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MONTGOMERY LABORATORIES

QUALITY ASSURANCE MANUAL

JAMES M. MONTGOMERY, CONSULTING ENGINEERS, INC.

LABORATORY QUALITY PHILOSOPHY:

"ACCURACY, PRECISION, EFFICIENCY"

LABORATORY QUALITY POLICY STATEMENT:

Deliver accurate reports and services without delay to the client.

I. INTRODUCTION

This document outlines the quality assurance program that underlies the values reported for analytical work performed by Montgomery Laboratories.

There are three important components in providing high quality analytical services.

- Accuracy
- Precision
- Timeliness

Our goal is to provide superior quality reports and analytical services in a timely manner.

Montgomery Laboratories performs analyses for inorganic, organic, and microbial consitituents of water, wastewater, soils, sludges, and hazardous wastes.

A. Quality Responsibility

1. Analytical Groups — Supervisor

Organic Chemistry	Albert R. Trussell
Inorganic Chemistry	Andrew D. Eaton
Microbiology	Carole J. Leong

2. Quality Assurance Officers

Organics	Robert R. Clark
Inorganics	Joan A. Oppenheimer
Microbiology	Carole J. Leong

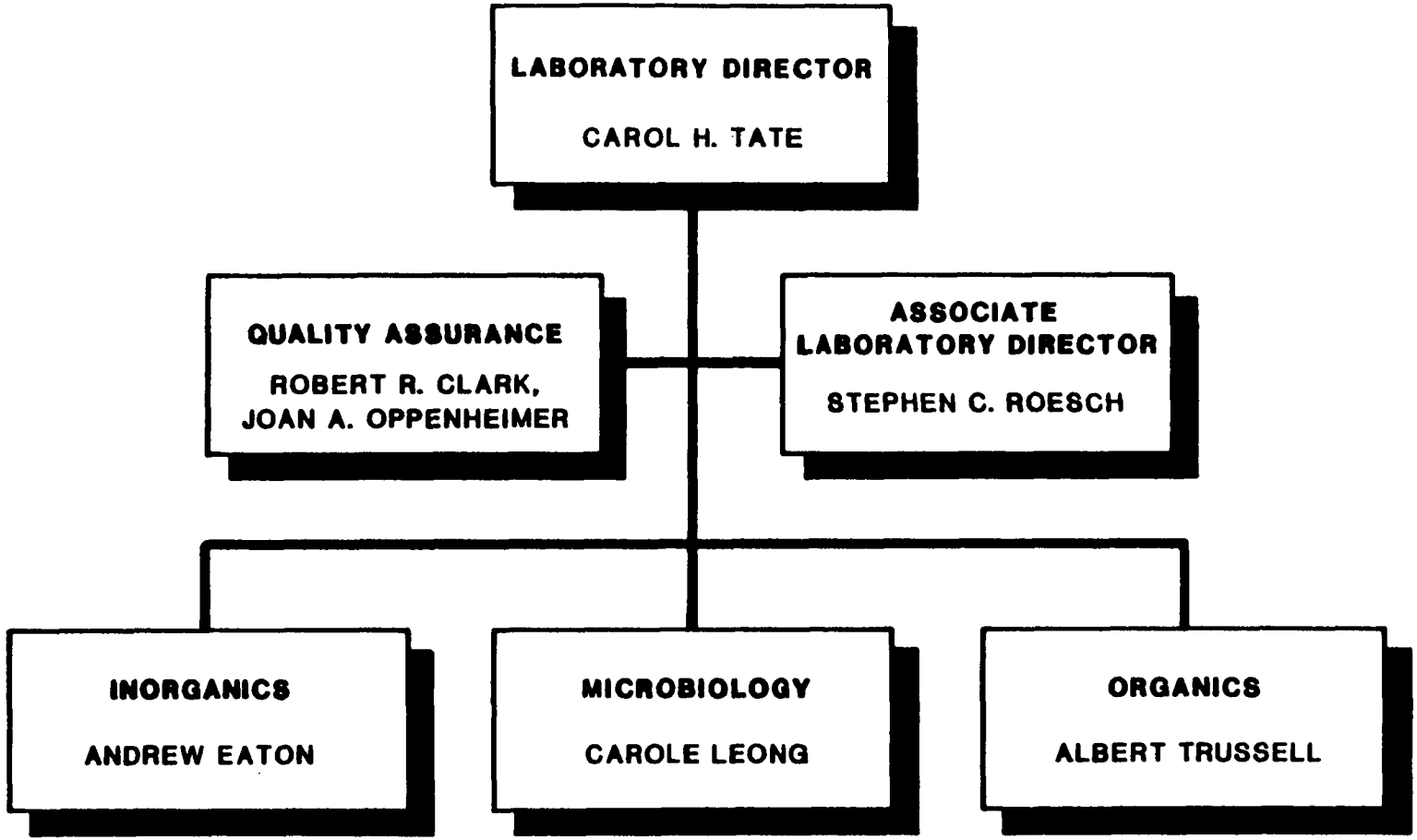
3. The Laboratory Organization is Presented in Figure 1

II. QUALITY ASSURANCE ORGANIZATION

A. Laboratory Personnel

Montgomery Laboratories has approximately 35 employees in management, supervisory, professional, subprofessional, and clerical positions. A listing of laboratory personnel along with a brief description of each person's responsibilities is presented in Table 1.

Responsibility for quality assurance is assumed not only by the adequately trained bench analyst performing the analysis, but also through the use of a hierarchy system within the laboratory where the work is checked by a chain of supervisors, the quality assurance officers, and the lab director.



MONTGOMERY LABORATORIES

ORGANIZATIONAL CHART

FIGURE 1

TABLE I

MONTGOMERY LABORATORIES' STAFF

	POSITION DESCRIPTION	HELD BY
1.	Laboratory Director	**Carol H. Tate** D. Env. Environmental Science and Eng. M.S. Water Resources Eng. B.S. Chemistry
2.	Associate Laboratory Director	**Stephen C. Roesch** M.S. Microbiology B.S. Biological Sciences
3.	System Manager	**John L. Cromer** M.S.P.H. Environmental Chemistry B.A. Chemistry
4.	Marketing/Special Projects Eng.	**Kenneth D. Reich** M.P.H. Public Health B.S. Biological Sciences B.A. Social Ecology
5.	Inorganic Supervisor	**Andrew D. Eaton** PhD. Geochemisry M.S. Geology, B.S. Earth Sciences
6.	Inorganic QC Officer	**Joan A. Oppenheimer** M.S.P.H. Environmental Chemistry B.A. Chemistry
7.	Chief Metals Analyst	**Gregg L. Oelker** B.S. Chemistry B.S. Biology
8.	Metals Analyst	**Larry G. Lawrence** B.S. Biological Sciences
9.	Inorganics Analyst	**Joe P. Marcinko** B.A. Chemistry (in progress)
10.	Technician	**Sondra M. Magruder** A.S. Chemical Technician
11.	General Physical Technician	**Ingrid I. Irbinskis** B.A. Microbiology (in progress)
12.	Organic Supervisor	**Albert R. Trussell** B.S. Chemistry
13.	Organic QC Officer	**Robert R. Clark** PhD. Environmental Chemistry M.S. Environmental Engineering B.S. Chemistry
14.	GC/MS Analyst	**Patty Reilly** A.A. Math (in progress)
15.	GC/MS Analyst	**Fong-yi Lieu** PhD. Environmental Chemistry M.S. Food Sciences B.S. AgriculturalChemistry

16. GC/MS Analyst	**Mike L. Zimmerman** M.S. Environmental Science B.S. Chemistry
17. GC/MS Analyst	**Ted K. Lieu** B.S. Chemistry (MBA in progress)
18. GC, HPLC Analyst	**Bart Koch** M.S. Environmental Science B.S. Chemistry
19. THM Analyst	**Jim Green** B.S. Chemistry
20. TOC Analyst	**Karen L. Prescott** B.S. Biology (in progress)
21. TOX Analyst	**Marsha Pearson** B.S. Chemistry B.A. Philosophy
22. TOC, TOX Analyst	**Rick J. Hansen** A.A. Environmental Health Safety
23. GC Analyst	**Eric W. Crofts** B.S. Biology Minor Environmental Toxicology
24. Extraction Technician	**Andrew Schaeffer** B.S. Chemistry
25. Extraction Technician	**Michelle Turner** B.S. Biology
26. Extraction Technician	**William Chauncy** B.S. Biology
27. Microbiology Supervisor Support Services Supervisor	**Carole J. Leong** M.S. Environmental Health B.S. Bacteriology
28. Assistant Microbiology Supervisor, Asbestos Analyst	**Carol Jean Belt** B.S Zoology
29. Microbiology Analyst	**Kim S. Banks** B.S. Microbiology Minor Chemistry
30. Accounting Assistant System Manager	**Barbara L. Cummins** B.A. Math B.S. Business
31. Sample Tracking	**Elizabeth B. Summers**
32. Sample Log-In	**Mary A. Augustyn**
33. Sample Shipping	**Martha Frost**
34. Dishwashing	**Dorothy Conzo**
35. Secretary-Laboratory Director	**Linda S. Fedorovich**
36. Secretary-Reports	**Patty A. Fedorovich**
37. Field Sampling	**Mark Augustyn**

B. Quality Assurance

This person is responsible for the following:

1. Ensure that all personnel working in the laboratory follow established standard operational and safety procedures.

2. Check procedures and ensure good housekeeping practices.

3. Acquaint new personnel with the rules and regulations of the laboratory.

4. Prepare, schedule, assign, and check quality assurance samples. Randomly introduce blind control samples to the analysts.

5. Insure that samples are properly taken, shipped, preserved, stored and analyzed.

6. Insure that sample log-in and traceability are done correctly.

7. Maintain the quality assurance policy.

8. Review and approve/reject all analytical reports.

9. Reject reports not meeting QA criteria.

C. Laboratory Analytical Groups

The analytical groups are responsible for the following:

1. Establish quality standards the group must live by.

2. Document the quality programs.

3. Assign responsibility within each group to manage QC tasks.

4. Submit QC data with client reports to QZ Officer.

5. Comply with the Quality Assurance Manual.

III. EQUIPMENT

A. Inventory

An equipment inventory is kept and maintained by the QA manager. Each new equipment item over $50.00 should be entered in this section when it arrives. All flyers, warranties, and maintenance instructions or agreements are filed.

B. Repair and Service

Service agreements have been established for the following:

1. Atomic Absorption Spectrophotometer and ICP: Perkin Elmer

2. Electron Microscope: Ziess

3. Computer: Hewlett Packard

4. GC/MS: Finnigan

5. Balances: Weigh Tech

6. GC: Varian

IV. SAMPLE CONTROL AND REPORTING

A. Sample Collection, Preservation and Submittal

One of the key elements in Montgomery's quality assurance program is proper preservation, shipment, and storage of samples. Typically, staff determine sampling sites and collection methods to ensure that the collected sample is representative. Sampling procedures must follow the guidelines established by the appropriate discharge permit, Standard Methods, EPA, and the senior staff recommendations. Where possible, staff collect the samples themselves. If this is not feasible, they brief the clients by telephone and/or in writing on the proper methods of sample collection, preservation, storage, and shipment. Montgomery follows the methods proposed in the Federal Register, volume 44, No. 244, December 18, 1979 for sample container type, container size and preservatives (Appendix B).

