

# E-Enterprise Advanced Monitoring: *A Path Forward for EPA, States, and Tribes*

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for the

## National Environmental Monitoring Conference 2018

Collaborative Efforts to Improve Environmental Monitoring, Session 1  
Thursday, August 9, 2018, 2:30 to 3:00 p.m.

# Presentation Outline

- Background
  - Defining advanced monitoring
  - Examples
  - Value of monitoring
- Paradigm Shift
- E-Enterprise Projects
  - Third party certification options analysis
  - Scan and Screen Network
  - Data interpretation and communication
  - Data standards
  - Learning methods approval processes

# Advanced monitoring is part of our life...



## Definition of “Advanced Monitoring”

“Advanced monitoring technology refers to a broad range of sampling and analytic equipment, systems, techniques, practices for enhancing detection and measurement of environmental conditions. It is generally defined by one or more of these factors:

1. Not yet widespread in a sector or program;
2. Monitors real-time (or near), often without lag times for lab analysis;
3. Less expensive, easier to use, or more mobile;
4. Data quality more complete or easier to interpret for a specific need; and/or
5. Existing technology used in new way to provide better info on pollutants, pollution sources, or environmental conditions.

From: Advanced Monitoring Technology: Opportunities and Challenges. By Hindin, Grumbles, et al. In *em* The Magazine for Environmental Managers, November 2016.

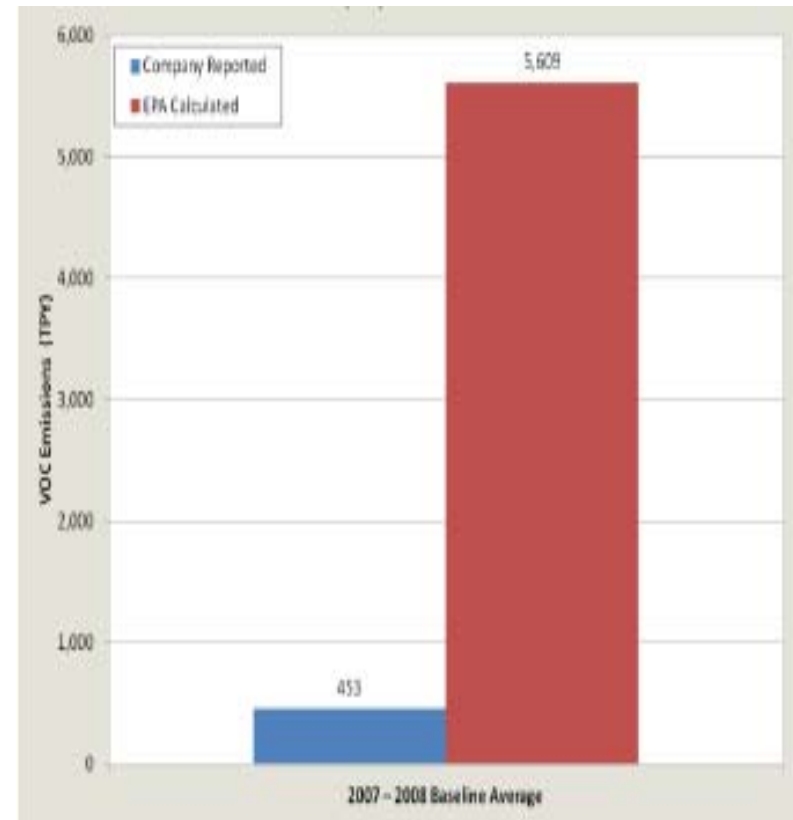
# Examples of Advanced Monitoring Devices



