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PM-10 MONITORING TASK FORCE REPORT

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PM$_{10}$ MONITORING

TASK FORCE REPORT

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PREFACE

This report was prepared by the PM_{10} Monitoring Task Force which was formed in July 1988. The Task Force was created by William G. Laxton, Director of the Technical Support Division in the Office of Air Quality Planning and Standards in response to concerns raised at the Air Division Directors meeting in June 1988. The Task Force was formed to look into the need for evaluating PM_{10} monitoring networks especially in existing Group III areas. The principal purpose of the Task Force was to address the apparent disparity in the number of PM_{10} nonattainment areas between the Western and Eastern States. The Task Force is composed of people from all 10 EPA Regions and the Office of Air Quality Planning and Standards.

The following people are recognized for their contributions as facilitators of the sections of the report:

Executive Summary - William F. Hunt, Jr., OAQPS, and Task Force Members

ISSUE 1 - Neil Berg, OAQPS, and Tom Pace, OAQPS

ISSUE 2 - Rudy Kapichak, Region II, and Dale Wells, Region VIII

ISSUE 3 - Ray Gregory, Region IV, and Jon Schweiss, Region X

ISSUE 4 - Norm Beloin, Region I, and Carol Bohnenkamp, Region IX

ISSUE 5 - Mary Kemp, Region VI, and Denis Lohman, Region III

ISSUE 6 - James Dewey, Region V, and James Kelly, Region VII

Other members of the Task Force that deserve recognition for their contributions are : Linda Larson of EPA Region V and Neil Frank, Dave Stonefield and Dean Wilson of OAQPS. Special mention should also be given to Whitmel Joyner for technical editing and to Barbara Stroud, Helen Hinton and Kathy Weatherspoon for typing the report.

EXECUTIVE SUMMARY

<u>Introduction</u>

The PM_{10} Monitoring Task Force was formed in July 1988 by William G. Laxton, Director of the Technical Support Division in the Office of Air Quality Planning and Standards. The Task Force was charged with responding to concerns raised at the Air Division Directors meeting in June 1988. Specifically, the Task Force was asked to look into the need for evaluating PM_{10} monitoring networks especially in existing Group III areas. The principal purpose of the Task Force was to address the apparent disparity in the number of PM_{10} areas between the Western and Eastern States.

The Task Force is composed of members from the ten EPA Regional Offices and the Office of Air Quality Planning and Standards. The Task Force began its work by designing a questionnaire and conducting a survey. Six major issues were identified and are addressed in this report. They are as follows:

1. Does the current monitoring network accurately reflect the scope and magnitude of the ambient PM_{10} problem in the United States?

2. How were PM_{10} problems identified?

3. What are the existing tools used for identification and how were they used?

4. What was the effect of PM_{10} monitoring resources in identifying the PM_{10} problem?

5. Can EPA do a better job using existing tools and resources? If so, how?

6. What new tools, resources, policies, authorities, etc., are needed?

A workshop was held in Denver during October 1988 to permit the Task Force members to discuss these issues and to develop the information for this report.

ISSUE 1. DOES THE CURRENT MONITORING NETWORK ACCURATELY REFLECT THE SCOPE AND MAGNITUDE OF THE AMBIENT PM_{10} PROBLEM IN THE UNITED STATES?

- Some people feel it does, some do not.
- Adequate in terms of meeting the existing regulation.
- Professional judgement says we need to go beyond bare minimum to properly characterize the magnitude of the ambient PM_{10} problem in the United States.
- Special studies in suspected high impact areas needed.
  - Region X Saturation Monitoring Technique.
    - Low cost, portable, battery-operated monitors.
    - Cost effective way to proceed.
  - Asheville Study & possible El Paso/Juarez Study.
  - Investigate nontraditional sources: Residential wood combustion (RWC), sanding and salting of roadways, gasoline and diesel exhaust emissions, re-entrained road dust and mining.

ISSUE 2. HOW WERE PM_{10} PROBLEMS IDENTIFIED?

- Use of probability guideline.
  - Applied to TSP data, plus use of limited PM_{10} data.
  - Estimated areas of high, medium and low probability of violating PM_{10} standards.
- PM_{10} monitoring network is based on old TSP network.
  - PM_{10} NAMS located at old TSP NAMS & SLAMS sites,
  - PM_{10} SLAMS tend to be located at former TSP SLAMS,
  - PM_{10} Special Purpose Monitoring (SPM) sites are new sites.
- Use of PM_{10} SIP development guideline - allowed other criteria.
  - Modeling, investigation of SIP requirements, etc.
  - Guideline was not used universally.
- Region X performed saturation monitoring with portable monitors to augment existing fixed site networks.
- Special studies conducted in Regions I, II, V, VII, VIII, IX and X.
  - Only Regions VIII, IX and X (and V, to a lesser extent) actively pursued monitoring RWC.
  - Only Region IX emphasized agricultural tilling (AT) and construction activities.

ISSUE 3. WHAT ARE THE TOOLS USED FOR IDENTIFICATION AND HOW WERE THEY USED?

- Probability guideline in combination with existing TSP data - primary tool.
- Limited PM_{10} monitoring data.
- Special PM_{10} monitoring studies initiated prior to promulgation of the NAAQS (see issue 2).
- Other special RO studies investigated nontraditional sources.
- Traffic data and entrapment (canyon) potential used to identify microscale problems in half of Regions.
    - Part 58 monitoring regulation requires deployment of microscale PM_{10} monitors in some instances.
    - Emphasis on diesel component of traffic.
- Receptor modeling used as a data interpretation tool.

ISSUE 4. WHAT WAS THE EFFECT OF PM_{10} MONITORING RESOURCES IN IDENTIFYING THE PM_{10} PROBLEM?

- Resources limited the extent to which PM_{10} monitoring networks were designed.
- Air Program allocated 14% of the Region's FTEs (91 of 649) to monitoring.
  - Depending upon Region, between 10 and 50% of monitoring resources were devoted to PM_{10}.
  - In total, estimates show that fewer than 18 RO FTEs were used in PM_{10} monitoring.
- PM_{10} Priority
  - In East, ROs rank PM_{10} third or fourth,
  - In West, ROs rank PM_{10} first or second.
- Given modest resources and lower priority assigned to PM_{10}, it is not surprising that TSP networks were used as basis for designing PM_{10} NAMS and SLAMS.
- Disinvestment of TSP monitoring has allowed for some resources, mostly labor, to be redirected to PM_{10} monitoring.
- Some TSP monitors are being used as surrogate PM_{10} monitors, while others are used to measure toxic compounds.
- An estimated 5% of Regional PM_{10} monitoring resources were spent on identifying PM_{10} problems. Lack of resources has hindered PM_{10} problem investigations.

ISSUE 5. CAN EPA DO A BETTER JOB WITH EXISTING TOOLS AND RESOURCES? IF SO, HOW?

- Yes

- Make air quality monitoring in general, and PM_{10} monitoring in particular, more visible within Air Program.

- Encourage use of saturation monitoring to determine adequacy of fixed site monitoring network and to identify problem areas.

  - Develop a guideline on use of saturation monitoring. This was initiated at the Air Monitoring Workshop in Southern Pines, North Carolina in July 1989.

  - Asheville, N.C. study and a possible El Paso/Juarez study

- More Headquarters/RO interaction is needed.

  - Semi-annual meetings with Regional air monitoring personnel.

  - Rotational assignments. This has already been initiated with Norm Beloin, Region I and Mary Kemp, Region VI participating in a rotational assignment with OAQPS.

  - Headquarters visits to the Regional offices. This has been initiated with Geri Dorosz participating in an assignment with Region VI.

- Provide better training of PM_{10} instrument operators.

- Elevate importance of Regional NAMS coordinator.

- Need to examine current monitoring resources to insure adequate use.

- Involve a RO meteorologist in ambient monitoring network review and design.

ISSUE 6. WHAT NEW TOOLS, RESOURCES, POLICIES, AUTHORITIES ARE NEEDED?

- New Tools:

  - Portable low cost monitors - saturation monitoring.

  - Technical guidance on saturation monitoring, etc.

  - Development of a continuous PM_{10} monitor.

  - Data quality objectives and guidance on the required data to use, operate and evaluate screening models to identify areas of potential high PM_{10} concentrations and assure consistent model application.

  - Cost effective and more accurate stagnation modeling to deal with mountain valley situations.

    - WYND Valley is available but there is a lack of data to test, evaluate and gain experience with the model's use.

  - Improve tech transfer through workshops and AMTEC.

- New Resources:

  - Undertake study to determine proper PM_{10} resource allocation and additional resource needs.

  - Provide additional resources for saturation studies, etc. to evaluate nontraditional problem areas.

- New Policies:

  - Develop guidance for saturation monitoring studies.

  - Develop guidance on use of inferential monitoring.

  - Reemphasize importance of PM_{10} and need for increased manpower and funding.

  - Review exceptional events guideline - already scheduled.

Recommendations

(1) Regions should develop a proactive attitude toward the design and revision of PM_{10} networks - Promote this to State and local agencies.

(2) Unmonitored areas should be prioritized according to high PM_{10} potential - Annual network reviews should consider allocation of resources to new areas.

(3) OAQPS should support concept of saturation sampling as a tool in establishing adequate PM_{10} networks, and with the Atmospheric Research and Exposure Assessment Laboratory (AREAL)/ROs prepare a guideline on its use. This recommendation is being implemented.

(4) OAQPS and ROs should strongly support development of low-cost portable PM_{10} reference methods/survey devices, and real-time continuous PM_{10} reference methods.

(5) OAQPS should actively promote the evaluation of an EPA approved stagnation dispersion model for use in low-wind speed situations to support SIP development (may also be of limited use in network design).

(6) OAQPS should promote refinement of emission factors for area sources such as RWC, agricultural tilling (AT) and reentrainment/mobile sources for dispersion model use.

(7) OAQPS and ROs should make every effort to identify and secure resources for saturation sampling studies, etc.

(8) OAQPS should develop a special projects team with capital and travel resources to promote/perform network design studies throughout the country.

(9) Within current resource structure, OAQPS and ROs should develop policies/techniques to promote concept of inferential monitoring - A set of techniques: saturation sampling, modeling (dispersion and receptor), flexible/rotating subnetworks, etc. to extend network coverage.

ISSUE 1. DOES THE CURRENT MONITORING NETWORK ACCURATELY REFLECT THE SCOPE AND MAGNITUDE OF THE AMBIENT PM_{10} PROBLEM IN THE UNITED STATES?

It is important to understand how the current PM_{10} networks have evolved from an historical perspective. The early pioneers in air pollution control were usually local agencies (city or county) that were formed as a result of complaints concerning obvious pollution. These were usually smoking stacks, visible dust layers on surfaces, or odors. Since total suspended particulate (TSP) monitoring was cheap and easy, TSP monitors proliferated, mainly located in urban core industrial and commercial areas. Residential neighborhoods devoid of industrial or commercial sources or major traffic arterials were sparsely monitored, and rural areas were almost never monitored. At one time, there were approximately 5,000 high volume samplers, which measured TSP, in operation with virtually no siting criteria, and monitors were located at the discretion of the local monitoring agency.

The late 1960s and early 1970s saw consolidation of the TSP networks due to various factors. The emergence of State-run air pollution control programs, the intensifying of national oversight on air pollution programs through EPA, and the expansion of monitoring in other criteria pollutant areas all contributed to closing the less desirable TSP sites. With the inevitable comparisons among cities, it became apparent that some form of uniform siting criteria was necessary, and the Standing Air Monitoring Work Group (SAMWG) was formed.

As a result of the impetus from SAMWG, uniform monitor siting regulations were developed and promulgated in 1979.[1] These regulations provided uniformity in monitor siting, still stressing point sources, commercial sources and high population density. The regulations were influenced by two studies. One was a national assessment of the urban particulate problem which was based upon a 14 city survey of TSP sites, which identified reentrained roadway dust as a major problem.[2] The other was a series of siting guidelines for the criteria pollutants which developed the concept of spatial scales of representativeness for monitoring sites.[3-6] As a result of these studies, microscale sites for National Air Monitoring Stations (NAMS) and State and Local Air Monitoring Stations (SLAMS) TSP monitoring, as well as middle scale sites for NAMS, were specifically excluded. The implementation of these regulations caused further consolidation of the TSP network to approximately 2800 sites. Another study which has major ramifications on today's situation was the Portland Aerosol Characterization Study (PACS) conducted from 1976-1978.[7] This study showed the effects of industrial point source emissions to be far less than suspected, and it documented that the major contribution in urban air sheds is reentrained roadway dust and other crustal material. Also, this was the first study which used Carbon 12 - Carbon 14 ratioing technique on ambient particulate samples to document unequivocally the impact of contemporary carbon (residential wood combustion) on neighborhood particulate levels.

