APPENDIX III-A

Protocol
Environmental Justice Initiative Number 2
Monitoring and Laboratory Analysis

South Coast
Air Quality Management District
21865 E. Copley Drive, Diamond Bar, CA 91765-4182
(909) 396-2000 • www.aqmd.gov

PROTOCOL
ENVIRONMENTAL JUSTICE INITIATIVE NUMBER 2
MONITORING AND LABORATORY ANALYSIS

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South Coast Air Quality Management AQMD

Draft Approved for Review

Melvin D. Zeldin
Director
Applied Science & Technology

Date Approved

4/21/98

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.

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Chapter 1.0
Introduction

This protocol document provides detailed information about the procedures and processes required to effectively conduct the field measurement portion of the South Coast Air Quality Management District's (AQMD) Environmental Justice Initiative Number 2 (EJ-2). This protocol document includes both the monitoring and laboratory analysis functions for 1) Multiple Air Toxics Exposure Study II (MATES II) [1] and 2) 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.*

This hot-spot ambient monitoring program consists of MATES II and MSS elements. The objective of MATES II is 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 will create a baseline through a field monitoring program, emission inventory enhancements, air toxics modeling, and risk assessment. The AQMD intends to conduct MATES II during a one-year period at ten sampling sites in the South Coast Air Basin (Basin). Details of MATES II are delineated in the *MATES II Study Workplan*[2], approved by the AQMD Board in December 1997.

The AQMD will conduct MSS to determine if communities are experiencing localized hot spots not otherwise identified by modeling. The AQMD will also use MSS to confirm the existence of hot spot areas indicated by modeling, and to assess the localized representativeness of the monitoring. MSS sampling will be conducted at four-week intervals at selected Basin locations using three mobile sampling platforms. During a minimum eight-month period, the platforms will be employed to collect ambient toxics measurements. The proposed sampling will be conducted on a more intensive basis than the MATES II element. Details of the MSS are described in the *Microscale Study Workplan*[3], approved by the AQMD Board in December 1997.

In the MATES II and 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

[1] MATES I was run in 1987. Copies of the final report are available from the AQMD library.

[2] Applied Science & Technology. (1997). *Environmental Justice - Initiative #2, MATES II Study Draft Workplan.* Diamond Bar, CA. South Coast Air Quality Management District.

[3] Applied Science & Technology. (1997). *Environmental Justice - Initiative #2, Microscale Study Draft Workplan.* Diamond Bar, CA. South Coast Air Quality Management District.

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 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 early spring 1998 and continue for 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 both the AQMD and Air Resources Board (ARB) laboratory staff. The ARB currently operates toxics monitoring equipment at five Basin sites: Long Beach, Los Angeles, Burbank, Fontana, and Rubidoux. The AQMD services ARB equipment and will install and service toxics instruments at the Pico Rivera, Hawthorne, Anaheim, Wilmington, and Huntington Park MATES II sites and the mobile platforms. MATES II laboratory sample analysis will be coordinated between the AQMD and ARB on an alternating six-day schedule. The ARB will provide laboratory support every 12 days, while the AQMD will conduct sampling on the alternating 12-day cycle. To be successful in this approach, close agency coordination is needed.

In Figure 1.1, the organizational structure for this program is detailed. Mel Zeldin, AQMD Director of Applied Science & Technology and Bill Loscutoff, ARB Monitoring and Laboratory Division Chief, will oversee agency coordination. Mssrs. Zeldin and Loscutoff will confer at least once a month for the duration of the project. Through close coordination, corrective actions, as warranted, can be developed and implemented promptly.

Rudy Eden, AQMD Laboratory Manager, will manage AQMD operations, while Mike Poore, ARB Chief Chemist, Laboratory and Monitoring Division, will oversee equivalent ARB efforts. These individuals will be primarily responsible for the day-to-day project operations. They will liaison via weekly telephone calls to maintain project status and operational objectives.

