AWWA Webinar Program: 2019 Regulatory Update
Wednesday, December 11, 2019
Presenter Biography Information

Kevin M. Morley, Ph.D. – Manager, Federal Relations, AWWA – Government Affairs
Kevin M. Morley, PhD is Manager, Federal Relations for the American Water Works Association (AWWA). He works closely with multiple organizations to advance the security and preparedness of the water sector. This includes supporting the development of several ANSI standards that represent minimum best practice for risk and resilience management in the water sector. Currently he is managing the development of resources to support utility compliance with §2013 of America's Water Infrastructure Act (AWIA) of 2018. This includes updating AWWA's cybersecurity guidance and use-case tool. Dr. Morley received his PhD from George Mason University for research on water sector resilience and developing the Utility Resilience Index (URI). He holds a MS from the State University of New York College of Environmental Science and Forestry and a BA from Syracuse University.

Christina Alito, PE, PhD – One Water Institute Lead, HDR
Dr. Christina Alito leads HDR's One Water Institute –the applied water research arm of HDR. In her current role, Christina is responsible for developing and managing water research projects for complex drinking water issues, such as emerging contaminants, technology validation, and water quality management. Mostly recently, Christina has focused on supporting drinking water PFAS projects nationwide, including AWWA's PFAS Policy Support Study which focused on developing regulatory pathway guidance based on the current state of PFAS research.

Rebecca Slabaugh – Associate Vice President, Arcadis
Ms. Slabaugh is an Associate Vice President and Drinking Water Practice Lead with Arcadis, specializing in the evaluation, planning and preliminary design of drinking water treatment and distribution systems. Her experience includes corrosion control treatment and pipe loop studies, regulatory compliance, contamination warning systems, and drinking water treatment process selection and optimization studies. She is a member of the AWWA Lead and Copper Rule Technical Advisory Workgroup, and contributing author to multiple chapters in AWWA Manuals of Water Supply and Practice as well as AWWA's standard for lead service line replacement and flushing. Education -MS Environmental Engineering Virginia Polytechnic Institute and State University 2007, BS Civil Engineering Purdue University 2005.

AWWA Webinar Program: The Evolving Challenge of DBPs and What to Do About It
Wednesday, January 29, 2020
Presenter Biography Information

David Reckhow – University of Massachusetts-Amherst
Dr. Dave Reckhow has made significant contributions to the field of drinking water through his outstanding research that has helped to identify and understand the mechanism of formation of various halogenated and non-halogenated disinfection by-products (DBPs). With over 100 significant journal papers published, Dr. Reckhow has made a major impact on water science during his 35-year academic career. Three of his papers were awarded best paper by the Journal AWWA and one awarded best paper by the International Ozone Association. In addition to his substantial research, Dr. Reckhow is an active participant in the water community, volunteering his time to develop workshops with the USEPA, AWWA, and the Water Research Foundation. Dr.

Reckhow is currently a professor with the Department of Civil and Environmental Engineering at the University of Massachusetts, where he continues to research the formation and control of DBPs in drinking water.

AWWA Webinar Program: LCR Revisions and Corrosion Control Basics
Wednesday, February 5, 2020
Presenter Biography Information

Steve Via – American Water Works Association
Steve Via is Director of Federal Relations for the American Water Works Association (AWWA) working in AWWA's Washington, D.C., office. Mr. Via's primary responsibilities are two-fold. First, working with the Environmental Protection Agency (EPA) and other federal agencies on the development of policy and regulations that affect the water sector, and communicating the basis and substance of federal policy and regulations to the water sector. Mr. Via has 31 years' professional experience in environmental regulatory compliance assistance related to federal and state drinking water, wastewater, and solid / hazardous waste regulations. His work experience includes supporting communities engaged in planning, financing, and managing infrastructure improvements.

Phil Brandhuber, PhD – AWWA Inorganics Committee Chair
Phil specializes in drinking water quality and treatment. His work has involved inorganic contaminants, disinfection byproducts, potable reuse and brine management. Phil received his PhD from the University of Colorado Boulder, and has been the principal or co-principal investigator for ten research projects sponsored by the Water Research Foundation and other agencies. He is the current chair of the AWWA Inorganics Committee and past chair of the AWWA Emerging Water Quality Issues Committee. Phil has 20 years' experience as a consultant, working for McGuire Environmental and HDR. When not working on water quality issues, he can be found hiking and biking in the Colorado mountains.

Tyson Ingels, PE, CWP – Colorado Dept. of Public Health and Environment
Tyson Ingels is the Lead Drinking Water Engineer for CDPHE. His responsibilities include technical justification for new policy and regulation, acceptance of alternative technologies (e.g. membranes, UV disinfection) within the State, as well as acting as technical expert both on DW design review issues and inspection issues. Mr. Ingels also is primary contact responsible for Drinking Water emergencies and acute situations within Colorado. Prior to working for CDPHE, Mr. Ingels worked as a member of the process optimization team throughout the United States for a private consulting firm.

Rachel Himyak, BS – Denver Water
Rachel is a Biologist with a BS undergraduate degree from MSU Denver and have been working at Denver Water for a year and a half, starting with water quality distributions operations, moving to the water quality lab, and finally settling in with the startup, commissioning, and optimization team where she became a treatment tech working on the Lead and Copper pilot plant that Denver Water has been running since 2015. Working with the pilot, she has studied and tested many different corrosion control techniques and completed other small studies on the water that were vital to helping Denver Water obtain acceptance from the EPA and CDPHE it implement the new Lead Reduction Program.

AWWA Webinar Program: Potable Reuse: Federal and State Perspectives
Wednesday, February 26, 2020
Presenter Biography Information

Dave MacNevin, PhD, PE – Environmental Engineer, CDM Smith
Water reuse and desalination expert, Dr. Dave MacNevin is an Environmental Engineer at CDM Smith. He has 14 years of environmental consulting experience in the testing, design, and implementation of drinking water and advanced water reuse treatment systems. Dave has also assisted 7 utilities in Florida, California, Oklahoma, and South Carolina in in the evaluation, design, and operation of potable reuse programs at varying stages.

Rosa Yu, PhD – Senior Process Engineer, Brown and Caldwell
Dr. Rosa Yu is an environmental process engineer at Brown and Caldwell. Before joining Brown and Caldwell, Rosa was a postdoctoral research associate at the University of Colorado Boulder. Rosa's research focuses on the evaluation of ozone, biofiltration, and adsorption by GAC as an alternative treatment approach to reverse osmosis for potable reuse. Rosa is currently leading the development and implementation of ozone-biofiltration-centered treatment trains at Brown and Caldwell.

Dr. Daniel Gerrity – Principal Research Scientist, Southern Nevada Water Authority
Dr. Daniel Gerrity earned his Ph.D. in Civil & Environmental Engineering at Arizona State University. After graduation, he worked as a Postdoctoral Researcher at the Southern Nevada Water Authority and as a Senior Engineer for Trussell Technologies. Dr. Gerrity then spent 7 years as an Assistant and Associate Professor in Civil & Environmental Engineering at UNLV where his teaching and research interests focused on water reuse. Dr. Gerrity is now a Principal Research Scientist in the Water Quality R&D group at SNWA.

Lydia Peri, PE – Emerging Resources Program Administrator, Truckee Meadows Water Authority
Lydia Peri is the Emerging Resources Program Administrator at Truckee Meadows Water Authority. Lydia is a registered professional environmental engineer in the state of Nevada. Lydia earned a bachelor's in ecohydrology from UNR, dual master's in hydrogeology and civil and environmental engineering from UNR and is a Ph.D. candidate at UNR in the Environmental Engineering Program. Her current role at TMWA is to manage the OneWater Nevada demonstration project. In this role, she is responsible for maintaining the operation of the advanced water treatment pilots while serving as the center link between UNR students, operators, equipment manufacturers, hydrogeologists and communications specialists.

AWWA Webinar: Utility Actions to Sustain Operations During COVID-19

March 20, 2020

Sandy Smith- Sandy Smith currently serves as the Water Production Manager for the DeKalb County Department of Watershed Management in Stone Mountain, GA since October of 2013. Sandy served as the Gwinnett County (GA) EMA Operations and Logistics Officer from 2009 to 2013 and was responsible for the day-to-day operations of the Emergency Operations Center. Since 9/11, Sandy has been involved in the early planning stages of water sector all hazards preparedness, response, security initiatives at the local, state and national level. Sandy has served on the U.S. Department of Homeland

Security/USEPA/Water Sector Coordinating Council – Critical Infrastructure Protection Advisory Committee, Emergency Management Assistance Compact Advisory Board and to WaterISAC . He also served as the Chair of the Georgia Water/Wastewater Agency Response Network (GAWARN) from its origin in 2006. He is completing a second term this year.

Joey Witcher- Joey Witcher has 30 years' experience in Water Treatment, distribution Wastewater treatment and utility operations and management. For the past 12 years he has been in the position of Plant Manager of the Sinclair Water Authority in Milledgeville, GA. Prior to this he held the position of Project Manager for OMI (now Ch2mhill) in the town of Barnesville GA. The Barnesville project included the Water Treatment Plant, Wastewater Treatment plant and the Streets Department. Prior to that he worked for City of Monroe GA Utilities and Rockdale Water Resources in Rockdale County GA.

Alan Roberson- Alan has over 25 years of experience in drinking water legislation, regulations, and policies on a wide array of issues. Most recently, Alan served as Director of Policy for Corona Environmental Consulting where he developed policy positions for utilities and government agencies on drinking water regulations; served as principal investigator on several Water Research Foundation projects; and collaborated with numerous stakeholders. Previously, he was Director of Federal Relations at the American Water Works Association (AWWA) where he provided technical and policy input on all aspects of the drinking water regulations. He also worked closely with EPA and DHS on implementation of the requirements for vulnerability assessments (VAs) and emergency response plans (ERPs).

Dawn Ison- Dawn Ison has been with EPA for over 19 years and is a Geologist for EPA's Office of Ground Water and Drinking Water, Water Security Division, where she leads emergency response efforts related to the Water/Wastewater Agency Response Network (WARN) mutual aid program, drought response and water loss and response agency coordination during contamination events affecting the water sector.

Ray Riordan- With 34 years experience, Raymond Riordan is currently the Director of the City Manager's Office of Emergency Management for the City of San José, CA, the tenth largest city in the United States. He was hired following the historic February 2017 Coyote Creek Flood and assisted the City in its recovery from the flood and instituting action to address the over 240 items identified in the post disaster after action and improvement report. His employment included Program Manager for Emergency Preparedness for the City of San Ramon Police Department in California, Acting Executive Director of the California Utilities Emergency Association, the Acting Security and Emergency Manager for East Bay Municipal Utility District, and Senior Emergency Planner for Contra Costa County, CA. He is a Certified Emergency Manager, recognized by the International Association of Emergency Managers (IAEM), and he serves as the elected Chair for the California Water/Wastewater Agency Response Network (or CalWARN). Among his professional awards, he is three-time recipient of the International Association of Emergency Managers Association Partners in Preparedness Award and three-time recipient of the California Emergency Services Association President's Award for leadership in emergency management. He completed a BS degree from Santa Clara University, a MS degree in Industrial Organization from San José State University, and he has published articles on emergency planning in several journals, including the American Water Works Association Journal Magazine.

AWWA Webinar: Water Data Nerd
March 25, 2020

Glen Semino- Xylem QA Engineer Glen Semino has worked at startup and enterprise level software companies for over 10 years as both an individual contributor and leader. He has held roles related to developer and customer support, qa, customer success, technical operations and developer community building. His technical blogs have been read by thousands and featured on various tech company blogs. He is currently a Senior QA Engineer at Xylem under the Digital Solutions Group and holds a bachelor's degree in Computer Science from the University of California, San Diego.

Thomas L. Kuczynski- VP Information Technology, DC Water Thomas Kuczynski is the Vice President of Information Technology for the District of Columbia Water and Sewer Authority (DC Water) and the interim President of Blue Drop. Tom joined DC Water in August 2013 and heads up an IT team of 60 individuals and a $20 million budget to develop applications that support customer services and operations and provide technical support to help employees do their jobs. As Interim President of Blue Drop, Tom leads the team responsible for generating non-ratepayer revenue from various products and services including Bloom, intellectual property and other non-traditional sources at DC Water. Tom has more than 40 years of experience in utility management and operations including nearly 30 years at Philadelphia Gas Works (PGW) in two separate terms of employment. He was most recently Senior Vice President, Strategic and Information Services for PGW managing Strategic Planning, Enterprise Performance Management, Information Services and Internal Auditing. In his first employment at PGW, he led development efforts for the company's customer information system, credit and collections, automated meter reading and distribution leak tracking. He has also worked for Pacific Gas & Electric's National Energy Group as Director of Technology Strategic Planning and Architecture, and for Delmarva Power in Wilmington, Delaware where he provided IT Strategic Planning Services to the Energy Supply Group. Tom is a graduate of La Salle College of Philadelphia and the Executive MBA program at University of Maryland University College

Christine Boyle, PhD-Founder, Valor Water, Xylem Digital Solutions Group Dr. Christine Boyle is the founder and CEO of Valor Water Analytics, now a Xylem Company. Her work focusses on developing decision support software that achieves both resource and financial sustainability goals for water utilities. She received a doctorate in water resource planning in 2011 and "spun" Valor Water out of her thesis work at UNC. She is a trustee of the Cal-Nevada American Water Works Association and a water policy advisor for the World Bank.

AWWA Webinar: Be a Trusted Source: How to Handle Communication Challenges During COVID-19
April 3, 2020

Melissa Elliott- Melissa Elliott's 25+ year public relations career is focused on helping water and wastewater utilities and municipalities tell their stories. She oversees strategic communication planning, stakeholder engagement and risk communication strategies for Raftelis. Highly active in the water industry, Melissa is President-Elect of the American Water Works Association, is a former chair of AWWA's Public Affairs Council, and a regular volunteer for The Water Research Foundation.

Samantha Villegas- For more than 15 years, Samantha Villegas has assisted water utilities with branding, reputation and crisis management, as well as the execution of communications strategies to ensure positive positioning for rate increases, acquisitions, capital projects and change management. Sam has been actively involved in both the American Water Works Association (AWWA), and the Public Relations Society of America (PRSA), where she currently serves on its Board of Directors.

Kelley Dearing- Kelley Dearing Smith is vice president for communications and marketing at Louisville Water Company in Louisville, Kentucky. She's worked at Louisville Water for over 20 years and is currently vice-chair of AWWA's Public Affairs Council. Much of Kelley's career focuses on brand-building and communicating the value of water.

Mary Gugliuzzais- Mary Gugliuzzais current chair of AWWA's Public Affairs Council. At the City of Fort Worth, Mary is responsible for development and coordination of the water department's communications, including employee communications, media relations, customer outreach, website content and school educational programs. She is also an active member of AWWA's Texas Section.

AWWA Webinar: Legal Aspects of COVID-19 for Water Utilities

April 6, 2020

The rapidly evolving issues that COVID-19 is bringing to water utilities across the nation are also impacting various legal aspects of their operations. Facing unfamiliar exposures and liabilities, water utilities are having to learn new ways to anticipate and address COVID-19's legal challenges. During this webinar, legal aspects of key topics to be covered will include: enforcement and compliance issues; discretionary changes under consent orders; procurement, contracting and force majeure issues; and water utility employee health and safety related issues. This webinar brings together legal and water utility operational experts to help guide attendees through these topics and seeks to provide them with insights on how they can proactively identify and then address the legal aspects of these issues. As a result of this webinar, attendees will be able to: - Understand various legal aspects of water utility operations being impacted by COVID-19. - Better meet the legal challenges of changing operational and enforcement activities related to COVID-19. - Understand legal aspects of various water utility employee health and safety issues as a result of COVID-19 operational changes. - Discuss challenges and options to procurement and contracts in light of changing operational needs of COVID-19.

Randall Brown- Randall Brown is the General Counsel for the Great Lakes Water Authority (GLWA), providing legal advice on a myriad of legal matters, including regulatory compliance, contracts, real estate, bond transactions, employment and general litigation matters. Prior to assuming this position in August 2017, Mr. Brown served in Wayne County's Corporation Counsel Department. Mr. Brown is a graduate of the University of Delaware and Howard University School of Law.

Marcia Reuben- Marcia Reuben is the Vice President, Quality and Compliance for Inframark, LLC. Ms. Reuben has an undergraduate degree in Business Administration from the University of Southern California, an MBA from St. Joseph's University and holds an Associate in Risk Management from the International Risk Management Institute. With more than 20 years in the water industry, Ms. Reuben oversees Inframark's compliance program, and provides operations support in areas of regulatory reporting and compliance.

Andrew Stewart- Andrew Stewart practices law in the Washington, D.C., office of Sidley Austin LLP and counsels clients on a broad range of compliance and enforcement matters. With over 20 years of experience in environmental law, he handles matters arising under all major federal environmental laws as well as state laws. Prior to joining the firm, served as EPA's Division Director in the Office of Civil Enforcement and as a senior attorney in the Water Enforcement Division.


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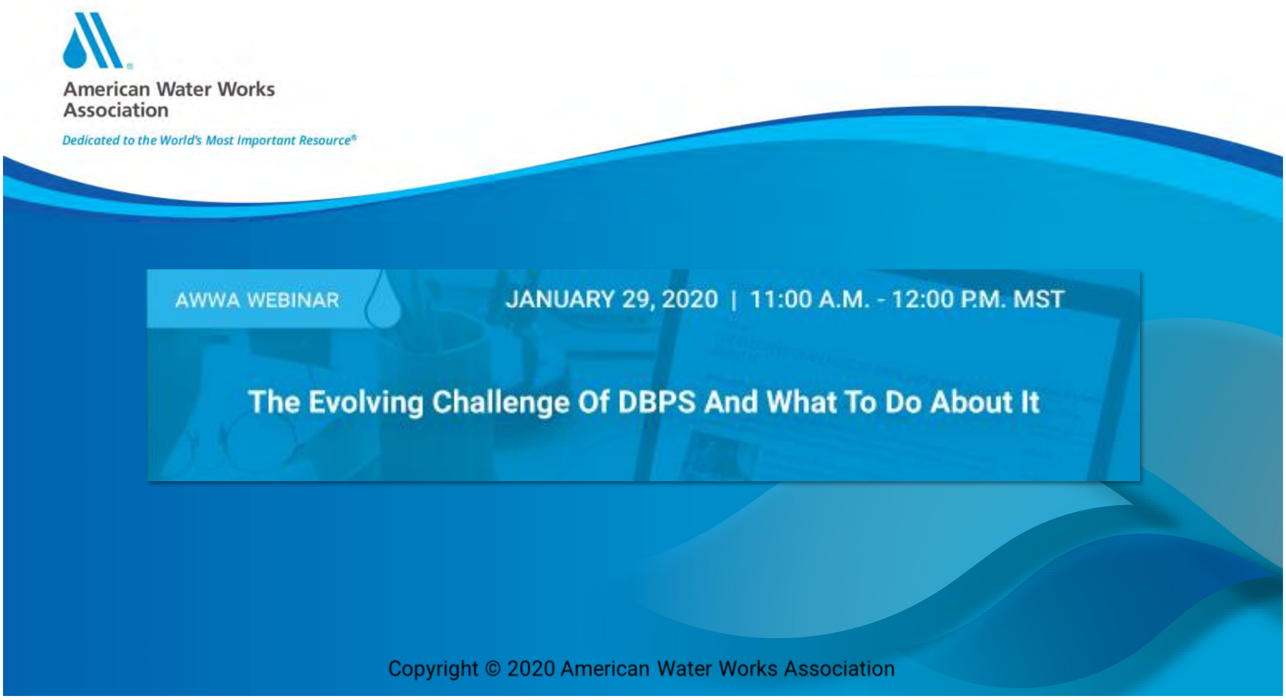

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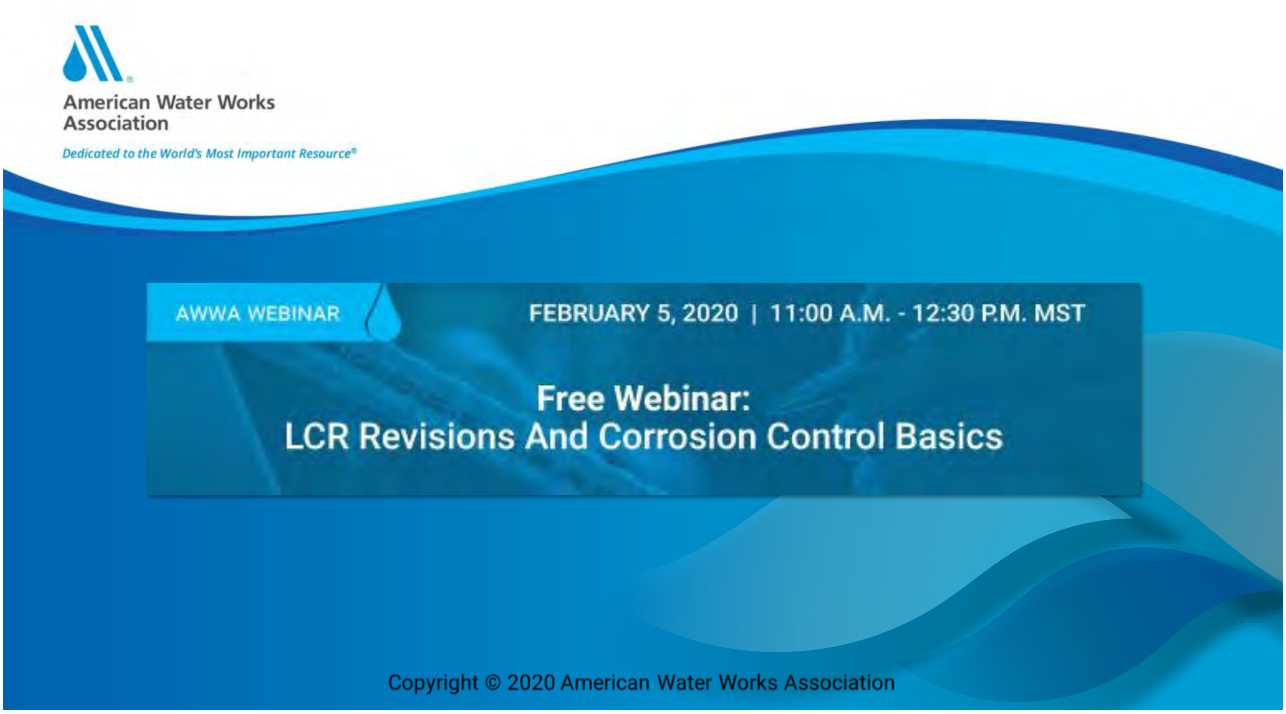
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WEBINAR MODERATOR

Corinne Bertoia

Associate Engineer

American Water Works Association

Corinne Bertoia is an Associate Engineer at the American Water Works Association. Her responsibilities include reviewing and developing technical programs and supporting the Divisions and Committees of the Technical and Education Council. Corinne received her MASc. in Civil Engineering from the University of Toronto in 2018, where her research focused on the removal of NDMA precursors from drinking water biofilters.

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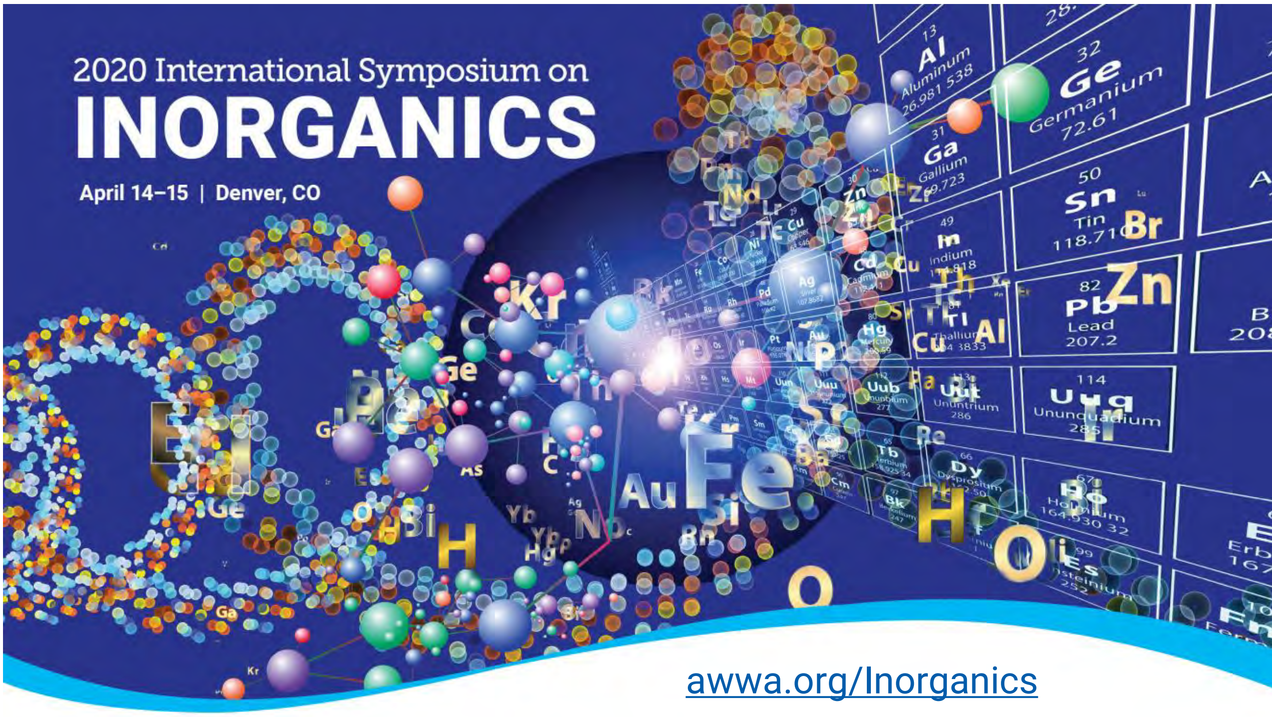

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PANEL OF EXPERTS

Steve Via
Director of Federal Relations
American Water Works Association

Phil Brandhuber, PhD
Retired
AWWA Inorganics Committee Chair

Tyson Ingels, PE, CWP
Lead Drinking Water Engineer
Colorado Department of Public Health and Environment

Rachel Himyak, BS
Start-up, Commissioning, Optimization Team
Treatment Tech
Denver Water

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AGENDA

I.	Lead and Copper Rule Revisions	Steve Via
II.	Overview of Lead Corrosion Control	Phil Brandhuber
III.	Implementing the Lead and Copper Rule Effectively – State Perspective	Tyson Ingels
IV.	Filter Challenge Study	Rachel Himyak

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ASK THE EXPERTS

Steve Via
American Water Works Association

Phil Brandhuber, PhD
AWWA Inorganics Committee Chair

Tyson Ingels, PE, CWP
Colorado Dept. of Public Health and Environment

Rachel Himyak, BS
Denver Water

Enter your **question** into the **question pane** at the lower right hand side of the screen.

Please specify to whom you are addressing the question.

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American Water Works Association

LEAD AND COPPER RULE REVISIONS

Steve Via
Director of Federal Relations
American Water Works Association

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RULE DEVELOPMENT PROCESS

Nov 2019
Proposal

Feb 2020
Comments Due@

??? 2020
Final

2023
LSL Inventory*
LSL Replacement Plan*
Trigger Level
Find-and-Fix
Public Notice
Notifications
Schools

2024
Revised Monitoring

@ Submit to www.regulations.gov; Docket No. EPA–HQ–OW-2017-0300
* Completed within 3 years of promulgation

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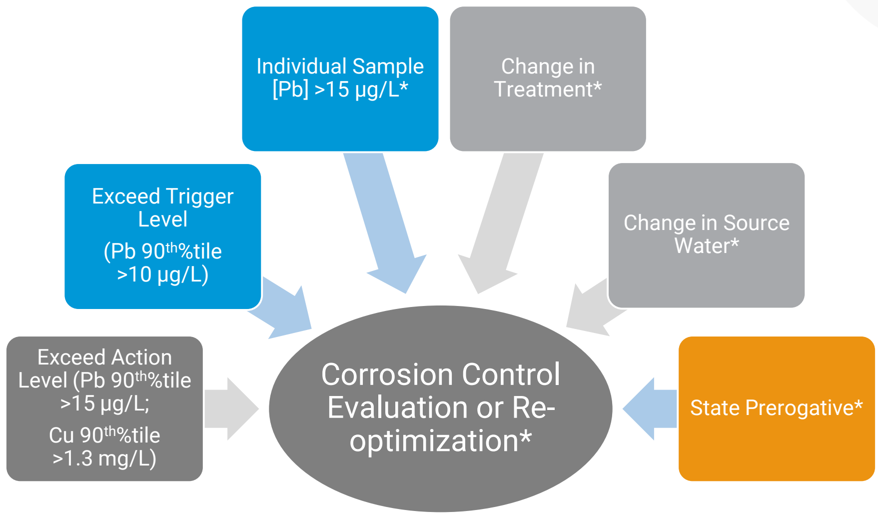
CORROSION CONTROL EVALUATION



* State discretion

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KEY ELEMENTS

- Evaluation
  - Pipe loop test
  - Specific requirements
    - Orthophosphate addition (1 and 3 mg/L)
    - pH / alkalinity
  - Other water quality impacts
  - Available time for evaluation
- Additional data collection to support selection
- Compliance rests on
  - Installation
  - Operating within selected water quality parameters

Once study is triggered, system must complete study. Once action level exceedance occurs then treatment is installed or re-optimized*

* Small system flexibility provision

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ASK THE EXPERTS

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Colorado Dept. of Public Health and Environment

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Denver Water

Enter your **question** into the **question pane** at the lower right hand side of the screen.

Please specify to whom you are addressing the question.

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OVERVIEW OF LEAD CORROSION CONTROL

Phil Brandhuber PhD
philbwater@gmail.com

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FIVE FACTS WE ALL SHOULD KNOW ABOUT LEAD

1. It is bad for you
   – It is worse for children
2. It is a legacy infrastructure issue
   - Prior plumbing practices at and downstream of the interface with the customer.
3. Its source is primarily lead pipes
   - BUT leaded solder, brass fixtures or galvanized pipe can release lead.
4. Its release can be minimized by intentionally forming insoluble scales on pipe walls
   - Water quality and hydraulics MUST be engineered to chemically form and physically preserve these scales.
5. It is released when these scales are disturbed
   – Change in source, treatment, hydraulics or physical disturbance.

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TYPES OF LEAD CORROSION

Type	Description	Becomes relevant when
Uniform	Uniform thinning of metal	Fresh lead surface present
Galvanic	Metals of different electrochemical potential in contact within electrolyte	Lead contacts more noble (cathodic) metal. Example: Partial lead service replacement
Microbially influenced	Microbes moderate or catalyze corrosion	Microbial action releases lead/destabilize scales
Dezincification	Zinc selectively leached from galvanized pipe	Loss of zinc allows galvanized pipe to corrode which retains/releases lead.

Understand the types of corrosion present in your system.

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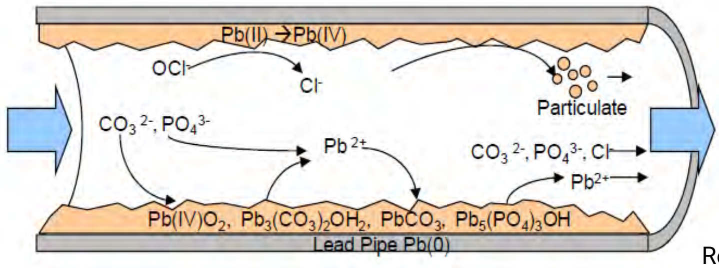
TYPES OF CORROSION SCALES ON LEAD SURFACES



Ref Xie 2010

Type	Lead Form	Name	Formula	Comment
Oxides	Lead (IV)	Plattnerite	PbO_2	Lower solubility but requires high ORP
	Lead (II)	Litharge	PbO	Higher solubility
Carbonates	Lead (II)	Cerussite	$PbCO_3$	Low solubility
	Lead (II)	Hydrocerussite	$Pb(CO_3)_2OH_2$	Low solubility
Phosphates	Lead (II)	Hydroxpyromorphite	$Pb_5(PO_4)_3OH$	Lower solubility but requires phosphate

Understand which scales you have or want to have.

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BUILDING RESILIENT PIPE SCALE IS KEY FOR MINIMIZING LEAD LEVELS AT CUSTOMER'S TAP

Approach	How	Consideration
Form lead(IV) oxide	Consistent Cl_2 residual	• Difficult to maintain sufficient residual – particularly in premise plumbing
Form lead(II) carbonate(s)	Adjust pH and/or alkalinity	• Sensitive to changes in pH and alkalinity • May conflict with other compliance requirements
Form lead(II) phosphate(s)	Add **orthophosphate**	• Additional chemical • Additional nutrient load to WWTP • Additional biological activity in distribution system • May promote movement of particulate lead

Proposed changes to LCR favor use of orthophosphate.

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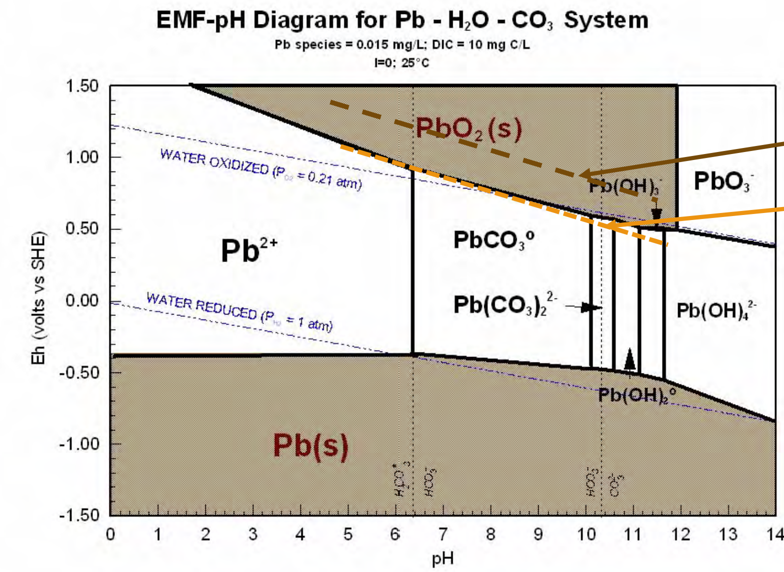
LEAD(IV) OXIDE (PLATTNERITE) FORMATION ONLY OCCURS UNDER HIGHLY OXIDIZED CONDITIONS



Modified from
Lytle & Schock 2005

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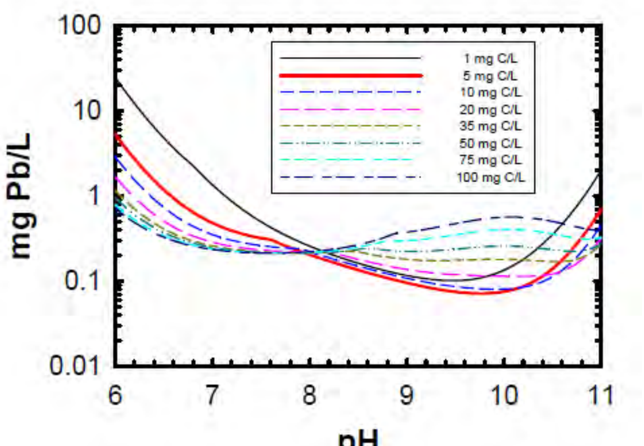
LEAD(II) CARBONATE SOLUBILITY IS SENSITIVE TO PH AND DIC



Schock 2016

$DIC = CO_2 + H_2CO_3 + CO_3^{2-} + HCO_3^-$

- Minimum solubility pH >9, DIC < 20 mg/L
  - May not be feasible for many systems
- Below pH 8.2
  - Increasing DIC or pH produces less soluble scale
- Above pH 8.2
  - Increasing DIC produces more soluble scale
  - Increasing pH may or may not produce less soluble scale

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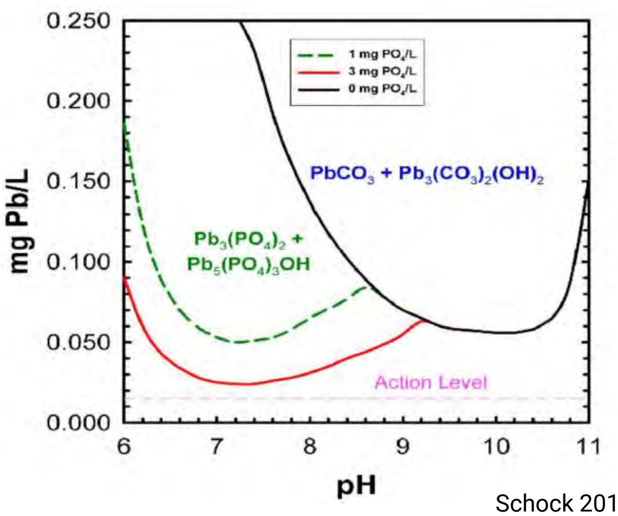
LEAD(II) PHOSPHATE SCALES ARE CONSISTENTLY LESS SOLUBLE THAN CARBONATE SCALES



Schock 2016

- Orthophosphate produces least soluble Pb(II) scale in pH 7-8 range
- Less effective above pH 8

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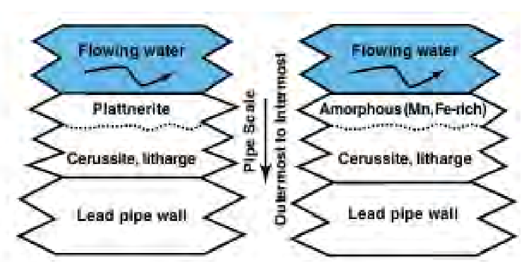
ACTUAL SCALES OBSERVED IN EXHUMED PIPES ARE COMPLEX

- Not only mineral scales are present
- Scales are often amorphous
  - More soluble
  - Physically less strong
  - Less tightly attached
- Other contaminants impact scales
  - Fe, Mn, Al, Si, Ca, NOM
  - Biofilms
- Lower concentrations of these contaminants will produce more resilient scales
  - Reduce solubilization of lead
  - Fewer lead particles



Schock et.al. 2014

Each system is unique. Analysis and testing may be required to know how to best stabilize scales.

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THINKING BEYOND THE CORROSION CONTROL EVALUATION (CCE)

Information need
- Scale type
- Solubility
- WQ impact
- Sequestrant impact
- Scale destabilization
- Others

Regulatory requirement for CCE

Time frame
- Batch: weeks
- Loop: years

Corrosion Control Test Program

Tools
- Solubility modeling
- Solubility tests
- Scale analysis
- Coupon tests
- Flow through test
- Loop test
- Field tests

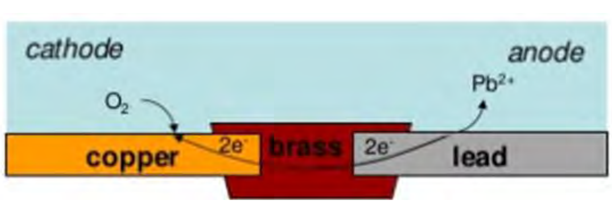
Consumer expectations

Cost
$1000's to $500K or more

Think carefully about how to get the most out of a corrosion control test program.

GALVANIC CORROSION AND CSMR

- When possibility of galvanic corrosion is present, ratio of chloride to sulfate (CSMR) is important



DeSantis 2009

$$\text{CSMR} = \frac{Chloride\ (\frac{mg}{L})}{Sulfate\ (\frac{mg}{L})}$$

- Avoid CSMR > 0.5
  - Particularly in water with alkalinity < 50 mg/L $CaCO_3$

If galvanic corrosion is a problem in your system, pay close attention to CSMR.

LEAD CORROSION RED FLAGS

Consideration	Red Flag
Distribution system infrastructure, premise plumbing	• Lead service lines; leaded goosenecks, solder, brass • Galvanized or unlined cast iron pipes
Source water quality	• Changes to pH, alkalinity, Cl, TOC (NOM), Mn, Fe, Si, Ca, ammonia
Treatment	• Changes - Coagulant (Fe or Al sulfate to chloride, ACH or PACl) - Addition of ion exchange - Addition of NF/RO • Conversion from Cl_2 to chloramine residual • Failure to maintain consistent pH and alkalinity
Distribution system operation	• Blending of sources • Polyphosphate/blended phosphates • Multiple residual disinfectants • Fe/Mn colored water events • Loss of disinfectant residual • Physical disturbance

Any of these red flags can cause trouble. The more you have, the greater the risk.

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CORROSION CONTROL DECISION SHOULD NOT BE MADE IN A VACUUM

- Ask, “Will this change destabilize scales in my distribution system or customer’s home?”
- Must maintain simultaneous compliance
  - Example: optimum pH for lead corrosion control vs. TTHM formation
- Unintended consequences
  - Example: impact of orthophosphate use on WWTP
- Corrosion control is not just about lead
  - Part of program to maintain water quality all the way to tap

Danger, danger

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OPFLOW LEAD ARTICLE SERIES

Issue	Title	Authors	Link
Dec 17	Lead in Drinking Water: Past, Present and Future	CAROLINE RUSSELL, PHILIP BRANDHUBER, AND DARREN LYTLE	https://dx.doi.org/10.5991/OPF.2017.43.0079
Jan 18	Manage Water Quality to Control Lead in Drinking Water	PHILIP BRANDHUBER	https://doi.org/10.5991/OPF.2018.44.0002
Feb 18	Fine-Tune System Operations for Lead and Copper Rule Compliance	AMLAN GHOSH	https://doi.org/10.5991/OPF.2018.44.0016
Mar 18	Identify Lead Plumbing Sources to Protect Public Health	DARREN A. LYTLE, MICHAEL R. SCHOCK, AND SIMONI TRIANTAFYLLIDOU	https://doi.org/10.5991/OPF.2018.44.0027
Apr 18	Lead Communications: it's Not What You Say but How You Say It	KELLEY DEARING SMITH	https://doi.org/10.5991/OPF.2018.44.0038
May 18	Utilities Lead the Way in Lead Corrosion Control	TARRAH HENRIE, KYLE SHIMABUKU, PHILIP BRANDHUBER, EMILY FRITZ, RYAN WALSH, STEVE PRICE, ALEXIS WOODROW, MELISSA ELLIOTT, AND DAVID KIMBROUGH	http://doi.org/10.5991/OPF.2018.44.0052

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ASK THE EXPERTS

Steve Via
American Water Works Association

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Colorado Dept. of Public Health and Environment

Rachel Himyak, BS
Denver Water

Enter your **question** into the **question pane** at the lower right hand side of the screen.

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COLORADO
Department of Public Health & Environment

IMPLEMENTING THE LEAD AND COPPER RULE EFFECTIVELY – STATE PERSPECTIVE

Tyson Ingels, PE, CWP
Lead Drinking Water Engineer
Colorado Department of Public Health and Environment

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LEARNING OBJECTIVES

- As a result of this presentation you will…
  - Understand some of the difficulties for water systems and states with the lead and copper rule (current and future)
  - Gain a knowledge of steps utilities can take to shore-up their lead and copper rule compliance
  - Learn about possible other ways of dealing with lead issues that do not involve strict adherence to the actual lead and copper rule but do protect public health

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AGENDA

- Review of a well-run lead program (from one state's perspective)
  - Sampling the proper homes
  - Effects of corrosion control
- Outlook on what is to come (possible new rule)
  - How to shore up your position as a utility
  - Potential difficulties and pitfalls of future compliance
- Insights into the Denver Water Variance from the State of Colorado's perspective.

- Acknowledgements:
  - State of Colorado Staff: Melanie Criswell, Bryan Pilson, Jamie Duvall, Alex Hawley
  - Denver Water Team: Nicole Poncelet-Johnson and Alexis Woodrow
  - USEPA: Angelique Diaz and Sarah Bahrman

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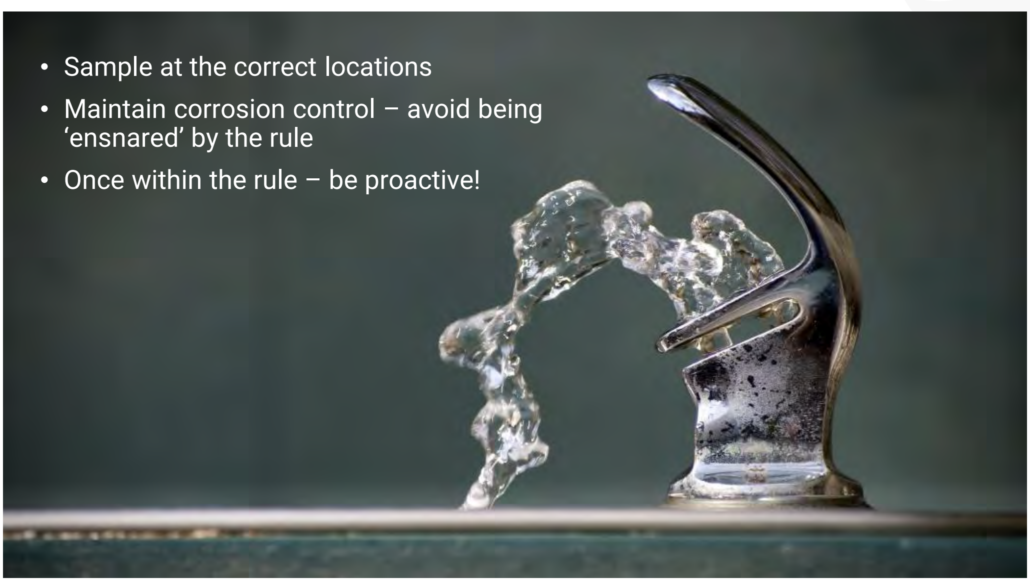
A WELL-RUN LEAD AND COPPER PROGRAM

- Sample at the correct locations
- Maintain corrosion control – avoid being 'ensnared' by the rule
- Once within the rule – be proactive!



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FIRST RESPONSE TO FLINT: PROPER SAMPLING!! = LEAD OUTREACH VERIFICATION EFFORT (LOVE)

- 2016
  - EPA sent letters to all states requesting information on how they implement the LCR
- April 2016
  - CDPHE responds to EPA confirming that state procedures are fully consistent with the LCR and applicable EPA guidance
- July 2016
  - All systems monitor annually
  - CDPHE sent out initial LOVE letter/request for information
- 2018-2019
  - Reviewed all information on file and performed outreach
  - Ensuring public health by determining if the highest risk sites are being sampled
  - Approved sample pools that are verified to contain the highest risk sites

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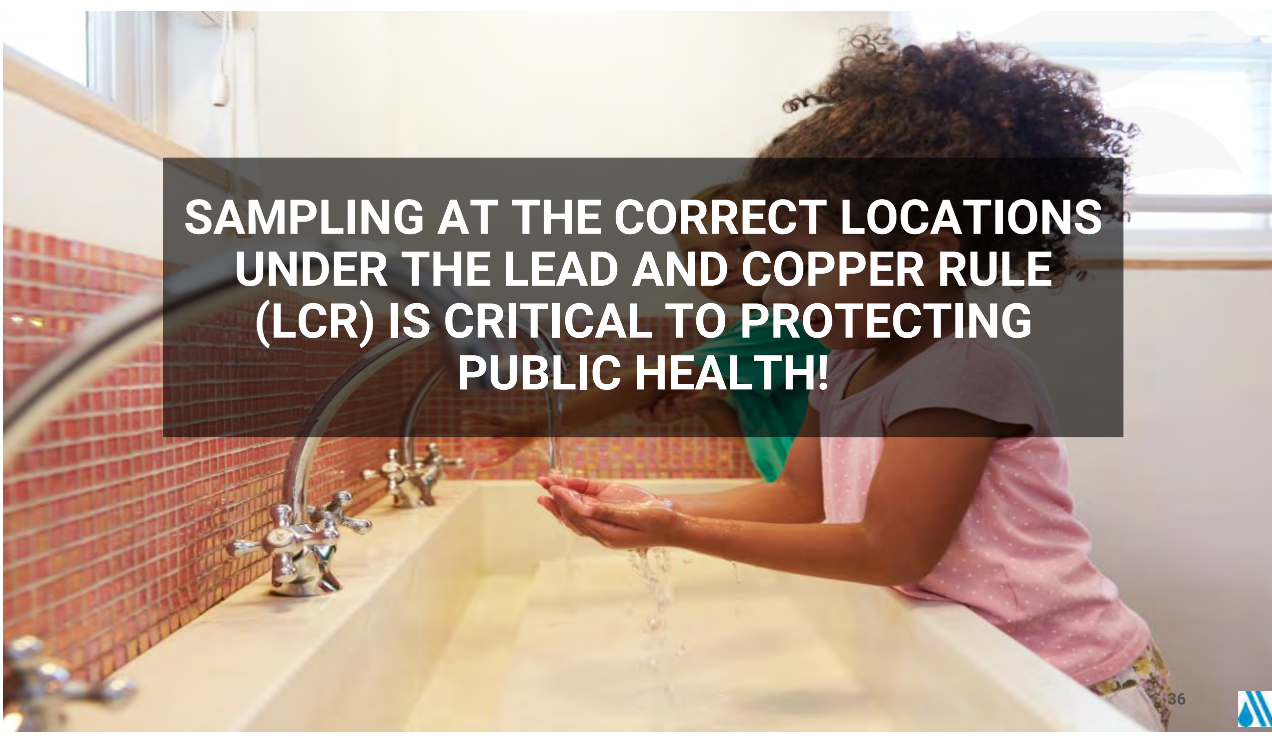

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SAMPLE POOLS

- What are the issues?
  - Materials Evaluation submitted but low risk sites being sampled
  - Not enough sites
  - Samples not collected from approved pool
  - Unverified plumbing materials
  - Missing information

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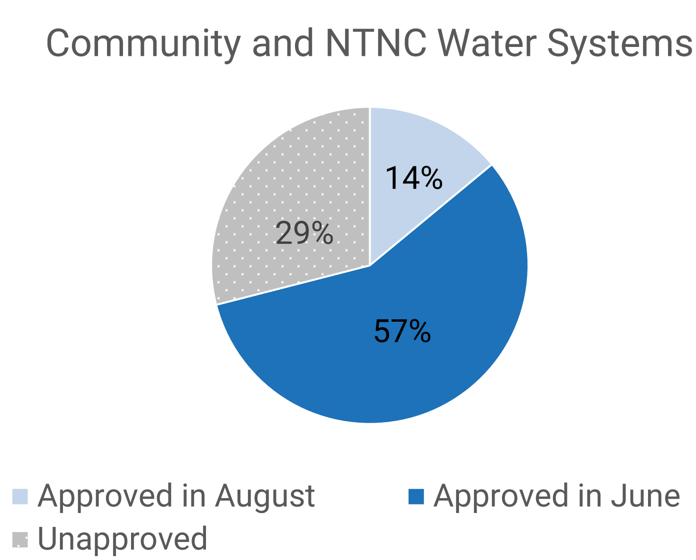
LATE 2019 STATUS



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WHERE DO WE GO FROM HERE?

- 2019
  - Any samples collected from unapproved, low risk sites will not apply towards monitoring requirements but will be reviewed to determine whether an action level is exceeded.
- 2020
  - Systems still out of compliance will be required to sample on a 6-month monitoring frequency and/or will be issued an enforcement order.

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DESIGN PROJECTS - TREATMENT AND SOURCE CHANGES

- OCCT recommendation template
- 2017 Design Criteria updated to address corrosion
  - Most changes will result in standard monitoring (every 6 months)
  - Possibility to reduce to reduced monitoring (annually at generally half the standard sites)
    - Reduced monitoring pilot project
  - Bench scale guidance and protocol

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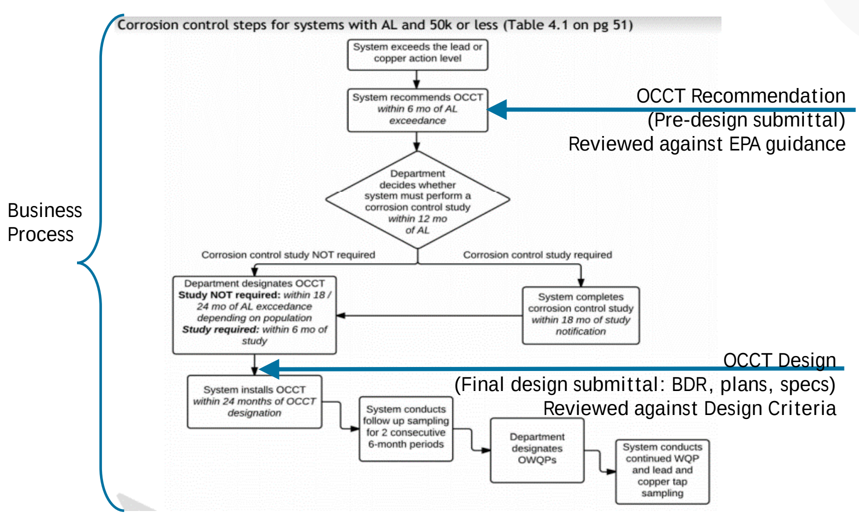
OCCT PROCESS FOR LEAD/COPPER ALE



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OCCT RECOMMENDATIONS FOR SMALL / MEDIUM SYSTEMS

- Most use the March 2016 *EPA Optimal Corrosion Control Treatment Evaluation Technical Recommendations* to select treatment recommendations (recently updated)
  - https://www.epa.gov/dwreginfo/optimal-corrosion-control-treatment-evaluation-technical-recommendations
- Some systems may elect or be required to do a full corrosion control study
- Design Criteria Appendix K is a submittal template for small/medium systems

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ALL DESIGN PROJECTS MUST CONSIDER CORROSION

- Reflect the 2016 EPA guidance on optimal corrosion control treatment (OCCT)
- Updated 2017 Design Criteria
  - Culture of Health - evaluate potential corrosion impacts of a long-term source or treatment changes before construction. Encourage predictive modeling
  - Corrosion impacts considered based on possible risk (categories 1-4). Appendix A, Table A.2
- https://www.colorado.gov/pacific/cdphe/wq-design-criteria-potable-water-systems-policies

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DESIGN CORROSION CONTROL CATEGORIES

Project Category	Required action
Category 1 - No impacts to corrosivity	No additional requirements to system.
Category 2 - Possible impact to corrosivity	Typically, system will be required to do standard monitoring.
Category 3 - Probable impact to corrosivity	Corrosivity Analysis: corrosion chemistry modeling, water quality from similar systems, pilot study results, or other supporting information as necessary to predict anticipated changes to corrosivity. Typically, system will be required to do standard monitoring, and design approval may include conditions related to corrosion mitigation.
Category 4 - New or changed OCCT - Regulation 11.26(3)	System must submit OCCT analysis in accordance with Appendix K. May include a Corrosion Control Study Process is for systems implementing OCCT in response to an action level exceedance (ALE) or wanting to make modifications to an existing OCCT.

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TABLE A.2 DESIGN CRITERIA EXCERPT

Project Type - Treatment Projects - Chemical addition	Default Category*
Addition of powder activated carbon	Category 1
Changes/additions of coagulant aid, floc aid, or filter aid (polymers)	Category 1
Changes to fluoridation	Category 1
Changing primary coagulant that will not impact chloride to sulfate mass ratio (e.g. Ferric sulfate to Aluminum sulfate).	Category 2
Changing primary disinfectant (e.g., from free chlorine residual to total chlorine residual, from chlorine to ozone)	Category 2
Changing primary coagulant that will impact chloride to sulfate mass ratio (e.g. Ferric sulfate to ferric chloride)	Category 3
Changes/additions of polyphosphate	Category 3
Changes/additions of pH adjustment (e.g., soda ash, caustic soda) if goal is corrosion control. Note: this includes turning off the chemical feed	Category 4

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REDUCED MONITORING PROJECT

- Most water systems are on an annual monitoring schedule (a.k.a. reduced monitoring)
- Approximately 180 systems on an every six month monitoring schedule (a.k.a. standard monitoring)
  - Increased sampling due to treatment or source changes, due to an action level exceedance…
- Pilot implementation process to evaluate if systems can be safely taken from standard 6 month to reduced annual monitoring
- Reduced for both Pb and Cu. Cannot be reduce for a single parameter

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REDUCED MONITORING STEPS

1. Is sampling at correct sites?
   - LOVE evaluation
2. Are customers sampling correctly?
   - Check against recommended instructions
3. Are the lead and copper results well below the action level?
   - Less than 1.0 mg/L copper
   - Less than 0.010 mg/L lead
4. If OCCT is installed, is it being operated continuously and consistently?
   - System is meeting set optimal water quality parameter ranges

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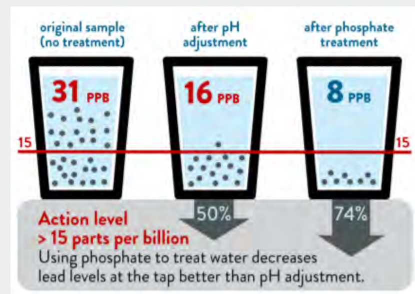
CORROSION CONTROL STUDIES

- Required for large system (over 50K) and may be required for small or medium systems
- Bench scale test or analogous system
- Relative measure of how different treatments will impact corrosion
- **Methodology can be used a predicative model to show a proposed project's corrosion impacts**

Bench-scale testing provides a relative measure of how different treatment will impact corrosion or predict if treatment and/or source changes impact corrosion.



LEAD AND COPPER CORROSION BENCH-SCALE TESTING GUIDANCE MANUAL

- Fall of 2018 CDPHE contracted with Hazen and Sawyer to develop a guidance document and bench scale testing protocol to assist Colorado water systems
- Background on desktop studies and types of corrosion testing methods
- Immersion coupon testing protocol in Appendix A

Denver Water's immersion test

GUIDANCE MANUAL AND IMMERSION TESTING PROTOCOL AVAILABLE FOR DOWNLOAD

- CDPHE LCR webpage: https://www.colorado.gov/pacific/cdphe/lcr

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INITIAL THOUGHTS ON THE PROPOSED REVISIONS TO THE RULE

- While some positives exist, Colorado sees some significant challenges:
- Keeping an accurate inventory of schools and daycares, what if the samples are high?
- Tier 1 (24 hour) public notice for an action level exceedance
  - Calculated during the sampling period?
  - Public panic?
- 24-hour notice to a home that has a high lead sample
- Corrosion Control – no coupon studies – pipe loops only

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PURSUING INNOVATIVE WAYS TO HANDLE LEAD SERVICE LINES

- Alternative Treatment Technique model:
  - Accurate inventory of lead service lines can be obtained
  - Willingness to replace all lead service lines within 15 years (7% per year)
  - Corrosion control (not 'optimal' by the rule) can be implemented to lessen corrosion
  - Effective 'at home' filter program can be implemented to reduce exposure
  - Contingent on an effective outreach and education program
- PROS:
  - Largest source of lead in drinking water is eliminated
  - Intervention to stop exposure now
  - Environmental impact mitigated

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FILTER CHALLENGE STUDY

Rachel Himyak, BS
Start-up, Commissioning, Optimization Team Treatment Tech
Denver Water

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AGENDA

- Background on lead reduction program and lead pilot
- Why is it important to test filter effectiveness?
- Characterization of lead concentration from the lead pilot
- Filter challenge and results
- Concluding thoughts

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LEAD REDUCTION PROGRAM (LRP/VARIANCE)

- For corrosion control treatment, EPA/CDPHE planned to mandate Denver Water dose orthophosphate by March 2020
- Denver Water has been working on an optimized corrosion control study since 2015
  - Lead Pilots, one located at each treatment system of Denver Water
  - 4 racks with 3 lead service lines running on each rack
  - Set up to reflect LCR sampling, pilot lead concentrations are not representative of LCR
- Several reasons to look at a more wholistic approach:
  - Smaller municipalities
  - Metro Wastewater Facility
  - Phosphorus is a nutrient for Algal blooms
- LRP was proposed
  - Replacing all customer lead service lines over the next 15 years
  - Increasing the pH level of the drinking water to help prevent corrosion from homes with lead fixtures and pipes with lead solder
  - Providing water filters to all Denver Water customers with suspected lead services line until the line is replaced
- Approved December of 2019!

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DOES A PITCHER FILTER REMOVE LEAD TO ACCEPTABLE LEVELS FROM DISTRIBUTION WATER THAT HAD LEAD INTRODUCED FROM A LEAD SERVICE LINE?

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WHAT WAS LOOKED FOR AND WHY

- Efficiency, usability and longevity of filters tested before distribution through LRP
- Preferred a filter that did not remove fluoride based on EPA recommendation
- How corrosion in lead service lines varies between Denver Water's north and south systems
  - North system is softer water, lower alkalinity, Moffat Treatment Plant
  - South system is larger, harder water, higher alkalinity, Marston Treatment Plant
- Interested in the physical character of the lead that was being released from the pipe scale
  - particulate, dissolved, colloidal

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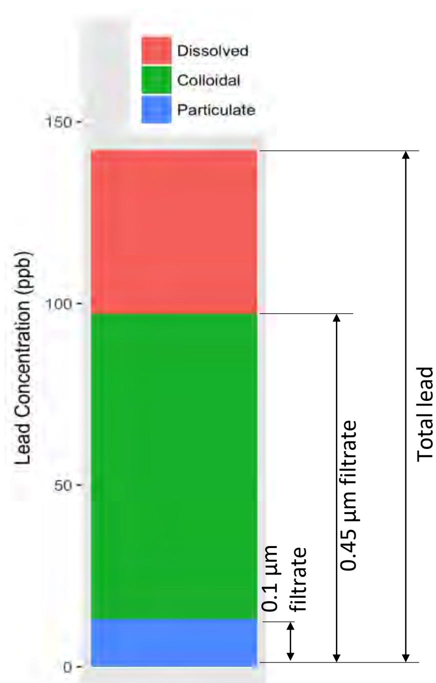
DEFINING DISSOLVED, COLLOIDAL, AND PARTICULATE

- Dissolved = 0.1 µm filtrate
- Colloidal = 0.45 µm filtrate - Dissolved
- Particulate = Whole Water – Dissolved - Colloidal



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PROCEDURE

- Filter challenge water was taken from the Marston and Moffat lead pipe racks.
  - Water was drawn from lines on the first 2 racks at each pilot plant
- Control rack water (pH 7.8) was collected, and the pH adjusted to 8.8 to represent variance conditions and tested for lead in 3 fractions.
- Five pitcher filters were selected for testing.
- Water was collected from control rack and rack 2 (pH 7.8, 1mg/L orthophosphate) to characterize the lead concentration going into the pitcher filters
- Prior to testing the filter cartridge was conditioned according to manufacturer instructions.
- Filtered water was analyzed for lead and fluoride

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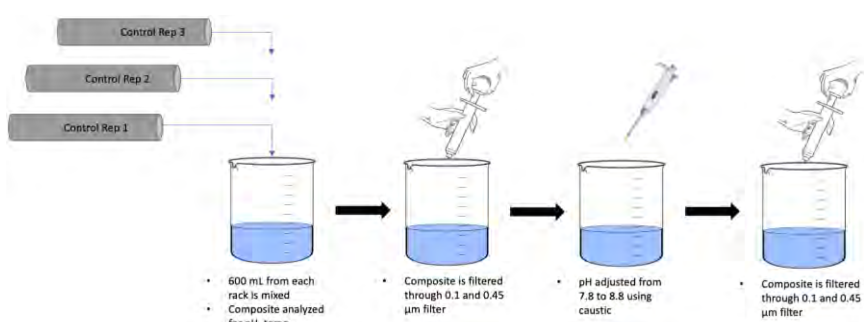
CONTROL PH ADJUSTMENT



- Determine if there is a significant difference between total, colloidal, and particulate fractions of lead with pH change.
- Collect volume off control rack
- Blended the volumes to create composite volume
- Sampled off composite
- Adjust composite volume to pH 8.8
- Sampled adjusted pH 8.8 composite

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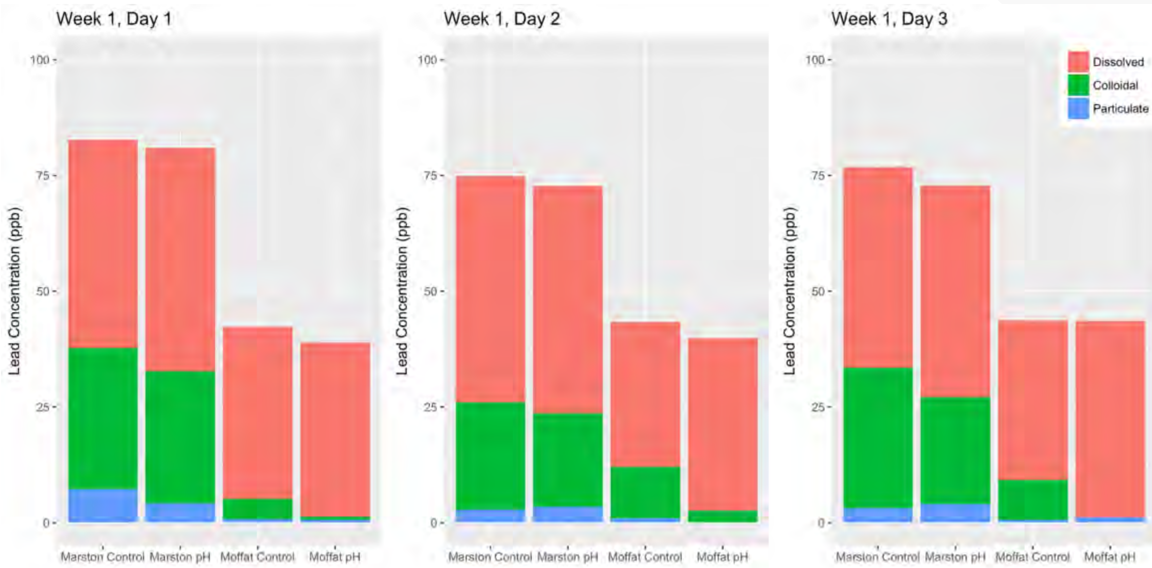
PH ADJUSTMENT OF CONTROL DOES NOT AFFECT LEAD DISTRIBUTION



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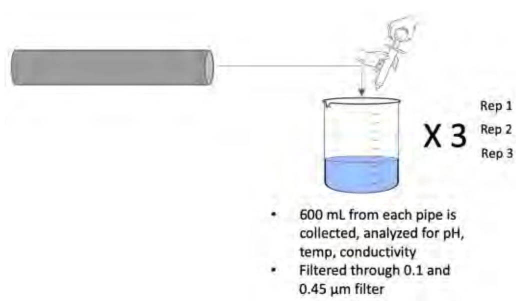
LEAD PIPELINE CHARACTERIZATION



- Collected volume from control rack, blended to create a composite volume
- Collected volume from rack 2, blended to create rack 2 composite volume
- Analyzed sample from each line to characterize lead concentration, dissolved, colloidal, particulate fractions
- Comparison of lead from control rack(pH 7.8) and rack 2 (ph 7.8, 1mg/L orthophosphate).

