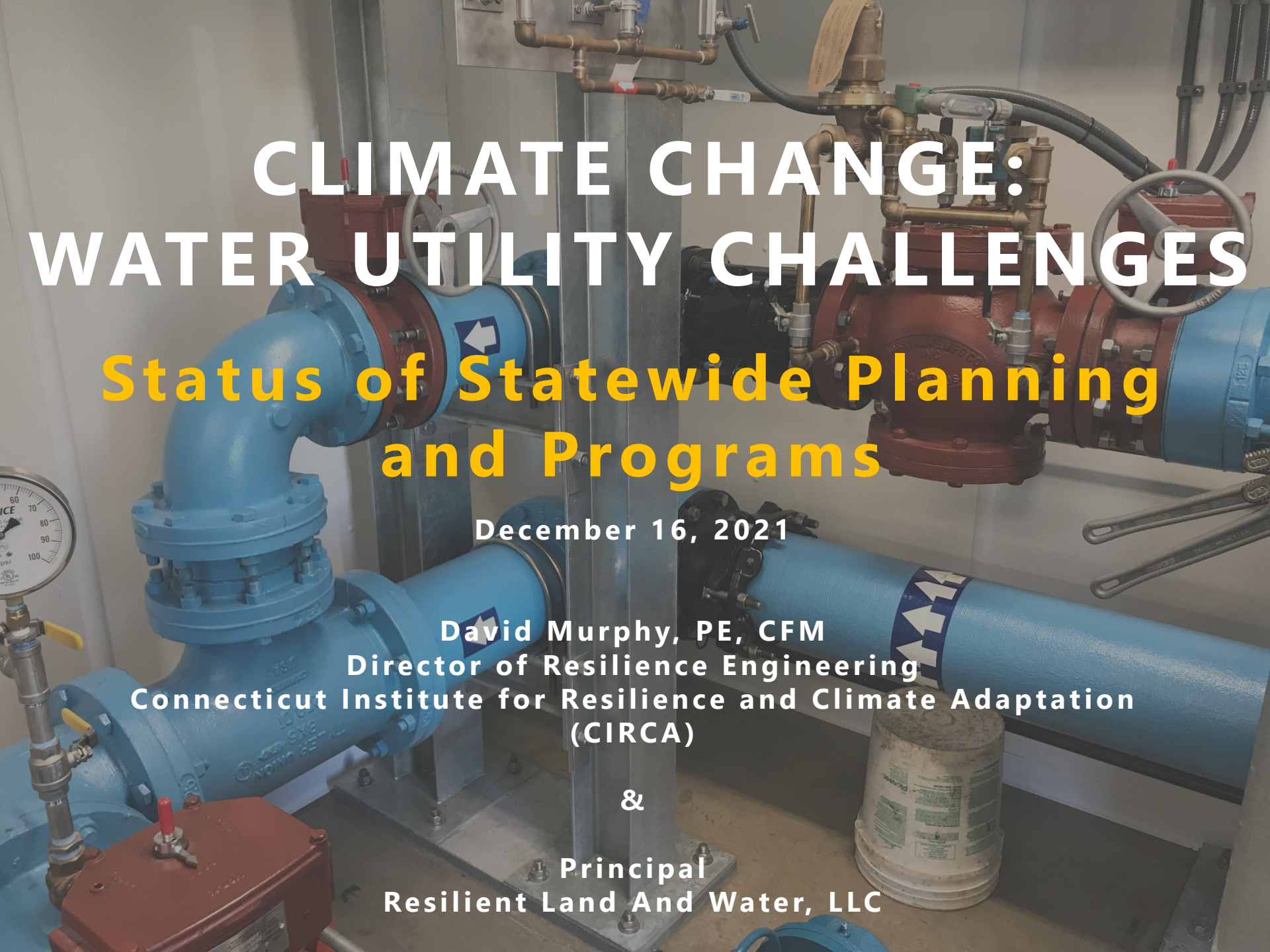


CLIMATE CHANGE: WATER UTILITY CHALLENGES

Status of Statewide Planning and Programs

December 16, 2021

David Murphy, PE, CFM
Director of Resilience Engineering
Connecticut Institute for Resilience and Climate Adaptation (CIRCA)