The following information is required on each sample submitted. This information is to be written on the container with a permanent felt tip marker.

a. Client or job number
b. Sampling date
c. Sample I.D.
d. Analyses required

In cases where chain of custody is required, the appropriate forms and labels are obtained from the QA officers.

B. Sample Receipt

The flow diagram (Figure 2) on the next page demonstrates the role of management in both the sample and QA programs. Upon arrival in Pasadena the sample control clerk will inspect each sample for broken or leaking containers and notify the section head to decide if resampling or other appropriate action is required. Samples will then be logged into the laboratory computer. Information required is client name, job or purchase order number, person requesting the analysis, when samples were collected and received, who collected the samples, sample identifiction and parameters to be tested. After log in, the samples are stored using the guidelines in the Federal Register, Volume 44, No. 244, December 18, 1979.

C. Data Validation

Following completion of the analyses, results are validated by examining quality control parameters and any additional checks where available. For example, with respect to general minerals, after the mg/l values are entered for general minerals, a computer program calculates meq/L for the cations and anions, as well as the % difference. This must balance within 2 percent for potable water and 5% for grossly contaminated samples. If not, the analyst alerts the section head, the sample is reevaluated and the QA sheets are examined. If the laboratory report passes the various data validation steps the analytical report is printed. The reports are checked and signed by the analyst, reviewed along with the data worksheets by the QA officer, and signed by the Section Head, prior to distribution to the client. The reports are also forwarded to the Lab Director for review.

D. Sample Handling (STAR)

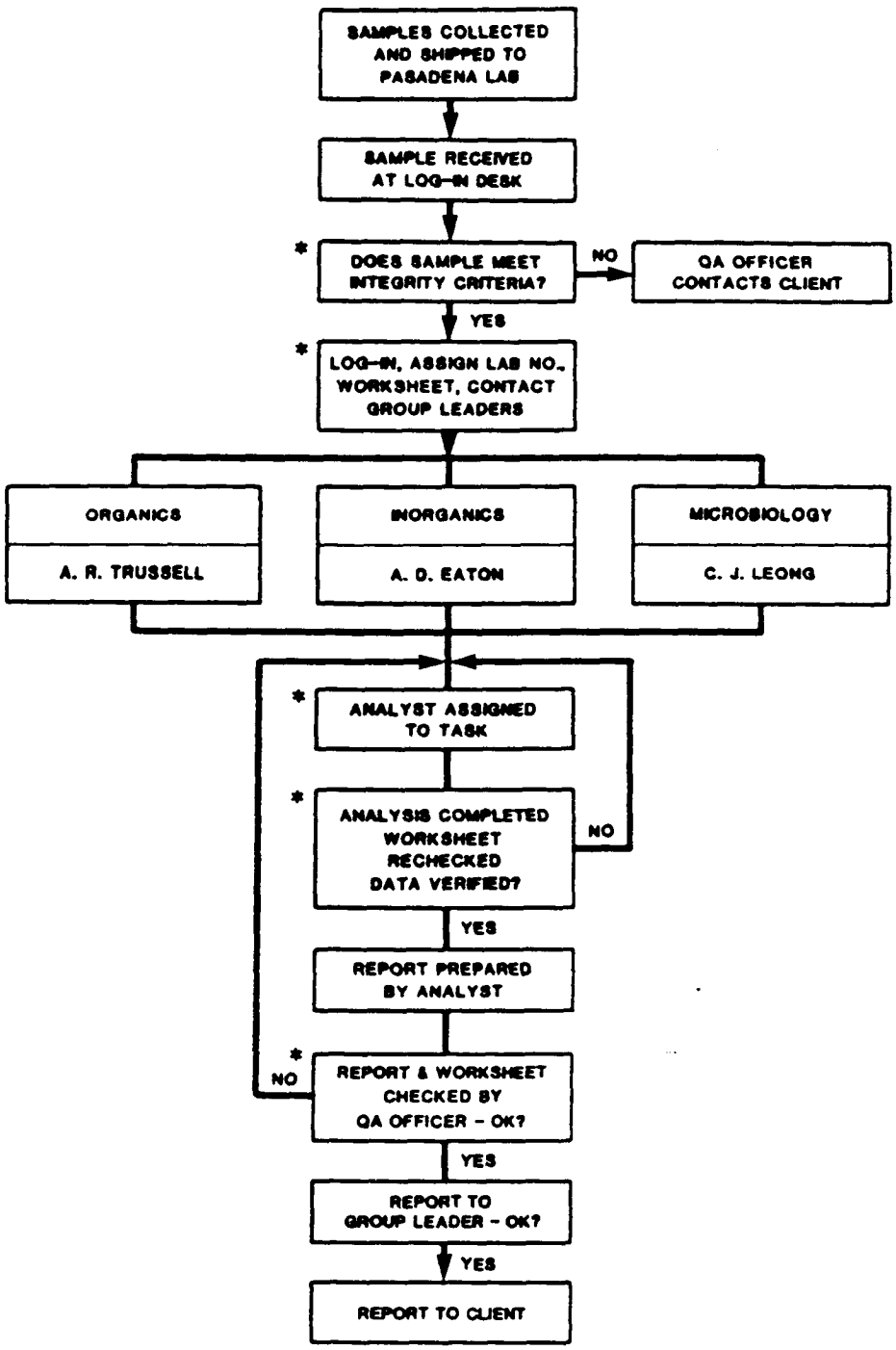
All samples received at Montgomery Laboratories are logged into the Sample Tracking and Retrival System (STAR) (Figure 3). This computer program keeps track of samples from the time they have arrived in the laboratory until they are transmitted to the client. STAR provides three functions:

1. Facilitates ready access to information on sample status (eg., which tests are completed.)

2. Allows analysts to schedule analyses efficiently by sorting all samples requiring a particular test.

3. Facilitates data manipulation in quality assurance procedures and data management.

Upon arrival, each sample is assigned a laboratory I.D. number, a test number for each analysis requested or a profile which corresponds to a routine group of tests such as a general mineral.



KEY QA STEPS DENOTED BY *

SAMPLE PROCESSING

STAR: FLOW CHART

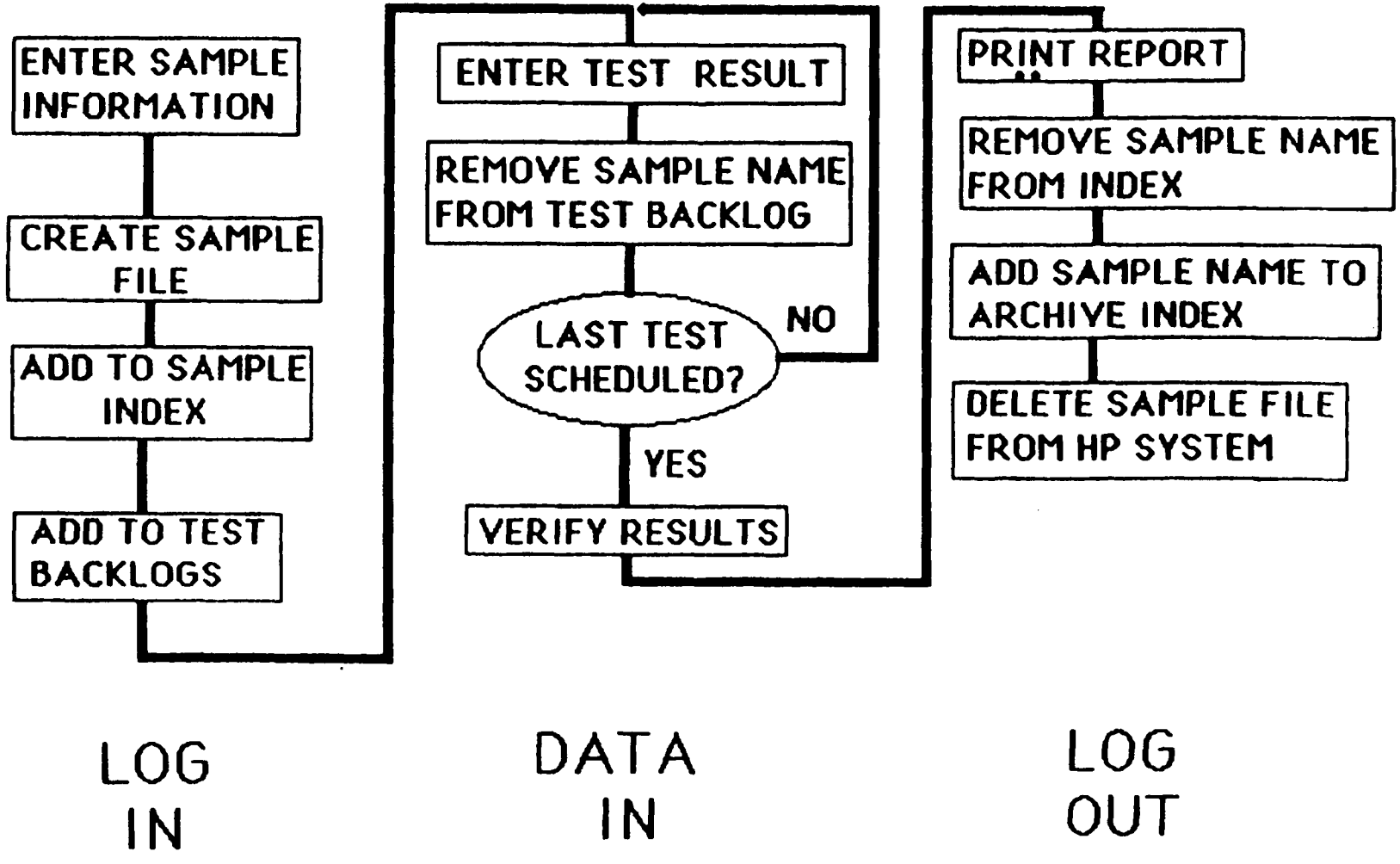


Figure 3

Individual analysts can determine what samples require a particular test by logging into STAR and requesting those sample numbers that require a particular test which is still incomplete.

Senior staff members use STAR to keep track of analyses, periodically checking sample status to determine whether data is being entered in a timely fashion. In addition, STAR and associated programs allow the senior staff to rapidly examine data for consistency among samples and institute appropriate QA measures.

When analysts have completed a test or series of tests on a group of samples, data are entered into the computer. Once all of the data have been entered, they are examined by a senior staff member for consistency and verified. When all tests scheduled for a particular sample are completed and entered, STAR automatically produces an in-house report on a printer, removes the sample name from the active sample index, and adds the name to the sample archive index.

Additional aspects of the STAR system which promote smooth sample flow are: (a) the production of a daily sample backlog list that lists all samples with their due dates and (b) a rush test backlog list to keep analysts aware of rush samples. STAR acts as an overall coordinating system for analysis and quality assurance (a cradle to grave system).

