



2015 BOSC Review

FY16-19 Water Systems Project Posters

Water Systems

1. Current Systems and Regulatory Support

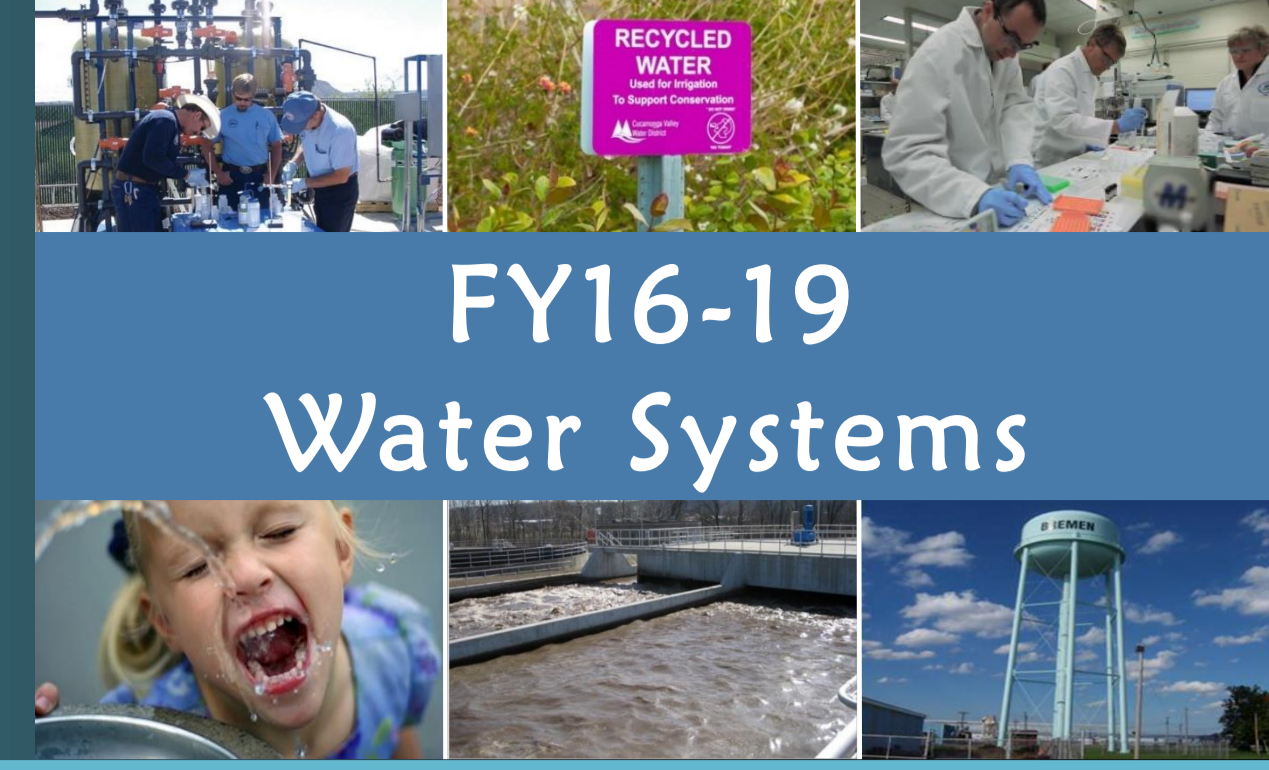
This project will supply research results to support federal regulations and guidance. It will also provide strategies to regions, states, and communities for improved regulatory compliance and rapid and effective emergency response where appropriate (e.g. harmful algal bloom outbreaks). This project will provide EPA with the following research support for existing water-related rules in close collaboration with program and regional offices, technical support for imminent issues (e.g. direct potable water reuse), and research results to improve compliance with existing regulations with an emphasis on small systems

2. Next Steps: Technology Advances

This project will focus on contaminants and their impact on health, adequate removal of contaminants from various water systems, and water and resource recovery within treatment systems. It will develop the next generation of technological advances to provide guidance in support of water systems. This project will provide EPA with new, innovative options for assessing exposure and risk from emerging contaminants, research results from cutting-edge treatment technologies, and human health impact assessments from emerging contaminants and chemical mixtures.

