



# **OAR Perspective on Air Sensors**

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# Agenda

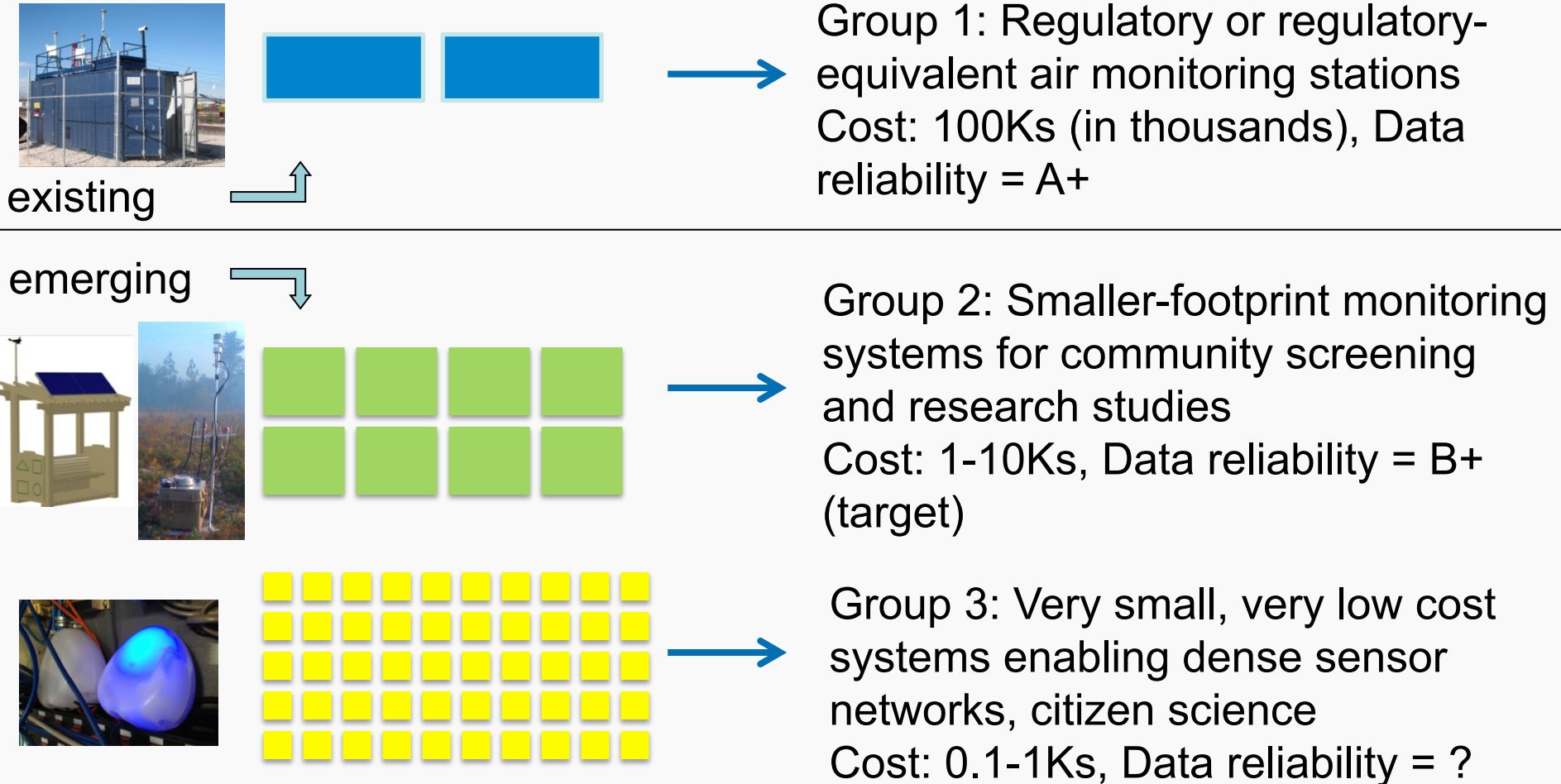


- Current Monitoring Requirements
- Data Applications
- Data Collection/Fusion
- Sensor Messaging
- Acknowledgements

