UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ENVIRONMENTAL SERVICES DIVISION
REGION 7
25 FUNSTON ROAD
KANSAS CITY, KANSAS 66115

AUG 28 1998

Site: Former Diller Battery
ID# IAD002244556
Break: 3.4
Other:
8-28-1998

MEMORANDUM

SUBJECT: Laboratory Quality Assurance Plan
Southwest Laboratory of Oklahoma, Inc.

FROM: Ernest L. Arnold
Region VII Quality Assurance Manager

TO: Dona Hamera
SACR/SUPR

As requested, we reviewed the subject document, dated April 7, 1998, for capability to conduct analyses indicated in *Attachment I, Engineering Evaluation/Cost Analysis (EE/CA), Draft Scope of Work (SOW), Former Diller Battery Site.*

This lab is an active contract lab program (CLP) lab in good standing for inorganic and organic analyses. Region 7 has used this lab recently to provide CLP determinations.

Use of the CLP inorganic or organic SOWs [Statement of Works] will provide adequate detection/quantitation for comparison to the action levels cited on page 6, with the exception of benzo(a)pyrene and dibenzo(ah)anthracene. The CLP's contract required quantitation limits are 330 µg/kg, while the action levels are 88 µg/kg.

This lab's documented detection or quantitation limits (attached) will provide adequate comparison to the action levels cited on page 6, with the exception of dibenzo(ah)anthracene. The lab's quantitation limit is 132 µg/kg, while the action level is 88 µg/kg.

The subject document does not provide an indication of a capability to provide determinations in fish.

If you have any questions, please contact Douglas J. Brune at x5180.

RQAO Activity Number: 98-QQP60
RQAO Document Number: 98232

Attachment

129046

129046

RECYCLE
PAPER CONTAINS RECYCLED FIBERS

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SOUTHWEST LABORATORY OF OKLAHOMA, INC.

Polynuclear Aromatic Hydrocarbons

Test Code GC420
Method SW846/8310
Matrix Water-Soil
Extract Volume 1000 mL - 30g
Initial Calibration 5 point calibration, %RSD = 20
Continuing Calibration single point calibration, %D = 15
Soil MDL performed on Instrument 12 / analysis date: 12/30/97
Water MDL performed on Instrument 10 / analysis date: 8/21/97

COMPOUND	CAS NUMBE	PQL's		MDL's	
		WATER	SOIL	WATER	SOIL
		ug/L	ug/Kg	ug/L	ug/Kg
Naphthalene	91-20-3	18.0	560	0.78	30
Acenaphthylene	208-96-8	17.0	430	0.58	61
Acenaphthene	83-32-9	18.0	1200	1.60	32
Fluorene	86-73-7	2.1	1210	0.059	3.7
Phenanthrene	85-01-8	4.0	165	0.014	0.80
Anthracene	120-12-7	0.1	6	0.001	0.08
Fluoranthene	206-44-0	1.9	84	0.029	3.4
Pyrene	129-00-0	2.7	180	0.094	4.7
Benzo(a)anthracene	56-55-3	0.1	32	0.009	0.40
Chrysene	218-01-9	1.5	100	0.073	3.3
Benzo(b)fluoranthene	205-99-2	0.2	12	0.004	0.28
Benzo(k)fluoranthene	207-08-9	0.2	9	0.004	0.33
Benzo(a)pyrene	50-32-8	0.2	15	0.005	0.43
Indeno(1,2,3-cd)pyrene	193-39-5	0.7	34	0.035	0.71
Dibenz(a,h)anthracene	53-70-3	0.9	132	0.10	2.3
Benzo(g,h,i)perylene	191-24-2	0.7	142	0.053	2.1

Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculate the laboratory for soil/sediment, calculated on dry weight basis will be higher. Practical Quantitation will be twice for GPC cleanup.

MDL = 3.14 (for 99 percent confidence; from the "Student's t Value" table) times the standard deviation of seven replicates of a spiked sample matrix analyzed using the pertinent calibration. Reference: Federal Register, July 1982.

PQL = (practical quantitation limit) based on the product of the MDL and a mulitplier ranging from 5 to 10.

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SOUTHWEST LABORATORY OF OKLAHOMA, INC.

Metals reporting limits by ICP

Regular ICP

Method	SW846 Method 6010B
Matrix	Water-Soil
Extract Volume	100mL - 1g
Initial Calibration	0-1000 ug/L -varies
Continuing Calibration	1/2 high std
Date	Jan. 30- March 10, 1998

COMPOUND	CAS NUMBER	Test Services List	MDLS* WATER ug/L	MDLS* SOIL mg/kg	PQLS WATE ug/L	PQLS SOIL mg/kg
Aluminum	7429-90-5	MT005	56	11.0	200	20.0
Antimony	7440-36-0	MT025	18	1.6	60	6.0
Arsenic	7440-38-2	MT055	73	1.5	150	15.0
Barium	7440-39-3	MT065	5.4	0.13	25	1.2
Beryllium	7440-41-7	MT085	0.5	0.08	5	0.5
Boron	7440-42-8	MT115	30	9.3	300	50.0
Cadmium	7440-43-9	MT125	4.6	0.78	1500	4.0
Calcium	7440-70-2	MT145	243	77.0	10	500.0
Chromium	7440-47-3	MT165	1.3	0.30	25	1.0
Cobalt	7440-48-4	MT185	5.3	0.39	25	2.5
Copper	7440-50-8	MT205	7.3	2.40	50	5.0
Iron	7439-89-6	MT225	34	5.0	100	10.0
Lead	7439-92-1	MT245	93	4.6	250	25.0
Magnesium	7439-95-4	MT265	24	4.6	250	25.0
Manganese	7439-96-5	MT285	1.7	0.14	10	1.0
Molybdenum	7439-98-7	MT325	18.0		100	
Nickel	7440-02-0	MT345	13.0	0.83	40	4.0
Potassium	7440-09-7	MT365	495	27.0	2500	250.0
Selenium	7782-49-2	MT385	31	2.4	250	20.0
Silicon	7440-21-3	MT445	151		750	
Silver	7440-22-4	MT405	7.0	0.25	10	1.0
Sodium	7440-23-5	MT425	45	57.0	400	300.0
Thallium	7440-28-0	MT455	57	2.8	250	25.0
Tin	7440-31-5	MT465	22	2.4	150	15.0
Titanium	7440-32-6	MT485	0.8	0.12	8	0.8
Vanadium	7440-62-2	MT505	4.4	0.09	20	2.0
Zinc	7440-66-6	MT525	6.8		20	

Metals reporting limits by Low Level ICP

TRACE ICP

Method	SW846 Method 6010B
Matrix	Water-Soil
Extract Volume	100mL - 1g
Initial Calibration	0-500ug/L - varies
Continuing Calibration	1/2 high std
Date	January 26 - March 20, 1998

COMPOUND	CAS NUMBER	Test Services List	MDLS* WATER ug/L	MDLS* SOIL mg/kg	PQL,S WATE ug/l	PQL,S SOIL mg/kg
Aluminum	7429-90-5	MT003	17.0	1.60	80.0	8.0
Antimony	7440-36-0	MT023	2.7	0.18	15.0	1.5
Arsenic	7440-38-2	MT053	2.9	0.18	10.0	1.0
Barium	7440-39-3	MT063	0.6	0.13	3.0	1.0
Beryllium	7440-41-7	MT083	0.1	0.01	1.0	0.1
Boron	7440-42-8	MT113	26.0	3.00	150.0	15.0
Cadmium	7440-43-9	MT123	0.3	0.03	3.0	0.3
Calcium	7440-70-2	MT143	40.0	4.50	250.0	25.0
Chromium	7440-47-3	MT163	0.7	0.08	5.0	0.5
Cobalt	7440-48-4	MT183	1.0	0.11	5.0	1.0
Copper	7440-50-8	MT203	0.8	0.09	7.0	0.7
Iron	7439-89-6	MT223	33.0	2.90	100.0	10.0
Lead	7439-92-1	MT243	1.5	0.14	3.0	0.3
Magnesium	7439-95-4	MT263	37.0	7.80	250.0	50.0
Manganese	7439-96-5	MT283	0.5	0.05	3.0	0.4
Molybdenum	7439-98-7	MT323	1.2	0.07	7.0	0.7
Nickel	7440-02-0	MT343	1.0	0.16	5.0	1.0
Potassium	7440-09-7	MT363	110.0	5.60	500.0	50.0
Selenium	7782-49-2	MT383	3.1	0.40	5.0	0.5
Scandium	7440-20-2	MT393	0.1	0.40	0.5	0.1
Strontium	7440-24-6	MT433	0.2	0.03	1.0	0.2
Silicon	7440-21-3	MT443	70.0	5.80	400.0	40.0
Silver	7440-22-4	MT403	1.4	0.12	7.0	1.0
Sodium	7440-23-5	MT423	39.0	20.00	200.0	100.0
Thallium	7440-28-0	MT453	3.1	0.39	10.0	1.0
Tin	7440-31-5	MT463	4.7	0.45	30.0	3.0
Titanium	7440-32-6	MT483	1.0	0.06	5.0	0.5
Uranium	7440-61-1	MT513	7.9	0.62	40.0	4.0
Vanadium	7440-62-2	MT503	0.8	0.08	0.8	0.6
Zinc	7440-66-6	MT523	2.7	1.20	20.0	2.0

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

JUN 26 1998

MEMORANDUM

SUBJECT: Former Diller Battery Site, Des Moines, Iowa

TO: Ernie Arnold, Quality Assurance Manager
ENSV/DISO

FROM: Don Hamera, Site Assessment Manager
SUPR/SACR

The EPA is negotiating with potentially responsible parties (PRPs) on this site to complete additional sampling and the subsequent development of an engineering evaluation/cost analysis (EE/CA). Your office had previously reviewed information pertaining to the Intertek Testing services lab (ITS) of Richardson, Texas.

Due to various circumstances the PRPs are no longer seeking approval of the ITS lab and have submitted information for an alternative lab for EPA's review and approval. The proposed lab is the Southwest Laboratory of Oklahoma, Inc.

Please review the attached information submitted for the proposed laboratory and advise us of whether the documentation is sufficient to support EPA's approval of this laboratory to conduct the analyses described in the attached draft Statement of Work (SOW). As we have discussed before, the chemicals of concern (COCs) are lead, arsenic, beryllium and antimony, and polynuclear aromatic hydrocarbons (PAHs). Please identify any additional information, if any, that is needed to make this determination.

Please contact me at extension 7818 if I can provide additional information. **In addition,** for the purposes of expediting this review, we have advised the PRPs that your staff may contact them or the lab directly to clarify or obtain the additional information necessary to make this determination. The following points of contact are provided for such follow up.

PRP's site manager:	Jeffrey McDermott, Union Pacific Railroad Company, telephone (402) 271-3675;
PRP's contractor;	Greg Nieman, Burns & McDonnell Waste consultants Inc., telephone (816) 822-3488;
Proposed lab,	Randy Staggs, Southwest Laboratory of Oklahoma, telephone (918) 251-2858

Attachments

JUN 26 1998

MEMORANDUM

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TO: Ernie Arnold, Quality Assurance Manager
ENSV/DISO

FROM: Don Hamera, Site Assessment Manager
SUPR/SACR

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SACR SACR
TAPIA HAMERA
6/26/98 6/25/98

PRP's site manager:	Jeffrey McDermott, Union Pacific Railroad Company, telephone (402) 271-3675;
PRP's contractor;	Greg Nieman, Burns & McDonnell Waste consultants Inc., telephone (816) 822-3488;
Proposed lab,	Randy Staggs, Southwest Laboratory of Oklahoma, telephone (918) 251-2858

Attachments

bcc: Andrea Jirka, Chief, RLAB/ENSV
Bob Dona, SACR
Shirley Williams, SACR

Burns & McDonnell Waste Consultants, Inc.
ENGINEERS · GEOLOGISTS · SCIENTISTS · 100% EMPLOYEE · OWNED

To U.S. Environ. Protection Agency
Region VII Laboratory
25 Funston Road
Kansas City, KS 66115

Date June 11,1998
Project UPDESMO
Via Regular Mail

Attention Mr. Donald Hamera

Subject Analytical Laboratory Information associated with the Former Diller Battery Site in Des Moines, Iowa

Enclosed are the following:

No. of Copies	Description and Remarks
	Mr. Hamera:
	Enclosed is a copy of the laboratory information
	for the alternate laboratory (Southwest Laboratory) for
	the former Diller Battery Site project. If you
	have any other questions or require additional
	information, please contact Mr. Jeff McDermott of UP at
	(402) 271-6572 or myself at (816) 822-3488.

Copies to:
Mr. Jeff McDermott, UP

Very truly yours,
Burns & McDonnell Waste Consultants, Inc.
By Greg Tamer

9400 WARD PARKWAY, KANSAS CITY, MO 64114 • TEL: (816) 333-8787 FAX: (816) 822-3463

SOUTHWEST LABORATORY OF OKLAHOMA, INC. / AMERICAN ANALYTICAL AND TECHNICAL SERVICES, INC.

Standard Operating Procedure

Laboratory Quality Assurance Plan

Document No.: SWL-GA-100

Rev No. / Date: Rev. 3.2 — 04/07/98

APPROVALS	DATES
Chuck Hoover Procedure Prepared By	4/8/98 Date
Steve L Martha Laboratory Operations Manager or Director	04/10/98 Date
Mitch Butler Laboratory Safety Officer	4/8/98 Date
Chuck Hoover Laboratory QA/QC Officer	4/8/98 Date

(Effective Date is 5 calendar days after the last signature above - QA/QC Officer)

Document Status

[ ] Controlled DC No. _____ Issued to: _____ Date: _____

[✓] Official Copy OC No.: 2098 Issued to: Greg Neiman Date: 6/9/98

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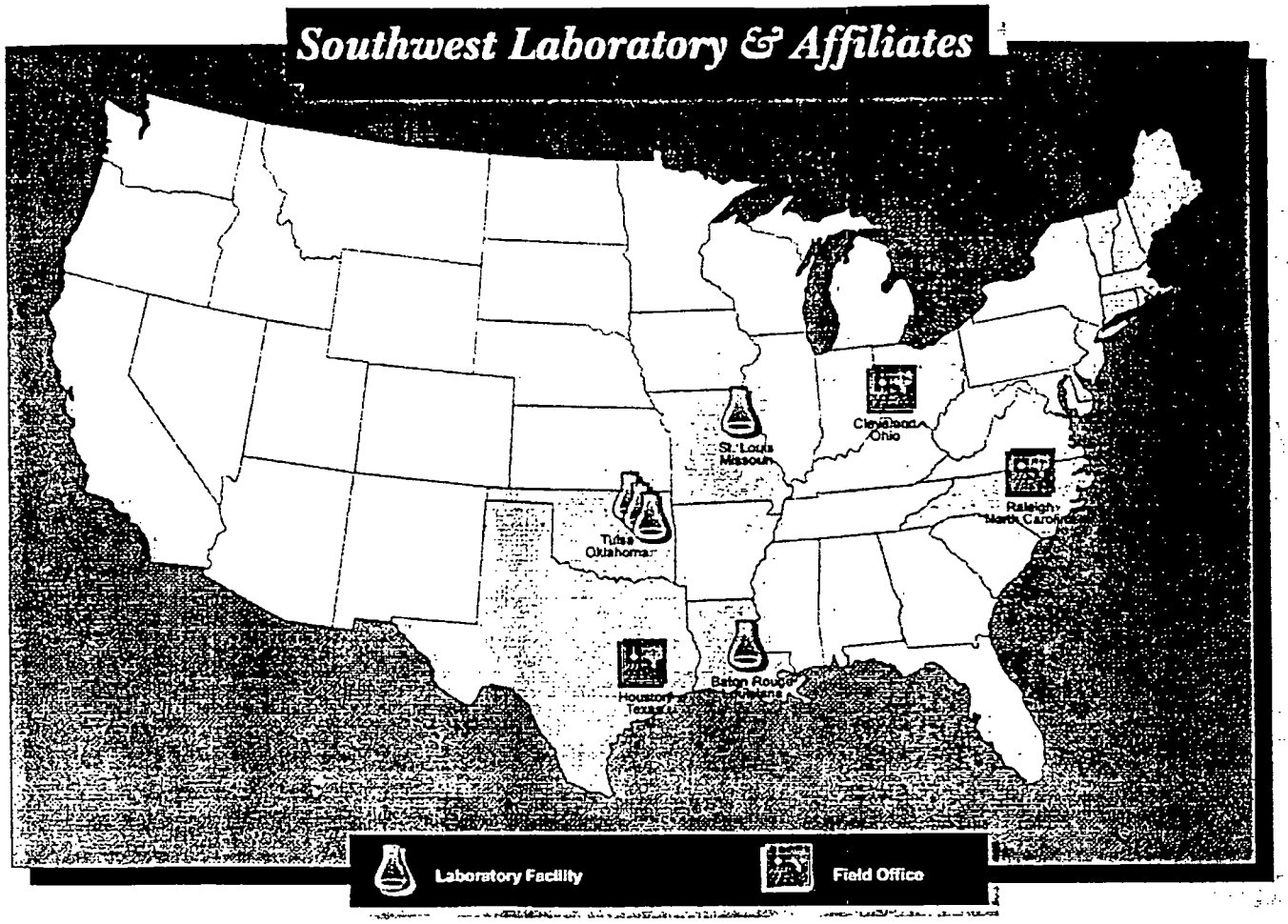
Figure 1.1

Southwest Laboratory and Affiliate Locations



1.5 Quality Assessment

Quality assessment includes a variety of techniques required to assess the quality of the measurement process and the results. The establishment of a system of "control charts" is a basic principle. Control charts are plots of multiple data points from the same or similar sample processes versus time. They are used to determine if a system is in a state of statistical control. Control charts are used to visualize or monitor the relative variability of repetitive data. They are used as appropriate with reference materials, spike samples, and the analysis of surrogates as a means to assessing the accuracy of measurements.

1.5.1 Quality Assessment Procedures

Procedures used to assess the effectiveness of the quality control system include:

1.5.1.1 Internal Performance Audits conducted by the QA Officer to assure adherence to the LQAP, and SOPs to assure systems are performing correctly. The use of control samples, replicate measurements, and use of reference materials in conjunction with control charts are also used to monitor the system performance.

1.5.1.2 External Performance Audits-conducted by the use of inter-laboratory checks such as:

1) Participation in laboratory evaluation programs; State Programs (Arkansas, California, Florida, Louisiana, Oklahoma, etc.) USEPA CLP Organics and Inorganics, and Corps of Engineers D.E.R.A. Program.
2) Participation in performance evaluation samples available from EPA (WP & WS Studies).

Using the assessment process, the overall quality system is maintained. Problems identified are routed through the Corrective Action Process, through which implementation of specified corrective actions improve the overall quality system. The quality system will be monitored using internal audits and blind PE's.

1.5.2 Quality Assessment Procedure Summary

The basic quality control program and its effectiveness, shall be maintained on a daily basis by tracking the following parameters:

- Laboratory Control Samples.
- Areas of the internal standard for specific organic analysis.
- Surrogate spike recovery for organic analysis.
- Matrix spike and matrix spike duplicate sample results for accuracy and precision.

1.6 QA Review

Assembled data shall be reviewed by the Project Officer (PO) before technical compilation into contract deliverables. Final review of about 8 - 12% of the assembled deliverables package is performed by the Quality Assurance Officer.

1.7 Data Quality

Data quality is the totality of features and characteristics of data that bear on their ability to satisfy a given purpose. Measurements of major importance are accuracy, precision, completeness, representativeness, and comparability. These are defined in Section 10.3.2.

1.8 Quality Assurance Plan Review

An overall review of the Laboratory Quality Assurance Plan (LQAP) is performed on an annual basis to ensure that the document adheres to current principles of good laboratory practice. The LQAP is revised more frequently, if necessary. The LQAP is reviewed by the Laboratory Operations Manager and the Quality Assurance Officer. Review and revision of the LQAP generally includes:

- Any procedure or policy changes
- Changes in Organizational Chart or Resumes
- Changes in responsibilities
- Any revisions to certifications and accreditations
- Changes in the facility or layout
- Changes in equipment or instrument inventory
- Changes to internal laboratory forms
- Changes to external and internal quality control checks
- Performance and system audit upgrades
- Method detection limits updates
- Typographical errors
- Grammar or context errors

Revisions are documented and placed in the LQAP file. The revised LQAP is then reviewed again to ensure that the changes are correct. The final published document is then placed under document control and released to the laboratory. Outdated copies of the LQAP are archived.

1.9 Project Management

The detailed procedure for project initiation and management is found in the project management SOP SWL-GA-131, "Project Management". A Project Officer (PO) is assigned to each project and he or she will be the client's representative for the laboratory. The PO works with the client to determine the type and amount of sample containers that are needed, the parameter lists for analyses, methodology and quality control requirements. The PO will supply the sample custodian with an "Analytical Request Form" (see Fig.1.2) along with any special project requirements. The special requirements will be attached to the laboratory worksheets, which are distributed to the applicable departments. The PO is responsible for monitoring the project from the time the samples are received until the final report is submitted to the client. He is also responsible for communicating the project requirements and changes to those requirements to laboratory personnel.

Figure 1.2

Analytical Request Form

AMERICAN ANALYTICAL AND TECHNICAL SERVICES/
SOUTHWEST LABORATORY OF OKLAHOMA
ANALYTICAL REQUEST FORM

CLIENT:
CONTACT:
PROJECT:
LOCATION:
DELIVERABLES:
SDG:

CLIENT CODE:
PHONE NO:
PO #
RCPT DATE
SAMPLE TAT:

CLIENT SAMPLE ID	SAMPLE MATRIX											

SPECIAL PROVISIONS:

REPORTING ADDRESS

BILLING ADDRESS

SWL PROJECT OFFICER

DATE PREPARED:

2.0 ORGANIZATION AND RESPONSIBILITIES

2.1 Corporate Organization

SWLO/AATS is located at 1700 West Albany, Broken Arrow, Oklahoma 74012, with additional facilities located in Cushing, Oklahoma as well as the Affiliate Labs in Baton Rouge, Louisiana and St. Louis, Missouri.

Specific QA/QC responsibilities are summarized in the following subsections. Figure 2.1 shows the line-staff relationships within the Broken Arrow facility. Resumes of Key Personnel and experience of all technical personnel is presented in Appendix A.

2.1.1 Laboratory Director

The Laboratory Director reports directly to the President and has overall responsibility for laboratory technical quality and personnel management. This overall management involves the quality assurance of the following items:

- Deliverable reports
- Subcontractor work product if required
- Task performance of key personnel

2.1.2 Operations Manager

The Operations Manager reports directly to the Laboratory Director and assists the Laboratory Director as the need arises. He is closely involved with the day-to-day activities of sample preparation/analyses and coordinates all laboratory activities necessary to fulfill contract and QC requirements.

2.1.3 Quality Assurance Officer

The Quality Assurance Officer (QAO) is responsible for monitoring the quality of laboratory work and taking appropriate actions to ensure that quality standards are being met. The QAO reports directly to the Laboratory Director in reviewing the work of teams and individuals and to report quality problems. The QAO is responsible for the following:

- Preparation of Performance Audit Samples, insertion of Performance Audit Samples into the laboratory sample stream, and review of results.
- Overseeing the laboratory's participation in external PE programs and following up with corrective actions when unacceptable scores are obtained.
- Coordinating external QA/QC audits and corrective actions in response to deficiencies identified during laboratory audits.
- Preparing and revising the Laboratory QA Plan (LQAP).
- Establishing QC procedures and reviewing warning and control limits for every test to assure they meet the reference method limits.
- Monitoring compliance with the LQAP by:

1) Reviewing QC-related activities and documentation.
2) Identifying and referring any instances in which QC objectives are not met to the section heads or the laboratory director for corrective action; Following up on these referrals to ensure that QC objectives are once again being met.
3) Perform system audits.
4) Reviewing corrective action reports for out-of-control events and implementation of those Corrective Actions to improve/maintain the overall quality system.

- Maintaining documentation of method capability and proficiency.

2.1.4 Technical Director

The Technical Director is responsible for research and development of new methods. The Technical Director will resolve technical issues related to GC/MS Analysis and will advise clients on technical issues. The Technical Director oversees the Dioxin and Air Toxic Programs.

2.1.5 Program Manager

The Program Manager oversees the primary functions of their department. These functions include: sample analysis, document control, data management, and client services. The Program Manager provides supervision and guidelines for sample handling and storage prior to analyses, maintenance of project files, data entries into the computer system after sample analysis, and quality review of the final data deliverables. The Program manager assures adherence to all standard operating procedures in their area. The Program manager is responsible for maintaining and compiling data for control charts, precision, accuracy and MDL data.

2.1.6 Department Supervisors/Group Leaders

The Department Supervisors and Group Leaders have primary responsibility for the technical quality of all data generated within their respective sections. In addition, they are responsible for the adherence to delivery schedules, management and utilization of manpower and the technical aspects of all Standard Operating Procedures (SOPs). They are responsible for scheduling routine instrument preventive maintenance.

2.1.7 Analysts

The Analysts are responsible for the analysis of a sample, sample extract, or digestate on a particular piece of instrumentation. The analytical sequence is conducted according to the document SOP which includes the required quality control monitoring. The process is documented in various run logs, including all associated Quality Control. The analysts are responsible for performing and documenting instrument preventive maintenance.

2.1.8 Sample Preparation Technicians

Sample Preparation Technicians (Organic & Inorganic) prepare samples requiring digestion, distillation, extraction, cleanup, etc. This process is documented in the various preparation logbooks, and follows method requirements. All method-specified QC is processed and documented likewise (i.e., blanks, spikes, etc.)

2.1.9 Project Officers (PO)

Project Officer — responsibilities include direct client representation within the laboratory. The PO acts in an advocacy role for the client. The PO will consult clients, as necessary, on technical aspects of the analytical results and how the results relate to the clients' needs. The PO will monitor all analytical projects as they progress through the laboratory and is responsible for communicating project requirements and changes in those requirements to laboratory staff.

2.1.10 Sample Custodian

Sample Custodian (SC) — responsibilities include receipt, inspection and log-in of samples. The SC initiates internal chain-of-custody for samples upon log-in, monitors the sample storage areas and oversees the maintenance of internal chain-of-custody forms. The SC also moves samples in and out of archive and documents their dumping into waste drums which are taken to the incinerator for disposal.

2.1.11 Data Managers

Data Managers — responsibilities include: document organization, assembly of all documents relating to contracts or projects (including project file and analytical file) to ensure clerical veracity during data handling, data assembly, and data report production and follow all associated SOPs.

2.1.12 Information Systems

Computer Services Personnel are responsible for the management and quality control of all computing systems (hardware, software, documentation and procedures), generating, updating, and performing quality control reviews of automated deliverables in accordance with SOP SWL-GA-102, "Information Systems Quality Assurance Program".

2.1.13 Information Systems Manager

The Information Systems Manager is responsible for the installation, operation, and maintenance of software and programs, generating, updating and performing quality control reviews of analytical databases and automated deliverables in accordance with SOP SWL-GA-102, "Information Systems Quality Control Assurance Program".

2.2 Authorization of Personnel

Following is the system in place to ensure that authorized personnel are designated to replace those personnel who are absent from the laboratory. Replacements for personnel generally flow upward on the Laboratory Organizational Chart (see Figure 2.1).

- When the Sample Custodian is absent, the Laboratory Director will designate a replacement from the trained backup Personnel.
- When an analyst is absent, the Group Leader will designate a qualified replacement or the Group Leader will replace the analyst.
- When a Group Leader is absent, the Department Supervisor will replace the Group Leader.
- When a Department Supervisor is absent, the Program Manager will replace the Department Supervisor.
- When a Project Officer is absent, the Laboratory Director will designate another Project Officer as a replacement, or the Laboratory Director will replace the Project Officer.
- When the Quality Assurance Officer is absent, the Laboratory Director will replace the Quality Assurance Officer.
- The Operations Manager will be responsible for the duties of the Laboratory Director in the Director's absence.

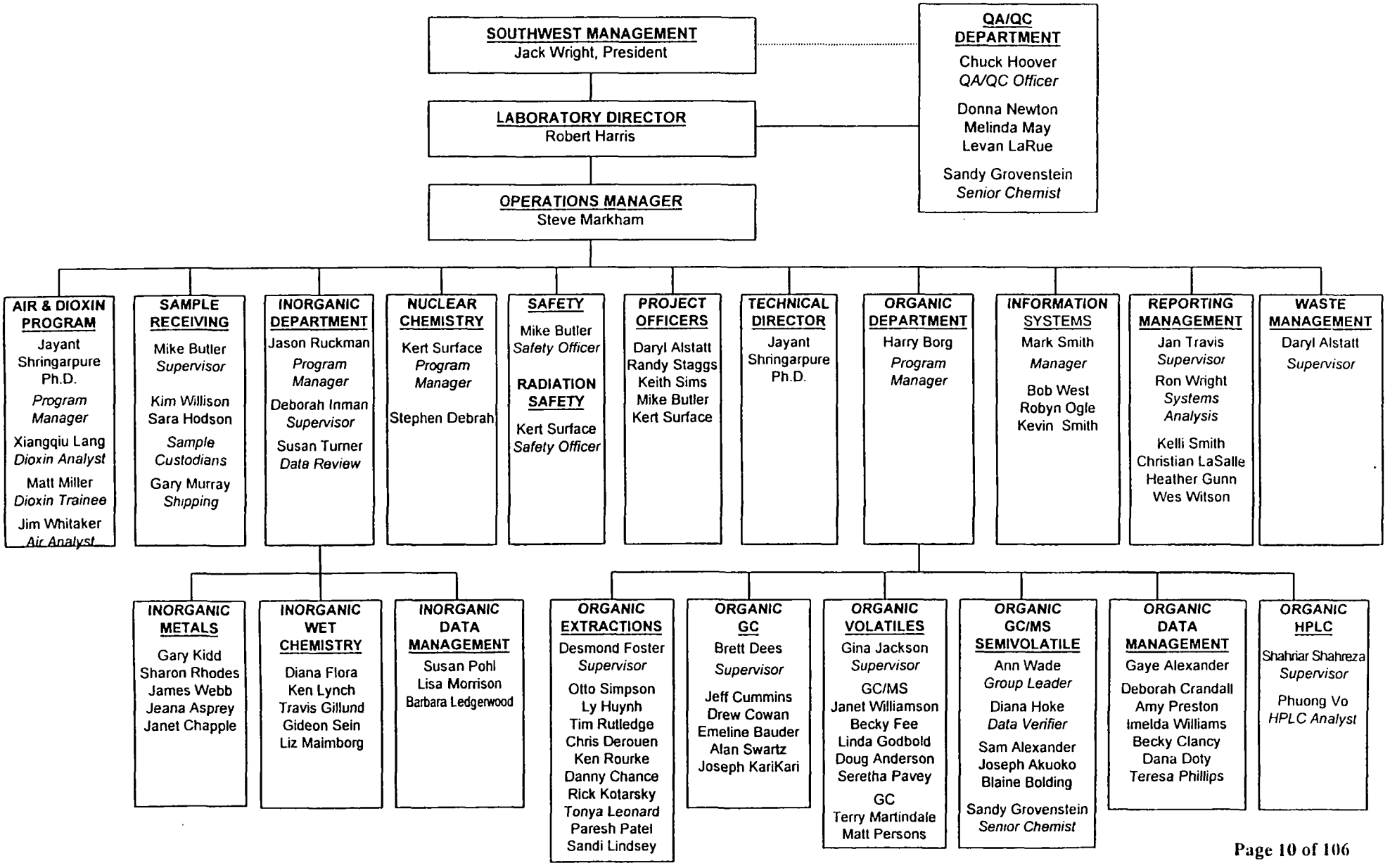
2.3 Stop Work Authority

- The analyst has the authority to stop work on the task they are performing when adherence to the quality control in the SOP is not achieved. The analyst is responsible for bringing the analytical system under control and reanalyzing the affected samples.
- The Department Supervisors have the authority to stop work in their department when the stated LQAP or SOP policies, procedures and practices are not met. The Department Supervisor is responsible for bringing the system back into control.
- The Program Managers have the authority to stop work for their areas when quality assurance or safety procedures are directly affected.
- The Quality Assurance Officer has the authority to stop work in all areas of the laboratory when it is deemed that a system is out of control. The QAO will meet the Laboratory Director and the Supervisor of the affected area to bring the system back under control.
- The Safety Officer has the authority to stop work when he feels the task being performed is harmful to employees.
- The President, Laboratory Director and Operations manager have the authority to stop work for quality, safety or financial reasons.

Figure 2.1

Organizational Chart

Southwest Laboratory of Oklahoma • Broken Arrow, Oklahoma



3.0 PERSONNEL TRAINING

3.1 Introduction

Training consists of a combination of formal sessions and "On the Job Training", both of which are detailed in SOP, SWL-GA-104, "Personnel Training". All new employees receive formal training in general orientation, safety and quality assurance as outlined in this SOP. When the training is completed, form 104-ATT1, "General, Quality Assurance and Safety Training for New Employees and/or Temporary Workers" (Fig. 3.1), is signed in acknowledgement that they received and understood the training. Those employees who will work in the radioactive materials control area will undergo further safety training in accordance with SOP, SWL-RD-141, "Radiation Safety". Supervised "On the Job Training" is provided to employees performing the technical tasks.

3.2 Safety Training

Health and safety hazards are initially introduced to all employees through a series of videotapes that cover pertinent safety topics. SOP, SWL-GA-111, "Laboratory Safety Plan" detailing the hazards involved in laboratory work, and the safeguards taken by the employees and Laboratory Management is presented to all employees at the inception of their employment. Refresher training is given to all employees on an annual basis.

3.3 Quality Assurance Training

Quality Assurance training is vital to all technical positions. The "Laboratory Quality Assurance Plan", SWL-GA-100, is discussed with all employees. The "Quality Assurance Training Checklist", shown in Figure 3.2[1] is used for this training. Annual training is conducted following the yearly update of the LQAP and prior to the LQAP effective date.

3.4 SOP Training and Proficiency Demonstration

All personnel are required to read and comply with the Laboratory Quality Assurance Plan and relevant Standard Operating Procedures. After the SOP(s) have been read and training has been completed for the appropriate analytical area, employees involved in analytical and technical data generation are certified as being proficient for those procedures. This proficiency determination is achieved by the successful analysis of a blind proficiency test sample. Reference methods that require an initial demonstration of performance will be performed be each analyst required to perform that method. Personnel shall be re-certified annually in the tasks for which they have been qualified.

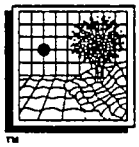
[1] A written, open-book exam is then given to the employee.

3.5 Other Training

Records of classes taken outside of the work environment which are work related and/or aid in job performance are also maintained. These records include certificates, grade cards or transcripts from college classes or college institutions. Documents regarding job descriptions and training requirements with aspects to the employees position are also maintained. These records are updated at least annually.

Figure 3.1

Training Documentation Forms



General, Quality Assurance and Safety Training for New Employees and/or Temporary Workers,SWL-GA-104

Personnel Training Form (104-ATT1.doc) Rev. # 1 0-05/14/97 Form ID: GA-104-GENSAF-F
o

Trainee :_____ **Employment Date:** _____

I certify by my signatures below that I have received the orientation indicated .

_____

1. Introduction to Southwest Laboratory **Date:** _____

Trainer: _____ Trainee Signature _____

2. Quality Assurance: QA Manual, Rev. No.: __.__ — __/__/__
Date :_____

Trainer: _____ Trainee Signature _____

3. Safety: Laboratory Safety Plan , Rev. No.: __.__ — __/__/__
Date :_____

A. Hazardous Materials and MSDS Orientation ..... ❑

B. Emergency Shower and Eyewash Locations and Use ..... ❑

C. Fire Extinguisher Locations and Operation ..... ❑

D. Basic Laboratory Safety .... ❑

E. Radiation Safety .... ❑

Trainer: _____ Trainee Signature _____

Figure 3.2

QA Training Checklist

QA TRAINING CHECKLIST

QA TRAINING CHECKLIST(100-ATT1.DOC) REV. #3 1-3/11/97 FORM I.D. GA-100-QATRAIN

ETHICS, POLICIES & OBJECTIVES

STANDARD OPERATING PROCEDURES (SOPs)

- REVISIONS/DATES/DOCUMENT CONTROL

SAMPLE RECEIVING, SWL-GA-110

- INTERNAL CHAIN-OF-CUSTODY
- STORAGE OF/ PRESERVATION OF SAMPLES

LOGBOOKS

- STANDARDS
- ANALYTICAL
- MAINTENANCE

DATA QUALITY OBJECTIVES, SWL-GA-100

- METHOD DETECTION LIMITS
  - SOP - (SWL-GA-113)
  - REDBOOK
  - RAW DATA SUMMARY
- PRACTICAL QUANTITATION LIMITS (PQLs)
- BLANK CRITERIA
- LABORATORY CONTROL SPIKES (LCS/LCSD) CRITERIA
- MATRIX SPIKES (MS/MSD)

ANALYST REVIEW

- SOP
- CHECKLIST(S)

CORRECTIVE ACTIONS, SWL-GA-105

THE ABOVE ITEMS WERE DISCUSSED AND DOCUMENTS DETAILING THESE SUBJECTS WERE PRESENTD TO & REVIEWED BY THE EMPLOYEE

TRAINEE: DATE:

TRAINER: DATE:

SAMPLE CUSTODY, PRESERVATION AND TRACKING

4.1 Sample Custody

A critical aspect of sound sample collection and analysis protocols is the maintenance of strict Chain of Custody (COC) procedures. COC procedures include inventory and documentation during sample collection, shipment and laboratory processing. A sample is considered to be in an individual's custody if the sample is:

(1) In the physical possession or view of the responsible party.[2]

(2) Secured to prevent tampering.

(3) Placed in a restricted area[3] by the responsible party.

The laboratory is responsible for the documentation of sample custody throughout the handling, processing, and analysis of samples.

The policies and procedures for internal and external chain of custody practices are outlined in SOP, SWL-GA-110, "Laboratory Documentation of Sample Custody".

4.2 Sample Control

The Sample Control Program describes the laboratory custody procedures associated with sample receipt, storage, preparation, analysis, disposal and security. Sample control is maintained at SWLO with several tracking systems designed to protect the integrity of the samples. Tracking systems include the use of laboratory COC procedures and sample analysis requests (in the form of worksheets), internal COC forms, the Laboratory Information Management System (LIMS), laboratory logbooks (extraction, digestion and analytical run logs). For a detailed description of the Sample Control Program see the SOPs, SWL-GA-115, "Sample Custodian" and SWL-GA-124, "LIMS for Sample Receiving".

4.3 Sample Containers

During the course of a project, the client will periodically call a Project Officer with a request for sample containers. The order is taken and a "Shipping Request Form" (see Figs. 4.1 and 4.2) is filled out for either "Priority" or "Standard" shipment. Information regarding client, client contact, project reference, requested carrier, shipping address, date the containers are required, quantity requested, sampling matrix, container types and preservative requirements are recorded.

SWLO/AATS uses sample containers supplied by I-Chem and/or ESS. Certified bottles are available if requested by the client, including the necessary documentation. All documentation of certification is maintained by the bottle shipment personnel.

