

**PROTOCOL  
MATES III  
MONITORING AND LABORATORY ANALYSIS**

**January 2004**

**Applied Science and Technology  
South Coast Air Quality Management AQMD**

**Draft Approved for Review**

**Date Approved**

---

Rudy Eden  
Senior Manager, Laboratory Services  
Applied Science & Technology

## **DISCLAIMER**

Any or all reference made in this Protocol to a specific product or brand name does not constitute an endorsement of that product or brand by the South Coast Air Quality Management District.

DRAFT

## Table of Contents

List of Figures  
List of Tables  
List of Appendices

Chapter 1.0	Introduction
1.1	Background
1.2	Organization and Coordination
Chapter 2.0	Monitoring Equipment
2.1	Introduction
2.2	Equipment Characteristics
2.2.1	Siting
2.2.2	Acceptance Testing
2.2.3	Calibration
2.2.4	Sample Pickup
2.2.5	Trouble Shooting
2.2.6	Repair
2.3	Sampling Equipment
2.3.1	XonTech 910A and 912
2.3.1.1	XonTech 910A, Description
2.3.1.2	XonTech 912, Description
2.3.1.3	Pre-Testing
2.3.1.4	Cleanliness Check
2.3.1.5	Sample Pickup
2.3.2	XonTech 920
2.3.2.1	Description
2.3.2.2	Operation
2.3.3	ATEC 800 Sequential Sampler
2.3.3.1	Description
2.3.3.2	Operation
2.3.4	MET One SASS
2.3.4.1	Description
2.3.4.2	Module and Media Description
2.3.5	Gil Solent 2 Axis Ultrasonic Anemometer
2.3.5.1	Description
2.3.5.2	Siting
2.3.5.3	Installation
2.3.5.4	Telemetry Interfacing
2.3.5.5	Routine Service
2.3.5.6	Diagnostics
2.3.5.7	Calibration
2.3.5.8	Data Handling
2.3.6	Graseby-GMW 1200 PM <sub>10</sub> Sampler
2.3.6.1	Description

Chapter 3.0 Laboratory Procedures  
3.1 Introduction  
3.2 Sample Handling  
3.2.1 Canister Cleaning  
3.2.2 Field Canister Use  
3.2.3 Sample Distribution in the Laboratory  
3.3 Analysis Methods  
3.4 Sampling and Analysis - Table 1 Compounds  
3.5 Sampling and Analysis - Table 2 Compounds  
3.6 Sampling Schedule  
Chapter 4.0 Quality Assurance and Quality Control  
4.1 Introduction  
4.2 Objectives  
4.3 Procedures  
4.3.1 Quality Assurance Procedures  
4.3.2 Quality Control Procedures  
4.4 Documentation  
4.5 Data Review  
Chapter 5.0 Data Processing and Reporting  
5.1 Introduction  
5.2 Data Base Compilation  
5.3 Periodic Reports  
5.4 Final Report

Glossary  
Acronym List

## List of Tables

Table 2-1	Performance Specifications Gill Solent 2 Axis Ultrasonic Meteorological Anemometer Specifications
Table 3-1	Mobile Platform Sampling Schedule
Table 3-2	2004 MATES III Sampling Schedule
Table 4-1	QA/QC Data Quality Objectives

## List of Figures

Figure 1-1	Organizational Structure for Monitoring and Analysis Program
Figure 2-1	Graseby-GMW PM <sub>10</sub> Sampler, Model 1200 with Two-Stage, SSI Head

## List of Appendices

Appendix A	Proposed Table 1 Air Contaminants for Inclusion in the Measurement Program
Appendix B	Proposed Table 2 Air Contaminants that Potentially May Be Monitored on a Limited Basis
Appendix C	Size-Selective Inlet PM <sub>10</sub> Sampler Envelope
Appendix D	Monthly WSD Quality Control Maintenance Check Sheet
Appendix E	High Volume Monthly Control Maintenance Check Sheet
Appendix F	MATES III Sample Log
Appendix G	VOC Canister Tag
Appendix H	Method Description for Sampling and Analysis of Carbonyls by HPLC at the AQMD Laboratory
Appendix I	Method Description for Sampling and Analysis of Toxic Metals by ICP/MS
Appendix J	Method Description for Sampling and Analysis of Elements by Energy Dispersive X-ray Fluorescence Spectrometry at the AQMD Laboratory
Appendix K	Method Description for Sampling and Analysis of Organic and Elemental Carbon by Thermal/Optical Carbon Analyzer at the AQMD Laboratory
Appendix L	QA/QC Matrix Summary
Appendix M	Method Description for Sampling and Analysis of VOCs by GC/MS at the AQMD

## Chapter 1.0 Introduction

This protocol document provides detailed information about the procedures and processes required to effectively conduct the field measurement portion by the Laboratory Services and Special Programs Branch, Monitoring and Analysis Division (Science and Technology Advancement Office) of the South Coast Air Quality Management District (AQMD). This protocol document includes both the monitoring and laboratory analysis functions for 1) Multiple Air Toxics Exposure Study III (MATES III)<sup>1</sup> and 2) 2004 Microscale Study (MSS).

### 1.1 BACKGROUND

In October 1997, the AQMD Governing Board adopted 10 Environmental Justice Initiatives. EJ-2 focuses on ambient toxics monitoring, emissions inventories, and modeling. Specifically, the goal of EJ-2 is:

*AQMD staff, with peer review feedback, will design and conduct a program of ambient monitoring for toxic hot spots. Expanded, accurate, reliable, and suitable data on exposure levels will enable us to begin to apply that knowledge to effective problem solving.*

The hot-spot ambient monitoring program consisted of MATES II and MSS elements. The objective of MATES II was to address Environmental Justice issues by establishing a baseline of existing air toxics ambient emissions, exposure and risk level data, and an assessment of model accuracy. Staff created a baseline through a field monitoring program, emission inventory enhancements, air toxics modeling, and risk assessment. The AQMD conducted MATES II during a one-year period at ten sampling sites in the South Coast Air Basin (Basin). The MATES II Final Report was issued in March 2000<sup>2</sup>.

The MSS of MATES II attempted to determine if communities were experiencing localized hot spots not otherwise identified by modeling. The AQMD also used MSS to confirm the existence of hot spot areas indicated by modeling, and to assess the localized representativeness of the monitoring. MSS sampling was conducted at four-week intervals at selected Basin locations using three mobile sampling platforms. During the year long period, the platforms were employed to collect ambient toxics measurements. The proposed sampling was conducted on a more intensive basis than the MATES II element. Details of the MSS are described in the MATES II Final Report dated March 2000.

In the MATES III and 2004-MSS elements, specific compounds will be sampled and analyzed. These compounds are identified in Appendices A and B. Table 1 compounds (Appendix A) will be measured on a routine basis, while Table 2 compounds (Appendix B) will undergo more limited measurement and sampling due to methodological limitations, high cost of analysis, or

---

<sup>1</sup> MATES I was run in 1987. Copies of the final report are available from the AQMD library.

<sup>2</sup> South Coast Air Quality Management District (2000). *MATES II Final Report*. Diamond Bar, CA

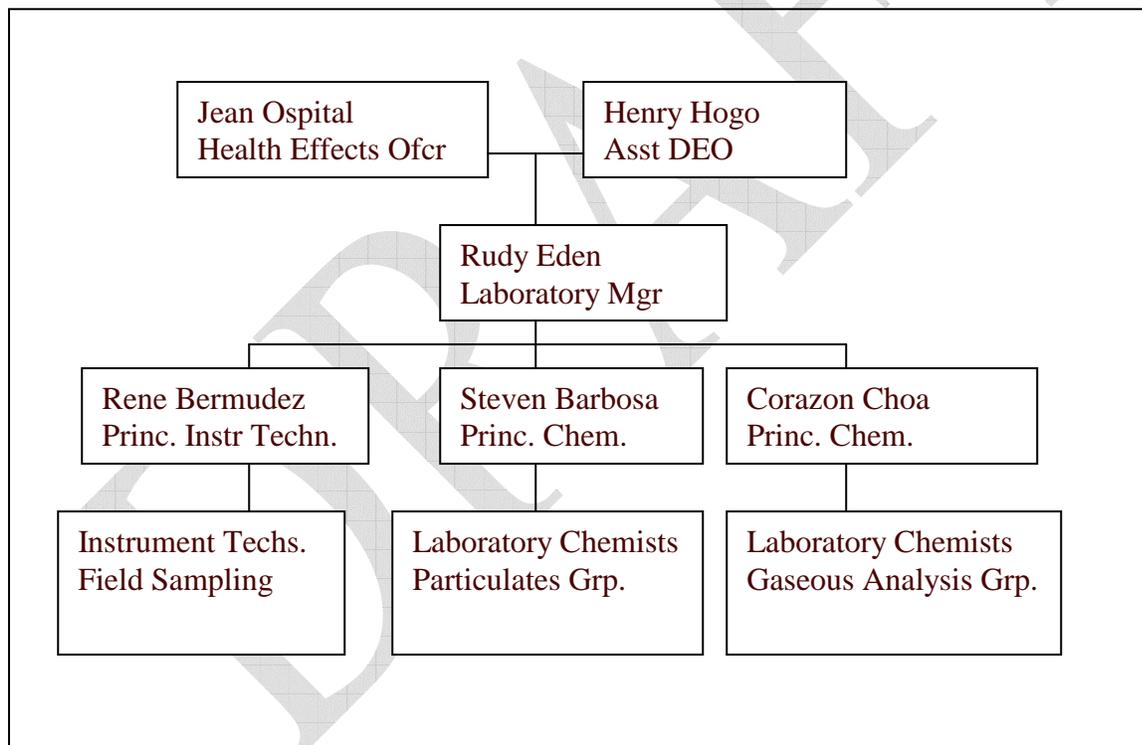
other limitations. The AQMD will exercise some flexibility in its selection of sampled compounds by basing its selection on dominating environmental conditions.

Field sampling will begin in February 2004 and continue for a minimum of one year. This document describes the monitoring, laboratory analysis, quality control (QC), and quality assurance (QA) activities necessary to support both sampling programs.

## 1.2 ORGANIZATION AND COORDINATION

This sampling program will involve the coordinated efforts of Instrument Technicians and Laboratory Chemists. Direct supervision will be provided by the Principal Chemists in conjunction with Rudy Eden, Laboratory Manager. The MATES III project lead is Jean Ospital, Health Effects Officer, Henry Hogo, Assistant DEO, Science and Technology Advancement Office, oversees the sample collection and analyses.

The organizational structure for this program is detailed in Figure 1.1.



**FIGURE 1-1** AQMD Oversight

## Chapter 2.0 Monitoring Equipment

### 2.1 INTRODUCTION

For the purposes of this protocol, the descriptions and operational and maintenance procedures of the following equipment used at AQMD-operated MATES III and MSS sites will be delineated.

