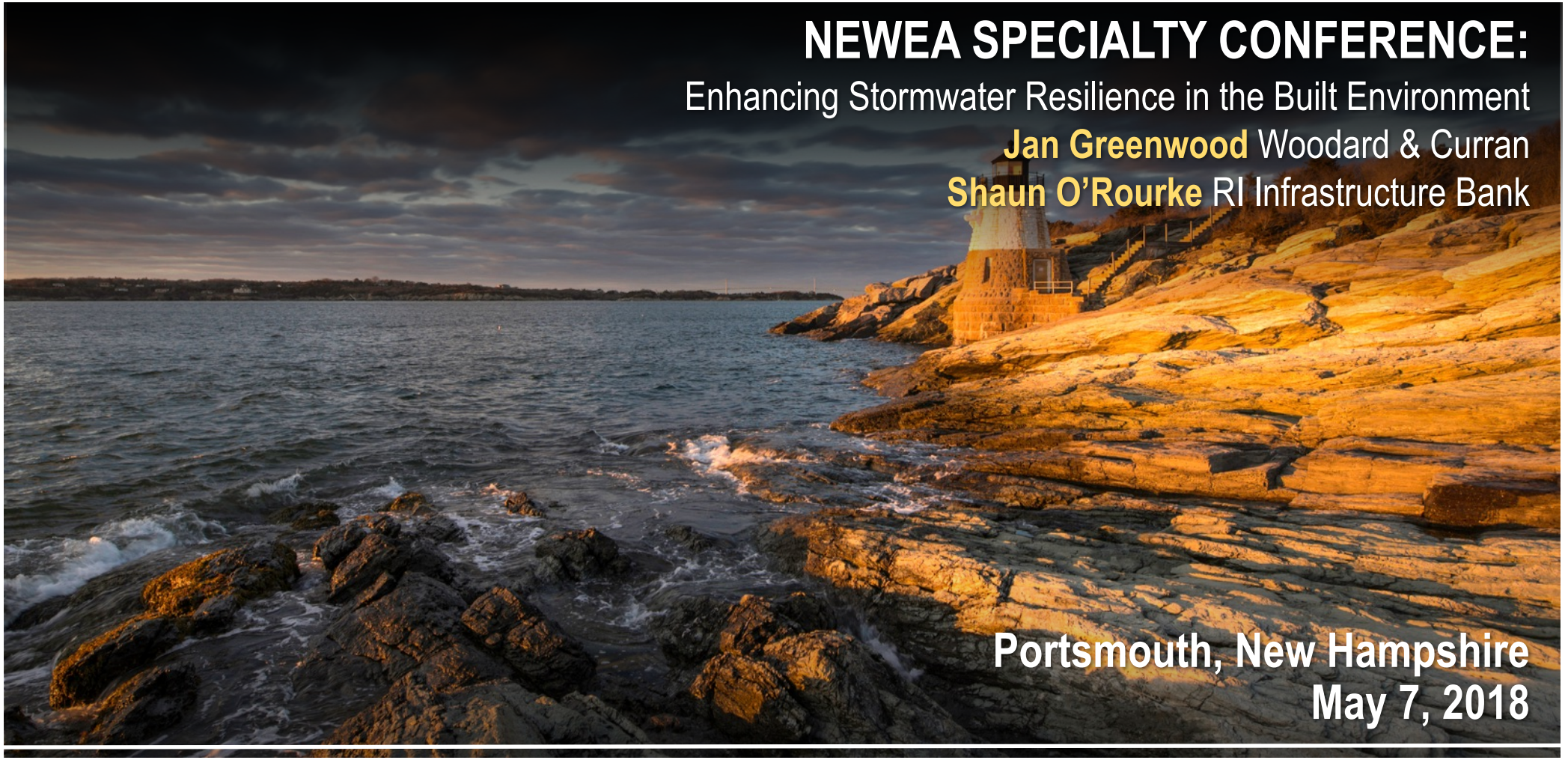
Rhode Island's Resiliency Efforts



NEWEA SPECIALTY CONFERENCE:

Enhancing Stormwater Resilience in the Built Environment

Jan Greenwood Woodard & Curran
Shaun O'Rourke RI Infrastructure Bank

Portsmouth, New Hampshire
May 7, 2018

Resilient Rhody:

Statewide Climate Resilience Action Strategy

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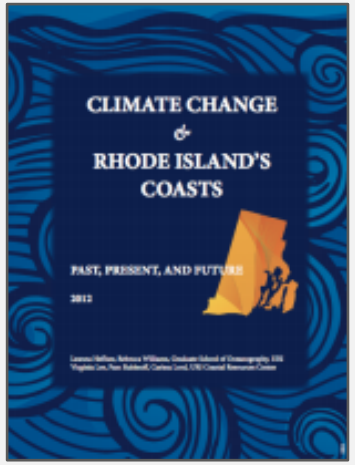
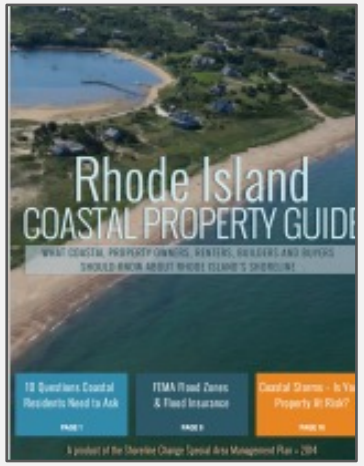
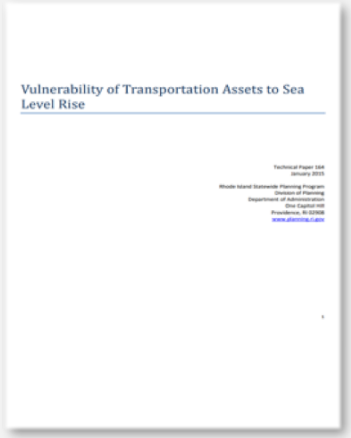
RHODE ISLAND INFRASTRUCTURE BANK

