

Lead (Pb) Monitoring Methods



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Lead (Pb) Monitoring Methods

- TSP is the indicator for Pb
 - Required for determining whether an area attains the NAAQS
 - Data reported at **local conditions**
- Pb in PM₁₀
 - Use of Pb-PM₁₀ can be approved by the Regional Administrator in certain cases
 - See 40 CFR Part 58, Appendix C (Section 2.10) for more detail
 - Data also reported at **local conditions**



Sampling Technique for Pb-TSP

- High volume sampler already approved as an Federal Reference Method (FRM)
 - 40 CFR Part 50, Appendix B
- Includes ultra-coarse particles that might be missed by PM₁₀ sampling
- Sampling efficiency known to vary according to wind speed and direction
- Acceptable precision and bias
 - Precision 15%; Bias 5%
- Low volume TSP alternatives have not been fully characterized



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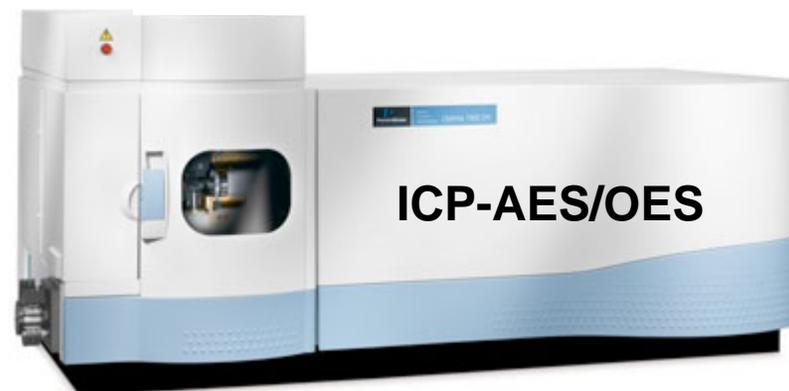
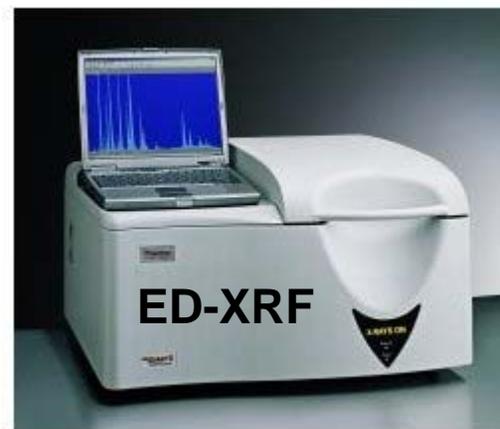
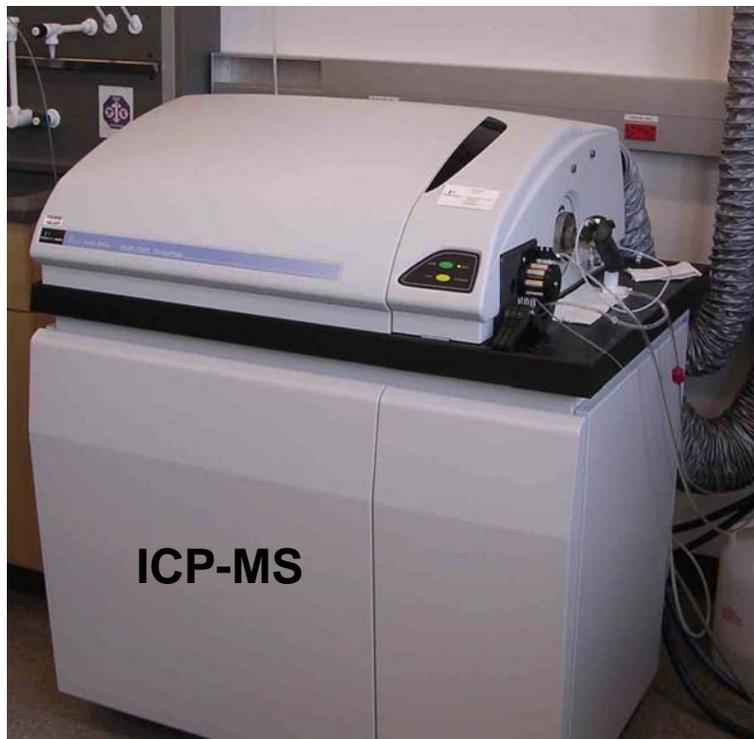


Sampling Technique for Pb-PM₁₀

- Low-volume PM₁₀ samplers already approved as FRMs
- **Low-volume PM₁₀** samplers that meet the requirements described in Appendix O of Part 50 **are approved** for monitoring to meet NAAQS comparison objectives
- Advantages include:
 - Omni-directional inlet
 - Supports sequential operation
 - Sample data can also support PM₁₀ NAAQS (standard conditions) and PM_{10-2.5} (local conditions)
- If it's an approved FRM for PM_{2.5} then you can use it for Pb-PM₁₀
- **High-volume PM₁₀** samplers **are not approved** for Pb-PM₁₀ in support of NAAQS