---

[3] The Responsible Party is the person who has signed for custody/possession of the sample(s) or has relinquished custody back into storage areas.

[4] Restricted areas (e. g. Radiation Containment Area, VOA Refrigerator, etc.) are areas of the laboratory which have limited access exclusive to certain employees.

The Project Officer delivers the Sample Container Request Form to the Sample Receiving department where the sample containers are prepared with the appropriate preservative, packaged (usually in coolers), and shipped with custody seals. The type of shipment, airbill, preservatives used and all other pertinent information is recorded on the request form. The request form is maintained in a file for future reference. Logs are maintained in document shipping.

4.3.1 Preservatives

Preservatives are prepared in the Inorganic or Volatile Organic department. When these preservatives are prepared, lot numbers are assigned. These reagents are checked for purity prior to use and their lot numbers are recorded on the Sample Container Request Form for tracking purposes. Table 4.1 lists the common preservatives used in bottle preparation.

Table 4.1

Preservatives

Preservative	Concentration	Parameters
Hydrochloric Acid (HCl)	1:1	Volatile Organics, Total Petroleum Hydrocarbons, Oil and Grease
Nitric Acid (HNO_3)	1:1	Metals
Sulfuric Acid (H_2SO_4)	1:1	Nitrate/Nitrite, Phenols, Total Organic Chloride (TOX), Total Organic Carbon (TOC), Chemical Oxygen Demand (COD)
Sodium Hydroxide (NaOH)	10N	Sulfide, Cyanide
Zinc Acetate	2N	Sulfide
Sodium Thiosulfate ($Na_2S_2O_3$)	0.008%	Chlorinated Drinking Water Organics

4.4 Sample Storage

All samples are stored in a secured area with separate storage facilities for volatile organics and radio chemistry samples. Unless otherwise specified by the client, all samples are stored at 2° - 6°C with a daily monitoring of all storage refrigerators. If temperatures exceed these limits immediate corrective action is implemented to bring the system back under control.

4.5 Sample Disposal

The provisions of 40 CFR, Part 262 apply to SWLO/AATS, its procedures, policies and personnel as a generator of on-site accumulation, and transfer of hazardous waste to a transporter for off site disposal. Details of storage and disposal of samples and hazardous waste are contained in SOP, SWL-GA-114, "Hazardous Waste Management Plan".

4.6 Security

Southwest laboratory is a secured facility[4]. Samples are stored in the Sample Receiving cold storage areas except during laboratory analysis[5]. The worksheet informs the analyst which samples are needed for preparation and/or analysis. All laboratory personnel who receive samples are responsible for the care and custody of all samples. Internal Chain of Custody forms are maintained outside the sample storage area where analysts sign, initial and date the removal and return of samples from storage. Subsets (extracts and digestates) of the samples may be kept in a storage area which is controlled by the appropriate laboratory department manager. In the case of metal digestates, samples are maintained on racks between the ICP and Furnace AA analysis areas.

For the control of proprietary or confidential information, refer to SOP SWL-GA-122, "Handling Confidential Documents". Software security details are found in SOP SWL-GA-102, "Information Systems Quality Assurance Plan".

[4] Access is limited to employees. All doors except the front door remain locked, and the front door is monitored by the receptionist. All visitors are required to sign in and are escorted throughout their visit at the laboratory. Sample cold storage areas are secured at night and access is authorized to employees during business hours.

[5] Aqueous metals samples for Navy Projects are stored at room temperature on shelves in the Sample Receiving area unless refrigeration is specified by the project QAPP.

Figure 4.1

Shipping Containers Request Form

CLIENT SHIPPING CONTAINERS REQUEST

White Copy–Client • Yellow Copy–SWL • Pink Copy–File

SAMPLE RECEIVING DEPARTMENT

TM

Project Name	Client Code	P.O.#	Date Contacted	Date Required	Shipper Requested

CLIENT INFORMATION

Client:	Containers: ☐ Billable ☐ Not Billable
Client Contact:	*If NOT billable, please explain*
Phone No:	Shipping: ☐ Billable ☐ Not Billable
Shipping Address:	*If NOT billable, please explain*
	SWL Contact:
	Approved By:

SHIPPING INFORMATION

☐ Coolers (QTY._____) ☐ Blue Ice ☐ Return Shipping Labels ☐ COCs

☐ Custody Seals ☐ Misc. _____

SPECIAL PROVISIONS: _____

CONTAINER REQUIREMENTS

✓	QTY.	MATRIX	CONTAINERS	ANALYTICAL	PRESERVATIVE

Date Shipped	# Pieces	Total Wt	Filled By	Shipped Via	Shippers Ref#

SOUTHWEST LABORATORY OF OKLAHOMA, INC • 1700 W. ALBANY • BROKEN ARROW, OK74012 • (918) 251-2858 • FAX (918) 251-2599 [SR004-0694-04]

Figure 4.2

Priority Shipping Containers Request Form

PRIORITY SHIPPING CONTAINERS REQUEST

SAMPLE RECEIVING DEPARTMENT

TM

CLIENT INFORMATION

Client:

Client Contact:

Shipping Address:

Phone No.

Project Name:

Client Code: P.O.#:

Date Contacted:

SHIPPING INFORMATION

Freight Co:

Freight No:

SWL Shipper:

Required Ship Date:

Date Shipped:

☐ COCs ☐ Coolers (QTY. _____)

☐ Custody Seals ☐ Blue Ice

☐ Return Shipping Labels ☐ Misc. _____

SWL Contact: _____

Approved by: _____

☐ Billable ☐ Not Billable

If NOT billable, please explain _____

CONTAINER REQUIREMENTS

QTY.	MATRIX	CONTAINERS	ANALYTICAL	PRESERVATIVE

SPECIAL PROVISIONS:

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

1700 W. ALBANY • BROKEN ARROW, OKLAHOMA 74012 • OFFICE (918) 251-2858 • FAX (918) 251-2599

[SR004-0194-03]

5.0 FACILITIES

5.1 Broken Arrow

SWLO/AATS's Broken Arrow facility contains 32,000 square feet of space allocated as shown in Figures 5.1 and 5.2. We are in the process of moving into our new 2200 sq.ft. Volatile GC & GC/MS Expansion (not shown in Figure 5.2). As soon as this move is complete, our Radio Chemistry Laboratory will acquire an additional 1100sqft. (included in Figure 5.1 below).

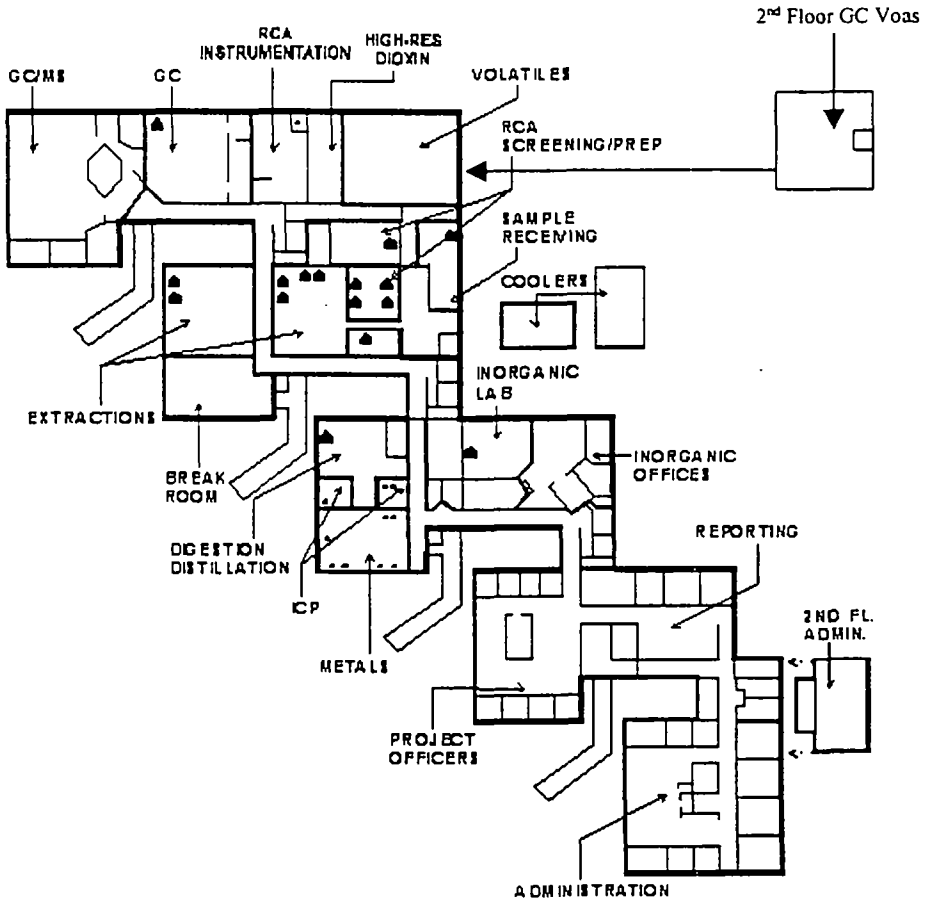
Figure 5.1

Southwest Laboratory Space Allocation

Layout of SWLO's 32,000 sq. ft. facility located in Broken Arrow, Oklahoma	Area Sq. Ft.
Volatile GC/MS	2200
Semivolatile	3200
Pesticide GC/HPLC	1100
Organic Extraction	1800
Metal Analysis	1000
Wet Chemistry	1900
Sample Receiving	1000
Radiochemistry	2600
Administrative/Reporting	4000
Dioxin	1000
Mechanical areas, walkways, and other non-work areas	14,400

Figure 5.2

Facility Layout



Layout of Southwest Laboratory's 32,000 square foot facility located in Broken Arrow, Oklahoma.

5.2 Instrumentation and Equipment

An inventory of computer hardware is found in SOP SWL-GA-102, "Information Systems Quality Assurance Plan".

Following is a current list of instrumentation and associated equipment used in providing analytical services:

Description	Year
GC/MS Hewlett Packard 5970 MSD	**1986**
Connected to DOS Chemstation with Target data procession on HP710 Packed/Capillary Injector W/ Jet Separator Hewlett Packard 5890 Gas Chromatograph Tekmar 2000 with 2016, 2032 Auto Sampler	
GC/MS Hewlett Packard 5970 MSD	**1987**
Connected to DOS Chemstation with Target data procession on HP715a Packed/Capillary Injector Hewlett Packard 5890 Gas Chromatograph Hewlett Packard 7673 Auto Sampler	
GC/MS Hewlett Packard 5970 MSD	**1988**
Connected to DOS Chemstation with Target data procession on HP710 Packed/Capillary Injector W/ Jet Spearator Hewlett Packard 5890 Gas Chromatograph Tekmar 2000 with 2016, 2032 Auto Sampler	
GC/MS Hewlett Packard 5970 MSD	**1988**
Connected to RTE Aquarius Data System (VIII) Packed/Capillary Injector Hewlett Packard 5890 Gas Chromatograph Hewlett Packard 7673 Auto Sampler	
GC/MS Hewlett Packard 5970 MSD	**1989**
Connected to RTE Aquarius Data System (V) Electronic Pressure Control Capillary Injector Hewlett Packard 5890 Gas Chromatograph Hewlett Packard 7673 Auto Sampler	

Description	Year
GC/MS Hewlett Packard 5970 MSD	**1989**
Connected to RTE Aquarius Data System (VIII)	
Packed/Capillary Injector	
Hewlett Packard 5890 Gas Chromatograph	
Hewlett Packard 7673 Auto Sampler	
GC/MS Hewlett Packard 5970 MSD	**1989**
Connected to DOS Chemstation with Target	
data procession on HP715b	
Packed/Capillary Injector W/ Jet Spearator	
Hewlett Packard 5890 Gas Chromatograph	
Tekmar 2000 with 2016, 2032 Auto Sampler	
GC/MS Hewlett Packard 5970 MSD	**1990**
Connected to DOS Chemstation with Target	
data procession on HP715c	
Packed/Capillary Injector	
Hewlett Packard 5890 Gas Chromatograph	
Hewlett Packard 7673 Auto Sampler	
GC/MS Hewlett Packard 5971 MSD	**1990**
Connected to DOS Chemstation with Target	
data procession on HP710	
Packed/Capillary Injector W/ Jet Spearator	
Hewlett Packard 5890 Gas Chromatograph	
Tekmar 2000 with 2016, 2032 Auto Sampler	
GC/MS Hewlett Packard 5971 MSD	**1991**
Connected to DOS Chemstation with Target	
data procession on HP715b	
Packed/Capillary Injector W/ Jet Spearator	
Hewlett Packard 5890 Gas Chromatograph	
Tekmar 2000 with 2016, 2032 Auto Sampler	
GC/MS Hewlett Packard 5971 MSD	**1991**
Connected to DOS Chemstation with Target	
data procession on HP715b	
Packed/Capillary Injector W/ Jet Spearator	
Hewlett Packard 5890 Gas Chromatograph	
Tekmar 2000 with 2016, 2032 Auto Sampler	

Description	Year

GC/MS Hewlett Packard 5971 MSD **1991**
Connected to DOS Chemstation with Target
data procession on HP715c
Packed/Capillary Injector
Hewlett Packard 5890 Gas Chromatograph
Hewlett Packard 7673 Auto Sampler

GC/MS Hewlett Packard 5971 MSD **1991**
Connected to DOS Chemstation with Target
data procession on HP715b
Packed/Capillary Injector W/ Jet Separator
Hewlett Packard 5890 Gas Chromatograph
Tekmar 3000 with Precept II Auto Sampler

GC/MS VG Trio-1(AIR ANALYSIS) **1991**
Connected to LABBASE data system
Packed/Capillary Injector
Hewlett Packard 5890 Gas Chromatograph
Tekmar 3000 with 6032 Auto Sampler
Entech 2000 Preconcentrator
2016 cm Autosampler for Summa Canisters

GC/MS Hewlett Packard 5970 MSD **1992**
Connected to DOS Chemstation
with Target data procession on HP715a
Packed/Capillary Injector
Hewlett Packard 5890 Gas Chromatograph
Hewlett Packard 7673 Auto Sampler

GC/MS Hewlett Packard 5972 MSD **1994**
Connected to DOS Chemstation
Packed Capillary Injector
Hewlett Packard 5890 Gas Chromatograph
Tekmar LSC 2000 with 6016 Auto Sampler

GC/MS Hewlett Packard 5972 MSD **1994**
Connected to DOS Chemstation with Target data processing on HP710
Packed Capillary Injector W/ Jet Separator
Hewlett Packard 5890 Gas Chromatograph
Tekmar 2000 w/2016,2032 Auto Sampler

Description	Year
GC/MS Hewlett Packard 5972 MSD	**1996**
Connected to DOS Chemstation with Target data procession on HP715b Packed/Capillary Injector Hewlett Packard 5890 Gas Chromatograph Tekmar LSC 3000 W/ Auto Sampler	
GC/MS Hewlett Packard 5972 MSD	**1994**
Connected to DOS Chemstation with Target data procession on HP715c Electronic Pressure Control Capillary Injector Hewlett Packard 5890 Gas Chromatograph Hewlett Packard 7673 Auto Sampler	
GC/MS Hewlett Packard 5972 MSD	**1993**
Connected to DOS Chemstation with Target data procession on HP715c Electronic Pressure Control Capillary Injector Hewlett Packard 5890 Gas Chromatograph Hewlett Packard 7673 Auto Sampler	
GC/MS Hewlett Packard 5972 MSD	**1993**
Connected to DOS Chemstation with Target data procession on HP715b Packed/Capillary Injector W/ Jet Spearator Hewlett Packard 5890 Gas Chromatograph Tekmar 3000 with 2032 Auto Sampler	
High Resolution GC/MS VG-70S	**1989**
Dioxin Analysis Connected to Vax 4000 data system Packed/Capillary Injector Hewlett Packard 5890 Gas Chromatograph Fisons A200S Autosampler	
High Resolution GC/MS Autospec	**1989**
Dioxin Analysis Connected to Vax 4000 data system Packed/Capillary Injector Hewlett Packard 5890 Gas Chromatograph Fisons A200S Autosampler	

Description	Year
High Resolution GC/MS Autospec	**1997**
Dioxin Analysis	
Connected to Vax 4000 data system	
CTC 200 Autosampler	
Hewlett Packard 5890 Gas Chromatograph	

Data Systems

RTE Data System (VI) Dioxin
HP A-900 Computer w/Aquarius Rev. F

RTE Data System (VIII)
HP A-900 Computer w/Aquarius Rev. F.

Unix Data System (HP735)
HP 735 Workstation w/HP-UX 9.01
Thruput Maestro Software

Unix Data System (HP710)
HP 710 Workstation w/ HP-UX 9.01
Thruput Target Software

Unix Data System (HP715a)
HP 715/33 Workstation w/ HP-UX 9.01
Thruput Target Software

Unix Data System (HP730)
HP 730 Workstation w/ HP-UX 9.01
Thruput Maestro Software (Rev. 3.0)

Unix Data System (HP715b)
HP 715/33 Workstation w/ HP-UX 9.01
Thruput Target Software

Unix Data System (HP_Dev.)
HP 712 Workstation w/ HP-UX 9.03
Thruput Target Software (Rev. 3.0)

Unix Data System (HP715c)
Samsung 715/50 Workstation w/ HP-UX 9.01
Thruput Target Software

Support Equipment

Purge and Trap, Tekmar LSC2 (2)
Tekmar, ALS - 10 Position Auto Samplers (2)
Tekmar 1000 - Capillary CRYO Focuser (1)
NesLab Refrigeration Cooler (2)
Ultra Sonic Cleaner, Mettler (1)
Frigidaire Coolers - Extract Storage (2)
Tekmar LSC 2000 Purge & Trap Units (4)
Tekmar 3000 Purge & Trap Units (3)
Tekmar 2016, 16 port ALS's (5)
Tekmar 2032, 16 port ALS's (5)
Tekmar 6016 16 port ALS's
Tekmar 6032 16 port ALS's
Precept II Autosamplers (Modified) (2)
Archon 5100A Autosampler (1)
Entech 2000 preconcentrator
2016 cm Autosampler for Summa Canisters

GC Laboratory

Description	Year
Gas Chromatograph	1989
Carle TCD (Nat Gas)	
Gas Chromatograph	1989
Carle TCD (Nat Gas)	
Gas Chromatograph	1989
Carle TCD (Nat Gas)	
Gas Chromatograph, HP 5890 ECD/ECD	1986
Dual Split/Splitless Injectors	
Dual HP 7673 Auto Sampler	
Gas Chromatograph, HP 5890 ECD/ECD	1987
Dual Split/Splitless Injectors	
Dual HP 7673 Auto Sampler	
Gas Chromatograph, HP 5890 PID/HALL	1987
Tekmar LSC2000 Purge and Trap	
Tekmar ALS 2016 & 2032 Position Auto Sampler	
Gas Chromatograph, HP 5890 FID/NPD	1988
Dual Split/Splitless Injectors	
HP 7673 Auto Sampler	

Description	Year
Gas Chromatograph, HP 5890 ECD/ECD Dual Split/Splitless Injectors HP 7673 Auto Sampler	**1988**
Gas Chromatograph, HP 5890 Series II ECD/ECD Dual Split/Splitless Injectors Dual HP 7673 Auto Sampler	**1989**
Gas Chromatograph, HP 5890 Series II ECD/ECD Dual Split/Splitless Injector Dual HP 7673 Auto Sampler	**1989**
Gas Chromatograph, HP 5890 PID ALS 2016 & ALS 2032	**1989**
Gas Chromatograph, HP 5890 ALL/PID/FID Split/Splitless Injectors HP 7673 Auto Sampler	**1989**
Gas Chromatograph, HP 5890 HALL/PID Split/Splitless Injectors HP 7673 Auto Sampler	**1989**
Gas Chromatograph, HP 5890 PID Split/Splitless Injectors HP 7673 Auto Sampler	**1989**
Gas Chromatograph HP-5890 TCD Split/Splitless Injectors	**1989**
Gas Chromatograph HP-5890B ECD Dual Split/Splitless Injectors Twin 7673A Auto Samplers	**1991**
Gas Chromatograph HP-5890 Series II ECD/ECD Dual Split/Splitless Injectors Twin 7673A Auto Samplers Electronic Pressure Control (EPC)	**1992**
Gas Chromatograph, Fisons 8130 EC/ECD	**1994**
Gas Chromatograph, Fisons 8130 EC/ECD	**1995**

Liquid Chromatography

Description	Year
Kratos HPLC (1)	**1992**
Spectroflow 400 Pumps (2)	
Spectroflow 480 Injector (1)	
Spectroflow 783 Programmable	
Absorbance Detector (1)	
Hitachi 655A - 40 Auto Sampler (1)	
Fluorescence Detector (1)	
FD200 Variable Wavelength	
Column Heater	
Waters HPLC (1)	**1992**
715 Ultra Wisp Sample Processor	
510 HPLC Pumps (2)	
486 Tunable Absorbance Detector	
Column Heater (1)	
Hewlett Packard HPLC (1)	**1992**
Variable Wavelength Detector 1050	
1050 Autosampler	
HP 1050 Series Pumps (2)	

Support Equipment

Oven, VWR 1310 (1)
Frigidaire Cooler - Sample Storage (1)

Extractions Laboratory

Concentrators

Kudera Danish (124)	1987
Drying Oven, Blue M	1980
Millipore (24)	1987

Description	Year
Extraction Apparatus	
Continuous Liquid Extractors (96)	1987
Soxhlet Extractors (20)	1987
Gel Permeation Clean-up (GPC) Apparatus, ABC1002B	1998
Applied BioSystems UV Detector, Model 757	1988
Gel Permeation Clean-up (GPC) Apparatus, ABC1002B	1991
Sontek UV Detector	1991
Zymark Benchmate	1992
SSI Pumps (2)	
Sontek UV Detectors (2)	
Zymark Turbovap (2)	1992
Marathon GPC	1994
Sontek Pump (1)	
Sontek UV Apparatus (1)	
Delfield Storage Refrigerator, Extracts	
General Electric Storage Refrigerator, Standards	
8-Place Auto Seperatory-funnel Shaker	1988
Glass Columns	
Extraction Apparatus (20) Seperatory Funnels, 2000 ml	
Funnels (75)	
Dioxin Columns (80 sets)	
400 ml Beakers (75)	
250 ml Erlenmeyers (50)	
500 ml Boiling Flask (90)	
Sample Concentrator, Nitrogen Blow Down, 30 Place	1984
Sample Concentrator, Nitrogen Blow Down, 30 Place	1988
Sonic Disruptor, Sonicator (Sonics)	1989
Sonic Disruptor, Sonicator (Sonics)	1990
Sonic Disruptor, Sonicator (Sonics)	1990
Top Loading Balance, Ohaus 400	1992
Top Loading Balance, Ohaus GT 4000	
Knauer UV Photometer (4)	

Metal Analyses Laboratory

Atomic Absorption

Description	Year
Instrumentation Laboratory Video 22 Double Beam Dual Channel Spectrophotometer with Graphics	1983
TJA Autosampler	
TJA Prep station	
TJA Video 22 Double Beam, Dual Channel Spectrophotometer with Graphics	1991
TJA CTF 188	
TJA Autosampler	
TJA Prep Station	
TJA 188 Controlled Temperature Furnace	1991
Perkin Elmer 5100 Zeeman	1990
PE HGA 600	
PE AS-60	
Varian 400Z GFAA (2)	1992
Buck Scientific Mercury Analyzer 400	1990
Leeman PS200 Mercury Analyzer	1992
Leeman PS200 Mercury Analyzer	1993

Inductively Coupled Plasma

ICP 61 Plasma Spectrometer (Thermo Jarrel Ash)	1988
Auto sampler-TJA	
ICP 61E Trace Analyzer (Thermo Jarrel Ash)	1993
ICP, 61E Trace Analyzer (Thermo Jarrel Ash)	1994

Wet Chemistry - Inorganic

Air Compressor
Analytical Balance, Mettler H80
Balance, top-loading, Ohaus model 400 (3)
Centrifuge, Damon IEC Clinical
Conductivity Meter, HACH
Electrode (Ammonia) 95-12 Orion
Electrode (Fluoride) 94-09-00 Orion
Flow Injection Analyzer, Lachet Quikchem

Description	Year
Gooch Crucibles	
Glass Dessicators	
Hoods, Labconco - 6 Foot	
Hot Plates & Stirrers	
Ion Chromatograph, Dionex,2010i	
Dionex-DX100 Ion Chromatograph	
Mettler Ultrasonic Cleaner	
MuffleFurnace, Themdyne, Type 1300	
pH Meter, Orion (Portable)	
Plastic Dessicators, Large	
Spectrometer, Bausch & Lomb, Spectronic 21	
Total Organic Carbon Analyzer, Schmadzu 5050	
Carbon Analyzer Leco CR12	
Dohrman Microcoulometer MCTS-20	
Vacuum-Pressure Pump, Thomas	
Balance-Anayltical American Scientific Products	
Model SP180	
Balance- Top Loading; Ohaus AS120	
Balance- Top Loading; Ohaus GT2100	
BOD Incubator - White Westinghouse, Model:MS-U14F3BW4	
BOD Incubator - E Series	
PH Meter, Fisher Scientific	
Centrifuge, Fisher Model: 225	
IEC Clinical COD Reactor, Model: 2090-OIC	
Queue Radial Shaker	
Turbidmeter, HF Instruments: DRT100B	
Drykeeper Desicators (10)	
Blue M Oven, Stabletherm (2)	
Labline, L-C- Model 2310, Model 3512	
Imperial IV Water Bath	
Griddles (Teflon coated hotplates for use in metals digestion) (8)	

High Hazards Laboratory

Description	Year
Analytical Balance, ASP Model 2410	
Blender, Waring	
Chemical Carcinogen Glove Box, LABCONCO	
Heated Dessicator, Precision Scientific	
Shaker, Eberbach	
Special Glassware	
Columbia Fisheries Dioxin Protocol	
Sonic Disruptor, Sonicator - Heat Systems	
Muffle Furnace, Linberg	
Samsung Storage Refrigerator	
Laboratory Furniture	
1 - Four Foot Hood, KEEWANEE	
1 - Six Foot Hood, KEEWANEE	

Data Management

Lims System

Description	Year
Computer, Gateway 2000 P5-90	1994
32 MB Memory, 1 G Hard Drive	
2 G Tape Backup	
450 Watt Ups	
WYSE 60 Terminals (2)	
Printers: HP LaserJet 4V (1)	
HP LaserJet 4+ (3)	
HP LaserJet 4 (2)	
HP LaserJet 3 (3)	

GC/MS Lab

Description	Year
Computer, Gateway 2000 P5-100	1996
32 MB Memory	
2 G Hard Drive	
2 G Tape Backup	
Ups	

Metals Lab

Description	Year
Computer, Gateway 2000 P5-90	1994
16 MB Memory	
1 G Hard Drive	
2 G Tape Backup	
Ups	

Spare

Computer, Gateway 2000 P5-60	1994
16 MB Memory	
500 M Hard Drive	
Tape Backup	
Ups	

Dev. Sys.

Computer, Gateway 2000 486DX2/50	1992
16 MB Memory	
500 Hard Drive	
2 G Tape Backup	
Ups	

Miscellaneous Computer Equipment

Terminal Ports (196)	
Computer Ports (96)	
INMAC 64 port Smart Switch	
Packard Bell 2400 baud modems (4)	
Hewlett Packard A900 Computer , 4 mb(2)	1990
Disk Drive, HP 7937, 500 Mb	
Tape Drive, HP 9144 (2)	
Terminals, HP2623 (6)	
Terminals, HP2627 (3)	
Terminal, HP 2393A (1)	
Terminal, HP 2622 (1)	
Terminal, HP 2392 (1)	
Printers, HP2934A (11)	
One Hundred Computers, IBM PCs and Compatibles	1991-1996
40 MB to 2.5 GB Disk Drives	
Streamer Tape Back-Up System (2)	

Mixed Waste Laboratory/Radiochemistry

Description	Year

Oxford HpGe Gamma Spectroscopy System 1995
40 Percent efficient detector, Be thin window, using Oxford GammaTrac analysis software.

Oxford HpGe Gamma Spectroscopy System 1995
40 Percent efficient detector, Be thin window, using Oxford GammaTrac analysis software.

Oxford Oasis Alpha Spectroscopy System 1995
20 Chamber/Detector series using TC256 NIM modules.

Oxford LB4100 Low Background Gas Proportional Alpha/Beta Counting System 1995
Multi-setector system running 8 detectors in two drawer assemblies.

Packard Tri-Carb 2550 TR/LL Liquid Scintillation Counting System 1995

The Nucleus Sodium Iodide Gamma Detector System 1995
4 Nal Detector array system using DMR-II
Digital Multiplexer Router and associated analytical software.

Ludlum Radon Flask Counter, Lucas Cell Counter (7) 1995

ChemCheck Kinetic Phosphorescence Analyzer 1995
ChemCheck KPA-11.

Ordela Photon-Electron-Rejecting Alpha Liquid Scintillation (PERALS) Spectrometer 1995

Ludlum Handheld 1X 1 Nal microR Survey Meter 1995

Ludlum Model 3 GM Survey Meter with Pancake Probe (2) 1995

Ludlum Model 177 Scaler with Hand Frisk Platform (2) 1995
Platform – 2 each, pancake type halogen quenched G – M.

Ludlum Model 177 Scaler with Hand Frisk Platform (2) 1995
Platform – 3 each, pancake type halogen quenched G – M.

Support Equipment

Description	Year
Accumet pH Meter (2)	
Denver Instruments Analytical Balances (2)	
Mettler PM2000 Top Loader Balance	
Marathon 10K Large 32 location Centrifuge	
Fisher Centrifuges (2)	
Large Muffler Furnace	
Large Drying Oven	
Ball Mill (60 can capacity)	
Large Industrial Jaw Crusher	
Explosion Proof Freezer	
Electroplating Unit	
Tritium Distillation Column Array (8)	

Southwest Laboratory of Oklahoma Novell File Server Information

Mickey: 100 user license Novell 3.12

Server: Gateway Pentium 60 Megahertz, 4mm 2 GB tape drive running Backup Exec. software,
40 MB memory-2 GB hard drive space-UPS

Data: 50 user license Novell 3.12

Server: Gateway Pentium 100 Megahertz, 4mm 2 GB tape drive running Backup Exec. software, 64 MB memory-4 GB hard drive space-UPS

Inlab: 50 user license Novell 3.12

Server: IBM Clone 486/25 Megahertz, 4mm 2 GB tape drive running Backup Exec. software16 MB memory-500 MB hard drive space-UPS

CS: 25 user license Novell 3.12

Server: Gateway 486DX2/50E, 4mm 2 GB tape drive running Backup Exec. software, 16 MB memory - 1.2 GB hard drive space-UPS

6.0 EQUIPMENT MAINTENANCE

6.1 Preventive Maintenance

A preventive maintenance program for the instrumentation ensures fewer interruptions of analyses, personnel efficiency, and lower repair costs. It eliminates premature replacement of parts, and reduces discrepancy among test results. It increases reliability of results. Detailed information on preventive maintenance is found in SOP SWL-GA-127, "Preventive Maintenance".

6.1.1 The laboratory has established the following preventive maintenance program:

6.1.1.1 Each type of equipment/instrument has a written Standard Operating Procedure (SOP) describing the methods for routine inspection, cleaning, maintenance, testing, calibration, and/or standardization of the equipment. Instrument operating manuals are kept near the instrument or where analysts have easy access.

6.1.1.2 Analysts using the instruments are properly trained and develop trouble-shooting skills in equipment failure to reduce dependence upon outside servicing agencies. In complicated cases, the servicing agency or supplier is called to solve the problem.

6.1.1.3 Written equipment records are kept to document all inspection, maintenance, trouble-shooting, calibration, or modifications. Whenever maintenance is performed on an instrument, it is documented in a preventive maintenance logbook, which is kept near the equipment. The records contain the date (month, day, year), description of the maintenance done, the actual findings, the name of the person doing the maintenance, a statement of whether the maintenance operations were routine, and if those operations followed the written SOP and the documented return to control after maintenance was completed.

6.1.1.4 Performance criteria is established for judging when data from instrument performance checks indicate the need to make adjustments in the instrument operating conditions.

6.1.1.5 Backup instrumentation is prevalent throughout the laboratory. This ensures the client that should an instrument develop problems, the samples can still be analyzed on the backup instruments.

6.2 Chromatographic Instruments

Preventive maintenance is done through daily performance checks. Parameters such as retention time and response factors are observed and back-checked with prior operational performance. Details are found in SOPs, SWL-OP-201, "Preventive Maintenance of Hewlett Packard and Fisons Gas Chromatographs", and SWL-GA-103, "Tekmar Maintenance".

In addition, the following are done:

- Septa are replaced as needed.
- Incoming gas drying cartridges are changed whenever the color of the absorbent is noticed.
- Effluent absorbent traps are changed every month.
- Columns (GC and HPLC) are checked by performance and operating conditions when in use, or prior to use.
- Oven performance checked daily prior to use.

6.3 Gas Chromatography/Mass Spectroscopy (GC/MS)

The preventive maintenance is provided by Hewlett-Packard on a semi-annual basis.

6.4 Inorganic Instrumentation – the preventive maintenance schedules are in SOP, SWL-IN-103, "Inorganic Preventive Maintenance Schedule".

6.5 General Laboratory Equipment

Analytical balances of various capacities and operational modes are calibrated annually by a licensed specialist and officially recorded as verification of performance.

Balances calibrations are checked with standard Class S weights before usage.

7.0 LABORATORY METHODS

7.1 References

The laboratory follows analytical procedures based on EPA-approved methods for both inorganic and organic analyses of multimedia environmental samples. Methods used for inorganic and organic analysis of routine samples are based on guidance documents such as "SW846 Test Methods for the Evaluation of Solid Waste" (3rd Edition), 40 CFR part 136 as published in the Federal Register, "Standard Methods for the Examination of Water and Wastewater", 18th Edition, 1992", and "The Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air". Unless otherwise notified by the client, the above methods shall be followed. All methods are available to the analysts. The laboratory's Standard Operating Procedures for each method are available to clients. Table 7.1 lists the analytical protocols utilized at Southwest Laboratory. Table 7.2 lists the most common analytical methods used. Table 7.3 gives estimated monthly production capacity for the laboratories. These production numbers can vary due to matrix or method.

If typical methods are rendered ineffective by matrix interferences, or if analytical parameters (detection limits, precision, specificity, etc) would require method variance (e. g. modification of the method), the Project Officer will notify the client/contractor of the method modification. A copy of the variance will be sent to the client/contractor to seek approval of the method change. The modification request must show that the conditions for the laboratory variance are similar to the expected conditions (e. g. sampling and handling techniques, environmental matrix concentration range, interferences) in the EPA approved methods.

Changes in operations prior to instrumental analysis (e. g. sample preparation and storage) must be documented and authorized by the client.

When newly released versions of a method are promulgated, the laboratory will evaluate the significance of any modifications made to the method. The laboratory will start the process of method development , validation and proficiency testing after evaluating the demand for the method by laboratory clientele.

7.2 Analytical Protocols

An initial demonstration of method performance is made prior to using any method. This same practice applies if at any time there is a change of personnel or instrument type. This demonstration is performed by completing the following:

- Analysis of four replicate aliquots of a quality control check standard where the comparability to the method, or laboratory generated acceptance criteria, are compared for precision and accuracy in required methods.
- Analysis of a single blind performance sample which meets method acceptance criteria.
- Analysis to determine method detection limits, for applicable methods.

The Quality Assurance Officer (QAO) has overall responsibility for overseeing that the method demonstrations are performed. The Department Supervisors are responsible for the maintenance of the data for their departments and ensuring the demonstration is performed when necessary.

Table 7.1

Analytical Protocols Used

Standard Methods for the Examination of Water and Wastewater: APHA, AWWA and WPCG, 18th Edition, 1985.

Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act, USEPA.

40CFR, Part 136, Federal Register, Volume 49, Number 209, Friday, October 26, 1984.

Methods for Chemical Analysis of Water and Wastes, USEPA, EPA-600/4-79-020, March 1979 and as amended December 1982 (EPA-600/482-055).

Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, USEPA, EPA-600/4-85-057, July 1982 and as subsequently amended.

Pesticide Analytical Manual, Volume I, Food and Drug Administration, Revised September 1977.

Recommended Methods of Analysis for the Organic Components Required for AB1803, State of California, 5th Edition, April 1986.

NIOSH Manual of Analytical Methods, US Department of Health and Human Services, 3rd Edition, February, 1984.

500 Series Methods-Drinking Water Test Methods, USEPA Compendium of Methods.

Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, USEPA, EPA-600/4-84-041, April 1984.

Annual Book of ASTM Standards, Water and Environmental Technology, ASTM, 1987, Volume 11.01 and 11.02.

Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, USEPA SW846, 3rd Edition, September 1986.

Statement of Work (SOW) Multimedia, Multiconcentration Organics, US EPA Contract Laboratory Program, 3/90.

Statement of Work (SOW) Multimedia, Multiconcentration Organics, US EPA Contract Laboratory Program, OLM03.2.

Statement of Work (SOW) Multimedia, Multiconcentration Inorganics, US EPA Contract Laboratory Program, ILM03.1.

Statement of Work (SOW) Multimedia, Multiconcentration Inorganics, US EPA Contract Laboratory Program, ILM04.0.

