

**ENERGY LABORATORIES, INC.  
GILLETTE, WY**

**Quality Assurance Program Manual**

Revision 6.08

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**Energy Laboratories, Inc.**

**Gillette, Wyoming**

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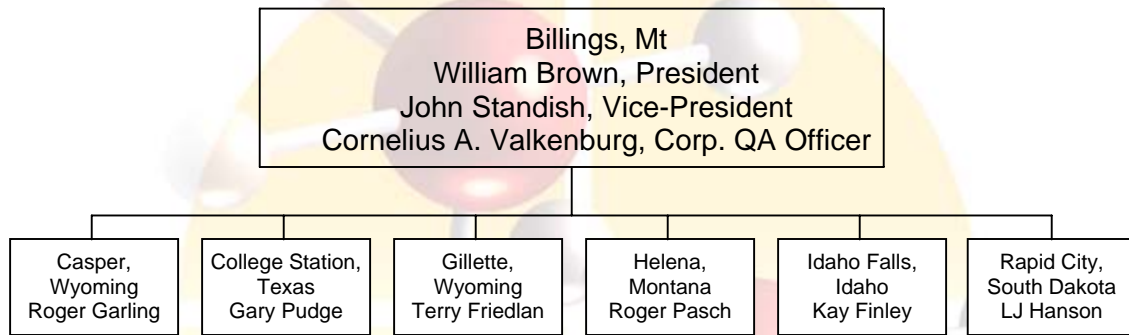
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## INTRODUCTION

Energy Laboratories, Inc. provides chemical, industrial hygiene, and environmental analytical services to private industry, agricultural industry, engineering consultants, government agencies, and private individuals. Analytical services include: analysis of waters and soils for inorganic and organic constituents, aquatic toxicity testing, hazardous waste analysis, radiochemistry, industrial hygiene, microbiology, soils and water physical parameters, and petroleum analysis. Founded in 1952, Energy Laboratories currently incorporates seven separate testing laboratories. The main headquarters are located in Billings, MT, with branch laboratories located in Casper, WY, Gillette, WY, Rapid City, SD, College Station, TX, Helena, MT, and Idaho Falls ID.

Figure 1  
Laboratory Organization



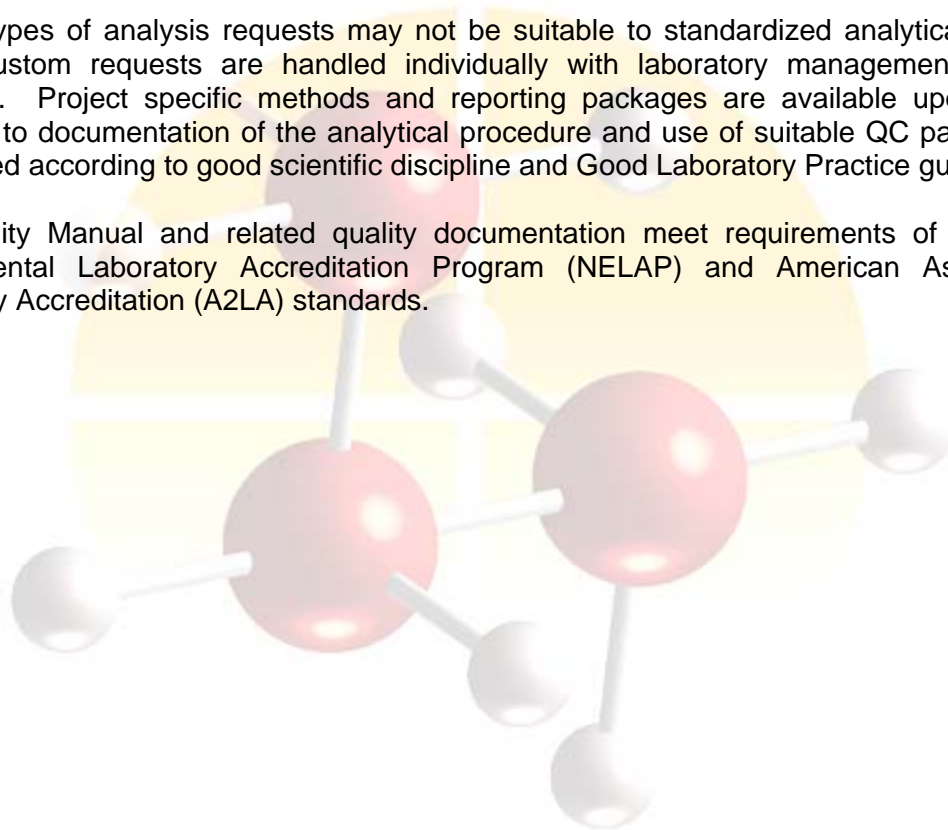
The Quality Control Program establishes acceptable performance criteria for all routine analytical procedures being performed by laboratory personnel. The Quality Control Assessment program provides a formal system for evaluating the quality of data being generated and reported. The ELI Chemical Hygiene Plan insures the safety of all laboratory personnel and monitors the safety of all laboratory operations. These, in addition to the experience and expertise of our analysts, provide a comprehensive Quality Assurance Program. Branch Laboratories of ELI are certified in their own state and in neighboring states. Details on certification parameters for all laboratories are given in our Qualifications Manual.

The ELI Quality Assurance Program Manual, the ELI Qualifications Manual, and the ELI Analytical Services Catalog together are used to outline the ELI Quality Assurance/Quality Control Program. This Quality Assurance Manual is appropriate to all departments of the Energy Laboratories – Gillette Wyoming. The procedures discussed or referenced in this manual describe our day-to-day laboratory practices and adhere to USEPA Safe Drinking Water Act and NELAP requirements and Good Laboratory Practices (GLPs). Information on ELI Gillette accreditations and certifications can be found in Appendix A of this plan. Where possible, ELI uses EPA, ASTM, APHA, NIOSH, OSHA, or published analytical methods and follows the procedures with strict adherence to described protocol and recommended QA/QC parameters. Actual method operating procedures are described in the Standard Operating Procedures Manual, and are available for review at the laboratory. Vital parts of our Quality Assurance Program, quality control and quality assessment, are outlined in Chapters One and Two of this manual.

To generate data that will meet project specific requirements, it is necessary to define the type of decisions that will be made and identify the intended use of the data. Data Quality Objectives (DQOs) are an integrated set of specifications that define data quality requirements and the intended use of the data. Project specific DQOs must be established for both field and lab operations. Through the DQO process, appropriate reporting limits, extraction/digestion methods, clean-up methods, analyses methods, target analytes, method quality control samples, sample security requirements, quality control acceptance ranges, corrective action procedures, and reporting formats and reporting levels can be specified. Professional laboratory project managers are available to assist clients in specifying appropriate laboratory analyses and reporting procedures necessary to meet project requirements. Written Standard Operating Procedures referenced within this manual are available upon request.

Certain types of analysis requests may not be suitable to standardized analytical methods. These custom requests are handled individually with laboratory management and staff scientists. Project specific methods and reporting packages are available upon request. Attention to documentation of the analytical procedure and use of suitable QC parameters is maintained according to good scientific discipline and Good Laboratory Practice guidelines.

This Quality Manual and related quality documentation meet requirements of the National Environmental Laboratory Accreditation Program (NELAP) and American Association of Laboratory Accreditation (A2LA) standards.



## CHAPTER 1 – QUALITY CONTROL PROGRAM

### Objective

It is the policy of the management of Energy Laboratories, Inc. to produce laboratory data that is scientifically valid, meets method specifications, satisfies regulatory requirements, and accomplishes the data quality objectives of the client and project. Those method, regulatory, and client requirements are incorporated into our Quality Assurance Program. We will apply appropriate corporate resources to set objectives, provide training opportunities, and monitor the quality performance of our staff. We will also provide facilities and equipment adequate and appropriate to those objectives.

### Purpose

The purpose of the Quality Assurance Program is to ensure that the analytical services provided by Energy Laboratories are of the highest quality, and each analytical result produced meets or exceeds a client's requirements and expectations. The quality systems in the program consist of the policies and procedures, and all referenced documents, described in this Quality Assurance Manual. The Quality Control Program also functions to maintain the laboratory's compliance with accreditations through USEPA, State Agencies, and NELAP. All employees are expected to implement and follow the policies contained within the Quality Assurance Program Manual. Internal documents, controlled and associated with the Quality Assurance Program are listed in Appendix B.

The Quality Control program insures that results of analyses are within established accuracy and precision limits required by the referenced method or Standard Operating Procedure (SOP). The Quality Control Program requires that the following points be met for each applicable analytical method:

### Demonstration of Laboratory Capability

Performance of any analytical method requires that the proper equipment and instrumentation are available. A list of major equipment is provided in the ELI-Qualifications Manual. The procedure for operation of an analytical instrument is described in the equipment manufacturers operating manual, and may also be supplemented with a specific Standard Operating Procedure (SOP) for the instrument and/or the method.

Each SOP covers operation of the instrument including the sequence of operations involved in instrument start-up, calibrating, analyzing, and shutting down. SOPs include recommended preventative maintenance, and/or a list of parameters used to identify other types of maintenance. The SOP also outlines any special safety precautions for operation of the instrument.

SOPs of well detailed EPA, ASTM, NIOSH, APHA, OSHA, or published procedures include, as appropriate, a list of any method specific items or variances, a list of QC parameters and their recommended performance ranges, recommended or example analytical sequences, specific or unique safety information, method references, and a signed signature page. Detailed SOPs are prepared for those procedures that do not have published methods.

Detailed information as to what information is required in method SOPs can be found in the ELI SOP 10-001.

### **Demonstration of Analyst's Ability to Generate Data Of Acceptable Accuracy and Precision**

ELI demonstrates that laboratory staff is qualified and capable of performing the method. Analysts are assigned duties based on their skills and experience. Training records are maintained for all analysts. Curricula vitae of supervisory and senior analysts are described in the ELI Qualification Manual.

It is the responsibility of the analyst to become thoroughly familiar with the methodology and instrument operation before performing the analysis. It is the responsibility of the person providing training to monitor all laboratory results generated for a reasonable time. The amount of time necessary may vary depending on the method and the experience of the analyst. As a minimum, the analyst's performance is to be monitored until the analyst demonstrates the ability to generate results of acceptable accuracy and precision according to the method.

All analysts are required to demonstrate and maintain a record of proof of competency by routinely analyzing quality control samples appropriate to the analytical procedures they perform. Competency in analyzing these control samples is documented in analysts' training files per NELAP requirements (for more information, see SOP 10-005 on Personnel Training). For those analyses where external performance evaluation samples are not routinely analyzed, competency is documented by including the results of routine analyses of internal method quality control samples and/or a verifying statement of procedural review by a supervisor.

## **Analysis of Quality Control Samples**

Each analytical method is subjected to quality control monitoring. The purpose is to demonstrate that results generated meet acceptable accuracy and precision criteria for the method. Quality control requirements are outlined in the methods and ELI at a minimum follows the guidelines specified in the methods used. Additional QC requirements are also added as appropriate. Statistical method performance is periodically evaluated against method requirements using control charts.

Quality control monitoring to measure accuracy for each method generally requires that five to ten percent of all samples analyzed be fortified (spiked) with a known concentration of target analytes tested by the method. Percent recovery is calculated. This provides a means for monitoring method accuracy and evaluating sample matrix effects. Where appropriate, surrogates are included in the method to monitor method performance on each individual sample. Blank spike samples replace matrix spike samples for certain methods, or when there is insufficient sample for a matrix spike analyses. Historical routine batch QC sample performance can be used to estimate the precision and accuracy of the method.

Quality control monitoring to measure precision for each method requires replicate samples be prepared and analyzed when possible. Actual requirements are outlined in the specific SOP. When replicate samples or matrix spike duplicates are analyzed, relative percent difference is calculated and used to monitor precision of the method. In instances where there are no specific method requirements, it is the policy of this laboratory to analyze five to ten percent of all samples in duplicate. Duplicate test results must be within the control limits established for each analysis type. Acceptance limits generally follow specifications listed in the method. Matrix spike duplicates replace sample duplicates for most methods.

When not defined in the method and as appropriate, method blanks and instrument blanks are analyzed one in every 20 samples at a minimum. Method blanks are used to verify that contamination from laboratory reagents and glassware is not present. Generally the method blank must be one half or less than the reporting limit for the analytical parameter being tested.

When not defined in the method, and as appropriate, method spikes (blank spikes) are analyzed one in every 20 samples at a minimum.

Calibration standards are analyzed and calibration curves developed for all applicable methods. For additional information on instrument calibration see Chapter 7 of this QA manual.

The initial calibration is continuously monitored by analyzing a continuing calibration standard every 10 to 20 samples, or within a specified time frequency, and at the end of each new set of samples, depending on the method and instrumentation. Results must be within an established range as described by the method SOP. Initial calibrations are verified against a standard from a second source.

Performance evaluation samples and further quality control check samples may be required for various methods. Refer to Chapter Two of this QA manual for further details.

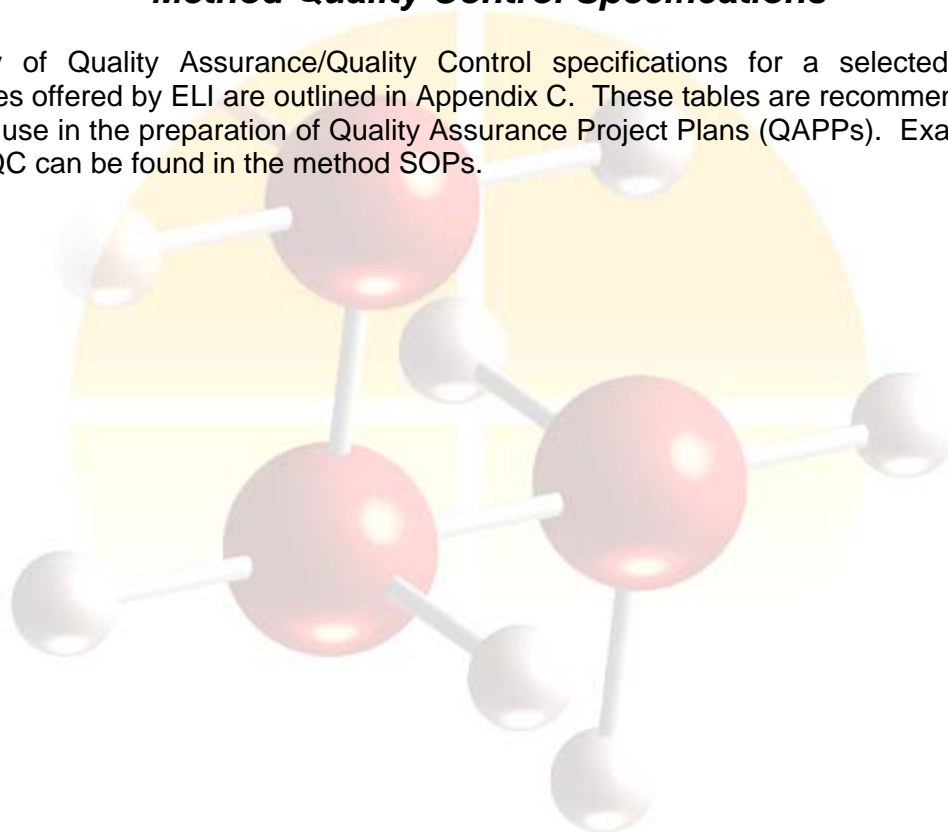
## Maintenance of Performance Records

All quality control monitoring is recorded and documented. Quality control data is recorded in laboratory notebooks, electronic summary files, and/or analyses sheets. QC data can also be maintained in quality control forms, graphs, or charts. QC data management and control chart generation, maintenance, and usage are described in ELI SOP 20-004. It is the responsibility of the analyst to see that all results are recorded in a timely manner.

All quality control data is filed and available for inspection and assessment by analysts, supervisors, management, and quality control personnel.

## Method Quality Control Specifications

Summary of Quality Assurance/Quality Control specifications for a selected subset of procedures offered by ELI are outlined in Appendix C. These tables are recommended for our clients to use in the preparation of Quality Assurance Project Plans (QAPPs). Exact details of method QC can be found in the method SOPs.



## CHAPTER 2 – QUALITY ASSESSMENT PROGRAM

### Purpose

The function of the Quality Assessment Program is to provide formal evaluation of the quality of data being generated and reported by the laboratory. External and internal quality control measures are used in this assessment. These measures include performance evaluation samples, laboratory quality control check samples, and routine internal and external audits on methodology and documentation procedures.

### Performance Evaluation (PE) Samples

PE samples are supplied by an outside entity and contain known amounts of constituents. The laboratory does not have access to known values of the samples. Only the PE provider has knowledge of constituent levels prior to the formal publishing of the test results. These samples are received on a routine basis, with results sent to the providing entity for evaluation. Acceptable results are those that fall within a defined range as determined by the supplier. These study results are available for review upon request.

