FINAL

70007

Quality Assurance Project Plan

Hudson River Project
Sampling and Analysis Program

General Electric Company
Corporate Environmental Programs
Albany, New York

Final Revision
May 1993

O'BRIEN & GERE
ENGINEERS, INC.

FINAL

QUALITY ASSURANCE PROJECT PLAN

HUDSON RIVER PROJECT
SAMPLING AND ANALYSIS PROGRAM

GENERAL ELECTRIC COMPANY
CORPORATE ENVIRONMENTAL PROGRAMS
ALBANY, NEW YORK

MAY 1993

O'BRIEN & GERE ENGINEERS, INC.
5000 BRITTONFIELD PARKWAY
SYRACUSE, NEW YORK 13221

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

Page

TABLE OF CONTENTS
(Continued)

Page

TABLE OF CONTENTS
(Continued)

Page

FIGURES

APPENDICES

SECTION 1 - PROJECT DESCRIPTION

1.01 General

This Quality Assurance Project Plan (QAPP) provides quality assurance/quality control (QA/QC) criteria for surface water sampling, sediment sampling and related analytical tasks conducted on the upper Hudson River by O'Brien & Gere Engineers, Inc. (O'Brien & Gere). This work was prompted by the PCB Reassessment Remedial Investigation and Feasibiity Study (RRI/FS) being performed on the upper Hudson River by the U.S. Environmental Protection Agency (USEPA). The work being performed by USEPA in conjunction with the Hudson River RRI/FS is described in their Phase 1 Report (USEPA, 1991) and the Final Phase 2 Work Plan and Sampling Plan (USEPA, 1992).

1.02 Site History

The Hudson River originates in the Adirondack Mountains of Northern New York State and empties into the Atlantic Ocean at the Battery in New York City. The lower Hudson River, which stretches 150 miles from the upper New York harbor to the confluence of the Mohawk River, is a tidal estuary which is subject to periodic fluctuations in water level. The lower Hudson is maintained and regulated as a Federal waterway by the US Army Corps of Engineers to provide waterborne access to the Port of Albany and the New York State Barge Canal. The portion of the river located north of Troy is considered the upper Hudson River. The 30-mile portion of the river located between Troy and Fort Edward is part of the New York State

Barge Canal System and is maintained and regulated by the New York State Department of Transportation.

1.03 Previous Studies

Various studies conducted throughout the late 1970s and early 1980s led to: 1) a state-mandated ban on fishing in the upper Hudson River between Albany and Fort Edward and restrictions on commercial and recreational fishing in the lower Hudson; 2) the placement of the Hudson River on the National Priorities List in 1983; and 3) the issuance of a Record of Decision (ROD) by the EPA in 1984.

The ROD called for in place containment of the remnant deposits and no-action for the river sediments. The ROD also called for a periodic reassessment of the site in light of new data and emerging technologies. In 1989, the EPA decided to reassess the no-action alternative for the Hudson River. An RRI/FS is currently being conducted by the EPA. This QAPP addresses sampling and analysis activities associated with the 1991-1992 Site Investigation of the Hudson River to be conducted by O'Brien and Gere on behalf of the General Electric Company (GE).

1.04 Project Description

The Site Investigation includes a number of programs requiring QA/QC oversight, including:

- Temporal Water Column Monitoring Program
- Float Surveys
- High-Flow Water Sampling and Analysis Program

- Suspended Solids Transport Study
- Sediment Sampling Program

1.05 Quality Assurance Project Plan Objectives

This document is site-specific and has been prepared for the 1991-1992 Site Investigation of the upper Hudson River. It was prepared in accordance with US EPA guidelines (USEPA, 1980a).

The objectives of this QAPP are to provide sufficiently thorough and concise descriptions of the measures to be applied during the Site Investigation such that the data generated will be of a known and acceptable level of precision and accuracy. This QAPP provides comprehensive information regarding the project description and personnel responsibilities, and sets forth specific procedures to be used during sampling of relevant environmental matrices, other field activities, and analyses of data.

The following Quality Assurance (QA) topics are addressed in this plan:

- Data Quality Objectives (DQOs) for measurement of data, including precision, accuracy, completeness, representativeness and comparability,
- project organization and responsibility,
- sampling procedures,
- hydrological procedures,
- sample custody,
- analytical procedures,
- calibration procedures, references and frequency,

- internal quality control (QC) checks and frequency,
- QA performance audits, system audits and frequency,
- QA reports to management,
- preventative maintenance procedures and scheduling,
- specific procedures to be used to routinely assess data precision, representativeness, comparability, accuracy and completeness,
- data validation, and
- corrective action.

SECTION 2 - PROJECT ORGANIZATION AND RESPONSIBILITY

2.01 Project Organization

While each person involved in the investigation and in the generation of data are implicitly a part of the overall project and quality assurance program, certain individuals have specifically designated responsibilities. Within O'Brien & Gere, these are the Project Officer, the Project Manager, the Quality Assurance Officer, the Data Validator, the Field Program Coordinator, the Data Management Coordinator, and the Site Environmental Technicians. OBG Laboratories, Inc. (Syracuse, New York) and Northeast Analytical, Inc. (Schenectady, New York), will provide analytical services for the investigation. Laboratory personnel with quality assurance/quality control responsibilities include the Laboratory Quality Assurance Coordinators and Laboratory Sample Custodians. Figure 1 illustrates key O'Brien & Gere project personnel. Table 1 contains the primary contacts for the project. Figure 2 illustrates OBG Laboratories, Inc. personnel. Appendix A contains project personnel resumes.

2.02 Project Officer

Dr. Edwin C. Tifft Ph.D. will serve as Project Officer for this project. As Project Officer, he will be responsible for the overall management of the investigation and for the completion of work specified in the contract. He will interface between regulatory agency personnel, the client, and O'Brien & Gere management staff. He will also be responsible for budget and administrative oversight.

2.03 Project Manager

James R. Rhea, Ph.D., will act as the Project Manager for this investigation. As Project Manager, Dr. Rhea will monitor the investigation's progress, regularly review the project schedule, and review major work elements prior to submittal. The Project Manager will oversee scheduling and budgeting, and serves as the primary contact with state, local and federal agencies.

2.04 Field Program Coordinator

Mark D. LaRue has been assigned the responsibilities of Field Program Coordinator. The Field Program Coordinator reports directly to the Project Manager and is immediately responsible for the day-to-day activities of O'Brien & Gere field personnel. In this capacity, the Field Program Coordinator is responsible for day-to-day quality assurance project activities and reports directly to the Project Manager concerning the maintenance of the QAPP.

2.05 Data Management Coordinator

Craig A. Gabrial has been assigned the responsibilities of Data Management Coordinator. The Data Management Coordinator reports directly to the Project Manager and is responsible for the storage and transfer of raw field and laboratory data generated by O'Brien & Gere in specific formats required by end users.

2.06 Quality Assurance Officer

Mr. Michael Caputo of O'Brien & Gere will serve as Quality Assurance Officer and is responsible for overall project quality assurance. Mr. Caputo will review project plans and revisions to the plans to maintain proper quality assurance throughout the investigation. In addition, Mr. Caputo will be responsible for performance and systems audits, data processing activities, data processing quality control, data quality review, and coordinating the efforts between O'Brien & Gere, OBG Laboratories, Inc., and Northeast Analytical, Inc.

2.07 Data Validator

Ms. Melissa Listman of O'Brien & Gere will be responsible for reviewing chemical data and validating laboratory analytical data.

2.08 Site Geologists and Environmental Technicians

Surface water and sediment sampling tasks required by this investigation will be conducted by experienced chemists, engineers, and/or environmental technicians. Their responsibilities will include the documentation of the proper sample collection protocols, sample collection, field measurements, equipment decontamination, and chain-of-custody documentation.

Each sampling team will be under the team leader. In addition to the responsibilities above, the team leaders' responsibilities include the initialing and accuracy verification of field notebooks, chain-of-custody records, sample labels, and other field-related documentation.

2.09 Laboratory Quality Assurance Coordinators

Ms. Colleen Burke of OBG Laboratories, Inc., and Mr. Robert Wagner of Northeast Analytical, Inc., will serve as Quality Assurance Coordinators for their respective laboratories and will be responsible for laboratory quality assurance and quality control activities associated with the project. The specific duties of the Laboratory Quality Assurance Coordinator include ensuring that analyses are conducted within the appropriate holding times and laboratory custody procedures are followed. Moreover, the Laboratory Quality Assurance Coordinator monitors daily precision and accuracy records, maintains detailed copies of all procedures, reschedules analyses based upon unacceptable data accuracy or precision, and identifies and implements corrective actions necessary to maintain quality assurance standards.

Ms. Burke and Mr. Wagner or their assignees will conduct initial validations and assessments of analytical results and report the findings directly to the Quality Assurance Officer.

2.10 Laboratory Sample Custodians

Ms. Anne Barnes of OBG Laboratories, Inc., and Ms. Tracy Bengston of Northeast Analytical, Inc., will serve as project Laborat ry Sample Custodians for their respective laboratories. The Sample Custodian's responsibilities include ensuring proper sample entry and sample handling procedures by laboratory personnel.

SECTION 3 - DATA QUALITY OBJECTIVES

3.01 Objectives

The objectives of this investigation are the following:

- to evaluate the short-term spatial and temporal variability in PCB concentrations and composition within the upper Hudson River,
- to evaluate sediment PCB concentration and composition within the upper Hudson River,
- to identify source areas which may be contributing PCBs to the water column,
- to define the impact of high-flow events on resuspension and transport of sediment containing PCBs in the upper Hudson River, and
- to evaluate the origin and fate of suspended solids within the Thompson Island Pool.

To achieve these project objectives, Data Quality Objectives (DQOs) were established in order to develop an analytical database of sufficient quality to support conclusions made as a result of this investigation. Therefore, requirements for data quality parameters such as: detection limits, accuracy, precision, sample representativeness, data comparability and data completeness are specified in this document.

DQOs are quantitative and qualitative statements specifying the quality of the environmental data required to support the decision-making process. DQOs define the total uncertainty in the data that is acceptable for each specific activity during the investigation. This uncertainty includes both sampling error and analytical error. Ideally, zero uncertainty is the intent; however, the variables associated with the

process (field and laboratory) inherently contribute to the uncertainty of the data. It is the overall objective to keep the total uncertainty within an acceptable range that will not hinder the intended use of the data.

Field and laboratory analyses will adhere to the DQOs described by the U.S. EPA (USEPA, 1987). For laboratory analyses, the following DQO levels will be achieved:

Matrix	Methodology	DQO Level
Surface Water	Total Dissolved Solids	III
	Total Suspended Solids	
	Total Organic Carbon	
	Dissolved Organic Carbon	
	Alkalinity	
	Specific Conductivity	
	Total PCBs	
	Congener Specific PCBs	V
Sediment	Bulk Density	III
	Moisture Content	
	Pore Water Total Organic Carbon	
	Total Organic Carbon	
	Total PCBs	
	Congener Specific PCBs	V
	Pore Water Congener Specific PCBs	

Field measurements and analyses will adhere to Level I DQOs. Level I implies the use of portable instruments for analysis of water elevation and velocity. The remainder of this QAPP describes the specific approaches that will be taken to achieve the required DQOs. Tables 2 to 5 list methods and method specific quality control criteria which will be adhered to during sample collection and analysis.

Data collected during the field investigation will be of sufficient quality to meet these DQOs. In order to assess adherence to DQOs, O'Brien & Gere has developed the QA/QC program described in this QAPP. The U.S. EPA Contract Laboratory Program (CLP), states that the purpose of the QA/QC program "is the definition of procedures for the evaluation and documentation of sampling and analytical methodologies and the reduction and reporting of data. The objective is to provide a uniform basis for sample collection and handling, instrument and methods maintenance, performance evaluation, and analytical data gathering and reporting." This QAPP for sampling, analysis and data handling is consistent with the requirements set forth by the USEPA CLP and in the NYSDEC Analytical Services Protocol. Two types of analytical support will be utilized to achieve the DQOs necessary for this investigation: field analyses and laboratory analyses.

3.02 Field Measurements, Analyses, and Sampling

Field measurements will include water elevation and velocity. These field investigation activities do not require sample collection, but nonetheless involve measurements for which QA concerns are appropriate. Therefore, these activities will adhere to DQO Level I. The primary QA objective of activities such as these is to obtain reproducible measurements to a degree of accuracy consistent with the intended use of the measurements and to document measurement procedures.

The objective of field sampling procedures is to obtain samples that represent the environmental matrix being investigated. This will be accomplished through the use of proper sampling techniques and equipment as set forth by the U.S. EPA

(USEPA, 1980b). The appropriate sampling methods are presented in Section 4 of this QAPP.

3.03 Laboratory Analyses

To obtain data quality sufficient to meet the overall objectives of the 1991-1992 Site Investigation, listed above, laboratory procedures will be as follows:

- Congener specific PCB analytical methodologies will adhere to procedures outlined by Northeast Analytical, Inc. (NEA, 1990).
- Other laboratory analyses, analytical QA/QC and data reporting requirements will adhere to guidelines outlined by USEPA, NYSDEC, and Page (USEPA, 1983, 1986; NYSDEC, 1989; Page, 1982).

3.04 Definitions

The following is a brief description/definition of data quality parameters addressed in the QAPP.

Representativeness refers to the degree to which a sample taken from a site accurately represents the matrix at the site. Representativeness will be achieved by the use of U.S. EPA procedures for the collection and preservation of samples.

Comparability refers to the use of consistent procedures, reporting units, standardized methods of field analysis and standardized data format with document control. Adherence to standard procedures maximizes the probability that data generated from different laboratories can be validly compared to one another.

Completeness refers to the process of obtaining all required data as outlined in the Work Plan. Completeness is also defined as the percentage of measurements

judged to be valid. On a nationwide basis, the U.S. EPA has found CLP data to be 80-85% complete. The completeness goal of this investigation is 90%.

Precision describes the reproducibility of results. It is defined as the agreement between the numerical values of two or more measurements that have made in an identical manner. Precision can be expressed in a variety of manners, including the absolute methods of deviation from the mean or median values, standard deviation and variance, or by relative methods, such as relative deviation from the mean or median. Precision will be determined through the analysis of duplicate samples and through duplicate analysis of the same sample.

Accuracy is a measure of closeness of an individual measurement or an average of a number of measurements to the true value, and is expressed in terms of absolute or relative error. Accuracy will be determined through analysis of spiked samples and through the analysis of standards with known concentrations.

SECTION 4 - SAMPLING PROCEDURES

4.01 Objective

The objective of this sampling section is to document the sampling procedures and practices that will be used in the field investigation of the upper Hudson River. Information will be obtained as to the location, amount, and vertical and horizontal distribution of PCBs in the water column and sediment of the upper Hudson River. The methods that will be used to carry out these activities are detailed in the following subsections.

4.02 General Sampling Locations and Numbers

4.02.1 Water Column Sampling Locations

Water samples will be obtained from eight stations on the river. Four of these stations will be located on the bridges utilized as the historical USGS sampling stations in Fort Edward, Schuylerville, Stillwater, and Waterford. Another station will be located on the abandoned Fenimore Bridge, adjacent to Bakers Falls (upstream of the remnant deposits), and another station will be located at the western end of the Thompson Island Dam. The samples will be collected from near the center of the channel off bridges at the stations, with the exception of the station located adjacent to the Thompson Island Dam, which will be sampled off the west wing wall of the dam (the center of the channel at this station is not accessible by land). Additionally, the Temporal Water Column Monitoring Program will include sampling of the

Hoosic River and Batten Kill, upstream of their confluence with the Hudson River.

4.02.2 Float Survey Sampling Locations

Water samples will be collected at approximately six evenly spaced stations within the reach of river extending from Baker's Falls to the Route 197 Bridge in Fort Edward, New York. The initial sample will be collected from Fenimore Bridge directly above Bakers Falls. The remaining samples will be collected by launching a small boat near Bakers Falls and drifting downstream with the current to the Route 197 Bridge in Fort Edward. The samples will be collected from mid-depth of the water column near the center of the main channel.

4.02.3 High-Flow Water Sampling Locations

The sampling stations established for the Temporal Water Column Monitoring Program will be utilized for the High-Flow Sampling Program (Section 4.02.1).

4.02.4 Suspended Solids Sampling Locations

This study will include the installation of Manning automatic samplers in the Thompson Island Pool. One sampler will be installed near Ft. Edward (on the northern tip of Rogers Island), and the other sampler will be installed on the western wing wall of the Thompson Island Dam. Samples will be collected during periods of high river flow.

4.02.5 Sediment Sampling Locations

Sampling will include approximately 500 cores from the Thompson Island Pool (Reach 8) and 500 cores between Troy and the Thompson Island Dam (Reach 1-7). Sediment Sampling Stations will be based on sediment sample data gathered from previous studies.

4.02.6 Sample Numbering System

A sample numbering system will be used to identify each sample taken during the field investigation sampling program. This numbering system will be part of a tracking procedure to permit accurate retrieval of information regarding a particular sample and to designate a unique number for each sample. A listing of the sample identification numbers will be maintained by the sample team leader (an example sample label may be found on Figure 3).

4.03 Sample Matrices

Sediment, surface water, and sediment pore water will be sampled and analyzed as part of this investigation's sampling efforts.

4.04 Field QA/QC Samples

In order to evaluate data quality, the following QA/QC sample types will be collected during the field investigation. Table 4 lists the samples to be collected by matrix and analysis type and the rate of field QC sample collection.

4.04.1 Duplicate Samples

Collection of laboratory duplicate or matrix spike duplicate samples provides for the evaluation of the laboratory's performance by comparing analytical results of two samples from the same location. Field duplicate samples are collected to evaluate field sample collection procedures. Field duplicate samples are duplicate samples collected from one location and sent to the laboratory blind (with two different sample numbers). Field and laboratory duplicate samples are to be included for each matrix at a minimum rate of five percent (5%). If less then twenty samples are taken during a particular sampling episode, then one duplicate collection should be performed. The number of duplicate samples to be collected is listed in Table 4.

Duplicate water samples will be obtained by alternately filling sample containers from the same sampling device for each parameter.

4.04.2 Matrix Spikes (MS) and Matrix Spike Duplicates (MSD)

Matrix spike and matrix spike duplicate samples are essentially duplicate samples that have matrix spiking solutions added. The percent recovery of the spiked amount approximates the accuracy and efficiency of the analysis extraction as well as interferences caused by the matrix. Relative percent differences between duplicate spike samples (when collected) will indicate the precision of the data. Matrix spike and matrix spike duplicate (if applicable) samples are to be included for each matrix at a minimum rate of five percent (5%) each. If less than twenty samples are collected during a

particular sampling episode, then one MS and one MSD collection should be performed. The number of matrix spike and matrix spike duplicates to be collected is listed in Table 4.

4.04.3 Field/Equipment Blanks

Field/equipment blanks will consist of a sample of the distilled water that is used to rinse the decontaminated sampling equipment. These blanks will be collected at a frequency of at least one per twenty samples per matrix where sampling equipment is reused. These samples will be subjected to the same analyses as the environmental samples. The number of field/equipment blanks to be collected is listed in Table 4.

4.05 Sampling Procedures

Table 3 lists the sample containers and types of preservations that will be used for sample collection. Table 3 also presents holding times that will be met during sample collection and analysis.

4.05.1 Surface Water Sampling Procedure

Surface water samples will be collected in conjunction with the Temporal Water Column Monitoring Program, the Float Surveys, and the High-Flow Sampling Program. In general, when sampling from an open body of water, care must be exercised to collect a representative sample. The sample should cause as little disturbance to the water body as possible. Taking a sample of water which shows evidence of sediment, debris, or other material which may have been stirred up by the presence of the sampler will be avoided. Copies of the Water Sampling Field Logs have been included as Figures 4, 5 and 6. The surface water sampling protocol will be as follows:

- The samples will be collected from near the center of the channel off bridges, where possible. The station located adjacent to the Thompson Island Dam as well as the Float Survey and tributary monitoring stations are exceptions to this procedure. The center of the channel at these stations is not accessible by land.
- If possible, discrete sub-samples will be collected at three foot intervals throughout the water column. The sub-samples will then be composited into a single sample by pouring each subsample into a clean stainless steel vessel.
- Samples will be taken while facing upstream, away from the influence of the sampler on river flow.
- Collection will be accomplished by one of two methods. A clean, 1.2 liter, stainless steel Kemmerer sampler will be

submerged to the desired depth, followed by the release of a weighted messenger. The messenger triggers the closure of the silicone stoppers. The sampler is then retrieved. Otherwise, a dedicated precleaned 1 gal jar will be submerged to the desired depth, allowed to fill, and retrieved.

- Samples will then be placed in the proper containers, preserved and stored in coolers. Containers and preservatives are presented in Table 3. Pertinent information will be recorded on the field log, including sample date, time, location, and sample identification. Chain-of-custody forms will also be completed. An example chain of custody form is shown as Figure 7.
- Between sampling stations, the sampling equipment will be rinsed with acetone, rinsed with hexane, allowed to dry, and finally rinsed with distilled water.
- Field Filtration for DOC will be performed using a 0.45 μm teflon filter and syringe.

4.05.2 Suspended Solids Sampling Procedure

Water Column Sampling for the Suspended Solids Transport Study will be accomplished by two Manning automatic samplers. Each sampler will be programmed to collect a water column sample at 6 hour intervals. The samplers will be serviced 3 times per week during operation. The field log for the automatic samplers is presented as Figure 8.

4.05.3 Sediment Sampling Procedure

The vessel to be employed for the sediment sampling program is a customized 24 foot pontoon boat powered by a 50 HP outboard engine. The boat is equipped with front and rear spuds which anchor the boat when embedded in the river bottom and a 15 foot high tripod which facilitates sediment coring. Sediment sampling will involve the following:

1) location of the vessel at predetermined sampling sites,
2) boat anchoring,
3) sediment core collection, and
4) sediment core processing.

Vessel Location

The sampling vessel will be located at each predetermined core station using an IMC Hydro I automated range-azimuth positioning system. This laser-based system provides position accuracy of ± 0.6 meters and will allow the boat driver to monitor the real time x-y position at one second intervals. The boat will approach each sediment station from downstream to minimize the effect of the craft on the sediment to be sampled.

Boat Anchoring

Once the boat has been positioned on a predetermined sampling station the front and rear spuds are lowered into the sediment with the assistance of mechanical winches. This anchors the craft and facilitates the collection of representative sediment samples.

Sediment Core Collection

Sediment core collection will follow the following standard operating procedure (SOP):

1) The depth to the sediment/water interface is determined manually or by using "Hummingbird" brand transducer. In dense sediment, a vibracorer is used to insert the core barrel into the sediment, otherwise the core barrel is manually inserted into the sediment. The following details use of the vibracorer:

   a) the vibracorer is securely attached to the coring barrel using two chain-vises,

   b) the core barrel is vibrated into the sediments to a penetration depth of 2 ft, and

   c) the vibracorer is detached from the core barrel and the core barrel is physically retrieved using a rope and pulley attached to the tripod; if retrieval is too difficult, an electric winch will be employed.

2) The bottom of the core barrel is capped as soon as the core barrel is removed from the water using a plastic cap that firmly seals the end of the core barrel, as a precautionary measure the cap will also be taped to assure a sealed core is obtained.

3) The length of the core is measured and the water above the core is removed by hack sawing through the core barrel one inch above the core.

4) The top of the core is then capped off, the core is then labeled and stored vertically until delivered to the field lab. A Field Sampling Log has been included as Figure 9.

5) Sediment cores collected during the day will be transported to the field laboratory in an upright position and logged in by the field lab manager.

6) A subsample of the surficial sediment will be removed and used to measure the bulk density (wet weight per volume). Each core will be visually classified as either COARSE or FINE.

The cut off between COARSE and FINE sediment will be established at 1.44 g/mL. FINE cores will be defined as those with a bulk density of 1.44 g/mL or less. COARSE cores will be defined as those with a density greater than 1.44 g/mL. The following procedure will then be used to determine the classification of sediment cores which are not able to be visually obtained.

a) remove a small amount of sediment from the top 5 cm of each core,

b) if the sediment is mostly clay (>80% by volume), the core will be classified as FINE without measuring its bulk density. If the sediment is mostly medium sand (or coarser), the core will be classified as COARSE,

c) to classify sediment which is neither obviously FINE or COARSE (i.e., silty sand), a pre-weighted 5-ml crucible will be completely filled with sediment and leveled with

a straight edge. The crucible will then be weighed to the nearest 0.1 gram, the weight will be recorded, and the process repeated once. If the average weight is 12.5 grams or less (<2.5 g (wet)/m (wet)), the core will be classified as FINE. If the average weight is greater than 12.5 (>2.5 g/wet)/m (wet)), the core will be classified as COARSE, and

d) this information will then be recorded on the Field Laboratory Log Sheet (Figure 10).

7) After the core classification procedure, the cores will be placed in a freezer overnight or until cores are frozen.

After overnight freezing, the sediment cores will be sectioned at 5, 10, 25 and 50 cm depths from the sediment-water interface. Core processing will proceed according to the following SOP:

1) The cores will be removed from the freezer and placed in a clamping device. The aluminum core liner will be cut length-wise from the top edge, down to the sediment-water interface using a router or other cutting tool.

2) The core liner will be cut at the interface using a pipe cutter and the top section removed by gently shearing the frozen core. The color and texture of the surficial sediment layer will be recorded on the sample log (Figure 10).

3) The total length of the core will be measured. The core will then be sectioned at 5, 10, and 25 cm depths using the pipe

cutter method and extruded one at a time into separate 750-ml stainless steel centrifuge bottles. Between cuts the pipe cutter blade and all other tools coming in contact with sediment will be decontaminated (see Section 4.06).

4) Sediment within the centrifuge bottles will be thawed and mixed with an electric beater in preparation for sampling and compositing. After mixing, the beater and ladel will be decontaminated. (Section 4.06) The color and texture of the inner core will be noted and described on the composite log (Figure 11).

5) Sediment not composited will be removed for archiving and placed into a precleaned 725-ml jar, properly labeled, and frozen. At the end of each work week the jars will be transported to a permanent freezer storage facility along with a chain of custody form.

6) Another small subsample will be removed and placed into one of ten stainless steel trays for compositing (see sediment compositing procedure below).

Pore Water Extraction

1) Pore water will be extracted from the sediment remaining in the centrifuge bottles by centrifugation at 3500 rpm for twenty minutes using a Beckman Model GS-6 benchtop centrifuge equipped with a horizontal rotor.

2) The resulting pore water will be decanted off and pressure filtered with high-purity (99.9999%) nitrogen through a 0.5

micron nylon membrane filter. The filter chamber will be decontaminated between samples.

3) Pore water extracted from 8 to 12 samples having the same texture and from the same depth will be composited. Equal volume aliquots of each subsample will be added to the same pre-cleaned sample container. Headspace will be minimized by judicious selection of sample container size.

4) Based on the amount of water needed to conduct the analyses on porewater, only those composite samples with at least 200 mls of porewater will be submitted to the lab for analysis.

Grain Size Analysis

1) An approximate 60 gram portion of the 0-5 cm composite will be wet sieved through a 63 μm stainless steel sieve using tap water. The fines will be collected in a plastic bucket, transferred to a centrifuge container, and centrifuged to facilitate the settling of fine particles. Excess water will then be decanted.

2) The total wet weight of the sediment prior to wet sizing will be determined to the nearest 0.1 gram and recorded. Dry weights of fine particles and sands will be measured to determine percent water, percent sand, and percent silt. These fractions will then be spooned into 250-ml sediment jars and submitted separately for total organic carbon and percent moisture analysis.

3) Based on the wet weight and moisture content of each fraction, the percent sand and percent silt/clay of the 0-5 cm core section will be calculated on a dry-weight basis.

Sediment Compositing

1) The sediment subsamples will be composited into separate stainless steel trays until 8 to 12 like samples have been combined. The solids will be mixed thoroughly until the sample appears homogeneous.

2) Subsamples of these composites will then be placed into 250-ml pre-cleaned jars, dropped into plastic bags, labeled, and stored in a 4°C cooler for transport to the analytical laboratory. Samples not being analyzed will not be composited, rather, they will be archived separately.

3) Grab samples will be composited separately from core samples so as to maintain the vertical stratigraphy of PCB in composite cores. A logsheet for composite sampling is included as on Figure 11.

4.06 Decontamination of Sampling and Field Laboratory Equipment

Decontamination procedures will be applied to sampling and laboratory activities. Equipment which directly contacts sample material will be decontaminated between distinct sample contact. The field laboratory and sampling equipment cleaning and decontamination procedure will be as follows:

1) scrub with brush and river or tap water,

2) wipe with clean paper towel containing acetone or rinse with acetone,

3) wipe with clean paper towel containing hexane or rinse with hexane,

4) allow to air dry, and

5) wipe with clean towel containing distilled water or rinse with distilled water.

Field decontamination wastes will be contained and transported to OBG Laboratories, Inc., for disposal according to applicable regulations.

4.07 Sample Preparation and Preservation

After collection and processing, samples will be transferred to properly labeled sample containers and properly preserved. Table 3 lists the container materials, volume requirements, and preservation needed for the site analyses. Water samples requiring refrigeration for preservation will be immediately transferred to coolers packed with ice and/or ice packs. These samples will be promptly shipped to the laboratory after sample collection. Sediment core samples will be held on the boat during the day and frozen overnight for processing in the Field Lab the next day. Proper chain of custody documentation will be maintained as discussed in Section 5. Samples will be analyzed within the holding times specified in Table 3.

SECTION 5 - SAMPLE CUSTODY

Chain of custody procedures will be instituted and followed throughout the study. These procedures include field custody, field laboratory custody, laboratory custody, and evidence files. Samples are physical evidence and will be handled according to strict chain of custody protocol. The Quality Assurance Officer must be prepared to produce documentation that traces the samples from the field to the laboratory and through the analyses, and long term storage. The National Enforcement Center of the US EPA has defined custody of evidence as follows:

- in actual physical possession,
- in view after being in physical possession,
- in a locked laboratory, and
- in a secure, restricted area.

Quality Assurance measures for this project will begin with the sample containers. Sample containers will be purchased from a U.S. EPA certified manufacturer and will be pre-cleaned (I-Chem series 200 or equivalent).

Chain of custody records will be created in the field when sample collection has been completed. This custody record will trace the sample from the field to long term storage. In the case of sediment samples, a new chain of custody record will be created in the field lab when the sample is split. The original form will stay with the archived portion of the sample. The new chain of custody form will reference the original sample and original chain of custody form. In the field log book, samplers will note meteorological data, equipment employed during collection, evacuation techniques and calculations and time of sample collection. Physical

characteristics of sample, date, time of day and location, and any abnormalities noted during sampling will be recorded in the field log book and on the chain of custody form. A photographic record will be established for the sample processing procedure. Daily entries into the field-laboratory logbook will include: sample ID, date, list of sediment cores processed, visual description of each sample, bulk density, and pertinent laboratory information. In addition, a record of the vertical stratification of sediment color and texture will be obtained for sediment cores. A photographic record of the descriptors used in sediment color and texture assignments will be developed. The chain-of-custody forms will include sample description, date and time of collection sample matrix and type, number and size of sample containers filled, and the type of analysis requested. An example chain-of-custody form may be found in Figure 7.

The sampler will complete the custody form, package the samples including the custody form, and seal the package with evidence tape. Shipment may be made by commercial vendors, and their policy will be to document the transfer of the package within their organization. When the samples arrive at the laboratory, the sample custodian will sign the vendor's bill. The sample custodian's duties and responsibilities upon sample receipt will be to:

- document receipt of samples,
- inspect sample shipping containers for the presence or absence of custody seals, locks, and evidence tape, and for container integrity,
- record condition of the shipping and sample containers in the log books,
- sign the appropriate forms or documents,

- verify and record the agreement or disagreement of information on sample documents and if there are discrepancies, record the problem and notify the Quality Assurance Officer,
- label sample with laboratory sample number, and
- place samples in secure storage.

The hand-to-hand custody of samples in the laboratory will be maintained. The analyst will be required to log samples into and from storage as the analysis proceeds. Samples will be returned to secure storage at the close of business. Log sheets will incorporate options for multiple entries, so that several people can handle the samples throughout the analytical scheme. Written records will be kept of each and every time the sample changes hands. The laboratory records may also be used as evidence in enforcement proceedings. Care must be exercised, therefore, to properly complete, date, and sign the items needed to generate data. Copies of the following items will be stored:

- documentation of the preparation and analysis of samples, including copies of the analyst's notebooks,
- bench sheets, graphs, computer printouts, chromatograms, and mass spectra,
- copies of all QA/QC data,
- instrument logs showing the date, time, and identity of the analyst, and
- analytical laboratory sample tracking forms that record the date, time, and the identity of the analyst for each step of the sample preparation, extraction, and analysis will be maintained.

The sample custodian will log in samples on a log-in form and note the appropriate information, including sample identification and the condition of the samples. Copies of relevant portions of these log-in forms can be provided if necessary. Inconsistencies in paperwork or comments on the condition of the samples will be duly noted on the form and filed with the case.

The custody of each sample will be further documented in the sample preparation and extraction log book and the instrument log book. The chemist or technician will sign and date the appropriate forms when handling the samples. During the analyses, these forms will be maintained in a secure file. Following the completion of the analysis of a group of samples, appropriate forms and data sheets will be collected and stored in the files.

Upon completion of the analysis, the Quality Assurance Officer or his assignee will begin assimilating the field and laboratory notes. In this way, the evidence file for the project will be generated. The file will be chronologically arranged for ease of review. When the information has been gathered, the file will be inventoried, numbered, and stored for future reference.

SECTION 6 - CALIBRATION AND FREQUENCY

6.01 Analytical Laboratory Equipment Calibration

Calibration of laboratory analytical instrumentation is essential for the generation of reliable data which meets project data quality objectives. Analytical instrument calibration is monitored through the use of control limits which are established for individual analytical methods. Analytical methods to be used during this project are located on Table 2, and corresponding control limits for those method are found in Table 5. Calibration procedures to be followed are specified, in detail, in the analytical methods. These procedures specify the type of calibration, calibration materials to be used, range of calibration, and frequency of calibration.

OBG Laboratories, Inc. and Northeast Analytical, Inc., will be responsible for the proper calibration and maintenance of laboratory analytical equipment. General calibration procedures are contained in OBG Laboratories, Inc. Quality Assurance/Quality Control Plan, September, 1992 (Appendix C) and Northeast Analytical, Inc. Standard Operating Procedure, June, 1990 (Appendix B).

6.02 Field Laboratory and Sampling Equipment Calibration

Field laboratory and sampling equipment used during this investigation, will be calibrated in a manner and at a frequency in accordance with the manufacturer's instructions. The equipment will also be operated in accordance with the manufacturer's instructions. Field laboratory and sampling equipment used during this project that is not covered by the standard operating procedures referenced herein will have a specific calibration and operation instruction sheet prepared for

it by the personnel who will be using the equipment in the field. Calibration procedures undertaken involving field equipment will be recorded in a field notebook.

Generally, field laboratory and sampling equipment will be calibrated on a daily basis. The calibration range will be designed to bracket the concentrations of concern. The field laboratory balance will be checked for calibration by comparing the weight of the 5 ml crucible used to determine bulk density against the weight as determined by an analytical balance at OBG Laboratories, Inc. Crucible integrity will be checked daily.

6.03 Standards

Standards may be generally grouped into two classifications: primary and secondary. Primary standards include United States Pharmacopoeia (USP) drugs, National Institute of Science and Technology (NIST) and American Society of Testing Materials (ASTM) materials, and certain designated U.S. EPA reference materials. Other standards are to be considered secondary. No testing of primary standards is necessary. Primary standards should not be used if there is any physical indication of contamination or decomposition (i.e. partially discolored, etc.) or if they are expired. Secondary standards should be examined when first received, either by comparison to an existing primary standard or by comparing known physical properties to literature values. The less stable standards will be rechecked at appropriate intervals, usually six months to one year.

6.04 Records

A records book will be kept for each standard and will include:

- name and date received,
- source,
- code or lot number,
- stock concentration and initial concentration calculations,
- special storage requirements, and
- storage location.

These records will be checked periodically as part of the Laboratory Controls Review.

6.05 Equipment

6.05.1 General

1) Each major piece of analytical laboratory instrumentation that will be used on this project has been documented and is on file with the analytical laboratory.

2) An equipment form will be prepared for each new purchase and old forms will be discarded when the instrument is replaced.

6.05.2 Testing

1) Each equipment form will detail both preventive maintenance activities and the required QA testing and monitoring.

2) In the event the instrument does not perform within the limits specified on the monitoring form, the Laboratory Manager will be

notified and a corrective action decision will be made. The corrective action procedure shall be documented in the instrument log.

3) If repair is necessary, an "out-of-order" sign will be placed on the instrument until repairs are effected. Repairs made to the instrument will be documented in the instrument log book. Required QA/QC testing and monitoring will be completed prior to the resumption of sample analysis.

6.06 Calibration Records

A bound notebook will be kept with each instrument requiring calibration in which will be recorded all activities associated with QA monitoring and repairs program. These records will be checked during periodic equipment review and internal and external QA/QC audits.

SECTION 7 - ANALYTICAL PROCEDURES

7.01 Laboratory Analytical Procedures

Control limits for analytical parameters are given in Table 5. The accuracy and precision of the data generated by the laboratory will be determined through analysis of duplicates, spiked samples, synthetic reference standard samples, and field and laboratory blanks analyzed along with each set of samples. Interferences will be identified and documented.

When matrix interferences are noted during sample analysis, actions will be taken by the laboratory to achieve the specified detection limits. Samples will not be diluted by more than a factor of five to reduce matrix effects. (Samples may diluted to a greater extent if analytes of concern generate responses in excess of the linear response of the instrument.) The laboratory will re-extract, re-sonicate, and/or use any of the clean-up methods presented in the NYSDEC Analytical Services Protocol (NYSDEC, 1989). In such cases, the Laboratory Quality Assurance Coordinator will assure that the laboratory demonstrates good analytical practices and that such practices are documented in order to achieve the specified detection limits.

In general, the methods accuracy and precision will be determined by spiking the sample matrix with the analyte. Percent recoveries of the spikes will be calculated and compared with control limits listed in Table 5. A measure of precision will be obtained through the relative percent difference (RPD) between matrix spikes and matrix spike duplicates for organic compounds and as the RPD between laboratory duplicates for metals. Sampling precision will be evaluated based

on the relative percent difference of duplicate field samples. RPDs will be compared to those control limits listed in Table 5.

The data generated will, whenever possible, be input to the laboratory database management system. Analyst's work sheets will be filed for one year as a temporary record. When approved and signed, data reports and pertinent information will be reported to GE.

The following analyses will be performed on the Temporal Water Column Monitoring Program samples; total dissolved solids (TDS), conductivity, alkalinity, total suspended solids (TSS), total organic carbon (TOC), dissolved organic carbon (DOC), and PCBs. Analyses to be performed on the Float Survey samples include: TDS, conductivity, alkalinity, TSS, TOC, DOC, and PCBs; these analyses will also be performed on High-Flow Sampling Program samples. TSS will be performed on the Suspended Solids Study samples. Analyses to be conducted on the Sediment samples will include: bulk density, percent moisture, pore water TOC, pore water PCBs, solids PCBs, and solid TOC.

Complete descriptions of analytical procedures to be used in the field and laboratory are described by NYSDEC (NYSDEC, 1989). A list of the laboratory analytical procedures to be used is presented in Table 2.

7.02 Field Analytical Procedures

Field analytical procedures will follow the same general principles and practices as laboratory analytical procedures. The percentage of quality control samples to be taken per total number of samples will be the same as for laboratory analyses and is listed on Table 4.

SECTION 8 - DATA REDUCTION, VALIDATION, AND REPORTING

8.01 General

OBG Laboratories, Inc. and Northeast Analytical, Inc., will be conducting analysis on collected samples in accordance with US EPA protocols. Data reduction and laboratory validation will be incorporated into the in-house effort for all parameters.

8.02 Data Production, Handling, and Reporting

The following data handling procedures will be followed at the laboratory.

8.02.1 Data Production, Reduction, and Transcription

OBG Laboratories, Inc. and Northeast Analytical, Inc., will be performing analyses on the environmental samples. The following data handling procedures are employed at OBG Laboratories, Inc. and Northeast Analytical, Inc.

8.02.1.1 OBG Laboratories, Inc.

OBG Laboratories, Inc. will perform analyses for PCBs, TDS, conductivity, alkalinity, TSS, TOC, and DOC. The following data handling procedures are employed by the laboratory for PCB analyses. The gas chromatography instrumentation consists of a Hewlett-Packard (HP) Model 5890S GC equipped with an Electron Capture Detector and a 7673A HP Auto injection system. This auto injection system is

used for positive identification and quantitation of sample extracts. Output from the GC unit is processed for presentation in two forms: a real time chromatogram and a post-run integration report. The post-run integration report contains the following information:

- retention time,
- response factors, calculated form initial calibration curve,
- surrogate standard recoveries, and
- listing of all positively identified compounds. Quality Assurance/Quality Control data such as spikes, spike duplicates, method blanks and calibration curves are also processed and stored in post-integration reports.

The WSI Model 32 conductance meter is used by the lab for conductivity analyses. The Orion Model 5A 720 and Orion 8104 Ross Combination Probe is used for alkalinity analyses. TOC and DOC will be performed on a Rosemount Analytical Dohrmann DC-190 Carbon Analyses.

8.02.1.2 Northeast Analytical, Inc.

Northeast Analytical, Inc. will be performing analyses for congener specific PCBs, percent moisture, bulk density, and sediment TOC on environmental samples. The following data procedures are employed by the laboratory for these analyses. The gas chromatography instrumentation consists of a Varian Model 3400 GC equipped with capillary on-column injection, temperature programmable oven,

Model 8000 automatic sampler and fast time constant electron capture detector. A data system (Dynamic Solutions, Maxima Workstation) for chromatographic operations and integration of detector signal is interfaced to the GC. Output from the GC system is processed into a real time chromatogram and a sample specific report that includes peak identification, retention time, peak name, integrated peak area, amount of solution and sample amount. In addition, a PCB congener report and a PCB summary report are included in the data package. A separate QA/QC data summary report is also included with each package detailing QA/QC data for spikes, EPA check samples, duplicates and method blanks.

Northeast Analytical Laboratories, Inc., will use an A&D Model ER 1804 microbalance to perform bulk-density and percent moisture analyses. Sediment TOC analyses will be performed on a Dohrman Analyzer.

8.02.2 Data Distribution

Following final review by the appropriate Group Leaders, Quality Assurance Personnel and Manager of Analytical Services, a single copy of the results of the analytical determination will be shipped to O'Brien & Gere Engineers, Inc.

8.02.3 Reporting

Analytical data packages, which are fully validatable and document sample preparation, extraction, and analysis, will be provided for each analysis. Data report forms will be securely bound and all pages will be sequentially numbered.

The analytical data reports will include the following information:

- case narrative,
- date of sampling,
- case file,
- description of samples,
- description of sample extraction and clean-up procedures,
- indication of analytical method,
- analytical results of all samples plus trip blank, field blank, and method blank (including tentatively identified compounds, if applicable),
- analytical results of QA/QC sample analyses,
- summarized calibration data,
- detection limits for parameters analyzed,
- QA/QC data summaries (i.e. MS/MSD results and summaries),
- copy of completed chain-of-custody forms,
- notebook accountability record,
- appropriate raw instrument outputs (e.g. GC/MS spectral printouts), and
- example calculations for each analysis.

Review and cross checking procedures will be conducted according to standard operating procedures of the laboratory and will ensure that the raw data and calculation results are properly, completely, and accurately transferred to the reporting format used by the laboratories' CLP programs.

8.03 Data Validation

The laboratory validation process begins with the group leaders who will review the raw and reduced data for possible calculation and transcription errors. Additionally, the group leaders will check unusually high or low parameter values. The Laboratory QA Coordinator will perform a final laboratory validation of the data which will include a review of quality control sample analyses and data completeness. The laboratory report will then be reviewed and approved by the manager of analytical services prior to its release.

Prior to submittal of the data to the Project Manager for his review, data will be validated by O'Brien & Gere Engineers, NYSDEC-approved data validators. Data validation is a systematic process of evaluating analytical data quality by comparing the data generation process (sample collection through sample analysis) to quality control criteria established prior to the initiation of the field investigation. Data quality criteria are established based on the project data quality objectives which are, in turn, established based on the intended use of the data. A data validation report establishes data usability by determining the degree of adherence to quality control criteria. As a result, sample data is determined to be usable as is, approximate, or unusable for the particular use established by the project data quality

objectives. A data validation report will be generated and incorporated into the summary reports, as required.

The requirements to be checked for the validation of congener specific and total PCB analyses data include the following:

1. Documentation Completeness
2. Holding Times
3. Instrument Performance
    a. 2,2; 3,3' 4,4' 5, 6, 6' - NCBP
    b. Baseline Stability
    c. Chromatographic Resolution
4. Calibration
    a. Initial Calibration
    b. Analytical Sequence Verification
    c. Continuing Calibration Verification
    d. Internal Standard Area Assessment
5. Blank Analysis
    a. Method Blank
    b. Field/Equipment Blank
6. Surrogate Recovery
7. Matrix Spike Analysis
8. Field/Laboratory Duplicate Analysis
9. Reference Standard Analysis
10. Spike Blank Analysis
11. Compound Identification and Quantitation

12. Overall Data Assessment

The requirements to be checked for the validation of TDS and TSS analyses data include the following:

1. Documentation Completeness
2. Balance Calibration
3. Blank Analysis
    a. Method Blank
    b. Field/Equipment Blank
4. Laboratory Duplicate Analysis
5. Field Duplicate Analysis
6. Reference Standard Analysis
7. Sample Quantitation
8. Overall Date Assessment

The requirements to be checked for the validation of TOC analyses data include the following:

1. Documentation Completeness
2. Calibration
    a. Initial Linearity Check
    b. Continuing Calibration
3. Blank Analysis
    a. Method Blank
    b. Field/Equipment Blank
4. Matrix Spike Analysis
5. Laboratory Duplicate Analysis

6. Field Duplicate Analysis

7. Reference Standard Analysis

8. Sample Quantitation

9. Overall Data Assessment

The requirements to be checked for the validation of specific conductance and alkalinity analyses data include the following:

1. Documentation Completeness

2. Calibration

3. Blank Analysis

   a. Method Blank

   b. Field/Equipment Blank

4. Laboratory Duplicate Analysis

5. Field Duplicate Analysis

6. Reference Standard Analysis

7. Sample Quantitation

8. Overall Data Assessment

The requirements to be checked for the validation of bulk density and percent moisture data include the following:

1. Documentation Completeness

2. Balance Calibration

3. Laboratory Duplicate Analysis

4. Field Duplicate Analysis

5. Reference Standard Analysis

6. Sample Quantitation

7. Overall Data Assessment

SECTION 9 - QUALITY CONTROL CHECKS

9.01 QC Checks

9.01.1 Laboratory

The numbers of QA/QC samples that must be taken for each sample matrix are listed in Table 4. Table 5 contains information regarding the audits, frequency and control limits for acceptability. Upon completion of analysis, the results of QA/QC data will be reviewed to verify compliance with the criteria listed. When results are reported to the Quality Assurance Officer, QA/QC data will be included in the package for review. Matrix spikes and surrogates will be used to monitor the methodology and recoveries will be compared to the QA/QC criteria presented in Table 5. Matrix spike duplicates and duplicate samples will be incorporated as an indicator of the precision of the sample results. The relative percent difference calculations will also be compared to the QA/QC criteria presented in Table 5.

Approximately ten percent of the congener specific sediment sample which are to be analyzed by Northeast Analytical Laboratories, will be analyzed in duplicate by OBG Laboratories. Ten percent of the Temporal Water Column Monitoring Program congener specific PCB samples will also be analyzed by both labs. This data will be used as a Quality Control check.

9.01.2 Field

Field instrument calibrations will be performed daily. Calibrations will be performed for equipment used in field activities according to manufactur-

ers recommendations. The calibration range will be designed to encompass the sample readings. The standards used in the field will be checked and replaced with fresh standards as they expire. Instrument conditions and calibration procedures will be checked by the Sampling Team Leader.

9.02 Field Sampling Quality Control

Field sampling crews will always be under the direct supervision of a field sampling leader. Bound log books and appropriate data sheets will be used to document the collection of samples and data so that any individual sample or data set can be traced back to its point of origin, sampler and sampling equipment used. Sampling will be performed according to the methods provided in this document. Blind field duplicate samples will be collected by the sampling team. These samples will be sent to the laboratory for analysis in conjunction with the environmental samples. Field sampling precision will be evaluated through the relative percent difference (RPD) of the duplicate sample analyses results. Control limits for field duplicate precision have been established and may be found on Table 5. Decontamination of sampling equipment will be verified through the analysis of equipment blanks. Proper chain of custody protocols, as presented in this document, will be followed.

SECTION 10 - PERFORMANCE AND SYSTEM AUDITS

O'Brien & Gere has designated a Quality Assurance Officer as indicated in Table 1. A performance audit consisting of analysis of appropriate blanks, spiked samples, and standard solutions will be performed. The specific schedule for QA/QC auditing is presented in Table 5. O'Brien & Gere's Quality Assurance Officer will maintain a record of such audits. These audits will test not only the total system's response, but major measurement methods. O'Brien & Gere's Quality Assurance Officer will report to the Project Coordinator the result of the assessment of the accuracy, precision, and completeness of the data, results of the performance and system audits, and any problems encountered in the analytical procedures. The Quality Assurance Officer, and Data Validator, in conjunction with the Laboratory QA Coordinator, the analyst, analyst's supervisor, and Project Coordinator will formulate recommendations to correct any deficiencies in the analytical protocols or data. These corrective measures will be in accord with on-going good laboratory practices and the overall QA/QC Program.

A field performance audit consisting of an on-site QA/QC audit will be performed by O'Brien & Gere's Quality Assurance Officer at least once during the field program. The audit will evaluate the adherence of the field program to the QA program outlined in this QAPP. O'Brien & Gere's Quality Assurance Officer will maintain a record of such audits. O'Brien & Gere's Quality Assurance Officer will report the results of the audit to the Program Coordinator. The Quality Assurance Officer and the Program Coordinator will formulate recommendations to correct any deficiencies in the field program.

SECTION 11 - PREVENTIVE MAINTENANCE

Preventive maintenance procedures will be carried out on field equipment in accordance with the procedures outlined by the manufacturer's equipment manuals. Field equipment used during this project will have a specific maintenance instruction sheet accompanying it. Maintenance activities involving field equipment will be recorded in a field log book.

A preventive maintenance schedule is followed and a maintenance log is kept for each laboratory instrument. Instrument downtime will be kept to a minimum, by maintaining service contracts on essential instrumentation and maintaining a supply of critical spare parts. OBG Laboratories, Inc. and Northeast Analytical, Inc., staff is experienced in cleaning, maintaining, and troubleshooting instrumentation. Maintenance, whether performed by laboratory or manufacturer personnel, is documented the appropriate instrument log. Log entries include the reason for maintenance, maintenance performed, date and initials of person in charge during maintenance.

SECTION 12 - DATA ASSESSMENT PROCEDURES

The Laboratory Quality Assurance Coordinators and the Quality Assurance Officer will be responsible for data assessment. Data quality assessment will be based on instrument tuning criteria, calibration and performance, surrogate recoveries, blanks and the analysis of quality control samples. Procedures for data assessment will be consistent with those recommended by the NYSDEC Analytical Services Protocol for the U.S. EPA Contract Laboratory Program.

Precision and accuracy will be assessed utilizing control charts. Control charts will consist of bar-line graphs which provide a continuous graphic representation of the state of each analytical procedure. Control charts are utilized by OBG Laboratories and NEA Laboratories, to identify problems before corrective action procedures become necessary. For example, 6 to 7 points in succession below the mean may indicate deterioration of a reference standard or spiking solution. The reference or spiking solution can be remade and the next few data points assessed to determine if the trend was in fact due to deterioration of the solution. Trend analysis, is essential in assisting the laboratory QA Coordinator in pinpointing possible problems in the analytical procedure before an "out of control" situation develops. The analytical laboratory will also utilize warning limits set at ± 2 standard deviations of the mean to assist in determining procedural problems before "out of control" situations develop. Reducing "out of control" situations is important to produce valid analytical data in a timely fashion, since reanalysis time is minimized.

In general, the accuracy of the methods will be determined by spiking the sample matrix with the analyte. The spiking levels will be selected to bracket the

concentration of interest. Percent recoveries of the spikes will be calculated and compared to the limits presented in Table 5. The precision of the methods will be determined by the analysis of matrix spike and laboratory and field duplicate samples. The precision will be evaluated by calculating the relative percent difference (RPD) between the duplicates. Relative percent difference calculations will be compared to the limits presented in Table 5.

The definitions and equations used for the assessment of data quality are the following:

a. Accuracy and Precision - Accuracy is a measure of the nearness of an analytical result, or a set of results, to the true value. It is usually expressed in terms of error, bias, or percent recovery (%R).

Normally the term "accuracy" is used synonymously with "percent recovery". It describes either the recovery of a synthetic standard of known value, or the recovery of known amount of analyte (spike) added to a sample of known value. The percent recovery (%R) or "accuracy" can be calculated by using:

1. standards: %R = (observed value/true value) x 100

2. spikes: $$\%R = \frac{(\text{conc. spike + sample}) - \text{sample}}{\text{conc. spike}} \times 100$$

Precision refers to the agreement or reproducability of a set of replicate results among themselves without assumption of any prior information as to the true result. It is usually expressed in terms of the percent difference or relative percent difference.

b. Average - The average or arithmetic mean (X) of a set of n values (Xi) is calculated by summing the individual values and dividing by n:

$$X = (\sum Xi_{\,i=1 \text{ to } n})/n$$

n = number of values

c. Range - The range (R_i) is the difference between the highest and lowest value in a group. For n sets of duplicate values (X_2, X_1) the range (R_i) of the duplicates and the average range (R) of the n sets are calculated by:

$$R_i = X_2 - X_1$$

and

$$R = \sum Ri_{i=1 \text{ to } n}/n$$

d. Standard Deviation and Variation - The standard deviation (S) of a sample of n results is the most widely used measure to describe the dispersion of a data set. It is calculated by using the equation.

$$S = \sqrt{\frac{\sum(Xi - X)^2_{i-1 \text{ to } n}}{n}}$$

where X is the average of the n results and Xi is the value of result i. Normally, X ± S will include 68% and X ± 2S about 95% of the data in a normal distribution curve.

The variance is equal to S^2. The percent relative standard deviation (%RSD) or coefficient of variation (CV) is the standard deviation divided by the mean and multiplied by 100, i.e,

$$CV = 100S/X$$

The Laboratory QA Coordinator, with individual laboratory group leaders, will identify any data that should be rated as "unacceptable", based on the assessment of the QA/QC criteria.

SECTION 13 - CORRECTIVE ACTION

Corrective action procedures will be implemented based on unacceptable audit results or upon detection of data unacceptability. Two types of audits will be performed during this investigation. The data generation process will be audited by assessing adherence to laboratory control limits specified in Table 5 and the field program will be audited by assessing adherence to the procedures outlined in this QAPP. If required, corrective action procedures will be developed on a case-by-case basis. The enacted corrective actions will be documented in the appropriate laboratory notebook, instrument log, or case file.

Generally, the following actions may be taken. When calibration, instrument performance, and blank criteria are not met, the cause of the problem will be located and corrected. The analytical system will then be recalibrated. Sample analysis will not begin until calibration, instrument performance, and blank criteria are met. When matrix spike, reference standard or duplicate analyses are out of control, samples analysis will cease. The problem will be investigated. Depending on the results of overall quality control program for the sample set, the data may be accepted with qualification or rejected. If the laboratory rejects data, those samples will be reprepared and reanalyzed. If matrix interferences are suspected, samples will be subjected to one or more of the clean-up techniques specified in the analytical methods. If QC criteria are met upon reanalysis, only the new results are to be reported. If quality control criteria are still not met upon reanalysis, both sets of sample results will be reported. The laboratory will make every reasonable effort to correct quality control excursions and to document the presence of matrix interfer-

ences. In this way, unnecessary resampling of difficult matrices may be avoided. However, if matrix interferences are not documented resampling may be required.

Corrective actions for the field investigation program, if required, will generally involve altering the incorrect field procedure to match the guidelines set forth in this QAPP. If problems arise with procedures or guidelines set forth in this QAPP, the Quality Assurance Officer and the Project Manager will formulate a corrective action.

SECTION 14 - QUALITY ASSURANCE REPORTS TO MANAGEMENT

The deliverables associated with the Tasks identified in the Work Plan will contain separate QA sections in which data quality information collected during the Task is summarized. Those reports will be prepared by the Project Manager and will include the Quality Assurance Officer Report on the accuracy, precision, and completeness of the data and the results of the performance and system audits.

REFERENCES

New York State Department of Environmental Conservation. 1989. *Analytical Services Protocol.* September 1989.

Northeast Analytical, Inc. Method NEA-608CAP, Rev. 3.0, June 1990. (Includes guidelines set forth in *Quality Assurance Plan*, Green Bay Mass Balance Study, I. PCBs and Dieldrin. USEPA Great Lakes National Program Office. Prepared by Deborah L. Swackhamer, Quality Assurance Coordinator, Field and Analytical Methods Committees, University of Minnesota, December 11, 1987 (Appendix B)).

Page, A.L., ed. 1982. *Methods of Soil Analysis.* American Society of Agronomy. Madison, WI

U.S. Environmental Protection Agency. 1992. *Final Phase 2 Work Plan and Sampling Plan. Hudson River PCB Reassessment RI/FS.* Prepared by Tams Consultants, Inc. and Gradient Corporation for Region II. New York, NY.

U.S. Environmental Protection Agency. 1991. *Phase I Report Interim Characterization and Evaluation. Hudson River PCB Reassessment RI/FS.* Prepared by Tams Consultants, Inc. and Gradient Corporation for Region II. New York, NY.

U.S. Environmental Protection Agency. 1987. *Data Quality Objectives for Remedial Response Activities.* USEPA 540/G87/1003.

U.S. Environmental Protection Agency. 1986. *Test Methods for Evaluating Solid Wastes.* SW-846 Third Edition. November 1986.

U.S. Environmental Protection Agency. 1983. *Methods for Chemical Analysis of Water and Wastes.* USEPA-600/4-79-020. Revised 1983.

U.S. Environmental Protection Agency. 1980a. *Interim Guidelines for Preparing Quality Assurance Project Plans.* QAMS-005/80. December 1980.

U.S. Environmental Protection Agency. 1980b. *A Compendium of Superfund Field Operations Methods.* USEPA 600/2-80-018.

Tables

TABLE 1

General Electric Company
Hudson River Project
Sampling and Analysis Program

PRIMARY CONTACTS

Name and Responsibility	Organization and Address	Phone Number
John Haggard Manager - Hudson River Project	General Electric Company 1 Computer Drive South Albany, NY 12205	(518) 458-6619
Edwin Tifft, Ph.D. Project Officer	O'Brien & Gere Engineers, Inc. 5000 Brittonfield Pkwy Syracuse, NY 13221	(315) 437-6100
James R. Rhea, Ph.D. Project Manager	O'Brien & Gere Engineers, Inc. 5000 Brittonfield Pkwy Syracuse, NY 13221	(315) 437-6100
Michael A. Caputo Quality Assurance Officer	O'Brien & Gere Engineers, Inc. 5000 Brittonfield Pkwy Syracuse, NY 13221	(315) 437-6100
David Hill OBG Laboratories, Inc. Quality Assurance Coordinator	OBG Laboratories, Inc. 5000 Brittonfield Pkwy Syracuse, NY 13221	(315) 437-0200
Robert Wagner Northeast Analytical, Inc. Quality Assurance Coordinator	Northeast Analytical, Inc. 301 Nott Street Schenectady, NY 12305	(518) 346-4592

TABLE 2

General Electric Company
Hudson River Project
Sampling and Analysis Program

ANALYTICAL METHODS TO BE USED AT THE HUDSON RIVER PCBs SITE

PARAMETER	METHOD NUMBER AND REFERENCE
WATER ANALYSES	
Filterable Solids (TSS)	160.1 (1)
Non-filterable Solids (TDS)	160.2 (1)
Total Organic Carbon (TOC)	415.1 (1)
Dissolved Organic Carbon (DOC)	415.1 (1)
Alkalinity	310.1 (1)
Specific Conductivity	205 (1)
Congener Specific PCB	NEA-608CAP (2)
SEDIMENT ANALYSES	
Bulk Density	(3)
% Moisture	(3)
Total Organic Carbon (TOC)	9060 (4)
Porewater TOC	415.1 (1)
Congener Specific PCB	NEA-608CAP (2)
Porewater Congener Specific PCB	NEA-608CAP (2)
Total PCB	8080 (4)
TCL Metals:	
ICAP	200.7 CLP-M (5)
Mercury	245.2 CLP-M (5)
Arsenic	206.2 CLP-M (5)
Selenium	270.2 CLP-M (5)
Thallium	279.2 CLP-M (5)

(1) USEPA, 1983
(2) NEA, 1990
(3) Page, 1982
(4) USEPA, 1986
(5) NYSDEC, 1989

TABLE 3

General Electric Company
Hudson River Project
Sampling and Analysis Program

SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIME REQUIREMENTS FOR ANALYSIS OF HUDSON RIVER PCBs SITE SAMPLES

PARAMETER	SAMPLE CONTAINER	PRESERVATION	HOLDING TIME
WATER ANALYSES			
TSS	500–ml plastic bottle	cool to 4 C	7 days
TDS	500–ml plastic bottle	cool to 4 C	7 days
TOC	100–ml plastic bottle	cool to 4 C H_2SO_4 to pH < 2	28 days
Congener Specific PCB	2–liter glass bottle with teflon lined cap	cool to 4 C	5 days to extraction 40 days to analysis
SEDIMENT ANALYSES			
% Moisture Bulk Density	8–oz wide–mouth glass jar with teflon lined cap	cool to 4 C	NA
Congener Specific PCB	8–oz wide–mouth glass jar with teflon lined cap	cool to 4 C	5 days to extraction 40 days to analysis
TOC	8–oz wide–mouth glass jar with teflon lined cap	cool to 4 C	28 days
Total PCB	8–oz wide–mouth glass jar with teflon lined cap	cool to 4 C	5 days to extraction 40 days to analysis
TCL Metals	8–oz wide–mouth glass jar with teflon lined cap	cool to 4 C	6 months (except mercury 28 Days)

TABLE 4

General Electric Company
Hudson River Project
Sampling and Analysis Program

NUMBER OF FIELD QUALITY CONTROL SAMPLES TO BE COLLECTED
AT THE HUDSON RIVER PCBs SITE

PARAMETER	SAMPLES	MATRIX SPIKE	MATRIX SPIKE DUPLICATE	DUPLICATE	FIELD/EQUIPMENT BLANK
TSS	TBD	NA	NA	5%	5%
TDS	TBD	NA	NA	5%	5%
TOC	TBD	5%	NA	5%	5%
Congener Specific PCB	TBD	5%	NA	5%	5%
Bulk Density	TBD	NA	NA	5%	NA
% Moisture	TBD	NA	NA	5%	NA
Total PCB	TBD	5%	5%	5%	5%
TCL Metals	TBD	5%	NA	5%	5%

NOTES: TBD – To be determined
Temporal Duplicates will be collected at a rate of 5% of total samples for the Source Characterzation program.

TABLE 5

General Electric Company
Hudson River Project
Sampling and Analysis Program

LABORATORY CONTROL LIMITS
Total PCB - U.S. EPA Method 8080

AUDIT	FREQUENCY	CONTROL LIMITS
5 point initial calibration curve utlizing standards containing the compounds of interest	Prior to sample analysis and whenever continuing calibration criteria is exceeded	If %RSD <20% use average calibration factor for quantitation; If %RSD >20% use calibration curve for quantitation.
Continuing Calibration Verification	At the beginning of an analysis sequence and every 10 samples	%D < 15% for quantitation column
Method Blank Analysis	1 per matrix and every 20 samples of similiar matrix	Less than MDL for all compounds of interest, and peaks that would interfer with sample identification or quantitation must not be present
Surrogate Analysis (Decachlorobiphenyl)	All samples, blanks, duplicates, spikes and external check standards	Percent Recovery must be within those limits established by the analytical laboratory and retention time shift for decachlorobiphenyl must be within 2% for packed column analyses
Matrix Spike/Matrix Spike Duplicate Analysis	1 per matrix and every 20 samples of similiar matrix	Percent Recovery must be within those limits established by the analytical laboratory
Field Duplicate Analysis	1 per matrix and every 20 samples of similiar matrix; provided by sampling crew	%D for soil $\leq$ 50% for values 5xMDL %D for waters $\leq$ 35% for values 5xMDL When values are <5xMDL criteria is $\pm$MDL
External QC Sample	1 per matrix type and every 20 samples of similiar matrix, if available; must be prepared and analyzed in the same manner as samples	Within established recovery limits for a 50ug/ml standard
Detection Limit	Not applicable	1ppm for sediment samples based on wet weight

TABLE 5 (continued)

General Electric Company
Hudson River Project
Sampling and Analysis Program

LABORATORY CONTROL LIMITS
Congener Specific PCB: Northeast Analytical, Inc. Method NEA-608CAP

AUDIT	FREQUENCY	CONTOL LIMITS
3 Point Initial Calibration utilizing mixed Aroclor standard 1232,1248, and 1262	Prior to sample analysis and whenever Performance Standard for continuing calibration does not meet criteria	If %RSD <20% use average RRF for quantitation; If %RSD >20% use calibration curve for quantitation For congeners not found in standards, RRFs from Mullin et al, 1984 may be adjusted for specific data analysis and quantitation (see method Appendix B)
Continuing calibration utilizing Performance Standard of mixed Aroclors (1232/1248/1262)	At the beginning of an analysis sequence and every 10 samples	For congeners #6 and #205 %D between actual and expected value must be <30% For congeners #61,181,44 and 180 %D between actual and expected values must be <10%
Chromatographic Resolution	Evaluate with each analysis of the Performance standard	Resolution must be sufficient to separate congeners 17 and 18 into two peaks with a valley less than half the height of congener 17.
Matrix Spike Analysis	1 per matrix type and every 10 samples of similiar matrix	%Recovery must be within 70%-130%
Laboratory/Field Duplicate Analysis	1 per matrix type and every 10 samples for laboratory duplicates and every 20 for field duplicates samples of similiar matrix	%RSD <25% for PCB concentrations $\geq$ 0.5ppm and %RSD $\leq$50% for PCB concentrations < 0.5ppm
Retention Time Windows	Must be established prior to sample analysis with the analysis of three standards in a minimum of a 72 hour period and daily using the Performance Standard in the continuing calibration	Retention time window is defined as the absolute retention time of the continuing calibration standard $\pm$ 3 x standard deviation determined from initial 3 standard analysis
Method Blank Analysis	1 per matrix type and every 20 samples of similiar matrix	Less than the MDL for all the compounds of interest and peaks that would interfere with compound identification and quantitation must not be present

TABLE 5 (continued)

General Electric Company
Hudson River Project
Sampling and Analysis Program

LABORATORY CONTROL LIMITS
TSS: U.S. EPA Method 160.1 / TDS: U.S. EPA Method 160.2

AUDIT	FREQUENY	CONTROL LIMITS
Drying time/temperature	Record drying time/temperature for each analytical batch	TDS: 103–105 C for 1 hour TSS: 180 C for 1 hour after evaporating at 103–105 C
Laboratory Duplicate	Every 20 samples	%D $\leq$ 20%
External Check Sample	Every 10 samples	%Recovery 80%–120%
Method Blank Analysis	Every 20 samples	Less than the method detection limit (MDL)

TABLE 5 (continued)

General Electric Company
Hudson River Project
Sampling and Analysis Program

LABORATORY CONTROL LIMITS
Total Organic Carbon: U.S. EPA Methods 415.1/9060

AUDIT	FREQUENCY	CONTROL LIMITS
Continuing Calibration	Every 10 samples	Actual value must be within +/− 10% of expected.
3 Point Linearity Check	Daily	RSD $\leq$ 10%
Laboratory Duplicate	1 per matrix and every 10 samples of similiar matrix	%D $\leq$ 20% for waters %D $\leq$ 35% for sediment/soils
Matrix Spike	1 per matrix and every 10 samples of similiar matrix	% Recovery 75%−125%
Sample Results	Every sample	Every sample will be run in duplicate, result reported with standard deviation of two runs.
Method Blank	1 per matrix and every 10 samples of similiar matrix	Less than MDL

TABLE 5 (continued)

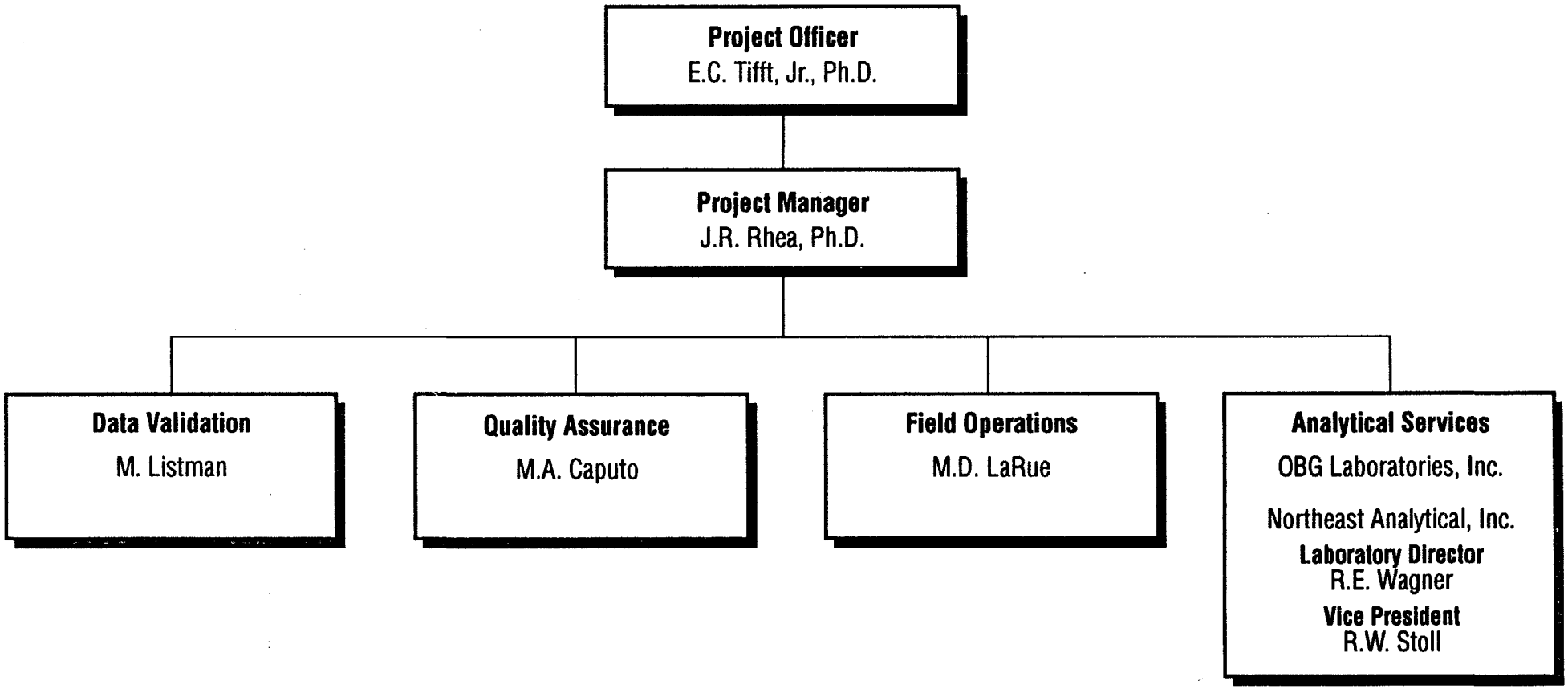
General Electric Company
Hudson River Project
Sampling and Analysis Program

LABORATORY CONTROL LIMITS
TCL Metals (sediment samples): U.S. EPA Methods 200.7/245.2/206.2/270.2/279.2

AUDIT	FREQUENCY	CONTROL LIMITS
Initial Calibration	Each time the instrument is set–up (ICP with a minimum of 2 standards; furnace AA with 4 standards)	Calibration correlation coefficients for furnace AA $\geq$ 0.995
Continuing Calibration Verification	Immediately after initial calibration, every 10 samples and at the end of an analysis run	%Recovery 90%–110%
Calibration Blank	Prior to sample analysis, every 10 samples and at the end of an analysis run (after every continuing calibration standard)	Less than CRDLs
Preparation Blank	1 per matrix, 1 per digestion batch and every 20 samples of similiar matrix	Less than CRDLs
CRDL Standard Analysis	ICP: at the beginning and end of analysis; AA: prior to sample analysis	%Recovery 80%–120%; except for mercury – CRDL not required
Laboratory Duplicate Analysis	1 per matrix, 1 per digestion batch and every 20 samples of similiar matrix	%D $\leq$ 35% for sediment analyses
Matrix Spike Analysis	1 per matrix, 1 per digestion batch and every 20 samples of similiar matrix	%Recovery 75%–125%
Laboratory Control Sample	1 per matrix, 1 per digestion batch and every 20 samples of similiar matrix	Values must be within those defined by EPA or EPA certified manufacturer of reference standard
ICP Analysis	Interference Check Sample (ICS): at the beginning and end of analysis sequence Serial Dilution Analysis: for each matrix and for each sample delivery group whichever is more frequent	ICS: $\pm$ 20% of true value Serial Dilution: %D <10% when sample concentration is $\geq$ 50 x IDL
Furnace Analysis	Every sample must be injected in duplicate and spiked; Method of Standard Additions is required when sample absorbance or concentration is $\geq$ 50% of spike concentration and %recovery is not within 85%–115%	%RSD of duplicate injections $\leq$ 20% %Recovery of spikes 85%–115%
Instrument Detection Limits	Quarterly	Must be at or lower than CRDLs

Figures

ORGANIZATION CHART
Hudson River Project
Sampling & Analysis Program
General Electric Company



319847

FIGURE 1

ORGANIZATION CHART
OBG LABORATORIES, INC.

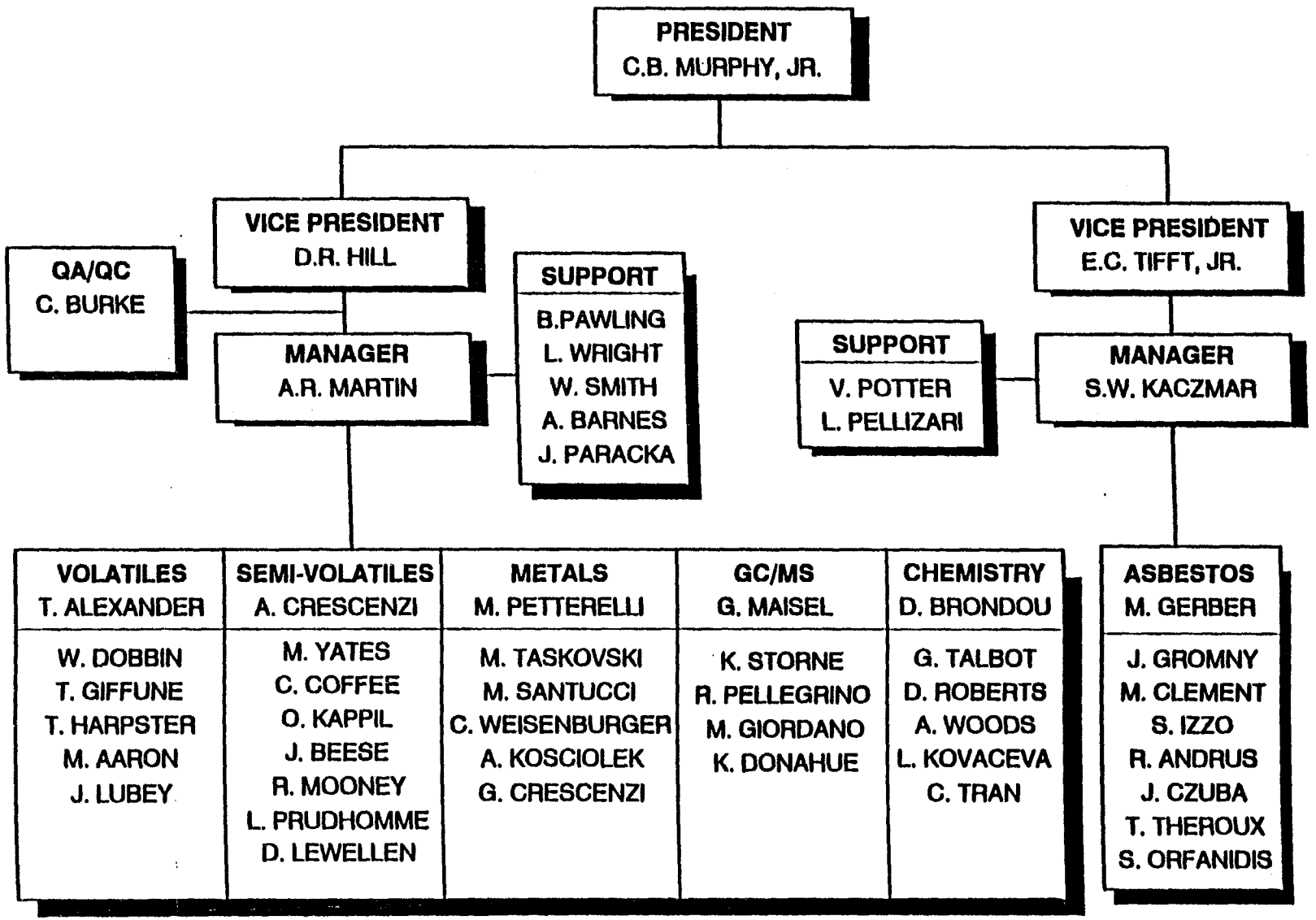
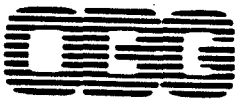


FIGURE 2

319848

FIGURE 3

SAMPLE LABEL



Sample Description:_____

_____ Initials: _____

Sample Date:_____ Sample Time:_____

Project No.:_____ Lab No.:_____

Date Received:_____ Time Received:_____

Preservation:_____

GE HUDSON RIVER PROJECT
SAMPLING AND ANALYSIS PROGRAM
TEMPORAL WATER COLUMN MONITORING PROGRAM

FIELD LOG

SITE	DATE	TIME	DEPTH TO WATER LINE	NUMBER OF 3 FT. INTERVALS	WATER DEPTH	WATER TEMP.(C)	WATER VELOCITY	COMMENTS/ OBSERVATIONS
Bakers Falls Bridge								
Rt. 197 Bridge								
Thompson Island Dam								
Battenkill								
Rt. 29 Bridge								
Stillwater Bridge								
Hoosic River								
Rt. 4 Bridge								

Weather Data:
Temperature_____
Wind_____
Precipitation_____

Sampled by:_____

FIGURE 5

O'BRIEN & GERE

SAMPLING LOG

Client : _____

Weather : _____

Sampled by : _____

I.D.	Date	Time	Type & Volume of Sample	pH	SPCOND	Temp.	Comments

319851

FIGURE 6

Sample Run #_____

GE HUDSON RIVER PROJECT
HIGH FLOW WATER COLUMN MONITORING PROGRAM

CREW #1
FIELD LOG

SITE	DATE	TIME	DEPTH TO WATER LINE	NUMBER OF 3 FT. INTERVALS	WATER DEPTH	WATER TEMP.(C)	WATER VELOCITY	COMMENTS/ OBSERVATIONS
Rt. 197 Bridge								
Snook Kill								
Moses Kill								
Thompson Island Dam								

Weather Data:
Temperature_____
Wind_____
Precipitation_____

Sampled by:_____

319852

FIGURE 7

O'BRIEN & GERE ENGINEERS, INC.