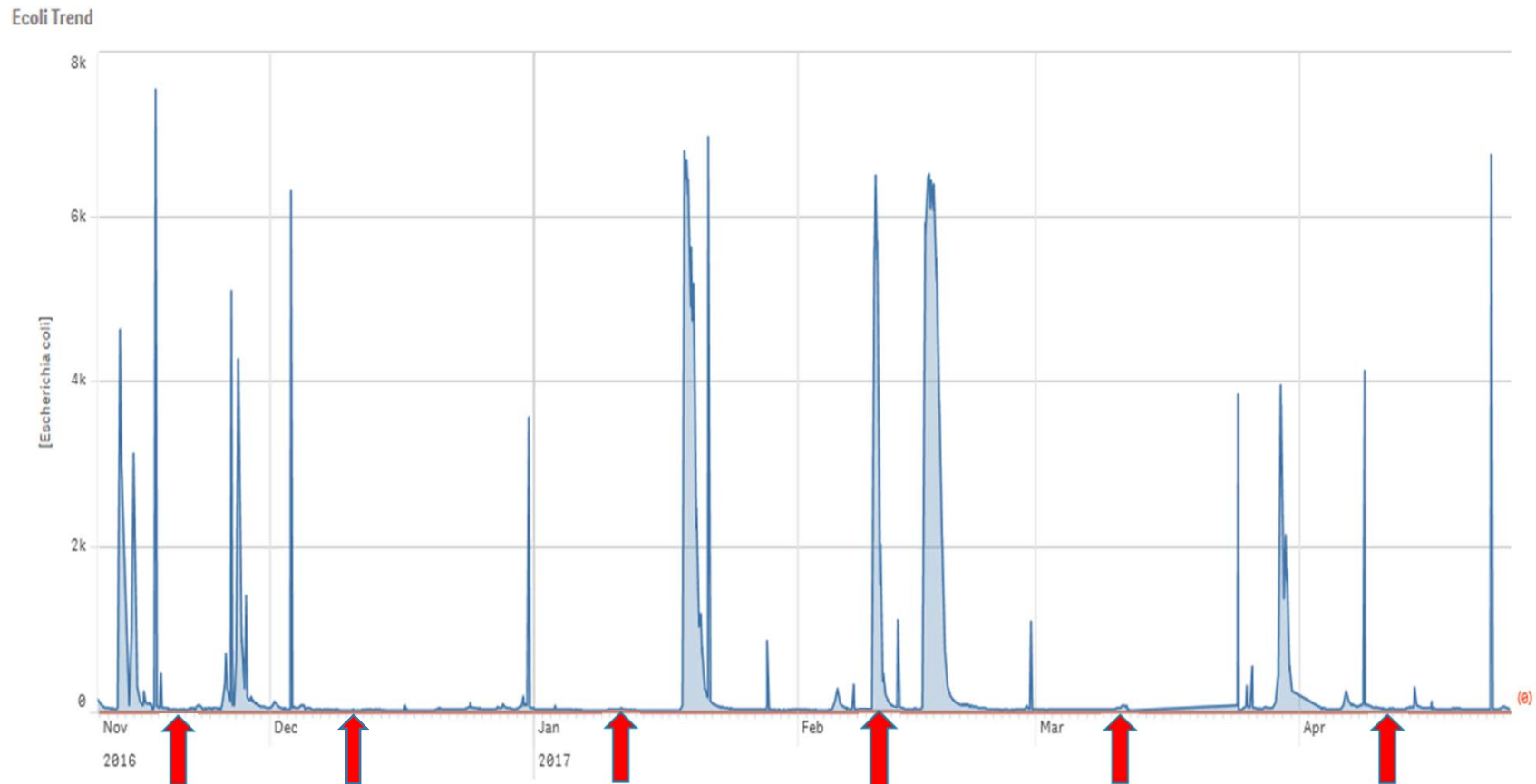
# Promise of Advanced Monitoring: Making the Invisible **Visible**

## ➤ Reduce pollution by improved:

1. Ability of sources to prevent, reduce, treat pollution (before it becomes violation).
2. Ability of government to assess environmental quality and target resources to significant problems.
3. Avoid hotspots.
4. Public engagement in doing the monitoring
5. Transparency
6. Permits and inspections