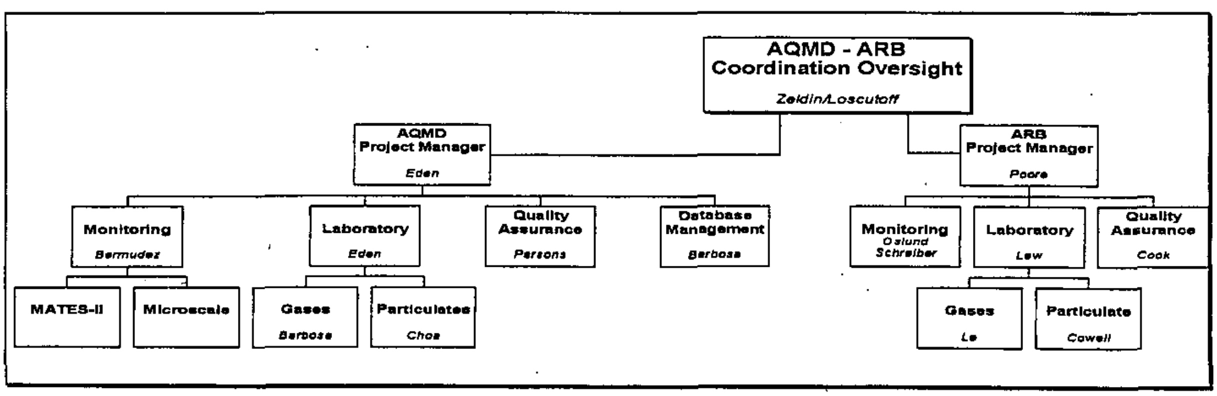

FIGURE 1-1 AQMD/ARB Coordination Oversight

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 II and MSS sites will be delineated.

Sampler Type	Vendor and Model Number
Volatile Organic Compounds (VOC)	XonTech 910A/ 912
Metal, Aldehyde	XonTech 920
Carbonyls	ATEC 800 Sequential Sampler
------------	Estherline\Angus Strip Chart Recorder
Polyurethane Foam (PUF)	Graseby-GMW PS-1
Wind, Speed, and Direction (WSD) One)	Gill Solent 2 Axis Ultrasonic Anemometer (Met-
PM_{10}	Graseby-GMW 1200 PM_{10} Sampler

The siting, acceptance testing, and calibration functions for each type of MATES II 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 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 ±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 four-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 a six-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 four-week sampling period.

2.2.3 Calibration

At each sampling site, final dynamic calibration will be performed on each analyzer prior to the start of the intensive four-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 filters. Each filter must be refrigerated during transportation and until it is used for sampling. Once the filter has been used to collect a sample, it must be refrigerated until it is returned to the AQMD. The sampled filter 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 EJ-2 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*[4].

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*[5].

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 Sample Pickup

The 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 H). 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 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. The time on the QC chart must also be checked and adjusted. This value must be within ± 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

2.3.2.1 Description

The Model 920 Toxic Air Sampler is 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

[4] XonTech, Inc. (1987). *Model 910 Toxic Air Sampler Operations Manual*. Van Nuys, CA: Author.
[5] Ibid.

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 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 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 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 MFC for flow.

2.3.2.3 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*[6].

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[6] XonTech, Inc. (1987). *Model 920 Toxic Air Sampler Operations Manual.* Van Nuys, CA: Author.

2.3.3 Estherline\Angus Strip Chart Recorder

The strip chart recorder is a device used to create a permanent, hard-copy record of the electrical signals it receives. While strip chart recorders were once used as a primary data-gathering media, with the advent of electronic data recording, chart records now primarily function as QC or backup devices. As such, the strip chart recorder is typically used to record instrument outputs. For both the MATES II and MSS sampling programs, strip chart recorders will be used to verify that the mass-flow controllers (MFC) have followed program parameters allowing canisters to be properly filled. A pressure transducer, mounted at the common sample outlet of the XonTech-910A, transmits electrical signals to the strip chart. The transducer output is sent to the station manager computer where the collected data will be graphically represented. Sample run time, proper start and stop time, and proof of integrated fill over the entire sample period may all be verified using this strip chart.