The Gillette ELI laboratory sends some of its samples to other ELI laboratories to perform analysis that is not normally done in Gillette. ELI Billings Montana laboratory and ELI Casper Wyoming are both NELAP certified. ELI Rapid City South Dakota is A2LA certified.

Performance Evaluation (PE) Samples for USEPA, NELAP and various State certifications are Water Pollution Study Samples (WP), Water Supply Study samples (WS) and NELAP PE samples provided by either Resource Technology Corporation (RTC) and/or Environmental Resource Associates (ERA), vendors accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). Routine participation in NELAP, WS and WP PE sample studies are used to maintain certifications for Drinking Water, NPDES permit monitoring analyses, and projects requiring A2LA certification. These types of external PE samples are received on a semi-annual basis, with results sent to the reference supplier for evaluation. Acceptable results are those that fall within a defined range as determined by the vendor/EPA/NELAP based on multi-laboratory study results. The provider sends results to USEPA and other certifying agencies as requested by that laboratory. Current study results are included in Appendix A. The certification includes a list of parameters for which drinking water certification has been granted for that state. Reciprocal certifications to perform drinking water analysis in Wyoming are based on the South Dakota certification. The A2LA certificate and list

of parameters includes methods associated with underground storage tank analysis in Wyoming.

Blind Quality Control Check Samples are samples submitted as regular lab samples and are processed through the system in the same manner as any other sample. The analysts do not know the true value when performing the analyses. Method performance reports are returned to the analysts and maintained in method performance files. Clients occasionally submit these types of samples for their QAPPs.

Laboratory Inter-comparison Samples are samples containing known/unknown quantities of analytes that are split and analyzed by more than one laboratory. These samples are routinely analyzed and results are kept on file.

## **Quality Control Check Samples**

Quality Control Check Samples - Are performance evaluation samples used for routine method performance monitoring. As appropriate, analytical procedures include the analysis of a quality control sample with every sample batch analyzed. The materials are obtained from a commercial source when available, or they may be prepared in-house. Acceptable results are within a defined range based on certified ranges, or, against statistically determined control limits. Routinely used methods not subjected to PE sample monitoring are evaluated with Quality Control Check Samples as appropriate.

QC samples are processed through the system in the same manner as any other sample, except the analyst is aware of the source, concentration, and acceptance ranges of target analytes and calculates analyte recoveries to evaluate method performance in real time.

## **Quality Control Audits**

Quality Control Audits are internal and external laboratory analyses inspections designed to monitor adherence to quality control requirements. The audit checks general laboratory operations, overall Quality Systems, adherence to QA program requirements, sample tracking procedures, sample holding times, storage requirements, adherence to procedures during analysis, calculations, completion of required quality control samples within the group surrounding the sample, and proper record-keeping.

Internal quality control audits are conducted periodically. The quality control director at the laboratory does the audit. (see SOP 30-001 Internal Quality Assurance Audits). ELI conducts internal inspections on a regular basis to monitor adherence to quality control requirements. Results of formal audits are given to management with possible recommendations for corrective action in the event any discrepancies are found. As necessary, a follow-up review is conducted to determine that identified problems have been addressed. Annually, the overall Quality Systems of the laboratory are reviewed and a summary report is prepared. Laboratory management is involved with the annual review of laboratory Quality Systems.

ELI welcomes external Quality Control Audits by qualified outside auditors for review and comment on the overall QA program. To maintain certifications, accrediting authorities from USEPA, and conduct periodic comprehensive external audits. External audits by private clients to meet Quality Assurance Project Plans (QAPPs), as applicable to environmental remediation projects, or for major industries, are also conducted on a continuing periodic basis.

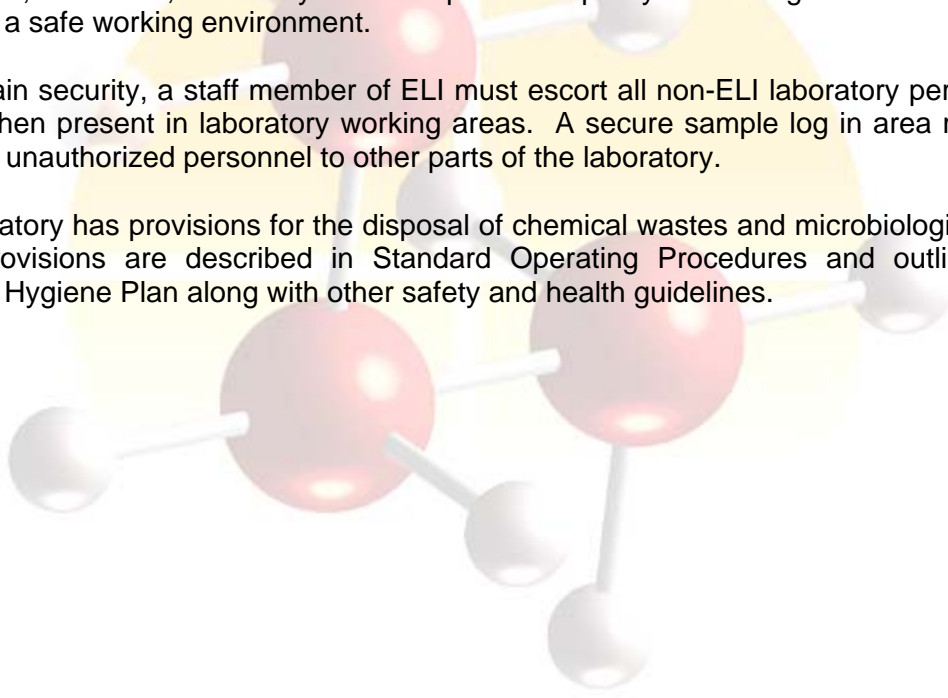
## CHAPTER 3 – LABORATORY FACILITIES

Laboratory space includes adequate bench top and floor space to accommodate periods of peak workloads. Working space includes sufficient bench top area for processing samples; storage space for reagents, chemicals, glassware, bench and portable equipment items; floor space for stationary equipment; and adequate associated area for cleaning glassware. Laboratory departments are organized and facilities designed for specific laboratory operations in order to protect the safety of analysts and to minimize potential sources of contamination between and within department areas (for more information see SOP 10-002, Facility Description, Access, and Security).

The laboratory is appropriately ventilated and illuminated, relatively free of dust and drafts, and is not subject to excessive temperature changes. A light intensity of 100-foot candles is present at all working surfaces. Ample cabinets, drawers and shelves are available for storage and protection of glassware. Exhaust hoods are available as needed for use during preparation, extraction, and analysis of samples. Air quality monitoring is conducted routinely to ensure a safe working environment.

To maintain security, a staff member of ELI must escort all non-ELI laboratory personnel and visitors when present in laboratory working areas. A secure sample log in area restricts the access of unauthorized personnel to other parts of the laboratory.

The laboratory has provisions for the disposal of chemical wastes and microbiological wastes. These provisions are described in Standard Operating Procedures and outlined in the Chemical Hygiene Plan along with other safety and health guidelines.



## CHAPTER 4 – PERSONNEL REQUIREMENTS AND LABORATORY ORGANIZATION

### Personnel Requirements

#### Laboratory Director

The Laboratory Director is required to have education equivalent to a Bachelor of Science degree in Chemistry or a related science. Five years of relevant laboratory experience is required. Laboratory experience can be substituted for academic requirements.

#### Quality Assurance Officer

The Quality Assurance Officer is required to have a bachelor's degree in Chemistry or a related science. Five years of relevant laboratory experience is required. Laboratory experience can be substituted for academic requirements.

#### Laboratory Supervisor/Project Manager

A Laboratory Supervisor/Project Manager is required to have education equivalent to a Bachelor of Science degree in Chemistry or related science, Two years of relevant laboratory experience is required. Laboratory experience can be substituted for academic requirements.

#### Analysts

Analysts are required to have education equivalent to a Bachelor of Science degree in Chemistry or related science, or a High School diploma and 3 years experience as an analyst in training. A minimum of 6 months of on-the-job training, under direct supervision of qualified analyst in the measurements being considered for certification is also required. After 6 months, and on a continuing basis thereafter, the analyst must demonstrate acceptable skills through the successful participation in the analysis of applicable performance evaluation and quality control samples.

For more information, see SOP 10-004, Roles and Responsibilities.

### Laboratory Organization

Corporate organization of the seven ELI laboratories located in Montana (2), Wyoming (2), Texas, South Dakota, and Idaho is shown in the Corporate Organizational Chart given in Appendix D. The Billings laboratory is the center for all corporate functions. Each laboratory is managed and operated individually under the supervision of a Laboratory director. Branch laboratory corporate responsibilities are only towards fiscal and general operating policies and goals. Quality Assurance Manuals are prepared individually for each branch and follow the QA/QC program outlined in the ELI-Billings QA manual.

The Organizational Chart is also included in Appendix D with Curricula vitae of key laboratory personnel maintained in Appendix E of this manual. Within the **Qualifications Manual**, detailed personnel summaries are given for all managers and supervisors of ELI, Inc. A Personnel Summary for all ELI employees listing title, academic background, and years of relevant experience is also maintained in the Qualifications Manual. Job descriptions can be found in the Roles and Responsibilities ELI SOP 10-004.

## CHAPTER 5 – SAMPLING PROCEDURES

Most of the samples processed in this laboratory are collected by private individuals or companies who are responsible for using proper collection procedures. Members of the staff are acquainted with proper sample collection and handling procedures and will advise those who need help in this area. Instructions and forms for initiating Chain-of-Custody are available from ELI. Laboratory procedures for logging in samples for analyses and maintaining Chain-of-Custody are described in ELI SOP 20-001.

When the laboratory has been assigned the responsibility of sample collection, there is strict adherence to correct sampling protocols, initiation of Chain-of-Custody, sampling documentation, complete sample identification, and prompt transfer of sample(s) to the laboratory.

This laboratory will provide proper sample containers and preservatives as specified for the procedure. Certified sample bottles are available upon request. Sample containers, preservatives, coolers for shipping, ice packs for maintaining refrigeration temperature, travel blanks for monitoring contamination during shipping, temperature blanks for accurately monitoring sample receiving temperatures, Chain-of-Custody forms, Chain-of-Custody Seals, and sample bottle labels are provided upon request. Instructions for sampling, sample labeling, sample preservation, and sample packaging/shipping are also provided upon request. Sample container type, sample volume, preservation requirements, and maximum holding times, are detailed for each analyte in the ELI Analytical Services Catalog. For metals analysis, polyethylene plastic with a polypropylene cap liner is preferred. Glass containers with Teflon-lined caps are required for organic analysis. The client is immediately notified (if possible) upon sample receipt if samples are received in unacceptable containers, or if samples have not been properly preserved. Samples not collected properly are rejected for any certifiable analysis and re-sampling is recommended. The laboratory will preserve samples at the time of sample login if samples are unpreserved and preservation is required by the methodology. Aqueous samples for volatile analyses are checked for preservation at the time of analyses. Samples for microbiological analysis are collected in pre-sterilized 120 mL plastic bottles containing sodium thiosulfate.

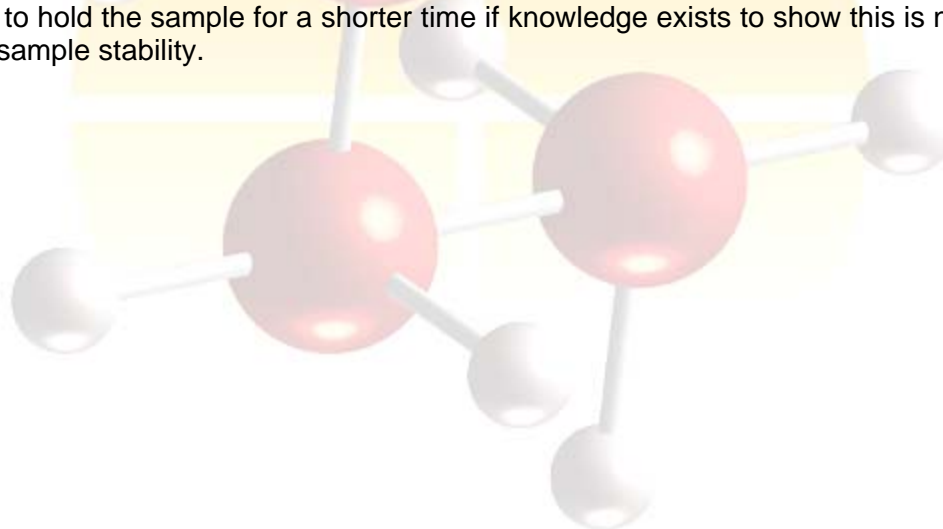
Sample preservation needs to be performed immediately upon sample collection. For composite samples, each aliquot is preserved at collection. When use of an automated sampler makes it impossible to preserve each aliquot, samples are preserved by maintaining at 4 C until compositing and sample splitting is completed.

The laboratory initiates a sample condition report at the time of sample receipt. The sample condition report evaluates Chain-of-Custody procedures, sample preservation status, carrier used for sample shipment, cooler temperature, and provides general comments concerning sample condition. The sample condition report is provided with the sample analyses results data package. For more information, see ELI SOP 20-001, Sample Receipt, Login, and Labeling.

When any sample is shipped by common carrier or sent through the United States Mail, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements as described in the ELI Services Catalog, the Office of Hazardous Materials, Material Transportation Bureau, Department of Transportation has determined the Federal Hazardous Materials Regulations do not apply to the following:

- A) Hydrochloric Acid - (HCl) in water solutions of 0.04% by weight or less (pH of 1.96 or greater).
- B) Nitric Acid - (HNO<sub>3</sub>) in water solutions of 0.15% by weight or less (pH of 1.62 or greater).
- C) Sulfuric Acid - (H<sub>2</sub>SO<sub>4</sub>) in water solutions of 0.35% by weight or less (pH of 1.15 or greater).
- D) Sodium Hydroxide - (NaOH) in water solutions of 0.080% by weight or less (pH of 12.30 or less).

It is required that all samples be analyzed within the prescribed holding times. Holding times are the maximum times allowed between sampling and analysis for results to still be considered valid. Samples should be delivered to the laboratory as soon as possible following collection to assure that holding times can be met. Samples are analyzed as soon as possible after sample receipt. When maximum-holding times cannot be met, re-sampling is requested. Samples may be held for longer periods only if the permittee, or monitoring laboratory has data on file to show that the specific types of samples under study are stable for the longer time or if a variance is allowed. Some samples may not be stable for the maximum time period as given in the ELI Analytical Services Catalog. A permittee or monitoring laboratory is obligated to hold the sample for a shorter time if knowledge exists to show this is necessary to maintain sample stability.



## CHAPTER 6 – SAMPLE HANDLING

### Sample Receipt

All samples arriving at the laboratory are recorded in the sample receipt log and each container is given a unique laboratory sample number.

Samples requiring preservation are checked to determine if the client performed preservation. If requested, ELI staff will preserve or filter samples as appropriate. Samples, which degrade quickly, or cannot be opened (such as aqueous samples for volatiles), are not preserved at the time of sample login.

Chain-of-Custody forms are checked for pertinent information. If necessary information has been omitted, the collector is notified, if possible, and the missing information is requested.

If samples are improperly preserved, out of the acceptable temperature range, or the maximum holding times are exceeded upon arrival at the laboratory, the collector is notified and re-sampling is requested.

Samples are stored in accordance with method specifications in designated laboratory areas.

During sample login, all sample information such as sample description, client name and address, analyses requested, special requirements, etc. are entered into the computer database of the Laboratory Information Management System (LIMS). Requested analyses parameters and special requirements are communicated to the analysts via their LIMS work lists. Project specific requirements are maintained in the LIMS for any samples received from a special project. This process ensures that individual requirements are maintained.

For more information, see SOP 20-001, Sample Receipt, Login, and Labeling.

### Chain-of-Custody

Evidence level internal Chain-of-Custody procedures are available on a project specific basis. For these procedures, internal COC sample custody is maintained down to the individual analyst level. When transferring the possession of the samples, the transferee must sign and record the date and time on the Chain-of-Custody record. Every person who takes custody must fill in the appropriate section of the Chain-of-Custody record. When received by ELI, sample identification information on the sample containers is compared to the custody report form. The sample is inspected and information regarding the condition of the sample and seal (if used) is recorded on a report form, the method of shipping is also documented on the report form. A copy of the report form is kept with the sample data file and a copy is sent to the client with the analysis report. Internal Chain-of-Custody forms are used to document the progress of the sample through the laboratory. For more information, see SOP 30-005, Chain-of-Custody Samples.

ELI's routine COC policy is maintained at the laboratory level through our laboratory access and security policies. See ELI SOP 10-002, Facility Description, Access, and Security.