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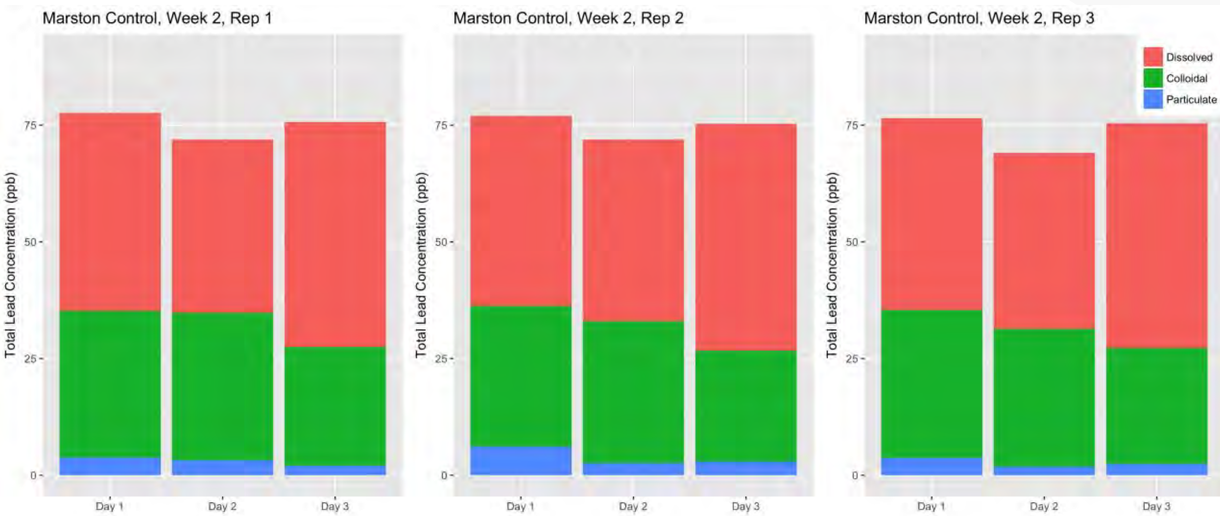
INFLUENT LEAD DISTRIBUTION DID NOT VARY MUCH FROM DAY-TO-DAY OR PIPE-TO-PIPE (MARSTON)



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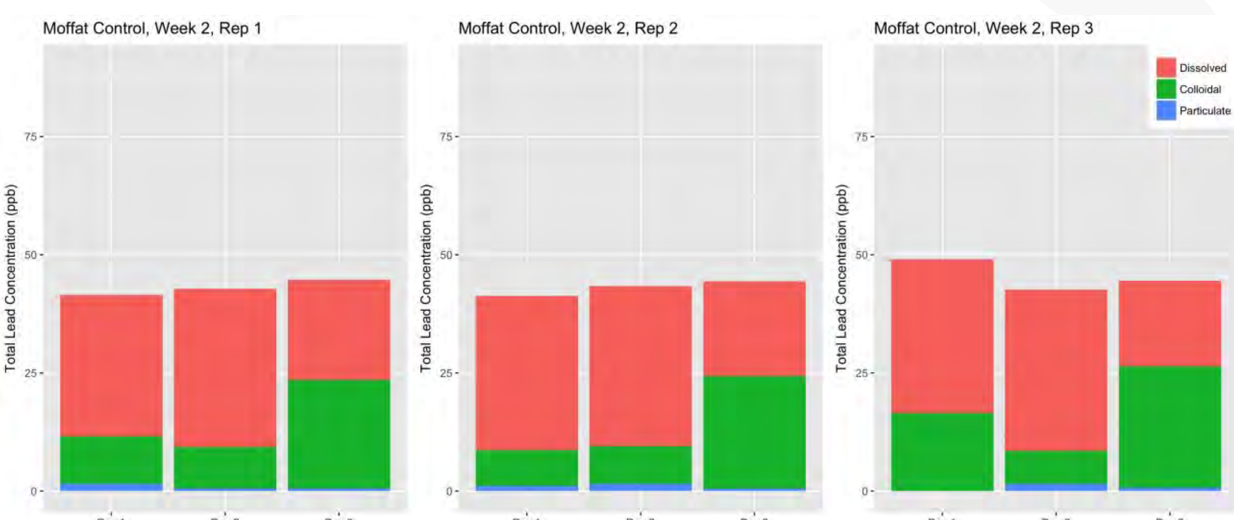
INFLUENT LEAD DISTRIBUTION DID NOT VARY MUCH FROM DAY-TO-DAY OR PIPE-TO-PIPE (MOFFAT)



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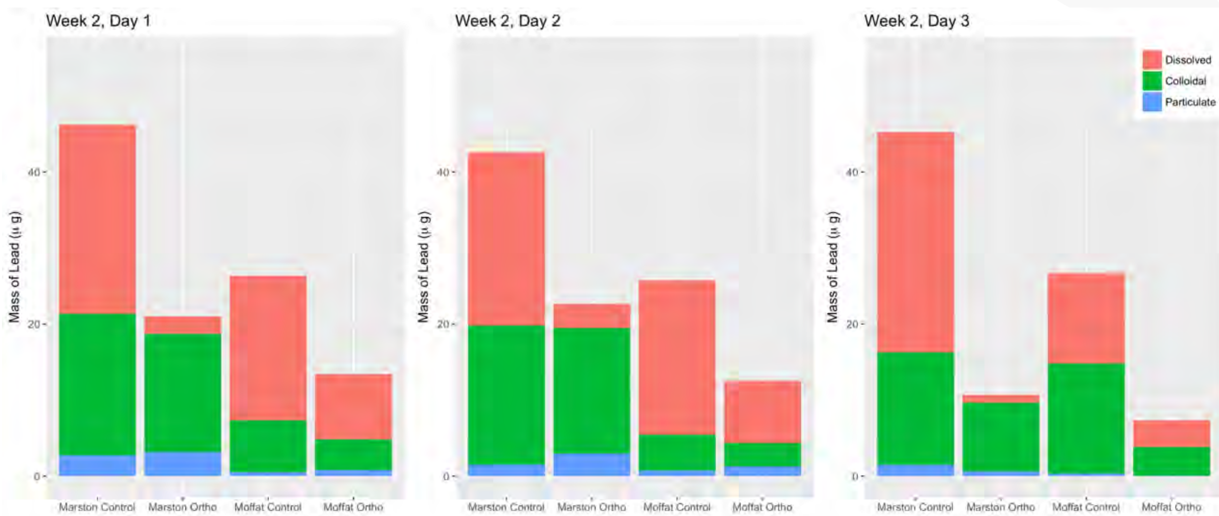
ORTHO (1MG/L) PRIMARILY REDUCES THE DISSOLVED FRACTION



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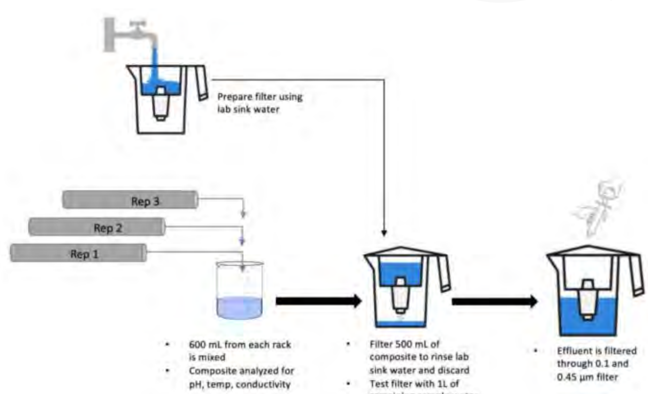
FILTER CHALLENGE

- Collected water from control rack and rack 2, blended volume for each individual rack
- Collected sample from the composite volumes of the control rack and rack 2
- Poured composite volume from each rack into an individual filter pitcher
- Collected sample of filter effluent from each filter
- Analyzed for lead concentrations, a comparison between the initial composite and the filter effluent
- Analyzed fluoride concentrations, compared initial composite and filter effluent
- Any filter effluent above 4ppb was analyzed for total, particulate, and colloidal fractions.



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PITCHER INFORMATION

Pitcher Filter Manufacturer	NSF 53 Certification Laboratory	Manufacturer's Filter Conditioning Requirements	Filter Media Type	Filter Capacity / Replacement Life (gallons)	Filter Cartridge Bed Volume
A	WQA	Hand wash pitcher, lid, and reservoir with mild detergent. Fill and discard first three pitchers of water.	Pleated fabric filter with embedded activated carbon powder and a metal silicate lead scavenger powder with charge attraction.	120	
B	WQA	Wash pitcher and all other parts with soap and warm water. Rinse thoroughly. Place the water filter refill in a clean glass or pan of water. Soak the filter for at least one hour (ensure filter is fully submerged). Flush the filter under water tap and rinse thoroughly. There could be some fine carbon particles in the washings. Continue washing until water is clear and free of carbon particles.	Carbon based filter media with electrostatic properties.	80	107 mL
C	WQA	Pre-soak the filter in cold water for 15 minutes. Flush filter under running water for 10 seconds.	Activated carbon and ion exchange.	40	100 mL
D	NSF	None - filters are rinsed before they are sealed.	Coarse filter screen to remove fine particles and sediment, foam distributor that maximizes contact time, multi-layer activated carbon and oxidation reduction alloy, dual comprehensive ion exchange resin array, and a non-woven membrane to remove ultra-fine particles.	15	60 mL
E	NSF	Fill and discard the first pitcher of water. There could be some fine carbon particles on the first rinse, but the water will clear quickly as it flows through the filter	Activated carbon	320	

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LEAD RESULTS – FILTER A

Filter A	Control			1 mg/L Ortho		
Marston						
Date	Influent (ppb)	Effluent (ppb)	% Removal	Influent (ppb)	Effluent (ppb)	% Removal
9/16/19	97.2	1.7	98%	15.6	<1	>94%
9/17/19	82.8	4.1	95%	10.6	<1	>91%
9/18/19	90.2	3.4	96%	14.9	<1	>93%
Moffat						
9/16/19	45.4	1.0	98%	12.0	<1	>92%
9/17/19	44.6	2.1	95%	11.5	<1	>91%
9/18/19	46.5	1.0	98%	11.7	<1	>91%

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LEAD RESULTS – FILTER B

Filter B	Control			1 mg/L Ortho		
Date	Influent (ppb)	Effluent (ppb)	% Removal	Influent (ppb)	Effluent (ppb)	% Removal
Marston						
9/19/19	82.8	1.1	99%	12.3	1.0	>92%
9/23/19	78.1	3.4	96%	14.8	13.2	10%
9/24/19	73.5	4.1	94%	18.1	2.1	89%
Moffat						
9/19/19	40.6	1.0	98%	10.3	<1	>90%
9/23/19	41.0	1.0	98%	10.2	<1	>90%
9/24/19	43.0	1.0	98%	8.8	<1	>89%

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LEAD RESULTS – FILTER C

Filter C	Control			1 mg/L Ortho		
Date	Influent (ppb)	Effluent (ppb)	% Removal	Influent (ppb)	Effluent (ppb)	% Removal
Marston						
9/25/19	90.9	1.7	98%	128.4	2.6	98%
9/26/19	74.5	2.8	96%	20.8	<1	>95%
9/30/19	65.3	1.0	98%	10.4	<1	>90%
Moffat						
9/25/19	48.4	1.0	98%	8.9	<1	>89%
9/26/19	46.2	1.0	98%	9.2	<1	>89%
9/30/19	43.5	1.5	97%	14.8	<1	>93%

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LEAD RESULTS – FILTER D

Filter D	Control			1 mg/L Ortho		
Date	Influent (ppb)	Effluent (ppb)	% Removal	Influent (ppb)	Effluent (ppb)	% Removal
Marston						
10/1/19	65.4	1.0	98%	50.8	6.9	86%
10/2/19	59.5	1.0	98%	10.7	1.0	91%
10/3/19	61.6	1.3	98%	7.5	<1	>87%
Moffat						
10/1/19	43.4	1.0	98%	11.8	<1	>92%
10/2/19	44.4	1.0	98%	11.4	<1	>91%
10/3/19	43.8	1.0	98%	11.6	1.1	91%

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LEAD RESULTS – FILTER E

Filter E	Control			1 mg/L Ortho		
Date	Influent (ppb)	Effluent (ppb)	% Removal	Influent (ppb)	Effluent (ppb)	% Removal
Marston						
11/14/19	59.8	1	98%	13.6	1	93%
11/18/19	54.3	1	98%	9.1	1	89%
11/20/19	59.9	1	98%	21.9	1.604	93%
Moffat						
11/14/19	31.4	1	97%	7.0	1	86%
11/18/19	32.4	1	97%	8.0	1	88%
11/20/19	32.1	1	97%	7.3	1	86%

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FLUORIDE RESULTS MOFFAT

- From 9/16/19-10/3/19, unfiltered values were taken from treatment plant results taken nearest to pilot sampling time

Moffat							
Date	Pitcher	Control Unfiltered Concentration (mg/L)	Control Filtered Concentration (mg/L)	Control % Removal	Ortho Unfiltered Concentration	Ortho Filtered Concentration (mg/L)	Ortho % Removal
9/16/19	A	0.28	0.26	6%	0.28	0.26	7%
9/17/19	A	0.27	0.25	6%	0.27	0.26	2%
9/18/19	A	0.28	0.25	10%	0.28	0.25	8%
9/19/19	B	0.25	0.27	-6%	0.25	0.26	-4%
9/23/19	B	0.31	0.27	14%	0.31	0.25	22%
9/24/19	B	0.29	0.26	12%	0.29	0.27	8%
9/25/19	C	0.31	0.04	88%	0.31	0.08	73%
9/26/19	C	0.28	0.04	86%	0.28	0.06	79%
9/30/19	C	0.25	0.08	69%	0.25	0.04	84%
10/1/19	D	0.47	0.00	100%	0.47	0.02	95%
10/2/19	D	0.54	0.02	96%	0.54	0.00	100%
10/3/19	D	0.49	0.00	100%	0.49	0.05	90%
11/14/19	E	0.58	0.49	15%	0.64	0.54	6%
11/18/19	E	0.64	0.53	16%	0.65	0.55	14%
11/20/19	E	0.59	0.54	8%	0.59	0.50	16%

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FLUORIDE RESULTS MARSTON

- From 9/16/19-10/3/19, unfiltered values were taken from treatment plant results taken nearest to pilot sampling time

Marston							
Date	Pitcher Brand	Control Unfiltered Concentration (mg/L)	Control Filtered Concentration (mg/L)	Control % Removal	Ortho Unfiltered Concentration	Ortho Filtered Concentration (mg/L)	Ortho % Removal
9/16/19	A	0.42	0.60	-44%	0.42	0.60	-18%
9/17/19	A	0.48	0.60	-25%	0.48	0.60	-13%
9/18/19	A	0.43	0.59	-36%	0.43	0.58	-14%
9/19/19	B	0.43	0.58	-35%	0.43	0.58	-15%
9/23/19	B	0.42	0.54	-28%	0.42	0.54	-11%
9/24/19	B	0.44	0.56	-27%	0.44	0.56	-12%
9/25/19	C	0.43	0.04	91%	0.43	0.17	25%
9/26/19	C	0.44	0.14	67%	0.44	0.09	35%
9/30/19	C	0.51	0.05	91%	0.51	0.05	46%
10/1/19	D	0.43	0.00	100%	0.43	0.02	95%
10/2/19	D	0.52	0.00	100%	0.52	0.00	100%
10/3/19	D	0.52	0.02	96%	0.52	0.00	100%
11/14/19	E	0.59	0.50	16%	0.59	0.54	5%
11/18/19	E	0.61	0.51	16%	0.61	0.56	5%
11/20/19	E	0.53	0.50	5%	0.54	0.52	1%

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SUMMARY

- The implementation of the LRP will remove all lead from the distribution system using a wholistic approach instead of dosing orthophosphate
- customers will be protected by the distribution of pitcher filters until all lead service lines are removed
- Lead pilot water was used to challenge filter effectiveness as it provided lead concentrations between 10-80ppb
- All pitcher brands removed lead adequately – only 4 samples had an effluent lead result >4ppb
- 2 of the 5 brands removed fluoride
- Pitcher filters will help protect customers from lead coming from lead service lines, assuming correct use
- Further testing has begun on the brand chosen to test the longevity of the filters so the filter cartridges can be replaced on a consistent basis

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SPECIAL THANKS TO:

- Chris Corwin and Sheldon Masters, Corona Environmental
- Denver Water Lead Team
- Marston and Moffat Treatment plants' operations and maintenance staff.

DENVER WATER

CORONA ENVIRONMENTAL CONSULTING

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ASK THE EXPERTS

Steve Via
American Water Works Association

Phil Brandhuber, PhD
AWWA Inorganics Committee Chair

Tyson Ingels, PE, CWP
Colorado Dept. of Public Health and Environment

Rachel Himyak, BS
Denver Water

Enter your **question** into the **question pane** at the lower right hand side of the screen.

Please specify to whom you are addressing the question.

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ADDITIONAL RESOURCES

- FREE Archived Webinar: Proposed Lead and Copper Rule Revisions– What could it mean for water systems?
- AWWA Lead Resource Community
- EPA: Proposed Revisions to the Lead and Copper Rule
- Lead and Copper Corrosion: An Overview of WRF Research

- Find more information about Denver Water’s study here:
  - Pitcher Filter Usability Observations
  - Additional Pilot/Filter Information

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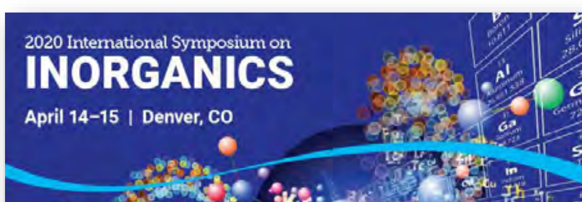

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- As part of your registration, you are entitled to an additional 30-day archive access of today's program.
- Until next time, keep the water safe and secure.

PRESENTER BIOGRAPHY INFORMATION

Steve Via is Director of Federal Relations for the American Water Works Association (AWWA) working in AWWA's Washington, D.C., office. Mr. Via's primary responsibilities are two-fold. First, working with the Environmental Protection Agency (EPA) and other federal agencies on the development of policy and regulations that affect the water sector, and communicating the basis and substance of federal policy and regulations to the water sector. Mr. Via has 31 years' professional experience in environmental regulatory compliance assistance related to federal and state drinking water, wastewater, and solid / hazardous waste regulations. His work experience includes supporting communities engaged in planning, financing, and managing infrastructure improvements.

Phil specializes in drinking water quality and treatment. His work has involved inorganic contaminants, disinfection byproducts, potable reuse and brine management. Phil received his PhD from the University of Colorado Boulder, and has been the principal or co-principal investigator for ten research projects sponsored by the Water Research Foundation and other agencies. He is the current chair of the AWWA Inorganics Committee and past chair of the AWWA Emerging Water Quality Issues Committee. Phil has 20 years' experience as a consultant, working for McGuire Environmental and HDR. When not working on water quality issues, he can be found hiking and biking in the Colorado mountains.

Tyson Ingels is the Lead Drinking Water Engineer for CDPHE. His responsibilities include technical justification for new policy and regulation, acceptance of alternative technologies (e.g. membranes, UV disinfection) within the State, as well as acting as technical expert both on DW design review issues and inspection issues. Mr. Ingels also is primary contact responsible for Drinking Water emergencies and acute situations within Colorado. Prior to working for CDPHE, Mr. Ingels worked as a member of the process optimization team throughout the United States for a private consulting firm.

Rachel is a Biologist with a BS undergraduate degree from MSU Denver and have been working at Denver Water for a year and a half, starting with water quality distributions operations, moving to the water quality lab, and finally settling in with the startup, commissioning, and optimization team where she became a treatment tech working on the Lead and Copper pilot plant that Denver Water has been running since 2015. Working with the pilot, she has studied and tested many different corrosion control techniques and completed other small studies on the water that were vital to helping Denver Water obtain acceptance from the EPA and CDPHE it implement the new Lead Reduction Program.

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WEBINAR MODERATOR

Corinne Bertoia

Associate Engineer

American Water Works Association

Corinne Bertoia is an Associate Engineer at the American Water Works Association. Her responsibilities include reviewing and developing technical programs and supporting the Divisions and Committees of the Technical and Education Council. Corinne received her MASc. in Civil Engineering from the University of Toronto in 2018, where her research focused on the removal of NDMA precursors from drinking water biofilters.

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AGENDA

I.	The Evolving Challenge of DBPs and What to Do About It	David Reckhow

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ASK THE EXPERT

David Reckhow
University of Massachusetts-Amherst

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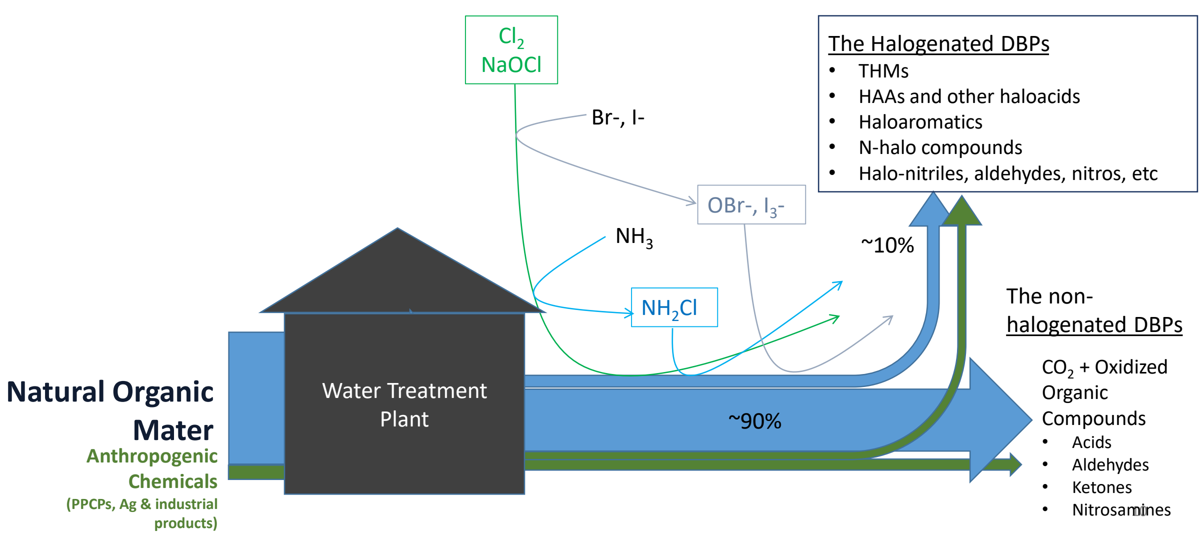
Formation of Cl_2-driven DBPs



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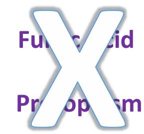
Key Points to Remember

- **NOM** is a complex, heterogeneous mixture, but not hopelessly complex
  - Faster progress can be made by treating it as such
  - Categorize based on underlying structural features rather than methods of extraction
  - Recognize the distinction between microstructure and macrostructure
- **Sources** set the stage
  - Terrestrial → Atmospheric
  - Aquatic

Anthropogenic (EfOM, etc.)



- **Processes** change the outcome
  - Natural Systems
    - Aerobic degradation & Anoxia (sediments)
  - Engineered Systems (Treatment – topic for another day)
- **DBP ratios** can be information rich
  - TCAA/DCAA
  - Dichloroacetonitrile/Chloroform (DCAN/TCM)
  - Chloroform/Bromodichloromethane

Role of Climate Change?

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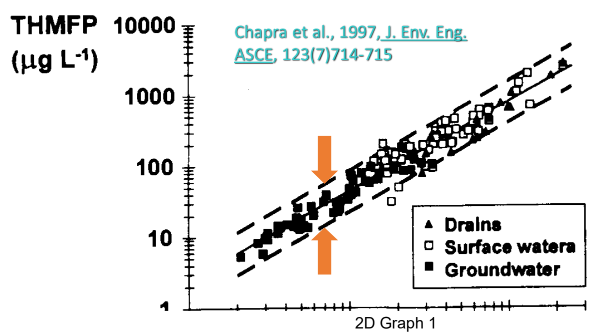
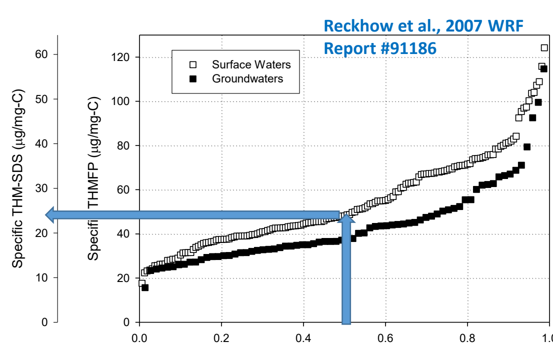
How well do DBP Precursor Concentrations correlate with TOC?

- Large span of THMFP at any given TOC
  - Almost 1 order of magnitude
- At 25 μg-THM precursor/mg-C,
  - 0.25% of the NOM carbon become incorporated into THMs,
  - **99.75%** of NOM carbon does not form THMs

The relative insignificance of TOC?





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NOM Origin, Release, Transport:

It's one of my favorite recipes. I call it NOM

Primary production

- Photosynthesis
  - Terrestrial plants
    - Intended Release
      - Air: through stomata
      - Soil: roots
    - Release during senescence
  - Phytoplankton
    - Intended Release
      - Exudates
    - Release during senescence
      - From lysis

Transport & transformation

- Air Processes
- Terrestrial
  - Groundwater and baseflow
  - Storm Runoff
- Changes in rivers and lakes/reservoirs

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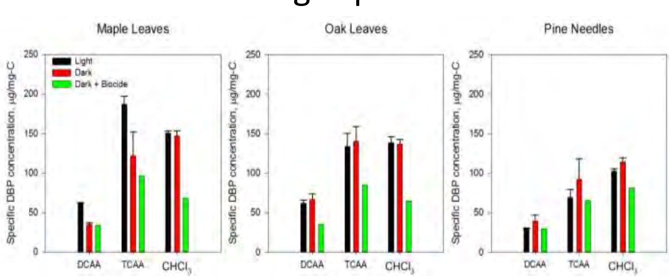
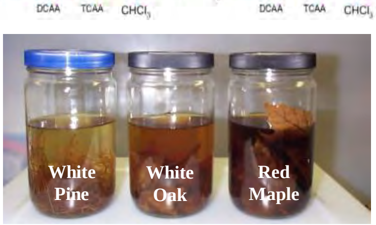
Terrestrial sources: vascular plants

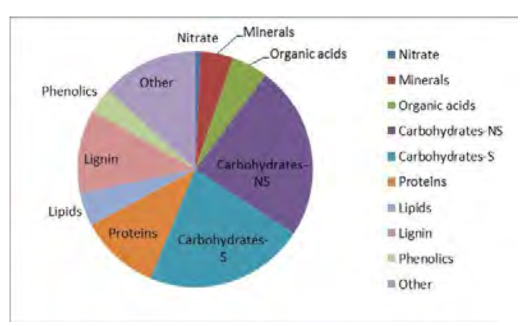
- Leaf Leaching experiments





Zhou et al., 2019
(manuscript in preparation)

- From Plant Biochemistry
  - An "average" leaf
    - 250 g/m^2/yr
      - estimated above ground biomass produced per year (EABP)



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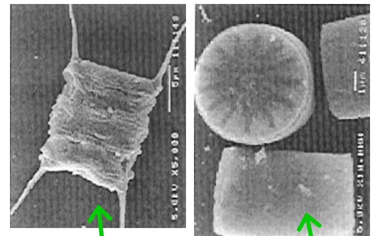
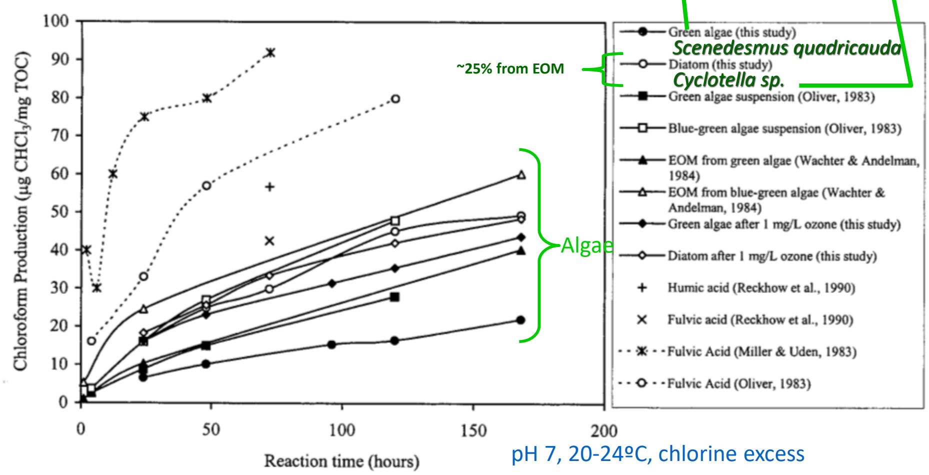
Algae as DBP Precursors

- From: Plummer & Edzwald, 2001
  - [ES&T:35:3661]





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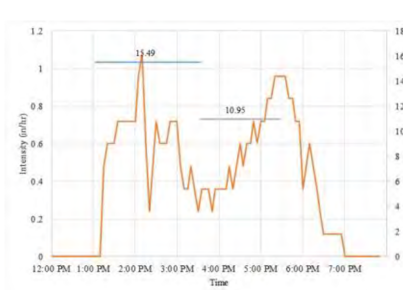
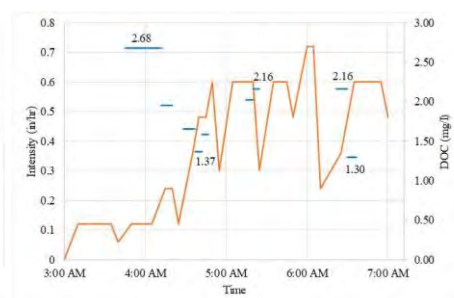
Air sources





- Pennsylvania Study
  - 0.7 mg/L volume average DOC
  - 8 kg-C/ha/yr average wet deposition
    - Same order of magnitude as riverine flux
- UMass precursor study
  - Very low SUVA and HAA precursor content
  - Low to moderate THM precursor content

Iavorivska et al., 2017
[J.Geophys. Res. Atm.]

Parameter	Mean Value	Units
SUVA	0.69	L/mg-m
Sp-THM-FP	16.7	µg/mg-C
Sp-TCAA-FP	0.9	µg/mg-C
Sp-DCAA-FP	2.9	µg/mg-C

Hosseini Shakib, 2016, MS Thesis, UMass Amherst

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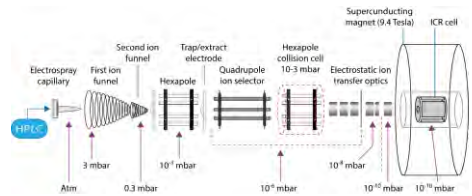
News about NOM and Precursors:

From Organic Geochemistry



- We still cannot determine exact structures for nearly all NOM
  - Even with the most advanced research instruments (e.g., FT-ICR-MS)
- NOM's Molecular Diversity
  - >10,000 unique empirical formulae that are source dependent (β-diversity)
  - Each may have 10 or more isomeric forms (α-diversity)
- NOM evolves from headwaters to the ocean
  - Lignin oligomers are intermediate in their lability (years but not centuries)
  - Glycosylated lignin oligomers persist longer
    - As do many terpenoid based compounds: carboxylic-rich moieties (CRAM) and material derived from linear terpenoids (MDLT)
  - After 1000s of years in the ocean, it approaches a "universal background" or "end member" character

Zark & Dittmar, 2018 [Nature comm. 9:3178]

Benk et al., 2018 [Frontiers in Earth Science 6:168]

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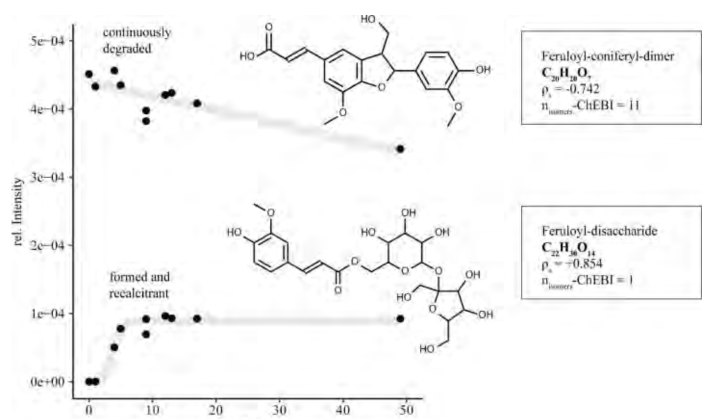
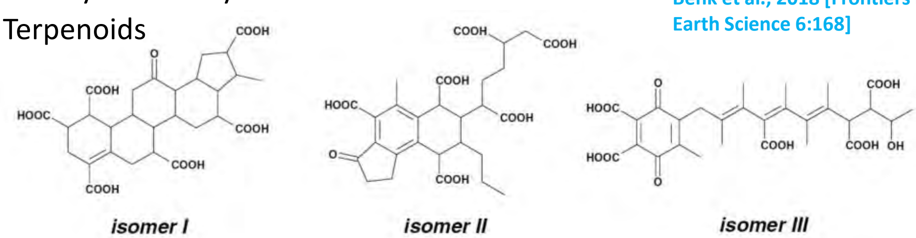
Persistent NOM

- Lignin Oligomers
  - Dimer
  - Glycosylated phenlypropanoid
- CRAM
  - Refractory Carboxyl-Rich Alicyclic Molecules
  - From Cyclic Terpenoids



Benk et al., 2018 [Frontiers in Earth Science 6:168]



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News about NOM and Precursors:

From Fluvial Geomorphology

- The River Continuum Concept (RCC)
  - Introduced by: Vannote et al., 1980 [Can. J. Fish. Aquat. Sci. 37:1:130]; refined many times since (e.g., Creed et al., 2015 [Can. J. Fish. Aquat. Sci. 72:1272]
  - Labile NOM disappears with time & distance downstream, leaving more recalcitrant NOM
  - Topography: flat areas lead to greater NOM mobilization
  - Droughts lead to increased production of refractory NOM, that is later flushed into streams
  - Storm events
    - Shift flow paths from deeper mineral soils to surface organic-rich soils
    - Exhibit flushing behavior for NOM - concentrations peak with the hydrograph
      - Hysteresis (peak shift) caused by degree of NOM source connectivity to stream channel

Climate Change

- Observations from large datasets – e.g., Creed et al., 2015
  - DOC decreases in downstream direction
  - SUVA may at first increase (from 1st to 4th order streams), then decrease
    - Most US dams are on mid-size streams (4th to 6th order)
      - water supply reservoirs too?

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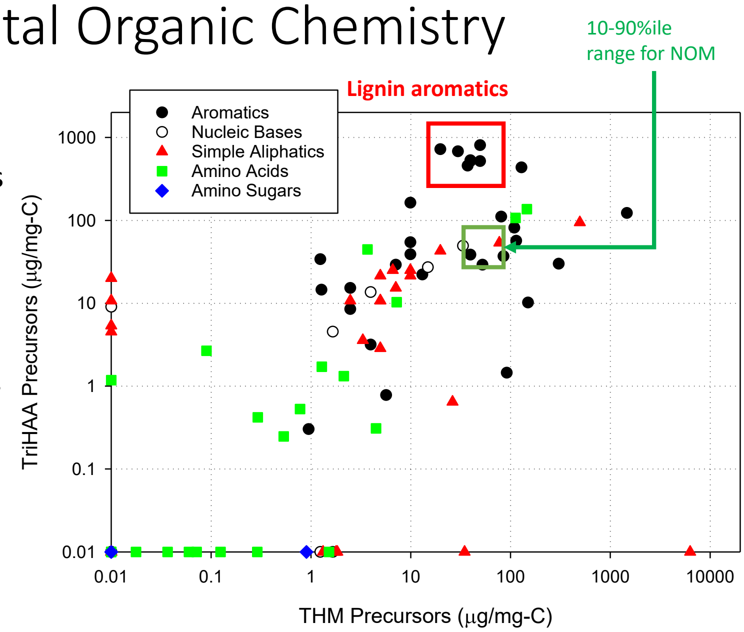
News about NOM and Precursors:

From Environmental Organic Chemistry

- Model compounds
  - Simple organic molecules that are found in nature
  - Easy to explore their reactivity in the lab
- TCAA and THM
  - Note the lignin aromatics



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Inside the DOC: Plant biomolecules

The River Continuum Concept (RCC)

Formation Potential

Sugars, starches	Low
Proteins	Moderate
Cellulose	Low
Hemicellulose	Low
Fats & waxes	Low
Lignins & tannins	**High**
Terpeniods & CRAM	Low

Most Potable Water Supplies

Very long RT Reservoirs

Increasing Recalcitrance

Simplification: Doesn't explicitly consider bacterial metabolites

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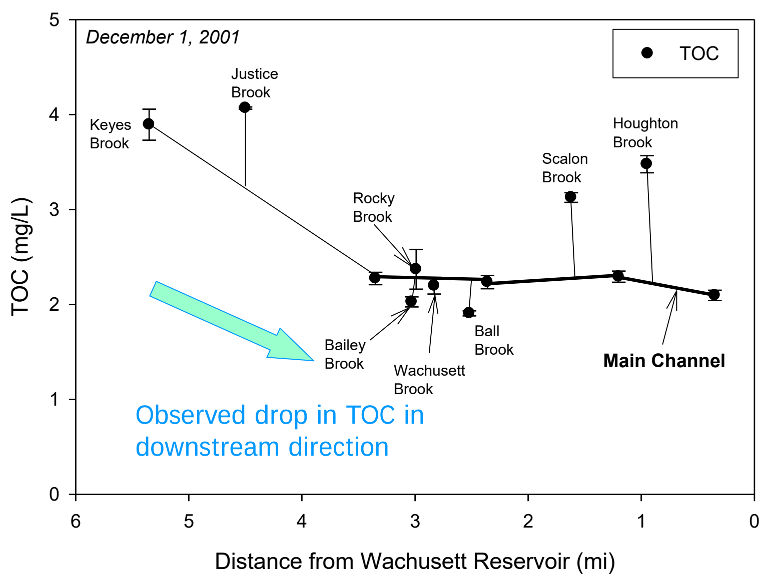
TOC along Stillwater River, MA

- TOC and DOC concentrations decline from headwaters to higher order streams
- General observations across the US
  - e.g., Creed et al., 2015



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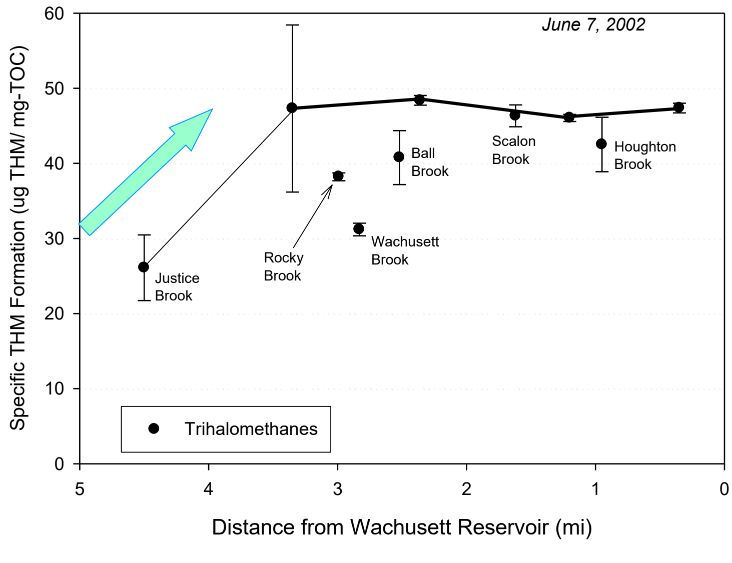
Specific THM Precursors, Stillwater River

- Whereas specific DBP precursor content goes up
- Same observations as with SUVA
- In general agreement with the RCC



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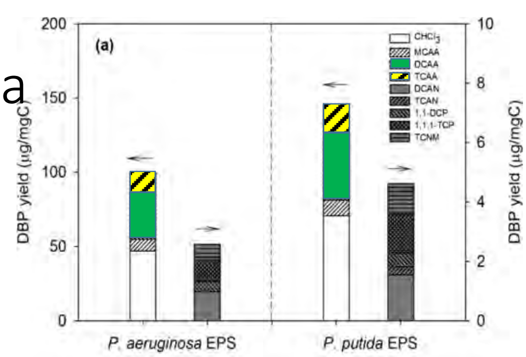
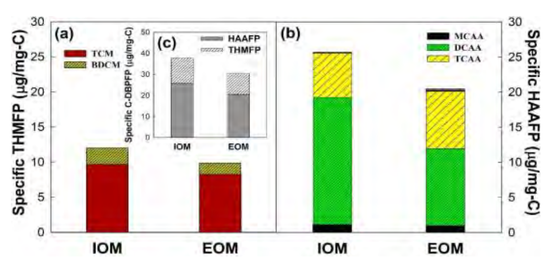
TCAA/DCAA: Algae & Bacteria

- Higher DHAA formation than THAA from Bacterial and Algae
  - Bacterial EPA: Pseudomonas strains (aeruginosa and putida)
    - Zhikang Wang; Junsung Kim; Youngwoo Seo; *Environ. Sci. Technol.* **2012,** 46, 11361-11369
  - Algal IOM, EOM & COM (Chlorella)
    - Lap-Cuong Hua, Jr-Lin Lin, Pei-Chung Chen, Chihpin Huang, **2017**, *Chemical Engineering Journal*, 328, 1022-1030.
    - Lap-Cuong Hua, Jr-Lin Lin, Pei-Chung Chen, Chihpin Huang, **2018**, *Science of the Total Environment*, 645, 71-78.

Especially for Intracellular OM





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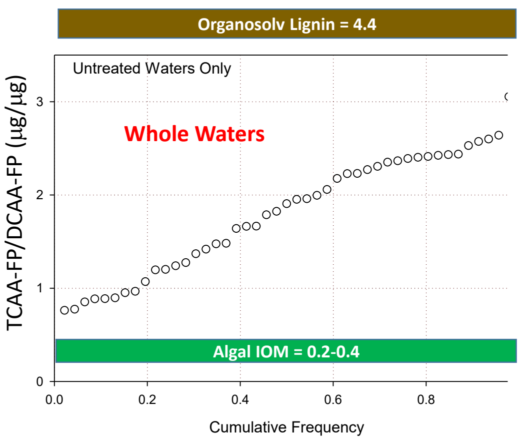
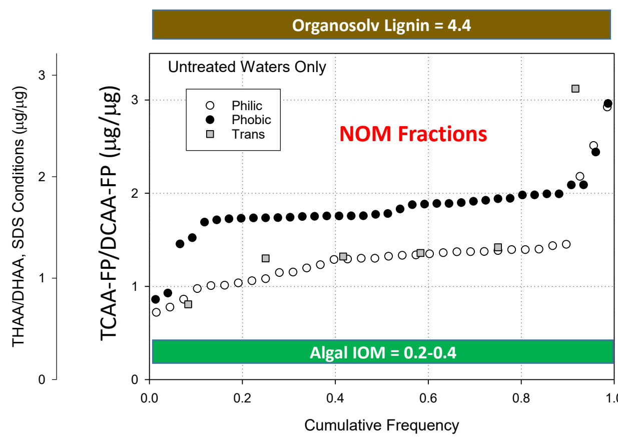
TCAA/DCAA Ratio for NOM & End Members

Whole Waters



Fractions



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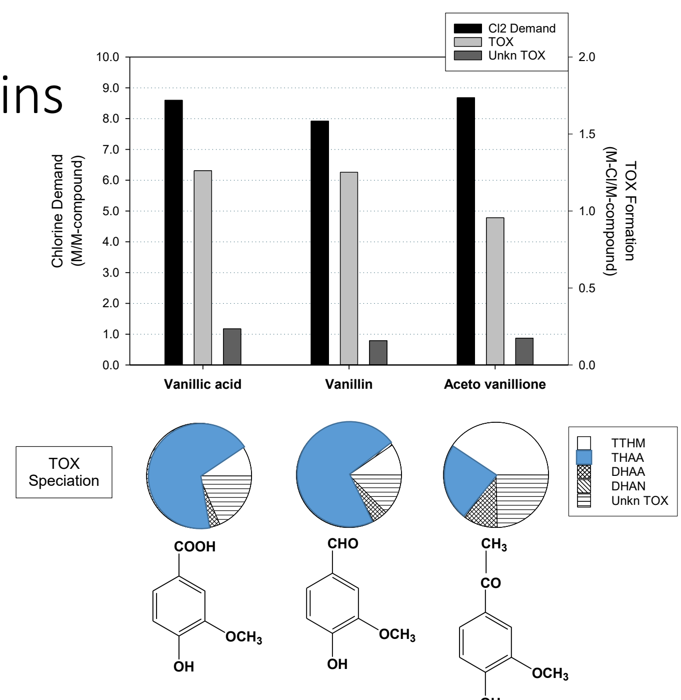
TCAA vs DCAA: Vanillins

- One of three main lignin monomeric groups
  - Syringyls & p-Hydroxybenzenes
- Shows dominance of Trihaloacetic acids (THAA)
- WRF funded study



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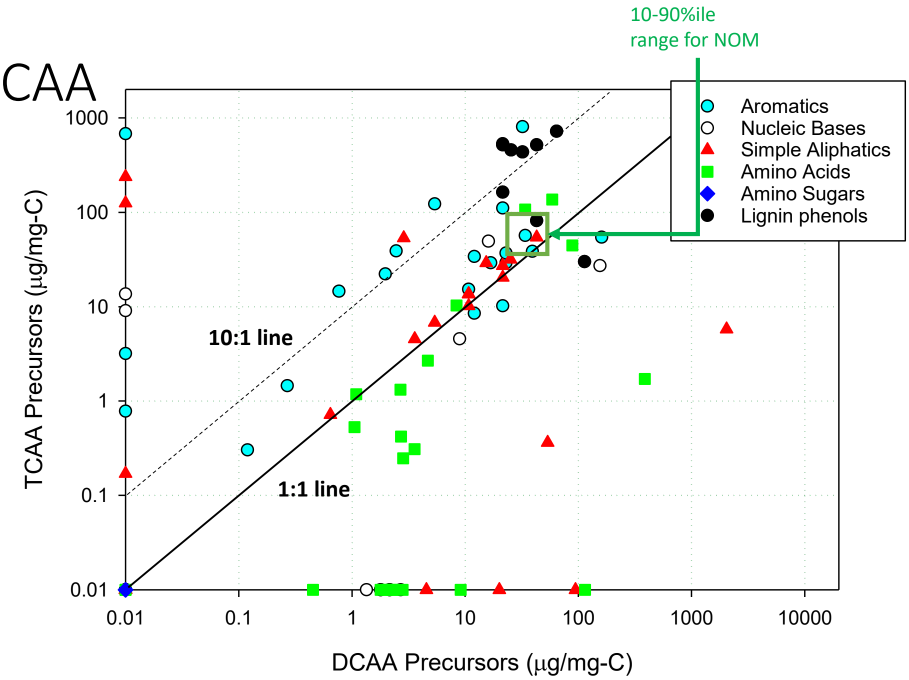
TCAA vs DCAA

- Simple model compounds



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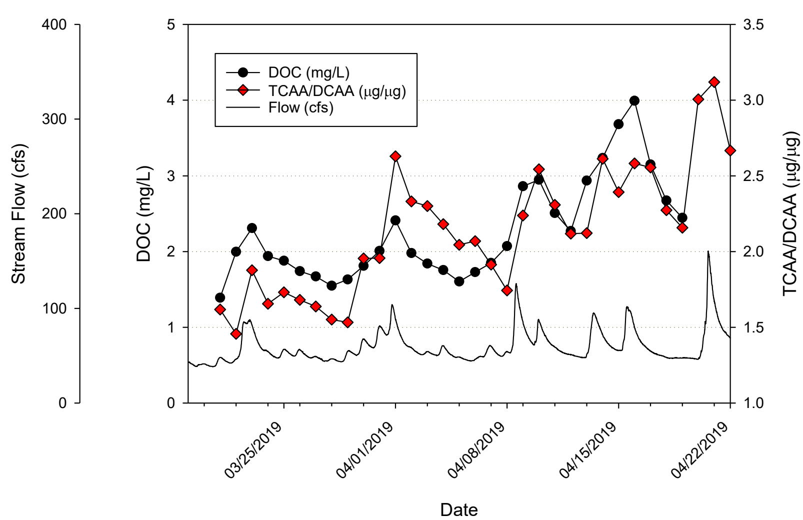
TCAA/DCAA in a tributary

- Some relatively minor rain events in April of this year
  - Mill River, Hadley
- TCAA/DCAA ratio goes up with increased discharge
  - This has been noted in many watersheds in the Northeast US
  - Many have also noted general increases in HAA5 in the past 2 years



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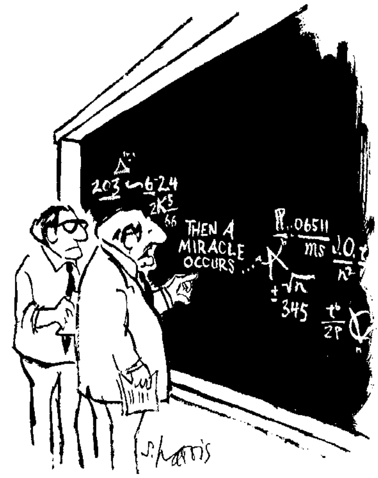
Climate Change

- Greater extremes
  - Longer droughts – warmer and more solar radiation
    - Accumulation of organic matter in watersheds
    - Algal blooms
  - Intense storms
    - Faster export of NOM from watersheds to intakes
- DBP outcomes
  - Larger swings between aquatic and terrestrial sources
  - General increases in DBPs
    - especially TCAA and N-DBPs



"I think you should be more explicit here in step two"

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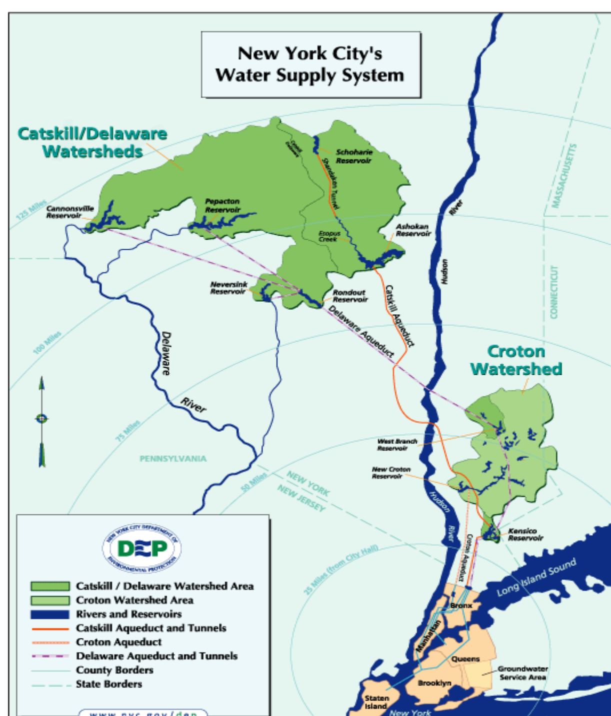
NYC Water Supply

- Largest unfiltered supply in the United States
- 19 reservoirs & 3 controlled lakes
- System capacity: 580 billion gallons
- Supplies water to ~9 million people (delivers about 1.1 billion gallons per day)
- 2,000 square mile watershed in three major reservoir systems:
  - Delaware System
  - Catskill System
  - Croton System

West of Hudson (WOH)

East of Hudson (EOH)



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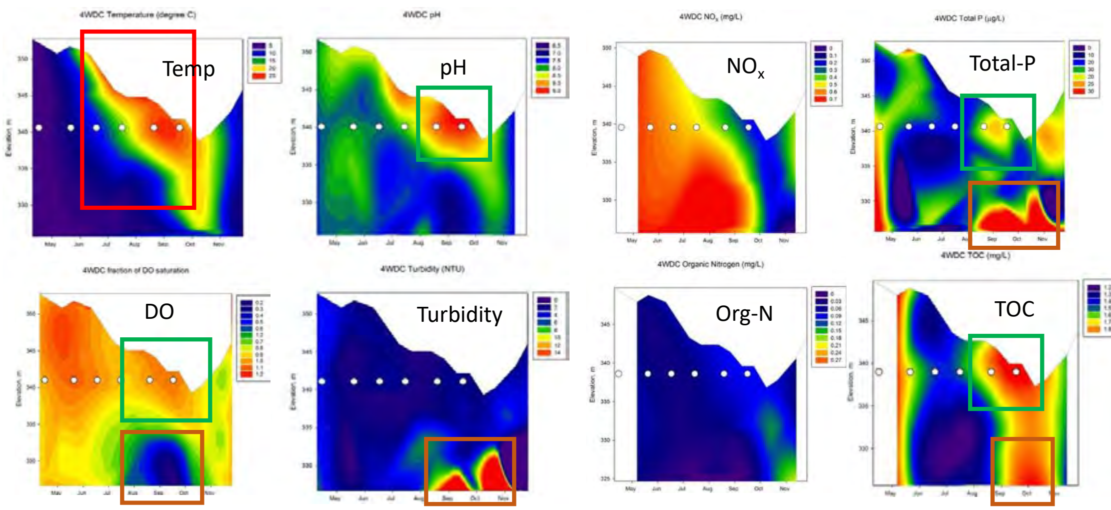
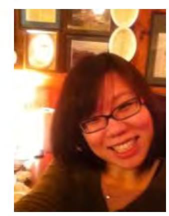
Cannonsville Res. 2007 near intake

Little runoff or allochthonous input, substantial drawdown
Signs of **Primary Productivity** and **Benthic Release**





Zhao et al., 2018 [JAWWA 110:11:15]

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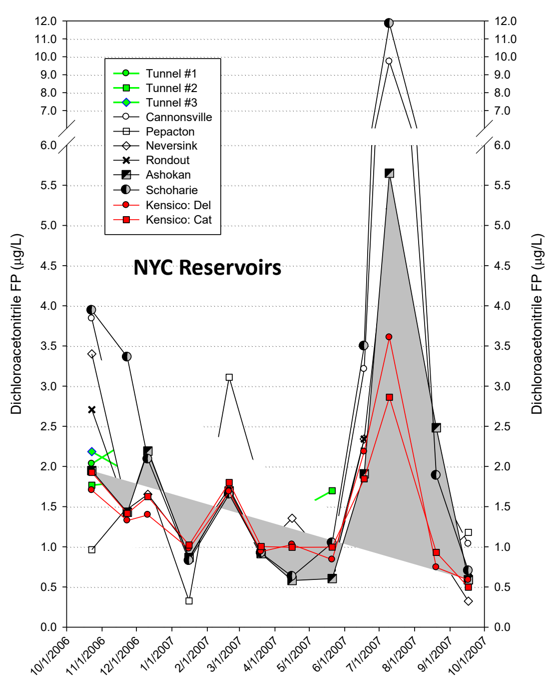
Haloacetonitriles

- Dichloroacetonitrile (DCAN)
  - A major N-DBP
  - From Amino acids?
  - Algal activity



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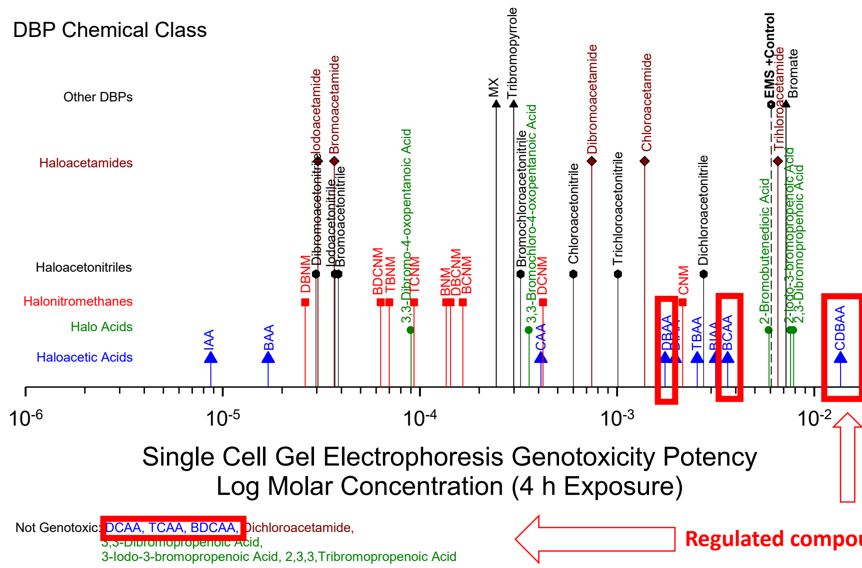
If not THMs or HAAs, then what?

Michael Plewa,
Univ. of Illinois

- Genotoxicity of some DBPs using Chinese Hamster Ovary cells



Regulated compounds

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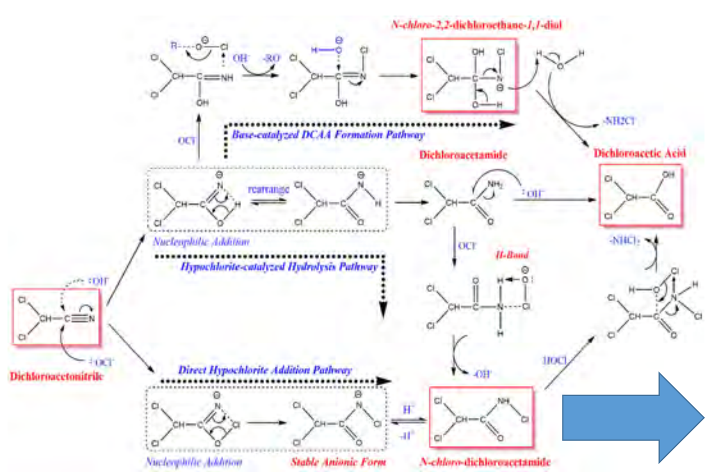
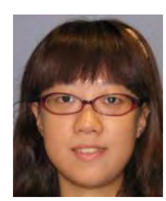
N-chloro-dichloroacetamides

Yu & Reckhow, 2017, *Env. Sci. Techn.*, [51:1488].

- ***An organic chloramine from chlorination of Aspartic Acid***





Rosa Yu

Ingestion and halogen transfer?

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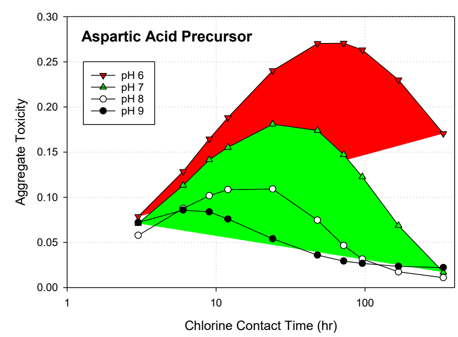
Regulatory Control of DBPs

- Dual Approach of the D/DBP Rule
  - Overall DBPs (known & unknown): required TOC removal
    - Good for chlorinated DBPs
    - Bad for poly brominated (R-CBr$_x$) DBPs
  - Known ones: MCL for THMs, HAAs
    - Good for the stable "end products" of disinfection
    - Bad for many of the intermediate, metastable DBPs

Based on Plewa's cytotoxicity database and Yu's DBP model. Assuming near zero toxicity for N-chloro-dichloroacetamide



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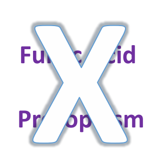
Key Points to Remember

- **NOM** is a complex, heterogeneous mixture, but not hopelessly complex
  - Faster progress can be made by treating it as such
  - Categorize based on underlying structural features rather than methods of extraction
  - Recognize the distinction between microstructure and macrostructure
- **Sources** set the stage
  - Terrestrial → Atmospheric
  - Aquatic

Anthropogenic (EfOM, etc.)



- **Processes** change the outcome
  - Natural Systems
    - Aerobic degradation & Anoxia (sediments)
  - Engineered Systems (Treatment – topic for another day)
- **DBP ratios** can be information rich
  - TCAA/DCAA
  - Dichloroacetonitrile/Chloroform (DCAN/TCM)
  - Chloroform/Bromodichloromethane

Role of Climate Change?

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Some additional recommendations

- Make full use of DBP data
  - **Compile DBP species** data as generated by labs at great expense
    - Big data; data visualization
    - With accompanying data that are normally collected anyway
  - Require labs to **report other DBP analytes** in EPA 551.1
    - HANs, HKs, CP, CH – even if they are not "certified"
    - These will help with in tracking treatment impacts, RW changes and sources of precursors

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UMass: Jim and John

Jim Edzwald

John Tobiason

- 35 years of collaboration

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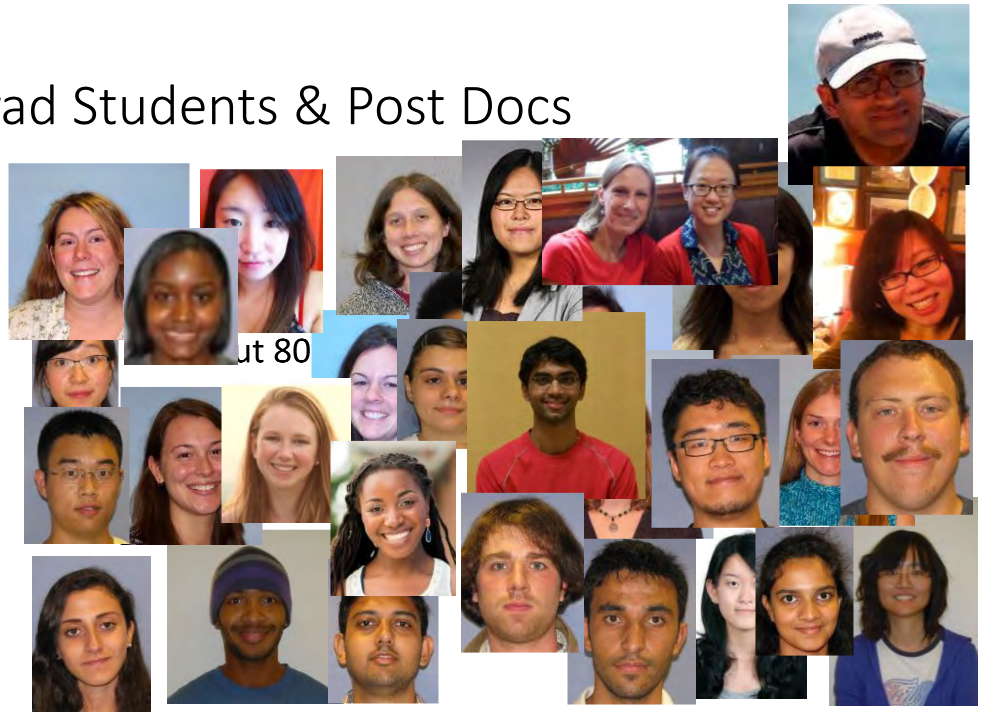
Grad Students & Post Docs



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Ask the Expert

David Reckhow
University of Massachusetts-Amherst

Enter your **question** into the **question pane** at the lower right hand side of the screen.

