QUALITY ASSURANCE PROJECT PLAN

PROJECT MANAGEMENT, MEASUREMENT/DATA ACQUISITION, ASSESSMENT, OVERSIGHT, DATA VALIDATION AND USABILITY

STATE OF NEW MEXICO
ENERGY, MINERALS & NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION

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QUALITY ASSURANCE PROJECT PLAN

Pursuant to:
Amendments to the Environmental Protection Agency
General Grants Regulations (40 CFR Part 31)

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A2. PROJECT/TASK ORGANIZATION

PURPOSE: The New Mexico Oil Conservation Division (OCD) Quality Assurance Project Plan (QAPP) shall provide a clear understanding of intra and inter-organization participation in environmental project management, objective planning, field sampling, laboratory analyses and environmental data quality management.

The QAPP provides documentary evidence of the roles and responsibilities of OCD Staff in charge of major environmental data gathering activities related to Underground Injection Control (UIC) sampling projects. The QAPP shall ensure that OCD Staff and/or hired contractors working on OCD environmental projects follow the QAPP. OCD is presently utilizing eight National Environmental Laboratory Accreditation Conference (NELAC) Environmental Analytical Laboratories that provide environmental laboratory services (see Appendix E QMP/QAPP).

The Quality Assurance Officer (QAO) for the OCD is an Environmental Bureau Staff member who reports to the Environmental Bureau Chief and Underground Injection Control (UIC) Director. The QAO works with the UIC Director, Environmental Bureau, and District Office Staff (see Appendix B Figure 1) to ensure that all environmental laboratory field collected samples are properly collected, stored, transported, and environmental analytical laboratory data measurements incorporate EPA approved Quality Assurance/Quality Control (QA/QC) and meet Data Quality Objectives (DQOs). This results in the successful procurement of legally defensible environmental analytical data results used in decision making and for environmental compliance and enforcement activities.

Environmental analytical laboratory data results derived from environmental field sampling events shall be reviewed by OCD Environmental Bureau and District Office staff. Environmental sampling and derived laboratory quality data will be utilized by the following:

1. OCD Environmental Staff,
2. OCD Underground Injection Control (UIC) Director,
3. OCD UIC Quality Assurance Officer (QAO),
4. OCD Compliance & Enforcement Officer, and
5. OCD General Counsel.

Environmental well and field samples will be collected as needed by experienced environmental staff at oilfield and geothermal regulated facilities at the following estimated frequency.

1. Class I (non-hazardous) Industrial Wells at OCD Permitted Facilities – (on approval and renewal under Water Quality Control Commission- WQCC permit).

2. Class II Salt Water Disposal and Enhanced Oil Recovery Injection Wells used to dispose of fluids associated with the production of oil and natural gas (hydrocarbons); to inject fluids for enhanced oil recovery; acid gas injection or for the storage of liquid petroleum hydrocarbons – (on random type basis under Oil & Gas Regulations). Note: Dry Gas Storage Wells (gas phase at STP) are not regulated under the UIC Program, but under Oil & Gas Regulations by Order.

3. Class III Brine or Solution Mining Wells – Wells used to inject fluids for the extraction of minerals (i.e. solution mining- on approval and renewal under WQCC permit).

4. Class IV Wells – Wells used to dispose of hazardous or radioactive wastes into or above an Underground Source of Drinking Water (USDW). The USEPA has banned the use of these wells.

5. Class V Wells not included in the other well classes and used generally to inject non-hazardous fluid into or above a USDW – on approval and renewal under WQCC Permit. Note: Geothermal injection wells and/or septic systems connected to oil, gas, and/or geothermal facility wastewater treatment systems. New Mexico Environment Department (NMED) generally has jurisdiction over septic systems not connected as described above.

6. Class VI Geologic Sequestration (GS) Wells involves the process of injecting carbon dioxide (CO_2), captured from an OCD energy-related source (e.g., a power plant or natural gas processing facility), into deep subsurface rock formation(s) for long-term storage. This is part of a process frequently referred to as “carbon capture and storage” or CCS. OCD currently does not have Primacy and/or regulatory authority over Geologic Sequestration (GS) Wells.

