2. QUALITY ASSURANCE TASKS, ORGANIZATION AND RESPONSIBILITIES

This section provides a summary of planned quality assurance tasks/activities for SCOS97-NARSTO and delineates the responsibilities of the quality assurance team. Quality assurance will be under the overall direction of Desert Research Institute, the QA manager for SCOS97-NARSTO. DRI is responsible for developing a quality assurance plan in conjunction with field managers from sponsoring agencies, measurement contractors, and quality assurance personnel from the District and the California Air Resources Board. Dr. Eric Fujita is the principal investigator for the project at DRI and will oversee QA for VOC measurements. Drs. John Bowen, Hans Moosmüller, and Mark Green will oversee QA efforts for surface air quality and meteorological, aloft air quality, and aloft meteorology, respectively. DRI will review standard operating procedures, oversee system and performance audits, and document the quality assurance findings for integration into the data archive.

QA personnel from the ARB, South Coast Air Quality Management District, San Diego Air Pollution Control District will conduct system and performance audits of surface air quality and meteorological measurements. These efforts will be directed by Ms. Alice Westerinen for the ARB, Mr. Bill Bope for the SCAQMD, and Mr. Mahmoud Hossain for the SDAPCD.

Aerovironment Environmental Services, Inc. (AVES) will review candidate upper-air meteorological monitoring sites and do system and performance audits of the network. AVES will review the measurement groups standard operating procedures, siting and set-up, quality control procedures, and procedures for communication and resolution of problems. The review will compare proposed procedures with procedures detailed in this QA plan (based on PAMS upper-air guidelines). Mr. Alex Barnett is the principal investigator for this project at AVES.

Mr. Richard Hackney of the Technical Support Division at the ARB serve as data manager for SCOS97-NARSTO. ARB will obtain project and supplemental data, integrate data into a common database, and maintain the data archive. NOAA's Environmental Technology Laboratory (ETL) will be responsible for acquisition and processing of upper-air meteorology data, periodic review of data, and data validation and archival. Dr. Bob Weber is the principal investigator for this project at NOAA.

The following is a summary of the work elements to be performed by the QA Team and the schedule for performing the work. The technical approach for implementing each element and audit procedures are described in Sections 4 through 7.

2.1 Surface Air Quality and Meteorological Measurements

The ARB, SCAQMD and SDAPCD quality assurance staff conduct regularly scheduled performance audits of all air quality monitoring stations. During the period between January and March 1997, the ARB audited 36 monitoring stations that are located in the SCOS97-NARSTO study area. During the April to June period, the ARB will audit 37 other monitoring station. In addition, twelve monitoring stations in the SoCAB will be audited based on relative importance of the monitoring data at those sites to the objectives of SCOS97. During this time, ARB will also audit the five supplemental air monitoring sites that will be operated by AeroVironment. ARB

QA staff will also audit the ozone and NOx analyzers onboard the four SCOS97 aircraft during early June.

2.2 Upper-Air Meteorological Measurement Audits

Upper-air meteorological measurement audits will be performed by Aerovironment Environmental Services, Inc. These will consist of system audits at all measurement sites and performance audits at all sodar sites and some of the radar wind profiler/RASS sites. At least one site operated by each measurement group will have performance audits. The sites, operator, instruments audited and audit method for the system audits are shown in Table 2-1. The system audits primarily evaluate whether the instrument siting and setup is proper. The performance audits evaluate the data collected by the instruments against standards or other collocateinstruments. System audits will be performed in May 1997. Performance audits will be done in early June 1997.

The radar wind profiler performance audits use sodars to check the lower gates of the RWP and rawinsondes to check the full RWP range. Sodars are performance audited by using collocated rawinsonde data and with acoustic pulse transponders (APT). The APT produces a simulated wind profile made up of sounds with known frequencies that are timed to simulate the doppler shifted echoes scattered by the atmosphere from various altitudes. The RASS performance audit will use collocated rawinsonde data to compute virtual temperature for comparison to the RASS derived virtual temperature.

Table 2-1
Sites, operators, instruments audited, and audit methods for upper-air meteorological measurement system audits

Site	Operator	Instruments Audited	Audit Method
Vandenberg[1]	USAF	RWP, RASS	Rawinsonde
Simi	VCAPCD	RWP, RASS	Mobile sodar & rawinsonde
El Monte AP	ARB	RWP, RASS	Mobile sodar & rawinsonde
Oceanside	NOAA	RWP, RASS, sodar	APT & Rawinsonde
Los Alimitos	NOAA	RWP, RASS, sodar	APT & Rawinsonde
San Gabriel Mountains	NOAA	Sodar	APT
Oxnard AP	NOAA	RWP, RASS	Mobile sodar & rawinsonde
Van Nuys AP	NOAA	RWP, RASS	Mobile sodar & rawinsonde
Temecula	Radian/STI	RWP, RASS	Mobile sodar & rawinsonde
LAX	SCAQMD	RWP, RASS	Mobile sodar & rawinsonde
Ontario	SCAQMD	RWP, RASS	Mobile sodar & rawinsonde
Point Loma	SDAPCD	RWP,RASS	Mobile sodar & rawinsonde
Escondido	SDAPCD	RWP, RASS, sodar	Mobile sodar & rawinsonde

[1] USAF will forward collocated rawinsonde and RWP/RASS data to Aerovironment Environmental Services Inc. for performance audit of RWP/RASS data.

