WEST VIRGINIA
AMERICAN WATER

Data Quality Management for Continuous Source Water Monitoring

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West Virginia American Water
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WEST VIRGINIA AMERICAN WATER

About Us

- Proudly serving West Virginia since 1886
- 550,000 people in 333 communities in 19 counties
- Approx.1/3 of population
- 8 water treatment facilities
- 4,200 miles of water main
- 9,500 fire hydrants
- Outstanding environmental and compliance record

WVAW has been recognized through the **Partnership for Safe Water** for outstanding commitment to delivering superior quality drinking water to customers.

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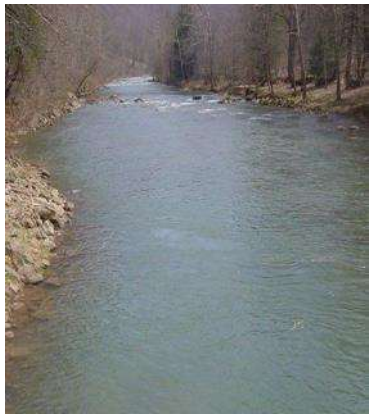
Source Water Supplies



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Source Water Protection

Objective: *Identify and mitigate potential risks to maintain or improve the quality of drinking water source(s)*

Key information inputs

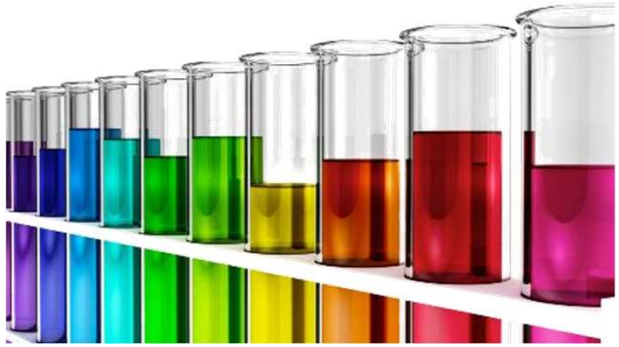
- ✓ Watershed protection zones
- ✓ Potential contaminant sources
- ✓ **Monitoring for changes in source water quality**

State Requirements (2014)

- Assess feasibility of early warning monitoring systems
- Required testing for utilities serving 100,000+ customers

Contaminant Classes

- ✓ Salts or ions
- ✓ Metals, including heavy metals
- ✓ Polar organic compounds
- ✓ Nonpolar organic compounds
- ✓ Pesticides
- ✓ Biotoxins
- ✓ Volatile compounds, oils and other hydrocarbons



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Source Water Monitoring Workshop

- EPA and industry experts
- Strategies and technologies to meet WV requirements
- Recommended continuous indicator monitoring

Morgantown, WV
August 19, 2014

Source Water Contaminant Detection Workshop: Early Warning and Response

Considerations for examining the technical and economic feasibility of implementing an early warning monitoring system

Purpose

The information in this fact sheet is provided to assist West Virginia drinking water suppliers as they implement the source water protection planning requirements set forth in West Virginia Code Chapter 16.

Background

In response to a chemical spill on January 9, 2014 in the Elk River in Charleston, West Virginia, lawmakers passed legislation to protect drinking water supplies statewide by decreasing the risk of source water contamination from above ground storage tanks (ASTs) and improving utility resiliency to effectively deal with spills should they occur. A workshop was held on August 19, 2014 to provide West Virginia drinking water utilities with information on meeting the requirements of West Virginia Code Chapter 16. The workshop addressed requirements for updating or completing source water protection plans and public water utility monitoring requirements. The workshop further focused on the technical and economic feasibility of implementing an early warning monitoring system.

By bringing together water sector experts to discuss existing contaminant monitoring technologies, the workshop provided an overview of the newest monitoring approaches and expert opinions on deployment feasibility. Although continuous real-time monitoring was discussed in depth throughout the workshop, it was noted that it is not the only method for early detection of contaminants in source water.

