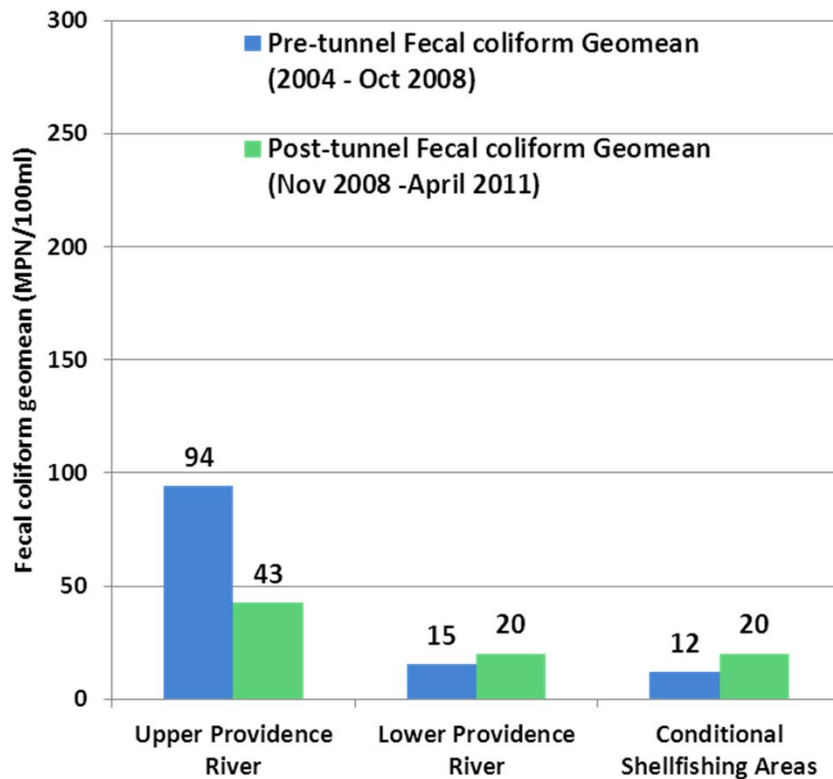


## Lower Providence River and Conditional Shellfishing Areas Fecal coliform Geomean Pre and Post Tunnel

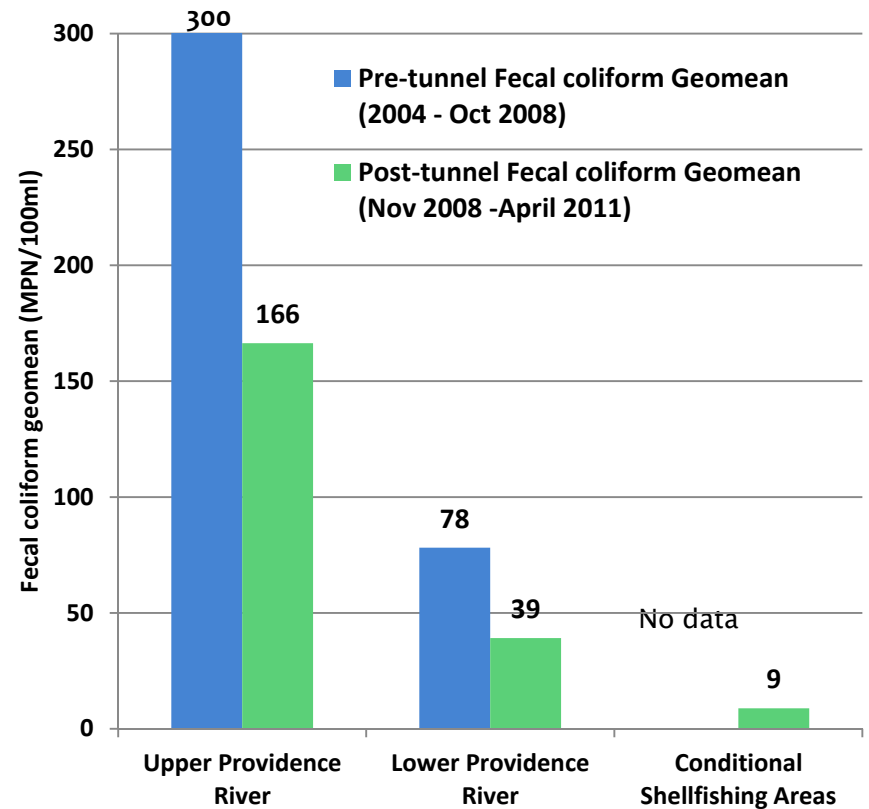


