Restoring Upper Narragansett Bay Through CSO Abatement – A Progress Report Following Phase II

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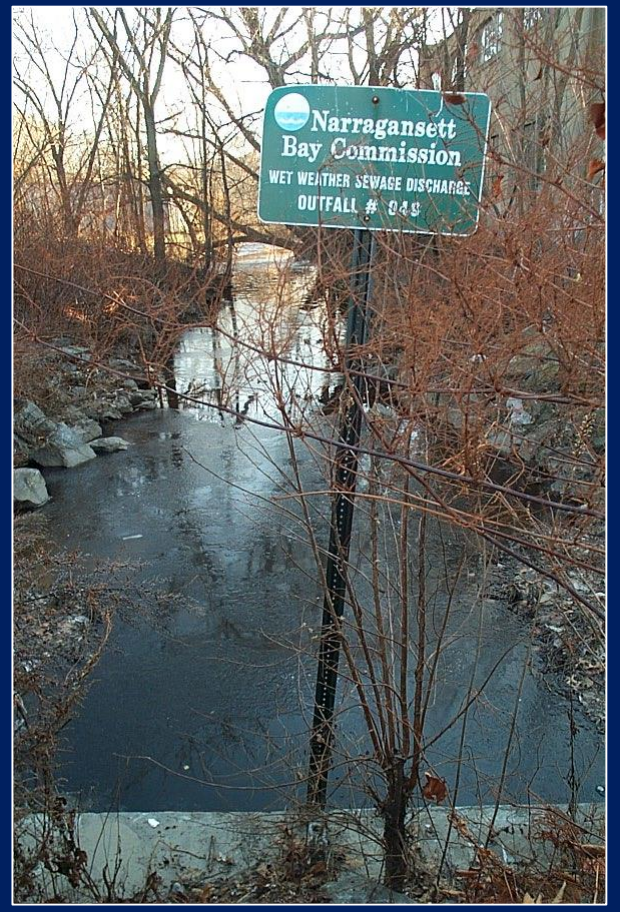
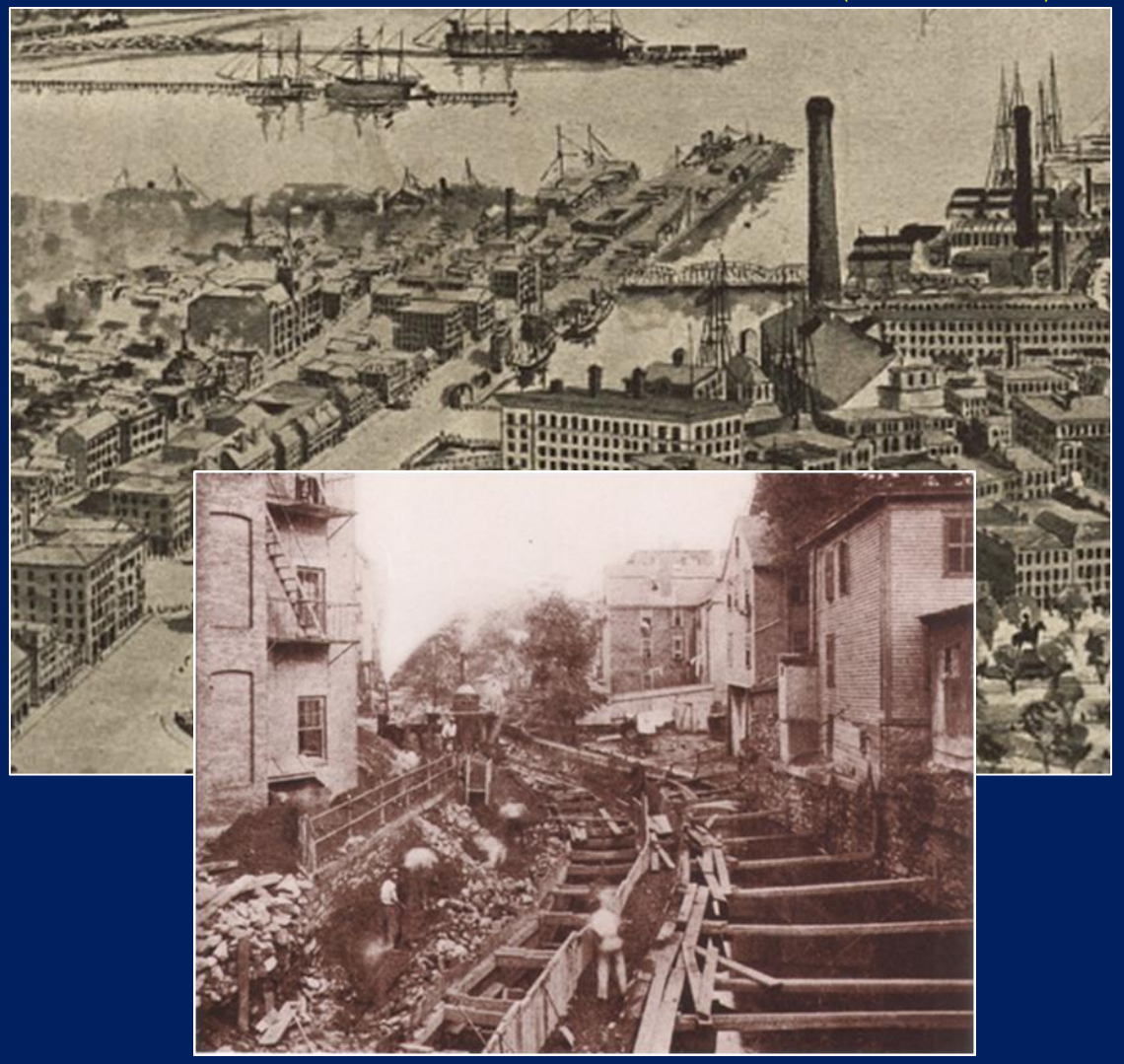


What are CSOs?

- Combined sewers - originally designed to collect stormwater and sewage during large rain events
  - Transport waste from households and streets to rivers
  - Discharge through combined sewer outfalls (CSOs)
  - CSOs intercepted and flows directed to WWTF

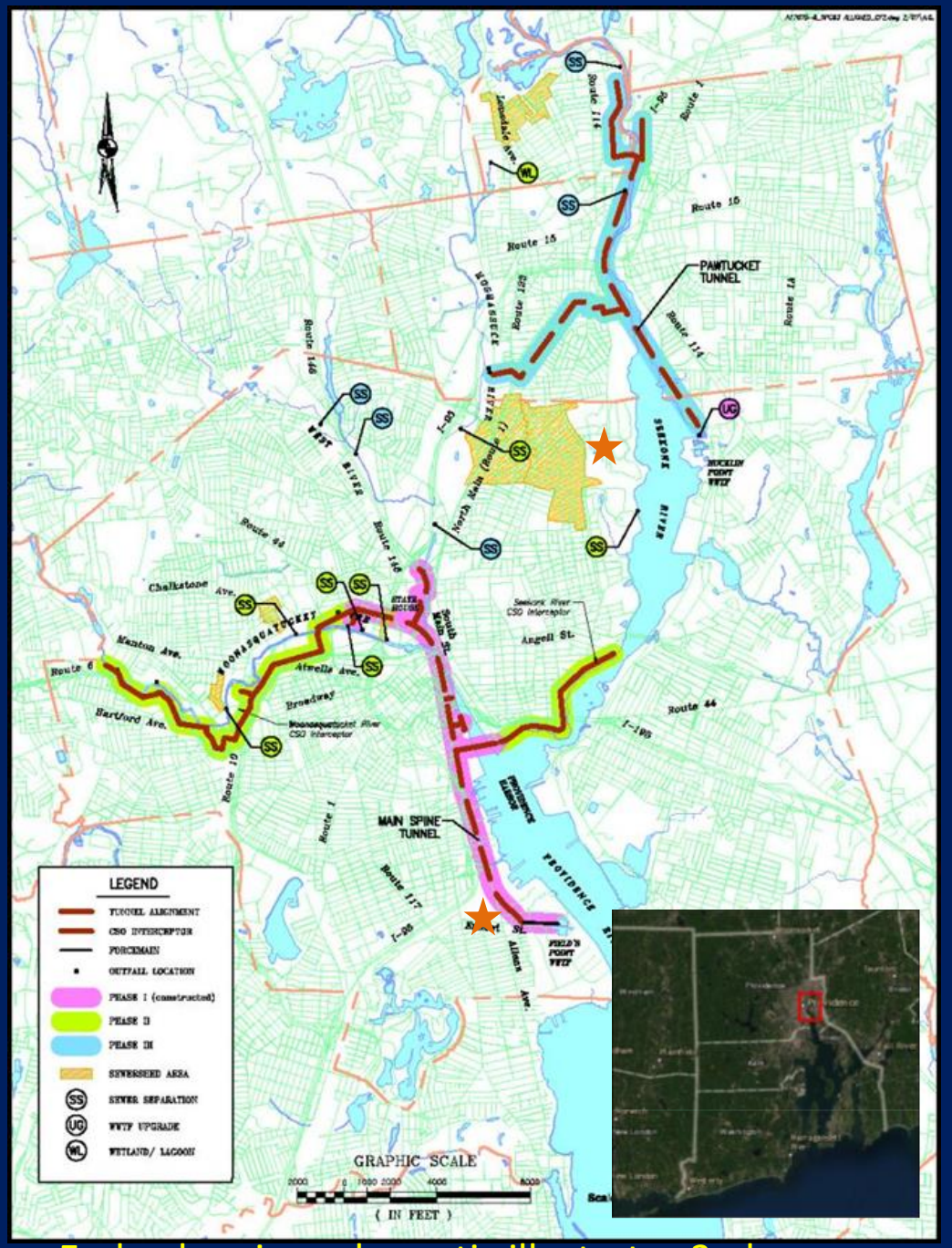
- Untreated discharges violate the CWA and create public health problems
- CSO Abatement – reducing overflows to protect public health and water quality

