Section 4

FIELD OPERATIONS

The operation of the B sites followed established procedures (AeroVironment, 1987b), which included procedures for checking on intensive study day decision and for sample handling, and standard operating procedures for each piece of monitoring equipment. These procedures, together with intensive study logistics and site operator training are described below.

4.1 DECISION ON INTENSIVE STUDY DAY

The decision as to whether a particular day would be an intensive study day was based on a forecast that certain criteria would be met. These criteria were that ambient ozone and PM-10 concentrations would both be above the historical 50 percentile levels or either ambient ozone or PM-10 concentrations would be above the historical 75 percentile level. The SCAQMD made the forecast and the "go" decision was based on both the forecast and the operational readiness of the study team.

Every day of the study period was a potential intensive study day. On each day, the SCAQMD made a preliminary forecast in late morning, meteorologists from the SCAQMD, the ARB and Southern California Edison conferred on the forecast in early afternoon, SCAQS participants reported any operational problems to SCAQS headquarters (Claremont in the summer and Long Beach in the fall) by 1400 PST, and a decision was made at 1430 PST that was made available on recorder and posted at SCAQS headquarters by 1515 PST. A decision on a "go" day was normally made a day in advance to allow adequate time for mobilization. The final decision was made the following day at 1430 PST, 8 1/2 hours before actual sampling.

4.2 INTENSIVE STUDY LOGISTICS

In preparation for an intensive study period, all B-site instruments were checked before the first intensive and between intensive study periods. The stations were also stocked with enough supplies, such as hydrocarbon canisters and SCAQS sampler filters, for a three-day intensive study period.

Upon receipt of the first "go" decision, 32-1/2 hours ahead of the actual sampling, all equipment was inspected to determine operational status, and supplies at all B sites were confirmed. Any operational problems affecting sampling were reported to SCAQS headquarters before 1400 the next day. Site technicians were put on alert for the intensive study period. During the summer SCAQS, San Nicolas Island site technicians boarded the next available flight to the island. Due to the lack of scheduled weekend flights, they arrived on Fridays if it appeared that sampling days might occur on the weekend.

When the final "go" decision had been made, scientists visited the sites with particle analyzers (Claremont, Long Beach and Rubidoux in the summer and Long Beach and Downtown Los Angeles in the fall) to program them to record six-minute averages. All site technicians were briefed on the upcoming intensive, any changes in operational procedures, or any situations requiring special attention. The B-site operations command center at AV-Monrovia was staffed continuously through each intensive study period. Instrument technicians were on standby to help with instrument problems, supply shortages, or unforeseen difficulties.

Two site technicians were assigned to operate each B site, one during the day and one at night. In preparation for the intensive sampling, the night operator would arrive at the site three hours before sampling was scheduled to begin. He or she conducted presampling site checks and instrument checks, then operated all instruments and collected samples according to the schedule in Table 3-8. The day operator arrived at the site at 8 a.m. local time. After conferring with the night operator, he or she relieved the night operator at 9 a.m. The day operator continued site operation until 7 p.m. During the summer at midnight and during the fall at 11 p.m., technicians again arrived at the site and repeated the cycle. Following the completion of the sampling period, the night operator was responsible for shutting off instruments and unloading filters, canisters, Tedlar bags, and cartridges, and preparing chain-of-custody forms for sample pick-up. Three couriers were dispatched that night to pick up all samples for transport back to the AV command center where they were cataloged.

Tables 4-1 through 4-4 give the operational schedule for the B sites during SCAQS.

4.3 SITE OPERATOR TRAINING

During the summer, 18 site operators were needed to staff all the sites on the intensive days. To make sure that they were proficient in operating the instruments and that site operations were conducted uniformly, AV implemented a carefully designed training program. This comprised preparation of the "SCAQS B-Site Operation Manual," a one-day formal classroom lecture in May, followed by training and practice in operating and maintaining all B-site instruments, changing of sampling media, record keeping and documentation. The site operators were also involved in filter changes during the side-by-side tests of the SCAQS samplers before the samplers were deployed to the field. To prepare the operators for the routines during an intensive period, three mock stations were established at AV-Monrovia. Each operator was asked to conduct a one-day intensive period. After the mock intensive period, the operators and trainers met to discuss problems found and to exchange experiences. Inputs were incorporated in a revised Station Operation Manual (AeroVironment Inc., 1987b). Twenty-two people were trained. One of the trainees was not able to grasp all of the instructions and was released before the intensive study. At the end of the training program, there were eighteen regular site operators, plus three additional trained standby site operators and several AV staff who could be deployed to the field if necessary.

TABLE 4-1. Summer sampling schedule for San Nicholas Island and regular B sites excluding downtown Los Angeles.

Local Time	Action Performed	Approximate Time for Task Completion (in minutes)
0000	1. Night operator arrived at site.	--
	2. Performed station checks (all sites except SNI).	30
	3. Performed met checks and air quality zero/span and nephelometer checks (SNI only).	45
	4. Changed PM-10 filter (HAW, ANA and SNI).	30
0100	Performed SCAQS sampler routine.+	75
0215	Loaded carbonyl sampler and set timer.	30
0315-0415	Midshift break.	60
0600	1. Performed SCAQS sampler routine.	75
	2. Performed station checks.*	
0650	Loaded and started C_1C_{10} sampler and completed SCAQS sampler routine.	--
0800	1. Unloaded C_1-C_{10} sampler.	10
	2. Day operator arrived at station.	--
0900	Night operator completed shift.	--
1000	1. Performed SCAQS sampler routine.	75
	2. Performed station checks.	
1150	Loaded and started C_1-C_{10} sampler and completed SCAQS sampler routine.	--
1200-1300	Midshift break.	60
1300	Unloaded C_1-C_{10} sampler.	10

TABLE 4-1. (continued)

Local Time	Action Performed	Approximate Time for Task Completion (in minutes)
1400	Performed SCAQS sampler routine.	75
1515	Cleaned SCAQS sampler Set B filter cassettes (Day 1 only).	30
1550	Loaded and started C_1-C_{10} sampler and completed SCAQS sampler routine.	--
1700	Unloaded C_1-C_{10} sampler.	10
1745	Unloaded carbonyl sampler and prepared filters for shipment.	15
1800	1. Performed SCAQS sampler routine. 2. Performed station checks.	75
1915	(2000 Day 1 only) Day operator completed shift.	--
1915	Cleaned SCAQS sampler Set A filter cassettes (Day 1 only).	30

\+ SCAQS sampler routine refers to: (1) AV-SCAQS sampler loading and unloading procedures, (2) the procedures for preparing the sampling cassettes for the next sampling period, and (3) the procedure for labeling and packing the filters just unloaded from the sampler for shipment.

* Station checks subsequent to initial station checks did not include the nephelometer or gases zero/span checks on San Nicholas Island. Instead, the output from these instruments was reviewed to insure that the instrument was functioning properly.

TABLE 4-2. Summer sampling schedule for B+ sites and downtown Los Angeles.

Local Time	Action Performed	Approximate Time for Task Completion (in minutes)
0000	1. Night operator arrived at site.	--
	2. Performed station checks.++	30
	3. Changed PM-10 filter (LB and CLA only).	30
	4. Loaded ARB air toxics sampler.	--
	5. Loaded Rasmussen air toxics sampler.	--
	6. Performed nephelometer check (LB and CLA only).	--
0100	1. Performed SCAQS sampler routine.+	75
	2. Performed H_2O_2 routine.*	10
0230	Loaded carbonyl sampler and set timer for sampling.	30
0330-0415	Midshift break.	45
0500	Loaded and started C_1-C_{10} sampler (LB and CLA only).	--
0600	1. Performed SCAQS sampler routine.	75
	2. Unloaded C_1-C_{10} sampler (LB and CLA only).	10
	3. Performed H_2O_2 routine.	
	4. Performed station checks.**	
0650	Loaded and started C_1-C_{10} sampler land completed SCAQS sampler routine.	--
0800	1. Unloaded C_1-C_{10} sampler.	10
	2. Day operator arrived at site.	--
0850	1. Loaded and started C_1-C_{10} sampler (CLA and LB only).	--
	2. Night operator left site.	--
1000	1. Performed SCAQS sampler routine.	75
	2. Unloaded C_1-C_{10} sampler (CLA and LB only).	10
	3. Performed H_2O_2 routine.	10
	4. Performed station checks.	
1150	Loaded and started C_1-C_{10} sampler and completed SCAQS sampler routine.	--
1200-1300	Midshift break.	60
1300	1. Unloaded C_1-C_{10} sampler.	10
	2. H_2O_2 operator arrived on site.	--

TABLE 4-2. (continued)

Local Time	Action Performed	Approximate Time for Task Completion (in minutes)
1350	1. Loaded and started C_1-C_{10} sampler (CLA and LB only).	75
	2. Performed SCAQS sampler routine.	10
	3. H_2O_2 operator performed H_2O_2 routine.	30
	4. Performed station checks.	
1500	1. Unloaded C_1-C-$_{10}$ sampler (CLA and LB only).	10
	2. H_2O_2 operator performed H_2O_2 routine.	10
1515	1. Cleaned SCAQS sampler set B filter cassettes (Day 1 only)	30
1550	1. Loaded and started C_1C_{10} sampler.	--
	2. H_2O_2 operator performed H_2O_2 routine.	10
1700	1. Unloaded C_1-C_{10} sampler.	10
	2. Unloaded carbonyl sampler and prepared filters for shipment.	30
	3. H_2O_2 operator performed H_2O_2 routine.	10
1800	1. Performed SCAQS sampler routine.	75
	2. H_2O_2 operator performed H_2O_2 routine.	10
	3. Performed station checks.	30
1915 (2000 Day 1 only)	1. Day operator completed shift.	--
	2. H_2O_2 operator left site.	--
1915	1. Cleaned SCAQS sampler Set A filter casettes (Day 1 only)	30

\+ SCAQS sampler routine refers to: (1) AV-SCAQS sampler loading and unloading procedures, (2) the procedures for preparing the sampling cassettes for the next sampling period, and (3) the procedure for labeling and packing the filters just unloaded from the sampler for shipment.

* H_2O_2 routine refers to the procedures for changing the H_2O_2 reagents and restarting the sampler.

++ The station check procedures for Rubidoux, Claremont and Long Beach included the checks of the OPC, probe and EAA samplers not found at downtown Los Angeles. The daily zero/span check of the nephelometer at Long Beach and Claremont stations was also performed at this time.

** Station checks subsequent to the initial morning station check did not include the nephelometer zero/span check at Claremont and Long Beach.

TABLE 4-3. Fall sampling schedule for Anaheim, Burbank, Hawthorne, and Rubidoux.

