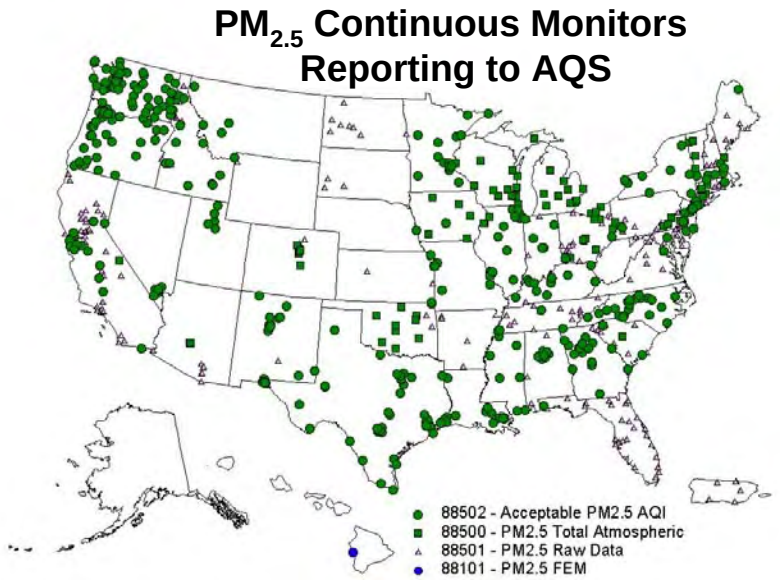
Ambient Air Monitoring Topics

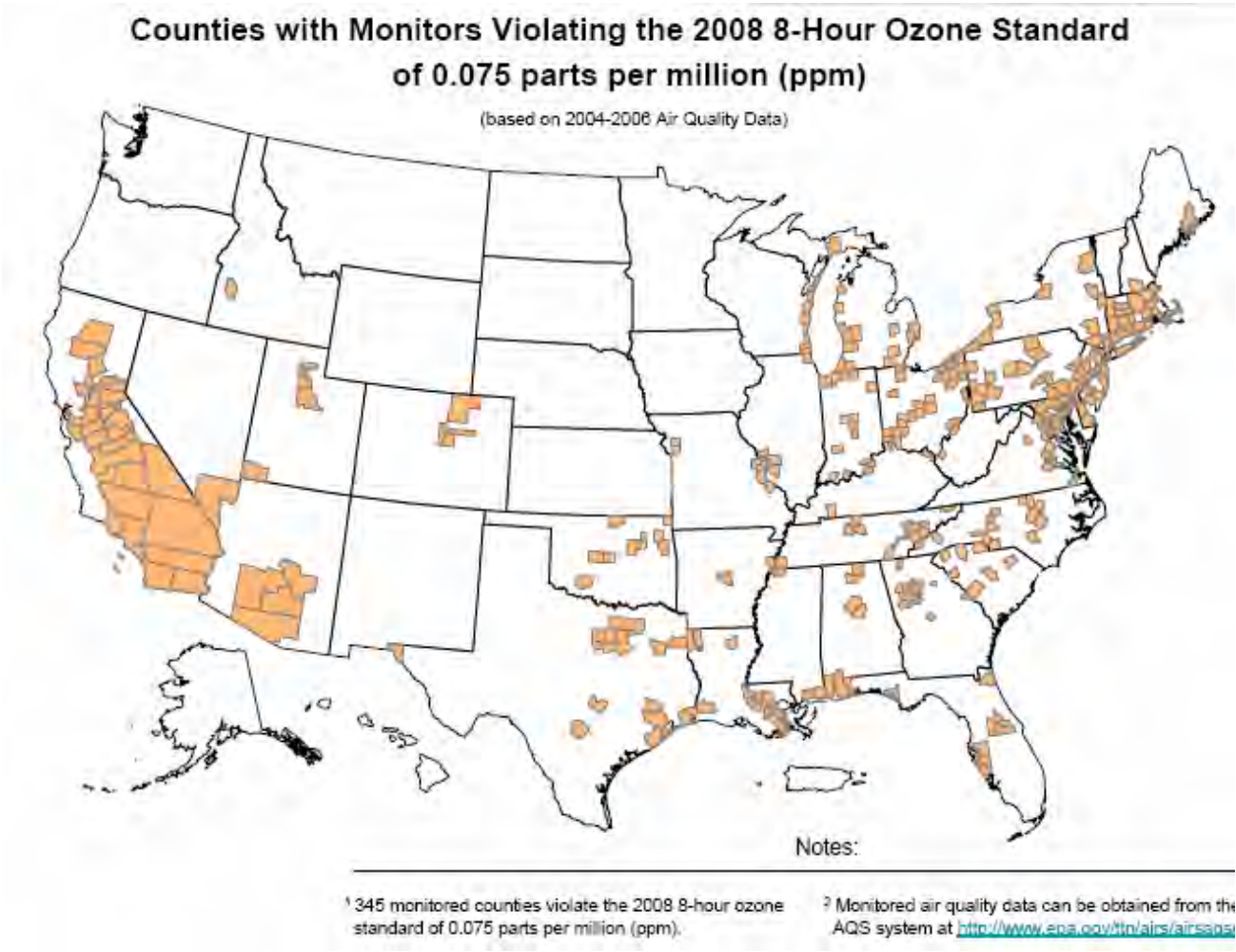


AQS Conference – Milwaukee, WI
August 20, 2008

Tim Hanley
U.S. EPA

Ozone NAAQS and Monitoring

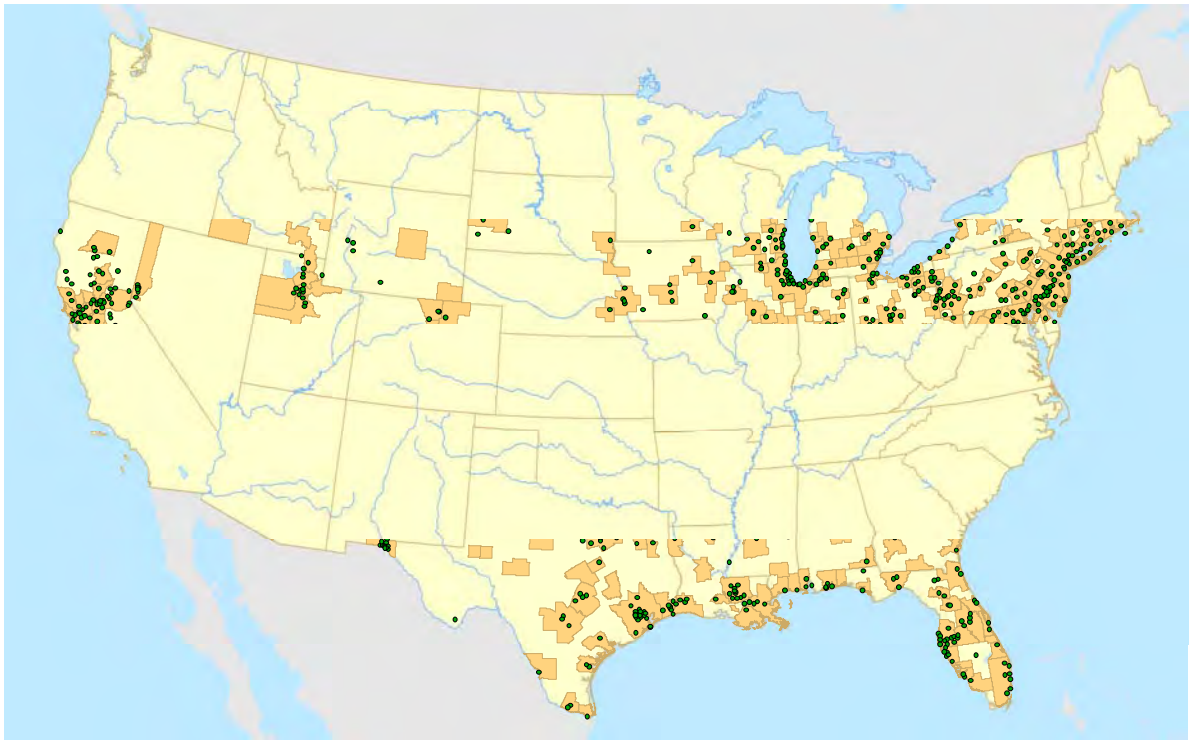
- On March 12, 2008, EPA significantly strengthened the ozone NAAQS
- Revised primary ozone NAAQS now at 0.075 parts per million (ppm)
  - Note: 3 decimal places
- Secondary standard set identical to the primary
- EPA identified need to address monitoring issues in a separate rule



Ozone Monitoring Network

- EPA is working on a proposal to address changes in monitoring requirements for ozone.
- Topics may include:
  - Length of ozone season
  - Monitoring requirements in smaller MSAs
  - Monitoring requirements in rural areas and sensitive ecosystems

Ozone Monitor Locations
Metropolitan Statistical Areas



Continued Implementation of Revised Monitoring Requirements – From 2006

- Effective January 1, 2009
  - Appendix A Quality Assurance requirements apply to Special Purpose Monitors using FRMs, FEMs, or ARMs.
    - Region can approve an alternative plan for practicality reasons, if full QA not essential to monitoring objective.
- Effective July 1, 2009
  - Plan for required NCore stations
  - Approval of NCore now delegated to EPA-OAQPS-AQAD Director

Continued Implementation of Revised Monitoring Requirements – *(continued)*

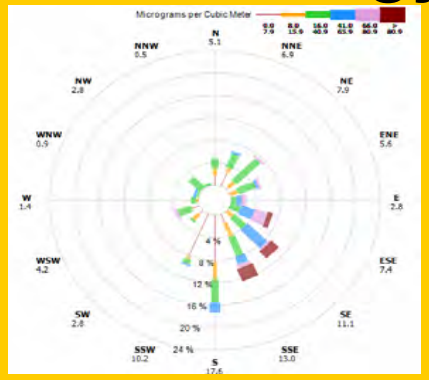
