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SOUTHERN CALIFORNIA AIR QUALITY STUDY (SCAQS)

SUGGESTED PROGRAM PLAN

EXECUTIVE SUMMARY

STI Ref. 10 95050

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Prepared for review and comment purposes by Sonoma Technology Inc. (STI) and Desert Research Institute (DRI) with extensive input from the California Air Resources Board (ARB) and other potential sponsors and members of the technical community.

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This plan has been prepared by the above contractors and represents their recommendations based upon the information available to them. It has not been approved by ARB or any of the other sponsors and does not represent the policy or intent of ARB or any of the other sponsors. This draft plan serves as a starting point for discussion and to make potential sponsors aware of ways in which they can usefully participate.

ABSTRACT

The program plan for the Southern California Air Quality Study (SCAQS) outlines a suggested measurement and management approach and reviews the technical background for the study. SCAQS will be a multi-year, integrated, cooperative study which will be funded by many different government agencies, industry groups, and individual corporate sponsors. The plan was prepared with the input of the sponsors and potential participants and represents a composite of their ideas.

The overall goal of SCAQS is to develop a comprehensive and properly archived air quality and meteorological data base for the South Coast Air Basin that can be used to test, evaluate, and improve elements of air quality simulation models for oxidants, PM-10, fine particles, toxic air contaminants, and acidic species. In addition, SCAQS will address specific technical questions regarding the emission, transport, transformation, and deposition of pollutants.

The study is planned to take place in 1987 during six weeks in early summer and four weeks in late fall. Extensive routine measurements and special studies will take place on about 19 days during the study. Most of the monitoring will take place at existing air quality monitoring sites. Airborne, meteorological, and tracer measurements are planned at additional locations.

EXECUTIVE SUMMARY

In recent years in California, the mix and spatial distribution of pollutant emissions have changed substantially, and several new classes of pollutants have gained the public's attention. In the next few years, many difficult regulatory issues relating to these changes will confront the California Air Resources Board (ARB). Resolution of these issues and development of effective control strategies to ameliorate California's air quality problems will require a better understanding of the relationships among the sources, receptors, and effects of the pollutants in question. This understanding can only be developed through measurement, data analysis, and modeling in an iterative fashion. Design and evaluation of alternative control strategies must be done using models which embody our best understanding of the above relationships.

The Southern California Air Quality Study (SCAQS) Suggested Program Plan outlines a measurement, analysis, and modeling strategy which can ultimately provide the ARB with tools necessary to make effective regulatory decisions for the South Coast Air Basin (SOCAB). SCAQS addresses the following issues: ozone (O_3), NO_2 and the roles of nitrogen oxides (NO_x), PM-10, fine particles, visibility, toxic substances, and atmospheric acidity. SCAQS will be a multi-year, integrated, cooperative study which will be funded by many different government agencies, industry groups, and individual corporate sponsors. The plan was prepared with the input of the sponsors and potential participants and represents a composite of their ideas.

The overall goals of SCAQS are:

1. to develop a comprehensive and properly archived air quality and meteorological data base for the South Coast Air Basin which can be used to test, evaluate, and improve elements of air quality simulation models for oxidants, NO_2, PM-10, fine particles, visibility, toxic substances, and acidic species. The data base should be adequate:

   - to test models proposed for the design of attainment strategies for PM-10, ozone, and NO_2; and

   - to clarify the hydrocarbon/NO_x/O_3 relationships so that ozone prediction models can be improved and new strategies to meet federal "reasonable efforts" requirements can be developed and tested;

2. to evaluate measurement methods for PM-10, fine particles, acidic species, and important nitrogen and carbon species; and

3. to enhance our understanding of the relationships between emissions and the spatial and temporal distributions of pollutants so that air quality simulation models and, ultimately, air quality management strategies can be improved.

The data obtained by meeting these goals should be of utility in the development and testing of air quality models of known accuracy, precision, and validity which can be used to design and evaluate the effect of proposed attainment strategies for O_3, NO_x, PM-10, and selected toxic substances.

