Executive Summary
$PM_{2.5}$ Monitoring Implementation Plan
DRAFT - 11/26/97

This is a draft executive summary, and we would like to have your comments. A final version will be provided to each Region, for external distribution, and placed for public access on the U.S.EPA Internet home page in the near future.

Please send your comments and suggestions by December 22, 1997, to one of the following people:

Dr. Richard Scheffe
Monitoring and Quality Assurance Group Leader
U.S.EPA, OAQPS MD-14
Research Triangle Park, NC 27711
919-541-4650
fax 919-541-1903
Email: scheffe.rich@epamail.epa.gov

Lee Ann B. Byrd
Monitoring and Quality Assurance Group
U.S.EPA, OAQPS MD-14
Research Triangle Park, NC 27711
919-541-5367
fax 919-541-1903
Email: byrd.lee@epamail.epa.gov

Executive Summary
$PM_{2.5}$ Monitoring Implementation Plan
DRAFT - 11/14/97

Table of Contents

Executive Summary
$PM_{2.5}$ Monitoring Implementation Plan
DRAFT - 11/14/97

Introduction

The deployment of a new $PM_{2.5}$ monitoring network is a critical component in the national implementation of the new $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS). Substantial resources are being provided to support the national monitoring network of 1,500 $PM_{2.5}$ sites. These networks will follow the regulations provided in 40 CFR Parts 53 and 58, and published in the ***Federal Register*** on July 18, 1997, and as described within President Clinton's Directive of July 16, 1997. The ambient data from this network will drive an array of regulatory decisions, ranging from designating areas as attainment or nonattainment, to developing cost-effective control programs, and to track the progress of such programs. There is an urgent need to establish the network as soon as practicable so that other programmatic efforts relying on $PM_{2.5}$ environmental data are not delayed. This document outlines the actions that U.S.EPA and State/local air pollution control agencies must undertake to establish the $PM_{2.5}$ monitoring network, and it will serve as the organizational basis for network implementation. This document is not a treatise on the PM-fine air pollution problem; rather, it is intended to provide a common foundation and approach for the many individuals and organizations responsible for developing and deploying the $PM_{2.5}$ network. The objectives of this action plan are:

- Describing the rationale underlying the network and its components.
- Establishing and affirming major products (e.g., training programs, procurements) and timelines required to implement the network.
- Defining roles and responsibilities of organizational groups and individuals.
- Generating consensus among those responsible for network deployment.

This executive summary provides an overview of the $PM_{2.5}$ implementation efforts including the basic rationale for the various network components, a summary of the implementation activities and resources, and a description of the various roles and responsibilities across organizations. After the executive summary, the document starts with an overview of the $PM_{2.5}$ monitoring regulations (Section 2), and a discussion of roles and responsibilities among U.S.EPA groups and State/local agencies (Section 3). Sections 4 through 9 address major program components (network design, sampling, laboratory analysis/speciation, data management, special studies, and quality assurance) representing core implementation elements that relate directly to budget allocation categories. Section 10 addresses the use of data beyond the data assessment and management activities that are discussed in Section 7. Sections 11 through 14 address the support and peripheral activities required to implement and track progress of the program. These include procedures for allocating costs and developing budget estimates (Section 11), a plan for tracking program implementation (Section 12), training

activities (Section 13), a compilation of major procurements (Section 14), program integration, liaison and communication activities (Section 15) and a summary and timeline for major products (Section 15).

Program Goal and Objectives:

The goal of the $PM_{2.5}$ monitoring program is to provide ambient data that support the nation's air quality programs. These data include aerosol mass measurements and chemically resolved, or speciated, data. Mass measurements are used principally for $PM_{2.5}$ NAAQS comparison purposes in identifying areas that meet or do not meet the $PM_{2.5}$ NAAQS, and in supporting area designations as attainment or nonattainment. Chemically resolved data serve the implementation needs associated with developing emission mitigation approaches to reduce ambient aerosol levels. These needs include emissions inventory and air quality model evaluation, source attribution analysis, and tracking the success of emission control programs. These resolved chemical measurements also provide support for regional haze assessments. Several targeted objectives service the requisite information needs:

1. Certification of Federal Reference and Equivalent Method (FRM/FEM) samplers to collect data for $PM_{2.5}$ NAAQS comparison purposes.

2. Establishment of a 1500 $PM_{2.5}$ site network by December 31, 1999, with 1100 $PM_{2.5}$ sites established by December 31, 1998.

3. Development of a national chemical speciation sampling and analysis program by December 31, 1998.

4. Collection, measurement and storage of quality assured data beginning on January 1, 1999, to support NAAQS comparisons, $PM_{2.5}$ program implementation needs, and regional haze assessments.

Each of the above objectives are tied into the Government Performance and Results Act (GPRA) U.S.EPA air program goals related to the $PM_{2.5}$ air quality program. These GPRA goals are a part of the program specific guidance elements that will accompany future grant guidance (FY99 and beyond) that is forwarded to the U.S.EPA Regions and State/local agencies.

Network Conceptualization and Major Program Components

The planned network serves multiple information needs, and reflects new siting and collection strategies. Consequently, the planned network is complex, difficult to describe, and subject to multiple interpretations based on an individuals perspectives and program familiarity. For example, the community-oriented siting of samplers and collection of mass data for comparison to the annual $PM_{2.5}$ NAAQS is different than other criteria pollutants, which focus on peak concentrations measured anywhere in the ambient air.

Data from this program will be used for (1) $PM_{2.5}$ NAAQS comparisons, (2) development and tracking of implementation plans, (3) assessments for regional haze, and (4) assistance for health studies and other ambient aerosol research activities. Clearly, the most immediate and highest priority for this program is developing a data base for $PM_{2.5}$ NAAQS comparisons. The design of the Federal Reference and Equivalent Method samplers and network concepts like community-oriented monitoring (including "spatial averaging") are predicated on the need to produce data commensurate with those health studies underlying the development of the $PM_{2.5}$ NAAQS. The FRM, built with many design-specified components, conceptually is similar to samplers used in the health studies supporting the $PM_{2.5}$ NAAQS. However, the FRM/FEM does not completely characterize ambient aerosols. Ambient aerosols are complex multi-phase (gas, liquid, solid) mixtures composed of various chemical constituents which vary across particle size ranges. Sampling is therefore subject to various positive and negative artifacts. The FRM design with a Teflon® filter does experience loss of volatile constituents (i.e., release of nitric acid vapor from particulate ammonium nitrate), which can be more completely captured by other sampling approaches. However, the principal objective of the FRM/FEM sampler is to measure a particulate matter "indicator" which defines $PM_{2.5}$ and which tracks back to those measurements used in the health studies supporting the $PM_{2.5}$ NAAQS. The requirement that these instruments rely on specific design elements, rather than performance criteria alone, is structured to produce greater consistency in the data and to avoid large data measurement uncertainties experienced in the PM_{10} monitoring program. Because the FRM/FEM $PM_{2.5}$ samplers do not provide temporally resolved data or full chemical characterization of ambient aerosols, other sampling instruments including continuous analyzers and speciation samplers constitute part of the instrument mix utilized in the $PM_{2.5}$ network.

Network elements.

Compliance monitoring. The network design addresses the aforementioned four program objectives through a combination of siting and instrumentation strategies. The network design focus for compliance of both the annual and 24-hour $PM_{2.5}$ NAAQS strives to locate monitoring sites in populated areas, with a major emphasis on communities exposed to concentrations representing larger areas, or area-wide concentrations. This emphasis on area-wide concentrations again reflects the need to be consistent with studies underlying the $PM_{2.5}$ NAAQS, analogous to the rationale for the FRM/FEM specifications.

The projected 1,500 site network includes 848 sites required as a minimum within the 40 CFR 58 regulation. (Typically, deployed regulatory networks are made of many more sites than

the minimum required by regulation.) A strict interpretation of the regulations suggest that a minimum of 745 sites would be eligible for comparison to the $PM_{2.5}$ NAAQS and require the use FRM/FEM samplers, and the remaining 103 sites are used to meet minimum background and transport requirements and may or may not employ FRM/FEM samplers. The 652 remaining, or supplemental sites are used to address the needs for broader coverage of populated areas, spatial averaging, special purpose monitoring, and visibility.

It is important to emphasize that all $PM_{2.5}$ sampling sites that are to provide data for comparison to either the 24-hour or the annual $PM_{2.5}$ NAAQS for the purposes of addressing attainment/nonattainment must employ FRM/FEM sampling techniques.