With the advent of the PM_{10} standard in 1987, the monitoring guidance tried to incorporate what was then known about these new sources; it reinstated microscale siting for PM_{10}, especially in street canyon settings for diesel particulate; and it specifically addressed residential wood combustion (RWC).[8] However, the conventional thinking was that, since PM_{10} was a subset of TSP, given the size and the refinement of the existing TSP monitoring network over the years, it was natural to characterize the existing PM_{10} problem areas from existing TSP data, using the probability guideline.[9]

Although not specifically asked to address Issue 1 in the survey, 5 Regions did. Two felt that there was adequate coverage, 2 felt that there was not, and 1 felt there was no way to know based on the TSP network. During the Denver Workshop, a consensus developed that held that the current PM_{10} monitoring network adequately reflected the effect of traditional sources, and was adequate in terms of meeting the existing regulations. Professional judgement says that we need to go beyond the bare minimum to properly characterize the magnitude of the ambient PM_{10} problem in the United States. The areas of impact, for which additional PM_{10} monitoring may be needed, are:

1. Areas affected by RWC
2. Agriculture/silvaculture tilling and burning
3. Roadway/street canyon diesel emissions
4. Roadway sanding and salting
5. Construction activities
6. Mining activities
7. TSP nonattainment areas labeled Category III by probability guideline
8. Category III areas with industrial sources

ISSUE 1A. <u>Why does there appear to be a disparity in the number of nonattainment areas between the West and the East?</u>

The differences may be philosophical, physical, or both. As described in detail in subsequent parts of this report, there is a difference between the East and West in the priority given to PM_{10} relative to the other criteria pollutants. In the East, PM_{10} ranks third or fourth behind O_3 and CO in all cases. In the West, PM_{10} tends to be the number one priority, or at least, no lower than tied for second place. With the current monitoring philosophy of doing more with a constantly shrinking budget, it is not surprising that, in the East, the focus is on existing problems like O_3 and CO. The special studies were initiated almost exclusively in the West, and it is interesting to note that it was in Portland, Oregon that RCW was first identified as a major contributor to PM_{10} levels.

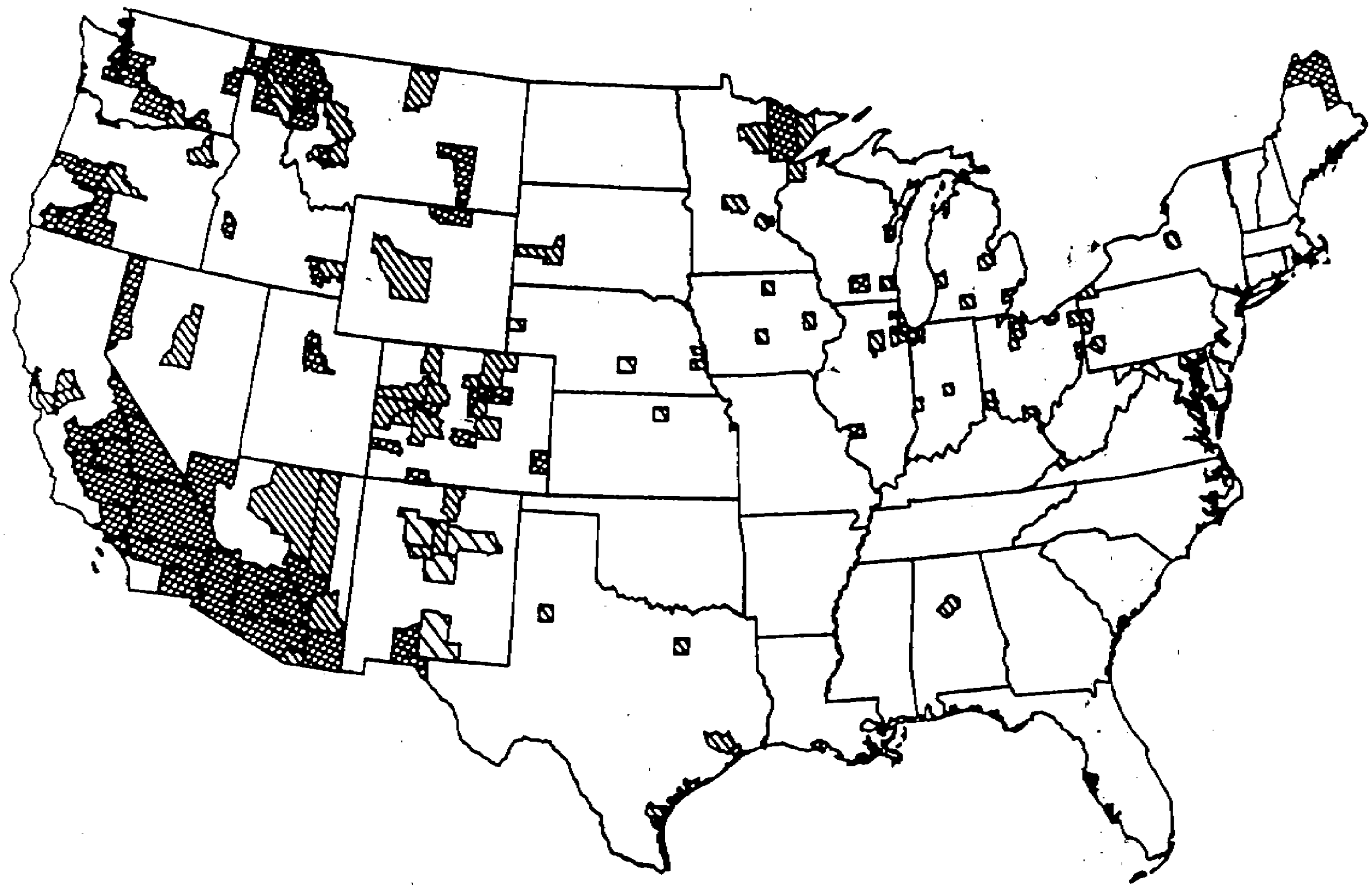
There still remains a question as to whether there are, in fact, undiscovered PM_{10} nonattainment areas in the East or if there are physical differences between the East and the West that perpetuate this disparity. Most Group I areas with the highest probability of violating the PM_{10} standard are located in the West (Figure 1). Also, there may be significant differences in the amount and type of fuel used in RWC between the two areas, however wood use surveys presented at the Denver meeting tended to deny this (see Appendix A).

To answer the question definitely, it was the overwhelming consensus at the Denver PM_{10} Task Force meeting that special studies in suspected high impact areas were needed. The saturation study technique employed in Region X, with low cost, portable, battery-operated particulate monitors, appeared to be the most cost effective and quickest way to go and caught the enthusiasm of the Denver attendees.

The Technical Support Division (TSD) of EPA's Office of Air Quality Planning and Standards (OAQPS) then funded a study of this type in Asheville, North Carolina. The results of the study are reported in Appendix B.

Although the results obtained from a single study at a single location will not answer the question either way, the results will be useful in beginning to implement the recommendations of the PM_{10} Task Force. These would include using the results of a saturation study to evaluate the effectiveness of the existing fixed site network and to extend the results by inference to other similar areas.

AREA GROUPINGS FOR PM10 SIP DEVELOPMENT



Map: WPF/MRB

Data: K. Woodard, CPDD 4/13/87

Figure 1

ISSUE 1B. Do current PM_{10} monitoring and implementation policies and practices match up with the objectives of protecting public health?

Appendix D to CFR Part 58 specifies the approximate number of PM_{10} NAMS stations per urbanized area, depending on the area's population and the reported PM_{10} and/or TSP concentrations. It further states that NAMS stations shall contain a mix of micro, middle, and neighborhood scale stations. Locations representative of these same scales are also applicable to SLAMS stations. If all stations are properly sited, and all the planned sites are operational, the monitoring network should meet EPA's objective of protecting public health, subject to the following network design needs and the comments on the identification of exceptional data.

Regarding network design, there are potential deficiencies in monitoring coverage in Group III areas and in determining the location of the maximum concentrations in monitored areas. Group III areas, particularly nonurban and smaller urban areas, may not receive adequate monitoring unless resources are increased and policies are clarified to encourage monitoring (at least periodic screening) in those areas. Priority should be given to monitoring in those areas where residential wood combustion or industry could potentially elevate PM_{10} concentrations. Also, there is often little assurance that the maximum concentration sites (Category A sites) are located at the true area of maximum concentration. In Region X's experience, the maximum concentration can easily be several times higher than that measured at a traditional center city location. Communities with industrial sources or area sources, such as wood stoves or diesel traffic, are most susceptible to such concentration variations. Saturation monitoring studies like the Asheville project would be necessary to ensure that public health is protected. Such studies could provide low cost screening to address the apparent lack of monitoring in Group III areas. Also, they would identify the locations of the maximum concentrations so that permanent sites could be relocated. Policies must be developed which require saturation monitoring and which define the proper protocol for their conduct.

Monitoring practices in many States and EPA Regions are governed in part by the policy issues discussed above, monitoring budget constraints, low priority on monitoring, and a lack of resources to solve new air quality problems. This lack of resources apparently fosters (in some areas), what could be interpreted as a lack of "will" to identify new problems. The resource constraints and low monitoring priorities have been overcome, at least in part, by some Regions and States, and in some cases, substantial progress has been made in implementing saturation monitoring and in providing at least periodic monitoring in all pertinent areas of the State. This perceived lack of "will" to find new PM_{10} problem areas because of insufficient resources to develop and implement control strategies is not consistent with our public health objectives. The perceived lack of "will" can be mitigated by better utilization of existing resources through the use of new policies and tools (e.g. saturation monitoring). This should be done in concert with efforts to increase monitoring and SIP planning resources and to fine-tune the policies.

The exceptional events guideline specifies the criteria and procedures for treating high concentrations due to certain activities as exceptional events. The guideline should be modified to address the following concerns:

a. Prescribed burning that does not occur regularly or frequently can be treated as exceptional. Current guidance does not require any demonstration of the efficacy of the smoke management plan under which the burn was conducted. Also, there is no mention that naturally occurring forest fires would likely have less adverse air quality impact if silvicultural practices such as prescribed burning or removal of fuels from the forest floor were practiced.

b. Some events may only be classified as "exceptional" if "reasonable control measures" or other conditions are met. There is inadequate discussion in the guidance as to what constitutes "reasonable control measures" for sources such as construction/ demolition, sanding and salting (for traction on icy pavement), sandblasting, and highway construction.

c. The provisions for treating agricultural tilling as exceptional could be improved through coordination with the provisions of the Food Security Act's soil conservation requirements.

d. The guideline should also be revised to consider industrial data collected during startup/shut downs and air pollution control device malfunctions. For example, the quarterly lead standard was violated because of an electrical problem which rendered an electrostatic precipitator inoperable for relatively short time period.

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ISSUE 2. HOW WERE PM_{10} PROBLEMS IDENTIFIED?

ISSUE 2a. Did the States/Regions go beyond the utilization of the existing TSP data in conjunction with the PM_{10} Probability Guideline to identify PM_{10} problems? Please explain and provide examples, if appropriate.

The guidance to the Regions allowed criteria other than the probability model to be used in establishing the PM_{10} groupings. The model used data from existing TSP, PM_{10} and other particulate monitoring networks to estimate the probability of exceeding the PM_{10} standards.

Region X decided to augment the established monitoring with "saturation monitoring" in determining monitor placement and in identifying PM_{10} problem areas.

In some areas, microscale monitoring sites have been used to obtain mobile source data. There are five such monitors in New York, including a special study location on Madison Avenue, and three in New Jersey. The Madison Avenue site has operated since January 1988. Readings from these sites are among the highest in the Region. In another special study, Puerto Rico has oriented monitoring to landfill and open burning problem areas.