# Fecal Results by Rain Category

## 0.0 – 0.49 inches of rain



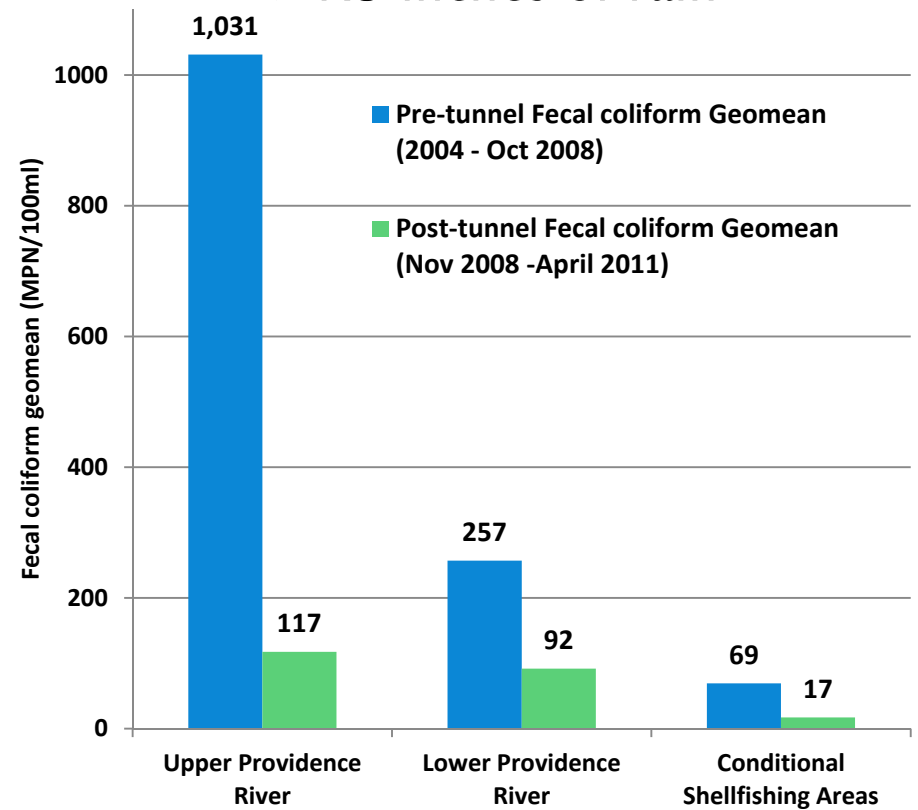
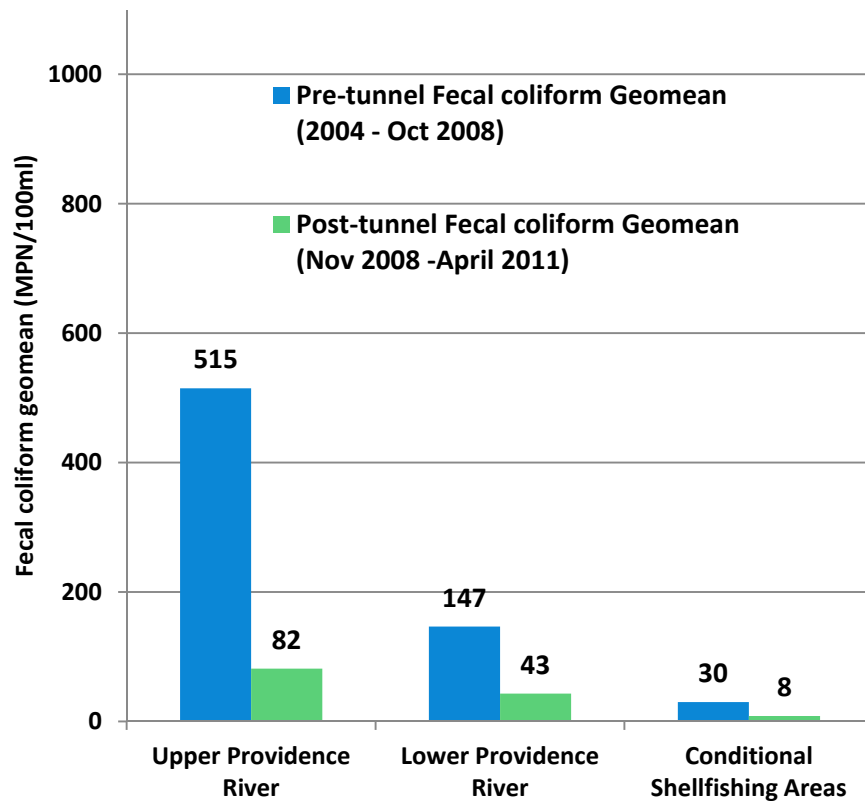
## 0.50 – 0.99 inches of rain