Prescribed procedures for Measurement of Radioactivity in Drinking Water, EPA 600/4-80-032, August, 1980

Table 7.2

Analytical Methods Typically used by Southwest Laboratory

INORGANICS	S = Soil, Sediment, Sludge	W = Water, Ground Water, Surface Water	P = Petroleum
Method		**Matrix**	**Description**
EPA 305.1		W	Acidity
EPA 310.1		W	Alkalinity
EPA 350.3/350.2		W	Ammonia
EPA 130.2		W	Hardness
EPA 351.3		W	Total Kjeldahl Nitrogen
EPA 413.1		W	Oil & Grease
EPA 415.1/9060		W/S/P	Total Organic Carbon
EPA 365.2		W	Phosphorus, Total
EPA 420.2/9066		W/S/P	Phenols
EPA 410.1/410.2		W	Chemical Oxygen Demand
EPA 160.3		W	Total Solids
EPA 160.2		W	Total Suspended Solids
EPA 160.1		W	Total Dissolved Solids
EPA 300		W/S	Chloride, Sulfate, Nitrate, o-Phosphate, Nitrite, Flouride
EPA 340.2		W	Fluoride
EPA 353.2		W	Nitrate
EPA 354.1		W	Nitrite
EPA 9010A/9012/335.3		W/S	Cyanide
EPA 375.4/9038		W	Sulfate
EPA 376.1/9030B		W/S/P	Sulfide
EPA 377.1		W	Sulfite
EPA 325.3		W	Chloride
EPA 120.1/9050		W	Specific Conductance
EPA 150.1/9040/9045A		W/S	pH
EPA 6010A		W/S/P	Metals by ICP
EPA 206.2/7060, 239.2/7421, 270.3/7740, 279.2/7841		W/S/P	Furnace AA
EPA 7196		W/S/P	HexCr
EPA 245.1/245.2/7470A/7471A		W/S	Mercury by Cold Vapor
CLP ILM04		W/S	CLP Inorganics
EPA 418.1		W	TRPH by GC/PID
EPA 9073		W	TRPH
EPA 1010		S/P	Ignitibility
EPA 1110		S/P/W	Corrosivity

SAMPLE PREPARATION

S = Soil, Sediment, Sludge
P = Petroleum
W = Water, Ground Water, Surface Water

Prep#/Method#	Matrix	Description
3020A/7060, 7421, 7440, 7481	W	Acid Digestion
3050A/6010A, 7060, 7421, 7740, 7841	S	Acid Digestion
3510B/8410, 8080, 8141, 8310	W	Separatory Funnel
3520B/8080, 8270A	W	Continuous Liq/Liq
3540A	S	Soxhlet
3550A/8080, 8270A, 8140, 8141, 8310, 8330	S	Ultrasonic
3580A/8080, 8270A	P	Waste Dilution
5030A/8010A, 8020, 8240A, 8260	W/S	Purge & Trap
3620A/8080	W/S	Florisil Cleanup
3630A/8080	W/S	Silica Gel Cleanup
3640/8080, 8270A	S	Gel Permeation Chrom.
8330/8330	W/S	Methanol Extraction Acetonitrile Extraction
1311, 6010A, 8080, 8240A, 8270A, 8150A, 7470A	W/S/P	TCLP

ORGANICS

S = Soil, Sediment, Sludge
W = Water, Ground Water, Surface Water
P = Petroleum

Method	Matrix	Description
EPA 8010A/601	W	Halogenated Volatile Organics by GC
EPA 8010A	S	Halogenated Volatile Organics by GC
EPA 8011	W/S	Ethylene Dibromide GC
EPA 8020/602	W	Aromatic Volatile Organics by GC/PID
EPA 8020	S	Aromatic Volatile Organics by GC/PID
EPA 8021	W/S	Volatiles by GC/PID/HALL in series
EPA 8040A	W/S	Phenol
EPA 8080A/8081A/8082/608	W/S/P	Organochlorine Pesticides/PCBs
CLP OLMO1.8	W/S	Organochlorine Pesticides/PCBs
CLP OLMO3.2	W/S	Organochlorine Pesticides/PCBs
CLP OLCO1	W	Low Conc. Organics (Pesticides/PCBs)
EPA 8140/8141A	W/S	Organophosphorus Pesticides
EPA 8150B/8151A	W/S	Chlorinated Herbicides
EPA 8240B/8260B/624	W/S/P	Volatile Organics by GC/MS
CLP OLMO1.8	W/S	CLP Volatile Organics
CLP OLMO3.2	W/S	CLP Volatile Organics
CLP OLCO1	W	Low Conc. Organics (Volatiles)
EPA 8270B/8270C/625	W/S/P	Semivolatile Organics by GC/MS
CLP OLMO1.8	W/S	Semivolatile Organics by GC/MS
CLP OLMO3.2	W/S	Semivolatile Organics by GC/MS
CLP OLCO1	W	Low Conc. Organics (Semivolatile)
EPA 8310	W/S	Polynuclear Aromatic Hydrocarbons by HPLC
EPA 8330	W/S	Explosives
EPA 8280	W/S	Polychlorinated Dibenzo-p-Dioxins/Furans
EPA 8290/1613	W/S	Polychlorinated Dibenzo-p-dioxins/Furans by HRMS
TO-1	AIR	Volatile organics using Tenax Adsorption
TO-3	AIR	Volatile organics using cryogenic preconcentration
TO-14	AIR	Volatile organics using summa canisters
TO-4	AIR	Pesticides/PCB's
TO-13	AIR	HPLC or GC/MS semi-volatiles
TO-9	AIR	Dioxins
EPA 504.1	W	Ethylene Dibromide

RADIOLOGICAL

S = Soil, Sediment, Sludge | W = Water, Ground Water, Surface Water | P = Petroleum

Method	Matrix	Description
EPA 900.0 Mod.	W/S	Gross Alpha
EPA 900.0 Mod.	W/S	Gross Beta
EPA 900.1 Mod.	W/S	Total Radium (Alpha)
EPA 903.1 Mod.	W/S	Radium 226 (RN/DEEM)
EPA 901.1 Mod.	W/S	Radium 226 (G.Spec.)
EPA 904.0 Mod.	W/S	Radium 228
EPA 901.1 Mod.	W/S	Gross Gamma
EPA 906.0 Mod.	W/S	Tritium
EPA 905.0	W/S	Radioactive Strontium
EPA 905.0	W/S	Strontium 89
EPA 905.0	W/S	Strontium 90
EPA 908.0 Mod.	W/S	Isotopic Uranium
EPA 908.0 Mod.	W/S	Uranium 233/234
EPA 908.0	W/S	Uranium 235
EPA 908.0 Mod.	W/S	Uranium 238
EPA 908.0 Mod.	W/S	Uranium (Total)
EPA 908.0 Mod.	W/S	Isotopic Thorium
EPA 908.0 Mod.	W/S	Thorium 228
EPA 908.0 Mod.	W/S	Thorium 130
EPA 908.0 Mod.	W/S	Thorium 232
EPA 908.0 Mod.	W/S	Thorium 234

Table 7.3

Estimated Monthly Production Capacity for SWLO/AATS – Broken Arrow and Tulsa

Department	Nominal	Peak
Organics Department		
GC/MS		
Volatiles	1,950	2,166
Semivolatiles	1,300	1,625
Dioxins	1,516	1,733
Special Services	542	758
GC/LC		
Volatiles	823	975
Herbicides	325	542
Pesticides/PCBs	975	1,408
Explosives	650	866
Miscellaneous	650	866
Inorganics Department		
Metals		
AA Furnace	1,083	1,300
Cold Vapor	1,083	1,300
ICP	1,083	1,300
Wet Chemistry		
Anions	1,516	1,820
Carbon, Organic	866	1,040
Chloride, Organic	650	866
Cyanide	866	1,300
Oil & Grease	520	866
Total Petroleum Hydrocarbons	866	1,300
Phenols	520	650
Sulfides	520	650
Hazardous Waste Department		
GC/MS		
TCLP Extraction/Analysis	520	650
TCLP Zero Headspace	468	624

Capacity: Monthly maximum capacity

Metals: Production figures are set for samples, not individual elements. Most samples are analyzed for multiple elements.

Categories of Analysis: Production categories include various analyses of a similar nature (e. g. GC/LC Volatiles include SW846-8020, SW846-8010, EPA 601, BTEX, THM)

8.0 CALIBRATION

Calibration is the process for determining the correctness relative to physical or chemical standards used or assigned values in scales of measuring instruments. It establishes a reproducible reference point to which all sample measurements are correlated. Instruments are calibrated as per the SOP. All calibrations used are documented in run logs and calibration summary forms for both Initial and Continuing Calibrations. Section 10.0 describes the QC checks used to verify instrument calibrations.

8.1 Geiger Counter

Geiger counters are sent annually to an independent contractor for calibration.

8.2 Atomic Absorption Spectrophotometer Systems (AAS)/Inductively Coupled Argon-Plasma Emission Spectrophotometer (ICAP).

For graphite furnace AA and ICP, the instruments are calibrated daily, or each time the instrument is set up for measuring different analytes. Operating Parameters are found in the Method SOPs.

Calibration standards are prepared fresh before each analysis and are discarded after use. These calibration standards are purchased from commercial vendors and are certified by the vendor as to traceability to standard reference materials.

10.5. Detailed calibration procedures for metals analysis are found in the following SOPs:

- SWL-IN-202, "ILM03.0 and ILM04.0 Analysis of Mercury by Cold Vapor"
- SWL-IN-203, "CLP ILM03.0/ILM04.0 Analysis of Metals by Inductively Coupled Argon Plasma"
- SWL-IN-204, "CLP ILM03.0/ILM04.0 Analysis of Metals by Graphite Furnace Atomic Absorption"
- SWL-IN-207, "Mercury SW846 Methods 7470A/7471A Digestion and Analysis"
- SWL-IN-209, "Metals by SW846 Method 6010A Inductively Coupled Argon Plasma (ICP)"
- SWL-IN-210, "GFAA SW846 7000 Series Analysis"

8.3 Spectrophotometers

The manufacturer instructions for instrument operation are followed for proper operating procedures.

Spectrophotometers are calibrated daily prior to any sample analysis. The calibration standards are prepared from reference materials or commercial standards (traceable to EPA or NIST reference materials) at a minimum of three concentrations, including a calibration blank to cover the anticipated range of measurements. The requirement for an acceptable initial calibration is a correlation coefficient equal to or greater than 0.996 (based on statistical historical data). Before sample analysis, an initial calibration

verification standard is analyzed. The response of this standard must be within ±10% of the true values. If not, the instrument must be re-calibrated.

The instruments are also checked for wavelength calibration. For UV/IR instruments, polystyrene film is used to calibrate the wavelength.

All absorption cells (i.e., cuvettes, quartz cells) are kept clean, free of scratches and fingerprints, and are rinsed with the solution to be analyzed prior to use. Matched cells are checked to see that they are equivalent by placing portions of the same solution in both cells and taking several readings of the transmittance or absorbance.

8.4 Total Organic Carbon Analysis (TOC)

For TOC calibration, a known concentration of potassium hydrogen phthalates (KHP) solution is analyzed as the calibration solution on the carbon analyzer. A minimum of three calibration solutions encompassing the linear range of the carbon analyzer is prepared and analyzed daily or prior to the sample analysis. Linear regression analysis of standard concentration in ug C versus response in millivolts (mv) is done to obtain a calibration curve. The correlation coefficient must be equal or greater than 0.995 or the standards are rerun and a new correlation coefficient is calculated. Details of TOC calibration are found in the SOPs SWL-IN-310, "Total Organic Carbon (TOC) in Water", and SWL-IN-311, "Total Organic Carbon (TOC) in Soil/Sediment".

8.5 Laboratory Instrumentation — Organic Processing Section

Gel Permeation Chromatograph (GPC)

8.5.1 The following general procedure is employed for preparing the GPC system for calibration:

- *Packing the column* — Place 70 grams (g) of Bio Beads SX-3 in a 400 milliliter (mL) beaker. Cover the beads with 50/50 methylene chloride and allow the beads to swell overnight before packing the column. Transfer the swelled beads to the column and start pumping solvent through the column, from bottom to top, at 5.0 mL/minute. After approximately 1 hour, adjust the pressure on the column to 7-10 psi and pump an additional 4 hours to remove air from the column. Adjust the column pressure periodically as required to maintain 7-10 psi.
- *GPC calibration solutions* — Prepare a calibration solution in methylene chloride containing the following analytes at the minimum concentrations, as listed below:

Compound	Concentration mg/mL
Corn Oil	25.0
Bis(2-Ethylhexyl Phthalate)	0.5
Methoxychlor	0.1
Perylene	0.02
Sulfur	0.08

- The GPC column is calibrated daily using the following procedure:
  1) *Calibration of the column* — Load sample loop #1 with calibration solution. Switch the value so that the GPC flow is through the UV flow-through cell. Adjust the detector to produce a UV trace that meets the following requirements.
     2) The corn oil and the phthalate peaks exhibit ≥ 85% resolution.
     3) The phthalate and the methoxychlor peaks exhibit ≥ 85% resolution.
     4) Methoxychlor and perylene peaks must exhibit ≥ 85% resolution.
     5) Perylene and sulfur peaks must not be saturated and must exhibit ≥ 90% baseline resolution.
  2) Choose the "collect time" to extend at least 10 minutes after the elution of pentachlorophenol. Wash the column at least 7 minutes between samples.
  3) Typical parameters selected are: Dump time = 16 minutes; collect time = 10 minutes; and wash time = 7 minutes; Elute volume collected = 50 ml.

8.5.2 Gas Chromatographs (GC) — The external calibration procedures are found in the following technical SOPs:

SWL-OP-400, "Pesticides/PCBs as Aroclors by GC Capillary Column Technique (Air)".

SWL-OP-401, "Determination of Pesticides and PCBs as Aroclors for AFCEE".

SWL-OP-402, "Determination of Pesticides and PCBs as Aroclors by GC Capillary Column Technique, Method 8080A".

SWL-OP-403, "Analysis of Pesticides/PCBs by GC/EC by EPA OLM03.2".

SWL-OP-404, "Analysis of Pesticides/PCBs by GC/EC by EPA OLM01.8".

SWL-OP-405, "Determination of Low Concentration Water for Pesticides/PCBs".

SWL-OP-406, "Analysis of 1,2-Dibromoethane (EDB) in Water by GC".

SWL-OP-407, "Analysis of Chlorinated Herbicides by Gas Chromatography".

SWL-OP-408, "Determination of Total PCBs as Aroclors by GC Capillary Column Technique for Gary Sanitary District".

SWL-OP-409, "Analysis of Phenols".

SWL-OP-410, "Analysis of Organophosphorus Pesticides by Gas Chromatography, Capillary Column Technique".

SWL-OP-411, "Extraction and Analysis of Pesticides by EPA Method 608".

SWL-OP-412, "Pesticides/PCBs as Aroclors by GC Capillary Column Technique, SW846-8081".

8.5.3 High Performance Liquid Chromatographs (HPLC) — The calibration procedure are found in the following technical SOPs:

SWL-OL-200, "Nitroaromatics and Nitroamines by HPLC".
SWL-OL-201, "Polynuclear Aromatic Hydrocarbons (PAH) by HPLC".
SWL-OL-202, "Low Detection Polynuclear Aromatic Hydrocarbons (PAH) by HPLC".
SWL-OL-203, "Polynuclear Aromatic Hydrocarbons (PAH) in Air by HPLC".
SWL-OL-204, "Formaldehyde by HPLC".
SWL-OL-205, "Carbamate Pesticides by HPLC".

8.5.4 Ion Chromatographs (IC) — The calibration procedure is found in SOP, SWL-IN-301, "Anions in Water by Ion Chromatography – Dionex 2010".

8.5.5 Mass Spectrometry Section — The calibration procedure are found in the following technical SOPs:

SWL-OV-301, "Volatile Organics".
SWL-OV-303, "Volatile Organics by GC/MS (SW846, Method 8260)".
SWL-OV-304, "Volatile Organics by GC/MS (SW846, Method 8260, 25 mL Purge".
SWL-OV-305, "Volatile Organics 3/90, New Protocol".
SWL-OV-306, "Volatile Organics New Protocol OLM03.2".
SWL-OV-307, "Volatile Organics — Skinner's List".
SWL-OV-308, "Volatile Organics — Appendix IX".
SWL-OV-309, "Volatile Organics — TCLP".
SWL-OV-310, "Volatile Organics — BTEX".
SWL-OV-311, "Volatile Organics — 6/91 New Protocol (Low Concentration Water, 25 mL Purge)".
SWL-OV-312, "Volatile Organics for AFCEE Projects Only".
SWL-OV-313, "Low Level Volatile Organics by 25 mL Purge".
SWL-OV-314, "Volatile Organics by Modified 524.2, Drinking Water, 25 mL Purge".
SWL-OV-315, "Volatile Organics by 524.2, Drinking Water, 25 mL Purge".

SWL-OS-500, "Semivolatile Organics by SW846, Method 8270".
SWL-OS-501, "Semivolatile Organics by CLP OLM01.8".
SWL-OS-502, "Semivolatile Organics by CLP OLM03.2".
SWL-OS-503, "Semivolatile Organics in Low Concentration Water".
SWL-OS-504, "Semivolatile Organics for AFCEE Projects Only".
SWL-OS-505, "Semivolatile Organics in Air by GC/MS".
SWL-OS-506, "Analysis of N-Nitrosodimethylamine".

SWL-OD-202, "Polychlorinated Dibenzo-P-Dioxins and Dibenzofurans".

SWL-OD-203, "Polychlorinated Dibenzo-P-Dioxins and Polychlorinated Dibenzofurans (USEPA DFLM01.0)".

SWL-OD-204, "PCDD and PCDF by High Resolution Mass Spetroscopy (EPA 1613A)".

SWL-OD-205, "PCDD and PCDF by High Resolution Mass Spetroscopy (SW846, Method 8290, and TO-9)".

SWL-OA-101, "Volatile Organics in Air by TO-1".

SWL-OA-102, "Volatile Organics in Air by GC/MS".

SWL-OA-103, "Analytical Modified Method TO-3 for the Determination of Volatile Organics in Air by GC/MS".

8.6 Balance Checks

Analytical balances of various capacities and operational mode are calibrated annually by a licensed specialist and officially recorded as verification of performance. Details of the calibration procedures are found in SOP SWL-IN-120, "Calibration of Electronic Balances".

Stickers documenting the calibration are placed on the balance noting the calibration date as well as the date of the next calibration. Certificates of calibration are maintained in the QA/QC department.

Balances are checked with known calibration weights before using. If the values of the calibration are not within limits, the balance will be calibrated per manufacturer's instructions.

8.7 Calibrating Thermometers

Thermometers are calibrated quarterly against an NIST thermometer using the following procedure:

- Install the NIST thermometer in the same environment as the thermometer in question (e. g. cold storage refrigerator, oven, etc.)
- Should the thermometer in the cold storage be in glycerin, verify that the NIST thermometer is in the same solution.
- Allow the thermometers to equilibrate.
- Read both thermometers and record in the calibration log.
- Verify that the thermometer in question is within the ±0.2 acceptance limit.
- Should the temperature be outside this limit, the thermometer should be replaced with a new calibrated thermometer.

8.8 Radiochemistry

The calibration procedures are found in the following SOPs:

- SWL-RD-117, "LB4100 Low Background Counting System"
- SWL-RD-119, "Alpha Spectrophotometer Operation/Calibration"
- SWL-RD-125, "Gamma Spectrophotometer Operation/Calibration"
- SWL-RD-131, "Liquid Scintillation Operation/Calibration"
- SWL-RD-135, "Sodium Iodide Detector Operation/Calibration"
- SWL-RD-136, "Survey Meters/Probes"

8.9 Documentation

See Appendix B on Logbook Maintenance Standard Operating Procedures.

9.0 DETECTION LIMITS

All MDLs will be determined annually for each instrument, method, matrix and analyte using SOP, SWL-GA-113, "Definition and Determination of Detection Limits". MDL studies will also be performed if the Section Supervisor determines that a significant change in the analytical process has occurred, or to allow the operator to demonstrate initial and continuing analytical proficiency. The QAO, or his designee, must approve all MDL study results, and all associated reporting limits.

The value reported to clients as the lowest possible concentration is based on the reference method or client-specific requests. The value to be reported is documented in the project-specific QAP for client-specific requests as well as in the "Redbook". The Redbook lists the in-house, validated, lowest possible concentration as measured by the in-house test method. The MDL determined by SWLO should not exceed the MDL as defined in the reference Method. The Redbook lists the in-house method, revision number, date performed, the calculated MDL, and the reporting limit. The IDL, when applicable, is discussed in the appropriate in-house method.

In some reference methods, a process for determining the lowest possible concentration to be measured is not specified. The SWLO procedure found in SOP, SWL-GA-113, "Definition and Determination of Detection Limits", which is based on 40 CFR Part 136 for the determination of MDLs is followed when the reference method does not specify a mechanism for determining the lowest possible concentrations. The process for determining the lower limit to be reported by the laboratory when not specified by the client or the reference method is defined in the SWLO in-house method.

The reporting limit as presented on the laboratory reports as "detection limit" is defined by the in house analytical SOP. This limit may correspond to the MDL, PQL, IDL, CRQL, CRDL or other limits as appropriate for the reference method, client or contract. The use of IDLs, MDLs and PQLs and other contract required limit determinations (e. g. CRDLs or CRQLs) in reporting results are determined first by any specific customer contract requirements. If there are no

contract-specific requirements, then the applicable reference method requirements for limit reporting are observed. Finally, if there are no method requirements for reporting, the reporting limits as defined in each SWL analytical SOP are observed. For contracts/projects requiring the use of non-EPA approved methods, the laboratory shall establish detection limits according to the contract requirements and protocol. Clients requiring matrix specific MDL studies using site specific matrices are performed using SWL-GA-113 as referenced above, or a documented client-specific procedure.

9.1 Reporting Limit

If the reporting limit is less than one half (½) of the lowest calibration standard, then a check standard must be analyzed at the reporting limit.

The reporting limit may be the method specified (e. g. the CRQL in CLP) or method defined practical quantitation limit as specified in the RCRA methods or other method defined sensitivity. In all cases the establishment of the reporting limit is documented in the in-house analytical SOPs. The reporting limit must never be less than the calculated Method Detection Limit from the in-house method as determined by the laboratory.

The reporting limit is always adjusted based on sample dilution, sample concentration or sample size. Client's developed or project's reporting limits based on project-specific requirements are documented in the client file and noted in the report to the client. In no case are client specific reporting limits, using the same in-house procedure, less than laboratory developed method detection limits.

10.0 QUALITY CONTROL CHECKS

10.1 Laboratory Control Checks

10.1.1 Method Blanks

Method blanks, also known as reagent blanks, are analyzed for each matrix with each batch of 20 or fewer samples. An aliquot of equal volume or weight to the sample is used for method blank analysis. The method blank, like that of duplicate and spike samples, is taken through the whole analytical process. The method blank shall not be contaminated with any analyte of interest above the reporting limit. In the case of volatiles and semivolatiles, contamination must be less than the reporting limit of common laboratory solvents or phthalates, except for EPA, CLP or client permission where the contamination can be up to 5X the reporting limit.

10.1.2 Calibration Blank/System Blank

A calibration blank/system blank is prepared by analyzing the same matrix used for the preparation of the calibration standards. It is used to establish the analytical curve by taking into account background responses during the calibration process. It is also used to check for carry-over contamination after a standard run or after a contaminated sample run.

10.1.3 Calibration Verification

Calibration Verifications are used to assure calibration accuracy during each analysis run. It must be analyzed for each analyte as described in the particular SOP. For inorganic analysis an initial calibration verification (ICV) must be analyzed to verify the accuracy of the initial calibration. A continuing calibration verification (CCV) must be analyzed at the beginning of the analysis, after every ten samples, and at the end of the run. The ICV is prepared from an independent source different than the calibration standards. The CCV is prepared to be near or at the mid-range levels of the calibration curve.

10.1.4 Laboratory Control Spikes (LCS)

Laboratory Control Samples (LCS) are prepared from standards received from commercial vendors. These are a secondary source from those standards used to prepare calibration (either from another vendor or another lot from the same vendor). LCS are analyzed each day for every sample batch run to check proficiency of the analysis in terms of working standards preparation, monitor standard degradation, and check traceability of the prepared standards. A measure of comparability between batches is established with the analysis of the LCS. It is also used to check efficiency of both the digestion/extraction, and the instrumental analysis. An LCS duplicate (LCSD) may also be analyzed with each batch to check precision (except for air analyses).

The percent recovery is determined by the following equation:

$$\text{Percent Recovery} = \frac{\text{LCS Found Value}}{\text{LCS True Value}} \times 100$$

10.1.5 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD is used to assess the impact of the sample matrix on analyte recovery and precision. These are replicate samples spiked with a known spike concentration that are taken through the whole sample preparation process. MS/MSD analyses are performed on one sample in each group of 20 samples (5%), and/or on each type of sample matrix per concentration. Table 10.1 shows a list of matrix spike compounds routinely employed by the laboratory. If the client requires that all targeted analytes of interest be spiked, this will also be done for each MS/MSD. For inorganic analyses, all elements of interest are spiked.

The sample analysis process and the spike sample process differ in the adding of known amounts of the substances to be analyzed to the aliquot of the replicate sample. The amount of spike added varies according to the working range of the analytical instrument and is at least 10X the MDL.

After the value of the sample is determined, the value of the sample spike is determined. The percent (%) recovery of the spike is calculated using the following equation:

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result}) \times 100}{\text{Spike Added}}$$

At times the sample value is outside the linear range of the analytical method. In such cases it is impossible to know the magnitude of the analyte before the spike is added. Occasionally, the sample and the spike sample require dilution to perform sample analysis within the linear range of the instrument. This dilution adjusts the analyte in the sample to the proper concentration, but it will sometimes also dilute the spike added below a detectable recovery. In this case, it is not possible to report spike recovery for that particular analyte.

The lack of spike recovery data for an analyte that has been diluted to levels outside the working concentration of the instrument is supplemented by the periodic analysis of spiked QC check sample and other additional sample data.

The calculated % recoveries are then used to assess data precision expressed as relative percent deviation (RPD). It is calculated using the following equation:

$$\text{RPD} = \frac{(\text{MS Result} - \text{MSD Result}) \times 100}{\text{Mean of MS and MSD Results where MS denotes Matrix Spike.}}$$

10.1.6 Duplicate Analyses

RPD can also be measured by duplicate sample analysis of one sample. In this case the (2) sample results take the place of the MS and MSD values in the above equation.

10.1.7 Surrogate Spike Analyses

Where applicable (organic analysis), the analytical process includes the addition, subsequent detection, and recovery calculation of surrogate spiking compounds. Surrogate compounds are analyte compound substitutes, (i.e., compounds not specifically requested to be determined as analytes in a particular scope of work) which most often do not occur naturally. Surrogate compounds are added to samples for analysis and are taken through the whole sample preparation process. Surrogate compounds, to be useful in QC analysis, must not interfere with the determination of the analytes of interest. Surrogates must also be chemically similar to the analytes of interest and capable of emulating the analyte response.

Surrogate standard determinations are performed on all samples and blanks. All samples and blanks are spiked with surrogate spiking compounds before purging or extraction in order to monitor preparation and analysis of samples. Table 10.2 shows a list of surrogate spike compounds routinely employed by the laboratory.

Acceptance criteria for surrogate recoveries are method dependent and are found in the Method SOPs.

10.1.8 Method of Standard Addition (MSA)

A method of standard addition is used to check the accuracy of the analysis method under optimum conditions, excluding chemical interference from sample matrix. The MSA procedure is performed for GFAA analysis in accordance with CLP protocol for all samples.

10.1.9 ICP Interference Check Sample (ICS) Analysis

ICP interference check sample verifies interelement and background correction factors of the ICP instrument. The ICS is analyzed at the beginning and at the end of the run, or every 8 hours, whichever is more frequent. Recoveries must be ± 20% of the true value or all samples in that run must be reanalyzed.

10.1.10 Internal Standards Analysis

Internal standard areas are monitored as a measure of instrument calibration. Internal standard determinations are performed on GC/MS analyses to monitor instrumental efficiency and also used as a reference retention time indicator to check retention time shifts of peaks of interest.

A known amount of internal standard concentration is added to a sample extract prior to instrumental analysis. Like the surrogate standard, it must not interfere with the determination of the analytes of interest. It must also be chemically similar to the analytes of interest and capable of emulating the analyte response.

10.1.11 Post-Digestion Spike

If the matrix spike is outside of method control limits for metal and cyanide analyses, an aliquot of the unspiked sample will be used to determine if matrix interference is the cause. The sample will be spiked with a concentration of either two times the reporting limit or two times the sample concentration, whichever is greater.

Table 10.1

List Of Matrix Spiking Standards for Organic Analysis
(Unless Otherwise Requested by the Client)

Matrix Spikes

Method 601/602/8010/8020 (GC Purgeables)
All Compounds of Interest

Method 608/8080/IFB (Pest/PCB)
All Pesticides

Method 615/8150 (Herbicides)
All Compounds of Interest

Method 8260A (GC/MS Volatiles)
All Compounds of Interest

Method 624/8240/IFB (GC/MS Purgeables)
1,1-Dichloroethene
Trichloroethene
Chlorobenzene
Toluene
Benzene

Method 625/8270/IFB (Semivolatiles)

Base/Neutrals	**Acids**
1,2,4-Trichlorobenzene	Phenol
Acenaphthene	Pentachlorophenol
2,4-Dinitrotoluene	4-Chloro-3-Methylphenol
Pyrene	2-Chlorophenol
N-Nitroso-di-N-Propylamine	4-Nitrophenol
1,4-Dichlorobenzene	

Table 10.2

List Of Surrogates Spiking Standards For
Organic Analysis

Surrogates

Method 601/602/8010/8020/8021 (GC Purgeables)
Bromochloromethane
Bromofluorobenzene

Method 608/8080A/8081/IFB (Pest/PCB)
Tetrachloro-m-xylene (TCX)
Decachlorobiphenyl (DCB)

Method 624/8240B/IFB (GC/MS Purgeables)
1,2 Dichloroethane-d4
Bromofluorobenzene
Toluene-d8

Method 8260A (GC/MS Purgeables)
4-Bromoflurobenzene
Dibromofluoromethane
Toluene-d8

Method 625/8270B/IFB (Semivolatiles)

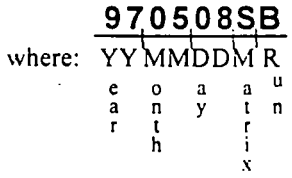
Nitrobenzene-d5	Phenol-d5
2-Fluorobiphenyl	2-Fluorophenol
2,4,6-Tribromo-phenol	Terphenyl-d14

Method 615/8151 (Herbicides)
2,4-Dichlorophenylacetic Acid (DCAA)

10.2 Sample Batching

A batch is defined as a group of samples prepared at the same time and location, using the same method. At SWLO/AATS the number of samples in a batch will not exceed (a) twenty field samples or (b) the number of samples which can be ran simultaneously or in a continuous sequence without interruption, whichever is lower.

Each batch of samples will contain at a minimum, a method blank (PB), a laboratory control sample (LCS), a matrix spike (MS), and a matrix spike duplicate or duplicate. The acceptance criteria for these quality control samples are present in each Method SOP. All preparation batches are labeled with a unique identification. For example:



Each PB and LCS is labeled with an identifier to tie them to the preparation batch.

10.3 Data Quality Objectives

10.3.1 Introduction

The laboratory scope and approach to produce data of known and sufficient quality are described in this section. Guidelines are provided for the assessment and reporting of data quality for any environmentally related measurements, and for the incorporation of such assessments into major environmental databases.

Controlled sample receiving, logging, and tracking throughout the length of the project/contract is maintained to ensure sample integrity throughout the sample analysis scheme. Documentation of instrument performance and preventive maintenance is used to provide a permanent record for data validation. SWLO checks the quality of analytical work through analysis of quality control (QC) reference samples, duplicate samples, or matrix spike duplicate and spike samples.

10.3.2 Data Quality

Data quality is the totality of features and characteristics of data that bear on their ability to satisfy a given purpose. Parameters of major importance are accuracy, precision, completeness, representativeness, and comparability. These are defined as follows:

- *Accuracy* — The degree of the difference between measured or calculated values and true value.
- *Precision* — The reproducibility or degree of agreement among replicate measurements of the same quantity.
- *Completeness* — The percentage of valid data obtained from a measurement system.
- *Representativeness* — The degree to which the data accurately represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.
- *Comparability* — The confidence with which one data set can be compared to another.

10.3.3 Accuracy

The accuracy of the measurement data is evaluated by the comparison of the percent recovery of the QC reference material of known or established concentration, independent of routine calibration. Statistically based control limits are established for each method of analysis and sample matrix (soil/water). A Laboratory Control Spike (LCS) is analyzed for each batch and is dependent upon the sample matrix, method of analysis and concentration level. Recoveries are assessed to determine method efficiency. Analytical accuracy is expressed as the percent of recovery of an analyte/parameter that has been added at a known concentration before preparation and analysis. The equation used to calculate percent recovery is as follows:

$$\text{Percent Recovery} = \frac{\text{LCS Result} \times 100}{\text{Amount of Spike Added}}$$

Accuracy can also be assessed on the recoveries of spiked analytes in a sample Matrix Spike.

$$\text{Percent Recovery} = \frac{(\text{Matrix Spike Result} - \text{Sample Result}) \times 100}{\text{Amount of Spike Added}}$$

10.3.4 Precision

The laboratory uses Laboratory Control Spike Duplicates, Matrix Spike Duplicates or duplicate sample analysis to assess precision. An LCS/LCSD, MS/MSD, or a duplicate sample are analyzed for each batch of 20 samples (5%) for in-house QC and are dependent upon the sample matrix and method of analysis. A more frequent analysis is performed (i.e., one in 10 samples) on a reference method or contract-specific basis. The basic precision statistics obtained from the multiple batch frequency are compared to develop a graph assessment (using control limits) for given sample matrix.

Analytical precision is expressed as a percentage of the difference between the results of two matrix spike samples or two duplicate sample analysis for a given analyte. Relative percent difference (RPD) is calculated as follows:

$$RPD = \frac{(\text{LCS Result - LCS Duplicate Result}) \times 100}{\text{Mean of LCS and LCS Duplicate Results}}$$

Where: LCS denotes Laboratory Control Spike.

$$RPD = \frac{(\text{MS Result - MS Duplicate Result}) \times 100}{\text{Mean of MS and MS Duplicate Results}}$$

Where: MS denotes Matrix Spike.

...Or ...

$$RPD = \frac{\text{Sample Result - Duplicate Result}}{\text{Mean of Sample and Duplicate Results}}$$

10.3.5 Completeness

For the data to be valid, it must meet all the acceptance criteria including accuracy, precision and any other criteria specified by the analytical method used. Data validation procedures are employed to minimize the amount of bad data from getting through data collection.

While the quality objective is to obtain the greatest accuracy and precision, the specific accuracy/precision level is dependent on the method of analysis and type of sample matrix. The Methods SOP statistical control limits are used as guidelines to validate the data generated unless client or contract requirements set more stringent criteria.

10.3.6 Representativeness

Data generated by the laboratory shall be representative of the samples received and analyzed by the laboratory. It shall be representative of the laboratory database of accuracy and precision measurements of the particular parameter(s), matrix and analytical method.

10.3.7 Comparability

Data shall be comparable to data sets recorded in the past to check for historical consistency. In order to maximize its usefulness, data shall be reported in appropriate units and in a consistent manner and following the reference method. Data shall be reproducible under similar conditions whether generated by the laboratory or another firm. This is demonstrated through the use of inter-laboratory performance audit samples (e. g. WP, WS).

10.4 Method Validation

All analysts must be certified for proficiency in each test method they performed. Details of the proficiency testing program are found in SOP, SWL-GA-104, "Personnel Training".

10.5 Statistical Evaluation of the Data

10.5.1 Control Charts

The performance of a measurement system will be demonstrated by the measurement of homogeneous and stable control samples in a planned repetitive process. The data generated is plotted in control charts to indicate whether the system is in control. It warns the laboratory of possible deviation from 95% confidence level by identifying systematic errors, drifts, or other types of problems. The control chart mechanism is how SWLO develops internal statistical limits. The discussion on the use and generation of control charts are found in the SOP, SWL-GA-112, "Control Charts".

The use of control charts is summarized as follows:

- They provide graphic assessment of accuracy and precision for the analysis of each analyte and instant detection of erroneous data
- They allow efficient observation of recovery trends for any particular analysis.
- They provide a long-term mechanism for self-evaluation of analytical output.
- They provide assessment of the analytical capability of the staff chemists with regard to the output of valid analytical data.
- They allow observations of deviations from control trends.

10.5.2 Control charts are generated monthly for laboratory control samples and quarterly for MS/MSD samples. Automated control charts are generated for Volatiles, Semivolatiles, Pesticides/PCBs, Metals and Cyanide. Manual control charts are generated in the Radiochemistry and HPLC laboratories.

Control Chart Analysis

The following actions will require immediate corrective action:

- One measurement exceeds the control limit.
- Two successive points exceed the warning limit.
- Seven successive points on one side of the mean.
- Six successive points are in decreasing or increasing order.

11.0 OUT-OF-CONTROL EVENTS

11.1 An "out of control" event is defined as any occurrence failing to meet the Laboratory QA Plan, SOP, Reference Method or client specifications.

11.2 Criteria Used for Determination of an "out of control" Event:

Factors that affect data quality (failure to meet calibration criteria, inadequate record keeping, improper storage, or preservation of samples) require investigation and corrective actions.

11.3 Responding to an "out of control" Event

11.3.1 Roles and Responsibilities:

When an "out of control" event is recognized, each individual involved with the analysis in question has an interactive role and responsibility. Some examples are as follows:

- Sample Receiving

  If a sample is broken upon receipt, the Project Officer/Client is notified and the decision is documented.

- The Analyst

  He/she must be able to recognize QC failure and immediately notify the Laboratory Supervisor and work with the QAO to solve the problem.

- The Laboratory Supervisor

  He/she must review all analytical and QC data for reasonableness, accuracy, and clerical errors; also responsible to monitor QC charts (in terms of control limits). In an "out of control" event, the Laboratory Operations Manager works with the analyst and QAO to solve the problem. Stopping work on the analysis prevents the reporting of suspect data and ensures that all results that are suspect are repeated, if possible, after the source of the error is determined and remedied.

- QA Officer

  In the event an "out of control" situation occurs that is unnoticed at the bench or supervisory level (e. g. performance failure on a QC sample), the QAO will notify the Laboratory Operations Manager. The QAO will help identify and solve the problem where applicable, and ensure that work is stopped on the analysis and no suspect data is reported.

- Project Officer

  The Project Officer will immediately notify the client when project or method requirements are not met. The Project Officer will discuss possible consequences of not meeting project requirements with the client.

11.4 Procedures for Stopping Analysis

Whenever the analytical system is "out of control", investigation/ correction efforts are initiated by all concerned personnel.

If the problem is instrumental or specific only to preparation of that sample batch, samples analyzed during the "out of control" event are processed after the instrument is repaired and re-calibrated, provided holding times are not exceeded.

If a sample batch is still "out of control" after reanalysis, all method-related activities shall stop immediately. A detailed laboratory-wide investigation shall be conducted to isolate and correct faulty operations. Sample security, integrity of standards, reagents, glassware, laboratory notebooks, instrument performance and adherence to the methods shall be included in the investigation following the guidelines in SOP SWL-GA-108, "Performance and System Audits" and/or SOP SWL-GA-105, "Corrective Action".

All actions shall be documented and placed in their respective case/contract file.

11.5 QC Reports

Results from QC are evaluated at the analyst level. Blank contamination and Laboratory Control Spikes outside of control limits warrant the repreparation/analysis of the sample batch. Surrogate spikes are also evaluated to determine whether there were adequate recoveries from the extraction process. The method blanks and spikes are reported to the client. Internal standard recoveries are evaluated to assure that they meet the requirements of the SOP.

12.0 DATA RECORDING, REDUCTION AND REVIEW

12.1 Laboratory Data Recording

All analysts/technicians document analysis activities in bound laboratory notebooks. These notebooks serve as the primary record for subsequent data reduction. "Stand alone" computers generate the data for GC/MS, AA, ICP, Mercury and GC analyses. Following the review by the Analyst, Group Leader and/or supervisor, the data is downloaded from the instrument to the department's database. The results for other analyses are transcribed manually onto "Analytical Results" forms specific to the analysis.

12.2 The review of data quality involves several levels of evaluation. In general, the analysts and the Program Manager are responsible for reviewing the data relative to instrument calibration, standard preparation, method blanks, raw data, calculations and transcriptions. The analyst reviews 100% of the raw analytical data generated, including the calibration data and all calculations. Upon completion of the analysis process, a 100% peer review is performed. Group Leaders/Section Supervisors perform a second level of review of the raw data. At this level, a 100% review for compliance is performed for method, QC, and Project requirements.

