IEA-CT LABORATORY

QUALITY ASSURANCE PLAN

IEA
An Aquarion Company

IEA-CT LABORATORY

QUALITY ASSURANCE PLAN

Prepared by:

Marsha K. Culik

200 Monroe Turnpike
Monroe, CT 06468

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIX

A) Equipment List

B) Professional Profiles

C) Chain of Custody

1.0 QUALITY ASSURANCE PROGRAM -IDENTIFICATION FORM

Document Title:	**IEA-CT QUALITY ASSURANCE PROGRAM PLAN**
Company Address:	IEA,Inc.-CT 200 Monroe Turnpike Monroe, CT 06468
Telephone:	(203) 261-4458
Company Official: Title:	Michael V. Bonomo Director of Operations
Company Official: Title:	Jeffrey C. Curran Laboratory Manager
Company Official: Title:	Marsha K. Culik Quality Assurance Manager
Plan Coverage:	IEA Connecticut laboratory including the following:

Functions:

- Sample Receipt
- GC Laboratory
- GC/MS Laboratories
- Quality Assurance
- Report Production
- Computer Systems
- Inorganics Laboratory
- Organic Extractions
- Data Entry
- Facilities and Safety

Concurrences:

Name:	Michael Bonomo	Signature:
Title:	Director of Operations	Date: 8/3/93
Name:	Jeffrey Curran	Signature:
Title:	Laboratory Manager	Date: July 31, 1993
Name:	Marsha Culik	Signature:
Title:	Quality Assurance Manager	Date: Aug. 3, 1993
Name:	Larry Lewis	Signature:
Title:	Organics Manager	Date: Aug. 3, 1993
Name:	Jack Bennett	Signature:
Title:	Extractions Group Leader	Date: Aug 5, 1993
Name:	Larry Decker	Signature:
Title:	GC/MS Volatiles Group Leader	Date: Aug. 4, 1993
Name:	Kristen Madden	Signature: Kristen Madden
Title:	GC/MS Semi-volatiles Group Leader	Date: August 3, 1993
Name:	Kim Maturo	Signature:
Title:	GC Group Leader	Date: Aug. 3, 1993
Name:	Peter Frick	Signature:
Title:	Classical Chemistry Group Leader	Date: August 3, 1993
Name:	Dan Helfirch	Signature:
Title:	Metals Group Leader	Date: Aug. 3, 1993

2.0 INTRODUCTION

2.1 Background

The Connecticut facility of IEA Corporation (Industrial & Environmental Analysts, Inc.) located at 200 Monroe Turnpike, Monroe, Connecticut. is a full service environmental testing laboratory specializing in analysis of air, water, soil, and sediments.

IEA is a wholly-owned subsidiary of the AQUARION Company, headquartered in Bridgeport, Connecticut.

2.2 Purpose

This Quality Assurance Program Plan (QAPmP) covers laboratory operation at IEA, Inc.-CT. The purpose of this QAPmP is to provide information on laboratory operations as required for specific Quality Assurance Project Plans (QAPjPs), and to provide the basis for the Quality Assurance Program at IEA, Inc.-CT. This program is based on the IEA Corporate Quality Assurance Program Plan document# QAQ00101.NET.

This QAPmP is based upon USEPA guidelines are specified in the following EPA document:

> QAMS-004/80, Guidelines and Specifications for Preparing Quality Assurance Program Plans. Quality Assurance Management Staff (QAMS), USEPA, 1979.

2.3 Scope

This QA program applies to the generation of analytical data utilized for environmental monitoring and assessment programs. The major types of laboratory support for government regulations are as follows:

- Analysis and characterization of environmental (soil, sediment, water and air) and waste samples per the Resource Conservation and Recovery Act (RCRA) for either compliance, disposal or delisting purposes.
- Analysis of drinking water samples in support of the Safe Drinking Water Act (SDWA).
- Analysis of environmental samples in accordance with contracts with the USEPA CLP program and various state agencies (CERCLA and NYSDEC).
- Analysis of environmental samples (soil, sediment, water and air) for contaminants such as those compounds found on the EPA priority pollutant list, target compound list, etc. for site assessment purposes.
- Analysis of waste stream samples in accordance with NPDES requirements.

3.0 QUALITY ASSURANCE POLICY STATEMENT

It is the policy of IEA, Inc.-CT that the Quality Assurance (QA) Program be appropriate to assure that all data collected and reported will be of known and documented value.

The objective of the QA Program (QAPmP) is to ensure, assess and document that all data collected, stored and reported are scientifically valid, defensible and of the precision and accuracy required to meet the objectives of our clients.

It is the goal of IEA, Inc.-CT to provide the best laboratory services to our clients. To accomplish this, the product which we produce, analytical measurement data, must be of defined quality and at the same time conform to government regulations and requirements.

IEA Quality Policy

> *"Management and staff are committed to maintaining a carefully controlled analytical environment in order to ensure the consistent generation of accurate data which meets or exceeds the data quality objectives of our clientele"*

3.1 ETHICS POLICY

IEA - CT recognizes that maintaining a proper ethical standard is an important element of an effective Quality Assurance program. In order to ensure that all personnel understand the importance the company places on maintaining high ethical standards at all times, the company has established an "Ethics Policy" (attached as Figure 1.0). All existing and new employees are required to review and sign an acknowledgment that they will adhere to the policy. A copy is maintained in personnel files.

4.0 QUALITY ASSURANCE MANAGEMENT

4.1 Introduction

The management of IEA-CT is committed to the execution of the quality assurance program described in this document. All managers and employees are required to comply with the program's goals, requirements and responsibilities.

4.2 Assignment of Responsibilities

Quality Assurance at IEA - CT is monitored at both the corporate and laboratory levels. IEA's Network Quality Assurance program is led by the Corporate Director of Quality Assurance, who reports directly to the Chief Executive Officer of IEA. The QA program at each network lab is directed by the QA Manager at that facility, who reports directly to the Laboratory Director and indirectly to the Corporate QA Director.

The following provides a listing of responsibilities and authority of key managerial personnel:

Director of Operations:

Responsibility:

To comply with the quality assurance program and require similar compliance by all staff personnel.

Ensure that all laboratory operations under control are active participants in attaining the network quality assurance objectives.

Ensure compliance with methods and procedures as written.

Timely compliance with any corrective action requirements.

Authority:

Maintain the authority to suspend or terminate employees for dishonesty, or non-compliance with established QA policies and procedures.

Authority is granted from the vice president of IEA, to whom they report.

Laboratory Manager:

Responsibility:

Ensure compliance with methods and procedures as written.

Ensure that analytical procedures are performed in accordance with the requested method and SOPs.

Oversee preparation of analytical reports and data review.

Authority:

Maintain the authority to suspend or terminate employees for dishonesty, or non-compliance with established QA policies and procedures.

Authority is granted from the Director of Operations, to whom they report.

Laboratory Quality Assurance Staff

Responsibility:

Responsible for monitoring and assessing compliance of the laboratory with the requirements contained in the corporate QA program.

Function as a liaison between the corporate QA director and laboratory staff at their facility.

Maintain a document control system containing correct policies and procedures utilized by the laboratory.

Maintain laboratory certification programs.

Oversee corrective action process with regards to data quality issues.

Conduct internal system and performance audits.

Authority:

The QA staff has the authority to stop or change any analytical procedure in order to assure that data quality is maintained.

The authority of the QA staff is granted by the director of the facility.

4.3 Communications

The quality assurance department communicates internally and externally through various means. Weekly conference calls are held by the network QA department for all QA Managers to discuss various issues and exchange information. Monthly quality assurance reports are generated and submitted to laboratory management and the corporate QA department.

4.4 Document Control

A document control system is set up both at the corporate level as well as the laboratory level. Procedures for Corporate Document Control are detailed in corporate SOP DOC# QAS00100.NET. The Quality Assurance Manager is responsible for ensuring that the document control system is properly managed. Any new or revised document must be submitted to the QA Manager for review and distribution.

It is the responsibility of all members of the laboratory to maintain complete records of all operations

performed. All records shall be neat and organized. All laboratory records are the property of the laboratory and shall not be removed from the premises without permission from supervisors. All records are considered confidential and must be safeguarded. Unauthorized changes, loss or destruction of records can be grounds for dismissal from the laboratory. Consult the IEA, Inc. Ethics Policy regarding integrity of data and employee conduct.

Measurement records must be recorded in pre-printed record logs or pre-printed measurement logs. This policy will facilitate the organization and archival of all laboratory data for future reference.

All injection forms, instrumentation forms, sample prep forms, QC forms, etc. which are used to process samples and measurement results are described and attached to each analytical SOP. The SOP specifies where these records and forms are cataloged and stored.

All measurement data is recorded in logbooks or on pre-printed log sheets in permanent ink. Transcriptions will be avoided whenever possible. The record will reflect the measurement performed and all appropriate details for conclusions related to the measurement. The record must be initialed and dated by the individual performing the measurement on the day the measurement is performed. Corrections shall be made by drawing a single line through the error, initialing and dating the error. All forms will be reviewed by the QA Manager annually. If it is found that the document does not meet the requirements of the SOP, the discrepancy is forwarded to the group/section leader through the corrective action process (reference SOP on Corrective Action Reports -QAS00501.CT). Further detail on laboratory document control is found in the SOP on Document Control - QAS00300.CT.

4.5 QA Program Assessment

On a semi-annual basis the QA Manager will perform laboratory audits. The purpose of this is to determine if the laboratory staff is following the SOPs or if the SOPs need revising. The QA Manager will also ensure that proper documentation through corrective action reports and case narratives is utilized and that there is conformance to identified critical control points.

The Corporate QA Director semi-annually audits the facility for conformance to corporate QA directives. The SOP for Corporate Audit checklist, Doc# QAS00300.NET, is used for all internal audits. Other performance audit checklists may be used to ensure adherence to specific protocols.

The QA Manager shall submit an audit report to the Laboratory Manager. A written response must be submitted back to the QA Manager within 30 days with a corrective action response to all findings. The audit report shall be included in the monthly progress report to management.

Quality Assurance reports are generated by the QA Manager on a monthly basis summarizing all QA/QC activities. The QA report to the corporate QA director may include a summary of PE results, data audits, external audits, changes in certification status, significant QA concerns and recommendations for resolution and a summary of the internal audit if performed. A copy of this is distributed to laboratory management and to the Corporate QA Director.

A written status report is also generated and distributed to the laboratory staff. In addition to the

information addressed on the corporate QA report, this report includes a summary of corrective action reports for the month, status of SOPs, external audit comments, data review comments, and communications from the corporate QA department.

4.6 Additional Lab Policies to Achieve QA Objectives

QA objectives are accomplished by having analytical data be of defined quality and at the same time conform to EPA regulations and requirements. There are numerous policies and standard procedures which have been implemented to ensure that data of known quality is continually generated by the IEA - CT laboratory. The following are examples of additional policies performed at the IEA-CT laboratory:

4.6.1 External Proficiency Program

Bi-annually, the laboratory participates in the USEPA Water Supply (WS) and Water Pollution (WP) proficiency programs. IEA - CT also participates in the NYSDOH proficiency testing program for Potable Water, Hazardous Waste and CLP. The lab currently analyzes quarterly organic PE samples from EPA for the CLP program.

4.6.2 Internal Proficiency Program

On a quarterly basis the QA Manager will submit QC samples supplied from an external source to the laboratory. The purpose of this is to check the accuracy of results, assess data quality, documentation and completeness of data reporting.

4.6.3 Routine Use of QC Check Samples

In order to access the quality of analytical data on a day-to-day QC check samples, a QC check sample/LCS is included in every inorganic batch which includes metals and wet chemistries. For organic analyses, these are included in analytical batches as required by the particular method. The check sample contains the analytes of interest and must be of an independent source or lot number. For organic Appendix 9 analyses the TAL sub-set shall be used for the QC check standard. Inorganic acceptance criteria is listed in figure 5.1. Organic acceptance criteria is method dependant. Examples are listed in figure 5.0.

4.6.4 Solvent Monitoring Program

All solvents are assayed prior to use. Solvents purchased in bulk are assayed by the IEA-NC laboratory for the IEA network of laboratories according to corporate SOP on Solvent Assay - QAS00400.NET. Assay results are on file at that facility. A list of approved solvents is distributed to all other facilities. Any solvents purchased independently of the corporate solvent program must be assayed according to the corporate SOP on Solvent Assays - QAS00400.NET. All cases of solvent received are coded and stored in a secured stock room. Solvent is used on first-in first-out basis. Method blank data is reviewed to access possible solvent contamination.

4.6.5 Quality Assurance Final Report Review

The QA Manager is responsible for reviewing 5 percent of the final data reports issued for each month.

4.6.6 Monitoring Lateness of Data Reports

One of the key aspects of the quality of laboratory services to IEA-CT is the timeliness of report generation. This information is monitored on a monthly basis through the use of the LIMS computer system and reported to IEA corporate through the QA department.

4.6.7 Method Detection Limit Verification

Method detection limit (MDL) studies are required during initial setup of the particular method. MDLs must be performed in the event of a major change in technique or instrumentation. Certain state certifications require that all MDLs be performed annually. This shall be performed for the standard target compound list for organics and all other certified parameters. Miscellaneous parameters will be done upon initial set-up. All MDLs are available for review upon request.

4.6.8 IEA Good Laboratory Practices

Below are listed examples of Good Laboratory Practices established to enhance the quality of data reported:

A. Standardized logbook requirements (Doc# QAS01201.NET)

Measurement records must be recorded in pre-printed record logs or pre-printed permanently bound measurement logs. This policy will facilitate the organization and archival of all laboratory data for future reference.

All measurement data is recorded in logbooks or on pre-printed log sheets in black permanent ink. Transcriptions will be avoided whenever possible. The record will reflect the measurement performed and all appropriate details for conclusions related to the measurement. The record must be initialed and dated by the individual performing the measurement on the day the measurement is performed. Corrections shall be made by drawing a single line through the error, initialing and dating the error.

B. Balance calibration (Doc# QAS01000.NET)

There must be a unique identifier for each balance. All balances are checked daily with use and documented. Acceptance ranges are established for each balance. Each balance must be checked in the weight range normally used. All balances are

professionally serviced and calibrated semi-annually.

C. Temperature monitoring requirements for lab apparatus (Doc# QAS00801.NET)

Refrigerators, freezers and lab ovens are checked each working day. A unique identifier is assigned for each unit. Acceptance ranges are established for each unit. Thermometers used in monitoring must be calibrated to a NBS traceable thermometer annually, at a minimum. State certification requirements may require more frequent calibration. All thermometers are immersed in appropriate media to avoid temperature fluctuations during measurement.

D. Correcting data and general laboratory records (Doc# QAS01300.NET)

All entries must be entered in black ink. "White Out" is not to be used at any time within the laboratory for alteration or correction of lab documents. Corrections are made using a one-line strikeout. All corrections are initialed and dated by the data editor.

E. Handling reagents and analytical standards

Full and complete documentation is provided on the use and composition of all standards used for preservation or measurement, or spiking of all environmental samples. This includes lot numbers of solvents, reagents, and standards used and the date and initials of the analyst who prepared the standard. These items must be recorded in the standards preparation logbook. IEA preparation code numbers must be assigned to each and every standard prepared including dilutions of standards. Further information on standards preparation can be found in the analytical SOPs.

F. Cleaning procedures for laboratory glassware

All glassware is cleaned according to procedures outlined in the laboratory SOPs. Glassware is washed with soap and water then either rinsed with a solvent or an acid wash depending on the type of analyses being performed. Glassware used for organic extractions are placed in a muffle furnace for further cleaning.

G. Requirements for general lab calibration curves including the following:

In cases where the referenced analytical method does not provide specific guidance or requirements for development of initial or continuing calibration curves, the following procedure is to be utilized by the laboratory.