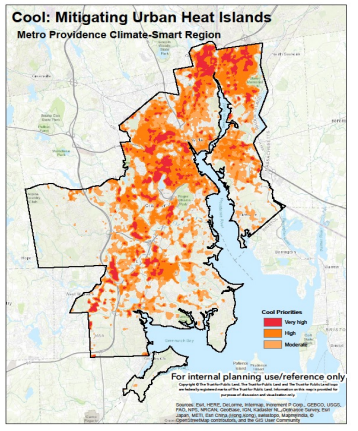
DEM RHODE ISLAND

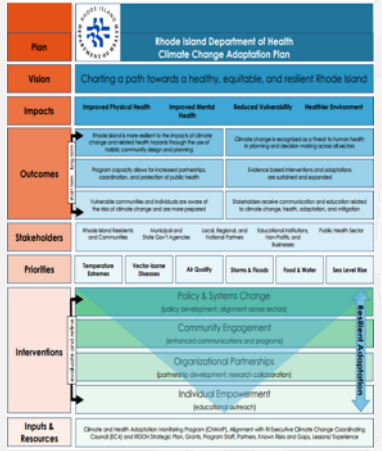
Statewide Climate Resiliency Action Strategy











Wealth of reports completed to date

EC4 Science and Technical Advisory Board (2017)

CHANGES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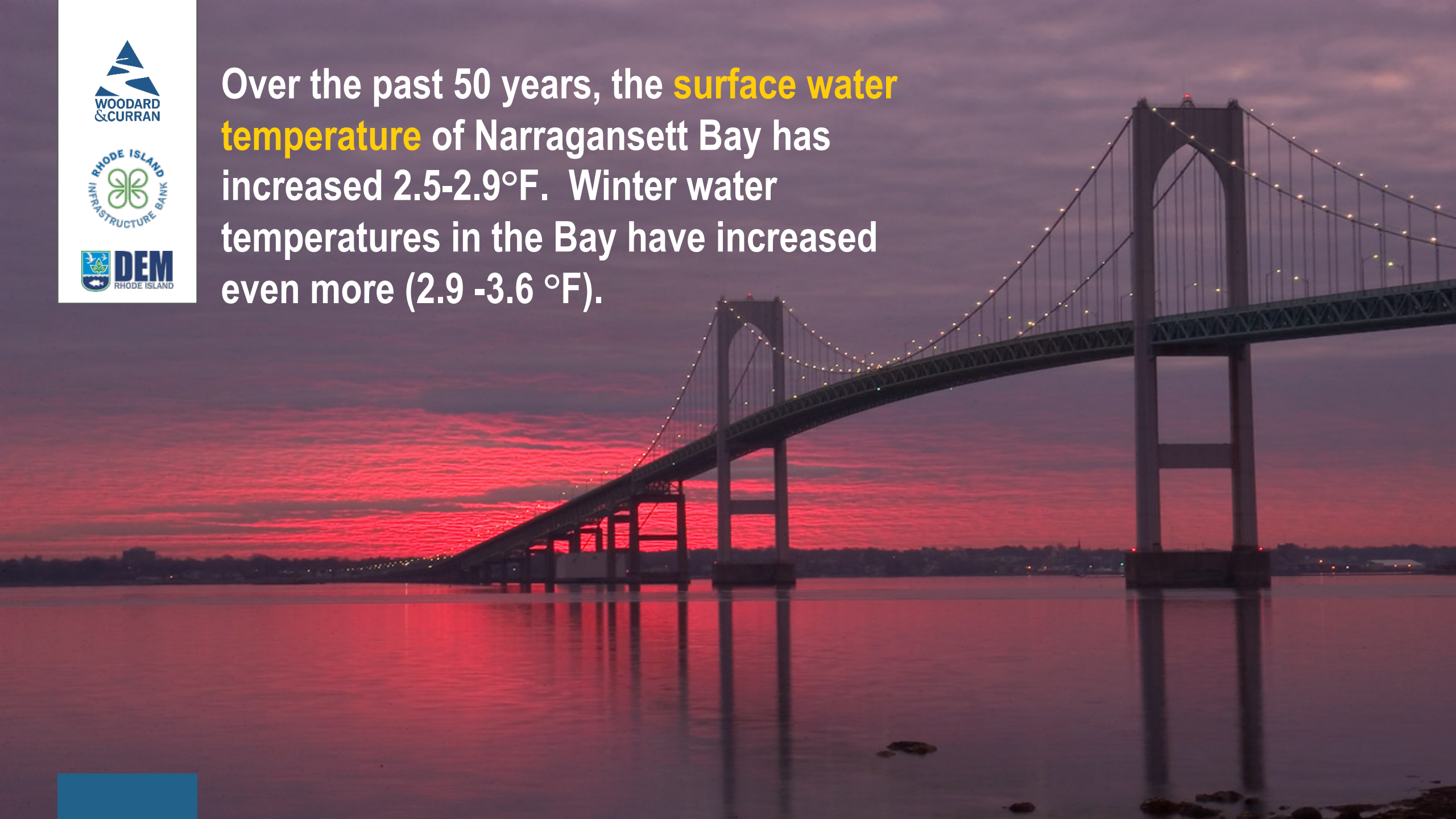
Temperatures in Rhode Island have increased by more than 3°F since the beginning of the 20th century. 2016 was the warmest year on record globally.