Analysis Methods, Lead in TSP and PM₁₀



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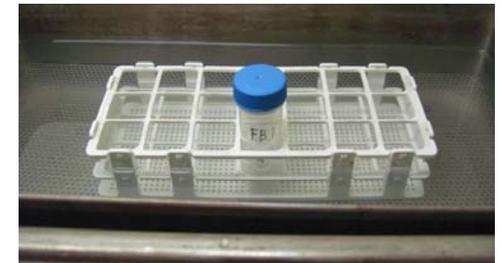
Pb Analysis Methods, TSP (Pb-TSP)

- FRM based on Flame Atomic Absorption (AA) as described in 40 CFR part 50, Appendix G (1978)
- Existing Federal Equivalent Methods (FEMs) approved for Pb-TSP
 - **Any of the existing FEMs can be used**
- Advances in measurement technology warrant development of new FRMs and FEMs
 - EPA is planning to develop a new FRM for Pb-TSP
 - FRM development process is beginning now
 - Rule making is required
 - Expect CASAC peer review and proposed rule in 2010



New Pb-TSP FEMs

- **A new FEM for Pb-TSP has been submitted to ORD for review**
 - Inductively-coupled plasma mass spectrometry (ICP-MS)
- EPA plans to pursue submittal of additional FEMs
 - Inductively-coupled plasma atomic emission spectrometry (ICP-AES)
- Moving towards universally-applicable or “generic” FEMs
- GSA Task Order Option – ICP-MS
 - In place January/February 2010
 - Does not include reporting to AQS



Pb Analysis Methods, PM₁₀ (Pb-PM₁₀)

- FRM based on Energy Dispersive X-ray Fluorescence (XRF) as described in 40 CFR Part 50, Appendix Q
- FEMs (none yet approved)
- EPA working on new FEMs for Pb-PM₁₀
 - Inductively-coupled plasma mass spectrometry (ICP-MS)
 - Inductively-coupled plasma atomic emission spectrometry (ICP-AES)
 - May be available in 2010
 - Field sampling by Missouri DEP
- GSA Task Order Option – XRF
 - In place January/February 2010
 - Does not include reporting to AQS



Preliminary MDLs for Pb in TSP and PM₁₀

MDL Requirement is 5% of NAAQS or 0.0075 µg/m³ (7.5 ng/m³)

Filter: MDL (ng/m ³)	Sample Analysis Method
TSP: 0.060 ^U ; 0.030 ^H	Graphite Furnace Atomic Absorption (GFAA)
PM ₁₀ : 0.7 ^a	Energy-dispersive X-Ray Fluorescence (EDXRF)
PM ₁₀ : 0.19 ^U ; 0.18 ^H TSP: 0.037 ^U ; 0.015 ^H	Inductively Coupled Plasma Mass Spectrometry (ICP-MS)
PM ₁₀ : 2.2 ^U ; 4.6 ^H TSP: 0.57 ^U ; 0.34 ^H	Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)
^U Heated Ultrasonic ^H Hot Block ^a 40 CFR Part 50, Appendix Q	



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Need More Information on Pb?

- Technical (Q&A) Notes Available
 - Network Design
 - Modeling of Pb Sources
 - Emissions Inventories
 - Sampling Methods
 - Analysis Methods
 - Quality Assurance
 - Reporting Data to AQS
- www.epa.gov/ttn/amtic/pb-monitoring.html



Particulate Matter (PM) Monitoring Update

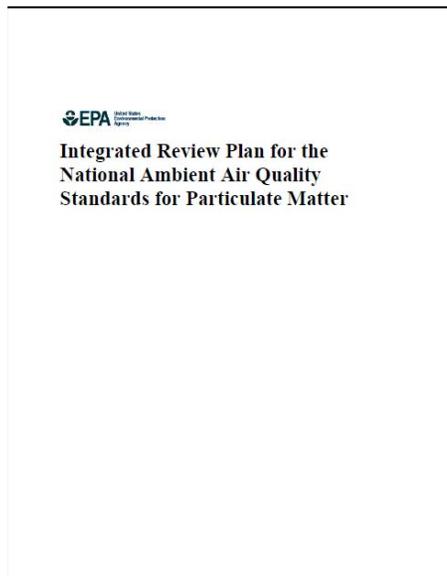


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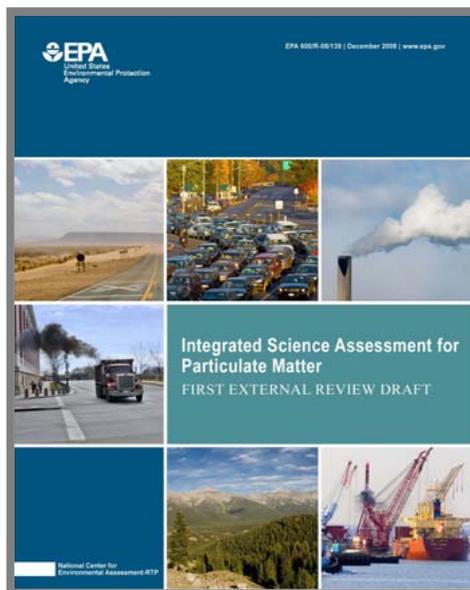
Current PM NAAQS Review

