2000
ANNUAL *DATA QUALITY* REPORT

AIR RESOURCES BOARD
MONITORING AND LABORATORY DIVISION

2000

Annual *Data Quality* Report

for the

Monitoring and Laboratory Division's
and
Local Districts' Air Monitoring Networks

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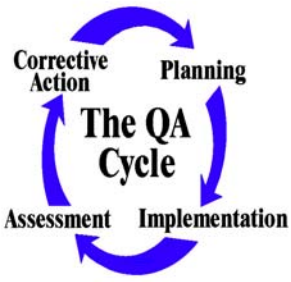
I. INTRODUCTION

The purpose of this report is to provide users of ambient air quality data with a summary of the quality of the 2000 data in quantifiable terms. This is the third edition of this document. It presents an overview of various quality assurance and quality control activities found in the previous report with several new additions. The tables used to depict the data provide a summary of the network of air monitoring sites in California. New topics for this volume include, through-the-probe carbonyl audits, special studies and site evaluations. Future documents will include reports on additional quality assessment and quality control parameters.

The ARB's mission is to promote and protect public health, welfare, and ecological resources through effective and efficient reduction of air pollutants while recognizing and considering the effects on the economy of the State. The Monitoring and Laboratory Division (MLD) provides a key element of that mission through collecting and reporting on quality information on a large number of pollutants and for a vast air monitoring network. The MLD, directed by State law, conducts ambient air monitoring in support of ARB divisions, local air pollution control and air quality management districts, and the United States Environmental Protection Agency (U.S. EPA). Monitoring programs include gaseous pollutants, particulate matter, toxic air contaminants, non-methane hydrocarbons, pesticides, consumer products, meteorological parameters, and visibility. Data from these monitoring sources provide the means to determine the nature of the pollution problem and assess how well control programs are working. The Division mission includes supporting the regulatory and assessment programs of the Board.

It is the goal of MLD to provide accurate, relevant, and timely measurements of air pollutants and their precursors to support California's Air Quality Management Program for the protection of public health. The Quality Assurance Section (QAS) conducts various quality assurance activities to ensure that data collected comply with procedures and regulations set forth by the U.S. EPA and can be considered good quality data and data-for-record.



What is quality assurance? Quality assurance is an integrated system of management activities that involves planning, implementing, assessing, and assuring data quality through a process, item, or service that meets users needs for quality, completeness, representativeness and usefulness. Known data quality enables users to make judgements about compliance with air quality standards, air quality trends and health effects based on sound data with a known level of confidence. The objective of quality assurance is to provide accurate and precise data, minimize data loss due to malfunctions, and to assess the validity of the air monitoring data to provide representative and comparable data of known precision and accuracy.

Quality assurance is composed of two activities: quality control and quality assessment. *Quality control* is composed of a set of internal tasks performed routinely at the instrument level that ensures accurate and precise measured ambient air quality data.

Q*uality control* tasks address sample collection, handling, analysis, and reporting. Examples include calibrations, routine service checks, chain-of-custody documentation, duplicate analyses, development and maintenance of standard operating procedures, and routine preparation of quality control reports.

Quality assessment is a set of external, quantitative tasks that provide certainty that the quality control system is satisfactory and that the stated quantitative programatic objectives for air quality data are indeed met. These external tasks are performed by staff independent of data generators. Tasks include conducting regular performance audits, on-site system audits, interlaboratory comparisons, and periodic evaluations of internal quality control data. Table 1 illustrates the types of performance audits currently performed by the ARB for each air monitoring program. Field and laboratory performance audits are the most common. System audits are performed on an as-need basis or by request. Whole air sample comparisons are conducted for the non-methane hydrocarbon program and the toxic air contaminants program.

***Table 1*. Audits Performed for Each Air Monitoring Program in 2000**

Air Monitoring Program	Field Performance Audit	Laboratory Performance Audit	System Audit	Whole Air Audit
Gaseous Pollutants	X	X	FUTURE	
Particulate Matter	X	X	X	
Toxic Air Contaminants	X	X		X
Non-Methane Hydrocarbons	X	X	FUTURE	X
Pesticides	X			
Consumer Products		X		
Meteorology	X			

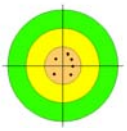
II. QUALITY CONTROL AND QUALITY ASSESSMENT

The Quality Assurance Section (QAS) supports all ambient monitoring programs undertaken by the Division, including gaseous criteria pollutants, particulate pollutants, toxic air contaminants, non-methane hydrocarbons, pesticides, consumer products, and meteorology, which are run by the ARB and local and private air monitoring agencies. There are approximately 230 air monitoring sites in 14 separate air basins operating in California.

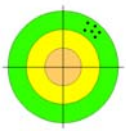
Appendix A provides information about the air monitoring network (i.e., sampling schedules, number of instruments, collection/analysis method, etc.). The information in Appendix A is also available at the following Internet site under Air Monitoring Activities at http://www.arb.ca.gov/aaqm/qmosqual/qmosqual.htm.

Information about each air monitoring station audited by the ARB is available at http://www.arb.ca.gov/aqdas/siteinfo.htm. This web site is new and includes maps of each site, latitude and longitude coordinates as determined by GPS, site photos, precision and accuracy data, and a detailed survey of the physical parameters and conditions at each site. The site surveys list in-depth monitoring information such as traffic descriptions, calibration dates, distances to trees and obstacles, and residence

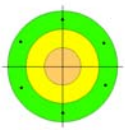
times. This site also includes an area for district precision and accuracy reports. These reports are available on a limited basis to district staff.



Good
Precision and Accuracy



Precision Good :
Accuracv Poor



Accuracy Good :
Precision Poor

The air quality monitors collect data in both real-time and on a time integrated basis. The data are used to define the nature, extent, and trends of air quality in the State; to support programs required by State and federal laws; and to track progress in attaining air quality standards. The precision and accuracy necessary depends on how the data will be used. The illustration to the right shows the relationship between precision and accuracy. Data that must meet specific requirements (i.e., criteria pollutants) are referred to as controlled data sets. Criteria for the accuracy, precision, completeness, and sensitivity of the measurement in controlled data sets must be met and documented.

Air Quality Data Actions (AQDAs) are a key tool used by the QAS to confirm the data set meets the established limits. They are initiated upon a failed audit and resolved after a review of calibrations, precision checks, and audit results. The AQDA must confirm that an analyzer/sampler has operated within ARB's control limits of +/-15 percent (+/-10 percent for PM10 and +/-5% for PM2.5), or for siting or temperature conditions otherwise, further action is taken.

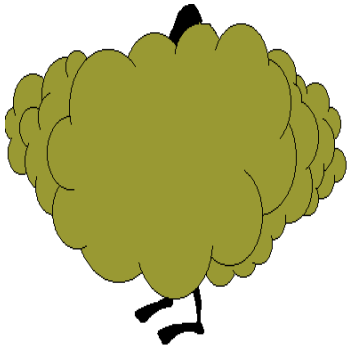
Data without formal data quality objectives (i.e., toxics) are called *descriptive data sets*. The data quality measurements are made as accurately as possible in consideration of how the data are being used. Quantified quality assessment results describe the measurement variability in standard terminology, but no effort is made to confine the data set to values within a predetermined quality limit.

The ARB's Quality Assurance Program is outlined in a six-volume *Quality Assurance Manual*. The volumes, listed below, guide the operation of the quality assurance programs used by the ARB, local districts, and private industry in California.

Volume I	Quality Assurance Plan
Volume II	Standard Operating Procedures for Air Quality Monitoring
Volume III	Laboratory Methods and Operations
Volume IV	Air Quality Data Processing (Not Available)
Volume V	Audit Procedures Manual
Volume VI	Standard Operating Procedures for Stationary Source Emission Monitoring and Testing

Volumes I, II, III, and V, and parts of VI are available on the Internet at http://www.arb.ca.gov/aaqm/qmosqual/qamanual/qamanual.htm. Volume I lists the data quality objectives and describes quality control and quality assessment activities used to ensure that the data quality objectives are met.

A. Gaseous Pollutants



Ambient concentrations of carbon monoxide (CO), nitrogen dioxide (NO2), ozone (O3), sulfur dioxide (SO2), and hydrogen sulfide (H2S) are continuously monitored by an automated network of stations run by MLD and the districts. Exposure to these pollutants cause adverse health effects which include respiratory impairment, fatigue, permanent lung damage, and increased susceptibility to infection in the general population. Non-criteria pollutants such as methane (CH4) and total hydrocarbons (THC) are also monitored continuously as precursors for criteria pollutants to help ensure the ambient air quality standards are met. Gaseous criteria pollutant data, including non-criteria pollutants CH4 and THC, are a controlled data set and are subject to meeting mandatory regulations.

Accuracy (field): Annually, the QAS conducts field through-the-probe (TTP) performance audits for gaseous pollutants to verify the system accuracy of the automated methods and to ensure the integrity of the sampling system.

Accuracy is represented as an average percent difference. The average percent difference is the combined differences from the certified value of all the individual audit points. The upper and lower probability limits represent the expected accuracy of 95 percent of all the single analyzer's individual percent differences for all audit test levels at a single site. Audit results were not used in statistical analysis if the audit was deleted due to an AQDA that resulted in data deletion.

Overall, the responses of the individual analyzers indicate that as a whole, the network is providing accurate data. Eighty-five percent of the instruments in 2000 were found to be operating within the ARB's control limits. The most common causes for audit failure are malfunctions within the instrument and leaks in the sampling system. The instruments operating outside of the control limits resulted in 930 days of deleted data and 130 days of corrected data. Tables A1 and A2 summarize the 2000 performance audit results for the criteria and non-criteria pollutants. In 2000, fewer non-criteria pollutant analyzers were audited due to a shift in the type of instrument used for monitoring (i.e. Bendix to TECO 55). The emphasis was placed on real-time hydrocarbon analysis, thus THC and CH4 were not being reported.

Further information about the air monitoring systems and the audit procedures are available at http://www.arb.ca.gov/aaqm/qmosqual/sysaudit/criteria/qa_gas.htm.

Table A1. **2000 Results for Criteria Pollutants Performance Audits Conducted by ARB**

Pollutant	Number of Analyzers Audited	Number of AQDAs	Average % Difference	Probability Limits 95%UL	95%LL
CO	71	10	0.1	7.3	-7.1
NO2	84	13	-1.3	7.6	-10.2
O3	144	20	-1.8	4.9	-8.5
SO2	26	5	0.7	12.6	-11.2
H2S	9	2	2.1	12.9	-8.7

Source: Quality Assurance Section, Accuracy Estimates

Table A2. **2000 Results for Non-Criteria Pollutants Performance Audits Conducted by ARB**

Pollutant	Number of Analyzers Audited	Number of AQDAs	Average % Difference	Probability Limits 95%UL	95%LL
CH4	3	0	-2.7	-0.1	-5.3
THC	3	0	0.2	7.5	-7.1

Source: Quality Assurance Section, Accuracy Estimates

MLD also participates in the U.S. EPA's National Performance Audit Program (NPAP). The results of the NPAP audits, available upon request, are calculated and compiled by the U.S. EPA. The audits differ from our TTP audits in that the gas is introduced at the back of the instrument instead of the probe.

Precision (field): Precision checks are performed by site operators on a nightly basis to confirm the linear response of the instrument. The zero precision check confirms the instrument's ability to maintain a stable reading. The span precision check confirms the instrument's ability to respond to a known concentration of gas.

Annually, the QAS conducts a precision data analysis as an overall indicator of data quality. The analysis addresses three parameters: precision data submission, precision data validity, and a combination of the two referred to as data usability rates. The precision performance goal for all three parameters is 85%. The submission rate is the number of precision points submitted for a pollutant divided by the expected number of bi-weekly submissions. Data validity is the percent difference of the actual and indicated values of each precision check. These differences should not exceed $\pm$15% for gaseous analyzers. Usable data rates are determined by multiplying the data submission and data validity rates; and indicate the completeness of verifiable air quality data on the official database. Overall, the precision data submitted met the design criteria; however, because of low submission rates, the 85% performance goal for usable data rates were not met. Table A3 shows the Statewide submission, validity, and usable data rates for each pollutant. For a more detailed description of the usability data rates for each District, please refer to Appendix B.

Table A3. **2000 Criteria Pollutants Precision Analysis Results for California**

Pollutant	Submission Rate	Validity Rate	Usable Rate
CO	71%	99%	71%
NO2	66%	99%	66%
O3	64%	93%	59%
SO2	83%	99%	82%
H2S	33%	100%	33%

Source: Quality Assurance Section, Precision Data Analysis

B. Particulate Matter

Particulate Sampler

Particulate matter monitoring is conducted using both manual and continuous type samplers. Manual samplers are operated on a six-day sampling schedule for PM10, and a similar, or more frequent schedule, for PM2.5. ARB's particulate program also includes total suspended particulates (TSP) sulfate and lead (Pb). Respirable particulate matter (PM10) and fine particulate matter (PM2.5) increase the chance of respiratory disease, lung damage, cancer, and premature death. Particulate matter is a controlled data set and as such is subject to formal data quality objectives and federal and State regulations. Visit the Particulate Matter Monitoring home page for more information at http://www.arb.ca.gov/aaqm/partic.htm.