Local Time	Action Performed	Approximate Time for Task Completion (in minutes)
2300	1. Night operator arrived.	--
	2. Changed PM-10 filter (HAW and ANA).	30
	3. Performed station checks.	30
0000	Performed SCAQS sampler routine.+	75
0045	Loaded carbonyl sampler and set timer.	30
0145-0415	Midshift break.	60
0600	1. Performed SCAQS sampler routine.	75
	2. Performed station checks.	
0650	Loaded and started C_1-C_{10} sampler and completed SCAQS sampler routine.	--
0800	1. Unloaded C_1-C_{10} sampler.	10
	2. Day operator arrived at monitoring station.	--
0900	Night operator completed shift.	--
1000	1. Performed SCAQS sampler routine.	75
	2. Performed station checks.	
1150	Loaded and started C_1-C_{10} sampler and completed SCAQS sampler routine.	--
1200-1300	Midshift break.	60
1400	Performed SCAQS sampler routine.	75
1515	Cleaned SCAQS sampler Set B filter cassettes (Day 1 only)	30
1550	Loaded and started C_1-C_{10} sampler and completed SCAQS sampler routine.	--
1700	Unloaded and started C_1-C_{10} sampler and completed SCAQS sampler routine.	--
1700	Unloaded C_1-C_{10} sampler.	10
1745	Unloaded carbonyl sampler and prepared filters for shipment.	15

TABLE 4-3. (continued)

Local Time	Action Performed	Approximate Time for Task Completion (in minutes)
1700	Performed C_1-C_{10} routine.	30
1745	Unloaded carbonyl sampler and prepared filters for shipment.	15
1800	1. Performed SCAQS sampler routine. 2. Performed station checks.	75
1915 (2000 Day 1 only)	Day operator completed shift.	--
1915	Cleaned SCAQS sampler Set A filter cassettes (Day 1 only)	30

+ SCAQS sampler routine refers to: (1) AV-SCAQS sampler loading and unloading procedures, (2) the procedures for preparing the sampling cassettes for the next sampling period, and (3) the procedure for labeling and packing the filters just unloaded from the sampler for shipment.

TABLE 4-4. Fall sampling schedule for Long Beach and downtown Los Angeles.

Local Time	Action Performed	Approximate Time for Task Completion (in minutes)
2300	1. Night operator arrived at site.	--
	2. Changed PM-10 filter (LB only).	30
	3. Performed station checks.	30
0000	Performed SCAQS sampler routine.+	75
0045	1. Performed checks on EAA, Climet OPC and Probe OPC.	30
	2. Loaded carbonyl sampler and set timer for sampling.	30
0215-0415	Midshift break.	60
0450	Loaded and started C_1-C_{10} sampler.	--
0600	1. Performed SCAQS sampler routine.	75
	2. Unloaded C_1-C_{10} sampler.	10
	3. Performed station checks.	
0650	Loaded and started C_1-C_{10} sampler and completed SCAQS sampler routine.	30
0800	1. Unloaded C_1-C_{10} sampler.	10
	2. Day operator arrived at monitoring station.	--
0850	1. Loaded and started C_1-C_{10} sampler.	--
	2. Night operator completed shift.	--
1000	1. Performed SCAQS sampler routine.	75
	2. Unloaded C_1-C_{10} sampler.	10
	3. Performed station checks.	
1150	Loaded and started C_1-C_{10} sampler and completed SCAQS sampler routine.	--
1200-1300	Midshift break.	60
1300	1. Unloaded C_1-C_{10} sampler.	10
1350	1. Loaded and started C_1-C_{10} sampler.	--
	2. Performed SCAQS sampler routine.	75

TABLE 4-4. (continued)

1500	1. Unloaded C_1-C_{10} sampler.	10
1515	Cleaned SCAQS sampler Set B filter cassettes (Day 1 only)	30
1550	1. Loaded and started C_1-C_{10} sampler.	--
1700	1. Unloaded C_1-C_{10} sampler. 2. Unloaded carbonyl sampler and prepared filters for shipment.	10 30
1800	1. Performed SCAQS sampler routine. 2. Performed station checks.	75
1915 (2000 Day 1 only)	1. Day operator completed shift.	--
1915	Cleaned SCAQS sampler Set A filter cassettes (Day 1 only)	30

\+ SCAQS sampler routine refers to: (1) AV-SCAQS sampler loading and unloading procedures, (2) the procedures for preparing the sampling cassettes for the next sampling period, and (3) the procedure for labeling and packing the filters just unloaded from the sampler for shipment.

After the summer study period, some of the trained operators returned to college. Two new operators were trained in October to replace those who were not available for the fall study. They went through the same training course. In addition, a refresher course was conducted for all fall study operators during the first week in November, before the fall study period.

4.4 QUALITY CONTROL

Various steps were taken to insure that data collected in the field were of high quality. These included:

- Training of site operators
- Standard operating procedures
- Chain-of-custody procedures
- Station records
- Data sheets
- Communication
- Site inspection

4.4.1 Training of Site Operators

Thorough training of site operators was essential to insure smooth operation of the sites during the intensive study. More importantly, it insured that the maintenance of equipment and the collection and handling of samples were carried out uniformly and that care was taken in collecting valid samples. This training was discussed in the preceding section.

4.4.2 Standard Operating Procedures

Standard operating procedures (AeroVironment, 1987b) were established for the operation of the B sites. These ranged from calling for information regarding the "go" decision, to what samples should be taken when and where, to sample handling, to step-by-step instructions on the operation of each piece of equipment. The procedures were first published in April 1987, then revised after the training sessions and issued to all site operators in June. Minor changes were made during the course of SCAQS based on our experience. For example, a Zefluor Teflon prefilter was added to avoid plugging the nylon filters in the SCAQS sampler. This procedure was adopted after the first intensive, during which the plugging was observed.

4.4.3 Chain-of-Custody Procedures

Chain-of-custody procedures were established to track the handling of sampling media and samples. Chain-of-custody forms were filled in and signed off by both the person relinquishing the sample or sampling media and the person accepting it. Figure 4-1 shows an example of a completed chain-of-custody form.

SCAQS PROGRAM

Chain-of-Custody Form

C1 - C10 HC Canisters

Sampling Period #: June 19, 1987

Canister Numbers

C191	C187	C177	C080
C139	C142	C178	C077
C138	C002	C057	C078
C183	C096	C113	C102
C185	C092	C111	C103
C128	C091	C194	C104
C129	C179	C118	C101
C182	C180	C131	C100
C094			

Relinqueshed by (signature)	Received by (signature)	Date/Time
[illegible]	[illegible]	6-23 1818

Relinqueshed by (signature)	Received by (signature)	Date/Time

Relinqueshed by (signature)	Received by (signature)	Date/Time

Relinqueshed by (signature)	Received by (signature)	Date/Time

FIGURE 4-1. **Example of a completed chain-of-custody form for C1-C10 samples.**

4.4.4 Station Records

The site operators maintained a station log, a checklist log and a sampler operation checklist. Any occurrence that might affect the operating status of the site or help in data interpretation was recorded in the station log. Information in the log included who was at the station, when he or she arrived, the schedule of performance of assigned tasks, communications with operations command center, unusual atmospheric phenomena, operational problems and resolutions, and unusual data values. Figure 4-2 shows an example of a station log from Rubidoux.

The station checklist log contained information (reference values and tolerances) to enable the site operator to rapidly identify equipment operating status. It also served to remind the site operator what he or she was to be working on and paying attention to. Any observations that were outside the tolerance limits were reported to operations command center and corrective action taken. Figure 4-3 is an example of a completed checklist log.

After the collection of a sample, the site technician recorded the status of that sample. Any problems associated with that sample collection were noted in the checklist. Figure 4-4 shows an example of a completed sampler operation checklist.

4.4.5 Data Sheets

A data sheet was designed for each sampler, namely, the SCAQS, PM-10, C_1-C_{10}, H_2O_2, carbonyl, ARB air toxics, and Rasmussen air toxics samplers. Data recorded included start and end times of each sample, the flow rate and other information pertinent to calculating pollutant concentrations. Figure 4-5 is an example of a SCAQS sampler data sheet.

4.4.6 Communications

The B-site operations command center was staffed during each intensive period. Site technicians contacted the command center at specified intervals to report the status of their operations. The command center staff also initiated calls to sites to remind the technicians of their duties, which served as a quality control check on their performance. Any changes in operational procedures or any events requiring attention were immediately passed to the sites from the center. All conversations between the center and the sites were logged. Key individuals also carried pagers so that they could be reached at any time.

SCAQS- RUBIDOUX

Project No.______
Book No.______

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Page No.__

JULY 12

22 56 ARB Air Toxics Sampler loaded with Bag A-43-J ready for 0100 start.

23 08 H_2O_2 sampler loaded with impingers A: KU-4-037-1A, B: KU-4-037-2B for 0100 start.

23 21 Station Check Completed.
Probe Not Present - Being Repaired
EAA Not [illegible]
Cabinet Power Light not On.
ST/DAS not taking new samples
Clock has not moved since 22:59:30.
AV Communications Called.

JULY 13

00 24 ST/DAS Froze at 00:23:30.
KC Moon Notified.

00 46 Adjusted Probe Serial No. to 'none' in setup on computer.

00 56 KC Moon called - EAA/OPC working OK.

00 58 H_2O_2 sampler started

01 00 Rasmussen AT sampler started

01 01 ~~[illegible]~~ ARB A.T. sampler started

01 05 SCAQS sampler started.

01 33 Station Check Completed Probe not present - all OK.

02 03 Completed Cleaning Set B SCAQS Cassettes.

To Page No.____

essed & Understood by me, | Date | Invented by | Date

FIGURE 4-2. Example of a station log.

AeroVironment Inc.