<u>Sampler Type</u>	<u>Vendor and Model Number</u>
Volatile Organic Compounds (VOC)	XonTech 910A/ 912
Metal, Aldehyde	XonTech 920 and 924
Carbonyls	ATEC 800 Sequential Sampler
PM <sub>2.5</sub> Speciation Air Sampling System	Met One Instruments SASS
Wind, Speed, and Direction (WSD)	Gill Solent 2 Axis Ultrasonic Anemometer (Met-One)
PM <sub>10</sub>	Graseby-GMW 1200 PM <sub>10</sub> Sampler

The siting, acceptance testing, and calibration functions for each type of MATES III and MSS equipment identified above are basically identical. Therefore, these functions are defined below. Non-generic functions will be discussed under each equipment heading.

### 2.2 EQUIPMENT CHARACTERISTICS

#### 2.2.1 Siting

- A) Monitoring site selection criteria will be the same in most regards whether the site will be used for a fixed or mobile site. Site uniformity will be achieved to the greatest degree possible. Descriptions will be prepared for all sampling sites. The description should include, at a minimum, the type of ground surface, the direction, distance, and approximate height to any airflow obstruction, and the direction and distance to any local pollutant sources.
- B) The sampler platform will be located in an area with unobstructed airflow, especially in the direction of any recognized sources of the sampled compounds. Turbulence and eddies from obstructions will cause non-representative results. The distance between the obstruction and the sampler should not be closer than two times the height of the obstruction.

- C) Locations unduly influenced by nearby sources or activities or where reactive surfaces may cause chemical changes in the air sampled will be avoided. Micro-meteorological influences caused by nearby hills, bodies of water, valley drainage flow patterns, etc. will be taken into consideration.
- D) The recommended intake probe height for criteria pollutants is 3 to 15 meters above ground level as near breathing height as possible, but not where a building is an obstruction or the equipment is easily vandalized.
- E) The probe should extend at least two meters away from the supporting structure. If the probe is located on a building, it must be mounted on the windward side.

### **2.2.2 Acceptance Testing**

Acceptance testing will be performed on all instrumentation for approximately one month after receipt. After acceptance testing is conducted on the instruments, they will be deployed in the field and ambient sampling will commence. Acceptance testing will be conducted through the following steps:

- A) All instruments will be carefully unpacked from their shipping containers and checked for completeness, broken parts, and correct subunits.
- B) The units will be assembled according to manufacturer guidelines and prepared for start-up.
- C) The flowrate/flow meter portion of the pneumatic system will be checked using the most appropriate calibration-transfer standard to verify the operating flow/flowrate.
- D) Timer accuracy will be evaluated by comparing it to an elapsed-timer standard. All timers must hold their accuracy to  $\pm 5$  minutes over a 24-hour period.
- E) Follow the manufacturer's procedures for correcting any deficiency.
- F) Each MSS will be operated for an intensive six-week sampling period. Following sampling, each MSS mobile platform will be loaded on the transport vehicle and moved to the next sampling site. The lease agreement for each monitoring site will be executed for a minimum eight-week period. Within this contractual time frame, the temporary power can be hooked up and all samplers at the new site can be calibrated prior to beginning the next intensive eight-week sampling period. Sampling will be conducted at each MSS on the same one day in three schedule as the MATES III fixed sites for approximate six week periods.

### **2.2.3 Calibration**

At each sampling site, final dynamic calibration will be performed on each analyzer prior to the start of the intensive six-week sampling period. At the end of this sampling period, an “As Is” dynamic calibration will be performed on each analyzer to ascertain the amount of analyzer drift.

### **2.2.4 Sample Pickup**

The AQMD senior chemist sample custodian will distribute the sampling media to the field technician. Filters and carbonyl cartridges will be transported in coolers with blue ice and the canisters will be kept capped at all times during transportation. Once the filter and carbonyl cartridge has been used to collect a sample, they must be refrigerated until they are returned to the AQMD. The sampling media will be returned to the senior chemist sample custodian as soon as possible following sampling.

### **2.2.5 Troubleshooting**

A maintenance guide based on the equipment manufacturers’ suggested operating procedures will be available for each instrument. If an instrument falls out of the correct operating range, or there is a component failure, the operator will immediately place a call to the AQMD AST/AM Support and Repair Section to schedule a repair.

### **2.2.6 Repair**

Due to anticipated failure of standard components such as pumps and flow controllers, the AQMD will warehouse standard-component spare parts. Since the sampling time at each location will be relatively brief, repair of MSS platform samplers will receive repair priority.

## **2.3 EQUIPMENT**

### **2.3.1 XonTech 910A and 912**

#### **2.3.1.1 XonTech 910A - Description**

The XonTech 910A air sampler has been designed to take air samples at a constant flow rate for a known sampling period. It is durable, serviceable and accurate making it useful for sampling a wide variety of gases. Its compact, constructed simply, and offers long term reliability.

Specifically, the 910A sampler takes air from the sample inlet and injects it into a canister at a constant flow rate for the preset period of time. Excess air is exhausted through a bypass exhaust. The constant flow rate and elapsed time allow the

operator to compute the integrated air sample volume. The sample will be pumped through a metal bellows pump that develops sufficient pressure to control the flow with a mass flowmeter. The XonTech 910A is operated according to the guidelines set forth in XonTech's *Model 910 Toxic Air Sampler Operations Manual*<sup>3</sup>.

### **2.3.1.2 XonTech 912 - Description**

The XonTech 912 adapter may be added to the XonTech 910A to enhance sampling capability over a reduced period of time. It cannot operate independent of the 910A. It is designed to route gas samples to a maximum of 16 canisters. An internal time base can be used to step a rotary valve from canister to canister at a user-selected rate. The 912 will also accept timing signals from the model 910A. The XonTech 912 adapter is operated according to the guidelines set forth in XonTech's *Model 910 Toxic Air Sampler Operations Manual*<sup>4</sup>.

### **2.3.1.3 Pre-Testing**

All canister samplers will be test run at the AQMD headquarters to assure proper operation. Most samplers are also field tested during field sampling.

### **2.3.1.4 Cleanliness Check**

To perform a system bias check, inject ultra-pure air or nitrogen will be injected into the sample manifold to fill one, 3-hour canister. Additionally, the 24-hour sampler can be tested by maximally increasing its sample flow to fill a canister in approximately 6 hours. A field blank will be filled at the site by flowing pure air or nitrogen into an evacuated cylinder. A difference of less than 2 parts per billion (ppb) per compound between the field blank and the bias samples indicates that the system is non-biasing (non-contaminated). A value greater than 2 ppb per compound requires corrective action. A system bias check will be repeated until all biases are demonstrated to be eliminated. The AQMD's Ambient Monitoring Support Group will perform system repairs. This group will assemble, leak check, disassemble, and clean the sample manifold and the Auditing Group will calibrate the mass flow controller (MFC) for flow.

### **2.3.1.5 Sample Pickup**

An AQMD senior chemist sample custodian will distribute the 910A sampler (with or without the XonTech 912 enhancement) VOC canisters. Evacuated canisters will be transported by vehicle to the respective air monitoring stations. Each canister has a tag attached (Appendix G). This tag will be completed to contain the following information: sample site, operator initials, sample date, and canister number in sampling sequence. The air monitoring station operator should complete this tag

---

<sup>3</sup> XonTech, Inc. (1987). *Model 910 Toxic Air Sampler Operations Manual*. Van Nuys, CA: Author.

<sup>4</sup> Ibid.

once the canister is set up for sampling. Once the canister is filled and disconnected from the 910A or 912 sampler, and prior to returning the sampled canister to the laboratory, the canister number, start vacuum, flow, and elapsed time will be recorded on the canister sample log (Appendix F). The time on the QC chart must also be checked and adjusted. This value must be within  $\pm 10$  minutes of actual PST. The canister will be delivered to the senior chemist sample custodian as soon as possible.

## **2.3.2 XonTech 920 and XonTech 924**

### **2.3.2.1 Description**

The Model 920 and equivalent Model 924 Toxic Air Samplers are designed to collect ambient air particulate samples on a variety of filter materials and sorbent media in unattended field use. These samples will be brought to the AQMD headquarters for laboratory analysis. The sampler precisely controls the sampling time and flowrate through each sampling head using a microprocessor and MFC. Sampler design is modular to facilitate installation of individual sampling channels. Each sampler may accommodate eight sampling channels for two types of sample collection media: one that accepts 37 or 47 millimeter filters and another that accepts sorbent tubes.

The sampler consists of three modules, each contained in a separate enclosure. The heart of the system is the control module. This module contains the microprocessor, controller, mass-flow controllers, and front panel, displays, printer, and keypad. The difference between the Model 920 and 924 is the electronics have been upgraded to reflect the increase in microprocessor functionality presently available that was not available in the circa 1995 Model 920. The sampling module is equipped with isolation valves that protect the sampling media from passive sampling before or after sampling or sample loss after sampling. The sampling module and the pump module have not changed between the Model 920 and 924. The sampling inlet height is 1.2 meters above ground level. The third element of the sampler is the pump module. It contains the vacuum pump that provides adequate capacity for simultaneous operation of four, 30 liters per minute (lpm) and 200 cubic centimeters per minute (ccm) sampling channels.

### **2.3.2.2 Operation**

To use the sampler, the operator will insert the sample filter cassette or sorbent tube into the sampling head and will key in the filter or sorbent head number. Start and stop times, and flow rates are pre-programmed or can be manually input. Following the sampling period, a report is automatically printed which may be removed from the printer and submitted to the laboratory with the filter for analysis.

When the sampling period concludes, a report is automatically printed. This report is removed from the printer and submitted with the sample to the laboratory. Sampler start up may be achieved by either a cold or warm start. Warm and cold-start options as well as all other operational specifications are discussed in XonTech, Inc. *Model 920 Toxic Air Sampler Operations Manual*<sup>5</sup>.

### 2.3.3 ATEC 800 Sequential Sampler

#### 2.3.3.1 Description

An ATEC Model 800 sequential sampling instrument will be used to perform 6 or 8 hour integrated carbonyl sampling. The Xontec 920/924 samples carbonyl compounds for an integrated 24 hour period only. The ATEC 800 instrument contains multiple channels that can be independently programmed for specific flowrates. Channel 1 is a multi-port channel containing eight ports. Each port can be programmed to sample over a specific time period. Optional Channels 2 and 3 consist of single ports that can be activated for parallel or different time periods than Channel 1.

#### 2.3.3.2 Operation

The sampler can be operated in either program or run modes, depending on the position of the program/run switch on the front panel. In program mode, all of the front panel function keys can be used to program operation cycles, display or print data, perform manual operations, set the MFC flowrate, or change the date and time. In the run mode, the sampler is activated according to the cycle programmed. If a sample is being collected, the sampler will display the current data for the active port or channel. For a full explanation of ATEC 800 operational procedures, refer to *Models 800 and 1600 Automated Samplers Operations and Maintenance Manual*<sup>6</sup>. Following sampling, the operator will remove the cartridges from the sampler, place them in a sealed container, and chill them in preparation for transport back to the laboratory for analysis. The operator will record all appropriate data on the sample log. Note; if a power failure should occur during port sampling, the data collected for that port before the power failure will be lost. The sampler will resume operation at whatever port is active at the time power is restored.