V. CHAIN OF CUSTODY

The purpose of chain of custody procedures is to provide evidence that a sample has not been tampered with. This is achieved by creating an accurate written record tracing the possession of the sample from collection through its final analysis and possible introduction as court evidence. Custody indicates that a sample is either in actual physical possession or locked up to prevent unauthorized access.

A. Rules for Sample Collection

Obtain samples using appropriate documented sampling techniques.

Transfer custody of the samples as little as possible.

Attach a chain of custody record bottle tag to the sample container at the time of sample collection. The tag contains information on sample number, date, time, source, analyses required, name of person sampling, and witnesses. The tag is signed and dated (including the time) by the sample collector. The sample container is sealed to that the bottle cannot be opened without breaking the seal.

Field measurements are recorded with ink in a bound field notebook or log. A separate set of field notebooks are maintained and stored in a safe place where they can be accounted for at all times. Entries are signed by the person taking the sample and errors crossed out with one line and initialed.

The person taking the sample is responsible for the care and custody of the sample and must assure that each container is in his physical possession or view at all times or is stored such that it cannot be tampered with.

B. Transfer of Custody

When transferring custody the transferree must sign and record the date and time on the chain of custody record tag. The field custodian is responsible for properly packaging and dispatching samples to the laboratory for analysis.

All samples are accompanied by a sample transmittal form which includes information identifying the contents.

Laboratory Procedures for Custody Samples:

The lab has a designated locked refrigerator for holding chain of custody samples. A log book is maintained which contains a record of all chain of custody samples received. The information on the chain of custody sample tag is transferred to this log and the person receiving the samples must sign the log book with the date and time of laboratory receipt.

Lab analysts are responsible for the care and custody of the sample once it is handed over to them for analysis. The analyst records in his notebook the name of the person from whom the sample was received, whether it was sealed, identifying information, procedures performed, and test results. Analysts must sign and dates their notes as a permanent lab record. Once the sample testing is completed, the usused portion of the sample along with any identifying tags and seals are returned to a designated locked storage area until they can be discarded.

VI. RECORDS

A. Worksheets

Printed worksheets are provided for use by analysts to standardize the format of certain routine analyses. Available data worksheets are presented in Appendix C.

MONTGOMERY LABORATORIES

CHAIN OF CUSTODY RECORD

ANALYSES

Use 1 column per bottle

Project/job #	Project Name					No. of containers										Remarks
Samplers: (Signature)																
Sta. No.	Date	Time	Comp.	Grab	Station Location											

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	

B. Laboratory Notebooks

Each analyst maintains his or her own laboratory notebook which is used to record data and perform calculations for those analyses where worksheets are not provided. The laboratory notebook is also used to document peripheral information not directly required on a worksheet.

C. Graphs and Charts

Each analyst is responsible for plotting and filing analytical standard curves. Graphs and charts which are produced as part of a final report are filed with the report. Analysts are responsible for maintaining and updating quality control forms for their assigned analyses. These control forms are submitted to each groups' quality control officer for review and then filed in a central location.

D. Inventory Control Logs

Records are maintained on the purchase of laboratory supplies, detailing the vendor, purchase order number, date of order, and date of receipt. Consumable supply forms are also maintained for most analyses to ensure adequate stock inventory and uniformity of supplies. (Appendix D). Bottles of reagents are dated as soon as they are received so that the shelf life can be monitored.

E. Stock Standard Logs

A log book is maintained for each analytical stock standard. Each log contains the date of fresh stock preparation and the result of the comparison between the old and new stocks as outlined in Section (VIII D) of this Quality Assurance Document.

F. Reagent Standardization Logs

Log books are maintained for all standardized reagents which are not prepared fresh for each run but are instead periodically restandardized. Restandardization should be performed once a month and the new standardization factor should be recorded in the log along with the date and the analyst's initials. More frequent standardization may be required for certain reagents if a consistent quality control problem occurs.

G. Media Log and Prepared Media Log

A media log is kept separately from the general inventory log. Upon receipt of new media, the date, the type of media, source of media, and initials of the individual receiving the media are logged into the Media Log. Media supplies are dated not only upon receipt but also when initially opened. A written record of quality control on media, materials, and equipment is logged

into the Media Log book. The record includes the results of the check, the initials of the individual performing the check, and the date. Media prepared in the lab is logged into the Prepared Media Log by the laboratory analyst. These records include media lot number, date, sterilization time and temperature, final pH, and the analyst's initials

H. Instrument Logs

The operating temperatures of incubators, waterbaths, hot air ovens, and refrigerators are checked daily and logged in the maintenance log book. Adjustments are made when necessary. Autoclave temperatures and pressures are logged in the maintenance log book for each cycle of use.

A separate log book is maintained for each analytical instrument. This log contains a record of daily instrument checks which are performed to verify proper functioning of instrument mechanics and to check performance on standards and reagent blanks. The log also contains a record of the dates when routine instrument maintenance is performed, a description of any problems found, and the analyst's initials. If the instrument is not performing according to specifications, the appropriate instrumentation specialist must be called in to perform the necessary repairs.

VII. Glassware

Selection of the appropriate glassware cleaning procedure is dependent on the particular analysis a piece of glassware is to be used for.

A. Preliminary Cleaning

All glassware is initially washed in a laboratory washer with distilled rinse capability. This glassware should be acceptable for use in analysis of most inorganic constituents in the mg/l concentration range. The surface of adequately cleaned glassware will drain in a uniform thin film. The formation of droplets upon drying is an indication that the glassware is not clean and must be rewashed. Calibrated glassware such as pipets and volumetrics should be completely dry and cooled to room temperature before they are put away.

B. Low Level Phosphorous

Glassware to be used for low level phosphorous determinations is soaked in 6N HCl to remove any phosphate detergent residue and rinsed several times with distilled water. A separate stock of glassware is maintained which is not washed with the regular glassware.

C. Organic Constituents

Glassware to be used for determination of organic constituents must be baked at 350 degrees C for at least 8 hours in order to remove any remaining organic residue.

D. Trace Metals

Glassware to be used for trace metal analyses must be soaked overnight in 4N HNO_3 followed by 4-5 deionized water rinses. This glassware is stored separately from the regular glassware and should only be handled with polyethylene gloves.

E. Grease

Glassware to be used for determination of oil and grease or any glassware contaminated with grease is soaked in acetone or warm sodium hydroxide followed by an acid rinse and then washed in the usual manner.

F. Bacteriological

Glassware to be used in bacteriological analysis is rinsed at least three times with distilled water which has not come in contact with copper tubing or other toxic material (glass or stainless stell plumbing is acceptable). All bacteriological glassware must be sterilized with some type of sterilization indicator prior to use.

VIII. GENERAL ANALYTICAL QC

A. Use of Documented Procedures

All routine procedures are documented in our analytical procedures writeups. These procedures were prepared from several approved sources: the 15th edition of Standard Methods for the Examination of Water and Wastewater, the 1979 edition of EPA Methods for the Examination of Water and Wastes, the 1979 edition of the Federal Register, SW 846 (2nd ed.), and California Assessment Manual (1980). If an analyst must deviate slightly from the established procedure because of an unusual matrix problem, these deviations are to be carefully described in the analyst's notebook.

B. Raw Data and Calculations Clearly Documented for Review

Raw data and calculations are legibly inscribed in the analyst's bench sheet or lab notebook to enable subsequent review by the analyst or his supervisor if an unexpected result or descrepancy arises.

C. Performance of Daily Instrument Checks and Routine Maintenance

Instrument performance is evaluated before analysis of samples by checking the calibration and evaluating instrument response on a series of standards and a reagent blank. Routine instrument maintenance is also performed periodically.

D. Verification of Standards

All stock standards have specified holding periods which are outlined in Table 2. When a new stock standard is prepared, it must be cross-checked against the old one before it can be used. The old stock standard and a new stock standard of the same concentration are analyzed in triplicate. If the difference between the means of these triplicates is greater than 5%, another stock standard is prepared and these three standards are compared. If the old stock standard is suspect, the freshly prepared standard must be compared against a known quality assurance sample such as those provided free of charge by EPA. All standards must be labeled with the date, concentration, and preparer's initials. Any preservatives or special storage procedures which are required to maintain the integrity of a stadard are specified in the lab writeup for that procedure. Organic stock standard solutions are stored in organic free 3 ml amber vials with teflon seals and stored at -20 degrees C until use. Be sure to store stock standards in a separate area from samples to avoid the potential for cross contamination.

E. Blanks

At least one reagent blank is performed with each set of samples analyzed. For manual non-instrumental analyses such as gravimetry and titrimetry, one ragent blank per set of samples is sufficient unless the sample load is greater than 50. For manual and automated instrumental analyses, a reagent blank should be run after every 10 samples.

For low level organic analyses, a laboratory water blank is analyzed to check for artifacts from the GC or GC/MS system and for the presence of impurities in the water blank which make it unsuitable for standard preparation. Field blanks are also analyzed for organic analyses. With each set of travel blanks sent out, a stationary travel blank is kept in the laboratory for analysis to demonstrate that the water sent out was free of contamination.

F. Duplicates

The precision of an analytical method is determined by running 10% of the samples in duplicate. Duplicate results are recorded on the quality control form for each analytical run. Duplicate agreement must fall within the range specified in the method writeup or +/- 10% if a range is not specified. All samples which are sandwiched between two unacceptable duplicates must be reanalyzed.

G. Spikes

The accuracy of an analytical method is determined by running 10% of the samples with a standard spike addition. Spike recoveries are recorded on the quality control form for each analytical run. Spike calculation worksheets are available which take into account the volume dilution effect of the spike and calculate the actual recovery of the spike rather than the recovery of the spike + sample value which could lead to misleading recovery results if the spike value was less than 50% of the sample value. All samples falling on either side of an unacceptable spike must be reanalyzed.

H. Outside Reference Samples

A known reference sample, such as those available from NBS and EPA, is run with each set of analyses for metals, inorganics, and organics and the true value and measured result are both recorded on the quality control form.

I. Eppendorf vs. Volumetric Pipets

Dilutions of samples, stock standards, and external QC samples may be made with Eppendorf pipets only if the precision and accuracy of the pipet has been verified by weighing out 7 DI water replicates and calculating the mean and standard deviation. On an adjustable Eppendorf pipet, this check must be made at 3 or 4 settings which cover the range of the pipet. All of this information should be recorded as part of the QC.

IX. METHOD SPECIFIC QC

A. Gravimetry

Use desiccators of sufficient size and limit the number of samples placed in them so that the samples will be at room temperature at the end of the specified drying period.

Maintain the temperature of the drying ovens within the specified limits of the required drying temperature.

Maintain a regular maintenance program for the analytical balance and make sure it is properly calibrated by checking with Class S weights.

If the working range of the method is exceeded, the procedure must be repeated because the amount of residue will be so great that it is likely that water will be entrapped and not completely driven off during the drying period.

B. Titrimetry

The basic equipment employed in a titrimetric procedure is a buret and it is imperative that this piece of glassware is properly cleaned and maintained. The titrant should drain out of the buret without leaving drops. If the buret is dirty, clean it by soaking in a Nochromix solution until it drains properly. Once a buret is adequately cleaned, it should require little more than occassional rinsing with distilled water to maintain it.