&

Principal
Resilient Land And Water, LLC

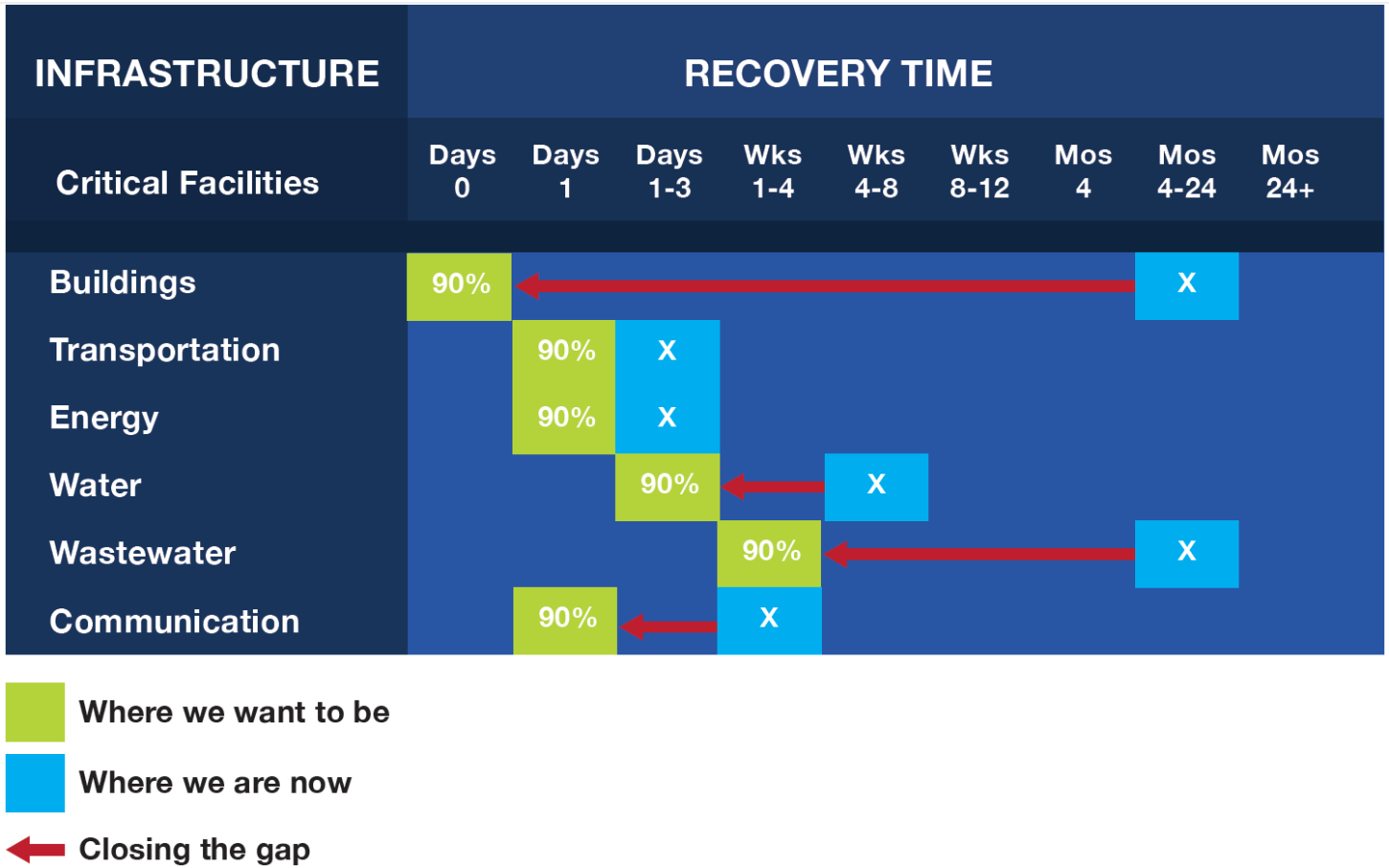
RESILIENCE VS. CLIMATE RESILIENCE

- "Resilience" was around before the climate discussions
- Resilience is the ability to:
  - **Resist/prepare**
  - **Withstand/absorb**
  - **Recover from**, and
  - **Adapt** to an event
- Resilience encompasses parts of the disaster management cycle, but adds "adapt"

RESILIENCE VS. CLIMATE RESILIENCE

In Words

- Resilience is also the reduction of recovery time



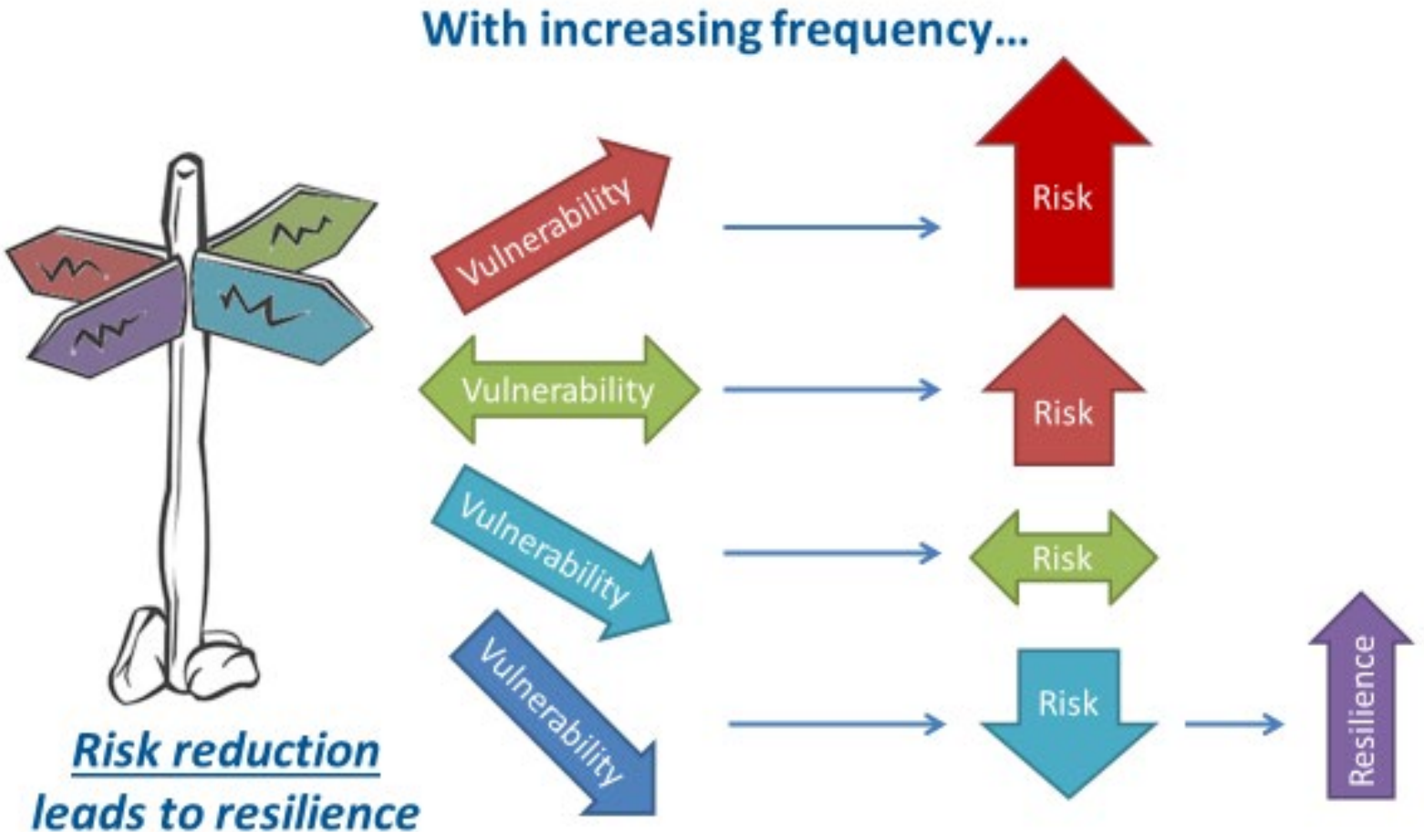
RESILIENCE VS. CLIMATE RESILIENCE

Equations in the Water System Industry

- Risk Analysis and Management for Critical Asset Protection (RAMCAP) Standard for Risk and Resilience Management of Drinking Water and Wastewater Systems
- Risk and Resilience Assessment (RRA) under America's Water Infrastructure Act (AWIA) uses the same equations:
    - Risk = Consequence x Vulnerability x Likelihood
    - Resilience = Duration x Service Denied x Vulnerability x Likelihood (zero is best)