Special Purpose Monitoring. Strict compliance monitoring for comparison to the $PM_{2.5}$ NAAQS is the highest priority, but not the only one, for the network. Special Purpose Monitoring (SPM) sites provide a means to characterize ambient aerosol levels in as many areas as possible. Historically, there have been monitoring disincentives associated with the consequence of a site showing violations of a NAAQS. As a result, the U.S.EPA has provided significant flexibility on the use of $PM_{2.5}$ SPM data for the first two years of a $PM_{2.5}$ SPM's operation. $PM_{2.5}$ SPM data that are collected with FRM/FEM samplers would not be used for compliance purposes for the first two years of its operation. If the sampling period extends beyond the second year, the $PM_{2.5}$ SPM data collected with a FRM/FEM would be subject to the same data analyses as other FRM/FEM sites. The U.S.EPA believes that there are more than sufficient compliance monitoring sites, and the flexibility provided by SPM sites allows for better spatial, temporal, and chemical characterization of ambient aerosols and ultimately a more sound information base for developing emission mitigation strategies. Note: the 40 CFR 58 regulations do not require SPM sites to be equipped with FRM/FEM samplers.

Continuous sampling. The 40 CFR 58 regulations require that a continuous sampler be placed in each of the 52 largest metropolitan areas or cities. In addition, the monitoring regulations allow the use of continuous samplers to reduce the resource burdens of everyday sampling in other areas. Data from these samplers will not be used for $PM_{2.5}$ NAAQS compliance, but they will provide useful data for public reporting of short-term concentrations, for understanding diurnal and episodic behavior of fine particles, and for use by health scientists investigating exposure patterns.

Chemical speciation sampling and analysis. The U.S.EPA recognizes that the $PM_{2.5}$ network will be the major source of information for developing emission mitigation strategies and for tracking the success of implemented control programs. The basic objective of the chemical speciation sampling is to develop seasonal and annual chemical characterizations of ambient aerosols across the nation. These chemically resolved data will be used to perform source attribution analyses, evaluate emission inventories and air quality models, and support health related research studies and regional haze assessments. Note that comparisons of air quality model predictions and mass measurements provide unsatisfactory tests of model behavior and are complicated further by the inherent uncertainties in mass measurements due to sampling artifacts. Speciated data provide a wealth of information (as opposed to mass concentrations alone) that potentially can uncover model flaws and lead to greater confidence in model

predictions.

The speciation program will provide identification of the chemical constituents including elements, elemental and organic fractions of carbon, and major ions including nitrate, sulfate, chloride, ammonium. The design of this sampler is similar to that established in the Interagency Monitoring of Protected Visual Environments (IMPROVE) visibility program. Recognizing that the FRM with a Teflon® filter is limited with regard to capturing certain volatiles (e.g., nitrates) and enabling subsequent chemical analyses, the sampling approach for speciation is very simple: add two additional samplers (or modules) that have a nylon filter for nitrate capture and a quartz filter that is required for combustion analysis to separate the elemental and organic carbon fractions. Note: speciated data are not compared to the $PM_{2.5}$ NAAQS, and the speciation samplers are not certified as FRM/FEM.

The U.S.EPA is developing laboratory standard operating procedures (SOPs) that will be consistent with techniques used by various agencies and research groups operating ambient air particulate matter speciation programs. Sampling for speciation purposes is a developing science, and as such, the U.S.EPA wants to encourage creative approaches to speciation sampling. Retaining flexibility by not prescribing speciation sampling methods should be viewed as a technology driver. Of course, the penalty for flexibility is some degree of data uncertainty stemming from different samplers. The greatest uncertainty of the speciation sampling and analysis program exists in the laboratory protocols; therefore, the U.S.EPA is requiring greater standardization on the laboratory analysis component.

Funding is provided for approximately 300 sites which would sample specifically for speciated data. Fifty speciated sites are required by regulation, the majority of which will be placed in dense emission areas such as the existing PAMS type 2 sites or at other sites with collocated FRM/FEM samplers (with some exceptions in SLAMS sites designated as background or transport which may not include FRM/FEM samplers). The balance between the 50 required sites and 300 planned sites reflects the need for tailoring certain sites to area specific needs. For example, some areas may choose to focus on episodes or specific seasons, such as a winter time wood smoke problem. Retaining a minimum of 50 sites for consistency across space and time for longer term trends allows other sites to address regional and local issues. The U.S.EPA does not believe that a single nationwide approach to speciation sampling and analysis is the best approach everywhere. The U.S.EPA expects that most sites will follow a sampling and analysis program similar to the 50 trends sites; however, alternative speciation approaches will be considered on a case-by-case basis through negotiation with appropriate U.S.EPA Regional Offices and Headquarters.

Special chemical speciation studies. Although the chemical speciation program described above is a critical tool in the $PM_{2.5}$ air program, routine programs often fall short of supplying the special data needs required for confident SIP development. Any assessment of technical tools such as emission inventories or air quality models which predict over continuous time and space frames benefit from monitoring that has increased spatial, temporal and chemical composition resolution. Historically, regulatory air programs have been criticized for not more fully utilizing special intensive studies to test the technical tools used for planning. To address these concerns, part of the monitoring program is dedicated to conducting specialized monitoring to address some of the rigorous demands involved in air quality assessments. Such monitoring

might include establishing "super" sites that sample for an array of chemical species on frequent sampling intervals. The sampling and analysis might result in diurnal profiles of size-resolved and chemically speciated aerosols. In addition, aerosol precursor and intermediate species such as nitric acid, ammonia, nitrogen dioxide and other NO_y constituents, peroxides and peroxy radicals could be measured to provide challenging tests of chemical mechanisms within air quality models. These measurements offer the peripheral advantage of supporting ozone and deposition assessments as well, since many of the physical and chemical processes operate across several pollutant categories. Other potential activities in special studies include enhancing some of the existing field studies, developing focused approaches on unique problem areas, and conducting elevated sampling through aircraft or other means.

Integration with visibility measurements. The 40 CFR 51 Regional Haze Regulation, proposed in the ***Federal Register*** on July 31, 1997, includes visibility monitoring requirements. The technical connections between visibility and fine aerosols are solid and logically point to a comprehensive monitoring program that services $PM_{2.5}$ and visibility assessments. These technical links include:

1. Fine particles are responsible for nearly all visibility degradation.

2. Visibility extinction budgets are calculated through speciated aerosol measurements; the measurement and analysis approaches virtually are the same.

3. Spatial scales associated with visibility measurements (regional) are frequently the same as spatial scales associated with background and transport $PM_{2.5}$ measurements (regional, urban). It is important to consider data collected in the regional haze program as part of the $PM_{2.5}$ data analysis activities.

4. Sources that affect visibility are the same sources that affect $PM_{2.5}$, and control programs that impact visibility impact $PM_{2.5}$ levels.

Clearly, the technical justification exists for merging these monitoring efforts. Similarly, there is pragmatic value of combining resource planning and network deployment efforts simultaneously as combined planning is far less burdensome than separate efforts. Currently, discussions are underway with U.S.EPA, State/local agencies and the Interagency Monitoring of Protected Visual Environments (IMPROVE) Steering Committee to facilitate this integration. IMPROVE chemically speciated data will also be useful in the overall $PM_{2.5}$ program. In fact, the nation is currently in the unusual position where aerosols are better characterized in rural/remote environments relative to urban and populated areas, due to the effectiveness of IMPROVE.

For the past several years, State Section 105 grant funds have been used to support visibility monitoring via the IMPROVE program. The IMPROVE Network is operated by a Steering Committee that includes the federal land managers who are responsible for preserving and improving air quality over the lands in their charge. Their involvement in such monitoring

programs represents a major advantage to U.S.EPA and the States for a number of reasons. They have access to secure monitoring locations and have provided staff to operate the equipment. For many sites, they have contributed the resources to purchase and operate complimentary monitoring equipment. They provide contract management for all phases of the field program (equipment procurement, deployment and maintenance; sample analyses; quality assurance; and data management). The IMPROVE Steering Committee also includes representatives from three state-based organizations (STAPPA, WESTAR, and NESCAUM) in recognition of the States' interest in this program. The forthcoming Regional Haze rule will include visibility monitoring requirements. With the technical connections between visibility and fine aerosols logically pointing to a comprehensive monitoring program that services $PM_{2.5}$ and visibility assessments, a recently developed technical plan to integrate the network with the existing IMPROVE network. This plan includes establishment of 78 additional IMPROVE sites in or near Federal Class I areas over the next two years. Combined with the existing 30 IMPROVE sites funded through 105 Grants, these 108 sites, whose principal objective is visibility, will be considered part of the 1,500 site $PM_{2.5}$ network. The estimated costs are $2.12 million for 1998, and $4.04 million for 1999. Currently, discussions are underway with U.S.EPA, State/local agencies and the IMPROVE Steering Committee to facilitate integration of IMPROVE and the National $PM_{2.5}$ Monitoring Program.