Since the strip chart (Appendix C) verifies proper fill over the sample period, calibration of the MFC is not required. However, a three-point flow calibration will be performed prior to sampling. Recheck the flow if the strip chart indicates a canister overfill situation. The criteria for an acceptable strip chart run include the following:

A) The start and stop times must be within ± 15 minutes of the correct start times. For example, the start times for the MSS are: 0000, 0300, 0600, 0900, 1200, 1500, 1800, and 2100 Pacific Standard Time (PST).

B) Each fill period must show a continuous increase in pressure during sampling and no vertical trace at the end of the period. A vertical trace would indicate an over-pressure situation.

C) The time check must be noted on the strip chart at least once per week.

2.3.4 ATEC 800 Sequential Sampler

2.3.4.1 Description

A ATEC Model 800 sequential sampling instrument will be used to perform carbonyl sampling. This 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.

2.3.4.2 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*[7]. 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.

2.3.5 Graseby-GMW PS-1

2.3.5.1 Description

The Graseby-GMW PS 1 PUF sampler is designed to sample airborne particulates and vapor contamination from pesticides compounds. This is accomplished through the use of the dual-chambered sampling module. The top chamber of the sample module collects suspended airborne particulates while the lower chamber simultaneously collects the pesticide vapors. Use of a by-pass blower motor permits continuous sampling for extended periods at rates up to 280 lpm. Flow is adjusted by altering the motor speed using the voltage variator adjusting screw. The airflow rate is measured through the flow venturi utilizing a 0 to 100-inch Magnehelic gage. A seven-day skip timer permits weekly scheduling with individual settings for each day as desired. Because sampled air is drawn through a sorbent material that may contain some interfering compounds for other analysis, PUF sampler exhaust will be exited down-wind of other samplers or manifold inlets. Operational guidelines for this sampler are detailed in *Instrument and Operation Manual, Model 1 PS-1 Puf Sampler*[8].

2.3.5.2 Module and Media Description

The dual-chambered, aluminum-sampling module contains two filtering systems in two different chambers. The upper chamber supports the airborne particulate filter media, a 102 mm quartz- or glass-fiber filter in a circular filter holder. The lower chamber encapsulates a glass cartridge that contains the

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[7] ATEC. (1996). *Models 800 and 1600 Automated Samplers Operations and Maintenance Manual.* Calabasas, CA: Author.

[8] Graseby-GMW. *Instruction and Operation Manual, Model 1 PS-1 Puf Sampler.* Village of Cleves, OH: Author.

PUF for vapor entrapment and/or granular solid sorbents such as porous macroreticular chromatography sorbents. Foam may be used separately or in combination with granular solids.

2.3.6 Gill Solent 2 Axis Ultrasonic Anemometer

2.3.6.1 Description

The Gill 2 Axle Ultrasonic Anemometer is used to measure 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 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*[9].

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

Wind Speed	Wind Direction
1. Starting Threshold 0 mph	0 degrees
2. Range 0-145 mph	0-360\540 degrees
3. Accuracy ± 5 percent rms	±4 degrees

2.3.6.2 Siting

WSD measurement, barometric pressure, relative humidity, and temperature monitoring equipment is housed in monitoring stations located in buildings or 10-foot-tall trailers. 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 trailer,

[9] Gill Instruments, Ltd. *Solent 2 Axis Ultrasonic Anemometer (Heated & Non-Heated) User Manual and Product Specification* (Doc No 1172 - 0003 - Iss3). Lymington, Hampshire, England: Author.

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.

2.3.6.3 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 trailer 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 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.

2.3.6.4 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 ± 15 and ± 5-volt DC power supply and an alternating current (AC) to DC converter. The input to the converter box comes directly from the sensors.

2.3.6.5 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 E).

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.

2.3.6.6 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.

2.3.6.7 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.

2.3.6.8 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.