Care should be taken to titrate every sample to the same endpoint. This is usually best achieved by comparing the color of the sample currently being titrated with the color of the previously titrated sample. The analyst should be aware, however, that some titrations have fading endpoints. In such instances, it is important to complete the titration as rapidly as possible.

Include a primary standard solution with each set of samples or at (weekly) intervals, whichever is less frequent, to ensure that the titrant has not changed strength.

A standard should be analyzed along with every set of samples to verify the accuracy of the end-point determination.

C. Colorimetric Spectrophotometry

Periodically check the alignment of the cell holder and light source.

Use a minimum of four standards, equally spaced over the concentration range to calibrate a spectrophotometer in the absorbance mode.

A record should be maintained of the absorbance readings for each set of standards run. Subsequent standard absorbance values must be within 10 percent of the previous documented values. If they are not, a problem exists either with the performance of the spectrophotometer or the accuracy of the standard solutions. Determine the source of error and take corrective action before any samples are analyzed. A gradual decrease in absorbance values from week to week is probably indicative of a deteriorating standard or the initial stage of lamp failure.

The rate of color development and color stability of spectrophotometric procedures varies considerably. The allowable time interval for reading the absorbance of the sample is specified in the procedure and must be rigidly adhered to in order to obtain accurate results.

The stability of the spectrophotometer should be checked by measuring a blank and a calibration standard after every tenth sample. If baseline drift has occured or the standard absorbance value has changed by more than 2%, recalibrate the instrument and reanalyze all samples analyzed since the last acceptable calibration check. If the color complex is unstable, sufficient standards must be prepared in the order in which they will be read so that a standard can be inserted after every tenth sample.

Some water samples have a natural color or turbidity which absorbs appreciably at the wavelength used in the analysis. If the sensitivity of a procedure is sufficiently high, it is usually possible to minimize this interference by diluting the sample. If the sensitivity is not adequate to permit sample dilution, the turbidity or color interference is corrected for by reading the absorbance of the sample carried through the procedure with the exception of the addition of the indicator reagent. This absorbance reading is then subtracted as a blank from the absorbance reading of the sample.

D. Atomic Absorption Spectrophotometry

Keep a record of the sensitivity of each element for a particular instrument in order to detect deficiencies in the instrument or operating conditions.

Each time the instrument is calibrated, the absorbance readings are to be recorded. If subsequent standard readings differ by more than 10% from the previous readings, a problem exists either with the operational settings, the performance of the instrument, or the accuracy of the standard solution. Corrective action must be taken before analyzing the samples. A gradual change in the standard absorbance readings from day to day is usually indicative of an instrument maintenance problem such as a dirty nebulizer system, a clogged burner, the initial stage of lamp failure or an instrument part malfunction.

Reagent blanks followed by a calibration standard are run for each metal determined with a frequency of 10% and the sample values are corrected for baseline drift. If there is a difference of over 2% from the initial standard reading, the instrument must be recalibrated and all samples that were analyzed after the last acceptable calibration check must be reanalyzed.

If the recovery of a spiked sample is not within +/- 10% of the expected value, the sample is analyzed by the method of standard additions. When using the method of standard additions, a linear curve over the entire range of addition is necessary for the results to be considered valid.

At least one known reference sample is analyzed with every run to verify the accuracy of the results. The value for the reference material should fall within 1.5 standard deviation of the theoretical value. If it doesn't, corrective action must be taken and all samples analyzed since the last acceptable reference value should be reanalyzed.

E. Radiochemistry

1. Sample Collection

Analytical results can be no more meaningful than the integrity of the samples that are analyzed. Representative samples must be collected so the data for any aliquot can be related to a well-defined pollution source. The sample is preserved at the sampling site to maintain its integrity and minimize activity losses from absorption on container walls.

2. Quality Control

All QC data are available for inspection to determine validity of laboratory results.

The laboratory participates four times each year in an appropriate EPA-administered performance study on unknows. Results must be within the control limits established by EPA for each analysis.

Counting-instrument operating manuals and calibration protocols are available to analysts and technicians.

Calibration data and maintenance records on all radiation instruments and analytical balances are maintained in a permanent record.

3. Minimum Daily QC

To verify precision of methods, a minimum of 10 percent of the samples are duplicates. Checks must be within ± 2 standard deviations of the mean range.

A standard and a background sample are run with each batch of radiation samples analyzed.

Quality control performance charts or performance records maintained.

4. Efficiency Curves

Efficiency curves are run annually and the data recorded in the radiation notebook.

F. Odor Analysis

Odor is one of the most important measurements for the consumer since it is most readily noticed.

1. All glassware for odor analysis is acid washed, baked and rinsed two times before daily use.

2. Glassware used for a sample is not to be used more than once without acid-washing and baking if a TON of 40 or greater is measured.

3. Odor-free water is prepared fresh each day an odor analysis is run.

4. Between samples glassware is rinsed with odor-free water prepared by passing deionized water through carbon from the sink in the Extraction Room.

5. An odor-free water blank is carried through with each set of samples analyzed.

6. At the beginning of a series of odor analyses, four randomly chosen flasks are carried through the procedure as blanks. If any of these have a noticeable odor, the entire lot is checked and the rejected flasks rewashed.

7. At least one sample per day is analyzed in duplicate on two different runs.

G. Gas Chromatography

For all analyses, a laboratory water blank is analyzed to check for artificats from the GC system and for the presence of impurities in the water blank making it unsuitable for standard preparation.

A field blank should be analyzed for each set of field samples taken. With each set of travel blanks sent out, a stationary travel blank is kept in the laboratory for analysis to demonstrate that the water sent out was free of contamination.

A standard curve is run once a week. These curves are used for comparison with the daily calibrations. A record of each standard curve is kept in the GC Instrument Log.

Standards are analyzed daily for each routine analysis. Standards are extracted along with the samples to ensure adequate recovery. Proper instrument sensitivity and stability are determined by comparison of performance with earlier weekly calibration curves. Significant deviations from previous quantitation curves not directly attributable to instrument adjustment requires running a complete new set.

Duplicates and spikes for assessing precision and accuracy are determined by carrying the duplicates and spikes through the extraction procedure as well as the instrumental analysis.

A record of the average internal area count for each analysis set utilizing an internal standard is kept in the GC Instrument Log.

H. Gas Chromatrography/Mass Spectrometry

GC/MS Tuning Specifications

1. The mass spectrometer must be shown to be properly tuned during each eight hour shift. This insures that the masses and abundances which the data system determines are accurate. The EPA has suggested criteria for tuning the GC/MS with two standard compounds; Decafluorotriphenylphosphine (DFTPP) and 1-Bromo-4-fluorobenzene (BFB). This data is presented in Table 3. In general, the GC/MS should meet these criteria at all times and spectra should be available which show this to be true.

2. The following settings are maintained:

   - Emission Current: 0.5 ma
   - Electron Energy: 70 ev
   - Electron Multiplier: 1000-2000 volts as required for sensitivity
   - Dynodes: 3000 V
   - Ion Source: 300 C

3. The GC/MS is calibrated daily with FC43 gas to obtain a millimass defect of less than or equal to 20 millimass units. The calibration is verified with the FIT program to an RMS error of less than 4 percent.

4. The instrument zero is checked using the zero control and adjusting as necessary to provide a minimum background electrical noise.

Criteria for Identification

The primary use of a GC/MS is to identify compounds for which the retention time and mass spectra are not well known to the operator. This is usually accomplished by performing a library search using a library of thousands of mass spectra and comparing them to the unknown. Most GC/MS data systems have programs and libraries to do this type of search. The programs ususally give five or ten of the "best fits". The best filts are determined by comparing the top eight or so mass fragments in the unknown to the spectra in the library. The program matches the mass numbers and the abundances at each mass number

to those in the library. The program returns the possible identifications along with the numbers which can be used by the MS operator to determine the quality of the identification. The fit is the degree to which the peaks and intensities in the unknown match those of a particular compound in the library. A perfect match would be 1000 or 1.000, depending on the software. A fit of 850 or 0.850 should be the minimum used for identification. In practice, however, these numbers are rarely seen, even with pure standards. This is because the library spectra were produced on a variety of mass spectrometers under slightly different conditions. Fits of 950 are typically seen in real environmental samples. Identifications assigned solely on the basis of computer library serach matches should be considered tentative only until actual standards can be obtained and run for verification. It should be noted that even with computer library searches there is no substitute for the judgement of a trained analyst.

I. Total Organic Carbon (TOC)

1. Prior to analysis of samples an instrument calibration standard is analyzed in order to update the instrument calibration factor and to determine instrument performance. The uncalibrated instrument response factors are recorded in the TOC Quality Control notebook.

2. Between each ten samples at least three standards and the laboratory water blank are analyzed in duplicate.

3. All samples are analyzed in duplicate. If the net values of the duplicates are not within 10% of one another, a third replicate is analyzed.

4. The volume of sample is adjusted for the sample analyzed to produce an organic carbon content in the range of optimum function of the instrument.

5. Every twentieth sample is spiked and recoveries are determined.

6. Every week a seven point standard curve is run by spiking reagent water with seven different concentrations of organic carbon. This curve is kept in the TOC Quality Control notebook.

7. Each day one standard is run in duplicate. The average of this standard must be within 10% of the value for that standard on the weekly standard curve or a new standard curve must be run.

J. Total Organic Halogen (TOX)

1. The analyzer module is run with the boat empty at the beginning of each day to remove all contamination accumulated since the previous analysis.

2. The response of the titration cell is checked each day by injecting 10ug of inorganic chloride directly into the titration cell solution. Injections are repeated and adjustment of the instrument made until two subsequent replicates within 2% are obtained. These results are kept in the TOX Quality Control notebook.

3. Duplicate 10ug organic chloride instrument calibration standards (standards injected directly onto the carbon contained in the adsorption columns) are analyzed at the beginning of each day, and one additional replicate of 10ug organic chloride instrument calibration standard after each 10 samples analyzed. These results are kept in the TOX Quality Control notebook.

4. Triplicate carbon blanks (carbon packed adsorption columns washed with nitrate-wash solution only) are analyzed at the beginning of each work shift, and subsequently one blank is analyzed after each 10 samples analyses. These results are kept in the TOX Quality Control notebook.

5. All samples are analyzed in duplicate. If the net values of the duplicates are not within 10% of one another, a third replicate is analyzed.

6. The titration cell is revitalized by rinsing with fresh cell solution after approximately every twenty analyses. After revitalization of the titration cell, its stability and response are checked by an injection of the inorganic chloride standard.

7. The volume of sample filtered is adjusted for the sample analyzed to produce adsorbed organic halogen content within the range of optimum function of the instrument.

8. Once during each work shift, the top and bottom adsorption columns from one sample adsorption are analyzed separately to determine if any organic halogen breakthrough is occurring. These results are kept in the TOX Quality Control notebook.

9. Every twentieth sample is spiked and recoveries are determined.

10. The purity and adsorption capacity of each new batch of carbon purchased is assessed by analysis of seven replicates each of reagent water, carbon blanks, instrument calibration standards, and adsorption efficiency standards (standards injected into reagent water then filtered). The results of these analyses are to be kept in the TOX Quality Control notebook.

