United States
Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park, NC 27711

GUIDELINE SERIES
OAQPS NO. 1.2-122
March 26, 1979

Air

EPA

GUIDELINE FOR SHORT-TERM LEAD MONITORING IN THE VICINITY OF POINT SOURCES

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OAQPS NO. 1.2-122

Monitoring and Data Analysis Division
Office of Air Quality Planning and Standards
and
Environmental Monitoring and Support Laboratory
Office of Research and Development

U.S. Environmental Protection Agency
Office of Air, Noise and Radiation
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

March 26, 1979

FOREWORD

Different individuals were involved in the preparation of this document and should be contacted if any questions arise in the application of the guideline.

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1. INTRODUCTION

On October 5, 1978, EPA promulgated a national ambient air quality standard for lead and requirements for the submittal of an implementation plan by each State to achieve the new standard. 40 CFR 51.80 requires each State to demonstrate that the national lead standard will be attained in areas in the vicinity of the following significant point sources: primary lead smelters, secondary lead smelters, primary copper smelters, lead gasoline additive plants, lead-acid storage battery manufacturing plants that produce more than 2,000 batteries per day, and any other stationary source that actually emits 25 or more tons per year of lead or lead compounds. Also, Section 51.84 requires that the State plans calculate the maximum lead air quality concentrations resulting from the above sources through the application of atmospheric dispersion modeling.

The SIPs should be based on ambient air data which reflect normal source operations. The significance of such ambient data for the development of the lead SIP is manifold. Clearly, ambient lead data collected from the vicinity of the source will help to identify concentrations exceeding the national standard. Additionally, ambient data is essential in the calibration of models used to calculate the maximum lead concentrations in the vicinity of lead point sources. The ambient data will also be useful for checking the validity of available emission factors and particularly for developing more accurate estimates of fugitive emissions. States may have difficulty in meeting the SIP requirements due to the small amount of ambient lead data that have been collected around the significant sources of lead mentioned above. Therefore, in order to correct this deficiency, it may be necessary to obtain additional ambient data prior to the submittal of the SIPs. Consequently, guidance is being provided herein for those States that need to obtain additional ambient air quality data through the operation of a short-term (i.e., 3-6 months) monitoring program. Because of serious restraints involving both time and resources, the monitoring effort is generally being focused on primary and secondary lead smelters, and primary copper smelters. These sources are believed to have the greatest environmental impact for lead, particularly from their fugitive emissions.

The purpose of this guideline is to provide recommended procedures for a short-term monitoring program to obtain ambient lead data essential to the development of a lead control strategy. The guideline also describes associated air quality data assurance and reporting procedures.

The guideline has been kept as general as possible, because the States will need some flexibility in implementing the requirements on a case-by-case basis due to the diversity and complexity of the many factors that affect air quality concentrations. However, this guideline should still provide for consistency between States when implementing a source monitoring program.

EPA believes that a more comprehensive data base will ultimately be necessary to assess compliance of significant lead point sources with the lead ambient air quality standard. Such information will have to be obtained from a more extensive network than that described herein. Additional monitoring guidance is currently being prepared to help States establish a more comprehensive network design to determine if significant lead point sources will cause violations of the national standard by the mandated attainment date, and to estimate the contribution of fugitive emissions to such violations.

2. LEAD MONITORING

2.1 Monitoring Objectives and Data Uses

The objective for conducting the short-term ambient lead monitoring is to obtain quantitative information on lead concentrations around primary and secondary lead smelters and primary copper smelters. The reasons for selecting these sources were discussed in Section I. The monitoring data obtained will then be used to determine compliance with the NAAQS.

2.2 Monitoring Options

There are two approaches available to States to obtain the necessary lead air quality data. The first approach involves a decision on the part of the State to establish a monitoring program and conduct ambient lead monitoring in the vicinity of the affected lead point source(s). The alternative is to have the source take full responsibility for the monitoring program. The obvious advantage of the latter course of action is that the State is not overburdened by the additional resources required to perform the special short-term monitoring. Some States have indicated, however, that they would prefer to do the monitoring themselves.

Where the States choose to make the source responsible for the acquisition of lead air quality data, each State is encouraged to work out a cooperative agreement with each affected source whereby the source would voluntarily agree to conduct the the monitoring and provide the data to the State agency. Where it is evident, however, that the source will not respond voluntarily, the State may obtain the necessary authority to require the source owner or operator to conduct the monitoring pursuant to Section 114(b) (1) of the Clean Air Act. In order to obtain this authority, a State must submit to EPA an approvable procedure for requiring the source to carry out the monitoring responsibility and for reporting the data to the State. The Administrator may approve such procedure and delegate the appropriate authority to the State.

Regardless of whether the source voluntarily performs the monitoring or is legally required to do so, the actual monitoring should be preceded by the submittal of a monitoring plan as described in Section 2.8 of this guideline. The State should approve such plans prior to the commencement of monitoring activities. Monitoring should commence as soon as possible in 1979.

