



Final Report on the National Summit on Waterborne Disease:
Major Themes and Recommendations

May 23, 2019

Ronald Reagan International Trade Center
Washington, DC

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**STEERING
COMMITTEE**



Alliance to Prevent
Legionnaires' Disease



I. Executive Summary

In the United States, waterborne diseases not only create substantial costs but has also resulted in the tragic loss of life. As municipalities across the country face the daunting task of replacing aging infrastructure that could alter the water system, the unintended consequence of not addressing the full spectrum of the issues surrounding waterborne disease should be a key consideration.

In an effort to address these concerns, leading voices representing public health, the scientific community, water treatment experts, impacted populations, and the federal government joined together on May 23, 2019 at the National Summit on Waterborne Disease: Source-to-Tap Solutions for Infrastructure Policy in Washington, DC at the Ronald Reagan International Trade Center.

Leaders across these key sectors addressed questions of how to better mitigate the spread of waterborne pathogens while grappling with water infrastructure updates. Several key themes emerged from the discussion, including:

- Both public officials and the public in general are substantially under-informed about the realities of their water quality, how it can impact their health, and actions they can take to protect themselves;
- Improved proactive communication and information-sharing between stakeholders could lead to fewer cases of waterborne diseases;
- Understanding the correlation between water sources and the spread of waterborne pathogens is critical;
- A source-to-tap approach for waterborne disease management would provide a more comprehensive approach to dealing with waterborne disease; and
- The federal government should play a more active and significant role in addressing water infrastructure and waterborne disease.

Participants discussed a core set of recommendations to address the increase in the presence of waterborne pathogens and key issues listed above.

- Better education of the public and policymakers on how waterborne pathogens spread – beginning at the water source, often as a result of, or exacerbated by, aging infrastructure – is vital to explain the link between infrastructure and public health;
- A significant investment in water infrastructure should be a central tenet of a national infrastructure initiative;
- Improved outreach and education to susceptible populations, which will allow at-risk Americans to be better prepared to safeguard themselves from exposure;
- Timely communication and information sharing across relevant leaders and stakeholder industries would allow for the dissemination of fact-based information;
- Thoughtful model state level legislation that comprehensively addresses the entirety of a water system, not solely where waterborne pathogens are ultimately detected, should be produced by a multi-stakeholder effort; and
- Continued conversations and efforts across stakeholders to carry forward a public policy **dialogue on these themes can help protect our citizens from the “next Flint.”**

Participants agreed that going forward, there is a critical need to sustain an ongoing focus on these themes and recommendations in order to better protect the public and make meaningful progress in the fight against waterborne disease.

II. Introduction and Background

Within the United States, waterborne diseases are estimated to generate annual hospitalization expenses of more than \$1 billion and nearly 7,000 deaths annually¹. In fact, it is anticipated that ensuring access to safe drinking water will cost \$200 billion over the next ten years². A significant factor associated with the increased incidence of waterborne disease is the **country's** aging drinking water distribution infrastructure. **As the majority of the nation's** more than one million miles of water infrastructure have exceeded their expected lifespan, aging and degrading water infrastructure has become a leading cause in the increased rate of waterborne disease, both episodic – which are more than 90 percent of diagnosed cases of some of the most common diseases stemming from waterborne pathogens -- and in larger public outbreaks. Given the high incidence of individualized cases of waterborne diseases like Legionnaires' disease, nontuberculous mycobacterial (NTM) infection, and *Pseudomonas*-related pneumonia, and other potentially deadly waterborne pathogens like *E. coli* and *Naegleria fowleri*, the true impact of waterborne diseases on Americans is much more significant than many realize.

The connection between U.S. water infrastructure and waterborne disease was driven home in April 2014, when government officials from Flint, **Michigan switched the city's water supply** from the Detroit River and Lake Huron to the Flint River as a cost-saving mechanism. Once this change occurred the influx of new surface waters disrupted the disinfectant present in the water (See Figure 1, below). Within weeks of the decision, reports of brown and foul-smelling water began to surface, and by August, ***E. coli* and coliform bacteria were detected in Flint's** water supply. In the ensuing months and years, a host of waterborne pathogens has been **detected in the city's water supply, which, in turn, resulted in the nation's third largest outbreak of Legionnaires' disease, among other illnesses suffered by Flint residents. Indeed,** from June 2014 through October 2015, the exact timeframe of the Flint River sourcing period, more than 85 individuals fell ill, and 12 died, as a result of exposure. Ultimately, public officials decided to switch back to their original water source, Lake Huron, resulting in an **immediate decline in the rate of Legionnaires' disease**³.

¹ Centers for Disease Control and Prevention, Current Waterborne Disease Burden Data & Gaps (2017).

<https://www.cdc.gov/healthywater/burden/current-data.html>

² Shanaghan, Peter E. "Assessing drinking water infrastructure need." *Journal-American Water Works Association* 104.8 (2012): 14-15.