---

<sup>5</sup> XonTech, Inc. (1987). *Model 920 Toxic Air Sampler Operations Manual*. Van Nuys, CA: Author.

<sup>6</sup> ATEC. (1996). *Models 800 and 1600 Automated Samplers Operations and Maintenance Manual*. Calabasas, CA: Author.

## 2.3.4 MET One SASS

### 2.3.4.1 Description

The MET One Speciation Air Sampling System (SASS) accommodates up to five sampling canisters to hold multiple 47 millimeter filters to capture PM<sub>2.5</sub> particles. The PM<sub>2.5</sub> separation is produced by a sharp cut cyclone (SCC) that removes both solid and liquid coarse particles. Particle penetration through the SCC mimics the PM<sub>2.5</sub> cutoff curve of the WINS impactor as defined by the U.S. Environmental Protection Agency. All routine maintenance can be done in the field. Filter containers are transported to the laboratory for inspection, cleaning and changing of sampling substrates. Every element of the sampler that is contacted by the sampled air stream ahead of the filter, including the inlet can be cleaned with each sample change. The SASS was designed with individual sharp cut cyclone inlets. Particles larger than 2.5 micron aerodynamic diameter are removed by the cyclonic inlet mounted with each Filter container. The filter containers may be equipped with a diffusion denuder ahead of the filter to remove selected gaseous compounds.<sup>7</sup>

### 2.3.4.2 Module and Media Description

The integrated SASS canister contains the following components: a sharp cut cyclone, a denuder to remove nitric acid or ammonia gases, a 47 mm front filter for particle capture, a 47 mm tandem or backup filter as needed, and a cover to protect the components.

Several types of filter media are needed for assaying the different chemical constituents of ambient particles. The filter media must be suitable for the type of analysis to be done. For example, Teflon filters are used for gravimetric mass and trace metal determinations. Quartz fiber filters are used for elemental and organic carbon analysis as well as anions and cations analysis.

## 2.3.5 Gill Solent 2 Axis Ultrasonic Anemometer

### 2.3.5.1 Description

The Gill 2 Axle Ultrasonic Anemometer is used to measure wind speed and direction (WSD) data. The performance specifications of this anemometer are delineated in Table 2-1. Data is stored in a data logger until it is telemetered to the AQMD's information system.

The wind-observer, ultrasonic anemometer consists of a sensing head with four transducers arranged in two pairs, surmounting a cylindrical electronic base

---

<sup>7</sup> MET One Instruments, Inc. (2001), *Model SASS & SuperSASS PM<sub>2.5</sub> Ambient Chemical Speciation Samplers*, Grants Pass, Oregon: Author.

enclosure. The onboard electronics provide all ultrasonic processing and vector computation required to output wind data in digital and analog form. For a complete description of anemometer operations, refer to *Solent 2 Axis Ultrasonic Anemometer (Heated & NonHeated) User Manual and Product Specification*<sup>8</sup>.

**TABLE 2-1** Performance Specifications - Gill Solent 2 Axis Ultrasonic Anemometer

<u>Wind Speed</u>	<u>Wind Direction</u>
1. Starting Threshold 0 mph	0 degrees
2. Range 0-145 mph	0-360\540 degrees
3. Accuracy $\pm 5$ percent rms	$\pm 4$ degrees

### 2.3.5.2 Siting

WSD measurement, barometric pressure, relative humidity, and temperature monitoring equipment is housed in monitoring stations located in buildings or mobile monitoring platforms. The stations meet Environmental Protection Agency (EPA) criteria for National Air Monitoring Stations (NAMS) and State and Local Air Monitoring Stations (SLAMS) as sited in part 40 Code of Federal Register (CFR) Part 58 attached and included herein by reference.

If the meteorological equipment is located in a one-story building, it is installed on a 6.1-meter tower in an unobstructed position. If the equipment is installed in a platform, it is mounted on a 6.1-meter mast. In those cases involving buildings higher than one story, the mast is made sufficiently high to rise above the surrounding geography.

### 2.3.5.3 Installation

WSD equipment is assembled and oriented according to the manufacturer's instructions. The manufacturer's manuals are used as the primary installation guide.

The mast base support is hinged to allow quick raising of the tower. The base will be welded to the top of the platform or secured to a cement base when positioned on a building. If the tower is erected close to an existing building, it will be secured to that building by an L-bracket. If the mast is mounted on the housing roof, guy wires will secure it. Tower vertical alignment may be checked during this process using a bubble level. If the tower is out of vertical alignment, shimming and the use of turnbuckles may be necessary. When the tripod is secured, the mast is fully extended

<sup>8</sup> Gill Instruments, Ltd. *Solent 2 Axis Ultrasonic Anemometer (Heated & Non-Heated) User Manual and Product Specification* (Doc No 1172 - 0003 - Iss3). Lyminster, Hampshire, England: Author.

with the sensor orientated in the generally correct direction. Additional guy wires further secure the tower.

Once the WSD monitoring equipment has been assembled, mounted on the mast, and raised to its full height in the correct orientation, the direction sensor will be aligned to true north using a true-north-calibrated compass. Although alignment must be performed from a distance, accuracy within five degrees is possible.

#### **2.3.5.4 Telemetry Interfacing**

A telemetry system is used at existing AQMD sites where such capabilities now exist. This system transfers WSD data from the station to the AQMD central computer. The telemetry system accepts direct current (DC) voltage signals from 0 to 5 volts. Since sensors other than WSD are not DC compatible, they must be converted to 0 to 5 volts DC. To convert to DC, input the barometric pressure, temperature, and humidity sensor outputs through the *converter box* that changes the sensor output to the proper voltage. The converter box consists basically of  $\pm 15$  and  $\pm 5$ -volt DC power supply and an alternating current (AC) to DC converter. The input to the converter box comes directly from the sensors.

#### **2.3.5.5 Routine Servicing**

The air quality instrument specialist responsible for each monitoring site will perform routine servicing and periodic checks of the WSD system, barometric pressure, and temperature. The instrument specialist must note and initial the type of service performed and the results of each periodic check on the strip chart, in the system's daily log, and on the WSD Monthly Quality Control Maintenance Sheet (Appendix D).

Any suspected operational problem must be communicated in detail by the instrument specialist to the appropriate supervisor. The supervisor, when informed of the problem, will contact the station operator to determine if the problem can be corrected in-house. If the problem cannot be corrected in-house (by the station operator), the AQMD supervisor will arrange for a system repair team. Anemometer servicing will be conducted on daily, weekly, and monthly bases as described below.

##### **A) Daily Checks (where chart recorder is used)**

Each day a site is visited, the station operator will write the date, station designation, comments, and initials on the strip chart. The operator will also provide a distinct and accurate time check on the chart. If the time is off, the operator must provide time checks both before and after adjusting the strip chart.

##### **B) Weekly Checks**

The sonic anemometer, barometric pressure, and temperature will be checked for daily trends as an indication of proper operation.

### C) Monthly Checks

The sonic anemometer will be lowered from the tower and clean the transducers with a dry towel and water when necessary. The mounting of all three sensors will be checked to verify they are securely attached. The WSD sensor will be aligned with true north.

#### 2.3.5.6 Diagnostics

The Gill 2 Axle Ultrasonic Anemometer microprocessor-based system is designed with continuous internal diagnostics. These diagnostics are used to ensure that the unit is operating correctly within calibration and without potential problems. In the unlikely event of a problem with the anemometer, or if anything physically obstructs its ultrasonic pulses, the anemometer will display different status codes. The transducers will not display inaccurate data. Thirteen different status codes may result. These codes are:

Status code 00 - System is okay  
Status code 01 - Transducer pair 1 failed  
Status code 02 - Transducer pair 2 failed  
Status code 04 - Transducer pairs 1 and 2 failed  
Status code 08 - Non-volatile checksum error  
Status code 09 - Volatile memory checksum error  
Status code 10 - System gain at maximum  
Status code 50 - Marginal system gain condition  
Status code 51 - Measurement average building  
Status code 60 - Heating operational  
Status code 61 - Heating operational but under power  
Status code 62 - Heating tripped  
Status code 63 - Temperature sensor fault  
Status code 64 - Heating operational but over power

A status code will result when an object partially blocks the transducer pulse or the transducer begins to lose efficiency. WSD transducers normally receive pulses from each other within a specific range of intensity amplified and fed to the receiving and recording electronics. When the intensity is lower than normal, the transducer will display the status code 10 as a percentage output. A status code 10 is normally reported just before transducer failure. The amplifier gain is automatically increased to keep the system stable and maintain transducer accuracy.

Transducers have stainless steel bodies capable of handling a harsh marine environment. They are manufactured to meet National Equipment Manufacturer's Association (NEMA) 4X or IP 65 Standards and are pretested in a wind tunnel.

The unit, consisting of a transducer and electronics, continuously checks itself, the transducers, and the calibration integrity and describes random access memory (RAM) faults. During each measurement cycle, the unit will perform 39 WSD measurements every second. This data is averaged and output one to four times per second.

### **2.3.5.7 Calibration**

The calibration process is completely computer controlled. However, operator intervention is necessary to change the erasable prompt chip (EPROM) found in the anemometer. An anemometer undergoing calibration is initially fitted with special firmware that operates within reciprocal tables and transducer delays stored in RAM rather than EPROM as is customary. The first requirement is to input the two axis path lengths and the wind tunnel temperature requirements. At this point, the wind tunnel is switched off and the air is still. Reciprocal tables are produced for each axis based upon the path lengths entered and transmitted to the anemometer. The wind tunnel is operated up to a speed of 40 knots and the anemometer is rotated through 360 degrees at 5-degree steps. The perceived WSD is recorded for 5 seconds at each step and the results are averaged and stored.

Because the unit has no moving parts, calibration and accuracy will not drift. The unit has been designed to announce calibration corruption. Anemometer calibration can be tested by inputting a zero value for the WSD and checking the outputs or by using a calibrated fan. The unit should only be placed in a chamber that does not reflect ultra-sonic pulses. The only way the unit can lose its calibrations, is if the distance between the traducers (path length) is altered. The path length can only be altered if the stainless steel arm is bent or physically damaged. To verify path length accuracy, the path length is measured and checked against the original calibration.

### 2.3.5.8 Data Handling

All data generated from the WSD system will be recorded. Specifically, the station name or number, time and date of the data run, and a brief discussion of any maintenance or repair work required will be noted on the strip chart each day the station is visited. The wind charts may not be cut at any time. When the wind chart is removed from the recorder and the data is reduced, the time and date of chart removal, the station location, and the station reporter's signature must be noted on the bottom of the printed side of the strip chart. The expended chart will be returned to the box in which it was received. The station name or number and the dates of the strip chart will be noted on the end flap of the box. Completed Wind Data Summary Sheets and strip charts will be submitted to the principal air quality instrument specialist responsible for the station.

