

Task 2: Draft Strategy for Technology Transfer of PM2.5 Monitoring Technologies to the U.S. Forest Service

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Prepared for

Jim Homolya
Work Assignment Manager

Vickie Presnell
Project Officer

U.S. Environmental Protection Agency
Office of Air Quality and Planning Standards
Research Triangle Park, NC 27711

by

BATTELLE
505 King Avenue
Columbus, Ohio 43201

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PM_{2.5} Monitoring Technologies to the U.S. Forest Service

1. Introduction

Fine particulate matter in ambient air (PM_{2.5}) has been widely linked to adverse health effects, and as such has been the target of air quality monitoring for a number of years. Much of this ambient air monitoring has been conducted by State and Local agencies in urban areas to assess compliance with the National Ambient Air Quality Standards (NAAQS). That and other monitoring work have led to a basic understanding of the chemical composition of PM_{2.5}, as well as an identification of the major sources of PM_{2.5}. Furthermore, PM_{2.5} is a contributor to visibility reduction in many of the national parks and wilderness areas. The goal of the Regional Haze Rule is to reduce visibility impairment in the 156 Mandatory Class I natural areas and to achieve natural visibility conditions by 2064. As such, the sources of PM_{2.5} must be characterized and controlled to limit visibility impairment. Included in the list of PM_{2.5} sources that contribute to both adverse health effects and visibility reduction is biomass burning, such as prescribed burning and wildland fires. However, limited monitoring has been conducted to assess the impacts of wildland fires on air quality and human health.

Assessing the impacts of wildland fires and prescribed burning on air quality provides useful information to land managers as well as public health officials. These impacts are currently assessed by the U.S. Forest Service (USFS) primarily by monitoring PM_{2.5} emissions in the smoke plume. The impacts on communities (i.e., public health) are assessed primarily using established monitoring networks and/or individual event monitoring for specific fires. The impacts of fires on the visibility in Class I areas is primarily assessed through PM_{2.5} monitoring in the IMPROVE network. The goals of these different types of monitoring efforts are not necessarily the same, and thus the protocols used are not necessarily consistent. Similarly, since the size and intensity of fires, and subsequently their impact, can vary as a function of fuel type and availability, meteorological conditions, and topographical conditions, a single monitoring

plan is not likely to be universally applicable to adequately monitor all fires, even if the intended monitoring goal is the same.

Previously, a report was prepared as part of this work assignment to summarize some current USFS activities associated with PM_{2.5} monitoring from wildland fires and prescribed burns, and the availability of monitoring protocols within the USFS. That report indicated that the USFS was familiar with many of the available monitoring technologies for measuring PM_{2.5}, and was employing several of these techniques in routine monitoring networks as well as in other event specific applications. However, as indicated in that report, it appeared as though there was not a consistent set of monitoring protocols or quality assurance documents that had been adopted by the different USFS groups throughout the nation to monitor PM_{2.5} from prescribed burns and wildland fires. As such, the most likely areas of opportunity for technology transfer from the EPA to the USFS for this purpose are in terms of document development for monitoring protocols, quality assurance plans and procedures, and training of personnel for PM_{2.5} monitoring.

A draft strategy for transfer of these technologies has been prepared and is presented here. This draft strategy focuses first on identifying specific needs within the USFS, then identifying available technologies within the EPA, and finally coordinating for efficient transfer between the agencies with the appropriate training to ensure the transfer is effective. It is beyond the scope of this draft strategy to provide specific details about how each of these processes should be addressed by the USFS or EPA, although some general recommendations are presented.

2. Identification of Technology Needs

As described previously, the area of need that is the focus of this technology transfer strategy falls under the general category of documents and document preparation. Specifically, quality assurance documents as well as protocols and plans for PM_{2.5} monitoring have been identified as technology needs within the USFS. Although examples of these types of documents have been developed by different groups within USFS, they are not generally adopted

by all parts of USFS. As such, it may benefit the USFS to establish documents that will ensure consistent approaches to PM_{2.5} monitoring that will be adopted nationally by the USFS.

Identification of the specific needs in this area should be addressed by USFS technical staff in one or more of the groups within USFS. Focus should be on those technologies that are currently being used by USFS to monitor PM_{2.5} and general monitoring protocols to aid in the design of monitoring networks.