SCAQS Project

Site Name: Claremont

B SITE STATION CHECK LIST LOG

Intensive Sampling Period: From 7/13 to ____

Year 87

Instrument	Item checked	Reference	Tolerance	Date\Time 7/12/87 2020	7/13/87 0100	7/13/87 0533	7/13/87 1025	7/13/87 1410	7/13/87 1830	7/14/87 0000
SCAQS Sampler	Pumps	Running		No	Yes	Yes	Yes	Yes	Yes	Yes
	Plumbing	Secure			Yes	Yes	Yes	Yes	Yes	Yes
	Vacuum 1	Last Reading	+/- 1" Hg		Yes	Yes	Yes	Yes	Yes	Yes
	Vacuum 2	Last Reading	+/- 1" Hg		Yes	Yes	Yes	Yes	Yes	Yes
	Vacuum 3	Last Reading	+/- 1" Hg		Yes	Yes	Yes	Yes	Yes	Yes
Carbonyl	Pump	Ok		Not running now	Yes	Yes	Yes	Yes		Yes
	Chrontrol Timer	Time	+/- 5 min.		Yes	Yes	Yes	Yes	SHUT	Yes
	Plumbing	Secure			Yes	Yes	Yes	Yes	DOWN	Yes
H202	Line Heater			Not operating now	Yes	Yes	Yes	Yes	Yes	Yes
	HCHO Scrubber				Yes	Yes	Yes	Yes	Yes	Yes
	NO Cyl. Pressure	>250 psi			Yes	Yes	Yes	Yes	Yes	Yes
	NO Del. Pressure	60 psi			Yes	Yes	Yes	Yes	Yes	Yes
	Rotameter Flow	15 cce			18cc/min	18 cc/min	16cc/m	17 cc/m	16 cc/m	16cc/min
C1-C10 Hydrocarbon Sampler	Pump	Ok		Not operating now	Yes	Yes	Yes	Yes	Shut	Shut
	Plumbing	Secure			Yes	Yes	Yes	Yes		
	Chrontrol Timer	Time	+/- 5 min.		None	None	None	None	Down	down
	Electrical Connections	Ok			Yes	Yes	Yes	Yes		
Rassmussan Air Toxics Sampler	Pump	Ok		Not operating Now	Yes	Yes	Yes	Yes	NO	Pressure
	Plumbing	Secure			Yes	Yes	Yes	Yes	canister	in the
	Chrontrol Timer	Time			None	None	None	None	not	Vaccum
	Electrical Connections	Ok			Yes	Yes	Yes	Yes	Filling	area (too low)
ARB Air Toxics Sampler	Pump	Ok		Not operating now	Yes	Yes	Yes	Yes	Yes	Yes
	Plumbing	Secure			Yes	Yes	Yes	Yes	Yes	Yes
Technician's Initials				[illegible]	[illegible]	[illegible]	JG	JG	JG	[illegible]

AeroVironment Inc. 825 Myrtle Ave., Monrovia, CA 91016 (818)357-9983

AV-F-F011A41b

FIGURE 4-3 Example of a station check list log.

AeroVironment Inc.

8 SITE STATION CHECK LIST LOG

SCAQS Project Site Name: Claremont

Intensive Sampling Period: From 7/13 to ____ Year 87

Instrument	Item checked	Reference	Tolerance	Date\Time 7/12/87 2030	7/13/87 0100	7/13/87 0530	7/13/87 1025	7/13/87 1410	7/13/87 1630	7/14/87 0000
Station	Time			8:32 PM	OK	OK	OK	OK	OK	OK
	Temperature min/max	25 Deg. C	+/- 5 Deg. C	25.0 °C	22.5/30.0	23/25	19/25	18/23	20/24	20/24
STI DAS	Operating	Yes/No		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Printer	Operating	Yes/No		Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Paper	Yes/No		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Aerosol Sampling Inlet	Fan	Yes/No		Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Plumbing	Secure		Yes	Yes	Yes	Yes	Yes	Yes	Yes
OPC Climet	Power	On		Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Flowmeter	Full Scale		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Probe PMS	Power	On		Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Sample Flow			1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Sheath Flow			20.0	20.0	20.0	20.0	20.0	20.0	20.0
EAA	Power	On		Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Cont./Ext. Switch	Ex. Prog.		Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Mode	Cont. Run		Manual	Man	Man	Man	Man	Man	Man
	Particle Dia. Steps	All		Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Performed Cal.	Yes/No		No	No	No	No	No	No	No
Neph.	Power	On		Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Air-Freon-Oper Switch	Oper		Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Zero-Oper-Cal Switch	Oper		Yes	Yes	Yes	Yes	Yes	Yes	Yes
PM-10	Pump	Running		No	Yes	Yes	Yes	Yes	Yes	Yes
	Flow Rate			—	39.0	39.5	39.5	39.0	35.0	39.0

FIGURE 4-3. Continued.

SCAQS Program
Sampler Operation Checklist
Continued, Page 3

CCA

Sampler	Run Times	OK (yes/no)	Comments
SCAGS	0100	OK	Started at 0018
	0600	OK	Started 0559
	1000	OK	Started 10:18
	1400	OK	Started 14:05
	1800	OK	Started 1800
Carbonyl	0500	NO	Valve # 6 not working properly - see log; everything else OK.
	0700	OK except for	previous problem
	0900	OK	Started on time, ended at 10:00
	1200	OK	Started on time, ended at 1300
	1400	OK	Started on time, ended at 1500
	1600	OK	Started on time, ended at 1700
C1-C10 Hydro-carbon	0500	OK	Started on time * [illegible] canister @ 0519
	0700	OK	Started on time
	0900	OK	Started at 0900, ended at 10:00
	1200	OK	Started at 1200, ended at 1300
	1400	OK	Started at 1400, ended at 1500
	1600	OK	Started at 1600, ended at 1700
H2O2	0100	OK	
	0600	OK (0625)	No flow rate now 18 ccm ± .5
	1000	OK	Ended at 10:00
	1400	OK	
	1500	OK	
	1600	OK	
	1700	OK	
	1800	OK	

* Note to station operators: Only fill in information for instrumentation that is particular to your sampling station.

FIGURE 4-4. Example of a sampler operation checklist.

SCAQS Sampler Data Sheet

Station Name: Claremont   Operator's Name: J Gray

Start Date: 7/14/87   Tupperware Box #: 054

Start Timer/Time: 49348.3 / 0100   Start Temperature: 19.5 °C

End Timer/Time: 49636.9 0550   End Temperature: 18.0 °C

Sampler Position	Collection Media	Flow Rate(lpm) Start	End	Ref Flow+ (lpm)	Sam vol* (m3)	Filter I.D. Number	Comments**
1	Nylon	10.2	10.2	9-13		1 -N1 054	
2	Zflour Teflon	22.0	22.0	20-25		2F-Z1 054	
	Carbonate	22.0	22.0	20-25		2B-C1 054	
3	Nylon	8.5	8.5	8-10		3 -N2 054	
4	Nylon	8.6	8.6	8-10		4 -N3 054	spare used
5	Oxalic Acid	4.3	4.2	3 - 5		5 -X1 054	
6	Polycarbonate	4.8	4.8	4 - 6		6 -P1 054	
7	Quartz	33.8	33.8	32-37		7 -Q1 054	
8	Teflon(prewt)	34.2	34.0	32-37		8 -T1 054	
9	Teflon	33.0	32.8	32-37		9F-T2 054	
	Quartz	33.0	32.8	32-37		9B-Q2 054	
10	Quartz	34.0	34.0	32-37		10 -Q3 054	
11	Teflon(prewt)	33.8	33.8	32-37		11 -T3 054	
12	Teflon	34.0	33.8	32-37		12 -T4 054	
	Denuder			3 - 5		5F-D1 054	

Vacuum Gauge Readings

	Start	End	w/o Filters
1)	23.0	23.0	29.0
2)	17.2	17.5	29.0
3)	18.5	18.7	31.0

+ Reference flow values are approximate and will be qualified for each site. If the measured flow rates are found to be outside of the specified reference flow range, the station operator must inform AV-Monrovia as soon as possible by means of the AV communication number.

* Sample volume, to be calculated by EMSI

** Indicate any problems with sample such as interrupted sample flow or

FIGURE 4-5. Example of a sampler data sheet.

4.4.7 Site Inspection

Throughout the SCAQS intensives, AV staff visited the B sites at random intervals to check the performance of the site operators. They observed the way the site operators handled samples and sampling media and reviewed entries to station records and data sheets. Similar inspections were also made whenever AV's scientists or senior technicians were on site to repair instruments, correct problems or deliver supplies.

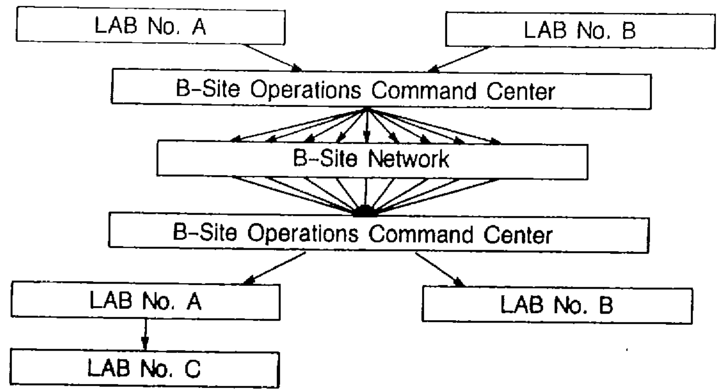
4.5 SAMPLE HANDLING AND STORAGE

Samples handled by the B-site operators included: SCAQs sampler samples, C_1-C_{10}, carbonyls, PM-10, H_2O_2, ARB air toxics, Rasmussen air toxics, and PAH. The sampling media for these samples were SCAQS sampler filters, canisters, capsules, filters, impingers, Tedlar bags, canisters, and filters, respectively.

The sampling media were prepared by various laboratories and sent either directly to the sites or to the B-site operations command center for distribution to sites. AV picked up most samples from the sites and delivered them to the AV operations command center for shipment to laboratories. A few samples were picked up directly by the laboratories. Figure 4-6 shows a flow diagram of sample and sample media handling.

EMSI prepared the SCAQS sampler filter media and shipped it, together with the carbonyl capsules ENSR prepared, to the B-site operations command center in ice chests. There, they were stored either in blue ice or in a room with a temperature of 10^oC. They were then transported to the sites in ice chests with blue ice and immediately transferred into refrigerators for storage until use. Canisters for C_1-C_{10} and air toxics from Biospherics, PM-10 filters from the SCAQMD, the PAH filters from the University of California at Riverside (UCR) were shipped to the B-site operations command center and distributed to and stored at the sites without special handling or refrigeration. The H_2O_2 impingers and Tedlar bags for air toxics were delivered to and picked up from sites by the laboratories that prepared the media and analyzed the samples, namely, EMSI and the ARB, respectively.

After the SCAQS sampler filter and carbonyl samples had been collected, they were refrigerated until they were picked up for transport to AV, at which time they were transferred into ice chests with blue ice and kept in ice chests until they were shipped to EMSI. PAH samples were also refrigerated and sent to UCR for analysis. The other samples AV handled, namely, PM-10, air toxics samples in canisters, and C_1-C_{10}, did not need refrigeration. The PM-10 and air toxics samples were shipped to the SCAQMD and Biospherics, respectively, for analysis. The C_1-C_{10} samples were first sent to the EPA for analysis. They were then picked up by AV and shipped to Biospherics for duplicate analysis. The EPA retained certain samples for further analysis.