Accuracy (field): The accuracy of particulate samplers is determined using a certified variable orifice (PM10 and TSP), or a calibrated mass flow meter (dichotomous, TEOM, BAM, and PM2.5 samplers) that is certified against a NIST-traceable flow device or calibrator. Since accurate measurement of particulate matter is dependent upon flow rate, the ARB conducts annual flow audits at each site. The average percent difference between the sampler flow rates and the audit flow rates represents the combined differences from the certified value of all the individual audit points for each sampler. The upper and lower probability limits represent the expected flow rate accuracy for 95 percent of all the single analyzer's individual percent differences for all audit test levels at a single site. Audit results were not used in the statistical analysis shown here if the audit was deleted due to an AQDA that resulted in data deletion.

Overall, the flow audit results indicate that the network is providing accurate flow rate data. Ninety-three percent of the instruments audited operated within the ARB's control limits. Instruments operating outside the control limits typically had an improper set-point of the mass flow controller or drift that was not discovered. Under normal operation, the set-point of the mass flow controller should compensate for a change in temperature and pressure. A total of 1167 days of data were deleted and 6 days of data were corrected in 2000 due to instruments operating outside of ARB's control limits. The 2000 performance audit results are listed below in Table B1.

***Table B1*. 2000 Results for Particulate Sampler Performance Audits Conducted by ARB**

Pollutant	Number of Samplers Audited	Number of AQDAs	Average % Difference	Probability Limits 95%UL	95%LL
PM2.5	86	16	-1.4	2.2	-5.0
PM10	150	1	-0.1	5.2	-5.4
PM10 Partisol	11	0	-0.6	2.6	-3.8
Dichotomous	11	1	-0.6	8.7	-9.9
TEOM	31	3	-1.2	3.5	-5.9
BAM	1	0	0.6	0.6	0.6
TSP	19	0	-2.3	3.6	-8.2
Pb	2	0	-3.7	4.6	-12.0

Source: Quality Assurance Section, Accuracy Estimates

Precision (field): Precision data for non-continuous particulate samplers is obtained by collocated sampling, the simultaneous operation of two identical samplers placed side-by-side whose filters are analyzed by the same laboratory. In 2000, collocated high-volume SSI samplers were operated at Bakersfield and Visalia and collocated dichotomous samplers at Bakersfield and Fresno. Collocated samplers are located at selected sites and are intended to represent the network precision on the whole. Data validity is based on the percent difference of the mass concentrations of the two samplers.

Particulate samplers, collocated PM10, dichotomous, and TSP samplers must have mass concentrations greater than or equal to 20µg/m^3 to be used in data validity calculations. The difference between the mass concentrations must be no greater than 5µg/m^3. If the mass concentrations are greater than 80µg/m^3, the difference must be within $\pm$7% of each other. For Pb samplers, both mass concentrations must be greater than or equal to 0.15µg/m^3 to be used in data validity calculations. For collocated PM2.5 samplers, data validity is based upon the sample's coefficient of variation, which cannot exceed 10%. Both sample masses must also be greater than 6µg/m^3 to be considered a valid sample in data validity rate calculations.

Continuous TEOM and BAM precision is based on the comparison of the sampler's/analyzer's indicated and actual flow rates. The differences between the flow rates must be within +/-15% of each other. Overall, the precision data that were submitted met the data validity rate performance goal of 85%. Although TSP met the submission rate performance goal, none of the pollutants met the usable data rate performance goal. The particulate sampler precision analysis results for 2000 are available in Table B2. For a more detailed description of the usability data rates for each District, please refer to Appendix B.

Table B2. **2000 Particulate Sampler Precision Analysis Results for California**

Pollutant	Submission Rate	Validity Rate	Usable Rate
PM2.5	Systemic input problem-analysis unable to be done		
PM10	69	66	46
PM10 Partisol	Systemic input problem-analysis unable to be done		
Dichotomous	64	73	46
TEOM	14	68	9
BAM	0	NA	0
TSP	85	67	57
Pb	36	31	11

Source: Quality Assurance Section, Precision Data Analysis

Accuracy (lab): Performance audits for PM10 mass analysis programs include an on-site check and assessment of the PM10 filter weighing balance, relative humidity and temperature sensors, and their documentation. The performance audits conducted in 2000 found that of the 11 District programs audited, all were operating in accordance with U.S. EPA guidelines, and that the data were of good quality and should be considered data-for-record. Table B3 summarizes the performance audit findings.

Table B3. **2000 PM10 Particulate Matter Mass Analysis Performance Audits**

District	Conducted	Pass/Fail
California Air Resources Board	05/11/00	Pass
Great Basin	01/17/00	Pass
Mojave Desert AQMD	12/28/00	Pass
North Coast Unified AQMD	06/12/00	Pass
No. Sierra AQMD	05/18/00	Pass
No. Sonoma Co. APCD	04/20/00	Pass
Placer Co. APCD	02/07/00	Pass
Sacramento Metropolitan AQMD	12/06/00	Pass
San Luis Obispo APCD	05/24/00	Pass
Santa Barbara Co. APCD	07/26/00	Pass
Siskiyou Co. APCD	06/13/00	Pass
Ventura Co. APCD	05/01/00	Pass

Laboratory audits for PM2.5 mass analysis programs include an annual on-site check and review of a monitoring organization's entire program. The total measurement system is reviewed annually (sample collection, sample analysis, data processing, etc.). The audits include a review of staff qualifications, procedures, facilities, and documentation to assure compliance with federal air quality monitoring, quality assurance, and data reporting regulations. Laboratories supporting the PM2.5 mass analysis program must first complete a pre-certification process that includes a questionnaire, an on-site visit, and a performance audit of the laboratory's microbalance

and relative humidity (RH) and temperature sensors. Pre-certification standards must be met before the laboratory is able to submit PM2.5 data to the U.S. EPA's Aerometric Information Retrieval System (AIRS)-Air Quality Subsystem (AQS). All laboratories met the pre-certification conditions. Full system audits were initiated thereafter. Two PM2.5 system audits were conducted in 2000. The system audit findings concluded that the Great Basin Unified Air Quality Management District, and the Mojave Desert Air Quality Management District's PM2.5 mass analysis program satisfied the U.S. EPA regulations, and that the data were of good quality and should be considered data-for-record.

Laboratory audits are also conducted using NIST-traceable filter standards for nitrate (NO3-), sulfate ($SO4^{-2}$), chloride (Cl-), ammonium (NH4+), and potassium (K+). The Northern Laboratory Branch was not asked to participate in the PM10 ions laboratory performance audits for 2000 due to resource constraints. The ions laboratory audit; however, were conducted in the 1st and 3rd quarters of 2001.

MLD also participates in the field and laboratory NPAP programs for PM10 and dichotomous. The U.S. EPA compiles the NPAP audit results. The results are available upon request from the U.S. EPA. The federal audit program covers only a portion of the PM10 network sites in California. The ARB audit results; however, are compared to the NPAP results to understand and improve the audit program.

Precision (lab): Laboratories perform various quality control tasks to ensure that quality data are produced. Tasks include duplicate weighings on exposed and unexposed filters, replicate analysis on every 10th filter, and a calibration of the balance before each weighing session. Filters are also visually inspected for pinholes, loose material, poor workmanship, discoloration, non-uniformity, and irregularities, and are equilibrated in a controlled environment for a minimum of 24 hours prior to pre- and post-sample weighing. Weighings must also be conducted in a controlled environment. If room conditions are not within the established U.S. EPA control limits, no weighings are done until 24 hours after the proper environment is re-established.

In 2000, there were no occurrences in which ARB's laboratory's balance room was outside of control limits. The analytical precision results indicate that ARB is providing precise particulate matter data. Tables B4 and B5 show the unexposed and exposed filter replicate results for ARB's laboratory in 2000.

***Table B4*. 2000 Summary of ARB's Unexposed Filter Mass Replicates**

QC Check	PM2.5	PM10	Dichotomous	TSP
# of pre-weighed filters	3552	5591	1220	880
# of replicates analyses	395	691	124	110
% replicates weighing conducted	89%	88%	90%	88%
# of replicates out of range	0	0	0	0

Source: Inorganics Laboratory Section, Quality Control Report

Table B5. **2000 Summary of ARB's Exposed Filter Mass Replicates**

QC Check	PM2.5	PM10	Dichotomous	TSP
# of pre-weighed filters	3983	4793	1350	850
# of replicates analyses	431	530	147	95
% replicates weighing conducted	89%	89%	89%	89%
# of replicates out of range	0	0	0	0

Source: Inorganics Laboratory Section, Quality Control Report

C. Toxic Air Contaminants

The ARB established an ambient volatile organic compound (VOC) toxic monitoring network in major urban areas of the state in 1985 to determine the average annual concentrations of toxic air contaminants. The recently enacted State law required that the ARB confirm the presence of compounds in the ambient air that were candidates as Toxic Air Contaminants. Under the current sampling schedule, ambient air is collected at each of the 18 sampling stations in a stainless steel canister every 12 days for a 24-hour period. The samples are analyzed by the Northern Laboratory Branch. Toxic air contaminants include aromatic, halocarbon semi volatiles, and oxygenated compounds.

Stainless Steel Toxics Canister

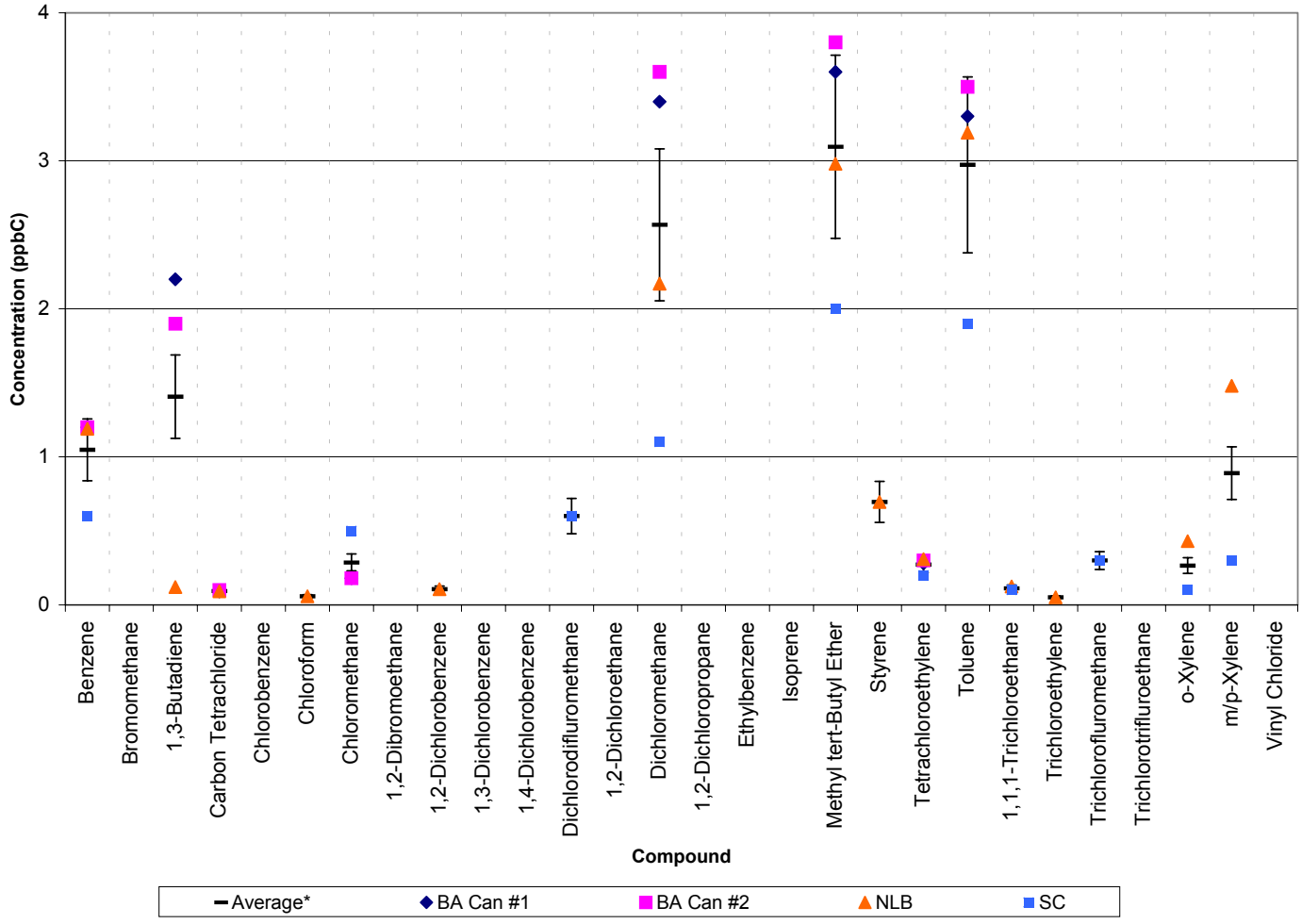
Toxic particulate samples are also collected and analyzed for toxic air contaminants to support the California Toxic Air Contaminant Identification and Control program. By using a low-flow, multi-channel sampler, capable of sampling onto filters or cartridges, ambient air is collected and analyzed for carbonyl and polycyclic aromatic hydrocarbons (PAH) compounds and toxic metals. The quality of the air toxic data set is governed by a series of quality assurance activities, including audits. However, because this is a descriptive data set, no mandatory corrections are made to the data based on audit results. The laboratory and monitoring staff are made aware of any exceedance found during and audit, and every effort is made to ensure that the data collected is as accurate as possible.