All standard calibration curves must consist of a minimum of three points. Any deviation from this must be approved in writing by the facility QA Manager.

The curve must yield a correlation coefficient greater than 0.995, or alternatively all

calibration points must be within 10 percent of the expected value for the curve to be considered acceptable.

Concentration of compounds or analytes must fall within the calibration range of the curve to be acceptable for quantitation for inorganic and organic methodology.

H. Method blank subtraction

Subtraction of method blanks from sample results is not permitted unless specifically authorized by the laboratory QA Manager unless stated in the method.

4.6.9 Quality Control Charts

Control charts are to be generated for parameters for which QC data is available. Both precision (RPD) and accuracy (percent recovery) are to be charted. All control charts are to be updated on a quarterly basis. Control charts are generated using a computer program. Procedures are outlined in the SOP.

5.0 PERSONNEL QUALIFICATIONS

5.1 Introduction

The IEA-CT staff consists of over 60 professionals and support personnel which include:

Analytical Chemists
Quality Assurance Specialists
Computer Systems Analysts
Environmental Technicians
Customer service Staff
Account Executives

5.2 Education and Experience

The personnel who are responsible for operations of sample analyses and data validation are outlined in Figure 2. Figure 2 also illustrates the reporting relationships. Professional profiles of key employees are presented in the appendix of the QAP.

IEA-CT has many years of experience in the environmental testing field. Examples of relevant experiences are available upon request.

5.3 Training

All laboratory personnel must have adequate education, training, and experience to carry out their responsibilities. The QA Manager and the Laboratory Management will periodically review the training needs of the staff and make recommendations for any additional training. Each department within the laboratory is responsible for personnel training. Training sessions are scheduled on a monthly basis. Each training session, whether it be individual or group training must be documented utilizing the forms attached to the corporate SOP for Employee Training QAS01600.NET. The completed forms must be submitted to the Human Resource department for placement into the employee training files. Included in the training process is analyst proficiency testing. A successful QC check sample must be analyzed and documented for each analyst. This information is on file with the QA Manager.

5.4 Certifications

Table 5.4.1 presents the state certifications held by the IEA-CT laboratory. Many states certify laboratories for specific parameters or tests within a category (i.e. method 325.2 for wastewater). The information in the following table indicates the lab is certified in a general category of testing such as drinking water or wastewater analysis. The laboratory should be contacted directly if parameter-specific certification information is required.

IEA-CT currently participates in the USEPA Superfund Contract Laboratory Program (CLP). The lab is also approved to perform work for the Army Corps of Engineers which validates laboratories on a project-by-project basis.

TABLE 5.4.1

STATE CERTIFICATIONS

In some instances it may be necessary for environmental data to be reported to a regulatory authority with reference to a certified laboratory. For your convenience, the laboratory identification numbers for the IEA-Connecticut laboratory are provided in the following table. Many states certify laboratories for specific parameters or tests within a category (i.e. method 325.2 for wastewater). The information in the following table indicates the lab is certified in a general category of testing such as drinking water or wastewater analysis. The laboratory should be contacted directly if parameter-specific certification information is required.

IEA-Connecticut
Certification Summary (as of June 1993)

State	Responsible Agency	Certification	Lab Number
Connecticut	Department of Health Services	Drinking Water, Wastewater	PH-0497
Kansas	Department of Health and Environmental Services	Drinking Water, Wastewater/Solid, Hazardous Waste	E-210/E-1185
Massachusetts	Department of Environmental Protection	Potable/Non-Potable Water	CT023
New Hampshire	Department of Environmental Services	Drinking Water, Wastewater	252891
New Jersey	Department of Environmental Protection	Drinking Water, Wastewater	46410
New York	Department of Health	CLP, Drinking Water, Wastewater, Solid/ Hazardous Waste	10602
North Carolina	Division of Environmental Management	Wastewater	388
Rhode Island	Department of Health	Chemistry...Non-Potable Water and Wastewater	A43
California	Department of Health Services	Hazardous Waste	1778

6.0 FACILITIES, EQUIPMENT AND SERVICEES

6.1 Introduction

The following describes the physical facility of the IEA-CT laboratory.

6.2 Facilities

IEA-CT is located at 200 Monroe Turnpike, Monroe, Connecticut. The laboratory currently maintains a staff of approximately 60 environmental professionals and occupies a facility of approximately 13,000 sq. ft. Separate laboratory areas are dedicated to GC instrumentation, GC/MS instrumentation, extractions for organic parameters, sample preparation for metals analysis, metals analysis and wet chemistries.

The volatiles analysis laboratory containing GC/MS instrumentation has a separate air handling system which is maintained at a positive pressure at all times. The organic sample preparation laboratory has a separate HVAC system that creates negative pressure in the area. This design results in a contaminant-free environment for trace-level volatiles analysis.

Critical instrumentation such as GC/MS units, ICP's, AA's, data systems and gas chromatographs are tied into an uninterruptable power supply system (UPS) to minimize instrument downtime and damage for short duration power interuptions.

The floor plan of the analytical laboratory is attached as Figure 3.

The laboratory is secured by a card key access system. Only authorized IEA-CT personnel have access to the facility. All visitors must sign in with the receptionist and must be accompanied by an IEA-CT employee.

The sample receipt and storage area is under the responsibility of the sample custodian. This area is a locked, secure area opened by the sample control department each day. A walk-in refrigeration unit and 14 locked commercial refrigerator units are used to house samples waiting for analysis. Samples for volatile analysis are stored in separate units. Locked laboratory refrigerators, located throughout the laboratory, are used to maintain sample extracts or laboratory reagents. Each laboratory refrigerator is dedicated to sample, sample extract, or reagent storage.

6.3 Equipment

A complete list of equipment utilized at the IEA-CT facility is listed in the Appendix. The following outlines major equipment used by the laboratory:

Gas Chromatography/Mass Spectrometers	7
Gas Chromatographs	6
Inductively Coupled Plasma Spectrophotometer	2
Graphite Furnace/AA	3

Automated Analyzer for Wet Chemistry	1	
Total Organic Halide (TOX) Analyzer	1	
Total Organic Carbon Analyzer	1	
LIMS (Laboratory Information System)	1	
Automated Data Acquisition Management System (ADAM)		1

6.4 Instrument Maintenance

Where it is economically feasible, the IEA-CT laboratory has service contracts for major instruments. These contracts provide routine preventive maintenance according to the manufacturer's requirements. Additionally the laboratory maintains an inventory of expendable parts and supplies to minimize downtime and to allow laboratory personnel to make minor repairs if necessary.

Each analytical measurement SOP lists the preventive maintenance schedule for each instrument which is to be followed by in-house and extramural repair contractors. In addition, each measurement group must maintain a log of all in-house and extramural preventive maintenance activities. The following represent examples of general measures which are performed throughout the laboratory.

GC/MS SYSTEMS

1.0 Hewlett-Packard 5995 GC/MS

Routine and Preventive Maintenance	Frequency
*Check oil level in mechanical pumps	Weekly
*Check water level and operating condition in the Neslab cooling units	Weekly
*Check compressed air gas supply	Daily
*Check helium gas supply	Daily
*Check carbon dioxide gas supply	Daily
*Change the oil in the mechanical pumps	Every 6 months
*Inspect the pump hoses and replace if required	Every 6 months
*Change oil in the diffusion pump	Every 6 months
*Change foreline and exhaust trap absorbent	Every 6 months
*Inspect and refill the calibration sample vial with PFTBA	Every 6 months
*Vacuum fan grills and filters	Every 6 months
*Check fore and separator pump pressures	Weekly
*Ion source cleaning and filament replacement	As needed
*Column replacement and conditioning	As needed
*Column cutting and reinstallation	As needed
*Manual tuning	As needed
*Change compressed air gas supply	As needed
*Change helium gas supply	As needed
*Change carbon dioxide gas supply	As needed
*Recharge Neslab cooling units	As needed

*Replace electron multiplier	As needed
*Remove and clean or replace jet separator	As needed

2.0 Hewlett-Packard 5970 MSD / 5971 MSD

Routine and Preventive Maintenance	Frequency
*Check oil level in mechanical pumps	Weekly
*Change the oil in the mechanical pumps	Every 6 months
*Inspect the pump hoses and replace if required	Every 6 months
*Change oil in the turbo pump	Every 6 months
*Change exhaust trap absorbent	Every 6 months
*Inspect and refill the calibration sample vial with PFTBA	Every 6 months
*Vacuum fan grills and filters	Every 6 months
*Ion source cleaning and filament replacement	As needed
*Manual tuning	As needed
*Replace electron multiplier	As needed
*Clean out transfer line to GC	After every column removal

3.0 Hewlett-Packard 5890 GC

Routine and Preventive Maintenance	Frequency
*Check helium gas supply	Daily
*Change split vent trap	Every 3 months
*Column replacement and conditioning	As needed
*Column cutting and reinstallation	Daily or as needed
*Change helium gas cylinder	As needed
*Change liner and septum	Daily or as needed
*Clean injection port	As needed

4.0 Hewlett-Packard 7672A Autosampler

Routine and Preventive Maintenance	Frequency
*Inspect and correct injector alignment	After reseating
*Inspect syringe	Daily
*Check compressed air gas supply	Daily
*Inspect and adjust tension on sample tray	Daily
*Change rinse vials	Daily
*Change waste vials	Weekly
*Replace syringe	As needed
*Sand injector post	As needed
*Realign autosampler on brackets	As needed
*Change compressed air cylinder	As needed

5.0 Hewlett-Packard 7673A Autosampler

Routine and Preventive Maintenance	Frequency
*Inspect syringe	Daily
*Inspect seating of injector	Daily
*Change rinse vials	Daily
*Change waste vials	Weekly
*Replace syringe	As needed
*Reset control box	As needed

6.0 Tekmar Purge and Trap Sample Concentrators and Autosamplers

Routine and Preventive Maintenance	Frequency
*Inspect spargers and fittings	Daily
*Check purge flow	Daily
*Inspect line and valve temperatures	Daily
*Change and condition trap	As needed
*Adjust purge flow	As needed
*Rinse or clean sparging vessels	As needed
*Rinse sample lines	As needed
*Bake out trap	After each analysis extend as needed
*Replace lines and fittings	As needed
*Adjust line and valve temperatures	As needed

7.0 Envirochem Air Sample Concentrator and Autosampler

Routine and Preventive Maintenance	Frequency
*Inspect fittings	Daily
*Check flows	Daily
*Inspect line and valve temperatures	Daily
*Change and condition internal traps	As needed
*Adjust flow	As needed
*Bake out trap	After each analysis extend as needed
*Replace lines and fittings	As needed
*Adjust line and valve temperatures	As needed

GC SYSTEMS

1.0 Hewlett-Packard 5890A GC (GC-4 Dual ECD)

Routine and Preventive Maintenance	Frequency
*Check gas supply	Daily
*Check breakdown criteria	As required by run sequence
*Vacuum filters and grills	Quarterly
*Column replacement and conditioning	As needed
*Column cutting and reinstallation	As needed
*Change gas cylinders	As needed
*Change liner and septum	As needed
*Replace guard column	As needed
*Clean injection port	As needed
*Recondition ECD	As needed
*Change ECD vent absorbent traps	Quarterly

2.0 Hewlett-Packard 5890A GC (GC-3 FID/NPD)

Routine and Preventive Maintenance	Frequency
*Check gas supply	Daily
*Vacuum filters and grills	Quarterly
*Column replacement and conditioning	As needed
*Column cutting and reinstallation	As needed
*Change gas cylinders	As needed
*Change liner and septum	As needed
*Clean injection port	As needed
*Replace or reactivate the NPD collector	As needed

3.0 Perkin-Elmer Sigma 3B GC (GC-2 ECD)

Routine and Preventive Maintenance	Frequency
*Check gas supply	Daily
*Vacuum filters and grills	Quarterly
*Column replacement and conditioning	As needed
*Change gas cylinders	As needed
*Change injection port septum	As needed
*Clean or replace ECD anode	As needed
*Change glass wool	As needed
*Replace partial packing	As needed
*Change ECD vent absorbent trap	Quarterly

6.0 Hewlett-Packard 7673A Autosampler

Routine and Preventive Maintenance	Frequency
*Inspect syringe	Daily
*Inspect seating of injector	Daily
*Inspect rinse and waste vials	Daily
*Vacuum filters and grills	Quarterly
*Replace syringe	As needed
*Change rinse and waste vials	As needed

7.0 Perkin-Elmer AS-100B Autosampler

Routine and Preventive Maintenance	Frequency
*Inspect syringe	Daily
*Inspect rinse and waste vials	Daily
*Check flushing efficiency	Daily
*Clean or replace syringe	As needed
*Change rinse and waste vials	As needed
*Change diverter valve septum	As needed

METALS SYSTEMS

1.0 Graphite Furnace

Routine and Preventive Maintenance	Frequency
*Clean contact rings, furnace housing and quartz windows	Daily
*Inspect, clean or replace graphite tubes	As needed
*Replenish matrix modifiers	Daily
*Check lamp alignments and energies	Daily
*Clean mirrors for the optical sensors	Weekly
*Clean windows on furnace housing	Weekly
*Inspect contact rings for excessive wear	Monthly

2.0 Inductively Coupled Plasma

Routine and Preventive Maintenance	Frequency
*Change capillary and pump tubing	Twice weekly
*Replace liquid argon tank	As required
*Reprofile via slit micrometer	Per manual
*Replace and realign plasma torch	As needed
*Clean nebulizer and spray chamber	As needed

*Check primary imaging mirror	Weekly

3.0 Mercury Analyzer

Routine and Preventive Maintenance	Frequency
*Clean sample cell and tubing	Monthly
*Check sparger condition	Daily
*Check level of mercury scrubber solution	Daily
*Replace lamps	As required

WET CHEMISTRY SYSTEMS

1.0 pH Meters

Routine and Preventive Maintenance	Frequency
*Clean electrode if calibration has deteriorated	As needed
*Store pH electrodes in pH 7.0 buffer	Daily
*Check ISE electrodes and meter	Per manual

2.0 Analytical Balances

Routine and Preventive Maintenance	Frequency
*Surfaces cleaned and covered	Daily
*Calibrated and cleaned by manufacturer	Semi-annually
*Accuracy checked by class "S" weights	Prior to use

3.0 Conductivity Meters

Routine and Preventive Maintenance	Frequency
*Instrument surfaces inspected and cleaned	Daily
*Calibrated using 0.01M potassium chloride	Daily
*Spare cells on inventory	As needed

4.0 Spectrophotometers

Routine and Preventive Maintenance	Frequency
*Instrument cleaned	Daily use

5.0 Total Organic Halogen Analyzer (TOX)

Routine and Preventive Maintenance	Frequency
*Instrument cleaned	Daily use
*Perform cell performance checks	Daily
*Flush cells and check heated tapes	Daily
*Inspect sample boats, inlet and exit tubes, o-rings and seals	Daily

6.0 Autoanalyzer Systems

Routine and Preventive Maintenance	Frequency
*Clean all components and flush system	Daily use
*Inspect all pump tubes and sample lines	Daily use
*Inspect line coils, heating baths and filters	Weekly
*Inspect all colorimeter filters	Weekly
*Inspect and clean chemical manifolds	Monthly

7.0 DATA GENERATION

7.1 Introduction

There are numerous policies and standard procedures which have been implemented to ensure that data of known quality is continually generated by the IEA-CT laboratory. The IEA Corporate and Laboratory Facility Quality Assurance Plans are examples of documents which are generated. Guidelines for the facility QA plans are detailed in section 7.2.1 of the Corporate Quality Assurance Program Plan Doc#QAQ00101.NET.