RESILIENCE VS. CLIMATE RESILIENCE

- **Even though resilience was always with us, how are risk and resilience affected by climate change?**



CHALLENGES FACED BY CT WATER SYSTEMS

Droughts

- Drought of record is 1962-1964
- Drought of the 1980s spurred the water supply plan Statutes and Regulations
- Drought of 2015-2016 resulted in several notable public water supply emergency declarations and some interesting emergency projects
- Flashy droughts in 1999, 2002, 2005, 2020

CHALLENGES FACED BY CT WATER SYSTEMS

Hurricanes and Winter Storms

- Tropical Storm Irene and Winter Storm Alfred (2011) each caused more than a week of power outages
- The "Two Storm" panel produced a key report
- Hurricane Sandy (2012) caused another week-long outage and severe coastal flooding
- T.S. Isaias in 2020
- Precip. events of summer 2021

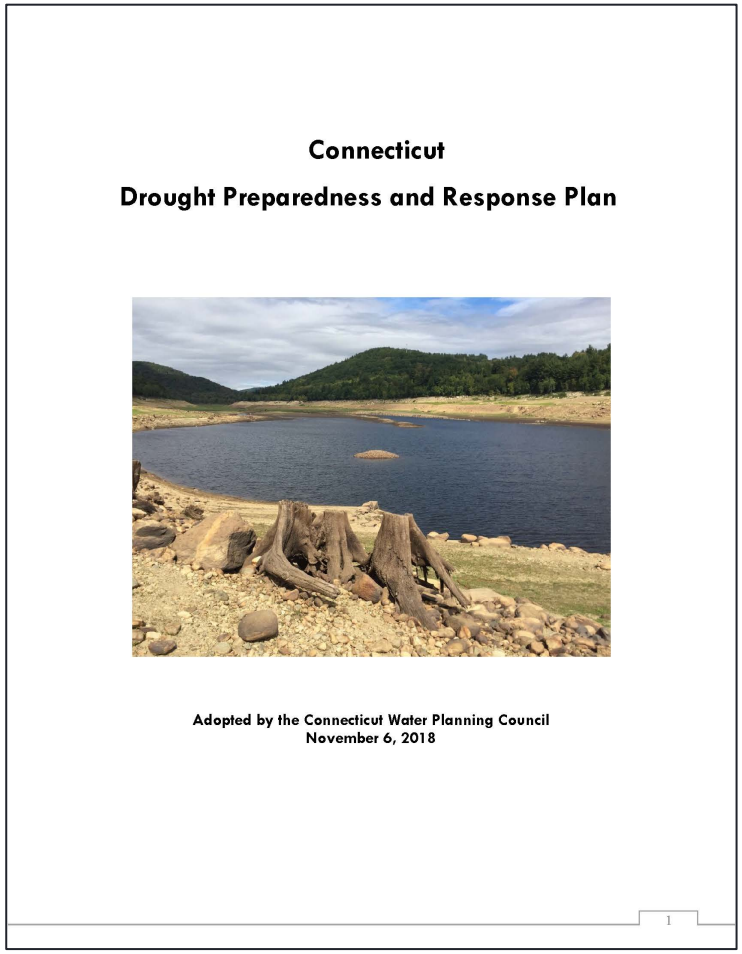
CHALLENGES FACED BY CT WATER SYSTEMS

Cascading Impacts

The May 2018 tornado outbreak suspended construction of an interconnection pumping station with a generator

DESCRIPTION OF CHALLENGES

Droughts


Connecticut

Drought Preparedness and Response Plan

Adopted by the Connecticut Water Planning Council
November 6, 2018

1

Authority for Connecticut Drought Preparedness and Response Plan

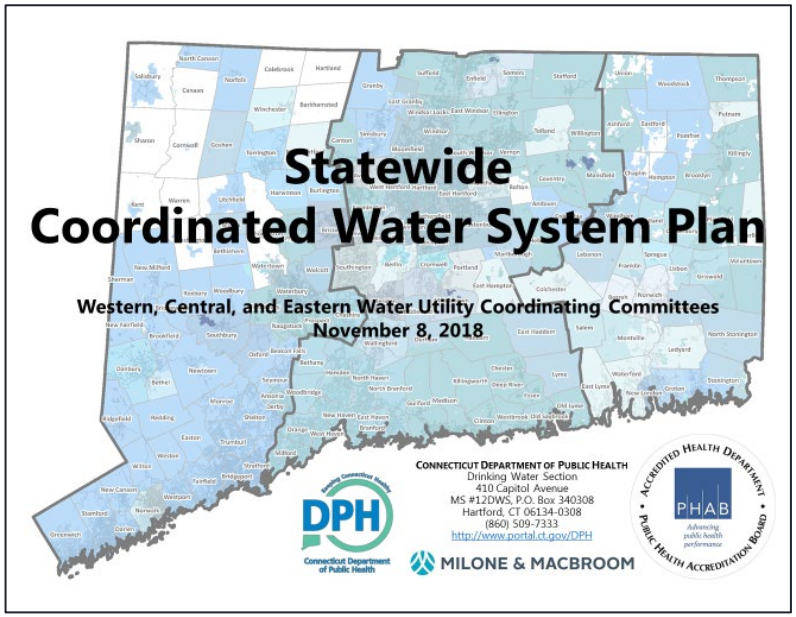
- Interagency Drought Workgroup is responsible for administering the Connecticut Drought Preparedness and Response Plan as part of the State Response Framework

Preparedness and Planning Strategies

- Designate a water coordinator in each municipality
- Promote industry and public awareness of appropriate conservation activities
- Expect all water withdrawers to prepare water supply contingency plans
- Ensure clear understanding of authority for mitigating drought conditions and enforcing water use restrictions; each municipality to adopt a water use restriction ordinance in order to establish such authority