Job No. _____

Sheet ____ of ____

Office: _____

Address: _____

Phone: _____

CHAIN OF CUSTODY

CLIENT: LOCATION:			COLLECTED BY: (Signature)			
SAMPLE DESCRIPTION	Date	Time	Sample Matrix[1]	Sample Type[2]	No. of Containers	ANALYSIS REQUESTED

[1] Matrix = water, wastewater, air, sludge, sediment, etc.
[2] Type = grab, composite

Relinquished by: _____ of: _____	Date	Time	Received by: _____ of: _____	Date	Time
Relinquished by: _____ of: _____	Date	Time	Received by: _____ of: _____	Date	Time
Relinquished by: _____ of: _____	Date	Time	Received by: _____ of: _____	Date	Time
Use this space if shipped via courier (e.g., Fed Ex) Relinquished by: _____ of: _____	Date	Time	Courier Name: _____ *Attach delivery/courier receipt to Chain of Custody	Date	Time
Relinquished by: _____ of: _____	Date	Time	Received by: _____ of: _____	Date	Time

dib/wpC

319853

September 17, 1990

FIGURE 8

GENERAL ELECTRIC COMPANY
HUDSON RIVER PROJECT

Fall 1991

ROGERS ISLAND AUTO-SAMPLER
FIELD LOG

Date	Sample Time	Comments

GENERAL ELECTRIC/HUDSON RIVER SEDIMENT SURVEY

Field Sampling Logsheet **Date**_____

Sample ID	Coordinates				Date Collected (mm/dd)	Time Collected	Water Depth (ft.)	Boring Depth (ft.)	Core Length (in.)	Basket (Y/N)	Comments
	Target		Actual								
	E:	N:	E:	N:							

Weather Conditions: _____

FIGURE

GENERAL ELECTRIC/HUDSON RIVER SEDIMENT SURVEY
Field Laboratory Logsheet

Date:_____
Page:_____of_____

Sample ID	Date Collected (mm/dd)	Time Collected	Visual Sediment Classification	Bulk Density (g/ml)	Sediment Type (F/C)	Core Length (cm)	No. of Sections (1-4)	Composite Number	Comments

Signed:_____

319856

FIGURE 11

GENERAL ELECTRIC/HUDSON RIVER SEDIMENT SURVEY
COMPOSITE LOGSHEET

COMPOSITE NUMBER:_____ DATE COMPOSITED: / /

OVERALL VISUAL DESCRIPTION:_____ TYPE: (circle) CORE / GRAB

#	LOCATIONS	0–5 cm		5–10 cm		10–25 cm		>25 cm	
		PW (ml)	VISUAL DESCRIPT.	PW (ml)	VISUAL DESCRIPT.	PW (ml)	VISUAL DESCRIPT.	PW (ml)	VISUAL DESCRIPT.
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

SIZE FRACTIONATION (0–5 CM ONLY)

BULK+CUP
–CUP
BULK WEIGHT

DRY SAND + FOIL
–FOIL WEIGHT
DRY SAND WEIGHT

DRY SILT + FOIL
–FOIL WEIGHT
DRY SILT WEIGHT

TOTAL WET WEIGHT
–TOTAL DRY WEIGHT
WEIGHT OF WATER

MOISTURE CONTENT _____

PERCENT SAND _____

PERCENT SILT _____

Appendices

APPENDIX A

Edwin C. Tifft, Jr., Ph.D.
O'Brien & Gere Engineers, Inc. Executive Vice President and Chief Scientist

PROFESSIONAL PROFILE

Education

Syracuse University, 1971, Ph.D./Chemistry
University of Rochester, 1966, BA/Chemistry

MANAGEMENT RESPONSIBILITIES

As Executive Vice President, Dr. Tifft directs the activities of five divisions comprising scientists and engineers from a variety of disciplines. These divisions are primarily engaged in:

- hazardous waste management
- environmental liability assessments and compliance audits
- environmental licensing and permitting

These activities include remedial investigations/feasibility studies (RI/FS), RCRA facility investigations (RFI) and corrective action programs, hydrogeologic studies, health and safety audits, asbestos remediation, solid waste, and a broad range of issues relating to environmental toxicology.

Dr. Tifft has served as an expert witness in adjudicatory hearings and lawsuits on behalf of the firm's clients. His strong sense of client advocacy and credibility are recognized in both academic circles and in the regulatory community, and his testimony has consistently led to favorable decisions for these clients.

Dr. Tifft also serves as President of OBG Laboratories, Inc., and is a member of the Board of Directors of several of the O'Brien & Gere companies.

As Chief Scientist, Dr. Tifft has responsibility for the technical quality and oversight of the scientific endeavors of the Firm. His activities include:

- Together with the Chief Engineer, development and implementation of the Firm's Total Quality Management (TQM) Program.
- Training in scientific matters and regulatory programs.
- Review and assistance in scientific projects and reports.

EXPERIENCE

Expert Testimony

Dr. Tifft works in confidence with law firms, either as direct clients or on behalf of other clients. He has served as an expert witness in adjudicatory hearings and civil lawsuits. He has also presented testimony for direct and cross examination; prepared affidavits, depositions, and negotiation of consent decrees; and assisted in the development of litigation strategy.

Dr. Tifft's expert testimony has consistently resulted in favorable decisions for the firm's clients. Representative examples of his recent testimony include:

General Electric - Testimony in support of remedial alternatives other then dredging for the Hudson River.

Tompkins County, NY - Testimony in support of New York State permit under 6 NYCRR 360 for a landfill.

Onondaga County, NY - Testimony in support of the air and solid waste permits for a 980 ton per day waste-to-energy facility.

Hazardous Waste Management

Dr. Tifft has directed and performed a variety of services to characterize hazardous waste sites and evaluate remedial alternatives. He has directed over one hundred Superfund and RCRA investigations for public and private sector clients throughout the country. Dr. Tifft emphasizes the development of cost-effective work plans, and the successful negotiation, and implementation of these plans through the regulatory process.

Several of the projects Dr. Tifft has directed have successfully implemented innovative remediation technologies in spite of regulatory and public opposition. These technologies have included:

- natural biodegradation
- soil washing
- low temperature thermal desorption

A recent example is an RI/FS directed by Dr. Tifft at a disposal site in EPA Region V that contained wood tars from a former charcoal manufacturer. The Record of Decision (ROD) specified in-situ natural biodegradation for the ground water operable unit, in spite of strong opposition from the state agency. This decision led to savings of several million dollars for the PRPs. Dr. Tifft has also directed the ongoing

work in support of anaerobic dechlorination of PCBs at a site in EPA Region II.

Dr. Tifft's services on hazardous waste sites include RI/FS and corrective action programs. Projects have included ground water, surface water, soil, sediment, and air quality sampling, analysis, and hydrogeologic investigations, transport modeling, risk assessments, cost benefit analyses, and quality assurance/quality control plans, and have addressed

- low level radioactive waste
- mixed wastes
- heavy metals
- PCBs
- coal tar residues
- solvents

Dr. Tifft is conversant with prescribed New York State procedures for the remediation of inactive hazardous waste disposal sites (Environmental Conservation Law Article 27 and 6 NYCRR375), with assessment techniques required by the New York State Department of Environmental Conservation (NYSDEC) in both Phase I and Phase II investigations, and with the categories used for sites. He is cognizant not only of the existing regulations, but also of the manner in which they are applied, particularly through State-issued Technical Assistance Guidance Memoranda (TAGMs).

Dr. Tifft has conducted Phase II investigations, and has reviewed Phase II investigations performed by New York State personnel. This extensive experience provides the benefit not only of a comprehensive understanding of regulatory procedures, but also of established relationships with personnel in NYSDEC's Albany office and regional offices.

A recent example of Dr. Tifft's hazardous waste management experience in New York State is an RI/FS conducted at an inactive landfill that had received industrial and municipal waste for 25 years. The RI/FS Work Plan, Health and Safety Plan (HASP), and Quality Assurance Project Plan (QAPP) were approved by NYSDEC; project includes Interim Remedial Measures to reduce risk of exposure and minimize costs and public concern.

Other hazardous waste management programs directed by Dr. Tifft include:

Representative hazardous waste management projects with which Dr. Tifft has been involved recently include:

RI/FS at an inactive landfill in New York State that had received industrial and municipal waste for 25 years. The RI/FS Work Plan, Health and Safety Plan (HASP), and Quality Assurance Project Plan (QAPP) were approved by NYSDEC; project includes Interim Remedial Measures (IRMs) to reduce risk of exposure and minimize costs and public concern.

RI/FS at National Priority List (NPL) site in Wyoming; involved the study of a 60-acre residential subdivision surrounded by industrial development strip. Major consideration was ground water contamination originating from multiple industrial sources adjacent to the subdivision. The ROD released client from liability for one of the operable units.

RI/FS at Crab Orchard National Wildlife Refuge, Illinois, which was placed on NPL because of PCBs observed in lake sediments. Study includes evaluation of 33 sites adjacent to active and abandoned industrial operations.

RI/FS for a major chemical company and three responsible parties at a wood tar disposal site in Michigan; tar materials on ground and surface water at this National Priority List site contained PAHs.

RCRA Corrective Action program for an automobile manufacturing facility in EPA Region II. This site involved PCBs.

Environmental Liability Assessments

Dr. Tifft directs environmental liability assessments to determine if real property to be transferred carries liabilities that might compromise its value or future uses. He has directed environmental liability assessments for a broad range of clients, including legal firms, developers, and lenders. Properties have included underground storage tanks, asbestos-containing building materials, electrical components with PCBs, hazardous wastes disposed of on the property, and other materials that compromise the marketability of the property. Projects have addressed historic use of the property, as well as potential contamination from adjacent properties.

Dr. Tifft performs both qualitative assessments ("Phase I") and quantitative assessments ("Phase II"), which include the estimated costs for remedial work. These cost estimates have been used in client negotiation. In addition, Dr. Tifft has given more than 75 presentations on environmental liability assessments to bankers, realtors, developers, and attorneys.

Representative environmental liability assessments include:

Beveridge & Diamond, P.C. - Assessment of 26 facilities (agricultural chemical production and engineered products) in connection with submission of an SEC liability statement; performed to determine extent of present and potential environmental liabilities corporate-wide.

Clayton & Dubilier, Inc., NYC - Preacquisition assessment for purchase of major electronics firm's typewriter, keyboard, and business services division at an estimated cost of $1.6 billion.

Assessment in conjunction with sale of microelectronics manufacturing facility in Boston, MA; focused on compliance with applicable environmental regulations and potential liability exposure from past and present site operations.

Assessment of four manufacturing/assembling facilities for electronics manufacturer, as part of corporate-wide survey for environmental compliance status.

Assessment of four trucking terminals; focused on review of RCRA regulations and their applicability to waste streams generated by the facility.

Environmental Licensing and Permitting

For both industrial and municipal clients, Dr. Tifft has developed environmental impact statements, siting studies, and permit and license applications. He has also presented testimony in support of these projects, which have involved complex and controversial issues such as dioxin emissions, wetlands, historic sites, and strong opposition from sectors of the public. This work has occasionally been challenged in state or federal court and has always been upheld.

The environmental licensing and permitting projects directed by Dr. Tifft were developed under numerous environmental regulations including 6 NYCRR 360 (New York State solid waste management), federal PSD requirements (Prevention of Significant Deterioration), Article 7 (transmission lines) of the New York Public Service Commission Law, the New York State Pollution Discharge Elimination System (SPDES), and regulations of the FERC (the Federal Energy Regulatory Commission). Many of the projects required a draft or final environmental impact statement, or both (DEIS and FEIS,) and other permits. Representative projects include:

Cogeneration Facility, Syracuse, NY - Prepared documentation that led to NYS DEC approval for 80 megawatt natural gas co-generation facility;

also required permits for gasoline and propane storage. Project included PSD permit, PSC Article 7 procedures for steam line, and DEIS-FEIS.

Seneca Meadows (Tantalo) Landfill, Waterloo, NY - Municipal landfill covering 250 acres. Project included 6 NYCRR 360 permit and DEIS.

Tompkins County Landfill, Ithaca, NY - 600-acre site with 130 acres for landfill and 50 to 60 acres for solid waste cells. Project included six NYCRR 360 permits and DEIS-FEIS.

Development Company, NY - Environmental impact statement and water supply plan for 400 room hotel and 300 unit condominium complex; included potential aesthetic impacts and conservation of sensitive natural resources.

James R. Rhea, Ph.D.
O'Brien & Gere Engineers, Inc. Senior Project Manager

PROFESSIONAL PROFILE

Education

Ph.D., Clarkson University, 1989, Civil and Environmental Engineering
MA, State University of New York, Plattsburgh, 1984, Biology
BA, State University of New York, Plattsburgh, 1982, Environmental Science

Professional Affiliations

American Chemical Society (Division of Environmental Chemistry)
Society of Environmental Toxicology and Chemistry
American Society of Limnology and Oceanography
International Association for Great Lakes Research
Water Environment Federation

PROJECT MANAGEMENT CAPABILITIES

Dr. Rhea joined O'Brien & Gere Engineers, Inc. in 1988 as the firm's Research and Development Program Coordinator. He was promoted to Project Manager in 1991 and Senior Project Manager in 1992. He came to O'Brien & Gere with 5 years of academic experience in applied research involving laboratory experimentation, field verification and modeling of the fate and effects of pollutants in the environment.

Dr. Rhea provides expertise in the areas of:

- fate and transport of chemicals in aquatic and terrestrial ecosystems
- aquatic sediment chemistry
- bioremediation of organic compounds in soil, sediments, and ground water
- hazardous waste management

As Project Manager, he coordinates and provides technical oversight for multi-phase, multidisciplinary programs for a broad range of industrial clients, as well as for municipalities and the military. A representative listing of Dr. Rhea's clients includes:

Allied Signal, Inc.
Chrysler Corp.
General Electric Co.
IBM
Pittston Petroleum
Rhone-Poulenc
Union Carbide
U.S. Army
City of Utica, NY

Anheuser-Busch, Inc.
Ciba-Geigy
Hercules
NL Industries
Reichhold Chemicals, Inc.
Rochester Gas & Electric
U.S. Air Force
U.S. Navy
City of Niagara Falls, NY

EXPERIENCE

Chemical Fate and Transport

Dr. Rhea's experience with fate and transport of chemicals in aquatic and terrestrial ecosystems has included bench-scale, pilot-scale, field-

scale, and modeling studies focused on pollution mitigation and control strategies. Representative projects include:

Electronics Manufacturer - Designed and managed a field sampling and analysis program to identify and quantify a suspected source of PCB to a natural river system.

Industrial Manufacturing Firm - Designed and managed a field sampling and analysis program to monitor the spatial and temporal changes in PCB congener distribution within a natural aquatic system and isolate potential PCB sources.

Electronics Manufacturer - Managed a field sampling and analysis program designed to construct an accurate conceptual model of an aquatic food chain. Program involved the collection of water column, sediment, and biotic samples for analysis of PCB as well as stable isotopes of various elements.

Industrial Manufacturing Firm - Designed and managed a field sampling and analysis program to monitor the effect of seasonal high flow events on the fate and transport of PCB congeners in a natural river system.

Pesticide Research - Developed and conducted laboratory microcosm research evaluating the effects of Atrazine, a broad leaf herbicide, on aquatic ecosystem structure and functioning. Research supported by the U.S. Environmental Protection Agency.

Aquatic Effects Assessment Model - Conceived and developed a mathematical model describing the nutrient flux dynamics of aquatic ecosystems in response to chemical perturbations. Research supported by the State University of New York.

Effects of Acidic Deposition - Evaluated the direct and indirect effects of acidic precipitation on plant chemistry in green house experiments. Research focused on changes in chemical composition of plants exposed to different frequencies and strengths of acid precipitation. Research supported by the State University of New York.

Aquatic Sediment Chemistry

Dr. Rhea has extensive experience in aquatic sediment chemistry and modelling. His work has involved bench-scale and field-scale studies on the distribution and chemical composition of natural aquatic systems. Representative projects include:

Electronics Manufacturing Firm - Conceptualized, designed, and managed an intensive field sampling and analysis program designed to

evaluate the small-scale horizontal and vertical distribution of PCBs in a natural river system. Work included the application of state-of-the-art statistical techniques to evaluate data collected at close intervals using a rectangular grid system.

Chemical Manufacturer - Managed field program involving the collection and analysis of lake sediments for subsequent analysis for mercury and other compounds.

Electronics Manufacturing Firm - Directed the development of an innovative technique for size fractionation of sediment particles for subsequent analysis of PCB.

Industrial Lead Smelter - Evaluated the application of sediment quality criteria for the remediation of stream sediments containing lead from an industrial smelting operation.

Electronics Manufacturing Firm - Designed and managed an extensive field sampling and analysis program to determine the large-scale spatial distribution of PCB congeners in the sediments of a large river system. Data valuations included assessment of the spatial distribution of PCB reductive dechlorination processes.

Industrial Manufacturing Firm - Directed evaluations of sediment data for the purpose of identifying PCB and organochlorine sources to a natural aquatic system. Approach included evaluation of PCB congener distribution patterns to identify potential sources from historical usage.

Industrial Manufacturing Firm - Designed field sampling and analysis program to evaluate the magnitude and extent of PCB contamination in river sediments from an industrial manufacturer. Approach included congener specific PCB analytical techniques to differentiate multiple PCB sources to a major river system.

Sediment Transport Model - Conceived, developed, calibrated, and verified a mathematical model describing major chemical, biological, and physical reactions affecting alkalinity production and consumption within lake sediments. Research sponsored by the Electric Power Research Institute (EPRI) and the Empire State Electric Energy Research Corporation (ESEERCO).

Sediment Alkalinity Flux Assessment - Conceived, designed, and conducted field studies which measured calcite enhanced sediment alkalinity flux in three lakes located in the Adirondack Mountains of New York. Research sponsored by EPRI and ESEERCO.

Sediment Cation Exchange Reactions - Conceived, developed, and conducted bench-scale experiments evaluating calcium-hydrogen exchange reactions on sediment particles. Research sponsored by EPRI and ESEERCO.

Calcite Dissolution and Deactivation - Conceived, developed, and conducted bench-scale experiments exploring the magnitude and intensity of calcium carbonate dissolution and chemical deactivation within simulated sediment reactors. Research sponsored by EPRI and ESEERCO.

Bioremediation

Dr. Rhea's experience with bioremediation of organic compounds has involved the direction and management of bench-scale and field-scale studies evaluating the effectiveness of bioremediation of ground water, sediments, and soils. Work has included studies on the natural degradation of organic compounds *in situ* and within engineered treatment vessels.

Chemical Manufacturing Firm - Conceptualized, designed, and directed bench-scale studies to facilitate the design of a sequencing batch reactor system for treatment of a high-strength hazardous waste leachate containing volatile and semivolatile organic compounds and heavy metals.

Auto Manufacturer - Designed bench-scale studies to determine the rate and extent of biodegradation of volatile and semi-volatile organic compounds within an engineered bioventing cell.

Petroleum Company - Managed bench-scale testing designed to evaluate naturally occurring biodegradation of petroleum hydrocarbons at a former petroleum distillation and distribution center. Designed field-scale testing studies to evaluate the effect of nutrient enrichments on the ability of endogenous microflora to degrade petroleum hydrocarbons.

Electronics Manufacturing Firm - Directed the evaluation of the rate and extent of PCB biodegradation in a natural river system from congener specific PCB sediment chemistry data.

Utility - Conceptualized and designed experiments to evaluate the effect of photochemical pretreatment on the biodegradation of polynuclear aromatic hydrocarbons extracted from coal tar contaminated soils.

Hazardous Waste Management:

Dr. Rhea's experience in the area of hazardous waste management has included a variety of tasks in connection with the identification of technologies for the treatment of hazardous and industrial waste streams. These tasks involve detailed analysis and interpretation of data collected from ground water, surface water, and soils, as well as industrial processes, evaluation of pollutant transport and fate, and the application of specific technologies for the treatment of ground water, surface water, soils and industrial wastes. Representative projects include:

National Chemical Manufacturing Firm - Evaluated characterization data of concentrated wastestream to identify and experimentally evaluate appropriate treatment technologies.

Industrial Foundry - Evaluated soil, ground water, and surface water data from a contaminated disposal area and identified appropriate alternatives for site remediation.

Major Chemical Manufacturer - Evaluated the fate and effects of an accidental release of a concentrated volume of styrene into a POTW.

U.S. DOD Installation - Collected and analyzed data regarding hazardous waste production and identified appropriate hazardous waste minimization technologies and techniques.

Major Chemical Manufacturer - Evaluated the source and identified appropriate alternative for the monitoring and treatment of wastewater containing elevated concentrations of volatile organic compounds.

Mark D. LaRue
O'Brien & Gere Engineers, Inc. Project Designer

PROFESSIONAL PROFILE

Mr. LaRue joined O'Brien & Gere Engineers, Inc. in 1978 as a Research Technician. He was promoted to Senior Research Technician in 1982; to Researcher in 1987, and Project Designer in 1991.

Education

SUNY Agricultural & Technical College at Delhi, 1978, AAS/Civil Technology

Special Training

40 Hour OSHA Hazardous Waste Site Operation Course
8 Hour OSHA Hazardous Waste Operations Health and Safety Training Supervisor's Course

TECHNICAL EXPERTISE

- Hazardous waste site investigation work plan development
- Field investigation program design
- Pilot plant design and operation
- Municipal and industrial wastewater and solid waste treatability studies
- Combined sewer overflow investigations
- Remedial investigations/feasibility studies on suspected hazardous waste sites
- Ground water quality surveillance
- Water quality surveillance
- Interim remedial measure work plan development and design

REPRESENTATIVE PROJECTS

HAZARDOUS WASTE SITE INVESTIGATIONS:

Experience includes development of methodology for determination of extent of possible contamination. Design of field sampling plans. Supervision of on-site field operations. Data interpretation and presentation. Development and assessment of remedial alternatives. Representative projects include:

Special Metals Corporation, New Hartford, NY - Coordinated on-site activities for remedial investigation at Ludlow Landfill site. Assisted in developing sampling plan for determining extent of contamination or soil, sediment, surface water and ground water surrounding an active landfill.

Broome County Industrial Development Agency, Broome County, NY - Coordinated on-site activities for remedial investigation/feasibility study at the former Town of Conklin municipal landfill. Assisted in developing sampling plan aimed at quantifying extent of stream sediment, ground water and surface water contamination. Assisted in developing and screening appropriate remedial technologies. Data interpretation and presentation.

Endicott-Johnson Corp., Endicott, NY - Coordinated on-site activities for remedial investigation/feasibility study at a former underground chemical storage facility. Activities included soil and ground water characterization, and investigation of ground water contaminants migrating along sewer bedding materials. Data interpretation and presentation.

Peter Cooper Industries, Inc., Gowanda, NY - Coordinated on-site activities for remedial investigations at two former solid waste disposal areas which contain industrial waste materials. Investigated the extent of contamination in ground water, surface water, soil and wetland sediments. Assisted in developing expanded phased investigation to correspond with feasibility study development. Assisted in data interpretation and presentation.

Crab Orchard National Wildlife Refuge, Marion, IL - Remedial investigation/feasibility study. Developed supplemental investigation plan to address informational needs generated by development of remedial technologies in the feasibility study. Data interpretation and presentation. Site was formerly used for munitions and other manufacturing and is on the National Priority List.

Harden Furniture, Inc., McConnellsville, NY - Development of Site Operations Plan for Interim Remedial Measures at a former municipal landfill. Design of on-site operations for the removal and management of drums buried in landfill.

Stauffer Management Co., Wilmington, DE - Development of Work Plan for Interim Remedial Measures at a former drum disposal site. Design of on-site operations for removal and management of drums buried in disposal trench adjacent to residential area.

Major Conglomerate, OH - Site inspection and subsequent design of sampling plan to evaluate extent of PCB contamination in plant-wide compressed air system.

Major Conglomerate, NY - Design of Field Sampling Plans for a reassessment Remedial Investigation performed in a major river system. Investigation tailored to data requirements of fate and transport modeling exercise for PCBs in sediments. Supervision of on-site activities including water column evaluation, sediment characterization, sediment transport evaluation, and hydraulic characterization. Development of sampling techniques and QA/QC procedures for the collection of water samples containing PCBs at low part per trillion concentrations. Data review and presentation.

WATER TREATMENT PILOT PLANT DESIGN AND OPERATION:

Experience includes various studies for treatment plant optimization, ozone disinfection, PCB removal, trihalomethane control, taste and odor control. Representative projects include:

IBM, Owego, NY - Assisted with design, construction and operation of 15,000 gpd ion-exchange pilot plant designed to develop treatment alternatives for industrial wastewater containing copper and chrome. Successful completion of this project led to approval for design and construction of a full scale ion-exchange wastewater treatment system.

Monroe County, NY - Design and operation of an ozone pilot plant at the Monroe County Water Authority Shoremont Water Treatment Facility. Evaluation of ozone disinfection on odor control and trihalomethane formation potential.

City of Watertown, NY - Development and operation of a 7,500 gpd pilot plant. Study included minimization of color, turbidity, and trihalomethane formation potential.

River Treatability Study, NY - Design, construction and operation of carbon pilot plant for research into the effectiveness of carbon treatment of PCB contaminated water.

City of Poughkeepsie, NY - Construction and operation of a pilot plant at the City of Poughkeepsie's water treatment facilities. Studies evaluated optimization of PCB removal through conventional and carbon treatment.

Michael A. Caputo
O'Brien & Gere Engineers, Inc. Senior Project Scientist

PROFESSIONAL PROFILE

Mr. Caputo joined O'Brien & Gere Engineers, Inc. in 1989 and presently works in the Environmental Toxicology Section. He was promoted to Project Scientist in 1991 and Senior Project Scientist 1992. Prior to joining O'Brien & Gere, Mr. Caputo worked for NUS Corporation, Boston, MA. His responsibilities included the coordination of EPA Contract Lab Program (CLP) activities and managing site assessment projects. Mr. Caputo validated data packages and reviewed validations, as well as instructed employees in CLP data validation protocols. He also authored guidelines for an abbreviated CLP data validation protocol.

Education

Hobart and William Smith Colleges, 1983, BS/Chemistry
University of California at Davis, 1987, MS/Agricultural and Environmental Chemistry

Special Training

Hazardous Waste Operations Training, 40 Hour OSHA Certification
Radiation Worker Training
Red Cross Advanced First Aid
New York State Department of Environmental Conservation Approved Data Validator

TECHNICAL EXPERTISE

- Performing health hazard evaluations
- Preparing Quality Control/Quality Assurance Plans, Work Plans and Design Specifications for work to be undertaken at hazardous waste sites

and

- Environmental sampling protocols health hazard evaluations
- Performs data validations, interpretation and usability assessments to qualify analytical sample results according to various state and federal agency guidelines

REPRESENTATIVE PROJECTS

HAZARDOUS WASTE MANAGEMENT:

City of Utica, Bo^sert Site, Utica, NY - Served as Quality Assurance Officer for a remedial program at a former metal machining facility. The project involved the removal of PCB and mercury contaminated wastes and the decontamination of equipment.

Confidential - Served as Quality Assurance Officer for a sampling and analysis program. The investigation involved river sediment and water sampling. The samples were analyzed for total and congener specific PCBs under strict quality control guidelines.

Thaler and Thaler/Hinman, Howard and Kattell, Attorneys; Weitsman Site, Owego, NY - Served as Quality Assurance Officer for a Phase II investigation.

General Electric Company, GE Aircraft Engines, Cincinnati, OH - Served as Quality Assurance Officer for a USEPA RCRA facility investigation. The facility develops, assembles, and tests jet engines.

City of Utica - Primoshield Site, Utica, NY - Prepared a Work Plan for an RI/FS. The investigation involved a hydrogeological investigation and public health evaluation of a former metal plating facility. Served as Quality Assurance Officer for the investigation.

General Services Administration - Federal Property Resource Center, Watertown, MA - Acted as Site Health and Safety Officer for a site investigation which included monitoring well installation and field sampling. Project involved mixed radioactive/chemical waste personnel protective equipment and procedures.

RISK ASSESSMENT:

General Services Administration - Federal Property Resource Center, Watertown, MA - Prepared a Qualitative and Quantitative Health Risk Assessment Report pursuant to MGL Chapter 21E. The report addressed both chemical and radioactive waste materials.

Dewitt Landfill, Town of Dewitt, NY - Prepared a conceptual site model for the scoping of an RI/FS and Interim Remedial Measures.

HEALTH HAZARD EVALUATIONS:

US Air Force - Duluth International Airport, Site 7; Runway 13 Northeast - Prepared a Health and Safety Plan for the Stage 4, Interim Remedial Measure (IRM) to be performed in connection with the Installation Restoration Program. The IRM involved a subsurface investigation and a removal operation.

Erdle Perforating Company - Prepared a Site Safety and Health Plan for an RI/FS of a former underground tank farm.

Ashland Chemical Company - Prepared a Site Safety and Health Plan for a subsurface hazardous waste investigation at an active chemical manufacturing plant.

City of Niagara Falls, NY - Prepared a Site Safety and Health Plan for a subsurface investigation in connection with a utility and road reconstruction in an area surrounded by several chemical manufacturing plants.

QUALITY ASSURANCE/QUALITY CONTROL:

Town of Dewitt, NY - Prepared a Quality Assurance Project Plan for an RI/FS of a municipal landfill.

Confidential - River Sediments PCBs Evaluation, National Priorities List, Superfund Site - Prepared a Quality Assurance project plan for work conducted in connection with a site investigation. The work involved development of a CLP quality reporting and validation procedure for congener specific PCB analyses.

Public Service Electric and Gas - Prepared a Quality Assurance Project Plan for an RI/FS of a former coal degasification plant.

US Army Corps of Engineers - Metaltec/Aerosystems National Priorities List Superfund site -Prepared construction specifications for a Chemical Quality Control Plan and Site Health and Safety Plan.

National Chemical Company - Prepared a Quality Assurance Project Plan for an RI/FS of a former wastewater lagoon area.

US Army Corps of Engineers - D'Imperio Property Site, National Priorities List Superfund - Prepared a Chemical Data Acquisition Plan for a pre-design bench scale wastewater treatment facility.

DATA VALIDATION:

Mr. Caputo has seven years of experience working and teaching in inorganic and organic research labs, and has worked as a research biochemist in a hospital biomedical lab. His work involved high pressure liquid chromatography, gas chromatography/mass spectrometry, atomic absorption spectrometry and wet chemistry.

Representative Site Assessment EPA CLP data validation projects include: Annelli Property, Johnson Carlyle Machine Company, Posick Property, Wiremold Company, Highland Avenue Landfill, City of Lowell Landfill, J. and L. Vinagro Landfills, Washington Well #1, Nadeau Landfill and Wessner Landfill.

Alcan Aluminum Corporation, Site #828005 - Prepared a Data Validation/Data Usability Report for data collected in connection with a focused remedial investigation.

Confidential - Prepared a Data Validation/Data Usability Report for data collected in connection with a preliminary investigation of a metal machining facility.

Confidential - River Sediments PCBs Evaluation - National priorities list, Superfund Site. Prepared a Data Validation/Data Usability Report for data from the analysis of hundreds of sediment and water samples. The samples were analyzed for total and congener specific PCBs.

Amphenol Corporation, Richardson Hill Road Landfill Site, National Priorities List, Superfund Site - Prepared a Data Validation Report for data collected in connection with an RI/FS.

Stauffer Management Corporation, Maestri Site - Prepared a Data Validation/Data Usability Report for data collected in connection with a Supplemental Remedial Investigation.

Beveridge and Diamond - Performed a data quality review of gas chromatographic fingerprint analyses of petroleum contaminated soils collected in connection with the investigation of a former tank farm.

Smith Corona Corporation - Prepared a Data Validation Report for data collected in connection with the supplemental remedial investigation of a former manufacturing facility in Groton, New York. The field investigation involved the collection of approximately 350 water, soil, and sediment samples.

NL Industries, Inc., National Smelting of New Jersey Site - National Priorities List Superfund Site -Prepared a Data Validation/Data Usability Report for data from the analysis of approximately 400 samples collected in connection with an RI/FS.

US Army Corps of Engineers, Richards-Gebaur Air Force Base - Prepared a Quality Control Data Validation Summary Report for data collected in connection with an RI/FS.

Cliffs-Dow Site - Prepared a CLP Data Validation report for data collected for approximately 200 samples in connection with an RI prepared on behalf of a PRP.

Peter Cooper/Markham Site - Prepared a Data Validation/Data Usability Report for data collected in connection with a drum and contaminated soil removal project.

Ludlow Sanitary Landfill - National Priorities List Superfund Site - Prepared a Data Validation/Data Usability Report for data collected in connection with an RI/FS prepared on behalf of a PRP.

Melissa Listman
O'Brien & Gere Engineers, Inc. Scientist

PROFESSIONAL PROFILE

Ms. Listman joined O'Brien & Gere Engineers, Inc. in 1990 and presently works in the Environmental Toxicology section. Prior to joining O'Brien & Gere, Ms. Listman was employed by Upstate Laboratories, Syracuse, New York, as Quality Assurance Manager.

Education

Alfred University, 1984, BS/Chemistry

TECHNICAL EXPERTISE

- Quality Assurance/Quality Control Plans
- Data Validation
- Laboratory wet chemistry and gas chromatography

EXPERIENCE SUMMARY

Ms. Listman has six years experience working and teaching in a laboratory environment, including development and supervision of a Quality Assurance department. Her work ranged from laboratory analysis using classical wet chemistry techniques to analysis by gas chromatography. Ms. Listman is also experienced in performing data validation studies for Federal and State agencies and authoring Quality Assurance Reports for specific clients regarding ongoing site monitoring and RCRA requirements. Representative clients include IBM, General Motors and Xerox Corporation.

REPRESENTATIVE PROJECTS

Data Validation

City of Niagara Falls, NYPA 10 Acre Buffalo Ave. Site - Prepared a Data Validation/Data Usability Report for data collected to develop support for a petition to delist the site from New York State Hazardous Waste Site Registry. Validation of soil and ground water samples were performed in accordance with New State Department of Environmental Conservation Contract Laboratory Program.

Allied Signal Inc., Willis Avenue Site - Prepared a Data Validation/Data Usability Report for data collected in connection with a focused remedial investigation through New York State Department of Environmental Conservation.

Alcan Aluminum Corporation, Site #838005 - Prepared a Data Validation/Data Usability report for data collected in connection with a focused remedial investigation through New York State Department of Environmental Conservation, involving inorganic and organic analyses.

Confidential, River Sediments PCBs Evaluation - National Priorities List Superfund site. Prepared a Data Validation Report for total PCB data for over four hundred sediment samples.

NL Industries, Inc., National Smelting of New Jersey Site, National Priorities List Superfund Site -Prepared Data Validation/Data Usability Reports for two rounds of samples collected in connection with an EPA Region II RI/FS investigation.

Amphenol Corporation, Richardson Hill Road Landfill Site, National Priorities List Superfund Site - Prepared Data Validation Report for data collected in connection with an RI/FS investigation.

Stauffer Management Corporation, Maestri Site - Prepared a Data Validation/Data Usability Report for data collected with a supplemental Remedial Investigation through New State Department of Environmental Conservation.

Beveridge and Diamond - Performed a data quality review of gas chromatographic fingerprint analyses of petroleum hydrocarbon data involving petroleum contaminated soils collected in connection with former tank farm investigation.

Smith Corona Corporation - Performed a data quality review for data collected in connection with the supplemental remedial investigation of a former manufacturing facility in Groton, New York. Approximately 350 soil, sediment and water samples were collected for this investigation.

Ludlow Sanitary Landfill, National Priorities List Superfund Site - Prepared a Data Validation/Data Usability Report for data collected in connection with an RI/FS prepared on behalf of PRP.

Quality Assurance/Quality Control

U.S. Air Force - Prepared a Quality Assurance Project Plan for an RI/FS of a municipal landfill.

National Chemical Company - Semet Residue Ponds Site. Prepared a site history in connection with an RI/FS investigation of a former wastewater lagoon.

Upstate Laboratories, Inc. - Prepared and implemented a comprehensive Quality Assurance Program to monitor field and laboratory quality control procedures in accordance with various state and federal guidelines. In addition, prepared and reviewed laboratory standard operating procedures to verify compliance with various regulatory guidelines.

Training Seminars - Presented several training seminars on Quality Assurance/Quality Control Procedures and Guidelines; Blasland &

Bouck & Lee, Syracuse, NY; Marcor, Rochester, NY; and SUNY Environmental School of Science and Forestry, Syracuse, NY.

APPENDIX B

NORTHEAST ANALYTICAL, INC.
301 NOTT STREET
SCHENECTADY, NEW YORK 12305
(518) 346-4592

STANDARD OPERATING PROCEDURE

LABORATORY METHOD NEA-608CAP

REVISION 3 (6/90)

TABLE OF CONTENTS

Lab Method NEA-608CAP

Congener-Specific Polychlorinated Biphenyl (PCB) Analysis

Method for Congener-Specific Polychlorinated Biphenyl (PCB) Quantification and Identification by Capillary Column/Gas Chromatography with Electron Capture Detection

1.0 Scope

1.1 This method is applicable in the determination and quantification of Polychlorinated Biphenyls (PCB) in sediments and soils. This method is a congener-specific determination, employing a high resolution fused-silica capillary chromatographic column. The method includes guidelines set forth in the document: "Quality Assurance Plan, Green Bay Mass Balance Study, I. PCBs and Dieldrin, US EPA Great Lakes National Program Office", prepared by Deborah L. Swackhamer, Quality Assurance Coordinator, Field and Analytical Methods Committees, University of Minnesota, December 11, 1987. This document outlines quality assurance and quality control procedures to be followed by laboratories participating in the Green Bay Mass Balance Study. Where applicable, Northeast Analytical, Inc., will incorporate and utilize this information in quality control of data generated. Instrumental analysis and conditions (Mullin, M.D., 1985, PCB Workshop, US EPA Large Lakes Research Station, Grosse Ile, MI, June.) cited in the Green Bay Mass Balance Study document will be refined to be applicable to an in-house data management software package.

1.2 This method will be applied specifically to the determination of PCBs by congener, in sediments. The results of these analyses will be used in studies related to biodegradation of PCBs. Highly sensitive techniques will generally not be required, since samples will contain appreciable quantities

319884

of PCBs. Capillary column methods will be used to effectively separate up to 117 or more peaks representing 187 PCB congeners.

2.0 Summary of Method

2.1 This method provides detailed instructions for gas chromatographic conditions, sample extraction, and sample clean-up techniques for analysis of PCBs by capillary gas chromatography.

2.2 This method utilizes a mixed Aroclor standard (1232/1248/1262 in the ratio of 25:18:18) for calibration. Method detection limit and practical quantitation limit will be established experimentally using the procedure in USEPA 40 CFR, Part 136, Appx. B.

2.3 In general, samples are first extracted with a pesticide-grade solvent. The extracts are further processed by concentrating or diluting, depending on the concentration of PCB, and carried through a series of clean-up techniques. The sample is then analyzed by direct liquid injection onto the gas chromatographic column and detected by an electron capture detector. This method should be performed by a skilled chemist or by an analyst trained in the quantification of trace organics by gas chromatography.

2.4 A key component of this method is the importance placed on the chromatographic separation that must be achieved for this congener specific technique. A total of 117 chromatographic peaks are detected, containing 187 PCB congeners in various ratios. This allows an almost complete profile of environmentally occurring PCBs.

2.5 Safe laboratory practices should be followed by the analyst at all times when conducting work in the lab. The analyst should refer to the reference file of material safety data sheets to familiarize himself with the hazards of handling the compounds used for standards and samples themselves.

3.0 Interference

3.1 One of the major sources of interference in the analysis of PCBs is that organochlorine pesticides are coextracted from the samples. A few of these ECD responding pesticides can be separated cleanly from the PCB profile by the resolving characteristics of the capillary column. Several of the commonly found pesticides and degradation products (DDT, DDE, DDD) overlap the PCB profile envelope and co-elute with several of the minor PCB congeners found in environmental samples. The analyst must be careful in chromatographic pattern review and flag peaks that are suspected of being contaminated so that they are not included in total PCB values generated.

3.2 There are several clean-up protocols available that can be used to fractionate PCBs from organochlorine pesticides found in environmental samples. These techniques and there effectiveness will be described in the

sample preparation and clean-up section of this manual. Other separation and clean-up techniques will be included in the section describing procedures to handle samples that contain oil and grease, hydrocarbons, and elemental sulfur.

3.3 Laboratory contamination can occur by introduction of plasticizers (phthalate esters) into the samples through the use of flexible tubing. Samples and extracts should not be exposed to plastic materials. Phthalate esters give response on electron capture detectors, usually as late eluting peaks, and can interfere in PCB quantification.

4.0 Sample Archiving

4.1 Extracts and sediment samples will be retained after analysis. The solvent extracts will be stored in a freezer, while the dry sediment samples can be stored at room temperature, protected from the light.

5.0 Equipment and Apparatus

5.1 Gas Chromatograph: Complete system for high resolution, capillary column capability and all required accessories. Northeast Analytical, Inc. will use a Varian Model 3400 gas chromatograph, equipped with capillary on-column injection (Septum Programmable Injector), temperature programmable oven, Model 8000 automatic sampler, and fast time constant electron capture detector. A data system (Dynamic Solutions, Maxima Workstation) for chromatographic operations and integration of detector signal is interfaced to the gas chromatograph.

5.1.1 Column: The gas chromatograph column to be used for analysis will be a DB-1 (J&W Company), bonded polydimethylsilicone, 30 meter fused silica capillary column with an internal diameter of 0.25 mm and phase coating thickness of 0.25 microns. This column is capable of resolving 117 chromatographic peaks from the full spectrum of all PCB congeners that could be expected in an environmental sample. Refer to Appendix A and Appendix B for a complete description of PCB congeners identified in each GC chromatographic peak and achievable analytical separations.

5.2 Chromatograph Data System: A data system for measuring peak height and peak area. A Maxima 820 workstation (Dynamic Solutions), PC-based data system, will be employed to record detector response and digitally store the chromatographic information on the computer hard disk. This system will allow for chromatographic review of data from the gas chromatograph, electronic peak integration for precise calculations, data base structuring of the analytical information, and archival capabilities.

5.3 Soxhlet Extractor: Complete system for use in extracting PCBs from soils, and sediments. The soxhlet extractor consists of a water cooled condensor, a 250 mL, or 500 mL round bottom flask, soxhlet repetitive flushing unit, appropriate heating mantle and controller.

5.4 Kuderna-Danish (K-D) apparatus: Complete system to evaporate extraction solvent and concentrate sample extract. The K-D apparatus consists of a concentrator tube (10 mL), evaporation flask (500 mL), and 3-ball snyder column.

5.5 Boiling Chips: Solvent extracted, silicon carbide or equivalent.

5.6 Volumetric Flasks: 10, 25, 50, and 100 mL, ground-glass stopper. For standards and sample dilutions.

5.7 Microsyringe: 10, 25, 100, 250, 500 uL for standard preparation.

5.8 Vials: Glass, 10, and 20 mL capacity for sample extracts.

5.9 Bottles: Glass, 50 and 100 mL capacity for sample storage.

5.10 Sample Concentrator: An evaporator unit that utilizes a stream of purified nitrogen gas to gently evaporate solvent from samples.

6.0 Reagents

6.1 Solvents: Pesticide grade or nano-grade quality. Hexane, acetone, toluene, methylene chloride, methanol, diethyl ether, dimethylformamide, and pentane.

6.2 Magnesium Sulfate: Anhydrous, suitable for pesticide analysis.

6.3 Sodium sulfate: Anhydrous, suitable for pesticide analysis.

6.4 Sulfuric acid: Concentrated, ACS reagent grade.

6.5 Mercury: Triple distilled.

6.6 Magnesium silicate (Florisil): 60-100 mesh, activated at 650 degrees C., reagent grade suitable for pesticide analysis.

6.7 Glass Wool: Silane treated, solvent washed to remove impurities.

6.8 Silica Gel: 100-200 mesh, grade 923, Aldrich, deactivated to 7.5% with water.

6.9 Potassium Hydroxide: Pellets, reagent grade.

6.10 Octachloronaphthalene: Obtained from Ultra Scientific (Hope, RI), with a purity greater than 95%.

319887

6.11 Polychlorinated biphenyls: Neet commercial material for standard preparation. These materials are multi-component mixtures of PCB congeners and are the actual materials that were used in products such as transformers and capacitors. Monsanto was the largest producer of PCB formulations and sold them under the tradename Aroclor. These standards should be compared to EPA PCB reference materials to verify commercial materials, to be used as standards, have the same pattern and congener distribution.

6.12 Stock Standard Solutions:

6.12.1 Stock standards are prepared from individual Aroclor formulations by weighing approximately 0.025 g to the nearest 0.1 mg, and dissolving and diluting to volume in a 25 mL volumetric flask. This will give a stock concentration of 1,000 ppm.

6.12.2 The stock standard is transferred into screw-cap vials and stored in a freezer, protected from light. Stock standards should be checked at frequent intervals for signs of evaporation, especially just prior to preparing calibration standards.

6.12.3 Stock PCB standards must be replaced after one year, or sooner if comparison with EPA certified check standards indicate a problem.

6.12.4 Stock standards for the following are prepared by the above procedure:

Aroclor 1232
Aroclor 1248
Aroclor 1262

6.13 Calibration Standard: The calibration standard is prepared by combining Aroclor 1232, Aroclor 1248, and Aroclor 1262 in a 25:18:18 ratio with a final mixture concentration of 2.5 ug/mL, 1.8 ug/mL, and 1.8 ug/mL respectively (total = 6.1 ug/mL). The final concentration of the mixed standard may vary to accommodate instrument sensitivity or more closely represent sample concentrations, but the same ratio values must be maintained. These ratios are strictly maintained so that the percent composition data remains applicable, since it was developed for use under these fixed mixture parameters.

6.13.1 Using a 500 uL microsyringe, accurately add 0.25 mL of stock Aroclor 1232 standard (1,000 ppm) to a 100 mL volumetric flask. Add 0.18 mL of stock Aroclor 1248 and Aroclor 1262 to the same 100 mL of stock volumetric flask. Add the internal standard to the 100 mL volumetric flask as outlined in Section 6.14, and make volume to the 100 mL mark with hexane.

6.13.2 Store calibration standard in the refrigerator at 4 degrees C. in a tightly capped bottle. Calibration standards must be replaced

after six months, or sooner, if comparison with EPA check standards indicate a problem.

6.13.3 Since the instrument calibration is based on a single point calibration standard, concentration of PCBs in the sample extracts mustbe within a factor of five of the calibration standard value. Sample extracts that fall outside this range should be diluted or concentrated to be within the accepted concentration range. To facilitate in meeting the established concentration range for samples, sample extracts are to be screened by packed column gas chromatography with electron capture detection to determine their approximate concentrations. Sample extract solution concentrations for this screening procedure will be calculated by using a mixed Aroclor standard (Aroclor 1242 and 1260) with instrument calibration based on the peak weight percent method of Webb and McCall. This concentration data is necessary so that the extract concentration can be adjusted to match (within a factor of five) the concentration of the three Aroclor calibration mixture. Besides assessing the PCB extract concentration, the packed column screen will supply information on possible contamination and interfering co-extractables which would indicate further sample clean-up is necessary.

6.14 Internal Standard: The internal standard used for capillary gas chromatography of PCBs will be octachloronaphthalene (OCN). Weigh, to the nearest 0.1 mg, solvent, quantitatively transfer the OCN using six successive 2 mL washings to a 50 mL volumetric flask. Be sure to rinse the 10 mL vial walls carefully so that all OCN is completely transferred to the 50 mL volumetric flask. Make the solution to volume using toluene and mix the internal standard solution by shaking the flask several times. This will give a concentration of OCN of 200 ppm. Calculate the exact concentration of OCN based on the amount weighed. Carefully transfer the internal standard solution to 10 mL vials, tightly cap, and store in a freezer.

6.14.1 The OCN internal standard is added to all calibration standards, performance check standards, blanks, samples, and QC samples at an amount to give the same concentration as the major PCBs found in standards and samples. In most cases this will be achieved by spiking 9 uL of OCN internal standard solution to 10 mL of standard or sample extract to give an concentration of 0.1818 ppm.

6.14.2 The internal standard will be added to calibration standards, sample extracts, blanks, and QC samples just prior to gas chromatographic analysis. Thus, the internal standard is used as a quantification spiking standard and will eliminate sample injection and instrument variations, but will not correct for analytical losses during sample preparation.

6.15 Performance Check Standard: A performance check standard is prepared from quality assurance/quality control standards obtained from the USEPA Environmental Monitoring and Support Laboratory (EMSL), Cincinnati, Ohio. The performance standard is a mixed Aroclor standard of Aroclor 1232, 1248, and 1262 in the fixed ratio used to prepare the calibration standard

319889

and must be strictly adhered to. The performance standard is made to a concentration at the lower end of the range that sample PCB extract concentrations must fall into (a factor of five of the calibration standard).

6.15.1 The performance standard is composed of: 0.50 ug/mL Aroclor 1232, 0.36 ug/mL Aroclor 1248, and 0.36 ug/mL Aroclor 1262, a total of 1.22 ug/mL PCB. This mixture is prepared from a concentration of 5,000 ug/mL in isooctane. The USEPA standards are diluted to 50 ug/mL by pipetting 0.5 mL of standard into a 50 mL volumetric flask and diluting to volume with hexane.

6.15.2 Using a 500 uL microsyringe transfer 500 uL of 50 ug/mL Aroclor 1232, 360 uL of 50 ug/mL Aroclor 1248, and 360 uL of 50 ug/mL Aroclor 1262 to a 50 mL volumetric flask. Using a 100 uL microsyringe, add 45 uL of OCN internal standard (final concentration of 0.1818 ug/mL). Dilute to volume with hexane and mix well by shaking and inverting flask several times. The prepared performance check solution will contain a total of 1.22 ug/mL PCB (0.5 ug/mL Aroclor 1232, 0.36 ug/mL Aroclor 1248, and 0.36 ug/mL Aroclor 1262).

6.15.3 Transfer the performance check standard to 10 mL vials, cap tightly, and store in a freezer. A new performance check standard must be prepared every three months.

6.16 Matrix Spike Standard: The matrix spike standard is prepared in the same manner as the calibration standard outlined in Section 6.13. The only change is that the internal standard is not added to the matrix spike standard. The matrix spike standard is used in quality control to determine percent recoveries of the analytical sample procedures. The matrix spike standard is added at a concentration of the same magnitude as the concentrations exhibited by the samples.

6.16.1 Using the Aroclor stock standards, prepare a stock matrix spike standard as follows. Accurately pipette 12.5 mL of 1,000 ug/mL Aroclor 1232, 9.0 mL of 1,000 ug/mL Aroclor 1248, and 9.0 mL of 1,000 ug/mL Aroclor 1262 into a 50 mL volumetric flask. Dilute to 50 mL with hexane, and mix by inverting the flask several times. The matrix spike standard will contain a total of 610.0 ug/mL PCB (250 ug/mL Aroclor 1232, 180 ug/mL Aroclor 1248, and 180 ug/mL Aroclor 1262).

6.16.2 Transfer the matrix spike standard to 10 mL vials, cap tightly, and store in a freezer. A new matrix spike standard must be prepared every six months, or sooner, if comparison with calibration standards indicate a problem.

7.0 Procedure

7.1 Calibration:

7.1.1 Gas Chromatographic Operation Parameters: Establish the gas chromatographic operation parameters as follows:

GC Column: DB-1 (J&W, bonded polydimethylsilicone), 30 meters, 0.25 mm internal diameter, 0.25 micron phase coating.

Oven Temperature Program: 50 degrees C. for 0.08 min hold time, 50 degrees C. to 220 degrees C. at 6.0 degrees C./min, hold at 220 degrees C. for 32 min.

GC Column Velocity: 30 cm/sec, Helium.

Detector: Electron Capture Detector (ECD), attenuation 1, range 10, autozero on.

Detector Temperature: 250 - 300 degrees C.

Injector Temperature Program: 45 degrees C. for 0.04 min hold time, 45 degrees C. to 250 degrees C. at 250 degrees C./min, hold at 250 degrees C. for 62.0 min.

Detector Make-up Gas: 30 mL/min, Nitrogen.

Auxiliary Temperature: 300 degrees C.

Autosampler: Multi-vial mode, 0.5 uL sample volume, Fast injection rate (4.0 uL/sec.), 0.0 min injection time, 3 purge pulses.

7.1.2 Initial GC Calibration: Prior to running samples the system must be calibrated and the system performance must be verified.

7.1.2.1 Establish the gas chromatographic operation parameters outlined in Section 7.1.1 and prepare the calibration standard composed of a mixture of Aroclors 1232, 1248, and 1262 as outlined in Section 6.13.

7.1.2.2 Load the gas chromatograph autosampler with a vial containing the calibration standard, bracketed by 2 wash vials containing acetone and proceed with the chromatographic analysis. During the chromatographic analysis, GC data acquisition should be performed for future peak integration and data manipulation.

7.1.2.3 Our laboratory will use a computer based data acquisition workstation (Dynamic Solutions, Maxima 820 workstation), interfaced to the gas chromatograph. The workstation processes the detector signal, performs an analog to digital conversion, and stores the digitized chromatograms on the computer hard disk. All data

319891

analysis will be done on the computer specialized software package including peak integration, calculating calibration curves/response factors, report generation, chromatogram hardcopies, and archival of data.

7.1.2.4 Calculate the response factor for each separated and identified peak. Appendix A identifies which congener and or congeners compose each resolvable GC peak in the calibration standard, along with the amount that each congener or co-eluting group of congeners are represented in the calibration standard. Throughout this document the IUPAC PCB numbering system will be used for congener identification, unless otherwise stated. Appendix B is an example of an acceptable chromatogram of the calibration standard, along with peak congener labels for cross reference to data in Appendix A. Chromatographic resolution should be sufficient so as to separate congeners 17 and 18 into two peaks with a valley less than half height of congener 17. Response factors are calculated relative to the internal standard by the following equation:

$$RRF = (Ax/Ais)x(Cis/Cx)$$

Where:
- RRF = Relative response factor of congener(s).
- Ax = Area of peak for the cogener(s).
- Ais = Area of peak for the internal standard.
- Cx = Concentration of the cogener(s).
- Cis = Concentration of the internal standard.

7.1.2.5 For congeners that are not found in the mixed Aroclor standard and do not have amount values in the Appendix A table, the following calibration scheme will be employed. Response factors for these additional 19 chromatographic peaks will be adapted from the tabulated data of response factors and relative retention times of all the 209 PCB congeners found in Mullin et al, 1984 (see reference 9.10). These relative response factors will be adjusted for the specific data analysis and quantification employed in this document, based on the calculated response factors generated from the mixed Aroclor standard used for instrument calibration.

7.2 On-going Calibration:

7.2.1 Chromatographic Resolution:

7.2.1.1 Chromatographic resolution should be sufficient so as to separate congeners 17 and 18 into two peaks with a valley less than the half height of congener 17. If this separation is not met, install a new GC column or adjust instrument conditions to achieve stated separation.

7.2.2 Response Factors:

7.2.2.1 The relative response factors calculated from the calibration standard will be verified on each working day by analyzing the performance standard, calculating the selected congener concentrations and comparing to their known concentration. A subset of six congeners will be used to verify the relative response factors before samples are processed. The six congeners include:

#6 and #205 - representing low level peaks in standard

#61 and #181 - representing medium level peaks in the standard
#44 and #180 - representing high level peaks in the standard.

7.2.3 After the performance standard is analyzed, calculate the amount for these six congeners and compare those values to the known concentrations by the following equation:

Percent Difference = [Amt(1)-Amt(2)]/Amt(2) x 100

Where: Amt(1)= Amount calculated for congener.
Amt(2)= Known amount for congener.

7.2.4 A percent difference greater than ±30% for the two low level peaks (#6 and #205) indicates an instrument problem or unacceptable relative response factors. A percent difference greater than ±10% for the medium level (#61 and #185) and high level (#44 and #180) peaks also indicates an instrument problem or unacceptable relative response factors. If any of the evaluation congeners fail to meet the percent difference acceptance criteria, the calibration standard must be re-analyzed and new relative response factors generated.

7.2.5 The performance standard must be analyzed again and values calculated using the new relative response factors. If the performance standard fails to meet the percent difference criteria after re-calibration, sample analysis must not proceed until the problem is found and corrected (i.e., GC gas leak, autosampler lines plugged, broken injector liner).

7.3 Sample Preparation:

7.3.1 Soil and Sediment Samples:

7.3.1.1 To provide guidance to the analyst, as much information about the samples received for analysis should be obtained from the generator and included in the sample log-in records. This may provide information on the expected levels of components being determined and whether dilution of the sample will be necessary.

7.3.1.2 Refer to Section 7.1 for gas chromatographic conditions before running any samples. The instrument calibration performance criteria must be met (see Section 7.2).

7.3.1.3 Sample Preparation:

7.3.1.3.1 Process the sample by first decanting water from the top of the sediment. Transfer the sample to a clean pyrex tray and remove any sticks, stones, and other foreign material, if present.

7.3.1.3.2 Allow the sample to dry at room temperature by placing in a chemical hood for 24 to 48 hours. Frequently mix the drying sample with a spatula and break up any clumps by crushing. The sample is ready for extraction when the sample has reached a free flowing consistency.

7.3.1.4 Extraction:

7.3.1.4.1 Weigh 5 to 20 grams of the air dried sample into a tared cellulose extraction thimble (Whatman 33 mm x 94 mm) and record the weight. Add a plug of silanized glass wool to the top of the thimble.

7.3.1.4.2 Add 200 mL of 1:1 mixture of Hexane and Acetone (1:1 Hexane/Acetone) to a 250 mL round bottom flask. Add several boiling chips to the round bottom flask.

7.3.1.4.3 Turn on the cooling water to the condenser units that will be used to condense the extraction solvent during the soxhlet extraction of the sample.

7.3.1.4.4 Place the sample filled thimble into the soxhlet extractor and attach the soxhlet to the 250 mL round bottom flask and condenser unit.

7.3.1.4.5 Place the 250 mL round bottom onto a heating mantle and set the controller to a value of 5 to 6. Once the solvent begins to boil, adjust the controller to achieve a solvent flushing action of once every two to three minutes.

7.3.1.4.6 Extract the sample overnight for a minimum of 16 hours. Turn the heating mantle off and allow the apparatus to cool to room temperature. Once cool, rinse the water cooled condenser with several disposable pipette volumes of hexane. Separate the condenser from the soxhlet extractor and rinse the ground glass joint with several disposable pipette volumes of hexane.

7.3.1.4.7 Move the soxhlet extractor and attached 250 mL round bottom flask into a chemical hood. Flush the remaining solvent from the soxhlet extractor by tipping the unit to facilitate the syphon action. Using forceps, remove the extraction thimble and allow residual solvent to drain into soxhlet chamber. Rinse the soxhlet chamber with several disposable pipette volumes of hexane, adding enough solvent to be able to flush the soxhlet extractor by tipping to start the siphoning action. Disconnect the soxhlet extractor from the 250 mL round bottom flask and rinse the ground glass joint with several disposable pipette volumes of hexane.

7.3.1.4.8 Add several fresh boiling chips to the round bottom flask and attach a 3-ball snyder condensing column to the round bottom flask. Prewet the snyder column with 2 mL of hexane.

7.3.1.4.9 Using a heating mantle, evaporate the solvent to approximately 5 mL. Make sure gentle boiling is taking place and that the snyder column sections are not becoming flooded with solvent. Once the extract reaches approximately 5 mL (do not go to dryness or loss of PCBs can occur), remove from heat source and quickly rinse the snyder column with 2 mL of hexane. Allow the glassware to cool to room temperature. Loosen the glass joint between the snyder column and 250 mL round bottom flask and rinse the joint into the round bottom flask with 2 mL of hexane.

7.3.1.4.10 Quantitatively transfer the sample extract to a 20 mL vial with three 2 mL hexane rinses. After the sample has been transferred, rinse the disposable transfer pipette with 0.5 mL of hexane into the 20 mL vial.

7.3.1.4.11 Evaporate the solvent with a gentle stream of purified nitrogen gas using a Pierce Reacti-therm block equipped with a 9 port syringe needle gas manifold. Gentle heating can be applied (40-50 degrees C.) to facilitate solvent evaporation. The extract should be concentrated to 0.2 to 0.3 mL, but never allow extract to go to dryness (PCB losses can occur). This concentration step removes the final traces of acetone, which needs to be removed before clean-up procedures are performed.

7.3.1.4.12 At this point the sample can be processed in either of three ways:

1) If the sample is known to be free of interferences, the sample extract volume can be adjusted to 10 mL and and screened by the GC packed column qualitative analysis to determine PCB concentration and necessary sample extract dilution or concentration for final GC capillary quantification analysis.

2) If the exact and nature of interfering co-extractables in the sample is unknown, the sample must be analyzed by the GC packed column qualitative procedure to determine appropriate clean-up procedures. The sample extract is adjusted to 10 mL and analyzed by packed column chromatography. After review of the chromatogram, the sample extract is processed using applicable clean-up techniques. After sample clean-up the extract is re-analyzed by GC packed column chromatography to determine PCB concentration and necessary extract dilution or concentration for final GC capillary quantitative analysis.

3) If prior knowledge and information exists on what types of interfering substances will be co-extracted with the PCBs, proceed directly with the necessary clean-up procedures. After sample clean-up, the extract is adjusted to 10 mL and analyzed by GC packed column chromatography to determine PCB concentration for final GC capillary quantitative analysis.

7.3.1.4.13 Refer to Section 7.4 for sample extract clean-up procedures.

7.3.1.4.14 After the sample extract has been analyzed by the GC packed column qualitative screening protocol, the sample is prepared for final analysis by capillary gas chromatography. Dilute or concentrate the sample extract so that the PCB concentration is within the established concentration range (see Section 6.13.3). Spike this sample extract with the internal standard (OCN) as close to the same level that it exists in the calibration standards (typically 0.1818 ug/mL). Place the sample into an autosampler vial and proceed with the capillary gas chromatography analysis.

7.3.1.4.15 Refer to Section 7.5 for the calculations of PCB concentration in the sample.

7.3.1.4.16 Section 8.0 outlines the necessary quality control (QC) samples to be included with each sample analysis sequence. QC samples are prepared and analyzed along with the samples being measured, and must meet defined acceptance criteria for the sample data to be valid. The QC data is tabulated or plotted on control charts and archived by the laboratory and is available for inspection by the individual requesting the analysis.

7.4 Sample Clean-up

7.4.1 Most extracts of environmental samples that are to be analyzed for PCBs by gas chromatography with electron capture detection

have co-extracted xenobiotics and other interfering substances that must be removed before accurate quantification can take place.

7.4.2 Not all clean-up procedures need to be performed on every sample and several are sample matrix specific. It is the experience and knowledge of the analyst combined with the sampling site history that should guide the selection of which clean-up procedures are necessary.

7.4.3 Hexane/Dimethylformamide partition:

7.4.3.1 This procedure is similar to the hexane/acetonitrile partition procedure, but affords quantitative recover of PCBs. This clean-up technique effectively removes lipids and oils from the sample extracts. When necessary, this procedure should be carried out prior to Florisil clean-up.

7.4.3.2 Quantitatively transfer the sample extract to a 30 mL vial and adjust the sample volume to 15 mL with hexane. Extract the sample four times with 5 mL of dimethylformamide saturated with hexane.

7.4.3.3 Transfer each dimethylformamide extract to a 150 mL separatory funnel. Rinse the transfer pipette with a 0.5 mL of dimethylformamide saturated with hexane into the separatory funnel. Add 100 mL of water containing 2% sodium chloride to the separatory funnel.

7.4.3.4 Extract the dimethylformamide/water mixture with 20 mL of hexane. Allow the phases to separate for 5 minutes after vigorously shaking for 30 seconds.

7.4.3.5 Decant the dimethylformamide/water phase (lower) into a 250 mL beaker. Transfer the hexane phase to a column containing 3 inches of anhydrous sodium sulfate and elute hexane containing PCBs into a 250 mL round bottom flask.

7.4.3.6 Transfer the dimethylformamide/water fraction back to the 150 mL separatory funnel and extract a second time with 20 mL of hexane. Decant the dimethylformamide/water phase back into the 250 mL beaker and add the 20 mL hexane extract to the anhydrous sodium sulfate drying column.

7.4.3.7 Repeat Section 7.4.3.6 for a total of three hexane extractions.

7.4.3.8 Rinse the separatory funnel into the sodium sulfate column with several disposable pipette volumes of hexane. Rinse the column with several disposable pipette volumes of hexane. Elute the column with an additional 50 mL of hexane to remove all the PCBs. Finally, rinse the drain tube of the column stopcock into the round bottom.

7.4.3.9 Add several boiling chips to the 250 mL round bottom flask and rinse the neck of the round bottom with several disposable pipette volumes of hexane. Attach a 3-ball snyder distilling column to the 205 mL round bottom flask and prewet the snyder column with 2 mL of hexane.

7.4.3.10 Using a heating mantle, evaporate the solvent to approximately 5 mL. Make sure gentle boiling is taking place and that the snyder column sections are not becoming flooded with solvent. Once the extract reaches approximately 5 mL (do not go to dryness or loss of PCBs can occur), remove from heat source and quickly rinse the snyder column with 2 mL of hexane. Allow the glassware to cool to room temperature. Loosen the glass joint between the snyder column and 250 mL round bottom flask with 2 mL of hexane.

7.4.3.11 Quantitatively transfer the sample extract to a 15 mL vial with three 2 mL hexane rinses. After the sample has been transferred, rinse the disposable transfer pipette with 0.5 mL of hexane into the 15 mL vial.

7.4.3.12 Evaporate the solvent with a gentle stream of purified nitrogen gas using a Pierce Reacti-therm heating block equipped with a 9 port syringe needle gas manifold. Gentle heating can be applied (40-50 degrees C.) to facilitate solvent evaporation. The extract should be concentrated to 0.2 to 0.3 mL, but never allow extract to go to dryness (PCB losses can occur).

7.4.3.13 Quantitatively transfer the sample to a 10 mL volumetric flask and proceed with the packed column GC analysis.

7.4.4 Sulfuric Acid Wash:

7.4.4.1 The concentrated sulfuric acid treatment removes hydrocarbons and other colored biogenic compounds which are co-extracted with the environmental PCB residues. The sulfuric acid wash should be done first if a florisil clean-up is also being applied to the sample.

7.4.4.2 Quantitatively transfer the sample extract to a 20 mL vial and adjust the volume to approximately 5 mL.

7.4.4.3 Add 2 mL of concentrated sulfuric acid to the sample extract and shake vigorously for 30 seconds. Centrifuge samples on low speed (2) using a bench top centrifuge. Transfer the hexane upper layer to a 20 mL vial.

7.4.4.4 Wash the sulfuric acid three times with 2 to 3 mL of hexane. Shake each wash vigorously and centrifuge to aid in phase separation. Transfer all three hexane washes to the 20 mL vial.

319898

Make sure to rinse the transfer pipette with 0.5 mL of hexane into the 20 mL vial.

7.4.4.5 Evaporate the solvent with a gentle stream of purified nitrogen gas using a Pierce Reacti-therm heating block equipped with a 9 port syringe needle gas manifold. Gentle heating can be applied (40-50 degrees C.) to facilitate solvent evaporation. The extract should be concentrated to 0.2 to 0.3 mL, but never allow extract to go to dryness (PCB losses can occur).

7.4.4.6 If the sample is to be analyzed at this point, quantitatively transfer the extract to a 10 mL volumetric and proceed with the packed column GC screening analysis.

7.4.4.7 If the sample needs further clean-up, proceed to the next clean-up procedure.

7.4.4.8 Caution must be taken in performing the sulfuric acid wash when high amounts of lipid (i.e., fish samples) or water remain in the sample extract. These types of samples may produce excessive heat due to the exothermic reaction of the sulfuric acid with these materials. The rise in sample temperature can cause sulfonation of the lower chlorinated PCB congeners and therefore losses of PCB from the sample. If high amounts of lipids and water are suspected, cool the sample in an ice bath. Also cool the concentrated sulfuric acid in an ice bath before addition to the sample. Gently shake the sample extract and keep the sample in the ice bath while treating it with the sulfuric acid.

7.4.4.9 The pesticides dieldrin and endrin are destroyed by the sulfuric acid treatment. If these pesticides are to be measured they must be fractionated (i.e., silica column) from the PCBs.

7.4.5 Florisil Adsorption Chromatography:

7.4.5.1 The florisil chromatography separates PCBs and certain pesticides (i.e., DDT and analogs) from other co-extracted, polar compounds. The procedure outlined below is for collection of the fraction that contains PCBs and certain organochlorine pesticides only. Additional fractions, eluted by stronger polarity solvent mixtures can be collected if other pesticides are to be determined.

7.4.5.2 Adjust the sample extract volume to 0.2 to 0.3 mL, so that the sample is applied to the florisil column in a small chromatographic band.

7.4.5.3 Prepare a micro florisil column in the following manner. Cut the top of a 5 mL disposable pipette at approximately 1 inch from the end of the pipette. Insert a small plug of silanized glass wool into the pipette and position at the 9 mL mark. Dry pack the 5 mL pipette with 100% deactivated Florisil to make a column of

319899

1 mL in height. Make sure the Florisil is well settled by tapping the column with a spatula. Rinse the micro column with 10 mL of hexane and after elution of the 10 mL, rinse the outside tip of the pipette column, with 1 mL hexane. Place a 20 mL vial under the micro column for collection of the elute.

7.4.5.4 Quantitatively transfer the sample extract to the Florisil micro column and rinse the sample container with 3 successive 0.5 mL hexane volumes. Rinse the disposable transfer pipette into the micro column with 0.5 mL of hexane. Carefully rinse the micro column with 1 mL of hexane and then elute the sample to a total volume of 20 mL with hexane. After collection of the sample rinse the outside tip of the micro column into the collection vial.

7.4.5.5 Evaporate the solvent with a gentle stream of purified nitrogen gas using a Pierce Reacti-therm heating block equipped with a 9 port syringe needle gas manifold. Gentle heating can be applied (40-50 degrees C.) to facilitate solvent evaporation. The extract should be concentrated to 0.2 to 0.3 mL, but never allow extract to go to dryness (PCB losses can occur).

7.4.5.6 If the sample is to be analyzed at this point, quantitatively transfer the extract to a 10 mL volumetric and proceed with the packed column GC screening analysis.

7.4.5.7 If the sample needs further clean-up, proceed to the next clean-up procedure.

7.4.6 Sulfur Removal:

7.4.6.1 Elemental sulfur is soluble in the extraction of solvents used for sediment and soil samples. It is almost always found as an interferant in these types of samples. Large amounts of sulfur can cause the electron capture detector to signal saturate for long periods during the elution envelope of PCBs. Even small amounts of sulfur can interfere with PCB measurement by co-eluting as a chromatographic peak with certain PCB congeners.

7.4.6.2 Sulfur removal clean-up should be routinely done on soil and sediment samples due to its ubiquitous nature. The sulfur removal should be done prior to sulfuric acid and column chromatography clean-up techniques.

7.4.6.3 Quantitatively transfer the sample extract to a 20 mL vial and adjust the volume to approximately 5 mL.

7.4.6.4 Add 0.3 to 0.5 mL of elemental mercury to the sample extract and vigorously shake for 1 minute. The sulfur is converted to mercuric sulfide and precipitates out of the sample extract.

7.4.6.5 Quantitatively transfer the sample extract to a 20 mL vial by using three successive 1.0 mL hexane rinses. Rinse the disposable transfer pipette into the vial with 0.5 mL of hexane.

7.4.6.6 The precipitated sulfur can be removed from the sample by performing a sulfuric acid clean-up or Florisil adsorption column clean-up.

7.4.6.7 After removal of the sulfur precipitate by either method listed in section 7.4.6.6, quantitatively transfer the sample extract to a 10 mL volumetric flask and proceed with the packed column GC screening analysis.

7.4.6.8 If the sample needs further clean-up, proceed to the next clean-up procedure.

7.4.7 Silica Gel Adsorption Chromatography:

7.4.7.1 Co-extracted organochlorine pesticides can interfere with PCB identification and quantification. A separation of PCBs from organochlorine pesticides can be accomplished by silica gel adsorption chromatography, allowing the analysis of both PCBs and pesticides as separate fractions.

7.4.7.2 Adjust the sample volume to 0.2 to 0.3 mL with hexane. Prepare a column of 7.5% deactivated silica gel (100-200 mesh, Grade 923, Aldrich), packed with 11.5 g of the silica gel. Rinse the column with 50 mL of methylene chloride followed by 50 mL of pentane. Rinse the stopcock drain tube with 1.0 mL of pentane. Place a 250 mL round bottom under the column to collect the sample eluate.

7.4.7.3 Quantitatively transfer the sample to the silica column using three successive 0.5 mL pentane rinses. Rinse the disposable transfer pipette into the column with 0.5 mL pentane. Rinse the column walls with several disposable pipette volumes of pentane. Elute the silica gel column with 50 mL of pentane. Rinse the stopcock drain tube with 1.0 mL of pentane. This fraction will contain the PCBs.

7.4.7.4 Place a 50 mL bottle under the silica gel column. Elute the silica gel column with 36 mL of 20% methylene chloride in pentane. This second fraction will contain the organopesticides and polychromatic hydrocarbons. This fraction can be stored in a refrigerator and analyzed at a later date if pesticide determination is requested.

7.4.7.5 To the round bottom flask containing the PCB fraction add several boiling chips and rinse the neck of the round bottom flask with several disposable pipette volumes of hexane. Attach a

3-ball snyder distilling column to the 250 mL round bottom flask and prewet the snyder column with 2 mL of hexane.

7.4.7.6 Using a heating mantle, evaporate the solvent to approximately 5 mL. Make sure gentle boiling is taking place and that the snyder column sections are not becoming flooded with solvent. Once the extract reaches approximately 5 mL (do not go to dryness or loss of PCBs can occur) , remove from heat source and quickly rinse the snyder column with 2 mL of hexane. Allow the glassware to cool to room temperature. Loosen the glass joint between the snyder column and 250 mL round bottom flask and rinse the joint into the round bottom flask with 2 mL of hexane.

7.4.7.7 Quantitatively transfer the sample extract to a 15 mL vial with three 2 mL hexane rinses. After the sample has been transferred, rinse the disposable transfer pipette with 0.5 mL of hexane into the 15 mL vial.

7.4.7.8 Evaporate the solvent with a gentle stream of nitrogen gas using a Pierce Reacti-therm heating block equipped with a 9 port syringe needle gas manifold. Gentle heating can be applied (40-50 degrees C.) to facilitate solvent evaporation. The extract should be concentrated to 0.2 to 0.3 mL, but never allow extract to go to dryness (PCB losses can occur).

7.4.7.9 If the sample is to be analyzed at this point, quantitatively transfer the extract to a 10 mL volumetric and proceed with the packed column GC screening analysis.

7.4.7.10 If the sample needs further clean-up, proceed to the next clean-up procedure.

7.5 Calculations:

7.5.1 External Standard Calibration (Packed GC):

7.5.1.1 The packed column GC screening analysis will be done by the external standard calibration technique. Calibration and sample quantification will be performed by a commercial GC software package installed on a personal computer. The GC will be standardized by using Aroclor 1242 and Aroclor 1260. These two Aroclor formulations incorporate most environmental PCBs found in sample extracts and provide a good estimate of PCB amount for final dilution or concentration for capillary analysis. A multi-level calibration curve will be developed based on 1 ppm and 10 ppm standards. Weight percent data (Webb and McCall) will be used to generate standard peak amounts.

7.5.1.2 The calibration curves for each calibrated PCB peak will be calculated using the following formula:

$$\text{Calibration factor} = \frac{\text{Amount (ug) of component}}{\text{Total area of analyte peak}}$$

The calibration curve will be fitted to the calculated calibration factors by a cubic equation to give the best line for all calibration points.

7.5.2 Sample Calculations (Packed GC)

7.5.2.1 The concentration of each identified PCB peak in a sample will be calculated based on the extract volume (not the sample weight or volume) to supply solution concentration values that show if the extract needs to be diluted or concentrated for final capillary GC analysis. The solution concentration of each standardized PCB peak in a sample is calculated as follows:

Concentration (ug/mL) = (Ax) x (CF)

Where: Ax=Area of peak of interest in sample
CF=Calibration factor from peak in standard.