Based on discussions with sponsors and the technical community and the lessons learned from prior studies, a SCAQS design was prepared which includes the following elements:

- a project management and coordination activity;
- planning and preparation, including model sensitivity studies to assist in fine-tuning the measurement program;
- instrumentation intercomparison and evaluation studies;
- a six week measurement program in early to mid-summer 1987, and a four week program in early winter 1987;
- appropriate quality assurance activities;
- an emissions inventory assessment and update for the study period;
- data archiving and distribution;
- data analysis and coordination activities;
- complementary emissions characterization studies for important source types; and
- reports and presentations.

Complementary model development and evaluation activities will be funded independently by some of the sponsors.

During each study period, three to five, two-day to three-day periods will be studied intensively, for a total of 16-19 "intensive study" days.

The field studies will include the following elements:

- a network of existing routine air quality monitoring stations (type "C" sites);
- nine monitoring stations located along typical air trajectories which will measure aerosols and gases routinely on "intensive study" days (type "B" sites). Type "B" sites typically will be collocated with type "C" sites. Type "B" measurements will be made by techniques of known precision and accuracy. Type "B" measurements will be more extensive and have better time resolution than type "C" measurements. Nine type "B" sites will be operated in the summer period and five during the winter period.
- one research station each in a source and receptor region in the summer and one station in a source region in the winter (type "A" sites). These stations will be collocated with type "B" sites and will be the base of operations for cooperating investigators. Type "A" measurements will be more sophisticated and experimental than the type "B" measurements. The type "A", "B", and "C" sites are shown in figure 1.

- a network of meteorological measurements at the surface and aloft to be operated on intensive study days;

- routine upper-air pollutant and lidar measurements to be made by aircraft on intensive study days;

- complementary measurements of selected toxic substances to be made by ARB at selected sites;

- complementary physical and chemical measurements of fog and clouds on intensive study days;

- "special" studies on selected intensive study days - including multiple tracer studies and studies of spatial representativeness;

- assembly and archiving of complementary data from existing data sources; and

- a quality assurance program including independent systems and performance audits.

Between and after the study periods, selected aerosol measurements will be continued at the type "B" sites to obtain data suitable for the calculation of annual averages.

The complete SCAQS project, including planning, management, measurement, and analyses will consist of a number of closely coordinated projects funded by several co-sponsors. The overall project has been estimated to cost about eight million dollars. A short summary of the cost elements is provided in Table 1. The project will take place over about four years with preparation starting in the summer of 1986, measurements in 1987, data processing in 1988, and analysis in 1989. The final report and technical publications should be available in early 1990. Sponsors who have expressed an interest in funding or participating in the study include ARB, the Environmental Protection Agency, the South Coast Air Quality Management District, the Coordinating Research Council, the Electric Power Research Institute, Ford Motor Co., General Motors, the Motor Vehicle Manufacturers Association, Southern California Edison Co., and the Western Oil and Gas Association.