DESCRIPTION OF CHALLENGES

Overall Challenges to PWSs



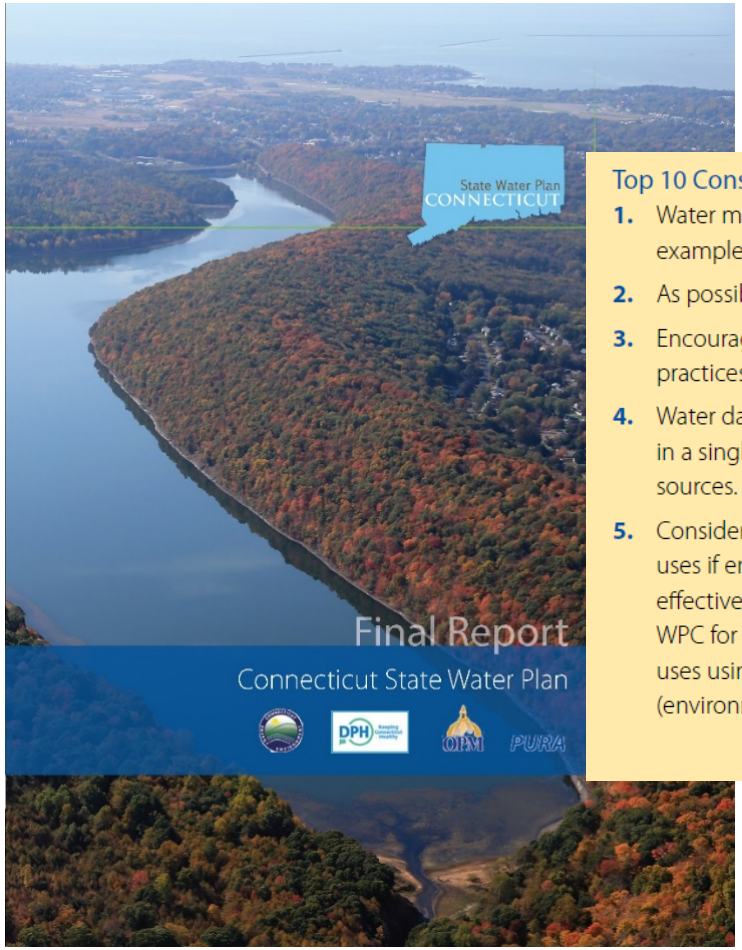
THE TOP TEN NEEDS FOR PUBLIC WATER SYSTEMS

As envisioned in CGS Section 25-33c, "*an adequate supply of potable water for domestic, commercial and industrial use is vital to the health and well-being of the people of the state.*" This **vision statement** guided the CWSP process and requires constant vigilance by state agencies and public water systems to ensure adequate water quality and quantity is maintained. Each regional CWSP includes more than 60 specific recommendations in the *Integrated Report* for responsible planning, drought management, source protection, water conservation, resiliency, and funding to be pursued through 2030. These recommendations are reflected in the following top ten needs for public water systems statewide.

1. **Regionalization and Interconnections**
   Ensure redundant and environmentally responsible supplies.
2. **Water Conservation and Water Efficiency**
   Reduce future demands and unnecessary water use.
3. **Reduction in Clustering of Small Water Systems**
   Encourage system consolidations and ensure responsible planning to prevent proliferation of adjacent (but independent) small systems.
4. **Assistance to Small Public Water Systems**
   Ensure proper technical, managerial, and financial capacity of small public water systems.
5. **Investment in Infrastructure**
   Replace aging infrastructure, including century-old pipes.
6. **Funding**
   Provide grants and loans for planning, projects, and small systems in line with the above needs.
7. **Drought Management and Resilience**
   Increase awareness of drought impacts and standardize responses to the extent practicable.
8. **Resiliency to Storms and Climate Change**
   Reduce recovery time and adapt to future conditions.
9. **Protection of Watersheds and Supplies**
   Continue to ensure adequate water supplies with high water quality.
10. **Improvements to Water Demand and Water Quality Planning**
    Avoid the development of unnecessary new sources and ensure proper consideration of regulated and unregulated contaminants.

DESCRIPTION OF CHALLENGES

General Water Challenges

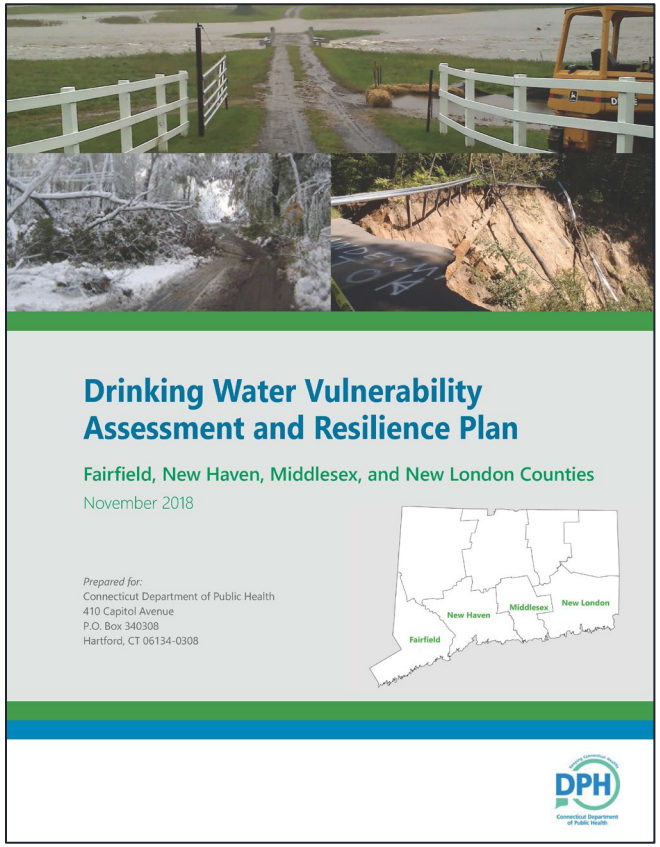


Top 10 Consenus-Based Policy Recommendations:

1. Water management should follow scientific examples.
2. As possible, remove obsolete water registrations.
3. Encourage innovation in agricultural water practices.
4. Water data (or access to it) should be centralized in a single database and/or portal to other sources.
5. Consider Class B Water for individual non-potable uses if environmentally prudent and cost-effective, using guidelines to be developed by the WPC for review of Class B water for non-potable uses using the Triple Bottom Line philosophy (environmental, social, and economic metrics).
6. Develop an education and outreach strategy focusing on water conservation topics.
7. The WPC should provide ongoing review of other Connecticut state plans in order to identify and address inconsistencies.
8. Encourage regional water solutions where they are practical and beneficial.
9. Reaffirm support for the protection of Class I and II land contributing to water supply. Expand protections to other watershed lands and land that feeds aquifers used for public water supply or by private wells.
10. Create a data-based water education program aimed at the general public and municipal officials.

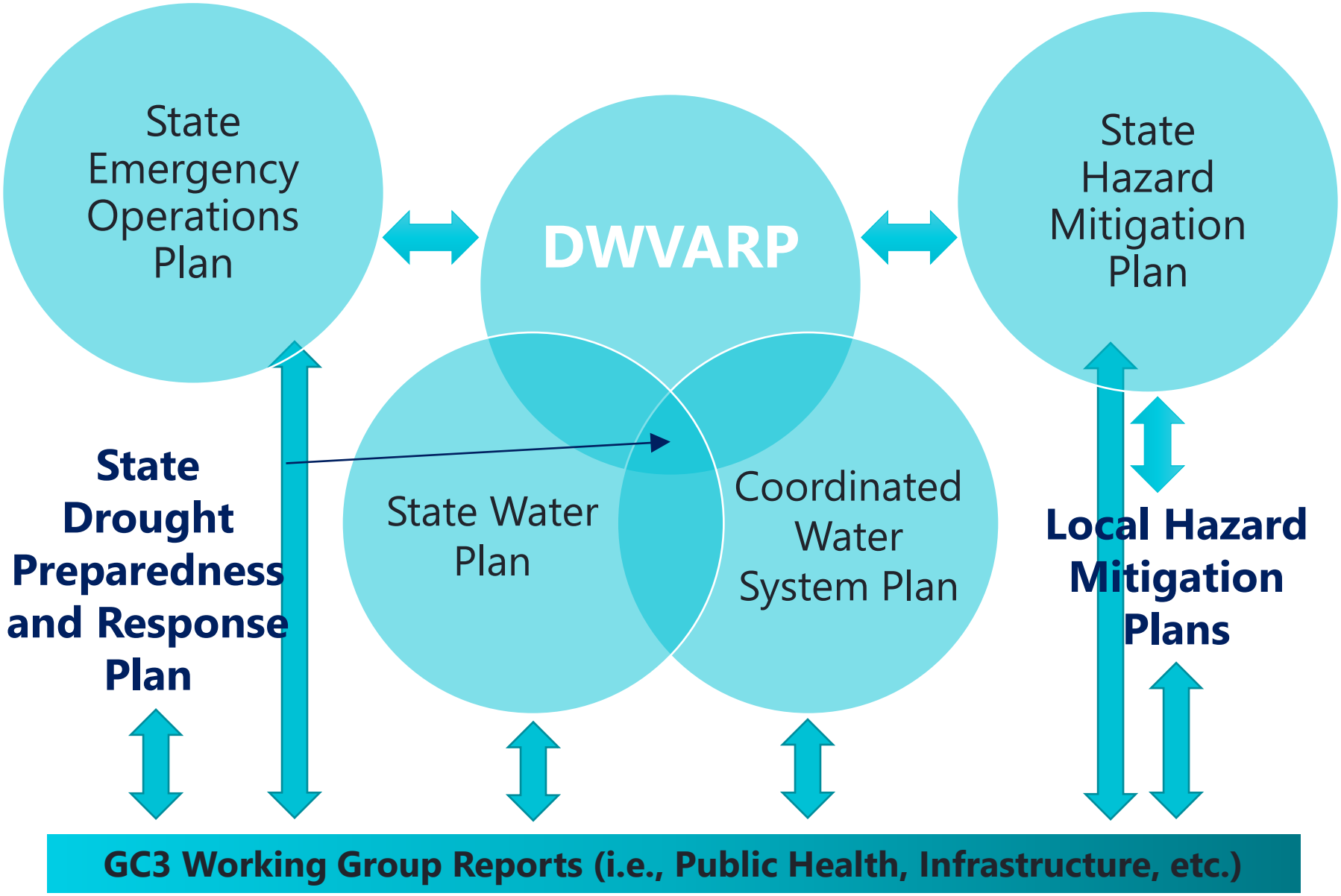
DESCRIPTION OF CHALLENGES

Risk/Resiliency Challenges to PWSs



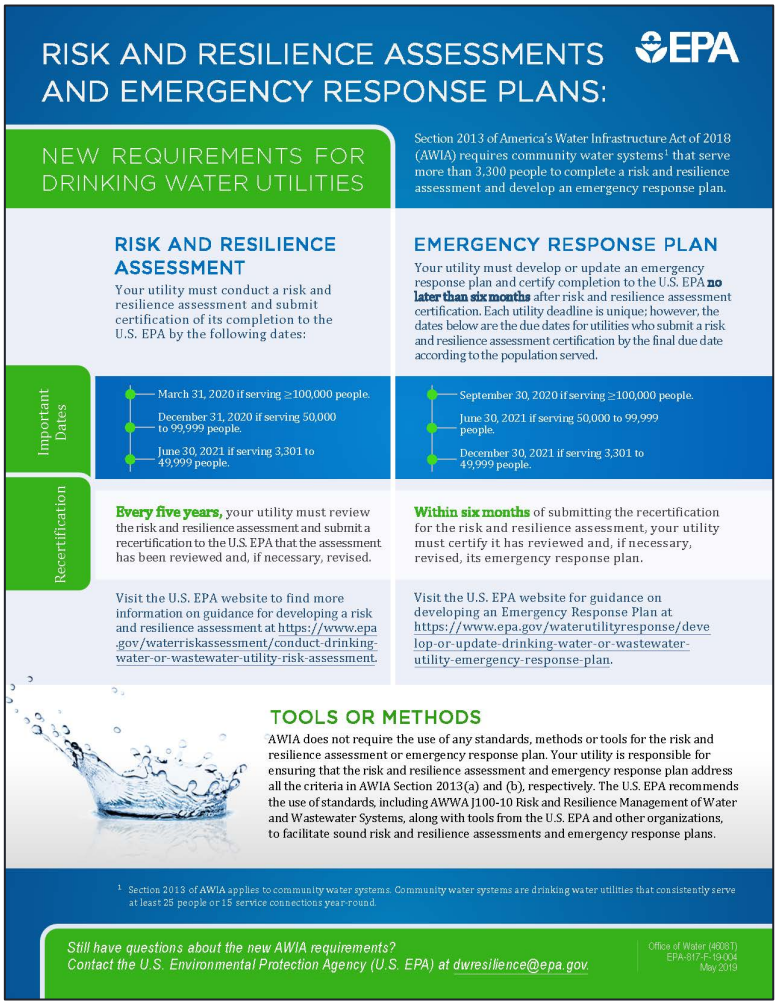
1. Lessons Learned from Past Events
2. Flood Risk to Community Water System Infrastructure & Critical Facilities
3. Water Quality and Quantity Vulnerabilities
4. Climate Change Impacts
5. Community Water System Vulnerabilities and Emergency Preparedness
6. Drought Planning and Resilience
7. Interconnections and Infrastructure Upgrades
8. Drinking Water Section Emergency Preparedness
9. State and Local Laws Affecting Drinking Water
10. Addressing Private Well Vulnerabilities

LINKAGES BETWEEN STATE PLANS



AND DON'T FORGET…

- **America's Water Infrastructure Act (AWIA)**
  - Requires development of a Risk and Resiliency Assessment (RRA) for CWSs that serve more than 3,300 people
  - Followed by Emergency Response Plan update or development **(DUE RIGHT NOW FOR SOME OF YOU)**



RISK AND RESILIENCE ASSESSMENTS AND EMERGENCY RESPONSE PLANS:

EPA

NEW REQUIREMENTS FOR DRINKING WATER UTILITIES

Section 2013 of America's Water Infrastructure Act of 2018 (AWIA) requires community water systems[1] that serve more than 3,300 people to complete a risk and resilience assessment and develop an emergency response plan.

RISK AND RESILIENCE ASSESSMENT

Your utility must conduct a risk and resilience assessment and submit certification of its completion to the U.S. EPA by the following dates:

EMERGENCY RESPONSE PLAN

Your utility must develop or update an emergency response plan and certify completion to the U.S. EPA **no later than six months** after risk and resilience assessment certification. Each utility deadline is unique; however, the dates below are the due dates for utilities who submit a risk and resilience assessment certification by the final due date according to the population served.

Important Dates

- March 31, 2020 if serving ≥100,000 people.
- December 31, 2020 if serving 50,000 to 99,999 people.
- June 30, 2021 if serving 3,301 to 49,999 people.

- September 30, 2020 if serving ≥100,000 people.
- June 30, 2021 if serving 50,000 to 99,999 people.
- December 30, 2021 if serving 3,301 to 49,999 people.

Recertification

Every five years, your utility must review the risk and resilience assessment and submit a recertification to the U.S. EPA that the assessment has been reviewed and, if necessary, revised.

Within six months of submitting the recertification for the risk and resilience assessment, your utility must certify it has reviewed and, if necessary, revised, its emergency response plan.

Visit the U.S. EPA website to find more information on guidance for developing a risk and resilience assessment at https://www.epa.gov/waterriskassessment/conduct-drinking-water-or-wastewater-utility-risk-assessment.

Visit the U.S. EPA website for guidance on developing an Emergency Response Plan at https://www.epa.gov/waterutilityresponse/develop-or-update-drinking-water-or-wastewater-utility-emergency-response-plan.

TOOLS OR METHODS

AWIA does not require the use of any standards, methods or tools for the risk and resilience assessment or emergency response plan. Your utility is responsible for ensuring that the risk and resilience assessment and emergency response plan address all the criteria in AWIA Section 2013(a) and (b), respectively. The U.S. EPA recommends the use of standards, including AWWA J100-10 Risk and Resilience Management of Water and Wastewater Systems, along with tools from the U.S. EPA and other organizations, to facilitate sound risk and resilience assessments and emergency response plans.

[1] Section 2013 of AWIA applies to community water systems. Community water systems are drinking water utilities that consistently serve at least 25 people or 15 service connections year-round.

Still have questions about the new AWIA requirements? Contact the U.S. Environmental Protection Agency (U.S. EPA) at dwresilience@epa.gov.