11. Quarterly, a seven point standard curve is run by spiking reagent water with seven different concentrations of organic halogen. This curve is kept in the TOX Quality Control notebook.

12. Each week a three point standard curve is run by spiking reagent water with three different concentrations of organic halogen. This curve is kept in the TOX Quality Control notebook.

13. Each day one standard is run in duplicate. The average of this standard must be within 10% of the value for that standard on the weekly standard curve or a new standard curve must be run.

K. General Microbiological

The individual collecting samples should be aware of the sampling precautions outlined in Standard Methods and summarized below. These precautions maintain the integrity of the samples. Prevent contamination of the sample bottle by collector. Prevent contamination from other sources not representative of the sample, e.g., rust from sampling tap and sediment from stream bed. Do not rinse the sample bottle with sample. Leave 1/2" of headspace in the container and cap tightly. If the samples cannot be analyzed within 4 hours, they are stored on ice in a cooler. First, the sample bottles are checked to insure tight caps and no leakage. The bottles are then wrapped in a strong plastic bag and sealed. This keeps the melting ice from contaminating the samples. Ice cubes or their equivalent are placed around the samples. Care must be taken that the samples do not freeze. Package the cooler securely for shipment. Sterilization indicators, Kilit Ampules, heat sensitive tape, steam clocks, or discs, are available and are used during each autoclave cycle. If problems exist as indicated by a failure of one of the various sterilization indicators, consult the supervisor.

Only dimineralized water is used for the preparation of media. Once opened, the powdered media is stored top down to prevent hydration. Prepared liquid medium is stored at 4 degrees C. The basket should be labeled with the type of medium, date and the person who made it up.

Prepared agar plates are stored in plastic bags, agar up, in the refrigerator. The bag is labeled to identify the type of medium, date made, and person who prepared it.

On a daily basis when bacteriological samples are incubated in a water bath or incubator, the temperature is recorded each morning in the appropriate log. The temperature can also be checked with the NBS calibrated thermometer at 20 and 35 degrees C. A thermometer calibrated at 44.5 degrees C is used when fecal coliforms are incubated.

Positive and negative controls for MPN are used each time the analysis is performed. Positive controls utilize a known coliform such a E. coli or E. aerogenes. Negative controls are composed of sterile phosphate buffer.

The lab analyzes a bacteriological reference sample from the California State Department of Health annually. An MPN test, through the confirmatory step and standard plate count, is conducted on this reference sample.

Before use in an analysis, each pH meter is standardized.

The quality of laboratory pure water is analyzed monthly and annually as described below:

Monthly - conductivity, pH, chlorine residual, and standard plate count

Annually - bacteriological suitability ratio, trace metals (Pb,Cd,Cr,Cu,Ni,and Zn).

Criteria

pH	4.5 - 8.5
EC	0.5 megohms
Trace Metals	<5 ppb each
Bacteriological Suitability Ratio	0.8 - 2.0

This data is recored into the Instrument Log.

The laboratory distilled water is tested annually for bacteriological quality as described in Standard Methods.

The washing and sterilization procedures for laboratory glassware are tested annually be inspecting glassware for inhibitory residues. (Check each set of washed glassware for acid or alkaline residue by adding a few drops of a 0.04 percent solution of bromothymol blue indicator to a few pieces, randomly chosen from the set. The indicator will show a yellow color at pH less than 6.2 and blue at pH greater than 7.6).

The completed test is conducted on 10% of the positive samples. If no positives are found, at least one positive source water is completed quaterly. Both gram (+) and gram(-) controls are used for the gram stain.

L. Asbestos

This program incorporates all the controls utilized by our laboratory to assure the level of quality reqired in our final report.

1. Personnel

All are experienced or trained by an analyst with 2 years minimum experience in asbestos determination.

2. Records

All quality control data is available for inspection upon request. Worksheets are maintained for rechecking calculations. All permanent records are kept in bound volumes.

3. Sampling Procedures

The sampling technique follows the methods outlined by the EPA on page 3 of the Interim Method for Determining Asbestos in Water EPA-600/4-80-005, January 1980. All samples are to be stored at 4° C until filtration and completion of analysis.

4. Measurements/Analyses

The standard accepted procedure is outlined in the Interim Methods. All modifications of procedures including reasons for modifications are recorded.

5. Reports

All calculations and reports are entered into the H-P computer to eliminate inconsistency in the final report. The analyst and the immediate supervisor must check and then sign the final report before sending it to the client.

6. Instruments

The manufacturers' manuals for proper operation of all equipment used in asbestos analyses are properly filed and accessible. Records of periodic inspection, calibration and service of equipment is maintained in appropriate log books. Phone numbers for instrument service are posted by each instrument.

7. Quality Control

i. All materials used in the analysis are dated upon receipt and replaced as needed or when shelf life has expired.

ii. A negative control blank using fiber-free water is processed each day that samples are filtered as stated on page 23 of the Interim Methods. 200 ml of asbestos-free water must have no more than 2 fibers in 20 grid squares of a 200 mesh grid.

iii. Standard asbestos fibers are checked twice a month (or as required) for identification, EDX performance, standard morphology photographs and diffraction patterns.

iv. A duplicate sample is run at least once per ten samples processed.

v. Once a year a sample is split with the EPA or another approved asbestos laboatory.

vi. The lab participates in approved round-robin asbestos test evaluations (when available).

vii. The lab analyzes a reference sample or an unknown performance sample once per year.

viii. Analytical results are cross-checked before the final report is sent to the client.

ix. All samples are filtered within 48 hours of their arrival.

x. The absolute (HEPA) filtration system is monitored daily.

xi. Asbestos glassware is prepared as stated in the EPA Interim Methods on page 12.

xii. When several grids of the same sample are counted, the deviation should not exceed $\pm 15\%$ as stated on page 27 of the EPA Interim Methods.

xiii. The chi-square test is used monthly to determine whether the fibers are randomly sized and uniformly distributed as stated on page 29 of the EPA Interim Methods.

X. Quality Assurance Evaluation

A. Quality Control Forms

Printed quality control forms are available for most routine analyses. Each analyst is provided with forms covering his or her area of responsibility. Forms are available for metals, titrations, inorganic instrumental analyses, total organic carbon, total organic halogen, and trihalomethanes. Worksheets are also available for spike calculations and water blank monitoring. Forms are not currently available for GC, GC/MS, and HPLC. Facsimilies of the available forms are presented in Appendix E.

The information required on the QC forms are the results of duplicates, spikes, external QC, blanks, dates of stock and working standards, statistical evaluation of the calibration curve (linear regression), and specific data on instrument settings and parameters. Every analyst is required to complete a QC form with each analytical run and submit the completed form to his or her group QC officer for review. Approved forms are then filed in a central location to provide a permanent record of quality control.

The acceptable limits for the duplicates, spikes, and blanks recorded on these forms are specified in most of the method writeups. If specific limits are not specified, the following default values are used:

80 - 120% spike recovery

± 10% agreement on duplicates

blank values <10% of sample values

external QC within the acceptance range provided with the standard (usually 2 standard deviations)

B. Evaluation of Linear Regression Data

i. The absolute value of the intercept must be <10% of the lowest sample value.

ii. The range of standard concentrations must cover the range of the samples.

iii. Any sample value above the top standard must be diluted and rerun.

iv. The correlation coefficient must be at least 0.996.

v. The concentration of the external QC standard must be within the range of the sample concentrations.

C. Evaluation of Sample Prep Error

i. The accuracy of sample preparation or dilution must be checked by running at least one standard through the identical procedure.

ii. If a run contains a large number of dilutions, duplicates should be run on separate dilutions.

D. Evaluation of In-house Blind Check Samples

Check samples are purchased from outside laboratories and submitted as blind samples to the analysts on a quarterly basis. All results from these check samples are kept in a central quality control file maintained by a senior staff member. Any unacceptable performances must be fully investigated and the cause of the problem solved before any additional samples can be analyzed.

E. Consistency Check of Sample Analytical Parameters

Wherever a sample is analyzed for enough analytical parameters to allow for internal consistency checks of these parameters, the checks are to be made (e.g. are the values for total constituents greater than dissolved constituents; is the TKN value greater than the NH3 value, etc). If these internal consistency checks are not met, the sample is reanalyzed until consistency is achieved.

F. Cation-Anion Balance

Whenever a sample is analyzed for enough parameters to perform a cation anion balance (Ca,Mg,Na,K,Cl,SO4,NO3,F,Alkalinity), the balance is checked to insure that it falls within a range of $\pm 2\%$. The percent error is calculated in accordance with the guidelines developed in Standard Methods. 5% is the balance criteria used for samples with milliequivalent sums > 15. Should the balance exceed these limits, a series of remedial measures are undertaken. The first measure is to recheck the original data sheets to be sure that the poor balance is not due to clerical or arithmetic errors. If not, the conductivity and cation-anion results are compared in order to determine the most likely erroneous test result. The original test run is then re-checked and the sample reanalyzed for that parameter. If this does not solve the balance discrepancy, all the parameters are reanalyzed and the individual tests checked by different analytical methods where possible.

APPENDIX A

TABLE 1

MONTGOMERY LABORATORIES' STAFF

	POSITION DESCRIPTION	HELD BY
1.	Laboratory Director	**Carol H. Tate** D. Env. Environmental Science and Eng. M.S. Water Resources Eng. B.S. Chemistry
2.	Associate Laboratory Director	**Stephen C. Roesch** M.S. Microbiology B.S. Biological Sciences
3.	System Manager	**John L. Cromer** M.S.P.H. Environmental Chemistry B.A. Chemistry
4.	Marketing/Special Projects Eng.	**Kenneth D. Reich** M.P.H. Public Health B.S. Biological Sciences B.A. Social Ecology
5.	Inorganic Supervisor	**Andrew D. Eaton** PhD. Geochemisry M.S. Geology, B.S. Earth Sciences
6.	Inorganic QC Officer	**Joan A. Oppenheimer** M.S.P.H. Environmental Chemistry B.A. Chemistry
7.	Chief Metals Analyst	**Gregg L. Oelker** B.S. Chemistry B.S. Biology
8.	Metals Analyst	**Larry G. Lawrence** B.S. Biological Sciences
9.	Inorganics Analyst	**Joe P. Marcinko** B.A. Chemistry (in progress)
10.	Technician	**Sondra M. Magruder** A.S. Chemical Technician
11.	General Physical Technician	**Ingrid I. Irbinskis** B.A. Microbiology (in progress)
12.	Organic Supervisor	**Albert R. Trussell** B.S. Chemistry
13.	Organic QC Officer	**Robert R. Clark** PhD. Environmental Chemistry M.S. Environmental Engineering B.S. Chemistry
14.	GC/MS Analyst	**Patty Reilly** A.A. Math (in progress)
15.	GC/MS Analyst	**Fong-yi Lieu** PhD. Environmental Chemistry M.S. Food Sciences B.S. AgriculturalChemistry