7.5.3 Internal Standard Calibration (Capillary GC)

7.5.3.1 The capillary column GC analysis will be done by the internal calibration technique. Calibration and sample quantification will be performed by a commercial GC software package installed on a personal computer. The capillary GC will be standardized by using an Aroclor mixture that encompasses all the possible PCB congeners present in environmental samples. Refer to Section 6.13 for details on the calibration standard and Aroclor ratios.

7.5.3.2 Response factors for each separated and identified peak in the standard will be calculated using the following formula:

RRF = (Ax/Ais)x(Cis/Cx)

Where: RRF = Relative response factor of congener(s).
Ax = Area of peak for the congener(s).
Ais = Area of peak for the internal standard.
Cx = Concentration of the congener(s).
Cis = Concentration of the internal standard.

7.5.3.3 For the 19 chromatographic peaks that will utilize response factors from tabulated data found in Mullin et at, 1984 (see Section 7.1.2.5), numbers will be manually entered into the peak calibration table used for sample quantification. All calculations will proceed exactly as outlined above for peaks that

319903

have response factors generated from amount information contained in Appendix A.

7.5.4 Sample Calculations (Capillary GC)

7.5.4.1 The concentration of each identified PCB peak in a sample will be calculated based on the sample air dried weight.

7.5.4.2 The sample PCB concentration of each standardized PCB peak is calculated as follows:

$$\text{Concentration (ng/g)} = \frac{[(Ax)(Cis)(D)]}{[(Ais)(RRF)(Ws)]}$$

Where:
- Ax = Peak area for congener(s) being measured.
- Cis = Amount of internal standard added to sample extract
- D = Dilution factor, if sample was diluted prior to analysis.
- Ais = Peak area of added internal standard.
- RRF = Relative response factor for congener(s) being measured,as determined in Section 7.5.3.2.
- Ws = Air dried weight of sample.

The dilution factor (D) is based on a final extract volume of 1 mL. Typically, the sample is extracted with about 200 mL which is then cleaned up and concentrated to a final volume of 10 mL. If no further volume adjustment is required, then D=10. If further dilutions are required, the D=10 x (dilution #1) x (dilution #2) x...

7.5.5 Data Output and Reporting Format:

7.5.5.1 Several specialized software routines have been developed for high resolution PCB analysis to aid the researcher in understanding and organizing the complex data generated from this extremely detailed analysis. Appendix C contains examples of the sample hard copy format that will be used in reporting sample information.

8.0 Quality Control

8.1 Table 3 lists the Quality Control requirements and required recording format that will be applied to the capillary gas chromatographic analysis of PCBs in soils and sediments.

Table 3 - Quality Control Requirements

QC Sample	Reporting Format	Frequency
Lab Blank	Tabulation	Daily, or with each sample analysis sequence (up to 20 samples).
Performance check	Tabulation	Performance check sample analyzed prior to each sample analysis sequence (up to 10 samples).
Duplicate Analysis	Tabulation	One duplicate analysis per 10 field samples, or monthly if less than 10 samples/month are analyzed.
Matrix Spike	Tabulation	One matrix spike per 10 field samples.

8.1.1 Sample Records: All samples that arrive at the lab should be accompanied by a chain of custody document. The following pertinent information should be documented for all samples:

1) Unique label that identifies sample.

2) Location of sample collection site.

3) Date and time of collection.

4) Project name and/or ID number.

5) Field personnel at sampling.

6) Required analysis.

The sample information will be recorded in the Lab Log Books and each sample will be assigned a unique Lab ID Number. The sample analysis will be archived by computer using the Lab ID Number.

8.1.2 Laboratory Blank: The laboratory blank will monitor and assess if the contamination of excessive interference is occurring from laboratory solvents, reagents, and glassware used in processing samples for analysis. The laboratory blank is taken through the sample extraction and clean-up procedures to include all manipulations exposed to actual samples (required volume of solvents, concentration steps, clean-up procedures, etc.). If the laboratory blank is positive for PCB contamination, the source of the contamination must be traced down and eliminated before samples can be processed and analyzed. If non-PCB contamination occurs that interferes with PCB quantification, it too must be traced down and eliminated before proceeding with sample analysis.

The laboratory blank will consist of sandbox sand, purchased at a local hardware store, which has been baked at 250 degrees C. in a vacuum

oven for 24 to 36 hours and allowed to cool and store in glass containers. This is the same procedure used to prepare material which is supplied to EPA's contract laboratories by EMSL/Cincinnvti, for use as clean solid matrix.

8.1.2.1 Samples analyzed after a positive laboratory blank should be considered unreliable. If a laboratory blank is positive for PCBs, the source of contamination shall be located and eliminated. If the contamination occurred during the extraction procedure, the samples will require re-extraction and re-analysis. If the contamination occurred after this step, then re-extraction is not appropriate and the existing extracts will be reanalyzed. Any aliquots of the extracts (i.e., injection vials) which could have become contaminated will be discarded.

8.1.3 Performance Check Standard: As outlined in section 7.2, a performance check standard will be analyzed on each working day prior to sample analysis and at an interval of one performance standard per each sample analysis sequence (up to 10 samples). The performance check standard must meet the acceptance criteria established in Section 7.2. If the performance check standard fails to meet the acceptance criteria, the calibration standard must be analyzed and new response factors generated.

8.1.3.1 The performance check standard must be analyzed again and compared to the acceptance criteria. If the performance check standard fails to meet the acceptance criteria after re-calibration, sample analysis must not proceed until the problem is corrected. A typical analytical sequence is as follows:

1)	Performance check standard.
2)	Method blank.
3 thru 11)	Samples (including duplicates, MS).
12)	Performance check standard.
13 thru 21)	Samples (including duplicates, MS).
22)	Performance check standard.

8.1.3.2 All samples that were analyzed after the performance check standard exceeded established criteria must be re-analyzed.

8.1.4 Duplicate Analysis: Duplicate analysis of the same sample are performed to assess method precision. The percent relative standard deviation of the two measurements on the sample is calculated on total PCB concentration by the following equation:

$$RSD = (DUP1 - DUP2)/AVG \times 100$$

Where:

RSD	=	Percent relative standard deviation.
DUP1	=	the greater of the measured values.
DUP2	=	the lesser of the measured values.
AVG	=	average of the two analyses.

8.1.4.1 The percent relative standard deviation must be less than or equal to 25% if the concentration of PCB in the sample is greater than or equal to 0.5 ppm. The percent relative standard deviation must be less than or equal to 50% if the concentration of the PCB in the sample is less than 0.5 ppm.

8.1.5 Matrix Spike: Spiked sample matrix data are analyzed to assess analytical accuracy. Thus the sample is spiked and carried through sample analytical procedures including extraction, clean-up, and GC analysis. Matrix spike duplicates are not required for this project.

8.1.5.1 If a sample matrix previously analyzed to be free of PCB is available, spike this sample with matrix spike standard (see Section 6.16) at a concentration similar to sample concentrations. Extract and analyze this spiked sample following procedures used for actual sample analysis. Calculate the percent recovery of the matrix spike by the following:

$$P = A/T \times 100$$

Where: P=Percent recovery, %.
A=Concentration of analyte in the spiked sample aliquot.
T=Known true value of the spike concentration added to the sample aliquot.

8.1.5.2 If an uncontaminated sample is not available, the matrix spike can be performed on a sample previously analyzed. There must be sufficient sample for re-analysis as a matrix spike and the sample must be homogeneous in PCB distribution for valid data to be produced. Preferably a sample of low level should be used in this case. Spike the sample with the matrix spike standard (see Section 6.16) at a concentration similar to sample concentrations. Extract and analyze this spiked sample following procedures used for actual sample analysis. Calculate the percent recovery of the matrix spike by the following:

$$P = (A-B)/T \times 100$$

Where: P=Percent recovery, %.
A=Concentration of analyte in the spiked sample aliquot.
T=Known true value of the spike concentration added to the sample aliquot.
B=Background concentration of PCB in the unspiked sample aliquot.

8.1.5.3 The percent recovery for a spiked matrix sample must be greater than or equal to 70% and less than or equal to 130%, based on the total PCB concentration. If a matrix spike recovery sample does not meet the acceptance criteria the cause must be found and corrected. All data collected on samples after the spiked

recovery sample failed to meet the acceptance criteria should be considered unreliable and samples must be re-extracted and analyzed. If additional sample is unavailable, then the data must be flagged as such.

8.1.6 Retention Time Windows

8.1.6.1 The GC system should be checked by the analyst to make sure it is functioning properly before establishing retention time windows. Make three analytical measurements of the standard mixture containing the compounds of interest of a minimum of a 72-hour period.

8.1.6.2 Calculate the standard deviation resulting from the variation in retention times for each component from three analytical runs.

8.1.6.3 The retention time window is defined as plus or minus three times the standard deviation of the three retention time determinations.

8.1.6.4 If the standard deviation for a particular component is zero, substitute the standard deviation of a close eluting compound found in the standard solution.

8.1.6.5 Besides using the retention time window to assign peaks for quantification, the analyst should also rely on his experience in pattern recognition of multi-residue sample analysis.

8.1.6.6 After the daily performance check standard has been analyzed, establish the daily retention time window for each analyte from the retention time of the standard just analyzed. The daily retention time window equals the absolute retention time of the performance check standard (midpoint of the window for the day) plus or minus three times the standard deviation determined in Section 8.1.6.2.

8.1.7 Qualitative Compound Identification/Confirmation: The identification of specific congeners in a PCB mixture is done by comparing the retention time of each peak with the retention times of the peaks in a known standard. The standard, consisting of a specified mixture of three Aroclors (1232, 1248, and 1262), has been completely characterized by workers at EPA's Large Lakes Research Station (see Mullin, 1985). Repeated injections of the standard are used to establish an acceptable "retention time window" for each peak. It should be noted, also, that the experience of the analyst plays a significant role in the recognition of PCB patterns. The Laboratory Director of Northeast Analytical, Inc., Robert Wagner, has over 8 years of experience in performing congener-specific analysis of PCBs. Comparative studies using GC/MS and GC-HECD detector analytical techniques have confirmed the validity of this method.

Potential interferences to the PCB analysis are minimized by a number of mechanisms. These include:

1. The EC detector is largely specific to chlorinated compounds.
2. Rigorous clean-up steps are performed to remove specific interferants, including pesticides, sulfur, lipids and oils, hydrocarbons and biogenic matter. The analyst will strive to produce an extract which is free of interferences.

9.0 References

9.1 US EPA 40 CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants", July, 1988.

9.2 Standard Methods for the Examination of Water and Wastewater, 16th Edition, Published by: American Public Health Association, American Water Works Association, Water Pollution Control Federation, 1985.

9.3 US EPA SW-846, "Test Methods for Evaluating Solid Waste; Volume 1B Laboratory Manual Physical/Chemical Methods", Office of Solid Waste and Emergency Response, 3rd Edition, 1986.

9.4 New York State Department of Health, "Environmental Laboratory Approval Program Certification Manual", Wadsworth Center for Laboratories and Research, 1988.

9.5 Mullin, M.D. 1985. PCB Workshop, US EPA Large Lakes Research Station, Grosse Ile, MI, June.

9.6 James L. Lake, Communication, Silica Gel S.O.P., US EPA Environmental Research Laboratory, Narragansett, RI, 1989.

9.7 G. Seidl, K. Ballschmiter, Isolation of PCBs from Vegetable Oils: Recovery and Efficiency of "Clean-up" Methods, Chemosphere, No. 5, pp 363-366, 1976.

9.8 M. Zell, K. Ballschmiter, Baseline Studies of the GLobal Pollution, III. Trace Analysis of Polychlorinated Biphenyls (PCB) by ECD Glass Capillary Gas Chromatography in Environmental Samples of Different Trophic Levels, Fresenius Z. Anal. Chem., 304, 337-349, 1980.

9.9 R.G. Webb, A.C. McCall, Quantitative PCB Standards for Electron Capture Gas Chromatography, J. CHem. Sci., Vol. II, 366-373, 1973.

9.10 M.D. Mullin, C.M. Pochini, S. McCrindle, M. Romkes, S.H. Save, "High-Resolution PCB Analysis: Synthesis and Chromatographic Properties of All 209 PCB Congeners", Environ. Sci. Technol., Vol. 18, No. 6, pp.468-476, 1984.

Appendix A

Congener Composition of Aroclor Calibration Mixture (6.1 ppm)

(Aroclors 1232, 1248, 1262 in a ratio of 25:18:18)

Peak Number	RRT	Amount (ng/mL)	Congener ID
1	0.3243	430	001
2	0.3536	*	002
3	0.3540	260	003
4	0.3685	28	004, 010
5	0.3887	22	007, 009
6	0.3941	42	006
7	0.3980	500	005, 008
8	0.4102	*	014
9	0.4106	10	019
10	0.4133	*	030
11	0.4220	*	011
12	0.4245	9.2	012, 013
13	0.4269	130	015, 018
14	0.4285	74	017
15	0.4339	8.8	024, 027
16	0.4389	131	016, 032
17	0.4436	*	023
18	0.4485	*	034, 054
19	0.4495	1.8	029
20	0.4517	23	026
21	0.4530	10	025
22	0.4564	166	031
23	0.4573	214	028, 050
24	0.4631	168.5	020, 021, 033, 053
25	0.4670	116.7	022, 051
26	0.4707	27	045
27	0.4746	*	036
28	0.4753	14	046
29	0.4790	*	039
30	0.4798	129.1	043, 052, 073
31	0.4825	90	049
32	0.4844	50	047
33	0.4854	40	048, 075
34	0.4897	*	062, 065
35	0.4915	*	035
36	0.4915	150	044, 104
37	0.4936	88	037, 042, 059
38	0.4990	163	041, 064, 071, 072
39	0.5026	*	068
40	0.5041	*	096
41	0.5031	33	040
42	0.5085	*	057, 103
43	0.5094	5	067, 100

Peak Number	RRT	Amount (ng/mL)	Congener ID
44	0.5119	7.4	058, 063
45	0.5145	81	074, 094
46	0.5164	210	061, 070, 076
47	0.5182	272	066, 093, 095
48	0.5227	14	055, 091, 098
49	0.5274	180	056, 060
50	0.5308	43	084, 092, 155
51	0.5324	3	089
52	0.5346	48	090, 101
53	0.5337	23	099
54	0.5421	1.8	112, 119, 150
55	0.5437	3.6	083, 109
56	0.5472	19	086, 097, 152
57	0.5500	33.2	081, 087, 111, 115
58	0.5528	21	085, 116
59	0.5549	14	136
60	0.5570	71	077, 110
61	0.5630	*	154
62	0.5637	13	082
63	0.5688	57	151
64	0.5714	22	124, 135
65	0.5727	2.23	144
66	0.5739	3.3	107, 108, 147
67	0.5770	*	123
68	0.5775	145	106, 118, 149
69	0.5833	*	139, 140
70	0.5858	8.5	114, 134, 143
71	0.5875	0.91	122, 131, 133, 142
72	0.5945	16	146, 161
73	0.5975	68.04	105, 132
74	0.6001	147.96	153
75	0.6100	*	168
76	0.6106	52	141
77	0.6121	54.6	179
78	0.6163	2.5	130
79	0.6193	13.88	137, 176
80	0.6237	98	138, 160, 163, 164
81	0.6274	12	158
82	0.6315	3	129
83	0.6379	34	178
84	0.6430	*	166
85	0.6439	6	175
86	0.6468	150	182, 187
87	0.6497	4.7	128
88	0.6529	77	183
89	0.6583	1.1	167
90	0.6651	22	185
91	0.6724	110	174, 181
92	0.6778	57	177
93	0.6838	36.9	156, 171

Peak Number	RRT	Amount (ng/mL)	Congener ID
94	0.6889	3.31	202
95	0.6919	*	157
96	0.6928	1.273	173
97	0.6996	20.697	200, 204
98	0.7045	19.2	172, 192
99	0.7104	2.18	197
100	0.7141	240	180
101	0.7190	14	193
102	0.7251	4.5	191
103	0.7323	10	199
104	0.7554	91.1	170
105	0.7611	29.9	190
106	0.7677	0.4	169
107	0.7779	6.7	198
108	0.7826	150	201
109	0.7036	170	196,203
110	0.8171	1.8	189
111	0.8484	55.9	195
112	0.8583	24.9	208
113	0.8774	4.8	207
114	0.9058	69	194
115	0.9241	4	205
116	1.0271	42	206
117	1.0838	0.95	209

RRT= Relative Retention Time to internal standard OCN= 1.0000

* Refer to Section 7.125 for description of peak quantification for congeners with no amount values.

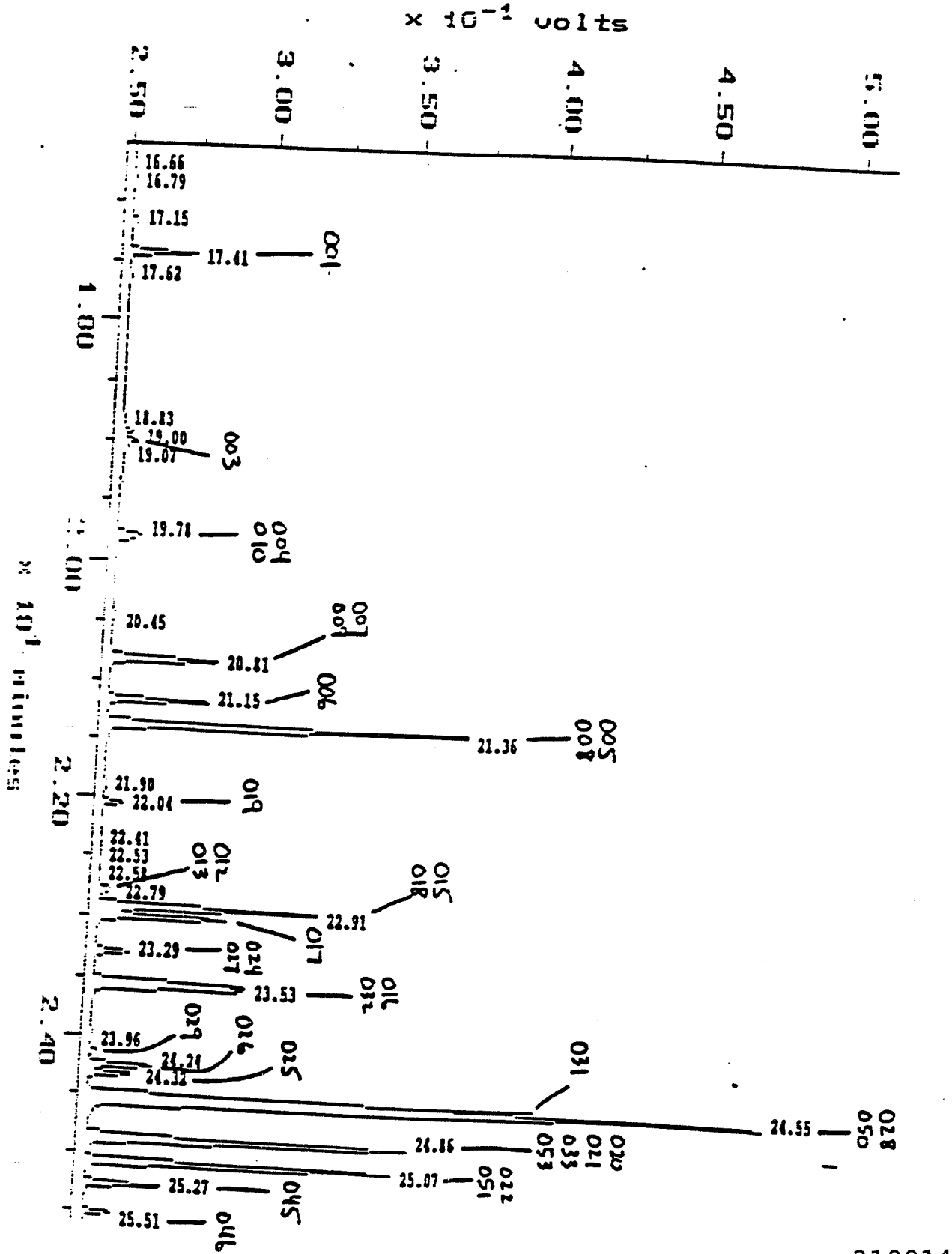
Appendix B

DB-1 Capillary GC Chromatogram of Aroclor Mixture
(Aroclors 1232, 1248, 1262 in a ratio of 25:18:18)

Sample: 1232/1248/1262
Acquired: 27-JUN-89 13:11

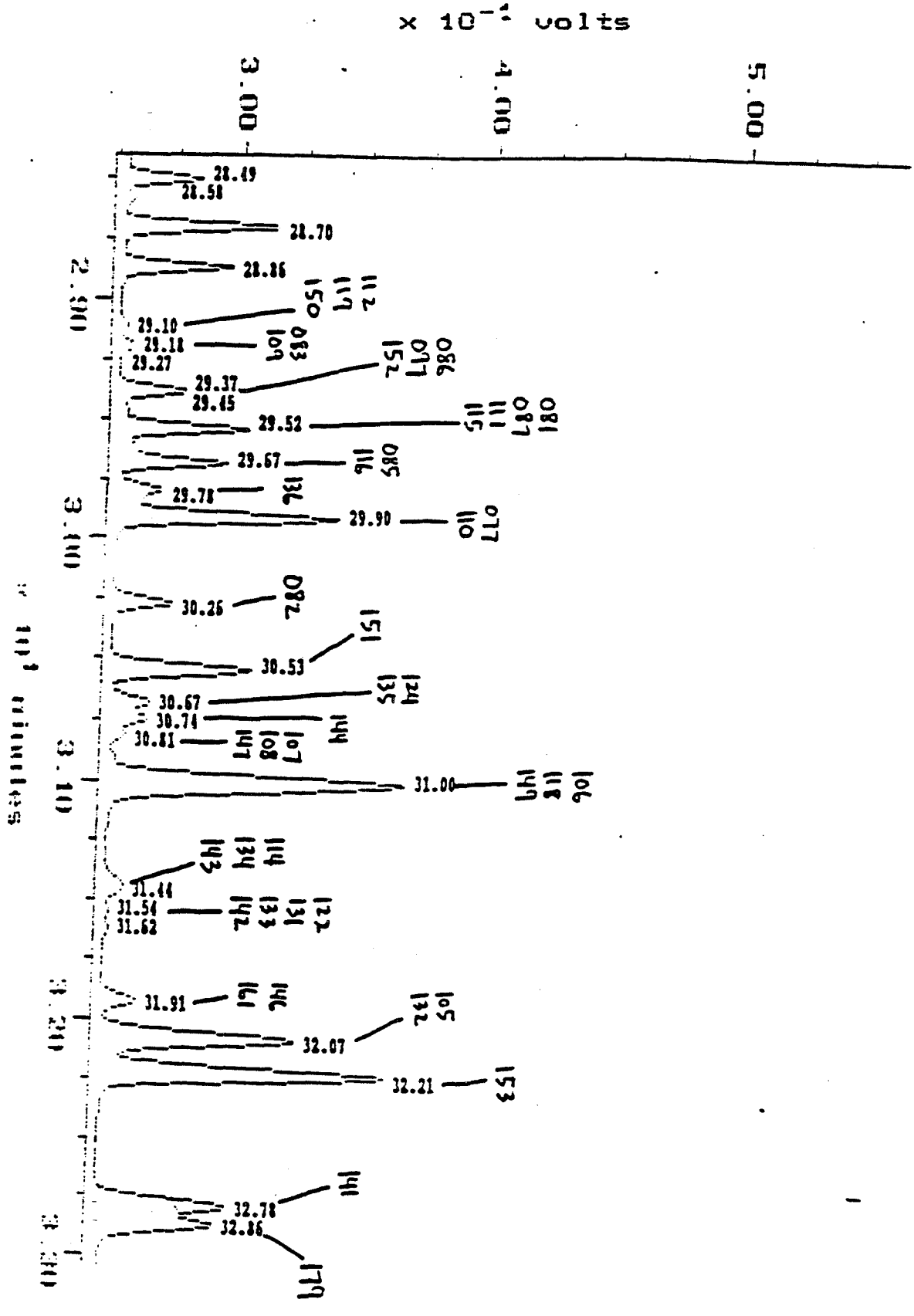
Channel: detector 1
Method: C:\MAZ\GC1\1188A

Filename: 1324862
Operator: EW



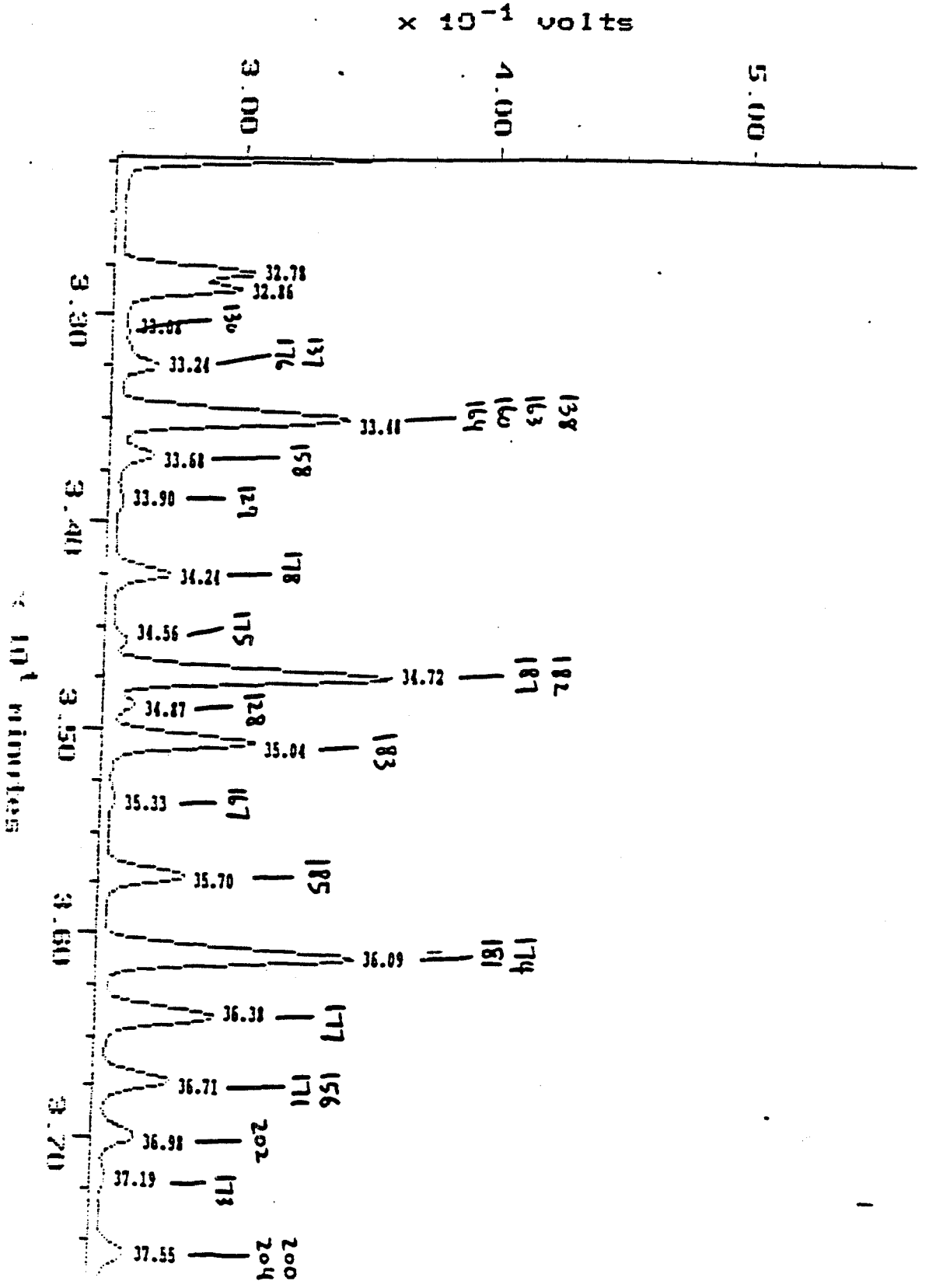
Sample: 1232/1248/1262 Channel: detector 1
Acquired: 27-JUN-89 13:11 Method: C:\MAX\GC1\1181

Filename: A324862
Operator: EM



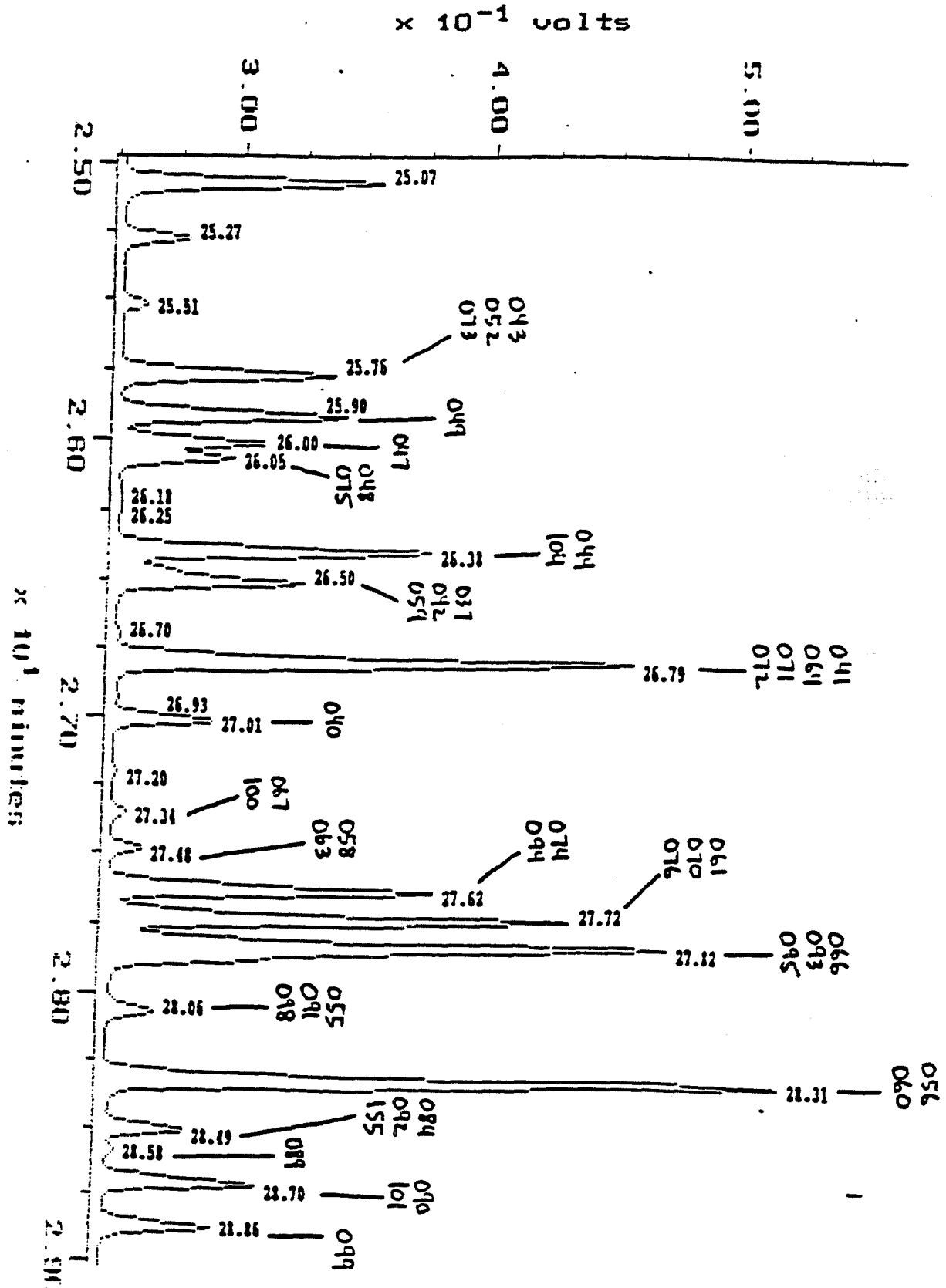
Sample: 1232/1248/1262 Channel: detector 1
Acquired: 27-JUN-89 13:11 Method: C:\MAX\GC1\1181

Filename: A328862
Operator: RKW

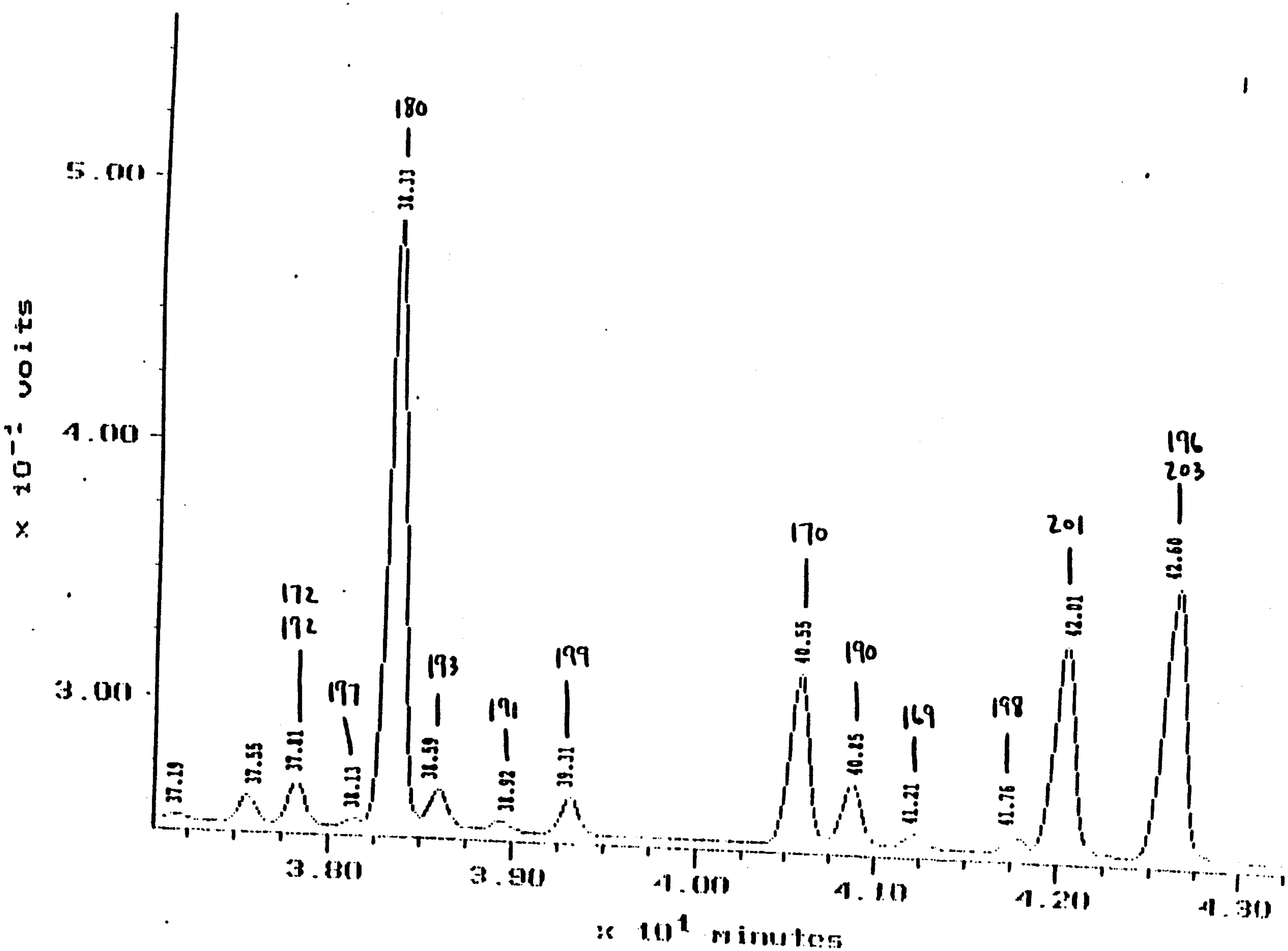


319916

Sample: 1232/1248/1262 Channel: detector 1
Acquired: 27-JUN-89 13:11 Method: C:\NAI\GC1\1188A
Filename: A324862
Operator: ESW



Sample: 1232/1248/1262 Acquired: 27-JUN-89 13:11
Channel: detector 1

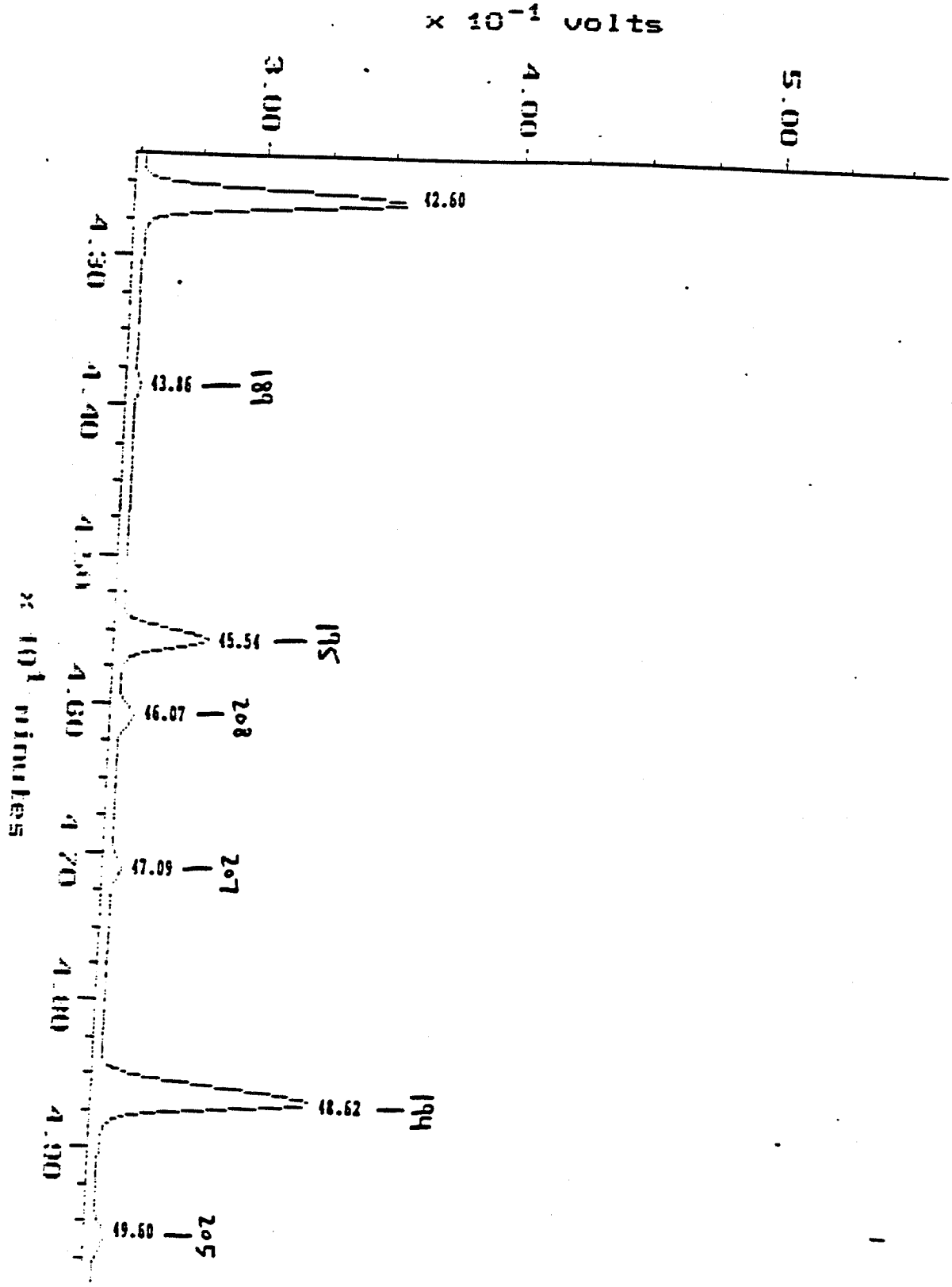


319918

Sample: 1232/1248/1262
Acquired: 27-JUN-89 13:11

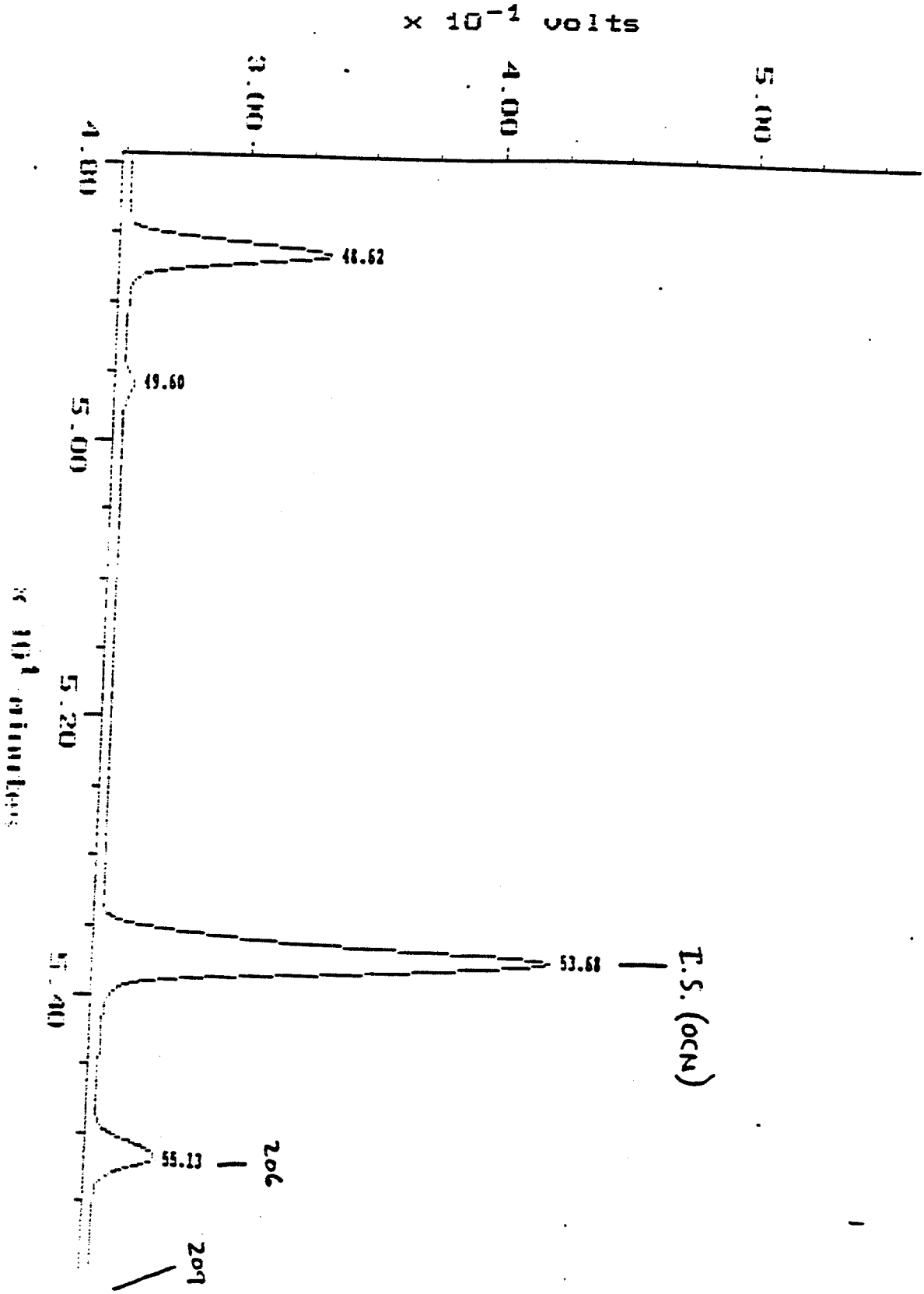
Channel: detector 1
Method: C:\HAX\GC1\1118A

Filename: A324862
Operator: RH



Sample: 1232/1248/1262 Channel: detector 1
Acquired: 27-JUN-89 13:11 Method: C:\HAX\GC1\1188

Filename: A324862
Operator: REW



Appendix C

Format of sample reports and specialized data handling and data reduction reports.

MAXIMA 820 CUSTOM REPORT

Printed: 27-JUL-1989 15:31:58

SAMPLE SEDIMENT, SECTION 617
87 in Method: HIGH RES AROCLOR QUANT.
ACQUIRED: 20-JUL-1989 10:34
Rate: 5.0 points/sec
Duration: 70.000 minutes
Operator: KEH

TYPE: UNKN
Instrument: GC2
FILENAME: 89001
Index: Dist

Dilution: 4.167
Amount: 0.500

DETECTOR: detector 1

ID#	PK#	RETENTION TIME (minutes)	PEAK NAME (chlorine no.)	Peak Area	AMOUNT SOULTION (ug/ml)	SAMPLE AMOUN (ug/g
2	4	17.48	2 (1)	16822.5	0.052630*	0.43862
5	7	19.89	5 (4,10)	94056.9	0.164038!	1.36709
6	9	20.88	6 (7,9)	4289.9	0.001725	0.01438
7	10	21.24	7 (6)	9915.7	0.004179	0.03483
8	11	21.45	8 (5,8)	45470.5	0.020305	0.16922
10	12	22.13	10 (19)	59987.6	0.027093	0.22579
14	13	23.02	14 (15,18)	21477.3	0.011548	0.09624
15	14	23.09	15 (17)	13372.2	0.005714	0.04762
16	15	23.38	16 (24,27)	62691.7	0.013882	0.11569
17	16	23.66	17 (16,32)	31481.6	0.007599	0.06333
19	17	24.06	19 (34,54)	5820.4	0.001119*	0.00933*
21	18	24.34	21 (26)	27177.8	0.005058	0.04215
22	19	24.42	22 (25)	21079.9	0.004588	0.03824
23	20	24.60	23 (31)	34627.1	0.006847	0.05706
24	21	24.64	24 (28,50)	37269.8	0.009023	0.07520
25	22	24.99	25(20,21,33,53)	37185.8	0.008428	0.07024
26	23	25.16	26 (22,51)	28349.4	0.003843	0.03203
27	24	25.37	27 (45)	4313.7	0.001029	0.00858
29	25	25.61	29 (46)	3220.1	0.001429	0.01191
31	26	25.86	31 (52,73)	54018.5	0.015520	0.12935
32	27	26.01	32 (49)	71918.7	0.015636	0.13031
33	28	26.10	33 (47)	98758.1	0.017085	0.14239
37	29	26.49	37 (44,104)	28673.3	0.003803	0.03169
38	30	26.60	38 (37,42,59)	23516.2	0.005290	0.04409
39	32	26.89	39(41,64,71,72)	37428.5	0.004803	0.04003
41	33	27.03	41 (96)	8237.6	0.002223*	0.01853*
42	34	27.11	42 (40)	2516.7	0.000407	0.00339
43	35	27.31	43 (57,103)	11719.7	0.002115*	0.01763*
44	36	27.49	44 (67,100)	10848.3	0.001987*	0.01656*
45	37	27.59	45 (58,63)	3222.5	0.000525*	0.00437*
46	38	27.72	46 (74,94)	13739.7	0.001839	0.01533
48	40	27.97	48 (66,93,95)	35057.2	0.005087	0.04239
49	41	28.17	49 (55,91,98)	38865.8	0.007035	0.05863
50	42	28.42	50 (56,60)	10320.4	0.001376	0.01146
51	43	28.62	51 (84,92,155)	61168.2	0.010703	0.08920
53	44	28.82	53 (90,101)	119450.8	0.026868	0.22392
54	45	28.98	54 (99)	66138.8	0.011244	0.09371
55	46	29.23	55(112,119,150)	19896.4	0.002236*	0.01863*
56	47	29.31	56 (83,109)	8803.6	0.001829	0.01525
57	48	29.50	57 (86,97,152)	18519.2	0.002503	0.02086
58	49	29.66	58 (87,111,115)	27694.5	0.003021	0.02518
59	50	29.81	59 (85,116)	32043.9	0.002879	0.02399
60	99	54.22	I.S. (OCN)	4566128.9	0.202000	
TOTAL				20278027.1	0.49676	4.14000

MAXIMA 820 CUSTOM REPORT

Printed: 27-JUL-1989 16:35:48

SAMPLE: SEDIMENT, SECTION 617
87 in Method: HIGH RES AROCLOR QUANT.
ACQUIRED: 20-JUL-1989 10:34
Rate: 5.0 points/sec
Duration: 70.000 minutes
Operator: REW

TYPE: UNKN
Instrument: GC2
FILENAME: 89001
Index: Disk

Dilution: 4.167
Amount: 0.500

DETECTOR: detector 1

ID#	PK#	RETENTION TIME (minutes)	PEAK NAME (chlorine no.)	Peak Area	AMOUNT SOULTION (ng/ml)	SAMPLE AMOUN (ng/g
1	51	29.92	60 (136)	49734.7	0.010919	0.09100
2	52	30.04	61 (77,110)	124172.2	0.016898	0.14083
3	53	30.30	62 (154)	13529.7	0.002472*	0.02060*
4	54	30.40	63 (82)	4784.6	0.000469	0.00391
5	55	30.69	64 (151)	131715.2	0.020118	0.16767
6	56	30.82	65 (124,135)	64105.8	0.007402	0.06169
8	57	30.96	67(107,109,147)	98570.7	0.014373	0.11979
10	58	31.17	69(106,118,149)	571825.7	0.088853	0.74050
12	59	31.58	71(114,134,143)	20598.9	0.002379	0.01983
13	60	31.79	72(122,31,33,42	15905.4	0.001914*	0.01595*
14	61	32.09	73 (146,161)	92894.3	0.013138	0.10949
15	62	32.26	74 (105,132)	118195.4	0.009147	0.07623
16	63	32.39	75 (153)	326473.3	0.075866	0.63227
18	64	32.97	77 (141)	117796.2	0.007936	0.06614
21	66	33.36	80 (137)	40671.6	0.006651	0.05543
22	67	33.44	81 (176)	32099.3	0.002073*	0.01728*
23	68	33.69	82(138,160,3,4)	404734.7	0.060371	0.50313
24	69	33.88	83 (158)	43052.2	0.003625	0.03021
25	70	34.11	84 (129)	7992.3	0.000879	0.00733
26	71	34.45	85 (178)	54400.3	0.007313	0.06095
28	72	34.78	87 (175)	12024.6	0.002160*	0.01800*
29	73	34.94	88 (182,187)	240682.9	0.035214	0.29347
30	74	35.10	89 (128)	39935.1	0.002761	0.02301
31	75	35.27	90 (183)	134422.3	0.018141	0.15118
32	76	35.57	91 (167)	14693.5	0.002[illegible]7	0.02231
33	77	35.94	92 (185)	46459.0	0.003893	0.03245
34	78	36.34	93 (174,181)	247191.1	0.029164	0.24305
35	79	36.64	94 (177)	143527.1	0.016853	0.14046
36	80	36.97	95 (156,171)	107088.6	0.009579	0.07983
38	81	37.24	97 (157)	20714.4	0.003228	0.02683
39	82	37.45	98 (173)	5934.7	0.000200*	0.00166*
40	83	37.83	99 (200,204)	15595.0	0.001545*	0.01288*
41	84	38.09	100 (172,192)	57179.2	0.005783	0.04820
43	85	38.62	102 (180)	567316.0	0.060987	0.50760
44	86	38.89	103 (193)	32653.3	0.001589*	0.01324*
45	87	39.23	104 (191)	13896.5	0.000639*	0.00533*
46	88	39.62	105 (199)	22381.4	0.001327*	0.01106*
47	89	40.88	106 (170)	316544.6	0.023393	0.19496
48	90	41.18	107 (190)	73528.3	0.004853	0.04045
49	92	42.11	108 (198)	10419.1	0.000479*	0.00400*
50	93	42.37	109 (201)	147378.5	0.011881	0.09835
51	94	42.95	110 (196,203)	193149.8	0.014278	0.11982
52	95	44.24	111 (189)	11566.8	0.000379*	0.00316*
53	96	45.96	112 (195)	82128.2	0.005304	0.04420
56	97	49.10	115 (194)	195965.6	0.010702	0.08919
57	98	50.10	116 (205)	7874.8	0.000275*	0.00229*
58	99	54.22	I.S. (OCN)	4566128.9	0.202000	

NORTHEAST ANALYTICAL, INC.

301 MOTT STREET
SCHENECTADY, NY 12305
(518) 346-4592

PCB CONGENER AMOUNT and NANOMOLE REPORT

NEA FILE NAME: 89001.MOL

CUSTOMER: J. EPA
SAMPLE DESCRIPTION: SEDIMENT, SECTION 617
COMMENT: SAMPLE SHOWED ENVIRONMENTAL ALTERATION

TYPE FOR MIXED PEAK DECONVOLUTION= S

PEAK NO.	MOLECULAR WT.	AMOUNT	Nanomoles/g(ml) Sample
2	188.70	0.43862	2.32443
5	223.10	1.36709	6.12770
6	223.10	0.01438	0.06446
7	223.10	0.03483	0.15612
8	223.10	0.16922	0.75849
10	257.50	0.22579	0.87685
14	249.00	0.09624	0.38651
15	257.50	0.04762	0.18493
16	257.50	0.11569	0.44928
17	257.50	0.06333	0.24594
19	267.90	0.00933	0.03483
21	257.50	0.04215	0.16369
22	257.50	0.03824	0.14850
23	257.50	0.05706	0.22159
24	257.50	0.07520	0.29204
25	259.50	0.07024	0.27067
26	258.70	0.03203	0.12381
27	292.00	0.00858	0.02938
29	292.00	0.01191	0.04079
31	292.00	0.12935	0.44298
32	292.00	0.13031	0.44627
33	292.00	0.14239	0.48764
37	292.00	0.03169	0.10853
38	272.40	0.04409	0.16186
39	292.00	0.04003	0.13709
41	326.40	0.01853	0.05677
42	292.00	0.00339	0.01161
43	298.90	0.01763	0.05898
44	298.90	0.01656	0.05540
45	292.00	0.00437	0.01497
46	292.00	0.01533	0.05250
48	293.50	0.04239	0.14443
49	324.70	0.05863	0.18057
50	292.00	0.01146	0.03925

NORTHEAST ANALYTICAL, INC.

301 NOTT STREET
SCHENECTADY, NY 12305
(518) 346-4592

CONGENER WEIGHT and MOLE REPORT

NEA FILE NAME: 89001.MOL

CUSTOMER: J. EPA
SAMPLE DESCRIPTION: SEDIMENT, SECTION 617
COMMENT: SAMPLE SHOWED ENVIRONMENTAL ALTERATION

TYPE FOR MIXED PEAK DECONVOLUTION= S

PEAK#	RET. TIME	T-CL:O-CL	IUPAC#	RRT	CONGENERS	WEIGHT %	MOLE %
2	17.48	1:1	001	.1544	2	4.716	7.543
5	19.89	2:2	004 010	.2245	22' ; 26	14.697	19.885
6	20.88	2:1	007 009	.2566	24 ; 25	0.155	0.209
7	21.24	2:1	006	.2709	23'	0.374	0.507
8	21.45	2:1	005 008	.2785	23 ; 24'	1.819	2.461
10	22.13	3:3	019	.3045	22'6	2.427	2.845
14	23.02	3:2 2:0	018 015	.3387	22'5 ; 44'	1.035	1.254
15	23.09	3:2	017	.3398	22'4	0.512	0.600
16	23.38	3:2	024 027	.3508	236 ; 23'6	1.244	1.458
17	23.66	3:2	016 032	.3625	22'3 ; 24'6	0.681	0.798
19	24.06	3:1 4:4	034 054	.3800	2'35 ; 22'66'	0.100	0.113
21	24.34	3:1	026	.3911	23'5	0.453	0.531
22	24.42	3:1	025	.3937	23'4	0.411	0.482
23	24.60	3:1	031	.4024	24'5	0.613	0.719
24	24.64	3:1 4:3	028 050	.4031	244' ; 22'46	0.808	0.948
25	24.99	3:1 4:3	021 033	.4170	233' ; 234 ; 22'56'	0.755	0.878
26	25.16	3:1 4:3	022 051	.4257	234' ; 22'46'	0.344	0.402
27	25.37	4:3	045	.4334	22'36	0.092	0.095
29	25.61	4:3	046	.4450	22'36'	0.128	0.132
31	25.86	4:2	052 073	.4554	22'55' ; 23'5'6	1.391	1.438
32	26.01	4:2	049	.4610	22'45	1.401	1.448
33	26.10	4:2	047	.4639	22'44'	1.531	1.582
37	26.49	5:4 4:2	104 044	.4832	22'466' ; 22'35'	0.341	0.352
38	26.60	3:0 4:2	037 042	.4870	344' ; 22'34' ; 233'6	0.474	0.525
39	26.89	4:2	064 071	.4990	23'34 ; 234'6 ; 23'4'6 +	0.430	0.445
41	27.03	5:4	096	.5057	22'366'	0.199	0.184
42	27.11	4:2	040	.5102	22'33'	0.036	0.038
43	27.31	5:3 4:1	103 057	.5155	22'45'6 ; 233'5	0.190	0.191
44	27.49	5:3 4:1	100 067	.5212	22'44'6 ; 23'4'5	0.178	0.180
45	27.59	4:1	058 063	.5267	233'5' ; 234'5	0.047	0.049
46	27.72	4:1 5:3	074 094	.5340	244'5 ; 22'356'	0.165	0.170
48	27.97	4:1 5:3	066 095	.5447	23'44' ; 22'356 ; 22'35'6	0.456	0.469
49	28.17	5:3 4:1	091 098	.5549	22'34'6 ; 22'3'46 ; 233'4	0.630	0.586
50	28.42						

319925

place.

The sample custodian fill out a bin index card, which is submitted to the section leader responsible for the job. An example of a bin card is included as Figure VII-14. When the program is complete, the section leader signs the card and returns it to the sample custodian. The section leader states the method of disposal or whether the samples should be saved. One month after the receipt of the bin card the sample custodian disposes or archives the sample as stated on the card. Additional information on sample disposal can be found in Section VIII.

F. Sample Transfer

If analysis of the samples is not possible at OBG Laboratories, Inc., then the samples will be subcontracted to another approved laboratory. The samples will be packed in coolers at 4° C and be shipped by common carrier or delivered by OBG Laboratory personnel. A chain of custody listing OBG Laboratories sample number, sample preparation date and tests required will accompany the samples.

G. Computer Services

OBG Laboratories has a LIMS system in place. The system is currently only being used for scheduling analyses and generation of control charts. Client reports or other types of forms are not being computer generated.

The QA/QC officer is responsible for verifying that the QC data was input properly and that it is being calculated properly by the computer. Whenever control charts are printed or control limits generated, the information is checked for accuracy.

Each analyst has a unique sign on code and all QC data that they enter into the

53	28.82	5:2	101 090	.5814	22'34'5 ; 22'455'	2.407	2.226
54	28.98	5:2	099	.5880	22'44'5	1.007	0.932
55	29.23	6:4 5:2	150 112	.5969	22'34'66' ; 233'56 ; 23'44'6	0.200	0.185
56	29.31	5:2	083 109	.6029	22'33'5 ; 233'46	0.164	0.152
57	29.50	6:4 5:2	152 097	.6062	22'3566' ; 22'345 ; 22'3'45	0.224	0.207
58	29.66	5:2	087 111	.6175	22'345' ; 233'55' ; 2344'6	0.271	0.250
59	29.81	5:2	085 116	.6224	22'344' ; 23456?	0.258	0.239
60	29.92	6:4	136	.6257	22'33'66'	0.978	0.818
61	30.04	4:0 5:2	077 110	.6295	33'44' ; 233'4'6	1.514	1.447
62	30.30	6:3	154	.6349	22'44'56'	0.221	0.185
63	30.40	5:2	082	.6453	22'33'4	0.042	0.039
64	30.69	6:3	151	.6499	22'355'6	1.803	1.508
65	30.82	6:3 5:1	135 124	.6563	22'33'56' ; 2'344'5	0.663	0.571
67	30.96	5:1 6:3	107 108	.6628	233'4'5 ; 233'45' ; 22'34'56	1.288	1.154
69	31.17	6:3 5:1	149 118	.6672	22'34'5'6 ; 23'44'5 ; 233'45	7.961	7.120
71	31.58	6:3 5:1	134 143	.6796	22'33'56' ; 22'3456'; 2344'5	0.213	0.185
72	31.79	5:1 6:3	122 131	.6871	2'33'45; 22'33'46;22'33'55'+	0.171	0.154
73	32.09	6:2	146 161	.6955	22'34'55' ; 233'45'6	1.177	0.984
74	32.26	6:3 5:1	132 105	.7035	22'33'46' ; 233'44'	0.820	0.711
75	32.39	6:2	153	.7036	22'44'55'	6.797	5.685
77	32.97	6:2	141	.7203	22'3455'	0.711	0.595
80	33.36	6:2	137	.7329	22'344'5	0.596	0.498
81	33.44	7:4	176	.7305	22'33'466'	0.186	0.142
82	33.69	6:2	138 163	.7403	22'344'5' ; 233'4'56 ; +2	5.409	4.524
83	33.88	6:2	158	.7429	233'44'6	0.325	0.272
84	34.11	6:2	129	.7501	22'33'45	0.079	0.066
85	34.45	7:3	178	.7537	22'33'55'6	0.655	0.500
87	34.78	7:3	175	.7611	22'33'45'6	0.194	0.148
88	34.94	7:3	187 182	.7653	22'34'55'6 ; 22'344'56'	3.155	2.409
89	35.10	6:2	128	.7761	22'33'44'	0.247	0.207
90	35.27	7:3	183	.7720	22'344'5'6	1.625	1.241
91	35.57	6:1	167	.7814	23'44'55'	0.240	0.201
92	35.94	7:3	185	.7848	22'3455'6	0.349	0.267
93	36.34	7:3	174 181	.7965	22'33'456' ; 22'344'56	2.613	2.000
94	36.64	7:3	177	.8031	22'33'4'56	1.510	1.156
95	36.97	7:3 6:1	171 156	.8105	22'33'44'6 ; 233'44'5	0.858	0.678
97	37.24	6:1	157	.8184	233'44'5'	0.288	0.241
98	37.45	7:3	173	.8152	22'33'456	0.018	0.014
99	37.83	8:4	200 204	.8197	22'33'45'66' ; 22'344'566'	0.138	0.097
100	38.09	7:2	172 192	.8278	22'33'455' ; 233'455'6	0.518	0.396
102	38.62	7:2	180	.8362	22'344'55'	5.457	4.167
103	38.89	7:2	193	.8397	233'4'55'6	0.142	0.109
104	39.23	7:2	191	.8447	233'44'5'6	0.057	0.044
105	39.62	8:4	199	.8494	22'33'4566'	0.119	0.084
106	40.88	7:2	170	.8740	22'33'44'5	2.096	1.600
107	41.18	7:2	190	.8740	233'44'56	0.435	0.332
108	42.11	8:3	198	.8[illegible]	22'33'455'6	0.043	0.030
109	42.37	8:3	201	.8875	22'33'4'55'6	1.057	0.743
110	42.95	8:3	196 203	.8935	22'33'44'5'6 ; 22'344'55'6	1.288	0.905
111	44.24	7:1	189	.9142	233'44'55'	0.034	0.026
112	45.96	8:3	195	.9321	22'33'44'56	0.475	0.334
115	49.10	8:2	194	.9620	22'33'44'55'	0.959	0.673
116	50.10	8:2	205	.9678	233'44'55'6	0.025	0.017

CONCENTRATION = 9.302

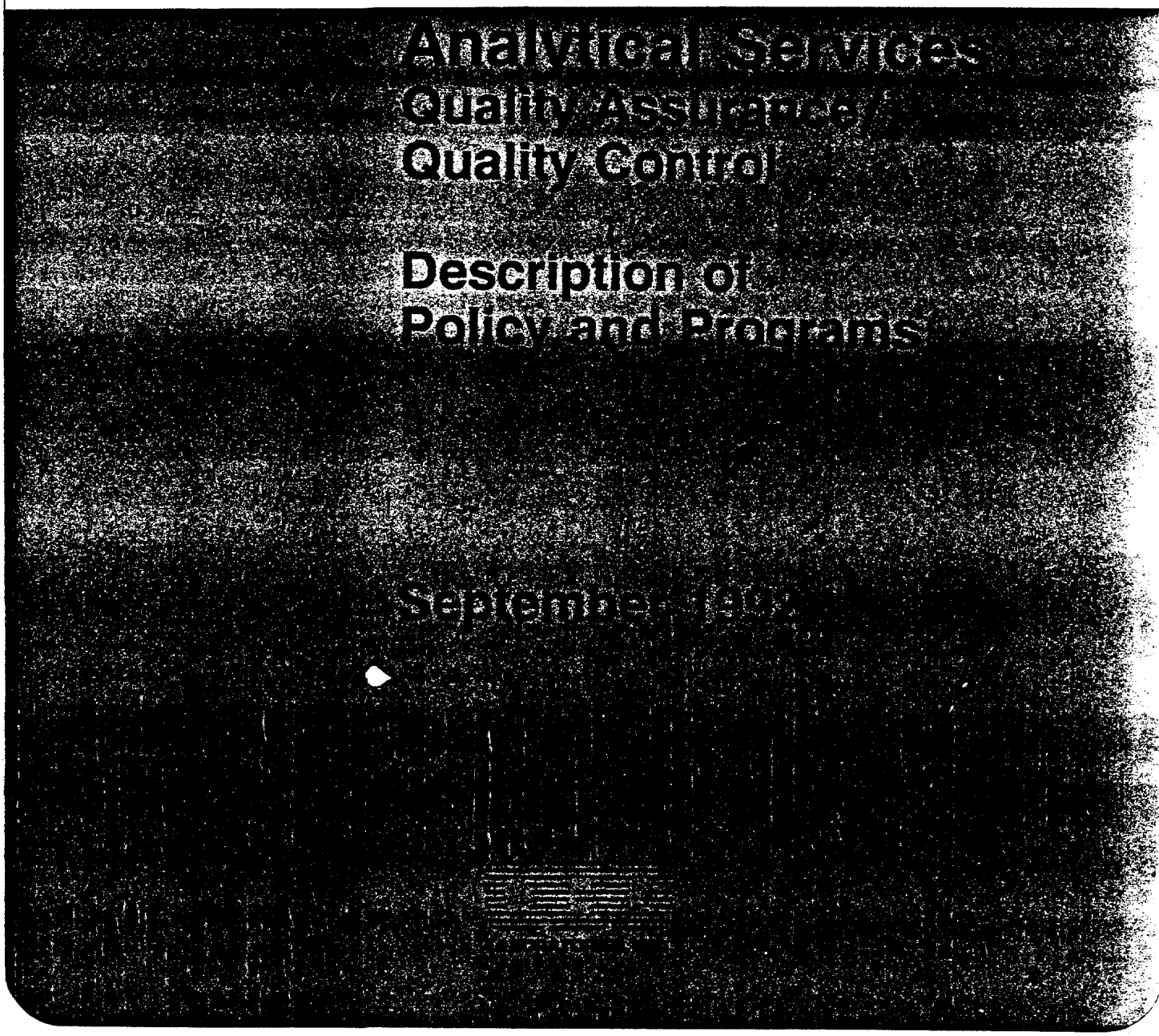
TOTAL MICROMOLES = 0.0308

AVERAGE MOLECULAR WEIGHT = 301.8

NUMBER OF CALIBRATED PEAKS FOUND= 88

APPENDIX C

Quality Assurance Manual



SECTION II. TABLE OF CONTENTS

SECTION II. TABLE OF CONTENTS

LIST OF TABLES

SECTION II. TABLE OF CONTENTS

LIST OF FIGURES

SECTION II. TABLE OF CONTENTS

LIST OF FIGURES

SECTION II. TABLE OF CONTENTS

APPENDIX

SECTION III. STATEMENT OF POLICY

OBG Laboratories, Inc. is located in the corporate headquarters of O'Brien and Gere Limited in Syracuse, New York. The firm is involved in the chemical and microbiological analysis of environmental contaminants in a variety of matrices. The ability of the laboratory to accurately identify and quantify these contaminants is of great importance. The decisions or conclusions based on these data are only as good as the documented quality of the data. The purpose of this manual is to document the procedures used to verify the high quality of analysis.

A. Quality Assurance/Quality Control Program Objectives

Quality control is the routine application of procedures used in the laboratory and in the field for controlling the measurement process. Quality assurance is the total program for assuring the reliability of field and analytical data.

The goal of the laboratory Quality Assurance/Quality Control (QA/QC) Program is to produce data of adequate quality and to provide the necessary documentation to verify these results. The data would have adequate quality if the data has consistency (precision) and the uncertainty is small when compared to specific requirements (accuracy). These objectives are accomplished through the use of quality control samples such as duplicates, spikes, blanks, surrogates, and reference samples. The lab also performs initial start up procedures to verify the accuracy and precision of the methods and to calculate MDLs (Method Detection Limits). Implementation of this program maximizes the validity of the data. Thus, the data can provide a reliable

foundation on which to base decisions.

A major effort of the QA/QC Program is to provide detailed control charts and control limits for monitoring the laboratory's daily performance and to plot trends over an extended period of time. These charts provide documentation that data collected, reported, or used by the laboratory are scientifically valid and of known precision and accuracy. The QA/QC activities performed at OBG Laboratories are carried out in accordance with established federal and state protocols.

B. Lab Policy on QA/QC

OBG Laboratories fully supports the QA/QC program outlined in this manual. This program has been implemented and is maintained to demonstrate that data reported by the laboratory are of known and documented quality. The technical and support personnel who contribute to any portion of the laboratory analyses follow the QA/QC procedures outlined in this manual.

The QA/QC manual is an integral part of routine laboratory practice. It is primarily intended to set control guidelines and direction for the chemical and microbiological measurements performed by the laboratory for non-CLP analyses. When NYSDEC or U.S. EPA CLP protocol is required, QA/QC procedures and documentation are done according to CLP guidelines. The contents of this manual will be re-evaluated and revised on a regular basis.

C. Levels of QC

Several different levels of QC and QA/QC documentation are available to a client utilizing OBG Laboratories' services. When clients submit samples for analysis, they can

receive only the sample results or they can request copies of any of the routine laboratory QC that was analyzed in the same batch as their group of samples. They may also request that specific QC be performed on their samples. As a last option, clients can request a full CLP package, which would include all QC and deliverables as required by NYSDEC or U.S. EPA CLP.

SECTION IV. ORGANIZATION AND RESPONSIBILITY

Any organization consists of a number of people whose skill and responsibilities determine the quality of the final product. The product of OBG Laboratories, Inc. is analytical services. The laboratory functions as a chemical laboratory only. All personnel have sufficient training in their appointed positions to contribute to the analysis and reporting of high quality data. The training is achieved through internal training, experience, and selected specialty courses.

Figure IV-1 is an organization chart of the laboratory staff.

The vice president's responsibilities involve the development and monitoring of the internal systems necessary to assure quality of the analytical data. His duties include the planning necessary to support methods development, review of QA/QC control information, review of proficiency sample results, and support necessary for the acquisition of personnel and instrumentation.

The day-to-day scheduling and coordination is handled by the manager of analytical services who reports to the vice president. The manager monitors the daily work load and redirects the section resources to complete project deadlines. The manager coordinates and distributes the project information to the section leaders and reviews the output to verify its completeness and technical acceptability. The manager also reviews QA/QC consistency between the laboratory sections.

The section leaders manage the day-to-day scheduling and operation of the individual analytical areas and report to the manager of analytical services. Their

responsibilities include monitoring of individual projects and project specific QA/QC, verification that analyses are conducted within contract holding times and implementing corrective action procedures recommended by the QA/QC officer. In addition, section leaders coordinate with the client or project manager to answer any questions related to the analytical requirements of the individual projects.

On a weekly basis the manager and section leaders meet to discuss the progress of in-house programs, staffing, the schedule of analytical programs, instrument problems, and analytical quality control. This information is also forwarded to the vice president for consideration and planning. The section leaders work with the QA/QC officer to keep the quality control procedures accurate and up to date. Together the section leaders and the QA/QC officer work on revisions of procedures applicable to their individual sections.

The QA/QC officer is responsible for the implementation, monitoring, and supervision of the Quality Control Program. The QA/QC officer reports directly to the vice president. The QA/QC officer verifies that the analyses are conducted in strict adherence to the procedures set forth in this manual. The QA/QC officer's duties include:

1) Developing and implementing new QA/QC programs, including statistical techniques and procedures
2) Conducting regular audits and inspections of analytical procedures and applications
3) Daily monitoring of analytical parameter accuracy and precision
4) Discussing necessary corrective action procedures with laboratory manager and individual section leaders

5) Generating control charts and setting control and warning limits on all parameters

6) Advising management of the status of the QA/QC program and giving recommendations for improvement

7) Writing, submitting and updating Quality Assurance Plans.

The sample custodians, who are part of the support staff, are responsible for initiating chain of custody procedures. Upon receipt of samples, they verify that the samples have been properly preserved. After receipt of samples, they are responsible for keeping them in a secure and restricted location.

OBG Laboratories also has a safety officer who is responsible for the distribution of the safety manual and the scheduling of safety training sessions for all new employees. The safety manual outlines safety policies, procedures, and guidelines. The safety officer, the section leaders and the manager meet periodically to review the safety manual and update it as necessary. A copy of the laboratory safety manual is included as Appendix A in this document.

OBG LABORATORIES ORGANIZATIONAL CHART

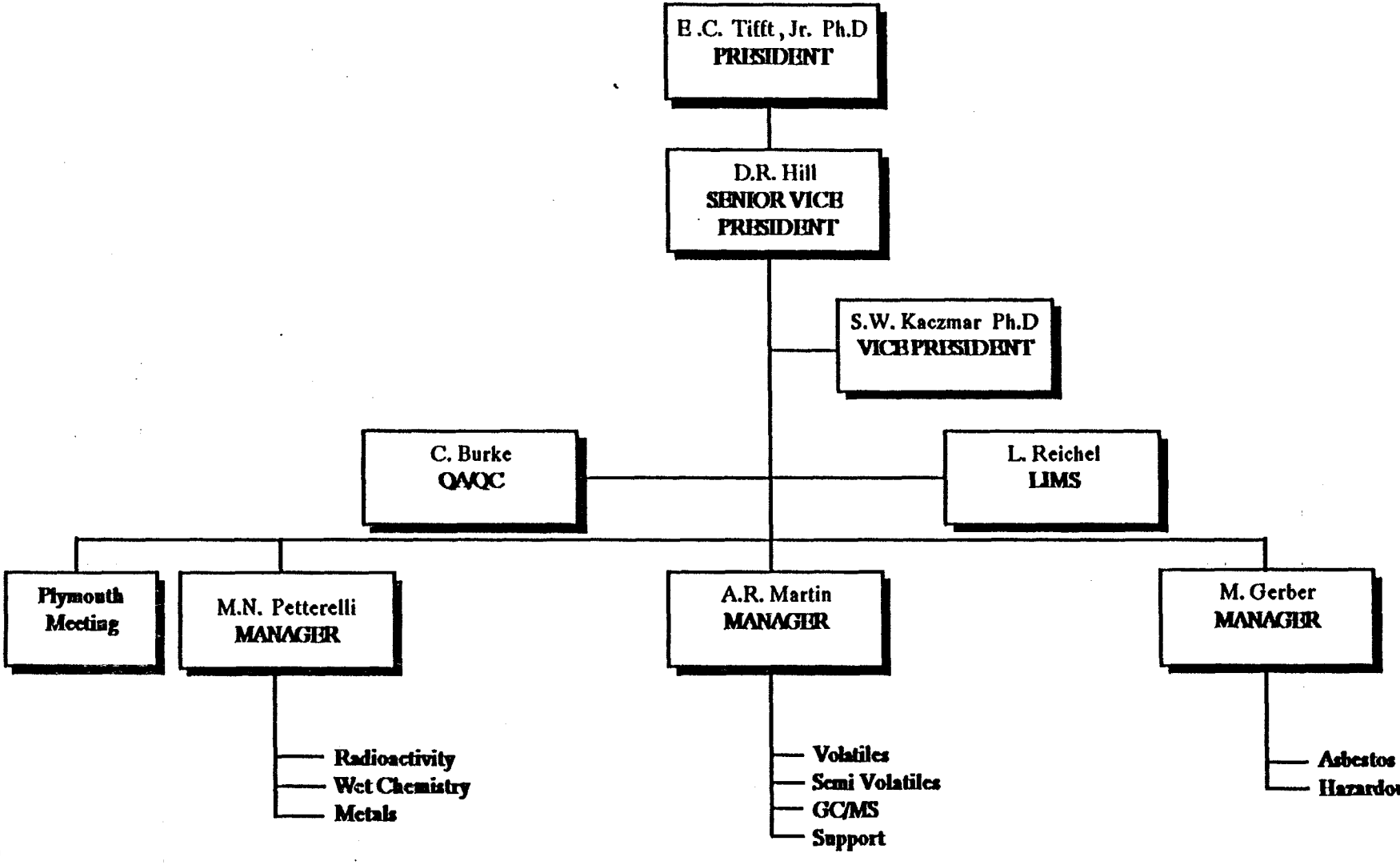


FIGURE IV-1

Section No. IV
Revision No. 1
Date: 09/25/92
Page 4 of 4

1-28-92

319941

SECTION V. QA LIMITS FOR PRECISION AND ACCURACY

Table V-1 is a listing of the accuracy and precision limits, MRDLs (minimum reportable detection limits) and methods used in the laboratory. Table V-2 is a listing of all sample preparation procedures used in the laboratory and their applicable methods.

The accuracy and precision limits listed in the table are derived from in-house data. Sufficient points for several parameters were not available at the time the limits were set. For these parameters, the limits have been arbitrarily set based on previous lab experience or are limits taken from the applicable method. As more points are added to the data base, the laboratory limits for these parameters are reestablished. Limits that are not derived from laboratory data are flagged with an asterisk (*). All limits are updated yearly, at a minimum.

Laboratory QA/QC limits are included to give an indication of the laboratory capabilities. Method QA/QC limits will be used if they are more stringent then the laboratory limits. Limits included in the table may not be the must up to date limits, since they are being updated at deemed statistically necessary. The most recent QA/QC limits are available from the laboratory.