The audit programs contained two elements in 2000: laboratory audits and a whole air comparison check. The audit results are available on the Internet at the following address: http://www.arb.ca.gov/aaqm/toxics.htm, including several papers that discuss these elements of the QA program in detail.

Accuracy (field): TTP performance audits are typically conducted for volatile organic compounds annually at each air toxic site to assess the accuracy of the total measurement system. System errors can include contamination during transport, artifacts created by the sample pump or the probe, and laboratory bias. These audits were suspended for calendar year 2000 due to budget cuts. However, a whole air comparison check was conducted to compare the analytical methods used by all the laboratories that measure ambient concentrations of toxic compounds. This was the

first time the check was performed for toxic air contaminants. The purpose of this comparison check is to confirm the comparability of the analytical methods currently used by those laboratories measuring ambient concentrations of gaseous toxic compounds. A specially designed sampler draws ambient air for 3 hours, filling up to 10 canisters at a time, to an approximate pressure of 14 pounds per square inch gauge (psig) each. A canister is sent to each laboratory for analysis. The laboratories follow their standard operating procedures in assaying the contents and report their results to the QAS, who in turn, compare the results to the other participating laboratories. As can be seen below in Figure C1, the three participating laboratory's responses compared well for most compounds. If a laboratory's response for a compound was significantly different from the other laboratories, the laboratory was asked to investigate the cause.

***Figure C1*. 2000 Whole Air Comparison Check for Toxic Air Contaminants**



Flow audits of the toxic metal and carbonyl sampler (shown right) are conducted annually at each site to ensure the accuracy of measuring toxic metals and carbonyl compounds. Flow rates are a determining factor in calculating concentration and are included as part of the quality assurance program.

Toxic metals and carbonyl sampler

Overall, the 2000 results indicate that the samplers maintained stable flows. Ninety-eight percent of the instruments audited operated within the ARB's control limits of +/-15% from true. Although a descriptive data set, AQDAs are issued based on the operating parameters of the sampler. Corrections are made to the data if an audit is found to be outside ARB's control limits. An AQDA was issued for the pollutant Cr6+, which resulted in 31 days of data to be corrected.

Table C1 shows the differences from the certified value of the individual audit points for each pollutant. The upper and lower probability limits represent the expected accuracy of 95 percent of all the single analyzer's individual percent differences for all audit test levels at a single site. Audit results were not used in the statistical analysis shown here if the audit was deleted due to an AQDA.

***Table C1*. 2000 Results for Toxic Air Sampler Flow Rate Performance Audits Conducted by ARB**

Pollutant	Number of Samplers Audited	Number of AQDAs	Average % Difference	Probability Limits 95%UL	95%LL
Cr6+	17	1	-1.1	7.1	-9.3
Total Metals	17	0	-0.6	5.6	-6.8
Aldehydes	16	0	0.1	11.6	-11.4

Source: Quality Assurance Section, *Accuracy Estimates*

Accuracy (lab): Laboratory performance audits were conducted semi-annually to determine the accuracy of a laboratory's ability to measure ambient VOC concentrations. However, in calendar year 2000, laboratory performance audits were conducted quarterly to assist the South Coast Air Quality Management District to troubleshoot potential problems with their analytical methods. In addition, the ARB's laboratory continued to show a significantly low response for methyl chloroform. ARB's laboratory was asked to investigate the potential cause of the low response and found that the primary gas chromatograph system was malfunctioning. The system has since been refurbished. The 2000 audit results are shown in Table C3. The percent difference presented in the table represents the average difference between the laboratory's observed level from the NIST certified value for all four audits conducted.

In addition, the laboratory analyzes for ambient arsenic, cadmium and lead in support of California's Toxic Air Contaminant Identification and Control Program. This program

begun in 1983 and is designed to identify and then control chemical, physical or biological agents that are found in ambient air and that interfere with life processes. To ensure accurate identification of these compounds, a toxic metals laboratory performance audit is conducted biannually. The results, shown on Table C4, indicate that the laboratory is accurately identifying arsenic, cadmium and lead.

***Table C3*. ARB's 2000 Toxic Air Contaminants Laboratory Performance Audit Results**

Compound	Laboratory	
	% Diff	Std Dev
Benzene	-1.8	0.8
Carbon Tetrachloride	-1.8	3.1
Chloroform	0.0	12.0
ortho-Dichlorobenzene	-10.5	14.0
Ethylbenzene	-8.6	16.7
Methyl Chloroform	-9.4	11.6
Methylene Chloride	-7.8	6.4
Perchloroethylene	8.9	10.2
Toluene	-5.2	6.1
Trichloroethylene	-0.8	5.1
m/p-Xylene	-6.9	15.4
o-Xylene	-21.2	12.8

***Table C4*. ARB's 2000 Toxic Metals Laboratory Performance Audit Results**

Pollutant	Average % Difference
Arsenic	6.6
Cadmium	-2.7
Lead	3.4

Precision (lab): A variety of tasks are performed to ensure the precision of toxic air contaminants data. To assess the analytical precision for method MLD057-butadiene and benzene, system blanks and duplicate analyses are performed. System blanks consisting of nitrogen compressed gas serve as an instrument check before sample analysis. For 2000, all blank samples performed were below the butadiene and benzene detection limits. Duplicate analyses were performed on 10% of the samples analyzed by method MLD057. The maximum allowable percent difference for the duplicates is 15%. Duplicate data not meeting the criterion are deleted from the database. All samples analyzed on the same day in which duplicate analyses exceed the criteria limit are also deleted from the database. Affected samples are re-analyzed. In 2000, the calculated percent differences of all duplicate samples whose concentrations were greater than five times the published LODs, were below the maximum allowable value of 15%.

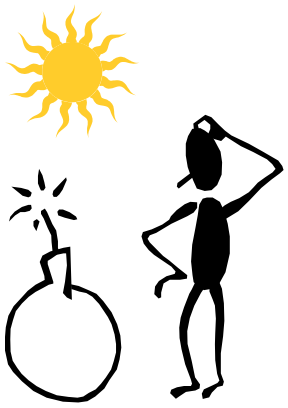
System blanks and duplicate analyses are also performed for method MLD050-MTBE to ensure analytical precision. In 2000, all system blanks were below the Methyl Tertiary-Butyl Ether (MTBE) detection limit of 0.3 ppb. Duplicate analyses were performed on 10% of the samples analyzed by method MLD050. The maximum allowable percent difference for the duplicates is 15%. Duplicate data not meeting the criterion are deleted from the database. All samples analyzed on the same day in which duplicate analyses exceed the criteria limit are also deleted from the database. Affected samples are re-analyzed. All duplicate data for 2000 were below the maximum allowable value of 15%.

In 2000, method MLD057 had no departures from the current SOP. A fifth standard level was added to the daily calibration of method MLD050. In addition, calculation of the LOD was reevaluated and revised for method MLD050.

Stainless steel canisters used to collect ambient air samples are also checked for contamination. One canister per batch of eight was assayed to ensure values were below the limit of detection. Canisters are analyzed for aromatic and halogenated hydrocarbons. In 2000, a total of 94 were analyzed for contamination. Of those, 1 failed the cleanliness check. All canisters represented in the batch of a failed check were re-cleaned until they met the cleanliness criteria. In addition, Xontech 910A air samplers were also checked for cleanliness. In 2000, only three air sampler cleanliness checks failed, however Xontech 910A cleanliness checks are not associated with a batch of canisters. Failed air samplers are re-cleaned and re-tested until they pass. Overall, the network is providing precise toxic air contaminants data. Due to the amount of precision data available, only a portion of the precision data is presented.

D. Non-Methane Hydrocarbons

Photochemical Assessment Monitoring Stations



In 1989, ARB began a routine seasonal sampling program to gather information about non-methane hydrocarbon (NMHC) species such as ethane and propane, in high ozone areas. Federal regulations require states to establish photochemical assessment monitoring stations (PAMS) as part of their State Implementation Plan monitoring networks in areas designated as serious or higher for ozone. Monitoring is to continue until the ozone standard is reached. PAMS sites collect data on ozone, oxides of nitrogen, real-time total NMHC, speciated hydrocarbons, carbonyls, and various ground level and aloft meteorological parameters. This is a descriptive data set. There are currently no mandatory data quality objectives or regulations for the data; however, much effort is expended to ensure that accurate data are collected and the analyzers are operating within ARB's audit standards of +/-20%. The errors in this data set are simply described here and on the ARB's Internet sites.

Accuracy (field): Performance audits have been incorporated into the PAMS program, however, due to limited resources in the 2000 PAMS season, fewer TTP audits were conducted for TTP samplers and TTP continuous analyzers. Three types of hydrocarbon performance audits are conducted (laboratory, TTP sampler, and TTP continuous analyzer) that support the canister-type collection system and the real-time analyzers. A cross-check is also run by the QA staff that allows all laboratories to compare their results from a *whole air sample* representing an identical parcel of air. The whole air sample element of the QA program was added after the 1997 South Coast Ozone Study and uses a system developed by QA staff. Staff presented a paper on the program at the 2000 International Symposium on the Measurement of Toxic and Related Air Pollutants. A copy of the paper as well as other information about the PAMS QA program is available on the Internet at the following address: http://www.arb.ca.gov/aaqm/qmosqual/perfaudit/nmhc/qa_nmhc.htm.

Laboratory performance audits are conducted annually to assess the participating laboratory's ability to measure ambient levels of hydrocarbons. *TTP Sampler* performance audits are conducted annually at each monitoring site to assess the integrity of the sampling, analysis, and transport system. In addition, blank samples are periodically collected to check for contamination. The 2000 blank samples collected indicated potential contamination of propene, propane, 2-methylpropane, butane, and 1-pentene. The QAS investigated the cause and determined the audit zero air to be the source of contamination. The compounds effected by the zero air were not included in the audit results. The QAS is currently working with the manufacturer and staff from the Operations Support Section to determine appropriate corrective action.

The average percent difference represents the combined differences from the certified value for all the sites and laboratories audited. Based on the results, the PAMS network is performing well. Individual laboratory audit results were also provided to them. The continued variability in the responses for ethane is caused by one laboratory. Also, several laboratories' reported higher values than the certified value for 3-methylhexane. The laboratories exceeding the U.S. EPA's ±20% control limits were asked to investigate the deviation. As would be expected, the TTP Sampler audits have greater bias than the laboratory audits. The 2000 *Laboratory* and *TTP Sampler* audit results are shown in Table D1.

Table D1. **2000 TTP Sampler and Laboratory NMHC Audit Results for California's PAMS Network**

	TTP			Laboratory	
Compound	Avg % Diff	Std Dev	Compound	Avg %Diff	Std Dev
Ethane	-1.9	14.0	Ethane	-6.2	23.2
Ethene	-7.7	15.6	Propane	-2.4	3.2
Butene	-13.6	18.8	Propene	-1.2	2.5
Pentane	0.7	18.2	2-Methylpropane	-1.6	3.0
2-Methylpentane	-2.1	14.7	Butane	-0.9	2.0
Hexane	4.2	24.7	2-Methylpropene	-8.3	-9.5
Benzene	-3.6	16.4	2-Methylbutane	1.9	4.2
3-Methylhexane	16.4	18.6	Pentane	2.9	3.0
2,2,4-Trimethylpentane	-2.6	16.8	1-Pentene	-0.3	3.1
Methylcyclohexane	2.0	14.1	Hexane	0.1	4.4
Toluene	-0.6	13.4	Benzene	-0.3	2.0
Octane	1.6	17.2	Octane	0.6	6.3
Ethylbenzene	-8.6	14.3	Toluene	-4.1	3.7
p-Xylene	-9.5	13.3	o-Xylene	-3.5	6.5
o-Xylene	-6.2	14.2	Decane	-4.3	7.5
Decane	-10.2	26.4			
3-Methylheptane	-4.8	16.3			
n-Propylbenzene	-11.0	16.1			
1,2,3-Trimethylbenzene	-22.9	17.4			

The *Whole Air Sampler* performance checks complement the TTP and laboratory audits and involve all the laboratories that measure ambient concentrations of hydrocarbons. A specially designed sampler draws ambient air for 3 hours, filling up to 10 canisters at a time, to an approximate pressure of 14 pounds per square inch gauge (psig) each. This replicates a normal sample duration and pressure. A canister is sent to each participating laboratory for speciated NMHC analysis. The laboratories follow their standard operating procedures in assaying the contents and report their results to the QAS. As can be seen below in Figure D1, the laboratory responses compared well for most compounds. If a laboratory's response for a compound was significantly different from the other laboratories, the laboratory was asked to investigate the cause. The results for ethane, which were of concern in the TTP audits, were relatively good with very little variation in the whole air sample. The QAS plans to track this anomaly to determine the difference between the two audits. The whole air comparison check results are available to view on the Internet at the following address: http://www.arb.ca.gov/aaqm/qmosqual/perfaudit/nmhc/whole/wholetable.htm.