## **Sample Tracking**

Samples are tracked through the analytical process by the LIMS. Completed analyses are noted on the sample status screen with a check box to indicate whether a sample has been approved by the appropriate supervisor as valid data. When all analyses are completed, the cover sheets are sent the reporting department for report generation. The completed report is sent to data validation and finally to invoicing at which point the report is mailed to the client. Generation of the invoice automatically changes the status of the samples in the LIMS to "Done" and removes them from the status report printed by the LIMS. Completed reports are reviewed by the Data Validators and sent to clients. See SOP 30-000, Report Generation and Review.

## **Sample Disposal**

It is preferred that excess hazardous sample material be returned to the originator (client) for disposal by the originator. When this is not possible or reasonable, ELI will dispose of excess hazardous sample materials with hazardous waste generated in the laboratory.

The disposal of all laboratory wastes will be performed in accordance with all local, state, and federal regulations, which apply to such activities. For specific information concerning a given waste, consult the appropriate SOP.

## **Subcontracting Policy**

The ELI Gillette laboratory utilizes the expanded branch laboratory capability and expertise to provide comprehensive analytical services. This occurs when the Gillette laboratory is requested to perform an analysis they are not capable of doing, during the peak season when we experience sample overload, and when equipment is out of service. Upon completion of the analyses, the branch laboratories report the sample results and their quality assurance package to a Project Officer. The results are reviewed before being reported to our clients.

Other branch laboratories are certified to perform drinking water analyses in their state and in neighboring states. Samples are forwarded to ELI branch laboratories only if the laboratory is certified in the state from which the sample originated. The Gillette QA program is consistent with the corporate QA Program and is monitored through internal laboratory audits.

The following methods are routinely analyzed by branch laboratories to support ELI-Gillette analytical services:

Total Organic Halogens (TOX) by SW846 9020  
Total Phenols by EPA 420.1  
Chlorinated Pesticides and PCB's by EPA 508  
N, P, and S Containing Pesticides by EPA 507  
Chlorinated Acid Herbicides by 515.1  
Pesticides by 525.2  
Endothall by 548.1  
Low level EDB and DBCP by EPA 504  
Organohalide Pesticides and PCBs by EPA 505  
Carbamates by EPA 531.1  
Glyphosate by EPA 547  
Diquat by EPA 549.1  
Semivolatiles by 625/8270  
Low Level Total Organic Carbon (TOC)  
Metals Analysis  
Volatile Organic Contaminants E524.2  
BTEX 8260B  
TCLP Extractions  
All Radiochemistry  
All Industrial Hygiene  
Soil and Overburden for ABA and Non-Metals Analysis  
Aquatic Toxicity

In the event that ELI is dependent on the service of an outside laboratory for analyses not available through our facility or our branch laboratories, the client will be notified in advance that their samples are being subcontracted to an outside laboratory. The outside laboratory reports the results to ELI and this becomes part of the final report. All final reports indicate where the analyses were performed.

## CHAPTER 7 – INSTRUMENT OPERATION AND CALIBRATION

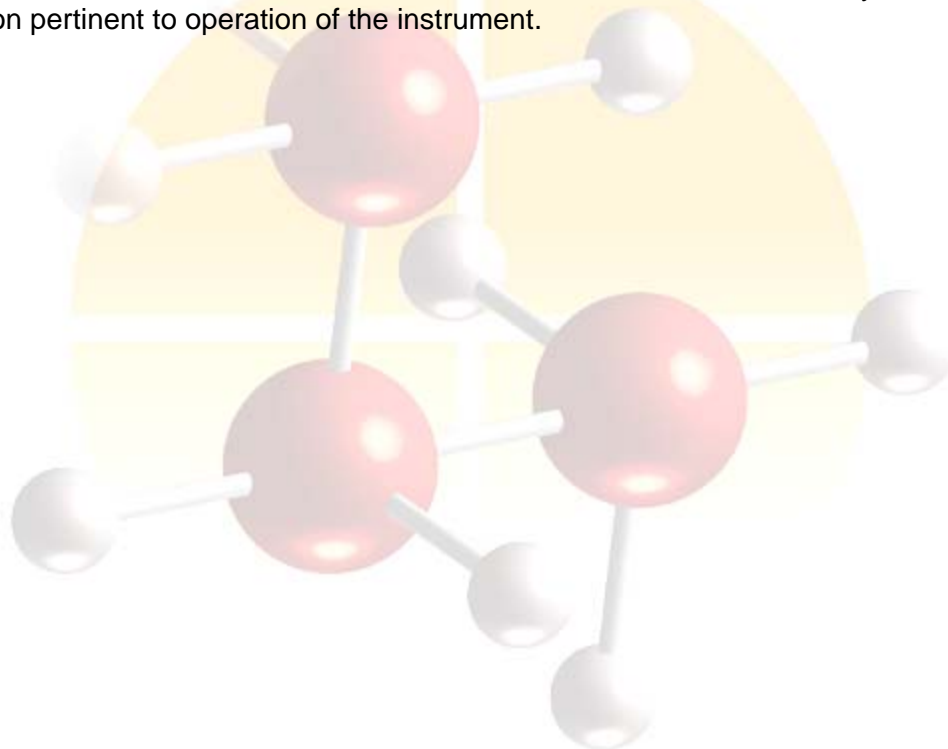
Laboratory instruments and equipment are operated and calibrated according to the manufacturer's instructions, and according to the requirements of the method being used. Exact calibration procedures are outlined in the appropriate SOP. For most instruments, a calibration curve composed of three to five standards covering the concentration range of the samples is prepared. Unless otherwise specified in the method, at least one of the standards is at or below the practical quantitation limit (PQL) of the method. Routine PQLs for each method are given in the **ELI Analytical Services Catalog**. Calibration standards are routinely compared against second source calibration standards to verify accuracy. The reference standard results must fall within an established range, as described by the SOP, to be accepted. Whenever possible, the laboratory uses calibration standards prepared from certified stock standards. Initial instrument calibration curves are verified and routinely monitored by running a continuing calibration standard every 10 to 20 samples, and at the end of every analytical sequence, depending on the analysis method and instrumentation. High-level samples, which produce an analytical response outside the calibrated range of the instrument, are diluted and reanalyzed such that a response within the calibrated range is obtained.

System cleanliness is verified through the analysis of reagent/instrument blanks prior to analysis, between highly contaminated samples, and at regular intervals during the analysis. Samples are only quantitated within the limits of the response of the standards.

Use of measuring equipment and reagents; glassware, water, chemical reagents, and industrial gases, conform to Good Laboratory Practice guidelines. Good Laboratory Practices (GLPs) are laboratory guidelines which were established by the Food and Drug Administration and published in the Federal Register (21 CFR, part 58) in the mid-1980's. The GLP guidelines were adopted by the Environmental Protection Agency. SOPs are developed in accordance with GLP and NELAC guidelines. Laboratory volumetric glassware conforms to National Institute of Standards and Technology (NIST) Class A standards. All mechanical pipetors are calibrated monthly. Laboratory balances are annually serviced and calibrated by certified technicians. Routine calibration checks of all balances are performed using NIST traceable Class S weights. Laboratory thermometers are annually calibrated against a NIST traceable thermometer, and routinely checked for accuracy. Laboratory drying ovens, incubators, freezers, refrigerators, and water bath temperatures are recorded each working day, or at frequencies as described in the specific SOP. Laboratory pure water is generated by commercial water purification systems and is monitored and documented each working day according to conductivity meter readings. The routine analyses of laboratory blanks is used to verify laboratory water quality and the suitability of sampling containers. Chemical reagents and gases exceed purity requirements for their intended uses. Laboratory stock and working standards are derived from commercially available primary standards whenever possible. Standards preparation notebooks document the source, purity, content, concentration, preparation date, and analyst. All calibrations standards are documented in the analytical sequence such that they are uniquely identifiable and traceable to stock standards and their source.

Standard Operating Procedures (SOPs) detail the sequence of operations involved in instrument start-up, calibration, analyzing, shutting down, and routine maintenance. Suggestions for corrective action are included with the SOPs and parameters are identified which dictate certain types of maintenance. Instrument and method detection limits are performed at the method required frequency or whenever there is a significant change in instrumentation. Detection limits are determined according to EPA guidelines found in 40 CFR, part 136, appendix B. Acceptable instrument response/performance criteria are based upon the manufacturer's or the analytical method specifications. SOPs exist for all major pieces of analytical equipment/methods. Instrument maintenance logbooks are used to document instrument maintenance and repairs.

All instrumental run sequences are documented. Laboratory analysts record and document all instrumental runs in Laboratory Instrument Logbooks or computer files. Instrument Logbooks and/or dated computer files record instrument performance data, analytical sequences, instrument maintenance, calibration standards data, and any other additional information pertinent to operation of the instrument.



## CHAPTER 8 - RECORDS AND REPORTING

### Laboratory Notebooks

Several different types of Laboratory Notebooks are maintained at the ELI Laboratory. These include, but are not limited to, the following:

- Method/Parameter Notebooks
- Instrument/Equipment Use and Maintenance Notebooks
- Standard Preparation Logbooks
- Sample Receipt Logbooks
- Safety Logbook
- Balance Calibration Logbooks
- Pipet Calibration Logbooks
- General Logbooks

The general purpose of maintaining each of these Laboratory Notebooks is to record the details which may be important in repeating a procedure, interpreting data, or documenting certain operations. Entries in the notebook may include data such as standard and sample weighing, pH measurements, instrument operating parameters, preparation of calibration curves, analytical run sequences, calculations, recording of instrument operating parameters, sample condition, etc. The analyst's notebook is particularly important in documenting analyses, which deviate in any way from routine or standard practices. It can also be an important training record. All pertinent data is to be recorded directly in the notebook. Some notebooks or data records are maintained in electronic files. Electronic data records are duplicated using hardcopy and/or alternate electronic backup techniques such as magnetic tape.

It is the responsibility of each analyst to maintain a laboratory notebook according to Good Laboratory Practices (GLP) Guidelines. Procedures for use and maintenance of laboratory notebooks are detailed in ELI SOP 20-010. All laboratory notebooks are assigned a unique logbook control # and are assigned to an analyst or supervisor. Laboratory Notebooks will remain the responsibility of the ELI staff member to whom they are assigned until, or unless, they are formally transferred to another staff member, until they are completely filled and returned to the ELI Quality Assurance Officer or ELI Laboratory Supervisor for archiving, or until the staff member resigns and returns them as a part of the check-out process. ELI staff members other than the individual to whom the Laboratory Notebook is issued may make entries in the Notebook as long as those entries are consistent with the intended use of the Notebook, and such entries are initialed. Laboratory Notebooks are the responsibility of each ELI staff member using the notebook. Supervisors review and approve all Laboratory Notebook formats.

### Records

The laboratory for minimum of five years keeps records of chemical analyses, including all quality control records. In the event the laboratory transfers ownership or goes out of business, files will either be maintained, or first be offered to the client prior to their disposal. Details are described in ELI SOP 20-002, Document Production, Control, and Archiving.

## **Data Reduction**

Data reduction refers to the process of converting raw data to reportable units. The reporting units used and analytical methods performed are described in the Analytical Services Catalog.

Wherever possible, the instrument is calibrated to read out directly in the units reported. In this case, the value is recorded directly into a laboratory notebook, logbook, bench sheet, or electronic file and presented for review by supervision.

In cases such as titration, gravimetric measurements, or other techniques which require calculation prior to reporting, raw data is recorded in the appropriate laboratory notebook or electronic file, or on the appropriate laboratory form. The calculations specified in the EPA method are used to determine the reported value. That value is also entered into the laboratory notebook or bench sheet, and on the draft of the client report. Most of the calculations are computerized to reduce the chance of arithmetic or transcription errors.

Wherever possible, electronic data results are transmitted throughout the laboratory via the LIMS computer network. This process is intended to minimize manual data transcriptions within the laboratory. Additional advantages include the opportunity for rapid comprehensive data validation by supervisors, and more rapid data reporting.

## **Validation**

Data validation includes the procedures used to ensure that the reported values are consistent with the raw data, calculated values, sample type, sample history, and other analyses parameters requested.

The data recorded on the draft report is validated with several steps. The analyst who submits the report checks all the values reported for omissions and accuracy. Elements of this review also evaluate all instrument and method QC results. Automated data management programs are designed with an interactive step allowing data review by the analyst. Results to be reported are approved by the analyst.

The reported result and associated QC data is reviewed by the project manager. Project managers review the suitability of the data according to project and method performance specifications. Analyses results for each requested parameter are evaluated against other requested parameters, project specifications, other samples within the set, historical files associated with the project/client, and any other information provided with the sample. Project managers initial all validated sample results.

The reports are generated, proofread, and then reviewed by the project management staff.

The final report is reviewed by the project manager, or their designate appointed by the laboratory manager.

Internal and external laboratory audits review selected sets of data to ensure that the analysis results are correct and accurate, analytical methods are appropriate, documentation and record keeping procedures complete, and that overall objectives of the Quality Assurance Program are adhered to.

All automated programs used to process and report data are verified using hand-calculated results. Whenever a modification is performed to a program re-verification of overall software function is performed.

## **Reporting**

One copy of the report is mailed to the client on the day the report is completed and reviewed. A standardized report format is used unless otherwise specified. Client specified report formats are available upon request. Electronic results via diskette, modem, FAX and/or e-mail are available upon request. All electronic reporting is followed with a hardcopy of final results.

Various levels of data reporting are available. All analyses results, regardless of the level of reporting used, have record keeping procedures which allow a complete "data validation package" to be produced. Note that a comprehensive "data validation package" is most easily generated at the time of sample analyses. Example data packages are available upon request.

Microbiological samples tested for compliance monitoring may require notification to the appropriate state agencies and this is detailed in individual method SOPs.

If requested by the client, additional copies of the report will be sent to a specified address or person.

The final copy of a completed report is scanned and maintained as a graphics file. The electronic file of the report meets NELAC reporting requirements. An electronic copy of this file is available upon request.

For more information, see SOP 20-002.

## CHAPTER 9 - GENERAL LABORATORY PRACTICES

### Chemicals and Reagents

When available and appropriate, chemicals used in the laboratory are analytical reagent grade (AR) chemicals purchased from reliable suppliers. Reagents are prepared, standardized, and made fresh as mandated by the method, their stability, and according to Good Laboratory Practices.

Stock or working standards are checked regularly for signs of deterioration, (e.g., discolorations, formation of precipitates) and are compared to independently prepared reference materials.

All standards and reagents are dated when received, opened, or prepared, and each are labeled with expiration dates.

Certified primary standards are obtained from commercial sources when available. Standards used for calibration are verified against second source standards. Secondary and working standards are accurately prepared in volumetric flasks or other calibrated glassware from primary standards and stored in appropriate containers.

Titants, standards, and other solutions used for analytical purposes frequently must be standardized upon preparation with certified or traceable standards. Method SOPs specify if standardization is necessary. The date and analyst's initials must be recorded on the container whenever re-standardized and records are maintained in a laboratory notebook.

Individual SOPs may also provide additional details for reagent requirements.

### Reagent Interference

To determine the extent of reagent interference, method blanks are analyzed prior to sample analysis whenever appropriate.

If any interference cannot be eliminated, the magnitude of the interference is considered when calculating the concentration of the specific constituent in the sample, but only when permitted within the method being used.

If reagents, materials, or solvents contain substances that interfere with a particular determination, they are replaced.

Individual method SOPs may also provide additional requirements for handling reagent interferences.

## Glassware Preparation

All glassware used for inorganic analyses is washed in warm detergent solution and thoroughly rinsed in tap water. Glassware is then rinsed well three times with deionized water. This cleaning procedure is sufficient for many analytical needs, but individual SOPs detail additional procedures when necessary. Glassware washing procedures for inorganic analyses are described in ELI SOP 30-001.

All glassware used for organic analyses is washed in warm synthetic detergent solution and thoroughly rinsed in tap water. The glassware is then rinsed well with deionized water, followed by rinses with acetone to remove any residual organics. Prior to use, the glassware is rinsed three times with the organic solvent to be used with the glassware. Glassware washing procedures for cleaning glassware for organic analyses are described in ELI-SOP-30-002.

All glassware used for microbiological analyses is washed in warm detergent solution. The detergent must be proven to contain no bacteriostatic or inhibiting substances. The glassware is rinsed thoroughly with suitable deionized water. Specific details are described in SOPs.

Disposable glassware/plasticware is preferred for many procedures in the laboratory. The cleanliness, and suitability of disposable glassware/plasticware is continuously evaluated for each test with the routine analyses of method blanks.

All volumetric glassware used in precise measurements of volume is class A, or laboratory calibrated.