³ Zahran, S., McElmurry, S. P., Kilgore, P. E., Mushinski, D., Press, J., Love, N. G., ... & Swanson, M. S. (2018). **Assessment of the Legionnaires' disease outbreak in Flint, Michigan. *Proceedings of the National Academy of Sciences*, 115(8), E1730-E1739.**

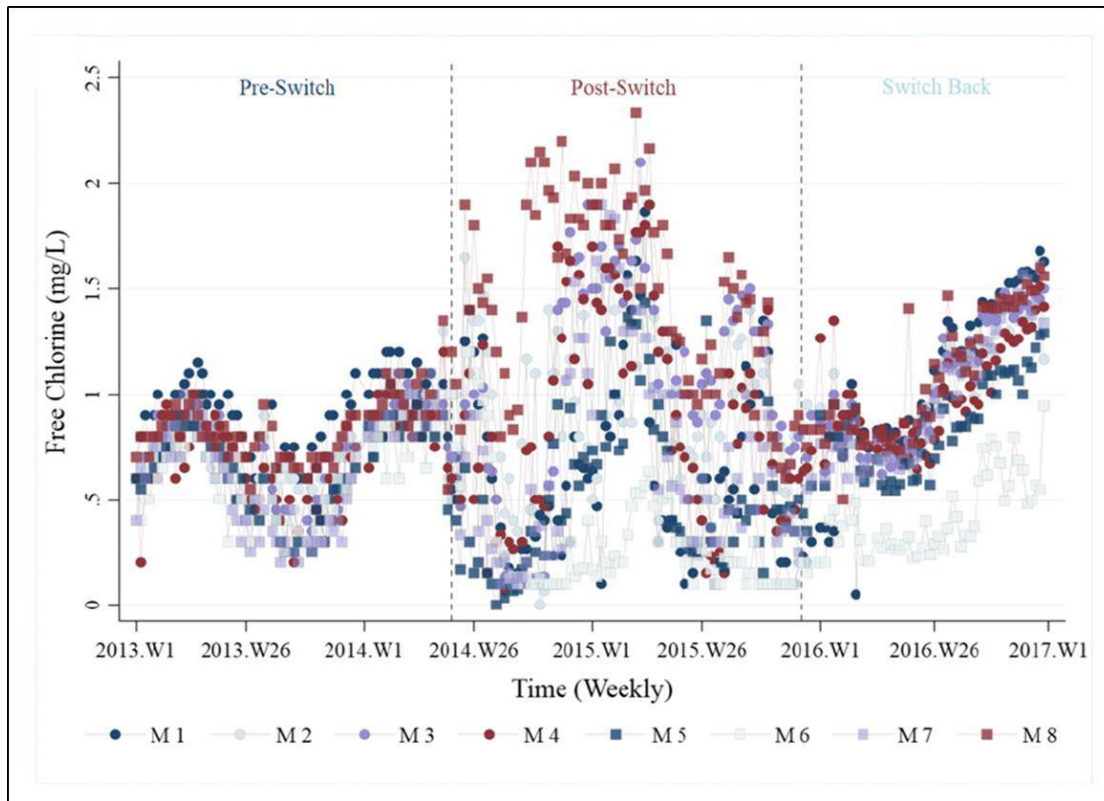


Figure 1: The graph above highlights free chlorine levels from 2013-2016 at eight monitoring stations in Flint’s water distribution system. Adapted from “Assessment of the Legionnaires’ disease outbreak in Flint, Michigan” Zahran, S, et al. 2018 PNAS February 5, 2018. Page E1731. Copyright 2018, National Academy of Sciences.

On May 23, 2019, five years after the Flint disaster, leaders in thought and action came together for the *National Summit on Waterborne Disease: Source-to-Tap Solutions for Infrastructure Policy* in Washington, DC at the Ronald Reagan International Trade Center. Delegates explored the impacts of aging water infrastructure on drinking water across the spectrum of source to consumption and how water infrastructure can affect the spread of waterborne disease and considered what types of infrastructure policy and stakeholder engagement efforts could improve the quality of America’s water. Summit delegates represented viewpoints from a broad spectrum of stakeholders, including federal government officials, public health groups, impacted populations, leading physicians and researchers, water utility managers and building operators.

The summit featured presentations and panel discussions on:

- ✓ How waterborne pathogens are introduced into drinking water;
- ✓ The role water infrastructure plays in the distribution of waterborne pathogens;
- ✓ Efforts being taken to address sporadic cases and outbreaks; and
- ✓ Ways in which relevant stakeholders could work with policymakers to stem the tide of the spread of waterborne diseases

With Washington policymakers considering major changes **targeting the nation's aging** infrastructure, timely opportunities exist to address water infrastructure and the spread of waterborne disease. The significant growth of waterborne illness in the United States and the prospect of a comprehensive infrastructure package in Congress suggests the need for experts to focus on water infrastructure. With that in mind, delegates discussed that municipalities, public health agencies, health advocacy associations, water managers, environmental organizations and individuals have an opportunity to remind policymakers of the return on investment in terms of community health and related economic benefits of making investments now in infrastructure that can help preempt the future spread of waterborne pathogens.

The summit included keynote remarks from two of the **nation's** leading scientists on the Flint water crisis, Drs. Marc Edwards and Michelle Swanson, who shared how the crisis unfolded and what steps were taken to address the water quality issues. Dr. Edwards also set the tone for the summit by providing a **high-level overview of how America's water infrastructure is failing and** how opportunistic waterborne pathogens are taking advantage of this failure. Additionally, the summit featured remarks from Gwen Hanlon, a New Jersey resident who tragically lost her husband, Kevin Hanlon, due to exposure to *Legionella* bacteria in 2017. **Hanlon's experience** illustrated the tragic reality that most cases of waterborne illness are individual cases – not associated with a larger outbreak. Ms. Hanlon underscored the importance of efforts by policymakers to comprehensively investigate and track all cases of waterborne disease, **including sporadic cases like Kevin's.**

In total, approximately 30 **of the nation's leading public health, city officials, federal** government officials, impacted population advocates and others probed the specific challenges that exist in water infrastructure and waterborne diseases, how the lack of informed and coordinated stakeholder communication stymies decision-making, and how a comprehensive **of the nation's water infrastructure system is needed to fully understand the true scope of how** waterborne pathogens are spread.