2.3 Aloft Air Quality Measurement Audits and Comparisons

As part of SCOS97, the Air Resources Board and Desert Research Institute is organizing an aloft performance audit, prior to the main study. This performance audit will be conducted in the vicinity of El Monte Airport (EMA) with the airport serving as base. Aloft intercomparisons between the NOAA ozone lidar (located at EMA), CE-CERT ozonesondes and several instrumented aircraft (UCD, STI, Gibbs Cessna, and NAVY EOPACE) will be included in this audit. The ARB Quality Assurance staff will conduct performance audits of the onboard air ozone and NO_X analyzers. Dr. John Bowen of the conduct a system audit of onboard instrumentation and Dr. Hans Moosmüller will oversee the aloft ozone comparisons. In addition, the availability of upper air meteorological data is important to improve the comparison between different sample volumes. Data from the RWP/RASS system located at EMA will be utilized for this purpose. Arrangements will be made to have AeroVironment conduct an audit of the RWP/RASS system prior to the audit/intercomparison.

Three flight patterns for the participating aircraft will be utilized for this performance audit:

- Spiral flight patterns will be used for the intercomparison between aircraft themselves, and between aircraft, ozone lidar, and ozonesondes. This is the most generally useful flight pattern for intercomparison.

- Spiral flight patterns interspersed with orbits will be used for the intercomparison between a single aircraft and the ozone lidar. The additional orbits make it possible to distinguish between horizontal and vertical gradients encountered by an aircraft flying a spiral pattern.

- Traverses will be used for additional intercomparison between the different instrumented aircraft.

The aloft performance audit will take place prior to the main study during the week of June 9, 1997. Details of this preliminary study are described in Section 5. Conducting the audit before the main study will make it possible to identify, address, and possibly correct potential performance problems prior to commencement of the main study period.

2.4 Volatile Organic Compound Measurements

The quality assessment of SCOS97-NARSTO VOC data included system audits of the two main VOC laboratories (AtmAA for carbonyl compounds and BRC for hydrocarbons). An on-site systems audit of AtmAA was conducted in 1995 by Dr. Eric Fujita for the NARSTO-Northeast Study, and the results of this audit will be summarized in lieu of an audit for SCOS97-NARSTO. While on-site systems audit of BRC was performed twice by DRI staff within the last ten years at Dr. Rasmussen's laboratory at Oregon Graduate Institute (OGI), it has been seven

years since the last audit. An on-site systems audit will be conducted at BRC by Dr. Zielinska of the DRI in May, 1997.

The hydrocarbon performance audits will consist of two ambient samples. A draft protocol is included as Appendix C. Participating laboratories include ARB, EPA, BRC, DRI, SDAPCD, SCAQMD, VCAPCD, and BAAQMD. Each participating laboratory will supply to ARB, Monitoring and Laboratory Division two cleaned, evacuated 6-liter canisters by April 25, 1997. EPA, ARB and DRI will supply two additional canisters (four in all). ARB will fill the two sets of canisters to 20-25 psi with ambient air from the Los Angeles area using a manifold sampling system supplied by the Desert Research Institute. One set of canisters will be collected in the morning (after 6:00 a.m. and before 9:00 a.m., PDT) in an area heavily influenced by mobile source emission. The other set will be collected in the afternoon (after 1:00 p.m. and before 4:00 p.m., PDT) in a downwind area with maximum ozone levels. Duplicate samples will be collected for EPA, ARB and DRI (total of eleven simultaneous canister samples at each site). ARB will send the two (or four) ambient audit samples to each participating laboratory by May 6, 1997. Each laboratory will analyze the audit samples within five working days after receiving the audit canisters. EPA, ARB and DRI will reanalyze their samples after one and two months to monitor the stability of the audit samples. Analytical results will be compiled by the California Air Resources Board, Research Division and results will be summarized by DRI.

The carbonyl performance audit will consist of sampling under field conditions with addition of a standard mixture of carbonyls from a 6-liter stainless steel canister to an ambient sample. A draft protocol is included in Appendix E. The main supply of the standard mixture will be prepared at the Desert Research Institute in a 33-liter tank. The standard mixture in a 6-liter canister and a dilution apparatus will be supplied by the Desert Research Institute, along with operating instructions. The standard audit protocol will consist of a 3-hour ambient sample using two DNPH cartridges in series (same as a breakthrough experiment) with addition of the standard mixture, with appropriate dilution, between the two cartridges. The front cartridge serves to scrub ambient carbonyl compounds and ozone. Each group will collect two samples and pass the 6-liter canister and gas dilution system on to the next group. The 6-liter canisters will hold sufficient sample for two groups. The Air Resources Board, Monitoring and Laboratory Division will analyze the contents of the canister by DNPH/HPLC prior to shipment and upon its return. The contents of the main tank will be periodically analyzed by both DNPH/HPLC and GC/FID (for higher MW carbonyls). These audits will be performed in June 1997.

The performance audit for the aircraft sampling of carbonyl compounds will be similar to surface-based measurements. The main procedural difference is that the Tedlar bag will be filled with zero-air with addition of the standard carbonyl mixture.