## 2.3.6 Graseby-GMW 1200 PM<sub>10</sub> Sampler

### 2.3.6.1 Description

A cross-sectional drawing of the Graseby-GMW Model 1200 two-stage, size-selective inlet (SSI) head is shown in Figure 2-1. This sampler is used to sample particulate with an aerodynamic diameter of 10 micron and less. The inlet head is symmetrical and therefore insensitive to wind direction and relatively insensitive to wind speed. The air is drawn through the acceleration nozzles at 40 cfm. Particles larger than 10 microns (aerodynamic diameter) cannot follow the air stream and are deflected below the nozzles onto the flat surface. The air sample is then drawn through vent tubes, the second-stage fractionator, and the filter where the particulate matter is collected. The height of the vent-tube inlets above the acceleration nozzle plate prevents re-entrainment of particles.

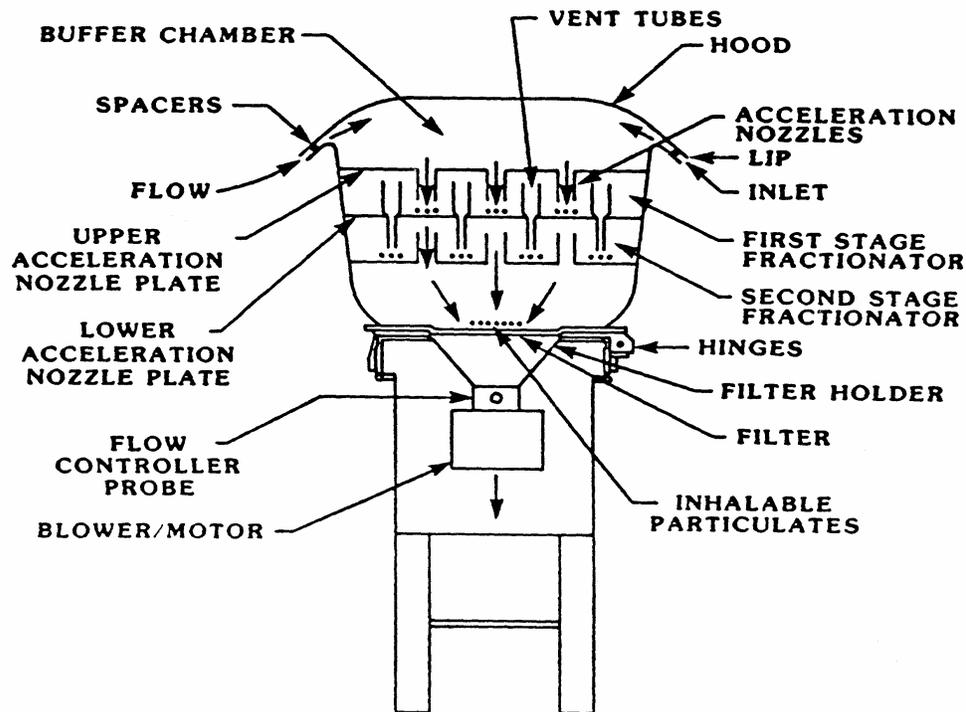
The PM<sub>10</sub> sampler draws air into a specially shaped inlet at a flowrate of 40, ±4, cubic feet per minute (cfm). PM<sub>10</sub> particulate matter collects on an 8 X 10 inch matted quartz fiber filter surface. The concentration of PM<sub>10</sub> particulate matter (in micrograms per cubic meter) is calculated by weighing the particulates collected on the filter and dividing by the measured air sample volume. The standard sampling frequency is every sixth day.

To initiate sampler start-up, the operator will complete a PM<sub>10</sub> sampler site report and send it to the appropriate AQMD supervisor for review of compliance with SLAMS total suspended particulates (TSP) siting criteria 40 CFR Part 58, Appendix E included herein by reference. The PM<sub>10</sub> sampler may be calibrated according to Appendix A, Section A.5.9 of the AQMD's *Quality Assurance Plan for Air Monitoring*<sup>9</sup>.

---

<sup>9</sup> Applied Science & Technology. (1996). *Quality Assurance Plan For Air Monitoring*. Diamond Bar, CA: South Coast Air Quality Management District.

The matted, quartz-fiber filter is very delicate and can be easily torn or gouged. Because a damaged filter will be invalid or invalidate results, it is important to carefully handle it by the edges. To avoid electrical shock, the 115V AC power should be disconnected before working on the motor. Complete operational details are contained in *Instruction and Operation Manual High Volume PM<sub>10</sub> Sampler*<sup>10</sup>.



**FIGURE 2-1** Graseby-GMW PM<sub>10</sub> Sampler, Model 1200 with Two-Stage, SSI Head

<sup>10</sup> Graseby Anderson. (1988). *Instruction and Operation Manual High Volume PM<sub>10</sub> Sampler*. Atlanta, GA: Author.

## **Chapter 3.0 Laboratory Procedures**

### **3.1 INTRODUCTION**

Monitoring of toxic air pollutants is required to confirm and qualify the modeling that is the major thrust of MATES III. To this end, analysis will be performed, to the extent possible, according to accepted analysis methods and QA practices as was performed in MATES II.

Since 1994, the AQMD laboratory has implemented the EPA-sponsored PAMS program to gather data on ozone precursors. Some of the same sampling and analytical instruments currently used in the PAMS program may be used in the MATES III and Microscale efforts. Hence, many of the procedures and protocols for the MATES III program will be taken from the AQMD *Quality Assurance Plan for Air Monitoring*<sup>11</sup> (updated July 1997). However, MATES III also utilizes several analytical methods not performed in the PAMS program and the protocols include herein will parallel accepted ARB and EPA procedures.

The AQMD laboratory will rely upon air quality instrument specialists to take the field samples and deliver them to the laboratory sample custodian. The laboratory sample custodian will handle logging and distribution within the AQMD laboratory. Procedures for proper sampling and initial chain-of-custody is outlined in the AQMD *PAMS Air Monitoring Network Quality Assurance Plan*<sup>12</sup>, Section 7E parts 1 and 2.

### **3.2 SAMPLE HANDLING**

All sampling media will be handled according to the laboratory practice for implementation of toxics analysis and particulate matter network programs as applicable. Field instrument specialists will complete the sampling information and chain-of-custody forms<sup>13</sup>, and deliver the samples to the laboratory sample custodian.

#### **3.2.1 Canister Cleaning**

The AQMD laboratory has a canister cleaning oven system. This system utilizes humidified nitrogen to flush and clean canisters in a heated oven to less than 5-ppb carbon of total organic compounds. The canisters are held at a 110°C temperature and are flushed a minimum of three times over a 2-hour period. One canister is randomly removed from each batch of eight canisters in the cleaning oven and analyzed for residual

---

<sup>11</sup> Applied Science & Technology. (1996). *Quality Assurance Plan For Air Monitoring*. Diamond Bar, CA: South Coast Air Quality Management District.

<sup>12</sup> Applied Science & Technology. (1977) *PAMS Air Monitoring Network Quality Assurance Plan*. Diamond Bar, CA: South Coast Air Quality Management District.

<sup>13</sup> These forms consist of the Size-Selective Inlet PM<sub>10</sub> Sampler Envelope (Appendix C), MATES II Sample Log (Appendix F), and VOC Canister Tag (Appendix G).

hydrocarbons. Long-term experience has proven that the canister-cleaning oven system is sufficient to provide clean canisters. Any hydrocarbons found in the randomly checked canister are cause for investigation and corrective action. The cleaning date and operator is noted on the canister tag that serves as the primary chain-of-custody.

### 3.2.2 Field Canister Use

The canisters are transported by the instrument specialist to the site and installed in accordance with the sampling SOP included in the *PAMS Air Monitoring Network Quality Assurance Plan*<sup>14</sup>. The sample is taken and the sample time, canister number, and start vacuum are noted on the MATES III Sample Log (Appendix E) that follows the canister from the field onward. The sample is promptly returned to the laboratory for log-in and distribution to the appropriate senior chemist.

### 3.2.3 Sample Distribution in the Laboratory

The laboratory sample custodian will log in the samples received from the courier and distribute them to the appropriate senior chemist following established laboratory protocol. The sample custodian will distribute samples to the laboratory personnel starting with the responsible Senior Chemist.

## 3.3 ANALYSIS METHODS

Table 1 gaseous compounds (Appendix A) will be analyzed using gas chromatography with multiple detection for the gaseous compounds. The method generally follows the EPA Method TO-15; *Determination of Volatile Organic Compounds (VOCs) in Specially Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)*. Carbonyl analysis will be conducted using EPA Method TO-11, *Determination of Formaldehyde in Ambient Air Using Adsorbent Cartridge Followed by High Pressure Liquid Chromatography*. These methods are detailed in the *EPA Compendium of Methods for the Determination of Toxic Organic Compounds*<sup>15</sup>.

---

<sup>14</sup> Ibid.

<sup>15</sup> Winberry, William, Murphy, Norma & Riggan, R.M. (1988). *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*. Research Triangle Park, NC: Quality Assurance Division, Environmental Monitoring Systems Laboratory, Office of Research and Development, US Environmental Protection Agency. (EPA-600/4-84-041)

### 3.4 SAMPLING AND ANALYSIS - TABLE 1 COMPOUNDS

The VOCs and Halo (halogenated) VOCs found in Table 1 (Appendix A) will be analyzed by cryogenic freeze-out to obtain the lowest possible detection limits. These compounds will be detected using a combination of gas chromatography with mass spectrometry and flame ionization detection. A short method description for sampling and analysis of VOCs by GC/MS can be found in this document as Appendix M.

Carbonyl measurement will be conducted utilizing the PAMS sampling and analysis methodology delineated in the *PAMS Air Monitoring Network Quality Assurance Plan*<sup>16</sup>. The AQMD will use the Waters<sup>R</sup> silica gel cartridge impregnated with dinitrophenyl hydrazine. The AQMD will use a potassium-iodide-coated ozone denuder in all samplers. For sampling at MATES III sites, the AQMD will follow the ARB's toxic network design method using the XonTech 920/924 with a carbonyl channel. A short method description for the carbonyl sampling and analysis can be found in this document as Appendix H. The AQMD will use the ATEC Model 800 sampler for sampling at its MSS sites. This model is similar to the AQMD's PAMS sampler.

Inorganic measurements will be taken on quartz fiber filters using XonTech 920/924 samplers and analysis by ICP/MS. The method will generally follow the EPA Method IO-3.5: *Determination of Metals in Ambient Particulate Matter Using Inductively Coupled Plasma/Mass Spectrometry* as found in the *EPA Compendium of Methods for Inorganic Air Pollutants (1997)*. A short method description of the sampling and analysis by ICP/MS for toxic metals is attached as Appendix I. For the PM<sub>2.5</sub> samples a Teflon filter will be used and X-ray fluorescence (XRF) will be used for analysis of elemental constituents. A short method description for sampling and analysis of elements by energy dispersive X-ray fluorescence spectrometry at the AQMD is attached to this document as Appendix J.