Monitoring Section 7.0



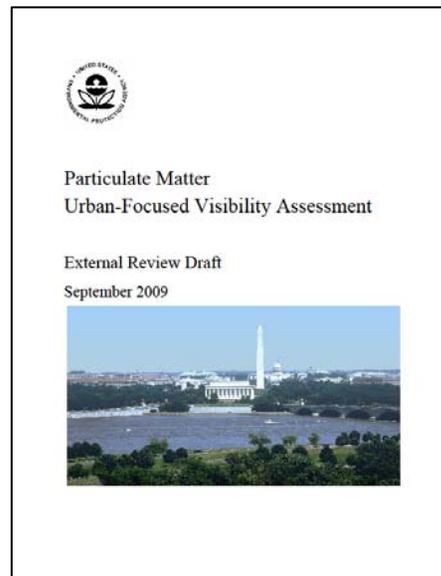
Integrated Review Plan
Final – March 2008

Monitoring Section 3.4



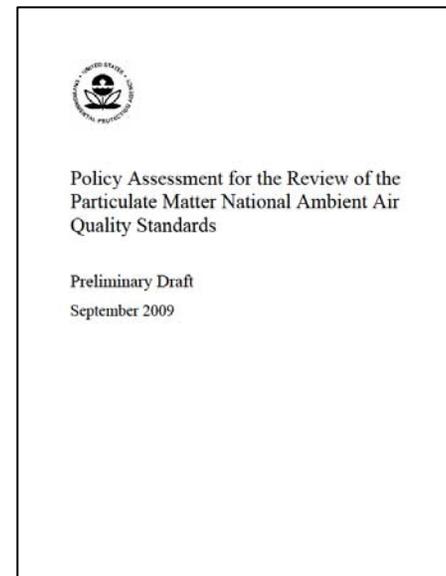
Integrated Science Assessment
2nd Draft – July 2009
Final – Dec 2009

Monitoring Section 4.1



Urban Visibility Assessment
Draft – Sept 2009
Final – Dec 2009

Monitoring Sections 2.3 & 2.4



Policy Assessment
Preliminary Draft - Sept 2009
2nd Draft & Final – 2010

Proposed Rule – 2010
Final Rule – 2011

More information: www.epa.gov/ttn/naaqs/standards/pm/s_pm_index.html



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Urban-Focused Visibility Assessment

- Supports PM Secondary NAAQS
- Potential Indicators
 - Total light extinction (light scattering and light absorption)
 - Hourly $PM_{2.5}$ Mass
- Potential Monitoring for the Indicator
 - Direct measure of light extinction
 - Examples: Nephelometer and Aethalometer™
 - Engaging ORD on measurement methods
 - Cleveland Multiple Air Pollutant Study (CMAPS)
 - Measurement of hourly $PM_{2.5}$ mass
 - Continuous $PM_{2.5}$ mass FEMs already available
 - CASAC Advisory on methods – early 2010



Types of PM Monitoring Networks

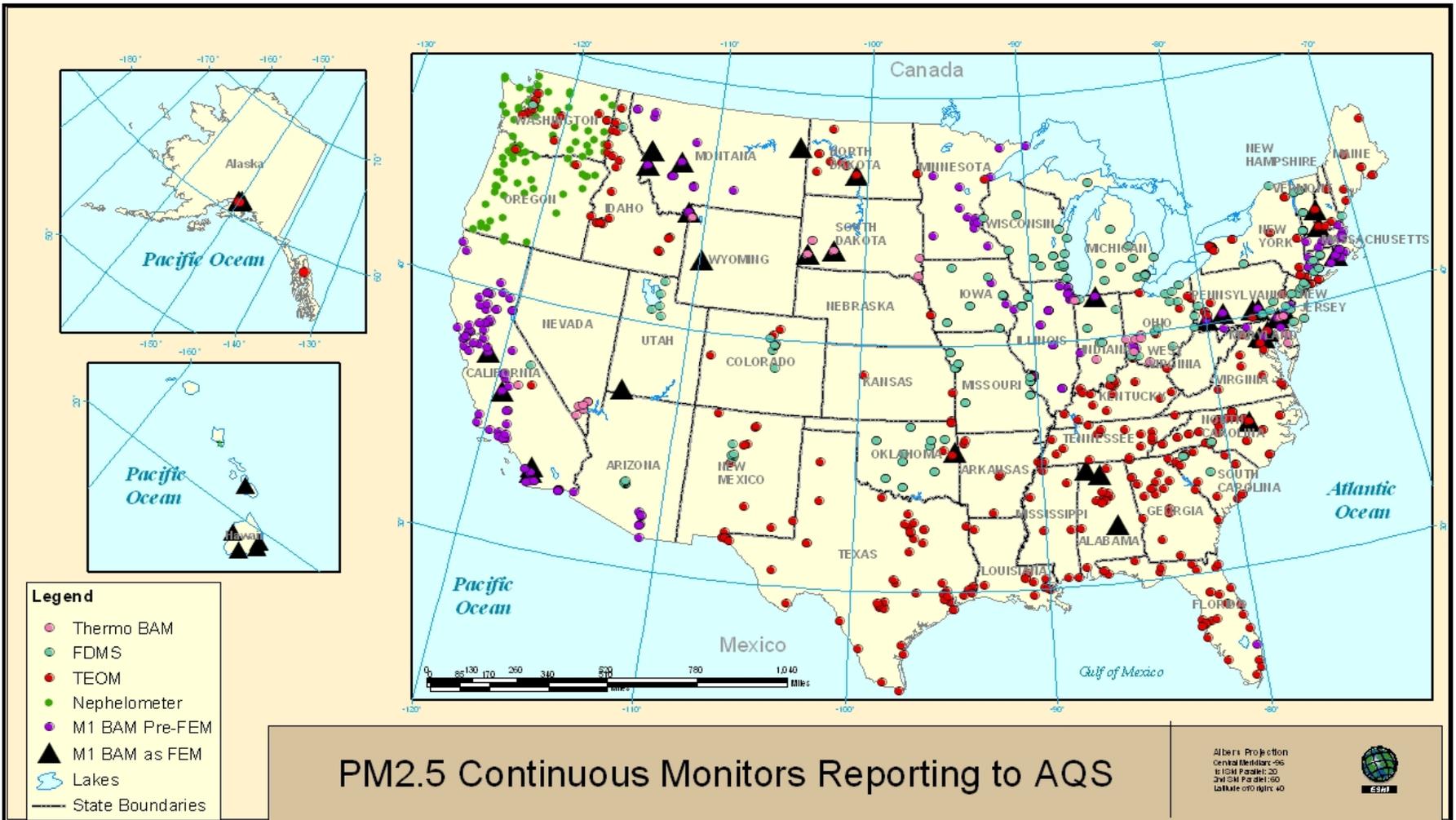
P = Primary purpose, S = Secondary purpose