III. Primary Discussion Themes

Leaders across key sectors from around the country addressed questions of how to better address the spread of waterborne pathogens. Several key themes emerged from the discussion, including:

- *Both public officials and the public in general are substantially under-informed about the realities of their water quality, how it can impact their health, and actions they can take to protect themselves.*

Water quality issues are complex and dynamic with low visibility to the integrity of the water infrastructure often buried below ground, and how the pathogens in our water impact individuals differently depending on their personal health conditions. Delegates and panelists

addressed this reality extensively, calling for educational initiatives that enable citizens to better protect themselves and their loved ones.

Panelists called for initiatives to educate people about the realities of waterborne pathogens, from the public officials that oversee infrastructure and public health, to residential, commercial and public water consumers. The lack of understanding surrounding water quality **issues is limiting society's ability to address them, including** critical prevention and medical response.

In addition, panelists discussed the hesitation of public officials and water utility manager to have candid discussions about water quality issues, to avoid **“causing panic” among the public**. The Flint water crisis was a clear example as public officials were ultimately charged with criminal negligence due to efforts to avoid acknowledging water quality issues publicly. Similar challenges were noted associated with the **Legionnaires’** disease outbreaks in the Bronx in 2015 – **the nation’s second largest** – and the multi-year outbreak at the Illinois Veterans Home in Quincy from 2015 - 2018.

Some delegates mentioned that similar to air quality warning systems, developing a water quality alert system would require factual disclosures of water quality issues as a fundamental public right, enabling individuals to take actions to better protect themselves – especially the immune compromised. This is particularly critical to healthcare and senior living facilities, private and public managers of buildings, and public water equipment managers who require knowledge of water quality variability to properly mitigate the risks of inbound pathogens to their facilities.

- *Improved proactive communication and information-sharing between stakeholders about waterborne disease management could lead to fewer cases of waterborne diseases.*

Delegates and panelists at the Summit spoke at length about the lack of timely and clear communication during water emergencies, service disruptions and disease outbreaks, highlighting how communication between water managers, healthcare professionals, building managers, homeowners, and government officials occur too infrequently. This lack of information sharing, discussants noted, leads to confusion and uncertainty in response scenarios. This leaves researchers and healthcare providers with a very limited window to accurately conduct an epidemiological investigation, so early communication would serve to expedite the research process during the active time of the outbreak.

Delegates and panelists used Flint, MI and the Bronx, NY as case studies of how poor communication impacted the spread of waterborne diseases. In these examples, delegates and panelists noted that if government officials been in contact with public health officials regarding water service disruptions, conversations could have occurred that would have indicated water system disruptions could lead to harmful substances like lead and waterborne pathogens passing through water systems at dangerous levels. Delegates also mentioned that subsequent straightforward, culturally sensitive messages that were informed by each stakeholder group

could provide the general public with a wealth of information they could use to protect themselves and their families.

Lastly, delegates discussed how timely and clear communication could prevent the spread of misinformation across social media platforms. While social media has been used to deliver mass messages to the public in many situations, it has also been used as a tool to further the spread of false information. Delegates highlighted the **fact that the government's lack of social media savvy** has been a hindrance in the past when emergency situations arise. In the absence of accurate and trustworthy information, many communities will turn to whatever source of information that may seem credible. However, the reliance on readily available, but uncorroborated information has shown to further misconceptions about emergency situations. Once inaccurate messages break in wide circulation, it is usually much more difficult to convey accurate information **to correct the public's misunderstanding of the facts at play.**

- *Understanding the correlation between water sources and the spread of waterborne pathogens is critical.*

Delegates discussed that most Americans do not fully understand the correlation between water infrastructure and waterborne disease. While it was agreed that waterborne disease outbreaks do raise public awareness, the response to many such outbreaks has been specific to residential or building water infrastructure, and has failed to raise awareness of challenges large portions of the overall water system face, particularly in population-dense areas where that infrastructure is especially old. The focus on outbreaks, discussants indicated, also leads individuals to believe that outbreak scenarios are the primary driver of waterborne illness, when in reality, sporadic cases far outnumber outbreaks. Delegates agreed that an increased focus on how sporadic cases occur is something that requires further discussion and stakeholder engagement. Public health professionals and researchers alike agreed that for clinical healthcare professionals to adequately diagnose a sporadic case or an outbreak, they must first trace the illness back to its source, and not just the location where the pathogen was detected.

Several delegates noted that managing pathogens is a balancing act, requiring active management that may necessitate a combination of different treatment and disinfectants to supply clean water. The point was also made that to effectively manage waterborne pathogens, a multi-pronged approach is required. Given population increases and increasing demands on our water systems, the correct combination and volume of disinfecting agents in water is critical for the delivery of safe drinking water. These factors highlight the importance of understanding how water sources can impact the spread of pathogens. As there is no **“silver bullet”** water treatment method to ensure all drinking water is safe, tailoring specific infrastructure improvement and water treatment plans to different water sources are critical components in addressing the spread of waterborne disease.