12.2.1 A third level of review involves the Program Managers or Project Officer[8]. This is generally the final review prior to the QA Officer's review.

[8] This review assures that all required levels of laboratory review have been performed and that project requirements have been met. Problems with the analysis, deviations from methods, and/or client communications are reviewed and addressed in the case narrative.

12.2.2 At the next level of data quality review, the QA Officer is generally responsible for a review of a minimum of 10% of the data generated. The emphasis is on the data acceptability relative to the data quality indicators and on the accuracy of the final data summaries.

12.3 Review Checklists

The review checklist and review procedures are found in the department data review SOPs:

SWL-OV-103, "Volatile Data Review".
SWL-OS-103, "Semivolatile Data Review".
SWL-OP-100, "Gas Chromatography Data Review".
SWL-IN-106, "1st and 2nd Review of ICP, GFAA, Mercury, and Cyanide".
SWL-IN-107, "1st and 2nd Review of Wet Lab Analysis".

Figure 12.1 is the Data Reporting section checklist and Figure 12.2 is the "Project Officer Data Review Checklist".

12.4 Data Collection/Data Reduction

Following the reviews by the analyst and the group leader and/or supervisor, the data is downloaded from the instrument to the departmental database. Data clerks transfer the results into the software report forms. The data is then qualified in accordance with SOP SWL-GA-119, "Data Reduction, Validation and Reporting". Data packages are then prepared. The Supervisor and/or Program Manager then reviews the data packages.

12.4.1 Gas Chromatograph Results

Calculations are performed for each analyte after it is identified. Identification is based on the retention time of the suspect peak in comparison with the retention time of the internal standard. The concentration of the analyte is determined by using the calibration curve and the peak area of the analyte. A response factor is determined from the calibration curve and used to calculate the concentration.

12.4.2 Mass Spectrometry/Gas Chromatograph Results

Qualitative identifications are determined by obtaining extracted ion current profiles (EICPs) for the primary ion mass to charge ratio (m/z) and the secondary masses for each analyte. Positive identification is based on the following criteria:

- The retention time must fall within ± 30 seconds of the retention time of the daily calibration standard.
- The relative peak heights of the characteristic masses in the EICPs must fall within ± 20% of the relative intensities of these masses in a reference mass spectrum (standard analysis or reference library).

If a compound cannot be verified by all of the criteria above, yet in the technical judgement of the mass spectral interpretation specialist the identification is correct, the compound shall be reported.

The calculation for the concentration for the suspect peak is made using the RF for each analyte.

$$\text{Concentration} = \frac{(A_S)\,(C_{IS})}{(A_{IS})\,(RF)}$$

Where:

A_S = Area of characteristic m/z for the analyte to be measured.

A_{IS} = Area of characteristic m/z for the internal standard

C_{IS} = Concentration of the internal standard, in ug/L.

RF = Average response factor as calculated from the area formed on an intensity plot of the ion of interest.

12.4.3 Inductively Coupled Plasma

The purpose of the ICP is to measure concentrations of elements in a sample. This is accomplished by measuring the emission intensity produced when a sample containing these elements is aspirated into the plasma, exciting the electrons to a higher state. The measurement of intensity is performed by allowing the light leaving the plasma through each exit slit to fall on a photomultiplier tube. This tube converts light energy into an electrical current. At the end of the integration time, the total current produced is measured and is proportional to the intensity and the concentration of the element being analyzed. This total current value is sent to the computer for data reduction. The final calculations are done by the computer system by comparing the intensity of unknowns against the intensity of known standards.

Interelement correction is performed by measuring the light intensity of interfering elements and mathematically correcting for the additional emitted intensity.

12.4.4 Atomic Absorption Spectrophotometry

Photometric absorbance is governed by the relationship:

$$\text{Absorbance} = \log (100 / \%T) = 2 - \log \%T$$

Where:

% T = 100 - % absorption

Percent absorption is based on the amount of light of a particular wavelength absorbed by a specific metal. Its calculation is based on the loss of light of a particular wavelength as it is passed through a flame into which a solution containing metals of interest have been aspirated.

Calibration curves establishing the absorption relationship with concentration are generated at various concentrations. From these curves, a comparison is made with absorbance from the sample measurement. Since absorbance is directly related to concentration, a plot of the two parameters is linear in certain operable ranges and allows for determination of unknown concentrations in solutions (direct samples or extracts) after measurement of absorbance.

Atomic absorption spectrophotometry is based on the principle that when light of a resonance wavelength is passed through a graphite tube containing atoms of an element to be measured, part of the light is absorbed. The extent of the absorption is proportional to the number of atoms present in the atomized sample. Because of the sophistication of current instrumentation, the partial application of this technique for the measurement of metal concentration in liquids relies on a Beer's absorption law approach, comparing absorbance from an unknown against the linear correlation between absorbance and concentration in standards.

In many spectrophotometric measurements, interferences occur in the absorption of light confusing the Beer's law relationship between absorption and concentration. This is especially true for atomic absorption. To alleviate this problem, a technique known as the "method of standard additions" is used, whereby sequential, known amounts of the component for which the sample is being analyzed are added to a sample of unknown concentration. By making an initial absorbance measurement after each addition, for which the effects of interference present in the analytical matrix can be accounted.

12.5 Data Verification

The Project Officer and/or the Quality Control Officer then verify the data (see Figure 12.2).

- Review of client chain-of-custody request vs. sample login.
- Review of Extraction Logs, Analytical Run Logs, etc.
- Review of performance indicators such as blanks, surrogate recoveries, LCS recoveries, and Matrix Spike results.
- Random calculation checks
- Review and approval of the final report.

Figure 12.1

Data Reporting Review Checklist

REPORT REVIEW

CLIENT:	PROJECT:		SDG/EPISODE:
ITEM	CHECK	☑	REMARKS/CORRECTIONS
Case Narrative	Typographical		
	Names		
	Ref IDs/Text IDs		
	Receipt Dates		
	Single/Plural Spelling		
	VOA - Gold Sheet		
	BNA - Extraction Log		
	QC Inorganic Notes		
Chain of Custody	Original		
	Copy		
Cooler Receipt Form	Yes		
	No		
Report - Headers	Dates		
	Date Sampled		
	Date Extracted		
	Date Analyzed		
	Sample IDs		
	Client		
	Lab		
	Proj. Ref. Consistency		
	Method References		
	Dilution factors		
Report - Results	Units of Measure		
	LIMS Manual Entry Data		
	Values Transcribed		
	Flags Correct		
	Surrogates		
	% Recoveries		
	Limits to Matrix		
QC Section	Header Information		
	Units of Measure		
	Values Transcribed		
	Surrogates		
	% Recoveries		
	Limits to Matrix		
Diskette	LabMan		
	Directory Check		
	Detection Limits		
	Spike Amounts		
	QC Check		
REVIEWER:	DATE:		CORRECTED (Initials/Date):

Instructions

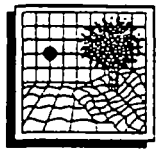
A check mark in the appropriate column indicates that the reviewer has reviewed and verified the item next to it.

If a check is not marked, please refer to "REMARKS/CORRECTIONS" column for report items which need correction or further review/investigation.

"CORRECTED" Initials/Date indicate that all corrections were made and verified.

Figure 12.2

Project Officers Data Review Checklist



DATA REVIEW CHECKLIST

PROJECT OFFICERS DEPARTMENT

CLIENT/PROJECT:

EPISODE:

REVIEW DATE:

Client Name/Address/Contact are all correct?	Yes ☐	No ☐
Sample I.D.s are as specified on client chain-of-custody?	Yes ☐	No ☐
If No: Is the I.D. change documented in a client phone log and in the case narrative?	Yes ☐	No ☐
Do all samples reflect the proper matrix?	Yes ☐	No ☐
Are all units reported reflecting the proper matrix?	Yes ☐	No ☐
Are the proper method references listed?	Yes ☐	No ☐
Do the results on the worksheets agree with the LIMS entered result?	Yes ☐	No ☐
Do the results from the raw data agree with reported results?	Yes ☐	No ☐
Are Dilution Factors/Calculations carried out correctly?	Yes ☐	No ☐
Are all parameters addressed in the QC section?	Yes ☐	No ☐
Do they have the following QC information tabulated?		
1. Method &/or TCLP Blank Results?	Yes ☐	No ☐
2. Blank Spike Results?	Yes ☐	No ☐
3. Laboratory Control Spike (LCS)?	Yes ☐	No ☐
4. Matrix Spike/Matrix Spike Duplicate Results?	Yes ☐	No ☐
5. Duplicate Sample Results?	Yes ☐	No ☐
Are Diskette Deliverables Required?	Yes ☐	No ☐
If Yes:		
Is the requested format supplied?	Yes ☐	No ☐
Are all the fields filled out?	Yes ☐	No ☐

Are CLP/"CLP-Like" Packages required by client?	Yes ☐	No ☐
If Yes: Are the following Items supplied?		
ORGANICS:		
1. QC Summary (i.e., Surrogate, MatrixSpike/ Matrix Spike Duplicate Summary, Method Blank Summary)	Yes ☐	No ☐
2. Sample Results?	Yes ☐	No ☐
3. Sample raw Data?	Yes ☐	No ☐
4. All Pertinent Calibration Summaries (Initial & Continuing)?	Yes ☐	No ☐
5. All Pertinent Calibration Raw Data?	Yes ☐	No ☐
6. All Tuning Summaries (BFB & DFTPP)?	Yes ☐	No ☐
7. All Tuning Raw Data?	Yes ☐	No ☐
8. Method Blank Raw Data?	Yes ☐	No ☐
9. MS/MSD Raw Data?	Yes ☐	No ☐
INORGANICS:		
1. Sample Results?	Yes ☐	No ☐
2. QC Summary (i.e., Initial & Continuing Calibration Verification, CRDL Standard for AA & ICP, Blanks, ICP Interference Check Sample, Spike Sample Recovery, Post Digestion Spike Sample Recovery, Duplicates Laboratory Control Sample, Standard Addition Results, ICP Serial Dilutions, Preparation Log, Analysis Run Log)?	Yes ☐	No ☐
3. Quarterly Verification of:		
Instrument Parameters?	Yes ☐	No ☐
Instrument Detection Limits?	Yes ☐	No ☐
ICP Interelement Correction Factors?	Yes ☐	No ☐
ICP Linear Ranges?	Yes ☐	No ☐
4. Raw Data?	Yes ☐	No ☐

ADDITIONAL COMMENTS:

Project Officer Signature:

SOUTHWEST LABORATORY OF OKLAHOMA, INC.
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[PJ007-0692-05]

13.0 HOLDING TIMES AND PRESERVATIVES

Table 13.1 and 13.2 list the recommended preservatives and holding times for the various analytes/parameters. When samples arrive, sampling dates are entered into the LIMS system upon log-in. The project officer is notified if a holding time might be exceeded and the project officer in turn notifies the client. A daily LIMS list is printed in the various sections detailing these parameters and samples approaching holding time deadlines (Fig. 13.3). This enables the laboratory personnel to set priorities to meet holding time requirements. In the event that holding times are exceeded, the Project Officer will notify the Field Sampling Manager or client and request a resampling or instructions for proceeding with the analysis. Details for samples outside of holding times are stated in the case narrative with the final report.

Table 13.1

Recommendation For Sampling And Preservation Of Samples According To Measurement(1)

Measurement	Vol. Req. (mL)	Holding Container[2]	Preservative[3,4]	Time[5]
Physical Properties				
Color	50	P,G	Cool, 4°C	48 Hrs.
Conductance	100	P,G	Cool, 4°C	28 days
Hardness	100	P	HNO_3 to pH <2	6 mos.
Odor	200	G only	Cool, 4°C	24 Hrs.
pH	2	P,G	None Required,	Analyze Immediately
Residue				
Filterable	100	P,G	Cool, 4°C	7 days
Non-Filterable	100	P,G	Cool, 4°C	7 days
Total	100	P,G	Cool, 4°C	7 days
Volatile	100	P,G	Cool, 4°C	7 days
Settleable Matter	1,000	P,G	Cool, 4°C	48 Hrs.
Temperature	1,000	P,G	None Req.	Analyze Immediately
Turbidity	100	P,G	Cool, 4°C	48 Hrs.
Metals				
Dissolved	200	P	Filter on site HNO_3 to pH <2	6 Mos.
Suspended	200		Filter on site	6 Mos.[8]
Total	100	P	HNO_3 to pH <2	6 Mos.
Chromium^{+6}	200	P	Cool, 4°C	24 Hrs.
Mercury (Dissolved)	100	P	Filter HNO_3 to pH <2	28 Days
Mercury (Total)	100	P	HNO_3 to pH <2	28 Days

(cont.)

Table 13.1

Recommendation For Sampling And Preservation Of Samples According To Measurement(1)

Measurement	Vol. Req. (mL)	Holding Container[2]	Preservative[3,4]	Time[5]
Inorganics, Non-Metallics				
Acidity	100	P,G	Cool, 4°C	14 Days
Alkalinity	100	P,G	Cool, 4°C	14 Days
Bromide	100	P,G	None Req.	28 Days
Chloride	50	P,G	None Req.	28 Days
Chlorine	200	P,G	None Req.	Analyze Immediately
Cyanides	500	P,G	Cool, 4°C NaOH to pH >12 0.6g ascorbic acid[6]	14 Days[7]
Fluoride	300	P,G	None Req.	28 Days
Iodide	100	P,G	Cool, 4°C	24 Hrs.
Sulfate	50	P,G	Cool, 4°C	28 Days
Silica	50	P only	Cool, 4°C	28 Days
Sulfide	500	P,G	Cool, 4°C add 2 mL zinc acetate plus NaOH to pH >9	7 Days
Sulfite	50	P,G	None Req.	Analyze Immediately
Nitrogen				
Ammonia	400	P,G	Cool, 4°C H_2SO_4 to pH <2	28 Days
Kjeldahl, Total	500	P,G	Cool, 4°C H_2SO_4 to pH <2	28 Days
Nitrate plus Nitrite	100	P,G	Cool, 4°C H_2SO_4 to pH <2	28 Days
Nitrate[9]	100	P,G	Cool, 4°C	48 Hrs.
Nitrite	50	P,G	Cool, 4°C	48 Hrs.
Dissolved Oxygen				
Probe	300	G bottle and top	None Req.	Analyze Immediately
Winkler	300	G bottle and top	Fix on site and store in dark	8 Hrs.

(cont.)

Table 13.1

Recommendation For Sampling And Preservation Of Samples According To Measurement[1]

Measurement	Vol. Req. (mL)	Holding Container[2]	Preservative[3,4]	Time[5]
Phosphorus				
Orthophosphate, Dissolved	50	P,G	Filter on site Cool, 4°C	48 Hrs.
Hydrolyzable	50	P,G	Cool, 4°C H_2SO_4 to pH <2	28 Days
Total	50	P,G	Cool, 4°C H_2SO_4 to pH <2	28 Days
Total, Dissolved	50	P,G	Filter on site	24 Hrs.
Organics				
BOD	1,000	P,G	Cool, 4°C	48 Hrs.
COD	50	P,G	Cool, 4°C H_2SO_4 to pH <2	28 Days
Oil & Grease	1,000	G only	Cool, 4°C H_2SO_4 or HCl to pH <2	28 Days
Organic Carbon	25	P,G	Cool, 4°C H_2SO_4 or HCl to pH <2	28 Days
Phenolics	500	G only	Cool, 4°C H_2SO_4 or HCl to pH <2	28 Days
MBAS	250	P,G	Cool, 4°C	48 Hrs.
NTA	50	P,G	Cool, 4°C	24 Hrs.
Purgeable Halocarbons (601)	40	G, Teflon-lined Septum	Cool, 4°C 0.008% $Na_2S_2O_3$[6]	14 Days
Purgeable Aromatic Hydrocarbons (602)	40	G, Teflon-lined Septum	Cool, 4°C, 0.008% $Na_2S_2O_3$[6], HCl to pH <2	10 Days[10]

(cont.)

Table 13.1

Recommendation For Sampling And Preservation Of Samples According To Measurement(1)

Measurement	Vol. Req. (mL)	Container[2]	Holding Preservative[3,4]	Time[5]
Organics (continued)				
Acrylonitrile & Acrolein (603)	40	G, Teflon-lined Septum	Cool, 4°C, 0.008% $Na_2S_2O_3$[6], Adjust pH to 4-5[11]	14 Days
Phenols[12] EPA Method 604	1,000	G, Teflon-lined Cap	Cool, 4°C, 0.008% $Na_2S_2O_3$	7 Days until extraction, 40 days after extraction
Benzidines[12] EPA Method 605	1,000	G, Teflon-lined Cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[6], H_2SO_4 to pH 2-7[13]	7 days until extraction
Phthalate Esters[12] EPA Method 606	1,000	G, Teflon-lined Cap	Cool, 4°C	7 days until extraction, 40 days after extraction
Nitrosamines[12] EPA Method 607	1,000	G, Teflon-lined Cap	Cool, 4°C, store in dark, 0.008% $Na_2S_2O_3$[6]	7 days until extraction, 40 days after extraction
Organochlorine Pesticides/PCBs[12] EPA Method 608	1,000	G, Teflon-lined Cap	Cool, 4°C, pH 5-9	7 days until extraction, 40 days after extraction
Nitroaromatics and Isophorone[12] EPA Method 609	1,000	G, Teflon-lined Cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[6], store in dark	7 days until extraction, 40 days after extraction
Polynuclear Aromatic Hydrocarbons[12] EPA Method 610	1,000	G, Teflon-lined Cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[6] store in dark	7 days until extraction, 40 days after extraction

(cont.)

Table 13.1

Recommendation For Sampling And Preservation Of Samples According To Measurement(1)

Measurement	(mL)	Vol .Req. Container[2]	Holding Preservative[3,4]	Time[5]
Organics (continued)				
Haloethers[12] EPA Method 611	1,000	G, Teflon-lined Cap	Cool, 4°C, 0.008% $Na_2S_2O_3$	7 days until extraction, 40 days after extraction
Chlorinated Hydrocarbon[12] (612)	1,000	G, Teflon-lined Cap	Cool, 4°C	7 days until extraction, 40 days after extraction
TCDD[12] EPA Method 613	1,000	G, Teflon-lined Cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[6]	7 days until extraction, 40 days after extraction
Purgeables EPA Method 624	2 x 40	G, Teflon-lined Septum	Cool, 4°C, 0.008% $Na_2S_2O_3$[6]	14 Days
Base/Neutrals Acids EPA Method 625	1,000	G, Teflon-lined Cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[6]	7 days until extraction, 40 days after extraction
Radiochemistry				
Tritium	200	Glass	None	6 months
All others	1000	P,G	HNO_3 to pH < 2	6 months

Footnotes:

1 More specific instructions for preservation and sampling are found with procedures as detailed in EPA-600/4-79-020, revised March, 1983, and in the Federal Register, Vol. 49, No. 209, Oct. 26, 1984, EPA 40 CFR part 136.

2 Plastic (P) or glass (G). Only EPA certified pre-cleaned bottles are used. For metals, polyethylene with a polypropylene cap (no liner) is preferred.

3 Sample preservation should be performed immediately upon sample collection. For composite samples, each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then samples may be preserved by maintaining them at 4° C until compositing and sample splitting is completed.

4 When any sample is to be shipped by common carrier or sent through the US Mail, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements of Table 1, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: (1) Hydrochloric Acid (HCl) in water solutions at concentrations of % by weight or less (pH about 1.96 or greater). (2) Nitric Acid (HNO_3) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater). (3) Sodium Hydroxide (NaOH) in water solutions at

concentrations of 0.08 by weight or less (pH about 12.3 or less).

5 Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still considered valid. Samples may be held for longer periods only if the permittee, or monitoring laboratory, has data on file to show that the specific types of sample under study are stable for the longer time and has received a variance from the Regional Administrator. Some samples may not be stable for the maximum time period given in the table. A permittee, or monitoring laboratory, is obligated to hold the sample for a shorter time if knowledge exists to show that this is necessary to maintain sample stability.

6 Should only be used in the presence of residual chlorine.

7 Maximum holding time is 24 hours when sulfide is present; Optionally, all samples may be tested with lead acetate paper before the pH adjustment in order to determine if sulfide is present. If sulfide is present, it can be removed by the addition of cadmium nitrate powder until a negative spot test is obtained. The sample is filtered and then NaOH is added to pH 12.

8 Samples should be filtered immediately on-site before adding preservatives for dissolved metals.

9 For samples from non-chlorinated drinking water supplies concentrated H_2SO_4 should be added to lower sample pH to less than 2. The sample should be analyzed before 14 days. Samples receiving no pH adjustment must be analyzed within seven days of sampling.

10 The pH adjustment is not required if acrolein will not be measured. Samples for acrolein receiving no pH adjustment must be analyzed within 3 days of the sampling.

11 When the extractable analytes of concern fall within a single chemical category, the specified preservative and maximum holding times should be observed for optimum safeguard of sample integrity. When the analytes of concern fall within two or more chemical categories, the sample may be preserved by cooling to 4° C, reducing residual chlorine with 0.008% sodium thiosulfate, storing in the dark, and adjusting the pH to 6 – 9. Samples preserved in this manner may be held for 7 days before extraction and 40 days after extraction. Exceptions to this optional preservation and holding time procedure are noted in footnote 6 (requirement for thiosulfate reduction of residual chlorine). .

12 If 1,2-Diphenylhydrazine is likely to be present, adjust the sample pH to 4.0 ± 0.2 to prevent rearrangement to benzidine.

Table 13.2

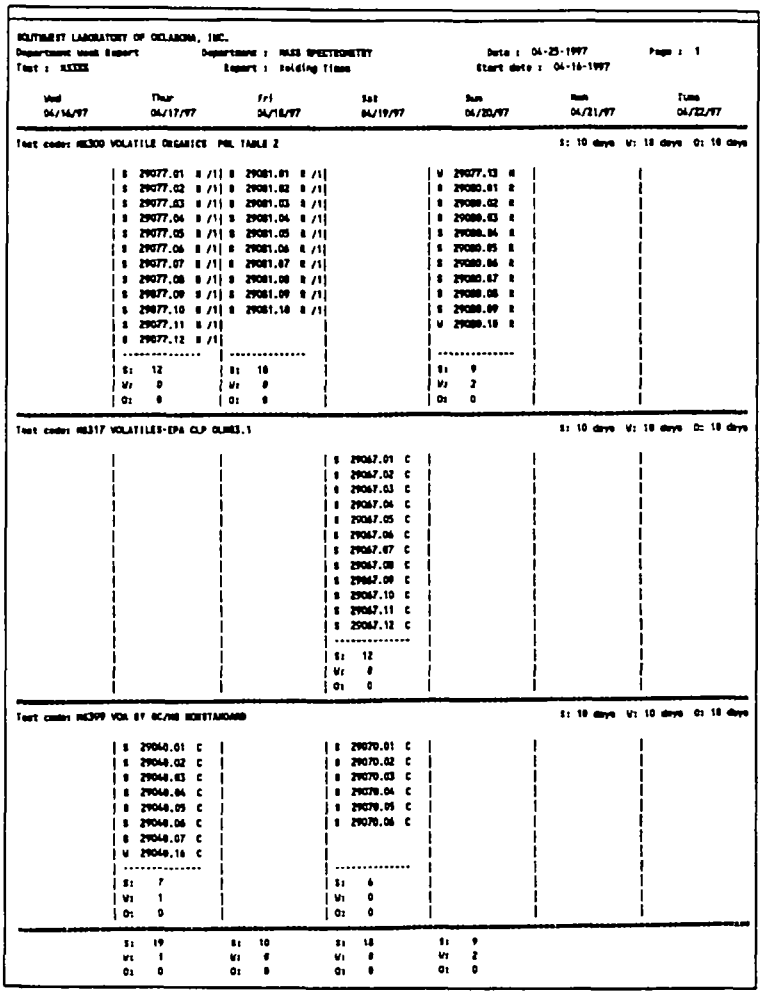
Recommendation For Sampling And Preservation Of Soil Samples According To Measurement[A]

Measurement	Container Size (oz)	Container	Holding Preservative	Time
Inorganics, Non-Metallics				
Petroleum Hydrocarbons	32	G	Cool, 4°C	28 days
Metals				
Total Recoverable	8	G	Cool, 4°C	6 months
Extraction Procedure Toxicity	32	G	Cool, 4°C	6 months
Organics				
VOCs and Xylenes, EPA Method 8240	2 x 4	G	Cool, 4°C	14 days
Extractable Priority Pollutants EPA Method 8270	32	G	Cool, 4°C	14 days – extraction, 40 days – analysis

A More specific instructions for preservation and sampling are found with procedures as detailed in SW846, "Test methods for Evaluating Solid Waste, Physical/Chemical Methods", 3rd Edition, Chapter 4.

Figure 13.3

Holding Time Report



14.0 QUALITY ASSURANCE AUDITS/EXTERNAL AGENCY APPROVAL

14.1 Audit is defined as systematic check to determine the quality of operation of laboratory activities. It is comprised of the following:

- Performance audit
- System audit

14.1.1 Laboratory Performance Audit

Procedures used to assess the effectiveness of the quality control system are as follows:

- Internal Performance Audits.

  Internal performance audits are accomplished through the QAO who monitors that the requirements of the LQAP and SOPs are being met. The use of control samples, replicate measurements and reference materials also help to monitor the system's performance. Internal audits and yearly assessments are conducted as per SOP, SWL-GA-108, "Performance and Systems Audits".

  Sample analysis systems for each laboratory area are conducted by the QA Officer and include the following:

- Verification of written procedures and analyst(s) understanding.
- Verification and documentation of procedures and documents.
- Review of analytical data and calculations.

The internal technical audits evaluate compliance with the QA Plan and with method and client requirements. Internal audit findings are tracked using the corrective action process discussed in SOP SWL-GA-105, "Corrective Action".

14.1.2 Laboratory System Audit

An on-site inspection is done by laboratory quality assurance personnel. The inspection reviews the laboratory quality control system including sample handling, sample analysis, record control, preventive maintenance, and proficiency testing. When the laboratory quality assurance personnel initiate a system audit of the laboratory, any recommendations made, or deficiencies identified will be considered for implementation and corrective actions taken to correct deficiencies.

14.1.3 Blind QC Program

Intra-laboratory check samples are analyzed on a quarterly basis for a full suite of organic and inorganic parameters. These samples are entered into the system as "blind" QC samples. Also, "blind" QC samples may be entered into the system in conjunction with external performance audits, or to check analyst proficiency. When the analysis is complete, laboratory performance is evaluated and any necessary corrective action is taken. The QAO monitors all results and maintains all QC performance sample data. The special processing of these blind QC checks and all PE samples is forbidden.

14.1.4 External Performance Audits

External performance audits are accomplished through inter-laboratory checks such as:

- Participation in various state laboratory evaluation programs.
- Participation in WP & WS studies from EPA.
- Analysis of split samples and comparing results with the other laboratory.
- Participation in the U.S. EPA CLP program.
- Participation in the U.S. Army Corps of Engineers DERA certification program.
- Participation in the U.S. Navy NFESC Program.

14.2 External Certifications and Approvals

The SWLO/AATS laboratory has participated in available certification programs pertaining to environmental chemistry. SWLO/AATS participates in numerous certification/approval programs (both state and federal). The federal programs are listed in Table 14.1 and the state programs are listed in Table 14.2.

Table 14.1

Program Participation

USEPA CLP (Contract Laboratory Program)

- Organics Analysis, Multi-Media, Multi Concentration, by GC/MS and GC/EC Techniques. *Note: Continuous Participation Since 1985.*
- Rapid Turn-Around Organics Analysis, Multi-Media, Multi Concentration, By GC/MS And GC/EC Techniques.
- Chemical Analytical Services For Multi-Media, Multi-Concentration Metals And Inorganics.

EMSL Cincinnati

- WP/WS Water Pollution/Water Supply Study Program.

U.S. Army Corps Of Engineers DERP Certification (Defense Environmental Restoration Program).

U.S. Air Force AFCEE IRP, Installation Restoration Program Participant, Analytical Services For AFB Projects.

U.S. Navy NFESC, Installation Restoration Program Participant, Analytical Services.

INEL, (Idaho National Engineering Lab.), Qualified By ERPSMO To Perform Analytical Services.

HAZWRAP, Certified To Perform Analytical Services For Hazardous Waste Remedial Actions Program.

NRC License, Licensed To Perform Analysis Of Environmental Samples. (License #35-27413-01)

Table 14.2

State Certification

State	Certification Number	Department	Type	Expires	Evaluation Process
ALABAMA	40890	Department Of Environmental Management	DW	5/31/97	Reciprocity (OK)
ARIZONA	AZ0436	Environmental Lab. Dept. of Health	ENV, HW	9/25/97	On-Site, WP
ARKANSAS	N/A	Pollution Control & Ecology	ENV	5/16/97	WP
CALIFORNIA	1221	Department Of Health Services, Environmental Lab Program	ENV	6/30/99	On-Site, PE & WP
COLORADO	335	Department of Health, Drinking Water Parameters	DW	6/30/97	Reciprocity (OK)
CONNECTICUT	PH-0195	Bureau of Labs	DW,HW	09/30/97	Reciprocity (OK)
DELAWARE	OK006		DW	05/31/97	Reciprocity (OK)
FLORIDA	87326	Department of Health and Rehabilitation	DW,ENV	06/30/97	On-Site, WP
FLORIDA	87376	Department of Health and Rehabilitation	DW,ENV	06/30/97	On-Site, WP
FLORIDA	87530	Department of Health and Rehabilitation	DW,ENV	06/30/97	On-Site, WP
GEORGIA	922	Environmental Protection Division	DW	05/31/97	Reciprocity (OK)
HAWAII	N/A	Hawaii Public Health	DW	07/31/97	Reciprocity (OK)
IDAHO	N/A	Idaho Dept. of Health and Welfare	DW	09/30/97	Reciprocity (OK)
INDIANA	C-OK-01	Indiana Dept. of Health	DW	05/31/97	Reciprocity (OK)
IOWA	104	Iowa University Hygienic Lab	WW TEMP		On-Site Pending
KANSAS	E-1126	Department of Health and Environment	HW	10/31/97	Reciprocity (UT)
KANSAS	E-10155	Department of Health and Environment	DW	10/31/97	Reciprocity (UT)
KANSAS	E-155	Department of Health and Environment	WW	10/31/97	Reciprocity (UT)
KENTUCKY	90065	Department of Environmental Protection	DW	12/31/97	Reciprocity (CO,LA)
LOUISIANA	93-19	Department of Health and Hospitals	DW	12/31/97	On-Site, WS
MICHIGAN	N/A	Department of Public Health	DW	05/31/97	Reciprocity (OK)
MISSISSIPPI	N/A	Department of Public Health	DW	05/31/97	Reciprocity (OK)
NORTH CAROLINA	404	Department of Environmental Health & Natural Resources	DW,HW	12/31/98	On-Site, PE & WP
NORTH DAKOTA	R-073	Department of Health and Conservation	HW,ENV	10/24/97	Reciprocity (AZ)
OKLAHOMA	8728	Water Resources Board	DW,ENV	05/31/97	On-Site, WS/WP
SOUTH CAROLINA	79003	Department of Health and Environmental Control	DW,HW, ENV	11/17/97	Reciprocity (OK)
TENNESSEE	02929	Department of Health and Environment	DW,UST	04/01/99	Reciprocity (OK)
UTAH	E-117	Department of Health	ENV,HW	03/31/97	On-Site, WP
VIRGINIA	00322	Department of Drinking Water	DW	06/30/97	Reciprocity (OK)
WASHINGTON	N/A	Department of Health	UST,DW	12/27/97	Reciprocity (COE)
WYOMING	N/A	Region 8	DW	01/10/98	Reciprocity (OK)

15.0 REFERENCES

- Naval Facilities Engineering Science Center, Interim Guidance Document, "Navy Installation Restoration Laboratory Quality Assurance Guide", February, 1996.
- National Environmental Laboratory Accreditation Conference, :Quality Systems", Revision 4, January 3, 1997.
- Office of Nuclear Safety Policy and Standards, DOE Order 5700.6C: "Quality Assurance Program, A Management System, Revision 1, October, 1992.
- USEPA SW846, "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods", Revision 2, September, 1994.
- USEPA Contract Laboratory Program, "Statement of Work for Organic Analysis, Multimedia, Multi-concentration", OLM03.2.
- USEPA 40CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; Final Rule and Interim Final Rule and Proposed Rule", October 26, 1984.
- USEPA Contract Laboratory Program, "Statement of Work for Inorganic Analysis, Multimedia, Multi-concentration", ILM04.0.
- USEPA "Methods for the Determination of Metals in Environmental Samples", EPA 600-91-010, June, 1991.
- USEPA "Methods for Chemical Analysis of Water and Wastes", EPA 600/4-79-020.
- "Standard Methods for the Examination of Water and Wastewater, 18th Edition.
- US Department of Energy, Oak Ridge Operations Office, Weldon Springs Site Remedial Action Project, "Scope of Work for Analytical Services", DOE/OR/21548-614.
- Air Force Center for Environmental Excellence, "Quality Assurance Project Plan", ver. 2.0.
- US Army Corp of Engineers, "Shell for Chemical Analytical Services – Draft, Rev. 4.2-1, August 1996.

16.0 DOCUMENT CONTROL AND STORAGE

Detailed instructions and guidelines for the preparation, review, approval and distribution control of documents affecting the quality and consistency of the work performed by SWLO/AATS are found in SOP, SWL-GA-101, "Preparation, Review, Revision and Control of Procedural Documents". Written documents are prepared and approved for all activities affecting the quality and consistency of work performed by SWLO/AATS. Activities include, and are not limited to, receipt, handling, preparation and analysis of samples; use and maintenance of standards; calibration and performance checks of measurement equipment; reduction, evaluation and reporting of data; the archival and retrieval of raw data, supporting documentation and electronic media generated during analysis; general laboratory practices which support these activities. In addition, procedures are written which conform to government regulations affecting worker health and safety, hazardous waste management, and radiation protection. These procedures are governed by the same controls as those affecting quality of work.

The policies and practices for the archival and retrieval of raw data are detailed in SOP, SWL-GA-106, "Archival and Retrieval of Sample Documentation". Policies and practices for electronic media are found in SOP, SWL-GA-102, "Information Systems Quality Assurance Plan". All systems are designed so that data, records and documents can be stored and retrieved ten years after the date of generation.

17.0 MATERIALS AND SUBCONTRACTORS

The policies, procedures and practices for the procuring and approving of materials and equipment are detailed in SOP, SWL-GA-107, "Procurement of Materials and Equipment". Policies for the verification of the quality of standards are located in each departments' "Standards and Traceability" SOPs.

17.1 Procurement and Inventory

17.1.1 Southwest Laboratory of Oklahoma, Inc. has established a system to assure that products and services, purchased or contracted, shall meet at least the minimum standards required. Factors such as cost, volume of work, ease of operation, inherent accuracy, expected equipment lifetime, length and condition of warranties or service contracts, expected downtime and repair costs are considered during the selection process. The increased usage of electronic analytical instruments has improved the quality and quantity of data and has increased productivity.

17.1.2 Control of materials (e. g. reagents, standards, solvents) and glassware used in the analyses is maintained as part of the quality assurance program. Reagents and solvents are analyzed prior to use to verify purity, documentation of these analyses are maintained. Lot numbers are recorded on preparation logs to facilitate the tracking of these items. This will correlate the analytical reagent lot number to specific analytical batches. All reagents are dated as they are received and when they are opened to assure systematic use. The identity, purity, shelf-life, source, tests to be considered for quality and purity, storage and handling procedures, and replacement dates are factors that are considered in making purchase requisitions.

Before any purchases are made, the purchase requisition orders and requests are checked and verified by the appropriate laboratory supervisor. The authority for approval for such purchases is held by the laboratory supervisors and the Laboratory Director.

17.2 Equipment Management

17.2.1 Information on performance of the equipment is obtained before a purchase request is made. Service availability for installation specification and verification is considered in purchase negotiation. When the instrument/equipment is installed, an internal calibration is made on the instrument to meet manufacturers' and Reference Methods' specifications. Calibration checks are done by using analytical reference standards for qualitative and quantitative checks to verify instrument performance during the sample run. Routine preventive maintenance of the instruments or equipment is made on a regular basis. Section 8.0 discusses preventive maintenance employed by the different laboratory sections to ensure instrument/equipment working conditions.

17.3 Supplies Management

17.3.1 Materials, reagents, solvents and gases are carefully selected to meet specifications as prescribed by the method of analyses. Each new supply of these items is verified for performance capability based on the required certified assay/analysis of chemicals and freedom from impurities that would interfere with the analysis. Background levels are measured to check the degree of contamination through conformance of storage requirements according to the manufacturer's directions and/or individual method of analysis. Solvents used for extraction are pre-analyzed to determine impurities that might interfere with the analytes of interest. Standards and reagents are dated, initialed and labeled with the expiration date (if not manufacturer stated) upon receipt. This procedure establishes the order of use and eliminates the possibility of exceeding shelf life.

17.4 Source of Standard Reagents

17.4.1 Primary standards and/or stock standards are obtained from a reliable, certifiable source and are high purity. Standards are purchased from approved commercial vendors such as Chem Services, Fisher Scientific, Supelco, etc., for use in all analytical testing. Standards are protected from degradation, deterioration and contamination based on storage requirements (e.g. polyethylene containers for alkali solutions, glass containers for organics and brown glass for light-sensitive solutions: temperature storage and segregation of standards based on reactivity).

Stock and working standard solutions are prepared fresh as required by their stability, and are checked regularly for signs of deterioration, (e. g. discoloration, formation of precipitates, and changes in concentration). Standard solutions are labeled with lot number, expiration date, preparation date and preparer.

17.5 Glassware

17.5.1 Class A volumetric glassware is used by the laboratory for accurate measurements in both inorganic and organic analysis.

Laboratory contamination is minimized through implementation of a standard operating procedure (SOP) for glassware and labware cleaning. It is followed to ensure the removal of all traces of parameters of interest and contaminants that could interfere with analysis.

17.6 Reagents, Solvents and Gases

17.6.1 Chemical Reagents aside from the primary standard reagents, solvents and gases are carefully selected to conform to specifications defined in the method SOP. Selection is based on the required purity for parameters being measured, sensitivity of the method and specificity of the detection system (e. g. AA, ICAP, GC-ED, GC/MS).

17.6.2 Laboratory reagents obtained from approved commercial vendors shall meet ACS standards and are labeled indicating contents, date of receipt or preparation, and expiration date (where appropriate). Hazardous reagents are adequately labeled and stored segregated from the rest of the reagents to indicate type and degree of hazard. All solvents are dated upon receipt, and again upon opening, to ensure "first in – first out" usage. Solvent bottles are stored in a grounded flammable liquid storage cabinet.

17.6.3 Gases used in organic and inorganic analyses are of commercial grade or are laboratory-supplied gases. For organic analyses, the type of detection (e. g. GC-EC, Hall, GC-FID, GC/MS) used affects gas quality requirement. Molecular sieves, carrier-gas filters, and drying tubes are required on combustion gases to improve quality. Gas cylinders are immediately replaced when the pressure falls to 100-200 pounds per square inch (psi) to minimize detector contamination that will affect sensitivity of the detector.