Please specify to whom you are addressing the question.

40

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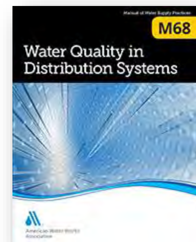
ADDITIONAL RESOURCES

- AWWA’s Disinfection Byproducts Resource Community
- AWWA’s Water Quality Resource Community
- M68 Water Quality in Distribution Systems
  - AWWA Catalog number: 30068
- Check out this year’s AP Black speech at ACE20:
  - Monday Keynote (June 15), 12:45 – 2:00 p.m.



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UPCOMING WEBINARS

Feb 26 - Potable Reuse: Federal and State Perspectives

May 6 - What’s New with Cyanobacteria and Cyanotoxins: A Review of Leading Research

Aug 5 - Disinfection By-Products: Perspectives on Formation, Control and Mitigation

Oct 28 - A Closer Look at New and Not so New CEC’s: PFAS, Microplastics and Solvents

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– Kenneth Mercer, Ph.D.,
EDITOR-IN-CHIEF

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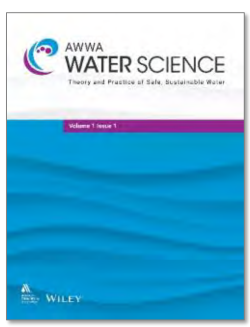

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PRESENTER BIOGRAPHY INFORMATION

Dr. Dave Reckhow has made significant contributions to the field of drinking water through his outstanding research that has helped to identify and understand the mechanism of formation of various halogenated and non-halogenated disinfection by-products (DBPs). With over 100 significant journal papers published, Dr. Reckhow has made a major impact on water science during his 35-year academic career. Three of his papers were awarded best paper by the Journal AWWA and one awarded best paper by the International Ozone Association. In addition to his substantial research, Dr. Reckhow is an active participant in the water community, volunteering his time to develop workshops with the USEPA, AWWA, and the Water Research Foundation. Dr. Reckhow is currently a professor with the Department of Civil and Environmental Engineering at the University of Massachusetts, where he continues to research the formation and control of DBPs in drinking water.

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AWWA WATER SCIENCE

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WEBINAR MODERATOR

Steve Via

Director of Federal Relations

American Water Works Association

Steve Via is Director of Federal Relations for the American Water Works Association (AWWA) working in AWWA's Washington, D.C., office. Mr. Via's primary responsibilities are two-fold. First, working with the Environmental Protection Agency (EPA) and other federal agencies on the development of policy and regulations that affect the water sector, and communicating the basis and substance of federal policy and regulations to the water sector. Mr. Via has 31 years' professional experience in environmental regulatory compliance assistance related to federal and state drinking water, wastewater, and solid / hazardous waste regulations. His work experience includes supporting communities engaged in planning, financing, and managing infrastructure improvements.

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PANEL OF EXPERTS

Kevin M. Morley, Ph.D.
Manager, Federal Relations
AWWA – Government Affairs

Christina Alito, PE, PhD
One Water Institute Lead
HDR

Rebecca Slabaugh
Associate Vice President
Arcadis

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AGENDA

I.	Understanding America's Water Infrastructure Act (AWIA) of 2018	Kevin Morley
II.	Regulating PFAS in Drinking Water WITAF 041 – PFAS Policy Support	Christina Alito
III.	Proposed Revisions to the Lead and Copper Rule	Rebecca Slabaugh

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ASK THE EXPERTS

Kevin M. Morley, Ph.D.
AWWA – Government Affairs

Christina Alito, PE, PhD
HDR

Rebecca Slabaugh
Arcadis

Enter your **question** into the **question pane** at the lower right hand side of the screen.

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UNDERSTANDING AMERICA'S WATER INFRASTRUCTURE ACT (AWIA) OF 2018

Kevin M. Morley, Ph.D.
Manager, Federal Relations
AWWA – Government Affairs

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AWIA §2013
COMMUNITY WATER SYSTEM RISK & RESILIENCE

BT Act 2002		**AWIA 2018**
Vulnerability Assessment (VA)	→	Risk & Resilience Assessment (RRA)
Terrorism or Intentional Act	→	All-Hazard
Submit VA to EPA	→	Certify RRA complete to EPA
Emergency Response Plan	→	Prepare/Update & Certify to EPA
	★	Directs EPA to recognize voluntary consensus standards
	★	Directs EPA to provide baseline threat info

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STEP 1. COMPLIANCE DEADLINES#

Community Water System (pop. served)*α	Certify RRA on or no later than:	Certify ERP within 6 months of RRA, but not later than:
>100K	March 31, 2020	September 30, 2020
50,000 – 99,999	December 31, 2020	June 30, 2021
3,300 – 49,999	June 30, 2021	December 30, 2021

 # Must review, update & recertify every 5 years
*** Wholesalers must use population of all systems served**
α Population is determined by SDWIS Profile

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STEP 2: CONDUCT RISK & RESILIENCE ASSESSMENT

A. Malevolent Acts and Natural Hazards

B. Critical Assets

- Pipes and constructed conveyances, physical barriers,
- Source water, water collection and intake,
- Pretreatment, treatment,
- Storage and distribution facilities,
- Electronic, computer, or other automated systems;
- Monitoring practices of the system;
- Financial infrastructure of the system;
- Use, storage, or handling of various chemicals by the system; and
- Operation and maintenance of the system; and
- May include an evaluation of capital and operational needs for risk and resilience management.

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STEP 3: PREPARE/UPDATE EMERGENCY RESPONSE PLAN

strategies and resources to improve the resilience of the system, including the physical security and cybersecurity of the system;

plans and procedures that can be implemented, and identification of equipment that can be utilized, in the event of a malevolent act or natural hazard that threatens the ability of the community water system to deliver safe drinking water;

actions, procedures, and equipment… lessen the impact of a malevolent act or natural hazard on the public health and the safety and supply of drinking water provided to communities and individuals, including the development of alternative source water options, relocation of water intakes, and construction of flood protection barriers; and

strategies that can be used to aid in the detection of malevolent acts or natural hazards that threaten the security or resilience of the system.

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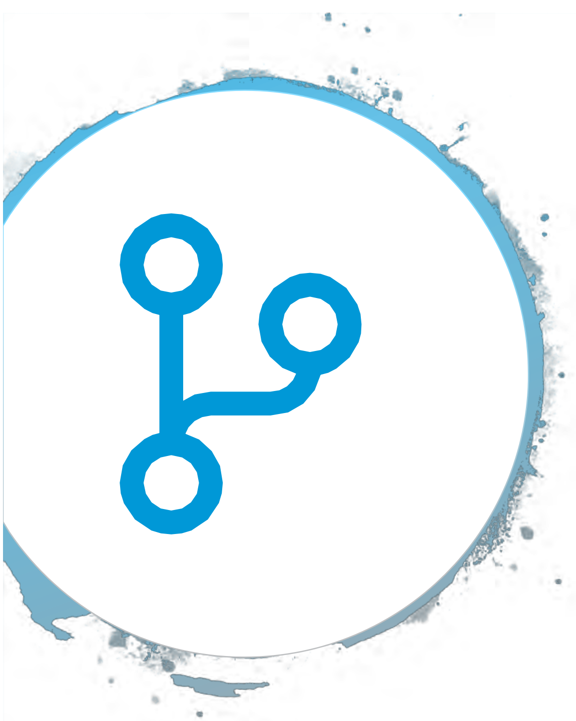

AWIA §2018 SOURCE WATER

- State must promptly **notify** a community water system of a release impacting source waters
- **Access** to EPCRA Tier II data from any facility within a delineated source water area granted to community water system

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AN APPROACH TO IMPLEMENTATION

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AWWA RISK & RESILIENCE RESOURCE SUITE

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ANSI/AWWA G430-14: SECURITY PRACTICES FOR OPERATIONS & MANAGEMENT

Section 4 Requirements:

1. Explicit Commitment to Security
2. Security Culture
3. Defined Security Roles and Employee Expectations
4. Up-To-Date Assessment of Risk
5. Resources Dedicated to Security and Security Implementation Priorities
6. Access Control and Intrusion Detection
7. Contamination, Detection, Monitoring and Surveillance
8. Information Protection and Continuity
9. Design and Construction
10. Threat Level-Based Protocols
11. Emergency Response and Recovery Plans and Business Continuity Plan
12. Internal and External Communications
13. Partnerships
14. Verification

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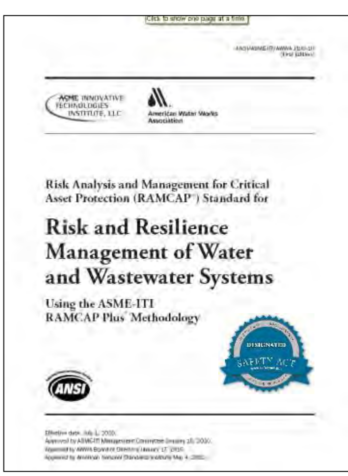
ANSI/AWWA J100-10 (R13): RISK AND RESILIENCE MANAGEMENT OF WATER AND WASTEWATER SYSTEMS



1) Asset Characterization
2) Threat Characterization
3) Consequence Analysis
4) Vulnerability Analysis
5) Threat Likelihood Analysis
6) Risk / Resilience Likelihood
7) Risk / Resilience Management

HOW?

PARRE™

VSAT

Consultant & Excel based app

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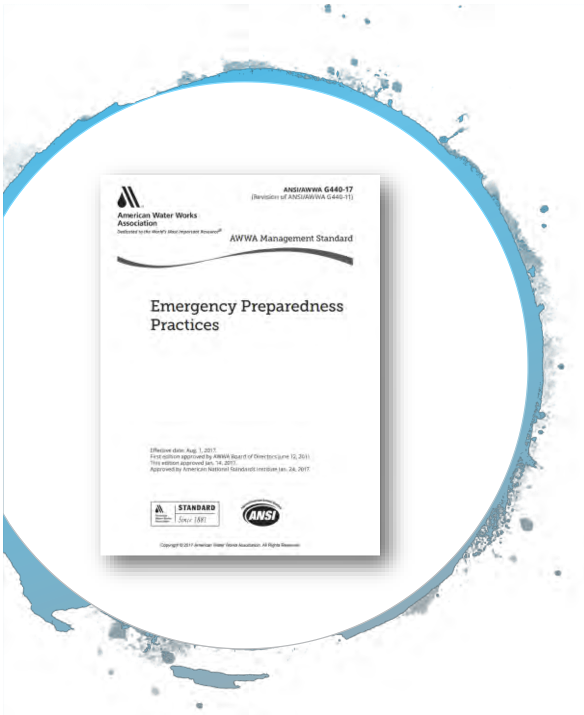

ANSI/AWWA G440-11: EMERGENCY PREPAREDNESS PRACTICES

Section 4 Requirements:

1. Explicit Commitment to Emergency Preparedness
2. Preparedness Culture
3. Defined Preparedness Roles and Employee Expectations
4. Risk Assessment
5. Preparedness Plans
6. Internal and External Communications
7. Training
8. Partnerships
9. Verification

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ALTERNATE WATER SUPPLY

- Nation is unprepared to scale
- Where and how to distribute

		Gal/Person/Day	
Population	25 Million	1	3
Bottles	8 oz	400,000,000	1,200,000,000
	12 oz	266,666,667	800,000,000
	16.9 oz	189,349,112	568,047,337
Trucks	8 oz	5,342	16,026
53' Trailer	12 oz	5,088	15,263
	16.9 oz	4,215	12,644

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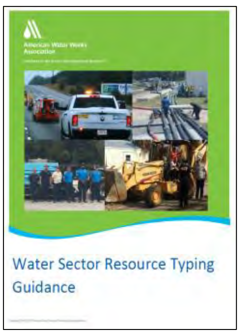
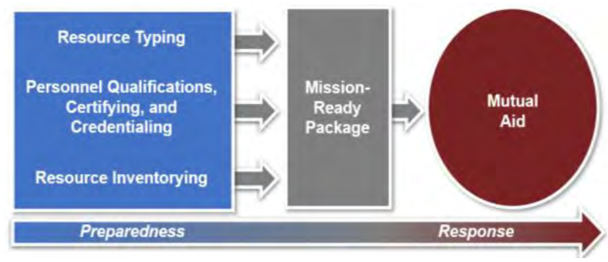
MAKE THE ERP OPERATIONAL

- Membership in WARN
- Implement Resource Typing





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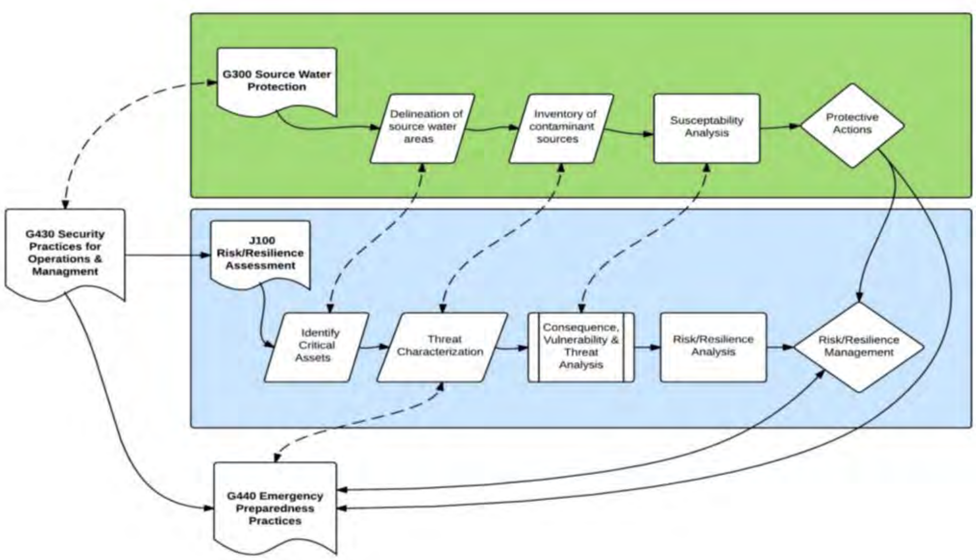
CONNECTING THE DOTS



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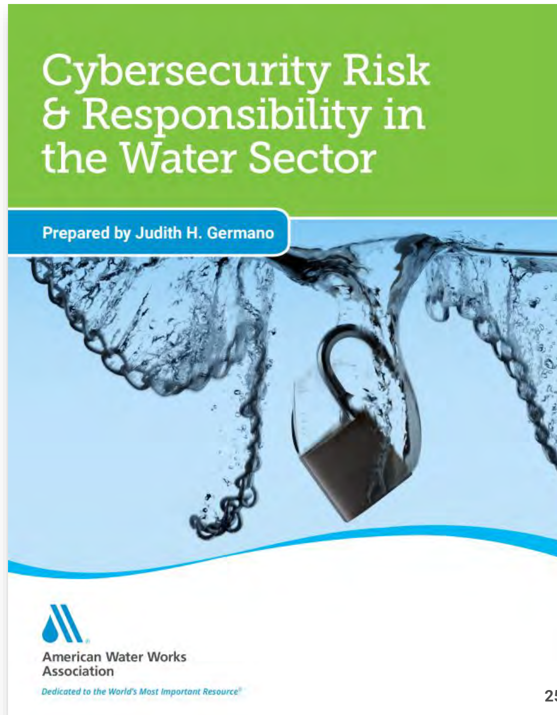
Cybersecurity #1 Threat to Critical Infrastructure

- Due Diligence
- Best Practices
- Foreseeability
- Insurance
- Sovereign Immunity



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Control Status Summary:
The second table summarizes the user defined implementation status of the recommended controls from the RRA- Control Output tab. The colors provide a visual the recommended controls with the associated status.

	Total Controls Not Fully Implemented	Not Planned and/or Not Implemented - Risk Accepted	Controls Planned and Not Implemented	Controls Partially Implemented	Controls Fully Implemented and Maintained
Priority 1 Controls	9	1	[illegible]	6	29
Priority 2 Controls	15	[illegible]	[illegible]	8	6
Priority 3 Controls	16	[illegible]	12	4	4
Priority 4 Controls	6	[illegible]	3	3	3

% of Recommended Controls Currently "Fully Implemented and Maintained":	45	%
% Recommended Controls that are "Partially Implemented" or "Planned and not Implemented":	49	%
% Recommended Controls that are "Not Planned and/or Not Implemented - Risk Accepted":	5	%
Controls Missing Implementation Status:	0	

Not Planned and/or Not Implemented - Risk	The controls are not currently implemented or planned for implementation. The organization accepts risks associated with the controls not being implemented.
[illegible]	Priority 1 or Priority 2 controls that have not been implemented, however, implementation of the controls are planned.
Planned and Not Implemented/ Partially	Priority 1 or Priority 2 controls that are partially implemented by internal or external resources. Priority 3 or Priority 4 controls that are neither planned nor implemented.
Partially Implemented -	Priority 3 or Priority 4 controls that are partially implemented by internal or external resources.
Fully Implemented and Maintained -	The controls are fully implemented and actively maintained by internal or external resources.

- Fulfills need for sector-specific guidance per EO 13636, and aligns with AWIA cyber priorities.
- Consistent and repeatable recommended course of action to reduce cyber vulnerabilities.
- Recognized by USEPA, DHS, NIST and multiple states.

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ADDITIONAL SUPPORTING RESOURCES

EPA United States Environmental Protection Agency

WATER ISAC

WARN WATER/WASTEWATER AGENCY RESPONSE NETWORK

FEMA

Local Emergency Management

Local/State Law Enforcement

State Primacy Agency

ICS-CERT INDUSTRIAL CONTROL SYSTEMS CYBER EMERGENCY RESPONSE TEAM

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HOW IS RRA AND ERP CERTIFIED?

Option 1: Electronic Submission
https://www.epa.gov/waterresilience/how-certify-your-risk-and-resilience-assessment-or-emergency-response-plan

Option 2: Email or Regular Mail (using EPA template)

- **Email:** awiasupport@epacdx.net
- **Mail:** *U.S. EPA Data Process Center*
  ATTN: AWIA
  C/O CGI Federal
  12601 Fair Lakes Circle
  Fairfax, VA 22033

RRA

ERP

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WHAT IF CERTIFICATION IS NOT SUBMITTED?

- Utility may be subject to enforcement action by EPA under SDWA §1414
- Penalty = **$57,317/day** for both RRA & ERP

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AWWA RISK & RESILIENCE RESOURCE SUITE

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COMPLIANCE DEADLINES#

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 # Must review, update & recertify every 5 years
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α Population is determined by SDWIS Profile

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QUESTIONS

Kevin M. Morley, Ph.D.
Manager, Federal Relations
AWWA – Government Affairs
202-628-8303 or kmorley@awwa.org

www.awwa.org/risk
www.awwa.org/cybersecurity

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ASK THE EXPERTS

Kevin M. Morley, Ph.D.
AWWA – Government Affairs

Christina Alito, PE, PhD
HDR

Rebecca Slabaugh
Arcadis

Enter your **question** into the **question pane** at the lower right hand side of the screen.

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REGULATING PFAS IN DRINKING WATER

WITAF 041 – PFAS Policy Support

Christina Alito, PE, PhD
One Water Institute Lead
HDR

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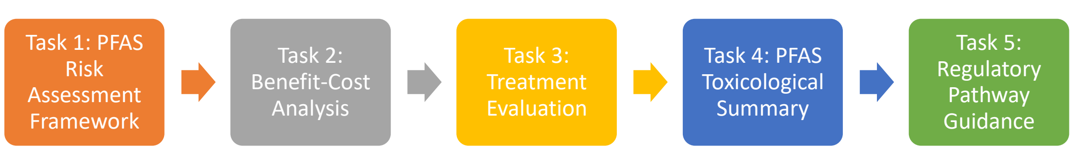
LEARNING OBJECTIVES

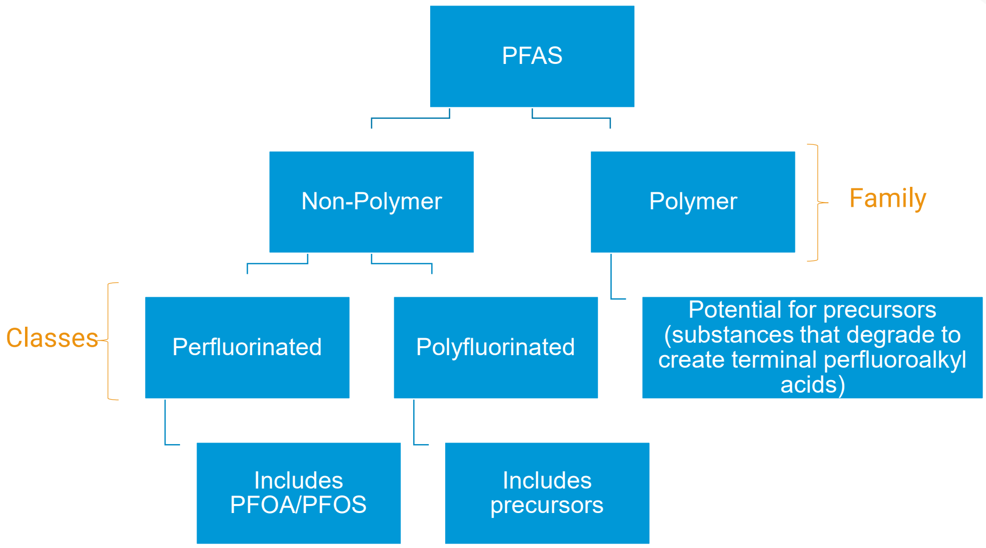
- As a result of this presentation, the viewers will:
  - Learn steps necessary to complete a PFAS risk assessment
  - Understand the toxicological basis for regulating PFAS
  - Consider if a benefit-cost analysis would be beneficial for assessing regulation of PFAS
  - Review and validate PFAS treatment technologies to manage PFAS risk
  - Understand the complexity of regulating PFAS

OVERVIEW, GOALS, AND AGENDA FOR DEVELOPING GUIDANCE FOR REGULATING PFAS

- AWWA would like to provide information to help inform federal policy makers and assist utilities and sections with state-level policy discussions.
  - Provide evaluation strategy to assess water system risk
  - Summarize benefit-cost analysis
  - Discuss drinking water treatment technologies
  - Summarize health risk of PFAS
  - Evaluate alternative strategies for regulating PFAS
  - Provide guidance for using strategic communications for PFAS crisis communication



WHAT ARE PER- AND POLY-FLUOROALKYL SUBSTANCES (PFAS)?



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IMPORTANT PFAS TERMINOLOGY

Category	Description
Families	Structural differentiation E.g. Non-polymer vs. polymer PFAS
Classes	Subgroup of chemicals E.g. Perfluoroalkyl substances and polyfluoroalkyl substances
Precursors	PFAS that degrade into terminal PFAAs like PFOA
Replacement PFAS	Alternatives that may include fluorotelomers or other chemical structures that may degrade to form short-chain PFAAs E.g. GenX

Interstate Technology Regulatory Council, 2017

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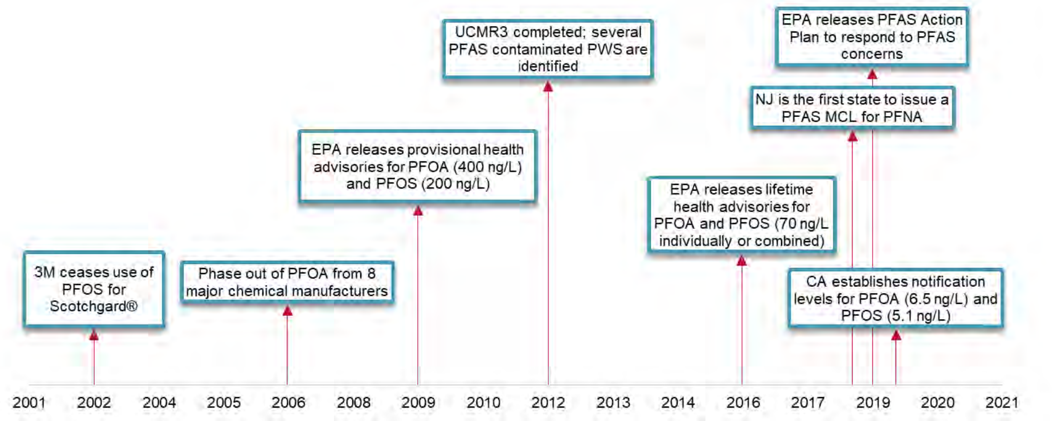

PFAS HISTORICAL TIMELINE

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RISK ASSESSMENT

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Phase 1: Assessing Level of Risk → Phase 2: Monitoring Program Planning → Phase 3: Implementation of Monitoring → Phase 4: Interpreting Results

RISK ASSESSMENT GUIDE
Phases of Assessment

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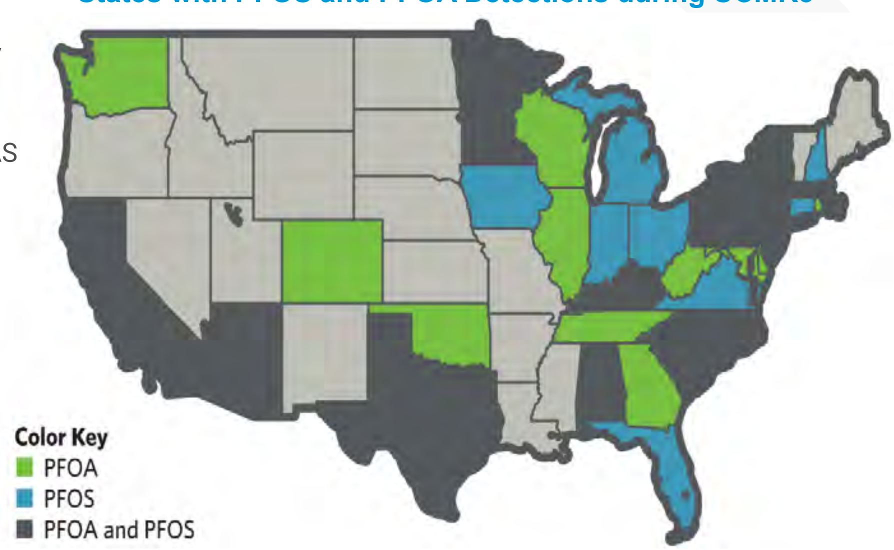
PHASE 1: ASSESSING THE LEVEL OF RISK

- Many utilities unexpectedly identified PFAS in their drinking water
- First step in assessing PFAS risk: evaluate the potential for PFAS occurrence in source water
- State sampling campaigns underway (MI, CA, NJ, PA, NC)

States with PFOS and PFOA Detections during UCMR3



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PHASE 2: MONITORING PROGRAM PLANNING

- Risk increase depending on proximity to PFAS source
  - Design sampling plan with consideration of PFAS point source proximity
- Significant detection of PFAS at:
  - Military fire training base
  - Manufacturing sites

Point Sources

Non-Point Sources

Aqueous Film Forming Foam (AFFF)

Industrial discharge

Landfills and leachates

Land application of WWTP biosolids

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PHASE 3: IMPLEMENTATION OF MONITORING

- Utility should develop sampling plan
- EPA method 537.1 outlined sampling protocols:
  - Collect samples using PFAS free or high-density polyethylene containers
- Analyzed samples using certified laboratories
- Sample various locations (point source, up- and downstream)

Source: https://www.limno.com/sampling-for-pfas-requires-caution/

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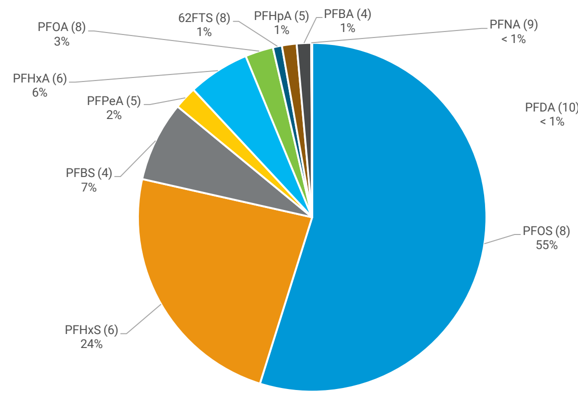
PHASE 4: INTERPRETING RESULTS

- Fingerprinting can be helpful for determining point-source discharges
  - Measure multiple sites and compare discharge speciation to contaminated water speciation
  - Fingerprinting assistance table



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BENEFIT COST ANALYSIS

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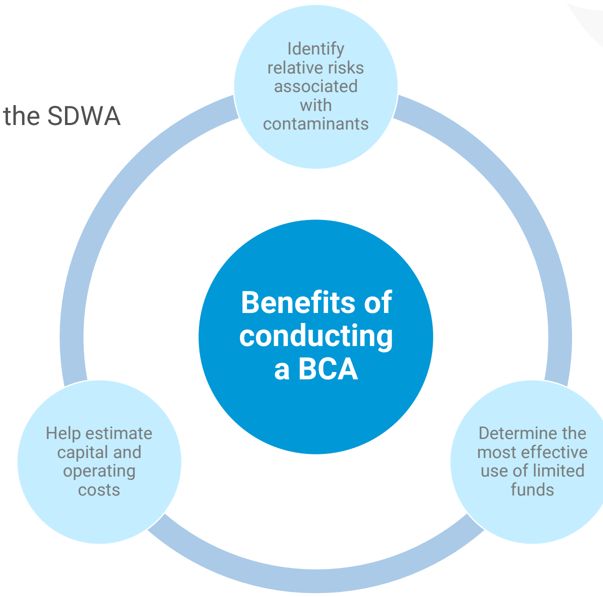
BENEFIT COST ANALYSIS OVERVIEW

- BCAs are required as part of the SDWA
- A BCA includes:
  - Cost Analysis
  - Benefits Analysis



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BENEFIT COST ANALYSIS (BCA)

- **Cost Analysis**
  - Considers direct and indirect costs to utilities and consumers in terms of treatment, water quality monitoring costs, and administrative efforts

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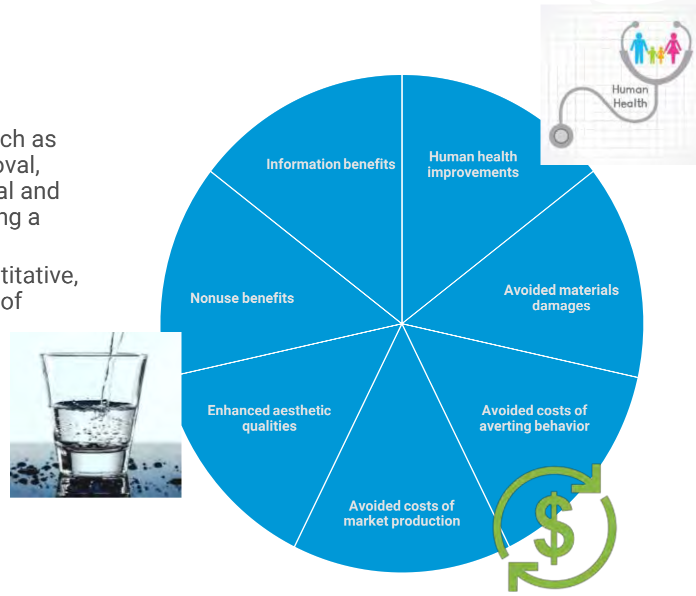
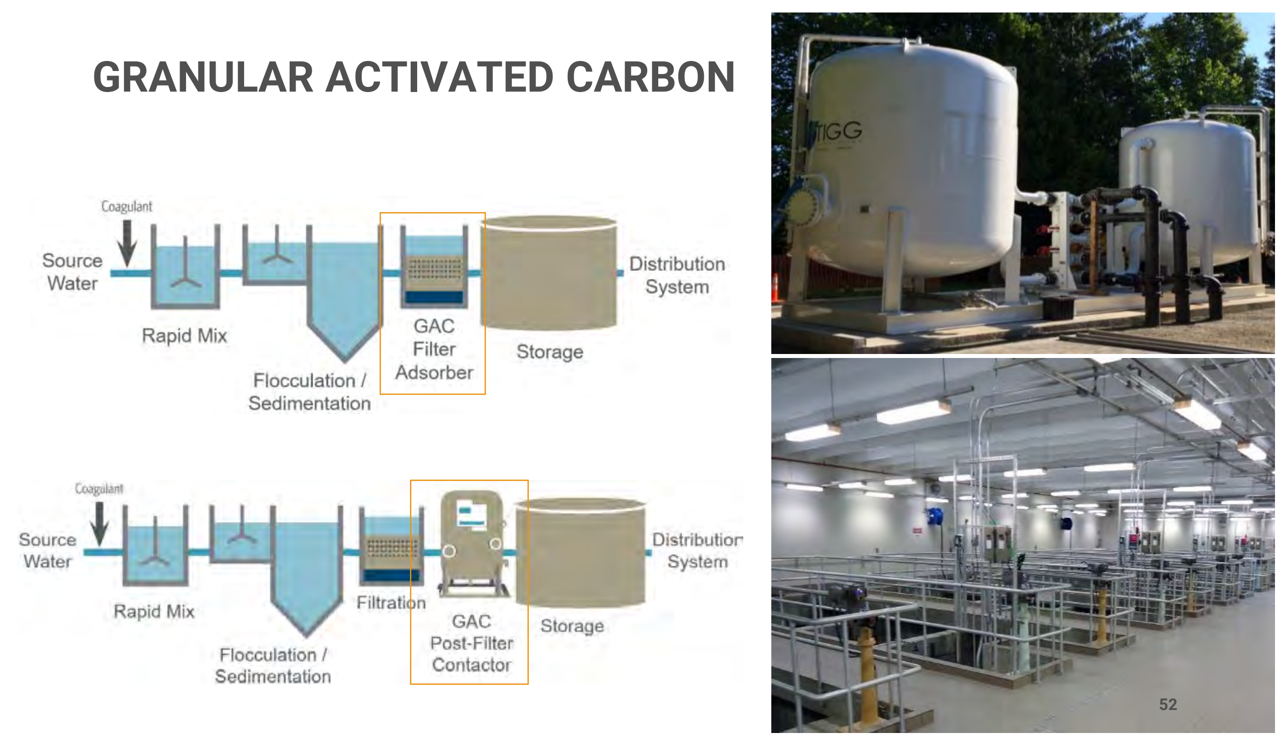
BENEFIT COST ANALYSIS (BCA)

- **Benefit Analysis**
  - Considers benefits of implementing treatment such as additional constituent removal, health, social, environmental and economic impacts of making a regulatory determination
  - Includes a qualitative, quantitative, and monetary assessment of regulating



PFAS TREATMENT


Effective Treatment Processes for PFAS Removal
Powdered Activated Carbon
Ion Exchange
CalgonCarbon
Granular Activated Carbon
Reverse Osmosis and Nanofiltration


GRANULAR ACTIVATED CARBON
Coagulant
Source Water
Rapid Mix
Flocculation / Sedimentation
GAC Filter Adsorber
Storage
Distribution System
Coagulant
Source Water
Rapid Mix
Flocculation / Sedimentation
Filtration
GAC Post-Filter Contactor
Storage
Distribution System
52

GRANULAR ACTIVATED CARBON

PFAS	Percent Removal
Long-Chain	40 to 96%
Short-Chain	0 to 96%

Advantages
- Variety of applications
- High PFAS removal
- Reliable process
- The only process that can completely destroy PFAS
- Secondary water quality benefits

Disadvantages
- Competitive adsorption
- Not as effective with short-chain PFAS
- Backwash water must be disposed of
- Media replacement may make GAC cost-prohibitive

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TREATMENT VALIDATION SUMMARY

	Isotherms	RSSCT	Pilot Testing
Primary Objective	Feasibility	Predictive modeling	Process validation
Treatment Processes Tested	GAC IX	GAC IX	GAC IX Membranes
Typical Length of Study	1 to 4 weeks	4 to 16 weeks	6 to 18 months
Key Data Derived	Relative removal rates Indication of adsorptive/reactive capacity of media or resin	Indication of adsorptive/reactive capacity of media or resin Complete breakthrough curves	Long-term removal rates Water quality data that can inform competition or potential treatability issues
Limitations	Mostly qualitative data No seasonal variation	Scalability issues No seasonal variation	May not fully represent full-scale performance
Relative Cost	<$100,000	$50,000 to $200,000	$200,000 to $800,000

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TOXICOLOGY SUMMARY

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RAPID EVALUATION AND ASSESSMENT OF CHEMICAL TOXICITY (REACT) TOXICOLOGY ASSESSMENT

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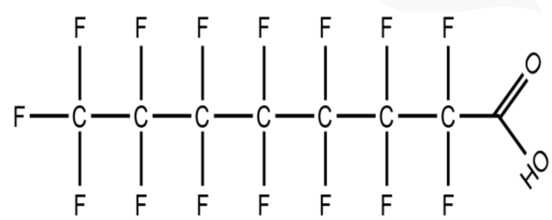
FEDERAL AND STATE TOXICOLOGICAL ENDPOINTS (CRITICAL EFFECTS)

Toxicological Endpoint (June 2019)	PFOA	PFOS	PFNA	PFHxS	PFBA	PFBS	GenX
Hepatotoxicity	NH, NJ	-	NH, NJ	-	MN	-	EPA, MI, NC
Developmental Effects	ATSDR, EPA, MI, MN, NY	ATSDR, EPA, MI	ATSDR, MI	-	-	-	
Immunotoxicity	-	NH, NJ, NY	-	-	-	-	
Thyroid Effects	-	-	-	ATSDR, MI, MN	-	EPA, MI	
Reproductive Effects	-	-	-	NH	-	-	
Kidney Hyperplasia	-	-	-	-	-	EPA, MA, MN	

Barlow et al., 2019

USING RELATIVE POTENCY FACTORS (RPFS) TO ASSESS TOXICITY

- RPFs have been developed as a means to assess the relative toxicity for chemicals with:
  - Similar structures
  - Similar toxicity mechanism or mode of action, but differing potency
  - Effects that are additive to specific target organs
  - Benchmark dose (BMD) of one PFAS (PFOA) as compared to others, ration is RPF

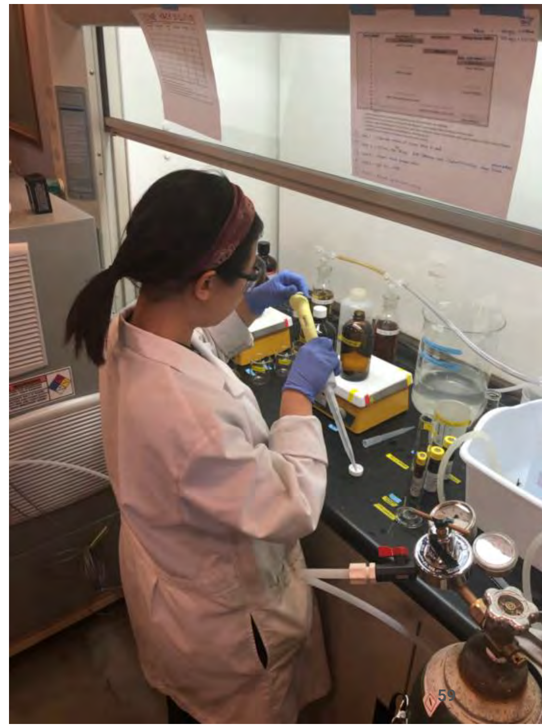


$$RPF = \frac{BMD_{PFOA}}{BMD_{PFAS\ individual}}$$

Please consider the environment before printing.

RESEARCH NEEDS

- Better understanding of exposure pathways and toxicity of each
- Structural and functional relationships between PFAS and toxicity mechanism
- Health effects of new PFAS entering marketplace
- Impacts of legacy and mixtures of PFAS
- Toxicity data related to life stages, especially for nursing infants
- An understanding of the impacts from PFAS precursors



NEXT STEPS FOR REGULATORY PATHWAY DEVELOPMENT

Pathway Gaps	Description
HTT Method Development and Standardization	The HTT approach conducts in vitro assays for multiple toxicological endpoints, such as immunotoxicity, developmental toxicity, mitochondrial toxicity, and neurotoxicity.
Cancer Risk Quantification	The evidence of carcinogenicity of PFAS is considered "suggestive", but not definitive by USEPA, due to the fact that the dose response is unclear.
PFAS Analytical Measurement	The primary method for characterizing PFAS in drinking water (EPA 537.1) includes measurement of 24 PFAS, which excludes hundreds, if not thousands, of additional PFAS.
Cost Implications	Effective and validated technologies include IX, GAC, and RO/NF which may have high capital and O&M costs.
Occurrence	Although UCMR 3 was helpful for providing a preliminary assessment of occurrence, limitations associated with sampling and analytical methods at the time.

Risk Assessment Guide → Treatment Evaluation → Regulatory Pathway Guidance

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QUESTIONS?

- Christina.alito@hdrinc.com
- 571-327-5875

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ASK THE EXPERTS

Kevin M. Morley, Ph.D.
AWWA – Government Affairs

Christina Alito, PE, PhD
HDR

Rebecca Slabaugh
Arcadis

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ARCADIS Design & Consultancy for natural and built assets

PROPOSED REVISIONS TO THE LEAD AND COPPER RULE

Rebecca Slabaugh
Associate Vice President
Arcadis

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PURPOSE AND AGENDA

- Explain the overall objectives of the proposed Lead and Copper Rule (LCR) and anticipated regulatory timeline
- Review key requirements of the proposed revisions
- Describe actions water utilities can take now to prepare

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OVERVIEW OF LCR REVISIONS

Objectives

- Improve public health protection via a **proactive and holistic approach**
- Require **earlier action to reduce risks** around lead in drinking water
- **Improve transparency and communication** to better protect children and families

25 Schedule

- Revisions have been under development **since 2004**
- Proposed revisions **published November 13th, 2019**, with a 60-day comment period
- Final rule expected in **2020**

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SEVERAL LCR ELEMENTS REMAIN LARGELY UNCHANGED

- Lead action level (AL) = 15 ppb and maximum contaminant level goal (MCLG) = 0 ppb
- Lead service line replacement (LSLR) is triggered based on 90th percentile lead value
- Codifies existing tap sampling protocol
- No substantive changes in copper requirements

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EARLY ACTION ITEMS FOR SYSTEMS WITH LEAD SERVICE LINES

Develop LSL Inventory

- List, table or map based on existing information
- Specify lead, non-lead or unknown material on both utility- and customer-owned portions
- Must be publicly available (website for systems serving >100,000)
- Notify customers via mail within 30 days of completion and annually thereafter
- Update annually*

Develop Full LSLR Plan

- LSLR goal rate, agreed upon by Primacy Agency/USEPA
- Procedures to conduct full replacements and notify customer prior to full or partial replacements
- Flushing instructions
- Pitcher filter tracking and maintenance plan
- Funding strategy

*Based on information collected as part of normal operations; primacy agency may determine acceptable methods for identification.

Deadline: Within 3 years of final rule publication

WHAT IS CONSIDERED A LEAD SERVICE LINE UNDER THE PROPOSED LCR?

Components Between Water Main and Interior Plumbing	Include in LSL Inventory*	Counts as a Replacement	Requires Public Education when Disturbed
Lead pipe anywhere between gooseneck and interior plumbing	Yes	When all lead is removed	Yes
Unknown pipe material anywhere between gooseneck and interior plumbing	Yes	Where lead pipe is found and all lead is removed	Yes
Galvanized pipe if preceded by lead (pipe, gooseneck, etc.) at any time	Yes	When replaced along with any remaining preceding lead pipe	Yes
Lead gooseneck with non-lead pipe between gooseneck and interior plumbing	No	No**	Yes

*Requires notification to all consumers informing them they have a LSL or a service line of unknown material and providing education around risks, mitigation strategies, and opportunities to verify material and replace if lead. Initial mailing within 30 days of completion of inventory and annually thereafter until customer no longer has a LSL.
**Must replace if utility-owned when encountered during planned or emergency work. Must offer to replace, but not pay, if customer-owned.

SYSTEM ACTIONS DURING REPLACEMENTS

	Planned Work	Unplanned Work	Customer-Initiated
Notification of Work	At least 45 days prior; offer to replace customer-portion	Within 24 hours	45 days to replace utility-portion
Education (Risks, Mitigation, Flushing Instructions)	At least 45 days prior	Within 24 hours	Within 24 hours
Pitcher Filters (3 months)	At least 45 days prior	Within 24 hours	Within 24 hours
Tap Sampling	3 to 6 months after	3 to 6 months after	3 to 6 months after

Reminder: Update inventory and Tier 1 sampling pool, if needed

ADDITIONAL CHANGES AROUND LSLR

- “Test outs” no longer allowed
- Partials allowed only during emergencies or customer is unwilling, unable or *unresponsive* as part of planned work
- Must replace utility-owned lead goosenecks, pigtails and connectors (or offer to replace if customer-owned) as encountered

Please consider the environment before printing.

SERVICE LINE DISTURBANCES AND RESPONSES

MINOR	• From water shut-offs • Provide education around potential for elevated lead and flushing procedure to remove particulate lead*
MAJOR	• From replacement of the water meter or gooseneck, pigtail, or connector • Same as above ***plus*** provide pitcher filter with 3 months of replacement cartridges*
OTHER	• Such as from other utilities • EPA encourages outreach and coordination to other utilities to mitigate impacts

*Must be completed before the consumer's water is turned back on.

TAP SAMPLING REVISIONS

- Shifts compliance to highest lead locations:
  - Systems with LSLs → 100% LSL sites
  - Systems with insufficient LSLs → all available LSL sites and highest non-LSL tap samples
  - Systems without LSLs → all tap samples collected
- Sample only at sites verified to contain lead pipe between connection at main and interior plumbing
  - Excludes sites containing galvanized service lines previously preceded by lead*, lead goosenecks and service lines of unknown materials
- Recategorize copper with lead solder regardless of age

*Assumed based on language included in the preamble.

CORROSION CONTROL TREATMENT (CCT) REVISIONS

- Studies:
  - Must evaluate:
    - Alkalinity and pH adjustment
    - Orthophosphate-based (at 1 and 3 mg/L as PO_4) or silicate-based corrosion inhibitor
  - Methods
    - Coupons (allowed only as a screening tool)
    - Pipe loops
    - Partial system tests
    - Analogous systems (size, chemistry, distribution system configuration)
  - Cannot eliminate based on downstream impacts
  - Complete within 18 months
  - State evaluates within 6 months
  - 12 months to install CCT
- Sanitary survey includes CCT review

State or USEPA can deem not optimal, triggering CCT study

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NEW LEAD TRIGGER LEVEL (TL) OF 10 PPB INITIATES UPFRONT ACTIONS BY SYSTEMS

Component	90th Percentile > TL	90th Percentile > AL
Tap Sampling	Annually at standard # of sites	Semi-annually
CCT	CCT study if no CCT; Re-optimize if CCT	Implement CCT if no CCT; Re-optimize if CCT
Replacement*	Based on plan	3% per year
Public Notification	Not required	Within 24 hours
Public Outreach	Within 30 days and annually thereafter to LSL customers**	Within 30 days and annually thereafter to LSL customers**

*Partials do not count towards actual replacement rates.
**Additional outreach required if LSLR goal rate is not met.

Must be below TL/AL for two years to cease actions

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FLEXIBILITY FOR SMALL SYSTEMS

- Applicability
  - Small CWSs (serving ≤ 10,000 people)
  - Non-transient, non-community water systems (NTNCWSs)
- Options
  - Implement CCT
  - Implement and maintain of point-of-use devices
  - Replace all LSLs within 15 years or less
  - Replace all lead-bearing materials within 1 year (*NTNCWSs only*)

Above TL
- Select option and obtain approval

→

Above AL
- Implement option

INDIVIDUAL SAMPLES ABOVE 15 PPB REQUIRE FIND-AND-FIX APPROACH

- Any sample – compliance or voluntary
- Notify within 24 hours
- **Find** the cause
  - Sample water quality parameters within 5 days
  - Collect follow-up lead tap sample within 30 days (*alternate protocols allowed*)
- **Fix** it
  - Flush to clean water main or improve water quality
  - Alter distribution (e.g., storage, looping)
  - If customer-owned (e.g., faucet), recommend fix
  - Report to State within 6 months for approval

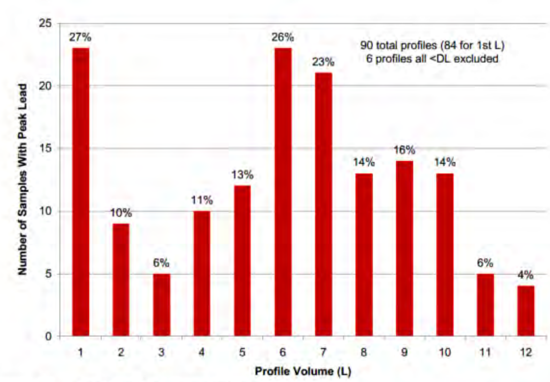

Figure 3.3 **Peak profile volume for total lead**

Source: Cornwell, D., & Brown, R. (2015). *Evaluation of Lead Sampling Strategies*. Water Research Foundation.

ADDED CWS REQUIREMENTS FOR SCHOOLS AND CHILDCARE FACILITIES

- Develop list of schools and childcare facilities and update every 5 years
- Collect lead samples at 20 percent per year (2 per childcare facility, 5 per school)
- Document facilities that decline to participate
- Provide EPA 3Ts
- Provide results to the facility, primacy agency, health departments within 30 days

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WHAT CAN UTILITIES DO NOW TO PREPARE?

Review and improve your current inventory
- Verify customer-owned portion
- Test methods to identify unknowns

Develop a path forward to achieve full LSLRs
- Decide how to conduct full replacements
- Obtain any needed legal authority
- Explore financing options

Assess existing resources, practices and processes
- How best to manage and report data
- Improve coordination – both internally and externally

For systems with LSLs, estimate new 90th percentile for lead

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ASK THE EXPERTS

Kevin M. Morley, Ph.D.
AWWA – Government Affairs

Christina Alito, PE, PhD
HDR

Rebecca Slabaugh
Arcadis

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ADDITIONAL RESOURCES

- AWWA Risk and Resilience Community
- AWWA Cybersecurity and Guidance Community
- AWWA PFAS Community
- AWWA Lead Resource Community
- EPA: Proposed Revisions to the Lead and Copper Rule
- Lead and Copper Corrosion: An Overview of WRF Research

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Mar 25 - Water Data Nerd
Apr 22 - Drought Preparedness and Response

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- Until next time, keep the water safe and secure.

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PRESENTER BIOGRAPHY INFORMATION

Kevin M. Morley, PhD is Manager, Federal Relations for the American Water Works Association (AWWA). He works closely with multiple organizations to advance the security and preparedness of the water sector. This includes supporting the development of several ANSI standards that represent minimum best practice for risk and resilience management in the water sector. Currently he is managing the development of resources to support utility compliance with §2013 of America's Water Infrastructure Act (AWIA) of 2018. This includes updating AWWA's cybersecurity guidance and use-case tool. Dr. Morley received his PhD from George Mason University for research on water sector resilience and developing the Utility Resilience Index (URI). He holds a MS from the State University of New York College of Environmental Science and Forestry and a BA from Syracuse University.

Dr. Christina Alito leads HDR's One Water Institute – the applied water research arm of HDR. In her current role, Christina is responsible for developing and managing water research projects for complex drinking water issues, such as emerging contaminants, technology validation, and water quality management. Mostly recently, Christina has focused on supporting drinking water PFAS projects nationwide, including AWWA's PFAS Policy Support Study which focused on developing regulatory pathway guidance based on the current state of PFAS research.

Ms. Slabaugh is an Associate Vice President and Drinking Water Practice Lead with Arcadis, specializing in the evaluation, planning and preliminary design of drinking water treatment and distribution systems. Her experience includes corrosion control treatment and pipe loop studies, regulatory compliance, contamination warning systems, and drinking water treatment process selection and optimization studies. She is a member of the AWWA Lead and Copper Rule Technical Advisory Workgroup, and contributing author to multiple chapters in AWWA Manuals of Water Supply and Practice as well as AWWA's standard for lead service line replacement and flushing. Education - MS Environmental Engineering Virginia Polytechnic Institute and State University 2007, BS Civil Engineering Purdue University 2005.

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WEBINAR MODERATOR

Chris Owen

Director of Water and Reuse Innovations

Hazen and Sawyer

Chris is the Director of Water and Reuse Innovations for Hazen and Sawyer. She has 29 years of experience in water quality, research, treatment and regulatory compliance. Her utility roles have included regulatory compliance, research, laboratory management, source water assessment and protection, and distribution system issues. Research work included investigations of UF/MF/RO membranes, online monitoring, total coliform occurrence, enhanced coagulation, biofiltration, distribution system, corrosion, biostability, ion exchange, chloramine chemistry and stability, contaminants of emerging concern, and algal toxins. She is active in regulatory issues at the state and federal levels, promoting utility concerns and science-based decisions. She served on the USEPA SAB for Drinking Water and the USEPA NACEPT.

She is an active member of the American Water Works Association (AWWA), serving as a Trustee and the current Chair of the Water Science and Research Division. She is a Trustee for WateReuse FL and the President of the Board of Directors for the American Membrane Technology Association. She has been active in the Water Research Foundation (WRF) and the WateReuse Foundation for more than 20 years.

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PANEL OF EXPERTS

Dave MacNevin, PhD, PE
Environmental Engineer
CDM Smith

Rosa Yu, PhD
Senior Process Engineer
Brown and Caldwell

Dr. Daniel Gerrity
Principal Research Scientist
Southern Nevada Water Authority

Lydia Peri, PE
Emerging Resources Program Administrator
Truckee Meadows Water Authority

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AGENDA

I.	Negotiating an Uncertain Landscape: Health and Regulatory Considerations for Potable Reuse	Dave MacNevin
II.	The Role of Coagulation in Potable Reuse	Rosa Yu
III.	Potable Reuse in Southern Nevada	Daniel Gerrity
IV.	OneWater Nevada Advanced Purified Water Demonstration	Lydia Perri

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ASK THE EXPERTS

Dave MacNevin, PhD, PE
CDM Smith

Rosa Yu, PhD
Brown and Caldwell

Dr. Daniel Gerrity
Southern Nevada Water Authority

Lydia Peri, PE
Truckee Meadows Water Authority

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CDM Smith

NEGOTIATING AN UNCERTAIN LANDSCAPE: HEALTH AND REGULATORY CONSIDERATIONS FOR POTABLE REUSE

Dave MacNevin, PhD, PE
Environmental Engineer
CDM Smith

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HEALTH AND REGULATORY CONSIDERATIONS FOR POTABLE REUSE

- Background
- Acute Health Risks
  - Microorganism Occurrence and Health Effects Data
  - State Regulatory Approaches
- Chronic Health Risks
  - Chemical Constituents Occurrence and Health Effects Data
  - State Regulatory Approaches
- Role of the Environmental Buffer
- Summary

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HEALTH AND REGULATORY CONSIDERATIONS FOR POTABLE REUSE

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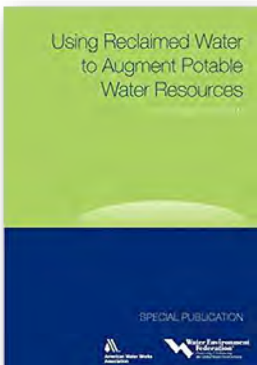
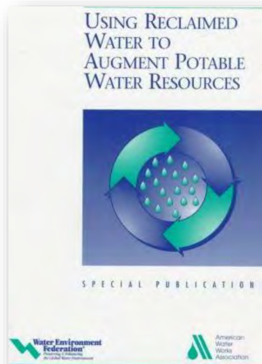
BACKGROUND: USING RECLAIMED WATER TO AUGMENT POTABLE WATER RESOURCES

1st Edition, 1999



2nd Edition, 2008



3rd Edition, Planned

What have we learned in the past decade?

This presentation will focus on Health and Regulatory Considerations

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A LOT HAS HAPPENED IN THE 2010S!

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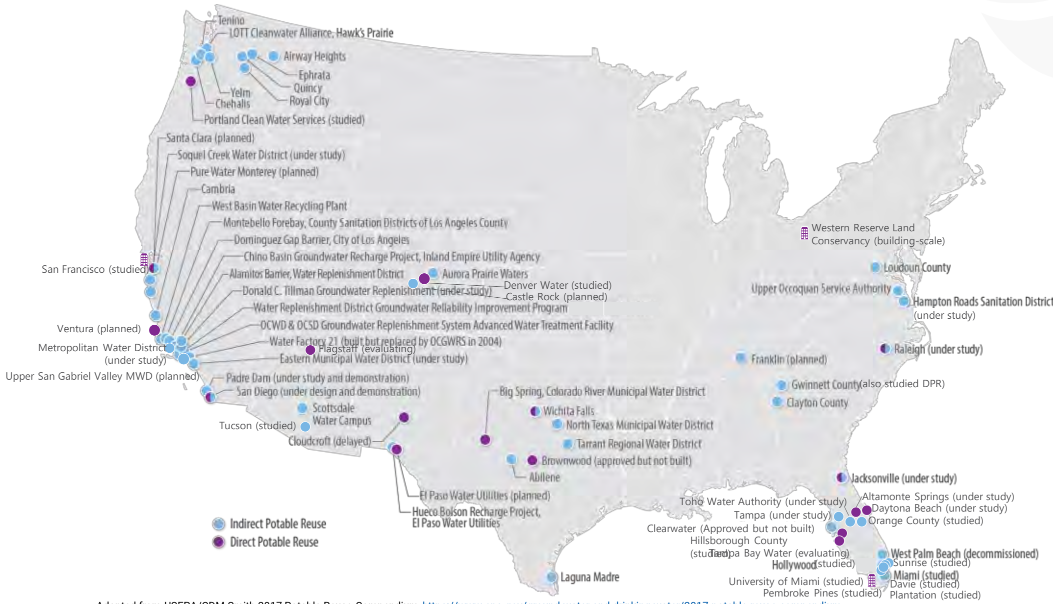
PLANNED POTABLE REUSE IN THE UNITED STATES



Adapted from USEPA/CDM Smith 2017 Potable Reuse Compendium https://www.epa.gov/ground-water-and-drinking-water/2017-potable-reuse-compendium
& Mulford, Moore, MacNevin 2018, https://www.researchgate.net/publication/323747301_Potable_Reuse_Pilots_Demonstrations_A_Review_of_Flow_Treatment_Costs

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PLANNED POTABLE REUSE OUTSIDE THE UNITED STATES

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REGULATORY STATUS OF POTABLE REUSE

Category of Reuse	Number of States with Policies to Address Potable Reuse in 2012	Number of States with Policies to Address Potable Reuse in 2019
IPR	8 (AZ, CA, FL, HI, MA, PA, VA, WA)	14 (AZ, CA, FL,HI, ID, MA,NV, NC, OK, OR, PA, TX, VA, WA)
DPR	0	4 (CA, OH*, NC, TX)

Adapted from USEPA/CDM Smith 2017 Potable Reuse Compendium https://www.epa.gov/ground-water-and-drinking-water/2017-potable-reuse-compendium
*Ohio Senate Bill 179 (2014) allows recycled water as a source for "private water systems"

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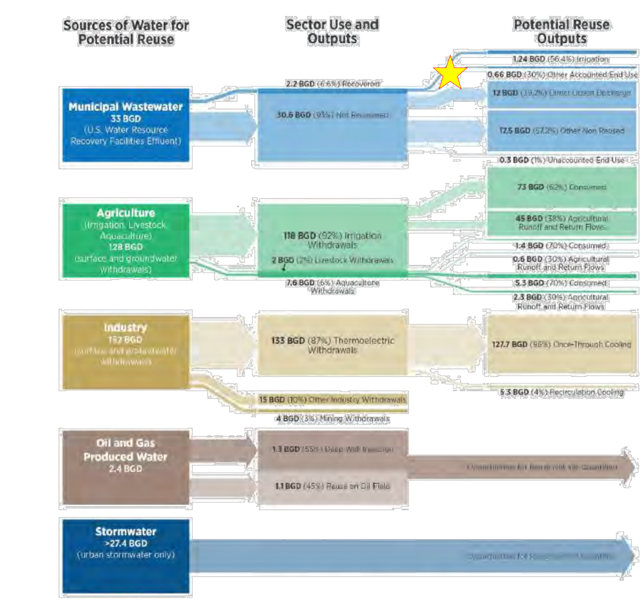
THE US HAS PLENTY OF WATER THAT CAN BE REUSED



Note that not all flows and associated percentages in Figure 2 add up to 100 percent.

- Only about 7% of Municipal Wastewater is Reused (Just 2.2 BGD of 33 BGD)
- Other sectors withdraw over 300 BGD
- Florida shows what is possible, reusing 45% (719 MGD) of total wastewater flow (1,468 MGD) (2013, SB536)
- What opportunities does a One Water future present?

Image Source: USEPA, Sep 2019, National Water Reuse Action Plan Draft, https://www.epa.gov/waterreuse/water-reuse-action-plan

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HEALTH AND REGULATORY CONSIDERATIONS FOR POTABLE REUSE

- Background
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  - Chemical Constituents Occurrence and Health Effects Data
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- Role of the Environmental Buffer
- Summary

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PATHOGENIC MICROORGANISMS IN POTABLE REUSE WATER SOURCES

Pathogenic Organism	Examples	Median Infection Dose (ID50) Category
Bacteria	Campylobacter Shigella Salmonella	~1,000,000
Viruses	Hepatitis A Rotaviruses Adenoviruses Noroviruses	<100
Protozoa	Giardia Cryptosporidium	<100

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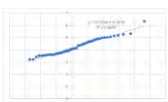
QUANTITATIVE MICROBIAL RISK ASSESSMENT (QMRA) IS THE PREFERRED BASIS FOR REGULATING PATHOGENS

Pathogen Densities



per Facility

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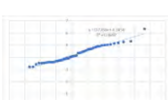
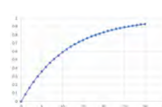
QUANTITATIVE MICROBIAL RISK ASSESSMENT (QMRA) IS THE PREFERRED BASIS FOR REGULATING PATHOGENS

Pathogen Densities



Dose Response Model



EXPONENTIAL MODEL

Daily Risk

$I(r,D)=1-e^{-r*D}$

Crypto, r=0.09

Giardia, r=0.0199

2L/Day

per Facility

Following method of Soller, J.; Eftim, S.; Nappier, S. 2018. "Direct potable reuse microbial risk assessment methodology: Sensitivity analysis and application to State log credit allocations." Water Research. 128. 2018. 286-292. DOI: 10.1016/j.watres.2017.10.034

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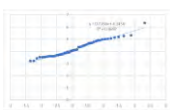
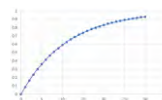
QUANTITATIVE MICROBIAL RISK ASSESSMENT (QMRA) IS THE PREFERRED BASIS FOR REGULATING PATHOGENS

Pathogen Densities + Dose Response Model = Annual Risk of Infection





EXPONENTIAL MODEL
Daily Risk
$I(r,D)=1-e^{-r*D}$
Crypto, r=0.09
Giardia, r=0.0199
2L/Day

MONTE CARLO ANALYSIS
-Estimate Annual Risk
-1,000 Annual Simulations per Facility

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STARTING FROM THE END: FINISHED WATER PATHOGEN GOALS ARE WELL-DEFINED

Pathogen	Drinking Water Goal		
	Density	Unit Volume (1 in ….)	Example
Giardia lamblia	<6.8 x 10^{-6} cysts/L	147,000 gal	~34 cysts in a 150-ft GST (5 MG)

Goal densities based on 10-4 annual risk of gastroenteritis. Sources: (Giardia and Virus) Regli et al. 1991. "Modeling the Risk from Giardia and Viruses in Drinking Water." Journal AWWA, Nov. 1991. 76-84. (Crypto) Haas et al. 1999. "Quantitative Microbial Risk Assessment." John Wiley & Sons.; MPN – "most probable number" of infectious units

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Cryptosporidium parvum	<3.0 x 10^{-5} oocysts/L	33,000 gal	~150 oocycsts in a 150-ft GST (5 MG)

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25

25

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Cryptosporidium parvum	<3.0 x 10^{-5} oocysts/L	33,000 gal	~150 oocycsts in a 150-ft GST (5 MG)
Enteric virus	<2.2 x 10^{-7} IU/L	4,550,000 gal	~1 IU in a 150-ft GST (5 MG)

Target pathogen densities are impractical to measure directly, therefore must rely on online monitoring of treatment barriers

Goal densities based on 10-4 annual risk of gastroenteritis. Sources: (Giardia and Virus) Regli et al. 1991. "Modeling the Risk from Giardia and Viruses in Drinking Water." Journal AWWA, Nov. 1991. 76-84. (Crypto) Haas et al. 1999. "Quantitative Microbial Risk Assessment." John Wiley & Sons.; MPN – "most probable number" of infectious units

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STARTING FROM THE END: FINISHED WATER PATHOGEN GOALS ARE WELL-DEFINED

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STARTING FROM THE END: FINISHED WATER PATHOGEN GOALS ARE WELL-DEFINED

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28

28

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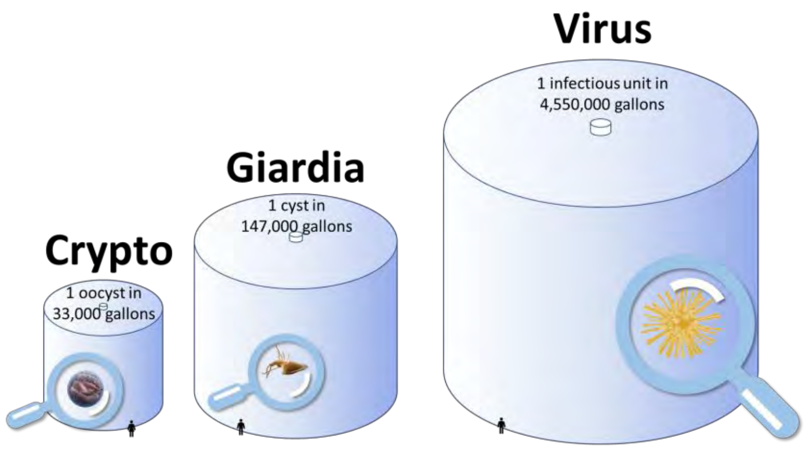

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MORE PATHOGEN DATA IS NEEDED!

