



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

MAY 06 2005

OFFICE OF  
AIR AND RADIATION

**MEMORANDUM**

**SUBJECT:** Action Plan in response to the Office of Inspector General's evaluation report, *EPA Needs to Direct More Attention, Efforts, and Funding to Enhance Its Speciation Monitoring Program for Measuring Fine Particulate Matter*, Report No. 2005-P-00004, issued February 7, 2005.

**FROM:** Jeffrey R. Holmstead  
Assistant Administrator

**TO:** J. Rick Beusse  
Director for Program Evaluation, Air Quality Issues

Thank you for your staff's rigorous evaluation of our progress in establishing a speciation monitoring network to support the PM<sub>2.5</sub> program. This memo reflects a joint response from the EPA's Office of Air and Radiation (OAR) and the Office of Research and Development (ORD). EPA is simultaneously considering the Office of the Inspector General's (OIG) final recommendations along with recommendations from the Clean Air Act Advisory Committee (CAAAC) Air Quality Management review, and related recommendations received on an ongoing basis from the Clean Air Scientific Advisory Committee's (CASAC) subcommittee on ambient air monitoring and methods. EPA agrees that the monitoring program could benefit from additional resources; however, we must examine resource needs in the context of EPA's overall air budget and Agency priorities. OAR and ORD are continuing to work on a comprehensive PM methods strategy, which should help make effective use of the available resources. In addition, EPA continues to pursue new cooperative efforts with partners in the Federal, state, and private sectors, and to evaluate and set priorities on the many needs associated with the PM program.

The recommendations provided by the OIG generally align with our current improvement efforts. EPA is pleased to see that the OIG acknowledges that control strategy development is a collaborative process and that speciation monitoring data assists in the development of effective control strategies as one of three tools important for this use. The OIG also stated in the final report that speciation data are available to begin the development of control strategies and increased efforts are needed. In the response to the draft report, EPA recognized that improvements in current inventories, monitoring, and modeling can be made to improve the efficiency and credibility of control strategies.

Attached is our action plan for addressing your recommendations. Several actions are already underway. In cases where we have not adopted OIG's recommendations as written, we have identified actions that address your concerns in alternative ways.

If you have additional questions or require clarification, please contact Peter Tsirigotis of my staff, at 919-541-9411.

**Attachment**

cc: Pete Cosier, Office of Air and Radiation, Audit Follow-up Coordinator (6102A)  
Stephen D. Page, Director, Office of Air Quality Planning and Standards (C404-04)  
Timothy Oppelt, Assistant Administrator, Office of Research and Development (163A)  
Laurie Trinca, Audit Liaison, Office of Air Quality Planning and Standards (C404-2)  
Peter Tsirigotis, Director, Emissions, Monitoring and Analysis Division (C304-02)  
Timothy Watkins, Deputy Director, Human Exposure and Atmospheric Sciences Division (E205-01)  
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## Action Plan

Prepared by the Office of Air and Radiation and the Office of Research and Development, Environmental Protection Agency

Responding to the Office of Inspector General's evaluation report, *EPA Needs to Direct More Attention, Efforts, and Funding to Enhance Its Speciation Monitoring Program for Measuring Fine Particulate Matter*, Report No. 2005-P-00004, issued February 7, 2005.

### Review of OIG's Recommendations and EPA's Planned Response

In its Evaluation Report, OIG recommended that the Assistant Administrator for Air and Radiation:

**OIG Recommendation 3-1:** Increase from 5 to 10 percent the OAQPS funding allocated for performing analytical assessments, adopting new methods, and conducting research on technologies that can more fully identify the chemical make-up of PM<sub>2.5</sub>, account for the atmospheric impacts on PM<sub>2.5</sub>, and assay the resultant changes that occur to the composition of the particle, with particular emphasis on:

- a) **Increasing and improving the speciated data for the six major components of PM<sub>2.5</sub> (sulfate, nitrate, ammonia, organic carbon, elemental carbon, and crustal material). This could be accomplished largely by the increased development and use of continuous speciation monitors.**