# State of the Science



## Emerging air monitoring systems (informal classification)



(slide courtesy of Gayle Hagler)

# Environmental Regulation



- Criteria Pollutants
  - Federal Reference Methods (FRM)/Federal Equivalent Methods (FEM)
- HAPs
  - Guidance Materials by Pollutant Class (e.g. VOCs)
- Source Testing
  - Test Methods/Alternative Test Methods



# Environmental Regulation



## Process Used to Ensure Data Quality for Use in NAAQS Decisions

Activity/Procedure	Regulation
FRM/FEM Instrument Approval (1-2 year process)	40 CFR Part 53.20 40 CFR Part 58 Appendix C Ambient Air Monitoring Methodology
Meet method requirements for NAAQS attainment	40 CFR Part 50 Appendices
QAPP approval	40 CFR Part 58 Appendix A and EPA QA Policy
Minimum QA/QC Requirements (e.g. calibration, zero/span checks)	40 CFR Part 58 Appendix A QA Handbook Volume II
Siting Requirements	40 CFR Part 58 Appendix E
Annual Data Certification	40 CFR Part 58.15
Meet reporting requirements	40 CFR Part 58.15

National Air Toxics Trends Stations (NATTS) information can be found at <http://www.epa.gov/ttn/amtic/natts.html>  
Methods and Procedures for Source Testing and Monitoring <http://www.epa.gov/ttn/emc/tmethods.html>

# Data Application<sup>1</sup>



Tier	Application Area	Pollutants	Precision & Bias Error <sup>2</sup>	Data Completeness <sup>2</sup>
I	Education and Information	All	<50%	≥ 50%
II	Hotspot Identification and Characterization	All	<30%	≥ 75%
III	Supplemental Monitoring	Criteria pollutants, Air Toxics (incl. VOCs)	<20%	≥ 80%
IV	Personal Exposure	All	<30%	≥ 80%
V	Regulatory Monitoring	O <sub>3</sub> CO, SO <sub>2</sub> NO <sub>2</sub> PM <sub>2.5</sub> , PM <sub>10</sub>	<7% <10% <15% <10%	≥ 75%

1. These are guidelines only (Tier I- Tier IV), and are likely to evolve over time as technology continues to develop and the state of the science continues to advance. The amount of data needed for any air quality purpose is highly specific to that purpose and could range from minutes to even years of data measurements.

2. Precision, bias, and data completeness requirements in part were taken from Appendix D of the *EPA Quality Assurance Handbook for Air Pollution Measurement Systems Volume II* (May 2013 edition). Refer to 40 CFR Parts 50, 53, 58, and the QA Handbook Volume II for all activities/criteria required for monitoring network data.

# Data Application



- Informing Network Design
  - Locate monitor in high concentration areas
- Provide insight into near road concentrations (NO<sub>2</sub>)
- Personal Exposure Monitoring
- Risk assessment
  - Characterization & Modeling
- Permitting
  - Help understand background pollutant concentrations
- Fenceline Monitoring

# Data Application - Example



Pre-Construction PSD Permit



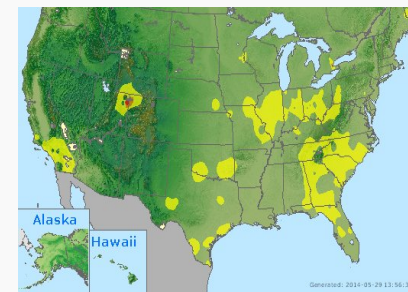
Permitting agency may require post-construction monitoring

Role for Sensors?