Quality Assurance. The quality assurance (QA) program strives to develop a reliable data base within prescribed accuracy limits. The entire quality assurance program covers many areas:

1. Establishment of data quality objectives that lead to determining acceptable accuracy.

2. Development of standardized sampling operation, filter handling and weighing procedures.

3. Frequent quality control tasks such as flow calibration, temperature and pressure checks.

4. Collocation of instruments to quantify measurement precision.

5. Independent FRM audits to quantify system accuracy (including bias).

In addition, the consistency derived from the FRM/FEM certification effort should be considered a major component of the quality assurance program. The complex nature of aerosols present substantial challenges in estimating system bias. Unlike criteria pollutant gases, aerosol standards for instrument calibration do not exist. Consequently, an important national FRM audit program will be implemented to capture overall system accuracy (bias and precision).

Implementing the Program: Milestones, Mechanisms, and Resources

Schedules and Milestones. Table 1 provides a listing of the major actions and milestones for the implementation of the $PM_{2.5}$ monitoring network.

Table 1. $PM_{2.5}$ Monitoring Implementation Schedule.

ACTION	MILESTONE
40 CFR 58 $PM_{2.5}$ monitoring regulation	July 18, 1997
States & Regions develop network designs	September 1997 - June 30, 1998
States establish $PM_{2.5}$ sites	September 1997 - December 31, 1999
U.S.EPA Regions send States section 103 $PM_{2.5}$ grant guidance memo	December 15, 1997
Network design guidance (draft 9/20/97)	December 15, 1997
Delivery of 50 prototype $PM_{2.5}$ samplers to States via Regions	December 1997 - January 31, 1998
QA guidance on sampling/filter handling (Method 2.12)	December 1997
Delivery of 37 mm Teflon® filters for dichots (nat'l purchase)	December 1997
U.S.EPA Regions will negotiate section 103 work plans	December 15, 1997 - January 31, 1998
Preliminary feedback from States on # samplers and site types	January 15, 1998
Award for national procurement contract to buy 47mm Teflon® filters	January 31, 1998
States Section 103 grant applications due to Regions containing approved program work plans and draft network plans	February 1, 1998
U.S.EPA Regions award section 103 grants for $PM_{2.5}$ monitoring	February 15 - March 1, 1998
FY99 Section 103 grant guidance to Regions from OAQPS	March 1998
QA Handbook (Red Book) with final Method 2.12	March 1998
FRM Audit Plan	March 1998
FRM/FEM Final Certifications (process began 8/97)	March 31, 1998
U.S.EPA awards nat'l $PM_{2.5}$ sampler proc. contract & makes 1st orders (info on # and type of samplers must be compiled by Regions and to OAQPS by March 2, 1998.)	March 31, 1998
U.S.EPA Regions provide comments to States on the draft network plans submitted with grant applications.	April 2, 1998
Speciation monitoring guidance (Draft in January 1998)	April 1998
Continuous monitoring guidance (Draft in January 1998)	April 1998
FRM/FEM samplers delivered to States (from 3/98 order)	June 1, 1998

Delivery of 47mm Teflon® filters	June 1, 1998
States submit final $PM_{2.5}$ network descriptions to Regions	July 1, 1998
Regions approve final $PM_{2.5}$ network descriptions	July 31, 1998
Speciation samplers delivered to States	September 30, 1998
Delivery of 47mm filters for speciation samplers (nat'l small purchase)	September 30, 1998
Portable QA FRM audit samplers delivered	October 30, 1998
Speciation laboratory analysis contract award	December 1998
Quality assurance project plans approved by Regions	December 1, 1998
1,100 $PM_{2.5}$ sites are established	December 31, 1998
States begin "routine" data collection at 1,100 sites	January 1, 1999
1,500 $PM_{2.5}$ sites are established (1100 from 1998 + 400 add'l sites)	December 31, 1999
States begin "routine" data collection at 1,500 sites	January 1, 2000
U.S.EPA Regions conduct oversight conference calls and/or visits with States on implementation of $PM_{2.5}$ monitoring networks.	Quarterly
U.S.EPA reports on the States $PM_{2.5}$ Monitoring Network implementation in mid-year and end-of-year grant reports.	Semi-annually

Major National Procurements. The U.S.EPA is developing national procurement contracts for elements of the program that benefit from centralized (or regional) coordination. Potential benefits include a net reduction in administrative burden, the advantage of economies of scale, consistency in services/products supplied, and the increased ability to account for expenditure of State Grant funds. National procurement efforts in place or under development include:

1. Multi-vendor, 5-year, National $PM_{2.5}$ Sampler Procurement Contract for the purchase of samplers including FRM/FEM (both single channel and sequential varieties), speciation samplers, and portable FRM audit samplers, and associated spare parts for each. The Request for Proposals was published on October 30, 1997, the vendor pre-proposal conference was held on November 6, 1997, and contract award is slated for March 31, 1998.

2. National 5-year contract for purchasing the 47 mm Teflon® filters used for the $PM_{2.5}$ FRM/FEM; national small purchases for the 47 mm quartz and nylon filters used in the $PM_{2.5}$ speciation modules; and a national purchasing vehicle for the 37 mm Teflon® filters used for dichotomous samplers.

3. Field and laboratory support for national FRM audits.

4. Laboratory services for chemical speciation filter analyses.

5. OAQPS small purchase orders for 50 prototype $PM_{2.5}$ samplers for delivery to Regions and then on to State and local agencies. Funds for these samplers were taken from U.S.EPA OAQPS' budget, and did not require a Section 103 grant tap.

These procurement efforts are a service provided by the U.S.EPA, and although State/local agency participation is not mandatory, the practical considerations of resource planning by the government and the vendor community almost demand an extremely high level of participation in these efforts.

Resources and Grant Allocations. The complete deployment of this network by December 31, 1999, will be provided by grant funds allocated by Congress under authority of the Clean Air Act, Section 103. These funds will cover all network establishment and operational costs (all categories of capital, operations and maintenance, and labor) in FY98 and FY99. A summary of the funded $PM_{2.5}$ monitoring network elements is provided in Table 2. These grant funds cannot be spent on programs unrelated to establishing the $PM_{2.5}$ network, nor for items that do no directly benefit the States/local agencies. Since several aspects of the monitoring program involve national procurements; substantial levels of Grant funds will be withheld to meet these expenditures. Categories subject to grant withholding include funding for samplers purchased from the National $PM_{2.5}$ Sampler Procurement Contract (FRM/FEM, portable FRM audit samplers, and speciation samplers), filters, chemical speciation analyses, IMPROVE samplers, and national FRM performance audit costs.

Table 2. Section 103 Grant Funding and $PM_{2.5}$ Monitoring Network Elements.

FY98 - $35,678,000 Section 103 Grant Funding Provided to States *Elements Funded*:	**FY99** *Anticipated Elements*
1,100 $PM_{2.5}$ Sites (existing sites and new FRM/FEM sites, all categories of site preparation, site establishment, samplers, and associated equipment.)	1,500 $PM_{2.5}$ sites (includes 400 additional sites plus costs for 1,100 existing sites, all categories of site operation and maintenance, site preparation, site establishment, samplers, and associated equipment. Also, includes sampler replacement costs for existing non-FRM/FEM sites--approx. 141 dichots, continuous samplers, PM_{10}-$PM_{2.5}$ conversions, and nephalometers.)
Filters (47 mm Teflon®, nylon, & quartz, for use in FY99 + 37 mm Teflon® filters)	Filters (47 mm Teflon®, nylon, & quartz, for use in FY00 + 37 mm Teflon® filters)
meteorological equipment, installation, operation and maintenance (25 stations)	Operation and maintenance for established meteorological stations
Continuous samplers (52)	Continuous Samplers (operation and maintenance for 52 sites + possible other new sites)
Characterization (or saturation) studies	Special chemical speciation studies
Laboratory upgrades (weighing rooms, balances, etc.)	Laboratory upgrades (weighing rooms, balances, etc.)
Speciation sampler modules (20)	Speciation sampling (additional modules, sampling and analysis, operation and maintenance)
IMPROVE sites (30 upgrades to existing sites + 20 new sites)	IMPROVE sites (58 additional sites + operation and maintenance for existing sites)
National FRM performance audit infrastructure costs	National FRM performance audits

** U.S.EPA's anticipated funding level request for FY99.*

For FY00, it is anticipated that the U.S.EPA will request additional grant funds to help offset the costs of operating and maintaining the $PM_{2.5}$ network. It is also anticipated that funding for the $PM_{2.5}$ monitoring network will revert back to Section 105 authority under the Clean Air Act, meaning that the States will be required to provide matching funds in order to qualify for the federal dollars. The projected increase in grant funds may necessitate an increase in State funds in order to meet the matching requirements (60% federal funds - 40% non-federal funds).

Internal U.S.EPA Resources. The suite of guidance products and overall program management requires substantial internal U.S.EPA resources beyond the Section 103 grant funds described above which support the mainstream of State and local efforts. The U.S.EPA Regional Offices and the Office of Research and Development also have significant resource requirements in supporting this program. Complete details of the internal U.S.EPA budget requirements are included in other sections of the full $PM_{2.5}$ Monitoring Implementation Plan.