Figure D1. **2000 Whole Air Comparison Check (Continued on next page)**

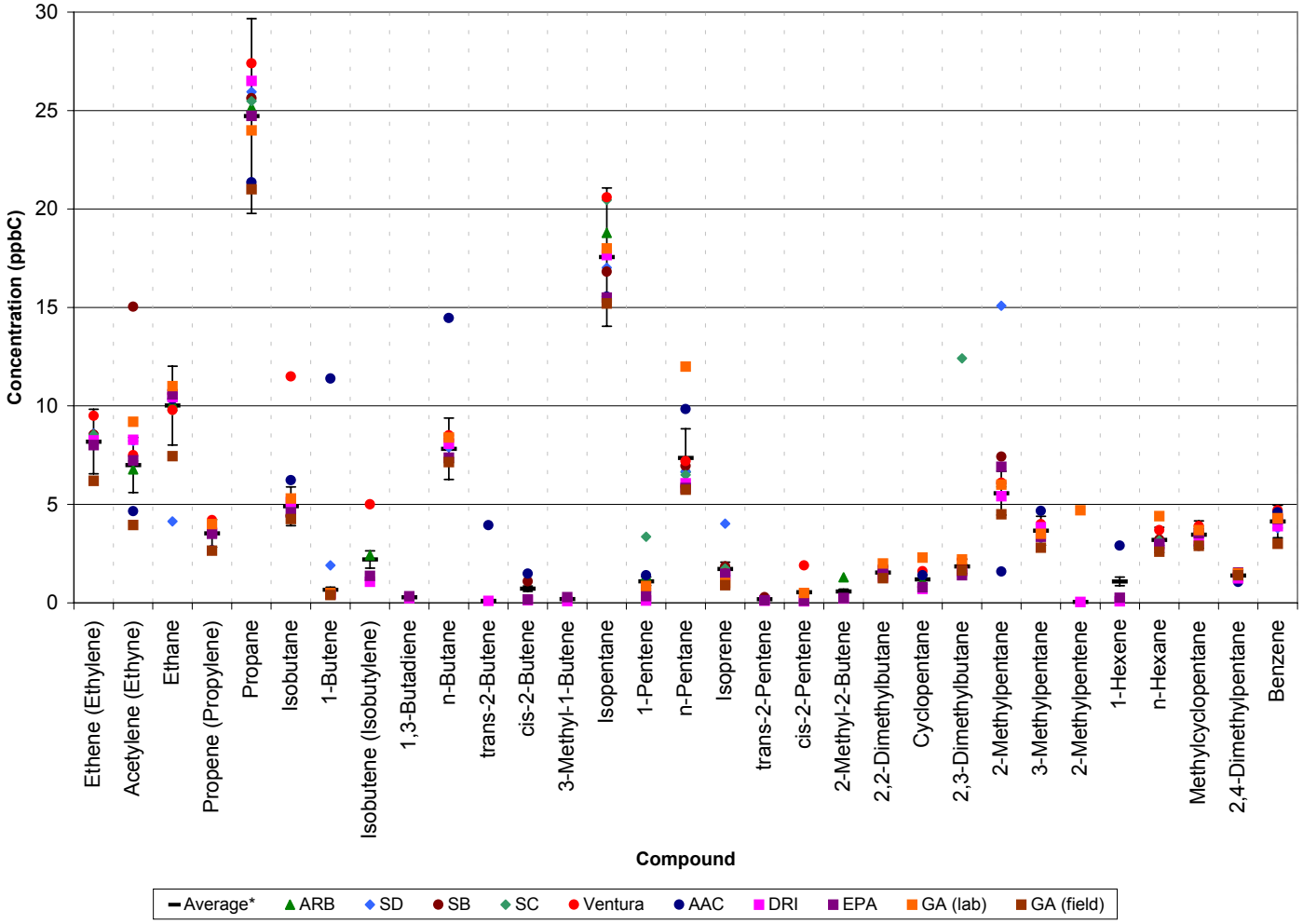
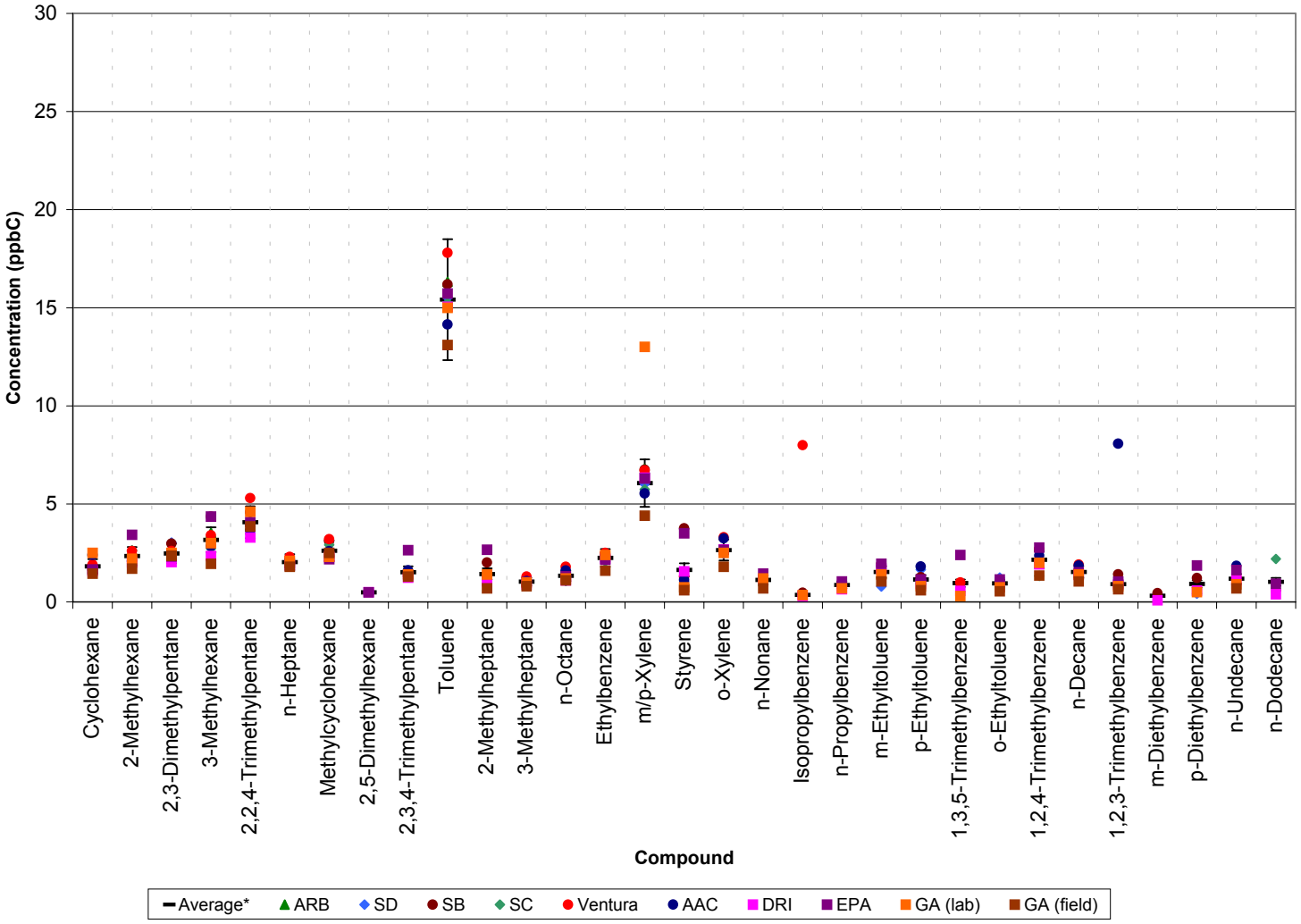


Figure D1. **2000 Whole Air Comparison Check (Continued)**



TTP continuous analyzer performance audits include audits of total NMHC analyzers (i.e., Bendix 8202a or TECO 55). Seventy-eight percent of the instruments audited were found to be operating within the ARB's control limits. The instruments operating outside the control limits were typically due to a blocked restrictor that shifted the timing window or retention time. The instruments found operating outside of the control limits were responsible for 260 days of lost data.

Table D2 shows the audit results for 2000. The purpose of this table is to estimate the accuracy of the hydrocarbon data that are on the database. The upper and lower probability limits represent the expected accuracy of 95 percent of all the analyzer's individual percent differences for all audit test levels at a single site. Consequently, audit results were not used in the statistical analysis if the audit was deleted due to an AQDA that resulted in data deletion.

Fewer TTP sampler and TTP continuous analyzer audits were conducted for the 2000 PAMS sampling season due to resource availability.

***Table D2*. 2000 TTP Audits of Continuous Analyzer NMHC for PAMS Sites Under the CAPII**

Pollutant	Number of Analyzers Audited	Number of AQDAs	Average % Difference	Probability Limits 95%UL	95%LL
NMHC	8	2	0.9	10.8	-9.1

Source: Quality Assurance Section, Accuracy Estimates

The QAS developed an annual TTP carbonyl audit method, which was implemented in the 2000 sampling season. A sample of audit gas with known (assigned) concentrations is introduced into the sampling probe inlet of a carbonyl sampler and is collected on a carbonyl cartridge for a three-hour period. Following standard operating procedures, the laboratory analyzes the cartridge and reports the results to the QAS, who in turn calculates the percent difference and reports the final results to the laboratory.

The purpose of the TTP audit is to assess the accuracy of the total measurement system, including errors inherent in transport, effects of sample pump and probe, and laboratory error. In 2000, a total of 18 sites were audited. Of the 18 sites audited, 11 sites were in support of the Central California Ozone Study, of which only 5 reported results. Those results were included in the statistical analysis. The audit results indicate the PAMS carbonyl network is performing well, making it possible to accurately measure carbonyl compounds in ambient air. The 2000 Carbonyl TTP Sampler performance audit results are shown in Table D3.

Because the accuracy of measuring carbonyl compounds is dependent upon the sampling flow rate, flow audits are conducted in conjunction with the TTP audits. Due to prioritization of the audit equipment, only a few flow audits were conducted. All instruments audited were found to be operating within the ARB's control limits. In previous years, problems with instruments operating outside the control limits were primarily due to improper calibration of the mass flow controllers. The upper and lower probability limits represent the expected accuracy of 95 percent of all the single analyzer's individual percent differences for all audit test levels at a single site. The flow audit results, shown in Table D4 below, indicate the PAMS carbonyl samplers as a group are able to maintain consistent and accurate flow rates.

Visit the carbonyl webpage at the following Internet address for more information: http://www.arb.ca.gov/aaqm/qmosqual/perfaudit/carbonyl/carbonyl.htm.

***Table D3*. 2000 Results for Carbonyl TTP Sampler Performance Audits Conducted by ARB**

Pollutant	Number of Samplers Audited	Average % Difference	Probability Limits 95%UL	95%LL
Carbonyl	12	-12.3	19.4	-43.7

***Table D4*. 2000 Results for Carbonyl Sampler Flow Audits Conducted by ARB**

Pollutant	Number of Samplers Audited	Average % Difference	Probability Limits 95%UL	95%LL
Carbonyl	4	3.3	7.7	-1.1

Source: Quality Assurance Section, Accuracy Estimates

Precision (field): Precision for the manual PAMS canister and aldehyde samplers is obtained through collocated sampling. Collocated sampling occurs at selected PAMS sites only. The data generated represent precision for the network as a whole. Each of the four participating PAMS laboratories selects one site where a duplicate canister of ambient air is collected using two separate sampling systems. In 2000, a collocated sampler was located at the Fresno-First site to represent the ARB network. The relative differences for regular/collocated comparisons ranged from 0.0% to 170.5%. Corrections were not made to the database based on the regular/collocated results.

In addition, daily duplicate analyses are performed by the laboratories on at least 10% of the total number of ambient samples. For the 2000 hydrocarbon season, the relative percent difference between the duplicate analyses were less than 15% for all target compounds that were measured at $\geq$ 5 times the reported limit of detection ($\geq$ 5 ppb C). This is well within the criteria of +/-25% recommended by the Technical Assistance Document for Analysis of Ozone Precursors (1998 TAD).

The precision of PAMS carbonyls data is also confirmed through collocated sampling in much the same manner as the canisters. The laboratory analyzes two collocated cartridges from one sampling system that has two sampling channels. In 2000, the collocated sampler was located at the Fresno-First site. The data for regular and collocated analyses varied from 0.11% to 32.4%. Corrections were not made to the database based on the regular/collocated results.