PM Indicator	Network Element	Compare to Standards	Public Reporting - AQI	Develop control strategies	Assess progress/ trends	Health/ Exposure	Assess Visibility
PM_{2.5}	FRM Mass	P		S	S	S	
	Continuous Mass	Now Available	P	S		S	
	Chemical Speciation Network			P	P	S	
	IMPROVE			S	S		P
PM₁₀	FRM Mass	P		S	S	S	
	FEM Continuous	P	S	S	S	S	
PM_{10-2.5}	FRM/FEM Mass				P	P	



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- Approximately 700 stations in 2008
- Expect some increase as FEMs are now available



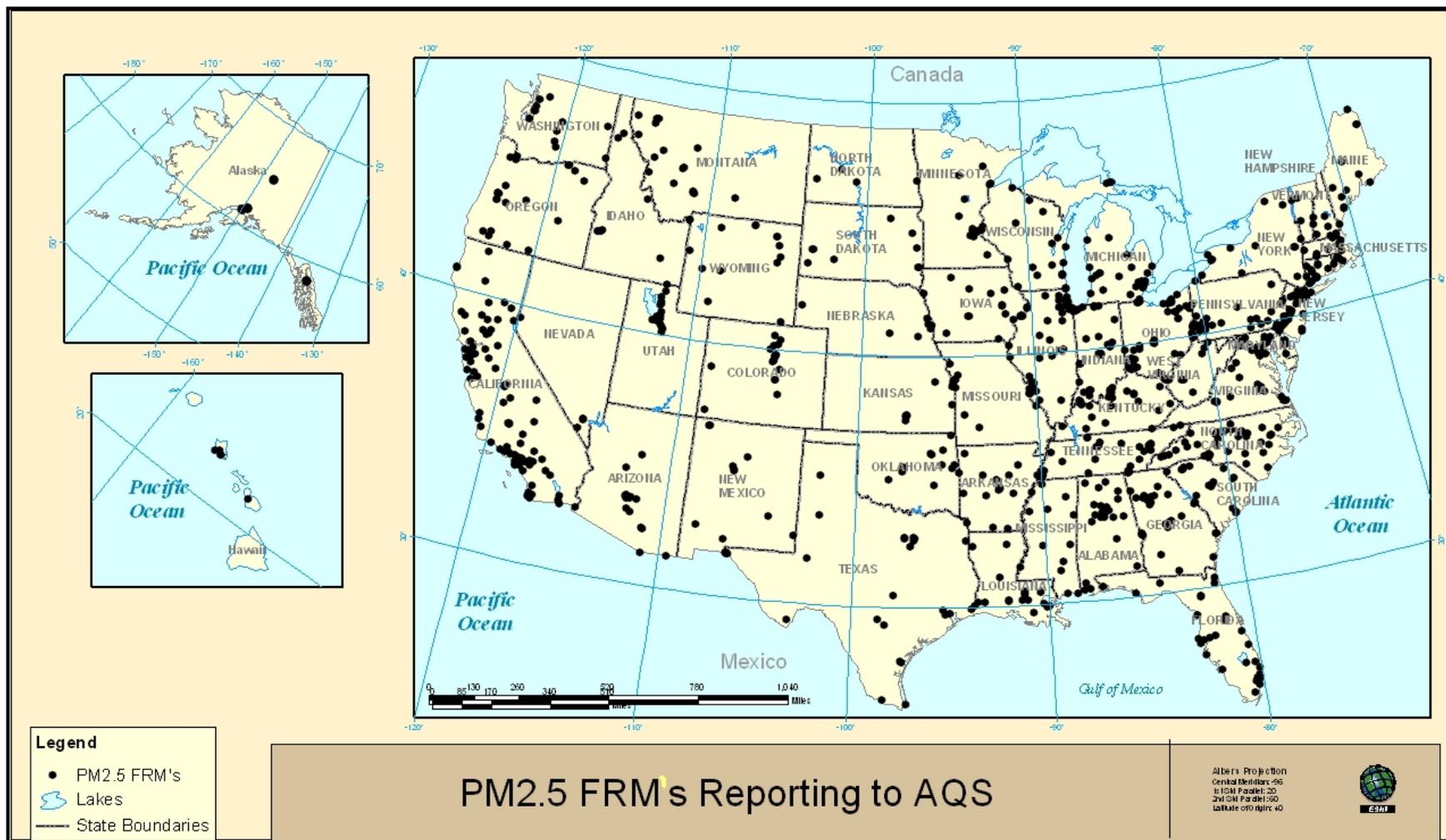
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Implementation of Continuous PM_{2.5} FEMs