Sampler	Group Responsible for Delivery to AV	Group Responsible from AV to Sites and Return to AV	Group Responsible for Delivery to First Analysis Lab	Name of First Lab	Group Responsible for Delivery to Second Analysis Lab	Name of Second Lab
SCAQS Sampler	EMSI	AV	ARB	EMSI	EMSI	EPA
C_1-C_{10}	Bio.	AV	AV	EPA	AV	Bio.
Carbonyls	ENSR	AV	ARB	ENSR	--	--
PM-10	AQMD	AV	AV	AQMD	--	--
H_2O_2		EMSI delivered and picked up samples directly to and from the monitoring stations				
ARB Air toxics		ARB delivered and picked up samples directly to and from the monitoring stations				
Rasmussen Air toxics	Bio.	AV	AV	Bio	Bio	--
PAH	UCR	UCR	AV	UCR	--	--

FIGURE 4-6. Chain-of-custody flow chart for B-site samples and collection substrates (samplers operated by AV).

Section 5

DATA REPORTING

Data that AV was responsible for reporting consisted of three types: those associated with samples collected for later analysis by laboratories; those from continuous air quality and meteorological monitoring, and those from particle analyzers. Each required different processing approaches and reporting formats.

5.1 SAMPLES REQUIRING LABORATORY ANALYSIS

Samples collected by AV and submitted to laboratories for analysis included: PM-10, C_1-C_{10}, carbonyl, H_2O_2, air toxics, PAH and SCAQS samples. Except for the SCAQS samples, AV's involvement with data reporting regarding these samples was limited to the submission of data sheets completed in the field to the appropriate laboratories with the samples. Figures 5-1 through 5-6 are examples of data sheets for PM-10, C_1-C_{10}, carbonyl, H_2O_2, Rasmussen and ARB air toxics, respectively. Data for PAH samples were recorded on the envelopes containing the samples. Basically, the data recorded were those needed to determine sample volumes. Thus, the start and end times of sampling and, for some samples, the flow rates were the key parameters recorded.

An example of the SCAQS sampler data sheet was presented earlier in Figure 4-5. Sample volumes were calculated from the actual flow rates and the sampling time. The actual flow rate was determined by applying a calibration factor to the flow rate recorded from rotameters. Calibrations were performed using a mass flowmeter that had been calibrated to a laminar flow element traceable to the National Bureau of Standards (NBS). Tables 5-1 and 5-2 show the results of calibrating the SCAQS sampler rotameter during SCAQS.

5.2 SCAQS SAMPLER VOLUME UNCERTAINTIES

In addition to determining flow volumes, we also calculated volume uncertainties for each flow volume and included them in the SCAQS data base. In making these calculations, we assumed that uncertainties were inherent in readings from all instruments used in determining the flow, sampling time, and calibrations. Maximum estimates of these reading uncertainties, standard errors in the slopes and intercepts from the calibration curves, and the maximum uncertainty involved in using the average flow were combined to yield an uncertainty for each volume calculated. This is similar to the approach used by Mueller et al. (1983), Kline et al. (1958), and Rogers (1984) in estimating sample volume uncertainties.

FIGURE 5-1

PM-10 Data Sheet

Station Name: Long Beach

Station Operator's Name: J Phillips

Filter Number: 297

Start:

Date: 12/9/87

Time: 2345

Meter: 899269

Chart: 38 cfm

End:

Date: 12/10/87

Time: 2345

Meter: 91263.9

Chart: 38 cfm

Comments: ______

FIGURE 5-2.

C1-C10 Sampler Data Sheet

Site Name: Rubidoux

Date: 9/3/87

Station Operator: [illegible]

SS Bottle Number	Start				End			
	Time	Press	Vac	Temp	Time	Press	Vac	Temp
CQ188	0700	23 psi	-30" Hg	26°C	0816	23 psi	18 psi	20.2
CQ199	1200	23 psi	30" Hg	29.9°C	1300	22.5 psi	13.5 psi	34.6
CQ430	1600	22.5 psi	30" Hg	31.9°C	1700	22.5 psi	13 psi	31.7

Comments:

FIGURE 5-3.

CARBONYL DATA SHEET

Site: Claremont

PROJECT: SCAQS

Date: 8/29/87

Time: 0009

Chrontrol Time: 0009

Station Operator: Sandifer

Gauge Nos: Main 25 Dup 24 Down A3

Sample Number	Channel Number	Date	Sampling Time Start	Sampling Time Stop	Initial Gauge Up	Initial Gauge Down	Final Gauge Up	Final Gauge Down	Remarks
841	1	8/29/87	0500	0600	7.5 in Hg	25.0 in Hg	81	24.8	
817	2	8/29/87	0700	0800	9.2	25.0	95	245	
819	3	8/29/87	0900	1000	9.6	25.0	101	247	
827	4	8/29/87	1200	1300	8.5	25.0	91	24.7	
826	5	8/29/87	1400	1500	8.5	25.0	9.8	25.0	
842	6	8/29/87	1600	1700	9.0	25.0	9.6	25.0	

FIGURE 5-4.

EMSI/BNL HYDROGEN PEROXIDE SAMPLING DATA SHEET

SITE: Long Beach NO CYLINDER PRESSURE: 2000 PUMP #: 04
DATE: 6/19/87 NO REGULATOR PRESSURE: 60 PSI HEATER ON? Yes
SCAQS TEST DAY #: 1 NO FLOW AT 0100: 60 PSI AT 1000: 60 PSI AT 1800: ___
scc/min scc/min

		Start	Stop	IMPINGER A	IMPINGER B
1	Time	1:02	6:01	LB-3-010-1A	LB-3-010-2B
	Flow	4.7	5.4		
	NO	60	60		
	Heatr	✓	✓		
	Intls	DF	TPM		
2	Time	6:18	9:58	LB-3-011-1A	LB-3-011-2B
	Flow	5.5	5.5		
	NO	60	60		
	Heatr	✓	✓		
	Intls	TPM	DF		
3	Time	10:00	1357	LB-3-012-1A	LB-3-012-2B
	Flow	5.5	5.4		
	NO	60	60		
	Heatr	✓	✓		
	Intls	DF	DF		
4a	Time	1400	1458	LB-3-013-1A	LB-3-013-2B
	Flow	5.5	5.5		
	NO	60	60		
	Heatr	✓	✓		
	Intls	DF	DF		
4b	Time	1500	1558	LB-3-014-1A	LB-3-014-2B
	Flow	5.5	4.6		
	NO	61	61		
	Heatr	✓	✓		
	Intls	DF	DF		
4c	Time	1600	1658	LB-3-015-1A	LB-3-015-2B
	Flow	4.6	4.6		
	NO	61	61		
	Heatr	✓	✓		
	Intls	DF	DF		
4d	Time	1700	1755	LB-3-016-1A	LB-3-016-2B
	Flow	4.4	4.4		
	NO	61	61		
	Heatr	✓	✓		
	Intls	DF	DF		
5	Time	1800	6/20 0050	LB-3-017-1A	LB-3-017-2B
	Flow	4.5	4.6		
	NO	60	62.5		
	Heatr	✓	✓		
	Intls	DF	TPM		

NOTES:

FIELD BLANK
LB-3-303-0

FIGURE 5-5.

Rasmussen
Air Toxics Sampler Data Sheet

Site Name: Claremont

Station Operator: C. Sandifer

Sampler Number: ______

SS Bottle Number: WM-18

Start

Date: 6/19/87

Time: 0100

Pressure Gauge Reading: 20 psi

Vacuum Gauge Reading: 27 in Hg

Temp: 16°C

.d

Date: 6/20/87

Time: 0122

Pressure Gauge Reading: 20 psi

Vacuum Gauge Reading: 16.2 psi

Temp: 16.9°C

FIGURE 5-6.

ARB Air Toxics Sampler Data Sheet

Site Name: Claremont

Station Operator: Sarah

Sampler Number:

Tedlar Bag Number: A-104-J

Start

Date: 7/14/87

Time: 0115

Flow: 35 cc/min

Temp: 19.5 °C

End

Date: 7/15/87

Time: 0120

Flow: 34 cc/min

Temp: 18.8 °C

TABLE 5-1. Calculated best regression fit and error for SCAQS samplers during summer.

$$Y = a X + b$$

SITE	s/n	**LOW** (0-10 lpm) **FLOWRATE** (Legs 3,4,5,6)	**HIGH** (0-100 lpm) **FLOWRATE** (Legs 1,2,7,8,9,10,11,12)	**COMMENT**
DLA	1	Y=.968 X + .121	Y=.958 X +2.033	27 C
		r=.994	r=.999	
	error	0.027 X ± 0.06	0.015 X ± 0.49	
HAW	2	Y= .955 X +.206	y= 1.026 X -.207	24 C
		r=.999	r=.999	
	error	0.024 X ± 0.14	0.02 X ± 0.65	
ANA	3	Y= .967 X +.171	Y= .965 X +.645	26 C
		r=.998	R=.999	
	error	0.035 X ± 0.20	0.015 X ± 0.50	
SNI	4	Y=.947 X +.150	Y=.983 X + .150	23 C
		r=1.000	r=1.000	
	error	0.011 X ± 0.081	0.014 X ± 0.40	
RUB	5	Y=.987 X -.087	Y=.971 X +1.666	24 C
		r=.999	r=.997	
	error	0.015 X ± 0.05	0.031 X ± 0.97	
BUR	6	Y=.992 X -.077	Y=1.004 X +1.655	28 C
		r=1.000	r=.998	
	error	0.007 X ± 0.03	0.023 X ± 0.67	
AZU	7	Y=.996 X +.145	Y=1.018 X +.325	24 C
		r=.995	r=1.000	
	error	0.057 X ± 0.25	0.011 X ± 0.34	
LB	8	Y=.967 X + .124	Y=.995 X + 1.427	26 C
		r=.999	r=1.000	
	error	0.03 X ± 0.15	0.018 X ± 0.54	
CLA	GM	Y= 1.010 X +.627	Y= .989 X +3.826	25 C
		r=.992	r=.998	
	error	0.027 X ± 0.20	0.031 X ± 0.84	

where X is rotameter reading and Y is actual liters per minute at the above indicated temp.