## Laboratory Pure Water

Distilled or deionized water is used in the laboratory for dilution, preparation of reagent solutions and final rinsing of glassware. For organic analyses, organic-free water is prepared and used. Deionized water is prepared to meet ASTM Type II specification for reagent water. Use and maintenance of laboratory reagent water systems are described in ELI SOP 30-005 and 30-007.

Water quality is monitored for acceptability in the procedure in which it is used. Specific details are listed in the appropriate SOPs.

## **Employee Training**

All new ELI employees and contract personnel are given an initial general orientation and tour of the laboratory facilities. Personnel are shown the locations of safety equipment such as safety showers, eye wash fountains, fire extinguishers, and first aid supplies. Personal protective equipment such as lab coats, disposable gloves, and safety glasses (if applicable) are issued at this time.

Safety considerations are a vital part of the training process. All hazards associated with the performance of a procedure or with the operation of an instrument are to be understood by the trainee before training can be considered complete. General lab safety procedures are a part of the new and current employee training. Specific safety procedures are outlined in SOPs and in instrument Operator's Manuals. Training in use of protective clothing, eye protection, ventilation, and general safety are provided to each employee. Each employee is required to read the laboratory Chemical Hygiene Plan.

All new and existing employees must demonstrate capability prior to performing an analytical procedure independently (See Chapter 1). Method performance on Quality Control Samples is used to document employee training and work quality. Employees are required to read and sign the Quality Assurance Manual and all appropriate SOPs. Each employee also receives training on general laboratory policies including ethics and conflict of interest. ELI encourages attendance at courses, workshops and other forms of continuing education available from on-site seminars, private institutions, local schools, and State and Federal regulatory agencies. Staff and department meetings are held routinely to communicate company policies and procedures. All training on procedures and policies is documented per NELAP guidelines in employee training files. For more information see ELI SOP 10-005, Personnel Training.

## **Standard Operating Procedures**

All routine laboratory operations and procedures are documented in Standard Operating Procedures (SOPs). SOPs are written to provide a reference which specifically defines requirements for routine procedures, so that consistent, safe, and efficient laboratory operations are possible. For analytical methods, SOPs generally provide information on the details of the analysis which are not specified in a published analytical method. For routine procedures other than analytical methods, SOPs define the steps required in accomplishing a given task. All SOPs are reviewed periodically to assure that they reflect any changes in laboratory operations. Method SOPs follow NELAP requirements. For more information on generation and distribution of SOPs, see SOP 10-001, Preparation, Numbering, Use, and Revision of Standard Operating Procedures.

## **Client Confidentiality**

Each employee has the responsibility to maintain confidentiality in all matters pertaining to our clients, samples submitted, and Energy Laboratories, Inc. Information obtained during employment with this laboratory regarding the specific business of this laboratory or its clients shall at no time be revealed to any outside sources without permission from the owner of the data.

## CHAPTER 10 - QUALITY CONTROL MONITORING

### Routine Monitoring

Temperatures of incubators, water baths, refrigerators, and ovens are checked and recorded according to a prescribed schedule.

All pH meters are calibrated against reference standards. Calibrations are noted in laboratory notebooks.

Conductivity, residual chlorine, trace metals and pH of de-ionized water are continuously monitored.

Reagents are dated and initialed at the time of receipt; reagents are not used after recommended shelf life is exceeded.

Balances are checked daily against NIST traceable weights and are calibrated and serviced by certified technicians annually.

SOPs are reviewed periodically for correctness.

Laboratory Notebooks are reviewed periodically by supervisors for correctness and accuracy.

Performance Evaluation Samples are analyzed as required. (See Chapter Two of this QA Manual)

Quality Control Check Samples are analyzed with each analytical batch.

Internal and External audits are performed as specified or requested. (See Chapter Two of this QA Manual for additional discussion)

Additional monitoring requirements may also be specified in individual SOPs.

The Laboratory maintains an active fraud protection program that is implemented through the laboratory ethics policy. Additionally, the potential of fraud is monitored through analyst supervision, management supervision, regular internal audits, PT study participation, and an active quality assurance program.

## Instruments/Methods

Calibration is performed as required by the analytical method or SOP. (See Chapter 7 of this QA Manual)

Depending on method requirements, the standard curve is verified with a known second source reference sample. The reference sample results must fall within the appropriate target range for the calibration to be accepted.

In most cases, the calibration is checked by running a continuing calibration standard every 10 to 20 samples, depending on the analysis and instrumentation. The verification standard results must fall within an established range as described by the SOP.

All laboratory instruments are subjected to preventive maintenance schedules. Preventive maintenance schedules are specified in instrument maintenance logbooks.

As appropriate, instrument and/or method detection limits are determined annually, or more frequently if changes in instrument performance are noted or per method requirements. Procedures for the determination of instrument detection and method detection limits are described in ELI SOP 30-009.

Precision and Accuracy requirements for each method are specified in the SOPs. General guidelines are given below.

Each sample analyses batch will contain QC samples to measure the accuracy of the method. Each QC sample result is monitored to be within QC specifications of the method. Results of blank spiked sample analysis must be within the established control limits. Quality Control Limits are specified in the SOPs and meet recommended QC limits as described in the referenced method.

Each sample analyses batch will contain QC samples to measure the precision of the method. (See chapter One for discussion on duplicate sample analyses.) Criteria for duplicate sample acceptance are found in the SOP, and are generally taken from the referenced method.

Each sample analyses batch will contain QC samples to measure the performance of the method on the sample matrix. These are typically identified as a matrix spike analyses and is often done in duplicate to also measure precision. Typically the sample is fortified with a known amount of target analyte and spike recoveries are calculated. Results outside of method QC guidance are flagged. Quality control limits and appropriate corrective actions steps are specified in the method SOP.

As appropriate, the performance of QC samples results are evaluated with Quality Control Charts. Suitability of existing QC limits is evaluated and possibly adjusted, but not to exceed method specification.

## CHAPTER 11 – CORRECTIVE ACTION

When the quality control checks indicate that an analysis is not within the established control limits, corrective action is needed. This section gives general guidelines for corrective action. Corrective actions for each method or instrument are detailed in individual SOPs.

Method QC such as continuing calibrations, instrument blanks, method blanks, duplicate, blank spike, matrix spike, or matrix spike duplicate samples which fail to fall within QC control limits are analyzed again to verify if a problem exists. If this repeat is not within control limits, the particular instrument or procedure is checked according to the specific protocols outlined in the method or according to the instrument manufacturer's guidelines. Once results are within control limits, analysis of all samples that were analyzed while the procedure was out of control are repeated, i.e., all analyses are repeated back to the previous acceptable control sample. If the analyst is unable to achieve acceptable results after following the corrective action guidelines detailed in the SOP, supervision is consulted. If necessary, the appropriate service personnel are contacted if the problem is determined to be due to instrument error, and cannot be resolved. In certain cases, where control limits are exceeded, it is possible that problems cannot be corrected to satisfy QC criteria. This could be due to problems such as matrix interference, instrument problems, lack of sufficient sample, missed holding times, high blank contamination, etc. If all possible solutions available to correct the problem are examined and the sample results are still considered valid, qualifying comments are attached to the sample report describing the non-compliance to QC and probable cause.

In the event that a QC audit or other informational review shows an analysis report to be incorrect, incomplete, or adversely compromised, a written corrected report and explanation is submitted to the client. As appropriate, an explanation submitted to the client should give a detailed review of the problem and document any unapproved deviations from the regulations, standard operating procedures, or project specific scope of work that may have caused it. The explanation to the client shall include but not be limited to the following components:

- What actions have been taken regarding the data set(s) affected.
- Identification of the cause.
- Corrective action taken to prevent future occurrence.

## Procedure for Dealing with Complaints

### Definition:

**Complaint** For the purposes of this procedure, a complaint comes from a client or other user of our data. The complaint might cover issues about the quality of our data, turnaround, method used, pricing, or other expectations.

**Client** The client is the person or company that ordered and paid for the services. This is the person that a sample is logged in or filed under.

### Procedure:

The staff person receiving the complaint exercises judgment in deciding the severity and disposition of every complaint. The judgment must be used to decide whom, if anyone is alerted to the complaint and what actions are appropriate. The individual handling the complaint is instructed to follow ELI's guidelines on how to handle the complaint. This involves listening to the client and getting adequate information so the complaint can be investigated and resolved. The appropriate laboratory staff is notified and a solution to the problem and a timeline for action is given.

After the complaint is investigated or resolved, as necessary, the client is made aware of the results and determination is made as to what further actions are needed. Complaints and investigations may result in the need to submit a revised report or invoice. Complaints that are straightforward and can be resolved using the resources available to the person handling the complaint should be resolved there. These include such things as minor revisions of reports or invoices. If other decisions need to be made, the appropriate person should be contacted.

It may be appropriate to initiate or prepare a non-compliance report. This report should be completed with the intention of informing the affected staff about the problem so that we can all learn from it, change our procedures and improve our service. A procedure to document non-compliance reports is documented in ELI SOP 20-011.

## Penalty for Improper, Unethical or Illegal Actions

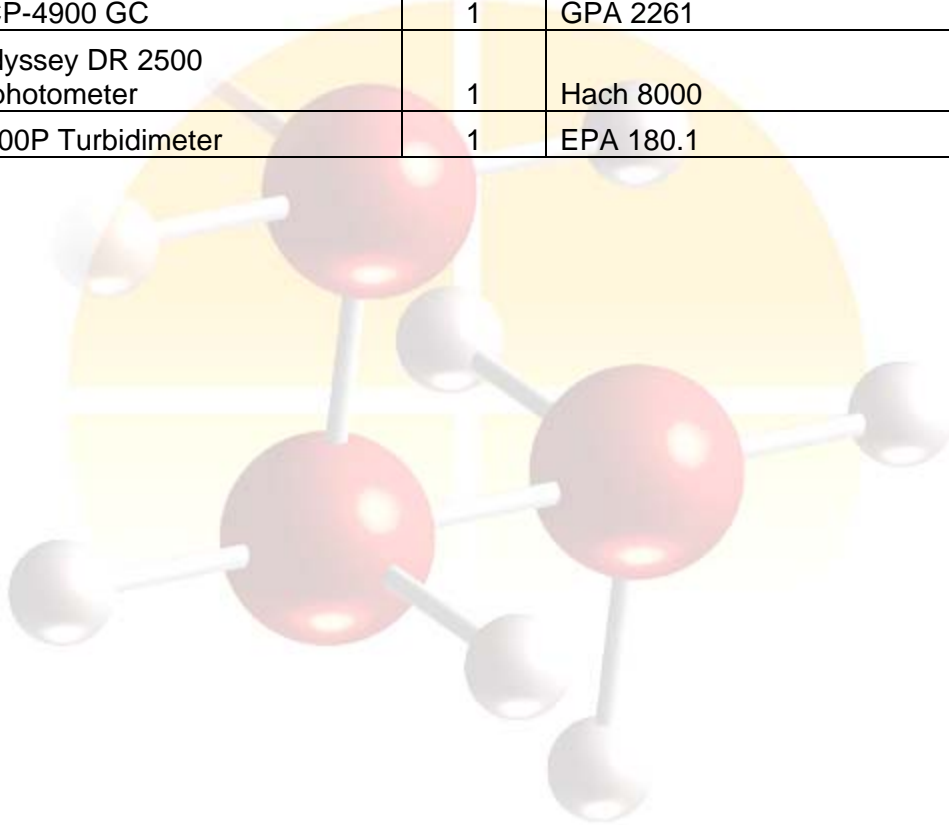
Employees of Energy Laboratories, Inc. are expected to work in an ethical, proper, and legal manner. They are expected to perform laboratory analyses according to the cited method(s) and in conjunction with the SOP and the Quality Assurance Plan. Employees are expected and required to report any violations of this policy.

The penalty for improper, unethical, or illegal actions performed by an employee will be determined on a case-by-case basis. It will be set, in part, by the severity of the offense. A first time, minor offense may simply require instruction about the expectations of the company. A subsequent, willful, or more serious incident may require anything from supervisor reprimand to termination of employment. The supervisory staff and the laboratory director will determine the penalty. Consideration of such elements as employee experience, training, and attitude, and the seriousness of the problem will be used to set the penalty.

## CHAPTER 12 - MAJOR EQUIPMENT AND METHODS

### ENERGY LABORATORIES, INC – Gillette, Wyoming

<u>Equipment</u>	<u>Quantit y</u>	<u>Methods</u>
Dionex Anion Chromatography	1	EPA 300.0
Man-Tech Auto-Titrator	1	SM 2320B
Buck Infrared Oil in Water Analyzer	1	EPA 418.1
Horizon Solid Phase Extractors	5	EPA 1664
Varian CP-4900 GC	1	GPA 2261
Hach Odyssey DR 2500 Spectrophotometer	1	Hach 8000
Hach 2100P Turbidimeter	1	EPA 180.1



## CHAPTER 13 - PREVENTIVE MAINTENANCE

Preventive maintenance is performed on laboratory equipment according to the manufacturer's guidelines and our experience in its operation. An outline of the maintenance on our major equipment follows:

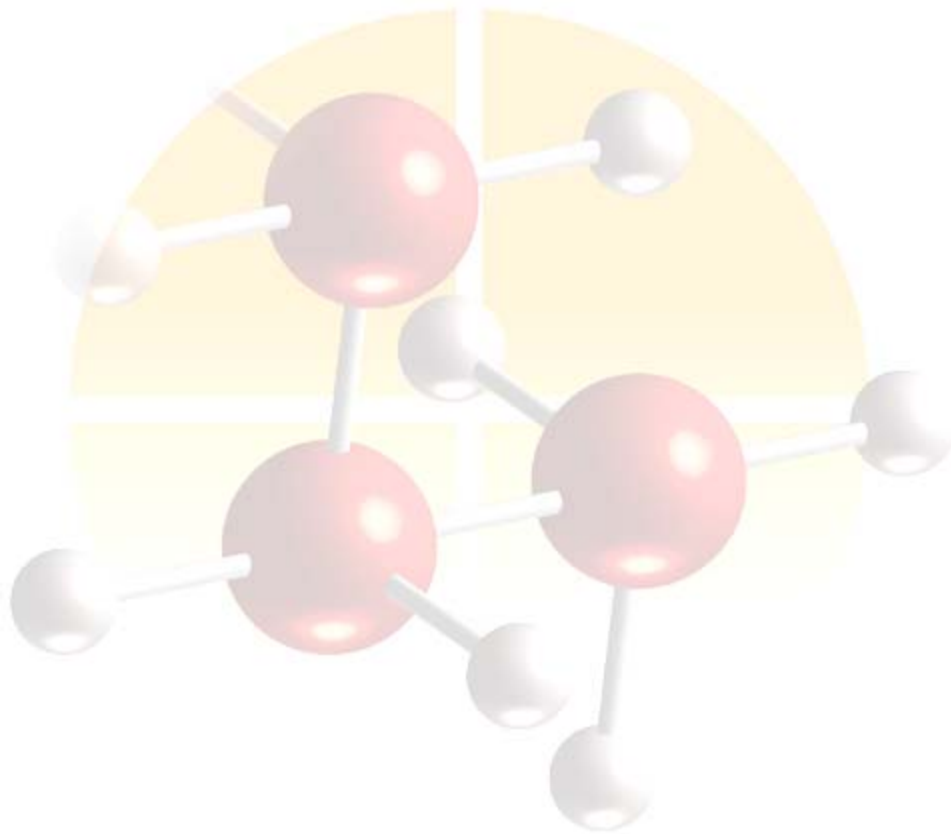
<u>Instrument</u>	<u>Maintenance</u>	<u>Frequency</u>
Balances	Check with Class S weights	Daily
Balances	Independent service	Annually
Pipettes	Check volume	Monthly/Daily
Glassware	Check volume	Monthly
Class S Weights	Independent service	Annually
Automatic dispensers	Check volume	Each new lot
Burets	Check volume	Monthly
Gas Chromatograph	Change septum	As needed
	Check injection liner	Daily
	Clean detector	As needed
	Change carrier gas cylinder	At 80 psi
	Change column	As needed
Auto Analyzers	Check bath temperature	Daily
	Check for leaks	Daily
	Change tubing	When wear is visible
	Align flow cell	Quarterly
	Lubricate pumps	Annually
	Lubricate sampler	Annually
Microbiology	Room temperature	Twice daily
	Incubator temperature	Twice daily
	Water bath temperature	Twice daily
	Incubator temperature	Twice daily
	Bench cleanliness	Monthly
	Air cleanliness	Monthly
	NIST thermometer checks	Semi-annually
	DO electrode check	As needed
	Winkler method DO check	Yearly
	Autoclave maintenance	Annually
	UV light cleaned	Monthly
	Membrane filters/pads	Each new lot
	sterility	
	Detergent suitability check	Each new batch
	Glassware residual pH	Quarterly
	Refrigerator temperature	Daily
	Autoclave Diack	Monthly
	sterilization	
	Autoclave sterilization time	Each run
	Autoclave sterilization temp	Each run
	Container sterility/minimum	Each new lot

**Quality Assurance Program**

**Energy Laboratories, Inc.**

**Gillette, Wyoming**

Reagent Water Systems	level check	
	Change/check cartridges	Quarterly, or as needed
	Residual chlorine	Monthly
	Conductivity check	Monthly
	HPC	Monthly
	Trace metals check	Annually
	pH	Monthly



## CHAPTER 14 - REFERENCES

Handbook for Analytical Quality Control in Water and Wastewater Laboratories Environmental Protection Agency.

