APPENDIX A3

COLUMBIA ANALYTICAL SERVICES, INC.

TABLE OF CONTENTS

QUALITY ASSURANCE MANUAL

Columbia Analytical Services, Inc.

1317 South 13th Avenue
Kelso, Washington 98626
(360) 577-7222

January 10, 2006

Approved by:

Laboratory Director/Technical Director: _____
Jeff Christian

Quality Assurance Manager: _____
Lee Wolf

Technical Director - Metals: _____
Jeff Coronado

Technical Director - Inorganics: _____
Todd Poyfair

Technical Director - Organics: _____
Jeff Grindstaff

Technical Director - Microbiology: _____
Lynda Huckestein

DOCUMENT CONTROL
NON-CONTROLLED
NUMBER: COPY

Initials: _____ Date: _____

2.0 TABLE OF CONTENTS

Figures Page

Appendices Page

3.0 INTRODUCTION AND COMPANY QUALITY ASSURANCE POLICY

Columbia Analytical Services, Inc. (CAS) is an employee-owned professional analytical services laboratory which performs chemical and microbiological analyses on a wide variety of sample matrices, including drinking water, groundwater, surface water, wastewater, soil, sludge, sediment, tissue, industrial and hazardous waste, and other material.

It is a policy at CAS that there will be sufficient Quality Assurance (QA) activities conducted in the laboratory to ensure that all analytical data generated and processed will be scientifically sound, legally defensible, of known and documented quality, and will accurately reflect the material being tested. This goal is achieved by ensuring that adequate Quality Control (QC) procedures are used throughout the monitoring process, and by establishing a means to assess performance of these Quality Control and other QA activities. Policies and procedures are established in order to meet the quality objectives of clients, accrediting authorities, and certifying organizations. The Quality System is established to meet the requirements of the National Environmental Laboratory Accreditation Conference (NELAC).

CAS maintains control of analytical results by adhering to written standard operating procedures (SOPs) and by observing sample custody requirements. All analytical results are calculated and reported in units consistent with project specifications to allow comparability of data.

We recognize that quality assurance requires a commitment to quality by everyone in the organization - individually, within each operating unit, and throughout the entire laboratory.

CAS is a network of laboratories. In addition to the Kelso, WA facility, to which this manual is applicable, CAS also operates laboratories in California, Florida, New York, Arizona, and Texas.

The information in this document has been organized according to the format described in *EPA Requirements for Quality Management Plans, EPA QA/R-2,* USEPA, 2001; and *EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5,* USEPA, 2001.

4.0 PROGRAM DESCRIPTION

The purpose of the QA program at CAS is to ensure that our clients are provided with analytical data that is scientifically sound, legally defensible, and of known and documented quality. The concept of Quality Assurance can be extended, and is expressed in the mission statement of CAS:

> "The mission of Columbia Analytical Services, Inc., is to provide high quality, cost-effective, and timely professional testing services to our customers. We recognize that our success as a company is based on our ability to maintain customer satisfaction. To do this requires constant attention to customer needs, maintenance of state-of-the-art testing capabilities and successful management of our most important asset - our people - in a way that encourages professional growth, personal development and company commitment."

In support of this mission, our QA program addresses all aspects of laboratory operations, including laboratory organization and personnel, standard operating procedures, sample management, sample and quality control data, calibration practices, standards traceability data, equipment maintenance records, method proficiency data (such as method detection limit studies and control charts), document control/storage and staff training records.

4.1 Facilities and Equipment

CAS features over 25,000 square feet of laboratory and administrative workspace. The laboratory has been designed and constructed to provide safeguards against cross-contamination of samples and is arranged according to work function, which enhances the efficiency of analytical operations. The ventilation system has been specially designed to meet the needs of the analyses performed in each work space. Also, CAS minimizes laboratory contamination sources by employing janitorial and maintenance staff to ensure that good housekeeping and facilities maintenance are performed. In addition, the segregated laboratory areas are designed for safe and efficient handling of a variety of sample types. These specialized areas (and access restrictions) include:

- Shipping and Receiving/Purchasing
- Sample Management Office, including controlled-access sample storage areas
- Inorganic/Metals Sample Preparation Laboratories (2)
- Inorganic/Metals “clean room” sample preparation laboratory
- ICP-AES Laboratory
- ICP-MS Laboratory
- AA Laboratory
- Water Chemistry & General Chemistry Laboratories
- Semi-volatile Organics Sample Preparation Laboratories (3)
- Gas Chromatography/High Performance Liquid Chromatography Laboratory

- Gas Chromatography/Mass Spectrometry Laboratory
- Petroleum Hydrocarbon Laboratory
- Semi-volatile Organics Drinking Water Laboratory
- Volatile Organics Laboratory
  - Separate sample preparation laboratory
  - Access by semi-volatile sample preparation staff only after removing lab coat and solvent-contaminated gloves, etc.
- Microbiology Laboratory
- Laboratory Deionized Water System
- Laboratory Management, Client Service, Report Generation and Administration
- Data Archival, Data Review and support functions areas
- Information Technology (IT) and LIMS

In addition, the designated areas for sample receiving, refrigerated sample storage, dedicated sample container preparation and shipping provide for the efficient and safe handling of a variety of sample types. Figure 4-1 shows the facility floor plan. The laboratory is equipped with state-of-the-art analytical and administrative support equipment. The equipment and instrumentation are appropriate for the procedures in use. Appendix C lists the major equipment, illustrating the laboratory's overall capabilities and depth.

4.2 Technical Elements of the Quality Assurance Program

The Quality Assurance Program provides a platform on which technical operations are based. The program provides laboratory organization, procedures, and policies by which the laboratory operates. The necessary certifications and approvals administered by external agencies are maintained. This includes method approvals and audit administration. In addition, internal audits are performed to assess compliance with policies and procedures. Standard Operating Procedures (SOPs) are maintained for technical and administrative functions. A document control system is used for SOPs, as well as laboratory notebooks, and this QA Manual. A list of QA Program documents is provided in Appendix A.

Acceptable calibration procedures are defined in the SOP for each test procedure. Calibration procedures for other laboratory equipment (balances, thermometers, etc.) are also defined. Quality Control (QC) procedures are used to monitor the testing performed. Each analytical procedure has associated QC requirements to be achieved in order to demonstrate data quality. The use of method detection limit studies, control charting, and preventative maintenance procedures further ensure the quality of data produced. Proficiency Testing (PT) samples are used as an external means of monitoring the quality and proficiency of the laboratory. PT samples are obtained from qualified vendors and are performed on a regular basis. In addition to method proficiency, documentation of analyst training is performed to ensure proficiency and competency of laboratory analysts and technicians. Sample handling and custody procedures are defined in SOPs. Procedures are also in place to monitor the sample storage areas. The technical elements of the QA program are discussed in further detail in later sections of this QA manual.

4.3 Operational Assessments

There are a number of methods used to assess the laboratory and its daily operations. In addition to the routine quality control (QC) measurements to measure quality, the senior laboratory management examines a number of other indicators to assess the overall ability of the laboratory to successfully perform analyses for its clients. On-time performance, report quality, training, and Quality Assurance are a few of the items that are used to assess performance from an external perspective. A frequent, routine assessment must also be made of the laboratory's facilities and resources in anticipation of accepting an additional or increased workload.

CAS utilizes a number of different methods to ensure that adequate resources are available in anticipation of the demand for service. Regularly scheduled senior staff meetings, tracking of outstanding proposals and an accurate, current synopsis of incoming work all assist the senior staff in properly allocating resources to achieve the required results. All Requests for Proposal (RFP) documents are reviewed by the Project Chemist and appropriate managerial staff to identify any project specific requirements that differ from the standard practices of the laboratory. Any requirements that cannot be met are noted and communicated to the client, as well as requesting the client to provide any project specific Quality Assurance Plans (QAPPs) if available. A weekly status meeting is also conducted with the laboratory staff by the Client Services Manager to inform the staff of the status of incoming work, future projects, or project requirements.

4.4 Document Control

Procedures for control and maintenance of documents are described in the *SOP for Document Control (ADM-DOC_CTRL).* The procedures described in the SOP include distribution, tracking, filing, and copyrighting of CAS controlled documents. The requirements of the SOP apply to all standards preparation logbooks, instrument maintenance logbooks, run logbooks, standard operating procedures (SOPs), quality assurance manuals (QAMs), quality assurance project plans (QAPPs), Environmental Health & Safety (EHS) manuals, and other controlled CAS documents.

Each controlled copy of a controlled document will be released only after a document control number is assigned and the recipient is recorded on a document distribution list. Filing and distribution is performed by the Quality Assurance Manager, or designee, and ensure that only the most current version of the document is distributed and in use. A document control number is assigned to logbooks. Completed logbooks that are no longer in use are archived in a master logbook file.

CAS maintains a records system that ensures all laboratory records (including raw data, reports, and supporting records) are retained and available. The archiving system is described in the *SOP for Data Archiving (ADM-ARCH).*

4.5 Subcontracting

Analytical services are subcontracted when CAS/Kelso needs to balance workload or when the requested analyses are not performed by CAS/Kelso. Subcontracting is only done with the knowledge and approval of the client. Subcontracting to another CAS laboratory is preferred over external-laboratory subcontracting. Further, sub-contracting is done using capable and qualified laboratories. Established procedures are used to qualify external subcontract laboratories. These procedures are described in the *SOP for Qualification of Subcontract Laboratories (ADM-SUBLAB).* The Quality Assurance Director is responsible for qualifying and oversight of subcontract laboratories.

4.6 Procurement

The quality level of reagents and materials (grade, traceability, etc.) required is specified in analytical SOPs. Department supervisors ensure that the proper materials are purchased. Inspection and verification of material ordered is performed at the time of receipt by receiving personnel. The receiving staff labels the material with the date received. Expiration dates are assigned (by the laboratory user) as appropriate for the material. Storage conditions and expiration dates are specified in the analytical SOP. The procedures for purchasing and procurement are described in the *SOP for Purchasing through CAS Purchasing Agent (SOP ADM-PUR).* Also, refer to section 10.4 for a discussion of reference materials.

Figure 4-1
CAS/Kelso Laboratory Floor Plan

Room Designations			
100A Organic Extractions Lab	111 General Chemistry Lab	213A Digestion Lab	220 Organic Extraction Lab
100B Electrical Room	112A Microbiology Lab	213B Sample Preparation	221 Organic Extraction Lab
102 Chromatography Lab	112B Copy Center	214 General Chemistry Lab	222 Purchasing Office
104A Organics Extraction Lab	113 Atomic Absorption Lab	215A Drinking Water Lab	223 General Receiving
104B Chromatography Lab	114A SMO / Receiving	215B Records/Admin	300 Janitorial Room
106 De-ionized Water Room	114B SMO / Receiving	216 Office Area	999 Switchboard
107 Oven Room	115A Metals Digestion Lab	217 Sample Storage	
108 TCLP Lab	115B ICP Lab	218A VOA Prepration	
109 Sample Preparation	212A ICP / MS Lab	218B VOA Lab	
110 Lunchroom	212B Clean Digestion Lab	219 GC/MS Lab	

TITLE	CAS Kelso Floor Plans
FILENAME	KELSOLABFLRPLAN.VSD
PAGE	1 OF 2
DATE	12/28/04
DESCRIPTION	Laboratory

Legend

Fume Hood — Sink

Emergency Shower — Sink

Cooler

5.0 PROFESSIONAL CONDUCT AND ETHICAL PRACTICES

One of the most important aspects of the success of CAS is the emphasis placed on the integrity of the data provided and services performed. To promote product quality, employees are required to comply with certain standards of conduct and ethical practices. The following examples of CAS policy are representative of these standards, and are not intended to be limiting or all-inclusive:

- Under no circumstances is the willful act of fraudulent manipulation of analytical data condoned. Such acts are to be reported immediately to senior management for appropriate corrective action. Unless specifically required in writing by a client, alteration, deviation or omission of written contractual requirements is not permitted. Such changes must be in writing and approved by senior management.

- Falsification of data in any form will not be tolerated. While much analytical data is subject to professional judgment and interpretation, outright falsification, whenever observed or discovered, will be documented, and appropriate remedies and punitive measures will be taken toward those individuals responsible. Employee discipline is progressive in its severity and each situation is handled individually in that the discipline is designed to fit the circumstances. Potential disciplinary actions may include a verbal warning, written warning, a second written notice (more severe and more strongly worded than a warning), suspension without pay, demotion, or termination.

- It is the responsibility of all CAS employees to safeguard sensitive company and client information. The nature of our business and the well being of our company and of our clients is dependent upon protecting and maintaining proprietary company/client information. All information, data, and reports (except that in the public domain) collected or assembled on behalf of a client is treated as confidential. Information may not be given to third parties without the consent of the client. Unauthorized release of confidential information about the company or its clients is taken seriously and is subject to formal disciplinary action.

All employees are required to sign and adhere to the requirements set forth in the CAS *Confidentiality and Conflicts of Interest Employee Agreement* and the CAS *Commitment to Excellence in Data Quality Policy.* All employees receive in-house ethics training and are periodically reminded of their data quality and ethical conduct responsibilities.

CAS makes every attempt to ensure that employees are free from any commercial, financial, or other undue pressures that might affect their quality of work. Related policies are described in the CAS Employee Handbook. This includes the CAS Ombudsman Program, the CAS Open Door Policy, and the use of flexible work hours. Operational assessments are regularly made to ensure that project planning is performed and that adequate resources are available during anticipated periods of increased workloads (Section 4.3). Procedures for subcontracting work are established, and within the CAS laboratory network additional capacity is typically available for subcontracting, if necessary.

6.0 ORGANIZATION AND RESPONSIBILITIES

The CAS/Kelso staff, consisting of approximately 110 employees, includes chemists, technicians and support personnel. They represent diverse educational backgrounds and experience, and provide the comprehensive skills that the laboratory requires. During seasonal workload increases, additional temporary employees may be hired to perform specific tasks.

CAS is committed to providing an environment that encourages excellence. Everyone within CAS shares responsibility for maintaining and improving the quality of our analytical services. The responsibilities of key personnel within the laboratory are described below. Table 6-1 lists the CAS/Kelso personnel assigned to these key positions. Managerial staff members are provided the authority and resources needed to perform their duties. An organizational chart of the laboratory, as well as the resumes of these key personnel, can be found in Appendix B.

- The role of the **Laboratory Director** is to provide technical, operational, and administrative leadership through planning, allocation and management of personnel and equipment resources. The Laboratory Director provides leadership and support for the QA program and is responsible for overall laboratory efficiency and the financial performance of the Kelso facility. The Laboratory Director has the authority to stop work in response to quality problems. The Laboratory Director also provides resources for implementation of the QA program, reviews and approves this QA Manual, reviews and approves standard operating procedures (SOPs), and provides support for business development by identifying and developing new markets through continuing support of the management of existing client activities.

- The responsibility of the **Quality Assurance Manager** (QAM) is to oversee implementation of the quality program and to coordinate QA activities within the laboratory. The QAM works with laboratory production units to establish effective quality control and assessment plans. The QAM has the authority to stop work in response to quality problems. The QAM is responsible for maintaining the QA Manual and performing an annual review of it; reviewing and approving SOPs and coordinating the annual review of each SOP; maintaining QA records such as metrological records, archived logbooks, PT sample results, etc.; document control; conducting PT sample studies; approving nonconformity and corrective action reports; maintaining the laboratory's certifications and approvals; performing internal QA audits; preparing QA activity reports; etc. The QAM reports directly to the Laboratory Director. The QAM also interacts with the CAS Quality Assurance Director. It is important to note that when evaluating data, the QAM does so in an objective manner and free of outside, or managerial, influence.

  The Quality Assurance Director is responsible for the overall QA program at all the CAS laboratories. The QA Director is responsible for performing an annual on-site audit at each CAS laboratory and preparing a written report; maintaining a data base of information about state certifications and accreditation programs; writing laboratory-wide SOPs; maintaining a data base of CAS-approved subcontract laboratories; providing assistance to the laboratory QA staff and laboratory managers; preparing a quarterly QA activity report; etc.

- In the case of absence of the Laboratory Director or QA Manager, deputies are assigned to act in that role. Default deputies for these positions are the Client Services Manager or Organics Department Manager (for the Laboratory Director) and the QA Director or Laboratory Director (for the QA manager).

- The **Environmental Health and Safety Officer** (EH&S) is responsible for the administration of the laboratory health and safety policies. This includes the formulation and implementation of safety policies, the supervision of new-employee safety training, the review of accidents, incidents and prevention plans, the monitoring of hazardous waste disposal and the conducting of departmental safety inspections. The EH&S officer is also designated as the Chemical Hygiene Officer. The EH&S Officer has a dotted-line reporting responsibility to CAS' EH&S Director.

- The **Client Services and Sample Management Office Manager** is responsible for the Client Services Department (customer services/project chemists, and Electronic Data Deliverables group) and the sample management office/bottle preparation sections. The Client Services Department provides a complete interface with clients from initial project specification to final deliverables. The sample management office handles all the activities associated with receiving, storage, and disposal of samples. The Client Services Manager has the authority to stop subcontractor work in response to quality problems.

- The **Project Chemist** is a senior-level scientist assigned to each client to act as a technical liaison between the client and the laboratory. The project chemist is responsible for ensuring that the analyses performed by the laboratory meet all project, contract, and regulatory-specific requirements. This entails coordinating with the CAS laboratory and administrative staff to ensure that client-specific needs are understood, and that the services CAS provides are properly executed and satisfy the requirements of the client.

- The Analytical Laboratory is divided into operational units based upon specific disciplines. Each department is responsible for establishing, maintaining and documenting a quality control program based upon the unique requirements within the department.. Each **Department Manager and Supervisor** has the responsibility to ensure that quality control functions are carried out as planned, and to guarantee the production of high quality data. Department managers and bench-level supervisors have the responsibility to monitor the day-to-day operations to ensure that productivity and data quality objectives are met. Each department manager has the authority to stop work in response to quality problems in their area. Analysts have the responsibility to carry out testing according to prescribed methods, SOPs, and quality control guidelines particular to the laboratory in which he/she is working.

- The **Sample Management Office** plays a key role in the laboratory QA program by maintaining documentation for all samples received by the laboratory, and by assisting in the archival of all laboratory results. The sample management office staff is also responsible for the proper disposal of samples after analysis.

- **Information Technology** (IT) staff are responsible for the administration of the Laboratory Information Management System (LIMS) and other necessary support services. Other functions of the IT staff include laboratory network maintenance, IT systems development and implementation, education of analytical staff in the use of scientific software, Electronic Data Deliverable (EDD) generation, and data back-up, archival and integrity operations.

Table 6-1
Summary of Technical Experience and Qualifications

Personnel	Years of Experience	Project Role
Jeff Christian, B.S.	27	Laboratory Director
Lee Wolf, B.S.	20	Quality Assurance Manager
Lynda Huckestein, B.S.	17	Client Services Manager Sample Management Office Manager
Jeff Coronado, B.S.	16	Inorganics Department Manager
Todd Poyfair, B.S.	14	Gas Chromatography and Petroleum Hydrocarbons Department Manager
Jeff Grindstaff, B.S.	17	Volatiles and Semivolatiles GC/MS Department Manager
Jim Smith, B.S.	18	Organics Drinking Water Department Manager
Eileen Arnold, B.A.	24	Environmental Health and Safety Officer
Paul Gowan, B.A.	19	Technical Information Specialist
Lawrence Jacoby, Ph.D.	33	CAS Quality Assurance Director
Gary Ward, M.S.	30	CAS Information Technology Director CAS Chief Quality Officer
Steve Vincent, B.S.	30	CAS President

7.0 INFORMATION MANAGEMENT

The generation, compilation, reporting, and archiving of electronic data is a critical component of laboratory operations. In order to generate data of known and acceptable quality, the quality assurance systems and quality control practices for electronic data systems must be complete and comprehensive and in keeping with the overall quality assurance objectives of the organization. CAS management provides the tools and resources to implement electronic data systems and establishes information technology standards and policies. Appendix C lists major automated data processing equipment.

7.1 Software Quality Assurance Plan

CAS has defined practices for assuring the quality of the computer software used throughout all laboratory operations to generate, compile, report, and store electronic data. These practices are described in the CAS Software Quality Assurance Plan (SQAP). The purpose of the SQAP is to describe the policies and practices for the procurement, configuration management, development, validation and verification, data security, maintenance, and use of computer software. The policies and practices described in the plan apply to purchased computer software as well as to internally developed computer software. Key components of configuration management plan are policies for controlling the software version that is in use in the laboratory.

7.2 IT Support

The local CAS Information Technology (IT) department is established to provide technical support for all computing systems. The IT department staff continually monitors the performance and output of operating systems. The IT department oversees routine system maintenance and data backups to ensure the integrity of all electronic data. A software inventory is maintained. Additional IT responsibilities are described in the SQAP.

In addition to the local IT department, CAS corporate IT provides support for network-wide systems. CAS also has personnel assigned to information management duties such as development and implementation of reporting systems; data acquisition, and Electronic Data Deliverable generation.

7.3 Information Management Systems

CAS has various systems in place to address specific data management needs. The CAS Laboratory Information Management System (LIMS) is used to manage sample information and invoicing. Access is controlled by password. This system is used to establish and define sample identification, analysis specifications, and provide a means of sample tracking. This system is used during sample login to generate the internal Service Request. The Service

Request provides a summary of client information, sample information, required analyses, work instructions, deliverable requirements and other necessary information provided on the chain of custody. The LIMS also is the basis for valuable sample tracking mechanisms used throughout the laboratory. Laboratory analysts generate responsibility reports from the LIMS and perform internal chain of custody via the LIMS.

Where possible, instrument data acquired locally is immediately moved to a server (Microsoft Windows2003® domain) dedicated to this function. This provides a reliable, easily maintained, high-volume acquisition and storage system for electronic data files. With password entry, users may access the system from many available computer stations, improving efficiency and flexibility. Another server is dedicated to data reporting, EDD generation, and administrative functions. Access to these systems is controlled by password. A standardized EDI (electronic data interchange) format is used as a reporting platform, providing functionality and flexibility for end users. With a common standardized communication platform, the EDI provides data reporting in a variety of hardcopy and electronic deliverable formats.

7.4 Backup and Security

CAS laboratory data is either acquired directly to the centralized acquisition server or acquired locally and then transferred to the server. All data is eventually moved to the centralized data acquisition server for reporting and archiving. Differential backups are performed on all file server information once per day, Sunday through Thursday. Full backups are performed each Friday night. Tapes are physically stored in a locked media cabinet within a locked, temperature controlled computer room.

Access to sample information and data is on a need-to-know basis. Access is restricted to the person's areas of responsibility. Passwords are required on all systems. No direct external, non-CAS access is allowed to any of our network systems.

The external e-mail system and Internet access is established via a single gateway to discourage unauthorized entry. CAS uses a closed system for company e-mail. Files, such as electronic deliverables, are sent through the external e-mail system only via a trusted agent. The external messaging system operates through a single secure gateway. Email attachments sent in and out of the gateway are subject to a virus scan. Because the Internet is not regulated, we use a limited access approach to provide a firewall for added security. Virus screening is performed continuously on all network systems.

8.0 SAMPLE MANAGEMENT

8.1 Sampling and Sample Preservation

The quality of analytical results is highly dependent upon the quality of the procedures used to collect, preserve and store samples. CAS recommends that clients follow sampling guidelines described in 40 CFR 136, 40 CFR 141, USEPA SW-846, and state-specific sampling guidelines, if applicable. Sampling factors that must be taken into account to insure accurate, defensible analytical results include:

- Amount of sample taken
- Type of container used
- Type of sample preservation
- Sample storage time
- Proper custodial documentation

CAS uses the sample preservation, container, and holding-time recommendations published in a number of documents. The primary documents of reference are: USEPA SW-846, Third Edition and Updates I, II, IIA, IIB, III for hazardous waste samples, and USEPA 600/4-79-020, 600/4-91-010, 600/4-82-057, 600/R-93/100, 600/4-88-039, 600/R-94-111, and Supplements; and *Standard Methods for the Examination of Water and Wastewater* for water and wastewater samples. The complete citation for each of these references can be found in Section 18.0 of this document. The container, preservation and holding time information for these references is summarized in Table 8-1 for soil, water, and drinking water. The current EPA CLP Statement of Work should be referred to for container, preservation and holding time information for CLP procedures. Where allowed by the project sampling and analytical protocols (such as Puget Sound Protocols) the holding time for sediment, soil, and tissue samples may be extended for a defined period when stored frozen at -20°C.

CAS routinely provides sample containers with appropriate preservatives for our clients. The containers are purchased as precleaned to a level 1 status, and conform to the requirements for analytical samples established by the USEPA. Certificates of analysis for the sampling containers are available to clients if requested. Reagent water used for sampling blanks (trip blanks, etc.) and chemical preservation reagents are tested by the laboratory to ensure that they are free of interferences and documented. Our sample kits typically consist of foam-lined, precleaned shipping coolers, (cleaned inside and out with appropriate cleaner, rinsed thoroughly and air-dried), specially prepared and labeled sample containers individually wrapped in protective material, (VOC vials are placed in a specially made, foam holder), chain-of-custody (COC) forms, and custody seals. Container labels and custody seals are provided for each container. Figure 8-1 shows the chain-of-custody form routinely used at CAS and included with sample kits. For large sample container shipments, the containers may be

shipped in their original boxes. Such shipments will consist of several boxes of labeled sample containers and sufficient materials (bubble wrap, COC forms, custody seals, shipping coolers, etc.) to allow the sampling personnel to process the sample containers and return them to CAS. The proper preservative is added to the sample containers prior to shipment, unless otherwise instructed by the client.

If any returning shipping cooler exhibits an odor or other abnormality after receipt and subsequent decontamination by laboratory personnel, a second, more vigorous decontamination process is employed. Containers exhibiting an odor or abnormality after the second decontamination process are promptly and properly discarded. CAS keeps client-specific shipping requirements on file and utilizes major transportation carriers to guarantee that sample shipping requirements (same-day, overnight, etc.) are met. CAS also provides courier service that makes regularly scheduled trips to the Greater Portland, Oregon Metropolitan area.

When CAS ships environmental samples to other laboratories for analysis each sample bottle is wrapped in protective material and placed in a plastic bag (preferably Ziploc®) to avoid any possible cross-contamination of samples during shipping. The sample management office (SMO) follows formalized procedures for maintaining the chain of custody of the sample(s) (SOP *for Chain of Custody for Sample Transfer between Laboratories* [SOP ADM-COC]), proper packaging and shipment, specification of proper methodology, etc. Blue or gel ice is the only temperature preservative used by CAS, unless otherwise specified by the client or receiving laboratory.

8.2 Sample Receipt and Handling

Standard Operating Procedures are established for the receiving of samples into the laboratory. These procedures ensure that samples are received and properly logged into the laboratory, and that all associated documentation, including chain of custody forms, is complete and consistent with the samples received. Complete documentation of all sample storage is maintained in order to preserve the integrity of the samples.

Once samples are delivered to the CAS sample management office (SMO), a Cooler Receipt and Preservation Check Form (CRF - See Figure 8-2 for an example) is used to assess the shipping cooler and its contents as received by the laboratory personnel. Verification of sample integrity includes the following activities:

- Assessment of custody seal presence/absence, location and signature;
- Temperature of sample containers upon receipt;
- Chain of custody documents properly used (entries in ink, signature present, etc.);
- Sample containers checked for integrity (broken, leaking, etc.);
- Sample is clearly marked and dated (bottle labels complete with required information);
- Appropriate containers (size, type) are received for the requested analyses;
- The minimum amount of sample material is provided for the analysis.

- Sample container labels and/or tags agree with chain of custody entries (identification, required analyses, etc.);
- Assessment of proper sample preservation (if inadequate, corrective action is employed); and
- VOC containers are inspected for the presence/absence of bubbles. (Assessment of proper preservation of VOC containers is performed by lab personnel).

Samples are logged into a Laboratory Information Management System (LIMS). Any anomalies or discrepancies observed during the initial assessment are recorded on the CRF and COC documents. Potential problems with a sample shipment are addressed by contacting the client and discussing the pertinent issues. When the Project Chemist and client have reached a satisfactory resolution, the login process may continue and analysis may begin. During the login process, each sample is given a unique laboratory code and a service request form is generated. The LIMS generates a Service Request that contains client information, sample descriptions, sample matrix information, required analyses, sample collection dates, analysis due dates and other pertinent information. The service request is reviewed by the appropriate Project Chemist for accuracy, completeness, and consistency of requested analyses and for client project objectives.

Samples are kept refrigerated until they undergo analysis, unless otherwise specified. CAS stores samples in various refrigerators or freezers, depending on the type of analysis and the matrix of the sample. CAS has five walk-in refrigerators which house the majority of sample containers received at the laboratory. In addition to the walk-in refrigerators, there are four additional refrigerators, including dedicated refrigerated storage of VOC samples. These refrigerators are segregated by matrix type (soil or water) and method of analysis. The dedicated storage areas for VOC samples are monitored using storage blanks, as described in the *SOP for VOA Storage Blanks (VOC-BLAN)*. CAS also has six sub-zero freezers capable of storing samples at -20° C; these are primarily used for tissue and sediment samples requiring specialized storage conditions. The temperature of each sample storage unit used at CAS is monitored daily and the data recorded in a bound logbook. Continuous-graph temperature recorders have also been placed in the walk-in refrigerators to provide a permanent record of the storage conditions to which samples are exposed.

CAS adheres to the method-prescribed or project-specified holding times for all analyses. In order to comply with holding time requirements, the sampling date and time are entered into the LIMS system at the time of sample receipt and login. Each analyst then monitors holding times by obtaining analysis-specific reports from the LIMS. These reports provide holding time information on all samples for the analysis, calculated from the sampling date and the holding time requirement. In order to report adherence to holding time requirements, the date analyzed is printed or written on the analytical raw data. For analyses with holding time prescribed in hours, the time analyzed is also recorded.

Unless other arrangements have been made in advance, upon completion of all analyses and submittal of the final report, aqueous samples and sample extracts are retained at ambient temperature for 30 days, soil samples are retained at ambient temperature for 60 days, and tissue samples are retained frozen for 3 months. Upon expiration of these time limits, the samples are either returned to the client or disposed of according to approved disposal

practices. All samples are characterized according to hazardous/non-hazardous waste criteria and are segregated accordingly. All hazardous waste samples are disposed of according to formal procedures outlined in the *CAS Environmental Health and Safety Manual.* All waste produced at the laboratory, including the laboratory's own various hazardous waste streams, is treated in accordance with applicable local and Federal laws. Documentation is maintained for each sample from initial receipt through final disposal. This ensures that an accurate history of the sample from "cradle to grave" is generated.

8.3 Sample Custody

Sample custody transfer at the time of sample receipt is documented using chain-of-custody (COC) forms accompanying the samples. During sample receipt, it is also noted if custody seals were present. This is described in the *SOP for Sample Receiving (SMO-GEN)*. Figure 8-1 is a copy of the chain-of-custody form routinely used at CAS.

Facility security and access is important in maintaining the integrity of samples received at CAS/Kelso. Access to the laboratory facility is limited by use of locked exterior doors with a coded entry, except for the reception area and sample receiving doors, which are manned during business hours and locked at all other times. In addition, the sample storage area within the laboratory is a controlled access area with locked doors with a coded entry. The CAS facility is equipped with an alarm system and CAS employs a private security firm to provide nighttime and weekend security.

A barcoding system is used to document internal sample custody. Each person removing or returning samples from/to sample storage while performing analysis is required to document this custody transfer. The system uniquely identifies the sample container and provides an electronic record of the custody of each sample. For sample extracts and digestates the analyst documents custody of the sample extract or digestate by signing on the benchsheet, or custody record, that they have accepted custody. The procedures are described in the *SOP for Sample Tracking and Internal Chain of Custody (SMO-SCOC).*

8.4 Project Setup

The analytical method(s) to be used for sample analysis are chosen based on the COC information and project requirements. Unless specified otherwise, the most recent versions of reference methods are used. LIMS codes are chosen to identify the analysis method used for analysis. The Project Chemist ensures that the correct methods are selected for analysis, deliverable requirements are identified, and due dates are specified on the LIMS generated Service Request. To communicate and specify project-specific requirements, a Tier V form (Figure 8-3) is used and accompanies the service request form.

Table 8-1
Sample Preservation and Holding Times

DETERMINATION	MATRIX[b]	CONTAINER[c]	PRESERVATION	MAXIMUM HOLDING TIME
Bacterial Tests				
Coliform, Colilert	W, DW	P, Bottle or Bag	Cool, 4°C, 0.008% $Na_2S_2O_3$[d]	6-24 hours[e]
Coliform, Fecal and Total	W, DW	P,G	Cool, 4°C, 0.008% $Na_2S_2O_3$[d]	6-24 hours[e]
Fecal Streptococci	W	P,G	Cool, 4°C, 0.008% $Na_2S_2O_3$[d]	6-24 hours[e]
Inorganic Tests				
Acidity	W	P,G	Cool, 4°C	14 days
Alkalinity	W, DW	P,G	Cool, 4°C	14 days
Ammonia	W, DW	P,G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Biochemical Oxygen Demand (BOD)	W	P,G	Cool, 4°C	48 hours
Bromate	W, DW	P,G	50mg/L EDA, cool to 4°C	28 days
Bromide	W, DW	P,G	None Required	28 days
Chemical Oxygen Demand (COD)	W	P,G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Chloride	W, DW	P,G	None Required	28 days
Chlorine, Total Residual	W, DW	P,G	None Required	24 hours
Chlorite	W, DW	P,G	50mg/L EDA, cool to 4°C	14 days
Chlorophyll-A	W	G Amber	Cool, 4°C	Analyze immediately
Color	W, DW	P,G	Cool, 4°C	48 hours
Cyanide, Total and Amenable to Chlorination	W, DW	P,G	Cool, 4°C, NaOH to pH>12, plus 0.6 g Ascorbic Acid	14 days
Cyanide, Weak Acid Dissociable	W	P,G	Cool, 4°C, NaOH to pH >12	14 days
Ferrous Iron	W, DW	G Amber	Cool, 4°C	24 hours
Fluoride	W, DW	P,G	None Required	28 days
Hardness	W, DW	P,G	HNO_3 to pH<2	6 months
Hydrogen Ion (pH)	W, DW	P,G	None Required	24 hours
Kjeldahl and Organic Nitrogen	W	P,G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Nitrate	W, DW	P,G	Cool, 4°C	48 hours
Nitrate	W, DW	P,G	Cool, 4°C	14 days
Nitrate-Nitrite	W, DW	P,G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Nitrite	W, DW	P,G	Cool, 4°C	48 hours
Orthophosphate	W, DW	P,G	Filter Immediately, Cool, 4°C	48 hours
Oxygen, Dissolved (Probe)	W, DW	G, Bottle and Top	None Required	Analyze immediately
Oxygen, Dissolved (Winkler)	W, DW	G, Bottle and Top	Fix on Site and Store in Dark	8 hours
Perchlorate	W, DW	P,G	Protect from temp. extremes	28 days

Table 8-1 (continued)
Sample Preservation and Holding Times

DETERMINATION	MATRIX[b]	CONTAINER[c]	PRESERVATION	MAXIMUM HOLDING TIME
Phenolics, Total	W	G Only	Cool, 4°C, H_2SO_4 to pH<2	28 days
Phosphorus, Elemental	W	G Only	Cool, 4°C	48 hours
Phosphorus, Total	W	P,G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Residue, Total	W	P,G	Cool, 4°C	7 days
Residue, Filterable (TDS)	W	P,G	Cool, 4°C	7 days
Residue, Nonfilterable (TSS)	W	P,G	Cool, 4°C	7 days
Residue, Settleable	W	P,G	Cool, 4°C	48 hours
Residue, Volatile	W	P,G	Cool, 4°C	7 days
Silica	W	P Only	Cool, 4°C	28 days
Specific Conductance	W, DW	P,G	Cool, 4°C	28 days
Sulfate	W, DW	P,G	Cool, 4°C	28 days
Sulfide	W	P,G	Cool, 4°C, Add Zinc Acetate plus Sodium Hydroxide to pH>9	7 days
Sulfite	W	P,G	None Required	24 hours
Surfactants (MBAS)	W	P,G	Cool, 4°C	48 hours
Tannin and Lignin	W	P,G	Cool, 4°C	28 days
Temperature	W	P,G	None Required	Analyze immediately
Turbidity	W, DW	P,G	Cool, 4°C	48 hours
Metals				
Metals, except CrVI and Mercury	W, DW	P,G	HNO_3 to pH<2	6 months
	S	G, Teflon-Lined Cap	Cool, 4°C	6 months
Chromium VI	W	P,G	Cool, 4°C	24 hours
Mercury	W	P,G	HNO_3 to pH<2	28 days
	S	P,G	Cool, 4°C	28 days
Organic Tests				
Oil and Grease, Hexane Extractable Material (EPA 1664)	W	G, Teflon-Lined Cap	Cool, 4°C, H_2SO_4 to pH<2	28 days
Organic Carbon, Total (TOC)	W	P,G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Organic Halogens, Total (TOX)	W	G, Teflon-Lined Cap	Cool, 4°C, H_2SO_4 to pH<2, No headspace	28 days
Organic Halogens, Adsorbable (AOX)	W	G, Teflon-Lined Cap	Cool, 4°C, HNO_3 to pH<2	6 months

Table 8-1 (continued)
Sample Preservation and Holding Times

DETERMINATION	MATRIX[b]	CONTAINER[c]	PRESERVATION	MAXIMUM HOLDING TIME
Petroleum Hydrocarbons, Total	W	G, Teflon-Lined Cap	Cool, 4°C, HCl or H_2SO_4 to pH<2	7 days until extraction; 40 days after extraction
	S	G, Teflon-Lined Cap	Cool, 4°C	14 days until extraction; 40 days after extraction
Volatile Organics				
Petroleum Hydrocarbons, Volatile (Gasoline-Range Organics)	W	G, Teflon-Lined Septum Cap	Cool, 4°C, HCl to pH<2 No Headspace	14 days
	S	G, Teflon-Lined Cap	Cool, 4°C Minimize Headspace	14 days
Purgeable Halocarbons	W	G, Teflon-Lined Septum Cap, No Headspace	**No Residual Chlorine Present**: HCl to pH<2, Cool, 4°C, No Headspace **Residual Chlorine Present**: 10% $Na_2S_2O_3$, HCl to pH<2, Cool, 4°C	14 days
	S	G, Teflon-Lined Cap	Cool, 4°C, Minimize Headspace	14 days
	S	Method 5035	Encore, Freeze at -20°C Methanol, Cool, 4°C Sodium Bisulfate Cool, 4°C	7 days 48 hrs to prepare from Encore, 14 days after preparation. 48 hrs to prepare from Encore, 14 days after preparation.
Purgeable Aromatic Hydrocarbons (including BTEX and MTBE)	W	G, Teflon-Lined Septum Cap, No Headspace	**No Residual Chlorine Present**: HCl to pH<2, Cool, 4°C, No Headspace **Residual Chlorine Present**: 10% $Na_2S_2O_3$, HCl to pH<2, Cool 4°C	14 days
	S	G, Teflon-Lined Cap	Cool, 4°C, Minimize Headspace	14 days
	S	Method 5035	Encore, Freeze at -20°C Methanol, Cool, 4°C Sodium Bisulfate Cool, 4°C	7 days 48 hrs to prepare from Encore, 14 days after preparation. 48 hrs to prepare from Encore, 14 days after preparation.

Table 8-1 (continued)
Sample Preservation and Holding Times

DETERMINATION	MATRIX[b]	CONTAINER[c]	PRESERVATION	MAXIMUM HOLDING TIME
Acrolein, Acrylonitrile, Acetonitrile	W	G, Teflon-Lined Septum Cap	Adjust pH to 4-5, Cool, 4°C, No Headspace	14 days
EDB and DBCP	W,S	G, Teflon-Lined Cap	Cool, 4°C, 3 mg $Na_2S_2O_3$, No Headspace	28 days
Semivolatile Organics				
Petroleum Hydrocarbons, Extractable (Diesel-Range Organics)	W,S	G, Teflon-Lined Cap	Cool, 4°C	7 days until extraction;[f] 40 days after extraction
Alcohols and Glycols	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Phenols	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Phthalate Esters	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Nitrosamines	W,S	G, Teflon-Lined Cap	Cool, 4°C, Store in Dark[g]	7 days until extraction;[f] 40 days after extraction
Organochlorine Pesticides and PCBs	W,S	G, Teflon-Lined Cap	Cool, 4°C	7 days until extraction;[f] 40 days after extraction
Nitroaromatics and Cyclic Ketones	W,S	G, Teflon-Lined Cap	Cool, 4°C, Store in Dark[g]	7 days until extraction;[f] 40 days after extraction
Polynuclear Aromatic Hydrocarbons	W,S	G, Teflon-Lined Cap	Cool, 4°C, Store in Dark[g]	7 days until extraction;[f] 40 days after extraction
Haloethers	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Chlorinated Hydrocarbons	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction

Table 8-1 (continued)
Sample Preservation and Holding Times

DETERMINATION	MATRIX[b]	CONTAINER[c]	PRESERVATION	MAXIMUM HOLDING TIME
Organophosphorus Pesticides	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Nitrogen- and Phosphorus-Containing Pesticides	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Chlorinated Herbicides	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Chlorinated Phenolics	W	G, Teflon-Lined Cap	H_2SO_4 to pH<2, Cool, 4°C[g]	30 days until extraction; 30 days after extraction
Resin and Fatty Acids	W	G, Teflon-Lined Cap	NaOH to pH ≥10, Cool, 4°C[g]	30 days until extraction; 30 days after extraction
Drinking Water Organics				
Purgeable Organics	DW	G, Teflon-Lined Septum Cap,	Ascorbic Acid, HCl to pH≤2, Cool, 4°C, No Headspace	14 days
EDB, DBCP, and TCP	DW	G, Teflon-Lined Septum Cap	Cool, 4°C, 3 mg $Na_2S_2O_3$, No Headspace	14 days
Carbamates, Carbamoyloximes	DW	G, Amber, Teflon-Lined Cap	1.8 mL monochloroacetic acid to pH<3; 80 mg/L $Na_2S_2O_3$ if Res.Cl.; Cool, 4°C	28 days
Chlorianted Herbicides	DW	G, Amber, Teflon-Lined Cap	If Res.Cl, 2mg/4omL NaS; Cool, <6°C	14 days until extraction; 21 days after extraction
Chlorinated Pesticides	DW	G, Amber, Teflon-Lined Cap	50 mg/L NaS, HCl to pH≤ 2; Cool, 4°C	14 days until extraction; 30 days after extraction
Diquat and Paraquat	DW	G, Amber, Teflon-Lined Cap	100 mg/L $Na_2S_2O_3$ if Res.Cl., Cool, 4°C,	7days until extraction; 21 days after extraction
Endothall	DW	G, Amber, Teflon-Lined Cap	Cool, 4°C	7 days until extraction; 14 days after extraction
Glyphosate	DW	G, Amber, Teflon-Lined Cap	100 mg/L $Na_2S_2O_3$, Cool, 4°C	14 days
Haloacetic Acids	DW	G, Amber, Teflon-Lined Cap	100 mg/L NH_4Cl, Cool, 4°C	14 days until extraction; 7 days after extraction
Semivolatile Organics	DW	G, Amber, Teflon-Lined Cap	50 mg/L NaS, HCl to pH≤ 2; Cool, 4°C	14 days until extraction; 30 days after extraction

Table 8-1 (continued)
Sample Preservation and Holding Times

DETERMINATION	MATRIX[b]	CONTAINER[c]	PRESERVATION	MAXIMUM HOLDING TIME
Toxicity Characteristic Leaching Procedure (TCLP)				
Mercury	HW	P,G	Sample: Cool, 4°C TCLP extract: HNO_3 to pH<2	28 days until extraction; 28 days after extraction
Metals, except Mercury	HW	P,G	Sample: Cool, 4°C TCLP extract: HNO_3 to pH<2	180 days until extraction; 180 days after extraction
Volatile Organics	HW	G, Teflon-Lined Cap	Sample: Cool, 4°C Minimize Headspace TCLP extract: Cool, 4°C, HCl to pH<2, No Headspace	14 days until extraction; 14 days after extraction
Semivolatile Organics	HW	G, Teflon-Lined Cap	Sample: Cool, 4°C, Store in Dark[g] TCLP extract: Cool, 4°C, Store in Dark[g]	14 days until TCLP ext'n; 7 days until extraction; 40 days after extraction
Organochlorine Pesticides	HW	G, Teflon-Lined Cap	Sample: Cool, 4°C TCLP extract: Cool, 4°C	14 days until TCLP ext'n; 7 days until extraction; 40 days after extraction
Chlorinated Herbicides	HW	G, Teflon-Lined Cap	Sample: Cool, 4°C TCLP extract: Cool, 4°C	14 days until TCLP ext'n; 7 days until extraction; 40 days after extraction

a See Section 18.0 for sources of holding time information.
b DW = Drinking Water, W = Water; S = Soil or Sediment; HW = Hazardous Waste
c P = Polyethylene; G = Glass
d For chlorinated water samples
e The recommended maximum holding time is variable, and is dependent upon the geographical proximity of sample source to the laboratory.
f Fourteen days until extraction for soil, sediment, and sludge samples.
g If the water sample contains residual chlorine, 10% sodium thiosulfate is used to dechlorinate.

Figure 8-1
Chain of Custody Form

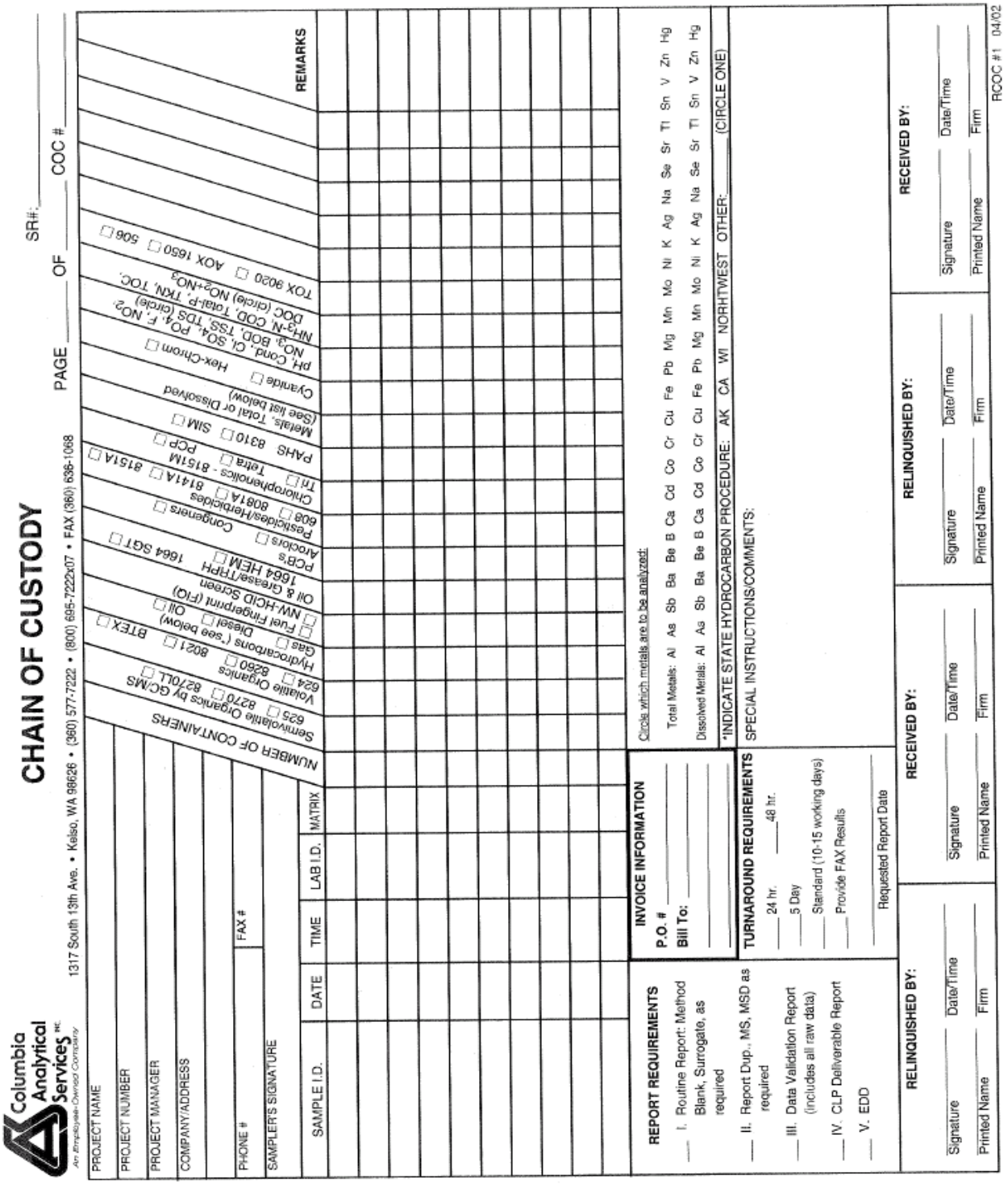


Figure 8-2

Columbia Analytical Services Inc.
Cooler Receipt and Preservation Form

Project/Client_____Work Order K060_____

Cooler received on _____ and opened on _____by_____

1.	Were custody seals on outside of coolers?	Y	N
	If yes, how many and where?_____		
2.	Were seals intact and signature & date correct?	Y	N
3.	Is the shipper's airbill available and filed? If no, record airbill number:_____	Y	N
4.	COC# _____ _____ _____ _____		
	Temperature of cooler(s) upon receipt: _____ _____ _____ _____		
	Temperature Blank: _____ _____ _____ _____		
5.	Were custody papers properly filled out (ink, signed, etc.)?	Y	N
6.	Type of packing material present_____		
7.	Did all bottles arrive in good condition (unbroken)?	Y	N
8.	Were all bottle labels complete (i.e analysis, preservation, etc.)?	Y	N
9.	Did all bottle labels and tags agree with custody papers?	Y	N
10.	Were the correct types of bottles used for the tests indicated?	Y	N
11.	Were all of the preserved bottles received at the lab with the appropriate pH?	Y	N
12.	Were VOA vials checked for absence of air bubbles, and if present, noted below?	Y	N
13.	Did the bottles originate from CAS/K or a branch laboratory?	Y	N
14.	Are CWA Microbiology samples received with >1/2 the 24hr. hold time remaining from collection?	Y	N
15.	Was C12/Res negative?	Y	N

Explain any discrepancies:_____
_____
_____
_____
_____
_____

RESOLUTION:_____

Samples that required preservation or received out of temperature:

Sample ID	Reagent	Volume	Lot Number	Bottle Type	Rec'd out of Temperature	Initials

Figure 8-3
Tier V Form

Client :

Project Chemist :

Project Name :

Service Request :

Project Number :

SMO LimsTemplate ID :

Project Description :

QAPP/SOW Information :

Reporting

Tier Level :

PDF:

Report to :

In result field use :

EDD :

Flagging Requirements :

Other Requirements :

Sample Considerations

Sample Limitations :

Sample Prep/Analysis :

Non-Standard Holdtimes :

Historical Data :

Comments :

9.0 ANALYTICAL PROCEDURES

CAS employs methods and analytical procedures from a variety of sources. The primary method references are: USEPA SW-846, Third Edition and Updates I, II, IIA, IIB, III for hazardous waste samples, and USEPA 600/4-79-020, 600/4-91-010, 600/4-82-057, 600/R-93/100, 600/4-88-039, 600/R-94-111, and Supplements; and *Standard Methods for the Examination of Water and Wastewater* for water and wastewater samples. The complete citation for each of these references can be found in Section 18.0 of this document. Other published procedures, such as state-specific methods, program-specific methods (such as Puget Sound Protocols), or in-house methods may be used. The implementation of methods by CAS is described in SOPs specific to each method. A list of SOPs and NELAC-accredited methods are given in Appendix E. Futher details are described below.

9.1 Standard Operating Procedures (SOPs) and Laboratory Notebooks.

CAS maintains SOPs for use in both technical and administrative functions. SOPs are written following the format and content requirements described in the *SOP for Preparation of Standard Operating Procedures* (SOP No. ADM-SOP). Each SOP is reviewed and approved by a minimum of two managers (the Laboratory Director and/or Department Manager and the Quality Assurance Manager). All SOPs undergo a documented annual review to make sure current practices are described. The QA Manager maintains a comprehensive list of current SOPs. The document control process ensures that only the most currently prepared version of an SOP is being used. The QA Manual, QAPPs, SOPs, standards preparation logbooks, maintenance logbooks, et al., are controlled documents. The procedures for document control are described in the *SOP for Document Control* (ADM-DOC_CTRL). In addition to SOPs, each laboratory department maintains a current file, accessible to all laboratory staff, of the current methodology used to perform analyses. Laboratory notebook entries are standardized following the guidelines in the *Making Entries into Logbooks and onto Benchsheets* SOP (ADM-DATANTRY). Entries made into laboratory notebooks are reviewed and approved by the appropriate supervisor at a regular interval.

9.2 Deviation from Standard Operating Procedures

When a customer requests a modification to an SOP (such as a change in reporting limit, addition or deletion of target analyte(s), etc.), the project chemist handling that project must discuss the proposed deviation with the department manager in charge of the analysis and obtain their approval to accept the project. The project chemist is responsible for documenting the approved or allowed deviation from the standard operating procedure by placing a detailed description of the deviation attached to the quotation or in the project file and also providing an appropriate comment on the service request when the samples are received.

For circumstances when a deviation or departure from company policies or procedures involving any non-technical function is found necessary, approval must be obtained from the appropriate supervisor, manager, the laboratory director, or other level of authority. Frequent

departure from policy is not encouraged. However, if frequent departure from any policy is noted, the laboratory director will address the possible need for a change in policy.

9.3 Modified Procedures

CAS strives to perform published methods as described in the referenced documents. If there is a material deviation from the published method, the method is cited as a "Modified" method in the analytical report. Modifications to the published methods are listed in the standard operating procedure. Standard operating procedures are available to analysts and are also available to our clients for review, especially those for "Modified" methods. Client approval is obtained for the use of "Modified" methods prior to the performance of the analysis.

9.4 Analytical Batch

The basic unit for analytical quality control is the analytical batch. The definition that CAS has adopted for the analytical batch is listed below. The overriding principle for describing an analytical batch is that all the samples in a batch, both field samples and quality control samples, are to be handled exactly the same way, and all of the data from each analysis is to be manipulated in exactly the same manner.

The <u>minimum</u> requirements of an analytical batch are:

1) The number of (field) samples in a batch is not to exceed 20.

2) All (field) samples in a batch are of the same matrix.

3) The QC samples to be processed with the (field) samples include:

   a) Method Blank (a.k.a. Laboratory Reagent Blank)

      Function: Determination of laboratory contamination.

   b) Laboratory Control Sample (a.k.a. Laboratory Fortified Blank)

      Function: Assessment of method performance

   c) Matrix Spiked (field) Sample (a.k.a. Laboratory Fortified Sample Matrix)

      Function: Assessment of matrix problems

      NOTE: A sample identified as a field blank, an equipment blank, or a trip blank is <u>not</u> to be matrix spiked.

   d) Duplicate Matrix Spiked (field) Sample or Duplicate (field) Sample (a.k.a. Laboratory Duplicate)

      Function: Assessment of batch precision

      NOTE: A sample identified as a field blank, an equipment blank, or a trip blank is <u>not</u> to be duplicated.

4) A single lot of reagents is used to process the batch of samples.

5) Each operation within the analysis is performed by a single analyst, technician, chemist, or by a team of analysts/technicians/chemists.

6) The time frame is not to exceed a 24-hour period. "Open batches" extending over more than one 24 hour period are not allowed.

7) (Field) samples are assigned to batches commencing at the time that sample processing begins. For example: for analysis of metals, sample processing begins when the samples are digested. For analysis of organic constituents, it begins when the samples are extracted.

8) The QC samples are to be analyzed in conjunction with the associated field samples prepared with them. However, for tests which have a separate sample preparation step that defines a batch (digestion, extraction, etc.), the QC samples in the batch do not require analysis each time a field sample within the preparation batch is analyzed (multiple instrument sequences to analyze all field samples in the batch need not include re-analyses of the QC samples).

9) The batch is is to be assigned a unique identification number that can be used to correlate the QC samples with the field samples.

10) Batch QC refers to the QC samples that are analyzed in a batch of (field) samples.

11) Specific project, program, or method SOP requirements may be exceptions. If project, program, or method SOP requirements are more stringent than these laboratory minimum requirements, then the project, program, or method SOP requirements will take precedence. However, if the project, program, or method SOP requirements are less stringent than these laboratory minimum requirements, these laboratory minimum requirements will take precedence.

10.0 CALIBRATION PROCEDURES AND FREQUENCY

All equipment and instruments used at CAS are operated, maintained and calibrated according to the manufacturer's guidelines and recommendations, as well as to criteria set forth in the applicable analytical methodology. Operation and calibration are performed by personnel who have been properly trained in these procedures. Documentation of calibration information is maintained in appropriate reference files. Brief descriptions of the calibration procedures for our major laboratory equipment and instruments are described below. Records are maintained to provide traceability of reference materials.

Any item of the equipment which has been subjected to overloading or mishandling, or has been shown by verification or otherwise to be defective; is taken out of service until it has been repaired. The equipment is placed back in service only after verifying by calibration that the equipment performs satisfactorily. An evaluation of the effect of this defect on previous calibrations or tests is made and documented appropriately.

Calibration verification is performed according to in the applicable analytical methodology. Calibration verification procedures and criteria are listed in laboratory Standard Operating Procedures. Documentation of calibration verification is maintained in appropriate reference files. For NELAP accredited methods, the concentration of calibration verification standards are varied within the calibration range periodically.

10.1 Temperature Control Devices

Temperatures are monitored and recorded for all of the temperature-regulating support equipment such as sample refrigerators, freezers, and standards refrigerators. Bound record books are kept which contain daily-recorded temperatures, identification and location of equipment, acceptance criteria and the initials of the technician who performed the checks. The procedure for performing these measurements is provided in the *SOP for Support Equipment Monitoring and Calibration (SOP ADM-SEMC).* The SOP also includes the use of acceptance criteria and correction factors.

Where the operating temperature is specified as a test condition (such as ovens, incubators, evaporators) the temperature is recorded on the raw data. All thermometers are identified according to serial number, and the calibration of these thermometers is checked annually against a National Institute of Standards and Technology (NIST) certified thermometer. The NIST thermometer is recertified by a professional metrology organization on an annual basis.

10.2 Analytical Balances

Analytical balances are serviced on a semi-annual basis by a professional metrology organization. New certificates of calibration for each balance are issued to the laboratory on a semi-annual basis. The calibration of each analytical balance is checked daily with three Class

S or S-1 weights, which assess the accuracy of the balance at low, mid-level and high levels within the working range. The weights are recertified using NIST traceable standards by a professional metrology organization on an annual basis.

As needed, the balances are recalibrated using the manufacturers recommended operating procedures. Bound record books are kept which contain the recorded measurements, identification and location of equipment, acceptance criteria and the initials of the technician who performed the checks. The procedure for performing these measurements and use of acceptance criteria is described in the SOP ADM-SEMC.

10.3 Water Purification System

The water purification system is designed to produce deionized water of 18 megohms resistivity or better, meeting specifications for Type I water, as described in *Standard Methods for the Examination of Water and Wastewater (SM1080)*. The system is monitored continuously for conductivity and resistivity with an on-line meter, which is recorded daily in a bound record book. Deionizers are rotated and replaced when the first unit in the series produces water of 0.5 megohms, which is monitored by a light on the unit. The status of the deionizers is also checked (resistivity reading and light status) and recorded daily in a bound record book. Activated carbon filters are also in series with the demineralizers to produce "organic-free" water. Water for microbiology is checked at a point downstream of the purification system at a tap in the laboratory, and the monitoring documented.

10.4 Source and Preparation of Standard Reference Materials

All analytical measurements generated at CAS are performed using materials and/or processes that are traceable to a reference material. Metrology equipment (analytical balances, thermometers, etc.) is calibrated using reference materials traceable to the National Institute of Standards and Technology (NIST). These primary reference materials are themselves recertified on an annual basis. All sampling containers provided to the client by the laboratory are purchased as precleaned (Level 1) containers, with certificates of analysis available for each bottle type. This information is provided to the client when requested.

Consumable reference materials routinely purchased by the laboratories (e.g., analytical standards) are purchased from nationally recognized, reputable vendors. All vendors have fulfilled the requirements for ISO 9001 certification and/or are accredited by A_2LA. CAS relies on a primary vendor for the majority of its analytical supplies. Consumable primary stock standards are obtained from certified commercial sources or from sources referenced in a specific method. Supelco, Ultra Scientific, AccuStandard, Chem Services, Inc., Aldrich Chemical Co., Baker, Spex, etc. are examples of the vendors used. Reference material information is recorded in the appropriate logbook(s) and materials are stored under conditions that provide maximum protection against deterioration and contamination. The logbook entry includes such information as an assigned logbook identification code, the source of the material (i.e. vendor identification), solvent (if applicable) and concentration of analyte(s), reference to the certificate of analysis and an assigned expiration date. The date that the standard is received in the laboratory is marked on the container. When the reference material is used for the first time, the date of usage and the initials of the analyst are also recorded on the container.

Stock solutions and calibration standard solutions are prepared fresh as often as necessary according to their stability. All standard solutions are properly labeled as to analyte concentration, solvent, date, preparer, and expiration date; these entries are also recorded in the appropriate notebook(s) following the *SOP for Making Entries into Logbooks and onto Benchsheets* (SOP No. ADM-DATANTRY). Prior to sample analysis, all calibration reference materials are verified with a second, independent source of the material (see section 11.3.5).

10.5 Inductively Coupled Plasma-Atomic Emission Spectrograph (ICP-AES)

Each emission line on the ICP is calibrated daily against a blank and against standards. Analyses of calibration standards, initial and continuing calibration verification standards, and inter-element interference check samples are carried out as specified in the EPA CLP Statement of Work for Inorganic Analysis, SOW No ILM04.0.

10.6 Inductively Coupled Plasma-Mass Spectrometer (ICP-MS)

Each element of interest is calibrated for using a blank and a single standard. Prior to calibration, a short-term stability check is performed on the system. Following calibration, an independent check standard is analyzed, and a continuing calibration verification standard (CCV) is analyzed with every ten samples.

10.7 Atomic Absorption Spectrophotometers (AAS)

These instruments are calibrated daily using a minimum of four standards and a blank. Calibration is validated using reference standards, and is verified at a minimum frequency of once every ten samples. Initial calibration points cannot be “dropped” from the resulting calibration curve.

10.8 GC/MS Systems

All GC/MS instruments are calibrated at a minimum of five different concentration levels for the analytes of interest (unless specified otherwise) using procedures outlined in Standard Operating Procedures and/or appropriate USEPA method citations. All reference materials used for this function are vendor-certified standards. Calibration verification is performed at method-specified intervals following the procedures in the SOP and reference method. Compounds selected as system performance check compounds (SPCCs) must show a method-specified response factor in order for the calibration to be considered valid. Calibration check compounds (CCCs) must also meet method specifications for percent difference from the multipoint calibration. For isotope dilution procedures, the internal standard response(s) and labeled compound recovery must meet method criteria. Method-specific instrument tuning is regularly checked using bromofluorobenzene (BFB) for volatile organic chemical (VOC) analysis, or decafluorotriphenylphosphine (DFTPP) for semi-volatile analysis. Mass spectral peaks for the tuning compounds must conform both in mass numbers and in relative intensity criteria before analyses can proceed. Calibration policies for organics chormatographic analyses are described in the *SOP for Calibration of Instruments for Organics Chromatographic Analyses (SOP SOC-CAL).*

10.9 Gas Chromatographs and High Performance Liquid Chromatographs

Calibration and standardization follow SOP guidelines and/or appropriate USEPA method citations. All GC and HPLC instruments are calibrated at a minimum of five different concentration levels for the analytes of interest (unless specified otherwise). The lowest standard is equivalent to the method reporting limit; additional standards define the working range of the GC or LC detector. Results are used to establish response factors (or calibration curves) and retention-time windows for each analyte. Calibration is verified at a minimum frequency of once every ten samples, unless otherwise specified by the reference method. *SOP for Calibration of Instruments for Organics Chromatographic Analyses (SOP SOC-CAL).*

10.10 UV-Visible Spectrophotometer (manual colorimetric analyses)

Routine calibrations for colorimetric and turbidimetric analyses involve generating a 5-point calibration curve including a blank. Initial calibration points cannot be "dropped" from the resulting calibration curve. Correlation coefficients must meet method or SOP specifications before analysis can proceed. Independent calibration verification standards (ICVs) are analyzed with each batch of samples. Continuing calibration is verified at a minimum frequency of once every ten samples. Typical UV-Visible spectrophotometric methods at CAS include total phenolics, phosphates, surfactants and tannin-lignin.

10.11 Flow Injection Analyzer (automated colorimetric analysis)

A minimum of three standards and a blank are used to calibrate the instrument for cyanide analysis. A blank and (minimum of) five standards are used to calibrate the instrument for all other automated chemistries. Initial calibration points cannot be "dropped" from the resulting calibration curve. Standard CAS acceptance limits are used to evaluate the calibration curve prior to sample analysis.

10.12 Ion Chromatographs

Calibration of the ion chromatograph (IC) involves generating a 5-point calibration curve. Initial calibration points cannot be "dropped" from the resulting calibration curve. A correlation coefficient of $\geq$ 0.995 for the curve is required before analysis can proceed. Quality Control (QC) samples that are routinely analyzed include blanks and laboratory control samples. The target analytes typically determined by the IC include nitrate, nitrite, chloride, fluoride, sulfate and bromide. Calibration verification is performed at method-specified intervals following the procedures in the SOP and reference method.

10.13 Turbidimeter

Calibration of the turbidimeter requires analysis of three Nephelometric Turbidity Unit (NTU) formazin standards. Quality Control samples that are routinely analyzed include blanks, Analytical Products Group® QC samples (or equivalent) and duplicates.

10.14 Ion-selective electrode

Two standards are used to calibrate the electrodes before analysis. The slope of the curve must be within acceptance limits before analysis can proceed. Quality Control samples that are routinely analyzed include blanks, LCSs and duplicates.

10.15 Pipets

The calibration of pipets and autopipettors used to make critical-volume measurements is verified following the *SOP for Checking Pipet Calibration*. Both accuracy and precision verifications are performed, at intervals applicable to the pipet and use. The results of all calibration verifications are recorded in bound logbooks.

10.16 Other Instruments

Calibration for the total organic carbon (TOC), total organic halogen (TOX), and other instruments is performed following manufacturer's recommendations and applicable SOPs.

11.0 QUALITY CONTROL

A primary focus of Columbia Analytical Services Quality Assurance (QA) Program is to ensure the accuracy, precision and comparability of all analytical results. Prior to using a procedure for the analysis of field samples, acceptable method performance is established by performing demonstration of capability analyses and performance characteristics are established by performing method detection limit studies and assessing accuracy and precision according to the reference method. CAS has established Quality Control (QC) objectives for precision and accuracy that are used to determine the acceptability of the data that is generated in its laboratories. These QC limits are either specified in the methodology or are statistically derived based on the laboratory's actual historical data obtained from the various QC measurements for each analytical method. The Quality Control objectives are defined below.

11.1 Quality Control Objectives

11.1.2 Demonstration of Capability - Where required by mandatory test method, regulation, or accreditation protocols, a demonstration of capability (DOC) is made prior to using any test method. This demonstration is made following regulatory, accreditation, or method specified procedures. In general, this demonstration does not test the performance of the method in real world samples, but in the applicable clean matrix free of target analytes and interferences.

A quality control reference material or quality control sample is obtained. The analyte(s) is (are) diluted in a volume of clean matrix (for analytes which do not lend themselves to spiking, e.g., TSS, the demonstration of capability may be performed using quality control samples). Where specified, the method-required concentration levels are used. Four aliquots are prepared and analyzed according to the test procedure. The mean recovery and standard deviations are calculated and compared to the corresponding acceptance criteria for precision and accuracy in the test method or laboratory-generated acceptance criteria (if there are not established mandatory criteria). All parameters must meet the acceptance criteria. Where spike levels are not specified, actual Laboratory Control Sample results or MDL study results may be used to meet this requirement, provided acceptance criteria is met.

11.1.3 Accuracy - Accuracy is a measure of the closeness of an individual measurement (or an average of multiple measurements) to the true or expected value. Accuracy is determined by calculating the mean value of results from ongoing analyses of laboratory-fortified blanks, standard reference materials, and standard solutions. In addition, laboratory-fortified (i.e. matrix-spiked) samples are also measured; this indicates the accuracy or bias in the actual sample matrix. Accuracy is expressed as percent recovery (% REC.) of the measured value, relative to the true or expected value. If a measurement process produces results whose mean is not the true or expected value, the process is said to be biased. Bias is the systematic error either inherent in a method of analysis (e.g., extraction efficiencies) or

caused by an artifact of the measurement system (e.g., contamination). CAS utilizes several quality control measures to eliminate analytical bias, including systematic analysis of method blanks, laboratory control samples and independent calibration verification standards. Because bias can be positive or negative, and because several types of bias can occur simultaneously, only the net, or total, bias can be evaluated in a measurement

11.1.4 Precision - Precision is the ability of an analytical method or instrument to reproduce its own measurement. It is a measure of the variability, or random error, in sampling, sample handling and in laboratory analysis. The American Society of Testing and Materials (ASTM) recognizes two levels of precision: repeatability - the random error associated with measurements made by a single test operator on identical aliquots of test material in a given laboratory, with the same apparatus, under constant operating conditions, and reproducibility - the random error associated with measurements made by different test operators, in different laboratories, using the same method but different equipment to analyze identical samples of test material.

"Within-batch" precision is measured using replicate sample or QC analyses and is expressed as the relative percent difference (RPD) between the measurements. The "batch-to-batch" precision is determined from the variance observed in the analysis of standard solutions or laboratory control samples from multiple analytical batches.

11.1.5 Control Limits - The acceptance limits for accuracy and precision originate from two different sources: For analyses having enough QC data, control limits are calculated at the 99% confidence limits. For analyses not having enough QC data, or where the method is prescriptive, control limits are taken from the method on which the procedure is based. If the method does not have control limits stated in it, then control limits are assigned method-default or reasonable values. New control limits are generated periodically. After review of the data by the Quality Assurance Manager, the new acceptance criteria replace the previous criteria and data is assessed using the new values.

These control limits are updated when new statistical limits are generated for the appropriate surrogate, laboratory control sample, and matrix spike compounds (typically once a year) or when method prescribed limits change. The current acceptance limits for accuracy and precision are available from the labaoratory and on the accompanying CD-ROM. For inorganics, the precision limit values listed are for laboratory duplicates. For organics, the precision limit values listed are for duplicate laboratory control samples or duplicate matrix spike analyses.

11.1.6 Representativeness - Representativeness is the degree to which the field sample represents the overall sample site or material. This can be extended to the sample itself, in that representativeness is the degree to which the subsample that is analyzed represents the entire field sample submitted for analysis. CAS has sample handling procedures to ensure that the sample used for analysis is representative of the entire sample. These include the SOP for Sample Preparation, Compositing, and Subsampling, the *SOP for Solid Sample Preparation*, and the *SOP for Tissue Sample Preparation*. Further, analytical SOPs specify appropriate sample handling and sample sizes to further ensure the sample aliquot that is analyzed is representative in entire sample.

11.1.7 Completeness - Completeness is a measure of the amount of valid data that is obtained, compared to the amount that is expected. For the purposes of this plan, completeness is calculated by dividing the number of samples having valid data by the total number of samples in the project, expressed as a percentage. The CAS objective for completeness is 100%.

11.1.8 Comparability - Comparability expresses the confidence with which one data set can be compared to another. To ensure comparability, standard operating procedures are used for the preservation, handling, and analysis of all samples. Data is reported in units specified by the customer.

11.2 Method Detection Limits and Method Reporting Limits

Method Detection Limits (MDL) for analytical methods routinely performed at CAS/Kelso are determined annually, thus may change slightly from year to year. The MDLs are determined by following the *SOP for the Determination of Method Detection Limits,* which is based on the procedure in 40 CFR Part 136, Appendix B. The Method Reporting Limits (MRLs) used at CAS are the routinely reported lower limits of quantitation. These MRLs are the levels to which CAS routinely reports results in order to minimize false positive or false negative results. The MRLs take into account day-to-day fluctuations in instrument sensitivity as well as other factors. Analyses are calibrated to the MRL, or lower. The MRL is typically two to ten times the MDL. Current laboratory MDLs and MRLs are available from the laboratory.

11.3 Quality Control Procedures

The specific types, frequencies, and processes for quality control sample analysis are described in detail in method-specific standard operating procedures and listed below. These sample types and frequencies have been adopted for each method and a definition of each type of QC sample is provided below. In addition, a number of other quality control processes that may impact analytical results are also described below.

11.3.1 Method Blank (a.k.a. Laboratory Reagent Blank)

The method blank is either analyte-free water or analyte-free soil (when available), subjected to the entire analytical process. When analyte-free soil is not available, anhydrous sodium sulfate, organic-free sand, or an acceptable substitute may be used instead. The method blank is analyzed to demonstrate that the analytical system itself is not contaminated with the analyte(s) being measured. The method blank results should be below the Method Reporting Limit (MRL) or, if required for DoD projects, below half of the MRL for the analyte(s) being tested. Otherwise, corrective action must be taken. A method blank is included with the analysis of every sample preparation batch, every 20 samples, or as stated in the method, whichever is more frequent.

11.3.2 Calibration Blanks

For some methods, calibration blanks are prepared along with calibration standards in order to create a calibration curve. Calibration blanks are free of the analyte of interest and, where applicable, provide the zero point of the calibration curve.

11.3.3 Continuing Calibration Blanks

Continuing calibration blanks (CCBs) are solutions of either analyte-free water, reagent, or solvent that are analyzed in order to verify the system is contamination-free when CCV standards are analyzed. The frequency of CCB analysis is either once every ten samples or as indicated in the method, whichever is greater.

11.3.4 Calibration Standards

Calibration standards are solutions of known concentration prepared from primary standard solutions that are, in turn, prepared from stock standard materials. Calibration standards are used to calibrate the instrument response with respect to analyte concentration. Standards are analyzed in accordance with the requirements stated in the particular method being used.

11.3.5 Initial (or Independent) Calibration Verification Standards

Initial (or independent) calibration verification standards (ICVs) are standards that are analyzed *after* calibration with newly prepared standard(s) but *prior to* sample analysis, in order to verify the validity and accuracy of the standards used in the calibration. Once it is determined that there is no reference material defect or systematic error in preparation of the calibration standard(s), standards are considered valid and may be used for subsequent calibrations and quantitative determinations (as expiration dates and methods allow). The ICV standards are prepared from materials obtained from a source independent of that used for preparing the calibration standards ("second-source"). ICVs are also analyzed in accordance with method-specific requirements.

11.3.6 Continuing Calibration Verification Standards

Continuing calibration verification standards (CCVs) are midrange standards that are analyzed in order to verify that the calibration of the analytical system is still acceptable. The frequency of CCV analysis is either once every ten samples, or as indicated in the method.

11.3.7 Internal Standards

Internal standards are known amounts of specific compounds that are added to each sample following sample preparation or extraction. Internal standards are generally used for GC/MS and ICP-MS procedures to correct sample results that have been affected by changes in instrument conditions or changes caused by certain matrix effects. The requirements for evaluation of internal standards are specified in each method and SOP.

11.3.8 Surrogates

Surrogates are organic compounds which are similar in chemical composition and chromatographic behavior to the analytes of interest, but which are not normally found in environmental samples. Depending on the analytical method, one or more of these compounds is added to method blanks, calibration and check standards, and samples (including duplicates, matrix spike samples, duplicate matrix spike samples and laboratory control samples) prior to extraction and analysis in order to monitor the method performance on each sample. The percent recovery is calculated for each surrogate, and the recovery is a measurement of the overall method performance.

11.3.9 Laboratory Control Samples (a.k.a. Laboratory Fortified Blanks)

The laboratory control sample (LCS) is an aliquot of analyte-free water or analyte-free soil (or anhydrous sodium sulfate or equivalent) to which known amounts of the method analyte(s) is(are) added. A reference material of known matrix type, containing certified amounts of target analytes, may also be used as an LCS. The LCS sample is prepared and analyzed in the same analytical batch, and in exactly the same manner, as the other routine samples. The percent recovery (% REC.) of the target analytes in the LCS assists in determining whether the methodology is in control and whether the laboratory is capable of making accurate and precise measurements at the required reporting limit. Comparison of batch-to-batch LCS analyses enables the laboratory to evaluate batch-to-batch precision and accuracy. Acceptance criteria for LCS analyses are obtained through the use of control charts. An LCS is prepared and analyzed at a minimum frequency of one LCS per 20 samples, with every analytical batch or as stated in the method, whichever is more frequent.

11.3.10 Matrix Spikes (a.k.a. Laboratory Fortified Sample Matrix)

Matrix spiked samples are aliquots of samples to which a known amount of the target analyte (or analytes) has been added. The samples are then prepared and analyzed in the same analytical batch, and in exactly the same manner as are routine samples. The stock solutions used for spiking the sample(s) are purchased and prepared independently of calibration standards. The spike recovery measures the effects of interferences caused by the sample matrix and reflects the accuracy of the method for the particular matrix in question. Spike recoveries are calculated as follows:

$$Recovery\ (\%) = (S - A) \times 100 \div T$$

Where: S = The observed concentration of analyte in the spiked sample,
A = The analyte concentration in the original sample, and
T = The theoretical concentration of analyte added to the spiked sample.

For the appropriate methods, matrix spiked samples are prepared and analyzed at a minimum frequency of one spiked sample (and one duplicate spiked sample, if appropriate) per twenty samples.

11.3.11 Laboratory Duplicates and Duplicate Matrix Spikes

Duplicates are additional replicates of samples that are subjected to the same preparation and analytical scheme as the original sample. Depending on the method of analysis, either a duplicate analysis (and/or a matrix spiked sample) or a matrix spiked sample and duplicate matrix spiked sample (MS/DMS) are analyzed. The relative percent difference between duplicate analyses or between an MS and DMS is a measure of the precision for a given method and analytical batch. The relative percent difference (RPD) for these analyses is calculated as follows:

$$\textit{Relative Percent Difference (RPD)} = (S1 - S2) \times 100 \div S_{ave}$$

Where S1 and S2 = The observed concentrations of analyte in the sample and its duplicate, or in the matrix spike and its duplicate matrix spike, and

S_{ave} = The average of observed analyte concentrations in the sample and its duplicate, or in the matrix spike and its duplicate matrix spike.

Depending on the method of analysis, either duplicates (and/or matrix spikes) or MS/DMS analyses are performed at a minimum frequency of one set per 20 samples. If an insufficient quantity of sample is available to perform a laboratory duplicate or duplicate matrix spikes, duplicate LCSs will be prepared and analyzed.

11.3.12 Interference Check Samples

An interference check sample (ICS) is a solution containing both interfering and analyte elements of known concentration that can be analyzed to verify background and interelement correction factors in metals analyses. The ICS is prepared to contain known concentrations of interfering elements that will provide an adequate test of the correction factors. The ICS is spiked with the elements of interest at concentrations of approximately ten times the instrument detection limits. The ICS is analyzed at the beginning and end of an analytical run or every eight hours, whichever is more frequent, and the results must be within ± 20% of the true values.

11.3.13 Post Digestion Spikes

Post digestion spikes are samples prepared for metals analyses that have an analyte spike added to determine if matrix effects may be a factor in the results. The spike addition should produce a method-specified minimum concentration above the

instrument detection limit. A post digestion spike is analyzed with each batch of samples and recovery criteria are specified for each method.

11.3.13 Control Charting

The generation of control charts is routinely performed at CAS. Surrogate, Matrix Spike and LCS recoveries are all monitored and charted. In addition, the laboratory also monitors the Relative Percent Difference (RPD) measurement of precision. Control charts are available to each individual laboratory unit to monitor the data generated in its facility using control charts that have been programmed to identify various trends in the analytical results. If trends in the data are perceived, various means of corrective action may then be employed in order to prevent future problems with the analytical system(s). Finally, data quality reports using control charts are generated for specific clients and projects pursuant to contract requirements. The control charting procedure is described in the SOP for *Control Charting Quality Control Data* (ADM-CHRT).

11.3.14 Glassware Washing

Glassware washing and maintenance play a crucial role in the daily operation of a laboratory. The glassware used at CAS undergoes a rigorous cleansing procedure prior to every usage. A number of SOPs have been generated that outline the various procedures used at CAS; each is specific to the end-use of the equipment as well as to the overall analytical requirements of the project. In addition, other equipment that may be routinely used at the laboratory is also cleaned following instructions in the appropriate SOP.

12.0 DATA REDUCTION, VALIDATION, AND REPORTING

CAS reports the analytical data produced in its laboratories to the client via the certified analytical report (CAR). This report includes a transmittal letter, a case narrative, client project information, specific test results, quality control data, chain of custody information, and any other project-specific support documentation. The following procedures describe our data reduction, validation and reporting procedures.

12.1 Data Reduction and Review

Results are generated by the analyst who performs the analysis and works up the data. All data is initially reviewed and processed by analysts using appropriate methods (e.g., chromatographic software, instrument printouts, hand calculation, etc.). Equations used for calculation of results are found in the applicable analytical SOPs. The resulting data set is either manually entered (e.g., titrimetric or microbiological data) into an electronic report form or is electronically transferred into the report from the software used to process the original data set (e.g., chromatographic software). Once the complete data set has been transferred into the proper electronic report form(s), it is then printed. The resulting hardcopy version of the electronic report is then reviewed by the analyst for accuracy. Once the primary analyst has checked the data for accuracy and acceptability, the hardcopy is forwarded to the supervisor or second qualified analyst, who reviews the data for errors. Where calculations are not performed a validated software system, the reviewer rechecks a minimum of 10% of the calculations. When the entire data set has been found to be acceptable, a final copy of the report is printed and signed by the laboratory supervisor, departmental manager or designated laboratory staff. The entire data package is then placed into the appropriate service request file, and an electronic copy of the final data package is forwarded to the appropriate personnel for archival. Data review procedures are described in the *SOP for Laboratory Data Review Process.*

Policies and procedures for manual editing of data are established. The analyst making the change must initial and date the edited data entry, without obliteration of the original entry. The policies and procedures are described in the *SOP for Making Entries into Logbooks and onto Benchsheets* (SOP ADM-DATANTRY).

Policies and procedures for electronic manual integration of chromatographic data are established. The analyst performing the integration must document the integration change by printing both the "before" and "after" integrations and including them in the raw data records. The policies and procedures are described in the *SOP for Manual Integration of Chromatographic Peaks* (SOP ADM-INT).

12.2 Confirmation Analysis

12.2.1 Gas Chromatographic and Liquid Chromatographic Analyses

For gas chromatographic (GC) and liquid chromatographic (LC) analyses, all positive results are confirmed by a second column, a second detector, a second wavelength (HPLC/UV), or by GC/MS analysis, unless exempted by one of the following situations:

- The analyte of interest produces a chromatogram containing multiple peaks exhibiting a characteristic pattern, which matches appropriate standards. This includes polychlorinated biphenyls and hydrocarbon fuels (e.g., gasoline and diesel).

- The sample is analyzed for benzene, toluene, ethylbenzene, xylenes, and naphthalene (BTEXN), and the sample is found, by a separate analysis, to contain gasoline. In a sample containing no gasoline, the presence of BTEXN compounds will be confirmed.

- The sample meets all of the following requirements:

1. All samples (liquid or solid) come from the same source (e.g., groundwater samples from the same well) for continuous monitoring. Samples of the same matrix from the same site, but from different sources (e.g., different sampling locations) are not exempt.

2. All analytes have been previously analyzed in sample(s) from the same source (within the last year), identified and confirmed by a second column or by GC/MS. The chromatogram is largely unchanged from the one for which confirmation was carried out. The documents indicating previous confirmation must be available for review.

12.2.2 Confirmation Data

Confirmation data will be provided as specified in the method. Identification criteria for GC, LC or GC/MS methods are summarized below:

- GC and LC Methods

1. The analyte must fall within plus or minus three times the standard deviation (established for the analyte/column) of the retention time of the daily midpoint standard in order to be qualitatively identified. The retention-time windows will be established and documented, as specified in the appropriate Standard Operating Procedure (SOP).

2. When sample results are confirmed by two dissimilar columns or detectors, the agreement between quantitative results must be evaluated. The relative percent difference between the two results is calculated and evaluated against SOP and/or method criteria.

- GC/MS Methods - Two criteria are used to verify identification:

    1. Elution of the analyte in the sample will occur at the same relative retention time (RRT) as that of the analyte in the standard.

    2. The mass spectrum of the analyte in the sample must, in the opinion of a qualified analyst or the department manager, correspond to the spectrum of the analyte in the standard or the current GC/MS reference library.

12.3 Data Review and Validation

The integrity of the data generated in the laboratory is assessed through the evaluation of the results of the analysis of method blanks, laboratory control samples, sample duplicates, matrix spiked samples, QC samples, trip blanks, et al. The numerical criteria for evaluation of these QC samples are listed within each method-specific Standard Operating Procedure. These various QC sample analyses are evaluated using the flow diagrams found in Figures 12-1 through 12-9. Other validation measures of the data include a check of the linearity of the calibration curve, an accuracy check of the QC standards and a check of the system sensitivity. Data transcriptions and calculations are also reviewed.

12.4 Data Reporting

When an analyst determines that a data package has met the data quality objectives (and/or any client-specific data quality objectives) of the method and has qualified any anomalies in a clear, acceptable fashion, the data package is reviewed by a trained chemist. Prior to release of the report to the client, the project chemist reviews and approves the entire report for completeness and to ensure that any and all client-specified objectives were successfully achieved. The original raw data, along with a copy of the final report, is filed in project files by service request number for archiving. CAS maintains control of analytical results by adhering to standard operating procedures and by observing sample custody requirements. All data are calculated and reported in units consistent with project specifications, to enable easy comparison of data from report to report.

To the extent possible, samples shall be reported only if all QC measures are acceptable. If a QC measure is found to be out of control, and the data is to be reported, all samples associated with the failed quality control measure shall be reported with the appropriate data qualifier(s). The *SOP for Data Reporting and Report Generation* addresses the flagging and qualification of data. The CAS-defined data qualifiers, state-specific data qualifiers, or project-defined data qualifiers are used depending on project requirements. A case narrative may be written by the project chemist to explain problems with a specific analysis or sample, etc.

For subcontracted analyses, the Project Chemist verifies that the report received from the subcontractor is complete. This includes checking that the correct analyses were performed, the analyses were performed for each sample as requested, a report is provided for each analysis, and the report is signed. The Project Chemist accepts the report if all verification items are complete. Acceptance is demonstrated by forwarding the report to the CAS client.

12.5 Documentation

CAS maintains a records system which ensures that all laboratory records of analysis data retained and available. Analysis data is retained for 5 years from the report date unless contractual terms specify a longer retention time. The archiving system is described in the *SOP for Data Archiving*.

12.5.1 Documentation and Archiving of Sample Analysis Data

The archiving system includes all of the following items for each set of analyses performed:

- Benchsheets describing sample preparation (if appropriate) and analysis;
- Instrument parameters (or reference to the data acquisition method);
- Sample analysis sequence;
- Instrument printouts, including chromatograms and peak integration reports for all samples, standards, blanks, spikes and reruns;
- Logbook ID number for the appropriate standards;
- Copies of report sheets submitted to the work request file; and
- Copies of Nonconformity and Corrective Action Reports, if necessary.

Individual sets of analyses are identified by analysis date and service request number. Since many analyses are performed with computer-based data systems, the final sample concentrations can be automatically calculated. If additional calculations are needed, they are written on the integration report or securely stapled to the chromatogram, if done on a separate sheet.

12.5.2 Documentation of Batch-related QC and Calibration Data

For organics analysis, data applicable to all analyses within the batch, such as GCMS tunes, CCVs, batch QC, and analysis sequences; are kept using a separate documentation system. This system is used to archive data on a batch-specific basis and is segregated according to the date of analysis. This system also includes results for the most recent calibration curves, as well as method validation results.

12.6 Deliverables

In order to meet individual project needs, CAS provides several levels of analytical reports. Basic specifications for each level of deliverable are described in Table 12-1. Variations may be provided based on client or project specifications. This includes (but is not limited to) to following specialized deliverables:

- ADEC – Alaska Department of Conservation specified data package
- ACOE/HTRW – Army Corps of Engineers HTRW specified data package and reporting requirements
- AFCEE – Air Force Center for Environmental Excellence project-specific reporting

When requested, CAS provides Electronic Data Deliverables (EDDs) in the format specified by client need or project specification. The EDD is prepared by report production staff using the electronic version of the laboratory report to minimize transcription errors. User guides and EDD specification outlines are used in preparing the EDD. The EDD is reviewed and compared to the hard-copy report for accuracy.

Figure 12-1
Evaluation of Method Calibration

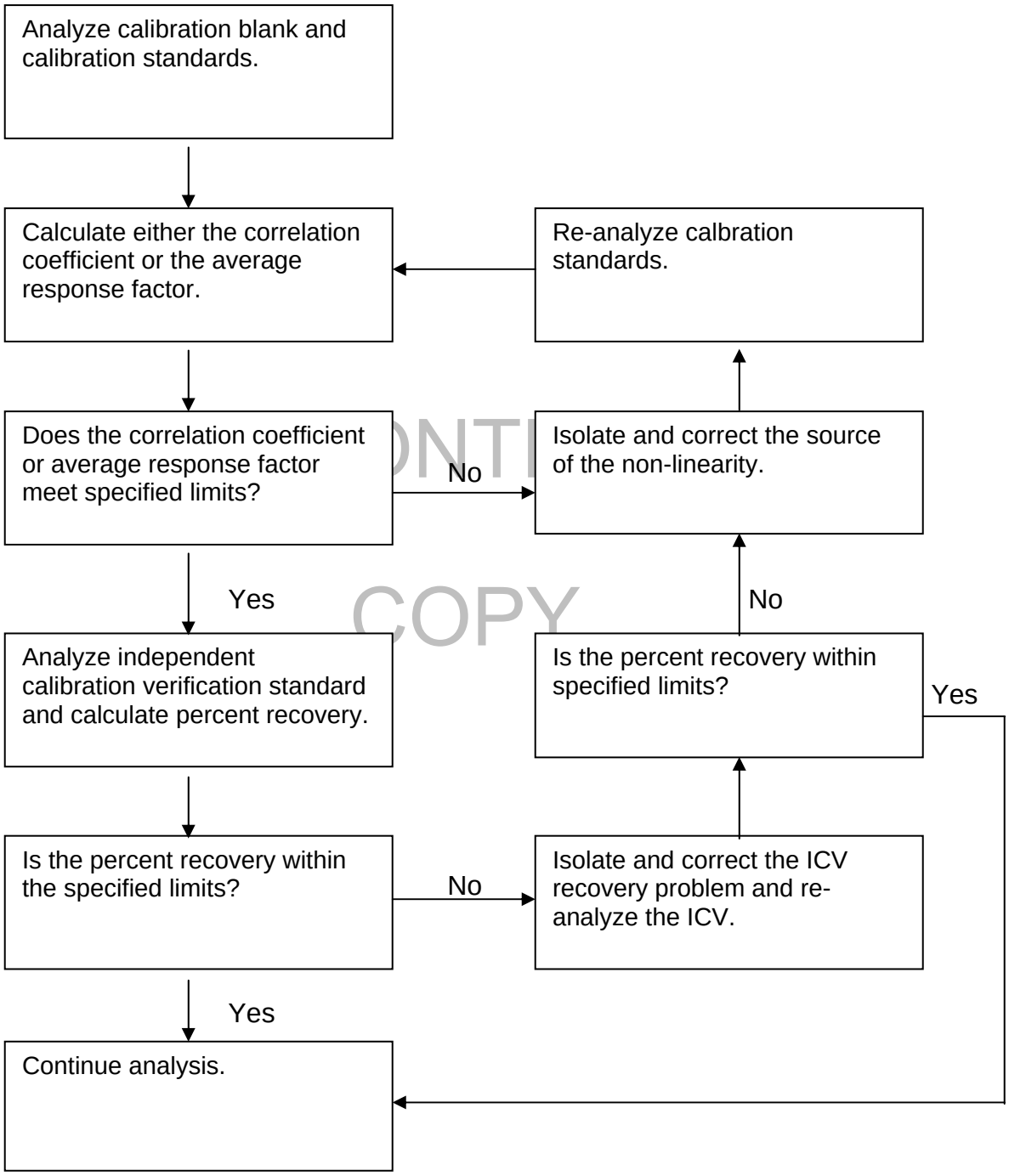


Figure 12-2
Evaluation of Continuing Calibration

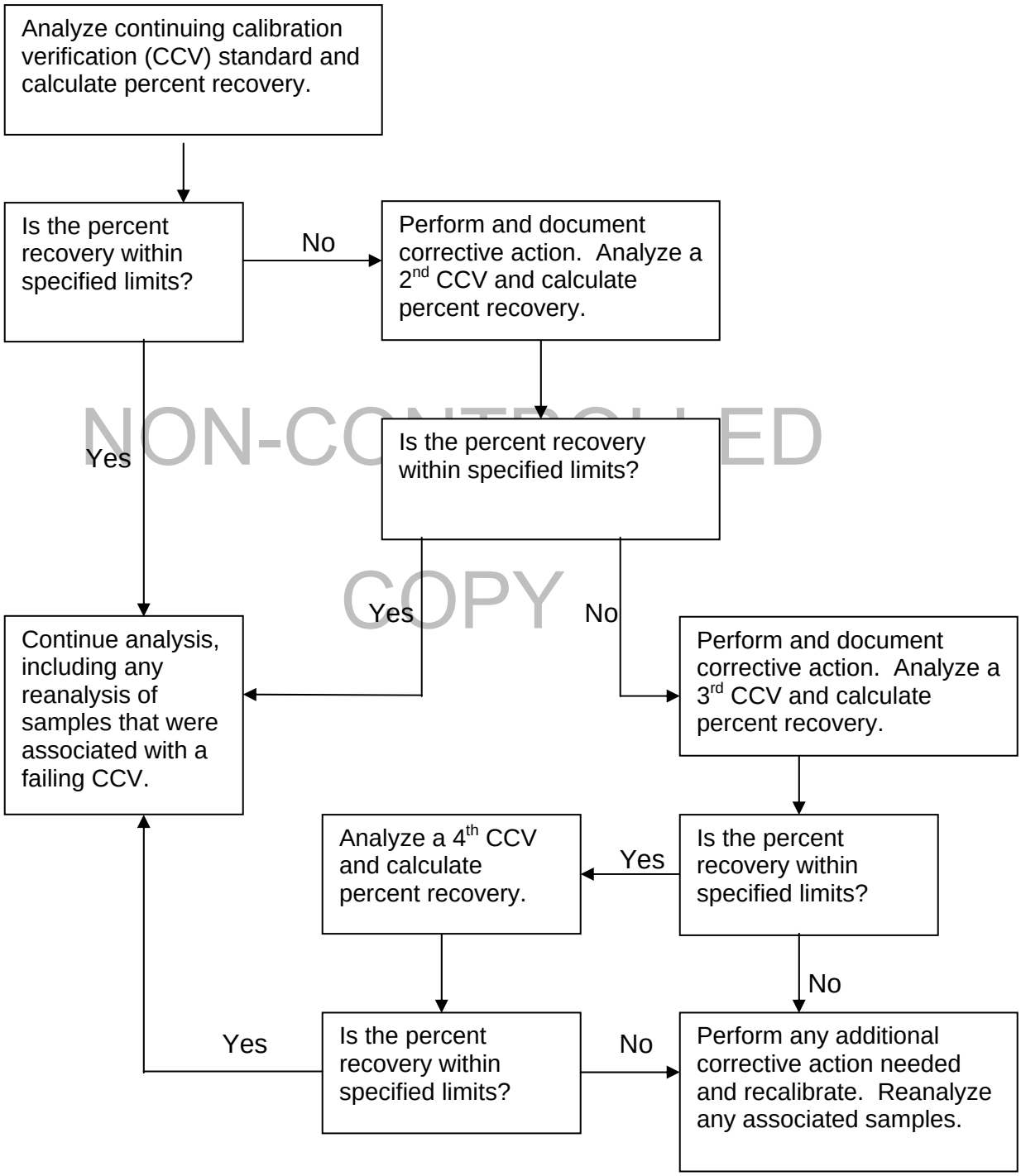


Figure 12-3
Evaluation of Method Blank and Instrument Blank Results

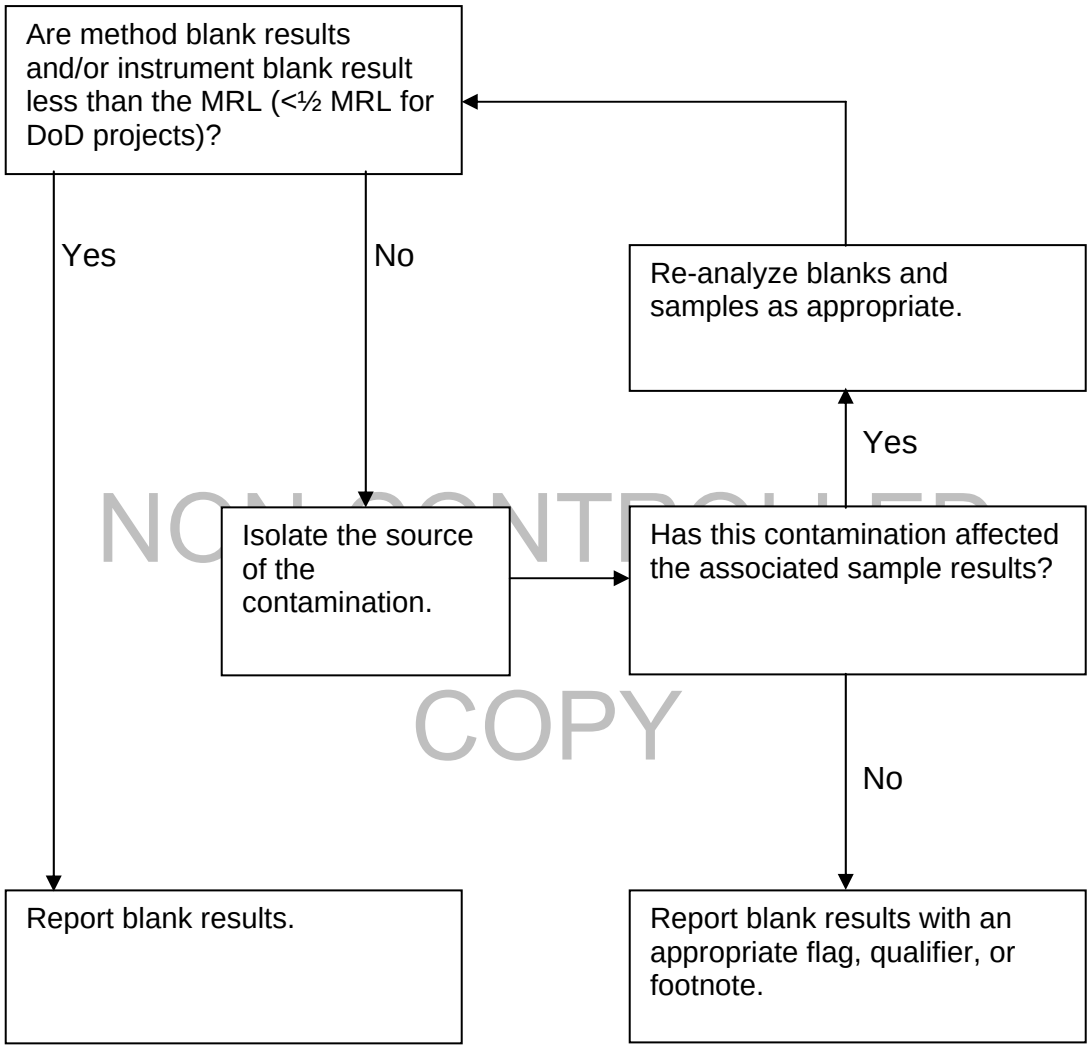


Figure 12-4
Evaluation of Sample Results for Inorganic Analyses

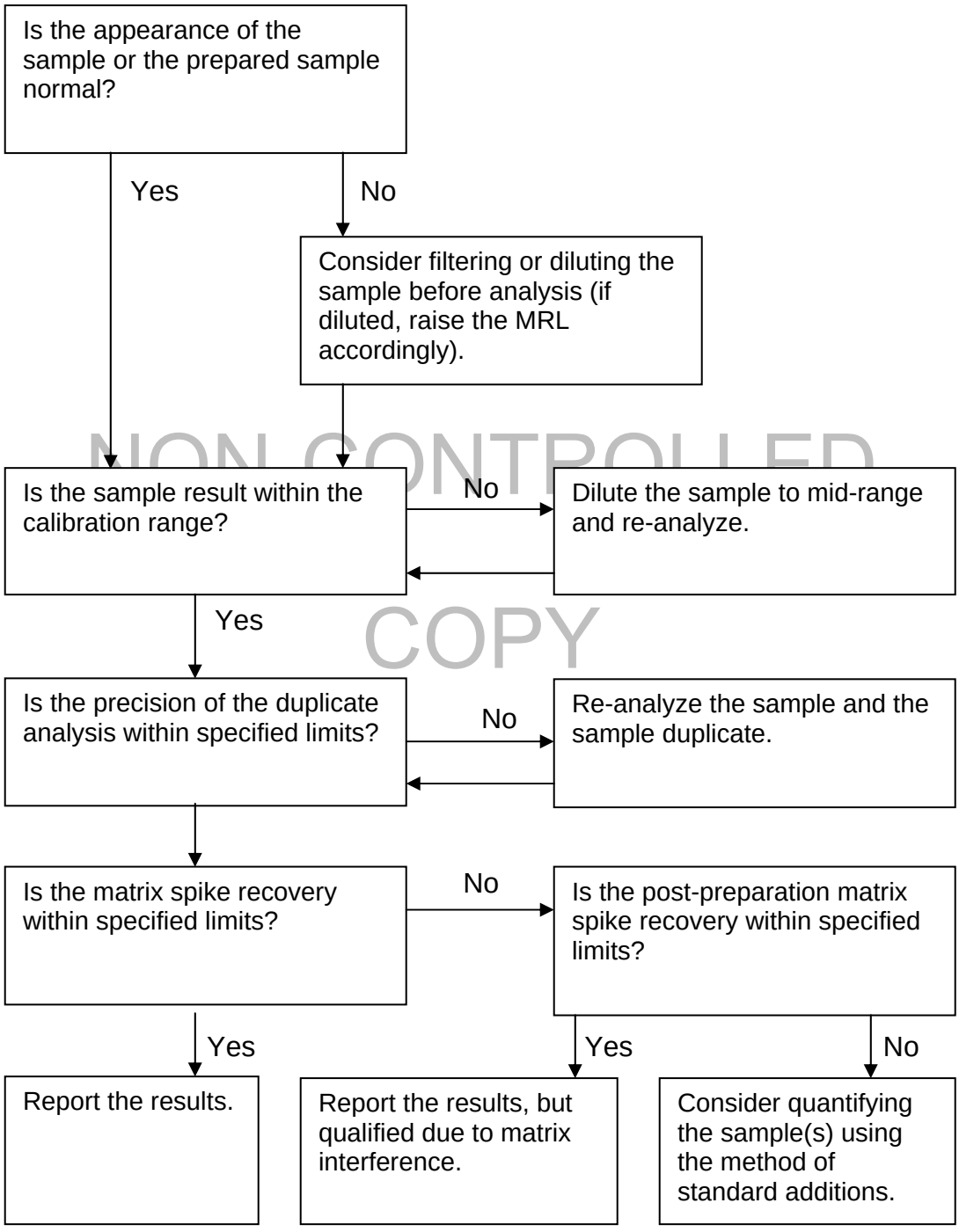


Figure 12-5
Evaluation of Sample Results for Organic Analyses

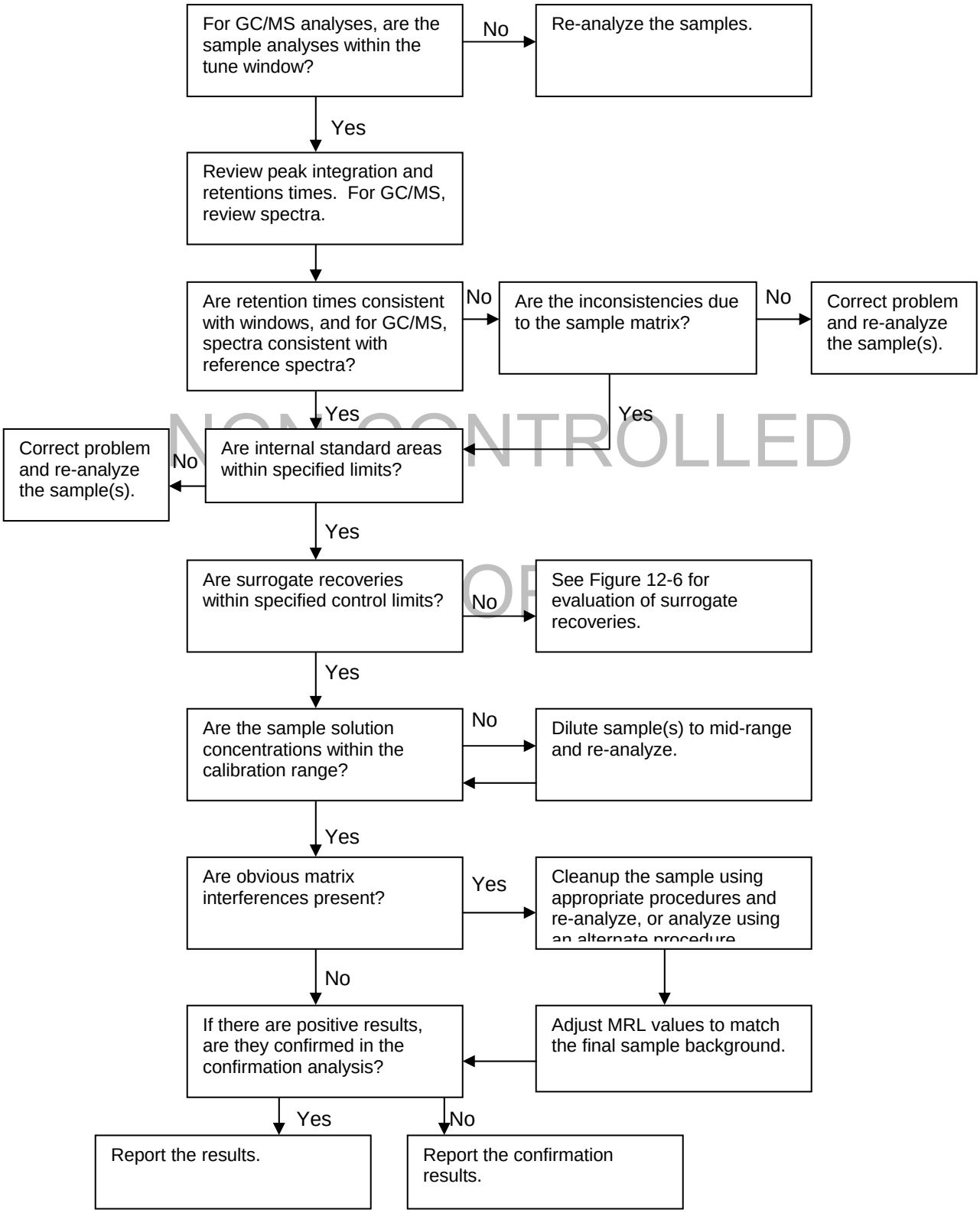


Figure 12-6
Evaluation of Surrogate Compound Recoveries

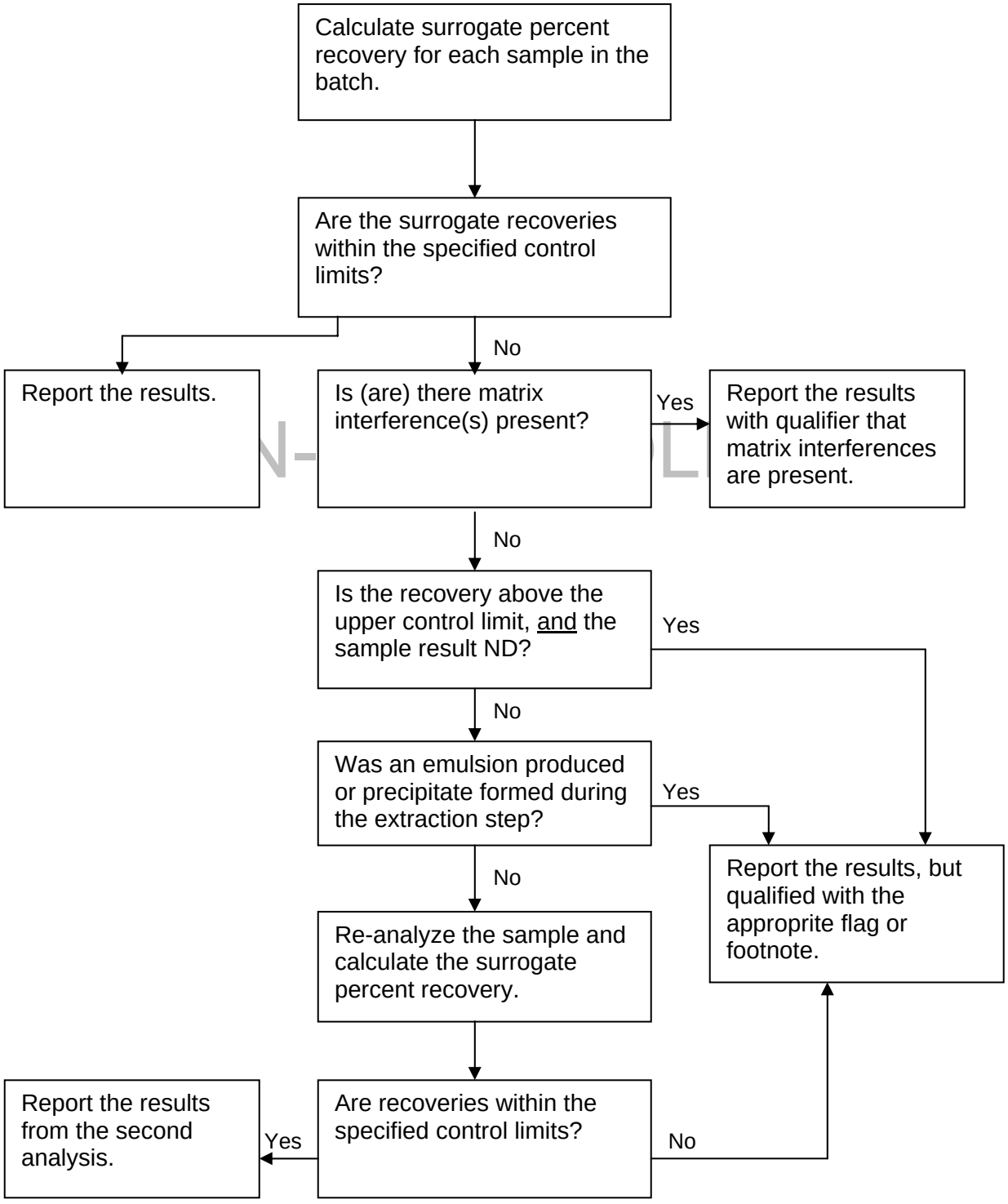


Figure 12-7
Evaluation of Duplicate Sample and/or Duplicate Matrix Spike Results

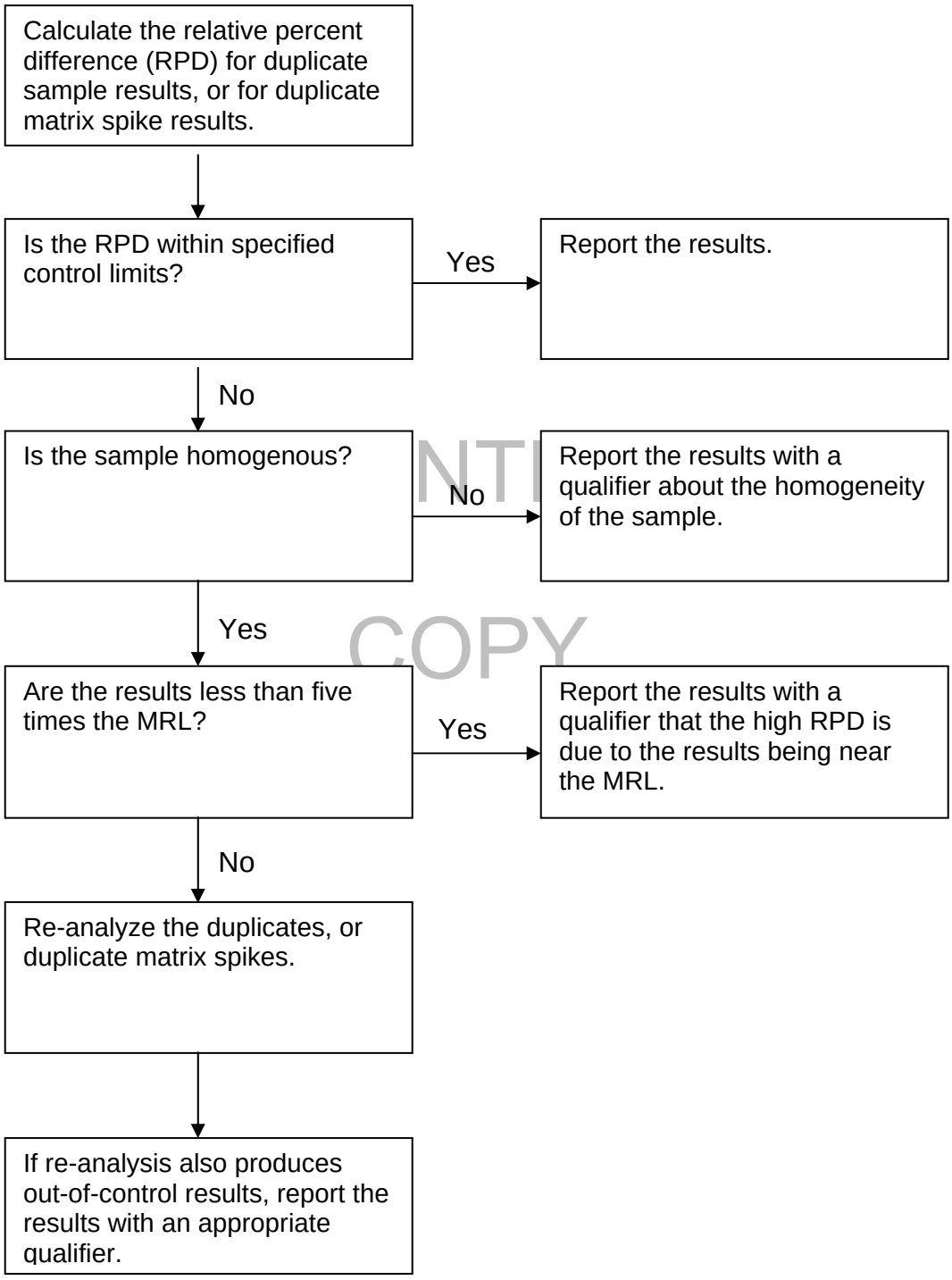


Figure 12-8
Evaluation of Matrix Spike Recoveries

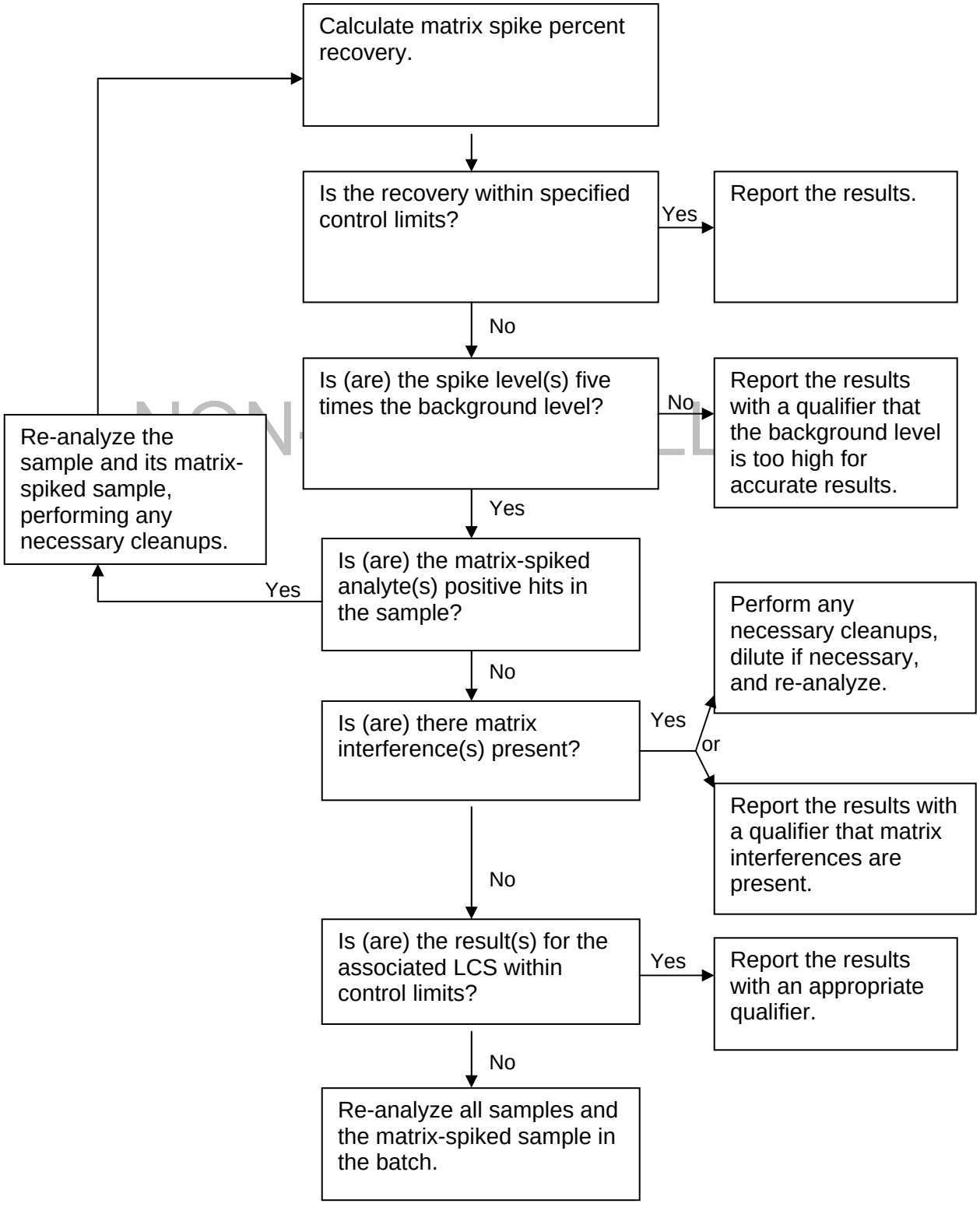


Figure 12-9
Evaluation of Laboratory Control Sample (LCS) Results

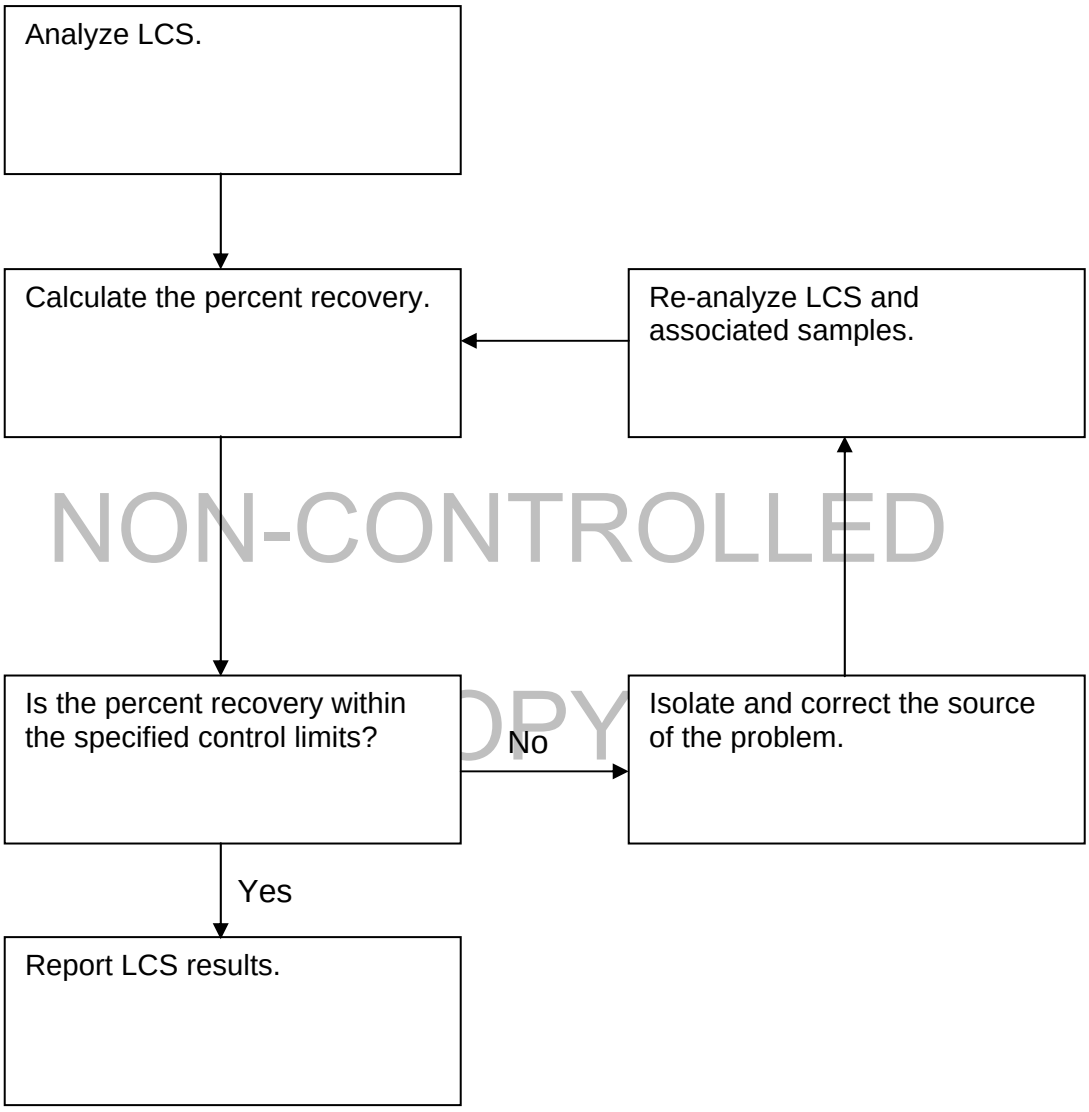


Table 12-1
Descriptions of CAS Data Deliverables

Tier I. Routine Certified Analytical Report (CAR) includes the following:

1. Transmittal letter
2. Sample analytical results
3. Method blank results
4. Surrogate recovery results and acceptance criteria for applicable organic methods
5. Chain of custody documents
6. Dates of sample preparation and analysis for all tests

Tier II and IIA. In addition to the Tier I Deliverables, this CAR includes the following:

1. Matrix spike result(s) with calculated recovery and including associated acceptance criteria
2. Duplicate or duplicate matrix spike result(s) (as appropriate to method), with calculated relative percent difference
3. Tier IIA also includes Laboratory Control Sample (LCS) result(s) with calculated recovery and including associated acceptance criteria

Tier III. Data Validation Package. In addition to the Tier II Deliverables, this CAR includes the following:

1. Case narrative
2. Calibration records and results of initial and continuing calibration verification standards, with calculated recoveries
3. Results of laboratory control sample (LCS) or Quality Control check sample, with calculated recovery and/or associated acceptance limit criteria
4. Results of calibration blanks or solvent blanks (as appropriate to method)
5. Summary forms for associated QC and calibration parameters
6. Copies of all raw data, including extraction/preparation bench sheets, chromatograms, and instrument printouts. For GC/MS, this includes tuning criteria and mass spectra of all positive hits. Results and spectra of TIC compounds will be included upon request.

Tier IV. CLP-Level Data Validation Package.

A complete Data Validation Package containing all sample results, quality control and calibration results, and raw data necessary to fulfill all deliverable requirements of an EPA Contract Laboratory Program (CLP) data package.

13.0 PERFORMANCE AND SYSTEM AUDITS

Quality audits are an essential part of CAS/Kelso's quality assurance program. There are two types of audits used at the facility: System Audits are conducted to qualitatively evaluate the operational details of the QA program, while Performance Audits are conducted by analyzing performance evaluation samples in order to quantitatively evaluate the outputs of the various measurement systems.

13.1 System Audits

The system audit examines the presence and appropriateness of laboratory systems. External system audits of CAS/Kelso are conducted regularly by various regulatory agencies and clients. Table 13-1 summarizes some of the major programs in which CAS/Kelso participates. Programs and certifications are added as required. Additionally, internal system audits of CAS/Kelso are conducted regularly by the Quality Assurance Manager and by the CAS Quality Assurance Director. The internal audit procedures are described in the *SOP for Internal Audits*. The internal audits are performed as follows:

- Comprehensive lab-wide system audit – performed annually. This audit is conducted such that systems, technical operations, hardcopy data, and electronic data are assessed.
- Hardcopy report audits – minimum of 3 per quarter.
- Electronic audit trail reviews – each applicable instrument per quarter.

All audit findings, and corrective actions are documented. The results of each audit are reported to the Laboratory Director and Department Managers for review. Any deficiencies identified are summarized in the audit report. Managers must respond with corrective actions correcting the deficiency within 30 days. Should problems impacting data quality be found during an internal audit, any client whose data is adversely impacted will be given written notification within the 30 day corrective action period (if not already provided).

Electronic data audits may be performed in conjunction with hardcopy data audits. The electronic audits focus on organic chromatographic data and include an examination of audit trails, peak integrations, calibration practices and files, GCMS tuning data, peak response data, use of appropriate files, and other components of the analysis. The audit also verifies that the electronic data supports the hardcopy reported data.

Additional internal audits or data evaluations may be performed as needed to address any potential data integrity issues that may arise.

13.2 Performance Audits

CAS/Kelso also participates in the analysis of interlaboratory proficiency testing (PT) samples. Participation in PT studies is performed on a regular basis and is designed to evaluate all analytical areas of the laboratory. CAS routinely participates in the following studies:

- Water Pollution (WP) and additional water parameters, 2 per year.
- Water Supply (WS) PT studies, 2 per year.
- Hazardous Waste/Soil PT studies, 2 per year.
- Underground Storage Tank PT studies, 2 per year.
- Microbiology (WS and WP) PT studies, 2 per year.
- Other studies as required for specific certifications, accreditations, or validations.

PT samples are processed by entering them into the LIMS system as samples (assigned Service Request, due date, testing requirements, etc.) and are processed the same as field samples. The laboratory sections handle samples the same as field samples, performing the analyses following method requirements and performing data review. The laboratory sections submit results to the QA Manager for subsequent reporting to the appropriate agencies or study provider. Results of the performance evaluation samples and audits are reviewed by the Quality Assurance Manager, Laboratory Director, the laboratory staff, and the CAS Quality Assurance Director. For any results outside acceptance criteria, the analysis data is reviewed to identify a possible cause for the deficiency, and corrective action is taken and documented.

Table 13-1
Current CAS Performance and System Audit Programs

Federal and National Programs

- Naval Facilities Engineering Service Center
  Validated Laboratory for NFESC Parameters
- U.S. Air Force, Air Force Center for Environmental Excellence (AFCEE)
  Approved Laboratory for AFCEE Projects
- U.S. Army Corps of Engineers - MRD, HTRW Center of Expertise
  Validated Laboratory for HTRW parameters
- National Environmental Laboratory Accreditation Conference (NELAC) Accredited

State and Local Programs

- State of Alaska, Department of Environmental Conservation
  UST Laboratory, Lab I.D. UST040
- State of Arizona, Department of Health Services
  License No. AZ0339
- State of Arkansas, Department of Environmental Quality
  Certified Environmental Laboratory
- State of California, Department of Health Services, Environmental Laboratory Accreditation Program
  Certification No. 2286
- State of Colorado, Department of Public Health and Environment
  Certified Drinking Water Laboratory
- State of Florida, Department of Health
  Primary NELAC Accreditation No. E87412
- State of Hawaii, Department of Health
  Certified Drinking Water Laboratory
- State of Idaho, Department of Health and Welfare
  Certified Drinking Water Laboratory
- State of Indiana, Department of Health
  Certified Drinking Water Laboratory, Lab I.D. C-WA-01
- State of Louisiana, Department of Environmental Quality
  Accredited Environmental Laboratory, Lab I.D. 3016
- State of Louisiana, Department of Health and Hospitals
  Accredited Drinking Water Laboratory, Lab I.D. LA050001
- State of Maine, Department of Human Services
  Certified Environmental Laboratory, Lab I.D. WA901
- State of Michigan, Department of Environmental Quality
  Certified Drinking Water Laboratory, Lab I.D. 9949
- State of Minnesota, Department of Health
  Certified Environmental Laboratory, Lab I.D. 053-999-368
- State of Montana, Department of Health and Environmental Sciences
  Certified Drinking Water Laboratory, Lab I.D. 0047
- State of Nebraska, Health and Human Services System
  Certified Drinking Water Laboratory
- State of Nevada, Division of Environmental Protection
  Certified Drinking Water Laboratory, Lab I.D. WA35

Table 13-1 (continued)

State and Local Programs (continued)

- State of New Jersey, Department of Environmental Protection
  Accredited Environmental Laboratory, Lab I.D. WA005
- State of New Mexico, Environment Department
  Certified Drinking Water Laboratory
- State of New York, Department of Health
  Accredited Environmental Laboratory, Lab I.D. 11775
- State of North Carolina, Department of Environment and Natural Resources
  Certified Environmental Laboratory, Lab I.D. 605
- State of Oklahoma, Department of Environmental Quality
  General Water Quality/Sludge Testing, Lab I.D. 9801
- State of Oregon, ORELAP Laboratory Accreditation Program
  Accredited Environmental Laboratory, Lab I.D. WA200001
- State of Pennsylvania Department of Environmental Protection
  Registered Environmental Laboratory
- State of South Carolina, Department of Health and Environmental Control
  Certified Environmental Laboratory, Lab I.D. 61002
- State of Utah, Department of Health, Division of Laboratory Services
  Accredited Environmental Laboratory
- State of Washington, Department of Ecology, Environmental Laboratory Accreditation Program
  Accreditation No. C001
- State of Wisconsin, Department of Natural Resources
  Accredited Environmental Laboratory, Lab I.D. 998386840

14.0 PREVENTIVE MAINTENANCE

Preventive maintenance is a crucial element of the Quality Assurance program. Instruments at CAS (e.g., ICP/MS and ICP systems, GC/MS systems, atomic absorption spectrometers, analytical balances, gas and liquid chromatographs, etc.) are maintained under commercial service contracts or by qualified, in-house personnel. All instruments are operated and maintained according to the instrument operating manuals. All routine and special maintenance activities pertaining to the instruments are recorded in instrument maintenance logbooks. The maintenance logbooks used at CAS contain extensive information about the instruments used at the laboratory.

An initial demonstration of analytical control is required on every instrument used at CAS before it maybe used for sample analysis. If an instrument is modified or repaired, a return to analytical control is required before subsequent sample analyses can occur. When an instrument is acquired at the laboratory, the following information is noted in a bound maintenance notebook specifically associated with the new equipment:

- The equipment's serial number;
- Date the equipment was received;
- Date the equipment was placed into service;
- Condition of equipment when received (new, used, reconditioned, etc.); and
- Prior history of damage, malfunction, modification or repair (if known).

Equipment records also include a copy of the manufacturer's manual(s) and dates and results of calibrations.

Preventive maintenance procedures, frequencies, etc. are available for each instrument used at CAS. They may be found in the various SOPs for routine methods performed on an instrument and may also be found in the operating or maintenance manuals provided with the equipment at the time of purchase.