TABLE 5-2. Calculated best regression fit and error for SCAQS samplers during fall.

$$Y = a X + b$$

SITE	s/n	LOW (0-10alpm) FLOWRATE (Legs 3,4,5,6)	HIGH (0-100alpm) FLOWRATE Legs(1,2,7,8,9,10,11,12)	COMMENT
DLA	1	Y=1.003 X -.075	Y=.981 X +1.794	14 C
		r=1.000	r=.999	
	error	0.018 X ± 0.13	0.025 X ± 0.70	
HAW	2	Y= .934 X +.216	y= .980 X +1.005	17 C
		r=.999	r=.997	
	error	0.012 X ± 0.15	0.04 ± 1.04	
ANA	3	Y= .944 X +.153	Y= 1.001 X +.813	17 C
		r=.998	r=1.000	
	error	0.032 X ± 0.34	0.008 X ± 0.21	
RUB	5	Y=1.003 X -.087	Y=1.019 X +.100	22 C
		r=.999	r=.997	
	error	0.014 X ± 0.16	0.024 X ± 0.65	
BUR	6	Y=.968 X +.242	Y=1.004 X +1.328	18 C
		r=.999	r=1.000	
	error	0.013 X ± 0.16	0.014 X ± 0.38	
LB	8	Y=.959 X + .197	Y=1.064 X - 1.692	18 C
		r=.998	r=.999	
	error	0.031 X ± 0.20	0.02 X ± 0.56	

where X is rotameter reading and Y is actual liters per minute at the above indicated temp.

The equation used is:

$$\sigma_v/V = [(1/Y)^2 \{a^2 (\sigma_x{}^2 + \sigma_{xa}) + X^2 \sigma_a{}^2 + \sigma_b{}^2\} + (1/\Delta T)^2 \sigma_{\Delta t}{}^2]^{1/2}$$

where σ_v is the sample volume uncertainty

V is the sample volume and is equal to $Y\Delta t$

Y is the actual flow rate and is equal to $aX + b$ where a and b are constants from the calibration curve and X is the average of the beginning and end rotameter readings (X_2 and X_1)

σ_{xa} is the uncertainty due to flow variation and is equal to $(X_2-X_1)/2$

Table 5-3 shows the uncertainties in the readings of the rotameters and timers (σ_x and $\sigma_{\Delta t}$), estimated from previous engineering experiences. The SCAQS sampler used two different rotameters (one for flows lower than 10 lpm and one for flows higher than 10 lpm). The twelve lines had nominal flow rates that varied from 4 to 36 lpm. Tables 5-1 and 5-2 show the best regressions and standard errors (σ_a and σ_b) for each rotameter at each site for the summer and fall studies.

Tables 5-4 and 5-5 give percent volume uncertainties ($\sigma v/V \times 100$) and their average standard deviations for each line of the sampler at each site for the summer and fall studies. The highest percent uncertainties are for Lines 1, 5, and 6 (those with the lowest flows in their rotameter range), showing the importance of the cumulative uncertainties in readings and calibrations. These larger percent uncertainties also reflect the lower volumes sampled. The time uncertainty is always negligible. Lines 1, 3, 4, and 6 had additional contributions to the volume uncertainty from flow drops. For Lines 1, 3, and 4, high uncertainties were due to the nylon filters becoming plugged and were corrected after the first few days of the study by adding a Zefluor Teflon filter before the nylon filter. Line 6 had problems only when mass loadings were very high. This occurred less than 5 percent of the time.

5.3 CONTINUOUS AIR QUALITY AND METEOROLOGICAL DATA

The continuous air quality and meteorological parameters AV processed included wind speed, wind direction, temperature, dew point, carbon monoxide, nitrogen oxides, ozone and light scattering on San Nicolas Island during the summer; ultraviolet (UV) radiation at Downtown Los Angeles, Long Beach and Rubidoux during the summer and fall; and light scattering at Claremont during the summer and at Long Beach during the summer and fall.

All continuous data collected on San Nicolas Island were recorded by the SUM-X data logger. All UV radiation data were recorded on strip charts, while light scattering data at Claremont and Long Beach were recorded by personal computers. The data logger and personal computers interrogated the analyzers once per second. An hourly averaged reading based on 3600 data points was then calculated and stored. Hourly averaged UV radiation data were hand-reduced from strip charts.

Table 5-3. Estimated uncertainties in the readings of the rotameters and timers.

Variables	Min. Value	Max. Value	Estimated Error
Rotameter Reading (high) (0-100 lpm) Legs 1,2,7-12	11 lpm	36 lpm	σ_x:0.5 lpm
Rotameter Reading (low) (0-10 lpm) Legs 3-6	4.5 lpm	10 lpm	σ_x:0.15 lpm
Sampling Time	240 min	360 min	$\sigma_{\Delta t}$:2 min

TABLE 5-4. Summary of Average SCAQS 1- sigma volume uncertainties ($\frac{\sigma v}{V} \times 100$) for the Summer study (6/19/87 to 9/3/87).

SITE

LEG	HAWTHORNE AVG %	HAWTHORNE SD	LONG BEACH AVG %	LONG BEACH SD	ANAHEIM AVG %	ANAHEIM SD
1	7.86	0.18	6.46	0.21	6.58	0.24
2	4.42	0.32	3.80	0.24	3.63	0.15
3	3.59	0.24	4.29	1.93	4.71	0.11
4	3.83	0.98	3.99	0.09	4.67	0.07
5	5.31	0.08	5.77	0.06	6.75	0.06
6	4.94	0.23	5.51	0.26	6.26	0.07
7	3.21	0.13	2.84	0.09	2.67	0.05
8	3.18	0.07	2.79	0.05	2.67	0.07
9	3.21	0.04	2.83	0.04	2.68	0.05
10	3.20	0.07	2.82	0.05	2.67	0.04
11	3.12	0.05	2.83	0.05	2.66	0.05
12	3.12	0.11	2.76	0.05	2.66	0.05

LEG	BURBANK AVG %	BURBANK SD	RUBIDOUX AVG %	RUBIDOUX SD	DOWNTOWN LA AVG %	DOWNTOWN LA SD
1	7.45	1.28	9.62	0.48	5.91	1.08
2	4.30	0.13	5.81	0.30	3.42	0.19
3	2.12	0.10	3.55	4.29	4.32	3.79
4	2.17	0.58	3.23	3.37	3.95	2.92
5	3.82	0.34	4.67	2.89	5.23	2.65
6	3.67	0.50	5.21	4.19	5.12	2.73
7	3.30	0.07	5.17	3.70	2.55	0.04
8	3.28	0.08	5.10	3.72	2.58	0.15
9	3.33	0.04	5.18	3.69	2.58	0.05
10	3.26	0.04	5.15	3.74	2.60	0.06
11	3.27	0.06	5.15	3.74	2.55	0.06
12	3.26	0.06	5.17	3.73	2.51	0.07

LEG	SAN NICOLAS ISLAND AVG %	SAN NICOLAS ISLAND SD	AZUSA AVG %	AZUSA SD	CLAREMONT AVG %	CLAREMONT SD
1	5.98	0.06	7.37	5.16	5.96	0.56
2	3.34	0.12	3.19	0.49	4.07	0.13
3	2.35	0.19	7.52	2.95	3.83	1.31
4	2.61	2.05	7.60	3.75	3.60	0.34
5	4.08	0.08	8.72	0.10	5.05	0.06
6	3.64	0.34	8.62	2.34	5.37	3.02
7	2.45	0.05	2.19	0.17	3.54	0.03
8	2.45	0.05	2.20	0.08	3.52	0.04
9	2.45	0.05	2.20	0.07	3.56	0.04
10	2.46	0.13	2.17	0.06	3.52	0.04
11	2.41	0.05	2.19	0.07	3.55	0.06
12	2.44	0.05	2.19	0.16	3.54	0.04

TABLE 5-5. Summary of average SCAQS 1-sigma volume uncertainties ($\frac{\sigma V}{V}$ x 100) for the fall study (11/11/87 to 12/11/87).

SITE

LEG	HAWTHORNE AVG %	HAWTHORNE SD	LONG BEACH AVG %	LONG BEACH SD	ANAHEIM AVG %	ANAHEIM SD
1	10.52	0.12	8.38	0.21	4.85	0.21
2	6.54	0.25	4.44	0.37	2.76	0.53
3	2.90	0.07	4.33	0.06	5.55	0.09
4	2.83	0.08	5.01	2.64	5.57	0.08
5	5.02	0.08	6.62	0.06	9.50	0.15
6	6.35	3.33	8.26	4.09	10.25	3.55
7	5.25	0.05	3.08	0.04	1.88	0.07
8	5.24	0.05	3.09	0.07	1.97	0.37
9	5.29	0.05	3.10	0.07	1.99	0.36
10	5.24	0.03	3.08	0.04	1.89	0.07
11	5.29	0.52	3.59	2.23	2.07	1.00
12	5.29	0.54	3.85	3.15	1.93	0.20

LEG	BURBANK AVG %	BURBANK SD	RUBIDOUX AVG %	RUBIDOUX SD	DOWNTOWN LA AVG %	DOWNTOWN LA SD
1	5.31	0.05	7.75	0.12	7.23	0.08
2	3.14	0.12	4.52	0.24	4.49	0.45
3	2.87	0.06	3.11	0.19	2.99	0.11
4	2.96	0.45	3.05	0.10	3.01	0.07
5	5.17	0.13	5.89	0.17	5.64	0.13
6	6.12	2.78	7.18	5.01	6.86	4.19
7	2.36	0.06	3.43	0.04	3.47	0.04
8	2.32	0.05	3.42	0.40	3.50	0.05
9	2.40	0.06	3.69	1.42	3.51	0.04
10	2.33	0.06	3.39	0.03	3.51	0.04
11	2.46	0.69	3.80	1.64	3.48	0.06
12	2.63	1.71	3.72	1.09	3.48	0.14

Figure 5-7 shows the procedure for processing and validating these data. This procedure complies with the EPA's Quality Assurance Handbook, Volumes I and II (EPA, 1985). Each site's data were reviewed for internal consistency using a combination of automatic and manual screening techniques. Upper and lower limits, as well as acceptable rate-of-change values for each parameter, were established in an outlier screening program in the data base (see Table 5-6). The printout shown in Figure 5-8 illustrates a typical output of raw data that have been subjected to the automated outlier screening routines. We examined the data flagged by the routine and reviewed station logs to determine the existence of abnormal operations or local interferences. Data determined invalid were replaced with codes identifying reasons for data loss (see Table 5-7). All the air quality and meteorological data AV processed and validated were submitted to the SCAQS data base.

5.4 AEROSOL DATA

Three instruments were used to measure physical properties of aerosols at B+ sites: the TSI electrical aerosol analyzer (EAA), Model 3030, the Particle Measuring System active scattering aerosol spectrometer probe (Probe), Model ASASP-X 32CH, and the Climet optical particle counter (OPC), Model CI208. The EAA takes one four-minute sample and reports it as a six-minute average. It counts particles with diameters from 0.0056 to 1.0 μm and stores the information in 9 different size channels. The Probe takes about 315 one-second counts to calculate a six-minute average. It counts particles with diameters from 0.09 to 3.0 μm and stores the information in 32 different size channels. The OPC takes about five and three quarter minutes of continuous readings to calculate a six-minute average. It counts particles with diameters from 0.3 to 10 μm and stores the information in 69 different size channels.