2.3.7 Graseby-GMW 1200 PM_{10} Sampler

2.3.7.1 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 mm 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_{10} sampler draws air into a specially shaped inlet at a flowrate of 40, ±4, cubic feet per minute (cfm). PM_{10} particulate matter collects on an 8 X 10 inch matted quartz fiber filter surface. The concentration of PM_{10} 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_{10} 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 attached and included herein by reference. The PM_{10} sampler may be calibrated according to Appendix A, Section A.5.9 of the AQMD's *Quality Assurance Plan for Air Monitoring*[10].

[10] 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_{10} Sampler*[11].

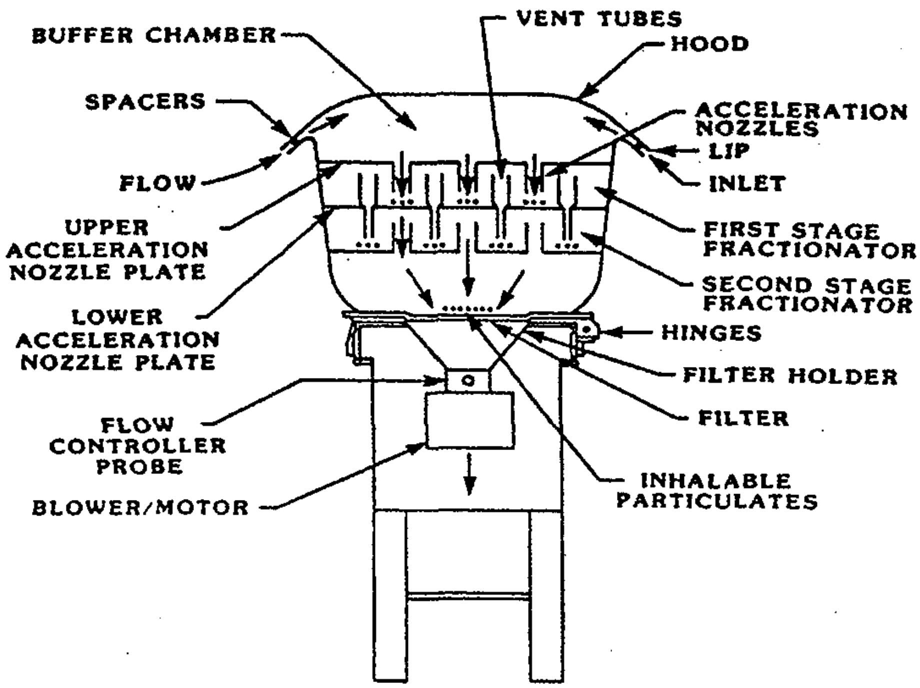

FIGURE 2-1 Graseby-GMW PM_{10} Sampler, Model 1200 with Two-Stage, SSI Head

[11] Graseby Anderson. (1988). *Instruction and Operation Manual High Volume PM_{10} Sampler.* Atlanta, GA: Author.

Chapter 3.0
Laboratory Procedures

3.1 INTRODUCTION

Laboratory monitoring of toxic air pollutants is required to confirm and qualify the modeling that is the major thrust of EJ-2. To this end, analysis will be performed, to the extent possible, according to accepted EPA and ARB analysis methods and QA practices.

Since 1994, the AQMD laboratory has implemented the EPA-sponsored PAMS program to gather data on ozone precursors. Many of the same sampling and analytical instruments currently used in the PAMS program may be used in the MATES II and Microscale efforts. Hence, many of the procedures and protocols for the MATES II program will be taken from the AQMD *Quality Assurance Plan for Air Monitoring*[12] (updated July 1997). However, MATES II also utilizes several analytical methods not performed in the PAMS program and the protocols include herein will parallel accepted ARB and EPA procedures. Where applicable, the AQMD will reproduce and follow ARB SOPs for sample collection and delivery to the laboratory.

The AQMD laboratory will rely upon air quality instrument specialists to take the field samples and deliver them to the laboratory sample custodian. The principal air quality instrument specialist will handle samples taken for ARB analysis, canisters, SSI Hi-Volumes, and Chrome VI. The laboratory sample custodian will handle logging and reshipping of AQMD/ARB shared samples to the ARB laboratory. Procedures for proper sampling and initial chain-of-custody is outlined in the AQMD *PAMS Air Monitoring Network Quality Assurance Plan*[13], Section 7E parts 1 and 2.