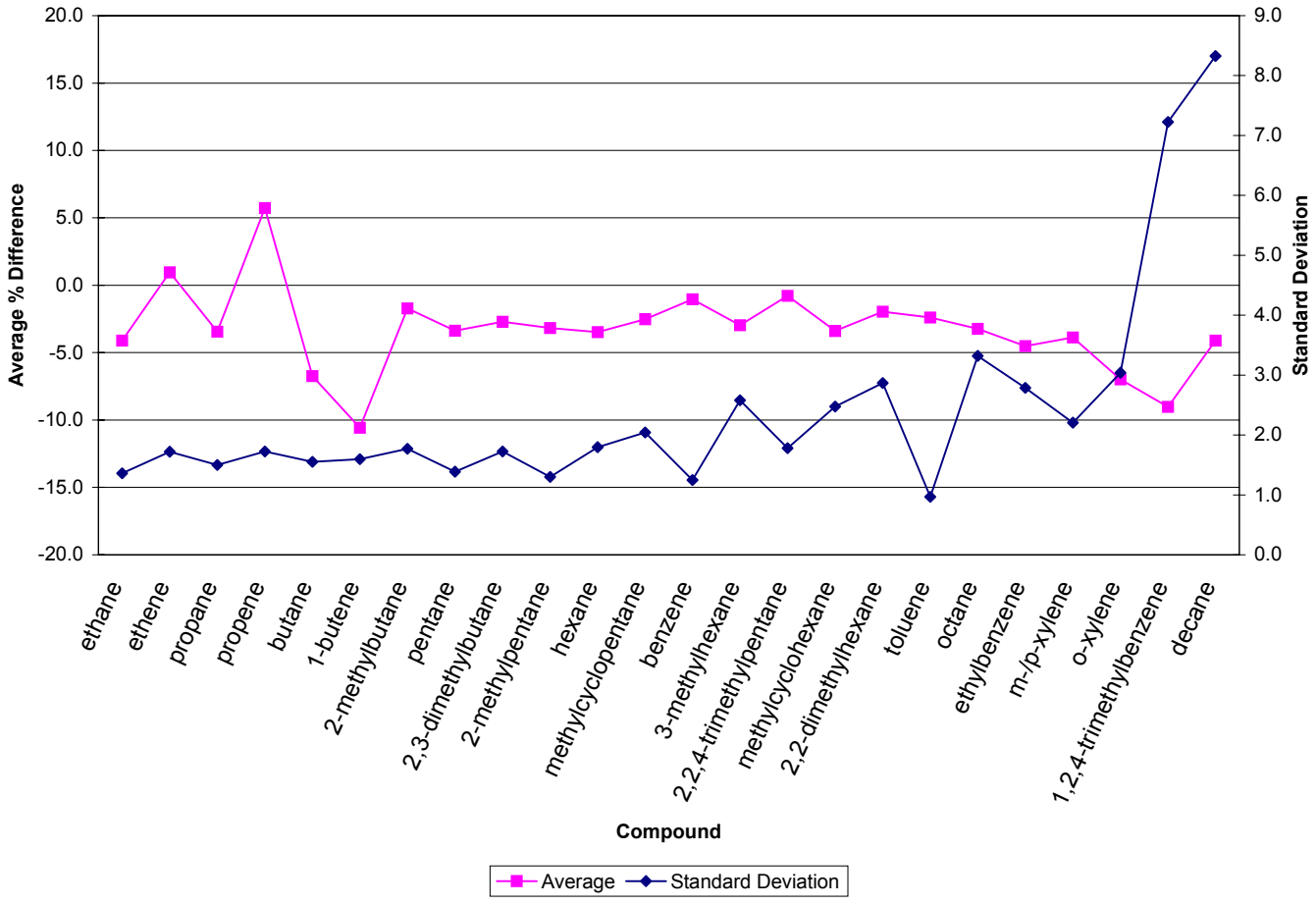
The laboratory also analyzes blank and spiked samples and performs duplicate analyses on 10% of the ambient samples. The blank data is obtained by attaching a cartridge to an unused channel of the sampler. A blank sample is collected for each scheduled trend day. The average blank values in 2000 were 0.00, 0.06, and 0.24 µg/5ml for formaldehyde, acetaldehyde, and acetone, respectively. These values are used to correct ambient air carbonyl concentrations (the average trip blank values for the respective compounds were subtracted from measured ambient concentrations) for any contamination that may have occurred during shipping and handling. Spiked samples are generally made at a frequency of one spike per analytical run and are done after the cartridges are desorbed. In 2000, the averages of the recoveries of the spiked samples were 103.80, 101.66 and 101.35% for formaldehyde, acetaldehyde, and acetone, respectively. The results were all within the acceptance criteria of 80-120%. Overall, the precision data indicates that the PAMS network is providing precise hydrocarbon and carbonyl data.

Motor Vehicle Exhaust Program

The motor vehicle exhaust program supports efforts to determine the reactivity of fuel components by speciating exhaust samples. The program provides hydrocarbon emissions data that can be compared against the regulatory standard for non-methane organic gases tail-pipe emissions, and a number of ozone precursors. Special studies are currently being conducted to determine emissions generated from vehicles operated under manufacturers recommendations. The data are included in a controlled data set, and are subject to formal data quality objectives.

Accuracy: The Southern Laboratory Branch analyzes exhaust samples collected on the dynomometer operated by the Mobile Source Control Division and Mobile Source Operations Division. Laboratory performance audits are conducted annually of the Southern Laboratory Branch for components of motor vehicle exhaust. The percent differences of the audit values and laboratory results shown here were calculated using the average reported concentration for each GC. Figure D1 illustrates the results for 2000. Overall, the laboratory performed well and provides accurate data to support the motor vehicle exhaust program. The laboratory continued to experience the typical low recovery rates for the heavier-end hydrocarbons.

Figure D2. **ARB's 2000 Motor Vehicle Exhaust Laboratory NMHC Audit Results**



E. Pesticides

Ambient and application pesticide monitoring is performed by the ARB at the request of the Department of Pesticide Regulation to determine the airborne concentration of pesticides at times and in areas of pesticide use. Some of the active ingredients found in pesticides are known to cause a wide range of adverse health effects in people, vegetation, and wildlife. The data are descriptive data sets, so are not subject to strict data quality objectives.

Two types of monitoring are conducted; ambient and application. During ambient, or community air measurements, ARB collects samples at approximately half a dozen locations (usually schools or other public buildings) in communities near agricultural areas expected to receive applications of the pesticide. Samples of 24 hours in duration are typically collected for four days per week for four or more consecutive weeks. Application-site monitoring (e.g., sampling before and after a specific application), samples are collected immediately before, during, and for approximately 72 hours following pesticide application.

In 2000, the California Department of Pesticide Regulation (DPR) requested that the ARB conduct ambient air monitoring for the soil fumigants methyl bromide and 1,3-dichloropropene (also known as Telone). Monitoring was conducted in Kern County from July 10, 2000 through September 2000 and in the Monterey and Santa Cruz Counties from September 11, 2000 through November 3, 2000. The times of monitoring correspond with the use of two soil fumigants prior to planting a variety of crops. Air samples for methyl bromide and 1, 3-dichloropropene were collected using evacuated 6-liter Silcosteel® canisters. Sampling was also conducted using charcoal tubes for three weeks in Kern County and one week in Monterey and Santa Cruz counties.

Accuracy (field): Since accurate measurement of pesticides in ambient air is dependent upon flow rate, flow audits are performed annually on pesticide samplers after calibration and prior to sampling to assure data quality. Table E1 represents the 2000 pesticide flow rate audit data. The flow audit results indicate that the network is providing accurate flow rate data.

Table E1. **ARB's 2000 Pesticide Flow Rate Audit Results**

Number of Samplers Audited	Average % Difference	Std Dev
46	-0.5	5.1

Precision (lab): Field quality control tasks are conducted for ambient and application monitoring to assess system precision for a variety of pesticides used. These tasks include: field spikes, trip spikes (standards), laboratory spikes and trip blanks. In

addition, collocated samplers are used and duplicate analyses are performed on 10 percent of the samples. These tasks are for evaluation purposes, as there are no formal data quality objectives or established criteria for these tasks to meet.

In Kern County, twenty-five collocated pairs of canister samples were collected for both methyl bromide and 1,3-dichloropropene. The relative differences (100 x average difference) of the data pairs for methyl bromide averaged 3.9% and ranged from 0.5% to 20.0%. The data pairs for 1,3-dichloropropene averaged 22.0% and ranged from 0% to 80%. In addition, eighteen collocated pairs of charcoal tube samples were collected for 1,3-dichloropropene. The relative differences of the data pairs averaged 7.4% and ranged from 0.7% to 19.0%.

In Monterey and Santa Cruz counties, forty collocated pairs of canister samples were collected for methyl bromide and eight canister samples were collected for 1,3-dichloropropene. The relative differences of the data pairs were 7.9% and 12.0% and ranged from 0.5% to 45.0% and 0.2% to 37.0%, respectively.

The analytical precision results indicate that the sample transport, storage, and analytical procedures used produced acceptable results for methyl bromide and 1,3-dichloropropene. Tables E2 and E2A represent the laboratory, trip, and field spikes results for methyl bromide and 1,3-dichloropropene conducted in Kern County. Tables E3 and E3A represent the laboratory, trip, and field spikes results for methyl bromide and 1,3-dichloropropene conducted in the Monterey and Santa Cruz counties. Additional precision data are available upon request.

Table E2. 2000 Canister Laboratory, Trip, and Field Spike Results for Methyl Bromide and 1,3-Dichloropropene for Kern County

Type of Spike	Methyl Bromide Average % Recovery	cis-1,3-Dichloropropene Average % Recovery	trans-1,3-Dichlorpropene Average % Recovery
Laboratory	102	125	130
Trip	98	108	101
Field	102	120	108

Source: Operations Planning and Assessment Section, *Ambient Air Monitoring for Methyl Bromide and 1,2-Dichloropropene in Kern County – Summer 2000*

Table E2A. 2000 Charcoal Tube Laboratory, Trip, and Field Spike Results for Methyl Bromide and 1,3-Dichloropropene for Kern County

Type of Spike	Methyl Bromide Average % Recovery	cis-1,3-Dichloropropene Average % Recovery	trans-1,3-Dichlorpropene Average % Recovery
Laboratory	NA	89	86
Trip	NA	94	91
Field	NA	189	112

Source: Operations Planning and Assessment Section, *Ambient Air Monitoring for Methyl Bromide and 1,2-Dichloropropene in Kern County – Summer 2000*

Table E3. 2000 Canister Laboratory, Trip, and Field Spike Results for Methyl Bromide and 1,3-Dichloropropene for Monterey and Santa Cruz Counties

Type of Spike	Methyl Bromide Average % Recovery	cis-1,3-Dichloropropene Average % Recovery	trans-1,3-Dichlorpropene Average % Recovery
Laboratory	101	91	91
Trip	101	88	87
Field	24	104	107

Source: Operations Planning and Assessment Section, *Ambient Air Monitoring for Methyl Bromide and 1,3-Dichloropropene in Monterey/Santa Cruz Counties – Fall 2000*

Table E3A. 2000 Charcoal Tube Laboratory, Trip, and Field Spike Results for Methyl Bromide and 1,3-Dichloropropene for Monterey and Santa Cruz Counties

Type of Spike	Methyl Bromide Average % Recovery	cis-1,3-Dichloropropene Average % Recovery	trans-1,3-Dichlorpropene Average % Recovery
Laboratory	NA	91	89
Trip	57	91	90
Field	58	207	160

Source: Operation Planning and Assessment Section, *Ambient Air Monitoring for Methyl Bromide and 1,3-Dichloropropene in Monterey/Santa Cruz Counties – Fall 2000*

F. Consumer Products

Consumer products are chemically formulated products used by the public in homes and businesses. These compounds are reported to emit approximately 260 tons per day of smog-forming VOCs. Monitoring VOC levels in consumer products and finding ways to reduce VOC emissions they contain facilitates ARB's effort to reduce smog in the State. Consumer products are descriptive data sets. Although formal data quality objectives have not been established, effort is made by staff to ensure the accuracy and precision of the data. Visit the Consumer Products Program website at http://www.arb.ca.gov/consprod/consprod.htm.

Accuracy: The QAS does not conduct performance audits on the Consumer Product Program at this time. The Organics Laboratory, however, performs internal quality control checks to ensure the validity of the data produced. Below are tasks currently used by the laboratory to ensure precise data.

Precision (lab): Analytical precision is derived from duplicate analysis performed on 10% of the samples. The results from the analyses are compared, and for the sample to be valid, the percent difference must be less than 3%. Duplicate data that do not meet the criteria are deleted. Samples analyzed on the same date are also deleted. Following an investigation of the problem, samples are re-analyzed. Table F1 shows the duplicate data for the 1st and 3rd quarter of 2000. Duplicate data for the 2nd and 4th quarters are available upon request.

