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QUALITY ASSURANCE PROJECT PLAN

FOR

NONRADIOACTIVE INORGANIC AND ORGANIC
CONTRACT LABORATORY PROGRAM
ANALYTICAL SERVICES

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May 6, 1991



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1.0 INTRODUCTION

This document contains summaries of the detailed Quality Assurance/Quality Control (QA/QC) protocols that are required for the Westinghouse/Hanford project. All aspects of sample receiving, analysis, QC procedures, data reporting, and data archiving must be carried out as described in this document and in the Statement of Work (SOW). Any deviations must be reported to project management.

1.1 TECHNICAL PROJECT OFFICER

The telephone numbers and addresses of the Technical Project Officer (TPO) and the QA Officer for Westinghouse/Hanford will be entered in this section.

1.2 ORDER OF PRECEDENCE

In the event of contradictions between various documents, the order of precedence will be the Statement of Work in the contract, this Quality Assurance Project Plan (QAPJP), and the S-Cubed Quality Assurance Program Plan (QAPrP).

1.3 SCOPE OF THIS EFFORT

This project will consist of the analysis of waters, soils, and other samples according to Contract Laboratory Program (CLP) protocols. Processing encompasses receipt, handling and storage of samples, analytical testing, and reporting of results, using full CLP analytical and reporting requirements. Solid and liquid samples will be analyzed for volatiles (VOA), semivolatiles (BNA), pesticides and PCBs, metals, and cyanide according to the CLP protocols for Regular Analysis Services (RAS). Other analyses may also be requested

under the SAS provisions of this contract on a task-specific basis.

Specific analytical assignments will be provided by Westinghouse, specifying the required analysis and quality control for each sample delivery lot.

Data from this project may be used in court or as part of the DOE Environmental Restoration Program, and as such, the most stringent QA/QC criteria apply. All records must be adequate to meet evidential requirements, as for the CLP. Any questions regarding this requirement must be addressed to the Project Manager, Mr. J. DeWald, for prompt resolution. This project must meet all DOE-Richland safety requirements for laboratory operations.

1.4 SCHEDULE

Upon contract initiation, the starting and stopping dates of the project will be noted in this section. The schedules for sample handling and delivery of data are summarized in Sections 5.0 through 7.0 of this QAPJP.

1.5 ORGANIZATION OF THIS QAPJP

This document is organized according to EPA guidelines as described in QAMS 005/80 and related documents, except that certain elements are combined when they are of minor importance to the proposed effort. Section 2.0 describes the project organization and responsibilities of key individuals, while Section 4.0 deals with personnel training. Section 8.0 summarizes the specific QC procedures and acceptance criteria that will

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be required to achieve the quality objectives required by this contract. This section summarizes, among other things, the procedures that will be used to measure precision and accuracy, and provides, when available, the required levels of precision, accuracy, and detectability that must be achieved before data can be reported. A closely related topic, QA Objectives, is treated in Section 3.0. This section is intended to summarize the client's needs for overall data quality, and as such, can only be completed after detailed discussions with

Westinghouse Hanford. Section 5.0 summarizes sample receipt and custody requirements, and Section 6.0 describes the analytical procedures and calibration requirements. Data deliverables are summarized in Section 7.0. Discussions of QA audits, corrective action, and QC reports to management are found in Sections 9.0 and 12.0, while calculation routines and formulas for the various QC parameters required by this project are in Section 11.0. Procurement and control of materials are discussed in Section 13.0.

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2.0 PROJECT ORGANIZATION AND MANAGEMENT

The following information describes S-Cubed project organization and management for support of Westinghouse. Mr. John DeWald is designated as the Project Manager for this effort.

2.1 ORGANIZATION AND RESPONSIBILITIES

Figure 2.1 illustrates the organizational structure for the Westinghouse project. This organization is designed to provide a focal point at the project manager position so that project efforts and communication are efficiently and effectively coordinated. This organization is also compatible with the matrix management structure of the Environmental Technology Sector and promotes the ability to manage many large projects concurrently.

Figure 2.1 also assigns personnel to specific functional positions within this organizational structure.

Table 2-1 summarizes the responsibilities of these personnel within the management plan, and Table 2-2 provides important addresses and phone numbers. Mr. DeWald will be responsible for coordinating laboratory services and general management functions.

2.2 MEANS AND FREQUENCIES OF INTERNAL COMMUNICATIONS

The primary means of communicating project-specific requirements to laboratory staff is this QAPJP. In addition, weekly staff meetings are held in each section for the purpose of updating all personnel on project and laboratory requirements. Each sample lot is also accompanied throughout the

laboratory with a form, referred to as the Internal Traffic Log, which identifies the project number and any special analytical requirements. Samples requiring non-standard procedures may also be accompanied by a Method Summary Form which tabulates QC procedures and method options, as needed. All analysts are accustomed to referring to these summary sheets and to the appropriate QAPJPs or related documents for the indicated project.

Formal internal communication among S-Cubed laboratory management occurs at least weekly during management staff meetings. Since all laboratory staff are located at the Sorrento Valley facility of S-Cubed, informal communication occurs frequently on an as-needed basis.

2.3 PERSONNEL TRAINING

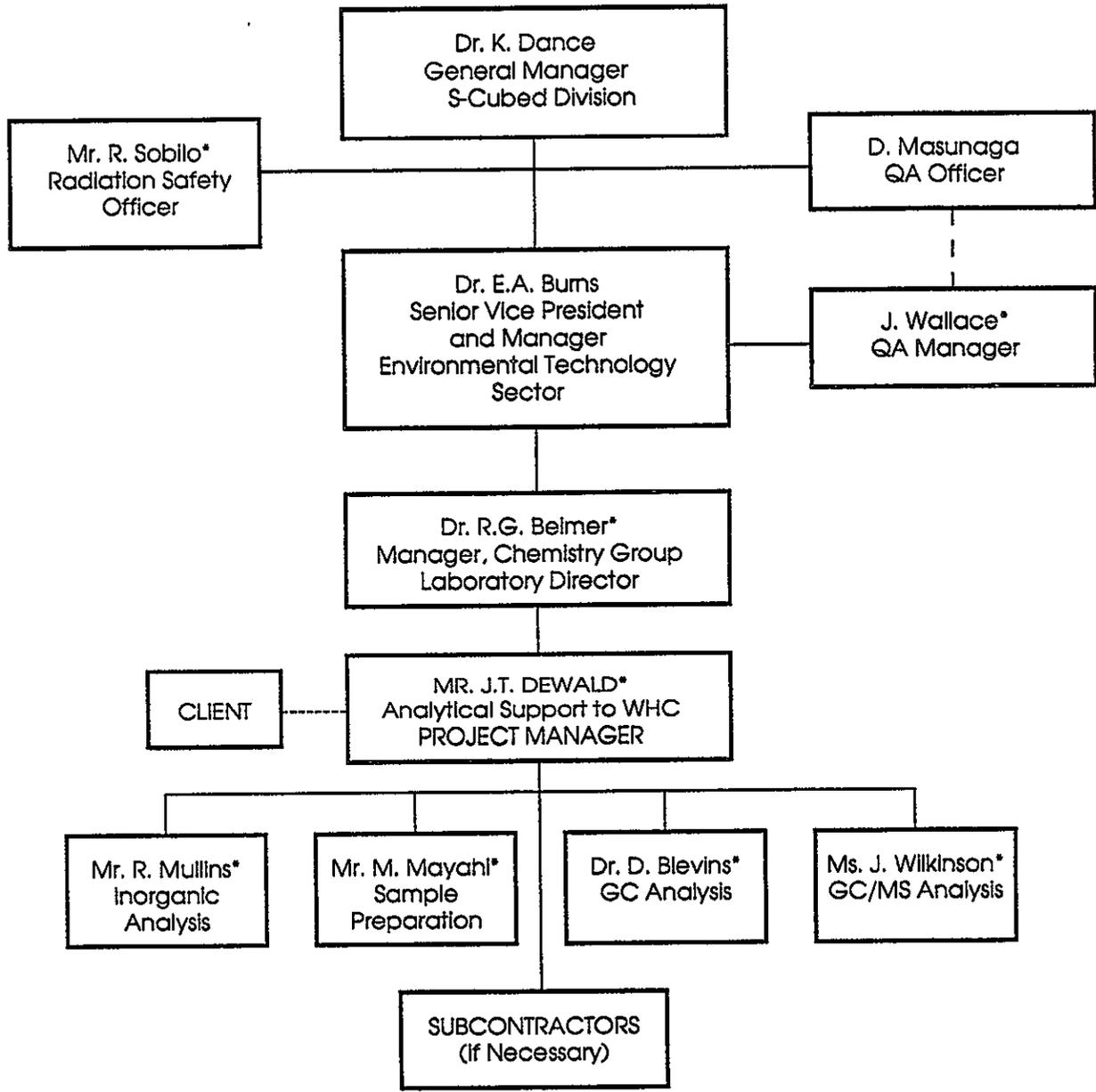
Personnel must be trained in analytical procedures and quality control practices on a task specific basis. The new analyst must be provided with literature and training materials describing the task. He will then assist a supervisor or senior technician in the specific task to observe the procedures. After this observation period he performs the task under direct supervision until it is determined by the supervisor that he is capable of performing a task alone. As a minimum, the analyst must then successfully analyze a spiked blank (QC check sample). His initial attempts at the task while unsupervised are evaluated for correct performance of the task. This evaluation includes performance on task documentation. The analyst must obtain satisfactory results before he is allowed to operate independently. Refer to S-Cubed SOP No. 86-001-00.