Some difficulties in identifying PM_{10} problems are:

a. Reliance on the probability guidelines has resulted in many TSP nonattainment areas being classified as Group III areas. Such reclassifications may have been inappropriate, because there is no requirement for further monitoring in such areas and it is possible that PM_{10} problems may exist there. Most Regions are conducting some monitoring in these areas. A priority should be placed on establishing PM_{10} monitors in such areas.

b. Many of the existing TSP monitors may not have been located in areas representative of the maximum PM_{10} concentrations. In the future, priority should be placed on PM_{10} monitoring in TSP nonattainment areas (which are Group III for PM_{10}) to obtain more detailed data on these areas. Resources should be allocated to make these efforts successful. Specific PM_{10} monitoring should address areas heavily affected by nontraditional sources such as wood burning, agricultural and silvicultural burning, quarries and strip mines, and high traffic densities. Saturation monitoring should be the preferred method of finding new PM_{10} problem areas and "hot spots."

ISSUE 2b. Before the PM_{10} SLAMS were established, were special studies conducted by the States to determine if they had problems with residential wood smoke, agricultural tilling, diesel particulates, and other emissions? Please explain and provide examples if appropriate.

Limited studies were conducted in Regions I, II and VIII, and extensive special effort was used in Region VII. In general, special studies were not widely used. A 1985 report by the Natural Resources Defense Council with serious concerns about diesel vehicle emissions in New York City led to the placement of two microscale sites there in street canyons with heavy bus traffic.

The most serious problem identified in these regards is the need for more resources to identify and detail the PM_{10} problems. In general, only very limited use of special studies was possible.

The most important needs in the future are to provide special studies in the SLAMS network design and to give high priority to the identification of new problem areas.

ISSUE 2c. Were special studies conducted by States and EPA Regions/Office of Research and Development in different parts of the country which would shed light on this problem?

Regions VIII, IX and X were aware of some applicable and useful special studies, but Regions I through VII were not. It is obviously a problem if so many of the involved agencies would have been helped by such information, but were unaware of it. In the future, provision should be made for technology transfer and information exchange on special monitoring studies, among all affected agencies. This could be in the form of an air monitoring technology center which would fill the need of a technical report clearinghouse.

ISSUE 2d. Were the States/EPA Regions/Office of Research and Development special studies designed to capture worst case conditions in terms of emissions, seasonality and sampling frequency? What do the studies show?

These special studies generally did address worst case situations. Most States did use them and benefitted from their use. It is helpful to users if such studies give first priority to worst cases and maximum concentrations. Special studies could resolve various other problems, such as spatial distribution of pollutants. A useful future effort would be the development of national guidance or directives on special studies. Such guidance should include methodology for performing saturation studies, when and how to deviate from 40 CFR Part 58 Appendix J requirements, the difference between a screening study and SLAMS/NAMS, and setting of priorities on the timing and locations for special studies.

ISSUE 2e. Are any special studies planned?

All Regions except Region VII have plans for special studies. For example, Region II is encouraging mobile source-oriented monitors in New York and New Jersey. The Regions and some States have recognized the need for, and the importance of, such special efforts.

ISSUE 2f. Is there a need for additional special studies?

Beyond the special studies already mentioned, most Regions have found other matters that could be addressed, preferably with saturation monitoring in most cases. Some specific proposals for special studies in the future are:

To identify any new problems that occur.

To place monitors at sites representative of maximum concentrations.

To determine the spatial distribution of pollutants.

To assess international problems, such as transport of PM_{10} from Mexico.

To investigate the effects of nontraditional sources that may not be correctly represented by existing networks, such as sanding and salting of roadways, gasoline and diesel exhaust emissions, re-entrained road dust, wood burning, and mining.

ISSUE 3. WHAT ARE THE EXISTING TOOLS USED FOR IDENTIFICATION AND HOW WERE THEY USED?

The broad question posed to the Task Force under Issue 3 concerns what tools exist for assisting in the design of PM_{10} monitoring networks (identifying problem areas) and how these were actually utilized in yielding the networks as we now recognize them. It is worth noting here at the outset that with few exceptions, most Regions have designed their PM_{10} networks as rather direct derivatives of their historic TSP networks. Justification for this approach references the presumed adequacy of the old TSP networks in correctly characterizing the scope and magnitude of all particulate impacts. Certain critical portions of Agency guidance also indirectly endorsed this perspective, most notably the probability guidelines, the focus of which centered exclusively on the interpretation of existing TSP data as a surrogate measure of PM_{10} impact potential. So in the most practical sense, it is quite immaterial in the vast majority of instances to discuss the linkage between tools for PM_{10} problem identification and their relatively recent application in yielding the current PM_{10} networks since they are now, and have nearly always been, largely decoupled.

This is in no way intended to criticize the design of all networks. Many surely reflect the product of best professional judgement which stems from years of experience. But there is concern that many agencies are unable to support the fundamental design adequacy of their particulate monitoring networks from a technical basis other than reliance on the former TSP network.

ISSUE 3A. <u>Did the monitoring guidance address residential wood burning, agricultural tilling, diesel particulates? Was it helpful? Please explain and provide examples, if appropriate</u>.

The Regions concluded that an important general distinction could be made between the objective adequacy of PM_{10} monitoring guidance and the Regions' actual perception and consequent application of it. Although the guidance addressed the above PM_{10} monitoring situations, it was only viewed as advisory and non-prescriptive by the Regions and was not generally implemented. The microscale initiative described in the revised particulate monitoring regulations endorses and, in some instances requires the deployment of microscale PM_{10} monitors, but most Regions did not see this as emphasizing the need to re-examine network design adequacy. This underscores the importance the Regions assign to having network design features articulated in regulatory versus guidance formats.

With the exception of the microscale PM_{10} sites, most Regions were substantially satisfied with the representativeness of their PM_{10} networks until the task force got underway. Once asked, many Regions responded that, since the development of PM_{10} monitoring guidance was simultaneous with the establishment of pre-promulgation PM_{10} monitoring networks, there was little real opportunity to accommodate new network design initiatives when negotiating and implementing the original networks.

The Regions also felt that resource constraints (additional equipment capitalization), political pressures, and overriding Regional priorities (particularly O_3), often combined as obstacles to realizing proactive revisions to PM_{10} network design in the foreseeable future.

It should be noted that several Regions actively pursued deployment of microscale monitoring sites to augment the earlier situation and thereby increase the adequacy of available data.

ISSUE 3B. Did the modeling guidance at that time address these emission sources? Was it helpful? Please explain.

As discussed above, the Regions felt that, in the vast majority of instances, the design of PM_{10} networks borrowed heavily, if not exclusively, from that of the historic TSP networks. Hence, agencies tended to view the design guidance as neither prescriptive nor timely. Because of the time that elapsed before the PM_{10} standard was finally promulgated, control agencies understandably sensed the inadequacies in earlier guidance and the existing emission inventories. Leading up to the PM_{10} promulgation, there was also an appreciable period of time before PM_{10} emission factors were available for many important and pervasive sources. Present guidance should emphasize that the increasing availability of PM_{10} factors since that time should lead directly to more credible emission inventories and more reliable dispersion modeling.

Whether or not the Regions would have performed dispersion modeling as an aid to PM_{10} network design had these EIs been available to them is an open question. It is again worth noting that for most Regions it is an uncommon notion to attempt linkage between dispersion modeling and network design, perhaps partly because these functions are often performed by different organizational entities that have little apparent contact.

On a technical plain, there are two substantial difficulties in modeling particulate sources such as RWC, AT, and DP. These sources are typically transient and aerially diffuse. When combined with the fact that their associated emission factors and EIs reflect uncertainties that are orders of magnitude higher than for many (perhaps most) point sources, model estimates are not perceived as having an acceptable level of accuracy.

The second problem stems from the fact that in many instances, particularly for RWC, the impacts of most interest occur under stagnant (<1m/s wind speeds) meteorological conditions. Since the Agency did not and currently does not have a guideline model applicable for this condition, dispersion modeling is either abandoned, or a nonguideline model is proposed for use. If the latter course is chosen, a rigorous protocol must be undertaken to test the efficacy of model performance on a case-by-case basis. This is resource intensive.

In summary, modeling was not employed as a matter of course by agencies in designing their TSP or PM_{10} networks.

ISSUE 3C: What approach did the Regions/States use in considering residential wood smoke, etc., in designing their networks? Was modeling used? Did they use receptor modeling?

Only Regions VIII, IX and X (and V, to a lesser extent) actively pursued monitoring of residential wood combustion (RWC) in their Regions. The original perception in the other Regions indicated the belief that RWC posed no threat to the NAAQS, but their subsequent awareness of wood use surveys and other information has stimulated new thinking about the potential of this source.

Regions VIII and IX addressed the effects of RWC largely relative to historical TSP site data, new energy surveys and public concern. Region X has augmented these elements in many instances with data derived from special particulate saturation sampling studies. These studies, with 10 to 20 portable or semiportable TSP or PM_{10} samplers sited throughout a possible impact area and operated for 15 to 30 days during the prime season, yield a wealth of information from which to evaluate the area's air quality. Wherever PM_{10} sampling had been conducted in an area previously, and one or more study sites exhibited consistently higher loadings, then a reference method PM_{10} sampler was placed at a new site and was run concurrently with the original PM_{10} site for a quarter during the prime impact season. This procedure has produced a more certain view of relative site character. The results could be considered as approaching an ultimate network design.

With respect to microscale PM_{10} sites, approximately half of the Regions have consulted traffic data and entrapment (canyon) potential in designing their networks. Particular emphasis is devoted to the diesel component of the traffic figures. Diesel emissions can be regarded as a potentially significant PM_{10} problem, for large urban areas with large bus fleets.

Of all Regions, Region IX has seemingly devoted the most efforts to monitoring PM_{10} from agricultural tilling and construction activities. Efforts to identify prototypical conditions to be monitored were gleaned from a strict review of proposed exceptional events. Although Region IX has added monitors in one urbanized area to determine the impact of construction and are reevaluating the PM_{10} network in another urbanized area, their current networks were not designed specifically to monitor impact from these activities. While other Regions have considered these sources in the design of their networks, most have done so either inadvertently or with TSP sampler surveillance only.

Receptor modeling use is viewed by most Regions as a data interpretation tool, more suitable in apportioning source contribution to a site's loading than as a determinant in network design. In this sense, receptor modeling is descriptive of a site's immediate representativeness, but it does not speak effectively to the larger issue of adequate subject characterization. This requires credible emission inventories, suitable dispersion models (model reconciliation), and most importantly, the ability to reference relative impacts at many other locations throughout the grid. The later ability is needed in order to render sound judgments on the efficacy of network design.

ISSUE 3D. <u>How many PM_{10} NAMS/SLAMS are located at former TSP sites or are collocated with TSP monitors</u>?

The data from the survey were not complete, with Region X not filling out the table. Although absolute numbers are therefore not available, the question can be addressed on a percentage basis, using the data from the other 9 Regions. Table 1 presents the results of this part of the survey.

TABLE 1
Distribution Of PM_{10} Sites

	Former TSP NAMS	Former TSP SLAMS	New SITES
PM_{10} NAMS	59%	23%	18%
PM_{10} SLAMS	24%	63%	14%
PM_{10} SPM	3%	18%	80%

As can be seen, there is a strong tendency for PM_{10} NAMS to be located at former TSP NAMS sites, and even stronger tendency for PM_{10} SLAMS to be located at former SLAMS sites. Only the PM_{10} special purpose monitoring (SPM) sites are primarily new sites.

ISSUE 3E. <u>How were unmonitored areas dealt with? Was inferential monitoring used to establish a link between similar areas, when one area had monitoring and the other did not</u>?

The Regions generally endorsed the inferential concept only when considering the representativeness of mobile source-affected sites. For example, in Region II, New York and Puerto Rico had high reading monitors along major highways, although the sites were fairly open. Additional sites were established in likely mobile source-affected areas which have corroborated the earlier data. Since most Regions did not orient networks to look at other types of area sources, such as RWC and AT, the inferential concept was not considered.