Training. The implementation of any new ambient monitoring program requires resources dedicated to providing appropriate training in a number of diverse subjects; deploying a network to monitor a new pollutant with a new sampling method requires exceptional efforts. Given that the new monitoring network for $PM_{2.5}$ will involve the selection of new sites, the operation of new Federal Reference Method (FRM) monitors, the evaluation of other candidate monitoring methods, the analysis of existing demographics, and new metrics, a comprehensive and diverse training program is required. This program is designed in cooperation with the STAPPA/ALAPCO PM Monitoring Training Subgroup to meet the needs of a range of environmental managers, data analysts, and technical staff, at the federal, state, and local government levels as well as selected representatives from the private sector.

Four $PM_{2.5}$ monitoring training areas are currently being focused on which include $PM_{2.5}$ network design, sampler operations and the FRM, laboratory procedures, and quality assurance/quality control for field and laboratory activities. U.S.EPA is using a number of mechanisms for both formal and informal training with stakeholders in the $PM_{2.5}$ monitoring program. A listing of these mechanisms follows:

- **Workshops**
- **Satellite Training** - Satellite training workshops will be crafted to provide an initial overview for managers and a technical program for monitoring and laboratory technicians with an interactive component. These productions will be available on video tape for later viewing. The first of these broadcasts took place on October 14, 1997, and four additional ones are planned.
- **Technical Assistance** - U.S.EPA is providing expert assistance from OAR, the Regional Offices and ORD scientists and engineers in the design and implementation of specific $PM_{2.5}$ monitoring networks. Additionally, U.S.EPA is exploring the use of contractual assistance for both State and Local government in the design and operation of $PM_{2.5}$ monitoring networks.
- **Courses** - The U.S.EPA is revising its existing Air Pollution Training Institute (APTI) courses to incorporate $PM_{2.5}$ monitoring information. Courses will take the form of on-site training, satellite broadcasts, or self-instructional courses.
- **Guidance Manuals**
- **Web Site** - Technical information pertaining to $PM_{2.5}$ monitoring is posted on the Ambient Monitoring Technology Information Center (AMTIC), URL address http://www.epa.gov/ttn and then select AMTIC. The current seven categories of $PM_{2.5}$ information are: NAAQS and CFR; Network Design; Federal Reference Method; Points of Contact; Quality Assurance, Speciation, and Training.

- **End User Provided Training -** Each of the Stakeholders in this project are supplying some $PM_{2.5}$ training.
- **Hands On Training -** The U.S.EPA's OAQPS and ORD are developing an onsite monitoring platform in Research Triangle Park, NC, that is planned to serve as a technical training center and research platform for routine and emerging sampling technologies (Jenkins Road Platform). The U.S.EPA is also providing each Regional Office with prototype $PM_{2.5}$ FRM/FEM samplers to be used to familiarize State/local agency personnel in basic sampler operation.

U.S.EPA has formulated a $PM_{2.5}$ Training Group to provide counsel in the development of $PM_{2.5}$ training programs. Currently U.S.EPA is engaging the assistance of such varied groups as the Northeast States Consortium of Air Use Managers (NESCAUM), the Western States Air Resources Council (WESTAR), the Mid-Atlantic Region Regional Air Management Association (MARAMA), the California Air Resources Board (CARB), the Air and Waste Management Association (A&WMA), the State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Control Officials, and others.

Roles and Responsibilities

The degree of complexity and the number of agencies involved with the $PM_{2.5}$ monitoring program require that the flow of information and associated communications be structured to optimize the collective resource efforts. The only realistic perspective on implementing this large program is one that recognizes that deployment and operation of this network is a shared responsibility among the involved governmental entities at the national, state, and local levels. The purpose of the following descriptions of roles across programs is to facilitate communications, and to outline very basic responsibilities.

State and local agency responsibilities. U.S.EPA could not effectively plan and execute this program without State/local participation. State and local agencies bear a tremendous amount of responsibility in implementing the $PM_{2.5}$ monitoring program. It is imperative that State and local agencies work with the U.S.EPA Regional Offices throughout this process to identify problems as early as possible, and to help find solutions to many of these issues. Some of the major activities that States and locals will deal with during the period of this program include:

- Participate in the $PM_{2.5}$ network development activities. Identify and communicate $PM_{2.5}$ network implementation problems to Regions as early as possible. Characterize problems in spending resources adequately, in obtaining technical guidance, and other issues that will complicate the implementation of this program.
- Provide $PM_{2.5}$ network descriptions; work with Regions in developing these descriptions.
- Provide Quality Assurance Project Plans (QAPPs); work with Regions in developing these QAPPs.
- Provide information to Regions for sampler and filter orders from national contracts and other procurement vehicles.
- Identify and establish $PM_{2.5}$ monitoring sites.
- Purchase support equipment for $PM_{2.5}$ monitoring sites and network.
- Prepare sites and install $PM_{2.5}$ monitoring equipment.
- Conduct acceptance review of $PM_{2.5}$ samplers upon receipt. Inform U.S.EPA of any major acceptance problems.
- Participate in/run characterization studies.
- Participate in training activities, including multi-State conferences, U.S.EPA satellite broadcasts, and other training vehicles.
- Operate and maintain $PM_{2.5}$ sites including operating FRM/FEM samplers, continuous samplers, and speciation samplers.
- Work with speciation laboratories to conduct filter analyses.
- Input $PM_{2.5}$ mass and supporting data into the U.S.EPA's Aerometric Information Retrieval System (AIRS); conduct associated data validation activities.
- Review $PM_{2.5}$ networks annually, and provide SLAMS data reports.
- Communicate with the public, including providing information on the $PM_{2.5}$ network as requested, pollutant index reporting, and other bulletins.
- Provide PM_{10} network reduction proposals to the Regional Offices as appropriate. PM_{10} network reductions are encouraged as $PM_{2.5}$ networks are being deployed.

The Office of Air and Radiation's Office of Air Quality Planning and Standards, the Office of Research and Development's National Exposure Research Laboratory, and the ten Regional Offices are the primary participants in the overall implementation of the $PM_{2.5}$ monitoring network. The Office of Administration and Resources Management's Contracts Management Division is providing critical contractual support to establish the variety of national procurement contracts and small purchases. Major responsibilities for each of these offices are listed here.

U.S.EPA Regional Office Responsibilities. The U.S.EPA Regional Offices are the major communication link with State/local agencies in terms of both communicating the needs and concerns of States to U.S.EPA program offices and in communicating the objectives and guidance that often are developed by headquarters to the State/local/tribal agencies. This role is rather complex and absolutely necessary in the development of effective policies and programs.

U.S.EPA's lead region for air monitoring issues is Region 6, and Region 1 for air program issues; however, each of the ten Regional Offices have significant responsibilities toward implementing the $PM_{2.5}$ program. These responsibilities include the following activities.

- Participate in the $PM_{2.5}$ network development activities. Identify and communicate $PM_{2.5}$ network implementation problems to the OAQPS as early as possible.
- Provide support to the States as they develop their $PM_{2.5}$ network descriptions; approve the initial network descriptions by July 31, 1998, and provide annual approvals thereafter.
- Provide support to the States as they develop their QAPPs; approve these QAPPs before formal data collection activities begin (January 1, 1999).
- Obtain and compile information from States for sampler and filter orders from national contracts; provide these orders to the OAQPS.
- Inform ORD and OAQPS of any major sampler acceptance problems identified during the State's acceptance review of $PM_{2.5}$ samplers.
- Support the use of characterization, or saturation, studies.
- Participate in training activities, including multi-State conferences, U.S.EPA satellite broadcasts, and other training vehicles. Identify training needs and communicate these needs to the OAQPS.
- Provide for the speciation laboratories to conduct filter analyses.
- Support the national FRM quality assurance audits.
- Communicate with the public, including providing information on the $PM_{2.5}$ network as requested, pollutant index reporting, and other bulletins.
- Provide SLAMS network approval authority and management activities. Take immediate action to review all SLAMS PM_{10} proposed network reductions and all $PM_{2.5}$ network additions.

U.S.EPA Office of Air Quality Planning and Standards responsibilities. Most budgetary and technical planning activities are coordinated through the Office of Air Quality Planning and Standards (OAQPS). The Monitoring and Quality Assurance Group (MQAG) within the Emission Monitoring and Analysis Division (EMAD) is ultimately responsible for this

implementation plan, most technical components (with support from ORD, RO's and States) and resource estimates underlying program implementation. Substantial additional support related to data analysis is provided from the Air Quality Trends and Analysis Group. Various forms of resource guidance necessary for the Section 103 and 105 grants distribution is coordinated through the Planning, Resources, and Regional Management staff within OAQPS. In addition, the Information Transfer and Program Integration Division is responsible for the Aerometric Information Retrieval System (AIRS) data management system and for the Air Pollution Training Institute.