Minimum reportable detection limits are included in Table V. Minimum reportable detection limits are the routine detection limits that are reported. Lower detection limits can be achieved and are avialable upon request. MDL and IDL studies are available from the laboratory.

Completeness can be described as a measure of the actual amount of usable

data obtained from an analytical procedure to the expected amount. The goal of OBG Laboratories' QA/QC program is to maintain a 90% completeness rate.

All laboratory QC data are entered into the Laboratory Information Management System (LIMS). A statistical program on the LIMS generates control charts and computes control and warning limits. Charts are generated, by matrix and method, for each parameter analyzed in the lab. Control limits are generated once a year by taking the last 20 to 50 points, depending on the amount of data in the data base, from the previous year and calculating the mean, standard deviation, and warning and control limits for the current year. Control limits can be updated more frequently if deemed statistically necessary.

When QC data are entered, the computer automatically compares the results to the established control limits. If the QC data fall outside of these control limits, the analyst is prompted to provide an explanation. A password is required by the QC officer to enter the data into the data base. In addition, the analyst informs the section leader of an out of control situation and the section leader insures that the analyst takes corrective action. Sample results are not reported until QA/QC criteria has been met.

An out-of-control log can be printed daily listing all QC that failed to meet established criteria and the associated explanations that were entered by the analysts. The out-of-control log is reviewed weekly by the QA/QC officer. The QA/QC officer reviews the out-of-control log to verify that corrective measures are being taken and documented. The out-of-control log is used as a summary of the percentage of QC data that does not meet established criteria. An example of the out-of-control log is included

as Figure V-1.

Whenever information in the QC data base is changed, an audit log is created listing who made the change, what was changed, and the date the change was made. Audit trails are noted even when typographical errors are made when entering the QC data. The audit log is used as evidence of changes that are made to the QC data base and helps prevent any unnecessary tampering with the data. An example of the audit log is included as Figure V-2.

TABLE V-1
ACCURACY, PRECISION AND MDLs

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Acidity as $CaCO_3$	Water	305.1[2]	85.0-115.0*	0.0-20.0*	1. mg/L
Alkalinity as $CaCO_3$	Water	310.1[2]	91.6-106.0	0.0-19.3	1. mg/L
Ammonia as N	Water	350.1[2]	86.3-119.1	0.0-24.2	0.05 mg/L
	Solid	350.1[2]	91.8-111.4	0.0-7.3	5. mg/kg
5-day BOD	Water	405.1[2]	82.1-116.6	0.0-23.3	1. mg/L
5-day CBOD	Water	507[3]	85.0-115.0*	0.0-20.0*	1. mg/L
COD	Water	410.4[2]	72.4-112.3	0.0-24.2	10. mg/L
Chloride	Water	325.2[2], 9251[1]	82.6-116.5	0.0-28.0	1. mg/L
	Solid	9251[1]	82.1-125.6	0.0-11.3	10. mg/kg
Chlorine, total residual	Water	330.5[2]	85.0-115.0*	0.0-20.0*	0.1 mg/L
Color	Water	110.2[2]	NA	0.0-29.3	5. C.P.U.
Cyanide, total	Water	335.2[2], 9010[1]	80.3-118.1	0.0-34.3	0.01 mg/L
	Solid	9010[1]	82.5-112.5	0.0-34.3	1. mg/kg
Cyanide, amenable to chlorination	Water	335.1[2], 9010[1]	80.3-118.1	0.0-20.0*	0.01 mg/L
	Solid	9010[1]	82.5-112.5	0.0-20.0*	1. mg/kg
Fluoride, total	Water	340.2[2]	72.0-139.8	0.0-39.5	0.1 mg/L
	Solid	340.2[2]	90.4-109.1	0.0-23.1	10. mg/kg
Hydrogen Ion (pH)	Water	150.1[2], 9040[1]	+/- 0.2 pH units	0.0-20.0*	
	Solid	9045[1]	+/- 0.2 pH units	0.0-20.0*	

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECSION % RPD	MRDL
Kjeldahl nitrogen, total as N	Water	351.2[2]	75.3-122.3	0.0-20.1	0.1 mg/L
	Solid	351.2[2]	89.5-105.7	0.0-10.2	1. mg/kg
Nitrite plus nitrate	Water	353.2[2]	79.1-116.6	0.0-10.3	0.05 mg/L
	Solid	353.2[2]	80.0-120.0*	0.0-20.0*	5. mg/kg
Nitrite	Water	354.1[2]	90.2-117.2	0.0-20.0*	0.05 mg/l
	Solid	354.1[2]	80.0-120.0*	0.0-20.0*	5. mg/kg
Nitrate	Water	Subtraction	80.0-120.0*	0.0-20.0*	0.05 mg/l
	Solid	Subtraction	80.0-120.0*	0.0-20.0*	5. mg/kg
Odor	Water	140.1[3]	NA	0.0-20.0*	1. T.O.N.
Oil and grease, total recoverable	Water	413.1[2], 9071[1]	62.6-99.5	0.0-31.0	1. mg/L
	Solid	9071[1]	54.8-112.8	0.0-47.7	100. mg/kg
Organic carbon, total	Water	415.1[2]	91.5-105.1	0.0-14.7	1. mg/L
Oxygen, dissolved	Water	360.1[2]	85.0-115.0*	0.0-3.9	0.1 mg/L
Phenols	Water	420.1[2], 9065[1]	73.1-122.2	0.0-36.5	0.005 mg/L
	Solid	9065[1]	65.6-148.4	0.0-61.8	1. mg/kg
Phosphorus, total	Water	365.4[2]	84.0-114.0	0.0-37.4	0.01 mg/L
	Solid	365.4[2]	80.0-120.0*	0.0-20.0*	1. mg/kg
Residue, total	Water	160.3[2]	NA	0.0-7.1	1. mg/L
	Solid	160.3[2]	NA	0.0-4.5	1. mg/kg
Residue, dissoved	Water	160.1[2]	79.8-111.8	0.0-18.1	1. mg/L
Residue, suspended	Water	160.2[2]	70.1-114.0	0.0-34.4	1. mg/L
Residue, settable	Water	160.5[2]	NA	0.0-17.9	0.1 mg/L
Residue, volatile	Water	160.4[2]	NA	0.0-20.0*	1. mg/L
	Solid	160.4[2]	NA	0.0-20.0*	1. mg/kg

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Orthophosphate	Water	365.1[2]	92.4-104.0	0.0-13.4	0.01 mg/l
Silica	Water	370.1[2]	91.4-109.8	0.0-8.1	0.1 mg/L
Specific Conductance	Water	120.1[2]	92.4-102.1	0.0-7.2	1 umho/cm
Sulfate, as SO_4	Water	375.3[2]	92.8-109.1	0.0-14.5	1. mg/L
	Solid	375.3[2]	95.4-108.4	0.0-18.2	100. mg/kg
Sulfide	Water	376.1[1]	61.8-150.0	0.0-26.4	0.1 mg/l
Sulfite, as SO_3	Water	377.1[2]	85.0-115.0*	0.0-20.0*	2. mg/L
Surfactants	Water	425.1[2]	70.9-126.2	0.0-16.4	0.1 mg/L
Temperature		170.1[2]			
Total Petroleum Hydrocarbons	Water	418.1[2], 9073[1]	62.3-121.6	0.0-31.0	1. mg/L
	Solid	9073[1]	76.6-120.7	0.0-34.4	100. mg/kg
Turbidity	Water	180.1[2]	81.7-110.9	0.0-31.0	0.02 NTU
Waste Ignitability	Water	1010[1]			
	Solid	1010[1]			
Waste Corrosivity	Water	1110[1]			
	Solid	1110[1]			
Waste Reactivity	Water	9010[1]/9030[1]			
	Solid	9010[1]/9030[1]			

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Aluminum	Water	200.7[2], 6010[1]	91.0-116.9	0.0-30.9	0.5 mg/L
	Solid	6010[1]	78.6-112.8	0.0-43.9	50. mg/kg
Antimony - ICP	Water	200.7[2], 6010[1]	84.4-106.7	0.0-5.7	0.1 mg/L
	Solid	6010[1]	63.3-120.4	0.0-50.3	10. mg/kg
Antimony - AA	Water	204.2[2], 7041[1]	71.4-115.3	0.0-20.0*	0.01 mg/L
	Solid	7041[1]	80.0-120.0*	0.0-20.0*	1. mg/kg
Arsenic	Water	206.2[2], 7060[1]	79.4-118.9	0.0-41.9	0.005 mg/L
	Solid	7060[1]	78.0-114.5	0.0-32.0	0.5 mg/kg
Barium	Water	200.7[2], 6010[1]	89.4-108.6	0.0-45.1	0.5 mg/L
	Solid	6010[1]	62.5-125.8	0.0-35.0	50. mg/kg
Beryllium	Water	200.7[2], 6010[1]	82.6-104.0	0.0-20.0*	0.05 mg/L
	Solid	6010[1]	76.8-105.0	0.0-20.0*	5. mg/kg
Boron	Water	200.7[2], 6010[1]	80.6-131.1	0.0-20.0*	0.05 mg/L
	Solid	6010[1]	80.0-120.0*	0.0-20.0*	50. mg/kg
Calcium	Water	200.7[2], 6010[1]	83.6-111.6	0.0-4.3	1. mg/L
	Solid	6010[1]	79.3-115.5	0.0-40.7	1000. mg/kg
Chromium, hexavalent	Water	307B[3], 7196[1]	85.6-110.6	0.0-22.1	0.01 mg/L
	Solid	7196[1]	85.3-109.1	0.0-20.0*	1. mg/kg
Chromium	Water	200.7[2], 6010[1]	91.7-106.2	0.0-16.1	0.05 mg/L
	Solid	6010[1]	80.3-103.1	0.0-43.5	5. mg/kg
Cobalt	Water	200.7[2], 6010[1]	87.0-106.9	0.0-20.0*	0.05 mg/L
	Solid	6010[1]	82.4-101.7	0.0-28.2	5. mg/kg
Copper	Water	200.7[2], 6010[1]	88.5-107.4	0.0-12.7	0.01 mg/L
	Solid	6010[1]	80.2-104.6	0.0-44.6	1. mg/kg

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Cadmium - ICP	Water	200.7[2], 6010[1]	88.4-111.1	0.0-30.8	0.01 mg/L
	Solid	6010[1]	50.5-99.8	0.0-35.6	1. mg/kg
Cadmium - AA	Water	213.2[2], 7131[1]	67.0-127.6	0.0-20.0*	0.001 mg/L
	Solid	7131[1]	80.0-120.0*	0.0-20.0*	0.1 mg/kg
Hardness, total as $CaCO_3$	Water	314B[3]	85.0-115.0*	0.0-20.0*	1. mg/L
Iron	Water	200.7[2], 6010[1]	87.9-108.3	0.0-23.8	0.05 mg/L
	Solid	6010[1]	86.4-105.6	0.0-68.6	5. mg/kg
Lead - ICP	Water	200.7[2], 6010[1]	86.2-112.8	0.0-13.2	0.05 mg/L
	Solid	6010[1]	74.7-109.8	0.0-36.1	5. mg/kg
Lead - AA	Water	239.2[2], 7421[1]	87.1-114.1	0.0-32.2	0.005 mg/L
	Solid	7421[1]	69.5-122.5	0.0-29.1	0.5 mg/kg
Magnesium	Water	200.7[2], 6010[1]	83.6-116.5	0.0-9.9	1. mg/L
	Solid	6010[1]	80.8-105.0	0.0-61.5	1000. mg/kg
Manganese	Water	200.7[2], 6010[1]	90.4-109.3	0.0-20.4	0.05 mg/L
	Solid	6010[1]	82.4-106.5	0.0-70.0	5. mg/kg
Mercury	Water	245.1[2], 7470[1]	69.5-117.7	0.0-41.5	0.0005 mg/L
	Solid	7471[1]	47.6-147.8	0.0-41.7	0.5 mg/kg
Molybdenum	Water	200.7[2], 6010[1]	84.0-121.3	0.0-20.0*	0.5 mg/L
	Solid	6010[1]	80.0-120.0*	0.0-20.8	50. mg/kg
Nickel	Water	200.7[2], 6010[1]	88.4-108.3	0.0-14.1	0.05 mg/L
	Solid	6010[1]	80.5-102.5	0.0-46.9	5. mg/kg
Potassium	Water	200.7[2], 6010[1]	73.7-113.9	0.0-24.6	5. mg/L
	Solid	6010[1]	60.4-103.5	0.0-43.9	5000. mg/kg

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Selenium	Water	270.2[2], 7740[1]	77.4-123.8	0.0-32.0	0.005 mg/L
	Solid	7740[1]	71.1-118.8	0.0-23.4	0.5 mg/kg
Silicon	Water	200.7[2], 6010[1]	85.0-115.0*	0.0-20.0*	1. mg/L
	Solid	6010[1]	80.0-120.0*	0.0-20.0*	100. mg/kg
Silver	Water	200.7[2], 6010[1]	70.0-119.6	0.0-12.9	0.01 mg/L
	Solid	6010[1]	61.6-109.3	0.0-39.3	1. mg/kg
Sodium	Water	200.7[2], 6010[1]	84.9-112.0	0.0-9.1	1. mg/L
	Solid	6010[1]	83.2-121.1	0.0-17.2	1000. mg/kg
Thallium	Water	279.2[2], 7841[1]	72.5-127.7	0.0-20.0*	0.05 mg/L
	Solid	7841[1]	50.1-127.0	0.0-20.0*	5. mg/kg
Vanadium	Water	200.7[2], 6010[1]	80.1-107.8	0.0-20.0*	0.05 mg/L
	Solid	6010[1]	79.2-107.2	0.0-38.7	5. mg/kg
Zinc	Water	200.7[2], 6010[1]	90.7-107.8	0.0-39.0	0.01 mg/L
	Solid	6010[1]	72.6-118.4	0.0-50.3	1. mg/kg

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Chloromethane	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	59.5-140.5*	0.0-25.0*	10. ug/L
	Solid	8010/8020[1]	59.5-140.5*	0.0-25.0*	100. ug/kg
	Water	624[4], 8240[1]	64.3-164.8	0.0-25.0*	10. ug/L
	Solid	8240[1]	47.1-174.6	0.0-25.0*	10. ug/L
Bromomethane	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	58.5-141.5*	0.0-25.0*	10. ug/L
	Solid	8010/8020[1]	58.5-141.5*	0.0-25.0*	100. ug/kg
	Water	624[4], 8240[1]	83.4-202.7	0.0-25.0*	10. ug/L
	Solid	8240[1]	76.6-180.2	0.0-25.0*	10. ug/kg
Vinyl Chloride	Water	502.1/503.1[3]	72.4-155.6	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	68.5-131.5*	0.0-14.8	1. ug/L
	Solid	8010/8020[1]	68.5-131.5*	0.0-25.0*	10. ug/kg
	Water	624[4], 8240[1]	79.8-181.1	0.0-25.0*	10. ug/L
	Solid	8240[1]	99.5-166.7	0.0-25.0*	10. ug/kg
Chloroethane	Water	502.1/503.1[3]	52.6-140.7	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	77.0-123.0*	0.0-25.0*	1. ug/L
	Solid	8010/8020[1]	77.0-123.0*	0.0-25.0*	10. ug/kg
	Water	624[4], 8240[1]	67.6-195.0	0.0-25.0*	10. ug/L
	Solid	8240[1]	70.4-186.6	0.0-25.0*	10. ug/kg
Methylene Chloride	Water	502.1/503.1[3]	50.1-140.7	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	77.5-122.5*	0.0-29.5	1. ug/L
(Dichloromethane)	Solid	8010/8020[1]	77.5-122.5*	0.0-12.1	10. ug/kg
	Water	624[4], 8240[1]	66.2-147.2	0.0-25.0*	5. ug/L
	Solid	8240[1]	74.3-133.8	0.0-25.0*	5. ug/kg
Trichlorofluoromethane	Water	502.1/503.1[3]	34.7-141.3	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	66.5-133.5*	0.0-25.0*	1. ug/L
	Solid	8010/8020[1]	66.5-133.5*	0.0-25.0*	10. ug/kg
	Water	624[4]	70.6-116.0	0.0-25.0*	5. ug/L

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Acetone	Water	8240[1]	59.6-180.2	0.0-25.0*	10. ug/L
	Solid	8240[1]	39.4-186.7	0.0-25.0*	10. ug/kg
Carbon Disulfide	Water	8240[1]	69.1-117.3	0.0-25.0*	5. ug/L
	Solid	8240[1]	74.3-107.3	0.0-25.0*	5. ug/kg
1,1-Dichloroethene	Water	502.1/503.1[3]	44.6-145.0	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	63.0-137.0*	0.0-25.0*	1. ug/L
	Solid	8010/8020[1]	63.0-137.0*	0.0-25.0*	10. ug/L
	Water	624[4], 8240[1]	70.7-119.4	0.0-25.0	5. ug/L
	Solid	8240[1]	73.5-117.3	0.0-12.8	5. ug/kg
1,1-Dichloroethane	Water	502.1/503.1[3]	57.9-132.7	0.0-20.0*	1. ug/L
	Water	601/602[4], 8010/8020[1]	84.0-116.0*	0.0-16.9	1. ug/L
	Solid	8010/8020[1]	84.0-116.0*	0.0-20.4	10. ug/kg
	Water	624[4], 8240[1]	57.9-137.1	0.0-25.0*	5. ug/L
	Solid	8240[1]	72.6-115.5	0.0-25.0*	5. ug/kg
trans-1,2-Dichloroethene	Water	502.1/503.1[3]	54.9-124.0	0.0-20.0*	0.5 ug/L
1,2-Dichloroethene (total)	Water	601/602[4], 8010/8020[1]	64.0-136.0*	0.0-18.6	1. ug/L
	Solid	8010/8020[1]	64.0-136.0*	0.0-26.1	10. ug/kg
	Water	624[4], 8240[1]	60.7-112.5	0.0-25.0*	5. ug/L
	Solid	8240[1]	64.7-109.5	0.0-25.0*	5. ug/kg
Chloroform	Water	501.1[3]	69.1-125.3	0.0-38.7	1. ug/L
	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	75.0-125.0*	0.0-25.0*	1. ug/L
	Solid	8010/8020[1]	75.0-125.0*	0.0-25.0*	10. ug/kg
	Water	624[4], 8240[1]	71.4-114.4	0.0-25.0*	5. ug/L
	Solid	8240[1]	74.3-111.4	0.0-25.0*	5. ug/kg

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
1,2-Dichloroethane	Water	502.1/503.1[3]	55.0-111.3	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	71.5-128.5*	0.0-29.5	1. ug/L
	Solid	8010/8020[1]	71.5-128.5*	0.0-17.6	10. ug/L
	Water	624[4], 8240[1]	74.6-118.1	0.0-25.0*	5. ug/L
	Solid	8240[1]	73.4-116.8	0.0-25.0*	5. ug/kg
2-Butanone	Water	8240[1]	37.5-137.7	0.0-25.0*	10. ug/L
	Solid	8240[1]	43.9-159.1	0.0-25.0*	10. ug/kg
1,1,1-Trichloroethane	Water	502.1/503.1[3]	44.9-145.3	0.0-20.0*	.5 ug/L
	Water	601/602[4], 8010/8020[1]	71.0-129.0*	0.0-20.0	1. ug/L
	Solid	8010/8020[1]	71.0-129.0*	0.0-15.2	10. ug/kg
	Water	624[4], 8240[1]	71.3-121.5	0.0-25.0*	5. ug/L
	Solid	8240[1]	62.9-119.5	0.0-25.0*	5. ug/kg
Carbon Tetrachloride	Water	502.1/503.1[3]	47.6-133.2	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	68.5-131.5*	0.0-19.7	1. ug/L
	Solid	8010/8020[1]	68.5-131.5*	0.0-10.0	10. ug/kg
	Water	624[4], 8240[1]	71.7-111.1	0.0-25.0*	5. ug/L
	Solid	8240[1]	71.4-109.6	0.0-25.0*	5/ ug/kg
Vinyl Acetate	Water	8240[1]	19.6-107.9	0.0-25.0*	10. ug/L
	Solid	8240[1]	25.5-110.0*	0.0-25.0*	10. ug/kg
Bromodichloro-methane	Water	501.1[3]	68.6-124.7	0.0-36.8	1. ug/L
	Water	502.1/503.1[3]	48.8-129.0	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	76.0-124.0*	0.0-25.0*	1. ug/L
	Solid	8010/8020[1]	76.0-124.0*	0.0-25.0*	10. ug/kg
	Water	624[4], 8240[1]	63.9-113.8	0.0-25.0*	5. ug/L
	Solid	8240[1]	70.5-107.0	0.0-25.0*	5. ug/kg
1,2-Dichloropropane	Water	502.1/503.1[3]	57.6-121.2	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	74.0-126.0*	0.0-26.0	1. ug/L
	Solid	8010/8020[1]	74.0-126.0*	0.0-21.6	10. ug/kg
	Water	624[4], 8240[1]	60.2-124.3	0.0-25.0*	5. ug/L
	Solid	8240[1]	72.8-112.9	0.0-25.0*	5. ug/kg

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
cis-1,3-Dichloropropene	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	64.0-136.0*	0.0-25.0*	1. ug/L
	Solid	8010/8020[1]	64.0-136.0*	0.0-25.0*	10. ug/kg
	Water	624[4], 8240[1]	50.2-119.2	0.0-25.0*	5. ug/L
	Solid	8240[1]	67.2-100.6	0.0-25.0*	5. ug/kg
Trichloroethene	Water	502.1/503.1[3]	55.4-144.6	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	77.0-123.0*	0.0-23.2	1. ug/L
	Solid	8010/8020[1]	77.0-123.0*	0.0-17.3	10. ug/kg
	Water	624[4], 8240[1]	73.4-111.3	0.0-34.1	5. ug/L
	Solid	8240[1]	73.2-109.2	0.0-17.2	5. ug/kg
	Water	MOD. 8020[1]	75.0-125.0*	0.0-25.0*	1. ug/L
	Solid	MOD. 8020[1]	75.0-125.0*	0.0-25.0*	10. ug/kg
Dibromochloro-methane	Water	501.1[3]	67.5-128.7	0.0-34.6	1. ug/L
	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	65.5-134.5*	0.0-25.0*	1. ug/L
	Solid	8010/8020[1]	65.5-134.5*	0.0-25.0*	10. ug/kg
	Water	624[4], 8240[1]	61.7-116.8	0.0-25.0*	5. ug/L
	Solid	8240[1]	70.2-110.1	0.0-25.0*	10. ug/kg
1,1,2-Trichloroethane	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	78.5-121.5*	0.0-25.0*	1. ug/L
	Solid	8010/8020[1]	78.5-121.5*	0.0-25.0*	10. ug/kg
	Water	624[4], 8240[1]	64.0-116.8	0.0-25.0*	5. ug/L
	Solid	8240[1]	64.5-115.7	0.0-25.0*	5. ug/L
Benzene	Water	502.1/503.1[3]	81.1-102.8	0.0-13.9	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	77.0-123.0*	0.0-17.4	1. ug/L
	Solid	8010/8020[1]	77.0-123.0*	0.0-28.4	10. ug/kg
	Water	624[4], 8240[1]	63.0-118.4	0.0-20.9	5. ug/L
	Solid	8240[1]	69.1-113.3	0.0-12.4	5. ug/kg
	Water	MOD. 8020[1]	78.9-108.0	0.0-18.6	1. ug/L
	Solid	MOD. 8020[1]	77.9-117.4	0.0-17.3	10. ug/kg

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
trans-1,3-	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
Dichloropropene	Water	601/602[4], 8010/8020[1]	64.0-136.0*	0.0-25.0*	1. ug/L
	Solid	8010/8020[1]	64.0-136.0*	0.0-25.0*	10. ug/kg
	Water	624[4], 8240[1]	51.3-133.4	0.0-25.0*	5. ug/L
	Solid	8240[1]	61.1-126.1	0.0-25.0*	5. ug/kg
2-Chloroethylvinyl ether	Water	601/602[4], 8010/8020[1]	60.0-140.0*	0.0-25.0*	10. ug/L
	Solid	8010/8020[1]	60.0-140.0*	0.0-25.0*	100. ug/kg
	Water	624[4]	23.5-121.3	0.0-25.0*	10. ug/L
Bromoform	Water	501.1[3]	62.6-130.1	0.0-38.6	1. ug/L
	Water	502.1/503.1[3]	19.5-105.9	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	73.5-126.5*	0.0-25.0*	10. ug/L
	Solid	8010/8020[1]	73.5-126.5*	0.0-25.0*	100. ug/kg
	Water	624[4], 8240[1]	54.3-124.4	0.0-25.0*	5. ug/L
	Solid	8240[1]	74.2-108.3	0.0-25.0*	5. ug/kg
4-Methyl-2-pentanone	Water	8240[1]	65.5-116.6	0.0-25.0*	10. ug/L
	Solid	8240[1]	70.3-125.8	0.0-25.0*	10. ug/kg
2-Hexanone	Water	8240[1]	37.7-114.5	0.0-25.0*	10. ug/L
	Solid	8240[1]	45.4-131.7	0.0-25.0*	10. ug/kg
Tetrachloroethene	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
	Water	601/602[2], 8010/8020[1]	70.0-130.0*	0.0-18.5	1. ug/L
	Solid	8010/8020[1]	70.0-130.0*	0.0-29.1	10. ug/L
	Water	624[4], 8240[1]	70.9-114.5	0.0-25.0*	5. ug/L
	Solid	8240[1]	73.1-113.2	0.0-25.0*	5. ug/kg
	Water	MOD. 8020[1]	75.0-125.0*	0.0-25.0*	1. ug/L
	Solid	MOD. 8020[1]	75.0-125.0*	0.0-25.0*	10. ug/kg
1,1,2,2-	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
Tetrachloroethane	Water	601/602[4], 8010/8020[1]	49.0-151.0*	0.0-25.0*	1. ug/L
	Solid	8010/8020[1]	49.0-151.0*	0.0-25.0*	10. ug/kg
	Water	624[4], 8240[1]	57.6-123.6	0.0-25.0*	5. ug/L
	Solid	8240[1]	63.9-122.0	0.0-25.0*	5. ug/kg

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Toluene	Water	502.1/503.1[3]	71.9-110.4	0.0-6.3	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	77.5-122.5*	0.0-23.2	1. ug/L
	Solid	8010/8020[1]	77.5-122.5*	0.0-14.7	10. ug/kg
	Water	624[4], 8240[1]	73.6-109.7	0.0-25.6	5. ug/L
	Solid	8240[1]	71.9-114.8	0.0-12.9	5. ug/kg
	Water	MOD. 8020[1]	78.2-106.8	0.0-11.2	1. ug/L
	Solid	MOD. 8020[1]	75.1-109.9	0.0-13.7	10. ug/kg
Chlorobenzene	Water	502.1/503.1[3]	43.2-128.1	0.0-6.5	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	80.5-119.5*	0.0-19.2	1. ug/L
	Solid	8010/8020[1]	80.5-119.5*	0.0-15.1	10. ug/kg
	Water	624[4], 8240[1]	78.8-106.2	0.0-23.1	5. ug/L
	Solid	8240[1]	75.7-110.3	0.0-11.9	5. ug/kg
Ethylbenzene	Water	502.1/503.1[3]	58.9-122.1	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	63.0-137.0*	0.0-27.1	1. ug/L
	Solid	8010/8020[1]	63.0-137.0*	0.0-31.3	10. ug/kg
	Water	624[4], 8240[1]	76.7-115.1	0.0-25.0*	5. ug/L
	Solid	8240[1]	72.9-116.4	0.0-25.0*	5. ug/kg
	Water	MOD. 8020[1]	78.0-110.0	0.0-11.4	1. ug/L
	Solid	MOD. 8020[1]	76.0-119.9	0.0-10.8	10. ug/kg
Styrene	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
	Water	8240[1]	83.5-121.6	0.0-25.0*	5. ug/L
	Solid	8240[1]	75.9-125.6	0.0-25.0*	5. ug/kg
Xylene (total)	Water	601/602[4], 8010/8020[1]	75.0-125.0*	0.0-22.0	3. ug/L
	Solid	8010/8020[1]	75.0-125.0*	0.0-20.0*	30. ug/kg
	Water	624[4], 8240[1]	82.6-107.8	0.0-25.0*	5. ug/L
	Solid	8240[1]	82.1-107.7	0.0-25.0*	5. ug/kg
	Water	MOD. 8020[1]	72.5-110.8	0.0-14.7	1. ug/L
	Solid	MOD. 8020[1]	31.4-147.4	0.0-21.0	10. ug/kg

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
1,2-Dichlorobenzene	Water	502.1/503.1[3]	74.6-120.0	0.0-13.2	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	70.0-130.0*	0.0-20.5	5. ug/L
	Solid	8010/8020[1]	70.0-130.0*	0.0-20.0*	50. ug/kg
	Water	624[4]	67.9-132.1	0.0-25.0*	5. ug/L
1,3-Dichlorobenzene	Water	502.1/503.1[3]	61.9-111.3	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	72.5-127.5*	0.0-20.0*	5. ug/L
	Solid	8010/8020[1]	72.5-127.5*	0.0-20.0*	50. ug/kg
	Water	624[4]	51.1-150.3	0.0-25.0*	5. ug/L
1,4-Dichlorobenzene	Water	502.1/503.1[3]	69.7-110.0	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	69.5-130.5*	0.0-20.0*	5. ug/L
	Solid	8010/8020[1]	69.5-130.5*	0.0-20.0*	50. ug/kg
	Water	624[4]	67.9-135.3	0.0-25.0*	5. ug/L
Dichlorodifluoro-methane	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
	Water	601/602[4], 8010/8020[1]	75.0-125.0*	0.0-25.0*	10. ug/L
	Solid	8010/8020[1]	75.0-125.0*	0.0-25.0*	100. ug/kg
Benzyl chloride	Water	8010/8020[1]	75.0-125.0*	0.0-25.0*	10. ug/L
	Solid	8010/8020[1]	75.0-125.0*	0.0-25.0*	100. ug/L
Bromobenzene	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
	Water	8010/8020[1]	75.0-125.0*	0.0-25.0*	5. ug/L
	Solid	8010/8020[1]	75.0-125.0*	0.0-25.0*	50. ug/kg
2-Chlorotoluene	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
	Water	8010/8020[1]	75.0-125.0*	0.0-25.0*	5. ug/L
	Solid	8010/8020[1]	75.0-125.0*	0.0-25.0*	50. ug/L
4-Chlorotoluene	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
	Water	8010/8020[1]	75.0-125.0*	0.0-25.0*	5. ug/L
	Solid	8010/8020[1]	75.0-125.0*	0.0-25.0*	50. ug/kg

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Dibromomethane	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
	Water	8010/8020[1]	75.0-125.0*	0.0-25.0*	10. ug/L
	Solid	8010/8020[1]	75.0-125.0*	0.0-25.0*	100. ug/kg
1,1,1,2-	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
Tetrachloroethane	Water	8010/8020[1]	75.0-125.0*	0.0-25.0*	10. ug/L
	Solid	8010/8020[1]	75.0-125.0*	0.0-25.0*	100. ug/kg
1,2,3-Trichloropropane	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
	Water	8010/8020[1]	75.0-125.0*	0.0-25.0*	10. ug/L
	Solid	8010/8020[1]	75.0-125.0*	0.0-25.0*	100. ug/kg
MTBE	Water	MOD. 8020[1]	76.6-121.8	0.0-14.0	1. ug/L
(tert-Butyl methyl ether)	Solid	MOD. 8020[1]	79.9-109.3	0.0-14.8	10. ug/kg
Volatile Petroleum	Water	MOD. 8020[1]	75.0-125.0*	0.0-25.0*	1. ug/L
Hydrocarbons	Solid	MOD. 8020[1]	75.0-125.0*	0.0-25.0*	10. ug/L
Bromochloromethane	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
cis-1,2-Dichloroethene	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
2,2-Dichloropropane	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
1,1-Dichloropropane	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
1,3-Dichloropropane	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
1,2-Dibromoethane	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
		504[3]	80.0-120.0*	0.0-20.0*	0.02 ug/L
p-Xylene	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
o-Xylene	Water	502.1/503.1[3]	80.0-120.0*	0.0-10.0	0.5 ug/L
m-Xylene	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
Isopropylbenzene	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
N-Propylbenzene	Water	502.1/503.1[3]	89.3-111.3	0.0-20.0*	0.5 ug/L
tert-Butylbenzene	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
sec-Butylbenzene	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
1,3,5-Trimethylbenzene	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
4-Isopropyltoluene	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
1,2,4-Trimethylbenzene	Water	502.1/503.1[3]	85.0-106.1	0.0-20.0*	0.5 ug/L
N-butylbenzene	Water	502.1/503.1[3]	80.0-120.0*	0.0-12.3	0.5 ug/L
Hexachlorobutadiene	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
1,2,4-Trichlorobenzene	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
Naphthalene	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L
1,2,3-Trichlorobenzene	Water	502.1/503.1[3]	80.0-120.0*	0.0-20.0*	0.5 ug/L

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Phenol	Water	625[4], 8270[1]	19.5-117.8	0.0-29.0	10. ug/L
	Solid	8270[1]	24.2-133.1	0.0-35.0	330. ug/kg
Bis(2-chloroethyl)ether	Water	625[4], 8270[1]	65.5-128.4	0.0-25.0*	10. ug/L
	Solid	8270[1]	38.9-115.2	0.0-30.0*	330. ug/kg
2-Chlorophenol	Water	625[4], 8270[1]	24.4-168.9	0.0-26.8	10. ug/L
	Solid	8270[1]	40.9-125.4	0.0-16.6	330. ug/kg
1,3-Dichlorobenzene	Water	625[4], 8270[1]	25.4-117.8	0.0-25.0*	10. ug/L
	Solid	8270[1]	44.8-104.0	0.0-30.0*	330. ug/kg
1,4-Dichlorobenzene	Water	625[4], 8270[1]	27.4-117.8	0.0-27.7	10. ug/L
	Solid	8270[1]	44.5-104.6	0.0-19.6	330. ug/kg
Benzyl Alcohol	Water	8270[1]	42.7-124.9	0.0-25.0*	10. ug/L
	Solid	8270[1]	11.2-159.7	0.0-30.0*	330. ug/kg
1,2-Dichlorobenzene	Water	625[4], 8270[1]	31.4-116.4	0.0-25.0*	10. ug/L
	Solid	8270[1]	32.7-117.9	0.0-30.0*	330. ug/kg
2-Methylphenol	Water	8270[1]	33.6-161.3	0.0-25.0*	10. ug/L
	Solid	8270[1]	39.1-120.1	0.0-30.0*	330. ug/kg
Bis(2-chloroisopropyl) ether	Water	625[4], 8270[1]	49.0-131.8	0.0-25.0*	10. ug/L
	Solid	8270[1]	29.6-129.2	0.0-30.0*	330. ug/kg
4-Methylphenol	Water	8270[1]	28.2-144.9	0.0-25.0*	10. ug/L
	Solid	8270[1]	43.2-109.4	0.0-30.0*	330. ug/kg
N-Nitroso-di-n-propylamine	Water	625[4], 8270[1]	73.1-132.2	0.0-34.3	10. ug/L
	Solid	8270[1]	27.1-122.2	0.0-28.0	330. ug/kg
Hexachloroethane	Water	625[4], 8270[1]	10.5-117.7	0.0-25.0*	10. ug/L
	Solid	8270[1]	40.2-110.8	0.0-30.0*	330. ug/kg

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Nitrobenzene	Water	625[4], 8270[1]	55.8-142.8	0.0-25.0*	10. ug/L
	Solid	8270[1]	33.5-123.0	0.0-30.0*	330. ug/kg
Isophorone	Water	625[4], 8270[1]	63.9-132.7	0.0-25.0*	10. ug/L
	Solid	8270[1]	39.4-119.0	0.0-30.0*	330. ug/kg
2-Nitrophenol	Water	625[4], 8270[1]	63.6-121.7	0.0-25.0*	10. ug/L
	Solid	8270[1]	34.5-113.1	0.0-30.0*	330. ug/kg
2,4-Dimethylphenol	Water	625[4], 8270[1]	38.9-123.6	0.0-25.0*	10. ug/L
	Solid	8270[1]	12.3-120.1	0.0-30.0*	330. ug/kg
Benzoic Acid	Water	8270[1]	20.1-117.7	0.0-25.0*	50. ug/L
	Solid	8270[1]	44.7-138.9	0.0-30.0*	1600. ug/kg
Bis(2-chloroethoxy) methane	Water	625[4], 8270[1]	70.8-117.5	0.0-25.0*	10. ug/L
	Solid	8270[1]	42.1-113.0	0.0-30.0*	330. ug/kg
2,4-Dichlorophenol	Water	625[4], 8270[1]	57.7-151.7	0.0-25.0*	10. ug/L
	Solid	8270[1]	28.2-133.2	0.0-30.0*	330. ug/kg
1,2,4-Trichlorobenzene	Water	625[4], 8270[1]	50.7-127.8	0.0-27.3	10. ug/L
	Solid	8270[1]	48.1-113.5	0.0-27.9	330. ug/kg
Naphthalene	Water	625[4], 8270[1]	51.3-126.0	0.0-25.0*	10. ug/L
	Solid	8270[1]	36.6-105.1	0.0-30.0*	330. ug/kg
4-Chloroaniline	Water	8270[1]	20.3-115.2	0.0-25.0*	10. ug/L
	Solid	8270[1]	0.0-86.9	0.0-30.0*	330. ug/kg
Hexachlorobutadiene	Water	625[4], 8270[1]	30.0-135.6	0.0-25.0*	10. ug/L
	Solid	8270[1]	49.8-109.1	0.0-30.0*	330. ug/kg
4-Chloro-3-methylphenol	Water	625[4], 8270[1]	67.7-136.1	0.0-21.0	10. ug/L
	Solid	8270[1]	50.3-128.2	0.0-56.1	330. ug/kg

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
2-Methylnaphthalene	Water	8270[1]	22.0-184.1	0.0-25.0*	10. ug/L
	Solid	8270[1]	25.6-133.3	0.0-30.0*	330. ug/kg
Hexachlorocyclopenta-diene	Water	625[4], 8270[1]	18.8-133.6	0.0-25.0*	10. ug/L
	Solid	8270[1]	26.4-110.7	0.0-30.0*	330. ug/kg
2,4,6-Trichlorophenol	Water	625[4], 8270[1]	48.3-164.1	0.0-25.0*	10. ug/L
	Solid	8270[1]	42.2-126.9	0.0-30.0*	330. ug/kg
2,4,5-Trichlorophenol	Water	8270[1]	50.7-184.0	0.0-25.0*	50. ug/L
	Solid	8270[1]	59.7-111.9	0.0-30.0*	1600. ug/kg
2-Chloronaphthalene	Water	625[4], 8270[1]	55.7-143.3	0.0-25.0*	10. ug/L
	Solid	8270[1]	46.4-115.9	0.0-30.0*	330. ug/kg
2-Nitroaniline	Water	8270[1]	27.4-190.9	0.0-25.0*	10. ug/L
	Solid	8270[1]	26.4-143.9	0.0-30.0*	330. ug/kg
Dimethylphthalate	Water	625[4], 8270[1]	19.0-119.4	0.0-25.0*	10. ug/L
	Solid	8270[1]	43.5-118.4	0.0-30.0*	330. ug/kg
Acenaphthylene	Water	625[4], 8270[1]	61.1-133.7	0.0-25.0*	10. ug/L
	Solid	8270[1]	48.3-95.4	0.0-30.0*	330. ug/kg
2,6-Dinitrotoluene	Water	625[4], 8270[1]	63.1-150.6	0.0-25.0*	10. ug/L
	Solid	8270[1]	46.6-124.2	0.0-30.0*	330. ug/kg
3-Nitroaniline	Water	8270[1]	17.3-141.6	0.0-25.0*	50. ug/L
	Solid	8270[1]	22.6-88.3	0.0-30.0*	1600. ug/kg
Acenaphthene	Water	625[4], 8270[1]	64.9-130.3	0.0-23.2	10. ug/L
	Solid	8270[1]	41.2-103.2	0.0-25.7	330. ug/kg
2,4-Dinitrophenol	Water	625[4], 8270[1]	17.0-156.8	0.0-25.0*	50. ug/L
	Solid	8270[1]	31.3-121.8	0.0-30.0*	1600. ug/kg

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
4-Nitrophenol	Water	625[4], 8270[1]	17.5-90.2	0.0-27.2	50. ug/L
	Solid	8270[1]	22.1-147.1	0.0-29.2	1600. ug/kg
Dibenzofuran	Water	8270[1]	59.6-145.9	0.0-25.0*	10. ug/L
	Solid	8270[1]	35.8-129.5	0.0-30.0*	330. ug/kg
2,4-Dinitrotoluene	Water	625[4], 8270[1]	69.0-151.8	0.0-8.5	10. ug/L
	Solid	8270[1]	44.0-131.8	0.0-30.5	330. ug/kg
Diethylphthalate	Water	625[4], 8270[1]	67.7-123.7	0.0-25.0*	10. ug/L
	Solid	8270[1]	39.4-119.6	0.0-30.0*	330. ug/kg
4-Chlorophenyl-phenylether	Water	625[4], 8270[1]	58.7-151.1	0.0-25.0*	10. ug/L
	Solid	8270[1]	43.8-109.1	0.0-30.0*	330. ug/kg
Fluorene	Water	625[4], 8270[1]	54.4-156.4	0.0-25.0*	10. ug/L
	Solid	8270[1]	42.9-108.0	0.0-30.0*	330. ug/kg
4-Nitroaniline	Water	8270[1]	32.4-183.3	0.0-25.0*	50. ug/L
	Solid	8270[1]	35.7-122.7	0.0-30.0*	1600. ug/kg
4,6-Dinitro-2-methylphenol	Water	625[4], 8270[1]	36.8-177.6	0.0-25.0*	50. ug/L
	Solid	8270[1]	33.0-123.4	0.0-30.0*	1600. ug/kg
N-Nitrosodiphenyl-amine	Water	625[4], 8270[1]	41.5-160.9	0.0-25.0*	10. ug/L
	Solid	8270[1]	22.9-148.4	0.0-30.0*	330. ug/kg
4-Bromophenyl-phenylether	Water	625[4], 8270[1]	53.1-173.7	0.0-25.0*	10. ug/L
	Solid	8270[1]	47.9-124.7	0.0-30.0*	330. ug/kg
Hexachlorobenzene	Water	625[4], 8270[1]	54.7-164.0	0.0-25.0*	10. ug/L
	Solid	8270[1]	29.8-125.9	0.0-30.0*	330. ug/kg
Pentachlorophenol	Water	625[4], 8270[1]	36.9-179.9	0.0-15.6	50. ug/L
	Solid	8270[1]	20.3-129.4	0.0-47.1	1600. ug/kg

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Phenanthrene	Water	625[4], 8270[1]	54.6-145.0	0.0-25.0*	10. ug/L
	Solid	8270[1]	47.4-102.3	0.0-30.0*	330. ug/kg
Anthracene	Water	625[4], 8270[1]	61.7-147.1	0.0-25.0*	10. ug/L
	Solid	8270[1]	53.8-105.3	0.0-30.0*	330. ug/kg
Di-n-butylphthalate	Water	625[4], 8270[1]	65.5-154.8	0.0-14.5	10. ug/L
	Solid	8270[1]	42.4-127.7	0.0-36.4	330. ug/kg
Fluoranthene	Water	625[4], 8270[1]	60.0-146.6	0.0-25.0*	10. ug/L
	Solid	8270[1]	53.4-99.6	0.0-30.0*	330. ug/kg
Pyrene	Water	625[4], 8270[1]	58.3-142.4	0.0-18.0	10. ug/L
	Solid	8270[1]	57.1-110.8	0.0-48.9	330. ug/kg
Butylbenzylphthalate	Water	625[4], 8270[1]	56.4-153.0	0.0-25.0*	10. ug/L
	Solid	8270[1]	35.2-156.9	0.0-30.0*	330. ug/kg
3,3'-Dichlorobenzidine	Water	625[4], 8270[1]	41.9-155.4	0.0-25.0*	20. ug/L
	Solid	8270[1]	27.4-134.1	0.0-30.0*	660. ug/kg
Benzo(a)anthracene	Water	625[4], 8270[1]	58.8-146.8	0.0-25.0*	10. ug/L
	Solid	8270[1]	57.8-109.4	0.0-30.0*	330. ug/kg
Chrysene	Water	625[4], 8270[1]	65.4-135.5	0.0-25.0*	10. ug/L
	Solid	8270[1]	45.3-129.3	0.0-30.0*	330. ug/kg
Bis(2-ethylhexyl) phthalate	Water	625[4], 8270[1]	56.0-163.7	0.0-25.0*	10. ug/L
	Solid	8270[1]	48.8-139.5	0.0-30.0*	330. ug/kg
Di-n-octylphthalate	Water	625[4], 8270[1]	40.9-184.4	0.0-25.0*	10. ug/L
	Solid	8270[1]	26.8-168.4	0.0-30.0*	330. ug/kg
Benzo(b)fluoranthene	Water	625[4], 8270[1]	51.6-159.1	0.0-25.0*	10. ug/L
	Solid	8270[1]	37.0-133.0	0.0-30.0*	330. ug/kg

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Benzo(k)fluoranthene	Water	625[4], 8270[1]	54.3-161.0	0.0-25.0*	10. ug/L
	Solid	8270[1]	47.4-114.2	0.0-30.0*	330. ug/kg
Benzo(a)pyrene	Water	625[4], 8270[1]	42.6-141.8	0.0-25.0*	10. ug/L
	Solid	8270[1]	47.2-115.3	0.0-30.0*	330. ug/kg
Indeno(1,2,3-cd)pyrene	Water	625[4], 8270[1]	48.4-158.4	0.0-25.0*	10. ug/L
	Solid	8270[1]	45.5-113.5	0.0-30.0*	330. ug/kg
Dibenz(a,h)anthracene	Water	625[4], 8270[1]	44.1-157.2	0.0-25.0*	10. ug/L
	Solid	8270[1]	33.3-124.0	0.0-30.0*	330. ug/kg
Benzo(g,h,i)perylene	Water	625[4], 8270[1]	35.7-172.6	0.0-25.0*	10. ug/L
	Solid	8270[1]	21.5-111.9	0.0-30.0*	330. ug/kg
1,2-Diphenylhydrazine	Water	625[4]	36.4-143.0	0.0-25.0* 0.0-30.0*	10. ug/L
Benzidine	Water	625[4]	0.0-43.3	0.0-25.0*	50. ug/L
N-Nitrosodimethyl-amine	Water	625[4]	23.2-90.2	0.0-25.0*	10. ug/L

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
α-BHC	Water	608[4], 8080[1]	54.9-123.9	0.0-61.2	0.05 ug/L
	Solid	8080[1]	65.4-155.8	0.0-32.9	8. ug/kg
γ-BHC	Water	608[4], 8080[1]	46.8-113.5	0.0-37.3	0.05 ug/L
	Solid	8080[1]	27.0-153.2	0.0-30.6	8. ug/kg
β-BHC	Water	608[4], 8080[1]	60.2-153.1	0.0-55.2	0.05 ug/L
	Solid	8080[1]	13.6-142.0	0.0-57.2	8. ug/kg
Heptachlor	Water	608[4], 8080[1]	16.3-125.0	0.0-19.2	0.05 ug/L
	Solid	8080[1]	42.4-146.9	0.0-27.8	8. ug/kg
δ-BHC	Water	608[4], 8080[1]	25.5-135.6	0.0-63.1	0.05 ug/L
	Solid	8080[1]	26.5-125.9	0.0-24.7	8. mg/kg
Aldrin	Water	608[4], 8080[1]	18.2-115.8	0.0-52.7	0.05 ug/L
	Solid	8080[1]	43.2-128.9	0.0-25.9	8. ug/kg
Heptachlor Epoxide	Water	608[4], 8080[1]	33.8-141.8	0.0-40.0	0.05 ug/L
	Solid	8080[1]	34.3-130.4	0.0-41.8	8. mg/kg
Endosulfan I	Water	608[4], 8080[1]	22.0-128.8	0.0-45.6	0.05 ug/L
	Solid	8080[1]	14.5-82.2	0.0-28.8	8. ug/kg
4,4'-DDE	Water	608[4], 8080[1]	34.0-133.8	0.0-62.5	0.1 ug/L
	Solid	8080[1]	20.4-179.2	0.0-23.4	16. ug/kg
Dieldrin	Water	608[4], 8080[1]	16.3-118.0	0.0-19.4	0.1 ug/L
	Solid	8080[1]	31.1-137.7	0.0-26.3	16. ug/kg
Endrin	Water	608[4], 8080[1]	35.3-136.3	0.0-20.5	0.1 ug/L
	Solid	8080[1]	51.1-150.8	0.0-25.0	16. ug/kg
4,4'-DDD	Water	608[4], 8080[1]	53.7-176.7	0.0-25.0*	0.1 ug/L
	Solid	8080[1]	48.0-126.0*	0.0-30.0*	16. ug/kg

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Endosulfan II	Water	608[4], 8080[1]	34.9-172.2	0.0-25.0*	0.1 ug/L
	Solid	8080[1]	22.0-171.0*	0.0-30.0*	16. ug/kg
4,4'-DDT	Water	608[4], 8080[1]	51.0-126.8	0.0-44.9	0.1 ug/L
	Solid	8080[1]	27.8-173.0	0.0-68.8	16. ug/kg
Endosulfan sulfate	Water	608[4], 8080[1]	44.9-137.5	0.0-49.9	0.1 ug/L
	Solid	8080[1]	11.1-111.9	0.0-24.4	16. ug/kg
Endrin Aldehyde	Water	608[4], 8080[1]	37.6-190.9	0.0-55.0	0.1 ug/L
	Solid	8080[1]	79.8-137.7	0.0-68.5	16. ug/kg
Methoxychlor	Water	608[4], 8080[1]	38.1-143.9	0.0-26.7	0.5 ug/L
	Solid	8080[1]	21.4-157.9	0.0-27.5	80. ug/kg
Endrin Ketone	Water	608[4], 8080[1]	50.0-150.0*	0.0-25.0*	0.1 ug/L
	Solid	8080[1]	50.0-150.0*	0.0-30.0*	16. ug/kg
Chlordane	Water	608[4], 8080[1]	55.2-108.6*	0.0-25.0*	0.5 ug/L
	Solid	8080[1]	55.2-108.6*	0.0-30.0*	80. ug/kg
Toxaphene	Water	608[4], 8080[1]	55.6-111.2*	0.0-25.0*	1. ug/L
	Solid	8080[1]	55.6-111.2*	0.0-30.0*	160. ug/kg
PCB-1016	Water	608[4], 8080[1]	66.5-103.2	0.0-25.0*	0.5 ug/L
	Solid	8080[1]	42.7-134.6	0.0-27.2	80. ug/kg
PCB-1221	Water	608[4], 8080[1]	21.1-133.4	0.0-65.2	0.5 ug/L
	Solid	8080[1]	44.2-150.4*	0.0-30.0*	80. ug/kg
PCB-1232	Water	608[4], 8080[1]	29.4-131.3	0.0-35.7	0.5 ug/L
	Solid	8080[1]	54.9-138.6	0.0-9.8	80. ug/kg
PCB-1242	Water	608[4], 8080[1]	24.5-115.1	0.0-26.7	0.5 ug/L
	Solid	8080[1]	27.7-127.3	0.0-38.3	80. ug/kg

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
PCB-1248	Water	608[4], 8080[1]	34.4-119.3	0.0-38.9	0.5 ug/L
	Solid	8080[1]	66.8-138.3	0.0-18.1	80. ug/kg
PCB-1254	Water	608[4], 8080[1]	38.7-116.3	0.0-20.1	1. ug/L
	Solid	8080[1]	36.1-138.8	0.0-30.4	160. ug/kg
PCB-1260	Water	608[4], 8080[1]	41.8-121.6	0.0-33.0	1. ug/L
	Solid	8080[1]	52.3-127.1	0.0-27.6	160. ug/kg

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Diethyl ether	Water	8015[1]	50.0-150.0*	0.0-50.0*	1. ug/L*
	Solid	8015[1]	50.0-150.0*	0.0-50.0*	10. ug/kg*
Ethanol	Water	8015[1]	50.0-150.0*	0.0-50.0*	1. ug/L*
	Solid	8015[1]	50.0-150.0*	0.0-50.0*	10. ug/kg*
Methyl ethyl ketone	Water	8015[1]	50.0-150.0*	0.0-50.0*	1. ug/L*
	Solid	8015[1]	50.0-150.0*	0.0-50.0*	10. ug/kg*
Methyl isobutyl ketone	Water	8015[1]	50.0-150.0*	0.0-50.0*	1. ug/L*
	Solid	8015[1]	50.0-150.0*	0.0-50.0*	10. ug/kg*
Acrolein	Water	8240[1]	75.0-125.0*	0.0-25.0*	20. ug/L*
	Solid	8240[1]	75.0-125.0*	0.0-25.0*	20. ug/kg*
Acrylonitrile	Water	8240[1]	75.0-125.0*	0.0-25.0*	20. ug/L*
	Solid	8240[1]	75.0-125.0*	0.0-25.0*	20. ug/kg*
2-sec-Butyl-4,6-dinitrophenol	Water	8040[1]	50.0-150.0*	0.0-25.0*	1. ug/L*
	Solid	8040[1]	50.0-150.0*	0.0-25.0*	1. mg/kg*
4-Chloro-3-methylphenol	Water	8040[1]	56.7-113.4*	0.0-25.0*	1. ug/L*
	Solid	8040[1]	56.7-113.4*	0.0-25.0*	1. mg/kg*
2-Chlorophenol	Water	8040[1]	54.1-110.2*	0.0-25.0*	1. ug/L*
	Solid	8040[1]	54.1-110.2*	0.0-25.0*	1. mg/kg*
Cresols	Water	8040[1]	50.0-120.0	0.0-25.0*	1. ug/L*
	Solid	8040[1]	50.0-120.0	0.0-25.0*	1. mg/kg*
2-Cyclohexyl-4,6-dinitrophenol	Water	8040[1]	50.0-150.0*	0.0-25.0*	20. ug/L*
	Solid	8040[1]	50.0-150.0*	0.0-25.0*	20. mg/kg*
2,4-Dichlorophenol	Water	8040[1]	59.7-103.3*	0.0-25.0*	1. ug/L*
	Solid	8040[1]	59.7-103.3*	0.0-25.0*	1. mg/kg*

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
2,6-Dichlorophenol	Water	8040[1]	40.0-120.0*	0.0-25.0*	1. ug/L*
	Solid	8040[1]	40.0-120.0*	0.0-25.0*	1. mg/kg*
2,4-Dimethylphenol	Water	8040[1]	50.4-100.0*	0.0-25.0*	1. ug/L*
	Solid	8040[1]	50.4-100.0*	0.0-25.0*	1. mg/kg*
2,4-Dinitrophenol	Water	8040[1]	31.7-125.1*	0.0-25.0*	15. ug/L*
	Solid	8040[1]	31.7-125.1*	0.0-25.0*	15. mg/kg*
2-Methyl-4,6-dinitrophenol	Water	8040[1]	42.4-123.6*	0.0-25.0*	20. ug/L*
	Solid	8040[1]	42.4-123.6*	0.0-25.0*	20. mg/kg*
2-Nitrophenol	Water	8040[1]	56.6-103.8*	0.0-25.0*	1. ug/L*
	Solid	8040[1]	56.6-103.8*	0.0-25.0*	1. mg/kg*
4-Nitrophenol	Water	8040[1]	22.7-100.0*	0.0-25.0*	5. ug/L*
	Solid	8040[1]	22.7-100.0*	0.0-25.0*	5. mg/kg*
Pentachlorophenol	Water	8040[1]	56.7-113.5*	0.0-25.0*	1. ug/L*
	Solid	8040[1]	56.7-113.5*	0.0-25.0*	1. mg/kg*
Phenol	Water	8040[1]	32.4-100.0*	0.0-25.0*	1. ug/L*
	Solid	8040[1]	32.4-100.0*	0.0-25.0*	1. mg/kg*
Tetrachlorophenol	Water	8040[1]	40.0-120.0*	0.0-25.0*	50. ug/L*
	Solid	8040[1]	40.0-120.0*	0.0-25.0*	50. mg/kg*
Trichlorophenol	Water	8040[1]	40.0-120.0*	0.0-25.0*	10. ug/L*
	Solid	8040[1]	40.0-120.0*	0.0-25.0*	10. mg/kg*
2,4,6-Trichlorophenol	Water	8040[1]	60.8-110.4*	0.0-25.0*	1. ug/L*
	Solid	8040[1]	60.8-110.4*	0.0-25.0*	1. mg/kg*
Benzyl butyl phthalate	Water	8060[1]	57.0-110.0*	0.0-25.0*	15. ug/L*
	Solid	8060[1]	57.0-110.0*	0.0-25.0*	15. mg/kg*

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Bis(2-ethylhexyl) phthalate	Water	8060[1]	2.4-111.8*	0.0-25.0*	20. ug/L*
	Solid	8060[1]	2.4-111.8*	0.0-25.0*	20. mg/kg*
Di-n-butyl phthalate	Water	8060[1]	41.2-118.4*	0.0-25.0*	14. ug/L*
	Solid	8060[1]	41.2-118.4*	0.0-25.0*	14. mg/kg*
Diethyl phthalte	Water	8060[1]	7.6-133.6*	0.0-25.0*	31. ug/L*
	Solid	8060[1]	7.6-133.6*	0.0-25.0*	31. mg/kg*
Dimethyl phthalate	Water	8060[1]	5.2-142.0*	0.0-25.0*	19. ug/L*
	Solid	8060[1]	5.2-142.0*	0.0-25.0*	19. mg/kg*
Di-n-octyl phthalate	Water	8060[1]	0.0-100.0*	0.0-25.0*	31. ug/L*
	Solid	8060[1]	0.0-100.0*	0.0-25.0*	31. mg/kg*
N-Nitrosodimethyl-amine	Water	8070[1]	50.0-150.0*	0.0-25.0*	0.15 ug/L*
	Solid	8070[1]	50.0-150.0*	0.0-25.0*	0.15 mg/kg*
N-Nitrosodiphenyl-amine	Water	8070[1]	50.0-150.0*	0.0-25.0*	0.46 ug/L*
	Solid	8070[1]	50.0-150.0*	0.0-25.0*	0.46 mg/kg*
N-Nitrosodi-n-propylamine	Water	8070[1]	50.0-150.0*	0.0-25.0*	0.81 ug/L*
	Solid	8070[1]	50.0-150.0*	0.0-25.0*	0.81 mg/kg*
Isophorone	Water	8090[1]	8.0-100.0*	0.0-25.0*	15.7 ug/L*
	Solid	8090[1]	8.0-100.0*	0.0-25.0*	15.7 mg/kg*
Nitrobenzene	Water	8090[1]	25.7-100.0*	0.0-25.0*	13.7 ug/L*
	Solid	8090[1]	25.7-100.0*	0.0-25.0*	13.7 mg/kg*
2,4-Dinitrotoluene	Water	8090[1]	18.0-114.0*	0.0-25.0*	0.02 ug/L*
	Solid	8090[1]	18.0-114.0*	0.0-25.0*	0.02 mg/kg*
2,6-Dinitrotoluene	Water	8090[1]	19.0-115.0*	0.0-25.0*	0.01 ug/L*
	Solid	8090[1]	19.0-115.0*	0.0-25.0*	0.01 mg/kg*

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Dinitrobenzene	Water	8090[1]	50.0-100.0*	0.0-25.0*	20. ug/L*
	Solid	8090[1]	50.0-100.0*	0.0-25.0*	20. mg/kg*
Naphthoquinone	Water	8090[1]	50.0-150.0*	0.0-25.0*	20. ug/L*
	Solid	8090[1]	50.0-150.0*	0.0-25.0*	20. mg/kg*
Acenaphthene	Water	8100[1]	0.0-105.7*	0.0-25.0*	1. ug/L*
	Solid	8100[1]	0.0-105.7*	0.0-25.0*	10. mg/kg*
Acenaphthylene	Water	8100[1]	22.1-112.1*	0.0-25.0*	10. ug/L*
	Solid	8100[1]	22.1-112.1*	0.0-25.0*	10. mg/kg*
Anthracene	Water	8100[1]	11.2-112.3*	0.0-25.0*	1. ug/L*
	Solid	8100[1]	11.2-112.3*	0.0-25.0*	10. mg/kg*
Benzo(a)anthracene	Water	8100[1]	31.0-116.0*	0.0-25.0*	10. ug/L*
	Solid	8100[1]	31.0-116.0*	0.0-25.0*	10. mg/kg*
Benzo(a)pyrene	Water	8100[1]	2.0-110.0*	0.0-25.0*	10. ug/L*
	Solid	8100[1]	2.0-110.0*	0.0-25.0*	10. mg/kg*
Benzo(b)fluoranthene	Water	8100[1]	18.0-138.0*	0.0-25.0*	10. ug/L*
	Solid	8100[1]	18.0-138.0*	0.0-25.0*	10. mg/kg*
Benzo(j)fluoranthene	Water	8100[1]	50.0-150.0*	0.0-25.0*	10. ug/L*
	Solid	8100[1]	50.0-150.0*	0.0-25.0*	10. mg/kg*
Benzo(k)fluoranthene	Water	8100[1]	0.0-140.0*	0.0-25.0*	10. ug/L*
	Solid	8100[1]	0.0-140.0*	0.0-25.0*	10. mg/kg*
Benzo(g,h,i)perylene	Water	8100[1]	0.0-107.0*	0.0-25.0*	10. ug/L*
	Solid	8100[1]	0.0-107.0*	0.0-25.0*	10. mg/kg*
Chrysene	Water	8100[1]	0.0-175.0*	0.0-25.0*	10. ug/L*
	Solid	8100[1]	0.0-175.0*	0.0-25.0*	10. mg/kg*

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Dibenz(a,h)acridine	Water	8100[1]	3.0-100.0*	0.0-25.0*	100. ug/L*
	Solid	8100[1]	3.0-100.0*	0.0-25.0*	100. mg/kg*
Dibenz(a,j)acridine	Water	8100[1]	0.0-100.0*	0.0-25.0*	100. ug/L*
	Solid	8100[1]	0.0-100.0*	0.0-25.0*	100. mg/kg*
Dibenzo(a,h)anthra-cene	Water	8100[1]	0.0-100.0*	0.0-25.0*	100. ug/L*
	Solid	8100[1]	0.0-100.0*	0.0-25.0*	100. mg/kg*
7H-Dibenzo(c,g) carbazole	Water	8100[1]	0.0-100.0*	0.0-25.0*	100. ug/L*
	Solid	8100[1]	0.0-100.0*	0.0-25.0*	100. mg/kg*
Dibenzo(a,e)pyrene	Water	8100[1]	0.0-100.0*	0.0-25.0*	100. ug/L*
	Solid	8100[1]	0.0-100.0*	0.0-25.0*	100. mg/kg*
Dibenzo(a,h)pyrene	Water	8100[1]	1.2-100.0*	0.0-25.0*	100. ug/L*
	Solid	8100[1]	1.2-100.0*	0.0-25.0*	100. mg/kg*
Dibenzo(a,i)pyrene	Water	8100[1]	0.0-100.0*	0.0-25.0*	100. ug/L*
	Solid	8100[1]	0.0-100.0*	0.0-25.0*	100. mg/kg*
Fluoranthene	Water	8100[1]	27.0-111.0*	0.0-25.0*	1. ug/L*
	Solid	8100[1]	27.0-111.0*	0.0-25.0*	10. mg/kg*
Fluorene	Water	8100[1]	0.0-119.0*	0.0-25.0*	1. ug/L*
	Solid	8100[1]	0.0-119.0*	0.0-25.0*	10. mg/kg*
Indeno(1,2,3-cd)pyrene	Water	8100[1]	12.0-100.0*	0.0-25.0*	100. ug/L*
	Solid	8100[1]	12.0-100.0*	0.0-25.0*	100. mg/kg*
3-Methylcholanthrene	Water	8100[1]	0.0-100.0*	0.0-25.0*	100. ug/L*
	Solid	8100[1]	0.0-100.0*	0.0-25.0*	100. mg/kg*
Naphthalene	Water	8100[1]	21.5-100.0*	0.0-25.0*	1. ug/L*
	Solid	8100[1]	21.5-100.0*	0.0-25.0*	10. mg/kg*

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Phenanthrene	Water	8100[1]	8.4-133.7*	0.0-25.0*	1. ug/L*
	Solid	8100[1]	8.4-133.7*	0.0-25.0*	10. mg/kg*
Pyrene	Water	8100[1]	14.0-121.0*	0.0-25.0*	10. ug/L*
	Solid	8100[1]	14.0-121.0*	0.0-25.0*	10. mg/kg*
1-Methylnaphthalene	Water	8100[1]	20.0-120.0*	0.0-25.0*	10. ug/L*
	Solid	8100[1]	20.0-120.0*	0.0-25.0*	10. mg/kg*
2-Methylnaphthalene	Water	8100[1]	20.0-120.0*	0.0-25.0*	1. ug/L*
	Solid	8100[1]	20.0-120.0*	0.0-25.0*	10. mg/kg*
Bis(2-chloroethoxy) methane	Water	8110[1]	40.0-120.0*	0.0-25.0*	0.5 ug/L*
	Solid	8110[1]	40.0-120.0*	0.0-25.0*	0.5 mg/kg*
Bis(2-chloroethyl)ether	Water	8110[1]	40.0-120.0*	0.0-25.0*	0.3 ug/L*
	Solid	8110[1]	40.0-120.0*	0.0-25.0*	0.3 mg/kg*
Bis(2-chloroisopropyl) ether	Water	8110[1]	40.0-120.0*	0.0-25.0*	0.8 ug/L*
	Solid	8110[1]	40.0-120.0*	0.0-25.0*	0.8 mg/kg*
4-Bromophenyl phenyl ether	Water	8110[1]	40.0-120.0*	0.0-25.0*	2.3 ug/L*
	Solid	8110[1]	40.0-120.0*	0.0-25.0*	2.3 mg/kg*
4-Chlorophenyl phenyl ether	Water	8110[1]	40.0-120.0*	0.0-25.0*	3.9 ug/L*
	Solid	8110[1]	40.0-120.0*	0.0-25.0*	3.9 mg/kg*
2-Chloronaphthalene	Water	612[4], 8120[1]	29.5-126.9*	0.0-25.0*	0.94 ug/L*
	Solid	8120[1]	29.5-126.9*	0.0-25.0*	0.94 mg/kg*
1,2-Dichlorobenzene	Water	612[4], 8120[1]	23.5-145.1*	0.0-25.0*	1.14 ug/L*
	Solid	8120[1]	23.5-145.1*	0.0-25.0*	1.14 mg/kg*
1,3-Dichlorobenzene	Water	612[4], 8120[1]	7.2-138.6*	0.0-25.0*	1.19 ug/L*
	Solid	8120[1]	7.2-138.6*	0.0-25.0*	1.19 mg/kg*

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
1,4-Dichlorobenzene	Water	612[4], 8120[1]	22.7-126.9*	0.0-25.0*	1.34 ug/L*
	Solid	8120[1]	22.7-126.9*	0.0-25.0*	1.34 mg/kg*
Hexachlorobenzene	Water	612[4], 8120[1]	26.0-148.0*	0.0-25.0*	0.05 ug/L*
	Solid	8120[1]	26.0-148.0*	0.0-25.0*	0.05 mg/kg*
Hexachlorobutadiene	Water	612[4], 8120[1]	0.0-127.0*	0.0-25.0*	0.34 ug/L*
	Solid	8120[1]	0.0-127.0*	0.0-25.0*	0.34 mg/kg*
Hexachlorocyclo-hexane	Water	612[4], 8120[1]	50.0-150.0*	0.0-25.0*	0.1 ug/L*
	Solid	8120[1]	50.0-150.0*	0.0-25.0*	0.1 mg/kg*
Hexachlorocyclo-pentadiene	Water	612[4], 8120[1]	0.0-104.0*	0.0-25.0*	0.4 ug/L*
	Solid	8120[1]	0.0-104.0*	0.0-25.0*	0.4 mg/kg*
Hexachloroethane	Water	612[4], 8120[1]	24.0-123.0*	0.0-25.0*	0.03 ug/L*
	Solid	8120[1]	24.0-123.0*	0.0-25.0*	0.03 mg/kg*
Pentachloroethane	Water	612[4], 8120[1]	50.0-150.0*	0.0-25.0*	0.1 ug/L*
	Solid	8120[1]	50.0-150.0*	0.0-25.0*	0.1 mg/kg*
Tetrachlorobenzene	Water	612[4], 8120[1]	50.0-150.0*	0.0-25.0*	0.1 ug/L*
	Solid	8120[1]	50.0-150.0*	0.0-25.0*	0.1 mg/kg*
1,2,4-Trichlorobenzene	Water	612[4], 8120[1]	20.2-133.7*	0.0-25.0*	0.05 ug/L*
	Solid	8120[1]	20.2-133.7*	0.0-25.0*	0.05 mg/kg*
Azinophos methyl	Water	8140[1]	50.0-150.0*	0.0-25.0*	1.5 ug/L*
	Solid	8140[1]	50.0-150.0*	0.0-25.0*	1.5 mg/kg*
Bolstar	Water	8140[1]	50.0-150.0*	0.0-25.0*	0.15 ug/L*
	Solid	8140[1]	50.0-150.0*	0.0-25.0*	0.15 mg/kg*
Chlorpyrifos	Water	8140[1]	50.0-150.0*	0.0-25.0*	0.3 ug/L*
	Solid	8140[1]	50.0-150.0*	0.0-25.0*	0.3 mg/kg*

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Coumaphos	Water	8140[1]	0.0-120.0*	0.0-25.0*	1.5 ug/L*
	Solid	8140[1]	0.0-120.0*	0.0-25.0*	1.5 mg/kg*
Demeton-O	Water	8140[1]	0.0-120.0*	0.0-25.0*	0.25 ug/L*
	Solid	8140[1]	0.0-120.0*	0.0-25.0*	0.25 mg/kg*
Demeton-S	Water	8140[1]	0.0-120.0*	0.0-25.0*	0.25 ug/L*
	Solid	8140[1]	0.0-120.0*	0.0-25.0*	0.25 mg/kg*
Diazinon	Water	8140[1]	0.0-120.0*	0.0-25.0*	0.6 ug/L*
	Solid	8140[1]	0.0-120.0*	0.0-25.0*	0.6 mg/kg*
Dichlorvos	Water	8140[1]	0.0-120.0*	0.0-25.0*	0.1 ug/L*
	Solid	8140[1]	0.0-120.0*	0.0-25.0*	0.1 mg/kg*
Disulfoton	Water	8140[1]	0.0-120.0*	0.0-25.0*	0.2 ug/L*
	Solid	8140[1]	0.0-120.0*	0.0-25.0*	0.2 mg/kg*
Ethoprop	Water	8140[1]	0.0-120.0*	0.0-25.0*	0.25 ug/L*
	Solid	8140[1]	0.0-120.0*	0.0-25.0*	0.25 mg/kg*
Fensulfothion	Water	8140[1]	0.0-120.0*	0.0-25.0*	1.5 ug/L*
	Solid	8140[1]	0.0-120.0*	0.0-25.0*	1.5 mg/kg*
Fenthion	Water	8140[1]	0.0-120.0*	0.0-25.0*	0.1 ug/L*
	Solid	8140[1]	0.0-120.0*	0.0-25.0*	0.1 mg/kg*
Merphos	Water	8140[1]	0.0-120.0*	0.0-25.0*	0.25 ug/L*
	Solid	8140[1]	0.0-120.0*	0.0-25.0*	0.25 mg/kg*
Mevinphos	Water	8140[1]	0.0-120.0*	0.0-25.0*	0.3 ug/L*
	Solid	8140[1]	0.0-120.0*	0.0-25.0*	0.3 mg/kg*
Naled	Water	8140[1]	0.0-120.0*	0.0-25.0*	0.1 ug/L*
	Solid	8140[1]	0.0-120.0*	0.0-25.0*	0.1 mg/kg*

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	ACCURACY % RECOVERY	PRECISION % RPD	MRDL
Dichloroprop	Water	615[4], 8150[1]	60.0-125.0*	0.0-25.0*	0.65 ug/L*
	Solid	8150[1]	60.0-125.0*	0.0-25.0*	0.65 mg/kg*
Dinoseb	Water	615[4], 8150[1]	60.0-125.0*	0.0-25.0*	0.07 ug/L*
	Solid	8150[1]	60.0-125.0*	0.0-25.0*	0.07 mg/kg*
MCPA	Water	615[4], 8150[1]	60.0-125.0*	0.0-25.0*	249. ug/L*
	Solid	8150[1]	60.0-125.0*	0.0-25.0*	249. mg/kg*
MCPP	Water	615[4], 8150[1]	60.0-125.0*	0.0-25.0*	192. ug/L*
	Solid	8150[1]	60.0-125.0*	0.0-25.0*	192. mg/kg*

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-1 - continued

ANALYTE	MATRIX	METHOD	SURROGATE % RECOVERY
Trifluorotoluene	Water	601/602[4], 8010/8020[1]	60.2-126.5
	Solid	8010/8020[1]	61.8-127.5
	Water	MOD. 8020[1]	77.7-111.5
	Solid	MOD. 8020[1]	49.0-149.3
Bromochloromethane	Water	601/602[4], 8010/8020[1]	72.6-117.5
	Solid	8010/8020[1]	70.6-123.7
2-Bromo-1-chloropropane	Water	601/602[4], 8010/8020[1]	68.9-426.5
	Solid	8010/8020[1]	63.7-119.2
Bromofluorobenzene	Water	624[4], 8240[1]	89.1-110.7
	Low Soil	8240[1]	68.9-118.4
	Med Soil	8240[1]	88.1-117.7
1,2-Dichloroethane-d4	Water	624[4], 8240[1]	85.1-114.7
	Low Soil	8240[1]	62.8-122.1
	Med Soil	8240[1]	80.1-126.0
Toluene-d8	Water	624[4], 8240[1]	91.2-108.4
	Low Soil	8240[1]	81.7-124.2
	Med Soil	8240[1]	71.7-128.1
2-Fluorophenol	Water	625[4], 8270[1]	42.9-80.4
	Solid	8270[1]	28.1-117.0
2,4,6-Tribromophenol	Water	625[4], 8270[1]	70.2-130.5
	Solid	8270[1]	24.6-144.1
Nitrobenzene-d5	Water	625[4], 8270[1]	32.2-123.5
	Solid	8270[1]	37.7-99.4
2-Fluorobiphenyl	Water	625[4], 8270[1]	16.4-112.6
	Solid	8270[1]	36.2-120.1
Terphenyl-d14	Water	625[4], 8270[1]	38.7-140.5
	Solid	8270[1]	44.7-154.2
Phenol-d6	Water	625[4], 8270[1]	11.6-74.0
	Solid	8270[1]	29.8-114.7
Octadecane	Water	608[4], 8080[1]	47.0-128.3
	Solid	8080[1]	21.7-151.7
Pentadecane	Water	608[4], 8080[1]	50.0-150.0*
	Solid	8080[1]	50.0-150.0*
2,4,6-Tribromophenyl	Water	608[4], 8080[1]	61.2-112.5
	Solid	8080[1]	20.3-131.7
Dibutylchlorendate	Water	608[4], 8080[1]	50.8-143.8
	Solid	8080[1]	35.1-153.1
Decachlorobiphenyl	Water	608[4], 8080[1]	43.2-136.4
	Solid	8080[1]	38.2-157.4

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

TABLE V-2
SAMPLE PREPARATION METHODS

SAMPLE PREP. METHOD NUMBER	DESCRIPTION	MATRIX	SAMPLE PREP. FOR THESE METHODS
3010[1]	Acid digestion	Water	200.7, 6010
3020[1]	Acid digestion	Water	204.2, 7041, 7131, 7421, 7841
3050[1]	Acid digestion	Solid	7041, 7131, 7421, 7841, 6010
1310[1]	EPTOX	Solid	
1311[1]	TCLP	Solid	
3540[1]	Soxhlet extraction	Solid	9071
5030[1]	Purge and Trap	Water & Solid	8010/8020, MOD 8020, 8240
3510[1]	Liquid-Liquid	Water	8080, 8270, 8040, 8060, 8070, 8090, 8100, 8120, 8140, 8150
3520[1]	Continuous Extraction	Water	8270
3550[1]	Sonication	Solid	8080, 8270, 8040, 8060, 8070, 8090, 8100, 8120, 8140, 8150
3640[1]	GPC	Water & Solid	8080, 8270, 8040, 8060, 8070, 8090, 8100, 8120, 8140, 8150

1) Test Methods for Evaluating Solid Waste, SW-846, Third Edition.
2) Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, Revised 1983.
3) Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WACF, 16th Ed.
4) Federal Register, 40 CFR Part 136, Appendix C, October 1984.