Protecting Source Water – Early Warning Monitoring and Response Systems

Implementing an early warning monitoring and response system may be approached in different ways depending upon the water utility's resources and threats to the source water. This fact sheet describes the following components of an early warning system that should be considered by utilities as they examine the technical and economic feasibility of implementing these systems:

I. Baseline Monitoring
II. Alternatives for Real-time Source Water Monitoring
III. Real-time Sensor Monitoring System Considerations
IV. Consequence Management
V. Communication and Planning

https://www.wvdhhr.org/oehs/eed/swap/

Source Monitoring Program

- ***Objective***: Optimize treatment and identify the presence of potential contaminants

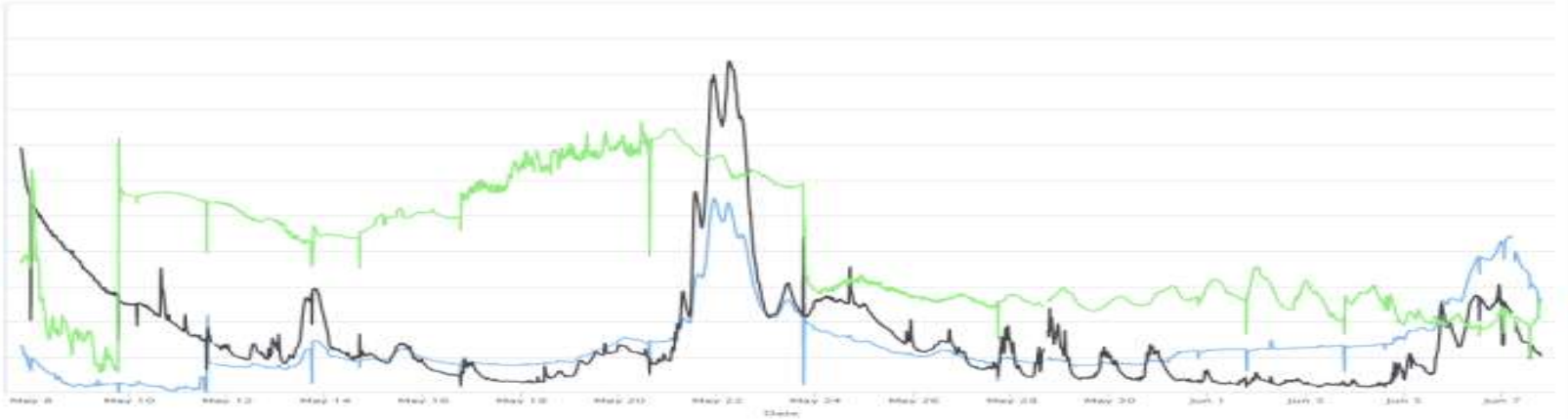
✓ Combines online source water quality indicators & advanced organics analysis

✓ Participation in monitoring networks (where available)

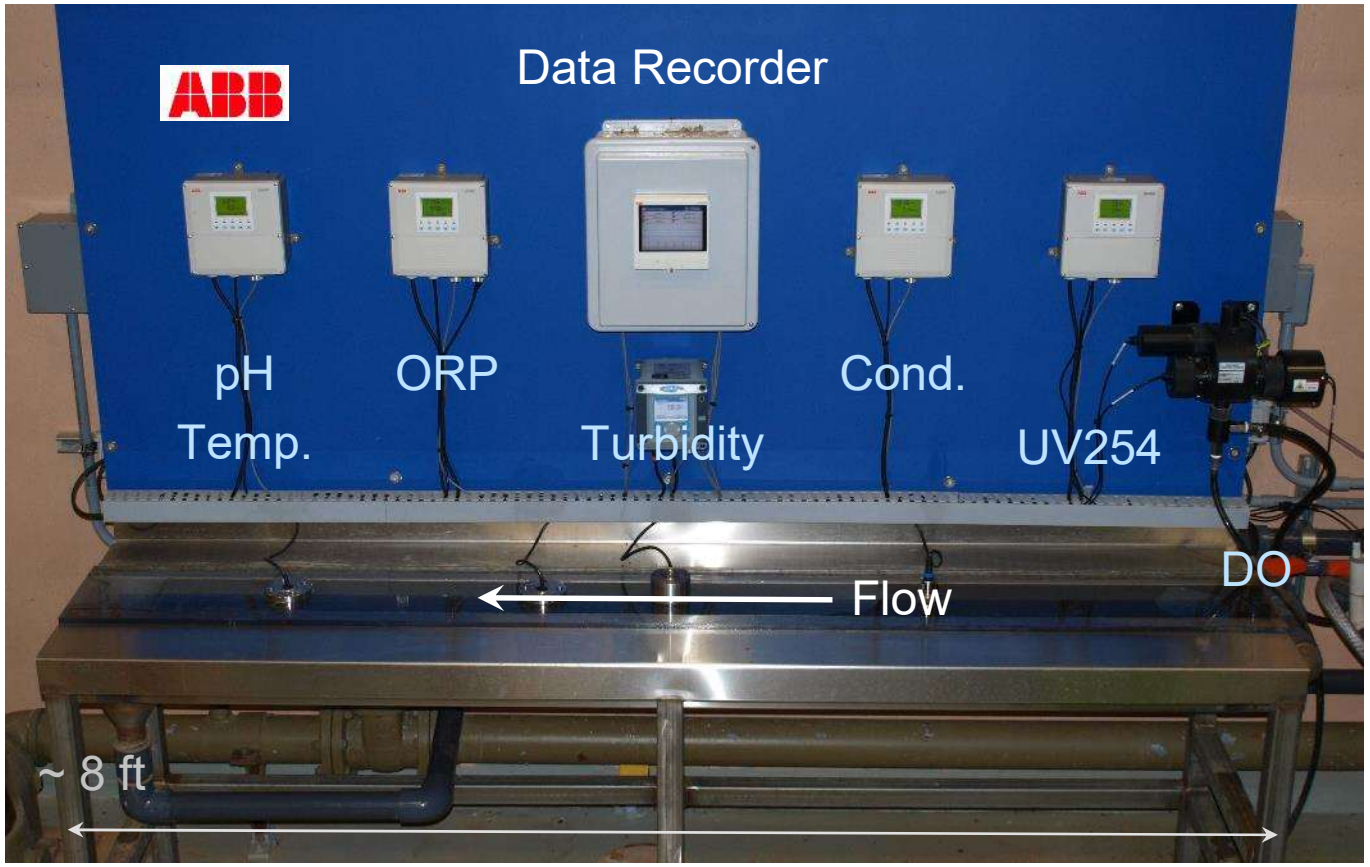
✓ Supplemental laboratory analyses as appropriate