17.7 Laboratory Reagent Water.

ASTM Type II water (by conductivity) is used in the laboratory for dilution, preparation of reagent solutions and final rinsing of glassware while ASTM Type I water is used for metals analysis. It is free from interferences and other contaminants. After passing through two ion exchange canisters and one carbon filter canister, conductivity is monitored and recorded daily and an indicator light, which (when out) alerts the analyst to have the tanks serviced.

17.8 Compressed Air

Compressed air is employed mainly in instruments using GC oven-door control and autosamplers. Absorption filters are installed between the outlets and the point of use to trap oil, moisture, and other contaminants entering the compressed air transfer lines. These lines are checked for the presence of moisture and contaminants and are replaced as soon as moisture is detected.

17.9 Hood System

An efficient hood system is necessary to remove the various toxic and hazardous fumes that may be generated when using organic solvents or that may be formed during an acid digestion step. It is also used to remove toxic gases that may be formed during atomic absorption analysis reactions. The laboratory fume hood face velocity is regularly checked every four months for optimum face velocity.

17.10 Electrical Services

The laboratory electrical system provides adequate and constant voltage, appropriate grounding, and efficient lighting which is required for satisfactory lighting, proper functioning of sensitive instruments and operation of high-current devices. A licensed electrical contractor provides repairs and services in the event of a power failure or electrical problems.

17.11 Subcontractors

In the event that subcontracted services are required, the procurement process shall be governed by SWL's Small Business Contracting Plan. The plan includes a historical list of small businesses that have performed to specifications in the past. The plan also includes the utilization of sources provided by the Small Business Administration (SBA). The current plan is maintained by the laboratory's manager of the Contracts/Proposal Department. It is the responsibility of the Contracts/Proposals Manager to write a solicitation that includes all of the requirements provided by the Prime Contractor for whom the subcontracted work will be performed. The requirements of the solicitation, or Request for Proposal (RFP), may include, but is not limited to the following:

- Any required state and/or federal agency certifications, validations, and/or proof of the successful completion of Performance Evaluation (PE) samples and on-site audits.
- The applicable scope of work and quality assurance objections from the Prime Contractor's requirements of Southwest Laboratory of Oklahoma. In all cases, Southwest Laboratory must confirm that any subcontracted analytical/technical firm shall meet or exceed all requirements as specified by SWLO's Prime Contractor.

18.0 QA REPORTS TO MANAGEMENT

18.1 Quality Assurance Reports to Management

Data from formal performance audits of the laboratory's activities are reviewed directly by the QAO, Laboratory Director, and Laboratory Operations Manager. Should any significant quality assurance problem arise, it is internally discussed among the QAO, Laboratory Director, and Laboratory Operations Manager at a weekly meeting. A weekly QC Report is produced, detailing quality assurance issues and actions taken. Figures 18.1 and 18.2 are examples of the weekly QC Reports.

Figure 18.1

Weekly Staff Meeting Report

QA DEPT.
WEEKLY STAFF-MEETING
REPORT
FOR WK/ENDING 04/18/97

A. DATA REVIEW

NO DATA REVIEWS PERFORMED

B. CONTROL CHARTS

NEED MARCH CONTROL CHARTS

C. CORRECTIVE ACTIONS

ICP – MATRIX MODIFIER (Li) NOT USED
IN ICP ANALYSIS (Na & K VALUES NOT USED)

D. QA MANUAL(S)

1. MANUAL REVISED 4/3/97.
   CONVERSION INTO WORD BEGUN.

E. AUDITS SCHEDULED

1. OXY – APR. 22-24th.
2. HAZWRAP – APR. 28-29th.
3. CALIFORNIA (RAD) – MAY 12th.
4. NAVY (TBA)
5. IOWA (TBA)

F. AUDIT RESPONSES

1. RMA
2. KERRM
3. ARCO
4. CALIFORNIA
5. ENV. STDS/WESTON
6. NAVY
7. CDM

G. EXTERNAL PEs

IN-HOUSE

	PE STUDY	DATE RECEIVED	DATE DUE
1.	WASHINGTON STATE	03/14/97	04/21/97
2.	WASH. STATE (SOILS)	04/11/97	05/20/97

(cont) **Figure 18.1**

Weekly Staff Meeting Report

QA DEPT.
WEEKLY STAFF-MEETING
REPORT
FOR WK/ENDING 04/18/97
(CONTINUED)

PAGE 2

SENT OUT / AWAITING RESULTS

	PE STUDY	DATE RECEIVED	DATE DUE
1.	CALIFORNIA	12/18/96	01/30/97
2.	MAP-EP	12/11/96	03/20/97
3.	WP-037	01/17/97	03/20/97

H. INTERNAL PEs

1. RS ENVIRONMENTAL- EPISODE 28802 (PESTICIDES)

I. MISC. SUPPORT

1. PREPARED A CONTROL CHART DIRECTORY & FILE LISTING FOR COMPLETED LAB CONTROL CHARTS.
2. PREPARED LCS CONTROL LIMIT SUMMARY FROM 4th QTR '96 CONTROL CHARTS
3. REVISED SOP ON SOP REVISION – (IN WORD PROCESSING)
4. COPIED LATEST REVISIONS OF THE LABORATORY SAFETY PLAN, RESPIRATORY PROTECTION PLAN QA MANUAL, BALANCE CHECK SOP WERE DISTRIBUTED TO LAB SECTIONS.
5. HAZWRAP MONTHLY REPORT FAXED.
6. RESOLVED SHIPPING PROBLEMS FOR EPA CASES 25410 & 25414.
7. REPORTED IMPROPER Ph FOR EPA Cn SAMPLES ON CASE 25386.
8. **NEED TO TRACK/FOLLOW-UP ON ANALYST SIGN-OFFs FOR NEW REVISIONS OF SOPs.(DOE REQUIREMENT).**

Figure 18.2

QC Tracking Coversheet

QC Tracking Coversheet

I. Overdue SOP's

II. Two-month SOP Outlook

III. Outdated Redbook Entries

IV. In-House PE Samples

Appendix A-1

Personnel Experience

Key Personnel Resumes

ROBERT HARRIS

Laboratory Director

EDUCATION: Bachelor of Science Degree, Microbiology
Oklahoma State University, 1971

PROFESSIONAL EXPERIENCE:

7/1/83 to Present — **Southwest Laboratory of Oklahoma, Inc.**
Laboratory Directors
As the Laboratory Director of Southwest Laboratory of Oklahoma Mr. Harris directs all aspects of laboratory operation in the Company's facility, including scheduling and cost control, staffing, training, customer support, and business development. He holds a B.S. in Microbiology from Oklahoma State University and has over 15 years experience in management of commercial laboratories. Analytical services under his direction include hazardous waste, drinking water and ground water investigation sponsored by a wide variety of governmental and private clients including EPA (e.g.,CLP,RCRA) Corps of Engineers (DERA) and the Air force (OHEL/HSD).

Prior to joining SWL he managed a geochemisty laboratory for Williams Brothers Engineering which supported major oil companies. Mr.Harris has developed supplemental methods for the analysis of hazardous waste when there were no applicable ones available for specific project requirements. His experience in directing the operations of environmental laboratories is exemplified by successful participation in the EPA CLP, U.S. Army Corps of Engineers, and other federal and State certification and accreditation programs. As an analyst Mr. Harris is experienced in the application of analytical methods using SW846, CLP, ASTM, and Standard Methods for organic and inorganic samples.

1981 to 1983 — **Williams Brothers Engineering**, Tulsa, Oklahoma
Assistant Laboratory Director
1975 to 1981 — Senior Research Engineer

1971 to 1975 — **Kansas City Testing Laboratory**, Kansas City, Missouri
Laboratory Manager

Appendix A-2

Personnel Experience

STEVE MARKHAM
Operations Manager

EDUCATION: Bachelor of Science Degree , Zoology
Oklahoma State University, Stillwater, OK, May 1977.

Fisheries Biology
Frostburg State College, Frostburg, Maryland, 1979.

Additional Education:

Atomic Absorption Training Course, Perkin-Elmer
Class II Wastewater Treatment Operators License, Virginia (1979)
Inductively Coupled Argon Plasma Course, Perkin-Elmer
Project Officer's Training - US Environmental Protection Agency.
ICAP-61 Training Course - Thermo Jarrell Ash

PROFESSIONAL EXPERIENCE:

- As the Operations Manager for Southwest Laboratory of Oklahoma, Mr. Markham assists the Laboratory Director in all aspects of laboratory operations, including scheduling, staffing, training and quality assurance.
- Mr. Markham is responsible for assuring that the laboratory has the personnel and support to deliver data of the highest quality and integrity.
- Mr Markham has eighteen years experience in the environmental profession and twelve years of management experience.

PROFESSIONAL EXPERIENCE:

1996 to Present — **Southwest Laboratory of Oklahoma, Inc.**
Operations Manager

1994 to 1996 — **Gulf States Analytical, Inc.**, Houston, Texas
Operations Manager

7/88 to 1993 — **Southwest Laboratory of Oklahoma, Inc.**
Inorganic Program Manager

1986 to 1988 — **Weston Corporation**, Stockton, California
Inorganics Section Manager.

1985 to 1986 — **U.S. Environmental Protection Agency, (Reg.III)**, Annapolis, Maryland
Environmental Scientist.

1983 to 1985 — **Water Pollution Control**, Arlington County, Virginia
Chief Chemist.

1979 to 1983 — **Lapteff Associates**, Woodbridge, Virginia

Appendix A-3

Personnel Experience

JAYANT SHRINGARPURE

Laboratory Technical Director

EDUCATION: Ph.D., Organic Chemistry
Indian Institute of Technology, Bombay, India

Master of Science , Environmental Management
University of San Francisco

Master of Science , Organic Chemistry
Indian Institute of Technology, Bombay, India.

Bachelor of Science, Chemistry
Bombay University, Bombay, India

PROJECT EXAMPLES:

- Project Manager for USEPA. Contract involving the rapid response (16 hour electronic data transmission) for the analyses of dioxins up to 100 samples per day by GC/MS.
- Program Manager for USEPA-CLP Organic Contract at SWLO.

PROFESSIONAL EXPERIENCE:

1985 to Present — **Southwest Laboratory of Oklahoma, Inc.**
Technical Director
Responsible for supervising the operations of the Extractions and GC/MS laboratories, including troubleshooting of instrument difficulties and final data review for GC/MS. Involved in ongoing work with the Research and Development laboratory conducting method developments and validation studies. Acts as client liaison on projects involving technical difficulties.

1985 to 1992 — **Organics Program Manager**
Program Manager for the organic department at SWL. Supervises work assignments, conducts method development and method validation. Supervises the operation of extraction GC and GC/MS Laboratory. Trains analysts on the use of instrumentation as well as trouble-shooting problems with the instruments. Reviews data for the GC/MS Laboratory.

1980 to 1985 — **EAL Corporation**
Supervisor — Responsible for the development of analytical methods for the analysis of organic compounds in the environment.

1978 to 1980 — **Columbia University** , New York
Research Associate — Specialized in the syntheses and purification of retinoids used against epithelial cancer.

1976 to 1978 — **Fordham University**, New York
Research Associate — Investigated intramolecular imino Diels-Adler reaction for the syntheses of idolizidine alkaloids.

1975 to 1976 — **Bakul Chemicals**
Senior Chemist

1969 to 1975 — **Indian Institute of Technology**, India
Reasearch Chemist

Appendix A-4

Personnel Experience

CHUCK HOOVER
Quality Assurance Officer

EDUCATION: Bachelor of Arts Degree in Biology
Minor in Chemistry
Wichita State University, 1976

PROJECT

- Experience with PCB analyses on transformer oils, Hydraulic fluids, soil/sediment, waters and fish flesh.
- Experience in EPA 600 series Methodologies, both extractions and analyses.
- Experience in Trihalomethane Studies on source and drinking water supplies.
- Experience in data review of analyses performed on samples from EPA's Superfund Sites; performed in various laboratories in the EPA's Contract Laboratory Program.
- Metal analysis using Flame/Furnace Atomic Absorption. Extraction/Clean-up of Dioxin/Furans using method 613.

PROFESSIONAL EXPERIENCE:

1987 to Present — **Southwest Laboratory of Oklahoma, Inc.**
QA/QC Officer

1985-1987 — **Lockheed Engineering and Management Services,** Las Vegas, Nevada
Technical Support Supervisor — Laboratory Performance Monitoring Section.

1983-1985 — **Southwest Laboratory Of Oklahoma, Inc.**
QA/QC Officer — Extractions Chemist — AA Operator

1982-1983 — **National Analytical Laboratories,** Tulsa, OK
Gas Chromatography/GC/MS Chemist

1980-1982 — **Williams Brothers Laboratories,** Tulsa, OK
Wet Chemistry Section Supervisor

1977-1980 — **Wichita Water Department, Water and Waste-water Laboratory,** Wichita, KS
Laboratory Technician

1976-Summer — **U.S. Department of Labor Occupational Health & Safety Administration (OSHA),** Kansas City, MO
Industrial Hygienist (Summer Merit)

Appendix A-5

Personnel Experience

HARRY M. BORG
Organic Program Mgr.

EDUCATION: Bachelor of Arts Degree, Chemistry, Minor: Physics, Math
Mount Marty College, Yankton, South Dakota

Additional Training

Hewlett Packard 5988 RTE - 6 System Mgr. Course, 9/97
Hewlett Packard 5987/88/96, Operators Course, 4/86

PROFESSIONAL EXPERIENCE:

2/92 to Present — **Southwest Laboratory of Oklahoma, Inc.**
Organic Program Manager — Responsible for day to day operations in the Organic department. Oversees performance for all GC and GC/MS operations including extractions, analyses, data review, and data management. Provides technical management for organic EPA contracts. Interviews prospects for organic personnel.

11/89 to 2/92 — **Cenref Labs**, Brighton, Colorado
Laboratory Manager — Management of an environmental production laboratory. Responsible for day to day operations and technical management, as well as evaluation and interpretation of analytical results. Responsible as client liaison and for coordination of laboratory projects.

11/88 to 11/89 — **Hager Laboratories**, Golden, Colorado
Technical Services Representative/Environmental Chemistry Manager — Responsible for management of day to day operations in an environmental production laboratory. Technical management, evaluation and interpretation of analytical results. Client liaison and project coordinator.

12/87 to 11/88 — **metaTRACE, Inc.**, Earth City, Missouri
Organic Section Supervisor — Responsible for hiring and scheduling of personnel, and Quality control and data review for GC and GC/MS depts.

12/83 to 11/87 — **Western Research Institute**, Laramie, Wyoming
Analytical Scientist II — Responsible for scheduling and training personnel. Analyst in the semivolatile and volatile GC/MS laboratories. Analyses included semivolatile extracts from water, soil, high concentration samples, Pesticide/PCBs by GC and GC/MS, Inorganic analyses of oil shale by-product waters by non-suppressed ion chromatography, separation and detection of sulfur anions by non-supressed ion chromatography (HPLC). Responsible for quality control of data. Utilized EPA 600 methods, SW846 methods, RCRA and EPA CLP protocols. Routine maintenance and troubleshooting of the HP59858 and HP5996 GC/MS systems with RTE-6 software and REV D/E.

3/80 to 11/83 — **Tosco Corporation**, Golden, Colorado & Martinez, Calif.
Chemist — Responsible for supervision of evening shift personnel during oil-shale project. Coordinated pilot plant ball test program. Coordinated personnel schedule to accommodate research refinery program.

Appendix A-6

Personnel Experience

JASON D. RUCKMAN
Inorganic Program Mgr.

EDUCATION: **Bachelor of Science**, Chemistry
Kansas Wesleyan University, Salina, Kansas, 1985

Additional Studies:
14 hours graduate credit
University of Kansas, Lawrence, Kansas, 1985-86

PROFESSIONAL EXPERIENCE:

6/89 to Present — **Southwest Laboratory of Oklahoma, Inc.**
Inorganic Program Manager
Manages and oversees the Contract Laboratory Program (CLP). Reviews data, resolves reporting problems and provides technical assistance to analysts. Directs troubleshooting of instruments to minimize instrument downtime. Performs sample analysis as needed to meet deadline requirements.

3/87 to 6/89 — **Wilson Laboratories**, Salina, Kansas
EPA Metals Manager. Primary operator for the Perkin-Elmer 5100. Responsible for analyzing water and soils samples for the EPA according to the 787 contract and assembling CLP packages.

Primary ICP operator (8/86-8/88) responsible for everyday maintenance and upkeep of the ICP (Perkin-Elmer 6000).

8/85 to 5/86 — **University of Kansas**, Lawrence, KS
Teaching Assistant, Department of Chemistry

Responsible for pre-laboratory lectures, enforcing safety requirements and grading labs and lecture tests.

Appendix A-8

Personnel Experience

DEBORAH INMAN

Inorganics Group Leader

EDUCATION: Bachelor of Science, Biochemistry
Oklahoma State University, May 1991

Additional Courses:

4 semesters undergraduate study, 1986-88
Rogers State College, Claremore, OK

2 semesters undergraduate study, 1980-81
Northeastern A&M, Miami, OK

PROFESSIONAL EXPERIENCE:

8/21/91 to Present — **Southwest Laboratory of Oklahoma, Inc,**

12/94 to Present — **Inorganics Group Leader.** Reviews Inorganic Data, Data Packages, sets up digestion batches, and reviews quality control on all analytical batches. Initiates corrective actions when analytical batches have failed QC criteria.

Instrument/Equipment Experience: Perken Elmer 5100 Zeeman, Varian 400 Zeeman, Leeman PS200 Mercury Analyzer.

10/93 to 4/94 — **Wet Chemistry.** Experience with all instrumentation in the Wet Lab.

9/91 to 12/94 — **AA Furnace Operator.** Specializing in metals analysis (AA Furnace), using TJA22, PE5000 and PE5100. Conducts analysis of soil and water samples to determine the presence of various metals in accordance with protocol established by the EPA. Maintains and troubleshoots instrumentation.

Appendix A-9

Personnel Experience

BRETT RANDALL DEES
GC Section Supervisor

EDUCATION: Bachelor of Science, Biology, Minor in Chemistry
University of Tulsa, Tulsa Oklahoma, 1990

Completed 21 hours graduate study in Environmental Engineering, Oklahoma State University

Laboratory coursework:
Gas Chromatogaphy (GC), Infrared Spectrometry, &
Nuclear Magnetic Resonance (NMR)

Tulsa Junior College, Tulsa, Oklahoma

PROFESSIONAL EXPERIENCE:

1991 to Present — **Southwest Laboratory of Oklahoma**
GC Section Supervisor
Prioritize projects and delegate laboratory duties for twelve personnel. Responsible for the interpretation and implementation of numerous SW-846 chromatographic methods, EPA Statement of Work 2/88, OLM01.8 and OLM03.1 and various EPA 500 and 600 series methods. Review data packages and prepare case narratives. Also performs routine maintenance of instruments.

5/91 to 6/94 — Environmental Analyst Pesticide section group leader in the Gas Chromatography laboratory. Successfully implemented the 14 day turnaround program for EPA SOW 3/91 contracts. Standardized data work-up procedures to enhance data quality and speed of data flow.

1990 to 1991 — **Laboratory Technician**
Symex Corporation. Research and development during summer/part-time during school. Principle assignment was to develop a patentable viral transport media for clinical applications. Use of UV-VIS Spectroscopy. Additionally responsible for coordination of and participation in the manufacture of Reagent Control Kits used as clinical diagnostic aids.

1987 to 1990 — **May's Drug Store**
Pharmacy Technician

Appendix A-10

Personnel Experience

DESMOND FOSTER

Extractions Laboratory Supervisor

EDUCATION: Tulsa Junior College — coursework includes Chemistry and Biology
Open Bible Institute, Trinidad — one year general coursework
Art Diploma — London University, London England
Basic Lab Skills Diploma — Hess Oil, U.S. Virgin Islands
Diploma — Trinidad High School (1964)

PROFESSIONAL EXPERIENCE:

1981 to Present — **Southwest Laboratory of Oklahoma, Inc.**
1988 to present — **Organic Extractions Laboratory Supervisor,**

Organic Extractions (12 years)
Supervision of 13 chemists in extractions of multiple matrices for organic chemical analyses. Methods used include the U.S. EPA SW-846 3500 Series, the U.S. EPA Contract Laboratory Program (CLP) Organic Statement of Work (SOW 3/90 & 2/88). Explosives, Herbicides, High Concentrations, Phenols and TPH's. Polychlorinated dibenzo-p-dioxins/dibenzofurans (PCDD/PCDF) extractions using 8280 and CLP Rapid Turnaround SOW. Multiple clean-up techniques including the Columbia Fishery (for Dioxins/Furans) and GPC (for semivolatiles and pesticides/PCBs).

Inorganics (5 years)
Wet chemistry work consisted of colorimetric and titrimetric procedures of chloride, fluoride, nitrate, nitrite, sulfates, COD, ammonia, and TKN. Other tests were pH, conductance, total dissolved solids, total solids, total suspended solids, hardness, acidity, and TOC.

Gas Chromatography (5 years)
Natural Gas Analysis

Field Sampling (5 years)
Sampled soils, monitoring water wells, and lysimeters.

Stack Sampling (2 years)
Collected SOX, NOX and particulate samples.

Hazardous Waste Supervisor
Maintained records and prepared reports as per 40CFR part 262. Filled out manifests and coordinated pick-up of drums by hazardous waste firms - ENSCO and APTUS. Inspected drum staging area to ensure proper storage and labeling of drums.

1979 to 1981 — **Hess Oil Company**, St. Croix, Virgin Islands
Petroleum Analyst — Gauged and sampled tanks, ships and refinery units for crude, JP4, JP54, gasoline, kerosene, benzene, toluene, xylene, napthas, #2 oil, #4 oil, #6 oil, etc. Laboratory tests performed were flash point (open cup and closed cup), cloud point, pour point, freeze point, sodium chloride in crude, D86 distillation, D286 distillation, D1160 distillation, true boiling point distillation, particulates in jet fuel, fuel system icing inhibitor, Reid Vapor Pressure, color ASTM, saybolt and Viscosities (SUS, SFS and kinematic).

Appendix A-13

Personnel Experience

GINA B. JACKSON

GC/MS Volatiles Section Supervisor

EDUCATION: Bachelor of Science Degree in Chemistry
University of Tulsa, Tulsa, Oklahoma, May 1988

Chemistry Major, 1983-1986
Oklahoma State University, Stillwater, Oklahoma,

Chemistry Major, 1984-1986, Summers
Tulsa Junior College, Tulsa, Oklahoma

Additional Courses:

HP Mass Spectral Interpretation Course
Houston, Texas, December 1990

PROFESSIONAL EXPERIENCE:

5/88 to Present — **Southwest Laboratory of Oklahoma, Inc.,**
GC/MS Volatiles Laboratory Supervisor
Supervises and coordinates the daily routine of the Volatiles Laboratory including workload assignments, holding time, meeting established deadlines, and data review. Conducts sample analysis and instrument troubleshooting.

3/87 to 5/88 — **Dowell Schlumberger, Inc**, Tulsa, Oklahoma
Student Laboratory Technician, Department of Research and Development Technology. R esponsible for operating equipment and evaluating data collected from VAX and Hewlett Packard mainframe computers and reduce to reaction rate data. Also ran semivolatile organics by GC/MS.

Assistant Group Leader, Chemist III in Analytical Research & Development Lab

PUBLICATIONS:

A list of publications is available upon request.

Appendix A-14

Personnel Experience

SHAHRIAR SHAHREZA
HPLC Section Supervisor

EDUCATION: Bachelor of Science degree, Biology and Chemistry
Northeastern State University, Tahlequah, Oklahoma, 1988

M.D.: Medical Arts
Dow Medical College, Karachi, Pakistan, 1980-1982

M.D.: Biology
St. Mary of the Plains College, Dodge City, KS, 1978-1979

PROFESSIONAL EXPERIENCE:

6/90 to Present — **Southwest Laboratory of Oklahoma, Inc.**

12/96 to Present — **HPLC Section Supervisor**
Supervises and coordinates the daily routine of the HPLC Laboratory, including workload assignments, meeting established deadlines, and data review. Other responsibilities include Method development, analysis and instrument trouble shooting.

6/90 to 12/96 — **GC Operator**
Conduct timely and reliable analysis of environmental samples using gas chromatography (GC) following established protocol and reporting procedures. Maintain GC operation by performing daily instrument maintenance and troubleshooting. Calibrate standards, process data, and maintain appropriate logs.

1/89 to 6/90 — Biological Assay Laboratory, Inc.
Analyst — Provided assistance in statistical method development, performed analytical and wet chemistry, analytical HPLC, U.V. detector, fluorescent detector, W.I.S.P., other manufacturer's equipment, GC, extraction.

10/88 to 1/89 — Howard Hughes Medical Institute, Department of Biochemistry
Chemist — Protein purification and characterization, DEA 53 column chromatography, gene sequence, UV-VIS spectrophotometer, prep HPLC, gel electrophoresis, wet chemistry, Rotofor system purification.

6/88 to 9/89 — Baylor College of Medicine, Renal Research Department
Analyst — Collected and analyzed experimental data using standard chemical and biological means. Methodology includes use of HPLC, UV-VIS spectrophotometer, A.A., TLC and transport using radioactive Na(22) and P(32).

Appendix A-15

Personnel Experience

MARK SMITH
Organic Data Manager

EDUCATION: Masters of Biomedical Science Program
Major: Pharmacology, 25 credit hrs.
Oral Roberts University, Tulsa, Oklahoma, 1985

Bachelor of Science, Chemistry
Minor, Computer Science
Oral Roberts University, Tulsa, Oklahoma, 1984

PROFESSIONAL EXPERIENCE:

9/91 to Present — **Southwest Laboratory of Oklahoma, Inc.**
Organics Data Manager
Assembly and review of Organic Data Packages. Development of automation software.

9/89 to 9/91 — **NET, Inc.**, Carrolton, Texas
GC/MS Supervisor
Responsible for the scheduling and analysis of all samples for volatiles and semivolatiles by GC/MS. Responsible for the operation and maintenance of four Hewlett-Packard GC/MS systems: three 5970 MSDs and a 5996. Duties include data review, standards preparation, methods development, SOP writing and updating, writing instrument automation software, employee training, and instrument operation.

3/86 to 9/89 — **Southwest Laboratory of Oklahoma, Inc.**

11/88 – 9/89 — **Volatile Organics Group Leader**
Leader of volatiles GC/MS laboratory. Responsible for the scheduling and analysis of all VOA samples, so that holding time deadlines and turnaround times were met. EPA CLP, 624 and 8240 methods were used. Responsibility to have QA/QC executed at the proper level and frequency. Reviewed data for quality and completeness. Responsible for maintenance of the GC/MS systems.

8/86 to 11/88 — **GC/MS Chemist**
Analyzed water, soil, and petroleum based samples for volatiles, semivolatiles, and dioxins in accordance with EPA CLP or SW846 methods and requirements. Wrote procedure files to help automate the analysis of samples and data review. Performed instrument maintenance and repairs.

3/86 to 8/86 — **Extractions and Inorganics Chemist**
Prepared sample extracts for semivolatiles, pesticides, PCBs, dioxins, and herbicides per EPA CLP or SW846 requirements. Performed analysis for total organic carbon, oil and grease, chemical oxidation demand, and ion chromatography.

Appendix A-16

Personnel Experience

KERT SURFACE

Nuclear Chemistry Manager/Project Officer

EDUCATION: B.S. Geology, Minor in Computer Science
Stephen F. Austin University, 1987

PROFESSIONAL EXPERIENCE:

3/95 to Present — **Southwest Laboratory of Oklahoma, Inc.**
Nuclear Chemistry Manager, Radiation Safety Officer, Project Officer
Manages Radiochemistry laboratory with emphasis on instrumentation and wet chemical separations. Oversees sample receipt screening for mixed waste samples. Responsible for all activities including sample flow, production, data compilation for data deliverables, and chemical analysis for naturally occurring and man-made radionuclides. Trains chemists and technicians. Maintains second-line quality checks and turnaround time assurance in the radiochemistry laboratory and enforces all operating procedures, as well as US Department of Energy's requirements and client-specific requirements. Monitors control charts and sample preparation documents. Conducts technical audit tours in radiochemistry and login/sample receiving departments.

1/95 to 3/95 — **Texas A & M University**
Radiochemistry Manager, Geochemical Environmental Research. Completed radiation safety training seminars.

1990 to 1995 — **SCIENTECH, Inc.**
1992 to 1995 — Radiochemistry Manager, Developed and/or adapted standard analysis procedures for radiochemistry. Developed transuranics procedure for the chemical separation of americium and plutonium with routine yields of 60 to 100 percent, respectively. Developed working standard operating procedures for the analyses and instrumentation in the radiochemistry laboratory.

1990 to 1992 — Safety Officer, Radiochemistry Group Leader, Developed safety manual for environmental laboratory.

1989 to 1990 — **Alpha Energy Laboratories, Inc.**
Radiochemist — Duties includes radiochemistry, information management, and quality control. Developed computerized radiochemistry data reporting format under US Department of Energy's "General Radiochemistry and Routine Analytical Services Protocol" for data package assembling and electronic deliverables, as well as other client specific protocols.

Appendix A-17

Personnel Experience

ANN WADE
GC/MS Operator/Group Leader

EDUCATION: Bachelor of Science, Environmental Health
Indiana State University, Terre Haute, Indiana, 1986

Additional Courses:

RTE-A GC/MS Operator Course, Analytical Ed. Center, Atlanta, GA, 10/90

Health & Safety Supervisors Courses, Psara Technologies, 48 hours, 6/90

Building Inspection & Mgmt. Planning, Univ. of Illinois at Chicago, 2/88

Sampling & Analysis of Airborne Asbestos, NIOSH, Cincinnati, OH, 7/87

PROFESSIONAL EXPERIENCE:

7/92 to Present — **Southwest Laboratory of Oklahoma, Inc.**
GC/MS Operator/Group Leader
Conduct organic analysis of semivolatile environmental samples using combined gas chromatography/mass spectrometry (GC/MS) following EPA/CLP protocol and previously determined computer format. Prepare internal standards and calibration standards according to contract specifications. Check data from runs to ensure it meets protocol requirements. Assemble initial reports. Perform instrument maintenance to assure instrument is operating at maximum efficiency.

11/87 to 7/92 — **Hayden Environmental Group, Inc.**, Miamisburg, Ohio
Senior Organics Laboratory Technician

12/90 to 7/92 — GC Laboratory Group Leader/Technician, Equipment and instrument operation and maintenance, training of additional operators, and GC/MS analysis. Certified by OEPA for volatile organic compounds, insecticides and herbicides for drinking water.

5/90 to 12/90 — GC/MS Analyst, Operation, maintenance, of an RTE-A 5970 GC/MS system for volatile and semivolatile priority pollutant analysis and interpretation. Utilized EPA methods and CLP QA/QC protocol. Identify and evaluate health and safety hazards as Health & Safety Coordinator. Disposal of hazardous waste as Hazardous Waste Manager.

5/88 to 5/90 — GC Operator, Analysis of Pesticides/PCBs, solvent identification of industrial hygiene samples. Sample preparation, analysis, data reduction, reporting of results, and maintenance of instrument.

11/87 to 5/88 — Industrial Hygiene Technician, Perform contractor surveillance and asbestos sampling at abatement sites. Asbestos analysis by polarized light microscopy.

1984 to 1987 — **Internship Experience**

7/87 to 9/87 — **Environmental Specialist**—Franklin Envir. Testing, Inc.,
3/87 to 7/87 — **Environmentalist**—Warren Cty. Combined Health Dist.
5/85 to 8/85 — **Environmental Intern**—Warren Cty. Combined Health Dist.
5/84 to 8/84 — **Sanitarian Intern**—Dekalb County Health Department

Internship experience included asbestos air monitoring/sampling; noise/ventilation surveys; analysis of organics and metals; water sampling; and health inspections.

Appendix A-18

Personnel Experience
(Technical Personnel Experience Summary)

	Total Years Experience												
	Total Experience in Laboratory Field	Current Position	GC/MS	Purge & Trap	Gas Chromatography	High Performance Liquid Chromatography	Sample Preparation	Data Review	Inductively Coupled Plasma	Inorganic Analysis	Atomic Absorption	Data Reporting	Nuclear Chemistry
Akuoko, Joseph GC/MS Analyst M.S. Chemistry	8	5	7	5			0.5	3		0.5			
Alexander, Sam GC/MS Analyst B.S. Chemistry	11	9	7	3	Also 2 years in Field Sampling 10	2	3	8			3		
Alstatt, Daryl Project Officer B.S. Chemistry	13	7					5	10		6			
Anderson, Doug GC/MS Analyst B.S. Natural Science	8	2	4	2			3						
Asprey, Jeana ICP Trace Operator B.S. Biology	20	1			1	2	3	15	15	4	7		
Bauder, Emiline GC Analyst A.S. Accounting	8	2			2							6	
Bolding, Blaine GC/MS Analyst B.S. Biology	1	1	3mo				2						
Borg, Harry Organic Program Manager B.A. Chemistry/Physics	17	6	11	1	11	1.5	2	12		2.5	1.5		
Butler, Mike Project Officer M.S. Environmental Science	5	3	0.5		Also 5 years Project Management, 5 years QAQC 1		3	5		3	2	5	5
Chance, Danny Extractions Technician B.S. Microbiology	0.5	0.5					0.5						
Chapple, Janet Metals Preparation H.S. Diploma	3mo	3mo					3mo						
Cowan, Drew GC Analyst B.S. Chemistry	5	2	1	1	3			3					
Cummins, Jeff GC Analyst B.S. Chemistry	5	4			4		1.5	2					
Debrah, Stephan Nuclear Chemist B.S. Chemical Technology	21	1.5					21	21					5
Dees, Brett GC Supervisor B.S. Biology/Chemistry	11	4			7		2	5					
Derouen, Chris Extraction Technician H.S. Diploma	4	3					3						

	Total Years Experience												
	Total Experience in Laboratory Field	Current Position	GC/MS	Purge & Trap	Gas Chromatography	High Performance Liquid Chromatography	Sample Preparation	Data Review	Inductively Coupled Plasma	Inorganic Analysis	Atomic Absorption	Data Reporting	Nuclear Chemistry
Fee, Rebecca GC/MS Analyst B.S. Chemistry	13	4	6	7	7	3		4		3			
Flora, Diana Inorganic Wet Chem. Analyst H.S. Diploma	8	7					8			4			
Foster, Desmond Organic Extractions Supv. H.S. Diploma	20	14			Also 5 years field & stack sampling * 2	5	18	6		5			
Gillund, Travis Inorganic Wet Chem. Analyst H.S. Diploma	5	2					5	2		2			
Godbold, Linda GC/MS Analyst A.S. Medical Technology	11	7	7	3				2				3	
Grovenstein, Sandy Senior Chemist B.S. Biology	18	4	13		17	4		12			2		
Harris, Robert Laboratory Director B.S. Microbiology	25		4	3	10		15	17	2		15		
Hoke, Diana GC/MS Analyst B.A. Chemistry	13	6	12	6	12		3	10		2			
Hoover, Chuck QA/QC Officer B.A. Biology/Chemistry	18	10	2	2	Also 10 yrs Project Management 5		8	6		5	4		
Inman, Deborah Inorganic Supervisor B.S. Biochemistry	7	4						6	2	5	6	2	2
Jackson, Gina GC/MS VOA Section Supv. B.S. Chemistry	8	7	7	6			3	5					
KariKari, Joseph GC Analyst B.S. Biochemistry	12	2	2	10	8		2	10		1	1	10	
Kidd, Gary AA Furnace Analyst H.S. Diploma	11	11					6	1	2	7	7		
Kotarsky, Rick Extractions Technician B.S. Wildlife Fisheries Management Ecology	0.5	0.5					0.5						
Leonard, Tonya Extractions Technician B.S. Biology	1	1					1						
Liang, Xiangqui GC/MS – HRMS Analyst M.S. Chemistry	19	6	11	3	11		5	6					
Lindsey, Sandi Extraction Technician B.S. Biological Sciences	1	1					1						

	Total Years Experience												
	Total Experience in Laboratory Field	Current Position	GC/MS	Purge & Trap	Gas Chromatography	High Performance Liquid Chromatography	Sample Preparation	Data Review	Inductively Coupled Plasma	Inorganic Analysis	Atomic Absorption	Data Reporting	Nuclear Chemistry
Lynch, Ken Inorganic Wet Chemistry Analyst B.A. History/A.S. Chemistry	9	2						1		2			
Maimborg, Liz Inorganic Analyst H.S. Diploma	0.5	0.5					0.5						
Markham, Steve Laboratory Manager B.S. Zoology	21	0.5					13	12	10	13	3		
Martindale, Terry GC Chemist B.S. Chemistry	16	11		11	16	1.5	16	16	2	2	2		
Miller, Matthew Dioxin Analyst Trainee B.S. Chemistry/B.S. Biology	4	0.5	6mo				4	3.5		3.5		3.5	
Morrison, Lisa Inorganic Wet Chem. Analyst H.S. Diploma	6	6					3	2		3		2	
Murray, Gary Shipping and Receiving Clerk A.A. Music / A.S. Drug & Alcohol Abuse Counseling	9mo	9mo											
Patel, Paresh Extractions Technician B.S. Environmental Science	1	1					1			1			
Pavey, Seretha GC/MS Analyst B.S. Math, A.S. Chemistry	9	2	5	2	5			2				3	
Persons, Matt GC Analyst B.S. Biology	7.5	1mo	7	1mo	7	3mo	2	2				2	
Rhoades, Sharon AA, Mercury CV Operator H.S. Diploma	9	7					7	7		7	7		
Rourke, Ken Extractions Technician B.S. Physical Science	26	5					8	8		5			
Ruckman, Jason Inorganic Program Manager B.S. Chemistry	10	7					9	9	9	6	9		
Rutledge, Tim Extractions Technician H.S. Diploma	19	8			3	2	11	6	2	11	4		
Sein, Gideon Inorganic Analyst MB.ChB. Medicine M.S. Biological Science	5	1mo	3		2	2	1.5	2		1		1	
Shahreza, Shariar LC Supervisor B.S. Biology/Chemistry	12	5	1		8	11	10	6		1	1		
Shringarpure, Jayant Technical Director Ph.D. Organic Chemistry	19	6	18	18	18	5	5	19					

	Total Years Experience												
	Total Experience in Laboratory Field	Current Position	GC/MS	Purge & Trap	Gas Chromatography	High Performance Liquid Chromatography	Sample Preparation	Data Review	Inductively Coupled Plasma	Inorganic Analysis	Atomic Absorption	Data Reporting	Nuclear Chemistry
Simpson, Otto Extractions Group Leader H.S. Diploma	6	6					6						
Sims, Keith Project Officer B.S. Biology/Chemistry	26	8						13	12	4	10		
Staggs, Randy Project Officer B.S. Biology	17	6			3		5	13		15	5		
Surface, Kert Nuclear Chemistry Manager B.S. Geology	11	3					11	11	1	3	1	8	8
Swartz, Alan GC Chemist B.S. Chemistry	11	9		1	7		8	9		2	2		
Turner, Susan AA Furnace Operator A.S. Chemistry	14	4			2			11		10	13	2	
Vo, Phuong HPLC Analyst B.S. Biology	8	5			2	6							
Wade, Ann GC/MS Analyst B.S. Environmental Health	12	6	8	2	Also 3 years of field sampling 12		4	9			1		
Webb, Jim ICP Trace Operator B.S. Biology	11	6					1	7	4	2	7		
Whitaker, Jim GC/MS Analyst B.S. Biochemistry	8	2	8	1	7	1	7	8			1		
Williamson, Janet GC/MS Analyst M.S. Analytical Chemistry	19	3	8	6	11	3	6	5			2		
Willison, Kim Sample Custodian H.S. Diploma	3	3			Also 3 years Sample Receiving								

Appendix B

Logbook Standard Operating Procedures

Details of SWLO's logbook maintenance procedures are found in the following standard operating procedures:

Title	Document ID
Maintenance of Zone Logbooks	SWL-GA-128
Guide to Volatile GC/MS Standard Log	SWL-OV-109
Guide to Semivolatile GC/MS Standard Log	SWL-OS-109
Standards Receipt Traceability And Preparation	SWL-OP-202
Inorganic Tracability of Standards	SWL-IN-104
Guide to Volatile GC/MS Run Log	SWL-OV-102
Semivolatile Run Logbook Maintenance	SWL-OS-102
Digestion/Distillation Log	SWL-IN-105

Appendix C-1

Ethics Policy Letter

Southwest Laboratory of Oklahoma, Inc.