16. GC/MS Analyst	**Mike L. Zimmerman** M.S. Environmental Science B.S. Chemistry
17. GC/MS Analyst	**Ted K. Lieu** B.S. Chemistry (MBA in progress)
18. GC, HPLC Analyst	**Bart Koch** M.S. Environmental Science B.S. Chemistry
19. THM Analyst	**Jim Green** B.S. Chemistry
20. TOC Analyst	**Karen L. Prescott** B.S. Biology (in progress)
21. TOX Analyst	**Marsha Pearson** B.S. Chemistry B.A. Philosophy
22. TOC, TOX Analyst	**Rick J. Hansen** A.A. Environmental Health Safety
23. GC Analyst	**Eric W. Crofts** B.S. Biology Minor Environmental Toxicology
24. Extraction Technician	**Andrew Schaeffer** B.S. Chemistry
25. Extraction Technician	**Michelle Turner** B.S.. Biology
26. Extraction Technician	**William Chauncy** B.S. Biology
27. Microbiology Supervisor Support Services Supervisor	**Carole J. Leong** M.S. Environmental Health B.S. Bacteriology
28. Assistant Microbiology Supervisor, Asbestos Analyst	**Carol Jean Belt** B.S Zoology
29. Microbiology Analyst	**Kim S. Banks** B.S. Microbiology Minor Chemistry
30. Accounting Assistant System Manager	**Barbara L. Cummins** B.A. Math B.S. Business
31. Sample Tracking	**Elizabeth B. Summers**
32. Sample Log-In	**Mary A. Augustyn**
33. Sample Shipping	**Martha Frost**
34. Dishwashing	**Dorothy Conzo**
35. Secretary-Laboratory Director	**Linda S. Fedorovich**
36. Secretary-Reports	**Patty A. Fedorovich**
37. Field Sampling	**Mark Augustyn**

APPENDIX B

MONTGOMERY LABORATORIES, A DIVISION OF JMM
SAMPLE BOTTLE SIZE AND PRESERVATIVES FOR WATER SAMPLES

Analysis	Container Type	Size	Preservative	Closure
BNA (2 bottles)				
BN	Amber Glass	2 liter	1 ml Na Sulfite/ 1 ml HgC12	Hard Cap w/Teflon Liner
Acids	Amber Glass	2 liter	1 ml Na Sulfite/ 2 ml H2SO4	Hard Cap w/Teflon Liner
Carbamate Pesticides	Amber Glass	2 liter	none	Hard Cap w/Teflon Liner
Organophosphorus Pesticides	Amber Glass	2 liter	none	Hard Cap w/Teflon Liner
Herbicides	Amber Glass	2 liter	1 ml Na Sulfite / 2 ml H2SO4	Hard Cap w/Teflon Liner
Pesticides/PCBs	Amber Glass	2 liter	1 ml Na Sulfite	Hard Cap w/Teflon Liner
THM	Amber Glass	125 ml	4 drops Na Sulfite	Septum
TCE	Amber Glass	125 ml	none	Septum
PCE	Amber Glass	125 ml	none	Septum
THM, PCE TCE (ONE BOTTLE)	Amber Glass	125 ml	4 drops Na Sulfite	Septum
TPTHM 6-point, also called TPTHM curve (2 bottles)				
TPTHM	Amber Glass	2 liter	none	Hard Cap w/Teflon Liner
Bromide	Plastic	60 ml	none	Plastic Cap
TPTHM 1 point	Amber Glass	1 liter	none	Hard Cap w/Teflon Liner
Geosmin/MIB	Amber Glass	250 ml	1 ml HgC12 (0.01%)	Septum
DHAN	Amber Glass	125 ml	none	Septum
Potential DHAN's 1 pt.	Amber Glass	1 liter	none	Hard Cap w/Teflon Liner
DBCP	Amber Glass	250 ml		Septum
Closed-Loop Stripping, 2 bottles	Amber Glass	2-500 ml	1 ml HgC12(0.01%)/ 10 drops Na Sulfite	Septum
Geosmin/MIB	Amber Glass	250 ml	1 ml HgC12 (0.01%)	Septum
TOC	Amber Glass	125 ml	8 drops H2SO4	Septum
TOX	Amber Glass	250 ml	4 drops H2SO4/ 2 drops Na Sulfite	Septum
VOA	Amber Glass	250 ml	4 drops Na Sulfite/ 1 ml HgC12 (0.01%)	Septum
High Volume VOA, 2 bottles	Amber Glass	2-500 ml	1 ml HGC12 (0.01%)/ 10 drops Na sulfite	Septum
Soils	Glass	1/2 pint	none	Hard cap

MONTGOMERY LABORATORIES, A DIVISION OF JMM
SAMPLE BOTTLE SIZE AND PRESERVATIVES FOR WATER SAMPLES

Analysis	Container Type	Size	Preservative	Closure
General Mineral (2 bottles)				
Anions	Plastic	500 ml	none	Plastic Cap
Cations	Plastic (acid washed)	500 ml	2 ml HNO3	Plastic Cap
Heavy Metals	Plastic (acid washed)	500 ml	2 ml HNO3	Plastic Cap
Nitrate	Plastic	125 ml	none	Plastic Cap
Nitrate (after 14 days)	Plastic	125 ml	4 drops H2SO4	Plastic Cap
Nutrients	Plastic	125 ml	10 drops H2SO4	Plastic Cap
TKN				
NH4(ammonia)				
P (phosphorous)				
Phenol	Glass	250 ml	1 ml H2SO4	Plastic Cap
General Physical				
(Odor, Color, Turbidity)	Amber Glass	500 ml	none	Hard Cap w/Teflon Liner
Odor	Amber Glass	500 ml	none	Hard Cap w/Teflon Liner
Taste	Glass (Sterilized)	250 ml	none	Hard Cap
Cyanide (CN)	Plastic	60 ml	5 drops NaOH/ 3 drops Na Sulfite	Plastic Cap
Oil & Grease	Glass	1 liter	4 ml H2SO4	Plastic Cap
Fluoride	Plastic	60 ml	none	Plastic Cap
Radioactivity (2 bottles)	Plastic	1 liter and	2 ml HNO3	Plastic Cap
	Plastic	125 ml	none	Plastic Cap
COD	Plastic	125 ml	8 drops H2SO4	Plastic Cap
Sulfide	Plastic	60 ml	5 drops Zn Acetate	Plastic Cap
Silica, Low Level or Trace	Polypropylene	250 ml	none	Plastic Cap
Silica High Level	Plastic	60 ml	none	Plastic Cap
Settleable Solids	Plastic	1 liter	none	Plastic Cap
Trace Anions	Polypropylene	250 ml	none	Plastic Cap
Trace Cations	Polypropylene	250 ml	none	Plastic Cap
Low level Sodium (Na)	Polypropylene	250 ml	none	Plastic Cap
Soils	Glass	1/2 pint	none	Hard Cap
MPN	Plastic(sterile)	125 ml	Na thiosulfate, autoclave	Plastic Cap & Sterile Indicator
Asbestos	Plastic (sonicated)	1 liter	none	Plastic Cap

APPENDIX C

CFA WORKSHEET

DATE:
PAN #
SAMPLER: [illegible]

CHANNEL 1

Chemistry:
Computer:
Zero Pot: Std. Cal. Pot:
Range:
Comments:

Sample Cup	SID		#1 Value	#2 Value
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				

CHANNEL 2

Chemistry:
Computer:
Zero Pot: Std. Cal. Pot:
Range:
Comments

Sample Cup	SID		#1 Value	#2 Value
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				

GROSS ALPHA AND BETA WORKSHEET

Date prepped _____ Date counted _____ actual counting time _____ Alpha Bkg _____ time _____ Beta Bkg ____ Time _____

Sample #	Ident	mls evap.	Gross pan wt	Tare pan wt.	Net mg solids	time req	counting time	gross counts	effic.	pci/l	2 sigma error	gross counts	effic.	pci/l	2 sigma error
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															

HERBICIDE DATA

LI NT _____

BORATORY # _____

AMPLE ID _____

st# _____ Report# _____

alysis/confirmation

olumn DB-5, DB-1701
g # _____
n # _____
ilution _____

Date sampled _____
Date received _____
Date extracted _____
Date analyzed _____

Matrix: water,wastewater

soil, sludge, other

Initial vol/wt _____
Final volume: 5 ml
Final solvent: toluene
Units: ug/l, mg/kg
MDL: same or _____

Result: all ND

other

Compound	RT	SAMPLE AREA	RESULT	RT	STANDARD AREA	CONC
2 4-D						
2,4,5-T						
3 L X						

PESTICIDE/PCB DATA

CLIENT _____

LABORATORY # _____

SAMPLE ID _____

Test # _____ Report # _____

Analysis/confirmation

Column DB-5, DB-1701

Seq # _____

Run # _____

Dilution _____

Date sampled _____

Date received _____

Date extracted _____

Date analyzed _____

Matrix: water, wastewater

soil, sludge, other

Initial vol/wt _____

Final volume: 5 ml

Final solvent: hexane

Units: ug/l, mg/kg

MDL same or _____

Result: all ND

other

Compound	RT	SAMPLE AREA	RESULT	RT	STANDARD AREA	CONC
A-BHC						
B-BHC						
D-BHC						
G-BHC						
HEPT						
ALDRIN						
HEPT-EPOX						
ENDO I						
DIELDRIN						
DDE						
ENDRIN						
DDD						
ENDO II						
DDT						
END-ALD						
ENDO-SULF						
METHOXY						
CHLORD						
PCB-						
TOXAPHENE						

CARBAMATE DATA

CLIENT _____

LABORATORY # _____

SAMPLE ID _____

Test # _____ Report# _____

Analysis/confirmation

Column _____

Log # _____

Run # _____

Dilution _____

Date sampled _____

Date received _____

Date extracted _____

Date analyzed _____

Matrix: water, wastewater

soil, sludge, other

Initial vol/wt _____

Final volume: 1 ml

Final solvent: methanol

Units: ug/l, mg/kg

MDL same or _____

Result: all ND other

Compound	RT	SAMPLE AREA	RESULT	RT	STANDARD AREA	CONC
METHOMYL						
BENOMYL						
[illegible]CARB						
AMINOCARB						
FURADAN						
CARBARYL						
IPC						
DIURON						
MESUROL						
CIPC						
PTC						
SUTAN						
KAMYL						
BAYGON						
CARTAN						

ORGANOPHOSPHATE PESTICIDE DATA

C ENT _____

ABORATORY # _____

SAMPLE ID _____

'ext# _____ Report# _____

Analysis/confirmation
'olumn DB-5, DB-1701
Log # _____
Run # _____
'ilution _____

Date sampled _____
Date received _____
Date extracted _____
Date analyzed _____

Matrix: water,wastewater

soil, sludge, other

Initial vol/wt _____
Final volume: 5 ml
Final solvent: methanol
Units: ug/l, mg/kg
MDL: same or _____

Result all ND other

Compound	RT	SAMPLE AREA	RESULT	RT	STANDARD AREA	CONC
ACEPHATE						
ZINPHOS						
CHLORPYRI						
ZINON						
DIMETHOATE						
DISULFOTON						
ENAMIPH						
MALATHION						
ETHAMIDO						
MEVINPHOS						
NALED						
ARA ETH						
PARA METH						
HOSDRIN						
THORATE						