Online Monitoring System

- Continuous real-time monitoring
- Identifies changes in water characteristics from baseline
- Equipment selection based on reliability, location, cost, O&M



Online Panel Configuration



Flow-Through Bench Weir

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Data Collection

7 sensors x 1 min intervals

= 10,080

readings per day

= 3,679,200

site readings per year

x 8 sites

= 29,433,600

total readings per year

Contamination Event Detection

- ***Objective***: Provide notification of water quality anomalies so that effective response actions can be implemented

- ✓ EDS automated monitoring and alert capabilities
- ✓ Several different methods of statistical analysis
- ✓ New application for source water monitoring

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Event Detection Integration

- **Detector** system learns the normal pattern of behavior and identifies anomalies that could indicate an event

- ✓ Analyze data from multiple sensors in real time
- ✓ Alerting based on “rare combination” comparison
- ✓ Baseline monitoring currently underway

Important Considerations

- Storage and analysis
- Process integration
- Consequence management
- **Data quality and reliability**

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Data Quality Management

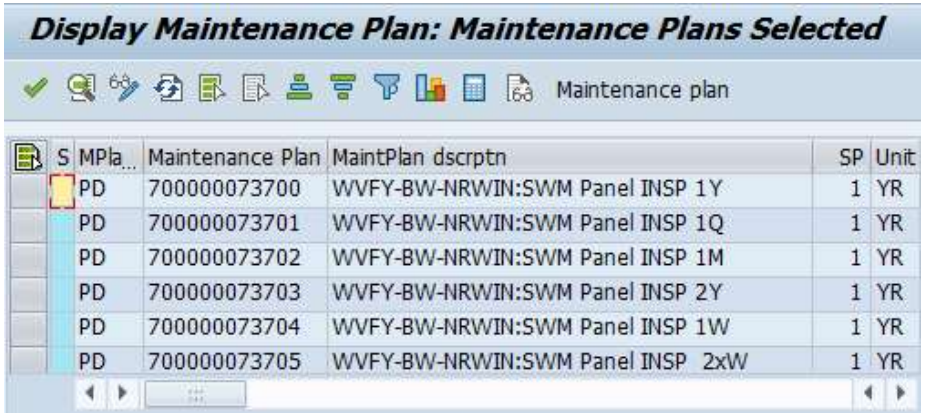
Routine O&M

Calibration Checks

Data Review

Operation & Maintenance

- Standard Operating Procedures (SOPs)
- Online maintenance system tracking



S	MPla...	Maintenance Plan	MaintPlan dscrptn	SP	Unit
	PD	700000073700	WVFY-BW-NRWIN:SWM Panel INSP 1Y	1	YR
	PD	700000073701	WVFY-BW-NRWIN:SWM Panel INSP 1Q	1	YR
	PD	700000073702	WVFY-BW-NRWIN:SWM Panel INSP 1M	1	YR
	PD	700000073703	WVFY-BW-NRWIN:SWM Panel INSP 2Y	1	YR
	PD	700000073704	WVFY-BW-NRWIN:SWM Panel INSP 1W	1	YR
	PD	700000073705	WVFY-BW-NRWIN:SWM Panel INSP 2xW	1	YR