3.2 SAMPLE HANDLING

All sampling media will be handled according to the laboratory practice for implementation of PAMS and particulate matter network programs as applicable. Field instrument specialists will complete the sampling information and chain-of-custody forms[14], and deliver the samples to the laboratory.

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 organic compounds. The canisters are held at a 100°C temperature and are flushed a

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[12] Applied Science & Technology. (1996). *Quality Assurance Plan For Air Monitoring.* Diamond Bar, CA: South Coast Air Quality Management District.

[13] Applied Science & Technology. (1977) *PAMS Air Monitoring Network Quality Assurance Plan.* Diamond Bar, CA: South Coast Air Quality Management District.

[14] These forms consist of the Size-Selective Inlet PM_{10} Sampler Envelope (Appendix D), MATES II Sample Log (Appendix G), and VOC Canister Tag (Appendix H).

minimum of three times over a 2-hour period. One canister is randomly removed once per week and analyzed for residual 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*[15]. The sample is taken and the sample time, canister number, and start vacuum are noted on the MATES II Sample Log (Appendix G) 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 principal air quality instrument specialist will handle ARB samples. The sample custodian will distribute SSI filter samples to the laboratory personnel. Those samples requiring ARB analysis will be forwarded to ARB by the laboratory technicians under the supervision of the principal chemist.

3.3 ANALYSIS METHODS

Table 1 and Table 2 compounds (Appendices A and B) will be analyzed using ARB Monitoring and Laboratory Division approved methods identified in Table 3-1. 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*. This method is detailed in the EPA *Compendium of Methods for the Determination of Toxic Organic Compounds*[16].

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[15] Ibid.

[16] 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)

Table 3-1 ARB Analysis Methods

Method	Title	Compound
050	Cryogenic Trap/Preconcentration/Capillary GC/FID	1,3-butadiene
051	Cryogenic Trap/Preconcentration/Capillary GC/PID	Aromatics
052	Cryogenic Trap/Preconcentration/Capillary GC/PID-ECD	Halogens and Aromatics
034	X-ray Fluorescence	Elemental Composition

3.4 SAMPLING AND ANALYSIS - TABLE 1 COMPOUNDS

Table 1 compounds, consisting primarily of aromatic and halogenated hydrocarbons, will be analyzed by cryogenic freeze-out. These compounds will be detected using an electron capture detector (ECD), photoionization detector (PID), etc. A different liquid argon freeze-out technique will be used for vinyl chloride and 1,3 butadiene. This process will be followed by flame ionization detection (FID). Every effort will be made to emulate the ARB's monitoring laboratory analysis methods. It is of primary importance that the AQMD and ARB laboratories use the same detection limits. Full SOPs of the preceding analyses will follow when the instrumentation is put on line.

Carbonyl measurement will be conducted utilizing the PAMS sampling and analysis methodology delineated in the *PAMS Air Monitoring Network Quality Assurance Plan*[17]. The ARB carbonyl analysis method, that utilizes XonTech 920 for sampling, differs from the AQMD's carbonyl analysis method (Appendix I) in respect to the type of cartridge used. The AQMD will use the ARB approved Waters ^{R} silica gel cartridge impregnated with dinitrophenyl hydrazine. The AQMD will also use a potassium-iodide-coated ozone denuder in all samplers. For sampling at MATES II sites, the AQMD will follow the ARB's toxic network design method using the XonTech 920 with a carbonyl channel. 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 Teflon filters using XonTech 920 samplers and analysis by X-ray fluorescence (XRF). 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.

Elemental and organic carbon analysis will be conducted on quartz filters using SSI hi-volumes samplers and analysis by a Desert Research Institute's Thermal/Optical analyzer. A method description for sampling and analysis of organic and elemental carbon by thermal/optical carbon analyzer at the AQMD laboratory is attached as Appendix K.

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[17] Applied Science & Technology. (1977) *PAMS Air Monitoring Network Quality Assurance Plan*. Diamond Bar, CA: South Coast Air Quality Management District.