# Real Time Monitoring vs Periodic Grab Samples





# Proliferation of Sensors





# Paradigm Shift Revolutionizing Environmental Monitoring

## Current Technology

1. Expensive
2. Often snapshot
3. May require expertise to use
4. Often delays for lab analysis
5. Established QA protocols
6. Collected by gov, industry, researchers
7. Data stored and explained on gov websites

## New Technology

1. Low cost
2. Often continuous
3. Perhaps easy-to-use
4. Real-time w/o lab analysis
5. QA protocol gaps
6. Collected by communities and individuals
7. Data crowd-sourced, shared and accessed on non-gov sites

# The Challenges

1. Technologies are rapidly evolving; EPA and States cannot keep up
  - Potential for false positives or false negatives
2. Large multi-\$B industry but most purchasers of technology (agencies or citizens) are not able to judge performance
  - Agency testing reveals manufacturer claims not always confirmed (but most sensors are not tested)
3. Interpreting short term data when our standards are often longer term averages
4. Adjust to likelihood that government won't be primary repository of monitoring data
5. Agency “gold standard” methods approval takes time and addresses only those appropriate for regulatory use

## E-Enterprise Advanced Monitoring Projects

1. Voluntary, independent third-party certification
2. Technology scanning, screening and user support
3. Data Interpretation and Communication
4. Data exchange standards
5. EPA Methods Approval Processes

# 1. E-Enterprise Advanced Monitoring: Third Party Certification Study

Feasibility study: 3rd-party program for certifying the performance of new sensors

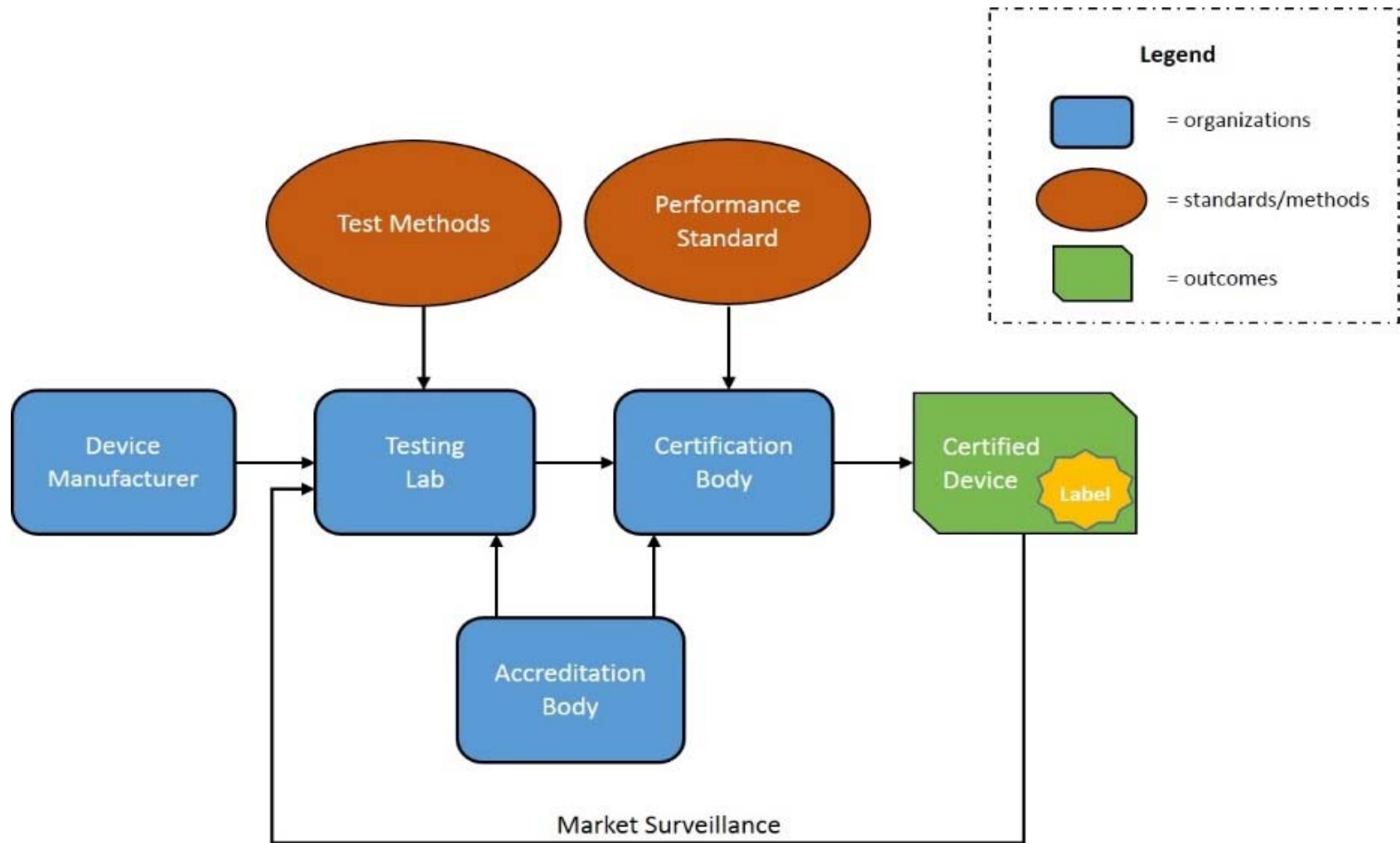
- Team's consensus top recommendation: Establish independent, non-governmental, voluntary program
- Operations similar to certification programs such as UL, Energy Star, and NSF