Responsibility for ensuring that routine maintenance is performed lies with the section supervisor. The supervisor may perform the maintenance or assign the maintenance task to a qualified bench level analyst who routinely operates the equipment. In the case of non-routine repair of capital equipment, the section supervisor is responsible for providing the repair, either by performing the repair themselves with manufacturer guidance or by acquiring on-site manufacturer repair. Each laboratory section maintains a critical parts inventory. The parts inventories include the items needed to perform the preventive maintenance procedures listed in Appendix D.

This inventory or “parts list” also includes the items needed to perform any other routine maintenance and certain in-house non-routine repairs such as gas chromatography/mass spectrometry jet separators and electron multipliers and ICP/MS nebulizer. When performing maintenance on an instrument (whether preventive or corrective), additional information about the problem, attempted repairs, etc. is also recorded in the notebook. Typical logbook entries include the following information:

- Details and symptoms of the problem;
- Repairs and/or maintenance performed;
- Description and/or part number of replaced parts;
- Source(s) of the replaced parts;
- Analyst's signature and date; and
- Demonstration of return to analytical control.

See the table in Appendix D for a list of preventive maintenance activities and frequency for each instrument.

15.0 CORRECTIVE ACTION

To the extent possible, samples shall be reported only if all quality control measures are acceptable. If a quality control measure is found to be out of control, and the data is to be reported, all samples associated with the failed quality control measure shall be reported with the appropriate data qualifier(s). Failure to meet established analytical controls, such as the quality control objectives outlined in Section 11, prompts corrective action. In general, corrective action may take several forms and may involve a review of the calculations, a check of the instrument maintenance and operation, a review of analytical technique and methodology, and reanalysis of quality control and field samples. If a potential problem develops that cannot be solved directly by the responsible analyst, the supervisor, team leader, the department manager, and/or the Quality Assurance Manager may examine and pursue alternative solutions. In addition, the appropriate project chemist may be notified in order to ascertain if contact with the client is necessary.

Problems with analysis, as well as the corresponding corrective actions taken, are documented on Nonconformity and Corrective Action Reports (See Figure 15-1) following the requirements in the *SOP for Nonconformity and Corrective Action Documentation* (SOP No. ADM - NCAR). This form is utilized to document corrective actions in response to out-of-control situations. The Quality Assurance Manager reviews each problem, ensuring that appropriate corrective action has been taken by the appropriate personnel. The Nonconformity and Corrective Action Report (NCAR) is filed in the associated service request file and a copy is kept by the Quality Assurance Manager. The Quality Assurance Manager periodically reviews all NCARs looking for chronic, systematic problems that need more in-depth investigation and alternative corrective action consideration. In addition, the appropriate project chemist is promptly notified of any problems in order to inform the client and proceed with any action the client may want to initiate.

Corrective action due to a performance audit or a check sample problem is initiated by the Quality Assurance Manager; the affected laboratory laboratory supervisors and managers are promptly informed of performance audit results requiring corrective action.

Figure 15-1

Nonconformity and Corrective Action Report

NONCONFORMITY N&CA Report No. _____

PROCEDURE (SOP or METHOD): EVENT DATE: _____

EVENT: ☐ Missed Holding Time ☐ QC Failure ☐ Lab Error (spilled sample, spiking error, etc.)
☐ Method Blank Contamination ☐ Login Error ☐ Project Management Error
☐ Equipment Failure ☐ Unacceptable PT Sample Result ☐ Other (describe):

SAMPLES / PROJECTS / CUSTOMERS / SYSTEMS AFFECTED

DETAILED DESCRIPTION

ORIGINATOR: _____ DATE: _____

PROJECT CHEMIST(s): _____ NOTIFIED BY: _____ DATE: _____

CORRECTIVE ACTION AND OUTCOME

Re-establishment of conformity must be demonstrated and documented. Describe the steps that were taken, or are planned to be taken, to correct the particular Nonconformity and prevent its reoccurrence. Include Project Chemist instructions here.

Is the data to be flagged in the Analytical Report with an appropriate qualifier? ☐ No ☐ Yes

APPROVAL AND NOTIFICATION

Supervisor Verification and Approval of Corrective Action _____ Date: _____
Comments:

QA PM Verification and Approval of Corrective Action _____ Date: _____
Comments:

Customer Notified by ☐ Telephone ☐ Fax ☐ E-mail ☐ Narrative ☐ Not notified
Project Chemist Verification and Approval of Corrective Action _____ Date: _____
Comments: (Retain record)

Page 1 of 1
Original: Customer File Photocopies: Supervisor and QA PM N&CA Report 2004.doc 3/26/2004

16.0 QUALITY ASSURANCE REPORTS

Quality assurance requires an active, ongoing commitment by CAS personnel at all levels of the organization. Information flow and feedback mechanisms are designed so that analysts, supervisors and managers are aware of quality assurance issues in the laboratory. Analysts performing routine testing are responsible for generating a Data Quality Report (DQR), or similar form, with every analytical batch they process. This report contains explicit documentation of the various controls that must be met during the analysis. This report also allows the analyst to provide appropriate notes and/or a case narrative if problems were encountered with the analyses. A Non-Conformity and Corrective Action Report (NCAR) (see Section 15.0) may also be attached to the data prior to review. Supervisors or qualified analysts review all of the completed analytical batches to ensure that all QC criteria have been examined and any deficiencies noted and corrected if possible.

It is the responsibility of each laboratory unit to provide the project chemist with a final report of the data, accompanied by signature approval. Footnotes and/or narrative notes must accompany any data package if problems were encountered that require further explanation to the client. Each data package is submitted to the appropriate project chemist, who in turn reviews the entire collection of analytical data for completeness. The project chemist must also review the entire body of data to ensure that any and all client-specified objectives were successfully achieved. A case narrative may be written by the project chemist to explain any unusual problems with a specific analysis or sample, etc.

The Quality Assurance Manager (QAM) provides overview support to the project chemists as required (e.g., contractually specified, etc.). The QAM is also responsible for the oversight of all internal and external audits, for all proficiency testing sample and analysis programs, and for all laboratory certification/accreditation responsibilities. The QAM provides the Laboratory Director with quarterly reports that summarize the various QA/QC activities that occurred during the previous quarter. The report addresses such topics as the following:

- Status, schedule, and results of internal and external audits;
- Status, schedule, and results of internal and external proficiency testing studies;
- Status of certifications, accreditations, and approvals;
- Status of QA Manual and SOP review and revision;
- Status of MDLs studies;
- Discussion of QC problems in the laboratory;
- Discussion of corrective action program issues;
- Status of staff training and qualification; and
- Other topics as appropriate.

Any operational or quality assurance problems noted by the Laboratory Director are then addressed during the senior staff operations meetings with all appropriate department managers. The Laboratory Director also performs an annual documented review of the laboratory quality system to identify any necessary changes or improvements to the quality system or quality assurance policies.

17.0 PERSONNEL TRAINING

Technical position descriptions are available for all employees, regardless of position or level of seniority. These documents are maintained by the Human Resources personnel and are available for review. In order to assess the technical capabilities and qualifications of a potential employee, all candidates for employment at CAS are evaluated, in part, against the appropriate technical description.

Training begins the first day of employment at CAS when the company policies are presented and discussed. Safety and QA/QC requirements are integral parts of all technical SOPs and, consequently, are integral parts of all training processes at CAS. Safety training begins with the reading of the *Environmental Health and Safety Manual.* Employees are also required to attend periodic safety meetings where additional safety training may be performed by the Environmental, Health and Safety Officer. Employees are responsible for complying with the requirements of the QA Manual and QA/QC requirements associated with their function(s).

Each employee participates in Ethics training, which is part of the CAS Improper Practices Prevention Program. CAS also encourages its personnel to continue to learn and develop new skills that will enhance their performance and value to the Company. Ongoing training occurs for all employees through a variety of mechanisms. The "CAS University" education system, external and internal technical seminars and training courses, and laboratory-specific training exercises are all used to provide employees with professional growth opportunities.

A training plan is developed for each Standard Operating Procedure. The training plan includes a description of the step-by-step process for training an employee and for initial demonstration of proficiency. Where the analyst performs the entire procedure, a generic training plan may be used. In cases where work cells are used, a training plan specific to the work cell is established.

17.1 Initial Demonstration of Capability

Training in analytical procedures typically begins with the reading of the Standard Operating Procedure (SOP) for the method. Hands-on training begins with the observation of an experienced analyst performing the method, followed by the trainee performing the method under close supervision, and culminating with independent performance of the method on quality control samples. Successful completion of the applicable Demonstration of Capability analysis qualifies the analyst to perform the method independently. Demonstration of Capability is performed by one of the following:

- Successful completion of a Initial Precision and Recovery (IPR) study (required where mandated by the method).

- Analysis of 4 consecutive Laboratory Control Samples, with acceptable accuracy and precision. (For use of this option, LCSs must be from "second-source" standard materials independent of the calibration standards materials.).

- Where spiking is not possible but QC standards are used ("non-spiked" Laboratory Control Samples), analysis of 4 consecutive Laboratory Control Samples with acceptable accuracy and precision.

- Where one of the three above is not possible, special requirements are as follows:

    - Total Settleable Solids: Successful single-blind PT sample analysis and duplicate results with RPD<10%.
    - Color: Four consecutive prepared LCSs with acceptable accuracy and precision of <10% RSD.
    - Physical Tests (Grain size, Corrosivity to Steel, etc.): Supervisor acknowledgement of training and approval.

A flowchart identifying the Demonstration of Proficiency requirements is given in Figure 17-1. The flowchart identifies allowed approaches to assessing Demonstration of Capability when a 4-replicate study is not mandated by the method, when spiking is not an option, or when QC samples are not readily available.

17.2 Continuing Demonstration of Proficiency

A periodic demonstration of proficiency is required to maintain continuing qualification. Continuing Demonstration of Proficiency is required each year, and may be performed one of the following ways:

- Successful performance on external (independent) single-blind PT sample analyses using the test method, or a similar test method using the same technology.

- Performing Initial Demonstration of Capability as described above, with acceptable levels of precision and accuracy.

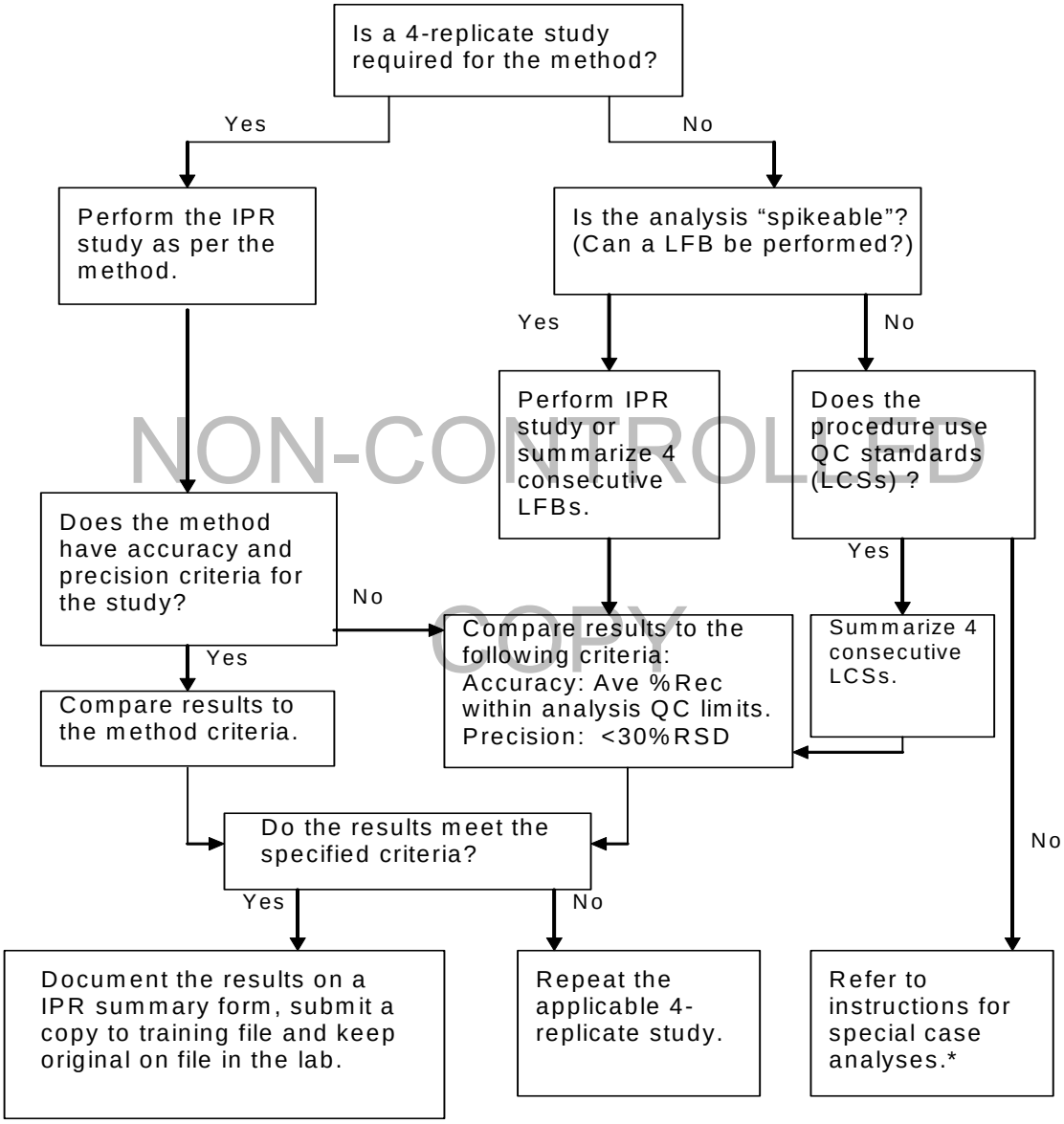
- Analysis of at least 4 consecutive LCSs with acceptable levels of accuracy and precision from in-control analytical batches.

- For methods for which PT samples are not available and a spiked analysis (LFB, MDL, etc.) is not possible, analysis of field samples that have been analyzed by another analyst with statistically indistinguishable results.

17.3 Documentation of Training

Records are maintained to indicate the employee has the necessary training, education, and experience to perform their functions. Information of previously acquired skills and abilities for a new employee is maintained in Human Resources personnel files and CAS resumes. A database is used to record the various technical skills and training acquired while employed by CAS. Information includes the employee's name, a description of the skill including the appropriate method and SOP reference, the mechanism used to document proficiency, and the date the training was completed. General procedures for documenting technical training are described in the *SOP for Documentation of Training (SOP No. ADM-TRANDOC).*

Figure 17-1
Initial Demonstration of Capability Requirements[a]



[a] For IDOC IPR or LFB studies, "second-source" reference materials are used, as per NELAC requirements
*Total Settleable Solids: Successful PT sample analysis and duplicate results with RPD<10%.
*Color: Four consecutive prepared LCSs with acceptable accuracy and precision of <10% RSD.
* Physical Tests (Grain size, Corrosivity to Steel, etc.): Supervisor acknowledgement of training and approval.

18.0 REFERENCES FOR ANALYTICAL PROCEDURES

The analytical methods used at CAS generally depend upon the end-use of the data. Since most of our work involves the analysis of environmental samples for regulatory purposes, specified federal and/or state testing methodologies are used and followed closely. Several factors are involved with the selection of analytical methods to be used in the laboratory. These include the method detection limit, the concentration of the analyte being measured, method selectivity, accuracy and precision of the method, the type of sample being analyzed, and the regulatory compliance objectives. Typical methods used at CAS are taken from the following references:

- *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, (September 1986) and Updates I (July 1992), II (September 1994), IIA (August 1993), IIB (January 1995), III (December 1996), and Proposed Update IVA (January 1998). See Chapters 1, 2, 3, and 4. Unless otherwise specified, the most current promulgated version is used.

- *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, (Revised March 1983).

- *Methods for the Determination of Inorganic Substances in Environmental Samples*, EPA/600/R-93/100 (August 1993).

- *Methods for the Determination of Metals in Environmental Samples*, EPA/600/4-91/010 (June 1991) and Supplements.

- *Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater*, EPA 600/4-82-057 (July 1982) and 40 CFR Part 136, Appendix A.

- *Methods for the Determination of Organic Compounds in Drinking Water*, EPA/600/4-88/039 (December 1988) and Supplements.

- *Standard Methods for the Examination of Water and Wastewater*, 16th Edition (1985); 17th Edition (1989); 18th Edition (1992); 19th Edition (1995). See Introduction in Part 1000.

- 40 CFR Part 136, Guidelines for Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act.

- 40 CFR Part 141, National Primary Drinking Water Regulations.

- *Analytical Methods for Petroleum Hydrocarbons*, ECY 97-602, Washington State Department of Ecology, June 1997.

- State-specific total petroleum hydrocarbon methods for the analysis of samples for gasoline, diesel, and other petroleum hydrocarbon products (Alaska, Arizona, California, Oregon, Washington, Wisconsin, etc.).

- Annual Book of ASTM Standards, Part 31, Water.

- EPA Contract Laboratory Program, Statement of Work for Organic Analysis, SOW Nos. OLM01.8, OLM02.0, OLM03.1, OLM03.2, OLM04.2, and OLM04.3.

- EPA Contract Laboratory Program, Statement of Work for Inorganic Analysis, SOW No. ILM04.0, ILM04.1, and ILM05.2.

- *U. S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA-540/R-94/012 (February 1993).

- *U. S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA-540/R-94/013 (February 1994).

- National Institute for Occupational Safety and Health (NIOSH) *Manual of Analytical Methods*, Third Edition (August 1987); Fourth Edition (August 1994).

- *Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound*, for USEPA and USACE (March 1986), with revisions through April 1997.

- WDOE 83-13, *Chemical Testing Methods for Complying with the State of Washington Dangerous Waste Regulations* (March 1982) and as Revised (July 1983 and April 1991).

- *Identification and Listing of Hazardous Waste,* California Code of Regulations, Title 22, Division 4.5, Chapter 11.

- *Analytical Methods for the Determination of Pollutants in Pulp and Paper Industry Wastewater*, EPA 821-R-93-017 (October 1993).

- *Analytical Methods for the Determination of Pollutants in Pharmaceutical Manufacturing Industry Wastewaters*, EPA 821-B-98-016 (July 1998).

- National Council of the Pulp and Paper Industry for Air and Stream Improvement (NCASI).

- *Good Automated Laboratory Practices, Principles and Guidance to Regulations For Ensuring Data Integrity In Automated Laboratory Operations*, EPA 2185 (August 1995).

- *Manual for the Certification of Laboratories Analyzing Drinking Water*, 4th Edition, EPA 815-B-97-001 (March 1997).

- National Environmental Laboratory Accreditation Conference (NELAC), 2003 Quality Standards.

APPENDIX A

LIST of QA PROGRAM DOCUMENTS

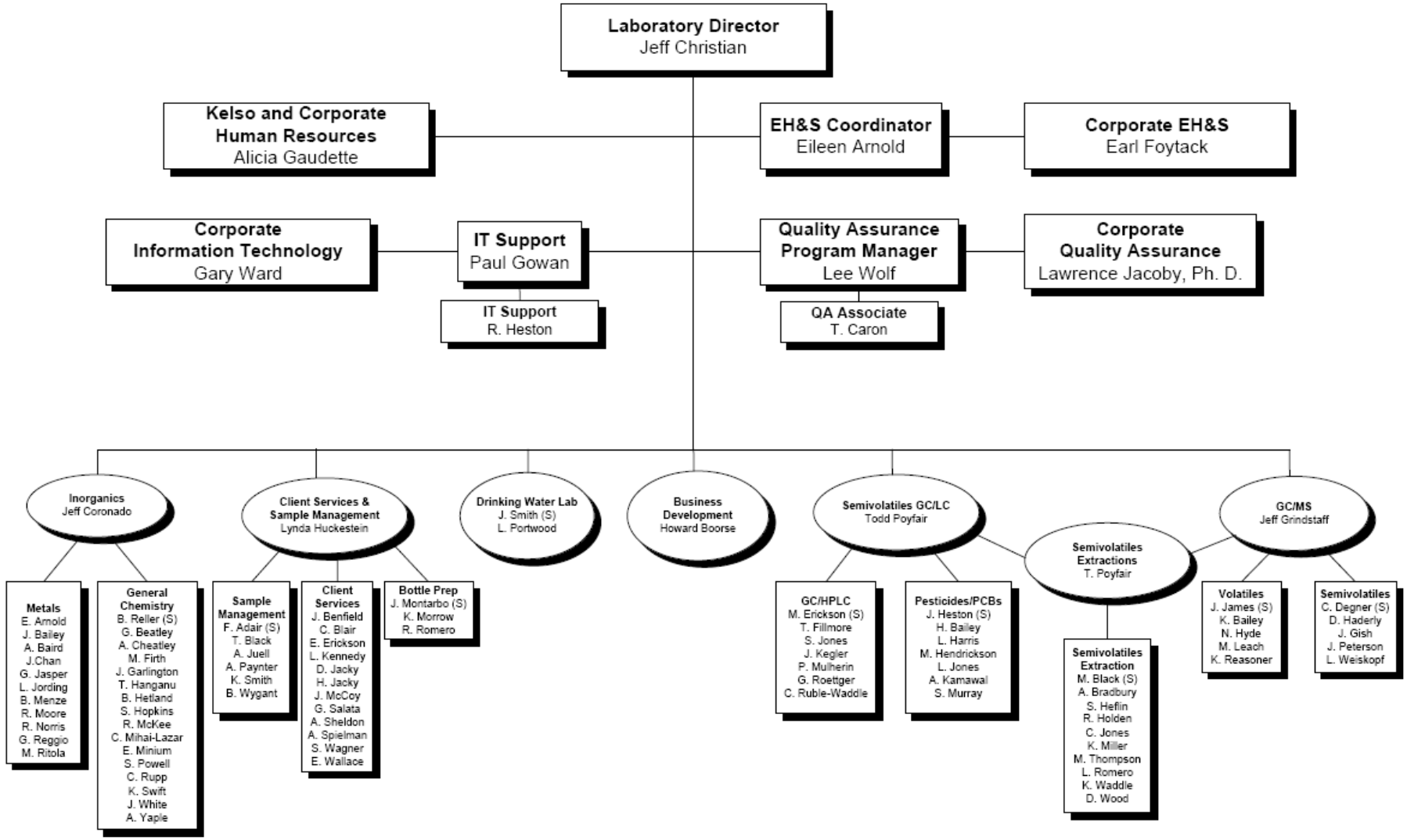
Quality Assurance Manual	1/10/05
Software Quality Assurance Plan	7/11/05
CAS-Kelso Certifications/Accreditations	Cert_kel.xls
Columbia Analytical Services MDL Tracking Spreadsheet	Mdl_list.xls
Technical Training Summary Database	TrainDat.mdb
Approved Signatories List	AppSignatories.pdf
Personnel resumes/qualifications	(all staff)
Personnel Job Descriptions	HR Department
Quality Control Acceptance Criteria	Qclimits.xls
Master Logbook of Laboratory Logbooks	Masterlog-001
TECHNICAL STANDARD OPERATING PROCEDURES	
SOP TABLE OF CONTENTS	SOPLIST.DOC
ADMINISTRATIVE STANDARD OPERATING PROCEDURES	
ADMINISTRATIVE - CORPORATE	**FILE NAME**
CHAIN OF CUSTODY FOR SAMPLE TRANSFER BETWEEN LABORATORIES	ADM-COC
CHECKING NEW LOTS OF CHEMICALS FOR CONTAMINATION	ADM-CTMN
CONTROL LIMITS	ADM-CTRL_LIM
DEALING WITH COMPLAINTS	ADM-CMPLT
DOCUMENT CONTROL	ADM-DOCCTRL
DOCUMENTATION OF TRAINING	ADM-TRANDOC
ELECTRONIC DATA AUDITING	ADM-E_DATAUDIT
MAKING ENTRIES INTO LOGBOOKS AND ONTO BENCHSHEETS	ADM-DATANTRY
MANUAL INTEGRATION OF CHROMATOGRAPHIC PEAKS	ADM-INT
NONCONFORMITY AND CORRECTIVE ACTION	ADM-NCAR
PREPARATION OF STANDARD OPERATING PROCEDURES	ADM-SOP
PURCHASING THROUGH CAS PURCHASING AGENT	ADM-PUR
QUALIFICATION OF SUBCONTRACT LABORATORIES	ADM-SUBLAB
SAMPLE BATCHES	ADM-BATCH
SIGNIFICANT FIGURES	ADM-SIG.FIG
THE DETERMINATION OF METHOD DETECTION LIMITS AND LODs	ADM-MDL

ADMINISTRATIVE – LOCAL LABORATORY	**FILE NAME**
ARMY CORPS OF ENGINEERS HTRW PROJECT MANAGEMENT	ADM-HTRW
CHECKING PIPET CALIBRATION	ADM-CPIP
CONTINGENCY PLAN FOR LABORATORY EQUIPMENT FAILURE	ADM-ECP
CONTROL CHARTING QUALITY CONTROL DATA	ADM-CHRT
DATA ARCHIVING	ADM-ARCH
DATA REPORTING AND REPORT GENERATION	ADM-RG
ELECTRONIC DATA BACKUP AND ARCHIVING	ADM-EBACKUP
INTERNAL QUALITY ASSURANCE AUDITS	ADM-IAUD
LABORATORY DATA REVIEW PROCESS	ADM-DREV
METHOD DETECTION LIMIT DOCUMENTATION AND CONTROL	ADM-MDLC
PROJECT MANAGEMENT	ADM-PCM
REAGENT LOGIN AND TRACKING	ADM-RLT
SUPPORT EQUIPMENT MONITORING AND CALIBRATION	ADM-SEMC
THERMOMETER CALIBRATION	ADM-TCAL
SAMPLE MANAGEMENT SOPS	**FILE NAME**
BOTTLE ORDER PREPARATION AND SHIPPING	SMO-BORD
FOREIGN SOILS HANDLING TREATMENT	SMO-FSHT
SAMPLE DISPOSAL	SMO-SDIS
SAMPLE RECEIVING	SMO-GEN
SAMPLE TRACKING AND LABORATORY CHAIN OF CUSTODY	SMO-SCOC

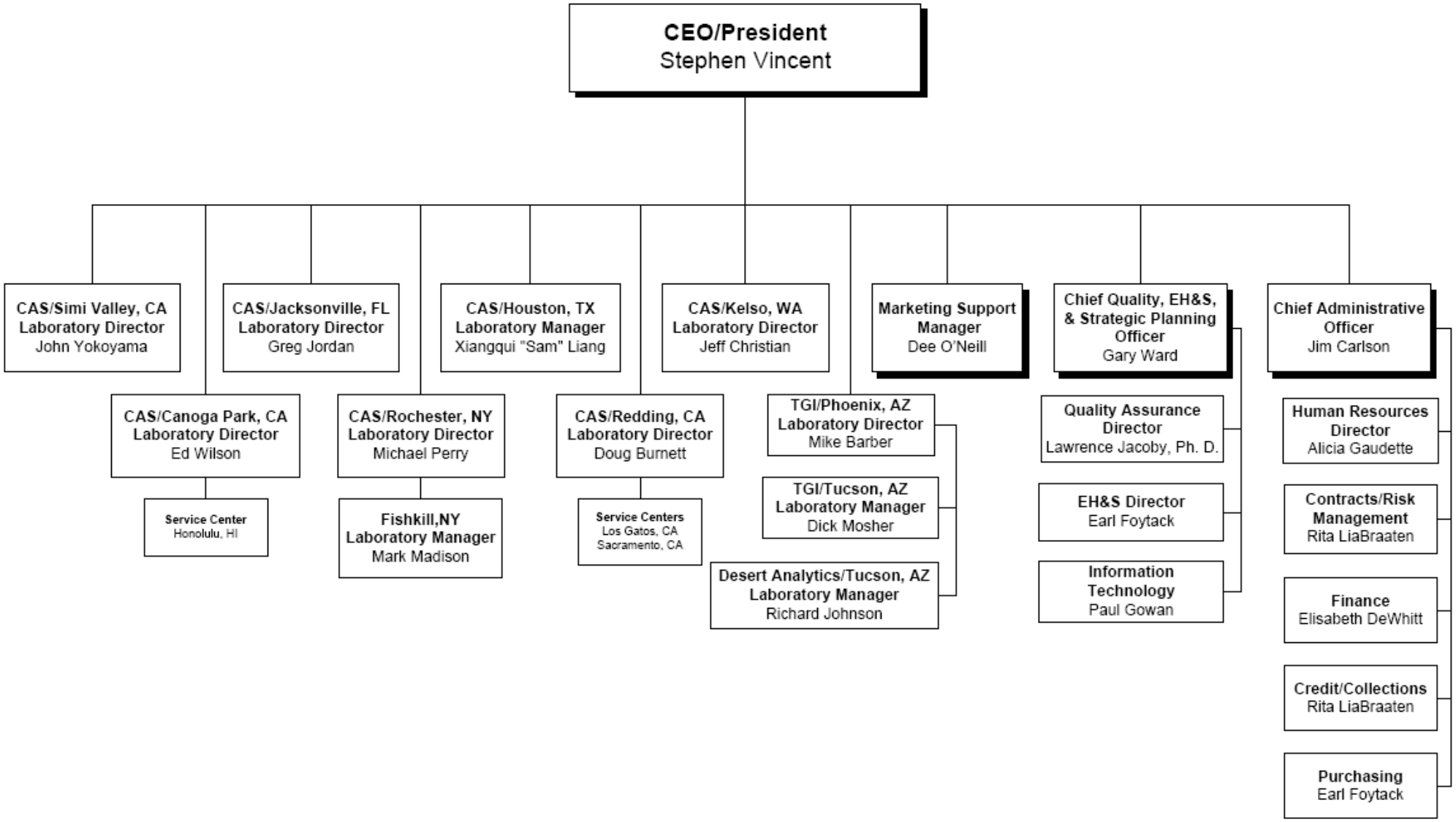
APPENDIX B

ORGANIZATIONAL CHARTS and RESUMES OF KEY PERSONNEL

Columbia Analytical Services, Inc.
Kelso, Washington Laboratory Organization



Columbia Analytical Services, Inc.
Laboratory Division Organization



JEFFREY D. CHRISTIAN

1989 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

VICE PRESIDENT/NW REGIONAL DIRECTOR – 1996 to Present

Responsibilities

Responsible for all phases of laboratory operations at the Kelso (WA) and Redding (CA) facilities, including project planning, budgeting, and quality assurance. Primary duties include the direct management of the Kelso laboratory (i.e. serves as the Kelso Laboratory Director, 1993-present). Also responsible for additional duties acquired as a member of the Columbia Analytical Services Holdings, Inc., Board of Directors.

Experience

Laboratory Director, Kelso Laboratory, *Columbia Analytical Services, Inc., Kelso, Washington,* 1993-1995. Responsible for all phases of laboratory operations, including project planning, budgeting, and quality assurance.

Operations Manager, Kelso Laboratory, *Columbia Analytical Services, Inc., Kelso, Washington,* 1992-1993. Responsibilities included directing the daily operation of the Kelso laboratory. Other responsibilities and duties included functioning as a technical consultant to clients, providing assistance in developing and planning analytical schemes to match client objectives, and writing and developing analytical procedures/methods. Also, served as Project Manager for State of Alaska Department of Environmental Conservation contract and Coordinator for EPA Special Analytical Services (SAS) contracts.

Project Chemist and Manager, Metals Analysis Laboratory, *Columbia Analytical Services, Kelso, Washington,* 1989-1992. Responsible for directing the daily operation of the Metals Laboratory, including the sample preparation, AAS, ICP-OES, and ICP-MS Laboratories.

Scientist, *Weyerhaeuser Technology Center, Federal Way, Washington,* 1986-1989. Responsibilities included supervising atomic spectroscopy laboratory which included flame and furnace AAS, ICP-OES, and sample preparation capabilities to handle a wide variety of sample types. Interfaced with internal and external clients to provide technical support. Wrote and developed analytical procedures/methods.

Lead Technician, Metals Lab, *Weyerhaeuser Technology Center, Federal Way, Washington,* 1981-1986. Responsibilities included primary ICP and AAS analyst for EPA-CLP contract work. Extensive experience in wide variety of environmental and product-related testing.

Research Assistant, *ITT Rayonier, Olympic Research Division, Shelton, Washington,* 1978-1981. Responsibilities included performing water quality tests, product-related analytical tests, corrosion tests (i.e., potentiometric polarization techniques), and operated pilot equipment specific to the pulp and paper industry.

Education

B.S., Chemistry, *Evergreen State College, Olympia, Washington,* 1993.
ICP/MS Training Course, *VG-Elemental,* 1992.
Coursework, *Pacific Lutheran University, Tacoma, Washington.* 1988-1989.
Coursework, *Tacoma Community College, Tacoma, Washington.* 1970-1971, 1988-1989.
Perkin-Elmer Advanced Furnace, *Norwalk, Connecticut,* 1986.
CERTIFICATION, Chemistry, *L.H. Bates Technical, Tacoma, Washington,* 1978.
Coursework, *Central Washington University, Ellensburg, Washington.* 1969-1970.

Publications/ Presentations

On request.

LEE E. WOLF

1988 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

TECHNICAL MANAGER IV, KELSO QUALITY ASSURANCE MANAGER – 2002 to Present

Responsibilities

Responsible for the overall coordination of the laboratory QA program, and for ensuring that established quality objectives are met. Responsible for Quality Assurance function, including the Quality Assurance Manual, certifications, documenting SOPs, and maintaining performance evaluation records. Oversee balance calibration and sample storage temperature control. Maintain certifications/accreditations for regulatory agencies and client certifications or approval programs. Act as primary point of contact during laboratory audits. Provides audit responses and initiates any changes in procedures resulting from an audit. Coordinate the analysis of performance evaluation samples required for certification/accreditation programs. Report and review results for these analyses. Conduct internal audits and make recommendations for corrective action.

Experience

Scientist IV, Kelso Quality Assurance Manager, *Columbia Analytical Services, Inc., Kelso, Washington,* 1996-2002. Duties primarily as listed above.

Project Chemist/Principal Organic Scientist, *Columbia Analytical Services, Inc., Kelso, Washington,* 1994-1996. Responsibilities included GC and GC/MS method development and special projects coordination. Acts as technical advisor to the GC and GC/MS laboratories and GC/MS interpretation specialist and CLP organics specialist. Also responsible for Project Chemist functions, including management and coordination of projects for clients, identifying client needs, and preparation of data reports.

Semi-VOA Department Manager, *Columbia Analytical Services,* 1988-1994. Responsibilities included overall management of the Semi-VOA department. Oversee the operation of Semi-VOA GC/MS, data review and reporting and related QA/QC function. Also responsible for supervision of staff, including training, scheduling, and other personnel issues. Beginning in 1992, increased responsibilities to include Project Chemist functions for organics EPA-SAS and other clients. This involved scheduling projects for clients, identifying client needs, and preparing data reports.

GC/MS Chemist, *U.S. Testing Co., Richland, Washington,* 1985-1988. Responsibilities included GC and GC/MS analysis of water and soil samples for volatiles and Semi-VOA by EPA protocol, including Methods 8240, 8270 and CLP. Coordinated extraction and GC-GC/MS areas to manage sample/data flow through the lab. Experience also with pesticide/PCB analysis by EPA Methods 8080 and CLP. Responsible for development of analysis methods for non-routine pesticides and herbicides and performed HPLC analysis.

Laboratory Assistant, *Eastern Washington University, Cheney, Washington,* 1985. Responsibilities included supervision and instruction of organic chemistry labs. Experience with GC and IR operation. Responsible for lab safety.

Chemist Assistant, *Spokane County Air Pollution Control Authority, Spokane, Washington,* 1984. Responsibilities included gathering and analyzing air samples for CO content using IR equipment.

Education

Documenting Your Quality System, *A2LA Short Course, Las Vegas, Nevada,* 1998.
Internal Laboratory Audits, *A2LA Short Course, Las Vegas, Nevada,* 1998.
Mass Spectra Interpretation, *ACS Short Course, Denver, Colorado,* 1992.
BS, Chemistry, Minor in Geology, *Eastern Washington University, Cheney, Washington,* 1985.

Publications/ Presentations

On Request.

Affiliations

American Chemical Society.

LYNDA A. HUCKESTEIN

1989 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

CLIENT SERVICES MANAGER IV – 1998 to Present

Responsibilities

Management of the Client Services Departments: Project Management, Electronic Data Deliverables and Report Generation, and Sample Management. Personally responsible for approximately 1.5 million dollars of client work annually performing technical project management and client service. Provides technical and regulatory interpretation assistance as-well-as project organization to work received by the laboratory.

Documentation of Demonstration of Capabilities is available for review.

Experience

Project Chemist, *Columbia Analytical Service, Inc., Kelso, Washington,* 1992-1998. Primary responsibilities included technical project management and client service in areas of pulp & paper, marine services, mining, and DOD. Also responsible for providing technical and regulatory interpretation assistance as-well-as project organization to work received by the laboratory

Project Chemist and Department Manager, General Chemistry Laboratory, *Columbia Analytical Services, Inc.,* 1989-1992. Responsible for management of the General Chemistry laboratory for routine wastewater, bioassay, and microbiological analyses. Also responsible for supervision of staff, data review, and reporting.

Analyst III, *Columbia Analytical Services, Inc., Kelso, Washington,* 1989. Primary responsibilities included coliform testing, total recoverable petroleum hydrocarbon extractions and analysis, BODs, ammonias, and TKN, in addition to miscellaneous wet chemistry analyses.

Microbiologist/Chemist, *Coffey Laboratories, Portland, Oregon,* 1983. Coliform analysis; water chemistry.

Laboratory Assistant, *Oregon State University, Corvallis, Oregon,* 1983. Wheat spike dissection and tissue culture.

Education

BS, Microbiology, *Oregon State University, Corvallis, Oregon,* 1983.

JEFFREY A. CORONADO

1989 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

TECHNICAL MANAGER IV, INORGANICS DEPARTMENT MANAGER – 2001 to Present

Responsibilities

Oversee the operation of the inorganic groups, which consists of two separate laboratories: Metals and General Chemistry. Responsible for the quality and timeliness of the inorganic laboratories analytical reports, departmental budgets, workload coordination, method development efforts, cost-effectiveness, and resource allocation.

Documentation of Demonstration of Capabilities is available for review.

Experience

Metals Department Manager, *Columbia Analytical Services, Inc., Kelso, Washington,* 1992-2001. Responsibilities included management of all aspects of the metal laboratory operation, including personnel training and evaluation, review of all metals data, and report generation. Also responsible for client service on a number of ongoing CAS accounts. Technical duties include primary analytical responsibility for trace level metals analysis by ICP/MS. Analyses range from routine water and soil analysis, to marine tissues, as well as industrial applications such as ultra-trace QA/QC work for various semiconductor clients. Also responsible for a number of specialized sample preparation techniques including trace metals in seawater by reductive precipitation, and arsenic and selenium speciation by ion-exchange chromatography. Developed methodology for performing mercury analysis at low part per trillion levels by cold vapor atomic fluorescence..

Supervisor, GFAA Laboratory, *Columbia Analytical Services, Inc., Kelso, Washington,* 1989-1992. Responsibilities included supervision of metals analysis by graphite furnace atomic absorption following SW-846 and EPA CLP methodologies. Duties include workload scheduling, data review, instrument maintenance, personnel training and evaluation.

Education

Field Immunoassay Training Course, *EnSys Inc*., 1995.
Winter Conference on Plasma Spectrochemistry, *San Diego, California*, 1994.
ICP-MS Training Course, *VG-Elemental*, 1992.
BS, Chemistry, *Western Washington University, Bellingham, Washington,* 1988.
BA, Business Administration, *Western Washington University, Bellingham, Washington,* 1985.

JEFFREY A. GRINDSTAFF

1991 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

TECHNICAL MANAGER III, GC/MS VOA AND SEMI-VOA LABORATORIES – 1997 to Present

Responsibilities

Primary responsibilities include supervision of GC/MS VOA and Semi-VOA staff, method development, training, data review, tracking department workload, scheduling analyses, and general maintenance and troubleshooting of GC/MS systems.

Documentation of Demonstration of Capabilities is available for review.

Experience

Manager, GC/MS VOA Laboratory, *Columbia Analytical Services, Inc., Kelso, Washington,* 1994-1997. Responsible for supervision of GC/MS VOA staff, method development, training, data review, tracking department workload, scheduling analyses, and general maintenance and troubleshooting of GC/MS systems.

Scientist III, GC/MS VOA Laboratory, *Columbia Analytical Services, Inc., Kelso, Washington,* 1991-1994. Responsibilities included scheduling workload, data review, instrument maintenance and troubleshooting, and personnel training and evaluation. Also responsible for supervision of extraction personnel and instrument analysts. Additional supervisory duties included report generation and data review for GC analyses. Responsibilities also included project management and customer service.

Chemist, *Enseco-CRL, Ventura, California*, 1990-1991. Established GC/MS department including inventory maintenance, preparation of state certification data packages, method development, SOPs, and extended data programs. Performed daily maintenance and troubleshooting of GC and GC/MS instrumentation. Scheduled and performed routine and non-routine VOA analyses.

GC/MS Chemist, VOA Laboratory *Coast-to-Coast Analytical Service, San Luis Obispo, California,* 1990-1991. Responsible for standard preparation for VOA analyses and instrument calibration, tuning, and maintenance. Also implemented and further developed EPA methods for quantitative analysis of pesticides and priority pollutants..

Education

Mass Selective Detector Maintenance, *Hewlett-Packard Education Center,* 1993.
Interpretation of Mass Spectra I, *Hewlett-Packard Analytical Education Center,* 1992.
B.S., Chemistry, *California Polytechnic State University, San Luis Obispo, California,* 1989.
A.A., Liberal Arts, *Allan Hancock College, Santa Maria, California.* 1986

Publications/ Presentations

Alternate Method to Lower Detection Limits to Satisfy Regulatory Action Levels for Volatiles in Groundwater, with David Edelman, Kairas Parvez, and Paul Laymon. TAPPI National Meeting, Orlando, Florida. 1996

Affiliations

American Chemical Society. 1989

TODD N. POYFAIR

1991 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

TECHNICAL MANAGER III, SVG LABORATORIES – 2001 to Present

Responsibilities

Primary responsibilities include supervision of GC, HPLC, and fuels Semi-VOA laboratory staff. Also responsible for training oversight, data review, tracking department workload, and scheduling and performance of GC and HPLC analyses.

Documentation of Demonstration of Capabilities is available for review.

Experience

Supervisor/Manager, General Chemistry Department, *Columbia Analytical Services, Inc., Kelso, Washington,* 1995-2001. Responsibilities included supervision, management, and training of General Chemistry staff. Also responsible for workload coordination, data review, reporting, and instrument maintenance within the General Chemistry department.

Project Chemist, Client Services Group, *Columbia Analytical Services, Inc., Kelso, Washington,* 1993-1995. Responsibilities included technical project management and customer service. Responsible for meeting the clients' needs of timely and appropriate analyses, and to acted as liaison for all client-related activities within CAS.

Scientist II, General Chemistry Laboratory, *Columbia Analytical Services, Inc., Kelso, Washington,* 1992-1993. Responsibilities included the review and summarization of pH, alkalinity, conductivity, turbidity, hardness, and CODs.

Scientist I, **General Chemistry Laboratory,** *Columbia Analytical Services, Inc., Kelso, Washington,* 1992. Responsibilities included analysis of Total Organic Halogens, Chemical Oxygen Demand, Sulfides, Ammonia, TKN, Nitrate/Nitrite by Lachat, and Cyanide.

Analyst III, **General Chemistry Laboratory,** *Columbia Analytical Services, Inc., Kelso, Washington,* 1991-1992. Responsibilities included analysis of pH, Conductivity, Alkalinity, Turbidity, and Oil and Grease.

Education

BS, Chemistry, *Portland State University, Portland, Oregon,* 1991.
BA, German, *Portland State University, Portland, Oregon,* 1990.
COURSEWORK, *Brigham Young University, Provo, Utah.* 1982-1983 & 1985-1986.

JAMES R. "JIM" SMITH

2001 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

TECHNICAL MANAGER I, DRINKING WATER LABORATORY SUPERVISOR – 2002 to Present

Responsibilities

Overall implementation of Organic Drinking Water Methods and method development. Project management of Drinking water accounts. Development of Standard Operating Procedures for Drinking Water methods. Operation of Varian GC/MS, Agilant GC/ECD and Agilant HPLC.

Documentation of Demonstration of Capabilities is available for review.

Experience

Project Manager III, *Columbia Analytical Services, Inc., Kelso, Washington,* 2001-2002. Responsible for technical project management, ensuring overall data quality and compliance with customer requirements, and providing technical support to clients regarding laboratory application to projects. Extensive technical experience with the various GC and GC/MS method allow for detailed technical review of organics projects. Also has extensive experience coordinating drinking water and sediment projects. Currently responsible for coordination of approximately $200,000 of analyses in the laboratory on a monthly basis. Current large clients include Bechtel (Navy work), which involves numerous groundwater-monitoring projects, the Port of Seattle and URS. Also responsible for various storm water studies for Bremerton Naval Shipyard.

Director, Trace Organics and Project Manager, *Amtest, Inc., Redmond, Washington,* 1987-2001. Responsible for project management, client contact, data review, and writing reports. Additional responsibilities pertained to supervision of the trace organics department and running the GC/MS system. Performed various methods by GC/MS for volatiles, semi-volatiles and by GC for pesticides, PCBs, herbicides, and fuels (LUST). Also performed hazardous waste characterization including completion of waste profile forms.

Education

BS, Chemistry, *Rochester Institute of Technology, Rochester, New York,* 1985.

EILEEN M. ARNOLD

1987 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

SCIENTIST IV, METALS LABORATORY, KELSO HEALTH AND SAFTEY OFFICER – 1994 to Present

Responsibilities

Duties include the operation and maintenance of the Inductively Coupled Argon Plasma (ICAP) Emission Spectrometer. This involves digestion, instrumental analysis, and report generation for environmental samples using approved EPA techniques. Health and Safety Officer responsibilities included development and implementation of the Kelso Health and Safety program, including accident investigation and incident review, maintenance of all safety related equipment and documents, and performance of monthly safety audits.

Documentation of Demonstration of Capabilities is available for review.

Experience

Project Chemist, Client Services Group, Kelso Health and Safety Officer, *Columbia Analytical Services, Inc., Kelso, Washington,* 1992-1994. Duties included technical project management and customer service. Responsible for meeting the clients' needs of timely and appropriate analyses, and to act as liaison for all client-related activities within Columbia Analytical Services, Inc. Health and Safety Officer responsibilities included development and implementation of the Kelso Health and Safety program, including accident investigation and incident review, maintenance of all safety related equipment and documents, and performance of monthly safety audits.

Scientist IV, Metals Laboratory, Health and Safety Officer, *Columbia Analytical Services, Inc., Kelso, Washington, 1987-1992.* Duties include the operation and maintenance of the Inductively Coupled Argon Plasma (ICAP) Emission Spectrometer. This involves digestion, instrumental analysis, and report generation for environmental samples using approved EPA techniques. Health and Safety Officer responsibilities included development and implementation of the Kelso Health and Safety program, including accident investigation and incident review, maintenance of all safety related equipment and documents, and performance of monthly safety audits.

Chemist, *Dow Corning Corporation, Springfield, Oregon,* 1986-1987. Responsibilities included ICP and atomic absorption work in silicon manufacturing. Methods development for ICP analysis of minor impurities found in silicon.

Chemist, *Ametek, Inc., Harleysville, Pennsylvania,* 1982-1985. Responsibilities included product research and development chemist involved in production of thin-film semiconductors for use as solar cells. Work involved AA and SEM techniques.

Chemist, *Janbridge, Inc., Philadelphia, Pennsylvania,* 1978-1982. Responsibilities included maintaining electroplating process lines through wet chemical analysis techniques, and performed Quality Assurance testing on printed circuit boards.

Education

BA, Chemistry, *Immaculata College, Immaculata, Pennsylvania,* 1977.

Affiliations

American Chemical Society, Member since 1987.

PAUL GOWAN

1994 TO PRESENT

CAS Holdings Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

IT MANAGER II, 2002 to Present

Responsibilities

Identify and plan IT requirements by interacting with management personnel to identify current and long-term user objectives. Assist in developing and tracking the IT computer capital budget. Provide electronic data deliverable (EDD) and LIMS system guidance to management personnel throughout the company. Ensure the effective utilization of computer systems. Train users as required. Establish IT policies, standards, practices, and specifications. Participate in the LIMS planning group.

Plan and supervise IT department staffing, organization, hardware and software acquisitions to meet requirements. Acquire, develop, and maintain a professional, skilled, and motivated staff through effective performance review and career development programs. Develop and maintain relationships with local and national vendors of computer hardware, software, and telephone equipment.

Experience

KELSO IT MANAGER, *Columbia Analytical Services, Inc., Kelso, Washington,* 1999-2002. Responsible for all IT efforts related to the CAS laboratory in Kelso, WA, including, but not excluded to computing equipment specification, purchasing and maintenance; network infrastructure; software development; strategic planning for future IT initiatives; budget preparation performance reviews, and career growth planning for IT staff.

TECHNICAL INFORMATION SPECIALIST, *CAS Holdings,Inc., Kelso, Washington,* 1994-1999. Primary responsibilities included support automation of HP chemstation and Enviroquant; support continued development of unified organic laboratories; support and development of project-specific data deliverables, technical assistance in Information Technology at Kelso to meet CAS IT objectives as related to LIMS.

Organics Section Manager, *Anametrix, Inc., San Jose, California,* 1992-1994. Responsibilities included managing the GC/MS and GC/Pesticide Departments, following protocols of the Department of Defense NEESA contracts (demanding stringent QA/QC and "Level D" data package submittals). Primary responsibilities included supervisor training and development, budget preparation and maintenance, performance reviews, data review, continuing research on environmental trends, SOP generation and updates, method development, capital equipment evaluation for laboratories, and project management.

GC/MS Program Manager, *Anametrix, Inc., San Jose, California,* 1988-1992. Responsibilities included supervision of five chemists, two Finnigan 4000 GC/MS Systems, and three HP 5971 GC/MS Systems. Primary responsibilities were to maintain high productivity and insure that the GC/MS department generated legally defensible data. Also responsible for sample scheduling and tracking, instrument maintenance and troubleshooting, analyst training and review, client interfacing, and purchasing.

GC/MS Analyst, *Anametrix, Inc., San Jose, California,* 1986-1988. Responsibilities included analyzing for VOA and Semi-VOA priority pollutants using EPA Methods 624/625 and 8240/8370.

Education

BA, Biochemistry, *San Jose State University, San Jose, California,* 1986.

LAWRENCE J. "LAWRY" JACOBY

1990 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

VICE PRESIDENT, QUALITY ASSURANCE DIRECTOR – 1992 to Present

Responsibilities

Responsible for the conduct of the quality assurance (QA) program and activities for CAS; for conducting systems and data audits at each CAS laboratory to ensure that the QA objectives established by management and by the various certifications, accreditations, project plans, and regulations under which CAS operates are satisfactorily met, to ensure that the QA programs are functioning as stated in QA Manuals, and to make appropriate recommendations for corrective actions and improvements; for management of performance evaluation and round-robin samples analyses programs; for evaluating data quality; for maintaining CAS-wide standard operating procedures; for preparing quarterly QA reports to management; for preparing, facilitating, and presenting quarterly ethics training; and for providing technical assistance and training to QA program managers at each CAS laboratory.

Experience

Quality Assurance Coordinator, *Columbia Analytical Services, Inc., Kelso, Washington,* 1990-1992. Responsible for CAS/Kelso's quality assurance program and projects, and for evaluating data quality.

Client Services Manager, *CH_2M Hill Laboratory, Redding, California,* 1989-1990. Management of client services and sample custody groups; customer service and maintenance; project management; proposal and quotation preparation; project-engineer/laboratory liaison.

Inorganic Division Manager, *CH_2M Hill Laboratory, Redding, California,* 1988-1989. Responsible for managing the operation of the inorganic analyses section including wet chemical, soil, and metals analyses; project management; customer service; proposal and quotation preparation.

Laboratory Manager, *CH_2M Hill Laboratory, Corvallis, Oregon,* 1986-1988. Responsible for managing the operation of the laboratory and coordinating the activities of project support staff; project management; quality assurance; proposal and quotation preparation; laboratory safety; engineering project consulting.

Analytical Chemist, *Teledyne Wah Chang, Albany, Oregon,* 1976-1986. Responsibilities included methods development; instrument maintenance; non-routine analyses; workload scheduling and coordination; and task force assignments.

Instructor, *Chemeketa Community College, Salem, Oregon,* 1971-1976. Taught college courses in general, organic and analytical chemistry.

Assistant Professor, *Portland State University, Portland, Oregon,* 1969-1971. Taught college courses in general and organic chemistry.

Education

PhD, Organic Chemistry, *Colorado State University, Ft. Collins, Colorado,* 1969.
BS, Chemistry, *Oregon State University, Corvallis, Oregon,* 1965.

Affiliations

American Society for Quality.
American Chemical Society.
AOAC International.

GARY K. WARD

2001 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

VICE PRESIDENT, CHIEF QUALITY, SAFETY, AND ETHICS OFFICER – 2001 to Present

Responsibilities

Responsibilities include directing and managing the overall corporate-wide quality systems, ethics and safety programs for all CAS facilities, as well as strategic planning, marketing, business development, and information technology. Responsible for all interaction and liaison with government entities involving quality, technical and operational issues.

Experience

Deputy Director, Laboratory Standards, *Intertek Testing Services, Houston, Texas,* 1998-2001. Responsibilities included professional standards/quality assurance for 240 laboratories in 93 countries, involving laboratory tests ranging from petroleum products and environmental samples to toys, textiles, and building products. Resolution of issues with a variety of governments, agiences, and companies with particular focus on interactions with the US EPA. Was previously responsible for all operations of over 100 labs in the Americas, ranging from Canada to South America, including duties to improve quality, raise profits and revenues, and implement a LIMS.

Director, Technical Operations, *Environmental Health Laboratories, South Bend, Indiana,* 1995-1998. Responsibilities included operations and quality assurance of the laboratory. Directed, administered and coordinated activities of the lab in accordance with goals and objectives of the company. Responsible for the R&D program, laboratory throughput and financial performance, and implementation of the new LIMS system.

Executive Scientist, *Quanterra (Enseco), Arvada, Colorado,* 1987-1995. Responsibilities included providing expertise and experience in laboratory analysis and operations to the entire laboratory system. Duties included implementation of network-wide LIMS as well as coordination of the Technology, QA, IS, and Operations groups. As Director of Technology and Quality Assurance was responsible for management of the R&D program, Quality Assurance program, and Environment, Health and Safety program throughout the Enseco lab system. Direct reports were all QA managers, safety managers, and chief scientists from each of the 13 laboratories.

Deputy Branch Chief, *U.S. Environmental Protection Agency*, 1983-1987. Responsibilities included providing expertise to entire Superfund program ranging from lab analytical services to sampling. Duties involved managing the CLP program as well as the Superfund R&D program. As CLP National Program Manager was responsible for development and implementation of CLP analytical protocols, administration of contracts for over 100 laboratories throughout the country, and liasion with contract divisions, other EPA programs, and enforcement. Responsible for development and implementation of disk deliverables, automated contract screening, as well as writing new protocols for specific methods such as ICP/MS and for EPA methods such as included in SW846, 3rd Edition. Duties also included coordination of the annual CLP conferences.

Education

MS, Chemical Oceanography, *RSMAS, University of Miami, Miami, Florida,* 1973.
BS, Chemistry, *Loyola University, Los Angeles, California,* 1970.

Publications, Presentations. And Affiliations

Mr. Ward has a number of publications and presentations, and is affiliated with several professional organizations. For a list of these, please contact CAS.

STEPHEN W. VINCENT

1986 TO PRESENT

Columbia Analytical Services, Inc., 1317 S. 13th Avenue, Kelso, WA 98626 (360) 577-7222

Current Position

PRESIDENT, CAS HOLDINGS INC. – 1986 to Present

Responsibilities

Responsible for the overall growth and profitability of the CAS laboratory network. This includes establishing and implementing long-range objectives, plans, and policies, and representing the company with its major customers, technical community, and the public.

Experience

Laboratory Manager, *Weyerhaeuser Company, Federal Way, Washington*, 1979-1986. Responsibilities involved all phases of technical and administrative management. This included management of organic, inorganic, and microbiological analyses and management of capital; an annual operating budget of approximately $2 million; management of thirty staff members; contract procurement, and project management. Projects included an EPA Inorganic CLP contract; an EPA acid rain deposition contract; a contract with the Fish and Wildlife Service to measure trace organic contaminants in animal tissues; and others.

Analytical Chemist, *Weyerhaeuser Company, Longview, Washington*, 1975-1979. Responsibilities: Method development, routine analysis and supervision for the Weyerhaeuser Multi-Region Support Lab. Responsible for setting up a company-wide laboratory audit, round robin, and quality assurance program.

Education

Market Strategy for Technology Based Companies, *Executives Program, Stanford University*. 1994.

Advanced Technical Management Program, *University of California at Los Angeles, Department of Business, Engineering and Management,* 1991.

Completion of Coursework for MS, Pulp and Paper Technology, *University of Washington, Seattle, Washington,* 1984.

Post Graduate Coursework, Engineering and Management, *University of California at Los Angeles, Graduate School of Engineering and Applied Science, Los Angeles, California,* 1981.

BS, Oceanography, *University of Washington, Seattle, Washington,* 1974.

Publications/ Presentations

Mr. Vincent has a number of publications and presentations. For a list of these publications and presentations, please contact CAS.

Affiliations

American Chemical Society.
Technical Association of the Pulp and Paper Industry.

APPENDIX C

MAJOR ANALYTICAL EQUIPMENT

GENERAL CHEMISTRY/WATER CHEMISTRY LABORATORY			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
Analytical Balances (9):			
Precisa and Mettler models	1988-2000	MM	15
Autoclave - Market Forge Sterilmatic	1988	LM	5
Calorimeters (2):			
Parr 1241 EA Adiabatic	1987	LM	2
Parr 6300 Isoparabolic	2005	LM	2
Centrifuge - Damon/IEC Model K	1992	LM	15
Colony Counter - Quebec Darkfield	1988	LM	4
Conductivity Meters (2):			
YSI Model 3200	2004	LM	4
VWR	2001	LM	4
Digestion Systems (5):			
COD (4)	1987, 1989	LM	3
Kjeldahl, Lachat 46-place (1)	1999	LM	3
Dissolved Oxygen Meter - YSI Model 58 (3)	1987, 1988, 1991	LM	5
Distillation apparatus (Midi) - Easy Still (2)	1996, 2000	LM	7
Drying Ovens (11):			
Shel-Lab and VWR models	1988 - 2003	LM	15
Flash Point Testers (2):			
ERDCO Setaflash Tester	1991	LM	2
Petroleum Systems Services	2005	LM	2
Flow-Injection Analyzers (2):			
Lachat Quik-Chem AE	1990	LM	5
Bran-Leubbe	2002	LM	3
Ion Chromatographs (3)			
Dionex 2000i with Peaknet Data Systems	1988	LM	2
Dionex DX-120 with Peaknet Data System	1998	LM	3
Dionex ICS-2500 with Chromchem Data System	2002	LM	3
Ion Selective Electrode Meters (5)			
Fisher Scientific Accument Model 50	1997	LM	6
Fisher Scientific Accument Model 25	1993	LM	6
Fisher Scientific Accument Model 20	2000	LM	6
Orion Model 920A	1990	LM	6
Corning pH/ion Meter Model 135	1992	LM	6
Microscopes (2):			
Bausch & Lomb	1988	LM	1
Swift	1988	LM	1
Muffle Furnace- Sybron Thermolyne Model F-A1730	1991	LM	15
pH Meters (2):			
Fisher Scientific Accument Model 20	1993	LM	6
Fisher Scientific Accument Model AR25	2005	LM	6

GENERAL CHEMISTRY/WATER CHEMISTRY LABORATORY (continued)			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
Shatter Box - GP 1000	1989	LM	5
Sieve Shakers (2):			
CE Tyler - Portable RX 24	1990	LM	5
WS Tyler - RX 86	1991	LM	5
Thomas-Wiley Laboratory Mill, Model 4	1989	LM	7
Total Organic Carbon (TOC) Analyzers (2)			
Coulemetrics Model 5012	1997	LM	3
O-I Corporation Model 1010	2002	LM	3
Total Organic Halogen (TOX) Analyzers (3):			
Mitsubishi TOX-Sigma	1995	LM	4
Mitsubishi TOX-100 (2)	2001	LM	4
Turbidimeter - Hach Model 2100N	1996	LM	8
UV-Visible Spectrophotometers (2):			
Hitachi 100-40 Single Beam	1986	LM	5
Beckman-Coulter DU520	2005	LM	5
Vacuum Pumps (2):			
Welch Duo-Seal Model 1376	1990	LM	13
Busch R-5 Series Single Stage	1991	LM	13
Water Baths/Incubators (6):			
Hach Model 15320 Incubator	1986	LM	15
Precision Model L-6 (2)	1989, 1990	LM	15
VWR 1540	1991	LM	15
Fisher 11-680-626M Incubator	1992	LM	15
Fisher Isotemp Incubator	2001	LM	15

METALS LABORATORY			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
Analytical Balance (6)			
Various Mettler AE 200 analytical balance	1990	MM	12
Various Mettler models (5)	1988	MM	12
Atomic Absorption Spectrophotometers (5):			
Varian SpectrAA Zeeman/220 AA w/Data Systems (2)	2000	LM	3
Varian SpectrAA 20 with Flame, Cold Vapor, and Hydride Systems	1988	LM	3
CETAC Mercury Analyzer	2000	LM	2
Perkin Elmer AAnalyst 200 Flame AA	2005	MM	2
Atomic Fluorescence Spectrophotometer			
Brooks-Rand Model III (2)	1996, 2005	LM	3
Centrifuge - IEC Model Clinical Centrifuge	1990	LM	12
Drying Oven - VWR Model 1370F	1990	LM	12
Freeze Dryers (2) - Labconco	1988, 1992	LM	5
Inductively Coupled Plasma Atomic Emission Spectrometer (ICP-AES) - Thermo Jarrell Ash Model 61E	1988	LM	4
Inductively Coupled Plasma Atomic Emission Spectrometer (ICP-AES): Thermo Jarrell Ash, Model IRIS	2000	MM	4
Inductively Coupled Plasma Mass Spectrometer (ICP-MS): VG PQ-S	1997	MM	3
Inductively Coupled Plasma Mass Spectrometer (ICP-MS): VG Excell	2001	MM	3
Muffle Furnace - Thermolyne Furnatrol Model 53600	1991	LM	5
Shaker - Burrell Wrist Action Model 75	1990	LM	12
TCLP Extractors (3)	1989, 2002	LM	5

SEMIVOLATILE ORGANICS SAMPLE PREPARATION LABORATORY			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
Accelerated Solvent Extractor - Dionex ASE 200	1996	LM	5
Analytical Balance (3)			
Mettler BB240	1987	MM	12
Satorious B610 (2)	1999, 2000	MM	12
Aspirator pumps - Labconco Cole Parmer (1)	1994	LM	7
Centrifuges (2):			
Adams Model DYNAC	1986	LM	7
Sorvall Model GLC-1	1988	LM	7
Drying Oven - Fisher Model 655 G	1991	LM	7
Evaporators (10):			
Organomation N-Evap (5)	1989-90,1998-2001	LM	12
Organomation S-Evap (5)	1989-1991	LM	12
Extractors: Lab-Line Multi-Unit Extraction Heaters (60)	1987-1992	LM	12
Extractors (64):			
Continuous Liquid/Liquid Extractors (24)	1991	LM	10
Branson Model 450 Sonifier (2)	1991	LM	4
Tekmar Sonifier (2)	1994	LM	4
Soxhtherm (36)	2000	LM	5
Gas Chromatograph: Hewlett-Packard 5890 with HP 7673 autosampler and FID Detector	1994	LM	5
Gel Permeation Chromatography (GPC) (3)			
ABC single column (2)	1998, 1999	LM	4
ABC Autoprep 1000	1995	LM	4
Muffle Furnace - Parflow MIC 6000	1994	LM	12
Solid Phase Extractors (4) – Dionex SPE-Dex 4790	2003	LM	6
Sonic Water Bath - Branson Model 8200	1991	LM	12
Vacuum Pump - Edwards	1992	LM	8

GC SEMIVOLATILE ORGANICS INSTRUMENT LABORATORY			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
Analytical Balance - Mettler AT 250	1989	MM	5
Chromatography Data Systems (12)			
HP Enviroquant (8)	1994-2002	LM	5
Thruput Target (4)	1998-2000	LM	5
Gas Chromatographs (13):			
Hewlett-Packard 5890 GC with HP 7673 Autosampler and Dual ECD Detectors (7)	1990 – 1995	LM	5
Hewlett-Packard 5890 GC with HP 7673 Autosampler and Dual FPD Detectors	1991	LM	5
Agilent 6890 GC with Agilent 7683 Autosampler and Dual ECD Detectors (4)	2001, 2005	LM	5
Agilent 6890 GC with Agilent 7683 Autosampler and Dual FPD Detectors	2003	MM	5

GC/MS SEMIVOLATILE ORGANICS INSTRUMENT LABORATORY			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
HP Enviroquant Chromatography Data Systems (9)	1994-2002	LM	6
Semivolatile GC/MS Systems (8):			
Agilent 6890/5973 with ATAS Optic2 LVI and HP 7673 Autosampler (2)	1997, 2001	MM	4
Agilent 5890/5970 with ATAS Optic2 LVI and HP 7673 Autosampler (2)	1990,1994	MM	4
Agilent 5890/5972 with ATAS Optic2 LVI and HP 7673 Autosampler (3)	1993, 1994, 1998	MM	4
Agilent 6890/5973 with ATAS Optic3 LVI and 7683 Autosampler (1)	2004	MM	4

PETROLEUM HYDROCARBONS GC/HPLC LABORATORY			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
SAMPLE PREPARATION			
Analytical Balance (3)			
Mettler BB300	1991	MM	6
Mettler BB240	1994	MM	6
Mettler AE166	1994	MM	6
Aspirator pumps – GAST (2)	2002, 2004	LM	6
Drying Oven - Fisher Model 630F	1991	LM	6
Evaporators (2):			
Organomation N-Evap	1990	LM	6
Organomation S-Evap	1991	LM	6
Extractors (4):			
Sonic Horns (3): Branson, Ultrasonics, Fisher Models	1991-1994	LM	6
INSTRUMENTATION			
HP Enviroquant Chromatography Data Systems (10)	1994-2002	LM	6
Gas Chromatographs (9):			
Varian 3300 with PID/FID detectors	1989	LM	3
O-I 4460A Purge and Trap Concentrator and	1989	LM	3
Dynatech PTA-30 Autosampler	1996	LM	3
Hewlett-Packard 5890 Series II with PID/FID detector,	1991	LM	3
Tekmar LSC-2000 Purge and Trap Concentrator	1991	LM	3
Dynatech Archon 5100 Autosampler	1992	LM	3
Hewlett-Packard 5890 Series II with TCD/FID detector	1988	LM	3
and ComBi-Pal Headspace Autosampler	1999	LM	3
Hewlett-Packard 5890 Series II with PID/PID/FID det.	1999	MM	3
O-I 4560A Purge and Trap Concentrator	1999	LM	3
Dynatech Archon 5100 Autosampler	1999	LM	3
Hewlett-Packard 5890 GC with HP 7673 Autosampler and Dual FID Detectors (3)	1990 - 1995	LM	4
Agilent 6890 with Dual FID Detectors and Agilent 7873 Autosampler (2)	2001, 2005	LM	4
High-Performance Liquid Chromatographs (2):			
HP 1090M Series II with Diode Array UV Detector	1999	LM	3
HP 1050/1100 Series with Fluorescence & Diode Array UV Detectors	2004	LM	3
High-Performance Liquid Chromatograph/Mass Spectrometer - Thermo Electron TSQ Quantum LC/MS/MS with Thermo Surveyor HPLC and Autosampler	2005	MM	2

VOLATILE ORGANICS LABORATORY			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
Analytical Balance			
Mettler PE 160	1989	MM	6
Baxter Vortex Mixer	1989	LM	6
Extractors (10):			
Millipore TCLP Zero Headspace Extractors (10)	1987-1992	LM	2
TCLP Extractor - Tumbler (12 position)	1989	LM	2
HP Enviroquant Chromatography Data Systems (10)	1994-2002	LM	6
Drying Ovens (2):			
Narco 420	1989	LM	6
VWR 1305 U	1991	LM	6
Sonic Water Bath - Branson Model 2200	1989	LM	6
Volatile GC/MS Systems (7):			
Agilent 5890/5970 (2)	1989	MM	4
Tekmar 3000 Purge and Trap Concentrator	1995	LM	4
Dynatech ARCHON 5100 Autosampler	1996	LM	4
Agilent 5890/5970	1999	MM	4
EST Encon Purge and Trap Concentrator	2002	LM	4
Dynatech ARCHON 5100 Autosampler	1999	LM	4
Agilent 5890/5971	1991	MM	4
Tekmar 3000 Purge and Trap Concentrator	2001	LM	4
Dynatech ARCHON 5100 Autosampler	1995	LM	4
Agilent 5890/5972A	1993	MM	4
Tekmar 3000 Purge and Trap Concentrator	1995	LM	4
Dynatech ARCHON 5100 Autosampler	1996	LM	4
Agilent 6890/5973	2001	MM	4
Tekmar 3100 Purge and Trap Concentrator	2001	LM	4
Varian Archon Autosampler	2001	LM	4
Agilent 6890/5973	2005	MM	4
Tekmar Velocity Purge and Trap Concentrator	2005	LM	4
Tekmar Aquatech Autosampler	2005	LM	4

DRINKING WATER ORGANICS LABORATORY			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
Analytical Balance - Mettler BB300	1991	MM	2
Extractors (5) – Horizon SPE-DEX Solid Phase Extractor	2003	LM	2
Aglinet Enviroquant Chromatography Data Systems (2)	2003	LM	2
Varian Saturn Chromatography Data System	2003	LM	2
Evaporator - Organomation N-Evap	2003	LM	2
Agilent 1100 HPLC w/post-column derivitization:	2003	LM	2
UV/Fluoescence detectors	2003	LM	2
Pickering PCX-5200 Post-column derivitization unit	2003	LM	2
Agilent 6890N GC/ECD system:	2003	LM	2
Dual micro-ECD detectors	2003	LM	2
Agilent autosampler	2003	LM	2
Varian Ion trap GC/MS:	2003	LM	2
Varian 3900 GC w/CP8400 autosampler	2003	LM	2
Varian Saturn 2100T mass spectrometer	2003	LM	2

PHARMACEUTICAL TESTING LABORATORY			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
Thermo High-Performance Liquid Chromatograph with Diode Array UV Detector	2005	MM	2
Thermo FTIR	2005	MM	4
Viscometer	2006	LM	1
Analytical Balance - Mettler AB104-5 and AT-250	2004	MM	4
Incubator – VWR 1510E	2004	LM	2
Karl Fisher Titrators (2) – Mettler DL38 and DL39	2004	MM	3
Melting point apparatus – Optimelt	2004	LM	3
Refractometer – Reichert Abbe Mark II	2004	LM	2
Rotary evaporator – Labonco/Cole-Parmer aspirator pump	2004	LM	3
Rotary shakers – Thermolyne Rotomix (2)	2004	LM	2
Vacuum oven – Precision Model 19 w/GAST aspirator	2004	LM	3
Water baths (3) – VWR Models 1212, 1235 and Labline 18002	2004	LM	2

AUTOMATED DATA PROCESSING EQUIPMENT			
Equipment Description	**Year Acquired**	**Manufacturer or Laboratory Maintained (MM/LM)**	**# of Trained Operators**
1-WAN: LIMS Sample Manager using Oracle 10g DBMS running on Redhat Advanced Server 3.0 (Linux) platform connected/linked on a frame relay WAN environment	1994-2004	LM	NA
2 - Network Servers Pentium 4 class, 1 for Reporting and Data Acquisition running Windows 2003 Advanced Server, 1 for Applications running Windows 2000 Advanced Server. Data acquisition capacity at 65GB with redundant tape and disk arrays.	1994 - 2004	LM	NA
Approximately 50+ HP and Dell Laserjet printers (various types including IIIs, 4s, 5s, 8150s, 4000s, 4050s, 4250, 8150s, W5300s)	1991 - 2004	LM	NA
Approximately 130 Gateway/Dell PC/Workstations running Windows 2000/XP on LAN connected via 10BT/100BT and TCP/IP for LIMs Terminal Emulation	1993 - 2004	LM	NA
Microsoft Office 2003 Professional as the base application for all PC/Workstations. Some systems still using Office 2000/97.	1996 - 2004	LM	NA
E-Mail with link to SMTP for internal/external messaging. Web mail via Cobalt Qube interface. Microsoft Outlook 2003.	1994 - 2004	LM	NA
Standard Excel (R) reporting platform application linked to LAN/WAN for data connectivity and EDD generation.	1996 - 2004	LM	NA
Standard Excel (R) reporting platform application linked to LAN/WAN for data connectivity and EDD generation.	1996 - 2004	LM	NA
Facsimile Machines 9600 - 33600 Baud, (2) Brother 4750e, 15 ppm; (1) Brother MFC 1970MC, 2ppm; (1) Canon CFX-L4000	1991 - 2004	LM	NA
Copiers/Scanners (2) Konica 7085, 85ppm, 20GB; (2) Konica 7155; (1) Konica 7035, BizHub. The 7085s and one 7155 are accessible via LAN for network scanning.	2000 - 2004	LM	NA
Dot Matrix Epson FX-880, LQ-1050, LX-300	1991 - 2004	LM	NA
Thruput, MARRS, Stealth, Harold, Blackbird, EDDGE, StarLIMS reporting software systems.	1998 - 2004	LM	NA

NA: Not applicable. This equipment administered by IT staff but may be used by all staff.

APPENDIX D

PREVENTIVE MAINTENANCE PROCEDURES

Instrument	Activity	Frequency
Refrigerators and Coolers	Record temperatures	Daily
	Clean coils	Annually
	Check coolant	Annually or if temperature outside limits
Vacuum Pumps	Clean and change pump oil	Every month or as needed
Fume Hoods	Face velocity measured	Quarterly
	Sash operation	As needed
	Change filters	Annually
	Inspect fan belts	Annually
Ovens	Clean	As needed or if temperature outside lim.
	Record temperatures	Daily, when in use
Incubators	Record temperatures	Daily, morning and evening
Water Baths	Record temperatures	Daily, morning and evening
	Wash with disinfectant solution	When water is murky, dirty, or growth appears
Autoclave	Check sterility	Every month
	Check temperature	Every month
	Clean	When mold or growth appears
Analytical Balances	Check alignment	Before every use
	Check calibration	Daily
	Clean pans and compartment	After every use
Dissolved Oxygen Meter	Change membrane	When fluctuations occur
pH probes	Condition probe	When fluctuations occur
Fluoride ISE	Store in storage solution	Between uses
Ammonia ISE	Store in storage solution	Between uses
UV-visible Spectrophotometer	Wavelength check	Annually
Total Organic Carbon Analyzers	Check IR zero	Weekly
	Check digestion/condensation vessels	Each use
	Clean digestion chamber	Every 2000 hours, or as needed
	Clean permeation tube	Every 2000 hours, or as needed
	Clean six-port valves	Every 200 - 2000 hours, or as needed
	Clean sample pump	Every 200 - 2000 hours, or as needed
	Clean carbon scrubber	Every 200 - 2000 hours, or as needed
	Clean IR cell	Every 2000 - 4000 hours, or as needed

Instrument	Activity	Frequency
Total Organic Halogen Analyzers	Change cell electrolyte	Daily
	Change electrode fluids	Daily
	Change pyrolysis tube	As needed
	Change inlet and outlet tubes	As needed
	Change electrodes	As needed
Flow Injection Analyzer	Check valve flares	Each use
	Check valve ports	Each use
	Check pump tubing	Each use
	Check light counts	Each use
	Check flow cell flares	Quarterly
	Change bulb	As needed
	Check manifold tubing	Each use
	Check T's and connectors	Each use
Ion Chromatographs	Change column	Every six months or as needed
	Change valve port face & hex nut	Every six months or as needed
	Clean valve slider	Every six months or as needed
	Change tubing	Annually or as needed
	Eluent pump	Annually
Atomic Absorption Spectro-photometers - FAA and CVAA	Check gases	Daily
	Clean burner head	Daily
	Check aspiration tubing	Daily
	Clean optics	Every three months
	Empty waste container	Weekly
Atomic Absorption Spectro-photometers - GFAA	Check gases	Daily
	Check argon dewar	Daily
	Change graphite tube	Daily, as needed
	Clean furnace windows	Monthly
ICP - AES	Check argon dewar	Daily
	Replace peristaltic pump tubing	Daily
	Empty waste container	Weekly
	Clean nebulizer, spray chamber, and torch	Every two weeks
	Replace water filter	Quarterly
	Replace vacuum air filters	Monthly

Instrument	Activity	Frequency
ICP - MS	Check argon dewar	Daily
	Check water level in chiller	Daily
	Complete instrument log	Daily
	Replace peristaltic pump tubing	Daily
	Clean sample and skimmer cones	As needed
	Clean RF contact strip	As needed
	Inspect nebulizer, spray chamber, and torch	Clean as needed
	Clean lens stack/extraction lens	As needed
	Check rotary pump oil	Monthly
	Change rotary pump oil	Every six months
Gel-Permeation Chromatographs	Clean and repack column	As needed
	Backflush valves	As needed
High Pressure Liquid Chromatographs	Backflush guard column	As needed
	Backflush column	As needed
	Change guard column	As needed when back pressure too high
	Change column	Annually or as needed
	Change in-line filters	As needed
	Leak check	After column maintenance
	Change pump seals	As needed
	Change pump diaphragm	Annually
	Clean flow cell	As needed
	Fluorescence detector check	Daily
	Diode array absorbance check	Daily
Gas Chromatographs, Semivolatiles	Check gas supplies	Daily, replace if pressure reaches 50psi
	Change in-line filters	Quarterly or after 30 tanks of gas
	Change septum	Daily
	Change injection port liner	Weekly or as needed
	Clip first 6-12" of capillary column	As needed
	Change guard column	As needed
	Replace analytical column	As needed when peak resolution fails
	Check system for gas leaks	After changing columns and after any power failure
	Clean FID	Weekly or as needed
	Clean ECD	Quarterly or as needed
	Leak test ECD	Annually

Instrument	Activity	Frequency
Gas Chromatograph/Mass Spectrometers, Semivolatiles	Check gas supplies	Daily, replace if pressure reaches 50psi
	Change in-line filters	Annually or as needed
	Change septum	Daily, when in use
	Change injection port liner	Weekly or as needed
	Clip first 6-12" of capillary column	As needed
	Change guard column	As needed
	Replace analytical column	As needed when peak resolution fails
	Clean source	As needed when tuning problems
	Change pump oil	As specified by service specifications
Purge and Trap Concentrators	Change trap	Every four months or as needed
	Change transfer lines	Every six months or as needed
	Clean purge vessel	Daily
Gas Chromatographs, Volatiles	Check gas supplies	Daily, replace when pressure reaches 50 psi
	Change in-line filters	Quarterly or after 30 tanks of gas
	Change septum	Daily
	Clip first 6-12" of capillary column	As needed
	Change guard column	As needed
	Replace analytical column	As needed when peak resolution fails
	Check system for gas leaks	After changing columns and after any power failure
	Clean PID lamp	As needed
	Clean FID	As needed
	Change ion exchange resin	Every 60 days
	Replace nickel tubing	Quarterly or as needed
Gas Chromatograph/Mass Spectrometers, Volatiles	Check gas supplies	Daily, replace when pressure reaches 50 psi
	Change in-line filters	Annually or as needed
	Change septum	Daily
	Clip first foot of capillary column	As needed
	Change guard column	As needed
	Replace analytical column	As needed when peak resolution fails
	Clean jet separator	As needed
	Clean source	As needed when tuning problems
	Change pump oil	As specified by service specifications

APPENDIX E

SOP LIST AND LIST OF NELAC ACCREDITED METHODS

COLUMBIA ANALYTICAL SERVICES, INC. , KELSO, WA.
STANDARD OPERATING PROCEDURES TABLE OF CONTENTS
January 11, 2006

SOP NAME	FILE NAME	REV #
ARMY CORPS OF ENGINEERS HTRW PROJECT MANAGEMENT	ADM-HTRW	1
CHECKING PIPETTE CALIBRATION	ADM-CPIP	4
CONTINGENCY PLAN FOR LABORATORY EQUIPMENT FAILURE	ADM-ECP	0
CONTROL CHARTING QUALITY CONTROL DATA	ADM-CHRT	1
DATA ARCHIVING	ADM-ARCH	2
DATA REPORTING AND REPORT GENERATION	ADM-RG	5
DEPARTMENT OF DEFENSE PROJECTS LABORATORY PRACTICES AND PROJECT MANAGEMENT	ADM-DOD	0
ELECTRONIC DATA BACKUP AND ARCHIVING	ADM-EBACKUP	0
FACILITY AND LABORATORY CLEANING	ADM-FACL	0
INTERNAL QUALITY ASSURANCE AUDITS	ADM-IAUD	5
LABORATORY DATA REVIEW PROCESS	ADM-DREV	4
METHOD DETECTION LIMIT DOCUMENTATION AND CONTROL	ADM-MDLC	1
PROJECT MANAGEMENT	ADM-PCM	6
REAGENT LOGIN AND TRACKING	ADM-RLT	2
SUPPORT EQUIPMENT MONITORING AND CALIBRATION	ADM-SEMC	6
COLIFORM, FECAL	BIO-9221FC	5
COLIFORM, FECAL (MEMBRANE FILTER PROCEDURE)	BIO-9222D	0
COLIFORM, TOTAL	BIO-9221TC	3
COLIFORM, TOTAL (DRINKING WATER)	BIO-9221DW	2
COLILERT COMPLETED TEST VERIFICATION OF E. COLI IN MUG CULTURES	BIO-CCT	0
COLILERT P/A	BIO-COLI	2
ENTEROLERT	BIO-ENT	0
FECAL STREPTOCOCCUS/ENTEROCOCCUS	BIO-9230B	4
HEPTEROTROPHIC PLATE COUNT	BIO-HPC	2
MICROBIOLOGY QUALITY ASSURANCE AND QUALITY CONTROL	BIO-QAQC	10
SHEEN SCREEN/OIL DEGRADING MICROORGANISMS	BIO-SHEEN	0
EPA CLP ORGANICS ANALYSES	CLP_ORGA	1
ADDITION OF SPIKES AND SURROGATES	EXT-SAS	5
AUTOMATED SOXHLET EXTRACTION	EXT-3541	3
CONTINUOUS LIQUID – LIQUID EXTRACTION	EXT-3520	10
CONTINUOUS LIQUID – LIQUID EXTRACTION FROM AQUEOUS SOURCE SAMPLING IMPINGERS	EXT-3520IMP	0
DIAZOMETHANE PREPARATION	EXT-DIAZ	4
FLORISIL CLEANUP	EXT-FLOR	1
ORGANIC EXTRACTIONS GLASSWARE CLEANING	EXT-GC	2

MASS BALANCE DETERMINATION OF TETRACHLOROETHYLENE AND ACETONE IN POLLEN PRODUCTION	EXT-MASSBAL	0
MEASURING SAMPLE WEIGHTS AND VOLUMES FOR ORGANIC ANALYSIS	EXT-WVOL	2
PREPARATION OF ANHYDROUS SODIUM SULFATE , MARTIX SAND, SODIUM CHLORIDE, AND POTASSIUM CARBONATE	EXT-SULF	2
PRESSURIZED FLUID EXTRACTION	EXT-3545	5
SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION	EXT-3510	7
SOLID PHASE EXTRACTION	EXT-3535	2
SOXHLET EXTRACTION	EXT-3540	8
ULTRASONIC EXTRACTION	EXT-3550	8
WASTE DILUTION EXTRACTION	EXT-3580	1
ACIDITY	GEN-305.2	1
ALKALINITY TOTAL	GEN-310.1	5
AMMONIA AS NITROGEN BY ION SPECIFIC ELECTRODE	GEN-350.3	5
AMMONIA BY FLOW INJECTION ANALYSIS	GEN-350.1	5
AUTOFLUFF	GEN-AUTOFLU	0
BIOCHEMICAL OXYGEN DEMAND	GEN-405.1	8
BULK DENSITY OF SOLID WASTE FRACTIONS	GEN-E1109	0
CARBON, TOTAL ORGANIC DETERMINATION (WALKELY BLACK METHOD)	GEN-OSU	1
CARBON, TOTAL ORGANIC IN SOIL	GEN-ASTM	4
CARBONATE (CO_3) BY EVOLUTION AND COLUMETRIC TITRATION	GEN-D513-82M	0
CHEMICAL OXYGEN DEMAND	GEN-COD	4
CHLORIDE (TITRIMETRIC, MERCURIC NITRATE)	GEN-325.3	3
CHLORINE, TOTAL/FREE RESIDUAL	GEN-330-4	1
COLOR	GEN-110.2	2
COLOR, NCASI	GEN-NCAS	0
CONDUCTIVITY IN WATER AND WASTES	GEN-COND	6
CORROSIVITY TOWARDS STEEL	GEN-CORR	1
CYANIDE EXTRACTION OF SOLIDS AND OILS	GEN-9013	0
CYANIDE, WEAK ACID DISSOCIABLE	GEN-CNWAD	0
DETERMINATION OF INORGANIC ANIONS IN DRINKING WATER BY ION CHROMATOGRAPHY	GEN-300_1	2
DISSOLVED SILICA	GEN-370.1	0
FERROUS IRON IN WATER	GEN-FeII	1
FLASHPOINT DETERMINATION – SETAFLASH	GEN-1020	4
FLUORIDE	GEN-FISE	4
FORMALDEHYDE COLORIMETRIC DETERMINATION	GEN-FORM	0
GLASSWASHING FOR INORGANIC ANALYSES	GEN-WASH	3
GRAVIMETRIC SULFATE	GEN-375.3	0
HALIDES, ADSORBABLE ORGANIC (AOX)	GEN-1650	1
HALIDES, ADSORBABLE ORGANIC (AOX) – SM 5320B	GEN-5320B	0
HALIDES, EXTRACTABLE ORGANIC (EOX)	GEN-9020M	2
HALIDES, TOTAL ORGANIC (TOX)	GEN-9020	7

HALOGENS TOTAL AS CHLORIDE BY BOMB COMBUSTION	GEN-5050	2
HARDNESS, TOTAL	GEN-130.2	4
HEAT OF COMBUSTION	GEN-BTU	2
HEXAVALENT CHROMIUM – COLORIMETRIC	GEN-CR6	7
HYDAZINE IN WATER USING COLORIMETRIC PROCEDURE	GEN-HYD	0
HYDROGEN HALIDES BY ION CHROMATOGTRAPHY (METHOD 26)	GEN-HA26	1
ION CHROMATOGRAPHY	GEN-IONC	9
MBAS	GEN-425.1	1
MERCURY IN COAL SAMPLE PREPARATION BY PARR BOMB COMBUSTION	GEN-HGPREP	0
NITRATE/NITRITE, NITRITE BY FLOW INJECTION ANALYSIS	GEN-353.2	6
NITRITE BY COLORIMETRIC PROCEDURE	GEN-354.1	0
NITROGEN, TOTAL AND SOLUBLE KJELDAHL	GEN-TKN	8
OXYGEN CONSUMPTION RATE	GEN-O2RATE	0
PARTICLE SIZE DETERMINATION	GEN-PSP	4
PARTICLE SIZE DETERMINATION – ASTM PROCEDURE	GEN-PSASTM	0
PERCHLORATE BY ION CHROMATOGRAPHY	GEN-314-0	10
Ph IN SOIL AND SOLIDS	GEN-Phs	7
Ph IN WATER	GEN-Phw	7
PHENOLICS, TOTAL	GEN-420.1	10
PHOSPHORUS DETERMINATION USING COLORMETRIC PROCEDURE	GEN-365.3	7
POST DIGESTION DETERMINATION OF TOTAL KJELDAHL NITROGEN BY SEMIAUTOMATED COLORIMETRY	GEN-TKNAA	0
REACTIVE CYANIDE	GEN-RCN	1
SETTEABLE SOLIDS	GEN-160.5	2
SOLIDS, TOTAL DISSOLVED (TDS)	GEN-160.1	6
SOLIDS, TOTAL SUSPENDED (TSS)	GEN-160.2	6
SOLIDS, TOTAL VOLATILE AND PERCENT ASH IN SOIL AND SOLID SAMPLES	GEN-160.4	3
SPECIFIC GRAVITY	GEN-SPGRAV	0
SUBSAMPLING AND COMPOSITING OF SAMPLES	GEN-SUBS	0
SULFIDE, SOLUBLE DETERMINATION OF SOLUBLE SULFIDE IN SEDIMENT	GEN-DIS.S2	1
SULFIDE, TITRIMETRIC (IODINE)	GEN-376-1	0
SULFIDES, ACIDS VOLATILE	GEN-AVS	5
SULFIDE, METHYLENE BLUE	GEN-376-2	0
SULFIDES, REACTIVE	GEN-RS	4
SULFITE	GEN-SO3	1
TANNIN AND LIGNIN	GEN-5550	4
THIOCYANATE	GEN-THIOCN	0
TISSUE SAMPLE PREPARATION	GEN-TISP	3
TOTAL CYANIDES AND CYANIDES AMENABLE TO CHLORINATION	GEN-335	11
TOTAL HALIDES BY OXIDATIVE COMBUSTION AND MICROCOULOMETRY	GEN-9076	0
TOTAL ORGANIC CARBON IN WATER	GEN-TOC	7
TOTAL SOLIDS	GEN-160.3	9
TOTAL SULFIDE BY PSEP	GEN-S2PS	0

TOTAL SULFIDES BY METHYLENE BLUE DETERMINATION	GEN-9030M	8
TOTAL SULFUR FOR ION CHROMATOGRAPHY	GEN-ICS	1
TURBIDITY MEASUREMENT	GEN-TURB	3
ULTIMATE BOD	GEN-UBOD	0
CATION-EXCHANGE CAPACITYOF SOILS (SODIUM ACETATE) – METHOD 9081	MET-9081	1
CLOSED VESSEL OIL DIGESTION	MET-3051M	0
DETERMINATION OF LEAD BY FLAME ATOMIC ABSORPTION (FAA)	MET-7420	0
DETERMINATION OF METALS & TRACE ELEMENTS BY INDUCTIVELY COUPLED PLASMA-MS (METHOD 6020)	MET-6020	8
DETERMINATION OF METALS & TRACE ELEMENTS BY INDUCTIVELY COUPLED PLASMA-MS (METHOD 200.8)	MET-ICP.MS	9
DETERMINATION OF METALS AND TRACE ELEMENTS BY ICP/AES	MET-ICP	17
DETERMINATION OF TRACE METALS BY GRAPHITE FURNACE ATOMIC ABSORPTION SPECTROMETRY	MET-GFAA	14
FLAME ATOMIC ABSORPTION SPECTROPHOTOMETRIC ANALYSES	MET-FAA	1
MERCURY ANALYSIS BY COLD VAPOR ABSORPTION SPECTROPHOTOMETRY	MET-HG	4
MERCURY IN LIQUID WASTE	MET-7470A	9
MERCURY IN SOLID OR SEMISOLID WASTE	MET-7471A	10
MERCURY IN WATER	MET-245.1	10
MERCURY IN WATER BY OXIDATION, PURGE&TRAP, AND COLD VAPOR ATOMIC FLUORESCENCE SPECTROMETRY	MET-1631	7
METALS AND SEMIVOLATILES TCLP EXTRACTION (EPA METHOD 1311)	MET-TCLP	5
METALS DIGESTION	MET-3005A	3
METALS DIGESTION	MET-3010A	8
METALS DIGESTION	MET-3020A	10
METALS DIGESTION	MET-3050	8
METALS DIGESTION	MET-7195	5
METALS DIGESTION – CLP	MET-DIG	8
METALS LABORATORY GLASSWARE CLEANING	MET-GC	2
METHYL MERCURY IN TISSUE BY ALCOHOLIC POTASSIUM HYDROXIDE DIGESTION, ETHYLATION, PURGE AND TRAP, AND COLD VAPOR ATOMIC FLUORESCENCE SPECTROMETRY	MET-1630T	0
MULTIPLE EXTRACTION PROCEDURE	MET-MEP	0
ORGANIC LEAD	MET-ORPB	4
SAMPLE FILTRATION FOR METALS ANALYSIS	MET-FILT	0
SAMPLE PREPARATION OF AQUEOUS SAMPLES BY “CLEAN” TECHNIQUES	MET-ACT	3
SAMPLE PREPARATION OF BIOLOGICAL TISSUES FOR METALS ANALYSIS BY GFAA, ICP-OES, AND ICP-MS	MET-TDIG	1
SELENIUM BY BOROHYDRIDE REDUCTION ATOMIC ABSORPTION	MET-7742	2
TRACE METALS IN WATER BY PRECONCENTRATION USING REDUCTIVE PRECIPITATION FOLLOWED BY ICP-MS	MET-RPMS	4
WASTE EXTRACTION TEST (WET) PROCEDURE (STLC) for NONVOLATILE and SEMIVOLATILE PARAMETERS	MET-STLC	0
ANALYSIS OF SOLID AND AQUEOUS SAMPLES FOR STATE OF WISCONSIN DIESEL RANGE ORGANICS	PHC-WIDRO	0

ANALYSIS OF WATER, SOLIDS AND SOLUBLE WASTE SAMPLES FOR SEMI-VOLATILE FUEL HYDROCARBONS	PET-SVF	8
GASOLINE RANGE ORGANICS BY GAS CHROMATOGRAPHY	PET-GRO	6
GRAVIMETRIC DETERMINATION OF HEAXANE EXTRACTABLE MATERIAL (1664)	PET-1664	5
BOTTLE ORDER PREPARATION AND SHIPPING	SMO-BORD	6
FOREIGN SOILS HANDLING TREATMENT	SMO-FSHT	4
SAMPLE DISPOSAL	SMO-SDIS	5
SAMPLE RECEIVING	SMO-GEN	22
SAMPLE TRACKING AND LABORATORY CHAIN OF CUSTODY	SMO-SCOC	9
ALDEHYDES BY HPLC	SOC-8315A	4
BUTYLTINS	SOC-BUTYL	6
CALIBRATION OF INSTRUMENTS FOR ORGANICS CHROMATOGRAPHIC ANALYSES	SOC-CAL	5
CARBON CLEANUP	SOC-CARCU	0
CHLORINATED HERBICIDES	SOC-8151	11
CHLORINATED PHENOLICS IN WASTE WATER BY IN-SITU	SOC-1653A	5
CHLORINATED PHENOLS METHOD 8151 MODIFIED	SOC-8151M	5
CONFIRMATION PROCEDURE FOR GC AND HPLC ANALYSES	SOC-CONF	4
CONGENER-SPECIFIC DETERMINATION OF PCBS BY GG/ECD	SOC-8082C	6
DETERMINATION OF NITROGEN OR PHOSPHORUS CONTAINING PESTICIDES	SOC-8141	7
DIMP	SOC-DIMP	4
DMD SYNTHESIS	SOC-DMD	1
EXTRACTION METHOD FOR ORGANOTINS IN SEDIMENTS, WATER, AND TISSUE	SOC-OSWT	4
GEL PERMEATION CHROMATOGRAPHY	SOC-3640A	5
GLYCOLS	SOC-8015M	6
HAPS AND OTHER COMPOUNDS IN IMPINGER/CANISTER SAMPLES FROM WOOD PRODUCTS FACILITIES	SOC-9902	0
HAZARDOUS AIR POLLUTANTS (HAPS) IN PULP AND PAPER INDUSTRY CONDENSATES	SOC-9901	1
METHANOL IN PROCESS LIQUIDS	SOC-9403	2
MONOCHLOROACETIC ACID BY GC-ECD	SOC-MCA	3
NITROAROMATICS AND NITRAMINES BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY	SOC-8330	9
NITROGLYCERIN AND PETN BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY	SOC-8332	4
NITROGUANIDINE BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY	SOC-NITG	1
N-NITROSODIMETHYLAMINE BY GC/MS	SOC-NDMA	0
ORGANIC ACIDS IN AQUEOUS MATRICES BY HPLC	SOC-OALC	0
ORGANOCHLORINE PESTICIDES AND PCBs (METHOD 608)	SOC-608	4
ORGANOCHLORINE PESTICIDES BY GAS CHROMATOGRAPHY: CAPILLARY COLUMN TECHNIQUE	SOC-8081	8
PCBS AS AROCLORS	SOC-8082A	9
PERCENT LIPIDS	SOC-LIPID	0
PHARMACEUTICALS, PERSONAL CARE PRODUCTS AND ENDOCRINE DISRUPTING COMPOUNDS (EDCS) BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY/TANDEM MASS SPECTROMETRY (HPLC/MS/MS)	SOC-LCMS	0
PICRIC ACID AND PICRAMIC ACID BY HPLC	SCO-PICRIC	1

POLYNUCLEAR AROMATIC HYDROCARBONS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY SIM	SOC-8270P	4
POLYNUCLEAR AROMATIC HYDROCARBONS BY HPLC	SOC-8310	10
REMOVAL OF SULFUR USING COPPER	SOC-3660	3
RESIN AND FATTY ACIDS BY GC/MS	SOC-85.01	3
SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS	SOC-625	3
SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS	SOC-8270C	7
SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS – LOW LEVEL PROCEDURE	SOC-8270L	2
SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS SELECTED ION MONITORING	SOC-8270S	3
SEMI-VOLATILE ORGANICS SCREENING	SOC-SCR	2
SILICA GEL CLEANUP	SOC-3630C	0
SULFURIC ACID CLEANUP	SOC-3665	1
TENTATIVELY IDENTIFIED COMPOUNDS BY GCMS ON EXTRACTS FROM AQUEOUS SOURCE SAMPLING IMPINGERS	SOC-IMPTIC	0
1,2-DIBROMOETHANE, 1,2-DIBROMO-3-CHLOROPROPANE, AND 1,2,3-TCP BY GC	SVD-504	3
CARBAMATES AND CARBAMOYLOXIMES IN WATER BY POST-COLUMN DERIVITIZATION HPLC	SVD-531 -1	3
CHLORINATED HEBICIDES IN DRINKING WATER	SVD-515_4	3
DIQUAT AND PARAQUAT BY HPLC	SVD-549	3
ENDOTHALL IN DRINKING WATER BY GC/MS	SVD-548	3
GLYPHOSATE IN DRINKING WATER BY HPLC	SVD-547	3
HALOACETIC ACIDS IN DRINKING WATER	SVD-552	4
ORGANOCHLORINE PESTICIDES AND PCBS IN DRINKING WATER	SVD-508_1	3
SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS (METHOD 525.2)	SVD-525	4
AROMATIC VOLATILE ORGANICS (BTEX) BY GC – METHOD 602	VOC-602BTEX	1
AROMATIC VOLATILE ORGANICS (BTEX) BY GC – METHOD 8021	VOC-8021BTEX	3
PURGE AND TRAP FOR AQUEOUS SAMPLES	VOC-5030	3
PURGE AND TRAP/EXTRACTION FOR VOC IN SOIL AND WASTE SAMPLES , CLOSED SYSTEM	VOC-5035	5
SAMPLE SCREENING FOR VOLATILE ORGANIC COMPOUNDS IN SOIL, WATER AND MISC. MATRICES	VOC-BVOC	3
TENTATIVELY IDENTIFIED COMPOUND ANALYSIS BY DIRECT INJECTION GCMS ON EXTRACTS FROM AQUEOUS SOURCE SAMPLING IMPINGERS	VOC-IMPTIC	0
VOA STORAGE BLANKS	VOC-BLAN	4
VOLATILE ORGANIC COMPOUNDS BY GC/MS	VOC-524.2	9
VOLATILE ORGANIC COMPOUNDS BY GC/MS	VOC-624	8
VOLATILE ORGANIC COMPOUNDS BY GC/MS	VOC-8260B	10
WA-DOH DRINKING WATER PROTOCOL	VOC-WA.DOH	2
ZERO HEADSPACE EXTRACTION (EPA METHOD 1311)	VOC-ZHE	4

PHARMACEUTICAL TESTING SOPS		
DETERMINATION OF TRACE METALS IN PHARMACEUTICAL EXCIPIENTS BY GFAA	MET-PHAA	0
MERCURY IN PHARMACEUTICAL EXCIPIENTS	MET-PHHG	0
DETERMINATION OF ORGANIC VOLATILE IMPURITIES (OVI's) IN PHARMACEUTICAL EXCIPIENTS BY GC	PHC-POVI	0
FDA EXTRACTABLES	PHC-FDAEX	0
GC-FID IMPURITIES IN METHYLSULFONYLMETHANE (MSM)	PHM-MSM	0
AMINO ACID ASSAY IN PHARMACUETICAL MANUFACTURING MATERIALS USING HPLC	SOC-AALC	0
OPERATION, CALIBRATION, AND MAINTENANCE OF THE METTLER TOLEDO AB104-S ANALYTICAL BALANCE	PHM-IN01	0
OPERATION, CALIBRATION, AND MAINTENANCE OF THE PRECISION VACUUM OVEN	PHM-IN02	0
OPERATION, CALIBRATION, AND MAINTENANCE OF THE METTLER TOLEDO DL38 TITRATOR	PHM-IN03	0
OPERATION, CALIBRATION, AND MAINTENANCE OF THE HEWLETT PACKARD 5890 GAS CHROMATOGRAPH	PHM-IN04	0
OPERATION, CALIBRATION, AND MAINTENANCE OF THE HEWLETT PACKARD 1050 SERIES HPLC	PHM-IN05	0
OPERATION, CALIBRATION, AND MAINTENANCE OF THE METTLER TOLEDO DL39 COULOMETRIC TITRATOR	PHM-IN06	0
OPERATION, CALIBRATION, AND MAINTENANCE OF THE SRS MPA100 AUTOMATED MELTING POINT SYSTEM	PHM-IN07	1
OPERATION, CALIBRATION, AND MAINTENANCE OF THE SUN INSTRUMENTS TYPE WXG-D DISK POLARIMETER	PHM-IN08	0
OPERATION, CALIBRATION, AND MAINTENANCE OF THE REICHERT ABBE MARK II MODEL 10480 REFRACTOMETER	PHM-IN09	0
OPERATION, CALIBRATION, AND MAINTENANCE OF THE THERMO ELECTRON NICOLET 4700 FOURIER TRANSFORM INFRARED SPECTROMETER	PHM-IN12	0
OPERATION, CALIBRATION, AND MAINTENANCE OF THE METTLER TOLEDO AT250 ANALYTICAL BALANCE	PHM-IN13	0
OPERATION, CALIBRATION, AND MAINTENANCE OF The PERKIN ELMER AANALYST 200 FLAME ATOMIC ABSORPTION SPECTROMETER (Flame Only)	PHM-IN14	0
CONTROLLED SUBSTANCES	PHM-CSUB	0
VALIDATION OF PHARMACEUTICAL AND NUTRACEUTICAL TESTING METHODS	PHM-QA01	0
INSTRUMENT QUALIFICATION AND VERIFICATION	PHM-QA02	1
PHARMACEUTICAL TESTING QUALITY RECORDS	PHM-QA03	1
DETERMINATION OF TEST SPECIFICATIONS	PHM-QA04	0
EVALUATING AND SELECTING METHODS FOR PHARMACEUTICAL AND NUTRACEUTICAL TESTING	PHM-QA05	1
OUT OF SPECIFICATION (OOS) INVESTIGATION AND RETESTING	PHM-QA06	1
CHANGE CONTROL	PHM-QA07	1
DATA MANAGEMENT OF PHARMACEUTICAL TESTING RECORDS	PHM-QA08	0
PHARMACEUTICAL PERSONNEL TRAINING	PHM-QA09	0
VALIDATION OF SOFTWARE USED FOR PHARMACEUTICAL TESTING	PHM-QA10	0
DATA SYSTEMS ACCESS AND AUDIT TRAILS	PHM-QA11	0

CORPORATE ADMINISTRATIVE SOPS – MAINTAINED BY CORPORATE QA		
CHAIN OF CUSTODY FOR SAMPLE TRANSFER BETWEEN LABORATORIES	ADM-COC	1
CHECKING NEW LOTS OF CHEMICALS FOR CONTAMINATION	ADM-CTMN	2
CONTROL LIMITS	ADM-CTRL_LIM	4
DEALING WITH COMPLAINTS	ADM-CMPLT	3
DETERMINATION OF METHOD DETECTION LIMITS AND LIMITS OF DETECTION	ADM-MDL	6
DOCUMENT CONTROL	ADM-DOCCTRL	4
DOCUMENTATION OF TRAINING	ADM-TRANDOC	9
ELECTRONIC DATA AUDITING	ADM-E_DATAAUDIT	1
ESTIMATION OF UNCERTAINTY OF MEASUREMENTS	ADM-UNCERT	1
MAKING ENTRIES INTO LOGBOOKS AND ONTO BENCHSHEETS	ADM-DATANTRY	5
MANAGERIAL REVIEW OF THE LABORATORY"S QUALITY SYSTEM	ADM-MGMTRVW	0
MANUAL INTEGRATION OF CHROMATOGRAPHIC PEAKS	ADM-INT	2
NONCONFORMITY AND CORRECTIVE ACTION	ADM-NCAR	4
PREPARATION OF ELECTRONIC DATA FOR ORGANIC ANALYSES ELECTRONIC DATA AUDITS	ADM-EDATA	2
PREPARATION OF STANDARD OPERATING PROCEDURES	ADM-SOP	6
PROFICIENCY TESTING SAMPLE ANALYSIS	ADM-PTS	0
PURCHASING THROUGH CAS PURCHASING AGENT	ADM-PUR	1
QUALIFICATION OF SUBCONTRACT LABORATORIES OUTSIDE OF CAS NETWORK	ADM-SUBLAB	2
SAMPLE BATCHES	ADM-BATCH	7
SIGNIFICANT FIGURES	ADM-SIG.FIG	6

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Drinking Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,1,1,2-Tetrachloroethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,1,1-Trichloroethane	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
1,1,2,2-Tetrachloroethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,1,2-Trichloroethane	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
1,1-Dichloroethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,1-Dichloroethylene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
1,1-Dichloropropene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,2,3-Trichlorobenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,2,3-Trichloropropane	EPA 504.1	Group II Unregulated Contaminants	NELAP	7/17/2003
1,2,3-Trichloropropane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,2,4-Trichlorobenzene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
1,2,4-Trimethylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,2-Dibromo-3-chloropropane (DBCP)	EPA 504.1	Synthetic Organic Contaminants	NELAP	7/17/2003
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 504.1	Synthetic Organic Contaminants	NELAP	7/17/2003
1,2-Dichlorobenzene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
1,2-Dichloroethane	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
1,2-Dichloropropane	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
1,3,5-Trimethylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,3-Dichlorobenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,3-Dichloropropane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,4-Dichlorobenzene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
2,2-Dichloropropane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
2,4,5-T	EPA 515.4	Synthetic Organic Contaminants	NELAP	7/17/2003
2,4-D	EPA 515.4	Synthetic Organic Contaminants	NELAP	7/17/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 525.2	Group III Unregulated Contaminants	NELAP	7/17/2003
2,6-Dinitrotoluene (2,6-DNT)	EPA 525.2	Group III Unregulated Contaminants	NELAP	7/17/2003
2-Chlorotoluene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
3-Hydroxycarbofuran	EPA 531.1	Group I Unregulated Contaminants	NELAP	7/17/2003
4,4'-DDD	EPA 508.1	Group I Unregulated Contaminants	NELAP	7/17/2003
4,4'-DDD	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
4,4'-DDE	EPA 508.1	Group I Unregulated Contaminants	NELAP	7/17/2003
4,4'-DDE	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
4,4'-DDT	EPA 508.1	Group I Unregulated Contaminants	NELAP	7/17/2003
4,4'-DDT	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
4-Chlorotoluene	EPA 524.2	Group II Unregulated Contaminants	NELAP	7/17/2003
4-Isopropyltoluene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Drinking Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Acetochlor	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Acifluorfen	EPA 515.4	Synthetic Organic Contaminants	NELAP	7/17/2003
Alachlor	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Aldicarb (Temik)	EPA 531.1	Group I Unregulated Contaminants	NELAP	7/17/2003
Aldicarb sulfone	EPA 531.1	Group I Unregulated Contaminants	NELAP	7/17/2003
Aldicarb sulfoxide	EPA 531.1	Group I Unregulated Contaminants	NELAP	7/17/2003
Aldrin	EPA 508.1	Group I Unregulated Contaminants	NELAP	7/17/2003
Aldrin	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Alkalinity as CaCO3	SM 2320 B	Primary Inorganic Contaminants	NELAP	10/8/2001
Aluminum	EPA 200.7	Secondary Inorganic Contaminants	NELAP	10/8/2001
Aluminum	EPA 200.8	Secondary Inorganic Contaminants	NELAP	10/8/2001
Antimony	EPA 200.8	Primary Inorganic Contaminants	NELAP	10/8/2001
Antimony	EPA 200.9	Primary Inorganic Contaminants	NELAP	10/8/2001
Arsenic	EPA 200.8	Primary Inorganic Contaminants	NELAP	10/8/2001
Arsenic	EPA 200.9	Primary Inorganic Contaminants	NELAP	10/8/2001
Atrazine	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Barium	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2001
Barium	EPA 200.8	Primary Inorganic Contaminants	NELAP	10/8/2001
Benzene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Benzo(a)pyrene	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Beryllium	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2001
Beryllium	EPA 200.8	Primary Inorganic Contaminants	NELAP	10/8/2001
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Bromate	EPA 300.1	Primary Inorganic Contaminants	NELAP	7/17/2003
Bromide	EPA 300.1	Primary Inorganic Contaminants	NELAP	7/17/2003
Bromoacetic acid	EPA 552.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Bromobenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Bromochloroacetic acid	EPA 552.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Bromochloromethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	7/17/2003
Bromodichloromethane	EPA 524.2	Other Regulated Contaminants,Group II Unregulated Contaminants	NELAP	10/8/2001
Bromoform	EPA 524.2	Other Regulated Contaminants,Group II Unregulated Contaminants	NELAP	10/8/2001
Butachlor	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Butyl benzyl phthalate	EPA 525.2	Group III Unregulated Contaminants	NELAP	7/17/2003
Cadmium	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2001

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Drinking Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Cadmium	EPA 200.8	Primary Inorganic Contaminants	NELAP	10/8/2001
Calcium	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2001
Carbaryl (Sevin)	EPA 531.1	Group I Unregulated Contaminants	NELAP	7/17/2003
Carbofuran (Furaden)	EPA 531.1	Synthetic Organic Contaminants	NELAP	7/17/2003
Carbon tetrachloride	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Chlorate	EPA 300.1	Secondary Inorganic Contaminants	NELAP	12/23/2005
Chlordane (tech.)	EPA 508.1	Synthetic Organic Contaminants	NELAP	7/17/2003
Chloride	EPA 300.0	Secondary Inorganic Contaminants	NELAP	10/8/2001
Chlorite	EPA 300.1	Primary Inorganic Contaminants	NELAP	7/17/2003
Chloroacetic acid	EPA 552.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Chlorobenzene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Chloroethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Chloroform	EPA 524.2	Other Regulated Contaminants,Group II Unregulated Contaminants	NELAP	10/8/2001
Chromium	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2001
Chromium	EPA 200.8	Primary Inorganic Contaminants	NELAP	10/8/2001
cis-1,2-Dichloroethylene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
cis-1,3-Dichloropropene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Color	SM 2120 B	Secondary Inorganic Contaminants	NELAP	7/17/2003
Conductivity	SM 2510 B	Primary Inorganic Contaminants	NELAP	10/8/2001
Copper	EPA 200.7	Primary Inorganic Contaminants,Secondary Inorganic Contaminants	NELAP	10/8/2001
Copper	EPA 200.8	Primary Inorganic Contaminants,Secondary Inorganic Contaminants	NELAP	10/8/2001
Copper	EPA 200.9	Primary Inorganic Contaminants	NELAP	10/8/2001
Cyanide	EPA 335.4	Primary Inorganic Contaminants	NELAP	10/8/2001
Dacthal (DCPA)	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Dalapon	EPA 515.4	Synthetic Organic Contaminants	NELAP	7/17/2003
DCPA di acid degradate	EPA 515.4	Group I Unregulated Contaminants	NELAP	7/17/2003
DCPA mono acid degradate	EPA 515.4	Group I Unregulated Contaminants	NELAP	7/17/2003
Di(2-ethylhexyl)adipate	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Dibromoacetic acid	EPA 552.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Dibromochloromethane	EPA 524.2	Other Regulated Contaminants,Group II Unregulated Contaminants	NELAP	10/8/2001
Dibromomethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Drinking Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Dicamba	EPA 515.4	Synthetic Organic Contaminants	NELAP	7/17/2003
Dichloroacetic acid	EPA 552.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Dichlorodifluoromethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Dichloromethane (DCM, Methylene chloride)	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Dieldrin	EPA 508.1	Group I Unregulated Contaminants	NELAP	7/17/2003
Dieldrin	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Diethyl phthalate	EPA 525.2	Group III Unregulated Contaminants	NELAP	7/17/2003
Dimethyl phthalate	EPA 525.2	Group III Unregulated Contaminants	NELAP	7/17/2003
Di-n-butyl phthalate	EPA 525.2	Group III Unregulated Contaminants	NELAP	7/17/2003
Di-n-octyl phthalate	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 515.4	Synthetic Organic Contaminants	NELAP	7/17/2003
Diquat	EPA 549.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Endothall	EPA 548.1	Synthetic Organic Contaminants	NELAP	7/17/2003
Endrin	EPA 508.1	Synthetic Organic Contaminants	NELAP	7/17/2003
Endrin	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
EPTC (Eptam, s-ethyl-dipropyl thio carbamate)	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Ethylbenzene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Fluoride	EPA 300.0	Primary Inorganic Contaminants,Secondary Inorganic Contaminants	NELAP	10/8/2001
Fluoride	SM 4500 F-C	Secondary Inorganic Contaminants,Primary Inorganic Contaminants	NELAP	10/8/2001
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 508.1	Synthetic Organic Contaminants	NELAP	7/17/2003
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Glyphosate	EPA 547	Synthetic Organic Contaminants	NELAP	7/17/2003
Heptachlor	EPA 508.1	Synthetic Organic Contaminants	NELAP	7/17/2003
Heptachlor	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Heptachlor epoxide	EPA 508.1	Synthetic Organic Contaminants	NELAP	7/17/2003
Heptachlor epoxide	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Heterotrophic plate count	SM 9215 B	Microbiology	NELAP	7/17/2003
Hexachlorobenzene	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Hexachlorobutadiene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Hexachlorocyclopentadiene	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Iron	EPA 200.7	Secondary Inorganic Contaminants	NELAP	10/8/2001
Isophorone	EPA 525.2	Group III Unregulated Contaminants	NELAP	7/17/2003
Isopropylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Drinking Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Lead	EPA 200.8	Primary Inorganic Contaminants	NELAP	10/8/2001
Lead	EPA 200.9	Primary Inorganic Contaminants	NELAP	10/8/2001
Magnesium	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2001
Manganese	EPA 200.7	Secondary Inorganic Contaminants	NELAP	10/8/2001
Manganese	EPA 200.8	Secondary Inorganic Contaminants	NELAP	10/8/2001
Mercury	EPA 245.1	Primary Inorganic Contaminants	NELAP	10/8/2001
Methomyl (Lannate)	EPA 531.1	Group I Unregulated Contaminants	NELAP	7/17/2003
Methoxychlor	EPA 508.1	Synthetic Organic Contaminants	NELAP	7/17/2003
Methoxychlor	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Methyl bromide (Bromomethane)	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Methyl chloride (Chloromethane)	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Methyl tert-butyl ether (MTBE)	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Metolachlor	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Metribuzin	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Molinate	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Naphthalene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
n-Butylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Nickel	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2001
Nickel	EPA 200.8	Primary Inorganic Contaminants	NELAP	10/8/2001
Nitrate	EPA 300.0	Primary Inorganic Contaminants	NELAP	10/8/2001
Nitrate	EPA 353.2	Primary Inorganic Contaminants	NELAP	10/8/2001
Nitrite	EPA 300.0	Primary Inorganic Contaminants	NELAP	10/8/2001
Nitrite	EPA 353.2	Primary Inorganic Contaminants	NELAP	10/8/2001
n-Propylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Orthophosphate as P	SM 4500-P F	Primary Inorganic Contaminants	NELAP	10/8/2001
Oxamyl	EPA 531.1	Synthetic Organic Contaminants	NELAP	7/17/2003
Paraquat	EPA 549.2	Synthetic Organic Contaminants	NELAP	12/23/2005
PCBs	EPA 508.1	Synthetic Organic Contaminants	NELAP	7/17/2003
Pentachlorophenol	EPA 515.4	Synthetic Organic Contaminants	NELAP	7/17/2003
Pentachlorophenol	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Perchlorate	EPA 314.0	Primary Inorganic Contaminants	NELAP	7/17/2003
pH	EPA 150.1	Secondary Inorganic Contaminants,Primary Inorganic Contaminants	NELAP	10/8/2001
Picloram	EPA 515.4	Synthetic Organic Contaminants	NELAP	7/17/2003
Propachlor (Ramrod)	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
sec-Butylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Drinking Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Selenium	EPA 200.8	Primary Inorganic Contaminants	NELAP	10/8/2001
Selenium	EPA 200.9	Primary Inorganic Contaminants	NELAP	10/8/2001
Silica as SiO2	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2001
Silver	EPA 200.7	Secondary Inorganic Contaminants	NELAP	10/8/2001
Silver	EPA 200.8	Secondary Inorganic Contaminants	NELAP	10/8/2001
Silvex (2,4,5-TP)	EPA 515.4	Synthetic Organic Contaminants	NELAP	7/17/2003
Simazine	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Sodium	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2001
Styrene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Sulfate	EPA 300.0	Secondary Inorganic Contaminants,Primary Inorganic Contaminants	NELAP	10/8/2001
Terbacil	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
tert-Butylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Tetrachloroethylene (Perchloroethylene)	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Thallium	EPA 200.8	Primary Inorganic Contaminants	NELAP	11/18/2004
Thallium	EPA 200.9	Primary Inorganic Contaminants	NELAP	10/8/2001
Toluene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Total coliforms & E. coli	SM 9223 B	Microbiology	NELAP	10/8/2001
Total dissolved solids	SM 2540 C	Secondary Inorganic Contaminants	NELAP	10/8/2001
Total haloacetic acids	EPA 552.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Total nitrate-nitrite	EPA 300.0	Primary Inorganic Contaminants	NELAP	10/8/2001
Total nitrate-nitrite	EPA 353.2	Primary Inorganic Contaminants	NELAP	10/8/2001
Total trihalomethanes	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Toxaphene (Chlorinated camphene)	EPA 508.1	Synthetic Organic Contaminants	NELAP	7/17/2003
trans-1,2-Dichloroethylene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
trans-1,3-Dichloropropylene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Trichloroacetic acid	EPA 552.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Trichloroethene (Trichloroethylene)	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Trichlorofluoromethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Turbidity	EPA 180.1	Secondary Inorganic Contaminants	NELAP	10/8/2001
Vinyl chloride	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Xylene (total)	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Zinc	EPA 200.7	Secondary Inorganic Contaminants	NELAP	10/8/2001
Zinc	EPA 200.8	Secondary Inorganic Contaminants	NELAP	10/8/2001

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Non-Potable Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,1,1,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1,1-Trichloroethane	EPA 624	Volatile Organics	NELAP	10/8/2001
1,1,1-Trichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1,2,2-Tetrachloroethane	EPA 624	Volatile Organics	NELAP	10/8/2001
1,1,2,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1,2-Trichloroethane	EPA 624	Volatile Organics	NELAP	10/8/2001
1,1,2-Trichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1-Dichloroethane	EPA 624	Volatile Organics	NELAP	10/8/2001
1,1-Dichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1-Dichloroethylene	EPA 624	Volatile Organics	NELAP	10/8/2001
1,1-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1-Dichloropropene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,3-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,3-Trichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,4,5-Tetrachlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,2,4-Trichlorobenzene	EPA 625	Extractable Organics	NELAP	10/8/2001
1,2,4-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,4-Trichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,2,4-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dichlorobenzene	EPA 624	Volatile Organics	NELAP	10/8/2001
1,2-Dichlorobenzene	EPA 625	Extractable Organics	NELAP	10/8/2001
1,2-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,2-Dichloroethane	EPA 624	Volatile Organics	NELAP	10/8/2001
1,2-Dichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dichloropropane	EPA 624	Volatile Organics	NELAP	10/8/2001
1,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Diphenylhydrazine	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,3,5-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8330	Extractable Organics	NELAP	7/1/2003
1,3-Dichlorobenzene	EPA 624	Volatile Organics	NELAP	10/8/2001
1,3-Dichlorobenzene	EPA 625	Extractable Organics	NELAP	10/8/2001
1,3-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,3-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Non-Potable Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,3-Dichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,3-Dinitrobenzene (1,3-DNB)	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,3-Dinitrobenzene (1,3-DNB)	EPA 8330	Extractable Organics	NELAP	7/1/2003
1,4-Dichlorobenzene	EPA 624	Volatile Organics	NELAP	10/8/2001
1,4-Dichlorobenzene	EPA 625	Extractable Organics	NELAP	10/8/2001
1,4-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,4-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,4-Dioxane (1,4- Diethyleneoxide)	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,4-Naphthoquinone	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,4-Phenylenediamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
1-Naphthylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ 206)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ 170)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ 180)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,4',5',6-Heptachlorobiphenyl (BZ 183)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,4',5'-Hexachlorobiphenyl (BZ 138)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ 187)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,5,5'-Hexachlorobiphenyl (BZ 141)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,5'-Pentachlorobiphenyl (BZ 87)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,5,5',6-Hexachlorobiphenyl (BZ 151)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,5'-Tetrachlorobiphenyl (BZ 44)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',4,4',5,5'-Hexachlorobiphenyl (BZ 153)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',4,5,5'-Pentachlorobiphenyl (BZ 101)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',5,5'-Tetrachlorobiphenyl (BZ 52)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',5-Trichlorobiphenyl (BZ 18)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
2,3,3',4',6-Pentachlorobiphenyl (BZ 110)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,3',4,4'-Tetrachlorobiphenyl (BZ 66)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,3,4,6-Tetrachlorophenol	EPA 1653	Extractable Organics	NELAP	10/8/2001
2,3,4,6-Tetrachlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,3-Dichlorobiphenyl (BZ 5)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,4,5-T	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,4',5-Trichlorobiphenyl (BZ 31)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,4,5-Trichlorophenol	EPA 1653	Extractable Organics	NELAP	10/8/2001
2,4,5-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4,6-Trichlorophenol	EPA 1653	Extractable Organics	NELAP	10/8/2001

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Non-Potable Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
2,4,6-Trichlorophenol	EPA 625	Extractable Organics	NELAP	10/8/2001
2,4,6-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4,6-Trinitrotoluene (2,4,6-TNT)	EPA 8330	Extractable Organics	NELAP	7/1/2003
2,4-D	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,4-DB	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,4-Dichlorophenol	EPA 625	Extractable Organics	NELAP	10/8/2001
2,4-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dimethylphenol	EPA 625	Extractable Organics	NELAP	10/8/2001
2,4-Dimethylphenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dinitrophenol	EPA 625	Extractable Organics	NELAP	10/8/2001
2,4-Dinitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 625	Extractable Organics	NELAP	10/8/2001
2,4-Dinitrotoluene (2,4-DNT)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 8330	Extractable Organics	NELAP	7/1/2003
2,6-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,6-Dinitrotoluene (2,6-DNT)	EPA 625	Extractable Organics	NELAP	10/8/2001
2,6-Dinitrotoluene (2,6-DNT)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,6-Dinitrotoluene (2,6-DNT)	EPA 8330	Extractable Organics	NELAP	7/1/2003
2-Acetylaminofluorene	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Amino-4,6-dinitrotoluene (2-am-dnt)	EPA 8330	Extractable Organics	NELAP	7/1/2003
2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Chlorobiphenyl (BZ 1)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2-Chloroethyl vinyl ether	EPA 624	Volatile Organics	NELAP	10/8/2001
2-Chloroethyl vinyl ether	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Chloronaphthalene	EPA 625	Extractable Organics	NELAP	10/8/2001
2-Chloronaphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Chlorophenol	EPA 625	Extractable Organics	NELAP	10/8/2001
2-Chlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Hexanone	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Methyl-4,6-dinitrophenol	EPA 625	Extractable Organics	NELAP	10/8/2001
2-Methyl-4,6-dinitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Methylnaphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Methylphenol (o-Cresol)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Nitrophenol	EPA 625	Extractable Organics	NELAP	10/8/2001

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Non-Potable Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
2-Nitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	7/1/2003
2-Picoline (2-Methylpyridine)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Sec-butyl-4,6-dinitrophenol (DNBP, Dinoseb)	EPA 8270	Extractable Organics	NELAP	7/1/2003
3,3'-Dichlorobenzidine	EPA 625	Extractable Organics	NELAP	10/8/2001
3,3'-Dichlorobenzidine	EPA 8270	Extractable Organics	NELAP	7/1/2003
3,3'-Dimethylbenzidine	EPA 8270	Extractable Organics	NELAP	7/1/2003
3,4,5-Trichlorocatechol	EPA 1653	Extractable Organics	NELAP	10/8/2001
3,4,5-Trichloroguaiacol	EPA 1653	Extractable Organics	NELAP	10/8/2001
3,4,6-Trichlorocatechol	EPA 1653	Extractable Organics	NELAP	10/8/2001
3,4,6-Trichloroguaiacol	EPA 1653	Extractable Organics	NELAP	10/8/2001
3-Methylcholanthrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
3-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
3-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	7/1/2003
4,4'-DDD	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
4,4'-DDD	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4,4'-DDE	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
4,4'-DDE	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4,4'-DDT	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
4,4'-DDT	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4,5,6-Trichloroguaiacol	EPA 1653	Extractable Organics	NELAP	10/8/2001
4-Amino-2,6-dinitrotoluene (4-am-dnt)	EPA 8330	Extractable Organics	NELAP	7/1/2003
4-Aminobiphenyl	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Bromophenyl phenyl ether	EPA 625	Extractable Organics	NELAP	10/8/2001
4-Bromophenyl phenyl ether	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chloro-3-methylphenol	EPA 625	Extractable Organics	NELAP	10/8/2001
4-Chloro-3-methylphenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chloroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chlorophenyl phenylether	EPA 625	Extractable Organics	NELAP	10/8/2001
4-Chlorophenyl phenylether	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	7/1/2003
4-Dimethyl aminoazobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Methyl-2-pentanone (MIBK)	EPA 8260	Volatile Organics	NELAP	7/1/2003
4-Methylphenol (p-Cresol)	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitrophenol	EPA 625	Extractable Organics	NELAP	10/8/2001

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Non-Potable Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
4-Nitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	7/1/2003
5-Nitro-o-toluidine	EPA 8270	Extractable Organics	NELAP	7/1/2003
7,12-Dimethylbenz(a) anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
a-a-Dimethylphenethylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
Acenaphthene	EPA 625	Extractable Organics	NELAP	10/8/2001
Acenaphthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Acenaphthene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Acenaphthylene	EPA 625	Extractable Organics	NELAP	10/8/2001
Acenaphthylene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Acenaphthylene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Acetone	EPA 8260	Volatile Organics	NELAP	7/1/2003
Acetonitrile	EPA 8260	Volatile Organics	NELAP	7/1/2003
Acetophenone	EPA 8270	Extractable Organics	NELAP	7/1/2003
Acrolein (Propenal)	EPA 624	Volatile Organics	NELAP	7/17/2003
Acrolein (Propenal)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Acrylonitrile	EPA 624	Volatile Organics	NELAP	7/17/2003
Acrylonitrile	EPA 8260	Volatile Organics	NELAP	7/1/2003
Adsorbable organic halogens (AOX)	EPA 1650	General Chemistry	NELAP	10/8/2001
Aldrin	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Aldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Alkalinity as CaCO3	EPA 310.1	General Chemistry	NELAP	10/8/2001
Allyl chloride (3-Chloropropene)	EPA 8260	Volatile Organics	NELAP	7/1/2003
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
alpha-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	12/23/2005
Aluminum	EPA 200.7	Metals	NELAP	10/8/2001
Aluminum	EPA 200.8	Metals	NELAP	10/8/2001
Aluminum	EPA 6010	Metals	NELAP	7/1/2003
Aluminum	EPA 6020	Metals	NELAP	7/1/2003
Aluminum	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Amenable cyanide	EPA 335.1	General Chemistry	NELAP	10/8/2001
Ammonia as N	EPA 350.1	General Chemistry	NELAP	10/8/2001
Ammonia as N	EPA 350.3	General Chemistry	NELAP	10/8/2001
Aniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
Anthracene	EPA 625	Extractable Organics	NELAP	10/8/2001

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Non-Potable Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Anthracene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Antimony	EPA 200.7	Metals	NELAP	10/8/2001
Antimony	EPA 200.8	Metals	NELAP	10/8/2001
Antimony	EPA 6010	Metals	NELAP	7/1/2003
Antimony	EPA 6020	Metals	NELAP	7/1/2003
Antimony	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Aramite	EPA 8270	Extractable Organics	NELAP	7/1/2003
Aroclor-1016 (PCB-1016)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Aroclor-1016 (PCB-1016)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1221 (PCB-1221)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Aroclor-1221 (PCB-1221)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1232 (PCB-1232)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Aroclor-1232 (PCB-1232)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1242 (PCB-1242)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Aroclor-1242 (PCB-1242)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1248 (PCB-1248)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Aroclor-1248 (PCB-1248)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1254 (PCB-1254)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Aroclor-1254 (PCB-1254)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1260 (PCB-1260)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Aroclor-1260 (PCB-1260)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Arsenic	EPA 200.7	Metals	NELAP	10/8/2001
Arsenic	EPA 200.8	Metals	NELAP	10/8/2001
Arsenic	EPA 200.9	Metals	NELAP	10/8/2001
Arsenic	EPA 6010	Metals	NELAP	10/8/2001
Arsenic	EPA 6020	Metals	NELAP	7/1/2003
Arsenic	EPA 7060	Metals	NELAP	10/8/2001
Arsenic	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Azinphos-methyl (Guthion)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Barium	EPA 200.7	Metals	NELAP	10/8/2001
Barium	EPA 200.8	Metals	NELAP	10/8/2001
Barium	EPA 6010	Metals	NELAP	7/1/2003
Barium	EPA 6020	Metals	NELAP	7/1/2003
Barium	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Benzene	EPA 624	Volatile Organics	NELAP	10/8/2001

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Non-Potable Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Benzene	EPA 8021	Volatile Organics	NELAP	7/1/2003
Benzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Benzidine	EPA 625	Extractable Organics	NELAP	10/8/2001
Benzo(a)anthracene	EPA 625	Extractable Organics	NELAP	10/8/2001
Benzo(a)anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(a)anthracene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzo(a)pyrene	EPA 625	Extractable Organics	NELAP	10/8/2001
Benzo(a)pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(a)pyrene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzo(b)fluoranthene	EPA 625	Extractable Organics	NELAP	10/8/2001
Benzo(b)fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(b)fluoranthene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzo(g,h,i)perylene	EPA 625	Extractable Organics	NELAP	10/8/2001
Benzo(g,h,i)perylene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(g,h,i)perylene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzo(k)fluoranthene	EPA 625	Extractable Organics	NELAP	10/8/2001
Benzo(k)fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(k)fluoranthene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzoic acid	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzyl alcohol	EPA 8270	Extractable Organics	NELAP	7/1/2003
Beryllium	EPA 200.7	Metals	NELAP	10/8/2001
Beryllium	EPA 200.8	Metals	NELAP	10/8/2001
Beryllium	EPA 6010	Metals	NELAP	7/1/2003
Beryllium	EPA 6020	Metals	NELAP	7/1/2003
Beryllium	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
beta-BHC (beta-Hexachlorocyclohexane)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
beta-Naphthylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
Biochemical oxygen demand	EPA 405.1	General Chemistry	NELAP	10/8/2001
bis(2-Chloroethoxy)methane	EPA 625	Extractable Organics	NELAP	10/8/2001
bis(2-Chloroethoxy)methane	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Chloroethyl) ether	EPA 625	Extractable Organics	NELAP	10/8/2001
bis(2-Chloroethyl) ether	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Chloroisopropyl) ether (2,2'-Oxybis(1-chloropropane))	EPA 625	Extractable Organics	NELAP	10/8/2001
bis(2-Chloroisopropyl) ether (2,2'-Oxybis(1-chloropropane))	EPA 8270	Extractable Organics	NELAP	7/1/2003