Standard Methods for the Examination of Water and Wastewater, 18th Edition, APHA, 1992.

Methods for Chemical Analysis of Water and Wastes Environmental Protection Agency, 600/4-79-020.

Methods for the Determination of Metals in Environmental Samples – Supplement I, EPA/600/R-94-111, May 1994

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

Methods for the Determination of Organic Compounds in Drinking Water, EPA/600/4-88/039, December 1998.

Methods for the Determination of Organic Compounds in Drinking Water – Supplement I, EPA/600/4-90/020, July 1990.

Methods for the Determination of Organic Compounds in Drinking Water – Supplement II, EPA/600/R-92/129, August 1992.

Technical Notes on Drinking Water Methods, EPA/600/R-94/173, October 1994.

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW846), Environmental Protection Agency, Final Update III, 1997

ASTM Annual Book of Standards, Part 31 (water). American Society for Testing and Materials.

Manual for the Certification of Laboratories Analyzing Drinking Water, 4<sup>th</sup> Ed., EPA 815-B-97-001, 1997.

NELAC Chapter 5: Quality System Standard, 2001

Laboratory Services Catalog, Current Revision, Energy Laboratories, Inc.

Qualifications Manual, Current Revision, Energy Laboratories, Inc.

## CHAPTER 15 - GLOSSARY OF TERMS

Accuracy - The degree of agreement between an observed value and an accepted reference value.

Analytical Sample - Any solution or media introduced into an instrument on which an analysis is performed, excluding instrument calibration, initial calibration verification, initial calibration blank, continuing calibration verification, and continuing calibration blank.

Audit - A systematic evaluation to determine the conformance to quantitative specifications of some operational function or activity.

Batch - Environmental samples which are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one to twenty environmental samples of the same matrix, meeting the criteria above. An analytical batch is composed of prepared environmental samples, extracts, digestates, or concentrates, which are analyzed together as a group and in a similar time frame.

Blind QC Check Samples - Samples whose analyte concentrations are not known to the analyst. That the sample is a QC check sample may or may not be known to the analyst.

Blank - An artificial sample designed to monitor the introduction of artifacts into the process. The blank is taken through the appropriate steps of the process.

Blank Spike - See Standard Matrix Spike.

Calibration - The set of operations which establish, under specified conditions, the relationship between values indicated by the measuring instrument and the corresponding known value of the property being measured.

Calibration Blank - A volume of reagent water fortified with the same matrix as the calibration standards, but without the analytes, internal standards, or surrogate analytes.

Calibration Check Standard - See Check Standard.

Calibration Curve - The mathematical relationship between the known values and the instrument responses for a series of calibration standards.

Calibration Standard - A solution of known concentration used in the calibration of an analytical instrument.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) - The enabling legislation (42 USC 9601 - 9675 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 USC 9601 et seq.), to eliminate the health and environmental threats posed by hazardous waste sites.

Check Standard - A material of known composition that is analyzed concurrently with test samples to evaluate a measurement process.

Clean Water Act - Public Law PL 92-500. Found at 40 CFR 100-140 and 400-470. The act regulates the discharge of pollutants into surface waters.

Continuing Calibration Standard - See Check Standard.

Continuing Calibration Verification - See Check Standard.

Control Limits - A range within which specified measurement results must fall to be compliant.

Control Standard - See Check Standard.

Corrective Action - An action taken to eliminate the causes of an existing nonconformity, defect, or other undesirable situation in order to prevent recurrence.

Data Quality Objectives - An integrated set of specifications that define data quality requirements and the intended use of the data.

Duplicate - A second aliquot of a sample that is treated the same as the original sample to determine the precision of the method.

Duplicate Sample - See Duplicate.

Fortified Sample - See Sample Matrix Spike.

Initial Calibration Verification - A sample of known concentration, from a source other than that of the calibration standards, analyzed following calibration to demonstrate validity of the calibration.

Instrument Blank - See Calibration Blank.

Laboratory Intercomparison Sample - A performance evaluation sample analyzed by numerous laboratories. Acceptance criteria are often based statistically on the analysis results.

LIMS - Laboratory Information Management System.

Matrix Spike - See Sample Matrix Spike.

Matrix Spike Duplicate - See Sample Matrix Spike Duplicate.

Method Blank - A clean sample processed simultaneously with, and under the same conditions as, samples containing an analyte of interest through all steps of the analytical procedure.

Method Detection Limit - A measure of the precision of an analytical method determined according to the procedure given in 40 CFR Part 136 Appendix B.

NELAC - National Environmental Laboratory Accreditation Conference.

NELAP - National Environmental Laboratory Accreditation Program.

National Pollutant Discharge Elimination System (NPDES) - A discharge permit system authorized under the Clean Water Act.

Performance Evaluation (PE) Sample - A sample with a composition unknown to the analyst which is provided to test whether the analyst/laboratory can produce analytical results with specified limits.

Precision - The degree to which a set of observations or measurements of the same property conform to themselves.

Preservation - Refrigeration and/or reagents added at the time of sample collection to maintain the chemical and/or biological integrity of the sample.

Quality Assurance Project Plan (QAPP) - A formal document describing the detailed quality control procedures pertaining to a specific project. For environmental clean-up projects this is typically produced by an engineering firm with references to include a laboratories Quality Assurance Program Manual.

Replicate - An additional aliquot of a sample that is treated the same as the original sample to determine the precision of the method.

Resource Conservation and Recovery Act (RCRA) - The enabling legislation under 42 USC 321 et seq. (1976) that gives EPA the authority to control hazardous waste.

Safe Drinking Water Act (SDWA) - The enabling legislation, 42 USC 300f et seq. (1974), which requires the USEPA to protect the quality of drinking water in the U.S. by setting maximum allowable contaminant levels, monitoring, and enforcing violations.

Sample - A portion of material to be analyzed.

Sample Matrix Spike - An aliquot of a sample to which known quantities of specific compounds are added, and which is carried through the entire analytical process to determine the effect of the matrix on the methods recovery efficiency.

Sample Matrix Spike Duplicate - A second aliquot of a sample to which known quantities of specific compounds are added, and which is carried through the entire analytical process to determine the effect of the matrix on the methods recovery efficiency and the precision of the method.

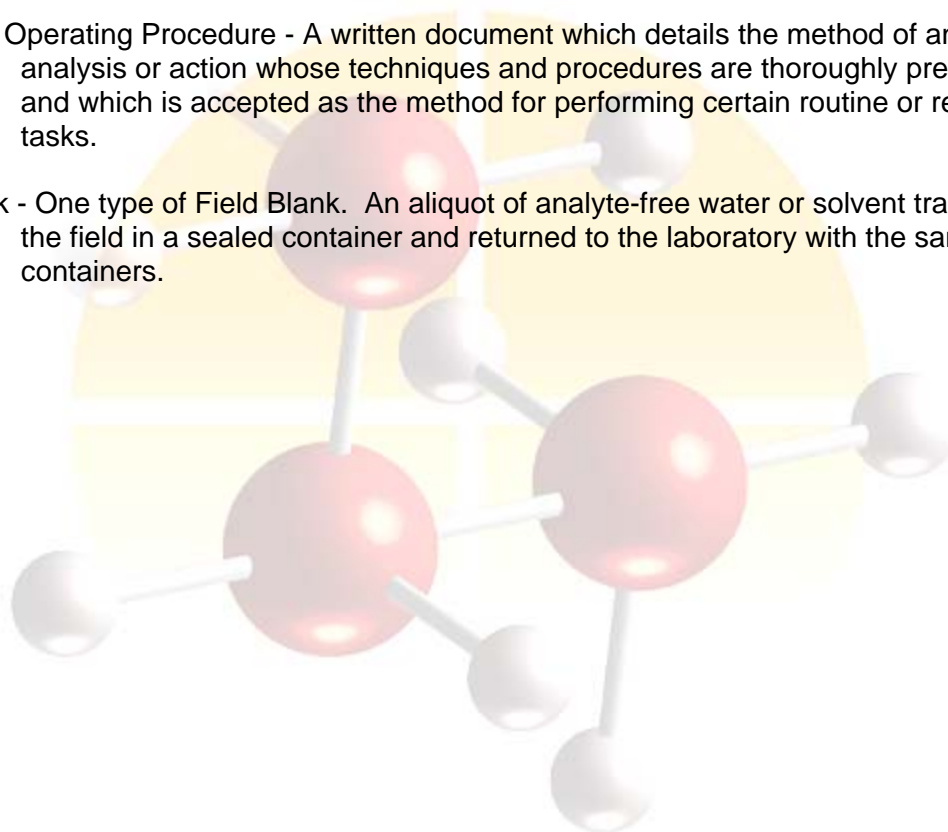
Spiked Sample - See Sample Matrix Spike.

Standardization - See Calibration.

Standard Matrix Spike - An aliquot of blank matrix to which known quantities of specific compounds are added, and which is carried through the entire analytical process to determine the methods recovery efficiency.

Standard Operating Procedure - A written document which details the method of an operation, analysis or action whose techniques and procedures are thoroughly prescribed and which is accepted as the method for performing certain routine or repetitive tasks.

Trip Blank - One type of Field Blank. An aliquot of analyte-free water or solvent transported to the field in a sealed container and returned to the laboratory with the sample containers.



**APPENDIX A**  
**Laboratory Certifications**

**EPA Region VIII Drinking Water Certificate**  
**Recent EPA WS and WP Study Results**





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 8

999 18<sup>TH</sup> STREET- SUITE 300  
DENVER, CO 80202-2466  
Phone 800-227-8917  
<http://www.epa.gov/region08>

December 22, 2004

Ref: 8TMS-L

Mr. Terry Friedlan  
Energy Laboratories, Inc.  
1105 West First Street  
Gillette, Wyoming 82716

Dear Mr. Friedlan:

Enclosed is a report summarizing the findings of the October 27, 2004 on-site evaluation of the Energy Laboratories' Gillette, Wyoming facility. The purpose of this evaluation was to determine the laboratory's eligibility for certification under the Safe Drinking Water Act Program.

Based on the noncritical nature of the findings identified during the on-site evaluation, I am pleased to grant **Full Certification** to the Energy Laboratories' Gillette facility for the following drinking water analyses cited in the Total Coliform Rule 40 CFR 141.21(f):

<u>Analyte</u>	<u>Method</u>
Total Coliforms	SM 9223B - Chromogenic/Fluorogenic Methods
<i>Escherichia coli</i>	SM 9223B - Chromogenic/Fluorogenic Methods

The enclosed report provides an explanation of the findings identified during the on-site evaluation and the corrective actions required. Please provide a written response to this report within three months of its receipt. Energy Laboratories' certification will remain in effect until **October 27, 2007**. Please, contact Alysia Tien at (303) 312-7809 if you have any questions concerning this report.

Sincerely,

A handwritten signature in cursive script that reads "Tony Medrano".

Tony Medrano, Director  
Regional Quality Assurance Program

Enclosure

cc: Alysia Tien, 8TMS-L  
Sandra Spence, 8TMS-L  
file

## APPENDIX B Quality Systems Controlled Documents

Quality Assurance Program Manual

Qualifications Manual

Energy Laboratories Analytical Services Catalog

Policies and Procedures Package

Benefits

401-K

Employee Leave Time, Work Week

Computer Software Policy

Work Ethic Policy

Drug and Alcohol

Non-Discrimination and Harassment in the Workplace Policy

Confidentiality Agreement

SOPs

Organization and Personnel (10-Series)

SOP of SOPs'

Access and Security

Roles and Responsibilities

Personnel Training

Policies and Procedures

General Facility Operations (20-Series)

Login/Chain of Custody

Document Production/Archives

Lab Waste Management

Internal QA Audits

External QA Audits

Shipping

Property Procurement

Lab Notebooks

Non-Conformance

Sample Storage

Purchasing of Laboratory Reagents and Supplies

General Laboratory Procedures (30-Series)

Equipment Use and Maintenance (40-Series)

Analytical Methods (50-Series)

Laboratory Notebooks

## APPENDIX C

### Quality Assurance / Quality Control Specifications

<b>METHOD QA/QC Parameters</b> Total Petroleum Hydrocarbons by EPA Method 418.1 Modified November 12, 2003				
QA INDICATOR	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION	COMMENTS
Instrument Calibration	3 Point Calibration. 20, 100, 250 mg/L standard.	Linear Calibration Plot $r > 0.995$	<ol style="list-style-type: none"> <li>1. Correct problem</li> <li>2. Recalibrate</li> <li>3. Prepare new standards</li> </ol>	Calibration of IR instrument for extract analysis.
Quality Control Standard	Daily follows valid initial calibration or continuing calibration check. Use Diesel or Motor Oil standard with Vegetable Oil.	%R = 92-108	<ol style="list-style-type: none"> <li>1. Repeat once</li> <li>2. Recalibrate</li> <li>3. Prepare fresh standards</li> </ol>	A second source reference material with known values to verify calibration standards.
Method Blank	Minimum 1/20 samples	<PQL	<ol style="list-style-type: none"> <li>1. Repeat once</li> <li>2. Correct problem</li> <li>3. Reanalyze all samples since last valid method blank.</li> </ol>	Method blanks for soils should be prepared using clean blank sand.
Matrix Spike	Minimum 1/20 samples	60-140% Recovery	<ol style="list-style-type: none"> <li>1. Repeat once possibly using higher spiking level.</li> <li>2. Correct problem</li> <li>3. Verify sample homogeneity for soils.</li> </ol>	No MSD performed. Evaluated performance of method on matrix. Soils are spiked at time of extraction.
Duplicate Sample	Minimum 1/20 samples	<3*PQL or < 10% RPD	<ol style="list-style-type: none"> <li>1. Repeat analyses</li> <li>2. Correct problem</li> <li>3. Reextract and re-analyze</li> <li>4. Choose another sample to analyze as duplicate.</li> </ol>	Duplicates are used to measure method precision.
Proof of Competency	Statistical review of method QC data for each analyst.	Data statistically within control limits.	<ol style="list-style-type: none"> <li>1. Correct method problem</li> <li>2. Replace analyst</li> </ol>	Review of analyst's QC data show him to be a skilled competent analyst.
Control Charting	Annually or as needed	Data statistically within control limits.	<ol style="list-style-type: none"> <li>1. Correct method problem</li> <li>2. Adjust Control Limits</li> <li>3. Replace Analyst</li> </ol>	Control Charting needs to be done to evaluate method control limits for each individual QC element.