Region X did make concerted efforts to employ this technique, particularly in RWC situations, recognizing that resources would not be sufficient to extend and sustain formal network coverage in all of the areas projected to have NAAQS-threatening RWC. The Region attempted to develop credible and compelling technical rationales to support this approach through establishing the comparability of characteristics shared by two or more areas, including topography, meteorology and emissions. This concept has met with substantial resistance from State and local agencies who believe that empirical data, preferably generated by PM_{10} reference methods, are needed to establish the formal status of all physically removed areas. The concept has been increasingly well received because of mounting expressions of public concern over exposure and of prospects that technically compelling area links can be demonstrated by short term saturation studies. Region 10 is pursuing the development of a protocol for implementing this concept that is acceptable to the affected agencies and communities. The Region has worked with each of its State agencies to develop a priority list of heretofore unmonitored areas to which saturation studies and/or formal network treatment will be applied, as resources allow. This list is quite extensive.

Region IX has made attempts to generalize the results of data reflecting AT and construction impacts. Similarly to Region X, the demand for area-specific empirical data in unmonitored locales is overriding the general application of this concept.

In summary, most of the Regions have not devoted much time and effort to addressing impacts in unmonitored areas. This has been largely a result of limited resources and the lesser importance of PM_{10} compared with ozone and carbon monoxide. In most Regions, the PM_{10} network is a derivative of TSP network. There has been a recent shift, though in the national focus, to East-West disparities in PM_{10} problem areas and to the Regions' awareness of the specific network design inadequacies divulged by one Region over the past several years.

ISSUE 4. WHAT WAS THE EFFECT OF PM_{10} MONITORING RESOURCES IN IDENTIFYING THE PM_{10} PROBLEM?

Resources limited the extent to which PM_{10} monitoring networks were designed.

ISSUE 4A. What percentage of monitoring resources was allocated to PM_{10} and what is the priority of PM_{10} in relation to the other criteria pollutants?

From existing FY '88 data the Regional Air Program full time employees (FTE) in FY '88 were allocated as follows:

Ambient Air Quality Monitoring, 90.7;
Air Quality Management, 288.2;
Stationary Sources Enforcement, 270;

Total 648.9 FTEs.

The Regions' questionnaire responses indicated that between 10 and 50 percent of the monitoring resources were devoted to PM_{10}. An average of these estimates shows that fewer than 18 FTEs were used in PM_{10} monitoring. This estimate, is high, in all likelihood, because not all Regions devoted 100 percent of their air monitoring resources to actual air monitoring work. Also, given the various tasks in the PM_{10} monitoring program, Regions could devote only 5 to 15 percent of their PM_{10} monitoring FTEs to identifying PM_{10} problems. The 1988 Air Monitoring Workload Model allocated four FTEs nationwide for PM_{10} network establishment.

It is even more difficult, lacking specific information, to estimate the State resources dedicated to PM_{10} monitoring. The Regions estimated that the States applied between 5 and 50 percent of their monitoring resources to particulate monitoring. In some cases, State numbers for 1988 were inflated because of the capital cost of procuring a large number of new PM_{10} samplers. State budgets usually show between 15 and 30 percent of the total 105 Grant resources being spent on the criteria pollutant monitoring program.

The Task Force was unable to obtain any hard information on how air monitoring contract funds were used, or if any 105 grant money was spent on PM_{10} NAMS/SLAMS network design projects. There is some evidence that some Regions used these funds for PM_{10} projects, but it is estimated that no more than $100,000 was spent nationwide.

Over the past several years in Region X, both base and special 105 Grant allocations have been dedicated to PM_{10} network design projects--totaling between $40K and $80K.

Table 2 summarizes Regional responses to the resource questionnaire, with Priority Ranking.

In summary, it is estimated that Nationally 5% of Regional PM_{10} monitoring resources were spent on identifying PM_{10} problems in Fiscal 1988.

In view of this estimate, and considering the low priority assigned to PM_{10} by both the eastern Regions and the 1988 Air Monitoring Workload model, it is not surprising that the TSP and Lead networks were used as the basis for designing the PM_{10} NAMS and SLAMS Networks. If PM_{10} problem areas are to be identified in the future, the Regions and the States need to apply additional resources to the issue.

ISSUE 4b. <u>How does PM_{10} rank as a Regional problem</u>?

Four regions primarily in the West consider PM_{10} to be their first or second priority. The remaining six Regions ranked PM_{10} as either the third or fourth most important concern.

ISSUE 4c. <u>How was potential TSP disinvestment used in the resource allocation for PM_{10} monitoring? Were an other innovative uses of existing resources considered?</u>

In general disinvestment has allowed for some resources, mostly labor, to be redirected to PM_{10} monitoring, although probably not as much as originally expected. No Region responded to this question quantitatively. However, Region V stated that, based on responses from the States, the savings projected by OAQPS through disinvestment were overestimated. Region VI stated that, although the disinvestment of TSP monitors helped in funding PM_{10} monitoring, the latter is more resource intensive, because of increases in the frequency of monitoring and maintenance requirements. Several group members stated that the small surplus value of a TSP sampler means little capital to be recovered by disinvestment. Labor savings from TSP disinvestment varies by site location, as more remote sites require more labor for filter servicing and selected activity.

Although most Regions indicated that TSP disinvestment was actively pursued, a substantial number of TSP sites are still in operation. Several reasons were given for the continued operation of the TSP network. In many cases, TSP monitors are being used, formally or informally, as PM_{10} surrogates. Because the TSP network is already in place, such surrogate use requires little additional capital. Region X said that, in Washington, PM_{10} samplers were used in key areas, and TSP samplers were used in less critical areas, with the understanding that any monitors recording an exceedance of the PM_{10} standard would be the first to be replaced with PM_{10} monitors. When TSP monitors are used as

Table 2

PM_{10} Resources And Priority Ranking

Region	Monitoring Resources %	Survey Estimated FTEs*	Workload Model FTEs**	Priority Ranking
I	10-20	.9	.04	4
II	5-10	.5	.15	3
III	5-10	.7	.16	3
IV	10-25	1.9	.11	3
V	20-25	3.4	.77	1-2 (Tie) O_3, CO
VI	10-40	2.2	.43	3
VII	5-20	.9	.32	4
VIII	10-50	2.7	.58	1 Tie O_3, CO
IX	10-30	1.8	.90	2 Tie CO
X	30-50	2.6	.61	1
Total	-	17.6	4.07	

*Based on the number of FTEs in Workload Model times the average percent of monitoring resources devoted to PM_{10}. This number overestimated the actual FTEs since Regions do not devote 100% of air monitoring resources to that work.

**Allocated by the 1988 Air Monitoring Work-load Model to PM_{10} network development.

surrogate PM_{10} monitors, however, PM_{10} monitoring must be initiated within 90 days of the end of the quarter in which the PM_{10} standard exceedance was recorded. Several Regions indicated that their State and local agencies did not have the resources to begin PM_{10} monitoring at sites where an exceedance occurred. Several group members stated that, in these cases, the true TSP samplers should be distinguished from surrogate PM_{10} monitors, to avoid penalties for not converting to PM_{10} sampling.

A second reason given for continuing TSP monitoring involves the measurement of toxic compounds. TSP samplers are preferred over PM_{10} samplers for measuring toxic compounds because they capture all particulate matter that could be ingested or inhaled. There seems to be an increasing interest in monitoring toxic pollutants in ambient air, and it is likely that TSP will be sampled, rather than PM_{10}. California plans to operate 20 TSP sites for analysis of toxic metal compounds in 1989.

Several other reasons were also given for retention of TSP monitors. One advantage of using TSP samplers is that operator retraining can be avoided. However, since the filter changing is not significantly more difficult for PM_{10} than for TSP, and the calibration and maintenance can be done by trained technicians, this is not too great a concern.

Another reason given for retention of the TSP network was that until PM_{10} SIPs are approved, TSP data are needed for SIP enforcement. However, SIP enforcement would not be based on ambient data in most cases.

Several group members stated that, because the historical data base for particulate is TSP, continued sampling for TSP would allow continuity in the data, even though a TSP data base may have limited use. It may be wiser to start the PM_{10} data base as soon as possible rather than build on an obsolete data base, a point that may also argue against the use of surrogate monitors.

Some indirect benefits may be gained by TSP sampling. An increased network gives an increased "presence" to an agency, and having inspectors travel regularly to a site to change filters entrances the visibility of the inspection program.

Region X mentioned a mobile network as an innovative use of resources, and some participants suggested that noon-to-noon monitoring might require fewer monitors.

ISSUE 5. CAN EPA DO A BETTER JOB USING EXISTING TOOLS AND RESOURCES? IF SO HOW?

Yes. Regions IV, V and VI provided written comments to this question. Region IV commented that EPA would be putting its tools and resources to better use by doing all the "homework" (costs of TSP equipment replacement, etc.) before establishing a new NAAQS. Region V's reply stressed a strict insistence on satisfactory placement of monitors, along with a review/revision of older monitor siting. This Region also recommended the redirection of unnecessary monitoring toward an examination of nontraditional sources. The response from Region VI emphasized the importance of considering specific Regional problems when EPA assigns its priorities to the various pollutants of concern.

There are no easy answers as to how EPA can do a better job with existing capabilities. The meeting in Denver saw some detailed discussion of these points, and below is a listing of the specific items identified.

Tools	Resources
Modeling	105 Grants
Monitoring	State matching funds
Technical judgement	Contract $ from Work Load Models
Citizen complaints	Outside funding
Clean Air Act	Superfund
Audits	Existing equipment
	A230 & A235 WLM

Over the years, some of these elements and resources have become overburdened at the State and Regional level due to increasing activities, the lack of offsetting cuts, and no substantial increase in funds. Also, these tools and resources have shortcomings that must be kept in mind.

Modeling

When used for initially identifying the ambient levels of a new area, modeling can require a resource intensive and time consuming effort. For some situations, such as stagnation and urban secondary particle formation, appropriate models may not be available to predict pollutant levels. Moreover, for many PM_{10} areas the requisite model inputs such as emission inventories and meteorological data, are either incomplete or nonexistent. All of these factors make modeling a tenuous choice as the sole basis for identifying potential nonattainment areas. Nevertheless, where data bases are available, models may be suitable in many cases for assessing the adequacy of control strategies designed to ultimately achieve attainment.

Air Monitoring

PM_{10} has low priority in most Regions compared to ozone or carbon monoxide. Headquarters has also emphasized ozone and carbon monoxide activities (for both sampling and SIPs) in the A230 and A235 workload models. In the A230 model an average of 1.00 workyear is given to PM_{10} activities, while an average 5.00 workyears are given for ozone and carbon monoxide activities. In the A235 model, an average 0.40 workyears are given to PM_{10}, and an average 1.10 workyears are given to ozone and carbon monoxide monitoring.

Overall, air monitoring is a low priority at the State and Regional Office levels. State and Regional managers see monitoring not as the foundation that all air programs are built on but as a required activity that provides little benefit.

Reluctance to identify the problems is apparent. The States hesitate to identify problems because of their lack of resources. The States feel that if they identify a problem they will have to solve it without a substantial increase in resources.

A lack of training exists. The air monitoring program is becoming an old program. As in all such situations, original personnel have moved upward in management or onward into other careers. The new personnel that replace them are usually given little training, or on-the-job training only. EPA has recently held several training programs for handling air monitoring data. When was the last time there were Regional training programs on the operation of monitoring equipment?

Other shortcomings are evident as well. No PM_{10} Quality Assurance (QA) document had been available to involved personnel. It is now available. Monitor siting guidance is not prescriptive enough and is designed to recommend monitoring of traditional sources. There is a lack of national oversight in agency efforts, and EPA Headquarters should visit the Regions regularly to encourage consistent performance. The cost of lab analysis with increased frequency of sampling and finally, affecting all the points mentioned is the fact that key staff people are wearing a lot of hats.

PM_{10} Equipment - A number of points were noted as shortcomings of the PM_{10} reference method.

- Can only obtain 24-hour concentration
- Does not work well in cold or humid weather
- Too expensive
- Not enough monitors
- Extensive maintenance is required
- Too noisy
- Problems with frequency of sampling

Technical Judgement - Technical judgement is used predominantly in Regional and State selection of monitoring sites. The majority of all nonattainment areas were found in this manner. To improve the technical judgement of the Regional and State air monitoring staffs, additional training, monitor siting guidance and workshops should be provided.