Jack Wright
President

December 8, 1995

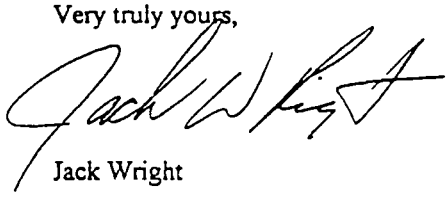
To: All Employees

A major factor in the continuing growth and success of Southwest Laboratory of Oklahoma, Inc. and its affiliated Companies (SWL) is the standard of personal and professional integrity with which its men and women conduct themselves.

Policies and standard operating procedures have been in place for some time governing the way in which the Company conducts its business. In addition to these policies and standard operating procedures, the Company is adopting a Code of Business Conduct, a written guide to assist SWL employees in understanding the principals of conduct that must be adhered to in order to fulfill the legal, moral and ethical obligations that each assumes as an employee.

The Company is committed to conducting its business in accordance with the Code of Business Conduct and established policies and standard operating procedures. All employees are expected to conduct their activities in a manner that will promote the observance of these principals and guidelines.

Very truly yours,



Jack Wright

Appendix C-2

Business Code of Conduct

Southwest Laboratory of Oklahoma, Inc.

Code of Business Conduct

Introduction

The purpose of this code is to state the principles of business ethics that the Company expects all employees to follow. The Code goes on further to state specific guidelines for conduct in situations that affect employees.

These principles and guidelines are to be strictly adhered to at all times and under all circumstances. Anyone who does not adhere to this Code is acting outside the scope of his or her employment. Additionally, conduct that does not comply with the provisions of the Code may well constitute a violation of one or more criminal laws.

The following principles and guidelines are applicable to all employees of Southwest Laboratory of Oklahoma and its affiliated Companies ("The Company"). Violations by any employee will result in disciplinary action, including, in proper cases, discharge from employment.

Compliance With All Laws

The Company is committed to being a good corporate citizen of all states in which it does business. Because of this commitment, it is the policy of the Company to comply in all respects with all laws and regulations that are applicable to its business at all government levels in the United States.

The laws and regulations of the states in which the Company does business and the laws and regulations of the United States form the framework around which the Company's operations are built. To comply in all respects with both the spirit and the letter of those laws will best serve the interests of the Company and its employees.

Ethical business conduct should normally exist at a level well above any minimum required by law. The Company expects its employees to deal fairly with all persons with whom the Company does business and to maintain the Company's reputation for integrity in all its business dealings.

Employees should make the Company's legal compliance policy known to all agents and contractors of the Company and inform such persons that the Company expects them likewise to adhere to this policy.

Laboratory Analysis And Test Results

It is the policy of the Company to produce accurate analytical test results. It is the responsibility of all employees to promptly report any information regarding improper performance of analytical testing or misrepresentation of analytical data.

Examples of improper performance of analytical testing or misrepresentation of analytical data include:

1. altering any analytical instrument, computer or clock;
2. altering the contents of any logbook or data sheet;
3. falsifying analyte identity;
4. preparation of data packages that do not faithfully reflect actual analytical data in logbooks or data sheets;
5. calibration techniques at variance with contract requirements, SOP's, industry standards or regulations;
6. any misrepresentation of data or events as they actually occur in the course of data generation, review or reporting;
7. any other improper activity that could result in improper performance of analytical testing or misrepresentation of analytical data.

Any employee having knowledge of any act or circumstance that is prohibited by this policy shall immediately report the matter to a member of the Company's management.

Conflict Of Interest

All employees of the Company have a primary business responsibility to the Company and are expected to avoid any activity that may interfere, or have the appearance of interfering with the performance of this responsibility.

The following will serve as a guide to the circumstances or types of activities that could cause conflicts and therefore should be fully reported to the Company.

1. Disclosure or use by any employee of information that is confidential, proprietary or privileged for the benefit or gain of the employee or any other person. It is the policy of the Company to require employees to sign a written agreement prohibiting unauthorized disclosure of confidential information and misappropriation of the Company's intellectual property.

2. Ownership by an employee or a close relative or associate of a two percent or more financial interest in any enterprise that does business with or is a competitor of the Company.

3. Participation in any outside activity that competes directly or indirectly with the Company or that interferes or has the appearance of interfering with the performance of the employees duties to the Company.

4. Service as a director, consultant or employee of an enterprise that conducts or seeks to conduct business with the Company.

5. Acceptance by an employee or a close relative or an associate of gifts of a size that may tend to influence business decisions or compromise independent judgment. This includes loans, excessive entertainment, or other favors from any individual, enterprise or organization that does, or is seeking to do business with, or is a competitor of the Company.

Failure by an employee to cease and desist any activity that, in the opinion of management, results in a conflict of interest, may result in discharge from employment.

Proper Recording Of Funds, Assets, Receipts and Disbursements

All funds, assets, receipts and disbursements of the Company shall be properly recorded on the books of the Company. To assure that this policy is implemented, it is specifically understood that:

1. No funds or accounts shall be established or maintained for purposes that are not fully and accurately reflected on the books and records of the Company.

2. No funds or other assets shall be received or disbursed without being fully and accurately reflected on the books and records of the Company.

3. No false, fictitious or intentionally misleading entries shall be made on the books or records of the Company and no false or misleading reports pertaining to the Company or its operations shall be issued.

Environmental And Safety Policy

The Company has long been committed to the goal of safe, efficient and environmentally sound business practices and operations and has been supportive of endeavors aimed at preserving our environmental heritage. The Company is committed to complying with all applicable laws and regulations relating to protection of the environment and the maintenance of a safe workplace. These laws and regulations are diverse and far reaching and any violation of them can produce severe consequences not only for the Company but for each employee involved in the violation.

The Company endeavors to maintain a safe workplace for the safety of its employees, customers and the general public. Each employee is required to use such safety equipment as may be required by law, regulation or Company policy. Employees are also required to use all reasonable efforts to maintain the work area in such condition as will not pose a safety hazard for themselves or others. Employees are encouraged to identify ways to improve safety and to bring them to the attention of their supervisors.

Human Resources

The Company recognizes that its greatest asset is its human resources and realizes the proper utilization and development of this asset is the key to continued success. The Company intends to operate under sound personnel policies and to apply an equitable standard of fair treatment to all its employees.

In order to fully realize these human resources, it is the Company's practice to:

1. Select and place employees based on their qualifications and without discrimination in terms of race, color, religion, national origin, sex, age or disability.

2. Provide a healthful and safe work environment in which self-development and the broadening of skills are encouraged, free from intimidating conduct.

3. Encourage and facilitate promotion and transfer from within the Company whenever possible.

4. Encourage employees to express freely their ideas and suggestions concerning the Company, its operations and services.

Violations

Any employee who becomes aware of any conduct he or she believes violates the letter or spirit of this Code should report the conduct to his or her supervisor, or to the Director of Human Resources, or to any member of management of the Company.

Appendix C-3

Southwest Laboratory of Oklahoma, Inc.

Code of Business Conduct

I have received the Company's Code of Business Conduct and have had an opportunity to review the Code and ask questions concerning the provisions of the Code.

I affirm the provisions of the Code and agree to adhere to the principles of conduct and guidelines therein.

As a Southwest Laboratory employee or as an employee of an affiliated Company, I understand that I have a responsibility to report to management any violation of the letter or the spirit of the Code of Business Conduct.

Employee Signature: _____ Date:_____

Business Code of Conduct Acknowledgement Form

Low Detection PAHs

CONTROL LIMITS *

	LCS RECOVERY LIMITS				MS/MSD LIMITS		
	SOILS		WATERS		SOILS/WATERS		MAX RPD
Compound	LCL	HCL	LCL	HCL	LCL	HCL	UCL
Naphthalene	50	118	60	140	60	140	**40**
Acenaphthylene	50	112	60	140	60	140	**40**
Acenaphthene	47	122	60	140	60	140	**40**
Fluorene	43	128	60	140	60	140	**40**
Phenanthrene	57	122	60	140	60	140	**40**
Anthracene	24	149	60	140	60	140	**40**
Fluoranthene	54	138	60	140	60	140	**40**
Pyrene	30	136	60	140	60	140	**40**
Benzo(a)Anthracene	60	130	60	140	60	140	**40**
Chrysene	61	134	60	140	60	140	**40**
Benzo(b)Fluoranthene	47	137	60	140	60	140	**40**
Benzo(k)Fluoranthene	59	130	60	140	60	140	**40**
Benzo(a)Pyrene	32	132	60	140	60	140	**40**
Dibenzo(a,h)Anthracene	58	128	60	140	60	140	**40**
Benzo(g,h,i)Perylene	42	127	60	140	60	140	**40**
Indeno-(1,2,3-cd)Pyrene	60	126	60	140	60	140	**40**

Surrogates	Soil	Water
2-Fluorobiphenyl	64-113	--
p-Terphenyl	66-125	10-140

* soil limits generated-waters are arbitrary

ICP - 6010A
CONTROL LIMITS

[redacted]	SOILS			WATERS			MS/MSD		DUP PREC.
	LCL	HCL	MAX RPD*	LCL	HCL	MAX RPD*	LCL	HCL	MAX RPD*
Aluminum	82	108	**15**	91	109	**25**	75	125	**20**
Antimony	78	104	**15**	90	108	**25**	75	125	**20**
Arsenic	80	108	**15**	91	114	**25**	75	125	**20**
Barium	83	106	**15**	89	108	**25**	75	125	**20**
Beryllium	81	108	**15**	92	113	**25**	75	125	**20**
Boron	85	123	**15**	94	124	**25**	75	125	**20**
Cadmium	81	105	**15**	88	110	**25**	75	125	**20**
Calcium	86	103	**15**	88	106	**25**	75	125	**20**
Chromium	82	104	**15**	88	106	**25**	75	125	**20**
Cobalt	73	105	**15**	76	109	**25**	75	125	**20**
Copper	77	107	**15**	78	111	**25**	75	125	**20**
Iron	84	107	**15**	89	108	**25**	75	125	**20**
Lead	81	104	**15**	84	107	**25**	75	125	**20**
Magnesium	82	104	**15**	90	108	**25**	75	125	**20**
Manganese	82	104	**15**	88	106	**25**	75	125	**20**
Molybdenum	82	105	**15**	90	107	**25**	75	125	**20**
Nickel	82	103	**15**	88	107	**25**	75	125	**20**
Potassium	79	98	**15**	78	101	**25**	75	125	**20**
Scandium	80	103	**15**	86	106	**25**	75	125	**20**
Selenium	67	110	**15**	91	117	**25**	75	125	**20**
Silicon	72	230	**15**	89	187	**25**	75	125	**20**
Silver	78	104	**15**	83	113	**25**	75	125	**20**
Sodium	84	105	**15**	85	109	**25**	75	125	**20**
Strontium	84	105	**15**	89	106	**25**	75	125	**20**
Thallium	74	105	**15**	83	108	**25**	75	125	**20**
Tin	84	104	**15**	89	107	**25**	75	125	**20**
Titanium	84	105	**15**	89	108	**25**	75	125	**20**
Vanadium	83	104	**15**	89	106	**25**	75	125	**20**
Zinc	79	109	**15**	89	108	**25**	75	125	**20**

* AFCEE LIMITS

ref col
02-Feb-98
MLM
ver
5.0

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

Polynuclear Aromatic Hydrocarbons

Test Code GC420
Method SW846/8310
Matrix Water-Soil
Extract Volume 1000 mL - 30g
Initial Calibration 5 point calibration, %RSD = 20
Continuing Calibration single point calibration, %D = 15
Soil MDL performed on Instrument 12 / analysis date: 12/30/97
Water MDL performed on Instrument 10 / analysis date: 8/21/97

COMPOUND	CAS NUMBE	PQL's		MDL's	
		WATER	SOIL	WATER	SOIL
		ug/L	ug/Kg	ug/L	ug/Kg
Naphthalene	91-20-3	18.0	560	0.78	30
Acenaphthylene	208-96-8	17.0	430	0.58	61
Acenaphthene	83-32-9	18.0	1200	1.60	32
Fluorene	86-73-7	2.1	1210	0.059	3.7
Phenanthrene	85-01-8	4.0	165	0.014	0.80
Anthracene	120-12-7	0.1	6	0.001	0.08
Fluoranthene	206-44-0	1.9	84	0.029	3.4
Pyrene	129-00-0	2.7	180	0.094	4.7
Benzo(a)anthracene	56-55-3	0.1	32	0.009	0.40
Chrysene	218-01-9	1.5	100	0.073	3.3
Benzo(b)fluoranthene	205-99-2	0.2	12	0.004	0.28
Benzo(k)fluoranthene	207-08-9	0.2	9	0.004	0.33
Benzo(a)pyrene	50-32-8	0.2	15	0.005	0.43
Indeno(1,2,3-cd)pyrene	193-39-5	0.7	34	0.035	0.71
Dibenz(a,h)anthracene	53-70-3	0.9	132	0.10	2.3
Benzo(g,h,i)perylene	191-24-2	0.7	142	0.053	2.1

Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculate the laboratory for soil/sediment, calculated on dry weight basis will be higher. Practical Quantitation will be twice for GPC cleanup.

MDL = 3.14 (for 99 percent confidence; from the "Student's t Value" table) times the standard deviation of seven replicates of a spiked sample matrix analyzed using the pertinent calibration. Reference: Federal Register, July 1982.

PQL = (practical quantitation limit) based on the product of the MDL and a mulitplier ranging from 5 to 10.

ref col
01-May-98
CFH
ver
5.0

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

Metals reporting limits by ICP

Regular ICP

Method	SW846 Method 6010B
Matrix	Water-Soil
Extract Volume	100mL - 1g
Initial Calibration	0-1000 ug/L -varies
Continuing Calibration	1/2 high std
Date	Jan. 30- March 10, 1998

COMPOUND	CAS NUMBER	Test Services List	MDLS* WATER ug/L	MDLS* SOIL mg/kg	PQLS WATE ug/L	PQLS SOIL mg/kg
Aluminum	7429-90-5	MT005	56	11.0	200	20.0
Antimony	7440-36-0	MT025	18	1.6	60	6.0
Arsenic	7440-38-2	MT055	73	1.5	150	15.0
Barium	7440-39-3	MT065	5.4	0.13	25	1.2
Beryllium	7440-41-7	MT085	0.5	0.08	5	0.5
Boron	7440-42-8	MT115	30	9.3	300	50.0
Cadmium	7440-43-9	MT125	4.6	0.78	1500	4.0
Calcium	7440-70-2	MT145	243	77.0	10	500.0
Chromium	7440-47-3	MT165	1.3	0.30	25	1.0
Cobalt	7440-48-4	MT185	5.3	0.39	25	2.5
Copper	7440-50-8	MT205	7.3	2.40	50	5.0
Iron	7439-89-6	MT225	34	5.0	100	10.0
Lead	7439-92-1	MT245	93	4.6	250	25.0
Magnesium	7439-95-4	MT265	24	4.6	250	25.0
Manganese	7439-96-5	MT285	1.7	0.14	10	1.0
Molybdenum	7439-98-7	MT325	18.0		100	
Nickel	7440-02-0	MT345	13.0	0.83	40	4.0
Potassium	7440-09-7	MT365	495	27.0	2500	250.0
Selenium	7782-49-2	MT385	31	2.4	250	20.0
Silicon	7440-21-3	MT445	151		750	
Silver	7440-22-4	MT405	7.0	0.25	10	1.0
Sodium	7440-23-5	MT425	45	57.0	400	300.0
Thallium	7440-28-0	MT455	57	2.8	250	25.0
Tin	7440-31-5	MT465	22	2.4	150	15.0
Titanium	7440-32-6	MT485	0.8	0.12	8	0.8
Vanadium	7440-62-2	MT505	4.4	0.09	20	2.0
Zinc	7440-66-6	MT525	6.8		20	

Metals reporting limits by Low Level ICP

Method SW846 Method 6010B
Matrix Water-Soil
Extract Volume 100mL - 1g
Initial Calibration 0-500ug/L - varies
Continuing Calibration 1/2 high std
Date January 26 - March 20, 1998

TRACE ICP

COMPOUND	CAS NUMBER	Test Services List	MDLS* WATER ug/L	MDLS* SOIL mg/kg	PQL,S WATE ug/l	PQL,S SOIL mg/kg
Aluminum	7429-90-5	MT003	17.0	1.60	80.0	8.0
Antimony	7440-36-0	MT023	2.7	0.18	15.0	1.5
Arsenic	7440-38-2	MT053	2.9	0.18	10.0	1.0
Barium	7440-39-3	MT063	0.6	0.13	3.0	1.0
Beryllium	7440-41-7	MT083	0.1	0.01	1.0	0.1
Boron	7440-42-8	MT113	26.0	3.00	150.0	15.0
Cadmium	7440-43-9	MT123	0.3	0.03	3.0	0.3
Calcium	7440-70-2	MT143	40.0	4.50	250.0	25.0
Chromium	7440-47-3	MT163	0.7	0.08	5.0	0.5
Cobalt	7440-48-4	MT183	1.0	0.11	5.0	1.0
Copper	7440-50-8	MT203	0.8	0.09	7.0	0.7
Iron	7439-89-6	MT223	33.0	2.90	100.0	10.0
Lead	7439-92-1	MT243	1.5	0.14	3.0	0.3
Magnesium	7439-95-4	MT263	37.0	7.80	250.0	50.0
Manganese	7439-96-5	MT283	0.5	0.05	3.0	0.4
Molybdenum	7439-98-7	MT323	1.2	0.07	7.0	0.7
Nickel	7440-02-0	MT343	1.0	0.16	5.0	1.0
Potassium	7440-09-7	MT363	110.0	5.60	500.0	50.0
Selenium	7782-49-2	MT383	3.1	0.40	5.0	0.5
Scandium	7440-20-2	MT393	0.1	0.40	0.5	0.1
Strontium	7440-24-6	MT433	0.2	0.03	1.0	0.2
Silicon	7440-21-3	MT443	70.0	5.80	400.0	40.0
Silver	7440-22-4	MT403	1.4	0.12	7.0	1.0
Sodium	7440-23-5	MT423	39.0	20.00	200.0	100.0
Thallium	7440-28-0	MT453	3.1	0.39	10.0	1.0
Tin	7440-31-5	MT463	4.7	0.45	30.0	3.0
Titanium	7440-32-6	MT483	1.0	0.06	5.0	0.5
Uranium	7440-61-1	MT513	7.9	0.62	40.0	4.0
Vanadium	7440-62-2	MT503	0.8	0.08	0.8	0.6
Zinc	7440-66-6	MT523	2.7	1.20	20.0	2.0

STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LARRY J. WILSON, DIRECTOR

01/27/1998

Southwest Laboratory Of Oklahoma
1700 West Albany
Broken Arrow, OK 74012

ATTENTION: Chuck Hoover, QA Manager
IA Lab #: 104
Expires: 09/01/1998

Dear Mr. Hoover:

The Iowa Department of Natural Resources is pleased to grant CERTIFICATION for Southwest Laboratory Of Oklahoma in Broken Arrow, OK, to analyze environmental samples for reporting WW results to the Iowa Department of Natural Resources.

This certificate supersedes any prior certificates issued from this Department.

You may not have received full certification for all of the parameters you requested **or** the parameter list may have changed since your last certificate was issued. Please review the parameter list and this certificate in detail to clarify the parameters for which your laboratory is certified.

The analytical methods that must be used are those shown on the attached parameter list and have been recommended for approval by the laboratory appraisal officer. Also attached is a listing of essential personnel and reporting requirements.

WW IOC Regulated A/S #1: Certification was not granted for some or all of this analytical series. The analyte(s) or method(s) were not listed on the home state certificate.

WW IOC Regulated A/S #2: Certification was not granted for some or all of this analytical series. Approved method(s) are required for certification in Iowa.

WW IOC Excluded A/S #1: Certification was not granted for some or all of this analytical series. Approved method(s) are required for certification in Iowa.

WW UST Regulated A/S #1: Conditional certification for some or all of this analytical series has been granted due to failure of the laboratory to submit acceptable performance evaluation (PE) results annually. Evidence of acceptable performance must be submitted to the DNR within 2 MONTHS FROM THE DATE OF THIS LETTER or certification for these analytes will be revoked.

WW SOC Regulated A/S #1: Certification was not granted for some or all of this analytical series. Approved method(s) are required for certification in Iowa.

WW SOC Regulated A/S #2: Certification was not granted for some or all of this analytical series. Approved method(s) are required for certification in Iowa and the laboratory must submit acceptable performance evaluation (PE) results before an evaluation can be conducted.

WW SOC Regulated A/S #4: Certification was not granted for some or all of this series. The laboratory must submit acceptable performance evaluation (PE) results before an evaluation can be conducted.

WW SOC Regulated A/S #5: Certification was not granted for some or all of this series. The laboratory must submit acceptable performance evaluation (PE) results before an evaluation can be conducted.

WW SOC Regulated A/S #6: Certification was not granted for some or all of this series. The laboratory must submit acceptable performance evaluation (PE) results before an evaluation can be conducted.

Certification by this Department is based upon the enclosed recommendation from the representatives of the University Hygienic Laboratory (UHL), current and future satisfactory performance on the audit samples for the listed parameters, and satisfactory performance throughout the certification period. If a change in certification status occurs during the certification period (i.e., due to a change in supervisory personnel, physical facility, methodology, performance on the audit samples, etc.), the laboratory must notify the Department in writing within 30 days of that change. Any questions may be directed to Stacy Freeburg, Laboratory Appraisal Coordinator, at 319/335-4500.

Use your assigned Lab ID (see top of page) when reporting results and when corresponding with this Department.

Be reminded that it is the laboratory's responsibility to keep this Department and UHL updated on any changes in current certification status in this laboratory's home state. It is also the laboratory's responsibility to automatically send to the Department and UHL the necessary and appropriate information required to keep this certification active and accurate without being prompted by either this department or UHL. Failure to do so may result in revocation of active certification in the State of Iowa.

A copy of this letter as well as the attachments should be made available to laboratory personnel for reference.

If you have any questions, please contact Charlotte Henderson, Laboratory Certification Officer, at 515/281-8914 or this office directly at 515/281-8869.

Sincerely,

Darrell McAllister
Chief
Water Quality Bureau

ATTACHMENTS: List of Approved Personnel and Reporting Requirements
Approved Parameter List
UHL's Recommendation for Certification
On-Site Inspection Report, where applicable

c: FILE IA Lab #: 104
Lee Friell, University Hygienic Laboratory - L O C A L -
Charlotte Henderson, IDNR-WS section

DEPARTMENT OF NATURAL RESOURCES LABORATORY CERTIFICATION
PERSONNEL AND REPORTING REQUIREMENTS

01/27/1998

IA Lab #: 104

The laboratory supervisor and personnel specifically approved in this certification are:

Chuck Hoover, QA Manager
Robert Harris, Laboratory Manager
Harry Borg, Organic Program Manager
Brett Dees, GC Supervisor
Randy Staggs, Project Officer
Keith Sims, Project Officer
James Hunter, Technical Lab Manager
Richard Ranan, Laboratory Director
Jayant Shringapure, Lab Technical Director
Gina Jackson, GC/MS Supervisor
Jason Ruckman, Inorganic Program Manager
Mike Butler, Project Officer
Daryl Alstaft, Project Officer
Kert Surface, Radiation Chemical Safety

WW REPORTING: Please refer to Rule 83.6(6)c (455B) of the Iowa Administrative Code for reporting requirements for the Wastewater program.

Laboratory Name: Southwest Laboratory Of Oklahoma
IA Lab #: 104

Certification Date: 01/27/1998
Expiration Date: 09/01/1998

Contaminant ID #	Contaminant Name	Source	Method	Conditional	IRC # SDWIS #
Basic Wastewater Analysis					
WW BASIC -- Regulated -- A/S #1 (INCOMPLETE Group)					
	Ammonia (as N)	EPA	350.2		
	Ammonia (as N)	EPA	350.3		
	Residue-nonfilterable (TSS)	EPA	160.2		
Inorganic Analysis					
WW IOC -- Regulated -- A/S #1 (INCOMPLETE Group)					
	Aluminum (Total)	EPA	200.7		125
	Antimony (Total)	EPA	200.7		125
	Arsenic (Total)	EPA	206.2		103
	Arsenic (Total)	EPA	200.7		125
	Barium (Total)	EPA	200.7		125
	Beryllium (Total)	EPA	200.7		125
	Boron (Total)	EPA	200.7		125
	Cadmium (Total)	EPA	200.7		125
	Calcium (Total)	EPA	200.7		125
	Chromium (Total)	EPA	200.7		125
	Cobalt (Total)	EPA	200.7		125
	Copper (Total)	EPA	200.7		125
	Cyanide (Total)	EPA	335.3		112
	Cyanide amenable to chlorination	EPA	335.1		108
	Fluoride (Total)	EPA	340.2		107
	Iron (Total)	EPA	200.7		125
	Kjeldahl Nitrogen (Total as N)	EPA	351.3		
	Lead (Total)	EPA	239.2		103
	Lead (Total)	EPA	200.7		125
	Magnesium (Total)	EPA	200.7		125
	Manganese (Total)	EPA	200.7		125
	Mercury (Total)	EPA	245.2		119
	Molybdeum (Total)	EPA	200.7		125
	Nickel (Total)	EPA	200.7		125
	Potassium (Total)	EPA	200.7		125
	Selenium (Total)	EPA	270.2		103
	Selenium (Total)	EPA	200.7		125
	Silver (Total)	EPA	200.7		125
	Sodium (Total)	EPA	200.7		125
	Sulfate (as SO4)	EPA	375.4		137
	Sulfide (as S)	EPA	376.1		
	Thallium (Total)	EPA	279.2		103
	Thallium (Total)	EPA	200.7		125
	Tin (Total)	EPA	200.7		125
	Titanium (Total)	EPA	200.7		125
	Vanadium (Total)	EPA	200.7		125
	Zinc (Total)	EPA	200.7		125
Inorganic Analysis					
WW IOC -- Regulated -- A/S #2 (INCOMPLETE Group)					
	Acidity as CaCO3	EPA	305.1		
	Alkalinity as CaCO3	EPA	310.1		
	Calcium (Total)	EPA	200.7		125
	Chloride	EPA	325.3		
	Chemical oxygen demand (COD)	EPA	410.1		

Contaminant ID #	Contaminant Name	Source	Method	Conditional	IRC # SDWIS #
	Hardness (Total as CaCO3)	EPA	130.2		
	Oil and Grease	EPA	413.1		
	Organic carbon (Total) (TOC)	EPA	415.1		
	Orthophosphate (as P)	EPA	365.2		
	Phenols	EPA	420.2		
	Phosphorus (Total)	EPA	365.2		
	Residue-nonfilterable (TSS)	EPA	160.2		
	Residue-Total	EPA	160.3		
	Silica	EPA	370.1		
	Specific conductance	EPA	120.1		145
	Surfactants	EPA	425.1		
	Residue-Filterable (TDS)	EPA	160.1		139
Inorganic Analysis					
WW IOC -- Excluded -- A/S #1 (INCOMPLETE Group)					
	Chlorine, Total residual	EPA	330.4		
	Hydrogen ion (pH)	EPA	150.1		135
	Residue-settleable	EPA	160.5		
Underground Storage Tank Analysis					
WW UST -- Regulated -- A/S #1 (COMPLETE Group)					
	Volatile Petroleum Hydrocarbons	OTHR	OA-1		
	Total Extractable Hydrocarbons	OTHR	OA-2	X	
Volatile Organic Chemical Analysis					
WW VOC -- Regulated -- A/S #1 (COMPLETE Group)					
	1,2-Dichloroethane.	EPA	601		
	1,2-Dichloroethane.	EPA	624		
	1,1-Dichloroethylene.	EPA	601		
	1,1-Dichloroethylene.	EPA	624		
	1,2-Dichloropropane.	EPA	601		
	1,2-Dichloropropane.	EPA	624		
	1,1,1-Trichloroethane.	EPA	601		
	1,1,1-Trichloroethane.	EPA	624		
	1,1,2-Trichloroethane.	EPA	601		
	1,1,2-Trichloroethane.	EPA	624		
	1,1-Dichloroethane.	EPA	601		
	1,1-Dichloroethane.	EPA	624		
	1,3-Dichloropropene (cis & trans)	EPA	601		
	1,3-Dichloropropene (cis & trans)	EPA	624		
2988	1,1,2,2-Tetrachloroethane	EPA	601		
2988	1,1,2,2-Tetrachloroethane	EPA	624		
	1,2-Dichloroethene (cis & trans)	EPA	601		
	1,2-Dichloroethene (cis & trans)	EPA	624		
	1,3-Dichlorobenzene	EPA	601		
	1,3-Dichlorobenzene	EPA	624		
	Methyl ethyl ketone	EPA	624		
	2-Chloroethyl vinyl ether	EPA	601		
	2-Chloroethyl vinyl ether	EPA	624		
	Acrolein	EPA	624		
	Acrylonitrile	EPA	624		
	Benzene.	EPA	602		
	Benzene.	EPA	624		

Contaminant ID #	Contaminant Name	Source	Method	Conditional	IRC # SDWIS #
	Bromodichloromethane.	EPA	601		
	Bromodichloromethane.	EPA	624		
	Bromoform.	EPA	601		
	Bromoform.	EPA	624		
	Bromomethane.	EPA	601		
	Bromomethane.	EPA	624		
	Carbon Tetrachloride.	EPA	601		
	Carbon Tetrachloride.	EPA	624		
	Chlorobenzene.	EPA	601		
	Chlorobenzene.	EPA	602		
	Chlorobenzene.	EPA	624		
	Chlorodibromomethane.	EPA	601		
	Chlorodibromomethane.	EPA	624		
	Chloroethane.	EPA	601		
	Chloroethane.	EPA	624		
	Chloroform.	EPA	601		
	Chloroform.	EPA	624		
	Chloromethane.	EPA	601		
	Chloromethane.	EPA	624		
	Dichloromethane.	EPA	601		
	Dichloromethane.	EPA	624		
	Ethyl Benzene	EPA	602		
	Ethyl Benzene	EPA	624		
	Flurotrichloromethane	EPA	601		
	Flurotrichloromethane	EPA	624		
	o-Dichlorobenzene (1,2)	EPA	601		
	o-Dichlorobenzene (1,2)	EPA	602		
	o-Dichlorobenzene (1,2)	EPA	624		
	p-Dichlorobenzene (1,4)	EPA	601		
	p-Dichlorobenzene (1,4)	EPA	602		
	p-Dichlorobenzene (1,4)	EPA	624		
	Tetrachloroethylene.	EPA	601		
	Tetrachloroethylene.	EPA	624		
	Toluene.	EPA	602		
	Toluene.	EPA	624		
	Trichloroethylene.	EPA	601		
	Trichloroethylene.	EPA	624		
	Vinyl Chloride	EPA	601		
	Vinyl Chloride	EPA	624		
Synthetic Organic Chemical Analysis					
WW SOC -- Regulated -- A/S #1 (COMPLETE Group)					
	Aldrin	EPA	608		
	alpha-BHC	EPA	608		
	Aroclor 1016	EPA	608		
	Aroclor 1221	EPA	608		
	Aroclor 1232	EPA	608		
	Aroclor 1242	EPA	608		
	Aroclor 1248	EPA	608		
	Aroclor 1254	EPA	608		
	Aroclor 1260	EPA	608		
	beta-BHC	EPA	608		
	Chlordane	EPA	608		

Laboratory Name: Southwest Laboratory Of Oklahoma
IA Lab #: 104

Certification Date: 01/27/1998
Expiration Date: 09/01/1998

Contaminant ID #	Contaminant Name	Source	Method	Conditional	IRC # SDWIS #
	4,4'-DDD	EPA	608		
	4,4'-DDE	EPA	608		
	4,4'-DDT	EPA	608		
	delta-BHC	EPA	608		
	Dieldrin	EPA	608		
	Endosulfan I	EPA	608		
	Endosulfan II	EPA	608		
	Endosulfan sulfate	EPA	608		
	Endrin	EPA	608		
	Endrin aldehyde	EPA	608		
	Heptachlor	EPA	608		
	Heptachlor epoxide	EPA	608		
	Lindane	EPA	608		
	Methoxychlor	EPA	608		
	Toxaphene	EPA	608		

01/27/1998

RECOMMENDATION FROM APPRAISAL OFFICER(S)

To: IDNR - Water Supply
From: UHL Laboratory Appraisal

Re: Laboratory Certification
Southwest Laboratory Of Oklahoma
IA Lab #: 104
Expiration Date: 09/01/1998

Laboratory Contact		Data Processing Contact	
Contact Name	Chuck Hoover	Contact Name	
Phone number	918/251-2858	Phone number	918/251-2858
Fax number	918/251-2599	Fax number	918/251-2599

This laboratory application fee was processed by IDNR for the following:

Date Fee Paid	Environmental Program	Fee Expires
05/14/1997	WW Basic Wastewater Analysis	09/01/1999
05/14/1997	WW Inorganic Analysis	09/01/1999
05/14/1997	WW Synthetic Organic Chemical Analysis	09/01/1999
05/14/1997	WW Underground Storage Tank Analysis	09/01/1999
05/14/1997	WW Volatile Organic Chemical Analysis	09/01/1999

UHL recommends that this laboratory be certified in Iowa under the Environmental Laboratory Certification program for the analytes and methods listed on the attached certificate. The expiration date should be consistent with Iowa policy and the home-state certificate where appropriate.

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

AMERICAN ANALYTICAL & TECHNICAL SERVICES, INC.

Standard Operating Procedure

Laboratory Documentation of Sample Custody

Document No.: SWL-GA-110

Rev No. / Date: Rev. 3.0 — 9/17/97

APPROVALS	DATES
Chuck Hoover Procedure Prepared By	9/17/97 Date
Steven L. Medlock Laboratory Manager or Director	04/29/98 Date
Mike Butler Laboratory Safety Officer	4/29/98 Date
Chuck Hoover Laboratory QA/QC Officer	4/28/98 Date

(Effective Date is 10 calendar days after the last signature above - QA/QC Officer)

Document Status

[ ] Controlled DC No. _____ Issued to:_____ Date:_____ QA Initials:____

[ ] Official Copy OC No.: 2099 Issued to: Greg Neiman Date: 6/9/98 QA Initials: GHH

LABORATORY DOCUMENTATION OF SAMPLE CUSTODY

TABLE OF CONTENTS

1.0 PURPOSE AND APPLICATION — A critical aspect of sound sample collection and analysis protocols is the maintenance of strict COC procedures. COC procedures include inventorying and documentation during sample collection, shipment, and laboratory processing. A sample is considered to be in an individual's custody if the sample is: (1) in the physical possession or view of the responsible party; (2) secured to prevent tampering; or (3) placed in a restricted area by the responsible party. The laboratory is responsible for this documentation of sample custody throughout the handling, processing, and analysis of samples.

2.0 RESPONSIBILITIES

2.1 Sample Custodian

2.1.1 Accept custody of samples and initiate the internal chain of custody documentation

2.1.2 Oversees the Internal Chain of Custody, making sure that all required information is accurately documented.

2.1.3 Notifies the Sample Receiving Supervisor and/or Quality Assurance Officer when forms are not being filled out correctly.

2.2 Sample Preparation Technicians/Analytical Chemists

- Documents acceptance and relinquishing of samples prior to returning samples to storage.

2.3 Sample Receiving Supervisor/QA Officer

- Follows-up with any corrective action necessary, upon notification of deficient internal chain of custody documentation.

3.0 EQUIPMENT

3.1 LIMS Monitor/Keyboard Access

3.2 Printer (HP Laserjet4 or equivalent)

4.0 PRECAUTIONS — N/A

5.0 PROCEDURE

5.1 Sample Label

5.1.1 Description — Field Sample Label. A label is attached to all sample containers at the time of collection. The label is written in indelible ink and contains the following information:

5.1.1.1 Sample number/identification

5.1.1.2 Date and time collected

5.1.1.3 Purpose of the sample (analyte and sample group)

5.1.1.4 Source/location and location of the sample

5.1.1.5 Contract task number and title of project

5.1.1.6 Preservative used (if any)

5.1.1.7 Collector's name or initials

5.1.2 An example of a sample label is presented in Attachment 1.

5.2 Chain of Custody Record — External COC

5.2.1 Description

5.2.1.1 Sample custody is initiated with the detailed record keeping by the field sampling personnel. COC establishes the documentation and control necessary to identify and trace a sample from sample collection to final analysis. It includes field sample labeling to prevent mix-up, custody seals to prevent sample tampering, secure custody, and provide the recorded support information for potential litigation.

5.2.1.2 COC forms are used to document the integrity of all samples. To maintain a record of sample collection, transfer between personnel, shipment, and receipt by the laboratory, a COC form will be filled out for each sample set at each sampling location. The COC form will contain the following information:

- Sample number (for each sample in shipment)
- Collection date (for each sample shipment)
- Time sample was obtained/or collected
- Number of containers of each sample
- Sample description (environmental matrix)
- Analyses required for each sample
- Shipment number
- Shipping address of the laboratory
- Date, time and method of shipment
- Spaces to be signed as custody is transferred.

5.2.1.3 The individual in charge of shipping samples to the laboratory is also responsible for completing the COC form. This individual will also inspect the form for completeness and accuracy. Any changes made

to the COC form shall be initialed by the person making the change. An example of the COC form is presented in Attachment 2.

5.3 Transfer of Custody and Shipment-External

5.3.1 Samples are to be accompanied by an approved COC record. When the possession of samples are transferred, the individual relinquishing the samples signs and records the date and time on the COC document. The individual receiving the samples repeats the procedure. This record represents the official documentation for all transference of the sample custody until samples have arrived at the laboratory.