7.2 Quality Assurance Project Plans

Quality Assurance Project Plans (QAPjP) are developed to meet contract and agency requirements on a project specific basis. These plans discuss specific terms, policies, objectives and QA activities designed to achieve the data quality objectives of the project.

All QA project plans are written in accordance with the following USEPA Document: USEPA Guidelines and Specification for Preparing Quality Assurance Project Plans, QAMS-005/80, Washington DC: USEPA, Quality Assurance Management Staff, October 17, 1980.

Guidelines for preparing QA project plans are also detailed in the Corporate Quality Assurance Program Plan Doc#QAQ00101.NET.

7.3 Methods

IEA-CT utilizes a wide variety of analytical methods. A listing of general analytical capabilities is presented in Table 7.3.1.

Each department is required to have a written standard operating procedure (SOP) in use which describes how the requirements of the method are met. All SOPs must be prepared in accordance with IEA Doc.#QAS00200.NET.

Analytical methodologies and quality assurance protocols in use are based on the following guidelines:

"Methods of Organic Chemical Analysis of Municipal and Industrial Wastewater", Federal Register Vol. 49, No. 209, October 26, 1984;

"Test Methods for Evaluating Solid Wastes", SW-846 Third Edition, September 1986, USEPA;

"Standard Methods for the Examination of Water and Wastewater" 1985, 14th, 15th, 16th and 17th Editions;

"Methods for Chemical Analysis of Water and Wastes" March 1983 EMSL, EPA;

Organic Analysis: Multi-media, Multi-concentration-IFB-CLP, January 1991, Document Number OLM01.8 (plus revisions);

Inorganic Analysis: Multi-media, Multi-concentration-IFB-CLP, Document Numbers ILM01.0 and ILM02.0;

New York State Department of Environmental Conservation - Analytical Services Protocol, September 1989, 12/91 Revisions;

"Methods for the Determination of Organic Compounds in Drinking Water" December 1988 (revised July, 1991), EPA-600/4-88/039;

"Handbook for Analytical Quality Control in Waste and Wastewater Laboratories", EPA-600/4-79-019, March 1979.

TABLE 7.3.1

IEA-CT ANALYTICAL CAPABILITIES

I. ORGANICS-GC/MS

Volatile Organics-524
Volatile Organics-8240
Volatile Organics-CLP
Volatile Organics-T01/T02
Volatile Organics-Appendix IX
Acid & Base/Neutrals-8270
Acid & Base/Neutrals-CLP
Acid & Base/Neutrals-Appendix IX

II. ORGANICS-GC

Organohalide Pesticides & PCBs-608
Organohalide Pesticides & PCBs-8080
Organohalide Pesticides & PCBs-CLP
Organophosphate Pesticides-8140
Organohalide Pesticides & PCBs-Appendix IX
Chlorinated Herbicides-8150
Chlorinated Herbicides-Appendix IX

III. INORGANIC METALS

ICP Metals
Furnace Metals
CLP Metals

IV. BIOLOGICAL ANALYSES

Total Coliform
Fecal Coliform
Standard Plate Count
Enterococci
Fecal Streptococcus

V. INORGANIC WET CHEMISTRY*

Acidity
Alkalinity
Ammonia
Bicarbonate
Biochemical Oxygen Demand (BOD)
Bromide
Chloride
Chlorine Demand
Chlorine Residual
Chemical Oxygen Demand
Color
Conductivity
Chromium (VI)
Cyanide - Amenable
Cyanide - Total
Cyanide (CLP)
Dissolved Oxygen
Flashpoint
Fluoride
Grain Size
Hydrocarbon analysis
MBAS
Nitrate
Nitrite
Odor
Oil and Grease
Paint Filter Test
pH
Phenols
Phosphate
Phosphorus
Settleable Solids
Silica
Specific Gravity
Sulfate
Sulfide
Sulfite
Sludge Volume Index
Tannins and Lignins
Total Dissolved Solids
Total Kjeldahl Nitrogen
Total Organic Carbon
Total Organic Halides
Total Solids
Total Suspended Solids
Turbidity
Volatile Solids
Corrosivity Characteristics
Ignitability Characteristics
EPTOX
TCLP

* Figures 6.0 - 6.1 list actual analytical methods utilized

7.4 Standard Operating Procedures

All laboratory activities, from sample receipt to analysis to final report generation, must adhere to the laboratory Standard Operating Procedures (SOPs) which have been developed to provide quality environmental data with adequate documentation to be of known quality and hence of maximum use to our clients. All SOPs provide complete documentation as to how each sample is measured for each parameter. Reference corporate document QAS00200.NET for the IEA corporate format for generating SOPs. Each SOP shall have a unique code in accordance with the IEA corporate document control procedure as outlined in the corporate SOP on document control.

On a regular basis the QA Manager will review data to check for compliance to SOPs. Additionally the QA Manager will review SOPs to ensure they meet the requirements of the methodologies and applicable regulations. If it is found that the document does not meet the requirements, the discrepancy is forwarded to the group/section leader through the corrective action process. (reference SOP on Corrective Action Reports -QAS00501.CT).

In addition to method SOPs, at minimum the laboratory is required to have on file SOPs for the following operations. Many of these SOPs have been generated by the IEA corporate QA department.

Sample Receipt and Log-in
Chain-of-Custody Procedures
Sample Storage
Security of Samples and Laboratory Facility
Preventing Sample Contamination
Purity of Standards and Standards Preparation Documentation
Maintaining Laboratory Records and Logbooks
Sample Analysis and Data Control Systems
Sample Bottle and Glassware Cleaning Procedures
Monitoring of Refrigerators, Freezers, and Ovens
Monitoring of Laboratory Reagent Water Quality
Technical Review of Data and Reports
Sample Analysis, Data Handling and Reporting
Instrument Preventive Maintenance
Document Control System
Corrective Action Process

A complete list of the laboratory SOPs is available upon reuqest.

7.5 Chain-of Custody

Chain of custody procedures are designed to document the physical flow of samples throughout the laboratory. The National Enforcement Investigations Center (NEIC) of EPA defines custody of evidence in the following ways:

It is in your actual possession; or

It is in your view, after being in your physical possession; or
It was in your possession and then you locked or sealed it up to prevent tampering; or
It is in a secure area.

At IEA-CT, chain of custody begins with shipment of the sample bottles and coolers. IEA-CT has a printed external chain-of-custody form that accompanies each sample shipment. An example of this form is found in the appendix.

Upon receipt of the samples in the laboratory the sample custodian and the sample control group are responsible for obtaining all necessary shipping documentation and verification of all data entered into the laboratory sample custody records. The internal chain of custody form is generated at this point.

All samples and projects entering the laboratory are identified with a job/project number. Individual samples are then identified using the job number and sample counter. The samples are then stored according to the requirements of the analytical protocols (refrigeration).

Preliminary sample receipt notifications are distributed to each department to notifiy department of sample arrival and facilitate the analysis of parameters with short holding times. Each department has a system of tracking sample analysis throughout their respective departments.

All documentation received with samples is reviewed by the sample custodian at the time of receipt. The project manager then reviews the paperwork again at the time of log-in to the LIMS computer system. If there are any discrepancies noted by the sample custodian, a corrective action report is filled out and submitted to the project manager. The client is then contacted for resolution.

The specific procedures and requirements for receiving samples are specified in the SOP for sample control - "Sample Processing Methods Performed at Sample Arrival".

8.0 DATA PROCESSING

8.1 Introduction

Data processing is defined as the mechanisms employed for collecting, reviewing, transcribing, reporting and storing of analytical data and related information.

Because of the critical relationship between instrument calibration, the accuracy of the analytical data generated, and specific method protocols that determine data quality, IEA maintains strict controls on the calibration procedures for the various types of analytical equipment. Each type of instrumentation is calibrated prior to sample analysis according to method criteria. Specific criteria for the instrument calibrations must be met before samples may be processed. Corrective action must be taken to remedy any out of control situations.

The following sections will describe the general procedures which are employed at the IEA-CT laboratory. More specific detail can be found in the standard operating procedures.

8.2 Collection

Gas Chromatography

Data from the Gas Chromatographs is collected through interfaces and processed by a Hewlett Packard computer system (HP-1000) with RTE-A operating system and 3550A LAS software. Data is reviewed at the bench level by the analyst. If all required QC is met then the data is reviewed for chromatographic scaling and dilutions. If necessary reintegrations and rescalings are done using the LAS system. The binary result files are then converted to ASCII report files for transfer to alternate computer systems for data report forms generation.

GC/Mass Spectrometry

GC/MS data is collected utilizing Hewlett Packard 1000 RTE, RTA or DOS chemstation computer systems with Aquarius or Environquant software. This software allows for the comparison of sample non-target spectrum against reference library spectra. The most recent NIST/EPA mass spectral library supported by the system must be used. Data is reviewed by the analyst. If the data meets QC requirements, then binary data files are sent to a HP 9000 computer with HP-UX operating system and Thru-put Systems, Inc Envision software for CLP deliverables and diskette preparation, or to an alternate PC for other types of deliverable packages.

Atomic Absorption

ICAP metals are analyzed by a Thermo-Jarrel Ash 61. Data is collected on a Dell computer and is directly transferred to a floppy disk. This data is then taken to a Compaq PC with software to generate metals data reporting forms. Furnace data analyzed by the Perkin

Elmer 5100s are collected on PCs, transfered to floppy and moved to the Compaq for forms generation. Mercury raw data results are manually entered into the LIMS computer where the data is processed and recorded. This data requires manual entry to the compaq for forms generation.

Classical Chemistry

Routine wet chemistry analyses have pre-printed logbooks, such as distillation logs and digestion logs. The less frequent analyses are recorded in analysts' notebooks. Raw data is then entered into the LIMS computer for data calculation. This includes the calibration curve data which may have been previously entered. Semi-automated analyses performed on the Lachat produce calculated final results. These results are then entered into LIMS. Any raw data produced is stored in a central file. Quality control data is manually calculated. Results data is reported off LIMS in the required format.

8.3 Validation/Review

There are numerous policies and standard procedures which have been implemented to ensure that data of known quality is continually generated by the IEA-CT laboratory.

Each analytical SOP details the type and frequency of quality control checks. This includes such items as analysis of client reference standards, matrix spikes, blanks, the use of internal standards and surrogate spikes, etc. All calibrations are checked before sample analysis can begin. If the analytical system does not pass the initial QC limits, then the system is determined to be "out of control", and the cause of the problem must be determined and corrected before measurements can continue. Once the problem is corrected, QC measurements are repeated to verify the calibration. If the system is still out of control, the system is re-examined until the problem is corrected. General requirements are listed below:

Organics

- A minimum of one method blank is analyzed per 20 samples (or batch) per matrix, per concentration level or extraction procedure. A method blank is required every 12 hours for volatile analysis. Blanks and samples are analyzed on the same instrumentation. Pesticides/PCB's also require instrument blanks.
- Holding blanks are placed in volatile refrigerators on a weekly basis. For EPA CLP SOW volatile analysis, holding blanks are analyzed once per SDG.
- A matrix spike/matrix spike duplicate is analyzed at a frequency of one per 20 samples per matrix, per concentration level or per SDG, whichever is more frequent.
- Prior to sample processing, surrogates are added to all samples and method blanks. GC/MS analyses also require the use of internal standards.
- Multi-level initial calibration curves are performed with continuing calibration standards analyzed every 12 hours. Recalibration is required if criteria cannot be met.
- GC/MS system tuning is verified every 12 hours.

Inorganics

- Multi-level calibration is performed on required instrumentation and verified as required.
- Calibration and prep blanks are analyzed at required frequencies.
- A matrix spike and sample duplicate are analyzed every 20 samples/SDG per matrix type.
- A Laboratory Control Sample is analyzed every 20 samples or per batch.
- Multi-level calibrations are performed for all manual and semi-automated wet chemistry methods and verified as required (if applicable).
- Method blanks are analyzed at required frequencies.

The precision and accuracy control limits employed by IEA are based primarily on limits contained in the published methods or required by the U.S. Environmental Protection Agency's Contract Laboratory Program (CLP). When warranted by IEA's historical data, more restrictive control limits are set than those cited by the method or the CLP.

When the CLP protocol is not applicable to analysis of samples, the precision and accuracy requirements for each analytical method are included in the individual laboratory Standard Operating Procedure (SOPs). Examples of data acceptance criteria is detailed in figures 5.0 - 5.1.

At a minimum, all data will be subject to supervisory review. Sensitive data requires higher level review and release. All releases must be in writing. Oral or Faxed preliminary releases are prohibited unless prior permission of the appropriate supervisor(s) is granted.

Each analytical group in the laboratory is responsible for generating the data for all analyses the group performs. In general the data must first meet all the specific QA/QC associated with the SOP that was used for the analysis prior to any release of the data. The analytical group leader (supervisor) is responsible for the final verification of the data from the analysis.

The laboratory employs a system of QA sign-off sheets called QC Batch Approval Forms and Quality Control Approval Reports (QCAR's), where each analyst must sign off that their respective part of the analysis is complete and meets the QA/QC requirements of the governing SOP. Both the Volatile and semi-volatile RTE computer systems produce batch-specific QC summary reports to check various analytical parameters. Analysis QCAR's are filled with the analysis batches while the final deliverable QCAR's are signed and placed in each job folder along with any Corrective Action Forms (CAF) which details any problems which were encountered in the measurement of samples. Any deviations from SOPs are noted on CAF's and explained in the SDG narrative which is incorporated into the final report. The group leader has final sign-off responsibility on the QCAR and is responsible for assuring the overall quality of the data.

The laboratory Quality Assurance Manager periodically examines data packages at random to ensure that all QCAR's are present and to ascertain that the data package meets the requirements as stated in the SOP. These findings are transmitted to laboratory management via progress reports.

8.4 Data and Report Storage

Reports for the current year are filed in the data management area in filing cabinets. If the report has a larger data package, such as "CLP like" deliverables, it is then stored in numbered boxes. The number of the box is recorded into the cross reference logs and then stored in the locked storage area in the basement. All jobs must be signed out if being taken from the data management area.

8.5 Transcription

Whenever possible, manual transcription is avoided through the use of electronic data transfer. Where manual transcription is used, information is checked and verified by the department manager or designee within the department.

8.6 Data Reduction

Data reduction includes all processes that change either the form of expression (i.e., the units of measure) or the quantity of data values (rounding). It often involves statistical and mathematical analysis of data and usually results in a reduced subset of the original data set. Data reduction is performed either manually by the analyst or by computer systems interfaced to the analytical instruments. Whenever such procedures are employed within the laboratory network, mathematical procedures have been verified for accuracy of computation.

An example of this would be for CLP data packages, the data is transfered directly onto the HP 9000 computer from the GC and GC/MS systems. The data is further processed and stored in the database. Other data is entered at this point such as TIC data, client ID's, etc. All calculations and final results are performed by the Envision software. Many of these calculations are also done at the instrumentation level as a secondary review. Data in the database is sorted be client delivery group for easy retrieval. CLP forms are generated after all data is entered and reviewed. The forms and raw data are compiled into a data package.

The data associated with each analysis is hardcopied for permanent storage either through the printing of computer files or through hand entry into bound laboratory notebooks. All notebook entries are dated and signed by the analyst.

Job packages which include 20 samples or samples received by the laboratory during a one week time frame will comprise an "SDG". All organic parameter results will be reported in ug/L for aqueous samples and ug/Kg dry weight for soil/sediment samples. Inorganic result units vary according to the methodology.

It is laboratory policy that any and all problems related to client samples and the measurement of client samples be documented in the SDG narrative of the final laboratory report which goes to the client. The mechanism for documenting problems which shall be included in the SDG narrative is described in Section 10.0. It is the responsibility of the data management group to see that information on CAR's is included in the final SDG narrative.