Proposed for MATES-III, particulate filter samples both in the coarse (PM<sub>10</sub>) and fine (PM<sub>2.5</sub>) aerodynamic diameter regions will be analyzed for metals, ions, total mass, OC, EC, and total carbon (TC). Analysis for EC, OC and TC upon the PM<sub>10</sub> filter samples will be analyzed using the IMPROVE method with some overlapping NIOSH analysis. Analysis for EC, OC and TC upon the PM<sub>2.5</sub> filter samples will be analyzed using the NIOSH method with some overlapping IMPROVE analysis. The results of the overlapping analyses between the NIOSH and IMPROVE methods will be compared. The results from the IMPROVE and NIOSH methods are expected to not be directly comparable, a factor may be realized which will allow for a comparison of the future NIOSH data with AQMD's historical PM database consisting of data measured by the IMPROVE method. Furthermore, seasonal and annual trend analysis will be conducted on data acquired from air monitoring stations used in both MATES II and MATES III.

---

<sup>16</sup> Applied Science & Technology. (1977) *PAMS Air Monitoring Network Quality Assurance Plan*. Diamond Bar, CA: South Coast Air Quality Management District.

The preceding discussion covers all Table 1 compounds (Appendix A) that will be sampled on a regular, one day in three sampling schedule synchronized with the national PM<sub>10</sub> and PM<sub>2.5</sub> network schedules. The samples will be integrated over a 24-hour period. AQMD personnel will conduct the sampling and analysis. Hired contract instrument technicians and chemists will assist regular AQMD employees.

### **3.5 SAMPLING AND ANALYSIS - TABLE 2 COMPOUNDS**

Although many Table 2 compounds (Appendix B) do not have a widely recognized analytical method, every effort will be made to follow American Society of Test Methods or American Industrial Hygiene Laboratory methodologies. A sampling and analysis sub-committee will be formed to address the problems of sampling frequency and analysis methods. The compounds ethylene dibromide and ethylene dichloride can be seen on chromatograms of the halogenated hydrocarbons analyzed for Table 1 compounds. Since these compounds are rarely used in the Basin, they are on the Table 2 list because they will be evaluated on an infrequent basis.

Compounds found in Table 2 are difficult to measure. Ambient air methods have recently become available for some compounds such as methyl tert-butyl ether (MTBE). Some Table 2 compounds may be sampled by the AQMD and analyzed by private or academic laboratories. Special efforts may be directed to analyzing the ambient air for naphthalene, one of the PAHs.

### **3.6 SAMPLING SCHEDULE**

MATES III sampling will be conducted on the same schedule as utilized by the air-monitoring network (Table 3-2). Using the same sampling schedule results in several benefits:

- 1) Data from MATES III can be correlated with the ambient data taken on the same day.
- 2) Additional staff time to service and maintain MATES III sampling equipment and instrumentation is minimized because the existing sampling schedule can be largely utilized.
- 3) Sample set-up, retrieval, and delivery time to the laboratory is minimized.

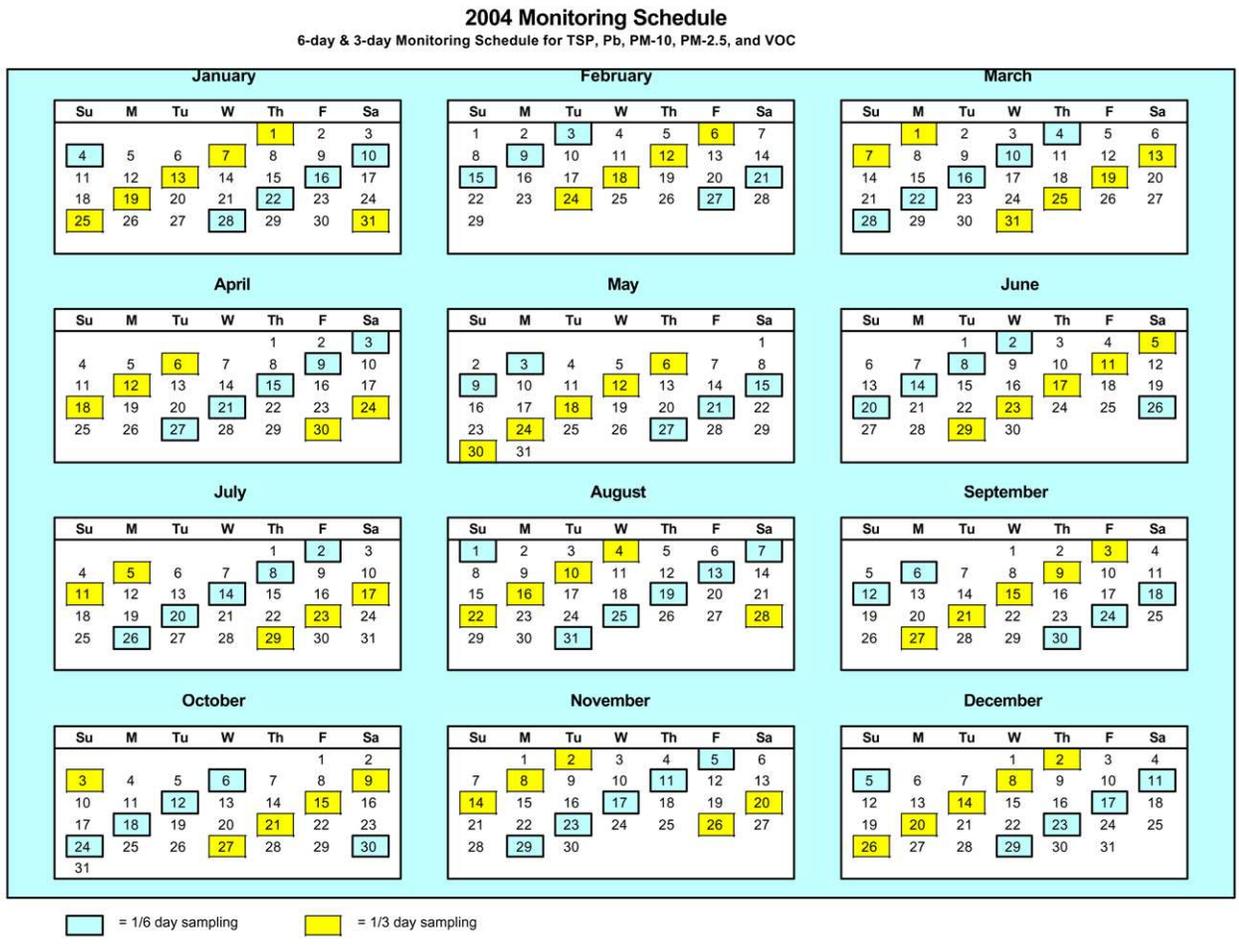
MSS sampling shall be conducted on a similar schedule to MATES III sampling. The AQMD will operate two to three MSS platforms. Platforms will be sited for eight weeks at each of a variety of different locations. Sampling will occur on days the MATES III fixed sites are sampling. The schedule for MSS sampling is depicted in Table 3-1. Sampling at the MSS sites will coincide with the MATES III sampling schedule (that is

on a one day in three schedule for approximately six weeks). The MATES III sampling schedule is identified in Table 3-2.

**Table 3-1** Sample Mobile Platform Sampling Schedule

	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Week 1	X			X			X
Week 2			X			X	
Week 3		X			X		
Week 4	X			X			X
Week 5			X			X	
Week 6		X			X		

**Table 3-2 2004 Mates III Sampling Schedule**



(Reproduced from EPA web page [www.epa.gov/ttn/amtic](http://www.epa.gov/ttn/amtic), *Sampling Schedule Calendar*. 2005 schedule as yet not available.)

## Chapter 4 Quality Assurance and Quality Control

### 4.1 INTRODUCTION

The AQMD is committed to achieving the highest possible data quality level in the MATES III and MSS programs. To achieve this data quality level, the AQMD has implemented the following QA/QC plan. This Chapter contains the objectives, procedures, documentation, and data review techniques that will be used by the AQMD to assure that the MATES III and MSS programs will produce accurate data.

### 4.2 OBJECTIVES

There are three objectives of the QA/QC procedures for the MATES III and MSS programs. These objectives are: 1) to provide accurate and precise data to meet AQMD monitoring requirements, 2) to minimize data loss, and 3) to assess air monitoring data quality and provide data that meets the QA/QC data quality objectives displayed in Table 4-1.

**TABLE 4-1** QA/QC Data Quality Objectives

ASSESSMENT	MEASURES	PROCEDURE	CRITERIA/PARAMETER			
			VOCs	carbonyls	PM <sub>10</sub>	PM <sub>2.5</sub>
Accuracy	Percent Deviation from True Value	Audits	± 25%	± 25 %	± 10%	± 10%
	95% Probability Limits		< 30%	< 30%	< 15%	< 15%
Precision	Percent Deviation from True Value	Collocation	± 25%	± 25%	< 10%	< 10%
	95% Probability Limits		< 30%	< 30%	< 15 %	< 15 %
Completeness	Percent of Valid Data		85%	75%	90%	90%

### 4.3 PROCEDURES

#### 4.3.1 Quality Assurance Procedures

AQMD staff will conduct QA Procedures. The AQMD will perform annual flow audits on all PM<sub>10</sub> and PM<sub>2.5</sub> samplers. These flow audits will be conducted according to the procedures outlined in the AQMD's *Quality Assurance Plan for Ambient Monitoring*, Appendix K. The EPA, and ARB will annually audit the performance of the AQMD laboratory for VOCs and carbonyls using the EPA's National Performance Audit Program and the ARB's VOC and carbonyl audits.

The AQMD will operate collocated Hi-Vol samplers at Rubidoux for a 24-hour average. The samplers will collect PM<sub>10</sub> on a one-day-in-six sampling schedule. Carbonyl and VOC sampling will be collocated at Pico Rivera on a one-day-in-six sampling schedule.

#### 4.3.2 Quality Control Procedures

##### A) Field Checks

Staff will perform a number of functions when conducting a field check. Specifically, Staff will:

- 1) observe and record all required data for each sampler's monthly maintenance sheet, chain-of-custody form, and sample identification tag
- 2) check and reset all timers if off by more than  $\pm 5$  minutes PST
- 3) check and adjust the flow settings if they are not within  $\pm 5$  percent of the calibrated setting

##### B) Laboratory Daily Checks

Staff will monitor the balance using a NIST traceable check standard; conduct a gas chromatograph standard check using a NIST traceable gas standard; will observe, record, and correct all sample media equilibration conditions if they are out of tolerance.

##### C) Semi-Annual Checks

Staff will conduct multipoint calibrations of all mass-flow controllers in all samplers; perform instrument leak checks; determine the level of detection (LOD) for each analytical method; and will clean the PM<sub>10</sub> inlet head.

##### D) Annual Checks

Staff will clean the sample probe using de-ionized water and a soft cloth; conduct sample probe leak checks and repair if necessary; and will conduct 24-hour tests by operating the sampler with a daytime start-stop time to observe actual run length. Actual start and stop must be observed. The timer will be repaired if the sample period varies from setting by more than  $\pm 20$  minutes.