- Effective May 1, 2010
  - Revised deadline for annual certification of data (CY 2009) submitted to AQS
- Effective July 1, 2010
  - First 5-year network assessment due to Region
- Effective January 1, 2011
  - Operation of NCore stations

Building the National Core (NCore) Ambient Air Monitoring Network

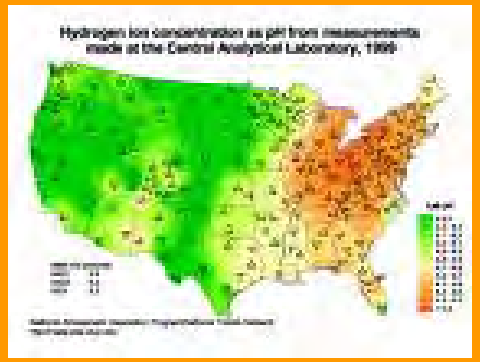
Particles

Gases

Meteorology



Deposition



NCore Implementation

- National Core (NCore) Multi-Pollutant Network:
  - Builds upon success of other highly leveraged networks (e.g. STN, IMPROVE, NATTS, CASTNET)
  - Full network operational by January 1, 2011
    - ~75 Stations Nationally
    - ~55 Urban Sites at Neighborhood to Urban Scale
    - ~20 Rural Sites at Regional Scale
    - 1-3 sites per State
    - Additional rural sites negotiated with States, NPS, Tribes, CASTNET

Candidate NCore Stations

NCore Measurements

Measurement Categories	Required Measurements	Additional Measurements
Particles	**$PM_{2.5}$ – continuous mass, filter-based mass, and speciation** **$PM_{10-2.5}$ – mass and speciation**	
Gases	**Ozone (O_3)** **Carbon monoxide (CO)** **Sulfur dioxide (SO_2)** **Nitrogen oxide (NO)/Total reactive nitrogen (NO_y)**	**Nitrogen dioxide (NO_2)** **Ammonia (NH_3)** **Nitric acid (HNO_3)**
Meteorology	**Wind Speed, Wind direction, Temperature, Relative Humidity**	Barometric Pressure, Solar Radiation, Precipitation, Vertical Characterization?