Processing the aerosol data involved summing particle counts over the entire size distribution range for each instrument. Level I validation was performed only on data collected during intensive periods. This consisted of generating time series plots of hourly averaged particle counts. An aerosol scientist reviewed these plots to determine outliers and inconsistencies. Suspect values were scrutinized by examining six-minute averages as well as field logs. Any data determined to be invalid were replaced by a missing data code (see Table 5-7).

Data submitted to the SCAQS data manager (ERT) included validated six-minute-average particle counts summed over the entire size distribution range for each instrument for intensive periods, hourly averaged particle counts for the entire size range for each instrument for nonintensive periods, and raw data as recorded in the field.

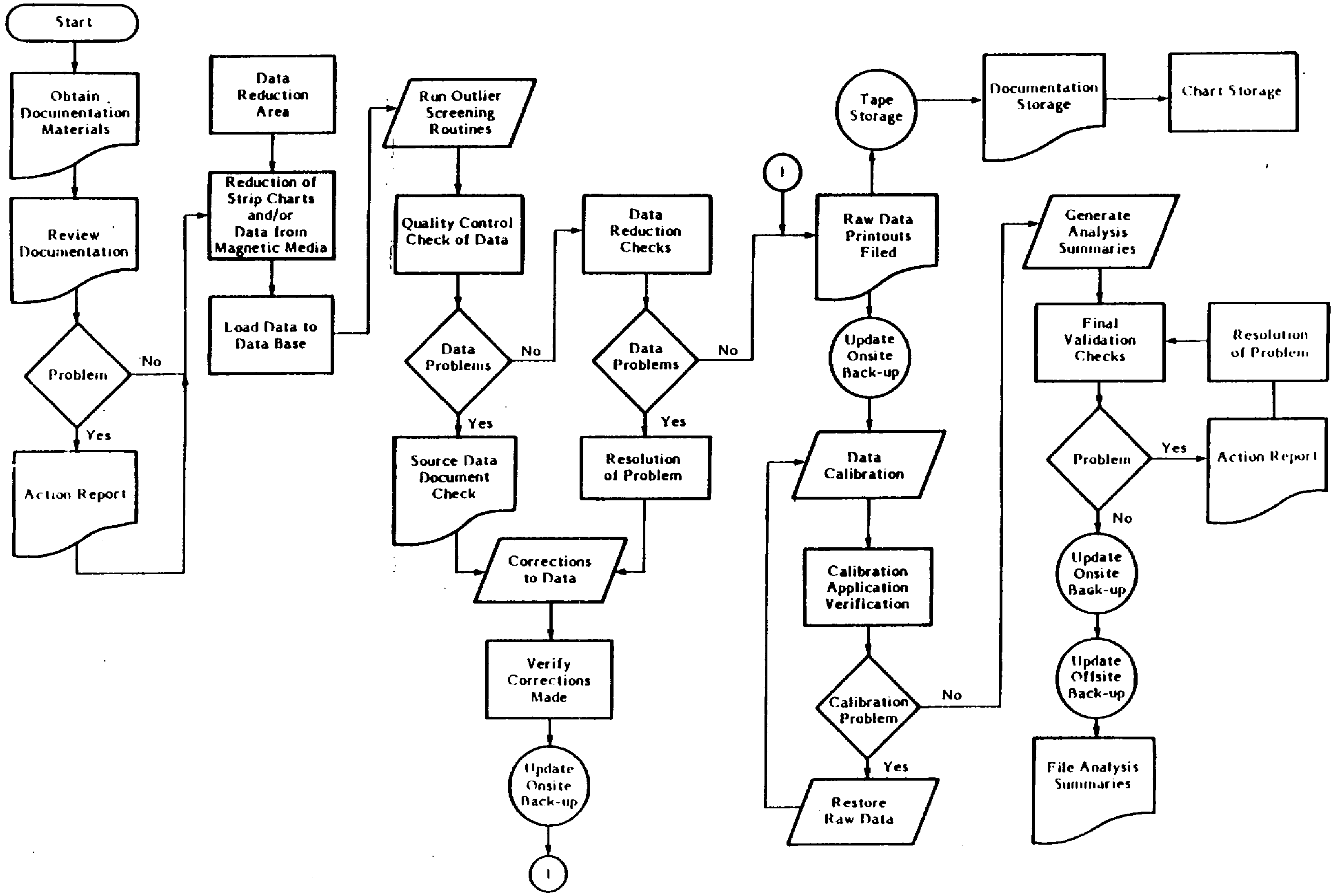


FIGURE 5-7. AV's data processing procedures.

TABLE 5-6. Level I air quality and meteorological data validation outlier screening values.

Parameter	Units	Range Check Min	Range Check Max	Rate of Change (per hour)
bsp	10^{-4}/m	0	1.50	.40
uv	mw/cm^2	0	600	300
temp	^oC	-20	40	5
DP	^oC	-20	30	3
WS	mps	0	15	4
WD	o	0	360	360
CO	ppm	-.1	5.0	2.0
NO	ppm	-.010	.100	.030
NO_x	ppm	-.010	.100	.030
O_3	ppm	-.010	.100	.030

OXIDES OF NITROGEN [CC:10]   SCAQS, #91034

PARTS PER MILLION   SITE 9   SAN NICOLAS ISLAND (SNI)

AUG, 1987

AEROVIRONMENT INC.

RAW DATA
AS OF 15/OCT/87

QC Checked 10-19-87 By: [illegible]

Edit C. checked OK. 10/28/87

CAJJ 10-28-87

CLOCK HOUR [LOCAL STANDARD TIME]

DY	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	MIN	MAX
1	.012	.012	.011	.011	.010	.010	.007	.009	.009	.011	.011	.014	.015	.017	.018	.019	.020	.021	.021	.020	.018	.016	.016	.014	.007	.021
2	.014	[RO]	.012	.010	.009	.009	.006	.005	.005	.004	.006	.007	.009	.010	.013	.015	.016	.017	.017	.015	.013	.012	.013	.013	.004	.017
3	.013	.012	.010	.008	.007	.005	.003	.002	.002	[illegible]	[illegible]	.006	.006	.008	.010	.013	.016	.017	.017	.016	.013	.012	.011	.010	.002	.017
4	.010	.008	.007	.006	.005	.003	.001	.001	.002	.001	.002	.003	.004	.005	.007	.009	.011	.012	.012	.011	.010	.010	.008	.007	.001	.012
5	.006	.005	.004	.004	.003	.003	.002	.001	.000	.002	.003	.004	.005	.007	.009	.011	.012	.013	.013	.012	.011	.010	.009	.008	.000	.013
6	.008	.007	.009	.009	.008	.006	.005	.005	.004	.010	.015	.009	.010	.012	.015	.017	.015	.012	.008	.007	.010	.014	.013	.009	.004	.017
7	.008	.008	.007	.007	.006	.004	.002	.005	.006	.003	.000	.003	.005	.008	.011	.014	.017	.016	.015	.015	.014	.013	.012	.012	.000	.017
8	.011	.009	.009	.008	.008	.007	.007	.007	.007	.008	.010	.010	.012	.014	.017	.019	.019	.020	.020	.017	.014	.013	.011	.010	.007	.020
9	.008	.008	.007	.006	.005	.004	.005	.004	.004	.005	.005	.006	.007	.008	.010	.011	.012	.012	.011	.010	.008	.006	.005	.003	.003	.012
10	.007	.002	.002	.002	.001	.000	-.001	-.001	.001	.000	.001	.001	.003	.007	.005	.005	.006	.007	.008	.008	.005	.005	.003	.003	-.001	.008
11	.002	.000	-.001	-.002	-.003	-.003	-.005	-.005	-.004	-.003	-.001	-.001	.001	.002	.005	.006	.008	.010	.010	.009	.007	.006	.005	.005	-.005	.010
12	.003	.003	.002	.002	.001	.000	-.002	-.002	-.003	-.002	.000	-.005	-.001	.001	.003	.005	.006	.008	.008	.006	.005	.003	.003	.002	-.003	.008
13	.002	.002	.001	-.001	-.001	-.002	-.003	-.004	-.004	-.003	-.002	.002	.004	.005	.006	.006	.007	.008	.005	.003	.002	.002	.001	-.001	-.004	.008
14	.000	.000	-.001	-.001	-.002	-.002	-.004	-.004	-.005	-.005	-.004	-.004	-.004	-.003	-.003	-.001	.001	.001	-.001	-.001	-.002	-.002	-.003	-.003	-.005	.001
15	-.004	-.004	-.004	-.004	-.005	-.006	-.006	-.006	-.006	-.004	-.003	-.003	-.001	.002	.004	.004	.005	.007	.006	.004	.003	.001	-.001	-.002	-.006	.007
16	-.002	-.003	-.003	-.004	-.004	-.004	-.005	-.005	-.003	-.002	-.001	.001	.003	.005	.006	.006	.007	.007	.007	.006	.003	.002	.002	.000	-.005	.007
17	-.001	-.002	-.002	-.003	-.003	-.003	-.003	-.004	-.003	-.003	-.003	-.002	.000	.002	.004	.006	.007	.008	.008	.005	.004	.003	.002	.000	-.004	.008
18	-.001	-.002	-.003	-.004	-.004	-.005	-.006	-.007	-.006	-.005	-.004	-.002	.000	.002	.002	.003	.001	[RO]	[SC]	.000	-.002	-.003	-.003	-.004	-.007	.003
19	-.005	-.006	-.006	-.007	-.007	-.008	-.008	-.007	-.007	-.007	-.007	-.007	-.006	-.005	-.004	-.003	-.003	~~-.004~~	~~-.003~~	-.004	-.004	-.006	-.007	-.007	-.008	-.003
20*	.007	-.008	-.009	-.009	-.009	-.009	-.011#	.012#	.010#	.010#	.010#	.008	-.007	-.006	-.005	-.003	-.001	.001	.001	.000	-.002	-.004	-.005	-.006	-.012	.001
21*	.006	-.007	-.007	-.008	-.009	-.010#	.010#	.011#	.011#	.009	-.009	-.008	-.006	-.005	-.002	.001	.002	.003	.003	.002	.000	-.002	-.003	-.003	-.011	.003
22	-.003	-.005	-.005	-.006	-.007	-.007	-.008	-.007	-.007	-.005	-.005	-.003	-.001	.001	.003	.006	.008	.009	.009	.006	.004	.002	.001	.000	-.008	.009
23	-.001	-.002	-.003	-.003	-.003	-.005	-.006	-.006	-.006	-.004	-.003	-.002	.000	.000	.001	.002	.004	.004	.003	.001	-.002	-.002	-.003	-.003	-.006	.004
24	-.005	-.005	-.006	-.006	-.007	-.007	-.007	-.007	-.007	-.008	-.007	-.007	-.006	-.004	-.003	-.001	.000	.002	.003	.001	-.001	-.001	-.001	-.002	-.008	.003
25	-.002	-.002	-.003	-.003	-.004	-.003	-.004	-.005	-.004	-.003	-.003	-.001	.000	.003	.005	.008	.010	.011	.013	.010	.009	.008	.006	.005	-.005	.013
26	.004	.004	.003	.003	.002	.001	-.001	-.001	-.002	.000	.001	.002	.003	.006	.007	.009	.011	.011	.011	.007	.006	.006	.006	.005	-.002	.011
27	.003	.003	.000	.001	-.001	-.003	-.004	-.004	-.004	-.004	-.003	-.002	.000	.001	.001	.003	.001	.000	.002	.001	-.001	-.001	-.001	-.001	-.004	.003
28	.000	-.002	-.003	-.004	-.004	-.005	-.007	-.006	-.007	-.005	-.007	-.004	-.002	.002	.004	.005	.006	.004	-.002	-.002	-.001	-.001	.003	.001	-.007	.006
29	-.001	-.004	-.004	-.002	-.001	.002	-.001	.001	-.003	-.003	-.002	-.001	.003	.005	.005	.005	.007	.007	.004	.005	.006	.006	.001	.002	-.004	.007
30	-.001	-.002	-.003	-.003	-.004	-.005	-.007	-.007	-.003	-.003	-.002	-.001	.001	.004	.006	.009	.007	.008	.007	.004	.002	.001	-.001	-.002	-.007	.009
31*	.003	-.004	-.004	-.005	-.007	-.008	-.008	-.009	-.009	-.010#	.010#	.008	-.007	-.006	-.005	-.003	-.001	-.001	-.001	-.003	-.004	-.005	-.006	-.007	-.010	-.001
AV	.002	.001	.001	.000	-.001	-.001	-.003	-.003	-.002	-.002	-.001	.000	.002	.003	.005	.007	.008	.008	.008	.006	.005	.004	.003	.002	[ ]	[ ]
MI	-.007	-.008	-.009	-.009	-.009	-.010	-.011	-.012	-.011	-.010	-.010	-.008	-.007	-.006	-.005	-.003	-.003	-.004	-.003	-.004	-.004	-.006	-.007	-.007	-.012	[ ]
MX	.014	.012	.012	.011	.010	.010	.007	.009	.009	.011	.015	.014	.015	.017	.018	.019	.020	.021	.021	.020	.018	.016	.016	.014	[ ]	.021