Providence, 1896
(Providence Journal Co.)



NBC CSO Abatement Project

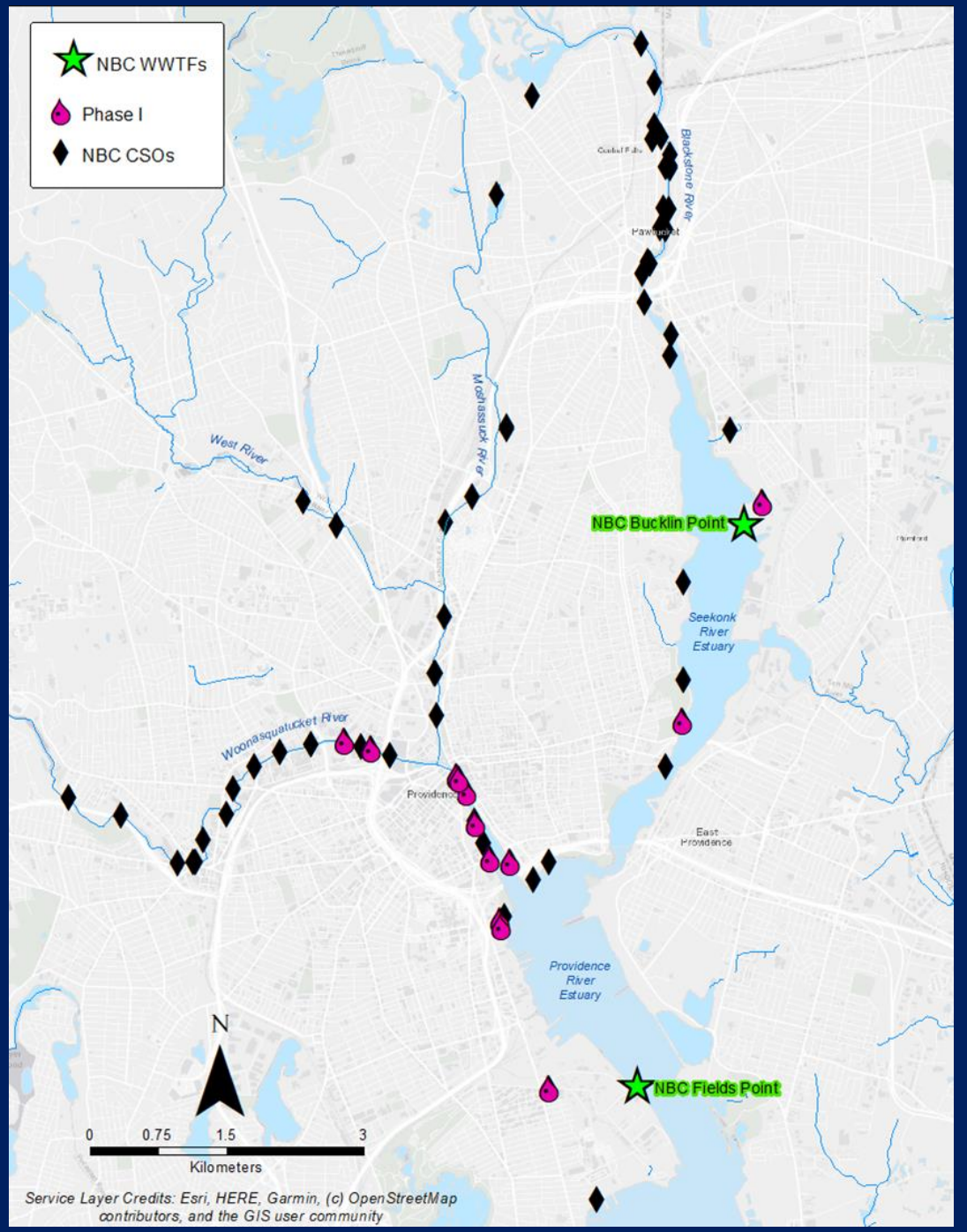
- Three phases
- $1.2 billion
- Goal: reduce CSO discharges and restore water quality in the upper Narragansett Bay
  - Currently, receiving waters are impaired (excess bacteria) and shellfishing is prohibited



Early planning schematic illustrates 3 phases

CSO Abatement Phase I

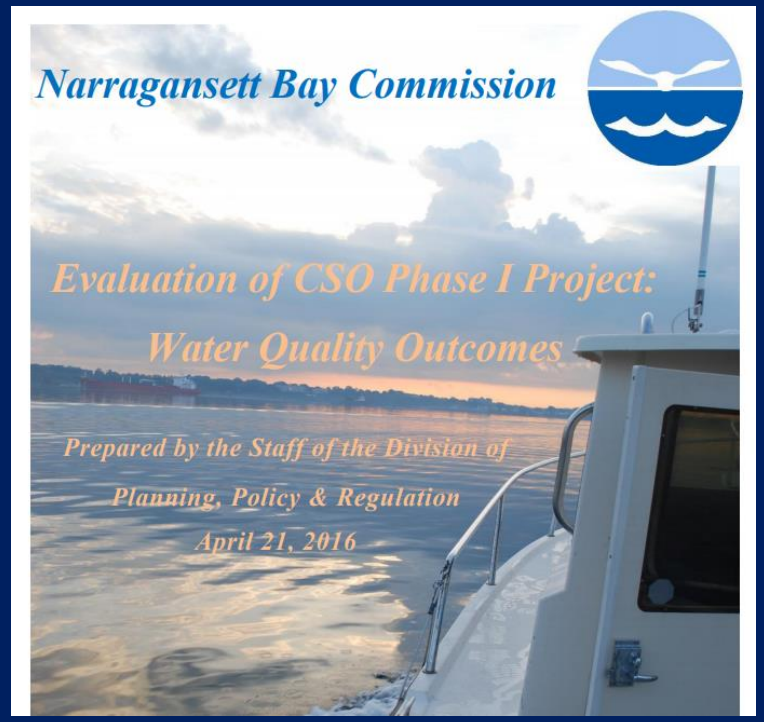
- Phase I Tunnel
  - 26-ft diameter deep rock tunnel, 3-mile long, 300 ft. below ground
  - 65-million-gallon capacity
  - Stores flows for eventual treatment at Field's Point WWTF
  - Captures "first flush"
- Completed Oct. 2008
- Addressed CSOs along the Woonasquatucket, Providence, and Seekonk Rivers
- "Addressed" – sealed or modifications made to reduce discharge frequency