After final review by the department manager, the data is placed in sample control for tracking on the project status sheet. If possible the data is placed into the job folder. When all parameters are complete the folder is removed by the data management department. It is the responsibility of the data management group to make sure that all the data is present and deliverable requirements are complete. This may include chain of custody forms, special instructions, and case narratives. The data is then compiled and sent to the report production group for word processing.

9.0 DATA QUALITY ASSESSMENT

Data quality is measured through comparison of resulting data with established acceptable limits for data precision, sensitivity, accuracy, representativeness, comparability and completeness (PSARCC) as described in EPA documentation. In order to routinely assess the precision and accuracy of the data generated, the laboratory performs monthly statistical analysis of the spike and spike duplicate data as part of our QA program. These results are used to generate control charts.

9.1 Precision

Precision is defined as a measure of agreement among individual measurements for samples of the same type. The objective of IEA - CT concerning precision, is to equal or exceed the precision demonstrated in the analytical methods on samples of similar matrix. Relative Percent Difference (RPD) is used as the measure of precision. The laboratory will analyze matrix spikes/matrix spike duplicates for organics and sample/sample duplicate for inorganics, on a one per 20 frequency, per matrix, per concentration level.

$$RPD = \frac{\text{absolute (MSR - MSDR)}}{(1/2)(MSR+MSDR)} \times 100$$

where,

MSR = matrix spike recovery

MSDR = matrix spike duplicate recovery

The absolute value of the recovery difference is used in the above equation.

9.2 Sensitivity

Sensitivity is defined as the achievement of method detection limits dependent on instrumental achievablity and matrix effects. Quantitation limits for routine analyses performed are specified in the laboratory SOPs with examples listed in figures 6.0 - 8.0. Quantitation limits may be affected by matrix interferences, such as highly-contaminated samples. Sample/extract cleanups are performed on samples to achieve the detection limits. Instrument detection limits are performed on a quarterly basis for metals analysis and semi-annually for organic analyses.

9.3 Accuracy

Accuracy is defined as the degree of agreement of a measurement with an accepted reference or true value. It is the measurement of the bias in a system and is usually reported as percent recovery of the true value. IEA-CT will access system accuracy by the analysis of matrix spikes. Surrogate spiking will be used for organic parameters. These procedures are outlined in the laboratory SOPs. Examples of specific criteria is listed in figures 5.0 - 5.1.

$$\% \text{ Recovery} = \frac{SSR - SR}{SA} \times 100$$

where,

SSR = spiked sample result

SR = sample result

SA = spike added

9.4 Representativeness

Representativeness of the analytical data is primarily a function of the sampling procedures and techniques employed in the field. As such, the sampling plan must be designed to provide representative samples to the laboratory. Once received at the laboratory, samples are homogenized as much as possible to yield representative data.

9.5 Comparability

Comparability is a measure of the confidence with which one data set can be compared to another. Comparability relies upon precision and accuracy to be within appropriate QC limits. IEA-CT accomplishes this through the use of standardized and approved methods, standardized QC acceptance criteria and laboratory SOPs.

9.6 Completeness

Completeness is the measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under routine conditions. It is IEA-CT's goal to strive for 100 percent completeness.

10.0 CORRECTIVE ACTION

10.1 Introduction

The Corrective action form provides a routine written communication vehicle to describe most types of problems which may occur throughout the laboratory or as a result of a client inquiry. Problems described in SDG narratives should be supported by a CAF.

Corrective actions can be initiated at several operational levels; however they must always involve the QA Manager. Corrective actions are reviewed, documented and distributed to the appropriate personnel through the QA department. Responses are returned to QA for review and redistributed in a specified time frame.

Examples of three types of corrective actions which may be initiated are as follows:

Sample problems

Individual samples or matrix problems may cause documented corrective actions such as re-extraction, reanalysis, cleanups or dilutions.

QC problems

Corrective action may occur on entire batches of samples when QC criteria cannot be achieved.

Systematic problems

Specific project issues and procedural issues may require corrective actions. These are handled by laboratory management and the QA department.

The QA Manager will monitor and log the progress of CAF's and will report in the QA Progress Report the status of major corrective actions taken in the past month. It is the QA Manager's responsibility to see that laboratory problems are documented and solved in a timely manner. This system is outlined in the SOP for Corrective Action Reports - QAS00501.CT.

10.2 System Audit

On a semi-annual basis the QA Manager will perform system audits of the laboratory. The purpose of this is to determine if the laboratory staff is in compliance with the QA program and analytical SOPs. The QA Manager will also ensure that proper documentation through corrective action reports and case narratives is utilized and that there is conformance to identified critical control points.

The Corporate QA Director semi-annually audits the facility for conformance to corporate QA directives. The audits are scheduled so that the laboratory is audited once per quarter.

The SOP for Corporate Audit checklist, Doc# QAS00300.NET, is used for all internal audits. Other performance audit checklists may be used to ensure adherence to specific protocols. The QA Manager shall submit an audit report to the Laboratory Manager. A written response must be submitted back to the QA Manager within 30 days with a corrective action response to all findings. The audit report shall be included in the monthly progress report to management.

10.3 Performance Audits

A performance audit is a quantitative check of the accuracy and/or precision of analytical data.

IEA-CT participates in a number of contracts and certification programs. Many of these programs employ performance evaluations which take the form of proficiency samples submitted to the laboratory on a regular basis.

Bi-annually, the laboratory participates in the USEPA Water Supply (WS) and Water Pollution (WP) proficiency programs. IEA-CT also participates in the NYSDOH proficiency testing program for Potable Water, Hazardous Waste and CLP. The lab currently analyzes quarterly organic PE samples from EPA for the CLP program.

On a quarterly basis the QA Manager will submit QC samples supplied from an external source to the laboratory. The purpose of this is to check the accuracy of results, assess data quality, documentation and completeness of data reporting. The QA Manager shall submit an data review report to the laboratory. A written response must be submitted to QA within two weeks addressing the unacceptable findings Corrective actions shall be put in place and monitored.

10.4 Independent Audits

The laboratory is routinely audited by state and federal agencies for compliance with government regulations. In addition many clients conduct system and performance audits of the laboratory.

10.5 Subcontracted Services

Selected analyses, not performed by the IEA-CT laboratory may be subcontracted within the IEA network or to other facilities outside the network. All subcontract laboratories require approval of the QA department and client prior to use. This includes, at a minimum, review of the facility's Quality Assurance plan. Subcontract laboratories may receive an on-site audit if deemed appropriate. All subcontractors must hold the required certifications necessary for the project.

All clients are notified whenever a subcontracted lab is to be used. This is documented in all laboratory reports.

11.0 IMPLEMENTATION

The date presented in the document header represents the official document date.

The IEA Corporate Quality Assurance Program Plan outlines the specific schedule of implementation required by the network laboratories.

FIGURES

IEA, INC.

ETHICS POLICY

The management of IEA corporation recognizes our responsibility to clients and fellow employees to ensure that fair and ethical business practices are followed at all facilities.

Our clients have placed their trust in our organization to continually provide high quality data which is reliable and represents sound professional judgement at all times. In order to meet this responsibility it is imperative that high ethical standards be maintained at all times by all employees.

The management and staff are committed to maintaining a carefully controlled analytical environment which assures the consistent generation of accurate data which meets the data quality objectives of our clientele.

The following represents the IEA ethics policy which has been adopted to clearly identify the corporate position on ethical practices. Failure to comply with this policy cannot and will not be tolerated.

The Company and All its Employees will:

- Fully comply with all applicable federal, state, and local laws and regulations.
- Produce analytical products that are accurate, defensible and which represent sound professional judgement at all times.
- Provide employees with guidance and an understanding of the ethical and quality standards required in the environmental industry. In this regard, all employees should feel free to identify any ethical misconduct without fear of retribution. Any employee involved in any form of ethical misconduct will be subject to immediate disciplinary action including potential termination of employment.
- Present services to clients in a confidential, honest and forthright manner and strive to deliver quality products at a fair price.

IEA, INC.

ETHICS POLICY -Continued...

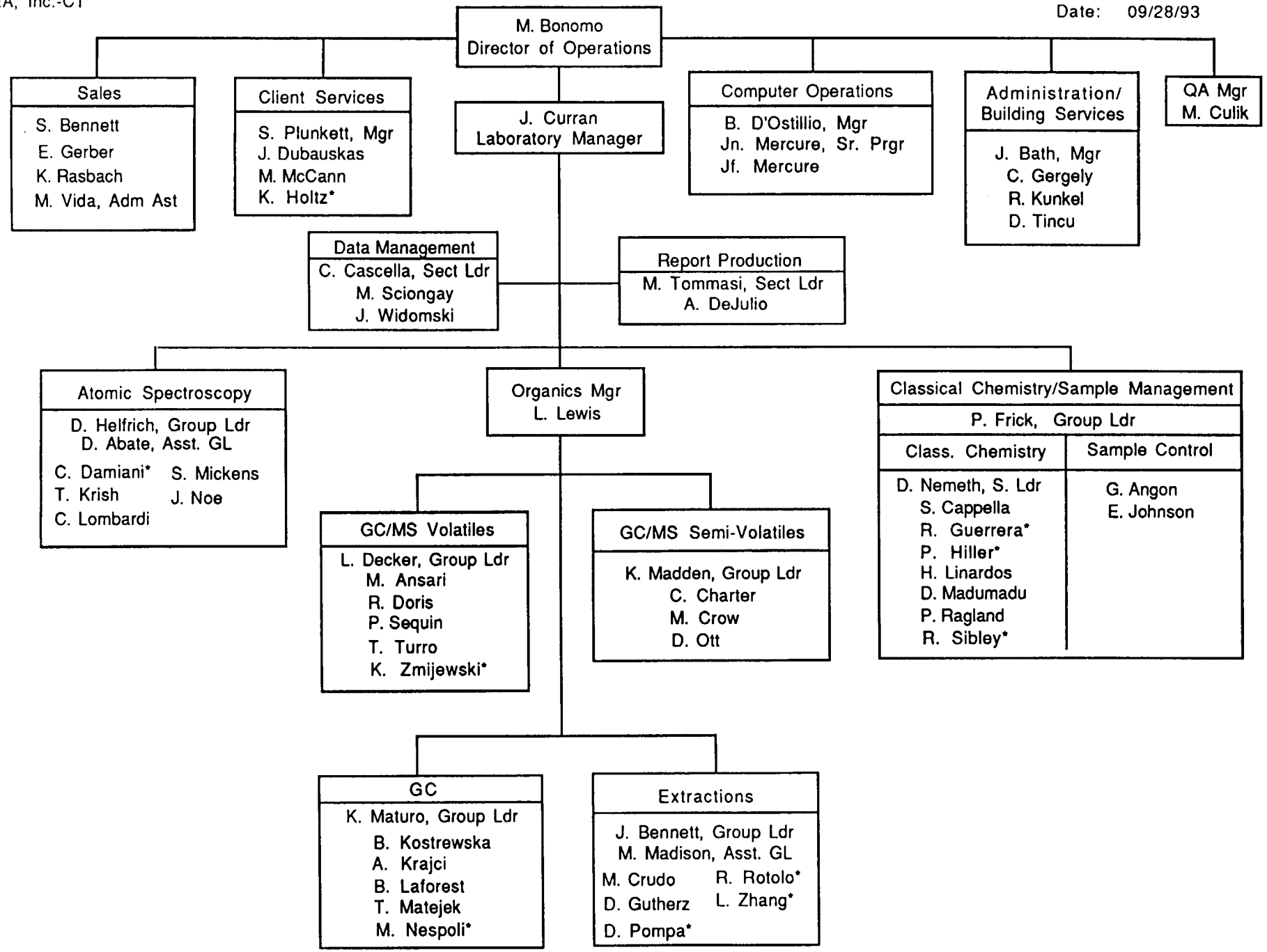
- Treat employees equitably by compensating them fairly, acknowledging their scientific contributions, and providing them opportunities for professional growth and development.
- Offer employment opportunities to qualified candidates regardless of their race, creed, color, sex or age.
- Be a responsible corporate citizen of the community by operating in an environmentally sound manner at all times.
- Maintain all facilities in a safe and professional manner through maintenance of a safety awareness program and provide the necessary safety equipment and training to protect all employees from preventable injury and chemical exposure.

Attached is an "Ethics and Data Integrity Agreement" which is utilized to ensure communication of the company's position on this important issue. Upon completion, a copy of the agreement is maintained in the employee's personnel folder.

If an employee is concerned about potential ramifications of reporting an incident, it is suggested that a notice (anonymous, if desired) be provided to the local QA Manager or Corporate QA Director. The QA department will investigate the allegation and ensure that appropriate action is taken.

IEA, Inc.-CT

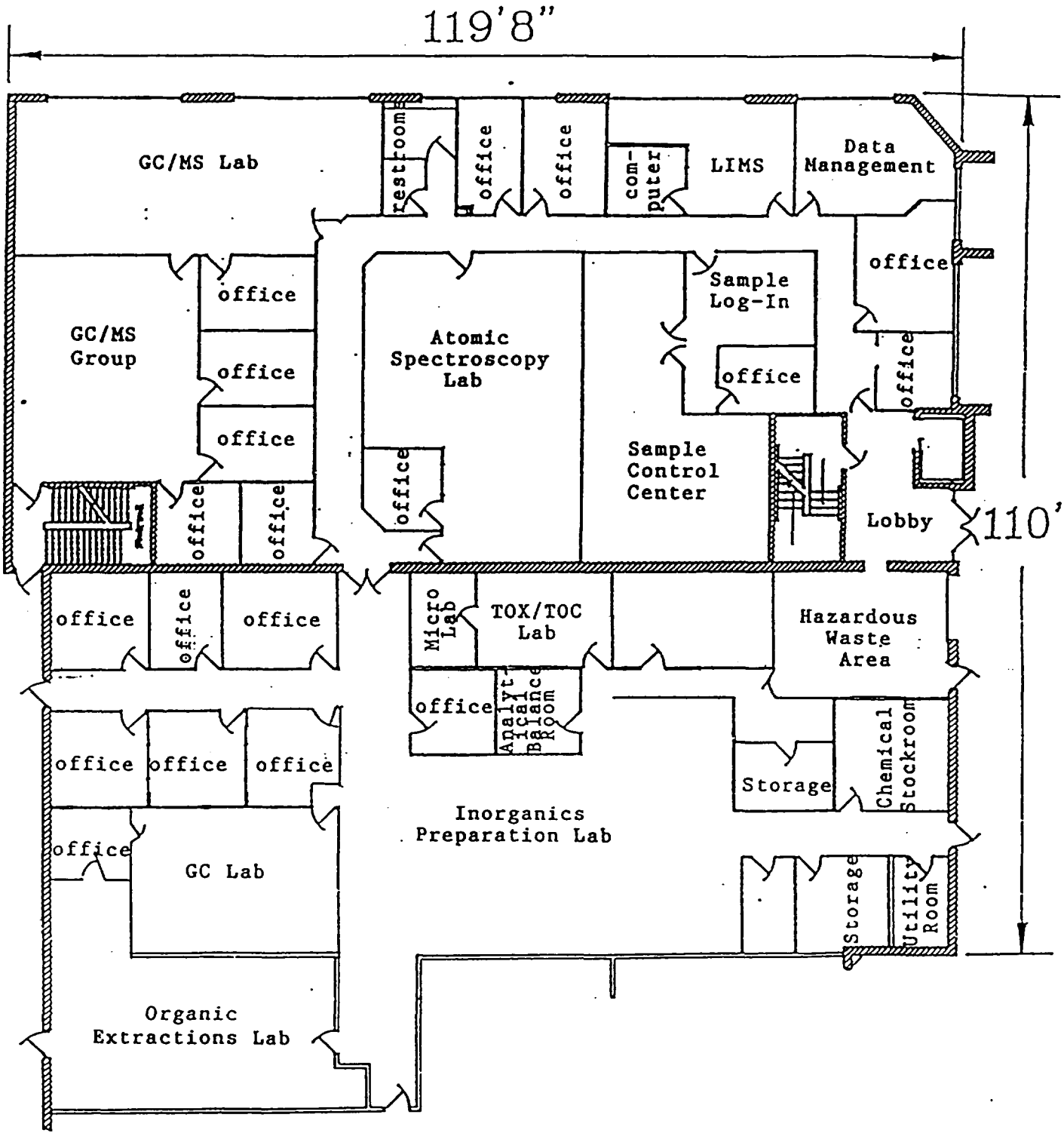
Doc #QAQ00101.C1
Date: 09/28/93



*Part Time/Temp

TUT 005 1753

Fig 3.0



IEA, INC.-CONNECTICUT
200 MONROE TURNPIKE MONROE, CONNECTICUT 0644
FLOOR PLAN 5/

IEA
An Aquarion Company

Fig. 4.0
CORRECTIVE ACTION FORM

A. Originator Information Client Inquiry_____

Client:_____ Job/Case:_____

Date/time:_____ Sample Number(s):_____

Client/Lab Contact: _____ Date/Time Response Due:_____

Detailed Description of Potential Problem:_____

B. Quality Assurance Information **Corrective Action ID#** _____

Recommended Corrective Action:_____

Groups Involved: __Sample Control __ Wet Chemistry __ Metals
__Gas Chromatography __ Mass Spectrometry __ Report Generation
__Client Service __ Sample Preparation