NOTABLE DATA SETS

Data Set	Pathogens	Location	Facilities	Points (n)
Rose et al. 2004	Crypto, Giardia, Coliforms, Enterococci, Clostridium, Coliphage	Raw, Reclaimed, etc.	6 (FL, AZ, CA)	32

Rose, J. B. et al. (2004). Reduction of pathogens, indicator bacteria, and alternative indicators by wastewater treatment and reclamation processes. WERF.
(Enteric Virus Dataset) Complied from lit review in Eftim, S. E., Hong, T., Soller, J., Boehm, A., Warren, I., Ichida, A., & Nappier, S. P. (2017). Occurrence of norovirus in raw sewage–a systematic literature review and meta-analysis. Water research, 111, 366-374.
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Florida DEP (1999-2017) ongoing, regulatory requirement	Crypto, Giardia	Reclaimed	292 (FL)	1,828

- Pathogen data in WW/Reclaimed is less common
  - Historically not required
  - Pathogen results are labor intensive to collect and process
- California has initiated an extensive pathogen sampling campaign in raw wastewater

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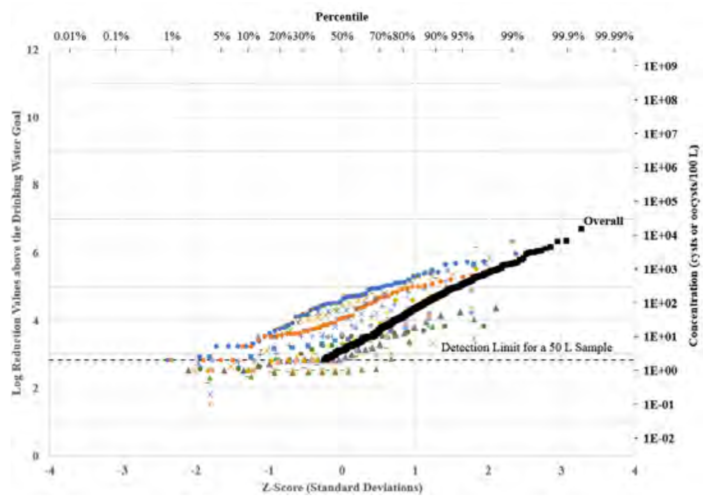
PROTOZOAN PATHOGEN DENSITIES VARIED 2-3 LOG_{10} ORDERS BETWEEN FACILITIES IN FDEP DATA SET

- Review of top 30 sites with most data
- **Crypto**
  - Sampled from reclaimed water
  - ±2 LRV between individual facilities



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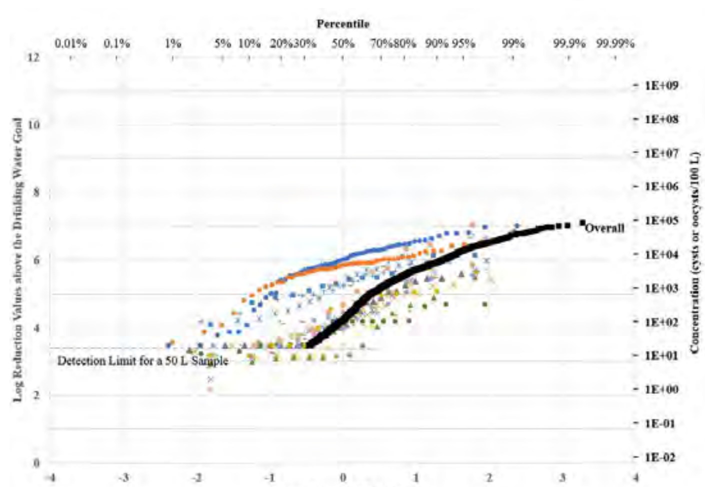

Source: MacNevin D., Azarian M., Netcher A., 2019 "A Framework for Regulating Protozoa in Potable Reuse." AWWA International Symposium on Waterborne Pathogens

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HEALTH AND REGULATORY CONSIDERATIONS FOR POTABLE REUSE

- Background
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  - Microorganism Occurrence and Health Effects Data
  - State Regulatory Approaches
- Chronic Health Risks
  - Chemical Constituents Occurrence and Health Effects Data
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- Role of the Environmental Buffer
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WHILE REGULATORY APPROACHES VARY BY STATE, THE BENCHMARK RISK GOAL IS THE SAME

State	Aquifer Recharge (Most Stringent Level)	Surface Water Augmentation*
CA	Virus – 12 LRV from Raw WW Crypto, Giardia – 10 LRV from Raw WW	Virus, Crypto – 8 LRV (Raw WW) Giardia – 7 LRV (Raw WW)

*-Before subsequent treatment by a surface WTP,
** Wilson, C. "Startup and Commissioning of a 1 MGD Advanced Treatment Demonstration Facility for Managed Aquifer Recharge." 2018 Water Research Foundation Conference.

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NC	Type 2 Reclaimed Water Effluent Standards • E.coli≥6-log reduction, ≤3/100 mL; Native coliphage≥5-log reduction; ≤5/100 mL; Clostridium perfringens≥4-log reduction; ≤5/100 mL	

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TX	Site specific requirements based on 12 months of monthly reclaimed source monitoring	
VA	No regulations – proposed regulatory limits** for SWIFT <2 total coliform/100 mL, 95th percentile <3 total coliform/100 mL, 20 day geo mean. Non-detect e.coli	Level 1 Standards: <14 fecal coliform/100 mL <11 e. coli/100 mL <11 enterococci/100mL

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HEALTH AND REGULATORY CONSIDERATIONS FOR POTABLE REUSE

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CHEMICAL CONSTITUENTS IN POTABLE REUSE WATER SOURCES

Origin	Categories	Examples
Industrial	Pesticides, preservatives, flame retardants, perfluorochemicals, nanoparticles	Plasticizers, heat stabilizers, biocides, epoxy resins, bleaching chemicals, solvents, dyes, polymers, hydrocarbons, phthalates, atrazine, DEET
Domestic	Personal care products, surfactants	Laundry detergent, ammonia, bleach, antifreeze, lotions, perfume
Human-based	Steroidal hormones, pharmaceutical residues	Oestradiol, oestrone, testosterone, trimethoprim, caffeine, ibuprofen, gemfibrozil, sulfamethoxazole, carbamazepine
Formed during WW treatment	Disinfection by-products	THMs, HAAs, NDMA, NDEA, aldehydes, haloacetonitriles, haloacetamides, bromate, chlorate

TrOC concentrations range from ng/L to hundreds of μg/L, compared with TOC in mg/L range

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PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)

PFOA
Perfluorooctanoic Acid

PFOS
Perfluorooctanesulfonic Acid

GenX

- Repel water, grease, and stains
- C-F is the shortest and strongest bond in chemistry
- Relatively soluble but also sticky
- Chain length (tail) and functional group (head) generally determine PFAS' affinity on treatment sorbents
- Many isomers exist (same formula, different structure)

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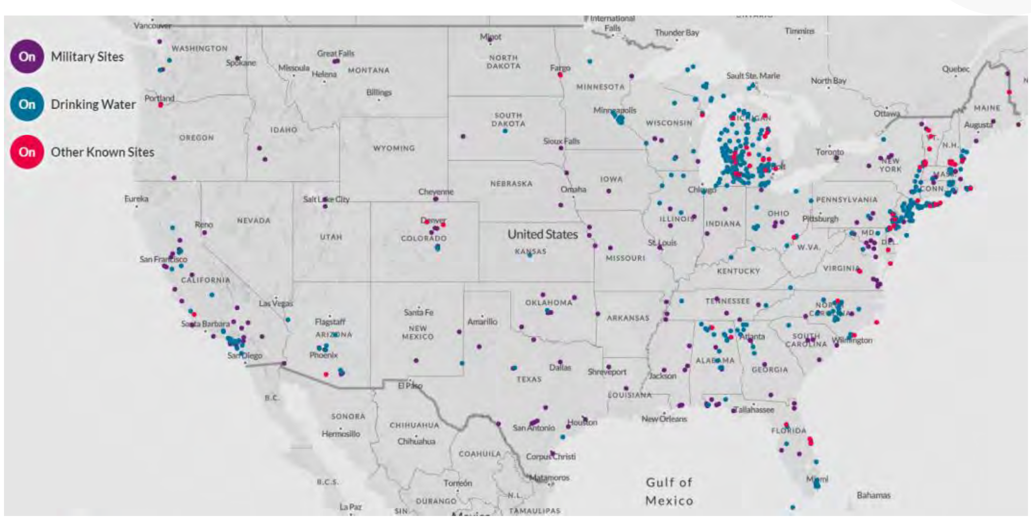
REPORTED DETECTIONS OF PFAS ACROSS THE US (UCMR 3 AND OTHER SOURCES)



Map shows data from UCMR3 and Other Sources, https://www.epa.gov/dwucmr/occurrence-data-unregulated-contaminant-monitoring-rule, Map Source: https://www.ewg.org/interactive-maps/2019_pfas_contamination/map/
Additional dots may be reflective of increased sampling efforts in certain states. Not an endorsement of EWG

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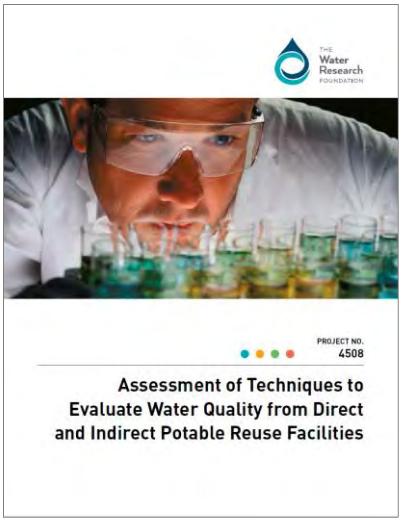
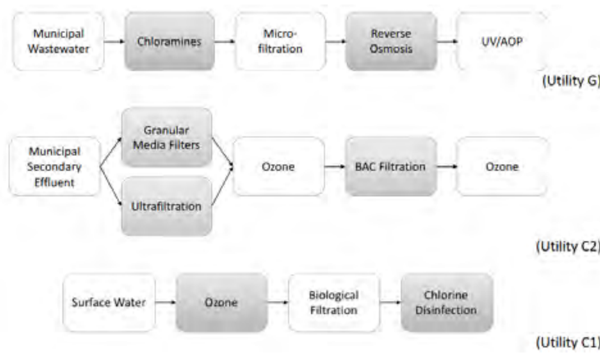
RECENT CHEMICAL REMOVAL PERFORMANCE DATA



Treatment Trains Sampled



WRF 4508 Authored by Channah Rock, Christiane Hoppe-Jones, Kevin Daniels, & Natalie Brassil (U of AZ), Jennifer Hooper, Jillian Vandegrift (CDM Smith), & Josh Goldman (Metro Wastewater Reclamation District)

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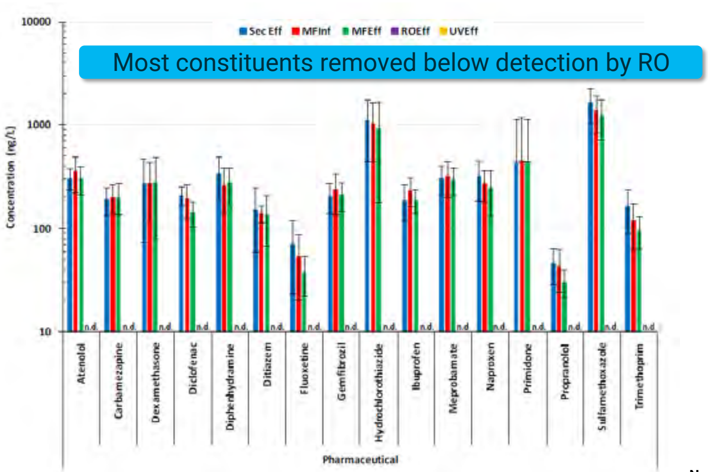
MF/RO/UVAOP REMOVES MOST CHEMICALS BELOW DETECTION LIMITS (1 OF 3)



Code	Location
Inf	Influent
MFInf	Microfiltration Influent
MFEff	Microfiltration Effluent
ROInf	Reverse Osmosis Influent
ROC	Reverse Osmosis Concentrate
ROEff	Reverse Osmosis Effluent
UVEff	UV/AOP Effluent

Note: Missing values were not detected

Source: WRF 4508 (2019), https://www.waterrf.org/research/projects/assessment-techniques-evaluate-water-quality-direct-and-indirect-potable-reuse

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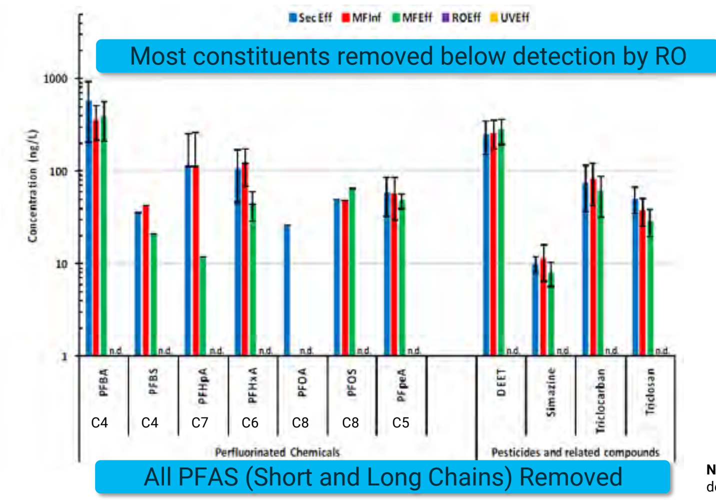
MF/RO/UVAOP REMOVES MOST CHEMICALS BELOW DETECTION LIMITS (2 OF 3)



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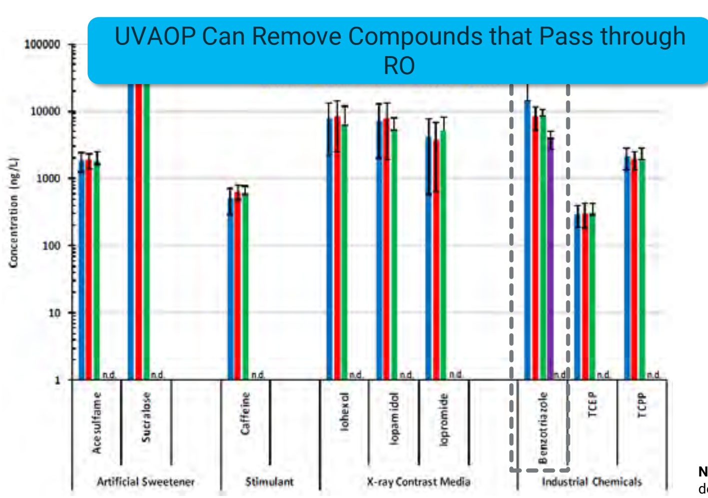
MF/RO/UVAOP REMOVES MOST CHEMICALS BELOW DETECTION LIMITS (3 OF 3)



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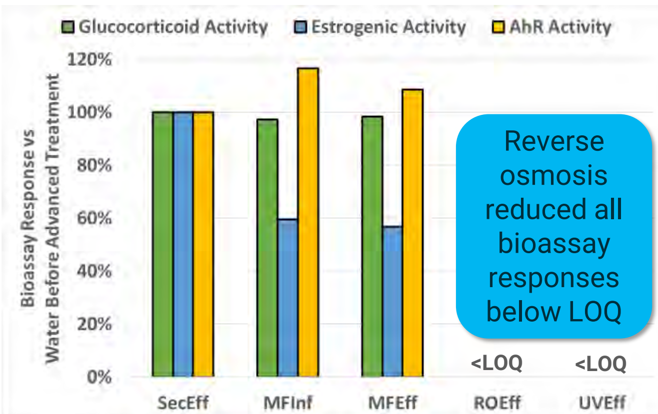
BIOASSAY RESULTS ARE ONE TOOL TO SCREEN FOR POTENTIAL HEALTH EFFECTS OF MIXTURES AND UNIDENTIFIED COMPOUNDS



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AhR-Aromatic hydrocarbon receptor
LOQ- Limit of quantification

Bars Represent Avg. Response of a # of Sampling Events
Glucocorticoid sampling events, n=7
Estrogenic sampling events, n=7
AhR sampling events, n=3

Zero (0) samples showed cytotoxic effects, zero (0) samples showed p53 reporter gene response (Indicator of damage to DNA)

Adapted from Source: WRF 4508 (2019), https://www.waterrf.org/research/projects/assessment-techniques-evaluate-water-quality-direct-and-indirect-potable-reuse

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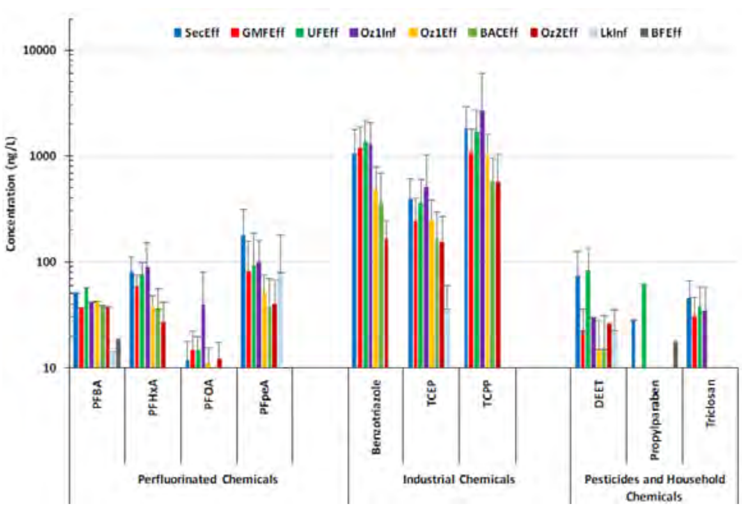
DUAL STAGE OZONE/BAC REDUCES, BUT DOES NOT ELIMINATE, MOST CHEMICALS (1 OF 2)



Code	Location
SecEff	Secondary Effluent
GMFEff	Granular Media Filtration Effluent
UFEff	Ultrafiltration Effluent
OZ1Inf	Ozone 1 Influent
Oz1Eff	Ozone 1 Effluent
BACEff	Biological Activated Carbon Effluent
Oz2Eff	Ozone 2 Influent
LkInf	Lake Influent
BFEff	Biofiltration Effluent (before disinfection)

Note: Missing values were not detected

Source: WRF 4508 (2019), https://www.waterrf.org/research/projects/assessment-techniques-evaluate-water-quality-direct-and-indirect-potable-reuse

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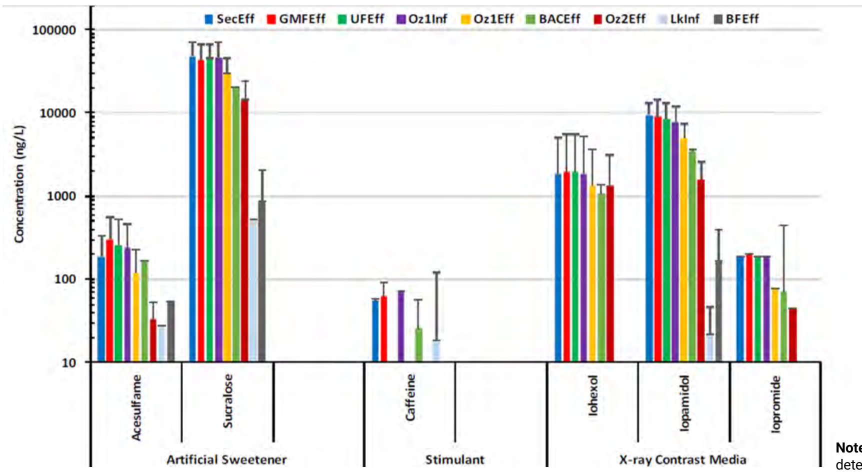
DUAL STAGE OZONE/BAC REDUCES, BUT DOES NOT ELIMINATE, MOST CHEMICALS (2 OF 2)



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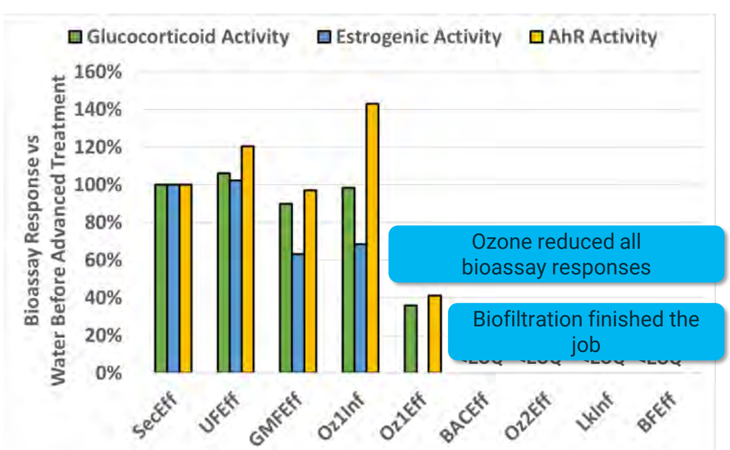

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AhR-Aromatic hydrocarbon receptor
LOQ- Limit of quantification

Bars Represent Avg. Response of a # of Sampling Events
Glucocorticoid sampling events, n=5
Estrogenic sampling events, n=5
AhR sampling events, n=3

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HEALTH AND REGULATORY CONSIDERATIONS FOR POTABLE REUSE

- Background
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  - State Regulatory Approaches
- Chronic Health Risks
  - Chemical Constituents Occurrence and Health Effects Data
  - State Regulatory Approaches
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- Summary

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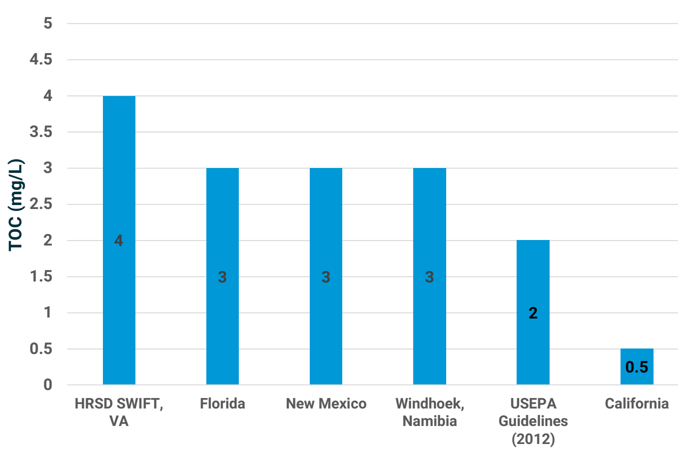
ORGANICS LIMITS FOR POTABLE REUSE PROJECTS



Texas requires monitoring of TOC for DPR, but sets no specific limit

COD-Chemical oxygen demand. Approximate Scaling Conversion for COD to TOC from Dubber, Donata, and Nicholas F. Gray. "Replacement of chemical oxygen demand (COD) with total organic carbon (TOC) for monitoring wastewater treatment performance to minimize disposal of toxic analytical waste." *Journal of Environmental Science and Health Part A* 45, no. 12 (2010): 1595-1600.

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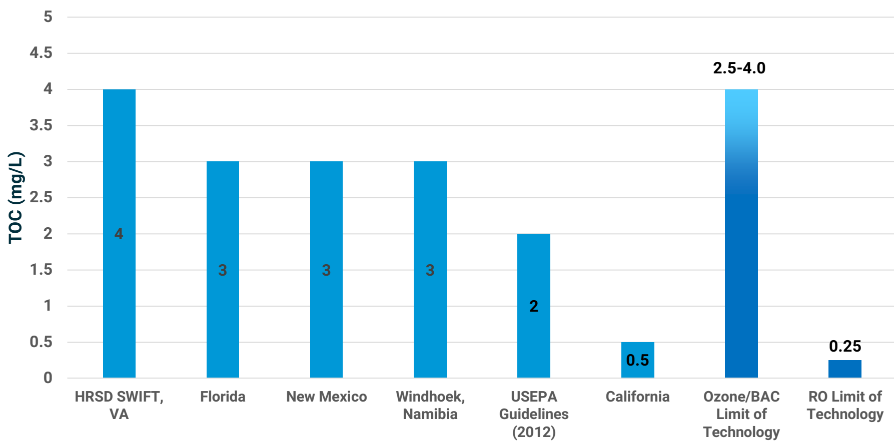

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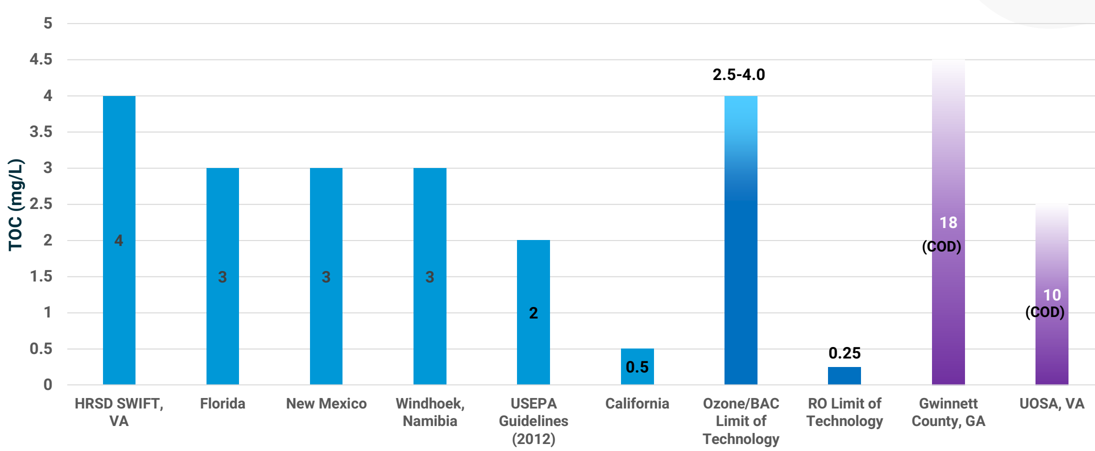

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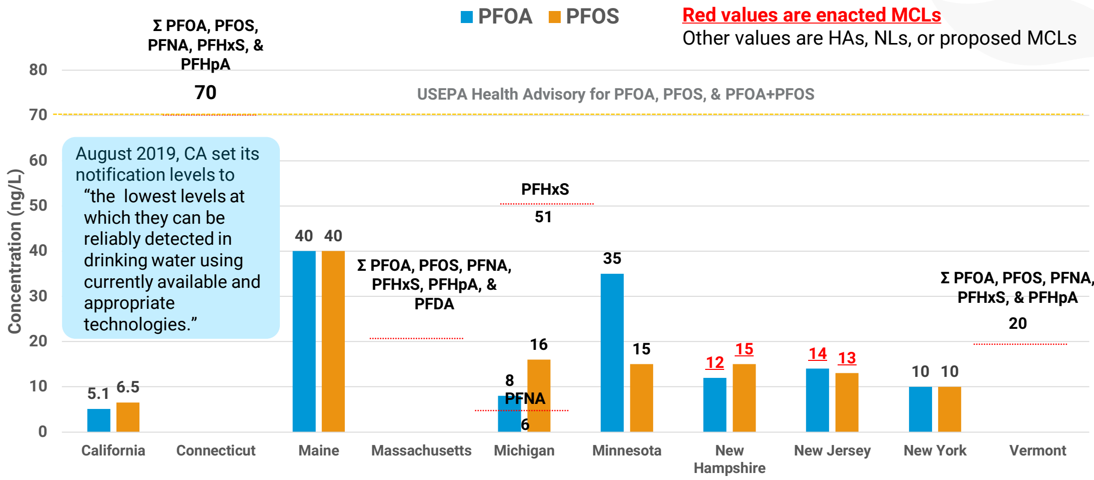
SELECT STATE PFAS ACTIONS BELOW USEPA HA



Laboratory reporting limits typically 1-5 ng/L, some labs can report below 1 ng/L.

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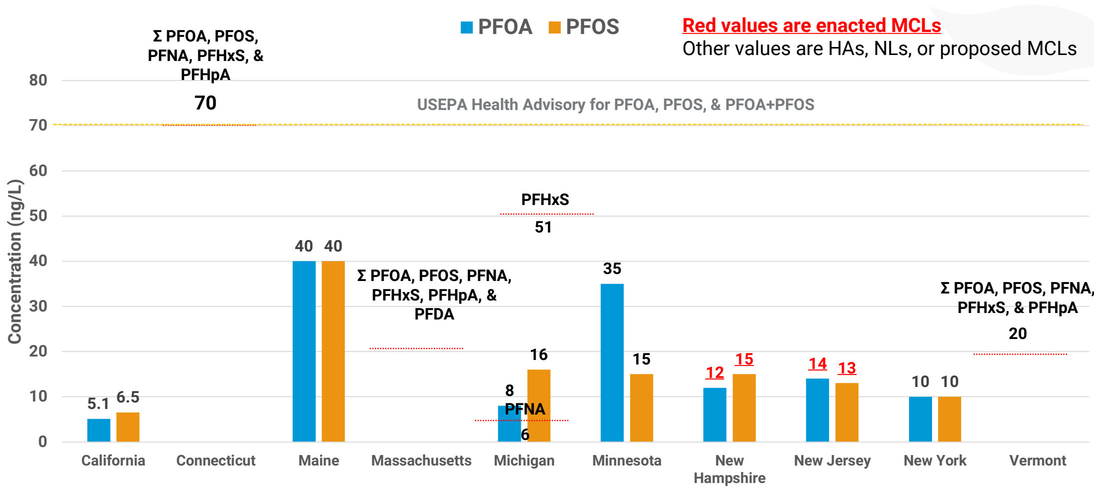
SELECT STATE PFAS ACTIONS BELOW USEPA HA



Laboratory reporting limits typically 1-5 ng/L, some labs can report below 1 ng/L.

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USEPA HEALTH ADVISORY PROGRAM


EPA United States Environmental Protection Agency

2018 Edition of the Drinking Water Standards and Health Advisories Tables

The 2012 Drinking Water Standards and Health Advisories (DWSHA) Tables were amended March 2018 to fix typographical errors and add health advisories published after 2012.

- Informal technical guidance on concentrations of unregulated drinking water contaminants
  - At the Drinking Water Specific Level Concentration for cancer (10^{-4} lifetime cancer risk)
  - Noncancer adverse health effects
- Health advisories are intended to protect against noncancer effects
- Includes health advisories on nearly **125** unregulated contaminants

https://www.epa.gov/dwstandardsregulations/2018-drinking-water-standards-and-advisory-tables

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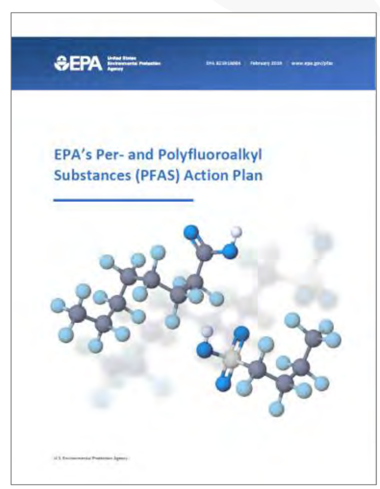
PFAS ACTION PLAN (FEB 2019)

- Key USEPA Actions Addressing PFAS-Related Challenges
  - Expand toxicity information for PFAS
  - Develop new tools to characterize PFAS in the environment
  - Evaluate cleanup approaches
  - Develop guidance to facilitate cleanup of contaminated groundwater
  - Use enforcement tools to address PFAS exposure in the environment and assist states in enforcement activities
  - Use legal tools such as those in TSCA to prevent future PFAS contamination
  - Address PFAS in drinking water using regulatory and other tools
  - Develop new tools and materials to communicate about PFAS


EPA

EPA's Per- and Polyfluoroalkyl Substances (PFAS) Action Plan

https://www.epa.gov/pfas/epas-pfas-action-plan

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UCMR5 EXPECTED TO FOCUS ON PFAS

Up to 30 of these candidate compounds may be included in UCMR 5 sampling

Metals

Method 200.7	
Lithium	

Semivolatiles

Method 525.3	
Chlorothalonil	Norflurazon (527)
Hexazinone (527)	Phorate
Metribuzin (551.1)	Prometryn (527)
Napropamide	Trifluralin (551.1)

Pesticides (Pyrethroids, Organophosphates)

Method 527
Bifenthrin
Esfenvalerate
Malathion

Pesticides (Carbamate)

Method 531.2
Carbaryl
Methomyl

Pesticides (Organophosphates)

Method 538
Acephate
Dicrotophos

Light blue highlight = CCL 4 analyte with a completed method
Purple highlight = CCL 4 analyte with a method in development

Pharmaceuticals and Personal Care Products

Method 542	
Erythromycin	Gemfibrozil
Carbamazepine	Naproxen
Diazepam	Phenytoin
Diclofenac (sodium salt)	Sulfamethoxazole
Enalapril (maleate salt)	Triclosan
Fluoxetine (HCl)	Trimethoprim

Haloacetonitrile DBPs

Method 551.1
Dichloroacetonitrile (DCAN)
Dibromoacetonitrile (DBAN)
Trichloroacetonitrile (TCAN)
Bromochloroacetonitrile (BCAN)

Carbonyls

Method 556.1
Formaldehyde
Acetaldehyde

Solvents

Method 558 (In Development)
N-Methyl-2-pyrrolidone
Urethane

Alkyphenols

Method 559 (In Development)
Nonylphenol
Octylphenol

Metals

Method In Development (to be determined)
Legionella pneumophila
Mycobacterium avium

Source: USEPA UCMR 5 Stakeholder Meeting (7/15/2019)

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UCMR5 EXPECTED TO FOCUS ON PFAS (CONT.)

Up to 30 of these candidate compounds may be included in UCMR 5 sampling

Draft Method 533	
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	4,8-dioxa-3H-perfluorononanoic acid (ADONA) (537.1)
1H, 1H, 2H, 2H-perfluorohexane sulfonic acid (4:2 FTS)	Hexafluoropropylene oxide dimer acid (HFPO-DA) (537.1)
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	Perfluorobutanesulfonic acid (PFBS) (537.1)
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	Perfluorodecanoic acid (PFDA) (537.1)
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	Perfluorododecanoic acid (PFDoA) (537.1)
Perfluoro-3-methoxypropanoic acid (PFMPA)	Perfluoroheptanoic acid (PFHpA) (537.1)
Perfluoro-4-methoxybutanoic acid (PFMBA)	Perfluorohexanoic acid (PFHxA) (537.1)
Perfluorobutanoic acid (PFBA)	Perfluorohexanesulfonic acid (PFHxS) (537.1)
Perfluoroheptanesulfonic acid (PFHpS)	Perfluorononanoic acid (PFNA) (537.1)
Perfluoropentanesulfonic acid (PFPeS)	Perfluorooctanesulfonic acid (PFOS) (537.1)
Perfluoropentanoic acid (PFPeA)	Perfluorooctanoic acid (PFOA) (537.1)
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) (537.1)	Perfluoroundecanoic acid (PFUnA) (537.1)
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS) (537.1)	

PFAS Analytes Unique to Method 537.1	
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	Perfluorotetradecanoic acid (PFTA)
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	Perfluorotridecanoic acid (PFTrDA)

Preliminary UCMR 5 Timeline:
Proposal (Summer 2020)
Final Rule (Late 2021)
PWSs Monitor (2023-2025)

Was included in UCMR3

Source: USEPA UCMR 5 Stakeholder Meeting (7/15/2019)

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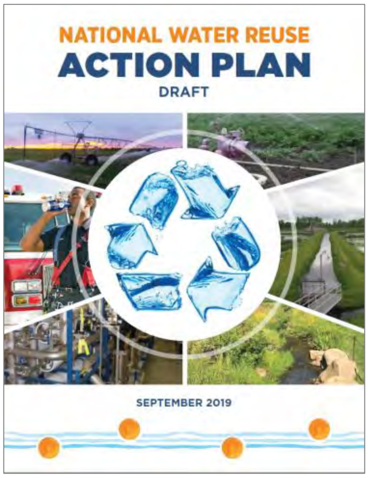
NATIONAL WATER REUSE ACTION PLAN (SEP 2019)



- Provides recommendations for non-potable and potable reuse
- Select Actions Relevant to Potable Reuse
  - 2.3.1 Fit-for-Purpose Specifications
  - 2.3.2. Public and Environmental Health Risk-Based Targets
  - 2.5.2 Monitoring Best Practices for Various Reuse Applications
  - 2.6.2 Promote Funding for Water Reuse
  - 2.7. Coordinate Research On Water Reuse
  - 2.9.1 Support State(s) Operator Certification for Reuse
- Note: No sign of any federal initiatives to regulate potable reuse.

https://www.epa.gov/waterreuse/water-reuse-action-plan

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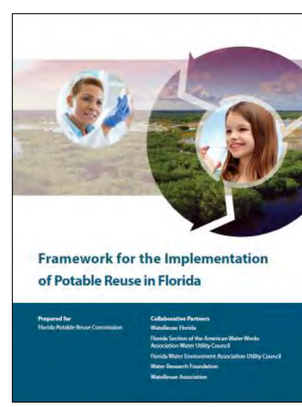
IN JANUARY 2020, FLORIDA'S POTABLE REUSE COMMISSION PUBLISHED A FRAMEWORK FOR IMPLEMENTING POTABLE REUSE IN FLORIDA

- WateReuse Florida convened the PRC as a consensus driven partnership of diverse stakeholders
- Florida Legislature considering HB 715 implementing Florida Potable Reuse Commission recommendations and requiring FDEP issue DPR regulations by **Dec. 2021**
- Similar unofficial framework documents have been drafted in Arizona, Colorado, and New Mexico



WATEREUSE FLORIDA

http://www.watereuseflorida.com/potable-reuse-commission/

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IFORNIA LAWS RELATING TO POTABLE REUSE

- AB 574 requires the SWB to adopt uniform water recycling criteria for DPR by **Dec. 2023**.
- In Aug 2019, SWB issued a second edition of its proposed framework for regulating DPR
- Intend to issue a single regulation for raw water augmentation (before existing WTP) and treated water augmentation (direct to distribution system)
- Existing drinking WTPs will be counted for LRV credits
- State is investing in additional research administered through WRF


A PROPOSED FRAMEWORK FOR REGULATING DIRECT POTABLE REUSE IN CALIFORNIA

STATE WATER RESOURCES CONTROL BOARD

https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/direct_potable_reuse.html

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HEALTH AND REGULATORY CONSIDERATIONS FOR POTABLE REUSE

- Background
- Acute Health Risks
  - Microorganism Occurrence and Health Effects Data
  - State Regulatory Approaches
- Chronic Health Risks
  - Chemical Constituents Occurrence and Health Effects Data
  - State Regulatory Approaches
- Role of the Environmental Buffer
- Summary

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STABILIZATION BEFORE DISCHARGE TO THE ENVIRONMENTAL BUFFER

- Aquifer Recharge
  - Non-stabilized purified water can be degraded by release of naturally occurring trace metals from a groundwater aquifer
  - Metals mobilization potential studied at Clearwater, FL and Orange County GWRS
- Surface Water Augmentation
  - Purified water with certain nutrient concentrations (N,P) can be degraded by eutrophication
  - San Diego North City Pure Water Project
    - Augmenting the Miramar Reservoir

Total Nutrients	Anticipated Effluent Limit	Purified Water Quality
Nitrogen	2 mg/L (long-term average)	0.8 to 1.7 mg/L
Phosphorus	0.025 mg/L	<0.01 mg/L

(Clearwater) MacNevin, D. 2018. "Protecting Membranes in Advanced Water Treatment: Effective Management of Chloramine and Peroxide Residuals." AWWA Membrane Technology Conference.
(Orange County) WRF Project #4708 (In Progress) Evaluating Post Treatment Challenges for Potable Reuse Applications. (San Diego) Final Title 22 Engineering Report. North City Pure Water Project.(April 2019)
https://www.sandiego.gov/public-utilities/sustainability/pure-water-sd/reports

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HEALTH AND REGULATORY CONSIDERATIONS FOR POTABLE REUSE

- Background
- Acute Health Risks
  - Microorganism Occurrence and Health Effects Data
  - State Regulatory Approaches
- Chronic Health Risks
  - Chemical Constituents Occurrence and Health Effects Data
  - State Regulatory Approaches
- Role of the Environmental Buffer
- Summary

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IN SUMMARY

- DPR and IPR already being implemented successfully throughout country and expected to increase.
- Pathogens:
  - Finished water pathogen goals are well understood
  - Need for wastewater/reclaimed water data and rapid biomonitoring methods.
- Chemicals
  - Number and concentration of chemicals difficult to evaluate individually.
  - Bulk indicators or bioassays useful for controlling potential chronic health impacts.
  - PFAS data collection a key focus.
- Stabilization prior to discharge to environmental buffer may be necessary to avoid degradation of purified water.
- Regulations continue to be handled on state-by-state basis.

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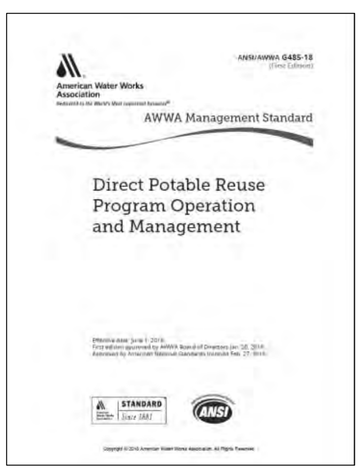
SOME HELPFUL RESOURCES



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CDM Smith

NEGOTIATING AN UNCERTAIN LANDSCAPE: HEALTH AND REGULATORY CONSIDERATIONS FOR POTABLE REUSE

Dave MacNevin, PhD, PE
Environmental Engineer
CDM Smith
macnevinde@cdmsmith.com

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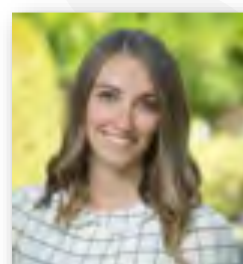
ASK THE EXPERTS

Dave MacNevin, PhD, PE
CDM Smith

Rosa Yu, PhD
Brown and Caldwell

Dr. Daniel Gerrity
Southern Nevada Water Authority



Lydia Peri, PE
Truckee Meadows Water Authority

Enter your **question** into the **question pane** at the lower right-hand side of the screen.

Please specify to whom you are addressing the question.

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Brown AND Caldwell

CONTROL OF TOC IN POTABLE REUSE BY WASTEWATER COAGULATION

Rosa Yu[1]; Eric Peterson[2]; R. Scott Summers[2]; Katherine Bell[1]
1. Brown and Caldwell
2. University of Colorado Boulder

Rosa Yu, Ph.D.
Environmental Process Engineer
Brown and Caldwell

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LEARNING OBJECTIVES

- Nationwide TOC guidance for potable reuse
- How total organic carbon (TOC) is controlled by non-RO-based treatment trains
- The role of coagulation in potable reuse for TOC control
- Benefits and tradeoffs of wastewater coagulation

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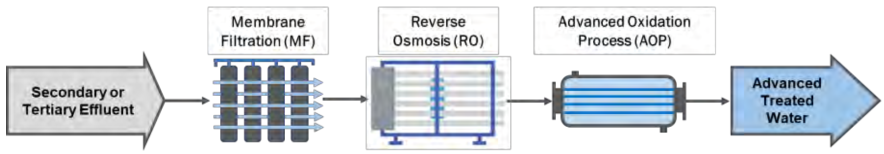
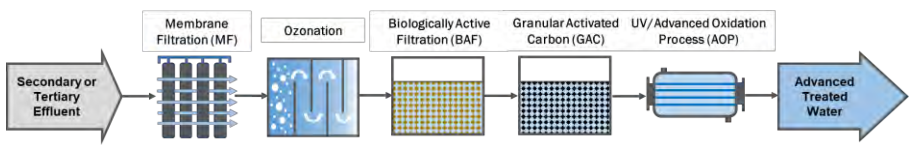
TREATMENT TECHNOLOGIES FOR POTABLE REUSE

A. Reverse osmosis (RO)-centered full advanced treatment (FAT)



B. Carbon-based advanced treatment without RO



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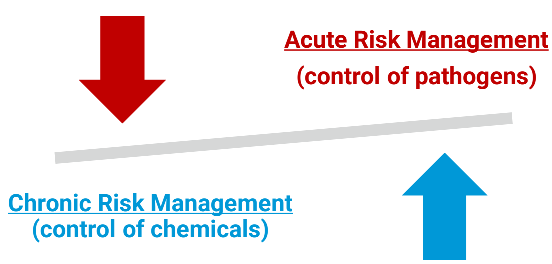
TREATMENT OBJECTIVES



- Total organic carbon (TOC) as a surrogate for organic contaminants.
- Prevent the potential for elevated hazardous organic chemicals to occur in advanced treated water

Parameter	Frequency	Monitoring Approach
pH	Continuous	Online monitoring
TOC	Continuous	Online monitoring
UV at 254 nm	Continuous	Online monitoring
Total Fluorescence	Continuous	Online monitoring
Turbidity	Continuous	Online monitoring
Ammonia	Continuous	Online monitoring
Nitrate	Continuous	Online monitoring
Nitrite	Continuous	Online monitoring
Total Nitrogen	Weekly	Grab sample
Bromide	Weekly	Grab sample
Bromate	Weekly	Grab sample
TTHM	Bi-weekly	Grab sample
HAA5	Bi-weekly	Grab sample
1,4-Dioxane	Monthly	Grab sample
NDMA	Monthly	Grab sample
NMOR	Monthly	Grab sample
PFOS	Monthly	Grab sample
PFOA	Monthly	Grab sample
Sucralose	Monthly	Grab sample
Sulfamethoxazole	Monthly	Grab sample
Fecal coliform	Weekly	Grab sample
E. Coli	Weekly	Grab sample
Native coliphage	Weekly	Grab sample

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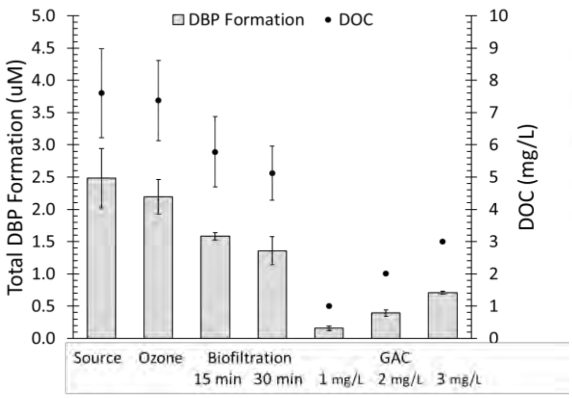
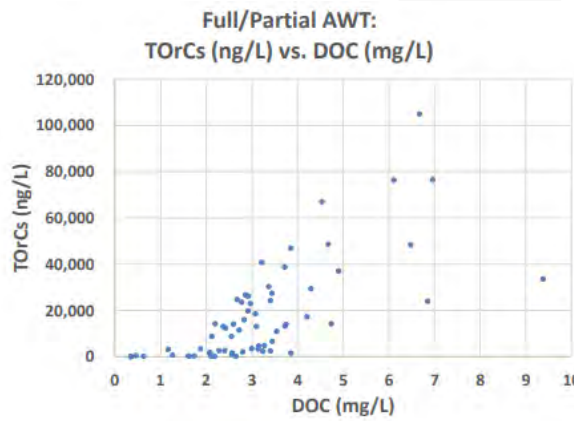
TOC IS CORRELATED WITH POTENTIAL HEALTH RELEVANCE



Peterson et al., Control of Disinfection Byproduct-associated Risk by Ozone, Biofiltration, and Adsorption for Potable Reuse. AWWA ACE, Denver, Colorado, 2019.



Shimmoller L., Mitch W., Daniels K. Characterizing and Controlling Organics in Direct Potable Reuse Projects. Water Research Foundation Webcast. 2019

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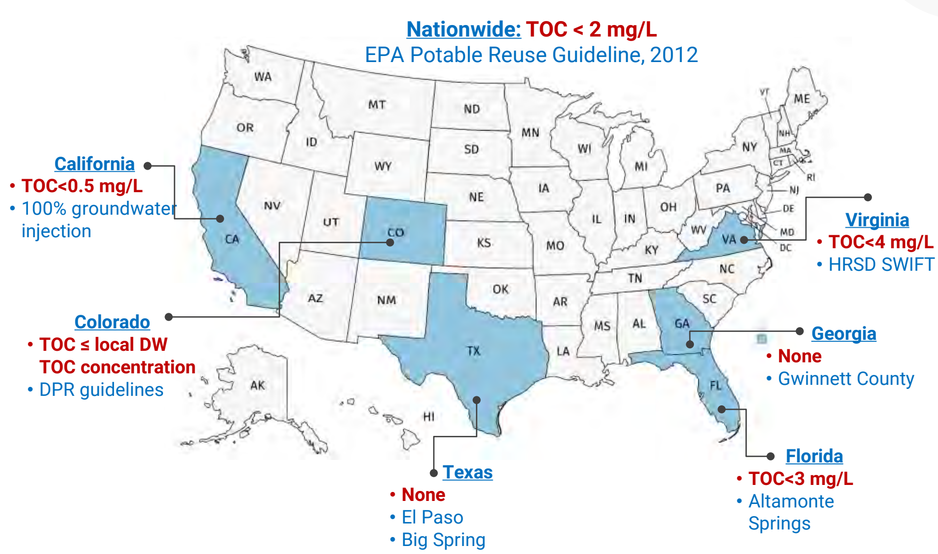
NATIONAL TOC GUIDANCE FOR POTABLE REUSE



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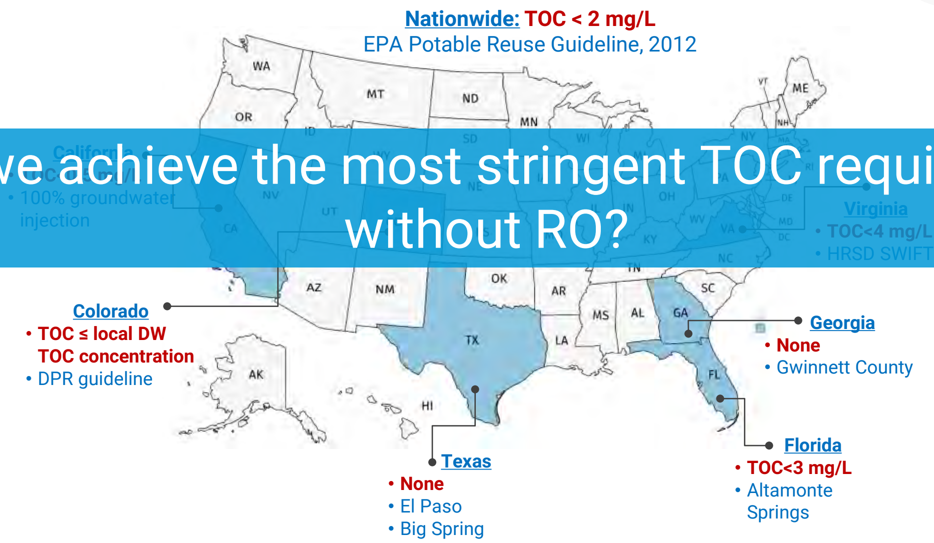
NATIONAL TOC GUIDANCE FOR POTABLE REUSE



Can we achieve the most stringent TOC requirement without RO?

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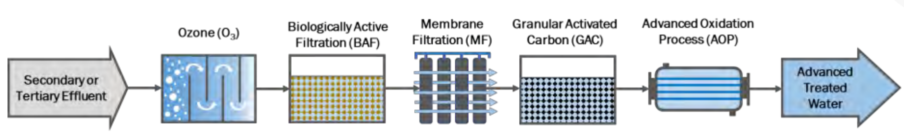
TREATMENT OPTIONS FOR TOC MANAGEMENT WITHOUT RO



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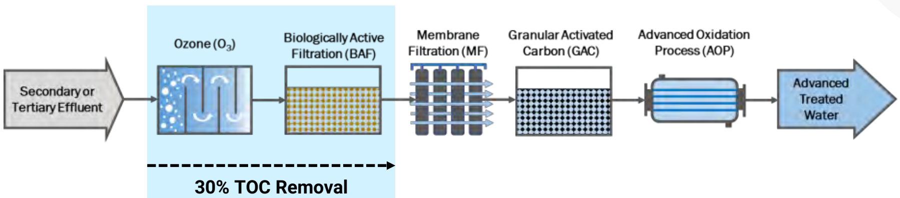

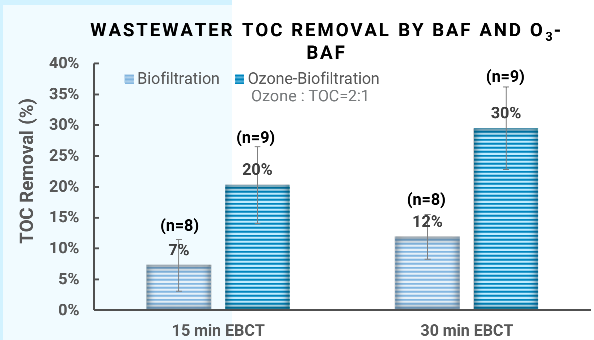

- *Peterson et al., A Systematic Bench-Scale Evaluation of Effluent Organic Matter Removal with Biofiltration for Potable Reuse Systems. Paper in progress.*

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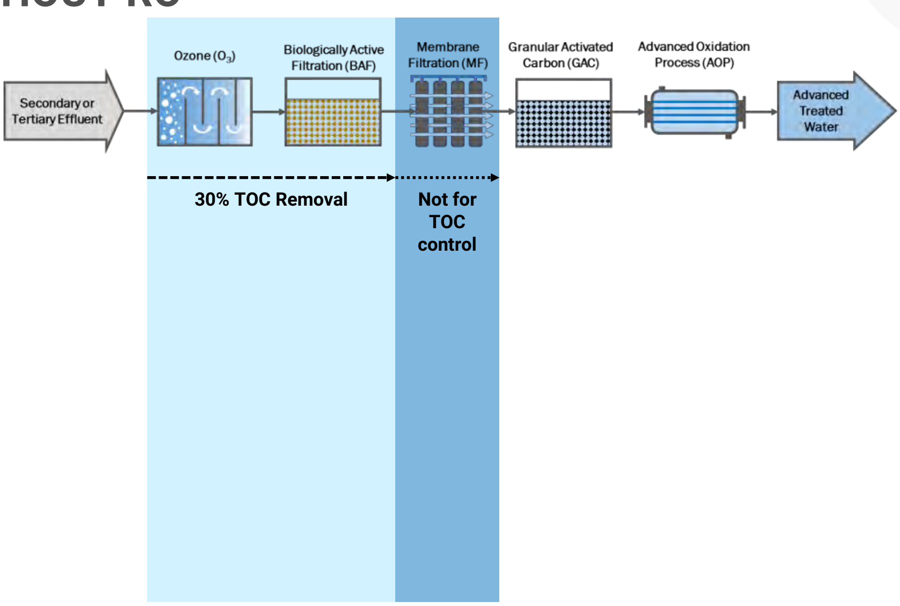
TREATMENT OPTIONS FOR TOC MANAGEMENT WITHOUT RO



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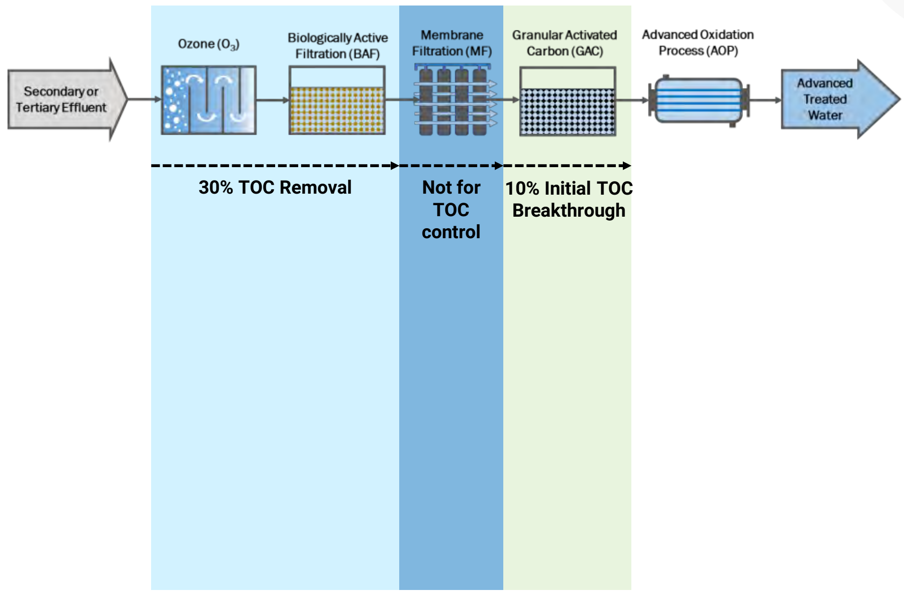
TREATMENT OPTIONS FOR TOC MANAGEMENT WITHOUT RO



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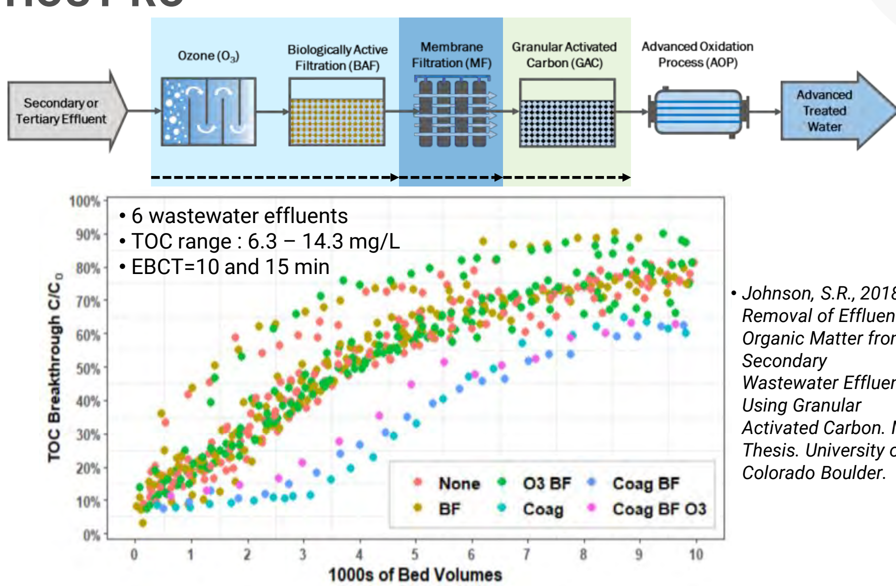
TREATMENT OPTIONS FOR TOC MANAGEMENT WITHOUT RO



• *Johnson, S.R., 2018. Removal of Effluent Organic Matter from Secondary Wastewater Effluent Using Granular Activated Carbon. MS Thesis. University of Colorado Boulder.*

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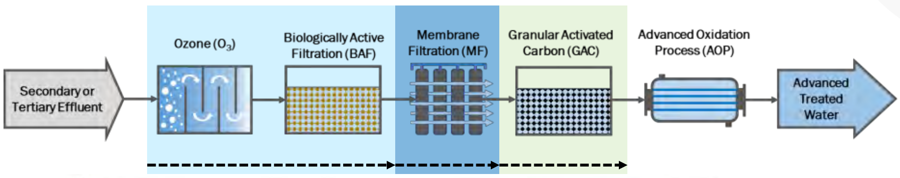
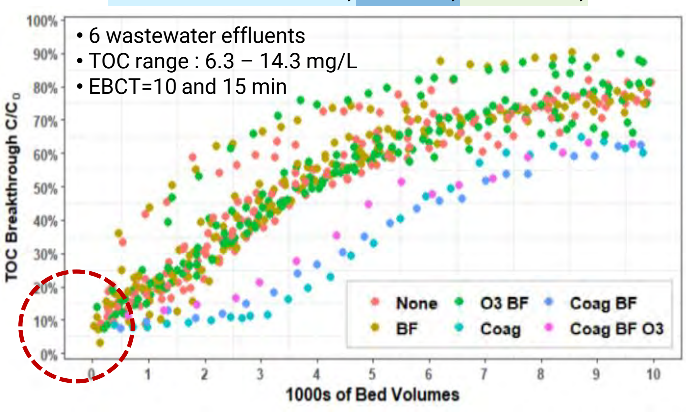
TREATMENT OPTIONS FOR TOC MANAGEMENT WITHOUT RO





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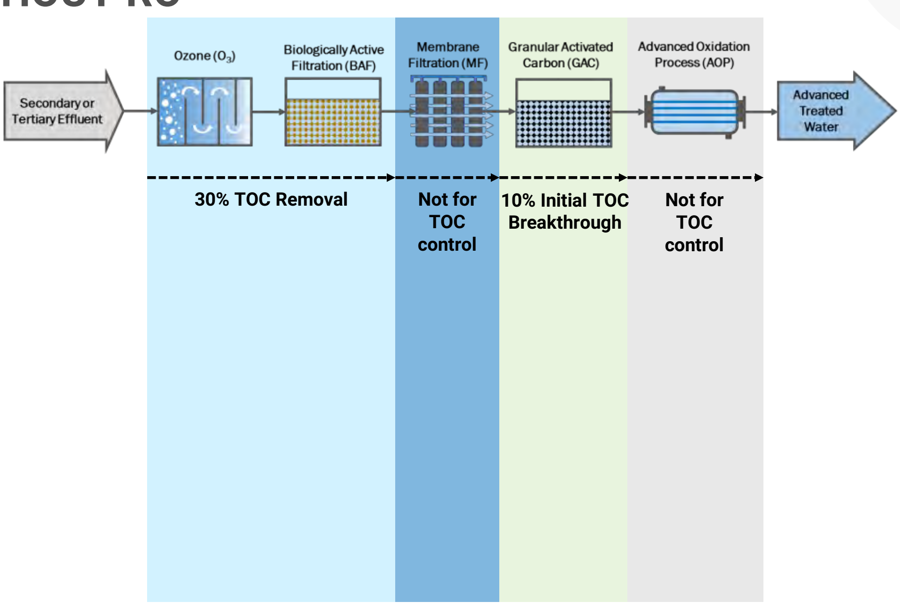

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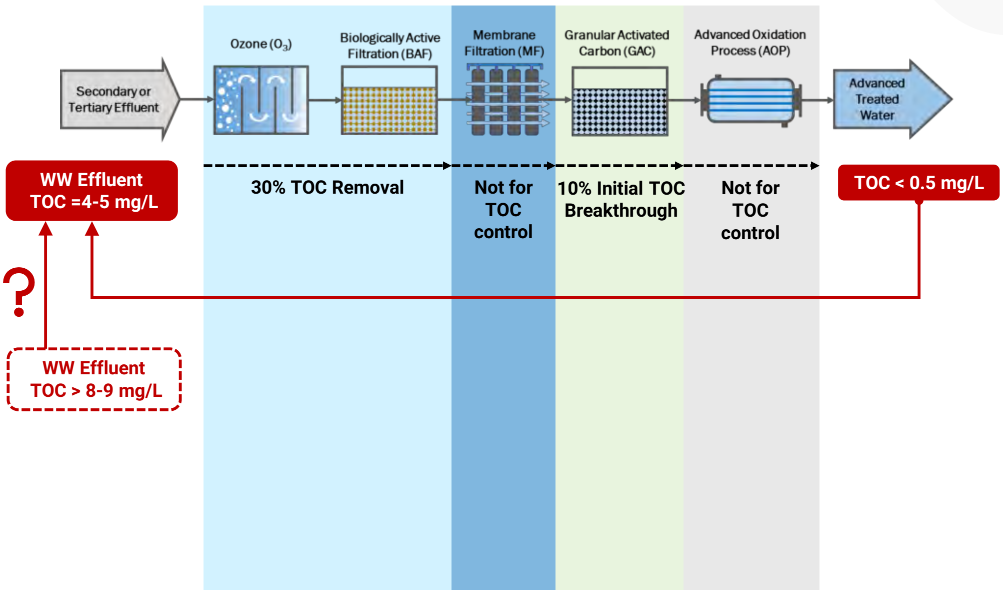
TREATMENT OPTIONS FOR TOC MANAGEMENT WITHOUT RO



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Therefore, TOC needs to be managed at the front end of the ozone-BAF-GAC treatment train to ensure reasonable GAC usage rate.