- Primary responsibility for 40 CFR 58 regulation and communication to Regions, States/locals.
- Provide national program direction and planning.
- Provide Section 103 grant funding, allocations, and guidance.
- Provide for and support the AIRS national data repository.
- Provide training and guidance on the variety of elements required for the $PM_{2.5}$ network deployment and operation; areas include network design, sampler operation, filter handling, speciation sampling and analysis, quality assurance activities, etc.
- Assist in the development and approval of the $PM_{2.5}$ networks; support both the Regional and State/local offices.
- Resolve issues associated with the $PM_{2.5}$ program; act as a liaison with the Contracts Management Division, the Regions, and the ORD.
- Ensure that national or regional laboratories are available to support speciation and quality assurance programs.
- Track progress in implementing the $PM_{2.5}$ program.
- Identify and support special chemical speciation studies, and characterization studies including the support of the saturation monitoring repository.
- Conduct management systems reviews of Regional Offices beginning in FY99.
- Provide support and direction for the national procurement contracts, including the preparation of statements of work, and technical evaluation of proposals.
- Establish communication links to Regions and State/local agencies through a variety of vehicles including work groups and electronic communications such as the Internet web site.
- Analyze and interpret the $PM_{2.5}$ data, conduct comparisons against the NAAQS.
- Provide for the National Air Monitoring Station (NAMS) network approval authority and for NAMS network management activities. Take immediate action to review all PM_{10} proposed NAMS network reductions, and all $PM_{2.5}$ NAMS network additions.
- Support the IMPROVE program and the operation of visibility measurement sites as they are integrated with the $PM_{2.5}$ monitoring program.

U.S.EPA Office of Research and Development responsibilities: The ORD's National Exposure Research Laboratory provides many of the technical infrastructure elements for the program. This support includes:

- Certify $PM_{2.5}$ samplers as FRM/FEM, and provide technical support.
- Provide technical support for the national procurement contracts.

- Provide technical standard operating procedures (SOPs) for filter weighing.
- Work with OAQPS and the Regions to support the quality assurance program development, including providing Method 2.12 for $PM_{2.5}$ monitoring.
- Provide technical SOPs and specifications for chemical speciation analyses.

U.S.EPA Contracts Management Division responsibilities. The Contracts Management Division (CMD) within the Office of Acquisition Management (OAM) is responsible for issuing contracts and various national procurements. These contracts are developed in concert with EMAD contract specialists and MQAG and ORD technical staff. The CMD is responsible for all communications with vendors and extramural contract organizations.

- Develop national contracts for the sampler purchases and filter purchases; work with ORD and OAQPS contracts and technical staff to provide these products.
- Provide Contracting Officer and other contracting support for national procurements.

U.S. Department of Interior, National Park Service responsibilities. The National Park Service and federal land managers have a sincere interest in the Regional Haze program led by the U.S.EPA. They are currently operating IMPROVE visibility measurement sites, and they will continue to work with the U.S.EPA and other involved agencies in this regard.

Communications

An organized communications framework is needed to facilitate the flow of information among the parties listed above as well as other users of the information produced by the $PM_{2.5}$ network. Figure 1 provides an overview of the principal communications pathways. Note that in addition to communications among U.S.EPA and State/local agencies, other Federal agencies, industry and academia are important data users. Table 3 provides a listing of existing and emerging workgroups working within the $PM_{2.5}$ program. Electronic transmission of information on this program is available through U.S.EPA's Internet site at http://www.epa.gov/ttn, under AMTIC.

Figure 1. Overview of Principal Communication Lines.

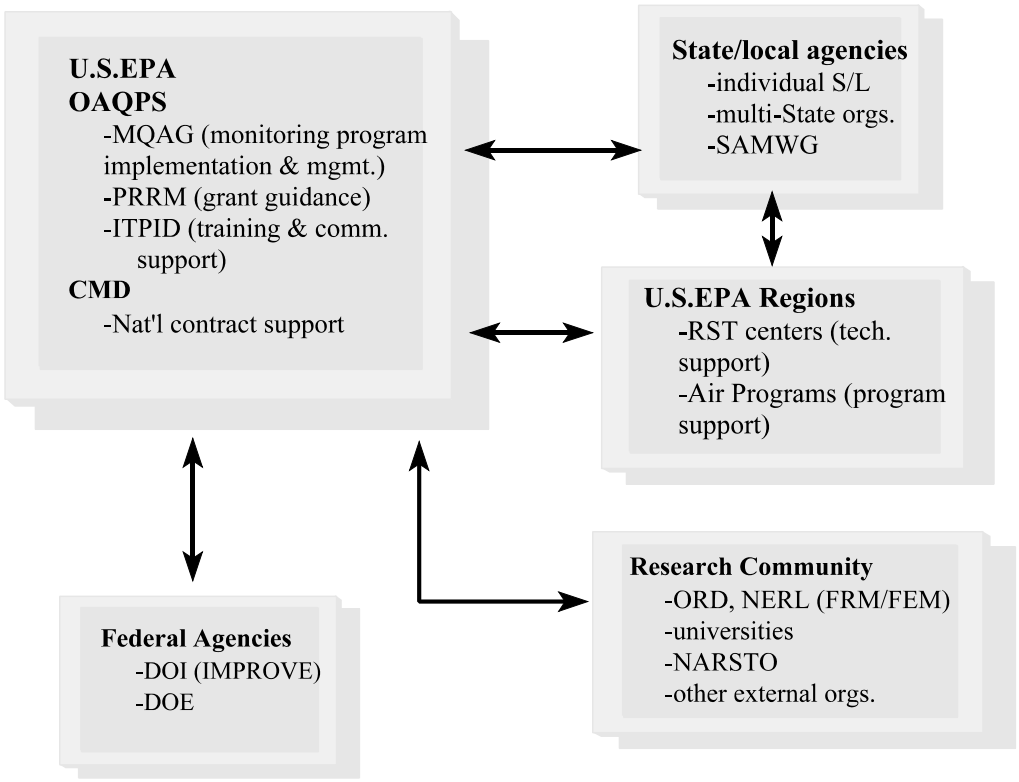

Table 3. Workgroups Addressing $PM_{2.5}$ Monitoring Implementation

Existing Workgroups/Teams	Members & Primary Contacts	Function	Products
MQAG/U.S.EPA Implementation Team	MQAG/OAQPS/RO staff Lee Byrd, Rich Scheffe	Core working group to coordinate development of technical guidance products and budgets, and communicate program elements across OAQPS	State Grant Allocations; Cost Estimates; Consistent Communications; Overall Implementation Plan
$PM_{2.5}$ Network Design Workgroup	OAQPS-MQAG, RO staff Neil H. Frank	Core U.S.EPA monitoring workgroup to track progress and to deal with issues/problems related to the design of $PM_{2.5}$ networks and their establishment.	Bi-monthly progress tracking reports; problem resolution on network design issues; network design guidance document
OAQPS $PM_{2.5}$ QA Team	OAQPS-MQAG Mike Papp	Core team that is ultimately responsible for the development of the quality system and its associated guidance and training.	QA Guidance documents including distribution of Method 2.12 and QA Handbook revisions.
$PM_{2.5}$ Quality Assurance Workgroup	OAQPS-MQAG/RO staff/ORD Mike Papp	Core work group to advise OAQPS $PM_{2.5}$ QA Team on quality assurance program	Technical input into guidance documents including Method 2.12 and QA Handbook revisions.
Chemical Speciation Workgroup	MQAG, RSTs, ORD, CARB Jim Homolya	Core work group to develop speciation program	Laboratory SOPs; Speciation Guidance Documents; Speciation Contract

National Monitoring Contract Workgroup	EMAD, CMD, OAQPS, ORD David Mobley, Vickie Presnell	U.S.EPA Headquarters Work group to develop National Monitoring Contract for Samplers	National $PM_{2.5}$ Sampler Procurement Contract
PM Steering Committee/ Associated Work Groups: -Allocation/Programmatic -Process -Communications	U.S.EPA OAR, Regions 1 & 6, States/Locals	The Allocation/Programmatic WG addresses funding issues (including tribal monitoring) and the network phase-in options. The Process WG is responsible for the development of grant guidance materials. The Communications WG is responsible for reviewing and supporting OAQPS communication activities.	Section 103 grant application form (completed) Internet site for $PM_{2.5}$ program
SAMWG	States/Locals; U.S.EPA OAQPS, U.S.EPA Regional Offices, Dr. Richard Scheffe	Advisory Panel to OAQPS on monitoring plans; programmatic, policy and technical issues; liaison with other State and locals	
STAPPA/ALAPCO Monitoring Committee	States/locals, MQAG U.S.EPA contacts: Rich Scheffe, Lee Byrd	Committee to identify and provide comment to U.S.EPA on State/local agency issues that arise with the $PM_{2.5}$ monitoring program implementation.	
IMPROVE Steering Committee	U.S.EPA; States; Universities Marc Pitchford Bruce Polkowsky	Directing IMPROVE visibility monitoring program	Provide for DOI operation of the IMPROVE visibility measurement sites.