Table F1. **2000 Duplicate Final %VOC Results for 1st and 3rd Quarter**

Sample Number	Dup 1 %VOC	Dup 2 %VOC	Percent Difference
1	70.0	69.2	1.2
2	11.7	12.4	5.8
3	14.1	13.2	6.6
4	20.3	21.9	7.6
5	8.0	8.6	7.3
6	90.1	90.4	0.4
7	56.0	57.4	2.5
8	6.4	5.8	9.8
9	48.4	49.0	1.2
10	20.9	24.5	15.9
11	9.4	10.0	6.2
12	0.3	0.8	90.9
13	5.4	2.4	76.9
14	1.1	1.1	0.0
15	27.9	28.4	1.8
16	81.5	81.5	0.0
17	69.4	69.4	0.0
18	2.9	2.8	3.1
19	9.9	8.9	10.4

Source: Special Analysis Section, Consumer Products Quality Control Report

The Consumer Product laboratory also analyzes known standards (trip standards) to establish control limits and limits of detection, runs system blanks to confirm the system is not contaminated, and conducts yearly multi-point calibrations to assess the instrument linearity. Presently, trip standards are not subject to meet established control limits or have corrective action(s) taken if a sample is out of the control range. The PE&S Section has recommended that these elements be added to enhance the value of trip standard as an assessment of precision. Overall, the analytical precision results indicate that the network is providing precise consumer product data. Table F2 represents the trip standard results for the 1st and 3rdquarters of 2000.

Table F2. **2000 ARB's Trip Standard Results for 1st and 3rd Quarters**

Sample Number	% Difference from Target Value for:						
	Volatile Material wt. fraction	Water (KFO) wt. Fraction	Water (GC/TCD) wt. Fraction	Acetone wt. Fraction	Methanol wt. fraction	Ethanol wt. fraction	%VOC (Total-Exempt)
1	-0.3	-2.2	5.3	-19.0	4.0	1.0	3.5
2	0.0	3.0	1.0	-10.0	-7.0	-10.0	2.0
3	0.0	1.0	0.7	-12.0	-9.0	-14.0	2.5
4	-0.1	-5.5	0.8	3.0	2.0	-5.0	5.0
5	-0.1	-10.2	0.3	15.0	17.0	11.0	7.0
6	-0.1	-0.7	-1.0	-13.0	-12.0	-16.0	8.5
7	-0.1	-3.0	1.3	-15.0	-11.0	-14.0	9.5
8	-0.1	-2.3	0.0	6.0	5.0	0.0	-3.0
9	0.0	0.3	3.7	0.0	7.0	-1.0	-1.5
10	0.0	-2.3	1.3	4.0	8.0	0.0	-0.5
11	0.0	NA	0.2	6.0	8.0	3.0	-4.0
12	0.0	NA	-0.7	2.0	2.0	-2.0	0.0
13	-0.1	-2.3	1.0	5.0	7.0	4.0	-1.0
14	-0.1	0.3	-2.3	-3.0	-1.0	-5.0	4.0
15	0.0	-6.2	2.2	-1.0	3.0	-1.0	6.5

NA=analysis not run

Source: Special Analysis Section, Consumer Products Quality Control Report

G. Meteorology

The ARB monitors meteorological parameters such as wind speed, wind direction, ambient temperature, relative humidity, barometric pressure, and total solar radiation. Real-time meteorological data are generated to characterize meteorological processes such as transport and diffusion, and to make air quality forecasts and burn-day decisions. The data are also used for control strategy modeling and urban airshed modeling. A State/local meteorology subcommittee of the Air Monitoring Technical Advisory Committee (AMTAC) agreed to define the level of acceptability for meteorological data as those used by the U.S. EPA for the Prevention of Significant Deterioration (PSD) program. The QAS audits to those levels.

The data variability collected by this element of the monitoring program are generally described as meeting or not meeting the PSD requirements. No mandatory corrections are made to the data. Even so, station operators are notified whether they passed the audit or not. Most operators make the effort to meet the audit standards. In 2001, the wind speed, wind direction and outside temperature data sets will be controlled data sets, subject to meeting PAMS objectives.

Accuracy (field): The accuracy of meteorological sensors are checked by annual performance audits. Overall, the network is performing well and providing extremely accurate meteorological data useful for airshed modeling and prescribing burn days. Visit http://www.arb.ca.gov/aaqm/met.htm for additional information. Table G1 summarizes the 2000 audit results. The average difference represents the combined differences from the certified value of all the individual audit points for each sensor. The upper and lower probability limits represent the expected accuracy of 95 percent of all the single sensor's individual percent differences for all audit test levels at a single site.

***Table G1*. 2000 Results for Meteorological Sensor Performance Audits Conducted by ARB**

Sensor	Number of Sensors Audited	Average Difference	Probability Limits 95%UL	95%LL
Ambient Temp	94	0.0	0.6	-0.6
Horiz Wind Speed	104	0.2	2.7	-2.3
Relative Humidity	19	1.0	13.5	-11.5
Solar Radiation	9	6.3	28.4	-15.8
Vert Wind Speed	7	-0.1	0.2	-0.4
Wind Direction	102	-2.0	42.9	-46.9

Source: Quality Assurance Section, Accuracy Estimates

III. QUALITY CONTROL REPORTS

Quality Control (QC) reports are summaries of the quality control activities conducted by all MLD laboratories to support accurate and precise measurements. These activities include: duplicate, control, and spiked samples, limits of detection, calibrations, and audit results. All MLD QC reports are reviewed by the PE&S Section to verify that good laboratory practices were followed and to identify opportunities for data quality or process improvement. The PE&S Section makes suggestions, where appropriate, to help improve the overall quality and/or effectiveness of the data. QC reports are prepared quarterly, biannually, or annually, depending upon the program. Table 1 lists the QC reports submitted for review in 2000. At this time, QC reports are not prepared for the following programs: gaseous pollutants, pesticides, and meteorology.

***Table 1*. Quality Control Reports Submitted to PE&S Section for Review in 2000**

Submittal Frequency	Title of QC Report	Program (s) Supported
Quarterly	Special Analysis Section, Consumer Products	Consumer Products
Quarterly	Analysis of Motor Vehicle Exhaust	Motor Vehicle Exhaust
Quarterly	Analysis of Motor Vehicle Fuel	Motor Vehicle Exhaust
Quarterly	Inorganic Procedures	Particulate Matter
Quarterly	Organic Procedures	Toxics, Non-Methane Hydrocarbons
Annually	Non-Methane Organic Compounds	Non-Methane Hydrocarbons
Quarterly	Standards Laboratory	All

IV. STANDARDS LABORATORY

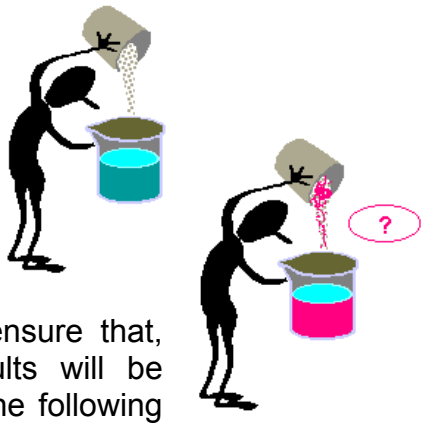
The Standards Laboratory, part of the PE&S Section, performs technical support and certification and verification services of calibration instruments, gases, and devices. Clients include ARB divisions, air districts, other states and countries, and private sector monitoring organizations. Calibrations and certifications are performed for ozone and flow rate transfer standards, certifications of compressed gas cylinders, and verifications of ozone and flow rate primary standards, to ensure that all are traceable to standards of the National Institute of Standards and Technology (NIST). A calibration establishes a correction factor to adjust or correct the output of an instrument, a certification establishes traceability of a transfer standard to a NIST-traceable standard, and a verification establishes comparability of a standard to a NIST-traceable standard of equal rank.

The Standards Laboratory also certifies and calibrates instruments used quarterly by the ARB's QA auditors. Table 1 shows the services and the volume of the services for 2000. For more information on the Standards Laboratory and the services they provide, visit the Certification of Standards website: http://www.arb.ca.gov/aaqm/qmosprog/stdslab/stdslab.htm.

Table 1. Standards Laboratory Services Provided for 2000

Service Provided	Number Conducted
Ozone Certifications	38
Ozone Verifications	38
Ozone Calibrations	2
Low Flow Certifications	409
Low Flow Verifications	0
Low Flow Calibrations	1
High Flow Certifications	61
Ambient Gas Cylinders Certified	181
Source Gas Cylinders Certified	192

V. LABORATORY AND FIELD STANDARD OPERATING PROCEDURES



Laboratory and field standard operating procedures (SOPs) are guidance documents for the operation of quality assurance programs used by the ARB, local districts and private industry. The SOPs are intended for field operators and supervisors; laboratory, data processing and engineering personnel; and program managers responsible for implementing, designing, and coordinating air quality monitoring projects. Each SOP has a specific method that each person must follow to produce data-for-record. The SOPs are developed and published to ensure that, regardless of the person performing the operation, the results will be consistent. Most of the SOPs are available on the Internet at the following address: http://www.arb.ca.gov/aaqm/qmosqual/qamanual/qamanual.htm.

VI. SITING EVALUATIONS

To generate accurate and representative data, air monitoring stations must and/or should meet specific current siting requirements and conditions. It is assumed that the stations met the then existing siting criteria when they began operation. As such, non-conformance today is the result of changing regulations, and for change in surrounding conditions and land use. The siting requirements of the ARB's Quality Assurance Manual Volume II; 40 CFR 58, Appendix E; U.S. EPA's Quality Assurance Handbook Volume IV: U.S. EPA's Prevention of Significant Deterioration (PSD); and U.S. EPA's PAMS guidelines, present siting criteria to ensure the collection of accurate and representative data.

The siting criteria for each pollutant vary depending on the pollutant's properties and the requirements addressed in the guideline documents. The U.S. EPA's siting criteria are stated as either "must meet" or "should meet". According to 40 CFR 58, Appendix E, the "must meet" requirements are necessary for high quality data. Any exception from

the “must meet” requirements must be formally approved through the Appendix E waiver provision. The “should meet” criteria establish a goal for data consistency.

Siting criteria are requirements for locating and establishing stations and samplers to meet selected monitoring objectives, and to help ensure that the data from each site are collected uniformly. There are four main objectives: to determine highest concentrations expected to occur in the area covered by the network; to determine representative concentrations in areas of high population density; to determine the impact on ambient pollution levels of significant sources or source categories; and to determine general background concentration levels. Typical siting designations are: micro, middle, neighborhood, and regional. These designations represent the size of the area surrounding the monitoring site which experiences relatively uniform pollutant concentrations. Typical considerations for each of these site designations are, for example, the terrain, climate, population, existing emission sources, and distances from trees and roadways.

Annually, siting evaluations are conducted by the QAS. Physical measurements and observations, which include, but are not limited to, probe/sensor height above ground level, distance from trees, type of ground cover, residence time, obstructions to air flow, and distance to local sources, are taken to determine compliance with 40 CFR Part 58, Appendix E requirements. In the case where a siting criteria deficiency is found during a site evaluation, the site operator will be informed and an AQDA issued, if warranted. For siting criteria distances, please refer to Appendix C.

VII. OPERATIONS PLANNING AND ASSESSMENT SECTION

The Operations, Planning, and Assessment Section (OPAS) was created in 2000 to be the management lead for various non-routine monitoring projects. The OPAS staff assists in preparing clear and detailed objectives for the monitoring activities and work in coordination with communities, Districts, and other ARB divisions to define the type, quality, and quantity of data needed for each monitoring project. From preparing sampling and analysis protocols to participating in monitoring site selection and instrument deployment, the OPAS staff provides guidance and serves as lead throughout all stages of a monitoring project. Monitoring projects stem from new initiatives and programs, which include the children’s environmental health protection program, the community health program, asbestos program, California ambient dioxin air monitoring program, and the expanded pesticide monitoring programs.

VIII. ENGINEERING AND CERTIFICATION BRANCH

The Engineering and Certification Branch has three sections, which include the Testing Section, the Engineering Evaluation Section, and the Vapor Recovery Certification Section. The Testing Section conducts stationary source tests and assists the Engineering Evaluation Section and the Vapor Recovery Certification Section in carrying out critical mission duties. Duties include, but are not limited to, performing setup and fabrication of test equipment, providing peer review for vapor recovery or stationary sources tests, and writing test protocols. The Engineering and Evaluation Section develops and updates vapor recovery and stationary source test methods. In addition, the section conducts technology reviews and equipment pre-certification. The

Vapor Recovery Certification Section performs testing and certification of vapor recovery systems components for gasoline dispensing facilities and performs extensive public outreach to aid air Districts with implementation of the enhanced vapor recovery program.

IX. SPECIAL STUDIES

During the course of the year, in-house studies as well as studies abroad, are conducted to further the information available about the trends of pollutants and to support regulations to promote the welfare of the public. The following are brief descriptions of some of the special studies that were conducted by MLD.

CCOS STUDY

MLD staff assisted in the Central California Ozone Study (CCOS) that was conducted during the summer of 2000. The primary objective of the study was to obtain a suitable database for grid-based, photochemical modeling, and to determine the contributions of transported and locally generated ozone, as well as to review the relative benefits of volatile (VOC) and nitrogen oxide (NOx) emission controls in upwind and downwind areas. The Organics Laboratory Section and the Air Monitoring Central Section staff from Bakersfield, Fresno, and Sacramento provided in-kind support at five monitoring sites: Arvin, Bakersfield-Golden, McKittrick, Trimmer, and San Andreas. At each site, continuous ozone and NOy analyzers were operated. In addition, Arvin, Bakersfield-Golden, Trimmer, and San Andreas had intensive canister sampling conducted on forecasted episode-days. Those canisters were of the same design as those used in the PAMS monitoring program and were analyzed by the Organics Laboratory.