MONTHLY AVG .002   UNFLAGED MONTHLY MIN-.009 DAY 20 HR 02   [#]: RANGE CHECK MIN-.010 MAX .100   [@]: MAX RATE OF CHANGE .030
QHOUTD -- OU003 -- <830811,1214>   MAX .021 DAY 1 HR 17   [$]: MIN ST. DEV. 0.000 FOR 0HR   [*]: MULTIPLE FLAGS.

FIGURE 5-8. Sample raw data printout.

TABLE 5-7. MISSING DATA CODES

BD	Below detection limit of instrument
BM	Begin Monitoring
CA	Calibration
EC	Converter Efficiency Check
EM	End Monitoring
FO	Flame Out (on the gas chromatographs)
IM	Instrument Malfunction (not discovered until after data had been collected)
IN	Interference (acts of nature)
IW	Instrument Warm-up
LI	Local Interference
LF	Data logger failure; strip chart available, but not used
MF	Mishandled Filter (label, analysis, or contamination error)
MT	Maintenance (changing chart paper, replacing instrument parts)
OE	Operator Error
OR	Out for Repair (instrument problem has been recognized and the instrument is no longer sampling while being repaired)
OS	Off Scale (at top of chart, data is presumed to be good)
PA	Performance Audit
PC	Precision Check
PF	Power Failure (generator failure)
RF	Recording System Failure (chart jams, chart runs out, or data acquisition system fails)
SA	System Audit
SC	Station Check = Precision Check + Instrument Zero/Span Check
SE	Special Experiment (instrument off-line for bag sample analysis or removed for special measurements in area)
TR	Trace
VA	Variable wind direction
ZS	Instrument Zero/Span check

Additional work was performed on data collected during intensive periods with a view to determining how best to combine the data from the three instruments into a single size distribution. First, hourly averaged particle concentration data for each size channel were converted to volume concentration. Next, both particle concentration data and volume concentration data from the Probe and the OPC for different size channels were combined to obtain a more manageable size distribution. As a first attempt, data were combined into six equal geometric size intervals (cycles) per decade. This choice was based on our experience with this type of data. It was not necessary or possible to manipulate the EAA data, since the instrument was programmed to record data in four cycles per decade.

Both number and volume concentration size distributions for a randomly selected number of hours during intensive days were plotted. Examples are shown in Figures 5-9 and 5-10. Although the number distribution plot shows a rather smooth continuity in the data reported by the three analyzers, the discrepancy in the overlapping regions becomes more apparent in the volume distribution plot. This discrepancy is due in part to the different measurement techniques employed by these analyzers. In addition, the tail ends of the size distribution of each analyzer are less reliable. The approach to creating a single size distribution from these three analyzers is to first remove the data from the tail ends of each distribution and then use computer programs such as MICRON (Wolfenbarger and Seinfeld, 1989) and DISTFIT (Whitby and Palm, 1985).

Based on our review of the randomly selected cases, we recommend dropping the tail ends of each distribution as shown in Figure 5-11. Figure 5-12 presents the volume distributions with the removal of the data from the tail ends of each distribution.

All data need to be further processed to develop a single size distribution for the data from the three analyzers before they could be used for modeling purposes.

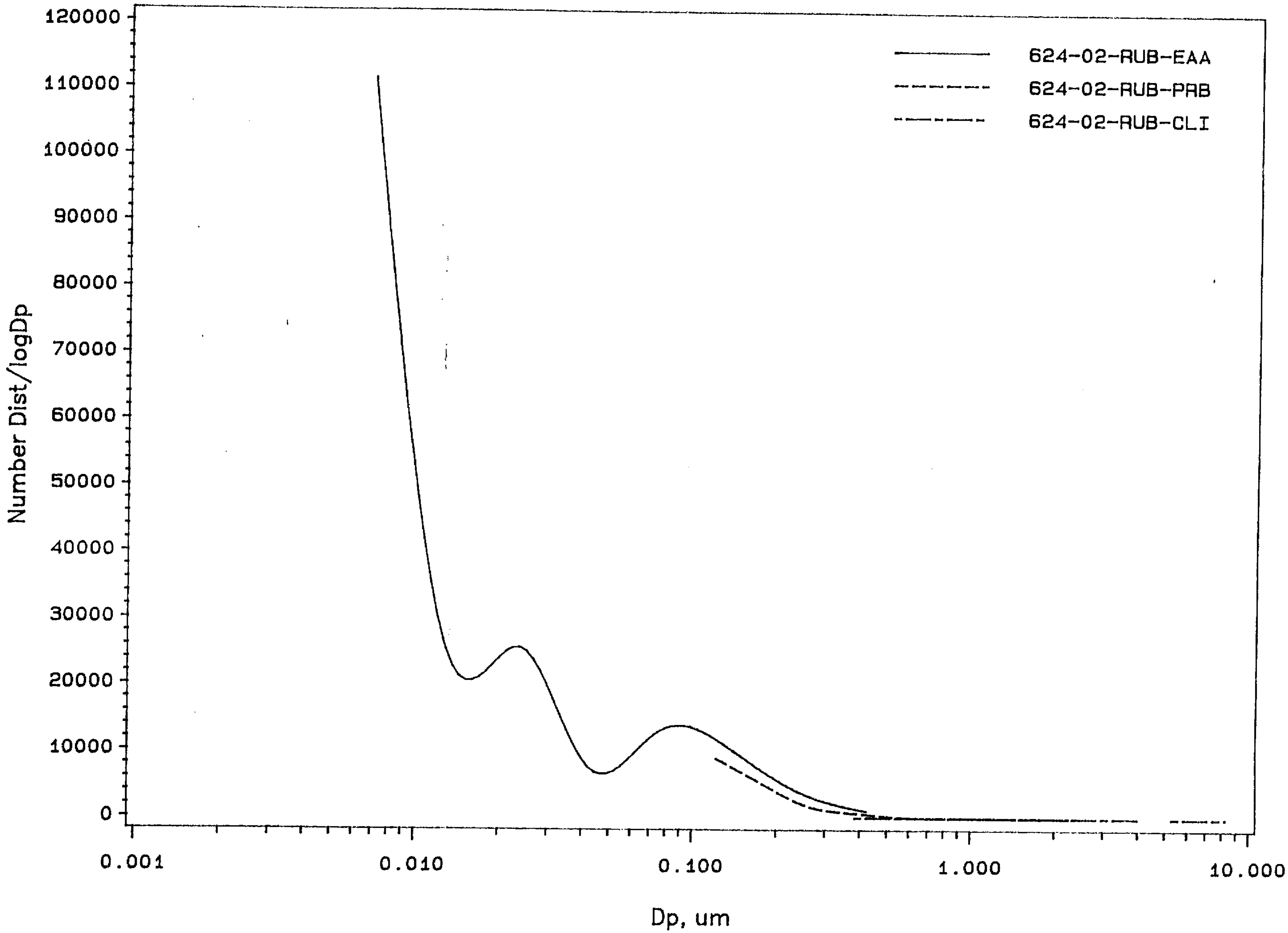


FIGURE 5-9. Number size distribution plot for 0200 on 24 June at Rubidoux.