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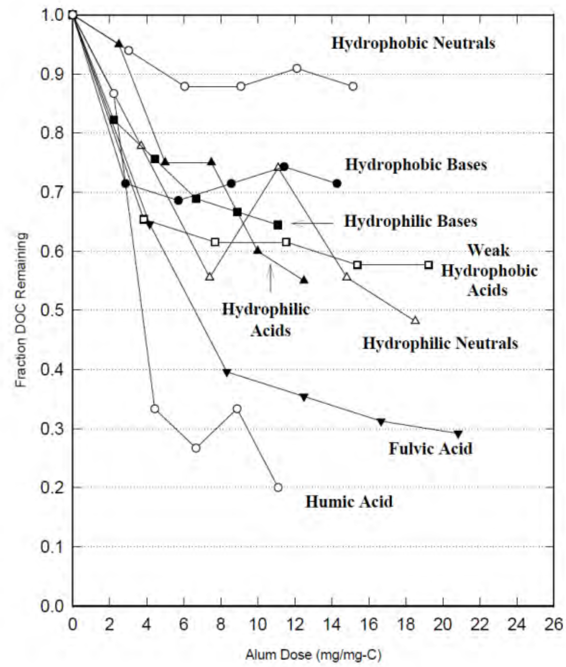
COAGULATION AS A CANDIDATE PRETREATMENT APPROACH FOR TOC REMOVAL

- Reckhow, D. A., P. Bose, E. R. Hesse and E. Lewis. 2005. New Approaches to DBP Precursor Characterization and Control: Application to Ozonation and Multi-stage Coagulation. Journal of Harbin Institute of Technology 12(supplement): 160-170.



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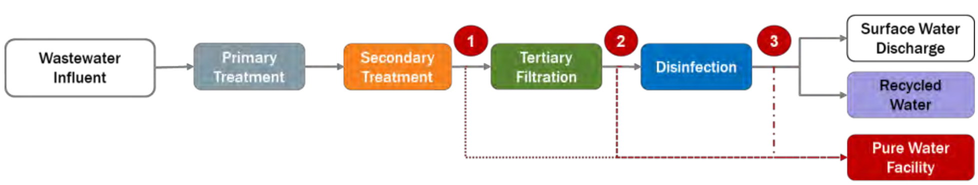
STUDY OBJECTIVES

- Evaluate the impact of ***wastewater type*** on TOC removal rate by coagulation.



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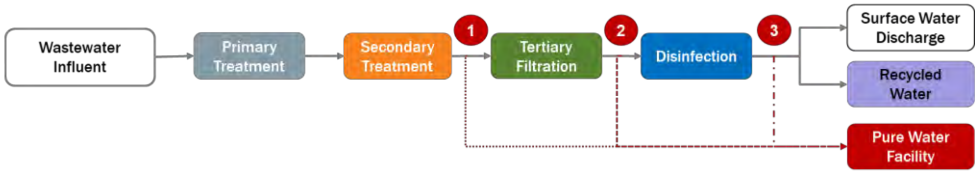

- Evaluate the impact of ***coagulant type and dose*** on TOC removal rate.
  - **Alum**
  - **Aluminum chlorohydrate (ACH)**
  - **Ferric Chloride ($FeCl_3$)**

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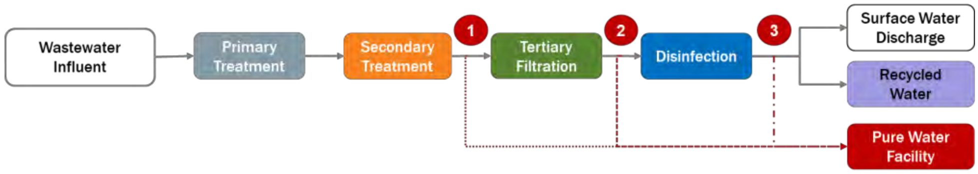
- Evaluate the impact of ***wastewater type*** on TOC removal rate by coagulation.



- Evaluate the impact of ***coagulant type and dose*** on TOC removal rate.
  - **Alum**
  - **Aluminum chlorohydrate (ACH)**
  - **Ferric Chloride ($FeCl_3$)**
- ***Feasibility assessment*** of coagulation as a pretreatment approach for TOC removal in potable reuse.
  - **Residual management**

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JAR TEST METHOD

- **Mixing Regime**
  - Rapid mixing: 1 minute at 290 rpm (G = 600 s-1)
  - Slow mixing: 10 minutes at 55 rpm (G = 55 s-1)
  - Slow mixing: 10 minutes at 20 rpm (G = 20 s-1)
  - Settling without mixing for 30 minutes
- **Coagulant Dose**
  - Alum doses: 0, 10, 20, 40, 80, 160, 320 mg/L as product
  - ACH and FeCl3 dose: equivalent molar metal doses to alum

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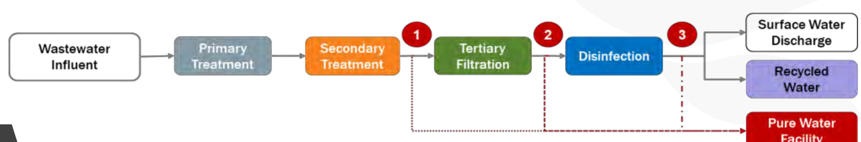
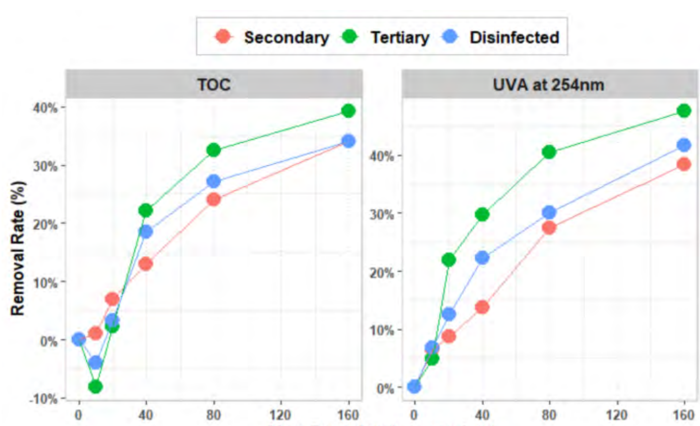


THE IMPACT OF WASTEWATER TYPE



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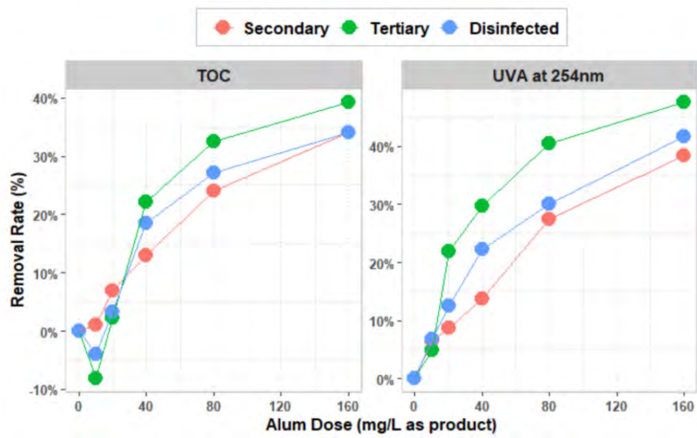
THE IMPACT OF WASTEWATER TYPE

	TOC (mg/L)	UVA 254 nm	Max. TOC Removal	Treated Water TOC (mg/L)
2nd Effluent	7.9	0.138	34%	5.3
3rd Effluent	9.0	0.141	39%	5.1
Disinfected	8.6	0.103	34%	5.7



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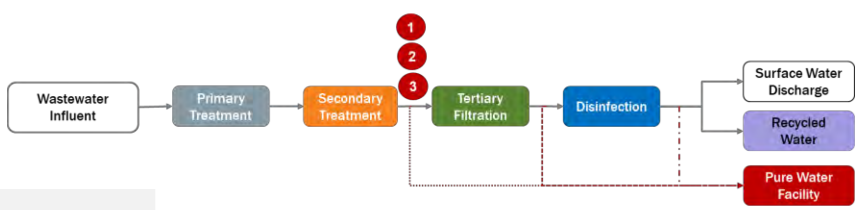
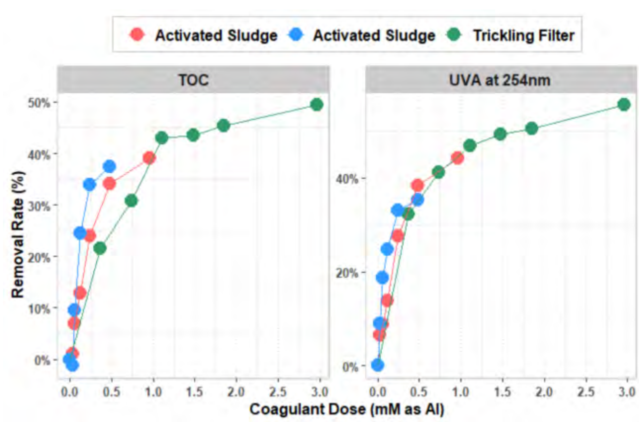


THE IMPACT OF WASTEWATER TYPE



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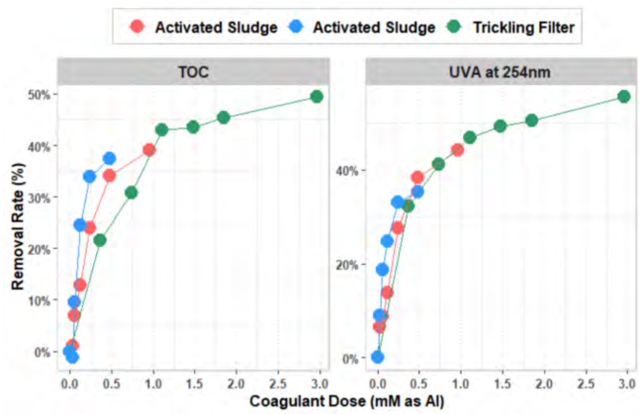
	2nd Treatment	TOC (mg/L)	UVA at 254 nm	Max. TOC Removal	Treated Water TOC (mg/L)
2nd Effluent 1	Activated Sludge	7.9	0.138	39%	4.9
2nd Effluent 2	Activated Sludge	9.0	0.133	38%	5.6
2nd Effluent 3	Trickling Filter	9.4	0.245	49%	4.8

THE IMPACT OF WASTEWATER TYPE



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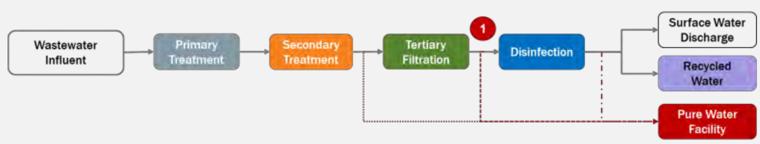
THE IMPACT OF COAGULANT TYPE



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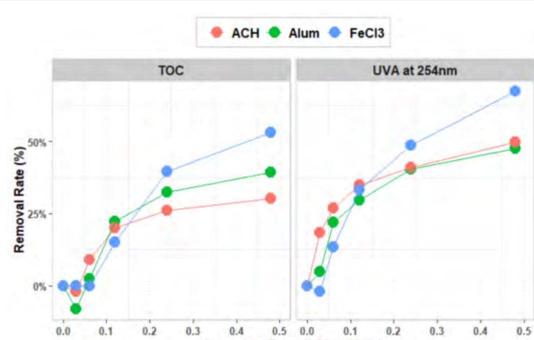
Coagulant	Max. TOC Removal	Treated Water TOC (mg/L)
CTRL	/	9.3
Alum	39%	5.1
ACH	30%	7.1
$FeCl_3$	53%	4.9



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THE IMPACT OF WASTEWATER AND COAGULANT TYPE

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- In general, wastewater is readily <u>coagulatable</u> to achieve high TOC removal.
- The type of wastewater <u>does not</u> have a significant impact on TOC removal by coagulation.
- Coagulant type also <u>doesn't affect</u> TOC removal in this study.

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SOLIDS MANAGEMENT—THE POTENTIAL TRADE-OFF

$$S\ (lbs/day) = 8.34 \times Q \times (\underbrace{0.44Al}_{\text{Coagulant}} + \underbrace{SS}_{\text{Suspended solids}} + \underbrace{TOC_r}_{\text{TOC removal}})$$

Assuming plant flow <u>Q=3 million gallons per day (MGD)</u>

Water	TOC Removal	Dry Alum Dose (mg/L)	Turbidity (NTU)	TOC (mg/L)	Treated Water TOC (mg/L)	Solids (lbs/day)
Secondary Effluent 1		458	0.72	7.97	**4.8**	**5161**
Secondary Effluent 2		529	4.68	9.43	**5.7**	**6181**
Tertiary Effluent 1	**40%**	229	1.02	8.32	**5.0**	**2660**
Tertiary Effluent 2		458	1.05	10.2	**6.1**	**5201**
Disinfected Recycle Water		458	0.66	8.62	**5.2**	**5164**

**Suspended solid concentrations are approximated using raw water turbidity and an empirical constant of 2.2, i.e., SS=2.2×Turbidity.*

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WHAT ABOUT MBR?

Feasibility of MBR

- Retrofit existing infrastructure at the WWTP?
- Treatment of entire wastewater flow?

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TAKE-HOME MESSAGES

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- **Observed TOC removal was not impacted by wastewater type and coagulant type.**
- **Wastewater coagulation is potentially viable to manage TOC for potable reuse (up to 50% TOC removal).**

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THANK YOU.
QUESTIONS?

ROSA YU, PH.D.
ENVIRONMENTAL PROCESS ENGINEER
DENVER, CO
BROWN AND CALDWELL

103

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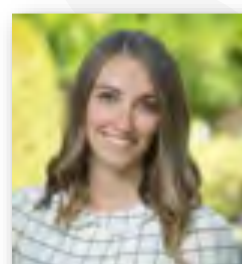
ASK THE EXPERTS

Dave MacNevin, PhD, PE
CDM Smith

Rosa Yu, PhD
Brown and Caldwell

Dr. Daniel Gerrity
Southern Nevada Water Authority



Lydia Peri, PE
Truckee Meadows Water Authority

Enter your **question** into the **question pane** at the lower right-hand side of the screen.

Please specify to whom you are addressing the question.

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SOUTHERN NEVADA WATER AUTHORITY™

POTABLE REUSE IN SOUTHERN NEVADA

Dr. Daniel Gerrity
Principal Research Scientist
Southern Nevada Water Authority

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ACKNOWLEDGEMENTS

- **U.S. Environmental Protection Agency**
  - **EPA STAR Grant:** R835823
  - **Grant Title:** Early Career Award: Framework for Quantifying Microbial Risk and Sustainability of Potable Reuse Systems in the United States
  - **Disclaimer:** The contents of this presentation do not necessarily represent the official views of the U.S. EPA or SNWA

- **Collaborators**
  - Cory Dow *(UNLV, SouthWest Water Company)*
  - Dr. Erfaneh Amoueyan *(UNLV, Jacobs Engineering Group)*
  - Dr. Sajjad Ahmad and Dr. Krystyna Stave *(UNLV)*
  - Tom Maher, Mao Fang, Rick Giltner *(Southern Nevada Water Authority)*
  - Dan Fischer, LeAnna Risso *(Clark County Water Reclamation District)*

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For more information (open access):

DOI: 10.1002/aws2.1153

ORIGINAL RESEARCH

AWWA WATER SCIENCE

Evaluating the sustainability of indirect potable reuse and direct potable reuse: a southern Nevada case study

Cory Dow[1,2] | Sajjad Ahmad[1] | Krystyna Stave[3] | Daniel Gerrity[1,4]

[1]Department of Civil and Environmental Engineering and Construction, University of Nevada, Las Vegas, Nevada
[2]Carollo Engineers, Las Vegas, Nevada
[3]School of Public Policy and Leadership, University of Nevada, Las Vegas, Nevada
[4]Applied Research and Development Center, Southern Nevada Water Authority, Las Vegas, Nevada

Correspondence
Daniel Gerrity, Department of Civil and Environmental Engineering and Construction, University of Nevada, Las Vegas, 4505 South Maryland Parkway, Box 454015, Las Vegas, NV 89154-4015.
Email: daniel.gerrity@unlv.edu; daniel.gerrity@snwa.com

Funding information
United States Environmental Protection Agency, Grant/Award Number: R835823

Abstract
This case study presents a framework for evaluating the sustainability of indirect potable reuse (IPR) and direct potable reuse (DPR) in Las Vegas, Nevada. A system dynamics model was developed to simulate population growth, water supply, water quality, energy costs, net present worth (NPW), and greenhouse gas (GHG) emissions. The model confirmed that DPR could achieve a net reduction in energy costs of up to US$250 million while still ensuring an adequate water supply. However, the high NPW of DPR ($1.0–$4.0 billion) relative to the status quo IPR approach ($0.6 billion) represents a significant economic hurdle, although future monetization of salt loadings and GHGs could reduce that disparity. DPR with ozone-biofiltration would also be hindered by an estimated concentration of total dissolved solids of up to 1,300 mg/L. Despite these barriers to implementation in Las Vegas, certain site-specific conditions may make DPR more attractive in other locations.

KEYWORDS
direct potable reuse, indirect potable reuse, net present worth, sustainability, system dynamics, water supply

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LEARNING OBJECTIVES

- Are emerging trends in potable reuse consistent with Southern Nevada's water management strategy?
- IPR and DPR: One size fits all?

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LEARNING OBJECTIVES

- Are emerging trends in potable reuse consistent with Southern Nevada's water management strategy?
- IPR and DPR: One size fits all?

Environmental Science & Technology

Beyond User Acceptance: A Legitimacy Framework for Potable Water Reuse in California

Sasha R. Harris-Lovett,*[†,‡] Christian Binz,[†,§,#] David L. Sedlak,[†,∥] Michael Kiparsky,[†,⊥] and Bernhard Truffer[†,§,∇]

Type 1: Pragmatic Legitimacy	*Description:* Why should I support the project?	*Example:* ~$2 billion in upgrades required for Point Loma WWTP in San Diego

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NEVADA RECYCLED WATER REGULATIONS

- Updated in 2016
- Incorporates some aspects of California's groundwater regulations:
  - 12-log virus reduction (raw sewage to point of extraction)
  - 10-log Giardia/Crypto reduction (raw sewage to zone of saturation)
- Return flow credits are exempted (i.e., Southern Nevada)
- DPR not currently addressed

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Is implementation of DPR justifiable in Las Vegas?

Or is the Return Flow Credits approach the best strategy?

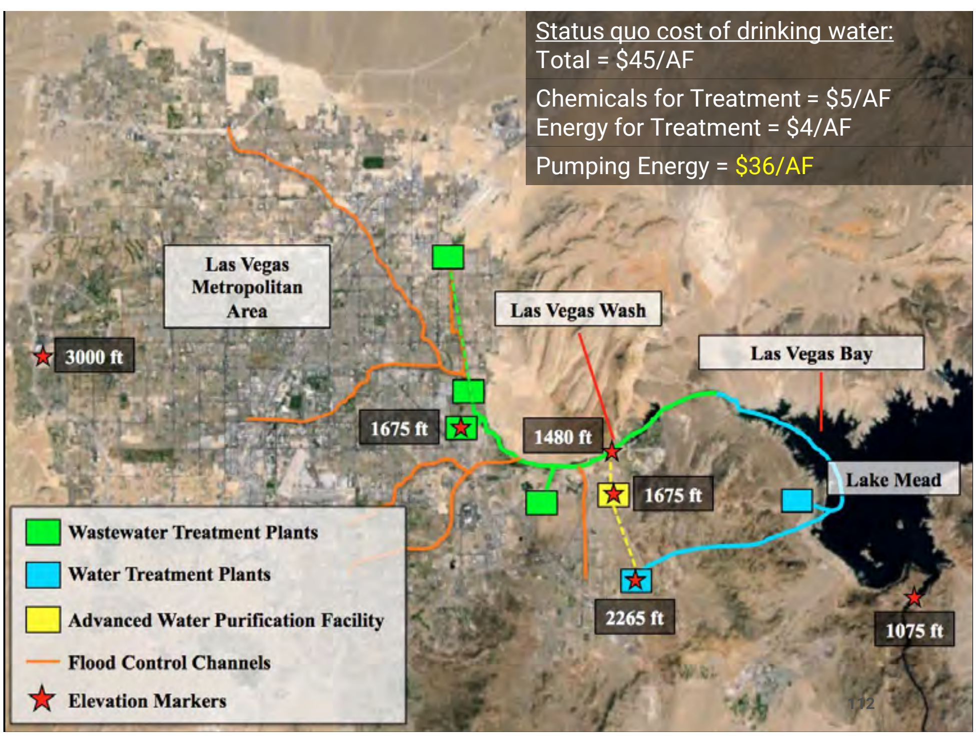
What are the critical factors influencing this decision?

111

Is implementation of DPR justifiable in Las Vegas?

Or is the Return Flow Credits approach the best strategy?

What are the critical factors influencing this decision?



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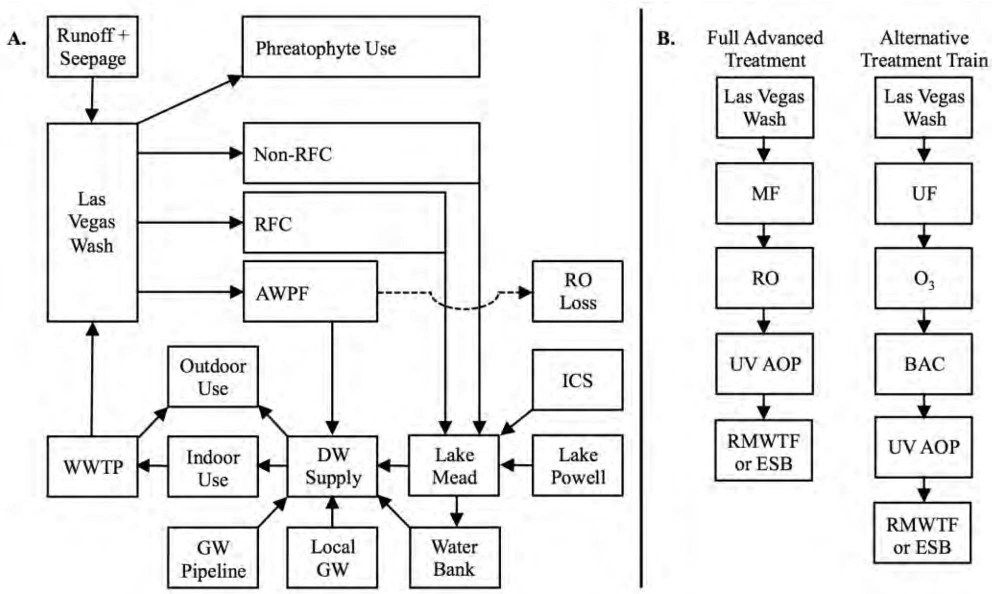
System Dynamics Model and Assumptions



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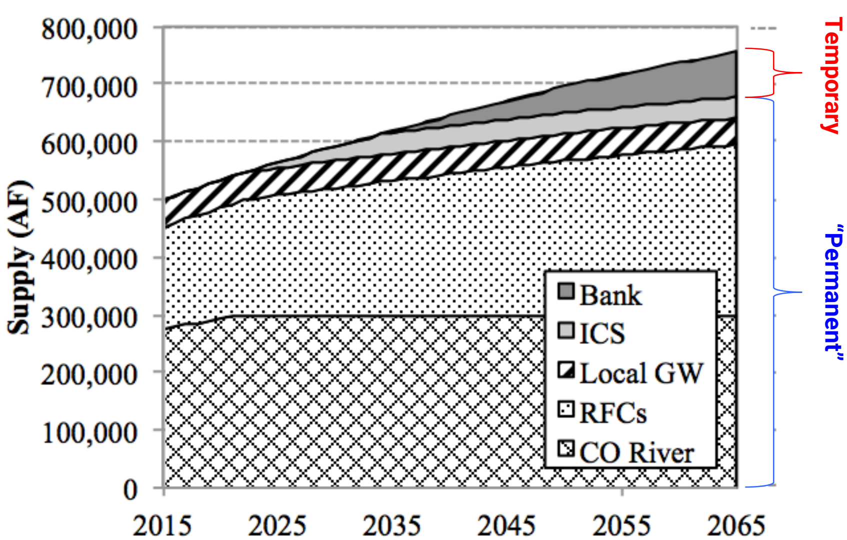
Example Water Supply Output for the Status Quo (RFC) Scenario



Water Supply Goals:

- Decrease reliance on temporary resources
- Increase permanent resources

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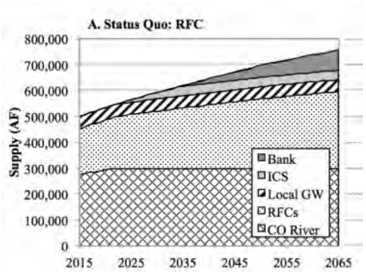

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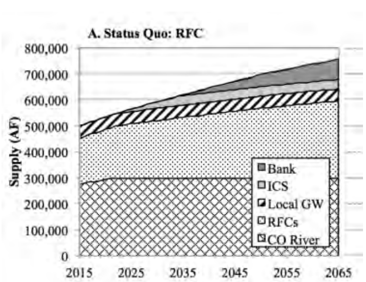
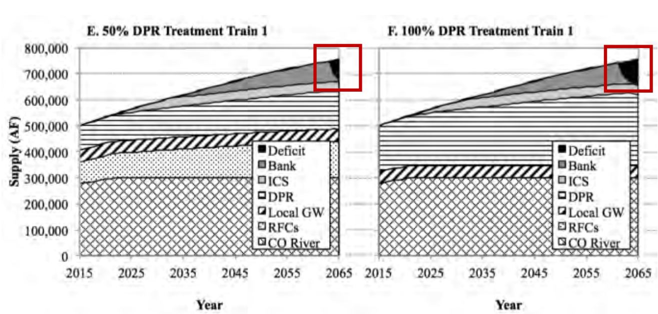


- **DPR Treatment Train 1** = MF + RO + UV AOP + DWTP (or direct distribution)



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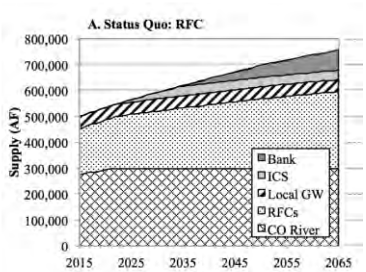
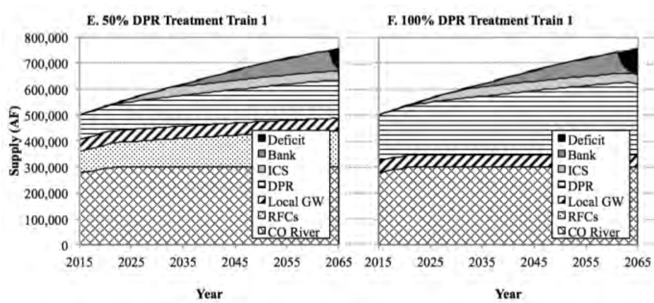
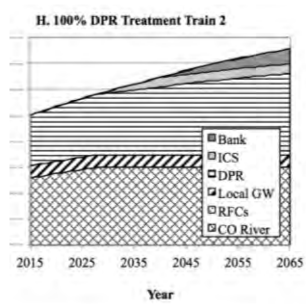


- **DPR Treatment Train 1** = MF + RO + UV AOP + DWTP (or direct distribution)
- **DPR Treatment Train 2** = UF + O_3 + BAC + UV AOP + DWTP (or direct distribution)





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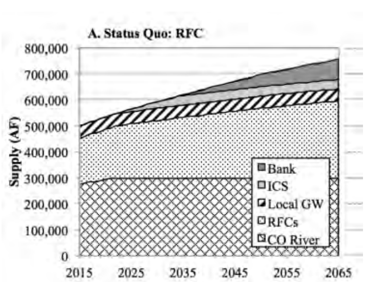
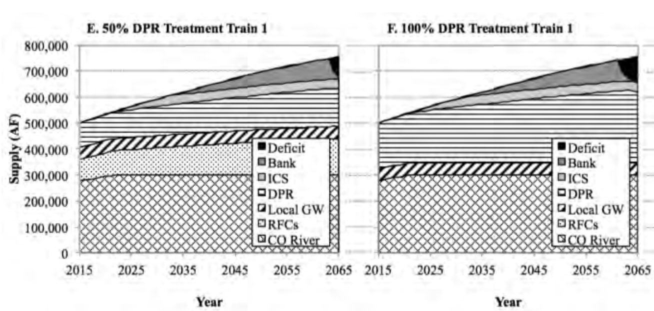
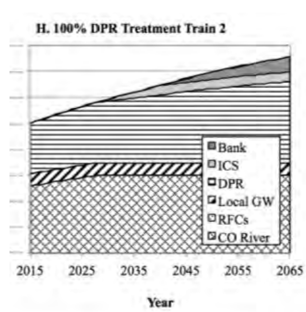


DPR offers no significant increase in permanent resources

- **DPR Treatment Train 1** = MF + RO + UV AOP + DWTP (or direct distribution)
- **DPR Treatment Train 2** = UF + O_3 + BAC + UV AOP + DWTP (or direct distribution)





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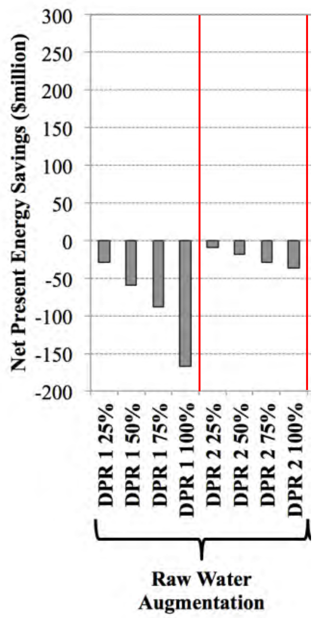
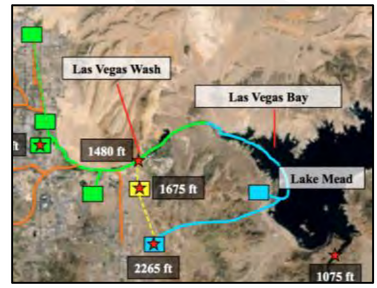
Potential Energy Savings – Pragmatic Legitimacy?

All calculations based on SNWA's historical electricity cost of $0.05/kWh





DPR Flow Rate in 2065:
DPR 25% ≈ 65 mgd
DPR 50% ≈ 130 mgd
DPR 75% ≈ 195 mgd
DPR 100% ≈ 260 mgd

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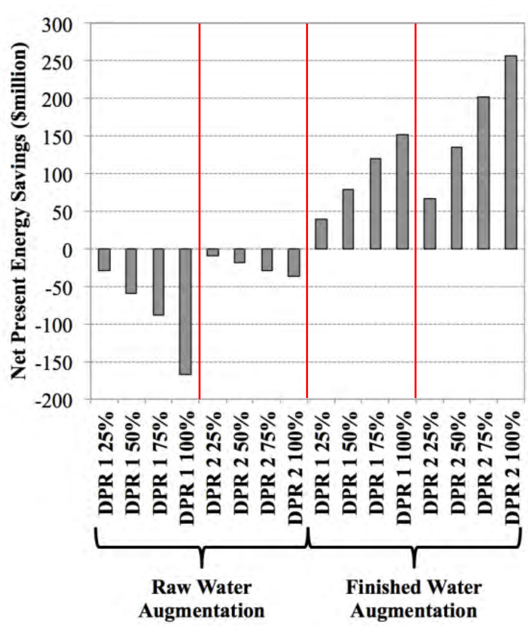
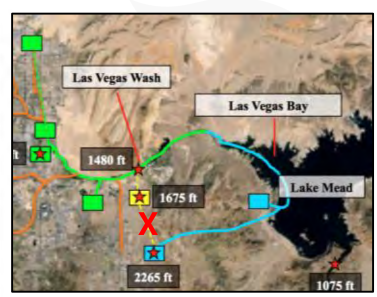
Potential Energy Savings – Pragmatic Legitimacy?

All calculations based on SNWA's historical electricity cost of $0.05/kWh





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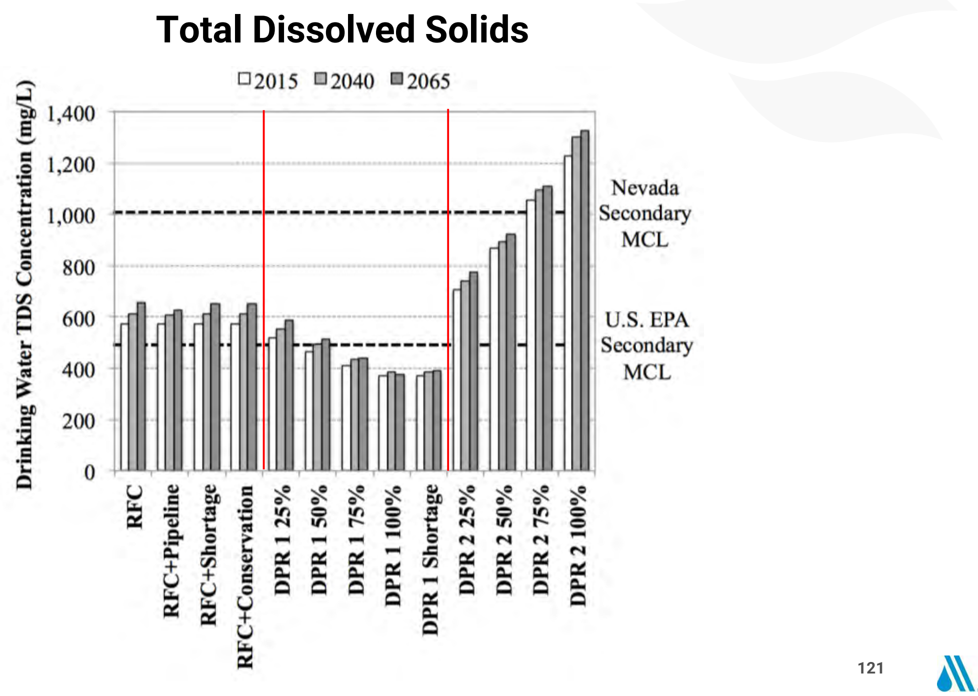
Total Dissolved Solids
□2015 ■2040 ■2065
Drinking Water TDS Concentration (mg/L)
1,400
1,200
1,000
800
600
400
200
0
Nevada Secondary MCL
U.S. EPA Secondary MCL
RFC
RFC+Pipeline
RFC+Shortage
RFC+Conservation
DPR 1 25%
DPR 1 50%
DPR 1 75%
DPR 1 100%
DPR 1 Shortage
DPR 2 25%
DPR 2 50%
DPR 2 75%
DPR 2 100%
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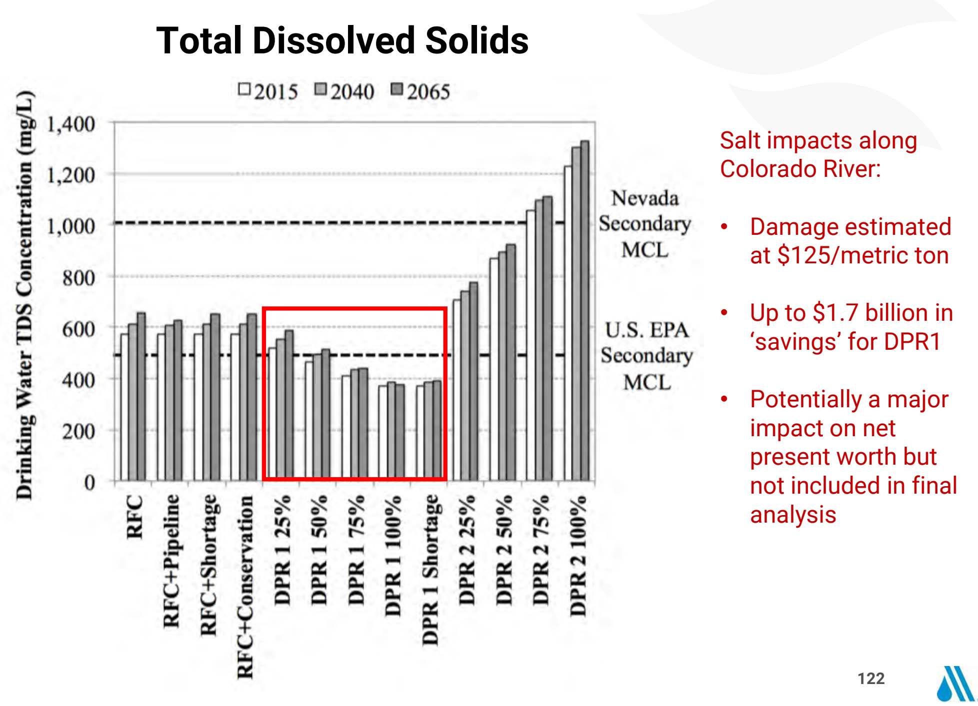
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DPR 1 25%
DPR 1 50%
DPR 1 75%
DPR 1 100%
DPR 1 Shortage
DPR 2 25%
DPR 2 50%
DPR 2 75%
DPR 2 100%
Salt impacts along Colorado River:
• Damage estimated at $125/metric ton
• Up to $1.7 billion in 'savings' for DPR1
• Potentially a major impact on net present worth but not included in final analysis
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Net Present Worth for 2015-2065 (2015 U.S. Dollars)

Scenario	Total Deficit MAF	Phase 1 Capital $M	Phase 2 Capital $M	NPW $M	NPW $/AF of DPR	NPW $/AF of RFC+DPR
RFC	0.019	N/A	N/A	$559	N/A	$45
RFC+Pipeline (in 2035)	0.000	$2,215	N/A	$2,774	N/A	$225
RFC+Shortage	0.618	N/A	N/A	$565	N/A	$46
RFC+Conservation	0.000	N/A	N/A	$574	N/A	$45
DPR with Finished Water Augmentation[a]						
DPR 1 25%	0.085	$313	$54	$1,569	$370	$128
DPR 1 50%	0.167	$546	$92	$2,382	$338	$196
DPR 1 75%	0.255	$758	$126	$3,135	$322	$260
DPR 1 100%	0.329	$921	$156	$3,827	$320	$320
DPR 1 100% Shortage	1.036	$919	$136	$3,655	$310	$310
DPR 2 25%	0.000	$224	$38	$1,000	$169	$79
DPR 2 50%	0.000	$395	$66	$1,316	$151	$102
DPR 2 75%	0.000	$553	$92	$1,599	$142	$122
DPR 2 100%	0.000	$675	$116	$1,821	$137	$137

Lower energy costs offer some pragmatic legitimacy,
but capital and overall O&M costs (energy, chemicals, labor, replacement)
are still too high to justify centralized DPR in Las Vegas.

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SUMMARY

- **Take-home message:** Insufficient pragmatic legitimacy to justify wide-scale implementation of DPR in Southern Nevada.

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SUMMARY

- **Take-home message:** Insufficient pragmatic legitimacy to justify wide-scale implementation of DPR in Southern Nevada.
- **Caveat 1:** Potable reuse is highly site-specific, with varying regulatory frameworks, levels of public acceptance, and practical considerations impacting its implementation in different areas → 'One size does not fit all'

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SUMMARY

- **Take-home message:** Insufficient pragmatic legitimacy to justify wide-scale implementation of DPR in Southern Nevada.
- **Caveat 1:** Potable reuse is highly site-specific, with varying regulatory frameworks, levels of public acceptance, and practical considerations impacting its implementation in different areas → 'One size does not fit all'
- **Caveat 2:** There may be more localized opportunities (decentralized systems) for IPR and DPR in Southern Nevada (not actively considered at this time)
  - $1.6 billion in expected construction for a new drinking water lateral (400 MGD)
  - $250 million in expected construction to supply industrial park (20 MGD)
  - $26 million to recapture Boulder City wastewater as return flow credits (1 MGD)

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SUMMARY

- **Take-home message:** Insufficient pragmatic legitimacy to justify wide-scale implementation of DPR in Southern Nevada.

- **Caveat 1:** Potable reuse is highly site-specific, with varying regulatory frameworks, levels of public acceptance, and practical considerations impacting its implementation in different areas → 'One size does not fit all'
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  - $250 million in expected construction to supply industrial park (20 MGD)
  - $26 million to recapture Boulder City wastewater as return flow credits (1 MGD)
- **Caveat 3:** Innovative partnerships to extend Southern Nevada's water supply
  - Funding conservation efforts in Mexico in exchange for Colorado River water
  - Funding potable reuse projects in California in exchange for Colorado River water

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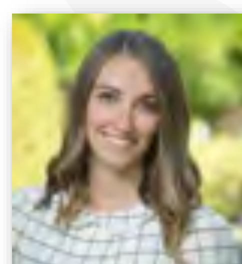
ASK THE EXPERTS

Dave MacNevin, PhD, PE
CDM Smith

Rosa Yu, PhD
Brown and Caldwell

Dr. Daniel Gerrity
Southern Nevada Water Authority



Lydia Peri, PE
Truckee Meadows Water Authority

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OneWater Nevada
Our Sustainable Water Future

ONEWATER NEVADA ADVANCED PURIFIED WATER DEMONSTRATION

Lydia Peri, P.E.
Emerging Resources Program Administrator
Truckee Meadows Water Authority

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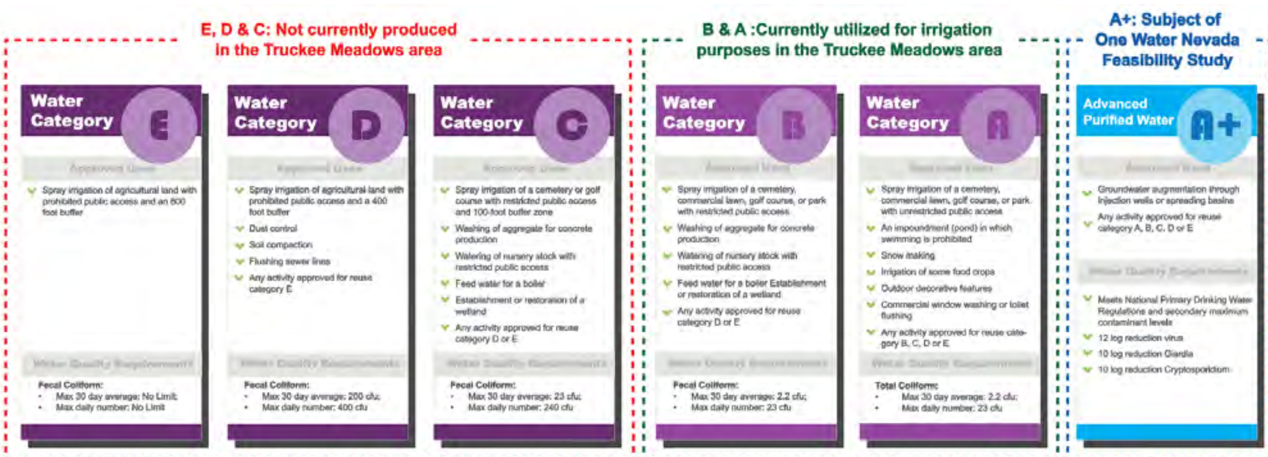
STATE OF NEVADA RECLAIMED WATER REGULATIONS

The A+ water category was established in 2016 by the Nevada Division of Environmental Protection.
It requires treatment to drinking water standards and allows for direct injection into groundwater aquifers.



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ONEWATER NEVADA FEASIBILITY STUDY

- **Purpose**
  - Determine if Nevada's newly adopted Category A+ for reclaimed water offers water management opportunities for the Truckee Meadows Region.

- **Key Questions**
  - What would be the social, economic, and environmental impacts?
  - How to ensure A+ water would be a safe, sustainable, and a reliable resource?
  - Can local aquifers be used for long-term water storage?
  - How to encourage public engagement?

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DEMONSTRATIONS AND INVESTIGATIONS

- **Treatment Technology Demonstration Projects**
  - 2017 - 2019 at South Truckee Meadows Water Reclamation Facility
  - 2019 - 2020 at Reno-Stead Water Reclamation Facility
  - 2019 - 2020 at Cold Springs Water Reclamation Facility

- **Groundwater Aquifer Investigations**
  - 2018 - 2019 at American Flat Road
  - 2018 - 2020 at Bedell Flat

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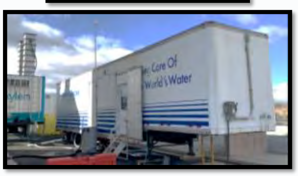
ONEWATER NEVADA SELECTED TECHNOLOGIES



Conventional Filtration


Ozone Biological Filter


GAC and UV

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CONVENTIONAL FILTRATION

- Conventional drinking water process
- Coagulation, Flocculation, Clarification, Granular Media Filtration
- Trident HS by WesTech – same treatment process as new local drinking water facility
- Goals: pathogen and turbidity reduction
- New to wastewater applications

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OZONE BIOLOGICAL ACTIVE FILTRATION

- Xylem Oxelia Pilot
- Operated in Reno since 2017
- Ozone generated onsite and doses at 0.9-1.5 ratio of ozone/influent TOC
  - Ozone oxidizes and degrades organic compounds such as pharmaceuticals, CECs
- Filtered through a biologically active carbon filter
  - Organic compounds are adsorbed and concentrations are significantly reduced
- Must consider bromate and disinfection by-product formation

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GAC AND UV DISINFECTION

- Granular activated carbon vessels for TOC removal
  - Acts as a polishing step
- Ultraviolet disinfection for pathogen and virus reduction/inactivation
  - Removes NDMA and other ozonated by-products
- Trailer owned by OneWater Nevada team
- Can be a research platform for universities and other cities

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AMERICAN FLAT RD HYDROLOGICAL STUDY

- **Phase 1: Potable Recharge - complete**
  - ~500 gpm for 4 months potable drinking water
  - Understanding the geology, hydrogeology, aquifer properties, and potential recharge storage volume
  - Groundwater model for long-term predictions
- **Phase 2: A+ Recharge – TBD**
  - Potential site to recharge A+ effluent
  - Conduct extensive water quality sampling at a later date

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Technical Indications

- Conventional water treatment approaches show promise
- Near-term focus will address pathogen log removal value validations and unregulated organic constituents
- Multiple pilot-scale treatment processes are challenging to integrate and operate
- Fast learning curve regarding operator and maintenance staff requirements
- Sampling and monitoring plans are much more challenging to produce and implement than anticipated

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SOCIAL ASPECTS FOR THE SUCCESS OF THE PROGRAM

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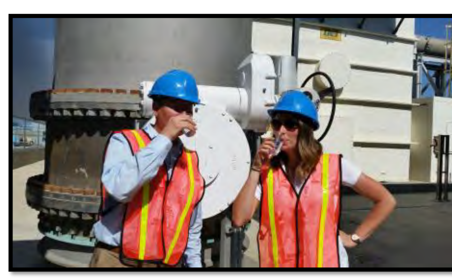
FEASIBILITY STUDY NEXT STEPS

- Technical Work
  - Pilot study completion in 2020
  - Independent expert panel input
  - Larger demonstration facility
- Community Elements
  - Regulatory agency engagement
  - Broadening public education opportunities
  - Gathering public officials input
  - Community leaders field trips



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SOCIAL ASPECTS FOR THE SUCCESS OF THE PROGRAM

Truckee Meadows Water Authority – Quality. Delivered.
Western Regional Water Commission
City of Reno
City of Sparks
Washoe County, Nevada 1861
University of Nevada, Reno
The Water Research Foundation – www.waterrf.org
Northern Nevada Water Planning Commission
Nevada DOT
xylem – Let's Solve Water
TrojanUV – Water Confidence
suez
U.S. Department of the Interior – Bureau of Reclamation
WesTech
Stantec
American Water
Coombs-Hopkins
KG Walters Construction

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American Water Works Association
Dedicated to the World's Most Important Resource®

CONTACT INFORMATION

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Truckee Meadows Water Authority
lperi@tmwa.com

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Please specify to whom you are addressing the question.

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ADDITIONAL RESOURCES

- AWWA's Reuse Resource Community
- M50 Water Resources Planning, 3rd Edition
  - AWWA catalog no: 30050-3E

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UPCOMING WEBINARS

May 6 - What's New with Cyanobacteria and Cyanotoxins: A Review of Leading Research

Aug 5 - Disinfection By-Products: Perspectives on Formation, Control and Mitigation

Oct 28 - A Closer Look at New and Not so New CEC's: PFAS, Microplastics and Solvents

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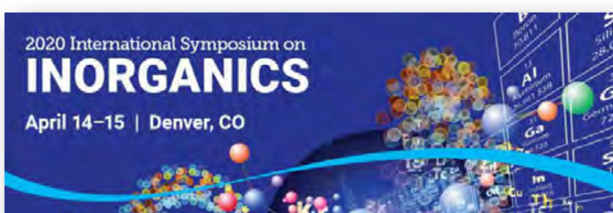
UPCOMING CONFERENCES



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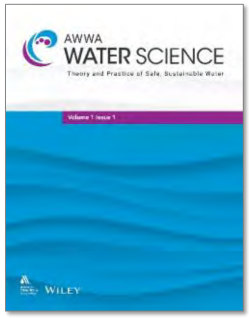
AWWA WATER SCIENCE
Theory and Practice of Safe, Sustainable Water

"The wide-ranging original research published in *AWWA Water Science* contributes to improvements across the water industry. By publishing your innovations and advances in AWS, you are bettering the health and economy of communities around the world."

– Kenneth Mercer, Ph.D.,
EDITOR-IN-CHIEF

awwawaterscience.com



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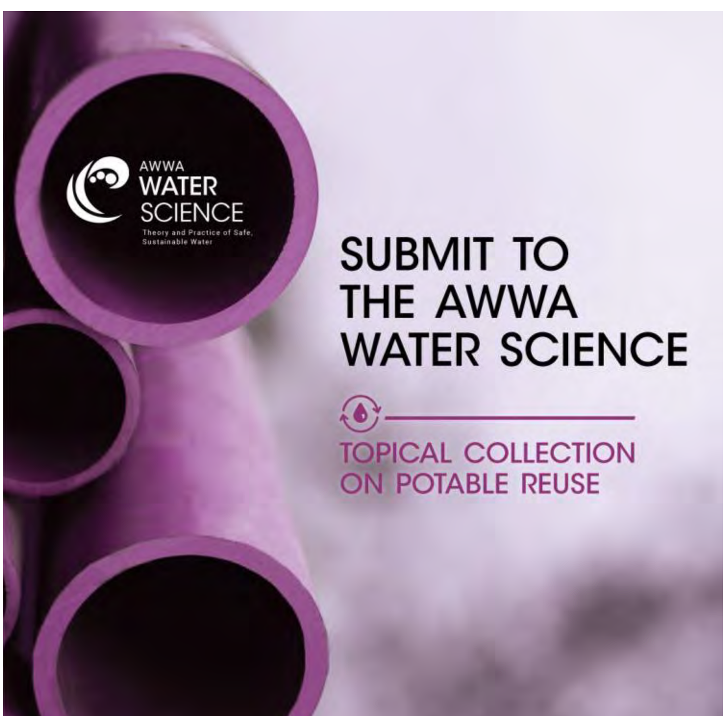

This topical collection in *AWWA Water Science* will capture the state of the science on potable water reuse.

Potable Reuse Topics
With topics that include treatment, operations, monitoring, regulatory compliance, outreach, and more, this collection aims to identify gaps in knowledge and to chart a course for future water reuse research.

Special Issue Editor
Kerry Howe (University of New Mexico)

Associate Editors
Brent Alspach (Arcadis)
Christopher Bellona (Colorado School of Mines)
Julie Minton (The Water Research Foundation)
George Tchobanoglous (UC Davis)

Submission Deadline
April 1, 2020
Learn more at **awwa.org/reusecollection**

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THANK YOU FOR JOINING TODAY'S WEBINAR

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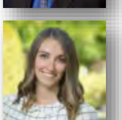
PRESENTER BIOGRAPHY INFORMATION

Water reuse and desalination expert, Dr. Dave MacNevin is an Environmental Engineer at CDM Smith. He has 14 years of environmental consulting experience in the testing, design, and implementation of drinking water and advanced water reuse treatment systems. Dave has also assisted 7 utilities in Florida, California, Oklahoma, and South Carolina in in the evaluation, design, and operation of potable reuse programs at varying stages.

Dr. Rosa Yu is an environmental process engineer at Brown and Caldwell. Before joining Brown and Caldwell, Rosa was a postdoctoral research associate at the University of Colorado Boulder. Rosa's research focuses on the evaluation of ozone, biofiltration, and adsorption by GAC as an alternative treatment approach to reverse osmosis for potable reuse. Rosa is currently leading the development and implementation of ozone-biofiltration-centered treatment trains at Brown and Caldwell.

Dr. Daniel Gerrity earned his Ph.D. in Civil & Environmental Engineering at Arizona State University. After graduation, he worked as a Postdoctoral Researcher at the Southern Nevada Water Authority and as a Senior Engineer for Trussell Technologies. Dr. Gerrity then spent 7 years as an Assistant and Associate Professor in Civil & Environmental Engineering at UNLV where his teaching and research interests focused on water reuse. Dr. Gerrity is now a Principal Research Scientist in the Water Quality R&D group at SNWA.



Lydia Peri is the Emerging Resources Program Administrator at Truckee Meadows Water Authority. Lydia is a registered professional environmental engineer in the state of Nevada. Lydia earned a bachelor's in ecohydrology from UNR, dual master's in hydrogeology and civil and environmental engineering from UNR and is a Ph.D. candidate at UNR in the Environmental Engineering Program. Her current role at TMWA is to manage the OneWater Nevada demonstration project. In this role, she is responsible for maintaining the operation of the advanced water treatment pilots while serving as the center link between UNR students, operators, equipment manufacturers, hydrogeologists and communications specialists.

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AWWA WEBINAR
MARCH 20, 2020 | 11:00 A.M. - 12:30 P.M. MST
Free Webinar
Utility Actions to Sustain Operations During COVID-19
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WEBINAR MODERATOR

Kevin Morley
Federal Relations Manager
American Water Works Association

Kevin Morley is respected for advancing the security and preparedness of the nation's critical infrastructure, having worked with multiple AWWA standards and technical committees, the Water Sector Coordinating Council, and WARNs in an effort to advance the resiliency of the water sector. This includes guiding the development of a cybersecurity risk management a strategy that is aligned with the NIST Cybersecurity Framework. Dr. Morley received his PhD from George Mason University for research in assessing the resilience of the water sector; he also holds an MS from SUNY College of Environmental Science and Forestry and a BA from Syracuse University.

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PANEL OF EXPERTS

Sandy Smith
DeKalb County Watershed Management

Joey Witcher
Sinclair Water Authority

Alan Roberson
Association of State Drinking Water Administrators

Dawn Ison
U.S. EPA Office of Water, Water Security Division

Ray Riordan
City of San Jose / CalWARN

7

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AGENDA

I.	Utility Actions to Sustain Operations During COVID-19	Kevin Morley
II.	Department of Watershed Management, Water Production Division COVID-19 Response	Sandy Smith
III.	COVID-19 Response Plan Template	Joey Witcher
IV.	State Primacy Agencies' Response to COVID-19	Alan Roberson
V.	EPA Tools and Products	Dawn Ison
VI.	San Jose Continuous Operations Plan	Ray Riordan

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ASK THE EXPERTS

Kevin Morley
American Water Works Association

Sandy Smith
DeKalb County Watershed Management

Joey Witcher
Sinclair Water Authority

Alan Roberson
Association of State Drinking Water Administrators

Dawn Ison
U.S. EPA Office of Water, Water Security Division

Ray Riordan
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American Water Works Association

Dedicated to the World's Most Important Resource®

UTILITY ACTIONS TO SUSTAIN OPERATIONS DURING COVID-19

10

KEY PANDEMIC CONSIDERATIONS

www.awwa.org/coronavirus

- Workforce contingency to sustain operations
- Coordination with local public health officials to ensure workforce access to facilities and can make necessary repairs to distribution or collection systems if travel restrictions are imposed in a community.
- Communicate frequently with suppliers of essential treatment chemicals and supplies.
- Communicate with your customers about the safety of the water supply per EPA and CDC guidance.
- Consider alternative payment methods for typical face-to-face transactions with customers.
- Consider postponing customer shut-offs to sustain hygiene and sanitation during the outbreak.

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AWWA SURVEY OF COVID-19 IMPACTS ON WATER SECTOR

Overview: AWWA surveyed utilities and other sector organizations to gauge the initial impacts of COVID-19 and actions being taken to manage risk and plan for contingencies. The results represent a snapshot of time of the survey period below. AWWA is planning to re-survey the week of March 22 to see how the landscape is changing in this rapidly evolving situation.

Survey Period: March 10 -16, 2020.

Response Summary:

Total Reponses:	495
Utility Responses:	335
Unique Utilities:	286
Non-Utility Responses*:	160

Margin of Error: +/- 6% utility responses
+/- 8% non-utility respondents

Confidence Level: 95%

*Non-Utility includes consultants, manufacturer & related, academic/nonprofit, government, and other

Key Takeaways:

- Eighty-two percent of utilities have business continuity plans (BCPs) in place or are in the process of developing them. 10% have plans to develop BCPs.
- Absenteeism/continuity of operations is the top concern for all respondents
- Some supply chain concerns are anticipated
- No adverse affects on budget, revenue, or spending restrictions for a majority of utilities at this time
- COVID-19 is affecting water professionals’ personal decisions, including more likely to minimize business travel, work from home (if any option), and use sick days if experiencing cold/flu symptoms.

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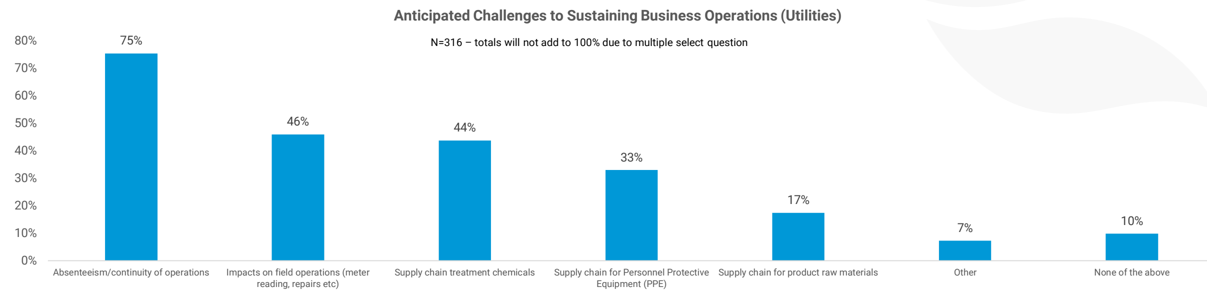
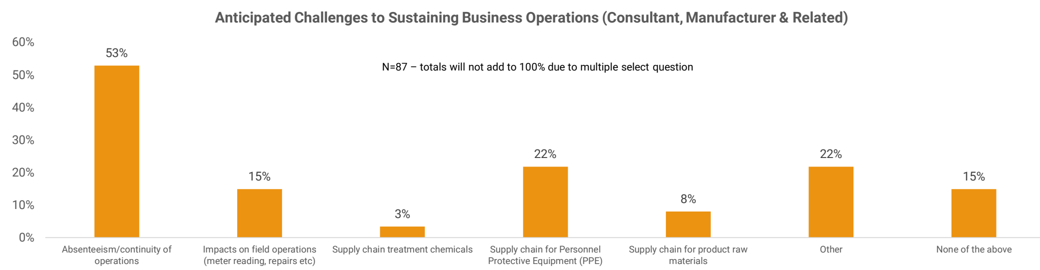
WHAT CHALLENGES TO SUSTAINING BUSINESS OPERATIONS IS YOUR ORGANIZATION ANTICIPATING DUE TO COVID-19? (SELECT ALL THAT APPLY)





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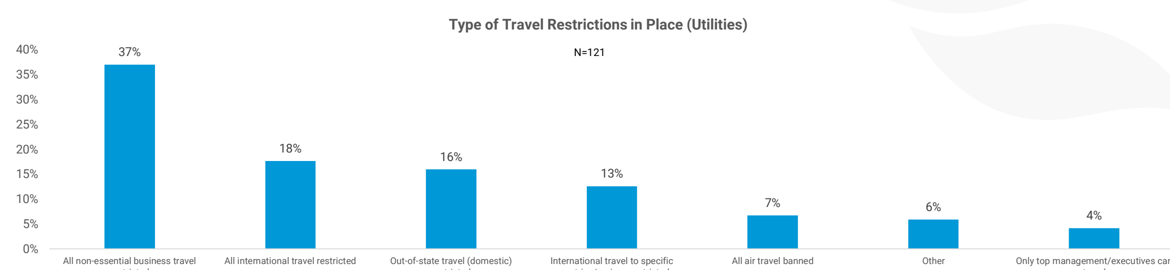
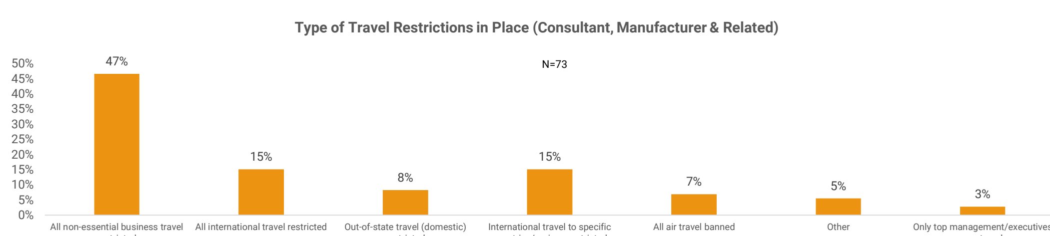
WHICH OF THE FOLLOWING BEST DESCRIBES YOUR ORGANIZATION'S TRAVEL RESTRICTIONS? (SELECT ALL THAT APPLY)





Non-essential travel includes: Conferences, trainings, meetings that can be done remote, etc.