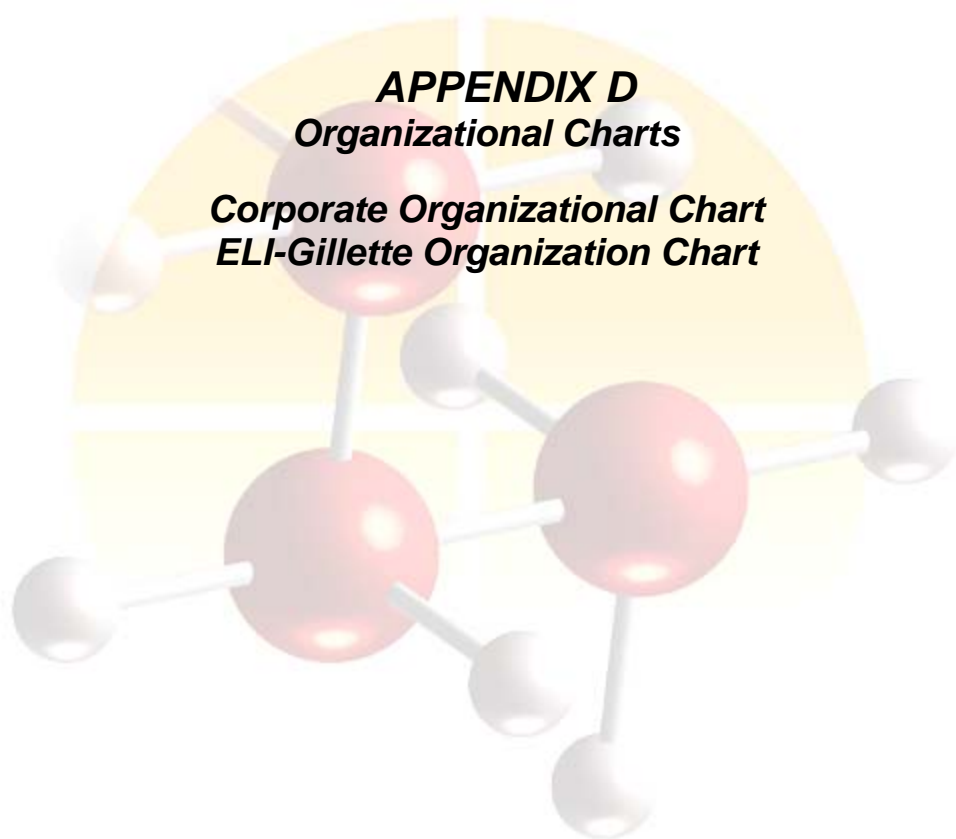
<b>METHOD QA/QC PARAMETERS</b> TOTAL DISSOLVED SOLIDS (EPA 160.1, SM 2540C) Water and Waste Analyses				
QA INDICATOR	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION	COMMENTS
Balance Calibration (4 Place)	Daily – 1 Point calibration check. Monthly – 5 point calibration and to include torsion range of balance	Within Balance Specifications +/- 0.0003 g	1. Correct problem 2. Recheck calibration. 3. Service balance/use other balance.	Balances are calibrated using NIST traceable weights. Balances are serviced annually.
Sample Preparation	Use 100 mL sample volume, or a lesser volume which gives > 0.0010 g of residue weight.	7 Day Holding time.	1. Correct problem 2. Repeat analyses 3. Document any problems concerning analyses results.	
Method Blank	Minimum 1/20 samples or for each batch, whichever is more frequent. (Each tray)	<PQL PQL = 10mg/L for a 100 mL sample volume.	1. Correct problem 2. Re-analyze samples in batch associated with contaminated method blank.	Method blank is used to demonstrate method detection level and to demonstrate that procedure is free of interference and contaminants.
Laboratory Control Samples	Follows valid initial calibration. Use RTC second source control sample.	R= 90-110%	1. Repeat once 2. Recalibrate 3. Prepare fresh standards	Evaluates accuracy bias in calibration standards. Used as QCS to monitor laboratory performance..
Matrix Spike	Minimum 1/20 samples or for each batch, whichever is more frequent. (Each tray)	R = 80-120% <20% RPD	1. Repeat analyses 2. Select another spike	High analyte levels may affect MS recoveries.
MDL Studies	N/A			Not applicable, review method blank performance.
External PE Samples	Biannual WS and WP EPA study samples	EPA defined interlaboratory control limits	N/A	External review of method performance.
Control Charting and Proof of Competency	Annual, statistical review of method QC data for each analyst.	Data statistically within control limits.	1. Correct method Problem 2. Adjust control limits 3. Replace Analyst	Review of method data shows good historical method performance

<b>METHOD QA/QC PARAMETERS</b> Fluoride analysis by EPA method 340.2, SM4500-F,C, Man-Tech Method				
QA INDICATOR	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION	COMMENTS
Instrument Calibration	6 point daily initial Calibration Range: 0.1, 0.2, 0.5, 1.0, 2.0, 5.0	Linear Regression Line $r > 0.995$	1. Correct problem 2. Prepare new standards 3. Recalibrate	Calibration of instrument and check of response linearity.
Initial Calibration Verification (ICV)	Follows valid initial calibration	Stated certified concentration $\pm$ 10%	1. Repeat once 2. Recalibrate 3. Prepare fresh standards	Evaluates accuracy/bias in calibration standards.
Duplicate	Minimum 1/10 samples	Larger of 3* PQL or 10% RPD	1. Rerun duplicates 2. Rerun samples	Measures method precision
Continuing Calibration Verification (CCV)	Mid-level standard analyzed every 10 samples and at the end of every analytical sequence	%R = 90-110	1. Repeat once 2. Correct problem 3. Re-analyze all samples since last valid calibration check.	Verifies instrument calibration and stability throughout analyses.
Method Blank (MBLK)	DI water run daily	< 0.10	1. Repeat once 2. Correct problem 3. 3. Re-analyze all samples	Measures and evaluates possible contamination in reagents
Matrix Spike (MS)	Minimum 1/10 samples or for each batch.	%R = 80-120	1. Repeat analyses 2. Dilute sample and re-spike 3. Spike different sample to see if the sample matrix is the problem. 4. Correct problem	Measures recovery of a known concentration
Matrix Spike Duplicate	Minimum 1/10 samples	RPD of MS 90-110%	1. Repeat analyses 2. Correct problem 3. Re-prepare samples 4. Spike a different sample. 5. Re-analyze set of samples.	Measure method precision Sample matrix may cause MS or MSD failure.
MDL Studies	MDL – annually and initially for each new instrument setup or analyst.	MDL < PQL	1. Repeat once 2. Correct problem	Used to demonstrate ability to measure at minimum reporting limit.
External PE Samples	Semi-annually, WS and WP study samples. Also internal audit samples.	Within specified inter-laboratory control limits	1. Repeat 2. Correct problem	External review of analytical method accuracy.
Control Charting and Proof of Competency	The ICV results will be control charted. Annual, statistical review of method QC data for each analyst or as needed.	Data statistically within control limits.	1. Correct method Problem 2. Adjust control limits 3. Replace Analyst	For statistical process control.

<b>METHOD QA/QC PARAMETERS</b>				
CHEMICAL OXYGEN DEMAND by Hach Method 8000				
QA INDICATOR	FREQUENCY	ACCEPTANCE CRITERIA	*CORRECTIVE ACTION	COMMENTS
Laboratory Control Samples	Follows valid initial calibration. Use RTC second source control sample. Required each batch	R%= 85-115% of certified value.	1. Repeat once 2. Recalibrate 3. Prepare fresh standards	Evaluates accuracy/bias in calibration standards. Used as QCS to monitor laboratory performance.
Duplicate Samples	One sample duplicate pair for every 10 analytical samples, or for each batch.	%R = 90-110	1. Repeat once 2. Select other duplicate	Measures method precision
Method Blank/ calibration blank	Reagent blank analyzed after calibration, every 10 samples and at the end of every analytical sequence.	< 1 mg/L Low level <2 mg/L Routine	1. Repeat once 2. Correct problem 3. Reanalyze all samples associated with failed method blank.	Measures and evaluates possible contamination in reagents and glassware used in method.
Matrix Spike (Lab fortified Matrix)	Minimum 1/10 samples and for each batch.	%R 90-110 Precision < greater of 3XPQL or 10%RPD	1. Repeat analyses 2. Prepare spike at higher level or dilute sample and re-spike 3. See LCS	Evaluates the method performance on individual sample matrices. No corrective action if LCS is within control limits.
MDL Studies	MDL – Every six months and initially for each new instrument setup or analyst.	MDL < PQL = 1ppm	1. Repeat 2. Correct problem	MDL Studies are current for method. Used to determine method sensitivity
External PE Samples	Semi-annually WP study samples.	Within specific interlaboratory control limits.	1. Cannot fail two in a row 2. Correct problem	External review of analytical method accuracy. Historically, excellence performance.
Control Charting and Proof of Competency	Annual, statistical review of method QC data for each analyst or as needed.	Data statistically within control limits.	1. Correct method problem 2. Adjust control limits 3. Replace analyst	For statistical process control.

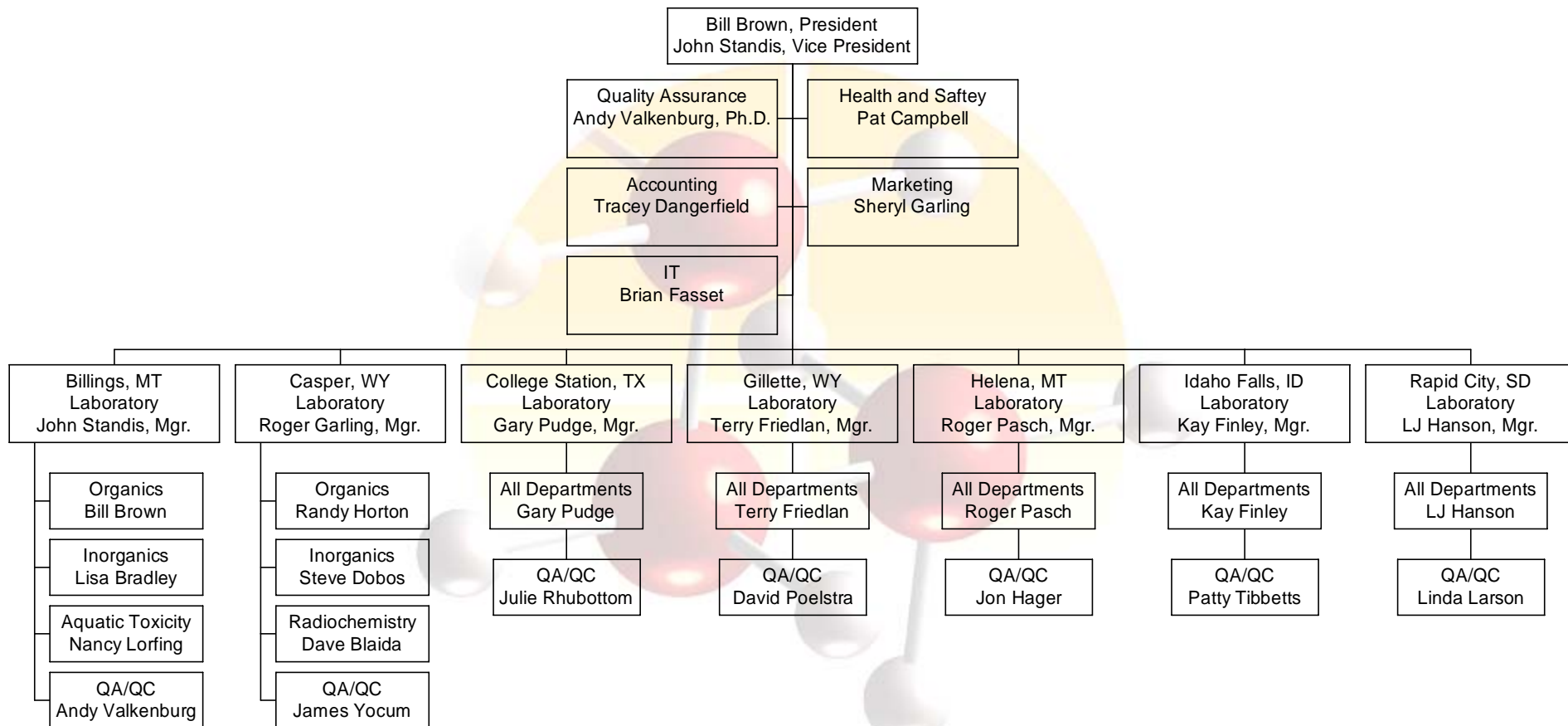
<p align="center"><b>METHOD QA/QC PARAMETERS</b>  <b>ALKALINITY IN WATER AND AQUEOUS SAMPLES</b>  <b>BY AUTOMATED POTENTIOMETRIC TITRATION</b>  <b>EPA Method 310.1/SM 2320B</b>  <b>FOR WATER, WASTE, AND SOIL EXTRACT ANALYSES</b></p>				
QA INDICATOR	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION	COMMENTS
Calibration	Titration method – titrant normality calibrated against sodium carbonate upon preparation of titrant. pH meter calibrated daily.	Titrant = 3X replicates, RSD< 5%, use average value.	1. Correct Problem 2. Prepare new reference standards 3. Recalibrate	Calibration of Titrant also verified with LCS analyses.
Method Blank (MBLK)	At beginning of every run.	< 4.0 mg/L	1. Correct Problem 2. Re-analyze method blank with fresh reagent water. 3. Re-analyze samples	Method blank demonstrates method detection level and that procedure is free of interference and contaminants.
Laboratory Control Samples (LCS)	After the method blank and matrix spike duplicate.	%R = 90-110%	1. Re-analyze LCS 2. Re-analyze samples	Evaluates method performance against a characterized sample.
Matrix Spike/Matrix Spike Duplicate	Must be analyzed at a frequency of 10% of samples.	%R = 80-120 Duplicate RPD <20%	1. Select other sample to spike 2. Re-run spike or other sample 3. See LCS performance	Evaluates method performance in a sample matrix. Matrix spike recovery only valid for spike levels > 4X sample amount.
MDL Studies	Annually, or whenever method changes might affect sensitivity.	< PQL (4.0 mg/L) Review against prior MDL data	1. Repeat if obvious problem occurs. 2. Adjust reporting limit above MDL	Used to evaluate minimum reporting level.
External PE Samples	Biannual WS and WP studies (total 4X/Year)	EPA defined interlaboratory control limits	1. Corrective action report completed for non-acceptable results.	External review of method performance.
Control Charting and Proof of Competency	Annual, statistical review of method QC data for each analyst, or as needed.	Data statistically within method control limits.	1. Correct method/instrument problems 2. Adjust control limits 3. Replace Analyst	Reviews method historical performance.

<b>METHOD QA/QC PARAMETERS</b> DETERMINATION OF COMMON ANIONS IN WATER AND AQUEOUS SAMPLES USING DIONEX AS3500 BY ION CHROMATOGRAPHY EPA METHOD 300.0 For Water, Waste, and Soil Analyses				
QA INDICATOR	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION	COMMENTS
Instrument Calibration	Daily, or when needed. 4 to 5 point calibration and blank. Quadratic fit for 5 pt	0.995 or better coefficient of correlation for 3 pt calibration. Visual interpretation for quadratic	Pour fresh standards and recalibrate.	Calibration of instrument. Calibration validity tested by ICV, ICB Reporting: Audit Review
(ICV) Initial Calibration Verification	Immediately follows calibration. Second source standard used.	R% = 90-110	1. Recalibrate and rerun 2. Prepare fresh standards and/or ICV.	Evaluates accuracy/bias in calibration standards. Reporting: In data validating report package
(ICB) Initial Calibration Blank	Immediately follows ICV	$\pm 1^*$ lowest reporting limit	1. Re-pour blanks, recalibrate, and rerun. 2. Prepare fresh blank.	Evaluates instrument calibration, reagent contamination, and instrument carryover. Reporting: In data validating report package
(CCV) Continuing Calibration Verification	Run every 10 samples and at end of run. Midpoint calibration std or ICV	R% = 90-110	1. Recalibrate and rerun samples since last valid CCV 2. Check for sample matrix problem.	Evaluates instrument drift. Reporting: In data validating report package.
(CCB) Continuing Calibration Blank	Run after every CCV	$\pm 1^*$ lowest reporting limit	1. Check for high conc. sample. 2. Re-pour blank and rerun. 3. Prepare fresh blank and rerun.	Measures analyte carryover. Reporting: In data validating report package.
Matrix Spike	Minimum 1/10 samples	R% = 80-120	1. Add comment to report "Matrix spike recovery failed due to matrix interference."	Evaluates affect of matrix on method performance. Reporting: Routine data reporting package.
(LRB) Laboratory Reagent Blank	1/preparation batch	$\pm 1^*$ lowest reporting limit	1. Re-prepare samples from batch where reporting limit < conc. < 10*blank conc.	Evaluates possible contamination in reagents and glassware. Reporting: Routine data reporting package.
Laboratory Fortified Blank (LFB)	1/preparation batch	R% = 90-110	1. Re-digest sample batch or flag data.	Evaluates preparation method precision and accuracy. Reporting: In data validating reporting package.
External PE Samples	WS and WP and internal blind and double blind samples	EPA/ERA defined control limits	1. Repeat 2. Correct problem.	External review of analytical method accuracy. Reporting: Audit review
MDL Studies	Annually, or whenever method changes might affect sensitivity	Prior studies	1. Repeat if obvious problem occurs. 2. Adjust reporting limit to MDL.	Evaluates overall method detection limits in clean sample matrix. Actual samples may have higher MDL. Reporting: Audit review
Control Charting and Proof of Competency	Annual statistical review of meth. QC data for each analyst or as needed MDL, PE samples.	Data statistically within control limits.	1. Correct method/instrument problem. 2. Adjust control limits 3. Replace analyst	For statistical process control. Reporting: Audit review.