Blue = mature measurements
Green = new or enhanced measurements
Red = measurements being developed or needed to be developed

NCore web site with site information and comment solicitation

http://www.epa.gov/ttn/amtic/ncore/networks.html

What's coming?

- EPA is on a schedule to review each NAAQS on a five-year cycle.

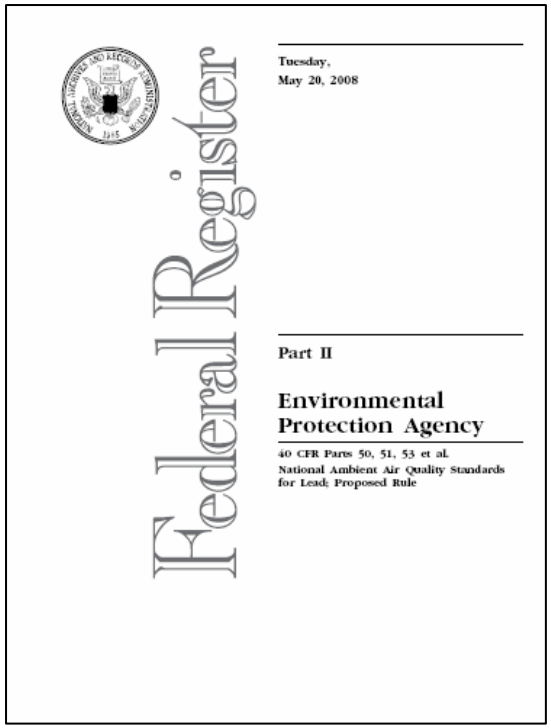
Ongoing NAAQS Reviews: Schedules as of 7/1/08

MILESTONE	POLLUTANT						
	Ozone	Lead	NO_2 Primary	SO_2 Primary	NO_2/SO_2 Secondary	PM	CO
Notice of Proposed Rule	Jun 20, 2007	May 1, 2008	May 28, 2009	Jul 30, 2009	Feb 12, 2010	Jan 2011	Oct 2011
Notice of Final Rule	Mar 12, 2008	Oct 15, 2008	Dec 18, 2009	Mar 2, 2010	Oct 19, 2010	Oct 2011	Jul 2012

Note: Underlined dates indicate court-ordered or settlement agreement deadlines.

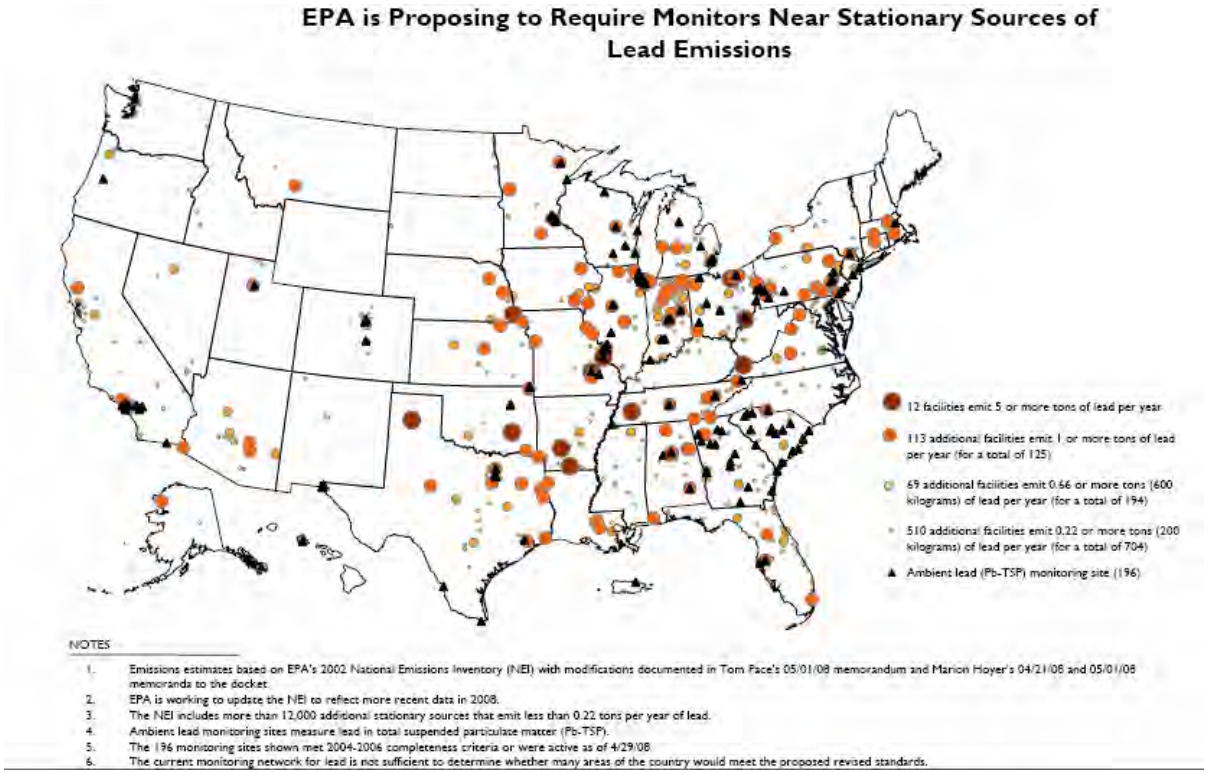
Lead NAAQS Proposal

- Published on May 20, 2008
- EPA proposed to strengthen the Lead NAAQS to a level between 0.10-0.30 µg/m^3
  - Current NAAQS has been at 1.5 µg/m^3 since 1978.
- The level is based on the concentration of lead in total suspended particles (TSP).
- EPA also proposed changes to the lead monitoring network to ensure monitors are assessing air quality in all areas that might violate new standards
- Comment period closed on August 4th, 2008.
- Notice of Final Rulemaking by October 15th, 2008



Lead Monitoring

- The current monitoring network is inadequate to assess national compliance with the proposed revised lead standards
- EPA proposed to improve the lead monitoring network by focusing on sources of lead emissions such as smelters, metallurgical operations, battery manufacturers, fugitive dust sources (e.g., mine tailings piles) and airports.