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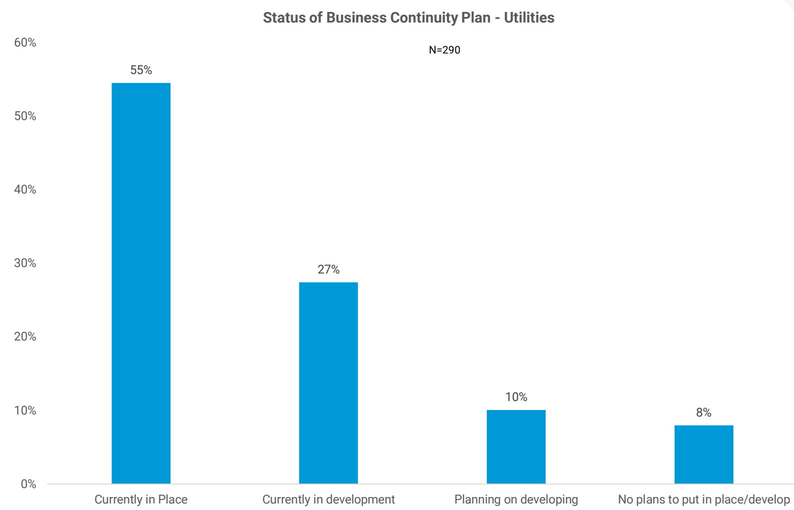
PLEASE INDICATE WHICH OF THE BELOW YOUR ORGANIZATION HAS IN PLACE OR IS DEVELOPING TO MANAGE RISK/PLAN FOR CONTINGENCIES DUE TO COVID-19



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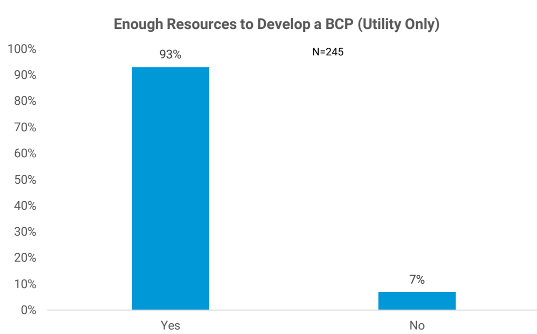
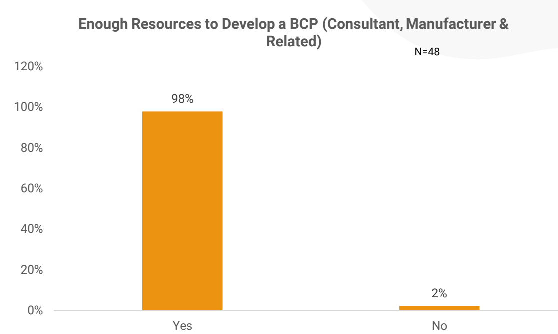
DO YOU FEEL THERE ARE ENOUGH RESOURCES TO HELP YOUR ORGANIZATION DEVELOP A BUSINESS CONTINUITY PLAN?





A few suggestions added in open end text box for this question:
"Yes, but would be curious to know what other organizations are doing as well"
"Plan yes, but implementing is a question"

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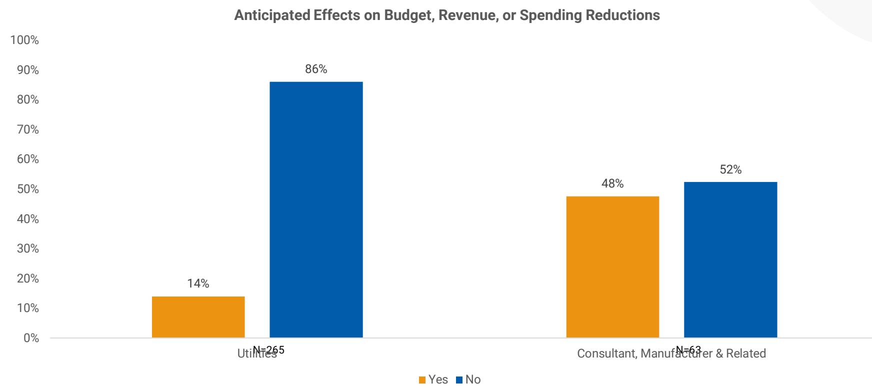
IS COVID-19 CURRENTLY OR POTENTIALLY PRESENTING ANY BUDGETARY, REVENUE, OR SPENDING REDUCTIONS?



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ESSENTIAL CRITICAL INFRASTRUCTURE WORKFORCE

This guidance is intended to support State, Local, and industry partners in identifying the critical infrastructure sectors and the essential workers needed to maintain the services and functions Americans depend on daily and that need to be able to operate resiliently during the COVID-19 pandemic response.

WATER AND WASTEWATER

Employees needed to operate and maintain drinking water and wastewater/drainage infrastructure, including:

- Operational staff at water authorities
- Operational staff at community water systems
- Operational staff at wastewater treatment facilities
- Workers repairing water and wastewater conveyances and performing required sampling or monitoring
- Operational staff for water distribution and testing
- Operational staff at wastewater collection facilities
- Operational staff and technical support for SCADA Control systems
- Chemical disinfectant suppliers for wastewater and personnel protection
- Workers that maintain digital systems infrastructure supporting water and wastewater operations

https://www.cisa.gov/identifying-critical-infrastructure-during-covid-19

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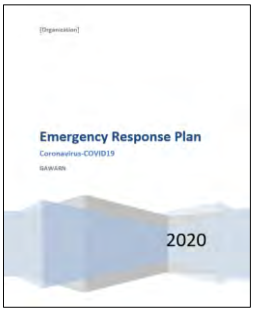
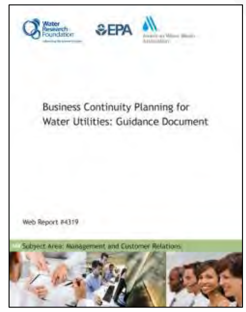
RESOURCES TO SUPPORT UTILITY ACTIONS



Discussed by Sandy Smith & Joey Witcher, GAWARN

Based on Van Atta, P. (2008). *Water System Preparedness for Pandemic Influenza*. Wright State University, Dayton, Ohio.



www.awwa.org/coronavirus
www.epa.gov/coronavirus
www.cdc.gov/coronavirus
www.waterisac.org
www.wef.org/coronavirus
www.waterrf.org/

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ASK THE EXPERTS

Kevin Morley
American Water Works Association

Sandy Smith
DeKalb County Watershed Management

Joey Witcher
Sinclair Water Authority

Alan Roberson
Association of State Drinking Water Administrators

Dawn Ison
U.S. EPA Office of Water, Water Security Division

Ray Riordan
City of San Jose / CalWARN

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DeKalb County
GEORGIA

DEPARTMENT OF WATERSHED MANAGEMENT
Water Production Division
COVID-19 Response
3/20/2020

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DeKalb County
GEORGIA

OUTLINE

- INTRODUCTION TO DEKALB
- SITUATIONAL AWARENESS
- COOP & PANDEMIC PLANNING GUIDE
- EMERGENCY OPERATIONS & ASSOCIATED SUPPORT

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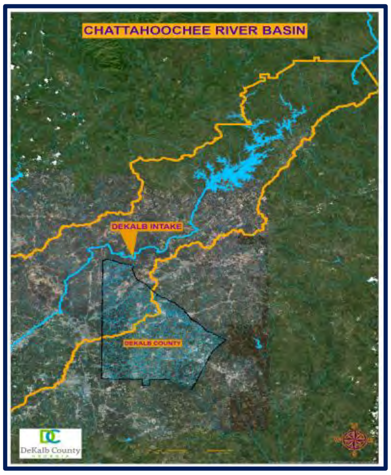
DRINKING WATER SOURCE



- Chattahoochee River
- 1 major reservoir – Lake Lanier
- River flow controlled by U.S. Corps of Engineers
- Supplies:
  - 12 Metropolitan Atlanta counties
  - South Georgia farmers
  - Florida
- Permitted withdrawal = 140 MGD

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DeKalb County
GEORGIA

SCOTT CANDLER WATER FILTER PLANT

- Serves entire County – 730,000
- Interconnections to 4 other counties
- Permitted at 128 MGD
- Capacity 200 MGD

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DeKalb County
GEORGIA

AWARENESS

- Dec 2019 - Started monitoring outbreak in China
- Rapid planning started with spread to South Korea, Italy, Middle East, etc.
- DEMA EOC activation prior to first cases in the US
- Water Production staff met with Emergency Management staff

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GEORGIA

AWARENESS

WATERSHED MANAGEMENT

CONTINUITY OF OPERATIONS PLAN
(COOP)

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GEORGIA

ACTIONS

- Distributed the plan to staff for situational awareness
- Covered Concept of Operations (CONOPS), activation, alternate locations, services & support, etc
- Started Water Production Division / Scott Candler Water Treatment Plant plan revision based on Pandemic Planning Guide

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DeKalb County
GEORGIA

PPG

<u>Pandemic Planning Guide</u>

Preparedness

- Develop a communication plan/phone tree for key staff and management within the organization- (*Overall*)
- Develop flexible leave policies to allow personnel to stay home to care for sick family members or for children if schools dismiss students or child care programs close- (*Overall*)
- Establish policies and practices, such as flexible worksites (telecommuting) and flexible work hours (staggered shifts) when possible to increase the social distancing between personnel at work- (*Overall*)

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PPG

Preparedness continued

- Notify all personnel of the organization's Pandemic Influenza plan to explain what policies are in place, including workplace/leave flexibilities, pay, and benefits- (*Overall*)
- Purchase supplies to encourage healthy habits in the workplace, including tissues, soap, and alcohol-based hand cleaners- (*Overall*)
- Order vaccine for Key Staff/High Impact staff members- (*Overall*)
- Ensure adequate supplies of hand sanitizer are maintained and placed in multiple locations in the workplace- (Overall)

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GEORGIA

PPG

Preparedness continued

- Encourage respiratory etiquette by providing education and reminders about covering coughs and sneezes with tissues- (*Overall*)
- Develop Pandemic Flu family planning guidelines and distribute to all personnel- (*Overall*)
- Dispense preventative vaccine to Key Staff/High Impact staff members- (*Overall*)

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Response

- Prioritize life safety. - (*Overall*)
- Ensure the safety and accountability of all personnel- (*Overall*)
- Check-in with immediate supervisor on a regular basis to report status and availability- (*Overall*)
- Personnel with symptoms should notify their supervisor and stay home- (*Overall*)

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PPG

Response continued

- Advise personnel to be aware of any signs of fever or other influenza-like illness before reporting to work each day- (*Overall*)
- Conduct active screenings of personnel when they arrive at work- (*Overall*)
- Clean commonly touched surfaces such as workstations, countertops, doorknobs, and light switches- (*Overall*)
- Close all non-essential facilities such as fitness centers, lunchrooms, and other high congregation areas- (*Overall*)

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PPG

Recovery

- Provide Critical Incident Stress Debriefing (CISD) to all responders and employees- (*Overall*)
- Report any deaths or injuries to Human Resources- (*Overall*)
- File necessary claims- (*Overall*)
- Reassign critical responsibilities to available personnel- (*Overall*)

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PPG

Mitigation

- Provide security for facility- (*Overall*)
- Develop a business impact analysis to determine the potential effects on the workplace due to increased absenteeism generated by a pandemic flu event- (*Overall*)
- Review the comprehensive emergency management plan quarterly and update as necessary- (*Overall*)

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ACTIONS

NEXT STEPS……..

- Staff input incorporated into Mr. Witcher`s template.
- Distributed to staff and senior leadership for comment
- Finalized the DRAFT plan.

THE FOLLOWING ARE HEIGHTENED OPERATIONAL ACTIONS TAKEN

35

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GEORGIA

ACTIONS

Starting at the Plant Entrance

Coronavirus 2019 (COVID-19) Screening Questionnaire

1. **Have you traveled outside of the country in the last 14 days?**
   Yes ☐ No ☐
2. **Have you had contact with anyone with confirmed COVID-19 in the last 14 days?**
   Yes ☐ No ☐
3. **Have you had any of these symptoms in the last 14 days?**

- Fever greater than 100: Yes ☐ No ☐
- Difficulty breathing: Yes ☐ No ☐
- Cough Yes ☐ No ☐

4. **Are you currently experiencing fever over 100, difficulty breathing or cough?**
   Yes ☐ No ☐

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ACTIONS

Staffing
- Three phases of scheduling…normal, reduced and inclement weather / facility lockdown.

Chemical monitoring
- Keep everything topped off
- Constant contact with suppliers
- Identify extra emergency storage

Communication protocols
- Plant training room also serves as an EOC.
- Full functionality test.
- Updated emergency contact list.
- More detailed shift reports.

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GEORGIA

ACTIONS

Staff support
- Took inventory of all First Aid Kits and medical supplies.
- In addition, placed infrared thermometer in room for staff self checks.
- Stocked up on PPE, wipes, hand sanitizer, etc.

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GEORGIA

ACTIONS

Bunker check

- Emergency quarters for staff.
- Cots, bedding and personal hygiene items for 7. Private individual quarters.
- 400 meals (MRE`s) in stock at all times.

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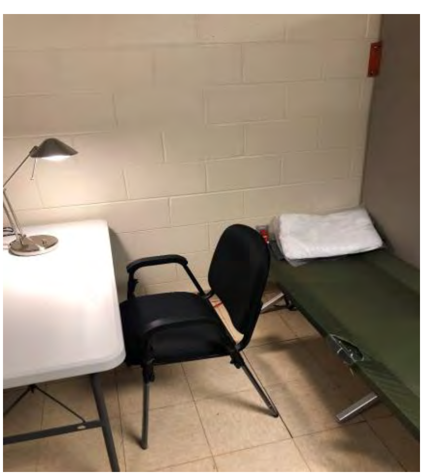
GEORGIA

ACTIONS



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DeKalb County
GEORGIA

ACTIONS

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DeKalb County
GEORGIA

Manager – Sandy Smith
Assistant Manager - John Patterson
Plant Operations Superintendent – Vernon Grant
Maintenance Superintendent – Jeff Winters
Instrumentation & Control Superintendent – Floyd Askew

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ASK THE EXPERTS

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American Water Works Association

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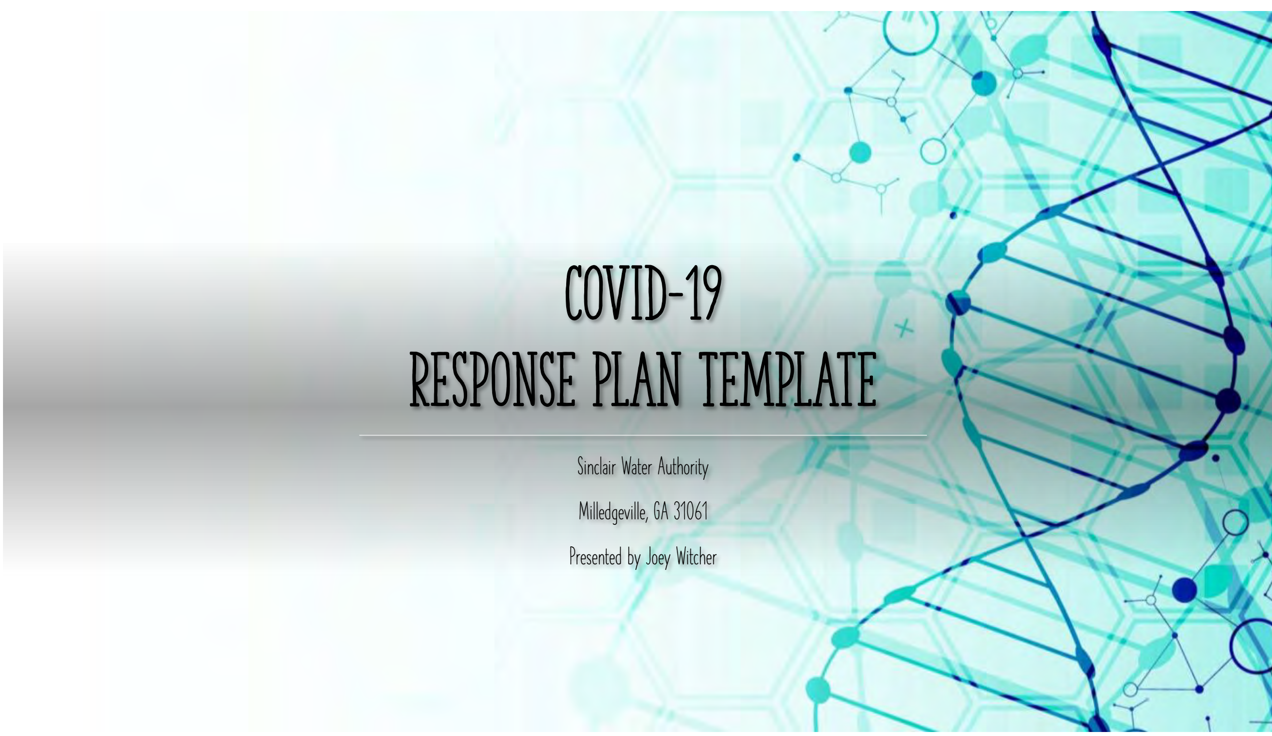

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INTRODUCTION TO THE TEMPLATE

- Template Mission Statement
- Plan Mission Statement
- Precautionary Steps
- Reactionary Steps
- Critical Supplies
- Safe Practices at work
- Reduced Workforce Plan
- Chain of Command
- Emergency Contacts
- Wrap Up

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TEMPLATE MISSION STATEMENT

This Template is intended to assist Utilities in the development of a plan in response to an infectious disease outbreak/pandemic and should be considered a guide. It is not comprehensive and is suggestive in its nature.

Recommendation:

The Mission statement and therefore the mission of your plan should be simple, easily read and understood.

The Plan itself should not be overly specific or complicated. Supporting materials can be as detailed as needed and the plan should lead the reader to those resources as needed.

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PLAN MISSION STATEMENT

"This Emergency Response Plan, known hereafter as 'The Plan', is intended to offer guidance in decision making to SWA staff and management during an outbreak of an infectious disease. "

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PRECAUTIONARY STEPS

This Section Should:

- List resources available for education about the specific contagion
- Should remind employees that they should monitor their own condition
- Include specific symptoms when available
- Include infection preventive measures
- Remind employees to monitor the status of any outbreak

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Reactionary Steps

This section list specific steps that can be taken to protect Employees and ensure that critical supplies are not exhausted.

There is no practical way to predict and plan for every situation, therefore this section should be fluid, allowing the decision makers to adjust, exclude or add steps.

Utilities with large workforces may wish to designate specific people as decision makers for this section so that implementation/retraction can happen without bureaucratic interference.

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CRITICAL SUPPLIES

Although part of the “Reactionary Steps” section, the background work for this section should be performed in advance of a pandemic

-Maximum inventory levels, number of days of supply, normal lead times for deliveries and possible alternative storage and supplies should be included in this section or in a separate linked document

-Inventories of critical supplies should be kept at their highest safe levels

-Critical Supplies include anything necessary to perform the entity’s normal function

-Include Safe Practices for receiving shipments

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CHEMICAL DELIVERY PAPERWORK DEPOSITORY

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SAFE PRACTICES AT WORK

The goal of this section is to give the employee with the least amount of understanding of the contagion practical steps to conform to that will minimize the chance that they get infected or infect others.

The steps should be precise and as easy to follow as possible to ensure compliance. Remember non-compliance of a complicated plan equals no plan.

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REDUCED WORKFORCE PLAN

This section is intended to address the possibility of workers becoming ill or quarantined and dropping from the workforce.

Include sample schedules or alternating workers as groups for extended periods.

Utilities may also wish to include the contact information of other entities with the capability to operate their facilities should the entire workforce become quarantined.

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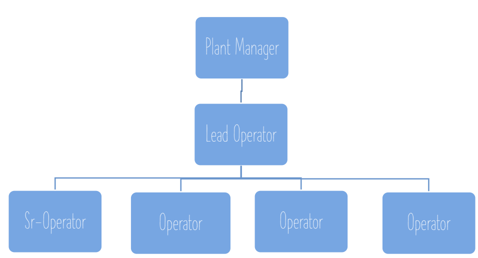
CHAIN OF COMMAND

The purpose of this section is to ensure that the decision-making structure continues as people leave the workforce.

This part of the plan must be worked out in advance and rigidly adhered to. Any gaps may cause conflict during the high stress of a reduced workforce.



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EMERGENCY CONTACTS

- Include contacts for state primacy, additional operations resources, alternate critical supply vendors, supporting utilities and any other resources which may be useful.
- Highlight critical contacts in the document such as: state primacy and alternate operational resources so that they can be identified quickly when using the list.

55

WRAP UP

- Fluidity is key for success
- Being able to improvise can mean the difference in success and failure

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ADDITIONS TO THE SWA PLAN SINCE IMPLEMENTATION

Sinclair Water Authority has already modified the plan since its implementation.

Here are a some of those modifications:

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DELIVERY BIN: SWA HAS ADDED A BIN FOR SMALL PACKAGE DELIVERIES

58

DELIVERY BIN: SWA HAS ADDED A BIN FOR SMALL PACKAGE DELIVERIES

SWA Staff came to the realization that in a normal day Staff members interact several times with package delivery drivers.

SWA placed a temporary bin at the gate for deliveries.

Packages are placed in the bin by the driver. If a package requires a signature the same procedure is followed as when the chemical delivery drivers are on site.

Packages are left in the bin until disinfected.

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FORKLIFT

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FORKLIFT

The company SWA normally uses for forklift repairs is not taking service calls. If either of our lifts need repair, SWA will have to use one lift at both, our intake and main plant. SWA will need to arrange for the operable lift to be transported between the two locations.

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SOP MANUAL

- SWA is currently updating its SOP manual to make sure it is complete and has the latest version of all operational manuals, checklist and procedures in it.
- SWA will place a copy of the complete manual in the office in a conspicuous place. In the event the staff has to be quarantined outside operations will need to have specific directions to operate the plant.
- Make sure to structure your SOPs so that you could walk into your plant, without prior experience there, start it up, shut it down and perform all normal daily task without instruction from anyone who works there.

62

CHECK LIST

The Importance of comprehensive checklist can not be overstated.

Again use the mindset of coming into your plant with no experience there. This mindset will help you to create good checklist of all daily duties so that nothing is left undone.

63

Night Shift Checklist

	Week of _______ - _______						
Daily	S	M	T	W	T	F	S
Instrument Verification in Lab & HS Bldg (if used)							
Standardize pH Meter in Lab							
Drain & Rinse Settled Turbidimeter							
Record Chemical Levels							
Complete Daily Reports							
Clean Lab @ end of shift							
Check/Clean Designated Cleaning Area							
Flush Lime Lines							
Trash as scheduled							
Weekly							
Sunday - Aluminum Test							
Jar Test							
Monday - Clean Bubble Trap during Recovery Clean							
Tuesday - THMs							
Neutralize Manganese Bottles							
Wednesday - Calibrate pH meter & clean probe in HS & Pre CW							
Clean CL17s in HS & Pre CW							
Friday - Neutralize Manganese Bottles							
Monthly							
Clean on-line Turbidimeters	Date-					Name	
Plant Safety Check as scheduled	Date-					Name	
Comments :							

	Week of _______ - _______						
Daily	S	M	T	W	T	F	S
Instrument Verification in Lab & HS Bldg (if used)							
Standardize pH Meter in Lab							
Drain & Rinse Settled Turbidimeter							
Record Chemical Levels							
Complete Daily Reports							
Clean Lab @ end of shift							
Check/Clean Designated Cleaning Area							
Flush Lime Lines							
Trash as scheduled							
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Neutralize Manganese Bottles							
Wednesday - Calibrate pH meter & clean probe in HS & Pre CW							
Clean CL17s in HS & Pre CW							
Friday - Neutralize Manganese Bottles							
Monthly							
Clean on-line Turbidimeters	Date-					Name	
Plant Safety Check as scheduled	Date-					Name	
Comments :							

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Day Shift Checklist

SINCLAIR WATER AUTHORITY — Week of: 3/15/2020

Dayshift Daily	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Standardize Accumet & Oakton ph Meter							
3 Hr Lab Test-See Lab Sheet							
Alkalinity, CLO2, Fluoride & Phosphate Finished Lab Test							
Intake Check							
RAW (Intake)-Manganese & Iron Lab Test							
RAW- (Intake) TOC Analyze							
Record Bi-Hourly							
Daily Shift Check							
Daily Train Cleans							
Record MIT's							
Check chemical levels							
Transfer chemicals as needed							
Order chemicals as needed							
Review previous days work, Verify State Report & Flows Input and file							
Record River Levels							
Sweep and Dust on Sundays	S & D	X	X	X	X	X	X
TSS Samples on Tuesdays	X	X	TSS	X	X	X	X
Draw Downs on Wednesdays	X	X	X	Drawdowns	X	X	X
Check Flow Rates on each Train							
Check CL17 Analyzers in CW & HSPS							
Drain outside containments if needed							
Flush Lime							
Trash							

Record in computer daily	NOTES:
Lab Results	
Bi_hourly	
Manganese Results	
Filter Cleans	
MIT results	
TOC's	
River Levels	

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CLOSING: DON'T PANIC, PLAN

There is a saying we like to repeat in the Fire Service, Author unknown,

" Courage is being the only person in the room that knows you're scared"

Having a plan and adhering to it breeds confidence in those that you are leading and that is priceless for morale in a stressful situation.

Make a plan. Work the plan. Evaluate the plan and adjust if needed.

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CONTACT INFO:

Sinclair Water Authority
Milledgeville, GA
706-485-8993

Joey Witcher
j.witcher@sinclairwaterauthority.com

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ASK THE EXPERTS

Kevin Morley
American Water Works Association

Sandy Smith
DeKalb County Watershed Management

Joey Witcher
Sinclair Water Authority

Alan Roberson
Association of State Drinking Water Administrators

Dawn Ison
U.S. EPA Office of Water, Water Security Division

Ray Riordan
City of San Jose / CalWARN

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Please specify to whom you are addressing the question.

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STATE PRIMACY AGENCIES' RESPONSE TO COVID-19

ASDWA

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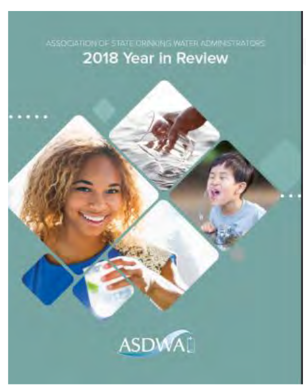
WHO ASDWA IS

- The professional Association serving state and territorial drinking water programs
  - 57 members (50 states, 5 territories, D.C., and the Navajo Nation)
    - All our members are government employees
  - Six staff in Washington, D.C.
    - Fourth Executive Director
      - Twitter @AlanTheWaterMan
- Founded in 1984 to address a growing need for state administrators to have national representation
- ASDWA works closely with Congress, the Environmental Protection Agency (EPA) and other Federal agencies, and other drinking water stakeholders



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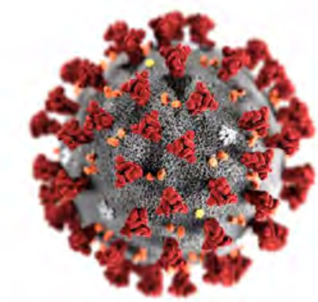
THE CURRENT SITUATION WITH COVID-19

- 10,442 cases as of 3/20 (CDC)
  - Over 14,000 cases (morning news)
- All 50 states have declared a state of emergency or public health emergency
- Almost all states have closed schools
- Almost all states have activated their National Guard
- Some/many states have closed state offices – working remotely
  - First time teleworking for many



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ISSUES IMPACTING EVERYONE

- "All Hands of Deck" for many sectors
  - Water and wastewater system employees
  - State primacy agencies
  - Health care
  - First responders
  - Others?
- Workforce
  - Taking care of family
  - Working from home

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THREE THINGS NEEDED FOR WATER TREATMENT

1. People
2. Power
3. Chemicals

Think about the supply chain for all three
Some of the supply chains are complex

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ISSUES BETWEEN PRIMACY AGENCIES & SYSTEMS

- Compliance monitoring
  - How much flexibility?
  - What is most important to monitor for? When?
    - Compliance period extensions?
  - Monitoring locations?
    - Sampler protection?
  - Laboratory capacity?
    - Commercial?
    - State?
  - Where/how to report results?
- Operators
  - Operator-in-charge
    - How to monitor treatment and distribution system remotely?
  - Reciprocity, if needed quickly
  - Training
    - How to conduct remotely?
  - Testing
    - Remote testing is not simple

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OTHER ISSUES

- States
  - State staff teleworking
    - Some functions (system inspections) can't be done remotely
      - Suspend inspections?
  - State reporting to EPA
    - How much information?
    - How often?
- Technical assistance providers (NRWA, RCAP, etc.)
  - Training
  - Site visits
- Potential Federal "stimulus"
  - Strings versus max. flexibility

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WHAT STATES ARE DOING - FIRST EXAMPLE

- Memo sent on March 6th to all CWSs serving >1,000 people
  - Update business continuity plan to address absenteeism and chemical sufficiency
    - Provided link to WaterISAC template
  - Join state WARN
  - Stood up WEBEOC

WATER /WASTEWATER AGENCY RESPONSE NETWORK

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WHAT STATES ARE DOING – SECOND EXAMPLE

- March 17th email
- State Offices Closed
  - Staff working remotely
  - Submit sample results via email to Regional Office
  - 24-hour written notification requirements still valid
- Notify if issues with laboratory capacity

- Notify if system has difficulties accessing routine sampling locations
  - Alternative sampling locations for TC/EC and residual
  - Within 5 connections
    - Use same sample ID#
  - >5 connections away
    - Make the appropriate notation

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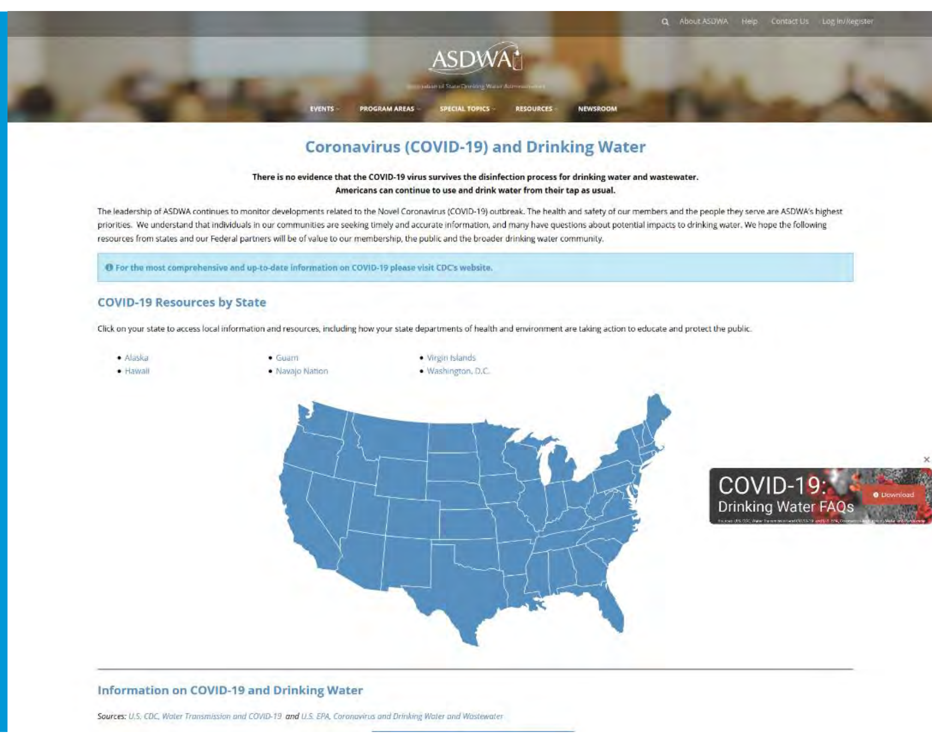
COVID-19: STATE RESOURCES AND FAQS

ASDWA.ORG/COVID19

- Local information accessible by state.
- Continuing to collect and expand resources daily.



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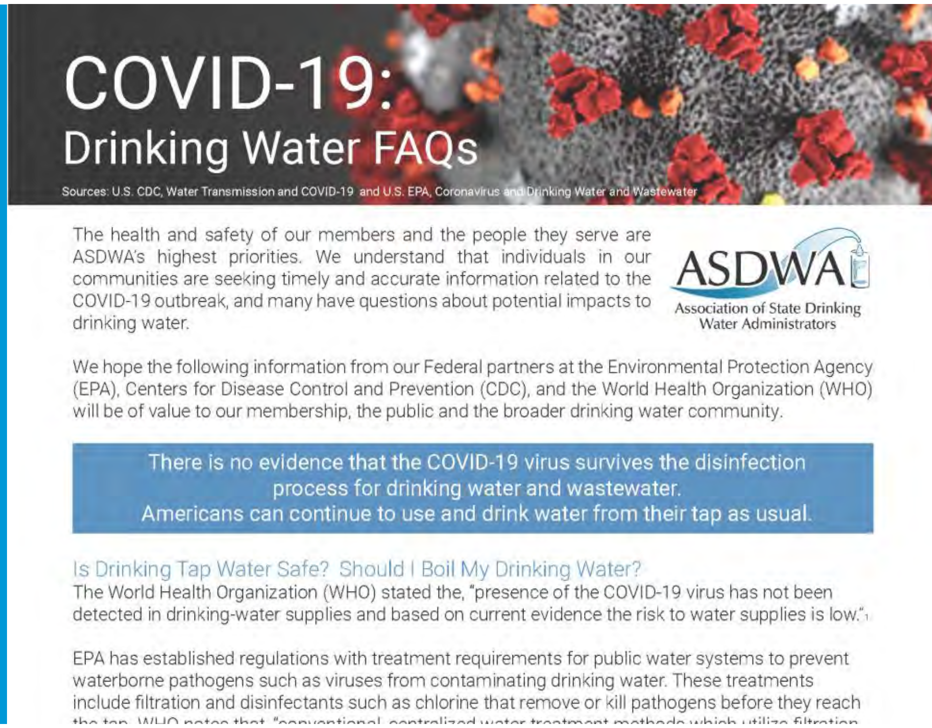
COVID-19: STATE RESOURCES AND FAQS

ASDWA.ORG/COVID19

- Downloadable Quick FAQs on COVID-19 and Drinking Water
- Combined information from CDC, EPA, and WHO.



COVID-19:
Drinking Water FAQs

Sources: U.S. CDC, Water Transmission and COVID-19 and U.S. EPA, Coronavirus and Drinking Water and Wastewater

The health and safety of our members and the people they serve are ASDWA's highest priorities. We understand that individuals in our communities are seeking timely and accurate information related to the COVID-19 outbreak, and many have questions about potential impacts to drinking water.

ASDWA
Association of State Drinking Water Administrators

We hope the following information from our Federal partners at the Environmental Protection Agency (EPA), Centers for Disease Control and Prevention (CDC), and the World Health Organization (WHO) will be of value to our membership, the public and the broader drinking water community.

There is no evidence that the COVID-19 virus survives the disinfection process for drinking water and wastewater.
Americans can continue to use and drink water from their tap as usual.

Is Drinking Tap Water Safe? Should I Boil My Drinking Water?
The World Health Organization (WHO) stated the, "presence of the COVID-19 virus has not been detected in drinking-water supplies and based on current evidence the risk to water supplies is low."[1]

EPA has established regulations with treatment requirements for public water systems to prevent waterborne pathogens such as viruses from contaminating drinking water. These treatments include filtration and disinfectants such as chlorine that remove or kill pathogens before they reach

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ASK THE EXPERTS

Kevin Morley
American Water Works Association

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City of San Jose / CalWARN

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EPA TOOLS AND PRODUCTS

Dawn Ison

US Environmental Protection Agency

Water Security Division – Emergency Response Team

Ison.dawn@epa.gov

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EPA RESOURCES

For general information from EPA about COVID-19 and water, see www.epa.gov/coronavirus

General COVID-19 Information

- U.S. Centers for Disease Control and Prevention Drinking Water and Wastewater COVID-19 (CDC)
- World Health Organization COVID-19 (WHO)

Information on Hygiene, Worker Safety and Access

- OSHA Guidance for Wastewater Workers COVID-19 (OSHA)
- Water, Sanitation, Hygiene and Waste Management for COVID-19 (WHO, UNICEF)
- Crisis Emergency Response and Recovery Access (CERRA) Framework (DHS)
- Memorandum on Identification of Essential Critical Infrastructure Workers During COVID-19 Response (DHS)

Mutual Aid Programs

- Water/Wastewater Agency Response Network (EPA)

Emergency Response and Continuity of Operations Planning

- Drinking Water Emergency Response Plans (EPA)
- Business Continuity Planning for Water Utilities: Guidance Document (WRF, AWWA, EPA)
- Tabletop Exercise Tool, Pandemic Scenario (EPA)

Other Tools and Resources

- Water Laboratory Alliance – Drinking Water and Wastewater (EPA)
- Water Utility Communication During Emergency Response (EPA)
- Water Utility Response On-The-Go (EPA)
- Resources for Small Public Water System Operators (EPA)

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ASK THE EXPERTS

Kevin Morley	**Sandy Smith**	**Joey Witcher**	**Alan Roberson**	**Dawn Ison**	**Ray Riordan**
American Water Works Association	DeKalb County Watershed Management	Sinclair Water Authority	Association of State Drinking Water Administrators	U.S. EPA Office of Water, Water Security Division	City of San Jose / CalWARN

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SAN JOSE CONTINUITY OF OPERATIONS PLAN

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PANDEMIC RESPONSE PLAN

1. Slow and reduce the spread of COVID-19
2. Protect our people so they can provide essential City services
3. Continue essential city operations for residents, businesses, and visitors
4. Effectively communicate with employees and our community
5. Support County of Santa Clara Public Health Department as the lead agency in pandemic response.

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PANDEMIC RESPONSE PLAN

	1 MONITORING	2 LOW	3 MEDIUM	4 HIGH	5 EXTREMELY HIGH
Risk	• No risk to local population	• Low risk to local population	• Medium risk to local population	• High risk to local population	• Extremely high risk to local population
Outbreak Status	• Emerging Disease present in other locations • No known cases in local population	• Local cases contained • No outbreaks • Containment	• Local cases increasing but still low • Outbreak possible • Containment shifts to Mitigation	• Number of infection cases increasing rapidly • Outbreak likely or imminent	• Full-Blown Epidemic • High # of cases of infection • Increasing mortality
City Response	• Plan • Learn about emergency threat	• Prepare Communications • Order supplies • Proactive cleaning	• Scale up communications • Accelerate preparation	• Service Modification • Social Distancing • Continuity of Operations Plan (COOP)	• Shut down non-essential services • Protective Equipment for Employees
EOC Activation	• None • Activate Pandemic Team	• Regular monitoring • Review and update plans	• Situation Room Activation ○ EPIO ○ OEM	• Partial Activation ○ Plans Section ○ Operations Section ○ EPIO	• Full EOC Activation

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CRITERIA FOR ESSENTIAL SERVICES:

Healthy	Safe	Engaged
Wastewater Garbage Roads	Police Fire Medical	Two-Way Communication with Community

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Roadmap Through Epidemic

Slow and reduce the spread of COVID-19

City Response – Top 10 Highest Priority Actions
1. City Continuity of Operations/Essential Service Provision
2. Enforcement of Public Health Order ("Shelter in Place"/Self-Quarantine)
3. Ensure Safety of First Responders/Essential Staff
4. First Responders/Essential Staff Families Support (including childcare)
5. Senior Support and Services
6. Medically Vulnerable Support and Services
7. Homeless Support and Services
8. Food Distribution and Feeding
9. Housing for Quarantine and Isolation
10. Small Business Support

Enabling Actions in Support of Top 10
▪ Communications with Community Language Capacity
▪ Non-Profit & Private Sector Mobilization for Response
▪ Volunteer Mobilization for Response (Food Distribution)
▪ Scaling Telecommuting Options and Capacity for City Staff
▪ Reassignment of Non-Essential Staff
▪ SJ Strong Campaign

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Slow and reduce the spread of COVID-19

Additional Priority Actions
▪ State/Federal Advocacy/Coordination for Support and Funding
▪ Local Assistance for Individuals and Families
▪ Homeless Prevention and Eviction Support
▪ Preparation for Civil Disturbance, Hospital Triage Neighborhood Quarantine/Cordon Sanitaire
▪ Child Care and Child Recreation Services
▪ School Children and Families Support

Community Value

Opportunity Enablement / Risk Mitigation

Time Criticality

Job Duration

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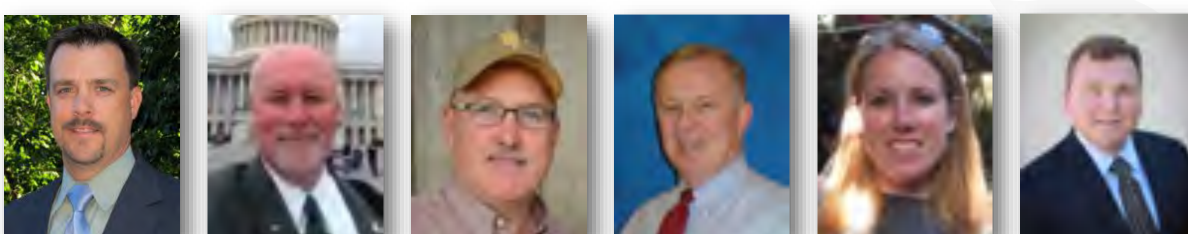
ASK THE EXPERTS



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Ray Riordan City of San Jose / CalWARN

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ADDITIONAL RESOURCES

- Coronavirus Resource page
- AWWA Connections - COVID-19 response: water sector preparation, vigilance crucial
- Public Affairs Advisory - Coronavirus and water
- Public Affairs Advisory – Additional coronavirus resources
- Business Continuity Planning for Water Utilities: Guidance Document
- Journal AWWA - Water system preparedness and best practices for pandemic influenza, Philip Van Atta & Robert Newsad
- G440-17 Emergency Preparedness Practices
- M19 Emergency Planning for Water and Wastewater Utilities

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UPCOMING WEBINARS

March 25 - Water Data Nerd

April 22 - Drought Preparedness and Response

April 29 - FREE Webinar: Innovation Roadmap for Utilities

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UPCOMING CONFERENCES

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THANK YOU FOR JOINING TODAY'S WEBINAR

- As part of your registration, you are entitled to an additional 30-day archive access of today's program.
- Until next time, keep the water safe and secure.

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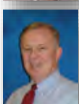
PRESENTER BIOGRAPHY INFORMATION

Sandy Smith currently serves as the Water Production Manager for the DeKalb County Department of Watershed Management in Stone Mountain, GA since October of 2013. Sandy served as the Gwinnett County (GA) EMA Operations and Logistics Officer from 2009 to 2013 and was responsible for the day-to-day operations of the Emergency Operations Center. Since 9/11, Sandy has been involved in the early planning stages of water sector all hazards preparedness, response, security initiatives at the local, state and national level. Sandy has served on the U.S. Department of Homeland Security/USEPA/Water Sector Coordinating Council – Critical Infrastructure Protection Advisory Committee, Emergency Management Assistance Compact Advisory Board and to WaterISAC . He also served as the Chair of the Georgia Water/Wastewater Agency Response Network (GAWARN) from its origin in 2006. He is completing a second term this year.

Joey Witcher has 30 years' experience in Water Treatment, distribution Wastewater treatment and utility operations and management. For the past 12 years he has been in the position of Plant Manager of the Sinclair Water Authority in Milledgeville, GA. Prior to this he held the position of Project Manager for OMI (now Ch2mhill) in the town of Barnesville GA. The Barnesville project included the Water Treatment Plant, Wastewater Treatment plant and the Streets Department. Prior to that he worked for City of Monroe GA Utilities and Rockdale Water Resources in Rockdale County GA.



Alan has over 25 years of experience in drinking water legislation, regulations, and policies on a wide array of issues. Most recently, Alan served as Director of Policy for Corona Environmental Consulting where he developed policy positions for utilities and government agencies on drinking water regulations; served as principal investigator on several Water Research Foundation projects; and collaborated with numerous stakeholders. Previously, he was Director of Federal Relations at the American Water Works Association (AWWA) where he provided technical and policy input on all aspects of the drinking water regulations. He also worked closely with EPA and DHS on implementation of the requirements for vulnerability assessments (VAs) and emergency response plans (ERPs).

Dawn Ison has been with EPA for over 19 years and is a Geologist for EPA's Office of Ground Water and Drinking Water, Water Security Division, where she leads emergency response efforts related to the Water/Wastewater Agency Response Network (WARN) mutual aid program, drought response and water loss and response agency coordination during contamination events affecting the water sector.

With 34 years experience, Raymond Riordan is currently the Director of the City Manager's Office of Emergency Management for the City of San José, CA, the tenth largest city in the United States. He was hired following the historic February 2017 Coyote Creek Flood and assisted the City in its recovery from the flood and instituting action to address the over 240 items identified in the post disaster after action and improvement report. His employment included Program Manager for Emergency Preparedness for the City of San Ramon Police Department in California, Acting Executive Director of the California Utilities Emergency Association, the Acting Security and Emergency Manager for East Bay Municipal Utility District, and Senior Emergency Planner for Contra Costa County, CA. He is a Certified Emergency Manager, recognized by the International Association of Emergency Managers (IAEM), and he serves as the elected Chair for the California Water/Wastewater Agency Response Network (or CalWARN). Among his professional awards, he is three-time recipient of the International Association of Emergency Managers Association Partners in Preparedness Award and three-time recipient of the California Emergency Services Association President's Award for leadership in emergency management. He completed a BS degree from Santa Clara University, a MS degree in Industrial Organization from San José State University, and he has published articles on emergency planning in several journals, including the American Water Works Association Journal Magazine.

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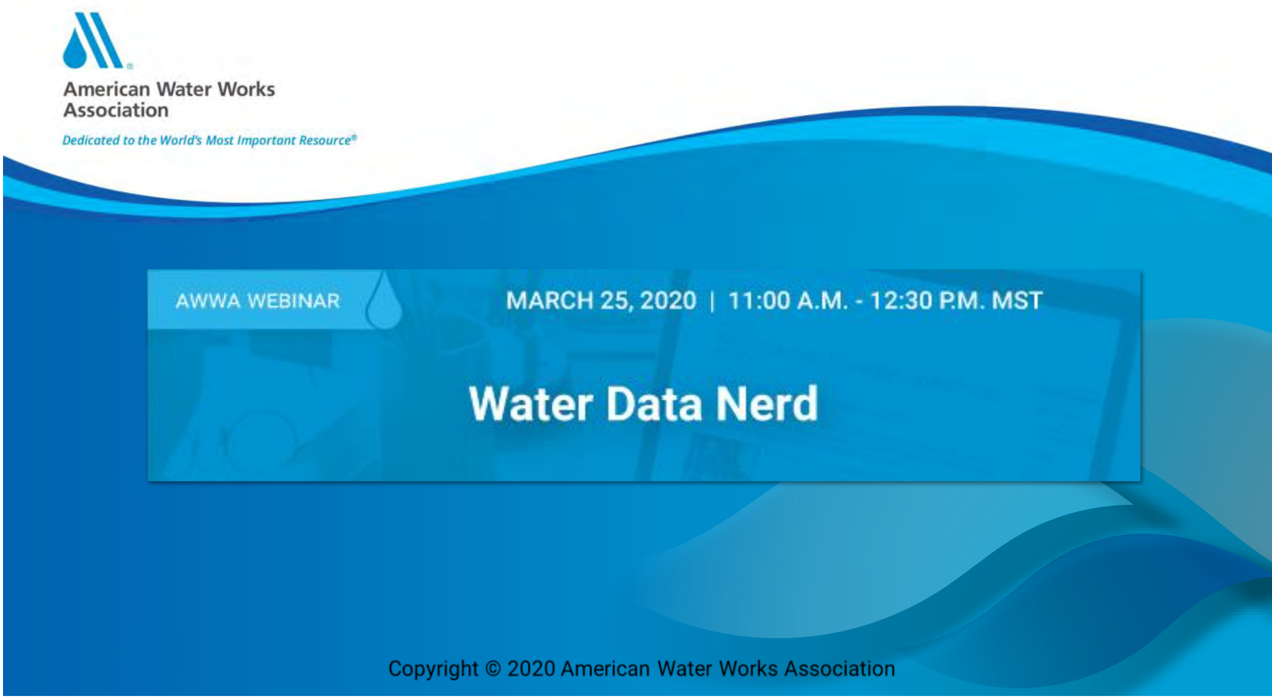
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WEBINAR MODERATOR

Christine Boyle, PhD
Founder, Valor Water
Xylem Digital Solutions Group

Dr. Christine Boyle is the founder and CEO of Valor Water Analytics, now a Xylem Company. Her work focusses on developing decision support software that achieves both resource and financial sustainability goals for water utilities. She received a doctorate in water resource planning in 2011 and “spun” Valor Water out of her thesis work at UNC. She is a trustee of the Cal-Nevada American Water Works Association and a water policy advisor for the World Bank.

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PANEL OF EXPERTS

Glen Semino
Xylem QA Engineer
Xylem, Inc

Thomas L. Kuczynski
VP Information Technology
DC Water

Christine Boyle, PhD
Founder, Valor Water
Xylem Digital Solutions Group

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AGENDA

I.	AWWA Water Data Nerd Webinar	Christine Boyle, PhD
II.	Cyber Security - What Should We Be Afraid of, and What Can We do to Protect Our Data?	Glen Semino
III.	Water Data Nerds	Thomas L. Kuczynski
IV.	Interactive Cloud Session – What happens when you have data “floating” in the cloud?	Christine Boyle, PhD

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ASK THE EXPERTS

Christine Boyle, PhD
Xylem Digital solutions Group

Glen Semino
Xylem, Inc

Thomas L. Kuczynski
DC Water

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xylem
Let's Solve Water

AWWA WATER DATA NERD WEBINAR

Christine E Boyle, PhD
Founder, Valor Water Analytics
Director, Xylem Inc.

10

10

PURPOSE

- The aim of this webinar is to gather utility and vendor water data experts to discuss issues related to using, protecting, and governing data in a modern water utility.
- When you finish this webinar you will be able to:
  - Understand best management practices for cyber-security
  - Know where to access additional information about cloud –policy and cyber security
  - Understand what to fight for with your data-providing vendors

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LEARNING OBJECTIVES

- As a result of this presentation you will be the supreme data nerd at your utility
- Best practices for:
  - **Cyber security**
  - **Cloud policy**
  - **Big data strategy to solve a regional water issue.**

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AGENDA

Topic	Speaker	Time Frame
Introduction	Christine E. Boyle	5 minutes
Cyber Security	Glen Semino	20 minutes
Data Interoperability	Tom Kuczynski	20 minutes
Interactive Cloud Session – What happens when you have data “floating” in the cloud?	Christine E. Boyle	20 minutes
Audience Q&A with Panel	ALL	20 minutes
Conclusion	Christine E Boyle	5 minutes

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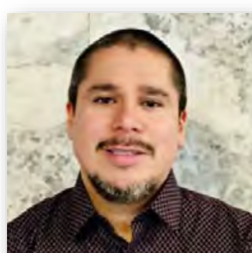
ASK THE EXPERTS

Christine Boyle, PhD
Xylem Digital solutions Group



Glen Semino
Xylem, Inc

Thomas L. Kuczynski
DC Water

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Please specify to whom you are addressing the question.

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CYBER SECURITY - WHAT SHOULD WE BE AFRAID OF, AND WHAT CAN WE DO TO PROTECT OUR DATA?

Glen Semino
Senior QA Engineer
Xylem Inc.

15

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PURPOSE

- Learn from past breaches to prevent them in your organization
- Be vigilant and aware of potential security risks and threats
- Learn security best practices to reduce the chances of a breach
- Go over resources AWWA provides on Cyber Security

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AGENDA

- Part 1: What should you be afraid of?
  - Go over some major security breaches and how they happened
  - Look at specific security breaches in the water industry
- Part 2: What can we do the protect our data?
  - What to learn from those that have been breached
  - How to look for and be vigilant of potential threats or risks
  - Best practices to protect your data
  - AWWA resources on cybersecurity

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Part 1: What should you be afraid of?

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MAJOR SECURITY BREACHES AND HOW THEY HAPPENED

- Yahoo
  - **Users Affected:** 3 Billion
  - **When:** 2013-2014
  - **How:** Through targeting employees at Yahoo via email
  - **What was exposed:** names, phone numbers, password challenge question & answers, password recovery emails to name a few
- First American Financial Corp.
  - **Users Affected:** 885 Million
  - **When:** 2019
  - **How:** Unsecured web server allowed access without authentication to client data
  - **What was exposed:** Bank Transactions, Social Security Numbers and other sensitive data
- Facebook
  - **Users affected:** 540 Million
  - **When:** 2019
  - **How:** Unsecured server with user data
  - **What was exposed:** account names, ids, details about comment/post reactions

Sources: https://www.cnbc.com/2019/07/30/five-of-the-biggest-data-breaches-ever.html, https://www.csoonline.com/article/3180762/inside-the-russian-hack-of-yahoo-how-they-did-it.html, https://gizmodo.com/885-million-sensitive-records-leaked-online-bank-trans-1835016235, https://www.cbsnews.com/news/millions-facebook-user-records-exposed-amazon-cloud-server/

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SECURITY BREACHES IN THE WATER INDUSTRY

- Fort Worth Water Department
  - **Users exposed:** 3,000
  - **When:** 2019
  - **How:** Unsecured third-party cloud application used for client payments
  - **What breach caused:** exposed credit card holder's name, credit card numbers, billing addresses and security codes
- City of Baltimore (including City of Baltimore Water Utility)
  - **Users exposed:** 500k
  - **When:** 2019
  - **How:** Legacy IT Infrastructure
  - **What breach caused:** Ransomware attacked disabled water utility from billing customers essentially taking away control from water utility's servers

Sources: https://en.wikipedia.org/wiki/2019_Baltimore_ransomware_attack, https://www.fox4news.com/news/3000-fort-worth-water-customers-affected-by-data-breach

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Part 2: What can we do to protect our data?

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WHAT TO LEARN FROM THOSE THAT HAVE BEEN BREACHED

- All servers in your organization should be secured
  - Authentication required
  - Accessible from only certain IPs or geo locations where possible/applicable
  - Data on server encrypted at rest and in transit
  - Latest updates and patches
  - Legacy software upgraded/replaced
  - Regular security checks e.g. checked for database inject attacks, denial of service attacks etc

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WHAT TO LEARN FROM THOSE THAT HAVE BEEN BREACHED (CONT'D)

- Safe email practices
  - Training everyone at your organization on the various types of email attacks
  - Even if an email comes from one of your contacts but looks suspicious ask
  - Be sure before you download any attachments or click a link in an email
- Vet the Security of any third-party software you use
  - Make sure they are using security best practices
  - Create a security policy to vet any third-party software you will be using
  - If security practices not known, come up with questions and have them answer

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HOW TO LOOK FOR AND BE VIGILANT OF POTENTIAL THREATS

- If you see anything that could be a potential security risk speak up immediately
- Keep up with the latest threats and implement changes in your organization if necessary
- Use vetted security tools where applicable to:
  - Monitor any suspicious network traffic
  - Monitor server access logs and server logs in general
- For any tool you will be using or creating for your organization always have security in mind
- Understand the risks and consequences of not having strict security policies

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BEST PRACTICES TO PROTECT DATA

- Encrypting all sensitive data
- Upgrade or replace software no longer supported by vendor
- All servers updated with latest patches and updates as soon option available
- Any employee devices that will access company data should adhere to company security policies
- Enforce strong policies for credentials and use multi-factor authentication
- Create and enforce company wide security policies
  - Use AWWA's Cybersecurity Guidance and Assessment Tool to get started
- Educate employees on how to identify potential threats and best security practices
- sources: https://usa.kaspersky.com/resource-center/definitions/data-breach

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AWWA RESOURCES ON CYBERSECURITY

- AWWA provides guidance and tools around Cyber Security
- These tools are aligned with the National Institute of Standards and Technology (NIST) Cybersecurity Framework and Section 2013 of America's Water Infrastructure Act (AWIA) of 2018
- These resources help those in the water sector implement cybersecurity controls and measures
  - Assess any security risks and threats in one's water systems and infrastructure
  - Utility Risk and Resilience Certificate Program
  - Provide insights on legal and risk management
- These tools can be used to train employees on what threats exist and how to prevent them
- For more information please visit: https://www.awwa.org/Resources-Tools/Resource-Topics/Risk-Resilience/Cybersecurity-Guidance

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SUMMARY

- Part 1: What should we be afraid of?
  - Learned about major breaches and why they happened
  - Learned about security breaches in the water industry
- Part 2: What we can do to protect our data?
  - Explored how past breaches could have been prevented
  - Learned about identifying potential security threats
  - Learned about some security best practices
  - Overview of tools that AWWA provides on Cyber Security

27

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Thank you

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ASK THE EXPERTS

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Xylem Digital solutions Group

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Thomas L. Kuczynski
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WATER DATA NERDS

Thomas L. Kuczynski

VP of Information Technology

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WILL YOU KNOW BIG DATA WHEN YOU SEE IT?

OR

To Boldly GO where no DATA has GONE before!

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AGENDA

1. The Digital Utility - Why data standards are needed
2. What are the challenges
3. Who benefits from standards

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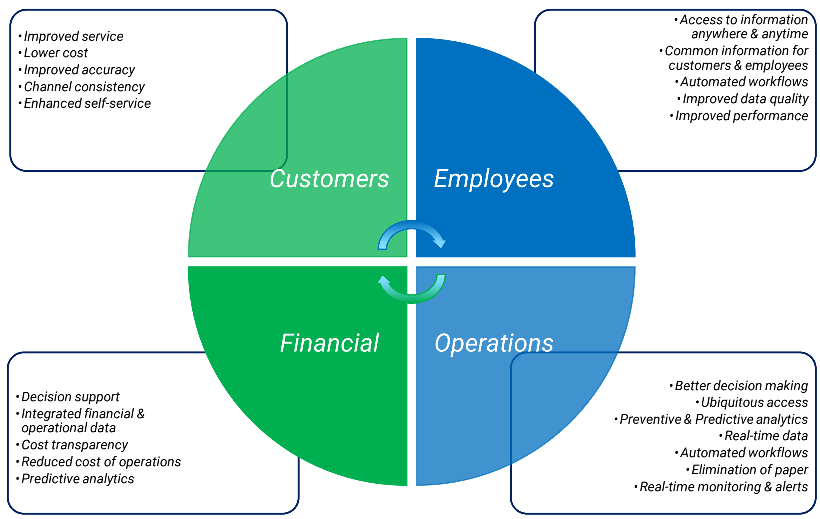
BENEFITS OF THE DIGITAL UTILITY

*The **Digital Utility** is characterized by the seamless exchange of data assets from source to use. Seamlessly blending disparate data sources and types produces the fuel necessary to power the **Digital Utility**.*



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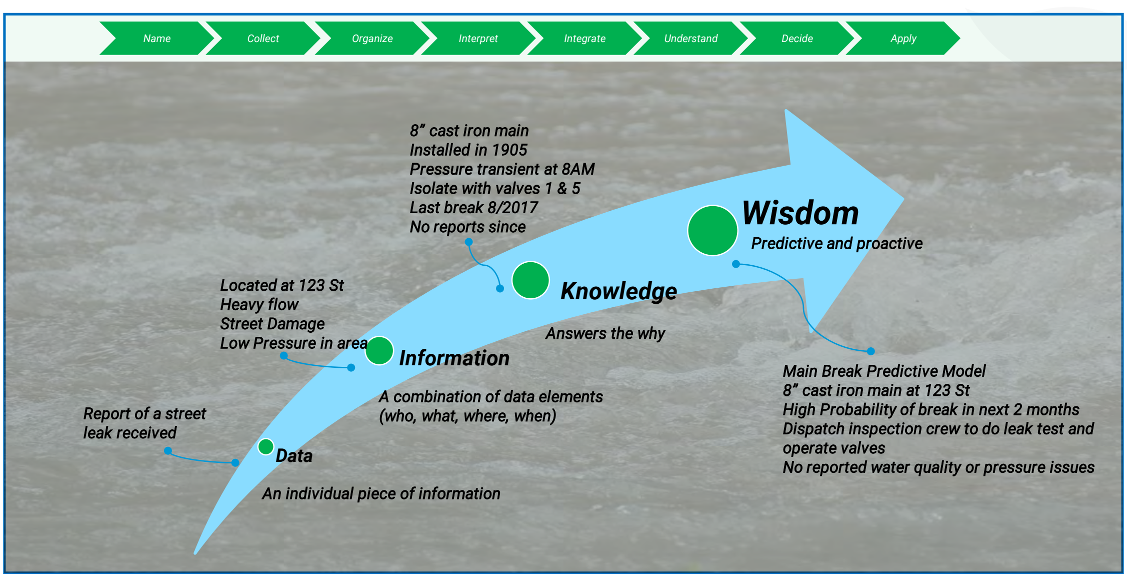
THE SEARCH FOR SPOCK



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THE VOYAGE HOME

The lack of standards lengthens the data capture and preparation process and can cause individuals to question information quality and rely heavily on intuition when making decisions.

The decision-making process is heavily weighted toward the Extraction & Preparation

Data standards can help eliminate confusion and allow for higher levels of automation

Decisions are fact based and made with confidence

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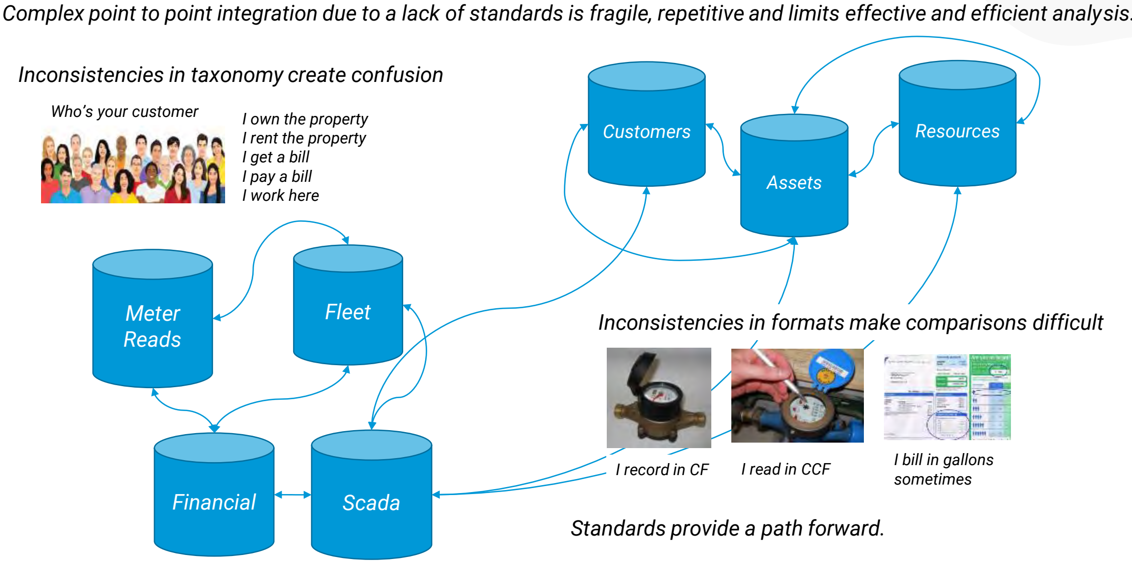
INTO DARKNESS

Complex point to point integration due to a lack of standards is fragile, repetitive and limits effective and efficient analysis.



Standards provide a path forward.

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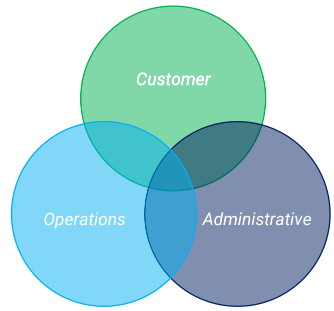
THE WRATH OF KHAN

*Digital silos hinder the transition to a **Digital Utility**. Its like trying to navigate the Mutara Nebula.*

CIS	PCS	Finance
MDM	SCADA	HR - Payroll
Social Media	GIS	Time & Labor
3rd Parties	Asset Mgmt	Intranet
Customer Portal	Mobile	Materials Mgmt
Website	Work Mgmt	Fleet

Characteristics:
Excessive data gathering
Extensive production cycles
Limited sharing
Limited analytics

Digital Transformation



Characteristics:
Automated data gathering
Automated data production
Seamless sharing
Automated & adhoc analysis

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THINGS TO CONSIDER

As a Utility
- Identify you biggest data pain points and document them
- Consider working with others to develop a consistent taxonomy
- Automate once and use multiple times
- Create and integration framework

As an Industry
- Consider establishing a standards body
- Engage willing solution providers
- Engage a diverse set of utilities including small and large providers
- Don't give up

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IT MAY NOT BE OBVIOUS, BUT EVERYONE BENEFITS

Utilities

Lower cost
Improved service
More Choice
Greater insights
Process Excellence

Vendors

Better integration
Greater adoption
Lower cost to deploy
Sustainable solutions

Regulators

Timely reporting
Ability to benchmark
More confidence

Customers

Lower cost
More services
Access to information
Improved Experience

"The needs of the many outweigh the needs of the few"

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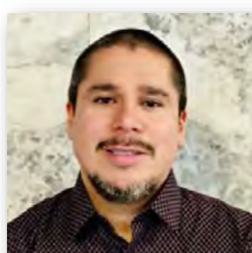
ASK THE EXPERTS

Christine Boyle, PhD
Xylem Digital solutions Group



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American Water Works Association

Dedicated to the World's Most Important Resource®

Interactive Cloud Session – What happens when you have data "floating" in the cloud?

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AGENDA

- Brief history of U.S. water utilities using the cloud (i.e. hosted services)
- Risks of Using the Cloud (SCADA, Billing Data, Other)
- Cloud Service Models
- Emerging Best Practices for Secure Cloud Management

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WHAT IS COMPUTING CLOUD?