Upcoming/New Committees			
Special Chem. Speciation Advisory Panel	National Experts; U.S.EPA; States/Locals	Provide guidance on preferred special studies projects	
Special Chem. Speciation Steering Committee	States/Locals; U.S.EPA	Based on Advisory Panel guidance and other needs; approve/disapprove special projects; Direct program to meet National and Regional Goals; Manage Resource allocations and distributions	

Technical Components

The following overview describes the approaches developed on implementing the major technical program elements (Network Design, Chemical Speciation, Quality Assurance, and Data Analysis).

Network Design/Deployment of Samplers

The design of $PM_{2.5}$ networks, including monitor siting, selection of sampler designs, and selecting sampling frequencies, consists of several phases beginning with the promulgated 40 CFR 58 monitoring regulations which provide general national direction, and leading to the final iterative stages where the details of exact locations and sampler selections are coordinated between State/local agencies and U.S.EPA. The eventual network design will reflect a balance of practical considerations and desired conceptual characteristics. Some of these practical considerations include the accelerated 2-year phase-in schedule which shifts greater emphasis to the use of existing platforms (as opposed to new locations), and the use of the National $PM_{2.5}$ Sampler Procurement Contract's impact on the timing of sampler orders and delivery. Although the regulation indicates that the State's plans are due to U.S.EPA by July 1, 1998, State participation in the National $PM_{2.5}$ Sampler Procurement Contract and the new 2-year funding schedule will requires that draft plans must be submitted to and reviewed by U.S.EPA in a shorter time frame (sampler orders will be placed in March 1998).

Network design can be broken into two phases, the first consisting of "national" estimates or general guidance, and the second more refined stage where exact locations and other details are proposed by State/local agencies and approved by U.S.EPA Regional Offices. The first phase (a 1,500 site network deployed over a two year period) is completed and was formed by a combination of a basic network providing mimimal population coverage together with a largely top-down allocation of supplemental monitoring sites proposed by U.S.EPA. OAQPS' most recent estimates of the number of required SLAMS and supplemental monitoring sites by State are described in Tables 5a-b, at the end of this discussion. The combination of required SLAMS monitoring sites which will utilize FRM/FEM samplers together with supplemental monitoring sites which can use alternative samplers will provide the States with broad flexibility in establishing their networks.

The more important second phase is largely a State/local activity that is coordinated with U.S.EPA Regional Offices. The means through which network design descriptions are finally developed can be broken into four categories:

1. Major National guidance

    - 40 CFR 58 monitoring regulations
    - Network design guidance documents
    - Grants guidance and associated resource allocations

2. Continuing guidance

    - Correction notices to existing regulation

- Memoranda on specific topics such as waivers for every day sampling and changes to sampling protocols
- Network design workgroup input

3. Workshops and meetings

4. Discussions/negotiations, technical reviews, and site visits among State/local and U.S.EPA agencies.

Once complete, the final network description will be forwarded to the appropriate Regional Office by July 1, 1998, for approval by the Regional Administrator by July 31, 1998. Each network description will contain information on site locations; monitoring methods; sampling frequency; monitoring objectives; optional community monitoring zones and sites intended for making comparisons to the $PM_{2.5}$ NAAQS; and a plan for deployment of future sites, implementation of quality assurance procedures and other needed changes to the monitoring network.

An OAQPS/Regional Office work group has been established to help facilitate the development of the new PM monitoring networks. Through bi-weekly conference calls, the group has been reviewing network design issues, preparing supplemental guidance, and resolving technical issues related to establishment of the new $PM_{2.5}$ monitoring sites. The group has adopted a network design tracking status report with which each Region will summarize the network design activities among its States. This report will allow Regional and OAQPS management to judge the positive movement of network design activities and highlight problem areas that require additional attention or problem solving. The tracking system will first report on general activities such as completed Regional/State discussions/meetings and will later discuss specifics such as identification of monitoring equipment, numbers and location of monitoring sites and completion of grant agreements. Issues that cannot be resolved or major impediments to the implementation of the network will be identified for management review.

To ensure national consistency in the development of the PM networks and adherence to the principles and goals set forth in the regulation, the OAQPS/Regional Office work group will compare and evaluate the State network plans across all 10 U.S.EPA Regions. The group will serve in an advisory role and its review will focus on (a) consistent deployment of compliance monitoring sites which principally represent community-oriented air quality and (b) uniform implementation of allowable waivers for sampling frequency, siting and other network requirements. An initial review will be conducted upon the January 15 submittal of draft network plans and periodically as revisions to the network plans are received. A final review will occur upon submittal of the July 1, 1998 formal network descriptions. This process is also intended to facilitate information exchange , to assist the States in benefitting from innovative ideas and capitalizing on opportunities to make efficient use of available monitoring resources.

Table 4 summarizes the steps, associated vehicles and milestones associated with network design and deployment of monitors.

Table 4. Network design components and key milestones.

Component	Role	Date
Monitoring Regulations	Description of network components and requirements	7/18/97
EPA and State Workshops	Forum for dissemination of guidance, regulation interpretations, and establishing initial network descriptions [MARAMA, NESCAUM, WESTAR, SAMWG, U.S.EPA OAQPS and RO workshops]	9/97-continuous
Network Design Guidance	Conceptual guide to monitor placement, data uses and interpretation of U.S.EPA regulations	draft 6/97; final 12/97
Grant Allocations to RO's	OAQPS estimate of monitoring sites and associated resources by State	12/97
Draft network descriptions to U.S.EPA RO's	Initial estimates of # and type of sites and samplers Numbers and types of sites and samplers for March order (These activities accelerate the schedule for developing draft network descriptions.)	1/15/98 3/2/98
Deployment of test monitors	Initial U.S.EPA funded monitors delivered to each State for testing/familiarization purposes	11/97 - 3/98
National $PM_{2.5}$ Sampler Procurement Contract	Vehicle to procure samplers for network	contract award 3/31/98
Network descriptions	Final network descriptions submitted by States to U.S.EPA RO's	7/1/98; approval by 7/30

Insert Tables 5a and 5b here.

Chemical Speciation: Network, Sampling, and Laboratory Services Support

Requirements

Chemical speciation is included in the discussion of major monitoring requirements and principles set forth by the final 40 CFR Part 58 regulations. A chemical speciation network of 50 $PM_{2.5}$ sites that provides a first order characterization of the metals, ions, and carbon constituents of $PM_{2.5}$ is a requirement of this rule. These sites will be part of the National Air Monitoring Stations (NAMS) network and will provide national consistency for trends purposes and serve as a model for other chemical speciation efforts. This required network represents a small fraction of all the chemical speciation work that U.S.EPA expects to support with Federal funds. Additional efforts may be used to enhance the required network and to tailor the collection and analyses of speciated data to the needs of individual areas. For planning purposes, U.S.EPA anticipates the national deployment of approximately 300 speciation monitors over the next two years.

Implementation

Sampling. The speciation monitoring program consists of two components; sampling and laboratory analysis. The National Monitor Procurement program includes the provision for the purchase of over 300 speciation monitors, including accessories, and replacements for establishing the speciation monitoring network. The state-level $PM_{2.5}$ network design descriptions will contain specific details on speciation monitoring requirements and siting. Speciation monitors will be provided to the states, as requested, through delivery orders placed under the National Procurement. The sampling approach is consistent with that in the IMPROVE program. Essentially, three monitors (or modules) simultaneously collect on three filter media: teflon, nylon and quartz. The various filter providing appropriate substrates for elemental analysis through XRF (teflon), collection of nitrates (nylon) and combustion analysis for total elemental and organic carbon (quartz). The monitors can be similar to FRM/FEM instruments, or other available samplers. The FRM/FEM at a site can be used as one of the three modules since it already is equipped with a teflon filter. Many positive and negative artifacts occur are associated with aerosol sampling, especially with respect to organic compounds. Largely unquantifiable uncertainties exist that will drive research and development in new methods for sampling and analysis dedicated to characterizing the chemical constituernts of aerosols. Given the expectation that new methods will emerge combined with the noncompliance use of the data (i.e., speciated data are not compared to NAAQS), the U.S.EPA is not requiring FRM/FEM designations for speciation samplers.