Examples of  
certification  
programs



# Generic Certification Program Structure



## Benefits to EPA and State Programs

- Improve government response to citizens' data
  - Reduces time addressing false positives
  - Raises awareness of potential false negatives
  - Provides insight on quality of data for use in assessments
- Improve government program work
- Potential to speed up EPA methods approval programs, allow compliance monitoring to keep closer pace with technology development
- Spurs manufacturers to produce higher-quality sensors and avoids “race to the bottom” that competition pressure from low-cost, low-quality sensors brings

## 2: Scan, Screen and User Support

- Network of EPA, state, tribal, and local experts – review new technology for potential use
- Establish a process to rapidly:
  - Scan: Assess new technologies to determine the utility
  - Screen: Recommend specific sensors for further and more rigorous evaluation based on all readily available data, including information provided by the manufacturer
- Clearinghouse
  - Hosted on SharePoint
  - Contains information about >300 water and air monitoring devices
  - Maintenance by EPA OECA for now; eventually, Network members may contribute



Search

Welcome!

Scan and Screen Adv...

Agency Requests for...

About

Members

Announcements

Documents

Calendar

Tasks

Accessibility

Site Contents

Edit

Return to classic SharePoint

SS

Scan and Screen Network

Following

Share




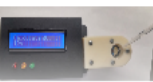

New

Export to Excel

...

All Items

Scan and Screen Technology Clearing House

Sensor Image	Device Name	Media	Parameter(s)	Manufacturer
	EXO Ammonium Smart Sensor	Water	Ammonia	YSI Environmental
	AMTAX Ammonium Analyzer	Water	Ammonia	Hach
	IntelliCAL Ammonia ISE Electrode with...	Water	Ammonia	Hach
	Safewater GuardTM 1.0	Water	Lead	NanoAffix Science LLC
	Aeroqual S500	Air	Ozone	Aeroqual

Feedback

https://usepa.sharepoint.com/sites/OECA\_Work/Scan\_Screen\_Clearing\_House/Lists/Discussions/AllItems.aspx