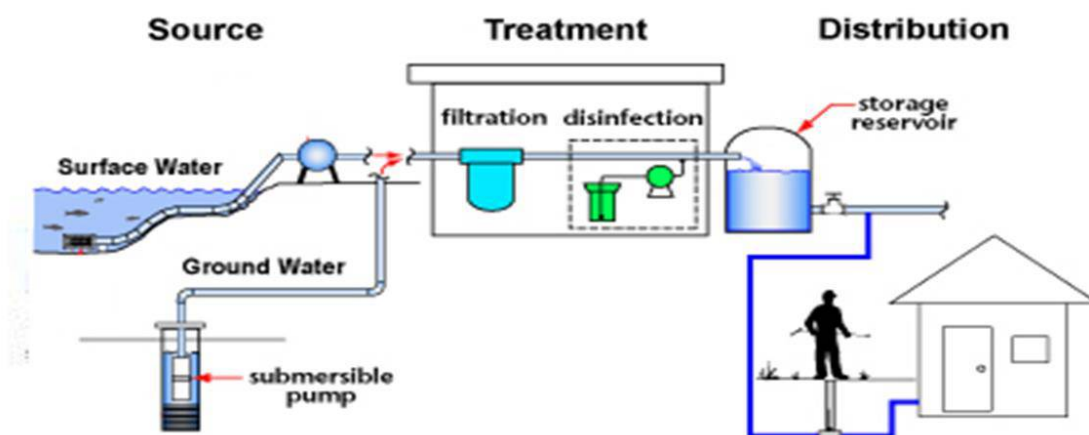
- *A source-to-tap approach for waterborne disease management would provide a more comprehensive approach to dealing with waterborne disease.*

A growing number of states have experienced issues with waterborne disease, yet in many instances, either a lack of understanding, pressure to act quickly or incomplete investigations have led to responses which have yielded few results. While the efforts behind many state level responses has been well intentioned, narrow investigations and a singular focus on water-using equipment has left problems with water sources unaddressed, resulting in continued occurrences of waterborne disease. In some states and localities, lawmakers have attempted to preempt future waterborne disease outbreaks with targeted approaches to building regulation, however not considering a broader scope of changes needed for the entire water distribution system has resulted in incomplete responses.

One such opportunity that panelists and delegates agreed to be “low hanging fruit” was the enactment of minimum residual disinfectant polices, which many states have already enacted to ensure that distal points of the distribution system have adequate residual disinfectant to combat waterborne bacteria before it enters premise plumbing.

Delegates and panelists agreed that current practices can be dramatically improved by considering the overall quality of water throughout the water distribution system from source to consumption. As one delegate stated, **“to address waterborne disease, we must collaborate across disciplines.”**

There was also discussion regarding the high level of focus on water management plans in certain facilities (health care) and buildings. While important, it was noted that water management plans do not relieve utilities of responsibility to ensure that the water entering homes and buildings is optimal. Also, it was noted that there is a need for states and localities to recognize that they must work across agencies since proper water management and oversight cuts across several areas and sectors.



A flow diagram of the Water Distribution System. Adapted from: Babubhai Paneria, et al. (2017). Modernization in Water Distribution System. New Horizons in Civil Engineering Conference (Surat, Gujarat, India)

- *The federal government should play a more active and significant role in addressing water infrastructure and waterborne disease.*

Delegates noted that responses to water infrastructure issues and waterborne diseases generally occur at the local or state level, and that the federal government’s **engagement** on this issue despite national health and economic ramifications has been limited. While federal representatives noted that 90% of public water systems meet EPA health standards and that the drinking water quality in the U.S. is amongst the best in the world, delegates acknowledged significant gaps in how water is measured and monitored, using methods such as proxies which imply that if certain pathogens are not present then others are not as well. This lack of proper measurement and monitoring results in low visibility to fluctuating water quality that occurs across virtually every water system, and in particular, where water systems are faltering, or the infrastructure has not kept pace with changes in water demands. One obvious opportunity exists, delegates noted, in the context of a federal infrastructure investment package, where Congress should adequately fund water infrastructure upgrades and improvements.

In addition to financial resources, clarifying and potentially updating federal regulations that relate to pathogen management and water monitoring would, some delegates pointed out, provide important clarity and guidance to water system managers and healthcare professionals. Delegates also agreed that research efforts focused on the upstream effects of water contamination could better inform policymakers when crafting responses to outbreaks. An increased focus on upstream effects that contribute to waterborne disease can provide a more comprehensive solution than reactionary responses to outbreaks that solely focus on one aspect of the spread of waterborne pathogens.

IV. Panel Overviews of the Summit and Delegates Discussion

The Summit was broken into three sessions, with each yielding active discussion, thoughtful presentations from clinical and policy leaders, and important takeaways from robust delegate dialogue. Each session was structured to help generate a consensus on next steps to ensuring policy approaches going forward are more inclusive. An overview of those sessions is below.

Panel 1: Level-Setting our Understanding of Waterborne Disease in the United States

Delegates and panelists noted that there is still a significant lack of understanding of how waterborne disease spreads through communities and across the country. Discussions also centered around the differences between outbreaks and sporadic cases of waterborne diseases and that the occurrences of sporadic cases far outweigh the overall number of outbreaks. A critical factor discussed was that what is documented about diagnosed cases of waterborne **diseases are “the tip of the iceberg.”** Since only individuals who are sick enough and were exhibiting telltale signs of specific waterborne diseases and who had lab tests to confirm they did, in fact, have a specific waterborne disease, the amount of information on diagnosed cases are limited, at best.