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Continued training of staff occurs through weekly staff meetings, on- and off-site seminars, and education programs. Safety training occurs during the initial staff orientation meeting and on a continual basis throughout the year. Training includes S-Cubed safety policy, employee right to

know, use of personal protective equipment, safe laboratory practices, chemical safety, hazardous materials handling, and emergency procedures. Records of attendance at staff training and safety seminars are kept in the secretarial office of the Chemistry Group.

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*Key personnel

Figure 2.1. Project organizational chart.

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TABLE 2-1. PROJECT RESPONSIBILITIES OF KEY PERSONNEL

Position	Responsibilities	Assignment
Group Manager	Laboratory Director. Chemistry Program performance. Provide personnel resources for project. Oversight of project management. Reports to Division Vice President.	R. Belmer
Project Manager	Technical and administrative performance of project. Coordination of project communication. Coordination of laboratory work. Final review and sign-off for reports. Final resolution of corrective actions. Project planning/progress monitoring. Adherence to QA project plans Timely completion of project tasks. Assignment of task management responsibilities. Reports to Program Manager.	J. DeWald
QA Manager	Ensure adherence to QAPP. Review project plans. Independent audits of performance. Oversight of QC procedures, and corrective action. QA advice and guidance. Reports to Division General Manager.	J. Wallace
Functional Area Supervisors and Task Managers	Manage day to day analytical functions. Ensure adherence to project plans. Review data and reports from area. Ensure completion of corrective actions in area. Communicate area progress and problems. Report to Project Manager and Program Manager. Schedule work.	J. Wilkinson D. Blevins R. Mullins M. Mayahi
Radiation Safety Officer	Facility monitoring. Adherence to mixed waste procedures. Oversight of radiation materials control. Personnel monitoring. Licensing requirements.	R. Sobilo

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TABLE 2-2. S-CUBED CONTACTS

• S-CUBED Switchboard, 7:30 am to 5:30 pm PST	(619) 453-0060
• Telefax	(619) 755-0474
	Direct Dial
• San Diego Project Manger, J. DeWald	(619) 587-8369
• Program Secretary, A. Brook	(619) 587-8343
• Sample Custodian, E. Walters	(619) 587-8481
• Client Service	(619) 587-8475
Mailing Address	Shipping Address
S-CUBED P.O. Box 1620 La Jolla, CA 92038-1620 Attention: J. DeWald	S-CUBED 3398 Carmel Mountain Road San Diego, CA 92121-1095 Attention: J. DeWald

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3.0 QA OBJECTIVES

QA objectives are the specifications that the measurements must meet in order to satisfy project objectives. The method-specific QC procedures that enable the attainment of these specifications are discussed in Section 8.0 of this QAPJP.

This section of a QAPJP normally contains a summary table indicating the precision, accuracy, method detection limits, and completeness objectives that are required to achieve project goals. Representativeness and comparability may also be discussed qualitatively.

Several questions must be resolved before QA objectives are entered into this Section. For example, are precision and accuracy objectives to be stated as project averages, or as requirements for individual samples? Are accuracy measurements to be based on surrogates that are added to every sample, or on a limited number of matrix spike samples? Which matrix spike compounds will be employed? These and similar questions must be resolved before actual initiation of the proposed effort in order to complete this section.

Section 8.0 of this QAPJP summarizes the specific quality control procedures and criteria that must be met before data can be released, including various procedures for measuring precision and accuracy. In some cases, these same criteria, if so desired by the client, can serve as QA objectives.

The following example is meant to illustrate the relationship between QA objectives and QC criteria:

HYPOTHETICAL EXAMPLE: Volatile organic compounds (VOCs) in drinking water

QA Objectives: *Essentially all VOC measurements must be accurate to $\pm 50\%$.*

QC Criteria: *Recovery of all VOCs from a QC check sample, prepared independently of calibration standards, must be in the range $\pm 55 - 145\%$.*

Samples must be re-analyzed if this criterion is not met.

The relative standard deviation of the relative response factors during initial calibration must be less than $\pm 20\%$ for all compounds.

All organic and inorganic analyses under this project are to be carried out according to CLP protocols, and it is assumed, unless notified otherwise by Westinghouse, that QA objectives for quantitation limits, precision and accuracy will be those required by the CLP program. Thus, contract-required quantitation limits will be those given in Exhibit C of the CLP Statements of Work (SOW). Accuracy will be measured as the percent recovery of the matrix spike compounds and elements specified in this SOW. Precision will be determined by the analysis of matrix spike duplicates for organics, and by unspiked duplicates for inorganics. The specific acceptance criteria and corrective action are summarized in Section 8 of this QAPJP. The target compound list and Contract Required Quantitation Limits are listed in Table 3.1.

Representatives will be assured by mixing the sample thoroughly before taking an aliquot

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for analysis. Obtaining a representative field sample will be the responsibility of Westinghouse.

S-Cubed will adhere strictly to the CLP protocols in order to assure comparability of data.

Since it is likely that all samples will be analyzed, completeness should be 100 percent. Westinghouse will be notified promptly in the event of sample loss, or if samples are received in a compromised form due to shipping damage.

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**TABLE 3-1. TARGET COMPOUND LIST AND
CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)**

CAS Number	Compound Name	Contract-Required Quantitation Limit ^a	
		Water ($\mu\text{g/L}$)	Low Soil ^c ($\mu\text{g/kg}$)
VOLATILE ORGANIC COMPOUNDS (VOA)^b			
74-87-3	Chloromethane	10	10
74-83-9	Bromomethane	10	10
75-01-4	Vinyl Chloride	10	10
75-00-3	Chloroethane	10	10
75-09-2	Methylene Chloride	5	5
67-64-1	Acetone	10	10
75-15-0	Carbon Disulfide	5	5
75-35-4	1,1-Dichloroethene	5	5
75-34-3	1,1-Dichloroethene	5	5
540-59-0	1,2-Dichloroethene (Total)	5	5
67-66-3	Chloroform	5	5
107-06-2	1,2-Dichloroethane		
78-93-3	2-Butanone	10	10
71-55-6	1,1,1-Trichloroethane	5	5
56-23-5	Carbon Tetrachloride	5	5
75-27-4	Bromodichloromethane	5	5
78-87-5	1,2-Dichloropropane	5	5
10061-01-5	cis-1,3-Dichloropropene	5	5
79-01-6	Trichloroethene	5	5
124-48-1	Dibromochloromethane	5	5
79-00-5	1,1,2-Trichloroethane	5	5
71-43-2	Benzene	5	5
10061-02-6	trans-1,3-Dichloropropene	5	5
75-25-2	Bromoform	5	5
108-10-1	4-Methyl-2-Pentanone	10	10

TABLE 3-1. TARGET COMPOUND LIST AND
CONTRACT REQUIRED QUANTITATION LIMITS (CRQL) (CONTINUED)

CAS Number	Compound Name	Contract-Required Quantitation Limit ^a	
		Water ($\mu\text{g/L}$)	Low Soil ^c ($\mu\text{g/kg}$)
87-68-3	Hexachlorobutadiene	10	330
59-50-7	4-Chloro-3-methylphenol	10	330
91-57-6	2-Methylnaphthalene	10	330
77-47-4	Hexachlorocyclopentadiene	10	330
88-06-2	2,4,6-Trichlorophenol	10	330
95-95-4	2,4,5-Trichlorophenol	50	1600
91-58-7	2-Chloronaphthalene	10	330
88-74-4	2-Nitroaniline	50	1600
131-11-3	Dimethylphthalate	10	330
208-96-8	Acenaphthylene	10	330
606-20-2	2,6-Dinitrotoluene	10	330
99-09-2	3-Nitroaniline	50	1600
83-32-9	Acenaphthene	10	300
51-28-5	2,4-Dinitrophenol	50	1600
100-02-7	4-Nitrophenol	50	1600
132-64-9	Dibenzofuran	10	330
121-14-2	2,4-Dinitrotoluene	10	330
84-66-2	Diethylphthalate	10	330
7005-72-3	4-Chlorophenyl-phenylether	10	330
86-73-7	Fluorene	10	330
100-01-6	4-Nitroaniline	50	1600
534-52-1	4,6-Dinitro-2-methylphenol	50	1600
86-30-6	N-Nitrosodiphenylamine (1)	10	330
101-55-3	4-Bromophenyl-phenylether	10	330
118-74-1	Hexachlorobenzene	10	330
87-86-5	Pentachlorophenol	50	1600
85-01-8	Phenanthrene	10	330
120-12-7	Anthracene	10	330
86-74-8	Carbazole		
84-74-2	Di-n-butylphthalate	10	330

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TABLE 3-1. TARGET COMPOUND LIST AND
 CONTRACT REQUIRED QUANTITATION LIMITS (CRQL) (CONTINUED)