- "A term used to describe a global network of servers, each with a unique function.
- The **cloud** is not a physical entity, but instead is a network of remote servers around the globe which are hooked together and meant to operate as a single ecosystem"

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HISTORY OF THE CLOUD

- Pre-1960's: Old cloud;
- 1960's-1990s: Apranet; Super computers (US Government projects);
- 1996: Internet arrives & cloud computing popularized by Compaq computers;
- 2001-3: Utilities pull back connxns to internet due to terrorism risks;
- 2002: Amazon Web Services (AWS) launches;
- 2010: Saas solutions adopted by utilities (GIS Cloud; WaterSmart);
- 2010-15: Conversions to hosted billing systems;
- 2020: Widespread migration to digital/cloud/hosted services.

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RISKS & RESPONSES

- **My Team has full control over on-premise solutions**
  - Local IT staff themselves are risky as you don't want too much control in one person's hands; on-premise solutions are vulnerable to floods, earthquakes, theft and pose large risks if not maintained well.
  - Leverage IT staff for advanced application development, and not routine security tasks. CAPEX / Ownership savings of up to 40%
- **Cloud is Expensive**
  - Cloud computing typically costs less than the on-site server-based system required to manage the same amount of processing power and data, and it eliminates on-site servers, storage devices and software applications.
- **SCADA is too critical to public health and infrastructure to connect to the internet**
  - Good point. Most SCADA systems remain disconnected form the internet.

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CLOUD SERVICE MODELS

- There are three service models for cloud computing:
- 1. **Software as a Service (SaaS):** runs the cloud provider's applications on a cloud infrastructure. Each application is accessible from a specific device through a portal such as a Web browser.
- 2. **Platform as a Service (PaaS):** provides clients the ability to deploy cloud provider-supported applications onto the cloud infrastructure.
- 3. **Infrastructure as a Service (IaaS)**: allows clients access to processing, storage, networks and other fundamental computing resources, giving clients the ability to deploy operating systems and other applications.

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CLOUD USE CASES

- Advanced customer engagement and self-service apps (Water Smart; Cayenta)
- Advanced Distribution System monitoring (Echologics, LeakView)
- The Green Button initiative in California has built an energy cloud to allow consumers to download their data to manage their appliances more efficiently.
- Real-time field services and work order management;
- Hosted AMI data and applications (i.e. Sensus Analytics and Network as a Service)

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STANDARD CLOUD SECURITY PRACTICES

- Utility –wide Cloud Policy
  - DC Water "Cloud First Approach"
- Cloud Security Questionnaire for all vendors;
- Run cloud / saas vulnerability scan (intruder.io; netsparker.com)
- Cloud security and privacy standards for vendors (ISO/IEC 27017 and ISO/IEC 27018)

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SAMPLE CLOUD SECURITY QUESTIONNAIRE 1

Page Movement Show Zoom Window Macros SharePoint

APPENDIX B: HOSTED/CLOUD SOLUTION SECURITY QUESTIONNAIRE

Instructions: Please complete all entries to the best of your knowledge.

Introduction		
1.	System Name:	Valor Water Analytics – Modular Platform
2.	System Description:	Hidden Revenue Locator Module, Dashboards updating daily / monthly, Sending a report daily / monthly by email (frequency dependent on AMI / AMR)
3.	Type of Cloud Service:	(Infrastructure-as-a-Service, Platform-as-a-Service, Software-as-a-Service) Software-as-a-Service

Access Controls

4. Please describe how American Water administrators will access the system?

Process Excellence Department will have one user license account and permissions. If they need more than one, let us know.

5. Please describe how the end-user will access the system?

End users do not have access to the system.

6. Please describe how the service provider administrators will access our data/portal?

Valor Admin Account

7. Please describe how remote access works? How are administrators authenticating to the cloud providers network?

Full user name & password in order to login to the Valor user interface / portal

8. Who will be administrating and authorizing accounts to the system? Will there be a review of accounts? If so, how often?

Valor Tech (Panos Jutras, Lead Data Engineer). Account activity monitored monthly.

9. Will each user have unique id or will it be shared?

The Process Excellence Department will have one user license account and permissions. If they need more than one, let us know.

10. Please describe the password requirements to use the system?

Passwords must be at least 8 characters long and must contain at least one uppercase letter, at least one lowercase letter, at least one number, and at least one special character.

11. Does the system require password aging, if so how often must passwords be changed?

No

12. Can American Water implement a warning banner to the site prior to authenticating?

(Does not apply) The portal space belongs to Valor.

13. Does the system lock out after a certain amount of time of inactivity?

Yes

14. Does the user get locked out if they mistype their password a certain amount of time? If so, how many times? What is the process to unlock the account?

There is no automatic lockout based on failed logins, however users can be manually locked out if suspicious activity is detected on a user account.

15. Please describe how separation of duties is implemented within the system?

Can set each user account with different permissions.

16. Are there any external connections to the system (i.e. interconnections, data feed, etc.)?

Data can be uploaded via SFTP

Auditing Controls

17. Please describe the type of auditing the system is able to log?

We log all activity that occurs on the Valor Portal, including user, timestamp, and action taken.

18. Who reviews the logs?

Valor Water CTO (David Wegman)

19. Can administrators or end-users modify audit logs?

No

20. What is the log retention period prior to deletion?

Logs are all archived for 2 years.

21. Are the servers synchronized to an NTP server to ensure the time stamps on the audit logs are accurate?

Yes.

System Communication

22. Is the data at rest encrypted? If so, how and what encryption method?

No.

23. Does the system support SSL? If so, who issues the certificate and what is the key strength?

Yes we use SSL. "Go Daddy Secure Certificate Authority - G2". 4096 bits for the portal access.

24. Who will be responsible for the security of the system in the Cloud?

Valor Water CTO (David Wegman)

25. Please describe the security controls that are in place (firewalls, IDS, IPS, anti virus, etc.)

SSH communications, firewall, antivirus, anti-malware and anti-spyware all running on the cloud servers.

26. Has the application itself gone through any kind of Application Security scan to identify any code vulnerability?

Planned for Q2, 2016.

27. Is there any vulnerability scanning and remediation done on the network/server infrastructure?

Yes, our cloud server utilizes a variety of tools to monitor, mitigate, and resolve any vulnerability and other issues. Tools running on the server include load balancing, intrusion detection and prevention, standard and dedicated hardware firewalls, anti-spyware, anti-virus, anti-malware and SSL certificates.

Change Management

28. Please describe the procedures to implement changes to the environment (application patching)?

Code is tested on staging environment and may be subject to automated tests and/or code review prior to production.

In Q3 2019, we implemented a change management tasking system using HRA, each change is captured in a ticket.

29. How are customers notified prior to changes occurring?

Email and Banner on Portal for changes and scheduled maintenance.

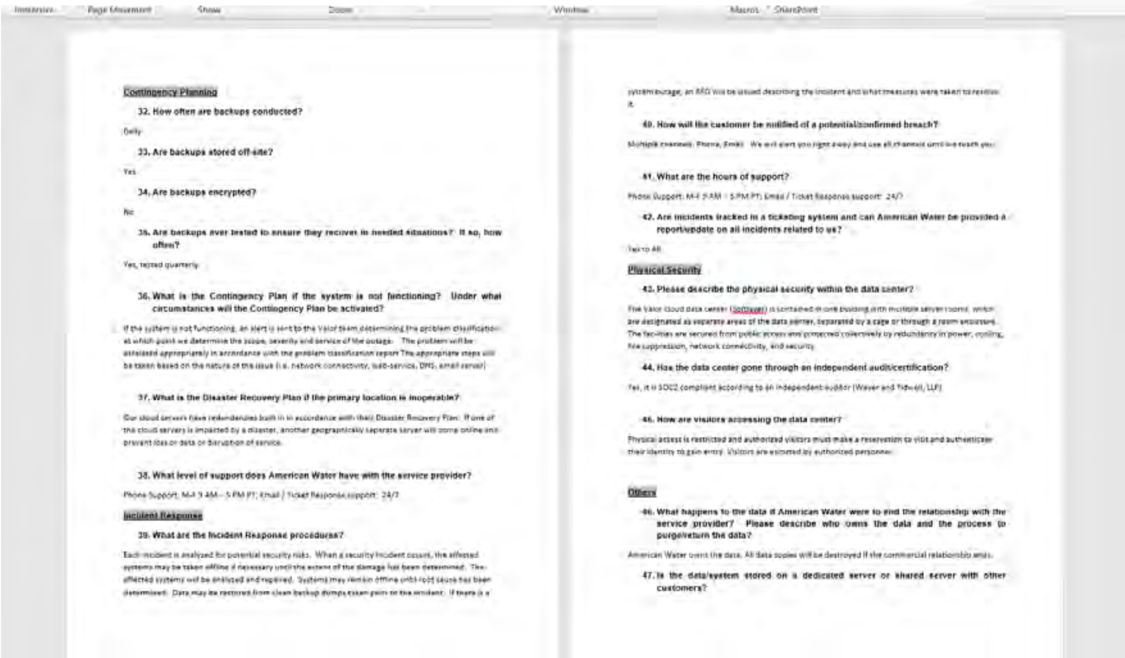
30. Who handles the patching (application and infrastructure)? How often does this occur?

Valor Staff, occurs as needed

31. Are there any third-party applications required to use this system (i.e. flash, java, etc.) If so, who handles those patching?

No

Please consider the environment before printing.



Contingency Planning

32. How often are backups conducted?

Daily

33. Are backups stored off-site?

Yes

34. Are backups encrypted?

No

35. Are backups ever tested to ensure they recover in needed situations? If so, how often?

Yes, tested quarterly

36. What is the Contingency Plan if the system is not functioning? Under what circumstances will the Contingency Plan be activated?

If the system is not functioning, an alert is sent to the Valor team determining the problem classification at which point we determine the scope, severity and service of the outage. The problem will be escalated appropriately in accordance with the problem classification report. The appropriate steps will be taken based on the nature of the issue (i.e. network connectivity, web-service, DNS, email server)

37. What is the Disaster Recovery Plan if the primary location is inoperable?

Our cloud servers have redundancies built in in accordance with their Disaster Recovery Plan. If one of the cloud servers is impacted by a disaster, another geographically separate server will come online and prevent loss of data or disruption of service.

38. What level of support does American Water have with the service provider?

Phone Support: M-F 9 AM – 5 PM PT; Email / Ticket Response support: 24/7

Incident Response

39. What are the Incident Response procedures?

Each incident is analyzed for potential security risks. When a security incident occurs, the affected systems may be taken offline if necessary until the extent of the damage has been determined. The affected systems will be analyzed and repaired. Systems may remain offline until root cause has been determined. Data may be restored from clean backup dumps taken prior to the incident. If there is a system outage, an RFO will be issued describing the incident and what measures were taken to resolve it.

40. How will the customer be notified of a potential/confirmed breach?

Multiple channels: Phone, Email. We will alert you right away and use all channels until we reach you.

41. What are the hours of support?

Phone Support: M-F 9 AM – 5 PM PT; Email / Ticket Response support: 24/7

42. Are incidents tracked in a ticketing system and can American Water be provided a report/update on all incidents related to us?

Yes to All

Physical Security

43. Please describe the physical security within the data center?

The Valor cloud data center (Softlayer) is contained in one building with multiple server rooms, which are designated as separate areas of the data center, separated by a cage or through a room enclosure. The facilities are secured from public access and protected collectively by redundancy in power, cooling, fire suppression, network connectivity, and security.

44. Has the data center gone through an independent audit/certification?

Yes, it is SOC2 compliant according to an independent auditor (Weaver and Tidwell, LLP)

45. How are visitors accessing the data center?

Physical access is restricted and authorized visitors must make a reservation to visit and authenticate their identity to gain entry. Visitors are escorted by authorized personnel.

Others

46. What happens to the data if American Water were to end the relationship with the service provider? Please describe who owns the data and the process to purge/return the data?

American Water owns the data. All data copies will be destroyed if the commercial relationship ends.

47. Is the data/system stored on a dedicated server or shared server with other customers?

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FOURTH INDUSTRIAL REVOLUTION HITS THE WATER INDUSTRY (BLUEFIELD RESEARCH)

- "A global economic transition is underway, resulting from the proliferation of a suite of new technologies and business models for connectivity, mobility, automation, and data analytics."

Exhibit 15: Comparison of Cellular Network Technologies—1G to 5G

Network Technology	Year Launched	Max Speed (bits per second)	Average Speed (bits per second)	Latency (milliseconds)
1G	1979	2.4 Kbps	N/A	N/A
2G	1991	0.3 Mbps	0.1 Mbps	500 ms
3G	2001	42 Mbps	8 Mbps	100 ms
4G	2009	1 Gbps	50 Mbps	50 ms
5G	2018	10 Gbps-20 Gbps	200 Mbps-500 Mbps	1 ms

Note: 1 Mbps=1,000 Kbps; 1 Gbps=1,000 Mbps; 1ms=0.001 seconds; speed, latency statistics reflect best-performing version of each network technology (e.g. 2G EDGE, 3G HSPA+)
Source: Bluefield Research

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CONCLUSION

- TAKEAWAYS
  - Today's workforce demands are moving toward real-time; remote capabilities;
  - Risks are real, but risk mitigation can help minimize risk and maximize benefits;
  - Consult peer utilities & AWWA for planning and policy consultations.
- RESOURCES

  AWWA Cyber-security Tool:

  https://www.awwa.org/Resources-Tools/Resource-Topics/Risk-Resilience/Cybersecurity-Guidance

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ASK THE EXPERTS

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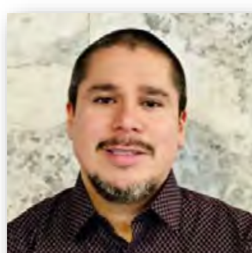
Xylem Digital solutions Group



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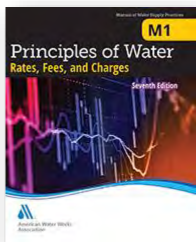
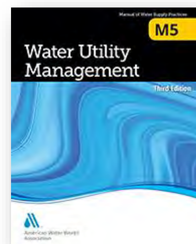
ADDITIONAL RESOURCES

[AWWA Cybersecurity & Guidance Resource Community]



M1 – Principles of Water Rates, Fees and Charges, 7th Edition
AWWA catalog no: 30001-7E



M5 – Water Utility Management, 3rd Edition
AWWA catalog no: 30005-3E

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UPCOMING WEBINARS

April 6 - Legal Aspects of COVID-19 for Water Utilities
April 22 - Drought Preparedness and Response
April 29 - FREE Webinar: Innovation Roadmap for Utilities

Register for a 2020 Webinar Bundle

View the full 2020 schedule at awwa.org/webinars

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www.awwa.org/conferences

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THANK YOU FOR JOINING TODAY’S WEBINAR

- As part of your registration, you are entitled to an additional 30-day archive access of today’s program.
- Until next time, keep the water safe and secure.

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PRESENTER BIOGRAPHY INFORMATION

Glen Semino has worked at startup and enterprise level software companies for over 10 years as both an individual contributor and leader. He has held roles related to developer and customer support, qa, customer success, technical operations and developer community building. His technical blogs have been read by thousands and featured on various tech company blogs. He is currently a Senior QA Engineer at Xylem under the Digital Solutions Group and holds a bachelor's degree in Computer Science from the University of California, San Diego.

Thomas Kuczynski is the Vice President of Information Technology for the District of Columbia Water and Sewer Authority (DC Water) and the interim President of Blue Drop. Tom joined DC Water in August 2013 and heads up an IT team of 60 individuals and a $20 million budget to develop applications that support customer services and operations and provide technical support to help employees do their jobs. As Interim President of Blue Drop, Tom leads the team responsible for generating non-ratepayer revenue from various products and services including Bloom, intellectual property and other non-traditional sources at DC Water. Tom has more than 40 years of experience in utility management and operations including nearly 30 years at Philadelphia Gas Works (PGW) in two separate terms of employment. He was most recently Senior Vice President, Strategic and Information Services for PGW managing Strategic Planning, Enterprise Performance Management, Information Services and Internal Auditing. In his first employment at PGW, he led development efforts for the company's customer information system, credit and collections, automated meter reading and distribution leak tracking. He has also worked for Pacific Gas & Electric's National Energy Group as Director of Technology Strategic Planning and Architecture, and for Delmarva Power in Wilmington, Delaware where he provided IT Strategic Planning Services to the Energy Supply Group. Tom is a graduate of La Salle College of Philadelphia and the Executive MBA program at University of Maryland University College.

Anand has dedicated his engineering career to the advancement of public policy and actions to benefit the environment and the community. He has more than 22 years of professional engineering experience and is a registered professional engineer in the State of Florida. He holds bachelor's and master's degrees in civil engineering and a master's degree in Management of Information Systems.

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- My Transcripts
  - To print your official transcript, click **Print list**
  - To print individual certificates, click **Download Certificate**

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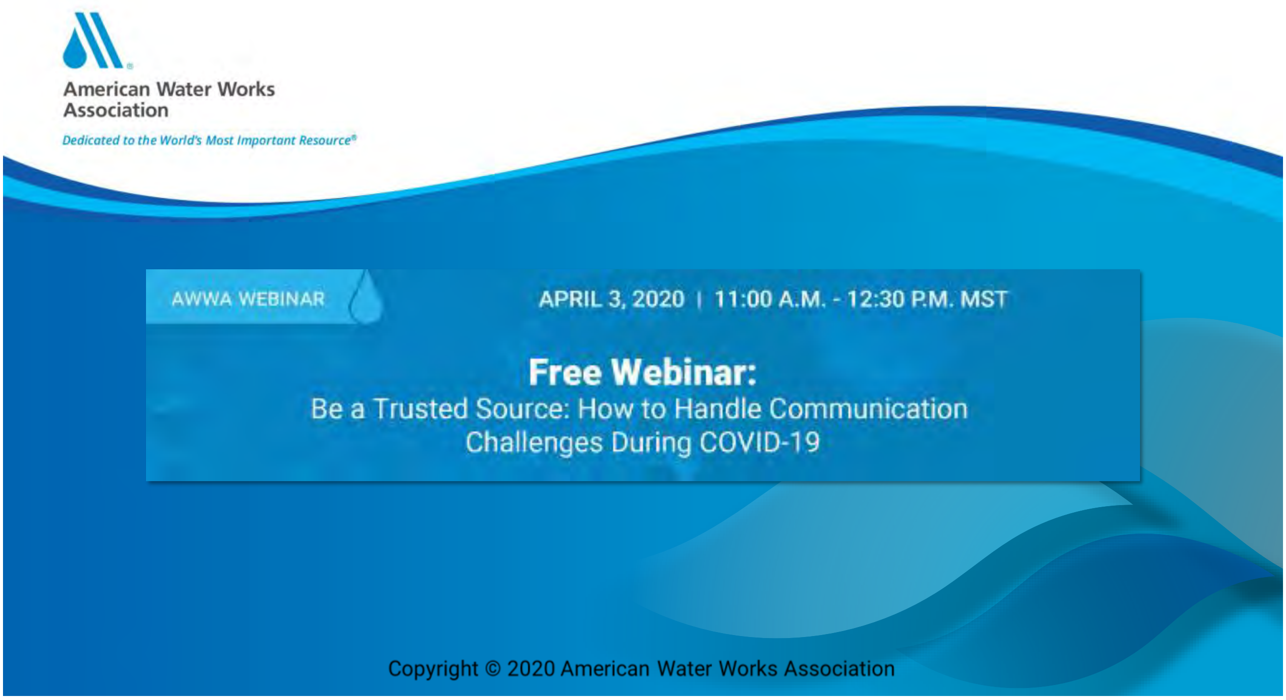

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WEBINAR MODERATOR

Karen Snyder
Vice President
Katz & Associates

Karen Snyder has been active in water, wastewater and environmental public affairs for nearly 30 years, specializing in strategic communication planning, public involvement, facility siting, construction relations, community relations, spokesperson and media training, and crisis communications. Karen is a member of the American Water Works Association (AWWA) and currently serves on the organization's national Public Affairs Council.

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PANEL OF EXPERTS

Melissa Elliott
AWWA President-Elect
Dir. Strategic Communication Services, Raftelis

Samantha Villegas
Senior Consultant
Raftelis

Kelley Dearing Smith
Vice President, Communications and Marketing
Louisville Water

Mary Gugliuzza
Media Relations & Communications Coordinator
Fort Worth Water Department

7

7

AGENDA

I.	Welcome and Intro	Melissa Elliott
II.	Communicating about COVID-19 in an Era of Distrust: Principles of Risk Communication	Samantha Villegas
III.	Building Trust from the Inside Out	Kelley Dearing Smith
IV.	When You're Part of the Solution – Not the Problem	Mary Gugliuzza

8

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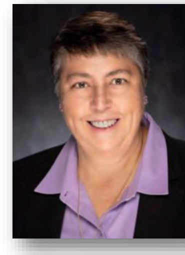

Mary Gugliuzza
Fort Worth Water Department

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American Water Works Association

Dedicated to the World's Most Important Resource®

WELCOME AND INTRO

Melissa Elliott, AWWA President-Elect
Director of Strategic Communication Services at Raftelis

10

AWWA is here for you with information, training, resources and a network of professionals

- COVID-19 resources available at www.awwa.org/coronavirus
- Resources are constantly being added and updated
- We're advocating for the water industry
- AWWA.org is your information hub

11

What leaders, managers, and communicators should do right now:

- Communicate consistently and constantly
- CEOs and GMs should be highly visible
- Put people first every time
- Use a human tone
- Keep websites and social media updated and informative
- Be kind and compassionate

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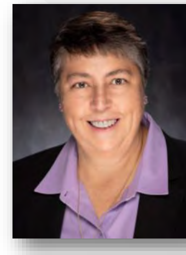

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Fort Worth Water Department

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Communicating about COVID-19 in an Era of Distrust

Principles of Risk Communication

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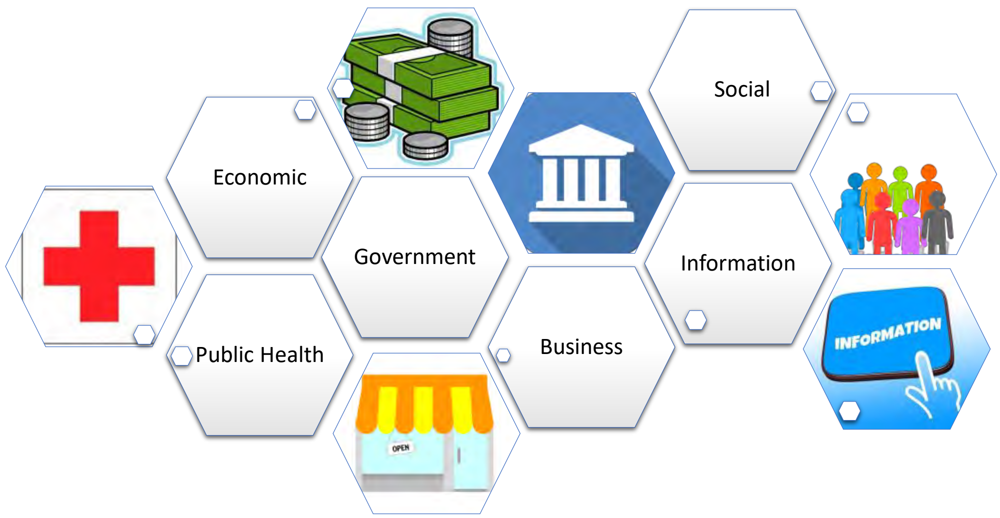
Why is this moment so different? 6 crises, not 1



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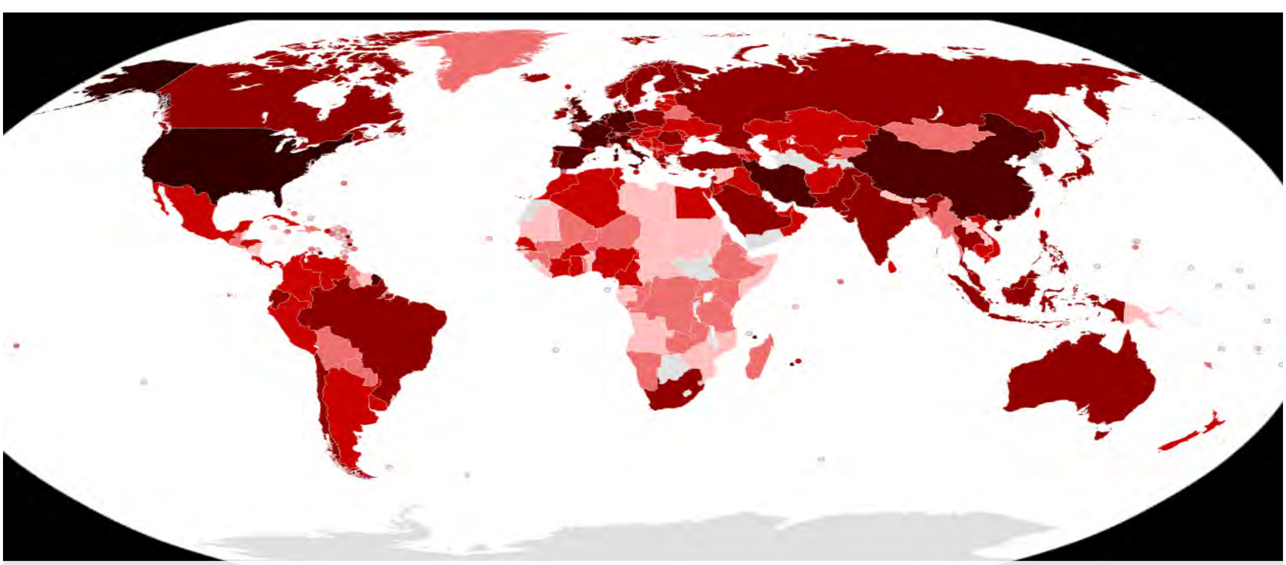

Everyone is affected and the situation changes daily

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Trust Happens When…

- Promises are filled
- Expectations are met
- Values are being lived

RAFTELIS

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17

Ask Yourself

What would *reasonable* people appropriately expect a *responsible* organization to do in this situation?

RAFTELIS

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In turbulent times, people crave reassurance

RAFTELIS

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Many voices will fill the silent void you left with misinformation

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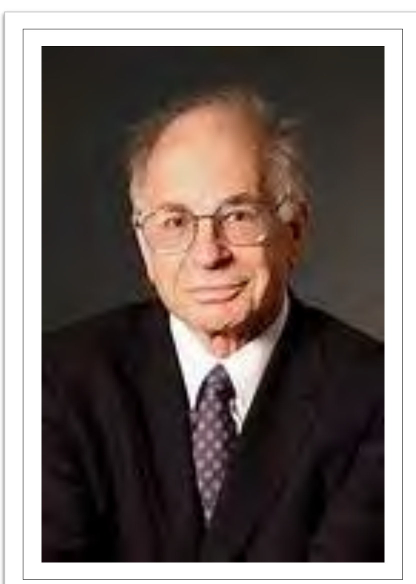

Discovered that when fear is present, people process information differently.

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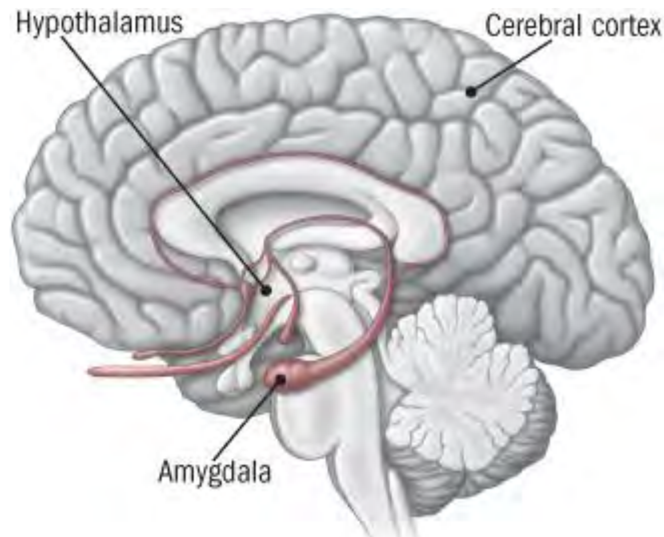
We need to move customers from this heightened emotional, fear-based state, back to one of reason



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No one will care what you know until they know that you care.

24

The CAP Template Demonstrates Caring Concern

25

CARING

- I understand your concern about COVID-19.
- I, too, am concerned, as a parent, a sister and a child of aging parents.

ACTIONS

- Your tap water is not something you need to worry about.
- It is safe to drink and use as always.
- Our treatment and disinfection process kills viruses, including the coronavirus.

PERSPECTIVE

- The United States has some of the highest standards for tap water in the world and we consistently meet those standards

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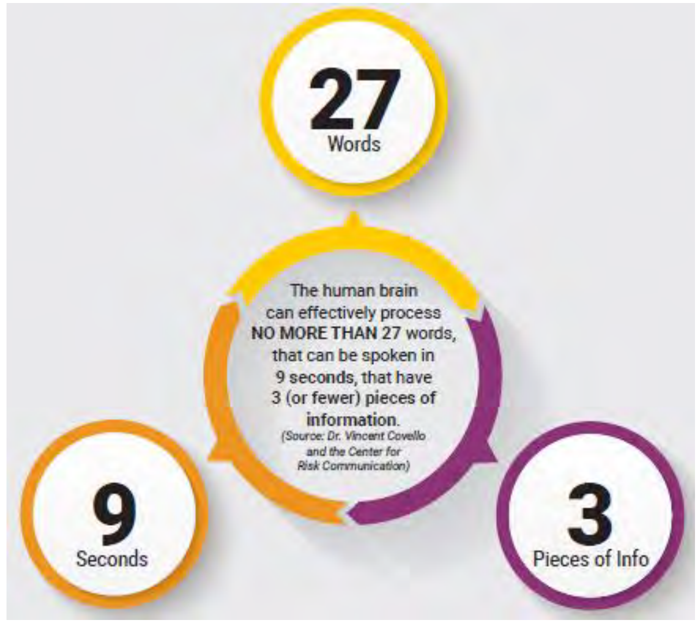
Follow the 27-9-3 Rule



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Your mental health is critically important to us

- Take breaks from COVID-19 news.
- Practice self-care, with meditation, getting enough sleep, exercising, and eating healthy
- Connect with friends and family safely, using online tools or staying six feet apart.

If you must go somewhere, please keep yourself and others healthy

- Wash hands for 20 seconds or use hand sanitizer with at least 60% alcohol.
- Stay six feet away from others.
- Clean and disinfect surfaces you touch frequently
- Cover your nose and mouth with a tissue to sneeze or cough

Here are some resources to help you and your family

- Contact our healthcare provider at INSERT HOW for access to licensed, online physicians.
- Access our free Employee Assistance Program if you need help with...
- We've posted many resources at the employee intranet site to help you work from home effectively.

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Don't be silent.

Be first.

Talk often.

Shift your objective

Use the CAP template

Use the 27-9-3 rule

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ASK THE EXPERTS

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AWWA
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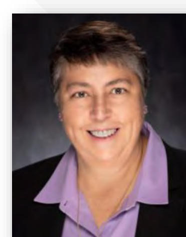
Kelley Dearing Smith
Louisville Water



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Fort Worth Water Department

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Building Trust from the Inside Out

Kelley Dearing Smith
Vice President, Communications and Marketing

Louisville Water Company

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Building Trust from the Inside Out

- Focus on Internal Communications
  - Louisville Water's risk communication plan
    - What's worked? Where can we improve?
  - Building trust and filling the goodwill glass
    - Utility examples
    - How the internal feeds your external message
  - Three-week perspective

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Louisville Water Company

Louisville Water

Drinking water to nearly one million people in Louisville, Kentucky region. Started operations in 1860 as Kentucky's first public water provider.

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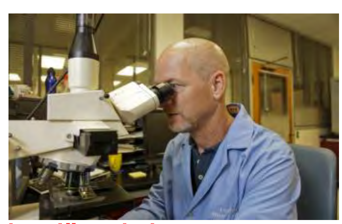
Biggest Challenge To Date

Louisville Water



This is not your "typical" crisis

- Crisis that impacts work and home
- Impacts the entire organization
- After the crisis, enormous ripple effects

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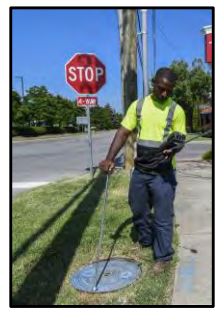
Who delivers the message?

Louisville Water

- How many people work at your utility?
- Not everyone who tells a story about your utility doesn't have "communications" in their title.



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The Foundation

Louisville Water

- Louisville Water has an Emergency Response Plan and a Pandemic Plan.
  - Plans **did not** account for:
    - Over 40-percent of employees working remotely
    - The personal impact of the crisis
    - The magnitude and longevity of this crisis
- Established Crisis Team
- Communication Plan – a plan that's used every day to build Louisville Water's brand

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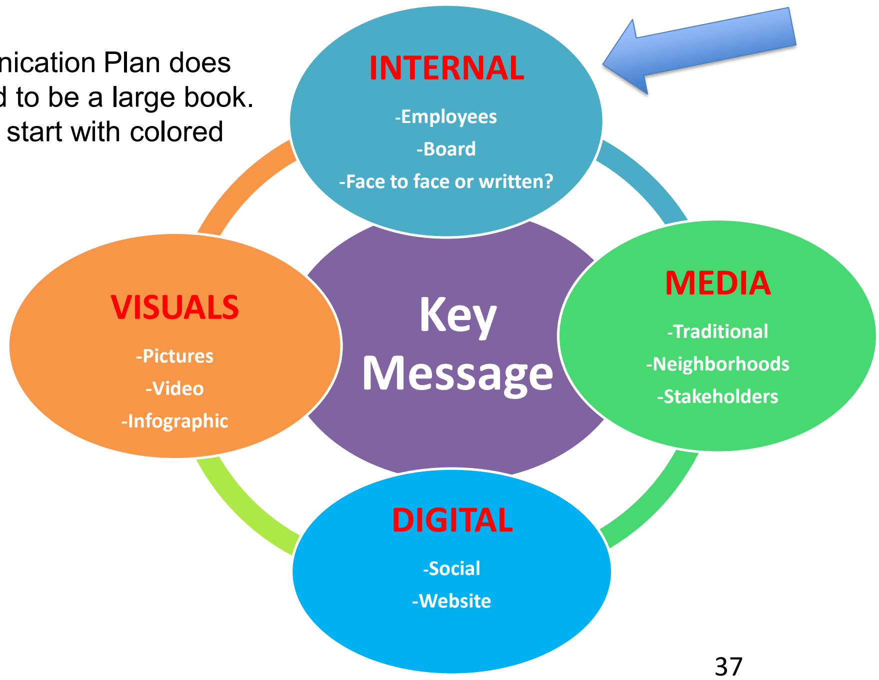
Communication Plan does not need to be a large book. You can start with colored circles



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The Foundation

- Internal checklist:
  - ✓Crisis team?
  - ✓Internal communication channels
  - ✓Draft messages for when an employee tests positive, is exposed or tragically dies
  - ✓Key messages you'll repeat, repeat and repeat

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Key Messages

Louisville Water

- Three key internal messages:
  - Your health and safety is our priority
  - We'll be honest, transparent; we'll listen and keep you informed
  - Louisville Water is an essential employer and our product is critical in this crisis

Internal messages translate into external messages:
Public health, safety of the water, transparent communication, listening.

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Draft Internal Message

Louisville Water

Human Resources was notified by (**insert agency**) that a Louisville Water employee at (**insert location*)** received a (**positive/presumptively positive**) diagnosis of Coronavirus.

We're hoping for a quick recovery and respecting this employee's privacy but it's important that you know what we have done and will continue to do:

*Internal conversation with HR and management before this is communicated

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Develop a Rhythm

Louisville Water

Daily structure since March 16

Crisis team meets at 9am → Officers meet afterwards

Email from CEO at 2:30 pm → Continuous Listening and Sharing

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Develop a Rhythm

Louisville Water

Crisis team meets at 9am

- Includes all aspects of the utility
- 30 minutes
- Agenda: safety, local/state/national information, operational issues, employee questions
- Included auditor to document everything we’re doing
- Expectation that there’s a trickle-down of information

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Develop a Rhythm

Louisville Water

Officers meet afterwards

- Deep dive into themes from the Crisis Team
- Big picture concerns: Human Resources, IT needs, revenue, employee morale, industry conversations

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Develop a Rhythm

Louisville Water

Email from CEO at 2:30 pm

- Short, two-three key messages
- CAP principal (Caring, Action, Perspective
- Answer questions
- No fancy design!

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Develop a Rhythm

Louisville Water

Email from CEO at 2:30 pm

- Union leadership and field managers deliver the message on job sites
- Everything repeated on Intranet

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45

Listen, Learn and Adapt

Louisville Water

#1: This is personal

– Managers need to know their employees. Who has children? Single parents? Special needs?

Caring: With schools closed, I know working will be a challenge for you.

Action: That's why we're developing remote abilities where we can and creating an employee "shared bank" of time

Perspective: Louisville Water is an essential employer during this crisis. We're doing our best to make sure we continue to deliver reliable, high-quality water.

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46

Listen, Learn and Adapt

Louisville Water

#2: Define "essential"

- This is an extraordinary time to work.
- Louisville Water is an essential employer. But it's not essential that all of our employees do their job in their traditional setting.
- But, for those employees who must be on site, we'll do everything we can to keep you safe.

Notice the CAP language:
Caring, Action, Perspective

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Listen, Learn and Adapt

Louisville Water

#3: Trust your employees

- Traditional conservative attitude on work-from-home had to quickly change
- IT department is the critical link
- Listen to Millennials for telecommuting ideas 
- Change your communication style to accommodate those at the facilities and at home

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Listen, Learn and Adapt

Louisville Water

#4 Be prepared to tweak your message

Initial message to stop water shut-offs went viral on social media with 3,000 people sharing the news.

Lots of trust for the goodwill glass!

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49

Listen, Learn and Adapt

Louisville Water

Three weeks later… shifting our message to prepare for what's coming:

We know this is a tough time, but we want to help. Call us and we'll work with you.

Pay what you can message starts internal with news to our employees

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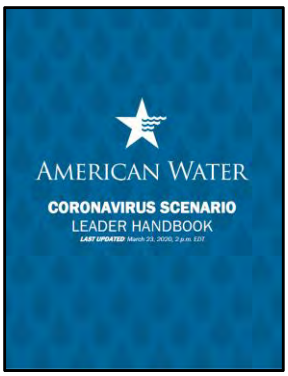
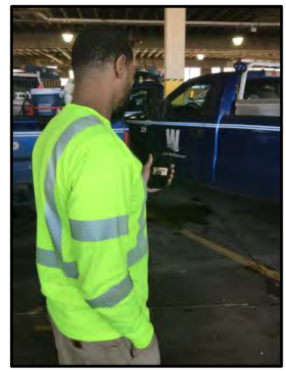
Key to Good Communication?

Consistent, Clear and Concise

"Visible" in whatever way works for your utility



Leadership handbook, virtual town halls, short iPhone videos, emails, social media



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Creative Tactics

- Digital is your friend, both in reaching employees and building trust in the community
- Remember, traditional ways of communicating are gone

Employees are "honorary members" of the Comm Team. Since I can't visit the lab to show how they're separating themselves, scientists take the pictures.

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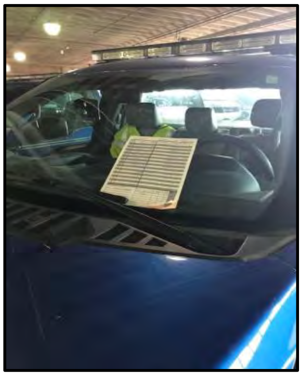
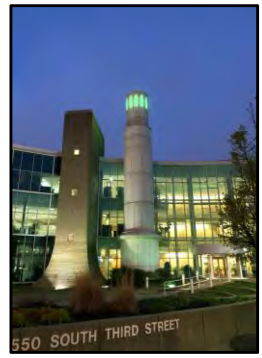
Creative Tactics

Louisville Water



To maintain social distancing, meter readers leave their information on the windshield for supervisors to retrieve

Union leadership fills and delivers bottles of hand sanitizer, donated from local wineries and bourbon distillers.



Lighting our nearly empty corporate office green to show compassion

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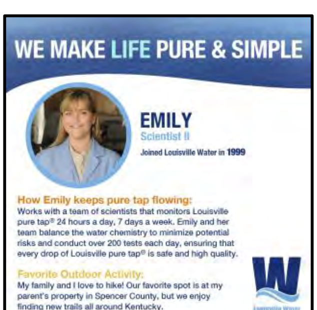
Creative Tactics

Louisville Water



Treatment plant operator selfies, employee profiles and help from AWWA

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Three Week Perspective

Louisville Water

- Kelley's reflection:
  - There's no playbook for this crisis
  - Plan changes daily, but your communication style should not
  - My network is my rock for managing through this
  - Trust your gut
  - I miss people

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Continue the conversation…

Louisville Water

Kelley Dearing Smith

Email: ksmith@lwcky.com

Twitter: @kelleydsmith @LouisvilleWater

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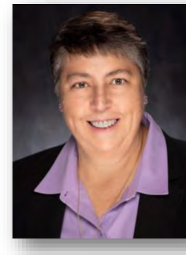

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Fort Worth Water Department

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When You’re Part of the Solution – Not the Problem

Mary Gugliuzza
Media Relations & Communications Coordinator
Fort Worth Water

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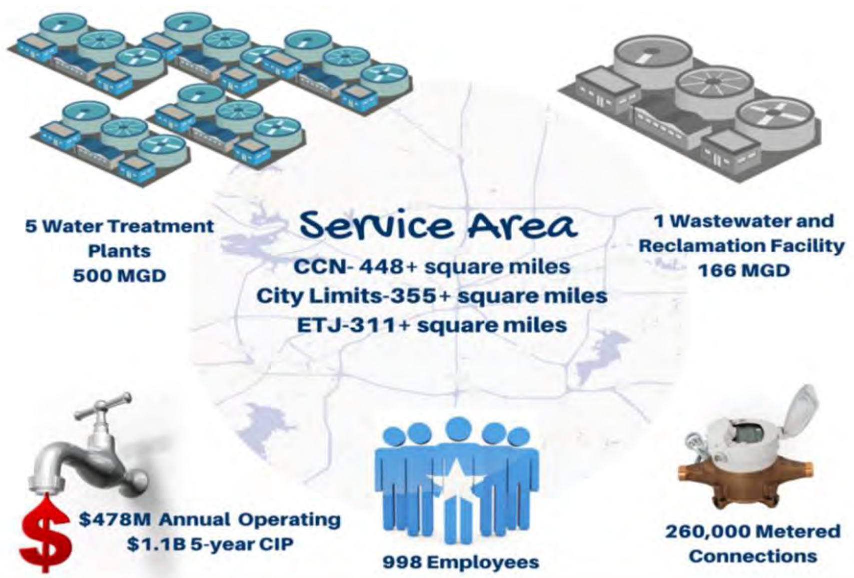

FORT WORTH WATER

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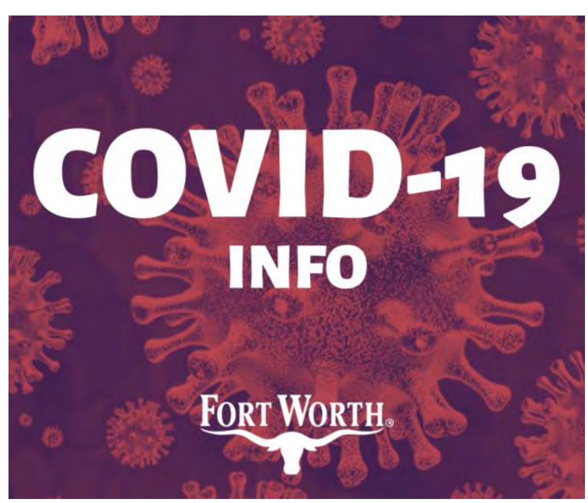
Telling Your Story

- Understand you are not the main story but….
- We cannot stay silent



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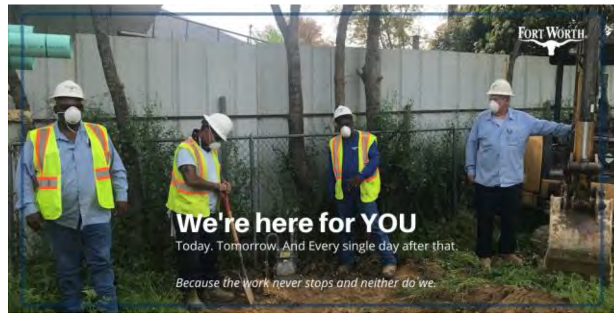
FORT WORTH

Objectives



- Build trust
- Raise awareness
- Fill the goodwill reservoir

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FORT WORTH

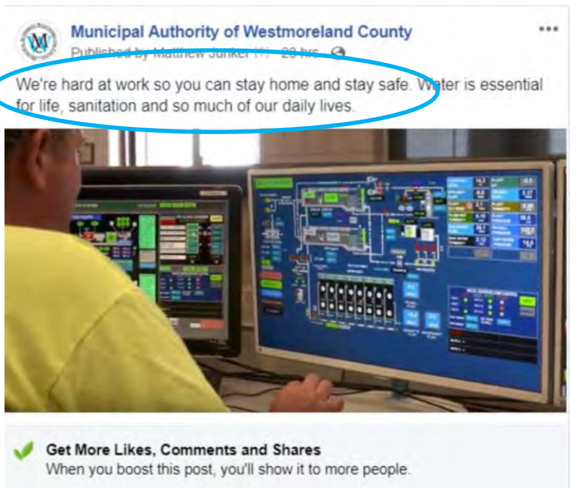
Key message:

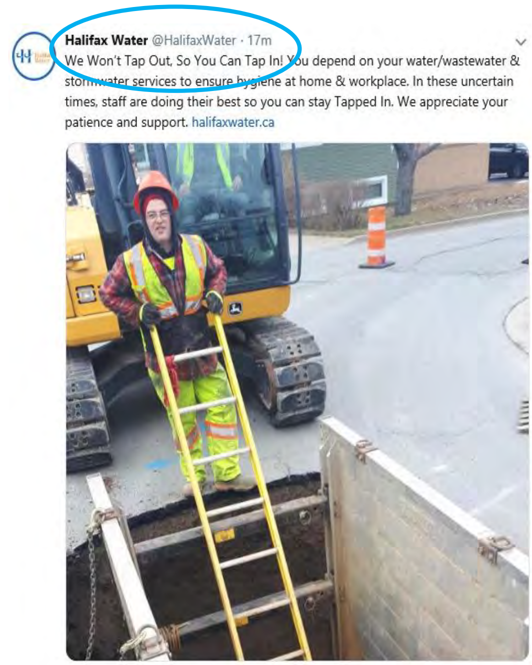
Service:

- Our offices are closed, but we're still here for YOU.

62

We ARE Essential:





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FORT WORTH

Key message:

Safety:

- Your tap water is safe.
- You don't need to clear the bottled water shelves – save it for a real water emergency

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FORT WORTH

Key message #3:

- **Economy**: We understand that many of you are unexpectedly unemployed… so no shutoffs or penalties for now.

Halifax Water Payment Options

Some customers may face economic impacts due to the COVID-19 situation that will cause them to struggle with paying their accounts. If during this period your account falls into arrears, please contact Halifax Water to discuss payment arrangements.

Disconnections for non-payment of service will be suspended during the next 30 days and customers that are currently disconnected will be reconnected based on agreement to a repayment arrangement.

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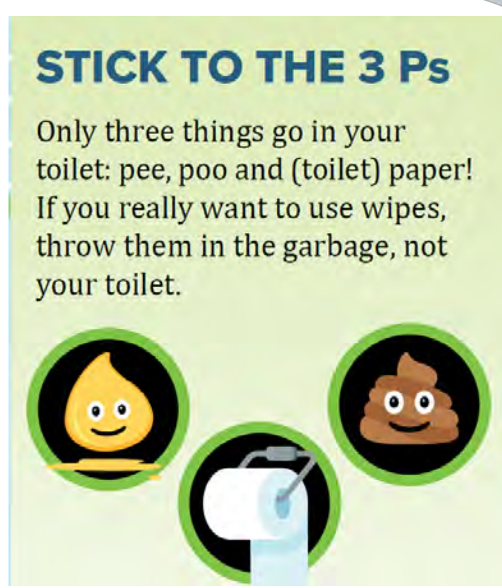
FORT WORTH

Key message:

We need your help

- Keep the plumber away. Flush only pee, poo and (toilet) paper.
- More people at home all day may mean more cooking, please don't put grease and fats down the drain.



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FORT WORTH

Maximize Opportunities: It's OK

- Can we show gratitude? Our team? Community partners?
- Can you "reuse" existing content?
- Is there appropriate humor?

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FORT WORTH

It's all about digital these days

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FORT WORTH

Fort Worth's efforts

Podcast

@FWWater

@FWAgua

Fort Worth Water

Fort Worth Agua

saveFWwater

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ZenCity analysis

Communications by the Water Department dispelling concerns about water safety are appreciated, while the issue of bill payments during the Coronavirus crisis stirs anxiety and anger 1 March - 29 March, 2020

coronavirus water-bill

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FORT WORTH

The Basics

- ✓Gather a team
- ✓Set your objective
- ✓Identify what the community wants to hear
- ✓Build effective messages
- ✓Deliver where they are listening
- ✓Be strategic on social media

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FORT WORTH

What's Ahead

- Employee diagnoses or even worse
- Sufficiency of staff resources
- "Essential" or not?
- Social distancing in the field and office (for those still there)
- When the bill comes due…

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FORT WORTH.

Prepare our customers now

Currently, Louisville Water is not turning off water service when an account is past-due. You're receiving this letter because our records show you are past due on your water and sewer bill.

We want to help. We recognize many of our customers face challenging times right now. You have several options:

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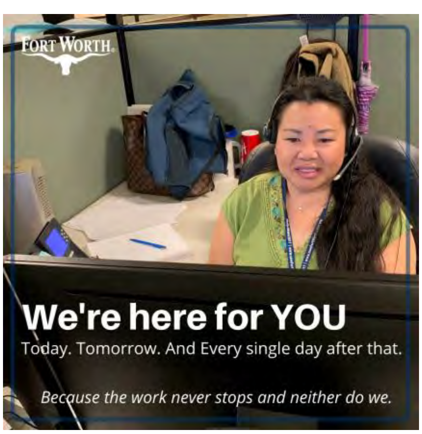
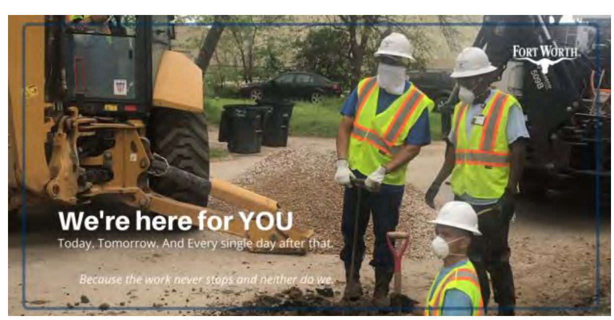
FORT WORTH.

We're in This for The Long Haul





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Thank you
to the Public Affairs Council!

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ASK THE EXPERTS

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ADDITIONAL RESOURCES

- Trending in an Instant: A Risk Communication Guide for Water Utilities
- "Trending in an Instant" Executive Summary

- AWWA's Coronavirus Resource Page

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UPCOMING WEBINARS

April 6: FREE Webinar: Legal Aspects of COVID-19 for Water Utilities
April 22: Drought Preparedness and Response
April 30: FREE Webinar from GE Digital: How to Create Your Digital Plant

Register for a 2020 Webinar Bundle

View the full 2020 schedule at awwa.org/webinars

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THANK YOU FOR JOINING TODAY'S WEBINAR

- As part of your registration, you are entitled to an additional 30-day archive access of today's program.
- Until next time, keep the water safe and secure.

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PRESENTER CONTACT INFORMATION

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80

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PRESENTER BIOGRAPHY INFORMATION

Melissa Elliott's 25+ year public relations career is focused on helping water and wastewater utilities and municipalities tell their stories. She oversees strategic communication planning, stakeholder engagement and risk communication strategies for Raftelis. Highly active in the water industry, Melissa is President-Elect of the American Water Works Association, is a former chair of AWWA's Public Affairs Council, and a regular volunteer for The Water Research Foundation.

For more than 15 years, Samantha Villegas has assisted water utilities with branding, reputation and crisis management, as well as the execution of communications strategies to ensure positive positioning for rate increases, acquisitions, capital projects and change management. Sam has been actively involved in both the American Water Works Association (AWWA), and the Public Relations Society of America (PRSA), where she currently serves on its Board of Directors.

Kelley Dearing Smith is vice president for communications and marketing at Louisville Water Company in Louisville, Kentucky. She's worked at Louisville Water for over 20 years and is currently vice-chair of AWWA's Public Affairs Council. Much of Kelley's career focuses on brand-building and communicating the value of water.

Mary Gugliuzza is current chair of AWWA's Public Affairs Council. At the City of Fort Worth, Mary is responsible for development and coordination of the water department's communications, including employee communications, media relations, customer outreach, website content and school educational programs. She is also an active member of AWWA's Texas Section.

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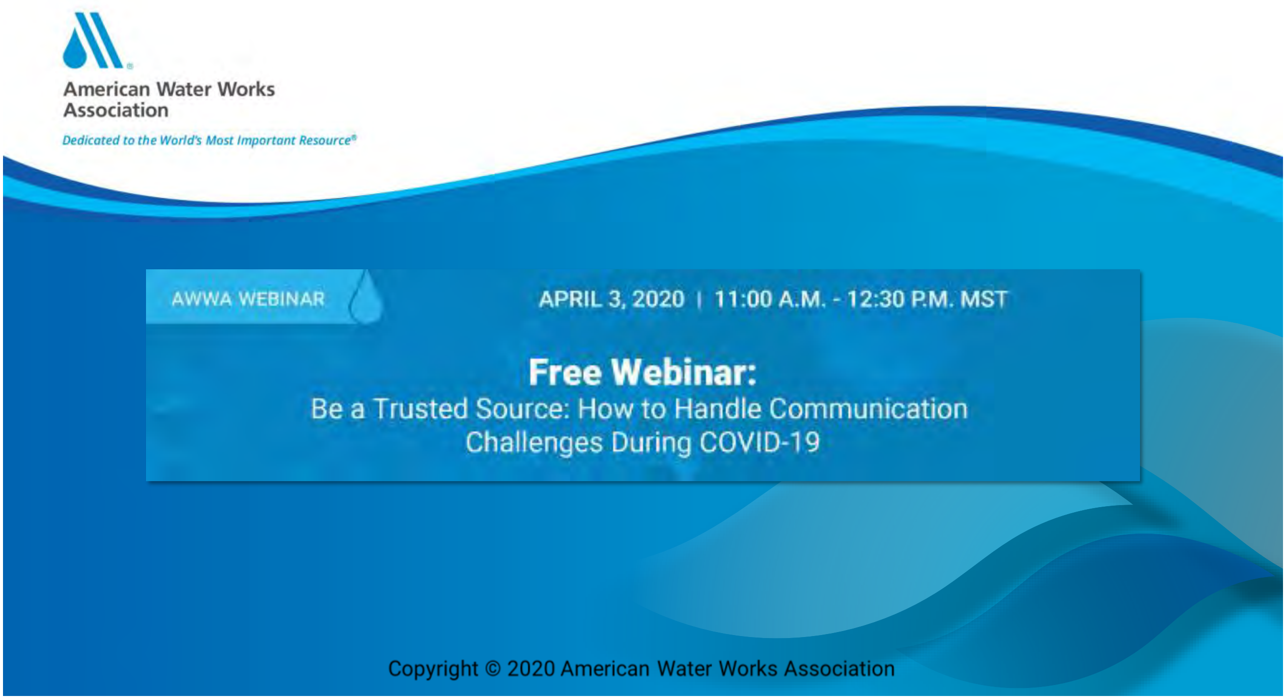
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WEBINAR MODERATOR

Karen Snyder
Vice President
Katz & Associates

Karen Snyder has been active in water, wastewater and environmental public affairs for nearly 30 years, specializing in strategic communication planning, public involvement, facility siting, construction relations, community relations, spokesperson and media training, and crisis communications. Karen is a member of the American Water Works Association (AWWA) and currently serves on the organization's national Public Affairs Council.

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PANEL OF EXPERTS

Melissa Elliott
AWWA President-Elect
Dir. Strategic Communication Services, Raftelis

Samantha Villegas
Senior Consultant
Raftelis

Kelley Dearing Smith
Vice President, Communications and Marketing
Louisville Water

Mary Gugliuzza
Media Relations & Communications Coordinator
Fort Worth Water Department

7

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AGENDA

I.	Welcome and Intro	Melissa Elliott
II.	Communicating about COVID-19 in an Era of Distrust: Principles of Risk Communication	Samantha Villegas
III.	Building Trust from the Inside Out	Kelley Dearing Smith
IV.	When You're Part of the Solution – Not the Problem	Mary Gugliuzza

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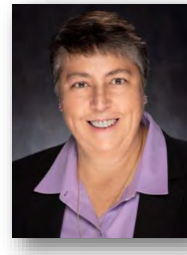

Mary Gugliuzza
Fort Worth Water Department

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American Water Works Association

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WELCOME AND INTRO

Melissa Elliott, AWWA President-Elect
Director of Strategic Communication Services at Raftelis

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AWWA is here for you with information, training, resources and a network of professionals

- COVID-19 resources available at www.awwa.org/coronavirus
- Resources are constantly being added and updated
- We're advocating for the water industry
- AWWA.org is your information hub

11

What leaders, managers, and communicators should do right now:

- Communicate consistently and constantly
- CEOs and GMs should be highly visible
- Put people first every time
- Use a human tone
- Keep websites and social media updated and informative
- Be kind and compassionate

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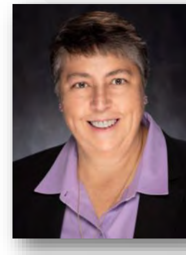
Kelley Dearing Smith
Louisville Water



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Communicating about COVID-19 in an Era of Distrust

Principles of Risk Communication

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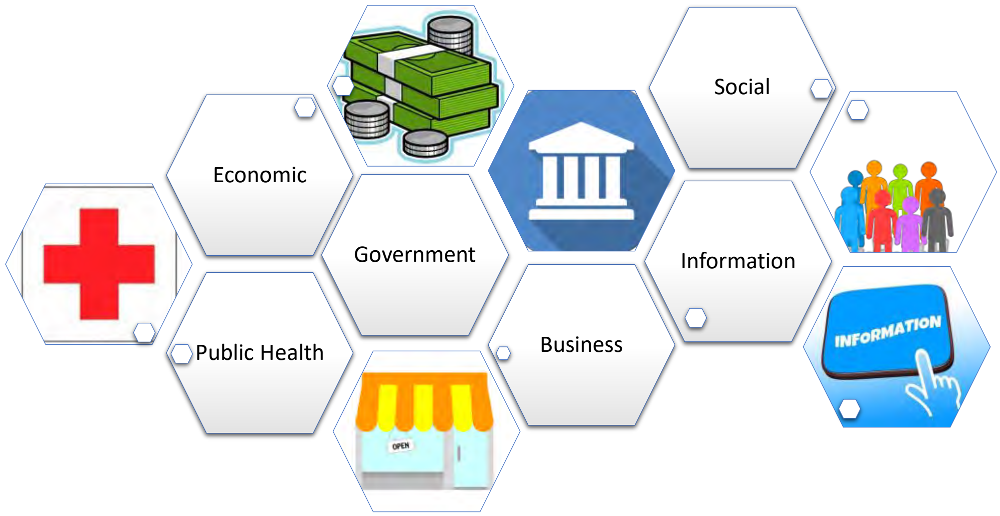
Why is this moment so different? 6 crises, not 1



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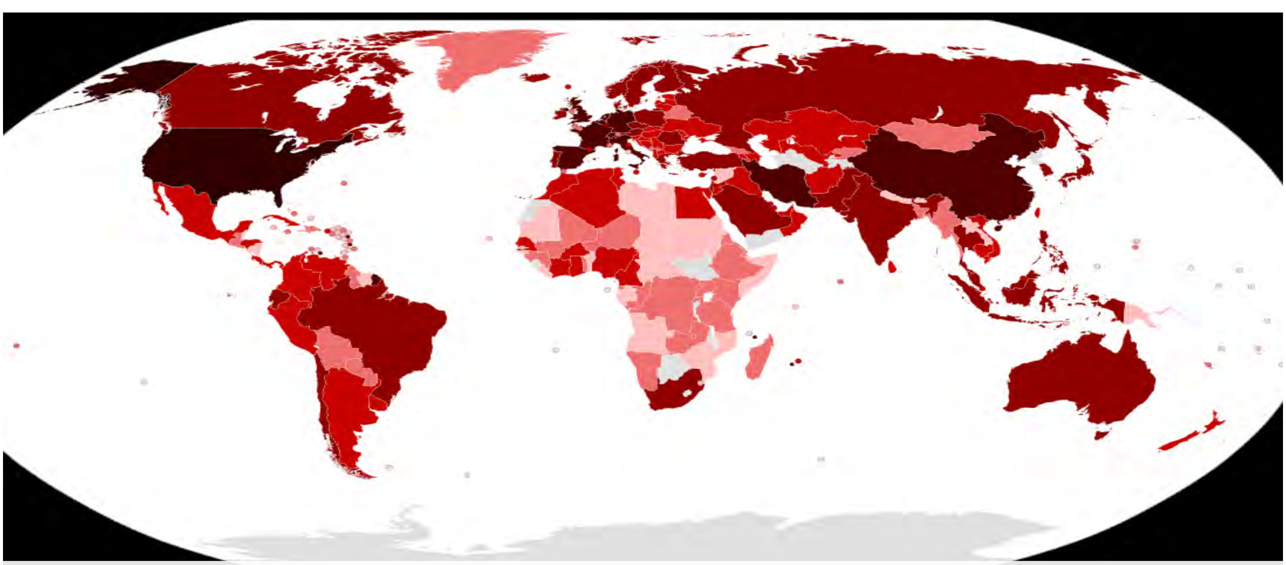

Everyone is affected and the situation changes daily

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Trust Happens When…

- Promises are filled
- Expectations are met
- Values are being lived

RAFTELIS

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Ask Yourself

What would *reasonable* people appropriately expect a *responsible* organization to do in this situation?

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In turbulent times, people crave reassurance

RAFTELIS

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Many voices will fill the silent void you left with misinformation

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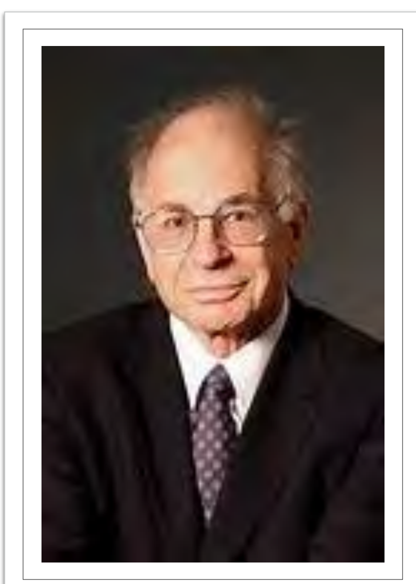

Discovered that when fear is present, people process information differently.

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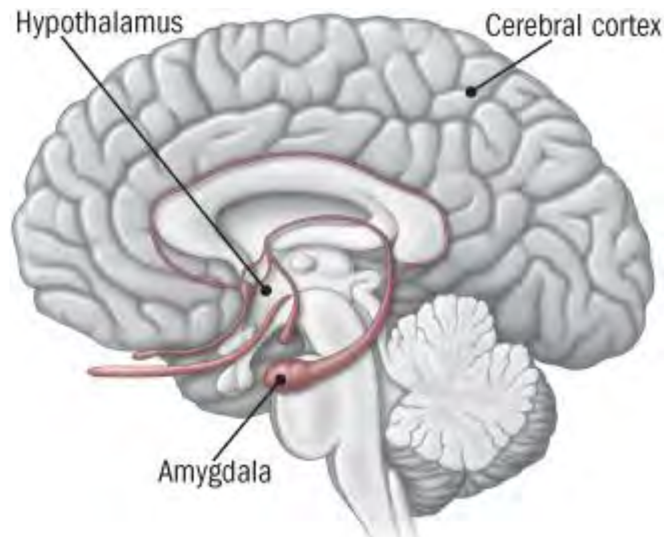
We need to move customers from this heightened emotional, fear-based state, back to one of reason



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No one will care what you know until they know that you care.