Phase I
Water Quality Improvement

- Phase I Tunnel captures an estimated 50% of CSO flows
  - "first flush" presumably captures more than 50% of pollutants!
    - Total suspend solids, metals, and nitrogen
- Shellfishing regulations relaxed in 2011
  - ~50-65 additional days open for shellfishing per year

Image: newenglandhistoricalsociety.com

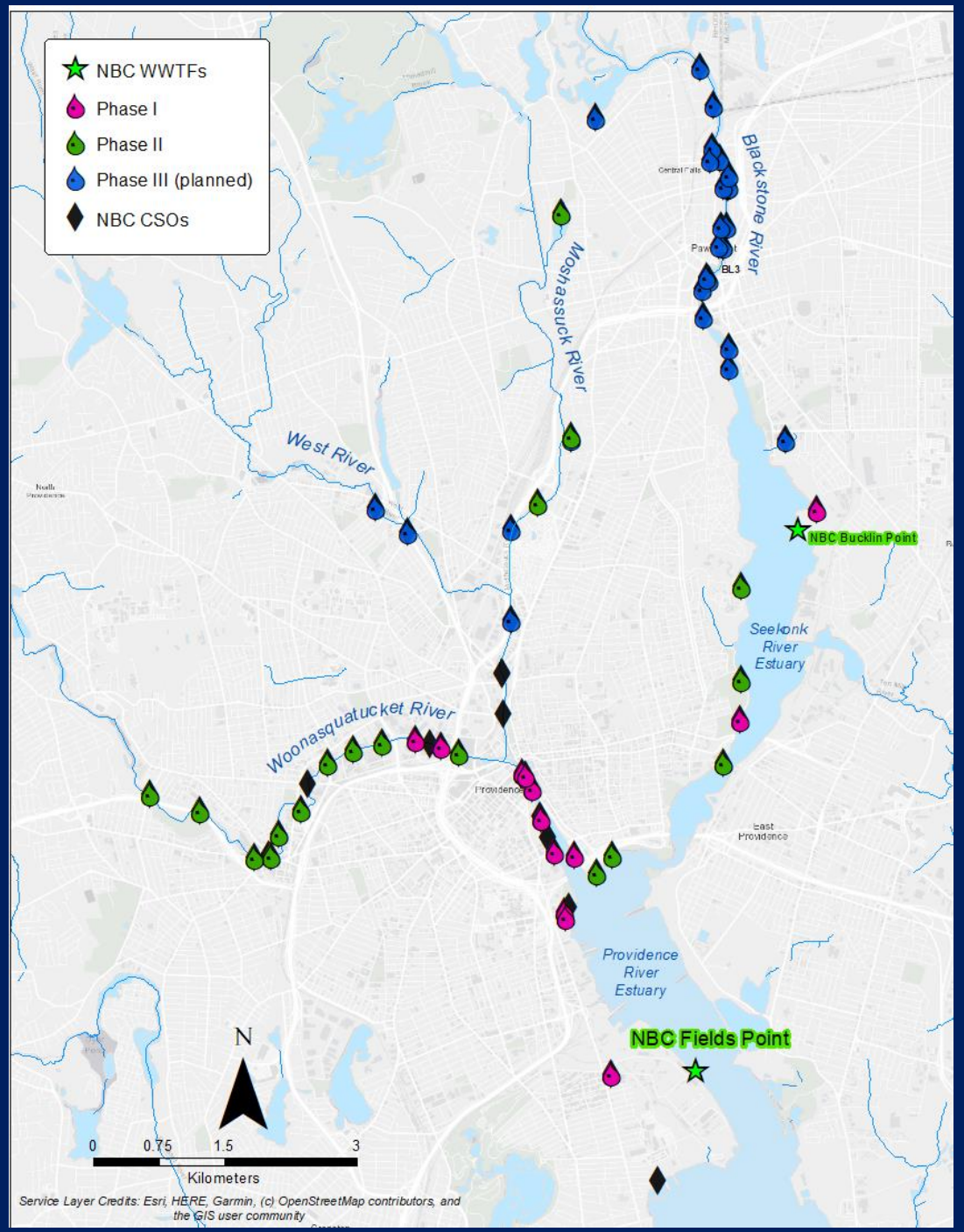


http://snapshot.narrabay.com/LearnMore/WaterQualityReports

~$5 million dockside value of quahogs (2012)
54% of the quahog harvest came from conditional areas (2013)
(The Rhode Island Shellfish Management Plan, 2014)

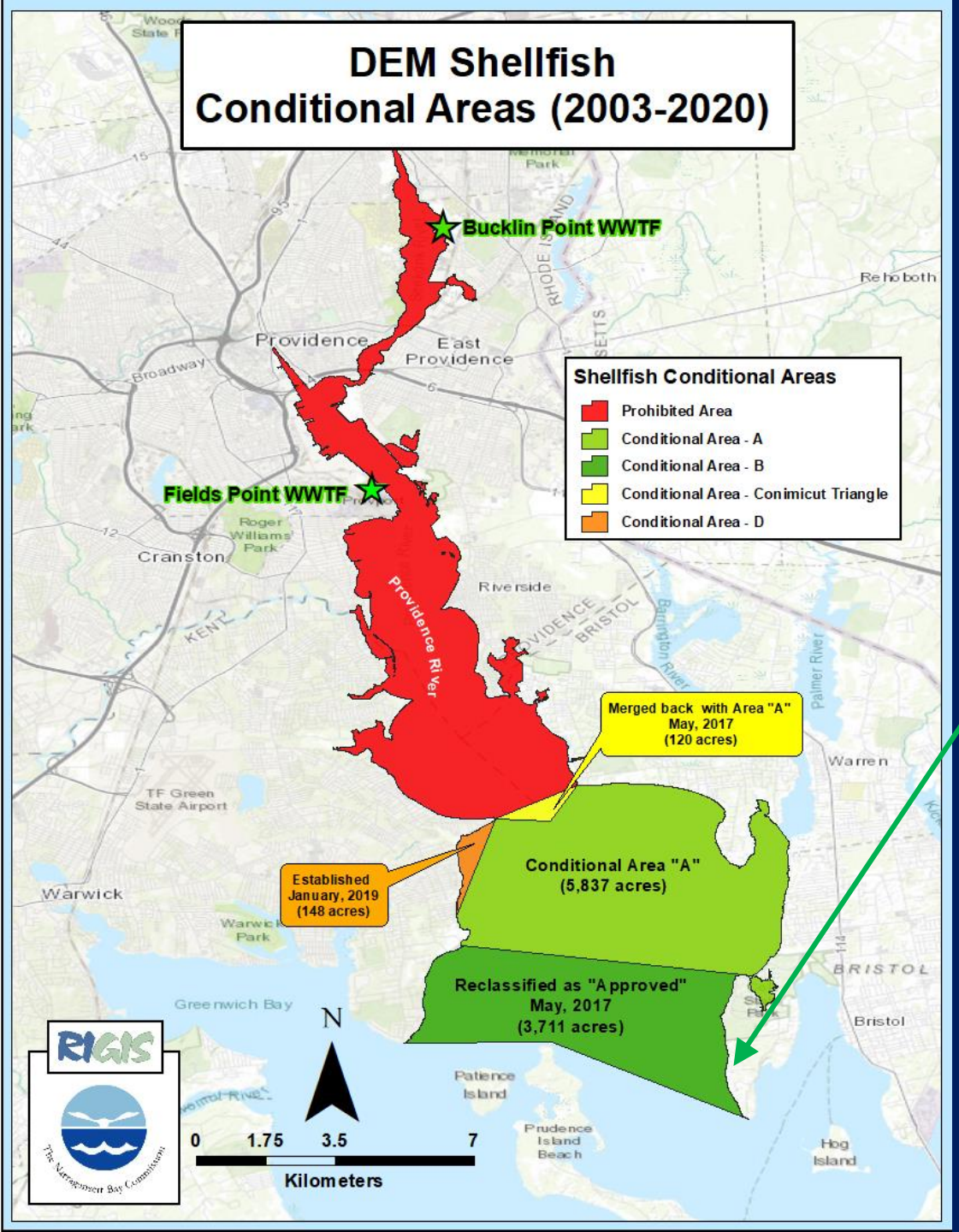
CSO Abatement Phase II

- Completed June 2015
- Additional tie-ins to the Phase I tunnel
- Sewer separations (separate sewage from stormwater)
- Constructed wetland facility