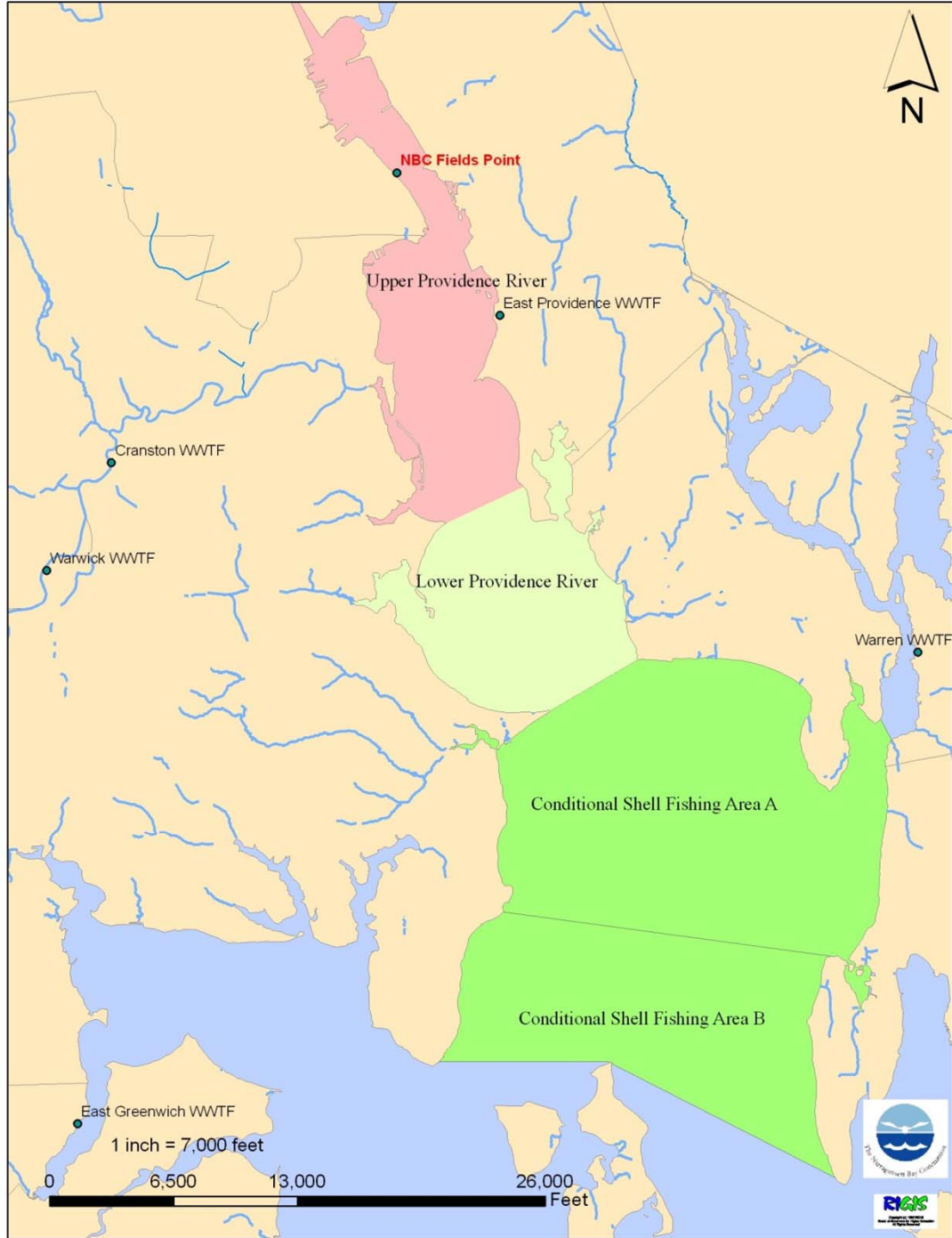


# Fecal Results by Rain Category

1.0 – 1.49 inches of rain

> 1.5 inches of rain





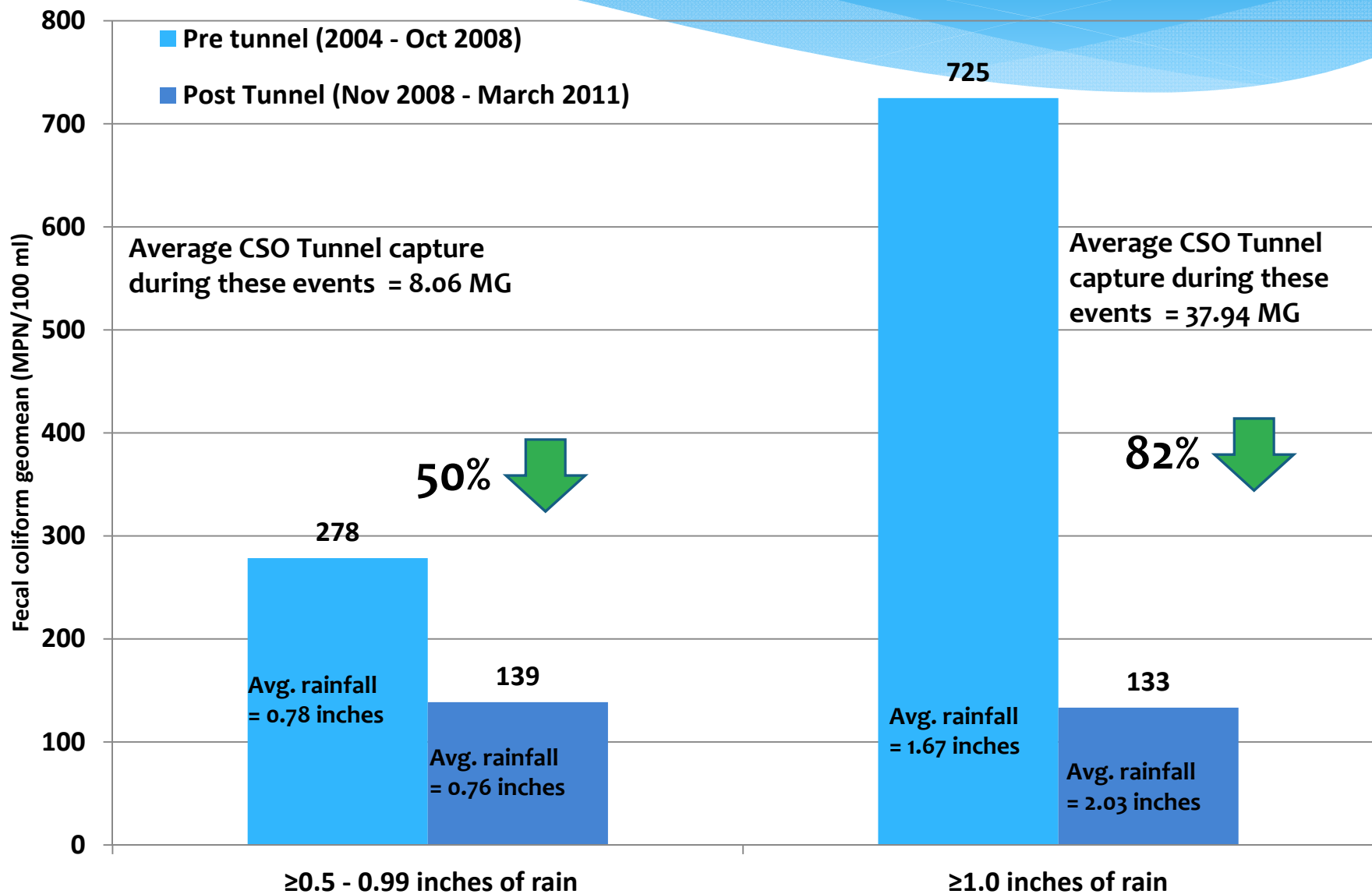
# Shellfish Closure Criteria Changes

- \* Historically, RIDEM closed Conditional Shellfishing Area A with rain of  $\geq 0.5$  inches rainfall (24 hr. period).
- \* Both Areas A & B were closed with  $\geq 1.0$  inches of rainfall
- \* On May 26<sup>th</sup>, 2011 DEM announced that Conditional Area A would now close with  $\geq 0.8$  inches of rain and Conditional Area B with  $\geq 1.5$  inches of rain
- \* On average Area A is expected to be open 65 more days/year  
Area B is projected to be open 45 more days/year
- \* *“the changes are a result of water quality improvements associated with the completion of Phase I of the three-phase Narragansett Bay Commission (NBC) combined sewer overflow (CSO) program in 2008”*

# Wet Weather Events at NBC Facilities in Relation to Shellfish Criteria

- \* Prior to tunnel operation, nearly all shellfish bed closures due to rain had an associated wet weather event at either of the NBC facilities (98%)
- \* After tunnel operation – only 88%
- \* In 2009 and 2010 there were 9 shellfish closure events that DEM ended early resulting in 20 extra days Conditional Areas A and B were open.
  - \* Changes in sampling protocols

