

**PARTICULATE MATTER  
MONITORING NETWORK DESCRIPTION  
FOR THE  
NORTHEAST PLATEAU  
MONITORING PLANNING AREA**

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## **1.0 INTRODUCTION**

This plan provides a description of the PM2.5 and PM10 ambient monitoring network designed for the Northeast Plateau Monitoring Planning Area (MPA). Airborne particles with aerodynamic diameter less than 10 microns (PM10) are small enough to be inhaled. The PM10 includes fine particles with aerodynamic diameter less than 2.5 microns (PM2.5) as a component. The deployment of the PM2.5 network is critical to the national implementation of the new PM2.5 National Ambient Air Quality Standards (NAAQS). The ambient data from this network will be used for designating areas as attainment or nonattainment, developing particulate matter control programs, and tracking the progress of such programs.

During the early stages of the PM2.5 network design process, the Air Resources Board (ARB) and the local air quality management districts established MPAs for the State. The entire State is covered by 18 MPAs. These MPAs will be used for planning monitoring locations for PM2.5. They are not intended for designating areas as attainment or non-attainment or for determining specific PM2.5 control measures. The boundaries to be used for these purposes will not be established until adequate PM2.5 data are available. The ARB and the local air quality management districts will recommend appropriate nonattainment boundaries to the U.S. EPA.

The proposed PM2.5 monitoring network for the Northeast Plateau MPA includes two monitoring sites. Both PM2.5 sites are located at existing PM10 sites. These sites will be operated by the Siskiyou County APCD and will use PM2.5 Federal Reference Method (FRM) monitors.

### **1.1 Physical Setting**

The Northeast Plateau MPA includes all of the Northeast Plateau Air Basin, it is the fourth largest basin in California, encompassing an area of 15,900 square miles and includes a wide diversity of climates. It includes all of Modoc, Lassen, and Siskiyou Counties. The basin may be divided into four topographical regions: the Klamath Mountains in western Siskiyou County; the Cascade Range in eastern Siskiyou County; the Modoc Plateau in western Modoc County and northern Lassen County; and the Great Basin region in the extreme northeastern Modoc County and southeastern Lassen County.

### **1.2 Population Characteristics**

The population of a Metropolitan Statistical Area (MSA) is one of the key parameters in determining the minimum number of required monitoring sites per the U.S. EPA PM2.5 regulations. The Northeast Plateau MPA does not include any MSAs. The counties included in the MPA are listed along with population figures in Table 1.2.1.

**Table 1.2.1 Population in the Northeast Plateau MPA**

<u>County</u>	<u>Population (in 1990)</u>
Lassen	27,515
Modoc	9,673
Siskiyou	45,084
<b>Total Population</b>	<b>82,272</b>

### **1.3 Climate and Weather**

The main control on weather in the Northeast Plateau Air Basin, as in all of Northern California, is the position of the high pressure cell off the coast. This cell is a quasi-stationary system in which air is continuously descending, thereby giving rise to fair, warm weather. In the western portion of the Northeast Plateau Air Basin, winters are exceedingly cloudy, cool, and rainy. Even the lower elevations experience a high incidence of cloudiness during winter. There is an almost unbroken succession of winter storms through extreme Northern California. Extensive cloudiness is usually the rule for the Modoc Plateau region during this weather sequence, but precipitation amounts are generally light. Winds are often from a southerly quadrant for the entire air basin during this weather type. Wind speeds vary from moderate to strong and gusty as frontal systems approach.

During the spring, the snowcover over the plateau region gradually disappears. In general, milder weather prevails over most of the air basin, as modified marine air becomes more dominant throughout the region. Although the precipitation received in the air basin as a whole declines as the winter storm track shifts northward, rarely is spring weather warm and dry in this extreme northern portion of the State. In summer, only an occasional brief period of thunderstorms normally breaks the routine of clear warm weather.

### **1.4 Dominant Economic Activities and Emission Sources**

Lumber production, recreation, agriculture, and livestock are the primary economic activities of the region.

The PM2.5 in California's air is the result of primary and secondary particulates. Primary particulate emissions are directly emitted from sources such as residential fireplaces, diesel trucks, forest burning, dust sources, and industrial processes. Secondary particulates form when gaseous or non-particulate substances react in the atmosphere with other substances to produce particulate matter.