C. Final Resolution

Describe What Happened and Long Term Corrective Action Taken:_____

Supervisor Signature: _____ Date_____ Date/Time Client Notified:_____

D. Quality Assurance Final Approval (QA Manager use only)

Corrective Action Approved: _____
Date Finalized: _____
Was a problem identified? Yes / No

ORGANICS

Parameter	QC	Compounds	Aqueous Control Limits	Solid Control Limits
VOA Components	Lab Blank, Trip Blank, Holding Blank	All TCL Compounds	<5 x RQL Methylene Chloride, Acetone, Toluene and 2-Butanone ≤RDL All Other Compounds	<5 X RQL Methylene Chloride, Acetone, Toluene and 2-Butanone ≤RQL All Other Compounds
	Surrogate Spike Recovery	1,2-dichloroethane-d_4 toluene-d_8 bromofluorobenzene	76-114% 88-110% 86-115%	70-121% 81-117% 74-121%
	Matrix Spike Recovery and Matrix Spike Duplicate Precision	1,1-dichloroethene trichloroethene benzene toluene chlorobenzene	61-145% (14% RPD) 71-120% (14% RPD) 76-127% (11% RPD) 76-125% (13% RPD) 75-130% (13% RPD)	59-172% (22% RPD) 62-137% (24% RPD) 66-142% (21% RPD) 59-139% (21% RPD) 60-133% (21% RPD)
BNA Components	Lab Blank	All Parameters	<5 x RQL Phthalate Esters, <RDL All Other Compounds	<5 x RQL Phthalate Esters <RDL All Other Compounds
	Matrix Spike Recovery and Matrix Spike Duplicate Precision	phenol 2-chlorophenol 1,4-dichlorobenzene N-nitroso-di-n-propylamine 1,2,4-trichlorobenzene p-chloro-m-cresol acenaphthene 4-nitrophenol 2,4-dinitrotoluene pentachlorophenol pyrene	12-110% (42% RPD) 27-123% (40% RPD) 36-97% (28% RPD) 41-116% (38% RPD) 39-98% (28% RPD) 23-97% (42% RPD) 46-118% (31% RPD) 10-80% (50% RPD) 24-96% (38% RPD) 9-103% (50% RPD) 26-127% (31% RPD)	26-90% (35% RPD) 25-102% (50% RPD) 28-104% (27% RPD) 41-126% (38% RPD) 38-107% (23% RPD) 26-103% (33% RPD) 31-137% (19% RPD) 11-114% (50% RPD) 28-89% (47% RPD) 17-109% (47% RPD) 35-142% (36% RPD)
	Surrogate Spike Recovery	nitrobenzene-d_4 2-fluorobiphenyl terphenyl-d_{14} phenol-d_8 2-fluorophenol 2,4,6-tribromophenol	35-114% 43-116% 33-141% 10-110% 21-110% 10-123%	23-123% 30-115% 18-137% 24-113% 25-121% 19-122%
Pesticide/PCB's	Lab Blank	All TCL pesticides/PCB's	<RQL - all Compounds	<RQL - all Compounds
	Matrix Spike Recovery and Matrix Spike Duplicate Precision	lindane heptachlor aldrin dieldrin endrin 4,4'DDT	56-123% (15% RPD) 40-131% (20% RPD) 40-120% (22% RPD) 52-126% (18% RPD) 56-121% (21% RPD) 38-127% (27% RPD)	46-127% (50% RPD) 35-130% (31% RPD) 34-132% (43% RPD) 31-134% (38% RPD) 42-139% (45% RPD) 23-134% (50% RPD)
	Surrogate Spike Recovery	dibutylchlorendate	24-154% (advisory)	24-150% (advisory)
Herbicides	Lab Blank	All Herbicides	<RQL - all Compounds	<RQL - all Compounds
	Compound Spike Recovery and Precision	2,4-D Silvex	10-80% (30%RPD) 10-80% (30%RPD)	20-110% (30%RPD) 20-110% (30%RPD)

For acceptance, the majority of % recoveries and RPDs obtained for the duplicate spike pair must meet the % recoveries and RPDs listed above.

Metals Quality Control Limits

Quality Control Sample	Control Limit	Failure Action
Initial Cal. Verification	± 10 %	Recalibrate
Initial Cal. Blank	± 0.20 ug/L	Recalibrate
CRA	± 20 %	None
Cont. Cal. Verification	± 20 %	Rerun Samples
Cont. Cal. Blank	± 0.20 ug/L	Rerun Samples
Duplicate	± 20 % RPD	Flag Sample
Sample Spike	± 25 % Recovery	Flag Sample
Prep Blank	± 0.20 ug/L	Reprep Samples
Lab Control Sample	± 20 %, 95 % Confid Win	Reprep Samples

Classical Chemistry Quality Control Limits

Quality Control Sample	Control Limit	Failure Action
Initial Cal. Verification	± 15 %	Recalibrate
Initial Cal. Blank	Method Dependent	Recalibrate
Cont. Cal. Verification	± 15 %	Rerun Samples
Cont. Cal. Blank	Method Dependent	Rerun Samples
Duplicate	± 20 % RPD	Rerun & Flag Sample
Sample Spike	± 25 % Recovery	Rerun & Flag Sample
Prep Blank	N/A	Method Dependent
Lab Control Sample	± 20 %, 95 % Confid Win	Rerun

Parameter	Method*	Reference	PQL
Acidity	305.1	600	1.0 mg/L
Alkalinity	310.1	600	1.0 mg/L
Ammonia-Nitrogen	350.1	600	0.04 mg/L
Bicarbonate	406C	SM	1.0 mg/L
Biochemical Oxygen Demand	405.1	600	2.0 mg/L
Bromide	405	SM	0.2 mg/L
Chloride	325.1	600	3.0 mg/L
Chlorine Demand	3-364	ACE	1.0 mg/L
Chlorine (Res.)	330.4	600	0.1 mg/L
Chemical Oxygen Demand	410.4	600	10.0 mg/L
Coliform Fecal	909C	SM	1 cfu/100 mL
Coliform Total	909A	SM	1 cfu/100 mL
Color	110.2	600	5 Pt-Co units
Conductivity	120.1	600	N/A
Chromium (VI)	7196	SW846	0.01 mg/L
Cyanide Amenable	335.1	600	10.0 ug/L
Cyanide Total	335.3	600	10.0 ug/L
Cyanide (CLP)	ILM01.2	EPA CLP	10.0 ug/L
Dissolved Oxygen	360.1	600	0.1 mg/L
Flashpoint	1010	SW846	
Fluoride	340.2	600	0.10 mg/L
Grain Size	D422-63	ASTM	N/A
Hardness	130.2	600	1.0 mg/L
Hydrocarbons (Grav.)	503E	SM	1.0 mg/L
Hydrocarbons (IR)	418.1	600	1.0 mg/L
MBAS	425.1	600	0.04 mg/L
Nitrate/Nitrite-Nitrogen	353.2	600	0.10 mg/L
Nitrite-Nitrogen	354.1	600	0.005 mg/L
Odor	140.1	600	
Oil & Grease (Grav.)	413.1	600	1.0 mg/L
Oil & Grease (IR)	413.2	600	1.0 mg/L
Paint Filter Test	9095	SW846	N/A
pH	150.1	600	N/A
Phenols	420.2	600	0.005 mg/L
Phosphorus	365.2	600	0.10 mg/L
Phosphate (Ortho)	365.2	600	0.10 mg/L
Settleable Solids	160.5	600	1.0 mL/L
Silica	370.1	600	1.0 mg/L

Parameter	Method*	Reference	PQL
Specific Gravity	3-61	ACE	N/A
Sulfate	375.3	600	10.0 mg/L
Sulfide	376.1	600	1.0 mg/L
Sulfite	377.1	600	1.0 mg/L
Sludge Volume Index	213C	SM	1.0 mL/mg
Tannin & Lignin	513	SM	0.5 mg/L
Total Dissolved Solids	160.1	600	5.0 mg/L
Total Kjeldahl Nitrogen	351.2	600	0.04 mg/L
Total Organic Carbon	415.2	600	0.5 mg/L
Total Organic Halides	9020	SW846	10.0 ug/L
Total Solids	160.3	600	1.0 mg/L
Total Suspended Solids	160.2	600	5.0 mg/L
Turbidity	180.1	600	0.10 NTU
Volatile Solids	160.4	600	1.0 mg/L
Corrosivity Characteristics	9045	SW846	N/A
Ignitability Characteristics	D93-79	ASTM	
TCLP	1311	SW846	NA

600 - Methods for Chemical Analysis of Water and Wastes, USEPA 600/4-79-020.
SM - Standard Methods for the Examination of Water and Wastewater, 16th Edition.
ACE - Army Corps of Engineers Procedures for Handling and Chemical Analysis of Sediment and Water Samples, May 1981.
SW846 - Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, SW846 3rd Edition.

* - Laboratory capablities may include alternate methods

Volatiles	Quantitation Limits [a,b] Water (ug/L)	Low Soil (ug/Kg)	Medium Soil (ug/Kg)
Chloromethane	10	10	1200
Bromomethane	10	10	1200
Vinyl Chloride	10	10	1200
Chloroethane	10	10	1200
Methylene Chloride	5	5	600
Acetone	10	10	1200
Carbon Disulfide	5	5	600
1,1-Dichloroethene	5	5	600
1,1-Dichloroethane	5	5	600
1,2-Dichloroethene (total)	5	5	600
Chloroform	5	5	600
1,2-Dichloroethane	5	5	600
2-Butanone	10	10	1200
1,1,1-Trichloroethane	5	5	600
Carbon Tetrachloride	5	5	600
Vinyl Acetate	10	10	1200
Bromodichloromethane	5	5	600
1,2-Dichloropropane	5	5	600
cis-1,3-Dichloropropene	5	5	600
Trichloroethene	5	5	600
Dibromochloromethane	5	5	600
1,1,2-Trichloroethane	5	5	600
Benzene	5	5	600
trans-1,3-Dichloropropene	5	5	600
Bromoform	5	5	600
4-Methyl-2-pentanone	10	10	1200
2-Hexanone	10	10	1200
Tetrachloroethene	5	5	600
Toluene	5	5	600
1,1,2,2-Tetrachloroethane	5	5	600
Chlorobenzene	5	5	600
Ethylbenzene	5	5	600
Styrene	5	5	600
Xylene (total)	5	5	600

[a] Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight bases as required by the contract, will be higher.

[b] Specific quantitation limits are highly matrix-dependent. The quantitation limits listed herein are provided for guidance and many not always be achievable.

Semi-Volatiles	Quantitation Limits [a,b] Water (ug/L)	Low Soil (ug/Kg)	Medium Soil (ug/Kg)
Phenol	10	330	10000
bis(2-Chloroethyl)ether	10	330	10000
2-Chlorophenol	10	330	10000
1,3-Dichlorobenzene	10	330	10000
1,4-Dichlorobenzene	10	330	10000
Benzyl alcohol	10	330	10000
1,2-Dichlorobenzene	10	330	10000
2-Methylphenol	10	330	10000
2,2'-oxybis(1-Chloropropane)#	10	330	10000
4-Methylphenol	10	330	10000
N-Nitroso-di-n-propylamine	10	330	10000
Hexachloroethane	10	330	10000
Nitrobenzene	10	330	10000
Isophorone	10	330	10000
2-Nitrophenol	10	330	10000
2,4-Dimethylphenol	10	330	10000
Benzoic acid	50	1600	50000
bis(2-Chloroethoxy)methane	10	330	10000
2,4-Dichlorophenol	10	330	10000
1,2,4-Trichlorobenzene	10	330	10000
Naphthalene	10	330	10000
4-Chloroaniline	10	330	10000
Hexachlorobutadiene	10	330	10000
4-Chloro-3-methylphenol	10	330	10000
2-Methylnaphthalene	10	330	10000
Hexachlorocyclopentadiene	10	330	10000
2,4,6-Trichlorophenol	10	330	10000
2,4,5-Trichlorophenol	50	1600	50000
2-Chloronaphthalene	10	330	10000
2-Nitroaniline	50	1600	50000
Dimethylphthalate	10	330	10000
Acenaphthylene	10	330	10000
2,6-Dinitrotoluene	10	330	10000
3-Nitroaniline	50	1600	50000

Previously known by the name bis(2-Chloroisopropyl)ether

[a] Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight bases as required by the contract, will be higher.

[b] Specific quantitation limits are highly matrix-dependent. The quantitation limits listed herein are provided for guidance and many not always be achievable.

Semi-Volatiles (cont.)	Quantitation Limits [a,b] Water (ug/L)	Low Soil (ug/Kg)	Medium Soil (ug/Kg)
Acenaphthene	10	330	10000
2,4-Dinitrophenol	50	1600	50000
4-Nitrophenol	50	1600	50000
Dibenzofuran	10	330	10000
2,4-Dinitrotoluene	10	330	10000
Diethylphthalate	10	330	10000
4-Chlorophenyl-phenylether	10	330	10000
Fluorene	10	330	10000
4-Nitroaniline	50	1600	50000
4,6-Dinitro-2-methylphenol	50	1600	50000
N-Nitrosodiphenylamine (1)	10	330	10000
4-Bromophenyl-phenylether	10	330	10000
Hexachlorobenzene	10	330	10000
Pentachlorophenol	50	1600	50000
Phenanthrene	10	330	10000
Anthracene	10	330	10000
Di-n-butylphthalate	10	330	10000
Fluoranthene	10	330	10000
Pyrene	10	330	10000
Butylbenzylphthalate	10	330	10000
3,3'-Dichlorobenzidine	20	660	20000
Benzo(a)anthracene	10	330	10000
Chrysene	10	330	10000
bis(2-Ethylhexyl)phthalate	10	330	10000
Di-n-octylphthalate	10	330	10000
Benzo(b)fluoranthene	10	330	10000
Benzo(k)fluoranthene	10	330	10000
Benzo(a)pyrene	10	330	10000
Indeno(1,2,3-cd)pyrene	10	330	10000
Dibenzo(a,h)anthracene	10	330	10000
Benzo(g,h,i)perylene	10	330	10000

[a] Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight bases as required by the contract, will be higher.