Laboratory Analyses. Samples collected from the speciation monitors will be analyzed for a predetermined list of target constituents through a network of 1-3 central contract laboratories[1]. The constituents of interest are similar to those currently being measured within the IMPROVE monitoring program. The contract laboratories will utilize uniform standard

[1] Certain States will operate their own laboratory for chemical analyses. Given the need for consistent application of laboratory methods and limited resources, most States that have been surveyed (informally) did not expect to develop laboratory capability for chemically analyzing filters.

operating procedures (SOPs) and be directed and coordinated through three U.S.EPA Regional Delivery Order Project Officers (DOPOs) located in the Eastern, Midwestern, and Western parts of the country. Quality assurance oversight for the speciation laboratory services contractors will be provided by a complement of U.S.EPA Regional Science and Technology (RST) centers, each with specialized expertise in a particular set of speciation target constituents. The specific details regarding what service a particular regional laboratory provides is being developed through an inter-laboratory workgroup headed facilitated by Regions 1 and 7. Note that U.S.EPA Regional Office air programs will receive support for QA of speciated samples on a national level from the RST laboratories.

Resources

Speciation monitors will be purchased, installed, and operated using resources obtained through the State 103 Grants Program. Monitoring resource allocations for each state will be consistent with approved network design and siting plans. Speciation laboratory support services will be provided by establishing fixed-price unit costs for an appropriate tier of speciation analyses that can be provided. Each state will then allocate a portion of 103 grant monies to be included in a combined cost center to fund the contract laboratory services on a indefinite-quantity, indefinite-delivery basis. A deployment of 300 speciation monitors with one-in-six day sampling for 50 sites and one-in-twelve day sampling for the remaining 250 sites will require an estimated combined 103 grant allocation of $2.25M/year to support 2-3 contract laboratories to provide analytical services. The Regional Delivery Order Project Officers and QA support from the U.S.EPA Regional Science Centers will be provided using existing staffing and laboratory resources. OAQPS/EMAD will utilize existing staff and internal FY-98 funding to develop guidance on speciation monitoring, sample analysis, data analysis, and overall program management and coordination.

Roles and Responsibilities

The following organizations are identified with the requirements and implementation of the speciation monitoring and analysis program:

Requirement	Organization
Network Design and Siting	States(lead), OAQPS(support)
Speciation Monitoring Guidance	OAQPS
Speciation Sampler Purchase	States(lead), OAQPS(support)
Speciation Laboratory Services Support	OAQPS(lead), U.S.EPA Regions 2, 5, 10(lead)
Speciation Laboratory QA Auditing	U.S.EPA Regions 1, 2, 7,9,10 (lead), OAQPS

The Network Design and Siting requirement is being met through the development of state-level network design and siting plans which will provide speciation monitor purchase needs and planned locations. OAQPS/EMAD will assist the states in speciation monitor siting. The Speciation Monitoring Guidance is being addressed by OAQPS/MQAG with contractor support from Desert Research Institute and in consultation with several technical elements within the IMPROVE monitoring program. The guidance document will aid states in the use and application of speciation monitors. The Speciation Sampler Purchase will be supported by the National Monitor Procurement. The Speciation Laboratory Services Support and Speciation

Laboratory QA Auditing requirements are being addressed by a Speciation Workgroup led by OAQPS/MQAG with participation by selected U.S.EPA Regions.

Schedule

The schedule of outputs and deliverables for the five speciation program requirement categories is contained in Table 6.

Table 6. Schedule for Speciation Program.

Speciation Program Requirement	**Delivery Dates**
Network design and siting	
a. Guidance provided to States by OAQPS	12/15/97
b. Draft State design descriptions	1/15/98
Speciation monitoring and analysis guidance	1/30/98
Speciation Sampler Purchase	
a. Summarize sampler and filter requirements from States	3/2/98
b. Initial delivery of speciation samplers & filters to States	9/15/98
Speciation Laboratory Services Support	
a. Development of services contract workscope and SOPs	2/15/98
b. Award services contract	12/15/98
c. Begin speciation analytical services support	2/15/99
Speciation Laboratory Quality Assurance Auditing	
a. Develop QA protocols and Regional RST support plan	5/15/98
b. Integrate QA auditing support with State monitoring program and analytical services support contract	12/15/98
c. Develop schedule and implement regional QA auditing support for speciation analytical services	2/15/99

$PM_{2.5}$ Quality Assurance

An important concern in any organization that is collecting and evaluating environmental data must be the quality of the results. A quality system is being developed and documented to ensure that the $PM_{2.5}$ monitoring results:

- Meet OAR's regulatory and scientific data needs;
- Satisfy customers expectations;
- Comply with applicable standards and specifications;
- Comply with statutory (and other) requirements;
- Reflect consideration of cost and economics.

The quality system includes a number of quality assurance and quality control activities including:

- **Flow check audits** - on every SLAMS monitor once every two weeks for automated instruments and each calendar quarter for manual instruments performed by the State/Locals.
- **Collocated sites**- 25% of the SLAMS performed every 6 days by the State/Locals
- **FRM Performance Audits** - on 25% of the sites 4 times a year performed by the U.S.EPA Regions.
- **Technical systems audits** -performed by the State/locals and U.S.EPA.
- **Internal quality control**- activities performed as part of standard operating procedures

Each of these activities provides information that helps to control and evaluate the measurement system to ensure that the $PM_{2.5}$ network produces that quality of data necessary for informed decision makers.

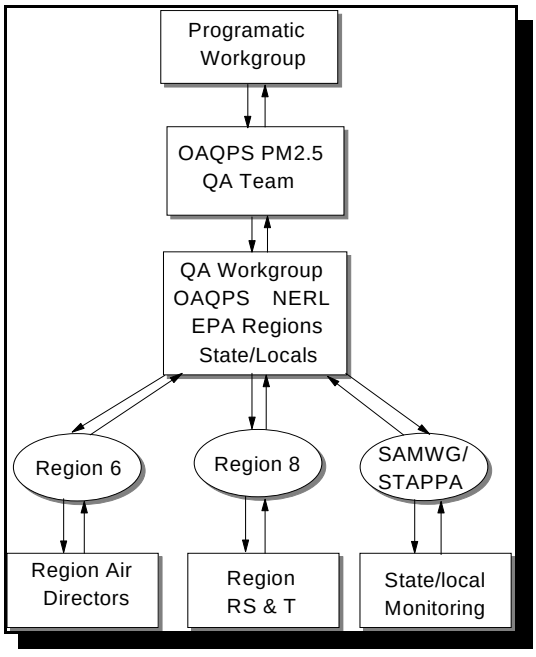

Figure 9.1 QA Communication

The quality system for $PM_{2.5}$ is being developed and will be implemented through a coordinated effort between U.S.EPA Headquarters and Regions, and the State and local monitoring community. Figure 9.1 represents the communication network for QA activities. This communication network is being used to develop and implement the $PM_{2.5}$ quality system and resolve QA issues. The various groups in this figure have the following responsibilities:

Programmatic Workgroup- Chaired by OAR/OAQPS and Region 1 and 6 to address such issues as Region-by-Region funding allocations, network phasing options and the definition of network composition. All QA activities requiring attention will be reported to this work group.

OAQPS $PM_{2.5}$ QA Team - This team is made up of QA personnel in the OAQPS Monitoring and Quality Assurance Group and meets

weekly to address implementation of the $PM_{2.5}$ quality system, develop budget allocations, develop/revise regulations, guidance and training, address specific technical issues and ensure proper communications among Headquarters, Regions, ORD, and State and local monitoring community. This group is ultimately responsible for the development of the quality system and its related guidance and training. Details of the roles and responsibilities within this group are included in Section 8.

$PM_{2.5}$ QA Workgroup- This group is made up of OAQPS, NERL, U.S.EPA Regions and State and local participants and it is used as an advisory group to assist the OAQPS $PM_{2.5}$ QA Team develop an appropriate and "implementable" quality system. This group meets every two weeks. It is used to help develop consensus QA approaches, resolve specific QA issues, and is also used as a communication device to ensure the Regional Air Directors, Regional Science and Technology (RS&T) Directors, and state and local monitoring communities have input into the development of the quality system.

Elements of the quality system include planning, implementation, and assessment. A listing of these products are included in Table 7. These development of these products will be will be the ultimate responsibility of the OAQPS $PM_{2.5}$ QA Team but will require the input of many organizations as well as contractor support.

Planning - Includes the development of:

- **Data quality objectives-** in order to understand and control measurement uncertainty (precision and bias) to acceptable levels.
- **Guidance documents** - That would include the QA Hand Book, various project specific guidance (e.g., FRM performance audits), training guidance and standard operating procedures
- **Training activities**- in order to ensure proper implementation of the quality system training is required. This Implementation Plan include a section specific to training. Table 9-1 lists QA training activities

Implementation - will include:

- **FRM Performance Audits** - Federally implemented performance audits conducted through the U.S.EPA regions
- **Technical systems audits**- Conducted by the U.S.EPA Regions of each reporting organization once every three years.
- **Network Reviews** - Conducted by the Regions and Headquarters to ensure network representativeness
- **Management Systems Reviews** - Conducted by Headquarters to review U.S.EPA Regions management/implementation of the $PM_{2.5}$ quality system.