The predominant sources of directly emitted PM2.5 vary regionally in California. The Northeast Plateau MPA emission inventory estimates show that the largest contributors of

directly emitted PM<sub>2.5</sub> are burning (including waste burning and disposal, residential fuel consumption, wildfires and fires) and unpaved road dust. Other sources are estimated to be less substantial PM<sub>2.5</sub> contributors.

Precursors to secondary PM<sub>2.5</sub> formation in California include oxides of nitrogen (NO<sub>x</sub>) from motor vehicles and other combustion sources, ammonia emissions, certain organic substances which form particulate matter, and additional emission sources. Secondary particulate levels are highly variable and are dependent on atmospheric conditions and precursor levels for formation. For example, in some regions at certain times of the year the secondary particles can comprise 50% or more of the total ambient measured PM<sub>2.5</sub> concentrations. At other times, the secondary particulates are nearly negligible. Because secondary particles form through complex and variable atmospheric processes, it is not currently possible to produce accurate secondary particulate emission estimates as can now be done for the primary, directly emitted PM<sub>2.5</sub>.

## **1.5 PM<sub>2.5</sub> Monitoring Requirements**

Based upon the U.S. EPA PM<sub>2.5</sub> regulations, all Metropolitan Statistical Areas with population greater than 200,000 are required to have a core PM<sub>2.5</sub> SLAMS (this is a site in a populated area representing PM<sub>2.5</sub> concentrations on a neighborhood or urban scale). The required number of core SLAMS and the sampling frequency is determined by the 1990 census population statistics for each MSA. In general, the greater the population in an MSA, the more monitoring sites required for that area. One additional core PM<sub>2.5</sub> monitor that samples everyday is required for each Photochemical Assessment Monitoring Station (PAMS) area included in the MPA.

The regulations also require a PM<sub>2.5</sub> monitor for every 200,000 people living either outside of an MSA or in MSAs with fewer than 200,000 people. These additional monitors are supposed to collect a 24-hour PM<sub>2.5</sub> sample once every three days.

Within the Northeast Plateau Monitoring Planning Area, there are no MSAs. Based on the 1990 census, there were 82,272 people living in the Northeast Plateau MPA. There is consequently no requirement for either everyday sampling or for one-in-three-day sampling. Nevertheless, two PM<sub>2.5</sub> monitors have been allocated for use in the Northeast Plateau MPA to provide geographical representation in this region.

Table 1.5.1 identifies the number of core PM<sub>2.5</sub> monitoring sites to be operated within the Northeast Plateau MPA.

**Table 1.5.1 Required and Planned Core PM2.5 Monitoring Sites**

MSA/PMSA/County	Population in 1990	Required Core PM2.5 Monitoring Sites		Planned PM2.5 Sites
		Everyday Sampling	1 in 3 day sampling	
Lassen	27,515	0	0	0
Modoc	9,673	0		1
Siskiyou	45,084	0		1
<b>Total</b>	<b>82,272</b>	<b>0</b>	<b>0</b>	<b>2</b>

## **2.0 PM2.5 MONITORING NETWORK ELEMENTS**

This section summarizes PM2.5 monitoring sites planned for deployment in 1998 and 1999. In most cases, the existing particulate matter monitoring sites will be used for the additional PM2.5 monitoring. The existing particulate matter data have assisted in the design of the PM2.5 network by providing information on the trends and the magnitude of concentrations. These data will be valuable in the future in understanding the particulate size distributions of emission sources and developing control strategies. The particulate matter monitors currently operating at the sites selected for PM2.5 monitoring are also summarized in this section.

Refer to Section 2.0 in the California Particulate Matter Monitoring Network Description for a summary of particulate matter monitoring outside of the PM2.5 monitoring network

### **2.1 PM2.5 Monitors Planned for Deployment**

The planned PM2.5 monitoring network will collect data for multiple objectives, including:

- (1) Comparing sampling results with the PM2.5 NAAQS to determine attainment/nonattainment status.
- (2) Developing and tracking implementation plans for the area.
- (3) Assisting health studies and other ambient aerosol research activities.