Over the past 50 years, the surface water temperature of Narragansett Bay has increased 2.5-2.9°F. Winter water temperatures in the Bay have increased even more (2.9 -3.6 °F).

Sea levels have risen 10 inches in RI since 1930 (Newport tide gauge). Updated NOAA predictions (Jan. 2017) put sea level rise in RI at close to 1 ft. by 2030 and upwards of 9 ft. by 2100.


Intense rainfall events in New England have increased 71% since 1958. RI's average annual precipitation has increased more than 10 inches since 1930.

What's at Risk

15,380 active flood insurance policies covering over $3.8 billion in **residential and commercial property**

337 miles of **state and municipal roadway** are vulnerable to flooding in a 100 yr. storm surge event

19 **wastewater treatment facilities**, all located in coastal or riverine flood zones

Salt marshes provide recreational and commercial fishing activities with an estimated of $6,417 an acre. Coastal wetlands generate $2 billion annually.

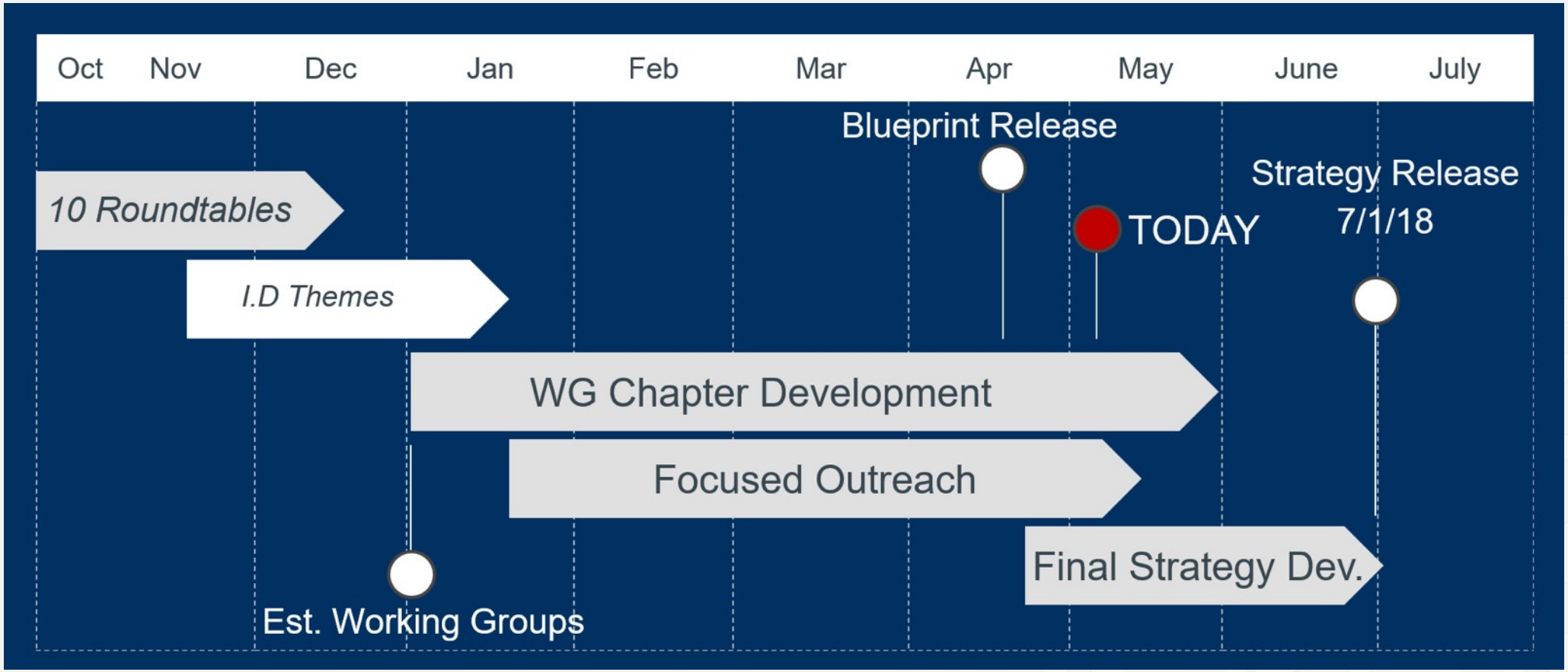
How are we defining Climate Resilience?

Climate Resilience is the capacity of individuals, institutions, businesses, and natural systems within Rhode Island to survive, adapt, and grow regardless of chronic stresses and weather events they experience.