## 4.4 DOCUMENTATION

A critical element of an effective QA/QC system is proper documentation. To ensure that all samples are properly handled, inspected, collected, analyzed, and reported, a comprehensive set of QA/QC documents will be completed. The information reported in these documents is crucial to determining the validity of reported data. Lack of proper documentation can be grounds for data invalidation. A summary of QA/QC sampling activities is attached as Appendix L.

### A) Chain-of-Custody Forms

Chain-of-custody forms (Appendices C, F and G) are necessary to identify and control the disposition of the samples through the multiple steps of preparation, sampling, retrieval, analysis, and data reporting. As appropriate, by sample type, chain-of-custody forms will accompany all samples collected in the MATES III and MSS programs. These forms will be originated by the field operators, delivered to the laboratory, and submitted to the assigned laboratory staff. The laboratory will be responsible for storing all chain-of-custody documents.

### B) Maintenance Check Sheets

Maintenance check sheets (Appendices D and E) will be completed by field instrument operators for the PM<sub>10</sub> sampler and ultrasonic wind speed and direction anemometer. These monthly maintenance sheets will be submitted to senior field operators for review, approval, and storage.

### C) Calibration Reports

Field and laboratory staff performing semi-annual and post-repair multipoint calibrations will prepare calibration reports. The calibration reports will be reviewed, approved, and stored by field and laboratory MATES III and MSS program supervisors.

### D) Equipment Relocation Notice (ERN)

ERNs are a vital element of the documentation required in the MATES III and MSS programs. Because the MSS program involves frequent relocation of fixed assets, it is the responsibility of the MATES III and MSS program field operations supervisor to complete and submit ERNs for all fixed assets within two weeks of each platform relocation.

## E) Station and Equipment Logbooks

Logbooks are provided for each sampling site and piece of sampling equipment. Each and every monitoring station visitor will note the station logbook at each and every visit. The notation should include the date, reason for the visit, and the visitor's clearly identifiable signature or initials. Instrument logbooks will be noted each time an instrument is repaired, calibrated, or audited.

## 4.5 DATA REVIEW

Program data validity is directly attributable to the proper implementation of all the operating and QA/QC procedures described in this protocol. To assure that the program's data quality objectives are met, responsibility for data review is distributed between the field operators, calibrators, auditors, and supervisors, laboratory chemists and supervisors, QA supervisors, and the laboratory and air monitoring managers.

### A) Field Supervisors

Field supervisors are responsible for locating and setting up the sites, scheduling operators, training field operators, coordinating supply ordering, supply receipt and distribution, and review of monthly QC maintenance sheets. The field supervisors are responsible for notifying the laboratory supervisor of every event that could invalidate the sample.

### B) Field Operators

Field operators are responsible for operating all samplers and analyzers according to the operating procedures specified in this protocol. The field operators must observe and annotate all information in the monthly QC maintenance sheets, chain-of-custody forms, sample tags, and logbooks. The field operators are responsible for notifying their supervisors of every out-of-control flow setting, timer setting, expected start or ending pressure, or any other instrument malfunction.

### C) Field Calibrators

Field calibrators are responsible for performing semiannual multipoint calibrations on all flow control-devices according to AQMD calibration procedures. Any as-is calibration showing a deviation from design flowrate in excess of  $\pm 15$  percent will be reported to the field supervisor. Any samples collected while flow percentage deviation from design flow exceeded  $\pm 15$  percent will be invalidated back to the previous flow calibration, audit, or malfunction date.

#### D) Field Auditors

AQMD field auditors will conduct flow audits on 25 percent of the entire network each calendar quarter. Auditors are responsible for notifying the QA supervisor of any audit indicating a greater than  $\pm 15$  percent average percent deviation from design flow.

#### E) QA Supervisor

The QA supervisor is responsible for reviewing field audit reports, scheduling audits, coordinating with ARB QA staff, and compiling and reporting QA flow accuracy reports.

#### F) Laboratory Chemists

The laboratory chemists are responsible for receiving field samples, maintaining and storing chain-of-custody documents, performing and documenting QC activities on the QC monthly maintenance sheets, performing laboratory audit analyses, and conducting preliminary data analysis for outliers and out-of-control conditions.

#### G) Laboratory Supervisor

The laboratory supervisor is responsible for final raw data review, calculation of precision based upon collocated, reviews monthly QA/QC sheets, makes final evaluation of data validity based on satisfactory reports from QA supervisor, field supervisor, and assessment of laboratory precision data.

#### H) Air Monitoring Manager

The air-monitoring manager is responsible for overseeing field operations and QA auditing operations.

#### I) Laboratory Manager

The laboratory manager is responsible for overall coordination of the entire MATES III and MSS programs and to ensure that all staff fulfills their responsibilities as detailed in this protocol. Additionally, the laboratory manager is responsible for establishing the final acceptance criteria for sample validity once actual precision and accuracy data become available.

## **Chapter 5.0 Data Processing and Reporting**

### **5.1 INTRODUCTION**

MATES III monitoring for ambient air toxics will develop a large data resource for modelers and health statisticians. Table 1 compounds, when multiplied by the projected frequency of sampling in MATES III, will result in more than 20,000 individual data points representing a concentration of a toxic compound at a particular time and location. The purpose of this chapter is to outline the data handling of such a large database. This section will only pertain to the laboratory work performed and not to the meteorological, criteria pollutant, or monitor calibration data.

The AQMD Laboratory has had recent experience handling such a large data base with the PTEP conducted in 1995 and the MATES II of 1998-99. Reporting templates for the carbon analysis and XRF elemental analysis (inorganics) will follow the outline used in the PTEP project. Reporting templates for the VOCs, halogenated hydrocarbons, and carbonyls will follow the PAMS format.

The aim of the reporting will be to generate Excel data files for electronic transfer to interested parties. The data will be checked for transcription errors and quality assured to represent the most accurate determinations possible. The laboratory will strive to disseminate the data in a timely fashion to facilitate feedback.

### **5.2 DATA BASE COMPILATION**

The laboratory chemists will generate a data point representing the concentration of a particular compound found over a particular time period at a particular MATES III or MSS site. The instrument analyzes the sample and determines the volume concentration on a parts-per-billion basis. These concentration numbers will be compiled into an Excel spreadsheet along with the name of the sampling site and the date the sample was taken. The chemist (analyst) is responsible for checking data point accuracy. The technician in charge of copying the data points into the spread sheet is responsible for their accurate transcription. The senior chemist is in charge of double checking the chemists' and technicians' data transcription work.

If resources permit, one chemist will operate the instrument while another chemist reduces the data and transcribes it to the Excel spreadsheet. This method would lead to the quickest turnaround time possible. One chemist may reduce the data from several instruments depending on the workload.

MATES III and MSS data will encompass PM<sub>10</sub> and PM<sub>2.5</sub> mass, VOCs, carbonyls, XRF, ICP/MS and carbon analysis results. The run date will be encoded with the year, month, and day in six numerals. This information will be followed by a two-letter acronym representing the station and concentration. The column header has the name of the compound and the concentration units. Uncertainties were given for each data point. These uncertainties

encompass the calculated limits for the sampling and analysis errors introduced into the measurement system.

The AQMD MATES III and MSS program data will be compiled into several spreadsheets. These spreadsheets will conjugate components along the lines of the analysis technique. Each instrument will have a separate spreadsheet for the compounds it analyzes.

The laboratory can work with the end data user to supply the electronic version in whatever file length or configuration is desired. The data can also be translated into ASCII flat files.

### **5.3 PERIODIC REPORTS**

The laboratory will strive to meet a two-month turnaround time from the date of sampling to the finished and checked report. The VOCs, carbonyls, XRF, and carbon analyzer will all be sampled individually, yet in very similar formats. Extra effort will be made to analyze duplicate samples and other QC samples and compile into a separate report for monthly reporting. The reports will be available in electronic file and printed spreadsheets.

### **5.4 FINAL REPORT**

Past experience has proven that the final report including the QA report can take from two to six months after the last day of sampling. The data will be compiled on a monthly basis and the final report is slated to be complete within two months of the end of sampling. Resources permitting, laboratory staff will migrate the Excel spreadsheets to the Access database software. The final report will be stored in several files segregated by date and analysis. The AQMD Laboratory has the ability to write the files to CD-ROM. Only limited hard copies of the report will be printed.

## Glossary

### Quality Assurance (QA)

The practice of establishing procedures external to the day-to-day monitoring operations that indicate whether or not air quality data is accurate, representative, precise and complete enough to satisfy the needs of the data users. QA activities include, but are not limited to, system and performance audits and collocated and parallel sampling. These activities are described in detail in Chapter 4.

### Quality Control (QC)

Any procedure incorporated into the internal, day-to-day operations of collection and analysis of air quality samples to satisfy the data user's need for valid data. These activities are described in detail in Chapter 4.

### Accuracy

A determination of how closely reported data values are to true values. Annually conducted performance audits will challenge the various samplers and instruments used in this program to assess their accuracy. All program data accepted as valid, will meet the criteria set forth in Table 4-1. Accuracy is expressed as "percent" deviation from true and is calculated as follows:

$$\text{Percent Deviation from True} = \frac{\text{Indicated Value} - \text{True Value}}{\text{True Value}} \times 100$$

### Precision

The measure of monitoring system repeatability. Precision is determined by amassing a variety of measurements of the same true value over a period of time and assessing the variability of those measurements. Precision objectives for the various monitoring methods used in MATES II and MSS programs are presented in Table 4-1.

### Data Completeness (DC)

The percent of valid data points actually collected out of the total number of data points possible. The data completeness objectives for the MATES II and MSS programs are presented in Table 4-1. DC is calculated using the following formula:

$$\text{percent DC} = \frac{\text{Total valid data points}}{\text{Total number of possible data points}} \times 100$$

### Representativeness

The goal that samples are representative of both temporal and/or spatial scales at all sites. This is accomplished by conforming to 40CFR58 siting and sampling requirements for PM<sub>10</sub>.

### Performance Audit

A procedure conducted to establish individual analyzer and overall sampling and analysis accuracy. Probe audits are used to measure the integrity of both the sampling and analysis

systems. Flow audits measure the accuracy of the flow metering devices that assure the sample's temporal representativeness. Gas standard audits determine accuracy of laboratory analyzers in measuring known concentrations of toxic compounds.

**System Audit**

An on-site inspection and review of the entire monitoring program.

**Collocated Sampling**

The process of running two identical samplers concurrently at the same location. Collocated data measures a method's precision. One of the samplers is designated *A* and is treated as the true value; while the other sampler is designated *B* and is regarded as the indicated value.

**Parallel Sampling**

The process of two different agencies such as the AQMD and ARB operating two different samplers side-by-side.