2.3 Meteorological Considerations

In order to best determine the proper placement of lead monitors to detect the maximum impact of stack and fugitive emissions as well as background concentrations, monthly surface wind and precipitation roses should be used for guidance. The meteorological data used for the monthly surface and precipitation roses should be the best that is currently available and should also best represent the conditions at the smelter site. Such data may be derived from routine measurements by National Weather Service (NWS) stations. The data are available as individual observations and in summarized form from the National Climatic Center, Federal Building, Asheville, North Carolina 28801.

The meteorological data are to be used to determine the predominant wind direction during the months lead data will be collected as discussed in Section 2.5. Lead monitors should then be sited based on this predominant wind direction.

2.4 Number and Location of Monitors

The location of the monitors is important in order to meet the required monitoring objectives and data uses. The upwind background concentration monitor should be located so that it measures ambient concentrations which do not have significant air quality impact from the source under study. The location of the downwind monitors is also critical because the monitor location has to be within the general location of expected maxima dispersion areas of the pollutant cloud. Factors, such as the emission rate from the source, wind speed, and wind direction must be taken into account by dispersion modeling techniques using the monthly meteorological data obtained previously.

The monitoring network around the source should be designed to measure the impact of both fugitive and stack emissions. There are different network configurations that could be used to measure the fugitive and stack emission impact. A network design which incorporates a minimum number of monitors (two or three) to provide sufficient data to estimate the emission impacts is discussed below. Changes from this type of network may be approved by the State because the ultimate placement and number of monitors is decided on a case-by-case basis due to many different factors, such as meteorological conditions, terrain, and other lead sources which may be nearby. In complex terrain situations, additional sites may be needed.

- Background Monitor Using Predominant Wind Direction Data

  One background monitor is needed to measure the lead being transported into the area around the source. This monitor should be located upwind of the source considering the predominant wind direction and where the contributions from the source would be minimal. For example, if the predominant wind direction is from the southwest, the background station should be located to the southwest of the source. For remote situations, background may be assumed to be zero and no monitoring for background would be needed.

- Impact of Stack Emission Monitoring Using Predominant Wind Direction Data

  One monitor is needed to measure the impact of the stack emissions and the general location of this monitor is determined by modeling. The maximum concentration area from the stack emissions using the predominant wind direction is calculated from wind speed and direction, stack height, emission rate, etc.

- Fugitive Emission Impact Monitors Using Predominant Wind Direction Data

  The siting of monitors to measure the fugitive emission impacts is more complex than for background and stack impact monitors because these emissions may be from buildings, i.e., windows, doors, hood vents, etc., or may be re-entrained from areas around the source. In addition, the land area affected by the fugitive emissions is probably not well defined and would probably need several monitors to full document the area. However, for the purposes of this short-term monitoring, one monitor is needed to measure the impact of the fugitive emissions. It should be located downwind of the source based on the predominant wind direction, and close to the fence line of the source.

2.5 Duration and Frequency of Sampling

The lead monitoring should be conducted for 3 to 6 months as a minimum. However, the monitoring can begin at any time and does not have to coincide with the calendar quarters (beginning with January, April, July or October).

A minimum of one 24-hour sample every sixth day is necessary but more frequent sampling is encouraged. This is consistent with standard sampling techniques.

2.6 Sample Method and Procedures

Particulates for lead analysis should be collected in accordance with the reference method as described in 40 CFR 50. The analysis method may be either the reference method as described in 40 CFR 50 or an equivalent method. Flow control and flow recorders should also be used. The results will be compared against the calendar quarter standard of 1.5 $\mu g/m^3$. Each filter should be analyzed separately. In the interest of economy and quality assurance, the filter samples should be accumulated and the analysis of each filter should be performed concurrently with other filters. The analysis frequency of these batches should be at least once per quarter.

2.7 Monitor Siting

The lead monitors should be located in such a manner as to minimize the contribution from other sources (stationary and mobile) and to avoid measurement biases. Also, there should be some uniformity in monitor siting for comparability purposes. Therefore, the following monitor siting criteria should be followed to the extent possible.

The air intake for a lead monitor should not exceed 5 meters above the ground level. There should be a minimum separation distance of 15 meters between the monitor and the edge of the nearest roadway. If the sampler is located on a roof or other structure, then there should be a minimum of 2 meters separation from walls, parapets, penthouses, etc. The sampler should also be placed at least 20 meters from trees, since the trees may absorb particles as well as restrict air flow. The sampler should be located away from obstacles such as buildings, so that the distance between the obstacles and the sampler is at least twice the height that the obstacle protrudes above the sampler. There should be unrestricted airflow in an arc at least 270° around the monitor, and the direction between the monitor and the source should be included in the 270° arc. The monitor should not be located in an unpaved area unless there is vegetative ground cover during the period of this short-term sampling so that the impact of re-entrained or fugitive dusts will be kept to a minimum.