Monitor for one year  
CAA Section 165(c)(2)



Existing source expansion – option for monitoring\*



\*Use sensors in design phase to inform placement of regulatory monitor



# Data Collection Needs



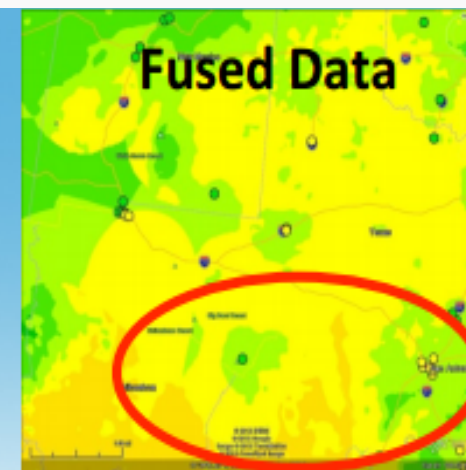
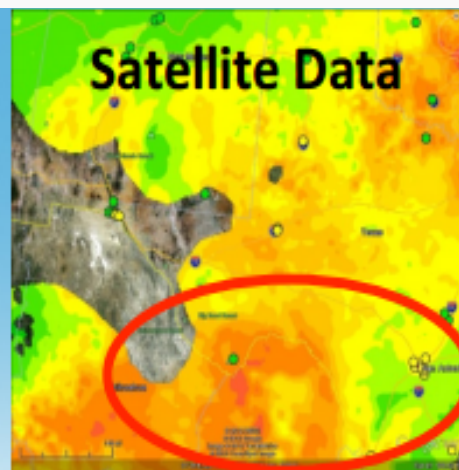
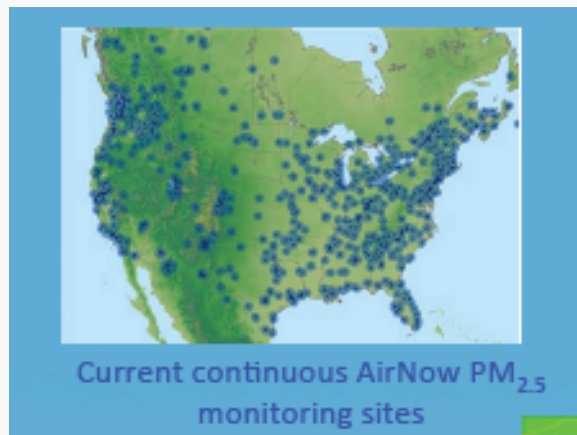
## Data Collection Needs for Supplemental Network Monitoring Data

Variable	
Name of Sensor	Ongoing QA checks
Sensor ID	Bias and Precision Results
Pollutant	Meteorological Measurements
Concentration	Units
Date of Measurement	Minimum Detection Limit
Latitude and Longitude	Pollutant Concentration Range
Averaging Time of Measurement	Response Time
Date of Sensor Origin	Interferents

# Data Fusion



## *AIRNow Satellite Data Processor (ASDP) Project*



# Messaging



## The Air Quality Index

*Not for use to interpret non-regulatory data*

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
<i>When the AQI is in this range:</i>	<i>..air quality conditions are:</i>	<i>...as symbolized by this color:</i>
0-50	Good	Green
51-100	Moderate	Yellow
101-150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

AQI focuses on health effects experienced within a few hours or days

# Messaging



## Factors to Consider for Reducing Exposure & Protecting Your Health:

- 1) Concentration – Amount of pollution in the air
- 2) Ventilation Rate – How hard and fast you're breathing
- 3) Duration of Exposure – Length of activity



# Brainstorming Sensor Messaging



## Messaging for Short-term Concentration Readings

### Example Questions to Answer:

- What does it mean?
- Am I in danger?
- Should I take action?
- How does my sensor reading relate to the Air Quality Index (AQI)?
- Additional FAQs and Responses