Statewide Climate Resilience Action Strategy Goals

- Catalyze the planning and vulnerability studies already developed and move towards implementation
- Identify and prioritize resiliency actions the State can control to demonstrate progress and implementation
- Prioritize actions that promote cross-agency collaboration and support municipalities in resilience planning and project implementation

Climate Resilience Action Strategy Timeline

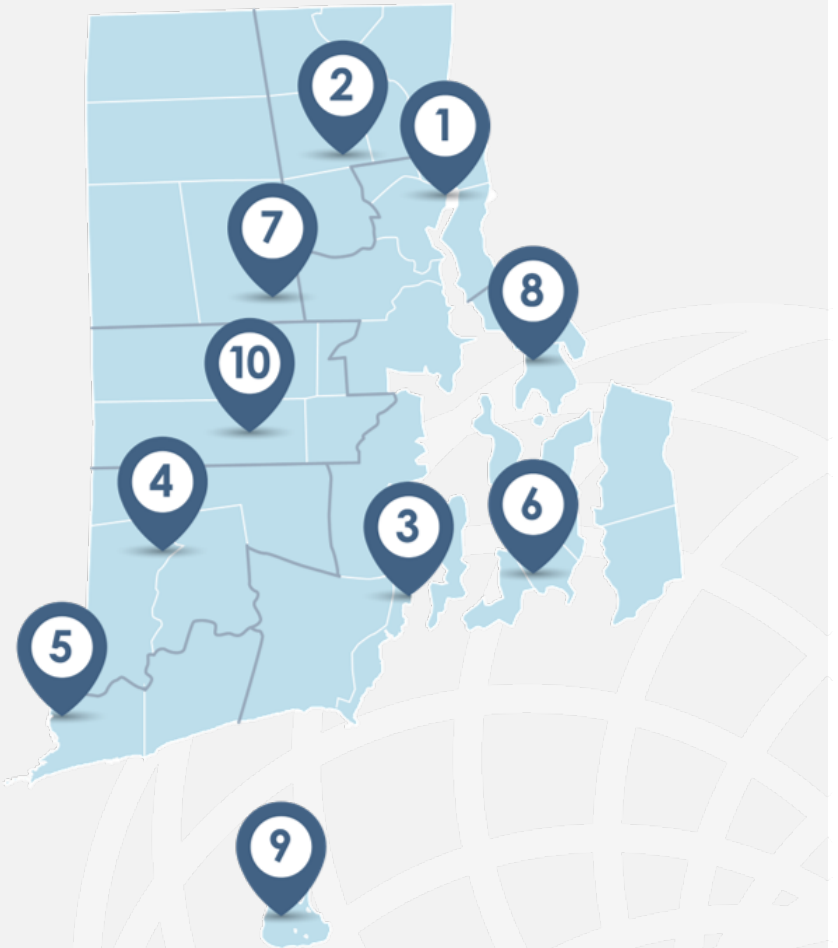


Statewide Resilience Roundtable Series

10 Roundtables over 2.5 months

350 Attendees

- Municipal Planners/Staff
- Environmental Orgs
- Community Orgs
  (Chambers, Faith-based groups,
  Historic districts)
- Business Owners
- State agency employees
- Residents



Feedback

The statewide strategy needs to recognize that municipalities are on the front lines of dealing with the impacts of a changing climate

We are glad you ventured to the inland communities for the Roundtable discussion as we often feel left out of the process since we aren't on the coast

Rhode Island has done a lot of planning and vulnerability studies, this strategy needs to drive investment where it's needed most

How are we going to pay for all these needed infrastructure upgrades?

Resiliency Themes

"Prioritize to Optimize"

- Critical Infrastructure Assets
  - Clean Water, Roads and Bridges
- Utilities
  - Drinking Water, Electric Grid
- Natural Systems
  - Coastal & Upland
- Emergency Response and Preparedness
- Local Community Resilience / Education
- Paying for Climate Resilience Projects

Strategy Outline & Chapter Leads

- Making the Case for Climate Resilience: EC4 Science and Technical Advisory Board (STAB)
- Critical Infrastructure and Utilities: (RIDEM), (OHCD), (RIEMA)
  - Water - (RIDEM), (WRB)
  - Power - (OER), (DPUC)
  - Transportation - (RIDOT), (SPP)
  - Food – (GOV), (RIDEM)
- Natural Systems: (CRMC) & (DEM)
  - Coastal – (CRMC)
  - Inland - (RIDEM)
- Emergency Preparedness: (RIEMA)
- Community Resilience: (RIDOH)
- Paying for Climate Resilience Projects: (RIIB)

Types of Actions

Projects	Projects and processes that can be accelerated now and in the future with existing resources
Policies	Policies in state control to drive climate adaptation across agencies
Programs	Programs and initiatives developed by state agencies to assist municipalities and communities become more climate resilient
Financing	Highlight existing and emerging financing mechanisms

CLIMATE RESILIENCE ACTION STRATEGY

» Climate Resilience is the capacity of individuals, institutions, businesses, and natural systems within Rhode Island to survive, adapt, and grow regardless of chronic stresses and weather events they experience.

STRATEGY GUIDING PRINCIPLES:

1. Prioritize actions and investments the state can make today
2. Leverage planning work already done by state agencies and organizations
3. Identify actions and investments ready for implementation in the near-term
4. Identify competencies that are shared among multiple state agencies
5. Provide resources and tools to municipalities across the state
6. Understand the impacts of climate change in environmental justice communities across the state

Findings from 10 roundtable meetings led to the development of six main themes highlighting key climate resilience issues for coastal and upland communities.