TRIAZINES DATA SHEET

: IENT _____

LAL RATORY # _____

: MPLE ID _____

T st# _____ Report# _____

Analysis/confirmation

C lumn DB-5, DB-1701
Log # _____
Run # _____
D lution _____

Date sampled _____
Date received _____
Date extracted _____
Date analyzed _____

Matrix: water,wastewater

soil, sludge, other

Initial vol/wt _____
Final volume: 5 ml
Final solvent: methanol
Units: ug/l, mg/kg
MDL: same or _____

Result: all ND other

Compound	RT	SAMPLE AREA	RESULT	RT	STANDARD AREA	CONC
c anazine						
prometryn						
a razine						
s mazine						

VOLATILE ORGANIC ANALYSIS
BY GC/MS

Client _____ Sample _____

Date Sampled _____ Date Analyzed _____

Lab number _____ GC/MS run number _____

Priority Pollutants:

	Compound	Mass ion					
2V	Acrolein	56					
3V	Acrylonitrile	53					
4V	Benzene	78					
48V	Bromodichloromethane	83					
47V	Bromoform	173					
46V	Bromomethane	94					
6V	Carbon tetrachloride	117					
7V	Chlorobenzene	112					
51V	Chlorodibromomethane	129					
16V	Chloroethane	64					
19V	2-Chloroethylvinyl ether	106					
23V	Chloroform	83					
45V	Chloromethane	50					
10V	1,2-Dichloroethane	62					
[illegible]V	1,1-Dichloroethane	63					
[illegible]V	1,1-Dichloroethene	61					
30V	trans-1,2-Dichloroethene	96					
50V	Dichlorodifluoromethane	85					
32V	1,2-Dichloropropane	63					
33V	cis-1,3-Dichloropropene	75					
33V	trans-1,3-Dichloropropene	75					
38V	Ethylbenzene	106					
49V	Fluorotrichloromethane	101					
44V	Methylene chloride	84					
15V	1,1,2,2-Tetrachloroethane	83					
85V	Tetrachloroethene	164					
86V	Toluene	92					
11V	1,1,1-Trichloroethane	97					
14V	1,1,2-Trichloroethane	83					
87V	Trichloroethene	130					
88V	Vinyl chloride	62					

Analyst _____ Checked by _____

REPORT OF THE NON-PRIORITY POLLUTANTS

Compound	Mass ion					
Acetone	58					
4-Chlorotoluene	126					
Decane	57					
Dibromochloropropane (DBCP)	157					
1,2-Dibromoethane (EDB)	107					
1,3-Dichlorobenzene	146					
1,2-Dichlorobenzene	146					
1,4-Dichlorobenzene	146					
cis-1,2-Dichloroethene	96					
1-Ethyl-3-methylbenzene	120					
Hexane	57					
Methylethylketone	72					
Naphthalene	128					
Propylbenzene	120					
Styrene	104					
1,3,5-Trichlorobenzene	180					
1,2,4-Trichlorobenzene	180					
1,2,3-Trichlorobenzene	180					
1,2,4-Trimethylbenzene	120					
m,p-Xylene	106					
-Xylene	106					

REPORT OF INTERNAL STANDARDS AND SURROGATE STANDARDS

Compound	Mass ion					
1-Chlorohexane (SS)	55					
1-Chlorooctane (IS)	91					
Bromochloropropane (IS)	41					
1,4-Dichlorobutane (IS)	55					
Bromofluorobenzene (SS)	95					

VOLATILE ORGANIC ANALYSIS
FOR PRIORITY POLLUTANTS

Client _____ Sample _____
Site number _____ Tag number _____
Date Sampled _____ Date Analyzed _____
Lab number _____ GC/MS run number _____

	Compound	1 RT	2 RRT	Mass ion	Area count	ug/l ug/Kg	3 DL
2V	Acrolein			56			
3V	Acrylonitrile			53			
4V	Benzene			78			
48V	Bromodichloromethane			83			
47V	Bromoform			173			
46V	Bromomethane			94			
6V	Carbon tetrachloride			117			
7V	Chlorobenzene			112			
51V	Chlorodibromomethane			129			
16V	Chloroethane			64			
19V	2-Chloroethylvinyl ether			106			
23V	Chloroform			83			
45V	Chloromethane			50			
10V	1,2-Dichloroethane			62			
3V	1,1-Dichloroethane			63			
29V	1,1-Dichloroethene			61			
30V	trans-1,2-Dichloroethene			96			
50V	Dichlorodifluoromethane			85			
32V	1,2-Dichloropropane			63			
33V	cis-1,3-Dichloropropene			75			
33V	trans-1,3-Dichloropropene			75			
38V	Ethylbenzene			106			
49V	Fluorotrichloromethane			101			
44V	Methylene chloride			84			
15V	1,1,2,2-Tetrachloroethane			83			
85V	Tetrachloroethene			164			
86V	Toluene			92			
11V	1,1,1-Trichloroethane			97			
14V	1,1,2-Trichloroethane			83			
87V	Trichloroethene			130			
88V	Vinyl chloride			62			

Notes: 1) RT = Retention Time given in scans (1 scan per 0.8 seconds)
2) RRT = Relative Retention Time, relative to the internal standard _____ (_____ scans).
3) DL = Detection Limit in the same units as the quantitation.

Analyst _____ Checked by _____

REPORT OF THE TEN LARGEST NON-PRIORITY POLLUTANTS
above 10 ug/l

Compound	1 RT	2 RRT	Area count	Estimated concentration

Notes: 1) RT = Retention Time given in scans (1 scan per 0.8 seconds)
2) RRT = Relative Retention Time, relative to the internal standard _____ (_____ scans).

REPORT OF INTERNAL STANDARDS AND SURROGATE STANDARDS

Compound	1 RT	2 RRT	Mass ion	Area Count	
1-Chlorohexane (SS)			55		
1-Chlorooctane (IS)			91		
Bromochloropropane (IS)			41		
1,4-Dichlorobutane (IS)			55		
Bromofluorobenzene (SS)			95		

Notes: 1) RT = Retention Time given in scans (1 scan per 0.8 seconds)
2) RRT = Relative Retention Time, relative to the internal standard _____ (_____ scans).

Amount of sample analyzed _____
Amount of IS spiked _____
Amount of SS spiked _____

Acid compounds:

Compound	1 RT	2 RRT	Mass ion	Area count	ug/l ug/Kg	3 DL
22A p-Chloro-m-cresol _____	_____	_____	142	_____	_____	_____
24A 2-Chlorophenol _____	_____	_____	128	_____	_____	_____
31A 2,4-Dichlorophenol _____	_____	_____	162	_____	_____	_____
34A 2,4-Dimethylphenol _____	_____	_____	122	_____	_____	_____
60A 4,6-Dinitro-2-methylphenol	_____	_____	198	_____	_____	_____
59A 2,4-Dinitrophenol _____	_____	_____	184	_____	_____	_____
57A 2-Nitrophenol _____	_____	_____	139	_____	_____	_____
58A 4-Nitrophenol _____	_____	_____	139	_____	_____	_____
64A Pentachlorophenol _____	_____	_____	266	_____	_____	_____
65A Phenol _____	_____	_____	94	_____	_____	_____
21A 2,4,6-Trichlorophenol _____	_____	_____	196	_____	_____	_____

Notes: 1) RT = Retention Time given in scans (1 scan per 1.0 seconds)
2) RRT = Relative Retention Time, relative to the internal standard _____ (_____ scans).
3) DL = Detection Limit in the same units as the quantitation.

Analyst _____ Checked by _____

BASE/NEUTRAL/ACID EXTRACTABLE ANALYSIS
FOR PRIORITY POLLUTANTS

Client _____ Sample _____
Site number _____ Tag number _____
Lab number _____
Date Sampled _____ Date Extracted _____
Date Analyzed _____ GC/MS run number _____

Base/Neutral compounds:

	Compound	1 RT	2 RRT	Mass ion	Area count	ug/l ug/Kg	3 DL
1B	Acenaphthene			154			
77B	Acenaphthylene			152			
78B	Anthracene			178			
5B	Benzidine			184			
72B	Benzo(a)anthracene			228			
74B	Benzo(b)fluoranthene			252			
75B	Benzo(k)fluoranthene			252			
79B	Benzo(ghi)perylene			276			
73B	Benzo(a)pyrene			252			
67B	Benzylbutylphthalate			149			
41B	4-Bromophenylphenylether			248			
43B	bis(2-Chloroethoxy)methane			93			
18B	bis(2-Chloroethyl)ether			93			
42B	bis(2-Chloroisopropyl)ether			45			
20B	2-Chloronaphthalene			162			
40B	4-Chlorophenylphenylether			204			
76B	Chrysene			228			
82B	Dibenzo(a,h)anthracene			278			
68B	Di-n-butylphthalate			149			
25B	1,2-Dichlorobenzene			146			
26B	1,3-Dichlorobenzene			146			
27B	1,4-Dichlorobenzene			146			
28B	3,3'-Dichlorobenzidine			252			
70B	Diethylphthalate			149			
71B	Dimethylphthalate			163			
35B	2,4-Dinitrotoluene			165			
36B	2,6-Dinitrotoluene			165			
69B	Di-n-octylphthalate			149			
37B	1,2-Diphenylhydrazine			77			
66B	bis(2-Ethylhexyl)phthalate			149			
39B	Fluoranthene			202			
80B	Fluorene			166			
9B	Hexachlorobenzene			284			
52B	Hexachlorobutadiene			225			
53B	Hexachlorocyclopentadiene			237			
12B	Hexachloroethane			117			
83B	Indeno(1,2,3-cd)pyrene			276			
54B	Isophorone			82			
55B	Naphthalene			128			
56B	Nitrobenzene			77			
62B	N-Nitrosodiphenylamine			169			
63B	N-Nitrosodipropylamine			70			
81B	Phenanthrene			178			
84B	Pyrene			202			
8B	1,2,4-Trichlorobenzene			180			

REPORT OF THE TWENTY LARGEST NON-PRIORITY POLLUTANTS
above 10 ug/l

Compound	1 RT	2 RRT	Area count	Estimated concentration

Notes: 1) RT = Retention Time given in scans (1 scan per 1.0 seconds)
2) RRT = Relative Retention Time, relative to the internal standard _____ (_____ scans).

REPORT OF INTERNAL STANDARDS AND SURROGATE STANDARDS

Compound	1 RT	2 RRT	Mass ion	Area Count	
D10-Phenanthrene (IS)			188		
1-Chlorooctane (IS)			91		
2-Fluorobiphenyl (SS)			172		
D5-Nitrobenzene (SS)			82		
2-Fluorophenol (SS)			112		

Notes: 1) RT = Retention Time given in scans (1 scan per 1.0 seconds)
2) RRT = Relative Retention Time, relative to the internal standard _____ (_____ scans).