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Non-Potable Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 625	Extractable Organics	NELAP	10/8/2001
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 8270	Extractable Organics	NELAP	7/1/2003
Bolstar (Sulprofos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Boron	EPA 200.7	Metals	NELAP	10/8/2001
Bromide	EPA 300.0	General Chemistry	NELAP	10/8/2001
Bromobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Bromochloromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Bromodichloromethane	EPA 624	Volatile Organics	NELAP	10/8/2001
Bromodichloromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Bromoform	EPA 624	Volatile Organics	NELAP	10/8/2001
Bromoform	EPA 8260	Volatile Organics	NELAP	7/1/2003
Butyl benzyl phthalate	EPA 625	Extractable Organics	NELAP	10/8/2001
Butyl benzyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Cadmium	EPA 200.7	Metals	NELAP	10/8/2001
Cadmium	EPA 200.8	Metals	NELAP	10/8/2001
Cadmium	EPA 6010	Metals	NELAP	10/8/2001
Cadmium	EPA 6020	Metals	NELAP	7/1/2003
Cadmium	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Calcium	EPA 200.7	Metals	NELAP	10/8/2001
Calcium	EPA 6010	Metals	NELAP	10/8/2001
Calcium	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Carbazole	EPA 8270	Extractable Organics	NELAP	7/1/2003
Carbon disulfide	EPA 8260	Volatile Organics	NELAP	7/1/2003
Carbon tetrachloride	EPA 624	Volatile Organics	NELAP	10/8/2001
Carbon tetrachloride	EPA 8260	Volatile Organics	NELAP	7/1/2003
Chemical oxygen demand	EPA 410.1	General Chemistry	NELAP	10/8/2001
Chemical oxygen demand	EPA 410.2	General Chemistry	NELAP	12/23/2005
Chlordane (tech.)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Chlordane (tech.)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Chloride	EPA 300.0	General Chemistry	NELAP	10/8/2001
Chloride	EPA 325.3	General Chemistry	NELAP	10/8/2001
Chlorobenzene	EPA 624	Volatile Organics	NELAP	10/8/2001
Chlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Chlorobenzilate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Chloroethane	EPA 624	Volatile Organics	NELAP	10/8/2001
Chloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Non-Potable Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Chloroform	EPA 624	Volatile Organics	NELAP	10/8/2001
Chloroform	EPA 8260	Volatile Organics	NELAP	7/1/2003
Chloroprene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Chlorpyrifos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Chromium	EPA 200.7	Metals	NELAP	10/8/2001
Chromium	EPA 200.8	Metals	NELAP	10/8/2001
Chromium	EPA 6010	Metals	NELAP	7/1/2003
Chromium	EPA 6020	Metals	NELAP	7/1/2003
Chromium	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Chromium VI	EPA 7195	Metals	NELAP	7/1/2003
Chromium VI	EPA 7196	General Chemistry	NELAP	7/1/2003
Chrysene	EPA 625	Extractable Organics	NELAP	10/8/2001
Chrysene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Chrysene	EPA 8310	Extractable Organics	NELAP	7/1/2003
cis-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	7/1/2003
cis-1,3-Dichloropropene	EPA 624	Volatile Organics	NELAP	10/8/2001
cis-1,3-Dichloropropene	EPA 8260	Volatile Organics	NELAP	7/1/2003
cis-1,4-Dichloro-2-butene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Cobalt	EPA 200.7	Metals	NELAP	10/8/2001
Cobalt	EPA 200.8	Metals	NELAP	10/8/2001
Cobalt	EPA 6010	Metals	NELAP	7/1/2003
Cobalt	EPA 6020	Metals	NELAP	7/1/2003
Cobalt	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Color	EPA 110.2	General Chemistry	NELAP	10/8/2001
Conductivity	EPA 120.1	General Chemistry	NELAP	10/8/2001
Copper	EPA 200.7	Metals	NELAP	10/8/2001
Copper	EPA 200.8	Metals	NELAP	10/8/2001
Copper	EPA 6010	Metals	NELAP	10/8/2001
Copper	EPA 6020	Metals	NELAP	7/1/2003
Copper	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Coumaphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Dalapon	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
delta-BHC	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
delta-BHC	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Demeton-o	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Diallate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Non-Potable Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Diazinon	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Dibenz(a,h) anthracene	EPA 625	Extractable Organics	NELAP	10/8/2001
Dibenz(a,h) anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dibenz(a,h) anthracene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Dibenzofuran	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dibromochloromethane	EPA 624	Volatile Organics	NELAP	10/8/2001
Dibromochloromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Dibromomethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Dicamba	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Dichlorodifluoromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Dichloroprop (Dichlorprop)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Dichlorovos (DDVP, Dichlorvos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Dieldrin	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Dieldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Diesel range organics (DRO)	CA-LUFT	Extractable Organics	NELAP	7/1/2003
Diesel range organics (DRO)	EPA 8015	Extractable Organics	NELAP	7/28/2003
Diesel range organics (DRO)	NWTPH-Dx	Extractable Organics	NELAP	7/1/2003
Diethyl phthalate	EPA 625	Extractable Organics	NELAP	10/8/2001
Diethyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dimethoate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Dimethyl phthalate	EPA 625	Extractable Organics	NELAP	10/8/2001
Dimethyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Di-n-butyl phthalate	EPA 625	Extractable Organics	NELAP	10/8/2001
Di-n-butyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Di-n-octyl phthalate	EPA 625	Extractable Organics	NELAP	10/8/2001
Di-n-octyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Disulfoton	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Disulfoton	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endosulfan I	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Endosulfan I	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endosulfan II	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Endosulfan II	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endosulfan sulfate	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Endosulfan sulfate	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endrin	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Non-Potable Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Endrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endrin aldehyde	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Endrin aldehyde	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Ethanol	EPA 8015	Volatile Organics	NELAP	7/1/2003
Ethoprop	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Ethyl methacrylate	EPA 8260	Volatile Organics	NELAP	7/1/2003
Ethyl methanesulfonate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Ethylbenzene	EPA 624	Volatile Organics	NELAP	10/8/2001
Ethylbenzene	EPA 8021	Volatile Organics	NELAP	7/1/2003
Ethylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Ethylene glycol	EPA 8015	Volatile Organics	NELAP	7/1/2003
Famphur	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Fecal coliforms	SM 9221 E	Microbiology	NELAP	10/8/2001
Fensulfothion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Fenthion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Fluoranthene	EPA 625	Extractable Organics	NELAP	10/8/2001
Fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Fluoranthene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Fluorene	EPA 625	Extractable Organics	NELAP	10/8/2001
Fluorene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Fluorene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Fluoride	EPA 300.0	General Chemistry	NELAP	10/8/2001
Fluoride	EPA 340.2	General Chemistry	NELAP	10/8/2001
Formaldehyde	EPA 8315	Extractable Organics	NELAP	7/1/2003
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
gamma-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	12/23/2005
Gasoline range organics (GRO)	CA-LUFT	Extractable Organics	NELAP	7/1/2003
Gasoline range organics (GRO)	EPA 8015	Volatile Organics	NELAP	7/17/2003
Gasoline range organics (GRO)	NWTPH-Gx	Extractable Organics	NELAP	7/1/2003
Hardness	EPA 130.2	General Chemistry	NELAP	10/8/2001
Heptachlor	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Heptachlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Heptachlor epoxide	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Heptachlor epoxide	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Non-Potable Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Hexachlorobenzene	EPA 625	Extractable Organics	NELAP	10/8/2001
Hexachlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachlorobutadiene	EPA 625	Extractable Organics	NELAP	10/8/2001
Hexachlorobutadiene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Hexachlorobutadiene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachlorocyclopentadiene	EPA 625	Extractable Organics	NELAP	10/8/2001
Hexachlorocyclopentadiene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachloroethane	EPA 625	Extractable Organics	NELAP	10/8/2001
Hexachloroethane	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachlorophene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachloropropene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Ignitability	EPA 1020	General Chemistry	NELAP	7/1/2003
Indeno(1,2,3-cd)pyrene	EPA 625	Extractable Organics	NELAP	10/8/2001
Indeno(1,2,3-cd)pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Indeno(1,2,3-cd)pyrene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Iodomethane (Methyl iodide)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Iron	EPA 200.7	Metals	NELAP	10/8/2001
Iron	EPA 6010	Metals	NELAP	7/1/2003
Iron	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Isodrin	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Isophorone	EPA 625	Extractable Organics	NELAP	10/8/2001
Isophorone	EPA 8270	Extractable Organics	NELAP	7/1/2003
Isopropylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Isosafrole	EPA 8270	Extractable Organics	NELAP	7/1/2003
Kepone	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Kjeldahl nitrogen - total	EPA 351.4	General Chemistry	NELAP	10/8/2001
Lead	EPA 200.7	Metals	NELAP	10/8/2001
Lead	EPA 200.8	Metals	NELAP	10/8/2001
Lead	EPA 200.9	Metals	NELAP	10/8/2001
Lead	EPA 6010	Metals	NELAP	10/8/2001
Lead	EPA 6020	Metals	NELAP	7/1/2003
Lead	EPA 7421	Metals	NELAP	10/8/2001
Lead	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Magnesium	EPA 200.7	Metals	NELAP	10/8/2001
Magnesium	EPA 6010	Metals	NELAP	7/1/2003

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Non-Potable Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Magnesium	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Malathion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Manganese	EPA 200.7	Metals	NELAP	10/8/2001
Manganese	EPA 200.8	Metals	NELAP	10/8/2001
Manganese	EPA 6010	Metals	NELAP	7/1/2003
Manganese	EPA 6020	Metals	NELAP	7/1/2003
Manganese	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
MCPA	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
MCPP	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Mercury	EPA 1631	Metals	NELAP	10/8/2001
Mercury	EPA 245.1	Metals	NELAP	10/8/2001
Mercury	EPA 7470	Metals	NELAP	10/8/2001
Mercury	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Merphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Methacrylonitrile	EPA 8260	Volatile Organics	NELAP	7/1/2003
Methanol	NCASI 94.03	Volatile Organics	NELAP	10/8/2001
Methanol	NCASI 99.01	Volatile Organics	NELAP	10/8/2001
Methapyrilene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Methoxychlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Methyl bromide (Bromomethane)	EPA 624	Volatile Organics	NELAP	10/8/2001
Methyl bromide (Bromomethane)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Methyl chloride (Chloromethane)	EPA 624	Volatile Organics	NELAP	10/8/2001
Methyl chloride (Chloromethane)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Methyl methacrylate	EPA 8260	Volatile Organics	NELAP	7/1/2003
Methyl parathion (Parathion, methyl)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Methyl parathion (Parathion, methyl)	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Methyl tert-butyl ether (MTBE)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Methylene chloride	EPA 624	Volatile Organics	NELAP	10/8/2001
Methylene chloride	EPA 8260	Volatile Organics	NELAP	7/1/2003
Mevinphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Molybdenum	EPA 200.7	Metals	NELAP	10/8/2001
Molybdenum	EPA 200.8	Metals	NELAP	10/8/2001
Molybdenum	EPA 6010	Metals	NELAP	10/8/2001
Molybdenum	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Naphthalene	EPA 625	Extractable Organics	NELAP	10/8/2001
Naphthalene	EPA 8260	Volatile Organics	NELAP	7/1/2003

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Non-Potable Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Naphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Naphthalene	EPA 8310	Extractable Organics	NELAP	7/1/2003
n-Butylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Nickel	EPA 200.7	Metals	NELAP	10/8/2001
Nickel	EPA 200.8	Metals	NELAP	10/8/2001
Nickel	EPA 6010	Metals	NELAP	10/8/2001
Nickel	EPA 6020	Metals	NELAP	7/1/2003
Nickel	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Nitrate as N	EPA 300.0	General Chemistry	NELAP	10/8/2001
Nitrate as N	EPA 353.2	General Chemistry	NELAP	7/17/2003
Nitrate-nitrite	EPA 353.2	General Chemistry	NELAP	10/8/2001
Nitrite as N	EPA 300.0	General Chemistry	NELAP	10/8/2001
Nitrite as N	EPA 353.2	General Chemistry	NELAP	7/17/2003
Nitrobenzene	EPA 625	Extractable Organics	NELAP	10/8/2001
Nitrobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Nitrobenzene	EPA 8330	Extractable Organics	NELAP	7/1/2003
Nitroquinoline-1-oxide	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosodiethylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosodimethylamine	EPA 625	Extractable Organics	NELAP	10/8/2001
n-Nitrosodimethylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitroso-di-n-butylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosodi-n-propylamine	EPA 625	Extractable Organics	NELAP	10/8/2001
n-Nitrosodi-n-propylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosodiphenylamine	EPA 625	Extractable Organics	NELAP	10/8/2001
n-Nitrosodiphenylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosomethylethylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosomorpholine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosopiperidine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosopyrrolidine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Propylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	EPA 8330	Extractable Organics	NELAP	7/1/2003
Oil & Grease	EPA 1664	General Chemistry	NELAP	10/8/2001
Orthophosphate as P	EPA 365.3	General Chemistry	NELAP	10/8/2001
o-Toluidine	EPA 8270	Extractable Organics	NELAP	7/1/2003
Parathion, ethyl	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Parathion, ethyl	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Non-Potable Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Pentachloronitrobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Pentachlorophenol	EPA 1653	Extractable Organics	NELAP	10/8/2001
Pentachlorophenol	EPA 625	Extractable Organics	NELAP	10/8/2001
Pentachlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
pH	EPA 150.1	General Chemistry	NELAP	10/8/2001
pH	EPA 9040	General Chemistry	NELAP	7/1/2003
Phenacetin	EPA 8270	Extractable Organics	NELAP	7/1/2003
Phenanthrene	EPA 625	Extractable Organics	NELAP	10/8/2001
Phenanthrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Phenanthrene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Phenol	EPA 625	Extractable Organics	NELAP	10/8/2001
Phenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
Phorate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Phorate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Phosphorus, total	EPA 365.3	General Chemistry	NELAP	10/8/2001
p-Isopropyltoluene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Potassium	EPA 200.7	Metals	NELAP	10/8/2001
Potassium	EPA 6010	Metals	NELAP	10/8/2001
Potassium	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Pronamide (Kerb)	EPA 8270	Extractable Organics	NELAP	7/1/2003
Propionitrile (Ethyl cyanide)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Pyrene	EPA 625	Extractable Organics	NELAP	10/8/2001
Pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Pyrene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Pyridine	EPA 8270	Extractable Organics	NELAP	7/1/2003
RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	EPA 8330	Extractable Organics	NELAP	7/1/2003
Residual free chlorine	EPA 330.4	General Chemistry	NELAP	10/8/2001
Residue-filterable (TDS)	EPA 160.1	General Chemistry	NELAP	10/8/2001
Residue-nonfilterable (TSS)	EPA 160.2	General Chemistry	NELAP	10/8/2001
Residue-settleable	EPA 160.5	General Chemistry	NELAP	10/8/2001
Residue-total	EPA 160.3	General Chemistry	NELAP	10/8/2001
Residue-volatile	EPA 160.4	General Chemistry	NELAP	10/8/2001
Ronnel	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Safrole	EPA 8270	Extractable Organics	NELAP	7/1/2003
sec-Butylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Selenium	EPA 200.7	Metals	NELAP	10/8/2001

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Non-Potable Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Selenium	EPA 200.8	Metals	NELAP	10/8/2001
Selenium	EPA 200.9	Metals	NELAP	10/8/2001
Selenium	EPA 6010	Metals	NELAP	10/8/2001
Selenium	EPA 7740	Metals	NELAP	10/8/2001
Selenium	EPA 7742	Metals	NELAP	7/17/2003
Selenium	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Silver	EPA 200.7	Metals	NELAP	10/8/2001
Silver	EPA 200.8	Metals	NELAP	10/8/2001
Silver	EPA 6010	Metals	NELAP	7/1/2003
Silver	EPA 6020	Metals	NELAP	7/1/2003
Silver	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Silvex (2,4,5-TP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Sodium	EPA 200.7	Metals	NELAP	10/8/2001
Sodium	EPA 6010	Metals	NELAP	7/1/2003
Sodium	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Stirofos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Styrene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Sulfate	EPA 300.0	General Chemistry	NELAP	10/8/2001
Sulfide	EPA 376.1	General Chemistry	NELAP	10/8/2001
tert-Butylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Tetrachlorocatechol	EPA 1653	Extractable Organics	NELAP	10/8/2001
Tetrachloroethylene (Perchloroethylene)	EPA 624	Volatile Organics	NELAP	10/8/2001
Tetrachloroethylene (Perchloroethylene)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Tetrachloroguaiacol	EPA 1653	Extractable Organics	NELAP	10/8/2001
Tetryl (methyl-2,4,6-trinitrophenylnitramine)	EPA 8330	Extractable Organics	NELAP	7/1/2003
Thallium	EPA 200.7	Metals	NELAP	10/8/2001
Thallium	EPA 200.8	Metals	NELAP	10/8/2001
Thallium	EPA 200.9	Metals	NELAP	10/8/2001
Thallium	EPA 6020	Metals	NELAP	7/1/2003
Thallium	EPA 7841	Metals	NELAP	7/1/2003
Thallium	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Thionazin (Zinophos)	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Tin	EPA 200.7	Metals	NELAP	7/17/2003
Titanium	EPA 200.7	Metals	NELAP	7/17/2003
Tokuthion (Prothiophos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Toluene	EPA 624	Volatile Organics	NELAP	10/8/2001

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Non-Potable Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Toluene	EPA 8021	Volatile Organics	NELAP	7/1/2003
Toluene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Total coliforms	SM 9221 B	Microbiology	NELAP	10/8/2001
Total cyanide	EPA 335.4	General Chemistry	NELAP	7/17/2003
Total cyanide	EPA 9012	General Chemistry	NELAP	12/23/2005
Total cyanide	ILM04.1-Exhibit D	General Chemistry	NELAP	7/1/2003
Total hardness as CaCO3	EPA 200.7	Metals	NELAP	10/8/2001
Total organic carbon	EPA 415.1	General Chemistry	NELAP	10/8/2001
Total organic carbon	EPA 9060	General Chemistry	NELAP	7/1/2003
Total organic halides (TOX)	EPA 9020	General Chemistry	NELAP	7/1/2003
Total Petroleum Hydrocarbons (TPH)	EPA 1664	General Chemistry	NELAP	10/8/2001
Total Petroleum Hydrocarbons (TPH)	EPA 8015	Extractable Organics	NELAP	7/1/2003
Total Petroleum Hydrocarbons (TPH)	NWTPH-HCID	Extractable Organics	NELAP	7/1/2003
Total phenolics	EPA 420.1	General Chemistry	NELAP	10/8/2001
Toxaphene (Chlorinated camphene)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Toxaphene (Chlorinated camphene)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
trans-1,2-Dichloroethylene	EPA 624	Volatile Organics	NELAP	10/8/2001
trans-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	7/1/2003
trans-1,3-Dichloropropylene	EPA 624	Volatile Organics	NELAP	10/8/2001
trans-1,3-Dichloropropylene	EPA 8260	Volatile Organics	NELAP	7/1/2003
trans-1,4-Dichloro-2-butene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Trichloroethene (Trichloroethylene)	EPA 624	Volatile Organics	NELAP	10/8/2001
Trichloroethene (Trichloroethylene)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Trichlorofluoromethane	EPA 624	Volatile Organics	NELAP	10/8/2001
Trichlorofluoromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Trichloronate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Trichlorosyringol	EPA 1653	Extractable Organics	NELAP	10/8/2001
Turbidity	EPA 180.1	General Chemistry	NELAP	10/8/2001
Uranium	EPA 200.8	Metals	NELAP	10/8/2001
Vanadium	EPA 200.7	Metals	NELAP	10/8/2001
Vanadium	EPA 200.8	Metals	NELAP	10/8/2001
Vanadium	EPA 6010	Metals	NELAP	7/1/2003
Vanadium	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003
Vinyl acetate	EPA 8260	Volatile Organics	NELAP	7/1/2003
Vinyl chloride	EPA 624	Volatile Organics	NELAP	10/8/2001
Vinyl chloride	EPA 8260	Volatile Organics	NELAP	7/1/2003

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Non-Potable Water**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Xylene (total)	EPA 624	Volatile Organics	NELAP	10/8/2001
Xylene (total)	EPA 8021	Volatile Organics	NELAP	7/1/2003
Xylene (total)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Zinc	EPA 200.7	Metals	NELAP	10/8/2001
Zinc	EPA 200.8	Metals	NELAP	10/8/2001
Zinc	EPA 6010	Metals	NELAP	10/8/2001
Zinc	EPA 6020	Metals	NELAP	7/1/2003
Zinc	ILM04.1-Exhibit D	Metals	NELAP	7/1/2003

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Solid and Chemical Materials**

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,1,1,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,1,1-Trichloroethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,1,2,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,1,2-Trichloroethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,1-Dichloroethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,1-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,1-Dichloropropene	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2,3-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2,3-Trichloropropane	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2,4,5-Tetrachlorobenzene	EPA 8270	Extractable Organics	NELAP	10/8/2001
1,2,4-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2,4-Trichlorobenzene	EPA 8270	Extractable Organics	NELAP	10/8/2001
1,2,4-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	10/8/2001
1,2-Dichloroethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2-Diphenylhydrazine	EPA 8270	Extractable Organics	NELAP	10/8/2001
1,3,5-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8270	Extractable Organics	NELAP	7/17/2003
1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8330	Extractable Organics	NELAP	10/8/2001
1,3-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,3-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	10/8/2001
1,3-Dichloropropane	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,3-Dinitrobenzene (1,3-DNB)	EPA 8270	Extractable Organics	NELAP	10/8/2001
1,3-Dinitrobenzene (1,3-DNB)	EPA 8330	Extractable Organics	NELAP	10/8/2001
1,4-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,4-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	10/8/2001
1,4-Naphthoquinone	EPA 8270	Extractable Organics	NELAP	10/8/2001
1,4-Phenylenediamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
1-Chlorohexane	EPA 8260	Volatile Organics	NELAP	7/17/2003
1-Chloronaphthalene	EPA 8270	Extractable Organics	NELAP	7/17/2003
1-Naphthylamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ 206)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Solid and Chemical Materials**

Analyte	Method/Tech	Category	Certification Type	Effective Date
2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ 170)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ 180)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',3,4,4',5',6-Heptachlorobiphenyl (BZ 183)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',3,4,4',5'-Hexachlorobiphenyl (BZ 138)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ 187)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',3,4,5,5'-Hexachlorobiphenyl (BZ 141)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',3,4,5'-Pentachlorobiphenyl (BZ 87)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',3,5,5',6-Hexachlorobiphenyl (BZ 151)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',3,5'-Tetrachlorobiphenyl (BZ 44)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',4,4',5,5'-Hexachlorobiphenyl (BZ 153)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',4,5,5'-Pentachlorobiphenyl (BZ 101)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',5,5'-Tetrachlorobiphenyl (BZ 52)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',5-Trichlorobiphenyl (BZ 18)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	10/8/2001
2,3,3',4',6-Pentachlorobiphenyl (BZ 110)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,3',4,4'-Tetrachlorobiphenyl (BZ 66)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,3,4,6-Tetrachlorophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,3-Dichlorobiphenyl (BZ 5)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,4,5-T	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,4',5-Trichlorobiphenyl (BZ 31)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,4,5-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,4,6-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,4,6-Trinitrotoluene (2,4,6-TNT)	EPA 8330	Extractable Organics	NELAP	10/8/2001
2,4-D	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,4-DB	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,4-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,4-Dimethylphenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,4-Dinitrophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,4-Dinitrotoluene (2,4-DNT)	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,4-Dinitrotoluene (2,4-DNT)	EPA 8330	Extractable Organics	NELAP	10/8/2001
2,6-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,6-Dinitrotoluene (2,6-DNT)	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,6-Dinitrotoluene (2,6-DNT)	EPA 8330	Extractable Organics	NELAP	10/8/2001
2-Acetylaminofluorene	EPA 8270	Extractable Organics	NELAP	10/8/2001
2-Amino-4,6-dinitrotoluene (2-am-dnt)	EPA 8330	Extractable Organics	NELAP	10/8/2001
2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260	Volatile Organics	NELAP	10/8/2001

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Solid and Chemical Materials**

Analyte	Method/Tech	Category	Certification Type	Effective Date
2-Chlorobiphenyl (BZ 1)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2-Chloroethyl vinyl ether	EPA 8260	Volatile Organics	NELAP	10/8/2001
2-Chloronaphthalene	EPA 8270	Extractable Organics	NELAP	10/8/2001
2-Chlorophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	10/8/2001
2-Hexanone	EPA 8260	Volatile Organics	NELAP	10/8/2001
2-Methyl-4,6-dinitrophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2-Methylnaphthalene	EPA 8270	Extractable Organics	NELAP	10/8/2001
2-Methylphenol (o-Cresol)	EPA 8270	Extractable Organics	NELAP	10/8/2001
2-Nitroaniline	EPA 8270	Extractable Organics	NELAP	10/8/2001
2-Nitrophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2-Nitropropane	EPA 8260	Volatile Organics	NELAP	7/17/2003
2-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	10/8/2001
2-Picoline (2-Methylpyridine)	EPA 8270	Extractable Organics	NELAP	10/8/2001
2-Sec-butyl-4,6-dinitrophenol (DNBP, Dinoseb)	EPA 8270	Extractable Organics	NELAP	10/8/2001
3,3'-Dichlorobenzidine	EPA 8270	Extractable Organics	NELAP	10/8/2001
3,3'-Dimethylbenzidine	EPA 8270	Extractable Organics	NELAP	10/8/2001
3-Methylcholanthrene	EPA 8270	Extractable Organics	NELAP	10/8/2001
3-Methylphenol (m-Cresol)	EPA 8270	Extractable Organics	NELAP	7/17/2003
3-Nitroaniline	EPA 8270	Extractable Organics	NELAP	10/8/2001
3-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	10/8/2001
4,4'-DDD	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
4,4'-DDE	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
4,4'-DDT	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
4-Amino-2,6-dinitrotoluene (4-am-dnt)	EPA 8330	Extractable Organics	NELAP	10/8/2001
4-Aminobiphenyl	EPA 8270	Extractable Organics	NELAP	10/8/2001
4-Bromophenyl phenyl ether	EPA 8270	Extractable Organics	NELAP	10/8/2001
4-Chloro-3-methylphenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
4-Chloroaniline	EPA 8270	Extractable Organics	NELAP	10/8/2001
4-Chlorophenyl phenylether	EPA 8270	Extractable Organics	NELAP	10/8/2001
4-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	10/8/2001
4-Dimethyl aminoazobenzene	EPA 8270	Extractable Organics	NELAP	10/8/2001
4-Methyl-2-pentanone (MIBK)	EPA 8260	Volatile Organics	NELAP	10/8/2001
4-Methylphenol (p-Cresol)	EPA 8270	Extractable Organics	NELAP	10/8/2001
4-Nitroaniline	EPA 8270	Extractable Organics	NELAP	10/8/2001
4-Nitrophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Solid and Chemical Materials**

Analyte	Method/Tech	Category	Certification Type	Effective Date
4-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	10/8/2001
5-Nitro-o-toluidine	EPA 8270	Extractable Organics	NELAP	10/8/2001
7,12-Dimethylbenz(a) anthracene	EPA 8270	Extractable Organics	NELAP	10/8/2001
a-a-Dimethylphenethylamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
Acenaphthene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Acenaphthene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Acenaphthylene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Acenaphthylene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Acetone	EPA 8260	Volatile Organics	NELAP	10/8/2001
Acetonitrile	EPA 8260	Volatile Organics	NELAP	10/8/2001
Acetophenone	EPA 8270	Extractable Organics	NELAP	10/8/2001
Acrolein (Propenal)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Acrylonitrile	EPA 8260	Volatile Organics	NELAP	10/8/2001
Aldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Allyl chloride (3-Chloropropene)	EPA 8260	Volatile Organics	NELAP	10/8/2001
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
alpha-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Aluminum	EPA 6010	Metals	NELAP	10/8/2001
Aluminum	EPA 6020	Metals	NELAP	10/8/2001
Aluminum	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Aniline	EPA 8270	Extractable Organics	NELAP	10/8/2001
Anthracene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Anthracene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Antimony	EPA 6010	Metals	NELAP	10/8/2001
Antimony	EPA 6020	Metals	NELAP	10/8/2001
Antimony	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Aramite	EPA 8270	Extractable Organics	NELAP	10/8/2001
Aroclor-1016 (PCB-1016)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Aroclor-1221 (PCB-1221)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Aroclor-1232 (PCB-1232)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Aroclor-1242 (PCB-1242)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Aroclor-1248 (PCB-1248)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Aroclor-1254 (PCB-1254)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Aroclor-1260 (PCB-1260)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Arsenic	EPA 6010	Metals	NELAP	7/1/2003
Arsenic	EPA 6020	Metals	NELAP	10/8/2001

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Solid and Chemical Materials**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Arsenic	EPA 7060	Metals	NELAP	10/8/2001
Arsenic	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Azinphos-methyl (Guthion)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Barium	EPA 6010	Metals	NELAP	10/8/2001
Barium	EPA 6020	Metals	NELAP	10/8/2001
Barium	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Benzene	EPA 8021	Volatile Organics	NELAP	10/8/2001
Benzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Benzo(a)anthracene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Benzo(a)anthracene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Benzo(a)pyrene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Benzo(a)pyrene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Benzo(b)fluoranthene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Benzo(b)fluoranthene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Benzo(g,h,i)perylene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Benzo(g,h,i)perylene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Benzo(k)fluoranthene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Benzo(k)fluoranthene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Benzoic acid	EPA 8270	Extractable Organics	NELAP	10/8/2001
Benzyl alcohol	EPA 8270	Extractable Organics	NELAP	10/8/2001
Beryllium	EPA 6010	Metals	NELAP	10/8/2001
Beryllium	EPA 6020	Metals	NELAP	10/8/2001
Beryllium	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
beta-Naphthylamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
bis(2-Chloroethoxy)methane	EPA 8270	Extractable Organics	NELAP	10/8/2001
bis(2-Chloroethyl) ether	EPA 8270	Extractable Organics	NELAP	10/8/2001
bis(2-Chloroisopropyl) ether (2,2'-Oxybis(1-chloropropane))	EPA 8270	Extractable Organics	NELAP	10/8/2001
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 8270	Extractable Organics	NELAP	10/8/2001
Bolstar (Sulprofos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Bromobenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Bromochloromethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
Bromodichloromethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
Bromoform	EPA 8260	Volatile Organics	NELAP	10/8/2001
Butyl benzyl phthalate	EPA 8270	Extractable Organics	NELAP	10/8/2001
Cadmium	EPA 6010	Metals	NELAP	10/8/2001

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Solid and Chemical Materials**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Cadmium	EPA 6020	Metals	NELAP	10/8/2001
Cadmium	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Calcium	EPA 6010	Metals	NELAP	10/8/2001
Calcium	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Carbazole	EPA 8270	Extractable Organics	NELAP	10/8/2001
Carbon disulfide	EPA 8260	Volatile Organics	NELAP	10/8/2001
Carbon tetrachloride	EPA 8260	Volatile Organics	NELAP	10/8/2001
Chlordane (tech.)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Chloride	EPA 9056	General Chemistry	NELAP	7/17/2003
Chlorobenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Chlorobenzilate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Chloroethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
Chloroform	EPA 8260	Volatile Organics	NELAP	10/8/2001
Chloroprene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Chlorpyrifos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Chromium	EPA 6010	Metals	NELAP	10/8/2001
Chromium	EPA 6020	Metals	NELAP	10/8/2001
Chromium	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Chromium VI	EPA 7195	Metals	NELAP	10/8/2001
Chromium VI	EPA 7196	General Chemistry	NELAP	10/8/2001
Chrysene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Chrysene	EPA 8310	Extractable Organics	NELAP	10/8/2001
cis-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	10/8/2001
cis-1,3-Dichloropropene	EPA 8260	Volatile Organics	NELAP	10/8/2001
cis-1,4-Dichloro-2-butene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Cobalt	EPA 6010	Metals	NELAP	10/8/2001
Cobalt	EPA 6020	Metals	NELAP	10/8/2001
Cobalt	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Copper	EPA 6010	Metals	NELAP	10/8/2001
Copper	EPA 6020	Metals	NELAP	10/8/2001
Copper	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Corrosivity (pH)	EPA 1110	General Chemistry	NELAP	10/8/2001
Coumaphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Dalapon	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
delta-BHC	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Demeton-o	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Solid and Chemical Materials**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Demeton-s	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Diallate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Diazinon	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Dibenz(a,h) anthracene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Dibenz(a,h) anthracene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Dibenzofuran	EPA 8270	Extractable Organics	NELAP	10/8/2001
Dibromochloromethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
Dibromomethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
Dicamba	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Dichlorodifluoromethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
Dichloroprop (Dichlorprop)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Dichlorovos (DDVP, Dichlorvos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Dieldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Diesel range organics (DRO)	CA-LUFT	Extractable Organics	NELAP	10/8/2001
Diesel range organics (DRO)	EPA 8015	Extractable Organics	NELAP	7/17/2003
Diesel range organics (DRO)	NWTPH-Dx	Extractable Organics	NELAP	10/8/2001
Diethyl ether	EPA 8260	Volatile Organics	NELAP	7/17/2003
Diethyl phthalate	EPA 8270	Extractable Organics	NELAP	10/8/2001
Dimethoate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Dimethoate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Dimethyl phthalate	EPA 8270	Extractable Organics	NELAP	10/8/2001
Di-n-butyl phthalate	EPA 8270	Extractable Organics	NELAP	10/8/2001
Di-n-octyl phthalate	EPA 8270	Extractable Organics	NELAP	10/8/2001
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Disulfoton	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Disulfoton	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Endosulfan I	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Endosulfan II	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Endosulfan sulfate	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Endrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Endrin aldehyde	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
EPN	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Ethoprop	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Ethyl acetate	EPA 8260	Volatile Organics	NELAP	7/17/2003
Ethyl methacrylate	EPA 8260	Volatile Organics	NELAP	10/8/2001
Ethyl methanesulfonate	EPA 8270	Extractable Organics	NELAP	10/8/2001

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Solid and Chemical Materials**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Ethylbenzene	EPA 8021	Volatile Organics	NELAP	10/8/2001
Ethylbenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Ethylene glycol	EPA 8015	Volatile Organics	NELAP	10/8/2001
Famphur	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Fensulfothion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Fenthion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Fluoranthene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Fluoranthene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Fluorene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Fluorene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Fluoride	EPA 9056	General Chemistry	NELAP	7/17/2003
Formaldehyde	EPA 8315	Extractable Organics	NELAP	10/8/2001
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
gamma-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Gasoline range organics (GRO)	CA-LUFT	Extractable Organics	NELAP	10/8/2001
Gasoline range organics (GRO)	EPA 8015	Extractable Organics	NELAP	7/17/2003
Gasoline range organics (GRO)	NWTPH-Gx	Extractable Organics	NELAP	10/8/2001
Heptachlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Heptachlor epoxide	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Hexachlorobenzene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Hexachlorobutadiene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Hexachlorobutadiene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Hexachlorocyclopentadiene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Hexachloroethane	EPA 8270	Extractable Organics	NELAP	10/8/2001
Hexachlorophene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Hexachloropropene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Ignitability	EPA 1020	General Chemistry	NELAP	10/8/2001
Indeno(1,2,3-cd)pyrene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Indeno(1,2,3-cd)pyrene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Iodomethane (Methyl iodide)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Iron	EPA 6010	Metals	NELAP	10/8/2001
Iron	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Isodrin	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Isophorone	EPA 8270	Extractable Organics	NELAP	10/8/2001
Isopropylbenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Solid and Chemical Materials**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Isosafrole	EPA 8270	Extractable Organics	NELAP	10/8/2001
Kepone	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Lead	EPA 6010	Metals	NELAP	10/8/2001
Lead	EPA 6020	Metals	NELAP	10/8/2001
Lead	EPA 7421	Metals	NELAP	10/8/2001
Lead	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Magnesium	EPA 6010	Metals	NELAP	10/8/2001
Magnesium	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Malathion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Manganese	EPA 6010	Metals	NELAP	10/8/2001
Manganese	EPA 6020	Metals	NELAP	10/8/2001
Manganese	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
MCPA	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
MCPP	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Mercury	EPA 7470	Metals	NELAP	10/8/2001
Mercury	EPA 7471	Metals	NELAP	10/8/2001
Mercury	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Merphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Methacrylonitrile	EPA 8260	Volatile Organics	NELAP	10/8/2001
Methapyrilene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Methoxychlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Methyl bromide (Bromomethane)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Methyl chloride (Chloromethane)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Methyl methacrylate	EPA 8260	Volatile Organics	NELAP	10/8/2001
Methyl methanesulfonate	EPA 8270	Extractable Organics	NELAP	7/17/2003
Methyl parathion (Parathion, methyl)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Methyl parathion (Parathion, methyl)	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Methyl tert-butyl ether (MTBE)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Methylene chloride	EPA 8260	Volatile Organics	NELAP	10/8/2001
Mevinphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Molybdenum	EPA 6010	Metals	NELAP	10/8/2001
Molybdenum	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Naphthalene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Naphthalene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Naphthalene	EPA 8310	Extractable Organics	NELAP	10/8/2001
n-Butylbenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Solid and Chemical Materials**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Nickel	EPA 6010	Metals	NELAP	10/8/2001
Nickel	EPA 6020	Metals	NELAP	10/8/2001
Nickel	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Nitrate	EPA 9056	General Chemistry	NELAP	7/17/2003
Nitrite	EPA 9056	General Chemistry	NELAP	7/17/2003
Nitrobenzene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Nitrobenzene	EPA 8330	Extractable Organics	NELAP	10/8/2001
Nitroglycerin	EPA 8332	Extractable Organics	NELAP	7/17/2003
Nitroquinoline-1-oxide	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Nitrosodiethylamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Nitrosodimethylamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Nitroso-di-n-butylamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Nitrosodi-n-propylamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Nitrosodiphenylamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Nitrosomethylethylamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Nitrosomorpholine	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Nitrosopiperidine	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Nitrosopyrrolidine	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Propylbenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
o,o,o-Triethyl phosphorothioate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	EPA 8330	Extractable Organics	NELAP	10/8/2001
Oil & Grease	EPA 1664	General Chemistry	NELAP	10/8/2001
Oil & Grease	EPA 9071	General Chemistry	NELAP	10/8/2001
o-Toluidine	EPA 8270	Extractable Organics	NELAP	10/8/2001
Parathion, ethyl	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Parathion, ethyl	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
p-Dioxane	EPA 8260	Volatile Organics	NELAP	10/8/2001
Pentachlorobenzene	EPA 8270	Extractable Organics	NELAP	7/17/2003
Pentachloronitrobenzene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Pentachlorophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
pH	EPA 9040	General Chemistry	NELAP	10/8/2001
pH	EPA 9045	General Chemistry	NELAP	7/17/2003
Phenacetin	EPA 8270	Extractable Organics	NELAP	10/8/2001
Phenanthrene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Phenanthrene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Phenol	EPA 8270	Extractable Organics	NELAP	10/8/2001

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Solid and Chemical Materials**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Phorate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Phorate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
p-Isopropyltoluene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Potassium	EPA 6010	Metals	NELAP	10/8/2001
Potassium	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Pronamide (Kerb)	EPA 8270	Extractable Organics	NELAP	10/8/2001
Propionitrile (Ethyl cyanide)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Pyrene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Pyrene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Pyridine	EPA 8270	Extractable Organics	NELAP	10/8/2001
RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	EPA 8330	Extractable Organics	NELAP	10/8/2001
Ronnel	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Safrole	EPA 8270	Extractable Organics	NELAP	10/8/2001
sec-Butylbenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Selenium	EPA 6010	Metals	NELAP	7/17/2003
Selenium	EPA 7740	Metals	NELAP	10/8/2001
Selenium	EPA 7742	Metals	NELAP	7/17/2003
Selenium	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Silver	EPA 6010	Metals	NELAP	10/8/2001
Silver	EPA 6020	Metals	NELAP	10/8/2001
Silver	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Silvex (2,4,5-TP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Sodium	EPA 6010	Metals	NELAP	10/8/2001
Sodium	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Stirofos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Styrene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Sulfate	EPA 9056	General Chemistry	NELAP	7/17/2003
Sulfide	EPA 9030/9034	General Chemistry	NELAP	7/17/2003
Sulfotepp	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Synthetic Precipitation Leaching Procedure	EPA 1312	General Chemistry	NELAP	7/17/2003
tert-Butyl alcohol	EPA 8260	Volatile Organics	NELAP	7/17/2003
tert-Butylbenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Tetrachloroethylene (Perchloroethylene)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Tetryl (methyl-2,4,6-trinitrophenylnitramine)	EPA 8330	Extractable Organics	NELAP	10/8/2001
Thallium	EPA 6010	Metals	NELAP	7/17/2003
Thallium	EPA 6020	Metals	NELAP	10/8/2001

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Solid and Chemical Materials**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Thallium	EPA 7841	Metals	NELAP	10/8/2001
Thallium	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Thionazin (Zinophos)	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Tokuthion (Prothiophos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Toluene	EPA 8021	Volatile Organics	NELAP	10/8/2001
Toluene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Total cyanide	EPA 9012	General Chemistry	NELAP	12/23/2005
Total cyanide	ILM04.1-Exhibit D	General Chemistry	NELAP	10/8/2001
Total organic carbon	EPA 9060	General Chemistry	NELAP	10/8/2001
Total organic halides (TOX)	EPA 9020	General Chemistry	NELAP	10/8/2001
Total Petroleum Hydrocarbons (TPH)	NWTPH-HCID	Extractable Organics	NELAP	10/8/2001
Toxaphene (Chlorinated camphene)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Toxicity Characteristic Leaching Procedure	EPA 1311	General Chemistry	NELAP	10/8/2001
trans-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	10/8/2001
trans-1,3-Dichloropropylene	EPA 8260	Volatile Organics	NELAP	10/8/2001
trans-1,4-Dichloro-2-butene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Trichloroethene (Trichloroethylene)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Trichlorofluoromethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
Trichloronate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Vanadium	EPA 6010	Metals	NELAP	10/8/2001
Vanadium	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001
Vinyl acetate	EPA 8260	Volatile Organics	NELAP	10/8/2001
Vinyl chloride	EPA 8260	Volatile Organics	NELAP	10/8/2001
Xylene (total)	EPA 8021	Volatile Organics	NELAP	10/8/2001
Xylene (total)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Zinc	EPA 6010	Metals	NELAP	10/8/2001
Zinc	EPA 6020	Metals	NELAP	10/8/2001
Zinc	ILM04.1-Exhibit D	Metals	NELAP	10/8/2001

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Biological Tissue**

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,2,4-Trichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,2-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,2-Diphenylhydrazine	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8330	Extractable Organics	NELAP	7/1/2003
1,3-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,3-Dinitrobenzene (1,3-DNB)	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,3-Dinitrobenzene (1,3-DNB)	EPA 8330	Extractable Organics	NELAP	7/1/2003
1,4-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ 206)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ 170)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ 180)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,4',5',6-Heptachlorobiphenyl (BZ 183)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,4',5'-Hexachlorobiphenyl (BZ 138)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ 187)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,5,5'-Hexachlorobiphenyl (BZ 141)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,5'-Pentachlorobiphenyl (BZ 87)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,5,5',6-Hexachlorobiphenyl (BZ 151)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,5'-Tetrachlorobiphenyl (BZ 44)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',4,4',5,5'-Hexachlorobiphenyl (BZ 153)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',4,5,5'-Pentachlorobiphenyl (BZ 101)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',5,5'-Tetrachlorobiphenyl (BZ 52)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',5-Trichlorobiphenyl (BZ 18)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,3,3',4',6-Pentachlorobiphenyl (BZ 110)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,3',4,4'-Tetrachlorobiphenyl (BZ 66)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,3-Dichlorobiphenyl (BZ 5)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,4',5-Trichlorobiphenyl (BZ 31)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,4,5-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4,6-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4,6-Trinitrotoluene (2,4,6-TNT)	EPA 8330	Extractable Organics	NELAP	7/1/2003
2,4-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dimethylphenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dinitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 8330	Extractable Organics	NELAP	7/1/2003
2,6-Dinitrotoluene (2,6-DNT)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,6-Dinitrotoluene (2,6-DNT)	EPA 8330	Extractable Organics	NELAP	7/1/2003

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Biological Tissue**

Analyte	Method/Tech	Category	Certification Type	Effective Date
2-Amino-4,6-dinitrotoluene (2-am-dnt)	EPA 8330	Extractable Organics	NELAP	7/1/2003
2-Chlorobiphenyl (BZ 1)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2-Chloronaphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Chlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Methyl-4,6-dinitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Methylnaphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Methylphenol (o-Cresol)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Nitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	7/1/2003
3,3'-Dichlorobenzidine	EPA 8270	Extractable Organics	NELAP	7/1/2003
3-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
3-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	7/1/2003
4,4'-DDD	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4,4'-DDE	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4,4'-DDT	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4-Amino-2,6-dinitrotoluene (4-am-dnt)	EPA 8330	Extractable Organics	NELAP	7/1/2003
4-Bromophenyl phenyl ether	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chloro-3-methylphenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chloroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chlorophenyl phenylether	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Methylphenol (p-Cresol)	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	7/1/2003
Acenaphthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Acenaphthylene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Aldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
alpha-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aluminum	EPA 6010	Metals	NELAP	7/1/2003
Aluminum	EPA 6020	Metals	NELAP	7/1/2003
Aniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
Anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Antimony	EPA 6010	Metals	NELAP	7/1/2003
Antimony	EPA 6020	Metals	NELAP	7/1/2003

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Biological Tissue**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Aroclor-1016 (PCB-1016)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1221 (PCB-1221)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1232 (PCB-1232)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1242 (PCB-1242)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1248 (PCB-1248)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1254 (PCB-1254)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1260 (PCB-1260)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Arsenic	EPA 6010	Metals	NELAP	7/1/2003
Arsenic	EPA 6020	Metals	NELAP	7/1/2003
Arsenic	EPA 7060	Metals	NELAP	7/1/2003
Barium	EPA 6010	Metals	NELAP	7/1/2003
Barium	EPA 6020	Metals	NELAP	7/1/2003
Benzo(a)anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(a)pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(b)fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(g,h,i)perylene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(k)fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzoic acid	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzyl alcohol	EPA 8270	Extractable Organics	NELAP	7/1/2003
Beryllium	EPA 6010	Metals	NELAP	7/1/2003
Beryllium	EPA 6020	Metals	NELAP	7/1/2003
beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
bis(2-Chloroethoxy)methane	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Chloroethyl) ether	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Chloroisopropyl) ether (2,2'-Oxybis(1-chloropropane))	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 8270	Extractable Organics	NELAP	7/1/2003
Butyl benzyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Cadmium	EPA 6010	Metals	NELAP	7/1/2003
Cadmium	EPA 6020	Metals	NELAP	7/1/2003
Carbazole	EPA 8270	Extractable Organics	NELAP	7/1/2003
Chlordane (tech.)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Chromium	EPA 6010	Metals	NELAP	7/1/2003
Chromium	EPA 6020	Metals	NELAP	7/1/2003
Chromium VI	EPA 7196	Metals	NELAP	7/1/2003
Chrysene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Cobalt	EPA 6010	Metals	NELAP	7/1/2003

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Biological Tissue**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Cobalt	EPA 6020	Metals	NELAP	7/1/2003
Copper	EPA 6010	Metals	NELAP	7/1/2003
Copper	EPA 6020	Metals	NELAP	7/1/2003
delta-BHC	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Dibenz(a,h) anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dibenzofuran	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dieldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Diethyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dimethyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Di-n-butyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Di-n-octyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Endosulfan I	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endosulfan II	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endosulfan sulfate	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endrin aldehyde	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endrin ketone	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Fluorene	EPA 8270	Extractable Organics	NELAP	7/1/2003
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
gamma-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Heptachlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Heptachlor epoxide	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Hexachlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachlorobutadiene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachlorocyclopentadiene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachloroethane	EPA 8270	Extractable Organics	NELAP	7/1/2003
Indeno(1,2,3-cd)pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Iron	EPA 6010	Metals	NELAP	7/1/2003
Isophorone	EPA 8270	Extractable Organics	NELAP	7/1/2003
Lead	EPA 6010	Metals	NELAP	7/1/2003
Lead	EPA 6020	Metals	NELAP	7/1/2003
Lead	EPA 7421	Metals	NELAP	7/1/2003
Manganese	EPA 6010	Metals	NELAP	7/1/2003
Manganese	EPA 6020	Metals	NELAP	7/1/2003
Mercury	EPA 7471	Metals	NELAP	7/1/2003

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-03, expiration date June 30, 2006. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87412** EPA Lab Code: **WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Biological Tissue**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Methoxychlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Molybdenum	EPA 6010	Metals	NELAP	7/1/2003
Naphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Nickel	EPA 6010	Metals	NELAP	7/1/2003
Nickel	EPA 6020	Metals	NELAP	7/1/2003
Nitrobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Nitrobenzene	EPA 8330	Extractable Organics	NELAP	7/1/2003
n-Nitrosodimethylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosodi-n-propylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosodiphenylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	EPA 8330	Extractable Organics	NELAP	7/1/2003
Pentachlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
Phenanthrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Phenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
Pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Pyridine	EPA 8270	Extractable Organics	NELAP	7/1/2003
RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	EPA 8330	Extractable Organics	NELAP	7/1/2003
Selenium	EPA 6010	Metals	NELAP	7/1/2003
Selenium	EPA 7740	Metals	NELAP	7/1/2003
Selenium	EPA 7742	Metals	NELAP	7/1/2003
Silver	EPA 6010	Metals	NELAP	7/1/2003
Silver	EPA 6020	Metals	NELAP	7/1/2003
Tetryl (methyl-2,4,6-trinitrophenylnitramine)	EPA 8330	Extractable Organics	NELAP	7/1/2003
Thallium	EPA 6020	Metals	NELAP	7/1/2003
Thallium	EPA 7841	Metals	NELAP	7/1/2003
Total cyanide	EPA 9012	General Chemistry	NELAP	12/23/2005
Toxaphene (Chlorinated camphene)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Vanadium	EPA 6010	Metals	NELAP	7/1/2003
Zinc	EPA 6010	Metals	NELAP	7/1/2003
Zinc	EPA 6020	Metals	NELAP	7/1/2003

GENERAL CHEMISTRY/WATER CHEMISTRY ANALYSES					
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**
110.2	NA	Water	Color	85-115	NA
120.1 / *SM* 2510B	NA	Water	Conductivity	85-115	NA
130.2 / *SM* 2340C	NA	Water	Hardness as $CaCO_3$	85-115	75-125
150.1	NA	Water	pH	85-115	NA
160.1 / *SM* 2540C	NA	Water	Solids, Total Dissolved (Filterable)	85-115	NA
160.2	NA	Water	Solids, Total Suspended (Nonfilterable)	85-115	NA
160.3	NA	Soil	Solids, Total	NA	NA
160.3	NA	Water	Solids, Total	92-106	NA
160.4	NA	Soil	Solids, Volatile	85-115	NA
160.4	NA	Water	Solids, Volatile	85-115	NA
160.5	NA	Water	Solids, Settleable	NA	NA
180.1	NA	Water	Turbidity	85-115	NA
300.0M	SOP	Soil	Bromide	90-110	80-120
300.0M	SOP	Soil	Chloride	90-110	80-120
300.0M	SOP	Soil	Fluoride	90-110	80-120
300.0M	SOP	Soil	Nitrate as Nitrogen	90-110	80-120
300.0M	SOP	Soil	Nitrite as Nitrogen	90-110	80-120
300.0M	SOP	Soil	Sulfate	90-110	80-120
300.0	NA	Water	Bromide	90-110	80-120
300.0	NA	Water	Chloride	90-110	80-120
300.0	NA	Water	Fluoride	90-110	80-120
300.0	NA	Water	Nitrate as Nitrogen	90-110	80-120
300.0	NA	Water	Nitrite as Nitrogen	90-110	80-120
300.0	NA	Water	Sulfate	90-110	80-120
300.1	NA	Water	Bromate	85-115	75-125
300.1	NA	Water	Bromide	85-115	75-125
300.1	NA	Water	Chlorite	85-115	75-125
300.1	NA	Water	Dichloroacetate (surrogate) 90-115	NA	NA
305.1	NA	Water	Acidity as $CaCO_3$	85-115	NA
310.1 / *SM* 2320B	NA	Water	Alkalinity as $CaCO_3$	85-115	NA
314.0	NA	Water	Perchlorate	85-115	80-120
325.3	NA	Water	Chloride, Titrimetric	85-115	75-125
330.4	NA	Water	Chlorine, Total Residual	85-115	NA
335.1M	SOP	Soil	Cyanides Amenable to Chlorination	85-115	75-125
335.1	NA	Water	Cyanides Amenable to Chlorination	85-115	75-125
335.2 / 335.4	SOP	Soil	Cyanide, Total	85-115	75-125
335.2 / 335.4	NA	Water	Cyanide, Total	85-115	75-125
340.1M	SOP	Soil	Fluoride, Bellack Distillation	85-115	75-125
340.1	NA	Water	Fluoride, Bellack Distillation	85-115	75-125
340.2M	SOP	Soil	Fluoride	85-115	75-125
340.2 / *SM* 4500-F⁻C	NA	Water	Fluoride	85-115	75-125
350.1M	SOP	Soil	Ammonia as Nitrogen	85-115	75-125
350.1	NA	Water	Ammonia as Nitrogen	90-110	90-110
350.3M	SOP	Soil	Ammonia as Nitrogen	85-115	75-125
350.3	NA	Water	Ammonia as Nitrogen	85-115	75-125
351.4M	SOP	Soil	Nitrogen, Total Kjeldahl	85-115	85-115
351.4	NA	Water	Nitrogen, Total Kjeldahl	85-115	85-115
353.2M	SOP	Soil	Nitrogen, Nitrate + Nitrite as Nitrogen	85-115	75-125
353.2	NA	Water	Nitrogen, Nitrate + Nitrite as Nitrogen	90-110	90-110
354.1	NA	Water	Nitrite as Nitrogen, Colorimetric	85-115	75-125
365.3M	SOP	Soil	Orthophosphate as Phosphorus	85-115	85-115
365.3	NA	Water	Orthophosphate as Phosphorus	85-115	75-125

GENERAL CHEMISTRY/WATER CHEMISTRY ANALYSES					
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**
SM 4500P-F	NA	Water	Orthophosphate as Phosphorus	85-115	89-110
365.3M	SOP	Soil	Phosphorus, Total	94-108	85-115
365.3	NA	Water	Phosphorus, Total	85-115	75-125
376.1	NA	Water	Sulfide	85-115	75-125
376.2	NA	Water	Sulfide	85-115	75-125
377.1	NA	Water	Sulfite	NA	NA
SM 5550B	NA	Water	Tannin and Lignin	85-115	75-125
405.1	NA	Water	Biological Oxygen Demand	NA	NA
410.1 and 410.2M	SOP	Soil	Chemical Oxygen Demand	85-115	75-125
410.1	NA	Water	Chemical Oxygen Demand	85-115	75-125
410.2	NA	Water	Chemical Oxygen Demand	85-115	75-125
ASTM D4129-82M	NA	Soil	Total Organic Carbon	85-115	75-125
415.1	NA	Water	Total Organic Carbon	90-109	65-133
420.1M	SOP	Soil	Phenolics, Total	85-115	75-125
420.1	NA	Water	Phenolics, Total	85-115	75-125
425.1	NA	Water	Surfactants (MBAS)	85-115	75-125
ASTM D1498	NA	Water	Oxidation-Reduction Potential	NA	NA
1020	NA	Soil	Flashpoint, Setaflash	NA	NA
1020	NA	Water	Flashpoint, Setaflash	NA	NA
1110	NA	Liquid	Corrosivity	NA	NA
1650A	NA	Water	Absorbable Organic Halides	78-116	78-116
7196A	3060A	Soil	Hexavalent Chromium	85-115	85-115
7196A	Method	Water	Hexavalent Chromium	85-115	85-115
9010B/9012A		Soil	Cyanide, Total and Amenable	85-115	75-125
9010B/9012A		Water	Cyanide, Total and Amenable	85-115	75-125
9020	NA	Water	Total Organic Halides	87-113	82-121
9030A	Method	Soil	Sulfides	60-130	60-130
9030	NA	Water	Sulfides	60-130	60-130
9040	NA	Water	Corrosivity (pH)	NA	NA
9045C	NA	Soil	pH	NA	NA
9060A	NA	Water	Total Organic Carbon	90-109	65-133
9095	NA	Soil	Paint Filter Test	85-115	NA
9252	NA	Water	Chloride, Titrimetric	85-115	75-125

Precision (RPD)
20
20
20
NA
20
20
20
14
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
NA
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20

Precision (RPD)
13
12
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
20
NA
20

METALS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
200.7 (ICP)	Method	Soil	Aluminum	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Antimony	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Barium	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Beryllium	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Boron	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Cadmium	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Calcium	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Chromium	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Cobalt	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Copper	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Iron	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Lead	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Magnesium	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Manganese	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Molybdenum	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Nickel	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Potassium	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Silver	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Sodium	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Tin	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Vanadium	Ref.	70-130	30
200.7 (ICP)	Method	Soil	Zinc	Ref.	70-130	30
200.7 (ICP)	Method	Water	Aluminum	85-115	70-130	20
200.7 (ICP)	Method	Water	Antimony	85-115	70-130	20
200.7 (ICP)	Method	Water	Barium	85-115	70-130	20
200.7 (ICP)	Method	Water	Beryllium	85-115	70-130	20
200.7 (ICP)	Method	Water	Boron	85-115	70-130	20
200.7 (ICP)	Method	Water	Cadmium	85-115	70-130	20
200.7 (ICP)	Method	Water	Calcium	85-115	70-130	20
200.7 (ICP)	Method	Water	Chromium	85-115	70-130	20
200.7 (ICP)	Method	Water	Cobalt	85-115	70-130	20
200.7 (ICP)	Method	Water	Copper	85-115	70-130	20
200.7 (ICP)	Method	Water	Iron	85-115	70-130	20
200.7 (ICP)	Method	Water	Magnesium	85-115	70-130	20
200.7 (ICP)	Method	Water	Manganese	85-115	70-130	20
200.7 (ICP)	Method	Water	Molybdenum	85-115	70-130	20
200.7 (ICP)	Method	Water	Nickel	85-115	70-130	20
200.7 (ICP)	Method	Water	Potassium	85-115	70-130	20
200.7 (ICP)	Method	Water	Silver	85-115	70-130	20
200.7 (ICP)	Method	Water	Sodium	85-115	70-130	20
200.7 (ICP)	Method	Water	Tin	85-115	70-130	20
200.7 (ICP)	Method	Water	Vanadium	85-115	70-130	20
200.7 (ICP)	Method	Water	Zinc	85-115	70-130	20
200.9	Method	Soil	Arsenic	Ref.	70-130	30
200.9	Method	Soil	Lead	Ref.	70-130	30
200.9	Method	Soil	Selenium	Ref.	70-130	30
200.9	Method	Soil	Thallium	Ref.	70-130	30
200.9/206.2	Method	Water	Arsenic	85-115	70-130	20
200.9/239.2	Method	Water	Lead	85-115	70-130	20
245.1	Method	Water	Mercury	85-115	70-131	20
1631	Method	Water	Mercury	77-123	71-125	24
200.9/270.2	Method	Water	Selenium	85-115	70-130	20

METALS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
200.9/279.2	Method	Water	Thallium	85-115	70-130	20
200.8	Method	Soil/Sed.	Aluminum	Ref.	70-130	30
200.8	Method	Soil/Sed.	Antimony	Ref.	70-130	30
200.8	Method	Soil/Sed.	Arsenic	Ref.	70-130	30
200.8	Method	Soil/Sed.	Barium	Ref.	70-130	30
200.8	Method	Soil/Sed.	Beryllium	Ref.	70-130	30
200.8	Method	Soil/Sed.	Cadmium	Ref.	70-130	30
200.8	Method	Soil/Sed.	Chromium	Ref.	70-130	30
200.8	Method	Soil/Sed.	Cobalt	Ref.	70-130	30
200.8	Method	Soil/Sed.	Copper	Ref.	70-130	30
200.8	Method	Soil/Sed.	Lead	Ref.	70-130	30
200.8	Method	Soil/Sed.	Manganese	Ref.	70-130	30
200.8	Method	Soil/Sed.	Molybdenum	Ref.	70-130	30
200.8	Method	Soil/Sed.	Nickel	Ref.	70-130	30
200.8	Method	Soil/Sed.	Selenium	Ref.	70-130	30
200.8	Method	Soil/Sed.	Silver	Ref.	70-130	30
200.8	Method	Soil/Sed.	Thallium	Ref.	70-130	30
200.8	Method	Soil/Sed.	Vanadium	Ref.	70-130	30
200.8	Method	Soil/Sed.	Zinc	Ref.	70-130	30
200.8	Method	Water	Aluminum	85-115	70-130	20
200.8	Method	Water	Antimony	85-115	70-130	20
200.8	Method	Water	Arsenic	85-115	70-130	20
200.8	Method	Water	Barium	85-115	70-130	20
200.8	Method	Water	Beryllium	85-115	70-130	20
200.8	Method	Water	Cadmium	85-115	70-130	20
200.8	Method	Water	Chromium	85-115	70-130	20
200.8	Method	Water	Cobalt	85-115	70-130	20
200.8	Method	Water	Copper	85-115	70-130	20
200.8	Method	Water	Lead	85-115	70-130	20
200.8	Method	Water	Manganese	85-115	70-130	20
200.8	Method	Water	Molybdenum	85-115	70-130	20
200.8	Method	Water	Nickel	85-115	70-130	20
200.8	Method	Water	Selenium	85-115	70-130	20
200.8	Method	Water	Silver	85-115	70-130	20
200.8	Method	Water	Thallium	85-115	70-130	20
200.8	Method	Water	Vanadium	85-115	70-130	20
200.8	Method	Water	Zinc	85-115	70-130	20
200.8	Red.Precip.	Seawater	Arsenic	71-125	50-145	20
200.8	Red.Precip.	Seawater	Beryllium	38-114	50-123	20
200.8	Red.Precip.	Seawater	Cadmium	79-114	64-115	20
200.8	Red.Precip.	Seawater	Chromium	76-119	50-130	20
200.8	Red.Precip.	Seawater	Cobalt	80-112	50-151	20
200.8	Red.Precip.	Seawater	Copper	81-113	50-120	20
200.8	Red.Precip.	Seawater	Lead	81-112	54-118	20
200.8	Red.Precip.	Seawater	Nickel	87-113	59-127	20
200.8	Red.Precip.	Seawater	Silver	78-110	67-104	20
200.8	Red.Precip.	Seawater	Thallium	79-110	63-111	20
200.8	Red.Precip.	Seawater	Zinc	75-136	50-133	20
200.8	3050B	Tissue	Aluminum	Ref.	70-130	30
200.8	3050B	Tissue	Antimony	Ref.	70-130	30
200.8	3050B	Tissue	Arsenic	Ref.	70-130	30
200.8	3050B	Tissue	Barium	Ref.	70-130	30

METALS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
200.8	3050B	Tissue	Beryllium	Ref.	70-130	30
200.8	3050B	Tissue	Cadmium	Ref.	70-130	30
200.8	3050B	Tissue	Cobalt	Ref.	70-130	30
200.8	3050B	Tissue	Copper	Ref.	70-130	30
200.8	3050B	Tissue	Lead	Ref.	70-130	30
200.8	3050B	Tissue	Manganese	Ref.	70-130	30
200.8	3050B	Tissue	Molybdenum	Ref.	70-130	30
200.8	3050B	Tissue	Nickel	Ref.	70-130	30
200.8	3050B	Tissue	Silver	Ref.	70-130	30
200.8	3050B	Tissue	Thallium	Ref.	70-130	30
200.8	3050B	Tissue	Vanadium	Ref.	70-130	30
200.8	3050B	Tissue	Zinc	Ref.	70-130	30
6010B	3050B	Soil	Aluminum	Ref.	75-125	30
6010B	3050B	Soil	Antimony	Ref.	10-132	30
6010B	3050B	Soil	Arsenic	Ref.	46-143	30
6010B	3050B	Soil	Barium	Ref.	77-125	30
6010B	3050B	Soil	Beryllium	Ref.	81-119	30
6010B	3050B	Soil	Boron	Ref.	25-175	30
6010B	3050B	Soil	Cadmium	Ref.	49-151	30
6010B	3050B	Soil	Calcium	Ref.	75-125	30
6010B	3050B	Soil	Chromium	Ref.	60-144	30
6010B	3050B	Soil	Cobalt	Ref.	84-113	30
6010B	3050B	Soil	Copper	Ref.	57-141	30
6010B	3050B	Soil	Iron	Ref.	75-125	30
6010B	3050B	Soil	Lead	Ref.	59-141	30
6010B	3050B	Soil	Magnesium	Ref.	75-125	30
6010B	3050B	Soil	Manganese	Ref.	31-169	30
6010B	3050B	Soil	Molybdenum	Ref.	71-117	30
6010B	3050B	Soil	Nickel	Ref.	74-127	30
6010B	3050B	Soil	Potassium	Ref.	75-125	30
6010B	3050B	Soil	Selenium	Ref.	65-130	30
6010B	3050B	Soil	Silver	Ref.	46-137	30
6010B	3050B	Soil	Sodium	Ref.	75-125	30
6010B	3050B	Soil	Thallium	Ref.	18-166	30
6010B	3050B	Soil	Tin	Ref.	75-125	30
6010B	3050B	Soil	Vanadium	Ref.	77-122	30
6010B	3050B	Soil	Zinc	Ref.	50-149	30
6010B	CLP	Water	Aluminum	92-110	71-128	20
6010B	CLP	Water	Antimony	93-112	82-120	20
6010B	CLP	Water	Arsenic	93-114	83-116	20
6010B	CLP	Water	Barium	78-128	87-115	20
6010B	CLP	Water	Beryllium	89-112	81-115	20
6010B	CLP	Water	Boron	91-117	78-128	20
6010B	CLP	Water	Cadmium	92-112	73-125	20
6010B	CLP	Water	Calcium	94-111	75-125	20
6010B	CLP	Water	Chromium	94-113	79-123	20
6010B	CLP	Water	Cobalt	93-113	86-115	20
6010B	CLP	Water	Copper	92-112	83-116	20
6010B	CLP	Water	Iron	92-112	47-155	20
6010B	CLP	Water	Lead	92-112	79-120	20
6010B	CLP	Water	Magnesium	77-124	75-125	20

METALS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
6010B	CLP	Water	Manganese	93-111	62-140	20
6010B	CLP	Water	Molybdenum	91-111	72-128	20
6010B	CLP	Water	Nickel	92-115	84-119	20
6010B	CLP	Water	Potassium	86-119	75-125	20
6010B	CLP	Water	Selenium	81-122	83-116	20
6010B	CLP	Water	Silver	78-124	77-121	20
6010B	CLP	Water	Sodium	91-117	75-125	20
6010B	CLP	Water	Thallium	75-133	71-128	20
6010B	CLP	Water	Tin	85-115	75-125	20
6010B	CLP	Water	Vanadium	93-113	88-112	20
6010B	CLP	Water	Zinc	93-111	84-115	20
6010B	3050B	Tissue	Chromium	Ref.	70-130	30
6020	3050B	Soil/Sed.	Aluminum	Ref.	70-130	30
6020	3050B	Soil/Sed.	Antimony	Ref.	20-108	30
6020	3050B	Soil/Sed.	Arsenic	Ref.	74-120	30
6020	3050B	Soil/Sed.	Barium	Ref.	79-117	30
6020	3050B	Soil/Sed.	Beryllium	Ref.	78-121	30
6020	3050B	Soil/Sed.	Boron	Ref.	70-130	30
6020	3050B	Soil/Sed.	Cadmium	Ref.	63-136	30
6020	3050B	Soil/Sed.	Chromium	Ref.	53-147	30
6020	3050B	Soil/Sed.	Cobalt	Ref.	77-119	30
6020	3050B	Soil/Sed.	Copper	Ref.	52-153	30
6020	3050B	Soil/Sed.	Lead	Ref.	66-134	30
6020	3050B	Soil/Sed.	Manganese	Ref.	47-169	30
6020	3050B	Soil/Sed.	Molybdenum	Ref.	56-128	30
6020	3050B	Soil/Sed.	Nickel	Ref.	77-128	30
6020	3050B	Soil/Sed.	Selenium	Ref.	74-119	30
6020	3050B	Soil/Sed.	Silver	Ref.	83-107	30
6020	3050B	Soil/Sed.	Thallium	Ref.	79-117	30
6020	3050B	Soil/Sed.	Uranium	Ref.	70-130	30
6020	3050B	Soil/Sed.	Vanadium	Ref.	70-130	30
6020	3050B	Soil/Sed.	Zinc	Ref.	57-156	30
6020	CLP/3020A	Water	Aluminum	66-153	34-161	20
6020	CLP/3020A	Water	Antimony	89-110	81-116	20
6020	CLP/3020A	Water	Arsenic	88-112	73-125	20
6020	CLP/3020A	Water	Barium	88-110	69-131	20
6020	CLP/3020A	Water	Beryllium	83-117	70-120	20
6020	CLP/3020A	Water	Cadmium	91-110	81-113	20
6020	CLP/3020A	Water	Chromium	88-112	72-120	20
6020	CLP/3020A	Water	Cobalt	92-108	63-128	20
6020	CLP/3020A	Water	Copper	89-112	70-116	20
6020	CLP/3020A	Water	Lead	90-110	60-127	20
6020	CLP/3020A	Water	Manganese	87-113	52-152	20
6020	CLP/3020A	Water	Molybdenum	84-115	71-134	20
6020	CLP/3020A	Water	Nickel	88-111	70-118	20
6020	CLP/3020A	Water	Selenium	90-114	67-127	20
6020	CLP/3020A	Water	Silver	85-112	64-122	20
6020	CLP/3020A	Water	Thallium	88-112	72-117	20
6020	CLP/3020A	Water	Vanadium	89-109	85-116	20
6020	CLP/3020A	Water	Zinc	88-115	64-120	20

METALS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
7060A	3050B	Soil	Arsenic	Ref.	41-133	30
7421	3050B	Soil	Lead	Ref.	41-139	30
7471A	Method	Soil	Mercury	Ref.	60-128	30
7740	3050B	Soil	Selenium	Ref.	36-134	30
7742/*SM* 3114B	3050B	Soil	Selenium	Ref.	62-123	30
7841	3050B	Soil	Thallium	Ref.	38-134	30
7060A	CLP/3020A	Water	Arsenic	76-114	62-116	20
7421	CLP/3020A	Water	Lead	77-115	61-133	20
7470A	Method	Water	Mercury	82-114	73-121	20
7740	CLP/3020A	Water	Selenium	79-111	37-119	20
7742/*SM* 3114B	3010A	Water	Selenium	73-120	67-122	20
7841	CLP/3020A	Water	Thallium	82-115	34-132	20
7471A	Method	Tissue	Mercury	Ref.	60-130	30
7740	3050B	Tissue	Selenium	Ref.	60-130	30

VOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
524.2	Method	Water	Dichlorodifluoromethane (CFC 12)	70-130	NA	
524.2	Method	Water	Chloromethane	70-130	NA	
524.2	Method	Water	Vinyl Chloride	70-130	NA	
524.2	Method	Water	Bromomethane	70-130	NA	
524.2	Method	Water	Chloroethane	70-130	NA	
524.2	Method	Water	Trichlorofluoromethane (CFC 11)	70-130	NA	NA
524.2	Method	Water	1,1-Dichloroethene	70-130	NA	NA
524.2	Method	Water	Methylene Chloride	70-130	NA	NA
524.2	Method	Water	trans-1,2-Dichloroethene	70-130	NA	NA
524.2	Method	Water	2,2-Dichloropropane	70-130	NA	NA
524.2	Method	Water	cis-1,2-Dichloroethene	70-130	NA	NA
524.2	Method	Water	1,1-Dichloroethane	70-130	NA	NA
524.2	Method	Water	Chloroform	70-130	NA	NA
524.2	Method	Water	Bromochloromethane	70-130	NA	NA
524.2	Method	Water	1,1,1-Trichloroethane (TCA)	70-130	NA	NA
524.2	Method	Water	1,1-Dichloropropene	70-130	NA	NA
524.2	Method	Water	Carbon Tetrachloride	70-130	NA	NA
524.2	Method	Water	Benzene	70-130	NA	NA
524.2	Method	Water	1,2-Dichloroethane	70-130	NA	NA
524.2	Method	Water	Trichloroethene (TCE)	70-130	NA	NA
524.2	Method	Water	1,2-Dichloropropane	70-130	NA	NA
524.2	Method	Water	Bromodichloromethane	70-130	NA	NA
524.2	Method	Water	Dibromomethane	70-130	NA	NA
524.2	Method	Water	cis-1,3-Dichloropropene	70-130	NA	NA
524.2	Method	Water	Toluene	70-130	NA	NA
524.2	Method	Water	trans-1,3-Dichloropropene	70-130	NA	NA
524.2	Method	Water	1,1,2-Trichloroethane	70-130	NA	NA
524.2	Method	Water	Tetrachloroethene (PCE)	70-130	NA	NA
524.2	Method	Water	1,3-Dichloropropane	70-130	NA	NA
524.2	Method	Water	1,2,3-Trichlorobenzene	70-130	NA	NA
524.2	Method	Water	Dibromochloromethane	70-130	NA	NA
524.2	Method	Water	1,2-Dibromoethane (EDB)	70-130	NA	NA
524.2	Method	Water	Chlorobenzene	70-130	NA	NA
524.2	Method	Water	Ethylbenzene	70-130	NA	NA
524.2	Method	Water	1,1,1,2-Tetrachloroethane	70-130	NA	NA
524.2	Method	Water	Styrene	70-130	NA	NA
524.2	Method	Water	Total Xylenes	70-130	NA	NA
524.2	Method	Water	Bromoform	70-130	NA	NA
524.2	Method	Water	Isopropylbenzene	70-130	NA	NA
524.2	Method	Water	1,1,2,2-Tetrachloroethane	70-130	NA	NA
524.2	Method	Water	1,2,3-Trichloropropane	70-130	NA	NA
524.2	Method	Water	Bromobenzene	70-130	NA	NA
524.2	Method	Water	n-Propylbenzene	70-130	NA	NA
524.2	Method	Water	1,3,5-Trimethylbenzene	70-130	NA	NA
524.2	Method	Water	2-Chlorotoluene	70-130	NA	NA
524.2	Method	Water	4-Chlorotoluene	70-130	NA	NA
524.2	Method	Water	tert-Butylbenzene	70-130	NA	NA
524.2	Method	Water	1,2,4-Trimethylbenzene	70-130	NA	NA
524.2	Method	Water	sec-Butylbenzene	70-130	NA	NA
524.2	Method	Water	4-Isopropyltoluene	70-130	NA	NA
524.2	Method	Water	1,3-Dichlorobenzene	70-130	NA	NA
524.2	Method	Water	1,4-Dichlorobenzene	70-130	NA	NA

VOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
524.2	Method	Water	n-Butylbenzene	70-130	NA	NA
524.2	Method	Water	1,2-Dichlorobenzene	70-130	NA	NA
524.2	Method	Water	1,2-Dibromo-3-chloropropane (DBCP)	70-130	NA	NA
524.2	Method	Water	1,2,4-Trichlorobenzene	70-130	NA	NA
524.2	Method	Water	Hexachlorobutadiene	70-130	NA	NA
524.2	Method	Water	Naphthalene	70-130	NA	NA
524.2	Method	Water	4-Bromofluorobenzene (Surr.) 82-110	NA	NA	NA
524.2	Method	Water	Dibromofluoromethane (Surr.) 83-121	NA	NA	NA
524.2	Method	Water	Toluene-D8 (Surr.) 89-117	NA	NA	NA
602	Method	Water	Benzene	39-150	39-150	30
602	Method	Water	Toluene	46-148	46-148	30
602	Method	Water	Ethylbenzene	32-160	32-160	30
602	Method	Water	Xylenes	32-160	32-160	30
602	Method	Water	1,4-Difluorobenzene (Surr.) 82-120	NA	NA	NA
624	Method	Water	1,1,1-Trichloroethane (TCA)	78-122	79-129	30
624	Method	Water	1,1,2,2-Tetrachloroethane	70-114	65-124	30
624	Method	Water	1,1,2-Trichloroethane	73-114	66-120	30
624	Method	Water	1,1-Dichloroethane	70-131	71-136	30
624	Method	Water	1,1-Dichloroethene	71-140	62-156	30
624	Method	Water	1,2-Dichlorobenzene	64-125	68-122	30
624	Method	Water	1,2-Dichloroethane (EDC)	63-138	59-141	30
624	Method	Water	1,2-Dichloropropane	71-119	68-128	30
624	Method	Water	1,3-Dichlorobenzene	72-118	69-125	30
624	Method	Water	1,4-Dichlorobenzene	74-115	71-122	30
624	Method	Water	2-Chloroethyl Vinyl Ether	24-130	10-129	30
624	Method	Water	Acrolein	25-166	10-156	30
624	Method	Water	Acrylonitrile	50-150	46-152	30
624	Method	Water	Benzene	79-119	79-124	30
624	Method	Water	Bromodichloromethane	71-133	78-129	30
624	Method	Water	Bromoform	53-145	52-147	30
624	Method	Water	Bromomethane	10-187	10-167	30
624	Method	Water	Carbon Disulfide	66-133	56-156	30
624	Method	Water	Carbon Tetrachloride	72-138	74-145	30
624	Method	Water	Chlorobenzene	74-117	73-124	30
624	Method	Water	Chloroethane	55-153	51-165	30
624	Method	Water	Chloroform	63-129	46-136	30
624	Method	Water	Chloromethane	49-140	46-151	30
624	Method	Water	cis-1,2-Dichloroethene	70-125	70-128	30
624	Method	Water	cis-1,3-Dichloropropene	67-122	43-131	30
624	Method	Water	Dibromochloromethane	50-140	55-137	30
624	Method	Water	Dichlorodifluoromethane	41-147	59-135	30
624	Method	Water	Ethylbenzene	68-126	69-132	30
624	Method	Water	m,p-Xylenes	74-124	74-129	30
624	Method	Water	Methylene Chloride	69-123	63-127	30
624	Method	Water	o-Xylene	61-126	64-128	30
624	Method	Water	Styrene	55-133	65-125	30
624	Method	Water	Tetrachloroethene (PCE)	65-129	66-138	30
624	Method	Water	Toluene	74-123	74-128	30
624	Method	Water	trans-1,2-Dichloroethene	75-120	76-128	30
624	Method	Water	trans-1,3-Dichloropropene	47-124	40-125	30
624	Method	Water	Trichloroethene (TCE)	74-119	43-164	30
624	Method	Water	Trichlorofluoromethane	55-131	58-136	30
624	Method	Water	Trichlorotrifluoroethane	42-185	37-196	30
624	Method	Water	Vinyl Acetate	41-163	70-130	30

VOLATILE ORGANICS ANALYSES							
Method	**Prep Method**	**Matrix**	**Analyte**		**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
624	Method	Water	Vinyl Chloride		54-134	54-146	30
624	Method	Water	Dibromofluoromethane (Surr.)	75-142	NA	NA	NA
624	Method	Water	Toluene-D8 (Surr.)	72-142	NA	NA	NA
624	Method	Water	4-Bromofluorobenzene (Surr.)	72-125	NA	NA	NA
8021BTEX	5035/5030B	Soil-mid	Benzene		75-121	53-135	40
8021BTEX	5035/5030B	Soil-mid	Toluene		77-118	52-134	40
8021BTEX	5035/5030B	Soil-mid	Ethylbenzene		78-118	44-145	40
8021BTEX	5035/5030B	Soil-mid	m,p-Xylenes		80-118	44-147	40
8021BTEX	5035/5030B	Soil-mid	o-Xylene		78-117	39-147	40
8021BTEX	5035/5030B	Soil-mid	4-Bromofluorobenzene (Surr.)	43-142	NA	NA	
8021BTEX	5030B	Water	Benzene		84-116	84-123	30
8021BTEX	5030B	Water	Toluene		84-116	46-160	30
8021BTEX	5030B	Water	Ethylbenzene		83-119	63-145	30
8021BTEX	5030B	Water	m,p-Xylenes		84-120	73-132	30
8021BTEX	5030B	Water	o-Xylene		82-118	69-138	30
8021BTEX	5030B	Water	1,4-Difluorobenzene (Surr.)	87-126	NA	NA	30
8260B	5030A/5035	Soil-low	1,1,1,2-Tetrachloroethane		65-129	10-136	40
8260B	5030A/5035	Soil-low	1,1,1-Trichloroethane (TCA)		63-140	13-145	40
8260B	5030A/5035	Soil-low	1,1,2,2-Tetrachloroethane		56-136	10-138	40
8260B	5030A/5035	Soil-low	1,1,2-Trichloroethane		62-138	10-140	40
8260B	5030A/5035	Soil-low	1,1-Dichloroethane		64-132	17-140	40
8260B	5030A/5035	Soil-low	1,1-Dichloroethene		64-142	22-142	40
8260B	5030A/5035	Soil-low	1,1-Dichloropropene		63-129	10-123	40
8260B	5030A/5035	Soil-low	1,2,3-Trichlorobenzene		67-132	10-127	40
8260B	5030A/5035	Soil-low	1,2,3-Trichloropropane		57-135	10-142	40
8260B	5030A/5035	Soil-low	1,2,4-Trichlorobenzene		65-136	10-124	40
8260B	5030A/5035	Soil-low	1,2,4-Trimethylbenzene		61-128	10-140	40
8260B	5030A/5035	Soil-low	1,2-Dibromo-3-chloropropane		62-128	10-126	40
8260B	5030A/5035	Soil-low	1,2-Dibromoethane (EDB)		65-131	10-134	40
8260B	5030A/5035	Soil-low	1,2-Dichlorobenzene		67-121	10-128	40
8260B	5030A/5035	Soil-low	1,2-Dichloroethane (EDC)		67-134	18-138	40
8260B	5030A/5035	Soil-low	1,2-Dichloropropane		68-130	17-135	40
8260B	5030A/5035	Soil-low	1,3,5-Trimethylbenzene		62-129	10-139	40
8260B	5030A/5035	Soil-low	1,3-Dichlorobenzene		66-127	10-128	40
8260B	5030A/5035	Soil-low	1,3-Dichloropropane		61-136	10-139	40
8260B	5030A/5035	Soil-low	1,4-Dichlorobenzene		67-126	10-131	40
8260B	5030A/5035	Soil-low	1,4-Dioxane		10-81	70-130	40
8260B	5030A/5035	Soil-low	1-Chlorohexane		50-158	10-119	40
8260B	5030A/5035	Soil-low	2,2-Dichloropropane		65-138	11-135	40
8260B	5030A/5035	Soil-low	2-Butanone (MEK)		61-145	21-126	40
8260B	5030A/5035	Soil-low	2-Chloroethyl Vinyl Ether		43-145	10-147	40
8260B	5030A/5035	Soil-low	2-Chlorotoluene		60-129	10-137	40
8260B	5030A/5035	Soil-low	2-Hexanone		49-149	10-143	40
8260B	5030A/5035	Soil-low	2-Nitropropane		10-196	70-130	40
8260B	5030A/5035	Soil-low	3-Chloro-1-propene		29-142	70-130	40
8260B	5030A/5035	Soil-low	4-Chlorotoluene		60-127	10-134	40
8260B	5030A/5035	Soil-low	4-Isopropyltoluene		59-125	10-135	40
8260B	5030A/5035	Soil-low	4-Methyl-2-pentanone (MIBK)		58-144	12-138	40
8260B	5030A/5035	Soil-low	Acetone		54-128	16-116	40
8260B	5030A/5035	Soil-low	Acetonitrile		45-121	70-130	40
8260B	5030A/5035	Soil-low	Acrolein		10-211	10-138	40
8260B	5030A/5035	Soil-low	Acrylonitrile		36-204	10-144	40
8260B	5030A/5035	Soil-low	Benzene		68-127	16-134	40
8260B	5030A/5035	Soil-low	Bromobenzene		66-127	10-129	40

VOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8260B	5030A/5035	Soil-low	Bromochloromethane	70-131	18-135	40
8260B	5030A/5035	Soil-low	Bromodichloromethane	72-137	10-151	40
8260B	5030A/5035	Soil-low	Bromoethane	70-130	70-130	40
8260B	5030A/5035	Soil-low	Bromoform	67-136	10-139	40
8260B	5030A/5035	Soil-low	Bromomethane	37-181	10-159	40
8260B	5030A/5035	Soil-low	Carbon Disulfide	58-141	10-142	40
8260B	5030A/5035	Soil-low	Carbon Tetrachloride	63-140	10-144	40
8260B	5030A/5035	Soil-low	Chlorobenzene	66-126	10-133	40
8260B	5030A/5035	Soil-low	Chloroethane	59-132	29-131	40
8260B	5030A/5035	Soil-low	Chloroform	65-129	18-136	40
8260B	5030A/5035	Soil-low	Chloromethane	49-141	21-136	40
8260B	5030A/5035	Soil-low	Chloroprene	28-140	70-130	40
8260B	5030A/5035	Soil-low	cis-1,2-Dichloroethene	68-127	21-132	40
8260B	5030A/5035	Soil-low	cis-1,3-Dichloropropene	71-132	10-133	40
8260B	5030A/5035	Soil-low	cis-1,4-Dichloro-2-butene	15-158	52-78	40
8260B	5030A/5035	Soil-low	Cyclohexane	56-154	15-173	40
8260B	5030A/5035	Soil-low	Dibromochloromethane	65-135	10-142	40
8260B	5030A/5035	Soil-low	Dibromomethane	69-126	12-133	40
8260B	5030A/5035	Soil-low	Dichlorodifluoromethane	32-164	10-155	40
8260B	5030A/5035	Soil-low	Diisopropyl Ether	41-146	24-113	40
8260B	5030A/5035	Soil-low	Ethyl Acetate	26-151	70-130	40
8260B	5030A/5035	Soil-low	Ethyl Acrylate	50-135	70-130	40
8260B	5030A/5035	Soil-low	Ethyl Methacrylate	26-144	70-130	40
8260B	5030A/5035	Soil-low	Ethylbenzene	68-129	10-134	40
8260B	5030A/5035	Soil-low	Ethylene Oxide	70-130	70-130	40
8260B	5030A/5035	Soil-low	Hexachlorobutadiene	62-137	10-115	40
8260B	5030A/5035	Soil-low	Iodomethane	15-197	17-134	40
8260B	5030A/5035	Soil-low	Isobutanol	41-136	70-130	40
8260B	5030A/5035	Soil-low	Isopropylbenzene	58-115	10-121	40
8260B	5030A/5035	Soil-low	m,p-Xylenes	70-124	10-137	40
8260B	5030A/5035	Soil-low	Methacrylonitrile	28-137	70-130	40
8260B	5030A/5035	Soil-low	Methyl Acetate	10-177	10-205	40
8260B	5030A/5035	Soil-low	Methyl Methacrylate	16-151	70-130	40
8260B	5030A/5035	Soil-low	Methyl tert-Butyl Ether	69-137	33-135	40
8260B	5030A/5035	Soil-low	Methylcyclohexane	63-146	10-159	40
8260B	5030A/5035	Soil-low	Methylene Chloride	51-133	15-127	40
8260B	5030A/5035	Soil-low	n-Butylbenzene	59-132	10-142	40
8260B	5030A/5035	Soil-low	n-Hexane	70-130	70-130	40
8260B	5030A/5035	Soil-low	n-Propylbenzene	58-132	10-140	40
8260B	5030A/5035	Soil-low	Naphthalene	62-130	10-138	40
8260B	5030A/5035	Soil-low	o-Xylene	68-124	10-141	40
8260B	5030A/5035	Soil-low	Propionitrile	10-145	70-130	40
8260B	5030A/5035	Soil-low	Propylene Oxide	70-130	70-130	40
8260B	5030A/5035	Soil-low	sec-Butylbenzene	63-135	10-137	40
8260B	5030A/5035	Soil-low	Styrene	68-125	10-139	40
8260B	5030A/5035	Soil-low	tert-Amyl Methyl Ether	34-164	70-130	40
8260B	5030A/5035	Soil-low	tert-Butyl Alcohol	16-173	70-130	40
8260B	5030A/5035	Soil-low	tert-Butyl Ethyl Ether	45-147	70-130	40
8260B	5030A/5035	Soil-low	tert-Butylbenzene	60-128	10-133	40
8260B	5030A/5035	Soil-low	Tetrachloroethene (PCE)	62-135	10-138	40
8260B	5030A/5035	Soil-low	Toluene	66-126	14-129	40
8260B	5030A/5035	Soil-low	trans-1,2-Dichloroethene	63-129	18-129	40
8260B	5030A/5035	Soil-low	trans-1,3-Dichloropropene	56-133	10-128	40
8260B	5030A/5035	Soil-low	trans-1,4-Dichloro-2-butene	10-248	10-166	40

VOLATILE ORGANICS ANALYSES							
Method	**Prep Method**	**Matrix**	**Analyte**		**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8260B	5030A/5035	Soil-low	Trichloroethene (TCE)		69-131	10-138	40
8260B	5030A/5035	Soil-low	Trichlorofluoromethane		48-140	10-142	40
8260B	5030A/5035	Soil-low	Trichlorotrifluoroethane		64-151	10-159	40
8260B	5030A/5035	Soil-low	Vinyl Acetate		10-201	10-132	40
8260B	5030A/5035	Soil-low	Vinyl Chloride		56-136	27-132	40
8260B	5030A/5035	Soil-low	1,2-Dichloroethane-D4 (Surr.)	71-138	NA	NA	NA
8260B	5030A/5035	Soil-low	4-Bromofluorobenzene (Surr.)	76-133	NA	NA	NA
8260B	5030A/5035	Soil-low	Dibromofluoromethane (Surr.)	77-132	NA	NA	NA
8260B	5030A/5035	Soil-low	Toluene-D8 (Surr.)	75-137	NA	NA	NA
8260B	5035/5030B	Soil-mid	1,1,1,2-Tetrachloroethane		45-149	55-136	40
8260B	5035/5030B	Soil-mid	1,1,1-Trichloroethane (TCA)		48-151	65-127	40
8260B	5035/5030B	Soil-mid	1,1,2,2-Tetrachloroethane		54-138	49-143	40
8260B	5035/5030B	Soil-mid	1,1,2-Trichloroethane		54-138	58-131	40
8260B	5035/5030B	Soil-mid	1,1-Dichloroethane		55-142	74-121	40
8260B	5035/5030B	Soil-mid	1,1-Dichloroethene		58-143	75-125	40
8260B	5035/5030B	Soil-mid	1,1-Dichloropropene		53-131	62-119	40
8260B	5035/5030B	Soil-mid	1,2,3-Trichlorobenzene		48-140	42-138	40
8260B	5035/5030B	Soil-mid	1,2,3-Trichloropropane		56-141	63-137	40
8260B	5035/5030B	Soil-mid	1,2,4-Trichlorobenzene		46-140	50-132	40
8260B	5035/5030B	Soil-mid	1,2,4-Trimethylbenzene		57-143	67-136	40
8260B	5035/5030B	Soil-mid	1,2-Dibromo-3-chloropropane		34-145	55-136	40
8260B	5035/5030B	Soil-mid	1,2-Dibromoethane (EDB)		51-134	62-118	40
8260B	5035/5030B	Soil-mid	1,2-Dichlorobenzene		56-132	64-118	40
8260B	5035/5030B	Soil-mid	1,2-Dichloroethane (EDC)		58-142	55-140	40
8260B	5035/5030B	Soil-mid	1,2-Dichloropropane		53-144	69-127	40
8260B	5035/5030B	Soil-mid	1,3,5-Trichlorobenzene		54-131	70-130	40
8260B	5035/5030B	Soil-mid	1,3,5-Trimethylbenzene		66-134	54-148	40
8260B	5035/5030B	Soil-mid	1,3-Dichlorobenzene		58-133	64-121	40
8260B	5035/5030B	Soil-mid	1,3-Dichloropropane		54-138	66-120	40
8260B	5035/5030B	Soil-mid	1,4-Dichlorobenzene		56-133	65-120	40
8260B	5035/5030B	Soil-mid	1,4-Dioxane		33-169	70-130	40
8260B	5035/5030B	Soil-mid	1-Chlorohexane		64-132	70-130	40
8260B	5035/5030B	Soil-mid	2,2-Dichloropropane		26-157	47-132	40
8260B	5035/5030B	Soil-mid	2-Butanone (MEK)		58-137	62-138	40
8260B	5035/5030B	Soil-mid	2-Chloroethyl Vinyl Ether		10-174	70-130	40
8260B	5035/5030B	Soil-mid	2-Chlorotoluene		77-121	55-146	40
8260B	5035/5030B	Soil-mid	2-Hexanone		41-142	33-148	40
8260B	5035/5030B	Soil-mid	2-Nitropropane		10-156	70-130	40
8260B	5035/5030B	Soil-mid	3-Chloro-1-propene		33-97	70-130	40
8260B	5035/5030B	Soil-mid	4-Chlorotoluene		57-142	59-141	40
8260B	5035/5030B	Soil-mid	4-Isopropyltoluene		53-135	33-155	40
8260B	5035/5030B	Soil-mid	4-Methyl-2-pentanone (MIBK)		66-124	55-134	40
8260B	5035/5030B	Soil-mid	Acetone		47-147	51-139	40
8260B	5035/5030B	Soil-mid	Acetonitrile		70-130	70-130	40
8260B	5035/5030B	Soil-mid	Acrolein		70-130	70-130	40
8260B	5035/5030B	Soil-mid	Acrylonitrile		10-142	70-130	40
8260B	5035/5030B	Soil-mid	Benzene		57-138	79-114	40
8260B	5035/5030B	Soil-mid	Bromobenzene		57-139	70-124	40
8260B	5035/5030B	Soil-mid	Bromochloromethane		59-138	78-117	40
8260B	5035/5030B	Soil-mid	Bromodichloromethane		57-145	67-128	40
8260B	5035/5030B	Soil-mid	Bromoform		42-157	49-138	40
8260B	5035/5030B	Soil-mid	Bromomethane		10-225	10-184	40
8260B	5035/5030B	Soil-mid	Carbon Disulfide		47-137	55-125	40
8260B	5035/5030B	Soil-mid	Carbon Tetrachloride		35-167	46-146	40

VOLATILE ORGANICS ANALYSES							
Method	**Prep Method**	**Matrix**	**Analyte**		**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8260B	5035/5030B	Soil-mid	Chlorobenzene		57-134	71-113	40
8260B	5035/5030B	Soil-mid	Chloroethane		18-155	59-127	40
8260B	5035/5030B	Soil-mid	Chloroform		55-132	61-123	40
8260B	5035/5030B	Soil-mid	Chloromethane		35-139	60-122	40
8260B	5035/5030B	Soil-mid	Chloroprene		47-88	70-130	40
8260B	5035/5030B	Soil-mid	cis-1,2-Dichloroethene		58-135	77-112	40
8260B	5035/5030B	Soil-mid	cis-1,3-Dichloropropene		55-141	69-125	40
8260B	5035/5030B	Soil-mid	cis-1,4-Dichloro-2-butene		30-150	70-130	40
8260B	5035/5030B	Soil-mid	Cyclohexane		70-130	70-130	40
8260B	5035/5030B	Soil-mid	Dibromochloromethane		47-147	55-127	40
8260B	5035/5030B	Soil-mid	Dibromomethane		60-133	74-116	40
8260B	5035/5030B	Soil-mid	Dichlorodifluoromethane		13-150	57-133	40
8260B	5035/5030B	Soil-mid	Diisopropyl Ether		70-130	70-130	40
8260B	5035/5030B	Soil-mid	Ethyl Acetate		43-76	70-130	40
8260B	5035/5030B	Soil-mid	Ethyl Ether		51-125	70-130	40
8260B	5035/5030B	Soil-mid	Ethyl Methacrylate		27-80	70-130	40
8260B	5035/5030B	Soil-mid	Ethylbenzene		57-143	58-135	40
8260B	5035/5030B	Soil-mid	Ethylene Oxide		70-130	70-130	40
8260B	5035/5030B	Soil-mid	Hexachlorobutadiene		53-143	35-162	40
8260B	5035/5030B	Soil-mid	Iodomethane		10-204	70-130	40
8260B	5035/5030B	Soil-mid	Isobutanol		47-165	70-130	40
8260B	5035/5030B	Soil-mid	Isopropylbenzene		51-129	51-125	40
8260B	5035/5030B	Soil-mid	m,p-Xylenes		57-143	63-129	40
8260B	5035/5030B	Soil-mid	Methacrylonitrile		44-87	70-130	40
8260B	5035/5030B	Soil-mid	Methyl Acetate		70-130	70-130	40
8260B	5035/5030B	Soil-mid	Methyl Methacrylate		28-97	70-130	40
8260B	5035/5030B	Soil-mid	Methyl tert-Butyl Ether		40-146	41-153	40
8260B	5035/5030B	Soil-mid	Methylcyclohexane		70-130	70-130	40
8260B	5035/5030B	Soil-mid	Methylene Chloride		56-138	76-116	40
8260B	5035/5030B	Soil-mid	n-Butylbenzene		48-142	37-169	40
8260B	5035/5030B	Soil-mid	n-Hexane		71-121	70-130	40
8260B	5035/5030B	Soil-mid	n-Propylbenzene		56-142	58-145	40
8260B	5035/5030B	Soil-mid	Naphthalene		46-161	10-211	40
8260B	5035/5030B	Soil-mid	o-Xylene		57-141	66-127	40
8260B	5035/5030B	Soil-mid	Propionitrile		39-89	70-130	40
8260B	5035/5030B	Soil-mid	sec-Butylbenzene		65-137	56-157	40
8260B	5035/5030B	Soil-mid	Styrene		55-139	63-123	40
8260B	5035/5030B	Soil-mid	tert-Amyl Methyl Ether		70-130	70-130	40
8260B	5035/5030B	Soil-mid	tert-Butyl Alcohol		70-130	70-130	40
8260B	5035/5030B	Soil-mid	tert-Butyl Ethyl Ether		70-130	70-130	40
8260B	5035/5030B	Soil-mid	tert-Butylbenzene		55-140	45-153	40
8260B	5035/5030B	Soil-mid	Tetrachloroethene (PCE)		53-132	56-120	40
8260B	5035/5030B	Soil-mid	Toluene		58-141	60-138	40
8260B	5035/5030B	Soil-mid	trans-1,2-Dichloroethene		57-135	69-121	40
8260B	5035/5030B	Soil-mid	trans-1,3-Dichloropropene		34-144	45-131	40
8260B	5035/5030B	Soil-mid	trans-1,4-Dichloro-2-butene		66-152	59-179	40
8260B	5035/5030B	Soil-mid	Trichloroethene (TCE)		65-133	73-126	40
8260B	5035/5030B	Soil-mid	Trichlorofluoromethane		38-137	53-126	40
8260B	5035/5030B	Soil-mid	Trichlorotrifluoroethane		54-140	56-122	40
8260B	5035/5030B	Soil-mid	Vinyl Acetate		10-148	70-130	40
8260B	5035/5030B	Soil-mid	Vinyl Chloride		42-145	69-127	40
8260B	5035/5030B	Soil-mid	1,2-Dichloroethane-D4[g]	54-132	NA	NA	NA
8260B	5035/5030B	Soil-mid	4-Bromofluorobenzene[g]	58-128	NA	NA	NA
8260B	5035/5030B	Soil-mid	Dibromofluoromethane[g]	58-121	NA	NA	NA

VOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**		**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8260B	5035/5030B	Soil-mid	Toluene-D8[g]	63-132	NA	NA	NA
8260B	5030B	Water	1,1,1,2-Tetrachloroethane		70-128	69-132	30
8260B	5030B	Water	1,1,1-Trichloroethane (TCA)		68-133	71-143	30
8260B	5030B	Water	1,1,2,2-Tetrachloroethane		64-128	70-126	30
8260B	5030B	Water	1,1,2-Trichloroethane		76-118	73-122	30
8260B	5030B	Water	1,1-Dichloroethane		66-126	63-134	30
8260B	5030B	Water	1,1-Dichloroethene		74-128	75-139	30
8260B	5030B	Water	1,1-Dichloropropene		68-115	68-124	30
8260B	5030B	Water	1,2,3-Trichlorobenzene		59-127	60-123	30
8260B	5030B	Water	1,2,3-Trichloropropane		70-123	67-127	30
8260B	5030B	Water	1,2,4-Trichlorobenzene		59-128	58-127	30
8260B	5030B	Water	1,2,4-Trimethylbenzene		68-124	69-128	30
8260B	5030B	Water	1,2-Dibromo-3-chloropropane		58-127	55-130	30
8260B	5030B	Water	1,2-Dibromoethane (EDB)		73-116	70-118	30
8260B	5030B	Water	1,2-Dichlorobenzene		73-110	72-113	30
8260B	5030B	Water	1,2-Dichloroethane (EDC)		70-129	70-133	30
8260B	5030B	Water	1,2-Dichloropropane		68-122	67-127	30
8260B	5030B	Water	1,3,5-Trichlorobenzene		47-137	67-129	30
8260B	5030B	Water	1,3,5-Trimethylbenzene		70-123	71-128	30
8260B	5030B	Water	1,3-Dichlorobenzene		73-113	70-119	30
8260B	5030B	Water	1,3-Dichloropropane		74-117	73-118	30
8260B	5030B	Water	1,4-Dichlorobenzene		72-115	73-115	30
8260B	5030B	Water	1,4-Dioxane		14-205	60-136	30
8260B	5030B	Water	1-Chlorohexane		66-126	70-142	30
8260B	5030B	Water	2,2-Dichloropropane		49-145	51-149	30
8260B	5030B	Water	2-Butanone (MEK)		60-143	54-142	30
8260B	5030B	Water	2-Chloroethyl Vinyl Ether		10-180	10-146	30
8260B	5030B	Water	2-Chlorotoluene		70-123	73-126	30
8260B	5030B	Water	2-Hexanone		58-129	50-133	30
8260B	5030B	Water	2-Nitropropane		11-187	79-171	30
8260B	5030B	Water	3-Chloro-1-propene		47-154	79-151	30
8260B	5030B	Water	4-Chlorotoluene		71-119	72-122	30
8260B	5030B	Water	4-Isopropyltoluene		62-118	62-123	30
8260B	5030B	Water	4-Methyl-2-pentanone (MIBK)		62-131	56-137	30
8260B	5030B	Water	Acetone		65-136	58-136	30
8260B	5030B	Water	Acetonitrile		54-156	58-135	30
8260B	5030B	Water	Acrolein		16-178	10-186	30
8260B	5030B	Water	Acrylonitrile		49-146	66-133	30
8260B	5030B	Water	Benzene		70-121	71-126	30
8260B	5030B	Water	Bromobenzene		74-116	73-119	30
8260B	5030B	Water	Bromochloromethane		74-122	73-126	30
8260B	5030B	Water	Bromodichloromethane		77-129	76-136	30
8260B	5030B	Water	Bromoform		61-141	56-146	30
8260B	5030B	Water	Bromomethane		25-163	27-173	30
8260B	5030B	Water	Carbon Disulfide		59-130	58-142	30
8260B	5030B	Water	Carbon Tetrachloride		59-147	63-158	30
8260B	5030B	Water	Chlorobenzene		75-112	74-115	30
8260B	5030B	Water	Chloroethane		61-126	58-137	30
8260B	5030B	Water	Chloroform		70-121	69-126	30
8260B	5030B	Water	Chloromethane		39-134	39-145	30
8260B	5030B	Water	Chloroprene		44-165	78-162	30
8260B	5030B	Water	cis-1,2-Dichloroethene		74-119	69-129	30
8260B	5030B	Water	cis-1,3-Dichloropropene		70-129	69-130	30
8260B	5030B	Water	cis-1,4-Dichloro-2-butene		20-177	51-152	30

VOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8260B	5030B	Water	Dibromochloromethane	71-129	67-135	30
8260B	5030B	Water	Dibromomethane	74-118	73-121	30
8260B	5030B	Water	Dichlorodifluoromethane	40-149	44-158	30
8260B	5030B	Water	Dichlorofluoromethane (CFC 21)	69-136	70-130	30
8260B	5030B	Water	Diisopropyl Ether	64-135	48-148	30
8260B	5030B	Water	Ethyl Acetate	44-153	47-150	30
8260B	5030B	Water	Ethyl Ether	32-145	68-120	30
8260B	5030B	Water	Ethyl Methacrylate	36-144	61-138	30
8260B	5030B	Water	Ethylbenzene	75-118	74-124	30
8260B	5030B	Water	Hexachlorobutadiene	59-130	54-136	30
8260B	5030B	Water	Iodomethane	16-177	29-172	30
8260B	5030B	Water	Isobutanol	19-184	45-145	30
8260B	5030B	Water	Isopropylbenzene	65-106	63-113	30
8260B	5030B	Water	m,p-Xylenes	73-118	72-124	30
8260B	5030B	Water	Methacrylonitrile	43-150	70-130	30
8260B	5030B	Water	Methyl Methacrylate	41-144	75-125	30
8260B	5030B	Water	Methyl tert-Butyl Ether	57-134	58-143	30
8260B	5030B	Water	Methylene Chloride	62-122	60-125	30
8260B	5030B	Water	n-Butylbenzene	57-127	55-133	30
8260B	5030B	Water	n-Hexane	50-142	60-152	30
8260B	5030B	Water	n-Propylbenzene	69-121	71-126	30
8260B	5030B	Water	Naphthalene	48-150	49-152	30
8260B	5030B	Water	o-Xylene	73-116	73-120	30
8260B	5030B	Water	Propionitrile	37-159	65-132	30
8260B	5030B	Water	sec-Butylbenzene	68-126	68-133	30
8260B	5030B	Water	Styrene	71-119	63-128	30
8260B	5030B	Water	tert-Amyl Methyl Ether	55-137	60-136	30
8260B	5030B	Water	tert-Butyl Alcohol	18-163	23-161	30
8260B	5030B	Water	tert-Butyl Ethyl Ether	51-145	58-140	30
8260B	5030B	Water	tert-Butylbenzene	68-119	69-125	30
8260B	5030B	Water	Tetrachloroethene (PCE)	71-117	64-127	30
8260B	5030B	Water	Tetrahydrofuran	15-161	40-137	30
8260B	5030B	Water	Toluene	72-117	71-124	30
8260B	5030B	Water	trans-1,2-Dichloroethene	72-119	69-130	30
8260B	5030B	Water	trans-1,3-Dichloropropene	62-123	61-123	30
8260B	5030B	Water	trans-1,4-Dichloro-2-butene	19-177	49-167	30
8260B	5030B	Water	Trichloroethene (TCE)	73-121	61-134	30
8260B	5030B	Water	Trichlorofluoromethane	60-122	60-133	30
8260B	5030B	Water	Trichlorotrifluoroethane	67-135	65-146	30
8260B	5030B	Water	Vinyl Acetate	10-202	55-160	30
8260B	5030B	Water	Vinyl Chloride	60-125	53-141	30
8260B	5030B	Water	1,2-Dichloroethane-D4 (Surr.) 70-124	NA	NA	NA
8260B	5030B	Water	4-Bromofluorobenzene (Surr.) 73-116	NA	NA	NA
8260B	5030B	Water	Dibromofluoromethane (Surr.) 80-120	NA	NA	NA
8260B	5030B	Water	Toluene-D8 (Surr.) 80-122	NA	NA	NA
8015B	5035/5030B	Soil	Gasoline Range Petroleum Hydrocarbons	51-139	51-127	40
8015B	5035/5030B	Soil	4-Bromofluorobenzene (Surr.) 50-136	NA	NA	NA
8015B	5030B	Water	Gasoline Range Petroleum Hydrocarbons	70-130	41-147	30
8015B	5030B	Water	1,4-Difluorobenzene (Surr.) 81-122	NA	NA	NA
AK 101	Method	Soil	Gasoline Range Petroleum Hydrocarbons	60-120	41-157	40
AK 101	Method	Soil	4-Bromofluorobenzene (Surr.) 50-150	60-120	NA	NA
AK 101	Method	Water	Gasoline Range Petroleum Hydrocarbons	60-120	67-127	30
AK 101	Method	Water	1,4-Difluorobenzene (Surr.) 50-150	60-120	NA	NA
NWTPH-Gx	Method	Soil	Gasoline Range Petroleum Hydrocarbons	63-116	42-139	40

VOLATILE ORGANICS ANALYSES							
Method	**Prep Method**	**Matrix**	**Analyte**		**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
NWTPH-Gx	Method	Soil	4-Bromofluorobenzene (Surr.)	50-150	NA	NA	NA
NWTPH-Gx	Method	Water	Gasoline Range Petroleum Hydrocarbons		61-132	67-127	30
NWTPH-Gx	Method	Water	1,4-Difluorobenzene (Surr.)	50-150	NA	NA	NA

SEMIVOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
1664	9071A	Soil	Hexane Extractable Material	78-114	78-114	18
1664	Method	Water	Hexane Extractable Material	78-114	78-114	18
600/4-81-045	Method	Oil	Aroclor 1016	38-94	12-133	40
600/4-81-045	Method	Oil	Aroclor 1260	52-113	32-136	40
600/4-81-045	Method	Oil	Decachlorobiphenyl (Surr.) 49-127	NA	NA	NA
608	3520C	Water	4,4'-DDD	62-132	10-163	30
608	3520C	Water	4,4'-DDE	54-138	10-154	30
608	3520C	Water	4,4'-DDT	72-121	10-160	30
608	3520C	Water	Aldrin	57-109	10-127	30
608	3520C	Water	alpha-BHC	68-114	35-121	30
608	3520C	Water	alpha-Chlordane	63-119	70-130	30
608	3520C	Water	Aroclor 1016	24-134	70-130	30
608	3520C	Water	Aroclor 1260	27-136	70-130	30
608	3520C	Water	beta-BHC	53-154	18-137	30
608	3520C	Water	Chlordane	70-130	70-130	30
608	3520C	Water	delta-BHC	72-122	19-143	30
608	3520C	Water	Dieldrin	68-114	10-152	30
608	3520C	Water	Endosulfan I	47-114	10-133	30
608	3520C	Water	Endosulfan II	51-120	10-136	30
608	3520C	Water	Endosulfan Sulfate	68-120	10-154	30
608	3520C	Water	Endrin	66-121	10-153	30
608	3520C	Water	Endrin Aldehyde	55-123	10-144	30
608	3520C	Water	Endrin Ketone	66-126	70-130	30
608	3520C	Water	gamma-BHC (Lindane)	68-114	10-138	30
608	3520C	Water	gamma-Chlordane	68-112	70-130	30
608	3520C	Water	Heptachlor	56-116	10-131	30
608	3520C	Water	Heptachlor Epoxide	66-119	10-144	30
608	3520C	Water	Methoxychlor	64-144	70-130	30
608	3520C	Water	Toxaphene	70-130	70-130	30
608	3520C	Water	Decachlorobiphenyl (Surr.) 10-168	NA	NA	NA
608	3520C	Water	Tetrachloro-*m*-xylene (Surr.) 25-127	NA	NA	NA
625	3510C/3520C	Water	1,2,4-Trichlorobenzene	63-90	10-180	30
625	3510C/3520C	Water	1,2-Dichlorobenzene	63-93	20-113	30
625	3510C/3520C	Water	1,2-Diphenylhydrazine	67-112	10-140	30
625	3510C/3520C	Water	1,3-Dichlorobenzene	59-92	22-107	30
625	3510C/3520C	Water	1,4-Dichlorobenzene	59-90	21-105	30
625	3510C/3520C	Water	2,3,4,6-Tetrachlorophenol	70-130	70-130	30
625	3510C/3520C	Water	2,4,5-Trichlorophenol	70-130	70-130	30
625	3510C/3520C	Water	2,4,6-Trichlorophenol	72-99	43-117	30
625	3510C/3520C	Water	2,4-Dichlorophenol	69-93	34-112	30
625	3510C/3520C	Water	2,4-Dimethylphenol	58-92	10-178	30
625	3510C/3520C	Water	2,4-Dinitrophenol	54-118	18-141	30
625	3510C/3520C	Water	2,4-Dinitrotoluene	73-116	42-133	30
625	3510C/3520C	Water	2,6-Dinitrotoluene	73-110	43-129	30
625	3510C/3520C	Water	2-Chloronaphthalene	63-100	10-132	30
625	3510C/3520C	Water	2-Chlorophenol	66-97	26-121	30
625	3510C/3520C	Water	2-Methyl-4,6-dinitrophenol	59-121	32-123	30
625	3510C/3520C	Water	2-Methylnaphthalene	70-130	70-130	30
625	3510C/3520C	Water	2-Methylphenol	70-130	70-130	30
625	3510C/3520C	Water	2-Nitroaniline	70-130	70-130	30
625	3510C/3520C	Water	2-Nitrophenol	68-95	29-124	30
625	3510C/3520C	Water	3,3'-Dichlorobenzidine	63-108	10-123	30
625	3510C/3520C	Water	3-Nitroaniline	70-130	70-130	30

SEMIVOLATILE ORGANICS ANALYSES							
Method	**Prep Method**	**Matrix**	**Analyte**		**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
625	3510C/3520C	Water	4-Bromophenyl Phenyl Ether		70-104	10-145	30
625	3510C/3520C	Water	4-Chloro-3-methylphenol		68-105	10-165	30
625	3510C/3520C	Water	4-Chloroaniline		70-130	70-130	30
625	3510C/3520C	Water	4-Chlorophenyl Phenyl Ether		71-104	10-131	30
625	3510C/3520C	Water	4-Methylphenol		63-103	70-130	30
625	3510C/3520C	Water	4-Nitroaniline		70-130	70-130	30
625	3510C/3520C	Water	4-Nitrophenol		61-122	20-141	30
625	3510C/3520C	Water	Acenaphthene		68-99	11-134	30
625	3510C/3520C	Water	Acenaphthylene		68-109	10-151	30
625	3510C/3520C	Water	Aniline		70-130	70-130	30
625	3510C/3520C	Water	Anthracene		68-107	10-136	30
625	3510C/3520C	Water	Benz(a)anthracene		71-111	10-147	30
625	3510C/3520C	Water	Benzidine		10-179	70-130	30
625	3510C/3520C	Water	Benzo(a)pyrene		68-110	10-140	30
625	3510C/3520C	Water	Benzo(b)fluoranthene		68-111	10-149	30
625	3510C/3520C	Water	Benzo(g,h,i)perylene		71-108	10-137	30
625	3510C/3520C	Water	Benzo(k)fluoranthene		66-118	10-161	30
625	3510C/3520C	Water	Benzoic acid		70-130	70-130	30
625	3510C/3520C	Water	Benzyl alcohol		70-130	70-130	30
625	3510C/3520C	Water	Bis(2-chloroethoxy)methane		60-98	10-179	30
625	3510C/3520C	Water	Bis(2-chloroethyl) Ether		65-98	30-113	30
625	3510C/3520C	Water	Bis(2-chloroisopropyl) Ether		53-108	22-124	30
625	3510C/3520C	Water	Bis(2-ethylhexyl) Phthalate		69-115	10-157	30
625	3510C/3520C	Water	Butyl Benzyl Phthalate		67-114	10-159	30
625	3510C/3520C	Water	Carbazole		70-130	70-130	30
625	3510C/3520C	Water	Chrysene		73-106	10-150	30
625	3510C/3520C	Water	Di-n-butyl Phthalate		64-127	10-157	30
625	3510C/3520C	Water	Di-n-octyl Phthalate		62-129	10-182	30
625	3510C/3520C	Water	Dibenz(a,h)anthracene		67-117	10-143	30
625	3510C/3520C	Water	Dibenzofuran		70-130	70-130	30
625	3510C/3520C	Water	Diethyl Phthalate		72-116	20-142	30
625	3510C/3520C	Water	Dimethyl Phthalate		73-107	12-143	30
625	3510C/3520C	Water	Fluoranthene		64-117	10-138	30
625	3510C/3520C	Water	Fluorene		67-106	16-135	30
625	3510C/3520C	Water	Hexachlorobenzene		70-107	10-148	30
625	3510C/3520C	Water	Hexachlorobutadiene		57-92	10-137	30
625	3510C/3520C	Water	Hexachlorocyclopentadiene		10-73	10-75	30
625	3510C/3520C	Water	Hexachloroethane		58-97	21-108	30
625	3510C/3520C	Water	Indeno(1,2,3-cd)pyrene		70-106	10-142	30
625	3510C/3520C	Water	Isophorone		74-112	33-137	30
625	3510C/3520C	Water	N-Nitrosodi-n-propylamine		68-108	30-136	30
625	3510C/3520C	Water	N-Nitrosodimethylamine		66-104	27-113	30
625	3510C/3520C	Water	N-Nitrosodiphenylamine		73-111	14-149	30
625	3510C/3520C	Water	Naphthalene		64-93	10-149	30
625	3510C/3520C	Water	Nitrobenzene		67-102	10-190	30
625	3510C/3520C	Water	Pentachlorophenol		63-101	39-123	30
625	3510C/3520C	Water	Phenanthrene		67-105	13-137	30
625	3510C/3520C	Water	Phenol		60-98	10-128	30
625	3510C/3520C	Water	Pyrene		64-106	10-147	30
625	3510C/3520C	Water	Pyridine		70-130	70-130	30
625	3510C/3520C	Water	2,4,6-Tribromophenol (Surr.)	46-123	NA	NA	NA
625	3510C/3520C	Water	2-Fluorobiphenyl (Surr.)	50-113	NA	NA	NA
625	3510C/3520C	Water	2-Fluorophenol (Surr.)	45-102	NA	NA	NA
625	3510C/3520C	Water	Nitrobenzene-d5 (Surr.)	53-115	NA	NA	NA

SEMIVOLATILE ORGANICS ANALYSES							
Method	**Prep Method**	**Matrix**	**Analyte**		**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
625	3510C/3520C	Water	Phenol-d6 (Surr.)	53-111	NA	NA	NA
625	3510C/3520C	Water	Terphenyl-d14 (Surr.)	33-142	NA	NA	NA
1653	Method	Water	2,4-Dichlorophenol-D3 (Surr.)	27-143	NA	NA	NA
1653	Method	Water	4-Chloroguaiacol-$^{13}C_6$ (Surr.)	43-168	NA	NA	NA
1653	Method	Water	3,4,5-Trichlorophenol (Surr.)	24-167	NA	NA	NA
1653	Method	Water	5-Chlorovanillin-$^{13}C_6$ (Surr.)	32-254	NA	NA	NA
1653	Method	Water	4,5-Dichlorocatechol-$^{13}C_6$ (Surr.)	D-190	NA	NA	NA
1653	Method	Water	4,5,6-Trichloroguaiacol-$^{13}C_6$ (Surr.)	51-139	NA	NA	NA
1653	Method	Water	Pentachlorophenol-$^{13}C_6$ (Surr.)	27-167	NA	NA	NA
1653	Method	Water	Tetrachloroguaiacol-$^{13}C_6$ (Surr.)	27-161	NA	NA	NA
1653	Method	Water	Tetrachlorocatechol-$^{13}C_6$ (Surr.)	D-184	NA	NA	NA
8015B	Method	Water	Ethylene Glycol		67-137	74-146	30
8015B	Method	Water	Isopropyl Ether		82-115	81-118	30
8015B	Method	Water	Propylene Glycol		69-135	58-148	30
8015B	Method	Water	Cyclohexanol (Surr.)	34-164	NA	NA	NA
8081A	3540C/3545	Soil	2,4'-DDD		38-149	14-150	40
8081A	3540C/3545	Soil	2,4'-DDE		39-149	14-152	40
8081A	3540C/3545	Soil	2,4'-DDT		38-146	10-149	40
8081A	3540C/3545	Soil	4,4'-DDD		48-145	15-144	40
8081A	3540C/3545	Soil	4,4'-DDE		47-147	11-151	40
8081A	3540C/3545	Soil	4,4'-DDT		47-150	10-163	40
8081A	3540C/3545	Soil	Aldrin		41-137	11-146	40
8081A	3540C/3545	Soil	alpha-BHC		43-144	16-140	40
8081A	3540C/3545	Soil	alpha-Chlordane		47-137	11-149	40
8081A	3540C/3545	Soil	beta-BHC		52-139	18-142	40
8081A	3540C/3545	Soil	Chlordane		53-132	70-130	40
8081A	3540C/3545	Soil	cis-Nonachlor		47-137	31-126	40
8081A	3540C/3545	Soil	delta-BHC		56-154	18-158	40
8081A	3540C/3545	Soil	Dieldrin		46-139	20-139	40
8081A	3540C/3545	Soil	Endosulfan I		32-127	10-135	40
8081A	3540C/3545	Soil	Endosulfan II		41-129	10-130	40
8081A	3540C/3545	Soil	Endosulfan Sulfate		48-139	10-152	40
8081A	3540C/3545	Soil	Endrin		50-145	10-160	40
8081A	3540C/3545	Soil	Endrin Aldehyde		44-137	10-141	40
8081A	3540C/3545	Soil	Endrin Ketone		48-145	10-146	40
8081A	3540C/3545	Soil	gamma-BHC (Lindane)		45-141	14-147	40
8081A	3540C/3545	Soil	gamma-Chlordane		45-137	10-146	40
8081A	3540C/3545	Soil	Heptachlor		43-138	12-147	40
8081A	3540C/3545	Soil	Heptachlor Epoxide		46-139	10-147	40
8081A	3540C/3545	Soil	Hexachlorobenzene		29-133	27-111	40
8081A	3540C/3545	Soil	Isodrin		57-144	70-130	40
8081A	3540C/3545	Soil	Methoxychlor		45-156	14-150	40
8081A	3540C/3545	Soil	Mirex		48-142	23-151	40
8081A	3540C/3545	Soil	Oxychlordane		42-130	10-137	40
8081A	3540C/3545	Soil	Toxaphene		53-128	10-172	40
8081A	3540C/3545	Soil	trans-Nonachlor		50-130	34-125	40
8081A	3540C/3545	Soil	Decachlorobiphenyl (Surr.)	26-144	NA	NA	NA
8081A	3540C/3545	Soil	Tetrachloro-*m*-xylene (Surr.)	19-134	NA	NA	NA
8081A	3520C/3535	Water	2,4'-DDD		31-135	70-130	30
8081A	3520C/3535	Water	2,4'-DDE		33-133	70-130	30
8081A	3520C/3535	Water	2,4'-DDT		33-133	70-130	30
8081A	3520C/3535	Water	4,4'-DDD		34-142	36-132	30

SEMIVOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8081A	3520C/3535	Water	4,4'-DDE	31-143	40-128	30
8081A	3520C/3535	Water	4,4'-DDT	32-149	33-144	30
8081A	3520C/3535	Water	Aldrin	24-123	30-114	30
8081A	3520C/3535	Water	alpha-BHC	40-131	43-123	30
8081A	3520C/3535	Water	alpha-Chlordane	44-123	38-123	30
8081A	3520C/3535	Water	beta-BHC	38-134	38-120	30
8081A	3520C/3535	Water	Chlordane	63-139	70-130	30
8081A	3520C/3535	Water	Chlorpyrifos	10-134	70-130	30
8081A	3520C/3535	Water	cis-Nonachlor	75-113	70-130	30
8081A	3520C/3535	Water	delta-BHC	41-147	43-136	30
8081A	3520C/3535	Water	Dieldrin	42-125	41-118	30
8081A	3520C/3535	Water	Endosulfan I	30-115	28-112	30
8081A	3520C/3535	Water	Endosulfan II	35-121	32-114	30
8081A	3520C/3535	Water	Endosulfan Sulfate	39-129	47-120	30
8081A	3520C/3535	Water	Endrin	45-130	43-129	30
8081A	3520C/3535	Water	Endrin Aldehyde	25-133	23-124	30
8081A	3520C/3535	Water	Endrin Ketone	47-126	45-119	30
8081A	3520C/3535	Water	gamma-BHC (Lindane)	39-130	43-120	30
8081A	3520C/3535	Water	gamma-Chlordane	42-121	39-120	30
8081A	3520C/3535	Water	Heptachlor	35-126	35-117	30
8081A	3520C/3535	Water	Heptachlor Epoxide	43-124	43-116	30
8081A	3520C/3535	Water	Hexachlorobenzene	28-118	30-104	30
8081A	3520C/3535	Water	Hexachlorobutadiene	70-130	70-130	30
8081A	3520C/3535	Water	Hexachloroethane	70-130	70-130	30
8081A	3520C/3535	Water	Isodrin	21-140	70-130	30
8081A	3520C/3535	Water	Methoxychlor	32-151	28-151	30
8081A	3520C/3535	Water	Mirex	73-118	70-130	30
8081A	3520C/3535	Water	Oxychlordane	67-109	70-130	30
8081A	3520C/3535	Water	Toxaphene	51-157	29-164	30
8081A	3520C/3535	Water	trans-Nonachlor	77-107	70-130	30
8081A	3520C/3535	Water	Decachlorobiphenyl (Surr.) 10-145	NA	NA	NA
8081A	3520C/3535	Water	Tetrachloro-*m*-xylene (Surr.) 18-125	NA	NA	NA
8081A	3540C	Tissue	2,4'-DDD	53-135	10-206	40
8081A	3540C	Tissue	2,4'-DDE	53-128	10-210	40
8081A	3540C	Tissue	2,4'-DDT	53-136	10-178	40
8081A	3540C	Tissue	4,4'-DDD	48-119	43-123	40
8081A	3540C	Tissue	4,4'-DDE	40-127	28-133	40
8081A	3540C	Tissue	4,4'-DDT	54-126	47-127	40
8081A	3540C	Tissue	Aldrin	47-118	38-122	40
8081A	3540C	Tissue	alpha-BHC	64-115	46-118	40
8081A	3540C	Tissue	alpha-Chlordane	36-122	42-124	40
8081A	3540C	Tissue	beta-BHC	53-120	13-172	40
8081A	3540C	Tissue	Chlorpyrifos	70-130	70-130	40
8081A	3540C	Tissue	cis-Nonachlor	70-130	70-130	40
8081A	3540C	Tissue	delta-BHC	48-141	27-141	40
8081A	3540C	Tissue	Dieldrin	42-122	38-122	40
8081A	3540C	Tissue	Endosulfan I	30-107	16-127	40
8081A	3540C	Tissue	Endosulfan II	41-106	34-124	40
8081A	3540C	Tissue	Endosulfan Sulfate	42-127	33-133	40
8081A	3540C	Tissue	Endrin	46-128	42-131	40
8081A	3540C	Tissue	Endrin Aldehyde	18-99	10-96	40
8081A	3540C	Tissue	Endrin Ketone	50-118	50-128	40
8081A	3540C	Tissue	gamma-BHC (Lindane)	63-117	41-126	40
8081A	3540C	Tissue	gamma-Chlordane	34-121	30-127	40

SEMIVOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8081A	3540C	Tissue	Heptachlor	51-116	42-122	40
8081A	3540C	Tissue	Heptachlor Epoxide	34-126	25-129	40
8081A	3540C	Tissue	Hexachlorobenzene	26-118	46-102	40
8081A	3540C	Tissue	Hexachlorobutadiene	70-130	70-130	40
8081A	3540C	Tissue	Hexachloroethane	70-130	70-130	40
8081A	3540C	Tissue	Isodrin	12-129	70-130	40
8081A	3540C	Tissue	Methoxychlor	48-135	30-156	40
8081A	3540C	Tissue	Mirex	70-130	70-130	40
8081A	3540C	Tissue	Oxychlordane	70-130	70-130	40
8081A	3540C	Tissue	Toxaphene	70-130	70-130	40
8081A	3540C	Tissue	trans-Nonachlor	70-130	70-130	40
8081A	3540C	Tissue	Decachlorobiphenyl (Surr.) 25-134	NA	NA	NA
8081A	3540C	Tissue	Tetrachloro-*m*-xylene (Surr.) 18-142	NA	NA	NA
8081A	3510C	TCLP	Chlordane	54-108	32-140	30
8081A	3510C	TCLP	Endrin	57-121	68-115	30
8081A	3510C	TCLP	gamma-BHC (Lindane)	56-115	70-109	30
8081A	3510C	TCLP	Heptachlor	37-99	39-108	30
8081A	3510C	TCLP	Heptachlor Epoxide	54-111	64-107	30
8081A	3510C	TCLP	Methoxychlor	53-122	62-118	30
8081A	3510C	TCLP	Toxaphene	70-130	70-130	30
8081A	3510C	TCLP	Decachlorobiphenyl (Surr.) 12-150	NA	NA	NA
8081A	3510C	TCLP	Tetrachloro-*m*-xylene (Surr.) 18-107	NA	NA	NA
8082	3540C/3545	Soil	Aroclor 1016	39-145	26-163	40
8082	3540C/3545	Soil	Aroclor 1260	51-146	24-171	40
8082	3540C/3545	Soil	Decachlorobiphenyl (Surr.) 33-153	NA	NA	NA
8082	3540C/3545	Soil	Tetrachloro-*m*-xylene (Surr.) 21-142	NA	NA	NA
8082	3520C/3535	Water	Aroclor 1016	50-125	37-137	30
8082	3520C/3535	Water	Aroclor 1260	56-122	31-149	30
8082	3520C/3535	Water	Decachlorobiphenyl (Surr.) 10-144	NA	NA	NA
8082	3520C/3535	Water	Tetrachloro-*m*-xylene (Surr.) 27-136	NA	NA	NA
8082	3580A	Oil	Aroclor 1016	38-94	12-133	40
8082	3580A	Oil	Aroclor 1260	52-113	32-136	40
8082	3580A	Oil	Decachlorobiphenyl (Surr.) 49-127	NA	NA	NA
8082	3580A	Oil	Tetrachloro-*m*-xylene (Surr.) 31-111	NA	NA	NA
8082	3540C	Tissue	Aroclor 1016	53-143	28-189	40
8082	3540C	Tissue	Aroclor 1260	58-138	43-153	40
8082	3540C	Tissue	Decachlorobiphenyl (Surr.) 39-136	NA	NA	NA
8082	3540C	Tissue	Tetrachloro-*m*-xylene (Surr.) 38-125	NA	NA	NA
8082	3540C	Soil	PCB 101	57-155	34-188	40
8082	3540C	Soil	PCB 105	51-144	27-183	40
8082	3540C	Soil	PCB 114	47-141	39-153	40
8082	3540C	Soil	PCB 118	58-154	37-174	40
8082	3540C	Soil	PCB 123	50-142	41-148	40
8082	3540C	Soil	PCB 126	53-139	40-148	40
8082	3540C	Soil	PCB 128	33-182	70-130	40
8082	3540C	Soil	PCB 138	44-130	15-167	40
8082	3540C	Soil	PCB 153	51-137	30-151	40
8082	3540C	Soil	PCB 156	50-151	24-183	40
8082	3540C	Soil	PCB 157	25-184	24-167	40
8082	3540C	Soil	PCB 158	45-149	36-176	40
8082	3540C	Soil	PCB 166	70-130	70-130	40
8082	3540C	Soil	PCB 167	26-160	70-130	40
8082	3540C	Soil	PCB 169	52-156	49-159	40

SEMIVOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8082	3540C	Soil	PCB 170	49-147	33-168	40
8082	3540C	Soil	PCB 18	44-121	19-156	40
8082	3540C	Soil	PCB 180	52-149	36-175	40
8082	3540C	Soil	PCB 183	49-141	21-175	40
8082	3540C	Soil	PCB 184	55-150	38-171	40
8082	3540C	Soil	PCB 187	32-140	70-130	40
8082	3540C	Soil	PCB 189	48-149	31-161	40
8082	3540C	Soil	PCB 195	47-147	31-172	40
8082	3540C	Soil	PCB 206	48-146	43-153	40
8082	3540C	Soil	PCB 209	47-146	23-173	40
8082	3540C	Soil	PCB 28	46-158	36-187	40
8082	3540C	Soil	PCB 44	48-137	20-181	40
8082	3540C	Soil	PCB 52	40-127	11-174	40
8082	3540C	Soil	PCB 60	50-150	10-233	40
8082	3540C	Soil	PCB 66	46-127	38-148	40
8082	3540C	Soil	PCB 77	33-150	18-159	40
8082	3540C	Soil	PCB 8	48-140	20-183	40
8082	3540C	Soil	PCB 81	10-189	26-159	40
8082	3540C	Soil	PCB 87	44-130	15-174	40
8082	3540C	Soil	PCB 90	47-141	41-134	40
8082	3540C	Soil	Tetrachloro-*m* -xylene (Surr.) 21-148	NA	NA	NA
8082	3520C	Water	PCB 101	74-171	70-130	30
8082	3520C	Water	PCB 105	73-154	70-130	30
8082	3520C	Water	PCB 114	76-151	70-130	30
8082	3520C	Water	PCB 118	76-167	70-130	30
8082	3520C	Water	PCB 123	64-159	70-130	30
8082	3520C	Water	PCB 126	41-171	70-130	30
8082	3520C	Water	PCB 128	70-130	70-130	30
8082	3520C	Water	PCB 138	34-173	70-130	30
8082	3520C	Water	PCB 153	37-178	70-130	30
8082	3520C	Water	PCB 156	73-167	70-130	30
8082	3520C	Water	PCB 157	66-157	70-130	30
8082	3520C	Water	PCB 158	60-165	70-130	30
8082	3520C	Water	PCB 166	70-130	70-130	30
8082	3520C	Water	PCB 167	70-130	70-130	30
8082	3520C	Water	PCB 169	67-156	70-130	30
8082	3520C	Water	PCB 170	73-150	70-130	30
8082	3520C	Water	PCB 18	23-173	70-130	30
8082	3520C	Water	PCB 180	73-156	70-130	30
8082	3520C	Water	PCB 183	65-148	70-130	30
8082	3520C	Water	PCB 184	73-153	70-130	30
8082	3520C	Water	PCB 187	70-130	70-130	30
8082	3520C	Water	PCB 189	71-159	70-130	30
8082	3520C	Water	PCB 195	64-159	70-130	30
8082	3520C	Water	PCB 206	64-160	70-130	30
8082	3520C	Water	PCB 209	33-189	70-130	30
8082	3520C	Water	PCB 28	79-172	70-130	30
8082	3520C	Water	PCB 44	63-154	70-130	30
8082	3520C	Water	PCB 52	29-172	70-130	30
8082	3520C	Water	PCB 60	75-166	70-130	30
8082	3520C	Water	PCB 66	32-175	70-130	30
8082	3520C	Water	PCB 77	24-180	70-130	30
8082	3520C	Water	PCB 8	53-158	70-130	30
8082	3520C	Water	PCB 81	50-152	70-130	30

SEMIVOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8082	3520C	Water	PCB 87	36-174	70-130	30
8082	3520C	Water	PCB 90	50-159	70-130	30
8082	3520C	Water	Tetrachloro-*m*-xylene (Surr.) 15-131	NA	NA	NA
8082	3540C	Tissue	PCB 101	52-156	70-130	40
8082	3540C	Tissue	PCB 105	46-144	29-150	40
8082	3540C	Tissue	PCB 114	45-135	70-130	40
8082	3540C	Tissue	PCB 118	52-154	34-152	40
8082	3540C	Tissue	PCB 123	51-129	70-130	40
8082	3540C	Tissue	PCB 126	52-137	44-135	40
8082	3540C	Tissue	PCB 128	65-114	24-155	40
8082	3540C	Tissue	PCB 138	44-127	26-140	40
8082	3540C	Tissue	PCB 153	50-123	31-124	40
8082	3540C	Tissue	PCB 156	51-143	70-130	40
8082	3540C	Tissue	PCB 157	48-149	70-130	40
8082	3540C	Tissue	PCB 158	10-210	70-130	40
8082	3540C	Tissue	PCB 166	70-130	70-130	40
8082	3540C	Tissue	PCB 167	70-130	70-130	40
8082	3540C	Tissue	PCB 169	59-138	43-147	40
8082	3540C	Tissue	PCB 170	47-139	37-130	40
8082	3540C	Tissue	PCB 18	50-117	35-122	40
8082	3540C	Tissue	PCB 180	54-137	35-138	40
8082	3540C	Tissue	PCB 183	43-136	58-122	40
8082	3540C	Tissue	PCB 184	10-203	70-130	40
8082	3540C	Tissue	PCB 187	70-130	70-130	40
8082	3540C	Tissue	PCB 189	46-140	59-136	40
8082	3540C	Tissue	PCB 195	51-134	39-138	40
8082	3540C	Tissue	PCB 206	50-140	39-140	40
8082	3540C	Tissue	PCB 209	49-136	35-141	40
8082	3540C	Tissue	PCB 28	50-157	41-148	40
8082	3540C	Tissue	PCB 44	53-132	47-131	40
8082	3540C	Tissue	PCB 52	50-118	48-127	40
8082	3540C	Tissue	PCB 60	10-211	70-130	40
8082	3540C	Tissue	PCB 66	47-128	35-132	40
8082	3540C	Tissue	PCB 77	51-133	17-191	40
8082	3540C	Tissue	PCB 8	51-140	42-138	40
8082	3540C	Tissue	PCB 81	10-184	70-130	40
8082	3540C	Tissue	PCB 87	10-178	70-130	40
8082	3540C	Tissue	PCB 90	10-243	70-130	40
8082	3540C	Tissue	Tetrachloro-*m*-xylene (Surr.) 27-129	NA	NA	NA
8141A	3540C/3545	Soil	Azinphos-methyl (Guthion)	44-151	51-143	40
8141A	3540C/3545	Soil	Bolstar (Sulprofos)	32-137	44-125	40
8141A	3540C/3545	Soil	Chlorpyrifos	43-135	33-148	40
8141A	3540C/3545	Soil	Coumaphos	48-143	51-136	40
8141A	3540C/3545	Soil	Demeton-O, S	10-131	10-116	40
8141A	3540C/3545	Soil	Diazinon	47-128	43-131	40
8141A	3540C/3545	Soil	Dichlorvos	24-137	10-139	40
8141A	3540C/3545	Soil	Dimethoate	45-138	41-134	40
8141A	3540C/3545	Soil	Disulfoton	10-133	16-123	40
8141A	3540C/3545	Soil	EPN	49-126	53-122	40
8141A	3540C/3545	Soil	Ethoprop (Prophos)	40-128	46-123	40
8141A	3540C/3545	Soil	Ethyl Parathion	47-128	48-126	40
8141A	3540C/3545	Soil	Fensulfothion	48-155	47-151	40
8141A	3540C/3545	Soil	Fenthion	34-137	45-127	40
8141A	3540C/3545	Soil	Malathion	49-131	55-124	40

SEMIVOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8141A	3540C/3545	Soil	Merphos	11-126	16-129	40
8141A	3540C/3545	Soil	Methyl Parathion	48-127	53-123	40
8141A	3540C/3545	Soil	Mevinphos	43-126	41-128	40
8141A	3540C/3545	Soil	Phorate	18-131	15-127	40
8141A	3540C/3545	Soil	Ronnel	48-123	53-118	40
8141A	3540C/3545	Soil	Stirophos (Tetrachlorovinphos)	45-148	45-143	40
8141A	3540C/3545	Soil	Sulfotep	45-114	47-115	40
8141A	3540C/3545	Soil	Tokuthion (Prothiofos)	48-132	51-126	40
8141A	3540C/3545	Soil	Trichloronate	39-129	33-135	40
8141A	3540C/3545	Soil	Tributyl Phosphate (Surr.) 26-162	NA	NA	NA
8141A	3540C/3545	Soil	Triphenyl Phosphate (Surr.) 34-143	NA	NA	NA
8141A	3520C/3535	Water	Azinphos-methyl (Guthion)	41-151	27-167	30
8141A	3520C/3535	Water	Bolstar (Sulprofos)	22-147	11-153	30
8141A	3520C/3535	Water	Chlorpyrifos	48-141	30-157	30
8141A	3520C/3535	Water	Coumaphos	43-147	36-144	30
8141A	3520C/3535	Water	Demeton-O, S	10-138	10-138	30
8141A	3520C/3535	Water	Diazinon	54-131	26-149	30
8141A	3520C/3535	Water	Dichlorvos	34-147	10-164	30
8141A	3520C/3535	Water	Dimethoate	38-147	27-172	30
8141A	3520C/3535	Water	Disulfoton	12-144	10-167	30
8141A	3520C/3535	Water	EPN	54-126	34-143	30
8141A	3520C/3535	Water	Ethoprop (Prophos)	52-131	10-164	30
8141A	3520C/3535	Water	Ethyl Parathion	52-126	15-159	30
8141A	3520C/3535	Water	Fensulfothion	53-153	35-171	30
8141A	3520C/3535	Water	Fenthion	25-150	10-171	30
8141A	3520C/3535	Water	Malathion	56-129	35-150	30
8141A	3520C/3535	Water	Merphos	42-115	10-150	30
8141A	3520C/3535	Water	Methyl Parathion	55-127	32-149	30
8141A	3520C/3535	Water	Mevinphos	46-135	49-144	30
8141A	3520C/3535	Water	Phorate	28-138	10-148	30
8141A	3520C/3535	Water	Ronnel	53-124	28-143	30
8141A	3520C/3535	Water	Stirophos (Tetrachlorovinphos)	58-139	34-155	30
8141A	3520C/3535	Water	Sulfotep	49-120	21-142	30
8141A	3520C/3535	Water	Tokuthion (Prothiofos)	54-129	29-144	30
8141A	3520C/3535	Water	Trichloronate	45-138	18-160	30
8141A	3520C/3535	Water	Tributyl Phosphate (Surr.) 14-173	NA	NA	NA
8141A	3520C/3535	Water	Triphenyl Phosphate (Surr.) 38-134	NA	NA	NA
8151A	Method	Soil	2,4,5-T	41-133	28-138	40
8151A	Method	Soil	2,4,5-TP (Silvex)	40-131	20-137	40
8151A	Method	Soil	2,4-D	41-115	19-129	40
8151A	Method	Soil	2,4-DB	31-147	10-171	40
8151A	Method	Soil	Dalapon	18-112	10-137	40
8151A	Method	Soil	Dicamba	43-124	17-138	40
8151A	Method	Soil	Dichlorprop	38-113	22-121	40
8151A	Method	Soil	Dinoseb	10-112	10-108	40
8151A	Method	Soil	MCPA	31-125	10-145	40
8151A	Method	Soil	MCPP	24-137	13-129	40
8151A	Method	Soil	2,4-Dichlorophenylacetic Acid (Surr.) 22-132	NA	NA	NA
8151A	Method	Water	2,4,5-T	24-128	27-122	30
8151A	Method	Water	2,4,5-TP (Silvex)	19-132	10-166	30
8151A	Method	Water	2,4-D	24-112	10-134	30
8151A	Method	Water	2,4-DB	10-127	10-148	30
8151A	Method	Water	Dalapon	11-109	10-115	30
8151A	Method	Water	Dicamba	28-111	31-107	30

SEMIVOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8151A	Method	Water	Dichlorprop	26-112	21-109	30
8151A	Method	Water	Dinoseb	14-99	18-91	30
8151A	Method	Water	MCPA	13-110	10-114	30
8151A	Method	Water	MCPP	10-115	10-98	30
8151A	Method	Water	2,4-Dichlorophenylacetic Acid (Surr.) 10-121	NA	NA	NA
8151M	Method	Soil	2,3,4,5-Tetrachlorophenol	51-119	59-160	40
8151M	Method	Soil	2,3,5,6-Tetrachlorophenol	53-132	68-146	40
8151M	Method	Soil	2,4,5-Trichlorophenol	38-116	47-157	40
8151M	Method	Soil	2,4,6-Trichlorophenol	54-112	60-127	40
8151M	Method	Soil	3,4,5-Trichlorophenol	13-88	70-130	40
8151M	Method	Soil	3,4-Dichlorophenol	10-158	70-130	40
8151M	Method	Soil	3,5-Dichlorophenol	10-127	70-130	40
8151M	Method	Soil	Pentachlorophenol	63-137	57-166	40
8151M	Method	Soil	4-Bromo-2,6-dichlorophenol (Surr.) 51-141	NA	NA	NA
8151M	Method	Water	2,3,4,5-Tetrachlorophenol	41-132	20-149	30
8151M	Method	Water	2,3,5,6-Tetrachlorophenol	41-133	41-140	30
8151M	Method	Water	2,4,5-Trichlorophenol	20-120	39-101	30
8151M	Method	Water	2,4,6-Trichlorophenol	52-108	31-135	30
8151M	Method	Water	3,4,5-Trichlorophenol	10-78	70-130	30
8151M	Method	Water	3,4-Dichlorophenol	10-123	70-130	30
8151M	Method	Water	3,5-Dichlorophenol	10-68	70-130	30
8151M	Method	Water	Pentachlorophenol	45-140	43-139	30
8151M	Method	Water	4-Bromo-2,6-dichlorophenol (Surr.) 41-152	NA	NA	NA
8270C	3541	Soil	1,2,4,5-Tetrachlorobenzene	70-130	70-130	40
8270C	3541	Soil	1,2,4-Trichlorobenzene	43-89	10-102	40
8270C	3541	Soil	1,2-Dichlorobenzene	45-89	10-96	40
8270C	3541	Soil	1,2-Diphenylhydrazine	53-104	70-130	40
8270C	3541	Soil	1,3,5-Trinitrobenzene	70-130	70-130	40
8270C	3541	Soil	1,3-Dichlorobenzene	42-86	10-92	40
8270C	3541	Soil	1,3-Dinitrobenzene	70-130	70-130	40
8270C	3541	Soil	1,4-Dichlorobenzene	42-84	10-91	40
8270C	3541	Soil	1,4-Dioxane	70-130	70-130	40
8270C	3541	Soil	1,4-Naphthoquinone	70-130	70-130	40
8270C	3541	Soil	1-Naphthylamine	70-130	70-130	40
8270C	3541	Soil	2,3,4,6-Tetrachlorophenol	39-124	70-130	40
8270C	3541	Soil	2,4,5-Trichlorophenol	40-100	21-107	40
8270C	3541	Soil	2,4,6-Trichlorophenol	40-97	17-106	40
8270C	3541	Soil	2,4-Dichlorophenol	42-90	11-107	40
8270C	3541	Soil	2,4-Dimethylphenol	10-92	10-91	40
8270C	3541	Soil	2,4-Dinitrophenol	13-119	10-134	40
8270C	3541	Soil	2,4-Dinitrotoluene	50-114	16-127	40
8270C	3541	Soil	2,6-Dichlorophenol	70-130	70-130	40
8270C	3541	Soil	2,6-Diisopropylnaphthalene	70-130	70-130	40
8270C	3541	Soil	2,6-Dinitrotoluene	50-105	22-117	40
8270C	3541	Soil	2-Acetylaminofluorene	70-130	70-130	40
8270C	3541	Soil	2-Chloronaphthalene	46-95	10-113	40
8270C	3541	Soil	2-Chlorophenol	40-89	16-92	40
8270C	3541	Soil	2-Methyl-4,6-dinitrophenol	30-116	10-114	40
8270C	3541	Soil	2-Methylnaphthalene	43-91	10-106	40
8270C	3541	Soil	2-Methylphenol	34-90	10-98	40
8270C	3541	Soil	2-Naphthylamine	70-130	70-130	40
8270C	3541	Soil	2-Nitroaniline	42-104	20-116	40

SEMIVOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8270C	3541	Soil	2-Nitrophenol	42-91	13-99	40
8270C	3541	Soil	2-Picoline	70-130	70-130	40
8270C	3541	Soil	3,3'-Dichlorobenzidine	10-109	10-98	40
8270C	3541	Soil	3,3'-Dimethylbenzidine	70-130	70-130	40
8270C	3541	Soil	3-Methylcholanthrene	70-130	70-130	40
8270C	3541	Soil	3-Nitroaniline	38-103	10-105	40
8270C	3541	Soil	4-Aminobiphenyl	70-130	70-130	40
8270C	3541	Soil	4-Bromophenyl Phenyl Ether	46-101	10-121	40
8270C	3541	Soil	4-Chloro-3-methylphenol	40-98	18-104	40
8270C	3541	Soil	4-Chloroaniline	17-95	10-83	40
8270C	3541	Soil	4-Chlorophenyl Phenyl Ether	45-101	10-118	40
8270C	3541	Soil	4-Methylphenol	34-93	10-103	40
8270C	3541	Soil	4-Nitroaniline	38-107	10-109	40
8270C	3541	Soil	4-Nitrophenol	40-113	10-129	40
8270C	3541	Soil	4-Nitroquinoline N-Oxide	70-130	70-130	40
8270C	3541	Soil	5-Nitro-o-toluidine	70-130	70-130	40
8270C	3541	Soil	7,12-Dimethylbenz(a)anthracene	70-130	70-130	40
8270C	3541	Soil	a,a-Dimethylphenethylamine	70-130	70-130	40
8270C	3541	Soil	Acenaphthene	47-94	10-115	40
8270C	3541	Soil	Acenaphthylene	51-105	10-140	40
8270C	3541	Soil	Acetophenone	45-105	10-127	40
8270C	3541	Soil	Aniline	10-80	10-73	40
8270C	3541	Soil	Anthracene	52-102	10-131	40
8270C	3541	Soil	Aramite, Total	70-130	70-130	40
8270C	3541	Soil	Atrazine	37-132	23-133	40
8270C	3541	Soil	Azobenzene	42-97	23-95	40
8270C	3541	Soil	Benz(a)anthracene	53-111	10-142	40
8270C	3541	Soil	Benzaldehyde	22-111	13-96	40
8270C	3541	Soil	Benzidine	10-69	70-130	40
8270C	3541	Soil	Benzo(a)pyrene	52-110	10-128	40
8270C	3541	Soil	Benzo(b)fluoranthene	52-111	10-145	40
8270C	3541	Soil	Benzo(g,h,i)perylene	36-126	10-129	40
8270C	3541	Soil	Benzo(k)fluoranthene	54-112	13-127	40
8270C	3541	Soil	Benzoic Acid	10-100	10-127	40
8270C	3541	Soil	Benzophenone	70-130	70-130	40
8270C	3541	Soil	Benzyl Alcohol	41-93	26-93	40
8270C	3541	Soil	Biphenyl	48-98	14-109	40
8270C	3541	Soil	Bis(2-chloroethoxy)methane	44-90	14-103	40
8270C	3541	Soil	Bis(2-chloroethyl) Ether	44-89	10-106	40
8270C	3541	Soil	Bis(2-chloroisopropyl) Ether	39-91	10-105	40
8270C	3541	Soil	Bis(2-ethylhexyl) Phthalate	37-133	10-138	40
8270C	3541	Soil	Butyl Benzyl Phthalate	50-111	10-128	40
8270C	3541	Soil	Caprolactam	25-110	10-132	40
8270C	3541	Soil	Carbazole	51-108	13-133	40
8270C	3541	Soil	Chlorobenzilate	70-130	70-130	40
8270C	3541	Soil	Chrysene	52-108	10-146	40
8270C	3541	Soil	Di-n-butyl Phthalate	52-116	10-132	40
8270C	3541	Soil	Di-n-octyl Phthalate	50-119	10-133	40
8270C	3541	Soil	Diallate	70-130	70-130	40
8270C	3541	Soil	Diazinon	34-74	70-130	40
8270C	3541	Soil	Dibenz(a,h)anthracene	45-124	16-129	40

SEMIVOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8270C	3541	Soil	Dibenzofuran	45-96	10-115	40
8270C	3541	Soil	Diethyl Phthalate	48-112	10-126	40
8270C	3541	Soil	Diethylene Glycol Dibenzoate	70-130	70-130	40
8270C	3541	Soil	Dimethoate	70-130	70-130	40
8270C	3541	Soil	Dimethyl Phthalate	49-102	21-114	40
8270C	3541	Soil	Dinoseb	70-130	70-130	40
8270C	3541	Soil	Diphenylamine	70-130	70-130	40
8270C	3541	Soil	Disulfoton	70-130	70-130	40
8270C	3541	Soil	Ethyl Methanesulfonate	70-130	70-130	40
8270C	3541	Soil	Ethylene Glycol Butyl Ether (EGBE)	70-130	70-130	40
8270C	3541	Soil	Famphur	70-130	70-130	40
8270C	3541	Soil	Fluoranthene	50-108	10-156	40
8270C	3541	Soil	Fluorene	47-100	10-123	40
8270C	3541	Soil	Hexachlorobenzene	49-104	15-120	40
8270C	3541	Soil	Hexachlorobutadiene	41-88	10-123	40
8270C	3541	Soil	Hexachlorocyclopentadiene	23-92	10-80	40
8270C	3541	Soil	Hexachloroethane	43-89	10-107	40
8270C	3541	Soil	Hexachlorophene	70-130	70-130	40
8270C	3541	Soil	Hexachloropropene	70-130	70-130	40
8270C	3541	Soil	Indeno(1,2,3-cd)pyrene	44-123	10-138	40
8270C	3541	Soil	Isodrin	70-130	70-130	40
8270C	3541	Soil	Isophorone	49-106	23-113	40
8270C	3541	Soil	Isosafrole	70-130	70-130	40
8270C	3541	Soil	Kepone	70-130	70-130	40
8270C	3541	Soil	Methapyrilene	70-130	70-130	40
8270C	3541	Soil	Methyl Methanesulfonate	70-130	70-130	40
8270C	3541	Soil	Methyl Parathion	70-130	70-130	40
8270C	3541	Soil	n-Dodecane	70-130	70-130	40
8270C	3541	Soil	N-Nitrosodi-n-butylamine	70-130	70-130	40
8270C	3541	Soil	N-Nitrosodi-n-propylamine	42-103	12-116	40
8270C	3541	Soil	N-Nitrosodiethylamine	70-130	70-130	40
8270C	3541	Soil	N-Nitrosodimethylamine	34-96	10-91	40
8270C	3541	Soil	N-Nitrosodiphenylamine	49-112	11-131	40
8270C	3541	Soil	N-Nitrosomethylethylamine	70-130	70-130	40
8270C	3541	Soil	N-Nitrosomorpholine	70-130	70-130	40
8270C	3541	Soil	N-Nitrosopiperidine	70-130	70-130	40
8270C	3541	Soil	N-Nitrosopyrrolidine	70-130	70-130	40
8270C	3541	Soil	Naphthalene	45-89	10-111	40
8270C	3541	Soil	Nitrobenzene	44-92	10-103	40
8270C	3541	Soil	O,O,O-Triethyl Phosphorothioate	70-130	70-130	40
8270C	3541	Soil	o-Toluidine	70-130	70-130	40
8270C	3541	Soil	p-Dimethylaminoazobenzene	70-130	70-130	40
8270C	3541	Soil	p-Phenylenediamine	70-130	70-130	40
8270C	3541	Soil	Parathion	70-130	70-130	40
8270C	3541	Soil	Pentachlorobenzene	70-130	70-130	40
8270C	3541	Soil	Pentachloroethane	70-130	70-130	40
8270C	3541	Soil	Pentachloronitrobenzene	70-130	70-130	40
8270C	3541	Soil	Pentachlorophenol	32-104	10-138	40
8270C	3541	Soil	Phenacetin	70-130	70-130	40
8270C	3541	Soil	Phenanthrene	51-99	10-155	40
8270C	3541	Soil	Phenol	43-90	21-92	40

SEMIVOLATILE ORGANICS ANALYSES							
Method	**Prep Method**	**Matrix**	**Analyte**		**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8270C	3541	Soil	Phorate		70-130	70-130	40
8270C	3541	Soil	Pronamide		70-130	70-130	40
8270C	3541	Soil	Pyrene		48-107	10-157	40
8270C	3541	Soil	Pyridine		10-110	70-130	40
8270C	3541	Soil	Quinoline		70-130	70-130	40
8270C	3541	Soil	Safrole		70-130	70-130	40
8270C	3541	Soil	Sulfotep		70-130	70-130	40
8270C	3541	Soil	Thionazin		70-130	70-130	40
8270C	3541	Soil	2,4,6-Tribromophenol (Surr.)	12-111	NA	NA	NA
8270C	3541	Soil	2-Fluorobiphenyl (Surr.)	10-109	NA	NA	NA
8270C	3541	Soil	2-Fluorophenol (Surr.)	10-85	NA	NA	NA
8270C	3541	Soil	Nitrobenzene-d5 (Surr.)	10-100	NA	NA	NA
8270C	3541	Soil	Phenol-d6 (Surr.)	17-96	NA	NA	NA
8270C	3541	Soil	Terphenyl-d14 (Surr.)	21-122	NA	NA	NA
8270C	3520C	Water	1,2,4,5-Tetrachlorobenzene		70-130	70-130	30
8270C	3520C	Water	1,2,4-Trichlorobenzene		41-103	43-98	30
8270C	3520C	Water	1,2-Dichlorobenzene		39-108	39-98	30
8270C	3520C	Water	1,2-Diphenylhydrazine		66-115	70-130	30
8270C	3520C	Water	1,3,5-Trinitrobenzene		70-130	70-130	30
8270C	3520C	Water	1,3-Dichlorobenzene		30-108	29-100	30
8270C	3520C	Water	1,3-Dinitrobenzene		70-130	70-130	30
8270C	3520C	Water	1,4-Dichlorobenzene		32-105	30-99	30
8270C	3520C	Water	1,4-Dioxane		70-130	70-130	30
8270C	3520C	Water	1,4-Naphthoquinone		70-130	70-130	30
8270C	3520C	Water	1-Naphthylamine		70-130	70-130	30
8270C	3520C	Water	2,3,4,6-Tetrachlorophenol		70-130	70-130	30
8270C	3520C	Water	2,4,5-Trichlorophenol		65-115	60-121	30
8270C	3520C	Water	2,4,6-Trichlorophenol		64-112	60-118	30
8270C	3520C	Water	2,4-Dichlorophenol		59-110	56-116	30
8270C	3520C	Water	2,4-Dimethylphenol		17-116	10-157	30
8270C	3520C	Water	2,4-Dinitrophenol		22-132	14-194	30
8270C	3520C	Water	2,4-Dinitrotoluene		75-120	67-128	30
8270C	3520C	Water	2,6-Dichlorophenol		70-130	70-130	30
8270C	3520C	Water	2,6-Dinitrotoluene		73-115	69-121	30
8270C	3520C	Water	2-Acetylaminofluorene		70-130	70-130	30
8270C	3520C	Water	2-Chloronaphthalene		55-110	54-106	30
8270C	3520C	Water	2-Chlorophenol		59-110	50-113	30
8270C	3520C	Water	2-Methyl-4,6-dinitrophenol		50-122	37-147	30
8270C	3520C	Water	2-Methylnaphthalene		50-104	49-100	30
8270C	3520C	Water	2-Methylphenol		55-109	39-118	30
8270C	3520C	Water	2-Naphthylamine		70-130	70-130	30
8270C	3520C	Water	2-Nitroaniline		64-117	18-140	30
8270C	3520C	Water	2-Nitrophenol		59-112	51-118	30
8270C	3520C	Water	2-Picoline		70-130	70-130	30
8270C	3520C	Water	3,3'-Dichlorobenzidine		30-122	10-160	30
8270C	3520C	Water	3,3'-Dimethylbenzidine		70-130	70-130	30
8270C	3520C	Water	3-Methylcholanthrene		70-130	70-130	30
8270C	3520C	Water	3-Nitroaniline		52-123	10-145	30
8270C	3520C	Water	4-Aminobiphenyl		70-130	70-130	30
8270C	3520C	Water	4-Bromophenyl Phenyl Ether		65-114	65-107	30
8270C	3520C	Water	4-Chloro-3-methylphenol		61-114	58-126	30

SEMIVOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8270C	3520C	Water	4-Chloroaniline	27-125	10-137	30
8270C	3520C	Water	4-Chlorophenyl Phenyl Ether	66-111	62-109	30
8270C	3520C	Water	4-Methylphenol	55-111	42-123	30
8270C	3520C	Water	4-Nitroaniline	58-118	10-135	30
8270C	3520C	Water	4-Nitrophenol	56-126	29-167	30
8270C	3520C	Water	4-Nitroquinoline N-Oxide	70-130	70-130	30
8270C	3520C	Water	5-Nitro-o-toluidine	70-130	70-130	30
8270C	3520C	Water	7,12-Dimethylbenz(a)anthracene	70-130	70-130	30
8270C	3520C	Water	a,a-Dimethylphenethylamine	70-130	70-130	30
8270C	3520C	Water	Acenaphthene	63-109	58-105	30
8270C	3520C	Water	Acenaphthylene	68-119	57-116	30
8270C	3520C	Water	Acetophenone	56-137	70-130	30
8270C	3520C	Water	Aniline	10-123	12-106	30
8270C	3520C	Water	Anthracene	66-112	43-117	30
8270C	3520C	Water	Aramite, Total	70-130	70-130	30
8270C	3520C	Water	Atrazine	11-169	70-130	30
8270C	3520C	Water	Azobenzene	61-117	70-130	30
8270C	3520C	Water	Benz(a)anthracene	71-116	53-118	30
8270C	3520C	Water	Benzaldehyde	70-130	70-130	30
8270C	3520C	Water	Benzidine	10-144	70-130	30
8270C	3520C	Water	Benzo(a)pyrene	64-116	44-120	30
8270C	3520C	Water	Benzo(b)fluoranthene	64-122	43-134	30
8270C	3520C	Water	Benzo(g,h,i)perylene	62-127	45-126	30
8270C	3520C	Water	Benzo(k)fluoranthene	66-125	44-132	30
8270C	3520C	Water	Benzoic Acid	10-120	26-162	30
8270C	3520C	Water	Benzyl alcohol	56-115	48-120	30
8270C	3520C	Water	Biphenyl	70-130	70-130	30
8270C	3520C	Water	Bis(2-chloroethoxy)methane	60-111	35-136	30
8270C	3520C	Water	Bis(2-chloroethyl) Ether	60-112	47-121	30
8270C	3520C	Water	Bis(2-chloroisopropyl) Ether	52-115	37-121	30
8270C	3520C	Water	Bis(2-ethylhexyl) Phthalate	71-119	48-132	30
8270C	3520C	Water	Butyl Benzyl Phthalate	71-114	59-122	30
8270C	3520C	Water	Caprolactam	70-130	70-130	30
8270C	3520C	Water	Carbazole	70-117	55-119	30
8270C	3520C	Water	Chlorobenzilate	70-130	70-130	30
8270C	3520C	Water	Chrysene	71-112	53-120	30
8270C	3520C	Water	Di-n-butyl Phthalate	67-126	59-123	30
8270C	3520C	Water	Di-n-octyl Phthalate	68-127	58-130	30
8270C	3520C	Water	Diallate	70-130	70-130	30
8270C	3520C	Water	Dibenz(a,h)anthracene	65-127	46-127	30
8270C	3520C	Water	Dibenzofuran	63-109	60-106	30
8270C	3520C	Water	Diethyl Phthalate	71-123	65-125	30
8270C	3520C	Water	Dimethoate	70-130	70-130	30
8270C	3520C	Water	Dimethyl Phthalate	72-114	69-116	30
8270C	3520C	Water	Dinoseb	70-130	70-130	30
8270C	3520C	Water	Diphenylamine	70-130	70-130	30
8270C	3520C	Water	Disulfoton	70-130	70-130	30
8270C	3520C	Water	Ethyl Methanesulfonate	70-130	70-130	30
8270C	3520C	Water	Famphur	70-130	70-130	30
8270C	3520C	Water	Fluoranthene	64-118	50-123	30
8270C	3520C	Water	Fluorene	66-112	61-112	30

SEMIVOLATILE ORGANICS ANALYSES							
Method	**Prep Method**	**Matrix**	**Analyte**		**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8270C	3520C	Water	Hexachlorobenzene		67-116	58-113	30
8270C	3520C	Water	Hexachlorobutadiene		22-108	20-97	30
8270C	3520C	Water	Hexachlorocyclopentadiene		10-68	10-67	30
8270C	3520C	Water	Hexachloroethane		19-118	12-111	30
8270C	3520C	Water	Hexachlorophene		70-130	70-130	30
8270C	3520C	Water	Hexachloropropene		70-130	70-130	30
8270C	3520C	Water	Indeno(1,2,3-cd)pyrene		61-125	45-127	30
8270C	3520C	Water	Isodrin		70-130	70-130	30
8270C	3520C	Water	Isophorone		70-129	63-125	30
8270C	3520C	Water	Isosafrole		70-130	70-130	30
8270C	3520C	Water	Kepone		70-130	70-130	30
8270C	3520C	Water	Methapyrilene		70-130	70-130	30
8270C	3520C	Water	Methyl Methanesulfonate		70-130	70-130	30
8270C	3520C	Water	Methyl Parathion		70-130	70-130	30
8270C	3520C	Water	N-Nitrosodi-n-butylamine		70-130	70-130	30
8270C	3520C	Water	N-Nitrosodi-n-propylamine		57-126	48-133	30
8270C	3520C	Water	N-Nitrosodiethylamine		70-130	70-130	30
8270C	3520C	Water	N-Nitrosodimethylamine		54-120	32-118	30
8270C	3520C	Water	N-Nitrosodiphenylamine		71-120	12-148	30
8270C	3520C	Water	N-Nitrosomethylethylamine		70-130	70-130	30
8270C	3520C	Water	N-Nitrosomorpholine		70-130	70-130	30
8270C	3520C	Water	N-Nitrosopiperidine		70-130	70-130	30
8270C	3520C	Water	N-Nitrosopyrrolidine		70-130	70-130	30
8270C	3520C	Water	Naphthalene		54-103	51-98	30
8270C	3520C	Water	Nitrobenzene		58-116	22-163	30
8270C	3520C	Water	O,O,O-Triethyl Phosphorothioate		70-130	70-130	30
8270C	3520C	Water	o-Toluidine		70-130	70-130	30
8270C	3520C	Water	p-Dimethylaminoazobenzene		70-130	70-130	30
8270C	3520C	Water	p-Phenylenediamine		70-130	70-130	30
8270C	3520C	Water	Parathion		70-130	70-130	30
8270C	3520C	Water	Pentachlorobenzene		70-130	70-130	30
8270C	3520C	Water	Pentachloroethane		70-130	70-130	30
8270C	3520C	Water	Pentachloronitrobenzene		70-130	70-130	30
8270C	3520C	Water	Pentachlorophenol		42-123	26-166	30
8270C	3520C	Water	Phenacetin		70-130	70-130	30
8270C	3520C	Water	Phenanthrene		68-109	59-111	30
8270C	3520C	Water	Phenol		56-110	35-131	30
8270C	3520C	Water	Phorate		70-130	70-130	30
8270C	3520C	Water	Pronamide		70-130	70-130	30
8270C	3520C	Water	Pyrene		66-111	52-117	30
8270C	3520C	Water	Pyridine		39-103	43-103	30
8270C	3520C	Water	Quinoline		70-130	70-130	30
8270C	3520C	Water	Safrole		70-130	70-130	30
8270C	3520C	Water	Sulfotep		70-130	70-130	30
8270C	3520C	Water	Thionazin		70-130	70-130	30
8270C	3520C	Water	2,4,6-Tribromophenol (Surr.)	44-124	NA	NA	NA
8270C	3520C	Water	2-Fluorobiphenyl (Surr.)	49-105	NA	NA	NA
8270C	3520C	Water	2-Fluorophenol (Surr.)	42-104	NA	NA	NA
8270C	3520C	Water	Nitrobenzene-d5 (Surr.)	51-113	NA	NA	NA
8270C	3520C	Water	Phenol-d6 (Surr.)	49-113	NA	NA	NA
8270C	3520C	Water	Terphenyl-d14 (Surr.)	27-136	NA	NA	NA
8270C	3510C	TCLP	1,2,4-Trichlorobenzene		44-102	NA	30
8270C	3510C	TCLP	1,2-Dichlorobenzene		45-100	NA	30

SEMIVOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8270C	3510C	TCLP	1,3-Dichlorobenzene	44-98	NA	30
8270C	3510C	TCLP	1,4-Dichlorobenzene	43-96	NA	30
8270C	3510C	TCLP	2,4,5-Trichlorophenol	68-108	60-119	30
8270C	3510C	TCLP	2,4,6-Trichlorophenol	67-106	58-119	30
8270C	3510C	TCLP	2,4-Dichlorophenol	54-108	NA	30
8270C	3510C	TCLP	2,4-Dimethylphenol	45-110	NA	30
8270C	3510C	TCLP	2,4-Dinitrophenol	14-128	NA	30
8270C	3510C	TCLP	2,4-Dinitrotoluene	67-121	56-126	30
8270C	3510C	TCLP	2,6-Dinitrotoluene	60-122	NA	30
8270C	3510C	TCLP	2-Chloronaphthalene	50-105	NA	30
8270C	3510C	TCLP	2-Chlorophenol	55-107	NA	30
8270C	3510C	TCLP	2-Methyl-4,6-dinitrophenol	46-123	NA	30
8270C	3510C	TCLP	2-Methylnaphthalene	48-100	NA	30
8270C	3510C	TCLP	2-Methylphenol	61-101	53-106	30
8270C	3510C	TCLP	2-Nitroaniline	55-125	NA	30
8270C	3510C	TCLP	2-Nitrophenol	53-111	NA	30
8270C	3510C	TCLP	3,3'-Dichlorobenzidine	41-134	NA	30
8270C	3510C	TCLP	3-Nitroaniline	55-126	NA	30
8270C	3510C	TCLP	4-Bromophenyl Phenyl Ether	52-117	NA	30
8270C	3510C	TCLP	4-Chloro-3-methylphenol	59-113	NA	30
8270C	3510C	TCLP	4-Chloroaniline	53-111	NA	30
8270C	3510C	TCLP	4-Chlorophenyl Phenyl Ether	54-114	NA	30
8270C	3510C	TCLP	4-Methylphenol	56-103	52-107	30
8270C	3510C	TCLP	4-Nitroaniline	52-125	NA	30
8270C	3510C	TCLP	4-Nitrophenol	33-120	NA	30
8270C	3510C	TCLP	Acenaphthene	55-108	NA	30
8270C	3510C	TCLP	Acenaphthylene	59-115	NA	30
8270C	3510C	TCLP	Aniline	15-109	NA	30
8270C	3510C	TCLP	Anthracene	57-117	NA	30
8270C	3510C	TCLP	Benz(a)anthracene	60-121	NA	30
8270C	3510C	TCLP	Benzo(a)pyrene	62-123	NA	30
8270C	3510C	TCLP	Benzo(b)fluoranthene	58-120	NA	30
8270C	3510C	TCLP	Benzo(g,h,i)perylene	56-120	NA	30
8270C	3510C	TCLP	Benzo(k)fluoranthene	59-121	NA	30
8270C	3510C	TCLP	Benzoic acid	10-103	NA	30
8270C	3510C	TCLP	Benzyl alcohol	52-106	NA	30
8270C	3510C	TCLP	bis(2-Chloroethoxy)methane	52-106	NA	30
8270C	3510C	TCLP	Bis(2-chloroethyl) Ether	52-108	NA	30
8270C	3510C	TCLP	Bis(2-chloroisopropyl) Ether	42-113	NA	30
8270C	3510C	TCLP	Bis(2-ethylhexyl) Phthalate	56-128	NA	30
8270C	3510C	TCLP	Butyl Benzyl Phthalate	56-124	NA	30
8270C	3510C	TCLP	Carbazole	60-117	NA	30
8270C	3510C	TCLP	Chrysene	61-117	NA	30
8270C	3510C	TCLP	Di-n-butyl Phthalate	55-126	NA	30
8270C	3510C	TCLP	Di-n-octyl Phthalate	57-130	NA	30
8270C	3510C	TCLP	Dibenz(a,h)anthracene	55-124	NA	30
8270C	3510C	TCLP	Dibenzofuran	55-111	NA	30
8270C	3510C	TCLP	Diethyl Phthalate	57-127	NA	30
8270C	3510C	TCLP	Dimethyl Phthalate	58-118	NA	30
8270C	3510C	TCLP	Fluoranthene	52-121	NA	30
8270C	3510C	TCLP	Fluorene	55-112	NA	30
8270C	3510C	TCLP	Hexachlorobenzene	62-112	61-112	30
8270C	3510C	TCLP	Hexachlorobutadiene	52-93	43-107	30
8270C	3510C	TCLP	Hexachlorocyclopentadiene	24-119	NA	30

SEMIVOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8270C	3510C	TCLP	Hexachloroethane	54-94	43-106	30
8270C	3510C	TCLP	Indeno(1,2,3-cd)pyrene	55-124	NA	30
8270C	3510C	TCLP	Isophorone	59-123	NA	30
8270C	3510C	TCLP	N-Nitrosodi-n-propylamine	56-116	NA	30
8270C	3510C	TCLP	N-Nitrosodimethylamine	48-117	NA	30
8270C	3510C	TCLP	N-Nitrosodiphenylamine	59-127	NA	30
8270C	3510C	TCLP	Naphthalene	48-100	NA	30
8270C	3510C	TCLP	Nitrobenzene	62-102	43-131	30
8270C	3510C	TCLP	Pentachlorophenol	54-110	49-122	30
8270C	3510C	TCLP	Phenanthrene	55-112	NA	30
8270C	3510C	TCLP	Phenol	41-100	NA	30
8270C	3510C	TCLP	Pyrene	51-116	NA	30
8270C	3510C	TCLP	Pyridine	10-98	10-105	30
8270C	3510C	TCLP	2,4,6-Tribromophenol (Surr.) 56-117	NA	NA	NA
8270C	3510C	TCLP	2-Fluorobiphenyl (Surr.) 54-104	NA	NA	NA
8270C	3510C	TCLP	2-Fluorophenol (Surr.) 55-99	NA	NA	NA
8270C	3510C	TCLP	Nitrobenzene-d5 (Surr.) 66-106	NA	NA	NA
8270C	3510C	TCLP	Phenol-d6 (Surr.) 55-99	NA	NA	NA
8270C	3510C	TCLP	Terphenyl-d14 (Surr.) 60-123	NA	NA	NA
8270C-LL	3541	Soil-LL	1,2,4,5-Tetrachlorobenzene	47-95	33-119	40
8270C-LL	3541	Soil-LL	1,2,4-Trichlorobenzene	40-91	10-80	40
8270C-LL	3541	Soil-LL	1,2-Dichlorobenzene	39-91	10-75	40
8270C-LL	3541	Soil-LL	1,3-Dichlorobenzene	36-89	10-70	40
8270C-LL	3541	Soil-LL	1,4-Dichlorobenzene	37-87	10-72	40
8270C-LL	3541	Soil-LL	2,4,5-Trichlorophenol	37-103	17-133	40
8270C-LL	3541	Soil-LL	2,4,6-Trichlorophenol	37-100	14-132	40
8270C-LL	3541	Soil-LL	2,4-Dichlorophenol	36-100	19-109	40
8270C-LL	3541	Soil-LL	2,4-Dimethylphenol	10-63	10-92	40
8270C-LL	3541	Soil-LL	2,4-Dinitrophenol	14-111	10-166	40
8270C-LL	3541	Soil-LL	2,4-Dinitrotoluene	52-107	30-120	40
8270C-LL	3541	Soil-LL	2,6-Dinitrotoluene	50-98	28-116	40
8270C-LL	3541	Soil-LL	2-Chloronaphthalene	40-94	16-105	40
8270C-LL	3541	Soil-LL	2-Chlorophenol	35-98	10-116	40
8270C-LL	3541	Soil-LL	2-Methyl-4,6-dinitrophenol	30-114	10-119	40
8270C-LL	3541	Soil-LL	2-Methylnaphthalene	41-87	10-109	40
8270C-LL	3541	Soil-LL	2-Methylphenol	30-91	10-105	40
8270C-LL	3541	Soil-LL	2-Nitroaniline	44-96	24-117	40
8270C-LL	3541	Soil-LL	2-Nitrophenol	37-100	18-101	40
8270C-LL	3541	Soil-LL	3,3'-Dichlorobenzidine	22-94	10-62	40
8270C-LL	3541	Soil-LL	3-Nitroaniline	43-93	10-91	40
8270C-LL	3541	Soil-LL	4-Bromophenyl Phenyl Ether	47-96	21-117	40
8270C-LL	3541	Soil-LL	4-Chloro-3-methylphenol	36-102	17-120	40
8270C-LL	3541	Soil-LL	4-Chloroaniline	26-78	10-62	40
8270C-LL	3541	Soil-LL	4-Chlorophenyl Phenyl Ether	44-97	23-111	40
8270C-LL	3541	Soil-LL	4-Methylphenol	28-94	10-114	40
8270C-LL	3541	Soil-LL	4-Nitroaniline	40-100	10-104	40
8270C-LL	3541	Soil-LL	4-Nitrophenol	35-120	22-128	40
8270C-LL	3541	Soil-LL	Acenaphthene	44-92	10-132	40
8270C-LL	3541	Soil-LL	Acenaphthylene	49-100	11-130	40
8270C-LL	3541	Soil-LL	Acetophenone	49-96	11-140	40
8270C-LL	3541	Soil-LL	Aniline	10-70	10-47	40
8270C-LL	3541	Soil-LL	Anthracene	51-97	10-135	40
8270C-LL	3541	Soil-LL	Atrazine	43-126	18-153	40
8270C-LL	3541	Soil-LL	Azobenzene	40-101	31-96	40

SEMIVOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8270C-LL	3541	Soil-LL	Benz(a)anthracene	58-106	10-136	40
8270C-LL	3541	Soil-LL	Benzaldehyde	20-95	10-105	40
8270C-LL	3541	Soil-LL	Benzo(a)pyrene	56-107	10-152	40
8270C-LL	3541	Soil-LL	Benzo(b)fluoranthene	56-104	10-156	40
8270C-LL	3541	Soil-LL	Benzo(g,h,i)perylene	27-121	10-146	40
8270C-LL	3541	Soil-LL	Benzo(k)fluoranthene	58-106	19-131	40
8270C-LL	3541	Soil-LL	Benzoic Acid	10-88	10-124	40
8270C-LL	3541	Soil-LL	Benzyl Alcohol	35-88	21-95	40
8270C-LL	3541	Soil-LL	Biphenyl	44-98	13-133	40
8270C-LL	3541	Soil-LL	Bis(2-chloroethoxy)methane	42-89	24-95	40
8270C-LL	3541	Soil-LL	Bis(2-chloroethyl) Ether	41-89	10-122	40
8270C-LL	3541	Soil-LL	Bis(2-chloroisopropyl) Ether	35-90	10-91	40
8270C-LL	3541	Soil-LL	Bis(2-ethylhexyl) Phthalate	47-124	10-150	40
8270C-LL	3541	Soil-LL	Butyl Benzyl Phthalate	48-119	21-130	40
8270C-LL	3541	Soil-LL	Caprolactam	23-113	10-197	40
8270C-LL	3541	Soil-LL	Carbazole	53-104	25-119	40
8270C-LL	3541	Soil-LL	Chrysene	57-111	10-139	40
8270C-LL	3541	Soil-LL	Di-n-butyl Phthalate	51-111	15-133	40
8270C-LL	3541	Soil-LL	Di-n-octyl Phthalate	41-123	28-122	40
8270C-LL	3541	Soil-LL	Dibenz(a,h)anthracene	55-107	10-148	40
8270C-LL	3541	Soil-LL	Dibenzofuran	44-91	10-129	40
8270C-LL	3541	Soil-LL	Diethyl Phthalate	48-107	23-123	40
8270C-LL	3541	Soil-LL	Dimethyl Phthalate	48-99	24-118	40
8270C-LL	3541	Soil-LL	Fluoranthene	53-108	10-150	40
8270C-LL	3541	Soil-LL	Fluorene	46-97	10-172	40
8270C-LL	3541	Soil-LL	Hexachlorobenzene	46-103	31-111	40
8270C-LL	3541	Soil-LL	Hexachlorobutadiene	37-92	10-93	40
8270C-LL	3541	Soil-LL	Hexachlorocyclopentadiene	21-98	10-75	40
8270C-LL	3541	Soil-LL	Hexachloroethane	37-90	10-89	40
8270C-LL	3541	Soil-LL	Indeno(1,2,3-cd)pyrene	55-107	10-130	40
8270C-LL	3541	Soil-LL	Isophorone	47-101	29-108	40
8270C-LL	3541	Soil-LL	N-Nitrosodi-n-propylamine	40-100	18-111	40
8270C-LL	3541	Soil-LL	N-Nitrosodimethylamine	31-103	21-101	40
8270C-LL	3541	Soil-LL	N-Nitrosodiphenylamine	47-108	22-130	40
8270C-LL	3541	Soil-LL	Naphthalene	41-90	10-113	40
8270C-LL	3541	Soil-LL	Nitrobenzene	40-91	20-92	40
8270C-LL	3541	Soil-LL	Pentachlorophenol	22-100	10-145	40
8270C-LL	3541	Soil-LL	Phenanthrene	50-96	10-147	40
8270C-LL	3541	Soil-LL	Phenol	35-102	14-114	40
8270C-LL	3541	Soil-LL	Pyrene	50-108	10-136	40
8270C-LL	3541	Soil-LL	Pyridine	10-68	70-130	40
8270C-LL	3541	Soil-LL	2,4,6-Tribromophenol (Surr.) 16-122	NA	NA	NA
8270C-LL	3541	Soil-LL	2-Fluorobiphenyl (Surr.) 10-107	NA	NA	NA
8270C-LL	3541	Soil-LL	2-Fluorophenol (Surr.) 12-88	NA	NA	NA
8270C-LL	3541	Soil-LL	Nitrobenzene-d5 (Surr.) 10-97	NA	NA	NA
8270C-LL	3541	Soil-LL	Phenol-d6 (Surr.) 20-101	NA	NA	NA
8270C-LL	3541	Soil-LL	Terphenyl-d14 (Surr.) 28-135	NA	NA	NA
8270C-LL	3520C	Water-LL	1,2,4,5-Tetrachlorobenzene	70-130	70-130	30
8270C-LL	3520C	Water-LL	1,2,4-Trichlorobenzene	38-94	26-96	30
8270C-LL	3520C	Water-LL	1,2-Dichlorobenzene	40-91	24-96	30
8270C-LL	3520C	Water-LL	1,3-Dichlorobenzene	34-84	19-87	30
8270C-LL	3520C	Water-LL	1,4-Dichlorobenzene	35-84	21-87	30
8270C-LL	3520C	Water-LL	2,4,5-Trichlorophenol	64-129	56-135	30
8270C-LL	3520C	Water-LL	2,4,6-Trichlorophenol	65-127	48-139	30

SEMIVOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8270C-LL	3520C	Water-LL	2,4-Dichlorophenol	57-134	43-134	30
8270C-LL	3520C	Water-LL	2,4-Dimethylphenol	14-116	10-181	30
8270C-LL	3520C	Water-LL	2,4-Dinitrophenol	10-125	20-203	30
8270C-LL	3520C	Water-LL	2,4-Dinitrotoluene	71-130	56-149	30
8270C-LL	3520C	Water-LL	2,6-Dinitrotoluene	70-121	63-138	30
8270C-LL	3520C	Water-LL	2-Chloronaphthalene	48-106	47-111	30
8270C-LL	3520C	Water-LL	2-Chlorophenol	64-130	46-129	30
8270C-LL	3520C	Water-LL	2-Methyl-4,6-dinitrophenol	22-149	26-165	30
8270C-LL	3520C	Water-LL	2-Methylnaphthalene	47-101	42-101	30
8270C-LL	3520C	Water-LL	2-Methylphenol	54-125	27-151	30
8270C-LL	3520C	Water-LL	2-Nitroaniline	64-118	10-160	30
8270C-LL	3520C	Water-LL	2-Nitrophenol	57-139	52-141	30
8270C-LL	3520C	Water-LL	3,3'-Dichlorobenzidine	37-121	70-130	30
8270C-LL	3520C	Water-LL	3-Nitroaniline	52-129	10-146	30
8270C-LL	3520C	Water-LL	4-Bromophenyl Phenyl Ether	64-110	47-122	30
8270C-LL	3520C	Water-LL	4-Chloro-3-methylphenol	59-133	17-166	30
8270C-LL	3520C	Water-LL	4-Chloroaniline	46-102	10-110	30
8270C-LL	3520C	Water-LL	4-Chlorophenyl Phenyl Ether	60-114	48-118	30
8270C-LL	3520C	Water-LL	4-Methylphenol	52-129	24-155	30
8270C-LL	3520C	Water-LL	4-Nitroaniline	56-122	10-127	30
8270C-LL	3520C	Water-LL	4-Nitrophenol	65-135	45-185	30
8270C-LL	3520C	Water-LL	Acenaphthene	62-107	38-118	30
8270C-LL	3520C	Water-LL	Acenaphthylene	66-119	43-130	30
8270C-LL	3520C	Water-LL	Acetophenone	53-123	65-135	30
8270C-LL	3520C	Water-LL	Aniline	10-103	70-130	30
8270C-LL	3520C	Water-LL	Anthracene	65-105	11-143	30
8270C-LL	3520C	Water-LL	Atrazine	70-130	70-130	30
8270C-LL	3520C	Water-LL	Azobenzene	66-112	70-130	30
8270C-LL	3520C	Water-LL	Benz(a)anthracene	73-111	32-130	30
8270C-LL	3520C	Water-LL	Benzaldehyde	70-130	58-121	30
8270C-LL	3520C	Water-LL	Benzo(a)pyrene	67-111	25-131	30
8270C-LL	3520C	Water-LL	Benzo(b)fluoranthene	68-112	29-136	30
8270C-LL	3520C	Water-LL	Benzo(g,h,i)perylene	71-116	24-145	30
8270C-LL	3520C	Water-LL	Benzo(k)fluoranthene	70-115	31-133	30
8270C-LL	3520C	Water-LL	Benzoic Acid	10-74	10-177	30
8270C-LL	3520C	Water-LL	Benzyl Alcohol	59-109	28-145	30
8270C-LL	3520C	Water-LL	Biphenyl	70-130	70-130	30
8270C-LL	3520C	Water-LL	Bis(2-chloroethoxy)methane	62-116	57-119	30
8270C-LL	3520C	Water-LL	Bis(2-chloroethyl) Ether	65-118	54-120	30
8270C-LL	3520C	Water-LL	Bis(2-chloroisopropyl) Ether	55-118	20-154	30
8270C-LL	3520C	Water-LL	Bis(2-ethylhexyl) Phthalate	65-124	26-167	30
8270C-LL	3520C	Water-LL	Butyl Benzyl Phthalate	69-121	48-136	30
8270C-LL	3520C	Water-LL	Caprolactam	70-130	70-130	30
8270C-LL	3520C	Water-LL	Carbazole	72-115	48-131	30
8270C-LL	3520C	Water-LL	Chrysene	70-115	42-135	30
8270C-LL	3520C	Water-LL	Di-n-butyl Phthalate	76-114	52-132	30
8270C-LL	3520C	Water-LL	Di-n-octyl Phthalate	66-122	49-130	30
8270C-LL	3520C	Water-LL	Dibenz(a,h)anthracene	72-114	27-142	30
8270C-LL	3520C	Water-LL	Dibenzofuran	59-109	50-120	30
8270C-LL	3520C	Water-LL	Diethyl Phthalate	72-120	42-146	30
8270C-LL	3520C	Water-LL	Dimethyl Phthalate	72-115	52-141	30
8270C-LL	3520C	Water-LL	Fluoranthene	69-117	33-151	30
8270C-LL	3520C	Water-LL	Fluorene	64-113	46-132	30
8270C-LL	3520C	Water-LL	Hexachlorobenzene	61-118	45-122	30

SEMIVOLATILE ORGANICS ANALYSES							
Method	**Prep Method**	**Matrix**	**Analyte**		**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8270C-LL	3520C	Water-LL	Hexachlorobutadiene		17-85	10-79	30
8270C-LL	3520C	Water-LL	Hexachlorocyclopentadiene		10-67	10-65	30
8270C-LL	3520C	Water-LL	Hexachloroethane		24-80	10-93	30
8270C-LL	3520C	Water-LL	Indeno(1,2,3-cd)pyrene		74-113	26-143	30
8270C-LL	3520C	Water-LL	Isophorone		68-131	50-146	30
8270C-LL	3520C	Water-LL	N-Nitrosodi-n-propylamine		61-124	44-149	30
8270C-LL	3520C	Water-LL	N-Nitrosodimethylamine		44-151	70-130	30
8270C-LL	3520C	Water-LL	N-Nitrosodiphenylamine		69-125	10-143	30
8270C-LL	3520C	Water-LL	Naphthalene		55-103	44-107	30
8270C-LL	3520C	Water-LL	Nitrobenzene		65-113	44-152	30
8270C-LL	3520C	Water-LL	Pentachlorophenol		23-130	38-150	30
8270C-LL	3520C	Water-LL	Phenanthrene		67-107	53-120	30
8270C-LL	3520C	Water-LL	Phenol		61-134	22-158	30
8270C-LL	3520C	Water-LL	Pyrene		67-114	24-144	30
8270C-LL	3520C	Water-LL	Pyridine		32-100	70-130	30
8270C-LL	3520C	Water-LL	2,4,6-Tribromophenol (Surr.)	43-144	NA	NA	NA
8270C-LL	3520C	Water-LL	2-Fluorobiphenyl (Surr.)	45-120	NA	NA	NA
8270C-LL	3520C	Water-LL	2-Fluorophenol (Surr.)	41-118	NA	NA	NA
8270C-LL	3520C	Water-LL	Nitrobenzene-d5 (Surr.)	46-130	NA	NA	NA
8270C-LL	3520C	Water-LL	Phenol-d6 (Surr.)	47-132	NA	NA	NA
8270C-LL	3520C	Water-LL	Terphenyl-d14 (Surr.)	43-150	NA	NA	NA
8270-SIM	3541	Soil	1,2,4-Trichlorobenzene		70-130	70-130	40
8270-SIM	3541	Soil	1,2-Dichlorobenzene		70-130	70-130	40
8270-SIM	3541	Soil	1,3-Dichlorobenzene		70-130	70-130	40
8270-SIM	3541	Soil	1,4-Dichlorobenzene		70-130	70-130	40
8270-SIM	3541	Soil	1-Methylnaphthalene		46-119	23-121	40
8270-SIM	3541	Soil	1-Methylphenanthrene		59-118	52-114	40
8270-SIM	3541	Soil	2,3,4,5-Tetrachlorophenol		44-134	48-141	40
8270-SIM	3541	Soil	2,3,4,6-Tetrachlorophenol		46-121	70-130	40
8270-SIM	3541	Soil	2,3,4-Trichlorophenol		49-131	35-155	40
8270-SIM	3541	Soil	2,3,5,6-Tetrachlorophenol		40-135	27-168	40
8270-SIM	3541	Soil	2,3,5-Trichlorophenol		45-134	26-166	40
8270-SIM	3541	Soil	2,3,5-Trimethylnaphthalene		53-116	47-105	40
8270-SIM	3541	Soil	2,3,6-Trichlorophenol		46-134	25-165	40
8270-SIM	3541	Soil	2,4,5-Trichlorophenol		39-131	59-118	40
8270-SIM	3541	Soil	2,4,6-Trichlorophenol		39-132	53-121	40
8270-SIM	3541	Soil	2,4-Dichlorophenol		70-130	70-130	40
8270-SIM	3541	Soil	2,4-Dimethylphenol		70-130	70-130	40
8270-SIM	3541	Soil	2,4-Dinitrophenol		70-130	70-130	40
8270-SIM	3541	Soil	2,4-Dinitrotoluene		70-130	70-130	40
8270-SIM	3541	Soil	2,6-Dimethylnaphthalene		36-136	36-107	40
8270-SIM	3541	Soil	2,6-Dinitrotoluene		70-130	70-130	40
8270-SIM	3541	Soil	2-Chloronaphthalene		70-130	70-130	40
8270-SIM	3541	Soil	2-Chlorophenol		70-130	70-130	40
8270-SIM	3541	Soil	2-Methyl-4,6-dinitrophenol		70-130	70-130	40
8270-SIM	3541	Soil	2-Methylnaphthalene		42-121	13-126	40
8270-SIM	3541	Soil	2-Methylphenol		70-130	70-130	40
8270-SIM	3541	Soil	2-Nitroaniline		70-130	70-130	40
8270-SIM	3541	Soil	2-Nitrophenol		70-130	70-130	40
8270-SIM	3541	Soil	3,3'-Dichlorobenzidine		70-130	70-130	40
8270-SIM	3541	Soil	3,4,5-Trichlorophenol		10-155	10-182	40
8270-SIM	3541	Soil	3-Nitroaniline		70-130	70-130	40
8270-SIM	3541	Soil	4-Bromophenyl Phenyl Ether		70-130	70-130	40
8270-SIM	3541	Soil	4-Chloro-3-methylphenol		70-130	70-130	40

SEMIVOLATILE ORGANICS ANALYSES							
Method	**Prep Method**	**Matrix**	**Analyte**		**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8270-SIM	3541	Soil	4-Chloroaniline		70-130	70-130	40
8270-SIM	3541	Soil	4-Chlorophenyl Phenyl Ether		70-130	70-130	40
8270-SIM	3541	Soil	4-Methylphenol		70-130	70-130	40
8270-SIM	3541	Soil	4-Nitroaniline		70-130	70-130	40
8270-SIM	3541	Soil	4-Nitrophenol		70-130	70-130	40
8270-SIM	3541	Soil	Acenaphthene		50-110	18-125	40
8270-SIM	3541	Soil	Acenaphthylene		50-111	21-121	40
8270-SIM	3541	Soil	Aniline		70-130	70-130	40
8270-SIM	3541	Soil	Anthracene		52-115	19-133	40
8270-SIM	3541	Soil	Benz(a)anthracene		51-118	12-139	40
8270-SIM	3541	Soil	Benzo(a)pyrene		56-122	10-148	40
8270-SIM	3541	Soil	Benzo(b)fluoranthene		55-125	12-144	40
8270-SIM	3541	Soil	Benzo(e)pyrene		61-117	22-131	40
8270-SIM	3541	Soil	Benzo(g,h,i)perylene		49-125	10-148	40
8270-SIM	3541	Soil	Benzo(k)fluoranthene		55-124	11-145	40
8270-SIM	3541	Soil	Biphenyl		40-130	18-131	40
8270-SIM	3541	Soil	Bis(2-chloroethoxy)methane		70-130	70-130	40
8270-SIM	3541	Soil	Bis(2-chloroethyl) Ether		70-130	70-130	40
8270-SIM	3541	Soil	Bis(2-chloroisopropyl) Ether		70-130	70-130	40
8270-SIM	3541	Soil	Bis(2-ethylhexyl) Phthalate		70-130	70-130	40
8270-SIM	3541	Soil	Butyl Benzyl Phthalate		70-130	70-130	40
8270-SIM	3541	Soil	Carbazole		10-138	14-177	40
8270-SIM	3541	Soil	Chrysene		54-120	12-145	40
8270-SIM	3541	Soil	Di-n-butyl Phthalate		70-130	70-130	40
8270-SIM	3541	Soil	Di-n-octyl Phthalate		70-130	70-130	40
8270-SIM	3541	Soil	Dibenz(a,h)anthracene		37-135	12-143	40
8270-SIM	3541	Soil	Dibenzofuran		50-115	21-126	40
8270-SIM	3541	Soil	Dibenzothiophene		34-113	10-127	40
8270-SIM	3541	Soil	Diethyl Phthalate		70-130	70-130	40
8270-SIM	3541	Soil	Dimethyl Phthalate		70-130	70-130	40
8270-SIM	3541	Soil	Fluoranthene		55-121	10-149	40
8270-SIM	3541	Soil	Fluorene		52-112	22-125	40
8270-SIM	3541	Soil	Hexachlorobenzene		70-130	70-130	40
8270-SIM	3541	Soil	Hexachlorobutadiene		70-130	70-130	40
8270-SIM	3541	Soil	Hexachlorocyclopentadiene		70-130	70-130	40
8270-SIM	3541	Soil	Hexachloroethane		70-130	70-130	40
8270-SIM	3541	Soil	Indeno(1,2,3-cd)pyrene		42-133	10-151	40
8270-SIM	3541	Soil	Isophorone		70-130	70-130	40
8270-SIM	3541	Soil	N-Nitrosodi-n-propylamine		70-130	70-130	40
8270-SIM	3541	Soil	N-Nitrosodimethylamine		70-130	70-130	40
8270-SIM	3541	Soil	N-Nitrosodiphenylamine		70-130	70-130	40
8270-SIM	3541	Soil	Naphthalene		48-107	10-121	40
8270-SIM	3541	Soil	Nitrobenzene		70-130	70-130	40
8270-SIM	3541	Soil	Pentachlorophenol		10-126	10-144	40
8270-SIM	3541	Soil	Perylene		62-118	25-129	40
8270-SIM	3541	Soil	Phenanthrene		53-112	10-143	40
8270-SIM	3541	Soil	Phenol		70-130	70-130	40
8270-SIM	3541	Soil	Pyrene		47-129	10-150	40
8270-SIM	3541	Soil	2,4,6-Tribromophenol (Surr.)	10-181	NA	NA	NA
8270-SIM	3541	Soil	2-Fluorobiphenyl (Surr.)	23-127	NA	NA	NA
8270-SIM	3541	Soil	2-Fluorophenol (Surr.)	10-94	NA	NA	NA
8270-SIM	3541	Soil	Fluoranthene-d10 (Surr.)	10-136	NA	NA	NA
8270-SIM	3541	Soil	Fluorene-d10 (Surr.)	10-123	NA	NA	NA
8270-SIM	3541	Soil	Nitrobenzene-d5 (Surr.)	10-130	NA	NA	NA

SEMIVOLATILE ORGANICS ANALYSES							
Method	**Prep Method**	**Matrix**	**Analyte**		**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8270-SIM	3541	Soil	Phenol-d6 (Surr.)	21-130	NA	NA	NA
8270-SIM	3541	Soil	Terphenyl-d14 (Surr.)	32-123	NA	NA	NA
8270-SIM	3510C/20C/35	Water	1,4-Dioxane		45-103	40-104	30
8270-SIM	3510C/20C/35	Water	1-Methylnaphthalene		28-135	27-154	30
8270-SIM	3510C/20C/35	Water	1-Methylphenanthrene		24-161	19-172	30
8270-SIM	3510C/20C/35	Water	2,3,4,5-Tetrachlorophenol		39-152	70-130	30
8270-SIM	3510C/20C/35	Water	2,3,4,6-Tetrachlorophenol		10-251	70-130	30
8270-SIM	3510C/20C/35	Water	2,3,4-Trichlorophenol		66-120	70-130	30
8270-SIM	3510C/20C/35	Water	2,3,5,6-Tetrachlorophenol		31-128	70-130	30
8270-SIM	3510C/20C/35	Water	2,3,5-Trichlorophenol		65-119	70-130	30
8270-SIM	3510C/20C/35	Water	2,3,5-Trimethylnaphthalene		23-155	34-149	30
8270-SIM	3510C/20C/35	Water	2,3,6-Trichlorophenol		63-122	70-130	30
8270-SIM	3510C/20C/35	Water	2,4,5-Trichlorophenol		53-135	70-130	30
8270-SIM	3510C/20C/35	Water	2,4,6-Trichlorophenol		54-132	70-130	30
8270-SIM	3510C/20C/35	Water	2,4-Dichlorophenol		70-130	70-130	30
8270-SIM	3510C/20C/35	Water	2,4-Dimethylphenol		70-130	70-130	30
8270-SIM	3510C/20C/35	Water	2,4-Dinitrophenol		70-130	70-130	30
8270-SIM	3510C/20C/35	Water	2,6-Dimethylnaphthalene		10-154	22-165	30
8270-SIM	3510C/20C/35	Water	2-Chlorophenol		70-130	70-130	30
8270-SIM	3510C/20C/35	Water	2-Methyl-4,6-dinitrophenol		70-130	70-130	30
8270-SIM	3510C/20C/35	Water	2-Methylnaphthalene		23-141	28-134	30
8270-SIM	3510C/20C/35	Water	2-Methylphenol		70-130	70-130	30
8270-SIM	3510C/20C/35	Water	2-Nitrophenol		70-130	70-130	30
8270-SIM	3510C/20C/35	Water	3,4,5-Trichlorophenol		66-125	70-130	30
8270-SIM	3510C/20C/35	Water	3-Methylcholanthrene		70-130	70-130	30
8270-SIM	3510C/20C/35	Water	4-Chloro-3-methylphenol		70-130	70-130	30
8270-SIM	3510C/20C/35	Water	4-Methylphenol		70-130	70-130	30
8270-SIM	3510C/20C/35	Water	4-Nitrophenol		70-130	70-130	30
8270-SIM	3510C/20C/35	Water	7,12-Dimethylbenz(a)anthracene		70-130	70-130	30
8270-SIM	3510C/20C/35	Water	Acenaphthene		41-135	33-135	30
8270-SIM	3510C/20C/35	Water	Acenaphthylene		40-138	28-143	30
8270-SIM	3510C/20C/35	Water	Anthracene		36-139	24-139	30
8270-SIM	3510C/20C/35	Water	Benz(a)anthracene		46-136	24-142	30
8270-SIM	3510C/20C/35	Water	Benzo(a)pyrene		43-138	10-153	30
8270-SIM	3510C/20C/35	Water	Benzo(b)fluoranthene		53-139	15-156	30
8270-SIM	3510C/20C/35	Water	Benzo(e)pyrene		28-160	16-152	30
8270-SIM	3510C/20C/35	Water	Benzo(g,h,i)perylene		42-146	19-150	30
8270-SIM	3510C/20C/35	Water	Benzo(k)fluoranthene		53-140	14-153	30
8270-SIM	3510C/20C/35	Water	Benzoic Acid		70-130	70-130	30
8270-SIM	3510C/20C/35	Water	Biphenyl		10-178	10-180	30
8270-SIM	3510C/20C/35	Water	Bis(2-ethylhexyl) Phthalate		10-255	70-130	30
8270-SIM	3510C/20C/35	Water	Carbazole		10-213	44-153	30
8270-SIM	3510C/20C/35	Water	Chrysene		51-134	23-144	30
8270-SIM	3510C/20C/35	Water	Dibenz(a,h)anthracene		37-148	12-162	30
8270-SIM	3510C/20C/35	Water	Dibenzofuran		10-183	30-150	30
8270-SIM	3510C/20C/35	Water	Dibenzothiophene		10-206	70-130	30
8270-SIM	3510C/20C/35	Water	Diphenyl Ether		58-130	70-130	30
8270-SIM	3510C/20C/35	Water	Fluoranthene		43-148	16-161	30
8270-SIM	3510C/20C/35	Water	Fluorene		43-139	31-151	30
8270-SIM	3510C/20C/35	Water	Indeno(1,2,3-cd)pyrene		40-146	10-167	30
8270-SIM	3510C/20C/35	Water	N-Nitrosodimethylamine		30-182	70-130	30
8270-SIM	3510C/20C/35	Water	Naphthalene		35-133	26-132	30
8270-SIM	3510C/20C/35	Water	Pentachlorophenol		10-151	10-203	30
8270-SIM	3510C/20C/35	Water	Perylene		17-161	70-130	30

SEMIVOLATILE ORGANICS ANALYSES							
Method	**Prep Method**	**Matrix**	**Analyte**		**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8270-SIM	3510C/20C/35	Water	Phenanthrene		45-138	38-137	30
8270-SIM	3510C/20C/35	Water	Phenol		19-171	70-130	30
8270-SIM	3510C/20C/35	Water	Pyrene		37-154	18-155	30
8270-SIM	3510C/20C/35	Water	Quinoline		53-124	69-133	30
8270-SIM	3510C/20C/35	Water	1,4-Dioxine-d8 (Surr.)	40-124	NA	NA	NA
8270-SIM	3510C/20C/35	Water	2,4,6-Tribromophenol (Surr.)	10-189	NA	NA	NA
8270-SIM	3510C/20C/35	Water	2-Fluorobiphenyl (Surr.)	32-151	NA	NA	NA
8270-SIM	3510C/20C/35	Water	2-Fluorophenol (Surr.)	10-138	NA	NA	NA
8270-SIM	3510C/20C/35	Water	Fluoranthene-d10 (Surr.)	28-150	NA	NA	NA
8270-SIM	3510C/20C/35	Water	Fluorene-d10 (Surr.)	26-131	NA	NA	NA
8270-SIM	3510C/20C/35	Water	Nitrobenzene-d5 (Surr.)	36-174	NA	NA	NA
8270-SIM	3510C/20C/35	Water	Phenol-d6 (Surr.)	28-183	NA	NA	NA
8270-SIM	3510C/20C/35	Water	Terphenyl-d14 (Surr.)	32-157	NA	NA	NA
8270-SIM	3541	Tissue	1,2,4-Trichlorobenzene		41-114	59-109	40
8270-SIM	3541	Tissue	1,2-Dichlorobenzene		41-117	51-106	40
8270-SIM	3541	Tissue	1,3-Dichlorobenzene		41-112	43-104	40
8270-SIM	3541	Tissue	1,4-Dichlorobenzene		41-109	45-101	40
8270-SIM	3541	Tissue	1-Methylnaphthalene		10-174	46-104	40
8270-SIM	3541	Tissue	1-Methylphenanthrene		12-187	70-130	40
8270-SIM	3541	Tissue	2,3,5-Trimethylnaphthalene		10-184	70-130	40
8270-SIM	3541	Tissue	2,4,5-Trichlorophenol		25-159	81-132	40
8270-SIM	3541	Tissue	2,4,6-Trichlorophenol		30-154	72-137	40
8270-SIM	3541	Tissue	2,4-Dichlorophenol		50-124	73-140	40
8270-SIM	3541	Tissue	2,4-Dimethylphenol		10-107	56-145	40
8270-SIM	3541	Tissue	2,4-Dinitrophenol		40-166	10-197	40
8270-SIM	3541	Tissue	2,4-Dinitrotoluene		54-136	73-137	40
8270-SIM	3541	Tissue	2,6-Dimethylnaphthalene		10-186	70-130	40
8270-SIM	3541	Tissue	2,6-Dinitrotoluene		48-138	71-138	40
8270-SIM	3541	Tissue	2-Chloronaphthalene		39-133	37-137	40
8270-SIM	3541	Tissue	2-Chlorophenol		47-118	71-115	40
8270-SIM	3541	Tissue	2-Methyl-4,6-dinitrophenol		42-156	49-148	40
8270-SIM	3541	Tissue	2-Methylnaphthalene		12-159	39-116	40
8270-SIM	3541	Tissue	2-Methylphenol		45-113	66-123	40
8270-SIM	3541	Tissue	2-Nitroaniline		47-122	62-131	40
8270-SIM	3541	Tissue	2-Nitrophenol		46-125	52-163	40
8270-SIM	3541	Tissue	3,3'-Dichlorobenzidine		35-135	70-130	40
8270-SIM	3541	Tissue	3-Nitroaniline		50-121	10-122	40
8270-SIM	3541	Tissue	4-Bromophenyl Phenyl Ether		57-123	66-119	40
8270-SIM	3541	Tissue	4-Chloro-3-methylphenol		54-124	68-161	40
8270-SIM	3541	Tissue	4-Chloroaniline		39-95	10-104	40
8270-SIM	3541	Tissue	4-Chlorophenyl Phenyl Ether		58-115	63-123	40
8270-SIM	3541	Tissue	4-Methylphenol		45-115	60-134	40
8270-SIM	3541	Tissue	4-Nitroaniline		51-134	10-122	40
8270-SIM	3541	Tissue	4-Nitrophenol		48-139	49-161	40
8270-SIM	3541	Tissue	Acenaphthene		44-120	52-112	40
8270-SIM	3541	Tissue	Acenaphthylene		44-124	44-126	40
8270-SIM	3541	Tissue	Acetophenone		10-137	70-130	40
8270-SIM	3541	Tissue	Aniline		10-78	70-130	40
8270-SIM	3541	Tissue	Anthracene		47-128	51-121	40
8270-SIM	3541	Tissue	Atrazine		48-143	70-130	40
8270-SIM	3541	Tissue	Azobenzene		13-143	70-130	40
8270-SIM	3541	Tissue	Benz(a)anthracene		51-135	49-127	40
8270-SIM	3541	Tissue	Benzaldehyde		10-113	70-130	40
8270-SIM	3541	Tissue	Benzo(a)pyrene		49-144	50-126	40

SEMIVOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8270-SIM	3541	Tissue	Benzo(b)fluoranthene	54-138	46-124	40
8270-SIM	3541	Tissue	Benzo(e)pyrene	23-184	70-130	40
8270-SIM	3541	Tissue	Benzo(g,h,i)perylene	45-138	46-124	40
8270-SIM	3541	Tissue	Benzo(k)fluoranthene	55-141	51-126	40
8270-SIM	3541	Tissue	Benzoic Acid	10-214	10-214	40
8270-SIM	3541	Tissue	Benzyl Alcohol	30-122	46-133	40
8270-SIM	3541	Tissue	Biphenyl	12-172	70-130	40
8270-SIM	3541	Tissue	Bis(2-chloroethoxy)methane	46-116	56-124	40
8270-SIM	3541	Tissue	Bis(2-chloroethyl) Ether	52-109	56-112	40
8270-SIM	3541	Tissue	Bis(2-chloroisopropyl) Ether	46-112	42-118	40
8270-SIM	3541	Tissue	Bis(2-ethylhexyl) Phthalate	39-174	53-172	40
8270-SIM	3541	Tissue	Butyl Benzyl Phthalate	56-145	39-171	40
8270-SIM	3541	Tissue	Caprolactam	31-156	70-130	40
8270-SIM	3541	Tissue	Carbazole	10-171	61-127	40
8270-SIM	3541	Tissue	Chrysene	59-132	59-123	40
8270-SIM	3541	Tissue	Di-n-butyl Phthalate	60-146	47-161	40
8270-SIM	3541	Tissue	Di-n-octyl Phthalate	49-156	35-184	40
8270-SIM	3541	Tissue	Dibenz(a,h)anthracene	36-155	42-144	40
8270-SIM	3541	Tissue	Dibenzofuran	11-168	57-115	40
8270-SIM	3541	Tissue	Dibenzothiophene	10-168	70-130	40
8270-SIM	3541	Tissue	Diethyl Phthalate	61-133	60-139	40
8270-SIM	3541	Tissue	Dimethyl Phthalate	60-120	68-124	40
8270-SIM	3541	Tissue	Fluoranthene	47-139	49-130	40
8270-SIM	3541	Tissue	Fluorene	49-120	53-120	40
8270-SIM	3541	Tissue	Hexachlorobenzene	59-124	62-121	40
8270-SIM	3541	Tissue	Hexachlorobutadiene	51-105	43-114	40
8270-SIM	3541	Tissue	Hexachlorocyclopentadiene	19-123	10-105	40
8270-SIM	3541	Tissue	Hexachloroethane	51-110	29-116	40
8270-SIM	3541	Tissue	Indeno(1,2,3-cd)pyrene	37-148	30-148	40
8270-SIM	3541	Tissue	Isophorone	54-127	61-147	40
8270-SIM	3541	Tissue	N-Nitrosodi-n-propylamine	42-132	48-139	40
8270-SIM	3541	Tissue	N-Nitrosodimethylamine	24-115	55-111	40
8270-SIM	3541	Tissue	N-Nitrosodiphenylamine	58-132	71-132	40
8270-SIM	3541	Tissue	Naphthalene	42-116	30-112	40
8270-SIM	3541	Tissue	Nitrobenzene	48-117	54-119	40
8270-SIM	3541	Tissue	Pentachlorophenol	27-160	10-181	40
8270-SIM	3541	Tissue	Perylene	19-189	70-130	40
8270-SIM	3541	Tissue	Phenanthrene	49-121	58-108	40
8270-SIM	3541	Tissue	Phenol	52-118	55-130	40
8270-SIM	3541	Tissue	Pyrene	52-129	58-110	40
8270-SIM	3541	Tissue	Pyridine	12-90	70-130	40
8270-SIM	3541	Tissue	2,4,6-Tribromophenol (Surr.) 47-152	NA	NA	NA
8270-SIM	3541	Tissue	2-Fluorobiphenyl (Surr.) 43-133	NA	NA	NA
8270-SIM	3541	Tissue	2-Fluorophenol (Surr.) 41-112	NA	NA	NA
8270-SIM	3541	Tissue	Fluoranthene-d10 (Surr.) 48-108	NA	NA	NA
8270-SIM	3541	Tissue	Fluorene-d10 (Surr.) 40-97	NA	NA	NA
8270-SIM	3541	Tissue	Nitrobenzene-d5 (Surr.) 35-128	NA	NA	NA
8270-SIM	3541	Tissue	Phenol-d6 (Surr.) 43-133	NA	NA	NA
8270-SIM	3541	Tissue	Terphenyl-d14 (Surr.) 49-137	NA	NA	NA
8310	3550B	Soil	2-Methylnaphthalene	10-170	70-130	40
8310	3550B	Soil	Acenaphthene	47-96	30-101	40

SEMIVOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8310	3550B	Soil	Acenaphthylene	54-97	10-148	40
8310	3550B	Soil	Anthracene	50-93	29-119	40
8310	3550B	Soil	Benz(a)anthracene	70-103	14-146	40
8310	3550B	Soil	Benzo(a)pyrene	45-103	10-156	40
8310	3550B	Soil	Benzo(b)fluoranthene	75-105	10-157	40
8310	3550B	Soil	Benzo(g,h,i)perylene	71-109	10-173	40
8310	3550B	Soil	Benzo(k)fluoranthene	79-102	10-163	40
8310	3550B	Soil	Chrysene	75-103	10-193	40
8310	3550B	Soil	Dibenz(a,h)anthracene	61-123	10-178	40
8310	3550B	Soil	Fluoranthene	54-118	10-173	40
8310	3550B	Soil	Fluorene	48-96	20-124	40
8310	3550B	Soil	Indeno(1,2,3-cd)pyrene	73-106	10-173	40
8310	3550B	Soil	Naphthalene	42-98	10-127	40
8310	3550B	Soil	Phenanthrene	41-118	31-130	40
8310	3550B	Soil	Pyrene	43-129	10-153	40
8310	3550B	Soil	*p* -Terphenyl (Surr.) 42-139	NA	NA	NA
8310	3510C	Water	2-Methylnaphthalene/Dibenzofuran	65-100	70-130	30
8310	3510C	Water	Acenaphthene	70-100	54-105	30
8310	3510C	Water	Acenaphthylene	70-96	41-112	30
8310	3510C	Water	Anthracene	74-107	61-113	30
8310	3510C	Water	Benz(a)anthracene	77-109	62-119	30
8310	3510C	Water	Benzo(a)pyrene	73-106	61-116	30
8310	3510C	Water	Benzo(b)fluoranthene	77-109	48-135	30
8310	3510C	Water	Benzo(g,h,i)perylene	55-130	59-121	30
8310	3510C	Water	Benzo(k)fluoranthene	78-110	66-113	30
8310	3510C	Water	Chrysene	74-108	55-122	30
8310	3510C	Water	Dibenz(a,h)anthracene	52-129	54-130	30
8310	3510C	Water	Fluoranthene	74-104	47-135	30
8310	3510C	Water	Fluorene	70-100	36-132	30
8310	3510C	Water	Indeno(1,2,3-cd)pyrene	43-137	54-116	30
8310	3510C	Water	Naphthalene	65-101	53-109	30
8310	3510C	Water	Phenanthrene	74-106	58-116	30
8310	3510C	Water	Pyrene	69-117	34-150	30
8310	3510C	Water	p-Terphenyl (Surr.) 42-137	NA	NA	NA
8315	Method	Soil	Acetaldehyde	46-125	34-148	40
8315	Method	Soil	Formaldehyde	39-153	39-153	40
8315	Method	Water	Acetaldehyde	10-168	17-165	30
8315	Method	Water	Formaldehyde	39-153	39-153	30
8330	Method	Soil	1,3,5-Trinitrobenzene	75-116	64-122	11
8330	Method	Soil	1,3-Dinitrobenzene	73-119	65-124	11
8330	Method	Soil	2,4,6-Trinitrotoluene	74-118	67-122	12
8330	Method	Soil	2,4-Dinitrotoluene	72-121	62-129	12
8330	Method	Soil	2,6-Dinitrotoluene	69-115	64-121	13
8330	Method	Soil	2-Amino-4,6-dinitrotoluene	50-147	55-138	12
8330	Method	Soil	2-Nitrotoluene	73-116	63-123	11
8330	Method	Soil	3-Nitrotoluene	71-118	61-125	17
8330	Method	Soil	4-Amino-2,6-dinitrotoluene	53-142	60-129	12
8330	Method	Soil	4-Nitrotoluene	77-110	67-119	11
8330	Method	Soil	HMX	74-119	62-125	14
8330	Method	Soil	Nitrobenzene	70-119	62-124	12
8330	Method	Soil	RDX	69-121	57-127	13
8330	Method	Soil	Tetryl	37-150	14-156	29
8330	Method	Soil	1-Chloro-3-nitrobenzene (Surr.) 61-124	NA	NA	NA
8330	Method	Water	1,3,5-Trinitrobenzene	71-108	56-125	14

SEMIVOLATILE ORGANICS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8330	Method	Water	1,3-Dinitrobenzene	72-110	51-140	11
8330	Method	Water	2,4,6-Trinitrotoluene	73-111	57-134	12
8330	Method	Water	2,4-Dinitrotoluene	72-113	53-143	13
8330	Method	Water	2,6-Dinitrotoluene	69-111	43-145	14
8330	Method	Water	2-Amino-4,6-dinitrotoluene	68-114	49-142	14
8330	Method	Water	2-Nitrotoluene	49-112	40-144	52
8330	Method	Water	3-Nitrotoluene	52-114	43-142	45
8330	Method	Water	4-Amino-2,6-dinitrotoluene	72-111	48-142	12
8330	Method	Water	4-Nitrotoluene	57-113	43-144	37
8330	Method	Water	HMX	66-109	47-128	13
8330	Method	Water	Nitrobenzene	53-115	42-145	44
8330	Method	Water	RDX	60-117	42-143	11
8330	Method	Water	Tetryl	55-134	49-138	14
8330	Method	Water	1-Chloro-3-nitrobenzene (Surr.) 55-112	NA	NA	NA
8330	Method	Tissue	1,3,5-Trinitrobenzene	70-130	70-130	40
8330	Method	Tissue	1,3-Dinitrobenzene	70-130	70-130	40
8330	Method	Tissue	2,4,6-Trinitrotoluene	70-130	70-130	40
8330	Method	Tissue	2,4-Dinitrotoluene	70-130	70-130	40
8330	Method	Tissue	2,6-Dinitrotoluene	70-130	70-130	40
8330	Method	Tissue	2-Amino-4,6-dinitrotoluene	70-130	70-130	40
8330	Method	Tissue	2-Nitrotoluene	70-130	70-130	40
8330	Method	Tissue	3-Nitrotoluene	70-130	70-130	40
8330	Method	Tissue	4-Amino-2,6-dinitrotoluene	70-130	70-130	40
8330	Method	Tissue	4-Nitrotoluene	70-130	70-130	40
8330	Method	Tissue	HMX	70-130	70-130	40
8330	Method	Tissue	Nitrobenzene	70-130	70-130	40
8330	Method	Tissue	RDX	70-130	70-130	40
8330	Method	Tissue	Tetryl	70-130	70-130	40
8330	Method	Tissue	1-Chloro-3-nitrobenzene (Surr.) 83-112	NA	NA	NA
8330M	Method	Soil	Picric Acid	70-130	70-130	40
8330M	Method	Soil	2,6-Dinitro-4-methylphenol (Surr.) 51-126	NA	NA	NA
8330M	Method	Water	Picric Acid	70-130	70-130	30
8330M	Method	Water	2,6-Dinitro-4-methylphenol (Surr.) 64-125	NA	NA	NA
8332	Method	Soil	Nitroglycerine	78-112	49-134	40
8332	Method	Soil	PETN	81-111	78-113	40
8332	Method	Soil	1-Chloro-3-nitrobenzene (Surr.) 79-105	NA	NA	NA
8332	Method	Water	Nitroglycerine	32-131	70-130	30
8332	Method	Water	PETN	44-127	70-130	30
8332	Method	Water	2,3-Dimethyl-2,3-dinitrobutane (Surr.) 48-109	NA	NA	NA
Organotin	Method	Soil	Dibutyltin	27-163	10-150	40
Organotin	Method	Soil	Monobutyltin	10-101	10-78	40
Organotin	Method	Soil	Tetrabutyltin	17-135	11-151	40
Organotin	Method	Soil	Tributyltin	26-131	10-146	40
Organotin	Method	Soil	Tripropyltin (Surr.) 20-121	NA	NA	NA
Organotin	Method	Water	Dibutyltin	39-127	34-127	30
Organotin	Method	Water	Monobutyltin	41-163	26-151	30
Organotin	Method	Water	Tetrabutyltin	32-112	10-99	30
Organotin	Method	Water	Tributyltin	51-119	50-120	30
Organotin	Method	Water	Tripropyltin (Surr.) 47-136	NA	NA	NA
Organotin	Method	Tissue	Dibutyltin	10-94	10-121	40
Organotin	Method	Tissue	Monobutyltin	10-115	10-113	40
Organotin	Method	Tissue	Tetrabutyltin	10-110	10-125	40
Organotin	Method	Tissue	Tributyltin	10-97	10-113	40

SEMIVOLATILE ORGANICS ANALYSES							
Method	**Prep Method**	**Matrix**	**Analyte**		**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
Organotin	Method	Tissue	Tripropyltin (Surr.)	10-114	NA	NA	NA
8015M	3550B	Soil	Diesel Range Petroleum Hydrocarbons		76-131	64-141	40
8015M	3550B	Soil	Residual Range Petroleum Hydrocarbons		66-136	49-144	40
8015M	3550B	Soil	Bromofluorobenzene (Surr.)	10-154	NA	NA	NA
8015M	3550B	Soil	o-Terphenyl (Surr.)	56-135	NA	NA	NA
8015M	3510C	Water	Diesel Range Petroleum Hydrocarbons		67-151	47-166	30
8015M	3510C	Water	Residual Range Petroleum Hydrocarbons		60-145	54-153	30
8015M	3510C	Water	Bromofluorobenzene (Surr.)	35-145	NA	NA	NA
8015M	3510C	Water	o-Terphenyl (Surr.)	39-152	NA	NA	NA
AK 102	Method	Soil	Diesel Range Petroleum Hydrocarbons		75-125	60-140	20
AK 102	Method	Soil	o-Terphenyl (Surr.)	50-150	60-120	NA	NA
AK 102	Method	Water	Diesel Range Petroleum Hydrocarbons		75-125	75-125	20
AK 102	Method	Water	o-Terphenyl (Surr.)	50-150	60-120	NA	NA
AK 103	Method	Soil	Residual Range Petroleum Hydrocarbons		60-120	60-140	20
AK 103	Method	Soil	n-Triacontane (Surr.)	50-150	60-120	NA	NA
NWTPH-Dx	Method	Soil	Diesel Range Petroleum Hydrocarbons		62-158	50-168	40
NWTPH-Dx	Method	Soil	o-Terphenyl (Surr.)	50-150	NA	NA	NA
NWTPH-Dx	Method	Water	Diesel Range Petroleum Hydrocarbons		53-161	40-164	30
NWTPH-Dx	Method	Water	o-Terphenyl (Surr.)	50-150	NA	NA	NA
NCASI 94.03	Method	Water	Methanol		70-132	49-141	30
NCASI 99.01	Method	Water	Acetaldehyde		59-127	53-125	30
NCASI 99.01	Method	Water	Methanol		74-124	48-136	30
NCASI 99.01	Method	Water	Methyl Ethyl Ketone		52-137	37-146	30
NCASI 99.01	Method	Water	Propionitrile		46-138	43-126	30
NCASI 99.02	Method	Water	Acrolein		80-120	80-120	30
NCASI 99.02	Method	Water	Acetaldehyde		80-120	80-120	30
NCASI 99.02	Method	Water	Methanol		80-120	80-120	30
NCASI 99.02	Method	Water	Methyl Ethyl Ketone		80-120	80-120	30
NCASI 99.02	Method	Water	Propionitrile		80-120	80-120	30

GENERAL CHEMISTRY/WATER CHEMISTRY ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
1650A	NA	Water	Absorbable Organic Halides	10	4	ug/L
305.1	NA	Water	Acidity as $CaCO_3$	NA	NA	mg/L
310.1 / *SM* 2320B	NA	Water	Alkalinity as $CaCO_3$	2	0.8	mg/L
350.1M	SOP	Soil	Ammonia as Nitrogen	2.5	1	mg/kg
350.3M	SOP	Soil	Ammonia as Nitrogen	10	1	mg/kg
350.1	NA	Water	Ammonia as Nitrogen	0.05	0.006	mg/L
350.3	NA	Water	Ammonia as Nitrogen	0.05	0.009	mg/L
405.1	NA	Water	Biological Oxygen Demand	4	0.5	mg/L
300.1	NA	Water	Bromate	5	2	ug/L
300.0M/9056	SOP	Soil	Bromide	1	0.3	mg/kg
300.0	NA	Water	Bromide	0.2	0.02	mg/L
300.1	NA	Water	Bromide	20	2	ug/L
410.1	NA	Water	Chemical Oxygen Demand	50	20	mg/L
410.2	NA	Water	Chemical Oxygen Demand	5	2.5	mg/L
300.1	NA	Water	Chlorate	20	4	ug/L
300.0M/9056	SOP	Soil	Chloride	0.2	0.03	mg/kg
300.0	NA	Water	Chloride	0.2	0.03	mg/L
9252	NA	Water	Chloride, Titrimetric	0.5	0.2	mg/L
325.3/9252	NA	Water	Chloride, Titrimetric	0.5	0.2	mg/L
330.4	NA	Water	Chlorine, Total Residual	0.1	0.06	mg/L
300.1	NA	Water	Chlorite	20	3	ug/L
110.2	NA	Water	Color	NA	NA	Color
120.1 / *SM* 2510B	NA	Water	Conductivity	2	0.04	umhos/cm
1110	NA	Liquid	Corrosivity	NA	NA	mm/yr
9040	NA	Water	Corrosivity (pH)	NA	NA	pH units
335.2 / 335.4	NA	Water	Cyanide, Total	10	2	ug/L
9012A	9010B	Soil	Cyanide, Total and Amenable	0.1	0.04	mg/kg
9012A	9010B	Water	Cyanide, Total and Amenable	10	2	ug/L
335.1	NA	Water	Cyanides Amenable to Chlorination	0.01	0.003	mg/L
1020	NA	Soil	Flashpoint, Setaflash	NA	NA	Deg. F
1020	NA	Water	Flashpoint, Setaflash	NA	NA	Deg. F
300.0M/9056	SOP	Soil	Fluoride	0.2	0.005	mg/kg
300.0	NA	Water	Fluoride	0.2	0.005	mg/L

GENERAL CHEMISTRY/WATER CHEMISTRY ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
340.2 / *SM* 4500-F⁻C	NA	Water	Fluoride	0.2	0.009	mg/L
340.1M	SOP	Soil	Fluoride, Bellack Distillation	1	0.3	mg/kg
340.1	NA	Water	Fluoride, Bellack Distillation	1	0.3	mg/L
130.2 / *SM* 2340C	NA	Water	Hardness as $CaCO_3$	2	0.6	mg/L
7196A	3060A	Soil	Hexavalent Chromium	0.5	0.08	mg/kg
7196A	Method	Water	Hexavalent Chromium	0.05	0.02	mg/L
300.0M/9056	SOP	Soil	Nitrate as Nitrogen	0.1	0.004	mg/kg
300.0	NA	Water	Nitrate as Nitrogen	0.1	0.004	mg/L
300.0M/9056	SOP	Soil	Nitrite as Nitrogen	0.1	0.003	mg/kg
300.0	NA	Water	Nitrite as Nitrogen	0.1	0.003	mg/L
354.1	NA	Water	Nitrite as Nitrogen, Colorimetric	0.01	0.003	mg/L
353.2M	SOP	Soil	Nitrogen, Nitrate + Nitrite as Nitrogen	10	1.5	mg/kg
353.2	NA	Water	Nitrogen, Nitrate + Nitrite as Nitrogen	0.2	0.02	mg/L
351.4M	SOP	Soil	Nitrogen, Total Kjeldahl	20	4	mg/kg
351.4	NA	Water	Nitrogen, Total Kjeldahl	0.1	0.07	mg/L
365.3	NA	Water	Orthophosphate as Phosphorus	0.01	0.003	mg/L
SM 4500P-F	NA	Water	Orthophosphate as Phosphorus	0.02	0.006	mg/L
ASTM D1498	NA	Water	Oxidation-Reduction Potential	NA	NA	mV
314.0	NA	Water	Perchlorate	2	0.2	ug/L
9045C	NA	Soil	pH	NA	NA	pH units
150.1	NA	Water	pH	NA	NA	pH units
420.1	NA	Water	Phenolics, Total	0.01	0.008	mg/L
365.3	SOP	Soil	Phosphorus, Total	1	0.5	mg/kg
365.3	NA	Water	Phosphorus, Total	0.01	0.003	mg/L
160.5	NA	Water	Solids, Settleable	5	NA	mg/L
160.3	NA	Soil	Solids, Total	NA	NA	%
160.3	NA	Water	Solids, Total	5	NA	mg/L
160.1 / *SM* 2540C	NA	Water	Solids, Total Dissolved (Filterable)	5	NA	mg/L
160.2	NA	Water	Solids, Total Suspended (Nonfilterable)	5	NA	mg/L
160.4	NA	Soil	Solids, Volatile	NA	NA	%
160.4	NA	Water	Solids, Volatile	0.1	NA	mL/L
300.0M/9056	SOP	Soil	Sulfate	2	0.9	mg/kg
300.0	NA	Water	Sulfate	0.2	0.03	mg/L
376.1	NA	Water	Sulfide	2	0.3	mg/L

GENERAL CHEMISTRY/WATER CHEMISTRY ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
9030M	Method	Soil	Sulfides	0.5	0.03	mg/kg
9030M	NA	Water	Sulfides	0.1	0.04	mg/L
377.1	NA	Water	Sulfite	2	0.3	mg/L
425.1	NA	Water	Surfactants (MBAS)	0.05	0.03	mg/L
SM 5550B	NA	Water	Tannin and Lignin	0.2	0.05	mg/L
ASTM D4129-82M	NA	Soil	Total Organic Carbon	0.05	0.02	%
415.1	NA	Water	Total Organic Carbon	0.5	0.07	mg/L
9060A	NA	Water	Total Organic Carbon	0.5	0.07	mg/L
9020	NA	Water	Total Organic Halides	10	4	ug/L
180.1	NA	Water	Turbidity	0.2	0.06	NTU

a Method Detection Limits are subject to change as new MDL studies are completed.

METALS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
7471A	Method	Soil	Mercury	0.02	0.004	mg/kg
245.1	Method	Water	Mercury	0.2	0.02	ug/L
1631	Method	Water	Mercury	1	0.04	ng/L
7470A	Method	Water	Mercury	0.2	0.02	ug/L
1630	Method	Soil	Methyl Mercury	0.1	0.06	ug/kg
1630	Method	Water	Methyl Mercury	0.1	0.02	ng/L
1630	Method	Tissue	Methyl Mercury	10	4	ug/kg
200.7 (ICP)	Method	Soil	Aluminum	10	10	mg/kg
200.7 (ICP)	Method	Soil	Antimony	10	8	mg/kg
200.7 (ICP)	Method	Soil	Arsenic	40	20	mg/kg
200.7 (ICP)	Method	Soil	Barium	1	0.2	mg/kg
200.7 (ICP)	Method	Soil	Beryllium	1	0.1	mg/kg
200.7 (ICP)	Method	Soil	Boron	10	2	mg/kg
200.7 (ICP)	Method	Soil	Cadmium	1	0.8	mg/kg
200.7 (ICP)	Method	Soil	Calcium	10	3	mg/kg
200.7 (ICP)	Method	Soil	Chromium	2	0.6	mg/kg
200.7 (ICP)	Method	Soil	Cobalt	2	2	mg/kg
200.7 (ICP)	Method	Soil	Copper	2	2	mg/kg
200.7 (ICP)	Method	Soil	Iron	4	3	mg/kg
200.7 (ICP)	Method	Soil	Lead	20	5	mg/kg
200.7 (ICP)	Method	Soil	Lithium	4	2	mg/kg
200.7 (ICP)	Method	Soil	Magnesium	4	2	mg/kg
200.7 (ICP)	Method	Soil	Manganese	1	0.3	mg/kg
200.7 (ICP)	Method	Soil	Molybdenum	2	2	mg/kg
200.7 (ICP)	Method	Soil	Nickel	4	3	mg/kg
200.7 (ICP)	Method	Soil	Phosphorus	40	30	mg/kg
200.7 (ICP)	Method	Soil	Potassium	400	300	mg/kg
200.7 (ICP)	Method	Soil	Selenium	40	20	mg/kg
200.7 (ICP)	Method	Soil	Silver	2	2	mg/kg
200.7 (ICP)	Method	Soil	Sodium	20	10	mg/kg
200.7 (ICP)	Method	Soil	Strontium	2	0.1	mg/kg
200.7 (ICP)	Method	Soil	Thallium	40	30	mg/kg

METALS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
200.7 (ICP)	Method	Soil	Tin	20	6	mg/kg
200.7 (ICP)	Method	Soil	Titanium	2	0.3	mg/kg
200.7 (ICP)	Method	Soil	Vanadium	2	0.9	mg/kg
200.7 (ICP)	Method	Soil	Zinc	2	0.5	mg/kg
200.7 (ICP)	Method	Water	Aluminum	50	40	ug/L
200.7 (ICP)	Method	Water	Antimony	50	40	ug/L
200.7 (ICP)	Method	Water	Arsenic	100	40	ug/L
200.7 (ICP)	Method	Water	Barium	5	2	ug/L
200.7 (ICP)	Method	Water	Beryllium	5	0.4	ug/L
200.7 (ICP)	Method	Water	Boron	50	20	ug/L
200.7 (ICP)	Method	Water	Cadmium	5	5	ug/L
200.7 (ICP)	Method	Water	Calcium	50	20	ug/L
200.7 (ICP)	Method	Water	Chromium	5	3	ug/L
200.7 (ICP)	Method	Water	Cobalt	10	5	ug/L
200.7 (ICP)	Method	Water	Copper	10	7	ug/L
200.7 (ICP)	Method	Water	Iron	20	20	ug/L
200.7 (ICP)	Method	Water	Lead	50	30	ug/L
200.7 (ICP)	Method	Water	Lithium	20	4	ug/L
200.7 (ICP)	Method	Water	Magnesium	20	9	ug/L
200.7 (ICP)	Method	Water	Manganese	5	2	ug/L
200.7 (ICP)	Method	Water	Molybdenum	10	9	ug/L
200.7 (ICP)	Method	Water	Nickel	20	20	ug/L
200.7 (ICP)	Method	Water	Phosphorus	200	100	ug/L
200.7 (ICP)	Method	Water	Potassium	2000	700	ug/L
200.7 (ICP)	Method	Water	Selenium	100	60	ug/L
200.7 (ICP)	Method	Water	Silicon	400	200	ug/L
200.7 (ICP)	Method	Water	Silver	10	9	ug/L
200.7 (ICP)	Method	Water	Sodium	100	60	ug/L
200.7 (ICP)	Method	Water	Strontium	10	10	ug/L
200.7 (ICP)	Method	Water	Thallium	200	200	ug/L
200.7 (ICP)	Method	Water	Tin	100	50	ug/L
200.7 (ICP)	Method	Water	Titanium	10	4	ug/L

METALS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
200.7 (ICP)	Method	Water	Vanadium	10	5	ug/L
200.7 (ICP)	Method	Water	Zinc	10	3	ug/L
200.8	Method	Soil/Sed.	Aluminum	2	2	mg/kg
200.8	Method	Soil/Sed.	Antimony	0.05	0.02	mg/kg
200.8	Method	Soil/Sed.	Arsenic	0.5	0.07	mg/kg
200.8	Method	Soil/Sed.	Barium	0.05	0.03	mg/kg
200.8	Method	Soil/Sed.	Beryllium	0.02	0.006	mg/kg
200.8	Method	Soil/Sed.	Cadmium	0.05	0.007	mg/kg
200.8	Method	Soil/Sed.	Chromium	0.2	0.04	mg/kg
200.8	Method	Soil/Sed.	Cobalt	0.02	0.01	mg/kg
200.8	Method	Soil/Sed.	Copper	0.1	0.02	mg/kg
200.8	Method	Soil/Sed.	Lead	0.05	0.02	mg/kg
200.8	Method	Soil/Sed.	Manganese	0.1	0.04	mg/kg
200.8	Method	Soil/Sed.	Molybdenum	0.05	0.008	mg/kg
200.8	Method	Soil/Sed.	Nickel	0.2	0.04	mg/kg
200.8	Method	Soil/Sed.	Selenium	1	0.2	mg/kg
200.8	Method	Soil/Sed.	Silver	0.02	0.003	mg/kg
200.8	Method	Soil/Sed.	Thallium	0.02	0.002	mg/kg
200.8	Method	Soil/Sed.	Uranium	0.02	0.004	mg/kg
200.8	Method	Soil/Sed.	Vanadium	0.2	0.03	mg/kg
200.8	Method	Soil/Sed.	Zinc	0.5	0.2	mg/kg
200.8	Method	Water	Aluminum	2	0.7	ug/L
200.8	Method	Water	Antimony	0.05	0.02	ug/L
200.8	Method	Water	Arsenic	0.5	0.2	ug/L
200.8	Method	Water	Barium	0.05	0.03	ug/L
200.8	Method	Water	Beryllium	0.02	0.007	ug/L
200.8	Method	Water	Boron	0.5	0.09	ug/L
200.8	Method	Water	Cadmium	0.02	0.02	ug/L
200.8	Method	Water	Chromium	0.2	0.06	ug/L
200.8	Method	Water	Cobalt	0.02	0.01	ug/L
200.8	Method	Water	Copper	0.1	0.03	ug/L
200.8	Method	Water	Lead	0.02	0.009	ug/L

METALS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
200.8	Method	Water	Manganese	0.05	0.02	ug/L
200.8	Method	Water	Molybdenum	0.05	0.02	ug/L
200.8	Method	Water	Nickel	0.2	0.06	ug/L
200.8	Method	Water	Selenium	1	0.2	ug/L
200.8	Method	Water	Silver	0.02	0.009	ug/L
200.8	Method	Water	Thallium	0.02	0.004	ug/L
200.8	Method	Water	Tin	0.1	0.02	ug/L
200.8	Method	Water	Uranium	0.02	0.006	ug/L
200.8	Method	Water	Vanadium	0.2	0.03	ug/L
200.8	Method	Water	Zinc	0.5	0.3	ug/L
200.9	Method	Soil	Arsenic	1	0.2	mg/kg
200.9	Method	Soil	Lead	1	0.2	mg/kg
200.9	Method	Soil	Selenium	1	0.2	mg/kg
200.9	Method	Soil	Thallium	1	0.2	mg/kg
200.9/206.2	Method	Water	Arsenic	5	1	ug/L
200.9/239.2	Method	Water	Lead	2	1	ug/L
200.9/270.2	Method	Water	Selenium	5	1	ug/L
200.9/279.2	Method	Water	Thallium	5	1	ug/L
6010B	3050B	Soil	Aluminum	10	10	mg/kg
6010B	3050B	Soil	Antimony	10	8	mg/kg
6010B	3050B	Soil	Arsenic	40	20	mg/kg
6010B	3050B	Soil	Barium	1	0.2	mg/kg
6010B	3050B	Soil	Beryllium	1	0.1	mg/kg
6010B	3050B	Soil	Boron	10	2	mg/kg
6010B	3050B	Soil	Cadmium	1	0.8	mg/kg
6010B	3050B	Soil	Calcium	10	3	mg/kg
6010B	3050B	Soil	Chromium	2	0.6	mg/kg
6010B	3050B	Soil	Cobalt	2	2	mg/kg
6010B	3050B	Soil	Copper	2	2	mg/kg
6010B	3050B	Soil	Iron	4	3	mg/kg
6010B	3050B	Soil	Lead	20	5	mg/kg
6010B	3050B	Soil	Lithium	4	2	mg/kg

METALS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
6010B	3050B	Soil	Magnesium	4	2	mg/kg
6010B	3050B	Soil	Manganese	1	0.3	mg/kg
6010B	3050B	Soil	Molybdenum	2	2	mg/kg
6010B	3050B	Soil	Nickel	4	3	mg/kg
6010B	3050B	Soil	Phosphorus	40	30	mg/kg
6010B	3050B	Soil	Potassium	400	300	mg/kg
6010B	3050B	Soil	Selenium	40	20	mg/kg
6010B	3050B	Soil	Silver	2	2	mg/kg
6010B	3050B	Soil	Sodium	20	10	mg/kg
6010B	3050B	Soil	Strontium	2	0.1	mg/kg
6010B	3050B	Soil	Thallium	40	30	mg/kg
6010B	3050B	Soil	Tin	20	6	mg/kg
6010B	3050B	Soil	Titanium	2	0.3	mg/kg
6010B	3050B	Soil	Vanadium	2	0.9	mg/kg
6010B	3050B	Soil	Zinc	2	0.5	mg/kg
6010B	CLP	Water	Aluminum	50	40	ug/L
6010B	CLP	Water	Antimony	50	40	ug/L
6010B	CLP	Water	Arsenic	100	40	ug/L
6010B	CLP	Water	Barium	5	2	ug/L
6010B	CLP	Water	Beryllium	5	0.4	ug/L
6010B	CLP	Water	Boron	50	20	ug/L
6010B	CLP	Water	Cadmium	5	5	ug/L
6010B	CLP	Water	Calcium	50	20	ug/L
6010B	CLP	Water	Chromium	5	3	ug/L
6010B	CLP	Water	Cobalt	10	5	ug/L
6010B	CLP	Water	Copper	10	7	ug/L
6010B	CLP	Water	Iron	20	20	ug/L
6010B	CLP	Water	Lead	50	30	ug/L
6010B	CLP	Water	Lithium	20	4	ug/L
6010B	CLP	Water	Magnesium	20	9	ug/L
6010B	CLP	Water	Manganese	5	2	ug/L
6010B	CLP	Water	Molybdenum	10	9	ug/L

METALS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
6010B	CLP	Water	Nickel	20	20	ug/L
6010B	CLP	Water	Phosphorus	200	100	ug/L
6010B	CLP	Water	Potassium	2000	700	ug/L
6010B	CLP	Water	Selenium	100	60	ug/L
6010B	CLP	Water	Silicon	400	200	ug/L
6010B	CLP	Water	Silver	10	9	ug/L
6010B	CLP	Water	Sodium	100	60	ug/L
6010B	CLP	Water	Strontium	10	10	ug/L
6010B	CLP	Water	Thallium	200	200	ug/L
6010B	CLP	Water	Tin	100	50	ug/L
6010B	CLP	Water	Titanium	10	4	ug/L
6010B	CLP	Water	Vanadium	10	5	ug/L
6010B	CLP	Water	Zinc	10	3	ug/L
6020	3050B	Soil/Sed.	Aluminum	2	2	mg/kg
6020	3050B	Soil/Sed.	Antimony	0.05	0.02	mg/kg
6020	3050B	Soil/Sed.	Arsenic	0.5	0.07	mg/kg
6020	3050B	Soil/Sed.	Barium	0.05	0.03	mg/kg
6020	3050B	Soil/Sed.	Beryllium	0.02	0.006	mg/kg
6020	3050B	Soil/Sed.	Cadmium	0.05	0.007	mg/kg
6020	3050B	Soil/Sed.	Chromium	0.2	0.04	mg/kg
6020	3050B	Soil/Sed.	Cobalt	0.02	0.01	mg/kg
6020	3050B	Soil/Sed.	Copper	0.1	0.02	mg/kg
6020	3050B	Soil/Sed.	Lead	0.05	0.02	mg/kg
6020	3050B	Soil/Sed.	Manganese	0.1	0.04	mg/kg
6020	3050B	Soil/Sed.	Molybdenum	0.05	0.008	mg/kg
6020	3050B	Soil/Sed.	Nickel	0.2	0.04	mg/kg
6020	3050B	Soil/Sed.	Selenium	1	0.2	mg/kg
6020	3050B	Soil/Sed.	Silver	0.02	0.003	mg/kg
6020	3050B	Soil/Sed.	Thallium	0.02	0.002	mg/kg
6020	3050B	Soil/Sed.	Uranium	0.02	0.004	mg/kg
6020	3050B	Soil/Sed.	Vanadium	0.2	0.03	mg/kg
6020	3050B	Soil/Sed.	Zinc	0.5	0.2	mg/kg
6020	CLP	Water	Aluminum	2	0.7	ug/L

METALS ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
6020	CLP	Water	Antimony	0.05	0.02	ug/L
6020	CLP	Water	Arsenic	0.5	0.2	ug/L
6020	CLP	Water	Barium	0.05	0.03	ug/L
6020	CLP	Water	Beryllium	0.02	0.007	ug/L
6020	CLP	Water	Boron	0.5	0.9	ug/L
6020	CLP	Water	Cadmium	0.02	0.2	ug/L
6020	CLP	Water	Chromium	0.2	0.06	ug/L
6020	CLP	Water	Cobalt	0.02	0.1	ug/L
6020	CLP	Water	Copper	0.1	0.03	ug/L
6020	CLP	Water	Lead	0.02	0.009	ug/L
6020	CLP	Water	Manganese	0.05	0.02	ug/L
6020	CLP	Water	Molybdenum	0.05	0.02	ug/L
6020	CLP	Water	Nickel	0.2	0.06	ug/L
6020	CLP	Water	Selenium	1	0.2	ug/L
6020	CLP	Water	Silver	0.02	0.009	ug/L
6020	CLP	Water	Thallium	0.2	0.004	ug/L
6020	CLP	Water	Tin	0.1	0.02	ug/L
6020	CLP	Water	Uranium	0.02	0.006	ug/L
6020	CLP	Water	Vanadium	0.2	0.03	ug/L
6020	CLP	Water	Zinc	0.5	0.3	ug/L
7060A	3050B	Soil	Arsenic	1	0.2	mg/kg
7421	3050B	Soil	Lead	1	0.2	mg/kg
7740	3050B	Soil	Selenium	1	0.2	mg/kg
7742/*SM* 3114B	3050B	Soil	Selenium	0.1	0.02	mg/kg
7841	3050B	Soil	Thallium	1	0.2	mg/kg
7060A	CLP/3020A	Water	Arsenic	5	1	ug/L
7421	CLP/3020A	Water	Lead	2	1	ug/L
7740	CLP/3020A	Water	Selenium	5	1	ug/L
7742/*SM* 3114B	3010A	Water	Selenium	1	0.3	ug/L
7841	CLP/3020A	Water	Thallium	5	1	ug/L

a Method Detection Limits are subject to change as new MDL studies are completed.

VOLATILE ORGANIC COMPOUNDS (VOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
602	Method	Water	Benzene	0.5	0.12	ug/L
602	Method	Water	Ethylbenzene	1.0	0.13	ug/L
602	Method	Water	m,p-Xylenes	1.0	0.23	ug/L
602	Method	Water	o-Xylene	1.0	0.15	ug/L
602	Method	Water	Toluene	1.0	0.13	ug/L
624	Method	Water	1,1,1-Trichloroethane (TCA)	5	0.23	ug/L
624	Method	Water	1,1,2,2-Tetrachloroethane	5	0.21	ug/L
624	Method	Water	1,1,2-Trichloroethane	5	0.22	ug/L
624	Method	Water	1,1-Dichloroethane	5	0.29	ug/L
624	Method	Water	1,1-Dichloroethene	5	0.21	ug/L
624	Method	Water	1,2-Dichlorobenzene	5	0.19	ug/L
624	Method	Water	1,2-Dichloroethane (EDC)	5	0.28	ug/L
624	Method	Water	1,2-Dichloropropane	5	0.15	ug/L
624	Method	Water	1,3-Dichlorobenzene	5	0.18	ug/L
624	Method	Water	1,4-Dichlorobenzene	5	0.19	ug/L
624	Method	Water	2-Butanone (MEK)	20	4.6	ug/L
624	Method	Water	2-Chloroethyl Vinyl Ether	10	0.11	ug/L
624	Method	Water	2-Hexanone	20	3.5	ug/L
624	Method	Water	Acetone	20	6	ug/L
624	Method	Water	Acrolein	50	2.9	ug/L
624	Method	Water	Acrylonitrile	10	0.91	ug/L
624	Method	Water	Benzene	5	0.16	ug/L
624	Method	Water	Bromodichloromethane	5	0.24	ug/L
624	Method	Water	Bromoform	5	0.26	ug/L
624	Method	Water	Bromomethane	5	0.41	ug/L
624	Method	Water	Carbon Disulfide	5	0.21	ug/L
624	Method	Water	Carbon Tetrachloride	5	0.23	ug/L
624	Method	Water	Chlorobenzene	5	0.21	ug/L
624	Method	Water	Chloroethane	5	0.24	ug/L
624	Method	Water	Chloroform	5	0.24	ug/L
624	Method	Water	Chloromethane	5	0.3	ug/L
624	Method	Water	cis-1,2-Dichloroethene	5	0.19	ug/L
624	Method	Water	cis-1,3-Dichloropropene	5	0.16	ug/L

VOLATILE ORGANIC COMPOUNDS (VOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
624	Method	Water	Dibromochloromethane	5	0.15	ug/L
624	Method	Water	Dichlorodifluoromethane	5	0.18	ug/L
624	Method	Water	Ethylbenzene	5	0.17	ug/L
624	Method	Water	m,p-Xylenes	5	0.29	ug/L
624	Method	Water	Methylene Chloride	5	0.22	ug/L
624	Method	Water	o-Xylene	5	0.12	ug/L
624	Method	Water	Styrene	5	0.16	ug/L
624	Method	Water	Tetrachloroethene (PCE)	5	0.17	ug/L
624	Method	Water	Toluene	5	0.2	ug/L
624	Method	Water	trans-1,2-Dichloroethene	5	0.24	ug/L
624	Method	Water	trans-1,3-Dichloropropene	5	0.16	ug/L
624	Method	Water	Trichloroethene (TCE)	5	0.23	ug/L
624	Method	Water	Trichlorofluoromethane	5	0.31	ug/L
624	Method	Water	Trichlorotrifluoroethane	5	0.22	ug/L
624	Method	Water	Vinyl Acetate	10	0.43	ug/L
624	Method	Water	Vinyl Chloride	5	0.28	ug/L
8021B	5035/5030B	Soil	Benzene	0.05	0.0064	mg/kg
8021B	5035/5030B	Soil	Ethylbenzene	0.10	0.0052	mg/kg
8021B	5035/5030B	Soil	m,p-Xylenes	0.10	0.0068	mg/kg
8021B	5035/5030B	Soil	o-Xylene	0.10	0.0066	mg/kg
8021B	5035/5030B	Soil	Toluene	0.10	0.0027	mg/kg
8021B	5030B	Water	Benzene	0.5	0.11	ug/L
8021B	5030B	Water	Ethylbenzene	1.0	0.2	ug/L
8021B	5030B	Water	m,p-Xylenes	1.0	0.2	ug/L
8021B	5030B	Water	o-Xylene	1.0	0.08	ug/L
8021B	5030B	Water	Toluene	1.0	0.27	ug/L
8260B	5030A/5035	Soil	1,1,1,2-Tetrachloroethane	5.0	0.51	ug/kg
8260B	5030A/5035	Soil	1,1,1-Trichloroethane (TCA)	5.0	0.57	ug/kg
8260B	5030A/5035	Soil	1,1,2,2-Tetrachloroethane	5.0	0.73	ug/kg
8260B	5030A/5035	Soil	1,1,2-Trichloroethane	5.0	0.69	ug/kg
8260B	5030A/5035	Soil	1,1-Dichloroethane	5.0	0.78	ug/kg
8260B	5030A/5035	Soil	1,1-Dichloroethene	5.0	0.69	ug/kg
8260B	5030A/5035	Soil	1,1-Dichloropropene	5.0	0.73	ug/kg

VOLATILE ORGANIC COMPOUNDS (VOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8260B	5030A/5035	Soil	1,2,3-Trichlorobenzene	20	0.90	ug/kg
8260B	5030A/5035	Soil	1,2,3-Trichloropropane	5.0	0.61	ug/kg
8260B	5030A/5035	Soil	1,2,4-Trichlorobenzene	20	0.77	ug/kg
8260B	5030A/5035	Soil	1,2,4-Trimethylbenzene	20	0.82	ug/kg
8260B	5030A/5035	Soil	1,2-Dibromo-3-chloropropane	20	0.85	ug/kg
8260B	5030A/5035	Soil	1,2-Dibromoethane (EDB)	20	0.79	ug/kg
8260B	5030A/5035	Soil	1,2-Dichlorobenzene	5.0	0.65	ug/kg
8260B	5030A/5035	Soil	1,2-Dichloroethane (EDC)	5.0	0.67	ug/kg
8260B	5030A/5035	Soil	1,2-Dichloropropane	5.0	0.72	ug/kg
8260B	5030A/5035	Soil	1,3,5-Trimethylbenzene	20	0.82	ug/kg
8260B	5030A/5035	Soil	1,3-Dichlorobenzene	5.0	0.71	ug/kg
8260B	5030A/5035	Soil	1,3-Dichloropropane	5.0	0.52	ug/kg
8260B	5030A/5035	Soil	1,4-Dichlorobenzene	5.0	0.82	ug/kg
8260B	5030A/5035	Soil	1,4-Dioxane	250	110	ug/kg
8260B	5030A/5035	Soil	1-Chlorohexane	5.0	0.69	ug/kg
8260B	5030A/5035	Soil	2,2-Dichloropropane	5.0	0.81	ug/kg
8260B	5030A/5035	Soil	2-Butanone (MEK)	20	8.4	ug/kg
8260B	5030A/5035	Soil	2-Chloroethyl Vinyl Ether	10	1.0	ug/kg
8260B	5030A/5035	Soil	2-Chlorotoluene	20	0.73	ug/kg
8260B	5030A/5035	Soil	2-Hexanone	20	6.1	ug/kg
8260B	5030A/5035	Soil	2-Nitropropane	20	3.8	ug/kg
8260B	5030A/5035	Soil	4-Chlorotoluene	20	.74	ug/kg
8260B	5030A/5035	Soil	4-Isopropyltoluene	20	0.72	ug/kg
8260B	5030A/5035	Soil	4-Methyl-2-pentanone (MIBK)	20	5.5	ug/kg
8260B	5030A/5035	Soil	Acetone	20	10	ug/kg
8260B	5030A/5035	Soil	Acetonitrile	100	69	ug/kg
8260B	5030A/5035	Soil	Acrolein	100	14	ug/kg
8260B	5030A/5035	Soil	Acrylonitrile	20	3.2	ug/kg
8260B	5030A/5035	Soil	Allyl Chloride	20	2.7	ug/kg
8260B	5030A/5035	Soil	Benzene	5.0	0.79	ug/kg
8260B	5030A/5035	Soil	Bromobenzene	5.0	0.81	ug/kg
8260B	5030A/5035	Soil	Bromochloromethane	5.0	0.52	ug/kg
8260B	5030A/5035	Soil	Bromodichloromethane	5.0	0.53	ug/kg
8260B	5030A/5035	Soil	Bromoform	5.0	0.65	ug/kg

VOLATILE ORGANIC COMPOUNDS (VOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8260B	5030A/5035	Soil	Bromomethane	5.0	0.8	ug/kg
8260B	5030A/5035	Soil	Carbon Disulfide	5.0	1.5	ug/kg
8260B	5030A/5035	Soil	Carbon Tetrachloride	5.0	0.60	ug/kg
8260B	5030A/5035	Soil	Chlorobenzene	5.0	0.70	ug/kg
8260B	5030A/5035	Soil	Chloroethane	5.0	0.78	ug/kg
8260B	5030A/5035	Soil	Chloroform	5.0	0.57	ug/kg
8260B	5030A/5035	Soil	Chloromethane	5.0	0.99	ug/kg
8260B	5030A/5035	Soil	Chloroprene	20	3.3	ug/kg
8260B	5030A/5035	Soil	cis-1,2-Dichloroethene	5.0	0.83	ug/kg
8260B	5030A/5035	Soil	cis-1,3-Dichloropropene	5.0	0.76	ug/kg
8260B	5030A/5035	Soil	cis-1,4-Dichloro-2-butene	20	14	ug/kg
8260B	5030A/5035	Soil	Cyclohexane	5.0	0.67	ug/kg
8260B	5030A/5035	Soil	Dibromochloromethane	5.0	0.60	ug/kg
8260B	5030A/5035	Soil	Dibromomethane	5.0	0.72	ug/kg
8260B	5030A/5035	Soil	Dichlorodifluoromethane	5.0	0.70	ug/kg
8260B	5030A/5035	Soil	Diisopropyl Ether	10	0.25	ug/kg
8260B	5030A/5035	Soil	Ethyl Acetate	20	4.1	ug/kg
8260B	5030A/5035	Soil	Ethyl Methacrylate	20	3.0	ug/kg
8260B	5030A/5035	Soil	Ethylbenzene	5.0	0.57	ug/kg
8260B	5030A/5035	Soil	Ethylene Oxide	100	18	ug/kg
8260B	5030A/5035	Soil	Hexachlorobutadiene	20	0.75	ug/kg
8260B	5030A/5035	Soil	Iodomethane (Methyl Iodide)	20	4.0	ug/kg
8260B	5030A/5035	Soil	Isobutanol	200	94	ug/kg
8260B	5030A/5035	Soil	Isopropylbenzene	20	0.68	ug/kg
8260B	5030A/5035	Soil	m,p-Xylenes	5.0	1.5	ug/kg
8260B	5030A/5035	Soil	Methacrylonitrile	20	3.4	ug/kg
8260B	5030A/5035	Soil	Methyl Acetate	5.0	0.73	ug/kg
8260B	5030A/5035	Soil	Methyl Methacrylate	20	3.3	ug/kg
8260B	5030A/5035	Soil	Methyl tert-Butyl Ether	5.0	0.64	ug/kg
8260B	5030A/5035	Soil	Methylcyclohexane	5.0	0.71	ug/kg
8260B	5030A/5035	Soil	Methylene Chloride	10	0.96	ug/kg
8260B	5030A/5035	Soil	Naphthalene	20	0.89	ug/kg
8260B	5030A/5035	Soil	n-Butylbenzene	20	0.75	ug/kg
8260B	5030A/5035	Soil	n-Hexane	10	4.0	ug/kg

VOLATILE ORGANIC COMPOUNDS (VOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8260B	5030A/5035	Soil	n-Octane	10	4.0	ug/kg
8260B	5030A/5035	Soil	n-Propylbenzene	20	0.72	ug/kg
8260B	5030A/5035	Soil	o-Xylene	5.0	0.69	ug/kg
8260B	5030A/5035	Soil	Propionitrile	20	3.7	ug/kg
8260B	5030A/5035	Soil	Propylene Oxide	50	10	ug/kg
8260B	5030A/5035	Soil	sec-Butylbenzene	20	0.74	ug/kg
8260B	5030A/5035	Soil	Styrene	5.0	0.73	ug/kg
8260B	5030A/5035	Soil	tert-Amyl Methyl Ether	10	0.15	ug/kg
8260B	5030A/5035	Soil	tert-Butyl Alcohol	50	3.6	ug/kg
8260B	5030A/5035	Soil	tert-Butyl Ethyl Ether	10	0.084	ug/kg
8260B	5030A/5035	Soil	tert-Butylbenzene	20	0.74	ug/kg
8260B	5030A/5035	Soil	Tetrachloroethene (PCE)	5.0	0.31	ug/kg
8260B	5030A/5035	Soil	Toluene	5.0	0.84	ug/kg
8260B	5030A/5035	Soil	trans-1,2-Dichloroethene	5.0	0.73	ug/kg
8260B	5030A/5035	Soil	trans-1,3-Dichloropropene	5.0	0.60	ug/kg
8260B	5030A/5035	Soil	trans-1,4-Dichloro-2-butene	20	1.5	ug/kg
8260B	5030A/5035	Soil	Trichloroethene (TCE)	5.0	0.28	ug/kg
8260B	5030A/5035	Soil	Trichlorofluoromethane	5.0	0.73	ug/kg
8260B	5030A/5035	Soil	Trichlorotrifluoroethane	5.0	0.74	ug/kg
8260B	5030A/5035	Soil	Vinyl Acetate	20	3.6	ug/kg
8260B	5030A/5035	Soil	Vinyl Chloride	5.0	0.62	ug/kg
8260B	5035/5030B	Soil-mid	1,1,1,2-Tetrachloroethane	.05	0.0111	mg/kg
8260B	5035/5030B	Soil-mid	1,1,1-Trichloroethane (TCA)	.05	0.0111	mg/kg
8260B	5035/5030B	Soil-mid	1,1,2,2-Tetrachloroethane	.05	0.0138	mg/kg
8260B	5035/5030B	Soil-mid	1,1,2-Trichloroethane	.05	0.00992	mg/kg
8260B	5035/5030B	Soil-mid	1,1-Dichloroethane	.05	0.00906	mg/kg
8260B	5035/5030B	Soil-mid	1,1-Dichloroethene	.05	0.0119	mg/kg
8260B	5035/5030B	Soil-mid	1,1-Dichloropropene	.05	0.0128	mg/kg
8260B	5035/5030B	Soil-mid	1,2,3-Trichlorobenzene	0.2	0.0326	mg/kg
8260B	5035/5030B	Soil-mid	1,2,3-Trichloropropane	.05	0.0213	mg/kg
8260B	5035/5030B	Soil-mid	1,2,4-Trichlorobenzene	0.2	0.0218	mg/kg
8260B	5035/5030B	Soil-mid	1,2,4-Trimethylbenzene	0.2	0.0141	mg/kg
8260B	5035/5030B	Soil-mid	1,2-Dibromo-3-chloropropane	0.2	0.0991	mg/kg
8260B	5035/5030B	Soil-mid	1,2-Dibromoethane (EDB)	0.2	.00730	mg/kg

VOLATILE ORGANIC COMPOUNDS (VOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8260B	5035/5030B	Soil-mid	1,2-Dichlorobenzene	.05	0.00847	mg/kg
8260B	5035/5030B	Soil-mid	1,2-Dichloroethane (EDC)	.05	0.0114	mg/kg
8260B	5035/5030B	Soil-mid	1,2-Dichloropropane	.05	0.0124	mg/kg
8260B	5035/5030B	Soil-mid	1,3,5-Trichlorobenzene	.2	0.0343	mg/kg
8260B	5035/5030B	Soil-mid	1,3,5-Trimethylbenzene	0.2	.0121	mg/kg
8260B	5035/5030B	Soil-mid	1,3-Dichlorobenzene	.05	0.0102	mg/kg
8260B	5035/5030B	Soil-mid	1,3-Dichloropropane	.05	0.00759	mg/kg
8260B	5035/5030B	Soil-mid	1,4-Dichlorobenzene	.05	.00869	mg/kg
8260B	5035/5030B	Soil-mid	1,4-Dioxane	25	10	mg/kg
8260B	5035/5030B	Soil-mid	1-Chlorohexane	.05	0.0118	mg/kg
8260B	5035/5030B	Soil-mid	2,2-Dichloropropane	.05	0.0174	mg/kg
8260B	5035/5030B	Soil-mid	2-Butanone (MEK)	2.0	0.322	mg/kg
8260B	5035/5030B	Soil-mid	2-Chloroethyl Vinyl Ether	0.5	0.0112	mg/kg
8260B	5035/5030B	Soil-mid	2-Chlorotoluene	0.2	0.0111	mg/kg
8260B	5035/5030B	Soil-mid	2-Hexanone	2.0	0.396	mg/kg
8260B	5035/5030B	Soil-mid	2-Nitropropane	0.5	0.0238	mg/kg
8260B	5035/5030B	Soil-mid	3-Chloro-1-propene	0.5	0.0127	mg/kg
8260B	5035/5030B	Soil-mid	4-Chlorotoluene	0.2	0.00884	mg/kg
8260B	5035/5030B	Soil-mid	4-Isopropyltoluene	0.2	0.0128	mg/kg
8260B	5035/5030B	Soil-mid	4-Methyl-2-pentanone (MIBK)	2.0	0.280	mg/kg
8260B	5035/5030B	Soil-mid	Acetone	2.0	0.229	mg/kg
8260B	5035/5030B	Soil-mid	Acetonitrile	0.5	0.105	mg/kg
8260B	5035/5030B	Soil-mid	Acrolein	2.0	0.142	mg/kg
8260B	5035/5030B	Soil-mid	Acrylonitrile	2.0	0.0161	mg/kg
8260B	5035/5030B	Soil-mid	Benzene	.05	0.0105	mg/kg
8260B	5035/5030B	Soil-mid	Bromobenzene	0.2	0.00972	mg/kg
8260B	5035/5030B	Soil-mid	Bromochloromethane	.05	0.0126	mg/kg
8260B	5035/5030B	Soil-mid	Bromodichloromethane	.05	0.00847	mg/kg
8260B	5035/5030B	Soil-mid	Bromoform	.05	0.0279	mg/kg
8260B	5035/5030B	Soil-mid	Bromomethane	.05	0.0217	mg/kg
8260B	5035/5030B	Soil-mid	Carbon Disulfide	.05	0.0159	mg/kg
8260B	5035/5030B	Soil-mid	Carbon Tetrachloride	.05	0.0123	mg/kg
8260B	5035/5030B	Soil-mid	Chlorobenzene	.05	0.00933	mg/kg
8260B	5035/5030B	Soil-mid	Chloroethane	.05	0.0173	mg/kg

VOLATILE ORGANIC COMPOUNDS (VOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8260B	5035/5030B	Soil-mid	Chloroform	.05	0.00958	mg/kg
8260B	5035/5030B	Soil-mid	Chloromethane	.05	0.0136	mg/kg
8260B	5035/5030B	Soil-mid	Chloroprene	1.0	0.0119	mg/kg
8260B	5035/5030B	Soil-mid	cis-1,2-Dichloroethene	.05	0.0116	mg/kg
8260B	5035/5030B	Soil-mid	cis-1,3-Dichloropropene	.05	0.00808	mg/kg
8260B	5035/5030B	Soil-mid	cis-1,4-Dichloro-2-butene	1.0	0.0562	mg/kg
8260B	5035/5030B	Soil-mid	Cyclohexane	0.10	0.0200	mg/kg
8260B	5035/5030B	Soil-mid	Dibromochloromethane	.05	0.00817	mg/kg
8260B	5035/5030B	Soil-mid	Dibromomethane	.05	0.00974	mg/kg
8260B	5035/5030B	Soil-mid	Dichlorodifluoromethane	.05	0.0166	mg/kg
8260B	5035/5030B	Soil-mid	Dichlorofluoromethane (CFC 21)	.05	0.05	mg/kg
8260B	5035/5030B	Soil-mid	Ethyl Acetate	0.5	0.0484	mg/kg
8260B	5035/5030B	Soil-mid	Ethyl Ether	0.1	0.1	mg/kg
8260B	5035/5030B	Soil-mid	Ethyl Methacrylate	0.2	0.00934	mg/kg
8260B	5035/5030B	Soil-mid	Ethylbenzene	.05	0.00974	mg/kg
8260B	5035/5030B	Soil-mid	Hexachlorobutadiene	0.2	0.0380	mg/kg
8260B	5035/5030B	Soil-mid	Iodomethane	0.5	0.0224	mg/kg
8260B	5035/5030B	Soil-mid	Isobutyl Alcohol	50.	0.427	mg/kg
8260B	5035/5030B	Soil-mid	Isopropylbenzene	0.2	0.00680	mg/kg
8260B	5035/5030B	Soil-mid	m,p-Xylenes	.05	0.0186	mg/kg
8260B	5035/5030B	Soil-mid	Methacrylonitrile	0.5	0.0155	mg/kg
8260B	5035/5030B	Soil-mid	Methyl Acetate	0.10	0.0297	mg/kg
8260B	5035/5030B	Soil-mid	Methyl Methacrylate	0.5	0.0118	mg/kg
8260B	5035/5030B	Soil-mid	Methyl tert-Butyl Ether	.05	0.00734	mg/kg
8260B	5035/5030B	Soil-mid	Methylcyclohexane	0.10	0.0190	mg/kg
8260B	5035/5030B	Soil-mid	Methylene Chloride	0.2	0.0193	mg/kg
8260B	5035/5030B	Soil-mid	Naphthalene	0.2	0.0285	mg/kg
8260B	5035/5030B	Soil-mid	n-Butylbenzene	0.2	0.0221	mg/kg
8260B	5035/5030B	Soil-mid	n-Heptane	0.1	0.1	mg/kg
8260B	5035/5030B	Soil-mid	n-Hexane	0.1	0.0180	mg/kg
8260B	5035/5030B	Soil-mid	n-Octane	0.1	0.1	mg/kg
8260B	5035/5030B	Soil-mid	n-Propylbenzene	0.2	0.00968	mg/kg
8260B	5035/5030B	Soil-mid	o-Xylene	.05	0.00785	mg/kg
8260B	5035/5030B	Soil-mid	Propionitrile	0.5	0.0862	mg/kg

VOLATILE ORGANIC COMPOUNDS (VOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8260B	5035/5030B	Soil-mid	sec-Butylbenzene	0.2	0.0127	mg/kg
8260B	5035/5030B	Soil-mid	Styrene	.05	0.00943	mg/kg
8260B	5035/5030B	Soil-mid	tert-Butyl Alcohol	0.25	0.103	mg/kg
8260B	5035/5030B	Soil-mid	tert-Butyl Ethyl Ether	0.05	0.005	mg/kg
8260B	5035/5030B	Soil-mid	tert-Butylbenzene	0.2	0.0122	mg/kg
8260B	5035/5030B	Soil-mid	Tetrachloroethene (PCE)	.05	0.0109	mg/kg
8260B	5035/5030B	Soil-mid	Tetrahydrofuran	1.0	0.5	mg/kg
8260B	5035/5030B	Soil-mid	Toluene	.05	0.00975	mg/kg
8260B	5035/5030B	Soil-mid	trans-1,2-Dichloroethene	.05	0.0139	mg/kg
8260B	5035/5030B	Soil-mid	trans-1,3-Dichloropropene	.05	0.00863	mg/kg
8260B	5035/5030B	Soil-mid	trans-1,4-Dichloro-2-butene	1.0	0.0597	mg/kg
8260B	5035/5030B	Soil-mid	Trichloroethene (TCE)	.05	0.0188	mg/kg
8260B	5035/5030B	Soil-mid	Trichlorofluoromethane	.05	0.0131	mg/kg
8260B	5035/5030B	Soil-mid	Trichlorotrifluoroethane	.05	0.0121	mg/kg
8260B	5035/5030B	Soil-mid	Vinyl Acetate	0.5	0.0387	mg/kg
8260B	5035/5030B	Soil-mid	Vinyl Chloride	.05	0.0211	mg/kg
8260B	5030B	Water	1,1,1,2-Tetrachloroethane	0.5	0.111	ug/L
8260B	5030B	Water	1,1,1-Trichloroethane (TCA)	0.5	0.116	ug/L
8260B	5030B	Water	1,1,2,2-Tetrachloroethane	0.5	0.138	ug/L
8260B	5030B	Water	1,1,2-Trichloroethane	0.5	0.138	ug/L
8260B	5030B	Water	1,1-Dichloroethane	0.5	0.101	ug/L
8260B	5030B	Water	1,1-Dichloroethene	0.5	0.122	ug/L
8260B	5030B	Water	1,1-Dichloropropene	0.5	0.150	ug/L
8260B	5030B	Water	1,2,3-Trichlorobenzene	2	0.326	ug/L
8260B	5030B	Water	1,2,3-Trichloropropane	0.5	0.213	ug/L
8260B	5030B	Water	1,2,4-Trichlorobenzene	2	0.218	ug/L
8260B	5030B	Water	1,2,4-Trimethylbenzene	2	0.141	ug/L
8260B	5030B	Water	1,2-Dibromo-3-chloropropane	2	0.991	ug/L
8260B	5030B	Water	1,2-Dibromoethane (EDB)	2	0.0981	ug/L
8260B	5030B	Water	1,2-Dichlorobenzene	0.5	0.111	ug/L
8260B	5030B	Water	1,2-Dichloroethane (EDC)	0.5	0.114	ug/L
8260B	5030B	Water	1,2-Dichloropropane	0.5	0.139	ug/L
8260B	5030B	Water	1,3,5-Trichlorobenzene	0.5	0.343	ug/L

VOLATILE ORGANIC COMPOUNDS (VOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8260B	5030B	Water	1,3,5-Trimethylbenzene	0.5	.121	ug/L
8260B	5030B	Water	1,3-Dichlorobenzene	0.5	0.102	ug/L
8260B	5030B	Water	1,3-Dichloropropane	0.5	0.147	ug/L
8260B	5030B	Water	1,4-Dichlorobenzene	0.5	0.114	ug/L
8260B	5030B	Water	1,4-Dioxane	100	23.9	ug/L
8260B	5030B	Water	1-Chlorohexane	0.5	0.118	ug/L
8260B	5030B	Water	2,2-Dichloropropane	0.5	0.174	ug/L
8260B	5030B	Water	2-Butanone (MEK)	20	1.94	ug/L
8260B	5030B	Water	2-Chloroethyl Vinyl Ether	5	0.333	ug/L
8260B	5030B	Water	2-Chlorotoluene	2	0.111	ug/L
8260B	5030B	Water	2-Hexanone	20	3.96	ug/L
8260B	5030B	Water	2-Nitropropane	5	1.99	ug/L
8260B	5030B	Water	3-Chloro-1-propene	5	0.154	ug/L
8260B	5030B	Water	4-Chlorotoluene	2	0.118	ug/L
8260B	5030B	Water	4-Isopropyltoluene	2	0.128	ug/L
8260B	5030B	Water	4-Methyl-2-pentanone (MIBK)	20	2.70	ug/L
8260B	5030B	Water	Acetone	20	4.08	ug/L
8260B	5030B	Water	Acetonitrile	50	7.44	ug/L
8260B	5030B	Water	Acrolein	20	1.42	ug/L
8260B	5030B	Water	Acrylonitrile	5	0.531	ug/L
8260B	5030B	Water	Benzene	0.5	0.136	ug/L
8260B	5030B	Water	Bromobenzene	2	0.172	ug/L
8260B	5030B	Water	Bromochloromethane	0.5	0.164	ug/L
8260B	5030B	Water	Bromodichloromethane	0.5	0.109	ug/L
8260B	5030B	Water	Bromoform	0.5	0.279	ug/L
8260B	5030B	Water	Bromomethane	0.5	0.217	ug/L
8260B	5030B	Water	Carbon Disulfide	0.5	0.159	ug/L
8260B	5030B	Water	Carbon Tetrachloride	0.5	0.139	ug/L
8260B	5030B	Water	Chlorobenzene	0.5	0.134	ug/L
8260B	5030B	Water	Chloroethane	0.5	0.226	ug/L
8260B	5030B	Water	Chloroform	0.5	0.136	ug/L
8260B	5030B	Water	Chloromethane	0.5	0.136	ug/L
8260B	5030B	Water	Chloroprene	10	0.348	ug/L
8260B	5030B	Water	cis-1,2-Dichloroethene	0.5	0.116	ug/L

VOLATILE ORGANIC COMPOUNDS (VOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8260B	5030B	Water	cis-1,3-Dichloropropene	0.5	0.110	ug/L
8260B	5030B	Water	cis-1,4-Dichloro-2-butene	10	0.600	ug/L
8260B	5030B	Water	Cyclohexane	1.0	0.200	ug/L
8260B	5030B	Water	Dibromochloromethane	0.5	0.104	ug/L
8260B	5030B	Water	Dibromomethane	0.5	0.119	ug/L
8260B	5030B	Water	Dichlorodifluoromethane	0.5	0.166	ug/L
8260B	5030B	Water	Dichlorofluoromethane (CFC 21)	0.5	0.400	ug/L
8260B	5030B	Water	Diisopropyl Ether	2.0	0.244	ug/L
8260B	5030B	Water	Ethyl Acetate	5	0.618	ug/L
8260B	5030B	Water	Ethyl Ether	1	0.5	ug/L
8260B	5030B	Water	Ethyl Methacrylate	5	0.0934	ug/L
8260B	5030B	Water	Ethylbenzene	0.5	0.130	ug/L
8260B	5030B	Water	Ethylene Oxide	10	1.1	ug/L
8260B	5030B	Water	Hexachlorobutadiene	2	0.28	ug/L
8260B	5030B	Water	Iodomethane	5	0.375	ug/L
8260B	5030B	Water	Isobutyl Alcohol	100	5.01	ug/L
8260B	5030B	Water	Isopropylbenzene	2	0.105	ug/L
8260B	5030B	Water	m,p-Xylenes	0.5	0.219	ug/L
8260B	5030B	Water	Methacrylonitrile	5	0.444	ug/L
8260B	5030B	Water	Methyl Acetate	1.0	0.354	ug/L
8260B	5030B	Water	Methyl Methacrylate	5	0.354	ug/L
8260B	5030B	Water	Methyl tert-Butyl Ether	0.5	0.197	ug/L
8260B	5030B	Water	Methylcyclohexane	1.0	0.190	ug/L
8260B	5030B	Water	Methylene Chloride	2	0.193	ug/L
8260B	5030B	Water	Naphthalene	2	0.285	ug/L
8260B	5030B	Water	n-Butylbenzene	2	0.221	ug/L
8260B	5030B	Water	n-Hexane	1	0.180	ug/L
8260B	5030B	Water	n-Octane	5	0.29	ug/L
8260B	5030B	Water	n-Propylbenzene	2	0.0980	ug/L
8260B	5030B	Water	o-Xylene	0.5	0.102	ug/L
8260B	5030B	Water	Propionitrile	5	1.27	ug/L
8260B	5030B	Water	sec-Butylbenzene	2	0.127	ug/L
8260B	5030B	Water	Styrene	0.5	0.0943	ug/L
8260B	5030B	Water	tert-Amyl Methyl Ether	2.0	0.143	ug/L

VOLATILE ORGANIC COMPOUNDS (VOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8260B	5030B	Water	tert-Butyl Alcohol	20	1.031	ug/L
8260B	5030B	Water	tert-Butyl Ethyl Ether	2.0	0.0741	ug/L
8260B	5030B	Water	tert-Butylbenzene	2	0.122	ug/L
8260B	5030B	Water	Tetrachloroethene (PCE)	0.5	0.126	ug/L
8260B	5030B	Water	Tetrahydrofuran	10	0.456	ug/L
8260B	5030B	Water	Toluene	0.5	0.108	ug/L
8260B	5030B	Water	trans-1,2-Dichloroethene	0.5	0.143	ug/L
8260B	5030B	Water	trans-1,3-Dichloropropene	0.5	0.0894	ug/L
8260B	5030B	Water	trans-1,4-Dichloro-2-butene	10	0.597	ug/L
8260B	5030B	Water	Trichloroethene (TCE)	0.5	0.133	ug/L
8260B	5030B	Water	Trichlorofluoromethane	0.5	0.131	ug/L
8260B	5030B	Water	Trichlorotrifluoroethane	0.5	0.132	ug/L
8260B	5030B	Water	Vinyl Acetate	5.0	0.663	ug/L
8260B	5030B	Water	Vinyl Chloride	0.5	0.042	ug/L
AK 101	Method	Soil	Gasoline Range Petroleum Hydrocarbons	20	0.32	mg/kg
8015B/CA-TPH-G	5035/5030B	Soil	Gasoline Range Petroleum Hydrocarbons	5	0.31	mg/kg
NWTPH-Gx	5035/5030B	Soil	Gasoline Range Petroleum Hydrocarbon	5	0.3	mg/kg
AK 101	Method	Water	Gasoline Range Petroleum Hydrocarbons	100	13	ug/L
8015B/CA-TPH-G	5030B	Water	Gasoline Range Petroleum Hydrocarbons	50	13	ug/L
NWTPH-Gx	5030B	Water	Gasoline Range Petroleum Hydrocarbon	250	13	ug/L

a Method Detection Limits are subject to change as new MDL studies are completed.