Lead monitoring *(continued)*

- EPA also proposed to require a small network of monitors to be placed in urban areas with populations greater than 1 million to gather information on the general population's exposure to lead in the air

- In addition, EPA proposed changes to
  - Sampling and analyses methods,
  - Quality assurance requirements,
  - Sample schedule,
  - Data reporting – (local conditions vs: STP)

Lead Sampling and Analysis Method

- Have met with CASAC Ambient Air Monitoring and Methods Subcommittee on multiple occasions for input on lead monitoring and analysis issues.
- If final standard is based on Pb-TSP
  - Existing high volume Federal Reference Method (FRM) and Federal Equivalency Methods (FEM) are already available
- If final standard is based on Pb-PM_{10} (or monitoring of Pb-PM_{10} is allowed as an alternative)
  - We will finalize new FRM for Pb-PM_{10} (and FEM criteria) based on low-volume PM_{10} sampler (as shown in picture)
  - Sampler and lab analysis addressed by CASAC peer review

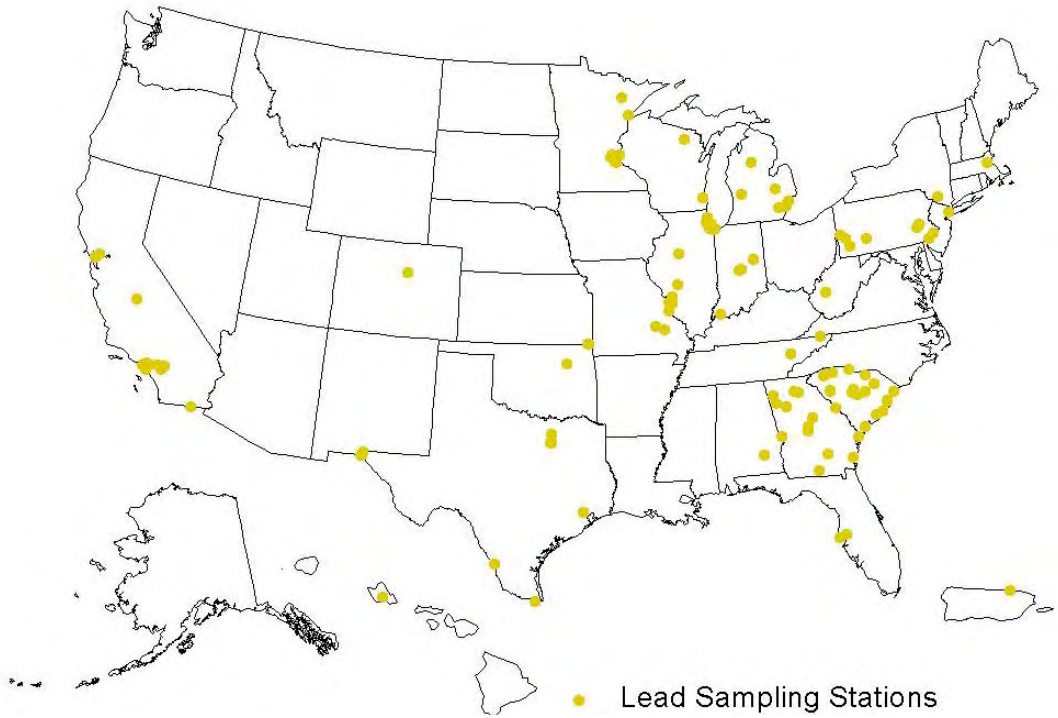
Typical high volume TSP

Typical low-volume PM_{10}

Lead Data Reporting Issue

- In a limited number of cases TSP-lead data is not being reported as a FRM or FEM.
- Please check and make sure a FRM or FEM is being used and reported.