Office of Water (4608T)
EPA-817-F-19-004
May 2019

EXAMPLES OF SUCCESS

SOUTHEAST CT INTRA-REGIONAL RESPONSE PLAN

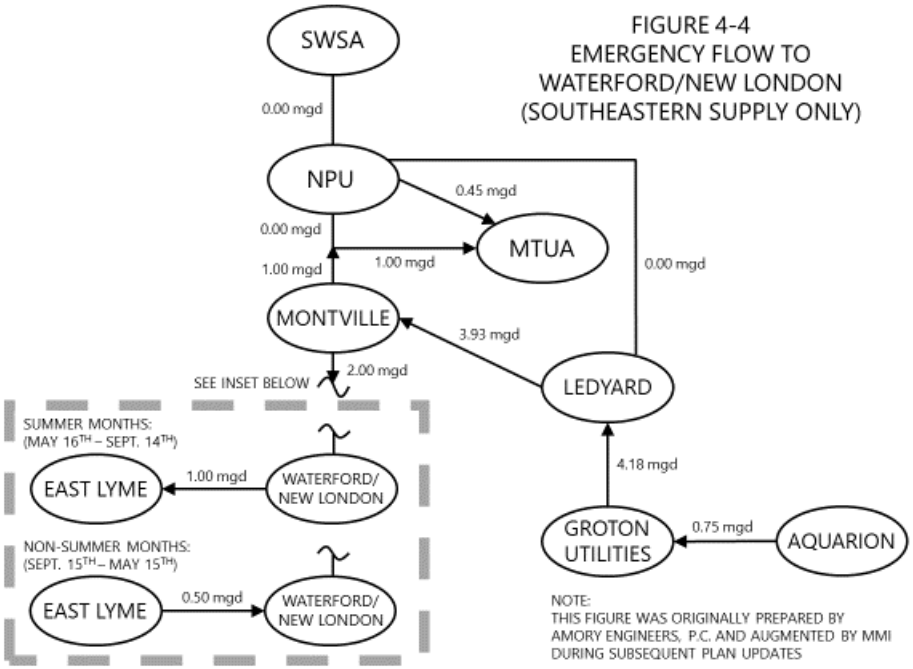


FIGURE 4-4
EMERGENCY FLOW TO
WATERFORD/NEW LONDON
(SOUTHEASTERN SUPPLY ONLY)

Situation

- Share water during **<u>planned or unplanned outages</u>**

- The plan does not supersede State emergency declarations, but works within the emergency context or outside the emergency context

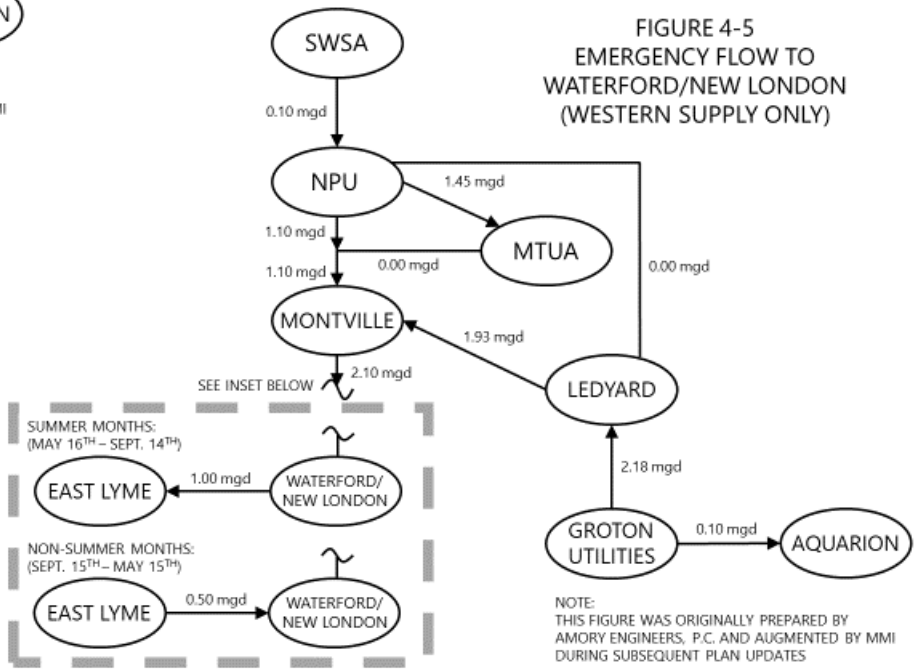


FIGURE 4-5
EMERGENCY FLOW TO
WATERFORD/NEW LONDON
(WESTERN SUPPLY ONLY)

UCONN WATER MANAGEMENT

- ## Wellfield Management Plan

River / Wellfield	Discharge (Q)	Management Procedure
Fenton	Q < 10 cfs	Prepare for Stage IA
Willimantic	Q < 27 cfs	
Fenton River Wellfield Management – Upstream Discharge		
Fenton	5 cfs ≤ Q < 6 cfs	Reduce wellfield withdrawals to a maximum of 0.633 mgd, minimize withdrawals from Well A
Fenton	4 cfs ≤ Q < 5 cfs	Reduce wellfield withdrawals to a maximum of 0.422 mgd, minimize withdrawals from Wells A and B
Fenton	3 cfs ≤ Q < 4 cfs	Reduce wellfield withdrawals upstream of Well A to a maximum of 0.211 mgd, utilize Well C or D only
Fenton	Q < 3 cfs	Cease wellfield withdrawals. **Activate Stage IA**. **Exception:** During September and October, withdrawals are allowed from Well D (maximum of 0.348 mgd) – Refer to Section 5.3 for specific operating recommendations
Willimantic River Wellfield Management – Downstream (Adjusted) Discharge		
Willimantic	Q < 27 cfs for 19+ days, or Q < 19 cfs	**Activate Stage IA[1]**
Willimantic	Q < 15 cfs	**Activate Stage IB**
Willimantic	Q < 15 cfs for 13+ days, or Q < 12 cfs	**Activate Stage II**
Willimantic	Q < 12 cfs for 12+ days, or Q < 7.8 cfs	**Activate Stage III**
Willimantic	Q < 7.8 cfs for 7+ days	**Activate Stage IV**

UCONN WATER MANAGEMENT

- **Reclaimed Water Facility**
- Feasibility, design, and construction 2010-2013
- Produces reclaimed water for non-potable needs
- Despite intent, was never able to be used for watering grass
- Is used in the Central Utility Plant, cutting the need for wellfield water

UCONN WATER MANAGEMENT

- **Interconnection with CWC**
- Provides that last increment of water that the reclaimed water facility was not able to provide
- Allows UConn to shed off-campus customers, who are now CWC customers
- Allows for growth on-campus and off-campus
- Allows for wellfield shut-downs – planned or unplanned!