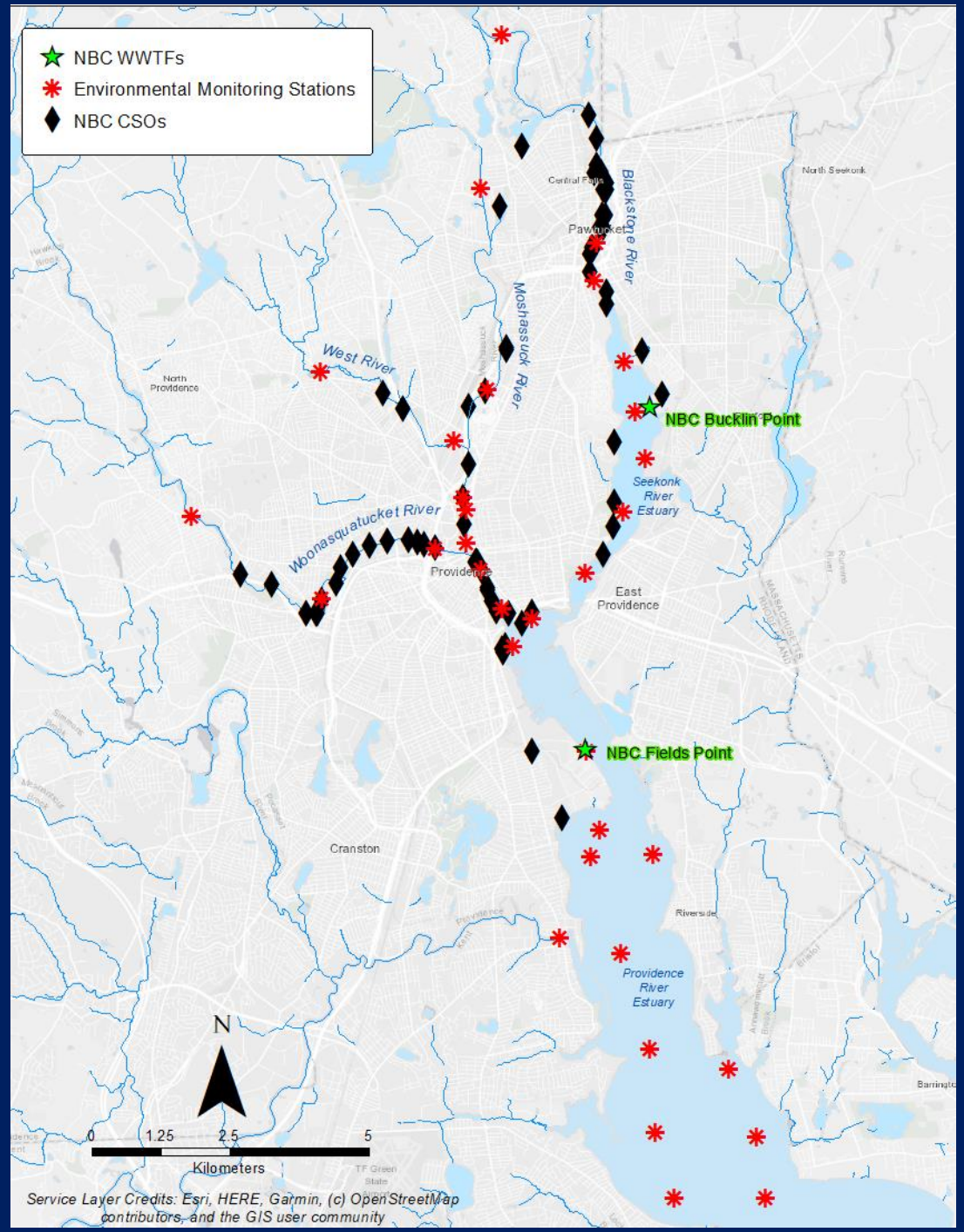
CSO Abatement Phase III

- Breaking ground soon
- Focus on Bucklin Point WWTF District
- Second deep storage tunnel
  - CSOs along Blackstone River
- Green infrastructure projects



Phase II
Water Quality Improvements

- 3,711 acres of conditionally-open shellfish areas reclassified to “APPROVED” in 2017
- Further relaxation of rainfall limits to initiate closure of “conditional” areas
  - Gain of up to ~40 additional days open to shellfishing per year!



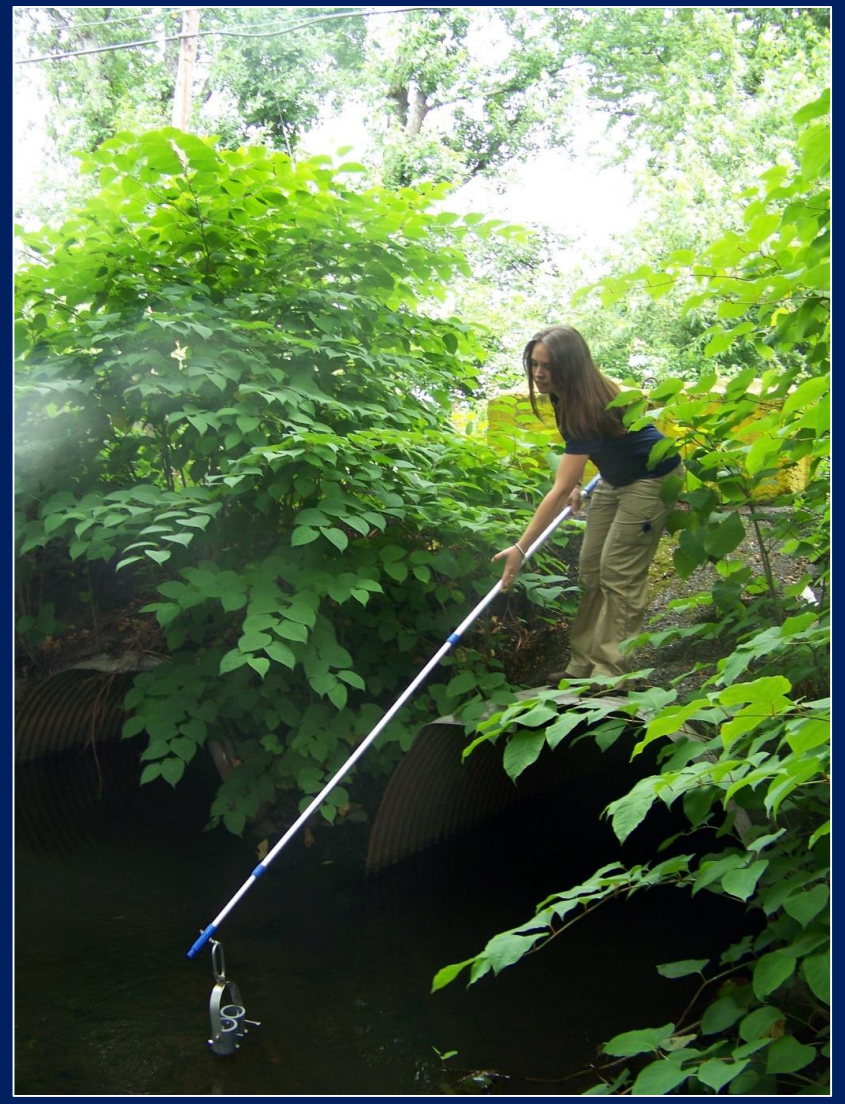
Phase II Water Quality Report: Bacteria Monitoring

- Preparing Phase II Report
- NBC monitoring program
  - Fecal coliform and enterococci
  - Freshwater rivers – sampled 1-2x per week
  - Seekonk and Providence Rivers (Bay) – sampled 2x per month