The QAS assisted in the study by auditing 6 aircraft, and 50 air monitoring stations to ensure the accuracy of the data generated. Air Quality Data Action (AQDA) requests were issued for instruments operating outside the ARB's control limits, non-operational at time of audit, and for not meeting siting requirements. AQDAs were not issued for carbonyl, NMOC, or meteorological sensors found operating outside the control limits; however, QA staff requested that all exceedances be investigated.

SB25 SITE DETERMINATION AND EVALUATION

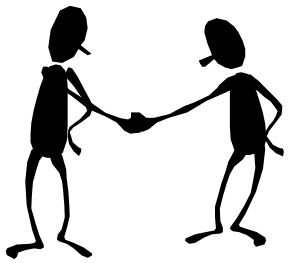
MLD staff reviewed monitoring site locations for Senate Bill 25 and other community-based monitoring programs. Locations were selected where children are typically present, such as schools and daycare centers, and near sources of air pollution, including busy highways and industry. The areas chosen exemplify the diversity of weather, geography, and air pollution sources present in California where emissions from diesel engines, automobiles, neighborhood sources, refineries and marine sources can affect air quality. Facilities located near school sites were also evaluated for their potential impact on schools and the surrounding communities. Special studies will be conducted at these locations to determine whether the current network established to measure air pollution in California adequately reflects the levels of air pollutants that infants and children are breathing. Final selection of a Senate Bill 25 sites will occur following a technical assessment of all the sites and will include input from ARB staff, District staff, and stakeholder groups.

1,3-BUTADIENE STABILITY STUDIES

MLD staff reviewed over 30 experiments using gas chromatographs for hydrocarbon speciation to determine the rate of 1,3-butadiene decomposition in vehicle exhaust samples. These experiments were conducted by spiking selected testing samples with 1,3-butadiene (either 50 ppbC or 1000 ppbC), and observing the subsequent concentration change over a 24-hour period. The 24-hour period was chosen because current non-methane organic gas (NMOG) regulations require samples to be analyzed within 24-hours. Initial review of the database showed that there is rapid decay of 1,3-butadiene in TEDLAR sample bags when either diesel or gasoline vehicle exhaust is present. Within one hour, as much as 60 to 90 percent of the 1,3-butadiene introduced into the sample bag containing the exhaust was lost. It was found that 1,3-butadiene, alone, is somewhat stable in the TEDLAR bag, but does lose 8 to 15 percent of its initial concentration over a 24-hour period. Additional experiments have established that some form of NOx is most likely responsible for the rapid 1,3-butadiene decomposition. Other exhaust components such as carbon dioxide and carbon monoxide have little or no effect on the 1,3-butadiene decomposition, while water has a small but uncertain effect. Evaluation of the database is continuing.

ASBESTOS MONITORING

MLD staff was asked by the Stationary Source Division to conduct ambient outdoor and indoor monitoring for airborne asbestos after high asbestos levels were found in piles of soil on a vacant lot located in El Dorado County. The soil was placed there due to grading of a nearby construction site. Outdoor sampling was conducted from January 7 through January 10, 2000. In addition, on January 10, 2000, samples were collected in two living rooms of two residences located near the soil piles. None of the monitoring sites showed detectable levels of asbestos. The results were reported in the January 22, 2000 edition of the Sacramento Bee.



The meteorological sensors and asbestos samplers were setup on four sides of the asbestos contaminated piles. The pile removal started on February 8, 2000 and was completed on February 9, 2000. Upon completion of the pile removal, a layer of crushed rock and straw were added. The Department of Toxic Substances Control (DTSC) supervised the removal of the piles and arranged for disposal at a landfill near Stockton. The airborne samples were sent to the RJ Lee Group for analyses.

TECO 55 MODIFICATION

MLD staff worked together to modify the calibration and auditing procedures for the modified TECO 55 continuous hydrocarbon analyzer to account for the lower limit of detection. Because ambient concentrations of hydrocarbons are low, the instrument was modified to allow for greater sensitivity. Subsequently, the concentrations of the standards used by MLD staff to calibrate, span, and audit the hydrocarbon analyzers, were lowered. Air Monitoring staff plans to order one cylinder each of the span and calibration standards for a pilot project to be conducted at the 13th and T street's air

monitoring station. Ultimately, the goal is to have all the TECO 55s modified to a lower sensitivity and operating range. As part of a bias evaluation of selected PAMS data, staff evaluated Total Non-Methane Organic Compounds (TNMOC) data from the 1998 and 1999 summer season for the PAMS program. The focus of the evaluations was to define the relationship between data collected from the TECO 55 NMOC and the canister collected/laboratory analyzed method in the Central Valley.

Staff found that a significant amount of TECO 55 data (77 percent) was below the detection limit of the instruments and could not be used in comparison with the canister-collected data. TNMOC data collected from one station in 1998 and three stations in 1999 had enough useable data to proceed with a comparison with the canister-collected data. In general, all stations followed the same trend; however, there was a significant bias towards the TECO 55 at Parlier. More data are needed to better define a relationship between the two methods. The next step is to perform the same evaluation on TECO 55 and canister data from the year 2000 PAMS season. As a part of this evaluation, the Districts will be encouraged to modify their TECO 55 analyzers to increase sensitivity and improve data capture.

EVALUATION OF PM10 SAMPLERS USED IN EXTREME CONDITIONS

MLD staff developed a concept paper on PM10 sampler performance related to extreme conditions. Significant differences in PM10 concentrations exist between 'equivalent' U.S. EPA samplers in the Owens Valley. The extreme conditions are characterized by high wind speeds and extreme PM loading dominated by coarse fractions. The goal of the study is to determine which PM10 sampler(s) (of the Dichot, Partisol, TEOM, and the Wedding) provides the most accurate and precise measurements of PM10 concentrations under extreme conditions. We propose that the study consist of laboratory and field parts. The laboratory part involves inlet performance and overall sampler's performance evaluations. The field studies are designed to verify any new operating procedures in the ambient environment. The concept paper underwent a series of in-house reviews and was presented to UC Davis faculties. After considering the various comments, the concept paper was modified. Staff plan to send the concept paper out for comments to the Great Basin Unified Air Pollution Control District, the U.S. EPA, and the City of Los Angeles Department of Water and Power. After receiving their comments, staff will develop a research proposal based on the concept paper. To meet programmatic needs, the study must be completed by mid 2002.

NIST TRACEABLE ON-SITE CALIBRATION SYSTEM

MLD staff developed a method to provide on-site NIST traceable calibration systems at selected ARB ambient air monitoring stations. Recently, a request to use these systems throughout the ARB's ambient air monitoring network was submitted to the U.S. EPA.

The overall response has been encouraging. The U.S. EPA has tentatively approved the use of the Environics 9100 as a NIST traceable fixed transfer standard in all ARB ambient air monitoring stations. This approval is the culmination of over two years of research, testing, and planning, and will greatly facilitate remote operations of several ambient air monitoring stations in the ARB network.

Certification of the NIST calibrators will be performed on an annual basis. Use of the new systems will greatly improve efficiency by eliminating the need for on-site quarterly equipment calibrations. Using the new systems, analyzer repairs and subsequent calibrations can be performed using the NIST 9100 calibrator in place of a 'carry-in' transfer standard. This will allow staff to perform remote calibrations when practical via the instruments RS232 communications ports.

EMERGENCY RESPONSE – OHIO HEXAVALENT CHROMIUM

MLD staff provided support to the U.S. EPA in their efforts to determine hexavalent chromium concentrations in the ambient air in East Liverpool, Ohio. The U.S. EPA discovered very high concentrations of total chromium in particulate air samples collected at a school and near the Ohio River in eastern Ohio. Since ARB has a hexavalent chromium program in place, the U.S. EPA requested our assistance. MLD provided consultative services for field and laboratory operations. Twenty-two samples were collected in the field between November 8 and November 16, 2000. Five of those samples collected had hexavalent chromium concentrations above the limit of detection (0.45 ng/m3), ranging from 0.64 ng/m3 to 1.58 ng/m3.

PORTABLE FUEL CAN PERMEATION TESTING

MLD completed permeation testing for two manufacturers. The data are currently in review and draft reports should be completed by the end of January 2001. The preliminary permeation rates were an average of 0.07 grams/gallon/day and 0.18 grams/gallon/day.

In addition, a draft protocol for the determination of the permeation rate from preconditioned Phase II California Reformulated Certification (CERT) fuel versus preconditioned commercial pump fuel through high-density polyethylene containers has been completed. This testing will be done to verify similar testing conducted by Phillips suggesting permeation rates will vary depending on fuel type used during preconditioning. The study will follow the procedures described in ARB's Test Method 513 "Determination of Permeation Rate for Spill-Proof Systems" with the exception of using CERT fuel for preconditioning. Containers from various manufacturers will be used to support this testing. The testing was conducted in February and March 2001 and the results will be presented in the 2001 report.

OFF-ROAD EQUIPMENT FUEL TANK (OREFT) PROJECT

MLD staff are working to develop regulations to limit emissions from off-road equipment fuel tanks. The proposed regulations will be presented to the Board in December, 2001 for implementation. The category of equipment evaluated is part of the Tier II Small Off-Road Engine (SORE) regulations. Tier II SORE regulations address exhaust emissions on equipment less than 25 horsepower (hp) and specifically pre-empt new construction and farm

equipment less than 175 hp. Validation of the emissions estimates was made during Sealed Housing for Evaporative Determination (SHED) tests in July through August 2000.

Staff have also developed a draft test protocol for measuring permeation, hot soak, and diurnal evaporative emissions from off-road equipment. The protocol will be followed while testing 19 pieces of off-road equipment and their OEM fuel tanks. After review, the draft protocol was placed on the OREFT Web page for stakeholder review. The testing will generate data that will be used to refine the OFFROAD model and support the development of the OREFT regulations.

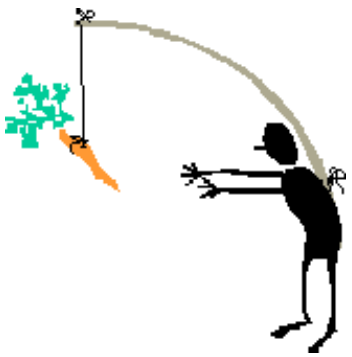
PROGRAM CONTACTS

Program	Contact	Phone	Email
Gaseous Pollutants	Fred Burriell	(916) 327-0886	fburriel@arb.ca.gov
Particulate Matter	Sam Vogt	(916) 322-8919	svogt@arb.ca.gov
Toxic Air Contaminants	Tim Gergen	(916) 322-7053	tgergen@arb.ca.gov
Non-Methane Hydrocarbons	Merrin Bueto	(916) 323-0346	mbueto@arb.ca.gov
Pesticides	Don Fitzell	(916) 322-3892	dfitzell@arb.ca.gov
Consumer Products	Don Fitzell	(916) 322-3892	dfitzell@arb.ca.gov
Meteorology	Fred Burriell	(916) 327-0886	fburriel@arb.ca.gov

X. UPCOMING ADDITIONS

This report will continue to evolve to include additional QA/QC measurements, new analyses of that information, and summary conclusions about the data meeting our clients' needs for stated objectives. Several elements we expect to include in the next annual issue of this report include:

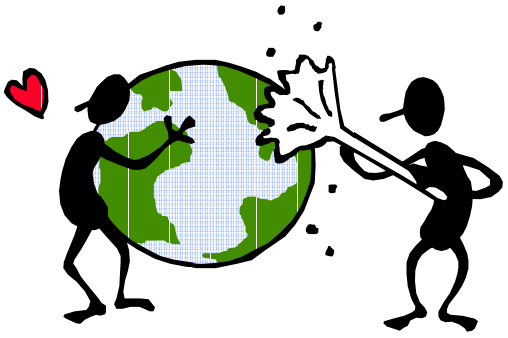
- 220v Survey and site installation
- PAMS System Audit
- AQDAs for meteorological parameters



APPENDIX A

AIR MONITORING NETWORK SURVEY

Quality Assurance Section
Monitoring and Laboratory Division



Gaseous Criteria Pollutant Monitoring as of December 11, 2000

Parameter Measured	**Ozone**	**Nitrogen Dioxide**	**Carbon Monoxide**	**Sulfur Dioxide**	**Hydrogen Sulfide***
Sampling Schedule	Continuous Hourly Average	Continuous Hourly Average	Continuous Hourly Average	Continuous Hourly Average	Continuous Hourly Average
Number of ARB Sites	43	26	26	3	0
Number of District Sites	146	91	74	34	15
Number of Sites in Mexico	9	9	9	8	0
Method Used By ARB	Ultraviolet Photometry	Gas Phase Chemiluminescence	Non-Dispersive Infrared Photometry	Ultraviolet Fluorescence Detector	Thermal Oxidizer with Ultraviolet Fluorescence Detector
EPA Reference Method	Ultraviolet Photometry	Gas Phase Chemiluminescence	Non-Dispersive Infrared Photometry	Spectrophotometry (Pararosaniline Method)	Not Applicable
Data Availability	Planning and Technical Support Division, Air Quality Data Branch, (916) 322-6076; U.S. EPA Aerometric Information Retrieval System (AIRS)				