All Lead Monitoring Stations Reporting to AQS
In 2007-2008

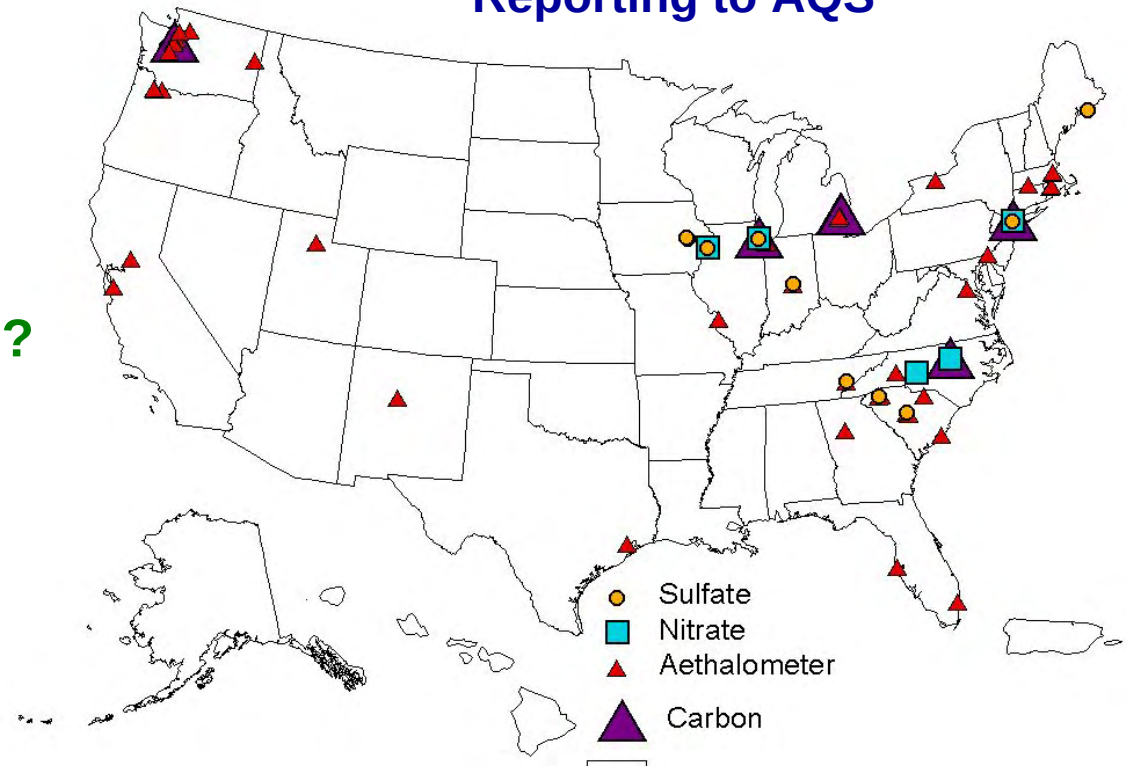


Updates on $PM_{2.5}$

- First $PM_{2.5}$ FEM Approved
- Reporting $PM_{2.5}$ Continuous Federal Equivalent Method (FEM) or Approved Regional Method (ARM) Data
- Review of $PM_{2.5}$ Continuous Mass Data Reported to AQS
- Continuous Speciation?

Does your agency use a Continuous Speciation Method? We are looking for data.

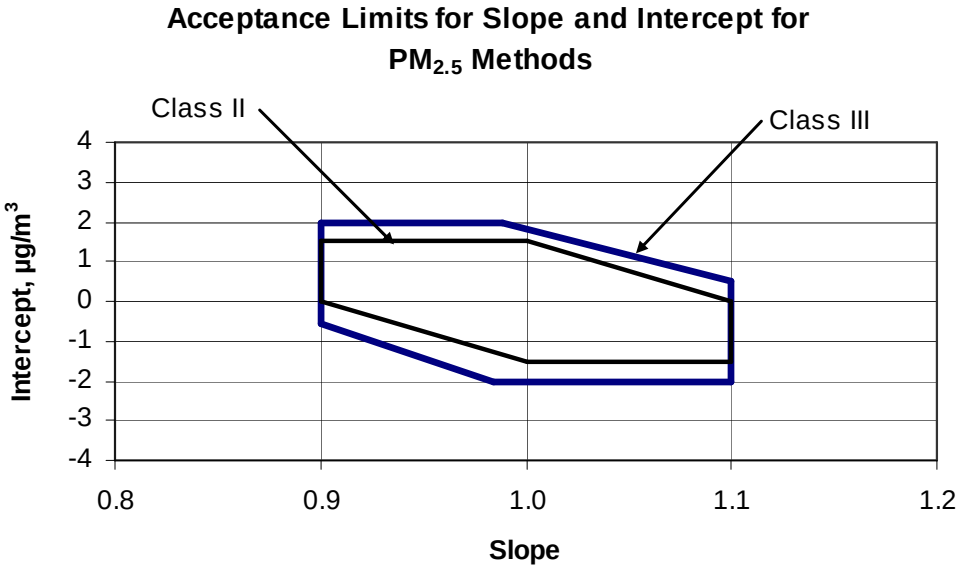
Continuous Speciation Monitors Reporting to AQS



$PM_{2.5}$ FEM's

- EPA's Office of Research and Development designated the Met One BAM 1020 as the first $PM_{2.5}$ Federal Equivalent Method (FEM) on March 12, 2008.
  - Designation number "EQPM-0308-**170**"

Met One BAM 1020



Reporting $PM_{2.5}$ Continuous Federal Equivalent Method (FEM) or Approved Regional Method (ARM) Data

- On July 24, 2008 EPA-OAQPS issued a technical note on "Use of $PM_{2.5}$ FEMs and ARMs in State or Local Air Monitoring Station (SLAMS) networks"

- TTN has the technical note available in two places:
  - AQS - http://www.epa.gov/ttn/amtic/datamang.html
  - AMTIC - http://www.epa.gov/ttn/airs/airsaqs/memos/

- Technical note explains relevant monitoring rules, practical issues of implementing a new method, and AQS data reporting for approved FEM and ARM $PM_{2.5}$ continuous methods.

Implementing a $PM_{2.5}$ Continuous FEM or ARM

- Monitoring agency wishes to install and use data right away:
  - Can be designated as the stations "primary monitor"
    - Can be done any time during the year
    - **Notify the Regional Office through the network modification process prior to changing designation of a stations primary monitor**
    - **Update – to be implemented – Primary Monitor Periods screen in AQS**
    - FRM can be shut down unless required for QA purposes
  - Can be designated as a "collocated monitor"
    - FRM is retained as the primary
    - FEM/ARM data are used on days that the primary monitor is invalid or did not operate.
    - No updates to:
      - Primary Monitor Periods screen
      - QA collocation screen – as this does not meet a required collocation requirement for QA purposes.