[b] Specific quantitation limits are highly matrix-dependent. The quantitation limits listed herein are provided for guidance and many not always be achievable.

Pesticides/Aroclors	Quantitation Limits[a,b] Water (ug/L)	Soil (ug/Kg)
alpha-BHC	0.05	8.0
beta-BHC	0.05	8.0
delta-BHC	0.05	8.0
gamma-BHC (Lindane)	0.05	8.0
Heptachlor	0.05	8.0
Aldrin	0.05	8.0
Heptachlor Epoxide	0.05	8.0
Endosulfan I	0.05	8.0
Dieldrin	0.10	16.0
4,4'-DDE	0.10	16.0
Endrin	0.10	16.0
Endosulfan II	0.10	16.0
4,4'-DDD	0.10	16.0
Endosulfan Sulfate	0.10	16.0
4,4'-DDT	0.10	16.0
Methoxychlor	0.50	80.0
Endrin-Ketone	0.10	16.0
alpha-Chlordane	0.50	80.0
gamma-Chlordane	0.50	80.0
Toxaphene	1.0	160.0
Aroclor - 1016	0.5	80.0
Aroclor - 1221	0.5	80.0
Aroclor - 1232	0.5	80.0
Aroclor - 1242	0.5	80.0
Aroclor - 1248	0.5	80.0
Aroclor - 1254	1.0	160.0
Aroclor - 1260	1.0	160.0

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

There is no differentiation between the preparation of low and medium soil samples in this method for the analysis of pesticides/aroclors.

[b] Specific quantitation limits are highly matrix-dependent. The quantitation limits listed herein are provided for guidance and many not always be achievable.

Fig. 8.0

IEA Corporation **Routine Metal Method Detection Limits**

Date: 07/28/93

Parameter	Soil (mg/Kg)	Water (ug/L)
Aluminum	40	200
Antimony	12	60
Arsenic	2	10
Barium	40	200
Beryllium	1	5
Boron	200	100
Cadmium	2	10
Calcium	200	1,000
Chromium	2	10
Cobalt	10	50
Copper	5	25
Iron	20	100
Lead	0.6	3
Magnesium	200	1,000
Manganese	3	15
Mercury	0.1	0.2
Molybdenum	4	10
Nickel	8	40
Potassium	200	1,000
Selenium	1	5
Silicon		100
Silver	2	10
Sodium	200	1,000
Thallium	2	10
Tin	10	50
Titanium	4	4
Vanadium	10	50
Zinc	4	20

APPENDIX A

CLASSICAL CHEMISTRY

Equipment Name	Manufacturer	Model Number	Serial Number
Spectrophotometer, UV-VIS	Perkin-Elmer	Hitachi 200	522-5
Spectrophotometer, UV-VIS	Perkin-Elmer	35	34630
IR-Spectrophotometer	Perkin-Elmer	1310	134423
Turbidimeter	Hach Company	2100A	851017142
TOC Analyzer	Xertex-Dohrmann	DC-80	HF2029
TOX Analyzer	Xertex-Dohrmann	MC3 A,B	MF 2106
Fluorometer	Sequoia-Turner Corp.	112-003	D 01491
pH/ISE Meter	Orion	SA 720	SR45A
pH/ISE Meter	Beckman	12	0232578
Conductivity Meter	Cole-Parmer Instrument	1484-20	1421
Flash Point Apparatus	Precision Scientific	Pensky-Martin	10 Au-12
Oven	Fisher Scientific	55G	291
Oven	VWR	1320	0701090
Incubator	Blue M Electric	100 A	IN1-1362
Bio Refrigerator	Frost Queen	R20/L	00029
Centrifuge	Garver Manufacturing	549	10883
Centrifuge	DYNAC	0101	16846
Water Bath	Blue M Electric	MW-1220	MX-2520
D.O. Meter	YSI	51A	0241
Autoclave	Market Forge	STM-E	034200
COD Reactor	HACH	45600	920300006892
Muffle Furnace	Thermolyne	-	-
TKN block digestor	Scientific Instruments	AD-4020	-
Digital Hot Plate/Stirrer	PMC	730	-
Digital Hot Plate/Stirrer	PMC	730	-
Semiautomated Analyzer	LACHAT	Quikchem	-

METALS

Mercury Analyzer	Spectro-Products	HG4	4708
ICP-Sequential	Perkin-Elmer	6500	128238
ICP-Semiultaneous	Jarrell-Ash	JA61	67782
Furnace AA	Perkin-Elmer	Z3030	3131
Furnace AA	Perkin-Elmer	Z5100	130911
Furnace AA	Perkin-Elmer	Z5100 PC	135141

ORGANIC EXTRACTIONS

Gas Chromatograph	Perkin-Elmer	8320	83N546502
Gel Permeation Chromato-tograph	ABC	1002B	7323
Gel Permeation Chromato-tograph	ABC	AP1000	9228
Refrigerator	WW	4EF	F3978U
Oven	ASP	D 1142	144011
Oven	ASP	D 1162	149010
Sonicator	Sonics & Materials	SM500	6892
Sonicator	Tekmer	TM500	7264
Auto Sampler	Perkin-Elmer	AS100	95234
Integrator/Plotter	Perkin-Elmer	LCI-100	N431931C
GC	Perkin-Elmer	Sigma 3	093317002180

GC/MS-VOLATILES

Purge & Trap	Tekmar	LSC 2000	91318021
Purge & Trap	Tekmar	ALS 2016	91322002
Purge & Trap	Tekmar	LSC 2000	91203019
Purge & Trap	Tekmar	ALS 2016	91232007
Tube Desorber	Envirochem	810TD	268153
Tube ALS	Envirochem	MTD	MT-1005
Purge & Trap	Tekmar	LSC 4000	254
Purge & Trap	Tekmar	ALS	372
Purge & Trap	Tekmar	LSC-2	1824
Computer/Data System	Hewlett Packard	425T	3048T147545
SCSI Tape Drive	Hewlett Packard	1300S	313E03914
Terminal	Hewlett Packard	X-window	3048T18725
Terminal	Hewlett Packard	X-window	3048T18726
Disc Drive	Hewlett Packard	7914	---
Disc Drive	Hewlett Packard	7914	---
P&T	Tekmar	LSC-2	227
P&T	Tekmar	4000	192
P&T	Tekmar	4000	398
P&T	Tekmar	14-2000-000	88068001
P&T	Tekmar	LSC-2	1324
P&T	Tekmar	ALS	679
P&T	Tekmar	14-2962-200	88061015

GC/MS-VOLATILES (cont.)

P&T	Tekmar	ALS	494
P&T	Tekmar	ALS	1068
GC/MS	Hewlett Packard	5995B	2217A00358
GC/MS	Hewlett Packard	5995C	2413A00659
GC/MS	Hewlett Packard	5995C	2413A00430
Terminal	Hewlett Packard	45849A	2530A13541
Terminal	Hewlett Packard	35751	2643A07666
CRT	Hewlett Packard	35731A	8633K26810
Printers (partial list)	Hewlett Packard	2934A	2635A32940
Printers	Hewlett Packard	2934A	2715A43948
Printers	Hewlett Packard	2225A	2512S30379
Printers	Hewlett Packard	2225A	2510S32359
Terminal	Hewlett Packard	35751	2630A06622
CRT	Hewlett Packard	35731A	8610K20516
Magnetic Tape Unit	Hewlett Packard	7970E	N/A
Scanning Interface	Hewlett Packard	59824A	N/A
Scanning Interface	Hewlett Packard	59824A	N/A
Cart. Tape Unit	Hewlett Packard	7914	N/A
5010 Auto Desorber	Tekmar	14-2150-000	133-GT
Cart. Tape Unit	Hewlett Packard	7914	N/A

GC-MS-SEMIVOLATILES

Gas Chromatograph	Hewlett Packard	5890	7518A05422
Gas Chromatograph	Hewlett Packard	5890	2728A14615
Auto Sampler	Hewlett Packard	76732A	2441A03468
Mass Selective Detector	Hewlett Packard	5970	2513A00923
Mass Selective Detector	Hewlett Packard	5970	2716A10638
Computer Terminal	Hewlett Packard	150 II	2720Y05798
Computer Terminal	Hewlett Packard	150 II	2720Y03266
Computer Terminal	Hewlett Packard	150 II	2530A13540
Scanning Interface	Hewlett Packard	59824A	---
Scanning Interface	Hewlett Packard	59824A	---
Tape Drive	Hewlett Packard	9144	---
Disc Drive	Hewlett Packard	7958	---
9 Track Magnetic Tape	Hewlett Packard	7970E	---
9 Track Magnetic Tape	Hewlett Packard	7970E	---

GC-MS-SEMIVOLATILES (cont.)

Computer	Hewlett Packard	HP1000A	---
Computer	Hewlett Packard	HP1000	---
Printer	Hewlett Packard	2934A	2524A19296
Printer	Hewlett Packard	2235A	2814A11816
Printer	Hewlett Packard	2225A	2618S30681
Printer	Hewlett Packard	2934A	2643A35608
Autosampler	Hewlett-Packard	7673A	2546A01489
GC	Hewlett-Packard	5890A	---
MSD	Hewlett-Packard	5971A	3040A01426
Autosampler	Hewlett-Packard	7673	3120A28431
Computer	Gateway	386/25 DX	365201578025
Terminal	Hewlett Packard	36731A	8635K28238

GAS CHROMATOGRAPHY

GC	Hewlett-Packard	5890	2541A06301
GC	Hewlett-Packard	5890	2750A14840
Autosampler	Hewlett-Packard	7673A	2546A00709
Autosampler	Hewlett-Packard	7673A	3123A25128
Autosampler	Hewlett-Packard	7673A	2718A0653A
Integrator	Hewlett-Packard	3396A	2804A01106
Integrator	Hewlett-Packard	3393A	2332A00D80
GC	Hewlett-Packard	5890 Series II	3121A35826
GC	Hewlett-Packard	5890 Series II	3235A44989
Data System	Hewlett-Packard	HP1000A	3020A05230
Terminals (3)	Hewlett-Packard	35741A	---
Printers (2)	Hewlett-Packard	35741A	---
Tape Drive	Hewlett Packard	9144	2724E13732

APPENDIX B

IEA
An Aquarion Company

200 Monroe Turnpike
Monroe, Connecticut 06468

Phone 203·261·4458
Fax 203·268·5346

Key Professional Profiles

IEA, INC. - CONNECTICUT

July 15, 1993

Sunrise, Florida 305·846·1730
Schaumburg, Illinois 708·705·0740
N. Billerica, Massachusetts 617·272·5212
Whippany, New Jersey 201·428·8181
Research Triangle Park, North Carolina 919·677·0090
Essex Junction, Vermont 802·878·5138

PROFESSIONAL PROFILE
Michael V. Bonomo

TITLE: Director of Operations-Connecticut

ACADEMIC ACCOMPLISHMENTS:

Fordham University - Bronx, New York
B.S. Biology

Pace University - White Plains, New York
M.B.A Marketing

MAJOR AREA OF EXPERTISE:

Environmental Regulations
(RCRA, CERCLA, CWA, SDWA, ECRA)

Sampling and Analysis Plan Design

Data Management

SUMMARY OF EXPERIENCE:

Mr. Bonomo has over 14 years experience in environmental monitoring programs. He has functioned in numerous roles including director, co-director, sales manager, project manager, field and laboratory scientist, consultant, and seminar instructor. He has assisted many Fortune 500 companies and consultant/engineers in the design and implementation of sampling and analysis project plans. He has been involved in a wide spectrum of environmental programs for groundwater, soil, and sludge testing to monitoring various aquatic biota. Mr. Bonomo is also experienced in data management requirements for large analytical projects. He was instrumental in developing and implementing a system that was successfully utilized on many projects. He has also served as a seminar instructor for groundwater monitoring sampling and data tracking for a major waste management company.

PROFESSIONAL EXPERIENCE:

1992 to Present IEA-Connecticut, Inc.

Position Director of Operations

Responsibility

Responsible for overall operations and profitability.

1991 to 1992 IEA-Connecticut, Inc.

Position Co-Director

Responsibilities

Co-responsibility for the profitability and management. Duties included business development, marketing, financial and budget management, sales management, strategic planning and monitoring operations.

1990 to 1991 IEA-Connecticut, Inc.

Position Sales and Marketing Manager

Responsibilities

Responsible for the sales staff, corporate strategic planning, sales management and marketing in the New Jersey, Connecticut, Massachusetts and Vermont laboratories.

1989 to 1990 York Wastewater Consultants (YWC)
Monroe, Connecticut

Position Executive Director

Responsibilities

Assisted in the growth of an unknown Connecticut based company to one that covered all of the Eastern United States. Participated in a 6-month strategic planning process that provided insight into the tools needed to run a successful company. In spite of severe banking problems, a 2-year Federal EPA investigation, and a downturn in the market, saw YWC through successful acquisition by Aquarion.

1987 to 1989 York Wastewater Consultants (YWC)
Monroe, Connecticut

Position Sales and Marketing Manager

Responsibilities

Managed three York Laboratories division of YWC, Inc. Responsible for the Northeast, Mid-Atlantic and Midwest United States. Built sales and marketing program where non had existed before. Helped to assimilate five disjointed businesses into a single working division with resource sharing, cross training, budget management, and team building.

1982 - 1987 ETC

Position National Account Executive

Responsibilities

Developed and managed new business for analytical and data management services. Responsible for marketing to many Fortune 500 chemical, petrochemical, waste, and electronics firms. Efforts included major projects throughout the United States. Worked with clients in regulatory compliance, project design, and data use and interpretation. Developed a client base that was involved in RCRA groundwater monitoring, CERCLA site Remedial Investigation Feasibility Studies, New Jersey ECRA investigations, and Clean Water Act compliance. Involved in one of the first petroleum refinery land treatment demonstrations in the United States. Served as the Chairman of the ETC Technical Product Development Committee.

1980 - 1982 Lawler, Matusky and Skelly Engineers

Position Project Manager

Responsibilities

Project Manager for environmental monitoring programs related to the electric utility industry. Responsible for proposal writing, program design, management of staff scientists and technicians for his projects, budget control, report writing and technical presentations. These projects included water chemistry, fish population studies, lower trophic level monitoring, and mitigation of the impact of power plants on the river environment. Designed and implemented groundwater sampling programs with customized equipment for a major site in New York State.

1978 - 1980 Lawler, Matusky and Skelly Engineers

Position Project Scientist

Responsibilities

Crew Chief for field survey including sampling of biota, water, soil and sludge. Responsible for maintaining field control of samples, including documentation, custody, and proper sampling techniques. Performed laboratory analysis including wet chemistry procedures, fish taxonomy and other biological studies. Responsible for writing Standard Operating Procedures for laboratory operations.

Doc# HRR02100.NET

PROFESSIONAL PROFILE
Jeffrey C. Curran

TITLE: Laboratory Manager

ACADEMIC ACCOMPLISHMENTS:

Southern Connecticut State University - New Haven, Connecticut
B.A. Chemistry, 1975
M.S. Chemistry, 1978

MAJOR AREA OF EXPERTISE:

Quality Control/Quality Assurance
Hazardous Waste Analyses
Classical and Wet Chemistry Analyses
PCB Analysis
Capillary GC/MS Analysis
Industrial Hygiene

Certified Laboratory Director for the States of Connecticut, New York, New Jersey and Massachusetts.

SUMMARY OF EXPERIENCE:

Mr. Curran has extensive experience in analytical chemistry specializing in environmental analysis. He has worked in all areas of the laboratory and has hands-on expertise in general wet chemistry techniques, atomic spectroscopy, gas chromatography, infrared spectroscopy and gas chromatography/mass spectrometry.