Panelists also highlighted the critical nature of the water's source as a key factor in determining how to properly treat drinking water. Discussants noted that several sources of water are unfit for consumption regardless of how much treatment might be introduced into the water, so knowing the source of water is a critical component in addressing waterborne diseases.

Summit participants also highlighted how water infrastructure is a key element in the spread of waterborne diseases and indicated that compromised or inappropriate water distribution systems are almost always a factor when outbreaks occur. With the combination of old pipes, **new "green" buildings and several other factors at play, it is difficult to pinpoint exact causes of diseases** which is why more research is needed.

Panel 2: State and Local Responses to Waterborne Disease: Key Case Studies

Inconsistent regulatory frameworks, both at the state and federal levels were a recurring topic of conversation during this panel discussion. Confusion surrounding the intent of federal regulations and how they apply at the local level was also a common theme. Participants indicated that certain federal standards are in need of updating or clarification as states and localities often are unsure what, if any consequences exist for not adhering to enacted regulations.

The impacts of system disruptions and poor communication was also a highly discussed topic. Panelists indicated that when drinking water operators perform certain tests such as coliform tests, there is limited communication between system operators and other stakeholders. Several examples were given where planned or unplanned system disruptions preceded waterborne disease outbreaks, and had better communication been present between system operators, government officials and public health officials, several preventative measures could have been taken to avoid outbreaks of waterborne diseases.

Participants agreed that routine discussions of water quality issues would help the consuming public adapt to the realities of water quality variation and allow them to play an active role in protecting themselves. With this understanding, government and public health officials could better meet the need for prompt and more informed communication critical in crisis situations and would do a great deal to keep the public both informed and enabled. There was general agreement that timely communication from appropriate sources would do a great deal to ensure all relevant stakeholders were properly informed and would also stave off unnecessary public panic.

Panel 3: Next Steps: Policy Options on Tap

Updating or reforming waterborne pathogen control regulations was a topic heavily discussed during this panel and participants agreed that waterborne disease regulation is something that

tends to be overlooked. Federal funding was also discussed in this regard; without appropriate funding mechanisms to implement pathogen control regulations, states and localities will be hard pressed to properly implement any regulations promulgated by the federal government.

Capacities of certain states and cities to handle waterborne illness was another topic discussed where panelists agreed that more resources from the federal government would benefit states and localities. Localities have typically been hampered in their responses to waterborne diseases due to their lack of resources, so a federal infrastructure package would need to include prioritized funds based on community needs. It was also noted that investing in water infrastructure improvements could serve as a significant economic development driver, creating millions of good jobs across industries and trades.

Additional research funds and opportunities was another commonly agreed upon topic during this panel. Research and funds for research into the various waterborne pathogens in water systems is critical for public health officials. While panelists generally agreed that most of these recommendations would be considered low hanging fruit, to date, few significant investments have been made to better understand waterborne pathogens and how these pathogens spread. Given the interrelationship between waterborne disease and water infrastructure, federal investments in both, as well as investing in research would provide a significant benefit to water system managers, public health officials and the general public.

There was agreement that any federal infrastructure package that is put forward must include **water infrastructure as a central element**. **One delegate noted, “water is key to the safety and security of this nation.”**

V. Recommended Action Areas of Focus

During the last session of the summit, participants discussed a core set of recommended options to address the increase in the presence of waterborne pathogens. Delegates discussed leading practices aimed at reducing both sporadic cases and outbreaks of waterborne disease.

The most often-cited recommendations among the delegates included:

- ✓ Better education of the public and policymakers on how waterborne pathogens spread – beginning at the water source, often as a result of, or exacerbated by, aging infrastructure – is vital to explain the link between infrastructure and public health;
- ✓ A significant investment in water infrastructure should be a central tenet of a national infrastructure initiative;
- ✓ Improved outreach and education to susceptible populations will allow at-risk Americans to be better prepared to safeguard themselves from exposure;
- ✓ Timely communication and information sharing across relevant leaders and stakeholder industries would allow for the dissemination of fact-based information;

- ✓ Thoughtful model state level legislation that more comprehensively addresses the entirety of a water system, not solely where waterborne pathogens are ultimately detected, should be produced by a multi-stakeholder effort; and
- ✓ Continued conversations and efforts across stakeholder groups to carry forward a public policy dialogue on these themes can help **protect our citizens from the “next Flint”**.

Appendix A: Steering Committee Member List

Steering Committee

Allergy and Asthma Network
Tonya Winders

Alliance to Prevent Legionnaires' Disease
Marcy Savage

Alliance to Prevent **Legionnaires' Disease**
Brad Considine

American Hotel and Lodging Association
Lauren Pravlik

Association of Clean Water Administrators
Frances Bothfeld

Hudson River Health Care
Dr. Jonathan Zellan

National Association of County and City Health Officials
Chelsea Gridley Smith

National Network of Public Health Institutes
Dr. Brenda Rivera-García

Appendix B: List of Participants

Delegates

Ryan Albert, Ph.D.
Chief, Standards and Risk Reduction Branch
United States Environmental Protection Agency

Ava Avila, Ph.D.
Director of Research
IOREX Company

Philip Berger
Hydrologist
United States Environmental Protection Agency

Carolyn Berndt
Program Director for Sustainability
National League of Cities

Kayla Bogdanowicz
Alliance to Prevent Legionnaires' Disease

Bob Bowcock
Founder
Integrated Resource Management

Morgan Brown
Technical Programs Manager
Water Environment Federation

Daryn Cline
Alliance to Prevent Legionnaires' Disease

Brad Considine
Director, Strategic Initiatives
Alliance to Prevent Legionnaire's Disease