Implementing a $PM_{2.5}$ Continuous FEM or ARM – *(continued)*

- Monitoring agency wants to evaluate the method
  - Agencies that have experience with a method
    - Short "burn-in" period may be warranted to
      - Install, familiarize and perform checks
      - Write/edit SOPs including validation procedures
      - Train staff on the FEM/ARM
      - Perform first set of audits by QA staff
      - Initial assessment to collocated FRM and nearby sites
    - Burn in period should be relatively short (e.g., a few weeks to a few months) but no more than 90 days.
    - **During burn-in period data are <u>not</u> expected to be reported to AQS**

Implementing a $PM_{2.5}$ Continuous FEM or ARM – *(continued)*

- Monitoring agency that may be new to a method and wants to perform an evaluation
  - Evaluation may begin and end at any time during the year
  - Normally expect to run for 12 months; however, in accordance with 40 CFR Part 58.20, agencies may use up to 24 months when designated as a Special Purpose Monitor (SPM). Under this provision data are not used for NAAQS comparisons.
  - **Report data to AQS with parameter code 88101, monitor type "Special Purpose", POC 3.**
  - See technical note for more details

Applicable AQS Codes for Implementing $PM_{2.5}$ FEM or ARM Methods

Scenario	Parameter Code	Populate "Primary Monitor Periods" Screen	Monitor Type	POC	Notes
Using the FEM or ARM as the Primary Monitor	88101	Yes	SLAMS	3[1]	Region to be notified prior to date of implementing as primary.
Retaining the FRM as the Primary Monitor while using the FEM or ARM as a collocated monitor. Store Collocated FEM or ARM as:	88101	No	SLAMS	3	Data from the FEM or ARM are eligible for comparison to the NAAQS on days that the FRM did not operate or have a valid sample.
Codes for a collocated FRM at a station that now has an FEM or ARM as the primary	88101	No	QA Collocated	1 or 2	Appropriate to keep same POC for the FRM at the site from prior to FEM implementation
Codes for a collocated FEM at a station that now has an FEM or ARM as the primary	88101	No	QA Collocated	4	See Appendix A of §58 for QA requirements
Short-term field implementation of an FEM	NA				Only intended to ensure method is up and running correctly as part of a burn-in period; i.e., not for method evaluation. Typical period < 90 days.
Long-term field evaluation of an FEM or ARM	88101	No	Special Purpose	3	Generally 12 months, but up to 24 months allowed

[1] The use of POC 3 for an FEM was not expected when a memo on Use of Collocated PM2.5 Data and Parameter Occurrence Codes was issued in December 1999. The technical note supersedes the December 1999 memorandum where they are in inconsistent.

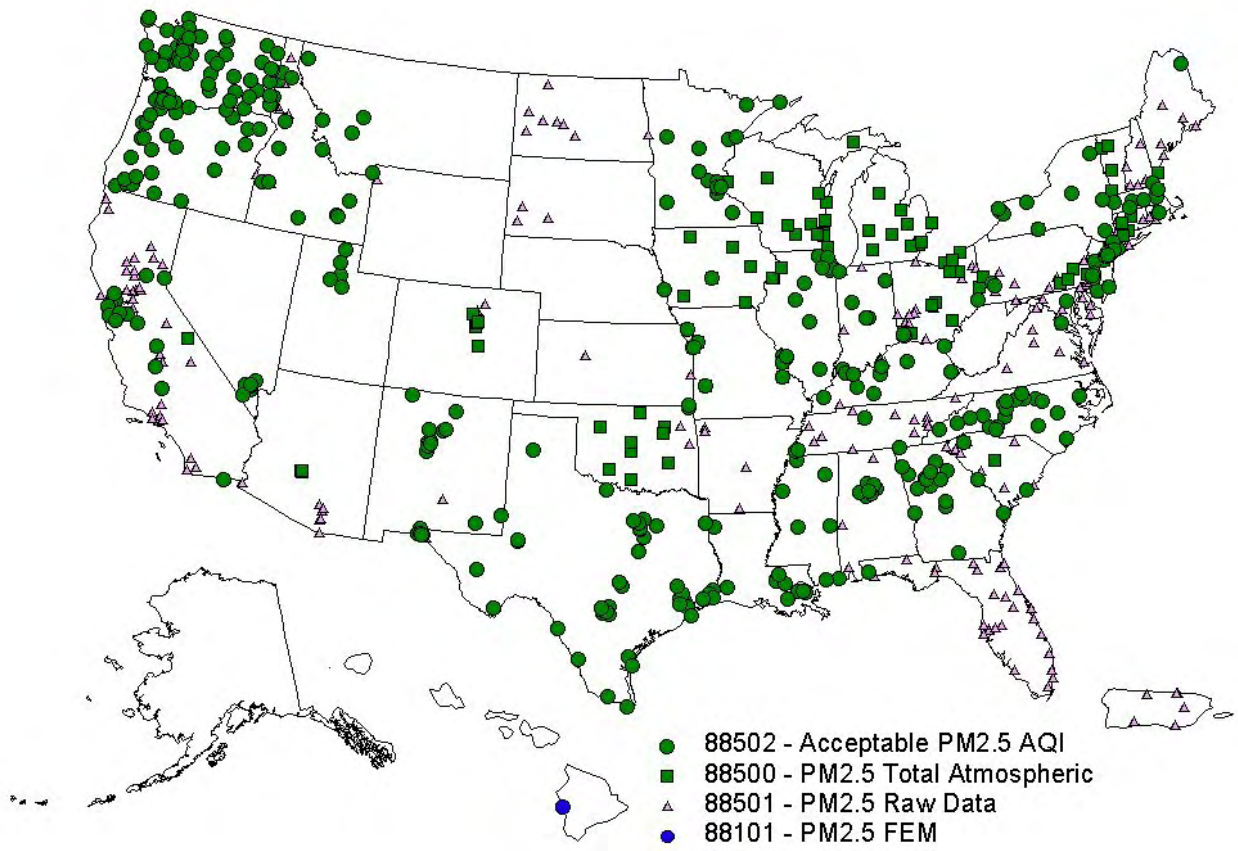
Parameter Codes for Reporting $PM_{2.5}$ Data to AQS

Parameter Name	Parameter Code	Purpose
PM2.5 LOCAL CONDITIONS	88101	Appropriate code for all FRM/FEM/ARMs
PM2.5 TOTAL ATMOSPHERIC	88500	Valid data from methods measuring total $PM_{2.5}$ aerosols in the atmosphere, including those that can be volatilized from the FRM
PM2.5 RAW DATA	88501	Valid uncorrected data that does not reasonably match the FRM
ACCEPTABLE PM2.5 AQI & SPECIATION MASS	88502	Valid data that does reasonably match the FRM with or without correction, but not to be used in NAAQS decisions
PM2.5 VOLATILE CHANNEL	88503	Store important related data such as the FDMS reference channel