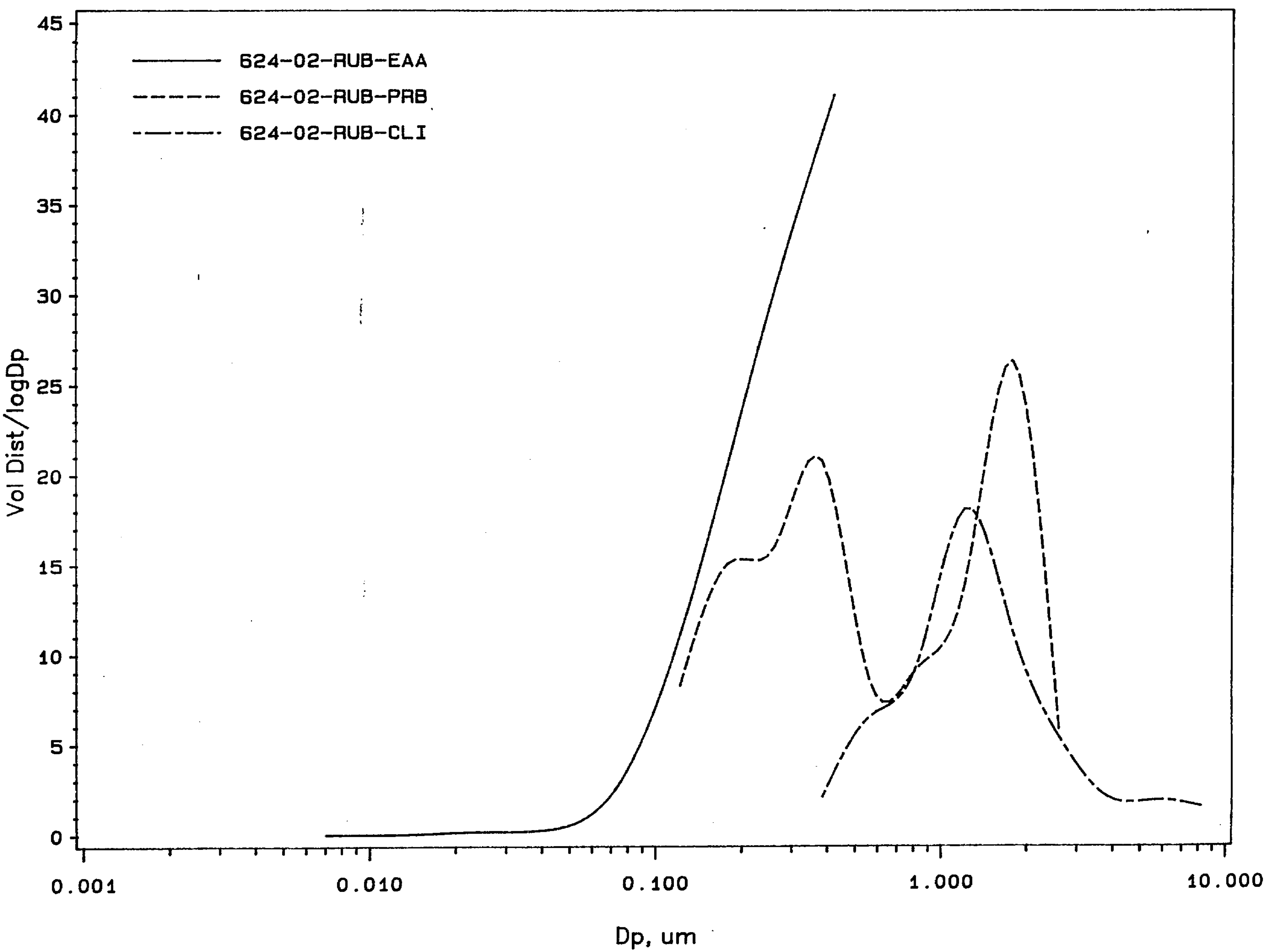


FIGURE 5-10. Volume size distribution plot for 0200 on 24 June at Rubidoux.

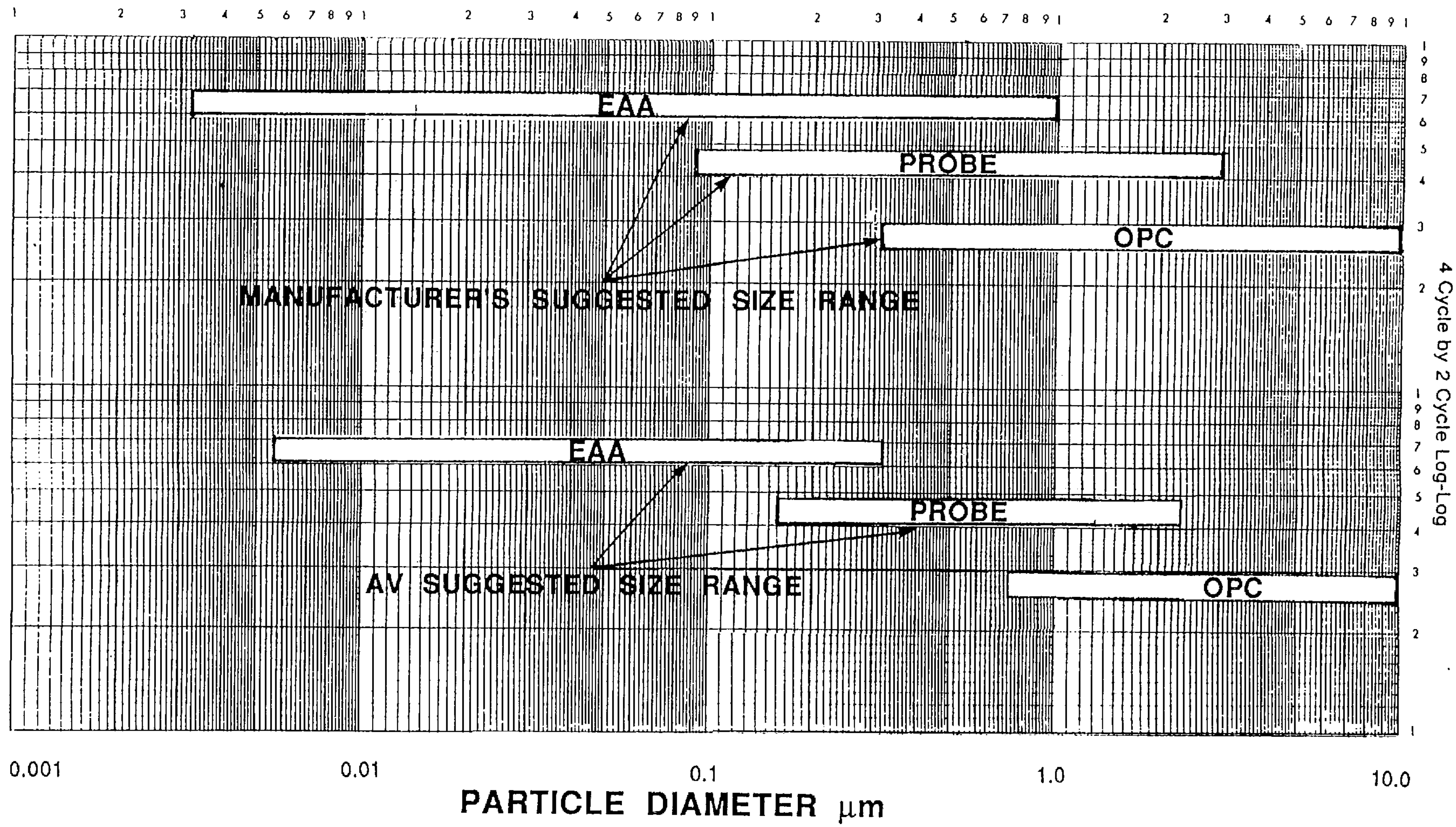


FIGURE 5-11. The particle diameter ranges covered by the aerosol instruments and AV suggested particle size range for each instrument.

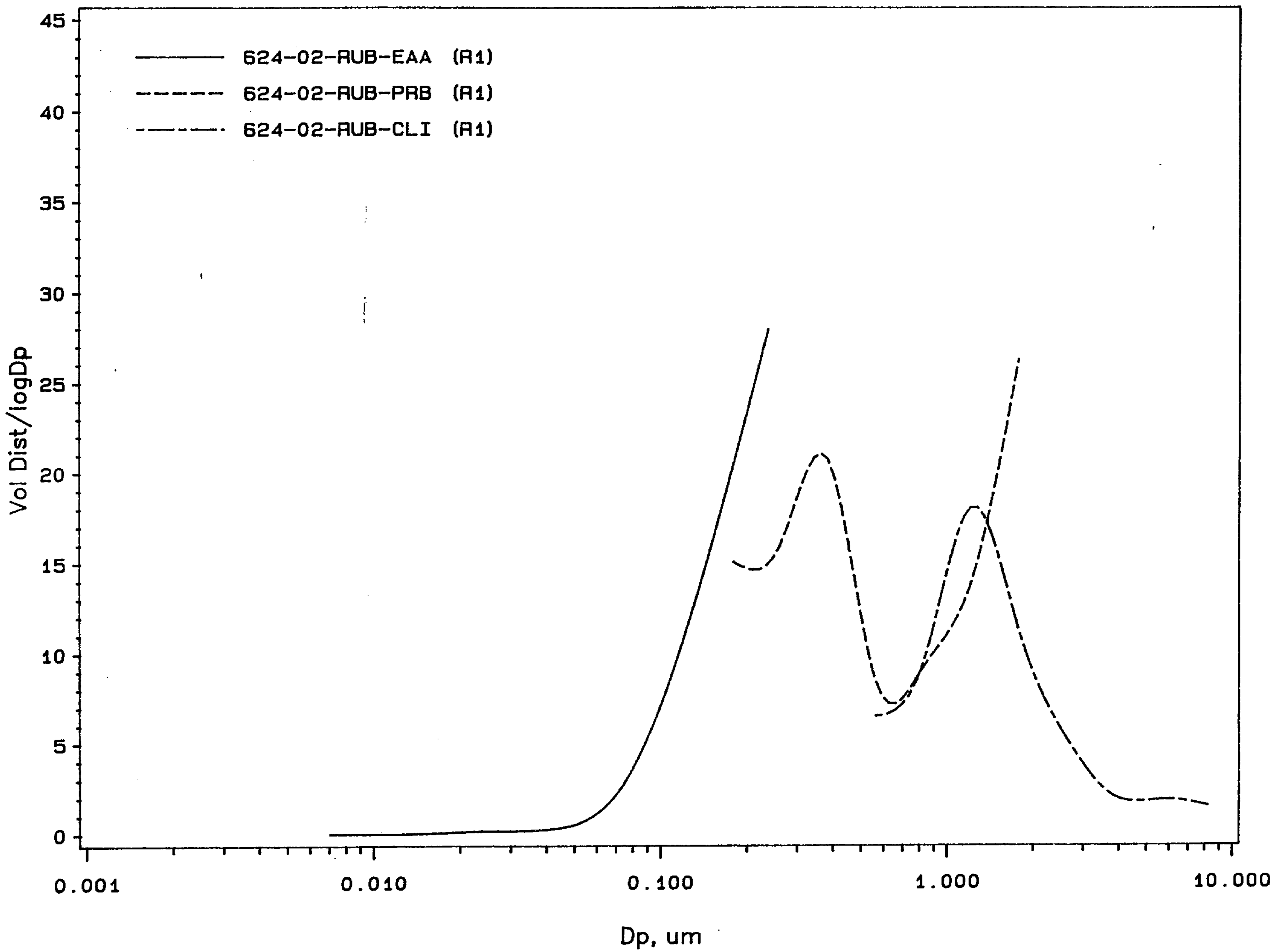


FIGURE 5-12. Volume size distribution based on our recommended size range for each instrument.