Data Analysis

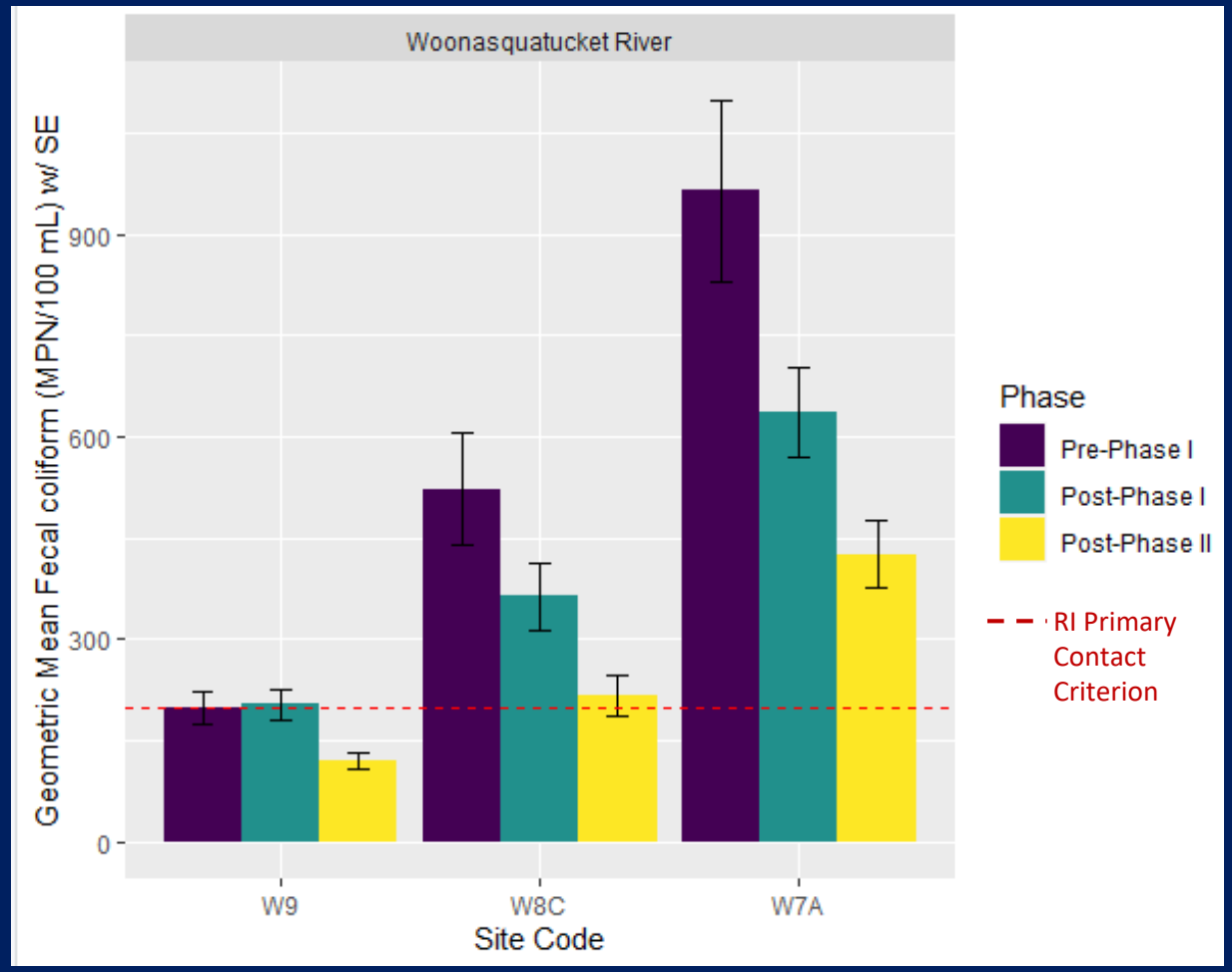
- Preliminary results
- Geometric mean fecal coliform counts with standard error
- Phase:
  - Pre-Phase I: March 2004 – October 2008
  - Post-Phase I: November 2008 – June 1, 2015
  - Post-Phase II: June 2, 2015 – December 2019
- Weather:
  - Wet: Sample day + 3 prior rain total ≥0.1 inches (TF Green NWS Station)
- Comparison to state primary contact criteria*

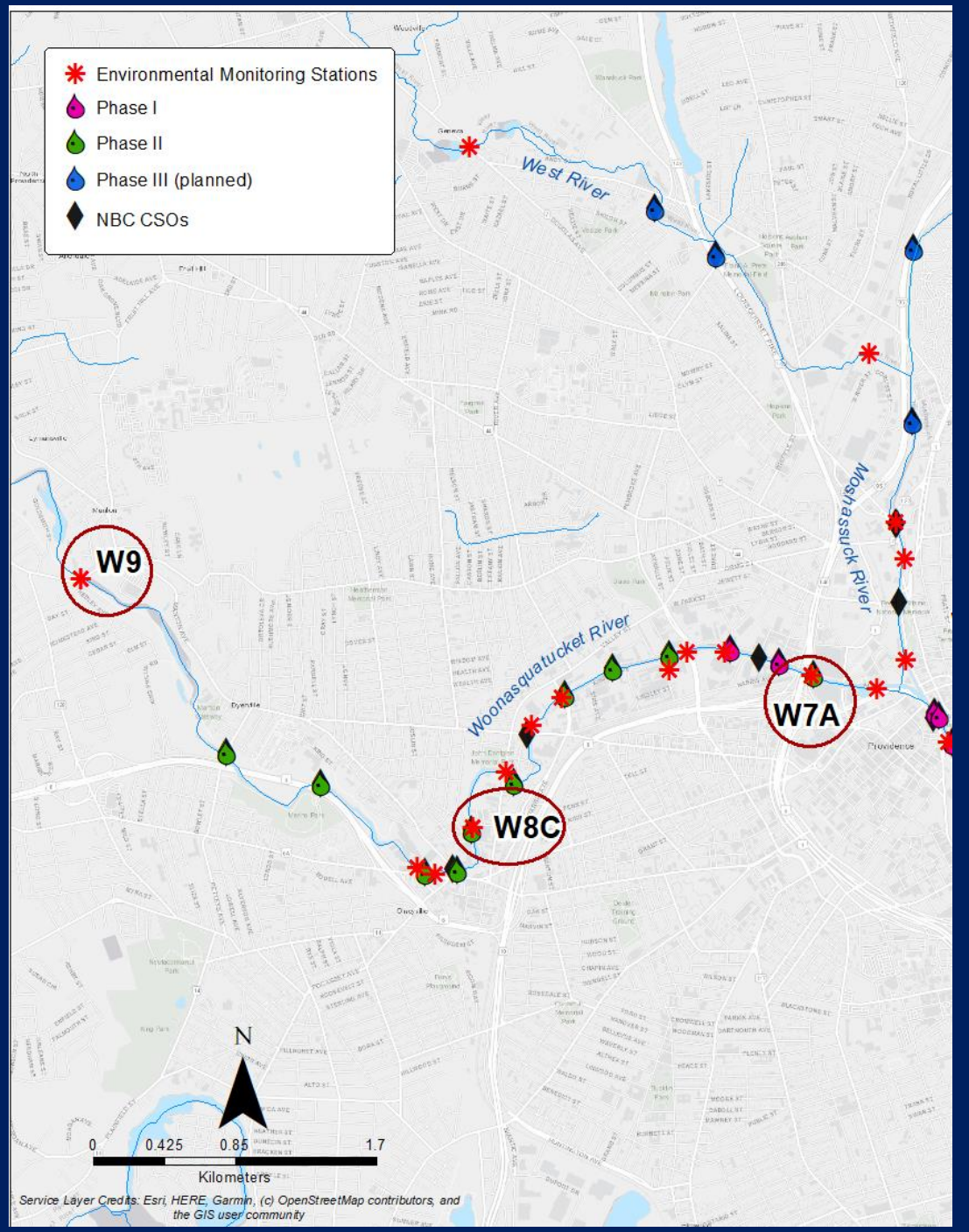
*For point of comparison only, actual compliance measured through different analysis methods