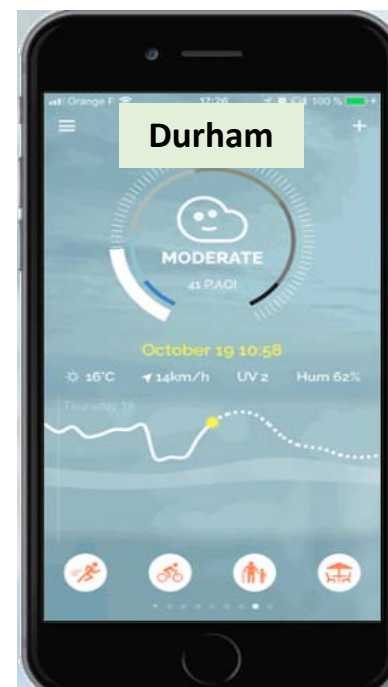
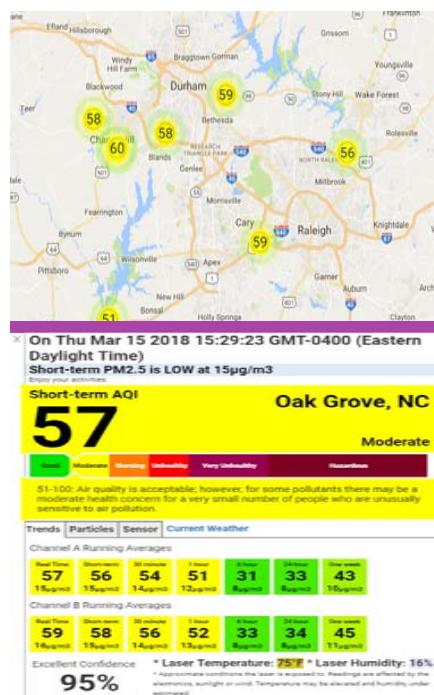
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### 3: Develop Tools and Guidance on Interpretation of Data from Emerging Technologies

Current Conditions	
Air Quality Index (AQI) observed at 14:00 EDT	
46 Good	
Health Message: None	
Note: Values above 500 are considered Beyond the AQI. Follow recommendations for the Hazardous category. Additional information on reducing exposure to extremely high levels of particle pollution is available <a href="#">here</a> .	
AQI - Pollutant Details	
Ozone	46 Good
Particles (PM10)	14 Good
Particles (PM2.5)	38 Good

Air Quality Forecast	
Today	Tomorrow
Air Quality Index (AQI)	
45 Good	48 Good
Health Message: None	
AQI - Pollutant Details	
Ozone	45 Good
Particles (PM2.5)	30 Good
Ozone	48 Good
Particles (PM2.5)	47 Good



Current Conditions in Durham, NC ~3:30pm on 3/15/18

- Developing a framework to communicate the meaning of short-term results

## 4: Data Standards for Continuous Monitoring

- Monitoring data are collected in inconsistent formats
- EPA-State team identified existing standards and characterized utility of Each in various use cases
  - Stakeholder feedback very positive
  - Piloted data standards on 2 projects

Standards need to be consistent across EPA, States, Tribes and the private sector.

[Link to Data Standards Report and Recommendations](#)

## 5. Lean Technology Evaluation Processes

- Current EPA approval has a longer timeframe compared to the rapid rate of monitoring technology development
- 5 EPA monitoring approval programs were considered for a process review
  - **Clean Water Act**
    - Safe Drinking Water Act
    - Clean Air Act
- Many other programs have methods approval processes that could be subjected to process review

# References and Resources

## **E-Enterprise Advanced Monitoring Article**

- “E-Enterprise Advanced Monitoring Technologies: Opportunities and Challenges – A Path Forward for EPA and States” <https://www.epa.gov/sites/production/files/2016-11/documents/article-adv-mon-technology.pdf>

## **E-Enterprise for the Environment**

<https://www.epa.gov/e-enterprise>

## **U.S. EPA ORD Sensor Toolbox Evaluations**

<https://www.epa.gov/air-sensor-toolbox/evaluation-emerging-air-pollution-sensor-performance>

## **South Coast Air Quality Management District Sensor Performance Evaluation Center**

<http://www.aqmd.gov/aq-spec>