Information Collection and Research Priorities

Vanessa Speight
TWG Representative
TCR / DS Federal Advisory Committee
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This Meeting's Presentation

Objectives

Provisions

System compliance

Improvement

Research

Information Collection and Research Priorities

Purpose of Presentation

- Describe the process used by the TWG to prioritize gaps for distribution system research and information collection
- Summarize the high priority gaps preliminarily identified by the TWG and discuss:
  - How the gaps relate to the use of information to make decisions in the future
  - How to include gaps in the agreement in principle

Questions to Consider

1. What research should be conducted, or information collected, to help characterize risk in the distribution system?
2. If there are issues where we know there is a risk, do we have enough information to mitigate that risk? Would closing a gap provide that information?
3. Depending on the time cycle for research and information collection that is selected by the FAC, which gaps should be prioritized for completion in the first cycle?

Distribution System Issues Selected for Further Analysis

1. Cross-connections and backflow of contaminated water
2. Contamination due to storage facility design, operation, or maintenance
3. Contamination due to main installation, repair or rehabilitation practices
4. Contaminant intrusion due to pressure conditions and physical gaps in distribution system infrastructure
5. Significance and control of biofilm and microbial growth
6. Nitrification issues that lead to public health effects
7. Accumulation and release of contaminants from distribution system scales and sediments

8 Gap Areas that provide Decision Relevance

1. Analytical framework for assessing occurrence and exposure
2. Public health data plan
3. Contributing factors to the event
4. National occurrence of contaminants
5. Measurement of water quality contaminants or indicators
6. Fate and transport of contaminants
7. Control measures [research on new & improved measures and effectiveness]
8. National characterization of existing control measures

Criteria for Rankings Identified by FAC

- Affects public health
- Informs actions to protect public health
- Completes gaps in this issue area
- Improves understanding of the effectiveness of mitigation options
- Fills gaps in multiple issue areas
- Efficiency
- “Do-ability”
- Relative cost
- Duration
- Applicability to PWSs
- Regulatory and policy decisions previously made on the issue

	High Priority Gaps that when completed will provide:	
Issue	Sufficient Info to Determine Need for Action	Sufficient Understanding of Mitigation Measures
CC and BF		
Storage		
Mains		
Intrusion		
Biofilm		
Nitrification		
Accumulation		

Cross-Cutting Gaps that Applied to All Issue Areas were Identified

- Analytical Framework:
  - Needs to go first in all issue areas
- Public Health Assessment Plan
- Fate & Transport of Contaminants

Cross-Cutting Gap: Analytical Framework

An iterative process (model, decision tree) by which to:

- Evaluate the key input factors that must be in place to inform the regulatory process
- Illustrate how the key factors and influencing variables interact
- Help assess the significance of critical data and information gaps
- Includes data assessment and data management

Cross-Cutting Gap: Public Health Assessment Plan

- A Public Health Assessment Plan, integrated across the 7 priority issues, is needed to:
  - Evaluate the state of knowledge of public health data relevant to the 7 distribution system issues, and
  - Assess the needs for additional public health data and the means to collect that data, or
  - Determine the impact of not having that data in either a qualitative or quantitative format.

Cross-Cutting Gap: Fate and Transport of Contaminants

- Need to better understand the chemical, physical and microbial changes to contaminants in the distribution system, and the mechanisms whereby contaminants travel and are retained within the distribution system.
- Need to determine most appropriate monitoring approach(es) to capture contamination events
  - Sample collection approach
  - Modeling
  - Data assessment/management
  - Will present a significant challenge for research and will require a long-term approach

Analysis for 7 Issue Areas

- After cross-cutting gaps had been identified, further evaluated the issue areas using the criteria to rank gaps as low, medium or high
  - Ranked the gaps that need to be conducted first as “high”
- Summary by issue area follows

Cross-Connections and Backflow

- Factors contributing to CC or BF events such as pressure loss are somewhat understood but we are lacking a national picture. Identification of factors is do-able in 5-year time frame (high)
- Some contaminant data exists from reported incidents (low)
- Some research on contaminant measurement during events is ongoing (med)
- Control measures are well understood (low)
- While CCC programs exist, there seem to be barriers to implementation that would need to be better understood to develop a national program. Do-able to gather this data in a 5-year time frame (high)

Storage Facilities

- Factors contributing to events such as deficiencies in design or O&M are somewhat understood but we are lacking a national picture. Identification of factors is do-able in 5-year time frame (high)
- Have some case study data on occurrence of different contaminants but again, are lacking a national picture (high)
- Measurement methods for contaminants are well understood (low)
- Control measures are well understood (low)
- Have some data on the effectiveness of control measures from sanitary surveys but no national picture (med)