Marc Edwards, Ph.D.
University Distinguished Professor of Civil
Engineering
Virginia Tech

Jonathan Flannery
Senior Associate Director of Advocacy
American Society for Healthcare Engineering

Deise Galan-Leonel
Director, Senior Program Analyst, Public Health
Preparedness
National Association of County and City Health
Officials

Mark Gibbons
President/CEO
RetireSafe

Gwen Hanlon
Allergy & Asthma Network

Chelsea Gridley-Smith, Ph.D.
Director, Environmental Health
National Association of County and City Health
Officials

Soohyun Julie Koo
President & CEO
IOREX Global Company

Arielle Kane
Director of Health Care
Progressive Policy Institute

Kevin McIntyre
Associate Government Relations Manager
Trust for America's Health

Ken Mortensen
Alliance to Prevent Legionnaire's Disease

Ken Rotert
Physical Scientist
United States Environmental Protection Agency

Marcy Savage
Alliance to Prevent Legionnaires' Disease

Michele Swanson, Ph.D.
Professor
Department of Microbiology & Immunology
University of Michigan Medical School

Jason Washington
Executive Director
National Council for Public-Private Partnerships

Tonya Winders
President/CEO
Allergy & Asthma Network

Kenneth Mallory
Legislative Affairs Counsel for Communications,
Technology and Water
National Association of Regulatory Utility
Commissioners

Gary Morgan
Regional Director of Engineering
Waterford Hotel Group

Brenda, Rivera-García
Country Director, Puerto Rico Office
Americares

José E. Sánchez
Deputy Director of Research and Development
U.S. Army Corps of Engineers (USACE)

Jana Summey
Healthcare Market Manager
Watts Water

Deborah Vacs Renwick
Environmental Engineer
United States Environmental Protection Agency,
Office of Ground Water and Drinking Water

Wendi Wilkes
Policy Analyst
Association of State Drinking Water Administrators

Additional Observers

Kevin Dowling
Legislative Director
Congressman Lee Zeldin

Stratton Kirton
Hamilton Place Strategies

Appendix C: Speaker Biographies

Ms. Carolyn Berndt
Program Director for Sustainability
National League of Cities

Carolyn Berndt is the Program Director for Sustainability in the federal advocacy department at **the National League of Cities, the nation's oldest and** largest national organization representing municipal governments. As a member of the federal advocacy team, **Carolyn leads NLC's** advocacy, regulatory, and policy efforts on energy and environmental issues, including water infrastructure and financing, water and air quality, climate change, and energy efficiency.

Prior to joining NLC, Carolyn served as associate director of government and public affairs at the American Society for Interior Designers, working with coalitions throughout the country to secure interior design registration and licensure laws. Formerly, Carolyn worked for Burns and Roe, a private engineering and construction company, in their government affairs office in Washington, DC. **Carolyn received her master's degree in public administration from American University in Washington, DC and her Bachelor of Arts in political science from Trinity College in Hartford, Connecticut.**

Mr. Robert W. Bowcock
Founder
Integrated Resource Management

Robert W. Bowcock founded Integrated Resource Management, Inc. in 1997 after serving as a Water Utility Manager in Azusa (1991-97) and Huntington Park (1987-91), California. Prior to that, Metropolitan Water District of Southern California (1982-87); and as a U.S. Army Civil Affairs Team Leader designing and constructing water treatment and distribution systems in Southeast Asia and South America. Bob has been appointed Watermaster by California Superior Courts since 1990. Bob is a licensed California Grade V Water Treatment Operator and maintains various other water industry licenses. Bob routinely provides expert witness in the specific area of water treatment and resource management.

Mr. Brad Considine
Director, Strategic Initiatives
Alliance to Prevent Legionnaires' Disease

Brad has more than 30 years of experience in strategy development, public policy, government relations and executive management with global manufacturers of advanced engineering solutions, and not-for profit organizations. He has a bachelor's degree from Illinois State University and both a master's degree in corporate marketing and public relations and an MBA from Northern Illinois University. Brad has been with APLD since 2016.

The Alliance to Prevent Legionnaires' Disease is a non-profit coalition of health advocates, health providers, building engineers, scientists, water treatment experts and manufacturers. The Alliance works to educate the public about the facts surrounding water quality and its relationship with Legionnaires' disease. The organization also works to promote comprehensive strategies that will address the root causes of *Legionella* bacteria growth to better protect public health.

Dr. Marc Edwards
University Distinguished Professor of Civil Engineering
Virginia Tech

Marc Edwards is a University Distinguished Professor of Civil Engineering at Virginia Tech, where he teaches courses in environmental engineering, applied aquatic chemistry and engineering ethics. His research group conducted the investigative science uncovering the 2001-2004 D.C. Lead Crisis, the 2014-2016 Flint Water Disaster, and illegal pesticide dosing to water of Denmark SC 2008-2018.

Time Magazine dubbed Edwards "The Plumbing Professor" in 2004, listing him amongst the 4 most important "Innovators" in water from around the world. The White House awarded him a Presidential Faculty Fellowship in 1996, he won a MacArthur Fellowship in 2007, and in 2013 Edwards' was the 9th recipient (in a quarter century) of the IEEE Barus Award for "courageously defending the public interest at great personal risk."

