Maintaining a Safe Water Supply in an Era of Compromised Sources and Aging Infrastructure

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Why is this important?
Overview

Source Waters

Distribution Systems

Building Water Systems

“Streams of Water and Information”
Overview

Source Waters
Elk River, WV Chemical Spill

January 9, 2014:

- 10,000 gallons of 4-Methylcyclohexanemethanol (MCHM) spilled into the Elk River about 1 mile upstream of the Kanawha Valley Water Treatment Plant in Charleston, West Virginia
- Storage tank was unknown to the water utility and WVDEP
- First detected by public, who smelled “licorice”, after MCHM was already in the drinking water
- MCHM properties, toxicology and treatability were largely unknown
- 300,000+ residents across 9 counties without access to potable water
- Key question: Is water safe?

Spill occurred from Freedom Industries, Inc. tank 396 and later discovered also from 397
Past Source Water Assessment

State of West Virginia
Source Water Assessment and
Protection Program
Source Water Assessment Report

WVAWC - Kanawha Valley
Kanawha County
PWSID: WV3302016

Date: July 29, 2002
Chemical Safety Board Review Recommendations

1. Emphasize importance of source water protection planning, emergency planning, and coordination among local, state, and federal agencies

2. Inventory all hazardous chemicals considered potential sources of contamination within the zone of critical concern
   • For each inventoried chemical, determine detectability and treatability in event of release to water supply
   • For all untreatable chemicals, develop contingency plan to respond to contamination events

3. Update the Chemical Safety Data Sheet to include toxicological and ecological information
American Water Launches Innovative Partnership with Corona Environmental Consulting to Provide Real-Time Monitoring of Water Systems

VOORHEES, N.J.--(BUSINESS WIRE)-- American Water (NYSE: AWK), the nation’s largest publicly traded water and wastewater utility company, announced today that it has formed a partnership with Corona Environmental Consulting to develop a cloud-based geographic information system software platform known as WaterSuite™. This partnership is a result of American Water’s Innovation Development Process, which drives innovation and supports the development of new products.

West Virginia American Water partnered with Corona to pioneer the development of the WaterSuite tool. By integrating real-time data from various sources, WaterSuite creates a context for effective and efficient management of water resources and enables prompt data-driven decision making. Its array of features allows utilities to visualize potential sources of contamination within a watershed, import and share water quality measurements and emergency monitoring plans, track water quality and movement of chemicals in the event of an unplanned release, and search for possible contaminants by characteristic, all within a platform that is highly secure, interactive, and easily customized.

"In contrast to paper source water assessment reports, WaterSuite is a 'living' source water assessment and a key tool for use in source water protection and event response," said Paul Gagliardo, Manager, Innovation Development. "As a leader in researching and deploying water industry innovations, American Water is committed to using technologies that help us increase our efficiencies and the value of the water services we provide to our customers."

Please visit www.coronakey.com

About American Water

Founded in 1883, American Water is the largest publicly traded U.S. water and wastewater utility company. With headquarters in Voorhees, N.J., the company employs approximately 6,000 dedicated professionals who provide drinking
WaterSuite

Source Water Protection Application

- Aggregates massive volumes of federal, state, local, private, and proprietary data
- Designed to assess threats, plan, and protect watersheds from vulnerabilities
- GIS foundation and context
Data Sources & Collection

**Federal Data**
- Ports
- Infrastructure (Airports, Railroads, Bridges)
- Pipelines
- EPA FRS (CERCLIS, RCRA, TRI, NPDES)
- Power Plants

**State Data**
- Aboveground Storage Tank Registry
- Confined Animal Feeding Operations
- Mining
- Oil and Gas Wells
- Landfills
- Wastewater Treatment Plants

**Local Data**
- Hazardous Chemical Storage Reporting
- Downstream Notification
- Industrial Pre-Treat Facilities
- Any other data available

**Data Frequency**
- Static
- Semi-static
- Dynamic / Real-time
Tabular search, filter, and export
Site Summary: Related features, contaminants, and permits
Zone of Concern Summary: Counts of potential sources of contamination
Contaminant database with searching and reporting
Acute Spill Risk Scores:
- Scoring & supporting time of travel
- Concentration estimates to aid priority setting
Overview