2.8 Monitoring Plan

A monitoring plan prepared by the source should be submitted and approved by the State before the lead monitoring is started. The number and location of the monitors will need to be determined on a case-by-case basis by the source and reviewed by the State. The review and approval of the source monitoring plan by the State should ensure that the monitoring locations are optimum for purposes of determining maximum pollutant concentrations. Table 1 lists the types of information that should be included in the monitoring plan.

2.9 Data Reporting

A summary of the lead monitoring data, all individual lead values, and the quality assurance data (discussed in Section 3) should be submitted to the State agency on a quarterly basis and should be submitted within 30 days after the quarter ends. The State agency should also transmit the data to appropriate EPA Regional Office quarterly. The individual lead values are to be submitted in SAROAD format, preferably in machine readable form. A printout of what is on the tape or cards should be included. Deviations from these reporting requirements will need to be negotiated with the State and appropriate EPA Regional Office. All raw data not previously submitted (i.e., calibration data, flow rates, etc.) should be retained for 1 year and submitted upon request to the State. The periodic submission of data is intended to identify any problems in the data as they may occur. At least 80 percent of the possible individual 24-hour values (with a one in six day sampling schedule) should be obtained by the source in any sampling period.

The monitoring data should be reviewed in light of the detailed work history of the source. This would ensure that the monitoring data were collected during a time that would be representative of normal operating conditions at the source.

TABLE 1. MINIMUM CONTENTS OF LEAD MONITORING PLAN

I. SOURCE ENVIRONMENT DESCRIPTION (within one mile of smelter)

- topographical description
- land-use description
- topographical map of source and environs (including location of existing stationary sources, roadways, and monitoring sites)
- climatological description
- monthly wind roses (from meteorological data collected at the lead source or other representative meteorological data)

II. SAMPLING PROGRAM DESCRIPTION

- time period for which lead will be measured
- rationale for location of monitors
- rationale for joint utilization of monitoring network by other lead sources

III. MONITOR SITE DESCRIPTION

- Universal Transverse Mercator (UTM) coordinates
- height of sampler (air intake) above ground
- distance from obstructions and heights of obstructions
- distance from other lead sources (stationary and mobile)
- average daily traffic of nearest roadway
- photographs of each site (five photos: one in each cardinal direction looking out from each existing sampler or where a future sampler will be located, and one closeup of each existing sampler or where a future sampler will be located. Ground cover should be included in the closeup photograph.)

IV. MONITOR DESCRIPTION

- name of manufacturer
- description of calibration system to be used
- type of flow control and flow recorder

V. DATA REPORTING

- format of data submission
- frequency of data reporting

VI. QUALITY ASSURANCE PROGRAM

- calibration frequency
- independent audit program
- internal quality control procedures
- data precision and accuracy calculation procedures

3. QUALITY ASSURANCE FOR AIR QUALITY DATA

3.1 Special Performance Audit Program

States, source owners, or their monitoring contractors should participate in the following special performance audit program conducted by EPA:

(a) Blind performance audit of the high-volume samler flow rate using reference flow device (ReF device).

(b) Blind performance audit for lead analysis using glass fiber filter strips containing lead.

3.1.1 Performance Audit of High-Volume Sampler Flow Rate

The frequency for sampler flow rate audits is dependent on the length of the monitoring program. The following audit frequency is recommended:

If monitoring program is $\leq$ 6 months duration:

(a) audit at beginning of sampling

(b) audit at 3 months

(c) audit at 6 months or end of sampling if less than 6 months.

If monitoring program > 6 months up to 12 months:

(a) audit at beginning of sampling

(b) audit at 3 months

(c) audit at 6 months

(d) audit at 12 months or end of sampling if less than 12 months.

3.1.2 Performance Audit of Lead Analysis

The frequency for lead analysis audits is dependent on the length of the monitoring program. The following audit frequency is recommended:

If monitoring program $\leq$ 6 months duration:

(a) audit at beginning of sampling; before or during the first scheduled analysis

(b) audit once each month if analyses are performed monthly or more frequently

(c) audit each analysis, if analyses are performed less frequently than monthly.

If sampling >6 months up to 12 months:

(a) audit at beginning of sampling; before or during the first scheduled analysis

(b) audit once every 6 weeks if analyses are performed every 6 weeks or more frequently

(c) audit each analysis, if analyses are performed less frequently than every 6 weeks.

3.2 Split Sample Analysis Program

States, owners, or operators should participate in a EPA Split Sample Analysis Program which will be conducted only during 1979, and includes the following:

(a) Duplicate 3/4 inch by 8 inch strips are cut from collected samples.

(b) If analyses are performed monthly or more frequently, there should be a split sample analysis once each month with EPA.

(c) If analyses are performed less frequently than monthly, there should be a split sample analysis during each analysis with EPA.

3.3 Technical Assistance

In order to assist States, owners, or operators in establishing an operational monitoring program as rapidly as possible, EPA has available a limited supply of precut (8 inch x 10 inch) glass fiber filters of suitable quality for lead monitoring. These filters will be distributed on a first come basis.

Information on obtaining filters and participation in the EPA performance audit program may be obtained from Thomas Clark (phone 919-541-2723).