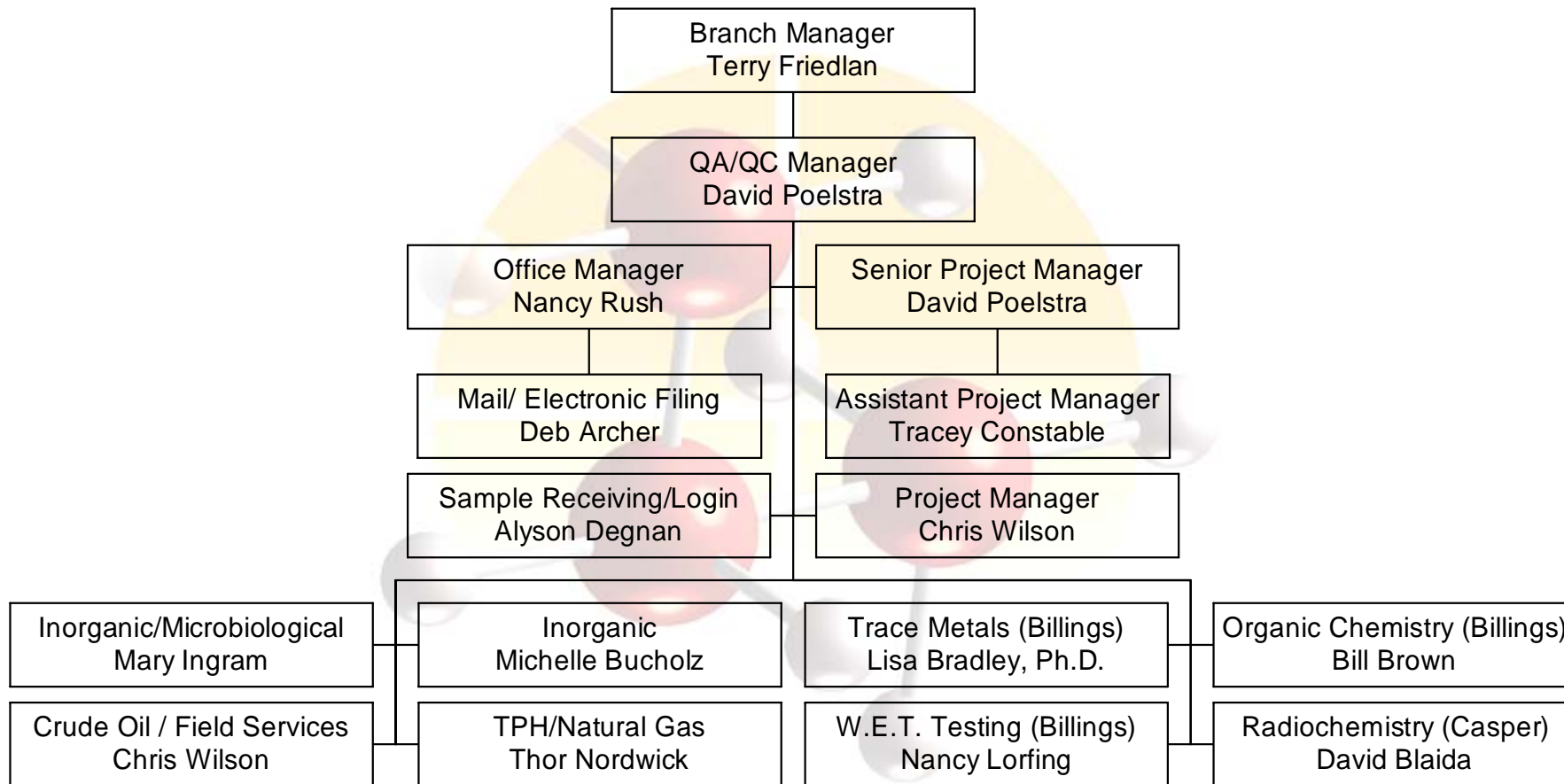


**ENERGY LABORATORIES, INC.  
CORPORATE ORGANIZATIONAL CHART**

**CORPORATE MANAGEMENT**

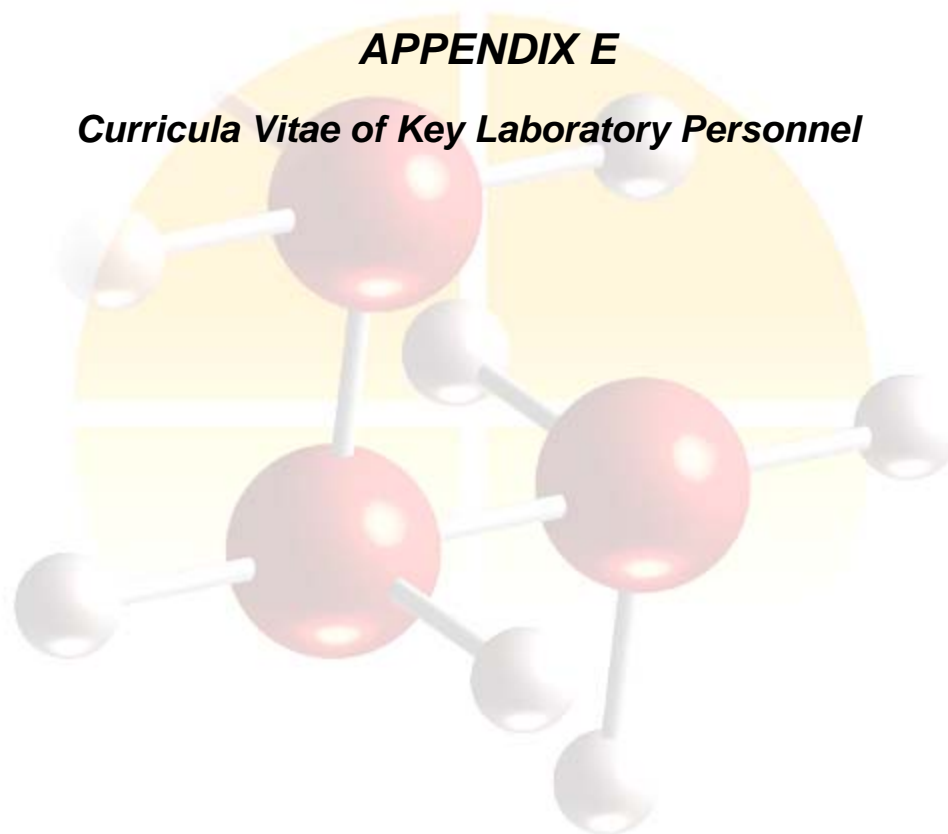


# ENERGY LABORATORIES, INC. GILLETTE ORGANIZATIONAL CHART



**APPENDIX E**

***Curricula Vitae of Key Laboratory Personnel***



**JOHN M. STANDISH**

**Lab Director/Chief Chemist**

**Experienced in the examination of many types of environmentally related samples including water, soil, coal, and air pollutants**

**Education and Academic Training**

Bachelor of Science in Biology, College of Great Falls, Great Falls, MT, 1973  
Managing the Chemical Analysis Laboratory, 32 hr seminar, 1979  
Financial Management of the Closely Held Business, 8 hr seminar, 1985  
Hiring and Firing, 8 hr seminar, 1986  
MS-DOS Operating Systems, 16 hr class, 1986  
Dale Carnegie Training, 14 week training 1986  
Taking Control of Your Workday, 8 hr seminar, 1989  
Pittsburgh Conference of Analytical Chemistry, 5 day conference, 1989 & 1992  
Unix Operating Systems, 24 hr class, 1991  
New Sample Preparation Methods for Chemical Analysis, American Chemical Society Short Course, 1992.

**Professional Experience**

1981 - Present, Chief Chemist - Energy Laboratories, Inc., Billings, Montana. Coordinates laboratory analysis with client contracts. Responsible for direction, training, and supervision of the analytical laboratory staff. Involved in new procedural and equipment development, quality assurance program, client relations, and report preparation.

1974 - 1981, Director of Chemical and Environmental Laboratory - Northern Testing Laboratories, Inc., Billings, Montana. Responsible for personnel training and supervision, laboratory schedules, client relations and analytical methodology development. Chief areas of analysis were soils, water, coal, air pollution, and meteorological monitoring.

**Professional Organizations**

American Society of Testing and Materials  
Montana Mining Association  
Montana Geological Society  
Northwestern Mining Association

**WILLIAM T. BROWN**

**President  
Director of Organic Analysis Department**

**Experienced in laboratory methods development, on-site sampling and analysis, and analytical chemistry.**

**Education & Academic Training**

Bachelor of Science in Fish and Wildlife, Montana State University, Bozeman, MT, Management, 1977  
Organic Chemistry and Analytical Instruments, Eastern Montana College, Billings, Montana. 1980  
Operation and maintenance of Dionex Ion Chromatograph, Dionex Corporation, 1977.  
Modern Techniques in Gas Chromatography, American Chemical Society Short Course, 1988.  
Gas Chromatography Mass Spectrometry, American Chemical Society Short Course, 1989.  
Finnigan Mat Company Gas Chromatograph Mass Spectrometry Training Course, 1989.  
Analysis of Water & Waste Samples by U.S. EPA Methods, American Chemical Society Short Course, 1990.

**Professional Experience**

1986 to present, President, Chemist - Energy Laboratories, Inc., Billings, Montana. In charge of the development of the trace organics analytical department. Develops test methods, selects equipment, and trains technical staff in the analysis of trace organic compounds in samples of environmental and commercial interest.

1981 - 1987, Manager - Energy Laboratories, Inc., Branch Laboratory, Gillette, Wyoming. Responsible for routine analysis and quality control of water, natural gas, and petroleum products. Involved in field on site sampling and testing, meter calibrations, and supervision of branch laboratory staff.

1979 - 1981, Laboratory Technician - Energy Laboratories, Inc., Billings, Montana. Responsible for the natural gas and petroleum products department of the lab including field natural gas testing. Also involved with various work in water and soil analysis including formal training in ion chromatography.

1977 - 1979, Fisheries Biologist - Water and Forests Department of the Government of Niger, Africa. While in the Peace Corps, responsible for developing fisheries management programs in a specific region including monitoring water quality by on-site testing.

**CORNELIUS A. VALKENBURG Ph.D.**

**Senior Analytical Chemist/Quality Assurance Officer**

**Education**

Ph.D., Analytical Chemistry, Montana State University, Bozeman, Montana, 1987  
Bachelor of Arts, Biology with minor in Chemistry, Carroll College, Helena, Montana, 1979  
Technical Writing, University of Nevada, Las Vegas, Nevada, 1988  
Emergency Medical Training, Hillsboro Medical Hospital, 1981  
Mass Spectrometry, Oregon Graduate Center, 1981  
Dale Carnegie Management Training, Billings, Montana, 1996  
Dale Carnegie Graduate Assistant Training, Billings, Montana 1997

**Professional Experience**

1992- Present, Analytical Chemist/Quality Assurance Officer - Energy Laboratories, Inc., Billings, Montana. Corporate Quality Assurance Officer responsible for the Quality Assurance monitoring of laboratory operations. Performs method development, prepares and updates standard operating procedures, performs technical training, and involved with special projects. Manages laboratory solvent recycling program.

1989 - 1992, Senior Organic Analytical Chemist - ICF Kaiser Engineers, Las Vegas, Nevada. Provide supervisory and technical support in the design, preparation, analysis, and multi-laboratory certification of analytical method performance evaluation materials used to evaluate current and proposed EPA organic analytical procedures. Also review proposed EPA methods contracts for technical accuracy. Secondary duties as Laboratory Safety Officer.

1987 - 1989, Senior Scientist - Lockheed Engineering and Sciences Company, Environmental Programs (Organic Chemistry Section), Las Vegas, Nevada. Responsible for research and development projects as applied to improved methods for the analysis of EPA priority pollutants. Areas of study include: liquid-liquid extractions, solid-phase extraction, soil leachability modeling (TCLP), chemical derivatives for gas and liquid chromatography, production of performance evaluation materials, gas chromatographic methods, supercritical fluid chromatography and extraction, and laboratory automation.

1981 - 1987, Ph.D. Candidate, Graduate Research, Assistant - Montana State University, Department of Chemistry, Bozeman, Montana. Research in gas chromatographic detector design, modification, and characterization by computer modeling. Teaching of undergraduate laboratories in the areas of inorganic, organic, and analytical chemistry.

1981 - 1981, Research and Development Chemist - Falls Chemicals, Great Falls, Montana. Methods development for the analysis of raw materials and formulated products used or produced by Falls Chemicals. Performed optimization studies for plant chemical processes.

1980 - 1981, Research Technician - Oregon Graduate Center, Beaverton, Oregon. Synthesis and purification of polyamine dueterated analogues for their use as internal standards in mass spectrometry.

1978 - 1979, Field Technician and Student Researcher - State of Montana Water Quality Bureau and Carroll College, Helena, Montana. Evaluate the effects of subsurface drainage on saline seep areas.

Summer 1978, Lab Technician - American Chemet Corporation, East Helena, Montana. Quality control for the manufacture of CuO and CuO<sub>2</sub>, and the trace analysis of Pb. Methods used were wet chemistry, electrochemistry, and atomic absorption.

**Professional Organizations**

American Chemical Society  
Environmental Employees Association

**NANCY LORFING**

**Aquatic Toxicologist/Supervisor**

**Academic Training**

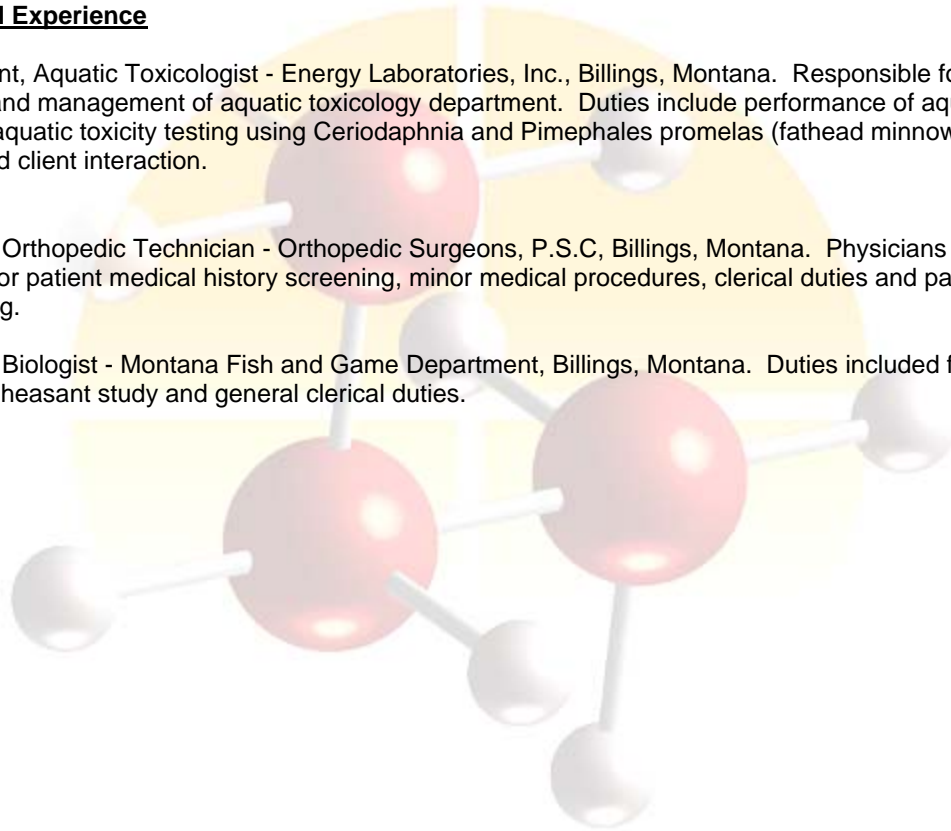
Bachelor of Science, Biology (Chemistry Minor), Eastern Montana College, Billings, MT, 1970

**Professional Experience**

1992 - Present, Aquatic Toxicologist - Energy Laboratories, Inc., Billings, Montana. Responsible for supervision and management of aquatic toxicology department. Duties include performance of aquatic acute and chronic aquatic toxicity testing using Ceriodaphnia and Pimephales promelas (fathead minnows), field sampling, and client interaction.

1977 - 1992, Orthopedic Technician - Orthopedic Surgeons, P.S.C, Billings, Montana. Physicians assistant responsible for patient medical history screening, minor medical procedures, clerical duties and patient file recordkeeping.

1970 - 1975, Biologist - Montana Fish and Game Department, Billings, Montana. Duties included field work on a 5 year pheasant study and general clerical duties.



**LISA A. BRADLEY Ph.D.**

**Senior Analytical Chemist/Supervisor**

Experienced in atomic absorption spectroscopy (AA), inductively coupled plasma optical emission (ICP-OES), and mass spectrometry (ICP-MS).