OUT OF CONTROL LOG

Date	Time	QC Parameter	Actual	Found	Ratio	Rel	Criteria	Comments	Analyst
901102	1330	VBZ5 SWATER	20.0	1.4	7.0000	<	73.3190	low reference due to overhandling	JL
901102	1330	VB6 SWATER	20.0	11.9	59.5000	<	67.8380	LOW REFERENCE DUE TO OVERHANDLING OF MIX1000 IN VOLUMETRIC FLASK	JL
901102	1330	VB8 SWATER	20.0	14.0	70.0000	<	72.5460	low reference due to overhandling	JL
901102	1330	VB11 SWATER	20.0	14.0	70.0000	<	77.7700	low handling due to overhandling	JL
901102	1330	VB12 SWATER	20.0	13.7	68.5000	<	70.5570	low reference due to overhandling	JL
901102	1330	VBZ5 SWATER	20.0	13.6	68.0000	<	73.3190	low reference due to overhandling	JL
901102	1330	VBZ6 SWATER	20.0	13.1	65.5000	<	73.3050	low reference due to overhandling	JL
901102	1330	VBZ7 SWATER	20.0	12.0	60.0000	<	72.7230	low reference due to overhandling	JL
901102	1330	VB11 SWATER	20.0	15.5	77.5000	<	77.7700	LOW REFERENCE DUE TO OVERHANDLING OF MIX 1000 IN VOLUMETRIC	JL
901106	1402	FNLBESWATER	1.00	0.892	89.2000	<	93.8490		CUT
901106	1130	VB3 SWATER	20.0	29.3	146.5000	>	138.0860		RB
901106	1130	VB7 SWATER	20.0	22.8	114.0000	>	109.6480		RB
901106	1130	VB14 SWATER	20.0	26.2	131.0000	>	120.9370		RB
901106	1041	Pb-P ESOLID	1.0	0.866	86.6000	<	[illegible]	RB	RT
901107	1307	OP EWATER	0.500	0.509	101.8000	>	100.9710		RBR
901107	1120	VB10 SWATER	50.0	46.9	93.8000	<	94.7750		RB
901108	931	Cr-P SWATER	0.2	0.15	75.0000	<	81.0660	R7	RT
901108	956	Cr-P RWATER	0.067	0.431	140.2623	>	30.0170	R3	RT

319980

FIGURE V-1

Section No. V
Revision No. 1
Date: 09/25/92
Page 40 of 41

Category	Category Title
FRPD	F RELATIVE % DIFFERENCE

Parameter	Date Modified	NEW VALUES Date	Actual	Found	Analyst	ORIGINAL VALUES Date	Actual	Found	Analyst
Fluoride	90/05/31	90/04/20	0.05	0.05	CCB	90/04/20	0.1	0.18	LK

Category	Category Title
FS	F SPIKE % RECOVERY

Parameter	Date Modified	NEW VALUES Date	Actual	Found	Analyst	ORIGINAL VALUES Date	Actual	Found	Analyst
Fluoride	90/05/31	90/05/07	1.	0.72	CCB	90/05/07	0.70	1.49	LK
Fluoride	90/05/31	90/05/31	1.	0.91	CCB	90/05/31	1.	0.1	LK
Fluoride	90/05/31	90/05/17	1.	0.97	CCB	90/05/17	1.	0.09	LK

Category	Category Title
V13SPK	BROMODICHLOROMETHANE % RECOVERIES FOR THM

Parameter	Date Modified	NEW VALUES Date	Actual	Found	Analyst	ORIGINAL VALUES Date	Actual	Found	Analyst
BROMODICHLOROMETHANE	90/06/01	90/01/09	20.0	22.6	ERN	90/01/09	20.0	24.5	TSH
BROMODICHLOROMETHANE	90/06/01	90/01/09	20.0	23.6	ERN	90/01/09	20.0	25.5	TSH
BROMODICHLOROMETHANE	90/06/01	90/01/16	20.0	21.4	ERN	90/01/16	20.0	22.3	TSH
BROMODICHLOROMETHANE	90/06/01	90/01/16	20.0	21.2	ERN	90/01/16	20.0	22.1	TSH
BROMODICHLOROMETHANE	90/06/01	90/01/18	20.0	22.7	ERN	90/01/18	20.0	23.8	TSH
BROMODICHLOROMETHANE	90/06/01	90/01/18	20.0	22.9	ERN	90/01/18	20.0	24.0	TSH
BROMODICHLOROMETHANE	90/06/01	90/01/29	20.0	24.6	ERN	90/01/29	20.0	25.4	TSH
BROMODICHLOROMETHANE	90/06/01	90/01/29	20.0	24.0	ERN	90/01/29	20.0	24.8	TSH
BROMODICHLOROMETHANE	90/06/01	90/02/20	20.0	20.2	ERN	90/02/20	20.0	25.5	TSH
BROMODICHLOROMETHANE	90/06/01	90/02/20	20.0	21.9	ERN	90/02/20	20.0	27.2	TSH
BROMODICHLOROMETHANE	90/06/01	90/02/23	20.0	22.7	ERN	90/02/23	20.0	29.8	TSH
BROMODICHLOROMETHANE	90/06/01	90/02/23	20.0	22.1	ERN	90/02/23	20.0	29.2	TSH
BROMODICHLOROMETHANE	90/06/01	90/04/20	20.0	19.6	ERN	90/04/20	20.0	24.1	TSH
BROMODICHLOROMETHANE	90/06/01	90/04/20	20.0	19.3	ERN	90/04/20	20.0	23.8	TSH

Category	Category Title
V14MSD	1,2-DICHLOROPROPANE BY GC - WATER RPD'S

Parameter	Date Modified	NEW VALUES Date	Actual	Found	Analyst	ORIGINAL VALUES Date	Actual	Found	Analyst
1,2-DICHLOROPROPANE	90/06/25	90/06/13	105.0	103.0	JL	90/06/13	92.0	89.0	JL

FIGURE V-2

Section No. V
Revision No. 1
Date: 09/25/92
Page 41 of 41

319981

SECTION VI. SAMPLING PROCEDURES

A critical concern in any project, especially those where a large number of samples and analyses of multiple parameters are required, is the maintenance of sample integrity. A sample is physical evidence of a situation in the environment at a specific place and time. Therefore, an essential part of all sampling projects is proper collection and handling of the samples. Representative samples of environmental matrices are collected through well defined protocols. The client performs the majority of the sampling and thus assumes responsibility for properly obtaining, handling, preserving, and shipping the sample. OBG Laboratories, Inc. provides sampling kits to the client upon request. These sampling kits contain sampling instructions, properly labeled sample containers and chain of custody forms. If OBG Laboratories, Inc. is requested to collect samples, a well defined sampling protocol is followed. This sampling protocol includes the following elements:

1) Sampling team members are competent and qualified
2) Proper sampling methods are used in the collection of a representative sample
3) Equipment is accurately calibrated
4) Samples are properly handled to prevent contamination from outside sources or cross contamination between samples
5) Samples are preserved in the proper manner
6) Samples are properly identified

7) Samples analyzed are actually the samples collected under reported conditions.

OBG Laboratories, Inc. does not routinely provide sampling services. The lab will give recommendations on proper sampling plans. Sampling will be sub-contracted out and a sampling plan will be provided at that time.

A. Sample Containers

When the laboratory sends out sample containers, the containers will already contain the proper preservative agents, if requested by the client. The containers are labeled with the type of preservative added. The client is responsible for verifying that the proper containers were received.

Each sample is collected in a new, precleaned container to minimize contamination with the exception of bacteriological samples. For these samples sterilized plastic bottles are used. I-Chem 300 precleaned containers are purchased on a project by project basis and their use is documented in the Case Narrative and identified on the sample bottle request form.

B. Holding Times and Preservatives

OBG Laboratories adheres to the holding time requirements outlined in the method being utilized. When CLP analyses are required, the holding times specified in the CLP protocol are adhered to. Holding times vary depending upon matrix, protocol, and regulatory requirements. Expedient delivery and scheduling are paramount to obtain compliance with holding times. The LIMS assists in the monitoring of holding times by incorporating a due date on the schedule queue. The analysts, when reviewing their

schedule, are aware not only of the workload but also of holding time requirements.

If samples are received over their holding times, the client is notified so resampling can be scheduled.

Preservation is the clients responsibility. We can and have provided at the clients request the appropriate preservative in the sample containers. This practice is noted on the sample request form. When preservatives are added, ACS grade reagents are used. As an example, Trace Metals nitric acid from Baker Scientific is added to pint plastic containers and used for metals analysis. All samples for organic analyses have sodium thiosulfate added to them whether residual chlorine is present or not. The sodium thiosulfate does not affect the sample analysis if residual chlorine is not present.

If the client requires additional preservatives, the amount requested will be put into a two ounce container at the same time the sample containers are prepared and shipped with the sample containers. A list of sample containers, preservatives and holding times are included as Table VI-1.

Sample containers are shipped in coolers to the clients by common carrier or are picked up at the lab by the client. Glass bottles are wrapped in styrofoam to prevent breakage. VOA vials are put into a vial holder to minimize breakage. All containers are put into plastic zip-lock bags to prevent cross contamination or leakage in case one of the containers should break during shipment. When the samples are shipped back to the lab, they are repacked into the coolers in the same manner in which they were shipped and crushed ice is added.

TABLE VI-1
SAMPLE CONTAINERS AND PRESERVATIVES

ORGANICS
DRINKING WATER

PARAMETER	CONTAINER/PRES.	HOLDING TIME	VOLUME REQUIRED	COMMON NAMES	COMMENTS
THM	40ml vial/$NA_2S_2O_3$ (Sodium Thiosulfate)	14 days	40ml(2)	EPA 501.2	Cool 4° C
Pesticides	Glass Liter/none Teflon Liner	7 days	1L	PESTICIDES	Cool 4° C
Herbicides	Glass Liter/none Teflon Liner	7 days	1L	HERBICIDES	Cool 4° C
Volatile Organic Chemicals	40 ml vial/1:1 HCl Ascorbic Acid	14 days	40 ml (3)	EPA 502.1/503.1	Cool 4° C

ORGANICS
HAZARDOUS WASTE

PARAMETER	CONTAINER/PRES.	HOLDING TIME	VOLUME REQUIRED	COMMON NAMES	COMMENTS
Volatiles (water)	40ml vials/1:1 HCl Teflon Lined Septum	14 days	40ml(2)	601/602, 8010/ 8020	Cool 4° C
Volatiles (soil)	4 oz glass/none Teflon Lined Cap	14 days	30g	8010/8020	Cool 4° C
Volatiles (water)	40ml vials/1:1 HCl Teflon Lined Septum	14 days	40ml(2)	624, 8240	Cool 4° C
Volatiles (soil)	4 oz glass/none Teflon Lined Cap	14 days	30g	8240	Cool 4° C
Volatiles (CLP)	40ml vials/1:1 HCl Teflon Lined Septum	5 days	40ml(2)		Cool 4° C
AE/BN (water)	Glass Liter/none Teflon Liner	7 days	1L	625, 8270	Cool 4° C
AE/BN (soil)	Sed. Jar/none Teflon Liner	14 days	200g	8270	Cool 4° C

TABLE VI-1 - continued

ORGANICS
HAZARDOUS WASTE

PARAMETER	CONTAINER/PRES.	HOLDING TIME	VOLUME REQUIRED	COMMON NAMES	COMMENTS
Volatile Petroleum Hydrocarbons (soil)	4 oz Glass/none Teflon Lined Cap	14 days	30g	8020 (mod.)	Cool 4° C
Volatile Petroleum Hydrocarbons (water)	40ml Vial/1:1 HCl Teflon Lined Septum	14 days	40ml(2)	8020 (mod.)	Cool 4° C
PCB (water)	Glass Liter/none Teflon Liner	7 days	1L	PCB	Cool 4° C
PCB (soil)	Sed. Jar/none Teflon Liner	14 days	500g	PCB	Cool 4° C
Pesticides (water)	Glass Liter/none pH of 5-9	7 days	1L	8080, 608	Cool 4° C
Pesticides (soil)	Sed. Jar/none	7 days	500g	8080	Cool 4° C
TOX	8oz Glass/H_2SO_4 Teflon Lined Septum	28 days	200ml(2)	TOX	Cool 4° C

TRACE METALS

PARAMETER	CONTAINER/PRES.	HOLDING TIME	VOLUME REQUIRED	COMMON NAMES	COMMENTS
Trace Metals	Plastic/1ml HNO_3 pH<2	6 months	200ml	DISSOLVED	-
			200ml	SUSPENDED	-
			100ml	TOTAL	-
Chromium-Hexavalent	P or G/none	24 hours	200ml	CR-HEX	Cool 4° C
Mercury	P or G/1ml HNO_3 pH<2	28 days	100ml	HG	Filter, add HNO_3 to pH <2

TABLE VI-1 - continued

INORGANIC NON-METALLICS

PARAMETER	CONTAINER/PRES.	HOLDING TIME	VOLUME REQUIRED	COMMON NAMES	COMMENTS
Acidity	P or G/none	14 days	100ml	TACID	Cool 4° C
Alkalinity	Glass/none Teflon Lined Septum	14 days	100ml	TALK	Cool 4° C
Bromide	P or G/none	28 days	100ml	BR	-
Chloride	P or G/none	28 days	50ml	CL	-
Chlorine	P or G/none	Analyze Immediately	200ml	Chlorine Demand Chlorine Residual	- -
Cyanides	Plastic/1ml NAOH ph>12	28 days 24 hours if S^- present	500ml	CN	Cool 4° C
Fluoride	P or G/none	28 days	300ml	F	-
Nitrogen Ammonia	P or G/1ml H_2SO_4;pH<2	28 days	400ml	NH3N	Cool 4° C
Kjeldahl, Total	P or G/1ml H_2SO_4;pH<2	28 days	500ml	TKN	Cool 4° C
Nitrite plus Nitrate	P or G/1ml H_2SO_4;pH<2	28 days	100ml	NO_2NO_3	Cool 4° C
Nitrite	P or G/none	48 hours	100ml	NO_2N	Cool 4° C
Phosphate	P or G/none	28 days	50ml	PO_4	Cool 4° C
Total Phosphorous	P or G/1ml H_2SO_4;pH,2	28 days	500ml	P	Cool 4° C
Silica	Plastic Only/none	28 days	100ml	SIO_2	Cool 4° C
Sulfate	P or G/none	28 days	100ml	SO_4	Cool 4° C
Sulfide	P or G/1ml ZnAC +NaOH to pH>9	7 days	500ml	S	Cool 4° C
Sulfite	P or G/none	Analyze Immediately	100ml	SO_3	-
BOD	P or G/none	48 hours	1000ml	BOD5, BOD28	Cool 4° C
COD	P or G/1ml H_2SO_4	28 days	100ml	COD-M	Cool 4° C

TABLE VI-1 - continued

INORGANIC NON-METALLICS

PARAMETER	CONTAINER/PRES.	HOLDING TIME	VOLUME REQUIRED	COMMON NAMES	COMMENTS
Oil and Grease	1 Glass Quart/ 1ml H_2SO_4;pH<2 Teflon Liner	28 days	1000ml	O&G	Cool 4° C
Total Organic Carbon	P or G/1ml H_2SO_4;pH<2	28 days	100ml	TOC	Cool 4° C
Phenolics	Glass Qt./1ml H_2SO_4 pH<2;Teflon Liner	28 days	500ml	PHENOL	Cool 4° C
Orthophosphate	P or G/none	48 hours	100ml	OP	Cool 4° C
MBAS	P or G/none	48 hours	100ml	MBAS	Cool 4° C
TPH	Glass Quart/HCl	28 days	1000ml	418.1	Cool 4° C
Ethylene Glycol	Glass/HCl	28 days	20ml	$C_2H_6O_2$	Cool 4° C
Fluoroborate	P or G/none	28 days	50ml	BF_4	Cool 4° C
Iodide	P or G/none	28 days	100ml	I	Cool 4° C

TABLE VI-1 continued

PHYSICAL PROPERTIES

PARAMETER	CONTAINER/PRES.	HOLDING TIME	VOLUME REQUIRED	COMMON NAMES	COMMENTS
Color	Plastic/none	48 hours	100ml	COLOR	Cool 4° C
Conductance	Plastic/none	28 days	100ml	SPCOND	Cool 4° C
Hardness	Plastic/HNO3 to pH <2	6 months	100ml	HARD(CA+MG)	Cool 4° C
Odor	Glass/none	24 hours	200ml	ODOR	Cool 4° C
pH	P or G/none	Analyze immediately	100ml	pH	
Residue	Plastic/none	7 days	500ml	Filterable, Total, Non-filterable, Volatile	Cool 4° C
Settable Solids	P or G/none	48 hours	1000ml	SETTS	Cool 4° C
Temperature	P or G/none	Analyze immediately	100ml	TEMP	
Turbidity	P or G/none	48 hours	100ml	TURB	Cool 4° C

BIOLOGICAL PROPERTIES

PARAMETER	CONTAINER/PRES.	HOLDING TIME	VOLUME REQUIRED	COMMON NAMES	COMMENTS
Total Coliform	Plastic 4 oz Sterilized/ $Na_2S_2O_3$	24 hours	120ml	T-Coli	Cool 4° C
Escherichia Coli	Plastic 4 oz Sterilized/ $Na_2S_2O_3$	24 hours	120ml	E-Coli	Cool 4° C
Fecal Coliform	Plastic 4 oz Sterilized/ $Na_2S_2O_3$	6 hours	120ml	F-Coli	Cool 4° C
Fecal Streptococcus	Plastic 4 oz Sterilized/ $Na_2S_2O_3$	6 hours	120ml	F-Strep	Cool 4° C
Standard Plate Count	Plastic 4 oz Sterilized/ $Na_2S_2O_3$	24 hours	120ml	SPC	Cool 4° C
Suitability	Plastic/none	28 days	1500ml	Suitability	Cool 4° C

SECTION VII. SAMPLE CUSTODY

A. Chain of Custody Procedures

The laboratory follows a chain of custody procedure. This procedure creates an accurate and legally defensible document that can be used to trace possession of a sample from its collection through analysis and final disposal. The chain-of-custody form is signed by all handlers of the sample. For CLP analyses, sample custody and handling are performed as required by NYSDEC and U.S. EPA CLP protocol. An example of a chain of custody is included as Figure VII-1.

A sample is considered in custody if it is:

1) In actual physical possession

2) In view after being in physical possession

3) In a locked repository

4) In a secure restricted area.

Formal custody begins with the shipment of precleaned properly preserved containers. The client contacts a section leader for sample bottles and the section leader submits a form requesting the proper containers to the sample custodian. An example of the sample bottle request form is included as Figure VII-2. After the request is completed and signed, the form is filed in a binder and kept in the sample tagging room for future reference.

Chain of custody forms are shipped with all sample bottles. The field sampler/client is responsible for filling in the sample location, date and time sampled,

sample matrix, and analysis required on the chain of custody. The field sampler signs the chain of custody when relinquishing custody and includes the form with the sample containers. Any comments that the sampler has is also listed on the chain of custody form. The field sampler is also responsible for filling in the sample labels that are present on every sample bottle. An example of a sample label is included as Figure VII-3.

Samples are shipped to the laboratory by common carrier or are delivered by the firm performing the sample collection in coolers packed with crushed ice to maintain the temperature at 4° C. Jars are wrapped in styrofoam sheets and put in plastic bags to help prevent breakage and cross-contamination.

B. Control of Incoming Samples

OBG Laboratories employs several sample custodians who are responsible for verifying the receipt of samples. When samples are received, the sample custodians follow the steps outlined below.

1) Coolers are checked to verify that the samples listed on the chain of custody were actually received. A notation is made of any missing samples.
2) Samples are checked and a notation is made of any samples that were received broken or damaged.
3) The Chain of Custody is signed and dated to verify time of sample receipt.
4) The sample custodian records the temperature of the cooler when received and verifies the proper preservation for the parameters requested by checking and recording the pH of each sample with the exception of volatile samples.

5) Coolers are checked for low level radiation with a geiger counter.

6) Each sample is assigned a unique laboratory identification number to make tracking of samples easier. Numbers are assigned sequentially. Each project is also assigned a unique project number that contains the client ID and job number.

7) Laboratory report forms are filled out and distributed to the appropriate laboratory personnel.

8) Samples are logged into the LIMS and the analyses are scheduled from the laboratory report form.

The observations of the sample custodians and any comment that they have are noted on the case file form. An example of the case file form is included as Figure VII-4. Samples are not routinely rejected by the laboratory. When problems arise the client is notified of the deficiency and a decision is made to continue or resample. Whatever the decision is, it is noted on the final report. If samples are improperly preserved, the client will be notified and the samples will be rejected if the client so desires.

The sample custodian tags each sample with a unique laboratory sample number which is input into the computer and recorded onto the sample log-in form. An example of the sample log-in form is included as Figure VII-5. The sample log-in form is filed in a three ring binder and functions as a sample receipt log book. The sample custodian fills out a laboratory report form which is copied and distributed to the section leaders. An example of a laboratory report form is included as Figure VII-6. The laboratory report contains the date the samples were collected, the date the samples were received, the

client sample description, the laboratory sample number and all tests that are required.

The chain of custody effort is intensified at the request of the client. The intensified procedure starts with the use of red evidence tape in the field. Each container is sealed with the tape at the sampling site and shipped in sealed coolers to the laboratory. When the samples are received by the laboratory, the condition of the sealed containers is recorded on part one of the sample control record and the laboratory numbers are assigned. An example of part one of the sample control record is included as Figure VII-7. Samples with red evidence tape must be signed in and out of the locked secured cooler using part two of the sample control record. An example of part two the sample control record is included as Figure VII-8.

The field chain of custody form, case file form, sample control record, and original laboratory report form are kept on file outside the walk-in cooler. All samples are stored in a secured, locked walk-in cooler.

Any errors made while completing the chain of custody forms are corrected by deleting the entry with one line through it, correcting the error, and dating and initialing the correction.

A complete chain of custody file is included as Appendix B.

C. Scheduling

The purpose of scheduling is to notify the manager, section leaders, chemists and technicians of the arrival of a sample and the tests to be performed.

Analyses are scheduled on the LIMS by the sample custodians from the laboratory report forms. A work schedule is printed every morning listing sample

numbers, tests required, due date, days left until the holding time expires, and bin number where the samples are located. An example of the work schedule is included as Figure VII-9. The analysts use the work schedule to identify what samples they are required to analyze. The section leaders review the work schedule with the analysts to ensure priorities and holding times are being met.

D. Sample Tracking

Our tracking system relies on project numbers and sample numbers. Therefore, laboratory sample numbers and client ID numbers are recorded on all raw data and preparation logs. Examples of the sample prep and analysis logs are included as Figures VII-10, VII-11, VII-12, and VII-13. Samples are primarily tracked using the laboratory sample numbers. Project status is tracked using project numbers and sample numbers.

E. Location and Disposal

All samples are stored in a locked walk-in cooler. Chain of custody samples are signed in and out of the cooler by the analyst performing the analysis. Sample extracts or digestates are stored in refrigerators in the appropriate lab section. Standards are stored in separate refrigerators in the appropriate lab section.

A separate system is used to help the chemists and technicians locate samples in the cooler. The system also gives direction on the ultimate disposal of the samples. The system has been termed the bin system. After the chain of custody record is processed, the samples are placed in a bin in the cooler. Each bin has a unique number which is transcribed on the sample bottles, the laboratory report form and in the computer. The number helps the chemists locate the sample and return it to the correct

place.

The sample custodian fill out a bin index card, which is submitted to the section leader responsible for the job. An example of a bin card is included as Figure VII-14. When the program is complete, the section leader signs the card and returns it to the sample custodian. The section leader states the method of disposal or whether the samples should be saved. One month after the receipt of the bin card the sample custodian disposes or archives the sample as stated on the card. Additional information on sample disposal can be found in Section VIII.

F. Sample Transfer

If analysis of the samples is not possible at OBG Laboratories, Inc., then the samples will be subcontracted to another approved laboratory. The samples will be packed in coolers at 4° C and be shipped by common carrier or delivered by OBG Laboratory personnel. A chain of custody listing OBG Laboratories sample number, sample preparation date and tests required will accompany the samples.

G. Computer Services

OBG Laboratories has a LIMS system in place. The system is currently only being used for scheduling analyses and generation of control charts. Client reports or other types of forms are not being computer generated.

The QA/QC officer is responsible for verifying that the QC data was input properly and that it is being calculated properly by the computer. Whenever control charts are printed or control limits generated, the information is checked for accuracy.

Each analyst has a unique sign on code and all QC data that they enter into the

data base is associated with their sign on. A password has to be entered in order to gain access to the data base. System management also has several passwords that need to be entered in order to gain access to programs that allow changes to be made to the data base.

A full backup of the data base is done weekly and a partial backup is done daily in order to protect against data lose in case of a system failure.

All software documentation is kept in a notebook provided by the software manufacturer. All software updates and any failures and the action required is documented in the system history log. An example of the system history log is included as Figure VII-15. Whenever software updates are done, several sets of trial data are run through the system and checked for the appropriate results.

OBG
LABORATORIES, INC.

CHAIN OF CUSTODY RECORD

FIGURE VII-1

Section No. VII
Revision No. 1
Date: 09/25/92

SURVEY:

LOCATION:

SAMPLED BY:

ORGANIZATION:

STATION NUMBER	SAMPLE LOCATION	DATE COLLECTED	TIME COLLECTED	SAMPLE MATRIX	COMP. OR GRAB	NO. OF CONTAINERS	ANALYSIS REQUIRED

Relinquished By:	DATE	TIME	Received By:	DATE	TIME
Relinquished By:	DATE	TIME	Received By:	DATE	TIME
Relinquished By:	DATE	TIME	Received by Laboratory:	DATE	TIME

COMMENTS:

METHOD OF SHIPMENT:

ABORATORIES, INC.

FIGURE VII-2

PROGRAM INFORMATION

Client/ Affiliate:	Company Name _____ Div. ____
	Project Eng. _____
Program or Survey:	Program Title _____
	Name of Sampler _____
Level of QC Documentation	I II III CLP ASPCLP (circle one)

SAMPLE BOTTLE PREPARATION

Samples:

Sites	Matrix	Analysis Required

Bottles:

Analysis	No. of Bottles	Size of Bottle	Glass or Plastic	Preservative

Bottle Type: _____ Standard _____ I Chem (Check One)

(more information required on back)

319998

Shipping and Billing Information

Address:	Shipping	Bil
Person		
Company		
Street		
City/St./Zip		
Telephone #		
P.O. / Job #		

Method of Shipment & Due Date

	Pickup	Regular	2 Day	Overnight
Day:				
Date:				
Time:		-		

Who will Pay Freight ?

_____ OBG Laboratories, Inc.
_____ Client (record client job # under shipping address)

(any method of freight other than routine mail is paid by the Client)

Secondary Containment ?

_____ Yes _____ No (check one)

Comments

Laboratory Approvals and Signatures

Submitted By: _____ Date Submitted: _____

Approved By: _____ OBG Project No: _____

Prepared By: _____ Date Sent: _____

FIGURE VII-3

Sample Description: _____

_____ Initials: _____

Sample Date: _____ Sample Time: _____

Project No.: _____ Lab No.: _____

Date Received: _____ Time Received: _____

Preservation: _____

CASE FILE

FIGURE VII-4

Survey: _____ Date Collected: _____

Sampler: _____ Date Received: _____

Client Name and Ref. #: _____

OBG Laboratory Client #: _____

CONDITION OF SHIPMENT: _____

_____

_____

_____

_____

RADIOACTIVITY SCREENING*:

___ The sample cooler(s) were screened for radioactivity and found safe for handling.

___ The samples come from a safe source and do not need to be screened.

Signed: _____
Sample Coordinator

****

DISPOSAL PROCEDURE**: _____

_____

_____

Signed: _____

Date: _____

*The radioactivity screen is performed to alert our employees of unexpected radioactivity at hazardous waste sites.

**Samples are disposed of four (4) weeks after a typed report is signed and mailed to the client. The routine method of disposal is: water samples are filtered through carbon to a sanitary sewer, solid samples are sent to a sanitary landfill.

SAMPLES RECEIVED _____

PAGE NO. _____ OF _____

SAMPLE LOG

CLIENT NAME	PROJECT DESCRIPTION	PROJECT NUMBER	LAB NO.	SITE DESCRIPTION	COLLECTION DATE	COLLECTION TIME	BIN NO.	PRESERVATION CHECKS: NUTRIENTS	DEMANDS	METALS	CYANIDE	HARDNESS	OIL & GREASE	PHENOLICS	SULFIDE	PESTICIDES				SCTN LDR	NO. OF CONT.	PARAMETERS

FIGURE VII-5

Section No. VII
Revision No. 1
Date: 09/25/92
Page 13 of 24

LABORATORIES, INC.

SECTION LEADER: _____

LEVEL OF REPORT: _____

DATE SCHEDULED: _____

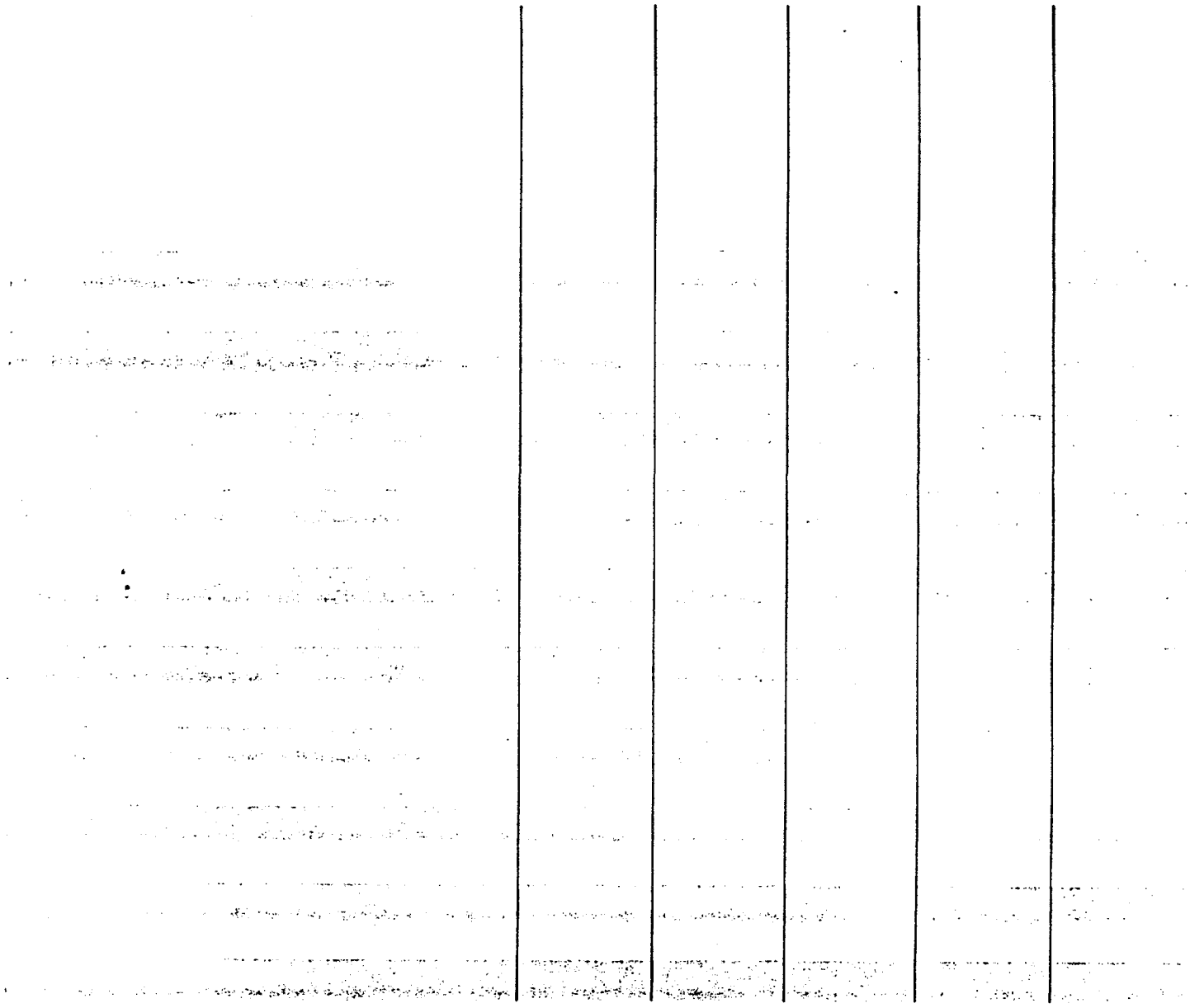
FIGURE VII-6

CLIENT _____ JOB NO. _____

DESCRIPTION _____

MATRIX: _____

_____ DATE COLLECTED _____ DATE RECEIVED _____



Comments:

Certification No.:

Units:

320003

Authorized: _____

Date: _____

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

Sample Custodian Signature: _____ Client Name: _____

Date of Sample Login: _____ Project No.: _____

Airbill Number: _____ Bin Number : _____

Circle The Appropriate Response:

1) Custody Seal — Present/Absent; Intact/Not Intact

2) Chain-of-Custody — Present/Absent

3) Sample Tags — Present/Absent

4) Sample Tag #'s — Listed/Not Listed

5) SMO Forms — Present/Absent

320004

Date Rec'd.	Time Rec'd.	Chain-of Custody Record #	SMO Sample Numbers	CORRESPONDING Sample Tag Numbers	CORRESPONDING Assigned Lab Numbers	Does Information On Custody Forms Traffic Reports & Sample Tags Agree ?	Remarks

FIGURE VII-7

Section No. VII
Revision No. 1
Date: 09/25/92
Page 15 of 24

320005

SAMPLE CONTROL RECORD

CLIENT: _____ DATE REC'D: _____

JOB #: _____ BIN NUMBER: _____

LABORATORY SAMPLE NUMBER	REMOVED BY	DATE AND TIME REMOVED	REASON	DATE AND TIME RETURNED

FIGURE VII-8

E, NOV 20, 1990, 12:15 AM

OBC Laboratories, Inc.
Department: WET CHEMISTRY (WETCHM) Work Schedule
Workstation: DAN ROBERTS (DDR)

RAMETER: CL WATER Chloride UNITS: (mg/L) SIGNIFICANT DIGITS: 6

up#	Sample#	Company Name	Cust# Result	Project#	Site/Cust-ID	MM	SampDate	SampTime	Due Date	Last Result	Locator	Logdate
38	000012-3877		2313	2313002517		17	90/11/09	00:00	90/12/03	110		90/11/19
29	000012-3390		3057	3057002517		20	90/11/12	00:00	90/11/27	56		90/11/13
58	000012-3878		2313	2313002517			00/00/00	00:00	90/12/03	110		90/11/19

RAMETER: NH3N SOLID Ammonia Nitr gen UNITS: (mg/kg) SIGNIFICANT DIGITS: 4

up#	Sample#	Company Name	Cust# Result	Project#	Site/Cust-ID	MM	SampDate	SampTime	Due Date	Last Result	Locator	Logdate
27	000012-3380	MILLER BREWING COMPANY	1669	1669041517			00/00/00	00:00	90/11/13	58		90/11/13

RAMETER: NH3N WATER Ammonia Nitrogen UNITS: (mg/L) SIGNIFICANT DIGITS: 4

up#	Sample#	Company Name	Cust# Result	Project#	Site/Cust-ID	MM	SampDate	SampTime	Due Date	Last Result	Locator	Logdate
22	000012-3319		3254	3254006520		16	90/11/08	00:00	90/11/26	11		90/11/13
50	000012-3789		1163	1163061517		23	90/11/15	00:00	90/11/29	27		90/11/16
50	000012-3790		1163	1163061517		23	90/11/15	00:00	90/11/29	27		90/11/16
33	000011-7360		1163	1163061517			00/00/00	00:00	90/08/19	33		90/08/08
:	000011-7674		1163	1163061517			00/00/00	00:00	90/08/30	21		90/08/15
00	000011-7979		1163	1163061517			00/00/00	00:00	90/09/10	11		90/08/21
65	000011-8911		1163	1163061517			00/00/00	00:00	90/09/19	47		90/09/05
93	000011-9238		1669	1669041517			00/00/00	00:00	90/09/21	45		90/09/07
97	000012-0686		3060	3060029517			00/00/00	00:00	90/10/12			90/10/10
22	000012-3320		3254	3254006520			00/00/00	00:00	90/11/26	11		90/11/13

RAMETER: NO2N SOLID Nitrite Nitrogen UNITS: (mg/kg) SIGNIFICANT DIGITS: 4

up#	Sample#	Company Name	Cust# Result	Project#	Site/Cust-ID	MM	SampDate	SampTime	Due Date	Last Result	Locator	Logdate
27	000012-3380		1669	1669041517			00/00/00	00:00	90/11/13	58		90/11/13

RAMETER: NO2NO3SOLID Nitrite - Nitrate Nitrogen UNITS: (mg/kg) SIGNIFICANT DIGITS: 4

up#	Sample#	Company Name	Cust# Result	Project#	Site/Cust-ID	MM	SampDate	SampTime	Due Date	Last Result	Locator	Logdate
07	000012-3268		3435	3435001170		17	90/11/09	00:00	90/11/19	2		90/11/09

RAMETER: NO2NO3WATER Nitrite - Nitrate Nitrogen UNITS: (mg/L) SIGNIFICANT DIGITS: 4

FIGURE VII-9

Section No. 1
Revision No. 1
Date: 09/25/92
Page 17 of 24

TRACE METALS
INDUCTIVELY COUPLED PLASMA SOILS DIGESTION LOG

FIGURE VII-10

Sample #	Job #	Bin #	Initial Weight	Final Volume	Color Before	Color After	Texture Artifacts	Percent Solids

Reagents:

1:1 HNO$_3$ #_____

1:1 HCl #_____

30% H$_2$O$_2$ #_____

Spiking Soln #_____

LCS #_____

Prepared by: _____

Date: _____

Reviewed by: _____

Date: _____

Batch # _____

Comments: _____

GC/MS SAMPLE PREPARATION AND EXTRACTION LOGBOOK - SOILS

Project # Client Job WI	Project Title	Sample Number	Date Rec'd.	Date Ext'd.	Analysis	Method	Amount Ext'd.	Vol. Surr.	Init. pH	Final Vol.	Extract Solvent	Comments

FIGURE VII-11

Section No. VII
Revision No. 1
Date: 09/25/92
Page 19 of 24

Notes:

320008

Extracted by: _____

SURROGATES STANDARDS

BNAs CLP

Surrogates Stock Solution # _____ AE SS Conc._____ BN SS Conc._____

Surrogate	Volume SS Stock Used	Conc. µg/ml	Micrograms Spk. Added
Phenol d-5			
2-Fluorophenol			
2,4,6-Tribromophenol			
Nitrobenzene d-5			
2-Fluorobiphenyl			
Terphenyl d-14			

MS/MSD STANDARDS

BNAs CLP

MS/MSD Stock Solution # _____ AE Conc._____ BN Conc._____

Spike Compound	Volume MS/MSD Stock Used	Conc. µg/ml	Micrograms Spk. Added
Pentachlorophenol			
Phenol			
2-Chlorophenol			
4-Chloro-3-methylphenol			
4-Nitrophenol			
1,2,4-Trichlorobenzene			
Acenaphthene			
2,4-Dinitrotoluene			
Pyrene			
N-nitroso-di-n-propylamine			
1,4-dichlorobenzene			
di-n-butylphthalate			

Test _____ Analyst _____

Instrument and Calibration FIGURE VII-12 _____

Run#	Project#	Lab#	SS	T.C.	I.C.	D.F.	T.O.C. (TC-IC)	Comments

Comments:

Signature _____

LABORATORIES, INC.

FIGURE VII-13

AMMONIA NITROGEN
METHOD: 350.1

DATE:_____ DETECTION LIMIT: 0.05 ppm Water/5 ppm Soil PAGE_____OF_____

:BEGINNING ANALYSIS TIME:_____ :ENDING ANALYSIS TIME:_____
:ICV:TRUE_____FOUND_____%R_____:ICB_____CCB1_____CCB2_____
:CCV1:TRUE_____FOUND_____%R_____:CCB3_____CCB4_____PB:_____
:CCV2:TRUE_____FOUND_____%R_____:REF#_____T_____F_____%R_____
:CCV3:TRUE_____FOUND_____%R_____:CORRELATION COEFFICIENT:_____
:MATRIX SPIKE: RUN # _____ SAMPLE # _____ SOURCE: _____
:RESULT: _____ - _____/_____X100% _____%
:DUPLICATE: RUN # _____ SAMPLE # _____ RESULT: _____ - _____/_____X100% = _____%

RUN #	PROJECT #	SAMPLE #	ABS.	INITIAL CONC. (PPM)	DF	FINAL CONC. (PPM)	COMM.

REAGENT AND/OR LOT#'S
Sodium Phenolate_____
Sodium Hypochlorite_____
Buffer_____
Sodium Nitroprusside_____
Stock (1,000 ppm)_____
Wking Stock (100 ppm)_____
CAL Std's _____

ANALYED BY:_____

REVIEWED BY:_____

FIGURE VII-14

CLIENT _____ BIN# _____

PROJECT# _____ DATE REC'D. _____

SAMPLE#(s) _____

CONTAINERS(s) _____

_____

INITIAL(s) _____

DISPOSAL COMMENTS _____

_____

_____

INITIAL _____ DATE _____

SYSTEM HISTORY LOG

TO BE COMPLETED BY USER			TO BE COMPLETED BY HP			
Date of Entry	System Operator	HP Notified Date/Time	CE On Site Date/Time	Customer Service Order (RO) Number	Down Time	HP Customer Engineer
Malfunction Description: unit Idev serial #			Action Required and Comments:			
Malfunction Description: unit Idev serial #			Action Required and Comments:			

47041-12

FIGURE VII-15

Section No. VII
Revision No. 1
Date: 09/25/92
Page 24 of 24

320013

SECTION VIII. ANALYTICAL PROCEDURES

A. Analytical Methods

A list of analytical methods used in the laboratory is included in Table V-1. Method numbers are cited from the following manuals:

- U.S. EPA. *Methods for Chemical Analysis of Water and Wastewater.* Revised March 1983. EPA 600/4-79-020.
- U.S. EPA. *Test Methods for Evaluating Solid Waste. 3d Ed.* November 1986. EPA SW-846.
- APHA, AWWA, WPCF. *Standard Methods for the Examination of Water and Wastewater. 16th Ed.*

Detection limits are listed for guidance only. The required limits vary depending upon the governing regulation and matrix. For CLP analyses, the methods and detection limits specified in the NYSDEC or U.S. EPA CLP are followed.

B. Method Modifications

Method 8020 was modified for the Volatile Petroleum Hydrocarbon analysis. The modification was the use of a capillary column instead of a packed column. Method validation is available upon request.

All other methods are not modified.

C. Waste Disposal

Laboratory workers are trained to be cautious when handling samples, spent chemicals, toxic, or dangerous materials. OBG Laboratories has a hazardous waste

officer who is responsible for coordinating and overseeing the disposal of waste and the cleanup of any accidental spills. The laboratory has a hazardous waste room where waste is stored in DOT- approved 55-gallon drums until disposal. Solvent wastes are currently separated into four categories: chlorinated, non-chlorinated, PCB (liquid) and PCB (solid). Solvent waste is collected in chemically resistant plastic coated bottles and stored in a well ventilated area until it is transferred to the appropriate 55-gallon drum. Mineral acid wastes are collected in a polyethylene DOT-approved 55-gallon drums. Laboratory hazardous wastes are manifested and disposed off-site at NYSDEC- and U.S. EPA-approved disposal facilities. Sample extracts and sample digestates are handled in the same manner as solvent and acid wastes.

The method of sample disposal depends on the analytical data generated. The results are compared to RCRA criteria and local disposal ordinances and a decision is made in connection with the hazardous waste officer to the means of disposal. If the sample is classified as hazardous, it is placed in the appropriate drum in the hazardous waste room. Upon filling the drum, the hazardous waste officer manifests the drum, arranges for disposal and files the disposal logs.

D. Cleaning of Glassware

The method of glassware cleaning is adopted to both the substances that are to be removed and the determinations to be performed. Class A volumetric glassware is not baked.

1. Organic Glassware

a. Volatile Analysis

Glassware used for volatile analysis is cleaned in a soapy Alconox solution and then rinsed four times with carbon column water. The glassware is then rinsed with methanol and baked at 180° C overnight. Glassware for volatile analysis is stored in drawers in the volatile organics lab.

b. Semi-volatile Analysis

Glassware is prerinsed in solvent and then washed with an Alconox solution and rinsed with DI water. The glassware is allowed to drain and is then rinsed with nanograde acetone and a final rinse with the nanograde solvent used in the extraction procedure. Glassware is wrapped in foil and stored in the appropriate drawers.

2. Metals Glassware

Metals glassware is washed in an Alconox solution and then rinsed with 1:1 HCl, followed by a DI water rinse. The glassware is then soaked in 1:1 HNO_3 for about 4 hours and a final rinse is done with DI water. Glassware is stored inverted in the metals digestion lab in the appropriate drawer. Pipets and volumetric flasks are stored in the metals lab.

3. Inorganic Glassware

The glassware is cleaned in an Alconox solution. It is then rinsed with tap water followed by DI water and allowed to dry. Glassware is stored inverted in drawers or a cabinet in the wet chemistry lab. Glassware for phosphorous analysis is washed separately from other inorganic glassware. It is rinsed in an HCl solution and then rinsed with distilled water and

allowed to dry. It is stored inverted in the appropriate drawer in the wet chemistry lab.

D. Quality of Lab Water

Distilled and deionized (DI) water with a conductivity of less than 1.5 micromho/cm is used to prepare all reagents and for final rinses of glassware. The conductivity and pH are measured and recorded daily. A standard plate count is performed monthly along with the chlorine residual test. Suitability and heavy metals are tested on a yearly basis. The results of all tests on the DI water supply are documented in a laboratory notebook.

The lab also uses organic free water in the preparation of samples for organic analysis. Distilled and deionized water is passed through a carbon column to remove organic compounds. The water is tested daily for any contamination and the results are documented in a laboratory notebook.

E. Reagents/Solvents and Standards

Reagents/solvents for quantitative purposes are ACS grade or better. All reagents are discarded after a set interval which has been established and recorded in the standards logbook. The date a prepared reagent is made is entered into the standards logbook and initialed by the preparer. Therefore, the results which may have been affected by a contaminated or otherwise improper reagent can be determined. Reagent bottles are also dated and initialed when a new reagent is prepared. These procedures are followed for all (even daily) preparations.

A listing of all reagents and chemicals stored in the laboratory is included as

Table VIII-1.

LABORATORY INVENTORY

TABLE VIII-1

Wet chemical areas

Chemical Name - As Labelled	CAS Number	Manufacturer	Date	Weight (Units)	Amount Left
Double Door Cooler					
Hydrogen peroxide	7722-84-1	Fisher		500 ml	0.75
		Fisher		6@500 ml	unopened
White Fridge					
Sodium sulfite nonahydrate	1313-84-4	Aldrich	10-27-87	500 g	0.75
Large Wall Cabinet					
Acetic Acid, Glacial	64-19-7	Mallinc.		500 ml	0.25
Mercuric Oxide Red	21908-53-2	Mallinc.	2-21-72	2@1/4 lb.	0.75
N-(1-Naphthyl)ethylene-diamine Dihydrochloride	1465-25-4	Kodak	4-20-81	100 g	full
		MCB		100 g	0.25
Phenol (liquified)	108-95-2	Mallinc.		5 pints	empty
Potassium Nitrate	7757-79-1	Mallinc.	8-7-86	125 g	0.75
		Mallinc.	8-7-86	500 g	0.75
Potassium Phosphate Monobasic	7778-77-0	Mallinc.	6-28-84	500 g	0.75
Sodium Nitrate	7631-99-4	MCB		1 lb.	0.75
Sulfanilamide	63-74-1	Fisher	1-20-88	100 g	0.25
Small Wall Cabinet					
Ammonium Molybdate	12054-85-2	Fisher		500 g	0.5
Antimony Potassium Tartrate	28300-74-5	Fisher	2-21-72	1 lb.	full
Silver Nitrate	7761-88-8	Anachemia	2-1-77	1 quart	0.25
Silver Nitrate Standard Sol.		Fisher		1 liter	0.75
Various Places in Wet Chem					
Ammonium Hydrogen Phosphate	7783-28-0	Morton Thiokol	11-4-88	500 g	0.75
Ammonium Phosphate Dibasic	7783-28-0	Fisher	1-20-88	500 g	full
Benzoic Acid	65-85-0	Parr Instrument		30 g	full
Buffer Solution pH 4.00	N/A	Fisher	3-3-89	500 ml	0.5
		Fisher	3-3-89	500 ml	0.125
		Fisher	3-3-89	2@500 ml	unopened
Buffer Solution pH 7.00	N/A	Fisher	3-3-89	500 ml	0.125
		Fisher	3-3-89	500 ml	unopened
Buffer Solution pH 10.00	N/A	Fisher	3-3-89	500 ml	0.75
		Fisher	3-3-89	500 ml	0.75
		Fisher	3-3-89	2@500 ml	unopened
Assorted A.A.S. Standards					
Assorted Atomic Absorption Standards					

LABORATORY INVENTORY

Microbiology room

Chemical Name - As Labelled	CAS No.	Manufacturer	Date	Weight (Units)	Amount Left
Fridge					
Bromothymol Blue	76-59-5	Mallinckrodt	8-14-84	1 liter	full
Rosolic Acid	603-45-2	MCB	4-1-77	25 g	0.5
		Mallinc.	6-17-74	5 g	0.25
		Mallinc.		25 g	0.75
Cabinets & Countertops					
Amyl Alcohol	71-41-0	Mallinc.	2-6-76	1 pint	full
		Mallinc.	2-6-76	1 pint	unopened
Anilin Blue	28631-66-5	Eastman		25 g	0.25
L-Arginine	74-79-3	Sigma		100 g	full
Crystal Violet	548-62-9	MCB	10-19-73	100 g	0.75
p-Dimethylaminobenzaldehyde	100-10-7	Mallinc.	6-23-72	25 g	full
Fluoride Standard - 100 ppm		Banco		500 ml	0.5
Flouride Standard - 10 ppm		Banco		1 liter	0.5
Formaldehyde solution	50-00-0	Mallinc.	10-4-74	1 pint	unopened
Glycerol	56-81-5	Mallinc.	2-21-72	1 pint	0.5
Hexane	110-54-3	Fisher	4-14-89	4 liter	0.75
* Malachite Green Oxalate	2437-29-8	Mallinc.	3-26-75	25 g	unopened
Methanol	67-56-1	Fisher		4 liter	0.5
Methyl Red	493-52-7	Mallinc.	2-21-72	1 ounce	0.5
Methyl Violet	8004-87-3	Mallinc.	5-10-82	100 g	0.5
L-Ornithine Hydrochloride	3184-13-2	Sigma		25 g	0.5
Rosolic Acid	603-45-2	MCB		25 g	minimal
		MCB	8-17-78	25 g	0.5
* Safranin O	477-73-6	MCB	1-6-76	100 g	0.75
2,3,5,-Triphenyl-2H-tetrazolium chloride	298-96-4	MCB		25 g	0.25

* Have expired.

LABORATORY INVENTORY

Waste Room

Chemical Name - As Labelled	CAS No.	Manufacturer	Date	Weight (Units)	Amount Left
Acetonitrile	75-05-8	Mallinc.	3-13-86	1 gal	full
Alumina Acid	1344-28-1	ICN		50 kg	
Chloroform	67-66-3	Fisher		500 ml	unopened
Cyclohexane	110-82-7	Mallinc.		4 liter	unopened
		Mallinc.		4 liter	unopened
		Mallinc.		4 liter	full
Manganese Sulfate	10034-96-5	Mallinc.		1 liter	full
		Mallinc.		1 liter	full
		Mallinc.		1 liter	full
N-Propyl Alcohol	71-23-8	Mallinc.		4 liter	unopened
Silica Gel	7631-86-9	ICN		25 kg	
1,1,1-Trichloroethane	71-55-6	Fisher	6-26-89	20 liter	unopened

Cases

Acetic Acid, Glacial - 5/6 case	64-19-7
Acetone - 6 cases	67-64-1
Ammonium Hydroxide - 1.5 cases	1336-21-6
Chloroform - 1 case	110-82-7
Hexane - 5 cases	110-54-3
Hexanes - 1 case	73513-42-5
Hydrochloric Acid - 1 + 2/6 cases	7647-01-0
Iso-Octane - 1.75 cases	540-84-1
Methanol - 3.75 cases	67-56-1
Methylene Chloride - 8.5 cases	75-09-2
Nitric Acid - 1 case	7697-37-2
Phosphoric Acid - 5/6 case	7664-38-2
Sodium Thiosulfate Solution - 3.5 cases	10102-17-7
Sulfuric Acid - 1 case	7664-93-9
Toluene - 1 case	108-88-3

LABORATORY INVENTORY

Acids stored in acid cabinet

Chemical Name	CAS Number	Manufacturer	Date	Weight (Units)	Amount Left
Acetic Acid, Glacial	64-19-7	Fisher		500 ml	0.5
Hydrochloric Acid	7647-01-0	Fisher		2.5 liter	0.5
Hydrofluoric Acid	7664-39-3	Mallinckrodt		1 lb.	full
Nitric Acid	7697-37-2	J.T. Baker		500 ml	minimal
		J.T. Baker		500 ml	0.25
		Fisher	6-28-89	500 ml	minimal
		Fisher		500 ml	0.125
		Mallinc.		500 ml	0.75
Perchloric Acid	7601-90-3	Mallinc.		8 lb.	0.5
Phosphoric Acid	7664-38-2	Mallinc.		8 lb.	0.75
		Mallinc.		8 lb.	0.75
Sulfuric Acid	7664-93-9	Fisher	6-20-89	2.5 liter	0.125
		Fisher		2.5 liter	minimal

Metals Prep - Wet Chem

Chemical Name - As Labelled	CAS Number	Manufacturer	Date	Weight (Units)	Amount Left
monium Hydroxide	1336-21-6	Mallinc.,	9-11-86	500 ml	minimal
propyl Alcohol	67-63-0	Mallinc.		4 liter	full
Methanol	67-56-1	Fisher		4 liter	0.75
		Mallinc.		4 liter	0.75
otassium Iodide	7681-11-0	Fisher		500 g	0.125
Sodium Thiosulfate Solution	10102-17-7	Fisher		1 liter	0.5

Chemical Name	CAS Number	Manufacturer	Date	Weight (Units)	Amount Left
olids Area					
arbituric Acid	67-52-7	Fisher		100 g	minimal
elite	61790-53-2	Fisher		500 g	0.5
		Fisher	9-12-88	300 g	0.5
odium Chloride	7647-14-5	Fisher		1000 g	unopened
Metals Area					
cetelyne - 2 tanks					
gon - 2 liquid tanks	7440-37-1				
on - 2 gas tanks	7440-37-1				
PA Knowns					

STOREROOM INVENTORY

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
Acetic Acid	64-19-7	Mallinc.		5 lb.	0.75
		Mallinc.		5 lb.	0.75
Acetic Anhydride	108-24-7	MCB	4-25-76	1 kg.	full
Allylthiourea (thiosinamine)	109-57-9	Aldrich	10-6-75	250 g	full
Alumina, Activated	1344-28-1	MCB		1 lb.	0.25
		MCB		1 lb.	0.5
Alumina, Basic	1344-28-1	Fisher	12-26-79	500 g	0.5
Aluminum Chloride	7784-13-6	Mallinc.	2-22-72	1 lb.	0.5
Aluminum Hydroxide	1336-21-6	Mallinc.	2-22-72	1 lb.	0.5
Aluminum Oxide	1344-28-1	American Optical Corp.		250 g	full
		VWR Scientific	3-19-74	1 kg	
		VWR Scientific		1 kg	0.25
Aluminum Potassium Sulfate	7784-24-9	Mallinc.	6-17-74	1 lb.	0.75
		Mallinc.	6-17-74	1 lb.	0.75
		Mallinc.	6-17-74	1 lb.	0.5
Aluminum Sulfate	10043-01-3	Mallinc.	7-19-78	1 lb.	0.125
		Mallinc.	7-19-78	1 lb.	0.5
		Mallinc.	7-12-74	1 lb.	minimal
Amberlite XAD-2	9060-05-3	Mallinckrodt		1 lb.	0.75
Amberlite IRN-77	1128-94-2	Rohm & Haas			0.5
4-Aminoantipyrine	83-07-8	Fisher	7-5-88	100 g	0.25
2-Amino-2-(hydroxymethyl)-1,3-propanediol	77-86-1	MCB	11-4-74	100 g	full
Amino-Naphthol-Sulfonic Acid	116-63-2	Hartman-Leddon Co.		5 @15.4 g each	full
Ammonium Acetate	631-61-8	Mallinc.	2-21-72	1 lb.	minimal
Ammonium Bisulfate	7803-63-6	MCB	2-21-72	1 lb.	0.5
Ammonium Carbonate	506-87-6	Mallinc.	7-25-79	1 lb.	0.75
Ammonium Chloride	12125-02-9	Mallinc.	8-13-82	1 lb.	0.25
		Mallinc.	8-13-82	1 lb.	0.75
		Mallinc.	9-27-82	5 lb.	0.125
Ammonium Citrate Dibasic	3012-65-5	Mallinc.	6-20-72	1 lb.	0.75
Ammonium Fluoride	12125-01-8	Fisher		1 lb.	0.5
		Fisher	2-21-72	1 lb.	0.5
		Fisher	2-21-72	1 lb.	0.5
		Fisher	2-21-72	1 lb.	0.5
Ammonium Hydroxide	1336-21-6	Fisher		3 @500 ml each	full
Ammonium Metavanadate	7803-55-6	Pfaltz & Bauer		500 g	0.5
Ammonium Molybdate	12054-85-2	Fisher		500 g	full
Ammonium Nitrate	6484-52-2	Mallinc.		500 g	0.75
Ammonium Oxalate	6009-70-7	Mallinc.	2-21-72	1/4 lb.	0.75
Ammonium Persulfate	7727-54-0	Mallinc.		5 lb.	0.25
Ammonium Phosphate Dibasic	7783-28-0	Mallinc.	11-8-85	500 g	0.25
Ammonium Phosphate Monobasic	7722-76-1	Mallinc.	6-16-72	1 lb.	0.5
		Mallinc.	6-16-72	1 lb.	0.5
Ammonium Pyrrolidinedithiocarbamate	5108-96-3	K & K Labs	2-21-72	10 g	full
Ammonium Sulfate	7783-20-2	Mallinc.	11-30-72	500 g	0.5
		Mallinc.	11-30-72	500 g	0.5
		Mallinc.	8-1-85	500 g	0.75
		Mallinc.	8-1-85	500 g	0.75
Ammonium Thiocyanate	1762-95-4	Mallinc.	7-17-72	1 lb.	0.5
Aniline	62-53-3	Fisher		500 ml	full
Antimony Pentachloride	7647-18-9	Mallinc.	6-8-78	1 lb.	full
		?		1 lb.	?

STOREROOM INVENTORY

Antimony Potassium Tartrate	28300-74-5	Fisher	2-21-72	1 lb.	full
Antimony Trioxide	1309-64-4	Mallinc.	11-26-84	1 lb.	0.75
Arabinogalactan	9036-66-2	Aldrich	10-8-81	100 g	0.75
Ascarite	81133-20-2	Arthur H. Thomas Co.		1 lb.	0.75
Aurintricarboxylic Acid Ammonium Salt	569-58-4	Eastman Organic Chemicals	2-21-72	25 g	0.5

STOREROOM INVENTORY

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
Barbituric Acid	67-52-7	Fisher		100 g	0.125
Barium Chloride	10361-37-2	Fisher	6-89	500g	0.125
		Fisher	6-89	500 g	unopened
		Fisher	6-89	500 g	unopened
		Mallinc.		5 lb.	minimal
Barium Diphenylamine Sulfonate	6211-24-1	Pfaltz & Bauer	11-19-75	10 g	unopened
Barium Hydroxide Anhydrous	12230-71-6	Mallinc.	2-21-72	1 lb.	full
Benzaldehyde	100-52-7	Mallinc.	7-21-75	1 pt.	0.75
Benzidine Sulfate	531-86-2	Alfred Bader Library	1-14-75	5 g	minimal
Benzoic Acid	65-85-0	Mallinc.	8-3-73	1/4 lb.	full
Benzotriazole	95-14-7	Kodak		500 g	0.5
3,3',4,4'-Biphenyltetraamine	7411-49-6	MCB	7-27-76	1 g	0.125
Tetrahydrochloride		MCB	7-27-76	1 g	0.125
Bismuth (III) Nitrate Pentahydrate	10035-06-0	Aldrich		100 g	unopened
Boric Acid	10043-35-3	Mallinc.		1 lb.	0.25
		Fisher	2-21-72	1 lb.	0.5
Boron Trifluoride (liquid)	7637-07-2	Allied		2 oz.	0.5
Boron Trifluoride (solid)	7637-07-2	Allied		5 lb.	0.75
Bromine	7726-95-6	Fisher		50 ml	full
a-Bromo-2,3,4,5,6-Pentafluorotoluene	1765-40-8	Aldrich		5 g	0.125
Bromophenol Blue	115-39-9	Kodak		10 g	0.5
Bromothymol Blue	76-59-5	Mallinc.	1-24-77	5 g	0.25
		Harleco	6-20-74	1 g	0.125
Brucine Sulfate	4845-99-2	MCB.	2-21-72	25 g	0.25

STOREROOM INVENTORY

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
Cadmium (Metal Sticks)	7440-43-9	Mallinc.	2-21-72	1 lb.	full
Cadmium	7440-43-9	MCB	2-21-72	1 lb.	full
		EM Labs		1 kg	?
Cadmium Chloride	10108-64-2	MCB	2-21-72	4 oz.	0.5
		Allied		1 lb.	0.5
		Mallinc.	2-21-72	5 lb.	0.25
Calcium Chloride Anhydrous	10043-52-4	Mallinc.	2-21-72	5 lb.	0.25
	---	Mallinc.	2-21-72	5 lb.	0.75
Calcium Hydroxide	1305-62-0	Mallinc.	1-83	1 lb.	0.5
Calcium Nitrate	10124-37-5	Mallinc.	8-20-73	1/4 lb.	0.25
Calcium Oxide	1305-78-8	MCB	10-6-72	1 lb.	full
		MCB	10-6-72	1 lb.	0.25
Calcium Sulfate	10101-41-4	Mallinc.	2-21-72	1 lb.	0.75
		Mallinc.	2-21-72	1 lb.	0.75
Carmine	1390-65-4	Mallinc.		5 g	0.5
Chloral Hydrate	302-17-0	J.T. Baker	2-21-72	1 lb.	full
Chloramine-T	127-65-1	Fisher	1-20-88	250 g	0.5
2-chloro-6-trichloromethyl pyridine	1929-82-4	Dow		5 g	unopened
Chromium Chloride	10025-73-7	MCB	1-7-76	1/4 lb.	full
		Mallinc.		1/4 lb.	0.5
Chromium Sulfate	10101-53-8	Mallinc.	2-21-72	1 lb.	0.75
Chromium Trioxide	7738-94-5	Mallinc.		1 lb.	0.5
Citric Acid	77-92-9	Mallinc.	3-4-80	1 lb.	0.25
Cobalt Chloride	7646-79-9	Mallinc.		1 lb.	0.5
		MCB	5-14-81	1 lb.	full
Cobalt Nitrate	10026-22-9	Mallinc.	2-21-72	1 lb.	full
Copper (powder)	7440-50-8	J.T. Baker		3 at 500 g each	unopened
		Fisher		5 at 500 g each	unopened
		Fisher		500 g	full
Copper Chloride	1344-67-8	ROC/RIC	2-21-78	2 lb.	full
18-Crown-6	17455-13-9	Aldrich		25 g	unopened
Cupferron	135-20-6	J.T. Baker	2-21-72	1 oz.	full
Cupric Acetate	142-71-2	Mallinc.		1 lb.	0.75
Cupric Chloride	1344-67-8	J.T Baker	2-21-72	1/4 lb.	0.75
Cupric Oxide	1317-39-1	Mallinc.	2-21-72	1/4 lb.	0.75
Cupric Sulfate	7758-98-7	Mallinc.	5-20-80	1 lb.	0.25
Cupric Sulfate Anhydrous	7758-98-7	Mallinc.	2-21-72	1 lb.	full
Cuprous Chloride	7758-89-6	Mallinc.	6-22-77	1 lb.	0.5
Curcumin	458-37-7	Eastman	9-4-74	10 g	0.5

STOREROOM INVENTORY

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
Dextrose	60-99-7	Mallinc.	9-26-73	1 lb.	0.125
		Mallinc.	3-26-80	1 lb.	0.75
		BBL		1 lb.	full
Diacetone Alcohol	123-42-2	Strathmore Paint		1 pint	
trans-1,2-Diaminocyclohexane-N,N,N',N'-tetraacetic acid monohydrate	87095-89-4	Mallinc.	7-18-84	100 g	0.25
		Mallinc.	6-15-87	100 g	0.5
		Mallinc.	6-22-87	100 g	unopened
2,6-Di-tert-Butyl-4-methylphenol	128-37-0	Aldrich		500 g	unopened
p-Dichlorobenzene	106-46-7	Mallinc.	7-20-76	1 kg	full
1,2-Dichloroethane	107-06-2	MCB		500 ml	full
2,4-Dichlorophenol	120-83-2	MCB	8-2-75	250 g	has crystallized
Diethanolamine	111-42-2	Mallinc.	7-17-72	1 pint	full
N,N-Diethyl-p-phenylenediamine	93-05-0	MCB	2-21-72	25 g	full
N,N-Diethyl-p-phenylenediamine Oxalate	62637-92-7	Eastman	2-21-72		0.25
4,5-Dihydroxy-2,7-naphthalene disulfonic acid practical	5808-22-0	Anachemia	3-85	25 g	0.25
		Anachemia	12-18-84	25 g	0.5
4,5-Dihydroxy-3-(p-sulfophenylazo)-2,7-naphthalene-disulfonic acid trisodium salt	23647-14-5	Eastman	11-26-73	25 g	0.5
p-Dimethyl-amino-benzaldehyde	100-10-7	Mallinc.	11-29-78	25 g	0.125
		Mallinc.	9-25-81	100 g	0.75
5-(p-Dimethylaminobenzylidene)-rhodanine	536-17-4	Eastman	2-21-72	10 g	0.75
		MCB		10 g	full
2,4-Dimethylaniline	121-69-7	Kodak		100 g	unopened
2,5-Dimethylaniline	121-69-7	Kodak		100 g	unopened
2,6-Dimethylaniline	121-69-7	Kodak		100 g	full
3,4-Dimethylaniline	121-69-7	Kodak		250 g	unopened
N,N-Dimethylaniline	121-69-7	Unlabeled	Unlabeled	Unlabeled	
3,3'-Dimethyl-1,1'-diphenyl[4,4'-bi-2-pyrazoline]-5,5'-dione	7477-67-0	Eastman	10-22-74	25 g	0.5
Dimethylglyoxime	15-45-4	Mallinc.	2-21-72	1 oz.	0.5
2,9-Dimethyl-1,10-phenanthroline hemihydrate (Neo-cuproine)	484-11-7	G. Frederick Smith	2-21-72	1 g	0.25
		G. Frederick Smith	2-21-72	1 g	0.125
		G. Frederick Smith	2-21-72	1 g	unopened
N,N-Dimethyl-p-phenylenediamine oxalate	62778-12-5	Kodak	3-83	100 g	full
N,N-Dimethyl-p-phenylenediamine sulfate	6219-73-4	Eastman	2-21-72	100 g	0.5
Dimethyl sulfoxide (DMSO) (also labelled as methyl sulfoxide)	67-68-5	Sigma	7-29-81	500 ml	unopened
		Sigma		500 ml	full
		Mallinc.		1 pint	full
		Mallinc.		1 pint	0.75
s-Diphenyl carbazide	140-22-7	Fisher		25 g	0.5
Dithizone	60-10-6	J.T. Baker	2-21-72	10 g	0.75

STOREROOM INVENTORY

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
Eicosane	112-95-8	MCB		25 g	0.75
l-Ephedrine	299-42-3	ICN	11-23-77	10 g	0.5
		ICN	11-23-77	2 @ 10 g each	unopened
Eriochrome Black T*	1787-61-7	Mallinc.	2-12-85	25 g	0.5
Eriochrome Cyanine R	3564-18-9	MCB	2-21-72	25 g	0.75
		J.T. Baker	8-3-84	100 g	full
(Ethylenedinitrilo)-	60-00-4	Mallinc.	8-16-83	500 g	0.75
tetraacetic acid		MCB	11-4-75	500 g	0.5
Ethylene glycol	107-21-1	Fisher	2-21-72	1 pint	0.75
		Fisher	2-21-72	1 pint	full
		Fisher	2-21-72	1 pint	full
		Will Corp.	2-21-72	1 quart	0.75

* Also labelled as Superchrome Black TS

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
Ferric Chloride	7705-08-0	Mallinc.		1 lb.	0.5
Ferric Nitrate	10421-48-4	Mallinc.	3-30-83	1 lb.	0.5
		Mallinc..	5-22-86	500 g	0.125
		Fisher	11-3-87	500 g	full
Ferric Sulfate	10028-22-5	Mallinc.	2-21-72	1 lb.	0.125
		Mallinc.	2-21-72	1 lb.	0.25
Ferroin Indicator	N/A	Mallinc.		100 ml	0.75
Ferrous Ammonium Sulfate	10045-89-3	Mallinc.	9-12-86	2.5 kg	0.25
Ferrous Chloride	7758-95-3	Mallinc.	2-21-72	1 lb.	0.75
Ferrous Sulfate	7720-78-7	Mallinc.	5-14-80	1 lb.	0.5
Fluorescein	2321-07-5	MCB		500 g	0.25
Formaldehyde solution	50-00-0	Mallinc.	3-83	500 ml	0.75

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
a-D(+) Glucose	492-62-6	Sigma		5 kg	
L(+) Glutamic acid	56-86-0	Mallinc.	12-13-76	500 g	0.5
		MCB	2-21-72	100 g	0.125
b-Glycerophosphoric acid disodium salt	27082-31-1	Eastman	4-20-76	25 g	unopened
.ycerol	56-81-5	Mallinc.	2-21-72	1 pint	0.25
Gum arabic No. 1 white	9000-01-5	Will Corp.	2-21-72		

STOREROOM INVENTORY

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
HEM		Handmade	5-28-81		0.75
Heptoxime		Hach Chem.	2-21-72	5 g	0.25
Hexamethylene-tetramine	100-97-0	MCB	10-25-72	500 g	0.25
Hydrazine Sulfate	10034-93-2	Mallinc.	5-7-84	500 g	0.75
	--	Mallinc.	6-7-84	500 g	0.75
Hydroquinone	123-31-9	Aldrich		100 g	unopened
Hydroxylamine hydrochloride	5470-11-1	Mallinc.	3-2-87	500 g	minimal
Hydroxylamine sulfate	10039-54-0	Fisher	5-12-89	500 g	0.25
		Fisher	5-12-89	500 g	unopened
		Unlabeled	?	?	
8-Hydroxyquinoline	148-24-3	Mallinc.	6-20-72	1/4 lb.	full
Hydrozine hychate (Hydrazine hydrate)	10217-52-4	Handmade	5-28-81		0.75

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
Iceland Spar	13397-26-7	Will Corp.	2-21-72	1 lb.	full
		Will Corp.	2-21-72	1 lb.	0.75
2,2'-Iminodiethanol	111-42-2	Eastman	2-21-72	500 g	0.5
Indicator pH 5-6	N/A	Mallinc.		25 g	full
Indium	7440-74-6	EM Science		25 g	2 chunks
dine	7553-56-2	Mallinc.	4-22-83	500 g	0.5
		Mallinc.	2-21-72	1 lb.	0.75
Iron wire	7439-89-6	Mallinc.	2-21-72	1/4 lb.	full
Isopentyl alcohol	123-51-3	Mallinc.	5-31-72	1 pint	full
Isopropyl ether	108-20-3	Aldrich	6-3-88	100 ml	0.75
		Mallinc.	7-17-72	1 lb.	0.5

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
Kaolin	1332-58-7	Mallinc.	2-21-72	1 lb.	0.5
Karl Fischer Reagent	N/A	Mallinc.		1 pint	0.75
		Anachemia	7-7-75	1 lb.	0.75

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
Lanthanum nitrate	10099-59-9	Mallinc.	1-5-87	100 g	full
Lanthanum oxide	1312-81-8	Fisher	5-20-87	250 g	0.5
Lauric acid	143-07-7	MCB	6-12-74	500 g	0.75
Lead acetate	301-04-2	Mallinc.	3-27-72	1 lb.	0.5
Lead chloride	7758-95-4	Mallinc.		1 lb.	0.5
Lead nitrate	10099-74-8	Mallinc.	6-20-72	1/4 lb.	full

STOREROOM INVENTORY

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
Magnesium Carbonate	39409-82-0	Mallinc.	4-13-76	1 lb.	0.5
		Mallinc.	3-27-72	1 lb.	0.25
Magnesium Chloride	7786-30-3	Fisher		3 at 500 g each	unopened
		Fisher		500 g	full
Magnesium Nitrate	10377-60-3	Fisher	4-7-87	500 g	0.5
Magnesium Oxide	1309-48-4	Mallinc.	6-20-73	1/4 lb.	0.75
		Mallinc.	6-20-73	1/4 lb.	0.75
		Mallinc.	6-20-73	1/4 lb.	unopened
Magnesium Perchlorate	10034-81-8	Fisher	6-22-89	4 at 500 g each	unopened
Magnesium Sulfate	7587-88-9	Mallinc.	2-26-80	1 lb.	0.25
		Fisher	5-20-81	1 lb.	0.5
Malonic Acid	141-82-2	Eastman	2-21-72	100 g	full
Menthyl Salicylate	89-46-3	Pfaltz & Bauer	1-83	100 g	0.5
Mercaptoacetic Acid	68-11-1	Eastman	2-21-72	100 g	0.75
2-Mercapto-benzothiazole	149-30-4	MCB	2-21-72	250 g	
		R.T. Vanderbilt		500 g	0.75
Mercaptopropionic Acid	79-42-5	Evans		2 at 1/4 lb. each	full
Mercuric Chloride	7487-94-7	Fisher		500 g	0.5
Mercuric Iodide	7774-29-0	Mallinc.	2-21-72	1 lb.	0.75
Mercuric Nitrate Monohydrate	10045-94-0		8-15-85	500 g	unopened
Mercuric Oxide Red	21908-53-2	Mallinc.	2-21-72	1 lb.	full
		Mallinc.		1/4 lb.	minimal
Mercuric Sulfate	7783-35-9	GFS Chemical	1-25-85		full
		GFS Chemical	1-25-85		unopened
		GFS Chemical			0.25
Mercuric Thiocyanate	592-85-8	MCB	2-24-76	2 at 1/4 lb. each	0.75
2-(2-Methoxyethoxy)-ethanol	111-77-3	Eastman	4-12-74	500 g	unopened
Methylamine	74-89-5	MCB	3-8-73	500 g	full
Methylcyclohexane	108-87-2	Fisher		1 pint	0.75
Methylene Blue	61-73-4	Mallinc.	2-21-72	1 lb.	0.25
4,4'-Methylene-dianiline	107-77-9	Kodak	7-13-84	100 g	unopened
Methyl Ethyl Ketone	78-93-3	Mallinc.		1 pint	0.5
4,4,4"-Methylidynetris	603-48-5	Eastman	1-16-79	100 g	full
Methyl Isobutyl Ketone	108-10-1	Mallinc.	2-21-72	1 pint	full
		Mallinc.	2-21-72	1 pint	0.25
N-Methyl-N-nitrso-p-toluenesulfonamide	60858-95-9	Kodak		100 g	0.5
Methyl Orange (powder)	547-58-0	Mallinc.		1 ounce	0.5
Methyl Orange (liquid)	547-58-0	Fisher		1 pint	0.75
3-Methyl-1-phenyl-2-pyrazolin-5-one	89-25-8	Eastman	10-3-74	100 g	0.5
		Eastman	11-30-77	100 g	full
Methyl Sulfoxide *	67-68-5	Mallinc.		1 pint	0.5
Mineral oil	8020-83-5	Squibb		1 quart	unopened
		Pennex		1 quart	0.5
Molybdenum Trioxide	1313-27-5	Mallinc.	2-21-72	1 lb.	0.75
Monopersulfate compound (Oxone)	37222-66-5	duPont			full
Murexide	3051-09-0	J.T. Baker	2-21-72	1 g	0.125

* Also labelled as Dimethyl sulfoxide

STOREROOM INVENTORY

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
Naphthalene	91-20-3	Mallinc.	7-21-75	1 lb.	0.75
1-Naphthol	90-15-3	MCB	7-12-72	250 g	0.75
1-Naphthylamine	134-32-7	MCB	2-21-72	100 g	0.5
Nickel Nitrate	13138-45-9	Mallinc.	12-22-80	1 lb.	0.5
		Mallinc.	4-19-78	1 lb.	Contaminated
Nickel Sulfate	7786-81-4	Mallinc.	2-21-72	1/4 lb.	0.75
Nicotinic Acid	59-67-6	MCB	7-26-76	100 g	full
p-Nitrophenol	100-02-7	Eastman	2-21-72	100 g	0.75

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
2-Octanol	4128-31-8	MCB	2-21-72	500 g	0.75
Oxalic Acid	144-62-7	Mallinc.	7-22-80	1 lb.	0.25
		Mallinc.	12-18-86	500 g	unopened

STOREROOM INVENTORY

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
Paraformaldehyde	30525-89-4	MCB	10-81	500 g	0.75
Para Nonyl Phenol (samples)	25154-52-3		7-20-87	2 at 1/4 lb. each	
Pararosaniline	529-61-9	Sigma		5 g	0.25
			3-10-87	10 g	0.5
Perchloric Acid	7601-90-3	Mallinc.		8 lb.	0.75
1,10-Phenan-Throline-Monohydrate	66-71-7	Mallinc.	10-26-83	5 g	0.25
		Mallinc.	2-3-87	5 g	0.5
Phenol	108-95-2	Fisher	10-23-87	500 g	0.5
Phenoldisulfonic Acid	96-77-5	Harleco	2-21-72	1 lb.	
		Unlabeled	2-21-72		
		Hellige	2-21-72	1 lb.	
Phenolphthalein	77-09-8	Mallinc.	2-21-72	1/4 lb.	0.25
Phenol Red	143-74-8	MCB		5 g	0.5
2-Phenoxyethanol	122-99-6	Eastman	6-7-72	100 g	minimal
		MCB	6-16-72	250 g	0.75
		MCB	5-3-74	2 at 250 g each	full
Phenylhydrazine Hydrochloride	59-88-1	Eastman		500 g	0.5
Phosphomolybdic Acid	11104-88-4	Mallinc.	2-21-72	1/4 lb.	0.75
		Mallinc.	1-26-76	1/4 lb.	unopened
		Mallinc.	1-30-76	1/4 lb.	full
Picric Acid	88-89-1	Fisher		1/4 lb.	
Platnium Chloride	10025-65-7	Mallinc.	2-21-72	1/8 ounce	0.25
Platnium-Cobalt Color Standard	N/A	Will Corp.		1 quart	0.5
Potasssium Acid Phthalate	877-24-7	Mallinc.	5-20-80	1 lb.	0.5
Potassium Biiodate	13455-24-8	Mallinc.	3-14-77	100 g	0.5
		Fisher		2 at 1 quart each	full
Potassium Borohydrate	13762-51-1	MCB	2-28-75	25 g	full
Potassium Bromate	7758-01-2	Mallinc.		1 lb.	0.75
Potassium Bromide	7758-02-3	C.P. Baker	1968	1 lb.	0.5
		Fisher	1968	1 lb.	0.75
Potassium Carbonate	584-08-7	MCB	4-25-76	1 lb.	0.75
Potassium Chloride	7447-40-7	Mallinc.	3-25-86	500 g	0.5
		Mallinc.	3-25-86	500 g	unopened
Potassium Chloroplatinate	16921-30-5	MCB	10-18-83	10 g	0.125
		MCB		10 g	0.125
Potassium Chromate	7789-00-6	Mallinc.		1 lb.	0.5
Potassium Cyanide	151-50-8	J.T. Baker	3-1-72	1/4 lb.	0.5
		Mallinc.	6-20-72	1 lb.	full
Potassium Dichromate	7778-50	Mallinc.		500 g	0.5
		Mallinc.	12-24-87	500 g	unopened
		Anachemia	11-74	100 g	0.25
Potassium Ferricyanide	13746-66-2	Fisher		500 g	full
		Merck		1 lb.	
Potassium Fluoride Dihydrate	7789-23-3	Aldrich		100 g	0.75
Potassium Hydroxide	1310-58-3	Fisher		500 g	0.125
		Fisher		500 g	unopened
Potassium Iodate	7758-05-6	Mallinc.	6-20-72	1/4 lb.	full
Potassium Iodide	7681-11-0	Fisher		2 at 500 g each	unopened

STOREROOM INVENTORY

Potassium Nitrate	7757-79-1	Mallinc.		1 lb.	0.5
Potassium Oxalate	583-52-8	Fisher	7-26-88	500 g	full
Potassium Periodate Meta	7790-21-8	Mallinc.		1/4 lb.	full
Potassium Permanganate	7722-64-7	Fisher		500 g	0.5
		Fisher		500 g	unopened
Potassium Persulfate	7727-21-1	Fisher	6-23-89	500 g	0.5
		Fisher		500 g	unopened
Potassium Phosphate Dibasic	7758-11-4				
Granular		Mallinc.	6-28-84	1 lb.	0.5
		Mallinc.	7-18-84	500 g	unopened
Anhydrous		Mallinc.	8-17-81	1 lb.	0.25
Crystals		Mallinc.	7-18-84	500 g	0.5
		Mallinc.	7-18-84	500 g	unopened
Potassium Phosphate Monobasic	7778-77-0	Mallinc.	6-28-84	500 g	0.5
		Mallinc.	7-18-84	500 g	0.5
		Mallinc.	7-18-84	500 g	unopened
		C.P. Baker		1 lb.	0.5
Potassium Sulfate	7778-80-5	Mallinc.	8-27-86	2.5 kg	0.25
Potassium Thiocyanate	333-20-0	Mallinc.		1/4 lb.	full
Propylene Glycol	57-55-6	Fisher	12-13-82	1 quart	full
Pyridine	110-86-1	Fisher			0.125
Pyrrolidine	123-75-1	Eastman	1-14-77	500 g	0.75

STOREROOM INVENTORY

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
Resorcinol	108-46-3	Mallinc.	7-17-74	1/4 lb.	full
Rhodamine B Base	81-88-9	MCB	3-27-72	25 g	0.5

STOREROOM INVENTORY

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
Acid Salicylic	69-72-7	Mallinc.		1 lb.	0.5
Selenium Dioxide	7446-08-4	MCB	10-12-78	1 lb.	minimal
		MCB	10-12-78	1 lb.	0.25
Silica Gel	7631-86-9	MCB		1 kg	0.5
		SMI		500 g	0.75
Silicic Acid	7699-41-4	Mallinc.	10-6-72	1 lb.	unopened
		Mallinc.		1 lb.	unopened
Silver Diethyldithiocarbamate	7470-61-7	Mallinc.	8-9-72	25 g	0.125
Silver Sulfate	10294-26-5	Fisher	6-16-88	2 at 25 g each	unopened
Soda Ash - Light	497-19-8	Allied			
Soda Ash - Dense	497-19-8	Allied			
Sodium Acetate	127-09-3	Fisher		3 kg	full
Sodium Aluminate	1302-42-7	MCB		1 lb.	full
Sodium Ammonium Phosphate	7783-13-3	Mallinc.		1 lb.	0.5
		Mallinc.	2-26-80	1 lb.	0.75
Sodium Arsenite	7784-46-5	Mallinc.		1 lb.	0.25
		Mallinc.		1 lb.	full
Sodium Azide	26628-22-8	J.T. Baker		100 g	0.25
		MCB	4-21-76	500 g	0.25
		MCB	4-21-76	500 g	full
Sodium Bicarbonate	144-55-8	Mallinc.	6-28-84	500 g	0.5
		Arm & Hammer		64 ounces	0.25
Sodium Bisulfate	7681-38-1	Mallinc.		1 lb.	0.75
		Mallinc.		500 g	0.5
Sodium Bisulfite	7631-90-5	C.P. Baker	1968	1 lb.	0.75
Sodium Borohydride	16940-66-2	Mallinc.	7-18-84	25 g	unopened
		Kodak		100 g	0.25
		Mallinc.	1-6-82	100 g	0.75
Sodium Bromide	7647-15-6	Mallinc.	5-17-84	1 lb.	full
Sodium Carbonate Anhydrous	497-19-8	Mallinc.		1 lb.	0.25
(soda ash)		Fisher	7-87	500 g	0.25
Sodium Chloride	7647-14-5	Fisher	1989	3 at 1 kg each	unopened
Sodium Chlorite	7758-19-2	MCB	10-6-72	1 lb.	0.25
Sodium Chromate	7775-11-3	C.P. Baker	3-1-72	1 lb.	0.75
Sodium Citrate	68-04-2	Mallinc.	2-11-87	500 g	0.5
		Mallinc.	3-9-79	1 lb.	0.5
Sodium Dichromate	10588-01-9	Mallinc.	7-20-82	1 lb.	0.5
Sodium Ferrocyanide	13601-19-9	EM Science	5-6-88	500 g	full
Sodium Fluoride	7681-49-4	Fisher		1 lb.	0.75
Sodium Formate	141-53-7	Mallinc.	3-14-77	1 lb.	0.75
		Mallinc.	3-14-77	1 lb.	full
Sodium Hexametaphosphate	50813-16-6	MCB	2-23-72	1 kg	full
Sodium Hydroxide	1310-73-2	Fisher		3 at 3 kg each	unopened
		Fisher		3 kg	full
Sodium Iodide	7681-82-5	Mallinc.	8-9-83	1 lb.	minimal
		Fisher		2 at 500 g each	unopened
Sodium Metabisulfite	7681-57-4	Mallinc.	3-2-87	500 g	0.5
Sodium Molybdate (VI) Dihydrate	7631-95-0	Aldrich		100 g	0.75

STOREROOM INVENTORY

Sodium Nitrate	7631-99-4	J.T. Baker	3-1-72	1 lb.	full
		Mallinc.		1/4 lb.	0.5
Sodium Nitroferricyanide	13755-38-9	MCB	1-10-77	1/4 lb.	full
Sodium Oxalate	62-76-0	Mallinc.		1 lb.	0.5
Sodium Phosphate Dibasic	7558-79-4	Fisher		1 kg	0.5
Sodium Phosphate Monobasic	7558-80-7	Fisher		500 g	0.25
Sodium Salicylate	54-21-7	Mallinc.	8-20-84	2.5 kg	0.25
Sodium Sulfite Anhydrous	7757-82-6	Mallinc.	8-8-86	500 g	0.125
		Fisher		3 kg	0.5
Sodium Tartrate	868-18-8	Mallinc.	1972	1 lb.	0.125
		Mallinc.	7-21-80	1 lb.	0.25
Sodium Thiosulfate	7772-98-7	Mallinc.	3-17-78	5 lb.	0.25
Sodium Tungstate	13472-45-2	Mallinc.	3-1-72	1 lb.	0.75
Stannous Chloride	7772-99-8	Fisher	6-8-89	500 g	empty
		Fisher	8-1-89	500 g	0.75
		Fisher	8-1-89	500 g	unopened
Stannous Sulfate	7488-55-3	Mallinc.	1-5-87	500 g	minimal
Starch Indicator Solution	N/A	Fisher		4 liter	0.5
		Fisher		2 at 4 liter each	unopened
Starch Potato	9005-25-8	Mallinc.	2-21-72	5 lb.	0.25
Sulfamic Acid	5329-14-6	Mallinc.	8-6-74	100 g	0.25
Sulfanilamide	63-74-1	Mallinc.		1 lb.	0.75
Sulfanilic Acid	121-57-3	Mallinc.	3-1-72	6 at 1/4 lb. each	full
		Mallinc.	3-1-72	18 at 1/4 lb. each	unopened
Flowers of Sulfur	7704-34-9	McKesson & Robbins		1 lb.	0.75
Sulfuric Acid Solution	7664-93-9	Fisher		1 pint	full
Superchrome Black TS *	1787-61-7	Allied	2-21-72		0.5

* Also labelled as Eriochrome Black T

STOREROOM INVENTORY

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
Acid Tannic	1401-55-4	Mallinc.		1/4 lb.	0.75
Tartaric Acid	133-37-9	Mallinc.	6-20-72	1 lb.	0.125
Thioglycolic Acid (has separated)	68-11-1	Evans		1/4 lb.	full
Thymol Blue	76-61-9	MCB	7-19-72	5 g	0.5
o-Tolidine Dihydrochloride	612-82-8	MCB		1/4 lb.	0.75
		Mallinc.	2-7-78	1/4 lb.	0.75
Tolylene-2,4-diisocyanate	584-84-9	Aldrich		250 g	unopened
Tricaprylyl Methyl Ammonium Chloride	5137-55-3	McKerson Corp.		2 at 1 pt each	full
2,3,5-Triphenol-2H-tetrazolium Chloride	298-96-4	MCB	3-26-79	25 g	0.5
Tungsten Metal Powder	7440-33-7	GTE Sylvania		500 g	

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
Urea	57-13-6	MCB	3-1-72	1 lb.	0.75

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
Xylenol Orange Indicator	1611-35-4	Mallinc.		5 g	0.25

Chemical Name	CAS Number	Manufacturer	Date	Weight	Amt. Left
Zinc	7440-66-6	Mallinc.	12-29-77	1 lb.	0.5
Zinc Acetate	557-34-6	Mallinc.	1-15-76	1 lb.	0.125
Zinc Chloride	7646-85-7	Mallinc.	1973	1 lb.	0.75
Zincon	135-52-4	J.T. Baker	3-1-72	1 g	unopened
Zirconyl Chloride	15461-27-5 or 13520-92-8	Fisher		1/4 lb.	0.5

STOREROOM INVENTORY

Chemical Name	Manufacturer	Date	Weight	Amt. Left
Conductivity Calibrator Solution	YSI, Inc.			unopened
Hengar Granules	Hengar Co.		500 g	0.5
	Hengar Co.		500 g	full

2 vials of Mercury waste

Assorted painting chemicals

Box of chemicals labelled "Flammable - Explosive"

SECTION IX. CALIBRATION PROCEDURES AND FREQUENCY

A. Instrumentation

OBG Laboratories maintains state-of-the-art instrumentation. The following equipment is currently in use:

1) One Hewlett Packard 5995 GC/MS system and one Hewlett Packard 5970A GC/MS system for semi-volatile analysis. The GC/MS's are connected to a HP1000 RTE-6 Series Computer.