**EPA's Planned Action:** As appropriate, OAR will continue to expand the continuous speciation study sites to aid in the development and implementation of continuous monitors at routine monitoring sites. Continuous monitoring technologies are still under development and EPA has an ongoing study to evaluate and demonstrate acceptable technologies for longer-term, routine monitoring. The current continuous speciation study is operating carbon, sulfate and nitrate monitors at five sites across the country. The addition of three sites (Georgia, New York, and North Carolina) in 2005, and two sites (locations to be determined) in 2006 are planned. However, there is no established need yet for a large number of continuous speciation monitoring sites. In addition, ORD is conducting research to improve our understanding of why there are differences between the methods (as has been observed) and to develop appropriate adjustments, as necessary, to address existing limitations. ORD is also working to develop standards to characterize the accuracy of these methods relative to what is actually in the air. ORD's efforts are being conducted through a combination of in-house and extramural programs. One extramural program of particular relevance is the recent Science to Achieve Results (STAR) grant solicitation to develop and improve the science of continuous particulate matter (PM) monitoring techniques. Results from this solicitation are expected within the next few years. These efforts are targeted at reducing the uncertainty in the methods to

allow for their effective use. As always, EPA's efforts to fully explore the scientific basis of continuous methods and their use will be driven by available resources and strategic needs.

- b) **Enabling EPA and State, local, and tribal agencies to perform more sophisticated analyses, through source-receptor modeling and other analysis and methods, to better identify the source of the PM<sub>2.5</sub> and fill the gaps in the data generated from the STN and IMPROVE networks.**

*EPA's Planned Action:* We believe that the tools (emissions, modeling, and measurements) currently available to identify the sources of PM<sub>2.5</sub> are sufficient for developing effective control strategies for attainment of the National Ambient Air Quality Standard (NAAQS). One potential complication is the level of expertise available, particularly in the State, local, and tribal agencies, to apply these tools. As a result, ORD plans to deliver guidance for source apportionment techniques, particularly receptor modeling approaches. In December 2005, they will deliver guidance, a user manual, and a training course on receptor modeling.

While we believe that current receptor modeling tools are capable of supporting control strategy development, enhancements in our measurements and modeling tools will certainly improve the ability to more specifically identify sources of PM. For example, hourly measurements conducted on a daily basis and improved modeling tools would enable us to separate and identify PM sources specific to an air basin. These detailed measurements are in contrast to the current practice of 24-hour integrated averages conducted on a 1-in-3 day basis. Some improvements in the tools needed to address this issue are likely to emerge from two, recent ORD Science to Achieve Results (STAR) grant solicitations. The first solicitation resulted in a series of grants to elucidate an improved understanding of the sources and the accumulation of airborne, carbonaceous, fine particulate matter (PM<sub>2.5</sub>). Research grants awarded in this area will:

- Improve emission source estimates of primary organic aerosol (POA) and secondary organic aerosol (SOA) precursors
- Study SOA formation mechanisms - including cloud processing, SOA from aromatics, and biogenic volatile organic compound (VOC) precursors
- Develop next generation of receptor model (combine UNMIX and positive matrix factorization (PMF))
- Develop cost-effective thermal desorption-gas chromatography-mass spectrometry (TD-GC-MS) technique for the analysis of organic compounds in atmospheric and source samples
- Explore aerosol time-of-flight MS technique to identify organic PM
- Construct on-line measurement systems with chemical speciation

- Evaluate and minimize organic aerosol sampling artifacts
- Integrate the thermal behavior and optical properties of carbonaceous PM to resolve differences in analysis methods (Improve vs. STN)

The second ORD solicitation has provided extramural funding for grants to improve source apportionment techniques that determine the origin of fine and coarse atmospheric particulate matter (PM). The goals of improving these techniques are to determine which sources contribute to measured concentrations and compositions of PM in ambient air, understand the regional variations in the importance of sources, and use results from these apportionment studies to examine the effectiveness of potential control strategies. The results of both of these STAR grant programs should be available over the next several years.

In summary, EPA is committed to advancing the science needed to identify sources of PM<sub>2.5</sub> and has a program to develop improved source-receptor tools. It is important to note, however, as stated in our original response to the OIG report, investments in this area must be balanced with investments in other priority research areas.