Woonasquatucket River

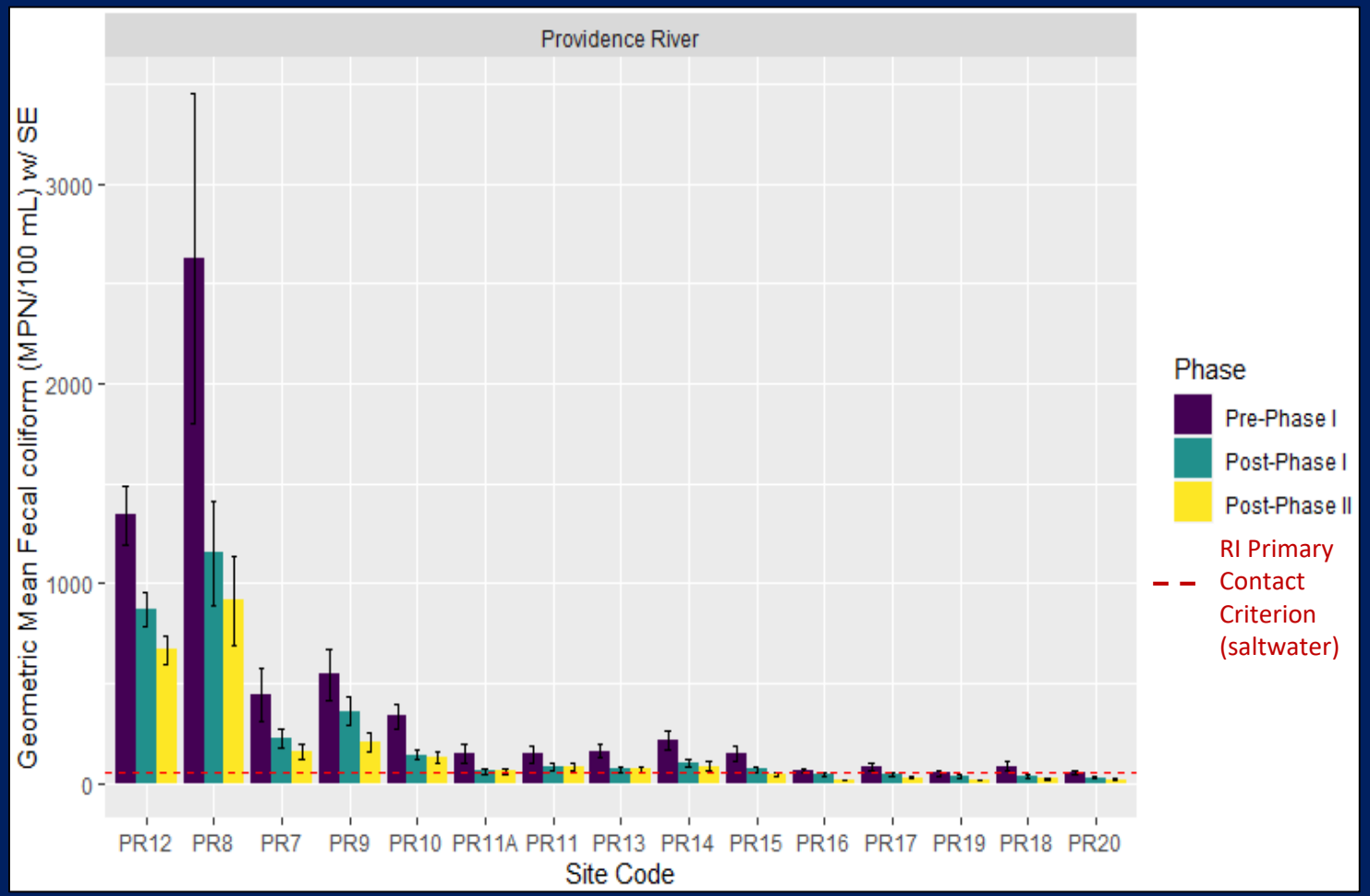
Some sites still exhibit elevated bacteria counts; continued impairment due to stormwater? Illicit connections?