In order to understand the nature of the PM2.5 problem in Northeast Plateau and to develop control strategies, multiple monitor types will be needed. The PM2.5 Federal Reference Method (FRM) sampler is a gravimetric filter-based sampler that produces a concentration measurement of PM2.5 over a 24-hour period. The FRM alone cannot support the multiple information needs of the PM2.5 network. The sampler design includes a Teflon filter that can experience a loss of volatile constituents, which can be captured and retained better by other sampling techniques. In addition, it does not provide temporally resolved data or full chemical characterization of ambient aerosols.

In addition to FRM monitors, two other types of instruments are required for deployment as part of the PM2.5 network: speciation samplers and continuous mass monitors. Speciation samplers provide a chemical characterization of ambient aerosols for developing emission mitigation strategies and for tracking the success of implemented control programs. Continuous PM2.5 mass monitors will collect data for public reporting of short-term concentrations, for understanding diurnal and episodic behavior of fine particles, and for use by health scientists investigating exposure patterns. However, currently available instruments for continuous measurements of suspended particles mass have many shortcomings. The Tapered Element Oscillating Microbalance (TEOM) sampler uses a heated inlet which causes evaporation of the volatile components of the air sample. The Beta Attenuation Monitor (BAM), which samples at ambient temperatures and relative humidities may overestimate particle concentrations by allowing liquid water to be collected along with particles. Currently, there are no plans to deploy

continuous PM2.5 monitors in the Northeast Plateau MPA.

The Northeast Plateau MPA PM2.5 monitoring network will consist of two monitoring sites. One of these sites will be deployed in 1998 and one in 1999. Each site will operate an FRM sampler purchased through the National PM2.5 Sampler Procurement Contract established by the U.S. EPA.

No speciation sampling is planned for Northeast Plateau at this time. Table 2.1.1 lists the proposed PM2.5 monitoring sites in the Northeast Plateau MPA and the type of instruments planned at these sites. The location of the proposed sites are presented on the map (Figure 2.1.1).

**Table 2.1.1 PM2.5 Monitoring Network Planned for Deployment**

Site Location	AIRS Site ID	PM2.5 FRM	PM2.5 Speciation	PM2.5 TEOM/BAM	Other PM2.5 Monitor
Alturas-W 4th Street	060490001	X			
Yreka	060932001	Y			

**Codes:**

- X Monitor to be deployed in 1998
- Y Monitor to be deployed in 1999
- XX Collocated particulate monitors used for precision data to be deployed in 1998

**2.2 Existing Particulate Matter Monitors**

The existing particulate matter network in the Northeast Plateau MPA consists of four monitoring sites. The monitoring instruments operating at these sites include:

- ▶ 4 High Volume Size Selective Inlet (SSI) samplers collecting 24-hour PM10 samples.

The proposed PM2.5 sites will be located at existing PM10 sites. Table 2.2.1 summarizes the particulate matter monitoring resources available at the proposed PM2.5 monitoring sites. The complete summary of particulate matter monitoring resources in Northeast Plateau can be found in Attachment 1 in the statewide summary.

Figure 2.1.1

The particulate matter data obtained from these sites are used to meet the following objectives:

- ▶ Compare measured concentrations to the State and national PM10 standards.
- ▶ Track changes in the particulate matter concentrations over time.
- ▶ Evaluate the population exposure.
- ▶ Assess the impact from transported particulate matter.
- ▶ Assist in health studies and other research.

**Table 2.2.1 Existing Particulate Matter Monitors at Proposed PM2.5 Sites**

Site Location	AIRS Site ID	Dichot	PM10 SSI	PM10 TEOM/BAM	Other PM Monitor
Alturas-W 4th Street	060490001		X		
Yreka	060932001		X		

**Codes:**

- X Existing monitor
- SSI High Volume Size Selective Inlet sampler collecting 24-hour PM10 samples
- Dichot Dichotomous sampler collecting 24-hour fine fraction and coarse fraction samples
- TEOM Tapered Element Oscillating Microbalance collecting PM10 measurements hourly
- BAM Beta Attenuation Monitor collecting PM10 measurements hourly

**2.3 PM2.5 Quality Assurance**

The agencies operating PM2.5 monitors in the Northeast Plateau MPA will adopt a schedule for implementing quality assurance procedures developed by the ARB. Please refer to Section 3.7 in the statewide summary for more information about the schedule.