**OIG Recommendation 3-2: Identify the uncertainties associated with the comparability of similar speciation monitoring methods, such as the IMPROVE and STN methods, and develop short- and long-term plans to address these uncertainties and increase the usability of the data generated from the various speciation networks. Specifically:**

- a) **Complete the six-site comparability study and incorporate the results of the study into Agency decision making; and**

***EPA's Planned Action:*** Besides the initial six-site study, we added an additional nine STN/IMPROVE sites to assess comparability and inform network decisions. This information will be used to develop a plan for future collocated sites. These sites will help us establish comparability and understand the differences between the data generated. EPA is beginning the task of compiling and analyzing the results from the first 6-site study and laying out questions specifically directed at informing decision making processes and making program improvements. The analysis will be completed in December 2005.

- b) **Expedite Agency efforts to determine whether the STN and IMPROVE monitors can produce adequately comparable data, and if not, determine which method should be further deployed to increase data consistency.**

***EPA's Planned Action:*** OAR is engaging the Clean Air Science Advisory Committee (CASAC) Ambient Air Monitoring Subcommittee in discussions regarding the establishment of comparability between the networks by possible

conversion of the STN sampling and analysis protocols to those of the IMPROVE program to ensure comparability. This process provides for extensive stakeholder participation and scientific review of EPA actions. Their feedback will be incorporated into the decision making process and development of a plan to establish comparability. Meanwhile, OAQPS is developing a contingency plan to switch all STN sites to "IMPROVE-like" sampling and analysis protocols so that the transition can begin quickly, once a final decision is reached.

ORD will continue research, as resources allow and the need exists, to identify the "optimal" method for the measurement of carbonaceous PM. Results from that research will aid in the identification of the method best suited for future deployment in EPA's speciation networks. Specifically, ORD is conducting research to address issues related to sampling and analysis of elemental carbon/organic carbon (EC/OC) thermal optical analysis, including the development of an optimal thermal optical analysis (TOA) Protocol and an analytical laboratory intercomparison. ORD is also conducting an assessment of artifact correction methods for OC and developing calibration standards for carbonaceous PM. In addition, working with OAR and the National Park Service (NPS), ORD is evaluating the sampling and analysis systems of both the STN and IMPROVE networks to identify differences and the resulting implications. Colorado State University, with funding from the NPS, is evaluating the denuder and filter-based methods for sulfate, nitrate, and ammonium. The University of California at Davis and Research Triangle Institute (RTI), in coordination with OAR and ORD, is evaluating differences/scatter observed between the x-rays fluorescence (XRF) methods used by both groups. Finally, we are also trying to understand why differences are inconsistently observed in the EC/OC methods. All of these efforts are aimed at improving the understanding of the measurement and analysis methods used by STN and IMPROVE.

**OIG Recommendation 3-3: Increase Agency efforts to develop the data needed to conduct the more advanced analyses necessary to understand the behavior, characteristics, and chemical composition of PM<sub>2.5</sub>, including:**

- a) **Increasing efforts to develop methods to collect and measure source profiles at emission sources, and the respective tracers in ambient air that uniquely identify those sources.**

***EPA's Planned Action:*** EPA will continue to invest in improvements to emission source profiles by updating the speciation source profile database (SPECIATE), planned for completion in 2005. In addition, ORD has on-going efforts to support emissions profile development and tracer methods, including efforts to develop profiles and emissions factors for several sources, with a focus on diesel and gas engines. ORD has also begun an extensive "in-house" laboratory effort for developing and evaluating ambient air methods for the collection and analysis of

organic species in PM with an emphasis on tracer species. ORD is conducting related research through its STAR grant program. STAR grants have been recently awarded, or will soon be awarded to: 1) collect and measure carbonaceous PM components, including improving emission source estimates of primary organic aerosol (POA) and secondary organic aerosol (SOA) precursors, 2) develop and improve source apportionment tools, and 3) develop continuous methods. These grants will provide not only species data, but time-resolved data that will add another, useful dimension for obtaining source-related information. While these grants will be useful to expand the knowledge about fine particles, additional effort by EPA will be required to develop and enter the grants results into a database, such as SPECIATE, for use by EPA and the States.