TSP and Visibility Monitoring as of December 11, 2000

Parameter Measured	**Total Suspended Particulates (TSP)**			**Coefficient of Haze**	**Relative Visibility**
	Mass	Lead	Sulfate	Particulates	Light Scatter
Sampling Schedule	Every 6 days (24 hr samples)	Every 6 days (24 hr samples)	1 Every 12 days 4 Every 6 days 2 Every 3 days (24 hr samples)	2-Hour Average	Continuous Hourly Average
ARB Collection Method	High Volume Total Suspended Particulate Sampler			Optical Test Tape Sampler	Nephelometer
Sampling Media	Glass Fiber Filter 8 x 10 inch			Filter Tape	Not Applicable
Number of Sites Analyzed by the ARB	13 (Includes 12 sites in Mexico)	15 (Includes 11 sites in Mexico)	5	22	13
Number of ARB Collocated Sites	0	1	2 (Bakersfield, San Diego)	0	0
Additional Sites Analyzed by other Agencies	1 Ventura APCD 1 Other	9 SCAQMD 1 Other	13 SCAQMD	8	1
ARB Analysis Method	Method 016 Electronic Analytical Balance	Method 005 Graphite Furnace Atomic Absorption/ ZEEMAN	Method 033 Ion Chromatography	Light Transmittance Through a Filter Tape	Scattering Coefficient of Light by Suspended Particles
Laboratory Analyst	Pam Niiya	Mike Humenny	Roxana Walker	Not Applicable	Not Applicable
Data Availability	Planning and Technical Support Division, Air Quality Data Branch, (916) 323-4887; U.S. EPA Aerometric Information Retrieval System (AIRS)				

Acid Deposition Monitoring as of December 11, 2000

Parameter Measured	Wet Deposition			Dry Deposition 0 - 2.5 microns				
	Conductance and pH	Chloride, Nitrate, Sulfate	Ammonium Calcium Magnesium Potassium Sodium	Mass	Nitric Acid	Chloride, Nitrate, Sulfate	Ammonium	Calcium Magnesium Potassium Sodium
Sampling Schedule	Continuous (Samples Collected Weekly)			Every 6 Days (24 hr samples)				
ARB Collection Method	Automatic Precipitation Sensor with Twin Buckets			Size Selective Particulate Sampler with Multiple Filters/Cartridges				
Sampling Media	Plastic Bucket			Teflon Filter	Nylon Filter	Teflon Filter	Teflon Filter	Teflon Filter
Number of Sites Analyzed by the ARB	3			0				
Number of ARB Collocated Sites	0			0				
Additional Sites Analyzed by other Agencies	1 SDAPCD 5 Other			3 SCAQMD 6 Other				
ARB Analysis Method	Method 036 Conductivity and pH Meter	Method 037 Ion Chromatography	Method 037 Ion Chromatography	Method 041 Microbalance	Method 035 Automated Colorimetry	Method 044 Ion Chromatography	Method 046 Automated Colorimetry	Method 048 Atomic Absorption
Laboratory Analyst	George Dunston			Nehzat Motallebi - Research Division				
Data Availability	Planning and Technical Support Division, Air Quality Data Branch, (916) 323-4887; U.S. EPA Aerometric Information Retrieval System (AIRS)							

Toxic Metals Monitoring as of December 11, 2000

Parameter Measured	Toxic Metals			
	Al, As, Ba, Br, Ca, Cl, Co, CR, Cu, Fe, Hg, K, Mn, Mo, Ni, p, Pb, Rb, S, Sb, Se, Si, Sn, Ti, U, V, Y, Zn, Zr	Chromium VI	Cadmium (Cd)	Arsenic (As)
Sampling Schedule	Every 12 Days (24 hr samples)		Every 12 Days (24 hr samples)	
ARB Collection Method	Xontech 920 Toxic Air Contaminant Sampler		High Volume Total Particulate Sampler	
Sampling Media	Teflon Filter 37 mm	Cellulose Filter 37 mm	Glass Fiber Filter 8 x 10 inch	
Number of Sites Analyzed by the ARB	27		11	18
Number of ARB Collocated Sites	2 (Bakersfield, Stockton)		0	1 (Bakersfield)
Additional Sites Analyzed by other Agencies	0		0	0
ARB Analysis Method	Method 034 X-Ray Fluorescence	Method 039 Ion Chromatography	Method 005 Graphite Furnace Atomic Absorption/ ZEEMAN	
Laboratory Analyst	Bill Davis	Pam Niiya	Mike Humenny	
Data Availability	Planning and Technical Support Division, Air Quality Data Branch, (916) 323-4887; U.S. EPA Aerometric Information Retrieval System (AIRS)			

Hydrocarbon Monitoring as of December 11, 2000

Parameter Measured	Non-Methane Hydrocarbon Compound (NMHC)		Continuous Non-Methane Hydrocarbons	Carbonyl Compounds
	Total NMHC	Speciated NMHC (69 species, C2 through C12)		Acetone Formaldehyde Acetaldehyde
Sampling Schedule	Every 3 days, July through September plus episodes (3-hr samples)		Continuous Hourly Average	3-hr sampler
ARB Collection Method	XonTech 910A Gaseous Sampler with XonTech 912 Multisampler		Thermal Environmental (TECO) 55C Hydrocarbon Analyzer	Xontech 925 or other Carbonyl Samplers
Sampling Media	Polished Stainless Steel Canister		Not Applicable	DNPH-Coated Silica Gel Cartridges
Number of Sites Analyzed by the ARB	14 (High Ozone Areas)		2	5
Number of ARB Collocated Sites	1		0	0
Additional Sites Analyzed by other Agencies	6 SCAQMD (includes 2 continuous GC) 4 San Diego County APCD 3 Ventura County APCD 1 Santa Barbara APCD		13	4 SCAQMD 2 San Diego County APCD 1 Ventura County APCD 1 Santa Barbara APCD
ARB Analysis Method	Method 024 Cryofocusing Direct GC/FID	Method 032 Cryfocusing GC/FID	Flame Ionization Detector	Method 022 High-Performance Liquid Chromatography/Ultraviolet Detector
Laboratory Analyst	Sean Roy	Sean Roy,Pamela Gupta, Barry Taylor, Ben Chang	Not Applicable	Paul Chima
Data Availability	Planning and Technical Support Division, Air Quality Data Branch, (916) 322-6076; U.S. EPA Aerometric Information Retrieval System (AIRS)			

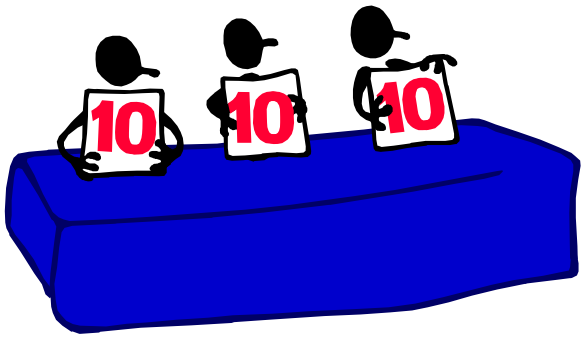
Meteorological Monitoring as of December 11, 2000

Parameter Measured	**Wind Speed**	**Wind Direction**	**Ambient Temperature**	**Relative Humidity**	**Atmospheric Pressure**	**Solar Radiation**
Sampling Schedule	Continuous Hourly Average	Continuous Hourly Average	Continuous Hourly Average	Continuous Hourly Average	Continuous Hourly Average	Continuous Hourly Average
Number of ARB Sites	45	45	44	20	18	8
Number of District Sites	132	132	103	52	25	37
Number of Mexico Sites	10	10	10	0	0	0
Method Used By ARB	Propeller or Cup Anemometer	Wind Vane Potentiometer	Aspirated Thermocouple or Thermistor	Thin Film Capacitor	Not Applicable	Thermopile or Pyranometer
Data Availability	Planning and Technical Support Division, Air Quality Data Branch, (916) 322-6076; U.S. EPA Aerometric Information Retrieval System (AIRS)					

APPENDIX B

2000
DISTRICT USABLE DATA ANALYSIS

Quality Assurance Section
Monitoring and Laboratory Division



Precision Data Analysis By District For Usable Data - 2000

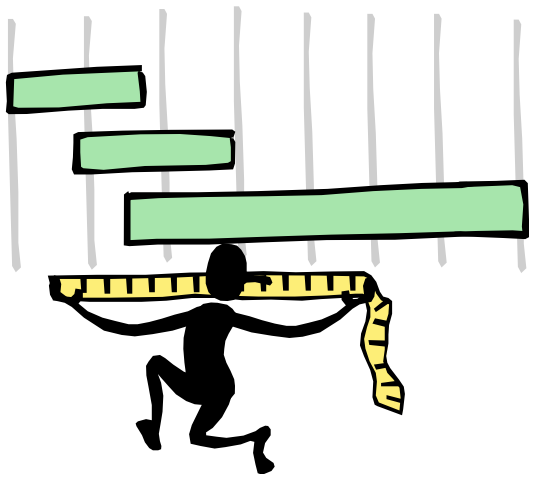
	Criteria Pollutants (%)					Particulate Samplers (%)							
District	CO	NO_2	O_3	SO_2	H_2S	PM2.5	PM10	PM10 Partisol	Dichot	TEOM	BAM	TSP	LEAD
Antelope Valley APCD	100	100	100							0			
Bay Area AQMD	100	100	95	100	0					10			
California ARB	74	76	79	100			77		73	0	0		0
Environmental Monitoring Company			0										
Glenn County APCD			77										
Great Basin Unified APCD	0												
Imperial County APCD	0	0	0		0								
Lake County APCD			92		97								
Mendocino County APCD	100	100	100										
Mojave Desert AQMD	100	100	89	100	100					0			
Monterey Bay Unified APCD	100	100	100	100									
National Park Service (NPS)			72										
Northern Sierra AQMD			67							0			
Northern Sonoma County APCD		0	100										
Placer County APCD			0										
Sacramento Metropolitan AQMD	92	85	81	92			85						
San Diego County APCD	82	85	88	87			37						
San Joaquin Valley Unified APCD	100	91	92							0			
San Luis Obispo County APCD	69	89	90	96						69			
Santa Barbara County APCD	80	99	100	100	0		85						
SEMARNAT (Mexico – Tracer Technologies)	0	0	0	0						0			
Shasta County APCD			100										
Siskiyou County APCD			0										
South Coast AQMD	96	95	89	91			44					57	66
Tehama County APCD			0										
Ventura County APCD	100	99	100	96			85						
XonTech, Inc.				83			0						
Yolo-Solano APCD			59										

Note: ARB's goal for usable data is 85%. Due to a systemic input problem, usable data rates unable to be determined for PM2.5 and PM10 Partisol.

APPENDIX C

SITING CRITERIA DISTANCES

Quality Assurance Section
Monitoring and Laboratory Division



Siting Criteria Distances

Instrument	Height above ground Micro	Other	Spacing between samplers	Height above obstructions	Distance from obstacles	Distance from tree dripline	Distance from walls, parapets, etc.	Airflow arc
PM10, AISI Nephelometer	2-7m	2-15m	<4>2m,		2 times height of obstacle above inlet	should be 20m, must be 10m if considered an obstruction	2m	270
Dichot, TEOM, PM2.5	2-7m	2-15m	<4>1m,		2 times height of obstacle above inlet	should be 20m, must be 10m if considered an obstruction	2m	270
Lead, TSP	2-7m	2-15m	<4>2m		2 times height of obstacle above inlet	micro and middle: no trees between sampler and source, neighborhood: should be 20m, must be 10m if considered an obstruction	2m	270
O3	3-15m	3-15m		1m	2 times height of obstacle above inlet	should be 20m, must be 10m if considered an obstruction	1m	270, or on side of building 180
CO	2 1/2 - 3 1/2m	3-15m		1m	2 times height of obstacle above inlet	micro: must be no trees between sampler and road, others: must be 10m if trees 5m above sampler.	1m	270, or on side of building 180
NO2	3-15m	3-15m		1m	2 times height of obstacle above inlet	should be 20m, if individual tree >5m above probe, must be 10m from dripline	1m	270, or on side of building 180
SO2	3-15m	3-15m		1m	2 times height of obstacle above inlet	should be 20m, must be 10m if considered an obstruction	1m	270, or on side of building 180
H2S	3-15m	3-15m		1m	2 times height of obstacle above inlet	should be 20m, must be 10m if considered an obstruction	1m	270,or on side of building 180
CH4, THC, NMHC, PAMS	3-15m	3-15m		1m	2 times height of obstacle above inlet	should be 20m, must be 10m in direction of urban core	1m	270, or on side of building 180
Toxics Gaseous 910, 910A, 920	3-15m	3-15m		2m	2 times height of obstacle above inlet			
Temperature and Relative Humidity	1.25-2m	1.25-2m			4 times height of obstacle above sensor	1 tower width from tower side	4.5m	
Wind Speed and Direction					1.5 times height of obstacle above sensor	2 tower widths from tower side, 1 tower width from tower top		
Solar Radiation								

MLD/QA

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