O&M Tasks	Daily	2x / Week	Other
	• Check status • Monitor data	• Flush bench • Clean probes • Verify data	• Replace parts • Other repairs

Calibration Checks

- Standard Operating Procedures (SOPs)
- Detailed log tracking for sensor calibration

Verification	Calibration
• Performed 2x / week • Check vs. known standard • Check vs. other instrument • Standard tolerance limits	• Performed quarterly or more often based on verification • Calibrate to standard solution • Document calibration results

Data Review

- **Reliability**
  - ✓ Missing data or errors
  - ✓ Down time for O&M
- **Accuracy**
  - ✓ Checks vs. standards
  - ✓ Calibration records
- **Precision**
  - ✓ Compare side-by-side panels
  - ✓ Compare to grab samples

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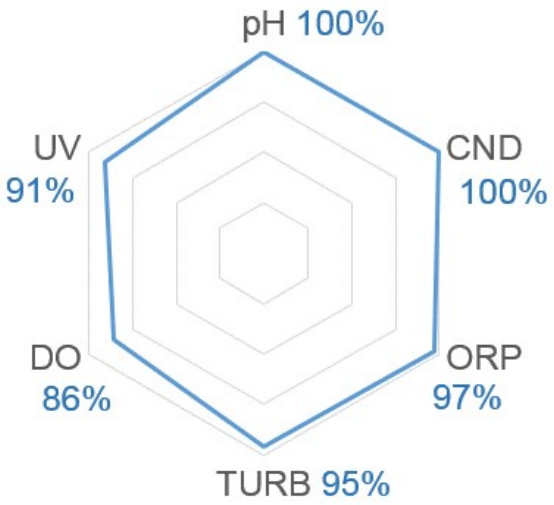
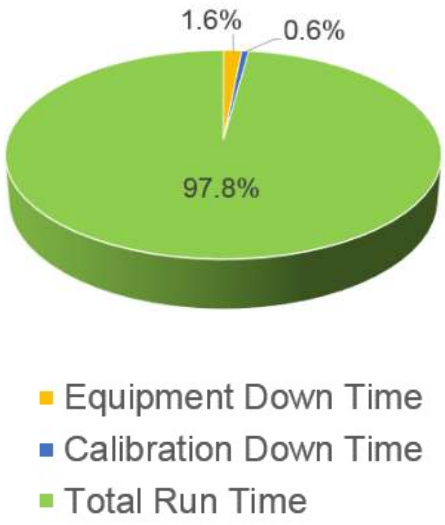
Case Study

Verification Checks

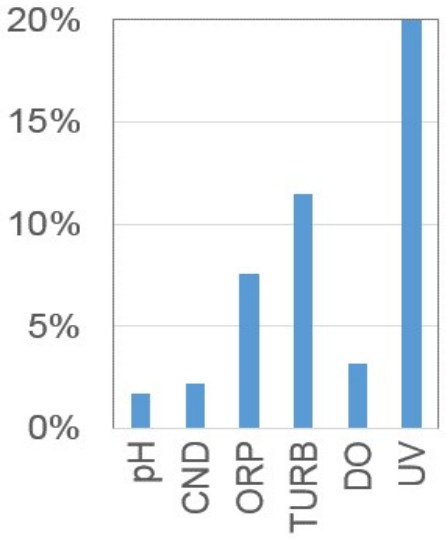


Percent Checks w/in Tolerance

Average Run Time



Two Panel Comparison



Average Percent Difference

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Successes and Challenges

- Standard configuration & management program
- High quality data for baseline monitoring period
- Cross-functional employee engagement

- New and/or additional responsibilities
- Instrument and system learning curve
- Long-term culture change and integration

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Key Takeaways

Data quality and reliability play an important role in continuous monitoring and effective decision making

- ✓ Focus on the big picture
- ✓ Integrate into operations for long-term sustainability
- ✓ Be open to alternative ideas, tools & solutions

Program Contacts

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