Risk Assessment Approach - Protection of large population vs. smaller populations comes under scrutiny.

Accountability of contract funds and FTEs - Some of the Regions complained at the Denver meeting of not having direct authority over the contract funds in A230 and A235 workload models.

Recommendations

The general tenor of comments and responses to questions about the air monitoring programs emphasizes many good and positive aspects of the programs. Still, the respondents have made some suggestions for improvement which should be considered and which may be valuable in the future. In general, the importance of air monitoring has to be stressed at every level, State, Regional and Headquarters. The air monitoring programs have aged. They have become less "visible", and there is a belief that State managers do not see the importance of air monitoring. It is hoped that the following suggestions and proposals for future work, accompanied by a more active and visible campaign at all levels, will be useful and productive.

Saturation monitoring -

- HQ contract to buy monitors for short term monitoring projects

- HQ should write the guidance for monitoring, to include priority for special studies for PM_{10} and prescribed methods for both reference samplers and utilizing more economical nonreference samplers as well.

Improved evaluation of monitoring sites

- Modeling
- Monitoring
- Improving spatial and temporal coverage

More frequent meetings for Regional Air Monitoring personnel -

- One meeting should be held in July at Southern Pines and a second meeting should be held each January or February at one of the Regional Offices. Alternating the second meeting among the Regional offices is advised. Additional funding would be needed to cover travel.

Training -

- Provide training on equipment operation through Regional workshops
- Encourage technology transfer among State, Regions, AREAL and OAQPS HQ
- Improve training courses in monitoring procedures and techniques
- More frequent HQ monitoring personnel visits to Regional Offices
- Provide rotational assignments for Regional staff to HQ

Also -

- Evaluate seasonal monitoring for PM_{10}, O3, Pb and CO
- Have AREAL develop QA guidance for PM_{10}
- For Regional NAMS Coordinators
  - Require that the Regional NAMS coordinator be a staff person at a GS-13 level
  - Expand the role of the NAMS coordinator

To accompany the above ideas to improve monitoring programs, the following recommendations are made regarding overall procedures.

- Improve communication between monitoring personnel and air programs staff

- After a problem is identified through monitoring, provide sufficient time to prepare the SIP remedies if needed.

- Public education programs and better marketing of air pollution problems are needed.

- Address not only the potential risk but also the potential successes. Maybe a risk should be solved if the solutions are readily available.

The answer to the question, "Can EPA do a better job with existing tools and resources?" is both yes and no. Visibility is a needed key element of not only air monitoring but the air program in general. To make the air monitoring program more visible it is recommended to encourage saturation monitoring, to provide better training and guidance, to focus the duties of the NAMS Coordinator, etc. Better guidance from Headquarters before promulgation of new standards, better review of the air monitoring networks, and a balancing of all air monitoring activities should all be productive. The air programs and monitoring staffs continue to balance their duties, although the A230 and A235 workload model resources are very limited. There comes a limit to the balancing that can be done without additional resources. Without increased resources, ultimately some activities will have to be cut.

ISSUE 6. WHAT NEW TOOLS, RESOURCES, POLICIES, AUTHORITIES, ETC., ARE NEEDED?

Tools

The Workshop participants have been deeply involved in the direct application of the modeling and monitoring guidance disseminated by EPA. Based upon this substantial collective experience, the following additional PM_{10} implementation tools have been determined necessary:

1. The Agency should provide data quality objectives (DQOs) for modeling applications to be used in monitoring network design. Guidance on when to use existing screening models and what data are required to run the model are required to ensure consistent and correct design criteria. This is a very critical element of PM_{10} SIP control strategy evaluation. Since many Group I control strategies are due within the next 12 months, this guidance should have a high priority.

2. Technical guidance on the generation of special studies is another imminent program need. Such guidance is necessary to assure that all such special studies (especially those used for SIP-related purposes) possess sufficient scientific credibility that their findings can be the bases of court-defensible, specific, enforceable and performance-based control strategies. Additionally, the guidance needs to have an integrated approach, to coordinate monitoring, modeling and control strategy development.

3. Recently developed portable low cost monitors appear ideally suited to applications such as saturation studies, collocation (with existing TSP monitors) to establish TSP/PM_{10} ratios, finding most sensitive receptor locations, determining complex terrain particulate deposition rates, etc. These monitors can be used for intermittent, continuous and documenting meteorological conditions of interest applications. A swift Agency evaluation program on this tool is strongly encouraged. If evaluation shows this tool to be acceptable, large scale Agency procurement is recommended.

4. Cost effective and more accurate stagnation modeling is needed to deal effectively with mountain valley situations. Evaluation of models like WYND Valley should be considered if sufficient funding to support this effort could be procured without affecting high priority items for the PM_{10} program (medium to long term effort).

5. Development of improved monitors in general should be initiated. Ideally, the finished products would be portable and quieter and less obtrusive than present apparatus. Beta and gravimetric continuous PM_{10} monitors and intermittent monitors possessing these attributes are needed.

6. Technology transfer needs to be improved. A technical report clearinghouse should be established to assure broader dissemination of technical reports and information, especially for the PM_{10} effort. Additional technology transfer through workshops would be very useful, especially workshops addressing inferential monitoring and coordination of modeling and monitoring activities.

Resources

Resource allocation to the various segments of the PM_{10} program is currently inconsistent, with some Regions allocating virtually no funds specifically for PM_{10} monitoring. Optimal resource allocation is a critical component of any program's success. To achieve optimal resource allocations for the PM_{10} program, it is important at this juncture to assess thoroughly both its present and its intended future status. Workshop participants were virtually unanimous in the determination that a timely and comprehensive study/evaluation should be undertaken to assure future success. The study should address, at a minimum, the following resource-related parameters, and it should incorporate them into a flexible, coordinated approach to resource allocation.

- Regional funding of monitoring activities
- Regional priority of PM_{10} funding
- Special study funding
- Section 105 grants
- A-235/A-20 contract funds
- Rotational Monitoring

Policies

Many policy aspects originally left to the discretion of Regional Offices (sometimes in an attempt to increase flexibility to individual State needs) will need national program directives for Regional use as leverage in Federal/State negotiations. Such national directives will also help to assure Agency-wide consistency in critical policy areas such as monitor networks, modeling, and control strategy evaluations. Specifically, the Regional Office representatives felt that national policy directives are needed for the following to help them implement the monitoring regulations:

1. Monitoring network evaluation guidance for existing Group II monitor sites is needed to assure that only representative site locations and data are used. Also, consistent criteria for monitoring network placement, sampling frequency, and extent of coverage of critical industrial emitters such as steel mills and powerplants are necessary for the success of a complete and consistent national program.

2. Many TSP nonattainment areas (both secondary and primary) were classified as Group III for PM_{10} based upon the PM_{10} probability guideline. In some cases, historically polluted areas have been removed from any Federally enforceable monitoring requirement. Without valid monitoring data to support such determinations, the public health may be affected and the Agency risks citizen litigation. Rectification of this problem may well be considered a <u>late hit</u> by States; further, they will need additional monitors to cover affected areas. Thus, it is critical that the Agency provide funding and/or monitors to support this increased effort, in conjunction with a consistent and convincing rationale for such actions.

3. Several Regions felt that it is important that a national directive be distributed to warn States of the necessity for representative monitoring networks in Group I areas. The directive should require adherence to specific monitoring guidance.

4. Funding constraints and heavy workloads have put the search for new problem areas low on the Federal list of things to do and States have similar problems. However, unless additional particulate problems are identified, long term funding for particulate programs may be adversely affected and the Agency will not be fulfilling its mandate to protect public health. To overcome State and intra-agency inertia, a national directive is needed to reserve 5 to 10 percent of State funding for new site investigation work.

5. The advent of new and low cost PM_{10} monitors will make saturation monitoring studies much more affordable. Since such studies could be employed for a variety of critical air quality applications, it is important to employ a nationally consistent and scientifically valid approach to these studies. As in the previous instances,

a national directive presenting specific and detailed mandatory guidance would be the most effective way to assure these criteria are met.

6. Clear and comprehensive guidance on the use of inferential monitoring is vital, given our present resource constraints. The use of inferential monitoring would save limited monitoring resources and could be invaluable in locating new potential problem areas. For such newly discovered problem areas, inferential techniques could also be useful in control strategy development/evaluation. However, the successful use of inferred data requires its scientific validity and law court defensibility. Comprehensive and specific national criteria are necessary for a valid and defensible national inferential monitoring program.

7. Rotational and surrogate PM_{10} monitoring guidance will be needed for use in PM_{10} attainment determinations, to assure their consistent and valid applications.

8. It may be time for the national program to reemphasize the high funding and manpower priority of PM_{10}, relative to other programs. Various Regional representatives felt that their management still did not believe PM_{10} to be a high priority item on the national agenda. To be truly effective, a directive stressing these points should be signed by the Administrator.

9. An agency policy on rural fugitive dust for PM_{10} is needed.

In addition to the aforementioned national policy directive, the collective experience of the Regions suggests a review of the exceptional events guidelines. Clarification of how frequently an event may occur and still qualify as "exceptional" is needed, as well as more specificity as to the type of event that qualifies as exceptional.

Under some circumstances, waivers to the standard siting criteria may be appropriate, if conditions at a monitoring site under consideration are representative of the area (i.e., if the monitor can be expected to record a typical ambient concentration to which the local population would be exposed). Appendix E to the Part 58 regulations specify the procedures necessary to grant waivers to the siting criteria.

APPENDIX A

CORDS OF WOOD USED BY HOUSEHOLD BY STATE

REGION 1	
MAINE	2.13
NEW HAMPSHIRE	1.42
VERMONT	2.28
MASSACHUSETTS	.52
*CONNECTICUT	.40
*RHODE ISLAND	.34
	1.18

REGION 2	
NEW YORK	.33
NEW JERSEY	.11
	.25

REGION 3	
PENNSYLVANIA	.52
MARYLAND	.33
*DELAWARE	.67
WEST VIRGINIA	.94
VIRGINIA	.94
	.68

REGION 4	
*KENTUCKY	.96
TENNESSEE	.91
NORTH CAROLINA	.94
SOUTH CAROLINA	.59
GEORGIA	.44
ALABAMA	.56
*MISSISSIPPI	.62
FLORIDA	.18
	.65

REGION 5	
MINNESOTA	.67
WISCONSIN	.77
MICHIGAN	.56
OHIO	.54
*INDIANA	.44
ILLINOIS	.39
	.56

REGION 6	
NEW MEXICO	.51
OKLAHOMA	.51
ARKANSAS	1.03
TEXAS	.27
*LOUISIANA	.22
	.51

REGION 7	
*IOWA	.13
*NEBRASKA	.13
MISSOURI	.69
*KANSAS	.15
	.27

REGION 8	
MONTANA	.91
NORTH DAKOTA	.61
WYOMING	.87
SOUTH DAKOTA	.90
*UTAH	.44
COLORADO	.37
	.68

REGION 9	
CALIFORNIA	.21
*NEVADA	.34
*ARIZONA	.23
	.26

REGION 10	
*ALASKA	1.19
WASHINGTON	1.09
IDAHO	1.21
OREGON	1.56
	1.26

ESTIMATES OF CORDS/HOUSEHOLD FROM USDA FOREST SERVICE - MOST ACCURATE FROM CAREFUL RANDOM SAMPLE TELEPHONE SURVEY.

* ESTIMATES OF U.S. DEPARTMENT OF ENERGY
  LESS ACCURATE
  DERIVED INDIRECTUALLY FROM DATA AND ASSUMPTIONS

NATIONAL TOTALS THE SAME

FOREST SERVICE	.51 CORDS/HH
DEPARTMENT ENERGY	.50 CORDS/HH

APPENDIX B

THE ASHEVILLE PM_{10} SATURATION MONITORING STUDY

Introduction

In anticipation of the recommendations of the PM_{10} Monitoring Task Force, personnel from TSD and Region 4 decided to apply the Saturation Survey Technique to a mountain valley wintertime situation in the East. OAQPS wanted to obtain first hand experience in saturation monitoring, already successfully conducted by Region 10 with their own portable, battery operated PM_{10} samplers, for the following reasons: (1) apply the technology of saturation monitoring to other Regions/States; (2) to demonstrate the low cost feature of the saturation monitoring technique; (3) to use saturation monitoring in site/network validation; (4) to look for residential wood combustion (RWC) effects in eastern mountain and valley terrain; (5) to investigate the effects of other types of PM_{10} sources; and (6) to validate the portable PM_{10} monitor by collocating it with a reference PM_{10} monitor.