High

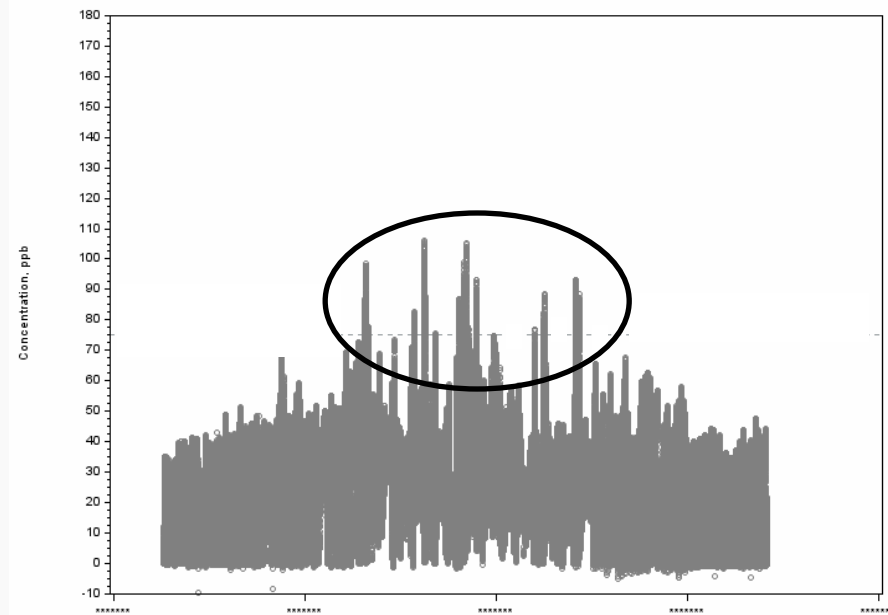
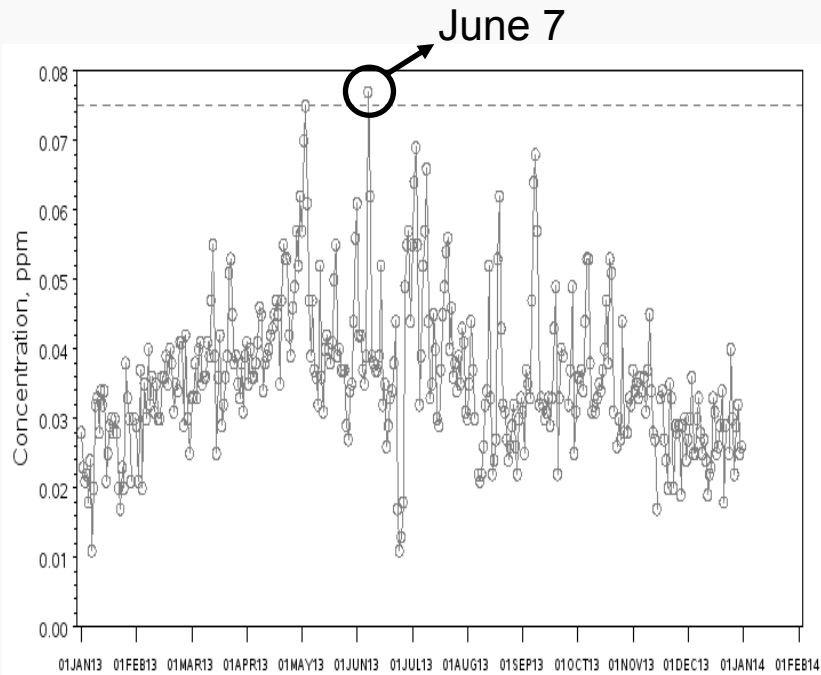
Medium