STRATEGY FRAMEWORK

RHODE ISLAND'S CHANGING CLIMATE

CLIMATE CHANGES
- Sea level rise
- Warming air temps
- Warming water temps
- Storm frequency and intensity
- Biodiversity
- Increased precipitation

CHALLENGE / VULNERABILITY
- Impacts across RI that are putting our residents, economy, and infrastructure at risk

RESILIENCE OPPORTUNITY
- Communicate up-to-date data and climate projections to ensure consistent use across all state agencies

CRITICAL INFRASTRUCTURE & UTILITIES

SECTORS
- Food
- Power
- Transportation
- Water

CHALLENGE / VULNERABILITY
- Critical assets and utilities in low-lying coastal and flood-prone areas
- High impact to the economy and quality of life at time of disruption

RESILIENCE OPPORTUNITY
- Identify collaborative projects and goals across agencies to stretch resources
- Align useful life of infrastructure investments with climate change projections

NATURAL SYSTEMS

GEOGRAPHY
- Coastal
- Upland

CHALLENGE / VULNERABILITY
- Contributions of natural resources to flood protection, water quality, and healthy communities
- Economic impact of loss of recreation areas and coastal access

RESILIENCE OPPORTUNITY
- Work across agencies to manage statewide natural resources for ecosystem services
- Work in collaboration with municipalities and private landowners to effectively manage contiguous natural areas

EMERGENCY PREPAREDNESS

THEMES
- Preparedness systems and processes
- Critical facilities

CHALLENGE / VULNERABILITY
- Safety of residents across the state during a severe weather event
- Lack of proactive local hazard mitigation planning

RESILIENCE OPPORTUNITY
- Continue to merge preparedness and long-term resilience planning
- Align municipal hazard mitigation planning with statewide initiatives

COMMUNITY RESILIENCE

THEMES
- Critical community assets
- Community resilience teams
- Environmental justice

CHALLENGE / VULNERABILITY
- The impacts of climate change are experienced differently across communities, with unequal rates of recovery

RESILIENCE OPPORTUNITY
- Develop locally based leadership on community resilience issues
- Align community resilience investments with statewide initiatives such as school upgrades and public housing

PAYING FOR CLIMATE RESILIENCE PROJECTS

THEMES
- Barriers to financing
- Established financing mechanisms
- Emerging financing mechanisms
- Conceptual financing mechanisms

CHALLENGE / VULNERABILITY
- Multiple funding/financing mechanisms often required for resilience projects
- Financing options that are not well known and often complicated

RESILIENCE OPPORTUNITY
- Explore established, conceptual, and emerging funding and financing mechanisms for climate adaptation projects
- Project costs are reduced if resilience projects are implemented before a severe weather event