Technical Note covering new codes available at http://www.epa.gov/ttn/amtic/datamang.html

Review of $PM_{2.5}$ Continuous Mass Data Reported to AQS

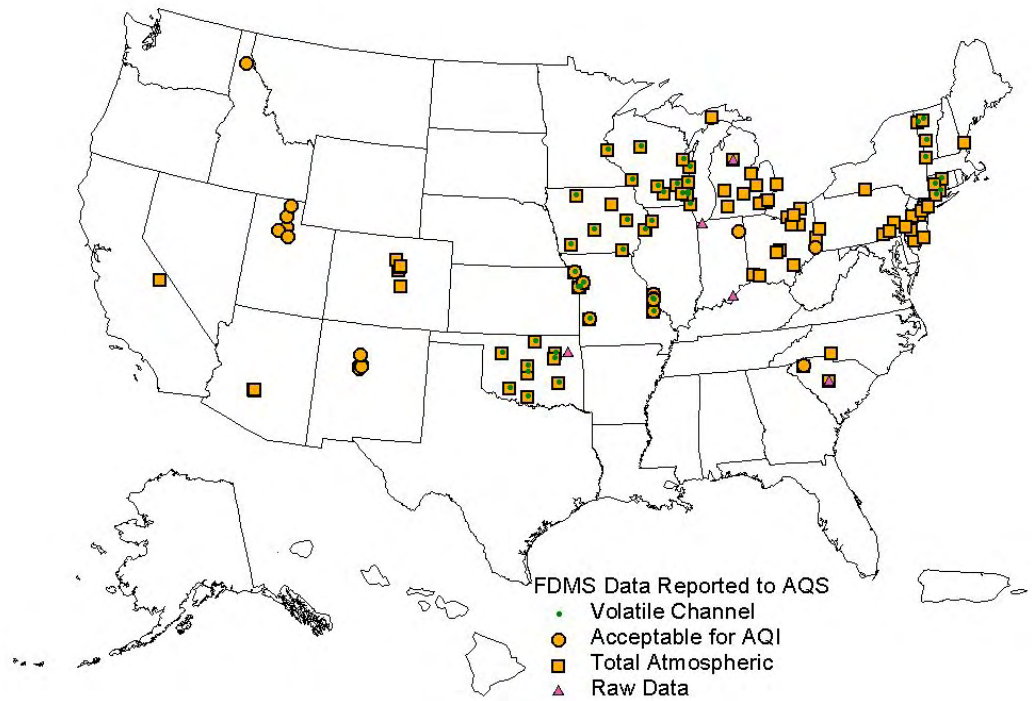
- Most States Reporting as 88502 "Acceptable PM2.5 AQI"
- A number of States only reporting as 88501 "PM2.5 Raw Data"



Continuous $PM_{2.5}$ FDMS Data in AQS

- Growing number of stations using the FDMS
- Request reporting:
  1. Base and Reference to 88500
  2. Concentrations used in AQI reports, if different than 88500 to 88502
  3. $PM_{2.5}$ volatile channel to 88503

Stations Reporting FDMS Data to AQS



AQS		FDMS (i.e., 8500 series)		
Parameter Name	Parameter Code	Description	Program Register Code	**Notes**
PM2.5 TOTAL ATMOSPHERIC	88500	1-Hour Mass Concentration	008 or 057	Depends how data are logged – all output throughout an hour or just a calculated hour.
PM2.5 RAW DATA	88501	Reporting “PM2.5 Raw Data” is not expected from the FDMS		
ACCEPTABLE PM2.5 AQI & SPECIATION MASS	88502	1-hour Mass Concentration or Base MC or calculated channel	(008 or 057) or 102 or calculated	If meeting DQO’s, data can be reported here regardless of whether its only base or some form of raw or corrected
PM2.5 VOLATILE CHANNEL	88503	Reference MC	104	May be most useful to use digital data acquisition to receive multiple channels from one monitor

Summary of Requests on $PM_{2.5}$ Continuous Data Reporting

- Every agency should be working towards:
  1. Using a $PM_{2.5}$ continuous method that is appropriate to report the AQI for their network
  2. Reporting these data to parameter code 88502 – Acceptable $PM_{2.5}$ AQI
- Request agencies using FDMS to report:
  - Base and Reference channel as 88500
  - What ever combination of channels or calculations used in AQI reports to 88502; could be:
    - Base only
    - Base and reference
    - Base and with equation for reference based on temperature
  - Volatile channel as parameter code 88503

Start of a Discussion on Metadata

(Lets introduce and talk some more on Thursday Morning)