Note: OCD may require that more frequent environmental sampling be conducted on regulated UIC discharge permit wells and/or facilities if the vadose zone and/or groundwater is impacted.

A3. PROBLEM DEFINITION/BACKGROUND

This QAPP shall provide the needed measures of environmental quality assurance/quality control (QA/QC) for the OCD UIC program.

The plan shall specifically address proper environmental sample collection, storage, delivery to laboratory, and environmental laboratory analytical test methods utilized during field inspections and/or investigations. These procedures will help ensure that environmental laboratory data results derived from field sampling will be representative of the media sampled and be legally defensible in a court of law.

The QAPP is a requirement for the EPA UIC Program and is needed to help ensure that the UIC Program provides the QA/QC necessary to obtain accurate soil and water media environmental quality data for the protection of ground surface, surface water, ground water, human health and the environment.

Upon receipt from an environmental laboratory, analytical data results will be sent and reviewed by OCD Environmental Staff and the OCD QAO if necessary in order to determine data validity and to make a decision or conclusion based on environmental data results from the well and/or media collected and analyzed.

The QAO in coordination with the Environmental Bureau Chief shall recommend or propose an appropriate corrective action to the OCD UIC Director for approval to communicate further with an owner/operator of a permitted well and/or oilfield/geothermal facility. If a discharge permit well or permitted facility is involved then the appropriate member of the Environmental Bureau Staff may also be involved in any corrective action measure(s) and/or compliance and enforcement.

A4. PROJECT/TASK DESCRIPTION

The OCD QAPP shall provide the framework in which environmental Staff may evaluate environmental analytical laboratory data derived from field sample collection. This data collected within the UIC Program shall ensure that conclusions drawn from the sample collection data are accurate and precise. Environmental analytical laboratory data that is collected in the field shall be utilized by environmental Staff to legally protect Underground sources of Drinking Water (USDW) and/or ground water under the UIC Program.

Environmental samples to be collected shall depend upon the type of well and/or facility and the contaminants of concern. EPA approved environmental analytical laboratory methods shall be utilized to analyze for contaminants of concern.

The frequency of sampling shall depend upon the permit conditions or the need for compliance and enforcement split-sampling and/or monitoring to ensure facility/operator compliance with State and Federal Regulations.

Environmental Staff from the Environmental Bureau and/or District Offices shall implement EPA QA/QC in field sample/collection methods, Chain-of-Custody and Data Quality Objectives to and at the environmental analytical laboratory and ensure that the QA/QC of an environmental analytical laboratory follows SW-846 and/or EPA approved methods with proper reporting of data (i.e., Summary Sheets w/ Supporting Lab QA/QC Data) verifying each laboratory performing analyses uses proper instrumentation, laboratory methods, procedures, etc. to derive acceptable data.

Reports shall be submitted to environmental Staff and/or the QAO when corrective action and/or compliance and enforcement action(s) may be needed for the QAO or environmental Staff recommendations to the Environmental Bureau Chief and UIC Director.

A5. DATA QUALITY OBJECTIVE (DQO) FOR MEASUREMENT OF DATA

The OCD QAPP shall ensure that DQOs are maintained through the environmental planning, sample collection and data generation process. Environmental analytical data must support conclusions that are representative of the sample and be defensible in Court.

Quantitative goals must therefore be established in order that the sample/data collection method is of sufficient quality and sensitivity. The data must also be precise in the sense that a sufficient number of samples are obtained in order to produce the required degree of certainty.

The scope of this QAPP covers a wide range of Exploration and Production provinces within the State of New Mexico. Generally the geographic areas can be divided into two areas, northwest New Mexico or the San Juan Basin, and Southeast New Mexico or the Permian Basin. The Class II UIC Wells receive oilfield exempt RCRA Exploration and Production wastes that can be different in chemical nature. The San Juan Basin is mostly a Natural Gas production area producing from Cretaceous Age sands, coals, and shales. The Permian Basin is mostly a crude oil production area that produces from carbonates of Permian age. The difference in the geology of the two basins leads to the produced and injected waters being chemically different in nature. The major differences would be in salinity, dissolved gases, and dissolved hydrocarbons.