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
1664	Method	Water	Hexane Extractable Material	5	0.64	mg/L
1664	Method	Water	Hexane Extractable Material - SGT	5	0.61	mg/L
1664	9071A	Soil	Hexane Extractable Material	100	60	mg/kg
1664	9071A	Soil	Hexane Extractable Material - SGT	100	50	mg/kg
600/4-81-045	Method	Oil	Aroclor 1016	1		mg/kg
600/4-81-045	Method	Oil	Aroclor 1221	2		mg/kg
600/4-81-045	Method	Oil	Aroclor 1232	1		mg/kg
600/4-81-045	Method	Oil	Aroclor 1242	1		mg/kg
600/4-81-045	Method	Oil	Aroclor 1248	1		mg/kg
600/4-81-045	Method	Oil	Aroclor 1254	1		mg/kg
600/4-81-045	Method	Oil	Aroclor 1260	1		mg/kg
608	3520C	Water	4,4'-DDD	0.01	0.0038	ug/L
608	3520C	Water	4,4'-DDE	0.01	0.005	ug/L
608	3520C	Water	4,4'-DDT	0.01	0.0063	ug/L
608	3520C	Water	Aldrin	0.01	0.0032	ug/L
608	3520C	Water	alpha-BHC	0.01	0.0037	ug/L
608	3520C	Water	alpha-Chlordane	0.01		ug/L
608	3520C	Water	beta-BHC	0.01	0.0051	ug/L
608	3520C	Water	Chlordane	0.2	0.027	ug/L
608	3520C	Water	delta-BHC	0.01	0.0041	ug/L
608	3520C	Water	Dieldrin	0.01	0.0037	ug/L
608	3520C	Water	Endosulfan I	0.01	0.0041	ug/L
608	3520C	Water	Endosulfan II	0.01	0.0039	ug/L
608	3520C	Water	Endosulfan Sulfate	0.01	0.0039	ug/L
608	3520C	Water	Endrin	0.01	0.0049	ug/L
608	3520C	Water	Endrin Aldehyde	0.01	0.0043	ug/L
608	3520C	Water	Endrin Ketone	0.01		ug/L
608	3520C	Water	gamma-BHC (Lindane)	0.01	0.0037	ug/L
608	3520C	Water	gamma-Chlordane	0.01		ug/L
608	3520C	Water	Heptachlor	0.01	0.0039	ug/L
608	3520C	Water	Heptachlor Epoxide	0.01	0.0039	ug/L
608	3520C	Water	Methoxychlor	0.01		ug/L
608	3520C	Water	Toxaphene	0.5	0.13	ug/L

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
608	3520C	Water	Aroclor 1016	0.1	0.10	ug/L
608	3520C	Water	Aroclor 1221	0.1	0.064	ug/L
608	3520C	Water	Aroclor 1232	0.1	0.043	ug/L
608	3520C	Water	Aroclor 1242	0.1	0.084	ug/L
608	3520C	Water	Aroclor 1248	0.1	0.017	ug/L
608	3520C	Water	Aroclor 1254	0.1	0.0084	ug/L
608	3520C	Water	Aroclor 1260	0.1	0.021	ug/L
608	3520C	Water	Aroclor 1262	0.1	0.028	ug/L
608	3520C	Water	Aroclor 1268	0.1	0.021	ug/L
625	3510C/3520C	Water	1,2,4,5-Tetrachlorobenzene	10	0.51	ug/L
625	3510C/3520C	Water	1,2,4-Trichlorobenzene	10	0.58	ug/L
625	3510C/3520C	Water	1,2-Dichlorobenzene	10	0.71	ug/L
625	3510C/3520C	Water	1,2-Diphenylhydrazine	10	0.65	ug/L
625	3510C/3520C	Water	1,3-Dichlorobenzene	10	0.70	ug/L
625	3510C/3520C	Water	1,4-Dichlorobenzene	10	0.62	ug/L
625	3510C/3520C	Water	2,3,5,6-Tetrachlorophenol	10	0.62	ug/L
625	3510C/3520C	Water	2,4,6-Trichlorophenol	10	0.35	ug/L
625	3510C/3520C	Water	2,4-Dichlorophenol	10	0.36	ug/L
625	3510C/3520C	Water	2,4-Dimethylphenol	10	1.5	ug/L
625	3510C/3520C	Water	2,4-Dinitrophenol	25	2.6	ug/L
625	3510C/3520C	Water	2,4-Dinitrotoluene	10	1.7	ug/L
625	3510C/3520C	Water	2,6-Dinitrotoluene	10	0.52	ug/L
625	3510C/3520C	Water	2-Chloronaphthalene	10	0.58	ug/L
625	3510C/3520C	Water	2-Chlorophenol	10	0.32	ug/L
625	3510C/3520C	Water	2-Methyl-4,6-dinitrophenol	25	1.9	ug/L
625	3510C/3520C	Water	2-Nitrophenol	10	0.31	ug/L
625	3510C/3520C	Water	3,3'-Dichlorobenzidine	25	1.1	ug/L
625	3510C/3520C	Water	4-Bromophenyl Phenyl Ether	10	0.38	ug/L
625	3510C/3520C	Water	4-Chloro-3-methylphenol	10	0.41	ug/L
625	3510C/3520C	Water	4-Chlorophenyl Phenyl Ether	10	0.34	ug/L
625	3510C/3520C	Water	4-Methylphenol	10	0.68	ug/L
625	3510C/3520C	Water	4-Nitrophenol	25	2.9	ug/L
625	3510C/3520C	Water	Acenaphthene	10	0.53	ug/L

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
625	3510C/3520C	Water	Acenaphthylene	10	0.42	ug/L
625	3510C/3520C	Water	Anthracene	10	0.35	ug/L
625	3510C/3520C	Water	Benz(a)anthracene	10	0.31	ug/L
625	3510C/3520C	Water	Benzidine	50	37	ug/L
625	3510C/3520C	Water	Benzo(a)pyrene	10	0.36	ug/L
625	3510C/3520C	Water	Benzo(b)fluoranthene	10	0.40	ug/L
625	3510C/3520C	Water	Benzo(g,h,i)perylene	10	0.39	ug/L
625	3510C/3520C	Water	Benzo(k)fluoranthene	10	0.45	ug/L
625	3510C/3520C	Water	Bis(2-chloroethoxy)methane	10	0.77	ug/L
625	3510C/3520C	Water	Bis(2-chloroethyl) Ether	10	0.39	ug/L
625	3510C/3520C	Water	Bis(2-chloroisopropyl) Ether	10	0.36	ug/L
625	3510C/3520C	Water	Bis(2-ethylhexyl) Phthalate	10	0.39	ug/L
625	3510C/3520C	Water	Butyl Benzyl Phthalate	10	0.24	ug/L
625	3510C/3520C	Water	Chrysene	10	0.33	ug/L
625	3510C/3520C	Water	Dibenz(a,h)anthracene	10	0.35	ug/L
625	3510C/3520C	Water	Diethyl Phthalate	10	0.41	ug/L
625	3510C/3520C	Water	Dimethyl Phthalate	10	0.36	ug/L
625	3510C/3520C	Water	Di-n-butyl Phthalate	10	0.54	ug/L
625	3510C/3520C	Water	Di-n-octyl Phthalate	10	0.30	ug/L
625	3510C/3520C	Water	Fluoranthene	10	0.37	ug/L
625	3510C/3520C	Water	Fluorene	10	0.34	ug/L
625	3510C/3520C	Water	Hexachlorobenzene	10	0.30	ug/L
625	3510C/3520C	Water	Hexachlorobutadiene	10	0.50	ug/L
625	3510C/3520C	Water	Hexachlorocyclopentadiene	10	0.35	ug/L
625	3510C/3520C	Water	Hexachloroethane	10	0.61	ug/L
625	3510C/3520C	Water	Indeno(1,2,3-cd)pyrene	10	0.56	ug/L
625	3510C/3520C	Water	Isophorone	10	0.37	ug/L
625	3510C/3520C	Water	Naphthalene	10	0.65	ug/L
625	3510C/3520C	Water	Nitrobenzene	10	0.44	ug/L
625	3510C/3520C	Water	N-Nitrosodiethylamine	10	0.66	ug/L
625	3510C/3520C	Water	N-Nitrosodimethylamine	25	0.50	ug/L
625	3510C/3520C	Water	N-Nitrosodi-n-butylamine	10	0.56	ug/L
625	3510C/3520C	Water	N-Nitrosodi-n-propylamine	10	0.45	ug/L
625	3510C/3520C	Water	N-Nitrosodiphenylamine	10	0.45	ug/L

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
625	3510C/3520C	Water	N-Nitrosopyrrolidine	10	0.61	ug/L
625	3510C/3520C	Water	Pentachlorobenzene	10	0.54	ug/L
625	3510C/3520C	Water	Pentachlorophenol	25	2.0	ug/L
625	3510C/3520C	Water	Phenanthrene	10	0.36	ug/L
625	3510C/3520C	Water	Phenol	10	0.47	ug/L
625	3510C/3520C	Water	Pyrene	10	0.33	ug/L
1653	Method	Water	2,3,4,6-Tetrachlorophenol	2.5	0.38	ug/L
1653	Method	Water	2,4,5-Trichlorophenol	2.5	0.57	ug/L
1653	Method	Water	2,4,6-Trichlorophenol	2.5	0.71	ug/L
1653	Method	Water	2,4-Dichlorophenol	2.5	0.15	ug/L
1653	Method	Water	2,6-Dichlorophenol	2.5	1.39	ug/L
1653	Method	Water	2,6-Dichlorosyringaldehyde	5.0	1.13	ug/L
1653	Method	Water	2-Chlorosyringaldehyde	2.5	0.87	ug/L
1653	Method	Water	3,4,5-Trichlorocatechol	5.0	0.53	ug/L
1653	Method	Water	3,4,5-Trichloroguaiacol	2.5	0.49	ug/L
1653	Method	Water	3,4,6-Trichlorocatechol	5.0	0.44	ug/L
1653	Method	Water	3,4,6-Trichloroguaiacol	2.5	0.46	ug/L
1653	Method	Water	3,4-Dichlorocatechol	2.5	0.60	ug/L
1653	Method	Water	3,4-Dichloroguaiacol	2.5	0.52	ug/L
1653	Method	Water	3,6-Dichlorocatechol	2.5	0.57	ug/L
1653	Method	Water	4,5,6-Trichloroguaiacol	2.5	0.25	ug/L
1653	Method	Water	4,5-Dichlorocatechol	2.5	0.24	ug/L
1653	Method	Water	4,5-Dichloroguaiacol	2.5	0.52	ug/L
1653	Method	Water	4,6-Dichloroguaiacol	2.5	0.45	ug/L
1653	Method	Water	4-Chlorocatechol	1.25	0.59	ug/L
1653	Method	Water	4-Chloroguaiacol	1.25	0.09	ug/L
1653	Method	Water	4-Chlorophenol	1.25	1.11	ug/L
1653	Method	Water	5,6-Dichlorovanillin	5.0	0.80	ug/L
1653	Method	Water	5-Chlorovanillin	2.5	1.01	ug/L
1653	Method	Water	6-Chlorovanillin	2.5	0.94	ug/L
1653	Method	Water	Pentachlorophenol	5.0	0.28	ug/L
1653	Method	Water	Tetrachlorocatechol	5.0	0.76	ug/L
1653	Method	Water	Tetrachloroguaiacol	5.0	0.23	ug/L

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
1653	Method	Water	Trichlorosyringol	2.5	0.64	ug/L
8015B	Method	Water	Ethylene Glycol	5	1.2	mg/L
8015B	Method	Water	Propylene Glycol	5	1.8	mg/L
8015B	Method	Water	Isopropyl Ether	1	0.32	mg/L
8081A	3545	Soil	2,4'-DDD	5	0.42	ug/kg
8081A	3545	Soil	2,4'-DDE	5	0.52	ug/kg
8081A	3545	Soil	2,4'-DDT	5	0.51	ug/kg
8081A	3545	Soil	4,4'-DDD	5	0.43	ug/kg
8081A	3545	Soil	4,4'-DDE	5	0.34	ug/kg
8081A	3545	Soil	4,4'-DDT	5	0.47	ug/kg
8081A	3545	Soil	Aldrin	5	0.33	ug/kg
8081A	3545	Soil	alpha-BHC	5	0.29	ug/kg
8081A	3545	Soil	alpha-Chlordane	5	0.55	ug/kg
8081A	3545	Soil	beta-BHC	5	0.78	ug/kg
8081A	3545	Soil	Chlordane	100	3.9	ug/kg
8081A	3545	Soil	Chlorpyrifos	5	0.43	ug/kg
8081A	3545	Soil	cis-Nonachlor	5	0.57	ug/kg
8081A	3545	Soil	delta-BHC	5	0.48	ug/kg
8081A	3545	Soil	Dieldrin	5	0.63	ug/kg
8081A	3545	Soil	Endosulfan I	5	0.31	ug/kg
8081A	3545	Soil	Endosulfan II	5	0.31	ug/kg
8081A	3545	Soil	Endosulfan Sulfate	5	0.49	ug/kg
8081A	3545	Soil	Endrin	5	0.36	ug/kg
8081A	3545	Soil	Endrin Aldehyde	5	0.37	ug/kg
8081A	3545	Soil	Endrin Ketone	5	0.54	ug/kg
8081A	3545	Soil	gamma-BHC (Lindane)	5	0.58	ug/kg
8081A	3545	Soil	gamma-Chlordane	5	0.40	ug/kg
8081A	3545	Soil	Heptachlor	5	0.42	ug/kg
8081A	3545	Soil	Heptachlor Epoxide	5	0.63	ug/kg
8081A	3545	Soil	Hexachlorobenzene	5	1.4	ug/kg
8081A	3545	Soil	Hexachlorobutadiene	5	1.0	ug/kg
8081A	3545	Soil	Hexachloroethane	5	0.83	ug/kg
8081A	3545	Soil	Isodrin	5	0.66	ug/kg

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8081A	3545	Soil	Methoxychlor	5	0.59	ug/kg
8081A	3545	Soil	Mirex	5	0.29	ug/kg
8081A	3545	Soil	Oxychlordane	5	0.32	ug/kg
8081A	3545	Soil	Toxaphene	250	9.7	ug/kg
8081A	3545	Soil	trans-Nonachlor	5	0.25	ug/kg
8081A	3540C	Soil-Low	2,4'-DDD	1.0	0.12	ug/kg
8081A	3540C	Soil-Low	2,4'-DDE	1.0	0.32	ug/kg
8081A	3540C	Soil-Low	2,4'-DDT	1.0	0.13	ug/kg
8081A	3540C	Soil-Low	4,4'-DDD	1.0	0.12	ug/kg
8081A	3540C	Soil-Low	4,4'-DDE	1.0	0.10	ug/kg
8081A	3540C	Soil-Low	4,4'-DDT	1.0	0.064	ug/kg
8081A	3540C	Soil-Low	Aldrin	1.0	0.15	ug/kg
8081A	3540C	Soil-Low	alpha-BHC	1.0	0.26	ug/kg
8081A	3540C	Soil-Low	alpha-Chlordane	1.0	0.23	ug/kg
8081A	3540C	Soil-Low	beta-BHC	1.0	0.30	ug/kg
8081A	3540C	Soil-Low	Chlordane	10	1.4	ug/kg
8081A	3540C	Soil-Low	Chlorpyrifos	1.0	0.054	ug/kg
8081A	3540C	Soil-Low	cis-Nonachlor	1.0	0.083	ug/kg
8081A	3540C	Soil-Low	delta-BHC	1.0	0.055	ug/kg
8081A	3540C	Soil-Low	Dieldrin	1.0	0.29	ug/kg
8081A	3540C	Soil-Low	Endosulfan I	1.0	0.17	ug/kg
8081A	3540C	Soil-Low	Endosulfan II	1.0	0.19	ug/kg
8081A	3540C	Soil-Low	Endosulfan Sulfate	1.0	0.079	ug/kg
8081A	3540C	Soil-Low	Endrin	1.0	0.20	ug/kg
8081A	3540C	Soil-Low	Endrin Aldehyde	1.0	0.053	ug/kg
8081A	3540C	Soil-Low	Endrin Ketone	1.0	0.082	ug/kg
8081A	3540C	Soil-Low	gamma-BHC (Lindane)	1.0	0.15	ug/kg
8081A	3540C	Soil-Low	gamma-Chlordane	1.0	0.064	ug/kg
8081A	3540C	Soil-Low	Heptachlor	1.0	0.080	ug/kg
8081A	3540C	Soil-Low	Heptachlor Epoxide	1.0	0.13	ug/kg
8081A	3540C	Soil-Low	Hexachlorobenzene	1.0	0.079	ug/kg
8081A	3540C	Soil-Low	Hexachlorobutadiene	1.0	0.49	ug/kg
8081A	3540C	Soil-Low	Hexachlorocyclopentadiene	1.0	0.39	ug/kg

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8081A	3540C	Soil-Low	Hexachloroethane	1.0	0.16	ug/kg
8081A	3540C	Soil-Low	Isodrin	1.0	0.097	ug/kg
8081A	3540C	Soil-Low	Methoxychlor	1.0	0.10	ug/kg
8081A	3540C	Soil-Low	Mirex	1.0	0.10	ug/kg
8081A	3540C	Soil-Low	Oxychlordane	1.0	0.37	ug/kg
8081A	3540C	Soil-Low	Toxaphene	50	4.9	ug/kg
8081A	3540C	Soil-Low	trans-Nonachlor	1.0	0.089	ug/kg
8081A	3535	Water	2,4'-DDD	0.01	0.00078	ug/L
8081A	3535	Water	2,4'-DDE	0.01	0.0016	ug/L
8081A	3535	Water	2,4'-DDT	0.01	0.00089	ug/L
8081A	3535	Water	4,4'-DDD	0.01	0.0010	ug/L
8081A	3535	Water	4,4'-DDE	0.01	0.00053	ug/L
8081A	3535	Water	4,4'-DDT	0.01	0.0014	ug/L
8081A	3535	Water	Aldrin	0.01	0.00083	ug/L
8081A	3535	Water	alpha-BHC	0.01	0.0025	ug/L
8081A	3535	Water	alpha-Chlordane	0.01	0.00058	ug/L
8081A	3535	Water	beta-BHC	0.01	0.00091	ug/L
8081A	3535	Water	Chlordane	0.2	0.022	ug/L
8081A	3535	Water	Chlorpyrifos	0.01	0.0012	ug/L
8081A	3535	Water	cis-Nonachlor	0.01	0.00093	ug/L
8081A	3535	Water	delta-BHC	0.01	0.00048	ug/L
8081A	3535	Water	Dieldrin	0.01	0.00045	ug/L
8081A	3535	Water	Endosulfan I	0.01	0.00050	ug/L
8081A	3535	Water	Endosulfan II	0.01	0.00094	ug/L
8081A	3535	Water	Endosulfan Sulfate	0.01	0.00078	ug/L
8081A	3535	Water	Endrin	0.01	0.00049	ug/L
8081A	3535	Water	Endrin Aldehyde	0.01	0.00068	ug/L
8081A	3535	Water	Endrin Ketone	0.01	0.00062	ug/L
8081A	3535	Water	gamma-BHC (Lindane)	0.01	0.0014	ug/L
8081A	3535	Water	gamma-Chlordane	0.01	0.00029	ug/L
8081A	3535	Water	Heptachlor	0.01	0.00048	ug/L
8081A	3535	Water	Heptachlor Epoxide	0.01	0.0011	ug/L
8081A	3535	Water	Hexachlorobenzene	0.01	0.0011	ug/L

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8081A	3535	Water	Hexachlorobutadiene	0.01	0.0067	ug/L
8081A	3535	Water	Hexachlorocyclopentadiene	0.01	0.01	ug/L
8081A	3535	Water	Hexachloroethane	0.01	0.0032	ug/L
8081A	3535	Water	Isodrin	0.01	0.0011	ug/L
8081A	3535	Water	Methoxychlor	0.01	0.0015	ug/L
8081A	3535	Water	Mirex	0.01	0.0012	ug/L
8081A	3535	Water	Oxychlordane	0.01	0.0032	ug/L
8081A	3535	Water	Toxaphene	0.5	0.14	ug/L
8081A	3535	Water	trans-Nonachlor	0.01	0.0013	ug/L
8081A	3520C	Water-Low	2,4'-DDD	0.5	0.060	ng/L
8081A	3520C	Water-Low	2,4'-DDE	0.5	0.047	ng/L
8081A	3520C	Water-Low	2,4'-DDT	0.5	0.12	ng/L
8081A	3520C	Water-Low	4,4'-DDD	0.5	0.047	ng/L
8081A	3520C	Water-Low	4,4'-DDE	0.5	0.12	ng/L
8081A	3520C	Water-Low	4,4'-DDT	0.5	0.047	ng/L
8081A	3520C	Water-Low	Aldrin	0.5	0.14	ng/L
8081A	3520C	Water-Low	alpha-BHC	0.5	0.25	ng/L
8081A	3520C	Water-Low	alpha-Chlordane	0.5	0.044	ng/L
8081A	3520C	Water-Low	beta-BHC	0.5		ng/L
8081A	3520C	Water-Low	Chlordane	5		ng/L
8081A	3520C	Water-Low	Chlorpyrifos	0.5		ng/L
8081A	3520C	Water-Low	cis-Nonachlor	0.5		ng/L
8081A	3520C	Water-Low	delta-BHC	0.5	0.062	ng/L
8081A	3520C	Water-Low	Dieldrin	0.5	0.056	ng/L
8081A	3520C	Water-Low	Endosulfan I	0.5	0.10	ng/L
8081A	3520C	Water-Low	Endosulfan II	0.5	0.063	ng/L
8081A	3520C	Water-Low	Endosulfan Sulfate	0.5	0.13	ng/L
8081A	3520C	Water-Low	Endrin	0.5	0.054	ng/L
8081A	3520C	Water-Low	Endrin Aldehyde	0.5	0.038	ng/L
8081A	3520C	Water-Low	Endrin Ketone	0.5	0.030	ng/L
8081A	3520C	Water-Low	gamma-BHC (Lindane)	0.5	0.20	ng/L
8081A	3520C	Water-Low	gamma-Chlordane	0.5	0.065	ng/L
8081A	3520C	Water-Low	Heptachlor	0.5	0.073	ng/L
8081A	3520C	Water-Low	Heptachlor Epoxide	0.5	0.21	ng/L

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8081A	3520C	Water-Low	Hexachlorobenzene	0.5	0.13	ng/L
8081A	3520C	Water-Low	Hexachlorobutadiene	0.5		ng/L
8081A	3520C	Water-Low	Hexachloroethane	0.5		ng/L
8081A	3520C	Water-Low	Isodrin	0.5	0.15	ng/L
8081A	3520C	Water-Low	Methoxychlor	0.5	0.17	ng/L
8081A	3520C	Water-Low	Mirex	0.5		ng/L
8081A	3520C	Water-Low	Oxychlordane	0.5		ng/L
8081A	3520C	Water-Low	Toxaphene	25	13	ng/L
8081A	3520C	Water-Low	trans-Nonachlor	0.5		ng/L
8082 Aroclors	3545	Soil	Aroclor 1016	0.10	0.013	mg/kg
8082 Aroclors	3545	Soil	Aroclor 1221	0.20	0.02	mg/kg
8082 Aroclors	3545	Soil	Aroclor 1232	0.10	0.025	mg/kg
8082 Aroclors	3545	Soil	Aroclor 1242	0.10	0.01	mg/kg
8082 Aroclors	3545	Soil	Aroclor 1248	0.10	0.013	mg/kg
8082 Aroclors	3545	Soil	Aroclor 1254	0.10	0.015	mg/kg
8082 Aroclors	3545	Soil	Aroclor 1260	0.10	0.0071	mg/kg
8082 Aroclors	3545	Soil	Aroclor 1262	0.10	0.0058	mg/kg
8082 Aroclors	3545	Soil	Aroclor 1268	0.10	0.00057	mg/kg
8082 Aroclors	3540C	Soil-Low	Aroclor 1016	10	1.6	ug/kg
8082 Aroclors	3540C	Soil-Low	Aroclor 1221	20	1.6	ug/kg
8082 Aroclors	3540C	Soil-Low	Aroclor 1232	10	1.6	ug/kg
8082 Aroclors	3540C	Soil-Low	Aroclor 1242	10	1.6	ug/kg
8082 Aroclors	3540C	Soil-Low	Aroclor 1248	10	1.6	ug/kg
8082 Aroclors	3540C	Soil-Low	Aroclor 1254	10	1.6	ug/kg
8082 Aroclors	3540C	Soil-Low	Aroclor 1260	10	1.6	ug/kg
8082 Aroclors	3540C	Soil-Low	Aroclor 1262	10	1.6	ug/kg
8082 Aroclors	3540C	Soil-Low	Aroclor 1268	10	1.6	ug/kg
8082 Aroclors	3535	Water	Aroclor 1016	0.2	0.012	ug/L
8082 Aroclors	3535	Water	Aroclor 1221	0.4	0.054	ug/L
8082 Aroclors	3535	Water	Aroclor 1232	0.2	0.028	ug/L
8082 Aroclors	3535	Water	Aroclor 1242	0.2	0.019	ug/L
8082 Aroclors	3535	Water	Aroclor 1248	0.2	0.025	ug/L
8082 Aroclors	3535	Water	Aroclor 1254	0.2	0.01	ug/L

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8082 Aroclors	3535	Water	Aroclor 1260	0.2	0.0085	ug/L
8082 Aroclors	3535	Water	Aroclor 1262	0.2	0.016	ug/L
8082 Aroclors	3535	Water	Aroclor 1268	0.2	0.015	ug/L
8082 Aroclors	3520C	Water-Low	Aroclor 1016	0.005	0.0024	ug/L
8082 Aroclors	3520C	Water-Low	Aroclor 1221	0.010	0.0024	ug/L
8082 Aroclors	3520C	Water-Low	Aroclor 1232	0.005	0.0024	ug/L
8082 Aroclors	3520C	Water-Low	Aroclor 1242	0.005	0.0024	ug/L
8082 Aroclors	3520C	Water-Low	Aroclor 1248	0.005	0.0024	ug/L
8082 Aroclors	3520C	Water-Low	Aroclor 1254	0.005	0.0024	ug/L
8082 Aroclors	3520C	Water-Low	Aroclor 1260	0.005	0.0024	ug/L
8082 Aroclors	3520C	Water-Low	Aroclor 1262	0.005	0.0024	ug/L
8082 Aroclors	3520C	Water-Low	Aroclor 1268	0.005	0.0024	ug/L
8082 Congeners	3540C	Soil	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	0.50	.095	ug/kg
8082 Congeners	3540C	Soil	2,2',3,3',4,4',5,5'-Octachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,2',3,3',4,4',5,6-Octachlorobiphenyl	0.50	.134	ug/kg
8082 Congeners	3540C	Soil	2,2',3,3',4,4',5-Heptachlorobiphenyl	0.50	.062	ug/kg
8082 Congeners	3540C	Soil	2,2',3,3',4,4'-Hexachlorobiphenyl	0.50	.290	ug/kg
8082 Congeners	3540C	Soil	2,2',3,3',4,5',6,6'-Octachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,2',3,3',4',5,6-Heptachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,2',3,3',4,5,6'-Heptachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,2',3,3',4,6'-Hexachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,2',3,4,4',5,5',6-Octachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,2',3,4,4',5,5'-Heptachlorobiphenyl	0.50	.035	ug/kg
8082 Congeners	3540C	Soil	2,2',3,4,4',5',6-Heptachlorobiphenyl	0.50	.086	ug/kg
8082 Congeners	3540C	Soil	2,2',3,4,4',5'-Hexachlorobiphenyl	0.50	.042	ug/kg
8082 Congeners	3540C	Soil	2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.50	.045	ug/kg
8082 Congeners	3540C	Soil	2,2',3,4',5,5',6-Heptachlorobiphenyl	0.50	.134	ug/kg
8082 Congeners	3540C	Soil	2,2',3,4,5,5'-Hexachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,2',3,4',5',6-Hexachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,2',3',4,5-Pentachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,2',3,4',5-Pentachlorobiphenyl	0.50	.045	ug/kg
8082 Congeners	3540C	Soil	2,2',3,4,5'-Pentachlorobiphenyl	0.50	.072	ug/kg
8082 Congeners	3540C	Soil	2,2',3,5,5',6-Hexachlorobiphenyl	0.50	.25	ug/kg

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8082 Congeners	3540C	Soil	2,2',3,5',6-Pentachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,2',3,5'-Tetrachlorobiphenyl	0.50	.054	ug/kg
8082 Congeners	3540C	Soil	2,2',4,4',5,5'-Hexachlorobiphenyl	0.50	.104	ug/kg
8082 Congeners	3540C	Soil	2,2',4,4',5-Pentachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,2',4,5,5'-Pentachlorobiphenyl	0.50	.034	ug/kg
8082 Congeners	3540C	Soil	2,2',4,5'-Tetrachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,2',5,5'-Tetrachlorobiphenyl	0.50	.110	ug/kg
8082 Congeners	3540C	Soil	2,2',5-Trichlorobiphenyl	0.50	.053	ug/kg
8082 Congeners	3540C	Soil	2,3,3',4,4',5,5'-Heptachlorobiphenyl	0.50	.094	ug/kg
8082 Congeners	3540C	Soil	2,3,3',4,4',5'-Hexachlorobiphenyl	0.50	.195	ug/kg
8082 Congeners	3540C	Soil	2,3,3',4,4',5-Hexachlorobiphenyl	0.50	.093	ug/kg
8082 Congeners	3540C	Soil	2,3,3',4,4',6-Hexachlorobiphenyl	0.50	.041	ug/kg
8082 Congeners	3540C	Soil	2,3,3',4,4'-Pentachlorobiphenyl	0.50	.093	ug/kg
8082 Congeners	3540C	Soil	2,3,3',4',6-Pentachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,3,3',4'-Tetrachlorobiphenyl	0.50	.074	ug/kg
8082 Congeners	3540C	Soil	2,3',4,4',5,5'-Hexachlorobiphenyl	0.70	.328	ug/kg
8082 Congeners	3540C	Soil	2,3,4,4',5,6-Hexachlorobiphenyl	0.50	.106	ug/kg
8082 Congeners	3540C	Soil	2,3',4,4',5',6-Hexachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,3,4,4',5-Pentachlorobiphenyl	0.50	.316	ug/kg
8082 Congeners	3540C	Soil	2',3,4,4',5-Pentachlorobiphenyl	0.50	.080	ug/kg
8082 Congeners	3540C	Soil	2,3',4,4',5-Pentachlorobiphenyl	0.50	.042	ug/kg
8082 Congeners	3540C	Soil	2,3',4,4',6-Pentachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,3,4,4'-Tetrachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,3',4,4'-Tetrachlorobiphenyl	0.50	.117	ug/kg
8082 Congeners	3540C	Soil	2,3',4',5-Tetrachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2',3,4-Trichlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,3-Dichlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,4,4',5-Tetrachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,4,4'-Trichlorobiphenyl	0.50	.072	ug/kg
8082 Congeners	3540C	Soil	2,4',5-Trichlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	2,4'-Dichlorobiphenyl	0.50	.110	ug/kg
8082 Congeners	3540C	Soil	2-Chlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	3,3',4,4',5,5'-Hexachlorobiphenyl	0.50	.133	ug/kg
8082 Congeners	3540C	Soil	3,3',4,4',5-Pentachlorobiphenyl	0.50	.140	ug/kg

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8082 Congeners	3540C	Soil	3,3',4,4'-Tetrachlorobiphenyl	0.50	.05	ug/kg
8082 Congeners	3540C	Soil	3,4,4',5-Tetrachlorobiphenyl	0.50	.096	ug/kg
8082 Congeners	3540C	Soil	3,4,4'-Trichlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Soil	Decachlorobiphenyl	0.50	.055	ug/kg
8082 Congeners	3520C	Water	PCB 1	5	1.1	ng/L
8082 Congeners	3520C	Water	PCB 101	5	0.23	ng/L
8082 Congeners	3520C	Water	PCB 105	5	0.35	ng/L
8082 Congeners	3520C	Water	PCB 110	5	0.19	ng/L
8082 Congeners	3520C	Water	PCB 114	5	0.23	ng/L
8082 Congeners	3520C	Water	PCB 118	5	0.32	ng/L
8082 Congeners	3520C	Water	PCB 119	5	0.25	ng/L
8082 Congeners	3520C	Water	PCB 123	5	0.20	ng/L
8082 Congeners	3520C	Water	PCB 126	5	0.24	ng/L
8082 Congeners	3520C	Water	PCB 128	5	0.95	ng/L
8082 Congeners	3520C	Water	PCB 132	5	0.25	ng/L
8082 Congeners	3520C	Water	PCB 138	5	0.23	ng/L
8082 Congeners	3520C	Water	PCB 141	5	0.23	ng/L
8082 Congeners	3520C	Water	PCB 149	5	0.29	ng/L
8082 Congeners	3520C	Water	PCB 151	5	0.21	ng/L
8082 Congeners	3520C	Water	PCB 153	5	0.51	ng/L
8082 Congeners	3520C	Water	PCB 156	5	0.29	ng/L
8082 Congeners	3520C	Water	PCB 157	5	0.32	ng/L
8082 Congeners	3520C	Water	PCB 158	5	0.21	ng/L
8082 Congeners	3520C	Water	PCB 166	5	0.44	ng/L
8082 Congeners	3520C	Water	PCB 167	5	0.19	ng/L
8082 Congeners	3520C	Water	PCB 168	5	0.27	ng/L
8082 Congeners	3520C	Water	PCB 169	5	0.41	ng/L
8082 Congeners	3520C	Water	PCB 170	5	0.28	ng/L
8082 Congeners	3520C	Water	PCB 174	5	0.95	ng/L
8082 Congeners	3520C	Water	PCB 177	5	0.19	ng/L
8082 Congeners	3520C	Water	PCB 18	5	0.95	ng/L
8082 Congeners	3520C	Water	PCB 180	5	0.35	ng/L
8082 Congeners	3520C	Water	PCB 183	5	0.20	ng/L

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8082 Congeners	3520C	Water	PCB 184	5	0.19	ng/L
8082 Congeners	3520C	Water	PCB 187	5	0.26	ng/L
8082 Congeners	3520C	Water	PCB 189	5	0.24	ng/L
8082 Congeners	3520C	Water	PCB 194	5	1.6	ng/L
8082 Congeners	3520C	Water	PCB 195	5	0.29	ng/L
8082 Congeners	3520C	Water	PCB 201	5	0.17	ng/L
8082 Congeners	3520C	Water	PCB 203	5	0.21	ng/L
8082 Congeners	3520C	Water	PCB 206	5	0.20	ng/L
8082 Congeners	3520C	Water	PCB 209	5	0.34	ng/L
8082 Congeners	3520C	Water	PCB 28	5	5	ng/L
8082 Congeners	3520C	Water	PCB 31	5	0.39	ng/L
8082 Congeners	3520C	Water	PCB 33	5	0.84	ng/L
8082 Congeners	3520C	Water	PCB 37	5	0.28	ng/L
8082 Congeners	3520C	Water	PCB 44	5	0.35	ng/L
8082 Congeners	3520C	Water	PCB 49	5	0.51	ng/L
8082 Congeners	3520C	Water	PCB 5	5	0.29	ng/L
8082 Congeners	3520C	Water	PCB 52	5	0.67	ng/L
8082 Congeners	3520C	Water	PCB 56	5	0.21	ng/L
8082 Congeners	3520C	Water	PCB 60	5	0.26	ng/L
8082 Congeners	3520C	Water	PCB 66	5	0.30	ng/L
8082 Congeners	3520C	Water	PCB 70	5	0.20	ng/L
8082 Congeners	3520C	Water	PCB 74	5	0.20	ng/L
8082 Congeners	3520C	Water	PCB 77	5	0.25	ng/L
8082 Congeners	3520C	Water	PCB 8	5	0.71	ng/L
8082 Congeners	3520C	Water	PCB 81	5	0.26	ng/L
8082 Congeners	3520C	Water	PCB 87	5	0.19	ng/L
8082 Congeners	3520C	Water	PCB 90	5	1.1	ng/L
8082 Congeners	3520C	Water	PCB 90 + PCB 101	10	10	ng/L
8082 Congeners	3520C	Water	PCB 95	5	0.53	ng/L
8082 Congeners	3520C	Water	PCB 97	5	0.32	ng/L
8082 Congeners	3520C	Water	PCB 99	5	0.27	ng/L
8141A	3545	Soil	Azinphos-methyl (Guthion)	0.05	0.0063	mg/kg
8141A	3545	Soil	Bolstar (Sulprofos)	0.05	0.0089	mg/kg

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8141A	3545	Soil	Chlorpyrifos	0.05	0.027	mg/kg
8141A	3545	Soil	Coumaphos	0.1	0.0077	mg/kg
8141A	3545	Soil	Demeton-O	0.04	0.0024	mg/kg
8141A	3545	Soil	Demeton-O,S	1.0	0.0124	mg/kg
8141A	3545	Soil	Demeton-S	0.06	0.010	mg/kg
8141A	3545	Soil	Diazinon	0.05	0.0072	mg/kg
8141A	3545	Soil	Dichlorvos	0.05	0.010	mg/kg
8141A	3545	Soil	Dimethoate	0.05	0.029	mg/kg
8141A	3545	Soil	Disulfoton	0.05	0.023	mg/kg
8141A	3545	Soil	EPN	0.05	0.0084	mg/kg
8141A	3545	Soil	Ethoprop (Prophos)	0.05	0.0070	mg/kg
8141A	3545	Soil	Ethyl Parathion	0.05	0.0083	mg/kg
8141A	3545	Soil	Fensulfothion	0.05	0.011	mg/kg
8141A	3545	Soil	Fenthion	0.05	0.0084	mg/kg
8141A	3545	Soil	Malathion	0.05	0.0076	mg/kg
8141A	3545	Soil	Merphos	0.05	0.0040	mg/kg
8141A	3545	Soil	Methyl Parathion	0.05	0.0084	mg/kg
8141A	3545	Soil	Mevinphos	0.05	0.0085	mg/kg
8141A	3545	Soil	Phorate	0.05	0.022	mg/kg
8141A	3545	Soil	Ronnel	0.05	0.0082	mg/kg
8141A	3545	Soil	Stirophos (Tetrachlorovinphos)	0.05	0.0069	mg/kg
8141A	3545	Soil	Sulfotep	0.05	0.0075	mg/kg
8141A	3545	Soil	Tokuthion (Prothiofos)	0.05	0.0077	mg/kg
8141A	3545	Soil	Trichloronate	0.05	0.028	mg/kg
8141A	3535	Water	Azinphos-methyl (Guthion)	1.0	0.20	ug/L
8141A	3535	Water	Bolstar (Sulprofos)	0.5	0.49	ug/L
8141A	3535	Water	Chlorpyrifos	0.2	0.14	ug/L
8141A	3535	Water	Coumaphos	1.0	0.14	ug/L
8141A	3535	Water	Demeton-O	0.4	0.22	ug/L
8141A	3535	Water	Demeton-O,S	2.0	0.317	ug/L
8141A	3535	Water	Demeton-S	1.6	0.097	ug/L
8141A	3535	Water	Diazinon	0.2	0.12	ug/L
8141A	3535	Water	Dichlorvos	0.5	0.17	ug/L
8141A	3535	Water	Dimethoate	0.5	0.11	ug/L

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8141A	3535	Water	Disulfoton	1.0	0.13	ug/L
8141A	3535	Water	EPN	0.2	0.13	ug/L
8141A	3535	Water	Ethoprop (Prophos)	0.2	0.40	ug/L
8141A	3535	Water	Ethyl Parathion	0.5	0.093	ug/L
8141A	3535	Water	Fensulfothion	0.5	0.13	ug/L
8141A	3535	Water	Fenthion	0.5	0.44	ug/L
8141A	3535	Water	Malathion	0.2	0.095	ug/L
8141A	3535	Water	Merphos	0.2	0.052	ug/L
8141A	3535	Water	Methyl Parathion	0.5	0.10	ug/L
8141A	3535	Water	Mevinphos	0.5	0.15	ug/L
8141A	3535	Water	Phorate	0.5	0.48	ug/L
8141A	3535	Water	Ronnel	0.2	0.11	ug/L
8141A	3535	Water	Stirophos (Tetrachlorovinphos)	0.2	0.16	ug/L
8141A	3535	Water	Sulfotep	0.2	0.097	ug/L
8141A	3535	Water	Tokuthion (Prothiofos)	0.2	0.13	ug/L
8141A	3535	Water	Trichloronate	0.2	0.13	ug/L
8151A	Method	Soil	2,4,5-T	50	1.9	ug/kg
8151A	Method	Soil	2,4,5-TP (Silvex)	50	1.8	ug/kg
8151A	Method	Soil	2,4-D	50	2.3	ug/kg
8151A	Method	Soil	2,4-DB	50	13	ug/kg
8151A	Method	Soil	3,5-Dichlorobenzoic Acid	50		ug/kg
8151A	Method	Soil	Acifluorfen	50		ug/kg
8151A	Method	Soil	Bentazon	50		ug/kg
8151A	Method	Soil	Chloramben	50		ug/kg
8151A	Method	Soil	Dacthal	50		ug/kg
8151A	Method	Soil	Dalapon	50	6.6	ug/kg
8151A	Method	Soil	Dicamba	50	2.8	ug/kg
8151A	Method	Soil	Dichlorprop	50	2.5	ug/kg
8151A	Method	Soil	Dinoseb	50	2.5	ug/kg
8151A	Method	Soil	MCPA	10000	240	ug/kg
8151A	Method	Soil	MCPP	10000	270	ug/kg
8151A	Method	Soil	Pentachlorophenol	50		ug/kg
8151A	Method	Soil	Picloram	50		ug/kg

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8151A	Method	Water	2,4,5-T	0.2	0.043	ug/L
8151A	Method	Water	2,4,5-TP (Silvex)	0.2	0.048	ug/L
8151A	Method	Water	2,4-D	0.4	0.048	ug/L
8151A	Method	Water	2,4-DB	0.4	0.10	ug/L
8151A	Method	Water	3,5-Dichlorobenzoic Acid	0.4		ug/L
8151A	Method	Water	Acifluorfen	0.4		ug/L
8151A	Method	Water	Bentazon	0.4		ug/L
8151A	Method	Water	Chloramben	0.4		ug/L
8151A	Method	Water	Dacthal	0.4		ug/L
8151A	Method	Water	Dalapon	0.4	0.23	ug/L
8151A	Method	Water	Dicamba	0.4	0.059	ug/L
8151A	Method	Water	Dichlorprop	0.4	0.058	ug/L
8151A	Method	Water	Dinoseb	0.2	0.068	ug/L
8151A	Method	Water	MCPA	100	35	ug/L
8151A	Method	Water	MCPP	100	6.0	ug/L
8151A	Method	Water	Pentachlorophenol	0.4		ug/L
8151A	Method	Water	Picloram	0.4		ug/L
8151M	Method	Soil	2,3,4,5-Tetrachlorophenol	5	0.62	ug/kg
8151M	Method	Soil	2,3,4,6-Tetrachlorophenol	5	0.3	ug/kg
8151M	Method	Soil	2,3,5,6-Tetrachlorophenol	5	0.3	ug/kg
8151M	Method	Soil	2,4,5-Trichlorophenol	5	0.55	ug/kg
8151M	Method	Soil	2,4,6-Trichlorophenol	5	0.39	ug/kg
8151M	Method	Soil	3,4,5-Trichlorophenol	10	0.84	ug/kg
8151M	Method	Soil	3,4-Dichlorophenol	10	0.57	ug/kg
8151M	Method	Soil	3,5-Dichlorophenol	10	1.7	ug/kg
8151M	Method	Soil	Pentachlorophenol	5	0.14	ug/kg
8151M	Method	Water	2,3,4,5-Tetrachlorophenol	0.5	0.15	ug/L
8151M	Method	Water	2,3,4,6-Tetrachlorophenol	0.5	0.11	ug/L
8151M	Method	Water	2,3,5,6-Tetrachlorophenol	0.5	0.11	ug/L
8151M	Method	Water	2,4,5-Trichlorophenol	0.5	0.27	ug/L
8151M	Method	Water	2,4,6-Trichlorophenol	0.5	0.33	ug/L
8151M	Method	Water	3,4,5-Trichlorophenol	1	0.27	ug/L
8151M	Method	Water	3,4-Dichlorophenol	2.0	0.64	ug/L

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8151M	Method	Water	3,5-Dichlorophenol	2.0	0.27	ug/L
8151M	Method	Water	Pentachlorophenol	0.5	0.13	ug/L
8270C	3541	Soil	1,2,4,5-Tetrachlorobenzene	0.33	0.013	mg/kg
8270C	3541	Soil	1,2,4-Trichlorobenzene	0.33	0.0110	mg/kg
8270C	3541	Soil	1,2-Dichlorobenzene	0.33	0.0179	mg/kg
8270C	3541	Soil	1,2-Diphenylhydrazine	0.33	0.0146	mg/kg
8270C	3541	Soil	1,3,5-Trinitrobenzene	0.67	0.096	mg/kg
8270C	3541	Soil	1,3-Dichlorobenzene	0.33	0.0183	mg/kg
8270C	3541	Soil	1,3-Dinitrobenzene	0.33	0.011	mg/kg
8270C	3541	Soil	1,4-Dichlorobenzene	0.33	0.0175	mg/kg
8270C	3541	Soil	1,4-Dichlorobutane	0.33	0.33	mg/kg
8270C	3541	Soil	1,4-Dioxane	0.67	0.13	mg/kg
8270C	3541	Soil	1,4-Naphthoquinone	0.33	0.063	mg/kg
8270C	3541	Soil	1,6-Dinitropyrene	0.33	0.33	mg/kg
8270C	3541	Soil	1,8-Dinitropyrene	0.33	0.33	mg/kg
8270C	3541	Soil	1-Chloronaphthalene	0.33	0.33	mg/kg
8270C	3541	Soil	1-Methylnaphthalene	0.33	0.33	mg/kg
8270C	3541	Soil	1-Naphthylamine	0.33	0.058	mg/kg
8270C	3541	Soil	1-Nitropyrene	0.33	0.10	mg/kg
8270C	3541	Soil	2,3,4,6-Tetrachlorophenol	1.0	0.011	mg/kg
8270C	3541	Soil	2,4,5-Trichlorophenol	0.33	0.0171	mg/kg
8270C	3541	Soil	2,4,6-Trichlorophenol	0.33	0.0143	mg/kg
8270C	3541	Soil	2,4-Dichlorophenol	0.33	0.0164	mg/kg
8270C	3541	Soil	2,4-Dimethylphenol	0.33	0.0151	mg/kg
8270C	3541	Soil	2,4-Dinitrophenol	2.0	0.112	mg/kg
8270C	3541	Soil	2,4-Dinitrotoluene	0.33	0.0149	mg/kg
8270C	3541	Soil	2,6-Dichlorophenol	0.33	0.013	mg/kg
8270C	3541	Soil	2,6-Diisopropylnaphthalene	0.33	0.33	mg/kg
8270C	3541	Soil	2,6-Dinitrotoluene	0.33	0.0156	mg/kg
8270C	3541	Soil	2-Acetylaminofluorene	4.0	0.015	mg/kg
8270C	3541	Soil	2-Chloronaphthalene	0.33	0.0100	mg/kg
8270C	3541	Soil	2-Chlorophenol	0.33	0.0099	mg/kg
8270C	3541	Soil	2-Methyl-4,6-dinitrophenol	2.0	0.1434	mg/kg

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8270C	3541	Soil	2-Methylnaphthalene	0.33	0.0110	mg/kg
8270C	3541	Soil	2-Methylphenol	0.33	0.0167	mg/kg
8270C	3541	Soil	2-Naphthylamine	0.33	0.0091	mg/kg
8270C	3541	Soil	2-Nitroaniline	2.0	0.0169	mg/kg
8270C	3541	Soil	2-Nitrofluorene	2.0	0.49	mg/kg
8270C	3541	Soil	2-Nitrophenol	0.33	0.0139	mg/kg
8270C	3541	Soil	2-Picoline	0.67	0.069	mg/kg
8270C	3541	Soil	3,3'-Dichlorobenzidine	2.0	0.0270	mg/kg
8270C	3541	Soil	3,3'-Dimethylbenzidine	2.0	1.2	mg/kg
8270C	3541	Soil	3-Methylcholanthrene	0.33	0.022	mg/kg
8270C	3541	Soil	3-Nitroaniline	2.0	0.175	mg/kg
8270C	3541	Soil	3-Nitrophenol	0.33	0.33	mg/kg
8270C	3541	Soil	4-Aminobiphenyl	0.33	0.012	mg/kg
8270C	3541	Soil	4-Bromophenyl Phenyl Ether	0.33	0.0122	mg/kg
8270C	3541	Soil	4-Chloro-3-methylphenol	0.33	0.0166	mg/kg
8270C	3541	Soil	4-Chloroaniline	0.33	0.0144	mg/kg
8270C	3541	Soil	4-Chlorophenyl Phenyl Ether	0.33	0.0160	mg/kg
8270C	3541	Soil	4-Methylphenol	0.33	0.0168	mg/kg
8270C	3541	Soil	4-Nitroaniline	2.0	0.179	mg/kg
8270C	3541	Soil	4-Nitrophenol	2.0	0.146	mg/kg
8270C	3541	Soil	4-Nitropyrene	0.33	0.092	mg/kg
8270C	3541	Soil	4-Nitroquinoline N-Oxide	3.0	0.068	mg/kg
8270C	3541	Soil	5-Methylchrysene	0.33	0.035	mg/kg
8270C	3541	Soil	5-Nitroacenaphthene	0.33	0.028	mg/kg
8270C	3541	Soil	5-Nitro-o-toluidine	0.33	0.015	mg/kg
8270C	3541	Soil	6-Nitrochrysene	0.33	0.096	mg/kg
8270C	3541	Soil	7,12-Dimethylbenz(a)anthracene	0.33	0.0098	mg/kg
8270C	3541	Soil	7H-Dibenzo(c,g)carbazole	0.33	0.049	mg/kg
8270C	3541	Soil	a,a-Dimethylphenethylamine	1.0	0.23	mg/kg
8270C	3541	Soil	Acenaphthene	0.33	0.0134	mg/kg
8270C	3541	Soil	Acenaphthylene	0.33	0.016	mg/kg
8270C	3541	Soil	Acetophenone	0.33	0.011	mg/kg
8270C	3541	Soil	Aniline	1.0	0.0216	mg/kg
8270C	3541	Soil	Anthracene	0.33	0.0139	mg/kg

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8270C	3541	Soil	Aramite, Total	2.0	0.070	mg/kg
8270C	3541	Soil	Atrazine	0.33	0.017	mg/kg
8270C	3541	Soil	Azobenzene	0.33	0.0146	mg/kg
8270C	3541	Soil	Benz(a)anthracene	0.33	0.0123	mg/kg
8270C	3541	Soil	Benzaldehyde	0.33	0.009	mg/kg
8270C	3541	Soil	Benzidine	2.0	0.340	mg/kg
8270C	3541	Soil	Benzo(a)pyrene	0.33	0.0198	mg/kg
8270C	3541	Soil	Benzo(b)fluoranthene	0.33	0.0172	mg/kg
8270C	3541	Soil	Benzo(g,h,i)perylene	0.33	0.0202	mg/kg
8270C	3541	Soil	Benzo(j)fluoranthene	0.33	0.33	mg/kg
8270C	3541	Soil	Benzo(k)fluoranthene	0.33	0.0194	mg/kg
8270C	3541	Soil	Benzoic Acid	2.0	0.139	mg/kg
8270C	3541	Soil	Benzophenone	0.33	0.33	mg/kg
8270C	3541	Soil	Benzyl Alcohol	0.33	0.0168	mg/kg
8270C	3541	Soil	Biphenyl	0.33	0.009	mg/kg
8270C	3541	Soil	Bis(2-chloroethoxy)methane	0.33	0.0110	mg/kg
8270C	3541	Soil	Bis(2-chloroethyl) Ether	0.33	0.0117	mg/kg
8270C	3541	Soil	Bis(2-chloroisopropyl) Ether	0.33	0.0141	mg/kg
8270C	3541	Soil	Bis(2-ethylhexyl) Phthalate	0.33	0.0186	mg/kg
8270C	3541	Soil	Butyl Benzyl Phthalate	0.33	0.0163	mg/kg
8270C	3541	Soil	Caprolactam	0.67	0.147	mg/kg
8270C	3541	Soil	Carbazole	0.33	0.0112	mg/kg
8270C	3541	Soil	Chlorobenzilate	0.33	0.025	mg/kg
8270C	3541	Soil	Chrysene	0.33	0.0118	mg/kg
8270C	3541	Soil	Diallate	0.33	0.011	mg/kg
8270C	3541	Soil	Diazinon	0.33	0.33	mg/kg
8270C	3541	Soil	Dibenz(a,h)acridine	0.33	0.028	mg/kg
8270C	3541	Soil	Dibenz(a,h)anthracene	0.33	0.0275	mg/kg
8270C	3541	Soil	Dibenz(a,j)acridine	0.33	0.048	mg/kg
8270C	3541	Soil	Dibenzo(a,e)pyrene	0.67	0.17	mg/kg
8270C	3541	Soil	Dibenzo(a,h)pyrene	0.67	0.14	mg/kg
8270C	3541	Soil	Dibenzo(a,i)pyrene	0.67	0.20	mg/kg
8270C	3541	Soil	Dibenzo(a,l)pyrene	0.67	0.18	mg/kg
8270C	3541	Soil	Dibenzofuran	0.33	0.0118	mg/kg

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8270C	3541	Soil	Dicyclopentadiene	0.33	0.032	mg/kg
8270C	3541	Soil	Diethyl Phthalate	0.33	0.0141	mg/kg
8270C	3541	Soil	Diethylene Glycol Dibenzoate	0.33	0.33	mg/kg
8270C	3541	Soil	Dimethoate	0.33	0.022	mg/kg
8270C	3541	Soil	Dimethyl Phthalate	0.33	0.0164	mg/kg
8270C	3541	Soil	Di-n-butyl Phthalate	0.33	0.0121	mg/kg
8270C	3541	Soil	Di-n-octyl Phthalate	0.33	0.0240	mg/kg
8270C	3541	Soil	Dinoseb	0.33	0.093	mg/kg
8270C	3541	Soil	Diphenylamine	0.33	0.010	mg/kg
8270C	3541	Soil	Disulfoton	0.33	0.013	mg/kg
8270C	3541	Soil	Ethyl Methanesulfonate	0.33	0.012	mg/kg
8270C	3541	Soil	Ethylene Glycol Butyl Ether (EGBE)	0.33	0.33	mg/kg
8270C	3541	Soil	Famphur	4.0	0.071	mg/kg
8270C	3541	Soil	Fluoranthene	0.33	0.0115	mg/kg
8270C	3541	Soil	Fluorene	0.33	0.0130	mg/kg
8270C	3541	Soil	Hexachlorobenzene	0.33	0.0147	mg/kg
8270C	3541	Soil	Hexachlorobutadiene	0.33	0.0141	mg/kg
8270C	3541	Soil	Hexachlorocyclopentadiene	0.33	0.0125	mg/kg
8270C	3541	Soil	Hexachloroethane	0.33	0.0216	mg/kg
8270C	3541	Soil	Hexachlorophene	6.7	1.2	mg/kg
8270C	3541	Soil	Hexachloropropene	0.33	0.014	mg/kg
8270C	3541	Soil	Indeno(1,2,3-cd)pyrene	0.33	0.0389	mg/kg
8270C	3541	Soil	Isodrin	0.33	0.016	mg/kg
8270C	3541	Soil	Isophorone	0.33	0.0140	mg/kg
8270C	3541	Soil	Isosafrole	0.67	0.011	mg/kg
8270C	3541	Soil	Kepone	4.0	0.39	mg/kg
8270C	3541	Soil	Malathion	0.83	0.83	mg/kg
8270C	3541	Soil	Methapyrilene	1.0	0.091	mg/kg
8270C	3541	Soil	Methyl Methanesulfonate	0.33	0.016	mg/kg
8270C	3541	Soil	Methyl Parathion	0.33	0.018	mg/kg
8270C	3541	Soil	N,N-Dimethylaniline	0.33	0.0604	mg/kg
8270C	3541	Soil	Naphthalene	0.33	0.0144	mg/kg
8270C	3541	Soil	n-Dodecane	0.33	0.33	mg/kg
8270C	3541	Soil	Nitrobenzene	0.33	0.0261	mg/kg

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8270C	3541	Soil	N-Nitrosodiethylamine	0.33	0.015	mg/kg
8270C	3541	Soil	N-Nitrosodimethylamine	2.0	0.0251	mg/kg
8270C	3541	Soil	N-Nitrosodi-n-butylamine	0.33	0.025	mg/kg
8270C	3541	Soil	N-Nitrosodi-n-propylamine	0.33	0.0191	mg/kg
8270C	3541	Soil	N-Nitrosodiphenylamine	0.33	0.018	mg/kg
8270C	3541	Soil	N-Nitrosomethylethylamine	0.33	0.11	mg/kg
8270C	3541	Soil	N-Nitrosomorpholine	0.33	0.0096	mg/kg
8270C	3541	Soil	N-Nitrosopiperidine	0.33	0.015	mg/kg
8270C	3541	Soil	N-Nitrosopyrrolidine	0.33	0.012	mg/kg
8270C	3541	Soil	O,O,O-Triethyl Phosphorothioate	0.33	0.014	mg/kg
8270C	3541	Soil	o-Toluidine	0.33	0.012	mg/kg
8270C	3541	Soil	Parathion	0.33	0.022	mg/kg
8270C	3541	Soil	p-Dimethylaminoazobenzene	0.33	0.021	mg/kg
8270C	3541	Soil	Pentachlorobenzene	0.33	0.013	mg/kg
8270C	3541	Soil	Pentachloroethane	1.0	0.014	mg/kg
8270C	3541	Soil	Pentachloronitrobenzene	2.0	0.011	mg/kg
8270C	3541	Soil	Pentachlorophenol	2.0	0.125	mg/kg
8270C	3541	Soil	Phenacetin	2.0	0.021	mg/kg
8270C	3541	Soil	Phenanthrene	0.33	0.0100	mg/kg
8270C	3541	Soil	Phenol	0.33	0.0195	mg/kg
8270C	3541	Soil	Phorate	0.33	0.011	mg/kg
8270C	3541	Soil	Picric Acid	3.3	3.3	mg/kg
8270C	3541	Soil	p-Phenylenediamine	2.0	0.79	mg/kg
8270C	3541	Soil	Pronamide	0.33	0.017	mg/kg
8270C	3541	Soil	Pyrene	0.33	0.0140	mg/kg
8270C	3541	Soil	Pyridine	0.33	0.0199	mg/kg
8270C	3541	Soil	Safrole	0.33	0.013	mg/kg
8270C	3541	Soil	Sulfotep	0.33	0.011	mg/kg
8270C	3541	Soil	Thionazin	2.0	0.019	mg/kg
8270C	3541	Soil-Low	1,2,4,5-Tetrachlorobenzene	10	4.9	ug/kg
8270C	3541	Soil-Low	1,2,4-Trichlorobenzene	10	1.5	ug/kg
8270C	3541	Soil-Low	1,2-Dichlorobenzene	10	1.3	ug/kg
8270C	3541	Soil-Low	1,2-Diphenylhydrazine	10	2.4	ug/kg

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8270C	3541	Soil-Low	1,3-Dichlorobenzene	10	1.6	ug/kg
8270C	3541	Soil-Low	1,4-Dichlorobenzene	10	1.9	ug/kg
8270C	3541	Soil-Low	2,4,5-Trichlorophenol	10	3.0	ug/kg
8270C	3541	Soil-Low	2,4,6-Trichlorophenol	10	1.8	ug/kg
8270C	3541	Soil-Low	2,4-Dichlorophenol	10	1.8	ug/kg
8270C	3541	Soil-Low	2,4-Dimethylphenol	50	5.5	ug/kg
8270C	3541	Soil-Low	2,4-Dinitrophenol	200	36	ug/kg
8270C	3541	Soil-Low	2,4-Dinitrotoluene	10	2.8	ug/kg
8270C	3541	Soil-Low	2,6-Dinitrotoluene	10	2.8	ug/kg
8270C	3541	Soil-Low	2-Chloronaphthalene	10	3.6	ug/kg
8270C	3541	Soil-Low	2-Chlorophenol	10	1.7	ug/kg
8270C	3541	Soil-Low	2-Methyl-4,6-dinitrophenol	100	1.7	ug/kg
8270C	3541	Soil-Low	2-Methylnaphthalene	10	1.2	ug/kg
8270C	3541	Soil-Low	2-Methylphenol	10	3.4	ug/kg
8270C	3541	Soil-Low	2-Nitroaniline	20	2.7	ug/kg
8270C	3541	Soil-Low	2-Nitrophenol	10	2.6	ug/kg
8270C	3541	Soil-Low	3,3'-Dichlorobenzidine	100	3.7	ug/kg
8270C	3541	Soil-Low	3-Nitroaniline	20	2.6	ug/kg
8270C	3541	Soil-Low	4-Bromophenyl Phenyl Ether	10	1.4	ug/kg
8270C	3541	Soil-Low	4-Chloro-3-methylphenol	10	2.1	ug/kg
8270C	3541	Soil-Low	4-Chloroaniline	10	2.1	ug/kg
8270C	3541	Soil-Low	4-Chlorophenyl Phenyl Ether	10	2.0	ug/kg
8270C	3541	Soil-Low	4-Methylphenol	10	2.9	ug/kg
8270C	3541	Soil-Low	4-Nitroaniline	20	3.4	ug/kg
8270C	3541	Soil-Low	4-Nitrophenol	100	30	ug/kg
8270C	3541	Soil-Low	Acenaphthene	10	1.0	ug/kg
8270C	3541	Soil-Low	Acenaphthylene	10	1.4	ug/kg
8270C	3541	Soil-Low	Acetophenone	50	12	ug/kg
8270C	3541	Soil-Low	Aniline	20	1.5	ug/kg
8270C	3541	Soil-Low	Anthracene	10	1.4	ug/kg
8270C	3541	Soil-Low	Atrazine	10	2.2	ug/kg
8270C	3541	Soil-Low	Azobenzene	10	2.4	ug/kg
8270C	3541	Soil-Low	Benz(a)anthracene	10	1.4	ug/kg
8270C	3541	Soil-Low	Benzaldehyde	20	8.8	ug/kg

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8270C	3541	Soil-Low	Benzidine	200	200	ug/kg
8270C	3541	Soil-Low	Benzo(a)pyrene	10	1.6	ug/kg
8270C	3541	Soil-Low	Benzo(b)fluoranthene	10	2.5	ug/kg
8270C	3541	Soil-Low	Benzo(g,h,i)perylene	10	2.3	ug/kg
8270C	3541	Soil-Low	Benzo(k)fluoranthene	10	2.5	ug/kg
8270C	3541	Soil-Low	Benzoic Acid	200	96	ug/kg
8270C	3541	Soil-Low	Benzyl Alcohol	10	3.7	ug/kg
8270C	3541	Soil-Low	Biphenyl	20	4.8	ug/kg
8270C	3541	Soil-Low	Bis(2-chloroethoxy)methane	10	1.3	ug/kg
8270C	3541	Soil-Low	Bis(2-chloroethyl) Ether	10	2.4	ug/kg
8270C	3541	Soil-Low	Bis(2-chloroisopropyl) Ether	10	1.2	ug/kg
8270C	3541	Soil-Low	Bis(2-ethylhexyl) Phthalate	200	1.7	ug/kg
8270C	3541	Soil-Low	Butyl Benzyl Phthalate	10	1.5	ug/kg
8270C	3541	Soil-Low	Caprolactam	20	12	ug/kg
8270C	3541	Soil-Low	Carbazole	10	1.3	ug/kg
8270C	3541	Soil-Low	Chrysene	10	1.4	ug/kg
8270C	3541	Soil-Low	Dibenz(a,h)anthracene	10	2.2	ug/kg
8270C	3541	Soil-Low	Dibenzofuran	10	1.3	ug/kg
8270C	3541	Soil-Low	Diethyl Phthalate	10	3.5	ug/kg
8270C	3541	Soil-Low	Dimethyl Phthalate	10	1.8	ug/kg
8270C	3541	Soil-Low	Di-n-butyl Phthalate	10	2.6	ug/kg
8270C	3541	Soil-Low	Di-n-octyl Phthalate	10	1.2	ug/kg
8270C	3541	Soil-Low	Fluoranthene	10	2.2	ug/kg
8270C	3541	Soil-Low	Fluorene	10	1.7	ug/kg
8270C	3541	Soil-Low	Hexachlorobenzene	10	2.1	ug/kg
8270C	3541	Soil-Low	Hexachlorobutadiene	10	1.4	ug/kg
8270C	3541	Soil-Low	Hexachlorocyclopentadiene	50	15	ug/kg
8270C	3541	Soil-Low	Hexachloroethane	10	2.2	ug/kg
8270C	3541	Soil-Low	HPAH	10	10	ug/kg
8270C	3541	Soil-Low	Indeno(1,2,3-cd)pyrene	10	1.9	ug/kg
8270C	3541	Soil-Low	Isophorone	10	1.6	ug/kg
8270C	3541	Soil-Low	LPAH	10	10	ug/kg
8270C	3541	Soil-Low	Naphthalene	10	1.3	ug/kg
8270C	3541	Soil-Low	Nitrobenzene	10	2.0	ug/kg

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8270C	3541	Soil-Low	N-Nitrosodimethylamine	50	6.1	ug/kg
8270C	3541	Soil-Low	N-Nitrosodi-n-propylamine	10	3.2	ug/kg
8270C	3541	Soil-Low	N-Nitrosodiphenylamine	10	2.2	ug/kg
8270C	3541	Soil-Low	Pentachlorophenol	100	8.5	ug/kg
8270C	3541	Soil-Low	Phenanthrene	10	1.3	ug/kg
8270C	3541	Soil-Low	Phenol	30	1.9	ug/kg
8270C	3541	Soil-Low	Pyrene	10	1.3	ug/kg
8270C	3541	Soil-Low	Pyridine	50	3.0	ug/kg
8270C	3520C	Water	1,2,4,5-Tetrachlorobenzene	10	0.26	ug/L
8270C	3520C	Water	1,2,4-Trichlorobenzene	10	0.355	ug/L
8270C	3520C	Water	1,2-Dichlorobenzene	10	0.431	ug/L
8270C	3520C	Water	1,2-Diphenylhydrazine	10	0.509	ug/L
8270C	3520C	Water	1,3,5-Trinitrobenzene	25	0.38	ug/L
8270C	3520C	Water	1,3-Dichlorobenzene	10	0.352	ug/L
8270C	3520C	Water	1,3-Dinitrobenzene	10	0.52	ug/L
8270C	3520C	Water	1,4-Dichlorobenzene	10	0.317	ug/L
8270C	3520C	Water	1,4-Dichlorobutane	10	1	ug/L
8270C	3520C	Water	1,4-Dioxane	25	3.7	ug/L
8270C	3520C	Water	1,4-Naphthoquinone	10	0.21	ug/L
8270C	3520C	Water	1,6-Dinitropyrene	10	10	ug/L
8270C	3520C	Water	1,8-Dinitropyrene	10	10	ug/L
8270C	3520C	Water	1-Chloronaphthalene	10	1	ug/L
8270C	3520C	Water	1-Methylnaphthalene	10	10	ug/L
8270C	3520C	Water	1-Naphthylamine	10	0.70	ug/L
8270C	3520C	Water	1-Nitropyrene	10	0.53	ug/L
8270C	3520C	Water	2,3,4,6-Tetrachlorophenol	10	0.55	ug/L
8270C	3520C	Water	2,3,5,6-Tetrachlorophenol	10	0.62	ug/L
8270C	3520C	Water	2,4,5-Trichlorophenol	10	0.381	ug/L
8270C	3520C	Water	2,4,6-Trichlorophenol	10	0.203	ug/L
8270C	3520C	Water	2,4-Dichlorophenol	10	0.297	ug/L
8270C	3520C	Water	2,4-Dimethylphenol	10	0.264	ug/L
8270C	3520C	Water	2,4-Dinitrophenol	25	2.22	ug/L
8270C	3520C	Water	2,4-Dinitrotoluene	10	0.274	ug/L

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8270C	3520C	Water	2,6-Dichlorophenol	10	0.48	ug/L
8270C	3520C	Water	2,6-Dinitrotoluene	10	0.349	ug/L
8270C	3520C	Water	2-Acetylaminofluorene	100	0.23	ug/L
8270C	3520C	Water	2-Chloronaphthalene	10	0.290	ug/L
8270C	3520C	Water	2-Chlorophenol	10	0.311	ug/L
8270C	3520C	Water	2-Methyl-4,6-dinitrophenol	25	2.12	ug/L
8270C	3520C	Water	2-Methylnaphthalene	10	0.239	ug/L
8270C	3520C	Water	2-Methylphenol	10	0.328	ug/L
8270C	3520C	Water	2-Naphthylamine	10	1.0	ug/L
8270C	3520C	Water	2-Nitroaniline	25	0.336	ug/L
8270C	3520C	Water	2-Nitrofluorene	50	15	ug/L
8270C	3520C	Water	2-Nitrophenol	10	0.373	ug/L
8270C	3520C	Water	2-Picoline	25	4.5	ug/L
8270C	3520C	Water	3- and 4-Methylphenol Coelution	10	0.478	ug/L
8270C	3520C	Water	3,3'-Dichlorobenzidine	25	0.270	ug/L
8270C	3520C	Water	3,3'-Dimethylbenzidine	20	5.4	ug/L
8270C	3520C	Water	3-Methylcholanthrene	10	0.31	ug/L
8270C	3520C	Water	3-Nitroaniline	25	3.25	ug/L
8270C	3520C	Water	3-Nitrophenol	10	1	ug/L
8270C	3520C	Water	4-Aminobiphenyl	10	1.4	ug/L
8270C	3520C	Water	4-Bromophenyl Phenyl Ether	10	0.274	ug/L
8270C	3520C	Water	4-Chloro-3-methylphenol	10	0.490	ug/L
8270C	3520C	Water	4-Chloroaniline	10	0.375	ug/L
8270C	3520C	Water	4-Chlorophenyl Phenyl Ether	10	0.278	ug/L
8270C	3520C	Water	4-Methylphenol	10	0.478	ug/L
8270C	3520C	Water	4-Nitroaniline	25	4.03	ug/L
8270C	3520C	Water	4-Nitrophenol	25	1.92	ug/L
8270C	3520C	Water	4-Nitropyrene	10	2.9	ug/L
8270C	3520C	Water	4-Nitroquinoline N-Oxide	100	4.6	ug/L
8270C	3520C	Water	5-Methylchrysene	10	1.1	ug/L
8270C	3520C	Water	5-Nitroacenaphthene	10	0.78	ug/L
8270C	3520C	Water	5-Nitro-o-toluidine	10	1.0	ug/L
8270C	3520C	Water	6-Nitrochrysene	10	2.4	ug/L
8270C	3520C	Water	7,12-Dimethylbenz(a)anthracene	10	0.32	ug/L

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8270C	3520C	Water	7H-Dibenzo(c,g)carbazole	10	0.90	ug/L
8270C	3520C	Water	a,a-Dimethylphenethylamine	25	6.4	ug/L
8270C	3520C	Water	Acenaphthene	10	0.281	ug/L
8270C	3520C	Water	Acenaphthylene	10	0.236	ug/L
8270C	3520C	Water	Acetophenone	10	0.35	ug/L
8270C	3520C	Water	alpha-Terpineol	10	10	ug/L
8270C	3520C	Water	Aniline	25	0.487	ug/L
8270C	3520C	Water	Anthracene	10	0.612	ug/L
8270C	3520C	Water	Aramite, Total	50	0.52	ug/L
8270C	3520C	Water	Atrazine	10	0.401	ug/L
8270C	3520C	Water	Azobenzene	10	0.509	ug/L
8270C	3520C	Water	Benz(a)anthracene	10	0.591	ug/L
8270C	3520C	Water	Benzaldehyde	10	0.441	ug/L
8270C	3520C	Water	Benzidine	50	8.8	ug/L
8270C	3520C	Water	Benzo(a)pyrene	10	0.651	ug/L
8270C	3520C	Water	Benzo(b)fluoranthene	10	0.584	ug/L
8270C	3520C	Water	Benzo(g,h,i)perylene	10	0.812	ug/L
8270C	3520C	Water	Benzo(j)fluoranthene	10	10	ug/L
8270C	3520C	Water	Benzo(k)fluoranthene	10	0.827	ug/L
8270C	3520C	Water	Benzoic acid	25	5.819	ug/L
8270C	3520C	Water	Benzyl alcohol	10	0.377	ug/L
8270C	3520C	Water	Biphenyl	10	0.305	ug/L
8270C	3520C	Water	Bis(2-chloroethoxy)methane	10	0.276	ug/L
8270C	3520C	Water	Bis(2-chloroethyl) Ether	10	0.333	ug/L
8270C	3520C	Water	Bis(2-chloroisopropyl) Ether	10	0.311	ug/L
8270C	3520C	Water	Bis(2-ethylhexyl) Phthalate	10	1.89	ug/L
8270C	3520C	Water	Butyl Benzyl Phthalate	10	0.470	ug/L
8270C	3520C	Water	Caprolactam	25	2.88	ug/L
8270C	3520C	Water	Carbazole	10	0.237	ug/L
8270C	3520C	Water	Chlorobenzilate	10	0.45	ug/L
8270C	3520C	Water	Chrysene	10	0.787	ug/L
8270C	3520C	Water	Diallate	10	0.47	ug/L
8270C	3520C	Water	Dibenz(a,h)acridine	10	0.90	ug/L
8270C	3520C	Water	Dibenz(a,h)anthracene	10	0.752	ug/L

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8270C	3520C	Water	Dibenz(a,j)acridine	10	6.1	ug/L
8270C	3520C	Water	Dibenzo(a,e)pyrene	10	2.8	ug/L
8270C	3520C	Water	Dibenzo(a,h)pyrene	10	5.9	ug/L
8270C	3520C	Water	Dibenzo(a,i)pyrene	10	2.6	ug/L
8270C	3520C	Water	Dibenzo(a,l)pyrene	10	1.2	ug/L
8270C	3520C	Water	Dibenzofuran	10	0.325	ug/L
8270C	3520C	Water	Dicyclopentadiene	10	0.59	ug/L
8270C	3520C	Water	Diethyl Phthalate	10	0.289	ug/L
8270C	3520C	Water	Dimethoate	10	0.69	ug/L
8270C	3520C	Water	Dimethyl Phthalate	10	0.254	ug/L
8270C	3520C	Water	Di-n-butyl Phthalate	10	0.364	ug/L
8270C	3520C	Water	Di-n-octyl Phthalate	10	0.626	ug/L
8270C	3520C	Water	Dinoseb	10	0.42	ug/L
8270C	3520C	Water	Diphenylamine	10	0.42	ug/L
8270C	3520C	Water	Disulfoton	10	0.57	ug/L
8270C	3520C	Water	Ethyl Methanesulfonate	10	0.28	ug/L
8270C	3520C	Water	Famphur	10	0.27	ug/L
8270C	3520C	Water	Fluoranthene	10	0.652	ug/L
8270C	3520C	Water	Fluorene	10	0.323	ug/L
8270C	3520C	Water	Hexachlorobenzene	10	0.628	ug/L
8270C	3520C	Water	Hexachlorobutadiene	10	0.291	ug/L
8270C	3520C	Water	Hexachlorocyclopentadiene	10	1.21	ug/L
8270C	3520C	Water	Hexachloroethane	10	0.289	ug/L
8270C	3520C	Water	Hexachlorophene	150	44	ug/L
8270C	3520C	Water	Hexachloropropene	10	0.19	ug/L
8270C	3520C	Water	Indeno(1,2,3-cd)pyrene	10	0.684	ug/L
8270C	3520C	Water	Isodrin	10	0.36	ug/L
8270C	3520C	Water	Isophorone	10	0.246	ug/L
8270C	3520C	Water	Isosafrole	10	0.48	ug/L
8270C	3520C	Water	Kepone	10	4.1	ug/L
8270C	3520C	Water	Malathion	25	1	ug/L
8270C	3520C	Water	Methapyrilene	100	9.3	ug/L
8270C	3520C	Water	Methyl Methanesulfonate	10	0.31	ug/L
8270C	3520C	Water	Methyl Parathion	10	0.51	ug/L

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8270C	3520C	Water	N,N-Dimethylaniline	10	2.22	ug/L
8270C	3520C	Water	Naphthalene	10	0.365	ug/L
8270C	3520C	Water	Nitrobenzene	10	0.567	ug/L
8270C	3520C	Water	N-Nitrosodiethylamine	10	0.41	ug/L
8270C	3520C	Water	N-Nitrosodimethylamine	25	0.479	ug/L
8270C	3520C	Water	N-Nitrosodi-n-butylamine	10	0.57	ug/L
8270C	3520C	Water	N-Nitrosodi-n-propylamine	10	0.496	ug/L
8270C	3520C	Water	N-Nitrosodiphenylamine	10	0.48	ug/L
8270C	3520C	Water	N-Nitrosomethylethylamine	25	4.6	ug/L
8270C	3520C	Water	N-Nitrosomorpholine	10	0.25	ug/L
8270C	3520C	Water	N-Nitrosopiperidine	10	0.32	ug/L
8270C	3520C	Water	N-Nitrosopyrrolidine	10	0.39	ug/L
8270C	3520C	Water	O,O,O-Triethyl Phosphorothioate	10	0.37	ug/L
8270C	3520C	Water	o-Toluidine	10	1.4	ug/L
8270C	3520C	Water	Parathion	10	0.51	ug/L
8270C	3520C	Water	p-Dimethylaminoazobenzene	10	0.31	ug/L
8270C	3520C	Water	Pentachlorobenzene	10	0.31	ug/L
8270C	3520C	Water	Pentachloroethane	25	0.28	ug/L
8270C	3520C	Water	Pentachloronitrobenzene	50	0.23	ug/L
8270C	3520C	Water	Pentachlorophenol	25	2.44	ug/L
8270C	3520C	Water	Phenacetin	50	0.42	ug/L
8270C	3520C	Water	Phenanthrene	10	0.482	ug/L
8270C	3520C	Water	Phenol	10	0.324	ug/L
8270C	3520C	Water	Phorate	10	0.36	ug/L
8270C	3520C	Water	p-Phenylenediamine	100	4.3	ug/L
8270C	3520C	Water	Pronamide	10	0.41	ug/L
8270C	3520C	Water	Pyrene	10	0.731	ug/L
8270C	3520C	Water	Pyridine	25	7.50	ug/L
8270C	3520C	Water	Quinoline	10	10	ug/L
8270C	3520C	Water	Safrole	10	0.36	ug/L
8270C	3520C	Water	Sulfotep	10	0.26	ug/L
8270C	3520C	Water	Thionazin	25	0.71	ug/L
8270C	3520C	Water-Low	1,2,4,5-Tetrachlorobenzene	0.2	0.057	ug/L

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8270C	3520C	Water-Low	1,2,4-Trichlorobenzene	0.2	0.0153	ug/L
8270C	3520C	Water-Low	1,2-Dichlorobenzene	0.2	0.0141	ug/L
8270C	3520C	Water-Low	1,2-Diphenylhydrazine	0.2	0.0119	ug/L
8270C	3520C	Water-Low	1,3-Dichlorobenzene	0.2	0.0106	ug/L
8270C	3520C	Water-Low	1,4-Dichlorobenzene	0.2	0.0133	ug/L
8270C	3520C	Water-Low	2,4,5-Trichlorophenol	0.5	0.0251	ug/L
8270C	3520C	Water-Low	2,4,6-Trichlorophenol	0.5	0.0367	ug/L
8270C	3520C	Water-Low	2,4-Dichlorophenol	0.5	0.0235	ug/L
8270C	3520C	Water-Low	2,4-Dimethylphenol	2	0.318	ug/L
8270C	3520C	Water-Low	2,4-Dinitrophenol	4	0.529	ug/L
8270C	3520C	Water-Low	2,4-Dinitrotoluene	0.2	0.0191	ug/L
8270C	3520C	Water-Low	2,6-Dinitrotoluene	0.2	0.00879	ug/L
8270C	3520C	Water-Low	2-Chloronaphthalene	0.2	0.0151	ug/L
8270C	3520C	Water-Low	2-Chlorophenol	0.5	0.0145	ug/L
8270C	3520C	Water-Low	2-Methyl-4,6-dinitrophenol	2	0.0130	ug/L
8270C	3520C	Water-Low	2-Methylnaphthalene	0.2	0.0112	ug/L
8270C	3520C	Water-Low	2-Methylphenol	0.5	0.0594	ug/L
8270C	3520C	Water-Low	2-Nitroaniline	0.2	0.0146	ug/L
8270C	3520C	Water-Low	2-Nitrophenol	0.5	0.0134	ug/L
8270C	3520C	Water-Low	3,3'-Dichlorobenzidine	2	0.428	ug/L
8270C	3520C	Water-Low	3-Nitroaniline	1	0.227	ug/L
8270C	3520C	Water-Low	4-Bromophenyl Phenyl Ether	0.2	0.0176	ug/L
8270C	3520C	Water-Low	4-Chloro-3-methylphenol	0.5	0.0289	ug/L
8270C	3520C	Water-Low	4-Chloroaniline	0.2	0.0174	ug/L
8270C	3520C	Water-Low	4-Chlorophenyl Phenyl Ether	0.2	0.00842	ug/L
8270C	3520C	Water-Low	4-Methylphenol	0.5	0.0508	ug/L
8270C	3520C	Water-Low	4-Nitroaniline	1	0.163	ug/L
8270C	3520C	Water-Low	4-Nitrophenol	2	0.534	ug/L
8270C	3520C	Water-Low	Acenaphthene	0.2	0.00872	ug/L
8270C	3520C	Water-Low	Acenaphthylene	0.2	0.0102	ug/L
8270C	3520C	Water-Low	Acetophenone	0.5	0.16	ug/L
8270C	3520C	Water-Low	Aniline	1.0	0.25	ug/L
8270C	3520C	Water-Low	Anthracene	0.2	0.0143	ug/L
8270C	3520C	Water-Low	Atrazine	0.2	0.053	ug/L

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8270C	3520C	Water-Low	Azobenzene	0.2	0.0119	ug/L
8270C	3520C	Water-Low	Benz(a)anthracene	0.2	0.0116	ug/L
8270C	3520C	Water-Low	Benzaldehyde	0.2	0.046	ug/L
8270C	3520C	Water-Low	Benzo(a)pyrene	0.2	0.0159	ug/L
8270C	3520C	Water-Low	Benzo(b)fluoranthene	0.2	0.0191	ug/L
8270C	3520C	Water-Low	Benzo(g,h,i)perylene	0.2	0.0164	ug/L
8270C	3520C	Water-Low	Benzo(k)fluoranthene	0.2	0.0191	ug/L
8270C	3520C	Water-Low	Benzoic Acid	5	1.71	ug/L
8270C	3520C	Water-Low	Benzyl Alcohol	5	0.971	ug/L
8270C	3520C	Water-Low	Biphenyl	0.2	0.037	ug/L
8270C	3520C	Water-Low	Bis(2-chloroethoxy)methane	0.2	0.0113	ug/L
8270C	3520C	Water-Low	Bis(2-chloroethyl) Ether	0.2	0.0142	ug/L
8270C	3520C	Water-Low	Bis(2-chloroisopropyl) Ether	0.2	0.0167	ug/L
8270C	3520C	Water-Low	Bis(2-ethylhexyl) Phthalate	2	0.270	ug/L
8270C	3520C	Water-Low	Butyl Benzyl Phthalate	0.2	0.0254	ug/L
8270C	3520C	Water-Low	Caprolactam	0.50	0.22	ug/L
8270C	3520C	Water-Low	Carbazole	0.2	0.0126	ug/L
8270C	3520C	Water-Low	Chrysene	0.2	0.0139	ug/L
8270C	3520C	Water-Low	Dibenz(a,h)anthracene	0.2	0.0303	ug/L
8270C	3520C	Water-Low	Dibenzofuran	0.2	0.0131	ug/L
8270C	3520C	Water-Low	Diethyl Phthalate	0.2	0.0259	ug/L
8270C	3520C	Water-Low	Dimethyl Phthalate	0.2	0.0125	ug/L
8270C	3520C	Water-Low	Di-n-butyl Phthalate	0.2	0.0263	ug/L
8270C	3520C	Water-Low	Di-n-octyl Phthalate	0.2	0.0320	ug/L
8270C	3520C	Water-Low	Fluoranthene	0.2	0.0122	ug/L
8270C	3520C	Water-Low	Fluorene	0.2	0.0120	ug/L
8270C	3520C	Water-Low	Hexachlorobenzene	0.2	0.0141	ug/L
8270C	3520C	Water-Low	Hexachlorobutadiene	0.2	0.0194	ug/L
8270C	3520C	Water-Low	Hexachlorocyclopentadiene	1	0.0406	ug/L
8270C	3520C	Water-Low	Hexachloroethane	0.2	0.0184	ug/L
8270C	3520C	Water-Low	Indeno(1,2,3-cd)pyrene	0.2	0.0239	ug/L
8270C	3520C	Water-Low	Isophorone	0.2	0.00842	ug/L
8270C	3520C	Water-Low	Naphthalene	0.2	0.0120	ug/L
8270C	3520C	Water-Low	Nitrobenzene	0.2	0.00740	ug/L

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8270C	3520C	Water-Low	N-Nitrosodimethylamine	2.0	0.42	ug/L
8270C	3520C	Water-Low	N-Nitrosodi-n-propylamine	0.2	0.0323	ug/L
8270C	3520C	Water-Low	N-Nitrosodiphenylamine	0.2	0.0278	ug/L
8270C	3520C	Water-Low	Pentachlorophenol	1	0.0283	ug/L
8270C	3520C	Water-Low	Phenanthrene	0.2	0.0102	ug/L
8270C	3520C	Water-Low	Phenol	0.5	0.0196	ug/L
8270C	3520C	Water-Low	Pyrene	0.2	0.0145	ug/L
8270C	3520C	Water-Low	Pyridine	5.0	1.4	ug/L
8270C-SIM PAH	3541	Soil	1-Methylnaphthalene	5	0.25	ug/kg
8270C-SIM PAH	3541	Soil	1-Methylphenanthrene	5	0.24	ug/kg
8270C-SIM PAH	3541	Soil	2,3,5-Trimethylnaphthalene	5	0.15	ug/kg
8270C-SIM PAH	3541	Soil	2,6-Dimethylnaphthalene	5	0.27	ug/kg
8270C-SIM PAH	3541	Soil	2-Methylnaphthalene	5	0.34	ug/kg
8270C-SIM PAH	3541	Soil	Acenaphthene	5	0.16	ug/kg
8270C-SIM PAH	3541	Soil	Acenaphthylene	5	0.22	ug/kg
8270C-SIM PAH	3541	Soil	Anthracene	5	0.22	ug/kg
8270C-SIM PAH	3541	Soil	Benz(a)anthracene	5	0.16	ug/kg
8270C-SIM PAH	3541	Soil	Benzo(a)pyrene	5	0.22	ug/kg
8270C-SIM PAH	3541	Soil	Benzo(b)fluoranthene	5	0.48	ug/kg
8270C-SIM PAH	3541	Soil	Benzo(e)pyrene	5	0.39	ug/kg
8270C-SIM PAH	3541	Soil	Benzo(g,h,i)perylene	5	0.23	ug/kg
8270C-SIM PAH	3541	Soil	Benzo(k)fluoranthene	5	0.33	ug/kg
8270C-SIM PAH	3541	Soil	Biphenyl	5	0.43	ug/kg
8270C-SIM PAH	3541	Soil	Carbazole	5	0.65	ug/kg
8270C-SIM PAH	3541	Soil	Chrysene	5	0.41	ug/kg
8270C-SIM PAH	3541	Soil	Dibenz(a,h)anthracene	5	0.26	ug/kg
8270C-SIM PAH	3541	Soil	Dibenzofuran	5	0.17	ug/kg
8270C-SIM PAH	3541	Soil	Dibenzothiophene	5	0.23	ug/kg
8270C-SIM PAH	3541	Soil	Fluoranthene	5	0.34	ug/kg
8270C-SIM PAH	3541	Soil	Fluorene	5	0.19	ug/kg
8270C-SIM PAH	3541	Soil	Indeno(1,2,3-cd)pyrene	5	0.24	ug/kg
8270C-SIM PAH	3541	Soil	Naphthalene	5	0.34	ug/kg
8270C-SIM PAH	3541	Soil	Pentachlorophenol	200	15	ug/kg

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8270C-SIM PAH	3541	Soil	Perylene	5	0.17	ug/kg
8270C-SIM PAH	3541	Soil	Phenanthrene	5	0.33	ug/kg
8270C-SIM PAH	3541	Soil	Pyrene	5	0.36	ug/kg
8270C-SIM PAH	3520C	Water	1-Methylnaphthalene	0.02	0.00250	ug/L
8270C-SIM PAH	3520C	Water	1-Methylphenanthrene	0.02	0.00193	ug/L
8270C-SIM PAH	3520C	Water	2,3,5-Trimethylnaphthalene	0.02	0.00110	ug/L
8270C-SIM PAH	3520C	Water	2,6-Dimethylnaphthalene	0.02	0.00237	ug/L
8270C-SIM PAH	3520C	Water	2-Methylnaphthalene	0.02	0.00268	ug/L
8270C-SIM PAH	3520C	Water	Acenaphthene	0.02	0.00198	ug/L
8270C-SIM PAH	3520C	Water	Acenaphthylene	0.02	0.00178	ug/L
8270C-SIM PAH	3520C	Water	Anthracene	0.02	0.00103	ug/L
8270C-SIM PAH	3520C	Water	Benz(a)anthracene	0.02	0.0021	ug/L
8270C-SIM PAH	3520C	Water	Benzo(a)pyrene	0.02	0.00158	ug/L
8270C-SIM PAH	3520C	Water	Benzo(b)fluoranthene	0.02	0.00194	ug/L
8270C-SIM PAH	3520C	Water	Benzo(e)pyrene	0.02	0.00182	ug/L
8270C-SIM PAH	3520C	Water	Benzo(g,h,i)perylene	0.02	0.00368	ug/L
8270C-SIM PAH	3520C	Water	Benzo(k)fluoranthene	0.02	0.00134	ug/L
8270C-SIM PAH	3520C	Water	Biphenyl	0.02	0.00351	ug/L
8270C-SIM PAH	3520C	Water	Carbazole	0.02	0.019	ug/L
8270C-SIM PAH	3520C	Water	Chrysene	0.02	0.00124	ug/L
8270C-SIM PAH	3520C	Water	Dibenz(a,h)anthracene	0.02	0.00162	ug/L
8270C-SIM PAH	3520C	Water	Dibenzofuran	0.02	0.00705	ug/L
8270C-SIM PAH	3520C	Water	Dibenzothiophene	0.02	0.00401	ug/L
8270C-SIM PAH	3520C	Water	Fluoranthene	0.02	0.00238	ug/L
8270C-SIM PAH	3520C	Water	Fluorene	0.02	0.00258	ug/L
8270C-SIM PAH	3520C	Water	Indeno(1,2,3-cd)pyrene	0.02	0.00208	ug/L
8270C-SIM PAH	3520C	Water	Naphthalene	0.02	0.00316	ug/L
8270C-SIM PAH	3520C	Water	Pentachlorophenol	1	0.095	ug/L
8270C-SIM PAH	3520C	Water	Perylene	0.02	0.00116	ug/L
8270C-SIM PAH	3520C	Water	Phenanthrene	0.02	0.00320	ug/L
8270C-SIM PAH	3520C	Water	Pyrene	0.02	0.00222	ug/L
8310	3550B	Soil	2-Methylnaphthalene/Dibenzofuran	0.100	0.032	mg/kg
8310	3550B	Soil	Acenaphthene	0.100	0.023	mg/kg

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8310	3550B	Soil	Acenaphthylene	0.100	0.029	mg/kg
8310	3550B	Soil	Anthracene	0.010	0.00069	mg/kg
8310	3550B	Soil	Benz(a)anthracene	0.010	0.0013	mg/kg
8310	3550B	Soil	Benzo(a)pyrene	0.010	0.0010	mg/kg
8310	3550B	Soil	Benzo(b)fluoranthene	0.02	0.00071	mg/kg
8310	3550B	Soil	Benzo(g,h,i)perylene	0.020	0.0025	mg/kg
8310	3550B	Soil	Benzo(k)fluoranthene	0.010	0.00096	mg/kg
8310	3550B	Soil	Chrysene	0.010	0.00092	mg/kg
8310	3550B	Soil	Dibenz(a,h)anthracene	0.02	0.0021	mg/kg
8310	3550B	Soil	Fluoranthene	0.02	0.0014	mg/kg
8310	3550B	Soil	Fluorene	0.02	0.0025	mg/kg
8310	3550B	Soil	Indeno(1,2,3-cd)pyrene	0.010	0.0023	mg/kg
8310	3550B	Soil	Naphthalene	0.100	0.021	mg/kg
8310	3550B	Soil	Phenanthrene	0.01	0.0023	mg/kg
8310	3550B	Soil	Pyrene	0.02	0.00084	mg/kg
8310	3510C	Water	2-Methylnaphthalene/Dibenzofuran	1.0	0.24	ug/L
8310	3510C	Water	Acenaphthene	1.0	0.31	ug/L
8310	3510C	Water	Acenaphthylene	1.0	0.42	ug/L
8310	3510C	Water	Anthracene	0.1	0.021	ug/L
8310	3510C	Water	Benz(a)anthracene	0.1	0.024	ug/L
8310	3510C	Water	Benzo(a)pyrene	0.1	0.026	ug/L
8310	3510C	Water	Benzo(b)fluoranthene	0.2	0.032	ug/L
8310	3510C	Water	Benzo(g,h,i)perylene	0.2	0.050	ug/L
8310	3510C	Water	Benzo(k)fluoranthene	0.1	0.035	ug/L
8310	3510C	Water	Chrysene	0.1	0.021	ug/L
8310	3510C	Water	Dibenz(a,h)anthracene	0.2	0.047	ug/L
8310	3510C	Water	Fluoranthene	0.2	0.028	ug/L
8310	3510C	Water	Fluorene	0.2	0.024	ug/L
8310	3510C	Water	Indeno(1,2,3-cd)pyrene	0.1	0.029	ug/L
8310	3510C	Water	Naphthalene	1.0	0.25	ug/L
8310	3510C	Water	Phenanthrene	0.1	0.020	ug/L
8310	3510C	Water	Pyrene	0.2	0.020	ug/L
8315	Method	Soil	Acetaldehyde	2	1.1	mg/kg

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8315	Method	Soil	Formaldehyde	2	0.81	mg/kg
8315	Method	Water	Acetaldehyde	100	12	ug/L
8315	Method	Water	Formaldehyde	100	11	ug/L
8330	Method	Soil	1,3,5-Trinitrobenzene	2.0	0.088	mg/kg
8330	Method	Soil	1,3-Dinitrobenzene	2.0	0.089	mg/kg
8330	Method	Soil	2,4,6-Trinitrotoluene	2.0	0.092	mg/kg
8330	Method	Soil	2,4-Dinitrotoluene	2.0	0.059	mg/kg
8330	Method	Soil	2,6-Dinitrotoluene	2.0	0.11	mg/kg
8330	Method	Soil	2-Amino-4,6-dinitrotoluene	2.0	0.099	mg/kg
8330	Method	Soil	2-Nitrotoluene	2.0	0.082	mg/kg
8330	Method	Soil	3-Nitrotoluene	2.0	0.081	mg/kg
8330	Method	Soil	4-Amino-2,6-dinitrotoluene	2.0	0.12	mg/kg
8330	Method	Soil	4-Nitrotoluene	2.0	0.11	mg/kg
8330	Method	Soil	HMX	2.0	0.072	mg/kg
8330	Method	Soil	Nitrobenzene	2.0	0.12	mg/kg
8330	Method	Soil	RDX	2.0	0.15	mg/kg
8330	Method	Soil	TETRYL	2.0	0.23	mg/kg
8330	Method	Water	1,3,5-Trinitrobenzene	2.0	0.38	ug/L
8330	Method	Water	1,3-Dinitrobenzene	2.0	0.27	ug/L
8330	Method	Water	2,4,6-Trinitrotoluene	2.0	0.50	ug/L
8330	Method	Water	2,4-Dinitrotoluene	2.0	0.32	ug/L
8330	Method	Water	2,6-Dinitrotoluene	2.0	0.39	ug/L
8330	Method	Water	2-Amino-4,6-dinitrotoluene	2.0	0.46	ug/L
8330	Method	Water	2-Nitrotoluene	2.0	0.32	ug/L
8330	Method	Water	3-Nitrotoluene	2.0	0.34	ug/L
8330	Method	Water	4-Amino-2,6-dinitrotoluene	2.0	0.53	ug/L
8330	Method	Water	4-Nitrotoluene	2.0	0.50	ug/L
8330	Method	Water	HMX	2.0	0.46	ug/L
8330	Method	Water	Nitrobenzene	2.0	0.45	ug/L
8330	Method	Water	RDX	2.0	0.38	ug/L
8330	Method	Water	TETRYL	2.0	0.37	ug/L
8332	Method	Soil	Nitroglycerin	2	0.49	mg/kg
8332	Method	Soil	PETN	2	0.50	mg/kg

SEMIVOLATILE ORGANIC COMPOUNDS (SOCs) ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8332	Method	Water	Nitroglycerin	2	0.69	ug/L
8332	Method	Water	PETN	2	0.84	ug/L
AK 102	Method	Soil	Diesel Range Petroleum Hydrocarbons	20	2.5	mg/kg
8015	3550B	Soil	Diesel Range Petroleum Hydrocarbons	10	2.7	mg/kg
NWTPH-Dx	Method	Soil	Diesel Range Petroleum Hydrocarbons	25	2.7	mg/kg
AK 102	Method	Water	Diesel Range Petroleum Hydrocarbons	800	7.6	ug/L
8015	3510C	Water	Diesel Range Petroleum Hydrocarbons	50	13	ug/L
NWTPH-Dx	Method	Water	Diesel Range Petroleum Hydrocarbons	100	7.6	ug/L
AK 103	3550B	Soil	Residual Range Petroleum Hydrocarbon	100	4.5	mg/kg
8015/CA-TPH-D	3510C	Water	Residual Range Petroleum Hydrocarbon	100	28	ug/L

a Method Detection Limits are subject to change as new MDL studies are completed.

SELECTED MARINE WATER, SEDIMENT, AND TISSUE ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
ASTM D4129-82M	Method	Sediment	Total Organic Carbon	0.05	0.02	%
9030M	Method	Sediment	Sulfides	0.5	0.03	mg/kg
PSEP	NA	Sediment	Particle Size	NA	NA	
6010B - ICP	AVS-SEM	Sediment	Cadmium	0.2		mg/kg
6010B - ICP	AVS-SEM	Sediment	Copper	0.4		mg/kg
6010B - ICP	AVS-SEM	Sediment	Lead	3		mg/kg
6010B - ICP	AVS-SEM	Sediment	Nickel	0.5		mg/kg
6010B - ICP	AVS-SEM	Sediment	Zinc	0.4		mg/kg
7470A	AVS-SEM	Sediment	Mercury	0.01		mg/kg
200.8 - ICP/MS	3050B	Sediment	Aluminum	2	2	mg/kg
200.8 - ICP/MS	3050B	Sediment	Antimony	0.05	0.02	mg/kg
200.8 - ICP/MS	3050B	Sediment	Arsenic	0.5	0.07	mg/kg
200.8 - ICP/MS	3050B	Sediment	Barium	0.05	0.03	mg/kg
200.8 - ICP/MS	3050B	Sediment	Beryllium	0.02	0.006	mg/kg
200.8 - ICP/MS	3050B	Sediment	Cadmium	0.05	0.007	mg/kg
6010B - ICP	3050B	Sediment	Chromium	2	0.6	mg/kg
200.8 - ICP/MS	3050B	Sediment	Cobalt	0.02	0.01	mg/kg
200.8 - ICP/MS	3050B	Sediment	Copper	0.1	0.02	mg/kg
200.8 - ICP/MS	3050B	Sediment	Lead	0.05	0.02	mg/kg
200.8 - ICP/MS	3050B	Sediment	Manganese	0.1	0.04	mg/kg
7471A- CVAA	Method	Sediment	Mercury	0.02	0.008	mg/kg
200.8 - ICP/MS	3050B	Sediment	Molybdenum	0.05	0.008	mg/kg
200.8 - ICP/MS	3050B	Sediment	Nickel	0.2	0.04	mg/kg
7740 - GFAA	3050B	Sediment	Selenium	1	0.2	mg/kg
200.8 - ICP/MS	3050B	Sediment	Silver	0.02	0.003	mg/kg
200.8 - ICP/MS	3050B	Sediment	Thallium	0.02	0.002	mg/kg
200.8 - ICP/MS	3050B	Sediment	Vanadium	0.2	0.03	mg/kg
200.8 - ICP/MS	3050B	Sediment	Zinc	0.5	0.2	mg/kg
200.8 - ICP/MS	Reductive Precip.	Seawater	Arsenic	0.5	0.01	ug/L
200.8 - ICP/MS	Reductive Precip.	Seawater	Beryllium	0.02	0.0006	ug/L
200.8 - ICP/MS	Reductive Precip.	Seawater	Cadmium	0.02	0.002	ug/L
200.8 - ICP/MS	Reductive Precip.	Seawater	Chromium	0.2	0.03	ug/L

SELECTED MARINE WATER, SEDIMENT, AND TISSUE ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
200.8 - ICP/MS	Reductive Precip.	Seawater	Cobalt	0.02	0.002	ug/L
200.8 - ICP/MS	Reductive Precip.	Seawater	Copper	0.1	0.005	ug/L
200.8 - ICP/MS	Reductive Precip.	Seawater	Lead	0.02	0.008	ug/L
200.8 - ICP/MS	Reductive Precip.	Seawater	Nickel	0.2	0.02	ug/L
200.8 - ICP/MS	Reductive Precip.	Seawater	Silver	0.02	0.002	ug/L
200.8 - ICP/MS	Reductive Precip.	Seawater	Thallium	0.02	0.0005	ug/L
200.8 - ICP/MS	Reductive Precip.	Seawater	Zinc	0.5	0.02	ug/L
7742	3010A/BRAA	Seawater	Selenium	1	0.3	ug/L
200.8 - ICP/MS	3050B/PSEP	Tissue	Aluminum	2	0.3	mg/kg
200.8 - ICP/MS	3050B/PSEP	Tissue	Antimony	0.05	0.008	mg/kg
200.8 - ICP/MS	3050B/PSEP	Tissue	Arsenic	0.5	0.03	mg/kg
200.8 - ICP/MS	3050B/PSEP	Tissue	Barium	0.05	0.02	mg/kg
200.8 - ICP/MS	3050B/PSEP	Tissue	Beryllium	0.02	0.007	mg/kg
200.8 - ICP/MS	3050B/PSEP	Tissue	Cadmium	0.02	0.006	mg/kg
6010B - ICP	3050B/PSEP	Tissue	Chromium	0.5	0.5	mg/kg
200.8 - ICP/MS	3050B/PSEP	Tissue	Cobalt	0.02	0.003	mg/kg
200.8 - ICP/MS	3050B/PSEP	Tissue	Copper	0.1	0.09	mg/kg
200.8 - ICP/MS	3050B/PSEP	Tissue	Lead	0.02	0.007	mg/kg
200.8 - ICP/MS	3050B/PSEP	Tissue	Manganese	0.05	0.006	mg/kg
7471A- CVAA	Method	Tissue	Mercury	0.02	0.01	mg/kg
200.8 - ICP/MS	3050B/PSEP	Tissue	Molybdenum	0.05	0.005	mg/kg
200.8 - ICP/MS	3050B/PSEP	Tissue	Nickel	0.2	0.03	mg/kg
7740 - GFAA	3050B/PSEP	Tissue	Selenium	1	1	mg/kg
200.8 - ICP/MS	3050B/PSEP	Tissue	Silver	0.02	0.004	mg/kg
200.8 - ICP/MS	3050B/PSEP	Tissue	Thallium	0.02	0.002	mg/kg
200.8 - ICP/MS	3050B/PSEP	Tissue	Zinc	0.5	0.06	mg/kg
8081A	3541	Sed.-Low	2,4'-DDD	1.0	0.12	ug/kg
8081A	3541	Sed.-Low	2,4'-DDE	1.0	0.32	ug/kg
8081A	3541	Sed.-Low	2,4'-DDT	1.0	0.13	ug/kg
8081A	3541	Sed.-Low	4,4'-DDD	1.0	0.12	ug/kg
8081A	3541	Sed.-Low	4,4'-DDE	1.0	0.10	ug/kg
8081A	3541	Sed.-Low	4,4'-DDT	1.0	0.064	ug/kg

SELECTED MARINE WATER, SEDIMENT, AND TISSUE ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8081A	3541	Sed.-Low	Aldrin	1.0	0.15	ug/kg
8081A	3541	Sed.-Low	alpha-BHC	1.0	0.26	ug/kg
8081A	3541	Sed.-Low	alpha-Chlordane	1.0	0.23	ug/kg
8081A	3541	Sed.-Low	beta-BHC	1.0	0.30	ug/kg
8081A	3541	Sed.-Low	Chlordane	10	1.4	ug/kg
8081A	3541	Sed.-Low	Chlorpyrifos	1.0	0.054	ug/kg
8081A	3541	Sed.-Low	cis-Nonachlor	1.0	0.083	ug/kg
8081A	3541	Sed.-Low	delta-BHC	1.0	0.055	ug/kg
8081A	3541	Sed.-Low	Dieldrin	1.0	0.29	ug/kg
8081A	3541	Sed.-Low	Endosulfan I	1.0	0.17	ug/kg
8081A	3541	Sed.-Low	Endosulfan II	1.0	0.19	ug/kg
8081A	3541	Sed.-Low	Endosulfan Sulfate	1.0	0.079	ug/kg
8081A	3541	Sed.-Low	Endrin	1.0	0.20	ug/kg
8081A	3541	Sed.-Low	Endrin Aldehyde	1.0	0.053	ug/kg
8081A	3541	Sed.-Low	Endrin Ketone	1.0	0.082	ug/kg
8081A	3541	Sed.-Low	gamma-BHC (Lindane)	1.0	0.15	ug/kg
8081A	3541	Sed.-Low	gamma-Chlordane	1.0	0.064	ug/kg
8081A	3541	Sed.-Low	Heptachlor	1.0	0.080	ug/kg
8081A	3541	Sed.-Low	Heptachlor Epoxide	1.0	0.13	ug/kg
8081A	3541	Sed.-Low	Hexachlorobenzene	1.0	0.079	ug/kg
8081A	3541	Sed.-Low	Hexachlorobutadiene	1.0	0.49	ug/kg
8081A	3541	Sed.-Low	Hexachlorocyclopentadiene	1.0	0.39	ug/kg
8081A	3541	Sed.-Low	Hexachloroethane	1.0	0.16	ug/kg
8081A	3541	Sed.-Low	Isodrin	1.0	0.097	ug/kg
8081A	3541	Sed.-Low	Methoxychlor	1.0	0.10	ug/kg
8081A	3541	Sed.-Low	Mirex	1.0	0.10	ug/kg
8081A	3541	Sed.-Low	Oxychlordane	1.0	0.37	ug/kg
8081A	3541	Sed.-Low	Toxaphene	50	4.9	ug/kg
8081A	3541	Sed.-Low	trans-Nonachlor	1.0	0.089	ug/kg
8081A	3540C	Tissue	2,4'-DDD	1.0	0.32	ug/kg
8081A	3540C	Tissue	2,4'-DDE	1.0	0.19	ug/kg
8081A	3540C	Tissue	2,4'-DDT	1.0	0.33	ug/kg
8081A	3540C	Tissue	4,4'-DDD	1.0	0.098	ug/kg

SELECTED MARINE WATER, SEDIMENT, AND TISSUE ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8081A	3540C	Tissue	4,4'-DDE	1.0	0.12	ug/kg
8081A	3540C	Tissue	4,4'-DDT	1.0	0.17	ug/kg
8081A	3540C	Tissue	Aldrin	1.0	0.11	ug/kg
8081A	3540C	Tissue	alpha-BHC	1.0	0.21	ug/kg
8081A	3540C	Tissue	alpha-Chlordane	1.0	0.18	ug/kg
8081A	3540C	Tissue	beta-BHC	1.0	0.32	ug/kg
8081A	3540C	Tissue	Chlordane	10	1.2	ug/kg
8081A	3540C	Tissue	Chlorpyrifos	1.0	0.15	ug/kg
8081A	3540C	Tissue	cis-Nonachlor	1.0	0.16	ug/kg
8081A	3540C	Tissue	delta-BHC	1.0	0.24	ug/kg
8081A	3540C	Tissue	Dieldrin	1.0	0.081	ug/kg
8081A	3540C	Tissue	Endosulfan I	1.0	0.16	ug/kg
8081A	3540C	Tissue	Endosulfan II	1.0	0.087	ug/kg
8081A	3540C	Tissue	Endosulfan Sulfate	1.0	0.16	ug/kg
8081A	3540C	Tissue	Endrin	1.0	0.088	ug/kg
8081A	3540C	Tissue	Endrin Aldehyde	1.0	0.20	ug/kg
8081A	3540C	Tissue	Endrin Ketone	1.0	0.24	ug/kg
8081A	3540C	Tissue	gamma-BHC (Lindane)	1.0	0.15	ug/kg
8081A	3540C	Tissue	gamma-Chlordane	1.0	0.25	ug/kg
8081A	3540C	Tissue	Heptachlor	1.0	0.13	ug/kg
8081A	3540C	Tissue	Heptachlor Epoxide	1.0	0.25	ug/kg
8081A	3540C	Tissue	Hexachlorobenzene	1.0	0.15	ug/kg
8081A	3540C	Tissue	Hexachlorobutadiene	1.0	0.27	ug/kg
8081A	3540C	Tissue	Hexachloroethane	1.0	0.16	ug/kg
8081A	3540C	Tissue	Isodrin	1.0	0.15	ug/kg
8081A	3540C	Tissue	Methoxychlor	1.0	0.21	ug/kg
8081A	3540C	Tissue	Mirex	1.0	0.20	ug/kg
8081A	3540C	Tissue	Oxychlordane	1.0	0.090	ug/kg
8081A	3540C	Tissue	Toxaphene	50	13	ug/kg
8081A	3540C	Tissue	trans-Nonachlor	1.0	0.082	ug/kg
8082 Aroclors	3541	Sed.-Low	Aroclor 1016	10	1.6	ug/kg
8082 Aroclors	3541	Sed.-Low	Aroclor 1221	20	1.6	ug/kg
8082 Aroclors	3541	Sed.-Low	Aroclor 1232	10	1.6	ug/kg
8082 Aroclors	3541	Sed.-Low	Aroclor 1242	10	1.6	ug/kg

SELECTED MARINE WATER, SEDIMENT, AND TISSUE ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8082 Aroclors	3541	Sed.-Low	Aroclor 1248	10	1.6	ug/kg
8082 Aroclors	3541	Sed.-Low	Aroclor 1254	10	1.6	ug/kg
8082 Aroclors	3541	Sed.-Low	Aroclor 1260	10	1.6	ug/kg
8082 Aroclors	3541	Sed.-Low	Aroclor 1262	10	1.6	ug/kg
8082 Aroclors	3541	Sed.-Low	Aroclor 1268	10	1.6	ug/kg
8082 Aroclors	3540C	Tissue	Aroclor 1016	10	1.3	ug/kg
8082 Aroclors	3540C	Tissue	Aroclor 1221	20	1.6	ug/kg
8082 Aroclors	3540C	Tissue	Aroclor 1232	10	3	ug/kg
8082 Aroclors	3540C	Tissue	Aroclor 1242	10	1.4	ug/kg
8082 Aroclors	3540C	Tissue	Aroclor 1248	10	2.6	ug/kg
8082 Aroclors	3540C	Tissue	Aroclor 1254	10	0.61	ug/kg
8082 Aroclors	3540C	Tissue	Aroclor 1260	10	0.79	ug/kg
8082 Aroclors	3540C	Tissue	Aroclor 1262	10	1.6	ug/kg
8082 Aroclors	3540C	Tissue	Aroclor 1268	10	1.3	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	0.50	.095	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,3',4,4',5,5'-Octachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,3',4,4',5,6-Octachlorobiphenyl	0.50	.134	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,3',4,4',5-Heptachlorobiphenyl	0.50	.062	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,3',4,4'-Hexachlorobiphenyl	0.50	.290	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,3',4,5',6,6'-Octachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,3',4',5,6-Heptachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,3',4,5,6'-Heptachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,3',4,6'-Hexachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,4,4',5,5',6-Octachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,4,4',5,5'-Heptachlorobiphenyl	0.50	.035	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,4,4',5',6-Heptachlorobiphenyl	0.50	.086	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,4,4',5'-Hexachlorobiphenyl	0.50	.042	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.50	.045	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,4',5,5',6-Heptachlorobiphenyl	0.50	.134	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,4,5,5'-Hexachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,4',5',6-Hexachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,2',3',4,5-Pentachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,4',5-Pentachlorobiphenyl	0.50	.045	ug/kg

SELECTED MARINE WATER, SEDIMENT, AND TISSUE ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8082 Congeners	3540C	Sediment	2,2',3,4,5'-Pentachlorobiphenyl	0.50	.072	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,5,5',6-Hexachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,5',6-Pentachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,2',3,5'-Tetrachlorobiphenyl	0.50	.054	ug/kg
8082 Congeners	3540C	Sediment	2,2',4,4',5,5'-Hexachlorobiphenyl	0.50	.104	ug/kg
8082 Congeners	3540C	Sediment	2,2',4,4',5-Pentachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,2',4,5,5'-Pentachlorobiphenyl	0.50	.034	ug/kg
8082 Congeners	3540C	Sediment	2,2',4,5'-Tetrachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,2',5,5'-Tetrachlorobiphenyl	0.50	.110	ug/kg
8082 Congeners	3540C	Sediment	2,2',5-Trichlorobiphenyl	0.50	.053	ug/kg
8082 Congeners	3540C	Sediment	2,3,3',4,4',5,5'-Heptachlorobiphenyl	0.50	.094	ug/kg
8082 Congeners	3540C	Sediment	2,3,3',4,4',5'-Hexachlorobiphenyl	0.50	.195	ug/kg
8082 Congeners	3540C	Sediment	2,3,3',4,4',5-Hexachlorobiphenyl	0.50	.093	ug/kg
8082 Congeners	3540C	Sediment	2,3,3',4,4',6-Hexachlorobiphenyl	0.50	.041	ug/kg
8082 Congeners	3540C	Sediment	2,3,3',4,4'-Pentachlorobiphenyl	0.50	.093	ug/kg
8082 Congeners	3540C	Sediment	2,3,3',4',6-Pentachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,3,3',4'-Tetrachlorobiphenyl	0.50	.074	ug/kg
8082 Congeners	3540C	Sediment	2,3',4,4',5,5'-Hexachlorobiphenyl	0.70	.328	ug/kg
8082 Congeners	3540C	Sediment	2,3,4,4',5,6-Hexachlorobiphenyl	0.50	.106	ug/kg
8082 Congeners	3540C	Sediment	2,3',4,4',5',6-Hexachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,3,4,4',5-Pentachlorobiphenyl	0.50	.316	ug/kg
8082 Congeners	3540C	Sediment	2',3,4,4',5-Pentachlorobiphenyl	0.50	.080	ug/kg
8082 Congeners	3540C	Sediment	2,3',4,4',5-Pentachlorobiphenyl	0.50	.042	ug/kg
8082 Congeners	3540C	Sediment	2,3',4,4',6-Pentachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,3,4,4'-Tetrachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,3',4,4'-Tetrachlorobiphenyl	0.50	.117	ug/kg
8082 Congeners	3540C	Sediment	2,3',4',5-Tetrachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2',3,4-Trichlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,3-Dichlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,4,4',5-Tetrachlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,4,4'-Trichlorobiphenyl	0.50	.072	ug/kg
8082 Congeners	3540C	Sediment	2,4',5-Trichlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	2,4'-Dichlorobiphenyl	0.50	.110	ug/kg
8082 Congeners	3540C	Sediment	2-Chlorobiphenyl	0.50	.25	ug/kg

SELECTED MARINE WATER, SEDIMENT, AND TISSUE ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8082 Congeners	3540C	Sediment	3,3',4,4',5,5'-Hexachlorobiphenyl	0.50	.133	ug/kg
8082 Congeners	3540C	Sediment	3,3',4,4',5-Pentachlorobiphenyl	0.50	.140	ug/kg
8082 Congeners	3540C	Sediment	3,3',4,4'-Tetrachlorobiphenyl	0.50	.05	ug/kg
8082 Congeners	3540C	Sediment	3,4,4',5-Tetrachlorobiphenyl	0.50	.096	ug/kg
8082 Congeners	3540C	Sediment	3,4,4'-Trichlorobiphenyl	0.50	.25	ug/kg
8082 Congeners	3540C	Sediment	Decachlorobiphenyl	0.50	.055	ug/kg
8082 Congeners	3540C	Tissue	PCB 1	1.0	0.37	ug/kg
8082 Congeners	3540C	Tissue	PCB 101	0.50	0.095	ug/kg
8082 Congeners	3540C	Tissue	PCB 105	0.50	0.10	ug/kg
8082 Congeners	3540C	Tissue	PCB 110	0.50	0.090	ug/kg
8082 Congeners	3540C	Tissue	PCB 114	0.50	0.090	ug/kg
8082 Congeners	3540C	Tissue	PCB 118	0.50	0.16	ug/kg
8082 Congeners	3540C	Tissue	PCB 119	0.50	0.12	ug/kg
8082 Congeners	3540C	Tissue	PCB 123	0.50	0.30	ug/kg
8082 Congeners	3540C	Tissue	PCB 126	0.50	0.12	ug/kg
8082 Congeners	3540C	Tissue	PCB 128	0.50	0.17	ug/kg
8082 Congeners	3540C	Tissue	PCB 132	0.50	0.081	ug/kg
8082 Congeners	3540C	Tissue	PCB 138	0.50	0.23	ug/kg
8082 Congeners	3540C	Tissue	PCB 141	0.50	0.090	ug/kg
8082 Congeners	3540C	Tissue	PCB 149	0.50	0.14	ug/kg
8082 Congeners	3540C	Tissue	PCB 151	0.50	0.099	ug/kg
8082 Congeners	3540C	Tissue	PCB 153	0.50	0.14	ug/kg
8082 Congeners	3540C	Tissue	PCB 156	0.50	0.31	ug/kg
8082 Congeners	3540C	Tissue	PCB 157	0.50	0.12	ug/kg
8082 Congeners	3540C	Tissue	PCB 158	0.50	0.19	ug/kg
8082 Congeners	3540C	Tissue	PCB 166	0.50	0.12	ug/kg
8082 Congeners	3540C	Tissue	PCB 167	0.50	0.10	ug/kg
8082 Congeners	3540C	Tissue	PCB 168	0.50	0.26	ug/kg
8082 Congeners	3540C	Tissue	PCB 169	0.50	0.36	ug/kg
8082 Congeners	3540C	Tissue	PCB 170	0.50	0.20	ug/kg
8082 Congeners	3540C	Tissue	PCB 174	0.50	0.15	ug/kg
8082 Congeners	3540C	Tissue	PCB 177	0.50	0.18	ug/kg
8082 Congeners	3540C	Tissue	PCB 18	0.50	0.11	ug/kg

SELECTED MARINE WATER, SEDIMENT, AND TISSUE ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8082 Congeners	3540C	Tissue	PCB 180	0.50	0.084	ug/kg
8082 Congeners	3540C	Tissue	PCB 183	0.50	0.14	ug/kg
8082 Congeners	3540C	Tissue	PCB 184	0.50	0.083	ug/kg
8082 Congeners	3540C	Tissue	PCB 187	0.50	0.20	ug/kg
8082 Congeners	3540C	Tissue	PCB 189	0.50	0.10	ug/kg
8082 Congeners	3540C	Tissue	PCB 194	0.50	0.11	ug/kg
8082 Congeners	3540C	Tissue	PCB 195	0.50	0.21	ug/kg
8082 Congeners	3540C	Tissue	PCB 201	0.50	0.077	ug/kg
8082 Congeners	3540C	Tissue	PCB 203	0.50	0.29	ug/kg
8082 Congeners	3540C	Tissue	PCB 206	0.50	0.14	ug/kg
8082 Congeners	3540C	Tissue	PCB 209	0.50	0.11	ug/kg
8082 Congeners	3540C	Tissue	PCB 28	0.50	0.12	ug/kg
8082 Congeners	3540C	Tissue	PCB 31	0.50	0.12	ug/kg
8082 Congeners	3540C	Tissue	PCB 33	0.50	0.071	ug/kg
8082 Congeners	3540C	Tissue	PCB 37	0.50	0.14	ug/kg
8082 Congeners	3540C	Tissue	PCB 44	0.50	0.11	ug/kg
8082 Congeners	3540C	Tissue	PCB 49	0.50	0.14	ug/kg
8082 Congeners	3540C	Tissue	PCB 5	0.50	0.15	ug/kg
8082 Congeners	3540C	Tissue	PCB 52	0.50	0.082	ug/kg
8082 Congeners	3540C	Tissue	PCB 56	0.50	0.19	ug/kg
8082 Congeners	3540C	Tissue	PCB 60	0.50	0.10	ug/kg
8082 Congeners	3540C	Tissue	PCB 66	0.50	0.094	ug/kg
8082 Congeners	3540C	Tissue	PCB 70	0.50	0.095	ug/kg
8082 Congeners	3540C	Tissue	PCB 74	0.50	0.16	ug/kg
8082 Congeners	3540C	Tissue	PCB 77	0.50	0.11	ug/kg
8082 Congeners	3540C	Tissue	PCB 8	0.50	0.13	ug/kg
8082 Congeners	3540C	Tissue	PCB 81	0.50	0.17	ug/kg
8082 Congeners	3540C	Tissue	PCB 87	0.50	0.11	ug/kg
8082 Congeners	3540C	Tissue	PCB 90	0.50	0.12	ug/kg
8082 Congeners	3540C	Tissue	PCB 90 + PCB 101	1.0	1.0	ug/kg
8082 Congeners	3540C	Tissue	PCB 95	0.50	0.13	ug/kg
8082 Congeners	3540C	Tissue	PCB 97	0.50	0.10	ug/kg
8082 Congeners	3540C	Tissue	PCB 99	0.50	0.089	ug/kg

SELECTED MARINE WATER, SEDIMENT, AND TISSUE ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8270C-SIM PAH	3541	Sediment	1-Methylnaphthalene	5	0.25	ug/kg
8270C-SIM PAH	3541	Sediment	1-Methylphenanthrene	5	0.24	ug/kg
8270C-SIM PAH	3541	Sediment	2,3,5-Trimethylnaphthalene	5	0.15	ug/kg
8270C-SIM PAH	3541	Sediment	2,6-Dimethylnaphthalene	5	0.27	ug/kg
8270C-SIM PAH	3541	Sediment	2-Methylnaphthalene	5	0.34	ug/kg
8270C-SIM PAH	3541	Sediment	Acenaphthene	5	0.16	ug/kg
8270C-SIM PAH	3541	Sediment	Acenaphthylene	5	0.22	ug/kg
8270C-SIM PAH	3541	Sediment	Anthracene	5	0.22	ug/kg
8270C-SIM PAH	3541	Sediment	Benz(a)anthracene	5	0.16	ug/kg
8270C-SIM PAH	3541	Sediment	Benzo(a)pyrene	5	0.22	ug/kg
8270C-SIM PAH	3541	Sediment	Benzo(b)fluoranthene	5	0.48	ug/kg
8270C-SIM PAH	3541	Sediment	Benzo(e)pyrene	5	0.39	ug/kg
8270C-SIM PAH	3541	Sediment	Benzo(g,h,i)perylene	5	0.23	ug/kg
8270C-SIM PAH	3541	Sediment	Benzo(k)fluoranthene	5	0.33	ug/kg
8270C-SIM PAH	3541	Sediment	Biphenyl	5	0.43	ug/kg
8270C-SIM PAH	3541	Sediment	Carbazole	5	0.65	ug/kg
8270C-SIM PAH	3541	Sediment	Chrysene	5	0.41	ug/kg
8270C-SIM PAH	3541	Sediment	Dibenz(a,h)anthracene	5	0.26	ug/kg
8270C-SIM PAH	3541	Sediment	Dibenzofuran	5	0.17	ug/kg
8270C-SIM PAH	3541	Sediment	Dibenzothiophene	5	0.23	ug/kg
8270C-SIM PAH	3541	Sediment	Fluoranthene	5	0.34	ug/kg
8270C-SIM PAH	3541	Sediment	Fluorene	5	0.19	ug/kg
8270C-SIM PAH	3541	Sediment	Indeno(1,2,3-cd)pyrene	5	0.24	ug/kg
8270C-SIM PAH	3541	Sediment	Naphthalene	5	0.34	ug/kg
8270C-SIM PAH	3541	Sediment	Pentachlorophenol	200	15	ug/kg
8270C-SIM PAH	3541	Sediment	Perylene	5	0.17	ug/kg
8270C-SIM PAH	3541	Sediment	Phenanthrene	5	0.33	ug/kg
8270C-SIM PAH	3541	Sediment	Pyrene	5	0.36	ug/kg
8270C-SIM PAH	3541	Tissue	1-Methylnaphthalene	0.5	0.11	ug/kg
8270C-SIM PAH	3541	Tissue	1-Methylphenanthrene	0.5	0.085	ug/kg
8270C-SIM PAH	3541	Tissue	2,3,5-Trimethylnaphthalene	0.5	0.077	ug/kg
8270C-SIM PAH	3541	Tissue	2,6-Dimethylnaphthalene	0.5	0.064	ug/kg
8270C-SIM PAH	3541	Tissue	2-Methylnaphthalene	1.0	0.15	ug/kg

SELECTED MARINE WATER, SEDIMENT, AND TISSUE ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8270C-SIM PAH	3541	Tissue	Acenaphthene	0.5	0.091	ug/kg
8270C-SIM PAH	3541	Tissue	Acenaphthylene	0.5	0.092	ug/kg
8270C-SIM PAH	3541	Tissue	Anthracene	0.5	0.080	ug/kg
8270C-SIM PAH	3541	Tissue	Benz(a)anthracene	0.5	0.12	ug/kg
8270C-SIM PAH	3541	Tissue	Benzo(a)pyrene	0.5	0.12	ug/kg
8270C-SIM PAH	3541	Tissue	Benzo(b)fluoranthene	0.5	0.15	ug/kg
8270C-SIM PAH	3541	Tissue	Benzo(e)pyrene	0.5	0.12	ug/kg
8270C-SIM PAH	3541	Tissue	Benzo(g,h,i)perylene	0.5	0.17	ug/kg
8270C-SIM PAH	3541	Tissue	Benzo(k)fluoranthene	0.5	0.13	ug/kg
8270C-SIM PAH	3541	Tissue	Biphenyl	0.5	0.14	ug/kg
8270C-SIM PAH	3541	Tissue	Carbazole	0.5	0.063	ug/kg
8270C-SIM PAH	3541	Tissue	Chrysene	0.5	0.19	ug/kg
8270C-SIM PAH	3541	Tissue	Dibenz(a,h)anthracene	0.5	0.11	ug/kg
8270C-SIM PAH	3541	Tissue	Dibenzofuran	0.5	0.071	ug/kg
8270C-SIM PAH	3541	Tissue	Dibenzothiophene	0.5	0.093	ug/kg
8270C-SIM PAH	3541	Tissue	Fluoranthene	0.5	0.36	ug/kg
8270C-SIM PAH	3541	Tissue	Fluorene	0.5	0.088	ug/kg
8270C-SIM PAH	3541	Tissue	Indeno(1,2,3-cd)pyrene	0.5	0.16	ug/kg
8270C-SIM PAH	3541	Tissue	Naphthalene	1.0	0.19	ug/kg
8270C-SIM PAH	3541	Tissue	PAHs, Total	0.5	0.5	ug/kg
8270C-SIM PAH	3541	Tissue	Perylene	0.5	0.16	ug/kg
8270C-SIM PAH	3541	Tissue	Phenanthrene	0.5	0.18	ug/kg
8270C-SIM PAH	3541	Tissue	Pyrene	0.5	0.28	ug/kg
8270C-SIM PAH	3520C	Water	1-Methylnaphthalene	0.02	0.00250	ug/L
8270C-SIM PAH	3520C	Water	1-Methylphenanthrene	0.02	0.00193	ug/L
8270C-SIM PAH	3520C	Water	2,3,5-Trimethylnaphthalene	0.02	0.00110	ug/L
8270C-SIM PAH	3520C	Water	2,6-Dimethylnaphthalene	0.02	0.00237	ug/L
8270C-SIM PAH	3520C	Water	2-Methylnaphthalene	0.02	0.00268	ug/L
8270C-SIM PAH	3520C	Water	Acenaphthene	0.02	0.00198	ug/L
8270C-SIM PAH	3520C	Water	Acenaphthylene	0.02	0.00178	ug/L
8270C-SIM PAH	3520C	Water	Anthracene	0.02	0.00103	ug/L
8270C-SIM PAH	3520C	Water	Benz(a)anthracene	0.02	0.0021	ug/L
8270C-SIM PAH	3520C	Water	Benzo(a)pyrene	0.02	0.00158	ug/L

SELECTED MARINE WATER, SEDIMENT, AND TISSUE ANALYSES						
Method	**Prep Method**	**Matrix**	**Analyte**	**Method Reporting Limit**	**Method Detection Limit[a]**	**Units**
8270C-SIM PAH	3520C	Water	Benzo(b)fluoranthene	0.02	0.00194	ug/L
8270C-SIM PAH	3520C	Water	Benzo(e)pyrene	0.02	0.00182	ug/L
8270C-SIM PAH	3520C	Water	Benzo(g,h,i)perylene	0.02	0.00368	ug/L
8270C-SIM PAH	3520C	Water	Benzo(k)fluoranthene	0.02	0.00134	ug/L
8270C-SIM PAH	3520C	Water	Biphenyl	0.02	0.00351	ug/L
8270C-SIM PAH	3520C	Water	Carbazole	0.02	0.019	ug/L
8270C-SIM PAH	3520C	Water	Chrysene	0.02	0.00124	ug/L
8270C-SIM PAH	3520C	Water	Dibenz(a,h)anthracene	0.02	0.00162	ug/L
8270C-SIM PAH	3520C	Water	Dibenzofuran	0.02	0.00705	ug/L
8270C-SIM PAH	3520C	Water	Dibenzothiophene	0.02	0.00401	ug/L
8270C-SIM PAH	3520C	Water	Fluoranthene	0.02	0.00238	ug/L
8270C-SIM PAH	3520C	Water	Fluorene	0.02	0.00258	ug/L
8270C-SIM PAH	3520C	Water	Indeno(1,2,3-cd)pyrene	0.02	0.00208	ug/L
8270C-SIM PAH	3520C	Water	Naphthalene	0.02	0.00316	ug/L
8270C-SIM PAH	3520C	Water	Pentachlorophenol	1	0.095	ug/L
8270C-SIM PAH	3520C	Water	Perylene	0.02	0.00116	ug/L
8270C-SIM PAH	3520C	Water	Phenanthrene	0.02	0.00320	ug/L
8270C-SIM PAH	3520C	Water	Pyrene	0.02	0.00222	ug/L
Organotins	Method	Sediment	Di-n-butyltin	1	0.028	ug/kg
Organotins	Method	Sediment	n-Butyltin	1	0.03	ug/kg
Organotins	Method	Sediment	Tetra-n-butyltin	1	0.07	ug/kg
Organotins	Method	Sediment	Tri-n-butyltin	1	0.056	ug/kg
Organotins	Method	Water	Di-n-butyltin	0.050	0.00055	ug/L
Organotins	Method	Water	n-Butyltin	0.050	0.0017	ug/L
Organotins	Method	Water	Tetra-n-butyltin	0.050	0.0015	ug/L
Organotins	Method	Water	Tri-n-butyltin	0.020	0.0006	ug/L
Organotins	Method	Tissue	Di-n-butyltin	1.0	0.042	ug/kg
Organotins	Method	Tissue	n-Butyltin	1.0	0.061	ug/kg
Organotins	Method	Tissue	Tetra-n-butyltin	1.0	0.067	ug/kg
Organotins	Method	Tissue	Tri-n-butyltin	1.0	0.027	ug/kg

a Method Detection Limits are subject to change as new MDL studies are completed.