Participant Responsibility

It was decided that the Asheville/Black Mountain area of North Carolina offered the best location for such a study, because of topography, logistics and reference PM_{10} monitor availability. Since it was early in January 1988 when the decision was made to try the study that same winter, an added bonus would be a demonstration of how quickly a saturation study could be designed and implemented, especially since it involved the cooperation of five government entities.

The following indicates the various participants in the study and their responsibilities:

Technical Support Division: Provide guidance and funding for the project. Participate in initial site selection. Coordinate the individual efforts of study participants. Develop sampling protocol.

Region 4: Provide coordination among State of North Caroling, EPA Regional personnel and OAQPS. Participate in initial site selection.

Region 10: Provide samplers and training in their use. Assist in writing the summary data report.

Lane Regional Air Pollution Authority: Acquire filters and mailers, tare, number and post weight filters, and calculate flow from data logs. Put data into AIRS format. Participate in writing data analysis report.

Western North Carolina Regional Air Pollution Control Agency: Obtain any required municipal authorizations for monitoring sites. Participate in initial site selection. Assist in obtaining site operator. Operate reference PM_{10} monitor according to agreed schedule.

Site Operator: Perform all field work, sample collection and sampler maintenance, sampler storage and shipment.

All participants cooperated, and actual site and operator selection had occurred by February 3, 1989. The samplers arrived and operators were trained February 16 through 17. The samplers were deployed on February 18 and sampling commenced then and continued through March 15. Results of the sample analysis were available by May. The involved agencies relied heavily on in-kind service; the total cost of the 26-day study to OAQPS was less than $7,000.00.

Site Selection

The study protocol called for 12 portable PM_{10} monitors placed within the Asheville urbanized area. Two of the monitors were collocated with the local agency's PM_{10} monitor, and the rest were located through the area using the following considerations:

1. local agency experience and needs
2. area topographical maps
3. census housing density maps
4. average daily traffic maps
5. local emission inventory information

To accommodate the schedule of the college student operator, samples were taken over a 24-hour period (normally from 4 p.m.-to-4 p.m.). The local agency ran their reference PM_{10} sampler daily 4 p.m.-to-4 p.m. during the study, except when its normally scheduled samples (every sixth day midnight-to-midnight) were taken. Over the study period, this provided 14 days of collocated, concurrent PM_{10} sampling at the reference site. Sampled filters were stored in a freezer and shipped on ice at the end of the study to Region 10 for analysis.

Selection of sites for the study was undertaken in two steps. First, a general tour was made to identify candidate areas, then specific sites were chosen within candidate areas.

The tour went first to the Montreat Black Mountain area some 18 miles east of Asheville. Montreat is in a small steep valley which opens into the moderate-sized Black Mountain Valley, which in turn opens into a large valley running along the Swannanoa River and I-40 into Asheville.

The average elevation of the valley floor is 2200 feet at the town of Black Mountain, dropping to 2000 feet at Asheville. Mountains rise to approximately 4000 feet at the sides of the valleys. In Asheville itself, Haw Creek Valley is located just to the east. The Blue Ridge Parkway offers a good overlook of the valley from near Asheville. Because of the unseasonable temperatures, (daytime highs approaching 80°F) there was no visible residential wood burning. January 31 was classified as an open burning day, i.e., a day when home owners are allowed to burn yard debris. We observed the valleys to the east of Asheville gradually filling up with smoke. Also, we observed a relatively high smoke stack at the mouth of the Haw Creek Valley emitting a visible plume, this from the Sayles Bleachery, which operates a coal fired boiler for process steam under a variance to emit an opacity of 40 percent continuously.

The following describes the sites used in the study by number and notes the major PM_{10} effects at each site.

001 - Kerlee Community at McCoy and Ruby Avenue, utility pole #KD-5-4-3. Residential wood smoke outflow from Ridgecrest at eastern edge of Black Mountain.

002 - Montreat Road, across the street from GKPS Printing Service, utility pole #CL07. Outflow from Montreat Valley, residential wood burning.

003 - Lake Tomahawk. Recreational park around lake, outflow of Montreat Valley and Ridgecrest Valley in Black Mountain, residential wood burning. A utility pole at the edge of the park was used.

004 - Property of Bussman Industry, utility pole #4734 at intersection of Old Hwy 70 and Keer Fott Road. Influenced by industrial sources and at the

outflow of the three previously described valleys. An asphalt batch plant immediately northwest, a rock crusher complex to the south and a lumber mill to the southeast.

005 - Haw Creek Canyon Area, little league ball park near intersection of New Haw Creek and Bell Road, second utility pole between fence and parking lot. Residential wood smoke.

006 and 007 - Health Department Building, city center, elevated commercial site, PM_{10} monitor and two portable samplers (to examine both precision and accuracy).

008 - K-Mart parking lot, commercial area across from another major shopping center (Asheville Mall). Site overlooks earth moving (ground preparation) activity for a large construction site. Site is 1 mile northwest of Sayles Bleachery coal fired boiler. Utility pole #AD13-93, commercial/construction.

009 - Bi-Lo Shopping Center. This site is on a light pole in the center of a vacant grocery store parking lot. The site is off HWY 81 and Fairway Drive and is across from a golf course. Also at the outflow of the Haw Creek Valley, a low drainage point along the Swannanoa River, 3/4 mile northeast of the Sayles Bleachery stack.

010 - On Winston between Lincoln and Broad, utility pole #KC73-1385. In an interior neighborhood located south of Haw Creek Valley and 1 mile south of the Sayles Bleachery stack. At a low point in a densely populated neighborhood with a substantial tree canopy around it. Primary effect is from residential wood combustion.

011 - Biltmore Village on Brook Street by Kitchen Place across the street from old train station, utility pole #B211. High traffic area, low drainage

point along Swannanoa River. Observed high amount of diesel truck traffic. average daily traffic (ADT) at this site is 7000 vehicles.

012 - Patton Avenue, utility pole #DN44. Highest traffic count in area, at 49,000 ADT. On a triangle formed by Patton Avenue and access to I-240. Primary effect is from traffic.

Results

Before presenting specific results of the study, it may be beneficial to look at the data collected. Table 1 presents the validated ("nonqualified") data and the caveats covering questionable data, with "B" indicating battery problems, "D" indicating damaged filter, "T" indicating timer malfunction, and "W" indicating problems associated with weather. It can be seen that the valid data compose 92 percent of the data possible. Only 4 percent of the data are missing and another 4 percent is questionable. Figure 1 summarizes these data in the form of a histogram denoting the maximum, the 75th, 50th, and 25th percentiles, minimum, and the mean. From the data, it is apparent that sites 004 and 009 behave in a manner similar to the rest of the RWC, affected sites, hence they will be averaged in with the Black Mountain and Asheville wood burning categories, respectively.

The averages of the two collocated portable PM_{10} monitors are 30.4 ug/m^3 and 28.6 ug/m^3. This agreement of $\pm$ 3 percent during the 26 day study is excellent. Also, on the 14 days in which the reference PM_{10} monitor was operated on the 4 p.m.-to-4 p.m. schedule, the averages were 35.8 ug/m^3 for collocated sampler 006, 33.1 ug/m^3 for collocated sampler 007 and 34.9 ug/m^3 for the reference PM_{10} monitor.

The average of the city center commercial elevated site for the study period, as represented by the average of the two collocated portable monitors,

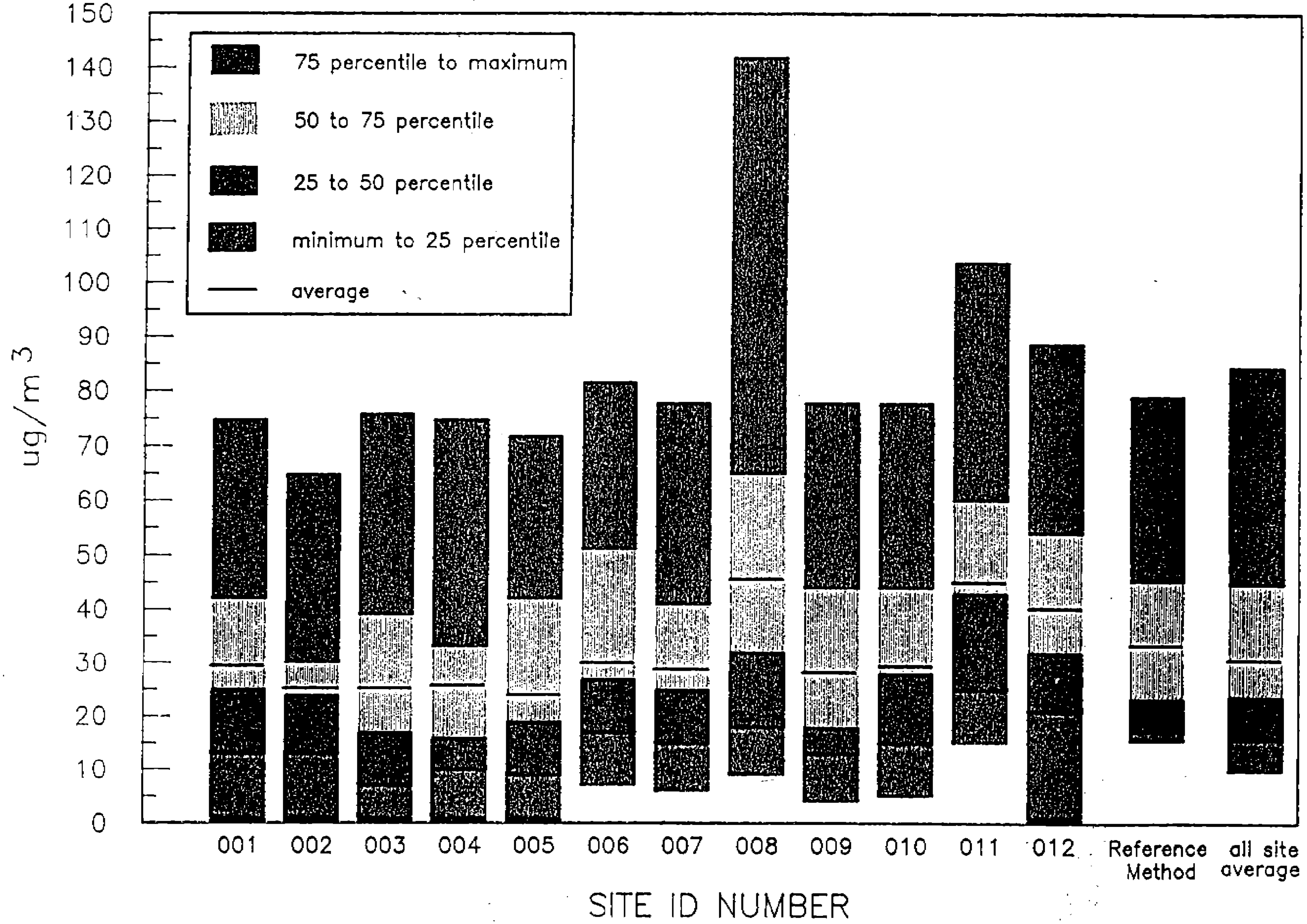
Table 1

PM10 SATURATION SAMPLING
FOR PERIOD: 02/18/89 -- 03/09/89 (26 days)