## Upper Narragansett Bay Fecal coliform Geomeans with Rainfall 1-2 days Prior to Sample Collection





# Beach Closures

- \* From a presentation entitled Rhode Island Department of Health Beach Program: 2011 Land and Water Conservation Summit March 26, 2011 – **one reason cited:**

**“Improvements in water quality and decrease in beach closures can be attributed to implementation of the Providence CSO Tunnel Project”**

- \* Statewide:
  - \* 36% decrease in closure events in 2010 vs. 2006
  - \* 73% decrease in closure days in 2010 vs. 2006.
- \* At 3 Upper Bay Beaches said to be affected by CSOs:
  - \* 44% decrease in closure events in 2010 vs. 2006
  - \* 82% decrease in closure days in 2010 vs. 2006
- \* Urban Beach Initiative
  - \* DOH is now investigating the possibility of opening 3 closed beaches in the Upper Bay.
    - \* 85% percent compliance rate; about on par with Southern RI coastal “open water” beaches



# Summary

- \* 2.9 billion gallons of storm/wastewater collected in CSO tunnel since November 2008
- \* Significant decrease in need to use Wet Weather Facilities at Field's Point (73% decrease)
  - \* Most flow into FP is now able to receive full secondary treatment
- \* Estimate over 723,000 lbs. of TSS; 646,000 lbs. of BOD; 67,000 lbs. of TN; and ~30,000 lbs. metals have been prevented from entering rivers/bay from CSOs.

# Summary Continued....

- \* Significant reduction in Fecal coliform geomeans in the Providence River/Upper Bay since tunnel went into operation