Distribution Systems
Naegleria fowleri in Louisiana

- Thermophilic, free-living ameba (113°F, 45°C)
- Cause of primary amebic meningoencephalitis (PAM)
- 300-400 cases identified worldwide with >100 in U.S.
- **2011:** Two people died of PAM in DeSoto Parish and St. Bernard Parish. Both cases involved the use of a neti-pot.
- **2013:** Second death in St. Bernard Parish (4-year old boy)
  - Testing conducted by LDHH/CDC in both St. Bernard and DeSoto found *Naegleria fowleri* in the distribution systems
  - Louisiana DHH issued an Emergency Rule requiring public water systems:
    - Maintain a minimum 0.5 mg/L disinfectant residual
    - Increased monitoring for disinfectant residuals, revised TCR monitoring plans and required nitrification control plans among other things.
- **2014-16:** Louisiana DHH conducted surveillance monitoring for *Naegleria fowleri* during the warm weather seasons
Past Disinfectant Residual Monitoring / Reporting Approach

- Lab 8 Carbon Copy Form
- Hand-written
- Inconsistent
- Limited locational information
- Limited QA/QC
- No electronic data collection, analysis, reporting
- ~80,000 per year
Monitoring Plan Portal

Public Water System Monitoring Plan

CROWLEY WATER SYSTEM (LAWCO) - LA1001002

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<th>Site Type</th>
<th>Description</th>
<th>Street Address</th>
<th>City</th>
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Louisiana Parishes with Nf Detections: 2015

- DeSoto
- Sabine
- Ouachita
- Ascension
- St. John
- St. Bernard
- Terrebonne
North Monroe Et Al Water System
(LA1073035)

- Population served: 8,400
- Consecutive system to the City of Monroe
- Receives chloraminated water
- 4 tank sites with booster pump stations
Historical Chlorine Residuals (January – July, 2015)

LDH minimum residual disinfectant level: 0.5 mg/L
DHH Confirms Naegleria Fowleri Ameba in North Monroe Water System

September 01, 2015

Presence of amoeba found in North Monroe Water System

Staff Report  9:34 p.m. CDT September 1, 2015

Brain-Eating Amoeba found in water

State Medical Officer Dr. Jimmy Guidry discusses the treatment process for water systems with the brain-eating amoeba Wednesday in Sterlington. (Photo: Scott Rogers/The News-Star)

Hundreds flood DHH meeting with water concerns

Scott Rogers, and Greg Hilburn  9:28 p.m. CDT September 2, 2015

MEDIA ADVISORY: Senator Mike Walsworth to Host Community Meeting in Sterlington, Sept. 2

September 02, 2015
Installed Four (4) PAX Residual Control Systems
- Water Quality Station
  - Total chlorine
  - ORP
  - pH
  - Temperature
- Chlorine and Ammonia Feed Systems
- Tank Mixers
PAX Water Residual Control System (RCS)

Smart Controller

Water Quality Station

Chlorine Feed System

Ammonia Feed System
Online Monitoring: Achieving Target

Water Quality Monitoring

North Monroe – Parrot’s Beak GST DOWNSAMPLED

Date

Mar 1, 2016 Apr 1, 2016 May 1, 2016 Jun 1, 2016 Jul 1, 2016 Aug 1, 2016 Sep 1, 2016 Oct 1, 2016

Total Chlorine Concentration mg/L

Total Chlorine (AVG) [SMS] mg/L → Total Chlorine Target (AVG) [SMS] mg/L
Problematic Location Chlorine Residual (March through June 2015 vs. 2016)

LDH minimum residual disinfectant level: 0.5 mg/L
LDHH Nf Sampling: June 21, 2016

• Same locations sampled as in 2015
• Total chlorine residual at all sampled locations: > 0.5 mg/L
• For all locations:
  – Amoebae culture: Amoeba absent
  – Flagella test: Not performed
  – *Naegleria fowleri* PCR: Not performed
Overview

Building Water Systems
Distribution System Water Quality Goals

• Pathogen free water
  o Primary and second disinfection
  o Prevent pathogens from seeding distribution system
  o Control biofilm growth

• Biological stability
  o Reducing regrowth through AOC control
  o Reducing disinfectant decay rates by NOM removal

• Chemical stability
  o Removal of inorganic contaminants
  o Reduce DBP formation

• Non-corrosive water
  o Minimize lead and copper exposure
  o Reduce iron corrosion
  o Better drinking water aesthetics (taste, odor, color)

Water Quality Deterioration in Distribution Systems

Why is building water quality unique?

- Buildings have the same water quality issues as the distribution systems, only to a far greater extent
- High surface to volume ratio due to smaller pipes
- High water age with higher water efficiency
- Many different types of plumbing materials
- Extreme temperatures
- Low disinfectant residuals
Operating Buildings Like Distribution Systems

- Managing water quality in buildings represents latest frontier
- Competing goals (e.g. Legionella vs. scalding)
Conclusions

• Streams of water and information have always been together; just recently starting to make use of this to support decision making

• Water community is historically slow to adopt new approaches and technology

• Recent events highlight the need to implement better approaches and technology

• Many opportunities to adopt improvements from other other communities
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