In 2016 he was named amongst TIME Magazine's 100 Most Influential people in the World, the World's 50 Greatest Leaders by Fortune Magazine, Politico Magazine's Top 50 Visionaries who have transformed American politics, Foreign Policy Magazines 100 World's Greatest Thinkers, and was short-listed amongst Flint whistleblowers as Time person(s) of the year.

He was co-recipient of the inaugural 2017 MIT Disobedience Award and received the AAAS Scientific Freedom and Responsibility award (2018) and the Hoover Humanitarian Medal (2019).

Ms. Deise Galan-Leonel
Director, Senior Program Analyst, Public Health Preparedness
National Association of County and City Health Officials

Deise Galan Leonel serves as a Senior Program Analyst for the Preparedness Team at the National Association of County and City Health Officials (NACCHO). Her work focuses on supporting local health departments strengthen public health capacity and preparedness capabilities by managing and implementing projects, collaborating with federal organizations, conducting research and promoting policies. At NACCHO, she leads the water emergency preparedness and response project aiming to identify common challenges, develop resources, share best practices and evaluate how existing tools can be improved to better equip health departments response to water emergencies. Deise has extensive experience in working in both national and international settings, focusing on public health preparedness, emergency **response, infectious diseases and environmental health. She holds a bachelor's degree in Biology from Virginia Tech and a Master's in Public Health from George Washington University.**

Mr. Mark Gibbons
President/CEO
RetireSafe

Mark Gibbons is the President/CEO for RetireSafe, helping to raise the platform in education and awareness for seniors across the nation. Before joining RetireSafe, Mark served 9 years at Caregiver Action Network (CAN) as the Senior Director of External Programs. Mr. Gibbons dedicated 10 years of service to the U.S. Army by serving as a Commander in Operation Desert Shield/Storm as well as Operation Provide Comfort. Following service to his country, Mark served as Chief of Staff for the Mayor of Augusta, Georgia and then as a congressional aide for Representative Charles Norwood (10th-GA). Following his relocation to Washington, DC, Mark brought his leadership skills to the syndicated television program, the McLaughlin Report and served as the Director of Operations for the American Red Cross. Mark is a graduate of Our Lady of the Lake University in San Antonio, Texas.

Ms. Gwen Hanlon
Allergy & Asthma Network

Gwen Hanlon has been working with the Allergy & Asthma Network since 2017 after losing her **husband, Kevin to complications from Legionnaires' disease. Gwen shares their family's story to bring awareness of the deadly consequences of Legionnaires' and contaminated water. Her love for Kevin, her family and community drive her to share her experience.** Gwen resides in Morristown, NJ with her two children, Hayden and Declan.

Dr. Brenda Rivera-García
Country Director, Puerto Rico Office
Americares

Dr. Brenda Rivera-García earned a Doctor of Veterinary Medicine degree from Iowa State University and a Master of Public Health from the University of Iowa. She also completed fellowships in Applied Field Epidemiology and Pediatric Environmental Health at the University of Puerto Rico. Dr. Rivera-García has more than 25 years of experience in public health; she worked for the Puerto Rico Department of Health as State Epidemiologist from 2013 to 2016 and served as the Zika Response incident manager. Additionally, she served as guest researcher at the U.S. Centers for Disease Control and Prevention Dengue Branch. Dr. Rivera-García also has extensive academic experience, having served as an Associate Professor at the Ponce School of Medicine and as a Professor in the Veterinary Technology Program at the University of Puerto Rico School of Health Professions. In her new role as Country Director for Americares' Puerto Rico Office, Dr. Rivera-García will be responsible for overseeing Hurricane Maria long-term recovery operations in the island, implementing programs that meet survivors' long-term health needs and directing initiatives that strengthen health systems in vulnerable communities.

Mr. José E. Sánchez
Deputy Director of Research and Development
U.S. Army Corps of Engineers (USACE)

Mr. José E. Sánchez serves as the Deputy Director of Research and Development and Deputy Chief Scientist for the U.S. Army Corps of Engineers (USACE) and has been with this agency for over 23 years. He assists in developing policy, setting direction and providing oversight for the Corps' research and development program conducted for approximately 700 sponsors and advises the Chief of Engineers on matters of science and technology. The R&D program totals over \$1B annually and supports the Department of Defense and other federal and state agencies in military and civil works projects as well as foreign, state and local governments.

Most recently, he served as the acting Director of Contingency Operations and Homeland Security for USACE. Following hurricanes Irma and Maria, Mr. Sánchez was temporarily deployed to Puerto Rico to direct the power restoration efforts on the island in support of FEMA's multi-billion-dollar mission assignment. Prior to this assignment, he served as the Director of the Coastal and Hydraulics Laboratory where he led a team of more than 250 researchers executing a multi-million-dollar research program in the specialized areas of coastal and hydraulics.

Mr. Sánchez is a registered Professional Engineer and has bachelor's and master's degrees in Civil Engineering from the University of Puerto Rico at Mayaguez, doctorate-level courses from

Mississippi State University and is a graduate of the Federal Executive Institute. He has received numerous awards for his contributions in science and technology from the Department of the Army, academia and industry.