CAS Number	Compound Name	Contract-Required Quantitation Limit ^a	
		Water ($\mu\text{g/L}$)	Low Soil ^c ($\mu\text{g/kg}$)
206-44-0	Fluoranthene	10	330
129-00-0	Pyrene	10	330
85-68-7	Butylbenzylphthalate	10	330
91-94-1	3,3'-Dichlorobenzidine	20	660
56-55-3	Benzo(a)anthracene	10	330
218-01-9	Chrysene	10	330
117-81-7	bis(2-Ethylhexyl)phthalate	10	330
117-84-0	Di-n-octylphthalate	10	330
205-99-2	Benzo(b)fluoranthene	10	330
207-08-9	Benzo(k)fluoranthene		
50-32-8	Benzo(a)pyrene		
193-39-5	Indeno(1,2,3-cd)pyrene		
53-70-3	Dibenz(a,h)anthracene		
191-24-2	Benzo(g,h,i)perylene		
PESTICIDES (PES)^e			
319-84-6	alpha-BHC	0	8
319-85-7	beta-BHC	0	8
319-86-8	delta-BHC	0	8
58-89-9	gamma-BHC (Lindane)	0	8
76-44-8	Heptachlor	0	8
309-00-2	Aldrin	0	8
1024-57-3	Heptachlor epoxide	0	8
959-98-8	Endosulfan I	0	8
60-57-1	Dieldrin	0	16
72-55-9	4,4'-DDE	0	16

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TABLE 3-1. TARGET COMPOUND LIST AND CONTRACT REQUIRED QUANTITATION LIMITS (CRQL) (CONTINUED)

CAS Number	Compound Name	Contract-Required Quantitation Limit ^a	
		Water (µg/L)	Low Soil ^c (µg/kg)
72-20-8	Endrin	0	16
33213-65-8	Endosulfane II	0	16
72-54-8	4,4'-DDD	0	16
1031-07-8	Endosulfan sulfate	0	16
50-29-3	4,4'-DDT	0	16
72-43-5	Methoxychlor	1	80
53494-70-5	Endrin ketone	0	16
5103-71-9	alpha-Chlordane	1	80
5103-74-2	gamma-Chlordane	1	80
8001-35-2	Toxaphene	1	160
12674-11-2	Aroclor-1016	1	80
11104-28-2	Aroclor-1221	1	80
11141-16-5	Aroclor-1232	1	80
53469-21-9	Aroclor-1242	1	80
12672-29-6	Aroclor-1248	1	80
11097-69-1	Aroclor-1254	1	160
11096-82-5	Aroclor-1260	1	160
METALS AND CYANIDE			
	Aluminum	200	
	Antimony	60	
	Arsenic	10	
	Barium	200	
	Beryllium	5	
	Cadmium	5	
	Calcium	5000	
	Chromium	10	
	Cobalt	50	
	Copper	25	

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TABLE 3-1. TARGET COMPOUND LIST AND CONTRACT REQUIRED QUANTITATION LIMITS (CRQL) (CONTINUED)

CAS Number	Compound Name	Contract-Required Quantitation Limit ^a	
		Water (µg/L)	Low Soil ^c (µg/kg)
	Iron	100	
	Lead	3	
	Magnesium	5000	
	Manganese	15	
	Mercury	0.2	
	Nickel	40	
	Potassium	5000	
	Selenium	5	
	Silver	10	
	Sodium	5000	
	Thallium	10	
	Vanadium	50	
	Zinc	20	
	Cyanide	10	

^aSpecific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

^bMedium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Volatile TCL Compounds are 125 times the individual Low Soil/Sediment CRQL.

^cQuantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

^dMedium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Semivolatile TCL Compounds are 60 times the individual Low Soil/Sediment CRQL.

^eMedium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Pesticide/PCB TCL compounds are 15 times the individual Low Soil/Sediment CRQL.

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4.0 PERSONNEL TRAINING

Personnel are trained in analytical procedures and quality control practices on a task specific basis. The new analyst is provided with literature and training materials describing the task. He then assists a supervisor or senior technician in the specific task to observe the procedures. After this observation period he performs the task under direct supervision until it is determined by the supervisor that he is capable of performing a task alone. His initial attempts at the task while unsupervised are evaluated for correct performance of the task. This evaluation includes performance on task documentation. Standard Operating Procedure (SOP) 86-001-00 describes documentation and procedures for personnel training.

Continued training of staff occurs through weekly staff meeting, on- and off-site seminars and education programs. Safety training occurs during the initial staff orientation meeting and on a continual basis throughout the year. Training includes S-Cubed safety policy, employee right to know, use of personal protective equipment, safe laboratory practices, chemical safety, hazardous materials handling, and emergency procedures. Records of attendance at staff training and safety seminars will be kept in the secretarial office of the Chemistry Group.

Reference materials and methods are available to staff through the S-Cubed technical library and the chemistry method libraries.

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5.0 SAMPLE MANAGEMENT AND DOCUMENT CONTROL

The following sections summarize sample handling, management, documentation, document control, and chain-of-custody requirements for this project. Detailed contractual requirements are specified in Section 3.0 of the Statement of Work for this contract. All Chain-of-Custody and sample storage requirements of the CLP must be followed.

5.1 SAMPLE SCHEDULING AND DELIVERY

S-Cubed will provide a point of contact during normal business hours (7:30 a.m. to 5:00 p.m. on regular business days, except legal holidays), and a point of contact in the event of emergency situations during all off-hours. Westinghouse is to contact the sample custodian, Ms. E. Walters at (619) 587-8481 to arrange for sample delivery. Sample should be shipped to

S-Cubed
3398 Carmel Mountain Road
San Diego, California 92121-1095
Attn: John DeWald

The home telephone number of Mr. DeWald will be provided to Westinghouse upon request for emergency situations. For after-hour emergencies, security personnel can be reached at (619) 748-5320.

The primary point of contact for sample delivery at Westinghouse will be the Office of Sample Management, Technical Representative. All sample delivery will be the responsibility of Westinghouse Hanford Company.

All samples will be labeled and identified by Westinghouse. Each label will specify unique sample identification, user identification, and the analytical test ordered.

S-Cubed will provide oral confirmation to the Office of Sample Management of sample receipt and package/storage integrity (i.e., refrigeration, temperature) within 24 hours of sample receipt. S-Cubed will provide, by facsimile, copies of the chain of custody, shipping documentation, and sample analysis request forms (SAR) to the Office of Sample Management within 24 hours of sample receipt.

5.2 SAMPLE MANAGEMENT

S-Cubed will ensure the integrity and security of all samples, including both the initial and unused portions, sample extracts and other preparations, as well as analytical data, using the Chain-of-Custody protocol as specified in the CLP Statements of Work, Exhibit F. The S-Cubed chain-of-custody Standard Operating Procedures shall be supplied to Westinghouse Hanford Company Office of Sample Management upon request. See S-Cubed SOPs 81-001-00 through 81-002-00.

S-Cubed will ensure that sample aliquots removed from the sample are representative of the entire sample by thoroughly stirring, shaking, or otherwise agitating the sample before obtaining an aliquot. In some cases, samples may be "coned and quartered" to obtain representative subsamples.

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S-Cubed will store and preserve the integrity of unused portions of samples as well as digestates and extracts. Sample storage must be in accordance with Contract Laboratory Program Statement of Work protocol as follows:

TABLE 5-1. SAMPLE PRESERVATION AND HOLDING TIMES ACCORDING TO THE CLP

Sample/Extract	Preservation	Maximum Holding Times
VOAs	4±2°C	10 days from VTSR
Semivolatiles, Pesticides	4±2°C	Extract soils within 10 days of VTSR. Extract waters within 5 days of VTSR. Analyze within 40 days of VTSR
Return or dispose of unused samples extracts, or digesta ^a	^b	60 days after receipt of data by Westinghouse. Requires written approval by Westinghouse
Metals except Hg	HNO ₃ , pH <2 for water. 4±2°C for soils/sediments	180 days after VTSR
Hg	HNO ₃ , pH <2 for water. 4±2°C for soils/sediments	26 days from VTSR
Cyanide	0.6 g ascorbic acid if Cl ₂ present NaOH to pH >12 4±2°C	12 days after VTSR

^aWestinghouse requirement.

^bThe same storage conditions must be maintained from sample receipt until disposal.

Note that in many cases data must be reported before maximum holding times are exceeded.

The Standard Operating Procedures (SOPs) for sample management and documentation that are currently in use at S-Cubed are SOP Nos. 81-001-00 and 81-002-00. These SOPs describe in detail the sample management procedures intended for the proposed effort, except for special handling requirements which will be required for mixed wastes. In addition, a checklist will be prepared summarizing the specific documentation and notification requirements for this effort, similar to that shown in Tables 3 through 6 in SOP No. 81-001-00. Sample numbering procedures are summarized in Table 2 of this SOP. Additional SOPs will be developed and approved for handling mixed wastes prior to project initiation.

The sample custodian and document clerk for this project will be Ms. Elaine Walters. Her responsibilities will include signing for incoming field samples, obtaining and reviewing all shipping documents, verifying data on sample custody forms, and satisfying all sample management and document control requirements.