Fields Point Wastewater Treatment Facility

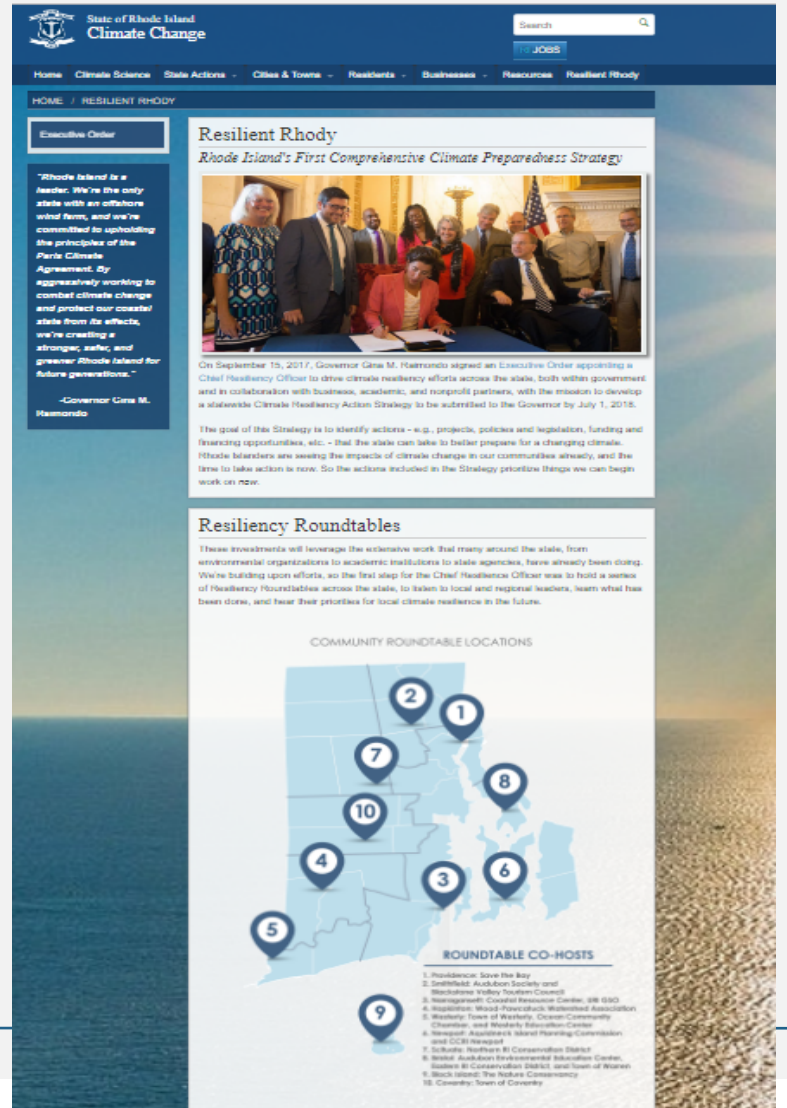
Goddard Memorial State Park Boat Ramp

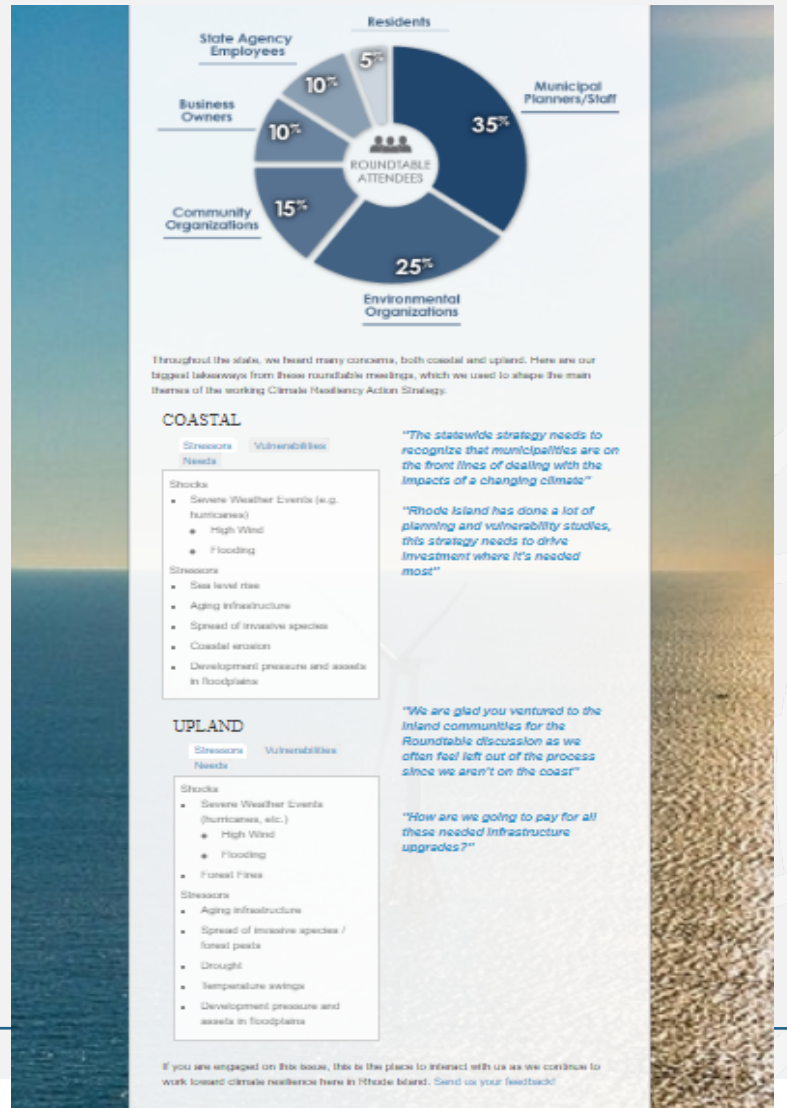
Providence River

ACTION TIME HORIZONS

NOW	2-5 years	5-10 years
ACTIONS THE STATE CAN TAKE NOW WITH EXISTING RESOURCES	PRIORITY ACTIONS TO ACCELERATE IN THE NEAR TERM	LARGE PROJECTS THAT REQUIRE INCREASED COLLABORATION AND INVESTMENT

www.climatechange.ri.gov





Implications of Climate Change for Rhode Island Wastewater Collection and Treatment Infrastructure

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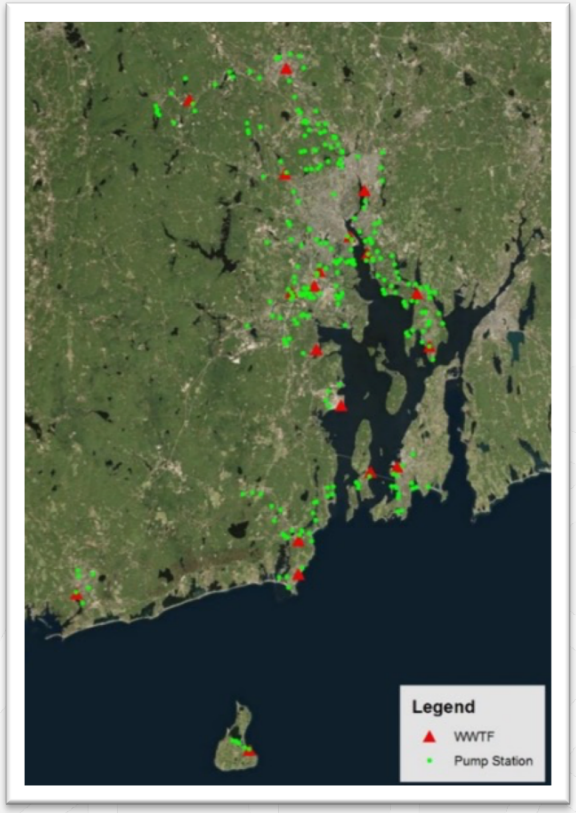
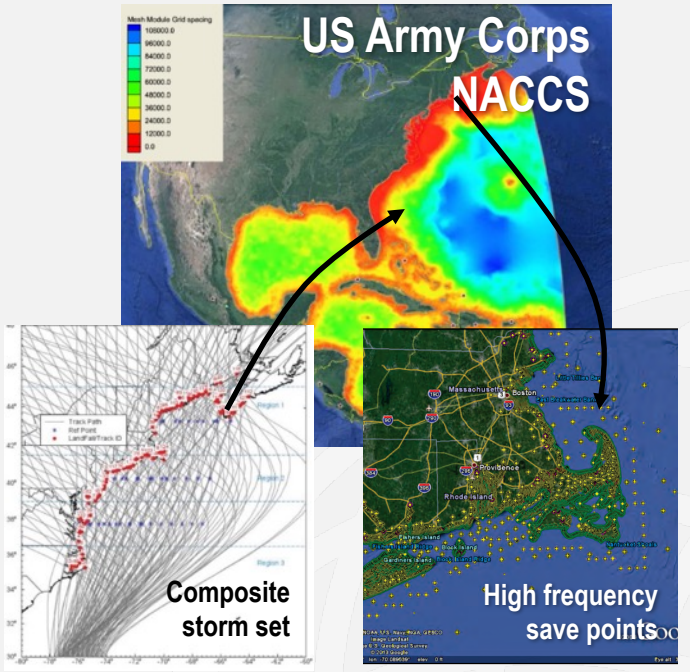
RI Wastewater Collection & Treatment Infrastructure