PROFESSIONAL EXPERIENCE:

Present

IEA, Inc. - Connecticut

Position Laboratory Manager

Responsibilities

For the past 15 years Mr. Curran has directed and participated in a variety of projects. Some highlights are listed below:

Hazardous Waste Site, East Windsor, CT

At a major Connecticut Hazardous Waste site Mr. Curran participated in the sampling analysis of buried drums of hazardous waste during a state-supervised cleanup project.

Ethylene Oxide Emissions Testing, Sherburn, New York

At a major EtO user in Upstate New York, Mr. Curran directed an on-site testing program for measuring EtO emissions using gas chromatography. Mr. Curran also worked on a testing program in conjunction with the NYSDEC for testing pollutant control equipment for EtO sterilizers.

Canadian Tariff Board Hearings

Mr. Curran provided expert witness testimony at a Canadian Tariff Board Hearing concerning chemical composition of foam packaging material.

Worker Exposure Study, Lynchburg, Virginia

Mr. Curran directed an on-site industrial hygiene study to monitor employee exposure to various solvents and chemicals. Mr. Curran was also part of the team which analyzed the various samples collected using gas chromatography, atomic spectroscopy, and UV-VIS spectroscopy in accordance with NIOSH protocols.

Food Processing Plant, Rochester, New York

Mr. Curran conducted an investigation to determine the cause of stainless steel tubing failures for a national food process company. The results of this study were used in determining alternatives to the current materials used in the process.

Hazardous Breakdown Product Study

Mr. Curran designed a system to identify and measure potentially hazardous breakdown products resulting from the pyrolysis of plastic materials for an international aircraft manufacturer. Results of this study were used to identify what materials were responsible for and how to alleviate the problem.

PROFESSIONAL AFFILIATIONS:

Member of the American Chemical Society

PROFESSIONAL PROFILE
Marsha Culik

TITLE: **QA Manager**

ACADEMIC ACCOMPLISHMENTS:

S.U.N.Y. at Alfred - Alfred, New York
A.A.S. Medical, 1976
Laboratory Technology

MAJOR AREA OF EXPERTISE:

Extensive development and "hands on" experience with Gas Chromatography, Atomic Absorption Spectrophotometry, Auto Analyzer, and some computer data stations.

SUMMARY OF EXPERIENCE:

Ms. Culik has over 12 years experience in the environmental laboratory field. Experience ranges from analysis of drinking water with a Grade 3 Water Treatment Plant Operator to gas chromatography chemist with environmental samples. Ms. Culik has experience as supervisor of the Gas Chromatography department.

PROFESSIONAL EXPERIENCE:

1/91 to Present

IEA, Inc. - Connecticut

Position QA Manager

Responsibilities

Quality Assurance Manager, responsible for monitoring the continuing compliance with the Corporate QA Program and to be a liaison between Corporate QA and laboratory staff.

Additional responsibilities include maintaining certification programs, coordination of external and internal audits, coordinate all inquiries relative to quality issues and follow-up on corrective actions as necessary, maintain files of all QA related documentation include review and approval of all SOP's.

1986 to 1991

Position GC Group Leader

Responsibilities

Supervisor of GC Group, responsible for analysis of environmental samples for pesticides/PCB's according to EPA/NYSDEC CLP Protocols, SW846 Methods and EPA "600" Series Methods. Additional responsibilities include analysis of samples via purge & trap/GC according to various protocols.

Other duties include analysis of air samples, charcoal absorbent tubes and other miscellaneous samples for any parameters requiring gas chromatography analysis. She is also responsible for supervision of the group including sample tracking, data review, etc.

1984 to 1986

Position Chemist

Responsibilities

Experience in sample prep and GC analyses of Pesticides/PCB's in water, oil and soil samples.

1981 to 1984

Position Laboratory Analyst - American Waterworks Service Company

Responsibilities

Experience performing complete laboratory analysis or raw, potable, and waste water including all miscellaneous include Volatile Organics, Trihalomethanes and Aromatics using Purge and Trap techniques; Pesticides and Herbicides by GLC; Transition and Heavy Metals by Flame and Graphite Furnace Atomic Absorption; and Nutrients by Automated and other various wet chemistry procedures. Assisted Lab Director in the development of many methods used in these analyses. Responsible for collection and interpretation of all quality control data.

1978 to 1981

Position Lab Technician - Suffolk County Water Authority

Responsibilities

Laboratory experience in the analysis of potable water for a large water utility. Cooperative studies done in conjunction with state and local health agencies concerning water and wastewater quality. Also monitoring the chemical quality of water and seawater programs for the U.S.G.S. Primary responsibilities were for the analysis of Halogenated and Aromatic organic compounds by Purge and Trap Gas Chromatography. Other areas of experience include the analyses of nutrients by Technicon Auto Analyzer, metals by Flame and Graphite Furnace Atomic Absorption, and microbiological testing using Millipore System.

1976-1978

Position Lab Technician - Hooker Chemicals & Plastics

Responsibilities

Responsible for the analysis of vinyl chloride monomer in PVC Compounds, Resins and Food Packageability studies utilizing Gas Chromatography. Responsible for monitoring the air quality of the plant environment.

SPECIALIZED TRAINING:

1984 Certified Grade 3 Water Treatment Plant Operator

1977 ASCP Registered MLT

Environmental Laboratory Management
Two day seminar on Environmental Laboratory Management
John H. Taylor, Analytical Technology.

Performance Management Workshop
One day seminar
Cynthia Barnet, Human Resources Consultant

Interview Skills Workshop
One day seminar
Cynthia Barnet, Human Resources Consultant

Leadership Development Workshop
Four day workshop
William Frackler, Ingoldsby, Inc.

Mass Spectral Data Interpretation
One day seminar
Dr. Frank Rutecek, Cornell University

Introduction to Analytical Separations
Four day seminar
Dr. Dhea Habboush, Sacred Heart University

ASQC Course
Auditing of Quality Systems

ASQC Course
Introduction to SPC

PROFESSIONAL PROFILE
Larry D. Lewis

TITLE: Organics Manager

ACADEMIC ACCOMPLISHMENTS:

University of Pittsburgh - Pittsburgh, PA
B.S. Chemistry, 1984

MAJOR AREA OF EXPERTISE:

Laboratory Operations Management
Organic analysis of environmental samples using CLP, SW846 and drinking water protocols
Instrument troubleshooting
Data reduction, computer deliverables preparation and final data review
Hewlett-Packard 1000 & 9000 series computer systems
RTE operating systems
Thru-Put Envision software
Improvement Team Leader

SUMMARY OF EXPERIENCE:

Mr. Lewis has nine years experience in the analysis of environmental samples and over six years experience in operational arrangement. He has functioned in numerous roles including Organics Manager, Chromatography Manager, GC/MS Group Manager, GC/MS Volatile Manager, and GC/MS Chemist. Mr. Lewis assumes the laboratory manager's responsibilities when required and has extensive operational management experience in the organics area.

PROFESSIONAL EXPERIENCE:

5/92 to Present

IEA, Inc.- Connecticut

Position Organics Manager

Responsibilities

Mr. Lewis is responsible for the daily operational management, production, and quality control of the organics departments and provides senior level technical support. Mr. Lewis is also experienced with Hewlett-Packard 1000 series computer with RTE operating systems and Hewlett-Packard 9000 series computers with UNIX operating systems.

5/91 to 5/92

Position Chromatography Manager

Responsibilities

Mr. Lewis managed the GC and GC/MS departments where he was responsible for the management, production, and quality control. He managed the implementation of new protocols and instrumentation and operational decisions in conjunction with the GC and GC/MS managers.

10/89 to 5/91

Position GC/MS Group Manager

Responsibilities

Mr. Lewis has extensive experience in the GC/MS analysis of environmental samples from sample preparation to deliverables preparation and review; and has supervised in the group for over four years. He was responsible for the management, production and quality control for the GC/MS group and provided senior level technical support for the group. He has extensive chromatography and mass spectrometry systems experience.

5/87 to 10/89

Position GC/MS Volatile Section Leader

Responsibilities

Mr. Lewis managed the volatile section of the GC/MS group where he was responsible for the production and quality control for all volatile analyses of water, soil, complex, air and drinking water samples. He was instrumental in the conversion from packed column volatile analysis to the use of wide bore capillary columns for all volatile work, as well as the development and application of volatile drinking water procedures.

11/84 to 5/87

Position GC/MS Chemist -NUS Corporation

Responsibilities

Mr. Lewis performed GC/MS analysis of environmental samples for volatile and semi-volatile compounds. He was intimately involved in the mass spectral interpretation of target and non-target compounds, data reduction and deliverables preparation; and performed all aspects of GC/MS analysis using USEPA methodologies. He routinely performed instrument troubleshooting and preventive maintenance and worked on method development for the group.

SPECIALIZED TRAINING:

Environmental Laboratory Management
John H. Taylor, Analytical Technologies

A two day seminar on environmental laboratory management concentrating on analysis and data turnaround time issues, problem solving, and personnel management in the laboratory.

Performance Management Workshop
Cynthia Barnet, Human Resources Consultant

A one day workshop on how to manage employee performance to maximize productivity and quality through effective feedback and performance evaluations.

Interview Skills Workshop
Cynthia Barnet, Human Resources Consultant

A one day workshop on how to perform effective employee searches and interviews, EEOC rules and regulations, and establishing the fit between the applicant and the position.

Leadership Development Workshop
Bill Fackler, Ingoldsby Consulting Group

A four day workshop covering leadership styles, management skills, effective meeting techniques, time management, and verbal and listening skills.

Mass Spectroscopy Data Interpretation
Dr. Frank Turecek (Cornell University)

A comprehensive two day lecture and workshop on mass spectral interpretation, including the examination of mass spectra pertaining to identifiable isotope clusters and fragmentation patterns.

RTE-VI Procedures File Workshop
GC/MS HP Aquarius Software Training
Mark Hartwig (HP Instructor)

The two day course was a detailed examination of the GC/MS hardware, theory and function of mass spectroscopy, and data acquisition, emphasizing the application of RTE/Aquarius software.

Hewlett-Packard RTE System Managers Course
Mark Barenburg, Compco Analytical

A one day lecture and workshop covering system hardware, disc cartridges, diagnostic problems, configurations, accounts troubleshooting and difference between RTE-6 and RTE A.

Introduction to Analytical Separations
Dr. Dhia Habboush, Sacred Heart University

The four day course was comprised of an introduction to chemical analysis, analytical separation chemistry, general chromatography and gas chromatography principles.

Capillary Gas Chromatography
Dr. Jack Hubball, Quadrex Corporation

A one day course detailing gas chromatography theory and practice with capillary columns, injection techniques, and optimization of selectivity, capacity, and resolution parameters.

Hewlett-Packard 3550 A System Managers Course
Hewlett-Packard Analytical Training Center, Atlanta, GA

A one week course covering system management of the 3550A RTE-A gas chromatography system.

Leading Improvement Teams
Wyndgate Sikes, The Productivity Network

A four day course covering team dynamics and leadership and a seven step team improvement process.

PROFESSIONAL PROFILE
John Bennett, Jr.

TITLE: Sample Preparation Laboratory Supervisor

ACADEMIC ACCOMPLISHMENTS:

Southern Connecticut State University - New Haven, CT
B.S. Biology 1978 (Chemistry Minor)

MAJOR AREA OF EXPERTISE:

Classical Chemistry
Atomic Spectroscopy
Organic Extractions
Gas Chromatography
Microbiology

SUMMARY OF EXPERIENCE:

An extensive background in all phases of laboratory operations. Was responsible for designing, specifying, and hiring staff for a state of the art environmental laboratory. Had day to day responsibility for all phases of operation of the lab. Responsible for writing and conducting performance reviews for staff. Implemented stringent QA/QC program in the lab following USEPA CLP protocols. Had direct responsibility for inorganics section of the laboratory. Functioned as a resource person and problem solver for staff.

Wide ranging experience in the analysis of environmental and hazardous waste samples using EPA, APHA, and ASTM methodologies. Experienced in the analysis of contaminants from stationary sources. Has performed industrial hygiene surveys fore a variety of contaminants, and is familiar with the NIOSH procedures for their analysis. Instrumental expertise is ICP spectroscopy, as well as flame and furnace atomic absorption spectroscopy. In addition, has extensive experience with all basic laboratory apparatus and gas chromatography.

A broad background in microbiology including the identification and enumeration of microorganisms from a wide variety of sources. Familiar with USP and APHA procedures of analysis. Performed studies on the effects of point source contamination of water supplies and has performed characterization of problem microorganisms in sewage treatment plants. Developed a novel procedure for determining the microbial kill effectiveness of ethylene oxide sterilization cycles..

PROFESSIONAL EXPERIENCE:

1988 to Present

IEA, Inc. - Connecticut

Position Sample Preparation Laboratory Supervisor

Responsibilities

Responsible for daily operations of organics extractions group. Interacted with other departments in the laboratory concerning the status of client samples. Responsible for the supervision of six staff members. Responsible for the quality of work produced by group as well as meeting turnaround goals.

1987 to 1989

Position Laboratory Director - Chemrox, Inc.

Responsibilities

State of Connecticut Certified Laboratory Director for Chemrox Laboratory Services. Had overall responsibility for the operation of the laboratory, as well as the development of the business. Supervised 10 staff members. Interacted with other departments in the company, as well as outside clients on technical aspects of laboratory analyses. Participated in seminars to educate various groups about environmental issues.

1985 to 1987

Position Senior Chemist

Responsibilities

Responsible for ethylene oxide associated analyses. Performed pilot scale testing on a variety of medical devices to determine optimal de-gassing conditions. Aided in the design and construction of a pilot ethylene oxide. Was a member of the AAMI committee that developed reference test methods for ethylene oxide residues in medical services.

1980 to 1985

Position Senior Microbiologist/Associate Chemist - YWC, Inc.

Responsibilities

Responsible for performing non-routine microbiological analyses as well as providing technical guidance to technicians performing routine work. Instituted strict quality control procedures on all reagents, media and organisms. Was responsible for routine and non-routine chemical analyses on environmental samples. Was heavily involved in atomic spectroscopy analysis. Also performed evaluations on consumer products ranging from air cleaners to home water purification units.

1978 to 1980

Position Senior Chemist - Nutmeg Chemical Company

Responsibilities

Promoted to Assistant Director of Laboratory. Supervised staff in absence of Director. Served as liaison between director and staff. Performed non-routine water and oil analysis, quality control companies products as well as routine water, oil and deposit analysis. Also performed microbiological analysis of water samples.

1978 to 1979

Position Laboratory Technician

Responsibilities

Responsibilities included routine water and oil analyses and quality control of products.

SPECIALIZED TRAINING:

Basic Atomic Spectroscopy
Perkin Elmer
Norwalk, Connecticut 1979

ICP Spectroscopy
Spectra Inc.
Pompton Lakes, New Jersey 1988

Graphite Furnace Atomic Absorption Spectroscopy
Spectra Inc.
Pompton Lanes, New Jersey 1988

Interpretation of Low Resolution Mass Spectra
YWC
Whippany, New Jersey 1989

PROFESSIONAL PROFILE
Peter P. Frick

TITLE: Laboratory Supervisor

ACADEMIC ACCOMPLISHMENTS:

University of Connecticut - Storrs, CT
B.S. Chemistry 1984
University of Bridgeport - Bridgeport, CT
M.B.A. Finance 1993

MAJOR AREA OF EXPERTISE:

Environmental Analytical Chemistry
Atomic Absorption Spectroscopy
Ion Chromatography
Point-of-Use Water Treatment
Environmental Field Services

SUMMARY OF EXPERIENCE

Mr. Frick has over eight years experience in environmental laboratories and pilot plant operation. He has performed a wide variety of analytical testing in the wet chemistry, gas chromatography, and atomic absorption areas. Mr. Frick has functioned in a supervisory role for over six years. He is familiar with hazardous waste management and the OSHA lab standard. Mr. Frick is 40 hour OSHA trained and has field sampling, as well as, field PCB screening experience.