The sample management and analytical documentation procedures used at S-Cubed are generally designed to meet EPA CLP requirements and to satisfy other stringent client requirements. All samples are received under strict chain-of-custody protocol, and samples and extracts are tracked and accounted for at all points in the laboratory. The original sample analysis data are captured in a permanent form along with the appropriate documentation to support its quality. A sufficient level of redundancy exists so that all information can be verified from one or more sources.

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Samples are received for S-Cubed Chemistry by the Sample Custodian in the Chemistry Receiving Area, Room 118 of Building C. Upon receipt of samples for projects, the sample custodian will check the temperature of each ice chest and record this information on the Chain-of-Custody form and Internal Traffic Log. The pH of those samples intended for inorganic analyses will be checked and recorded after scanning for radioactivity. If an ice chest is found to be warmer than 4°C, the appropriate contract representative will be notified.

Samples are assigned unique S-Cubed lot and sample numbers and are logged into the sample receipt logbook in the order they are received. Other documentation is prepared as is necessary for the individual client. The documentation is distributed to the analysts and departments requiring it, and the samples are stored in the appropriate locked walk-in refrigerators or VOA refrigerators. Access to the samples is obtained through the sample custodian.

Internal traffic logs track the progress of samples, extracts, and digests through each step of preparation and analysis for each matrix and method required. Extraction and instrument logs, sample tags, and analysts notebooks are also kept and provide redundancy in sample tracking, preparation, and

analysis documentation. The sample tags are prepared for each extract and digest and remain with it until its ultimate disposal. Each bound laboratory notebook is assigned a sequential number, and is archived by the QA staff upon completion.

After all work has been completed, copies of the data, result summaries, sample documentation, and other information are collected together in a Sample Delivery Group (SDG) file and are given to the project manager or his designate for review and report preparation. After additional review for quality control, the report is released. The SDG file of original documents is given to the document control officer for archiving. If requested, samples and extracts are also archived for retrieval, reanalysis, and eventual disposal. This is recorded on the appropriate internal traffic logs.

5.3 SAMPLE BOTTLES

Westinghouse will be responsible for obtaining sample containers and preserving samples. S-Cubed will advise Westinghouse regarding the minimum sample size required. Sample mass or volume must be sufficient for duplicate analysis, plus QA/QC required by the CLP.

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6.0 ANALYTICAL PROCEDURES AND CALIBRATION

6.1 ANALYTICAL PROCEDURES

The analytical procedures to be used in support of this project are those specified in the Contract Laboratory Program "Statement of Work - Organics" (2/88) and "Statement of Work - Inorganics" (7/88). Procedures for radionuclide determinations will be specified on a case-by-case basis, as is done for the CLP Special Analytical Services Program. Any variances to these written procedures will be performed only after approval by Westinghouse Hanford Company.

6.2 CALIBRATION PROCEDURES

Calibration procedures are specified explicitly in the CLP Statements of Work. Routine calibration schedules and acceptance criteria are summarized in Section 8.0 of this QA Project Plan.

6.3 STANDARDS PREPARATION AND TRACEABILITY

Procedures for preparing standards and assuring traceability are described in S-Cubed SOP Nos. 81-003-00, 83-001-00, 83-002-00, and 83-011-00. In summary, traceability of standards is accomplished by comparing in-house standards to EPA or NIST materials, and by maintaining the required records. Whenever a standard is prepared, the manufacturer's lot number, the starting materials, the source and volume of the solvent or acid, the starting amount and volume, the data preparation, and the initials of the technician are recorded in a permanent, bound notebook. The accuracy of the standards will be established by comparison to previously prepared standard

and by comparison to standards prepared independently from different starting materials.

6.4 ROUTINE QUALITY CONTROL

Routine quality control samples, such as blanks, matrix and surrogate spikes, and QC check samples, are summarized in Section 8 of this QA Project Plan.

6.5 ADDITIONAL ANALYTICAL REQUIREMENTS

Data Re-checks (7 Days)

Within seven business days after receipt of written request by the Office of Sample Management, S-Cubed will perform data re-checks of previously reported results as ordered by the Technical Representative of the Westinghouse Hanford Office of Sample Management. Data re-checks may consist of a review of calculations, aliquot size, yield, and other data pertinent to the reported analytical result. S-Cubed may also have to review the results of quality control samples as well as the results of other samples processed in the same batch. The quality control sample results and the results of the data re-check evaluations shall be delivered in writing to the Westinghouse Office of Sample Management technical representative within the allotted seven days.

Re-Analysis (35 Days)

S-Cubed will perform analytical tests on the preserved, unused portions of samples (i.e., re-analysis), if ordered by the Westinghouse Office of Sample Management Technical Representative. A completed data packet

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for reanalysis must be received within 35 days of receipt of written request by Westinghouse Hanford Company's Office of Sample Management.

Repeat of Prepared Samples (35 Days)

S-Cubed will perform re-analysis of the original, preserved analytical preparations from samples previously analyzed, if ordered by the Westinghouse Office of Sample Management Technical Representative. The completed data packet for re-analysis must be received within 35 days of receipt of written request by Office of Sample Management. S-Cubed shall report the results of re-analyses in writing in accordance with the specifications of the Contract Laboratory Program, "Statements of Work - Organics" (2/88) and "Statement of Work - Inorganics" (7/88).

Priority and Regular (10 and 35 Days)

There will be two types of samples included in this project: Regular and Priority. All requested work on "Regular" samples, including a completed data packet, shall be received by Westinghouse Office of Sample Management within 35 days from the VTSR, as defined in the U.S. Environmental Protection Agency Contract Laboratory Program Statement of Work, Exhibit G. All requested work on "Priority" samples, including a completed data packet, shall be received by Westinghouse Office of Sample Management within 10 days from VTSR.

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7.0 DATA REDUCTION, VALIDATION, AND REPORTING

Data reduction, validation, and reporting is essentially identical to that of the CLP program, with certain modifications noted below. Note also the delivery schedule in Section 6.0 of this QA Project Plan, which in certain instances is somewhat shorter than permitted by the CLP program. Note also the requirement for diskette deliverable in Format A.

7.1 INTERNAL S-CUBED PROCEDURE

Each analytical method given in the CLP protocols provides detailed instructions and equations for calculating analyte concentrations. Section 11.0 of the QA Project Plan describes calculations related to QC requirements.

All results reported under this program will be reviewed first with respect to QC requirements by the analyst performing the assay. Compiled results will be further reviewed by Annina Lukini-Johnson (who currently reviews all CLP data packages at S-Cubed) with respect to completeness of the data package and compliance to all contractual and in-house QC requirements. J. DeWald will provide a final review of the completed data package with respect to contract compliance.

Section 8.0 of this QA Project Plan summarizes QC requirements that must be met before data can be released. However, the definitive description of QC requirements is found in the CLP Statements of Work. Figure 7.1 illustrates the data reduction, validation, and reporting scheme.

7.2 PROJECT-SPECIFIC REQUIREMENTS

Communications of analytical results will be made only to Westinghouse Hanford Company's Office of Sample Management Technical Representative. In no case will reports, results, or data be released to a third party without the prior written permission of the Westinghouse Hanford Company's Office of Sample Management Technical Representative.

S-Cubed will maintain records of data and other technical information generated in the performance of the services described in this Statement of Work.

7.2.1 Reporting Results of Analyses

All deliverables and reports for Regular Analytical Services (RAS) will be identical to those specified in the U.S. EPA Contract Laboratory Program "Statement of Work - Organics" (2/88) and "Statement of Work - Inorganics" (7/88) protocols. In addition, the following information for RAS and SAS (Special Analytical Services) shall be provided for each test result reported:

- Westinghouse identifier code.
- Sample identification number.
- The sites and/or locations of laboratory(s) performing the analyses.
- Certification statement signed by the S-Cubed Project Manager that the analysis was performed in accordance with requirements of the purchase document. This statement will be part of the Case Narrative.