SITE #	02/18	02/19	02/20	02/21	02/22	02/23	02/24	02/25	02/26	02/27	02/28	03/01	03/02	03/03	03/04	03/05	03/06	03/07	03/08	03/09	03/10	03/11	03/12	03/13	03/14	03/15	
001	25	23	15	12		D 7 D	2	35	23	14	38	42	28	16	16	1 D	9	13	31	42	57	41	59	75	60	48	29
002	30	25	17	8	20	9	8	29	33	8	20	25 D	24	16	16	1	5	13	28	28	29	32	42	65	38	45	24
003	17	26	13	8	14	4	1	43		D 7	27	9	4	17		2	4	9	24	39	42	38	51	76	50	45	24
004	18	32	11	10	16	14	5	35	25	14	15	35	21	9	10	1	1	12	26	40	35	53	33	75	70	38	25
005	23	20	6	3		D 8	2	42	22	9		28		13		10	1	10	20	19	43	45	49	72	43	11	23
006	37	23	13	7	28	12	16	52	14	17	27	56	30	30	12	22	17	21	28	27	31	53	47	82	48	41	30.4
RMPM10					22		19	61			31	55	30	18			16	18	26	24			46	80		44	
007	23	25	6	9	27	12	13	53	18	15	25	55	29	17	15	19	10	17	28	25	35	53	45	78	51	41	28.6
008	19		B 22	10	16 B	9 W	17 D	65 B	23	18	44	106	67	44	29	31	18	32	29	50	65	71	117	142	76	42	46
009	6	21 T	4	8	15	9	11	44	16	17	37	13	24	7	14	22	14	18	36	44	48	49	55	78	55	47	27
010	29 T	18	5	13	16		D 14	44	15	23	36	44	28	13	14	15	16	20	32	44	38	49	50	78	41	46	30
011	30		15	23	30 D	19	43	67	25	38	57	84	46	27	19	22	38	46	46	38	62	53	61	104	63	60	45
012	30		16	24	1		T 27	71	21	19 D	54	71	44	32 B	18	21	23	30	37	40	58	72	52	89	61	52	40
avg. all sites	24	24	12	11	18	10	13	48	21	17	35	47	31	20	16	14	13	20	33	36	45	51	55	85	55	43	31
AVG. TEMP	29	34	44	46	29	19	23	35	42	38	37	36	43	46	50	63	43	36	40	46	51	50	53	44	60	51	
WS	1.6	7.8	9.0	15.1	20.0	28.4	18.3	7.6	12.6	6.9	9.9	5.7	6.5	5.7	9.6	11.8	15.9	10.1	10.0	13.1	9.3	9.1	9.3	7.6	7.9	9.0	
WD	S	S	S	SW	N	N	N	N	NW	NW	N	N	SE	SW	S	SW	N	N	N	N	N	S	N	S	S	N	

FIGURE 1

ASHEVILLE PM_{10} SATURATION STUDY



is 29.5 ug/m^3. The average of all the sites is very similar, at 31 ug/m^3. This would seem to indicate that the single reference PM_{10} instrument in the city center commercial location does a good job of demonstrating what a larger, more widespread network would indicate. However, on any given day, the picture can be different. The city center portable monitor provided the maximum concentration for the network only one time out of 26. Wood burning sites 002 and 004 accounted for the network maximum on two occasions, while the microscale roadway sites 011 and 012 provided the maximum concentration 11 times and the earth moving ground preparation site, 010, recorded the maximum 12 times and in fact recorded the top three values for the entire study (142, 117 and 106 ug/m^3). The ratios between the maximum site and the city center site ranged up to 2.63, and on eight different days a value was obtained somewhere in the network that was over two times higher than the city center site.

Since one of the driving factors behind the study was to investigate the effects of residential wood combustion, the average of the four wood burning sites in Black Mountain (001 through 004) and the three wood burning sites in Asheville (005, 009 and 010) were plotted, as well as the composite average of all 7 sites, and Figure 2 presents these data. Although Asheville and Black Mountain are 18 miles apart, they track each other almost identically. Figure 3 indicates wood burning data in perspective relative to other data from traffic corridor sites 011 and 012, earth moving/ground preparation site 008, and city center commercial sites 006 and 007. To reduce clutter, the average of the sites only in Black Mountain is used to calculate wood burning conditions. From Figure 3, it can be shown that wood burning is the lowest contributor during the study period, and that microscale roadway sites and the

FIGURE 2

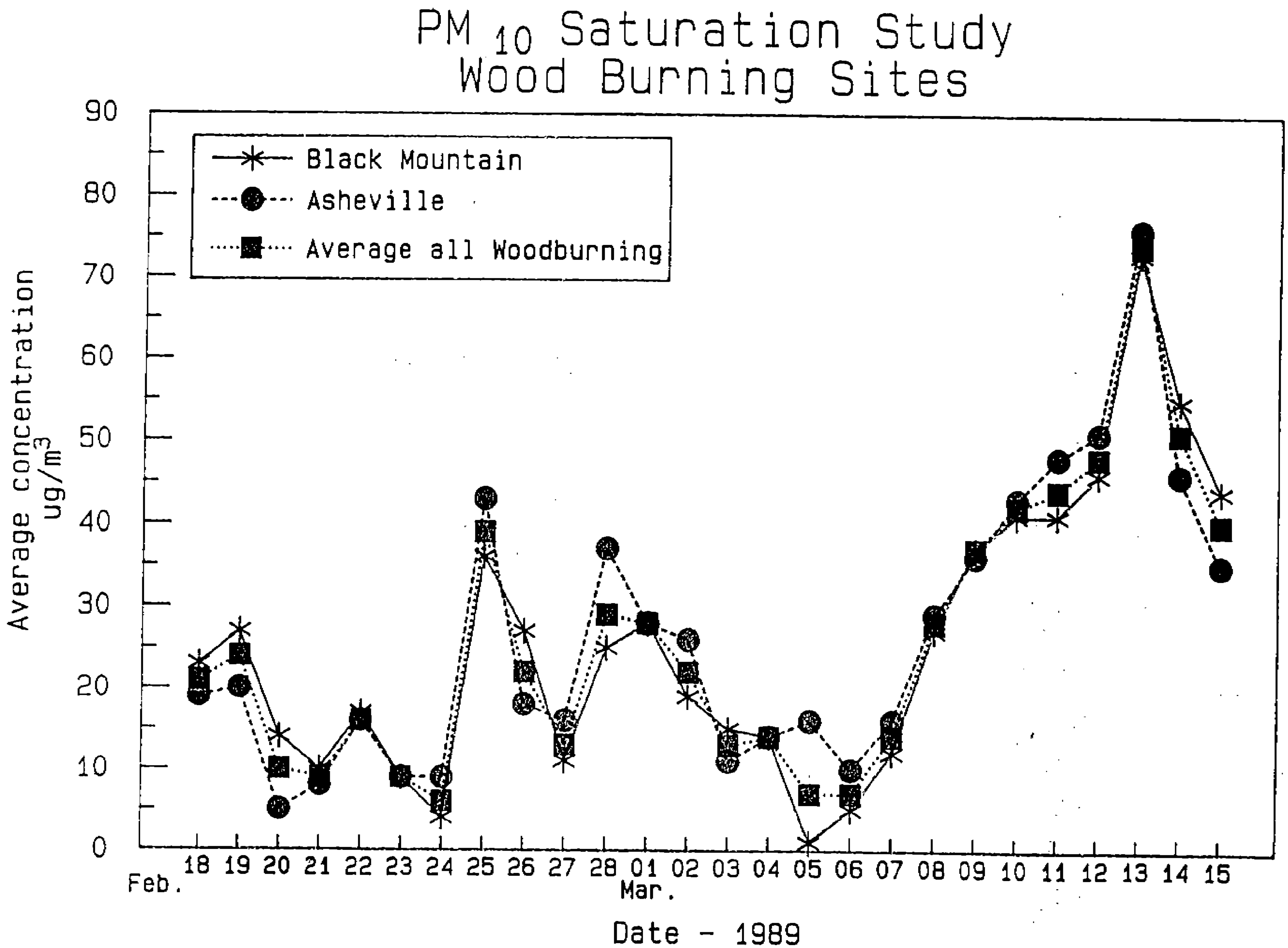
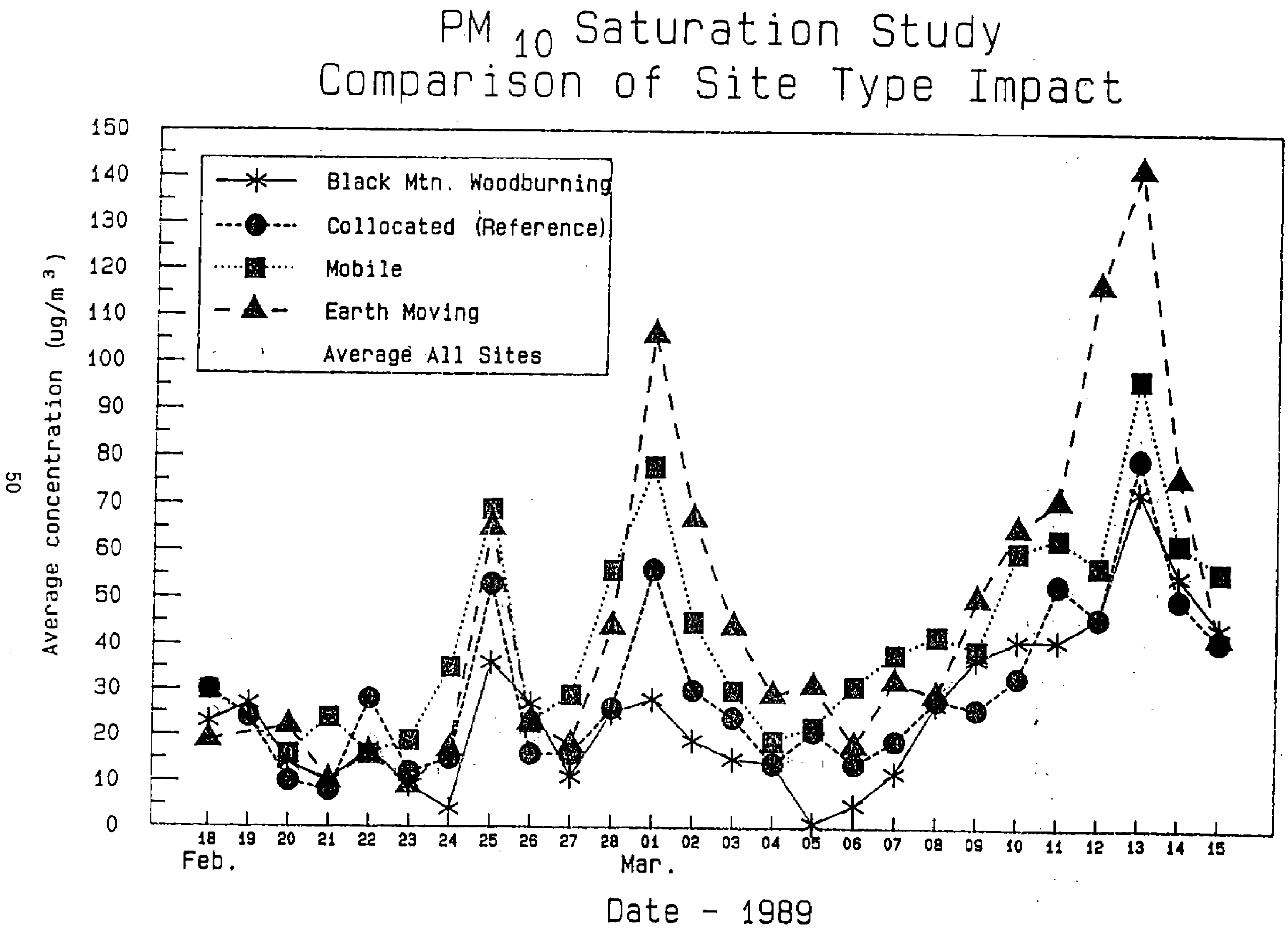

PM 10 Saturation Study
Wood Burning Sites
Black Mountain
Asheville
Average all Woodburning
Average concentration ug/m3
90
80
70
60
50
40
30
20
10
0
Feb.
18 19 20 21 22 23 24 25 26 27 28 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15
Mar.
Date - 1989

FIGURE 3



PM 10 Saturation Study
Comparison of Site Type Impact
Black Mtn. Woodburning
Collocated (Reference)
Mobile
Earth Moving
Average All Sites
Average concentration (ug/m 3)
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
18 19 20 21 22 23 24 25 26 27 28 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15
Feb.
Mar.
Date - 1989

earth moving site indicate the two highest levels. Also, it is evident that all the specific categories have are highly correlated PM_{10} levels. A correlation matrix was developed which shows that all of the sites have correlation coefficients ranging from .7032 to .9713 and all were significant at the .001 level. Table 2 pulls out the key correlations among the various readings. It is interesting to note that the three highest correlations in the study are between the reference and the collocated portable monitors, and that the correlations of wood burning sites are equally as good when compared with sites within Black Mountain, within Asheville, or between Black Mountain and Asheville.