- First approved continuous PM_{2.5} FEM designated - March 2008
 - Five FEMs now approved
- Memo issued July 2008 on the use of continuous FEM data at SLAMS
- Memo covered several issues:
 - Implementation and method evaluation
 - Reporting of data to AQS
 - Use of data for the NAAQS
- More information posted at:
 - www.epa.gov/ttn/amtic/datamang.html



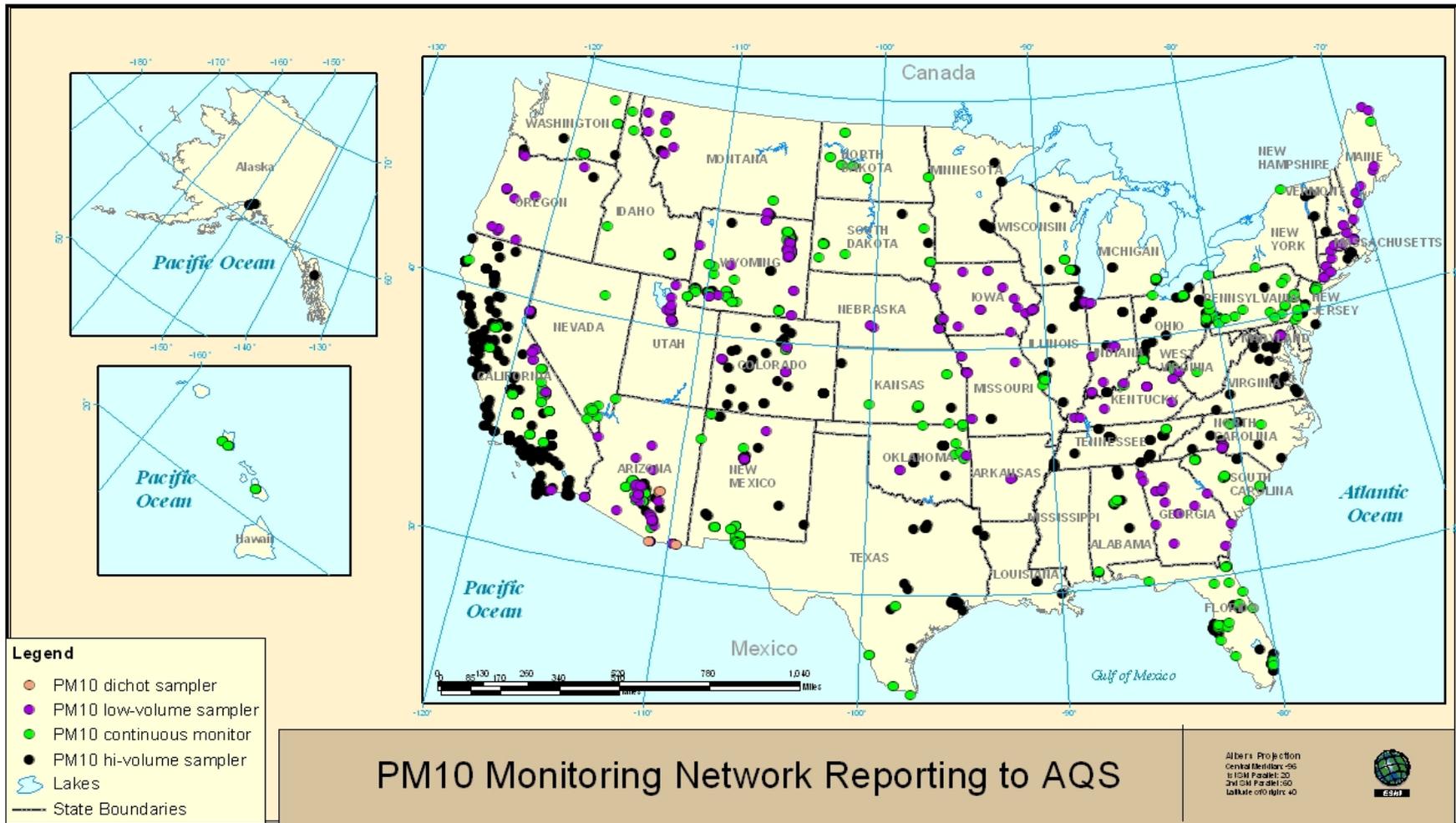


- Approximately 940 sites in 2008
- Expect some decrease as continuous FEMs implemented