Sampling using SSI hi-volume samplers will follow prescribed methods found in the 40 CFR Part 60 for PM_{10} network operations.

The preceding discussion covers all Table 1 compounds (Appendix A) that will be sampled on a regular, one day in six sampling schedule synchronized with the national PM_{10} and TSP network schedules. The samples will be integrated over a 24-hour period. AQMD personnel will primarily conduct sampling while the AQMD and ARB will share analysis responsibilities. The logistics of splitting the sample analysis is discussed later in this section.

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 has been formed to address the problems of sampling frequency and analysis methods. The ARB Monitoring Laboratory Division will analyze several of the compounds on a reduced frequency schedule. These compounds include arsenic, cadmium, hexavalent chromium, and selected PAHs. They will be analyzed from samples taken every 12 days from the MATES II sites. 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. Antimony also occurs infrequently. This compound may be seen in the XRF analysis of elements found in the Teflon filters taken at all MATES II sites. Antimony will be reported along with Table 1 inorganics.

Table 2 VOCs (Appendix B) are difficult to measure. Ambient air methods have recently become available for some compounds such as methyl tetra butyl ether. Some Table 2 compounds will be sampled by the AQMD and analyzed by private or academic laboratories. These compounds will include, but are not be limited to dioxins, furans, and asbestos.

3.6 SAMPLING SCHEDULE

To the extent possible, MATES II sampling will be conducted on the same schedule as utilized by the air-monitoring network. Using the same sampling schedule results in several benefits:

1) Data from MATES II can be correlated with the ambient data taken on the same day.
2) Additional staff time to service and maintain MATES II 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.

Sampling will occur every day of the week during the year on a rotational schedule. The MATES II sampling schedule is identified in Table 3-2. MSS sampling shall be conducted on a different schedule than MATES II sampling. The AQMD will operate three MSS platforms. Staff will rotate one platform quarterly between the Pacoima and Hawthorne sites on a two-day-per-week basis. The other two platforms will be sited for one month at each of a variety of different locations. Sampling will occur on a three-day-per-week basis. Sampling will occur on each day of the week at one of the MSS platforms. The schedule for MSS sampling is depicted in Table 3-3.

Table 3-3 Mobile Platform Sampling Schedule

	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
MSS	M/S	MSS	M/S	MSS	M/S	MSS	---
1st Qtr	M/S	H/P	---	---	M/S	H/P	---
2nd Qtr	H/P	---	M/S	H/P	M/S	---	---
3rd Qtr	M/S	---	H/P	---	M/S	H/P	---
4th Qtr	M/S	H/P	M/S	---	H/P	---	---
Shut Down	M/S	---	---	---	---	---	---

H: Hawthorne, P: Pacoima, M/S: Maintenance and Service, MSS: Microscale Site

3.7 ARB COORDINATION

The ARB's *Air Monitoring Quality Assurance Volume II, Standard Operating Procedures for Air Quality Monitoring*[18] document describes the methods used in the ARB's long running Toxic Air Contaminant (TAC) monitoring network currently operating in five Basin sites. The AQMD presently operates several ARB TAC sites. The practice of receiving ARB canisters and filters through the AQMD mailroom will continue. The responsible principal air quality instrument specialist will ensure ARB materials are delivered to the field and returned to the ARB for analysis after sampling. Sampling will occur on a one-day-in-six regime. Each sample set will either be sent to the ARB or AQMD for laboratory analysis. Accordingly, the AQMD and ARB laboratories will receive a complete sample set every twelve days. The AQMD will analyze the PM_{10} filters for elemental and organic carbon, while the ARB will analyze their samples for

[18] California Air Resources Board. (1978). *Air Monitoring Quality Assurance Volume II, Standard Operating Procedures for Air Quality Monitoring.* Sacramento, California: Author

arsenic, cadmium, and PAHs lower in vapor pressure than benzo-a-pyrene. The AQMD and ARB data sets will not overlap except for those parallel samples taken as part of the QA/QC regime. The ARB chief chemist will coordinate directly with the AQMD laboratory senior manager.