New & Repaired Mains

- Data is not available on the national occurrence of factors contributing to contamination (high)
- Monitoring of contaminants is difficult to do, lacking a national picture of contaminant occurrence (med)
- Measurement methods for contaminants are well understood (low)
- Control measures are well understood (low)
- National characterization of the impact of different control measures does not exist and would be important for evaluating their effectiveness and developing a national program (high)

Contaminant Intrusion

- Fundamental research is needed to fully understand contributing factors to risk, including frequency and magnitude of events (high)
- Difficult to develop a national picture of contaminant occurrence from measured data, will likely require a modeling effort that builds upon fundamental research (med)
- Measurement methods for contaminants are well understood (low)
- Research is ongoing about control measures, likely to be incorporated into other pressure management strategies (low)
- National characterization of the effectiveness of control measures has not been done and could be done along with fundamental research (high)

Biofilm and Microbial Growth

- Fundamental research is needed on the interaction of contributing factors such as high organic content with the microbial ecology, including pathogens. Some research is ongoing (med)
- National understanding of the ability of pathogens to live, grow & detach from biofilms is needed. Fundamental research would help inform public health risks (high)
- Measurement methods for contaminants are somewhat understood (med)
- We have some understanding of control measures but need findings of fundamental research first (med)
- National characterization of the effectiveness of control measures depends on getting a better understanding of fundamental mechanisms (med)

Nitrification

- Need to more clearly understand contributing factors to nitrification events. This could be done in conjunction with a national occurrence study (high)
- Health effects and measurement methods are already known (low)
- Control measures are somewhat understood (med)
- National characterization of the effectiveness of control measures could be done after the national occurrence study identifies factors (med)

Contaminant Accumulation & Release

- Contributing factors such as the type of contaminant can be deduced from source water data (med)
- National occurrence of the phenomenon is needed to make a regulatory decision. Contaminants and their health effects are generally well known, just lacking the national picture (high)
- Measurement methods for contaminants are well understood (low)
- Control measures are understood for source water treatment but not for accumulation & release mechanisms (med)
- National characterization of effectiveness of control measures could be done once the previous gaps have been addressed (med)

High Priority Needs (1 of 4)

Issue	Gap	Rationale	Relative Cost $ $$ $$$	Leads Effort/ Provides Funding	Significant PWS or State Burden
All 7 issues	**Analytical framework** to guide the assessments, for each of the issues	It is essential to first map the analysis of all of the questions that need to be answered to get sufficient understanding of the issue.	$	EPA, AWWA, AwwaRF, (Other organizations based on the issue)	
Crosscutting	**Public Health Assessment Plan**	Need for more surveillance and epidemiological study to better understand the evidence of public health impacts for each issue, and the linkage of data and information among all of the issues.	$$$	EPA, CDC	
Crosscutting	**Fate and transport of contaminants**	Need to better understand the chemical, physical and microbial changes to contaminants in the distribution system, and the mechanisms whereby contaminants move within it.	$$	EPA, AwwaRF	

High Priority Needs (2 of 4)

Issue	Gap	Rationale	Relative Cost $ $$ $$$	Leads Effort/ Provides Funding	Significant PWS or State Burden
CC/BF	**Contributing factors to cross connections and backflow (backpressure, backsipohonage, hazards, cross connections)**	Contributing factors are fairly well known (eg, pressure loss, unprotected high hazard service connection). Information on occurrence of factors varies widely depending on the state. Could be accomplished in conjunction with collection of information on control measures.	$$	EPA, AwwaRF, States, AWWA, Organizations	PWSs and States
Storage	**Contributing factors.** Deficiencies in storage facility design, construction and O&M that lead to introduction, growth and retention of waterborne pathogens	Many storage facilities. Monitoring at these locations is not often done (no national requirement to monitor there) and the information is not being put together to evaluate it.	$$	EPA, States, AWWA, Organizations	
New and Repaired Mains	**Contributing factors** due to water main installation or repair procedures that can lead to contamination	Many breaks are cracks that can be clamped, are not big blowouts. Occurrence of break repairs and main installations are likely to be recorded by PWSs and are likely to be easily tracked. Need information on contributing factors to be able to make regulatory decisions.	$$	EPA, States, AWWA	
Nitrification	**Contributing factors** due to nitrification	Need to re-evaluate our understanding of occurrence and contributing factors, become aware of systems with high nitrate/nitrite in their DS and high ammonia in their source water. Could be accomplished in conjunction with research/information collection on the national occurrence of contaminants and national characterization of existing control programs and methods.	$$	EPA, States	
Intrusion	**Contributing factors** that can lead to contamination via intrusion	Current research is identifying contributing factors. The next step is to assess the occurrence of these factors.	$$	EPA, AwwaRF	