5.3.2 If samples are to be split with another laboratory facility or governmental agency, a separate COC record is prepared for those samples. This COC record indicates with whom the samples have been split and is appropriately signed and dated with the time of transfer of splits.

5.4 Laboratory Custody Procedures-Internal

5.4.1 The Sample Control program describes the laboratory custody procedures associated with sample receipt, storage, preparation, analysis and security. Sample control is maintained at SWLO through the use of several tracking systems designed to protect sample integrity. Tracking systems include the use of laboratory COC procedures and sample analysis requests (in the form of worksheets), Internal Chain of Custody forms, the Laboratory Information Management System (LIMS), Laboratory log Books (Extraction, Digestion and Analytical Run Logs).

5.4.2 Sample Tracking

5.4.2.1 An overview of the sample tracking and Internal Chain of Custody, (ICOC) procedure to be employed is presented in the Attachment 3 flow diagram. It includes the following components:

- Laboratory COC documentation is initiated by the SC when the sample is relinquished by the courier.
- After sample shipment arrival, the SC begins sample inspection and log-in. All samples are inspected: comparisons are made between the clients' paperwork and that paperwork supplied by the Project Officer. Anomalies are noted and resolved with the client.
- Suspected Radioactive samples are handled and "screened" by the Radiation Safety Officer or Designee as per SOP, SWL-RD139 in the Radiation Control Area.
- Each sample is assigned a unique SWLO laboratory identification number, which is cross-coded with the client's identification. Sample identification information is entered into the computerized

- laboratory database, and the assigned number is used to track sample locations and status throughout the analytical process.

5.4.2.2 The following sample information is recorded into the computerized laboratory database system:

- Customer and project information
- Date of receipt
- Client identification
- Date sampled
- Matrix Type
- Number of containers
- Analytical requirements
- Other pertinent comments
- Radiation Screening results (RAD samples only)

5.4.2.3 The SC logs in samples with the tests and test code information supplied by the project officer.

5.4.2.4 The field COC document is completed and copies returned to the appropriate party(s).

5.4.2.5 After the sample is logged in, an Internal COC form (see Attachment 4) is generated. A facility transfer sheet (Attachment 5) is completed for those tests performed at one of our affiliated facilities. Analytical tests not performed by SWLO/AATS or affiliates (i.e. physical parameters such as Porosivity, Bulk Density, and Atterburg Limits), are transferred using an Outside Analytical Services request Form (Attachment 6).

5.4.2.6 This ICOC (Attachment 4) documents the movement of the sample within the laboratory from storage to sample preparation and back to sample storage.

5.4.2.7 When all analyses are complete, ICOC documents are filed with appropriate data in the report file.

5.4.2.8 Samples that are depleted with the analytical process are recorded on the pitched bottle log (Attachment 8). The remaining sample volumes are archived. A monthly archive list is generated from LIMS (Attachment 7) samples and extracts are moved into Archive following report generation and stored for another 90 days (1yr. for

extracts). Following the archive period, samples/extracts are disposed of. Records of disposal are maintained on the Sample Disposal Forms (see SWL-GA-114 Standard Operating Procedure for Hazardous Waste Management).

Drum numbers listed on the disposal forms are recorded on the manifest upon transportation to the waste incinerating company.

5.4.2.9 In addition to the internal and external COC documents, a computer-generated listing of the sample analysis parameters is used to control sample flow and facilitate tracking within the laboratory. Each laboratory unit is given the list of parameters and is responsible for maintaining sample integrity (holding time), fulfilling COC requirements, scheduling sample flow, and tracking sample status.

6.0 RECORDS — All initial paperwork (i.e., Chain of Custody, Sample Log-In Forms: OE-1, cooler Receipt Forms, etc.

6.1 Field Chain of Custody's are maintained (after sample log-in), in either the reporting department files, the organic data assembly files or the inorganic data assembly files until reporting. Originals or copies are sent back to the client with the report.

6.2 Internal Chain of Custody sheets, used by analysts to sign samples in or out, are located outside the walk-in cooler storage. Upon completion, the Internal COC is incorporated into the case file.

7.0 REFERENCES — N/A

8.0 ATTACHMENTS — See the following 8 Attachments.

9.0 DEFINITIONS — N/A

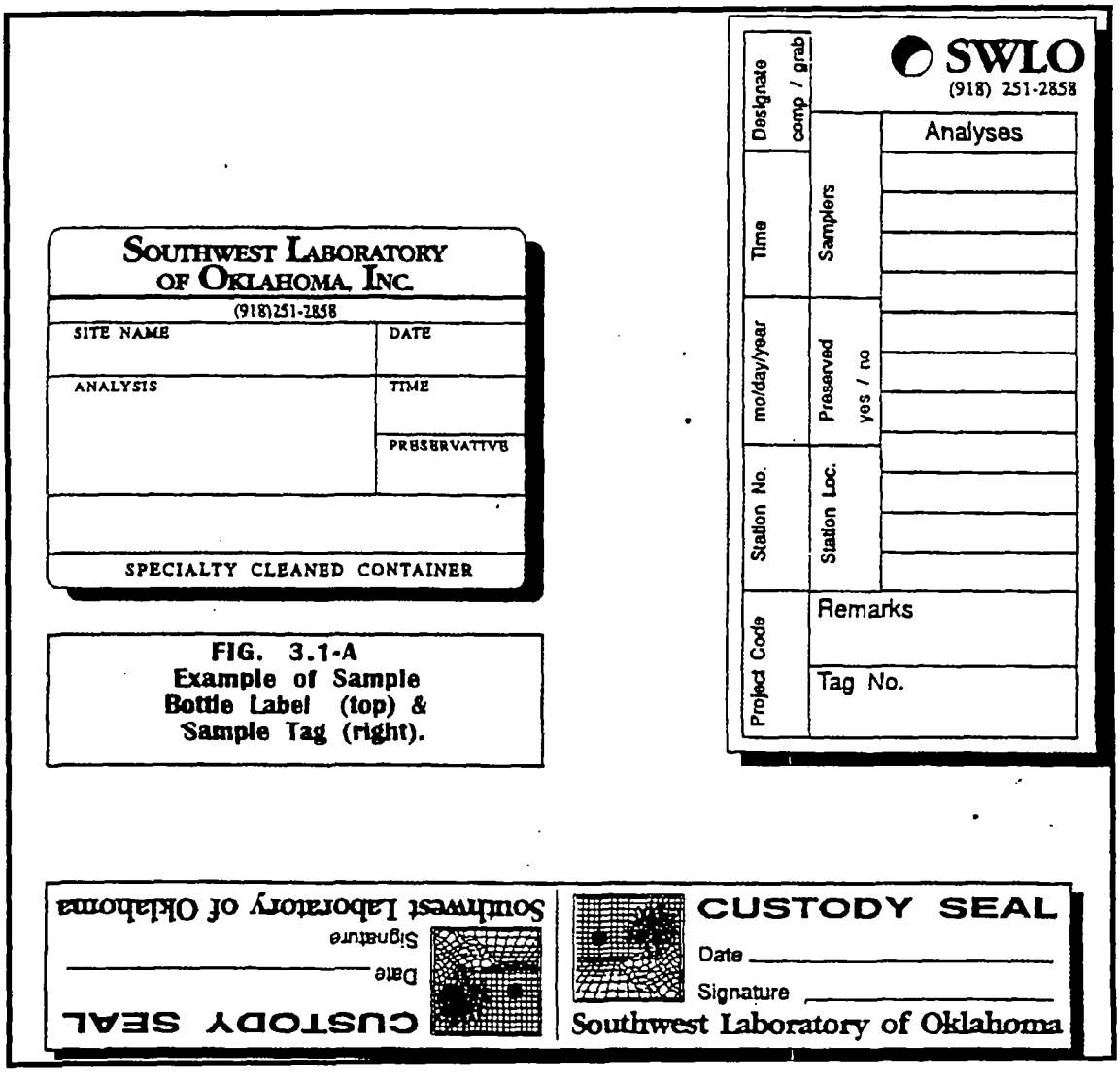
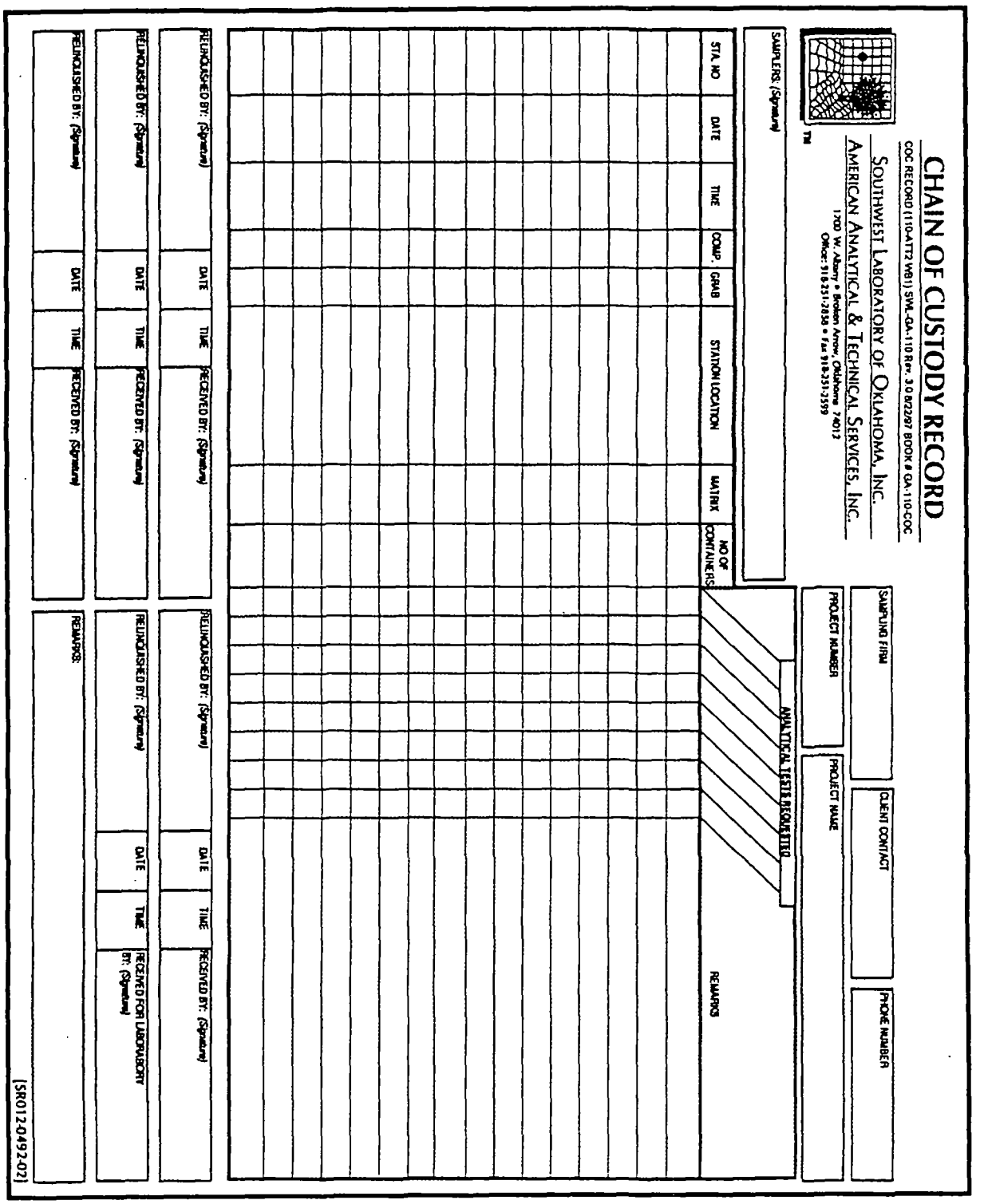


FIG. 3.1-A
Example of Sample Bottle Label (top) & Sample Tag (right).

ATTACHMENT 1
Example Custody Seal for Sample Containers/Coolers



CHAIN OF CUSTODY RECORD

COC RECORD (110-ATT2 WB1) SWL-GA-110 Rev. 3.0 8/22/97 BOOK # GA-110-COC

SOUTHWEST LABORATORY OF OKLAHOMA, INC.
AMERICAN ANALYTICAL & TECHNICAL SERVICES, INC.
1700 W. Albany • Broken Arrow, Oklahoma 74012
Office: 918.251.2858 • Fax 918.251.3599

TM

SAMPLERS: (Signature)

SAMPLING FIRM | CLIENT CONTACT | PHONE NUMBER

PROJECT NUMBER | PROJECT NAME

ANALYTICAL TESTS REQUESTED

STA. NO	DATE	TIME	COMP.	GRAB	STATION LOCATION	MATRIX	NO OF CONTAINERS	REMARKS

RELINQUISHED BY: (Signature) | DATE | TIME | RECEIVED BY: (Signature)

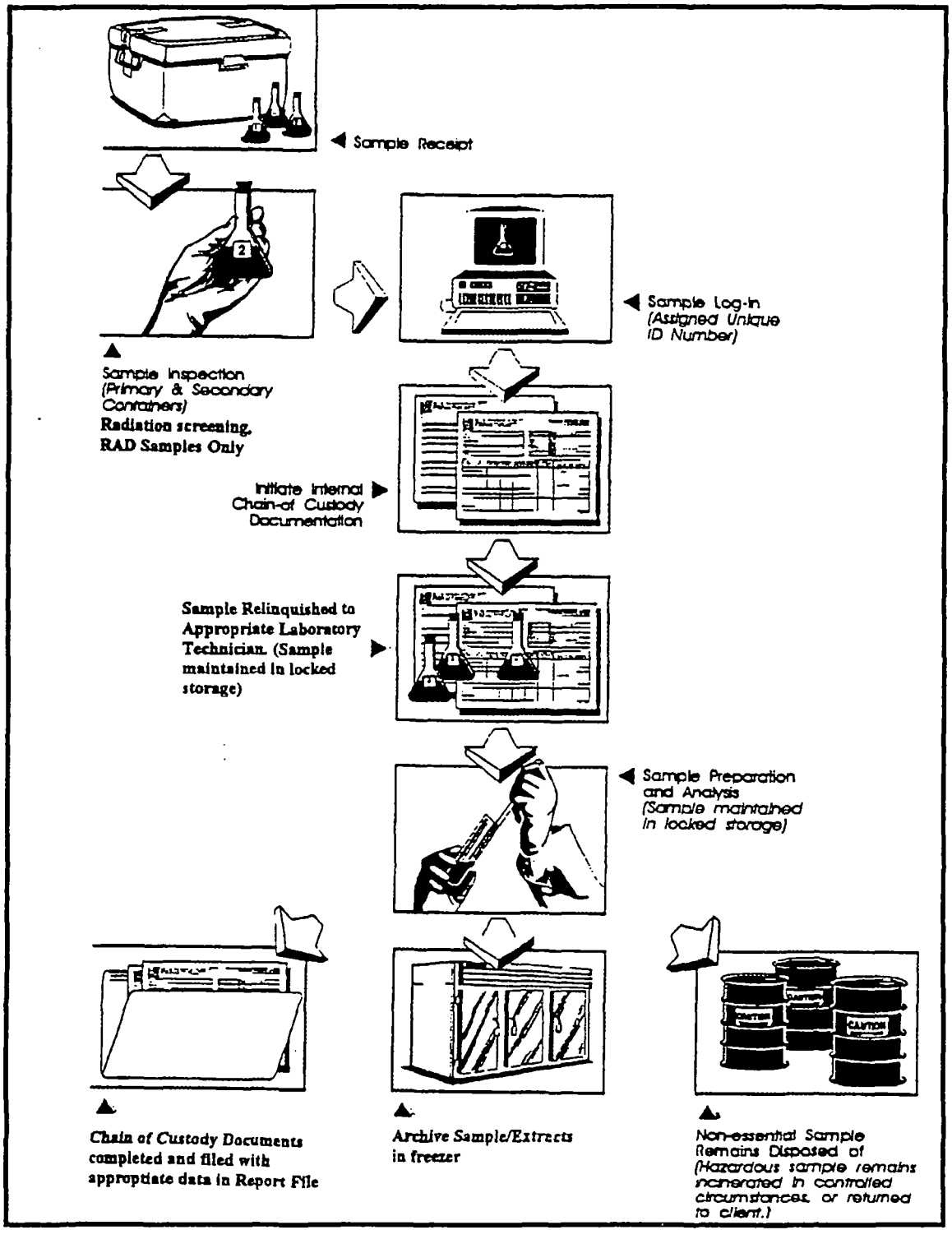
RELINQUISHED BY: (Signature) | DATE | TIME | RECEIVED BY: (Signature)

RELINQUISHED BY: (Signature) | DATE | TIME | RECEIVED FOR LABORATORY BY: (Signature)

REMARKS:

(SR012-0492-02)

ATTACHMENT 2
Chain of Custody Record



ATTACHMENT 3
Chain of Custody Sample Tracking Flow Diagram

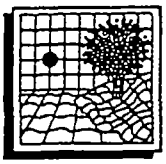
SOUTHWEST LABORATORY OF OKLAHOMA, INC.

INTERNAL COC

Client: EPAMT136 Project: 25653
Episode: 30817

Test Code	Cont ID	Samp. #	Samp. #	Samp. #	Samp. #	Samp. #	Samp. #	Location (ref/shelf)	Date/Time Out	Analyst	Date/time In
IN120	A	7	9					#9	9/8 11:00		9/8 100
	B	1	2	6	8						
	C	5									
	D	5									
MT310	A	1 8	2	3	4	5	6				
	B	5									
MT600	A	1 8	2	3	4	5	6		9-8/600	JDL	9-8/330
	B	5									
MT620	A	1 8	2	3	4	5	6		9-9 6:00		9-9/330
	B	5									
MT810	A	1 8	2	3	4	5	6				
	B	5									
MT813	A	1 8	2	3	4	5	6				
	B	5									

ATTACHMENT 4
Internal COC



FACILITY TRANSFER SHEET

SAMPLE RECEIVING DEPARTMENT

ANALYTICAL SERVICES REQUEST

FACILITY TRANSFER SHEET (110-ATT5.WB1) SWL-GA-110 Rev. 3.0 8/22/97 BOOK # GA-110-FACLTRANS

TM

Laboratory:	Date Results Required:
SWL Contact:	Comments:

SWL Sample #	Sample Matrix	No. of Containers	Testing Parameters							

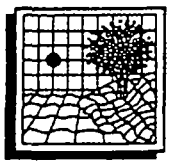
Sample Matrix Key: *S = Soil* *SL = Sludge* *W = Water* *P = Petroleum* *O = Other*

CHAIN-OF-CUSTODY:

Relinquished by:	Date/Time	Received by:
Relinquished by:	Date/Time	Received for lab by:

SOUTHWEST LABORATORY OF OKLAHOMA, INC.
1700 W. ALBANY • BROKEN ARROW, OKLAHOMA 74012 • OFFICE (918) 251-2858 • FAX (918) 251-2599 [SR001-1093-02]

ATTACHMENT 5
Facility Transfer Sheet



OUTSIDE ANALYTICAL SERVICES REQUEST

SAMPLE RECEIVING DEPARTMENT

OUTSIDE ANALYTICAL SERVICES REQUEST (110-ATT6 WB1) SWL-GA-110 Rev. 3.0 8/22/97 BOOK # GA-110-OUTANSRVREQ

TM

Laboratory:	Date Results Required:
SWL Contact:	Comments:

SWL Sample #	Sample Matrix	No. of Containers	Testing Parameters							

Sample Matrix Key: *S = Soil* *SL = Sludge* *W = Water* *P = Petroleum* *O = Other*

CHAIN-OF-CUSTODY:

Relinquished by:	Date/Time	Received by:
Relinquished by:	Date/Time	Received for lab by:

SOUTHWEST LABORATORY OF OKLAHOMA, INC.
1700 W. ALBANY • BROKEN ARROW, OKLAHOMA 74012 • OFFICE (918) 251-2858 • FAX (918) 251-2599

[SR018-1093-01]

ATTACHMENT 6
Outside Analytical Services Request

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

ARCHIVE RECORD SHEET (110-ATT7.WB1) SWL-GA-110 Rev. 3.0 8/22/97 BOOK # GA-110-ARCHRECRD

Page 4

SAMPLES READY TO BE ARCHIVED

ARCHIVE DATE 08-29-97
DISPOSAL DATE 11-27-97

SAMPLE	CLIENT	DESCRIPTION	MATRIX	LOGIN
30295.01	AATS-E	CNK19 (CASE#25586)	W	07/25/97
30295.02	AATS-E	CNK20 (CASE#25586)	W	07/25/97
30295.03	AATS-E	CNK21 (CASE#25586)	W	07/25/97
30295.04	AATS-E	CNK23 (CASE#25586)	W	07/25/97
30295.05	AATS-E	CNK24 (CASE#25586)	S	07/25/97
30295.06	AATS-E	CNK25 (CASE#25586)	S	07/25/97
30295.07	AATS-E	CNK26 (CASE#25586)	S	07/25/97
30295.08	AATS-E	CNK28 (CASE#25586)	S	07/25/97
30295.09	AATS-E	CNK29 (CASE#25586)	W	07/25/97
30295.10	AATS-E	CNK30 (CASE#25586)	W	07/25/97
30295.11	AATS-E	CNK31 *QA/QC	W	07/25/97
30295.12	AATS-E	CNK32 (CASE#25586)	W	07/25/97
30295.13	AATS-E	CNK33 (CASE#25586)	W	07/25/97
30310.01	EPAMT137	MJP235 (CASE#25589)	S	07/25/97
30310.02	EPAMT137	MJP236 (CASE#25589)	S	07/25/97
30310.03	EPAMT137	MJP237 (CASE#25589)	S	07/25/97
30310.04	EPAMT137	MJP238 (CASE#25589)	S	07/25/97
30310.05	EPAMT137	MJP239 (CASE#25589)	S	07/25/97
30310.06	EPAMT137	MJP240 (CASE#25589)	S	07/25/97
30310.07	EPAMT137	MJP241 (CASE#25589)	S	07/25/97
30310.08	EPAMT137	MJP242 *QA/QC	S	07/25/97
30310.09	EPAMT137	MJP243 (CASE#25589)	S	07/25/97
30310.10	EPAMT137	MJP244 (CASE#25589)	W	07/25/97
30310.11	EPAMT137	MJP322 (CASE#25589)	S	07/25/97
30310.12	EPAMT137	MJP323 (CASE#25589)	S	07/25/97
30310.13	EPAMT137	MJP324 (CASE#25589)	S	07/25/97
30310.14	EPAMT137	MJP325 (CASE#25589)	S	07/25/97
30310.15	EPAMT137	MJP326 (CASE#25589)	S	07/25/97
30310.16	EPAMT137	MJP328 (CASE#25589)	S	07/25/97
30310.17	EPAMT137	MJP330 (CASE#25589)	S	07/25/97
30310.18	EPAMT137	MJP331 (CASE#25589)	S	07/25/97

ATTACHMENT 7
Archive Record Sheet

PITCHED BOTTLES

PITCHED BOTTLE LOG (110-ATT8.WB1) SWL-GA-110 Rev. 3.0 BOOK # GA-110-PTCHBOTL

DATE	SAMPLE #	CLIENT	ANALYST

Southwest Laboratory of Oklahoma, Inc. / American Analytical & Technical Services, Inc.
1700 W. Albany • Broken Arrow, Oklahoma 74012 • Office (918)251-2858 • Fax (918)251-2599

ATTACHMENT 8
Pitched Bottles Log

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

AMERICAN ANALYTICAL & TECHNICAL SERVICES, INC.

Standard Operating Procedure

Sample Custodian

Document No.: SWL-GA-115

Rev No. / Date: Rev. 5.0 — 10/28/97

APPROVALS	DATES
Chuck Hoover Procedure Prepared By	10/28/97 Date
Stan L. Mathis Laboratory Manager or Director	04/29/98 Date
Mitch Butts Laboratory Safety Officer	4/29/98 Date
Chuck Hoover Laboratory QA/QC Officer	4/28/98 Date

(Effective Date is 10 calendar days after the last signature above - QA/QC Officer)

Document Status

[ ] Controlled DC No. _____ Issued to:_____ Date:_____ QA Initials:____

[✓] Official Copy OC No.: 2100 Issued to: Greg Neiman Date: 6/9/98 QA Initials: GH

SAMPLE CUSTODIAN

TABLE OF CONTENTS

ATTACHMENTS

1.0 PURPOSE & APPLICATION. The Sample Custodian is the person who initiates the receipt of samples into the laboratory. It is the purpose of this Standard Operating Procedure to make uniform the duties/procedures needed to ensure that sample integrity and documents associated with that integrity are properly performed.

2.0 RESPONSIBILITIES. The Sample Custodian (SC) for the laboratory has duties and responsibilities that include but are not limited to:

2.1 Receiving/Inspecting shipping coolers.

2.2 Noting the integrity/ temperature of samples on appropriate forms.

2.3 Signing Chain-of-Custody (COC) documents (Attachment 1).

2.4 Verifying agreement between the COC and the samples.

2.5 Taking pH of all applicable containers to verify sample preservation.

2.6 Logging samples; labeling containers.

2.7 Placing samples in appropriate storage.

2.8 Documenting cooler/ sample information on Cooler Receipt/Sample Log-in Sheet (Attachment 2).

NOTE: EPA has a separate log-in form: FORM-DC-1.

2.9 Distriibution of paperwork to appropriate laboratories.

2.10 Archiving reported samples to appropriate storage.

2.11 Disposal of expired samples.

2.12 Calibration of temperature reading device.

2.13 Monitoring storage temperatures.

2.14 Maintaining a secure area.

3.0 EQUIPMENT

3.1 Box knife or equivalent.

3.2 Infra-red temperature Gun Raytech Model _____or equivalent.

3.3 pH paper, ranges: 1 to 6 pH and 6 to 12 pH.

3.4 Sample Transfer Carts.

3.5 LIMS Access.

3.6 HP Laser Jet Printer or equivalent.

4.0 **PRECAUTIONS.** Refer to the Laboratory Safety Plan GA-111 for safety precautions.

5.0 **PROCEDURE**

5.1 Sample Receipt.

5.1.1 Receiving & Inspecting Samples.

5.1.1.1 Upon arrival at the Laboratory, all sample shipping coolers-except potentially radioactive coolers which are handled only by the Radiation Safety Officer (RSO) or designee-are inspected for the following and documented on the Cooler Receipt/Sample Log-In Sheet. (See Attachment 2).

- Condition of cooler
- Presence/absence, and condition of Custody Seals.
- Labeling on cooler

5.1.1.2 Coolers are identified on the Cooler Receipt/Sample Log-In Sheet as follows:

- Client code
- Date
- Container # (Example: EPA-09/01/97-1)

5.1.2 After hour receipt

5.1.2.1 For after-hour sample receipt, a designated person shall receive the samples and store them properly for sample log-in processing the next business day.

5.1.2.2 The designee shall leave a notice in Sample Receiving showing what was received and the refrigerator number in which the cooler is located.

5.1.3 Opening Cooler

5.1.3.1 All shipping containers shall be opened under an exhaust hood or an approved, well-ventilated area.

5.1.3.2 The temperature of a representative sample or provided temperature blank is measured using the non-contact I.R thermometer gun.

5.1.3.3 The COC is removed from the cooler, and the temperature is recorded in the lower right corner. The bias of IR thermometers from the monthly calibration check (see section 5.8) is also recorded at the cooler temperature on the Cooler Receipt/Sample Log-In Sheet (See Attachment 2).

5.1.3.4 The COC is signed by the Sample Custodian.

5.1.3.5 A copy of the COC is taken to the PO for completion of an Analytical Request Form (ARF).

An ARF (see Attachment 3) consists of the following:

- Client info./client code
- Project name/number
- Sample ID from COC
- Sample matrix
- Analysis to be performed
- Turn around time
- Special Provisions
- Deliverable information

5.2 Sample Log-In

5.2.1 Sample Verification

5.2.1.1 Samples are removed from the cooler and set out in the order of the ARF form. At this time any problems with the samples are noted on the Cooler Receipt/Sample Login Sheet. Any problems discovered may consist of the following:

- Breakage
- Leakage
- Sample ID discrepancy on the COC verses the sample bottle and vice versa.
- Incorrect preservative or absence of preservative.(See Attachment 13).
- Insufficient volume for analysis requested.
- Odor of a sample.

- Presence of headspace in volatile samples.

5.2.1.2 The SC verifies pH of all applicable containers for sample preservation (see Attachment 13). Verification procedures are as follows:

- Disposable plastic cups are laid out corresponding to the layout of samples on table.
- A small piece of pH paper is placed in the bottom of each plastic cup.

NOTE: The pH must be less than 2, for 1-6 pH paper used for acids. The pH must be greater than or equal to 12, for 6-12 pH paper used for caustic preservation.

- The SC pours a small amount of the sample into its plastic cup, watching the paper for a change in color (which determines the pH level).
- The SC shall document level of pH on the Cooler Receipt/Sample Log-In Sheet and notify the PO if any of the following are also determined:

  Absence of a preservative
  Incorrect preservative present
  pH above or below required range
  Incorrect analysis and/or preservative labeling

  The PO may then decide to add preservation in the laboratory.

5.2.2 Procedure for Log-In of Samples

5.2.2.1 After samples are set out and all pertinent information has been recorded, the samples are then logged into the Laboratory Information Management System (LIMS).

- A group of samples is assigned a unique number called an episode number. This number is generated by the LIMS system and is a sequential, non-repeating number. (e.g. 23456).
- Each sample in the episode is assigned a unique sample number. Sample numbers follow the episode number and a decimal point. (e.g. 23456.01, 23456.02).
- Individual sample containers are assigned a unique alpha character to assure each container received is accounted for in the LIMS. (e.g. 23456.01A, 23456.01B, 23456.02A, 23456.02B)

5.2.2.2 As samples are logged in, LIMS automatically generates a worksheet (Attachment 4) and container labels simultaneously.

- The worksheet gives a full scope of the samples logged in, identifying each sample separately and the specific analysis for each sample bottle.
- The LIMS system is capable of assigning 99 samples per episode, and 26 containers per sample number.

5.2.2.3 Following a login review (see SOP, SWL-GA-135), photocopies of the worksheet, along with any associated paperwork, are distributed to the appropriate laboratory departments. This worksheet package consists of the following:

- LIMS worksheet
- Any special compound lists and/or attachments provided by the client or PO
- COC documents
- Cooler Receipt / Sample Log-In Sheet.
- ARF
- Shipping document/ Airbill

The SC retains an additional copy of the worksheet package for the Sample Receiving area and sends the original to the Reporting Department files.

5.3 Sample Storage

5.3.1 Immediately after samples have been logged in and labeled with laboratory ID, they are put into their appropriate storage area.

5.3.2 All refrigerators in the Sample Receiving area are designated for specific types of samples. (See Attachment 14). Listed below are the refrigerators currently located in the Sample Receiving area:

5.3.2.1 #7 Volatile Samples

5.3.2.2 #4 EPA volatile samples

5.3.2.3 #8 Inside walk-in

5.3.2.4 #9 Current walk-in

5.3.2.5 #12 Archive walk-in

5.3.2.6 #18 Radioactive Materials Controlled Area (RMCA walk-in)

5.3.3 Descriptions of Appropriate Storage for Each Refrigerator

5.3.3.1 The #7 refrigerator contains only volatile samples - both water and soil matrices.

5.3.3.2 The #4 EPA refrigerator contains only EPA volatile samples.

5.3.3.3 The #8 walk-in contains archived volatile samples, as well as samples to be transferred to other facilities for outside service.

5.3.3.4 The #9 walk-in contains all in-use (current) organic and inorganic samples. No potentially radioactive samples or volatiles samples are stored in #9.

5.3.3.5 Walk-in #12 contains samples that are already reported and have been archived into storage, awaiting disposal in 90 days.

5.3.3.6 The RMCA walk-in (#18) contains and is restricted to potentially radioactive samples. Authorized personnel only are allowed in this walk-in!!!

5.3.3.7 Aqueous metal samples for Navy projects will be stored on shelves in the sample receiving area (stored at room temperature), unless specified otherwise by the client's QAPP.

5.3.4 Southwest Laboratory of Oklahoma is a secure facility, allowing access by authorized personnel only to the storage facilities.

5.3.5 Internal Chain-Of-Custody. An Internal (COC) is generated from LIMS at the same time as samples are put into storage. The ICOC (Attachment 8) is put in a 3 ring binder outside the sample storage units; analysts are to sign samples out and into storage via use of this form. Samples that are used and not returned to storage are logged into the pitched bottle log. (Attachment 11).

5.4 Sample Document Verification

5.4.1 Verification of Documents

5.4.1.1 The SC will compare the following documents to verify agreement among the information contained on them:

- COC.
- Sample tags.
- Analytical Request Form.

- The SC shall document agreement and note any discrepancies found among the forms on the Cooler Receipt/Sample Login sheet.

5.4.1.2 The SC will note and record problems in the "remarks" box.

- SC may reference another form, such as the COC, that details the problems.
- The SC reports discrepancies to the PO for client clarification. The discussion and resolution are documented on the Client/Laboratory Communication Form (Attachment 5). These forms are then included in the Case File.

5.5 Sample Splitting/ Facility Transfer

5.5.1 Procedure for Splitting Samples

5.5.1.1 When clients supply their own containers or when bulk samples are received, the SC may split the samples to provide sufficient aliquots for each analysis to be performed. To determine the manner in which samples are split, the PO will notify the client of the necessity to split the sample and request his instructions.

5.5.2 Procedure for Facility Transfer

5.5.2.1 For samples which require analytical protocols performed in one of SWLO affiliated laboratories or an outside laboratory, a Facility Transfer Sheet or Outside Analytical Services Request Form are completed (Attachment 6 & 7).

5.5.2.2 The form is sent to that facility along with the samples and a copy of the worksheet, and client Chain-of-Custody forms.

5.5.2.3 Samples are returned to the Broken Arrow facility after analysis as per the SOP SWL-GA-134 (Facility Transfers).

5.6 Log-in Modification/Cancellation

5.6.1 A Sample Modification/Cancellation Request form (Attachment 9) should be completed and approved for any modification or cancellation requests of a sample or analysis.

5.6.2 Upon receipt of this Modification Request Form, the SC shall update LIMS accordingly.

5.6.3 When modification or cancellation is completed in LIMS, the original form will accompany a corrected worksheet to the project file. A copy of the new worksheet will be kept in Sample Receiving, and additional copies will be distributed to the laboratory.

5.7 Sample Archive.

5.7.1 Each morning the LIMS generates a list of samples ready to be archived. These selected samples were reported the previous day. The archive list (Attachment 12) shows the SC the following:

5.7.1.1 SWLO sample ID.

5.7.1.2 Client code.

5.7.1.3 Client sample ID.

5.7.1.4 Matrix.

5.7.1.5 Original log-in date.

5.7.1.6 Archive date.

5.7.1.7 Disposal date.

5.7.2 The SC uses the archive list to record the moving of spent samples from walk-in #9 to walk-in #12 for 90-day storage.

5.7.2.1 Samples found on the archive list are taken off the shelf in #9 and placed into a box, as the SC highlights the sample on the archive list.

5.7.2.2 Once a box is full, the SC slides the archive list(s) into a plastic jacket taped to the side of the box. The clear plastic jacket allows the SC to see the highlighted samples to determine the contents of the box.

5.7.2.3 Soils and waters are archived separately to eliminate sorting them out at the time of disposal.

5.7.3 When pulling archival boxes from walk-in #12 for disposal, the SC uses the disposal date on the archive list to determine which samples have expired. Disposal procedures may be found in the Hazardous Waste SOP.

5.8 Calibration Check of Infra-red thermometer gun

5.8.1 The Infra-red thermometer is checked against one of the NIST traceable sample receiving thermometers.

5.8.1.1 The check is performed monthly.

5.8.1.2 The check is documented in a calibration log with the I.R. Gun reading, the NIST traceable thermometer reading, and the NIST traceable thermometer I.D. #.

5.9 Monitoring Storage Temperatures.

5.9.1 The SC is responsible for monitoring the temperature of all storage refrigerators in the Sample Receiving area each morning, excluding weekends and holidays.

5.9.2 A glycerin thermometer including a serial number can be found in each refrigerator.

5.9.3 The temperature from each thermometer is recorded in the SR Zone Calibration Checks log found in the Sample Receiving area. This log provides a specific entry space for each refrigerator and for every day of the month. (See Attachment 10), and allows the SC to record:

5.9.3.1 Time of the check.

5.9.3.2 His/ Her Initials.

5.9.3.3 Temperature.

5.9.3.4 Affirmation that the temperature recorded was within accepted limits.

5.9.3.5 Corrective Action.

- If the temperature is outside of accepted limits, the laboratory manager or designee shall be notified immediately.
- In the event of unit failure, a repairman will be called out as soon as possible. The SC shall transfer all current samples to an alternate storage refrigerator temporarily.

6.0 RECORDS

6.1 Original field Chain Of Custody, Airbills, Sample Tags, Cooler Receipt/Sample Log-In Sheet. The Project Officer's Analytical Request Form, and Laboratory work sheet go to data reporting's case files.

6.2 Copies of the above documents are maintained in a sequential three ring binder.

6.3 The Internal Chain Of Custody upon completion is also placed in the case file. (Maintained in the data reporting section).

6.4 Facility Transfer sheet to and from Tulsa-55th Place Facility as with the Internal COC are also placed in the case file.

7.0 REFERENCES. Not Applicable.

8.0 ATTACHMENTS. (See Attachment's 1 through 14).

9.0 DEFINITIONS

COC:.....Chain of Custody. Field document used here to document and relinquish custody of sample from field to Laboratory.

Internal COC:.....Internal Chain of Custody. Document used to record custody of samples through the laboratory.