The AQMD and ARB laboratories will sample and standardize results as a function of the QA/QC regime. The AQMD laboratory will run the TAC performance audits as supplied by the ARB's QA Branch. Collocated and parallel samples will be run. The ARB and AQMD will exchange calibration and standardization materials prior to, and during, the MATES II and MSS programs. Sampling equipment flowrates will be audited by both agencies on a selected basis. An exchange of sampled canisters will determine the comparability of the laboratories' results.

Table 3-2 1998-1999 Mates II Sampling Schedule

April - 1998
5 TSP/PM_{10}/ARB Toxics/MATES
11 TSP/PM_{10}/MATES
17 TSP/PM_{10}/ARB Toxics/MATES
23 TSP/PM_{10}/MATES
29 TSP/PM_{10}/ARB Toxics/MATES

May - 1998
5 TSP/PM_{10}/MATES
11 TSP/PM_{10}/ARB Toxics/MATES
17 TSP/PM_{10}/MATES
23 TSP/PM_{10}/ARB Toxics/MATES
29 TSP/PM_{10}/MATES

June - 1998
4 TSP/PM_{10}/ARB Toxics/MATES
10 TSP/PM_{10}/MATES
16 TSP/PM_{10}/ARB Toxics/MATES
22 TSP/PM_{10}/MATES
28 TSP/PM_{10}/ARB Toxics/MATES

July - 1998
4 TSP/PM_{10}/MATES
10 TSP/PM_{10}/ARB Toxics/MATES
16 TSP/PM_{10}/MATES
22 TSP/PM_{10}/ARB Toxics/MATES
28 TSP/PM_{10}/MATES

August - 1998
3 TSP/PM_{10}/ARB Toxics/MATES
9 TSP/PM_{10}/MATES
15 TSP/PM_{10}/ARB Toxics/MATES
21 TSP/PM_{10}/MATES
27 TSP/PM_{10}/ARB Toxics/MATES

September - 1998
2 TSP/PM_{10}/MATES
8 TSP/PM_{10}/ARB Toxics/MATES
14 TSP/PM_{10}/MATES
20 TSP/PM_{10}/ARB Toxics/MATES
26 TSP/PM_{10}/MATES

October - 1998
2 TSP/PM_{10}/ARB Toxics/MATES
8 TSP/PM_{10}/MATES
14 TSP/PM_{10}/ARB Toxics/MATES
20 TSP/PM_{10}/MATES
26 TSP/PM_{10}/ARB Toxics/MATES

November - 1998
1 TSP/PM_{10}/MATES
7 TSP/PM_{10}/ARB Toxics/MATES
13 TSP/PM_{10}/MATES
19 TSP/PM_{10}/ARB Toxics/MATES
25 TSP/PM_{10}/MATES

December - 1998
1 TSP/PM_{10}/ARB Toxics/MATES
7 TSP/PM_{10}/MATES
13 TSP/PM_{10}/ARB Toxics/MATES
19 TSP/PM_{10}/MATES
25 TSP/PM_{10}/ARB Toxics/MATES
31 TSP/PM_{10}/MATES

January- 1999
6 TSP/PM_{10}/ARB Toxics/MATES
12 TSP/PM_{10}/MATES
18 TSP/PM_{10}/ARB Toxics/MATES
24 TSP/PM_{10}/MATES
30 TSP/PM_{10}/ARB Toxics/MATES

February - 1999
5 TSP/PM_{10}/MATES
11 TSP/PM_{10}/ARB Toxics/MATES
17 TSP/PM_{10}/MATES
23 TSP/PM_{10}/ARB Toxics/MATES

March - 1999
1 TSP/PM_{10}/MATES
7 TSP/PM_{10}/ARB Toxics/MATES
13 TSP/PM_{10}/MATES
19 TSP/PM_{10}/ARB Toxics/MATES
25 TSP/PM_{10}/MATES
31 TSP/PM_{10}/ARB Toxics/MATES

April - 1999
6 TSP/PM_{10}/MATES
12 TSP/PM_{10}/ARB Toxics/MATES
18 TSP/PM_{10}/MATES
24 TSP/PM_{10}/ARB Toxics/MATES
30 TSP/PM_{10}/MATES

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 II 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 II and MSS programs will produce accurate data.