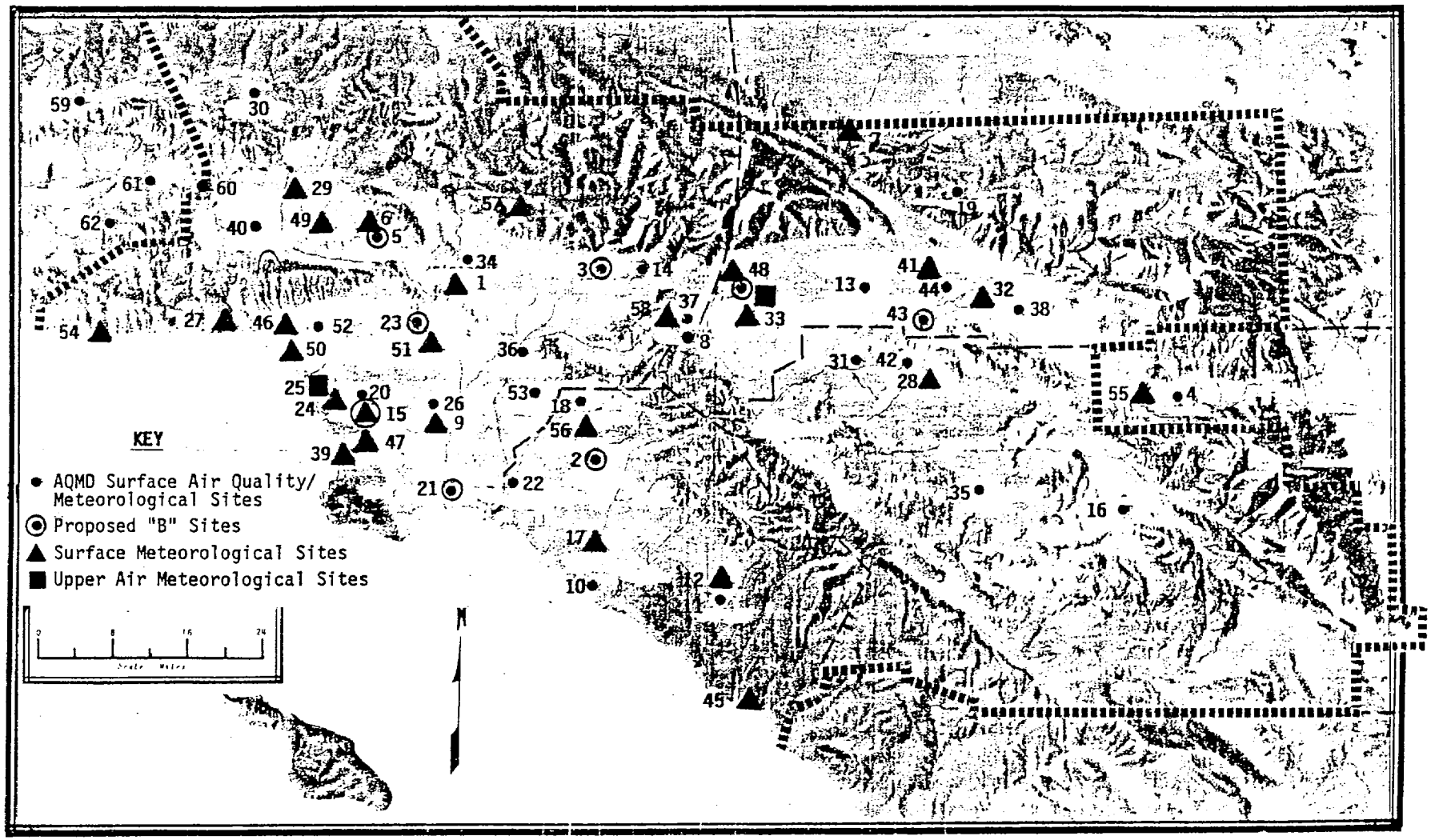

Figure 1. SCAQS Air Quality Monitoring Sites (Site codes are listed in the program plan; the "A" sites are sites 21 and 48.)

Table 1. Cost Estimates, Short Summary

Program Element	Cost Estimate
Program Management/Data Management/Analysis Coord.	$ 520,000
Type "C" Sites - addition of PM-10, PM-2.5 to 5 selected sites	50,000
Type "B" Sites -	
Gas and Meteorological Measurements	375,000
Aerosol Physical Property Meas.	185,000
Aerosol Chemistry/Mass Meas.	818,000
Site Prep. and Personnel Training	300,000
Site Operation (2 people/site plus expenses)	244,000
Type "A" Sites -	
Organic Gases	95,000
Inorganic Gases	320,000
Radicals	150,000
Organic Aerosol including mutagens	240,000
Inorganic Aerosol	245,000
Aerosol Physical Properties	355,000
Individual Particles	30,000
Site Preparation (power, platforms, etc.)	200,000
Site Operation (1 person/site plus expenses)	35,000
Meteorological Measurements	350,000
Aircraft Measurements	420,000
Airborne Lidar	150,000
Emissions Inventory and Analysis	300,000
QA Functions	500,000
Tracer Studies	500,000
Representativeness Studies	150,000
Dry Deposition Studies	200,000
Annual Average PM-10 Monitoring	108,000
Data Interpretation to meet Specific Objectives	1,000,000
Model Sensitivity Studies	100,000
Auto Emission Tunnel Studies	200,000
TOTAL	$8,140,000*

* This estimate does not include nitrogen or carbon methods comparison studies or emissions characterization measurements.