Although the USFS routinely uses a variety of monitoring technologies for measuring PM_{2.5}, it is not apparent that a set of published standard operating procedures (SOP) exists within the USFS to ensure comparability of results among independent users. As such, a set of SOPs should be prepared by the USFS for the various technologies that are deployed for PM_{2.5} monitoring. These SOPs should be developed based on guidelines for SOP preparation (i.e., EPA/240/B-01/004) and may be based on currently available operating procedures that may be in place. For example, the MIE DataRam is used extensively by the USFS as a portable, real-time PM_{2.5} monitor and is generally operated based on the recommended procedures in the instrument manual. The actual procedures that are followed for calibration, operation, quality assurance activities, and maintenance of this monitor should be established in a single SOP that is consistent across the USFS. Similar documents should be prepared for other monitoring technologies as well as for laboratory activities associated with samples collected in the field

General monitoring protocols should also be considered as an area of need. The USFS has several examples of monitoring protocols which are widely used and can serve as the basis for specific network protocols. However, these protocols are general prepared with certain regions of the country in mind and may not be applicable to other regions. For example, the USFS has adopted a protocol to assess when and where to monitor smoke from prescribed burns. This protocol is widely cited as the basis for monitoring conducted by the USFS but was developed specifically for use in the Pacific Northwest region of the United States. The USFS should determine if the monitoring protocols that do exist are appropriate for all regions or if other protocols should be developed.

3. Identification of Available Technologies

Once the technology needs have been identified within the USFS, the EPA should help in identifying those technologies that may be currently available and readily transferred to the USFS. A variety of documents have been prepared by the EPA which can be transferred directly to the USFS to meet their specific needs. Other documents prepared by the EPA can be transferred and used as templates or guidance in the preparation of documents by the USFS.

Identification of available technologies should focus on SOPs that EPA or States may have developed. These SOPs may include both real-time monitors (e.g., the Rupprecht & Patashnick, TEOM monitor, the MIE DataRam, etc.) and filter-based sampling technologies (i.e., PM_{2.5} Federal Reference Monitors), as well as other procedures for laboratory activities (e.g., filter weighing) and quality assurance activities (e.g., performance evaluation audits). In addition to SOPs that are available, the EPA's guidelines on preparation of SOPs (EPA-240/B-01/004) should be considered an appropriate technology for transfer to the USFS.

Of particular interest in a technology transfer strategy would be the use of EPA developed guidance documents. For example, the EPA's "Guidance for Using Continuous Monitors in PM_{2.5} Monitoring Networks" contains information that would likely be of practical use to the USFS in establishing and maintaining their smoke monitoring networks. This guidance document describes a variety of specific monitoring technologies (including those currently used by USFS) and discusses how these technologies are used for real-time PM_{2.5} applications.

A second guidance document that might be of great practical use to the USFS in developing general protocols, network specific plans, or SOPs, is the Visibility Monitoring Guidance document (EPA-454/R-99-003). This document covers a great deal of information including objectives to be considered in developing monitoring strategies, and includes example procedures for specific monitoring technologies. For example, one section of this document is devoted to the operation of the Optec NGN-2, which is used in some applications by the USFS. Described in that section are criteria for siting these monitors (with illustrations), recommended activities to be conducted during routine site visits, data handling activities, and quality assurance procedures. Also included is a list of SOPs that have been prepared and are available

for use by the USFS. This document also contains similar information concerning the IMPROVE sampler.

Other documents may also be identified as appropriate for transfer to the USFS and should be included in a technology transfer strategy. A list of all documents and relevant material should be made available to the USFS and reviewed by the USFS to ensure suitability.

4. Coordination of Transfer

Once both the technology needs and available technologies have been identified, it is important to coordinate a transfer of these technologies between the EPA and USFS to ensure that the technologies are routed to the appropriate staff within the USFS. This step in the transfer strategy may be best conducted by the parties involved with the previous steps, and should involve an organized training program to foster familiarization of the documents within the USFS. This program should be designed to include not only demonstration of technical procedures associated with monitoring activities, but also instruction on how to develop and prepare documents that will be consistent within the USFS on a national scale.

5. References

USEPA, *Guidance for the Preparation of Standard Operating Procedures (SOPs)*, EPA/240/B-01/004, Washington, DC, March 2001.

USEPA, *Guidance on the Use of Continuous Monitors in PM_{2.5} Monitoring Networks*, EPA-454/R-98-012, Research Triangle Park, NC, May 1998.

USEPA, *Visibility Monitoring Guidance*, EPA-454/R-99-003, Research Triangle Park, NC, June 1999.

USFS, Pacific Northwest Region, *When and How to Monitor Prescribed Fire Smoke: A Screening Procedure*, prepared by CH2M Hill, September 1, 1997.