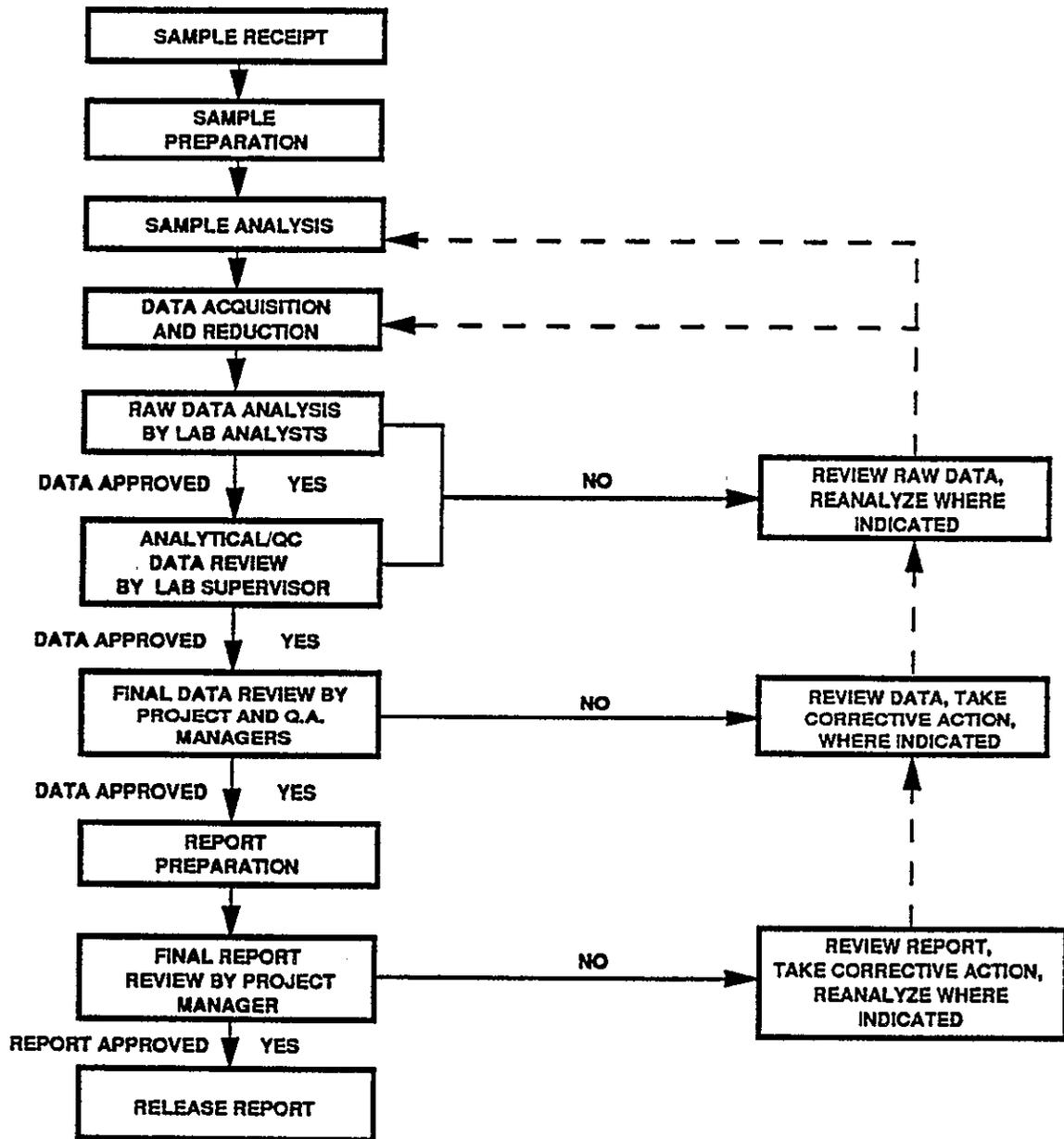


Figure 7.1. Reduction, validation, and reporting scheme

All RAS deliverables shall be in the format of the U.S. EPA Contract Laboratory Program "Statement of Work - Organics" (2/88) and "Statement of Work - Inorganics" (7/88).

All deliverables and reports for SAS shall include the following:

- All chain-of-custody documentation (airbills, traffic reports, packing lists, chain-of-custody, etc.).
- Case Narrative
- Summary data package, including QC data
- Raw technical data
- Raw QC data
- Standards data
- Sample data

Data shall be presented in a concise and rational form.

Deliverables for all "Regular" processed analytical samples shall be received by Westinghouse Office of Sample Management within 35 days from VTSR. All deliverables for "Priority" analytical samples shall be received by the Office of Sample Management within 10 days from VTSR.

All results for RAS entered onto diskettes shall be entered using Format A from "Environmental Protection Agency Statement of Work - Organics" (2/88) or Format A from the Environmental Protection Agency Statement of Work - Inorganics" (7/88). Diskette deliverables shall be included as part of the data package, whether sample is a "Regular" or "Priority" sample.

All results for SAS entered onto diskette shall be entered using a format to be determined by the Westinghouse Hanford Company.

Transmission of data packets for "Priority" samples via facsimile machine is acceptable as long as the data packets, including the diskette deliverables, are received within 10 days from VTSR.

7.2.2 Case-File Maintenance and Record Turnover

S-Cubed will maintain records in a two-hour rated, Class B file container, meeting requirements of NFPA 232-1975.

Up to 140 days after submission of the sample data package to the Westinghouse Office of Sample Management, S-Cubed may be requested to provide duplicate copies of all laboratory records not previously submitted.

The original documentation will be maintained by S-Cubed per DOE Order 1324.3, Files Management, DOE-1981.

S-Cubed will also provide the same case-file information to Westinghouse Office of Sample Management within seven days of receipt of written request from Office of Sample Management.

The additional information may include, but is not limited to: sample tags, custody records, sample tracking records, analysts logbook pages, bench sheets, chromatographic charts, computer printouts, raw data summaries, instrument logbook pages, correspondence, and the document inventory.

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7.2.3 Notification of Lost Samples, Reporting Error, Out-of-Control Samples, or Loss of Capability

S-Cubed will notify the Westinghouse Hanford Company's Office of Sample Management Technical Representative via facsimile machine (with oral confirmation of facsimile transmission) within 24 hours of lost or inadvertently destroyed samples, discrepancies or out-of-control results or supporting documentation, errors in reporting, or the loss of a capability which may adversely affect analytical test results or the delivery of analytical test reports within the times specified herein.

Written confirmation with an Action Plan will be provided by S-Cubed within five business days of the oral report. Whenever S-Cubed determines that a correction should be made to a previously reported result, the correct result and reason for the correction shall be reported via facsimile machine (with oral confirmation of facsimile transmission) within 24 hours to the Westinghouse Hanford Company's Office of Sample Management Technical Representative, and confirmed in writing within five business days.

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8.0 INTERNAL QUALITY CONTROL CHECKS

This section describes the scheduled QC and calibration procedures for selected analytical methods to be employed in the proposed effort. These procedures are summarized in Table 8-1, which includes an explanatory reference, the required frequency, the acceptance criteria, and the required corrective action. This format has proven to be an effective means of alerting the analyst to the main QC requirements. In addition, all analysts have in their possession the complete SOW or method, which serves as the definitive description for QC requirements. In its current

form, this table covers regulatory methods specified in the Statement of Work. QC for the SAS analyses will be designated in specific work orders, and then summarized in a similar format as an aid to the analyst.

In addition to the QC listed in this table, it should also be mentioned that S-CUBED routinely analyzes internal quality control (IQC) samples consisting of spiked blanks as part of its internal QA program. These have proven helpful in identifying and correcting problem areas.

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TABLE 8.1. Scheduled QC and Calibration

SEMIVOLATILES BY CLP METHODS (2/88)				
Reference ^a	Procedure	Frequency ^b	Acceptance Criteria	Corrective Action
E.SV.1	DFTPP Tune	Every 12 hours.	Table 1.2 of Section E.III.1 of SOW.	Correct before sample analysis.
E.SV.2	ICAL & Inertness. One standard near CRQL.	Initially and as needed.	RSD of CCC compounds $\leq 30\%$. RRT within 0.06. RRF for all SPCCs ≥ 0.05 .	Re-calibrate.
E.SV.2.6	Continuing calibration.	Every 12 hours.	RF for all SPCCs ≥ 0.05 . RRF for all CCCs within 25% of ICAL. RT of IS within 30 sec. Area of IS within factor of two of last CCC.	Correct before analyses. Otherwise re-run ICAL.
E.SV.3	Method Blank.	Before any samples; each case or batch ≤ 20 ; every 14 days.	Phthalates $\leq 5X$ CRQL; all other \leq CRQL.	Correct before analysis.
E.SV.4	Surrogate Recovery.	Each sample blank.	Table 4.2 of Section E.III.4 of SOW. See E.III.4.3.	Recheck and reanalyze. See E.III.4.3.
E.SV.5	Matrix Spike/Matrix Spike Duplicate.	Each case or batch ≤ 20 ; every 14 days.	Forms III.	Report data.
VOLATILES BY CLP (2/88)				
Reference ^a	Procedure	Frequency ^b	Acceptance Criteria	Corrective Action
E.VOA.1	BFB Tune.	Every 12 hours.	Table 1.1 of E.VOA of SOW.	Correct problem before proceeding.
E.VOA.2	ICAL and Inertness.	Initially and as needed.	RSD of CCCs $\leq 30\%$. RRF of SPCCs ≥ 0.30 (0.25 for bromoform).	Correct before analyzing samples.
E.VOA.2.6	Continuing Calibration.	Every 12 hours.	RRFs for SPCCs as for ICAL. RRFs for all CCCs within 25% of ICAL. RT of ISs within 30 sec of ICAL. Areas of ISs within -50, +100% of ICAL.	Correct problem before analysis. Otherwise re-run ICAL.