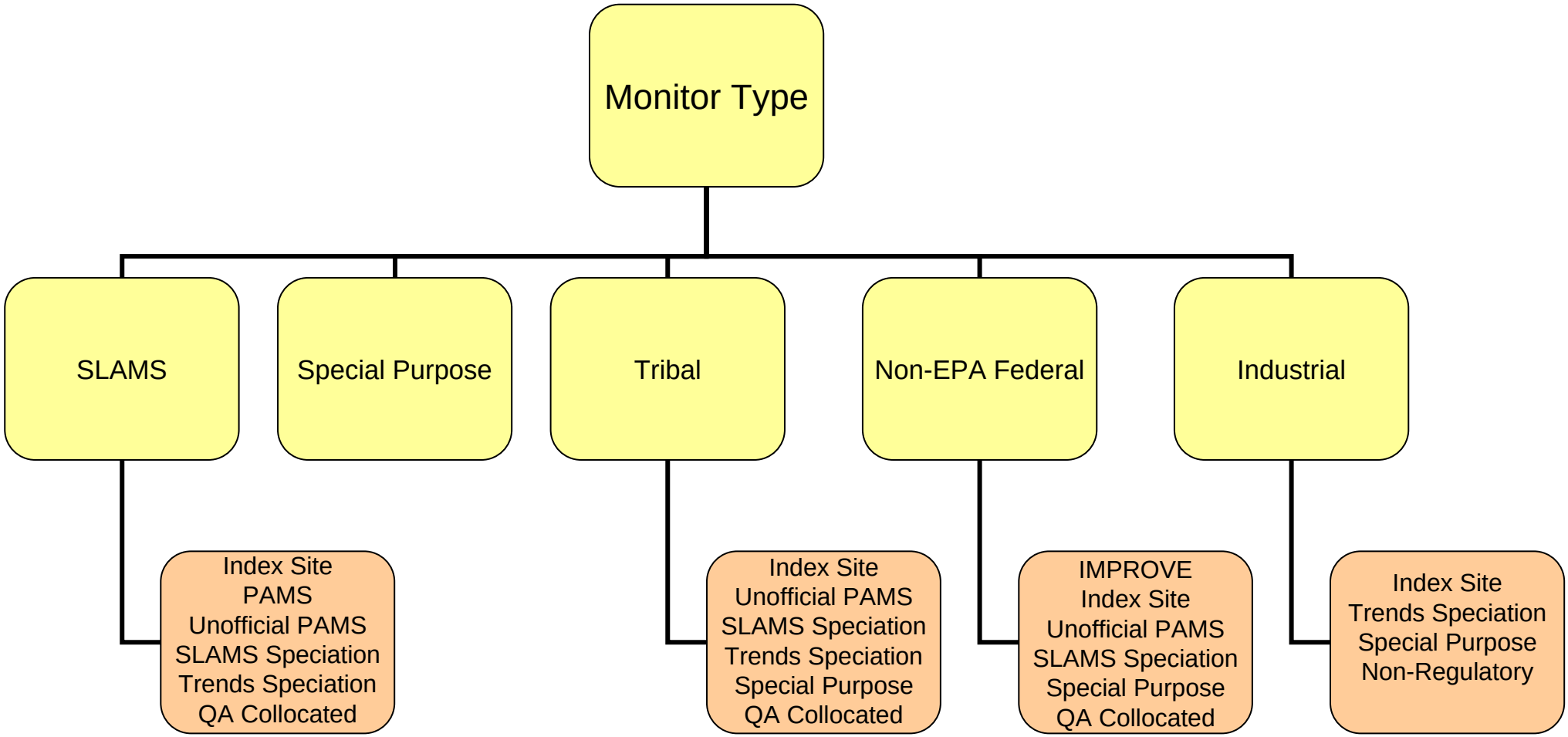
- Targeted improvements in metadata could help increase value of data
- Motivated by more frequent look at design values and other assessments that feed into NAAQS reviews, but also for other data users (e.g., health)
- Monitoring Station Meta-data
  - Lots of room for improvement
  - Databases are capable of storing much more information than we'll ever look at
  - Need to focus on metadata that matters most
    - e.g., Measurement Scale, Monitor Type, Monitoring Objective…
    - Use other data systems (not AQS), where appropriate, for additional data (e.g., land use, vehicle counts…)

Metadata we are thinking really needs to be paid attention to; What do you think?

AQS Metadata Field	Are multiple records allowed?	Is the field required?	Examples
Measurement Scale	No	No	Middle Scale, Neighborhood Scale
Monitor Type	Yes	Yes	See next slide
Monitoring Objective	Yes	Yes	Highest Concentration, Regional Transport
Sample Frequency	No	Required for PM only	Every day, Every 3rd day
Latitude/Longitude	No	Yes	+35.842778; -78.679722
Method Code	No	Yes	118
Primary Sampler Indicator	No	Required for PM	Y

Monitor Type – for Discussion Purposes

- Defined as - The Administrative Classification of the monitor
- Multiple “Monitor Types” can be assigned to a monitor
- Almost all monitors should fall into one of five “Monitor Types” based on the responsible monitoring agency for the monitor or to ensure the monitor is not used in comparison to the NAAQS. State and local agencies should use SLAMS or Special Purpose; other monitoring agencies should use one of the following applicable monitor types: Tribal, Non-EPA Federal, or Industrial.
- Monitor Types “WHO, WMO, SECURED, and UNKNOWN” are all frozen. They can be used where already created but no new monitors can be created with them.
- Assign additional “Monitor Types” to a Monitor based on network grouping or purpose of a monitor.



Metadata that would help allow better use of the data if it were fully and appropriately populated :

AQS Metadata Field	Are multiple records allowed?	Is the field required?	Examples
Project Class	No	No	Population Oriented Surveillance, Source-Oriented Surveillance
Area Represented	Depends – one area represented is allowed for each specified monitoring objective. e.g., “Extreme downwind” for one area and “Max ozone concentration” for another.	No	8280
Local Site Name	No	No	Dallas Hinton

- Local Site Name could match descriptive name on State/local Web Sites and AIRNow

Metadata that may be more useful from another data source

AQS Metadata Field	Are multiple records allowed?	Is the field required?	Examples
Location Setting	No	Yes	Urban and Center City Suburban
Land Use	No	Yes	Residential Commercial
Traffic Count and year	Depends – each referenced street from a site can have a separate traffic count	No	15000, 1990

- It may be appropriate to populate AQS with the latest information on these fields; however, other data sets (e.g., remote sensing) may provide a more consistent dataset across networks for a given time period.

Relevant Internet Addresses

- **Ambient Monitoring Program Information**
  - *http://www.epa.gov/ttn/amtic/*
    - Ambient Monitoring Technology Information Center
    - Program information, methods, links to regulations

- **AQS**
  - http://www.epa.gov/ttn/airs/airsaqs/
    - Manuals, software, data access…

Some of my other favorite Web Sites:

- AIRExplorer - http://www.epa.gov/airexplorer/
- AirCompare - http://www.epa.gov/aircompare/
- AIRNOWTech - http://www.airnowtech.org/
- IDEA – Satellite Site - http://idea.ssec.wisc.edu/
- VIEWS – IMPROVE data - http://vista.cira.colostate.edu/views/
- NOAA – Air Quality - http://www.weather.gov/aq/