PROFESSIONAL EXPERIENCE:

6/88 to Present

IEA, Inc. - Connecticut

Position Group Leader

Responsibilities

Mr. Frick has managed the Classical Chemistry Group since June 1988; responsibilities include scheduling and training, as well as chemical and technical support. He has been charged with implementing and maintaining rigorous QA/QC programs. The Classical Chemistry Group performs tests in the areas of inorganic wet chemistry, bulk organics (oil & grease, hydrocarbons, TOX, TOC, phenols, etc.) and microbiology. Mr. Frick is familiar with both EPA and NYSDEC protocols and SW846 Methods relating to inorganic wet chemistry analyses.

Mr. Frick is currently responsible for overseeing the Wet Chemistry staff operations, field services, and the direction of the Sample Management Group. He also functions as the site safety officer responsible for the IEA-Connecticut facility.

5/86 to 6/88

Position Manager - Water Lab Systems

Responsibilities

Responsible for the marketing, engineering and installation of Point-of-Use water treatment systems. Water treatment systems used included commercial/industrial ion exchange, chlorination, water softeners, liquid and solid neutralizers, carbon and reverse osmosis. Routinely analyzed potable waters for water quality parameters. Participated in seminars to educate various groups about environmental issues.

3/85 to 5/86

Environmental Analysis Corporation

Position Senior Chemist

Responsibilities

Responsible for performing chemical and bacterial analyses, water sampling of various sources, and supervision of the lab technicians.

American Cyanamid

Position Pilot Plant Engineering Assistant

Responsibilities

Activities included formulating herbicides and pesticides, maintaining area safety, pipe fitting, product sampling, and packaging.

PROFESSIONAL AFFILIATIONS:

American Chemical Society
Water Quality Association

PROFESSIONAL PROFILE
Lawrence H. Decker

TITLE: GC/MS Volatiles Supervisor

ACADEMIC ACCOMPLISHMENTS:

Franklin Pierce College - Rindge, New Hampshire
B.A. Biology 1982

MAJOR AREA OF EXPERTISE:

Final Data Review
Coordination of sample analysis for the GC/MS group
Organics analysis by GC/MS

SUMMARY OF EXPERIENCE:

Lawrence Decker has eight years of GC/MS experience. He has been responsible for operations of the GC/MS group for five years. Presently functioning as the Volatile Group Leader.

PROFESSIONAL EXPERIENCE:

5/92 to Present

IEA, Inc. - Connecticut

Position GC/MS Volatile Manager

Responsibilities

Responsible for the volatile group operations. Duties include: Scheduling workforce, ordering supplies, final data package review, employee reviews, overseeing sample analysis and sample prioritizing, adhering to forecasted budget, dealing with client requests, training employees, updating sample/job status with client service and laboratory directors. Tracking workflow through group.

10/91 to 5/92

Position GC/MS Section Leader

Responsibilities

Responsibilities included: Sample analysis for both semi-volatile and volatile samples, tracking and scheduling sample analysis, troubleshooting instrumentation, final data package preparation and review. Unknown compound determination (TIC's). Assisting Group Leader with selected tasks. Responsible for tracking and prioritizing sample analysis, reviewing both initial sample batches and final reports, troubleshooting instruments and monitoring of GC/MS operations.

4/86 to 9/90

Position GC/MS Operator

Responsibilities

Running samples, calibrating instruments, tracking samples, screening, total solids standard preparation, paperwork. Familiarity with EPA/NYSDEC CLP, SW846 and EPA "6--" Series VOA and BNA methods and routine analysis of aqueous and soil samples for VOA and BOA target and non-target (TIC) compounds. Experience in the data review process which involves monitoring surrogate recoveries, internal standard areas, target compounds concentration ranges and matrix spike/matrix spike duplicate performance parameters.

SPECIALIZED TRAINING:

Mass Spectroscopy Data Interpretation
One day Seminar
Dr. Frank Turecek (Cornell University)

Course description included close examination of mass spectra pertaining to identification of molecular ion, stability structure relationship, characteristic ion group effects, fragmentation and identifiable isotope clusters. Further concepts discussed include the nitrogen rule, the picket fence (alkane) series, and common fragment ions.

RTE-VI Procedures File Workshop
Four day seminar
GC/MS HP Aquarius Software Training
Mark Harwick (HP Instructor)

Course description included detailed examination of GC/MS Hardware, theory and function of mass spectroscopy, data acquisition and interpretation. Course emphasized software manipulation to enhance the overall quality and quantity of accurate and legible data.

Hewlett-Packard User I Course
Five day seminar
Hewlett-Packard, Paramus, New Jersey

Course description included a general overview of the HP computer system, mass spectrometer theory, instrument tuning and utility programs.

Introduction to Analytical Separations

Introduction to Chemical Analysis

Terms associated with chemical analysis; a review of the important considerations in analytical chemistry; sensitivity and detection limit; evaluation of results.

Analytical Separation

Solvent extraction; emulsions, completeness of extraction; extraction of organic compounds; pH effect; extraction with metal chelator.

Chromatography (General Principles)

Chromatographic behavior of solutes; column efficiency and resolution.

Gas Chromatography

Gas chromatograph; gas chromatographic columns; liquid phases and column selection; detectors for gas chromatography; optimization of experimental conditions; interfacing gas chromatography with mass spectrometry.

PROFESSIONAL PROFILE
Daniel W. Helfrich

TITLE: Group Leader

ACADEMIC ACCOMPLISHMENTS:

Quinnipiac College
Sacred Heart University
M.S. Chemistry
M.B.A.
B.A. Biology
B.S. Biology, 1985

MAJOR AREA OF EXPERTISE

Four years running ICP on environmental samples.
Two years running Furnace analysis.
Four years sample prep in environmental area.
Three years CLP Data Review.
OSHA trained and certified.
Familiar with EPA & NYSDEC protocols and SW846 Methods relating to inorganic metals analysis.

SUMMARY OF EXPERIENCE:

Mr. Helfrich has over 4 years experience in environmental analysis. He has functioned in numerous analytical roles including: Sample prep, Furnace analysis, ICP analysis and hazardous waste coordinator. Experienced in data review, and familiar with EPA and NYSDEC protocols. OSHA trained and experienced.

PROFESSIONAL EXPERIENCE:

1992 to Present

IEA, Inc. - Connecticut

Position Group Leader

Responsibilities

Manage daily flow of work, set priorities.
Monitor productivity of group.
CLP data review ensuring QA/QC protocols are followed.
Manage the collection and removal of all hazardous waste generated by IEA-CT.

1989 to 1992

Position Senior Chemist - IEA,Inc. CT

Responsibilities

ICP & Furnace Operator, manage flow of work, CLP data review ensuring QA/QC protocols are followed.

1987 to 1989

Position Lab Manager - PGP Industries

Responsibilities

ICP Operator and Health & Safety Manager

1984 to 1987

Position Senior Chemist - Handy & Harmon

Responsibilities

ICP Operator

SPECIALIZED TRAINING:

OSHA Seminar - 40 hour training + 28 hour update

Clean Harbours - Hazardous Waste Seminar

PROFESSIONAL PROFILE
Kimberly A. Maturo

TITLE: GC Group Leader

ACADEMIC ACCOMPLISHMENTS:

Southern Connecticut State University - New Haven, Connecticut
B.S. Biology, 1985

SUMMARY OF EXPERIENCE:

Ms. Maturo has over 7 years experience in the environmental field. She started in the organic extractions department as a lab technician and worked her way up to supervisor. From there, she transferred to the Gas Chromatography Department in order to expand her knowledge by learning more about the analysis of environmental samples. She is now Group Leader of the GC Department and is experienced in Pesticide and PCB residue analysis.

PROFESSIONAL EXPERIENCE:

3/91 to Present

IEA, Inc. - Connecticut

Position GC Group Leader

Responsibilities

Supervisor of GC Group, responsible for analysis of environmental samples for pesticides/PCB's according to EPA/NYSDEC CLP Protocols, SW846 Methods and EPA "600" Series Methods. Additional responsibilities include analysis of samples via purge & trap/GC according to various protocols.

Other duties include analysis of air samples, charcoal absorbent tubes and other miscellaneous samples for any parameters requiring gas chromatography analysis. She is also responsible for supervision of the group including sample tracking, data review, etc.

10/88 to 3/91

Position GC- Senior Lab Technician

Responsibilities

Ms. Maturo's primary duties are the operation of the gas chromatographs for a variety of analyses. She has experience in pesticide/PCB determinations as well as other miscellaneous analytes such as alcohols, herbicides and solvents in general.

Ms. Maturo's other duties include computer data entry, sample tracking and monitoring QC samples for the group.

10/85 to 10/87

Position Extractions Group

Responsibilities

Over this time period Ms. Maturo was a member of the extractions group and supervised the operations and staff for the last year. Her duties were primarily extraction of environmental samples for semi-volatile organics, pesticides/PCB's and herbicides. She also was responsible for screening of organic extracts via gas chromatography.

PROFESSIONAL PROFILE
Kristin Madden

TITLE: **Semi-Volatile Manager**

ACADEMIC ACCOMPLISHMENTS:

Thomas Edison State College
B.A. Psychology
Working on M.S. Environmental - transferring from Syracuse

MAJOR AREA OF EXPERTISE:

Organic Analyses.
Interpretation of Mass Spectra.
Maintenance & troubleshooting of GC/MS Systems.

SUMMARY OF EXPERIENCE:

Reorganized and upgraded classical chemistry department to accommodate EPA SAS contracts. Created organics department, including GC/MS VOC, ABN; Pesticides, PCB's, Herbicides, other misc. GC analyses; and extractions.
Instituted laboratory waste disposal program including solvent recycling.
Co-wrote proposal and acted as project manager on NYS research project of bioaccumulation in Onondaga Lake fish flesh.

PROFESSIONAL EXPERIENCE:

2/93 to Present

IEA, Inc. - Connecticut

Position Semi-Volatile Manager

Responsibilities

Supervision of all aspects of analysis and data production. Duties include: Enforcement of QA/QC plan and safety plan, training, data review, scheduling of personnel and analyses, purchasing, updating/developing standard operating procedures.

Responsible for profitability of department through scheduling, budgets, and efficiency.

5/91 to 1/93

Position Organics Department Manager - Stearns & Wheler Laboratory, N. Syracuse, NY

Responsibilities

Responsible for set-up of organics department. Duties included staff training, development & enforcement of QA plan, data review, purchasing and budget development. Also functioned as safety officer and interim operations manager.

12/87 to 1/91

ICM Environment Laboratories - Randolph, NJ

Position GC/MS BNA VOC Analyst 8/90 - 1/91

Responsibilities

Analysis & data reduction of BNA samples SW846, 600 Series, RCRA, ECRA, training of VOA analysts.

Position GC/MS CLP VOC Analyst

Responsibilities

Analysis & data reduction of CLP Volatiles under supervision.

Position Classical Chemistry Supervisor

Responsibilities

Upgrade department to be able to perform EPA SAS contracts, data review, purchasing.

Position Classical Chemistry Technician

Responsibilities

Analysis & data reduction of various classical chemistry tests.

5/91

Position GC/MS Semivolatiles Group Leader - First Environmental Laboratories, Denville, NJ

Responsibilities

Analysis & data reduction of BNA samples. Supervision & scheduling of BNA analyses.

SPECIALIZED TRAINING:

Hewlett Packard Basic Chomatography: Intro to Capillary GC.
Hewlett Packard GC/MS Troubleshooting & Maintenance.
Hewlett Packard Environmental Lab. Productivity Video Teleconference.
USEPA Conference on the Analysis of Environmental Pollutant.

PROFESSIONAL AFFILIATIONS:

Member American Chemical Society
Member American Society for Mass Spectrometry

PROFESSIONAL PROFILE
Bruno D'Ostilio

TITLE: Systems Manager

ACADEMIC ACCOMPLISHMENTS:

Western Connecticut State University - Danbury, CT
Computer Science and Business Program
September 1978 , 1989 - Present

MAJOR AREA OF EXPERTISE:

Various types of computer hardware.
Unix and DOS operating systems.
Networks.
Programming.

SUMMARY OF EXPERIENCE:

Mr. D'Ostilio has over 10 years experience in the computer industry. He has a broad knowledge of computers ranging from mainframes to P.C.'s. He has extensive knowledge of UNIX, XWINDOWS, TCP/IP, DOS and various types of hardware.

PROFESSIONAL EXPERIENCE:

10/92 to Present

IEA, Inc. - Connecticut

Position Systems Manager

Responsibilities

Systems Manager reintegration, rescaling, checking standards. Mr. D'Ostilio has over 10 years computer related experience on systems ranging from mainframes to personal computers. His is responsible for all systems hardware and software for our CLP 390 system. This system includes a HP9000 workstation with a UNIX Operating System, Envision application software, Ingres RDMS, XWindows and a network of X Terminals and P.C.'s using Advanlink and TCP/IP. His is also responsible for ensuring diskette deliverables meet the requirements specified by the EPA.

10/86 to 10/92

Position Senior Customer Engineer - Concurrent Computer Corp., Wallingford, CT

Responsibilities

Install, service and maintain Concurrent mini and microcomputers, as well as many other types and manufacturers of disk drives, tape drives, printers, modems, multiplexers, networks and personal computers. Also responsible for the installation, troubleshooting and upgrading of systems software which involves shell and C programming. System software includes UNIX SYSTEM V, XWINDOWS, MOTIF, TCP/IP, LABWORKBENCH, DOS and many other packages.

1984 to 1986

Position Customer Engineer - Memorex Corporation, Darien, CT

Responsibilities

Install, service and maintain magnetic tapes drives, disk drives, display stations and printers within local Connecticut & New York territories.

SPECIALIZED TRAINING:

IBM compatible mainframe peripherals, include:

High performance disk drives, tape drives, Impact & Laser printers.
Concurrent computer corp. mini computer hardware.
UNIX Systems Manager.
UNIX based Workstation Hardware.
Novell networks.
RDMS.

APPENDIX C

IEA
An Aquarion Company

[illegible] Monroe [illegible] ike
Monroe, CT 06468
203-261-4458

[illegible]HA[illegible] OF [illegible]STO[illegible] RECORD

PAGE OF | NO. [illegible]

IEA JOB #:

CLIENT:

PROJECT ID:

IEA PROJECT MGR:

RUSH ☐ YES ☐ NO | DUE DATE

BOTTLE SET #	CLIENT SAMPLE ID	DATE / TIME SAMPLED	MATRIX	LAB ID	QC Y / N	TESTS								BOTTLE TYPE AND PRESERVATIVE								FIELD FILTERED - CIRCLE Y or N								GENERAL REMARKS / SAMPLE REMARKS
																						Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	

MATRIX CODES

A - AIR
AQ - AQUEOUS
C - COMPLEX
D - DRUM WASTE
OI - OIL
S - SOIL
SL - SLUDGE
W - WIPE
O - OTHER
FB - FIELD BLANK
TB - TRIP BLANK

BOTTLES PREPPED BY	DATE / TIME	BOTTLES REC'D BY	DATE / TIME
SIGNATURE		SIGNATURE	
SAMPLES COLLECTED BY	DATE / TIME	RECEIVED IN LAB BY	DATE / TIME
SIGNATURE		SIGNATURE	

REMARKS ON SAMPLE RECEIPT

☐ BOTTLES INTACT ☐ CUSTODY SEALS
☐ PRESERVED ☐ SEALS INTACT
☐ CHILLED ☐ SEE REMARKS

TUT 005 1802