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TABLE 8.1. Scheduled QC and Calibration
(Continued)

E.VOA.3	Method Blank.	Each case or batch ≤ 20 ; every 2 hours.	Section E.SV.3.2.1 . \leq CRQL for most compounds.	Correct problem and repeat associated batch.
E.VOA.4	Surrogate recovery	Each sample.	Table 4.2 of E.VOA.	Reanalyze, but see E.VOA.4.3.
E.VOA.5	MS/MSD	Each case or batch ≤ 20 ; every 14 days.	Table 5.2 of E.VOA.	Report data.
PESTICIDES/PCBS BY CLP METHODS (2/88)				
Reference ^a	Procedure	Frequency ^b	Acceptance Criteria	Corrective Action
E.PEST.4.3	3-pt Initial Calibration (I-CAL)/Eval A,B,C.	Initially and as specified in 72-hr sequence and at end of sequence.	%RSD $\leq 10\%$.	Correct problem before sample analysis.
E.PEST.4.3	Inertness for Endrin DDT.	Evaluate Eval A & B Chromatograms in 72-hr sequence.	Must not exceed 20% breakdown.	Correct problem before beginning analysis or discontinue.
E.PEST.4.3	Continuing Calibration (C-CAL)/IND A, B	Initially and as specified in 72-hr sequence and at end of sequence.	Must not exceed 15% D for quantitation and 20% D for confirmation run.	If >15% D, repeat samples analyzed following the last valid quantitation standard.
E.PEST.3	MS/MSD	Every case or batch ≤ 20 samples.	Table 5.2 of E.PEST.	TBD.
E.PEST.2	Surrogate recovery.	Each sample, blank, and standard.	Table 4.2 of E. PEST.	TBD.
E.PEST.1	Method Blank.	Before any samples are analyzed; each batch ≤ 20 samples; every 14 days; each case.	<CRQL.	Find source and remove interference. Re-extract & re-analyze.
E.PEST.4.2	Retention time windows - establish and verify.	3 injections at equal intervals on 72-hr sequence.	<2.0% D for packed columns; <1.5% D for medium & wide bore capillary columns. Verification = ± 3 std dev. But see E.PEST.4.2.2.	Continue injecting replicate standards until criteria are met.

TABLE 8.1. Scheduled QC and Calibration
(Continued)

ICP AND GFAA (7/88)				
Reference ^a	Procedure	Frequency ^b	Acceptance Criteria	Corrective Action
E.V.1	Initial Instrument Calibration (ICAL). Two-point calibration for ICP, four-point for AA, including blanks.	Instrument set up; daily.	See Section E.V.1 if instrument cannot accept indicated number of standards.	To be decided.
E.V.2.a	Initial Calibration Verification (ICV). Check calibration with standard from independent source, traceable to EPA.	After each initial instrument calibration. At every wavelength used.	Results within $\pm 20\%$ of true value for Hg, $\pm 10\%$ for all other elements.	Terminate analysis, correct problem, repeat ICAL and ICV before proceeding.
E.V.2.b	Continuing Calibration Verification (CCV). Use midpoint standard from independent source, traceable to NIST or EPA.	10% of samples; every two hours; beginning and end of run. At every wavelength used.	90% <R< 110% for all ICP and AA metals. 80% <R< 120% for Hg.	Terminate analysis. Correct problem, repeat ICAL and ICV. Repeat samples since last valid CCV.
E.V.3	Attainment of CRDL. Analyze CRI for ICP, and CRA for AA. Required at each wavelength used, but see Section E.V.3.	ICP: Beginning and end of each run; two times per eight-hour shift; but after ICV. AA: Beginning of each run, after ICV.	Report recoveries. Acceptance limits to be set later.	To be determined.
E.V.4	Initial and Continuing Calibration Blank (ICB and CCB). Required at each wavelength used.	After each ICV and CCV; 10% of samples; beginning and end of run after last CCV. Every 2 hrs.	Quantitative: Blank \leq CRDL.	Correct problem, repeat ICAL, etc. Reanalyze samples since last valid calibration blank. Report all values over IDL.
E.V.4.b	Preparation (reagent) Blank (PB).	Each batch, each SDG.	Blank \leq CRDL.	See Section E.V.4.b.

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TABLE 8.1. Scheduled QC and Calibration
(Continued)

E.V.5	Interference Check Samples (ICS) for ICP. All wavelengths used. Obtain solutions A and AB from EPA, if available.	Beginning and end of each run; twice per eight-hour shift. After ICV.	Results for analytes within $\pm 20\%$ of true value.	Terminate run, recalculate, and re-run samples since last valid ICS.
E.V.6	Matrix Spike. Do not spike field blanks. See Table 3, Section E.V.	10% of samples; each episode or set.	Recovery = 75 to 125%	See E.V.6. Flag data or spike digestate, as indicated.
E.V.7	Duplicate sample analysis; do not use field blanks.	Each SDG or batch of each sample type	RPD $< 20\%$ if $C > 5X$ CRDL; otherwise \pm CRDL.	Flag data.
E.V.8	Laboratory Control Sample (LCS) obtained from independent source, carried through digestion procedure.	Each set or episode; each batch of standards. Not required for aqueous Hg & CN.	Recovery = 80 - 120% (except Sb and Ag).	Correct problem, redigest and reanalyze samples.
E.V.9	ICP Serial Dilution Analysis.	10% of each sample type, or once per each set or episode. Not for field blanks.	Agreement within 10% for all elements that are initially present at $50 \times$ MDL.	Flag affected elements.
E.V.10	Instrument Detection Limit (IDL), for each wavelength used. 3x7 determinations.	Initial set-up of method; within 30 days of start-up of contract; quarterly; after instrument modifications.	Exhibit C.	Correct problem before analyzing samples; update quarterly.
E.V.11	Interelement Correction Factors for ICP for all wavelengths used.	Prior to contract; quarterly thereafter; after instrument modification.	NA	Record and report.
E.V.12	Linear Range Analysis (LRA) for each element and wavelength. Determines high limit for ICP.	Quarterly.	$\pm 5\%$ of true value.	Defines upper limit for ICP.
E.V.13.b E.V.13.c	Method of Standard Additions (MSA) for AA.	As determined by Section E.V.13.b.	$r > 0.995$.	Repeat MSA once; flag results if r is still < 0.995 .

TABLE 8.1. Scheduled QC and Calibration
(Continued)

E.V.13.b	Post-digestate spike (GFAA only)	All samples, LCSs, & PBs.	R = 85-115%	Determines whether MSA is employed. See E.V.13.b.
E.V.13	Duplicate injections.	All samples, standards, and QC, except for MSA.	20% RSD.	Repeat duplicate set once.
CYANIDE (METHOD 335.2-M)				
Reference ^a	Procedure	Frequency ^b	Acceptance Criteria	Corrective Action
8.3.2 & 8.4.2 of Method; E.V.1	Initial Instrument Calibration (ICAL), 3-point & blank. Need not be distilled, but see 8.3.2.1.	One std at CRDL, Each run.	TBD.	TBD.
8.3.2.1	Distilled standard.	Each run.	±15% of calibration standard.	Correct before proceeding.
E.V.2.a	Initial Calibration Verification (ICV) & LCS.	Immediately after each ICAL. Distilled with each batch.	±15% of calibration standard.	Correct before proceeding.
E.V.2.b	Continuing Calibration Verification (CCV).	10% of samples; every two hours; & end of each run.	±15% of true value.	Correct before proceeding.
E.V.4.a	Initial and Continuing Calibration Blank (ICB, CCB).	After each ICV & CCV; 10% of samples; beginning & end of run after last CCV; every 2 hrs.	Blank < CRDL.	Correct before proceeding.
E.V.4.b	Preparation Blank (PB).	Each batch; each SDG	Blank <CRDL	See Section E.V.4.b.
E.V.6	Matrix Spike	10% of samples; each SDG or batch.	Recovery = 75-125%	See E.V.6. Flag data or spike digestate as indicated.
E.V.7	Duplicate sample analysis; do not use field blanks.	Each SDG or batch of each sample type	RPD <20% of C> 5X CRDL; otherwise ±CRDL.	Flag data.

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TABLE 8.1. Scheduled QC and Calibration

(Continued)

E.V.8	Laboratory Control Sample (LCS) obtained from independent source, carried through digestion procedure.	Each set or episode; each batch of standards. Not required for aqueous Hg & CN.	Recovery = 80 - 120%	Correct problem, redigest and reanalyze samples.
E.V.10	Instrument Detection Limit (IDL), for each wavelength used. 3x7 determinations.	Initial set-up of method; within 30 days of start-up of contract; quarterly; after instrument modifications.	Exhibit C.	Correct problem before analyzing samples; update quarterly.
PERCENT MOISTURE				
Reference ^a	Procedure	Frequency ^b	Acceptance Criteria	Corrective Action
E.V.7	Duplicate sample analysis; do not use field blanks.	Each SDG or batch of each sample type	RPD <20% if C> 5X CRDL; otherwise ±CRDL.	Flag data.

TBD = To be determined.

RSD = Relative Standard Deviation.

ICAL = Initial Calibration.

CCC = Calibration Check Compounds.

s = Standard Deviation.

RPD = Relative Percent Difference.

BOA = Basic Ordering Agreement.

D = Percent Difference.

IS = Internal Standard.

MS = Matrix Spike.

MSD = Matrix Spike Duplicate.

RF = Response Factor.

R = Recovery.

r = Linear Correlation Coefficient.

C = Concentration.

CRQL = Contract required quantitation limit.

RT = Retention Time.

RRT = Relative Retention Time.

SPCC = System Performance Check Compound.

RRF = Relative Response Factor.

MSA = Matrix Spike Analysis.