- \* Significant reduction in Fecal coliform geomeans in rainstorms  $\geq 0.5$  inches (50%) and even greater reduction in rain events of  $\geq 1.0$  inches (82%)
- \* Shellfishing areas opened early for additional 20 days
  - \* New DEM shellfish bed closure criteria
- \* Reduction in number of days & events in Upper Bay beaches & DOH looking into possibility of opening 3 closed areas

# What's next – Phase II

- \* Phase II – 2011 - 2014 Cost: ~\$363 million
- \* Woonasquatucket River CSO Interceptor (2.35 miles)
- \* Seekonk River CSO Interceptor (1.4 miles)
- \* Collect 14 more CSO's into interceptors and then to tunnel
- \* Sewer/stormline separation of 2 CSOs
- \* Construction of wetlands treatment facility for 1 CSO
- \* Will coincide with the completion of WWTF BNR upgrades

# Phase III and When All is Said and Done....

- \* Phase III – evaluation period after Phase II
  - \* Estimated Cost - \$603 million
  - \* Pawtucket Tunnel – deep rock tunnel to go to Bucklin Point
  - \* 12 CSO's collected into Tunnel
  - \* Sewer separation of 4 CSOs
- \* What do we anticipate?
  - \* 95% reduction in number of overflows/year
  - \* Overflow volume reduced by 98%
  - \* 98% reduction in CSO fecal coliform load
  - \* CSO TSS & BOD loads reduced by 78% and 80%
  - \* Rainfall amounts for shellfish bed closure would increase (*already happened!*)

# Questions?

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