Factors Influencing PM_{10} Levels

To gain some insight into what may be causing the PM_{10} levels to increase or decrease, the network average was plotted against wind speed and temperature, as shown in Figure 4. Also indicated are if there was rain (R), a trace of rain (T), or dry weather (D) during the sampling period. As seen from Figure 4, there is little apparent relationship between PM_{10} levels and either temperature or wind speed. It is apparent that the PM_{10} levels came down when it rained and went up when it was dry. While this is not in and of itself a blinding revelation, a nonparametric statistical test was applied to examine the relationship of the direction of the PM_{10} levels to the direction of the temperature and to wind speed changes, as well as to the wet/dry situation. This led to the hypothesis that, all other things being equal, when the temperature goes down, more wood is burned and the PM_{10} levels go up. Also, when wind speed goes up, there is more dilution/transport, and PM_{10} levels should go down. When it rains and continues to rain, PM_{10} levels should drop, and conversely, when it is dry and continues to stay dry, the

TABLE 2

CORRELATIONS

Black Mountain Wood Burning

	Site 1	Site 2	Site 3	Site 4
Site 1	1.0	.8985	.9078	.8839
Site 2		1.0	.9069	.8639
Site 3			1.0	.8668
Site 4				1.0

Asheville Wood Burning

	Site 5	Site 9	Site 10
Site 5	1.0	.8302	.8504
Site 9		1.0	.8879
Site 10			1.0

Black Mountain vs. Asheville Wood Burning

	Site 1	Site 2	Site 3	Site 4
Site 5	.8732	.8215	.8657	.8506
Site 9	.8768	.7872	.9186	.8322
Site 10	.9004	.8275	.8496	.8416

Collocated/Reference Method Sites

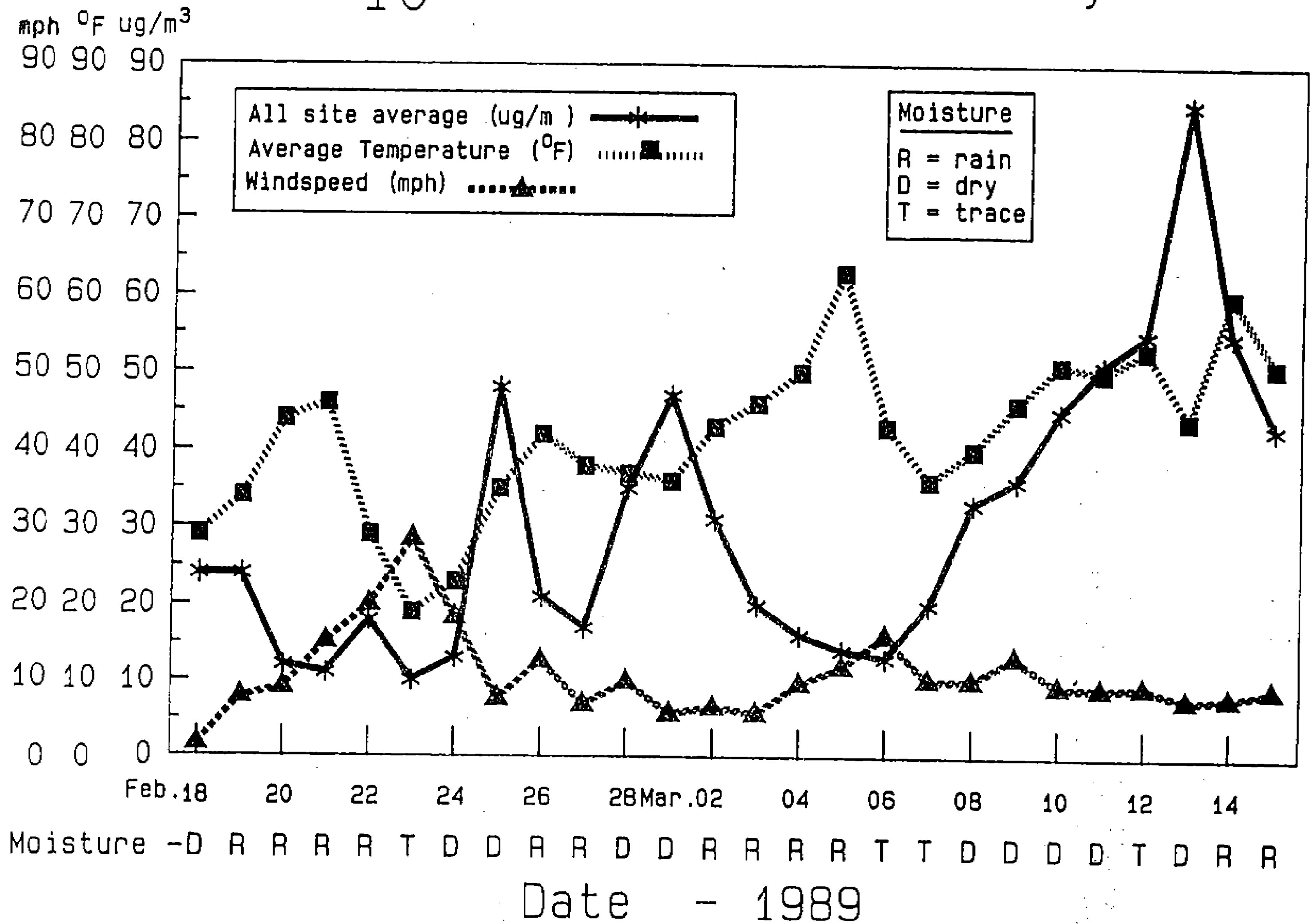
	Site 6	Ref	Site 7
Site 6	1.0	.9622	.9678
Ref		1.0	.9713
Site 7			1.0

Traffic Microscale
Stop and go vs. high speed

	Site 11	Site 12
Site 11	1.0	.8974
Site 12		1.0

FIGURE 4

PM 10 Saturation Study



PM_{10} levels should rise. For the purposes of this test, when there was a trace of rain (T), i. e., less than .01 inch in a 24-hour period, that period included in the dry category. In order not to confound the hypothesis with other emission changes from Asheville, only the RWC-affected sites in Black Mountain have been used. Table 3 depicts this test by using a 1 for an increasing change in PM_{10} levels and a predicted increase in PM_{10} levels for a change in wind speed, temperature or moisture, as described in the hypothesis. Conversely, a -1 indicates a lowering of the actual or predicted PM_{10} levels. From Table 3 it is seen that, for both the temperature and the wind speed column, the predicted change matched the actual change in PM_{10} levels 15 out of 24 times. For the moisture predictor, however, the agreement was much better, with 20 out of 24 directional change agreements, the highly significant probability of .0009 indicates that this agreement was not due to chance alone.

Meteorological Representativeness

In any short-term study, particularly if it is focused on a specific impact, it is always necessary to determine how representative of the time period were the meteorological conditions experienced during the study and how likely was it that the specific impact or conditions of interest occurred during the study period. Table 4 documents the meteorological ranges found during the study period and compares them with the area's 30-year averages. It is apparent from this table that, during this study, it was slightly warmer, the wind blew slightly faster, and it was substantially wetter than average winter conditions in the Asheville area. However, when an event of interest is associated with infrequent meteorological situations which occur 3 or 4 times per year, average meteorological conditions do not tell the whole

TABLE 3

PM_{10} DIRECTIONAL CHANGES VS METEOROLOGICAL CHANGES

OBS	MONTH	DAY	DPM_{10}	DT	DWS	H_2O
1	1	19	1	−1	−1	−1
2	1	20	−1	−1	−1	−1
3	1	21	−1	−1	−1	−1
4	1	22	1	1	−1	−1
5	1	23	−1	1	−1	1
6	1	24	−1	−1	1	1
7	1	25	1	−1	1	1
8	1	26	−1	−1	−1	−1
9	1	27	−1	1	1	−1
10	1	28	1	1	−1	1
11	2	1	1	1	1	1
12	2	2	−1	−1	−1	−1
13	2	3	−1	−1	1	−1
14	2	4	−1	−1	−1	−1
15	2	5	−1	−1	−1	−1
16	2	6	1	1	−1	1
17	2	7	1	1	1	1
18	2	8	1	−1	1	1
19	2	9	1	−1	−1	1
20	2	10	1	−1	1	1
21	2	11	0	1	1	1
22	2	12	1	−1	−1	1
23	2	13	1	1	1	1
24	2	14	−1	−1	−1	−1
25	2	15	−1	1	−1	−1
			Agreements −	15*	15*	20*
				(*out of 24 trials)		

Ho: P(agree) = P (do not agree) = .5
P (20 or more agreements out of 24) = .0009
P (15 or more agreements out of 24) = >.1537

TABLE 4

ASHEVILLE METEOROLOGICAL STATISTICS

- Temperature ranged from 13 to 71 °F
- Average daily temperature ranged from 19 to 63 °F
- Mean temperature for study period was 41.8 °F
- Average daily wind speed ranged from 2 to 28 mph
- Average wind speed for study period was 10.7 mph
- Total precipitation for study period was 4.26 inches

Comparison to 30-Year Averages

Month	Temperature (°F)	Wind Speed (mph)	Precipitation (inches)
Dec.	39.2	8.7	2.98
Jan.	38.8	9.4	2.84
Feb.	40.0	9.9	2.89
Mar.	46.7	10.0	3.74
Study	41.8	10.7	5.08*

* scaled from 26 days to 31 days

story. Studies in the Northwest have demonstrated that high levels of PM_{10} resulting from RWC occur under cold, calm stagnation conditions which have persisted for two or three days. An indicator of these stagnation conditions is the hours of wind speed less than 3 knots (recorded as 0 on Local Climatological Data monthly summaries for an area. With the exception of the first sampling period, 4 p.m. February 18 to 4 p.m. February 19, which had 18 hours of calm, there were only 33 hours, or 5.5 percent, of calm during the next 600 hours of the sampling period. Although the wind speed (average 1.6 mph) and the temperature (24-hr average. 29°F) were favorable in the first sampling period for high levels of PM_{10} from RWC, little RWC effect was noted. The previous 2 days it had been mild and then wet, and early the day sampling commenced, it had snowed four to six inches. Also the RWC sources (houses) in the northwest are more densely packed or closer together, in the northwestern U.S. experiencing high levels of PM_{10} from RWC.

Conclusions

In summary, while the question "Does the Asheville area suffer from a winter residential wood combustion problem?" cannot be definitively answered, there are indications that the problem is not nearly as serious in Asheville as has been found in the West. OAQPS does believe that the study has been successful in addressing its other stated objectives stated. The study points out that Asheville's city center commercial PM_{10} monitor adequately reflects the average of a larger network, but that areas of maximum concentration, in 24-hr levels or maximum monthly averages, are likely being missed. Portable monitors were again shown to correlate closely with the reference PM_{10} monitor, and a considerable amount of data can be acquired in a short time for reasonable costs in both money and effort. Consequently, OAQPS is in the process of acquiring portable monitors of its own to encourage agencies to use the saturation monitoring approach in previously unmonitored areas for PM_{10} and/or to investigate the effectiveness of their own PM_{10} networks.

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(Please read Instructions on the reverse before completing)

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16. ABSTRACT

This report was prepared by the PM_{10} Monitoring Task Force which was formed in July 1988. The Task Force was created by William G. Laxton, Director of the Technical Support Division in the Office of Air Quality Planning and Standards in response to concerns raised at the Air Division Directors meeting in June 1988. The Task Force was formed to look into the need for evaluating PM_{10} monitoring networks especially in existing Group III areas. The principal purpose of the Task Force was to address the apparent disparity in the number of PM_{10} nonattainment areas between the Western and Eastern States. The Task Force is composed of people from all ten (10) EPA Regions and the Office of Air Quality Planning and Standards. This report addresses six principal issues raised by the Task Force and offers recommendations on ways to improve the National PM_{10} monitoring program.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
PM_{10} Particulate Monitoring Network Evaluation Monitoring Task Force Group III Areas Monitoring Networks Nonattainment		

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