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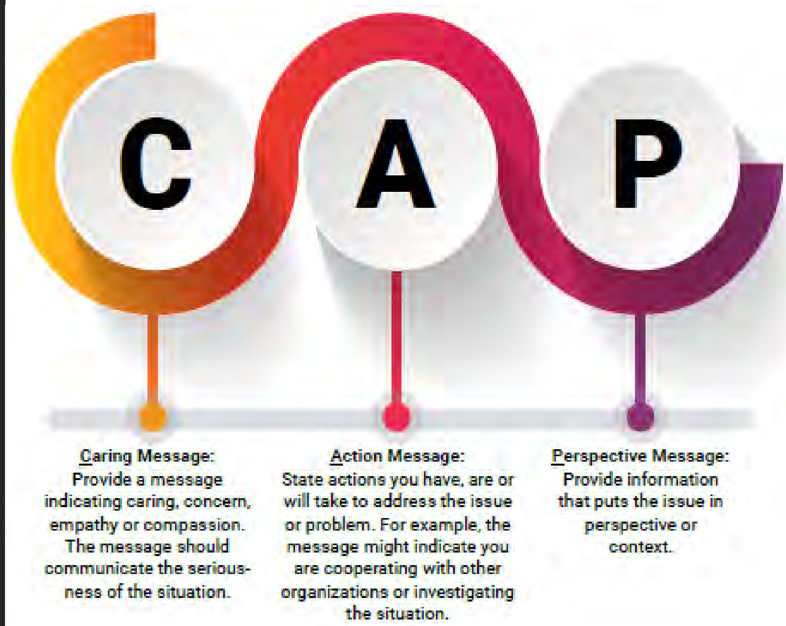
The CAP Template Demonstrates Caring Concern



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CARING

- I understand your concern about COVID-19.
- I, too, am concerned, as a parent, a sister and a child of aging parents.

ACTIONS

- Your tap water is not something you need to worry about.
- It is safe to drink and use as always.
- Our treatment and disinfection process kills viruses, including the coronavirus.

PERSPECTIVE

- The United States has some of the highest standards for tap water in the world and we consistently meet those standards

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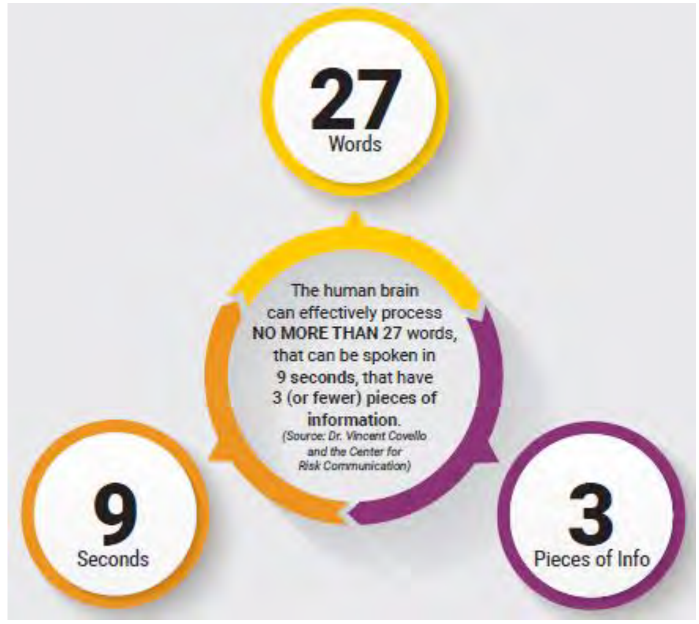
Follow the 27-9-3 Rule



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Your mental health is critically important to us

- Take breaks from COVID-19 news.
- Practice self-care, with meditation, getting enough sleep, exercising, and eating healthy
- Connect with friends and family safely, using online tools or staying six feet apart.

If you must go somewhere, please keep yourself and others healthy

- Wash hands for 20 seconds or use hand sanitizer with at least 60% alcohol.
- Stay six feet away from others.
- Clean and disinfect surfaces you touch frequently
- Cover your nose and mouth with a tissue to sneeze or cough

Here are some resources to help you and your family

- Contact our healthcare provider at INSERT HOW for access to licensed, online physicians.
- Access our free Employee Assistance Program if you need help with...
- We've posted many resources at the employee intranet site to help you work from home effectively.

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Don't be silent.

Be first.

Talk often.

Shift your objective

Use the CAP template

Use the 27-9-3 rule

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ASK THE EXPERTS

Karen Snyder
Katz & Associates

Melissa Elliott
AWWA
Raftelis

Samantha Villegas
Raftelis

Kelley Dearing Smith
Louisville Water

Mary Gugliuzza
Fort Worth Water Department

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Building Trust from the Inside Out

Kelley Dearing Smith
Vice President, Communications and Marketing

Louisville Water Company

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Building Trust from the Inside Out

- Focus on Internal Communications
  - Louisville Water's risk communication plan
    - What's worked? Where can we improve?
  - Building trust and filling the goodwill glass
    - Utility examples
    - How the internal feeds your external message
  - Three-week perspective

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Louisville Water Company

Drinking water to nearly one million people in Louisville, Kentucky region. Started operations in 1860 as Kentucky's first public water provider.

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Biggest Challenge To Date

This is not your "typical" crisis

- Crisis that impacts work and home
- Impacts the entire organization
- After the crisis, enormous ripple effects

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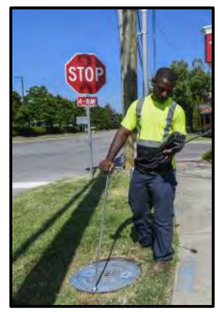
Who delivers the message?

Louisville Water

- How many people work at your utility?
- Not everyone who tells a story about your utility doesn't have "communications" in their title.



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The Foundation

Louisville Water

- Louisville Water has an Emergency Response Plan and a Pandemic Plan.
  - Plans **<u>did not</u>** account for:
    - Over 40-percent of employees working remotely
    - The personal impact of the crisis
    - The magnitude and longevity of this crisis
- Established Crisis Team
- Communication Plan – a plan that's used every day to build Louisville Water's brand

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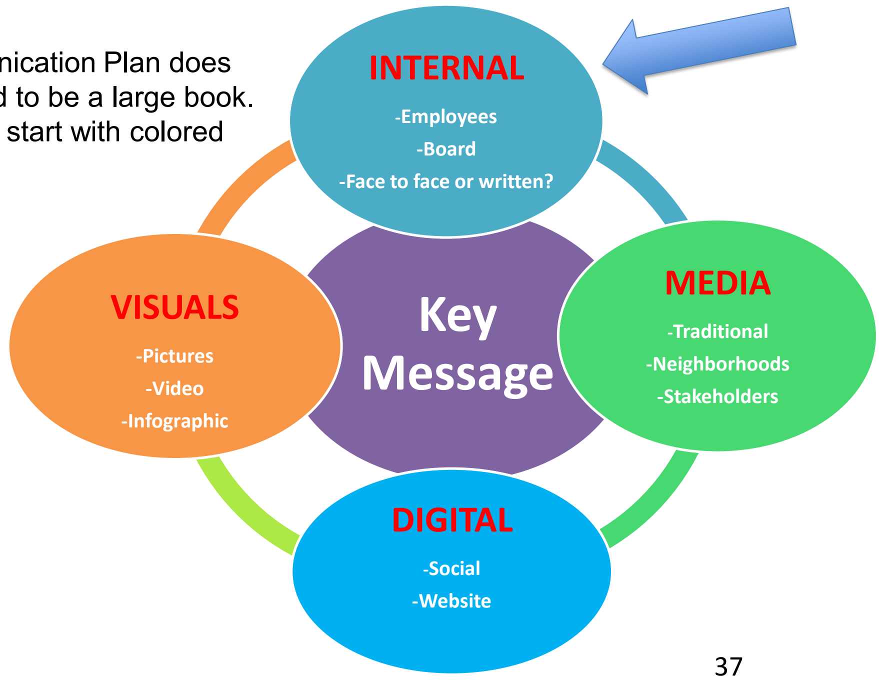
Communication Plan does not need to be a large book. You can start with colored circles



Louisville Water

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The Foundation

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- Internal checklist:
  - ✓Crisis team?
  - ✓Internal communication channels
  - ✓Draft messages for when an employee tests positive, is exposed or tragically dies
  - ✓Key messages you'll repeat, repeat and repeat

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Key Messages

Louisville Water

- Three key internal messages:
  - Your health and safety is our priority
  - We'll be honest, transparent; we'll listen and keep you informed
  - Louisville Water is an essential employer and our product is critical in this crisis

Internal messages translate into external messages:
Public health, safety of the water, transparent communication, listening.

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Draft Internal Message

Louisville Water

Human Resources was notified by (**insert agency**) that a Louisville Water employee at (**insert location*)** received a (**positive/presumptively positive**) diagnosis of Coronavirus.

We're hoping for a quick recovery and respecting this employee's privacy but it's important that you know what we have done and will continue to do:

*Internal conversation with HR and management before this is communicated

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Develop a Rhythm

Louisville Water

Daily structure since March 16

Crisis team meets at 9am → Officers meet afterwards

Email from CEO at 2:30 pm → Continuous Listening and Sharing

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Develop a Rhythm

Louisville Water

Crisis team meets at 9am

- Includes all aspects of the utility
- 30 minutes
- Agenda: safety, local/state/national information, operational issues, employee questions
- Included auditor to document everything we're doing
- Expectation that there's a trickle-down of information

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Develop a Rhythm

Louisville Water

Officers meet afterwards

- Deep dive into themes from the Critical Team
- Big picture concerns: Human Resources, IT needs, revenue, employee morale, industry conversations

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Develop a Rhythm

Louisville Water

Email from CEO at 2:30 pm

- Short, two-three key messages
- CAP principal (Caring, Action, Perspective
- Answer questions
- No fancy design!

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Develop a Rhythm

Louisville Water

Email from CEO at 2:30 pm

- Union leadership and field managers deliver the message on job sites
- Everything repeated on Intranet

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Listen, Learn and Adapt

Louisville Water

#1: This is personal

– Managers need to know their employees. Who has children? Single parents? Special needs?

Caring: With schools closed, I know working will be a challenge for you.

Action: That's why we're developing remote abilities where we can and creating an employee "shared bank" of time

Perspective: Louisville Water is an essential employer during this crisis. We're doing our best to make sure we continue to deliver reliable, high-quality water.

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Listen, Learn and Adapt

Louisville Water

#2: Define "essential"

- This is an extraordinary time to work.
- Louisville Water is an essential employer. But it's not essential that all of our employees do their job in their traditional setting.
- But, for those employees who must be on site, we'll do everything we can to keep you safe.

Notice the CAP language:
Caring, Action, Perspective

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Listen, Learn and Adapt

Louisville Water

#3: Trust your employees

- Traditional conservative attitude on work-from-home had to quickly change
- IT department is the critical link
- Listen to Millennials for telecommuting ideas 
- Change your communication style to accommodate those at the facilities and at home

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Listen, Learn and Adapt

Louisville Water

#4 Be prepared to tweak your message

Initial message to stop water shut-offs went viral on social media with 3,000 people sharing the news.

Lots of trust for the goodwill glass!

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Listen, Learn and Adapt

Louisville Water

Three weeks later… shifting our message to prepare for what's coming:

We know this is a tough time, but we want to help. Call us and we'll work with you.

Pay what you can message starts internal with news to our employees

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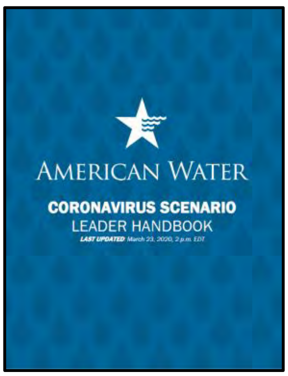
Key to Good Communication?

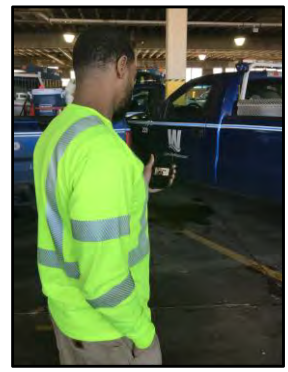
Louisville Water

Consistent, Clear and Concise

"Visible" in whatever way works for your utility



Leadership handbook, virtual town halls, short iPhone videos, emails, social media



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Creative Tactics

Louisville Water

- Digital is your friend, both in reaching employees and building trust in the community
- Remember, traditional ways of communicating are gone

Employees are "honorary members" of the Comm Team. Since I can't visit the lab to show how they're separating themselves, scientists take the pictures.

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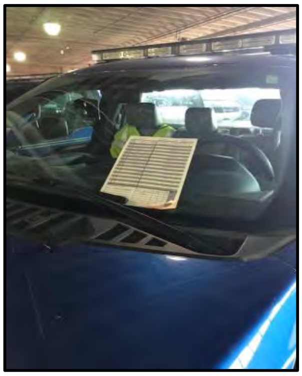
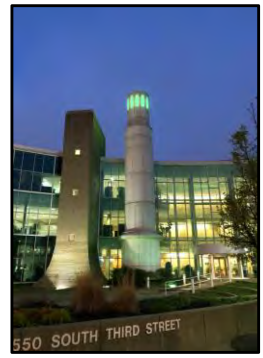
Creative Tactics



To maintain social distancing, meter readers leave their information on the windshield for supervisors to retrieve

Union leadership fills and delivers bottles of hand sanitizer, donated from local wineries and bourbon distillers.



Lighting our nearly empty corporate office green to show compassion

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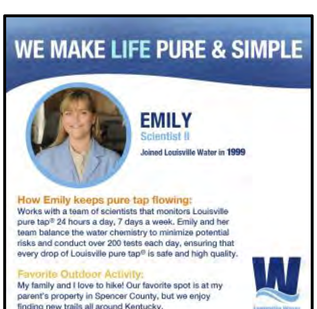
Creative Tactics



Treatment plant operator selfies, employee profiles and help from AWWA

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Three Week Perspective

- Kelley's reflection:
  - There's no playbook for this crisis
  - Plan changes daily, but your communication style should not
  - My network is my rock for managing through this
  - Trust your gut
  - I miss people

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Continue the conversation…

Kelley Dearing Smith

Email: ksmith@lwcky.com

Twitter: @kelleydsmith @LouisvilleWater

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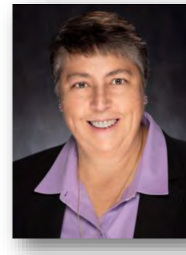

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Fort Worth Water Department

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When You're Part of the Solution – Not the Problem

Mary Gugliuzza
Media Relations & Communications Coordinator
Fort Worth Water

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FORT WORTH WATER

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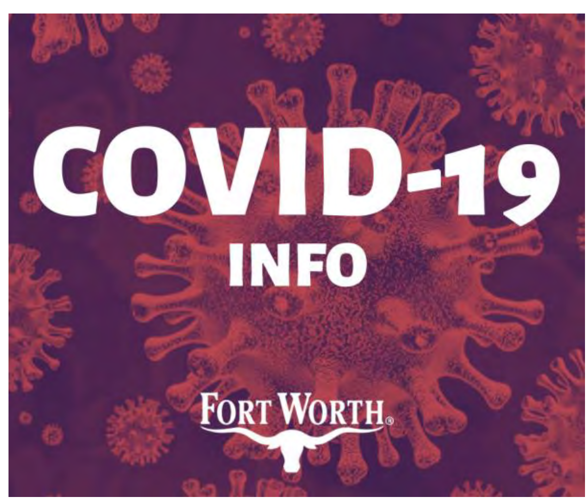
FORT WORTH

Telling Your Story

- Understand you are not the main story but….
- We cannot stay silent



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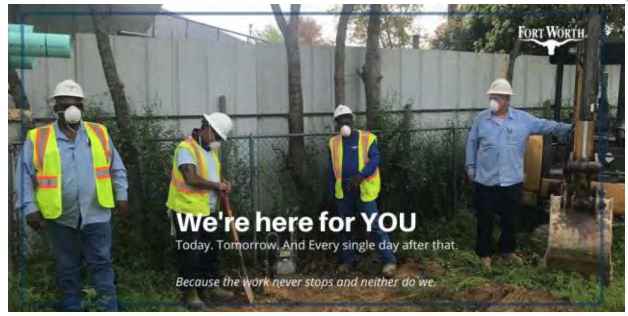
FORT WORTH

Objectives



- Build trust
- Raise awareness
- Fill the goodwill reservoir

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FORT WORTH

Key message:

Service:

- Our offices are closed, but we're still here for YOU.

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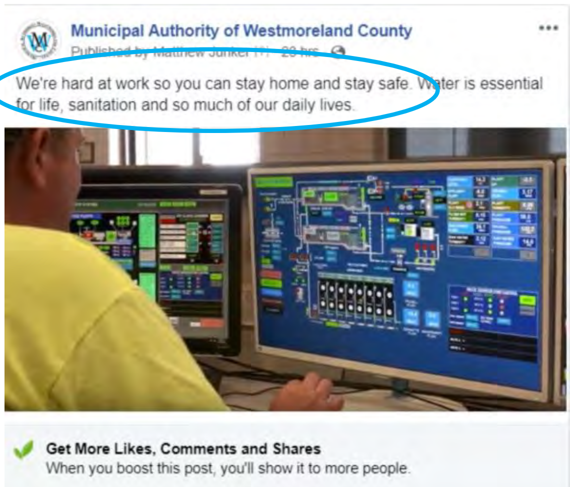
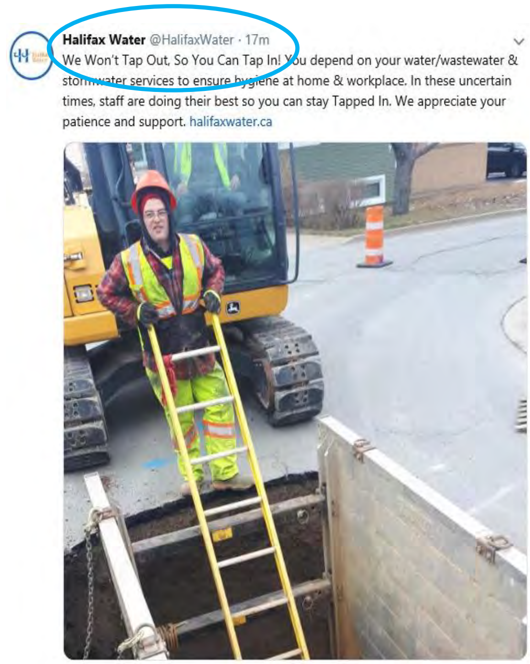
We ARE Essential:





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FORT WORTH

Key message:

Safety:

- Your tap water is safe.
- You don't need to clear the bottled water shelves – save it for a real water emergency

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FORT WORTH

Key message #3:

- **Economy**: We understand that many of you are unexpectedly unemployed… so no shutoffs or penalties for now.

Halifax Water Payment Options

Some customers may face economic impacts due to the COVID-19 situation that will cause them to struggle with paying their accounts. If during this period your account falls into arrears, please contact Halifax Water to discuss payment arrangements.

Disconnections for non-payment of service will be suspended during the next 30 days and customers that are currently disconnected will be reconnected based on agreement to a repayment arrangement.

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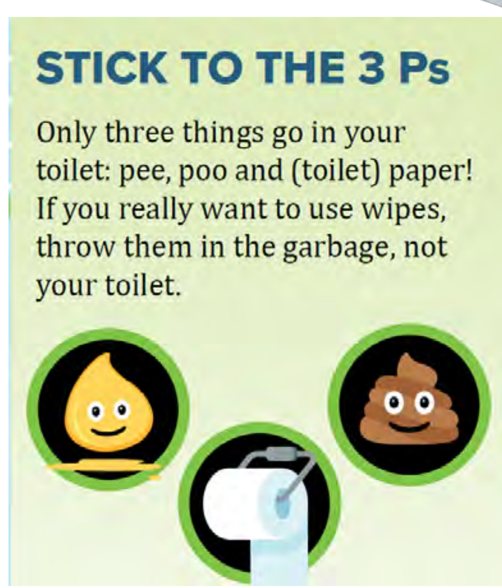
FORT WORTH

Key message:

We need your help

- Keep the plumber away. Flush only pee, poo and (toilet) paper.
- More people at home all day may mean more cooking, please don't put grease and fats down the drain.



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FORT WORTH

Maximize Opportunities: It's OK

- Can we show gratitude? Our team? Community partners?
- Can you "reuse" existing content?
- Is there appropriate humor?

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FORT WORTH

It's all about digital these days

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Fort Worth's efforts

Podcast

@FWWater

@FWAgua

Fort Worth Water

Fort Worth Agua

saveFWwater

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Cheryl Hood Thank you, I drink water from my tap all day long!! I do think about it and am appreciative for not having to worry!!❤️
Love · Reply · Message · 1w 5

Michael J Duggan I drink it everyday and it hydrates just as good as any bottled water and the taste is good keep up the great work I approve 👍
Like · Reply · Message · 10h

ZenCity analysis

Communications by the Water Department dispelling concerns about water safety are appreciated, while the issue of bill payments during the Coronavirus crisis stirs anxiety and anger 1 March - 29 March, 2020

coronavirus water-bill

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FORT WORTH.

The Basics

- ✓Gather a team
- ✓Set your objective
- ✓Identify what the community wants to hear
- ✓Build effective messages
- ✓Deliver where they are listening
- ✓Be strategic on social media

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FORT WORTH.

What's Ahead

- Employee diagnoses or even worse
- Sufficiency of staff resources
- "Essential" or not?
- Social distancing in the field and office (for those still there)
- When the bill comes due…

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FORT WORTH

Prepare our customers now

Currently, Louisville Water is not turning off water service when an account is past-due. You're receiving this letter because our records show you are past due on your water and sewer bill.

We want to help. We recognize many of our customers face challenging times right now. You have several options:

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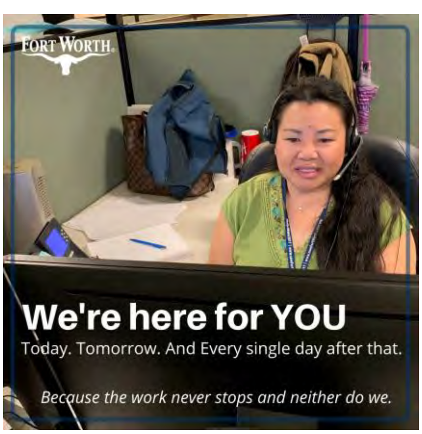
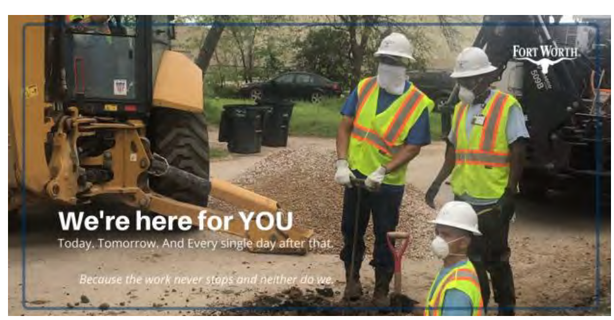
FORT WORTH

We're in This for The Long Haul





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Thank you
to the Public Affairs Council!

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ADDITIONAL RESOURCES

- Trending in an Instant: A Risk Communication Guide for Water Utilities
- "Trending in an Instant" Executive Summary

- AWWA's Coronavirus Resource Page

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UPCOMING WEBINARS

April 6: FREE Webinar: Legal Aspects of COVID-19 for Water Utilities
April 22: Drought Preparedness and Response
April 30: FREE Webinar from GE Digital: How to Create Your Digital Plant

Register for a 2020 Webinar Bundle

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- As part of your registration, you are entitled to an additional 30-day archive access of today's program.
- Until next time, keep the water safe and secure.

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PRESENTER CONTACT INFORMATION

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PRESENTER BIOGRAPHY INFORMATION

Melissa Elliott's 25+ year public relations career is focused on helping water and wastewater utilities and municipalities tell their stories. She oversees strategic communication planning, stakeholder engagement and risk communication strategies for Raftelis. Highly active in the water industry, Melissa is President-Elect of the American Water Works Association, is a former chair of AWWA's Public Affairs Council, and a regular volunteer for The Water Research Foundation.

For more than 15 years, Samantha Villegas has assisted water utilities with branding, reputation and crisis management, as well as the execution of communications strategies to ensure positive positioning for rate increases, acquisitions, capital projects and change management. Sam has been actively involved in both the American Water Works Association (AWWA), and the Public Relations Society of America (PRSA), where she currently serves on its Board of Directors.

Kelley Dearing Smith is vice president for communications and marketing at Louisville Water Company in Louisville, Kentucky. She's worked at Louisville Water for over 20 years and is currently vice-chair of AWWA's Public Affairs Council. Much of Kelley's career focuses on brand-building and communicating the value of water.

Mary Gugliuzza is current chair of AWWA's Public Affairs Council. At the City of Fort Worth, Mary is responsible for development and coordination of the water department's communications, including employee communications, media relations, customer outreach, website content and school educational programs. She is also an active member of AWWA's Texas Section.

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WEBINAR MODERATOR

Tracy Mehan

Executive Director of Government Affairs

AWWA

Tracy Mehan is Executive Director, Government Affairs, for AWWA. He was an independent consultant and served as Interim President of the U.S. Water Alliance and national Source Water Protection Coordinator for the U.S. Endowment for Forestry and Communities. He is also an Adjunct Professor at George Mason University School of Law and Carnegie Mellon University's Heinz College. He was Principal with The Cadmus Group, Inc., an environmental consulting firm, from 2004 to 2014. Mehan served as Assistant Administrator for Water at the U.S. Environmental Protection Agency from 2001-2003. He served as Environmental Stewardship Counselor to the 2004 G-8 Summit Planning Organization (2004). Mehan also served as director of the Michigan Office of the Great Lakes (1993-2001) and as Associate Deputy Administrator of EPA in 1992. He was director of the Missouri Department of Natural Resources from 1989 to 1992.

Mehan is a graduate of Saint Louis University and its School of Law. Mehan served on the Water Science and Technology Board and now the Committee on the Mississippi River and the Clean Water Act for the National Research Council of the National Academies. He was also an independent expert judge for the City Water Conservation Achievement Award program (2006 & 2011) sponsored by The U.S. Conference of Mayors and its Urban Water Council. Mehan is a member of the Environmental Law Institute (ELI) and a regular book reviewer for ELI's flagship publication, The Environmental Forum. Mehan serves on EPA's Environmental Financial Advisory Board as well as the boards of the U.S. Water Alliance and the Great Lakes Ob-serving System. He is also a member of the Advisory Board of the Center for Environmental Pol-icy, School of Public Affairs, American University and a past member of the board of the Potomac Conservancy (2006-2014).

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PANEL OF EXPERTS

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General Counsel
Great Lakes Water Authority

Marcia Reuben
VP, Quality and Compliance
Inframark

Andrew Stewart, Esq.
Counsel
Sidley Austin LLP

AGENDA

I.	Legal Aspects of Covid-19	Randal Brown
II.	Navigating the COVID-19 Regulatory and Enforcement Landscape	Marcia Reuben
III.	Force Majeure Considerations for Wastewater Treatment and Drinking Water Systems	Andrew Stewart

ASK THE EXPERTS

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Legal Aspects of Covid-19

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Agenda

1 Families First Coronavirus Response Act Considerations

2 Contract Considerations

3 Litigation Considerations

4 Workers Compensation Considerations

5 About the Great Lakes Water Authority & Randal Brown

6 COVID-19 in Michigan

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Families First Coronavirus Response Act Considerations

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Families First Coronavirus Response Act (FFCRA), Generally

- FFCRA requires covered employers to provide their employees with paid sick leave or expanded family and medical leave for specified reasons related to COVID-19.
- United States Department of Labor's Wage and Hour Division administers and enforces the new law's paid leave requirements.
  - Temporary period of non-enforcement for the first 30 days after the Act takes effect.
- Provisions will apply from the effective date through December 31, 2020; Covered employer must post in a conspicuous place on its premises a notice of FFCRA requirements.
- Employers may not discharge, discipline, or otherwise discriminate against any employee who takes paid sick leave under the FFCRA and files a complaint or institutes a proceeding under or related to the FFCRA.

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FFCRA Exemption Language for Emergency Responders

Secretary of Labor determines who is a "emergency responder"

Emergency Paid Sick Leave Act (EPSLA)	Emergency Federal Medical Leave Expansion Act (EFMLEA)
SEC. 5111. REGULATORY AUTHORITIES. The Secretary of Labor shall have the authority to issue regulations for good cause under sections 553(b)(B) and 553(d)(A) of title 5, United States Code— (1) to exclude certain health care providers and emergency responders from the definition of employee under section 5110(1) including by allowing the employer of such health care providers and emergency responders to opt out;	"(3) REGULATORY AUTHORITIES.—The Secretary of Labor shall have the authority to issue regulations for good cause under sections 553(b)(B) and 553(d)(A) of title 5, United States Code— "(A) to exclude certain health care providers and emergency responders from the definition of eligible employee under section 110(a)(1)(A); and

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DOL Rules—Emergency Responder definition includes public works personnel

(i) For the purposes of Employees who may be excluded from Paid Sick Leave or Expanded Family and Medical Leave by their Employer under the FFCRA, an emergency responder is anyone necessary for the provision of transport, care, healthcare, comfort and nutrition of such patients, or others needed for the response to COVID-19. This includes but is not limited to military or national guard, law enforcement officers, correctional institution personnel, fire fighters, emergency medical services personnel, physicians, nurses, public health personnel, emergency medical technicians, paramedics, emergency management personnel, 911 operators, child welfare workers and service providers, public works personnel, and persons with skills or training in operating specialized equipment or other skills needed to provide aid in a declared emergency, as well as individuals who work for such facilities employing these individuals and whose work is necessary to maintain the operation of the facility. This also includes any individual whom the highest official of a State or territory, including the District of Columbia, determines is an emergency responder necessary for that State's or territory's or the District of Columbia's response to COVID-19.

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Rationale for Emergency Responder Exclusion

The authority for employers to exempt emergency responders is reflective of a balance struck by the FFCRA. On the one hand, the FFCRA provides for paid sick leave and expanded family and medical leave so employees will not be forced to choose between their paychecks and the individual and public health measures necessary to combat COVID-19. On the other hand, providing paid sick leave or expanded family and medical leave does not come at the expense of fully staffing the necessary functions of society, including the functions of emergency responders. The FFRCA should be read to complement—and not detract from—the work being done on the front lines to treat COVID-19 patients, prevent the spread of COVID-19, and simultaneously keep Americans safe and with access to essential services. Therefore, the Department interprets "emergency responder" broadly.

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If the FFCRA Exemption is not exercised

	Employee is...	Duration	Amount of Pay
1	Subject to a Federal, State, or local quarantine or isolation order related to COVID-19	Full time-up to 80 hours Part time-avg hours for 2 weeks	Regular rate or the applicable minimum wage, whichever is higher
2	Advised by a health care provider to self-quarantine related to COVID-19	Full time-up to 80 hours Part time-avg hours for 2 weeks	Regular rate or the applicable minimum wage, whichever is higher
3	Experiencing COVID-19 symptoms and is seeking a medical diagnosis	Full time-up to 80 hours Part time-avg hours for 2 weeks	Regular rate or the applicable minimum wage, whichever is higher
4	Caring for an individual subject to an order described in (1) or self-quarantine as described in (2);	Full time-up to 80 hours Part time-avg hours for 2 weeks	2/3 their regular rate or 2/3 the applicable minimum wage, whichever is higher
5	Caring for a child whose school or place of care is closed (or child care provider is unavailable) for reasons related to COVID-19	Full time- up to 12 weeks of leave @ 40 hours a week Part time-normal hours worked	2/3 their regular rate or 2/3 the applicable minimum wage, whichever is higher,
6	Is experiencing any other substantially-similar condition specified by the Secretary of Health and Human Services, in consultation with the Secretaries of Labor and Treasury	Full time-up to 80 hours Part time-avg hours for 2 weeks	2/3 their regular rate or 2/3 the applicable minimum wage, whichever is higher

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Contract Considerations

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Contract Considerations

Delays, Additional COVID-19 Costs and Essential Vendor Designations

- Construction Delays Due to COVID-19
  - Check your contract's force majeure provision
    - Does it include language about pandemics, national emergencies?
    - What's the remedy?
      - Additional time, money or both
    - Under GLWA's Construction Contract only remedy is more time.

8.4 DELAYS AND EXTENSIONS OF TIME.

8.4.1 If the Contractor shall be delayed by: (1) the combined action of workmen (either those employed on the Work or in any industry essential to the conduct of the Work) in no way caused by or resulting from default or collusion on the part of the Contractor; (2) by strikes, lockouts, embargoes, fire, unavoidable casualties, unusual delays in transportation, national emergency, unusually severe and adverse weather conditions not reasonably anticipatable; or (3) by any other causes which the Contractor could not reasonably control or circumvent, and if such delay affects the critical path activity, then the CPM Schedule shall be adjusted as necessary to compensate for such delay (but the total extension of all critical path activities may not exceed the length of the delay).

8.4.2 Extension of the Contract Time shall be the Contractor's sole remedy for any delay.

  - Additional cost of materials and safety precautions associated with COVID-19
    - Be prepared for request for change orders and additional costs associated with finding alternative manufacturers for parts and safety precautions
  - "Essential Vendor" designations
    - Needed in some states to allow contractors to travel freely to worksite

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Litigation Considerations

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Litigation Considerations

Courts are closed, what should I do?

- Court Filings
  - Prepare like the courts will reopen tomorrow for any filing pleadings, trial, etc.
  - Timely-file pleadings if E-filing is available
  - Statute of Limitations may be extended, but do not jeopardize it if E-filing is available
- Discovery
  - Depositions
    - Research on video conference deposition options
    - Prepare witness on quirks of video conference technology
  - Site Visit and Inspections
    - All persons allowed on-site should go through a temperature check and medical screening
    - Virtual site visit should be considered
- Settlements
  - Opposing party and their attorneys may be more willing to settle
  - Keep your governing bodies updated, but comply with Open Meetings Acts laws
  - Revisit Settlement Policy
    - With reduced or virtual board meetings delays in securing authority to jeopardize an advantageous settlement, closed sessions will be more challenging

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Litigation Consideration-Governmental Immunity

Social Distancing through use of Personal Vehicles

- Prior to the COVID-19 outbreak: GLWA Field Services primarily used GLWA-owned vehicles in crews of 2 people or more.
- After the COVID-19 outbreak: GLWA shifted to employees using their personal vehicle to go to worksites and required a cleaning protocol for GLWA-owned vehicles
- In Michigan (MCL 691.1405), and in other states, negligent operation requires the use of *government-owned* vehicles to establish liability. This created an unintended benefit from shifting to employees using personal vehicles.

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Workers Compensation Considerations

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Workers Compensation Considerations

COVID-19 Scenarios

- The employee contracts COVID-19 outside of work and calls-in sick.
  - WC does not apply
- The employee is quarantined because of exposure to the virus that is not work-related.
  - WC does not apply
- The employee contracts COVID-19 due to a work-related exposure.
  - WC may apply
    - A determination needs to be made as to whether COVID-19 is "an ordinary disease of life to which the public is generally exposed outside of the employment..."
      Note: COVID-19 has not been found in the drinking water process
    - Does the consideration of public works personnel as "emergency responders" make the analysis similar to medical professionals and create a presumption that they contracted the illness at work?
- The employer quarantines one of its employees due to a known work-related COVID-19 exposure. This employee does not have the disease but, because of the exposure, is not allowed to return to work for a specified number of days.
  - WC does not apply
    - Employer may consider the following options during the quarantine period 1) requiring the employee to use paid leave time; 2) paying the employee normal wages or a percentage of normal wages; or 3) requiring the employee to take a leave without pay.

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About the Great Lakes Water Authority & Randal Brown

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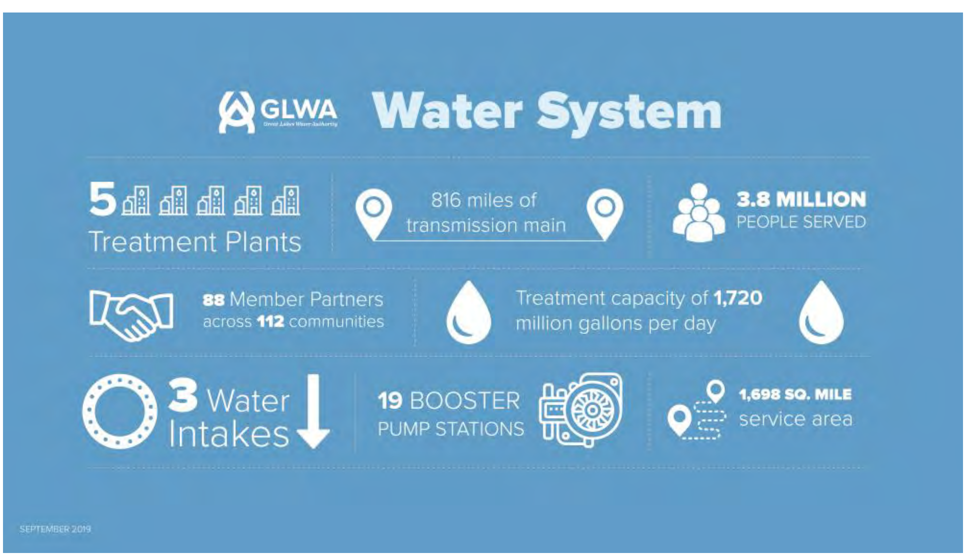

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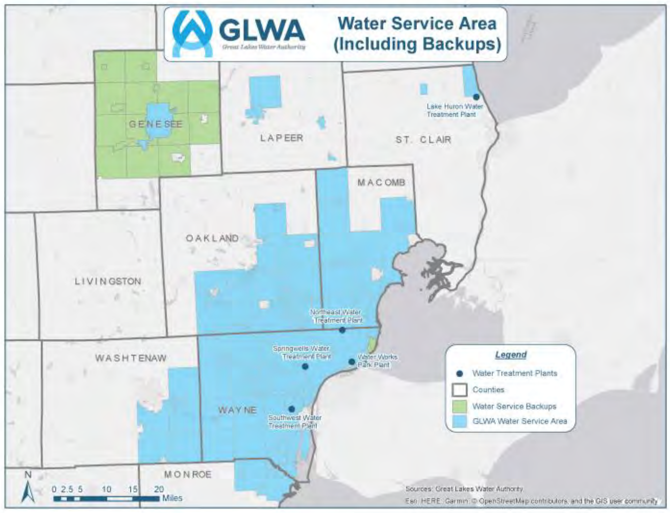

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Randal Brown, Esq., Great Lakes Water Authority General Counsel

- Current Employment
  - Great Lakes Water Authority, General Counsel (2017-Present)
- Prior Employment
  - Wayne County, Deputy Corporation Counsel (2015-2017)
  - Plunkett Cooney, Associate (2006-2014)
- Education
  - Howard University School of Law (2003-2006)
  - University of Delaware (1999-2003)
- Boards
  - Rose Hill Center
  - Wolverine Bar Association, Past President and Board Member

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Covid-19 in Michigan

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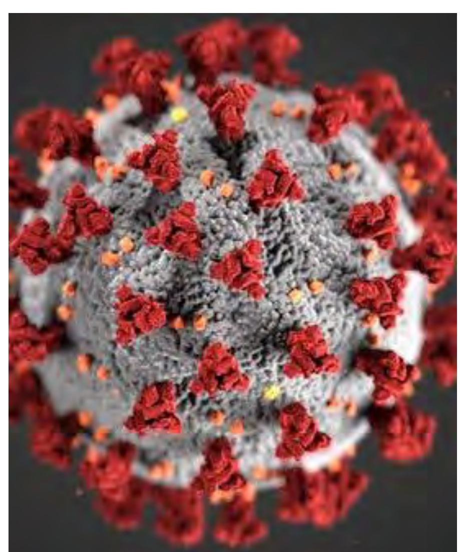
COVID-19 in Michigan (as of April 3rd)

- Relevant Michigan Executive Orders
  - Declaration State of Emergency (EO 2020-04; March 10, 2020)
  - Temporary Authorization of Remote Participation in Public Meetings and Hearings (EO 2020-15; March 18, 2020)
  - Stay Home; Stay Safe Order (EO 2020-21; March 24, 2020)
    - Noted Waterworks is critical infrastructure
  - Restoring Water Service to Occupied Residences During the COVID-19 Pandemic (EO 2020-28; March 28, 2020)

- COVID-19 Cases
  - Genesee County
    - 422 cases; 11 deaths
  - Oakland County
    - 2,540 cases; 136 deaths
  - Macomb County
    - 1,560 cases; 65 deaths
  - Wayne County
    - 2,546 cases; 106 deaths
  - City of Detroit
    - 3,550 cases; 117 deaths
  - State of Michigan
    - 12,744 cases; 479 deaths



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ASK THE EXPERTS

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INFRAMARK
WATER & INFRASTRUCTURE SERVICES

Navigating the COVID-19 Regulatory and Enforcement Landscape

Marcia Reuben, VP Quality and Compliance
marcia.reuben@Inframark.com

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Navigating the Regulatory and Enforcement Landscape

Maintaining safe and compliant operations to protect the public and the environment

Enforcement Discretion – what does it mean for utilities?

Potential causes of COVID-19 related compliance issues

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Navigating the Regulatory and Enforcement Landscape

Comply with regulations and permits

Document with COVID-19 related justification

Communicate with regulatory agencies early and as often as needed

State requirements will differ
Program requirements will differ

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Expectations for Compliance

- Compliance is not on hold during the COVID-19 emergency
- According to the CDC website, Water Transmission and Covid-19, "Conventional water treatment methods that use filtration and disinfection…should remove or inactivate the virus that causes COVID-19."

  https://www.cdc.gov/coronavirus/2019-ncov/php/water.html
- Therefore, it is critical that those treatment methods continue to operate properly and in compliance with regulations

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Enforcement Discretion - EPA


UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON D.C. 20460

MEMORANDUM

SUBJECT:

FROM:

TO:

ENFORCEMENT DISCRETION

I. Civil Violations

A. General conditions

All enforcement discretion set forth in this temporary policy is conditioned on the following.

1. Entities should make every effort to comply with their environmental compliance obligations.
2. If compliance is not reasonably practicable, facilities with environmental compliance obligations should:
   a. Act responsibly under the circumstances in order to minimize the effects and duration of any noncompliance caused by COVID-19;
   b. Identify the specific nature and dates of the noncompliance;
   c. Identify how COVID-19 was the cause of the noncompliance, and the decisions and actions taken in response, including best efforts to comply and steps taken to come into compliance at the earliest opportunity;
   d. Return to compliance as soon as possible; and
   e. Document the information, action, or condition specified in a. through d.

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Enforcement Discretion - EPA

B. Routine compliance monitoring and reporting by regulated entities

The consequences of the pandemic may constrain the ability of regulated entities to perform routine compliance monitoring,[2] integrity testing,[3] sampling,[4] laboratory analysis,[5] training,[6] and reporting or certification.[7]

Entities should use existing procedures to report noncompliance with such routine activities, such as pursuant to an applicable permit, regulation or statute. If no such procedure is applicable, or if reporting is not reasonably practicable due to COVID-19, regulated entities should maintain this information internally and make it available to the EPA or an authorized state or tribe upon request. In general, the EPA does not expect to seek penalties for violations of routine compliance monitoring, integrity testing, sampling, laboratory analysis, training, and reporting or certification obligations in situations where the EPA agrees that COVID-19 was the cause of the noncompliance and the entity provides supporting documentation to the EPA upon request.

How are States Exercising Enforcement Discretion?

- States may implement their own enforcement discretion policies
- Many state agencies have already made their discretionary enforcement policies clear, either by direct communication with regulated entities or by web page postings
- Know your state's policy and expectations
  - What does the state consider to be COVID-19 causes for noncompliance
  - What documentation is required
  - When do you need to communicate the noncompliance event and COVID-19 related cause
  - What documentation is required
  - How long does documentation need to be retained

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Examples of Potential COVID-19 related issues

- Staffing shortages.
- Laboratory issues
- Sampling issues
- Supply chain issues
- Reporting delays

If you have not updated your business continuity plan or emergency response plan, do it now.

Steps to Take if you have a COVID-19 Related Compliance Issue

- Take all reasonable steps to mitigate the event if you are unable to comply
- Document the specific COVID-19 related cause of the noncompliance
- Communicate as soon as possible with your primary agency and follow their communication guidelines
- Take all reasonable steps to return to compliance as quickly as possible
- Maintain documentation so it is available upon request

Closing Thoughts

- Remain focused on compliance
- Document
- Communicate

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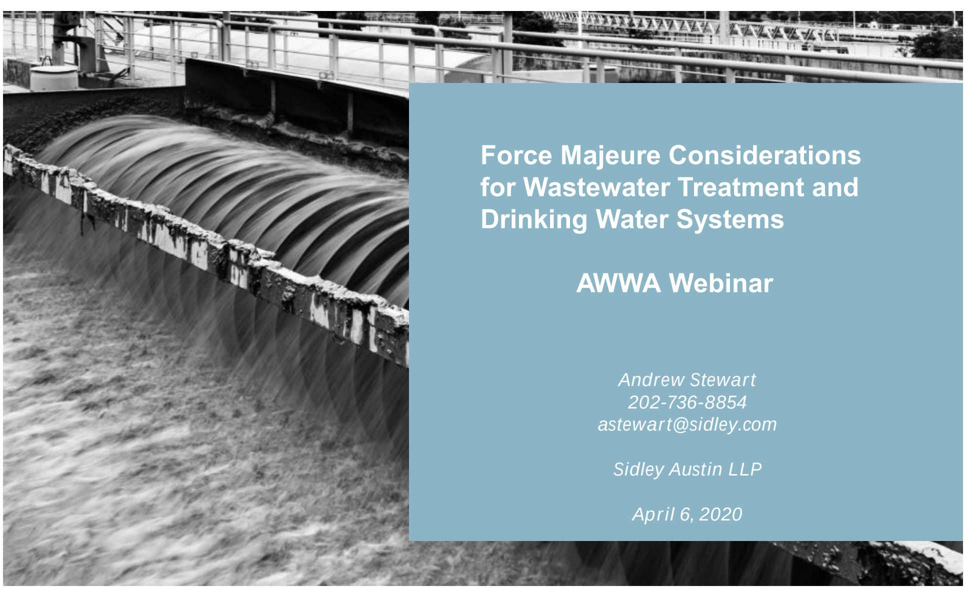

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Key Concepts

Force Majeure – Definitions vary, but generally:

- "an event that will be or has been caused by circumstances beyond the control of the affected facility, its contractors, or any entity controlled by the affected facility . . . . Examples of such events are acts of nature, acts of war or terrorism, or equipment failure or safety hazards beyond the control of the facility."

Enforcement Discretion – The government has inherent authority to decide not to pursue enforcement for violations in particular circumstances:

- In light of evolving COVID-19 pandemic, EPA will focus on situations that may ***create an acute risk or imminent threat to public health or the environment*** over other non-compliance provided that entities make every effort to comply with environmental obligations and act with responsibility in order to minimize the effects and duration of any noncompliance caused by COVID-19.

EPA COVID-19 Enforcement and Compliance Guidance

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

ASSISTANT ADMINISTRATOR FOR ENFORCEMENT AND COMPLIANCE ASSURANCE

March 26, 2020

MEMORANDUM

SUBJECT: COVID-19 Implications for EPA's Enforcement and Compliance Assurance Program

FROM: Susan Parker Bodine Susan Parker Bodine

TO: All Governmental and Private Sector Partners

As all of us at the U.S. Environmental Protection Agency adjust to the evolving COVID-19 pandemic, we are first and foremost mindful of the health and safety of the public, as well as our staff, and those of Federal Agencies, State and Local Governments, Tribes, Regulated Entities, Contractors, and Non-governmental Organizations. The agency must take these important considerations into account as we all continue our work to protect human health and the environment. Accordingly, we are announcing the following temporary policy regarding EPA enforcement of environmental legal obligations during this time.

The EPA will exercise the enforcement discretion specified below for noncompliance covered by this temporary policy and resulting from the COVID-19 pandemic, if regulated entities take the steps applicable to their situations, as set forth in this policy. For noncompliance that occurs during the period of time that this temporary policy is in effect, and that results from the COVID-19 pandemic, this policy will apply to such noncompliance in lieu of an otherwise applicable EPA enforcement response policy.

EPA COVID-19 Enforcement and Compliance Guidance

E. Public water systems regulated under the Safe Drinking Water Act

Public water systems have a heightened responsibility to protect public health because unsafe drinking water can lead to serious illnesses and access to clean water for drinking and handwashing is critical during the COVID-19 pandemic. Accordingly, the EPA has heightened expectations for public water systems. The EPA expects operators of such systems to continue normal operations and maintenance as well as required sampling to ensure the safety of our drinking water supplies. The EPA expects laboratories performing analysis for water systems to continue to provide timely analysis of samples and results. States play the lead role on drinking water issues, but the EPA also has important drinking water enforcement and oversight responsibilities, including direct implementation responsibilities in some locations.

In the event of worker shortages in the water sector, the EPA will consider continued operation of drinking water systems to be the highest priority. In anticipation of worker shortage and laboratory capacity problems, the EPA considers the following tiers of compliance monitoring to assure the safety of our drinking water supplies and prioritize prevention of acute risks. Of highest priority is monitoring required under National Primary Drinking Water Regulations to protect against microbial pathogens. Additional priorities include nitrate/nitrite and Lead and Copper Rule monitoring followed by contaminants for which the system has been non-compliant. States may wish to adopt similar priorities.

The EPA is working closely with our federal partners, states, and other organizations to ensure resources and personnel are available to assist facilities facing staffing and contractor challenges during this period of COVID-19 response and the Office of Water plans to launch a website with this information. Accordingly, the EPA strongly encourages public water systems to consult with the state and EPA regional offices without delay if issues arise that prevent the normal delivery of safe drinking water and encourages states to continue to work closely with the EPA on measures to address the potential impacts of COVID-19. The EPA also encourages certified drinking water laboratories to consult with the state and the EPA if issues arise that prevent laboratories from conducting analyses of drinking water contaminants.

The EPA will consider the circumstances, including the COVID-19 pandemic, when determining whether any enforcement response is appropriate at public water systems acting in accordance with this subpart.

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EPA March 30 Clarification – Policy is Not a "License to Pollute"

The policy does **not** say that the COVID-19 pandemic will excuse **exceedances of pollutant limitations in permits, regulations, and statutes**. EPA expects regulated entities to comply with all obligations and if they do not, the policy says that EPA will consider the pandemic, on a case-by-case basis, when determining an appropriate response. Further, in cases that may involve acute risks or imminent threats, or failure of pollution control or other equipment that may result in exceedances, EPA's willingness to provide even that consideration is conditioned on the facility contacting the appropriate EPA region, or authorized state or tribe, to allow regulators to work with that facility to mitigate or eliminate such risks or threats.

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Clean Water Act

33 U.S.C. § 1321(f) – "Act of God" carve-out from liability for federal response cost following discharge of hazardous substance

- "Act of God" defined as "an act occasioned by an unanticipated grave natural disaster"

33 U.S.C. § 1321(c) – National Contingency Plan exemption from liability

- "A person is ***not liable for removal costs or damages*** which result from actions taken or omitted to be taken in the course of rendering care, assistance, or advice consistent with the National Contingency Plan or as otherwise directed by the President relating to a discharge or a substantial threat of a discharge of oil or a hazardous substance.
- Related regulation, 40 C.F.R. § 122.3(d): National Pollutant Discharge Elimination System (NPDES) waiver for discharges made pursuant to National Contingency Plan

Clean Water Act – NPDES Regulations

40 C.F.R. § 122.41 – Conditions applicable to all permits

- No general force majeure provision contained in the standard permit conditions

40 C.F.R. § 122.41(n) – NPDES "upset" exception and affirmative defense to noncompliance

- "unintentional and temporary noncompliance with technology based permit effluent limitations because of ***factors beyond the reasonable control of the permittee***"
- permittee must demonstrate upset through contemporaneous relevant evidence and provide initial notification within 24 hours of event
- NPDES "upset" exception is narrow
  - "Both EPA and the courts have consistently interpreted the CWA as a strict liability statute. ***The only defense to liability recognized under federal law is the federal upset defense*** found at 40 CFR 122.41[n), ***which is a very narrow affirmative defense for violations of technology-based effluent limitations***."
  - Application for approval of Texas Pollution Discharge Elimination System, 63 Fed. Reg. 33655, 33662 (June 19, 1998)

Clean Water Act – NPDES Regulations

Conditions necessary for demonstration of upset. A Discharger who wishes to establish the affirmative defense of upset shall demonstrate, though properly signed, contemporaneous operating logs or other relevant evidence that (40 C.F.R. § 122.141(n)(3)):

a. An upset occurred and that the Discharger can identify the cause(s) of the upset (40 C.F.R. § 122.41(n)(3)(i));
b. The permitted facility was, at the time, being properly operated (40 C.F.R. § 122.41(n)(3)(ii));
c. The Discharger submitted notice of the upset as required in Standard Provisions – Reporting V.E.2.b below (24-hour notice) (40 C.F.R. § 122.41(n)(3)(iii)); and
d. The Discharger complied with any remedial measures required under Standard Provisions – Permit Compliance I.C above. (40 C.F.R. § 122.41(n)(3)(iv))

Burden of proof. In any enforcement proceeding, the Discharger seeking to establish the occurrence of an upset has the burden of proof. (40 C.F.R. § 122.41(n)(4))

40 C.F.R. § 122.62(a)(4) – NPDES permit compliance schedules may be modified for "good cause . . . such as an ***act of God***, strike, flood, or materials shortage or other events over which the permittee has little or no control and for which there is no reasonably available remedy."

Safe Drinking Water Act and Implementing Regulations

42 U.S.C. § 300g-5(a) – State-granted exemption "from any requirement respecting a maximum contaminant level or any treatment technique requirement," provided:

- the public water system is unable to comply "due to compelling factors" AND
- "the granting of the exemption will not result in an unreasonable risk to health"

40 C.F.R. § 141.4 – Variances and exemptions

- "Variances or exemptions from certain provisions of these regulations may be granted pursuant to [42 U.S.C. § 300g-5(a)] by the entity with primary enforcement responsibility, except that variances or exemptions from the MCLs for total coliforms and E. coli and variances from any of the treatment technique requirements of subpart H [Indian Tribes] part may not be granted."

Consent Decree Example – *U.S. et al. v. City of Houston*, No. 18-cv-03368 (S.D. Tex. 2018)

"Force Majeure" means "any event arising from causes beyond the control of the City . . . that delays or prevents the performance of any obligation under this Consent Decree despite the City's best efforts to fulfill the obligation."

- Does not include financial inability to perform any obligation under the Consent Decree

Initial notice required within 15 business days, written notice in 30 days to include:

- An explanation and description of the reasons for the delay;
- The anticipated duration of any delay;
- All actions taken to prevent or minimize the delay;
- A schedule for implementing any measure to be taken to prevent or mitigate the delay or the effect of the delay; and
- The City's rationale for attributing the delay to a Force Majeure event, if it intends to assert such a claim.

Dispute resolution procedures available if plaintiffs do not agree that Force Majeure event occurred

Consent Decree Example – *U.S. v. City of Tyler*, No. 17-cv-00029, Section XII (E.D. Tex. 2017)

"Force Majeure" means "any event arising from causes beyond the control of Tyler . . . that delays or prevents the performance of any obligation under this Consent Decree despite Tyler's best efforts to fulfill the obligation."

- Does not include financial inability to perform any obligation under the Consent Decree

Initial notice required within five business days, written notice in 14 days to include:

- Explanation and description of reasons for delay;
- Anticipated duration of delay;
- Actions taken to prevent or minimize the delay;
- Schedule for implementation of any measure to be taken to prevent or mitigate the delay;
- Rationale for attributing such delay to a Force Majeure event; and
- A statement as to whether such an event may cause or contribute to an endangerment to public health, welfare, or environment.

Dispute resolution procedures available if plaintiffs do not agree that Force Majeure event occurred

How Could Force Majeure Arise?

- Staffing or equipment shortage prevents complying actions such as sampling
- Travel restrictions prevent consultants from traveling to your facility
- Impacts to contractors or subcontractors cause interference with operations and compliance
- Delays occur in receiving needed input from regulatory agencies

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Practice Tips

"Heightened Responsibility" of Water Systems – EPA identifies special considerations it will apply to public water systems in applying enforcement discretion

Document Everything – Contemporaneous explanation of exactly why force majeure may impact compliance obligations, and what was done to limit or mitigate effect, is critical

Proactive Notification – Clock for notifying regulators starts when you know force majeure event is coming

Ongoing Communication – Keep regulators apprised of how ongoing developments may affect normal operations, should requests need to be extended. Regulators value transparency.

Prepare Contingencies – Even if initial compliance extensions are granted, continued extensions are not guaranteed

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APPENDIX

EPA's March 26, 2020 Enforcement Discretion Memorandum

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TALENT. TEAMWORK. RESULTS.

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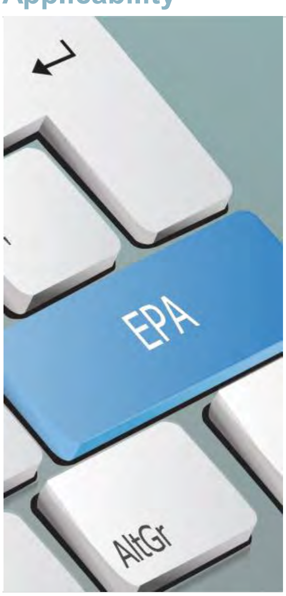
Applicability



Temporary policy on EPA's civil enforcement discretion due to COVID-19 (the virus)

Policy applies retroactively beginning on 3/13/20

- Gap: What about virus-related compliance issues that began before that date?

Policy may be terminated with seven days' notice

- Continues to apply to actions and omissions while policy in effect
- Gap: How would termination apply if the President's "risk-based" reopening policy applies on a county-by-county basis?

States may take different approach

- Gap: The policy is tepid in encouraging states to provide relief

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Civil Enforcement Discretion

General conditions

- Identify virus as a cause of the violation, including dates of violation
- Minimize violation's consequences
- Best efforts to comply including returning to compliance
- Documentation required

Routine compliance monitoring and reporting

- Examples of compliance monitoring: CEMs, stack tests, LDAR, tank and piping inspections, lab analysis, tank integrity testing
- Examples of reporting:
  - TRI
  - GHG inventory reporting

Report noncompliance if existing procedures available and reporting reasonably practicable

- Strong suggestion of just keeping the information on file if the virus prevents reporting

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Civil Enforcement Discretion

No general "catch up" with reporting and monitoring

- Exceptions for reporting with three-month+ reporting intervals, annual reports, bi-annual reports, annual reports
- Gap: Semi-annual reports excused from catch up?

No wet signature enforcement

Training may be excused

- On-line training should not be affected
- EPA's preference for experienced operators to stay on the job

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Civil Enforcement Discretion

Consent decrees and administrative agreements

- Force majeure determines relief
- Use the procedures in the agreements
  - Several consent decrees have onerous process traps (force majeure notice required if performance "might" be delayed)
- "Notice and go" approach – proceed unless you hear from the government
- Gap: Leaves companies with no additional relief

Existing cases: "All ongoing enforcement matters are continuing."

New cases:

- Focus resources on "acute risk or imminent threat to public health or the environment"

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Civil Enforcement Discretion

Facility operations

- Notify EPA, states and/or tribal authority if virus impact on a facility "may create an acute risk or an imminent threat" to human health or the environment
- Notify EPA, states and/or tribal authority if air, water or waste controls fail, resulting in excess emissions, discharges, etc.
  - Gap: Malfunctions and upsets occur regularly, so this reporting obligation should only be for virus-related impacts on operations
- Resource Conservation and Recovery Act (RCRA) relief for entities unable to transfer hazardous waste off-site due to the virus
  - E.g., a facility doesn't become a RCRA treatment, storage and disposal (TSD) facility for storing waste on-site for 90+ days

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Civil Enforcement Discretion

Critical essential infrastructure

- Critical essential facilities may be able to obtain "no action assurance" that provides further relief from compliance obligations
  - Critical facilities defined by DHS guidance – includes refineries, chemical plants
- Assistant Administrator (AA) for OECA able to grant relief
- Gap: Will this authority be delegated? Not realistic for OECA AA, the senior political official on enforcement, to review all of those
- Gap: What specific circumstances may give rise to relief?

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Scope: What's Out

CERCLA and RCRA Interim Status

- Forthcoming guidance
- Gap: What is the timing?

Imports

- The guidance mentions pesticides but not limited to pesticides
- Gap: What does the carve-out for imports mean?

Criminal cases

- Gap: Greater clarity on discretion in making investigative decisions
- E.g., simple negligence can give rise to criminal exposure, e.g., negligent discharges under the Clean Water Act

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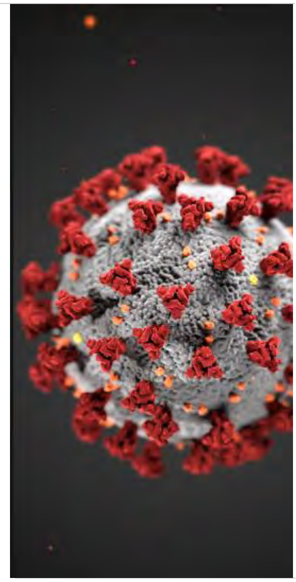
Scope: What's Out

No relief for EPCRA/CERCLA accidental release reporting

- Gap: 15-minute reporting obligation difficult for RQs with fully functional facility

E-Disclosure for self-reporting violations still an option

- Does it make sense to file here in lieu of, or in addition to, using this COVID-19 guidance?



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PRACTICES

- Environmental
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ANDREW STEWART has over 20 years of experience advising on matters under both federal and state environmental laws. He helps clients navigate compliance requirements and defend high-stakes enforcement matters drawing on his previous time at the United States Environmental Protection Agency (EPA), where he served as a senior case attorney and enforcement manager working on Clean Water Act (CWA) and Safe Drinking Water Act (SDWA) matters.

Andrew's practice at Sidley Austin focuses on advising clients regarding critical obligations and complex enforcement actions involving the EPA, Department of Justice, and state environmental agencies.

At EPA, Andrew served as a Division Director in the Office of Civil Enforcement and senior enforcement attorney handling SDWA actions involving drinking water compliance issues at water systems, as well as CWA National Pollutant Discharge Elimination System actions involving municipalities

Andrew currently serves as a Vice Chair on the Environmental Enforcement and Crimes Committee within the ABA Section of Environment, Energy, and Resources.

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Andrew is a graduate of the University of Virginia School of Law and obtained his undergraduate degree from Duke University. While at the University of Virginia School of Law, Andrew served on the Virginia Environmental Law Journal. After graduation from law school, he clerked for a federal district court judge in the District of Maryland.

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ASK THE EXPERTS

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Great Lakes Water Authority

Marcia Reuben
Inframark

Andrew Stewart, Esq.
Sidley Austin LLP

Enter your **question** into the **question pane** at the lower right-hand side of the screen.

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ADDITIONAL RESOURCES

- AWWA's Coronavirus Resource Page
  - With the coronavirus (COVID-19) pandemic impacting communities throughout the world, water professionals are working around the clock to ensure that safe, reliable water service continues to flow.
- Recorded Webinar: Utility Actions to Sustain Operations During COVID-19
- Recorded Webinar: Be a Trusted Source: How to Handle Communication Challenges During COVID-19

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UPCOMING WEBINARS

April 22 - Drought Preparedness and Response

April 30 - FREE Webinar from GE Digital: How to Create Your Digital Plant

May 6 - What's New with Cyanobacteria and Cyanotoxins: A Review of Leading Research

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PRESENTER BIOGRAPHY INFORMATION

Randall Brown is the General Counsel for the Great Lakes Water Authority (GLWA), providing legal advice on a myriad of legal matters, including regulatory compliance, contracts, real estate, bond transactions, employment and general litigation matters. Prior to assuming this position in August 2017, Mr. Brown served in Wayne County's Corporation Counsel Department. Mr. Brown is a graduate of the University of Delaware and Howard University School of Law.

Marcia Reuben is the Vice President, Quality and Compliance for Inframark, LLC. Ms. Reuben has an undergraduate degree in Business Administration from the University of Southern California, an MBA from St. Joseph's University and holds an Associate in Risk Management from the International Risk Management Institute. With more than 20 years in the water industry, Ms. Reuben oversees Inframark's compliance program, and provides operations support in areas of regulatory reporting and compliance.

Andrew Stewart practices law in the Washington, D.C., office of Sidley Austin LLP and counsels clients on a broad range of compliance and enforcement matters. With over 20 years of experience in environmental law, he handles matters arising under all major federal environmental laws as well as state laws. Prior to joining the firm, served as EPA's Division Director in the Office of Civil Enforcement and as a senior attorney in the Water Enforcement Division.

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