2) One Hewlett Packard 5970 GC/MS system and one Hewlett Packard 5987A GC/MS system for volatile analysis. The GC/MS's are connected to a HP1000 RTE-6 Series Computer.

3) Three Tracor 540 GCs with Tracor PID and HECD detectors and one Tracor 565 GC with Tracor PID and HECD detectors for volatile analysis.

4) Two Hewlett Packard HP5890 and two Hewlett Packard HP5880 GC's and six Hewlett Packard ECD detectors and two Hewlett Packard FID detectors for semi-volatile analysis. Also one Hewlett Packard 19304 nitrogen-phosphorous detector.

5) One Thermo Jarrell Ash ICAP-61, 29 channel 0.75 meter direct reading simultaneous spectrometer for metals analysis.

6) One Perkin-Elmer 5100-PC Atomic Absorption Spectrometer, Zeeman system with an optical interface for metals analysis.

7) One Thermo Jarrell Ash Smith-Hieftje 22 Atomic Absorption Dual Channel Spectrometer for metals analysis.

8) One Perkin-ElmerModel 3100 Atomic Absorption Spectrometer, used predominately for flame atomic absorption and cold vapor atomic absorption techniques.

9) One Lachat QuikChem AE multi-channel analyzer for automated determination of nutrients and other inorganic parameters.

10) One Rosemont Analytical Dohrmann DC-190 for TOC analysis.

11) One ABC model 1002B GPC with UV detector.

12) Eight continuous one-step liquid-liquid extractors.

13) Balances, pH meter, specific conductivity meter and other supporting equipment.

B. Calibration

Accurately calibrated instruments are a major concern at OBG Laboratories, Inc. A brief explanation of the calibration procedures used at OBG Laboratories, Inc. is summarized below.

1) Instruments

All automated analytical instruments are calibrated daily using a curve consisting of two to seven points. The calibrations are verified at the time that they are run to

confirm that they meet certain QC requirements. The information is recorded in the laboratory logbook that is set up for each analysis. A copy of the calibration data, if available is also put into a laboratory notebook. The logbook is kept near the instrument. If the calibration does not meet established QC requirements, then the problem is located, corrected and a new curve analyzed.

2) Thermometers

Thermometers used in the lab are calibrated against an NIST-certified thermometer on site once a year. They are checked at the freezing point, boiling point, and the temperature at which they are used. Correction factors for each thermometer are calculated and the thermometers are tagged listing the thermometer number and the correction factors. Correction factors, date calibrated, temperature calibrated at, and actual temperature with reference to the thermometer number are documented in a laboratory notebook.

3) Balances

Analytical balances are professionally calibrated and cleaned once a year. When the balances are professionally calibrated, a document stating the specific balance model and serial number and the date calibrated is provided by the company doing the calibration. The balances are checked daily with Class S weights. The weights must read within 0.02% of the true value. If the weight is out of the control limits, it will be professionally recalibrated. The analyst performing the check, the date the balance was checked and the weights the balance was checked at are recorded in a laboratory notebook.

4) pH Meter

A two-point calibration bracketing the pH of the samples analyzed is done daily on the pH meter. The calibration is then verified with a third pH buffer. The calibration date, analyst's initials, calibration data and pH of verification buffer are recorded in a laboratory notebook.

C. Standards and Calibration Procedures

Reference standards are obtained from third party sources. Primary, intermediate and working standards are traceable back to a known source such as NIST or EPA through the use of the standards logbook. Each laboratory section has its own standards logbook which is kept in a convenient location in the lab. The analyst preparing the respective standards is responsible for entering the lot number, date received, date opened, date standards are prepared, expiration date, concentrations, and any intermediate calculations into the standards logbook. Stock standard solutions, intermediate standards and working standards are stored at 4° C, protected from light and periodically checked for signs of degradation or evaporation. Standards are prepared to meet the requirements set forth in the methods. A table of standard sources and storage is included as Table IX-1.

1. GC/MS

GC/MS stock standard solutions are prepared from pure standard materials along with being purchased as certified solutions from either Supelco, Accustandard, or Chem Service. All standard preparations are recorded in the standards logbook. The standards are combined to contain specific compounds and are diluted to concentrations necessary

for calibration. New standards are prepared if comparison with check standards indicate a problem or after one month. One standard source is used as a reference and the other is used as the calibration standards. This system provides an external check on the standards. All standard preparation and usage is documented in the standards logbook.

Before the GC/MS is calibrated, it is first autotuned and then tuned with PFTBA. Then the mass calibration and resolutions of the instruments are verified by either a 50 nanogram injection of BFB (4-bromofluorobenzene) for volatiles or a 50 nanogram injection of DFTPP (decafluorotriphenylphosphine) for semi-volatiles. The tune must meet the ion abundance criteria listed below taken from the U.S. EPA CLP Statement of Work. The system must be retuned every 12 hours of analysis and when the instrument performance check solution fails to meet criteria. After retuning, the performance check solution is reanalyzed. No samples are analyzed until tuning criteria is met.

BFB KEY IONS AND ABUNDANCE CRITERIA

MASS	ION ABUNDANCE CRITERIA
50	15.0 - 40.0 percent of the base peak
75	30.0 - 60.0 percent of the base peak
95	base peak, 100 percent relative abundance
96	5.0 - 9.0 percent of the base peak
173	less then 2.0 percent of mass 174
174	greater than 50.0 percent of the base peak
175	5.0 - 9.0 percent of mass 174
176	greater than 95.0 percent but less than 101.0 percent of mass 174
177	5.0 - 9.0 percent of mass 176

DFTPP KEY IONS AND ABUNDANCE CRITERIA

MASS	ION ABUNDANCE CRITERIA
51	30.0 - 60.0 percent of mass 198
68	less than 2.0 percent of mass 69

70	less than 2.0 percent of mass 69
127	40.0 - 60.0 percent of mass 198
197	less than 1.0 percent of mass 198
198	base peak, 100 percent relative abundance
199	5.0 - 9.0 percent of mass 198
275	10.0 - 30.0 percent of mass 198
365	greater than 1.0 percent of mass 198
441	present but less than mass 443
442	greater than 40.0 percent of mass 198
443	17.0 - 23.0 percent of mass 442

A continuing calibration standard is analyzed at the beginning of every 12-hour period. This standard must meet specific QC limits listed in the method to ensure that the initial five point calibration is still valid. The continuing calibration standard is matrix specific (i.e. water, low soil, medium soil). The concentration of the continuing calibration is 250 ng for volatiles and 50 ng for semi-volatiles.

An initial five-point calibration is done whenever system specifications change or if the continuing calibration acceptance criteria have not been met. A different calibration curve is generated for each matrix (i.e. water, low soil, medium soil). The initial five point calibration is performed prior to the analysis of samples and blanks. The relative response factors and percent relative standard deviation of specific compounds must meet established criteria as specified in the method. If these parameters fail to meet criteria, the initial calibration must be repeated.

2. GC Volatiles

GC stock standard solutions are prepared from pure standard materials and also purchased from Supelco and Chem Service, Inc. Spiking solutions are received from EPA. All standards are logged into the reagent logbook. The standards are mixed to

contain specific compounds and are diluted to the concentrations necessary for calibration. New working standards are made every 28 days. A reference standard which is prepared from an independent source is used to check the calibration.

The GCs are calibrated with a 3 to 5 point standard curve monthly or whenever the calibration check standard is not within established criteria. The instrument is also recalibrated whenever instrument conditions change. For methods 601/602 and 501.1, three calibration standards are analyzed to calibrate the instrument and to define linearity. One of the standards is at a concentration near but above the detection limit. The other standards reflect the concentration range of the samples to be analyzed or the working range of the detector. If the ratio of response to concentration (calibration factor) is constant over the working range (10% relative standard deviation), linearity through the origin can be assumed and an average calibration factor can be used in place of a calibration curve.

For methods 8010/8020 and volatile petroleum hydrocarbons, five calibration standards are analyzed to calibrate the instrument. One of the standards is at a concentration at but above the detection limit. The other standards reflect the concentration range of the samples to be analyzed or the working range of the detector. The ratio of the response to the amount injected (calibration factor), can be calculated for each analyte at each standard concentration. If the percent relative standard deviation (%RSD) of the calibration factor is less than 20% over the working range, linearity through the origin can be assumed, and the average calibration factor can be used in place of a calibration curve.

For methods 502.1 and 503.1, a one point calibration method is used. Standards are prepared from standard stock solutions at concentrations to give responses within 20% of expected sample responses.

A reference sample is run at a frequency of ten percent to verify calibration. The reference sample is run at a concentration of 20 ppb. Acceptance criteria is from the method Table 2 (Table 3 for 8010/8020).

3. GC Semi-volatiles

Standards solutions are prepared from pure standard materials or purchased as certified solutions from either Chem Services, Accustandard, or Supelco. All standards are logged into the standards logbook. Stock solutions are replaced every six months to one year. Working standards are replaced at the most every six months. A calibration check sample from a different source is run to verify the concentration of the standards.

In accordance with Method 608-Organochloride Pesticides and PCBs, the gas chromatographic system is calibrated using standards at a minimum of three concentrations. For Method 8080, five concentration levels are used to generate the calibration curve and demonstrate linearity. One of the standard concentrations should be close to but above the MDL and the other concentrations should correspond to the expected concentrations found in real samples. The peak heights or area responses are tabulated against the amount injected, and response factors are generated. If the response factors are constant over the working range (the relative standard deviation is less than 10%), linearity through the origin can be assumed and an average response factor can be used for calculations.

The response factors are verified on each working day by the analysis of a check standard. If the response for any parameter exceeds 15% of the expected value, the analysis must be repeated using a new calibration standard. The check standard is run at a level at the mid point of the calibration range. Calibration check standards are also analyzed at a frequency of ten percent throughout the analytical sequence.

4. Metals

Standards used for ICP analysis are received from Environmental Resources Associates or Leeman Labs on a monthly basis. Stock solutions are mixed to contain specific elements and are diluted to obtain working standards. Standards for furnace analysis are received from Alfa Johnson Matthey. Working standards are made fresh daily. All standards are logged into the reagent logbook.

Instrument calibration for metals analysis is performed daily. A two-point calibration curve for ICP, a four-point curve for graphite furnace and a five-point curve for mercury analysis are generated. The calibration curves must have correlation coefficients greater then or equal to 0.995. Calibration verification is monitored by analyzing a reference solution after the initial calibration and every ten samples. The calibration verification must meet the recovery criteria specified in the individual methods. For ICP and furnace analysis, the recovery must be between 90% and 110%. For mercury analysis, the recovery must be between 85% and 115%. The calibration verification is run at the mid point of the calibration curve. If it fails to meet this criteria, then the instrument is recalibrated and the reference standard reanalyzed to verify calibration.

Detection limits, Interelement Correction Factors and Linear Ranges are

determined at a frequency based on the QA/QC requirements of the individual methodologies. An interference check sample is run at the beginning and end of every ICP run and must have a recovery of ±20%.

5) Wet Chemistry

There are many different types of analyses handled by the wet chemistry section. The wet chemistry section performs potentiometric, colorimetric, and titrametric analysis. The QC requirements vary from test to test. For colorimetric analyses, there is a standard curve consisting of 5 to 7 points, depending on the test. The correlation coefficient of the standard curve must be greater then or equal to 0.995. A standard is run at the detection limit to verify accuracy at that level. A reference sample and a blank are analyzed at the beginning of each run to ensure the method is in control. In addition, continuing calibration standards are run at a 5% frequency to ensure calibration is maintained throughout the analytical sequence. The continuing calibration check is generally analyzed at a level at the mid point of the detection limit.

Titrating solutions are standardized once per month or whenever the titrant is prepared. The procedures outlined in *Standard Methods, 16th Edition* are followed. The acidity titrating solution is standardized against a potassium hydroxide phthalate solution and the alkalinity titrating solution is standardized against a sodium carbonate solution. The standardization is written up by the analysts in their lab notebook, and are checked by the group's section leader. A reference standard is analyzed each analysis day to verify the concentration of the standard titrant.

TABLE IX-1
STANDARD SOURCES AND PREP

INSTRUMENT GROUP	STANDARD TITLE	SOURCE	SOURCE STORAGE	PREP. FROM SOURCE	LAB STOCK STORAGE	FREQ. OF PREP
GC Semi-Volatiles	Calibration Stock Standards	Chem Service	Freezer	Working Calibration Stds.	Freezer	Every 6 months or as needed
	Surrogate Stock Standards	Chem Service	Freezer	Surrogate Spiking Solution	Freezer	Every 6 months or as needed
	MS/MSD Spiking Solution	EPA or EPA CRADA RTHM std.	Freezer			Every 6 months or as needed
PCBs	Calibration Stock Standard	Chem Service, Ultrascientific, or Accustandard	Freezer	Calibration Working Standards	Freezer	Every 6 months or as needed
	Surrogate Stock Standard	Accustandard	Freezer	Surrogate Spiking Solution	Freezer	Every 6 months or as needed
	MS/MSD Spiking Solution	EPA or EPA CRADA RTHM std.	Freezer			Every 6 months or as needed
Pesticides and Herbicides	Calibration Stock Standards	EPA or EPA CRADA RTHM std.	Freezer	Working Calibration Standards	Freezer	Every 6 months or as needed
	Surrogate Stock Standards	Ultrascientific or Accustandard	Freezer	Surrogate Spiking Solution	Freezer	Every 6 months or as needed
	MS/MSD Spiking Standard	Ultrascientific or Accustandard	Freezer			Every 6 months or as needed
GC/MS Semi-Volatile	Calibration Stock Standards	Chem Service	Freezer	Working Calibration Standards	Freezer	Every 6 months or as needed
	Spiking Standards	Accustandard	Freezer	Working Spike Solution	Freezer	Every 6 months or as needed
	Surrogate Stock	Chem Service	Freezer	Surr. Spike Solution	Freezer	Monthly

TABLE IX-1

INSTRUMENT GROUP	STANDARD TITLE	SOURCE	SOURCE STORAGE	PREP. FROM SOURCE	LAB STOCK STORAGE	FREQ. OF PREP
	Reference	Accustandard	Freezer	Working Standards	Freezer	As needed
GC/MS Volatiles*	Calibration Stock Standards	Chem Service	Freezer	Calibration Working Standards	Freezer	Every month or as needed Gases every week
	Spiking Standards	Accustandard	Freezer	Working Spike Solution	Freezer	Every month or as needed
	Surrogate Stock	Chem Service	Freezer	Surr. Spike Solution	Freezer	Monthly or as needed
	Reference	Accustandard	Freezer	Working Standards	Freezer	Monthly or as needed
GC - 8010/8020 and 601/602*	Calibration Stock Standards	Chem Service, Supelco, Ideal Gas, Matherson, or Aldrich	Freezer	Calibration Working Standards	Freezer	Every 4 weeks
	Reference Standard	Supelco	Freezer	Working Reference Standard	Freezer	Every 4 weeks
	Spiking Standard	EPA	Freezer	Working Spike Solution	Freezer	Every 4 weeks
GC - THM*	Calibration Stock Standards	Chem Service	Freezer	Calibration Working Standards	Freezer	Every 4 weeks
	Reference Standard	Chem Service	Freezer	Working Reference Standard	Freezer	Every 4 weeks
	Spiking Standards	Chem Service	Freezer	Working Spike Solution	Freezer	Every 4 weeks
GC - 502.1/503.1*	Calibration Stock Standards	Chem Service or Supelco	Freezer	Calibration Working Standards	Freezer	Every 4 weeks
	Reference Standard	Chem Service or Supelco	Freezer	Working Reference Standard	Freezer	Every 4 weeks
	Spiking Standards	EPA	Freezer	Working Spike Solution	Freezer	Every 4 weeks

* All volatile standards are mixed from neat standards at the indicated frequency, but are prepared daily to dilution required for use.

TABLE IX-1

INSTRUMENT GROUP	STANDARD TITLE	SOURCE	SOURCE STORAGE	PREP. FROM SOURCE	LAB STOCK STORAGE	FREQ. OF PREP
GC - MOD. 8020*	Calibration Stock Standards	Chem Service	Freezer	Calibration Working Standards	Freezer	Every 4 weeks
	Reference Standards	Chem Service	Freezer	Working Refernece Standard	Freezer	Every 4 weeks
	Spiking Solutions	Chem Service	Freezer	Working Spike Solution	Freezer	Every 4 weeks
GC - Volatiles (all methods)*	Surrogate Spiking Solution	Chem Service	Freezer	Working Standard	Freezer	Every 4 weeks
ICP	Calibration stds.	Commercial	Room Temperature	Working Standard	Room temp.	Monthly or as needed
	Spike Solution	Commercial	Room Temperature	Working Standard	Room temp.	Yearly or as needed
	LaL. Control Sample	Commercial	Room Temperature	Working Standard	Room temp.	Yearly or as needed
AA	Calibration stock stds.	Commercial	Room Temperature	Working Calibration Stds.	Room temp.	Daily
	Spike Solution	Commercial	Room Temperature	Working Standard	Room temp.	Yearly or as needed
	Lab. Control Sample	Commercial	Room Temperature	Working Standard	Room temp.	Yearly or as needed
Hg	Calibration	Commercial	Room Temp.	Working Standard	Room temp.	Each batch
	Spike Solution	Commercial	Room Temp.	Working Standard	Room temp.	Yearly or as needed
	Lab. Control Sample	Commercial	Room Temp.	Working Standard	Room temp.	Yearly or as needed

* All volatile standards are mixed from neat standards at the indicated frequency, but are prepared daily to dilution required for use.

TABLE IX-1

INSTRUMENT GROUP	STANDARD TITLE	SOURCE	SOURCE STORAGE	PREP. FROM SOURCE	LAB STOCK STORAGE	FREQ. OF PREP
Cr-Hex	Stock Cr^{+6} soln.	Commercial	Shelf	Working Soln.	N/A	Daily
Ethylene Glycol	Stock Soln.	Commercial	Refrigerature	Working Soln.	N/A	Daily
MBAS	Stock LAS Soln.	Commercial	Refrig. at 5° C.	Working Soln.	N/A	Daily
TPH	Stock Standard	Commercial	Refrig.	Working Soln.	Refrig.	Monthly
Total Phosphorus	Stock Phosphate	Commercial	Refrig.	Working Soln.	N/A	Daily
TKN	Stock Standard	Commercial	Tightly Stoppered	Working Standard	Tightly Stoppered In Refrig.	15 days
Silica	Stock Standard	Commercial	Shelf	Working Standard	N/A	Daily
Iodine	Stock Soln.	Commercial	Shelf	Working Standard	N/A	Daily
Bromide	Stock Soln.	Commercial	Shelf	Working Standard	N/A	Daily
COD	Stock Soln.	Commercial	Refrig.	Working Standard	N/A	Daily
Cyanide	Stock Soln.	Commercial	Refrig.	Working Soln.	Refrig.	Monthly
TOC	Stock Standard	Commercial	Refrig. at 4° C.	Working Standard	Refrig.	14 days
Sulfate	Sulfate Stock	Commercial	Refrig. at 4° C.	Working Standard	Refrig at 4°C	Every 6 months
BOD	Glucose-Glutamic Acid Std.	Commercial	Shelf	200 ppm Working Standard	Refrig.	Monthly
Chloride	Cl Stock	Commercial	Refrig.	Working Standard	Refrig.	Monthly
Orthophosphate	Stock	Commercial	Refrig.	Working Standard	Refrig.	Monthly
Total Phosphate	Stock	Commercial	Refrig.	Working Standard	Refrig.	Monthly

TABLE IX-1

INSTRUMENT GROUP	STANDARD TITLE	SOURCE	SOURCE STORAGE	PREP. FROM SOURCE	LAB STOCK STORAGE	FREQ. OF PREP
Nitrate & Nitrite	,tock	Commercial	Refrig.	Working Standard	Refrig. with 2ml $CHCl_3$	Monthly
Nitrite	Stock	Commercial	Refrig.	Working Standard	Refrig. with 2ml $CHCl_3$	Monthly
Ammonia	Stock	Commercial	Refrig.	Working Standard	Refrig.	15 days
Flouride	Stock	Commercial	Shelf	Working Standard	N/A	Daily
pH	Buffer	Commercial	Room temp.			6 months
Total Alkalinity	Stock H_2SO_4	Commercial	Room temp.	1.N H_2SO_4 0.1N and 0.02N H_2SO_4	Room temp.	6 months Monthly
	Stock Reference	Commercial	Refrigerator	Working reference	Room temp.	2 months
	Standardization Titrant	Commercial	Room temp.	0.05N Na_2CO_3 standardization titrant	Room temp.	Daily
Turbidity	Stock Solution	Commercial	Refrigerator	400 NTU std.	Room temp.	Monthly
				40 NTU std from 400 std	Room temp.	Daily
				4 NTU std from 400 std	Room temp.	Daily
				.4 NTU std from 400 std	Room temp.	Daily
Phenol	Stock Solution	Commercial	Refrigerator	Reference std.	Refrigerator	6 months
				Working std.	Refrigerator	6 months
				Calibration std. from working std.	Room temp.	Daily
	Buffer Solution	Commercial	Room temp.			2 months

TABLE IX-2
STANDARDIZATION OF TITRANTS

TITRANT	STANDARDS USED	FREQUENCY
H_2SO_4 (1N; 0.1N; 0.02N)	0.05N Na_2CO_3	Monthly
NaOH (1N; 0.1N; 0.02N)	0.05N Potassium Biphthalate	As needed
$Na_2S_2O_3$ (0.005N)	0.005N Patassium Bi-Iodate	Monthly or as needed
$Na_2S_2O_3$ (0.025N)	Potassium Iodine Potassium Bi-Iodate	Monthly or as stock is changed

SECTION X. PREVENTIVE MAINTENANCE

A. Instrument Maintenance

A preventive maintenance schedule is followed and a maintenance log is kept on all instruments. The prevention of instrument failure is important to laboratory operation. The laboratory needs to meet certain analytical schedules and holding times and this can only be accomplished by keeping instrument downtime to a minimum. Instruments are cleaned and maintained on a regular basis to help limit downtime.

The lab has maintenance contracts on all major pieces of equipment. If the lab experiences a problem with an analytical instrument, a service call is made, and a certified technician is sent to correct the problem. The analysts are also trained in troubleshooting their instruments to determine if outside assistance is needed.

Routine maintenance as outlined by the manufacturers are followed on all pieces of laboratory instrumentation. A list of routine maintenance is included as Table X-1.

In the event of equipment failure, in most cases there is an alternate piece of equipment that can be substituted. If there is no alternate equipment available, the sampling will be delayed if possible, or samples will be subcontracted to an alternate approved laboratory.

B. Maintenance Log

Maintenance logs are kept on every instrument in the lab. The logs are located near their respective instruments. Maintenance, whether performed by laboratory personnel or by professional maintenance personnel, is documented as an entry in the

appropriate log book. Entries include the reason for maintenance, maintenance that was performed, individual performing the maintenance, the date of maintenance, and the initials of the analyst in charge during the maintenance.

A maintenance check list is also completed each day on each major piece of analytical equipment. Two examples of the maintenance check lists are included as Figures X-1 and X-2.

C. Equipment Monitoring

The operating temperatures of all ovens, incubators, water baths, refrigerators, coolers and freezers are checked daily and recorded in a laboratory notebook. A specific analyst is assigned the responsibility to perform and record these temperature checks. The analysts initials, date, time performed and temperature reading are recorded for all ovens, refrigerators, etc. A table of the types of equipment that is monitored and the frequency that it is monitored is included as Table X-2.

TABLE X-1
PREVENTIVE MAINTENANCE

Instrument	Activity	Frequency
Atomic Absorption - Furnace	Clean furnace windows	Daily
	Check plumbing connections	Daily
	Change graphite tube	As needed
	Check gases	Daily
	Check autosampler and tubing	Daily
ICAP	Clean filters	Monthly
	Check gas flow	Daily
	Change tubing	Weekly
	Clean nebulizer	As needed
	Check autosampler and tubing	Daily
Gas Chromatograph - Volatiles	Check Hall propanol flow	Daily
	Check Hall furnace temp.	Daily
	Check PID sensitivity	Daily
	Change lamp	As needed
	Rinse purge devices	Daily
	Bake purge devices	Daily
	Check carrier gases	Daily
	Change carrier gases	As needed
	Check column flows	Daily
	Check for gas leaks	At each column change
	Replenish electrolytic conductivity detector solvents	As needed
	Clean transfer lines	As needed
Gas Chromatograph - Semi-Volatiles	Change septum	Every 100 shots or as needed
	Check carrier gas	Daily
	Change carrier gas	When pressure reaches 250 psi
	Change in-line filters	Every 6 mos. or as needed
	Remove first foot of capillary column	As needed
	Clean ECD	As needed
	Clean Nitrogen-Phosphorous Detector	As needed
	Check system for gas leaks	At each column change
	Replace column	As needed
	Clean FID	As needed
	Replace capillary injection port liner	At column change or as needed
	Replace capillary injection port seal	As column change or as needed
	Measure gas flow	After changing column
	Check syringe	Daily
	Change syringe	As needed

TABLE X-1 - continued

Instrument	Activity	Frequency
Gas Chromatograph/ Mass Spectrometer	Change septum	Monthly/as needed
	Check carrier gas	Daily
	Change carrier gas	When pressure reaches 100 ps
	Change gas filters	Semi-annually/as needed
	Change trap on Tekmar	As needed/poor sensitivity
	Change GC column	As needed/poor sensitivity
	Clean MS source	As needed/poor sensitivity
	Check pump oil leaks	Monthly
	Leak check septum	As needed/when leak suspected
	Check gas flows	As needed
	Clean VOA purge glassware	As needed
	Cut capillary column	As needed
	Replace liner	As needed/contamination susp.
	Replace BNA seal	As needed/contamination susp.
Lachat Quikchem AE	Dry and clean random access sampler	Daily
	Clean sample boats	Daily
	Coat rollers of pump with silicon spray	Every 2500 samples
	Replace pump tubes	Monthly
	Replace flares at port of valve module	Every 25000 samples
	Clean unions of the valve	Every 25000 samples
	Replace O-rings	When necessary
	Clean each port of the valve	Weekly
	Clean fitting of manifolds	Every 25000 samples
TOC	Replace water in IC Chamber	Weekly
	Clean IC chamber	As needed
	Clean underside of IC inlet valve	As needed
	Check combustion tube	Daily
	Repack quartz wool in comb. tube	As needed
	Check TC inlet valve	Daily
	Clean TC inlet valve	As needed
	Refill acid bottle	When 2/3 empty
GPC	Change seals and oil motor on positive displacement pump	Ever 1500-2000 hours of use
	Repack column	When column flow is restricted ot operating pressure increases
	Check system pressure	Check daily when operating
	Replace mesh at column effluent/influent	Replace if torn or wrinkled
	Check calibratio, pressure and solvent flow	Check weekly

TABLE X-1 - continued

Instrument	Activity	Frequency
pH Meter and Electrodes	Clean electrode	Weekly
	Flush and replace filling solution	Weekly
Flouride Ion Specific Electrodes	Replace electrodes	Every nine months
	Flush and replace filling solution	With each use
	Condition in buffered distilled water	With each use
IR Analyzer	Clean and inspect quartz tubes	With each use
Spectronic 21	Clean, dry and inspect set of matched curvettes	With each use

TABLE X-2
EQUIPMENT MONITORING

Equipment Type	Activity	Frequency
Ovens	Temperature monitoring	Twice daily
Refrigerators	Temperature monitoring	Twice daily
Incubators	Temperature monitoring	Twice daily
Walk-in Cooler	Temperature monitoring	Twice daily

MAINTENANCE CHECK LIST - GC/MS SEMI-VOLATILES

Instrument:_____

DATE	INJ. PORT REMOVE & CLEAN (RC) OR REPLACE (RE)							COLUMN		CLEANING			CHANGE GASES			HP PM	MISCELLANEOUS
	SEPTA	LINER	O-RING	FERR	SYR	FIL	OTHER	CUT	LENGTH	INJ. PORT	SOURCE	OTHER	LIQ NIT	HELIUM	AIR		

FIGURE X-1

Section No. X
Revision No. 1
Date: 09/25/92
Page 7 of 8

MAINTENANCE CHECK LIST - ICAP-61

DATE	INITIALS	CLEAN FILTERS	CHECK GAS FLOW	CHANGE PERISTALIC PUMP TUBING	CLEAN NEBULIZER	CHECK AUTOSAMPLER AND TUBING	CHANGE LIQUID ARGON TANK	COMMENTS

FIGURE X-2

Section No. X
Revision No. 1
Date: 09/25/92
Page 8 of 8

320061

SECTION XI. QUALITY CONTROL CHECKS, ROUTINES TO ASSESS PRECISION AND ACCURACY, AND CALCULATION OF METHOD DETECTION LIMITS

When analyzing samples, the accuracy and precision of the data generated are determined through the analysis of replicates, spiked samples, reference standards, and laboratory blanks with each set of samples. Results of QC samples are charted against control limits established for the current year.

A. Method Detection Limits

Method detection limits (MDLs) are calculated for each instrument in the lab. They are calculated following the procedures outlined in 40 CFR Part 136, Appendix B. An example of the MDL worksheet is included as FIgure XI-1. Seven replicate measures are used to determine the method detection limits. MDLs are calculated as part of the initial demonstration of precision and accuracy, that is done when an instrument is first received. MDLs are continually verified by running a standard at a concentration near but above the MDL value each time a calibration curve is generated.

B. Method Accuracy and Precision

Method accuracy is the ability to determine that the measurement of a known reference standard will be acceptably close to the defined true value. This is measured by the analysis of an external reference standard. The analytical method accuracy and matrix effects are determined by spiking a known amount of analyte into a sample. The percent recoveries are then calculated. The amount of analyte recovered from the sample reflects matrix effects upon the accuracy of the method. A trend over time indicates a

lack of control of accuracy. A trend could be described as five or more points on the same side of the mean or points gradually approaching warning or controlling limits.

Method Precision is the ability to limit the spread of replicate measurements relative to their average in a manner which approximates the bell-shaped normal distribution. The analytical method precision is determined by analyzing equal amounts of a split sample. Ideally, the analytical results will be identical; however, differences occur due to variations in the procedure. A quantitative measure of these differences is assessed by calculating the relative percent differences between duplicate results for each analyte.

C. Intralaboratory QA/QC Program

One of the main goals of this QA/QC manual is to establish guidelines for intralaboratory QC (QC that is performed within the laboratory). In addition, this manual provides a mechanism where QC procedures can be documented for review.

A quality control program is a systematic attempt to maintain the precision and accuracy of analyses by detecting and preventing the recurrence of errors. By identifying the sources of errors, confidence in the precision and accuracy of analytical results can be established, and improvements in the analytical methods can be made.

In general, OBG Laboratories quality control program incorporates the concepts of: a) calibration to attain accuracy, b) replication to establish precision limits, and c) use of synthetic standards and spikes to confirm accuracy.

Table XI-1 contains a list of all laboratory QC checks and the frequency at which they are done. If method QC requirements are more stringent than the routine measures

typically followed, the method QC requirements will be followed.

Table XI-2 is a list of the procedures used to determine the accuracy and precision levels in Table V-1. Low level is defined as concentrations from the minimum detection limit to a level five times the MDL. Mid level is defined as the mean level between the minimum detection level and the upper end of the linear range. High level is defined as the concentration at the upper end of the linear range.

1) Definitions of Basic Terms

There are some basic terms that are frequently used when discussing QA/QC. Below are the definitions of some of the common terms.

a) Method Blank - The method or preparation blank is an aliquot of distilled and deionized water, organic free water, or organic reagents used in the analysis of samples. The method blank for inorganic analyses consists of distilled and deionized tap water. The method blank is passed through the entire analytical procedure (including all glassware and other materials that come into contact with the samples). These blanks are analyzed along with the samples to verify that: a) no false positives occur, and b) concentrations are accurate and do not reflect contamination.

b) Trip Blank - Trip blanks are water blanks sent from the laboratory to the sampling site and are returned to be analyzed in the same manner as the samples. They are treated in the same manner as the field samples during sampling. If the samples are to be analyzed for purgeable organics, the analysis of trip blanks provides a check on possible contamination of the samples by permeation of volatiles through the septum seal. At least one trip blank for each volatile organic method will be prepared and analyzed for

each cooler used to transport the volatile samples.

c) Matrix Spike - Spikes are the result of the addition of a known amount of analyte to a sample or blank. The analytical results yield a quantitative measure of accuracy (spiked blanks) or percent recovery (spiked samples). The spike percent recovery reflects matrix effects upon the analytical method accuracy. Matrix spikes are used to calculate spike recovery limits.

d) Duplicates - Duplicates are the result of splitting a field sample into equal amounts and treating them as two unique samples throughout the analytical procedure. The results of duplicate analyses provide information on overall precision of the analytical methodology. Quantitative results are obtained by calculating the relative percent difference (RPD) for each analyte in the sample matrix. RPDs can only be calculated if both the sample and duplicate have results above the detection limit. Duplicate samples are used to calculate the precision limits listed in Table V-1.

e) Matrix Spike Duplicates - Matrix Spike Duplicates are the result of splitting a field sample into three parts and adding the same known amount of analyte into two of them. One is used as the matrix spike and the other is used as the matrix spike duplicate. The RPD is calculated on the two percent recoveries. The advantage of doing a matrix spike duplicate is that there will always be a calculable RPD since there should never be a result less then the detection limit. Matrix spike duplicate samples are also used to calculate the precision limits listed in Table V-1.

f) Surrogate Spike - Surrogate spikes consist of the addition of known amounts of standards to every sample prior to the analysis of some organic methods.

The standards are chemically similar to the compounds of interest. For GC/MS analysis, deuterated compounds are often used. The analysis of surrogate spikes provide quality control on every sample by constantly monitoring unusual matrix effects. Surrogate spikes added to every sample are used to calculate the surrogate spike recovery limits listed in Table V-1.

g) Internal Standard - An internal standard is a solution added to all samples for GC/MS analysis. Internal standards are used as the basis for quantitation of the target compounds.

h) Reference Standard - A reference standard is analyzed on every run or with each batch of samples to verify calibration. The type of standard used is an external reference standard solution obtained from a source different then the source of the calibration standards. The external reference samples are used for monitoring the complete analytical method. Reference standards are used to calculate the accuracy limits listed in Table V-1.

i) Continuing Calibration Check Standard - A standard used to verify calibration throughout the analytical sequence. They are analyzed at a frequency of 10%.

j) Performance Evaluation Samples - A set of samples sent to the laboratory by a certifying agency to be analyzed. The laboratory is unaware of the concentration of the compounds in the samples and the results must fall within certain limits. Approximately four sets of Performance Evaluation samples are analyzed per year. If P.E. sample analysis is unacceptable, results will be reported in a QA report if required.

2) Analytical Errors

The laboratory is dedicated to minimizing errors that cause inaccurate results. There are three types of errors: determinate, indeterminate, and systematic. Determinate errors are caused by improper technique such as glassware contamination, dirty hands, etc. Indeterminate errors are those in which no cause can be assigned. Systematic errors are a bias common to a sequence or batch of results frequently induced by an indeterminate or determinate error in a standard or in the use of a standard.

QC data is plotted on a daily basis and results are compared to established criteria to minimize out of control situations and analytical errors. The analysts are familiar with the methods they are running, and can detect when calibration standards and QC checks are not providing the proper results.

Errors are reduced by properly training the analysts and having written standard operating procedures for the analysts to use. The analysts are trained in good laboratory practices. Every effort is made to keep contamination to a minimum. Blanks are run with every group of samples to check for contamination from glassware or standards.

D. Statistical Quality Control

Statistical calculations form the basis of the QA/QC program. They are the foundation for the generation of control charts and the setting of warning and control limits. The definitions of some of the widely used statistical terms follows.

1) Mean - The average of n values is calculated by taking the sum of n values and dividing by n.

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

2) Standard Deviation - A parameter used to measure the dispersion of a data set. It is calculated by the following:

$$s = \sqrt{\frac{\sum_{i=1}^{n} (\bar{x} - x_i)}{n-1}}$$

The relative standard deviation (RSD) or coefficient of variation (CV) is the standard deviation divided by the mean and multiplied by 100.

$$CV = \frac{s}{\bar{x}} * 100$$

3) RPD - The relative percent difference of two numbers is calculated by dividing the absolute value of their differences by the average of the two numbers.

$$RPD = \frac{|x_1 - x_2|}{((x_1 + x_2)/2)} * 100$$

4) Percent Recovery - Percent recovery is calculated by dividing the spike sample result by the spike added for blank spikes or by dividing the spike sample result minus the sample by the spike added.

$$\%R = \frac{SS}{SA} * 100$$

$$\%R = \frac{SS-S}{SA} * 100$$

Where: SS = Spike sample
SA = Spike added
S = Sample

E. Control Charts

Control charts provide the necessary tools for detecting quality variations in the various analytical methodologies used. They are a continuous graphic indication of the state of an analytical procedure with respect to quality. Control charts indicate when corrective action procedures are necessary and often assist in defining what corrective action procedures should be taken.

The control limits on QC charts set the criteria for assessing the significance of variations in the analytical results. When the plotted QC data fall within these limits, the analytical methodologies are considered under control. If a data point falls outside of the control limits, there is an indication that some assignable cause is present which has thrown the system out of control.

Control limits can be considered action limits. They enable the laboratory to detect significant deviations in analytical procedures and to take corrective action before producing erroneous results. Warning limits are used as a warning that the analytical

system is approaching "out of control" conditions and that the cause should be investigated and corrected before the system is out of control.

Warning limits (WL) are set at ± 2 standard deviations and control limits (CL) at ± 3 standard deviations of the mean. The WLs and CLs correspond, respectively, to the 95% (2s) and 99.7%(3s) confidence limits of a normal distribution curve.

1) Precision QC Charts

Precision QC charts are used for graphing the RPDs of duplicate samples. The charts are developed using up to fifty data points, depending on how often the parameter is analyzed by a particular method. Once these data points have been collected, the warning and control limits on the QC charts are calculated by using the following method:

a) For each pair of duplicate samples calculate the RPD.

b) Calculate the mean RPD by summing all the RPDs and divide by the total number (n) of duplicate sets.

c) Calculate the standard deviation (s).

d) Calculate the warning and control limits.

$$UCL = \overline{RPD} + 3s$$
$$UWL = \overline{RPD} + 2s$$
$$LWL = \overline{RPD} - 2s$$
$$LCL = \overline{RPD} - 3s$$

The LWL is often equal to the LCL which is usually zero, since it is impossible to have a negative RPD. See Figure XI-2 for an example of a precision QC chart. Due to a problem in the statistical program used to generate control charts, negative numbers are

printed on the precision control charts, but they are not used.

2) Accuracy QC Charts

Accuracy QC charts are used for graphing the percent recoveries of reference standards. The charts are developed using up to fifty data points, depending on how often the parameter is analyzed. The warning and control limits are calculated by using the following procedures:

a) For each reference standard, calculate the percent recovery (%R).

b) Calculate the mean %R by taking all the %Rs and dividing by the total number (n) of %Rs.

c) Calculate the standard deviation (s) of the percent recoveries.

d) Set the warning and control limits by the following:

$$UCL = \overline{\%R} + 3s$$
$$UWL = \overline{\%R} + 2s$$
$$LWL = \overline{\%R} - 2s$$
$$LCL = \overline{\%R} - 3s$$

3) Matrix Spike Recovery QC Charts

Matrix spike recovery QC charts are used for graphing the percent recoveries of spiked samples. The charts are developed using up to fifty data points, depending on how often the parameter is analyzed. The warning and control limits are calculated by using the following procedures:

a) For each spiked sample, calculate the percent recovery (%R).

b) Calculate the mean %R by taking all the %Rs and dividing by the total

number (n) of %Rs.

c) Calculate the standard deviation (s) of the percent recoveries.

d) Set the warning and control limits by the following:

$$UCL = \overline{\%R} + 3s$$
$$UWL = \overline{\%R} + 2s$$
$$LWL = \overline{\%R} - 2s$$
$$LCL = \overline{\%R} - 3s$$

See Figure XI-3 for an example of a spike recovery chart.

TABLE XI-1
LABORATORY QC CHECKS AND FREQUENCY

LABORATORY SECTION	QC SAMPLE	FREQUENCY
GC/MS	Reference Standard	5%
	BFB or DFTPP	Every 12 hours
	Continuing Cal. Check	After BFB or DFTPP
	Matrix Spike	5%
	Matrix Spike Duplicate	5%
	Reagent Blank	Daily or every batch
	Surrogates	Every sample
	Internal Standards	Every sample
	P.E. Samples	Semi-annually
GC Volatiles	Reference Standard	10%
	Continuing Cal. Check	10%
	Matrix Spike	10%
	Matrix Spike Duplicate	10%
	Reagent Blank	Daily
	Surrogates	Every sample
	P.E. Samples	Semi-annually
GC Semi-volatiles	Reference Standard	5%
	Continuing Cal. Check	10%
	Matrix Spike	5%
	Matrix Spike Duplicate	5%
	Extraction Blank	10%
	Surrogates	Every sample
	P.E. Samples	Semi-annually
Metals	Reference Standard	5%
	Continuing Cal. Check	10%
	Matrix Spike	5%
	Duplicate	5%
	Preparation Blank	5%
	P.E. Samples	Semi-annually

TABLE XI-1 - continued

LABORATORY SECTION	QC SAMPLE	FREQUENCY
Wet Chemistry	Reference Sample	5%
	Continuing Cal. Check	10%
	Matrix Spike	5%
	Duplicate	5%
	Blank	5%
	P.E. Samples	Semi-annually

TABLE XI-2
PROCEDURES USED FOR PRECISION AND ACCURACY

QC PROCEDURE	PURPOSE	CONC. LEVEL	METHOD
Reference	Accuracy	Low	410.4, 420.1, 9065
Matrix Spike	Matrix Accuracy	Low	410.4, 420.1, 9065
Duplicate	Precision		410.4, 420.1, 9065
Reference	Accuracy	Mid	310.1, 350.1, 410.4, 325.2, 9251, 330.5, 335.2, 9010, 335.1, 340.2, 150.1, 9040, 351.2, 353.2, 413.1, 9071, 415.1, 365.4, 375.2, 180.1
Matrix Spike	Matrix Accuracy	Mid	350.1, 410.4, 352.2, 9251, 330.5, 335.2, 9010, 335.1, 340.2, 351.2, 353.2, 413.1, 9071, 415.1, 365.4
Duplicate	Precision		310.1, 350.1, 410.4, 325.2, 9251, 330.5, 335.2, 9010, 335.1, 340.2, 150.1, 9040, 351.2, 353.2, 413.1, 9071, 415.1, 365.4, 375.2, 180.1
Reference	Accuracy	High	405.1, 120.1
Duplicate	Precision		405.1, 120.1
Duplicate	Precision		305.1, 110.2, 140.1, 160.3, 160.1, 160.2, 160.5, 160.4, 377.1
Reference	Accuracy	Mid	All metals methods
Matrix Spike	Matrix Accuracy	Low	All metals methods
Duplicate	Precision		All metals methods

TABLE XI-2 - continued

QC PROCEDURE	PURPOSE	CONC. LEVEL	METHOD
Reference	Accuracy	Mid	601/602, 8010/8020
Matrix Spike/Matrix Spike Duplicate	Accuracy & Precision	Mid	601/602, 8010/8020
Reference	Accuracy & Precision	Low	502.1/503.1
Matrix Spike/Matrix Spike Duplicate	Accuracy & Precision	Mid	502.1/503.1
Reference	Accuracy	Mid	501.1
Matrix Spike/Matrix Spike Duplicate	Accuracy & Precision	Mid	501.1
Reference	Accuracy	Mid	MOD. 8020
Matrix Spike/Matrix Spike Duplicate	Accuracy & Precision	Mid	MOD. 8020
Reference	Accuracy	Low	608,8080
Matrix Spike/Matrix Spike Duplicate	Accuracy & Precision	Low	608, 8080
Reference	Accuracy	Mid	608 PCB only 8080 PCB only
Matrix Spike/Matrix Spike Duplicate	Accuracy & Precision	Mid	608 PCB only 8080 PCB only
Reference	Accuracy	Mid	8040, 8060, 8100, 8110, 8120, 8015, 8070, 8090
Matrix Spike/Matrix Spike Duplicate	Accuracy & Precision	Mid	8040, 8060, 8100, 8110, 8120, 8015, 8070, 8090
Reference	Accuracy	Low	8140, 8150
Matrix Spike/Matrix Spike Duplicate	Accuracy & Precision	Low	8140, 8150

TABLE XI-2 - continued

QC PROCEDURE	PURPOSE	CONC. LEVEL	METHOD
Matrix Spike	Accuracy	Low	624, 625, 8240, 8270
Matrix Spike Duplicate	Accuracy & Precision	Low	624, 625, 8240, 8270
Duplicates	Precision	Low	624, 625
Reference	Accuracy	Low	624, 625, 8240, 8270
Surrogates	Accuracy	Low	624, 625, 8240, 8270

FIGURE XI-1

Table ___

Method Detection Limit Worksheet

Parameter _____

Estimated Detection Limit _____

Concentration Used in this Study _____

Trial # 1 _____

Trial # 2 _____

Trial # 3 _____

Trial # 4 _____

Trial # 5 _____

Trial # 6 _____

Trial # 7 _____

Standard Deviation _____

3.143 x Standard Deviation _____

Method Detection Limit _____

Laboratory Detection Limit _____

Units _____

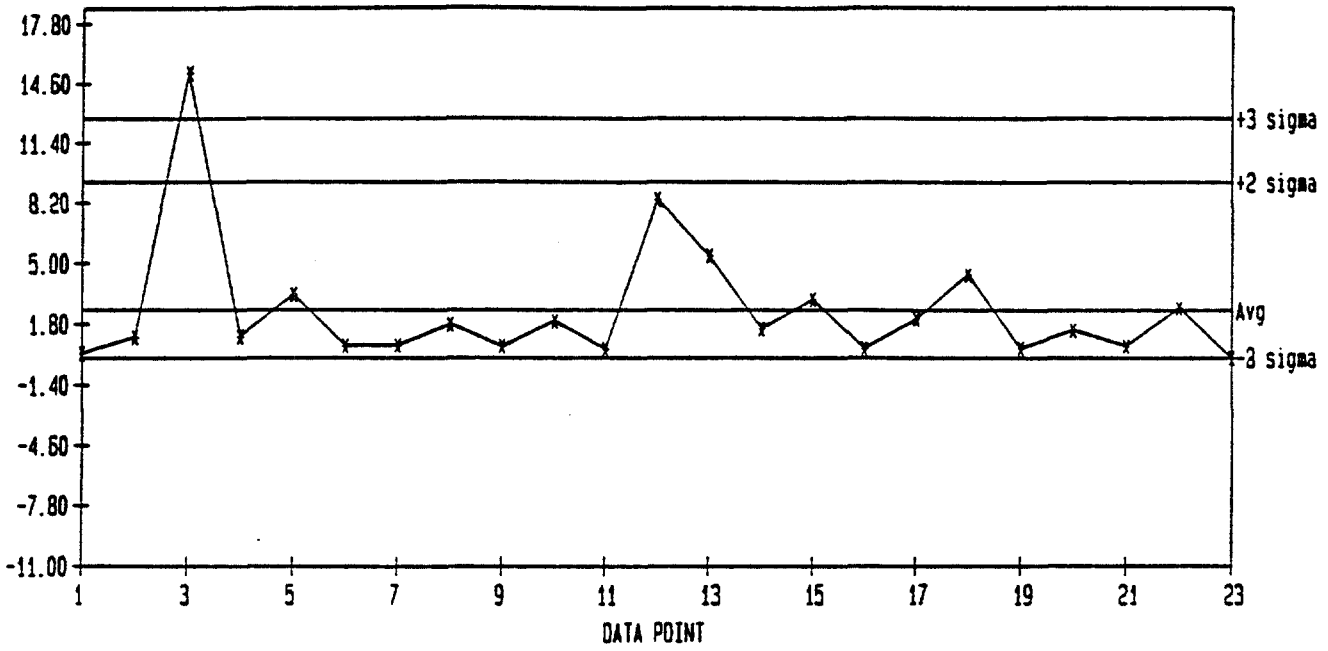
Date Analyzed _____

Signature _____

Reviewed _____

FIGURE XI-2

CU BY ICP - WATER RPD'S



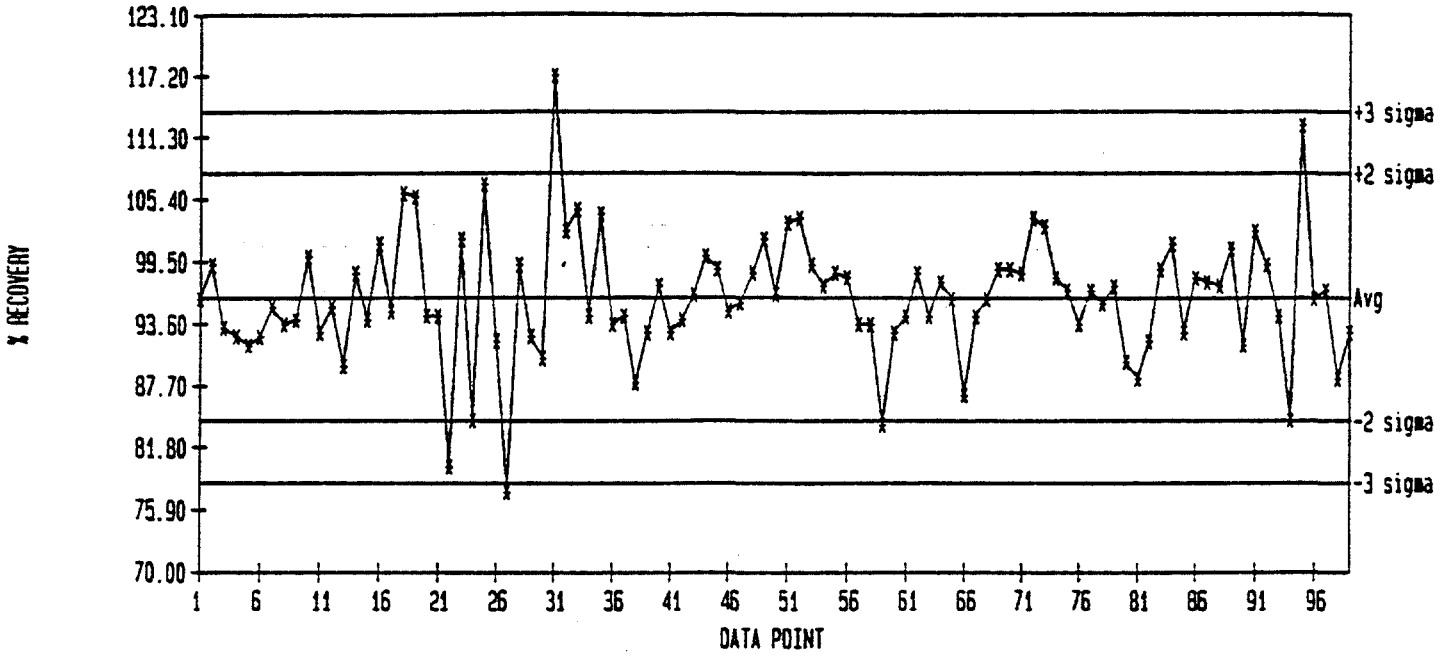
Descriptive Statistics

AVERAGE	:	2.503	STANDARD DEVIATION	:	3.385
UPPER WARNING LIMIT	:	9.273	LOWER WARNING LIMIT	:	0.000
UPPER CONTROL LIMIT	:	12.658	LOWER CONTROL LIMIT	:	0.000

DATA POINT	DATE	SAMPLE	DUPLICATE	RPD	ENTERED BY
1	91/01/15	0.437	0.438	.22	MT
2	91/01/18	0.181	0.183	1.09	MT
3	91/02/04	0.128	0.149	15.16	MT
4	91/02/04	0.529	0.535	1.12	MT
5	91/02/28	0.352	0.364	3.35	MT
6	91/03/12	0.969	0.963	.62	MT
7	91/03/26	0.152	0.151	.66	MT
8	91/04/02	0.169	0.172	1.75	MT
9	91/04/09	0.326	0.328	.61	MT
10	91/04/09	1.53	1.56	1.94	MT
11	91/04/10	0.218	0.219	.45	MT
12	91/05/09	0.287	0.264	8.34	MT
13	91/06/06	0.649	0.615	5.37	MT
14	91/07/12	0.328	0.323	1.53	MT
15	91/08/20	0.329	0.319	3.08	MT
16	91/09/19	0.612	0.609	.49	MT
17	91/09/19	1.93	1.97	2.05	MT
18	91/09/26	0.155	0.162	4.41	MT
19	91/10/11	0.391	0.393	.51	MT
20	91/10/17	0.899	0.886	1.45	MT
21	91/10/29	0.160	0.159	.62	MT
22	91/11/26	1.87	1.92	2.63	MT
23	91/12/18	1.42	1.42	.00	CVT

FIGURE XI-3

CU BY ICP - WATER SPIKE % RECOVERY



Descriptive Statistics

AVERAGE	:	96.089	STANDARD DEVIATION	:	5.872
UPPER WARNING LIMIT	:	107.833	LOWER WARNING LIMIT	:	84.345
UPPER CONTROL LIMIT	:	113.705	LOWER CONTROL LIMIT	:	78.473

DATA POINT	DATE	ACTUAL	FOUND	% RECOVERY	ENTERED BY
1	91/01/02	0.250	0.24	96.00	MT
2	91/01/02	0.25	0.248	99.20	MT
3	91/01/03	0.25	0.233	93.20	MT
4	91/01/08	0.250	0.231	92.40	MT
5	91/01/15	0.25	0.229	91.60	MT
6	91/01/15	0.25	0.231	92.40	MT
7	91/01/18	0.25	0.238	95.20	MT
8	91/01/19	0.25	0.234	93.60	MT
9	91/01/24	0.25	0.235	94.00	MT
10	91/01/24	1.0	1.0	100.00	MT
11	91/01/25	0.25	0.232	92.80	MT
12	91/02/04	0.25	0.238	95.20	MT
13	91/02/04	0.25	0.224	89.60	MT
14	91/02/13	0.25	0.246	98.40	MT
15	91/02/14	0.25	0.235	94.00	MT
16	91/02/15	0.25	0.253	101.20	MT
17	91/02/19	0.25	0.237	94.80	MT
18	91/02/26	0.25	0.265	106.00	MT
19	91/02/27	0.25	0.264	105.60	MT
20	91/03/05	0.25	0.236	94.40	MT
21	91/03/06	0.25	0.236	94.40	MT
22	91/03/11	0.25	0.2	80.00	MT
23	91/03/12	0.25	0.254	101.60	MT
24	91/03/12	0.25	0.211	84.40	MT
25	91/03/13	0.25	0.267	106.80	MT
26	91/03/18	0.25	0.23	92.00	MT
27	91/03/19	0.25	0.194	77.60	MT
28	91/03/22	0.25	0.248	99.20	MT
29	91/03/25	0.25	0.231	92.40	MT
30	91/03/26	0.25	0.226	90.40	GDC

CU BY ICP - WATER SPIKE % RECOVERY

(Continued)

DATA POINT	DATE	ACTUAL	FOUND	% RECOVERY	ENTERED BY
31	91/04/01	0.25	0.293	117.20	MT
32	91/04/02	0.25	0.256	102.40	GDC
33	91/04/02	0.25	0.261	104.40	GDC
34	91/04/02	0.25	0.236	94.40	GDC
35	91/04/03	0.25	0.26	104.00	MT
36	91/04/09	0.25	0.234	93.60	GDC
37	91/04/09	0.25	0.236	94.40	GDC
38	91/04/09	0.25	0.22	88.00	GDC
39	91/04/10	0.25	0.232	92.80	MT
40	91/04/10	0.25	0.243	97.20	MT
41	91/04/10	0.25	0.232	92.80	MT
42	91/04/16	0.25	0.235	94.00	MT
43	91/04/24	0.25	0.241	96.40	MT
44	91/05/02	0.25	0.25	100.00	MT
45	91/05/06	0.25	0.247	98.80	MT
46	91/05/08	0.25	0.237	94.80	MT
47	91/05/08	0.25	0.239	95.60	MT
48	91/05/09	0.25	0.246	98.40	MT
49	91/05/10	0.25	0.254	101.60	MT
50	91/05/10	0.25	0.241	96.40	MT
51	91/05/17	0.25	0.258	103.20	MT
52	91/05/20	0.25	0.259	103.60	MT
53	91/05/23	0.25	0.248	99.20	MT
54	91/05/29	0.25	0.243	97.20	MT
55	91/05/31	0.25	0.246	98.40	MT
56	91/05/31	0.25	0.245	98.00	MT
57	91/06/04	0.25	0.234	93.60	MT
58	91/06/05	0.25	0.234	93.60	MT
59	91/06/06	0.25	0.21	84.00	MT
60	91/06/17	0.25	0.232	92.80	MT
61	91/06/19	0.25	0.236	94.40	MT
62	91/06/25	0.25	0.246	98.40	MT
63	91/06/26	0.25	0.236	94.40	MT
64	91/07/03	0.25	0.244	97.60	MT
65	91/07/09	0.25	0.24	96.00	MT
66	91/07/12	0.25	0.217	86.80	MT
67	91/07/29	0.25	0.236	94.40	MT
68	91/07/31	0.25	0.240	96.00	MT
69	91/08/01	0.25	0.247	98.80	MT
70	91/08/01	0.25	0.247	98.80	MT
71	91/08/06	0.25	0.246	98.40	MT
72	91/08/09	0.25	0.259	103.60	MT
73	91/08/20	0.25	0.257	102.80	MT
74	91/08/21	0.25	0.245	98.00	MT
75	91/08/22	0.25	0.242	96.80	MT
76	91/08/22	0.25	0.234	93.60	MT
77	91/08/22	0.25	0.242	96.80	MT
78	91/09/04	0.25	0.239	95.60	MT
79	91/09/18	0.25	0.243	97.20	MT
80	91/09/18	0.25	0.225	90.00	MT
81	91/09/19	0.25	0.221	88.40	MT
82	91/09/19	0.25	0.23	92.00	MT
83	91/09/20	0.25	0.247	98.80	MT
84	91/09/25	0.25	0.253	101.20	MT
85	91/09/26	0.25	0.232	92.80	MT
86	91/09/26	0.25	0.245	98.00	MT
87	91/10/04	0.25	0.244	97.60	MT
88	91/10/04	0.25	0.243	97.20	MT
89	91/10/08	0.25	0.252	100.80	MT
90	91/10/08	0.25	0.229	91.60	MT
91	91/10/08	0.25	0.256	102.40	MT
92	91/10/11	0.25	0.248	99.20	MT
93	91/10/15	0.25	0.236	94.40	MT
94	91/10/16	0.25	0.211	84.40	MT
95	91/10/17	0.25	0.281	112.40	MT
96	91/10/24	0.25	0.240	96.00	MT
97	91/10/26	0.25	0.242	96.80	MT
98	91/10/26	0.25	0.221	88.40	MT
99	91/10/29	0.25	0.232	92.80	MT

SECTION XII. DATA REDUCTION, VALIDATION AND REPORTING

A. Data Reduction

Data is generated from several different sources (scientific equipment, manual calculations, or computer generated). Most of the raw data is stored in hardcopy form and calculations are done to generate a final result. In several instances, the bench chemist performs calculations in a laboratory notebook and transfers the final result onto the client report form.

Calculations are either done manually or by computer programs. Calculations are done according to the method employed. They are based on sample matrix, method detection limits and dilutions or concentrations that may have been done. A brief description of some of the calculations used follows.

1. Response Factors for GC/MS

$$RRF = \frac{A_x}{A_{is}} * \frac{C_{is}}{C_x}$$

Where:

A_x = Area of characteristic ion for the compound to be measured.
A_{is} = Area of characteristic ion for the specific internal standard.
C_{is} = Concentration of the internal standard.
C_x = Concentration of the compound to be measured.

2. Final Concentration for GC/MS

$$\text{Concentration (ug/L)} = \frac{(A_x)\,(I_s)}{(A_s)\,(RRF)\,(V_s)} * 2$$

Where:

A_x = Area of characteristic m/z for the parameter or surrogate standard to be measured.
A_s = Area of the characteristic m/z for the internal standard.
I_s = Amount of internal standard added to each extract.
V_s = Volume of water extracted.

3. Response Factor for GC

$$\text{Response Factor} = \frac{(\text{Area})_{std}}{(\text{Concentration})_{std}}$$

4. Final Concentration for GC

$$\text{Sample conc.} = \frac{(\text{Area})_{sample}}{\text{Response Factor}} * \frac{\text{Extract Volume}}{\text{Sample Size}}$$

5. Alkalinity Concentration

$$\text{Alkalinity mg } CaCO_3/L = \frac{A * N * 50000}{\text{ml. sample}}$$

Where:

A = ml. acid used
B = Normality of acid

6. Total Solids

$$\text{Total solids mg/L} = \frac{(A-B)*1000}{\text{ml. sample}}$$

Where:

A = Weight of dried residue and dish
B = Weight of dish

7. Sulfate Concentration

$$\text{Sulfate mg/L} = \frac{(A-B)*1000}{\text{ml. sample}} * 0.41 * 1000$$

Where:

A = Weight of filter and residue
B = Weight of filter

8. BOD Concentration

$$\text{BOD mg/L } O_2 = \frac{(A-B)-(C-D)*F}{G}$$

Where:

A = Initial D.O. sample
B = Final D.O. sample
C = Initial D.O. seed control
D = Final D.O. seek control
F = Ratio of seed in sample to seed in control
G = ml. sample/300

9. Specific Conductivity

$$\text{Specific Cond. } \mu\text{mho/cm} = \text{Cond. Reading} * \text{Cell Constant}$$

10. Cell Constant for Conductivity

$$\text{Cell Constant} = \frac{1413}{A}$$

Where:

A = Conductivity of 0.0100 N KCl at 25° C

All other calculations performed in the laboratory are similar in nature.

All GC/MS data is computer calculated using internal standards. All GC data is hand calculated. All metals data is computer calculated except for Mercury data. All wet chemistry data is hand calculated with the exception of the parameters that are analyzed on the autoanalyzer. Linear regressions done in the inorganic labs are performed by computer. Temperature compensations are done automatically.

All raw data is labeled with the sample number and date analyzed. A shot book sheet serves as a table of contents for each analytical GC run. An example of a shot book sheet is included as Figure XII-1. Each sample and standard is identified on the shotbook sheet and on each chromatogram. An injection log sheet serves the same purpose for the inorganic analytical runs. An example of an injection log sheet is included as Figure XII-2.

All data reduction and chromatogram identification is done by the analysts. Analysts identify GC peaks and patterns based on retention times from the integrator, and

manually convert the area or peak height for these peaks into reportable values using response factors generated from calibration standards.

The analysts are responsible for transcribing the final results onto the laboratory report forms for the test parameters that they analyze and documenting the analyses in the appropriate logbooks. The analysts are also responsible for inputting their QC information into the LIMS.

When the analysts enter their QC into the LIMS, it is automatically checked to see if it meets QC criteria. If the QC fails criteria, the section leader or QA/QC officer is notified. All QC data that is entered into the LIMS is reviewed by the QA/QC officer.

B. Data Validation

As stated in Section III, the lab provides several different levels of QC and QC documentation. Each level of QC has different validation and reporting requirements.

In general, the data on the laboratory report form is checked by the section leader in charge of the laboratory section that generated the data. The section leader checks calculations, chromatograms, raw data, calibration curves, QC samples, and holding times. Any errors detected are reviewed with the analyst who made the error.

A flow chart outlining data validation procedures performed at OBG Laboratories, Inc. has been included as Figure XII-3.

C. Data Reporting

The section leader in charge of the project collects all of the laboratory report forms, checks them for completeness, compiles them into report format, and submits them into typing. After typing, the report is checked for typographical errors and these

are corrected if necessary. The report is then reviewed by the manager of analytical services.

An example of a final report, without raw data, is included as Appendix C.

As a general rule, results are reported to two significant figures. Normal rounding rules are followed. That is, if the number to the right of the digit to be kept is greater than five, the number is rounded up. If the number to the right of the digit to be kept is less than five, the number is rounded down. If the number to the right is equal to five and there are no numbers to the right of the five, then the number is rounded up if is odd or rounded down if it is even.

All QC data is input into the LIMS system. The QA/QC officer is responsible for checking that information is input into the LIMS properly.

D. Data Storage

A copy of the final laboratory report is retained by the laboratory. All laboratory reports are filled by client ID number and project number. This allows for all data belonging to a specific client and project to be filed together. All reports are kept at the laboratory for one year and are then stored at a access-restricted warehouse.

The original chain of custody forms and case file forms are filed with the final report. If the client requested specific QC be performed, copies of the QC will also be filed with the report.

All QC data is input into the LIMS. At the end of every year, all QC data is copied onto tape and is printed out. Hardcopy data is stored in parameter and date order and is maintained by the quality control officer. Tapes are labeled with the year and the

contents and are kept by the quality control officer. Hardcopy data and tapes are kept for five years.

Following is a section by section breakdown of how raw data is maintained.

1. GC/MS

All GC/MS data is computer generated. When a group of samples is completed, the data is down loaded onto tapes. Information on the tapes includes calibration data, batch QC data, tuning data and sample data. A file log is created for each tape that contains the file ID numbers of all the files on the tape. The file ID number corresponds to the file number that is recorded in the injection logbook at the time of sample analysis. Tapes are stored for five years in the GC/MS lab.

Extractions, if applicable, are written up in extraction logbooks. Extraction logs include sample #'s, weights/volumes used, surrogates added, spikes added, date extracted and analyst comments. Extraction logs are kept for five years.

Data for specific clients and projects are identified by a unique project number. Raw data is identified on shotbook sheets and extraction sheets, if applicable, by project number, sample number and date.

2. GC Volatiles

Records are stored on integrator printer paper filed by dates analyzed in three ring binders. Each contains a shotbook sheet that identifies injections by sample number and client number and list the injection response. All batch QC and calibration information is stored with the raw data. Each instrument has a maintenance log that is also kept in a three ring binder.

Raw data are organized by date and instrument and kept in the GC lab for 6 months. It is then stored in the warehouse for up to five years.

Data for specific clients and projects are identified by a unique project number. Raw data is identified on shotbook sheets by project number, sample number and date.

3. GC Semi-volatiles

All chromatograms, shotbook sheets and copies of data reduction sheets are stored in three-ring binders, organized by instrument and date analyzed. All batch QC and claibration information is included with the raw data. Copies of extraction sheets are kept in a separate three-ring binders, by date extracted. Each instrument maintenance log is a spiral notebook kept with the particular instrument. Each chemist of technician has their own personal lab notebook for original extraction or data reduction sheets.