IFB = "Invitation for bid", containing contractually defined methods for CLP.

^aReference throughout this table refers to the 2/88 organic or 7/88 Inorganic CLP Statements of Work, as appropriate.

^bWhichever is more frequent.

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9.0 PERFORMANCE AND SYSTEMS AUDITS

QA management at S-Cubed performs three types of independent QA audits. Technical Systems Audits (TSAs) are performed by examining the laboratory procedures, documentation, and QC procedures that are currently in use. The objective of the TSA is to determine whether the required analytical and QC procedures are being correctly and consistently carried out. Performance Evaluation Audits (PEAs) consist of submitting blind samples to the laboratory and judging the accuracy of the results. Audits of data quality (ADQs) consist of retrospective examinations of completed data sets. Typically, a fraction of the report analysis are recalculated from the raw data.

9.1 REPORTS TO MANAGEMENT

Formal reports of all audits are prepared, discussed with laboratory staff, and submitted to the laboratory management. All reports of QA activities within the Environmental Technology Sector are forwarded to the Senior Vice President of the Environmental Technology Sector (Dr. Burns) and to upper QA management within Maxwell Laboratories, Inc.

It is anticipated that S-Cubed QA management will audit the proposed effort on at least an annual basis.

9.2 EXTERNAL AUDIT PROGRAMS AT S-CUBED

S-Cubed participates in the PEAs carried out by the following programs.

- EPA CLP (quarterly basis)
- EPA OSW PE Program (approximately quarterly)
- EPA NPDES Program (quarterly)
- State of California Drinking Water Program (approximately yearly)
- DOE HAZWRAP (yearly)

The EPA and DOE each execute on-site TSAs approximately yearly.

9.3 QUALITY AUDITS BY WESTINGHOUSE

It is anticipated that Westinghouse will submit performance evaluation samples during the course of this project. In addition, on-site TSAs may be carried out by Westinghouse management.

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10.0 ROUTINE MAINTENANCE

Most instrument maintenance occurs on an "as-needed" basis, as indicated by QC checks or electronic responses. However, a limited amount of preventative maintenance is scheduled on a routine basis. Thus, Figures 10.1, 10.2, and 10.3 show the maintenance

schedules for the GC/MS, GC, and inorganic laboratories, respectively. In addition, preventative maintenance SOPs 51-001-00 and 52-001-00 for GC/MS and GC are applicable.

		Complete			
		VG 1	VG 2	VG 3	VG 4
Daily	Change septa Change injector liner Remove 5-10 cm of front end of column				
Jan	Vacuum the filters in computer, interface module and RF Generator - check if fans are working properly. Vacuum the printers, remove loose paper, clean tension bar if dirty. Clean hoods, new paper, throw away all trash, wipe down.				
Feb					
Mar					
Apr	Vacuum the filters in computer, interface module and RF Generator - check if fans are working properly. Vacuum the printers, remove loose paper, clean tension bar if dirty. Clean hoods, new paper, throw away all trash, wipe down.				
May					
Jun					
Jul	Vacuum the filters in computer, interface module and RF Generator - check if fans are working properly. Vacuum the printers, remove loose paper, clean tension bar if dirty. Clean hoods, new paper, throw away all trash, wipe down. Change H ₂ O filters. Defrost VOA standard freezer. Clean taping heads on computers.				
Aug					
Sep					
Oct	Vacuum the filters in computer, interface module and RF Generator - check if fans are working properly. Vacuum the printers, remove loose paper, clean tension bar if dirty. Clean hoods, new paper, throw away all trash, wipe down. Change H ₂ O filters. Defrost VOA standard freezer. Clean taping heads on computers.				
Nov					
Dec	Vacuum the filters in computer, interface module and RF Generator - check if fans are working properly. Vacuum the printers, remove loose paper, clean tension bar if dirty. Clean hoods, new paper, throw away all trash, wipe down. Change H ₂ O filters. Defrost VOA standard freezer. Clean taping heads on computers.				

Figure 10.1. GC/MS Routine Maintenance.

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Daily:	Check gas pressures Check printer ribbons and paper Check refrigerator and freezer temperatures
Monthly:	Clean hood Check standards by date of expiration Vacuum printers
As indicated by QC samples:	Change septa Remove end of column Bake out ECD

Figure 10.2. GC Maintenance Schedule

Furnace AA

- Replace carbon tubes after 200 to 300 burns; as needed.
- Clean furnace lenses each time carbon tube is replaced.
- Clean contact rings each time carbon tube is replaced.
- Clean lamp lenses each time carbon tube is replaced.
- Vacuum Instrument, computer, and printer weekly.
- Empty waste collection container.
- Optimize lamps each run.
- Check argon gas level - each use.
- Check and/or replace autosampler tubing and clip tubing tip. Clean autosampler - quarterly.
- Check and replace argon gas supply tubing, if necessary - quarterly.
- Check and replace contact rings, if necessary - every 6 months.

COLD VAPOR AA

- Clean and check quartz cell - each run.
- Check gas levels - each run.
- Clean and replace tubing and fitting on cold vapor apparatus - quarterly.
- Replace air supply filters - as needed.

ICP

- Check pump tubing - each use.
- Check argon and water supply - each run.
- Check optical alignment - each use.
- Check waste container - each use.
- Vacuum Instrument, PC, and printer - weekly.
- Clean torch and nebulizer - weekly.
- Replace tubing in sample uptake system.
- Replace cooling water - check every 6 months.

Figure 10.3. Preventive maintenance schedule for the inorganic laboratory

11.0 CALCULATIONS OF DATA QUALITY INDICATORS

This section describes how to calculate various data quality indicators that are referred to elsewhere in this QA Project Plan. Additional data quality indicators, such as confidence limits for certain types of QC samples, may be added during contract negotiation, as needed.

11.1 PRECISION

The principal measurement of precision for this project will be RPD obtained from duplicate sample pairs:

$$RPD = \frac{(C_1 - C_2) \times 100\%}{(C_1 + C_2) / 2} \quad (1)$$

where:

- RPD = relative percent difference
- C₁ = larger of the two observed values
- C₂ = smaller of the two observed values.

11.2 ACCURACY

Recovery from spiked samples will be calculated as:

$$\%R = 100\% \times \left[\frac{S - U}{C_{sa}} \right] \quad (2)$$

where:

- %R = percent recovery
- S = measured concentration in spiked aliquot
- U = measured concentration in unspiked aliquot
- C_{sa} = actual concentration of spike added.

For situations where a Standard Reference Material (SRM) is used instead of or in addition to matrix spikes:

$$\%R = 100\% \times \left[\frac{C_m}{C_{SRM}} \right] \quad (3)$$

where:

- %R = percent recovery
- C_m = measured concentration of SRM
- C_{SRM} = actual concentration of SRM.

11.3 METHOD DETECTION LIMIT AND PRACTICAL QUANTITATION LIMITS

Method Detection Limit (MDL) is defined as follows for all measurements:

$$MDL = t_{(n-1, 1-\alpha=0.99)} \times s \quad (4)$$

where:

- MDL = method detection limit
- s = standard deviation of the replicate analyses
- t_(n-1, 1-α=0.99) = Student's t-value for a one-sided 99% confidence level and a standard deviation estimate with n-1 degrees of freedom.

Normally, seven replicates will be employed for determining MDLs. Note that the CLP procedure for determining detection limits may differ slightly, requiring three sets of seven replicates each.

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11.4 COMPLETENESS (SAMPLING AND ANALYTICAL)

Completeness is defined as follows for all measurements:

$$\%C = 100\% \times \left(\frac{v}{n} \right) \quad (5)$$

where:

- %C = percent completeness
- v = number of measurements judged valid
- n = total number of measurements necessary to achieve a specified level of confidence in decision making.

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12.0 CORRECTIVE ACTION AND QC REPORTS TO MANAGEMENT

The corrective action that results from routine QC is summarized in Section 8.0 of this QA Project Plan. The following discussion is thus restricted to non-routine situations that would require the involvement of S-Cubed management or Westinghouse. See also Section 9.0 of this QAPJP regarding reporting procedures for QA audits.

S-Cubed will notify Westinghouse if any individual sample fails to meet the QC requirements of Section 8.0 of this QAPJP after the indicated corrective action is taken.

Such notification will be carried out by the S-Cubed Project Manager.

Each analytical report will include a QC section describing QC results for the individual samples in that lot as described in Section 7.0 of this QAPJP.

From time to time during the course of this project, it may be necessary to modify this QAPJP as a result of a corrective action measure. Such changes will be by mutual consent of S-Cubed and Westinghouse and will immediately be documented by transmission of amended pages or sections to the personnel listed on the QAPJP distribution list.

The S-Cubed Project Manager will inform Westinghouse of any other significant QA/QC related problems and subsequent resolutions. Westinghouse will be informed of the results of such corrective actions.

All corrective action undertaken by the laboratory is recorded on a Corrective Action

Form (Figure 12.1), which indicates the initial problem, the required corrective action, the date of the corrective action that occurred, and sample identification information. Upon completion of the required corrective action, this form becomes a permanent part of the case file.

QA reports to management are discussed in Section 9.0 of this QAPJP.