Report List Information

Report Title: Polynuclear Aromatic Hydrocarbons

Analyte Name	MDL	MRL	Surr/MS Limits	LCS Limits	Units
1-Methylnaphthalene	0.25	5	23-121	46-119	ug/Kg
2-Methylnaphthalene	0.34	5	13-126	42-121	ug/Kg
Acenaphthene	0.16	5	18-125	50-110	ug/Kg
Acenaphthylene	0.22	5	21-121	50-111	ug/Kg
Anthracene	0.22	5	19-133	52-115	ug/Kg
Benz(a)anthracene	0.16	5	12-139	51-118	ug/Kg
Benzo(a)pyrene	0.22	5	10-148	56-122	ug/Kg
Benzo(b)fluoranthene	0.48	5	12-144	55-125	ug/Kg
Benzo(e)pyrene	0.39	5	22-131	61-117	ug/Kg
Benzo(g,h,i)perylene	0.23	5	10-148	49-125	ug/Kg
Benzo(k)fluoranthene	0.33	5	11-145	55-124	ug/Kg
C1-Chrysenes	5	5	70-130	70-130	ug/Kg
C1-Fluoranthenes/Pyrenes	5	5	70-130	70-130	ug/Kg
C1-Fluorenes	5	5	70-130	70-130	ug/Kg
C1-Phenanthrenes/Anthracenes	5	5	70-130	70-130	ug/Kg
C2-Chrysenes	5	5	70-130	70-130	ug/Kg
C2-Fluorenes	5	5	70-130	70-130	ug/Kg
C2-Naphthalenes	5	5	70-130	70-130	ug/Kg
C2-Phenanthrenes/Anthracenes	5	5	70-130	70-130	ug/Kg
C3-Chrysenes	5	5	70-130	70-130	ug/Kg
C3-Fluorenes	5	5	70-130	70-130	ug/Kg
C3-Naphthalenes	5	5	70-130	70-130	ug/Kg
C3-Phenanthrenes/Anthracenes	5	5	70-130	70-130	ug/Kg
C4-Chrysenes	5	5	70-130	70-130	ug/Kg
C4-Naphthalenes	5	5	70-130	70-130	ug/Kg
C4-Phenanthrenes/Anthracenes	5	5	70-130	70-130	ug/Kg
Chrysene	0.41	5	12-145	54-120	ug/Kg
Dibenz(a,h)anthracene	0.26	5	12-143	37-135	ug/Kg
Fluoranthene	0.34	5	10-149	55-121	ug/Kg
Fluorene	0.19	5	22-125	52-112	ug/Kg
Indeno(1,2,3-cd)pyrene	0.24	5	10-151	42-133	ug/Kg
Naphthalene	0.34	5	10-121	48-107	ug/Kg
Perylene	0.17	5	25-129	62-118	ug/Kg
Phenanthrene	0.33	5	10-143	53-112	ug/Kg
Pyrene	0.36	5	10-150	47-129	ug/Kg

STANDARD OPERATING PROCEDURE

VOLATILE ORGANIC COMPOUNDS BY GC/MS

VOC-8260B
Revision 10
October 11, 2005

Approved By:

Supervisor	10/11/05 Date
QA Manager	10-11-05 Date
Laboratory Manager	10/11/05 Date

COLUMBIA ANALYTICAL SERVICES, INC.
1317 South 13th Avenue
Kelso, Washington 98626

Annual review of this SOP has been performed and the SOP still reflects current practice.
Initials: _____ Date: _____
Initials: _____ Date: _____
Initials: _____ Date: _____

NON-CONTROLLED COPY
Will Not Be Updated

VOLATILE ORGANIC COMPOUNDS BY GC/MS

1. SCOPE AND APPLICATION

1.1. This procedure is used to determine the concentration of volatile organic compounds in water and soil using USEPA Method 8260B. This method is also applicable to TCLP ZHE leachates and may also be applicable to various types of aqueous and nonaqueous waste samples.

1.2. Table 1 lists the compounds that can be determined by this method and the achievable method reporting limits (MRLs) in water and soil. Equivalent nomenclature for MRL includes Estimated Quantitation Limit (EQL) and Practical Quantitation Limit (PQL). Therefore, MRL=EQL=PQL. The reported MRL may be adjusted if required for specific project requirements, however, the capability of achieving other reported MRLs must be demonstrated. The Method Detection Limits (MDLs) will vary depending on the instrument used.

1.3. The nominal quantitation range for water samples is 0.5 – 80 ug/L. The nominal quantitation range for low-level soils is 5-200 ug/kg. The nominal quantitation range for mid-level soils is 50-8000 ug/kg.

2. METHOD SUMMARY

2.1. This procedure gives gas chromatographic/mass spectrometric (GC/MS) conditions for the detection of parts per billion (ppb) levels of volatile organic compounds. A sample aliquot is injected into the gas chromatograph (GC) by either the purge and trap method or by direct injection. The compounds are separated on a fused silica capillary GC column. The compounds are detected by a mass selective detector (MSD), which gives both qualitative as well as quantitative information.

2.2. In the purge and trap process an inert gas, helium, is bubbled through the sample aliquot, at room temperature. This gas stream sweeps the volatile organic compounds out of the aqueous phase and into the gas stream - it purges the compounds out of the sample. The gas stream then passes through a sorbent column which selectively adsorbs, (traps) these compounds out of the helium. The preparation and analysis of soil samples uses procedures described in USEPA Method 5030B or 5035. After the purging sequence is done, the sorbent column (the trap) is heated and desorbed onto the GC column. The GC column separates the compounds and passes then onto the MSD for identification and quantification.

2.3. The sensitively of this method depends on the level of background contamination (i.e. interferences) rather than on instrumental limitations. Highly contaminated waste samples

will require a methanol extraction prior to analysis. This will elevate the reporting levels and may mask low levels of compounds of interest.

2.4. Deviations from the reference method(s): For water samples, a purge volume of 10mL is used, whereas the method (section 7.5.5) states 5 mL or 25 mL. The use of a 10 mL volume ensures sensitivity for "5 mL" type analyses *and,* on the analytical systems in use, meets the sensitivity goals of a 25 mL purge volume analysis. Also, the use of 10 mL rather than 25 mL decreases the negative effects of water being introduced into the P/T-GC-MS system.

3. DEFINITIONS

Analysis Window - Samples are analyzed in a set referred to as "a window". The window begins with the injection of the tune verification standard. After this standard has passed the method specific criteria a 12 hour analysis window is started. Next, a calibration curve or a continuing calibration standard (CCV see below) is run. If the CCV meets the specified criteria, sample and QC analyses are run until the 12 hour time limit closes. A new window must then be opened and the sequence repeated.

Internal Standards - Internal standards are organic compounds which are similar to the analytes of interest but which are not found in the samples. The chosen internal standards are used to help calibrate the instrument's response and to compensate for slight instrument variations from injection to injection.

Independent Calibration Verification (ICV) - Verification of the ratio of instrument response to analyte amount, a calibration check, is done by analyzing for analyte standards in an appropriate solvent. ICV solutions are made from a stock solution which is different from the stock used to prepare calibration standards.

Laboratory Control Sample (LCS) - In the LCS analysis, predetermined quantities of standard solutions of all analytes are added to a blank matrix prior to sample extraction and analysis. The purpose of the LCS is to monitor analytical control for the sample batch. Percent recoveries are calculated for each of the analytes.

Matrix Spike/Duplicate Matrix Spike Analysis - In the matrix spike analysis, predetermined quantities of standard solutions of all analytes are added to a sample matrix prior to sample extraction and analysis. The purpose of the matrix spike is to evaluate the effects of the sample matrix on the methods used for the analyses. Samples are split into duplicates, spiked, and analyzed. Percent recoveries are calculated for each of the analytes detected. The relative percent difference between the samples is calculated and used to assess analytical precision. The concentration of the spike should be at 5 to 10 times the MRL or at levels specified by a project analysis plan.

Standard Curve - A standard curve is a curve which plots concentrations of a known analyte standard versus the instrument response to the analyte.

Surrogate - Surrogates are organic compounds which are similar to the analytes of interest in chemical composition, extraction, and chromatography, but which are not normally found in environmental samples. The purpose of the surrogates is to evaluate the preparation and analysis of samples. These compounds are spiked into all blanks, standards, samples, and spiked samples prior to analysis. Percent recoveries are calculated for each surrogate.

Continuing Calibration Verification Standard (CCV) - A mid-level standard injected into the instrument at specified intervals and is used to verify the initial calibration.

Method Blank (MB) - The method blank (also called continuing calibration blank) is a volume of clean reagent water analyzed on each GC/MS used for sample analysis. The purpose of the blank is to determine the levels of contamination associated with the instrumental analysis itself, particularly with regard to the carry-over of analytes from standards or highly contaminated samples into other analyses.

4. INTERFERENCES

4.1. Interferences by common laboratory extraction solvents, such as Methylene Chloride, Acetone, and Freon 113 can cause problems. The area where volatile organic analyses are performed should be free of these solvents.

4.2. Other interferences include but are not limited to impurities in the inert purge gas, dirty plumbing/purge vessels, cross contamination by highly contaminated samples to clean ones in transport and storage, and carry over from one analysis to subsequent ones.

5. SAFETY

5.1. All appropriate safety precautions for handling solvents, reagents and samples must be taken when performing this procedure. This includes the use of personnel protective equipment, such as, safety glasses, lab coat and the correct gloves.

5.2. Chemicals, reagents and standards must be handled as described in the CAS safety policies, approved methods and in MSDSs where available. Refer to the CAS Environmental, Health and Safety Manual and the appropriate MSDS prior to beginning this method.

6. SAMPLE CONTAINERS, COLLECTION, PRESERVATIONS, AND STORAGE

6.1. Refer to procedures for methods 5030 and 5035 for sample container and collection procedures. All sample containers for volatile organic analyses should be washed with soap and water, deionized water rinsed, and baked at 105°C ± 5°C for approximately 2 hours prior to use. Alternatively, one can buy precleaned sample containers from major lab equipment suppliers. All containers should be of glass or amber glass and equipped with a screw top cap and PFTE (teflon) lined septa.

6.2. Samples collected using EPA Method 5035 should be shipped in Encore sample tubes or collected in VOA vials containing sodium bisulfate (low level) and/or methanol (mid level).

6.3. Collect all samples in duplicate, triplicate when possible. Prepare the proper number of sample bottles/containers prior to the sampling event with preservatives to adjust the samples pH to <2 with 1:1 HCI (water samples).

6.4. Slowly fill sample bottles to just overflowing taking care not to flush out the preservative or to entrain air bubbles in the samples. Seal the bottles with PFTE lined septa toward the sample and invert to check for entrained air bubbles.

6.5. Experimental evidence has shown refrigeration at 4°C alone will not stop biological degradation of some aromatic volatile organics. Adjusting the pH of the replicate samples to less than two (pH <2) with 1:1 HCl (@ 2-3 drops per 40 mLs) preserves samples for 14 days after collection. Residual chlorine can also degrade some organic compounds, generating trihalomethanes (THM's).

6.6. All samples must be stored at 4 ± 2°C and must be analyzed within 14 days of collection. See SOP VOC-5035 for additional holding time information. Any free product samples to be tested do not have any set holding times but should be analyzed as soon as possible.

7. APPARATUS AND EQUIPMENT

7.1. Gas chromatograph/Mass Selective Detector Systems

7.1.1. Each GC/MS system is set up with a GC capable of cooling the GC oven/column (subambient capability optional), injection onto a capillary column, and a stainless steel jet separator at the column's detector end prior to the transfer line interfaced with the MSD. Each MSD is a HP5970, HP5971, HP5972, or HP5973 that is controlled by the HP-MSDOS Chemstation software.

7.1.2. An alternate option to the use of a jet separator is to use a split/splitless injector and interfacing the capillary column directly into the MSD.

7.1.3. Instrument systems and associated test methods are listed below. Individual operating conditions for 8260 instruments are given in Attachment A.

Instrument ID	Description	Tests Performed
MS02	5890/5970	8260W, 524.2, 624
MS04	5890/5972	8260W, 8260S, 524.2, 624
MS05	5890/5972	8260S
MS13	6890/5973	8260W, 8260S, 624
MS15	5890/5970	624
MS12	5890/5970	Screening only

7.2. Purge and Trap with Autosampler

Each volatile GC/MS analytical system uses a purge and trap to introduce the sample onto the GC column. A Tekmar LSC-2000 or its equivalent is needed. Each purge and trap has an autosampler (A/S) attached to run multiple samples, one at a time, and run unattended for extended periods of time. Varian Archon, Tekmar ALS 2016, or equivalents are preferred for extended unattended automated analyses.

7.3. GC Columns

Column 1: J&W Scientific DB-624 (or equivalent) 60 meters x 0.53 mm and fused silica column 1.5µm film thickness.

Column 2: J&W Scientific DB-624 (or equivalent) 60 meters x 0.25 mm and fused silica column 1.4µm film thickness.

Column 3: Restex RTX-Volatiles (or equivalent) 60 M x 0.53mm id fused silica column 2.0µm film thickness

Column 4: Restex RTX-Volatiles (or equivalent) 60 M x 0.32mm id fused silica column 1.8µm film thickness

Column 5: Restex RTX-Volatiles (or equivalent) 30 M x 0.25mm id fused silica column 1.4µm film thickness

Column 6: Restex RTX-624 (or equivalent) 20 M x 0.18mm id fused silica column 1.0µm film thickness

7.4. Each volatile GC/MS data processing station uses the most recent version of the EPA/NIST Mass Spectral Library. The current version is the NIST98k library.

8. STANDARDS, REAGENTS, AND CONSUMABLE MATERIALS

8.1. Methanol, purge and trap grade or equivalent.

8.2. Reagent water, prepared from deionized water, by charcoal filtration and then purging for approximately 2 hours prior to use.

8.3. Stock Standard Solutions

Commercially prepared and certified stock standards are used routinely for all the method specified analytes. All such mixtures are also routinely checked against an independent source for both analyte identification and analyte concentration. All such stock standard mixtures have expiration dates given by the manufacturer and must be replaced if the comparison with the independent check standards indicates a problem. Alternatively, stock

standards may be prepared from neat chemicals. Store with minimal headspace, at -10° to -20°C and protect from light.

8.4. Working Standards - Prepare these standards from stock solutions. Prepare at concentrations which facilitate ease of preparation of instrument-level standards (calibration standards, etc.). Refer to Table 2 for Standard Expiration Date Guidelines.

8.5. Calibration Standards

8.5.1. A minimum of five different concentration levels for all the analytes are prepared by diluting working standards into reagent water. The lowest concentration level must be at the method reporting level, or a level corresponding to a sample concentration meeting project-specific data quality objectives, with the remaining four levels defining the working linear range of the analytical system. *The permanent gas stock standards used to prepare calibration standards must not be more than one week old.* See Attachment B for detailed instructions and forms for preparing calibration standards and ICVs.

8.5.2. The suggested levels are 0.5, 2, 10, 20 and 40 ppb for waters; and 5, 20, 50, 100, and 200 ppb for soils. All calibration solutions are made up daily.

8.5.3. QC Spiking Solutions – Prepare LCS and MS spiking solutions the same as ICV solutions. See Attachment B.

8.6. Internal Standards and Surrogates

The surrogates recommended are Dibromofluoromethane, toluene-d_8 and 4-bromofluorobenzene. The internal standards recommended are fluorobenzene, 1,4-difluorobenzene, 1,4-dichlorobenzene-d_4 and chlorobenzene-d_5. Other internal standards and surrogates may be used, depending on the analysis requirements. All surrogates and internal standards are added to every calibration standard. The spike level for samples, blanks, and matrix spikes is 10 ug/L for waters and 50 ug/L for soils.

8.7. Spiking Solutions

Matrix spike and laboratory control spike solutions must be prepared from a separate source than the calibration standards. Spiking solutions should contain the full list of analytes of interest. However, a subset may be reported.

Note: Refer to Table 2 for Standard Expiration Date Guidelines.

9. PREVENTIVE MAINTENANCE

9.1. All maintenance activities are recorded in a maintenance logbook kept for each instrument.

9.2. Carrier gas - Inline purifiers or scubbers should be in place for all sources of carrier gas. These are selected to remove water, oxygen, and hydrocarbons. Purifiers should be changed as recommended by the supplier.

9.3. Purge and Trap /Autosamplers

9.3.1. The purge/trap system should be baked out and back-flushed daily as needed, generally prior to use on a daily basis.

9.3.2. Replace the trap monthly, or sooner if performance deteriorates.

9.4. Gas Chromatograph

9.4.1. Clipping off a small portion of the head of the column often improves chromatographic performance. When cutting off any portion of the column, make sure the cut is straight and "clean" (uniform, without fragmentation) by using the proper column cutting tool.

9.4.2. Over time, the column will exhibit poorer overall performance, as contaminated sample matrices are analyzed. The length of time for this to occur will depend on the samples analyzed. When a noticeable decrease in column performance is evident and other maintenance options do not result in improvement, the column should be replaced. This is especially true when evident in conjunction with calibration difficulties.

9.5. Mass Spectrometer

9.5.1. Tune the MS as needed to result in consistent and acceptable performance (see section 11).

9.5.2. For units under service contract, certain maintenance is performed by instrument service staff, including pump oil changed, vacuuming boards, etc., as recommended by the manufacturer.

9.5.3. MS source cleaning should be performed as needed, depending on the performance of the unit. This may be done by the analyst or by instrument service staff.

10. RESPONSIBILITIES

10.1. It is the responsibility of the analyst to perform the analysis according to this SOP and to complete all documentation required for data review. Analysis and interpretation of the results are performed by personnel in the laboratory who have demonstrated the ability to generate acceptable results utilizing this SOP. This demonstration is in accordance with the training program of the laboratory. Final review and sign-off of the data is performed by the department supervisor/manager or designee.

10.2. It is the responsibility of the department supervisor/manager to document analyst training. Documenting method proficiency, as described in 8260B, is also the responsibility of the department supervisor/manager.

11. PROCEDURE

11.1. Sample Preparation

11.1.1. Water Samples

11.1.1.1. No preparation is generally required, other than dilution with reagent water to bring analytes into the upper half of the calibration range. Thus, a 10 mL sample volume is run straight from the sample vial. See USEPA Methods 8260B and 5030B for further discussion.

11.1.1.2. All water samples must be checked to have a pH $\leq$ 2 after sample analysis has taken place. Narrow range pH paper is used and the results are recorded on the injection log.

11.1.2. TCLP ZHE leachates are diluted 1:400 in reagent water prior to analysis.

11.1.3. Soil samples are analyzed as either low-level (5035) or mid-level (methanol extraction w/5030B purge&trap).

11.1.3.1. For low-level analyses, one of the sampling options given in method 5035 is to be used. Depending on the option used, follow the instructions given in the method. The use of EnCore samplers is the preferred sampling technique.

11.1.3.1.1. In the event that low-level analyses are specified but samples were not taken using a 5035 procedure, a portion of the sample is analyzed via direct heated purge of soil and EPA Method 5030A is cited. The analytical report should also be narrated with a statement indicating that 5030A has been deleted from SW-846. The low-level analyses require a calibration specific to direct soil analysis.

11.1.3.1.2. For soil, 1-5 grams is weighed out into the sample vial and 5 mL of reagent water is added. QC spikes and internal standards are then added, and the sample is purged at a temperature of 40°C° ±1°. Calibration standards, LCS, and method blanks require 5grams Ottawa sand as the matrix.

11.1.3.2. The mid-level type is a methanol extraction method. In general, a 5 gram wet weight of soil is extracted with 5 mL of purge-and-trap methanol in a scintillation vial. Quickly add purge-and-trap methanol and the surrogate spike to the soil after transferring the soil aliquot to the vial. Cap and

vortex until the sample is thoroughly mixed. A 1:100 dilution (500uL to 50mL) of this extract is then prepared in reagent water and analyzed using the water calibration. The extract weight, volume used, and methanol lot number are recorded on the injection log (or a bench sheet).

NOTE: For soil/solid samples requiring VOA and non-VOA analyses and only one container was submitted to the lab, sample receiving will label the sample container as "VOA Analysis First" and/or attach a "VOA FIRST" tag. The VOA department will remove a sample aliquot first for their analyses. The sample should be handled as if it were a Rush analysis, so that the other non-VOA analyses will not be unduly delayed. The VOA analyst who opens the container will either break the custody seal and will initial and date it when the container was opened or sign and date the "VOA FIRST" tag. A VOA Analysis First note will also be included on the SR.

11.2. Calibration

NOTE: Refer to the CAS SOP *for Calibration of Instruments for Organics Chromatogaphic Analysis*. The calibration procedure(s) and options chosen must follow the CAS protocols. In general, the calibration procedure is as follows:

11.2.1. BFB Tuning

11.2.1.1. Prior to calibration and sample analyses, analyze a 25ng or 50ng injection of Bromofluorobenzene (BFB). Each volatile GC/MS analytical system set up to run 8260B must meet the criteria listed in Table 3 for the injection of BFB. The analysis time for BFB is used to define the start of the 12-hour window in which all analyses must be performed. Once the instrument is tuned, all subsequent analyses of standards, samples, and QA/QC samples within the same 12-hour window must be analyzed using the identical mass spectrometer operating conditions.

11.2.1.2. Obtain the spectrum for evaluation using one of the following options:

- Three scans (the peak apex scan and the scans immediately preceding and following the apex) are acquired and averaged. Background subtraction is required, and must be accomplished using a single scan acquired no more than 20 scans prior to the elution of BFB. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the BFB peak or part of any other closely eluting peak.

- Use one scan at the apex of the peak. Background subtraction is required, and must be accomplished using a single scan acquired no more than 20 scans prior to the elution of BFB. The background subtraction should be designed only to eliminate column bleed or instrument background ions.

Do not subtract part of the BFB peak or part of any other closely eluting peak.

- Use one scan either directly preceding or following the apex of the peak. Background subtraction is required, and must be accomplished using a single scan acquired no more than 20 scans prior to the elution of BFB. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the BFB peak or part of any other closely eluting peak.

- Use the average across the entire peak up to a total of 5 scans. Peak integration must be consistent with standard operating procedure. If the peak is wider than 5 scans, the tune will consist of the peak apex scan and the two scans immediately preceding and following the apex. Background subtraction is required, and must be accomplished using a single scan acquired no more than 20 scans prior to the elution of BFB. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the BFB peak or part of any other closely eluting peak.

11.2.1.3. Evaluate the spectrum against the criteria specified in Table 3. The criteria used must be the same for all ion abundance criteria checks associated with a given analysis. For example, initial calibration, continuing calibration(s), QC, and sample analyses for a given sample must all use the same criteria.

11.2.2. GC/MS Analytical System Initial Calibrations

11.2.2.1. Prior to conducting any sample analyses, a multi-point (5 point minimum) calibration must be run. Recommended calibration levels are 0.5, 2, 10, 20, and 40 ppb for waters, and 5, 20, 50, 100, and 200 ppb for soils. Analyze each calibration standard and tabulate the area response of the characteristic quantitation ions (Table 4) versus concentration for each compound, internal standards and surrogate. Calculate the response factors (RF) for each compound and surrogate relative to the specified internal standard by:

$$RF_x = \frac{(A_x)(C_{ISTD})}{(A_{ISTD})(C_x)}$$

Where:

A_x = Area of the characteristic quantitation ion for compound x.
A_{ISTD} = Area of the characteristic quantitation ion for the specified internal standard.
C_x = The concentration of the compound added.
C_{ISTD} = The concentration of the specified internal standard.

11.2.2.2.Calculate the mean response factor $(\overline{RF_x})$ for each analyte and surrogate from the five calibration levels. Calculate standard deviation (SD) and the percent relative standard deviations (%RSD) for each analyte from the mean with:

$$\%RSD = \frac{(SD)}{(\overline{RF_x})} 100.$$

11.2.2.3.The % RSD should be less than 15% for each compound. However, the %RSD for each individual CCC must be less than 30%. The CCC's are: 1,1-Dichloroethene, Chloroform, 1,2-Dichloropropane, Toluene, Ethylbenzene and Vinyl Chloride.

11.2.2.4.If a % RSD greater than 30% is measured for any CCC, then corrective action to eliminate a system leak and/or column reactive sites is required before performing recalibration.

11.2.2.5.If the % RSD for any compound is 15% or less, linearity can be assumed over the calibration range, and the relative response factor for each analyte and surrogate is used to quantitate sample analytes.

11.2.2.6.In those instances where the %RSD for one or more analytes exceeds 15%, the initial calibration may still be acceptable if the following conditions are met:

- The mean of the RSD values for all analytes in the calibration standards is $\leq$ 15%.
- The mean RSD criteria applies to all target analytes in the calibration standards, regardless of whether or not they are of interest for a specific project.
- The data user must be supplied with an initial calibration summary indicating the compounds which exceed 15% RSD and the result of the mean RSD calculation.

11.2.2.7. If all of the conditions in Section 11.2.2.6 are met and the %RSD is less than 30%, then the average response factor may be used to determine sample concentrations as described in Section 13.1. If the %RSD exceeds 30%, then a linear regression or quadratic calibration is used.

11.2.2.8.The response of 5 SPCC's must also be checked for their minimum $\overline{RF_x}$:

Chloromethane	0.10
1,1-Dichloroethane	0.10
Bromoform	0.10
Chrorobenzene	0.30
1,1,2,2-Tetrachloroethane	0.30

11.2.3. Independent Calibration Verification

11.2.3.1. Following initial calibration, analyze an ICV standard. The ICV solution must be obtained for all analytes that are analyzed and reported. Calculate the concentration using the typical procedure used for quantitation. Calculate the percent difference (%D) from the ICV true value. The acceptance limits for the ICV are the same as those for the CCV.

11.2.3.2. If a second source standard is not available or is cost prohibitive (such as certain non-routine analytes), then an independently prepared solution (prepared by analyst other than analyst preparing initial calibration standards) may be used as the ICV and must meet the criteria above.

11.2.3.3. After the multi-point calibration has passed all of the above criteria, and the Independent Calibration Verification has been performed, samples can be analyzed. The calibration curve mid-point standard may serve as the CCV for the opening set of samples within the same 12-hour window as the initial calibration.

11.2.4. Daily GC/MS Calibration

11.2.4.1. The start of a 12-hour analysis window requires a check of the instrument tune via an injection of 25ng or 50 ng of BFB. Refer to section 11.2.1 for the procedure. If the criteria found in Table 3 are met, then a check of the initial calibration curve is done. If the first analysis of the BFB fails, inspect the instrument for malfunction and perform maintenance as necessary. A second BFB tune verification may then be performed. If the second run also fails, it may be necessary to retune and recalibrate the system.

11.2.4.2. After the tuning criteria have been verified, the initial calibration must be checked and verified by analyzing a midrange calibration standard. The 10 ppb level for waters and 50 ppb level for soils is recommended. For water, CCVs are prepared by adding 10µl of the 50 ppm 8260 working standard and 5µl of the 2000 ppm ketone mix into 50 mL reagent water, and a 10 mL aliquot is purged (for MS02, the ketones are in the 50ppm 8260 working standard and the ketone mix is not needed). For soil, CCVs are prepared by adding 12.5µl of the 200ppm (nominal) working standard into 50 mL reagent water, and a 5 mL aliquot is purged. The results are compared with those of the initial calibration's $\overline{RF}$. The criteria for the SPCCs, as outlined above,

must be met. Also, the CCCs must meet < 20% drift from the initial calibration curve average RFs. For non-CCC analytes, the maximum allowable %Dif or %Drift is ±30%, except dichlorofluoromethane, chlormethane, bromomethane, 2-Chloroethylvinylether, iodomethane, and vinyl acetate, which are ±40%.

11.2.4.3. If the tune criteria and the continuing calibration criteria are met, then the retention times of all compounds, surrogates, and internal standards are checked against the initial calibration. If the retention time for any internal standard changes by more than 30 seconds from the retention time from the mid-point standard of the most recent initial calibration, the system must be inspected for malfunctions and corrections must be made, as required. If the area for any of the internal standards changes by a factor of 2 (-50% to +100%) from the area from the mid-point standard of the most recent initial calibration, corrections must be made to the system.

11.2.5. Quantitation of all compounds will be based on the initial calibration.

11.3. Identification of Analytes

The MSD data system software identifies a sample component by first finding and identifying the surrogate and internal standards. After they have been integrated, the extracted ion chromatogram is searched for all calibrated analytes. The data system makes a positive identification for any peak associated with the proper time window and having the primary and secondary ions (as specified in the data system "method" file) in characteristic relative abundances. The analyte result is then calculated. The analyst reviews all analyses to confirm (or correct) all data system qualitative interpretations. The analyst should follow interpretation guidelines in the method for identification of analytes. Table 4 lists characteristic ions as given in Method 8260B. If there is no peak found for an analyte in the expected retention time window and the mass spectrum does not match according to the method criteria, then the analyte is "not found". Print out spectra for all confirmed hits.

12. QA/QC REQUIREMENTS

Note: The analyst should refer to the CAS *SOP for Sample Batches* and the CAS *SOP for The Determination of Method Detection Limits*.

12.1. Initial Precision and Recovery Validation

The accuracy and precision of the procedure must be validated before analysis of samples begin, or whenever significant changes to the procedures have been made. To do this, analyze four water sample spikes, calculate the average recovery and standard deviation, and evaluate as described in EPA SW-846. The concentration of the analytes to be spiked should be in the working calibration range. Initial Precision and Recovery studies should be performed as part of analyst training. Copies of the studies should be maintained in the lab and in the analyst's training file.

12.2. Method Detection Limits

12.2.1. A method detection limit (MDL) study must be undertaken before analysis of samples begins. To establish detection limits that are precise and accurate, the analyst must perform the following procedure. Spike a minimum of seven blank replicates with a MDL spiking solution (at a level below the MRL) for each target analyte, extract, and analyze. The MDL studies should be done for each matrix, prep method, and instrument. Refer to the CAS SOP for The Determination of Method Detecion Limits.

12.2.2. Calculate the average concentration found (x) in the sample concentration, and the standard deviation of the concentrations for each analyte. Calculate the MDL for each analyte using the correct T value for the number of replicates. The MDL study should be done annually.

12.3. Ongoing QC Samples required are described in the CAS-Kelso Quality Assurance Manual and in the *SOP for Sample Batches*. For every 12-hour analysis window, after meeting the tune and continuing calibration criteria, at least one method blank, one LCS, and one MS/DMS pair must be run for each matrix. Analytical windows must have at least one base (primary) sample analysis to require a MS/DMS pair.

12.3.1. Method blank - A method blank is analyzed with every batch of 20 or fewer samples to demonstrate that there are no method interferences. The method blank must demonstrate that interferences from the analytical and preparation steps minimized. No target analytes should be detected above the MRL in the method blank. For some project specific needs, additional requirements or exceptions may be given.

Note: For DoD projects, no target analytes should be detected in the Method Blank above ½ the MRL.

12.3.2. A lab control sample (LCS) must be prepared and analyzed with every batch of 20 or fewer samples. The LCS is prepared by spiking a blank with the matrix spike solution, and going through the entire preparation and analysis. Calculate percent recovery (%R) as follows:

$$\%R = X/TV \times 100$$

Where X =Concentration of the analyte recovered
TV =True value of amount spiked

Evaluate the recovery using the QC acceptance criteria in Attachment C. If the lab control sample (LCS) fails acceptance limits for any of the control compounds, the analyst must evaluate the sample preparation, analytical system, and calibration. Corrective action must be taken. Corrective action may include re-extraction, re-analysis, and/or recalibration and re-analysis.

12.3.3. A matrix spike/duplicate matrix spike (MS/DMS) must be prepared and analyzed with every batch of 20 or fewer samples. The MS is prepared by spiking a sample aliquot with the matrix spike solution, and going through the entire preparation and analysis. Calculate percent recovery (%R) as follows:

$$\%R = \frac{X - X1}{TV} \times 100$$

Where X =Concentration of the analyte recovered
X1 =Concentration of unspiked analyte
TV =True value of amount spiked

Calculate Relative Percent Difference (RPD) as:

$$RPD = \frac{R1 - R2}{(R1 + R2)/2} \times 100$$

Where R1 = % recovery of the MS
R2 = % recovery of the DMS

Evaluate the recovery and RPD using the QC acceptance criteria in Attachment C. If the MS/DMS recovery is out of acceptance limits for reasons other than matrix effects, corrective action must be taken.

12.3.4. Calculate and evaluate the surrogate recovery using the QC acceptance criteria in Attachment C. If surrogate recovery is outside acceptance criteria, the sample data must be closely evaluated for possible matrix interferences. If none are present, then corrective action must be identified.

12.4. Acceptance Criteria

12.4.1. The acceptance criteria for tuning verification, initial, and continuing calibration verification have been outlined above in Section 11.

12.4.2. Current acceptance criteria for matrix spikes, LCSs and surrogates are listed in Attachment C and in QA document QCLIMITS.xls. The acceptance criteria listed are current criteria, but are subject to change as control limits are updated.

12.5. Corrective action requirements have been outlined above in Section 11. Also, the corrective action requirements of any project-specific project plan should be used when applicable.

12.6. Additional QA/QC measures include control charting of QC sample results.

13. DATA REDUCTION , REVIEW, AND REPORTING

13.1. Calculations

13.1.1. The GC/MS data stations, in current use, all use the H-P RTE Integrator to generate the raw data used to calculate the standards $\overline{RF_x}$ values, the sample amounts, and the spike values. The software does three passes through each data file. The first two identify and integrate each internal standard and surrogate. The third pass uses the time-drift information from the first two passes to search for all method analytes in the proper retention times and with the proper characteristic quantitation ions. The results for a water sample are calculated as follows when $\overline{RF_x}$ is used:

$$A_x = \frac{(Resp_x)(Amt_{ISTD})}{(Resp_{ISTD})(\overline{RF_x})}$$

Where: A_x = the amount, in ppb, of the analytes in the sample;
$Resp_x$ = the peak area of the analytes of interest;
$Resp_{ISTD}$ = the peak area of the associated internal standard;
Amt_{ISTD} = the amount, in ppb, of internal standard added

$\overline{RF_x}$ = the average response from the five-point for the analytes of interest.

13.1.2. The results for low-level soil work are calculated by taking the normal print out, in ppb, (see the water results outlined above) and correcting for the total, dry soil sample actually purged:

$$(A_x) = \frac{(5\ grams)}{(ASW_t\ gr)(\%\ Solids)} = A_x\ Low\text{-}Level\ Soil$$

Where: A_x = the amount, in ppb, from the data system; five grams is the nominal amount of soil that is heated and purged;
ASW_t = the actual soil wet weight, in grams, that is purged; and
% Solids the correction factor for dry weight.

13.1.3. Results for a high-level soil extract are calculated as follows:

$$(A_x) = \frac{(Dilution)(10\ ml)}{(ASW_t)(\%\ Solids)} = A_x\ High\text{-}Level\ Soil\ Amt.$$

Where: A_x = the data station results, in ppb;
Dilution = the dilution of the extract.
10 ml = the amount of methanol used to extract the soil;
ASW_t = the actual wet weight of soil extracted; and
% Solids = the dry soil correction.

13.2. Data Review

Following primary data interpretation and calculations, all data is reviewed by a secondary analyst. Following generation of the report, the report is also reviewed. Refer to the *SOP for Laboratory Data Review Process* for details.

13.3. Reporting

13.3.1. Reports are generated using the STEALTH Data Reporting System which compiles the SMO login information and Enviroquant data. This compilation is then transferred to a file, which STEALTH uses to generate a report. The forms generated may be CAS standard reports, DOD, or client-specific reports. The compiled data from LIMS is also used to create EDDs.

13.3.2. Alternatively, Excel templates located in R:\VOA\forms may be used to prepare reports from hard-copy data. The analyst should choose the appropriate form and QC pages to correspond to required tier level. The detected analytes, surrogate and matrix spikes are then transferred, by hand, to the templates.

14. CONTENGENCIES FOR HANDLING OUT-OF-CONTROL OR UNACCEPTABLE DATA

Corrective action measures applicable to specific analysis steps are discussed in the applicable section of this (and other applicable) SOP(s). Also, refer to the SOP for Nonconformity and Corrective Action for correct procedures for identifying and documenting such data. Procedures for applying data qualifiers are described in the SOP for Report Generation or in project-specific requirements.

15. METHOD PERFORMANCE

This method was validated through single laboratory studies of accuracy and precision. Refer to the reference method for additional method performance data available.

The method detection limit (MDL) is established using the procedure described in the SOP for *The Determination of Method Detection Limits* (ADM-MDL). Method Reporting Limits are established for this method based on MDL studies and as specified in the CAS Quality Assurance Manual.

16. POLLUTION PREVENTION

It is the laboratory's practice to minimize the amount of solvents and reagents used to perform this method wherever technically sound, feasibly possible, and within method requirements. Standards are prepared in volumes consistent with laboratory use in order to minimize the

volume of expired standards to be disposed of. The threat to the environment from solvents and/or reagents used in this method may be minimized when recycled or disposed of properly.

17. WASTE MANAGEMENT

17.1. The laboratory will comply with all Federal, State and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions as specified in the CAS EH&S Manual.

17.2. This method uses non-halogenated solvents and any waste generated from this solvent must be placed in the collection cans in the lab. The solvent will then be added to the hazardous waste storage area and disposed of in accordance with Federal and State regulations.

18. TRAINING

18.1. Training Outline

18.1.1. Review literature by reading references. Review the EPA methodology and any applicable state-specific methods. Review the SOP. Also review the MSDS for methanol.

18.1.2. Observe the procedure as performed by an experienced analyst at least three times.

18.1.3. Assist in the procedure under the guidance of an experienced analyst for a period of three months. During this training process, the analyst is expected to transition from a role of assisting, to performing the procedure with minimal oversight from an experienced analyst.

18.1.4. Following the three-month training period the analyst is expected to complete an initial precision and recovery (IPR) study for solid samples by direct, solid samples by extraction, and water samples. Summaries of the IPR are reviewed and signed by the supervisor and forwarded to the employee's training file.

18.1.4.1. Perform IPR studies by preparing and analyzing four replicate laboratory control samples spiked at a level of 10-20 times the MRL. Calculate average percent recovery and relative standard deviation for the four replicate analyses. Refer to Method 8000B and 8260B for analysis and evaluation guidelines.

18.1.4.2. For applicable tests, IPR studies should be performed in order to be equivalent to NELAC's Initial Demonstration of Capability.

18.2. Training is documented following the SOP for Documentation of Training.

NOTE: When the analyst training is documented by the supervisor on internal training documentation forms, the supervisor is acknowledging that the analyst has read and understands this SOP and that adequate training has been given to the analyst to competently perform the analysis independently.

19. REFERENCES

19.1. CAS SOP for Purge and Trap for Aqueous Samples (VOC-5030).

19.2. CAS SOP for Purge and Trap Extraction for Volatile Organics in Soil and Waste Samples, Closed System (VOC-5035).

19.3. *Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS): Capillary Column Technique*, U.S. EPA, SW-846, Final Update III, Method 8260B, Revision 2, December 1996.

19.4. *Purge and Trap*, U.S. EPA, SW-846, Final Updates I and III, Methods 5030A (Rev. 1) and 5030B (Rev. 2).

19.5. *Closed System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste*, U.S. EPA, SW-846, Final Update III, Method 5035, Revision 0, December 1996.

TABLE 1
Method 8260B Analyte List

Compound	Water MRL	Soil MRL(low)	Soil MRL(mid)
	ug/L	ug/kg	mg/kg
1,1,1,2-Tetrachloroethane	0.5	5	.05
1,1,1-Trichloroethane (TCA)	0.5	5	.05
1,1,2-Trichloroethane	0.5	5	.05
1,1-Dichloroethane	0.5	5	.05
1,1-Dichloroethene	0.5	5	.05
1,1-Dichloropropene	0.5	5	.05
1,2-Dibromoethane (EDB)	2	20	0.1
1,2-Dichloroethane	0.5	5	.05
1,2-Dichloropropane	0.5	5	.05
1,3-Dichloropropane	0.5	5	.05
2,2-Dichloropropane	0.5	5	.05
2-Butanone (MEK)	20	20	1
2-Hexanone	20	20	1
4-Methyl-2-pentanone (MIBK)	20	20	1
Acetone	20	50	1
Benzene	0.5	5	.05
Bromochloromethane	0.5	5	.05
Bromodichloromethane	0.5	5	.05
Bromomethane	0.5	5	.05
Carbon Disulfide	0.5	5	.05
Carbon Tetrachloride	0.5	5	.05
Chlorobenzene	0.5	5	.05
Chloroethane	0.5	5	.05
Chloroform	0.5	5	.05
Chloromethane	0.5	5	.05
cis-1,2-Dichloroethene	0.5	5	.05
cis-1,3-Dichloropropene	0.5	5	.05
Dibromochloromethane	0.5	5	.05
Dibromomethane	0.5	5	.05
Dichlorodifluoromethane (CFC 12)	0.5	5	.05
Ethylbenzene	0.5	5	.05
Methylene Chloride	2	10	.25
Tetrachloroethene (PCE)	0.5	5	.05
Toluene	0.5	5	.05
trans-1,2-Dichloroethene	0.5	5	.05
trans-1,3-Dichloropropene	0.5	5	.05
Trichloroethene (TCE)	0.5	5	.05
Trichlorofluoromethane (CFC 11)	0.5	5	.05
Vinyl Chloride	0.5	5	.05

TABLE 1, continued

Compound	Water MRL	Soil MRL(low)	Soil MRL(mid)
	ug/L	ug/kg	mg/kg
Total Xylenes	1	5	0.1
Styrene	0.5	5	.05
Bromoform	0.5	5	.05
Isopropylbenzene	2	20	0.2
1,1,2,2-Tetrachloroethane	0.5	5	.05
1,2,3-Trichloropropane	0.5	5	.05
Bromobenzene	0.5	5	.05
n-Propylbenzene	2	20	.02
2-Chlorotoluene	2	20	.02
4-Chlorotoluene	2	20	0.2
1,3,5-Trimethylbenzene	2	20	0.2
tert-Butylbenzene	2	20	0.2
1,2,4-Trimethylbenzene	2	20	0.2
sec-Butylbenzene	2	20	0.2
1,3-Dichlorobenzene	0.5	5	.05
4-Isopropyltoluene	2	20	0.2
1,4-Dichlorobenzene	0.5	5	.05
n-Butylbenzene	2	20	0.2
1,2-Dichlorobenzene	0.5	5	.05
1,2-Dibromo-3-chloropropane (DBCP)	2	20	0.1
1,2,4-Trichlorobenzene	2	20	0.2
1,2,3-Trichlorobenzene	2	20	0.2
Naphthalene	2	20	0.1
Hexachlorobutadiene	2	20	0.2
Acetonitrile (Methyl Cyanide)	5	1000	.25
Acrolein	20	500	1
Acrylonitrile	20	50	1
2-Chloro-1,3-butadiene (Chloroprene)	10	500	0.5
3-Chloro-1-propene (Allyl Chloride)	5	50	.25
trans- + cis-1,4-Dichloro-2-butene	10	50	0.5
1,4-Dioxane	2500	12000	5
Ethyl Methacrylate	2	50	0.1
Iodomethane (Methyl Iodide)	5	50	.25
Isobutyl Alcohol (2-Methyl-1-propanol)	200	1000	1
Methacrylonitrile	5	50	.25
Methyl Methacrylate	5	50	.25
Propionitrile (Ethyl Cyanide)	5	250	.25
Vinyl Acetate	5	50	.25

TABLE 2

Standard Expiration Date Guidelines

Standard	Expiration time
Neat Chemicals	Expiration date 3 years from date opened, or supplier's assigned date.
Stock Standards (unopened ampules, commercially prepared or lab prepared)	Supplier's assigned date, or 1 year if no expiration date provided.
Opened ampules (working stocks)	
• concentration $\geq$ 5000 ppm	6 month expiration date.
• concentration 1000 - 5000 ppm	2 month expiration date.
• concentration < 1000 ppm	1 month expiration date.
Working Standards	
• concentration > 200 ppm (fuels)	1 month expiration date.
• concentration $\leq$ 200 ppm	7 day expiration date.
Internal Standard Solutions	One month expiration date.

Note: The analyst performing specific analytical procedures should use judgement and take into consideration the solution reactivity, volatility, and concentration when using standards to prepare calibration curves. Certain standards, depending on use and storage, may have shorter usable life than described in these guidelines.

TABLE 3

4-Bromofluorobenzene Characteristic Ion Abundance Criteria

Mass	Ion Abundance Criteria **MS04, MS05, MS12**	Ion Abundance Criteria **MS02**	Ion Abundance Criteria **MS13**
50	15-40% of mass 95	15-40% of mass 95	15-40% of mass 95
75	30-60% of mass 95	30-80% of mass 95	30-60% of mass 95
95	Base peak, 100% relative abundance	Base peak, 100% relative abundance	Base peak, 100% relative abundance
96	5-9% of mass 95	5-9% of mass 95	5-9% of mass 95
173	< 2% of mass 174	< 2% of mass 174	< 2% of mass 174
174	> 50% of mass 95	> 50% of mass 95	> 50% of mass 95
175	5-9% of mass 174	5-9% of mass 174	5-9% of mass 174
176	95 -101% of mass 174	95 -101% of mass 174	95 -101% of mass 174
177	5-9% of mass 176	5-9% of mass 176	5-9% of mass 176
Reference:	EPA 8260B	EPA 524.2	EPA 8260B

TABLE 4

Characteristic Masses (m/z) for Purgeable Organic Compounds

Acetone	58	43
Acetonitrile	41	40, 39
Acrolein	56	55, 58
Acrylonitrile	53	52, 51
Allyl alcohol	57	58, 39
Allyl chloride	76	41, 39, 78
Benzene	78	-
Benzyl chloride	91	126, 65, 128
Bromoacetone	136	43, 138, 93, 95
Bromobenzene	156	77, 158
Bromochloromethane	128	49, 130
Bromodichloromethane	83	85, 127
Bromoform	173	175, 254
Bromomethane	94	96
iso-Butanol	74	43
n-Butanol	56	41
2-Butanone	72	43
n-Butylbenzene	91	92, 134
sec-Butylbenzene	105	134
tert-Butylbenzene	119	91, 134
Carbon disulfide	76	78
Carbon tetrachloride	117	119
Chloral hydrate	82	44, 84, 86, 111
Chloroacetonitrile	48	75
Chlorobenzene	112	77, 114
1-Chlorobutane	56	49
Chlorodibromomethane	129	208, 206
Chloroethane	64	66
2-Chloroethanol	49	44, 43, 51, 80
Bis(2-chloroethyl) sulfide	109	111, 158, 160
2-Chloroethyl vinyl ether	63	65, 106
Chloroform	83	85
Chloromethane	50	52
Chloroprene	53	88, 90, 51
3-Chloropropionitrile	54	49, 89, 91
2-Chlorotoluene	91	126
4-Chlorotoluene	91	126
1,2-Dibromo-3-chloropropane	75	155, 157
Dibromochloromethane	129	127
1,2-Dibromoethane	107	109, 188
Dibromomethane	93	95, 174
1,2-Dichlorobenzene	146	111, 148
1,3-Dichlorobenzene	146	111, 148
1,4-Dichlorobenzene	146	111, 148
cis-1,4-Dichloro-2-butene	75	53, 77, 124, 89
trans-1,4-Dichloro-2-butene	53	88, 75

TABLE 4

Characteristic Masses (m/z) for Purgeable Organic Compounds (Continued)

Dichlorodifluoromethane	85	87
1,1-Dichloroethane	63	65, 83
1,2-Dichloroethane	62	98
1,1-Dichloroethene	96	61, 63
cis-1,2-Dichloroethene	96	61, 98
trans-1,2-Dichloroethene	96	61, 98
1,2-Dichloropropane	63	112
1,3-Dichloropropane	76	78
2,2-Dichloropropane	77	97
1,3-Dichloro-2-propanol	79	43, 81, 49
1,1-Dichloropropene	75	110, 77
cis-1,3-Dichloropropene	75	77, 39
trans-1,3-Dichloropropene	75	77, 39
1,2,3,4-Diepoxybutane	55	57, 56
Diethyl ether	74	45, 59
1,4-Dioxane	88	58, 43, 57
Epichlorohydrin	57	49, 62, 51
Ethanol	31	45, 27, 46
Ethyl acetate	88	43, 45, 61
Ethylbenzene	91	106
Ethylene oxide	44	43, 42
Ethyl methacrylate	69	41, 99, 86, 114
Hexachlorobutadiene	225	223, 227
Hexachloroethane	201	166, 199, 203
2-Hexanone	43	58, 57, 100
2-Hydroxypropionitrile	44	43, 42, 53
Iodomethane	142	127, 141
Isobutyl alcohol	43	41, 42, 74
Isopropylbenzene	105	120
p-Isopropyltoluene	119	134, 91
Malononitrile	66	39, 65, 38
Methacrylonitrile	41	67, 39, 52, 66
Methyl acrylate	55	85
Methyl-t-butyl ether	73	57
Methylene chloride	84	86, 49
Methyl ethyl ketone	72	43
Methyl iodide	142	127, 141
Methyl methacrylate	69	41, 100, 39
4-Methyl-2-pentanone	100	43, 58, 85
Naphthalene	128	-
Nitrobenzene	123	51, 77
2-Nitropropane	46	-
2-Picoline	93	66, 92, 78
Pentachloroethane	167	130, 132, 165, 169
Propargyl alcohol	55	39, 38, 53
b-Propiolactone	42	43, 44

TABLE 4

Characteristic Masses (m/z) for Purgeable Organic Compounds (Continued)

Propionitrile (ethyl cyanide)	54	52, 55, 40
n-Propylamine	59	41, 39
n-Propylbenzene	91	120
Pyridine	79	52
Styrene	104	78
1,2,3-Trichlorobenzene	180	182, 145
1,2,4-Trichlorobenzene	180	182, 145
1,1,1,2-Tetrachloroethane	131	133, 119
1,1,2,2-Tetrachloroethane	83	131, 85
Tetrachloroethene	164	129, 131, 166
Toluene	92	91
1,1,1-Trichloroethane	97	99, 61
1,1,2-Trichloroethane	83	97, 85
Trichloroethene	95	97, 130, 132
Trichlorofluoromethane	151	101, 153
1,2,3-Trichloropropane	75	77
1,2,4-Trimethylbenzene	105	120
1,3,5-Trimethylbenzene	105	120
Vinyl acetate	43	86
Vinyl chloride	62	64
o-Xylene	106	91
m-Xylene	106	91
p-Xylene	106	91
Surrogates:		
1,2-Dichloroethane-d4	65	67, 51
4-Bromofluorobenzene	95	174, 176
Dibromofluoromethane	113	111, 192
Toluene-d8	98	99, 70
Internal Standards:		
1,4-Difluorobenzene	114	63, 88
Fluorobenzene	96	77, 70, 50
1,4-Dichlorobenzene-d4	152	115, 150
Chlorobenzene-d5	117	119, 82

ATTACHMENTS

Attachment A
Instrument Operating Parameters

Attachment B
Detailed Standard Preparation Instructions

Attachment C
QC Acceptance Criteria

ATTACHMENT A

TOPLEVEL PARAMETERS

Method Information For: D:\MSD2\METHODS\MS28260J.M

Method Sections To Run:

( ) Save Copy of Method With Data
( ) Pre-Run Cmd/Macro =
(X) Data Acquisition
(X) Data Analysis
(X) Post-Run Cmd/Macro = MACRO "loctonet.MAC",G

Method Comments:
8260 METHOD FOR SOIL

END OF TOPLEVEL PARAMETERS

ACQUISITION PARAMETERS

General Information

Inlet : GC
Tune File : JON.U
Acquisition Mode : Scan

MS Information

Solvent Delay : 2.10 min

EM Absolute : False
EMV Offset : 0.0
Resulting Voltage : 1458.9

[Scan Parameters]

Low Mass : 35
High Mass : 300
Threshold : 500
Sampling # : 3 A/D Samples 8

[Real Time Plot Parameters]

Time Window : 10 min
Iconize Real Time Display : False

Plot 1 type : Total Ion
Scale minimum : 0
Scale maximum : 1000000
Plot 2 type : No plot

Temperature Information

[GC Zone Temperatures]

Inj. A : 150 C Off
Inj. B : 0 C Off
Det. A : 175 C
Det. B : 350 C

[Oven Parameters]

Oven Equib Time : 0.10 min
Oven Max : 260 C
Oven : On
Cryo : On

[Oven Program]

Initial Temp. : 20 C
Initial Time : 2.00 min

Level	Rate (C/min)	Final Temp. (C)	Final Time (min)
1	8.00	152	0.00
2	30.00	220	3.23
3	0.00		

Next Run Time : 24.00 min

Injector Information

Injection Source : Manual

[Purge Information]

Purge A/B	Init. Value	On Time	Off Time
A	Off	0.75	0.00
B	On	0.00	0.00

END OF ACQUISITION PARAMETERS

Method Name: D:\MS02\METHODS\MS28260J.M

Percent Report Settings

Sort By: Retention Time

Output Destination
    Screen: No
    Printer: No
    File: No

Integration Events: Meth Default

Generate Report During Run Method: No

Signal Correlation Window: 0.020

Qualitative Report Settings

Peak Location of Unknown: Apex

Library to Search	Minimum Quality
NBS75K	0

Integration Events: Meth Default

Report Type: Summary

Output Destination
    Screen: No
    Printer: No
    File: No

Generate Report During Run Method: No

Quantitative Report Settings

Report Type: Summary

Output Destination
    Screen: Yes
    Printer: No
    File: No

Generate Report During Run Method: No

TOPLEVEL PARAMETERS

Method Information File: D:\MS04\METHODS\524W2.M

Method Sections To Run:

( ) Save Copy of Method With Data
( ) Pre-Run Cmd/Macro =
(X) Data Acquisition
( ) Data Analysis
(X) Post-Run Cmd/Macro = macro "loctonet.mac",g

Method Comments:
EPA METHOD 8260/APP on 0.25 DB-624 column

END OF TOPLEVEL PARAMETERS

ACQUISITION PARAMETERS

General Information
------- -----------

let : GC
Tune File : BFB.U
Acquisition Mode : Scan

MS Information
-- -----------

Solvent Delay : 4.00 min

EM Absolute : False
EMV Offset : 105.9
Resulting Voltage : 2105.9

[Scan Parameters]

Low Mass : 35
High Mass : 260
Threshold : 500
Sampling # : 3 A/D Samples 8

[Real Time Plot Parameters]

ime Window : 10 min
conize Real Time Display : False
Plot 1 type : Total ion

[illegible]

GC Inlet Information
[illegible]

[Inlet A Temperature Program Information]

Oven Track : Off
Inlet A Off

[Inlet B Temperature Program Information]

Oven Track : Off
Initial Temp. : 250 C
Initial Time : 480.00 min

Level	Rate (C/min)	Final Temp. (C)	Final Time (min)
1	0		

Total Program Time: 430.00 min

[Inlet A Pressure Program Information]

Constant Flow : Off
Initial Pres. : 10.0 psi
Initial Time : 480.00 min

Level	Rate(psi/min)	Final Pres.(psi)	Final Time (min)
1	0		

Total Program Time: 480.00 min
Pressure Units : psi

[Inlet A Flow Settings]

Column length : 60.00 m
Column diameter : 0.250 mm
Gas : He
Vacuum compensation : Off
Pressure : 26.7 psi
Flow : 1.5 ml/min
Linear velocity : 26.8 cm/sec

[Inlet B Pressure Program Information]

Constant Flow : On 8.0 psi at 40 C
Pressure Units : psi

[Inlet B Flow Settings]

Column length : 60.00 m
Column diameter : 0.320 mm
Gas : He

Vacuum Compensation : On
Pressure : 8.3 psi
Flow : 1.0 ml/min
Linear Velocity : 51.2 cm/sec
Split flow : 20 ml/min
Split ratio : 13.3

[Auxiliary Channel C Information]

Comment:

Pressure Program:
Initial Pres. : 0.0 psi
Initial Time : 480.00 min

Level	Rate(psi/min)	Final Pres.(psi)	Final Time (min)
1	0		

Total Program Time: 480.00 min

[Auxiliary Channel D Information]

Comment:

Pressure Program:
Initial Pres. : 0.0 psi
Initial Time : 480.00 min

Level	Rate(psi/min)	Final Pres.(psi)	Final Time (min)
1	0		

tal Program Time: 480.00 min

[Auxiliary Channel E Information]

Comment:

Pressure Program:
Initial Pres. : 0.0 psi
Initial Time : 480.00 min

Level	Rate(psi/min)	Final Pres.(psi)	Final Time (min)
1	0		

Total Program Time: 480.00 min

[Auxiliary Channel F Information]

Comment:

Pressure Program:
Initial Pres. : 0.0 psi
Initial Time : 480.00 min

Level	Rate(psi/min)	Final Pres.(psi)	Final Time (min)
1	0		

GC Temperature Information
-- ----------- -----------

[GC Zone Temperatures]

Inj. A : 170 C Off
Inj. B : 250 C
Det. A : 170 C Off
Det. B : 250 C
Aux. : 280 C Off

[Oven Parameters]

Oven Equib Time : 0.20 min
Oven Max : 275 C
Oven : On
Cryo : Off
Ambient : 35 C
Cryo Blast : Off

[Oven Program]

Initial Temp. : 45 C
Initial Time : 2.00 min

Level	Rate (C/min)	Final Temp. (C)	Final Time (min)
1	7.50	90	1.00
2	15.00	160	0.00
3	20.00	230	6.70

Next Run Time : 23.87 min

Injector Information
-------- -----------

Injection Source : Manual

[Purge Information]

Purge A/B	Init. Value	On Time	Off Time
A	On	0.00	0.00
B	On	0.00	0.00

END OF ACQUISITION PARAMETERS
--- -- ----------- ----------

TOPLEVEL PARAMETERS

Method Information File: D:\MSFT\METHODS\A_8260.M

Method Sections To Run:

( ) Save Copy of Method With Data
( ) Pre-Run Cmd/Macro =
(X) Data Acquisition
(X) Data Analysis
(X) Post-Run Cmd/Macro = macro "loctonet.mac",g

Method Comments:
EPA METHOD 8260 FOR SOILS

END OF TOPLEVEL PARAMETERS

ACQUISITION PARAMETERS

General Information

let : GC
Tune File : SOIL_BFB.U
Acquisition Mode : Scan

MS Information

Solvent Delay : 4.30 min

EM Absolute : False
EMV Offset : 0.0
Resulting Voltage : 2235.3

[Scan Parameters]

Low Mass : 35
High Mass : 260
Threshold : 500
Sampling # : 3 A/D Samples 8

[Real Time Plot Parameters]

Time Window : 10 min
Iconize Real Time Display : False
Plot 1 type : Total ion

[illegible]

GC Inlet Information
[illegible]

[Inlet A Temperature Program Information]

Oven Track : Off
Inlet A Off

[Inlet B Temperature Program Information]

Oven Track : Off
Initial Temp. : 250 C
Initial Time : 480.00 min

Level	Rate (C/min)	Final Temp. (C)	Final Time (min)
1	0		

Total Program Time: 480.00 min

[Inlet A Pressure Program Information]

Constant Flow : On 4.8 psi at 100 C
Pressure Units : psi

nlet A Flow Settings]

Column length : 60.00 m
Column diameter : 0.320 mm
Gas : He
Vacuum compensation : On
Pressure : 7.1 psi
Flow : 1.0 ml/min
Linear velocity : 26.2 cm/sec
Split flow : 25 ml/min
Split ratio : 25.0

[Inlet B Pressure Program Information]

Constant Flow : On 4.1 psi at 100 C
Pressure Units : psi

[Inlet B Flow Settings]

Column length : 60.00 m
Column diameter : 0.320 mm
Gas : He
Vacuum compensation : On
`ressure : 4.2 psi
low : 0.8 ml/min
Linear velocity : 22.7 cm/sec

[illegible]

[Auxiliary Channel C Information]

Comment:

Pressure Program:
Initial Pres. : 0.0 psi
Initial Time : 480.00 min

Level	Rate(psi/min)	Final Pres.(psi)	Final Time (min)
1	0		

Total Program Time: 480.00 min

[Auxiliary Channel D Information]

Comment:

Pressure Program:
Initial Pres. : 0.0 psi
Initial Time : 480.00 min

Level	Rate(psi/min)	Final Pres.(psi)	Final Time (min)
1	0		

Total Program Time: 480.00 min

[Auxiliary Channel E Information]

Comment:

Pressure Program:
Initial Pres. : 0.0 psi
Initial Time : 480.00 min

Level	Rate(psi/min)	Final Pres.(psi)	Final Time (min)
1	0		

Total Program Time: 480.00 min

[Auxiliary Channel F Information]

Comment:

Pressure Program:
Initial Pres. : 0.0 psi
Initial Time : 480.00 min

Level	Rate(psi/min)	Final Pres.(psi)	Final Time (min)
1	0		

Total Program Time: 480.00 min

[GC Zone Temperatures]

Inj. A : 170 C Off
Inj. B : 250 C
Det. A : 170 C Off
Det. B : 250 C
Aux. : 280 C

[Oven Parameters]

Oven Equib Time : 0.00 min
Oven Max : 225 C
Oven : On
Cryo : On
Ambient : 35 C
Cryo Blast : Off

[Oven Program]

Initial Temp. : 40 C
Initial Time : 1.50 min

Level	Rate (C/min)	Final Temp. (C)	Final Time (min)
1	10.00	200	0.00
2	30.00	220	5.83
3	0.00		

Next Run Time : 24.00 min

Injector Information
-------- -----------

Injection Source : Manual

[Purge Information]

Purge A/B	Init. Value	On Time	Off Time
A	On	0.00	0.00
B	On	0.00	0.00

END OF ACQUISITION PARAMETERS

DATA ANALYSIS PARAMETERS

Method Information File: D:\MSD\METHODS\8260W4.M

Method Sections To Run:

( ) Save Copy of Method With Data
( ) Pre-Run Cmd/Macro =
(X) Data Acquisition
(X) Data Analysis
(X) Post-Run Cmd/Macro = macro "loctonet.mac",g

Method Comments:

END OF TOPLEVEL PARAMETERS

INSTRUMENT CONTROL PARAMETERS

Sample Inlet: GC
Injection Source: External Device
Injection Location: Front
Mass Spectrometer: Enabled

HP6890 GC METHOD

OVEN
Initial temp: 40 'C (On)
Initial time: 2.00 min
Maximum temp: 260 'C
Equilibration time: 0.00 min
Ramps:

#	Rate	Final temp	Final time
1	4.00	65	1.00
2	15.00	200	1.00
3	0.0(Off)		

Post temp: 0 'C
Post time: 0.00 min
Run time: 19.25 min

FRONT INLET (UNKNOWN)
Mode: Split
Initial temp: 200 'C (On)
Pressure: 14.26 psi (On)
Split ratio: 100:1
Split flow: 68.8 mL/min
Total flow: 72.8 mL/min
Gas saver: On
Saver flow: 20.0 mL/min
Saver time: 2.00 min

BACK INLET ()

[illegible]

COLUMN 1
   Capillary Column
   Model Number: J&W [illegible]
   [illegible]
   Max temperature: 260 'C
   Nominal length: 20.0 m
   Nominal diameter: 180.00 um
   Nominal film thickness: 1.00 um
   Mode: constant flow
   Initial flow: 0.7 mL/min
   Nominal init pressure: 14.27 psi
   Average velocity: 37 cm/sec
   Inlet: Front Inlet
   Outlet: (unspecified)
   Outlet pressure: vacuum

COLUMN 2
   (not installed)

FRONT DETECTOR (NO DET)

BACK DETECTOR (NO DET)

SIGNAL 1
   Data rate: 20 Hz
   Type: test plot
   Save Data: Off
   Zero: 0.0 (Off)
   Range: 0
   Fast Peaks: Off
   Attenuation: 0

SIGNAL 2
   Data rate: 20 Hz
   Type: test plot
   Save Data: Off
   Zero: 0.0 (Off)
   Range: 0
   Fast Peaks: Off
   Attenuation: 0

COLUMN COMP 1
   (No Detectors Installed)

COLUMN COMP 2
   (No Detectors Installed)

THERMAL AUX 2
   Use: MSD Transfer Line Heater
   Description:
   Initial temp: 250 'C (On)
   Initial time: 0.00 min

#	Rate	Final temp	Final time
1	0.0(Off)		

POST RUN
   Post Time: 0.00 min

TIME TABLE

Time	Specifier	Parameter & Setpoint

7673 Injector

Front Injector:

Sample Washes	0	
Sample Pumps	0	
Injection Volume	1.0	microliters
Syringe Size	10.0	microliters
Nanoliter Adapter	Off	
PostInj Solvent A Washes	0	
PostInj Solvent B Washes	0	
Viscosity Delay	0	seconds
Plunger Speed	Fast	

Back Injector:
Sample Washes 3
Sample Pumps 3
Injection Volume 1.0 microliters
Syringe Size 10.0 microliters
Nanoliter Adapter Off
PostInj Solvent A Washes 0
PostInj Solvent B Washes 0
Viscosity Delay 0 seconds
Plunger Speed Fast

MS ACQUISITION PARAMETERS

General Information
------- -----------

Tune File : BFB1.U
Acquistion Mode : Scan

MS Information
-- -----------

Solvent Delay : 1.02 min

EM Absolute : False
EM Offset : 106
Resulting EM Voltage : 1258.8

[Scan Parameters]

Low Mass : 35.0
High Mass : 260.0
Threshold : 200
Sample # : 3 A/D Samples 8

[MSZones]

MS Quad : 150 C maximum 200 C
MS Source : 250 C maximum 250 C

END OF MS ACQUISITION PARAMETERS

END OF INSTRUMENT CONTROL PARAMETERS

DATA ANALYSIS PARAMETERS

Method Name: J:\MS13\METHODS\082804_8260W.M

Sort By: Signal

Output Destination
Screen: No
Printer: Yes
File: No

Integration Events: Meth Default

Generate Report During Run Method: No

Signal Correlation Window: 0.020

Qualitative Report Settings

Peak Location of Unknown: Apex

Library to Search Minimum Quality
L:\Database\NIST98.L 0

Integration Events: Meth Default

Report Type: Summary

Output Destination
Screen: No
Printer: Yes
File: No

Generate Report During Run Method: No

Quantitative Report Settings

Report Type: Summary

Output Destination
Screen: No
Printer: Yes
File: No

Generate Report During Run Method: No

VOA MS13 EPA Method 8260B
Calibration Last Updated: Sun Aug 29 17:56:26 2004

Reference Window: 100.00 Minutes

ATTACHMENT B

INITIAL CALIBRATION CURVE

Date_____ Analysis: 8260/App.

Prepared By_____ Instrument:

Matrix: Water

Stock Solution #1_____ Analytes: Surrogate Init. Concentration: 100ppm

Stock Solution #2_____ Analytes: Low 8260/Ketones Init. Concentration: 5/10/20/100/200ppm

Stock Solution #3_____ Analytes: 8260 Init. Concentration: 50/100/200/1000/2000ppm

Stock Solution #4_____ Analytes: Ketones Init. Concentration: 2000ppm

Aliquot of Stock Solution #1 (µL)	Final Conc. of #1 (µg/L)	Aliquot of Stock Solution #2 (µL)	Final Conc. of #2 (µg/L)	Aliquot of Stock Solution #3 (µL)	Final Conc. of #3 (µg/L)	Aliquot of Stock Solution #4 (µL)	Final Conc. of #4 (µg/L)	Final Volume (mL)	Notes
1.5	3	2.0	0.2/.4/.8/4/8					50	Level ID: 1
2.0	4	3.0	0.3/.6/1.2/6/12					50	Level ID: 2
2.5	5	5.0	.5/1/2/10/20					50	Level ID: 3
3.0	6	12.5	1.25/2.5/5/25/50					50	Level ID: 4
4.0	8	20	2/4/8/40/80					50	Level ID: 5
4.5	9			5	5/10/20/100/200	2.5	100	50	Level ID: 6
5.0	10			10	10/20/40/200/400	5.0	200	50	Level ID: 7
10	20			20	20/40/80/400/800	10	400	50	Level ID: 8
20	40			40	40/80/160/800/1600	20	800	50	Level ID: 9
25	50			80	80/160/320/1600/3200	40	1600	50	Level ID: 10

8260 ICV: 10uL of 50/250ppm Accustd ICV ( ) + 50uL of 100ppm Acrolein ( ) +

5uL of 100ppm Dichlorofluoromethane ( ) + 5uL of 200ppm n-Octane/Tetrahydrofuran ( ) +

7.5uL of 200/2000ppm Appendix ICV ( ) + 5uL of 200/1000ppm Oxygenates ( ) to 50mL.

INITIAL CALIBRATION CURVE

Date_____ Analysis: 8260

Prepared By_____ Instrument:

Matrix: Soil

Stock Solution #1_____ Analytes: Surrogate Init. Concentration: 100ppm

Stock Solution #2_____ Analytes: Low 8260/Ketones Init. Concentration: 10/20/40/50/100ppm

Stock Solution #3_____ Analytes: 8260/Ketones Init. Concentration: 100/200/400/500/1000ppm

Aliquot of Stock Solution #1 (µL)	Final Conc. of #1 (µg/L)	Aliquot of Stock Solution #2 (µL)	Final Conc. of #2 (µg/L)	Aliquot of Stock Solution #3 (µL)	Final Conc. of #3 (µg/L)			Final Volume (mL)	Notes
2.5	5.0	5.0	1.0/2.0/4.0/5.0/10					50	Level ID: 1
5.0	10	10	2.0/4.0/8.0/10/20					50	Level ID: 2
10	20	25	5.0/10/20/25/50					50	Level ID: 3
15	30	50	10/20/40/50/100					50	Level ID: 4
20	40			10	20/40/80/100/200			50	Level ID: 5
25	50			25	50/100/200/250/500			50	Level ID: 6
30	60			50	100/200/400/500/1000			50	Level ID: 7
40	80			150	300/600/1200/1500/3000			50	Level ID: 8

8260 ICV: 50uL of 50/250ppm Accustd ICV ( ) + 50uL of 100ppm Acrolein ( ) +

12.5uL of 200/1000ppm Oxygenates ( ) to 50mL.

ATTACHMENT C

VOLATILE ORGANICS ANALYSES						
Method	Prep Method	Matrix	Analyte	LCS Accuracy (% Rec.)	Matrix Spike (% Rec.)	Precision (RPD)
8260B	5030A/5035	Soil-low	1,1,1,2-Tetrachloroethane	64-120	10-121	40
8260B	5030A/5035	Soil-low	1,1,1-Trichloroethane (TCA)	64-129	23-126	40
8260B	5030A/5035	Soil-low	1,1,2,2-Tetrachloroethane	56-119	10-114	40
8260B	5030A/5035	Soil-low	1,1,2-Trichloroethane	64-120	19-123	40
8260B	5030A/5035	Soil-low	1,1-Dichloroethane	66-124	30-124	40
8260B	5030A/5035	Soil-low	1,1-Dichloroethene	70-132	35-127	40
8260B	5030A/5035	Soil-low	1,1-Dichloropropene	61-128	19-128	40
8260B	5030A/5035	Soil-low	1,2,3-Trichlorobenzene	64-132	10-111	40
8260B	5030A/5035	Soil-low	1,2,3-Trichloropropane	58-124	13-123	40
8260B	5030A/5035	Soil-low	1,2,4-Trichlorobenzene	61-139	10-111	40
8260B	5030A/5035	Soil-low	1,2,4-Trimethylbenzene	63-131	10-124	40
8260B	5030A/5035	Soil-low	1,2-Dibromo-3-chloropropane	58-126	10-122	40
8260B	5030A/5035	Soil-low	1,2-Dibromoethane (EDB)	63-122	10-124	40
8260B	5030A/5035	Soil-low	1,2-Dichlorobenzene	64-119	10-119	40
8260B	5030A/5035	Soil-low	1,2-Dichloroethane (EDC)	62-130	21-132	40
8260B	5030A/5035	Soil-low	1,2-Dichloropropane	67-124	25-123	40
8260B	5030A/5035	Soil-low	1,3,5-Trimethylbenzene	59-131	10-134	40
8260B	5030A/5035	Soil-low	1,3-Dichlorobenzene	64-123	10-108	40
8260B	5030A/5035	Soil-low	1,3-Dichloropropane	63-123	19-129	40
8260B	5030A/5035	Soil-low	1,4-Dichlorobenzene	65-124	10-112	40
8260B	5030A/5035	Soil-low	1,4-Dioxane	10-91	70-130	40
8260B	5030A/5035	Soil-low	1-Chlorohexane	61-145	70-130	40
8260B	5030A/5035	Soil-low	2,2-Dichloropropane	62-135	26-132	40
8260B	5030A/5035	Soil-low	2-Butanone (MEK)	53-141	12-142	40
8260B	5030A/5035	Soil-low	2-Chloroethyl Vinyl Ether	61-140	10-134	40
8260B	5030A/5035	Soil-low	2-Chlorotoluene	60-129	15-113	40
8260B	5030A/5035	Soil-low	2-Hexanone	46-146	10-140	40
8260B	5030A/5035	Soil-low	2-Nitropropane	33-142	70-130	40
8260B	5030A/5035	Soil-low	3-Chloro-1-propene	31-152	70-130	40
8260B	5030A/5035	Soil-low	4-Chlorotoluene	58-127	13-108	40
8260B	5030A/5035	Soil-low	4-Isopropyltoluene	57-129	10-122	40
8260B	5030A/5035	Soil-low	4-Methyl-2-pentanone (MIBK)	53-149	14-147	40
8260B	5030A/5035	Soil-low	Acetone	49-128	10-141	40
8260B	5030A/5035	Soil-low	Acetonitrile	36-138	70-130	40
8260B	5030A/5035	Soil-low	Acrolein	10-201	10-83	40
8260B	5030A/5035	Soil-low	Acrylonitrile	10-231	10-150	40
8260B	5030A/5035	Soil-low	Benzene	68-126	26-125	40
8260B	5030A/5035	Soil-low	Bromobenzene	62-124	13-115	40

VOLATILE ORGANICS ANALYSES						
Method	Prep Method	Matrix	Analyte	LCS Accuracy (% Rec.)	Matrix Spike (% Rec.)	Precision (RPD)
8260B	5030A/5035	Soil-low	Bromochloromethane	68-129	26-134	40
8260B	5030A/5035	Soil-low	Bromodichloromethane	66-127	12-129	40
8260B	5030A/5035	Soil-low	Bromoethane	72-137	70-130	40
8260B	5030A/5035	Soil-low	Bromoform	64-126	10-125	40
8260B	5030A/5035	Soil-low	Bromomethane	30-157	10-146	40
8260B	5030A/5035	Soil-low	Carbon Disulfide	63-129	11-126	40
8260B	5030A/5035	Soil-low	Carbon Tetrachloride	62-131	10-129	40
8260B	5030A/5035	Soil-low	Chlorobenzene	68-119	13-115	40
8260B	5030A/5035	Soil-low	Chloroethane	38-156	13-151	40
8260B	5030A/5035	Soil-low	Chloroform	67-126	28-126	40
8260B	5030A/5035	Soil-low	Chloromethane	46-152	14-147	40
8260B	5030A/5035	Soil-low	Chloroprene	54-142	70-130	40
8260B	5030A/5035	Soil-low	cis-1,2-Dichloroethene	67-126	25-129	40
8260B	5030A/5035	Soil-low	cis-1,3-Dichloropropene	66-132	11-127	40
8260B	5030A/5035	Soil-low	cis-1,4-Dichloro-2-butene	47-143	70-130	40
8260B	5030A/5035	Soil-low	Cyclohexane	52-138	10-107	40
8260B	5030A/5035	Soil-low	Dibromochloromethane	64-122	10-127	40
8260B	5030A/5035	Soil-low	Dibromomethane	67-127	23-130	40
8260B	5030A/5035	Soil-low	Dichlorodifluoromethane	30-187	12-164	40
8260B	5030A/5035	Soil-low	Diisopropyl Ether	64-125	20-125	40
8260B	5030A/5035	Soil-low	Ethyl Acetate	10-194	70-130	40
8260B	5030A/5035	Soil-low	Ethyl Acrylate	70-130	70-130	40
8260B	5030A/5035	Soil-low	Ethyl Methacrylate	45-146	70-130	40
8260B	5030A/5035	Soil-low	Ethylbenzene	65-128	12-121	40
8260B	5030A/5035	Soil-low	Ethylene Oxide	70-130	70-130	40
8260B	5030A/5035	Soil-low	Hexachlorobutadiene	56-137	10-103	40
8260B	5030A/5035	Soil-low	Iodomethane	10-225	10-157	40
8260B	5030A/5035	Soil-low	Isobutanol	19-159	70-130	40
8260B	5030A/5035	Soil-low	Isopropylbenzene	55-120	5-111	40
8260B	5030A/5035	Soil-low	m,p-Xylenes	64-131	5-127	40
8260B	5030A/5035	Soil-low	Methacrylonitrile	42-149	70-130	40
8260B	5030A/5035	Soil-low	Methyl Acetate	32-146	13-135	40
8260B	5030A/5035	Soil-low	Methyl Methacrylate	31-152	70-130	40
8260B	5030A/5035	Soil-low	Methyl tert-Butyl Ether	60-144	19-148	40
8260B	5030A/5035	Soil-low	Methylcyclohexane	49-141	10-101	40
8260B	5030A/5035	Soil-low	Methylene Chloride	60-126	17-132	40
8260B	5030A/5035	Soil-low	n-Butylbenzene	56-140	10-122	40
8260B	5030A/5035	Soil-low	n-Hexane	40-286	70-130	40

VOLATILE ORGANICS ANALYSES							
Method	Prep Method	Matrix	Analyte		LCS Accuracy (% Rec.)	Matrix Spike (% Rec.)	Precision (RPD)
8260B	5030A/5035	Soil-low	n-Propylbenzene		58-131	10-117	40
8260B	5030A/5035	Soil-low	Naphthalene		58-138	10-127	40
8260B	5030A/5035	Soil-low	o-Xylene		65-127	10-129	40
8260B	5030A/5035	Soil-low	Propionitrile		30-147	70-130	40
8260B	5030A/5035	Soil-low	Propylene Oxide		70-130	70-130	40
8260B	5030A/5035	Soil-low	sec-Butylbenzene		60-134	10-116	40
8260B	5030A/5035	Soil-low	Styrene		65-129	10-118	40
8260B	5030A/5035	Soil-low	tert-Amyl Methyl Ether		67-125	70-130	40
8260B	5030A/5035	Soil-low	tert-Butyl Alcohol		35-158	70-130	40
8260B	5030A/5035	Soil-low	tert-Butyl Ethyl Ether		63-122	70-130	40
8260B	5030A/5035	Soil-low	tert-Butylbenzene		58-128	10-114	40
8260B	5030A/5035	Soil-low	Tetrachloroethene (PCE)		63-129	10-130	40
8260B	5030A/5035	Soil-low	Toluene		68-127	19-124	40
8260B	5030A/5035	Soil-low	trans-1,2-Dichloroethene		68-128	24-126	40
8260B	5030A/5035	Soil-low	trans-1,3-Dichloropropene		56-121	10-120	40
8260B	5030A/5035	Soil-low	trans-1,4-Dichloro-2-butene		10-263	10-155	40
8260B	5030A/5035	Soil-low	Trichloroethene (TCE)		67-130	18-130	40
8260B	5030A/5035	Soil-low	Trichlorofluoromethane		49-144	14-138	40
8260B	5030A/5035	Soil-low	Trichlorotrifluoroethane		65-156	22-135	40
8260B	5030A/5035	Soil-low	Vinyl Acetate		10-181	10-114	40
8260B	5030A/5035	Soil-low	Vinyl Chloride		46-147	17-144	40
8260B	5030A/5035	Soil-low	1,2-Dichloroethane-D4 (Surr.)	61-123	NA	NA	NA
8260B	5030A/5035	Soil-low	4-Bromofluorobenzene (Surr.)	66-122	NA	NA	NA
8260B	5030A/5035	Soil-low	Dibromofluoromethane (Surr.)	70-119	NA	NA	NA
8260B	5030A/5035	Soil-low	Toluene-D8 (Surr.)	72-121	NA	NA	NA
8260B	5035/5030B	Soil-mid	1,1,1,2-Tetrachloroethane		72-128	67-126	40
8260B	5035/5030B	Soil-mid	1,1,1-Trichloroethane (TCA)		72-135	67-131	40
8260B	5035/5030B	Soil-mid	1,1,2,2-Tetrachloroethane		58-120	33-152	40
8260B	5035/5030B	Soil-mid	1,1,2-Trichloroethane		74-116	67-125	40
8260B	5035/5030B	Soil-mid	1,1-Dichloroethane		74-123	68-126	40
8260B	5035/5030B	Soil-mid	1,1-Dichloroethene		71-132	66-135	40
8260B	5035/5030B	Soil-mid	1,1-Dichloropropene		74-124	71-121	40
8260B	5035/5030B	Soil-mid	1,2,3-Trichlorobenzene		60-132	56-140	40
8260B	5035/5030B	Soil-mid	1,2,3-Trichloropropane		68-128	48-148	40
8260B	5035/5030B	Soil-mid	1,2,4-Trichlorobenzene		60-130	59-136	40
8260B	5035/5030B	Soil-mid	1,2,4-Trimethylbenzene		78-137	71-139	40
8260B	5035/5030B	Soil-mid	1,2-Dibromo-3-chloropropane		60-114	60-121	40
8260B	5035/5030B	Soil-mid	1,2-Dibromoethane (EDB)		72-119	67-123	40

VOLATILE ORGANICS ANALYSES						
Method	Prep Method	Matrix	Analyte	LCS Accuracy (% Rec.)	Matrix Spike (% Rec.)	Precision (RPD)
8260B	5035/5030B	Soil-mid	1,2-Dichlorobenzene	77-113	73-116	40
8260B	5035/5030B	Soil-mid	1,2-Dichloroethane (EDC)	72-127	69-129	40
8260B	5035/5030B	Soil-mid	1,2-Dichloropropane	78-115	77-115	40
8260B	5035/5030B	Soil-mid	1,3,5-Trimethylbenzene	81-129	51-150	40
8260B	5035/5030B	Soil-mid	1,3-Dichlorobenzene	79-115	75-117	40
8260B	5035/5030B	Soil-mid	1,3-Dichloropropane	74-118	69-123	40
8260B	5035/5030B	Soil-mid	1,4-Dichlorobenzene	79-112	75-114	40
8260B	5035/5030B	Soil-mid	1,4-Dioxane	10-178	70-130	40
8260B	5035/5030B	Soil-mid	1-Chlorohexane	71-128	70-130	40
8260B	5035/5030B	Soil-mid	2,2-Dichloropropane	64-136	54-129	40
8260B	5035/5030B	Soil-mid	2-Butanone (MEK)	72-129	61-141	40
8260B	5035/5030B	Soil-mid	2-Chloroethyl Vinyl Ether	10-205	70-130	40
8260B	5035/5030B	Soil-mid	2-Chlorotoluene	79-125	55-152	40
8260B	5035/5030B	Soil-mid	2-Hexanone	59-130	54-141	40
8260B	5035/5030B	Soil-mid	2-Nitropropane	70-130	70-130	40
8260B	5035/5030B	Soil-mid	3-Chloro-1-propene	70-130	70-130	40
8260B	5035/5030B	Soil-mid	4-Chlorotoluene	78-123	65-133	40
8260B	5035/5030B	Soil-mid	4-Isopropyltoluene	70-132	59-140	40
8260B	5035/5030B	Soil-mid	4-Methyl-2-pentanone (MIBK)	65-130	61-134	40
8260B	5035/5030B	Soil-mid	Acetone	65-130	54-140	40
8260B	5035/5030B	Soil-mid	Acetonitrile	70-130	70-130	40
8260B	5035/5030B	Soil-mid	Acrolein	70-130	70-130	40
8260B	5035/5030B	Soil-mid	Acrylonitrile	10-91	70-130	40
8260B	5035/5030B	Soil-mid	Benzene	83-121	78-122	40
8260B	5035/5030B	Soil-mid	Bromobenzene	77-120	71-126	40
8260B	5035/5030B	Soil-mid	Bromochloromethane	79-126	72-133	40
8260B	5035/5030B	Soil-mid	Bromodichloromethane	74-124	69-126	40
8260B	5035/5030B	Soil-mid	Bromoethane	70-130	70-130	40
8260B	5035/5030B	Soil-mid	Bromoform	64-132	62-131	40
8260B	5035/5030B	Soil-mid	Bromomethane	10-102	10-126	40
8260B	5035/5030B	Soil-mid	Carbon Disulfide	56-140	54-144	40
8260B	5035/5030B	Soil-mid	Carbon Tetrachloride	67-143	61-137	40
8260B	5035/5030B	Soil-mid	Chlorobenzene	80-113	73-118	40
8260B	5035/5030B	Soil-mid	Chloroethane	10-179	10-174	40
8260B	5035/5030B	Soil-mid	Chloroform	74-125	69-126	40
8260B	5035/5030B	Soil-mid	Chloromethane	35-131	47-140	40
8260B	5035/5030B	Soil-mid	Chloroprene	70-130	70-130	40
8260B	5035/5030B	Soil-mid	cis-1,2-Dichloroethene	79-120	71-126	40

VOLATILE ORGANICS ANALYSES						
Method	Prep Method	Matrix	Analyte	LCS Accuracy (% Rec.)	Matrix Spike (% Rec.)	Precision (RPD)
8260B	5035/5030B	Soil-mid	cis-1,3-Dichloropropene	76-121	74-124	40
8260B	5035/5030B	Soil-mid	cis-1,4-Dichloro-2-butene	70-130	70-130	40
8260B	5035/5030B	Soil-mid	Cyclohexane	70-130	70-130	40
8260B	5035/5030B	Soil-mid	Dibromochloromethane	69-121	65-123	40
8260B	5035/5030B	Soil-mid	Dibromomethane	79-119	73-125	40
8260B	5035/5030B	Soil-mid	Dichlorodifluoromethane	19-142	33-177	40
8260B	5035/5030B	Soil-mid	Diisopropyl Ether	70-130	70-130	40
8260B	5035/5030B	Soil-mid	Ethyl Acetate	70-130	70-130	40
8260B	5035/5030B	Soil-mid	Ethyl Acrylate	70-130	70-130	40
8260B	5035/5030B	Soil-mid	Ethyl Methacrylate	70-130	70-130	40
8260B	5035/5030B	Soil-mid	Ethylbenzene	84-124	74-127	40
8260B	5035/5030B	Soil-mid	Ethylene Oxide	70-130	70-130	40
8260B	5035/5030B	Soil-mid	Hexachlorobutadiene	71-130	59-143	40
8260B	5035/5030B	Soil-mid	Iodomethane	10-147	70-130	40
8260B	5035/5030B	Soil-mid	Isobutanol	70-130	70-130	40
8260B	5035/5030B	Soil-mid	Isopropylbenzene	75-118	68-119	40
8260B	5035/5030B	Soil-mid	m,p-Xylenes	85-125	61-141	40
8260B	5035/5030B	Soil-mid	Methacrylonitrile	70-130	70-130	40
8260B	5035/5030B	Soil-mid	Methyl Acetate	70-130	70-130	40
8260B	5035/5030B	Soil-mid	Methyl Methacrylate	70-130	70-130	40
8260B	5035/5030B	Soil-mid	Methyl tert-Butyl Ether	65-130	56-144	40
8260B	5035/5030B	Soil-mid	Methylcyclohexane	70-130	70-130	40
8260B	5035/5030B	Soil-mid	Methylene Chloride	71-125	66-129	40
8260B	5035/5030B	Soil-mid	n-Butylbenzene	63-134	55-145	40
8260B	5035/5030B	Soil-mid	n-Hexane	70-130	70-130	40
8260B	5035/5030B	Soil-mid	n-Propylbenzene	79-128	62-137	40
8260B	5035/5030B	Soil-mid	Naphthalene	53-146	42-173	40
8260B	5035/5030B	Soil-mid	o-Xylene	83-124	68-137	40
8260B	5035/5030B	Soil-mid	Propionitrile	70-130	70-130	40
8260B	5035/5030B	Soil-mid	Propylene Oxide	70-130	70-130	40
8260B	5035/5030B	Soil-mid	sec-Butylbenzene	77-135	70-136	40
8260B	5035/5030B	Soil-mid	Styrene	83-127	79-130	40
8260B	5035/5030B	Soil-mid	tert-Amyl Methyl Ether	70-130	70-130	40
8260B	5035/5030B	Soil-mid	tert-Butyl Alcohol	70-130	70-130	40
8260B	5035/5030B	Soil-mid	tert-Butyl Ethyl Ether	70-130	70-130	40
8260B	5035/5030B	Soil-mid	tert-Butylbenzene	79-129	71-131	40
8260B	5035/5030B	Soil-mid	Tetrachloroethene (PCE)	75-123	43-149	40
8260B	5035/5030B	Soil-mid	Toluene	78-126	73-127	40

VOLATILE ORGANICS ANALYSES							
Method	Prep Method	Matrix	Analyte		LCS Accuracy (% Rec.)	Matrix Spike (% Rec.)	Precision (RPD)
8260B	5035/5030B	Soil-mid	trans-1,2-Dichloroethene		76-123	70-125	40
8260B	5035/5030B	Soil-mid	trans-1,3-Dichloropropene		63-115	58-121	40
8260B	5035/5030B	Soil-mid	trans-1,4-Dichloro-2-butene		70-130	70-130	40
8260B	5035/5030B	Soil-mid	Trichloroethene (TCE)		76-131	69-134	40
8260B	5035/5030B	Soil-mid	Trichlorofluoromethane		27-153	48-138	40
8260B	5035/5030B	Soil-mid	Trichlorotrifluoroethane		65-137	54-129	40
8260B	5035/5030B	Soil-mid	Vinyl Acetate		10-206	70-130	40
8260B	5035/5030B	Soil-mid	Vinyl Chloride		55-145	58-152	40
8260B	5035/5030B	Soil-mid	1,2-Dichloroethane-D4[g]	43-148	NA	NA	NA
8260B	5035/5030B	Soil-mid	4-Bromofluorobenzene[g]	36-150	NA	NA	NA
8260B	5035/5030B	Soil-mid	Dibromofluoromethane[g]	46-141	NA	NA	NA
8260B	5035/5030B	Soil-mid	Toluene-D8[g]	45-147	NA	NA	NA
8260B	5030B	Water	1,1,1,2-Tetrachloroethane		72-133	75-135	30
8260B	5030B	Water	1,1,1-Trichloroethane (TCA)		72-132	74-141	30
8260B	5030B	Water	1,1,2,2-Tetrachloroethane		70-122	69-125	30
8260B	5030B	Water	1,1,2-Trichloroethane		76-120	76-121	30
8260B	5030B	Water	1,1-Dichloroethane		76-117	71-128	30
8260B	5030B	Water	1,1-Dichloroethene		76-129	76-143	30
8260B	5030B	Water	1,1-Dichloropropene		72-118	75-125	30
8260B	5030B	Water	1,2,3-Trichlorobenzene		66-131	63-131	30
8260B	5030B	Water	1,2,3-Trichloropropane		73-125	71-127	30
8260B	5030B	Water	1,2,4-Trichlorobenzene		61-135	58-136	30
8260B	5030B	Water	1,2,4-Trimethylbenzene		74-138	74-144	30
8260B	5030B	Water	1,2-Dibromo-3-chloropropane		63-124	60-129	30
8260B	5030B	Water	1,2-Dibromoethane (EDB)		75-120	77-119	30
8260B	5030B	Water	1,2-Dichlorobenzene		81-113	77-117	30
8260B	5030B	Water	1,2-Dichloroethane (EDC)		74-121	74-122	30
8260B	5030B	Water	1,2-Dichloropropane		76-116	74-119	30
8260B	5030B	Water	1,3,5-Trichlorobenzene		71-127	91-108	30
8260B	5030B	Water	1,3,5-Trimethylbenzene		78-132	79-138	30
8260B	5030B	Water	1,3-Dichlorobenzene		81-116	78-121	30
8260B	5030B	Water	1,3-Dichloropropane		77-121	78-120	30
8260B	5030B	Water	1,4-Dichlorobenzene		80-113	73-121	30
8260B	5030B	Water	1,4-Dioxane		72-177	71-167	30
8260B	5030B	Water	1-Chlorohexane		70-125	70-130	30
8260B	5030B	Water	2,2-Dichloropropane		63-142	60-151	30
8260B	5030B	Water	2-Butanone (MEK)		69-132	66-134	30
8260B	5030B	Water	2-Chloroethyl Vinyl Ether		10-160	10-147	30

VOLATILE ORGANICS ANALYSES						
Method	Prep Method	Matrix	Analyte	LCS Accuracy (% Rec.)	Matrix Spike (% Rec.)	Precision (RPD)
8260B	5030B	Water	2-Chlorotoluene	82-126	80-134	30
8260B	5030B	Water	2-Hexanone	67-127	62-132	30
8260B	5030B	Water	2-Nitropropane	47-171	70-130	30
8260B	5030B	Water	3-Chloro-1-propene	78-146	67-157	30
8260B	5030B	Water	4-Chlorotoluene	80-122	80-127	30
8260B	5030B	Water	4-Isopropyltoluene	62-132	64-138	30
8260B	5030B	Water	4-Methyl-2-pentanone (MIBK)	70-128	64-135	30
8260B	5030B	Water	Acetone	70-127	62-134	30
8260B	5030B	Water	Acetonitrile	70-146	70-130	30
8260B	5030B	Water	Acrolein	16-154	10-160	30
8260B	5030B	Water	Acrylonitrile	70-145	66-146	30
8260B	5030B	Water	Benzene	78-121	75-130	30
8260B	5030B	Water	Bromobenzene	80-121	80-123	30
8260B	5030B	Water	Bromochloromethane	80-125	80-126	30
8260B	5030B	Water	Bromodichloromethane	74-130	74-133	30
8260B	5030B	Water	Bromoform	63-149	62-150	30
8260B	5030B	Water	Bromomethane	36-158	30-165	30
8260B	5030B	Water	Carbon Disulfide	62-138	61-154	30
8260B	5030B	Water	Carbon Tetrachloride	66-146	66-157	30
8260B	5030B	Water	Chlorobenzene	79-113	78-117	30
8260B	5030B	Water	Chloroethane	62-125	61-136	30
8260B	5030B	Water	Chloroform	76-121	76-126	30
8260B	5030B	Water	Chloromethane	53-135	51-146	30
8260B	5030B	Water	Chloroprene	79-146	91-142	30
8260B	5030B	Water	cis-1,2-Dichloroethene	83-118	70-135	30
8260B	5030B	Water	cis-1,3-Dichloropropene	79-123	76-124	30
8260B	5030B	Water	cis-1,4-Dichloro-2-butene	58-166	57-169	30
8260B	5030B	Water	Dibromochloromethane	72-133	72-133	30
8260B	5030B	Water	Dibromomethane	76-123	76-124	30
8260B	5030B	Water	Dichlorodifluoromethane	45-171	45-189	30
8260B	5030B	Water	Dichlorofluoromethane (CFC 21)	80-123	70-130	30
8260B	5030B	Water	Diisopropyl Ether	68-127	38-158	30
8260B	5030B	Water	Ethyl Acetate	25-220	70-130	30
8260B	5030B	Water	Ethyl Ether	44-146	43-154	30
8260B	5030B	Water	Ethyl Methacrylate	72-138	70-130	30
8260B	5030B	Water	Ethylbenzene	84-122	83-130	30
8260B	5030B	Water	Hexachlorobutadiene	66-132	61-141	30
8260B	5030B	Water	Iodomethane	27-192	39-176	30

VOLATILE ORGANICS ANALYSES							
Method	**Prep Method**	**Matrix**	**Analyte**		**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8260B	5030B	Water	Isobutanol		59-168	51-159	30
8260B	5030B	Water	Isopropylbenzene		72-114	74-120	30
8260B	5030B	Water	m,p-Xylenes		83-125	84-132	30
8260B	5030B	Water	Methacrylonitrile		79-135	91-124	30
8260B	5030B	Water	Methyl Methacrylate		72-135	79-127	30
8260B	5030B	Water	Methyl tert-Butyl Ether		63-132	50-152	30
8260B	5030B	Water	Methylene Chloride		65-127	62-131	30
8260B	5030B	Water	n-Butylbenzene		51-138	51-146	30
8260B	5030B	Water	n-Hexane		56-155	58-156	30
8260B	5030B	Water	n-Propylbenzene		78-124	78-131	30
8260B	5030B	Water	Naphthalene		53-157	56-155	30
8260B	5030B	Water	o-Xylene		83-122	83-128	30
8260B	5030B	Water	Propionitrile		66-142	55-155	30
8260B	5030B	Water	sec-Butylbenzene		72-133	73-141	30
8260B	5030B	Water	Styrene		83-127	78-134	30
8260B	5030B	Water	tert-Amyl Methyl Ether		68-127	74-132	30
8260B	5030B	Water	tert-Butyl Alcohol		10-194	59-159	30
8260B	5030B	Water	tert-Butyl Ethyl Ether		68-121	78-124	30
8260B	5030B	Water	tert-Butylbenzene		76-126	79-132	30
8260B	5030B	Water	Tetrachloroethene (PCE)		72-124	68-134	30
8260B	5030B	Water	Tetrahydrofuran		10-186	26-151	30
8260B	5030B	Water	Toluene		76-122	72-132	30
8260B	5030B	Water	trans-1,2-Dichloroethene		81-121	82-129	30
8260B	5030B	Water	trans-1,3-Dichloropropene		70-117	68-118	30
8260B	5030B	Water	trans-1,4-Dichloro-2-butene		69-145	75-135	30
8260B	5030B	Water	Trichloroethene (TCE)		79-119	69-132	30
8260B	5030B	Water	Trichlorofluoromethane		66-126	69-135	30
8260B	5030B	Water	Trichlorotrifluoroethane		69-147	78-153	30
8260B	5030B	Water	Vinyl Acetate		27-217	63-142	30
8260B	5030B	Water	Vinyl Chloride		67-130	64-144	30
8260B	5030B	Water	1,2-Dichloroethane-D4 (Surr.)	76-115	NA	NA	NA
8260B	5030B	Water	4-Bromofluorobenzene (Surr.)	72-114	NA	NA	NA
8260B	5030B	Water	Dibromofluoromethane (Surr.)	80-119	NA	NA	NA
8260B	5030B	Water	Toluene-D8 (Surr.)	83-113	NA	NA	NA

STANDARD OPERATING PROCEDURE

POLYCYCLIC AROMATIC HYDROCARBONS BY GC/MS SELECTIVE ION MONITORING

EPA Method 8270C SIM

SOC-8270P
Revision 5
February 21, 2006

Approved By:

Supervisor	2/22/06 Date
QA Manager	2-22-06 Date
Laboratory Manager	2/23/06 Date

COLUMBIA ANALYTICAL SERVICES, INC.
1317 South 13th Avenue
Kelso, Washington 98626

Annual review of this SOP has been performed and the SOP still reflects current practice.
Initials: _____ Date: _____
Initials: _____ Date: _____
Initials: _____ Date: _____

DOCUMENT CONTROL

NUMBER: _____

Initials: _____ Date: _____

POLYCYCLIC AROMATIC HYDROCARBONS BY GC/MS SELECTIVE ION MONITORING
Method 8270C SIM

1. SCOPE AND APPLICATION

1.1. This procedure is used to determine the concentrations of Semi-Volatile Organic Compounds in water, soil, and tissue matrices using EPA Method 8270C SIM. This procedure may also be applicable to various miscellaneous waste samples. Table 1 lists compounds that may be determined by this method and the method reporting limits (MRLs) in water, soil, and tissue. Alkylated PAHs listed in Table 1A may also be determined using this procedure. Equivalent nomenclature for MRL includes Estimated Quantitation Limit (EQL) and Practical Quantitation Limit (PQL). Therefore, MRL=EQL=PQL. Table 1 lists Method Detection Limits (MDLs) that have been achieved, however, MDLs may change as MDL studies are performed,

1.2. The procedure is intended for samples containing trace-level amounts of target compounds. Samples containing high concentrations of target analyte will not be analyzed undiluted. Extracts may be screened using GC/FID to estimate the hydrocarbon content and concentrations of individual polynuclear aromatic hydrocarbons (PAHs). Samples containing PAHs in excess of five times the high calibration standard will be diluted prior to analysis. All MRLs will be adjusted in accordance with this dilution. Therefore, samples containing high levels of PAHs will not be analyzed to achieve the optimum MRLs for the analysis.

1.3. This procedure can be used to quantitate most neutral organic compounds that are soluble in methylene chloride and capable of being eluted without derivatization as sharp peaks from a gas chromatographic fused-silica capillary column coated with a slightly polar silicone phase. This procedure is optimized for the analysis of polynuclear aromatic hydrocarbons.

1.4. Other compounds than those listed in Tables 1 and 1A may be analyzed. However, analytes not summarized in Table 1 have not been validated with a method detection limit study. Therefore, the lab will not use this procedure to analyze for non-routine analytes unless a similar analyte has been validated with a MDL study. As a general rule, the MRL for these compounds will equal the MRL of a similar compound in the routine analyte list. Results will not be reported below this estimated MRL.

2. METHOD SUMMARY

2.1. This method provides Gas Chromatography/Mass Spectrometry (GC/MS) conditions for the detection of Semi-volatile Organic Compounds. Prior to the use of this method, water samples are extracted using either method 3520 (SOP EXT-3520) or 3535 (SOP EXT-3535) and soil/solid samples are extracted using 3541 (SOP EXT-3541).

2.2. All soil, tissue, and colored water extracts will be cleaned using method 3630 (silica gel cleanup, SOP SOC-3630) prior to analysis. In cases where project-specified analytes are not amenable to silica gel cleanup, gel permeation chromatography (SOP SOC-3640) will be used for cleanup prior to analysis.

2.3. A 5.0 µL aliquot of the extract is injected into the gas chromatograph (GC). The compounds are separated on a fused silica capillary column. Compounds of interest are detected by a mass selective detector in the selective ion mode. Identification of the analytes of interest is performed by comparing the retention times of the analytes with the respective retention times of an authentic standard, and by comparing mass spectra of analytes with mass spectra of reference materials. Quantitative analysis is performed by using the authentic standard to produce a response factor and calibration curve, and using the calibration data to determine the concentration of an analyte in the extract. The concentration in the sample is calculated using the sample weight or volume and the extract volume.

3. DEFINITIONS

3.1. **Analysis Sequence** - Samples are analyzed in a set referred to as an analysis sequence The sequence begins with injection of Decafluorotriphenylphosphine (DFTPP) acquired in full scan mode followed by initial calibration standard(s) acquired in SIM mode. Once calibrated, a CCV is evaluated and extracts can be run. The sequence ends after 12 hours based on the DFTPP acquisition time.

3.2. **Laboratory Control Sample (LCS)** - In the LCS analysis, predetermined quantities of standard solutions of all analytes are added to a blank matrix prior to sample extraction and analysis. The purpose of the LCS is to monitor analytical control for the sample batch. Percent recoveries are calculated for each of the analytes.

3.3. **Matrix Spike/Duplicate Matrix Spike Analysis** - In the matrix spike analysis, predetermined quantities of stock solutions of certain analytes are added to a sample matrix prior to sample extraction and analysis. The purpose of the matrix spike is to evaluate the effects of the sample matrix on the methods used for the analyses. Samples are split into duplicates, then spiked and analyzed. Percent recoveries are calculated for each of the controlled analytes detected. The relative percent difference between the samples is calculated and used to assess analytical precision.

3.4. **Standard Curve** - A standard curve is a plot of concentrations of a known analyte standard versus the instrument response to the analyte.

3.5. **Surrogate** - Surrogates are organic compounds which are similar to analytes of interest in chemical composition, extraction, and chromatography, but which are not normally found in environmental samples. The purpose of the surrogates is to evaluate the preparation and analysis of samples. These compounds are spiked into all blanks, standards, samples and matrix spikes prior to extraction. Percent recoveries are calculated for each surrogate.

3.6. **Method Blank** - The method blank is an artificial sample designed to monitor introduction of artifacts into the process. The method blank is carried through the entire analytical procedure.

3.7. **Continuing Calibration Verification Standard (CCV)** - A mid-level standard injected into the instrument at specified intervals and is used to verify the validity of the initial calibration.

3.8. **Second Source Verification Standard or Independent Verification Standard (SSV or ICV)** - A mid-level standard injected into the instrument after the calibration curve from a different source than the standards in the curve and is used to verify the validity of the initial calibration.

3.9. **Selective Ion Monitoring (SIM)** – Mass spectrometry technique where ions resulting from fragmentation are selectively monitored, therefore excluding other ions. The technique enhances sensitivity as compared to full scan analysis. Because the analysis results in significantly less mass spectral information, this gain in sensitivity is made at the expense of analyte selectivity. Therefore, the use of SIM results in significantly lower instrument detection limits, but increases the uncertainty associated with the analysis.

4. INTERFERENCES

4.1. Raw GC/MS data from all blanks, samples, and spikes must be evaluated for interferences. Determine if the source of interference is in the preparation of the samples. Corrective action should be taken to eliminate the interferences.

4.2. Contamination by carryover can occur whenever high-concentration and low-concentration samples are sequentially analyzed. To reduce carryover, the sample syringe must be rinsed out between samples with solvent. Whenever an unusually concentrated sample is encountered, it should be followed by the analysis of an instrument blank to check for carryover.

5. SAFETY

5.1. All appropriate safety precautions for handling solvents, reagents and samples must be taken when performing this procedure. This includes the use of personnel protective equipment, such as, safety glasses, lab coat and the correct gloves.

5.2. Chemicals, reagents and standards must be handled as described in the CAS safety policies, approved methods and in MSDSs where available. Refer to the CAS Environmental, Health and Safety Manual and the appropriate MSDS prior to beginning this method.

5.3. This method uses Methylene Chloride, a known human carcinogen. Viton brand gloves should be used while rinsing, pouring or transferring the solvent

6. SAMPLE COLLECTION, CONTAINERS, PRESERVATION, AND STORAGE

6.1. Certified clean containers should be purchased for sample collection. Alternatively, containers used to collect samples for the determination of semivolatile organic compounds should be soap and water washed followed by methanol (or isopropanol) rinsing. The sample containers should be of glass or teflon and have screw-top covers with teflon liners. In situations where teflon is not available, solvent-rinsed aluminum foil may be used as a liner. Highly acidic or basic samples may react with the aluminum foil, causing eventual contamination of the sample. Plastic containers or lids may not be used for the storage of samples due to the possibility of sample contamination from the phthalate esters and other hydrocarbons within the plastic.

6.2. Water and soil samples should be iced or refrigerated at 4 ± 2°C from time of collection until extraction. Tissue samples are stored frozen until extraction.

6.3. Water samples must be extracted within 7 days. Soil samples must be extracted within 14 days. Holding times for tissues are typically defined by project specifications, otherwise tissue samples may be held frozen up to one year before extraction. Extracts are stored at -10°C and must be analyzed within 40 days following extraction.

7. APPARATUS AND MATERIALS

7.1. Gas Chromatograph/Mass Spectrometer System

7.1.1. Gas Chromatograph - An analytical system complete with a temperature-programmable gas chromatograph suitable for splitless injection and all required accessories, including syringes, analytical columns, and gases. The capillary column should be directly coupled to the source. An injector capable of large volume injection must be attached to the GC system. Optic 2 and Optic 3 systems are recommended.

7.1.2. Column: 5% Dipenyl, 95% Dimethyl Polysiloxane - 30 m x 0.25 mm ID x 0.25 µm film thickness silicone-coated fused-silica capillary column or equivalent. Recommended: Restek XTI-5 with Integra-guard, catalog #12223-124.

7.1.3. Mass Spectrometer - Capable of scanning from 35 to 500 amu every 1 second or less, using 70 volts (nominal) electron energy in the electron impact ionization mode, and capable of operating in the SIM mode.

7.1.4. GC/MS Interface - Any GC-to-MS interface that gives acceptable calibration points for each compound of interest and achieves acceptable tuning performance criteria may be used.

7.1.5. Data System - A computer system must be interfaced to the mass spectrometer. The system must allow the continuous acquisition and storage on machine-readable media of all mass spectra obtained throughout the duration of the chromatographic program. The computer must have software that can search any GC/MS data file for ions of a specific mass and that can plot such ion abundances versus time or scan number. This type of plot is defined as an Extracted Ion Current Profile (EICP). Software must also be available that allows integrating the abundances in any EICP between specified time or scan-number limits.

7.1.6. Instrumental systems are identified as follows:

Instrument I.D.	Analytical System	Routine Matrix
MS11	6890/5973	Water/Soil
MS14	6890/5973	Tissue
MS06	5890/5972	Water/Soil (overflow capacity)*

* MDL studies are not maintained for overflow capacity instrumentation. Prior to any sample analyses on this instrument, MDL studies for each matrix and preparation method will be analyzed.

7.2. Appropriate analytical balance (0.0001 g), volumetric flasks, syringes, vials, and bottles for standards preparation.

8. STANDARDS, REAGENTS, AND CONSUMABLE MATERIALS

8.1. Solvents: Acetone, methylene chloride, methanol, and other appropriate solvents. Solvents must be of sufficient purity to permit usage without lessening the accuracy of the determination or introducing interferences.

8.2. Stock Standard Solutions

8.2.1. Commercially prepared stock standards are typically used when available at a concentration of 100 ug/ml or more. They must be A2LA or ISO9000 certified by the manufacturer. Standard concentrations can be verified by comparison versus an independently prepared standard. Alternatively, prepare stock standard solutions at a concentration of 1000 µg/ml by dissolving 0.0100 g of reference material in methylene chloride or other suitable solvent and diluting to volume in a 10mL volumetric flask. Larger volumes can be used at the convenience of the analyst. When compound purity is assayed to be 96% or greater, the weight can be used without correction to calculate the concentration of the stock standard.

8.2.2. Transfer stock standard solutions into amber Teflon-sealed crimp top autosampler vials. Store at -10°C and protect from light, or store as recommended by the manufacturer. Standards should be checked frequently for signs of degradation or evaporation, especially just prior to preparing calibration standards from them.

8.2.3. Unopened stock standards and neat materials have an expiration date equal to the manufacturer's recommendation. Neat material that does not have a manufacturer's recommended expiration date should be replaced after three years. Stock standard solutions received in sealed ampules with manufacture expiration dates in excess of 1 year have an expiration date of 1 year from the date of opening the sealed ampule.

8.2.4. For the alkylated PAH option, a PAH-ALKH SRM is used. This SRM is a petroleum crude oil which has been cleaned up using GPC and silica gel cleanup procedures. All of the homologs are present in the SRM.

8.3. Internal Standard Solutions - The internal standards are naphthalene-d_8, acenaphthene-d_{10}, phenanthrene-d_{10}, chrysene-d_{12}, and perylene-d_{12} (See Table 3 for corresponding compounds). The nominal concentration of the standard is 20 ng/µL. See Table 5 for standard preparation instructions. Each 1 ml of sample extract undergoing analysis should be spiked with 10 µL of the internal standard solution, resulting in a concentration of 0.2 ng/µL of each internal standard. Store at -10°C or less when not being used. When using premixed certified solutions, store according to the manufacturer's recommendations.

8.4. GC/MS Tuning Standard - A methylene chloride solution containing 50 ng/µL of decafluorotriphenylphosphine (DFTPP). The standard should also contain 50 ng/µL of pentachlorophenol and benzidine to verify injection port inertness and GC column performance. This injection is acquired in full scan mode and evaluated in accordance with the method specified criteria. Store at -10°C or less when not being used, or store according to the manufacturer's recommendations.

8.5. Calibration Standards

8.5.1. Prepare an intermediate surrogate standard by diluting 40uL of the 5000ppm stock to 2.0mL in DCM, resulting in 100ug/mL. An intermediate standard is prepared to combine the PAHs and surrogates into a standard that is used to prepare the calibration standards. See Table 5 for preparation instructions.

8.5.2. A minimum of six initial calibration standards should be prepared from stock solutions (note that a seven point calibration is recommended). One of the calibration standards should be at a concentration at or below the method reporting limit. The others should correspond to the range of concentrations found in samples, but should not exceed the working range of the GC/MS system. Each 1 ml aliquot of calibration standards should be spiked with 10 µL of the internal standard solution prior to analysis.

8.5.3. All calibration standards should be stored at -10°C or less and should be freshly prepared from stocks every 365 days, or sooner if check standards indicate a problem.

8.5.4. The following calibration standards are recommended: 0.002 ng/µl, 0.004 ng/µl, 0.008 ng/µl, 0.02 ng/µl, 0.1 ng/µl, 0.2 ng/µl, 0.4 ng/µl, 1.0 ng/µl, 1.6 ng/µl and 2.0 ng/µl. See Table 5 for preparation instructions.

8.5.5. The independent calibration verification (ICV) standard is prepared at a nominal 0.4 ng/µL concentration from stock solutions (see Table 5). The ICV is prepared at the time of initial calibration and can be stored at 4°C ± 2°C.

8.5.6. The daily calibration standard (CCV) is prepared at a nominal 0.4 ng/µL concentration from stock solutions (see Table 5). The CCV is prepared weekly and can be stored at 4°C ± 2°C.

8.6. QC Standards

8.6.1. Surrogates: Prepare a working spiking solution in methanol containing Fluorene-d10, Fluoranthene-d10, and Terphenyl-d14 at 100 ng/µL. This solution may be combined with the surrogate solution used to monitor analyses for 8270 full list. Aliquots of the solution are spiked into all extracted samples, blanks, and QC samples according to the extraction SOP used.

8.6.2. Matrix Spike Standards: Prepare a working spiking solution in methanol containing all analytes of interest ("full list spike"). All analytes are prepared at 25 ng/µl. Aliquots of the solution are spiked into the selected QC aliquots according to the extraction SOP used.

9. PREVENTIVE MAINTENANCE

9.1. All maintenance activities are recorded in a maintenance logbook kept for each instrument.

9.2. Carrier gas - Inline purifiers or scubbers should be in place for all sources of carrier gas. These are selected to remove water, oxygen, and hydrocarbons. Purifiers should be changed as recommended by the supplier.

9.3. Gas Chromatograph

9.3.1. Whenever GC maintenance is performed, care should be taken to minimize the introduction of air or oxygen into the column. Injection port maintenance includes changing the injection port liner, seal, washer, o-ring, septum, column ferrule, and autosampler syringe as needed. Liners and seals should be changed when recent sample analyses predict a problem with chomatographic performance. In some cases liners and seals may be cleaned and re-used.

9.3.2. Clipping off a small portion of the head of the column often improves chromatographic performance. When cutting off any portion of the column, make sure the cut is straight and "clean" (uniform, without fragmentation) by using the proper column cutting tool.

9.3.3. Over time, the column will exhibit poorer overall performance, as contaminated sample matrices are analyzed. The length of time for this to occur will depend on the samples analyzed. When a noticeable decrease in column performance is evident and other maintenance options do not result in improvement, the column should be replaced. This is especially true when evident in conjunction with calibration difficulties.

9.4. Mass Spectrometer

9.4.1. For units under service contract, certain maintenance is performed by instrument service staff, including pump oil changed, vacuuming boards, etc., as recommended by the manufacturer.

9.4.2. MS source cleaning should be performed as needed, depending on the performance of the unit. This may be done by the analyst or by instrument service staff.

9.4.3. Tune the MS as needed to result in consistent and acceptable performance while meeting the required ion abundance criteria.

10. RESPONSIBILITIES

10.1. It is the responsibility of the analyst to perform the analysis according to this SOP and to complete all documentation required for data review. Analysis and interpretation of the results are performed by personnel in the laboratory who have demonstrated the ability to generate acceptable results utilizing this SOP. This demonstration is in accordance with the training program of the laboratory. Final review and sign-off of the data is performed by the department supervisor/manager or designee.