Amount of sample analyzed _____
Amount of IS spiked _____
Amount of SS spiked _____

APPENDIX D

CONSUMABLE SUPPLIES

ANALYSIS _____

Item Description	Supplier (list 2 where possible)	Part Number (Both suppliers)	Location	Stock Quantity	Minimum Stock

APPENDIX E

QC FORM FOR INSTRUMENTAL ANALYSIS (use one element/sheet)

Analysts Initials _____ Analyte _____ Date _____

# of samples per run _____ Date of stock Std _____ Method _____

A=sample value E=measured sample + spike Date of working std _____

C=(B+D)=spike value in sample F=% recovery

CONC STDS mg/L	CORR COEFF + calc values	BLANKS mg/L	DUPS mg/L	DUPS mg/L	SPIKES A	SPIKES C/(B+D)	SPIKES E	SPIKES F	MATRIX Desc
1, 2, 5, 10	9995	08	1 5	1 4	1 2	1 0	2 0	91	clean
5	4 8	.05	3 6	3 8	2 4	1.0	3.4	100	oily
2	1 9	.03	.23	.26					wastewater
1	1.0		1 4	1 4					
10	10 0								
1, 2, 5, 10	.9991		EXAMPLE DATA SHOWN HERE						

EXTERNAL QC		
SOURCE	TRUE	MEASURED

COMMENTS

8/15/84 QC FORM FOR METALS ANALYSIS DATE_____

ent						
ials						
Std						
alue						
s(Gain)						
ples						

1																								
2																								
3																								
4																								
5																								
6																								

e info. A = orig sample value, C/(B+D)=spike value in sample, E=measured sample +spike, F= % recovery

es	A	C / (B+D)	E	F	A	C/ (B+D)	E	F	A	C/ (B+D)	E	F	A	C/ (B+D)	E	F	A	C/ (B+D)	E	F	A	C/ (B+D)	E	F

EXTERNAL QC

ce												
ured												

COMMENTS

OC FORM FOR TITRATION ANALYSIS (use one element/sheet)

Analysts Initials_____ Element_____ Date _____

# of samples per run _____ Expiration date of compound used for Stdization (eg. Na2CO3)_____

DATE TITRANT	DATE STDIZ.	FACTOR	BLANK mg/L	DUPLICATES mls	mg/L	mls	mg/L	MATRIX DESCRIPTION

EXTERNAL OC			COMMENTS
SOURCE	TRUE	MEASURED	

SPIKE CALCULATION WORKSHEET

ANALYST _____ DATE _____

ELEMENT	mg/L sample	sample volume (mls)	Spike conc. (mg/L)	Spike volume (mls)	Measured value (sample + spike (mg/L)	Spike Recovery %
	A	B	C	D	E	$F = \frac{(E*(B+D)-A*B)}{C*D}*100$

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ORGANIC CARBON QUALITY CONTROL

Date Analyzed: _____ Analyst: _____ Type of Analysis: L M H

I. STANDARDS - Precision: _____ ppm Range:

	Value 1	Value 2	Difference	$\left\lvert \frac{X_1 - X_2}{X_1 + X_2} \right\rvert$
Set: 1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

II. SAMPLES - Precision

Number 10				
20				
30				
40				
50				

III. SAMPLE - Accuracy

Unspiked	Spiked	Recovered	Amount Spiked	% Recovery

IV. LINEAR REGRESSION ($Y = mX+b$)

m = _____ b = _____

SPIKES

Lab No.	Sample Value	Amount Spiked	Sample + Spike	Percent Recovery	Date Analyzed	Analyst

DUPLICATES

Lab No.	Duplicates: Value 1	Value 2	Difference	Range: $\left\lvert \frac{X_1 - X_2}{X_1 + X_2} \right\rvert$	Date Analyzed	Analyst

WEEKLY DI VALUES

(Low Level Analysis)

Date Analyzed		Values			Avg.	Avg Minus Blank mg/l	Analyst
_____	DI	_____	_____	_____	_____	_____	_____
	Blank	_____	_____	_____	_____		
_____	DI	_____	_____	_____	_____	_____	_____
	Blank	_____	_____	_____	_____		
_____	DI	_____	_____	_____	_____	_____	_____
	Blank	_____	_____	_____	_____		
_____	DI	_____	_____	_____	_____	_____	_____
	Blank	_____	_____	_____	_____		
_____	DI	_____	_____	_____	_____	_____	_____
	Blank	_____	_____	_____	_____		
_____	DI	_____	_____	_____	_____	_____	_____
	Blank	_____	_____	_____	_____		
_____	DI	_____	_____	_____	_____	_____	_____
	Blank	_____	_____	_____	_____		
_____	DI	_____	_____	_____	_____	_____	_____
	Blank	_____	_____	_____	_____		
_____	DI	_____	_____	_____	_____	_____	_____
	Blank	_____	_____	_____	_____		
_____	DI	_____	_____	_____	_____	_____	_____
	Blank	_____	_____	_____	_____		

10 ppm RECALIBRATION

Date Recalibrated	10 ppm Before	10 ppm Uncalibrated			10 ppm After	Analyst
		Value 1	Value 2	Avg.		

STANDARDS DATA

2000 ppm and 200 ppm

Date Analyzed: _____ Standard Analyzed: _____

Analyst: _____ Amount Injected: _____

	OLD _____ ppm	NEW _____ ppm
Date Prepared:	_____	_____
Values:	_____ (1)	_____ (1)
	_____ (2)	_____ (2)
	_____ (3)	_____ (3)
	_____ (4)	_____ (4)
Avg.:	_____	_____

Difference: _____

% Difference: _____

Date Analyzed: _____ Standard Analyzed: _____

Analyst: _____ Amount Injected: _____

	OLD _____ ppm	NEW _____ ppm
Date Prepared:	_____	_____
Values:	_____ (1)	_____ (1)
	_____ (2)	_____ (2)
	_____ (3)	_____ (3)
	_____ (4)	_____ (4)
Avg.:	_____	_____

Difference: _____

% Difference: _____

REPORT OF QUALITY CONTROL

Date of Analysis: _____ Instrument Number ___

SAMPLES ANALYZED

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
----------	----------	----------	----------	----------	----------
----------	----------	----------	----------	----------	----------
----------	----------	----------	----------	----------	----------
----------	----------	----------	----------	----------	----------
----------	----------	----------	----------	----------	----------

STANDARDS	n	$\bar{x}$	$\bar{s}$	$\%\bar{s}$	-Blank	% of Actual
Carbon Blank	------	-------	-------	------		
Water Blank	------	-------	-------	-------	-------	
Std. ___ ug	------	-------	-------	-------	-------	-------
Std. ___ ug	------	-------	-------	-------	-------	-------
Std. ___ ug	------	-------	-------	-------	-------	-------
Std. ___ ug	------	-------	-------	-------	-------	-------
Std. ___ ug	------	-------	-------	-------	-------	-------

SAMPLE SPIKE RECOVERY

Sample I.D.	Unspiked Value	Spiked Value	Amount of Spike	Percent Recovery
----------	----------	----------	----------	----------

INORGANIC HALOGEN/ORGANIC CARBON BREAKTHROUGH

Sample I.D.	Top Column - Blank	Second Column - Blank	Second/Top x 100
----------	----------	----------	----------
----------	----------	----------	----------
----------	----------	----------	----------
----------	----------	----------	----------
----------	----------	----------	----------

Submitted by: _____ Checked by: _____

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Water Analysis for
ORGANIC HALOGEN

Report of Instrument Data

Date: Intrument Model No:

Sample Description	Value Top Column Replicate 1	Value Bottom Column Replicate 1	Value Top Column Replicate 2	Value Bottom Column Replicate 2
Instrument Calibration Standard ( )	____	***	____	***
Standard Blanks (Resv. #____) ( )	____	____	____	____
Method Blanks ( )	____	____	____	____
Method Blanks ( )	____	____	____	____
____	____	____	____	____
Instr. Calib. Std./Method Blk ( )	____	***	____	***
____	____	____	____	____
Instr. Calib. Std./Method Blk ( )	____	***	____	***
____	____	____	____	____
Instr. Calib. Std./Method Blk ( )	____	***	____	***
____	____	____	____	____
Instr. Calib. Std./Method Blk ( )	____	***	____	***

*** Second adsorption column in series not required.

Submitted By _____ Checked By _____

Liquid/Liquid Extraction Analysis for Trihalomethanes and Chlorinated Organic Solvents

Date Analyzed: _____ Date Extracted: _____ Auto Sampler: _____

Laboratory Sample Identification:

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

ITERNAL STANDARD: $\bar{X}$ = _____ n = _____

$\bar{S}$ = _____ %$\bar{S}$ = _____

Split = _____ mls/ _____ sec

Control Limits for
nternal Standard Area Counts:

Control Limits:

Limits: _____ to _____ # of Sample Reports Rejected: _____

# of Standard Reports Rejected: _____

5% Limits: _____ to _____ # of Sample Reports Rejected: _____

# of Standard Reports Rejected: _____

Identification of Samples to be Reanalyzed

_____ _____

_____ _____

Quality Control
Duplicates

SID		CMCL3	DCBM	DBCM	CHBR3	TCA	CCL4	TCE	PCE
____	a	____	____	____	____	____	____	____	____
	b	____	____	____	____	____	____	____	____
____	a	____	____	____	____	____	____	____	____
	b	____	____	____	____	____	____	____	____

Spikes

____	____ %	____ %	____ %	____ %	____ %	____ %	____ %	____ %	____ %
____	____ %	____ %	____ %	____ %	____ %	____ %	____ %	____ %	____ %

Other

Extraction Eff. Std. _____

Stationary Tr. Bl. _____

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Quality Control for
Liquid/Liquid Extraction Analysis for
Trihalomethanes and Chlorinated Organic Solvents

SAMPLE DUPLICATES

Compounds:	$CHCl_3$	DCBM	DBCM	$CHBr_3$	TCA	CCl_4	TCE	PCE
Lab ID Number	(CONCENTRATIONS IN MICROGRAMS/LITER)							

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Quality Control for
Liquid/Liquid Extraction Analysis for
Trihalomethanes and Chlorinated Organic Solvents

SAMPLE SPIKES

Compounds:	$CHCl_3$	DCBM	DBCM	$CHBr_3$	TCA	CCl_4	TCE	PCE
Lab ID Number								
_____	_____	_____	_____	_____	_____	_____	_____	_____
Spiked	_____	_____	_____	_____	_____	_____	_____	_____
Difference	_____	_____	_____	_____	_____	_____	_____	_____
% Recovery	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
Spiked	_____	_____	_____	_____	_____	_____	_____	_____
Difference	_____	_____	_____	_____	_____	_____	_____	_____
Recovery	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
Spiked	_____	_____	_____	_____	_____	_____	_____	_____
Difference	_____	_____	_____	_____	_____	_____	_____	_____
% Recovery	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
Spiked	_____	_____	_____	_____	_____	_____	_____	_____
Difference	_____	_____	_____	_____	_____	_____	_____	_____
% Recovery	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
Spiked	_____	_____	_____	_____	_____	_____	_____	_____
Difference	_____	_____	_____	_____	_____	_____	_____	_____
% Recovery	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
Spiked	_____	_____	_____	_____	_____	_____	_____	_____
Difference	_____	_____	_____	_____	_____	_____	_____	_____
Recovery	_____	_____	_____	_____	_____	_____	_____	_____