3. Transformative Approaches and Technologies for Water Systems

This project will advance the transformation of water systems towards a more sustainable future. It will provide EPA with a sustainability assessment framework integrating drinking water, wastewater, and water reuse/resource recovery components, advances in real-time monitoring, evaluations of alternative systems including economic development potential, and new approaches to waterborne human health risk measurements.



Current Systems and Regulatory Support

Thomas Speth, Project Lead | Ann Grimm, Deputy Project Lead

Problem Summary and Decision Context

Problem: Regulatory mandates under the Safe Drinking Water Act (SDWA) and Clean Water Act (CWA) require periodic review. The Contaminant Candidate List (CCL) undergoes revision on a five year cycle and contaminants listed on the CCL are monitored under the Unregulated Contaminant Monitoring Rule. Additionally, many water systems, particularly small systems, continue to face challenges from existing regulations.

Objectives:

- Supply research results to support federal regulations and guidance.
- Provide strategies to regions, states, and communities for improved regulatory compliance.
- Provide rapid and effective emergency response where appropriate (e.g. harmful algal bloom outbreaks).

Utility to Agency

This project will provide EPA with the following:

- Research support for existing water-related rules in close collaboration with Program and Regional Offices.
- Technical support for imminent issues (e.g. direct potable water reuse).
- Research results to improve compliance with existing regulations with an emphasis on small systems.

Tasks and Projected Outputs

Task 6.01A: Evaluating current wastewater treatment plants for contaminant removal

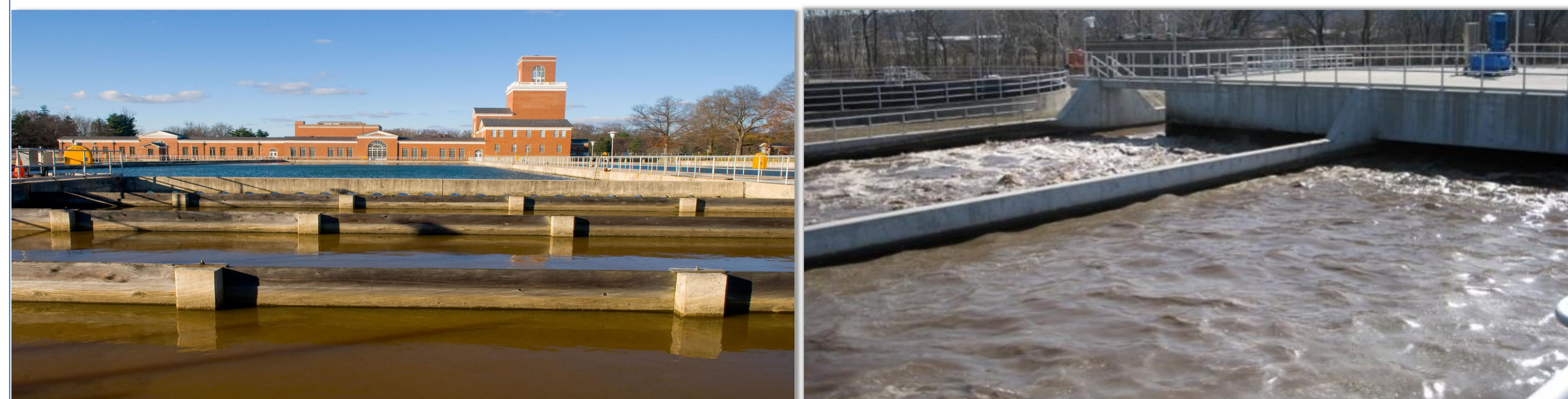
Task 6.01B: Analytical methods and monitoring for regulatory and utility purposes

Task 6.01C: Cost and effectiveness of water treatment to achieve regulatory compliance

Task 6.01D: Health effects for regulatory development

Output Examples:

- Evaluation of currently existing and market-ready water resource recovery systems.
- Improved analytical methods and tools for rapid quantitative assessment of CCL, UCMR, and emerging contaminants.
- Evaluation of existing and market-ready technologies for the collection, treatment, and distribution of water.
- Health effects data on contaminants that are prioritized based on existing, but incomplete, health information including individual and groups of contaminants.