10.2. It is the responsibility of the department supervisor/manager to document analyst training. Documenting method proficiency, as described in 8270C, is also the responsibility of the department supervisor/manager.

11. PROCEDURE

11.1. Sample Preparation

11.1.1. Water, soil, tissue and waste samples are prepared using the appropriate extraction and cleanup methods (refer to SOPs) and screened by GC/FID (see SOP SOC-SCR).

11.1.2. An appropriate cleanup procedure may be performed depending on the sample matrix and target analytes. Perform cleanups on all soil, tissue, and colored water extracts using method 3630 (silica gel cleanup, SOP SOC-3630) prior to analysis. In cases where project-specified analytes are not amenable to silica gel cleanup, perform method 3640 GPC cleanup (SOP SOC-3640) prior to analysis.

11.1.3. Following sample preparation, sample extracts are then transferred to the extract cold storage unit. Extracts must be analyzed within 40 days of extraction.

11.2. The recommended GC/MS operating conditions:

Ion dwell time:	10 – 50 msec per ion
Initial temperature:	40°C, hold for 1 minutes
Temperature program:	40-140°C at 30°C/min hold for 0 minutes
Temperature program:	140-270°C at 10°C/min hold for 4 minutes
Final temperature:	270-320°C at 20°/min, hold for 1.10 minutes
Injector temperature:	320°C
Detector interface temp:	300°C
Injector:	splitless, electronic pressure control with pulse
Sample volume:	5.0 µL
Carrier gas:	helium at 1.2ml/min (constant flow)

11.3. Selected Ion Acquisition

11.3.1. Determine the ions to be monitored for the compounds of interest. Refer to Table 2 for characteristic ions. At a minimum, 2 ions should be monitored for each compound, and 3 monitored for compounds with more complex fragmentation patterns. Set the SIM windows in order to monitor the correct ions at the correct time, based on chromatographic elution of the compounds. This can be setup by analyzing a standard using a full scan analysis and using the GC conditions of the SIM analysis. This analysis will give retention time and spectral information for determining the location of start times for the SIM groups or windows. This is often referred to as a "locator" analysis.

11.3.2. Select the dwell times to be used for each group of ions to be monitored. Dwell times should be selected in order to provide a sufficient number of measurements across the chromatographic peak to accurately define the peak shape. Too few measurements across the peak will result in poor definition of the peak and subsequently result in poor accuracy and precision of results. Too many measurements across the peak may result in inconsistent detector behavior over the calibration range. Significant differences in dwell times may also affect sensitivity. Typical dwell times are listed in section 11.2.

11.4. Initial Calibration

Refer to the SOP for *Calibration of Instruments for Organics Chromatographic Analysis* (SOC-CAL) for general calibration procedures. The calibration procedure and options chosen must follow SOP SOC-CAL and this SOP. In general, the calibration procedure is as follows:

11.4.1. Prior to calibration, analyze the GC/MS tuning standard using instrument conditions used for calibration. Obtain the spectrum for evaluation using one of the following options:

- Three scans (the peak apex scan and the scans immediately preceding and following the apex) are acquired and averaged. Background subtraction is required, and must be accomplished using a single scan acquired no more than 20 scans prior to elution of DFTPP. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the tune peak or part of any other peak eluting close to the tune peak.
- Use one scan at the apex of the peak. Background subtraction is required, and must be accomplished using a single scan acquired no more than 20 scans prior to the elution of DFTPP. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the tune peak or part of any other peak eluting close to the tune peak.
- Use one scan either directly preceding or following the apex of the peak. Background subtraction is required, and must be accomplished using a single scan acquired no more than 20 scans prior to the elution of DFTPP. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the tune peak or part of any other peak eluting close to the tune peak.
- Use the average across the entire peak up to a total of 5 scans. Peak integration must be consistent with standard operating procedure. If the peak is wider than 5 scans, the tune will consist of the peak apex scan and the two scans immediately preceding and following the apex. Background subtraction is required, and must be accomplished using a single scan acquired no more than 20 scans prior to the elution of DFTPP. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the tune peak or part of any other peak eluting close to the tune peak.

11.4.2. Evaluate the spectrum obtained for DFTPP against the tuning criteria in Table 4 or 4A (dependent upon instrumentation). The GC/MS must meet the DFTPP ion abundance criteria prior to further analyses. Pentachlorophenol must be present at the normal response, with no visible peak tailing, as demonstrated by the peak tailing factors.

The acceptance criteria for the peak tailing factor for pentachlorophenol is <5.0. If excessive tailing or poor chromatography is noted, the injection port may require cleaning. It may also be necessary to remove the first 15-30 cm of the GC column. If hardware tuning criteria cannot be met, the source may need cleaning, filaments replaced or other maintenance.

11.4.3. The internal standards should permit most of the components of interest in the chromatogram to have retention times of 0.80-1.20 relative to one of the internal standards. Refer to Table 3 for internal standards and corresponding analytes assigned for quantitation. Use the base peak ion from the specific internal standard as the primary ion for quantitation (See Table 2). If interferences are noted, use the next most intense ion as the quantitaion ion (i.e. for acenaphthene-d_{10}, use 162 m/z for quantitation).

11.4.4. Analyze 5.0 µL of each calibration standard (containing internal standards) and tabulate the area of the primary characteristic ion against concentration for each compound (as indicated in Table 2). Calculate response factors (RFs) for each compound relative to one of the internal standards as follows:

$$RF = (A_x C_{is})/(A_{is} C_x)$$

where:

A_x = Area of the characteristic ion for compound being measured.
A_{is} = Area of the characteristic ion for specific internal standard.
C_{is} = Concentration of the specific internal standard (ng/µL).
C_x = Concentration of the compound being measured (ng/µL).

11.4.5. A system performance check must be performed to ensure that minimum average RFs are met before the calibration curve is used. The minimum acceptable average RF for these compounds is 0.10. If they are not acceptable, perform GC maintenance (see section 9).

11.4.6. The percent relative standard deviation (%RSD) should be less than 15% for each compound. The relative retention times of each compound in each calibration run should agree within 0.06 relative retention time units.

$$\%RSD = \frac{SD}{RF} \times 100$$

where:

RSD = relative standard deviation.
RF = mean of 5 initial RFs for a compound.
SD = standard deviation of average RFs for a compound.

$$SD = \sqrt{\sum_{i=1}^{N} \frac{(RF_i - RF)^2}{N - 1}}$$

where:

RF_i	=	RF for each of the 5 calibration levels
N	=	Number of RF values (i.e., 5)

11.4.7. Linearity - If the % RSD of any compound is 15% or less, then the relative response factor is assumed to be constant over the calibration range, and the average relative response factor may be used for quantitation.

11.4.8. In those instances where the %RSD for one or more analytes exceeds 15%, the initial calibration may still be acceptable if the following conditions are met:

11.4.8.1. The mean of the RSD values for all analytes in the calibration is $\leq$ 15% and the %RSD does not exceed 30% for any compound.

11.4.8.2. The mean RSD criteria applies to all target analytes in the calibration standards, regardless of whether or not they are of interest for a specific project.

11.4.8.3. The data user must be supplied with a list of compounds which exceed 15% RSD and the result of the mean RSD calculation. For tier III and higher deliverables, an initial calibration summary may be used.

11.4.9. If all of the conditions in Section 11.4.8 are met, then the average response factor may be used to determine sample concentrations as described in Section 11.4.4.

11.4.10. When analysis for alkylated PAHs is to be performed, follow the calibration procedure given in Appendix A.

11.4.11. If the RSD of any target analyte is greater than 15%, refer to SOP SOC-CAL, section 11.2.3 and sections 7.5.2 and 7.5.3 in Method 8000B for additional calibration options. One of the options must be applied to initial calibration in this situation, or a new initial calibration must be performed.

11.4.12. Following initial calibration, analyze an ICV standard. The ICV solution must contain all analytes in the calibration standards. Calculate the concentration using the typical procedure used for quantitation. Calculate the percent difference (%D) from the ICV true value. For each compound of interest, the calculated value must be ± 20% of the true value for the initial calibration to be valid.

11.5. Continuing Calibration

11.5.1. Following an acceptable tune, a calibration standard, or standards, at mid-concentration containing all PAH analytes, and all required surrogates, must be analyzed every 12 hours during analysis.

11.5.2. For each daily calibration, a system performance check must be made. For each compound in the daily calibration standard, a minimum response factor of 0.10 must be obtained. This is the same check that is applied during the initial calibration. If the minimum response factors are not met, the system must be evaluated, and corrective action must be taken before sample analysis begins. Some possible problems are standard mixture degradation, injection port inlet contamination, contamination at the front end of the analytical column, and active sites in the column or chromatographic system.

11.5.3. If the percent drift for each compound of interest is less than or equal to 20%, the initial calibration is assumed to be valid. If the criterion is not met (> 20% drift) for any one compound, corrective action must be taken. Problems similar to those listed in 11.5.2 could affect this criterion. If no source of the problem can be determined after corrective action has been taken, a new initial calibration must be generated. This criterion must be met before sample analysis begins.

Calculate the percent drift using:

$$\%\ Drift = \frac{C_I - C_c}{C_I} \times 100$$

where:

C_I = Compound standard concentration.
C_c = Measured concentration using selected quantitation method.

11.5.4. When analysis for alkylated PAHs is to be performed, follow the calibration procedure given in Appendix A.

11.5.5. The internal standard responses and retention times in the calibration check standard must be evaluated immediately after or during data acquisition. If the retention time for any internal standard changes by more than 30 seconds from that in the midpoint standard of the most recent initial calibration sequence, the chromatographic system must be inspected for malfunctions and corrective action identified, as required. If the EICP area for any of the internal standards changes by a factor of two (50% to 200%) from that in the midpoint standard of the most recent initial calibration sequence, the chromatographic system must be inspected for malfunctions and corrective action identified, as appropriate.

When corrective action is taken, reanalysis of samples analyzed while the system was malfunctioning is required. Update the reference spectra and retention times in the quantitation database for the instrument method or ID file. The initial calibration average RF or calibration curve is then used in the quantitation of subsequent analyses.

11.5.6. A blank (method blank, GPC blank, or solvent blank) should be analyzed after the CCV to prove the system is free of contaminants. If contaminants are found in a method blank or GPC blank, then a solvent blank should be ran to help isolate the source of contamination.

11.6. GC/MS Analysis

11.6.1. Evaluate FID screen and make proper dilution (See SOP SOC-SCR).

11.6.2. Spike the 1 ml extract obtained from sample preparation with 10 µL of the internal standard solution just prior to analysis. Use the same operating conditions as were used for initial calibration.

11.6.3. If the response for any quantitation ion exceeds the initial calibration curve range of the GC/MS system, extract dilution must take place. Additional internal standard must be added to the diluted extract to maintain the required 0.2ng/µL of each internal standard in the extracted volume. The diluted extract must be reanalyzed.

11.6.4. Store the extracts at -10°C or less, protected from light in vials equipped with unpierced Teflon lined septa. Archive extract in freezer for 3 months, or longer if required by client, after analysis in the instrument/date specific storage boxes.

12. QA/QC REQUIREMENTS

12.1. In addition to instrument criteria for calibration, the ability of each analyst/instrument to generate acceptable accuracy and precision must be documented prior to sample analysis (IPR study). This must be validated before analysis of samples begin, or whenever significant changes to the procedures have been made. To do this, four deionized water samples are spiked with each target analyte, extracted, and analyzed. Refer to Method 8270C Section 8.3 for this requirement and acceptance criteria.

12.2. Method Detection Limits

12.2.1. A method detection limit (MDL) study must be undertaken before analysis of samples can begin. To establish detection limits that are precise and accurate, the analyst must perform the following procedure. Spike a minimum of seven blank replicates with a MDL spiking solution (at a level below the MRL) for each target analyte, extract, and analyze.

12.2.2. The MDL studies should be done for each matrix, prep method, and instrument. Refer to the CAS SOP *for The Determination of Method Detection Limits and Limits of Detection (ADM-MDL).*

12.2.3. Calculate the average concentration found (x) in the *sample concentration*, and the standard deviation of the concentrations for each analyte. Calculate the MDL for each analyte using the correct T value for the number of replicates. The MDL study should be done annually.

12.3. Ongoing QC Samples required are described in the CAS-Kelso Quality Assurance Manual and in the SOP for *Sample Batches*. In general, these include:

12.3.1. Method blank - A method blank is extracted and analyzed with every batch of 20 or fewer samples to demonstrate that there are no method interferences. The method blank must demonstrate that interferences from the analytical and preparation steps minimized. No target analytes should be detected above the MRL in the method blank. For some project specific needs, exceptions may be noted and method blank results above the MRL may be reported for common lab contaminants.

12.3.2. A lab control sample (LCS) must be extracted and analyzed with every batch of 20 or fewer samples. The LCS is prepared by spiking a blank with the matrix spike solution, and going through the entire extraction and analysis. Calculate percent recovery (%R) as follows:

$$\%R = X/TV \times 100$$

Where X = Concentration of the analyte recovered
TV = True value of amount spiked

Acceptance criteria for lab control samples are listed in Attachment A. If the lab control sample (LCS) fails acceptance limits for any of the compounds, the analyst must evaluate the system and calibration. Corrective action must be taken.

12.3.3. A matrix spike/duplicate matrix spike (MS/DMS) must be extracted and analyzed with every batch of 20 or fewer samples. The MS is prepared by spiking a sample aliquot with the matrix spike solution, and going through the entire extraction and analysis. Calculate percent recovery (%R) as follows:

$$\%R = \frac{X - X1}{TV} \times 100$$

Where X = Concentration of the analyte recovered
X1 = Concentration of unspiked analyte
TV = True value of amount spiked

Calculate Relative Percent Difference (RPD) as:

$$RPD = \frac{R1 - R2}{(R1 + R2)/2} \times 100$$

Where R1 = % recovery of the MS
R2 = % recovery of the DMS

The acceptance limits for the MS/DMS are given in Attachment A. If the MS/DMS recovery is out of acceptance limits for reasons other than matrix effects, corrective action must be taken.

12.3.4. The acceptance limits for the surrogates are given in Attachment A. If any surrogate recovery is outside acceptance criteria, the sample data must be closely evaluated for possible matrix interferences. If none are present, then corrective action must be taken. The sample should be re-analyzed if instrument factors (calibration, injection port) are suspected. If not, re-extraction and re-analysis is required, except in cases of high recovery and no positive hits in the sample for the analyte class represented by the particular surrogate.

12.3.5. The acceptance criteria listed in Attachment A are current criteria, but are subject to change as control limits are updated.

12.3.6. Additional QA/QC measures include control charting of QC sample results.

12.3.7. Corrective action – When a data quality objective is not met, the initial corrective action will include a review of the raw data for potential calculation and/or integration errors. If this review does not correct the problem, the following corrective actions will be performed.

12.3.7.1. Method Blank – No target analyte should be detected in a method blank at or above the method reporting limit (1/2 the MRL for DoD projects). If target analytes are detected in the method blank, the sample data must be reviewed for possible laboratory contribution. Detections of target analytes greater than the MRL require a Nonconformity and Corrective Action Report (NCAR). A decision to reextract the associated samples will depend on the level of the contamination, data quality implications, and the intended use of the data. At a minimum, all positive detections in the associated samples that are not more than 20X the concentration in the blank will be qualified with a "B". Also, as part of the corrective action, the problem will be discussed with the appropriate sample prep personnel in an effort to identify the contamination source.

12.3.7.2.Laboratory Control Sample – The analysis should include a full list LCS spike. All target analytes will be evaluated. The following cases require corrective action:

- If any analytes do not meet acceptance criteria, the analytical batch should be considered out of control for that analyte. Corrective action may include reinjection to verify the result. If the result is confirmed, a NCAR will be filed and the problem investigated to determine that cause. A decision to reextract the associated samples will depend on the data quality implications and the intended use of the data, and should involve the Project Chemist and client. If reextraction is not feasible, all reported results for that analyte will be qualified and the implications will be discussed in the case narrative.
- In cases where a result is outside the upper control criterion, corrective action is only required if that analyte was also detected in field samples. The associated samples with positive results should be reextracted. In cases where a result is outside the lower control criterion, the associated samples should be reextracted. If reextraction is not feasible, all reported results for that analyte will be qualified and the data quality implications will be discussed in the case narrative. Hoever, investigation into the cause of the failure should still be performed.

12.3.7.3.Matrix Spike and Duplicate Matrix Spike Samples – If a recovery is outside of control criteria, review the consistency between the two analyses. If the result is supported between the two analyses, the outlier can be attributed to matrix inteference. Do not reanalyze the extract. If the results do not support each other, reanalyze the extracts to verify the results. If the results confirm, review the LCS recovery and take corrective action accordingly. If the LCS recovery is acceptable, flag the matrix spike data and discuss potential data quality implications in the case narrative.

12.3.7.4.Relative Percent Difference – For MS/DMS or LCS/DLCS, no corrective action is required based on RPD data alone. However, the data should be reviewed for information that will help determine if the RPD problem is the result of a sample specific issue (e.g., the DMS was concentrated to dryness), or if the problem is representative of the entire analytical batch. When the problem is apparently universal to the batch, a NCAR will be filed and the batch will be reextracted. If results of the reextraction confirm the original analyses of the field samples, the original data is reported and the RPD problems are discussed in the case narrative. If results of the reextraction confirm a problem in the original data, only the reextracted data is reported.

12.3.7.5. Surrogates – Corrective action includes reinjection to verify the result. If the result is confirmed, a NCAR will be filed and the sample will be reextracted. If the reextraction confirms the original results are biased due to matrix interferences, report the original data. If reextraction is not feasible, the surrogate will be qualified and the data quality implications will be discussed in the case narrative.

13. DATA REDUCTION, REVIEW, AND REPORTING

13.1. Qualitative Analysis - The qualitative identification of compounds determined by this procedure is based on retention time, and comparison of the sample mass spectrum with characteristic ions in a reference mass spectrum. The reference mass spectrum must be generated by the laboratory using the instrument and conditions used for the sample analysis. The characteristic ions from the reference mass spectrum are defined to be the ions monitored in the SIM mode and typically are the two or three ions of greatest relative intensity. Compounds are identified as present when the criteria below are met.

13.1.1. The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other. Selection of a peak by a data system target compound search routine where the search is based on the presence of a target chromatographic peak containing ions specific for the target compound at a compound-specific retention time will be accepted as meeting this criterion.

13.1.2. The RRT of the sample component is within ± 0.06 RRT units of the RRT of the standard component.

13.1.3. The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum.

13.1.4. Structural isomers that produce very similar mass spectra should be identified as individual isomers if they have sufficiently different GC retention times. Sufficient GC resolution is achieved if the height of the valley between two isomer peaks is <25% of the sum of the 2 peak heights. Otherwise, structural isomers are identified as isomeric pairs.

13.1.5. Identification is hampered when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When the gas chromatographic peaks appear to represent more than one component (i.e., a broadened peak with shoulder(s) or a valley between two or more maxima), appropriate selection of analyte spectra and background spectra is important. Examination of extracted ion current profiles of appropriate ions can aid in the selection of spectra, and in qualitative identification. When analytes coelute, the identification criteria can be met, but each analyte spectrum will contain extraneous ions contributed by the coeluting compound.

13.1.6. Evaluate internal standard areas in each sample. If the area in the sample is less than 50% or greater than 200% the area of in the CCV, corrective action must be taken. Depending on the analysis, this corrective action may include reinjection or dilution of the extract followed by reinjection.

13.2. Tentatively identified compounds (TICs) cannot be reported using this method.

13.3. Quantitation and Calculations

13.3.1. The GC/MS data stations, in current use, all use the H-P RTE Integrator to generate the raw data used to calculate the standards $\overline{RF_x}$ values, the sample amounts, and the spike values. The software does three passes through each data file. The first two identify and integrate each internal standard and surrogate. The third pass uses the time-drift information from the first two passes to search for all method analytes in the proper retention times and with the proper characteristic quantitation ions. When $\overline{RF_x}$ is used, calculate the extract concentration as follows:

$$C_{ex} = \frac{(Resp_x)(Amt_{ISTD})}{(Resp_{ISTD})(\overline{RF_x})}$$

Where: C_{ex} = the concentration in the sample extract (ppm);
$Resp_x$ = the peak area of the analytes of interest;
$Resp_{ISTD}$ = the peak area of the associated internal standard;
Amt_{ISTD} = the amount, in ppm, of internal standard added
$\overline{RF_x}$ = the average response from the initial calibration.

13.3.2. The concentration of analytes in the original sample is computed using the following equations:

Aqueous Samples: $Concentration\ (\mu g / L) = \frac{(Cex)\ (Vf)\ (D)}{(Vs)}$

Nonaqueous Samples: $Concentration\ (ug/Kg) = \frac{(Cex)\ (Vf)\ (D)}{(W)}$

Where	Cex	=	Concentration in extract in ng/mL
	Vf	=	Final volume of extract in mL
	D	=	Dilution factor
	Vs	=	Volume of sample extracted, liters
	W	=	Weight of sample extracted in grams.

13.4. Data Review

Following primary data interpretation and calculations, all data is reviewed by a secondary analyst. Following generation of the report, the report is also reviewed. Refer to the SOP for *Laboratory Data Review Process* for details.

13.5. Reporting

Reports are generated in the CAS LIMS by compiling the SMO login, sample prep database, instrument, date, and client-specified report requirements (when specified). This compilation is then transferred to a file which the Stealth reporting system uses to generate a report. The forms generated may be CAS standard reports, DOD, or client-specific reports. The compiled data from LIMS is also used to create EDDs.

14. CONTINGENCIES FOR HANDLING OUT-OF- CONTROL OR UNACCEPTABLE DATA

Corrective action measures applicable to specific analysis steps are discussed in the applicable section of this (and other applicable) SOP(s). Also, refer to the SOP for *Nonconformity and Corrective Action* (ADM-NCAR) for correct procedures for identifying and documenting such data. Procedures for applying data qualifiers are described in the SOP for *Report Generation* (ADM-RG) or in project-specific requirements.

15. METHOD PERFORMANCE

15.1. This method was validated through single laboratory studies of accuracy and precision. Refer to the reference method for additional method performance data available.

15.2. The method detection limit (MDL) is established using the procedure described in the SOP for *the Determination of Method Detection Limits* (ADM-MDL). Method Reporting Limits are established for this method based on MDL studies and as specified in the CAS Quality Assurance Manual.

16. POLLUTION PREVENTION

It is the laboratory's practice to minimize the amount of solvents and reagents used to perform this method wherever technically sound, feasibly possible, and within method requirements. Standards are prepared in volumes consistent with laboratory use in order to minimize the volume of expired standards to be disposed of. The threat to the environment from solvents and/or reagents used in this method may be minimized when recycled or disposed of properly.

17. WASTE MANAGEMENT

17.1. The laboratory will comply with all Federal, State and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions as specified in the CAS EH&S Manual.

17.2. This method uses Methylene Chloride and any waste generated from this solvent must be placed in the collection cans in the lab. The solvent will then be added to the hazardous waste storage area and recycled off site.

18. TRAINING OUTLINE

18.1. The following items provide guidelines for training analysts.

18.1.1. Review applicable literature (method references, etc.) and this SOP. Review the MSDS for all chemicals used in the analysis.

18.1.2. Observe the procedure as performed by an experienced analyst at least three times.

18.1.3. Assist in the procedure under the guidance of an experienced analyst for at least one month, preferably three months. During this training period, the analyst is expected to progress from a role of assisting to a role of performing the procedure with minimal oversight.

18.2. Following this training period, the analyst is expected to complete an Initial Precision and Recovery (IPR) study as described in Section 12. Documentation of the IPR study should be forwarded to the analyst's training file.

19. REFERENCES

19.1. *Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry*, Method 8270C, EPA Test Methods for Evaluating Solid Waste, SW-846, Final Update III, December 1996.

19.2. Exxon Valdez Spill Assessment Procedure EV89-2, Revision 2.0, June 1989.

19.3. Standard Methods Manual for Environmental Sampling and Analysis in San Francisco Bay, US Army Corps of Engineers, November 1992 Draft, Volume 2 of 3.

19.4. CAS SOPS

19.4.1. Continuous Liquid-Liquid Extraction, EXT-3520

19.4.2. Solid Phase Extraction, EXT-3535

19.4.3. Automated Soxhlet Extraction, EXT-3541

19.4.4. Silica Gel Cleanup, SOC-3630

19.4.5. Gel Permeation Chromatography, SOC-3640

TABLE 1

Target Analytes, Method Reporting Limits, and Method Detection Limits

	WATER µg/L (ppb)		SOIL µg/Kg Dry Weight (ppb)		Tissue µg/Kg Wet Weight (ppb)	
Analytes	**MRL**	**MDL**	**MRL**	**MDL**	**MRL**	**MDL**
Naphthalene	0.02	0.004	5	0.2	5	5
2-Methylnaphthalene	0.02	0.003	5	0.09	5	5
1-Methylnaphthalene	0.02	0.003	5	0.2	5	5
Biphenyl	0.02	0.004	5	0.1	5	5
2,6-Dimethylnaphthalene	0.02	0.003	5	0.1	5	5
Acenaphthylene	0.02	0.002	5	0.08	5	4
Acenaphthene	0.02	0.002	5	0.1	5	4
Dibenzofuran	0.02	0.008	5	0.3	5	4
2,3,5-Trimethylnaphthalene	0.02	0.002	5	0.09	5	4
Fluorene	0.02	0.003	5	0.2	5	3
Dibenzothiophene	0.02	0.02	5	0.6	5	5
Phenanthrene	0.02	0.004	5	0.3	5	2
Anthracene	0.02	0.002	5	0.2	5	2
1-Methylphenanthrene	0.02	0.002	5	0.08	5	2
Fluoranthene	0.02	0.003	5	0.2	5	2
Pyrene	0.02	0.003	5	0.2	5	2
Benz(a)anthracene	0.02	0.003	5	0.2	5	2
Chrysene	0.02	0.002	5	0.2	5	3
Benzo(b)fluoranthene	0.02	0.002	5	0.2	5	3
Benzo(k)fluoranthene	0.02	0.002	5	0.2	5	3
Benzo(e)pyrene	0.02	0.002	5	0.2	5	2
Benzo(a)pyrene	0.02	0.002	5	0.1	5	3
Perylene	0.02	0.002	5	0.2	5	3
Indeno(1,2,3-cd)pyrene	0.02	0.003	5	0.2	5	2
Dibenz(a,h)anthracene	0.02	0.002	5	0.2	5	3
Benzo(g,h,i)perylene	0.02	0.004	5	0.2	5	2

TABLE 1A
Additional Analytes
Target Analytes and Method Reporting Limits

	WATER µg/L (ppb)		SOIL µg/Kg Dry Weight (ppb)		Tissue µg/Kg Wet Weight (ppb)	
Analytes	**MRL**		**MRL**		**MRL**	
C2-Naphthalenes	0.02		5		5	
C3-Naphthalenes	0.02		5		5	
C4-Naphthalenes	0.02		5		5	
C1-Fluorenes	0.02		5		5	
C2-Fluorenes	0.02		5		5	
C3-Fluorenes	0.02		5		5	
C1-Dibenzothiophenes	0.02		5		5	
C2-Dibenzothiophenes	0.02		5		5	
C3-Dibenzothiophenes	0.02		5		5	
C1-Phenanthrenes/Anthracenes	0.02		5		5	
C2-Phenanthrenes/Anthracenes	0.02		5		5	
C3-Phenanthrenes/Anthracenes	0.02		5		5	
C4-Phenanthrenes/Anthracenes	0.02		5		5	
C1-Fluoranthenes/Pyrenes	0.02		5		5	
C1-Chrysenes	0.02		5		5	
C2-Chrysenes	0.02		5		5	
C3-Chrysenes	0.02		5		5	
C4-Chrysenes	0.02		5		5	

TABLE 2
TARGET COMPOUNDS AND CORRESPONDING PRIMARY AND SECONDARY IONS

Compound	Approximate Retention Time (min)	Primary Ion	Secondary Ion
Naphthalene-d 8 (I.S.)	5.86	136	68
Naphthalene	5.87	128	127
2-Methylnaphthalene	6.62	141	142
1-Methyl naphthalene	6.74	141	142
Biphenyl	7.18	154	153
2,6-Dimethylnaphthalene	7.37	156	155
Acenaphthlene-d 10 (I.S.)	7.95	164	162
Acenaphthylene	7.75	152	153
Acenaphthlene	8.00	154	153
Dibenzofuran	8.22	168	139
2,3,5-Trimethylnaphthalene	8.53	170	155
Fluorene	8.70	166	165
Phenanthrene-d 10 (I.S.)	10.10	188	94
Dibenzothiophene	9.95	184	152
Phenanthrene	10.13	178	179
Anthracene	10.20	178	176
1-Methylphenanthrene	11.10	192	150
Fluoranthene	11.99	202	203
Chrysene-d 12 (I.S.)	14.51	240	236
Pyrene	12.35	202	203
Benz (a) anthracene	14.48	228	226
Chrysene	14.57	228	226
Perylene-d 12 (I.S.)	18.48	264	260
Benzo(b)fluoranthene	17.50	252	126
Benzo(k)fluoranthene	17.56	252	126
Benzo(e)pyrene	18.22	252	126
Benzo(a)pyrene	18.33	252	126
Perylene	18.52	252	126
Indeno (1,2,3-cd) pyrene	20.42	276	277
Dibenz (a, h) anthracene	20.47	278	276
Benzo(g,h,i)perylene	20.86	276	277
Fluorene-d10 (surr.)	8.67	176	175
Fluoranthene-d10 (surr.)	11.97	212	213
Terphenyl-d 14 (surr.)	12.63	244	122

TABLE 3

SEMIVOLATILE INTERNAL STANDARDS WITH CORRESPONDING ANALYTES ASSIGNED FOR QUANTITATION

Naphthalene-d8	**Acenaphthene-d10**	**Phenanthrene-d10**
Naphthalene	Acenaphthene	Dibenzothiophene
2-Methylnaphthalene	Acenaphthylene	Phenanthrene
1-Methylnaphthalene	Dibenzofuran	Anthracene
Biphenyl	2,3,5-Trimethylnaphthalene	1-Methylphenanthrene
2,6-Dimethylnaphthalene	Fluorene	Fluoranthene
	Fluorene-d_{10} (surr.)	Fluoranthene-d_{10} (surr.)

Chrysene-d12	**Perylene-d12**
Pyrene	Benzo(b)fluoranthene
Benzo(a) anthracene	Benzo(k)fluoranthene
Chrysene	Benzo(e)pyrene
Terphenyl-d_{14} (surr.)	Benzo(a)pyrene
	Perylene
	Indeno (1,2,3-ccd)pyrene
	Dibenz(a,h)anthracene
	Benzo(g,h,i)perylene

TABLE 4
DFTPP KEY IONS AND ION ABUNDANCE CRITERIA
for **5973** GC/MS systems

Mass	Ion Abundance Criteria
51	10-80% of mass 198
68	0-2% of mass 69
70	0-2% of mass 69
127	10-80% of 198
197	0-2% of 198
198	30-100% of 442 (alternate base)
199	5-9% of 198
275	10-60% of 198
365	1-50% of 442
441	0.01-100% of 443
442	30-100% of 198 (alternate base)
443	15-24% of 442

TABLE 4A
DFTPP KEY IONS AND ION ABUNDANCE CRITERIA
for **5972** GC/MS systems

Mass	Ion Abundance Criteria
51	30-80% of mass 198
68	0-2% of mass 69
69	Present
70	0-2% of mass 69
127	25-75% of 198
197	0-1% of 198
198	100% Relative abundance, Base Peak
199	5-9% of 198
275	>0.75% of 198
365	1-50% of 442
441	0.01-99.99% of 443
442	40-110% of 198
443	15-24% of 442

TABLE 5

STANDARD PREPARATION

Internal Standard Working Standard

Parent Solution	Initial Concentration	Aliquot	Final Volume	Final Concentration	Solvent
AccuStandard Z-014J	4000 ug/mL	50 uL	10 mL	20 ug/mL	DCM

Initial Calibration Intermediate Standard

Parent Solution	Initial Concentration	Aliquot	Final Volume	Final Concentration	Solvent
Absolute PAH Mix	100 ug/mL	80 uL	2 mL	4 ug/mL	DCM
PAH Surr. Intermediate	100 ug/mL	80 uL	↓	4 ug/mL	↓

Initial Calibration Standards

Initial Cal. Intermediate Std. 4ug/mL	Internal Std Working Std 20ug/mL	Final Volume	Solvent	Final Concentration PAH	Final Concentration Int Std
5 uL	100 uL	10 mL	DCM	0.002 ug/mL	0.2 ug/mL
5 uL	50 uL	5 mL		0.004 ug/mL	
4 uL	20 uL	2 mL		0.008 ug/mL	
5 uL	10 uL	1 mL		0.02 ug/mL	
25 uL	↓	↓		0.1 ug/mL	
50 uL				0.2 ug/mL	
100 uL				0.4 ug/mL	
250 uL				1.0 ug/mL	
400 uL				1.6 ug/mL	
500uL			↓	2.0 ug/mL	↓

Independent Calibration Verification (ICV) Standard

Parent Solution	Initial Concentration	Aliquot	Final Volume	Final Concentration	Solvent
Cerilliant PAH Mix CSQ-4049	100 ug/mL	20 uL	5 mL	0.4 ug/mL	DCM
PAH Surr. Intermediate	100 ug/mL	20 uL		0.4 ug/mL	
Int. Std Working Std	20 ug/mL	50 uL	↓	0.2 ug/mL	↓

APPENDIX A

Procedure for quantifying alkylated homologs of polynuclear aromatic hydrocarbons

1. Analyze a PAH ICAL using the A_PAHK method. These acquisition parameters will acquire data for the parent PAHs as well as the homologs.

Process the data and update the calibration table. Go into EDIT COMPOUNDS which is under the INITCAL menu. Enter the peak areas from the parent compounds into the corresponding levels in the associated homologs calibration table as listed below.

PARENT	HOMOLOG
Naphthalene	C2-Naphthalenes
	C3-Naphthalenes
	C4-Naphthalenes
Fluorene	C1-Fluorenes
	C2-Fluorenes
	C3-Fluorenes
Dibenzothiophene	C1-Dibenzothiophenes
	C2-Dibenzothiophenes
	C3-Dibenzothiophenes
Phenanthrene	C1-Phenanthrenes/Anthracenes
	C2-Phenanthrenes/Anthracenes
	C3-Phenanthrenes/Anthracenes
	C4-Phenanthrenes/Anthracenes
Pyrene	C1-Fluoranthenes/Pyrenes
Chrysene	C1-Chrysenes
	C2-Chrysenes
	C3-Chrysenes
	C4-Chrysenes

Use the same Curve Fit for the Homolog as is used for the Parent compound. Use the average RF if the %RSD is less than 20%. Use a quadratic curve if the %RSD exceeds 20%.

2. Analyze the PAH-ALKH SRM. This SRM is a petroleum crude oil which has been cleaned up using GPC and silica gel cleanup procedures. All of the homologs are present in the SRM.

3. Process the SRM data against the ICAL. Review the SRM data in QEDIT and manually integrate the homologs using the example in the SOP book as a guide. Print a graphics report for each homolog.

4. Update the calibration table using the PAH CCV. Enter the average retention time for each of the homologs into the processing method.

5. Analyze the sample extracts and process the data against the ICAL. Using the SRM data as a guide, manually integrate the homologs. Print graphics reports for each sample hit.

Attachment A
QC Acceptance Criteria

Compound	QC	Matrix	QC Limits (% Rec)
1-Methylnaphthalene	LCS	Soil	44-108
1-Methylphenanthrene	LCS	Soil	61-115
2,3,5-Trimethylnaphthalene	LCS	Soil	49-112
2,6-Dimethylnaphthalene	LCS	Soil	43-112
2-Methylnaphthalene	LCS	Soil	44-105
Acenaphthene	LCS	Soil	50-105
Acenaphthylene	LCS	Soil	51-107
Anthracene	LCS	Soil	61-113
Benz(a)anthracene	LCS	Soil	57-120
Benzo(a)pyrene	LCS	Soil	58-128
Benzo(b)fluoranthene	LCS	Soil	58-126
Benzo(e)pyrene	LCS	Soil	61-121
Benzo(g,h,i)perylene	LCS	Soil	52-125
Benzo(k)fluoranthene	LCS	Soil	61-122
Biphenyl	LCS	Soil	49-105
Carbazole	LCS	Soil	10-151
Chrysene	LCS	Soil	64-116
Dibenz(a,h)anthracene	LCS	Soil	50-128
Dibenzofuran	LCS	Soil	50-106
Dibenzothiophene	LCS	Soil	10-121
Fluoranthene	LCS	Soil	63-117
Fluorene	LCS	Soil	54-108
Indeno(1,2,3-cd)pyrene	LCS	Soil	46-133
Naphthalene	LCS	Soil	43-102
Perylene	LCS	Soil	61-119
Phenanthrene	LCS	Soil	58-106
Pyrene	LCS	Soil	59-121
1-Methylnaphthalene	MS	Soil	33-99
1-Methylphenanthrene	MS	Soil	25-141
2,3,5-Trimethylnaphthalene	MS	Soil	32-111
2,6-Dimethylnaphthalene	MS	Soil	30-102
2-Methylnaphthalene	MS	Soil	27-106
Acenaphthene	MS	Soil	32-114
Acenaphthylene	MS	Soil	36-113
Anthracene	MS	Soil	38-133
Benz(a)anthracene	MS	Soil	24-149
Benzo(a)pyrene	MS	Soil	30-146
Benzo(b)fluoranthene	MS	Soil	26-144
Benzo(e)pyrene	MS	Soil	37-130
Benzo(g,h,i)perylene	MS	Soil	23-142
Benzo(k)fluoranthene	MS	Soil	29-136
Biphenyl	MS	Soil	28-107
Carbazole	MS	Soil	70-130
Chrysene	MS	Soil	38-133
Dibenz(a,h)anthracene	MS	Soil	33-136
Dibenzofuran	MS	Soil	33-110
Dibenzothiophene	MS	Soil	70-130
Fluoranthene	MS	Soil	30-143
Fluorene	MS	Soil	39-118
Indeno(1,2,3-cd)pyrene	MS	Soil	24-147
Naphthalene	MS	Soil	22-101

Perylene	MS	Soil	10-152
Phenanthrene	MS	Soil	29-130
Pyrene	MS	Soil	28-143
Fluoranthene-d10	SURR	Soil	34-122
Fluorene-d10	SURR	Soil	27-110
Terphenyl-d14	SURR	Soil	50-132
1-Methylnaphthalene	LCS	Water	37-110
1-Methylphenanthrene	LCS	Water	47-131
2,3,5-Trimethylnaphthalene	LCS	Water	39-118
2,6-Dimethylnaphthalene	LCS	Water	33-113
2-Methylnaphthalene	LCS	Water	36-106
Acenaphthene	LCS	Water	48-107
Acenaphthylene	LCS	Water	49-114
Anthracene	LCS	Water	42-117
Benz(a)anthracene	LCS	Water	53-123
Benzo(a)pyrene	LCS	Water	38-142
Benzo(b)fluoranthene	LCS	Water	57-132
Benzo(e)pyrene	LCS	Water	46-133
Benzo(g,h,i)perylene	LCS	Water	50-125
Benzo(k)fluoranthene	LCS	Water	54-126
Biphenyl	LCS	Water	36-113
Carbazole	LCS	Water	48-134
Chrysene	LCS	Water	57-118
Dibenz(a,h)anthracene	LCS	Water	47-138
Dibenzofuran	LCS	Water	40-115
Dibenzothiophene	LCS	Water	44-121
Fluoranthene	LCS	Water	61-123
Fluorene	LCS	Water	55-111
Indeno(1,2,3-cd)pyrene	LCS	Water	49-139
Naphthalene	LCS	Water	44-101
Perylene	LCS	Water	25-135
Phenanthrene	LCS	Water	56-108
Pyrene	LCS	Water	53-123
1-Methylnaphthalene	MS	Water	18-121
1-Methylphenanthrene	MS	Water	70-130
2,3,5-Trimethylnaphthalene	MS	Water	70-130
2,6-Dimethylnaphthalene	MS	Water	70-130
2-Methylnaphthalene	MS	Water	29-107
Acenaphthene	MS	Water	41-105
Acenaphthylene	MS	Water	42-112
Anthracene	MS	Water	25-118
Benz(a)anthracene	MS	Water	21-133
Benzo(a)pyrene	MS	Water	10-146
Benzo(b)fluoranthene	MS	Water	17-142
Benzo(e)pyrene	MS	Water	70-130
Benzo(g,h,i)perylene	MS	Water	18-132
Benzo(k)fluoranthene	MS	Water	19-135
Biphenyl	MS	Water	70-130
Carbazole	MS	Water	70-130
Chrysene	MS	Water	24-128
Dibenz(a,h)anthracene	MS	Water	16-142

Dibenzofuran	MS	Water	42-107
Dibenzothiophene	MS	Water	70-130
Fluoranthene	MS	Water	32-131
Fluorene	MS	Water	40-115
Indeno(1,2,3-cd)pyrene	MS	Water	16-145
Naphthalene	MS	Water	28-110
Perylene	MS	Water	70-130
Phenanthrene	MS	Water	40-112
Pyrene	MS	Water	27-131
Fluoranthene-d10	SURR	Water	18-137
Fluorene-d10	SURR	Water	37-107
Terphenyl-d14	SURR	Water	18-153
1-Methylnaphthalene	LCS	Tissue	28-141
1-Methylphenanthrene	LCS	Tissue	57-126
2,3,5-Trimethylnaphthalene	LCS	Tissue	53-114
2,6-Dimethylnaphthalene	LCS	Tissue	53-109
2-Methylnaphthalene	LCS	Tissue	27-138
Acenaphthene	LCS	Tissue	57-108
Acenaphthylene	LCS	Tissue	56-111
Anthracene	LCS	Tissue	61-116
Benz(a)anthracene	LCS	Tissue	43-127
Benzo(a)pyrene	LCS	Tissue	55-139
Benzo(b)fluoranthene	LCS	Tissue	59-132
Benzo(e)pyrene	LCS	Tissue	56-131
Benzo(g,h,i)perylene	LCS	Tissue	53-130
Benzo(k)fluoranthene	LCS	Tissue	57-141
Biphenyl	LCS	Tissue	56-107
Carbazole	LCS	Tissue	10-98
Chrysene	LCS	Tissue	50-127
Dibenz(a,h)anthracene	LCS	Tissue	49-144
Dibenzofuran	LCS	Tissue	27-150
Dibenzothiophene	LCS	Tissue	11-131
Fluoranthene	LCS	Tissue	59-127
Fluorene	LCS	Tissue	57-114
Indeno(1,2,3-cd)pyrene	LCS	Tissue	48-142
Naphthalene	LCS	Tissue	53-103
Perylene	LCS	Tissue	50-136
Phenanthrene	LCS	Tissue	56-112
Pyrene	LCS	Tissue	48-121
1-Methylnaphthalene	MS	Tissue	54-93
1-Methylphenanthrene	MS	Tissue	63-109
2,3,5-Trimethylnaphthalene	MS	Tissue	61-100
2,6-Dimethylnaphthalene	MS	Tissue	40-106
2-Methylnaphthalene	MS	Tissue	47-116
Acenaphthene	MS	Tissue	61-117
Acenaphthylene	MS	Tissue	64-115
Anthracene	MS	Tissue	72-115
Benz(a)anthracene	MS	Tissue	50-120
Benzo(a)pyrene	MS	Tissue	65-122
Benzo(b)fluoranthene	MS	Tissue	65-120
Benzo(e)pyrene	MS	Tissue	58-121

Benzo(g,h,i)perylene	MS	Tissue	57-115
Benzo(k)fluoranthene	MS	Tissue	65-124
Biphenyl	MS	Tissue	62-95
Carbazole	MS	Tissue	70-130
Chrysene	MS	Tissue	58-117
Dibenz(a,h)anthracene	MS	Tissue	52-134
Dibenzofuran	MS	Tissue	58-114
Dibenzothiophene	MS	Tissue	70-130
Fluoranthene	MS	Tissue	66-123
Fluorene	MS	Tissue	68-116
Indeno(1,2,3-cd)pyrene	MS	Tissue	47-136
Naphthalene	MS	Tissue	45-110
Perylene	MS	Tissue	70-130
Phenanthrene	MS	Tissue	67-111
Pyrene	MS	Tissue	58-114
Fluoranthene-d10	SURR	Tissue	56-109
Fluorene-d10	SURR	Tissue	53-103
Terphenyl-d14	SURR	Tissue	50-124

STANDARD OPERATING PROCEDURE

SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS - LOW LEVEL PROCEDURE

EPA Method 8270-LL

SOC-8270L
Revision 3
September 6, 2006

Approved By:

Supervisor		9/7/06 Date
QA Manager		9-7-06 Date
Laboratory Manager		9/7/06 Date

COLUMBIA ANALYTICAL SERVICES, INC.
1317 South 13th Avenue
Kelso, Washington 98626

Annual review of this SOP has been performed and the SOP still reflects current practice.
Initials: _____ Date: _____
Initials: _____ Date: _____
Initials: _____ Date: _____

DOCUMENT CONTROL

NUMBER: _____

Initials: _____ Date: _____

SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS
LOW LEVEL PROCEDURE

1. SCOPE AND APPLICATION

1.1. This procedure is used to determine low level concentrations of Semi-Volatile Organic Compounds in water and soil using EPA Method 8270C. This procedure may also be applicable to various miscellaneous waste samples. Table 1 indicates compounds that may be determined by this method and lists their method reporting limits (MRLs) in water and soil. Equivalent nomenclature for MRL includes Estimated Quantitation Limit (EQL) and Practical Quantitation Limit (PQL). Therefore, MRL=EQL=PQL. The reported MRL may be adjusted if required for specific project requirements, however, the capability of achieving other reported MRLs must be demonstrated. Table 1 lists Method Detection Limits (MDLs)that have been achieved, however, MDLs may change as MDL studies are performed, and will vary depending on the instrument used and preparation method.

1.2. This procedure can be used to quantitate most neutral, acidic, and basic organic compounds that are soluble in methylene chloride and capable of being eluted without derivatization as sharp peaks from a gas chromatographic fused-silica capillary column coated with a slightly polar silicone phase. Such compounds include polynuclear aromatic hydrocarbons, chlorinated hydrocarbons and pesticides, phthalate esters, organophosphate esters, nitrosamines, haloethers, aldehydes, ethers, ketones, anilines, pyridines, quinolines, aromatic nitro compounds, and phenols, including nitrophenols. Other compounds than those listed in Tables 1 may be analyzed. Refer to Section 1 of method 8270C.

2. METHOD SUMMARY

2.1. This method provides Gas Chromatography/Mass Spectrometry (GC/MS) conditions for the detection of Semi-volatile Organic Compounds. Prior to the use of this method, an appropriate sample preparation method must be used to recover the analytes of interest. A 20 µL aliquot of the extract is injected into the gas chromatograph (GC) using a large volume injector. The compounds are separated on a fused silica capillary column. Compounds of interest are detected by a mass selective detector. Identification of the analytes of interest is performed by comparing the retention times of the analytes with the respective retention times of an authentic standard, and by comparing mass spectra of analytes with mass spectra of reference materials. Quantitative analysis is performed by using the authentic standard to produce a response factor and calibration curve, and using the calibration data to determine the concentration of an analyte in the extract. The concentration in the sample is calculated using the sample weight or volume and the extract volume.

2.2. The following compounds may require special treatment when being determined by this method. Hexachlorocyclopentadiene is subject to decomposition in the injection port of

the gas chromatograph, to a chemical reaction in acetone, and can undergo photochemical decomposition. N-nitroso-dimethylamine is difficult to separate from the solvent under the chromatographic conditions described. N-nitroso-diphenylamine decomposes in the gas chromatographic inlet and cannot be separated from diphenylamine. Benzoic acid, pentachlorophenol, 2,4-dinitrophenol, 2-nitroaniline, 3-nitroaniline, 4-chloroaniline, and benzyl alcohol are subject to erratic chromatographic behavior, especially if the GC system is contaminated with high boiling material.

3. DEFINITIONS

3.1. **Analysis Sequence** - Samples are analyzed in a set referred to as an analysis sequence. The sequence begins with injection of Decafluorotriphenylphosphine (DFTPP) followed by initial calibration standard(s). Once calibrated, a CCV is evaluated and extracts can be run. The sequence ends after 12 hours based on the DFTPP injection time.

3.2. **Matrix Spike/Duplicate Matrix Spike Analysis** - In the matrix spike analysis, predetermined quantities of target analytes are added to a sample matrix prior to sample extraction and analysis. The purpose of the matrix spike is to evaluate the effects of the sample matrix on the methods used for the analyses. Samples are split into duplicates, then spiked and analyzed. Percent recoveries are calculated for each of the analytes detected. The relative percent difference between the samples is calculated and used to assess analytical precision.

3.3. **Standard Curve** - A standard curve is a calibration curve which plots concentrations of a known analyte standard versus the instrument response to the analyte.

3.4. **Surrogate** - Surrogates are organic compounds which are similar to analytes of interest in chemical composition, extraction, and chromatography, but which are not normally found in environmental samples. The purpose of the surrogates is to evaluate the preparation and analysis of samples. These compounds are spiked into all blanks, standards, samples and spiked samples prior to analysis. Percent recoveries are calculated for each surrogate.

3.5. **Method Blank** - The method blank is an artificial sample designed to monitor introduction of artifacts into the process. The method blank is carried through the entire analytical procedure.

3.6. **Continuing Calibration Verification Standard (CCV)** - A mid-level standard injected into the instrument at specified intervals and is used to verify the validity of the initial calibration.

3.7. **Independent Calibration Verification Standard (ICV)** - A mid-level standard injected into the instrument after the calibration curve from a different source than the standards in the curve and is used to verify the validity of the initial calibration.

4. INTERFERENCES

4.1. Raw GC/MS data from all blanks, samples, and spikes must be evaluated for interferences. Determine if the source of interference is in the preparation of the samples. Corrective action should be taken to eliminate the interferences.

4.2. Accurate determination of phthalate esters can pose difficulties when using this methodology. Common flexible plastics contain varying amounts of phthalates. These phthalates are easily extracted or leached from such materials during laboratory operations. Cross contamination of clean glassware may occur when plastics are handled during extraction steps, especially when solvent-wetted surfaces are handled. Interferences from phthalates can best be minimized by avoiding contact with any plastic materials. Exhaustive cleanup of reagents and glassware may be required to eliminate background phthalate contamination.

4.3. Contamination by carryover can occur whenever high-concentration and low-concentration samples are sequentially analyzed. To reduce carryover, the sample syringe must be rinsed out between samples with solvent. Whenever an unusually concentrated sample is encountered, it should be followed by the analysis of a solvent blank to check for cross contamination.

5. SAFETY

5.1. All appropriate safety precautions for handling solvents, reagents and samples must be taken when performing this procedure. This includes the use of personal protective equipment, such as, safety glasses, lab coat and the correct gloves.

5.2. Chemicals, reagents and standards must be handled as described in the CAS safety policies, approved methods and in MSDSs where available. Refer to the CAS Environmental, Health and Safety Manual and the appropriate MSDS prior to beginning this method.

5.3. This method uses Methylene Chloride, a known human carcinogen. Viton brand gloves should be used while rinsing, pouring or transferring the solvent

6. SAMPLE COLLECTION, CONTAINERS, PRESERVATION, AND STORAGE

6.1. Containers used to collect samples for the determination of semivolatile organic compounds should be soap and water washed followed by methanol (or isopropanol) rinsing. The sample containers should be of glass or teflon and have screw-top covers with teflon liners. In situations where teflon is not available, solvent-rinsed aluminum foil may be used as a liner. Highly acidic or basic samples may react with the aluminum foil, causing eventual contamination of the sample. Plastic containers or lids may not be used

for the storage of samples due to the possibility of sample contamination from the phthalate esters and other hydrocarbons within the plastic.

Sample containers should be filled with care so as to prevent any portion of the collected sample coming in contact with the sampler's gloves, thus causing contamination. Samples should not be collected or stored in the presence of exhaust fumes. If the sample comes in contact with the sampler (e.g., if an automatic sampler is used), run reagent water through the sampler and use the rinsate as a field blank.

6.2. Water and soil samples must be iced or refrigerated at 4 ± 2°C from time of collection until extraction.

6.3. Water samples must be extracted within 7 days and the extracts analyzed within 40 days following extraction. Soil samples must be extracted within 14 days and the extract analyzed within 40 days following extraction. Extracts are stored at -10°C.

Note: The extract holding time is that period of time from the completion of the sample extraction to the time when the extract is analyzed. Sample extraction is considered completed when all sample/solvent interaction is complete, but prior to any solvent concentration or extract cleanup.

7. APPARATUS AND MATERIALS

7.1. Gas Chromatograph/Mass Spectrometer System

7.1.1. Gas Chromatograph unit- An analytical system complete with a temperature-programmable gas chromatograph suitable for large volume injection with cryogenic cooling.

7.1.1.1. Atas Optic 2 large volume injector unit – This allows for injection of up to 100uL of solvent for each analysis. After injection into the cold injector, the solvent is vented while the analytes are retained within a specially packed liner. The injector is then flash heated and the analytes are transferred into the GC. The unit also controls gas flow rates.

7.1.1.2. Autosampler – HP7673A, or equivalent with programmable operation.

7.1.1.3. All other required accessories, syringes, analytical columns, and gases. The capillary column should be directly coupled to the source.

7.1.2. Column: ZB-5MS, 30m x 0.25mm ID x 0.25µm film thickness silicone-coated fused-silica capillary column with 5m guard column (or equivalent). Recommended part number 7HG-6010-11-GGA.

7.1.3. Mass Spectrometer - Capable of scanning from 35 to 500 amu every 1 second or less, using 70 volts (nominal) electron energy in the electron impact ionization mode. The mass spectrometer must be capable of producing a mass spectrum for decafluorotriphenylphosphine (DFTPP) which meets all of the criteria in Table 2 when 20 µL of the GC/MS tuning standard is injected through the GC (50 ng of DFTPP).

7.1.4. GC/MS Interface - Any GC-to-MS interface that gives acceptable calibration points at 50 ng per injection for each compound of interest and achieves acceptable tuning performance criteria may be used.

7.1.5. Data System - A computer system must be interfaced to the mass spectrometer. The system must allow the continuous acquisition and storage on machine-readable media of all mass spectra obtained throughout the duration of the chromatographic program. The computer must have software that can search any GC/MS data file for ions of a specific mass and that can plot such ion abundances versus time or scan number. This type of plot is defined as an Extracted Ion Current Profile (EICP). Software must also be available that allows integrating the abundances in any EICP between specified time or scan-number limits. The most recent version of the EPA/NIST Mass Spectral Library should also be available.

7.2. Appropriate analytical balance (0.0001 g), volumetric flasks, syringes, vials, and bottles for standards preparation.

8. STANDARDS, REAGENTS, AND CONSUMABLE MATERIALS

8.1. Solvents: Acetone, methylene chloride, methanol, and other appropriate solvents. Solvents must be of sufficient purity to permit usage without lessening the accuracy of the determination or introducing interferences.

8.2. Stock Standard Solutions (See Table 3)

8.2.1. Commercially prepared stock standards are typically used when available at a concentration of 1000 ug/ml or more. They must be obtained from a A2LA or ISO9000 certified vendor. Standard concentrations can be verified by comparison versus an independently prepared standard. Alternatively, prepare stock standard solutions at a concentration of 1000 µg/ml by dissolving 0.0100 g of reference material in methylene chloride or other suitable solvent and diluting to volume in a 10mL volumetric flask. Larger volumes can be used at the convenience of the analyst. When compound purity is assayed to be 96% or greater, the weight can be used without correction to calculate the concentration of the stock standard.

8.2.2. Transfer the stock standard solutions into Teflon-sealed screw-cap bottles. Store at -10°C and protect from light, or store as recommended by the manufacturer. Stock standards should be checked frequently for signs of degradation or evaporation, especially just prior to preparing calibration standards from them.

8.2.3. Stock standard solutions must be replaced after one year, or sooner, if comparison with check standards or samples indicates a problem.

8.3. Internal Standard Solutions (See Table 3) - The internal standards are 1,4-dichlorobenzene-d_4, naphthalene-d_8, acenaphthene-d_{10}, phenanthrene-d_{10}, chrysene-d_{12}, and perylene-d_{12} (See Table 4 for corresponding compounds). The nominal concentration of the standard is 100 ng/µL. Each 1 ml of sample extract undergoing analysis should be spiked with 10 µL of the internal standard solution, resulting in a concentration of 1.0 ng/µL of each internal standard. Store at -10°C or less when not being used. When using premixed certified solutions, store according to the manufacturer's recommendations.

8.4. GC/MS Tuning Standard (See Table 3) - A methylene chloride solution containing 2.5 ng/µL of decafluorotriphenylphosphine (DFTPP). The standard should also contain 2.5 ng/µL of benzidine, DDT, and pentachlorophenol, to verify injection port inertness and GC column performance. Store at -10°C or less when not being used, or store according to the manufacturer's recommendations.

8.5. Calibration Standards (See Table 3)

8.5.1. A minimum of five initial calibration standards should be prepared from stock solutions. One of the calibration standards should be at a concentration at or below the method reporting limit; the others should correspond to the range of concentrations found in real samples, but should not exceed the working range of the GC/MS system. At least one calibration standard must be at a concentration corresponding to a sample concentration meeting project-specific data quality objectives. Each standard should contain each analyte for detection by this method. Each 1 ml aliquot of calibration standards should be spiked with 10 µL of the internal standard solution prior to analysis. All calibration standards should be stored at -10°C or less and should be freshly prepared once a year, or sooner if check standards indicate a problem.

8.5.2. The daily calibration standard (CCV) is prepared from stock solutions at a concentration at the midpoint of the calibration curve (typically 2-4 ng/µL). The CCV is prepared weekly and can be stored at 4 ± 2°C, or as recommended by the manufacturer. The DFTPP standard may be combined with this standard (maintaining 2.5 ng/µL concentration) providing tuning verification and calibration verification can be done without interferences.

8.6. QC Standards (See Table 4)

8.6.1. Surrogates: Prepare a working solution in methanol containing 2-fluorophenol, phenol-d6, and 2,4,6-tribromophenol at 150 ng/µL and nitrobenzene-d5, 2-fluorobiphenyl, and terphenyl-d14 at 100 ng/µL. Aliquots of the solution are spiked into all extracted samples, blanks, and QC samples according to the extraction SOP used.

8.6.2. Matrix Spike Standards: Prepare a working solution in methanol containing all analytes of interest ("full list spike") at 100 ng/µL. Aliquots of the solution are spiked into the selected QC aliquots according to the extraction SOP used.

Note: The spiking level of surrogate and spike may need to be adjusted according to project requirements, if dilutions are expected due to high levels of extracted components, or if a lower calibration range is used.

9. PREVENTIVE MAINTENANCE

9.1. All maintenance activities are recorded in a maintenance logbook kept for each instrument.

9.2. Carrier gas - Inline purifiers or scrubbers should be in place for all sources of carrier gas. These are selected to remove water, oxygen, and hydrocarbons. Purifiers should be changed as recommended by the supplier.

9.3. Gas Chromatograph

9.3.1. Whenever GC maintenance is performed, care should be taken to minimize the introduction of air or oxygen into the column. Injection port maintenance may include swabbing out the port, changing the injection port liner, seal, washer, o-ring, septum, column ferrule, and autosampler syringe as needed. Liners and seals should be changed when recent sample analyses predict a problem with chomatographic performance. In some cases liners and seals may be cleaned and re-used.

9.3.2. Clipping off a small portion of the head of the column often improves chromatographic performance. When cutting off any portion of the column, make sure the cut is straight and "clean" (uniform, without fragmentation) by using the proper column cutting tool. The column headpressure must be adjusted to maintain proper flow rates.

9.3.3. Over time, the column will exhibit poorer overall performance, as indicated by poor peak shape and reduced responses. The length of time for this to occur will depend on the samples analyzed. When a noticeable decrease in performance is evident, more thorough maintenance is necessary. Some steps are to solvent rinse the split

vent and septum lines with a mix of 20% methanol in DCM. When these and other maintenance options do not result in improvement, the column should be replaced. This is especially true when evident in conjunction with calibration difficulties.

9.4. Mass Spectrometer

9.4.1. Tune the MS as needed to result in consistent and acceptable performance while meeting the required ion abundance criteria given in section 11.

9.4.2. For units under service contract, certain maintenance is performed by instrument service staff, including pump oil changed, vacuuming boards, etc., as recommended by the manufacturer.

9.4.3. MS source cleaning should be performed as needed, depending on the performance of the unit. This may be done by the analyst or by instrument service staff.

10. RESPONSIBILITIES

10.1. It is the responsibility of the analyst to perform the analysis according to this SOP and to complete all documentation required for data review. Analysis and interpretation of the results are performed by personnel in the laboratory who have demonstrated the ability to generate acceptable results utilizing this SOP. This demonstration is in accordance with the training program of the laboratory. Final review and sign-off of the data is performed by the department supervisor/manager or designee.

10.2. It is the responsibility of the department supervisor/manager to document analyst training. Documenting method proficiency, as described in 8270C, is also the responsibility of the department supervisor/manager.

11. PROCEDURE

11.1. Sample Preparation

11.1.1. Water samples

11.1.1.1. Water samples are prepared using continuous liquid-liquid extraction and EPA method 3520C. Refer to the CAS SOP EXT-3520. In some circumstances, such as rush samples, samples may be prepared using separatory funnel procedures (EPA 3510C). Refer to the CAS SOP EXT-3510.

11.1.1.2. Perform the extraction on a 1000mL aliquot of sample.

11.1.2. Soil, sediment, and solid samples are prepared using automated soxhlet extraction CAS SOP EXT-3541). The nominal sample size is 20g. Sample amounts may be decreased in the case of high-concentration waste samples. GPC cleanup is required (SOP SOC-3640A).

11.1.3. Extracts should be screened by GC/FID (SOP SOC-SCR).

11.1.4. Following sample preparation, sample extracts are then transferred to the extract cold storage unit. Extracts must be analyzed within 40 days of extraction.

11.2. The recommended GC/MS operating conditions are listed below. The GC conditions may modified to accommodate specific instrument models and configurations.

Mass range:	35-500 amu
Scan Time:	1 sec/scan
Initial temperature:	45°C, hold for 3.5 minutes
Temperature program:	45-100°C at 15°C/min, 100-270°C at 10°C/min, 270-320°C at 6°C/min, hold until 3 minutes after benzo[g,h,i]perylene has eluted.
Detector interface temp:	300°C
Injector:	Atas Optic 2, Expert Mode:

Final time: 37.0 min.
Initialization time: 0.00 min.
Temperature profile:

Initial temperature 9°C

Ramp	Rate	Final Temp	Isothermal time
1	6°C/sec	10°C	2.20 min.
2	6°C/sec	300°C	34.16 min.

Pressure ramps:

Ramp	Start Press.	Step time	Target press.
1	5.00 psi	0.50 min.	5.00 psi
2	5.00 psi	3.90 min.	15.00 psi
3*	8.73 psi	30.81 min.	34.50 psi

* The start pressure is set to give 1.0 ml/min. @ 45°C and the target pressure is set to give 1.5 ml/min @ 320°C.

Split state:

Time	Split state
Initial	Vent
0.60 min.	Closed/splitless*
1.90 min.	Open/split

* Splitless time may be adjusted to optimize GC performance.
Vent flow: 85ml/min. @ 5 psi
Split flow: 2-5ml/min. @ 10°C and 10 psi
Sample volume: 20 µL

Carrier gas: helium at 30-45 cm/sec

NOTE: Refer to the *SOP for Calibration of Instruments for Organics Chromatographic Analysis*. The calibration procedure(s) and options chosen must follow the CAS SOP. In general, the calibration procedure is as follows:

11.3. Initial Calibration

11.3.1. Prior to calibration, analyze the GC/MS tuning standard using instrument conditions used for calibration. Obtain the spectrum for evaluation using one of the following options:

- Three scans (the peak apex scan and the scans immediately preceding and following the apex) are acquired and averaged. Background subtraction is required, and must be accomplished using a single scan acquired no more than 20 scans prior to the elution of DFTPP. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the DFTPP peak or part of any other closely eluting peak.

- Use one scan at the apex of the peak. Background subtraction is required, and must be accomplished using a single scan acquired no more than 20 scans prior to the elution of DFTPP. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the DFTPP peak or part of any other closely eluting peak.

- Use one scan either directly preceding or following the apex of the peak. Background subtraction is required, and must be accomplished using a single scan acquired no more than 20 scans prior to the elution of DFTPP. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the DFTPP peak or part of any other closely eluting peak.

- Use the average across the entire peak up to a total of 5 scans. Peak integration must be consistent with standard operating procedure. If the peak is wider than 5 scans, the tune will consist of the peak apex scan and the two scans immediately preceding and following the apex. Background subtraction is required, and must be accomplished using a single scan

acquired no more than 20 scans prior to the elution of DFTPP. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the DFTPP peak or part of any other closely eluting peak.

11.3.2. Evaluate the spectrum obtained for DFTPP against the tuning criteria (see 8270C, Section 7.3.1 for guidance). Criteria is given in Tables 2 and 2A. The GC/MS must meet the DFTPP ion abundance criteria prior to further analyses. To assess column performance and injection port inertness, pentachlorophenol and benzidine should be present at an acceptable level and peak tailing should not be excessive. DDT degradation should not exceed 20%. If excessive tailing, poor chromatography, or degradation of >20% is noted, the injection port may require cleaning. It may also be necessary to remove the first 15-30 cm of the GC column. If hardware tuning criteria can not be met, the source may need cleaning, filaments replaced or other maintenance.

11.3.3. The internal standards should permit most of the components of interest in the chromatogram to have retention times of 0.80-1.20 relative to one of the internal standards. Refer to Table 5 for internal standards and corresponding analytes assigned for quantitation. Use the base peak ion from the specific internal standard as the primary ion for quantitation (See Table 1 of EPA 8270C). If interferences are noted, use the next most intense ion as the quantitaion ion (i.e. for 1,4-dichlorobenzene-d_4, use 152 m/z for quantitation).

11.3.4. Analyze 20 µL of each calibration standard (containing internal standards) and tabulate the area of the primary characteristic ion against concentration for each compound (as indicated in Table 1 of EPA 8270C). Calculate response factors (RFs) for each compound relative to one of the internal standards as follows:

$$RF = (A_x C_{is})/(A_{is} C_x)$$

where:
A_x = Area of the characteristic ion for compound being measured.
A_{is} = Area of the characteristic ion for specific internal standard.
C_{is} = Concentration of the specific internal standard (ng/µL).
C_x = Concentration of the compound being measured (ng/µL).

11.3.5. A system performance check must be performed to ensure that minimum average RFs are met before the calibration curve is used. For semivolatiles, the System Performance Check Compound (SPCCs) are: N-nitroso-di-n-propylamine; hexachlorocyclopentadiene; 2,4-dinitrophenol; and 4-nitrophenol. The minimum acceptable average RF for these compounds is 0.050. The SPCCs typically have very low RFs (0.1-0.2) and tend to decrease in response as the chromatographic system begins to deteriorate or the standard material begins to deteriorate. They are

usually the first to show poor performance. Therefore, they must meet the minimum requirement when the system is calibrated. If they are not acceptable, perform GC maintenance (see section 9.3).

11.3.6. The percent relative standard deviation (%RSD) should be less than 15% for each compound. However, the %RSD for each individual Calibration Check Compound (CCC) (see below) must be less than 30%. The relative retention times of each compound in each calibration run should agree within 0.06 relative retention time units.

$$\%RSD = \frac{SD}{\overline{RF}} \times 100$$

where:

RSD = relative standard deviation.

RF = mean of 5 initial RFs for a compound.
SD = standard deviation of average RFs for a compound.

$$SD = \sqrt{\sum_{i=1}^{N} \frac{(RF_i - \overline{RF})^2}{N - 1}}$$

where:

RF_i = RF for each of the 5 calibration levels
N = Number of RF values (i.e., 5)

Calibration Check Compounds (CCC):

Base/Neutral Fraction	Acid Fraction
Acenaphthene	4-Chloro-3-methylphenol
1,4-Dichlorobenzene	2,4-Dichlorophenol
Hexachlorobutadiene	2-Nitrophenol
(N-Nitroso)-diphenylamine	Phenol
Di-n-octyl phthalate	Pentachlorophenol
Fluoranthene	2,4,6-Trichlorophenol
Benzo(a)pyrene	

11.3.7. If the % RSD of any CCC is 30% or greater, then the chromatographic system is too reactive for analysis to begin. Clean or replace the injector liner and/or capillary column, then repeat the calibration procedure.

11.3.8. Linearity - If the % RSD of any compound is 15% or less, then the relative response factor is assumed to be constant over the calibration range, and the average relative response factor may be used for quantitation.

11.3.9. In those instances where the %RSD for one or more analytes exceeds 15%, the initial calibration may still be acceptable if the following conditions are met:

11.3.9.1. The mean of the RSD values for all analytes in the calibration is < 15%.

11.3.9.2. The mean RSD criteria applies to all target analytes in the calibration standards, regardless of whether or not they are of interest for a specific project.

11.3.9.3. The data user must be supplied with an initial calibration summary indicating the compounds which exceed 15% RSD and the result of the mean RSD calculation.

11.3.10. If all of the conditions in Section 11.3.9 are met, then the average response factor may be used to determine sample concentrations as described in Section 11.3.8.

11.3.11. Following initial calibration, analyze an ICV standard. The ICV solution must contain all analytes in the calibration standards. Calculate the concentration using the typical procedure used for quantitation. Calculate the percent difference (%D) from the ICV true value. Evaluate the ICV as described in the CAS Organics Calibration SOP.

11.4. If CCCs are not included in the list of analytes for a project and are not included in the calibration standards, refer to the *SOP for Calibration of Instruments for Organics Chromatographic Analysis,* Section 11.2.6.2 for calibration requirements.

11.5. Continuing Calibration

11.5.1. A calibration standard, or standards, at mid-concentration (See Table 3) containing all semivolatile analytes, DFTPP, and all required surrogates, must be analyzed every 12 hours during analysis. The DFTPP must result in a mass spectrum (see 8270C, Section 7.3.1 for guidance) which meets the criteria given in Table 2.

These criteria must be demonstrated during each 12 hour shift. Obtain the DFTPP spectrum as described in section 11.3.1.

11.5.2. System Performance Check Compounds (SPCCs): For each daily calibration, a system performance check must be made. For each SPCC compound in the daily calibration standard, a minimum response factor of 0.050 must be obtained. This is the same check that is applied during the initial calibration. If the minimum response factors are not met, the system must be evaluated, and corrective action must be taken before sample analysis begins. Some possible problems are standard mixture degradation, injection port inlet contamination, contamination at the front end of the analytical column, and active sites in the column or chromatographic system. This check must be met before analysis begins.

11.5.3. Calibration Check Compounds (CCCs): After the system performance check, CCCs listed in Section 11.3.6 are used to check the validity of the initial calibration. Calculate the percent drift using:

$$\%\ Drift = \frac{C_I - C_c}{C_I} \times 100$$

where:

C_I = Calibration Check Compound standard concentration.
C_c = Measured concentration using selected quantitation method.

If the percent drift for each CCC is less than or equal to 20%, the initial calibration is assumed to be valid. If the criterion is not met (> 20% drift) for any one CCC, corrective action must be taken. Problems similar to those listed under SPCCs could affect this criterion. If no source of the problem can be determined after corrective action has been taken, a new initial-point calibration must be generated. This criterion must be met before sample analysis begins. If the % RSD for non-CCC compounds exceeds 30%, the analyst must determine if the response is sufficient to attain MRL for that analyte and any hits for that analyte must be rerun for quantitation.

11.5.4. The internal standard responses and retention times in the calibration check standard must be evaluated immediately after or during data acquisition. If the retention time for any internal standard changes by more than 30 seconds from that in the midpoint standard of the most recent initial calibration sequence, the chromatographic system must be inspected for malfunctions and corrective action identified, as required. If the EICP area for any of the internal standards changes by a factor of two (50% to 200%) from that in the midpoint standard of the most recent initial calibration sequence, the chromatographic system must be inspected for malfunctions and corrective action identified, as appropriate. When corrective

action is taken, reanalysis of samples analyzed while the system was malfunctioning is required. Update the reference spectra and retention times in the quantitation database for the instrument method or ID file. The initial calibration average RF or calibration curve is then used in the quantitation of subsequent analyses.

11.5.5. A blank (method blank, GPC blank, or solvent blank) should be analyzed after the CCV to prove the system is free of contaminants. If contaminants are found in a method blank or GPC blank, then a solvent blank should be ran to help isolate the source of contamination.

11.6. GC/MS Analysis

11.6.1. Evaluate FID screen and make proper dilution (See FID screening SOP).

11.6.2. Spike the 1 ml extract obtained from sample preparation with 10 µL of the internal standard solution just prior to analysis. Use the same operating conditions as were used for initial calibration.

11.6.3. If the response for any quantitation ion exceeds the initial calibration curve range of the GC/MS system, extract dilution must take place. Additional internal standard must be added to the diluted extract to maintain the required 1.0ng/µL of each internal standard in the extracted volume. The diluted extract must be reanalyzed.

11.6.4. Store the extracts at -10°C or less, protected from light in vials equipped with unpierced Teflon lined septa. Archive extract in freezer for 3 months after analysis in the instrument/date specific storage boxes.

12. QA/QC REQUIREMENTS

12.1. Refer to Section 8.0 of Method 8270C for general QC protocol. In addition to instrument criteria for calibration, the ability of each analyst/instrument to generate acceptable accuracy and precision must be documented prior to sample analysis (IPR study). This must be validated before analysis of samples begins, or whenever significant changes to the procedures have been made. To do this, four tap water samples are spiked with each target analyte, extracted, and analyzed. Refer to Method 8270C Section 8.3 for this requirement and acceptance criteria.

12.2. Method Detection Limits

12.2.1. A method detection limit (MDL) study must be undertaken before analysis of samples can begin. To establish detection limits that are precise and accurate, the analyst must perform the following procedure. Spike a minimum of seven blank replicates with a MDL spiking solution (at a level below the MRL) for each target

analyte, extract, and analyze. The MDL studies should be done for each matrix, prep method, and instrument. Refer to the CAS SOP *for The Determination of Method Detection Limits and Limits of Detection.*

12.2.2. Calculate the average concentration found (x) in the *sample concentration*, and the standard deviation of the concentrations for each analyte. Calculate the MDL for each analyte using the correct T value for the number of replicates. The MDL study should be done annually.

12.3. Ongoing QC Samples required are described in the CAS-Kelso Quality Assurance Manual and in the SOP for *Sample Batches*. In general, these include:

12.3.1. Method blank - A method blank is extracted and analyzed with every batch of 20 or fewer samples to demonstrate that there are no method interferences. The method blank must demonstrate that interferences from the analytical and preparation steps are minimized. No target analytes should be detected above the MRL in the method blank. For some project specific needs, exceptions may be noted and method blank results above the MRL may be reported for common lab contaminants (phthalate esters, etc.).

12.3.2. A lab control sample (LCS) must be extracted and analyzed with every batch of 20 or fewer samples. The LCS is prepared by spiking a blank with the matrix spike solution, and going through the entire extraction and analysis. Calculate percent recovery (%R) as follows:

$$\%R = X/TV \times 100$$

Where X = Concentration of the analyte recovered
TV = True value of amount spiked

Acceptance criteria for lab control samples are listed in Attachment A. If the LCS recovery for any control analyte fails acceptance limits, corrective action is required. If instrument corrective action is not applicable or ineffective, re-extraction of the associated samples is required. If any other analyte fails the advisory acceptance limits, the analyst must evaluate the impact on data quality and take any necessary corrective action, which may include re-extraction of the associated samples. Project-specific requirements may require all compounds to be treated as control analytes, or dictate use of project acceptance criteria.

12.3.3. A matrix spike/duplicate matrix spike (MS/DMS) must be extracted and analyzed with every batch of 20 or fewer samples. The MS is prepared by spiking a sample aliquot with the matrix spike solution, and going through the entire extraction and analysis. Calculate percent recovery (%R) as follows:

$$\%R = \frac{X - X1}{TV} \times 100$$

Where X = Concentration of the analyte recovered
X1 = Concentration of unspiked analyte
TV = True value of amount spiked

Calculate Relative Percent Difference (RPD) as:

$$\%RPD = \frac{R1 - R2}{(R1 + R2)/2} \times 100$$

Where R1 = recovered concentration in the MS
R2 = recovered concentration in the DMS

The acceptance limits for the MS/DMS recovery are given in Attachment A. If the MS/DMS recovery is out of acceptance limits for reasons other than matrix effects, corrective action must be taken. The RPD acceptance limits are 30% for water and 40% for soils, sediments, and solids. Project-specific requirements may dictate the use of project acceptance criteria.

12.3.4. The acceptance limits for the surrogates are given in Attachment A. If any surrogate recovery is outside acceptance criteria, the sample data must be closely evaluated for possible matrix interferences. If none are present, then corrective action must be taken. The sample should be re-analyzed if instrument factors (calibration, injection port) are suspected. If not, re-extraction and re-analysis is required, except in cases of high recovery and no positive hits in the sample for the analyte class represented by the particular surrogate.

12.3.5. The acceptance criteria listed in Attachment A are current criteria, but are subject to change as control limits are updated.

12.3.6. Additional QA/QC measures include control charting of QC sample results.

13. DATA REDUCTION, REVIEW, AND REPORTING

13.1. Qualitative Analysis - The qualitative identification of compounds determined by this procedure is based on retention time, and comparison of the sample mass spectrum, after background correction, with characteristic ions in a reference mass spectrum. The reference mass spectrum must be generated by the laboratory using the instrument and conditions used for the sample analysis. The characteristic ions from the reference mass spectrum are defined to be the three ions of greatest relative intensity, or any ions over 30%

relative intensity, if less than three such ions occur in the reference spectrum. Compounds should be identified as present when the criteria below are met.

13.1.1. The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other. Selection of a peak by a data system target compound search routine where the search is based on the presence of a target chromatographic peak containing ions specific for the target compound at a compound-specific retention time will be accepted as meeting this criterion.

13.1.2. The RRT of the sample component is within ± 0.06 RRT units of the RRT of the standard component.

13.1.3. The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum.

13.1.4. Structural isomers that produce very similar mass spectra should be identified as individual isomers if they have sufficiently different GC retention times. Sufficient GC resolution is achieved if the height of the valley between two isomer peaks is <25% of the sum of the 2 peak heights. Otherwise, structural isomers are identified as isomeric pairs.

13.1.5. Identification is hampered when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When gas chromatographic peaks appear to represent more than one sample component (i.e., a broadened peak with shoulder(s) or a valley between two or more maxima), appropriate selection of analyte spectra and background spectra is important. Examination of extracted ion current profiles of appropriate ions can aid in the selection of spectra, and in qualitative identification. When analytes coelute, the identification criteria can be met, but each analyte spectrum will contain extraneous ions contributed by the coeluting compound.

13.2. For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. Refer to method 8270C for guidance on tentatively identified compound (TIC) identification and quantification.

13.3. Quantitation and Calculations

13.3.1. The GC/MS data stations, in current use, all use the H-P RTE Integrator to generate the raw data used to calculate the standards $\overline{RF_x}$ values, the sample amounts, and the spike values. The software does three passes through each data file. The first two identify and integrate each internal standard and surrogate. The third pass uses the time-drift information from the first two passes to search for all method analytes in the proper retention times and with the proper characteristic quantitation ions.

When $\overline{RF_x}$ is used, calculate the extract concentration as follows:

$$C_{ex} = \frac{(Resp_x)(Amt_{ISTD})}{(Resp_{ISTD})(\overline{RF_x})}$$

Where: C_{ex} = the concentration in the sample extract (ppb);
$Resp_x$ = the peak area of the analytes of interest;
$Resp_{ISTD}$ = the peak area of the associated internal standard;
Amt_{ISTD} = the amount, in ppb, of internal standard added
$\overline{RF_x}$ = the average response from the initial calibration.

13.3.2. The concentration of analytes in the original sample is computed using the following equations:

Aqueous Samples: $Concentration\ (\mu g / L) = \frac{(Cex)\ (Vf)\ (D)}{(Vs)}$

Where
Cex = Concentration in extract in ng/mL
Vf = Final volume of extract in mL
D = Dilution factor
Vs = Volume of sample extracted, liters

Nonaqueous Samples: $Concentration\ (ug/Kg) = \frac{(Cex)\ (Vf)\ (D)}{(W)}$

Where
Cex = Concentration in extract in ng/mL
Vf = Final volume of extract in mL
D = Dilution factor
W = Weight of sample extracted in grams.

13.4. Data Review

Following primary data interpretation and calculations, all data is reviewed by a secondary analyst. Following generation of the report, the report is also reviewed. Refer to the SOP for *Laboratory Data Review Process* for details.

13.5. Reporting

Reports are generated in the CAS LIMS by compiling the SMO login, sample prep database, instrument, date, and client-specified report requirements (when specified). This compilation is then transferred to a file which the Stealth reporting system uses to generate a report. The forms generated may be CAS standard reports, DOD, or client-specific reports. The compiled data from LIMS is also used to create EDDs.

14. CONTINGENCIES FOR HANDLING OUT-OF- CONTROL OR UNACCEPTABLE DATA

Corrective action measures applicable to specific analysis steps are discussed in the applicable section of this (and other applicable) SOP(s). Also, refer to the SOP for *Nonconformity and Corrective Action* for correct procedures for identifying and documenting such data. Procedures for applying data qualifiers are described in the SOP for *Report Generation* or in project-specific requirements.

15. METHOD PERFORMANCE

15.1. This method was validated through single laboratory studies of accuracy and precision. Refer to the reference method for additional method performance data available.

15.2. The method detection limit (MDL) is established using the procedure described in the SOP for *the Determination of Method Detection Limits and Limits of Detection* (ADM-MDL). Method Reporting Limits are established for this method based on MDL studies and as specified in the CAS Quality Assurance Manual.

16. POLLUTION PREVENTION

It is the laboratory's practice to minimize the amount of solvents and reagents used to perform this method wherever technically sound, feasibly possible, and within method requirements. Standards are prepared in volumes consistent with laboratory use in order to minimize the volume of expired standards to be disposed of. The threat to the environment from solvents and/or reagents used in this method may be minimized when recycled or disposed of properly.

17. WASTE MANAGEMENT

17.1. The laboratory will comply with all Federal, State and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions as specified in the CAS EH&S Manual.

17.2. This method uses Methylene Chloride and any waste generated from this solvent must be placed in the collection cans in the lab. The solvent will then be added to the hazardous waste storage area and recycled off site.

18. TRAINING OUTLINE

18.1. The following items provide guidelines for training analysts.

18.1.1. Review applicable literature (method references, etc.) and this SOP. Review the MSDS for all chemicals used in the analysis.

18.1.2. Observe the procedure as performed by an experienced analyst at least three times.

18.1.3. Assist in the procedure under the guidance of an experienced analyst for at least one month, preferably three months. During this training period, the analyst is expected to progress from a role of assisting to a role of performing the procedure with minimal oversight. Following this training period, the analyst is expected to complete an Initial Precision and Recovery (IPR) study as described in Section 12.1 for both solid and water matrices. Documentation of the IPR study should be forwarded to the analyst's training file.

19. REFERENCES

Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry, Method 8270C, EPA Test Methods for Evaluating Solid Waste, SW-846, Final Update III, December 1996.

TABLE 1

SEMI-VOLATILE ORGANIC COMPOUNDS - STANDARD ANALYTE LIST				
	METHOD REPORTING LIMITS		METHOD DETECTION LIMITS	
Compound	**Water (µg/L)**	**Soil (ug/Kg)**	**Water (µg/L)**	**Soil (ug/Kg)**
Bis(2-chloroethyl) Ether	0.2	10	0.02	3
1,2-Dichlorobenzene	0.2	10	0.02	3
1,3-Dichlorobenzene	0.2	10	0.02	3
1,4-Dichlorobenzene	0.2	10	0.02	3
Bis(2-chloroisopropyl) Ether	0.2	10	0.02	3
N-Nitrosodi-n-propylamine	0.2	10	0.04	4
Hexachloroethane	0.2	10	0.02	3
Nitrobenzene	0.2	10	0.01	3
Isophorone	0.2	10	0.01	4
Bis(2-chloroethoxy)methane	0.2	10	0.02	4
1,2,4-Trichlorobenzene	0.2	10	0.02	3
Naphthalene	0.2	10	0.02	2
4-Chloroaniline	0.2	10	0.02	2
Hexachlorobutadiene	0.2	10	0.02	3
2-Methylnaphthalene	0.2	10	0.02	3
Hexachlorocyclopentadiene	1	50	0.05	10
2-Chloronaphthalene	0.2	10	0.02	3
2-Nitroaniline	0.2	20	0.02	3
Dimethyl Phthalate	0.2	10	0.02	3
Acenaphthylene	0.2	10	0.02	2
3-Nitroaniline	1	20	0.3	4
Acenaphthene	0.2	10	0.01	3
Dibenzofuran	0.2	10	0.02	3
2,4-Dinitrotoluene	0.2	10	0.02	3
2,6-Dinitrotoluene	0.2	10	0.01	3
Diethyl Phthalate	0.2	10	0.03	4
4-Chlorophenyl Phenyl Ether	0.2	10	0.01	3
Fluorene	0.2	10	0.02	3

TABLE 1 (continued)

SEMI-VOLATILE ORGANIC COMPOUNDS - STANDARD ANALYTE LIST				
	METHOD REPORTING LIMITS		METHOD DETECTION LIMITS	
Compound	Water (µg/L)	Soil (ug/Kg)	Water (µg/L)	Soil (ug/Kg)
4-Nitroaniline	1	20	0.2	4
N-Nitrosodiphenylamine	0.2	10	0.03	3
4-Bromophenyl Phenyl Ether	0.2	10	0.02	3
Hexachlorobenzene	0.2	10	0.02	4
Phenanthrene	0.2	10	0.02	3
Anthracene	0.2	10	0.02	3
Di-n-butyl Phthalate	0.2	10	0.03	3
Fluoranthene	0.2	10	0.02	3
Pyrene	0.2	10	0.02	3
Butylbenzyl Phthalate	0.2	10	0.03	2
3,3'-Dichlorobenzidine	2	100	0.5	5
Benz(a)anthracene	0.2	10	0.02	2
Bis(2-ethylhexyl) Phthalate	2	200	0.3	2
Chrysene	0.2	10	0.02	2
Di-n-octyl Phthalate	0.2	10	0.04	2
Benzo(b)fluoranthene	0.2	10	0.02	1
Benzo(k)fluoranthene	0.2	10	0.02	2
Benzo(a)pyrene	0.2	10	0.02	1
Indeno(1,2,3-c,d)pyrene	0.2	10	0.03	1
Dibenz(a,h)anthracene	0.2	10	0.04	1
Benzo(g,h,i)perylene	0.2	10	0.02	2
Azobenzene	0.2	10	0.02	3
Carbazole	0.2	10	0.02	2
Phenol	0.5	30	0.02	3
2-Chlorophenol	0.5	10	0.02	3
Benzyl Alcohol	5	10	1	3
2-Methylphenol	0.5	10	0.06	3
3- and 4-Methylphenol (coeluting cpds)	0.5	10	0.06	3
2-Nitrophenol	0.5	10	0.02	3

TABLE 1 (continued)

SEMI-VOLATILE ORGANIC COMPOUNDS - STANDARD ANALYTE LIST				
	METHOD REPORTING LIMITS		METHOD DETECTION LIMITS	
Compound	**Water (µg/L)**	**Soil (ug/Kg)**	**Water (µg/L)**	**Soil (ug/Kg)**
2,4-Dimethylphenol	2	50	0.4	20
Benzoic Acid	5	200	2	20
2,4-Dichlorophenol	0.5	10	0.03	3
4-Chloro-3-methylphenol	0.5	10	0.03	3
2,4,6-Trichlorophenol	0.5	10	0.04	4
2,4,5-Trichlorophenol	0.5	10	0.03	4
2,4-Dinitrophenol	4	200	0.6	20
4-Nitrophenol	2	100	0.6	3
2-Methyl-4,6-dinitrophenol	2	100	0.02	4
Pentachlorophenol	1	100	0.03	3

TABLE 2
DFTPP KEY IONS AND ION ABUNDANCE CRITERIA

Method 8270C Ion Abundance Criteria		CLP OLM04.2 Ion Abundance Criteria	
Mass	Ion Abundance Criteria	Mass	Ion Abundance Criteria
51	30-60% of mass 198	51	30-80% of mass 198
68	< 2% of mass 69	68	<2% of mass 69
70	< 2% of mass 69	69	Present
127	40-60% of mass 198	70	<2% of mass 69
197	< 1% of mass 198	127	25-75% of mass 198
198	Base peak,100% relative abundance	197	<1% of mass 198
199	5-9% of mass 198	198	Base peak,100% relative abundance
275	10-30% of mass 198	199	5-9% of mass 198
365	> 1% of mass 198	275	10-30% of mass 198
441	Present but less than mass 443	365	>0.75% of mass 198
442	> 40% of mass 198	441	Present, but less than mass 443
443	17-23% of mass 442	442	40-110% of mass 198
		443	15-24% of mass 442

TABLE 2A
DFTPP KEY IONS AND ION ABUNDANCE CRITERIA
FOR **5973** GC/MS SYSTEMS

Mass	Ion Abundance Criteria
51	10-80% of mass 198
68	0-2% of mass 69
70	0-2% of mass 69
127	10-80% of 198
197	0-2% of 198
198	30-100% of 442 (alternate base)
199	5-9% of 198
275	10-60% of 198
365	1-50% of 442
441	0.01-100% of 443
442	30-100% of 198 (alternate base)
443	15-24% of 442

Alternate tuning criteria (from Method 525.2 or CLP OLM04.2) may be used provided that method performance is not adversely affected and that method performance criteria is met. The criteria used must be the same for **all** ion abundance criteria checks associated with a given analysis. For example, initial calibration, continuing calibration(s), QC, and sample analyses for a given sample must all use the same criteria.

TABLE 3
8270-LL STANDARDS

CALIBRATION

Prepare 1 ml of each calibration point from a new unopened ampule. The calibration curve is prepared from the following Supelco stock standards (or equivalent from other vendors*):
Equity 8270 Mix 1, Equity 8270 Mix 4, Equity Benzidines Mix, Equity N-Nitrosodiphenylamine, and 8270 Surrogates Mix.
Calibration curve: 0.1 ppm, .2/.5ppm, .5/1ppm, 1/2ppm, 2/4ppm, 3/6ppm, 4/8ppm, and 5/10ppm with the phenols and benzidines at the higher concentration listed in each standard.
Add internal standard when curve is prepared.
Place in amber autosampler vial, cap.
Store at -10°C. Expiration is 1 year from date prepared.
Order more solutions when down to one unopened ampule.

ICV
Recommended: AccuStandard catalog #(or equivalent from other vendors*):

CLP-HC-BN-R	1 ml x 2 2000 ppm BN mix
CLP-HC-A-PAK	1 ml x 2 2000 ppm Acid composite mix
Z-014E-R3	1 ml x 2 2000 ppm Composite 3 mix
M-8270-SS-PAK	1 ml x 5 4000 ppm Surrogates mix
Z-014J	1 ml x 5 4000 ppm Internal standards mix
M-625C	1 ml x 3 25000 ppm DFTPP
Z-014F	1 ml x 2 2000 ppm Benzidines mix

Add 10 µl internal standard for each 1 ml of ICV prepared.
Place in autosampler vial, analyze, recap, and refrigerate.
Expiration is 1 week after ICV was prepared.

CCV & TUNE
Use the same solutions that were used for the calibration curve and the following:

AccuStandard (recommended) catalog #(or equivalent from other vendors*):

M-625C-3-1000X	1 ml 25 mg/ml DFTPP

Prepare 1 ml of 2/4ppm 8270 CCV standard, place in autosampler vial and cap with crimp top.
Expiration date is 1 week after CCV was prepared.

RECAP AND STORE IMMEDIATELY AFTER INJECTING
Store remaining stock solutions in 1 ml amber mininert vial. Expiration date is six months after ampule is opened. Order when down to one unopened ampule.

* Vendor must be A2LA and/or ISO9000 certified.

TABLE 4
QC Standards

Surrogate Spiking Solution					
Parent	Initial Concentration	Aliquot	Final Volume	Final Concentration	Solvent
8-61377*	5000 ug/mL	20 mL	1000 mL **	100 ug/mL	Methanol
8-61376*	10000 ug/mL	15 mL	↓	150 ug/mL	↓
S-8522*	5000 ug/mL	20 mL	↓	100 ug/mL	↓
Expiration – Unopened = 6 months from prep date. Opened = 3 months from open or prep date, whichever is sooner. When opening, write the new expiration date on the bottle and in the standards logbook, initial, and date.					
* 8-61377 – Supelco BN Surrogate Standard (custom mix) – reorder 4 at a time					
* 8-61376 – Supelco Acids Surrogate Standard (custom mix) – reorder 3 at a time					
* S-8522 – Accustandard custom – reorder 4 at a time.					
** Split into 4 – 250 mL bottles.					
LCS/MS Spiking Solution					
Parent	Initial Concentration	Aliquot	Final Volume	Final Concentration	Solvent
8-61378*	1000 ug/mL	10 mL	100 mL **	100 ug/mL	Methanol
20198962*	1000 ug/mL	10 mL	↓	100 ug/mL	↓
Expiration – Unopened = 6 months from prep date. Opened = 3 months from open or prep date, whichever is sooner. When opening, write the new expiration date on the bottle and in the standards logbook, initial, and date.					
* 8-61379 – Supelco CLP Semivolatiles Calib. Mix – reorder 2 at a time					
* 20198962 – Custom mix – reorder 2 at a time					
** Split into 2 – 50 mL bottles.					

TABLE 5
SEMIVOLATILE INTERNAL STANDARDS WITH CORRESPONDING ANALYTES ASSIGNED FOR QUANTITATION

1,4-Dichlorobenzene-d4 Internal Standard		
N-Nitrosodimethylamine	2-Chlorophenol	N-Nitrosodi-n-propylamine
Aniline	Benzyl Alcohol	Hexachloroethane
2-Fluorophenol (surrogate)	Pyridine	2-Methylphenol
Bis(2-chloroethyl) Ether	1,2-Dichlorobenzene	3- and 4-Methylphenol (coeluting cpds)
Phenol-d5 (surrogate)	1,3-Dichlorobenzene	Bis(2-chloroisopropyl) Ether
Phenol	1,4-Dichlorobenzene	
Naphthalene-d8 Internal Standard		
Nitrobenzene-d5(surrogate)	Naphthalene	2,4-Dimethylphenol
Nitrobenzene	4-Chloroaniline	Benzoic Acid
Isophorone	Hexachlorobutadiene	2,4-Dichlorophenol
Bis(2-chloroethoxy)methane	2-Methylnaphthalene	4-Chloro-3-methylphenol
1,2,4-Trichlorobenzene	2-Nitrophenol	
Acenaphthene-d10 Internal Standard		
2-Fluorobiphenyl (surrogate)	Acenaphthylene	Fluorene
Hexachlorocyclopentadiene	Acenaphthene	4-Nitrophenol
2-Chloronaphthalene	Dibenzofuran	2,4,6-Trichlorophenol
2-Nitroaniline	2,4-Dinitrotoluene	2,4,5-Trichlorophenol
3-Nitroaniline	2,6-Dinitrotoluene	2,4-Dinitrophenol
4-Nitroaniline	Diethyl Phthalate	Azobenzene
Dimethyl Phthalate	4-Chlorophenyl Phenyl Ether	2,4,6-Tribromophenol (surrogate)
Pnenanthrene-d10 Internal Standard		
N-Nitrosodiphenylamine	Anthracene	Pentachlorophenol
4-Bromophenyl Phenyl Ether	Di-n-butyl Phthalate	Carbazole
Hexachlorobenzene	Fluoranthene	
Phenanthrene	2-Methyl-4,6-dinitrophenol	

TABLE 5 continued

Chrysene-d12 Internal Standard		
Pyrene	Benz(a)anthracene	Terphenyl-d14 (surrogate)
Butylbenzyl Phthalate	Bis(2-ethylhexyl) Phthalate	
3,3'-Dichlorobenzidine	Chrysene	
Perylene-d12 Internal Standard		
Di-n-octyl Phthalate	Benzo(a)pyrene	Benzo(g,h,i)perylene
Benzo(b)fluoranthene	Indeno(1,2,3-c,d)pyrene	
Benzo(k)fluoranthene	Dibenz(a,h)anthracene	

ATTACHMENT A
QC Acceptance Criteria

SEMIVOLATILE ORGANICS ANALYSES						
Method	Prep Method	Matrix	Analyte	LCS Accuracy (% Rec.)	Matrix Spike (% Rec.)	Precision (RPD)
8270C-LL	3541	Soil-LL	1,2,4,5-Tetrachlorobenzene	47-95	33-119	40
8270C-LL	3541	Soil-LL	1,2,4-Trichlorobenzene	40-91	10-80	40
8270C-LL	3541	Soil-LL	1,2-Dichlorobenzene	39-91	10-75	40
8270C-LL	3541	Soil-LL	1,3-Dichlorobenzene	36-89	10-70	40
8270C-LL	3541	Soil-LL	1,4-Dichlorobenzene	37-87	10-72	40
8270C-LL	3541	Soil-LL	2,4,5-Trichlorophenol	37-103	17-133	40
8270C-LL	3541	Soil-LL	2,4,6-Trichlorophenol	37-100	14-132	40
8270C-LL	3541	Soil-LL	2,4-Dichlorophenol	36-100	19-109	40
8270C-LL	3541	Soil-LL	2,4-Dimethylphenol	10-63	10-92	40
8270C-LL	3541	Soil-LL	2,4-Dinitrophenol	14-111	10-166	40
8270C-LL	3541	Soil-LL	2,4-Dinitrotoluene	52-107	30-120	40
8270C-LL	3541	Soil-LL	2,6-Dinitrotoluene	50-98	28-116	40
8270C-LL	3541	Soil-LL	2-Chloronaphthalene	40-94	16-105	40
8270C-LL	3541	Soil-LL	2-Chlorophenol	35-98	10-116	40
8270C-LL	3541	Soil-LL	2-Methyl-4,6-dinitrophenol	30-114	10-119	40
8270C-LL	3541	Soil-LL	2-Methylnaphthalene	41-87	10-109	40
8270C-LL	3541	Soil-LL	2-Methylphenol	30-91	10-105	40
8270C-LL	3541	Soil-LL	2-Nitroaniline	44-96	24-117	40
8270C-LL	3541	Soil-LL	2-Nitrophenol	37-100	18-101	40
8270C-LL	3541	Soil-LL	3,3'-Dichlorobenzidine	22-94	10-62	40
8270C-LL	3541	Soil-LL	3-Nitroaniline	43-93	10-91	40
8270C-LL	3541	Soil-LL	4-Bromophenyl Phenyl Ether	47-96	21-117	40
8270C-LL	3541	Soil-LL	4-Chloro-3-methylphenol	36-102	17-120	40
8270C-LL	3541	Soil-LL	4-Chloroaniline	26-78	10-62	40
8270C-LL	3541	Soil-LL	4-Chlorophenyl Phenyl Ether	44-97	23-111	40
8270C-LL	3541	Soil-LL	4-Methylphenol	28-94	10-114	40
8270C-LL	3541	Soil-LL	4-Nitroaniline	40-100	10-104	40
8270C-LL	3541	Soil-LL	4-Nitrophenol	35-120	22-128	40
8270C-LL	3541	Soil-LL	Acenaphthene	44-92	10-132	40
8270C-LL	3541	Soil-LL	Acenaphthylene	49-100	11-130	40
8270C-LL	3541	Soil-LL	Acetophenone	49-96	11-140	40
8270C-LL	3541	Soil-LL	Aniline	10-70	10-47	40
8270C-LL	3541	Soil-LL	Anthracene	51-97	10-135	40
8270C-LL	3541	Soil-LL	Atrazine	43-126	18-153	40
8270C-LL	3541	Soil-LL	Azobenzene	40-101	31-96	40
8270C-LL	3541	Soil-LL	Benz(a)anthracene	58-106	10-136	40
8270C-LL	3541	Soil-LL	Benzaldehyde	20-95	10-105	40
8270C-LL	3541	Soil-LL	Benzo(a)pyrene	56-107	10-152	40

SEMIVOLATILE ORGANICS ANALYSES						
Method	Prep Method	Matrix	Analyte	LCS Accuracy (% Rec.)	Matrix Spike (% Rec.)	Precision (RPD)
8270C-LL	3541	Soil-LL	Benzo(b)fluoranthene	56-104	10-156	40
8270C-LL	3541	Soil-LL	Benzo(g,h,i)perylene	27-121	10-146	40
8270C-LL	3541	Soil-LL	Benzo(k)fluoranthene	58-106	19-131	40
8270C-LL	3541	Soil-LL	Benzoic Acid	10-88	10-124	40
8270C-LL	3541	Soil-LL	Benzyl Alcohol	35-88	21-95	40
8270C-LL	3541	Soil-LL	Biphenyl	44-98	13-133	40
8270C-LL	3541	Soil-LL	Bis(2-chloroethoxy)methane	42-89	24-95	40
8270C-LL	3541	Soil-LL	Bis(2-chloroethyl) Ether	41-89	10-122	40
8270C-LL	3541	Soil-LL	Bis(2-chloroisopropyl) Ether	35-90	10-91	40
8270C-LL	3541	Soil-LL	Bis(2-ethylhexyl) Phthalate	47-124	10-150	40
8270C-LL	3541	Soil-LL	Butyl Benzyl Phthalate	48-119	21-130	40
8270C-LL	3541	Soil-LL	Caprolactam	23-113	10-197	40
8270C-LL	3541	Soil-LL	Carbazole	53-104	25-119	40
8270C-LL	3541	Soil-LL	Chrysene	57-111	10-139	40
8270C-LL	3541	Soil-LL	Di-n-butyl Phthalate	51-111	15-133	40
8270C-LL	3541	Soil-LL	Di-n-octyl Phthalate	41-123	28-122	40
8270C-LL	3541	Soil-LL	Dibenz(a,h)anthracene	55-107	10-148	40
8270C-LL	3541	Soil-LL	Dibenzofuran	44-91	10-129	40
8270C-LL	3541	Soil-LL	Diethyl Phthalate	48-107	23-123	40
8270C-LL	3541	Soil-LL	Dimethyl Phthalate	48-99	24-118	40
8270C-LL	3541	Soil-LL	Fluoranthene	53-108	10-150	40
8270C-LL	3541	Soil-LL	Fluorene	46-97	10-172	40
8270C-LL	3541	Soil-LL	Hexachlorobenzene	46-103	31-111	40
8270C-LL	3541	Soil-LL	Hexachlorobutadiene	37-92	10-93	40
8270C-LL	3541	Soil-LL	Hexachlorocyclopentadiene	21-98	10-75	40
8270C-LL	3541	Soil-LL	Hexachloroethane	37-90	10-89	40
8270C-LL	3541	Soil-LL	Indeno(1,2,3-cd)pyrene	55-107	10-130	40
8270C-LL	3541	Soil-LL	Isophorone	47-101	29-108	40
8270C-LL	3541	Soil-LL	N-Nitrosodi-n-propylamine	40-100	18-111	40
8270C-LL	3541	Soil-LL	N-Nitrosodimethylamine	31-103	21-101	40
8270C-LL	3541	Soil-LL	N-Nitrosodiphenylamine	47-108	22-130	40
8270C-LL	3541	Soil-LL	Naphthalene	41-90	10-113	40
8270C-LL	3541	Soil-LL	Nitrobenzene	40-91	20-92	40
8270C-LL	3541	Soil-LL	Pentachlorophenol	22-100	10-145	40
8270C-LL	3541	Soil-LL	Phenanthrene	50-96	10-147	40
8270C-LL	3541	Soil-LL	Phenol	35-102	14-114	40
8270C-LL	3541	Soil-LL	Pyrene	50-108	10-136	40
8270C-LL	3541	Soil-LL	Pyridine	10-68	70-130	40

SEMIVOLATILE ORGANICS ANALYSES							
Method	Prep Method	Matrix	Analyte		LCS Accuracy (% Rec.)	Matrix Spike (% Rec.)	Precision (RPD)
8270C-LL	3541	Soil-LL	2,4,6-Tribromophenol (Surr.)	16-122	NA	NA	NA
8270C-LL	3541	Soil-LL	2-Fluorobiphenyl (Surr.)	10-107	NA	NA	NA
8270C-LL	3541	Soil-LL	2-Fluorophenol (Surr.)	12-88	NA	NA	NA
8270C-LL	3541	Soil-LL	Nitrobenzene-d5 (Surr.)	10-97	NA	NA	NA
8270C-LL	3541	Soil-LL	Phenol-d6 (Surr.)	20-101	NA	NA	NA
8270C-LL	3541	Soil-LL	Terphenyl-d14 (Surr.)	28-135	NA	NA	NA
8270C-LL	3520C	Water-LL	1,2,4,5-Tetrachlorobenzene		70-130	70-130	30
8270C-LL	3520C	Water-LL	1,2,4-Trichlorobenzene		38-94	26-96	30
8270C-LL	3520C	Water-LL	1,2-Dichlorobenzene		40-91	24-96	30
8270C-LL	3520C	Water-LL	1,3-Dichlorobenzene		34-84	19-87	30
8270C-LL	3520C	Water-LL	1,4-Dichlorobenzene		35-84	21-87	30
8270C-LL	3520C	Water-LL	2,4,5-Trichlorophenol		64-129	56-135	30
8270C-LL	3520C	Water-LL	2,4,6-Trichlorophenol		65-127	48-139	30
8270C-LL	3520C	Water-LL	2,4-Dichlorophenol		57-134	43-134	30
8270C-LL	3520C	Water-LL	2,4-Dimethylphenol		14-116	10-181	30
8270C-LL	3520C	Water-LL	2,4-Dinitrophenol		10-125	20-203	30
8270C-LL	3520C	Water-LL	2,4-Dinitrotoluene		71-130	56-149	30
8270C-LL	3520C	Water-LL	2,6-Dinitrotoluene		70-121	63-138	30
8270C-LL	3520C	Water-LL	2-Chloronaphthalene		48-106	47-111	30
8270C-LL	3520C	Water-LL	2-Chlorophenol		64-130	46-129	30
8270C-LL	3520C	Water-LL	2-Methyl-4,6-dinitrophenol		22-149	26-165	30
8270C-LL	3520C	Water-LL	2-Methylnaphthalene		47-101	42-101	30
8270C-LL	3520C	Water-LL	2-Methylphenol		54-125	27-151	30
8270C-LL	3520C	Water-LL	2-Nitroaniline		64-118	10-160	30
8270C-LL	3520C	Water-LL	2-Nitrophenol		57-139	52-141	30
8270C-LL	3520C	Water-LL	3,3'-Dichlorobenzidine		37-121	70-130	30
8270C-LL	3520C	Water-LL	3-Nitroaniline		52-129	10-146	30
8270C-LL	3520C	Water-LL	4-Bromophenyl Phenyl Ether		64-110	47-122	30
8270C-LL	3520C	Water-LL	4-Chloro-3-methylphenol		59-133	17-166	30
8270C-LL	3520C	Water-LL	4-Chloroaniline		46-102	10-110	30
8270C-LL	3520C	Water-LL	4-Chlorophenyl Phenyl Ether		60-114	48-118	30
8270C-LL	3520C	Water-LL	4-Methylphenol		52-129	24-155	30
8270C-LL	3520C	Water-LL	4-Nitroaniline		56-122	10-127	30
8270C-LL	3520C	Water-LL	4-Nitrophenol		65-135	45-185	30
8270C-LL	3520C	Water-LL	Acenaphthene		62-107	38-118	30
8270C-LL	3520C	Water-LL	Acenaphthylene		66-119	43-130	30
8270C-LL	3520C	Water-LL	Acetophenone		53-123	65-135	30
8270C-LL	3520C	Water-LL	Aniline		10-103	70-130	30

SEMIVOLATILE ORGANICS ANALYSES						
Method	Prep Method	Matrix	Analyte	LCS Accuracy (% Rec.)	Matrix Spike (% Rec.)	Precision (RPD)
8270C-LL	3520C	Water-LL	Anthracene	65-105	11-143	30
8270C-LL	3520C	Water-LL	Atrazine	70-130	70-130	30
8270C-LL	3520C	Water-LL	Azobenzene	66-112	70-130	30
8270C-LL	3520C	Water-LL	Benz(a)anthracene	73-111	32-130	30
8270C-LL	3520C	Water-LL	Benzaldehyde	70-130	58-121	30
8270C-LL	3520C	Water-LL	Benzo(a)pyrene	67-111	25-131	30
8270C-LL	3520C	Water-LL	Benzo(b)fluoranthene	68-112	29-136	30
8270C-LL	3520C	Water-LL	Benzo(g,h,i)perylene	71-116	24-145	30
8270C-LL	3520C	Water-LL	Benzo(k)fluoranthene	70-115	31-133	30
8270C-LL	3520C	Water-LL	Benzoic Acid	10-74	10-177	30
8270C-LL	3520C	Water-LL	Benzyl Alcohol	59-109	28-145	30
8270C-LL	3520C	Water-LL	Biphenyl	70-130	70-130	30
8270C-LL	3520C	Water-LL	Bis(2-chloroethoxy)methane	62-116	57-119	30
8270C-LL	3520C	Water-LL	Bis(2-chloroethyl) Ether	65-118	54-120	30
8270C-LL	3520C	Water-LL	Bis(2-chloroisopropyl) Ether	55-118	20-154	30
8270C-LL	3520C	Water-LL	Bis(2-ethylhexyl) Phthalate	65-124	26-167	30
8270C-LL	3520C	Water-LL	Butyl Benzyl Phthalate	69-121	48-136	30
8270C-LL	3520C	Water-LL	Caprolactam	70-130	70-130	30
8270C-LL	3520C	Water-LL	Carbazole	72-115	48-131	30
8270C-LL	3520C	Water-LL	Chrysene	70-115	42-135	30
8270C-LL	3520C	Water-LL	Di-n-butyl Phthalate	76-114	52-132	30
8270C-LL	3520C	Water-LL	Di-n-octyl Phthalate	66-122	49-130	30
8270C-LL	3520C	Water-LL	Dibenz(a,h)anthracene	72-114	27-142	30
8270C-LL	3520C	Water-LL	Dibenzofuran	59-109	50-120	30
8270C-LL	3520C	Water-LL	Diethyl Phthalate	72-120	42-146	30
8270C-LL	3520C	Water-LL	Dimethyl Phthalate	72-115	52-141	30
8270C-LL	3520C	Water-LL	Fluoranthene	69-117	33-151	30
8270C-LL	3520C	Water-LL	Fluorene	64-113	46-132	30
8270C-LL	3520C	Water-LL	Hexachlorobenzene	61-118	45-122	30
8270C-LL	3520C	Water-LL	Hexachlorobutadiene	17-85	10-79	30
8270C-LL	3520C	Water-LL	Hexachlorocyclopentadiene	10-67	10-65	30
8270C-LL	3520C	Water-LL	Hexachloroethane	24-80	10-93	30
8270C-LL	3520C	Water-LL	Indeno(1,2,3-cd)pyrene	74-113	26-143	30
8270C-LL	3520C	Water-LL	Isophorone	68-131	50-146	30
8270C-LL	3520C	Water-LL	N-Nitrosodi-n-propylamine	61-124	44-149	30
8270C-LL	3520C	Water-LL	N-Nitrosodimethylamine	44-151	70-130	30
8270C-LL	3520C	Water-LL	N-Nitrosodiphenylamine	69-125	10-143	30
8270C-LL	3520C	Water-LL	Naphthalene	55-103	44-107	30

SEMIVOLATILE ORGANICS ANALYSES							
Method	**Prep Method**	**Matrix**	**Analyte**		**LCS Accuracy (% Rec.)**	**Matrix Spike (% Rec.)**	**Precision (RPD)**
8270C-LL	3520C	Water-LL	Nitrobenzene		65-113	44-152	30
8270C-LL	3520C	Water-LL	Pentachlorophenol		23-130	38-150	30
8270C-LL	3520C	Water-LL	Phenanthrene		67-107	53-120	30
8270C-LL	3520C	Water-LL	Phenol		61-134	22-158	30
8270C-LL	3520C	Water-LL	Pyrene		67-114	24-144	30
8270C-LL	3520C	Water-LL	Pyridine		32-100	70-130	30
8270C-LL	3520C	Water-LL	2,4,6-Tribromophenol (Surr.)	43-144	NA	NA	NA
8270C-LL	3520C	Water-LL	2-Fluorobiphenyl (Surr.)	45-120	NA	NA	NA
8270C-LL	3520C	Water-LL	2-Fluorophenol (Surr.)	41-118	NA	NA	NA
8270C-LL	3520C	Water-LL	Nitrobenzene-d5 (Surr.)	46-130	NA	NA	NA
8270C-LL	3520C	Water-LL	Phenol-d6 (Surr.)	47-132	NA	NA	NA
8270C-LL	3520C	Water-LL	Terphenyl-d14 (Surr.)	43-150	NA	NA	NA

STANDARD OPERATING PROCEDURE

for

DETERMINATION OF METALS AND TRACE ELEMENTS BY INDUCTIVELY COUPLED PLASMA-MASS SPECTROMETRY (ICP-MS); EPA METHOD 6020

SOP No.: MET-6020

Revision: 9

November 20, 2006

Approved by: _____ Supervisor — 11/20/06 Date

_____ QA Manager — 11-20-06 Date

_____ Laboratory Manager — 11/20/06 Date

COLUMBIA ANALYTICAL SERVICES, INC.
1317 South 13th Avenue
Kelso, Washington 98626

Annual review of this SOP has been performed and the SOP still reflects current practice.
Initials: _____ Date: _____
Initials: _____ Date: _____
Initials: _____ Date: _____

DOCUMENT CONTROL

NUMBER: _____

Initials: _____ Date: _____

DETERMINATION OF METALS AND TRACE ELEMENTS BY INDUCTIVELY COUPLED PLASMA-MASS SPECTROMETRY (ICP-MS) EPA METHOD 6020

1 SCOPE AND APPLICATION

1.1. This procedure is used to determine the concentrations of certain elements in water, soil, tissues, aqueous and non-aqueous wastes, and sediment samples using EPA Method 6020. Table 1 indicates analytes that are typically determined by this procedure and lists the method reporting limits (MRLs) for each analyte in water and soil. Equivalent nomenclature for MRL includes Estimated Quantitation Limit (EQL) and Practical Quantitation Limit (PQL). Therefore, MRL=EQL=PQL. The reported MRL may be adjusted if required for specific project requirements, however, the capability of achieving other reported MRLs must be demonstrated. The complexity of the technique generally requires outside study of appropriate literature as well as specialized training by a qualified spectroscopist. The scope of this document does not allow for the in-depth descriptions of the relevant spectroscopic principles required for gaining a complete level of competence in this scientific discipline. Method Detection Limits (MDLs) that have been achieved are listed in Table 1. These may change as annual studies are performed.

2 SUMMARY OF METHOD

2.1 Discussion:

2.1.1 Prior to analysis, samples must be digested using appropriate sample preparation methods. The digestate is analyzed for the elements of interest using ICP-mass spectrometry (ICP-MS).

2.1.2 Method 6020 describes the multi-elemental determination of analytes by ICP-MS. The method measures ions produced by a radio-frequency inductively coupled plasma. Analyte species originating in a liquid are nebulized and the resulting aerosol transported by argon gas into the plasma torch. The ions produced are entrained in the plasma gas and introduced, by means of an interface, into a mass spectrometer. The ions produced in the plasma are sorted according to their mass-to-charge ratios and quantified with a channel electron multiplier. Interferences must be assessed and valid corrections applied or the data flagged to indicate problems. Interference correction must include compensation for background ions contributed by the plasma gas, reagents, and constituents of the sample matrix.

2.2 Deviations from the reference method(s):

2.2.1 The concentration of interfering elements in the ICSA and ICSAB solutions are spiked at levels 10 times lower than recommended in Table 2 of Method 6020. Running the full strength solutions introduces too much material into the ICP-MS system when trying to conduct low level analysis.

2.2.2 The ICV solution is not at the midpoint of the linear range which may be as high as 1000 µg/L for some elements. The ICV solution used is a premixed standard purchased from Inorganic Ventures and contains the elements of interest between 2.5 and 100 µg/L. This solution provides calibration confirmation at more reasonable levels, given that most ICP-MS analysis are quantifying analytes in the low-ppb to sub-ppb range.

2.2.3 Section 8.8.4 of the method states that the CCB must be controlled to <3 times the IDL. The IDL, which are calculated from the analysis of reagent blank, are in most cases too low to be used as a control criteria for analyzing environmental samples. The effects of sample matrices on the baseline values can be great in relation to the IDLs. The CCBs are controlled to the CAS MRL (thus minimizing any negative impact on the data) and in cases where the CCB value is greater than the MRL the effected data is evaluated for usability (i.e. are the sample levels greater than 20 times the level in the CCB.).

3 DEFINITIONS

3.1 **Analysis Sequence** - Samples are analyzed in a set referred to as an analysis sequence. The sequence begins with instrument calibration followed by sample digestates interspersed with calibration standards.

3.2 **Independent Calibration Verification (ICV)** - ICV solutions are made from a stock solution which is different from the stock used to prepare calibration standards and is used to verify the validity of the standardization.

3.3 **Matrix Spike** (MS) - In the matrix spike analysis, predetermined quantities of standard solutions of certain analytes are added to a sample matrix prior to sample digestion and analysis. The purpose of the matrix spike is to evaluate the effects of the sample matrix on the methods used for the analyses. Percent recoveries are calculated for each of the analytes detected.

3.4 **Matrix Spike Duplicate** (MSD) - In the matrix spike duplicate analysis, predetermined quantities of standard solutions of certain analytes are added to a sample matrix prior to sample digestion and analysis. The purpose of the matrix spike duplicate is to evaluate the effects of the sample matrix on the methods used for the analyses. Percent recoveries are calculated for each of the analytes detected. The relative percent difference between the matrix spikes is calculated and used to assess analytical precision.

3.5 **Duplicate Sample** (DUP) - A laboratory duplicate. The duplicate sample is a separate field sample aliquot that is processed in an identical manner as the sample proper. The relative percent difference between the samples is calculated and used to assess analytical precision.

3.6 **Method Blank** - The method blank is an artificial sample designed to monitor introduction of artifacts into the process. The method blank is carried through the entire analytical procedure.

3.7 **Continuing Calibration Verification Standard (CCV)** - A standard analyzed at specified intervals and used to verify the ongoing validity of the instrument calibration.

3.8 **Instrument Blank (CCB)** - The instrument blank (also called continuing calibration blank) is a volume of blank reagent of composition identical to the digestates. The purpose of the CCB is to determine the levels of contamination associated with the instrumental analysis.

4 INTERFERENCES

4.1 Isobaric elemental interferences in ICP-MS are caused by isotopes of different elements forming atomic ions with the same nominal mass-to-charge ratio (m/z). A data system must be used to correct for these interferences. This involves determining the signal for another isotope of the interfering element and subtracting the appropriate signal from the analyte isotope signal. Attention should be given to circumstances where very high ion currents at adjacent masses may contribute to ion signals at the mass of interest. Matrices exhibiting a significant problem of this type may require resolution improvement, matrix separation, or analysis using another isoptope.

4.2 Isobaric molecular and doubly-charged ion interferences in ICP-MS are caused by ions consisting of more than one atom or charge, respectively. Most isobaric interferences that could affect ICP-MS determinations have been identified in the literature. Refer to Method 6020 for further discussion.

5 SAFETY

5.1 All appropriate safety precautions for handling solvents, reagents and samples must be taken when performing this procedure. This includes the use of personnel protective equipment, such as, safety glasses, lab coat and the correct gloves.

5.2 Chemicals, reagents and standards must be handled as described in the CAS safety policies, approved methods and in MSDSs where available. Refer to the CAS Environmental, Health and Safety Manual and the appropriate MSDS prior to beginning this method.

5.3 Hydrochloric and/or Nitric Acid are used in this method. These acids are extremely corrosive and care must be taken while handling them. A face shield should be used while pouring

acids. And safety glasses should be worn while working with the solutions. Lab coat and gloves should always be worn while working with these solutions.

5.4 High Voltage - The RF generator supplies up to 2000 watts to maintain an ICP. The power is transferred through the load coil located in the torch box. Contact with the load coil while generator is in operation will likely result in death. When performing maintenance on the RF generator, appropriate grounding of all HV capacitors must be performed as per manufacturer.

5.5 UV Light - The plasma is an intense source of UV emission, and must not be viewed with the naked eye. Protective lenses are in place on the instrument. Glasses with special protective lenses are available when direct viewing of the plasma is necessary.

6 SAMPLE COLLECTION, CONTAINERS, PRESERVATION, AND STORAGE

6.1 Samples are generally received in the ICP-MS laboratory as 1-15% Nitric Acid digestates. Samples are stored in the appropriate volumetric containers.

6.2 Samples are prepared using methods 3020A or 3050 (CAS SOPs MET-3020A and MET-3050). Digestates originating from soil samples with greater than 60% solids are diluted prior to instrumental analysis by a factor of 5. This allows the analysis to achieve maximum sensitivity which results in optimum Method Reporting Limits (MRL). Digestates are neutralized prior to disposal through the sewer system, 2 weeks after data is reviewed. Following analysis, digestates are stored until all results have been reviewed.

7 APPARATUS & EQUIPMENT

7.1 Instruments: VG PQ-S (K-ICP-MS-01), Thermo Elemental ExCell (K-ICP-MS-02), or Thermo Elemental X-Series (K-ICP-MS-03).

7.2 Nebulizer: TJA Fixed Crossflow (PQ-S), or equivalent.

7.3 Spray Chamber: VG Water-cooled

7.4 Cones: Nickel Sampler (1.0 mm orifice)

7.5 Nickel Skimmer (0.75 mm orifice)

7.6 Peristaltic Pump

8 PREVENTIVE MAINTENANCE

8.1 All maintenance is documented in the instrument logbook. CAS/Kelso maintains a service contract with the instrument manufacturer that allows for an unlimited number of service calls and full reimbursement of all parts and labor.

8.2 Most routine maintenance and troubleshooting is performed by CAS staff. Preventive maintenance activities listed below should be performed when needed as determined by instrument performance (i.e. stability, sensitivity, etc.) or by visual inspection. Other maintenance or repairs may, or may not require factory service, depending on the nature of the task.

- cone removal and cleaning
- removal and cleaning of ICP glassware and fittings
- checking and cleaning RF contact strips
- checking air filters and cleaning if necessary
- checking the oil mist filters and cleaning if necessary
- checking the rotary pump oil and adding or changing if necessary
- removal and cleaning of extraction lens
- removal and cleaning of ion lens stack
- replace the electron multiplier as necessary

9 STANDARDS, REAGENTS, & CONSUMABLE MATERIALS

9.1 All standards are prepared from NIST traceable standards. The expiration dates are assigned according to Method 6020 and the vendor's assigned expiration dates. For example, working ICS solutions are prepared weekly in accordance with Method 6020, Section 5.6.1.

9.1.1 Stock Standard Solutions: The manufacturer, lot number, and expiration date of each stock standard is recorded in a bound logbook located in the room 113 of the Metals Department. Additionally each stock standard is given a unique, identifying name.

9.1.2 Intermediate Standard Solutions: Intermediate mixed stock solutions are made from the individual stock standards described above. The individual components of each mixed solution is recorded in a bound logbook located in the ICP-MS laboratory and mixed solution is given a unique, identifying name.

9.1.3 Calibration Standards: Calibration standards are made fresh daily from the intermediate standard solutions. Each individual intermediate standard used in the calibration standard is recorded in a bound logbook located in the ICP-MS laboratory, and the calibration standard solution is given a unique, identifying name. The calibration standards unique name is used on the raw data to link the data to the subsequent prepared standards and ultimately the original purchased stock standard.

9.2 Standards Preparation

9.2.1 Expiration of all standard solutions defaults to the earliest expiration date of an individual component unless otherwise specified.

9.2.2 Calibration Standards

The calibration standard is prepared from two intermediate stock solutions. These solutions are prepared in acid rinsed 1000 mL Class A volumetric flasks following the formulations laid out on the attached example standard sheet (see Attachments). The working calibration standard is made daily by aliquoting 2.5 mL of each of the intermediate solutions in to a 100 mL Class A volumetric flask and diluting to volume with 1% HNO3. This standard is also used as the Continuing Calibration Verification (CCV).

9.2.3 Initial Calibration Verification (ICV)

9.2.3.1 The ICV intermediate stock solution is prepared in an acid rinsed 100 mL Class A volumetric flask. The solution is prepared by adding 2.0 mL of Inorganic Ventures QCP-CICV-1, 1.0 mL each of QCP-CICV-2 and QCP-CICV-3, 1.0 mL of 1000 ppm Molybdenum stock solution, 1.0 mL of 1000 ppm Uranium stock solution and diluting to volume with 1% HNO3.

9.2.3.2 The working ICV solution is prepared by aliquoting 0.5 mL of the mixed ICV intermediate solution into an acid rinsed 100 mL Class A volumetric flask and diluting to volume with 1% HNO3.

9.2.4 Interference Check Solutions (ICSA and ICSAB)

9.2.4.1 The ICSA is prepared in an acid rinsed 50 mL Class A volumetric flask by aliquoting 0.5 mL of Inorganic Ventures 6020ICS-0A solution and diluting to volume with 1% HNO3.

9.2.4.2 The ICSAB is prepared in an acid rinsed 50 mL Class A volumetric flask by aliquoting 0.5 mL of Inorganic Ventures 6020ICS-0A and 0.5 mL of and of Inorganic Ventures 6020ICS-0B solutions and diluting to volume with 1% HNO3.

9.2.5 Post-digestion spikes are performed by adding appropriate amounts of the calibration intermediate solutions to aliquots of the sample digestate. The volumes of each standard used vary based on the native concentrations found in the field samples.

9.2.6 Refer to the appropriate digestion SOP for details of LCSW and matrix spike solution composition and preparation.

10 RESPONSIBILITIES

10.1 It is the responsibility of the analyst to perform the analysis according to this SOP and to complete all documentation required for data review. Analysis and interpretation of the results are performed by personnel in the laboratory who have demonstrated the ability to generate acceptable results utilizing this SOP. This demonstration is in accordance with the training program of the laboratory. Final review and sign-off of the data is performed by the department supervisor/manager or designee.

10.2 It is the responsibility of the department supervisor/manager to document analyst training. Documenting method proficiency, as described in 6020, is also the responsibility of the department supervisor/manager.

11 PROCEDURE

11.1 Refer to method 6020 (Section 7.0) and the instrument manuals for detailed instruction on implementation of the following daily procedures preceding an analytical run.

11.2 After the instrument has been placed in the "Operate" mode, begin completing the daily instrument log (see Attachments). Refer to the instrument manuals for the optimum settings for each instrument.

11.3 The following parameters are monitored to assure awareness of changes in the instrumentation that serve as signals that optimum performance is not being achieved, or as indicators of the physical condition of certain consumable components (i.e. EMT and cones).

11.3.1 Multiplier Voltages

11.3.2 Gas Flows - Coolant Ar

11.3.3 The nebulizer and auxiliary flows are adjusted later as part of the optimizing procedure.

11.4 Optimization

11.4.1 Gas Flows

11.4.1.1 Allow a period of not less than 30 minutes for the instrument to warm up.

11.4.1.2 Aspirate a mixed tune solution into the plasma and monitor the instrument output signal of In at mass 115 on the ratemeter. Adjust the nebulizer and auxiliary flows to obtain maximum signal. Adjust the tension screw on the peristaltic pump to obtain minimum noise in the analytical signal. Record flow rates and note any large variances.

Note: Significant differences in flow rates will be observed for different torches and cones.

11.4.2 Ion Lens Setting

While monitoring the output signal of a mixed tune solution at mass 115 on the ratemeter, adjust the ion lenses to obtain maximum sensitivity. Refer to the instrument manual for details on performing the adjustments.

11.4.3 Mass Calibration

Aspirate a solution of Be, Mg(PQS only), Co, In, Pb, and U using the Mass Calibration program in the VG software with these elements identified in the program as the points used for mass calibrating. Refer to the instrument manual for details pertaining to the mass calibration procedure.

11.4.4 Resolution Check

Using the spectra created during the mass calibration procedure, perform the resolution check to assure the resolution is less than 0.1 AMU at 10% peak height (Note: resolution on the PQS and X-Series instruments are checked at 5% peak height which is more rigorous).

11.4.5 Stability Check

Using the mixed element solution from the mass calibration check, perform a short-term stability check as per EPA Method 6020. The relative standard deviations of five scans for each element in the tune solution must be < 5%.

11.5 Analytical Run

11.5.1 Calibrate the instrument using a blank (Standard 0) and the working calibration standard (9.2.2). The masses typically monitored and those used for quantification are listed in Table 1. These masses are set as defaults in the instrument's analytical procedures. To begin select the correct method. Nebulize Standard 0 (Blank) into the plasma. Allow 1-2 minutes for system to equilibrate prior to establishing baseline. Follow directions on computer screen to perform standardization. Nebulize the working calibration standard into the plasma. The operator must sign and date the first page of standardization.

11.5.2 Perform the analysis in the order listed below. A daily run log of all samples analyzed is maintained.

Initial Calibration Verification (ICV)
Continuing Calibration Verification (CCV)
Initial Calibration Blank (ICB)
Continuing Calibration Blank (CCB)
CRA - 1ppb or project specified level*
ICSA
ICSAB
Analyze 7 Samples
CCV
CCB
Analyze 10 Samples
CCV
CCB
Repeat sequence as required to complete analytical run, analyzing CCVs/CCBs every 10 analyses

* Note: For AFCEE projects, the CRA standard concentrations will be equal to the MRL, or project-specific level.

12 QA/QC REQUIREMENTS

12.1 Initial Precision and Recovery Validation

The accuracy and precision of the procedure must be validated before analysis of samples begins, or whenever significant changes to the procedures have been made. To do this, four LCS aliquots are prepared and analyzed. The average percent recovery of for each analyte must be 85-115%(for water, and within the LCS limits for soils) and the RSD< 30%.

12.2 Method Detection Limits

12.2.1 A method detection limit (MDL) study must be undertaken before analysis of samples can begin. To establish detection limits that are precise and accurate, the analyst must perform the following procedure. Spike a minimum of seven blank replicates at a level near or below the MRL. Follow the procedures starting in Section 11 to analyze the samples. Refer to the CAS SOP for The Determination of Method Detection Limits and Limits of Detection.

12.2.2 Calculate the average concentration found (x) and the standard deviation of the concentrations for each analyte. Calculate the MDL for each analyte using the correct T value for the number of replicates. MDL's must be performed annually or whenever there is a significant change in the background or instrument response.

12.3 The Initial Calibration Verification (ICV) standard is analyzed immediately after calibration. The results of the ICV must agree with ±10% of the expected value. If the control limits are exceeded, the problem will be identified and the instrument recalibrated.

12.4 A Continuing Calibration Verification (CCV) and Continuing Calibration Blank (CCB) are analyzed after every 10 samples. The results of the CCV must agree within ±10% of the expected value. If the control limits are exceeded, the problem will be identified and the instrument recalibrated. The previous 10 samples must be reanalyzed.

12.5 The ICSA and ICSAB solutions are analyzed after calibration and before any field samples. The solutions are then reanalyzed every 12 hours. Results of the ICSA are used by the analyst to identify the impact of potential interferences on the quality of the data. Based on these results appropriate action should be taken when interferences are suspected in an field sample including, but not limited to, selecting and alternative isotope for quantification, manual correction of the data, elevating the MRL, selection of an alternative method (e.g. optical ICP, GFAA) or flagging the result as estimated when no other action is possible. Results for the spiked analytes in the ICSAB solution must agree with ±20% of the expected value.

12.6 Internal standards are used to correct for physical interferences. Masses used as internal standards include; ^{209}Bi, ^{115}In, ^{6}Li, ^{103}Rh ^{45}Sc, ^{232}Th, and ^{89}Y. These internal standards are used in combination to cover the appropriate mass ranges. Internal standard correction is applied to the analytical isotopes via interpolation of the responses form nearest internal standard isotopes. This function is performed in real-time by the instruments operating system. Internal standards must be run within 50 AMU of the masses that are analyzed. When the intensity is less than 30 % or greater than 120%, the sample must be reanalyzed after a fivefold or greater dilution has been performed.