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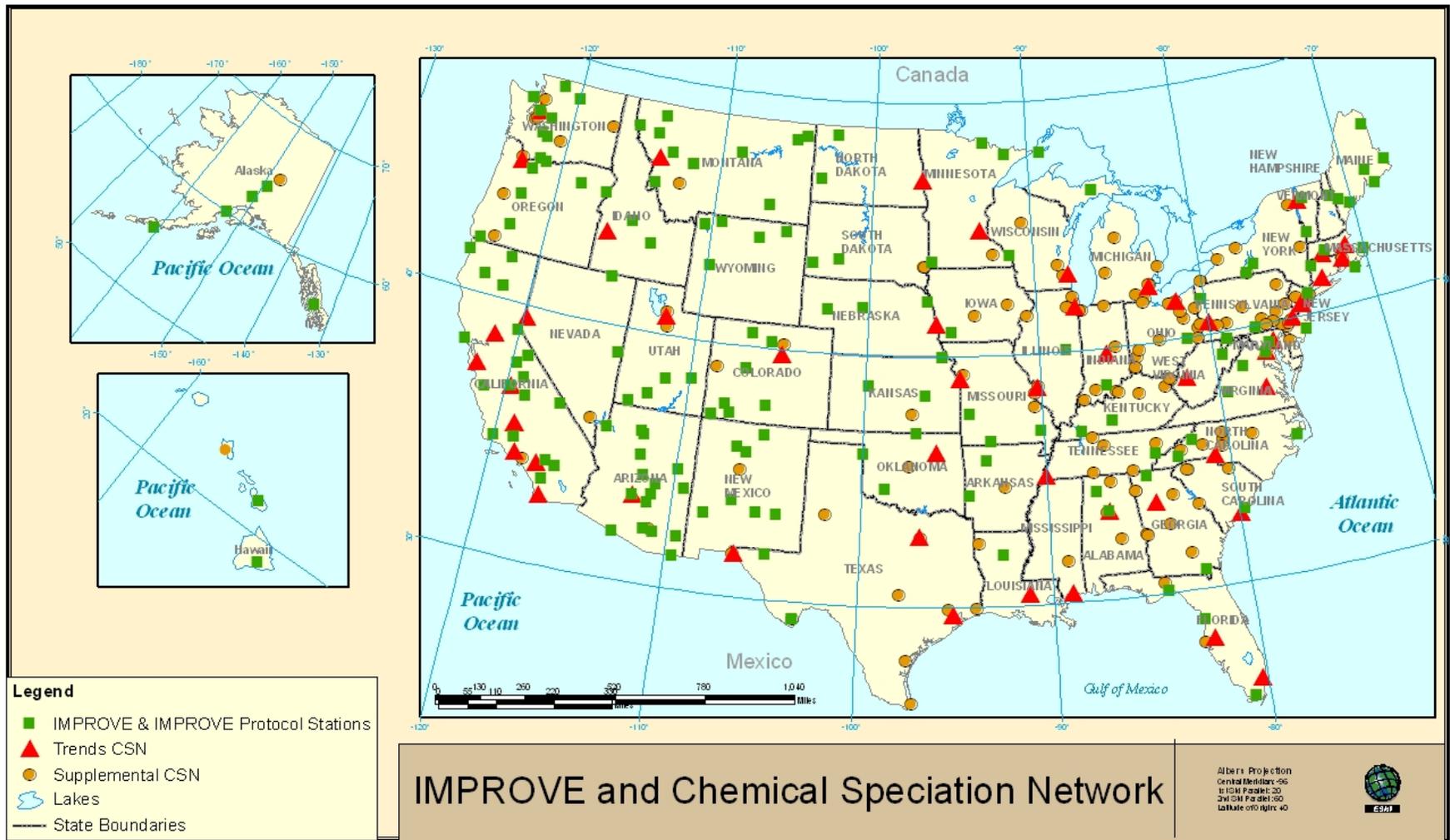


- Approximately 868 sites in 2008
- PM₁₀ still reported at STP (Standard Temperature and Pressure)
- Some areas operating more sites than required



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- Approximately 190 IMPROVE and 200 CSN sites in 2008
- Networks relatively stable at this time



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CSN Carbon Method Implementation

- EPA and monitoring agencies have implemented **changes to the carbon method**
 - Sampling and analysis protocols both changed
- **Needed for consistency** in organic and elemental carbon measurements between the CSN and IMPROVE
- Sampling with URG3000N Carbon Sampler
- Analysis performed using IMPROVE_A TOR analysis method
- Field blanks and backup filters collected at all sites
- Blank correction protocol to be determined
- 3 Phase implementation – completed October 2009
- Detailed Information:
www.epa.gov/ttn/amtic/specurg3000.html