Low

# Brainstorming Sensor Messaging



## Profiles of Max 8-Hour and 1-Minute Ozone Concentrations *Livermore California (2013)*

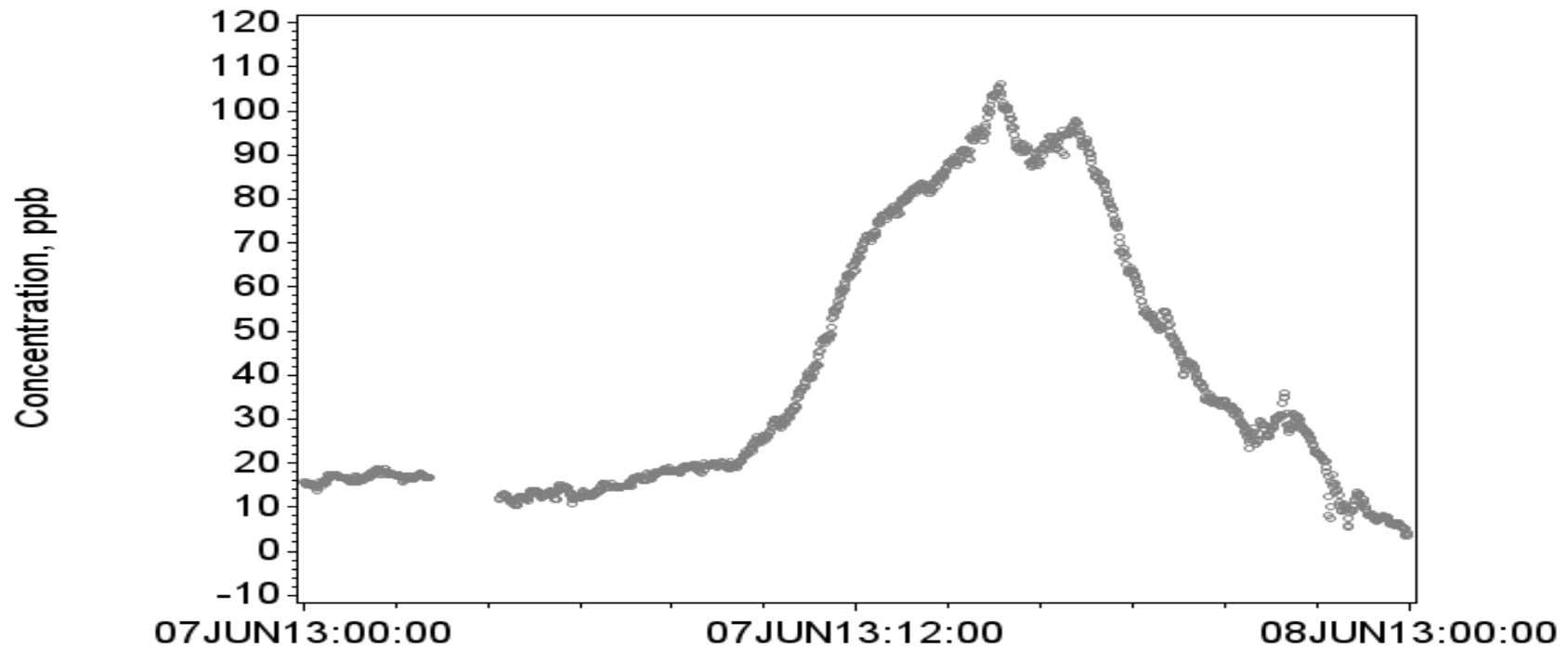


# Brainstorming Sensor Messaging



Profile of 1-minute Ozone Concentrations  
Livermore (AQS site id: 060010007)

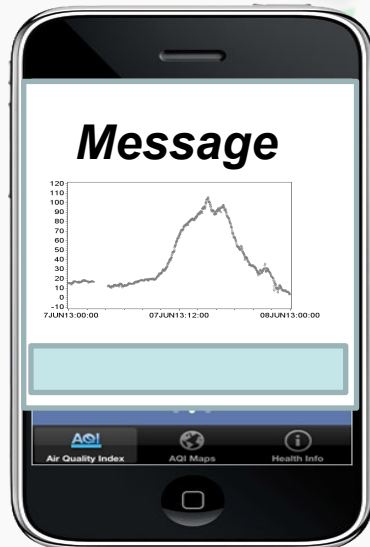
6/7/2013



# Brainstorming Sensor Messaging

## Proposed Project:

Mobile App Development  
Sensor Messaging Webpage  
Focus Group Study

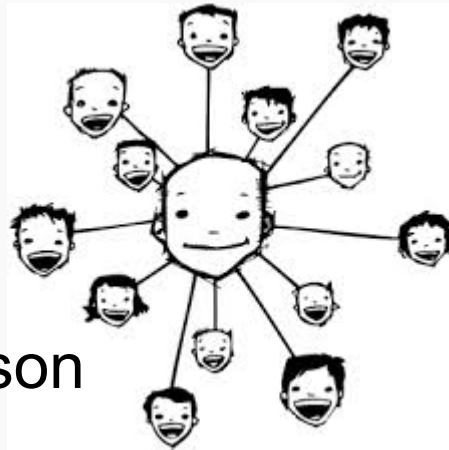




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