DRINKING WATER QUALITY MANAGEMENT PLAN

Authority

- Numerous State statutes and the PHC

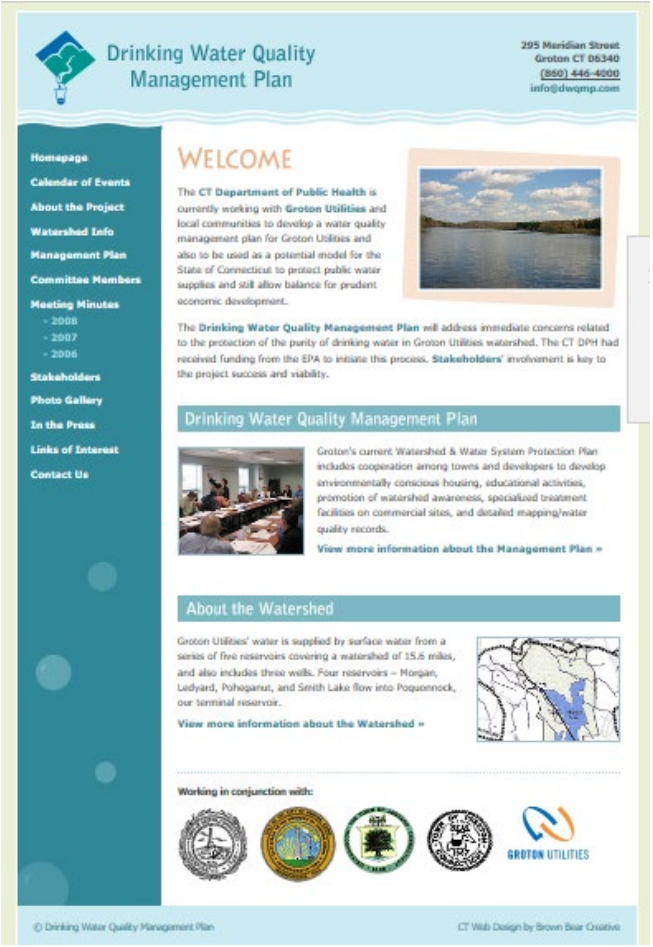
What is it?

- A locally based planning mechanism for water quality management of drinking water.
- A tool to define, organize, and prioritize actions within the public drinking water supply watersheds aimed at maintaining drinking water quality.
- A voluntary planning effort that transcends regulations and mandates.
- A grass roots effort that works within existing frameworks in a manner that does not exist in any single mechanism.

DRINKING WATER QUALITY MANAGEMENT PLAN

SE CT Plan – a Model for the State?

- History & Background of the Process
- Communications Plan
- Watershed Assessment (Existing & Future)
- Stormwater Management Strategies & Recommendations
- Policy & Regulation Strategies & Recommendations
- Recreation and Security Strategies & Recommendations
- Land Acquisition & Open Space Strategies & Recommendations
- Water Quality Strategies & Recommendations
- Spill Response Strategies & Recommendations
- Water Treatment and Reservoir Management Strategies & Recommendations



LINKAGE TO GC3

GC3 Recommendations from Land & Ag Chapters

- 31a. Incorporate more specific climate-related criteria into selection of projects/level of funding. These include the Open Space and **Watershed Land Acquisition Grant Program** (OSWA), the Recreation and Natural Heritage Trust Program (RNHT), and the Recreational Trails Program (RTP). Flood Risk to Community Water System Infrastructure & Critical Facilities
- 33c. Prioritize nature-based adaptation strategies that will ameliorate the effects of water inundation, including natural habitat conservation, Low Impact Development (LID) Best Management Practices (BMPs), agriculture water BMPs, and **drinking water treatment standards**. (cross-listed Science and Technology) Climate Change Impacts
- 35d. Expand **water quality focus of watershed-based planning** to also consider related flooding and climate resilience issues and solutions.

LINKAGE TO GC3

GC3 Recommendations from Rivers Chapter

- 38. Promote **demand-side water conservation** and water reuse by reducing transmission losses and developing educational programming.
- 38a. Review opportunities to reduce transmission losses by **expanding leak detection** and maintenance programs.
- 38b. Work with partners to develop **educational programming** and outreach to educate the public as to where their drinking water comes from, the connection between a healthy environment and clean drinking water.

LINKAGE TO GC3

GC3 Recommendations from Public Health Chapter

- 53. **Prepare public and private drinking water systems for climate impacts**, including utilizing geographic information systems (GIS); developing guidelines for drought management, engaging in planning and vulnerability assessments; tracking impacts; and incorporating resilience into laws, policies, and regulations.
- 53a. Develop **water conservation measures and communication guidelines** to manage droughts.
- 53b. Develop a GIS database and framework for continued updates to capture critical facilities to **identify which public water systems (PWS) they are served by and which critical facilities are served by their own PWS.**
- **53c. Update planning guidelines, drought triggers, and drought response protocols at least once per decade.**

LINKAGE TO GC3

GC3 Recommendations from Public Health Chapter

- 53d. Develop **emergency interconnections** between PWSs to ensure that multiple sources and interconnections are available for mutually beneficial sharing of water during emergencies.
- 53e. Use source water protection and the **Drinking Water Quality Management Plans to encourage resiliency** and increase funding and support for investments in watershed protection.
- "53f. Develop a statewide GIS database and framework for continued updates that identifies the location of private wells and decentralized sewage disposal systems.
  Identify and improve **wells that are located within a flood zone** to increase resilience and reduce risk of flooding. "
- 53g. Track harmful or potentially **harmful cyanobacteria algal bloom** data in Connecticut and provide technical assistance to community water suppliers to address and prevent these events.

LINKAGE TO GC3

GC3 Recommendations from Public Health Chapter

- 53i. Develop an **energy audit program** for water systems (Water and Wastewater) to increase energy efficiency and reduce greenhouse gas emissions across the water industry.
- 53k. Incorporate **resiliency into the consideration of new laws, regulations, and policies** and promote greater education of PWS about the importance of resiliency, specifically:
- i. Regulate the construction of public water supply wells in flood zones.
- ii. Develop guidance for local land use commissions on revising regulations to make well construction in flood zones more stringent.
- iii. Incorporate a **resiliency metric into the sanitary surveys** through the small system CAT ("scorecard") and monitor results over time.
- iv. **Update the water supply planning regulations** to require assessment of the potential impacts of climate change (changing rainfall patterns, flooding, sea level rise, drought management) on the water system as part of Water Supply Plan updates. "

LINKAGE TO GC3

GC3 Recommendations from Funding Chapter

- 55b. **Develop a resilience project pipeline** for state and federal funding opportunities. Be prepared to take advantage of state and federal funding opportunities by inventorying existing resilience infrastructure; and develop a project pipeline of "shovel ready" resilience and adaptation projects that are engineered and prepared for permit application and emergency funding.