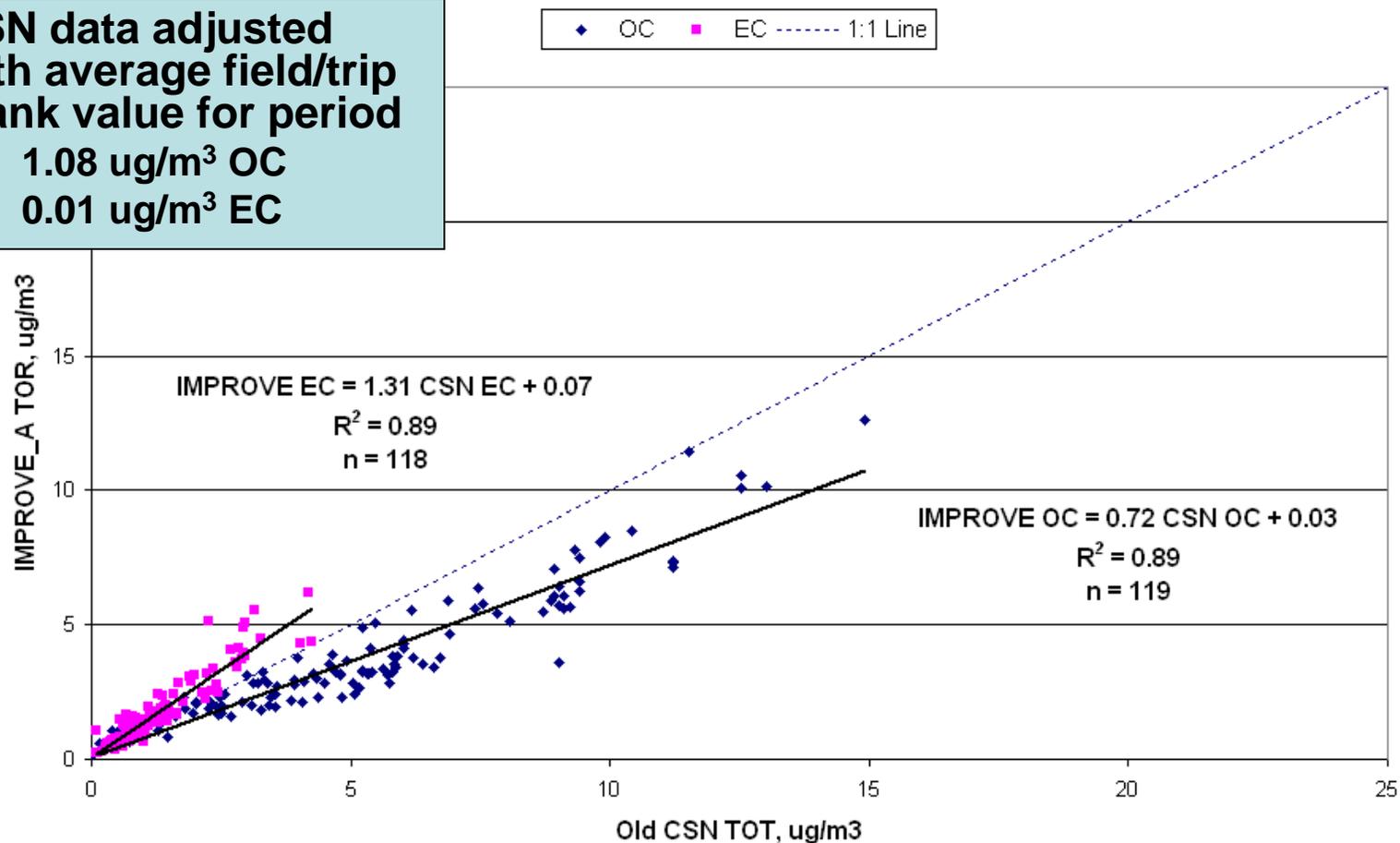
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Old CSN (SASS) and IMPROVE Birmingham, AL (Jan 1 – Dec 31, 2006)

Collocated Old CSN TOT and IMPROVE_A TOR 2006

CSN data adjusted
with average field/trip
blank value for period
1.08 ug/m³ OC
0.01 ug/m³ EC