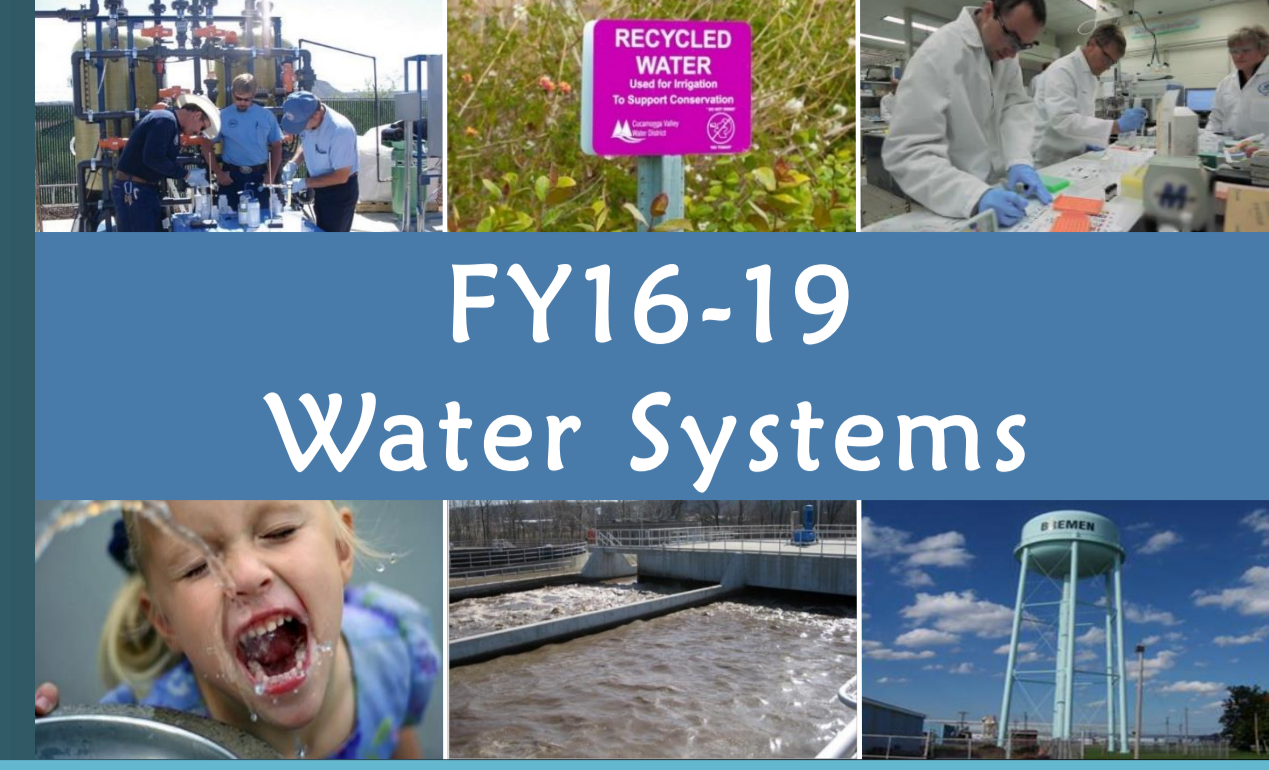
Future Directions

- Development of analytical tools for comprehensive and rapid assessment of algal toxins, disinfection by-products (DBP), microbes, and other emerging contaminants.
- Apply a suite of physiologically-based pharmacokinetic models to assess human health impacts from regulated trihalomethanes.
- Advance our understanding of changing source water characteristics and water treatment scenarios on DBP formation and contaminant transformation products.

Partner Engagement Opportunities

Partners and potential collaborators:

- EPA Program Offices and Regions
- Water Research /Water Environment Research Foundation
- Water Reuse Research Foundation
- Environmental Research Institute of the States
- Association of State DW Administrators
- National Association of Clean Water Administrators



Next Step: Technological Advances

Vickie Wilson, Project Lead | Adam Biales, Deputy Project Lead

Problem Summary and Decision Context

Problem: Water treatment systems in the U.S. face numerous challenges from unregulated emerging microbial and chemical contaminants. Some areas of the U.S. suffer from drought and currently search for alternative water sources. Other areas need to address excess water in combined sewers to prevent overflows into surface waters which are often downstream drinking water sources.