**b) Identifying and minimizing the uncertainties associated with measuring the organic fraction of PM<sub>2.5</sub>.**

*EPA's Planned Action:* EPA will continue ongoing efforts that address this topic and cover both improvements in the methods (sampling and analysis) and development of calibration and reference standards. This research is being accomplished through a combination of in-house and extramural research. Specifically, ORD is conducting an assessment of artifact correction methods for organic carbon and developing calibration standards for carbonaceous PM via an Interagency Agreement with the National Institute of Standards and Technology (NIST). ORD is also conducting relevant research through the recently awarded STAR grants on carbonaceous PM as described above. In addition, ORD is working to develop and improve methods to characterize PM<sub>2.5</sub> mass associated with organic carbon as measured in the speciation program and the individual species of PM for application to the future national monitoring network. Finally, it is important to note that EPA is building upon the efforts and insights obtained via the Supersites program to address these issues.

**c) Adding the capability to measure ammonia to the ambient Speciation network.**

*EPA's Planned Action:* OAR will continue to move forward with implementation of the National Ambient Air Monitoring Strategy (NAAMS) National Core (NCore) level 2 sites. NCore level 2 sites will add the capability for measurement of gaseous ammonia at sites logically collocated with ambient speciation monitors. ORD will work with OAR to investigate these methods and evaluate their deployment in the national speciation network.

- d) **Developing and deploying continuous speciation monitors that help provide the real-time data needed to more accurately depict what is occurring in the atmosphere on a real-time basis and better pinpoint the sources of PM<sub>2.5</sub>.**

*EPA's Planned Action:* Also see Recommendation 3-1 a. OAR will continue to pursue and support limited expansion of the continuous speciation study sites to aid in the development and implementation of continuous monitors at routine monitoring sites. OAR and ORD will continue to work together to identify a level of effort for diagnostic evaluation (to determine what is actually being measured and with what certainty). Also, as part of its STAR program, ORD is currently seeking applications proposing continuous measurement techniques that determine the composition of fine atmospheric particulate matter. These improved continuous measurement techniques should provide insight into the sources contributing to measured concentrations in ambient air and into the effectiveness of potential control strategies.

**OIG Recommendation 3-4: Establish a stakeholders workgroup to address the challenges described in Recommendations 3-1, 3-2, and 3-3, comprised of officials from OAQPS, ORD, and selected EPA Regions; State, local, and tribal agencies; State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Control Officials; RPOs; affected industries; academia; and monitor manufacturers.**

*EPA's Planned Action:* The EPA will use two existing workgroups to address the concerns outlined in recommendations 3-1, 3-2 and 3-3. These groups are the CASAC Ambient Air Monitoring and Methods Subcommittee, and the EPA/State/Local Ambient Air Monitoring Steering Committee. We will continue to work with each of these groups on an as-needed basis.

**OIG Recommendation 3-5: Through the workgroup discussed in Recommendation 3-4, increase partnering efforts with monitor manufacturers to maximize the availability and use of current continuous speciation monitors and expedite the development of the next generation of speciation monitors to address the challenges described above. Given the health and economic consequences if controls are not implemented expeditiously and at the right sources, EPA should consider a joint EPA-private sector pre-competitive technological research program similar to the groundbreaking Partnership for a New Generation of Vehicles (PNGV) program that helped to develop a new generation of low emitting vehicles.**

*EPA's Planned Action:* EPA will continue to communicate with the instrument vendors about monitoring needs, instrument issues, and future directions of the nation's air monitoring programs. ORD will explore how Cooperative Research and Development Agreements with the monitoring research community, manufacturers/vendors, affected industries and various Federal, State, tribal and

local governments could benefit the advancement of continuous speciation methods. Partnerships with vendors require very careful development. EPA must be cautious about committing to use a vendor's developed methods in the monitoring networks. However, EPA will continue to support and interact with instrument vendors through the Small Business Innovative Research (SBIR) program where vendors compete for funds to develop new methods. SBIR contracts for continuous PM methods were awarded in 2003.