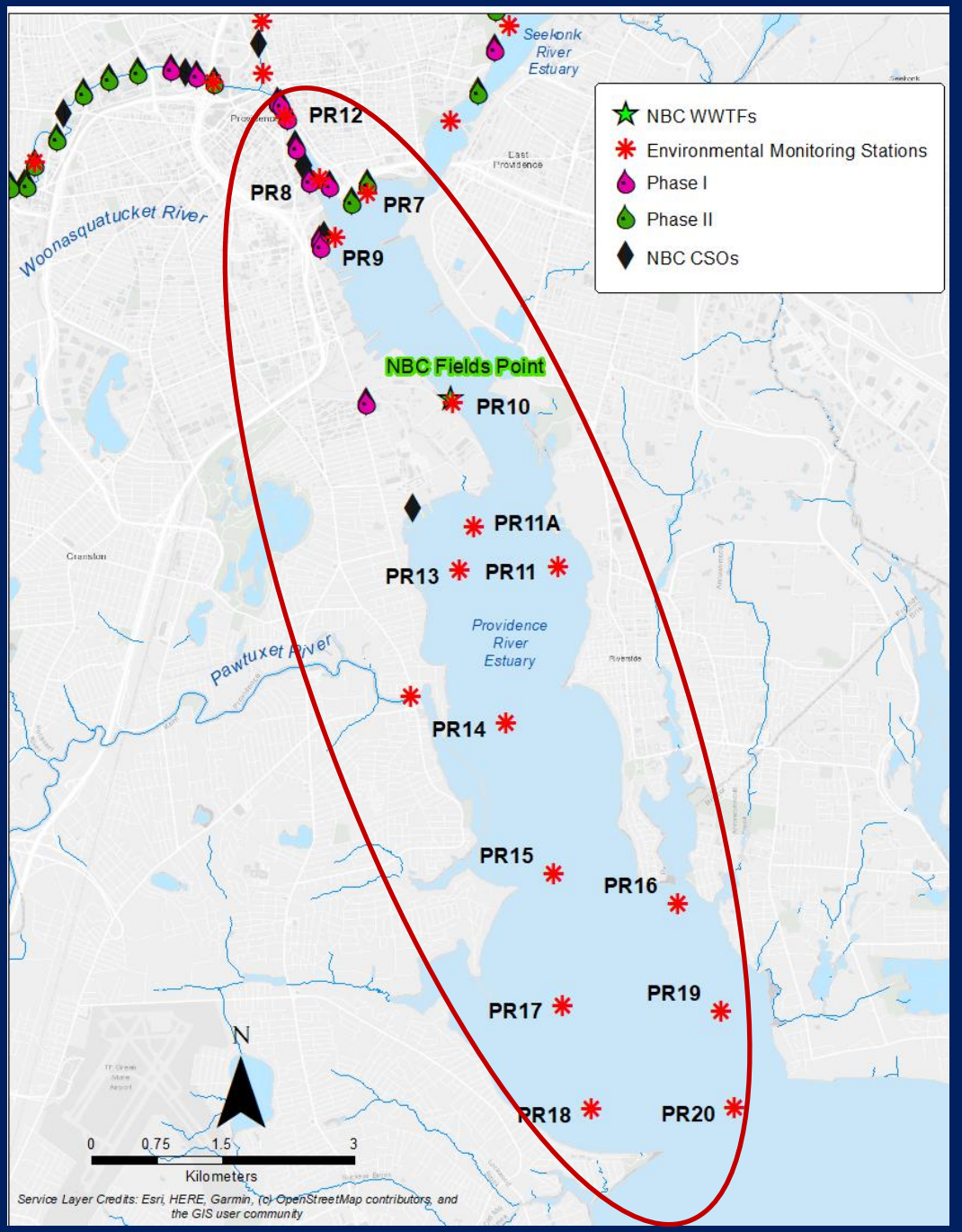




Providence River Estuary

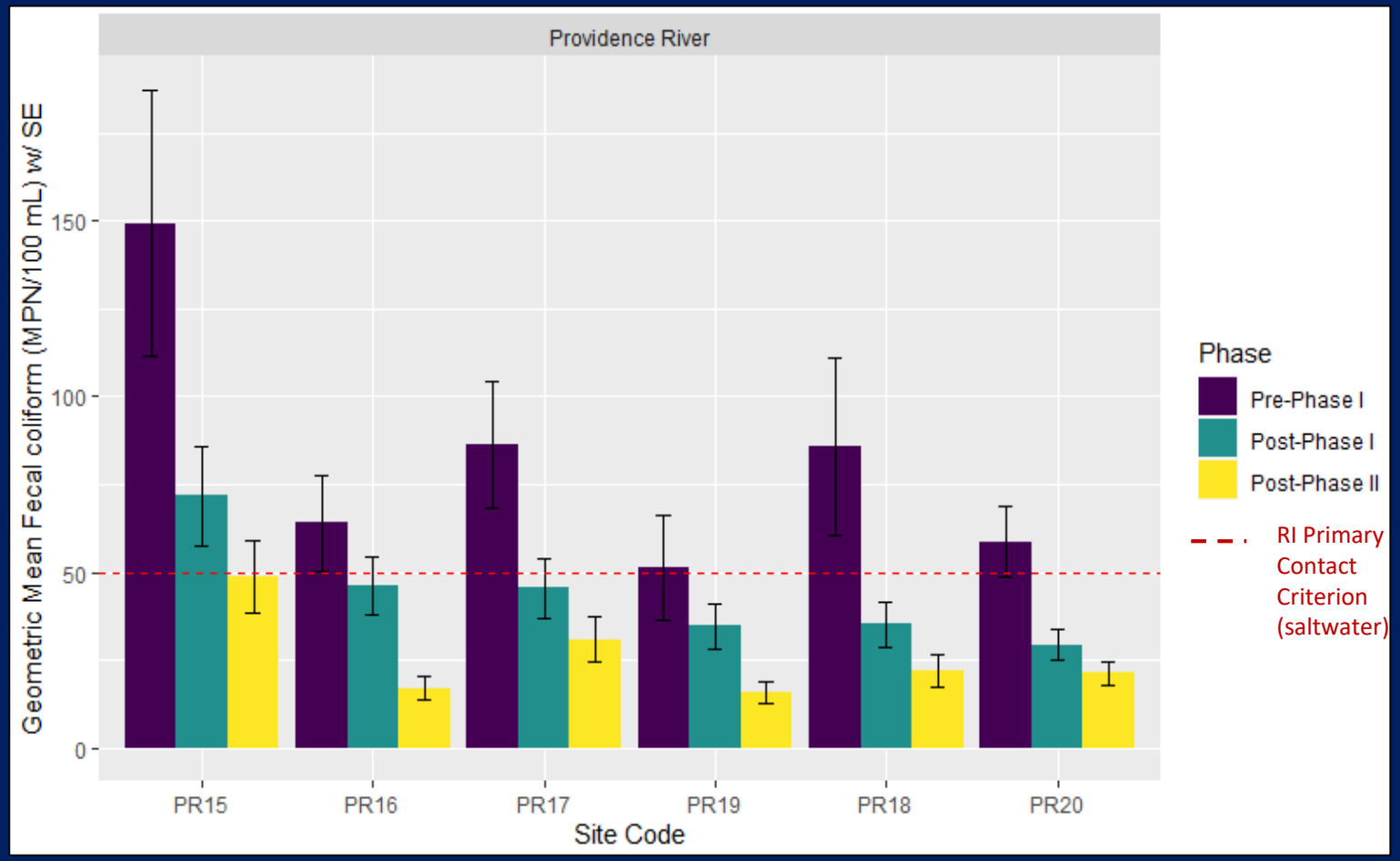
Most dramatic change after Phase I; bacteria still elevated at northernmost sites (located in city center)

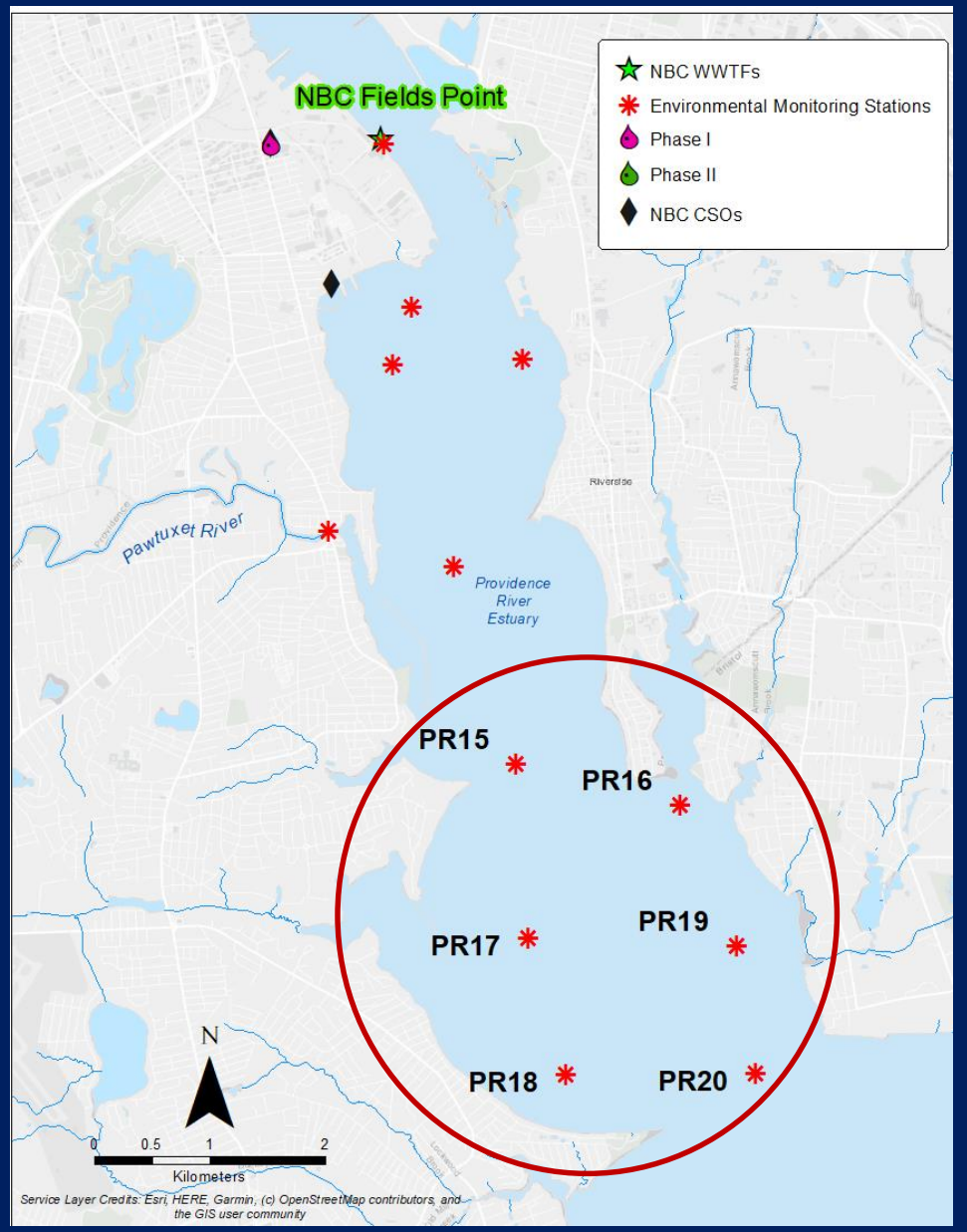




Providence River Estuary (lower)