Assessments - (conducted by U.S.EPA/OAQPS) will include:

- **Data Quality Assessments** - yearly assessments of data quality in relation to the data quality objects and the quality system
- **P&A Reports** - Quarterly and annual reports associated with the recision and bias data.
- **QA Reports** - All encompassing reports generated ~every 3 years that provide uncertainty estimates in the data base and report on the effect of the quality system to provide data of acceptable quality.

FRM Performance Audits. These audits are an additional element to the $PM_{2.5}$ program that attempt to quantify total system performance (precision and bias). Reference standards for aerosols are not available to challenge samplers in a manner comparable to gaseous pollutants. The FRM audits are designed to test the entire measurement system (sampler through laboratory filter weighing) through an independent means. The U.S.EPA Regional Office RST laboratories will be responsible for these audits. A combination of U.S.EPA contract and Federal personnel will perform these audits. Regional Laboratories (estimated 1-3) will develop filter weighing facilities as centers for these audits. Field activities will be conducted from each Region. Details on the FRM audit plan will be forthcoming from the RST group.

Products and Deliverables

Table 7. $PM_{2.5}$ QA Products and Deliverables

Product/Deliverable	Completion
Planning Products	
QA Hand Book	3/98
Mass DQOs	10/97
Speciation DQOs	3/98
FRM Performance Audit Implementation Plan	3/98
FRM Performance Audit SOPs	5/98
Speciation Quality Assurance Project Plans	1/99
Speciation SOPs	1/99
Technical Systems Audits Plans	
Management Systems Review Guidance	3/98
Network Review Guidance	6/98
QA Outreach Document	3/98
Data Review Guidance	1/98
Implementation (Dates are implementation dates)	
FRM Performance Audits	1/1/99
Technical Systems Audits	9/30/98
Network Reviews	9/30/98
Management Systems Reviews	1/1/99
Assessments	
Data Quality Assessments	9/30/99
P & A Reports	6/3/99
QA Reports	1/1/00

Analysis of $PM_{2.5}$ Data

Although not strictly a monitoring discipline, the relationship between data collection activities and data interpretation and analysis must be considered in the network's design and subsequent changes in later years. That is, although data collection precedes analysis and interpretation, an understanding of the data's use, particularly with respect to making comparisons to the $PM_{2.5}$ NAAQS, must drive the design of a data collection program.

Following are some of the anticipated analyses of the data collected from the $PM_{2.5}$ monitors. Many of these analyses will be performed by OAQPS, others by the regions and state and local agencies, and some by multiple, interested groups. To assist the state and local agencies, OAQPS/EMAD will provide guidance regarding various techniques for analyzing the $PM_{2.5}$ mass and speciated data. Additionally, OAQPS/EMAD will conduct workshops to assist the state and local agencies in the use of these techniques in the analysis of the $PM_{2.5}$ data.

The data analysis will proceed in three phases. The first phase occurs from now until the time that monitors begin reporting data. During this time, the guidance for the techniques for analyzing the $PM_{2.5}$ data will be developed. The second phase will occur from the time that the monitors first begin reporting data until a couple of quarters of data are available. During this time, OAQPS will assess the data for its precision and accuracy and conduct some preliminary exploratory data analyses. The purpose of this phase is to provide a report documenting the "state of the data." The third phase begins once there is sufficient, quality-assured data to conduct the analyses based on several quarters worth of data. During this third phase, OAQPS will conduct the workshops to assist the state and local agencies in the analyses of their data.

Uses of the $PM_{2.5}$ Mass Data.

Support of the PM NAAQS. After at least 3 years of data are available, the measured $PM_{2.5}$ levels will be compared to the 24-hour and annual National Ambient Air Quality Standards for the purpose of determining nonattainment designations. Prior to the designations, the data will be analyzed for informational purposes and as part of the ongoing PM NAAQS review process.

Analysis of Trends. The annual trend in $PM_{2.5}$ concentrations will be analyzed to track progress in solving $PM_{2.5}$ air quality problems. Initially, a baseline will be established, from which progress can be evaluated.

Exploratory Data Analysis. Currently, our understanding of the extent of transport contributions, temporal variability, spatial variability, and impact of meteorology for $PM_{2.5}$ concentrations is limited due to the minimal network currently monitoring $PM_{2.5}$ concentrations. Exploratory data analyses will be performed to enhance our understanding of the sources of variability. This understanding is essential for developing strategies for controlling $PM_{2.5}$ concentrations.

Episode Selection for Air Quality Modeling. Since air quality models predict concentrations for only a few days of a year, due to the expense of running such models, it is important to determine which days, or episodes, to model. The $PM_{2.5}$ monitoring network will

provide the needed data for determining the correspondence between urban scale or mesoscale meteorological observations and $PM_{2.5}$ concentrations to aid in episode selection.

Uses of the $PM_{2.5}$ Speciation Data.

Exploratory Data Analysis. As with $PM_{2.5}$ mass data, exploratory data analyses will enhance our understanding of the extent of transport contributions, the spatial and temporal variability of the constituents of the fine particulate and the impact of meteorology on the constituents. Furthermore, at the sites with both $PM_{2.5}$ speciation monitoring and PAMS monitoring, we will perform analyses to investigate the relationships between $PM_{2.5}$ constituents and other ozone precursors. Additionally, where $PM_{2.5}$ mass and speciation monitors are collocated, we will develop an empirical relationship between the $PM_{2.5}$ mass observations and the mass concentration obtained from the speciation monitors. Such an analysis will provide information about the quality of the measurements from the FRMs.

Analysis of Trends. The annual trend in $PM_{2.5}$ constituents will be analyzed to track progress in solving $PM_{2.5}$ air quality problems. Initially, a baseline will be established, from which progress can be evaluated. Additionally, it is possible to construct estimates of visibility from the constituents monitored at the $PM_{2.5}$ speciation sites, thus trends in visibility can be analyzed.

Source Apportionment. The $PM_{2.5}$ mass monitors will identify the regions of the country with high $PM_{2.5}$ concentrations. The speciation network will be used to determine which constituents contribute to the high mass concentrations. Such information will be used in developing strategies for controlling $PM_{2.5}$.

Air Quality Model Evaluation. The speciation network will provide the data necessary to evaluate the predicted concentrations from air quality models to the ambient concentrations, at a species level. Such comparisons will be useful for identifying ways to improve the air quality models.

Additionally, the data from the $PM_{2.5}$ network will provide information that will assist with numerous other studies. For examples, the data will be invaluable to studies evaluating the costs and benefits of the 1990 Clean Air Act and its Amendments and to the ongoing health effects studies.

Schedule

A data analysis program is under development, and details regarding mechanisms, programs, and schedules are forthcoming.

Common Acronyms in the $PM_{2.5}$ Program

AIRS - Aerometric Information Retrieval System (maintained by the U.S.EPA)

ALAPCO - Association of Local Air Pollution Control Officers

AMTIC - Ambient Monitoring Technology Information Center, from U.S.EPA Internet site at http://www.epa.gov/ttn

CAA - Clean Air Act

CFR - Code of Federal Regulations

CMD - Contracts Management Division (within the Office of Acquisition Management, U.S.EPA)

CORE - community-oriented monitoring

FRM/FEM - Federal Reference Method/Federal Equivalent Method as approved by U.S.EPA

GPRA - Government Performance and Results Act

IMPROVE - Interagency Monitoring of Protected Visual Environments

ITPID - Information Transfer and Program Integration Division (within U.S.EPA OAQPS)

MARAMA - Mid-Atlantic Regional Air Managers Association

MQAG - Monitoring and Quality Assurance Group (within Emissions, Monitoring & Analysis Division of the Office of Air Quality Planning and Standards, U.S.EPA)

NAAQS - National Ambient Air Quality Standard

NAMS - National Air Monitoring Station

NERL - National Exposure Research Laboratory (within the Office of Research and Development, U.S.EPA)

NESCAUM - Northeast States for Coordinated Air Use Management

NPS - National Park Service, U.S. Department of Interior

OAQPS - Office of Air Quality Planning and Standards, U.S.EPA

ORD - Office of Research and Development, U.S.EPA

PAMS - Photochemical Assessment Monitoring Station

PRRM - Planning, Resources, and Regional Management Staff (within U.S.EPA OAQPS)

QA - quality assurance

QAPP - quality assurance project plan

RO - U.S.EPA Regional Office

RST - Regional Science and Technology laboratories/centers, U.S.EPA Regional Offices

SAMWG - Standing Air Monitoring Work Group

SIP - State implementation plan

SLAMS - State and Local Air Monitoring Station

SOP - standard operating procedure

SPM - special purpose monitor

STAPPA - State and Territorial Air Pollution Program Administrators

WESTAR - Western States Air Resources Council