12.7 A digested duplicate and matrix spike are analyzed at a frequency of 5% or one per batch, whichever is greater. The matrix spike recovery and relative percent difference will be calculated while analysis is in progress. See the Attachments for a listing of control limits. Project, QAPP, or client-specific control limits may supercede the limits listed. If the control limits are exceeded, the samples will be redigested and reanalyzed, unless matrix interference or sample non-homogeneity are established as cause. In these instances, the data and the report will be flagged accordingly.

12.8 A Serial Dilution test must be performed for each matrix and each batch of sample. For sample concentrations that are sufficiently high (minimally, a factor of greater than 100 times the IDL), the analysis of a fivefold (1+4) dilution must agree within ± 10% of the original determination. If not, an interference must be suspected and the data flagged accordingly.

12.9 A Post Digestion Spike must be performed for each matrix and each batch of sample. The prepared sample or its dilution is spiked for each element of interest at a concentration sufficiently high to be observed. The post spike should be recovered to within 75-125% of the known value or within the laboratory derived acceptance criteria. If the spike is not

recovered within the specified limit, the sample must be diluted and reanalyzed. The diluted result must agree within 10% of the original result.

12.10 Laboratory Control Samples are analyzed at a frequency of 5% or one per batch, whichever is greater. See the Attachments for a listing of control limits. Project, QAPP, or client-specific control limits may supercede the limits listed. If the control limits are exceeded, the associated batch of samples will be redigested and reanalyzed.

12.11 Instrument blanks should be evaluated for potential carryover. Results from instrument blanks run after standards or control samples should be used to establish levels at which carryover in samples may occur. Samples exhibiting similar effects of carryover should be reanalyzed.

12.12 Instrument Detection Limits (IDLs) and linear ranges are performed periodically as per Method 6020. These will be calculated and made available to the ICP-MS operator.

12.13 Refer to the Quality Control section of EPA Method 6020 for additional information describing required QA/QC. Note that the nomenclature of certain QC samples in the method differs from that of the CLP SOW, but the function of those samples is equivalent in both cases.

13 DATA REDUCTION, REPORTING, AND REVIEW

13.1 Calculations

Calculate sample results using the data system printouts and digestion information. the digestion and dilution information is entered into the data system. The data system then uses the calculations below to generate a sample result.

Aqueous samples are reported in µg/L:

$$\mu g / L\ (Sample) = C^{*} \times Digestion\ Dilution\ Factor \times Post\ Digestion\ Dilution\ Factor$$

C*= Concentration of analyte as measured at the instrument in ug/L (in digestate).

Solid samples are reported in mg/Kg:

$$mg/Kg\ (Sample) = C^{*} \times Post\ Digestion\ Dilution\ Factor \times \frac{Digestion\ Vol.(ml)}{Sample\ wt.(g)} \times \frac{1mg}{1000ug} \times \frac{1L}{1000ml} \times \frac{1000g}{1Kg}$$

C*= Concentration of analyte as measured at the instrument in ug/L (in digestate).

13.2 Common isobaric interferences are corrected using equations equivalent to those listed in EPA Methods 6020 and 200.8. Monitoring of multiple isotopes for a single element provides a mechanism for identifying isobaric interferences. Refer to the Interferences section of EPA Method 6020 and 200.8 for additional descriptions of possible interferences and the mechanisms required for adequately compensating for their effects.

13.3 Data Review and Reporting

13.3.1 The ICP-MS operator reviews the MS data and signs and dates the Data Review Form. A qualified senior staff spectroscopist performs a secondary review of the data and the Data Review Form is signed and dated. The data is then delivered to the report generation area where it is filed in the service request file. Once all of the data for the service request is complete, a CAR is generated.

13.3.2 The data is saved on the local hard drive and is also copied to the appropriate directory on the network. The data directories are located at r:\icp\wip\data. The data is kept on the local directory for 1 month. The network files are periodically backed up on disc or network tape.

13.3.3 For "non-production" work (such as method development or research/development studies) the analyses are performed under the direction of a senior spectroscopist. All associated data is scrutinized by the senior spectroscopist. Original raw data and associated records are archived in the analytical project file.

13.3.4 The final review and approval of all data is performed by qualified spectroscopists.

14 CONTENGENCIES FOR HANDLING OUT-OF-CONTROL OR UNACCEPTABLE DATA

Corrective action measures applicable to specific analysis steps are discussed in the applicable section of this (and other applicable) SOP(s). Also, refer to the SOP for *Nonconformity and Corrective Action* for correct procedures for identifying and documenting such data. Procedures for applying data qualifiers are described in the SOP for *Report Generation* or in project-specific requirements.

15 METHOD PERFORMANCE

This method was validated through single laboratory studies of accuracy and precision. Refer to the reference method for additional available method performance data.

The method detection limit (MDL) is established using the procedure described in the SOP for *The Determination of Method Detection Limits and Limits of Detection* (ADM-MDL). Method

Reporting Limits are established for this method based on MDL studies and as specified in the CAS Quality Assurance Manual.

16 TRAINING

16.1 A minimum of two senior level spectroscopists are to be maintained on staff at all times. Senior spectroscopists are defined as individuals with a minimum of ten years combined education and experience in, or related to atomic spectroscopy. Of those ten years, a minimum of two years of ICP-MS experience is required.

16.2 All technical staff are encouraged to attend one technical seminar per year. In addition to the technical seminars, senior spectroscopists are required to complete a one week training session offered by the instrument manufacturer.

16.3 Training outline

16.3.1 Review literature (see references section). Read and understand the SOP. Also review the applicable MSDS for all reagents and standards used. Following these reviews, observe the procedure as performed by an experienced analyst at least three times.

16.3.2 The next training step is to assist in the procedure under the guidance of an experienced analyst. During this period, the analyst is expected to transition from a role of assisting, to performing the procedure with minimal oversight from an experienced analyst.

16.3.3 Perform initial precision and recovery (IPR) study as described above for water samples. Summaries of the IPR are reviewed and signed by the supervisor. Copies may be forwarded to the employee's training file. For applicable tests, IPR studies should be performed in order to be equivalent to NELAC's Initial Demonstration of Capability.

16.4 Training and proficiency is documented in accordance with the SOP ADM-TRANDOC.

17 POLLUTION PREVENTION

It is the laboratory's practice to minimize the amount of solvents and reagents used to perform this method wherever technically sound, feasibly possible and within method requirements. Standards are prepared in volumes consistent with the laboratory use in order to minimize the volume of expired standards to be disposed of. The threat to the environment from solvents and/or reagents used in this method may be minimized when recycled or disposed of properly.

18 WASTE MANAGEMENT

TABLE 1

Method Reporting Limits and Method Detection Limits

	Water (ug/L) CLP Digestion		Water (ug/L) EPA 3020A Digestion		Soil/Sediment (mg/kg) EPA 3050B Digestion		Tissue (mg/kg) PSEP Digestion	
Analyte	**MRL**	**MDL**	**MRL**	**MDL**	**MRL**	**MDL**	**MRL**	**MDL**
Aluminum	**1.0**	0.8	**5**	5	**1.0**	0.4	**1.0**	0.5
Antimony	**0.05**	0.02	**0.1**	0.05	**0.02**	0.01	**0.02**	0.02
Arsenic	**0.5**	0.1	**0.5**	0.1	**0.5**	0.1	**0.5**	0.2
Barium	**0.05**	0.02	**0.1**	0.05	**0.05**	0.02	**0.05**	0.02
Beryllium	**0.02**	0.009	**0.02**	0.01	**0.02**	0.01	**0.02**	0.02
Boron	**0.5**	0.2	**10**	9	**1.0**	0.6	**0.5**	0.2
Cadmium	**0.05**	0.02	**0.05**	0.05	**0.05**	0.01	**0.05**	0.02
Chromium	**0.2**	0.05	**0.2**	0.06	**0.2**	0.05	**0.2**	0.04
Cobalt	**0.02**	0.01	**0.05**	0.03	**0.02**	0.01	**0.02**	0.02
Copper	**0.1**	0.03	**0.2**	0.2	**0.1**	0.01	**0.1**	0.03
Lead	**0.02**	0.006	**0.1**	0.05	**0.05**	0.02	**0.02**	0.01
Manganese	**0.05**	0.02	**0.1**	0.05	**0.05**	0.02	**0.05**	0.02
Molybdenum	**0.05**	0.02	**0.05**	0.03	**0.05**	0.01	**0.05**	0.01
Nickel	**0.2**	0.03	**0.5**	0.2	**0.2**	0.02	**0.2**	0.03
Selenium	**1.0**	0.4	**1.0**	0.7	**1.0**	1.0	-	-
Silver	**0.02**	0.007	**0.02**	0.01	**0.02**	0.01	**0.02**	0.02
Thallium	**0.02**	0.01	**0.02**	0.01	**0.02**	0.01	**0.02**	0.01
Tin	**0.1**	0.02	**0.1**	0.04	-	-	**0.1**	0.01
Uranium	**0.02**	0.003	**0.02**	0.01	**0.02**	0.01	**0.02**	0.01
Vanadium	**0.2**	0.05	**0.2**	0.03	**0.2**	0.02	**0.2**	0.02
Zinc	**0.5**	0.2	**0.5**	0.2	**0.5**	0.05	**0.5**	0.08

ATTACHMENTS

List of Target Element Masses
Example Standard Sheet
Instrument Logs
QC Acceptance Criteria

QC Acceptance Criteria						
Method	Prep Method	Matrix	Analyte	LCS Accuracy (% Rec.)	Matrix Spike (% Rec.)	Precision (RPD)
6020	3050B	Soil/Sed.	Aluminum	Ref.	70-130	30
6020	3050B	Soil/Sed.	Antimony	Ref.	20-108	30
6020	3050B	Soil/Sed.	Arsenic	Ref.	74-120	30
6020	3050B	Soil/Sed.	Barium	Ref.	79-117	30
6020	3050B	Soil/Sed.	Beryllium	Ref.	78-121	30
6020	3050B	Soil/Sed.	Boron	Ref.	70-130	30
6020	3050B	Soil/Sed.	Cadmium	Ref.	63-136	30
6020	3050B	Soil/Sed.	Chromium	Ref.	53-147	30
6020	3050B	Soil/Sed.	Cobalt	Ref.	77-119	30
6020	3050B	Soil/Sed.	Copper	Ref.	52-153	30
6020	3050B	Soil/Sed.	Lead	Ref.	66-134	30
6020	3050B	Soil/Sed.	Manganese	Ref.	47-169	30
6020	3050B	Soil/Sed.	Molybdenum	Ref.	56-128	30
6020	3050B	Soil/Sed.	Nickel	Ref.	77-128	30
6020	3050B	Soil/Sed.	Selenium	Ref.	74-119	30
6020	3050B	Soil/Sed.	Silver	Ref.	83-107	30
6020	3050B	Soil/Sed.	Thallium	Ref.	79-117	30
6020	3050B	Soil/Sed.	Uranium	Ref.	70-130	30
6020	3050B	Soil/Sed.	Vanadium	Ref.	70-130	30
6020	3050B	Soil/Sed.	Zinc	Ref.	57-156	30
6020	CLP/3020A	Water	Aluminum	66-153	34-161	20
6020	CLP/3020A	Water	Antimony	89-110	81-116	20
6020	CLP/3020A	Water	Arsenic	88-112	73-125	20
6020	CLP/3020A	Water	Barium	88-110	69-131	20
6020	CLP/3020A	Water	Beryllium	83-117	70-120	20
6020	CLP/3020A	Water	Cadmium	91-110	81-113	20
6020	CLP/3020A	Water	Chromium	88-112	72-120	20
6020	CLP/3020A	Water	Cobalt	92-108	63-128	20
6020	CLP/3020A	Water	Copper	89-112	70-116	20
6020	CLP/3020A	Water	Lead	90-110	60-127	20
6020	CLP/3020A	Water	Manganese	87-113	52-152	20
6020	CLP/3020A	Water	Molybdenum	84-115	71-134	20
6020	CLP/3020A	Water	Nickel	88-111	70-118	20
6020	CLP/3020A	Water	Selenium	90-114	67-127	20
6020	CLP/3020A	Water	Silver	85-112	64-122	20
6020	CLP/3020A	Water	Thallium	88-112	72-117	20
6020	CLP/3020A	Water	Vanadium	89-109	85-116	20
6020	CLP/3020A	Water	Zinc	88-115	64-120	20
6020	3050B	Tissue	Aluminum	Ref.	70-130	30
6020	3050B	Tissue	Antimony	Ref.	70-130	30
6020	3050B	Tissue	Arsenic	Ref.	70-130	30
6020	3050B	Tissue	Barium	Ref.	70-130	30
6020	3050B	Tissue	Beryllium	Ref.	70-130	30
6020	3050B	Tissue	Cadmium	Ref.	70-130	30
6020	3050B	Tissue	Cobalt	Ref.	70-130	30
6020	3050B	Tissue	Copper	Ref.	70-130	30
6020	3050B	Tissue	Lead	Ref.	70-130	30
6020	3050B	Tissue	Manganese	Ref.	70-130	30
6020	3050B	Tissue	Molybdenum	Ref.	70-130	30
6020	3050B	Tissue	Nickel	Ref.	70-130	30
6020	3050B	Tissue	Silver	Ref.	70-130	30
6020	3050B	Tissue	Thallium	Ref.	70-130	30
6020	3050B	Tissue	Vanadium	Ref.	70-130	30
6020	3050B	Tissue	Zinc	Ref.	70-130	30

Analyte	ISOTOPES ANALYZED	ISOTOPE REPORTED
Aluminum	27	27
Antimony	121,123	123
Arsenic	75	75
Barium	135,137,138	137
Beryllium	9	9
Cadmium	111,112,114	111
Chromium	52,53	52
Cobalt	59	59
Copper	63,65	65
Lead	206,207,208	208
Manganese	55	55
Molybdenum	95,97,98	98
Nickel	60,61,62	60
Selenium	77,78,82	82
Silver	107,109	107
Thallium	203,205	205
Uranium	238	238
Vanadium	51	51
Zinc	66,67,68	66

Columbia Analytical Services, Inc.
PQ ExCell ICP-MS Service Request Run Log

Date of Analysis	ICP-MS Method	Experiment Name	Service Request #	Sample #'s	Calibration Data w/Sr #	Analyst	Comments

STANDARD OPERATING PROCEDURE

for

MERCURY IN LIQUID WASTE

SOP No.: MET-7470A

Revision: 9

October 13, 2005

Approved by: _____ Supervisor — 10/13/05 Date

_____ QA Manager — 10-13-05 Date

_____ Laboratory Manager — 10/17/05 Date

COLUMBIA ANALYTICAL SERVICES, INC.
1317 South 13th Avenue
Kelso, Washington 98626

Annual review of this SOP has been performed and the SOP still reflects current practice.
Initials: _____ Date: _____
Initials: _____ Date: _____
Initials: _____ Date: _____

DOCUMENT CONTROL
NUMBER: _____
Initials: _____ Date: _____

MERCURY IN LIQUID WASTE

1. SCOPE AND APPLICATION

1.1. This procedure is used to determine the concentrations of Mercury in aqueous samples, including mobility-procedure extractions, aqueous wastes, and ground water, using EPA Method 7470A. Method 7470A is a cold-vapor atomic absorption procedure.

1.2. The Method Reporting Limit (MRL) is 0.2 ug/L. Equivalent nomenclature for MRL includes Estimated Quantitation Limit (EQL) and Practical Quantitation Limit (PQL). Therefore, MRL=EQL=PQL. The reported MRL may be adjusted if required for specific project requirements, however, the capability of achieving other reported MRLs must be demonstrated. A Method Detection Limit (MDL) of 0.1 ug/L has been achieved using this procedure.

2. METHOD SUMMARY

A representative aliquot of sample is prepared as described in this procedure. The mercury is reduced to its elemental state and aerated from solution and measured with an atomic absorption spectrometer. The mercury vapor passes through a cell positioned in the light path of the AA where absorbance is measured as a function of mercury concentration.

3. DEFINITIONS

3.1. **Analysis Sequence** - Samples are analyzed in a set referred to as an analysis sequence. The sequence begins with instrument calibration followed by sample digestates interspersed with calibration standards.

3.2. **Independent Calibration Verification** (ICV) - ICV solutions are made from a stock solution which is different from the stock used to prepare calibration standards and is used to verify the validity of the standardization.

3.3. **Matrix Spike** (MS) - In the matrix spike analysis, predetermined quantities of standard solutions of certain analytes are added to a sample matrix prior to sample digestion and analysis. The purpose of the matrix spike is to evaluate the effects of the sample matrix on the methods used for the analyses. Percent recoveries are calculated for each of the analytes detected.

3.4. **Matrix Spike Duplicate** (MSD) - In the matrix spike duplicate analysis, predetermined quantities of standard solutions of certain analytes are added to a sample matrix prior to sample digestion and analysis. The purpose of the matrix spike duplicate is to evaluate the effects of the sample matrix on the methods used for the analyses. Percent recoveries are calculated for each of the analytes detected. The relative percent difference between the matrix spikes is calculated and used to assess analytical precision.

3.5. **Duplicate Sample** (DUP) - A laboratory duplicate. The duplicate sample is a separate field sample aliquot that is processed in an identical manner as the sample proper. The relative percent difference between the samples is calculated and used to assess analytical precision.

3.6. **Method Blank** - The method blank is an artificial sample designed to monitor introduction of artifacts into the process. The method blank is carried through the entire analytical procedure.

3.7. **Continuing Calibration Verification Standard (CCV)** - A standard analyzed at specified intervals and used to verify the ongoing validity of the instrument calibration.

3.8. **Instrument Blank (CCB)** - The instrument blank (also called continuing calibration blank) is a volume of blank reagent of composition identical to the digestates. The purpose of the CCB is to determine the levels of contamination associated with the instrumental analysis

4. INTERFERENCES

Potassium permanganate is added to eliminate possible interference from sulfide. Samples high in chlorides require additional permanganate because, during the oxidation step, chlorides are converted to free chlorine, which absorbs radiation at 253 nm.

5. SAFETY

5.1. All appropriate safety precautions for handling solvents, reagents and samples must be taken when performing this procedure. This includes the use of personnel protective equipment, such as, safety glasses, lab coat and the correct gloves.

5.2. Chemicals, reagents and standards must be handled as described in the CAS safety policies, approved methods and in MSDSs where available. Refer to the CAS Environmental, Health and Safety Manual and the appropriate MSDS prior to beginning this method.

5.3. Hydrochloric and/or Nitric Acid are used in this method. These acids are extremely corrosive and care must be taken while handling them. A face shield should be used while pouring acids. And safety glasses should be worn while working with the solutions. Lab coat and gloves should always be worn while working with these solutions.

6. SAMPLE PRESERVATION AND STORAGE

6.1. Aqueous samples are preserved with nitric acid (pH<2), then refrigerated at 4 ± 2ºC from receipt until analysis.

6.2. The maximum holding for mercury in aqueous samples is 28 days.

7. APPARATUS AND EQUIPMENT

7.1. CETAC M-6000A Mercury Analyzer. (See Attachments for instrument parameters).

7.2. 50 ml test tubes with disposable caps.

7.3. Hot water bath capable of maintaining a temperature of 90-95ºC. A 0-150°C thermometer that has been calibrated with a reference thermometer is used to monitor the bath.

7.4. Pipettes and graduated cylinders.

7.5. 300 ml BOD Bottles

8. STANDARDS AND REAGENTS

8.1. Mercury stock solution (1,000 mg/L). Commercially prepared certified solution.

8.2. Mercury working standard (100 µg/L). Prepare from the stock solution.

Note: See section 11.2.2 for details on preparation of calibration and ICV standards. See section 12 for QC sample preparation.

8.3. Reagent water - ASTM Type II water (laboratory deionized water).

8.4. Concentrated nitric and sulfuric acids. Purity of acids must be established by the laboratory as being high enough to eliminate the introduction of contamination above the Method Reporting Limit.

8.5. Potassium permanganate solution, 5% w/v. To prepare, add 50 g of solid reagent to 1000 mL of D.I. water and place on magnetic stir plate for a approximately 30 minutes until dissolved.

8.6. Potassium persulfate solution, 5% w/v. To prepare, add 50 g of solid reagent to 1000 mL of D.I. water and warm in water bath for approximately 10 minutes. Place the warmed solution on a magnetic stir plate for approximately 10 minutes until dissolved.

8.7. Sodium chloride/hydroxylamine hydrochloride solution, 12% w/v each. To prepare, add 120g sodium chloride and 120 g of hydroxylamine hydrochloride to 1000 mL of D.I. water and place on magnetic stir plate for a approximately 15 minutes until dissolved.

8.8. Stannous chloride, 10% w/v in HCl (7% v/v). To prepare, add 100g stannous chloride crystals and 70 mL of concentrated hydrochloric acid in 1000 mL of D.I. water. Seal lid on mixing bottle and shake until the stannous chloride is dissolved.

9. PREVENTIVE MAINTENANCE

9.1. CAS staff performs all routine maintenance and troubleshooting. Preventative maintenance activities listed below should be performed when needed as determined by instrument performance (i.e. stability, sensitivity, etc.) or by visual inspection. Repairs of an extraordinary nature may or may not require factory service, depending on the nature of the task. All maintenance activities are recorded in a maintenance logbook kept for each instrument.

9.2. Keep the instrument free of dust, deposits, and chemical spills.

9.3. Replace the peristaltic and autosampler rinse tubing.

9.4. Remove and clean the Gas-Liquid.

9.5. Remove, dismantle, and clean the optical cells (sample cell and reference cell) including the sapphire windows.

9.6. Replace the Hg lamp bulb when the lamp current reaches 13 mA.

10. RESPONSIBILITIES

10.1. It is the responsibility of the analyst to perform the analysis according to this SOP and to complete all documentation required for data review. Analysis and interpretation of the results are performed by personnel in the laboratory who have demonstrated the ability to generate acceptable results utilizing this SOP. This demonstration is in accordance with the training program of the laboratory. Final review and sign-off of the data is performed by the department supervisor/manager or designee.

10.2. It is the responsibility of the department supervisor/manager to document analyst training. Documenting method proficiency, as described in 7470A, is also the responsibility of the department supervisor/manager.

11. PROCEDURE

11.1. Sample Preparation

11.1.1. Shake the sample and measure 20 ml into a 50 ml test tube. Add 1 ml of H_2SO_4 and 0.5 ml of concentrated HNO_3, mixing after each dilution. Add 3 ml of potassium permanganate to each sample tube (samples with high organic content

may required additional permanganate). Note: Spiking solution is added prior to acidification.

11.1.2. Shake and add additional permanganate solution, if necessary, until the purple color persists for at least 15 minutes.

11.1.3. Add 1.6 ml of potassium persulfate to each bottle and heat for 2 hr in a water bath maintained at 95ºC. The temperature of each water bath is monitored with calibrated thermometer. Cool and add 1.2 ml of sodium chloride-hydroxylamine hydrochloride solution.

11.1.4. The samples are now ready to be analyzed. The analyzer does the final step of adding the stannous chloride solution automatically.

11.2. Calibration

11.2.1. To prepare calibration standards a 10 ppm intermediate stock solution is first prepared by aliquoting 1.0 mL of commercially prepared 1000 ppm stock standard into an acid rinsed 100 mL Class A volumetric flask and diluting to volume with 1% HNO3. (This solution must be prepared monthly) Next, a 100 ppb working solution is prepared by aliquoting 1.0 mL of the 10 ppm intermediate stock solution into an acid rinsed 100 mL Class A volumetric flask and diluting to volume with 1% HNO3. This solution must be prepared daily.

Note: All standard aliquots are measured using calibrated fixed or adjustable volume autopipetters or calibrated disposable 5.0 or 10.0 mL pipettes.

11.2.2. Transfer 0, 0.2, 0.5, 1.0, 5.0 and 10.0 mL aliqouts of the working solution to a series of labeled 300 mL BOD bottles. Add the appropriate amount of reagent water to bring each bottle to a final volume of 100 ml. The final concentrations of the prepared standards are 0, 0.2, 0.5, 1.0, 5.0, 10.0 ppb. (Note: The standards are prepared in 100 mL volumes rather than 20 mL volumes as the sample in order to efficiently prepare enough volume for possible recalibrations as well as aliquoting for CCV, CCB and CRA samples in the analytical run. The proportions of reagents and their sources are identical to those of the samples.)

The Initial Calibration Verification (ICV) is prepared by first making a 1000 ppb intermediate solution. 0.10 mL of commercially prepared 1000 ppm stock standard, from a different manufacturer and lot than the calibration standard, is aliquoted into an acid rinsed 100 mL Class A volumetric flask and diluting to volume with 1% HNO3. This solution must be prepared monthly. Prepare the ICV standard by aliquoting 0.5 mL to a labeled 300 mL BOD bottle. Add the 99.5 mL of reagent water to bring the final volume to 100 mL.

11.2.3. Mix thoroughly and add 5 ml of concentrated H_2SO_4 and 2.5 ml of concentrated HNO_3 to each bottle. Add 15 ml of potassium permanganate to each bottle and let stand for 15 minutes. Add 8 ml of potassium persulfate to each bottle and heat in the water bath for 2 hours at 95°C. Cool and add 6 ml of sodium chloride-hydorxylamine hydrochloride solution.

11.2.4. CETAC Calibration and Sample Analysis

11.2.4.1. Turn on the CETAC instrument, including the Hg lamp, and autosampler. After this is done turn open the operating software (Mercury Analyzer 1.5.1.1).

11.2.4.2. The rinse station for the autosampler turns on automatically, but the peristaltic pump must be started manually. Make sure all sample uptake and drain tubes are placed correctly on the pump and are secured with the appropriate tension. Place the reagent uptake tube in the stannous chloride and start the pump.

11.2.4.3. From the software's main screen select the "Worksheet" button and then the "Template" button. Select the "Kelso Mercury Program".

11.2.4.4. Go to the "Labels" tab and enter the QC and field samples to be analyzed in the appropriate order.

11.2.4.5. Transfer the solutions to be analyzed to labeled 12mL polyethylene test tubes and place them in the appropriate spaces on the autosampler trays.

11.2.4.6. Transfer the calibration blank and standards (0.2, 0.5, 1.0, 5.0, and 10 ppb) from their BOD bottles to the standard tubes located behind the autosampler trays. The calibration blank is placed in the left most tube and the other standards are placed in ascending order to the right.

11.2.4.7. Return to the software and go to the "Analysis" tab. At this point the analysis is ready to begin. Click on the start button. In the dialog box that appears be sure the following are checked:

- Calibrate before first sample.
- New output file before first sample.
- Zero before first sample.

Click start and the analysis will begin.

11.2.5. After the calibration standards have run the software will use linear regression to create a calibration curve based on the concentration and measured absorbance of

each standard. The form of regression line is y = mx + b. If the correlation coefficient of the curve is greater than 0.995 the analysis will continue, if not the analysis will be terminated and corrective action will be needed by the analyst.

11.3. As the analysis sequence proceeds, next analyze the following QC standards.

- ICV (5.0 ppb standard prepared from a second source)
- ICB
- CCV (5.0 ppb calibration standard)
- CCB
- CRA (0.2 ppb calibration standard)

11.4. If either the ICV or CCV are different from their true values by more than 10% the software will terminate the analysis. If either the ICB or CCB is greater than the MRL of 0.2 µg/L the software will terminate the analysis. No control limit is applied to the CRA except under specific project requirements.

11.5. Sample Analysis

11.5.1. The samples are analyzed with the CETAC analyzer in the same manner as the calibration standards. The analyzer does the step of adding the stannous chloride solution automatically. Check the baseline between samples to verify that the spectrometer reading has stabilized at the normal baseline level.

11.5.2. The analytical sequence should be set up to include all samples, QC samples, blanks, and calibration verification standards at necessary intervals. Refer to the SOP for Sample Batches.

11.5.3. Sample digestion batches are analyzed with a set of CCV and CCB being run at a minimum every 10 samples until the analysis is completed. The same criteria listed above are applied to the CCVs and CCBs and if one is found to be outside these limits the analysis is terminated.

12. QA/QC REQUIREMENTS

12.1. Method Detection Limits

12.1.1. A method detection limit (MDL) study must be undertaken before analysis of samples can begin. To establish detection limits that are precise and accurate, the analyst must perform the following procedure. Spike a minimum of seven blank replicates with a MDL spiking solution near the MRL and analyze. Refer to the CAS *SOP for The Determination of Method Detection Limits*.

12.1.2. Calculate the average concentration found (x) in the sample concentration, and the standard deviation of the concentrations for each analyte. Calculate the MDL for each analyte using the correct T value for the number of replicates. The MDL study should be done annually.

12.2. Ongoing QC Samples required are described in the CAS-Kelso Quality Assurance Manual, in the *SOP for Sample Batches*. For this analysis, these include:

12.2.1. Prepare one method blank (MB) per digestion batch, or per 20 samples, or per EPA SDG group, whichever is more frequent. Use D.I. water and follow the digestion procedures. The Method Blank should be < MRL. Redigest the associated samples if sample levels are <20X MB level.

12.2.2. Prepare one duplicate and matrix spike sample per each digestion batch, or per twenty samples, or per EPA SDG group, whichever is more frequent. At times, specific samples will be assigned as duplicates or spikes depending on client requirements. The matrix spike is prepared by aliquoting 0.2 mL of the 100 ppb working standard (section 11.2.1) to the 20 mL sample designated as the matrix spike, resulting in a spike concentration of 1ppb.

The RPD criteria for duplicates is 20% RPD. If not, flag the data or redigest samples. The Matrix spike recovery criteria is 75-125%. If not, flag the data if the sample value is >4 X spike level or redigest samples in batch.

12.2.3. Prepare one Laboratory Control Sample (LCS) per digestion batch, or per 20 samples. The LCSW is prepared by aliquoting 0.1 mL of the 1000 ppb ICV intermediate solution (section 11.2.2) to 20 mL of reagent water, resulting in a concentration of 5ppb, and processing as per the procedure.

The LCS recovery criteria are 85-115%, unless project-specific or in-house limits are established. If the LCS fails the acceptance criteria, redigest the batch of samples.

13. DATA REDUCTION, REVIEW, AND REPORTING

13.1. Solution concentrations are calculated by the Mercury Analyzer software based on the linear regression calibration curve created when the calibration standards are analyzed. The absorbance measured for each sample is applied to the linear regression curve and the final solution concentration is determined and displayed as the instrument result.

13.2. Calculate sample results using the data system printouts and digestion information. The digestion and dilution information is entered into the data system. The data system then uses the calculations below to generate a sample result.

Aqueous samples are reported in µg/L:

$$\mu g / L\ (Sample) = C^{*} \times Digestion\ Dilution\ Factor \times Post\ Digestion\ Dilution\ Factor$$

C*= Concentration of analyte as measured at the instrument in mg/L (in digestate).

13.3. A daily run log of all samples analyzed is maintained. All CLP data should be printed and stored after operator has checked for evenness of burns. A copy of this document will go with each package of Tier III or higher data run that day.

13.4. It is the analysts responsibility to review analytical data to ensure that all quality control requirements have been met for each analytical run. Results for QC analyses are calculated and recorded as specified in section 12.

1.1. Record all sample volumes and dilutions on an A.A. benchsheet (see Attachments).

1.1. Record all concentrations determined at the instrument and calculate the final results in µg/L. Record the final results on the A.A. benchsheet.

1.1. The data packet for the sequence is submitted for review by supervisor or designee. The results are transferred to the appropriate report form located in the CAS network directory R:\ICP\WIP. Once the results are transferred, the report is reviewed.

13.8. Refer to the SOP for Laboratory Data Review Process for general instructions for data review.

14. CONTENGENCIES FOR HANDLING OUT-OF-CONTROL OR UNACCEPTABLE DATA

Corrective action measures applicable to specific analysis steps are discussed in the applicable section of this (and other applicable) SOP(s). Also, refer to the SOP for *Nonconformity and Corrective Action* for correct procedures for identifying and documenting such data. Procedures for applying data qualifiers are described in the SOP for *Report Generation* or in project-specific requirements.

15. METHOD PERFORMANCE

15.1. This method was validated through single laboratory studies of accuracy and precision. Refer to the reference method for additional available method performance data.

15.2. The method detection limit (MDL) is established using the procedure described in the SOP for *The Determination of Method Detection Limits* (ADM-MDL). Method

Reporting Limits are established for this method based on MDL studies and as specified in the CAS Quality Assurance Manual.

16. POLLUTION PREVENTION

It is the laboratory's practice to minimize the amount of solvents, acids and reagent used to perform this method wherever feasible. Standards are prepared in volumes consistent with methodology and only the amount needed for routine laboratory use is kept on site. The threat to the environment from solvent and reagents used in this method can be minimized when recycled or disposed of properly.

17. WASTE MANAGEMENT

17.1. The laboratory will comply with all Federal, State and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions as specified in the CAS EH&S Manual.

17.2. This method uses acid. Waste acid is hazardous to the sewer system and to the environment. All acid waste must be neutralized to a pH of 5-9 prior to disposal down the drain. The neutralization step is considered hazardous waste treatment and must be documented on the treatment by generator record. See the CAS EH&S Manual for details.

18. TRAINING OUTLINE

18.1. Review literature (see References section). Review the SOP. Also review safety procedures. Following these reviews, observe the procedure as performed by an experienced analyst at least three times.

18.2. The next training step is to assist in the procedure under the guidance of an experienced analyst for a period of 1-2 months. During this period, the analyst is expected to transition from a role of assisting, to performing the procedure with minimal oversight from an experienced analyst.

18.3. Independently perform Initial Demonstration of Proficiency studies and QC analyses. The data must be reviewed by a supervisor or trained analyst. Documentation is forwarded to the employee's training file.

19. REFERENCES

Test Methods For Evaluating Solid Waste, Physical/Chemical Methods. EPA SW-846, 3rd Edition, Final Update II, Method 7470A, September 1994.

ATTACHMENTS

Instrument Parameters
Benchsheets

CETAC Hg Analysis Report - 04011304.DB - Tuesday, January 13, 2004, 3:47:17 PM

Analyst	ANGELA BAIRD
Date Created:	Tuesday, January 13, 2004
Worksheet	Hg 1/13/04 RUN3
Comment	KA0323238
Sip Duration (Sec.):	30
Rinse Duration (Sec.):	60
Read Delay:	38
Integration Time/Replicate:	2.69
# of Replicates:	4
# of Repeats:	1
Baseline Correction Enabled:	True
Baseline Point 1 Start Time:	8
Baseline Point 1 End Time:	13
2-Point Baseline Corr. Enabled:	False
Baseline Point 2 Start Time:	
Baseline Point 2 End Time:	
Gas Flow (ml/min):	135
Calibration Algorithm:	Linear
Recalibration Frequency:	0
Reslope Frequency:	0
Reslope Standard:	5
Calibration Standard #1 Conc.:	0.20 PPB
Calibration Standard #2 Conc.:	0.50 PPB
Calibration Standard #3 Conc.:	1.00 PPB
Calibration Standard #4 Conc.:	5.00 PPB
Calibration Standard #5 Conc.:	10.00 PPB
QC Enabled:	True
QC-RSD Enabled:	True
Limit Condition & Error Action:	If %RSD > 20.0%, if µAbs. > 500, Flag and Continue
QC-Std Enabled:	True
Limit Condition & Error Action:	If outside 90% .. 110%,Stop
QC-Blank Enabled:	True
Limit Condition & Error Action:	If outside -200 .. 200,Stop

Columbia Analytical Services

EPA METHOD 7470A

Service Request Number(s) :

Sample	Initial Volume	Final Volume	Sample	Initial Volume	Final Volume
			Std. 0.2	0.2 *	100
			Std. 0.5	0.5 *	100
			Std. 1.0	1.0 *	100
			Std. 5.0	5.0 *	100
			Std. 10.0	10.0 *	100
			ICV	0.5 **	100

Lot # of Reagents Used:

HNO3:Y31024
H2SO4: 43212
HCL: K30655903 221

K2S2O8 T44H13
KMnO4:V25588
SnCl2:Y23648

NaCl :Y07624
NH2OH-HCL:Y28599

LCSS = **ERA CLP Soil Lot # 246**

LCSW= **ICV Intermediate stock solution.**

Other: ___________________

* **Source Standard:**_______________

** **Source Standard: ICV** ____________

TIME STARTED:

Comments:	
Analyst:	**Date:**

STANDARD OPERATING PROCEDURE

for

MERCURY IN SOLID OR SEMISOLID WASTE

SOP No.: MET-7471A

Revision: 10

October 13, 2005

Approved by: _____ Supervisor — 10/13/05 Date

_____ QA Manager — 10-13-05 Date

_____ Laboratory Manager — 10/17/05 Date

COLUMBIA ANALYTICAL SERVICES, INC.
1317 South 13th Avenue
Kelso, Washington 98626

Annual review of this SOP has been performed and the SOP still reflects current practice.
Initials: _____ Date: _____
Initials: _____ Date: _____
Initials: _____ Date: _____

NON-CONTROLLED COPY
Will Not Be Updated

MERCURY IN SOLID OR SEMISOLID WASTE

1. SCOPE AND APPLICATION

1.1. This procedure is used to determine the concentrations of Mercury in soils, sediments, bottom deposits, and sludge-type materials. If this dissolution procedure is not sufficient to dissolve a specific matrix type or sample, then this method is not applicable for that matrix. Method 7471A is a cold-vapor atomic absorption procedure.

1.2. The Method Reporting Limit (MRL) is 0.02 mg/kg. Equivalent nomenclature for MRL includes Estimated Quantitation Limit (EQL) and Practical Quantitation Limit (PQL). Therefore, MRL=EQL=PQL. The reported MRL may be adjusted if required for specific project requirements, however, the capability of achieving other reported MRLs must be demonstrated. A Method Detection Limit (MDL) of 0.01 mg/kg has been achieved using this procedure.

2. METHOD SUMMARY

A representative aliquot of sample is prepared as described in this procedure. The mercury is reduced to its elemental state and aerated from solution and measured with an atomic absorption spectrometer. The mercury vapor passes through a cell positioned in the light path of the AA where absorbance is measured as a function of mercury concentration.

3. DEFINITIONSDEFINITIONS

3.1. **Analysis Sequence** - Samples are analyzed in a set referred to as an analysis sequence. The sequence begins with instrument calibration followed by sample digestates interspersed with calibration standards.

3.2. **Independent Calibration Verification** (ICV) - ICV solutions are made from a stock solution which is different from the stock used to prepare calibration standards and is used to verify the validity of the standardization.

3.3. **Matrix Spike** (MS) - In the matrix spike analysis, predetermined quantities of standard solutions of certain analytes are added to a sample matrix prior to sample digestion and analysis. The purpose of the matrix spike is to evaluate the effects of the sample matrix on the methods used for the analyses. Percent recoveries are calculated for each of the analytes detected.

3.4. **Matrix Spike Duplicate** (MSD) - In the matrix spike duplicate analysis, predetermined quantities of standard solutions of certain analytes are added to a sample matrix prior to

sample digestion and analysis. The purpose of the matrix spike duplicate is to evaluate the effects of the sample matrix on the methods used for the analyses. Percent recoveries are calculated for each of the analytes detected. The relative percent difference between the matrix spikes is calculated and used to assess analytical precision.

3.5. **Duplicate Sample** (DUP) - A laboratory duplicate. The duplicate sample is a separate field sample aliquot that is processed in an identical manner as the sample proper. The relative percent difference between the samples is calculated and used to assess analytical precision.

3.6. **Method Blank** - The method blank is an artificial sample designed to monitor introduction of artifacts into the process. The method blank is carried through the entire analytical procedure.

3.7. **Continuing Calibration Verification Standard (CCV)** - A standard analyzed at specified intervals and used to verify the ongoing validity of the instrument calibration.

3.8. **Instrument Blank (CCB)** - The instrument blank (also called continuing calibration blank) is a volume of blank reagent of composition identical to the digestates. The purpose of the CCB is to determine the levels of contamination associated with the instrumental analysis

4. INTERFERENCES

Potassium permanganate is added to eliminate possible interference from sulfide. Samples high in chlorides require additional permanganate because, during the oxidation step, chlorides are converted to free chlorine, which absorbs radiation at 253 nm.

5. SAFETY

5.1. All appropriate safety precautions for handling solvents, reagents and samples must be taken when performing this procedure. This includes the use of personnel protective equipment, such as, safety glasses, lab coat and the correct gloves.

5.2. Chemicals, reagents and standards must be handled as described in the CAS safety policies, approved methods and in MSDSs where available. Refer to the CAS Environmental, Health and Safety Manual and the appropriate MSDS prior to beginning this method.

5.3. Hydrochloric and/or Nitric Acid are used in this method. These acids are extremely corrosive and care must be taken while handling them. A face shield should be used while pouring acids. And safety glasses should be worn while working with the solutions. Lab coat and gloves should always be worn while working with these solutions.

6. SAMPLE PRESERVATION AND STORAGE

Non-aqueous samples are stored at 4 ± 2 °C from receipt until analysis, unless otherwise dictated by project specifications.

7. APPARATUS AND EQUIPMENT

7.1. CETAC M-6000A Mercury Analyzer. See Attachments for instrument parameters.

7.2. Hot water bath capable of maintaining a temperature of 90-95°C. A 0-150°C thermometer that has been calibrated with a reference thermometer is used to monitor the bath.

7.3. Pipettes and graduated cylinders.

7.4. 300 mL BOD Bottles

7.5. Analytical balance

8. STANDARDS AND REAGENTS

8.1. Mercury stock solution (1,000 mg/L). Commercially prepared certified solution.

8.2. Mercury working standard (100 µg/L). Prepare from the stock standard.

8.3. Laboratory Control Sample – ERA Priority Pollutant/CLP Inorganic Soil reference material.

8.4. Matrix spike solution (1 mg/L) – Prepare from the mercury stock solution.

Note: See section 11.2.2 for details on preparation of calibration and ICV standards. See section 12 for QC sample preparation.

8.5. Reagent water - ASTM Type II water (laboratory deionized water).

8.6. Acids - Purity of acids must be established by the laboratory as being high enough to eliminate the introduction of contamination above the Method Reporting Limit.

8.6.1.1.Concentrated nitric acid

8.6.1.2.Concentrated sulfuric acid

8.6.1.3.Aqua regia

8.7. Potassium permanganate solution, 5% w/v. To prepare, add 50 g of solid reagent to 1000

mL of D.I. water and place on magnetic stir plate for a approximately 30 minutes until dissolved.

8.8. Sodium chloride/hydroxylamine hydrochloride solution, 12% w/v each. To prepare, add 120g sodium chloride and 120 g of hydroxylamine hydrochloride to 1000 mL of D.I. water and place on magnetic stir plate for a approximately 15 minutes until dissolved.

8.9. Stannous chloride, 10% w/v in HCl (7% v/v). To prepare, add 100g stannous chloride crystals and 70 mL of concentrated hydrochloric acid in 1000 mL of D.I. water. Seal lid on mixing bottle and shake until the stannous chloride is dissolved.

9. PREVENTIVE MAINTENANCE

9.1. CAS staff performs all routine maintenance and troubleshooting. Preventative maintenance activities listed below should be performed when needed as determined by instrument performance (i.e. stability, sensitivity, etc.) or by visual inspection. Repairs of an extraordinary nature may or may not require factory service, depending on the nature of the task. All maintenance activities are recorded in a maintenance logbook kept for each instrument.

9.2. Keep the instrument free of dust, deposits, and chemical spills.

9.3. Replace the peristaltic and autosampler rinse tubing.

9.4. Remove and clean the Gas-Liquid Separator.

9.5. Remove, dismantle, and clean the optical cells (sample cell and reference cell) including the sapphire windows.

9.6. Replace the Hg lamp bulb when the lamp current reaches 13 mA.

10. RESPONSIBILITIES

10.1. It is the responsibility of the analyst to perform the analysis according to this SOP and to complete all documentation required for data review. Analysis and interpretation of the results are performed by personnel in the laboratory who have demonstrated the ability to generate acceptable results utilizing this SOP. This demonstration is in accordance with the training program of the laboratory. Final review and sign-off of the data is performed by the department supervisor/manager or designee.

10.2. It is the responsibility of the department supervisor/manager to document analyst training. Documenting method proficiency, as described in 7471A, is also the responsibility of the department supervisor/manager.

11. PROCEDURE

11.1. Sample Preparation

11.1.1. For soil, sediment, solids, weigh 1.00 g of sample and place in the bottom of a 300 mL BOD bottle. Add 5 mL of reagent water and 5 mL of aqua regia, then heat in the water bath for 2 minutes at 95°C.

For tissue samples, weigh 5.0g of wet tissue and place in the bottom of a 300mL BOD bottle. Add 10mL of concentrated nitric acid and 4mL of concentrated HCl. Heat on a hotplate at 95°C for 15-20 minutes.

11.1.2. Cool, then add 50 mL of reagent water and 15 mL of potassium permanganate solution. Make sure that there is an excess of potassium permanganate, as indicated by the sample maintaining a purple color. Add additional potassium permanganate if needed. Note: Spiking solution is added prior to acidification.

11.1.3. Mix thoroughly and place in the water bath for 30 minutes at 95°C. The temperature of each water bath is monitored with calibrated thermometer.

11.1.4. Cool and add 6 mL of sodium chloride-hydroxylamine hydrochloride to reduce the excess permanganate. Perform this addition under a hood as Cl_2 could be evolved.

11.1.5. Add 55 mL of reagent water and the sample is ready for analysis. (The vapor generator does the final step of adding the stannous chloride solution automatically.)

11.2. Calibration

11.2.1. To prepare calibration standards a 10 ppm intermediate stock solution is first prepared by aliquoting 1.0 mL of commercially prepared 1000 ppm stock standard into an acid rinsed 100 mL Class A volumetric flask and diluting to volume with 1% HNO3. This solution must be prepared monthly. Next, a 100 ppb working solution is prepared by aliquoting 1.0 mL of the 10 ppm intermediate stock solution into an acid rinsed 100 mL Class A volumetric flask and diluting to volume with 1% HNO3. This solution must be prepared daily.

Note: All standard aliquots are measured using calibrated fixed or adjustable volume autopipetters or calibrated disposable 5.0 or 10.0 mL pipettes.

11.2.2. Transfer 0, 0.2, 0.5, 1.0, 5.0, 10.0 mL aliquots of the working solution to a series of labeled 300 mL BOD bottles. Add the appropriate amount of reagent water to bring each bottle to a volume of 10 mL. Add 5 mL of aqua regia and heat in the water bath for 2 minutes at 95°C. The final concentrations of the prepared

standards are 0, 0.2, 0.5, 1.0, 5.0, 10.0 ppb. (Note: The standards are prepared in 100 mL volumes rather than 20 mL volumes as the sample in order to efficiently prepare enough volume for possible recalibrations as well as aliquoting for CCV, CCB and CRA samples in the analytical run. The proportions of reagents and their sources are identical to those of the samples.)

The Initial Calibration Verification (ICV) is prepared by first making a 1000 ppb intermediate solution. 0.10 mL of commercially prepared 1000 ppm stock standard, from a different manufacturer and lot than the calibration standard, is aliquoted into an acid rinsed 100 mL Class A volumetric flask and diluting to volume with 1% HNO3. This solution must be prepared monthly. Prepare the ICV standard by aliquoting 0.5 mL to a labeled 300 mL BOD bottle. Add the 99.5 mL of reagent water to bring the final volume to 100 mL.

11.2.3. Cool and then add 50 mL of reagent water and 15 mL of potassium permanganate solution and return the bottles to the water bath for 30 minutes.

11.2.4. Cool and add 6 mL of sodium chloride-hydroxylamine hydrochloride solution. Add 50 mL of reagent water and the standards are ready for analysis.

11.2.5. CETAC Calibration and Sample Analysis

11.2.5.1. Turn on the CETAC instrument, including the Hg lamp, and autosampler. After this is done turn open the operating software (Mercury Analyzer 1.5.1.1).

11.2.5.2. The rinse station for the autosampler turns on automatically, but the peristaltic pump must be started manually. Make sure all sample uptake and drain tubes are placed correctly on the pump and are secured with the appropriate tension. Place the reagent uptake tube in the stannous chloride and start the pump.

11.2.5.3. From the software's main screen select the "Worksheet" button and then the "Template" button. Select the "Kelso Mercury Program".

11.2.5.4. Go to the "Labels" tab and enter the QC and field samples to be analyzed in the appropriate order.

11.2.5.5. Transfer the solutions to be analyzed to labeled 12mL polyethylene test tubes and place them in the appropriate spaces on the autosampler trays.

11.2.5.6. Transfer the calibration blank and standards (0.2, 0.5, 1.0, 5.0, and 10 ppb) from their BOD bottles to the standard tubes located behind the autosampler trays. The calibration blank is placed in the left most tube

and the other standards are placed in ascending order to the right.

11.2.5.7. Return to the software and go to the "Analysis" tab. At this point the analysis is ready to begin. Click on the start button. In the dialog box that appears be sure the following are checked:

- Calibrate before first sample.
- New output file before first sample.
- Zero before first sample.

Click start and the analysis will begin.

11.2.6. After the calibration standards have run the software will use linear regression to create a calibration curve based on the concentration and measured absorbance of each standard. The form of regression line is $y = mx + b$. If the correlation coefficient of the curve is greater than 0.995 the analysis will continue, if not the analysis will be terminated and corrective action will be needed by the analyst.

11.3. As the analysis sequence proceeds, next analyze the following QC standards.

- ICV (5.0 ppb standard prepared from a second source)
- ICB
- CCV (5.0 ppb calibration standard)
- CCB
- CRA (0.2 ppb calibration standard)

11.4. If either the ICV or CCV are different from their true values by more than 10% the software will terminate the analysis. If either the ICB or CCB is greater than the MRL the software will terminate the analysis. No control limit is applied to the CRA except under specific project requirements.

11.5. Sample Analysis

11.5.1. The samples are analyzed with the CETAC analyzer in the same manner as the calibration standards. The analyzer does the step of adding the stannous chloride solution automatically. Check the baseline between samples to verify that the spectrometer reading has stabilized at the normal baseline level.

11.5.2. The analytical sequence should be set up to include all samples, QC samples, blanks, and calibration verification standards at necessary intervals. Refer to the SOP for Sample Batches.

11.5.3. Sample digestion batches are analyzed with a set of CCV and CCB being run at a minimum every 10 samples until the analysis is completed. The same criteria

listed above are applied to the CCVs and CCBs and if one is found to be outside these limits the analysis is terminated.

12. QA/QC REQUIREMENTS

12.1. Method Detection Limits

12.1.1. A method detection limit (MDL) study must be undertaken before analysis of samples can begin. To establish detection limits that are precise and accurate, the analyst must perform the following procedure. Spike a minimum of seven blank replicates with a MDL spiking solution near the MRL and analyze. Refer to the CAS *SOP for The Determination of Method Detection Limits*.

12.1.2. Calculate the average concentration found (x) in the sample concentration, and the standard deviation of the concentrations for each analyte. Calculate the MDL for each analyte using the correct T value for the number of replicates. The MDL study should be done annually.

12.2. Ongoing QC Samples required are described in the CAS-Kelso Quality Assurance Manual, in the *SOP for Sample Batches*. For this analysis, these include:

12.2.1. Prepare one method blank (MB) per digestion batch, or per 20 samples, whichever is more frequent. Use 100 mL of D.I. water and follow the digestion procedures. The Method Blank should be < MRL. Redigest the associated samples if sample levels are <20X MB level.

12.2.2. Prepare one Laboratory Control Sample (LCS) per digestion batch, or per 20 samples. Weigh 0.50 g of the current lot of "Environmental Resource Associates PriorityPollutnT/CLP Inorganic Soil" prepared reference material in to a 300 mL BOD bottle and prepare as per the procedure.

The LCS recovery criteria are 60-130%, unless project-specific or in-house limits are established. If the LCS fails the acceptance criteria, redigest the batch of samples.

12.2.3. Prepare one sample duplicate and one matrix spike sample per each digestion batch, or per twenty samples, whichever is more frequent. For the matrix spike, add 0.5mL of the matrix spike solution to the designated spike sample, resulting in a spike concentration of 0.5 mg/kg. At times, specific samples will be assigned as duplicates or spikes depending on client requirements.

The RPD criteria for duplicates is 20% RPD. If not, flag the data or redigest samples. Matrix spike recovery criteria is 60-130%. If not, flag the data if the sample value is >4 X spike level or redigest samples in batch.

13. DATA REDUCTION, REVIEW, AND REPORTING

13.1. It is the analysts responsibility to review analytical data to ensure that all quality control requirements have been met for each analytical run. Results for QC analyses are calculated and recorded as specified in section 12.

1.1. Record all sample weight, volumes and dilutions on an A.A. benchsheet (see Attachments).

1.2. Solution concentrations are calculated by the Mercury Analyzer software based on the linear regression calibration curve created when the calibration standards are analyzed. The absorbance measured for each sample is applied to the linear regression curve and the final solution concentration is determined and displayed as the instrument result.

1.3. Calculate sample results using the data system printouts and digestion information. The digestion and dilution information is entered into the data system. The data system then uses the calculations below to generate a sample result.

Solid samples are reported in mg/Kg:

$$mg/Kg(Sample) = C^{*} \times PostDigestionDilutionFactor \times \frac{DigestionVol.(ml)}{Samplewt.(g)} \times \frac{1mg}{1000ug} \times \frac{1L}{1000ml} \times \frac{1000g}{1Kg}$$

C*= Concentration of analyte as measured at the instrument in ug/L (in digestate).

1.1. Record all concentrations determined at the instrument and calculate the final results in mg/Kg. Record the final results on the A.A. Benchsheet.

1.6. The data packet for the sequence is submitted for review by supervisor or designee. The results are transferred to the appropriate report form located in the CAS network directory R:\ICP\WIP. Once the results are transferred, the report is reviewed.

1.7. A daily run log of all samples analyzed is maintained. All data should be printed and stored after operator has checked for evenness of burns. A copy of this document will go with each package of Tier III or higher data run that day.

1.8. Refer to the SOP for Laboratory Data Review Process for general instructions for data review.

14. CONTENGENCIES FOR HANDLING OUT-OF-CONTROL OR UNACCEPTABLE DATA

Corrective action measures applicable to specific analysis steps are discussed in the applicable section of this (and other applicable) SOP(s). Also, refer to the SOP for *Nonconformity and Corrective Action* for correct procedures for identifying and documenting such data. Procedures for applying data qualifiers are described in the SOP for *Report Generation* or in project-specific requirements.

15. METHOD PERFORMANCE

1.1. This method was validated through single laboratory studies of accuracy and precision. Refer to the reference method for additional available method performance data.

1.2. The method detection limit (MDL) is established using the procedure described in the SOP for *The Determination of Method Detection Limits* (ADM-MDL). Method Reporting Limits are established for this method based on MDL studies and as specified in the CAS Quality Assurance Manual.

16. POLLUTION PREVENTION

It is the laboratory's practice to minimize the amount of solvents, acids and reagent used to perform this method wherever feasible. Standards are prepared in volumes consistent with methodology and only the amount needed for routine laboratory use is kept on site. The threat to the environment from solvent and reagents used in this method can be minimized when recycled or disposed of properly.

17. WASTE MANAGEMENT

1.1. The laboratory will comply with all Federal, State and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions as specified in the CAS EH&S Manual.

1.2. This method uses acid. Waste acid is hazardous to the sewer system and to the environment. All acid waste must be neutralized to a pH of 2.5-12 prior to disposal down the drain. The neutralization step is considered hazardous waste treatment and must be documented on the treatment by generator record. See the CAS EH&S Manual for details.

18. TRAINING OUTLINE

1.1. Training outline

1.1.1. Review literature (see references section). Read and understand the SOP. Also review the applicable MSDS for all reagents and standards used. Following these reviews, observe the procedure as performed by an experienced analyst at least three times.

1.1.2. The next training step is to assist in the procedure under the guidance of an experienced analyst. During this period, the analyst is expected to transition from a role of assisting, to performing the procedure with minimal oversight from an experienced analyst.

1.1.3. Perform initial precision and recovery (IPR) study as described above for water samples. Summaries of the IPR are reviewed and signed by the supervisor. Copies may be forwarded to the employee's training file. For applicable tests, IPR studies should be performed in order to be equivalent to NELAC's Initial Demonstration of Capability.

18.2. Training is documented following the SOP *for Documentation of Training*.

NOTE: When the analyst training is documented by the supervisor on internal training documentation forms, the supervisor is acknowledging that the analyst has read and understands this SOP and that adequate training has been given to the analyst to competently perform the analysis independently.

19. REFERENCES

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. EPA SW-846, 3rd Edition, Final Update II, Method 7471A, September 1994.

ATTACHMENTS

Instrument Parameters
Benchsheets

Analyst	C. BAIRD
Date Created:	Tuesday, June 19, 2001
Worksheet	KA0102248 6/19/01 7471
Comment	CETAC 1
Sip Duration (Sec.):	30
Rinse Duration (Sec.):	60
Read Delay:	38
Integration Time/Replicate:	2.69
# of Replicates:	4
# of Repeats:	1
Baseline Correction Enabled:	False
Baseline Point 1 Start Time:	
Baseline Point 1 End Time:	
2-Point Baseline Corr. Enabled:	False
Baseline Point 2 Start Time:	
Baseline Point 2 End Time:	
Gas Flow (ml/min):	135
Calibration Algorithm:	Linear
Recalibration Frequency:	0
Reslope Frequency:	0
Reslope Standard:	5
Calibration Standard #1 Conc.:	0.20 PPB
Calibration Standard #2 Conc.:	0.50 PPB
Calibration Standard #3 Conc.:	1.00 PPB
Calibration Standard #4 Conc.:	5.00 PPB
Calibration Standard #5 Conc.:	10.00 PPB
QC Enabled:	True
QC-RSD Enabled:	True
Limit Condition & Error Action:	If %RSD > 20.0%, if µAbs. > 500, Flag and Continue
QC-Std Enabled:	True
Limit Condition & Error Action:	If outside 90% .. 110%,Stop
QC-Blank Enabled:	True
Limit Condition & Error Action:	If outside -200 .. 200,Stop

Columbia Analytical Services

EPA METHOD 7471A

Service Request Number(s) :

Sample	Wet Weight (g)	% Solids	Dry Weight (g)	Final Volume (mL)
Std. 0.2	0.2 * mL			100
Std. 0.5	0.5 * mL			100
Std. 1.0	1.0 * mL			100
Std. 5.0	5.0 * mL			100
Std. 10.0	10.0 * mL			100
ICV	0.5 ** mL			100

Lot # of Reagents Used:

HNO3: T28062 **K2S2O8: T44H13** **NaCl : T12617**

H2SO4: 39160 **KMnO4: T39610** **NH2OH-HCL: T14470**

HCL: K25842703847 **SnCl2: T46598**

LCSS = **ERA CLP Soil Lot # 246** **Other: _____**

LCSW= **ICV Intermediate stock solution.**

*** Source Standard: Hg S2 _____**

**** Source Standard: Hg ICV S1 _____** **TIME STARTED:**

Comments: _____	
Analyst:	**Date:**

Columbia Analaytical Services
Metals Tier IV Digestion Sheet

SR : SDG: Prep Method: IML04.0 Soil: Wet Dry

SAMPLE	Hg			Hg			
	Initial Volume	(mL)	Final (mL)	Initial Weight	(g)	Final (mL)	
BATCH #							

LCSS (circle appropriate) ERA CLP Soil Lot # 246 EPA Lot # 0287 Other:_____

TIME STARTED Hg SOIL: _____

TIME STARTED Hg WATER: _____

Hg Soil Spike= _____

Hg Water Spike= _____

Lot # of Reagents Used:

HNO3: T28062
H2SO4: 39160
HCl: K25842703847
K2S2O8: T44H13
KMnO4: T39610
SnCl2: T46598
NaCl: T12617
NH2OH-HCl: T14470

Comments: _____

Analyst: _____ Date: _____

clpdig.xlw
5/10 /1999

STANDARD OPERATING PROCEDURE

for

TOTAL CYANIDES AND CYANIDES AMENABLE TO CHLORINATION

SOP No.: GEN-335

Revision: 11

January 4, 2006

Approved by: _____ Supervisor _____ Date 1/5/06

_____ QA Manager _____ Date 1-5-06

_____ Laboratory Manager _____ Date 1/5/06

COLUMBIA ANALYTICAL SERVICES, INC.
1317 South 13th Avenue
Kelso, Washington 98626

Annual review of this SOP has been performed and the SOP still reflects current practice.
Initials: _____ Date: _____
Initials: _____ Date: _____
Initials: _____ Date: _____

DOCUMENT CONTROL

NUMBER: _____

Initials: _____ Date: _____

TOTAL CYANIDES AND CYANIDES AMENABLE TO CHLORINAITON

1. SCOPE AND APPLICATION

1.1. This procedure is applicable to cyanides, either as free cyanide, in simple soluble salts or in metal complexes, as well as cyanides amenable to chlorination. Routinely, this procedure is applicable to EPA methods 335.1, 335.4, and 9012A and 9010B; and Standard Methods 4500C,E. Alternatively, the cyanide determination can be done using methods 335.2 and 9010B/9014. This procedure applicable to drinking, surface, and saline waters, domestic and industrial waste.

1.2. The working range is 0.005 mg/L to 0.40 mg/L and dilutions can be made to extend this range for higher level samples. The Method Detection Limit (MDL) has been experimentally determined to be 0.003 mg/L in water for total CN and 0.003 mg/L for CN amenable to chlorination. The routine Method Reporting Limit (MRL) is 0.01 mg/L in water and 0.2 mg/kg in soil. Equivalent nomenclature for MRL includes Estimated Quantitation Limit (EQL) and Practical Quantitation Limit (PQL). Therefore, MRL=EQL=PQL.

1.3. If total cyanide is detected below 250 mg/kg in waste, reactive cyanide is therefore considered < 250 mg/kg, and the reactive cyanide analysis is not necessary. Otherwise, use the distillation method for reactive cyanide found in section 7.3.3, Chapter 7, SW-846 to determine actual reactive cyanide.

2. METHOD SUMMARY

2.1. **Total/Amenable Cyanide -** Cyanide is released from cyanide complexes and converted to hydrocyanic acid (HCN) during reflux - distillation with sulfuric acid and magnesium chloride ($MgC1_2$) and absorbed in a scrubber containing a sodium hydroxide solution.

2.2. **Total/Amenable Cyanide -** The cyanide ion is then converted to cyanogen chloride (CNCl) by reaction with chloramine-T at a pH less than eight without hydrolyzing to the cyanate. After the reaction is complete, color is formed with the addition of pyridine barbituric acid reagent. The absorbance is read at 570 nm on the Lachat Automated Ion Analyzer. Back-up method: color development with pyridine barbituric acid reagent read at 578 nm or with pyridine - pyrazolone reagent read at 620 nm on manual spectrophotometer.

2.3. **Amenable Cyanide –** A portion of the sample is chlorinated at a pH >11 to decompose the cyanide. Cyanide levels in the chlorinated sample are then determined by the method for Total Cyanide. Cyanides amenable to chlorination are then calculated by the difference.

3. DEFINITIONS

Cyanide is defined as cyanide ion and complex cyanides converted to hydrocyanic acid by reaction in a reflux system of a mineral acid in the presence of magnesium ion.

4. INTERFERENCES

4.1. A number of interferences will be eliminated or reduced by using the distillation procedure in section 11.

4.2. Oxidizing agents such as chlorine decompose most cyanides. These should be removed, if possible, prior to preservation described in 6.2. If they were not removed before, they can be removed prior to distillation. Test by placing a drop of sample onto potassium iodide (KI) - starch paper wetted with 10% nitric acid. A purple color indicates the presence of oxidizing agents. Treat by adding ascorbic acid crystals, a few at a time, until a drop of sample no longer turns the KI - starch paper blue. Then add an additional 0.03 g of ascorbic acid for each 500 ml of sample.

4.3. Nitrates and nitrites can lead to high results as they can form nitrous acid during distillation, which will react with some organic compounds to form oximes. Ultimately these can decompose to generate HCN. Sulfamic acid, approximately 2 g, is added prior to addition of sulfuric acid.

4.4. Sulfides interfere with the colorimetric determination and titration procedure. Samples that contain hydrogen sulfide, metal sulfides or other compounds that may produce hydrogen sulfide during the distillation should be distilled by the optional procedure 11.4.2. Test by wetting a lead acetate test strip (8.6) in lead acetate (8.2.6). Squirt sample with 10% HNO_3 and hold wetted lead acetate test strip above sample. A brown color indicates the presence of sulfides.

4.5. The presence of surfactants may cause the sample to foam during refluxing. If this occurs the addition of an anti-foam agent should be added to the distillation flask to prevent the sample from foaming up into the condenser.

5. SAFETY

5.1. All appropriate safety precautions for handling solvents, reagents and samples must be taken when performing this procedure. This includes the use of personnel protective equipment, such as, safety glasses, lab coat and the correct gloves.

5.2. Chemicals, reagents and standards must be handled as described in the CAS safety policies, approved methods and in MSDSs where available. Refer to the CAS Environmental, Health and Safety Manual and the appropriate MSDS prior to beginning this method.

5.3. Sodium Hydroxide (NaOH) is a strong caustic and a severe health and contact hazard. Use nitrile or latex gloves while handling pellets or preparing solutions.

5.4. This procedure involves the evolution of hydrocyanic acid (HCN), a highly poisonous gas. Care must be taken during distillation to prevent the release of this gas. A cyanide dosimeter is recommended for the lab bench near the distillation units.

5.5. Caution should be used when preparing and using stock standard solutions and other reagents. The MSDS for each of these should be read before handling. Specific care is listed below:

5.5.1. Potassium cyanide (KCN) and sodium cyanide (NaCN) are highly toxic and a severe health and contact hazard. Upon contact with acid they will liberate HCN, a highly poisonous gas. Use caution when preparing standards.

5.5.2. Sulfuric acid (H_2SO_4) is a severe health, reactivity, and contact hazard. Always wear gloves and use caution when handling.

5.5.3. Chloramine - T is a mutagen, avoid breathing dust and do not purge for an excessive period of time.

5.5.4. Pyridine is also a health hazard and its odor is very pervasive. Always prepare in a hood, wearing gloves, and keep capped tightly when transporting.

6. SAMPLE COLLECTION, CONTAINERS, PRESERVATION, AND STORAGE

6.1. Sample bottles can both be glass or plastic and must be thoroughly cleaned and rinsed prior to use. For macro distillation, a minimum of 250 mL of sample should be collected or 75 mL if the midi distillation is used.

6.2. Oxidizing agents such as chlorine decompose most cyanides and should be removed prior to preservation with sodium hydroxide, if possible, by the procedure described in 4.2.

6.3. Samples are to be preserved with 2 ml of a 10 N sodium hydroxide solution per liter of sample (to a pH $\geq$ 12) at time of collection.

6.4. Samples must be stored refrigerated at 4 $\pm$ 2°C and distilled within the specified maximum holding time of 14 days from date of sample collection for water samples. Soil samples must be extracted within 14 days of sampling (see SOP GEN-9013).

7. APPARATUS AND EQUIPMENT

7.1. Macro distillation

7.1.1. Reflux distillation apparatus as shown in Figure 1 is used. Laboratory should have equipment and glassware for 12 distillation units and extras, including:

- Distillation flask, one liter size, two-neck.
- Air inlet tube and safety trap and tubing.
- Cold-finger condenser and jacket.
- Absorber top and jacket with gas dispersion fritted outlet.
- Adjustable heater.
- Vacuum source with 500 ml vacuum trap and cooling water supply.

7.2. For midi distillation, reflux distillation apparatus as shown in Figure 2. The Easy-Still unit will accommodate up to 20 distillations at one time with the following equipment.

- Boiling tube
- Reagent inlet adapter
- Cold-finger condenser and jacket
- Fritted bubbler, bubbler vessel, and clip
- Vacuum source and cooling water supply

7.3. Laboratory glassware including: graduated cylinders, 25, 50, 250, and 500 ml sizes, volumetric flasks, 10, 25, 50, 100, 250, 500, and 1000 ml sizes with stoppers, a range of volumetric pipettes, class A, and calibrated eppendorf pipettes in a range of volumes.

7.4. Lachat brand Quick Chem, Automated Ion Analyzer, and related equipment including:

7.4.1. Autosampler.

7.4.2. Peristaltic pump.

7.4.3. Six-way valve and cyanide manifold.

7.4.4. Flow cell with 570 nm filter.

7.4.5. Printer, Panasonic, KX-P2123.

7.4.6. Data system, IBM personal System/2 with keyboard.

7.4.7. Borosilicate glass sample tubes.

7.4.8. Reagents, sample, and manifold tubing.

7.5. Manual Spectrophotometer, Milton Roy Spectronic 1001 Plus, capable of measurements at 578 nm or 620 nm with either a 1.0 cm or 5.0 cm cell. (Backup method)

8. STANDARDS, REAGENTS, AND CONSUMABLE MATERIALS

8.1. Record all reagent preparation and all standard preparation in CN^- logbook designated as CN (book#)-page I.D.

8.2. Distillation reagents

8.2.1. Sodium hydroxide solution, 0.5N: dissolve 20 g of NaOH pellets in distilled water, dilute to one liter. (See safety section 5).

8.2.2. Sulfuric acid: Concentrated H_2SO_4. (See safety section 5).

8.2.3. Magnesium chloride solution: Dissolve 510 g of $MgCl_2 \cdot 6H_2O$ into distilled water and dilute to one liter.

8.2.4. Sulfamic acid, crystals from macro distillation. Dissolve 20g in deionized water and dilute to 500mL for midi distillation.

8.2.5. Ascorbic acid: crystals.

8.2.6. Lead acetate: Dissolve 30 g of Pb $(C_2H_3O_2).3H_2O$ in 950 ml of distilled water. Adjust the pH to 4.5 with acetic acid. Dilute to 1 liter.

8.2.7. Calcium Hypochlorite solution: Dissolve 5 g of calcium hypochlorite $(Ca(Ocl)_2)$ in 100 ml of distilled water.

8.2.8. Sodium Hydroxide solution (1.25N): Dissolve 50 g of sodium hydroxide (NaOH) in distilled water and dilute to 1 L.

8.2.9. Potassium Iodide-starch test paper.

8.2.10. Lead acetate test paper

8.3. Standards and QC samples

8.3.1. Stock cyanide solution: Carefully weigh out 2.510 g of KCN and dissolve in distilled water, dilute to one liter. Standardize with 0.0192 N $AgNO_3$, 1 ml = 1 mg CN^- (1000 mg/L). Keep refrigerated. (See safety section 5).

8.3.2. Working standard cyanide solution: Dilute 1 ml of stock cyanide solution and 20 ml of 1.25 NaOH to 100 ml final volume with distilled water, 1 ml = 10 µg (10 mg/L). Prepare fresh monthly.

8.3.3. Stock NaCN solution: Carefully weigh 0.189g NaCN (oven dried) and 0.16g NaOH. Dissolve in distilled water and dilute to 100 ml. Standardize with 0.0192N $AgNO_3$, 1 ml CN^- (1000 mg/L). Keep refrigerated. (See safety section 5).

8.3.4. Working NaCN solution: Dilute 1 ml of stock NaCN solution and 20 ml of 1.25N NaOH to a 100 ml final volume with distilled 1 ml = 10 µg (10 mg/L). Prepare fresh monthly.

8.3.5. Standard silver nitrate solution, 0.0192 N: 1 ml = 1 mg CN^- for standardization.

8.3.5.1. Purchased as prepared 0.0192 N AgNO3 standard.

8.3.5.2. Prepare by crushing approximately 5 g $AgNO_3$ crystals and drying to constant weight at 40°C. Allow to cool in a desiccator and carefully weigh out exactly 3.2647 g of dried $AgNO_3$ and dissolve in one liter.

8.3.6. LCS: Purchased from Inorganic Ventures. Preserve with NaOH and make according to manufacturer's directions. Equivalent LCS standards may be purchased from other vendors.

8.4. Semi-Automated Spectrophotometer Reagents.

8.4.1. Sodium hydroxide solution, 0.25 N: dissolve 10 g of NaOH pellets in distilled water and dilute to one liter.

8.4.2. Phosphate Buffer Solution: Dissolve 97g $KH_2PO_4 \cdot H_2O$ in distilled water and dilute to one liter.

8.4.3. Chloramine-T solution: dissolve 1.0 g chloramine -T in distilled water and dilute to 250 ml. Prepare fresh daily. (See safety section 5).

8.4.4. Pyridine - barbituric acid solution: ALWAYS IN A HOOD, dissolve 15 g barbituric acid in 100 ml distilled water and 75 ml pyridine in a one liter volumetric flask. Add 15 ml concentrated HCl and mix, dilute to one liter with distilled water. Transfer to an amber, one liter, stopper bottle. (See safety section 5).

8.4.5. In HCl Rinse solution: Dilute 62.5 ml concentrated HCl to one liter with distilled water.

8.5. Manual Spectrophotometric Reagents (Backup Method)

8.5.1. Sodium phosphate monobasic 1M: Dissolve 138 g of $NaH_2PO_4 \cdot H_2O$ in one liter of distilled water. Keep refrigerated.

8.5.2. Chloramine-T solution: Dissolve 10 g of chloramine-T in distilled water, dilute to one liter. Make fresh daily.

8.5.3. Pyridine - pyrazolone solution:

8.5.3.1. 3-Methyl-1-phenyl-2-pyrazolin-5-one reagent, saturated solution: Add 2.5 g of 3-Methyl-1-phenyl-2-pyrazolin-5-one to 500 ml distilled water, heat to 60°C with stirring, cool to room temperature (it may not all dissolve).

8.5.3.2. 3,3'-Dimethyl-1,1'-diphenyl[4,4'-bi-2-pyrazolim]- 5,5'-dione (bispyrazolone): Dissolve 0.1 g of bispyrazolone in 100 ml of pyridine. (See safety section 5)

8.5.3.3. Pour solution (8.5.3.1) through non-acid-washed filter paper and collect the filtrate. Through the same filter paper pour solution (8.5.3.2) collecting the filtrate in the same container as the filtrate from (8.5.3.1). Mix until it is homogenous and store in a dark bottle and prepare fresh daily.

NOTE: The reagent develops a pink color but this does not affect the color development with cyanide if used within 24 hours of preparation.

8.6. Consumables

Other equipment includes: Lead acetate and KI - starch test strips, funnels, tygon tubing and vacuum hosing for distillation, pipette bulbs, eppendorf pipette tips, stir bars, stir plates, gloves, and screw type clamps.

9. RESPONSIBILITIES

It is the responsibility of the analyst to perform the analysis according to this SOP and to complete all documentation required for data review. Analysis and interpretation of the results are performed by personnel in the laboratory who have demonstrated the ability to generate acceptable results utilizing this SOP. This demonstration is in accordance with the training program of the laboratory. Final review and sign-off of the data is performed by the department supervisor/manager or designee.

10. PREVENTIVE MAINTENANCE

10.1. No specific maintenance steps are needed other than normal cleaning and inspection of apparatus.

10.2. In case of problems encountered with distillation, check vacuum pump performance, apparatus connections, and plugs in tubing. Record any maintenance performed in CN logbook.

10.3. For problems encountered with Lachat operation, see Lachat troubleshooting guide.

11. PROCEDURE

11.1. Sample Preparation

11.1.1. The pH of samples should be taken and noted if other than 12.

11.1.2. Interference should be tested and treated for as described in Section 4.

11.1.3. Soil samples are prepared using EPA Method 9013 - see SOP GEN-9013.

11.2. Sample Preparation for cyanides amenable to chlorination

11.2.1. Two sample aliquots are required to determine cyanides amenable to chlorination. To one 50 ml aliquot or a volume diluted to 50 ml, add calcium hypochlorite dropwise while agitating and maintaining the pH between 11 and 12 with sodium hydroxide. CAUTION: The initial reaction product of alkaline chlorination is the very toxic gas cyanogen chloride, therefore, it is recommended that this reaction be performed in a hood.

11.2.2. Test for residual chlorine with KI-starch paper and maintain this excess for one hour, continuing agitation. A distinct blue color on the test paper indicates a sufficient chlorine level. If necessary, add additional hypochlorite solution.

11.2.3. After one hour, add 0.5 g portions of ascorbic acid until the KI-starch paper shows no residual chlorine. Add an additional 0.5 g of ascorbic acid to insure the presence of excess reducing agent.

11.2.4. Test for total cyanide in both the chlorinated and unchlorinated aliquots.

11.3. Apparatus Preparation

11.3.1. The reflux - distillation apparatus should be assembled as in Figure 1 or 2. Up to 20 stills can be used for the midi setup (up to twelve stills for macro) are setup with cooling water flow through six condensers in a train.

11.3.2. A vacuum trap flask, to which tubing is connected, again in a train of six, each tube fitted with a screw-down clamp to connect to each absorber. The absorbers are not yet connected to the condenser, vacuum should be closed.

11.4. When preparing standards using either distillation procedure below, treat the standards the same as the samples, adding all of the same reagents. Do not adjust volumes for distilled

standards to match sample volumes. Sample volumes are accounted for in data calculations and reporting (see 13.2.2.2).

11.5. Distillation Procedure - Macro

11.5.1. For samples without sulfides.

Place 200 ml of liquid sample, or 0.5g - 5.0g of solid sample, diluted to approximately 500 ml, in the one liter distillation flask, connect the cold-fingered condenser. Place 50 ml of the 0.5N NaOH solution (8.2.1) into absorber jacket, insert absorber top and carefully connect absorber to condenser, with clamp securing absorber. Insert inlet tube.

11.5.2. For samples containing sulfides

Place 200 ml of sample, or 0.5g - 5.0g of solid sample, diluted to 500 ml in the 1 liter boiling flask. Place 50 ml of 0.5 N NaOH (8.2.1) in the absorber jacket. Add 25 ml of lead acetate (8.2.6) to the sulfide scrubber. Assemble distillation apparatus in line such that lead acetate scrubber is in-line between distillation flask and NaOH scrubber.

11.5.3. For Waste Reactivity distillation, run samples as Total CN-

11.5.4. The low and high verification standards (0.05 and 0.15 mg/l) must be distilled in the same manner as the samples.

11.5.5. Connect vacuum line with absorber top and open clamp to start a slow steady stream of air entering the flask through the inlet tube. Adjust the vacuum so that air enters at a rate approximately two bubbles per second. Add approximately 2 g of sulfamic acid (8.2.4) through the air inlet tube. Rinse with distilled water and allow the airflow to mix for three minutes.

NOTE: The bubble rate will not remain constant after reagents have been added and while heat is applied. It will be necessary to readjust the air rate to prevent the sample from backing up into the air inlet tube or the sodium hydroxide solution from backing up into the vacuum trap.

11.5.6. Slowly add 25 ml concentrated sulfuric acid (8.2.2) through the air inlet tube and rinse with distilled water. Allow to mix for three minutes maintaining a steady bubble rate. Turn on water to condensers.

CAUTION: Violent reactions and foaming can occur, add slowly and be prepared to place safety trap tubing over air inlet tube. See Figure 1.

11.5.7. Add 20 ml of magnesium chloride solution through air inlet tube and rinse with distilled water and place safety trap stopper into air inlet tube.

11.5.8. Heat the solution to boiling and reflux for one hour (one hour and 15 minutes for sulfide positive). Take care to maintain a steady bubble rate and prevent sodium hydroxide from being pulled out vacuum source and to prevent sample solution from being pulled up air inlet tube. If it does, note that this is now a hot sulfuric acid solution and care must be taken, the safety trap should prevent a dangerous spill.

11.5.9. After one hour (one hour and 15 minutes for sulfide positive), turn off the heat and allow to cool for at least 15 minutes. Carefully disconnect the absorber top from the condenser, pull the absorber top quickly out of the solution, and then allow it to drain inside for a moment, close off vacuum.

11.5.10. Into a 100 ml volumetric flask with a funnel atop rinse the absorber tube, pour the solution from the absorber jacket and rinse several times with distilled water. Bring up to volume with distilled water.

11.5.11. Record all samples, duplicates, spikes, and QC samples distilled volumes, spike level and any other pertinent information on bench sheet.

11.6. Distillation Procedure - Midi

11.6.1. For samples without sulfides

Place 50 mL of liquid sample, or 0.1g - 0.5g of solid sample, in approximately 50 mL of DI water in boiling tube. Prepare a soil method blank by placing 0.1-0.5g or analyte-free matrix sand in approximately 50mL of DI water in a boiling tube. Place 25 mL of 0.25N NaOH (8.4.1) in bubbler vessel. Place boiling tube in midi distillation unit, insert inlet adapter, install condenser. Install bubbler in vessel and secure with clip. Attach vacuum hose to scrubber and install onto condenser.

11.6.2. For samples containing sulfides, place lead acetate scrubber apparatus in series, similar to the arrangement for macro distillation.

11.6.3. For waste reactivity samples, run as Total CN-.

11.6.4. Low and high verification standards (0.05 and 0.15 mg/L) must be distilled in the same manner as the samples.

11.6.5. Set operating parameters on the Easy Still for automatic operation.

Settings for CN-

Rate1: 15.0^{0}C/min.	Rate2: 0
Temp1: 190^{o}C	Temp2: 190^{o}C
Time1: 1.5 hr	Time2: 0

Press button for the desired parameters. The LED will flash corresponding to the chosen parameter. Enter the desired value using the keypad and press "enter". Repeat for each value given above.

11.6.6. Turn on the cooling water supply to condensers and open vacuum valves to give a bubble rate of approximately 2 bubbles/sec at the inlet adapter.

Note: If bubble rate is too low, the sample may boil out the inlet tube. If the bubble rate is too high, the sample becomes carbonated, causing interference with the Lachat analysis.

11.6.7. Add reagents at inlet adapter as follows: 5 mL sulfamic acid solution, 2.5 mL H_2SO_4 (conc.) ***slowly***, and 2.0 mL $MgCl_2$ solution. Rinse inlet adapter with DI water.

11.6.8. Press "start" button. The Easy Still will automatically go through the distillation cycle set above.

Note: Periodic check of boiling and vacuum rate is necessary to avoid possible sample loss.

11.6.9. When the distillation cycle is complete, wait for block temperature to fall below 100^{o}C to remove samples.

11.6.10. Remove scrubber and vessel from condenser as a unit with vacuum hose attached. Remove clip and separate vessel from scrubber. Empty vessel contents into 30 mL centrifuge tube. No further dilution is required prior to initial Lachat analysis.

11.6.11. Record all pertinent information on benchsheet.

11.7. Semi-Automated Spectrophotometric Determination

11.7.1. Set up Lachat system and cyanide manifold as described by manufacturer and download the cyanide method. Purge carrier (0.25N NaOH), phosphate buffer, and chloramine-T with Helium for approximately two minutes.

NOTE: Do not purge pyridine barbituric acid solution. (See safety section 5).

11.7.2. For all analyses, enter analyst name, service request, and current LCS information in the comments section for tray being run. Next enter sample identification numbers for tray in order being run, including all QC samples being run (see section 10) into identification location.

11.7.3. Pour calibration standards, blanks, control standards and samples in tray in order being run. An analyses sequence could appear as follows.

Calibration Standards
ICV
ICB
CCV-1
CCB-1
MB
LCS
0.15mg/L dist. std.
0.05 mg/L dist. std.
Sample 1
Sample 1Dup.
Sample 1Spk.
Sample 2
Sample 3
Sample 4
CCV-2
CCB-2
Sample 5
Sample 6
Sample 7
Sample 8
Sample 9
Sample 10
Sample 11
Sample 12
CCV-3
CCB-3

11.7.4. Calibration

11.7.4.1. The Linear Calibration Range (LCR) must be determined initially and verified every six months or whenever a significant change in instrument response is observed or expected. The initial demonstration of

linearity must use sufficient standards to insure that the resulting curve falls in the linear range of the instrument. The verification of linearity must use a minimum of a blank and three standards. If any verification data exceeds the initial values by ±10%, linearity must be reestablished. If any portion of the range is shown to be nonlinear, sufficient standards must be used to clearly define the nonlinear portion.

11.7.4.2. Calibration standards: When prepared as follows, the calibration standards are valid for 7 days. Prepare a blank and eight calibration standards at the following concentrations by adding 20 ml of 1.25N NaOH solution and the following amount of standard solution and making up to 100 ml with distilled water:

ml Standard Cyanide Solution (8.3.2) 10 mg/L	Concentration mg CN^-/L
0	0
0.1	0.01
0.2	0.02
0.5	0.05
1.0	0.1
1.5	0.15
2.0	0.2
3.0	0.3
4.0	0.4

11.7.4.3. Analyze the standards using the Lachat system as set up in Section 11.7.1.

11.7.4.4. The data system which accompanies the instrument uses specific functions for calibration and quantitation. The algorithm used is a linear regression calibration curve (see Appendix A). The system software calculates the calibration equation using the response or signal from the analysis of the standard to establish the calibration. No other calibration options are available to the analyst.

11.7.4.5. The correlation coefficient for each calibration is checked by the analyst to determine that the coefficient is = or >0.995. The data system will reject a calibration with a value <0.995 and will not process subsequent samples. If the criteria is not met, repeat the calibration.

11.7.4.6. An Independent Calibration Verification (ICV) standard should be run as first injection of the sample tray immediately after running the calibration. The ICV is at level mid range in the calibration. The ICV is prepared from NaCN. This is a second source (source other than

calibration standards), undistilled standard. The measured amount must be within 90-110% of the true value. If not, remake the standards and recalibrate.

11.7.4.7. Continuing Calibration Verification (CCV): A 0.100 mg CN^-/L. standard is analyzed after every ten samples including duplicates, spikes, MB's, etc. and at the end of the tray, at the level of the mid-range standard. The measured amount must be 90-110% of the true value. If not, remake the standards and recalibrate. Reanalyze any sample associated with a failing CCV.

11.7.4.8. Calibration blanks (ICB, CCB) are analyzed after every calibration verification (i.e., ICB after every ICV and CCB after every CCV). The measured amount must be less than the MRL or CRDL. If not, recalibrate and reanalyze any sample associated with the failing CCB.

11.7.4.9. As a check on the distillation, undistilled and distilled standards at 0.05 mg CN^-/L and 0.15mg CN^-/L are analyzed (one distilled/undistilled set at each level). The measured values of the distilled standards should be 90-110% of the measured values in the undistilled standards. If not, re-make and reanalyze the undistilled standard and apply the criteria.

11.7.5. Sample Analysis

11.7.5.1. Analyze the samples as described in section 11.7. Observe progress of the run noting anything noteworthy about peak shapes etc. onto post run report.

11.7.5.2. Reportable sample concentrations can be no higher than the highest standard. Make dilutions as necessary and include these on the end of the tray with the proper calibration verification and QC (e.g. CCV/CCB bracket) and record these on post run report also. For dilutions, ensure normality of final solution is 0.25N, using NaOH solution.

11.8. If problems occur due to instrument malfunction, stop the run and perform any necessary service or maintenance, recording what was done in the Lachat Maintenance Log.

11.9. When run is complete, pump in HCl rinse solution and then distilled water through all reagent lines, including carrier, for approximately ten minutes. Clean up sample tubes etc.. Drain lines of liquid.

11.10. Print out the following forms: Post-run report, calibration report, and calibration statistics. Record the slope and intercept of the calibration curve. Date and initial post run report.

12. QA/QC REQUIREMENTS

12.1. The ability of each analyst/instrument to generate acceptable accuracy and precision must be documented prior to sample analysis by performing 4 replicate LCS analyses and calculating average recovery and %RSD. Method criteria must be met for these results. This must be completed before analysis of samples, or whenever significant changes to the procedures have been made.

12.2. A method detection limit (MDL) study must be undertaken before analysis of samples can begin. The MDL studies should be done for each matrix, prep method, and instrument. Refer to the CAS SOP for The Determination of Method Detection Limits.

12.3. Ongoing QC Samples required for each sample batch (20 or fewer samples) are described in the CAS-Kelso Quality Assurance Manual and in the SOP for Sample Batches. The following QC samples are to be prepared and distilled each day, or with each analytical batch of 20 samples, whichever is less.

12.3.1. Method blanks - Method Blanks are aliquots of reagent water which are carried through the same procedure as the samples. Method Blanks must not contain detectable amounts of analyte > MRL, or the samples must be rerun.

12.3.2. One duplicate sample should be distilled for every twenty samples or less of a particular matrix (i.e. water, soil, etc.) and concentration if known (i.e. low, high). The first sample on a service request should be chosen sample QC unless another is specifically designated. Samples designated as field blanks are not to be used. The acceptance criteria is $\leq$ 20% RPD (for sample and duplicate results $\geq$ 5x MRL. If either or both sample replicate is < 5x MRL, then RPD is not applicable).

12.3.3. The LCS, or laboratory control standard, is a purchased standard used to check the performance of the analytical system. LCS recovery must be acceptable before samples can be analyzed. See the following table for QC limits.

12.3.4. One matrix spike should be performed for every twenty samples or less of a particular matrix (i.e. water, soil, etc.). Spike should also be the first sample on a service request, and preferably the same sample chosen for the duplicate unless another is designated. Field blanks should not be used, if designated as such. See the following table for QC limits. If the recovery falls outside the recovery range and the laboratory performance for that analyte is shown to be in control (LCS acceptable), the recovery problem with the MS is judged to be either matrix or solution related, not system related. No reanalysis is necessary.

Note: For method 9012A analyses, the method of standard additions shall be used for the analysis of all samples that suffer from matrix interferences such as samples which contain sulfides.

Method	LCS Water (%Rec)	LCS Soil (%Rec)	MS Water (%Rec)	MS Soil (%Rec)
335.4	90-110	NA	90-110	NA
9012A*	85-115	85-115	85-115	75-125

* For 9012A, these are default limits. Use statistical in-house limits when available.

13. DATA REDUCTION AND REPORTING

13.1. Calculations

13.1.1. Calculate the concentrations of samples and standards from distillate concentrations taking into account any dilutions made at the instrument and the initial sample volume and final distillate volume, using bench sheet, 12.4.

$$e.g. CN^{-} mg/L = \frac{AxBxC}{D}$$

Where A = mg CN^{-}/L read from Lachat Report
B = dilutions made
C = final distillate volume (e.g. 100 ml)
D = sample size (e.g. 200 ml)

13.1.2. Calculate the cyanide amenable to chlorination as follows:

CN, mg/L = A – B

Where:

A = mg/L total cyanide in unchlorinated aliquot.
B = mg/L total cyanide in chlorinated aliquot.

13.2. Reporting

13.2.1. Reporting units are mg CN^{-}/L.

13.2.2. Method Detection Limits and Method Reporting Limits

13.2.2.1. A method detection limit (MDL) of 0.003 mg/L has been determined using 200 mls of sample and a 100 ml final volume.

13.2.2.2. The MRL is 0.01 mg/L using 200 mls of sample to a 100 ml final volume. In order to obtain a lower MRL, increased sample volume (up to 500mls), and decreased final volume, (down to 50 mls), can be used. If a 500 ml sample volume and a 50 ml final volume are employed, the MRL is 0.002 mg/L.

13.3. It is the operator's responsibility to review analytical data to ensure that all quality control requirements have been met for each analytical run. Results for QC analyses are calculated and recorded as specified in section 12 of SOP. Average, RPD, spike level and spike recovery are entered on spreadsheet (see append. B) for corresponding samples. All data will be initialed, dated and attached to required data quality worksheet.

13.4. The data packet for the sequence is submitted for review by supervisor or designee. The results are transferred to the appropriate report form located in the CAS network directory R:\WET\WIP. These forms are made from templates located in R:\WET\FORMS.

13.5. Refer to the *SOP for Laboratory Data Review Process* for general instructions for data review.

13.6. Include copy of the cyanide bench sheet and instrument reports (run time, post run, calibration report and calibration stats) with the report forms.

14. CONTENGENCIES FOR HANDLING OUT-OF-CONTROL OR UNACCEPTABLE DATA

Corrective action measures applicable to specific analysis steps are discussed in the applicable section of this (and other applicable) SOP(s). Also, refer to the SOP for *Nonconformity and Corrective Action* for correct procedures for identifying and documenting such data. Procedures for applying data qualifiers are described in the SOP for *Report Generation* or in project-specific requirements.

15. METHOD PERFORMANCE

15.1. This method was validated through single laboratory studies of accuracy and precision. Refer to the reference method for additional method performance data available.

15.2. The method detection limit (MDL) is established using the procedure described in the SOP for *The Determination of Method Detection Limits* (ADM-MDL). Method Reporting Limits are established for this method based on MDL studies and as specified in the CAS Quality Assurance Manual.

16. POLLUTION PREVENTION

It is the laboratory's practice to minimize the amount of solvents, acids and reagent used to perform this method wherever feasible. Standards are prepared in volumes consistent with methodology and only the amount needed for routine laboratory use is kept on site. The threat to the environment from solvent and reagents used in this method can be minimized when recycled or disposed of properly.

17. WASTE MANAGEMENT

17.1. The laboratory will comply with all Federal, State and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions as specified in the CAS EH&S Manual.

17.2. This method uses acid. Waste acid is hazardous to the sewer system and to the environment. All acid waste must be neutralized to a pH of 2.5-12 prior to disposal down the drain. The neutralization step is considered hazardous waste treatment and must be documented on the treatment by generator record. See the CAS EH&S Manual for details.

17.3. This method uses a base. Waste base is hazardous to the sewer system and to the environment. All waste must be neutralized to a pH of 2.5-12 prior to disposal down the drain. The neutralization step is considered hazardous waste treatment and must be documented on the treatment by generator record. See the CAS EH&S Manual for details.

18. TRAINING

18.1. Refer to the SOP for Documentation of Training for standard procedures.

18.2. Training outline

18.2.1. Review literature (see references section). Read and understand the SOP. Also review the applicable MSDS for all reagents and standards used. Following these reviews, observe the procedure as performed by an experienced analyst at least three times.

18.2.2. The next training step is to assist in the procedure under the guidance of an experienced analyst. During this period, the analyst is expected to transition from a role of assisting, to performing the procedure with minimal oversight from an experienced analyst.

18.2.3. Perform initial precision and recovery (IPR) study as described above for water samples. Summaries of the IPR are reviewed and signed by the supervisor. Copies

may be forwarded to the employee's training file. For applicable tests, IPR studies should be performed in order to be equivalent to NELAC's Initial Demonstration of Capability.

18.3. Training is documented following the SOP for Documentation of Training.

NOTE: When the analyst training is documented by the supervisor on internal training documentation forms, the supervisor is acknowledging that the analyst has read and understands this SOP and that adequate training has been given to the analyst to competently perform the analysis independently.

19. REFERENCES

19.1. *Methods for Chemical Analysis of Water and Wastes*, March 1979 EPA publication #600\14 - 79 - 2.

19.2. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. EPA SW-846, 3rd Edition, Final Update III, Methods 9010B and 9012A, December 1996.

19.3. USEPA Contract Laboratory Program, document Number ILMO 4.0, Method for Total Cyanide Analysis by MIDI Distillation #335.4 CLP-M.

19.4. *Standard Methods for the Examination of Water and Wastewater,* 20th Edition.

19.5. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. EPA SW-846, 3rd Edition, Final Update III, Method 9010B, December 1996.

19.6. Operation Manual - Lachat

19.7. Quick Chem Methods

19.8. Troubleshooting guide - Lachat

19.9. Easy-Still Environmental Methods Manual

FIGURE 1

CYANIDE DISTILLATION APPARATUS (MACRO)

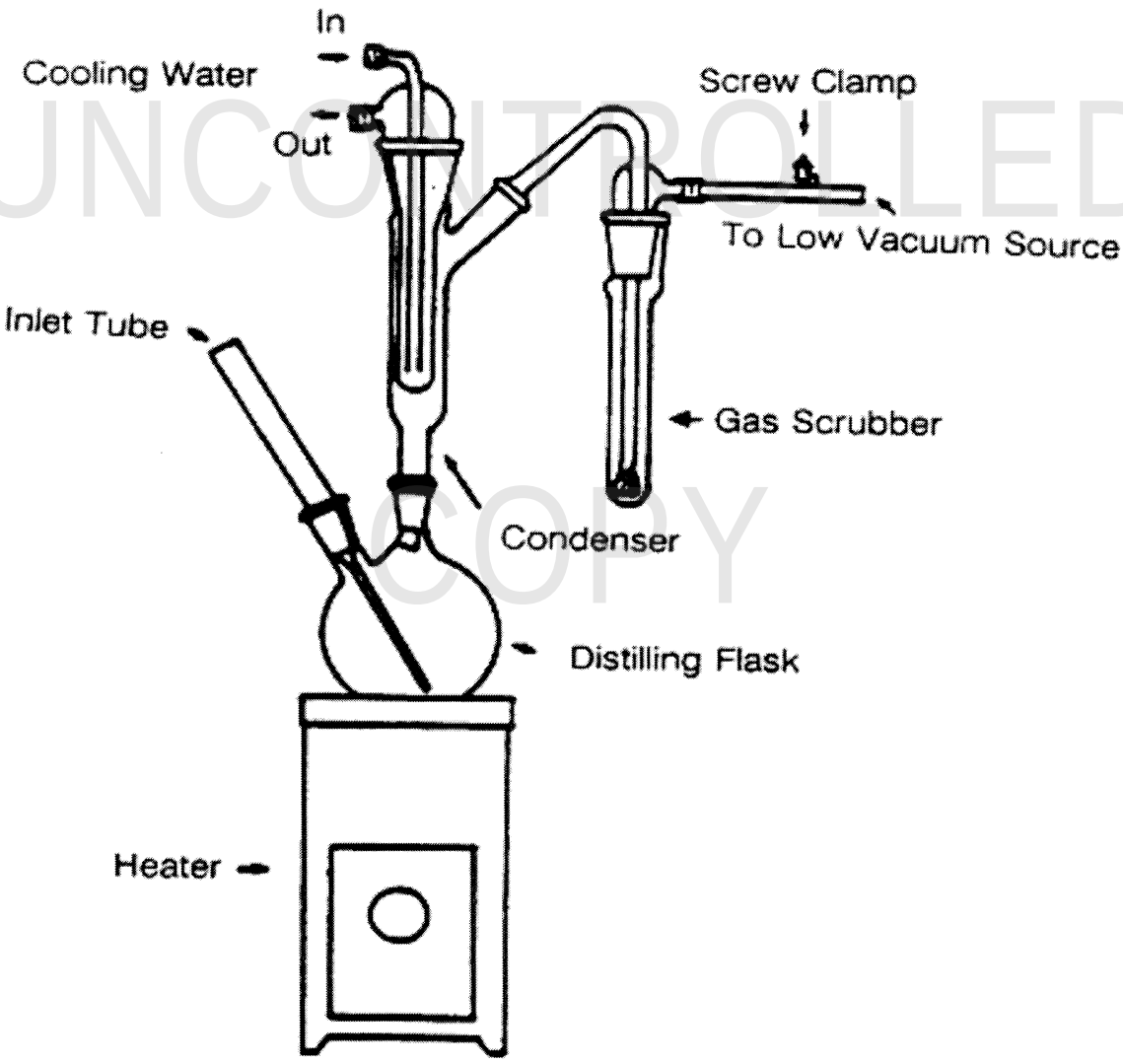
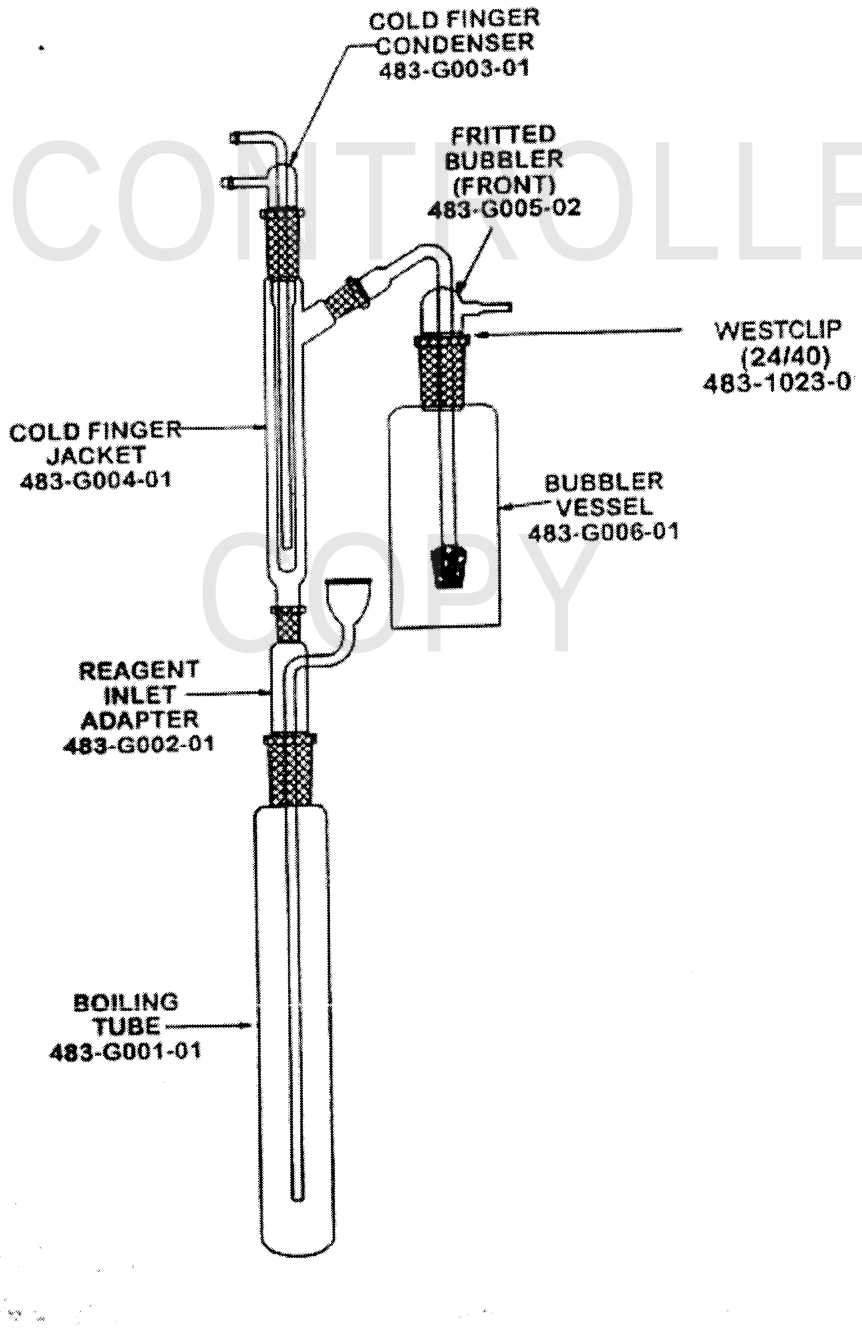


FIGURE 2

CYANIDE DISTILLATION APPARATUS (MIDI)



APPENDIX A

The calibration is determined using a linear regression that best fits the line of the X:Y pairs. The quality of the fit is determined by calculating the coefficient of determination (R^2), also called the correlation coefficient.

The line of regression is calculated as follows:

Start with the equation for a line, y = mx + b. From here the line of regression can be determined.

$$m = \frac{n\sum(xy) - \sum x \sum y}{n\sum(x^2) - (\sum x)^2}$$

$$b = \frac{\sum y - m\sum x}{n}$$

Where:

x = the values of the x variables.
y = the values of the y variables.
n = the number of data points.

Once the line of regression has been determined then the coefficient of determination can be calculated.

$$r^2 = \frac{\left(\sum xy - n\bar{x}\bar{y}\right)^2}{\left(\sum x^2 - \bar{x}\sum x\right) * \left(\sum y^2 - \bar{y}\sum y\right)}$$

APPENDIX B

Benchsheet

COLUMBIA ANALYTICAL SERVICES, INC. Page of

Work Order #: Method: EPA 335.1 / 335.2

9010 / SM 4500-CN I

Analysis: Total CN^- CN^- WAD Chlor. CN^-

Method modified using the Lachat Autoanalyzer for the colorimetric analysis.

Date Prepared	Lab Sample ID	Sample Name	Initial Wt./Vol. (g) or (ml)	Final Volume (ml)	mg/L (in solution)	mg/L - mg/kg As Rec'd	% Solids	mg/kg Dry Wt.
	MB							
	LCS							
	0.15							
	0.05							

Comments: All standards and total cyanides distilled with sulfamic acid.

LCS: ERA QC STD. Lot #: 9983 ID # CN/4-4- T.V. = 0.62 % REC:

0.15 Distilled = (0.75 mL x 10 ppm KCN) / 50 mL %REC = Qualitative test for sulfides:

0.05 Distilled = (0.25 mL x 10 ppm KCN) / 50 mL %REC = Qualitative test for oxidants:

10 ppm KCN / $K_3Fe(CN)_5$ ID #: CN/4-

MS = (0.50 mL x 10 ppm KCN) / ml = mg/L % REC: =

x = RPD =

MS = (0.50 mL x 10 ppm KCN) / ml = mg/L % REC: =

x = RPD =

Prepared By:	Date Prepared:
Analyzed By:	Date Analyzed:
Reviewed By:	Date Reviewed:

STANDARD OPERATING PROCEDURE

TOTAL ORGANIC CARBON IN WATER

GEN-TOC
Revision 7
January 5, 2006

Approved By:

Supervisor		1/5/06 Date
QA Manager		1-5-06 Date
Laboratory Manager		1/5/06 Date

COLUMBIA ANALYTICAL SERVICES, INC.
1317 South 13th Avenue
Kelso, Washington 98626

Annual review of this SOP has been performed and the SOP still reflects current practice.
Initials: _____ Date: _____
Initials: _____ Date: _____
Initials: _____ Date: _____

DOCUMENT CONTROL

NUMBER: _____

Initials: _____ Date: _____

Total Organic Carbon in Water

1 SCOPE AND APPLICATION

1.1 This procedure is applicable to the determination of Total Organic Carbon (TOC) in drinking, surface and saline waters, domestic and industrial wastewater using methods 415.1, 9060, and Standard Methods 5310C, 20th Edition. The procedure may also be extended to certain domestic or industrial wastes.

1.2 Normal operating parameters (i.e. 1 ml sample loop) yield a Method Reporting Limit (MRL) of 0.5 ppm C. A 5 ml sample loop may be used to lower the MRL to 0.1 ppm C. Equivalent nomenclature for MRL includes Estimated Quantitation Limit (EQL) and Practical Quantitation Limit (PQL). Therefore, MRL=EQL=PQL. The Method Detection Limit currently determined for a water matrix is 0.1 ppm.

2 METHOD SUMMARY

2.1 Total Organic Carbon (TOC) is determined by measuring carbon dioxide released by chemical oxidation of the non-purgeable organic carbon in the sample. After the sample has been acidified and purged of inorganic carbon, sodium persulfate, a strong oxidizer, is added. This oxidant quickly reacts with non-purgeable organic carbon in the sample at 100°C to form carbon dioxide. When the reaction is complete, the carbon dioxide is purged from the solution, concentrated by trapping, and thermally desorbed (200°C) and carried into a non-dispersive infrared detector that has been calibrated to directly display the mass of carbon dioxide detected. The resulting carbon mass in the form of carbon dioxide is the equivalent to the mass of organic carbon originally in the sample.

2.2 Total Inorganic Carbon is determined by carbon dioxide released by acidification of a sample. The pH of the sample is lowered, carbonate and bicarbonate ions are converted to dissolved carbon dioxide. This carbon dioxide is purged from the solution, concentrated by trapping, and detected as described for TOC.

3 DEFINITIONS

3.1 Analysis Sequence - Samples are analyzed in a set referred to as an analysis sequence. The sequence begins with instrument calibration (initial or continuing verification) followed by sample extracts interspersed with calibration standards (CCBs, CCVs, etc...) The sequence ends when the set of samples has been injected or when qualitative and/or quantitative QC criteria indicate an out-of-control situation.

3.2 Independent Calibration Verification (ICV) - Initial calibration verification standards which are analyzed after initial calibration with newly prepared standards but prior to sample analysis, in order to verify the validity of the standards used in calibration. The ICV standards are prepared from a materials obtained from a source different from that used to prepare calibration standards.

3.3 Matrix Spike/Duplicate Matrix Spike (MS/DMS) Analysis - In the matrix spike analysis, predetermined quantities of target analytes are added to a sample matrix prior to sample preparation and analysis. The purpose of the matrix spike is to evaluate the effects of the sample matrix on the method used for the analysis. Samples are split into duplicates, spiked, and analyzed as a MS/DMS pair. Percent recoveries are calculated for each of the analytes detected. The relative percent difference (RPD) between the duplicate spikes (or samples) is calculated and used to assess analytical precision. The concentration of the spike should be at 25 mg/L or at levels specified by a project analysis plan.

3.4 Method Blank (MB) - The method blank is an artificial sample composed of analyte-free water or solid matrix and is designed to monitor the introduction of artifacts into the analytical process. The method blank is carried through the entire analytical procedure.

3.5 Continuing Calibration Verification Standard (CCV) - A mid-level standard analyzed at specified intervals. Used to verify that the initial calibration curve is still valid for quantitative purposes.

3.6 Instrument Blank (CCB) - The instrument blank (also called continuing calibration blank) is a volume of clean solvent analyzed on each column and instrument used for sample analysis. The purpose of the instrument blank is to determine the levels of contamination associated with the instrumental analysis itself, particularly with regard to the carry-over of analytes from standards or highly contaminated samples into subsequent sample analyses.

4 INTERFERENCES

4.1 Carbonate and bicarbonate carbon are interferences under the terms of this test and must be removed or accounted for in the final calculations.

4.2 This procedure is applicable only to homogenous samples that can be injected reproducibly by microliter type syringe or pipette. The opening of the syringe or pipette limits the size of particles which may be included in the samples (both the

Model 700 and Model 1010 analyzers can analyze samples with suspended solids up to 500 microns diameter).

4.3 Positive bias may be caused by contaminants in the gas, dilution water, reagents, glassware, or other sample processing hardware. The use of high purity reagents and gases help minimize interference problems. Materials may be demonstrated to be free from interference by running reagent blanks.

4.4 Interference by non-CO2 gases: The infrared detector is sensitized to carbon dioxide and accomplishes virtually complete rejection of response from other gases which absorb energy in the infrared region. Trapping and desorption of carbon dioxide on the molecular sieve trap isolates the component of interest and allows the complete absence of interference in the system from gases other than carbon dioxide.

5 SAFETY

5.1 All appropriate safety precautions for handling solvents, reagents and samples must be taken when performing this procedure. This includes the use of personnel protective equipment, such as, safety glasses, lab coat and the correct gloves.

5.2 Chemicals, reagents and standards must be handled as described in the CAS safety policies, approved methods and in MSDSs where available. Refer to the CAS Environmental, Health and Safety Manual and the appropriate MSDS prior to beginning this method.

5.3 Always wear chemical eye, skin, and clothes protection when handling samples or working with reagents.

5.4 Sodium Persulfate is a strong oxidizer and should be handled with extreme care.

5.5 Phosphoric Acid is a corrosive material should be handled with extreme care.

5.6 Potassium Biphthalate and Sodium Carbonate are chemical irritants and may cause eye burns.

6 SAMPLE COLLECTION, CONTAINERS, PRESERVATION, AND STORAGE

6.1 For most accurate analyses, sampling containers should be free of organic contaminants.

6.2 Sampling and storage of samples in glass bottles is preferable. If this is not feasible, sampling and storage in plastic bottles such as conventional polyethylene and

cubitainers is permissible if it is established that the containers do not contribute contaminating organics to the samples.

Note: A brief study performed at the EPA Laboratory indicated that distilled water stored in new, one quart cubitainers did not show any increase in organic carbon after two weeks exposure.

6.3 For samples requiring very low-level TOC analysis (below about 50 ppb C) consult appropriate literature for sample handling and storage.

6.4 Because of the possibility of oxidation or bacterial decomposition of certain components in aqueous samples, the time between sample collection and analysis should be minimized. In addition, the samples should be kept cool (4°C) and protected from sunlight and atmospheric oxygen.

6.5 In situations where analysis cannot be performed within two hours (2 hours) of sampling, the sample must be acidified (pH < 2) with HCL or H2SO4. Once preserved, samples must be analyzed within 28 days.

7 APPARATUS AND EQUIPMENT

7.1 Model 1010 Total Organic Carbon Analyzer: Utilizes classic persulfate oxidation method. (O.I. Analytical)

7.2 Autosampling Capability, Model 1010: 88-sample capacity, (model 1051).

7.3 Apparatus for blending or homogenizing samples.

Note: Homogenization: Prior to analysis, the sample is thoroughly mixed by shaking the sample in the bottle rather than blending the sample. The concern is for possible contamination from the blender. It is not considered that this will misrepresent the true best average of the sample. The Model 1051 autosampler has magnetic stirring capability that homogenizes the sample prior to injection.

8 STANDARDS, REAGENTS, AND MATERIALS

8.1 Reagent (laboratory deionized) water

8.2 Potassium Biphthalate (KHP) stock solutions:

8.2.1 1000 ppm C stock solution is prepared by adding 2.128 g of KHP (previously dried to a constant weight at 105°C) into a 1000 ml volumetric flask. Dilute to volume with reagent water. Solution contains 1.0 ug C per ul.

8.2.2 5000 ppm C stock solution is prepared by adding 10.64 g of KHP (previously dried to a constant weight at 105°C) into a 1000 ml volumetric flask. Dilute to volume with reagent water. Solution contains 5.0 ug C per ul.

Note: Stock solution has a shelf life of six months after preparation. Sodium oxalate and acetic acid are not recommended as stock solutions.

8.2.3 Linear range verification solutions at a minimum 5 concentrations, typically 0.05-50 ppm are prepared by diluting appropriate amounts of the 1000 mg/L stock standard to 100 mls with reagent grade water. These standards should be prepared fresh each time a multi-point calibration is performed.

8.3 Sodium Carbonate Stock solution (1000 ppm C) - Prepare stock solution by adding 8.826 g of Na_2CO_3 (previously dried to a constant mass at 105°C) to a 1000 ml volumetric flask. Dilute to volume with reagent water. Solution contains 1.0 ug C per ul.

8.4 Sodium Persulfate (250 g/L) - Prepare solution of sodium persulfate by dissolving 250g $Na_2S_20_8$ into preheated reagent water (1 liter volume). Reagent has a shelf life of one month.

Note: Reagent water is heated until solution just comes to a boil. Once reagent water has come to a boil, remove from heat and add sodium persulfate (250 g). Stir until persulfate goes into solution, then immediately cool by running water over the outside of beaker. This procedure purifies the $Na_2S_20_8$ solution by reducing TOC content of reagent water. Once cool, place the Model 700 purge lines in solution to remove any CO2 from oxidation of organics. Alternatively, dissolve sodium persulfate (250g) in 1L reagent water and purge with nitrogen for 5-10 minutes before use.

8.5 Phosphoric Acid (5%) - Prepare 5% by volume solution of phosphoric acid by adding 59 ml of ACS reagent grade 85% H_3PO_4 to reagent water (1 liter total volume). Reagent has a shelf life of one month.

Note: If high organic contamination of acid solution is suspected, see Model 700 user manual (pg. 11) for steps necessary to purify solution.

8.6 The ICV is prepared by diluting 0.8 mL of 5000 ppm KHP stock solution to 200 mL DI water in a class A volumetric flask. Resulting concentration is 20.0 ppm. For low

level analysis, dilute 2.0 mL of the 1000 ppm KHP stock solution to 1L DI water in a class A volumetric flask. Resulting concentration is 2.0 ppm. The shelf life is 6 months.

8.7 Continuing Calibration Verification (CCV) - The CCV is prepared by diluting 5.0 mls of 5000 ppm KHP stock solution (see 8.2) to 1000 mls in a class A volumetric flask. Resulting concentration is 25.0 ppm. For low level analysis, dilute 5.0 mls of the 1000 ppm KHP stock solution to 1000 mls in a class A volumetric flask. The shelf life is 6 months.

8.8 Laboratory Control Sample (LCS) - The LCS is prepared from Demand APG (Analytical Products Group). The true value is determined based on the lot number of the standard. The resulting standard has a shelf life of six months unless APG has a predetermined expiration date which expires prior to six months.

8.9 Gas Service: Nitrogen

9 PREVENTIVE MAINTENANCE

9.1 For the most reliable performance of the instrument, the following schedule of routine maintenance is suggested:

Weekly:
- Replace gas cylinder
- Adjust IR "zero"
- Leak-check the carrier and purge gases
- Check tube end fitting connections

Quarterly:
- Replace or clean the permeation tube
- Clean the IR cell (Model 700 only)
- Clean the digestion vessel
- Replace the molecular sieve trap (Model 700 only)
- Check indicating drying tube (Model 1010 only)
- Check sample pump

Semi-annually:
- Replace gold foil in IR (Model 700 only)
- Clean valves, replace stators (Model 700 only)
- Clean NDIR cell (Model 1010 only)

Annually:
- NDIR linearization check

9.2 Record any maintenance procedures performed in a maintenance logbook. Initial and date all entries.

10 RESPONSIBILITIES

10.1 It is the responsibility of the analyst to perform the analysis according to this SOP and to complete all documentation required for data review. Analysis and interpretation of the results are performed by personnel in the laboratory who have demonstrated the ability to generate acceptable results utilizing this SOP. This demonstration is in accordance with the training program of the laboratory. Final review and sign-off of the data is performed by the department supervisor/manager or designee.

10.2 It is the responsibility of the department supervisor/manager to document analyst training. Documenting method proficiency, as described in the SOP for Documentation of Technical Personnel Training is also the responsibility of the department supervisor/manager.

11 PROCEDURE

11.1 Turn on the nitrogen gas flow and confirm delivery pressure (30psi for model 700 and 50-60psi for model 1010). Maintain this delivery pressure. If pressure drops to below 15 psi, the instrument will automatically shut down.

11.2 Initial Power Up - Model 1010

11.2.1 Turn on power to the Model 1010 analyzer, Model 1051 autosampler and computer using the main power switches.

11.2.1.1 During the Model 1010 power-up, listen for a series of beeps to determine the status of the instrument. The beep sequence is 1 beep= system startup, 2 beeps= CMOS check passed and 3 beeps= Firmware ready. If the beeps are not heard, contact OI Analytical Service Department for assistance.

11.2.1.2 Log into the WinTOC program. The user name is "user" and the password is "toc." Select TOC1 for operation.

11.2.2 To obtain a stable baseline, a reagent blank sequence must be started.

11.2.2.1 From the 'Setup' drop down, select WinTOC output. Change file names to reflect the date of analysis.

11.2.2.2 Select the reagent blank sequence from the 'Sequence' drop down.

11.2.2.3 Ensure that the most recent calibration check is selected from the 'Calibration' drop down.

11.2.2.4 Ensure that the TOC method is selected from the Database menu.

11.2.2.5 Click the start button on the status screen to begin the reagent blank sequence.

11.2.2.6 A stable baseline is obtained when the area counts are in the range of 50 to 300, and the last three area counts are within 50 counts of each other.

11.2.2.7 Once these criteria are met, abort the reagent blank sequence by clicking 'Abort' on the status screen.

11.2.3 An analysis sequence may now be started.

11.2.3.1 Select the run sequence desired from the 'Sequence' drop down.

11.2.3.2 Enter samples and standards in the selected run sequence.

11.2.3.3 Load tray into autosampler and click start on the status screen.

11.3 Calibration

11.3.1 The infrared detector response has been linearized and is fixed. A single point calibration verification is performed. Consult pg. 68 of the Model 700 user manual, or page 63 of the model 1010 user manual, for the proper calibration procedure.

11.3.1.1For routine analyses (i.e. 1 ml sample loop) a 25 ppm standard is used for calibration.

11.3.1.2For low level analyses (i.e. 5 ml sample loop) a 5 ppm standard is used for calibration.

11.3.2 Although the infrared detector response has been linearized, a series of five linear range verification standards are analyzed annually to confirm that the instrument is giving accurate readings over the working range of the analysis.

11.3.2.1 Analyze each of the linear range verification standards and check each result against the true value.

11.3.2.2 A least squares linear regression is performed on mass:area pairs (see Appendix B). From the slope of the regression line a response factor is calculated as ug C per thousand area counts. A correlation coefficient is also calculated and must be $\geq$0.995. The carbon mass from the reagent water is determined from the y-intercept of the regression line.

11.3.2.3 If the results indicate a non-linear response over the range, corrective action is necessary. This may include maintenance and/or recalibration. Maintain documentation of the linear range verification.

11.3.3 A CCV must be analyzed following every tenth injection and at the end of the run. The CCV is a 25.0 ppm TOC Standard made from stock KHP solution (see 8.2). Recovery must be 90-110% of the value (91-106% for Arizona samples). For low level analyses (i.e. 0.1ppm MRL), the CCV is a 5.0 ppm standard. Calculate the CCV recovery as follows:

$$\%R = X/TV \times 100$$

Where X = Measured concentration of the CCV
TV = True value of CCV

11.3.4 A CCB must be analyzed following every CCV. The CCB is D.I. water, and the result must be below the MRL.

11.4 Sample Analysis

11.4.1 Once system configurations have been established and baseline is stable, the instrument is ready for analysis.

11.4.2 For the Model 700, confirm that the millivolt output is between 5-10 mV. For the Model 1010, reagent blank counts must be between 50 and 500 counts. The last 3 counts must be within 50 counts of each other.

11.4.3 Load samples into Autosampler vials and arrange them according to the analytical run sequence shown below. Samples containing suspended solids must be thoroughly mixed prior to sampling.

11.4.4 Analytical Run Sequence. Press the Run/Stop key (Model 700) or click Start on the model 1010 to begin analysis. Analyze samples in a analysis sequence as listed below.

11.4.5 When performing method 5310C, analyze all samples in duplicate.

Step	Sample
1	ICV
2	ICB
3	CCV-1
4	CCB-1
5	Method blanke
6	LCS
7	Sample
8	Sample-Dup
9	Sample-Spk
10	Rinse blank
11	Rinse blank
12	Sample
13	Sample
14	Sample
15	CCV-2
16	CCB-2

12 QA/QC REQUIREMENTS

12.1 The ability of each analyst/instrument to generate acceptable accuracy and precision must be documented prior to sample analysis by performing 4 replicate LCS analyses and calculating average recovery and %RSD. Method criteria must be met for these results. This must be completed before analysis of samples, or whenever significant changes to the procedures have been made.

12.2 A method detection limit (MDL) study must be undertaken before analysis of samples can begin. The MDL studies should be done for each matrix, prep method, and instrument. Refer to the CAS SOP for The Determination of Method Detection Limits.

12.3 Ongoing QC Samples required for each sample batch (20 or fewer samples) are described in the CAS-Kelso Quality Assurance Manual and in the SOP for Sample Batches. In general, these include:

12.3.1 A laboratory Control Sample (LCS) must be analyzed with each batch of 20 or fewer samples. The LCS is prepared from a standard which is an independent source from the calibration standards. Results must be 90-109% of the certified value. This statistically derived acceptance limit is subject to change as limits are updated.

Note: When performing Method 9060 analysis, the second source LCS must be analyzed every 15 samples rather than every 20 samples.

Calculate the LCS recovery as follows:

$$\%R = X/TV \times 100$$

Where X = Concentration of the analyte recovered
TV = True value of amount spiked

12.3.2 A method blank (Deionized Water) must be analyzed with each batch of 20 or fewer samples. The result must be below the MRL.

12.3.3 One sample per service request must be analyzed in duplicate or one per 20 samples, whichever is more frequent. The percent RPD for the duplicates must be $\leq$17%. This statistically derived acceptance limit is subject to change as limits are updated. For SM 5310C, all duplicates must be within 10% RPD.

Note: Method 9060 requires quadruplicate analysis with both the average and the range reported.

Relative Percent Difference calculation:

$$RPD = \frac{(S - D)}{((S + D)/2)} \; X \; 100$$

where: S = Initial sample result
D = Duplicate sample result

12.3.4 Matrix Spikes- One spike sample must be analyzed per service request or one per 20 samples, whichever is more frequent. Spike 50 ul of 5000 ppm KHP stock solution to 10.0 mls of sample. For low level analysis, spike 50 ul of 1000 ppm KHP stock solution to 10.0 mls of sample. The matrix spike recovery must be 68-132%. This statistically derived acceptance limit is subject to change as limits are updated.

Note: Method 9060 requires spike and spike duplicate be analyzed every ten samples.

Calculate percent recovery as follows:

$$Matrix\ Spike\ Recovery = \frac{Spiked\ Sample - Sample}{Spike\ Added} \times 100$$

13 DATA REDUCTION, REVIEW, AND REPORTING

13.1 Preliminary results are reviewed to determine if dilutions are required. Sample information is transferred to an Excel spreadsheet for calculations (see R:\WET\ANALYSES\TOC\DATA). Instrument baseline is determined by taking the average of all Method Blanks, CCB's, and Rinse Blanks (see R:\WET\ANALYSES\TOC\TOC_CBA1.SPD). Sample concentration is corrected by subtracting calculated blank average (CBA) from instrument response. Concentration and sample identification number are highlighted for reporting purposes.

13.2 It is the operators responsibility to review analytical data to ensure that all quality control requirements have been met for each analytical run. Results for QC analyses are calculated and recorded as specified in section 11 of SOP. Average, RPD, spike level and spike recovery are entered on spreadsheet (see append. B) for corresponding samples. All data will be initialed, dated and attached to required data quality worksheet.

13.3 The data packet for the sequence is submitted for review by supervisor or designee. The results are transferred to the appropriate report form located in the CAS network directory R:\WET\WIP. These forms are made from templates located in R:\WET\FORMS. Once the results are transferred, the report is reviewed.

13.4 Refer to the SOP for Laboratory Data Review Process for general instructions for data review.

14 CONTENGENCIES FOR HANDLING OUT-OF-CONTROL OR UNACCEPTABLE DATA

Corrective action measures applicable to specific analysis steps are discussed in the applicable section of this (and other applicable) SOP(s). Also, refer to the SOP for *Nonconformity and Corrective Action* for correct procedures for identifying and documenting such data. Procedures for applying data qualifiers are described in the SOP for *Report Generation* or in project-specific requirements.

15 METHOD PERFORMANCE

This method was validated through single laboratory studies of accuracy and precision. Refer to the reference method for additional method performance data available.

The method detection limit (MDL) is established using the procedure described in the SOP for *The Determination of Method Detection Limits* (ADM-MDL). Method Reporting Limits are established for this method based on MDL studies and as specified in the CAS Quality Assurance Manual.

16 POLLUTION PREVENTION

It is the laboratory's practice to minimize the amount of solvents, acids and reagent used to perform this method wherever feasible. Standards are prepared in volumes consistent with methodology and only the amount needed for routine laboratory use is kept on site. The threat to the environment from solvent and reagents used in this method can be minimized when recycled or disposed of properly.

17 WASTE MANAGEMENT

The laboratory will comply with all Federal, State and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions as specified in the CAS EH&S Manual.

18 TRAINING

18.1 Refer to the SOP for Documentation of Training for standard procedures.

18.2 Training outline

18.2.1 Review literature (see references section). Read and understand the SOP. Also review the applicable MSDS for all reagents and standards used. Following these reviews, observe the procedure as performed by an experienced analyst at least three times.

18.2.2 The next training step is to assist in the procedure under the guidance of an experienced analyst. During this period, the analyst is expected to transition from a role of assisting, to performing the procedure with minimal oversight from an experienced analyst.

18.2.3 Perform initial precision and recovery (IPR) study as described above for water samples. Summaries of the IPR are reviewed and signed by the supervisor.

Copies may be forwarded to the employee's training file. For applicable tests, IPR studies should be performed in order to be equivalent to NELAC's Initial Demonstration of Capability.

18.3 Training is documented following the SOP for Documentation of Training.

NOTE: When the analyst training is documented by the supervisor on internal training documentation forms, the supervisor is acknowledging that the analyst has read and understands this SOP and that adequate training has been given to the analyst to competently perform the analysis independently.

19 REFERENCES

U.S. Environmental *Protection Agency, Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, Revised 1983, Method 415.1.*

U.S. Environmental Protection Agency, Total Organic Carbon, Method 9060, SW-846 Third Edition, September 1986.

Total Organic Carbon, Combustion-Infrared Method, 5310C. Standard Methods for the Examination of Water and Wastewater, 20th ed., 1995.

APPENDIX A

Seawater, Brine, and High Chloride Samples

High levels of chloride ion present analytical problems not adequately addressed by EPA 415.1/9060. The major interferences associated with the analysis of seawater are overcome by maintaining effective Sample: Oxidant ratios, and allowing sufficient analysis time.

Chloride ions compete directly with carbon for available persulfate ions. In seawater and brine, the amount of chloride present in a sample is much greater than the organic carbon present. In these cases the recovery of TOC will suffer due to incomplete oxidation. Some precautions that can be taken are to increase reaction time and increase the volume and concentration (250g/L) of the persulfate reagent used during analysis. An increase in persulfate to 4000 uL/sample will provide enough persulfate so that the organic carbon is able to oxidize.

The oxidation process of organic compounds by persulfate generally follows first order reaction kinetics. The oxidation of chloride to chlorine introduces intermediate steps, which result in a more complex reaction. This reaction proceeds more slowly. By extending the reaction time to 5 minutes, the reaction will have time to finish, resulting in complete oxidation of all the organic carbon present in the sample.

In addition to the modifications designed to eliminate chloride interferences, the instrument is configured to operate in a fashion that allows TIC to be vented during an extended purge period, thus avoiding I.R. saturation.

Consult user manual for more information pertaining to difficult sample matrices (Model 700, pg. 92 or Model 1010 pg. 77).

APPENDIX B

The calibration is determined using a linear regression that best fits the line of the X:Y pairs. The quality of the fit is determined by calculating the coefficient of determination (R^2), also called the correlation coefficient.

The line of regression is calculated as follows:

Start with the equation for a line, y = mx + b. From here the line of regression can be determined.

$$m = \frac{n\sum(xy) - \sum x \sum y}{n\sum(x^2) - (\sum x)^2}$$

$$b = \frac{\sum y - m\sum x}{n}$$

Where:

x = the values of the x variables.
y = the values of the y variables.
n = the number of data points.

Once the line of regression has been determined then the coefficient of determination can be calculated.

$$r^2 = \frac{\left(\sum xy - n\bar{x}\bar{y}\right)^2}{\left(\sum x^2 - \bar{x}\sum x\right) * \left(\sum y^2 - \bar{y}\sum y\right)}$$

Attachment A

Analysis Benchsheet

COLUMBIA ANALYTICAL SERVICES, INC.

Service Request #:
Analysis For: Total Organic Carbon
Instrument: A B

Matrix: Water
Method: Oxidation EPA 415.1

Printout SPL#	CBA	1	2	3	4
Sample Number					
Dilution Factor	1	1	1	1	1
Solution Conc., mg/L					
Blank Correction, mg/L	0.00000	0.00000	0.00000	0.00000	0.00000
Net mg/L	0.00000	0.00000	0.00000	0.00000	0.00000
TOC mg/L	**<0.5**	**<0.5**	**<0.5**	**<0.5**	**<0.5**

Printout SPL#	5	6	7	8	9
Sample Number					
Dilution Factor	1	1	1	1	1
Solution Conc., mg/L					
Blank Correction, mg/L	0.00000	0.00000	0.00000	0.00000	0.00000
Net mg/L	0.00000	0.00000	0.00000	0.00000	0.00000
TOC mg/L	**<0.5**	**<0.5**	**<0.5**	**<0.5**	**<0.5**

Printout SPL#	10	11	12	13	14
Sample Number					
Dilution Factor	1	1	1	1	1
Solution Conc., mg/L					
Blank Correction, mg/L	0.00000	0.00000	0.00000	0.00000	0.00000
Net mg/L	0.00000	0.00000	0.00000	0.00000	0.00000
TOC mg/L	**<0.5**	**<0.5**	**<0.5**	**<0.5**	**<0.5**

LCS =18.3 ppm APG 1075 Lot #17102 (REF#TOC1-03-I)
CCV = 25.0 (Ref.#TOC1-42-K)
Spike: 0.05 ml if 5000 ppm stock ---> 10.0 mls solution =25.0 x Dilution Factor (Ref.# TOC1-19-BB)

Comments:

	Date Analyzed / /
Analyst	Date / /
Approved by	Date / /