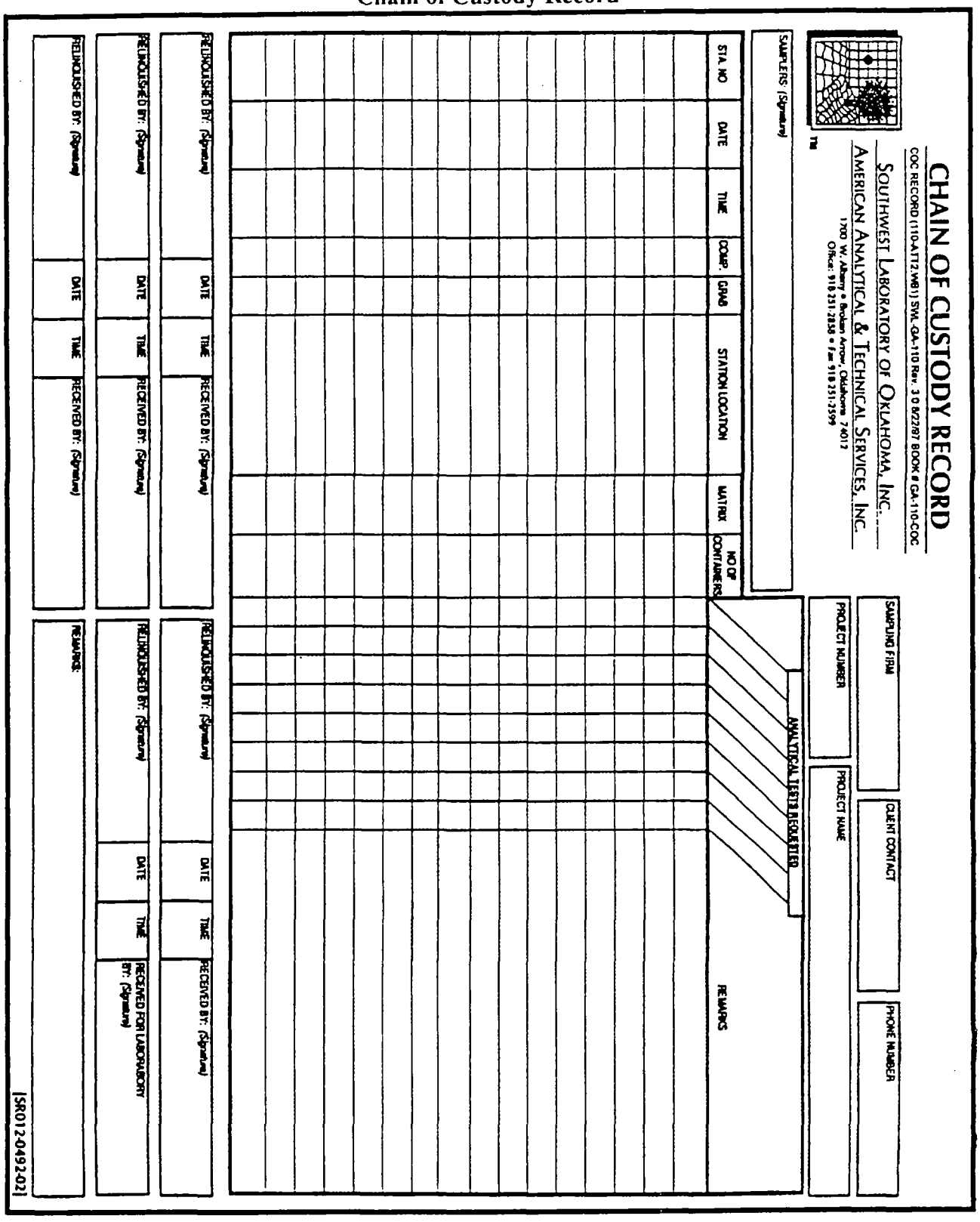
DC-1:.....Document Control-Form #1. Used as initial Laboratory sample log-in document.

ARF:.....Analytical Request Form. A form completed by the Project Officer and used by the SC, to detail what analyses is required for each sample.

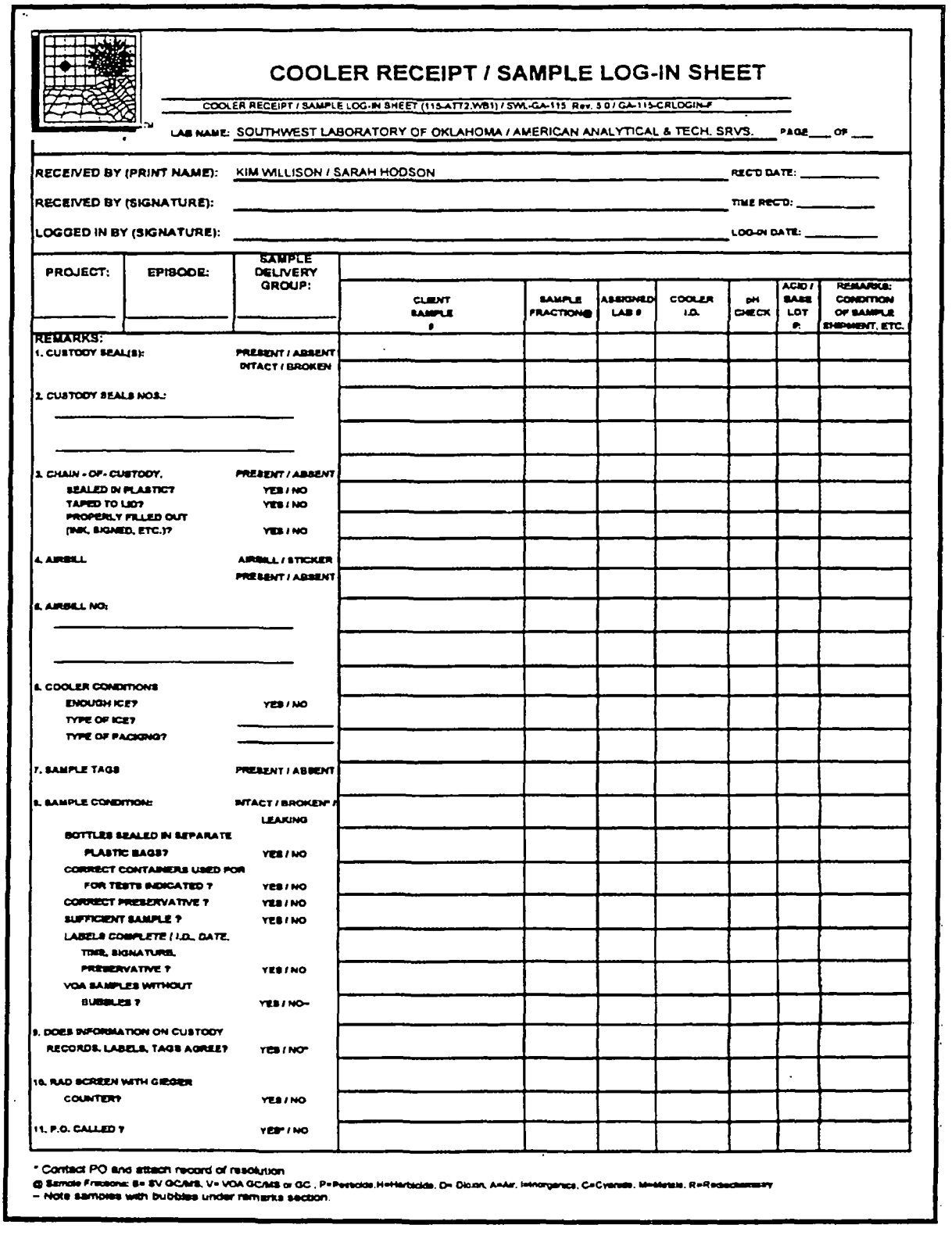
LIMS:.....Laboratory Information Management System

RMCA:.....Radioactive Materials Controlled Area

ATTACHMENT 1
Chain of Custody Record



ATTACHMENT 2
Cooler Receipt / Sample Log-In Sheet



COOLER RECEIPT / SAMPLE LOG-IN SHEET

COOLER RECEIPT / SAMPLE LOG-IN SHEET (115-ATT2.WB1) / SWL-GA-115 Rev. 5.0 / GA-115-CRLOGIN-F

LAB NAME: SOUTHWEST LABORATORY OF OKLAHOMA / AMERICAN ANALYTICAL & TECH. SRVS. PAGE ___ OF ___

RECEIVED BY (PRINT NAME): KIM WILLISON / SARAH HODSON REC'D DATE: _____

RECEIVED BY (SIGNATURE): _____ TIME REC'D: _____

LOGGED IN BY (SIGNATURE): _____ LOG-IN DATE: _____

PROJECT:	EPISODE:	SAMPLE DELIVERY GROUP:

REMARKS:

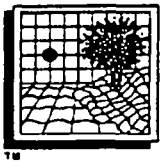
1. CUSTODY SEAL(S): PRESENT / ABSENT
   INTACT / BROKEN
2. CUSTODY SEALS NOS.: _____
3. CHAIN - OF - CUSTODY, PRESENT / ABSENT
   SEALED IN PLASTIC? YES / NO
   TAPED TO LID? YES / NO
   PROPERLY FILLED OUT (INK, SIGNED, ETC.)? YES / NO
4. AIRBILL AIRBILL / STICKER PRESENT / ABSENT
5. AIRBILL NO: _____
6. COOLER CONDITIONS
   ENOUGH ICE? YES / NO
   TYPE OF ICE? _____
   TYPE OF PACKING? _____
7. SAMPLE TAGS PRESENT / ABSENT
8. SAMPLE CONDITION: INTACT / BROKEN* / LEAKING
   BOTTLES SEALED IN SEPARATE PLASTIC BAGS? YES / NO
   CORRECT CONTAINERS USED FOR FOR TESTS INDICATED ? YES / NO
   CORRECT PRESERVATIVE ? YES / NO
   SUFFICIENT SAMPLE ? YES / NO
   LABELS COMPLETE / I.D., DATE, TIME, SIGNATURE, PRESERVATIVE ? YES / NO
   VOA SAMPLES WITHOUT BUBBLES ? YES / NO~
9. DOES INFORMATION ON CUSTODY RECORDS, LABELS, TAGS AGREE? YES / NO*
10. RAD SCREEN WITH GIEGER COUNTER? YES / NO
11. P.O. CALLED ? YES* / NO

CLIENT SAMPLE #	SAMPLE FRACTION@	ASSIGNED LAB #	COOLER I.D.	pH CHECK	ACID / BASE LOT #:	REMARKS: CONDITION OF SAMPLE SHIPMENT, ETC.

* Contact PO and attach record of resolution
@ Sample Fractions: S= SV GC/MS, V= VOA GC/MS or GC , P=Pesticide,H=Herbicide, D= Dioxin, A=Air, Inorganics, C=Cyanide, M=Metals, R=Radiochemistry
~ Note samples with bubbles under remarks section.

ATTACHMENT 3
Analytical Request Form

PAGE 1



Analytical Request Form, SWL-GA-131

Analytical Request Form (131att3f.wb1) SWL SOP Rev.1.1Form ID: GA-131-ARF-F

CLIENT: _____ CLIENT CODE: _____
CONTACT: _____ PHONE NO: _____
PROJECT: _____ PO #: _____
LOCATION: _____ RCPT DATE: _____
DELIVERABLES: _____ SAMPLE TAT: _____
SDG: _____

CLIENT SAMPLE ID	SAMPLE MATRIX											

SPECIAL PROVISIONS: _____

BILLING ADDRESS: _____
REPORTING ADDRESS: _____
SWL PROJECT OFFICER: _____ DATE PREPARED: 28-Oct-97

Southwest Laboratory of Oklahoma, Inc. / American Analytical & Technical Services, 1700 W. Albany, Broken Arrow, Oklahoma 74012, Office (918)251-2858 Fax(918)251-2599

ATTACHMENT 4
Sample Log-In Record

SOUTHWEST LABORATORY OF OKLAHOMA, INC.
1700 W. ALBANY SUITE C
BROKEN ARROW, OK 74012-1421

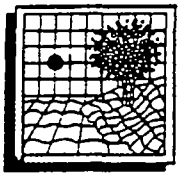
Date: 09/19/97
Episode: 31053
Client: EPA
Project: 25678

SAMPLE LOG-IN RECORD

SAMPLE #	DATE IN	DESCRIPTION	SDG	MA	NC	TEST	PRI	DUE	CONTAINER	DESCRIPTION	RESULTS	ANALYST	DATE/TIME
31053.01	09/17/97	BJF67 (CASE#25678) Sampled: 09/16/97 Type: RIN		W	2	MS517	4	10/07/97	AB	BNA CLP OLM03.			
										EXTRACTION			
31053.02	09/17/97	BJF68 (CASE#25678) Sampled: 09/16/97		S	1	IN660	8	09/18/97	A	% MOISTURE			
						MS517	4	10/07/97	A	BNA CLP OLM03.			
										EXTRACTION			
31053.03	09/17/97	BJF69 (CASE#25678) Sampled: 09/16/97		S	1	IN660	8	09/18/97	A	% MOISTURE			
						MS517	4	10/07/97	A	BNA CLP OLM03.			
										EXTRACTION			
31053.04	09/17/97	BJF70 (CASE#25678) Sampled: 09/16/97		S	1	IN660	8	09/18/97	A	% MOISTURE			
						MS517	4	10/07/97	A	BNA CLP OLM03.			
										EXTRACTION			
31053.05	09/17/97	BJF71 *QA/QC Sampled: 09/16/97		S	1	IN660	8	09/18/97	A	% MOISTURE			
						MS517	4	10/07/97	A	BNA CLP OLM03.			
										EXTRACTION			

Total samples = 5

ATTACHMENT 5
Client / Laboratory Communication Form



CLIENT/LABORATORY COMMUNICATION FORM, SWL-GA-171

Client Laboratory Communication Form (171-fig4.doc), SWL SOP Rev. 1.0, Form ID: GA-171-COMM-F

TELEPHONE RECORD LOG

➤ In Reference to Case Contract/Proposal:

➤ Date of Call:

➤ Client Name:

➤ Client Contact:

➤ Call Initiated By: ☐ Client ☐ Laboratory

➤ In reference to data for the following sample number(s):

➤ Sumary of Questions/Issues Discussed:

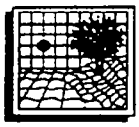
➤ Summary of Resolution:

Signature: *Date:*

➤ Distribution: ✔ White/Lab Copy ✔ Yellow/Client Copy ✔ Pink/Project Officer Copy

SOUTHWEST LABORATORY OF OKLAHOMA, INC.
1700 W. Albany • Broken Arrow, Oklahoma 74012 • Office (918) 251-2858 • Fax (918) 251-2599

ATTACHMENT 6
Facility Transfer & Analytical Services Request Form



Facility Transfer & Analytical Services Request Form

SWL-GA-134; Form Name: GA134-Trans-F; Path and Filename: F:\Navy97\Series\G-Series\Attchmnt\Ga-134-1

Laboratory:	Date Results Required:
SWL Contact:	Comments:

SWL Sample #	Sample Matrix	No. of Containers	Testing Parameters								

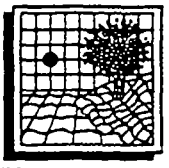
Sample Matrix Key: *S = Soil* *SL = Sludge* *W = Water* *P = Petroleum* *O = Other*

CHAIN-OF-CUSTODY:

Relinquished by:	Date/Time	Received by:
Relinquished by:	Date/Time	Received for lab by:

Southwest Laboratory of Oklahoma, Inc. / American Analytical & Technical Services, Inc.
1700 W. Albany • Broken Arrow, Oklahoma 74012 • Office (918) 251-2858 • Fax (918) 251-2599

ATTACHMENT 7
Outside Analytical Services Request



OUTSIDE ANALYTICAL SERVICES REQUEST

SAMPLE RECEIVING DEPARTMENT

OUTSIDE ANALYTICAL SERVICES REQUEST (110-ATTS WB1) SWL-GA-110 Rev. 3 0 8/22/97 BOOK # GA-110-OUTANSRVREQ

TM

Laboratory:	Date Results Required:
SWL Contact:	Comments:

SWL Sample #	Sample Matrix	No. of Containers	Testing Parameters								

Sample Matrix Key: *S = Soil* *SL = Sludge* *W = Water* *P = Petroleum* *O = Other*

CHAIN-OF-CUSTODY:

Relinquished by:	Date/Time	Received by:
Relinquished by:	Date/Time	Received for lab by:

SOUTHWEST LABORATORY OF OKLAHOMA, INC.
1700 W. ALBANY • BROKEN ARROW, OKLAHOMA 74012 • OFFICE (918) 251-2858 • FAX (918) 251-2599

[SR018-1093-01]

ATTACHMENT 8
Internal COC

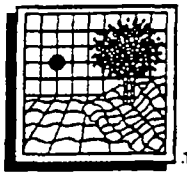
SOUTHWEST LABORATORY OF OKLAHOMA, INC.

INTERNAL COC

Client: EPAMT136 Project: 25653
Episode: 30817

Test Code	Cont ID	Samp. #	Samp. #	Samp. #	Samp. #	Samp. #	Samp. #	Location (ref/shelf)	Date/Time Out	Analyst	Date/time In
IN120	A	7	9								
	B	1	2	6	8			#9	9/8 1100		9/8 100
	C	5									
	D	5									
MT310	A	1 8	2	3	4	5	6				
	B	5									
MT600	A	1 8	2	3	4	5	6				
	B	5							9-8/600	JDL	9-8/350
MT620	A	1 8	2	3	4	5	6				
	B	5							9-9 6:00		9-9/330
MT810	A	1 8	2	3	4	5	6				
	B	5									
MT813	A	1 8	2	3	4	5	6				
	B	5									

ATTACHMENT 9
Sample Modification or Cancellation Request



SAMPLE MODIFICATION OR CANCELLATION REQUEST, SWL-GA-171

Sample Modification or Cancellation Request (171-fic5.doc), SWL SOP Rev. 1.0, Form ID: GA-171-Mod-F

To be completed by the Requesting Individual

NAME:	DATE:
DEPARTMENT:	

REQUEST TYPE:	Modification ☐	Cancellation ☐
EXPLANATION OF REQUEST:		

AUTHORIZATION BY PROJECT OFFICER:	DATE:

To be completed by Sample Receiving

PROJECT COMPLETED:

BY:	DATE:

SOUTHWEST LABORATORY OF OKLAHOMA, INC.
1700 West Albany • Broken Arrow, OK 74012 • Office (918) 251-2858 • Fax (918) 254-2599

ATTACHMENT 10
Refrigerator Temperature Record

SWLO / AATS

REFRIG: _____
MONTH: _____
THERM. ID: _____

REFRIGERATOR TEMPERATURE RECORD, SWL-GA-128-1
File Name (F:\Navy97\Sop's\Forms\Books\GA128F1.doc) SWL SOP Rev.2.1 Book ID: GA-128-ZoneRef-3

CONTROL LIMITS: 2.0 °C TO 6.0 °C

DATE	TIME	ANALYST	TEMP °C / °F	WITHIN LIMITS?	CORRECTIVE ACTION * (IF NEEDED)
1				YES NO	
2				YES NO	
3				YES NO	
4				YES NO	
5				YES NO	
6				YES NO	
7				YES NO	
8				YES NO	
9				YES NO	
10				YES NO	
11				YES NO	
12				YES NO	
13				YES NO	
14				YES NO	
15				YES NO	
16				YES NO	
17				YES NO	
18				YES NO	
19				YES NO	
20				YES NO	
21				YES NO	
22				YES NO	
23				YES NO	
24				YES NO	
25				YES NO	
26				YES NO	
27				YES NO	
28				YES NO	
29				YES NO	
30				YES NO	
31				YES NO	

REPAIR SERVICE: *Tobey's Heating & A/C • Ken Toby • 664-1166*
OK Refrigeration CO • McIntosh Services • 836-6401

TYPIST: LLR

ATTACHMENT 11
Pitched Bottles

PITCHED BOTTLES

PITCHED BOTTLE LOG (110-ATT8.WB1) SWL-GA-110 Rev. 3.0 BOOK # GA-110-PTCHBOTL

DATE	SAMPLE #	CLIENT	ANALYST

Southwest Laboratory of Oklahoma, Inc. / American Analytical & Technical Services, Inc.
1700 W. Albany • Broken Arrow, Oklahoma 74012 • Office (918)251-2858 • Fax (918)251-2599

ATTACHMENT 12
Archive Record Sheet

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

ARCHIVE RECORD SHEET (110-ATT7.WB1) SWL-GA-110 Rev. 3.0 BOOK # GA-110-ARCHRECRD

Page 1

SAMPLES READY TO BE ARCHIVED

ARCHIVE DATE 09-13-97
DISPOSAL DATE 12-12-97

SAMPLE	CLIENT	DESCRIPTION	MATRIX	LOGIN
30061.01	EPA	62-SO-MNW1-01	S	07/12/97
30061.02	EPA	62-SO-MNW1-101	S	07/12/97
30061.03	EPA	62-SO-MNW1-02	S	07/12/97
30061.04	EPA	EB0711971	W	07/12/97
30061.05	EPA	TB0711971	W	07/12/97
30077.01	EPA14	62-SO-MNW2-01	S	07/14/97
30077.02	EPA14	62-SO-MNW2-02	S	07/14/97
30077.03	EPA14	TB0713971	W	07/14/97
30077.04	EPA14	EB0713971	W	07/14/97
30077.05	EPA14	62-SO-MNW3-01	S	07/14/97
30077.06	EPA14	62-SO-MNW3-02	S	07/14/97
30099.06	EPA14	TB0714971	W	07/15/97
30099.07	EPA14	AB0714971	W	07/15/97
30099.08	EPA14	62-SO-MNW4-01	S	07/15/97
30367.01	AATS-E	EAFN1 (CASE#25602)	S	07/30/97
30367.02	AATS-E	EAFN2 *QA/QC	S	07/30/97
30367.03	AATS-E	EAFN3 (CASE#25602)	S	07/30/97
30367.04	AATS-E	EAFN4 (CASE#25602)	S	07/30/97
30367.05	AATS-E	EAFN5 (CASE#25602)	S	07/30/97
30367.06	AATS-E	EAFN6 (CASE#25602)	S	07/30/97
30367.07	AATS-E	EAFN7 (CASE#25602)	S	07/30/97
30367.08	AATS-E	EBXZ0 (CASE#25602)	S	07/30/97
30367.09	AATS-E	EBXZ1 (CASE#25602)	S	07/30/97
30367.10	AATS-E	EBXZ2 (CASE#25602)	S	07/30/97
30367.11	AATS-E	EBXZ3 (CASE#25602)	S	07/30/97
30367.12	AATS-E	EBXZ4 (CASE#25602)	S	07/30/97
30367.13	AATS-E	EBXZ5 (CASE#25602)	S	07/30/97
30409.01	AATS-E	EBXZ6 (CASE#25602)	S	08/01/97
30409.02	AATS-E	EBXZ7 (CASE#25602)	S	08/01/97
30409.03	AATS-E	EBXZ8 (CASE#25602)	S	08/01/97
30409.04	AATS-E	EBXZ9 (CASE#25602)	S	08/01/97
30409.05	AATS-E	EBYA0 (CASE#25602)	S	08/01/97
30409.06	AATS-E	EBYA1 (CASE#25602)	S	08/01/97
30409.07	AATS-E	EBYA2 (CASE#25602)	S	08/01/97
30409.08	AATS-E	EBYA3 (CASE#25602)	S	08/01/97
30409.09	AATS-E	EBYA4 *QA/QC	S	08/01/97
30409.10	AATS-E	EBYA5 (CASE#25602)	S	08/01/97
30409.11	AATS-E	EBYA6 (CASE#25602)	S	08/01/97
30409.12	AATS-E	EBYA7 (CASE#25602)	S	08/01/97
30409.13	AATS-E	EBYA8 (CASE#25602)	S	08/01/97
30409.14	AATS-E	EBYA9 (CASE#25602)	S	08/01/97
30409.15	AATS-E	EBYB0 (CASE#25602)	S	08/01/97
30409.16	AATS-E	EBYB1 (CASE#25602)	S	08/01/97
30409.17	AATS-E	EBYB2 (CASE#25602)	S	08/01/97
30409.18	AATS-E	EBYB3 (CASE#25602)	S	08/01/97
30409.19	AATS-E	EBYB4 (CASE#25602)	S	08/01/97
30409.20	AATS-E	EBYB5 (CASE#25602)	S	08/01/97
30409.21	AATS-E	EBYB6 (CASE#25602)	S	08/01/97
30409.22	AATS-E	EBYB7 (CASE#25602)	S	08/01/97

ATTACHMENT 13
EPA 40 CFR Part 136

Measurement	SWL/AATS Test Codes	Vol. Req. (mL)	Container[1]	Preservative[1,4]	Holding Time[5]
Physical Properties					
Color	IN100	50	P,G	Cool, 4°C	48 Hrs.
Conductance	IN080	100	P,G	Cool, 4°C	28 days
Hardness	IN140	100	P	HNO_3 to pH <2	6 mos.
pH	IN220	2	P,G	None Req. Immediately	Analyze
Residue					
Filterable	IN270	100	P,G	Cool, 4°C	7 days
Non-Filterable	IN275	100	P,G	Cool, 4°C	7 days
Total	IN280	100	P,G	Cool, 4°C	7 days
Volatile	IN285	100	P,G	Cool, 4°C	7 days
Settleable Matter	IN287	1,000	P,G	Cool, 4°C	48 Hrs.
Turbidity	IN310	100	P,G	Cool, 4°C	48 Hrs.
Metals					
Dissolved		200	P	Filter on site HNO_3 to pH <2	6 Mos.
Suspended		200		Filter on site	6 Mos.[10]
Total		100	P	HNO_3 to pH <2	6 Mos.
Chromium VI[6]	MT169	200	P	Cool, 4°C	24 Hrs.
Mercury (Dissolved)	MT310	100	P	Filter HNO_3 to pH <2	28 Days
Mercury (Total)	MT310	100	P	HNO_3 to pH <2	28 Days
Inorganics, Non-Metallics					
Acidity	IN005	100	P,G	Cool, 4°C	14 Days
Alkalinity	IN010	100	P,G	Cool, 4°C	14 Day
Bromide	IN030	100	P,G	None Req.	28 Days
Chloride	IN060	50	P,G	None Req.	28 Days
Chlorine	IN070	200	P,G	None Req.	Analyze Immediately
Cyanides	IN120	500	P,G	Cool, 4°C NaOH to pH >12 0.6g ascorbic acid[8]	14 Days[7]
Fluoride	IN130/IN135 /IN137	300	P,G	None Req.	28 Days
Iodide	IN150	100	P,G	Cool, 4°C	24 Hrs.

Continued

Attachment 13 (Continued)

Measurement	SWL/AATS Test Codes	Vol. Req. (mL)	Container[1]	Preservative[3,4]	Holding Time[2]
Nitrogen					
Ammonia	IN015/IN020	400	P,G	Cool, 4°C H_2SO_4 to pH <2	28 Days
Kjeldahl, Total	IN170	500	P,G	Cool, 4°C H_2SO_4 to pH <2	28 Days
Nitrate plus Nitrite	IN108/IN185 /IN187/IN190/IN195	100	P,G	Cool, 4°C H_2SO_4 to pH <2	28 Days
Nitrate[9]	IN180/IN185/IN87	100	P,G	Cool, 4°C	48 Hrs.
Nitrite	IN190/IN195	50	P,G	Cool, 4°C	48 Hrs.
Dissolved Oxygen					
Probe	IN235	300	G bottle and top	None Req.	Analyze Immediately
Phosphorus					
Ortho-phosphate	IN250,UB255	50	P,G	Filter on site Cool, 4°C	48 Hrs.
Silica	IN260	50	P only	Cool, 4°C	28 Days
Sulfate	IN290/IN295	50	P,G	Cool, 4°C	28 Days
Sulfide	IN300	500	P,G	Cool, 4°C add 2 mL zinc acetate plus NaOH to pH >9	7 Days
Sulfite	IN307	50	P,G	None Req. Immediately	Analyze
Organics					
BOD	IN025	1,000	P,G	Cool, 4°C	48 Hrs.
COD	IN090	50	P,G	Cool, 4°C H_2SO_4 to pH <2	28 Days
Oil & Grease	IN200/IN205	1,000	G only	Cool, 4°C H_2SO_4 or HCl to pH <2	28 Days
Organic Carbon	IN045	25	P,G	Cool, 4°C H_2SO_4 or HCl to pH <2	28 Days
Phenolics	IN230	500	G only	Cool, 4°C H_2SO_4 or HCl to pH <2	28 Days

Continued

Attachment 13 (Continued)

SWL/AATS Measurement	Req. Test Codes	Vol. (mL)	Container[2]	Holding Preservative[3,4]	Time[5]
Organics (Cont.)					
MBAS	IN160	250	P,G	Cool, 4°C	48 Hrs.
Purgeable Halocarbons (601)	GC110	40	G, Teflon-lined Septum	Cool, 4°C 0.008% $Na_2S_2O_3$[6]	14 Days
Purgeable Aromatic Hydrocarbons (602)	GC120	40	G, Teflon-lined Septum	Cool, 4°C, 0.008% $Na_2S_2O_3$[6], HCl to Ph 2	14 Days
Phenols[12]	MS505	1,000	G, Teflon-lined	Cool, 4°C, 0.008%	7 days until extraction
EPA Method 604	GC700		Cap	$Na_2S_2O_3$	40 days after extraction
Organochlorine	GC800/GC810	1,000	G, Teflon-lined	Cool, 4°C, pH 5-9	7 days until extraction
Pesticides/PCBs[12]	GC800/GC810		Cap		40 days after extraction
EPA Method 608	GC800/GC810				
Polynuclear Aromatic Hydrocarbons[12]	GC420	1,000	G, Teflon-lined	Cool, 4°C, 0.008%	7 days until extraction
EPA Method 610	GC420		Cap	$Na_2S_2O_3$[6], store in dark	40 days after extraction
TCDD[12]	MS700	1,000	G, Teflon-lined	Cool, 4°C, 0.008%	7 days until extraction
EPA Method 613	MS700		Cap	$Na_2S_2O_3$[6]	40 days after extraction
Purgeables	MS300/MS310	2x40	G, Teflon-lined	Cool, 4°C, 0.008%	14 Days
EPA Method 624	MS300/MS310		Septum	$Na_2S_2O_3$[6]	
Base/Neutrals Acids	MS500/MS510	1,000	G, Teflon-lined	Cool, 4°C, 0.008%	7 days until extraction
EPA Method 625	MS500/MS510		Cap	$Na_2S_2O_3$[6]	40 days after extraction

1. More specific instructions for preservation and sampling are found with procedures as detailed in EPA-600/4-79-020, revised March 1983, and in the Federal Register, Vol. 49, No. 209, Oct. 26, 1984, EPA 40 CFR part 136.

2. Plastic (P) or Glass (G). For metals, polyethylene with a polypropylene cap (no liner) is preferred.

3. Sample preservation should be performed immediately upon sample collection. For composite samples, each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.

4. When any sample is to be shipped by common carrier or sent through the United States Mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements of Table 1, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid (HCl) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); Sodium

Continued

Attachment 13 (Continued)

hydroxide (NaOH) in water solutions at concentrations of 0.08% by weight or less (pH about 12.30 or less).

5. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still considered valid. Samples may be held for longer periods only if the permittee, or monitoring laboratory, has data on file to show that the specific types of sample under study are stable for the longer time, and has received a variance from the Regional Administrator. Some samples may not be stable for the maximum time period given in the table. A permittee, or monitoring laboratory, is obligated to hold the sample for a shorter time if knowledge exists to show this is necessary to maintain sample stability.

6. Should only be used in the presence of residual chlorine.

7. Maximum holding time is 24 hours when sulfide is present. Optionally, all samples may be tested with lead acetate paper before the pH adjustment in order to determine if sulfide is present. If sulfide is present, it can be removed by the addition of cadmium nitrate powder until a negative spot test is obtained. The sample is filtered and then NaOH is added to pH 12.

8. Samples should be filtered immediately on-site before adding preservatives for dissolved metals.

9. For samples from non-chlorinated drinking water supplies concentrated H_2SO_4 should be added to lower sample pH to less than 2. The sample should be analyzed before 14 days.

10. Sample receiving no pH adjustment must be analyzed within seven days of sampling.

11. The pH adjustment is not required if acrolein will not be measured. Samples for acrolein receiving no pH adjustment must be analyzed within three days of sampling.

12. When the extractable analytes of concern fall within a single chemical category, the specified preservative and maximum holding times should be observed for optimum safeguard of sample integrity. When the analytes of concern fall within two or more chemical categories, the sample may be preserved by cooling to 4°C, reducing residual chlorine with 0.008% sodium thiosulfate, storing in the dark, and adjusting the pH to 6-9; samples preserved in this manner may be held for seven days before extraction and for 40 days after extraction. Exceptions to this optional preservation and holding time procedure are noted in footnote 6 (requirement for thiosulfate reduction of residual chlorine), and footnotes 13 and 14 (analysis of benzidine).

13. If 1,2-diphenylhydrazine is likely to be present, adjust the sample pH to 4.0 +0.2 to prevent rearrangement to benzidine.

Continued

Attachment 13 (Continued)

Measurement	Vol. Req. (oz)	Container[b]	Preservative[c,d]	Holding Time[e]
Inorganics, Non-Metallics				
Petroleum Hydrocarbons	32	G	Cool, 4°C	28 days
Metals				
Total Recoverable	8	G	Cool, 4°C	6 months
Extraction Procedure Toxicity	32	G	Cool, 4°C	6 months
Organics				
VOCs and Xylenes, EPA Method 8240	2x4	G	Cool, 4°C	14 days
Extractable Priority Pollutants EPA Method 8270	32	G	Cool, 4°C	14 days - extraction 40 days - analysis

a. More specific instructions for preservation and sampling are found with procedures as detailed in EPA-600/4-79-020, revised March 1983, and in the Federal Register, Vol. 49, No. 209, Oct. 26, 1984, EPA 40 CFR Part 136, Table II.

b. Plastic (P) or Glass (G). For metals, polyethylene with a polypropylene cap (no liner) is preferred.

c. Sample preservation should be performed immediately upon sample collection. for composite samples, each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.

d. When any sample is to be shipped by common carrier of sent through the United States Mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements of Table 1, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid (HCl) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); Sodium hydroxide (NaOH) in water solutions at concentrations of 0.08% by weight or less (pH about 12.30 or less).

e. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still considered valid. Samples may be held for longer periods only if the permittee, or monitoring laboratory, has data on file to show that the specific types of sample under study are stable for the longer time, and has received a variance from the Regional Administrator. Some samples may not be stable for the maximum time period given in the table. A permittee, or monitoring laboratory, is obligated to hold the sample for a shorter time if knowledge exists to show this is necessary to maintain sample stability.

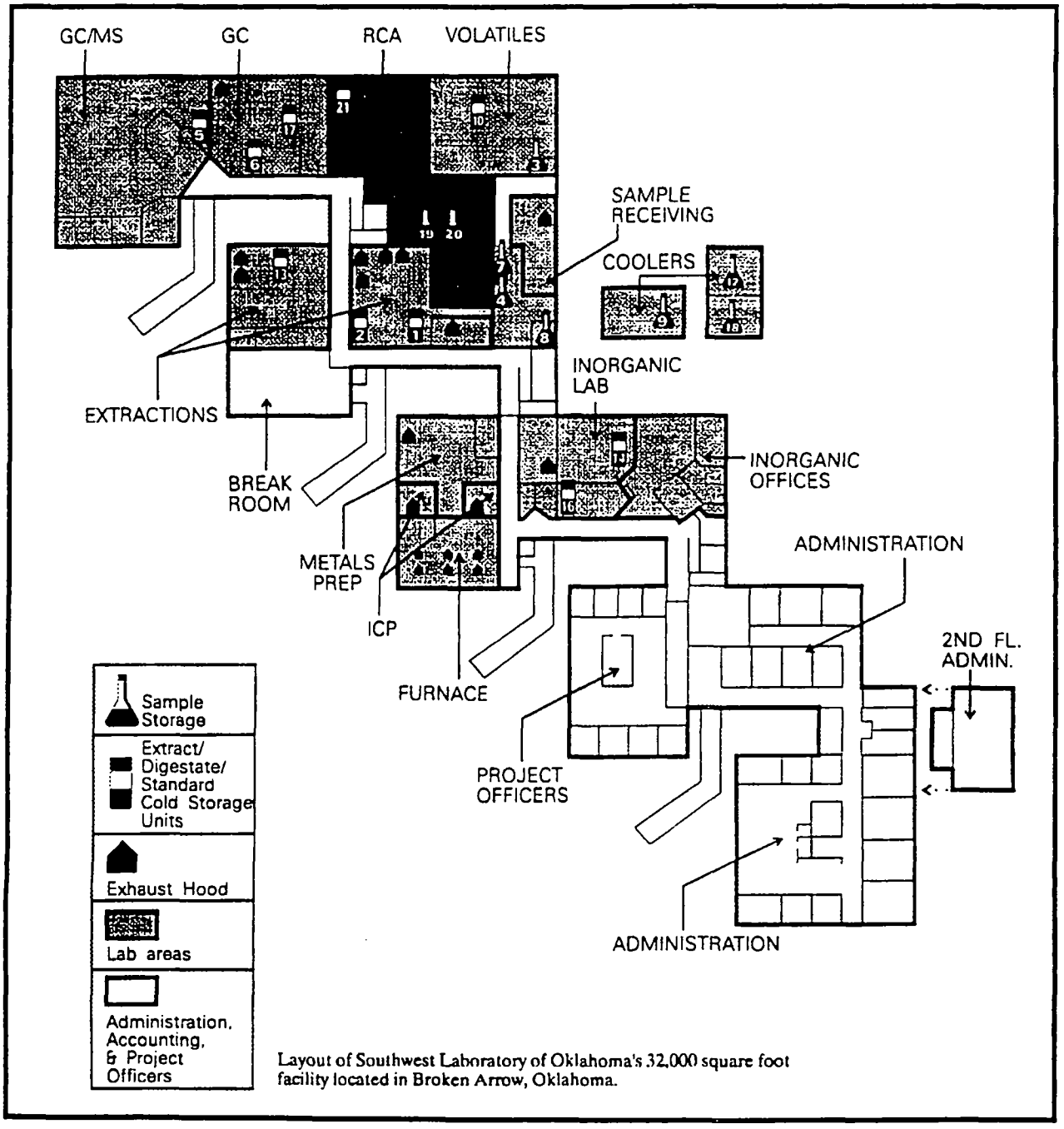
f. Should only be used in the presence of residual chlorine.

g. For samples from non-chlorinated drinking water supplies, concentrated H_2SO_4 should be added to lower sample pH to less than 2. The sample should be analyzed before 14 days.

h. Sample receiving no pH adjustment must be analyzed within 7 days of sampling.

i. If analysis is to include benzene, toluene, and/or ethyl benzene, sample must be analyzed within 7 days of sampling.

ATTACHMENT 14
Facility Layout



Layout of Southwest Laboratory of Oklahoma's 32,000 square foot facility located in Broken Arrow, Oklahoma.

Request for New or Revised Procedure, SWL-GA-101

SWL SOP Rev. # 1.0 - 05/14/97: Form ID: GA101-DOCREQ-F: Location/File ID: F:\SOP\GA\101-ATT5

REVISED (includes Forms/Logs) Submitted By: CHH Date: 9/17/97

Document Title: Sample Custodian

Document No.: SWL-GA-115 Rev. No. 5.0 — ___ / ___ / ___

Reference: Page ___ of ___ Section: ___.___; Subpart: _____

Attachment No. _____ — Title: _____

Brief Description **(need for revision):** Update into new Format

Approved: _____ **Dated:** _____ **Denied:** ☐ **PM/SS Initials:** _____
Program Manager/Section Supervisor (see attached explanation)

NEW (Procedural Document) Submitted By: _____ Date: _____

Justification for New Procedure: _____

Approved: _____ **Dated:** _____ **Denied:** ☐ **PM/SS Initials:** _____
Program Manager/Section Supervisor (see attached explanation)

Author: _____ **Assigned By:** _____ **Date:** _____

Review/Approval by Manager/Supervisor

Draft No. ___ Author's Initials:____ Date:____
Reviewed: ☐ Revise: ☐ Approved: ☐
PM/SS Initials____ Date_____ (revise as marked)

Draft No. ___ Author's Initials:____ Date:____
Reviewed: ☐ Revise: ☐ Approved: ☐
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QA/QC Initials____ Date_____ (revise as marked)

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Date Rec'd by Document Control:_____ Initials:____