- Goal to improve WWTF reliability under changing climate conditions
- Major modifications to WWTFs require long term planning
- Benefit to collaborative partnership among state agencies and local communities
- Resulting Scope:
  - Statewide assessment of 19 WWTFs and major collection components
  - Identify vulnerabilities
  - Identify short-term and long-term adaptive strategies

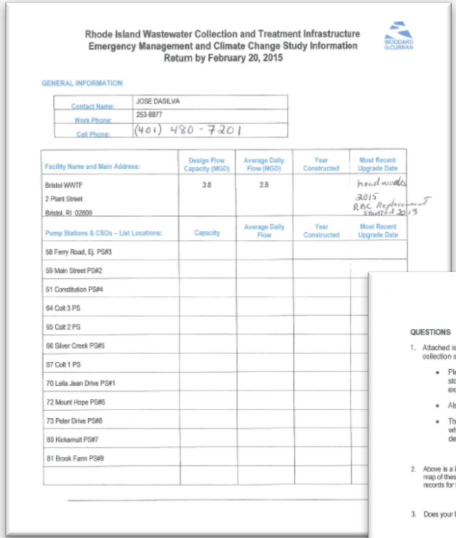


Statewide Models Provided Consistent Criteria

- Sea Level Rise
- Storm Surge
- Shoreline Change
- Wave Action
- Riverine Flood Elevations



Facility Operators Provided Site Specific Data

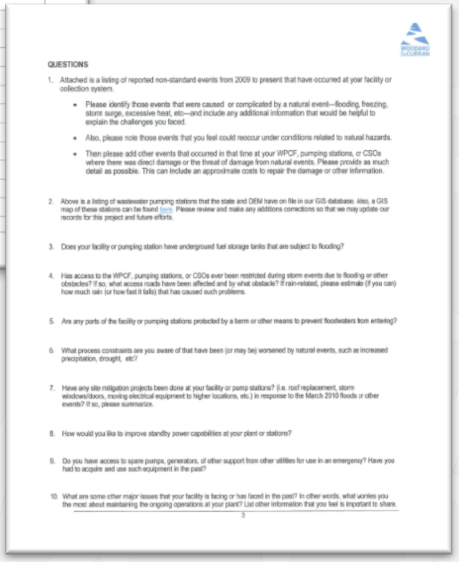


Rhode Island Wastewater Collection and Treatment Infrastructure
Emergency Management and Climate Change Study Information
Return by February 20, 2015

GENERAL INFORMATION

Contact Name:	JOSE DASILVA
Work Phone:	253-8877
Cell Phone:	(401) 480-7201

Facility Name and Main Address:	Design Flow Capacity (MGD)	Average Daily Flow (MGD)	Year Constructed	Most Recent Upgrade Date
Bristol WWTF 2 Plant Street Bristol, RI 02809	3.8	2.8		head works 2015 RBC Replacement Started 2013
Pump Stations & CSOs – List Locations:	**Capacity**	**Average Daily Flow**	**Year Constructed**	**Most Recent Upgrade Date**
58 Ferry Road, Ej. PS#3				
59 Main Street PS#2				
61 Constitution PS#4				
64 Colt 3 PS				
65 Colt 2 PS				
66 Silver Creek PS#5				
67 Colt 1 PS				
70 Leila Jean Drive PS#1				
72 Mount Hope PS#6				
73 Peter Drive PS#8				
80 Kickamuit PS#7				
81 Brook Farm PS#9				