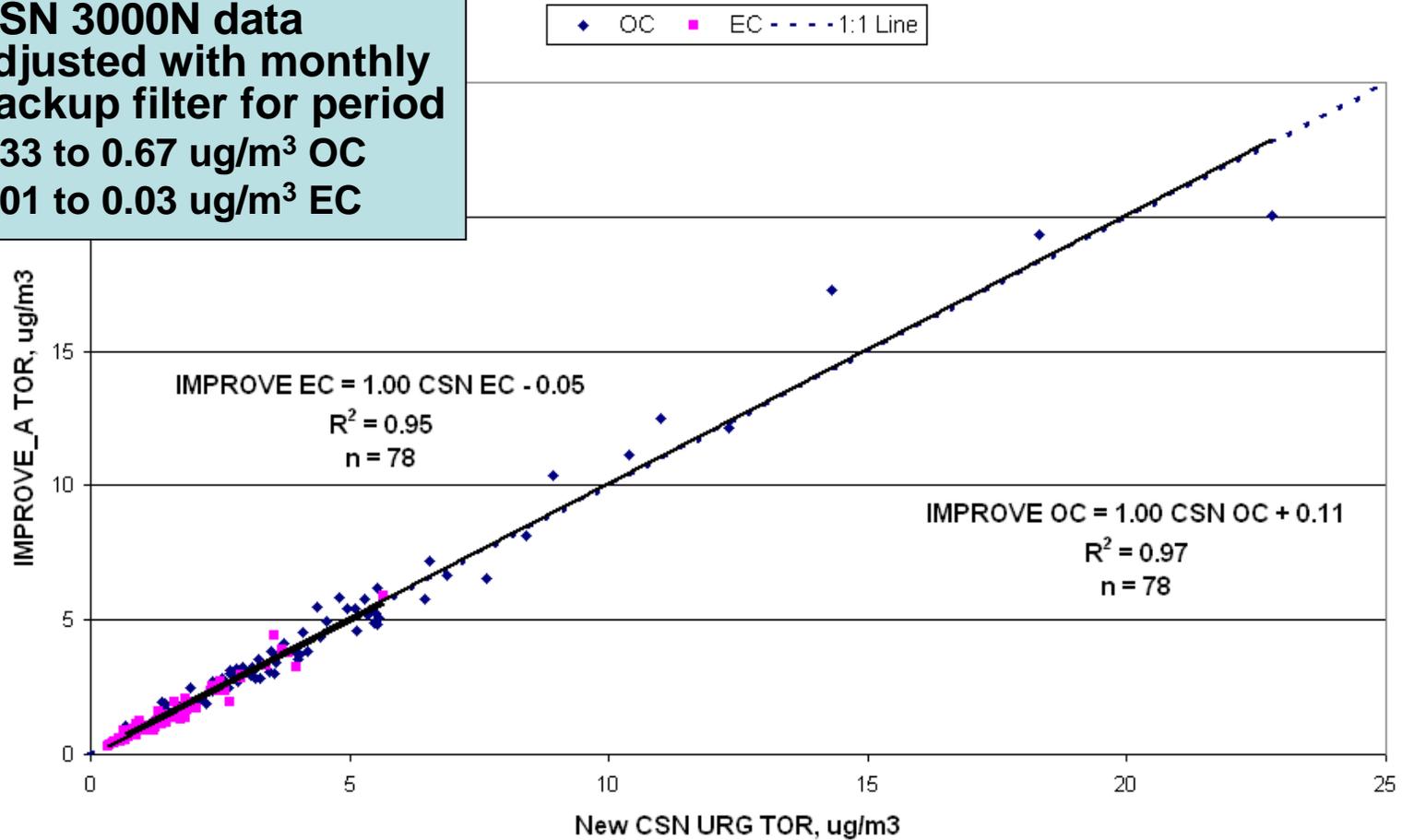
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New CSN (3000N) and IMPROVE Birmingham, AL (May 1 – Dec 31, 2007)

Collocated New CSN and IMPROVE_A TOR 2007

CSN 3000N data
adjusted with monthly
backup filter for period
0.33 to 0.67 $\mu\text{g}/\text{m}^3$ OC
0.01 to 0.03 $\mu\text{g}/\text{m}^3$ EC



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New PM_{2.5} CSN Laboratory Contract

- New Contract Awarded January 2009
- Changes...
 - Reduced XRF target list
 - Removed 15 elements rarely detected and mercury
 - Retained 24 elements measured by IMPROVE
 - Addition of optical light absorption measurements
 - Ability to order line items separately
 - Addition of tabular metadata reports
 - Chronological documentation of changes to lab and field procedures
 - Chronological documentation of measurement issues identified, data affected, and resolutions implemented



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Recently Approved FRMs/FEMs for PM

PM _{2.5}	PM _{10-2.5}
Met One BAM 1020 Measurement System	BGI Model PQ200 Sampler Pair
Thermo TEOM [®] 1400a Monitor with Series 8500C FDMS [®]	Met One BAM 1020 Measurement System
Thermo TEOM [®] 1405-DF Dichotomous Monitor with FDMS [®]	Thermo Dichotomous Partisol [®] -Plus Model 2025-D Sequential
Thermo Partisol [®] 2000-D Dichotomous Sampler	Thermo Partisol [®] 2000-D Dichotomous Sampler
Thermo Dichotomous Partisol [®] -Plus Model 2025-D Sequential	Thermo Partisol [®] Model 2000 Sampler Pair
Thermo FH62C14-DHS Continuous Ambient Particle Monitor	Thermo Partisol [®] -Plus Model 2025 Sequential Sampler Pair
Thermo Model 5030 SHARP Monitor	
www.epa.gov/ttn/amtic/files/ambient/criteria/reference-equivalent-methods-list.pdf	



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PM_{10-2.5} Monitoring

- NCore requirements finalized in 2006 as part of the last revision to the PM NAAQS and monitoring regulations
- Although PM₁₀ was retained as the indicator, the PM_{10-2.5} requirements were finalized to initiate characterization
- PM_{10-2.5} FEMs have been approved
- **PM_{10-2.5} mass monitoring required as part of NCore**
 - **Monitoring plans were due by July 1, 2009**
 - **Full network deployment by January 1, 2011**
- Primary objective for PM_{10-2.5} speciation data is to support further research in understanding the chemical composition and sources
- **EPA will not be requiring deployment of PM_{10-2.5} speciation sampling by January 2011 at NCore stations**



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PM_{10-2.5} Speciation Monitoring Pilot

- Some measurement issues not yet resolved
- Prior to future implementation, a small pilot project will occur in 2010 at two locations
 - Primarily using PM_{10-2.5} FRMs and dichot FEMs
 - Goal to identify key target species
 - Further development of analysis methods
 - Develop Standard Operating Procedures (SOPs)
- CASAC consultation on pilot February 2009
 - Supported pilot monitoring effort
 - Strongly recommended use of dichot samplers
 - Recommended analysis of pilot data prior to network deployment...”move slowly”



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Questions?



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