DRAFT

## ACRONYM LIST

AC	alternating current
AIHL	American Industrial Hygiene Laboratory
AM	Air Monitoring
AQMD	South Coast Air Quality Management District
ARB	Air Resources Board
AST	Applied Science and Technology
ASTM	American Society of Test Methods
Basin	South Coast Air Basin
cc	cubic centimeters
ccm	cubic centimeters per minute
cfm	cubic feet per minute
CFR	Code of Federal Records
DC	direct current
DNPH	2, 4-dinitrophenyl-hydrazine
EDB	ethylene dibromide
EDC	ethylene dichloride
EJ-2	Environmental Justice Initiative Number 2
EPA	Environmental Protection Agency
EPROM	erasable prompt chip
ERN	equipment relocation notice
ETM	elapsed time meter
FPC	filter paper cartridge
HPLC	High Performance Liquid Chromatograph
ICP/MS	Ion coupled Plasma/Mass Spectrometry
LIMS	Laboratory Information Management System
LOD	Level of Detection
lpm	liters per minute
MATES II	Multiple Air Toxics Study II
MATES III	Multiple Air Toxics Study III
MFC	mass flow controller
mph	miles per hour
MSS	Microscale Study
MTBE	methyl tert butyl ether
NAMS	National Air Monitoring Stations
NEMA	National Equipment Manufacturer's Association
PAH	polycyclic aromatic hydrocarbon
PAMS	Photochemical Assessment Monitoring Station
PM	particulate matter
ppb	parts per billion
ppbC	parts per billion carbon
PSI	pounds per square inch
PST	Pacific Standard Time
PTEP	Particulate Technical Enhancement Program

PUF	polyurethane foam
QA	quality assurance
QC	quality control
RAM	random access memory
rms	root mean standard
SASS	speciation air sampling system
SCAQMD	South Coast Air Quality Management District
SCC	sharp cut cyclone
SCFM	standard cubic feet per minute
SLAMS	State and Local Air Monitoring Stations
SOP	standard operating procedure
SSI	size selective inlet
TAC	toxic air contaminant
TSP	total suspended particulates
V	Volt
VOC	volatile organic compound
WSD	wind speed and direction
XRF	X-ray fluorescence

DRAFT

**APPENDIX A** Proposed Table 1 Air Contaminants for Inclusion in the Measurement Program  
(Compounds in bold are proposed for U.S EPA AIRS database reporting)

CAS No.	Chemical Name	Lab Test Method	Sampling Freq.	Comment
<b>VOCs</b>				
<b>71432</b>	<b>Benzene</b>	<b>GC/MS/FID</b>	<b>1 in 3 days</b>	
<b>7440439</b>	<b>Butadiene [1,3]</b>	<b>GC/MS/FID</b>	<b>1 in 3 days</b>	
106467	Dichlorobenzene [ortho- & para]	GC/MS/FID	1 in 3 days	
<b>75014</b>	<b>Vinyl chloride</b>	<b>GC/MS/FID</b>	<b>1 in 3 days</b>	
	Ethylene	GC/MS/FID	1 in 3 days	
	Propylene	GC/MS/FID	1 in 3 days	
	Hexane [n-]	GC/MS/FID	1 in 3 days	
	Toluene	GC/MS/FID	1 in 3 days	
	Xylene [m-, o-, p-]	GC/MS/FID	1 in 3 days	
	Styrene	GC/MS/FID	1 in 3 days	
<b>Halo-HCs</b>				
<b>56235</b>	<b>Carbon tetrachloride</b>	<b>GC/MS/FID</b>	<b>1 in 3 days</b>	
<b>67663</b>	<b>Chloroform</b>	<b>GC/MS/FID</b>	<b>1 in 3 days</b>	
75343	Dichloroethane [1,1-]	GC/MS/FID	1 in 3 days	
	Dichloroethylene [1,1-]	GC/MS/FID	1 in 3 days	
<b>75092</b>	<b>Methylene chloride (Dichloromethane)</b>	<b>GC/MS/FID</b>	<b>1 in 3 days</b>	
<b>127184</b>	<b>Perchloroethylene (tetrachloroethene)</b>	<b>GC/MS/FID</b>	<b>1 in 3 days</b>	
	<b>Propylene Dichloride (1,2-dichloropropane)</b>	<b>GC/MS/FID</b>	<b>1 in 3 days</b>	<b>Not in MatesII</b>
<b>79016</b>	<b>Trichloroethylene</b>	<b>GC/MS/FID</b>	<b>1 in 3 days</b>	
<b>Carbonyls</b>				
<b>75070</b>	<b>Acetaldehyde</b>	<b>HPLC</b>	<b>1 in 3 days</b>	
	Acetone	HPLC	1 in 3 days	
<b>50000</b>	<b>Formaldehyde</b>	<b>HPLC</b>	<b>1 in 3 days</b>	
<b>Inorganics</b>				
<b>7440382</b>	<b>Arsenic</b>	<b>ICP/MS:XRF</b>	<b>1 in 3 days</b>	
	Chromium (total)	ICP/MS:XRF	1 in 3 days	
<b>18540299</b>	<b>Chromium (hexavalent)</b>	<b>IC</b>	<b>1 in 3 days</b>	
<b>7439921</b>	<b>Lead</b>	<b>ICP/MS:XRF</b>	<b>1 in 3 days</b>	<b>Network</b>
<b>7440020</b>	<b>Nickel</b>	<b>ICP/MS:XRF</b>	<b>1 in 3 days</b>	
	Cobalt	ICP/MS:XRF	1 in 3 days	
	Copper	ICP/MS:XRF	1 in 3 days	
	<b>Manganese</b>	<b>ICP/MS:XRF</b>	<b>1 in 3 days</b>	
7723140	Phosphorous	ICP/MS:XRF	1 in 3 days	
	Selenium	ICP/MS:XRF	1 in 3 days	
<b>7440439</b>	<b>Cadmium</b>	<b>ICP/MS:XRF</b>	<b>1 in 3 days</b>	
<b>7440417</b>	<b>Beryllium</b>	<b>ICP/MS:XRF</b>	<b>1 in 3 days</b>	
	Zinc	ICP/MS:XRF	1 in 3 days	
<b>Others</b>				
	Elemental & organic carbon	C analyzer	1 in 3 days	
<b>Criteria Pollutants</b>				
	PM2.5	SASS	1 in 3 days	
	PM10	SSI-Hivol	1 in 3 days	PM network

**APPENDIX B** Proposed Table 2 Air Contaminants that Potentially May Be Monitored on A Limited Basis

CAS No.	Chemical Name	Laboratory Test Method	Comment
<b>VOCs</b>			
	<b>Acrolein</b>		No ambient method
	Methyl tert butyl ether (MTBE)	GC	
<b>Halo-HCs</b>			
106934	Ethylene dibromide {EDB}	GC/MS	
107062	Ethylene dichloride {EDC}	GC/MS	
	Methyl chloride	GC/MS	
<b>Others</b>			
	PAHs	HPLC	Send out for analysis
	Napthalene	HPLC	Send out for analysis
	Diesel exhaust "Markers"	TBD	Send out for analysis

**APPENDIX C**

Size-Selective Inlet PM<sub>10</sub> Sampler Envelop

**South Coast Air Quality Management District  
Applied Science & Technology**

**Size-Selective Inlet PM<sub>10</sub> Sampler Envelop**

FIELD OPERATOR USE	LABORATORY USE ONLY
STATION # _____	SAMPLE # _____
LOCATION _____	FLOWRATE, CFM _____
SAMPLER # _____	VOLUME OF AIR, M <sup>3</sup> _____
QUARTZ FILTER # _____	FINAL WEIGHT (gm) _____
DATE _____	TARE WEIGHT (gm) _____
TIME	SAMPLE WEIGHT (gm) _____
END _____	PM <sub>10</sub> (ug/M <sup>3</sup> ) _____
START _____	SAMPLE RECV'D _____
TOTAL _____	
REMOVED FROM SAMPLER _____	SAMPLE WEIGHED _____
SENT TO HQ _____	SAMPLE EXTR. _____
RECEIVED AMB _____	SAMPLE ANALYSIS _____
	REF. _____

DATE SAMPLER CALIBRATION \_\_\_\_\_

STATION OPERATOR \_\_\_\_\_

Remarks (unusual activities sampling conditions, etc.):

**APPENDIX D WSD Monthly Quality Control Maintenance Check Sheet**

**SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT**

**MONTHLY QUALITY CONTROL MAINTENANCE CHECK SHEET**

MAKE/MODEL \_\_\_\_\_ Wind Speed and Direction System  
 Location \_\_\_\_\_ Month/Year \_\_\_\_\_  
 Station No. \_\_\_\_\_ Specialist \_\_\_\_\_  
 Control No. \_\_\_\_\_ Reviewed by \_\_\_\_\_ Date \_\_\_\_\_

Date	Zero Speed		Zero Direction		Visual Wind Transmitter Check	Chart Time	
	As Found	Final	As Found	Final		As Found	Final

**OPERATOR INSTRUCTIONS:**

Daily Checks: Chart trace and time.  
 Weekly Checks: Zero speed and direction inking system  
 Visual wind transmitter check. The station operator will visually check the wind transmitter to confirm the direction coincides with recorder. Notify supervisor immediately if problem occurs.  
 Bi-monthly Maintenance:

DATE	COMMENTS OR MAINTENANCE PERFORMED

Calibration Date: \_\_\_\_\_ Operator \_\_\_\_\_

**APPENDIX E**

**High Volume Monthly Quality Control Maintenance Check Sheet**

**High Volume  
Monthly Quality Control Maintenance Check Sheet**

MAKE/MODEL \_\_\_\_\_

HIGH VOLUME SAMPLER \_\_\_\_\_

Location \_\_\_\_\_  
Station No. \_\_\_\_\_  
Control No. \_\_\_\_\_  
Operating Set Point \_\_\_\_\_  
Date SSI Head Cleaned \_\_\_\_\_

Month/Year \_\_\_\_\_  
Specialist \_\_\_\_\_  
Reviewed by/Date \_\_\_\_\_  
Cubic Feet per Meter \_\_\_\_\_  
Due Date \_\_\_\_\_

Sample Date	Initial Flow cfm	Final Flow cfm	Filter No.	Initial Elapsed Time	Final Elapsed Time	Total Time
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						

South Coast Air Quality Management District

**Mates III Sample Log**

Location: \_\_\_\_\_

Sample Date: \_\_\_\_\_

Station No.: \_\_\_\_\_

Station Operator: \_\_\_\_\_

Date Last Calibrated: \_\_\_\_\_

<b>Lab No.:</b> _____
<b>Date Sample Received:</b> _____
<b>Reference No.:</b> _____
<b>Analyst:</b> _____

**Canister Log - XonTech 910**

Sample Time	Canister No.	Start Vacuum	End Pressure	Comments
24 hour				
Blank				
Collocated				

*(Staple Printout Here)*

**DNPH Cartridge Log - XonTech 920**

Sample Time	Cartridge No.	Elapsed Time	Flow Rate	Comments
24 hour				
Blank				
Sample				
Collocated				

**Filter Log - XonTech 920**

Sample Time	Filter No.	Flow Rate	Comments
Teflon (Metals)			
Cellulose (Chrome VI)			
PM <sub>10</sub> (Hi-Vol)			



## APPENDIX H

### Method Description for Sampling and Analysis of Carbonyls by HPLC at the AQMD Laboratory

**Sampling** - Ambient air is drawn through a glass and/or stainless steel probe at the air monitoring site and pulled through DNPH coated cartridges mounted in the A-Tech 2400 sampler. The sampling cartridges are coated with a minimum of 300 mg of DNPH on Waters C-18 Sep-Pak cartridges. The sample is pulled through the cartridge at approximately one lpm for 3-hour sampling and at 0.4 lpm for 24-hour sampling. The sampler does not utilize a KI coated ozone denuder. Before and after sampling the cartridges are kept capped and refrigerated in small vials to prevent loss and contamination.