Raw data are organized by date and instrument and kept in the GC lab for 18 months. It is then stored in the warehouse for up to five years.

Data for specific clients and projects are identified by a unique project number. Raw data is identified on shotbook sheets and extraction sheets by project number, sample number and date.

4. Metals

All ICP and furnace data is computer generated. Computer printouts are stored in binders by instrument and parameter chronologically. Mercury data is in the form of strip charts which are also filed in a binder chronologically. Batch QC and calibraiton information is stored with the raw data. All data is filed in the lab for one year and in the warehouse for five years. Each instrument has a maintenance log which is kept in the

lab.

Digestions are written up and kept in a bound laboratory notebook. Digestion logs include sample #'s, date digested, weights/volume used, spikes added, sample description, type of digestion and any analyst comments. Digestion logs are stored in the lab for one year and kept in the warehouse for five years.

Data for specific clients and projects are identified by a unique project number. Raw data is identified on injection log sheets and digestion log sheets by project number, sample number and date.

5. Wet Chemistry

Three ring binders are set up for every type of analysis performed in the wet chemistry section. A copy of all data is filed in the three ring binder. Included in this data are sample #'s, calculations, dilutions, QC data including RPD's and percent recoveries, standard curves if applicable, strip charts if applicable, and any data that is computer generated. Data is stored in the wet chemistry lab for one year and in the warehouse for up to five years.

Data for specific clients and projects are identified by a unique project number. Raw data is identified by project number, sample number and date.

FIGURE XII-1

DATE _____ INSTRUMENT _____ DETECTOR/MC

COLUMN _____ DETECTOR TE

_____

IP TEMP _____ °C TRANSFER LINE _____ °C FURNACE TEMP _____ °C

TEMP PROGRAM: Oven ____ °C TO ____ °C At ____ °C/min SOLVENT/FLOW _____ ml/min

INITIAL HOLD ____ min FINAL HOLD ____ min CARRIER FLOW _____ ml/min

GAS 1/FLOW _____ ml/min

GAS 2/FLOW _____ ml/min

COMMENTS: _____

_____

T# / #	Project # Client	Job	Phase	Sample #	Sample Description	Inj. Volume	Conductivity Attenuation	Comments

JAGAS NO. _____ SIGNATURE(S) _____

_____

LABORATORIES, INC.

FIGURE XII-2

ICAP-61 SUMMARY SHEET

DATE: ______ METHOD: ______ PROFILE BEGIN: ______

REAGENT #:	SAMPLE #	SAMPLE DESCRIPTION	DF	COMMENTS

CCB = CONTINUING CALIBRATION BLANK
CCV = CONTINUING CALIBRATION VERIFICATION
CRI = CONTRACT REQUIRED DETECTION LIMIT
ICV = INITIAL CALIBRATION VERIFICATION
ICB = INITIAL CALIBRATION BLANK
ICS-A = INTERFERENCE CHECK SAMPLE A
ICS-AB = INTERFERENCE CHECK SAMPLE AB
DF = DILUTION FACTOR
LCS = LABORATORY CONTROL SAMPLE
PB = PREPARATION BLANK

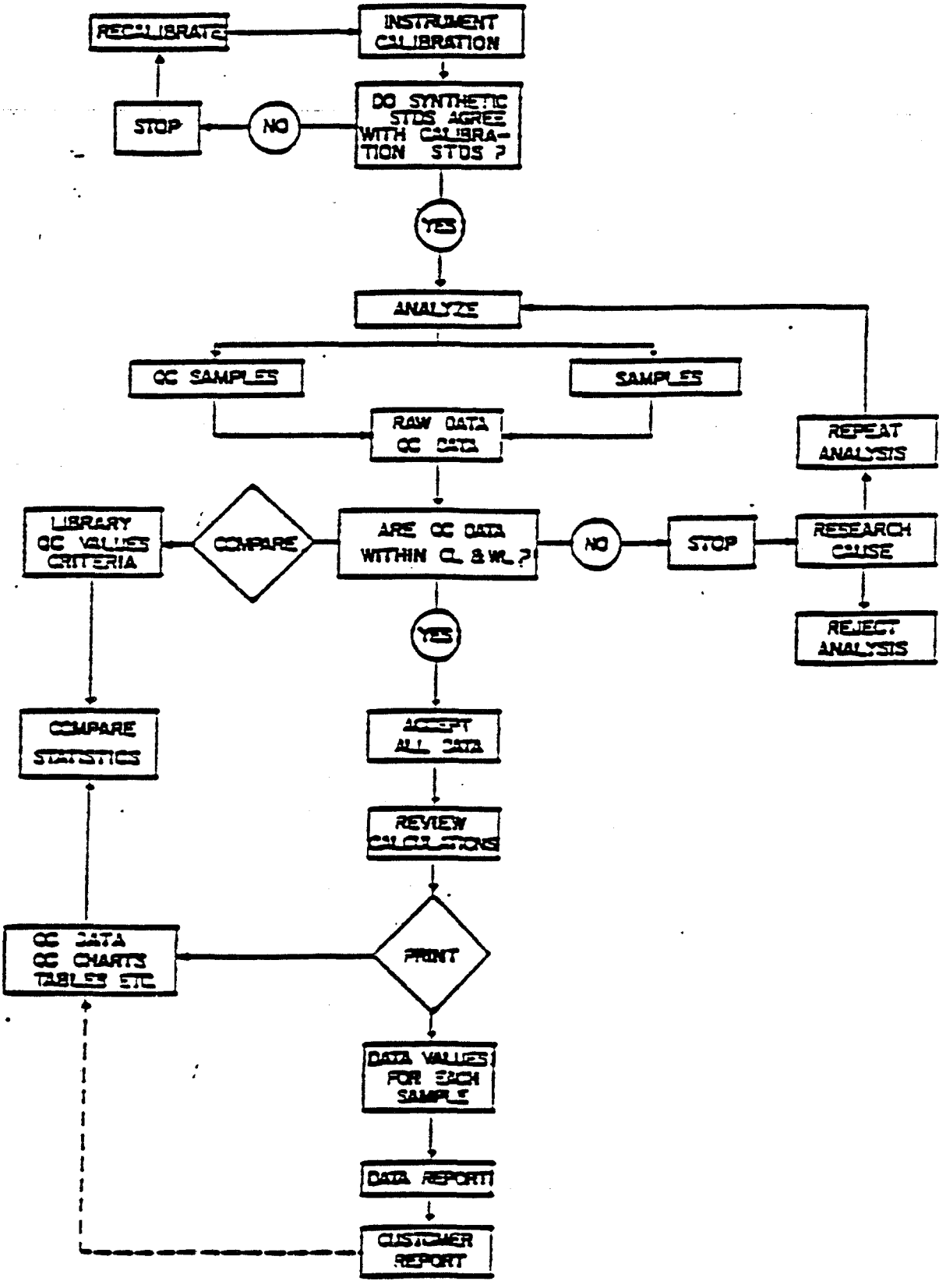
D = DUPLICATE
S = MATRIX SPIKE
L = SERIAL DILUTION
A = POST DIG. SPIKE

ANALYZED BY : ______

AUTHORIZED BY: ______

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300 / PO Box 4942 / Syracuse, NY 13221 / (315) 437-0200

FIGURE XII-3


RECALIBRATE
INSTRUMENT CALIBRATION
STOP
NO
DO SYNTHETIC STDS AGREE WITH CALIBRATION STDS ?
YES
ANALYZE
QC SAMPLES
SAMPLES
RAW DATA QC DATA
REPEAT ANALYSIS
LIBRARY QC VALUES CRITERIA
COMPARE
ARE QC DATA WITHIN C & W ?
NO
STOP
RESEARCH CAUSE
REJECT ANALYSIS
YES
COMPARE STATISTICS
ACCEPT ALL DATA
REVIEW CALCULATIONS
QC DATA QC CHARTS TABLES ETC
PRINT
DATA VALUES FOR EACH SAMPLE
DATA REPORT
CUSTOMER REPORT

SECTION XIII. CORRECTIVE ACTIONS

All QC samples must meet established criteria. If they fail to meet these criteria, corrective actions are taken. If the calibration data fail to meet QC criteria, the problem is located and corrected and the system recalibrated. Samples cannot be analyzed until the calibration meets the QC criteria. If matrix spikes or duplicates are out of control, the data may be rejected and the samples reanalyzed or reextracted. Alternatively, the sample data may be accepted, depending upon many circumstances, including sample matrix, level of analytes, etc. The client is notified if QC data fails criteria and ultimately makes the decision on whether or not to accept the data. If the data are accepted, they are marked with qualifiers to document that the QC did not meet established criteria.

The analyst who is responsible for running the samples is the first to assess the quality of the data. If a problem is detected, the section leader is immediately notified. The quality of the data is also checked by the section leader, the project leader and the laboratory manager. If samples need to be reanalyzed or reextracted, the section leader is first consulted, and then the procedure is rescheduled. The analyst will compare the new result with the old one and note any differences. The results are then discussed with the section leader. If the new results meet the QC criteria, the results are then reported. If QC criteria still are not met, the results are reviewed with the project manager, the vice president, and the client. A decision is then made to accept the data or to resample. The decision-making process varies depending on the type of project and the ultimate use of the data.

There are certain corrective actions that are routinely followed by the laboratory. A list of the common QC activities, acceptance criteria, and corrective actions are included as Table XIII-1. Any corrective actions recommended by the client or a state certifying agency will also be implemented.

If QC data fails any of the limits, a corrective action log is filled out by the analyst and signed by the section leader and the Quality Control Officer. A copy of a corrective action log is included as Figure XIII-1. The corrective action logs are then filed in a binder and kept in the laboratory.

TABLE XIII-1
CORRECTIVE ACTIONS

QC Activity	Acceptance Criteria	Corrective Action
Calibration Standard	Must be within limits set by the method	Prepare new standards Recalibrate instrument
Calibration Check Standard	Must be within limits set by the method	Rerun standard Prepare new standard Recalibrate instrument
Matrix Spike	Must be within laboratory QC limits or method limits	Investigate problem, document and qualify data
Lab Duplicate	Must be within laboratory QC limits or method limits	Investigate problem, document and qualify data
Method Blank	Must be less then the detection limit	Investigate problem and reextract or reanalyze
Surrogate Recoveries	Must be within laboratory QC limits or method limits	Investigate problem and reextract or reanalyze
Internal Standards	Must be within a factor of 2 of the area of the internal std. of the calibration std.	Investigate problem and reextract and reanalyze
Result over highest std.	All results must be within range of the instrument	Dilute and reanalyze
P.E. Samples	Results must be within pre-established limits	Investigate problem and write an explanation
Field Duplicate	Must be within laboratory QC limits or limits specified by client	Notify client
Field Blank	Must be less then the detection limit	Notify client

FIGURE XIII-1

CORRECTIVE ACTION LOG

Date: _____ Lab. Section: _____

Analyst: _____ Instrument: _____

Excursion:

Associated Samples:

Corrective Action:

Reviewed by: _____
Section Leader

_____
QA/QC Officer

SECTION XIV. PERFORMANCE AND SYSTEMS AUDITS

A. Internal System Audits

An internal audit is performed monthly on each section of the laboratory for overall adherence to the guidelines and procedures outlined in this manual. Laboratory notebooks are checked to verify signatures and dates. Calibration curves and QC samples are checked for the proper frequency and compliance with established control limits. Procedures are reviewed to verify compliance with specific methods and SOP's.

The QA/QC officer is responsible for scheduling each audit. The results of the audit are discussed with the section leaders and the vice president. Changes or updates are implemented as needed.

B. External System Audits

External system audits are performed yearly by several certifying agencies including New York State Department of Health, New Jersey Department of Environmental Protection, and Pennsylvania Department of Environmental Regulation. Some audits are unannounced, while others are scheduled in advance. The laboratory will allow audits, either planned or unplanned, during normal business hours.

C. Performance Audits

The laboratory also participates in the analysis of Performance Evaluation (P.E.) Samples. These are sent out semi-annually by either the U.S. EPA or a certifying state agency. Results must fall within certain limits in order to be acceptable. It is by successfully completing the P.E. sample analysis that the laboratory obtains certification

to perform sample analysis. The P.E. sample analysis also serves as a means of comparison with other laboratories performing similar work. The laboratory participates in the following P.E. studies:

1) New York State Department of Health for air emissions, potable water, wastewater and hazardous waste
2) New York State Department of Environmental Conservation - State Superfund
3) U.S. EPA water pollution and water supply studies for Pennsylvania, New Jersey, Massachusetts, Connecticut, Rhode Island and North Carolina
4) Corps of Engineers - Project specific approval
5) U.S. EPA - Project specific approval

All data related to the P.E. sample analysis and the results of the analysis are maintained by the lab and filed in binders according to agency administering the P.E. samples. If any parameters are failed, the problem is investigated and an explanation is written up and filed with the P.E. sample results.

SECTION XV. QUALITY ASSURANCE REPORTS

The quality control officer is responsible for making periodic reports to management concerning QA activities. These reports serve to document lab personnel cooperation with QA requirements and to go over any updates or changes necessary to the QC program. There are informal oral reports and formal written reports. Oral reports are given weekly during a meeting with the vice president. Formal written reports are given periodically and contain results of section audits and review of control charts. The QA/QC officer keeps a copy of all quality assurance reports, whether informal or formal.

Any significant trends in the QC data, such as data points running significantly above or below the average, are discussed with management and section leaders to detect any possible problems before data gets out of control.

External QA reports will be submitted to state or federal agencies at the frequency required by contract. Reports will be submitted at least quarterly, depending on the type of project being performed. They will contain results of internal system audits, performance evaluation sample results, review of control charts and control limits, any QA/QC problems that were detected and the results of any corrective actions related to these problems. If no project audits were performed and no major QA/QC problems were detected, a letter stating this will be submitted instead of a QA report.

SECTION XVI. RESUMES

Resumes of key personnel follow.

David R. Hill
Vice President

PROFESSIONAL PROFILE

Mr. Hill joined O'Brien & Gere Engineers, Inc. in 1971 and was promoted to Manager of Analytical Services in 1981. In 1985, he became General Manager of OBG Laboratories, Inc., and in 1987 was promoted to Vice President.

Education

Clarkson University, 1971, BS/Chemistry
Syracuse University, 1979, MS/Sanitary Science

Professional Affiliations

American Chemical Society
American Water Works Association
Member, Subcommittee on Phosphorus, Standard Methods for the Examination of Water and Wastewater, 16th edition.
Member, Subcommittee on Method 514, Purge and Trap and Method 506, TOX, Standard Methods for the Examination of Water and Wastewater, 17th edition
New York State Department of Health - Environmental Laboratory Accreditation Program - Advisory Board
New York State Association of Approved Environmental Laboratories - Board of Directors

TECHNICAL EXPERTISE

- Hazardous waste analytical protocol development
- Chain-of-custody procedures
- QA/QC, data validation, and expert testimony
- Water and wastewater analysis
- Gas chromatographic analysis of organic compounds
- Project coordination and interpretation of analytical data

REPRESENTATIVE PROJECTS

Responsible for financial and market efforts of analytical services; also for the supervision, coordination, scheduling and evaluation of data analyzed by a staff of over 40 scientists.

Mr. Hill's experience includes the supervision of projects dealing with the following: Organic characterization of a chemical waste pond for a chemical manufacturer; a ground water m nitoring program for the analysis of hazardous wastes, volatile halogenated organics and aromatic hydrocarbons for a major manufacturer; analytical programs to support RCRA compliance; provision of analytical support for the identification of hazardous waste material for a metal manufacturer; and analysis of water, sediment and biological tissue samples for PCBs.

Mr. Hill designed OBG Laboratories and purchased instrumentation to provide the following capabilities: Gas chromatography/mass spectroscopy, automated instrumentation, microbiology, virology, atomic absorption, wet chemistry, specific ion electrode chemistry, NMR, ESR, quality control, methods development, infrared and ultraviolet

spectroscopy, X-ray crystallography, electron microscopy; interpretation and review of analytical results; oversee a co-op program with area community colleges; oversee analysis of drinking water, wastewater, and industrial effluents; assist in the design of a computerbased laboratory data system; quantitative and qualitative analysis of chlorinated hydrocarbons; fingerprinting organics via liquid partioning and gas chromatographic analysis; proficient in analytical techniques for wastewater analysis.

In addition, he has directed the following specific projects:

Confidential - Ground water monitoring program to assess the extent of volatile halogenated organic contamination. Generation of 40-60 samples per week for three years.

USEPA - Supervise a contract laboratory program (CLP) for the analysis of dioxin samples from throughout the US.

Sangamo Weston, Inc. - Oversee the analytical portion of a remedial investigation at a USEPA Superfund site. Program generated over 500 samples for priority pollutants and dioxin analysis.

General Electric Company - Supervised the development of congener specific PCB analysis.

Gibbs & Hill, Inc. - Supervise data validation of analytical program associated with a state-wide Phase II hazardous waste investigation into potential abandoned site.

Blasland & Bouck Engineers - Oversaw a large analytical program that required 48 hour generation of 200 PCBs per day.

Blasland & Bouck Engineers - Provide data validation services for TCL analysis.

Blasland & Bouck Enginee.. - Performed laboratory audit to verify the subcontractor's ability to provide analytical support on a hazardous waste program.

Schenectady Chemical, Schenectady, NY - Oversee analytical program for RCRA Part B permitting documentation.

Harter Secrest & Emery Attorneys, Rochester, NY - Direct analytical program in response to state marshall's investigation of alleged improper hazardous waste disposal.

New York State Department of Environmental Conservation - Spill prevention program - involves the fingerprinting of petroleum products in surface waters and potable water supplies to determine the possible source.

Confidential - Oversee hazardous waste analytical program which is on New York State Superfund list. Initially, indicator parameter will be analyzed to determine extent of contamination followed by more extensive characterization of soil and ground water from the site.

Department of Environmental Conservation, Syracuse, NY - Characterization of hazardous waste at fire demolition site. Immediate response needed due to public health concern.

Department of Environmental Conservation, Waterford Pilot Plant, Albany, NY - Analysis of water samples from the pilot plant for the treatment of halogenated organics, including PCBs, using granular activated carbon, macroreticular resins and filtration.

Monsanto Company - Collaborative testing program for evaluation of methods to analyze purgeable halogenated aliphatic and aromatic hydrocarbons. Methods 601, 602, 5011 and 5012.

Southwest Research Institute - Collaborative testing program for evaluation of methods for phthalate ester compounds. Method 606.

Onondaga County, NY - Combined sewer overflow characterization analysis; Onondaga Lake and Creek Monitoring analysis; Onondaga County Industrial Waste Study Analysis.

PUBLICATIONS & MANUSCRIPTS

Manuscripts

Evaluation of New York Bight Lobsters for PCBs, DDT, Petroleum Hydrocarbons, Mercury and Cadmium. Hill, David R., Roberts, Alan E., Tifft, Edwin C. Jr., Bulletin of Environmental Contaminations and Toxicology 29, 711-718 (1982).

Studies of Certain Inorganic Nutrients in Cazenovia Lake. (Thesis) Hill, David R., Syracuse University, December 1979.

Publications

Characterization of Industrial Wastes by Evaluating BOD, COD and TOC. Hill, David R., Spiegel, Stuart J., Journal Water Pollution Control Federation, Vol. 52II, November 1980.

Loss of Polychlorinated Biphenyl Homologues During Chromium Trioxide Extraction of Fish Tissue. Hill, David R., Spiegel, Stuart J., Szelewski, Michael J., Tifft, Edwin C., Jr., Analytical Chemistry, 51:14, December 1979.

BOD, TOC and COD in Industrial Wastes. Hill, David R., Spiegel, Stuart J., Industrial Wastes, 21, November/December 1979.

A General Nutrient Evaluation of Cazenovia Lake. Hill, David R., 1977, (Lake Report 2), p. 80-88, Effler, S.W., Rand, M.E. (eds) Cazenovia Lake Study, 1 - Initiation Department of Civil Engineering, Syracuse University.

A. Robert Martin
Manager of Analytical Services
OBG Laboratories, Inc.

PROFESSIONAL PROFILE

Mr. Martin joined O'Brien & Gere companies in 1982 after working for seven years in the field of analytical chemistry. He managed the Trace Organics Section for seven years and in 1988 was promoted to Manager of Analytical Services. In this role he manages the day-to-day operations of the laboratory.

Education

Northeastern University, 1977, BA/Biology

TECHNICAL EXPERTISE

- The analysis of environmental samples for organic and inorganic chemicals using analytical methods developed by EPA in support of the Safe Drinking Water Act, Clean Water Act, RCRA and Superfund. Special emphasis in the areas of gas chromatography.

REPRESENTATIVE PROJECTS

As Manager of Analytical Services, Mr. Martin's responsibilities include the supervision of thirty-one chemists, technicians and clerical staff, the coordination of analytical activities and the review of reports.

Mr. Martin's accomplishments during his seven years as group leader for the Trace Organics Section included the introduction of CLP pesticide analysis to the group, the incorporation of capillary chromatography to the 600 series methods, the development of petroleum analytical methods, and the recent introduction of VOC testing under the Safe Drinking Water Act.

Before joining the firm, Mr. Martin supervised a wastewater chemistry laboratory in New Jersey. There he introduced trace metal and gas chromatography capabilities to the operation and organized the documentation of the wet chemical section to meet state requirements. Typical programs include the measurement of waste treatment performance, the determination of lake deterioration in local communities and industrial pretreatment programs.

Between 1978 and 1980 Mr. Martin directed a gas chromatography laboratory in Virginia. Typical programs included: the monitoring of sediment and water samples from across the country for organochlorine pesticides and triazine herbicides, the measurement of PCBs in oils, sludges, soils and water collected under PCB compliance programs, and the validation of analytical methods for the measurement of PCBs in transformer oil, hydraulic fluids, capacitor fluids and waste oils.

Representative recent and current programs include:

Department of Environmental Conservation - Provide sampling and analytical services for the oil spill response program for the past nine

years. Laboratory services include fuel oil identification, ground water and soil testing for petroleum products.

Confidential Industrial Client - Supervised the analytical portion of a large ground water monitoring and remediation program. Analyses focuses primarily on volatile organics and chemicals in more than 180 ground water monitoring wells and 16 activated carbon treatment systems. OBG Laboratories has satisfied this client for over ten years.

Blasland and Bouck Engineers, P.C. - Oversee and supervise analytical programs in support of PCB investigations, underground tank removals, RI/FS programs and ground water monitoring.

Woodward-Clyde Consultants - Provide PCB, cyanide, flouride and PNA analytical services to this environmental consulting firm and their client, a major aluminum manufacturer. Programs include soil and sediment investigations and quarterly ground water monitoring. Laboratory data packages are prepared in a validatable format.

CECOS International - Manage the analytical portion of PCB and ? investigation and remediation program. Hundreds of soils were analyzed for PCBs and HCB by EPA Method 8080. Full evidence report packages were prepared and found acceptable by NYSDEC.

Special Metals Corp. - Sanitary landfill investigation for potential hazardous waste contamination. Surveys included PCB testing, volatile organic testing and full priority pollutants.

Monsanto Company - Provide analytical services for a ground water remediation program. Services included priority pollutants, total organic halogens and formaldehyde testing.

Safe Drinking Water Act - Analysis of municipal water supplies for volatile organic compounds (VOCs) by EPA 500 methodologies.

Alcan Corporation - Analysis of process water, oils, sediments and concrete for PCB compliance.

Maestri Site - Site investigation and development of interim remedial measures, requiring NYSDEC ASP CLP.

Evans Chemetics - Industrial landfill investigation requiring full NYS DEC ASP CLP.

Michael N. Petterelli
Manager of Analytical Services
OBG Laboratories, Inc.

PROFESSIONAL PROFILE

Mr. Petterelli joined the O'Brien & Gere companies in 1983. In 1989 he became Section Leader of the Trace Metals section and in 1992 was promoted to Manager of Analytical Services.

Education

Alfred University, 1982, BA/Chemistry
Principles and Applications of ICP Spectroscopy, Thermo Jarrell Ash Corporation, 1988
Environmental Analytical Chemistry, ACS Short Course, Pittsburgh Conference, 1989

TECHNICAL EXPERTISE

- CLP and NYSDEC ASP Inorganic Analyses
- Quality Assurance/Quality Control
- Analysis of industrial wastewater, ground water, sediments, sludges, extracts, air and other matrices for inorganic parameters using a variety of classical and instrumental methods

REPRESENTATIVE PROJECTS

As Manager of Analytical Services, Mr. Petterelli's responsibilities include the supervision of chemists and technicians, the coordination of analytical activities, the development of analytical methodologies, data validation, data reduction, project management, marketing of services, and the review and reporting of analytical data.

Mr. Petterelli's experience has included the direction and supervision of an inorganic chemistry laboratory with varying capabilities. His responsibilities have involved the purchase, incorporation, operation and maintenance of atomic absorption, atomic emission, AutoAnalyzer, and inductively coupled plasma systems. Other responsibilities have included analytical protocol development, inorganic CLP deliverables report preparation, CLP data validation, on-site sampling, and quality control review.

Participation in various projects has provided experience with EP Toxicity and TCLP analysis, drinking water analysis, ground water monitoring programs, air monitoring programs and hazardous waste analysis.

Representative projects include:

Special Metals Corp. - Investigation of sanitary landfill for potential hazardous waste contamination. The study involved analysis of soil borings and ground water samples for full priority pollutants.

Remington Arms Co. - Program involving SPDES permit testing and analysis of ground water from a hazardous waste site.

PPG Industries, OH - Hydrogeologic study of several sites to provide data for waste disposal site assessment.

Woodward-Clyde Consultants - Ground water investigation of a hazardous waste site. Services included analysis for mercury, TOX, TOC, TKN, and phosphorus. Contract laboratory protocol was followed.

Electronics Manufacturer - Analysis of a variety of environmental samples including water, air, oil, sediment, and sludge for priority pollutants.

J.T. Baker Inc. - Analysis of soil samples for priority pollutants.

Amperex Electronics Corporation - Analysis of soil and ground water samples for the USEPA target compound list.

Peter Cooper Corporation - Analysis of ground water, surface water, and soil samples for a variety of organic and inorganic parameters.

Westchester County, NY, City of Jamestown, NY, City of Schenectady, NY, City of Poughkeepsie, NY - Analyze influents, effluents, and sludge samples for priority pollutants. Results were used to develop contaminant mass balance throughout the treatment plant processes.

Onondaga County, NY - Industrial-municipal effluents analyzed for priority pollutants.

Rhino Trust, Brooklyn, NY - Supervised the analysis of soil samples for heavy metals and base neutral organics in order to characterize subsurface conditions and define the environmental quality of the site.

Envirocomp, Westfield, MA - Coordinated the analysis of ground water samples for volatile and semivolatile organics.

Richards-Gebaur AFB, MO - Supervised analytical services associated with spill and burn pit areas. Heavy metals and petroleum hydrocarbons were both quantified and qualified.

Sair Aviation, Syracuse, NY - Coordinated sampling and analysis of samples for volatile organics analysis in order to fulfill NPEDES requirements.

Confidential - Involved in an analytical program to support RCRA compliance. Program included EP toxicity and TCLP extraction of solid and semi-solid matrices with subsequent analysis for trace metals.

Iron and Steel Manufacturer - Ground water monitoring program for a hazardous waste disposal site.

Organic Chemical Manufacturer - Characterization of lagoon cores for appropriate disposal alternatives. Analyses included EP Toxicity characterization for possible hazardous waste classification.

Energy Answers Corporation - Preparation and analysis of EPTOX and TCLP extracts.

Transit America Corporation - Analysis of water, air, soil, and EP Toxicity extracts for a variety of parameters.

Fairfax County, VA - Managed the analysis of bottom and fly ash for EPTOX and TCLP metals in order to characterize the ash stream from a resource recovery facility.

Confidential - Managed the analysis of ash residue from resource recovery facilities to characterize ash streams according to RCRA. Analytical procedures included Extraction Procedure (EP) Toxicity, Toxicity Characteristic Leaching Procedure (TCLP), Distilled Water (DI) Extraction, and carbon dioxide saturated DI water extraction followed by trace metals and wet chemistry analyses.

NL Industries, Inc. - Analysis of soil and water samples from a national Superfund site. Complete CLP deliverables were provided.

Confidential - Analysis of soil samples for the New York State Hazardous Substance List using USEPA Contract Laboratory Protocols.

Amphenol Corporation - Soil, water, and air samples from a landfill site analyzed for the hazardous substance list compounds in accordance with CLP procedures.

Edward Allen Landfill, NY - Analytical services project manager for analyses performed according to NYSDEC ASP requirements.

Confidential - Supervised analysis of particulates and sulfur dioxide as required by a resource recovery facility's air permit.

Newman Crosby Steel, Inc. - Directed the analysis of workplace air samples for Trace Metals and PCBs.

Pitney Bowes, Inc. - Directed the analysis of air samples for trace metals.

Hoechst-Celanese, Inc. - Supervised the analysis of air pollution samples for lead, cadmium, zinc, and copper.

Occidental Chemical Corp. - Analysis of ground water samples from a landfill containing hazardous wastes. All work was performed under CLP protocols.

General Motors Corp. - Involved in a ground water monitoring program.

US Army Corps of Engineers - Supervised laboratory analysis related to a comprehensive water quality survey.

Reynolds Metals, Inc. - Analysis of ground water samples for trace metals and various inorganic parameters.

Moog Automotive, Maryville, MO - Supervised the analysis of a quarterly ground water monitoring program for trace metals.

Gibbs & Hill Consultants - Provided data validation on analytical data performed according to NYSDEC CLP protocols.

Blasland & Bouck Engineers, P.C. - Coordinated the on-site audit of an environmental laboratory for compliance with the requirements outlined in the NYSDEC Analytical Services Protocols (ASP), September 1989.

Wehran, NY, Inc. - Prepared a data validation report for samples analyzed according to NYSDEC ASP Inorganic Superfund requirements.

OBG Laboratories, Inc.

Coleen C. Burke
QA/QC Coordinator

PROFESSIONAL PROFILE

Ms. Burke joined OBG Laboratories, Inc. in April 1989 as QA/QC Coordinator. Her previous experience includes the generation of EPA CLP reports for inorganic analytes.

Education

SUNY Geneseo, 1987, BA/Mathematics, minor Computer Science

TECHNICAL EXPERTISE

- Quality control supervision
- Data validation

REPRESENTATIVE PROJECTS

Ms. Burke's responsibilities at OBG Laboratories, Inc. include overseeing the Quality Control (QC) program and verifying that all daily QC is being performed. She is also responsible for generating Quality Control charts and updating control limits for all parameters analyzed by the laboratory.

Ms. Burke has participated in the on-site laboratory inspections from the states of New York and Pennsylvania. She has pursued laboratory certification in the states of Florida, Massachusetts, Tennessee and North Carolina.

She helped develop the statistical portion of the LIMS in order to be able to generate control charts showing warning and control limits. Control limits can be easily updated yearly or whenever statistically deemed necessary.

Ms. Burke performs data validation on analytical packages generated by other laboratories. The data is monitored for contract compliance and deficiencies as required by both the NYSDEC and USEPA CLP deliverables.

She has also trained as a sample custodian to receive and tag samples for CLP work, prepped containers for sample collection making sure the proper container and preservative is used and has checked to verify samples are stored properly after receipt at the lab.

She has worked on preparing disk deliverables for NYSDEC-ASP proficiencies for pesticide/PCB data using the Terwilliger software.

Ms. Burke has put CLP reports together for clients and for certification purposes. She has prepared case narratives to go along with these reports.

Harold H. Trimm, Ph.D.
Radiochemical Section Supervisor
OBG Laboratories, Inc.

PROFESSIONAL PROFILE

Education

Post-Doctoral Research Fellow in Physics
Clarkson University, 1981, Ph.D./Chemistry - Emphasis in Inorganic Solution Kinetics and Thermodynamics
Clarkson University, 1978, MS/Chemistry
Clarkson University, 1976, BS/Chemistry

Professional Affiliations

Chairman, Binghamton Section, American Chemical Society
Sigma Xi, Honorary Research Fellowship
Association of Official Analytical Chemists
American Institute of Chemical Engineers
Cum Laude Society

PATENTS

"*Monitoring Deflocculated Particles in a Suspension*", B.R. Jennings, H.H. Trimm, T.W. Webb and D.J. Watson, European Patent Application 10730 (1984).

"*Monitoring Deflocculated Particles in a Suspension*", B.R. Jennings, H.H. Trimm, T.W. Webb and D.J. Watson, U.S. Patent Application (1984).

EXPERIENCE

Consultant, Dunning Analytical Laboratories, in the area of forensic, environmental, and health issues related to chemical exposure.

Radiation Safety Committee Member, Broome Community College, Binghamton, New York.

Expert witness testimony for environmental and forensic matters.

Chairman and Analytical Professor, Broome Community College.

Right-To-Know Resource Person, Broome Community College.

Analytical consultant for Thompson Anodizing, Universal Instruments and New York State Electric and Gas Company.

Consultant, English China Clays Ltd.

Research Fellow in Electro-Optics, Brunel University, Uxbridge, Middlesex, England.

Research Associate in Fast Reaction Kinetics, Clarkson University, Potsdam, New York.

Radiochemical Research Assistant, Brookhaven National Laboratories.

PUBLICATIONS AND PRESENTATIONS

Publications

"A Thermodynamic Study of Magnesium (II) Interactions with Mono and Dinucleotides", H.H. Trimm and R.C. Patel, Inorganica Chimica Acta, 35 (1979) 15-21.

"Thermodynamic Analysis of a Coupled Chemical Reaction", H.H. Trimm, R.C. Patel, and H. Ushio, J. Chm. Ed., 56 (1979) 762-766.

"Simultaneous Determination of Kinetic and Thermodynamic Parameters from Fast-reaction Kinetic Measurements", H.H. Trimm, H. Ushio, and R.C. Patel, Talanta, 28 (1981) 753-757.

"Thermodynamic Parameters of Coupled Chemical Reactions from Temperature Jump Relaxation Amplitudes", H. Ushio, H.H. Trimm, R.C. Patel, and M.D. Zemany, J. Sol. Chem. 10 (1), (19811) 39-50.

"Determination of Proteoglycan Dimer Geometry by Electric Birefringence", H.H. Trimm, and B.R. Jennings, Int. J. Biol. Macromol., 4 (6), (1981) 370-371.

"The Study of Proteoglycan Interactions by Electro-Optics", H.H. Trimm and B.R. Jennings, Croatia Chimica Acta, 56 (4), (1983) 803-808.

"Study of Hyaluronic Acid Flexibility by Electric Birefringence", H.H. Trimm and B.R. Jennings, Biochem. J., 213 (1983) 671-677.

"Electric Birefringence, a Simple Apparatus for Determining Physical Parameters of Biological Macromolecules", H.H. Trimm, K. Parslow, and B.R. Jennings, J. Chem. Ed., 61 (12), (1984).

"The Transient Kerr Effect", H.H. Trimm, B.R. Jennings, and K. Parslow, Eur. J. Phys. 5 (1984) 88-93.

"A Fibre-optics Sensor for Flocculation Detection by Electric Field Light Scattering", H.H. Trimm, B.R. Jennings, and K. Parslow, Optics and Laser Technology, December 1985.

"Determination of 1,1-Dimethylhydrazine in Apple Juice" (given at the Toronto ACS meeting, 1988) P. Beauseigneur, H.H. Trimm, and M.J. Costello.

Presentations

Third Chemical Congress, ACS, Toronto, 1988
Analytical Colloquium, SUNY, Binghamton, 1984
British Connective Tissue Society, Southampton, UK, 1982

The Dielectric Society, Cambridge University, UK, 1982
Colloid and Surface Institute, Cavtat, Yugoslavia, 1982
ACS National Meeting, Washington, D.C., 1979
NERM 10, Clarkson University, 1978

OBG Laboratories, Inc.

Thomas A. Alexander
Section Supervisor

PROFESSIONAL PROFILE

Mr. Alexander joined OBG Laboratories, Inc. in 1980 as a Senior Laboratory Technician. He was promoted to Chemist in 1984, Senior Chemist in 1987 and to Section Supervisor in 1989.

Education

St. Lawrence University, 1977, BS/Biology

TECHNICAL EXPERTISE

- Gas chromatographic analysis of industrial wastewater
- Municipal drinking water
- Ground water, sediments, sludges, and solvents for organic hydrocarbons
- Toxicity characteristic leaching procedure (TCLP)

REPRESENTATIVE PROJECTS

Mr. Alexander is responsible for the supervision of three chemists and two senior laboratory technicians. His experience with the firm includes the supervision of projects dealing with ground water monitoring, lagoon closure, petroleum spill response, CLP characterization, potable water monitoring, RCRA compliance, tank removal and RI/FS. His supervision includes reviewing quality assurance project plans, supervising the analytical work of his section, compilation of the analytical work of other sections and formatting the results into a data report format.

Mr. Alexander has participated in the following projects:

Confidential - An ongoing ground water and industrial wastewater monitoring program to assess the extent of volatile halogenated organic contamination.

Confidential - Involved in an analytical program to support RCRA compliance.

Monsanto Company - Collaborative testing program for the evaluation of methods to analyze purgeable halogenated aliphatic and aromatic hydrocarbons. Method 601, 602, 501.1 and 501.2.

Poughkeepsie, NY - Analytical portion of current process optimization study for the removal of trihalomethanes.

Westchester County, NY - Involved in an industrial pretreatment program.

Gunlocke Company - Analysis for specific organics at a possible State Superfund site.

Englehard Corp., NJ, ECRA program - Analysis of water samples for organics.

TRW - Analysis of samples from a hazardous waste disposal site.

New York State Department of Environmental Conservation Spill Prevention Program - The qualitative and quantitative analysis of samples containing petroleum products resulting from petroleum spills.

Sangamo Weston, Inc. - Analysis of samples from a national Superfund site.

Remington Arms, New York - A hazardous waste investigative site. Analysis required under a SPDES Permit.

Cornell University, NY - Ground water monitoring program for specific volatile organics.

Major Organic Chemical Manufacturer - Ground water investigation of a hazardous waste site following a contract laboratory protocol.

Confidential - RI/FS for volatile and semivolatile organics.

Smith Corona Corporation - TCL-CLP hazardous characterization program and a supplemental remedial investigation program.

Empire State Electric Energy Research Corp. - A wood preservative mobility study.

IBM Corp. - Volatile organic analysis according to NYS TCL-CLP specifications to support tank closure and removal.

Ordnance Products Inc. - Site assessment evaluation for volatile and semivolatile organics.

Dow Chemical - Supervision of the extraction and analysis of soil samples using the TCLP methodology.

U.S. Army Corps of Engineers - Site assessment evaluation of drinking water for principal organic contaminants.

Allied-Signal, Inc. - NYSDEC-ASP investigation program.

OBG Laboratories, Inc.

Anthony Crescenzi
GC Semivolatile Section Leader

PROFESSIONAL PROFILE

Mr. Crescenzi joined O'Brien & Gere Engineers, Inc. in 1980, was promoted Senior Chemist in 1987, and to Section Leader in 1989.

Education

SUNY College of Environmental Science and Forestry, 1980 BS/Biology

TECHNICAL EXPERTISE

- Gas chromatographic analysis of environmental and industrial waste matrices for semivolatile organic compounds

REPRESENTATIVE PROJECTS

Mr. Crescenzi supervises a staff of six chemists and technicians in the Gas Chromatograph section which is responsible for trace level organic analysis of surface water, ground water, hazardous waste, industrial waste, sediments, air, and biological tissues. He has been involved with programs which have included the analysis of various matrices for organochlorine pesticides, PCBs, chlorophenoxyacid herbicides, polyaromatic hydrocarbons, phthalates, phenols, and petroleum hydrocarbons.

He is also experienced with USEPA contract laboratory protocol for quantitating compounds on the target compound list. This includes sample documentation, chain-of-custody, sample processing, analysis, and reporting of data.

Other laboratory experience includes wet chemistry analysis of various anion and cation concentrations by gravimetric, titrimetric, potentiometric, spectrophotometric, and colormetric techniques. Representative projects include:

Beveridge & Diamond - Analysis of over 400 samples for pesticides, PCBs, AE/BN screen for a site remediation under the superfund program. Samples prepared and analyzed by CLP for possible use in litigation.

Evans Chemetics - Analysis for substances of concern and those on the hazardous substances list utilizing the contract lab protocol.

Transformer Oil Reclaimer - Measurement and identification of over 200 transformer oils for PCBs under the PCB compliance program.

Englehard Corp. - ECRA program; conducted pesticide and PCB analysis of water and soils.

Alcan Aluminum Corp. - Coordinated and supervised a 10-day/24-hr. PCB wipe program consisting of over 750 samples.

Dow Chemical Corp. - Conducted PCB, pesticide and AE/BN screens for industrial landfill. Continued chemical characterization and monitoring of contaminants originally found.

Union Carbide Corp. - Monitoring ground water for PNA's to determine impact of disposal.

FMC Corp. - Analyzed waters to determine impact of agricultural pesticides on ground water contamination.

Westchester County, NY - Conducted pesticide and PCB analysis of wastewater for an industrial pretreatment program.

TRW - Analysis of PCBs from a hazardous waste disposal site.

Shering-Plough Corp. - Conducted ground water monitoring for organic solvents.

Limnotech - Analyzed a paper manufacturer's landfill and surrounding area for PCBs to a level of part per trillion. Matrices included water, soil and fish.

Special Metals Corp.- Analyzed soil and water from a sanitary landfill investigation for PCBs.

Singer Company - Supervised CLP PCB extraction and analysis of soil and wipe samples.

GM, Massena, NY - Air monitoring for organic solvents utilizing FID.

USEPA - Successfully completed a USEPA Contract Laboratory Program proficiency evaluation for pesticides and PCBs.

Donald R. Brondou
Wet Chemistry Group

OBG Laboratories, Inc.

PROFESSIONAL PROFILE

Mr. Brondou joined O'Brien & Gere companies in 1969 as a field technician. He entered the laboratory in 1972 and was promoted to Chemist in 1975. After serving as Quality Control Officer for the laboratory he became a Senior Chemist in 1980. He presently serves as group leader for the laboratory's Wet Chemistry Section.

Education

State University College of New York at Morrisville, 1969 AS/Water Resource Management

TECHNICAL EXPERTISE

- Analytical services, review and reporting of data

REPRESENTATIVE PROJECTS

As manager of the laboratory's Wet Chemistry Section Mr. Brondou is responsible for the supervision of a staff of six chemists and technicians, coordination of analytical activities, review and reporting of analytical data.

Various projects have provided experience with limnological studies, public drinking water analysis, ground water monitoring programs, and hazardous waste analysis. Representative projects include:

Westchester County, NY - Industrial pretreatment study. Two-year program involving analysis of industrial waste steams, sanitary influents, sanitary effluents, and sludges to determine the source and impact of toxic chemicals on several sewage treatment plants.

Special Metals Corp. - Investigation of sanitary landfill for potential hazardous waste contamination. The study involved analysis of soil borings and ground water samples for full priority pollutants.

Remington Arms Co. - Ongoing program involving SPDES permit testing and analysis of ground water from hazardous waste location.

Sangamo-Weston, Inc. - Hazardous waste investigation involving the analysis of 500 sediment samples collected at a USEPA Superfund site.

PPG Industries, OH - Hydrogeologic study of several sites to provide data for waste disposal site assessment.

Occidental Chemical Corp. - Analysis of ground water samples from landfill containing hazardous wastes. All work was done under CLP protocol.

Woodward Clyde Consultants - Ground water investigation of a hazardous waste site. Services included analysis for mercury, TOX, TOC, TKN and phosphorous. Contract laboratory protocol was followed.

OBG Laboratories, Inc.

Lee Reichel
System Analyst

PROFESSIONAL PROFILE

Mr. Reichel joined O'Brien & Gere Engineers, Inc. as a Programmer/ Analyst in 1974 and in 1987 became System Coordinator for the firm, responsible for management of all CADD and microcomputer systems. In 1991 he joined OBG Laboratories, Inc., an affiliate of O'Brien & Gere Engineers, Inc., as a System Analyst.

Education

Syracuse University, 1971, BS/Mathematics

Professional Affiliations

Society for Industrial and Applied Mathematics
American Mathematical Society
Association for Computing Machinery
Special Interest Group on Numerical Mathematics
Special Interest Group on Symbolic & Algebraic Manipulation

TECHNICAL EXPERTISE

- CADD and microcomputer systems

REPRESENTATIVE PROJECTS

Developed a database for a Laboratory Information Management System (LIMS) using Oracle software. The system includes sample tracking, quality control, report generation and client invoicing functions.

Developed a variety of computer applications involving data handling. Representative projects include programs to:

- Perform finite element analysis of structural designs.
- Three dimensional analysis of 200' stiff leg clearance crane.
- Static, dynamic and response spectrum analysis of 330' high Madrigal Dam, D.R.
- Conduct computer highway and earth work design, including multi-span bridge girder analysis.
- Computerize results of sewer system evaluation surveys and infiltration/inflow analyses for the cities of Washington, DC, Boston, Philadelphia and Syracuse and for the County of Westchester.
- Monitor precision and accuracy of analytical procedures in environmental chemistry.
- Perform dynamic routing of stormwater flows through major storm drainage systems for the cities of Washington, DC, Boston, Syracuse, Rochester, Poughkeepsie and Charlotte.

- Computerize the logging, updating and tracking of shop drawings.
- Perform digital plotting of laboratory, highway, infiltration/inflow, hydraulic and hydrologic data.
- Write engineering and scientific programs on PC's using the C programming language.
- Write programs to convert and transfer CAD drawing files between different computer platforms
- Design and implement a client/server, distributed Laboratory Information Management System (LIMS) using Oracle software on PC's.

APPENDIX A

OBG LABORATORIES, INC.

EMPLOYEE SAFETY PROGRAM

November 1989

TABLE OF CONTENTS

320126

GENERAL POLICIES

PURPOSE

Health and safety protection is everyone's concern. Providing the training, facilities and equipment to best assure the health and safety of employees is one of the most important obligations of an employer. Federal, state and local laws and regulatory compliance make it a legal requirement.

Safety in the laboratory can only be achieved through good judgement by informed, conscientious employees who learn to work with and to accept the responsibility of working with hazardous materials. It is the responsibility of every employee to utilize the provided training and understand the proper methods of safely handling hazardous materials which he or she may come in contact with in the laboratory environment.

The purpose of this manual is to outline the general policies and guidelines associated with health and safety for employees of OBG Laboratories.

APPROACH

Good laboratory practice requires mandatory safety rules and programs. These rules and/or codes should reflect the hazards that are present and must be based on both the participation of both employees and management. The program must include regular safety inspections, training sessions, safe disposal procedures of waste chemicals, and regular monitoring of all environmental controls, such as ventilation systems, and safety equipment.

In order to adequately inform employees, a formal, amendable document has been developed to provide guidance to all laboratory workers so that they can perform their work safely. Each employee has the responsibility to read and understand this manual. Should questions arise during the reading of this document or while performing one's tasks, immediately ask your supervisor, Safety Officer, Lab Manager or Vice President.

It is a prudent practice to avoid working in the laboratory alone. Arrangements shall be made by the Group Leader for the assignment of a "buddy" system. Alternatively, the building security guard shall be asked to check on those workers present during off working hours.

In order to eliminate the potential for accidental ingestion of hazardous materials in the workplace, eating, drinking and smoking are not permitted in work areas in which hazardous materials are present, and employees are strongly encouraged to wash their hands thoroughly prior to eating, drinking, or smoking elsewhere.

Currently, the "key players" in the Safety Program are:

Vice President - David R. Hill
Lab Manager - A. Robert Martin
Safety Officer - Cheryl M. Coffee
Hazardous Waste Officer - Russell J. Pellegrino

EYE AND FACE PROTECTION

PURPOSE

The primary goal of proper safety equipment and practices is to prevent or minimize injuries to personnel or damage to facilities. Eye protection is required and supplied to all laboratory personnel who work in locations where chemicals and samples are either stored or handled.

APPROACH

SAFETY GLASSES used in the laboratory will comply with the American National Standard for Occupational and Educational Eye and Face Protection ANSI(Z87.1). This standard specifies a minimum lens thickness of 3mm, impact resistance requirements flammability test, and lens retaining frames. OBG Laboratories supplies, at the corporation's expense, safety glasses that meet the above requirements to all employees and visitors.

GOGGLES are intended for wear when there is danger of chemical splashes or flying objects. Goggles are required to be worn where chemicals are being transferred or handled in bulk.

FACE SHIELDS which protect the face and neck should be worn when maximum protection from flying particles and splashing liquids is needed. Face shields are intended for acid digestion areas.

CONTACT LENSES should not be worn in the laboratory. Gases and vapors can be concentrated under the lens and cause permanent eye damage. In the event of a chemical splash into the eye, it is often nearly impossible to remove the contact lens from the eye because of involuntary spasms of the eye lid. Persons who must wear contact lenses under the care of an opthamologist should consult with the Laboratory Manager and Safety Officer.

All protective eye and face equipment should be kept in a clean well-maintained manner. Employees should see the safety officer for assistance in the supply and selection of safety eye wear.

GLOVE USE AND SELECTION

PURPOSE

Effective personal protection is essential for any person who may be exposed to potentially hazardous substances. Skin contact is a potential source of exposure to toxic materials. Thus, it is important to take the proper steps to prevent such contact.

APPROACH

Wearing the appropriate gloves will protect your hands from injuries, shock, or chemical contact, as well as freezing and burns. When selecting gloves, there are several performance factors to consider:

PENETRATION - the flow of a liquid through seams, pores, or imperfections in the material.

DEGRADATION - the reduction in one or more physical properties of a glove due to chemical contact. This is especially critical where the potential for sample contamination exists.

PERMEATION - the process by which a chemical can pass through a protective film without going through visible openings.

Gloves are located in the supply stock room as well as throughout the lab. Specific questions on glove fit, selection or use should be directed to the Safety Officer and the Section Leader.

Available gloves in stock are:

POWDERED VINYL - protects against a variety of chemicals, contaminants, and irritants. They are suitable for most laboratory applications.

LATEX - nonsterile gloves made from surgical grade latex

POLYETHYLENE - low-cost, light-duty hand protection

NITRILE - tough finish nitrile that resists punctures, cuts, and water permeability

NEOPRENE-NATURAL LATEX - skid proof tread that provides a sure grip for safety (orange)

NEOPRENE-100% NATURAL LATEX - neoprene over 100% natural latex that provides excellent dexterity combined with heavy duty chemical, abrasion, puncture and tear resistance (blue)

GLOVE USE AND SELECTION (continued)

STANZOIL - PCB tested neoprene that provides maximum protection against PCBs

ZETEX - High tensile material that conducts heat radially, enabling it to withstand temperatures up to 1100F

As always, conscienceous personal hygiene and frequent hand washing will help in minimize potential contact hazards.

The following table lists several commonly used solvents and the recommended glove.

CHEMICAL	RECOMMENDED GLOVE
Acetic Acid	neoprene, latex, nitrile
Acetone	latex
Ammonium Hydroxide	neoprene, latex, nitrile
Asbestos	neoprene, latex, nitrile
Benzene	neoprene, latex, nitrile
Carbon Disulfide	neoprene, latex, nitrile
Chloroform	neoprene, latex, nitrile
Freon	neoprene, latex, nitrile
Fuel Oils	nitrile
Gasoline	nitrile
Hexane	latex
Methanol	neoprene, latex, nitrile
Methylene Chloride	neoprene, latex
Mercury	neoprene, latex, nitrile
Nitric Acid	neoprene
PCB/Pesticides/Herbicides	latex
Propanol	nitrile
Sodium Hydroxide	neoprene, latex, nitrile
Sulfuric Acid	neoprene, latex, nitrile
Toluene	neoprene, nitrile

RESPIRATORY PROTECTION

PURPOSE

Provisions for the use of respiratory protection are provided here. Normally, engineering (facility) controls and appropriate employee work practices will negate the need for routine use of respirators as a means of employee protection. Respirators are not routinely required for typical work efforts and conditions.

However, under specific conditions or in special situations, additional employee protection in the form of negative pressure, air purifying respirators (half- or full-face) may be needed. Such conditions would include handling open volatile materials (e.g. wastes containers) in an enclosed area, or during operations involving close handling of such materials while a hood is temporarily inoperational.

APPROACH

In accordance with OSHA's standard practices, and as specifically designated in 29 CFR 1910.134, engineering (facility) controls and work practice controls are established as a priority over the use of respirators. Engineering controls include general ventilation, local and adjustable ventilation exhaust systems, and standard fume hoods. Work practice controls include activities such as proper materials handling, storage, employee training and awareness, and the proper uses and regular inspection of hoods.

Should conditions develop which would require the use of respirators, the Safety Officer is to be contacted. She will evaluate the conditions and select the appropriate respirator.

All aspects of 29 CFR 1910.134 would be adhered to, including the following aspects of a minimally acceptable Respiratory Protection Program:

1. Written Standard Operating Procedures on Selection and Use

Half-face, negative pressure respirators shall be used in the laboratory, when deemed necessary by the Safety Officer. This would be only under conditions of a high potential for inhalation exposure of toxic vapors, gases, fumes, dusts, mists or other particulates. Each respirator will be worn snugly to the face, with straps tightened appropriately over the head and behind the neck. Each respirator must be fit-checked (with positive and negative pressure) upon donning.

Cartridges are to be changed (and "old" ones discarded) following a total of 12 hours use.

RESPIRATORY PROTECTION (continued)

2. Selection Based on Hazard of Exposure

Cartridges for the respirators will be selected and properly inserted into the respirators, as follows:

Hazard	Cartridge(s)
organic vapors	organic vapor
sodium hydroxide	HEPA filters
acid gases (H_2SO_4, HCl, etc.)	acid gas
dusts, fibers, etc.	HEPA filters
mists, fumes, etc.	HEPA filters

3. Training on Use and Limitations

Training on respirator use and limitations will take place during new employee orientation, and during designated training sessions.

4. Cleaning and Disinfecting After Each Use

All surfaces of all respirators will be cleaned immediately following use in the laboratory. Outside surfaces must be cleaned with a mild detergent to remove any residual materials. All inside surfaces must be wiped clean with a disinfectant solution.

5. Storage Protocols

Clean, sanitary, convenient facilities are needed for storing respirators. This area is the duty of the Safety Officer. They consist of a cabinet, with ample space for the respirators to lay flat, plastic covers to prevent dust accumulation, and cleaning supplies/solutions and necessary maintenance equipment, spare cartridges, etc.

6. Inspection and Maintenance During Cleaning

All personnel will inspect the respirators for integrity, wear, damage, etc. during cleaning. Should maintenance of any portion of the respirator be needed, as noted during inspection, this must be brought to the attention of the Safety Officer.

7. Surveillance of Employee Exposure and/or Stress; and
8. Regular Inspection and Evaluation of the Program

The Safety Officer, Lab Manager and Vice President must regularly review the use of and observe, in practice, employee use of respirators. Problems, difficulties, potential overexposures or stress must be corrected upon discovery. This may involve the assistance of an O'Brien & Gere Engineers, Inc. Industrial Hygienist.

RESPIRATORY PROTECTION (continued)

9. Medical approval

Medical approval for employees for negative-pressure respirator use is incorporated into the Medical Surveillance portion (Section 9).

10. Only NIOSH/MSHA Approved Respirators Are To Be Used

All respirators purchased and/or used by OBG Laboratories must have NIOSH/MSHA approval. For consistency, these should all be of the same brand and model, whenever possible. Suggested brands include 3M and Willson.

11. Fit-Testing

All OBG Laboratory employees that wear a respirator will be fit-tested by an O'Brien & Gere Engineers Industrial Hygienist prior to using the respirator. A qualitative fit test will be conducted and results recorded by the Safety Officer.

CHEMICAL HANDLING, STORAGE, AND DISTRIBUTION

PURPOSE

The achievement of safe handling and use of hazardous substances is important for all those involved with it. Material safety data sheets, which give physical property data and toxiological information, are readily available to each employee to aid in the understanding of the safe handling and use of each chemical in the workplace. These are available as part of the existing Hazard Communication Program. The Safety Officer and Lab Manager can provide more details on the Haz Comm Program.

APPROACH

It is necessary that all substances be received at the chemical stockroom prior to distribution. No container of chemical or compressed gas cylinder should be accepted for use in the laboratory that does not have an identifying label.

There is a wide range of issues associated with appropriate chemical storage. Insufficient or inappropriate storage of incompatible chemicals and poor housekeeping can create hazards.

Stored chemicals should be examined at periodic intervals. Those kept beyond their shelf-life or those that may have deteriorated should be safely disposed of. Any employee who sees any container in poor or inappropriate condition should notify the Safety Officer.

Centralized storage of bulk quantities provides the best method of minimizing the impacts of potential hazards. Storage of chemicals on bench tops is undesirable. They are unprotected against fire and the containers are more readily knocked over. The analyst should return all chemicals to the proper storage at the end of the day or following completion of a specific analysis. Flammable liquids shall be stored in cabinets designed for flammable storage. Acids and bases shall be stored in trays made of polyethylene contained in designated cabinets.

Laboratory refrigerators are to be used for chemical storage only. All containers shall be properly labeled and food must never be placed in them. All food items should be stored in the refrigerators provided in the lounge or the designated food refrigerators in the lab.

CHEMICAL DISPOSAL

PURPOSE

It is the responsibility of all employees to follow the OBG Laboratories procedures for the proper disposal of chemical wastes. Waste should be transferred in a manner that is safe and acceptable to disposal operations.

APPROACH

All persons using chemicals in the laboratory should be generally aware of the toxic properties of the substance, through a review of the applicable MSDS. Generally, there are local regulations about permissable discharges down the drain. In general, only dilute water-soluble substances may be disposed of in the laboratory sink. Strong acids and bases should be diluted before they are poured into the sewer system. Toxic, malodorous, or lachrymatory (eye irritating) chemicals should not be disposed of down the drain. It is unlawful to discharge these materials due to local regulation. In addition, as laboratory drains are often interconnected, a substance that goes down one sink may well come up as a vapor in another.

Separated, well-defined wastes are easier to dispose of and are less expensive than combined wastes. Segregation of two or more types of wastes is required. Four types of solvent wastes are currently segregated: chlorinated (methylene chloride), non-chlorinated (acetone and hexane), PCB (liquid, or "solid free") and PCB (solid). Because chlorinated solvents form hydrogen chloride upon combustion, they must be segregated from other wastes destined for incineration. Currently, solvent waste is collected into chemically- resistant plastic coated safety containers and stored in a ventilated safety cabinet prior to transfer to an appropriate DOT-approved 55 gallon drum prior to disposal, which are stored in the Hazardous Waste Room. Alternatively, all mineral acid wastes are collected in a polyetylene DOT approved 55 gallon drum.

Should questions arise please contact the Hazardous Waste Officer, Section Leader, Lab Manager or Vice President.

EMERGENCY PROCEDURES AND EQUIPMENT

PURPOSE

A system should be established to ensure that accidents or emergencies are reported promptly. Accident reporting is required by OSHA on the "OSHA Form 200 Log" to help uncover laboratory hazards. In addition, established procedures and available equipment allow for employees to be best prepared for and able to respond to emergency situations. To this end, the following general procedures are to be followed. The available emergency response equipment, tabled along with locations, are also listed below.

APPROACH

All accidents resulting in medical treatment or medical observation will be recorded. A written accident investigation report to the responsible group leaders and division Vice President stating the cause, effect, and recommendation for remedial efforts regarding the accident will be made and retained by the Safety Officer as part of the safety program and reviewed at the next safety meeting.

FIRES AND EXPLOSIONS: In the case of a fire, alert personnel and send someone for assistance. If there is any doubt whether the fire can controlled, the following action should be taken:

1) Notify the fire department and activate alarms
2) Confine the fire, if possible, and if not presenting a safety hazard
3) Call for medical assistance
4) Proceed with follow-up measures appropriate to the situation

CHEMICAL SPILLS: For most small scale laboratory spills, there are supplies and equipment on hand to deal with the spill. Paper towels and sponges may be used, but should be used with caution. When flammable solvents are absorbed with vermiculite or sand, the resultant solid is highly flammable. Commercial spill kits are also available in the Wet Chemistry and Extraction Labs. If a spill should occur, the following procedures should be followed:

1) Attend to any persons who may have been contaminated
2) Evacuate personnel from the immediate area
3) Turn off ignition sources
4) Use a respiratory to avoid breathing vapors, if necessary
5) Proceed safely with the cleanup
6) Notify immediate supervisor or safety officer

OVEREXPOSURE OR PERSONAL ILLNESS/INJURY: If an employee is overcome by accidental exposure, or suddenly feels ill or is injured, the person should immediately be assisted, as follows:

1) Take the person away from instruments and chemicals to fresh air
2) Give the person first aid, as necessary
3) Proceed with follow-up measures appropriate to the situation

EMERGENCY PROCEDURES AND EQUIPMENT (continued)

LIST OF AVAILABLE EMERGENCY RESPONSE EQUIPMENT

FIRE EXTINGUISHERS

TYPE	ADVANTAGES	DISADVANTAGES	COMMENT
Dry Chemical	good on oil and grease	possible equipment damage	compatible with other agents
Carbon Dioxide	good visibility thermal damage	heavy vapor toxic	second choice to halon
Halon	good visibility reaches hidden fires	expensive	most common for electrical fires

EYEWASH/SHOWER:	immediate first aid drenching; delivers a continuous flow of water
FIRST AID KIT:	assortment of general use first aid supplies
BURN KIT:	supplies needed to effectively treat burns
SPILL PILLOWS:	SorbaSet, a foam like sand sorbent that absorbes 10X its weight in solvents, caustics and acids for spills up to 1 liter
SPILL ABSORBANT:	SorbaSet in a 3.5 gallon spill box for larger spills
MERCURY SPILL KIT:	supplies needed to clean up small mercury spills and prevent toxic vapor contamination
Hg ABSORB POWDER:	converts elemental mercury into metal/mercury amalgam for safe and easy clean up.

REVIEW AND INSPECTION

PURPOSE

The designated Safety Officer must be committed to the attainment of a high level of safety and must work with the individual managers to develop and implement policies and practices appropriate for safe laboratory work.

APPROACH

It is the responsibility of the Safety Officer to routinely monitor current operations and practices, see that mandated compliance audits are conducted, and to constantly seek ways to improve the existing safety program. This will include a weekly inspection of all operational safety equipment, updating of safety files, and hood monitoring. The Safety Officer also has the responsibility for providing for regular weekly safety and housekeeping inspections and to make recommendations for improved facilities, equipment, and training which may be necessary.

Weekly Group meetings within the OBG Labs staff should allow a direct avenue for employees to discuss health and safety concerns. Where this is not achievable, direct contact with the Safety Officer should be made to resolve any health and safety issues.

Monthly meetings between the Management and the Safety Officer play an important role in the regular review and inspection process, providing for direct transfer of information and updating of the safety program. The monthly agenda should include items such as employee suggestions, accident reports, violations of rules or policies, observations by any involved party, management updates, and any pertinent special topic.

Quarterly meeting with the staff are held to update the general staff on pertinent developments, changes, additions, etc. Where appropriate, these are included as part of the regular training sessions (See "Training and Information Sessions").

MEDICAL SURVEILLANCE

PURPOSE

Any person whose work involves regular and frequent handling of materials that are acutely or chronically toxic should consult a physician prior to and throughout such employment. This is intended to assure a level of health and fitness appropriate to job duties and conditions, as well as to set a base-line condition to monitor for signs or symptoms of potential exposure.

APPROACH

OBG LABORATORIES requires and provides medical suveillance testing with an local, independent qualified physican on a yearly basis for all employees. This service is provided by Industrial Medical Associates (IMA), unless an employee prefers to use a personal physician.

The medical surveillance includes a hazardous waste questionnaire, urinalysis, CBC/blood chemistry profile, negative-pressure respirator use approval (asbestos personnel), general review and physician consultation.

The physican reviews the employees test results and comments in writing to that employee of any irregularity. The communication is discreet and unknown to the employer. However, if the physican feels that there is a common phenomena among employees, the employer will be notified to help determine the common cause.

Further information on this aspect of the safety program can be obtained from the Manager or the Vice President.

TRAINING AND INFORMATION SESSIONS

PURPOSE

Training classes and information sessions, such as new-employee orientation, are designed to:

- increase awareness of potential hazards in the laboratory
- increase the respect for hazard potential, thereby adding a level of safety to daily activities
- develop a unified "team" approach to health and safety in the laboratory

APPROACH

Several phases of training and information sessions are planned. These are:

- Orientation Sessions for New Employees.

These will last approximately 3 - 4 hours, providing introductory information about the lab, layout, functions, personnel, the Health & Safety Program, location of pertinent information (such as MSDS file) and emergency equipment, a Hazard Communication Program presentation and follow-up.

- Quarterly Sessions on Pertinent Health & Safety Topics

Topics will vary, and are intended to represent topics of current concern, or general topics pertinent to the operations of the laboratory. These sessions will include multi-media presentations and "guest lecturers" from outside OBG Laboratories, representing specific areas of knowledge and information.

Specific topics for the quarterly sessions may include:

- evacuation procedures and information for "team leaders"
- respiratory protection
- spill clean-up procedures
- respiratory protection
- waste disposal procedures
- chemical handling and storage

APPENDIX B

320142

SAMPLE CONTROL RECORD

CLIENT: _____ DATE REC'D: 9-24-91

JOB #: 395.021.512 BIN NUMBER: 100&101

LABORATORY SAMPLE NUMBER	REMOVED BY	DATE AND TIME REMOVED	REASON	DATE AND TIME RETURNED
D2649-54, 2659 D2611-2610, 2675	Rafael Chavez	10:00 AM 9/25/91	Extraction	

Section No. B
Revision No. 0
Date: 10/01/91
Page 2 of 18

320143

SAMPLE CONTROL RECORD

CLIENT: _____ DATE REC'D: 9-24-91

JOB #: 3195.021.512 BIN NUMBER: 100 & 101

LABORATORY SAMPLE NUMBER	REMOVED BY	DATE AND TIME REMOVED	REASON	DATE AND TIME RETURNED

Section No. B
Revision No. 0
Date: 10/01/91
Page 3 of 18

Sample Custodian Signature: Chris Barnes

Client Name:

Date of Sample Login: 9-24-91

Project No.: 395.021.512

Airbill Number: MPS 929576892 1 - FEDEX.

Bin Number : 100&101

FEDERAL EXPRESS 929576893 CUSTOMER PACKAGE TRACKING NUMBER — PULL UP PURPLE TAB

Circle The Appropriate Response:

1) Custody Seal (~~Present~~/Absent) Intact/(Not Intact)

2) Chain-of-Custody (Present)/Absent

3) Sample Tags (Present)/Absent

4) Sample Tag #'s (Listed)/Not Listed

5) SMO Forms Present/(Absent)

Date Rec'd.	Time Rec'd.	Chain-of Custody Record #	SMO Sample Numbers	CORRESPONDING Sample Tag Numbers	CORRESPONDING Assigned Lab Numbers	Does Information On Custody Forms Traffic Reports & Sample Tags Agree ?	Remarks
9-24-91 9-20-	0930	—	—	X9D5W	N26449	See Case file	—
				X9D5E	50		
				X9D1	51		
				X9D1e	52		
				X9D2W	53		
				X9D3	54		
				X-1	55		
				X-2	56		
				X-3	57		
				X-4	58		
				1BB5	N26459		
				1BB5-MS	N26459-S		

Section No. B
Revision No. 0
Date: 10/01/91
Page 4 of 18

320144

Sample Custodian Signature: Chris Barnes

Client Name:

Date of Sample Login: 9-24-91

Project No.: 325.021.512

Airbill Number: 929576892142 37 - FED EX

Bin Number : 100 & 101

Circle The Appropriate Response:

1) Custody Seal — Present/Absent; Intact/Not Intact

2) Chain-of-Custody — Present/Absent

3) Sample Tags — Present/Absent

4) Sample Tag #'s — Listed/Not Listed

5) SMO Forms — Present/Absent

Date Rec'd.	Time Rec'd.	Chain-of Custody Record #	SMO Sample Numbers	CORRESPONDING Sample Tag Numbers	CORRESPONDING Assigned Lab Numbers	Does Information On Custody Forms Traffic Reports & Sample Tags Agree ?	Remarks
9-24-91	0930	—	—	Trip Blk	N26660	See Case File	—
				Field Blk.	61		
				T8A6	62		
				T8A2W	63		
				T8A7E	64		
				T8A7W	65		
				T8D1E	66		
				T8B5	67		
				T8B3	68		
				T8B1W	69		
				T8B1E	70		
				T-2	71		

320145

Section No. 9 B
Revision No.
Date: 10/01/91
Page 5 of 18

Sample Custodian Signature: Chris Barnes

Client Name:

Date of Sample Login: 9-24-91

Project No.: 3125.021.502.

Airbill Number: 929576892147937 - FED EX

Bin Number : 1004101

Circle The Appropriate Response:

1) Custody Seal — Present/Absent — Intact/Not Intact

2) Chain-of-Custody — Present/Absent

3) Sample Tags — Present/Absent

4) Sample Tag #'s — Listed/Not Listed

5) SMO Forms — Present/Absent

Date Rec'd.	Time Rec'd.	Chain-of Custody Record #	SMO Sample Numbers	CORRESPONDING Sample Tag Numbers	CORRESPONDING Assigned Lab Numbers	Does Information On Custody Forms Traffic Reports & Sample Tags Agree ?	Remarks
9-24-91	0930	—	—	T-4	N2673	See Case File	—
				T-1	74		
				W8C5	75		
				W8C1W	76		
				W8C1E	77		
				W8C6W	78		
				W8C6E	N2679		
				W8C6E-MS	N2679-S		
				W8C6E-MSD	N2679-MSD		
				W8C7W	N2680		
				W8C2W	81		
				W8C2E	82		

Section No. — Revision No. 0 — B

Date: 10/01/91

Page 6 of 18

320146

Sample Custodian Signature: Dan Barnes

Client Name: _____

Date of Sample Login: 9-24-91

Project No.: 3195.021.572.

Airbill Number: 929576892149 37 - FED EX

Bin Number : 100101

Circle The Appropriate Response:

1) Custody Seal — Present/Absent; Intact/Not Intact

2) Chain-of-Custody — Present/Absent

3) Sample Tags — Present/Absent

4) Sample Tag #'s — Listed/Not Listed

5) SMO Forms — Present/Absent.

Date Rec'd.	Time Rec'd.	Chain-of Custody Record #	SMO Sample Numbers	CORRESPONDING Sample Tag Numbers	CORRESPONDING Assigned Lab Numbers	Does Information On Custody Forms Traffic Reports & Sample Tags Agree ?	Remarks
9-24-91	9:30	—	—	W-1	N2684	See Case File	—
				W-2	85		
				W-3	86		
				W-4	87		

320147

Section No. B
Revision No. 0
Date: 10/01/91
Page 7 of 18

OBG LABORATORIES, INC.

SECTION LEADER: AC
LEVEL OF REPORT: III
DATE SCHEDULED: 9-24-91

Section No. B
Revision No. 0
Date: 1/1/91
Page 8 of 18

Laboratory Report

Pg. 183

BIN #: 100d1

CLIENT _____ JOB NO. 3195.021.577

DESCRIPTION Scrapyard,

MATRIX: Soil

DATE COLLECTED 9-23-91 DATE RECEIVED 9-24-91

	Sample #	PCB	As	Pb	PCB
X9D5W	N26649				
X9D5E	58				
X9D1	51				
X9D6	52				
X9D2W	53				
X9D3	54				
X-1	55				
X-2	56				
X-3	57				
X-4	58				
13B5	59				
13B5-MS	N26595				
13B5-MSD	N26595MSD				
Trip Blk. water	N26660				
Field Blk - sand	61				
T8A6	62				
T8A2W	63				
T8A7E	64				
T8A7W	65				

COPY CHECK: TAA ____ /ARM ____ /AC ____ /MNP ____ /DRB ____

Comments:

Certification No.:

Units:

1-Week Turnaround!

Authorized: _____

Date: _____

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

320148

OBG LABORATORIES, INC.

SECTION LEADER: AC
LEVEL OF REPORT: III
DATE SCHEDULED: 9-24-91

Section No. 8
Revision No. 0
Date: 10/1/91
Page 9 of 10
BIN #: 101

Pg. 2 of 3

Laboratory Report

CLIENT _____ JOB NO. 3195-021-577

DESCRIPTION _____

MATRIX: Soils

DATE COLLECTED 9-23-91 DATE RECEIVED 9-24-91

	Sample #	PCB	AS	PB	PCTS.
T8D1E	N2666				
T8B5	67				
T8A3	68				
T8B1W	69				
T8B1E	70				
T-2	71				
T-3	72				
T-4	73				
T-1	74				
W8C5	75				
W8C1W	76				
W8C1E	77				
W8C6W	78				
W8C6E	79				
W8C6E MS	N2679-S				
W8C6E MSD	N2679-MSD				
W8C7W	N2680				
W8C2W	81				
W8C2E	82				

COPY CHECK: TAA ____/ARM ____/AC ____/MNP ____/DRB ____

Comments:

Certification No.:

Units:

1 WEEK TURNAROUND!

Authorized: _____

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

Date: _____

320149

OBG LABORATORIES, INC.

SECTION LEADER: AC
LEVEL OF REPORT: III
DATE SCHEDULED: 9-24-91

Section: Laboratory
Revision No.: 0
Date: 10/01/91
Page 10 of 10
BIN #: 109

Report

CLIENT _____ JOB NO. 3195.021.577.

DESCRIPTION Scrapyard

MATRIX: Soils.

DATE COLLECTED 9-23-91 DATE RECEIVED 9-24-91

	Sample #	PCB	AS	Pb	PCB's.
1085A5(2)	82683	—	—	—	
W-1	84	—			
W-2	85				
W-3	86				
W-4	87				

COPY CHECK: TAA ____ /ARM ____ /AC ____ /MNP ✓ /DRB ✓

Comments: Certification No.:

Units:

1-WEEK TURNAROUND!

Authorized: _____

Date: _____

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

320150

OBG LABORATORIES, INC.

CHAIN OF CUSTODY RECORD

Section No. B
Revision No. 0
Date: 10/01/91

SURVEY:

SAMPLED BY: Don Wirthner / Jeff Cunningham

LOCATION:

ORGANIZATION:

STATION NUMBER	SAMPLE LOCATION	DATE COLLECTED	TIME COLLECTED	SAMPLE MATRIX	COMP. OR GRAB	NO. OF CONTAINERS	ANALYSIS REQUIRED
TRIP BLANK	COLOS - SCRAP	9/23/91	1010	W	G	1	PCB, Pb, As
FIELD BLANK	" "	"	1015	SAND	G	2	" " "
TBA6	POLYGON T 0-6"	"	1035	SOIL	G	2	PCB
TBA2W	"	"	1040	"	"	2	"
TBA7E	"	"	1045	"	"	2	"
TBA7W	"	"	1055	"	"	2	"
TBO1E	"	"	1100	"	"	2	"
TBB5	"	"	1105	"	"	2	"
TBA3	"	"	1115	"	"	2	"
TBB1W	"	"	1120	"	"	2	"
TBB1E	"	"	1125	"	"	2	"
T-2	TBA6, TBA2W TBA7E	"	1050	"	"	2	Pb
T-3	TBA7W, TBO1E, TBB5	"	1110	"	"	2	Pb
T-4	TBA3, TBB1W, TBB1E	"	1130	"	"	2	Pb

Relinquished By:	DATE	TIME	Received By:	DATE	TIME
Don Wirthner	9/23/91	1530			
Relinquished By:	DATE	TIME	Received By:	DATE	TIME
Relinquished By:	DATE	TIME	Received by Laboratory: Ellen Barnes	DATE 9/24/91	TIME 0900

COMMENTS: CONTACT W. SMITH AND T. WOODWARD WHEN COOLERS ARRIVE. RETURN COOLERS W/ JARS, FOAM, ETC TO ATTN. T. BUSH - CB+O #1 ASAP.

Cooler 1 of 4

METHOD OF SHIPMENT: FED EX

OBG LABORATORIES, INC.

CHAIN OF CUSTODY RECORD

Section No. B
Revision No. 0
Date: 10/01/91

SURVEY:

SAMPLED BY: Don WARTINGER / JEFF [illegible]

LOCATION:

ORGANIZATION:

STATION NUMBER	SAMPLE LOCATION	DATE COLLECTED	TIME COLLECTED	SAMPLE MATRIX	COMP. OR GRAB	NO. OF CONTAINERS	ANALYSIS REQUIRED
T-1	TBASE, TBA1, TBA2E 0-6"	9/23/91	1135	Soil	C	2	Pb
WBC5	PCL TBCW W	"	1140	"	"	2	PCB
WBC1W	"	"	1145	"	"	2	"
WBC1E	"	"	1150	"	"	2	"
WBC6W	"	"	1200	"	"	2	"
WBC6E	"	"	1205	"	"	2	"
WBC6E	"	"	1205	"	"	2	" MS/MSD
WBC7W	"	"	1210	"	"	2	"
WBC2W	"	"	1220	"	"	2	"
WBC2E	"	"	1225	"	"	2	"
WBA5W	"	"	1230	"	"	2	"
W-1	WBC5, WBC1W, WBC1E	"	1155	"	"	2	Pb, As
W-2	WBC6W, WBC6E, WBC7W	"	1215	"	"	2	Pb, As
W-3	WBC2W, WBC2E, WBA5W	"	1235	"	"	2	Pb, As
W-4	WBC3, WBC7E	"	1240	"	"	2	Pb, As

Relinquished By:	DATE	TIME	Received By:	DATE	TIME
Don Wartinger	9/23/91	1530			
Relinquished By:	DATE	TIME	Received By:	DATE	TIME
Relinquished By:	DATE	TIME	Received by Laboratory:	DATE	TIME
			[signature]	9/24/91	933

COMMENTS: PLEASE CONTACT W. SMITH AND T. WOODWARD WHEN COOLERS ARRIVE. RETURN COOLERS TO [illegible] ATTN: T. BUDD-CZTC (3500) FILL W/ JARS, PACKING FOAM ETC

Cooler 2 of 4

METHOD OF SHIPMENT: FED Ex.

OBG LABORATORIES, INC.