High Priority Needs (3 of 4)

Issue	Gap	Rationale	Relative Cost $ $$ $$$	Leads Effort/ Provides Funding	Significant PWS or State Burden
Storage	**National occurrence of contaminants** from storage and characterization of their adverse health effects	Need this information to be able to make decisions about future directions and needs. Could be done in conjunction with information collection on occurrence and risk factors. Do-able: EPA, States, PWSs have this information.	$$	EPA, States, CDC, AWWA	PWSs
Biofilms	**National occurrence of contaminants** from biofilms and their adverse health effects	Need this information to be able to make decisions about future directions and needs. Could be done in conjunction with information collection on occurrence and risk factors. Do-able: EPA, States, PWSs have this information.	$$	EPA, States, CDC, AWWA	PWSs
Contaminant Accumulation	**National occurrence of** accumulating **contaminants** and characterization of their adverse health effects	This information is required if we are to make a regulatory decision on inorganics accumulation. Very do-able, contaminants basically known, can be measured directly via standard methods. Collecting the samples in various distribution systems is the most difficult part.	$$	EPA, CDC, AwwaRF	PWSs and States
Nitrification	**National occurrence** of nitrification and characterization of its adverse health effects	Need to determine how many systems (especially smalls) have high source water ammonia. Acute health effects from NO2, NO3 are already known	$	EPA, States	

High Priority Needs (4 of 4)

Issue	Gap	Rationale	Relative Cost $ $$ $$$	Leads Effort/ Provides Funding	Significant PWS or State Burden
CC/BF	**National characterization of CCC/BP control program implementation** and limitations	Need this info to be able to make decisions about future directions and needs. Could be done inconjunction with info collection on occurrence and risk factors. Do-able: EPA, States, PWSs have this information.	$	EPA, States, AWWA, Organizations	
New and Repaired Mains	**National characterization of** use , effectiveness, limitations of **BMPs** in repair and installation of mains	A national assessment of the use of BMPs, success of use, and barriers to use has not yet been made.	$$	EPA, States, AWWA	
Intrusion	**National characterization of use, effectiveness, limitations of BMPs** to control pressure drops and intrusion	This should be done along with the analysis of contributing factors.	$$	EPA, AwwaRF, States	

Additional Consideration: Research and Information Collection Related to Current TCR

- Not evaluated by TWG but should be included by FAC if appropriate
- Might include topics such as:
  - Evaluation of analytical methods
  - Evaluation of monitoring and compliance data
  - Better understanding of Total Coliform , *E. coli* , and other indicators
  - Other unanswered questions

Recommendations from TWG

- A research program should be conducted in a systematic way with adequate funding and time
- The analytical framework for each of the 7 issues was selected as the highest priority because it sets up the analysis for follow-up work
- Prioritization recommendations are the best professional judgment of the TWG members and are open for change by the FAC
  - Not all rankings achieved consensus within the group

Questions to Consider

1. What research should be conducted, or information collected, to help characterize risk in the distribution system?
2. If there are issues where we know there is a risk, do we have enough information to mitigate that risk? Would closing a gap provide that information?
3. Depending on the time cycle for research and information collection that is selected by the FAC, which gaps should be prioritized for completion in the first cycle?

	High Priority Gaps that when completed will provide:	
Issue	Sufficient Info to Determine Need for Action	Sufficient Understanding of Mitigation Measures
CC and BF	Public Health Assessment Plan Fate and Transport Analytical Framework Contributing Factors	National Characterization of CCC Programs
Storage	Public Health Assessment Plan Fate and Transport Analytical Framework Contributing Factors Occurrence of Contaminants	
Mains	Public Health Assessment Plan Fate and Transport Analytical Framework Contributing Factors	National Characterization of BMPs

	High Priority Gaps that when completed will provide:	
Issue	Sufficient Info to Determine Need for Action	Sufficient Understanding of Mitigation Measures
Intrusion	Public Health Assessment Plan Fate and Transport Analytical Framework Contributing Factors	National Characterization of BMPs
Biofilm	Public Health Assessment Plan Fate and Transport Analytical Framework Occurrence of Contaminants	
Nitrification	Public Health Assessment Plan Fate and Transport Analytical Framework Contributing Factors Occurrence of Contaminants	
Accumulation	Public Health Assessment Plan Fate and Transport Analytical Framework Occurrence of Contaminants	