4.2 OBJECTIVES

There are three objectives of the QA/QC procedures for the MATES II 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

			CRITERIA/PARAMETER			
ASSESSMENT	MEASURES	PROCEDURE	VOCs	carbonyls	PM_{10}	PUF
Accuracy	Percent Deviation from True Value	Audits	± 25%	± 25 %	± 10%	
	95% Probability Limits		< 30%	< 30%	< 15%	
Precision	Percent Deviation from True Value	Collocation	± 25%	± 25%	< 10%	
	95%		< 30%	< 30%	< 15 %	
Completeness	Percent of Valid Data		85%	75%	95%	75%

4.3 PROCEDURES

4.3.1 Quality Assurance Procedures

Both AQMD and ARB QA staff will conduct QA Procedures. Because of the infrequency of ARB audit visits to the AQMD, it is not currently possible to determine which MSS sites will be in operation during ARB visits. The ARB will conduct annual system audits on all MATES II sampling sites including through-the-probe audits for VOCs and carbonyls. The audit procedures are described in the ARB's *Air Monitoring Quality Assurance Manual*, Volume V[19].

[19] Ibid.

The AQMD will perform annual flow audits on all PM_{10} samplers. These flow audits will be conducted according to the procedures outlined in the AQMD's *Quality Assurance Plan for Ambient Monitoring*, Appendix D. The AQMD, 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 samplers at Rubidoux for a 24-hour average. The samplers will collect VOC and PM_{10} on a one-day-in-six sampling schedule. Carbonyl sampling will be collocated at Burbank on a one-day-in-six sampling schedule. The AQMD and ARB will conduct 24-hour average parallel sampling for VOCs at Burbank on a one-day-in-six 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 ± 5 minutes PST
3) check and adjust the flow settings if they are not within ± 5 percent of the calibrated setting

B) Laboratory Daily Checks

Staff will balance the standard check 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_{10} 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 ± 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 D, G, H, and I) 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 II 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 E and F) will be completed by field instrument operators and the laboratory for PM_{10} sampler, VOC-mass gas chromatograph spectrometer, and carbonyls HPLC analyzer instrumentation used in the MATES II and MSS programs. These monthly maintenance sheets will be submitted to senior field operators or senior chemists 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 II and MSS program supervisors.

D) Equipment Relocation Notice (ERN)

ERNs are a vital element of the documentation required in the MATES II and MSS programs. Because the MSS program involves frequent relocation of fixed assets, it is the responsibility of the MATES II 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 ± 15 percent will be reported to the field supervisor. Any samples collected while flow percentage deviation from design flow exceeded ± 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 ± 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 II and MSS programs and to ensure that all staff fulfill 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

EJ 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 EJ-2, will result in more than 10,000 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 that will be developed in support of the Environmental Justice Initiative.

The AQMD Laboratory has had recent experience handling such a large data base with the PTEP conducted in 1995 and the first quarter of 1996. 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 II 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 spreadsheet, is responsible for their accurate transcription. The senior chemist is in charge of double checking the analysts' 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 II and MSS data will encompass $PM_{2.5}$ mass, VOCs, carbonyls, XRF, 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 ARB and AQMD MATES II 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 three to six months after the last day of sampling. Resources permitting, laboratory staff will migrate the Excel spreadsheets to the Access database software. The Laboratory Information Management System (LIMS) due in the laboratory by the start of monitoring for the EJ-1 will use a Microsoft Sequel database server ported over to an Access user interface. To the extent possible, the laboratory will use the new LIMS for data storage and retrieval. 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:

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

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_{10}.

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.

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
LIMS	Laboratory Information Management System
LOD	Level of Detection
lpm	liters per minute
MATES II	Multiple Air Toxics Study II
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
SCAQMD	South Coast Air Quality Management District
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