Dr. Michele Swanson

Professor

*Department of Microbiology & Immunology, University of Michigan
Medical School*

Michele Swanson is a Professor in the Department of Microbiology & Immunology at the University of Michigan Medical School. After studying biology and playing field hockey and softball at Yale, she worked as a research technician in the lab of Samuel C. Silverstein, an expert in leukocyte cell biology who conducted seminal studies of *Legionella pneumophila* growth in macrophages. As a graduate student with Marian Carlson at Columbia and Fred Winston at Harvard, she used *Saccharomyces cerevisiae* as a tool to study gene expression. She trained as a postdoctoral fellow with Ralph Isberg at Tufts and HHMI, where she developed cell biological methods to analyze the fate of *L. pneumophila* in macrophages. In addition to exploiting this waterborne pathogen as a genetic probe of macrophage function, **her lab at Michigan investigates how metabolic cues govern the microbe's virulence in phagocytes and resilience in the environment.** More recently she worked with an interdisciplinary, multi-institutional team to investigate whether changes that coincided with the Flint Water Crisis increased the risk of infection by *L. pneumophila*.

At the University of Michigan, Swanson teaches infectious diseases to medical students, bacterial pathogenesis to graduate students, and current topics in microbiology to first year **undergraduates.** She is also **Director of the medical school's Office of Postdoctoral Studies** and member of the operating committee for the Molecular Mechanisms of Microbial Pathogenesis. Professor Swanson is an active member of the *American Society for Microbiology*. Currently she serves as President, member of the Board of Directors, co-host of the podcast *This Week in Microbiology*, and co-author of the ASM Press textbook *Microbe*. Swanson also served as a Councilor for the *Society for Leukocyte Biology* and Chair of a 2009 FASEB Summer Research Conference and 2014 Gordon Research Conference on Microbial Toxins and Pathogenesis. Currently she is serving on the National Academies of Sciences, Engineering, and Medicine committee on Managing *Legionella* in Water Systems.

Ms. Deborah Vacs Renwick
Environmental Engineer
*United States Environmental Protection Agency, Office of Ground Water
and Drinking Water*

Deborah is an environmental engineer in EPA's Office of Water, Office of Ground Water and Drinking Water (OGWDW). Within OGWDW, she focuses on distribution system issues related to microbial contaminants and disinfection byproducts. Before coming to the EPA in 2016, she worked as an engineer at a California water utility for three years and as a water and sanitation volunteer in the Peace Corps in Peru (2.5 years). Deborah has an Sc.B. in Civil and Environmental Engineering from Brown University and a Master of Engineering in Water Quality and Environmental Engineering from MIT, where she focused on drinking water issues in developing countries.

Ms. Tonya Winders, MBA
President/CEO
Allergy & Asthma Network

Tonya Winders, MBA is currently the President and Chief Executive Officer of Allergy & Asthma Network, the leading patient advocacy organization dedicated to ending the needless death and suffering due to asthma, allergies and related conditions. Tonya has over 17 years of experience in leadership roles within the allergy and asthma industry. From sales and marketing leadership to managed markets access, she has worked tirelessly to ensure patients have access to effective diagnostic and treatment tools. Tonya serves on several expert panels including the ATS Public Advisory Roundtable. Furthermore, she is on the Board of Directors for Not One More Life, American Respiratory Care Foundation and is the current president of the Global Allergy Asthma Patient Platform, representing 35 patient organizations throughout the world. Personally, Tonya is the mother of five children, four of whom have asthma and/or allergies, ranging in age from 13-19 years old. She enjoys spending time with her husband of 21 years Brian Winders and cheering on her children in various sports.

Appendix D: Summit Agenda

9:00 am Opening Remarks

Ms. Stephanie Silverman, CEO, Venn Strategies

9:10 am Kickoff Speaker

Dr. Marc Edwards, University Distinguished Professor of Civil Engineering, Virginia Tech

9:40 am Panel I – Level-Setting our Understanding of Waterborne Disease in the United States

Moderator: Ms. Tonya Winders, President/CEO, Allergy & Asthma Network

Panelist: Dr. Brenda Rivera-García, Country Director, Puerto Rico Office, Americares

Panelist: Mr. Mark Gibbons, President/CEO, RetireSafe

Panelist: Ms. Deborah Vacs Renwick, Environmental Engineer, United States

Environmental Protection Agency Office of Ground Water and Drinking Water

10:40 am: Break

10:50 am: How Waterborne Disease Can Lead to Devastating Consequences:

Impact on Real Americans

Ms. Gwen Hanlon

11:10 am: Panel II – State and Local Responses to Waterborne Disease: Key Case Studies

Moderator: Mr. Bob Bowcock, Founder, Integrated Resource Management

Panelist: Dr. Brenda Rivera-García, Country Director, Puerto Rico Office, Americares

Panelist: Mr. José Sánchez, Deputy Director of Research and Development/Deputy Chief Scientist for the U.S. Army Corps of Engineers

Panelist: Mr. Brad Considine, **Alliance to Prevent Legionnaires' Disease**

12:10 pm Morning Recap

Dr. Shanta Whitaker, Vice President, Venn Strategies

12:15 pm Luncheon Speaker

Dr. Michele Swanson, Professor, Microbiology & Immunology, University of Michigan Medical School

1:10 pm Panel III – Next Steps: Policy Options on Tap

Moderator: Mr. Matthew Scott, Assistant Vice President, Venn Strategies

Panelist: Ms. Deise Galan-Leonel, Senior Program Analyst, Public Health Preparedness,
National Association of County and City Health Officials

Panelist: Ms. Carolyn Berndt, Program Director, Sustainability, National League of Cities

Panelist: Dr. Marc Edwards, University Distinguished Professor of Civil Engineering,
Virginia Tech

2:10 pm Discussion on Takeaways and Next Steps

3:10 pm: Adjourn