Areas most commonly requiring corrective action include the following:

- Sample Check-in

Problems encountered during sample check-in (i.e., broken sample containers or incomplete or incorrect documentation, etc.) will be documented and reported immediately to the appropriate personnel. See Attachment I for a detailed discussion of sample check-in procedures.

- Sample Analysis

Difficulties encountered during preparation and analysis are documented on the form illustrated in Figure 12.1. The form will be distributed for appropriate review and action. The review may include the technical supervisor, the project manager, and the quality assurance manager. The specific corrective action may include reanalysis, reextraction, alteration of procedures, or simply a notation of the difficulty depending on the severity of the problem and its affect on the quality of the data.

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- Data Review

Problems encountered during data review may be corrected by any of the following actions: request for reanalysis, re-review of raw data, flagging sample results, or inclusion of comments in the report narrative.

The sample flagging procedures will be specified in Section B of the Basic Ordering Agreement.

Other problem conditions which may arise in the course of method evaluation, optimization and ruggedness testing will also be handled in this manner.

Corrective actions will also be initiated by the Task Manager as a result of other QA activities, including performance evaluation audits and technical systems audits. A formal corrective action program is more difficult to define in advance for these QA activities and will be defined as the need arises.

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Corrective Action Form Sample Preparation Laboratory

Date: _____ Issuer: _____ Department: _____

Problem	Corrective Action Required	Sample Information	Corrective Action Completion
<p>Insufficient sample size Sample lost Extract lost in handling at K-D at blowdown at GPC Sample matrix problem Missing/incorrect paperwork Holding time missed Extract lost in analysis Surogates out of spec Matrix out of spec Blank contamination Additional cleanup required Insufficient QC Spiking error Reagent QC missing/out of spec Sample/extract missing Equipment Glassware Supplies Other: _____</p> <p>Comments:</p>	<p>Date required: _____</p> <p>URGENT Reextraction Additional extracts Additional cleanup For information only Project manager review Lab coordinator review Equipment repair Equipment/supplies purchase Other: _____</p> <p>Comments:</p>	<p>Case/Project: _____</p> <p>BNA Pesticides SAS</p> <hr/> <p>Sample IDs:</p>	<p>Date: _____</p> <p>Review: _____</p> <p>Notes:</p>

Distribution: Lab Coordinator GC Lab Supervisor Sample Preparation Lab Other: _____
 Project Manager GC/MS Lab Supervisor Quality Assurance Officer

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Figure 12.1. Corrective Action Form.

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13.0 MATERIALS PROCUREMENT AND CONTROL, FACILITIES, AND EQUIPMENT

Chemicals and reagents are selected and tested to ensure they meet the necessary criteria for use in trace analysis. Refer to SOP Nos. 20-000-00 through 20-006-00 regarding reagent preparation.

13.1 STANDARDS

Analytical standard management and use must be carefully controlled to provide personnel safety and ensure the quality of analytical data. Refer to SOP Nos. 81-001-00 through 83-011-00.

13.2 GLASSWARE AND CONSUMABLES

Refer to specific SOWs, and SOP Nos. 20-004-00 and 60-001-00.

13.3 WASTE DISPOSAL

Refer to SOPs Nos. 10-001-00, 84-001-00, and 84-002-00.

13.4 PURCHASING PROCEDURES

Purchase of materials and equipment is coordinated through the Chemistry Purchasing Agent. Purchase requests are forwarded to the Purchasing Agent who determines the appropriate source, places the order and prepares the appropriate documentation.

Materials are received by the S-Cubed Receiving Department and logged in as received. Then they are transferred to the Chemistry Purchasing Agent who inspects the shipment for quality and correctness and then distributes the materials to the appropriate personnel or storage area.

13.5 FACILITIES

S-Cubed's facilities are located in 95,700 square feet of office and laboratory space in the Sorrento Valley Industrial Park near La Jolla, California, in close proximity to the University of California. The facilities include: 3,500 ft² of sample preparation laboratory, a 2,500 ft² inorganic laboratory, a 3,800 ft² GC laboratory, GC/MS laboratories totaling 2,600 ft², a bench scale process laboratory, a containment laboratory, a document control room, a document archive area, sample receiving and storage with over 1,500 cu. ft. of refrigerated storage, bulk chemical storage facilities, and hazardous waste handling facilities. Nearby buildings contain printing facilities, a computer center, a technical library, an electronics workshop, a machine shop, and administrative support services.

The laboratories are designed to meet the needs of high volume sample preparation and analysis while providing flexibility for constantly changing requirements. The laboratories are equipped with over 150 linear feet of hooded bench top and include numerous custom designed ventilation systems to provide safe working areas for chemical and sample handling.

13.6 EQUIPMENT

S-Cubed's laboratory capital equipment inventory is valued in excess of \$5 M and includes both state-of-the-art and newly emerging instrument technologies. With 11 GC/MS instruments, the S-Cubed La Jolla facility is one of the largest environmental laboratories on the West coast

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Analytical instrumentation includes GC/MS, GC, HPLC, IC, IR, AA, ICP, ICP/MS, and UV/VIS capabilities. When possible, all instruments have autosampler systems, and most are equipped with computers for data acquisition, reduction, and reporting. The sample preparation laboratories are well equipped to handle a wide variety of analytical methods and sample matrices. With over 75 liquid-liquid extractors, 35 Soxhlet extractors, 6 sonication extractors, and 3 GPC units, the sample preparation laboratories can provide a very high sample throughput.

Table 13-1 lists the major equipment currently available at S-Cubed.

13.7 MAINTENANCE

Our instrument redundancy provides substantial sample capacity and reduces delays due to instrument downtime. In addition, S-Cubed maintains a large spare part inventory, an electronics workshop, an instrument manufacturing facility, and trained and experienced technicians so that most instrument repair and maintenance are conducted in-house.

Routine preventative maintenance is performed on all instrumentation and recorded in maintenance logs. Maintenance contracts are maintained for all instrumentation requiring yearly calibration, etc., such as analytical balances. When outside service is required, it is generally available within 24 to 48 hours.

The operators assigned to specific instruments are responsible for performing routine preventative maintenance on their assigned instruments and recording this in the appropriate maintenance log. The area supervisor is responsible for ensuring that routine maintenance is performed on a timely basis.

The area supervisor should be notified immediately when an instrument failure or problem occurs. The supervisor is responsible for ensuring that repairs are performed in a timely manner and that they are adequate to return the instrument to acceptable performance levels.

TABLE 13-1. S-CUBED MAJOR EQUIPMENT

		Manufacture	Model	Installation Date
GC/MS/DS	#1	VG	12-250/PDP 11-73	12/85
	#2	VG	12-250/PDP 11-73	12/85
	#3	VG	Trio 2/PDP 11-73	12/86
	#4	VG	Trio 2/PDP 11-73	12/86
	#5	Finnigan	4021/INCOS	02/81
	#6	Finnigan	4500/INCOS	12/83
	#7	Hewlett Packard	5970 MSD/HP 1000	06/87
	#8	Hewlett Packard	5970 MSD/HP 1000	01/89
Purge & Trap	#1	Tekmar	LSC2/ALS	12/84
	#2	Tekmar	4000/4200	12/85
	#3	Tekmar	LSC1	06/78
	#4	Tekmar	2000	08/88
	#5	Tekmar	LSC2/ALS	03/88
GC Data System		Nelson Analytical Multichrome	PDP/11-73/Multichrom	01/89
GPC	#1	ABC	Autoprep 1002A	06/84
GPC	#2	ABC	Autoprep 1002A	08/86
GPC	#3	ABC	Autoprep 1002B	01/89
Ultrasonic	#1	Heat Systems	W-370	06/84
	#2	Heat Systems	W-370	06/85
	#3	Heat Systems	W-385	06/87
	#4	Heat Systems	W-385	06/87
	#5	Heat Systems	W-385	01/89
	#6	Heat Systems	W-385	01/89
GC/ECD (Dual)	#1	Hewlett Packard	5890	02/86
	#2	Hewlett Packard	5890	02/86
	#3	Hewlett Packard	5890	03/85
GC/ECD/FID	#4	Hewlett Packard	5880	12/84
GC/ECD/PID	#5	Hewlett Packard	5890	11/87
GC/NPD/FID	#6	Hewlett Packard	5880	12/83
GC/FID/FPD	#7	Varian	3300	07/85
GC/TCD	#8	GOW-MAC	550	03/83
GC/HECD/PID/FID	#9	Hewlett-Packard	5890	12/87
GC/FPD (Dual)	#10	Hewlett-Packard	5890	04/89
HPLC/DAD/Fluorescence	1	Spectra Physis, Hewlett Packard		06/87
IR	#1	Perkin Elmer	1310	09/88
UV/VIS	#1	Hoch	DR3000	07/88
UV/VIS	#2	Bausch & Lomb	Spec 20	03/83
AA	#1	Perkin Elmer	Z5100	12/89
AA	#2	Instrumentation Laboratory	257	01/83
AA/Mercury Analyzer	#3	Spectra Products	HG-4	02/90
ICP/MS	#1	VG Elemental	PQ-2 Plus	9/88
ICP	#1	Leeman Labs	PS-3000	04/90

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