**Laboratory Analysis**- The laboratory uses a Waters Millennium system high performance liquid chromatograph (HPLC) with autosampler. After elution of the Sep-Pak cartridge with 3 milliliters of acetonitrile, the samples are placed in the autosampler. Samples are run isocratically (55 percent acetonitrile and 45 percent H<sub>2</sub>O) on a Waters C-18, 5 micron, 4.6 mm by 250-mm cartridge column. Flow is one milliliter per minute. Twenty microliters are injected onto the column by autosampler.

**Quantification** - A calibration curve is derived from multi-point injections of standards obtained from Radian Corporation. One point control standards are run daily with the sample analysis. PAMS compounds, acetaldehyde, formaldehyde, and acetone, are quantified by comparison to the calibration curve.

**QA/QC**- The limit of detection is determined for the HPLC response and the system LOD is calculated for a typical air volume sampled. A collocated cartridge is run every 6 days of sampling in the field. Blank cartridges are run at a similar frequency. Replicate samples are run every autosampler tray (maximum 35 samples).

**APPENDIX I**

Method Description for Sampling and Analysis of Toxic Metals by  
Ion Coupled Plasma/Mass Spectrometry (ICP/MS) at the AQMD  
Laboratory

DRAFT

## APPENDIX J

### Method Description for Sampling and Analysis of Elements by Energy Dispersive X-ray Fluorescence Spectrometry at the AQMD Laboratory

**Sampling-**Ambient air is drawn through a 47 mm Teflon filter loaded in a PM<sub>10</sub> or PM<sub>2.5</sub> sampler. A minimum of 8-hour sampling at a flow rate of 20 lpm is necessary for X-ray analysis. Typically, 24 hour sampling at about 20 lpm provides sufficient sample mass on the filter for a successful analysis. The sampler must collect a homogeneous sample across the surface of the filter. The KeveX XRF instrument examines a very small cross section of the filter near the center.

**Laboratory Analysis-**A KeveX Energy Dispersive X-ray fluorescence spectrometer is used to analyze 35 elements in the filter sample. There is no need for sample preparation other than bringing the filters to room conditions. Each filter is loaded onto a sample wheel brought to a vacuum and scanned under five different instrumental conditions. Each condition is optimized for certain groups of elements. After spectral acquisition, an identification and deconvolution process extracts the net contributions of counts of each of the 35 elements.

**Speciation and Quantification-**Each element has a unique spectral pattern. After accounting for overlaps, each of the elements is identified qualitatively. By using previously calibrated standard values the net counts for each element are converted to actual concentrations in ug/filter. Using air volume data gathered during sampling, the ug/filter concentrations of the elements are converted to ug/M<sup>3</sup>.

**QA/QC-**The X-ray analytical instrument is calibrated using 35 single element standards. These calibration standards are checked using an NIST multi-element film standard. Filter blanks are analyzed for subsequent background correction during the spectral analysis of the run. Field blanks are taken at specified times depending on the frequency of sampling. Field blank results are either subtracted or reported in accordance with data reporting and analysis requirements. Finally, collocated runs are utilized to check precision.

## **APPENDIX K** Method Description for Sampling and Analysis of Organic and Elemental Carbon by Thermal/Optical Carbon Analyzer at the AQMD Laboratory

**Sampling-**Ambient air is drawn through a 47-mm quartz filter loaded in a PM10 or PM2.5 sampler. A minimum of 8 hour sampling at a flow rate of 20 lpm is necessary for carbon analysis. Typically, 24 hour sampling at about 20 lpm provides sufficient sample mass on the filter for a successful analysis. The sampler must collect a homogeneous sample across the surface of the filter. A one-centimeter diameter punch from any quadrant of the filter is used in the instrument.

**Laboratory Analysis-**A Desert Institute thermal/optical carbon analyzer is used to determine the total carbon content of aerosol deposited on quartz filters. The analyzer is able to distinguish and characterize organic and inorganic carbon if analyses are performed at different temperatures. There is no need for sample preparation other than bringing the filters to room conditions. A small circular filter area is punched out from the quartz filter and loaded on to the carrier quartz tube. The filter is pushed into an oven whose temperature is raised in steps from ambient to. An inert gas, such nitrogen is continuously passed over the filter. At the same time the surface of the filter is monitored with a laser beam to determine the exact point at which all the elemental carbon (soot) is burned off. The combusted carbon forms carbon dioxide that is carried over to a methanizer. The methanizer (active nickel with the addition of hydrogen gas) converts the carbon dioxide to methane.. The methane flows to a flame ionization detector. The detector output is integrated and converted to ug of carbon per filter using previously calibrated standards.

**Speciation and Quantification-**The light organic fraction is driven off the filter at the early stages of heating and oxidizing of the aerosol mass on the filter. The elemental carbon fraction is then oxidized at a higher temperature and with an oxygen enriched carrier gas. A laser beam constantly scanning the filter surface follows the exact point at which the organic and elemental carbon fractions are removed from the filter. The two fractions are summed to give the total carbon concentration of the sample. The analysis results in the elemental, organic, and total carbon content of the sample. Using air volume data gathered during sampling, the ugC/filter concentrations are converted to ug/M<sup>3</sup>.

**QA/QC-**The optical-thermal carbon analyzer is calibrated using two types of standards. One set consists of carbon containing gases, methane and carbon dioxide in an inert gas mixture. These are passed through the entire system to calibrate the instrument. In addition, filters impregnated with solution containing a known concentration of carbon are run as external standards. Filter blanks are analyzed for subsequent background correction during the run. Field blanks are taken at specified times depending on the frequency of sampling. Field blank results are either subtracted or reported in accordance with the data reporting and analysis requirements. Finally, collocated runs are utilized in checking precision.

## APPENDIX L QA/QC Matrix Summary

Process	Interval	Activity	Criteria	Corrective Action
	Before & After Each	QC - Note Activities in Log Book, Canister	Notes For Each Canister	N/A
		QC - Check Chart Time	± 10 Minutes of Actual PST	AQIS Resets
<b>Field Canister Sampler</b>	Annually	QC - Clean Manifold	Pass Leak Check	AM Support Repairs
		QC - Calibrate Flow	± 5 Percent True Flow	AM Operations Calibrates
	1 Day in 6	QA - Collocated Sample	10 Percent Of Network	Run A + B Make-Ups if Possible
	Annually	QA - ARB Through-the-Probe Audit	Within ± 25 Percent of True For all Compounds	Isolate & Repair, Validate Data
		QA - Flow Audit	Indicated Flow Must Be Within ± 10 Percent of True Flow	Notify Operations If Outside Limits, Delete Data
	Before & After Each	QC - Note Activities in Log Book	N/A	N/A
	Sampling Event	QC - Check Start & Stop Times & Volume	Note On Carbonyls Log Sheet	AQIS Resets Time
<b>Field Carbonyl Sampler</b>		QC - Clean Manifold	Pass Leak Check	AQIS Cleans & Tests
	Annually	QC - Calibrate Flow Controller	± 5 Percent True Flow	AM Operations Calibrates
	1 Day in 6	QA - Collocated Sample	10 Percent of Network	Run A + B Make-Ups if Possible
	Annually	QA - Through-the-Probe Audit By ARB	Within ± 25 Percent of True For All Compounds	Isolate & Repair, Validate Data
		QA - Flow Audit	Indicated Flow Must be Within ± 10 Percent of True Flow	Notify Operations if Outside Limits, Delete Data
		QC - Chain-of-custody	Log Sheet & Canister Numbers Agree	Chemist Corrects Any Errors
		QC - Propane Peak	± 10 Percent Of Previous	Chemist Adjusts Span
	Daily	QC - System Blank	< 10 ppb/C Total NMOC	Chemist Repairs/ Leak Checks
		QC - Replicate Sample	Visual Evaluation of Chromatogram	Chemist Repairs/Leak Checks
<b>Laboratory</b>	Semiannually	QC - Replicate Standard Analysis	± 10 Percent on All Compounds	Chemist Repairs
		QC - Bias Check	2 ppb/C Per Compound	Chemist Repairs/Leak Checks
	Annually	QC - LOD Check	All Loads Must Be Less Than 1 ppb/C	Chemist Repairs/Rechecks
	1 Day In 6	QA - Collocated Samples	± 25 Percent On All Compounds	Chemist Repairs
	Quarterly	QA - Parallel Sampling	All Compounds Must Be Within ± 30 Percent	
	Annually	QA - NPAP Performance Audit	Within ± 30 Percent of True For All Compounds	Chemist Repairs
		QC - Standard Response	± 10 Percent of Previous	Chemist Repairs/Adjusts Span
	Daily	QC - Purge Cycle	System Pressure Between 800 & 1700 PSIG	Chemist Leak Checks
<b>Laboratory</b>	Semiannually	QC - Multipoint Calibration	± 10 Percent Of Previous	Chemist Develops New Calibration Curve
		QC - Bias Check	<3 ppb Per Compound	Chemist Repairs
	Annually	QC - LOD Check	<1 ppb Per Compound	Chemist Repairs/Leak Checks
	Quarterly	QA - Parallel Sampling	All Compounds Must Be Within ± 30 Percent	
	Annually	QA - NPAP Performance Audit	Within ± 30 Percent of True For All Compounds	Chemist Repairs
	Before & After Each Sample	QC - Note the Maintenance Sheet, Log	Notes as Required	N/A
	Semiannually	QC - Change Motor & Multipoint	Create New Calibration Curve	N/A
		QC - Clean Inlet		
<b>Field PM<sub>10</sub> SSI</b>	Annually	QC - Timer Check	Timer Tested For Start With 20 Minutes of Setting & Elapsed	Repair or Replace
	1-Day-in- 6	QA - Collocate	Run At 10 Percent Of Sites	N/A
	Annually	QA - Flow Audit	Actual Flow Must be Within ± 10 Percent of True Flow	Request Repair; Investigate & Confirm Data Validity
		QC - Balance Checks		
<b>Laboratory PM<sub>10</sub> SSI</b>	Daily	QC - Inspect Filters	No Light Leaks or Tears	
		QC - Equilibrate Filters		
	1 Day in 6	QA - Collocate Filters	Agreement Within ± 20 Percent, all Compounds	

**Appendix M** Method Description for Sampling and Analysis of VOCs by GC/MS at  
The AQMD

DRAFT