**Education**

Ph.D., Analytical Chemistry, Indiana University - Bloomington, Indiana, 1995  
Bachelor of Science, Chemistry, Montana State University, Bozeman, Montana, 1990

**Professional Experience**

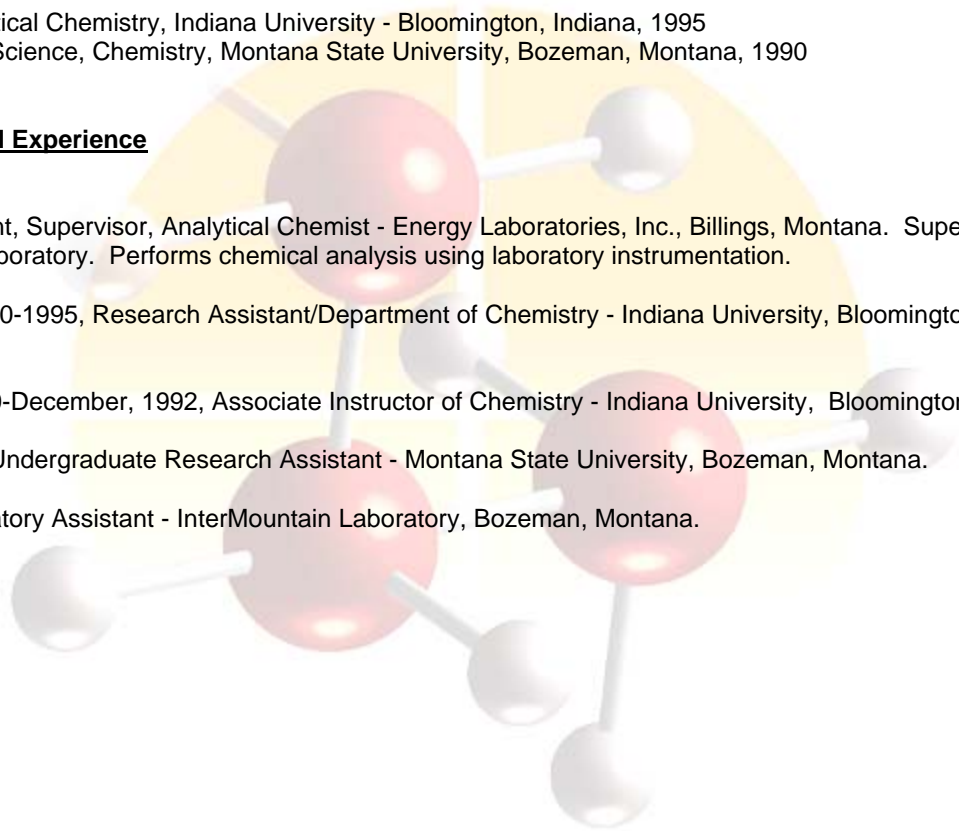
1996- Present, Supervisor, Analytical Chemist - Energy Laboratories, Inc., Billings, Montana. Supervisors inorganics laboratory. Performs chemical analysis using laboratory instrumentation.

October, 1990-1995, Research Assistant/Department of Chemistry - Indiana University, Bloomington, Indiana.

August, 1990-December, 1992, Associate Instructor of Chemistry - Indiana University, Bloomington, Indiana.

1986-1990, Undergraduate Research Assistant - Montana State University, Bozeman, Montana.

1989, Laboratory Assistant - InterMountain Laboratory, Bozeman, Montana.



**TERRY L. FRIEDLAN**

**Gillette Laboratory Manager**

**Experienced in the examination of many types of environmentally related samples including water, natural gas and crude petroleum.**

**Education and Academic Training**

Associate of Science, University of Wyoming, 1982  
Engineering courses in Petroleum Engineering, University of Wyoming, 1982-1983  
Organic chemistry, Northeastern Wyoming Community College, 1998  
PC Repair and Operation, Northeastern Wyoming Community College, 1994  
Visual Basic Programming, Northeastern Wyoming Community College, 2000

**Professional Experience**

1987 to Present, Energy Laboratories, Inc., Gillette, Laboratory Manager  
Responsible for routine analysis and quality control of water, natural gas and petroleum products. Develop test methods, select equipment, train and supervise all laboratory staff.

1983 – 1987, Energy Laboratories, Inc., Gillette, Laboratory and Field Technician  
Responsible for water, natural gas, and petroleum products' sampling and testing. Responsible for natural gas meter calibrations in the field.

**Professional Organizations**

Society of Petroleum Engineers, 1982 to present  
Society of Metallurgical and Mining Engineers, 2005 to present

**DAVID N. POELSTRA**

**Senior Project Manager**

**Experienced in the examination of many types of environmentally related samples including water, soil, organics, and air pollutants**

**Education and Academic Training**

Chemistry, Sheridan College, Sheridan, WY, 1981  
Campbell Pacific Nuclear, Moisture Density Probe Training, 1981  
Chemistry, San Juan College, Farmington, NM, 1985  
Dale Carnegie Course, Effective Speaking & Human Relations, 1991  
Business, Blinn College, College Station, TX, 1991  
Rapport Leadership Institute, Leadership Breakthrough I, Las Vegas, NV, 1996

**Professional Experience**

2003 – Present, Project Manager – Energy Laboratories, Inc., Gillette, WY. Responsible for client reporting and data quality review of water analyses. Develop test methods and train laboratory staff.

2002 – 2003, Project Manager – Energy Laboratories, Inc., College Station, TX. Helped with start-up of new laboratory.

2000 – 2002, Vice-President-Northern Operations – Inter-Mountain Laboratories, Sheridan, WY. Directed operations of the Sheridan Inorganic Laboratory, Sheridan Organic Laboratory, Sheridan and Gillette Field Service Division, and the Gillette Inorganic Laboratory.

1999 - 2002, Organic Laboratory Manager – Inter-Mountain Laboratories, Sheridan, WY. Supervised daily operations of the organic laboratory including, client contact, analysis and reporting.

1990 – 1998, Lab Director – Inter-Mountain Laboratories, Inc. College Station, TX. Managed and directed the daily operations of the inorganic and organic laboratories.

1986 – 1990, Soil Manager – Inter-Mountain Laboratories, Inc. College Station, TX. Managed the daily operations of the soil laboratory including client contact, analysis and reporting.

1985 – 1986, Laboratory Manager – Inter-Mountain Laboratories, Inc., Farmington, NM. Responsible for daily operations of a water and soil laboratory. Managed start-up of a new lab including marketing, hiring, training, and supervision.

1982 – 1985, Trace Metal Analyst/Soil Analyst – Inter-Mountain Laboratories, Inc., Sheridan, WY. Responsible for trace metal analyses for water, soil, RCRA, and vegetation using GFAA, CVAA, Flame-AA, and Hydride-AA, methodologies. Operated a Varian Atomic Absorption Spectrophotometer, Fisher Sulfur analyzer, Technicon and Alpkem Auto-Analyzer, and routine titrimetric and potentiometric water and soil procedures.

1982 – 1982, Water Analyst – Inter-Mountain Laboratories, Inc., Gillette, WY. Analyzed water, wastewater, and oil field waters for NPDES permits and surface mining requirements.

1980 - 1981, Soil Analyst – Inter-Mountain Laboratories, Inc., Sheridan, WY. Responsible for sample preparation and routine soil analyses.

**Professional Organizations**

Northwestern Mining Association  
Texas Mining & Reclamation Association  
Society of Metallurgical and Mining Engineers

**NANCY L. RUSH**

**Office Manager**

**Experienced with office machines operations, computers and databases.**

**Education and Academic Training**

High School Studies  
First Aid – CPR  
Administrative Assistant Training Seminar

**Professional Experience**

2003 – Present Energy Laboratories, Inc., Gillette, Office Manager  
Responsible for database log-in review and invoicing.  
Supervisor for mail distribution, shipping and handling.  
Primary resource for customer questions regarding sample bottles, preservation, sampling methods and chain-of-custodies.

1988 – 2003 Outpatient Surgery Administrative Assistant, Campbell County Memorial Hospital, Gillette, WY  
Responsible for Scheduling, Public interaction, Filing, Statistical compiling, Data entry and retrieval, and Record Keeping.



**MARY LOU H. INGRAM**

**Analytical Chemist**

**Education and Academic Training**

Bachelor of Science in Education, Black Hills State College, Spearfish, SD, 1979  
State of Wyoming Professional Teaching Standards Board, Endorsements in Biology, General Science, Mathematics, Chemistry, Earth Science, March 2000 – August 2010  
Missionette Leadership Course, 1983  
Family Math in Service  
Safe Drinking Water Update II, Casper College, 1990  
Mine Safety and Health Administration, Gillette, WY, 1999  
Customer Service, Gillette, WY, 2004  
Fire Extinguisher Training, Gillette, WY, 2004  
Capillary Gas Chromatography, 1994  
Presidents Honor Roll, 2004  
PHI, THETA, KAPPA, 2004

**Professional Experience**

2000 – Present Energy Laboratories, Inc., Gillette, Wyoming  
Responsible for bench wet chemistry and microbiology analysis. Assist with SOP updates. Participate in internal and external PE studies and audits. Insure all area QA/QC procedures are followed to maintain laboratory certification in drinking water. Responsible for successfully completing Demonstration of Capability and MDL studies.

1983 – 2000 Inter-Mountain Laboratories, Inc., Gillette, WY  
Responsible for bench wet chemistry, microbiology, metals, TPH and oil and grease, gas chromatography and ion chromatography, soils, chloride and sulfate. Training of new personnel in bench wet chemistry and microbiology.

1981 – 1982 Core Laboratories, Cordero Mining Company, Gillette, WY  
Analyzed moisture content of coal, ash analysis, volatile matter for coal, gross calorific value (BTU) and total sulfur

**CHRIS L. WILSON**

**Project Manager**

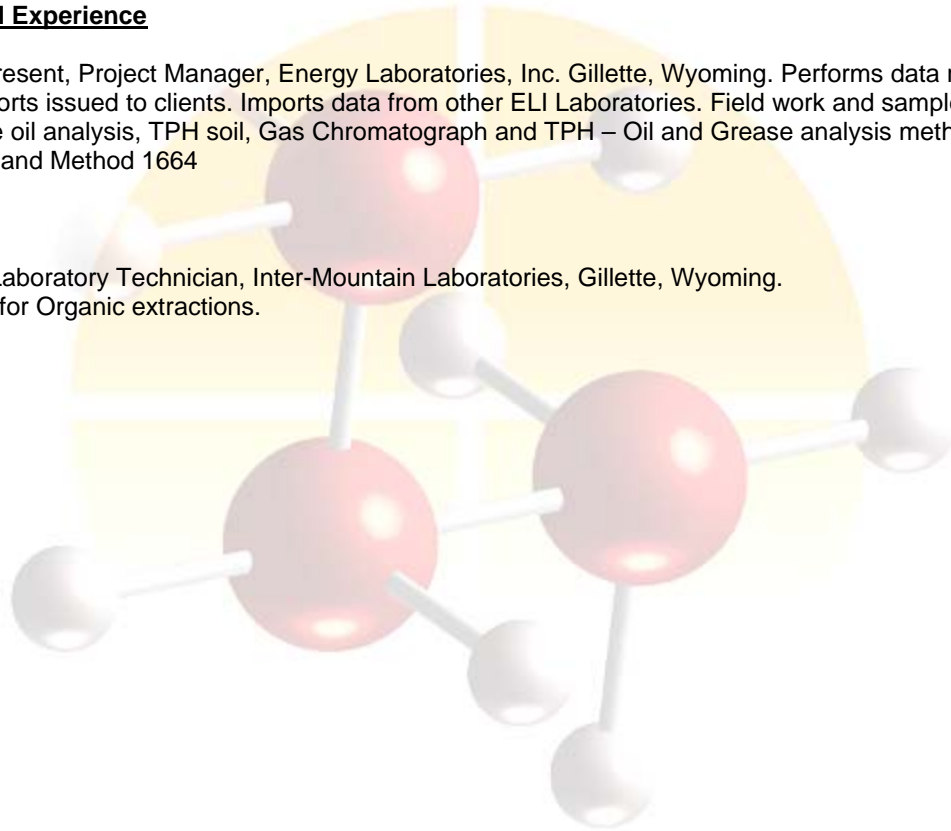
**Education**

Bachelor of Science, Botany, University of Wyoming, Laramie, Wyoming 1997

**Professional Experience**

Nov. 1999-Present, Project Manager, Energy Laboratories, Inc. Gillette, Wyoming. Performs data review of technical reports issued to clients. Imports data from other ELI Laboratories. Field work and sample collection. Oil and crude oil analysis, TPH soil, Gas Chromatograph and TPH – Oil and Grease analysis method 1664. Oversee GC and Method 1664 analysis.

1998-1999, Laboratory Technician, Inter-Mountain Laboratories, Gillette, Wyoming. Responsible for Organic extractions.



**Michelle R. Bucholz**

**Analytical Chemist**

**Education and Academic Training**

Bachelor of Science, Chemistry - Extended, Montana State University, Billings, MT - 1999

**Professional Experience**

2005 - Present Energy Laboratories, Inc., Gillette, Wyoming

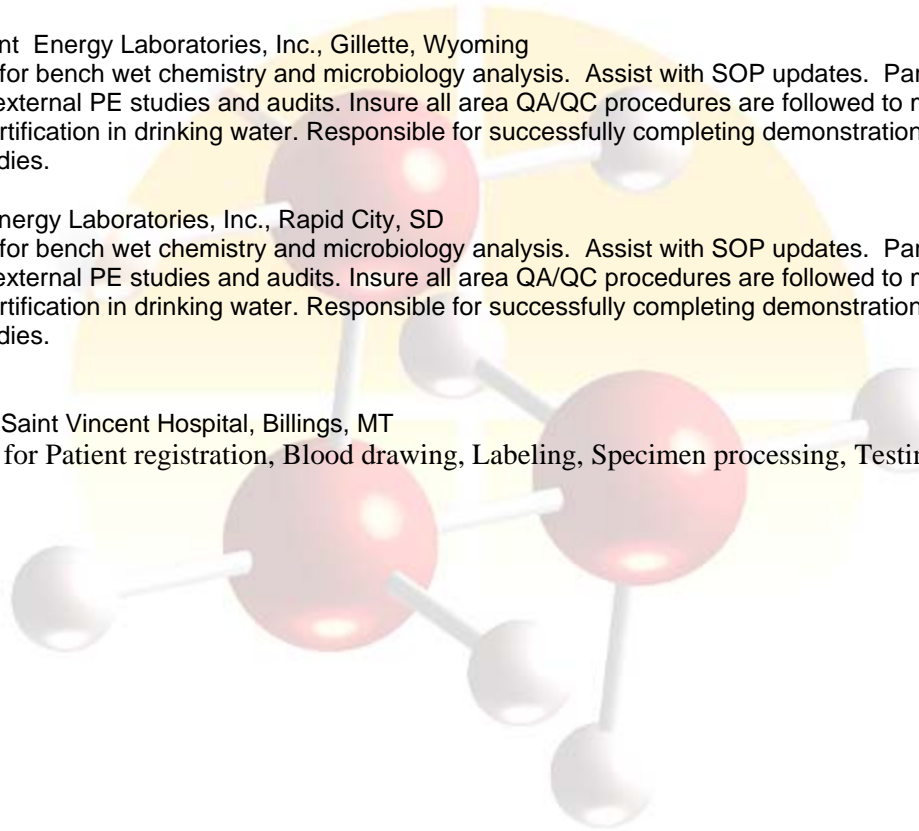
Responsible for bench wet chemistry and microbiology analysis. Assist with SOP updates. Participate in internal and external PE studies and audits. Insure all area QA/QC procedures are followed to maintain laboratory certification in drinking water. Responsible for successfully completing demonstration of capability and MDL studies.

2005-2005 Energy Laboratories, Inc., Rapid City, SD

Responsible for bench wet chemistry and microbiology analysis. Assist with SOP updates. Participate in internal and external PE studies and audits. Insure all area QA/QC procedures are followed to maintain laboratory certification in drinking water. Responsible for successfully completing demonstration of capability and MDL studies.

1998 – 2004 Saint Vincent Hospital, Billings, MT

Responsible for Patient registration, Blood drawing, Labeling, Specimen processing, Testing at outlying clinics.



**DAVID P. BLAIDA**

**RADIOCHEMISTRY SUPERVISOR**

**Education**

Bachelor of Science, Geology, University of Wyoming, Laramie, Wyoming, 1977

**Specialties**

Measurements of U.S. Environmental Protection Agency radiochemical parameters for process and drinking water, soils, vegetation, air, and biota. Perform isotopic analysis via alpha and gamma spectroscopy. Research, development, and modification of analytical methodology. Streamline production of the radiochemical department's analytical capabilities.

**Professional Experience**

1987 – Present, Radiochemistry Supervisor – Energy Laboratories, Inc., Casper, WY. Responsible for scheduling, setup, process and measurement of radioactive elements in the actinium, thorium, and uranium series.

1978-1987, Laboratory technician – Union Pacific Minerals, Casper, WY. Performed daily inorganic analyses for a conventional commercial uranium process facility.

**Affiliations**

American Institute of Mining Engineers