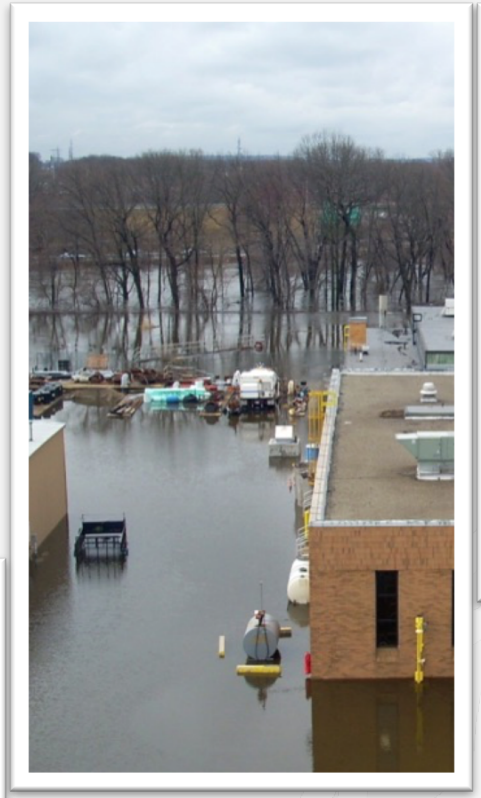
QUESTIONS

1. Attached is a listing of reported non-standard events from 2009 to present that have occurred at your facility or collection system.
   - Please identify those events that were caused or complicated by a natural event—flooding, freezing, storm surge, excessive heat, etc—and include any additional information that would be helpful to explain the challenges you faced.
   - Also, please note those events that you feel could reoccur under conditions related to natural hazards.
   - Then please add other events that occurred in that time at your WPCF, pumping stations, or CSOs where there was direct damage or the threat of damage from natural events. Please provide as much detail as possible. This can include an approximate costs to repair the damage or other information.
2. Above is a listing of wastewater pumping stations that the state and DEM have on file in our GIS database. Also, a GIS map of these stations can be found here. Please review and make any additions corrections so that we may update our records for this project and future efforts.
3. Does your facility or pumping station have underground fuel storage tanks that are subject to flooding?
4. Has access to the WPCF, pumping stations, or CSOs ever been restricted during storm events due to flooding or other obstacles? If so, what access roads have been affected and by what obstacle? If rain-related, please estimate (if you can) how much rain (or how fast it falls) that has caused such problems.
5. Are any parts of the facility or pumping stations protected by a berm or other means to prevent floodwaters from entering?
6. What process constraints are you aware of that have been (or may be) worsened by natural events, such as increased precipitation, drought, etc?
7. Have any site mitigation projects been done at your facility or pump stations? (i.e. roof replacement, storm windows/doors, moving electrical equipment to higher locations, etc.) in response to the March 2010 floods or other events? If so, please summarize.
8. How would you like to improve standby power capabilities at your plant or stations?
9. Do you have access to spare pumps, generators, of other support from other utilities for use in an emergency? Have you had to acquire and use such equipment in the past?
10. What are some other major issues that your facility is facing or has faced in the past? In other words, what worries you the most about maintaining the ongoing operations at your plant? List other information that you feel is important to share.

3

Recommended Adaptive Strategies

- Hardening
- Relocation
- Readily Repairable/Replaceable
- Redundancy
- Wet Weather Bypass



Budgetary Implementation Costs

Help communities plan and budget for climate change resiliency projects

ADAPTIVE STRATEGIES					
SYSTEM	Hardening	Relocating	Readily Repairable/ Replaceable	Redundancy	Mitigation Strategy
Influent Pump Station (Screw Pumps)	D		B		Raise and extend perimeter berm.[1] Store replacement pump components on-site.
Primary Clarifiers	D		B		Raise and extend perimeter berm.[1] Pumps may be easily augmented. Replace sludge pumps with submersibles. Store replacement drive components on-site.
Disinfection System	D	B		B	Raise and extend perimeter berm.[1] Relocate critical components to high ground. Back-up temporary chemical storage and pumping.
Effluent Pump Station	D	B			Raise and extend perimeter berm.[1] Relocate drive systems to high ground.
Saylesville PS	A				Protect building with flood barriers, and seal penetrations.

1. Raising and extending the perimeter berm will address multiple systems under one project.

A = < $50,000 B = $50,000 to $250,000 C = $250,000 - $1,000,000 D = > $1,000,000

RIDEM Actions Resulting from this Study

- Issued state-wide guidance to address climate change in WWTF planning and design
- Established a cost-benefit analyses approach to implement adaptation measures
- Implemented a requirement for all RIPDES permit renewals to prepare a Climate Resiliency Plan

Clean Water Financing / Funding for Resiliency Projects

Rhode Island Programs

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RI Clean Water SRF Financed Resiliency Projects

- Program administered in partnership between Rhode Island Infrastructure Bank and RI Dept. of Environmental Management

- Project Examples:
  - WWTF Upgrade and Flood Mitigation, City of Warwick – backstopped FEMA funding of the raising of existing flood berm to the 500 year storm elevation
  - WWTF Upgrade, Town of Warren – Elevating drive motors and electrical equipment above projected flood elevation; replacing some pumps with submersible pumps

Bay & Watershed Restoration Fund Grants

- Bond funds made available through statewide ballot referendum.
- Grants up to 75% of total project cost.
- Funds flood mitigation/prevention projects that have an ecological co-benefit. Initial (2017) grant round awarded 11 grants totaling $2.6M.
- The Nature Conservancy – Maidford River Restoration: replacing undersized culverts to reduce flooding, improve tidal flow and restore saltmarsh sparrow habitat.

Final Thoughts

- RI is moving planning to implementation
- Collaboration across the region is critical
- Projects require technical expertise and a funding quilt
- Need for increased awareness of available funding / financing programs
- 2018 Green Economy and Clean Water Bond – $48.5M
  - 20.5 for climate resilience investments

Rhode Island's Resiliency Efforts

Jan Greenwood Woodard & Curran

Shaun O'Rourke RI Infrastructure Bank

Jay Manning RIDEM