This project will focus on three areas:

- 1) Contaminants and their impact on health
- 2) Adequate removal of contaminants from various water systems
- 3) Water and resource recovery within treatment systems

This project will develop the next generation of technological advances to provide guidance in support of water systems.

Utility to Agency

This project will provide EPA with the following:

- New, innovative options for assessing exposure and risk from emerging contaminants.
- Research results from cutting-edge treatment technologies.
- Human health impact assessments from emerging contaminants and chemical mixtures.

Tasks and Projected Outputs

- Task 6.02A:** Treatment, monitoring and risk assessment for fit for purpose water
- Task 6.02B:** Novel monitoring technologies for occurrence, exposure, and effect for individual and groups of contaminants
- Task 6.02C:** Water treatment technologies for enhanced reduction of chemical and microbial risks
- Task 6.02D:** New methods and tools for measuring human and ecological health risks from chemicals and pathogens
- Task 6.02E:** Advancing public health protection through water infrastructure sustainability (STAR)
- Task 6.02F:** National Center for innovation in small drinking water systems (STAR)
- Task 6.02G:** Research and demonstration of innovative drinking water (DW) treatment technologies in small systems (STAR)

Output Examples:

- Information on health risks and treatment requirements for targeted reuse (e.g. agricultural, industrial) of treated wastewater
- Development of analytical and monitoring tools for future UCMR, CCL, and emerging contaminants
- Guidance for implementation of next generation technologies for DW treatment and wastewater (WW) treatment/reuse
- Monitoring tools and assessments for advancing our understanding of risks to human health from water systems.



Future Directions

- Employ new bioassay methods for use in monitoring risks in source and treated water.
- Develop, optimize and demonstrate novel water treatment technologies for DW and WW reuse.
- Advance predictive models for human health risks from emerging contaminants, groups of contaminants, and pathogens (in collaboration with the Chemical Safety and Sustainability Research Program).

Partner Engagement Opportunities

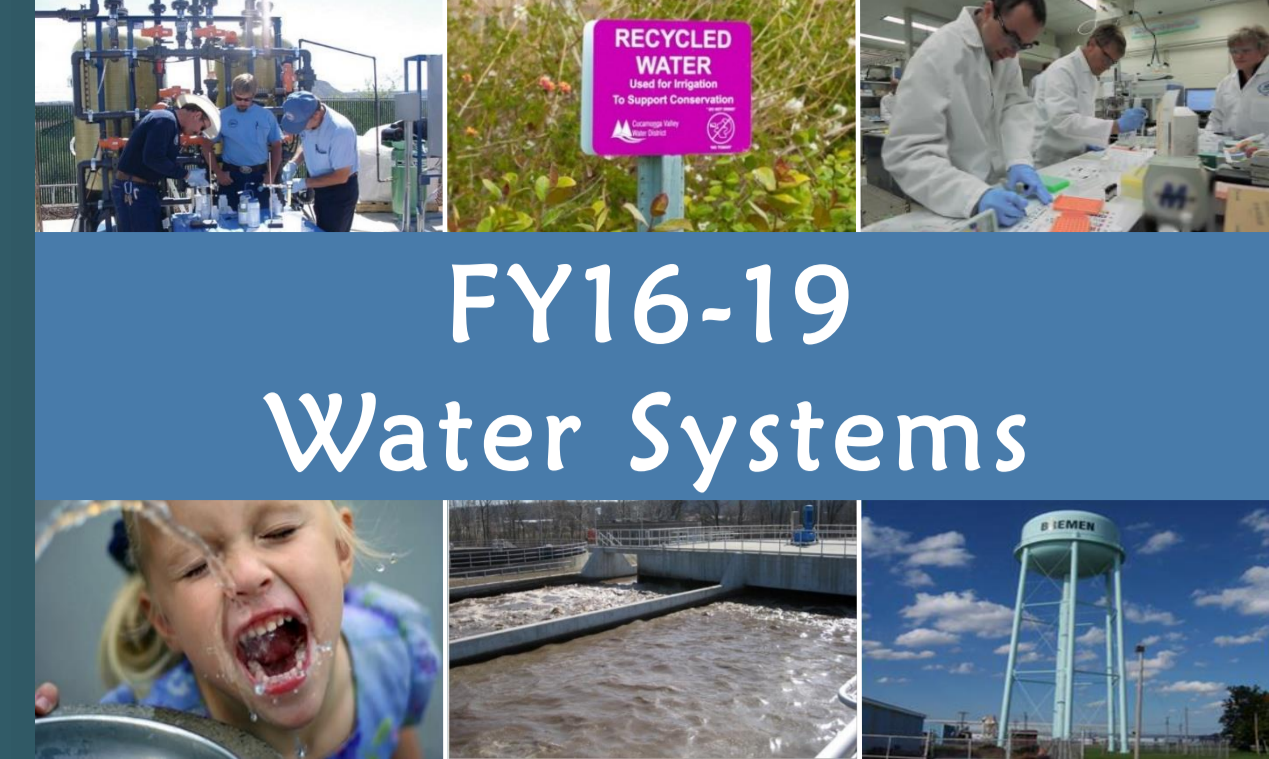
Partners and potential collaborators:

- EPA Program Offices and Regions
- Water Research /Water Environment Research Foundation
- Water Reuse Research Foundation
- Environmental Research Institute of the States
- Association of State DW Administrators
- National Association of Clean Water Administrators



Transformative Approaches and Technologies for Water Systems

Jay Garland, Project Lead | Evelyn Hartzell, Deputy Project Lead



FY16-19

Water Systems

Problem Summary and Decision Context

Problem: Increasing stresses on water resources will impact water supply and demand. Stressors include population growth and density, climate variability, energy consumption, contaminants, and deteriorating infrastructure.

The American Society of Civil Engineers predicts a funding gap of 84 billion dollars for water and wastewater infrastructure needs by the year 2020 with an increase in the funding gap to 144 billion dollars by 2040 (ASCE, 2011). Transformative, sustainable approaches to water systems will be necessary in order to meet future demands.

Objective: Advance the transformation of water systems towards a more sustainable future.

Utility to Agency

This project will provide EPA with the following:

- A sustainability assessment framework integrating drinking water, wastewater, and water reuse/resource recovery components.
- Advances in real-time monitoring .
- Evaluations of alternative systems including economic development potential.
- New approaches to waterborne human health risk measurements.

Tasks and Projected Outputs

Task 6.03A: Systems approaches for assessment of water reuse

Task 6.03B: Novel detection tools for systems applications

Task 6.03C: NetZero

Task 6.03D: Water Technology Innovation Cluster

Task 6.03E: Approaches to assess the overall health of a community

Task 6.03F: Human and ecological health impacts associated with water reuse and conservation practices (STAR)

Task 6.03G: NetZero Interagency Agreement (STAR)

Output Examples:

- Suite of integrated system-based tools, including life cycle assessments, life cycle costs, advanced water footprinting approaches, energy analyses, and resiliency assessments.
- A biologically-based effects monitor will be developed that senses and responds to chemical exposures that could result in adverse health effects.
- Case studies and demonstrations of transformative technologies, with an emphasis on mapping pathways to successful mainstreaming of niche technologies and the potential for system optimization through redefining wastewater treatment as a resource recovery process.
- Evaluation of the potential role of waterborne pathogens as triggers for novel health outcomes, such as diabetes and other autoimmune disorders.



Future Directions

- Advance the development of a comprehensive, systems-based life cycle assessment framework for future sustainable water management planning in communities.
- Improve the adoption of new technologies and systems for water treatment through the NetZero and Water Technology Innovation Cluster programs.

Partner Engagement Opportunities

Partners and potential collaborators:

- EPA Program Offices and Regions
- Department of Defense
- Private sector and trade organizations
- Centers for Disease Control and Prevention
- Utilities, state, and local communities