**2.4 Laboratory Analyses**

The FRM instruments collect PM2.5 over 24-hour periods on Teflon-membrane filters from air drawn at a controlled flow rate through a tested PM2.5 inlet. Within 96 hours after the sample collection period, the filter contained in the filter cassette will be removed from the sampler and placed in a protective container. During the period between filter retrieval from the sampler and the start of conditioning, the filter will be maintained at a temperature below 25 degrees centigrade. The filters will be transported to the mass analysis facility. It is currently proposed that the ARB Monitoring and Laboratory Division in Sacramento will weigh the PM2.5 filters from Northeast Plateau MPA, but the final decision has not yet been made. The filters

containing PM2.5 samples will be “conditioned” and weighed at the laboratory.

Samples collected from the speciation monitors will be analyzed by a nationwide network of 1 to 3 laboratories. These laboratories will be working under contract performing the necessary laboratory analyses. The establishment of this network of laboratories is still under development, with the specific laboratories yet to be determined.

### **3.0 PM2.5 MONITORING SITES TO BE DEPLOYED IN 1998**

During 1998, one PM2.5 monitoring site is planned for deployment in the Northeast Plateau MPA. This section discusses the criteria used in the selection of the PM2.5 monitoring site along with the important parameters that characterize the site.

#### **3.1 Monitor Siting**

The existing particulate matter network in the Northeast Plateau MPA consists of four sites. During the PM2.5 site selection process, the following factors were evaluated:

- ▶ Population statistics and distribution.
- ▶ Land use characteristics.
- ▶ Local climate.
- ▶ Suspected area emission sources (wood smoke, agricultural burning, etc.).
- ▶ Existing particulate matter monitoring network.
- ▶ Existing particulate matter data, including data collected by the dichotomous network, PM10 network, and special studies.
- ▶ Potential transport corridors.
- ▶ Ongoing special health studies.

After the review process, it was determined that an existing PM10 site would be well suited as a location for monitoring PM2.5. The site selected to operate a PM2.5 sampler is located in a more populated area of the MPA where high PM2.5 concentrations are expected. This site will also provide useful information about PM2.5 emission sources and population exposure.

#### **3.2 Site Description**

The network for the Northeast Plateau MPA, as proposed, includes one site that will be deployed in 1998. The following characteristics describe this site:

- ▶ Uses a Federal Reference Monitor (FRM) type sampler purchased through the national contract established by the U.S. EPA.
- ▶ Sited in a population-oriented location.
- ▶ “Site Type” is Core SLAMS.
- ▶ Represents neighborhood spatial scale.
- ▶ Provides data that will be compared to both the annual standard and the 24-hour standard.

Based on these criteria, the site listed in Table 3.2.1 is identified for use for PM2.5 monitoring within the Northeast Plateau MPA.

The Alturas-Fourth Street site was selected to represent an area of maximum PM2.5

concentration in a populated area in the Northeast Plateau MPA. These monitoring objectives will be further evaluated during the annual network review period next year when PM2.5 data will be available from these sites.

**Table 3.2.1 PM2.5 Monitoring Sites to be Deployed in 1998**

Site Location	AIRS Site ID	Operating Agency	Spatial Scale	Monitoring Objective	Site Type	Measurement Method
Alturas-Fourth Street	060490001	SIS	Neighborhood	M	C	FRM/SCH

The following codes are used in this table:

**Operating Agency :**

SIS Siskiyou County APCD

**Monitoring Objectives:**

R Represent high concentrations in a populated area.  
M Determine the highest concentration expected to occur in the area covered by the network (more than one site per area may be needed).  
T Determine the extent of regional pollutant transport.

**Site Type:**

C Core SLAMS  
S Non-core SLAMS  
P Special Purpose Monitors

**Measurement Method :**

FRM/SCH Federal Reference Method Single Channel Sampler  
FRM/SQ Federal Reference Method Sequential Sampler

#### 4.0 PM2.5 MONITORING SITES TO BE DEPLOYED IN 1999

There are plans to establish an additional PM2.5 monitoring site in 1999 that would operate an FRM monitor. The PM2.5 data from this site are intended to help better define the boundaries of nonattainment areas and satisfy other monitoring objectives of the PM2.5 monitoring network. There are no plans to deploy PM2.5 chemical speciation monitors in Northeast Plateau MPA in 1999.