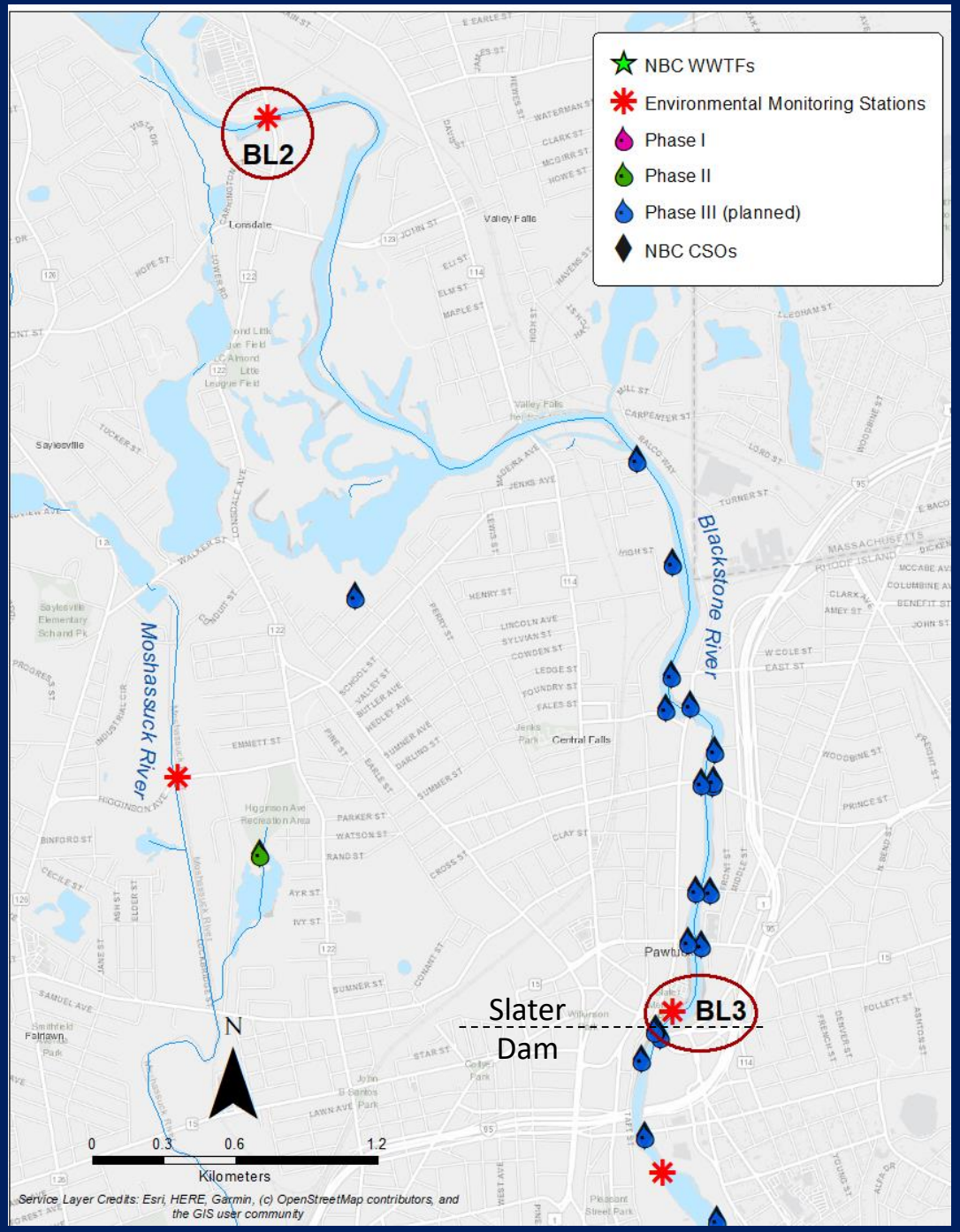
Bacteria counts following Phases I and II frequently below state water quality criteria for primary contact

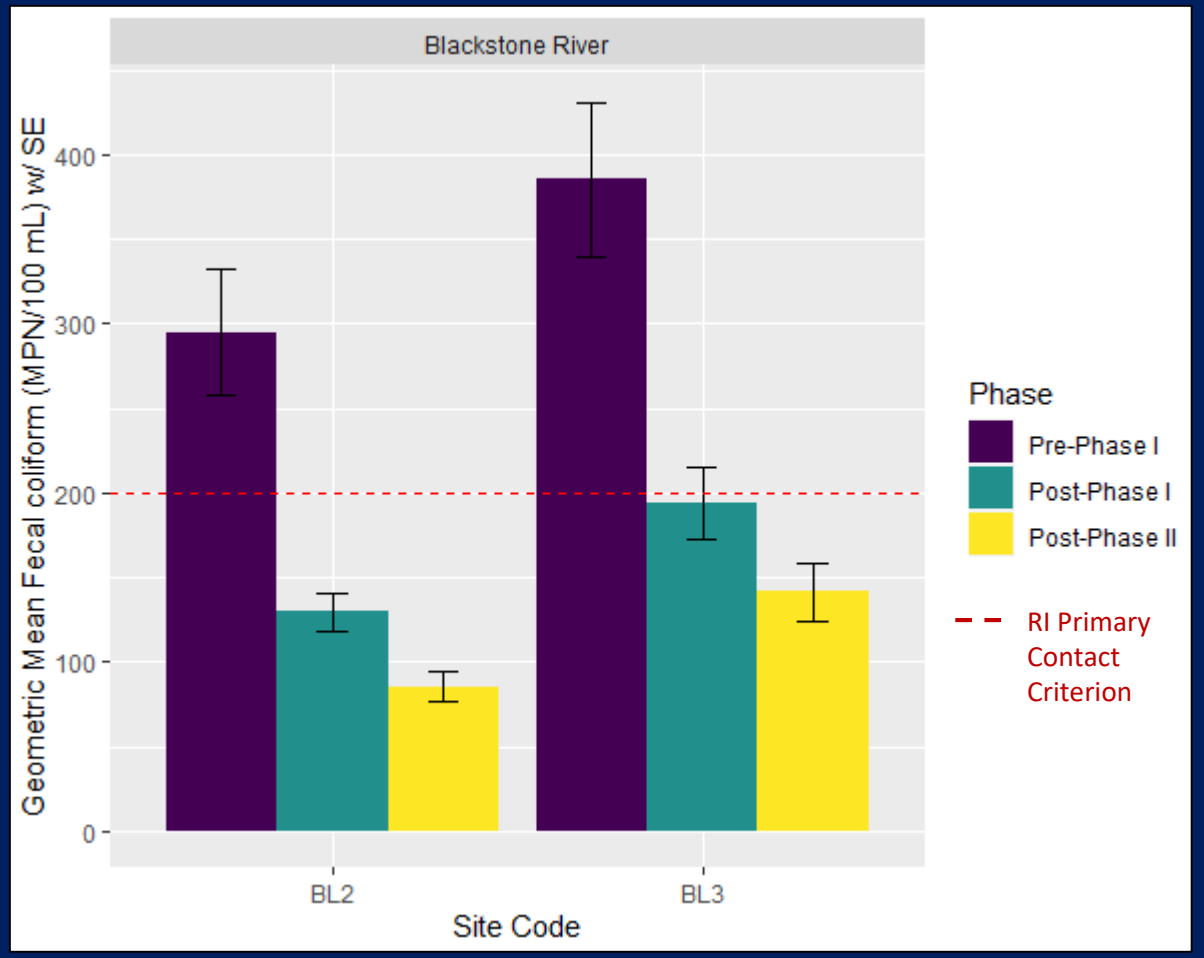




Blackstone River

Fecal coliform counts dropped post-Phase I at sites not impacted by CSOs or CSO Abatement





Closing Thoughts

- Phases I and II have contributed to the restoration of water quality, shellfishing access, and recreation in the urban upper reaches of Narragansett Bay
- Concurrent efforts to improve water quality complicate isolation of the CSO story
- CSOs are not the only source of bacteria impairment

Thank you!

- Comprehensive Phase II report will include:
  - Further exploration of “wet weather” (alternate rain gauges, antecedent rain amounts, precipitation intensity)
  - Site-by-site evaluation of infrastructure changes and impacts to water quality

- Questions: lcruz@narrabay.com
- Data: http://snapshot.narrabay.com/app/
- Many staff & depts at the NBC, notably:
  - Environmental Monitoring Dept.
  - NBC Laboratory
  - Technical Analysis & Compliance Dept.
  - Engineering Dept.
  - Interceptor Maintenance Dept.