CHAIN OF CUSTODY RECORD

Section No. B
Revision No. 0
Date: 10/01/91
Page 13 of 18

SURVEY:

SAMPLED BY: Don WARTINGER / JEFF CONTINO

LOCATION:

ORGANIZATION:

STATION NUMBER	SAMPLE LOCATION	DATE COLLECTED	TIME COLLECTED	SAMPLE MATRIX	COMP. OR GRAB	NO. OF CONTAINERS	ANALYSIS REQUIRED
X905W	PeLYGON X 0-6"	9/23/91	1245	Soil	C	2	PCB
X905E	"	"	1250	"	"	2	"
X901	"	"	1255	"	"	2	"
X906	"	"	1305	"	"	2	"
X902W	"	"	1310	"	"	2	"
X903	"	"	1315	"	"	2	"
X-1	X905W, X905E, X901	"	1300	"	"	2	As
X-2	X906, X902W, X903	"	1320	"	"	2	As
X-3	X902E, X906W	"	1325	"	"	2	As
X-4	X907W, X907E, X908	"	1330	"	"	2	As
1385	Quad 13	"	1435	"	"	2	PCB ms/msD

Relinquished By:	DATE	TIME	Received By:	DATE	TIME
Don Wartinger	9/23/91	1530			
Relinquished By:	DATE	TIME	Received By:	DATE	TIME
Relinquished By:	DATE	TIME	Received by Laboratory: Chris Barnes		9/24/91 0900

COMMENTS: Please Contact W. Smith and T. Woodward when Coolers Arrive. Return Coolers to T. Bold - OBG (ASAP). Fill with Jars' packing, foam, ect. → N.Y. Att.

Coolers 3 & 4

METHOD OF SHIPMENT: FED EX

Sample Bottle Request Form

Section No. B
Revision No. 0
Date: 10/01/91
Page 14 of 18

Client:

Billing Information:
Name:
Address: 56th and Niagara Falls Blvd.
City/State: Niagara Falls, NY. 14304-034
Telephone #:

Client Job or P.O. #:
OBG Lab Job #: 3195.030.450

Program Information:
Program Description:

# Sites	Matrix	Analysis Required

Sample Bottles:

# Bottles	Size	Type	Pres.	Analysis
6 - cases - Seals w/ labels packing & Rubberbands - C.O.C. baggies.				

Quality Control: (Circle One): I II (III) CLP

Shipping Information:
Due Date:
Method Of Shipment: (Circle One): Pickup (Overnight) 2 Day Regular
Shipping Address: To the Above.

OVERNIGHT BILLING INFORMATION
B
<A> OBG Laboratories will pay freight
<B> Client will pay freight via:
___ 1. Unit Price Invoice
___ 2. Cost Plus Invoice

Submitted By: CR
Date: 9/18/91
Approved By: RC
Prepared By: CR
Date Sent: 9-10-91

X STANDARD BOTTLES
___ CHEM BOTTLES

Thank You!

320154

CASE FILE

Survey: Sample - Date Collected: Date: 3-9/10/01/91

Sampler: D Westinger/T. Cortese Date Received: 9-24-91

Client Name and Ref. #: -8 O'Brien & Gere Eng.

OBG Laboratory Client #: 3195.021.572.

CONDITION OF SHIPMENT: Trip Blk requests Pb & GS portion poured BK & glass of vials proper containers with & correct preservative done in Lab.

RADIOACTIVITY SCREENING*:

X The sample cooler(s) were screened for radioactivity and found safe for handling.

___ The samples come from a safe source and do not need to be screened.

Signed: A. Barnes
Sample Coordinator

****

DISPOSAL PROCEDURE**:

Signed:

Date:

*The radioactivity screen is performed to alert our employees of unexpected radioactivity at hazardous waste sites.

**Samples are disposed of four (4) weeks after a typed report is signed and mailed to the client. The routine method of disposal is: water samples are filtered through carbon to a sanitary sewer, solid samples are sent to a sanitary landfill.

LABORATORIES, INC.

Section No. B
Revision No. 0
Date: 10/01/91

SUBJECT	SHEET	BY	DATE	JOB NO.
	1	AR	9/23/94	Page 16 of 18

FEDERAL EXPRESS

QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL PACKAGE TRACKING NUMBER 3792274454

3792274454

RECIPIENT'S COPY

1 Date: 9/23/91

From (Your Name) Please Print: [illegible] GOLD
Your Phone Number (Very Important): (7[illegible]
Company:
Department/Floor No.:
Street Address:
City: State: ZIP Required:

2 To (Recipient's Name) Please Print: GERDY
Recipient's Phone Number (Very Important): ( )
Company: CERTIFIED LABORATORIES
Department/Floor No.:
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 5000 BRITTONFIELDS PARKWAY
City: SYRACUSE State: NY ZIP Required: 13221

YOUR INTERNAL BILLING REFERENCE INFORMATION (First 24 characters will appear on invoice.): DFK 13

3 PAYMENT 1 [X] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No 3 [ ] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card 5 [ ] Cash/Check

4 IF HOLD FOR PICK-UP, Print FEDEX Address Here
Street Address:
City: State: ZIP Required:

5 SERVICES (Check only one box)

Priority Overnight		Standard Overnight	
11	[X] YOUR PACKAGING	51	[ ] YOUR PACKAGING
16	[ ] FEDEX LETTER *	56	[ ] FEDEX LETTER *
12	[ ] FEDEX PAK *	52	[ ] FEDEX PAK *
13	[ ] FEDEX BOX	53	[ ] FEDEX BOX
14	[ ] FEDEX TUBE	54	[ ] FEDEX TUBE
Economy Two-Day		Government Overnight	
30	[ ] ECONOMY	46	[ ] GOVT LETTER
		41	[ ] GOVT PACKAGE
†Freight Services			
70	[ ] OVERNIGHT FREIGHT **	80	[ ] TWO-DAY FREIGHT **

DELIVERY AND SPECIAL HANDLING (Check services required)

1	[ ] HOLD FOR PICK-UP	7	[ ] OTHER SPECIAL SERVICE
2	[ ] DELIVER WEEKDAY	8	[ ]
3	[ ] DELIVER SATURDAY	9	[ ] SATURDAY PICK-UP
4	[ ] DANGEROUS GOODS	10	[ ]
5	[ ]	11	[ ]
6	[ ] DRY ICE	12	[ ] HOLIDAY DELIVERY

6 PACKAGES / WEIGHT: Total / Total

DIM SHIPMENT (Cardboard Weight): [ ] 2[illegible]

7 Emp. No. | Date
[ ] Cash Received
[ ] Return Shipment
[ ] Third Party [ ] Chg To Del. [ ] Chg To Hold
Street Address:
City: State: Zip:
Received By: X
Date/Time Received: FedEx Employee Number:
Release Signature: Date/Time

Federal Express Use
Base Charges
Declared Value Charge
Other
Other 2
Total Charges

REVISION DATE 4/91
PART #137204 NCREC 7/91
FORMAT #082
082
© 1990-91 FEC
PRINTED IN U.S.A.

320156

SAMPLES RECEIVED 9-24-91

PAGE NO. 4 OF 5

SAMPLE LOG

CLIENT NAME	PROJECT DESCRIPTION	PROJECT NUMBER	LAB NO.	SITE DESCRIPTION	COLLECTION DATE	COLLECTION TIME	BIN NO.	PRESERVATION CHECKS: NUTRIENTS	DEMANDS	METALS	CYANIDE	HARDNESS	OIL & GREASE	PHENOLICS	SULFIDE	PESTICIDES	SCTN LDR
	UST-51-01 Sampling	1163.021.517	N26476	UST-51-WT-C16A	9-23-91		165										AC
			30	-C17A													
			31	-C18A													
			32	-C19A													
			33	-C20A													
			34	-C7B													
			35	-C8B													
			36	-C9B													
			37	-C11B													
			38	-C12B													
			39	-C13B													
			40	-C14B													
			41	-C15B													
			42	-C16B													
			43	-C18B													
			44	-C19B													
			45	-C20B													
	California	1149.021.517	N26476	TAP Water	9-24-91	N/A	—										DLB
	"		47			1005											
	Wastebeds	1163.061.517	N26478	Drayton	9-24-91	—	165	1	1	1	12						TAA
		1163.021.517	N26479	X9D5W	9-23-91		100										AC
			50	X9D5E													
			51	X9D1													
			52	X9D1D													
			53	X9D2W													
			54	X9D3													
			55	X-1													
			56	X-2													
			57	X-3													
			58	X-4													
			59	13B5, MS/MSD													
			60	TRIP BLK													
			61	FIELD BLK													
			62	TAP-1a													
			63	TAP-2W													

Section No. B
Revision No. 0
Date: 10/01/91
Page 17 of 18

0.B46 Eng.

320157

SAMPLES RECEIVED 9-24-91

PAGE NO. 5 OF 5

SAMPLE LOG

CLIENT NAME	PROJECT DESCRIPTION	PROJECT NUMBER	LAB NO.	SITE DESCRIPTION	COLLECTION DATE	COLLECTION TIME	BIN NO.	PRESERVATION CHECKS: NUTRIENTS	DEMANDS	METALS	CYANIDE	HARDNESS	OIL & GREASE	PHENOLICS	SULFIDE	PESTICIDES			SCTN LDR
0.B&G Eng.		395.021.527	N2664	T8A7E	9-23-91		100												AC
			65	T8A7W															
			66	T8D1E															
			67	T8B5															
			68	T8A3															
			69	T8B1W			101												
			70	T8B1E															
			71	T-2															
			72	T-3															
			73	T-4															
			74	T-1															
			75	W8C5															
			76	W8C1W															
			77	W8C1E															
			78	W8C6W															
			79	W8C6E, MS, MSD															
			80	W8C7W															
			81	W8C2W															
			82	W8C2E															
			83	W8A5W															
			84	W-1															
			85	W-2															
			86	W-3															
			87	W-4															
	H. Connelly	5288.001.527	N2688	Kitchen kap.	9-24-91	10:00	—												
	Parish, NY	3069.001.527	N2689	Comp.	〃		106												
	〃	〃	〃	90 Grab.	〃		〃												

Section No. B
Revision No. 0
Date: 10/01/91
Page 18 of 18

320158

APPENDIX C

OBG LABORATORIES, INC.

Section No. C
Revision No. 0
Date: 10/01/91

Volatile Organics Method 8240

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Water

DATE COLLECTED 7-24-91 DATE RECEIVED 7-24-91 DATE ANALYZED 7-26-91

DESCRIPTION:	Trib 5A Surface	Trib 5A Mid Depth 8"	Trib 5A Bottom 16"	Trib 5A State Fair Blvd. 8"	Trib 5A Crucible Mid Stream	Trib 5A RR Bridge Upstream 26"
SAMPLE NO.:	M8628	M8629	M8630	M8631	M8632	M8633
Chloromethane	<10.	<10.	<10.	<10.	<10.	<10.
Bromomethane	↓	↓	↓	↓	↓	↓
Vinyl chloride						
Chloroethane						
Methylene chloride	<5.	<5.	<5.	<5.	<5.	<5.
Acetone	<10.	<10.	<10.	<10.	<10.	<10.
Carbon disulfide	<5.	<5.	<5.	<5.	<5.	<5.
1,1-Dichloroethene	↓	↓	↓	↓	↓	↓
1,1-Dichloroethane						
1,2-Dichloroethene (total)						
Chloroform	14.	14.	16.	14.	19.	<5.
1,2-Dichloroethane	<5.	<5.	<5.	<5.	<5.	<5.
2-Butanone	<10.	<10.	<10.	<10.	<10.	<10.
1,1,1-Trichloroethane	<5.	<5.	<5.	<5.	<5.	<5.
Carbon tetrachloride	<5.	<5.	<5.	<5.	<5.	<5.
Vinyl acetate	<10.	<10.	<10.	<10.	<10.	<10.
Bromodichloromethane	<5.	<5.	<5.	<5.	<5.	<5.
1,2-Dichloropropane	↓	↓	↓	↓	↓	↓
cis-1,3-Dichloropropene						
Trichloroethene						
Dibromochloromethane						
1,1,2-Trichloroethane	↓	↓	↓	↓	↓	↓
Benzene	30.	31.	33.	34.	110.	

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

320160

Volatile Organics
Method 8240

LABORATORIES, INC.

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Water

DATE COLLECTED 7-24-91 DATE RECEIVED 7-24-91 DATE ANALYZED 7-26-91

DESCRIPTION:	Trib 5A Surface	Trib 5A Mid Depth 8"	Trib 5A Bottom 16"	Trib 5A State Fair Blvd. 8"	Trib 5A Crucible Mid Stream	Trib 5A RR Bridge Upstream 26"
SAMPLE NO.:	M8628	M8629	M8630	M8631	M8632	M8633
trans-1,3-Dichloropropene	<5.	<5.	<5.	<5.	<5.	<5.
Bromoform	<5.	<5.	<5.	<5.	<5.	<5.
4-Methyl-2-pentanone	<10.	<10.	<10.	<10.	<10.	<10.
2-Hexanone	<10.	<10.	<10.	<10.	<10.	<10.
Tetrachloroethene	<5.	<5.	<5.	<5.	<5.	<5.
1,1,2,2-Tetrachloroethane	↓	↓	↓	↓	<5.	↓
Toluene	↓	↓	↓	↓	16.	↓
Chlorobenzene	↓	↓	↓	↓	<5.	↓
Ethylbenzene	↓	↓	↓	↓	↓	↓
Styrene	↓	↓	↓	↓	↓	↓
Xylene (total)	↓	↓	↓	↓	↓	↓

Comments:

Methodology: EPA Target Compound List By 8240, SW-846 November 1986, 3rd Edition

Certification No.: 10155

Units: µg/l

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

Volatile Organics
Method 8240

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Water

DATE COLLECTED 7-24-91 DATE RECEIVED 7-24-91 DATE ANALYZED 7-26,27,29-91

DESCRIPTION:	Trib 5A RR Bridge Upstream 26" Dup	Field Blank	Field Blank for Sed.	QC Trip Blank
SAMPLE NO.:	M8634	M8635	M8640	M8641
Chloromethane	<10.	<10.	<10.	<10.
Bromomethane				
Vinyl chloride				
Chloroethane				
Methylene chloride	<5.	<5.	<5.	<5.
Acetone	<10.	<10.	<10.	<10.
Carbon disulfide	<5.	<5.	<5.	<5.
1,1-Dichloroethene				
1,1-Dichloroethane				
1,2-Dichloroethene (total)				
Chloroform				
1,2-Dichloroethane				
2-Butanone	<10.	<10.	<10.	<10.
1,1,1-Trichloroethane	<5.	<5.	<5.	<5.
Carbon tetrachloride	<5.	<5.	<5.	<5.
Vinyl acetate	<10.	<10.	<10.	<10.
Bromodichloromethane	<5.	<5.	<5.	<5.
1,2-Dichloropropane				
cis-1,3-Dichloropropene				
Trichloroethene				
Dibromochloromethane				
1,1,2-Trichloroethane				
Benzene				

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

320162

OBG LABORATORIES, INC.

Section No. C
Revision No. 0
Date: 10/01/91

Volatile Organics Method 8240

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Water

DATE COLLECTED 7-24-91 DATE RECEIVED 7-24-91 DATE ANALYZED 7-26,27,29-91

DESCRIPTION:	Trib 5A RR Bridge Upstream 26" Dup	Field Blank	Field Blank for Sed.	QC Trip Blank
SAMPLE NO.:	M8634	M8635	M8640	M8641
trans-1,3-Dichloropropene	<5.	<5.	<5.	<5.
Bromoform	<5.	<5.	<5.	<5.
4-Methyl-2-pentanone	<10.	<10.	<10.	<10.
2-Hexanone	<10.	<10.	<10.	<10.
Tetrachloroethene	<5.	<5.	<5.	<5.
1,1,2,2-Tetrachloroethane	↓	↓	↓	↓
Toluene				
Chlorobenzene				
Ethylbenzene				
Styrene				
Xylene (total)				

Comments:

Methodology: EPA Target Compound List By 8240, SW-846 November 1986, 3rd Edition

Certification No.: 10155

Units: µg/l

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

320163

OBG LABORATORIES, INC.

Section No. C
Revision No. 0
Date: 10/01/91

Volatile Organics Method 8240

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Solid

DATE COLLECTED 7-24-91 DATE RECEIVED 7-24-91 DATE ANALYZED 7-26,27,29-91

DESCRIPTION:	Trib 5A Upstream	Trib 5A Upstream Duplicate	Trib 5A Crucible Midstream	Trib 5A State Fair Blvd.
SAMPLE NO.:	M8636	M8637	M8638	M8639
Chloromethane	<12.	<14.	<2900.	<13.
Bromomethane	↓	↓	↓	↓
Vinyl chloride				
Chloroethane				
Methylene chloride	<6.	<7.	<1400.	<6.
Acetone	56.	53.	<2900.	20.
Carbon disulfide	<6.	<7.	<1400.	<6.
1,1-Dichloroethene	↓	↓	↓	↓
1,1-Dichloroethane				
1,2-Dichloroethene (total)				
Chloroform				
1,2-Dichloroethane				
2-Butanone	<12.	<14.	<2900.	<13.
1,1,1-Trichloroethane	<6.	<7.	<1400.	<6.
Carbon tetrachloride	<6.	<7.	<1400.	<6.
Vinyl acetate	<12.	<14.	<2900.	<13.
Bromodichloromethane	<6.	<7.	<1400.	<6.
1,2-Dichloropropane	↓	↓	↓	↓
cis-1,3-Dichloropropene				
Trichloroethene				
Dibromochloromethane				
1,1,2-Trichloroethane				
Benzene	↓	↓	19,000.	↓

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

320164

Volatile Organics
Method 8240

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Solid

DATE COLLECTED 7-24-91 DATE RECEIVED 7-24-91 DATE ANALYZED 7-26,27,29-91

DESCRIPTION:	Trib 5A Upstream	Trib 5A Upstream Duplicate	Trib 5A Crucible Midstream	Trib 5A State Fair Blvd.
SAMPLE NO.:	M8636	M8637	M8638	M8639
trans-1,3-Dichloropropene	<6.	<7.	<1400.	<6.
Bromoform	<6.	<7.	<1400.	<6.
4-Methyl-2-pentanone	<12.	<14.	<2900.	<13.
2-Hexanone	<12.	<14.	<2900.	<13.
Tetrachloroethene	<6.	<7.	<1400.	<6.
1,1,2,2-Tetrachloroethane			<1400.	
Toluene			8500.	
Chlorobenzene			<1400.	
Ethylbenzene				
Styrene				
Xylene (total)			6200.	
Other Analysis:				
Percent Total Solids	71.	67.	43.	67.

Comments:

Methodology: EPA Target Compound List By 8240, SW-846 November 1986, 3rd Edition

Certification No.: 10155

Units: µg/kg dry weight

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

OBG LABORATORIES, INC.

Section No. C
Revision No. 0
Date: 10/01/91

Volatile Organics Method 8240

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Water

DATE COLLECTED 7-24-91 DATE RECEIVED 7-25-91 DATE ANALYZED 7-27,30-91

DESCRIPTION:	MW-5C	MW-5B	MW-5A	MW-9A	MW-9B	MW-9C
SAMPLE NO.:	M8659	M8660	M8661	M8662	M8663	M8664
Chloromethane	<10.	<50.	<10.	<50.	<10.	<10.
Bromomethane	↓	↓	↓	↓	↓	↓
Vinyl chloride						
Chloroethane						
Methylene chloride	<5.	<25.	<5.	<25.	<5.	<5.
Acetone	<10.	470.	<10.	<50.	<10.	<10.
Carbon disulfide	<5.	<25.	<5.	<25.	<5.	<5.
1,1-Dichloroethene	↓	↓	↓	↓	↓	↓
1,1-Dichloroethane						
1,2-Dichloroethene (total)						
Chloroform						
1,2-Dichloroethane						
2-Butanone	<10.	57.	<10.	<50.	<10.	<10.
1,1,1-Trichloroethane	<5.	<25.	<5.	<25.	<5.	<5.
Carbon tetrachloride	<5.	<25.	<5.	<25.	<5.	<5.
Vinyl acetate	<10.	<50.	<10.	<50.	<10.	<10.
Bromodichloromethane	<5.	<25.	<5.	<25.	<5.	<5.
1,2-Dichloropropane	↓	↓	↓	↓	↓	↓
cis-1,3-Dichloropropene						
Trichloroethene						
Dibromochloromethane						
1,1,2-Trichloroethane						
Benzene	↓	↓	↓	580.	↓	↓

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

320166

Volatile Organics
Method 8240

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Water

DATE COLLECTED 7-24-91 DATE RECEIVED 7-25-91 DATE ANALYZED 7-27,30-91

DESCRIPTION:	MW-5C	MW-5B	MW-5A	MW-9A	MW-9B	MW-9C
SAMPLE NO.:	M8659	M8660	M8661	M8662	M8663	M8664
trans-1,3-Dichloropropene	<5.	<25.	<5.	<25.	<5.	<5.
Bromoform	<5.	<25.	<5.	<25.	<5.	<5.
4-Methyl-2-pentanone	<10.	<50.	<10.	<50.	<10.	<10.
2-Hexanone	<10.	<50.	<10.	<50.	<10.	<10.
Tetrachloroethene	<5.	<25.	<5.	<25.	<5.	<5.
1,1,2,2-Tetrachloroethane	↓	↓	↓	↓	↓	↓
Toluene						
Chlorobenzene						
Ethylbenzene						
Styrene						
Xylene (total)						

Comments:

Methodology: EPA Target Compound List By 8240, SW-846 November 1986, 3rd Edition

Certification No.: 10155

Units: µg/l

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

OBG LABORATORIES, INC.

Section No. C
Revision No. 0
Date: 10/01/91

Volatile Organics Method 8240

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Water

DATE COLLECTED 7-24-91 DATE RECEIVED 7-25-91 DATE ANALYZED 7-29,30-91

DESCRIPTION:	MW-2A	MW-7A	MW-7B	MW-7C	MW-3A	MW-3B
SAMPLE NO.:	M8665	M8666	M8667	M8668	M8669	M8670
Chloromethane	<10.	<10.	<250.	<10.	<10.	<500.
Bromomethane	↓	↓	↓	↓	↓	↓
Vinyl chloride						
Chloroethane						
Methylene chloride	<5.	<5.	<120.	<5.	<5.	<250.
Acetone	<10.	17.	580.	<10.	16.	<500.
Carbon disulfide	<5.	<5.	<120.	<5.	<5.	<250.
1,1-Dichloroethene	↓	↓	↓	↓	↓	↓
1,1-Dichloroethane						
1,2-Dichloroethene (total)						
Chloroform						
1,2-Dichloroethane						
2-Butanone	<10.	<10.	<250.	<10.	<10.	<500.
1,1,1-Trichloroethane	<5.	<5.	<120.	<5.	<5.	<250.
Carbon tetrachloride	<5.	<5.	<120.	<5.	<5.	<250.
Vinyl acetate	<10.	<10.	<250.	<10.	<10.	<500.
Bromodichloromethane	<5.	<5.	<120.	<5.	<5.	<250.
1,2-Dichloropropane	↓	↓	↓	↓	↓	↓
cis-1,3-Dichloropropene						
Trichloroethene						
Dibromochloromethane						
1,1,2-Trichloroethane						
Benzene	↓	160.	3700.	100.	45.	6400.

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

320168

Volatile Organics
Method 8240

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Water

DATE COLLECTED 7-24-91 DATE RECEIVED 7-25-91 DATE ANALYZED 7-29,30-91

DESCRIPTION:	MW-2A	MW-7A	MW-7B	MW-7C	MW-3A	MW-3B
SAMPLE NO.:	M8665	M8666	M8667	M8668	M8669	M8670
trans-1,3-Dichloropropene	<5.	<5.	<120.	<5.	<5.	<250.
Bromoform	<5.	<5.	<120.	<5.	<5.	<250.
4-Methyl-2-pentanone	<10.	<10.	<250.	<10.	<10.	<500.
2-Hexanone	<10.	<10.	<250.	<10.	<10.	<500.
Tetrachloroethene	<5.	<5.	<120.	<5.	<5.	<250.
1,1,2,2-Tetrachloroethane	↓	<5.	<120.	↓	↓	↓
Toluene		6.	240.			
Chlorobenzene		<5.	<120.		75.	560.
Ethylbenzene		↓	↓		<5.	<250.
Styrene					↓	↓
Xylene (total)						

Comments:

Methodology: EPA Target Compound List By 8240, SW-846 November 1986, 3rd Edition

Certification No.: 10155

Units: µg/l

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

Volatile Organics Method 8240

LABORATORIES, INC.

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Water

DATE COLLECTED 7-24-91 DATE RECEIVED 7-25-91 DATE ANALYZED 7-29,30-91, 8-1-91

DESCRIPTION:	MW-3C	Equipment Blank	Blind Dup.	QC Trip Blank
SAMPLE NO.:	M8671	M8672	M8673	M8674
Chloromethane	<10.	<10.	<250.	<10.
Bromomethane	↓	↓	↓	↓
Vinyl chloride				
Chloroethane				
Methylene chloride	<5.	<5.	<120.	<5.
Acetone	<10.	<10.	650.	<10.
Carbon disulfide	<5.	<5.	<120.	<5.
1,1-Dichloroethene	↓	↓	↓	↓
1,1-Dichloroethane				
1,2-Dichloroethene (total)				
Chloroform				
1,2-Dichloroethane				
2-Butanone	<10.	<10.	<250.	<10.
1,1,1-Trichloroethane	<5.	<5.	<120.	<5.
Carbon tetrachloride	<5.	<5.	<120.	<5.
Vinyl acetate	<10.	<10.	<250.	<10.
Bromodichloromethane	<5.	<5.	<120.	<5.
1,2-Dichloropropane	↓	↓	↓	↓
cis-1,3-Dichloropropene				
Trichloroethene				
Dibromochloromethane				
1,1,2-Trichloroethane			↓	
Benzene	↓	↓	3900.	↓

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

320170

OBG LABORATORIES, INC.

Section No. C
Revision No. 0
Date: 10/01/91
Page 13 of 53

Volatile Organics Method 8240

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Water

DATE COLLECTED 7-24-91 DATE RECEIVED 7-25-91 DATE ANALYZED 7-29,30-91, 8-1-91

DESCRIPTION:	MW-3C	Equipment Blank	Blind Dup	QC Trip Blank
SAMPLE NO.:	M8671	M8672	M8673	M8674
trans-1,3-Dichloropropene	<5.	<5.	<120.	<5.
Bromoform	<5.	<5.	<120.	<5.
4-Methyl-2-pentanone	<10.	<10.	<250.	<10.
2-Hexanone	<10.	<10.	<250.	<10.
Tetrachloroethene	<5.	<5.	<120.	<5.
1,1,2,2-Tetrachloroethane			<120.	
Toluene			260.	
Chlorobenzene			<120.	
Ethylbenzene				
Styrene				
Xylene (total)				

Comments:

Methodology: EPA Target Compound List By 8240, SW-846 November 1986, 3rd Edition

Certification No.: 10155

Units: µg/l

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

320171

Volatile Organics
Method 8240

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Water

DATE COLLECTED 7-25-91 DATE RECEIVED 7-26-91 DATE ANALYZED 7-31-91, 8-1,2-91

DESCRIPTION:	MW-6B	MW-6A	MW-6C	MW-4B	MW-4A	MW-4C
SAMPLE NO.:	M8743	M8744	M8745	M8746	M8747	M8748
Chloromethane	<1000.	<10.	<50.	<250.	<500.	<100.
Bromomethane						
Vinyl chloride						
Chloroethane						
Methylene chloride	<500.	<5.	<25.	<120.	<250.	<50.
Acetone	<1000.	27.	<50.	1800.	<500.	1100.
Carbon disulfide	<500.	<5.	<25.	<120.	<250.	<50.
1,1-Dichloroethene						
1,1-Dichloroethane						
1,2-Dichloroethene (total)						
Chloroform						
1,2-Dichloroethane						
2-Butanone	<1000.	<10.	<50.	<250.	<500.	<100.
1,1,1-Trichloroethane	<500.	<5.	<25.	<120.	<250.	<50.
Carbon tetrachloride	<500.	<5.	<25.	<120.	<250.	<50.
Vinyl acetate	<1000.	<10.	<50.	<250.	<500.	<100.
Bromodichloromethane	<500.	<5.	<25.	<120.	<250.	<50.
1,2-Dichloropropane						
cis-1,3-Dichloropropene						
Trichloroethene						
Dibromochloromethane						
1,1,2-Trichloroethane						
Benzene	15,000.	64.	410.		4000.	

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

320172

Volatile Organics Method 8240

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Water

DATE COLLECTED 7-25-91 DATE RECEIVED 7-26-91 DATE ANALYZED 7-31-91, 8-1,2-91

DESCRIPTION:	MW-6B	MW-6A	MW-6C	MW-4B	MW-4A	MW-4C
SAMPLE NO.:	M8743	M8744	M8745	M8746	M8747	M8748
trans-1,3-Dichloropropene	<500.	<5.	<25.	<120.	<250.	<50.
Bromoform	<500.	<5.	<25.	<120.	<250.	<50.
4-Methyl-2-pentanone	<1000.	<10.	<50.	<250.	<500.	<100.
2-Hexanone	<1000.	<10.	<50.	<250.	<500.	<100.
Tetrachloroethene	<500.	<5.	<25.	<120.	<250.	<50.
1,1,2,2-Tetrachloroethane	<500.	<5.	↓	↓	<250.	↓
Toluene	1100.	87.			450.	
Chlorobenzene	<500.	<5.			<250.	
Ethylbenzene	↓	14.			↓	
Styrene		<5.				
Xylene (total)		330.				

Comments:

Methodology: EPA Target Compound List By 8240, SW-846 November 1986, 3rd Edition

Certification No.: 10155

Units: µg/l

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

Volatile Organics
Method 8240

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Water

DATE COLLECTED 7-25-91 DATE RECEIVED 7-26-91 DATE ANALYZED 7-31-91, 8-1,2-91

DESCRIPTION:	Equipment Blank	MW-8B	MW-8A	MW-8C	Blind Dup.	QC Trip Blank
SAMPLE NO.:	M8749	M8750	M8751	M8752	M8753	M8754
Chloromethane	<10.	<4000.	<40.	<50.	<500.	<10.
Bromomethane	↓	↓	↓	↓	↓	↓
Vinyl chloride	↓	↓	↓	↓	↓	↓
Chloroethane	↓	↓	↓	↓	↓	↓
Methylene chloride	<5.	<2000.	<20.	<25.	<250.	<5.
Acetone	<10.	<4000.	<40.	<50.	<500.	<10.
Carbon disulfide	<5.	<2000.	<20.	<25.	<250.	<5.
1,1-Dichloroethene	↓	↓	↓	↓	↓	↓
1,1-Dichloroethane	↓	↓	↓	↓	↓	↓
1,2-Dichloroethene (total)	↓	↓	↓	↓	↓	↓
Chloroform	↓	↓	↓	↓	↓	↓
1,2-Dichloroethane	↓	↓	↓	↓	↓	↓
2-Butanone	<10.	<4000.	<40.	<50.	<500.	<10.
1,1,1-Trichloroethane	<5.	<2000.	<20.	<25.	<250.	<5.
Carbon tetrachloride	<5.	<2000.	<20.	<25.	<250.	<5.
Vinyl acetate	<10.	<4000.	<40.	<50.	<500.	<10.
Bromodichloromethane	<5.	<2000.	<20.	<25.	<250.	<5.
1,2-Dichloropropane	↓	↓	↓	↓	↓	↓
cis-1,3-Dichloropropene	↓	↓	↓	↓	↓	↓
Trichloroethene	↓	↓	↓	↓	↓	↓
Dibromochloromethane	↓	↓	↓	↓	↓	↓
1,1,2-Trichloroethane	↓	↓	↓	↓	↓	↓
Benzene	↓	46,000.	440.	640.	4500.	↓

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

Volatile Organics
Method 8240

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Water

DATE COLLECTED 7-25-91 DATE RECEIVED 7-26-91 DATE ANALYZED 7-31-91, 8-1,2-91

DESCRIPTION:	Equipment Blank	MW-8B	MW-8A	MW-8C	Blind Dup.	QC Trip Blank
SAMPLE NO.:	M8749	M8750	M8751	M8752	M8753	M8754
trans-1,3-Dichloropropene	<5.	<2000.	<20.	<25.	<250.	<5.
Bromoform	<5.	<2000.	<20.	<25.	<250.	<5.
4-Methyl-2-pentanone	<10.	<4000.	<40.	<50.	<500.	<10.
2-Hexanone	<10.	<4000.	<40.	<50.	<500.	<10.
Tetrachloroethene	<5.	<2000.	<20.	<25.	<250.	<5.
1,1,2,2-Tetrachloroethane	↓	<2000.	↓	<25.	<250.	↓
Toluene		3800.		80.	490.	
Chlorobenzene		<2000.		<25.	<250.	
Ethylbenzene		↓		↓	↓	
Styrene						
Xylene (total)						

Comments:

Methodology: EPA Target Compound List By 8240, SW-846 November 1986, 3rd Edition

Certification No.: 10155

Units: µg/l

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

Semivolatile Organics Method 8270

OBG LABORATORIES, INC.

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION MW-8B MATRIX: Water

SAMPLE NO. M8750 DATE COLLECTED 7-25-91 DATE RECEIVED 7-26-91

DATE EXTRACTED 7-29-91 DATE ANALYZED 8-23-91

Phenol	11,000.	4-Chloro-3-methylphenol	<1000.
Bis (2-chloroethyl) ether	<1000.	2-Methylnaphthalene	↓
2-Chlorophenol	↓	Hexachlorocyclopentadiene	
1,3-Dichlorobenzene		2,4,6-Trichlorophenol	
1,4-Dichlorobenzene		2,4,5-Trichlorophenol	<5000.
Benzyl alcohol		2-Chloronaphthalene	<1000.
1,2-Dichlorobenzene		2-Nitroaniline	<5000.
2-Methylphenol		Dimethylphthalate	<1000.
Bis (2-chloroisopropyl) ether		Acenaphthylene	↓
4-Methylphenol	1000.	2,6-Dinitrotoluene	
N-Nitroso-di-n-propylamine	<1000.	3-Nitroaniline	<5000.
Hexachloroethane	↓	Acenaphthene	<1000.
Nitrobenzene		2,4-Dinitrophenol	<5000.
Isophorone		4-Nitrophenol	<5000.
2-Nitrophenol		Dibenzofuran	<1000.
2,4-Dimethylphenol		2,4-Dinitrotoluene	↓
Benzoic acid	<5000. (3000.)	Diethylphthalate	
Bis (2-chloroethoxy) methane	<1000.	4-Chlorophenyl-phenylether	
2,4-Dichlorophenol	↓	Fluorene	↓
1,2,4-Trichlorobenzene		4-Nitroaniline	<5000.
Naphthalene		4,6-Dinitro-2-methylphenol	<5000.
4-Chloroaniline		N-Nitrosodiphenylamine	<1000.
Hexachlorobutadiene		4-Bromophenyl-phenylether	<1000.

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

320176

Semivolatile Organics Method 8270

LABORATORIES, INC.

CLIENT 'N JOB NO. 1163.061.525

DESCRIPTION MW-8B MATRIX: Water

SAMPLE NO. M8750 DATE COLLECTED 7-25-91 DATE RECEIVED 7-26-91

DATE EXTRACTED 7-29-91 DATE ANALYZED 8-23-91

Hexachlorobenzene	<1000.	Benzo (a) anthracene	<1000.
Pentachlorophenol	<5000.	Chrysene	
Phenanthrene	<1000.	Bis (2-ethylhexyl) phthalate	
Anthracene		Di-n-octylphthalate	
Di-n-butylphthalate		Benzo (b) fluoranthene	
Fluoranthene		Benzo (k) fluoranthene	
Pyrene		Benzo (a) pyrene	
Butylbenzylphthalate		Indeno (1,2,3-cd) pyrene	
3,3'-Dichlorobenzidine	<2000.	Dibenz (a,h) anthracene	
		Benzo (g,h,i) perylene	

Comments:

Values in parentheses are estimated, detected but below the quantitation limits.

Methodology: EPA Target Compound List By 8270, SW-846 November 1986, 3rd Edition

Certification No.: 10155

Units: µg/l

Authorized: Thomas Alexander

Date: September 3, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

320177

OBG LABORATORIES, INC.

Organochlorine Pesticide / PCB Method 8080

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION MW-2A MATRIX: Water

SAMPLE NO. M8665 DATE COLLECTED 7-24-91 DATE RECEIVED 7-25-91

DATE EXTRACTED 7-30-91 DATE ANALYZED 8-17-91

α-BHC	<0.05	4,4'-DDT	<0.10
γ-BHC		Endosulfan sulfate	
β-BHC		Endrin aldehyde	
Heptachlor		Methoxychlor	<0.50
δ-BHC		Endrin ketone	<0.10
Aldrin		Chlordane	<0.50
Heptachlor epoxide		Toxaphene	<1.0
Endosulfan I		PCB-1221	<0.50
4,4'-DDE	<0.10	PCB-1232	
Dieldrin		PCB-1016/1242	
Endrin		PCB-1248	3.2
4,4'-DDD		PCB-1254	<1.0
Endosulfan II		PCB-1260	<1.0

Comments:

Methodology: USEPA,SW-846, November 1986, 3rd Edition

Certification No.: 10155

Units: µg/l

Authorized: _____

Date: September 3, 1991

OBG LABORATORIES, INC.

Section No. C
Revision No. 0
Date: 10/01/91

Laboratory Report

CLIENT

JOB NO. 1163.061.525

DESCRIPTION

MATRIX: Water

DATE COLLECTED 7-24-91 DATE RECEIVED 7-24-91

Sample #	TOTAL MAGNESIUM	TOTAL SODIUM	TOTAL CALCIUM	TOTAL POTASSIUM	TOTAL IRON
Trib 5A Surface M8628	14.	150.	100.	<5.	0.76
Trib 5A Mid Depth 8" M8629	14.	150.	100.	5.	0.82
Trib 5A Bottom 16" M8630	14.	150.	100.	6.	0.86
Trib 5A State Fair Blvd. 8" M8631	14.	150.	89.	<5.	0.55
Trib 5A Crucible Midstream M8632	14.	170.	84.	<5.	0.54
Trib 5A RR Bridge Upstream 26" M8633	10.	380.	100.	76.	0.36
Trib 5A RR Bridge Upstream 26"Dup. M8634	10.	370.	100.	76.	0.37
Field Blank M8635	<1.	<1.	<1.	<5.	<0.05

Comments:

Certification No.: 10155

Units: mg/l

Authorized:

Date: August 28, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

Laboratory Report

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Water

DATE COLLECTED 7-25-91 DATE RECEIVED 7-26-91

	Sample #	TOTAL MAGNESIUM	TOTAL SODIUM	TOTAL CALCIUM	TOTAL POTASSIUM	TOTAL IRON
MW-2A	M8730	3.	310.	30.	<5.	0.09
MW-5A	M8731	8.	250.	300.	9.	1.4
MW-5B	M8732	<100.*	11,000.	19,000.	100.	210.
MW-5C	M8733	120.	4600.	3200.	59.	25.
MW-9A	M8734	160.	98.	350.	<5.	6.6
MW-9B	M8735	54.	43.	170.	<5.	0.73
MW-9C	M8736	110.	2000.	650.	12.	3.9
MW-3A	M8737	<10.*	55.	960.	70.	<0.5*
MW-3B	M8738	21.	4000.	230.	120.	1.2
MW-3C	M8739	81.	2400.	1900.	66.	11.
MW-7A	M8740	<1.	80.	540.	<5.	<0.05
MW-7B	M8741	<10.*	930.	1400.	43.	0.6
MW-7C	M8742	120.	9900.	12,000.	180.	36.

Comments: * Elevated detection limits due to matrix complexity and/or interferences.

Certification No.: 10155

Units: mg/l

Authorized: _____

Date: August 28, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

OBG LABORATORIES, INC.

Section No. C
Revision No. 0
Date: 10/01/91

Laboratory Report

CLIENT

JOB NO. 1163.061.525

DESCRIPTION

MATRIX: Water

DATE COLLECTED 7-25-91 DATE RECEIVED 7-26-91

	Sample #	TOTAL MERCURY	TOTAL SODIUM	TOTAL CALCIUM	TOTAL POTASSIUM	TOTAL IRON
MW-6A	M8793	<1.	80.	550.	8.	0.10
MW-6B	M8794	100.	2800.	2800.	130.	56.
MW-6C	M8795	130.	11,000.	13,000.	180.	82.
MW-8A	M8796	20.	160.	550.	21.	<0.05
MW-8C	M8797	110.	3600.	3900.	60.	1.3
MW-8B	M8798	<100.*	9600.	14,000.	190.	140.
MW-4B	M8799	<100.*	13,000.	19,000.	580.	150.
MW-4C	M8800	<100.*	13,000.	21,000.	320.	240.
MW-4A	M8801	<10.*	52.	890.	72.	<0.5*

Comments: *Elevated detection limits due to matrix complexity and/or interferences.

Certification No.: 10155

Units: mg/l

Authorized: Thomas A. Wheeler

Date: August 28, 1991

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

OBG LABORATORIES, INC.

Laboratory Report

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Water

DATE COLLECTED 7-24-91 DATE RECEIVED 7-24-91

	Sample #	SULFATE	CHLORIDE	CARBONATE	BICARBONATE
Trib 5A Surface	M8628	72.	230.	<1.0	140.
Trib 5A Mid Depth 8"	M8629	75.	240.	<1.0	140.
Trib 5A Bottom 16"	M8630	71.	230.	<1.0	140.
Trib 5A State Fair Blvd 8"	M8631	75.	220.	<1.0	130.
Trib 5A Crucible Midstream	M8632	88.	230.	<1.0	130.
Trib 5A RR Bridge Upstream 26"	M8633	170.	510.	<1.0	170.
Trib 5A RR Bridge Upstream 26" Dup	M8634	160.	400.	<1.0	170.
Field Blank	M8635	<1.0	<1.0	<1.0	1.9

Comments:

Certification No.: 10155

Units: mg/l

Authorized: _____

Date: September 6, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

OBG LABORATORIES, INC.

Section No. C
Revision No. 0
Date: 10/01/91

Laboratory Report

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Water

DATE COLLECTED 7-25-91 DATE RECEIVED 7-26-91

	Sample #	SULFATE	CHLORIDE	CARBONATE	BICARBONAT
MW-2A	M8730	120.	280.	88.	92.
MW-5A	M8731	280.	330.	<1.	230.
MW-5B	M8732	1300.	11,000.	<1.	220.
MW-5C	M8733	200.	95,000.	<1.	57.
MW-9A	M8734	1300.	260.	<1.	390.
MW-9B	M8735	360.	120.	<1.	300.
MW-9C	M8736	1500.	3200.	<1.	480.
MW-3A	M8737	37.	570.	<1.	<1.
MW-3B	M8738	980.	9500.	<1.	1100.
MW-3C	M8739	740.	8000.	<1.	240.
MW-7A	M8740	96.	160.	<1.	<1.
MW-7B	M8741	1400.	5400.	360.	<1.
MW-7C	M8742	810.	38,000.	<1.	36.

Comments:

Certification No.: 10155

Units: mg/l

Authorized: _____

Date: September 6, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

OBG LABORATORIES, INC.

Laboratory Report

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

MATRIX: Water

DATE COLLECTED 7-25-91 DATE RECEIVED 7-26-91

	Sample #	SULFATE	CHLORIDE	CARBONATE	BICARBONATE
MW-6A	M8793	70.	140.	<1.	<1.
MW-6B	M8794	<1.	11,000.	<1.	93.
MW-6C	M8795	790.	37,000.	<1.	93.
MW-8A	M8796	1300.	260.	52.	<1.
MW-8C	M8797	710.	13,000.	<1.	32.
MW-8B	M8798	22.	41,000.	<1.	140.
MW-4B	M8799	1.	64,000.	<1.	290.
MW-4C	M8800	340.	66,000.	<1.	160.
MW-4A	M8801	5.	77.	<1.	<1.

Comments:

Certification No.: 10155

Units: mg/l

Authorized: _____

Date: September 6, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

Volatile Organics Method 8240

QUALITY CONTROL

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

Quality Control Summary: Reference Sample MATRIX: Water

DATE COLLECTED - DATE RECEIVED - DATE ANALYZED 7-26-91

DESCRIPTION:	REFERENCE SAMPLE		
	True Value	Value Found	Recovery %
SAMPLE NO.:			
Chloromethane	20.	30.	150.
Bromomethane		24.	120.
Vinyl chloride		27.	135.
Chloroethane		25.	125.
Methylene chloride		26.	130.
Acetone		10.	50.
Carbon disulfide		20.	100.
1,1-Dichloroethene		21.	105.
1,1-Dichloroethane		24.	120.
1,2-Dichloroethene (total)		20.	100.
Chloroform		22.	110.
1,2-Dichloroethane		20.	100.
2-Butanone		10.	50.
1,1,1-Trichloroethane		22.	110.
Carbon tetrachloride		21.	105.
Vinyl acetate		9.	45.
Bromodichloromethane		19.	95.
1,2-Dichloropropane		21.	105.
cis-1,3-Dichloropropene	30.	25.	83.
Trichloroethene	20.	21.	105.
Dibromochloromethane		18.	90.
1,1,2-Trichloroethane		18.	90.
Benzene		21.	105.

Authorized: _____

Date: August 29, 1991

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

320185

Volatile Organics Method 8240

QUALITY CONTROL

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

Quality Control Summary: Reference Sample MATRIX: Water

DATE COLLECTED - DATE RECEIVED - DATE ANALYZED 7-26-91

DESCRIPTION:	REFERENCE SAMPLE		
SAMPLE NO.:	True Value	Value Found	Recovery %
trans-1,3-Dichloropropene	10.	10.	100.
Bromoform	20.	17.	85.
4-Methyl-2-pentanone		17.	85.
2-Hexanone		12.	60.
Tetrachloroethene		22.	110.
1,1,2,2-Tetrachloroethane		17.	85.
Toluene		20.	100.
Chlorobenzene		19.	95.
Ethylbenzene		20.	100.
Styrene		22.	110.
Xylene (total)	40.	41.	102.

Comments: RS Stock Solution # V172

Methodology: EPA Target Compound List By 8240, SW-846 November 1986, 3rd Edition

Certification No.: 10155

Units: µg/l

Authorized: _____

Date: August 30, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

Volatile Organics Method 8240

QUALITY CONTROL

CLIENT ,1 JOB NO. 1163.061.525

DESCRIPTION Sv 1

Quality Control Summary: Reference Sample MATRIX: Solid

DATE COLLECTED - DATE RECEIVED - DATE ANALYZED 7-26-91

DESCRIPTION: REFERENCE SAMPLE

SAMPLE NO.:	True Value	Value Found	Recovery %
Chloromethane	20.	45.	225.
Bromomethane		28.	140.
Vinyl chloride		39.	195.
Chloroethane		31.	155.
Methylene chloride		21.	105.
Acetone		44.	220.
Carbon disulfide		17.	85.
1,1-Dichloroethene		18.	90.
1,1-Dichloroethane		18.	90.
1,2-Dichloroethene (total)		16.	80.
Chloroform		17.	85.
1,2-Dichloroethane		18.	90.
2-Butanone		28.	140.
1,1,1-Trichloroethane		18.	90.
Carbon tetrachloride		17.	85.
Vinyl acetate		12.	60.
Bromodichloromethane		17.	85.
1,2-Dichloropropane		18.	90.
cis-1,3-Dichloropropene	26.	24.	92.
Trichloroethene	20.	18.	90.
Dibromochloromethane		18.	90.
1,1,2-Trichloroethane		18.	90.
Benzene		17.	85.

Authorized: Thomas Alexander

Date: August 30, 1991

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

320187

Volatile Organics
Method 8240
QUALITY CONTROL

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

Quality Control Summary: Reference Sample MATIRX: Solid

DATE COLLECTED - - DATE RECEIVED - - DATE ANALYZED 7-26-91

DESCRIPTION:	REFERENCE SAMPLE		
SAMPLE NO.:	True Value	Value Found	Recovery %
trans-1,3-Dichloropropene	14.	9.	64.
Bromoform	20.	18.	90.
4-Methyl-2-pentanone		21.	105.
2-Hexanone		23.	115.
Tetrachloroethene		18.	90.
1,1,2,2-Tetrachloroethane		18.	90.
Toluene		18.	90.
Chlorobenzene		19.	95.
Ethylbenzene		18.	90.
Styrene		20.	100.
Xylene (total)		18.	90.

Comments: RS Stock Solution #V172

Methodology: EPA Target Compound List By 8240, SW-846 November 1986, 3rd Edition

Certification No.: 10155

Units: µg/kg dry weight

Authorized: _____

Date: August 30, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

320188

Volatile Organics
Method 8240
QUALITY CONTROL

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

Quality Control Summary: Reference Sample MATRIX: Water

DATE COLLECTED - DATE RECEIVED - DATE ANALYZED 7-30-91

DESCRIPTION:	REFERENCE SAMPLE		
SAMPLE NO.:	True Value	Value Found	Recovery %
Chloromethane	20.	32.	160.
Bromomethane		24.	120.
Vinyl chloride		28.	140.
Chloroethane		26.	130.
Methylene chloride		26.	130.
Acetone		13.	65.
Carbon disulfide		22.	110.
1,1-Dichloroethene		22.	110.
1,1-Dichloroethane		26.	130.
1,2-Dichloroethene (total)		22.	110.
Chloroform		23.	115.
1,2-Dichloroethane		21.	105.
2-Butanone		6.	30.
1,1,1-Trichloroethane		22.	110.
Carbon tetrachloride		22.	110.
Vinyl acetate		9.	45.
Bromodichloromethane		19.	95.
1,2-Dichloropropane		22.	110.
cis-1,3-Dichloropropene	30.	24.	80.
Trichloroethene	20.	20.	100.
Dibromochloromethane		17.	85.
1,1,2-Trichloroethane		17.	85.
Benzene		21.	105.

Authorized: _____

Date: August 30, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

Volatile Organics
Method 8240
QUALITY CONTROL

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

Quality Control Summary: Reference Sample MATRIX: Water

DATE COLLECTED - DATE RECEIVED - DATE ANALYZED 7-30-91

DESCRIPTION:	REFERENCE SAMPLE		
SAMPLE NO.:	True Value	Value Found	Recovery %
trans-1,3-Dichloropropene	10.	9.	90.
Bromoform	20.	16.	80.
4-Methyl-2-pentanone		18.	90.
2-Hexanone		12.	60.
Tetrachloroethene		22.	110.
1,1,2,2-Tetrachloroethane		17.	85.
Toluene		20.	100.
Chlorobenzene		19.	95.
Ethylbenzene		20.	100.
Styrene		21.	105.
Xylene (total)	40.	41.	102.

Comments: RS Stock Solution #V172

Methodology: EPA Target Compound List By 8240, SW-846 November 1986, 3rd Edition

Certification No.: 10155

Units: µg/l

Authorized: _____

Date: August 30, 1991

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

Volatile Organics
Method 8240
QUALITY CONTROL

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

Quality Control Summary: Reagent Blanks MATRIX: Water

DATE COLLECTED - DATE RECEIVED - DATE ANALYZED See Below

DESCRIPTION:	VBLK072601	VBLK072701	VBLK072901	VBLK072902	VBLK073002	VBLK073101
SAMPLE NO.: Date Analyzed	7-26-91	7-27-91	7-29-91	7-29-91	7-30-91	7-31-91
Chloromethane	<10.	<10.	<10.	<10.	<10.	<10.
Bromomethane						
Vinyl chloride						
Chloroethane						
Methylene chloride	<5.	<5.	<5.	<5.	<5.	<5.
Acetone	<10.	<10.	<10.	<10.	<10.	<10.
Carbon disulfide	<5.	<5.	<5.	<5.	<5.	<5.
1,1-Dichloroethene						
1,1-Dichloroethane						
1,2-Dichloroethene (total)						
Chloroform						
1,2-Dichloroethane						
2-Butanone	<10.	<10.	<10.	<10.	<10.	<10.
1,1,1-Trichloroethane	<5.	<5.	<5.	<5.	<5.	<5.
Carbon tetrachloride	<5.	<5.	<5.	<5.	<5.	<5.
Vinyl acetate	<10.	<10.	<10.	<10.	<10.	<10.
Bromodichloromethane	<5.	<5.	<5.	<5.	<5.	<5.
1,2-Dichloropropane						
cis-1,3-Dichloropropene						
Trichloroethene						
Dibromochloromethane						
1,1,2-Trichloroethane						
Benzene						

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

LABORATORIES, INC.

Volatile Organics Method 8240

QUALITY CONTROL

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

Quality Control Summary: Reagent Blanks MATRIX: Water

DATE COLLECTED - DATE RECEIVED - DATE ANALYZED See Below

DESCRIPTION:	VBLK072601	VBLK072701	VBLK072901	VBLK072902	VBLK073002	VBLK073101
SAMPLE NO.: Date Analyzed	7-26-91	7-27-91	7-29-91	7-29-91	7-30-91	7-31-91
trans-1,3-Dichloropropene	<5.	<5.	<5.	<5.	<5.	<5.
Bromoform	<5.	<5.	<5.	<5.	<5.	<5.
4-Methyl-2-pentanone	<10.	<10.	<10.	<10.	<10.	<10.
2-Hexanone	<10.	<10.	<10.	<10.	<10.	<10.
Tetrachloroethene	<5.	<5.	<5.	<5.	<5.	<5.
1,1,2,2-Tetrachloroethane	↓	↓	↓	↓	↓	↓
Toluene						
Chlorobenzene						
Ethylbenzene						
Styrene						
Xylene (total)						

Comments:

Methodology: EPA Target Compound List By 8240, SW-846 November 1986, 3rd Edition

Certification No.: 10155

Units: µg/l

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

Volatile Organics Method 8240

QUALITY CONTROL

LABORATORIES, INC.

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION NY

Quality Control Summary: Reagent Blanks MATRIX: Solid

DATE COLLECTED - DATE RECEIVED - DATE ANALYZED See Below

DESCRIPTION:	VBLK072601	VBLK0727Ext.
SAMPLE NO.: Date Analyzed	7-26-91	7-27-91
Chloromethane	<10.	<1200.
Bromomethane		
Vinyl chloride		
Chloroethane		
Methylene chloride	<5.	<620.
Acetone	<10.	<1200.
Carbon disulfide	<5.	<620.
1,1-Dichloroethene		
1,1-Dichloroethane		
1,2-Dichloroethene (total)		
Chloroform		
1,2-Dichloroethane		
2-Butanone	<10.	<1200.
1,1,1-Trichloroethane	<5.	<620.
Carbon tetrachloride	<5.	<620.
Vinyl acetate	<10.	<1200.
Bromodichloromethane	<5.	<620.
1,2-Dichloropropane		
cis-1,3-Dichloropropene		
Trichloroethene		
Dibromochloromethane		
1,1,2-Trichloroethane		
Benzene		

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

320193

Volatile Organics
Method 8240

QUALITY CONTROL

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

Quality Control Summary: Reagent Blanks MATRIX: Solid

DATE COLLECTED - DATE RECEIVED - DATE ANALYZED See Below

DESCRIPTION:	VBLK072601	VBLK0727Ext.
SAMPLE NO.: Date Analyzed	7-26-91	7-27-91
trans-1,3-Dichloropropene	<5.	<620.
Bromoform	<5.	<620.
4-Methyl-2-pentanone	<10.	<1200.
2-Hexanone	<10.	<1200.
Tetrachloroethene	<5.	<620.
1,1,2,2-Tetrachloroethane	↓	↓
Toluene		
Chlorobenzene		
Ethylbenzene		
Styrene		
Xylene (total)		

Comments:

Methodology: EPA Target Compound List By 8240, SW-846 November 1986, 3rd Edition

Certification No.: 10155

Units: µg/kg dry weight

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

Volatile Organics
Method 8240

QUALITY CONTROL

CLIENT _____ JOB NO. 1163 061 525

DESCRIPTION _____

Quality Control Summary: Reagent Blanks MATRIX: Water

DATE COLLECTED - DATE RECEIVED - DATE ANALYZED See Below

DESCRIPTION:	VBLK080101	VBLK080201
SAMPLE NO.: Date Analyzed	8-1-91	8-2-91
Chloromethane	<10.	<10.
Bromomethane		
Vinyl chloride		
Chloroethane		
Methylene chloride	<5.	<5.
Acetone	<10.	<10.
Carbon disulfide	<5.	<5.
1,1-Dichloroethene		
1,1-Dichloroethane		
1,2-Dichloroethene (total)		
Chloroform		
1,2-Dichloroethane		
2-Butanone	<10.	<10.
1,1,1-Trichloroethane	<5.	<5.
Carbon tetrachloride	<5.	<5.
Vinyl acetate	<10.	<10.
Bromodichloromethane	<5.	<5.
1,2-Dichloropropane		
cis-1,3-Dichloropropene		
Trichloroethene		
Dibromochloromethane		
1,1,2-Trichloroethane		
Benzene		

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

Volatile Organics Method 8240

QUALITY CONTROL

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____

Quality Control Summary: Reagent Blanks MATRIX: Water

DATE COLLECTED _____ DATE RECEIVED _____ DATE ANALYZED See Below

DESCRIPTION:	VBLK080101	VBLK080201
SAMPLE NO.: Date Analyzed	8-1-91	8-2-91
trans-1,3-Dichloropropene	<5.	<5.
Bromoform	<5.	<5.
4-Methyl-2-pentanone	<10.	<10.
2-Hexanone	<10.	<10.
Tetrachloroethene	<5.	<5.
1,1,2,2-Tetrachloroethane	↓	↓
Toluene		
Chlorobenzene		
Ethylbenzene		
Styrene		
Xylene (total)		

Comments:

Methodology: EPA Target Compound List By 8240, SW-846 November 1986, 3rd Edition

Certification No.: 10155

Units: µg/l

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

OBG LABORATORIES, INC.

Laboratory Report

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION - Quality Control Summary

Volatile Organics: Matrix Spike and Matrix Spike Duplicate

Date Analyzed 7-26-91 DATE COLLECTED 7-24-91 DATE RECEIVED 7-24-91

	SAMPLE INFORMATION			MATRIX SPIKE AND MATRIX SPIKE DUPLICATE					
	SAMPLE #	MATRIX	SAMPLE RESULT	SPIKE ADDED	MS CONC.	RECOVERY %	MSD CONC.	RECOVERY %	RPD %
1,1-DICHLOROETHENE	M8633	Water	<5.00	50.0	64.2	128.	57.3	115.	11.
TRICHLOROETHENE	↓	↓	↓	↓	60.9	122.	55.2	110.	10.
BENZENE					61.1	122.	54.6	109.	11.
TOLUENE					59.8	120.	54.0	108.	10.
CHLOROBENZENE					59.0	118.	52.7	105.	12.

Section No. C
Revision No. 0
Date: 10/01/91
Page 39 of 53

Comments: MS Stock Solution # V151

Certification No.: 10155

Units: µg/l

MS = MATRIX SPIKE
MSD = MATRIX SPIKE DUPLICATE
RPD = RELATIVE PERCENT DIFFERENCE

Authorized: Thomas Wellington

Date: August 30, 1991

320197

OBG Laboratories Inc. an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300 Box 4942 / Syracuse, NY 13221 / (315) 437-0200

OBG LABORATORIES, INC.

Laboratory Report

CLIENT ___ JOB NO. 1163.061.525

DESCRIPTION ___ - Quality Control Summary

Volatile Organics: Matrix Spike and Matrix Spike Duplicate

Date Analyzed 7-30-91 DATE COLLECTED 7-24-91 DATE RECEIVED 7-25-91

	SAMPLE INFORMATION			MATRIX SPIKE AND MATRIX SPIKE DUPLICATE					
	SAMPLE #	MATRIX	SAMPLE RESULT	SPIKE ADDED	MS CONC.	RECOVERY %	MSD CONC.	RECOVERY %	RPD %
1,1-DICHLOROETHENE	M8670	Water	<5.00	50.0	62.9	126.	57.1	114.	10.
TRICHLOROETHENE	↓	↓	<5.00	↓	52.4	105.	52.4	105.	0.
BENZENE			127.		181.	108.	182.	110.	2.
TOLUENE			<5.00		55.2	110.	54.4	109.	1.
CHLOROBENZENE	↓	↓	11.2	↓	62.3	102.	61.2	100.	2.

Section No. ___C___
Revision No. 0
Date: 10/01/91
Page 40 of 53

320198

Comments: MS Stock Solution # V151

Certification No.: 10155

Units: µg/l

MS = MATRIX SPIKE
MSD = MATRIX SPIKE DUPLICATE
RPD = RELATIVE PERCENT DIFFERENCE

Authorized: [signature]

Date: August 30, 1991

OBG Laboratories, Inc. an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse NY 13221 / (315) 437 0200

OBG LABORATORIES, INC.

Laboratory Report

CLIENT [redacted] JOB NO. 1163.061.525

DESCRIPTION NY - Quality Control Summary

Volatile Organics: Matrix Spike and Matrix Spike Duplicate

Date Analyzed 7-31-91 DATE COLLECTED 7-25-91 DATE RECEIVED 7-26-91

	SAMPLE INFORMATION			MATRIX SPIKE AND MATRIX SPIKE DUPLICATE					
	SAMPLE #	MATRIX	SAMPLE RESULT	SPIKE ADDED	MS CONC.	RECOVERY %	MSD CONC	RECOVERY %	RPD %
1,1-DICHLOROETHENE	M8744	Water	<5.00	50.0	58.8	118.	54.5	109.	8.
TRICHLOROETHENE	↓	↓	<5.00	↓	54.2	108.	51.6	103.	5.
BENZENE			64.4		111.	94.	111.	94.	0.
TOLUENE			86.7		132.	90.	124.	74.	20.
CHLOROBENZENE	↓	↓	<5.00	↓	52.3	105.	47.3	95.	10.

Section No. C
Revision No. 0
Date: 10/01/91
Page 41 of 53

Comments: MS Stock Solution # V151

Certification No.: 10155

Units: µg/l

MS = MATRIX SPIKE
MSD = MATRIX SPIKE DUPLICATE
RPD = RELATIVE PERCENT DIFFERENCE

Authorized: [signature]

Date: August 30, 1991

320199

OBG Laboratories Inc. an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300 Box 4942 / Syracuse NY 13221 / (315) 437 0200

LABORATORIES, INC.

Laboratory Report

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION - Quality Control Summary

Volatile Organics: Matrix Spike and Matrix Spike Duplicate

Date Analyzed 7-27-91 DATE COLLECTED 7-24-91 DATE RECEIVED 7-24-91

	SAMPLE INFORMATION			MATRIX SPIKE AND MATRIX SPIKE DUPLICATE					
	SAMPLE #	MATRIX	SAMPLE RESULT	SPIKE ADDED	MS CONC.	RECOVERY %	MSD CONC.	RECOVERY %	RPD %
1,1-DICHLOROETHENE	M8638	Solid	<620.	14500.	11800.	81.	12200.	84.	4.
TRICHLOROETHENE	↓	↓	<620.	↓	12200.	84.	12400.	86.	2.
BENZENE			18800.		30300.	79.	31800.	90.	15.
TOLUENE			8480.		20100.	80.	20600.	84.	5.
CHLOROBENZENE	↓	↓	<670.	↓	12100.	83.	12300.	85.	2.

Section No. ___C___
Revision No. 0
Date: 10/01/91
Page 42 of 53

320200

Comments: MS Stock Solution # Surr 1/08/91

Certification No.: 10155

Units: µg/kg dry weight

MS = MATRIX SPIKE
MSD = MATRIX SPIKE DUPLICATE
RPD = RELATIVE PERCENT DIFFERENCE

Authorized: Thomas Kellyanda

Date: August 30, 1991

OBG Laboratories Inc. an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

LABORATORIES, INC.

Laboratory Report

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____ - Quality Control Summary

Volatile Organics; Matrix Spike and Matrix Spike Duplicate

Date Analyzed 7-26-91 DATE COLLECTED 7-24-91 DATE RECEIVED 7-24-91

	SAMPLE INFORMATION			MATRIX SPIKE AND MATRIX SPIKE DUPLICATE					
	SAMPLE #	MATRIX	SAMPLE RESULT	SPIKE ADDED	MS CONC.	RECOVERY %	MSD CONC	RECOVERY %	RPD %
1,1-DICHLOROETHENE	M8636	Solid	<6.00	59.4/60.3	67.9	114.	66.6	110.	4.
TRICHLOROETHENE	↓	↓	↓	↓	49.3	83.	50.0	83.	0.
BENZENE					62.4	105.	65.0	108.	3.
TOLUENE					71.9	121.	73.4	122.	1.
CHLOROBENZENE					58.3	98.	63.6	105.	7.

Section No. ___C___
Revision No. 0
Date: 10/01/91
Page 43 of 53

Comments: MS Stock Solution # V151

Certification No.: 10155

Units: µg/kg dry weight

MS = MATRIX SPIKE
MSD = MATRIX SPIKE DUPLICATE
RPD = RELATIVE PERCENT DIFFERENCE

Authorized: _____

Date: August 30, 1991

320201

OBG Laboratories Inc. an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

Laboratory Report

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION Water - Quality Control Summary

Volatile Organics: Surrogate Recoveries

Date Analyzed 7-26,27,29-91 DATE COLLECTED 7-24-91 DATE RECEIVED 7-24-91

Surrogate	1.	2.	3.
Sample #			
M8628	96.	102.	99.
M8629	98.	102.	100.
M8630	98.	104.	101.
M8631	101.	102.	98.
M8632	100.	103.	101.
M8633	102.	102.	101.
M8633MS	104.	104.	104.
M8633MSD	105.	102.	104.
M8634	103.	108.	101.
M8635	106.	104.	100.
M8640	99.	103.	100.
M8641	103.	104.	102.

Comments: Stock Solution # V165

1. 1,2-Dichloroethane-D4
2. Toluene D8
3. 4-Bromofluorobenzene

Certification No.: 10155

Units: Percent

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

OBG LABORATORIES, INC.

Section No. C
Revision No. 0
Date: 10/01/91

Laboratory Report

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION Water - Quality Control Summary

Volatile Organics: Surrogate Recoveries

Date Analyzed 7-27,29-30,8-1-91 DATE COLLECTED 7-24-91 DATE RECEIVED 7-25-91

Surrogate	1.	2.	3.
Sample #			
M8659	105.	102.	102.
M8660	109.	104.	105.
M8661	110.	104.	103.
M8662	108.	104.	103.
M8663	101.	103.	100.
M8664	104.	102.	101.
M8665	97.	103.	100.
M8666	102.	101.	101.
M8667	111.	104.	102.
M8668	108.	101.	105.
M8669	107.	109.	105.
M8670	109.	104.	103.
M8670MS	114.	107.	105.
M8670MSD	113.	105.	108.
M8671	115.	104.	104.
M8672	103.	103.	100.
M8673	109.	104.	104.
M8674	106.	104.	103.

Comments: Stock Solution # V165

1. 1,2-Dichloroethane-D4
2. Toluene D8
3. 4-Bromofluorobenzene

Certification No.: 10155

Units: Percent

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

OBG LABORATORIES, INC.

Laboratory Report

CLIENT ... JOB NO. 1163.061.525

DESCRIPTION Water - Quality Control Summary

Volatile Organics: Surrogate Recoveries

Date Analyzed 7-31,8-1,2-91 DATE COLLECTED 7-25-91 DATE RECEIVED 7-26-91

Surrogate	1.	2.	3.
Sample #			
M8743	112.	105.	106.
M8744	110.	104.	103.
M8744MS	112.	106.	105.
M8744MSD	110.	99.	100.
M8745	112.	104.	102.
M8746	110.	104.	103.
M8747	110.	107.	105.
M8748	112.	104.	103.
M8749	107.	104.	101.
M8750	114.	104.	105.
M8751	111.	104.	104.
M8752	114.	105.	105.
M8753	111.	105.	104.
M8754	111.	109.	100.

Comments: Stock Solution # V165
1. 1,2-Dichloroethane-D4
2. Toluene D8
3. 4-Bromofluorobenzene

Certification No.: 10155

Units: Percent

Authorized: [signature]

Date: September 3, 1991

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

OBG LABORATORIES, INC.

Laboratory Report

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION Water - Quality Control Summary

Volatile Organics: Surrogate Recoveries/Method Blanks

Date Analyzed 7-26 thru 8-2-9 DATE COLLECTED _____ - _____ DATE RECEIVED _____ - _____

Surrogate	1.	2.	3.
Sample #			
VBLK072601	97.	102.	97.
VBLK072701	102.	103.	98.
VBLK072901	100.	103.	98.
VBLK072902	104.	104.	102.
VBLK073002	106.	104.	102.
VBLK073101	105.	105.	102.
VBLK080101	105.	106.	102.
VBLK080201	110.	104.	102.

Comments: Stock Solution # V165

1. 1,2-Dichloroethane-D4
2. Toluene D8
3. 4-Bromofluorobenzene

Certification No.: 10155

Units: Percent

Authorized: [signature]

Date: September 3, 1991

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

OBG LABORATORIES, INC.

Laboratory Report

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION Solid - Quality Control Summary

Volatile Organics: Surrogate Recoveries

Date Analyzed 7-26,27-91 DATE COLLECTED 7-24-91 DATE RECEIVED 7-24-91

Surrogate / Sample #	1.	2.	3.
M8636	87.	116.	78.
M8636MS	88.	121.	71.
M8636MSD	89.	115.	81.
M8637	90.	109.	86.
M8638	88.	83.	84.
M8639	84.	102.	89.
VBLK072601	87.	98.	97.
VBLK0727Ext	107.	99.	102.
M8638MS	89.	82.	83.
M8638MSD	84.	80.	80.

Comments: Stock Solution # V165, V161

1. 1,2-Dichloroethane-D4
2. Toluene D8
3. 4-Bromofluorobenzene

Certification No.: 10155

Units: Percent

Authorized: _____

Date: September 3, 1991

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

OBG LABORATORIES, INC.

Section No. C
Revision No. 0
Date: 10/01/91
Page 49 of 53

Laboratory Report

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION Laboratory Control Sample #080391

DATE COLLECTED _____ - _____ DATE RECEIVED _____ - _____

	Observed Conc.	Actual Conc.	% Recovery
Total Metals:			
MAGNESIUM	9.9	10.	99.
SODIUM	9.8	10.	98.
CALCIUM	9.5	10.	95.
POTASSIUM	9.8	10.	98.
IRON	0.98	1.0	98.

Comments:

Certification No.: 10155

Units: mg/l

Authorized: Thomas A. Alexander

Date: August 28, 1991

OBG Laboratories, Inc., *an O'Brien & Gere Limited Company*
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

Laboratory Report

JOB NO. 1163.061.525

Laboratory Control Sample #080491

DATE COLLECTED - DATE RECEIVED -

	Observed Conc.	Actual Conc.	% Recovery
l Metals:			
GNESIUM	9.6	10.	96.
DIUM	9.6	10.	96.
LCIUM	9.2	10.	92.
TASSIUM	9.8	10.	98.
	0.95	1.0	95.

Certification No.: 10155

Units: mg/l

Authorized: Thomas C. Wilczynski

Date: August 28, 1991

Comments: NC = Not calculated (SR>4x spike added)

Certification No.: 10155

Units: mg/l

Authorized: Thomas C. Wilczynski

Date: August 29, 1991

es, Inc., an O'Brien & Gere Limited Company
Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

OBG Laboratories Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300 Box 4942 / Syracuse, NY 13221 / (315) 437-0200

OBG LABORATORIES, INC.

Laboratory Report

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION _____ - Water - Quality Control Summary

Trace Metals: Matrix Spike, Duplicate and Method Blank

DATE COLLECTED 7-24,25-91 DATE RECEIVED 7-24,26-91

PARAMETER	DATE ANALYZED	LABORATORY NUMBER OF SPIKED SAMPLE	SPIKED SAMPLE RESULT	SAMPLE RESULT (SR)	SPIKE ADDED (SA)	SPIKE (%R)	LABORATORY NUMBER OF DUPLICATE SAMPLE	SAMPLE RESULT (S)	DUPLICATE RESULT (D)	DUPLICATE RPD	METHOD BLANK
Total Metals:											
MAGNESIUM	8-7-91	M8633	55.8	10.	50.	92.	M8633	10.	9.	11.	<1.
SODIUM	↓	↓	470.	380.	100.	90.	↓	380.	380.	0.	<1.
CALCIUM			187.	100.	100.	87.		100.	100.	0.	<1.
POTASSIUM			121.	76.	50.	90.		76.	75.	1.	<5.
IRON			1.26	0.36	1.0	90.		0.36	0.36	0.	<0.05
Total Metals:											
MAGNESIUM	8-8-91	M8793	47.4	<1.	50.	95.	M8793	<1.	<1.	-	<1.
SODIUM	↓	↓	174.	80.	100.	94.	↓	80.	77.	4.	<1.
CALCIUM			608.	550.	100.	NC		550.	540.	2.	<1.
POTASSIUM			53.2	8.	50.	90.		8.	7.	13.	<5.
IRON			1.01	0.10	1.0	91.		0.10	0.10	0.	<0.05

Section No. ____ C ____
Revision No. ____ 0 ____
Date: 10/01/91
Page 51 of 53

320209

Comments: NC = Not calculated (SR>4x spike added)

Certification No.: 10155

Units: mg/l

Authorized: _____

Date: August 29, 1991

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300 Box 4942 / Syracuse, NY 13221 / (315) 437-0200

OBG LABORATORIES, INC.

Laboratory Report

CLIENT _____ JOB NO. 1663.061.525

DESCRIPTION _____ - Quality Control Summary

Wet Chemistry: Matrix Spike, Duplicate, Reference Sample & Reagent Blank

_____ DATE COLLECTED 7-25-91 DATE RECEIVED 7-26-91

PARAMETERS	DATE ANALYZED	SAMPLE INFORMATION MATRIX	SAMPLE #	SAMPLE VALUE	MATRIX SPIKE CONC. OF SPIKE ADDED	SPIKED SAMPLE RESULT	RECOVERY %	DUPLICATE DUPLICATE VALUE	RPD %	REFERENCE SAMPLE TRUE VALUE	REFERENCE SAMPLE RESULT	RECOVERY %	REAGENT BLANK VALUE
TOTAL ALKALINITY	8-05-91	Water	M8742	36.	-	-	-	36.	0.	60.	58.	97.	<1
PHENOLPHTHALEIN ALKALINITY	8-05-91		M8742	<1.	-	-	-	<1.	-	-	-	-	<1
SULFATE	8-23-91		M8735	360.	-	-	-	360.	0.	-	-	-	<1
SULFATE	8-23-91		M8736	1500.	1000.	2500.	100.	-	-	120.	120.	100.	<1
CARBONATE	8-05-91		M8742	<1.	-	-	-	<1.	-	-	-	-	<1
BICARBONATE	8-05-91		M8742	36.	-	-	-	36.	0.	-	-	-	<1
TOTAL ALKALINITY	8-05-91		M8801	2200.	-	-	-	2200.	0.	60.	59.	98.	<1
PHENOLPHTHALEIN ALKALINITY	8-05-91		M8801	2200.	-	-	-	2200.	0.	-	-	-	<1
SULFATE	8-20-91		M8798	22.	-	-	-	21.	5.	120.	121.	101.	<1
SULFATE	8-20-91		M8800	340.	50.	397.	102.	-	-	120.	121.	101.	<1
CHLORIDE	8-22-91		M8801	77.	10.	85.	82.	77.	0.	50.	48.	97.	<1
CHLORIDE	8-26-91		M8733	95,000.	*	*	*	94,000.	1.	50.	49.	98.	<1.
CARBONATE	8-05-91		M8801	<1.	-	-	-	<1.	-	-	-	-	-
BICARBONATE	8-05-91		M8801	<1.	-	-	-	<1.	-	-	-	-	-

Section No. 0 C
Revision No. 0
Date: 10/01/91
Page 52 of 53

Comments: *Sample value exceeds spike level more than 4 times.

Certification No.: 10155

Units: mg/l

RPD = Relative Percent Difference

Authorized: Thomas A. Clark

Date: September 6, 1991

OBG Laboratories Inc. an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300, Box 4942 / Syracuse, NY 13221 / (315) 437-0200

320210

OBG LABORATORIES, INC.

Laboratory Report

CLIENT _____ JOB NO. 1163.061.525

DESCRIPTION Water & Soil - Quality Control Summary

Wet Chemistry; Matrix Spike, Duplicate, Reference Sample & Reagent Blank

DATE COLLECTED 7-24-91 DATE RECEIVED 7-24-91

PARAMETERS	DATE ANALYZED	SAMPLE INFORMATION			MATRIX SPIKE			DUPLICATE		REFERENCE SAMPLE			REAGENT BLANK
		MATRIX	SAMPLE #	SAMPLE VALUE	CONC. OF SPIKE ADDED	SPIKED SAMPLE RESULT	RECOVERY %	DUPLICATE VALUE	RPD %	TRUE VALUE	REFERENCE SAMPLE RESULT	RECOVERY %	VALUE
TOTAL ALKALINITY	7-29-91	Water	M8633	170.	-	-	-	180.	6.	60.	59.	98.	
PHENOLPHTHALEIN ALKALINITY	7-29-91	Water	M8633	<1.	-	-	-	<1.	-	-	-	-	
PERCENT TOTAL SOLIDS	8-01-91	Soil	M8636	71.	-	-	-	55.	25.	-	-	-	
CHLORIDE	8-07-91	Water	M8633	510.	-	-	-	530.	4.	50.	50.	100.	
SULFATE	8-18-91	Water	M8633	165.	50.	220.	110.	160.	3.	120.	116.	97.	
CHLORIDE	8-26-91	Water	M8633	510.	50.	550.	80.	-	-	-	-	-	

Section No. C
Revision No. 0
Date: 10/01/91
Page 53 of 53

Comments:

Certification No.: 10155

RPD = Relative Percent Difference

Units: mg/l

Authorized: _____

Date: September 6, 1991

320211

OBG Laboratories Inc. an O'Brien & Gere Limited Company
5000 Brittonfield Parkway / Suite 300 Box 4942 / Syracuse, NY 13221 / (315) 437-0200