#### 4.1 Monitoring Sites Operating PM2.5 FRM Monitors

There are plans to deploy an additional PM2.5 FRM monitoring site at Yreka-Foothill Drive in 1999. This PM2.5 monitoring site will be located at an existing PM10 monitoring site. The PM2.5 data collected at this site will be used to determine the boundaries of a PM2.5 national attainment/nonattainment area. This site was selected to represent an area of poor air quality in a populated area and it may not necessarily be in an area of expected maximum concentrations.

**Table 4.1.1 PM2.5 Monitoring Sites to be Deployed in 1999**

Site Location	AIRS Site ID	Operating Agency	Spatial Scale	Monitoring Objective	Site Type	Measurement Method
Yreka	060932001	SIS	Neighborhood	R	C	FRM

SIS Siskiyou County APCD  
 R Represent high concentrations in a populated area.  
 C Core SLAMS  
 FRM Federal Reference Method sampler

#### 4.2 PM2.5 Chemical Speciation Sampling

The basic objective of the PM2.5 chemical speciation sampling and analysis program is to develop seasonal and annual chemical characterizations and distributions, across the country, of the ambient aerosols present in PM2.5 samples. These chemically resolved data will be used to perform source attribution analyses, evaluate emission inventories and air quality models, and support health related research studies. There are no sites planned for the Northeast Plateau MPA that will include chemical speciation analyses.

#### 4.3 Continuous PM2.5 Monitoring

The Federal regulation 40 CFR 58, Appendix D, 2.8.2.3, requires that continuous PM2.5 samplers be placed in metropolitan areas where there is a population greater than 1 million people. Continuous PM2.5 data are useful for public reporting of short-term concentrations, for understanding diurnal and episodic behavior of fine particles, and for use by health scientists investigating exposure patterns. The Northeast Plateau MPA, with a population of 82,272 based on the 1990 census, is not required to have a continuous PM2.5 monitor. There are no plans to

deploy a continuous PM2.5 monitor in this MPA.

## 5.0 PM2.5 SAMPLING FREQUENCY

The U.S. EPA requirements call for everyday sampling of PM2.5 at certain core SLAMS sites and one in three day sampling at all other PM2.5 and all PM10 sites. In order to collect sufficient data and at the same time conserve monitoring resources, the ARB and the local air quality management districts are proposing alternative sampling frequencies for PM2.5 and PM10.

### 5.1 PM2.5 FRM Sampling Frequency

Everyday sampling is not required at any of the two sites in the Northeast Plateau MPA as specified in the regulations, i.e., two sites per area over 500,000 population and one site per PAMS area. All other core PM2.5 monitoring sites are required to collect a sample once every three days.

Initially, both sites will sample once every six days. Monitoring sites with PM2.5 concentrations above the 24-hour standard will be considered for more frequent sampling.

**Table 5.1.1 PM2.5 FRM Sampling Frequency**

Site Location	AIRS Site ID	Operating Agency	Sampling Frequency	
			Required	Proposed
Alturas-W 4th Street	060490001	SIS	1 in 3 day	1 in 6 day
Yreka	060932001	SIS	1 in 3 day	1 in 6 day

SIS Siskiyou County APCD

### 5.2 PM2.5 Chemical Speciation Sampling Frequency

There are no sites planned for the Northeast Plateau MPA that will include chemical speciation analyses.

### 5.3 PM10 Sampling Frequency

The new U.S. EPA minimum requirement for PM10 sampling frequency is once every three days. The Air Resources Board and the local air pollution control districts in California are requesting that the U.S. EPA Region 9 grant a statewide waiver allowing sampling at the current schedule of 1-in-6-day, with certain exceptions to be determined on a case by case basis. To demonstrate a change in the attainment status of the national 24-hour PM10 standard, more frequent sampling may be needed. Monitoring sites with maximum 24-hour concentrations close to the 24-hour standard may be required to sample everyday or at least on a 1-in-3-day schedule.