The Class I Non-Hazardous wells receive non-hazardous type oil field wastes. These facilities are permitted by the OCD through the Water Quality Control Commission (WQCC) and Water Quality Act (WQA) of the State of New Mexico. The operators of these sites are required to sample the injected effluent stream quarterly to ensure that the wastewater is non-hazardous.

OCD Class III brine extraction wells are located in southeast New Mexico. These wells are permitted with the OCD as discharge permits through the WQCC and WQA of the State of New Mexico. The effluent generated at these sites would consist of very high salinity brines, which are used as drilling and completion fluids in Exploration and Production operations

The data that OCD obtains and reviews will essentially be generated from sampling of a wide range of media such as soils, surface and ground water, including waste streams generated by Exploration and Production operations. The data would primarily be utilized by the Environmental Bureau Staff, but could also be utilize by district environmental representatives, the UIC Director, and the general public, and oil and gas industry. In the case of a compliance issue it could be used by all of the above and the Federal EPA along with other concerned regulatory agencies.

The data needed will be rom specific UIC facilities. Sampling requirements in terms of types and frequency will depend on the type of UIC facility. However, the QA/QC for the collection and analysis for the data would generally be the same. These procedures are listed below:

1. In Appendix C – Are sample holding times, sampling methods, and quantitative acceptance criteria.

2. In Appendix D – Under OCD sampling procedures all sample types and collection methods are listed as a document.

3. In Appendix E – Under Quality Management Plan (QMP)/Quality Assurance Project Plan (QAPP) lists all the quality control steps for the laboratory.

By integrating 1, 2, and 3 listed above the QAO for the OCD can maintain the needed sensitivity, precision, accuracy, and completeness of each sampling event for each major parameter. Thus allowing the goal of obtaining environmental data that will be representative, accurate, precise and comparable shall be met. The following process may then be integrated in an efficient manner to obtain these goals:

1. Develop and utilize statistical and/or random sampling methods where appropriate.

2. Collect appropriate type an amount of samples.

3. Ensure that all samples collected are representative of the media by sampling at different locations within the project area.

4. Include verification and validation of sampling and analytical techniques in the process.

Consistency shall form the basis for obtaining sample data that is comparable. Selection of sampling and analytical laboratory methods, procedures, and preservation methods throughout a sampling project shall result in data that are comparable.

A6. PROJECT NARRATIVE

The success of a project shall be determined by the accuracy and precision of the sample in relation to both the sampling event and the sample analysis. Sample design requirements shall be surveyed in such a manner as to reduce or eliminate any possibility of the samples being rendered unacceptable in terms of accuracy and precision. Sample types and their collection location shall also be of prime consideration and shall be done in such a manner as to ensure that sample repeatability shall not be compromised due to collection methods. Samples shall be handled in such a manner as to ensure that custody transfer and sample handling is done in such a way as to ensure sample validity.

The Staff involved in collecting and using the data shall be mostly OCD Environmental Bureau staff and may sometimes include district office environmental staff representatives. The staff members have training with technical degrees in engineering and geology with on-the-job training.

Only EPA approved analytical methods may be selected based on the nature of the specimen, i.e., solid or liquid and possible constituents, i.e., organic/inorganic. The analytical methods are outlined and discussed in OCD sampling procedures listed in Appendix C. The QAO and other environmental staff members shall evaluate jointly the validity of ongoing sampling procedures in order to ensure that sample and analytical methods are delivering the desired results. The QAO and the lab shall also work together in order to optimize sampling events in terms of methods that are selected are acceptable EPA Standard Methods for the sample of interest. Sampling events shall be done in such a manner as to ensure that site problems and logistics issues are handled in a manner to assure sample validity, i.e., items which can be controlled such as sample dates and sample equipment shall be addressed so they do not have an adverse impact on the QA/QC o the samples being taken at a particular facility or project site.

A7. SPECIAL TRAINING/CERTIFICATION

All Environmental Bureau Staff (including the QAO) and District Environmental Staff involved in UIC Program activities shall have had and/or may receive the OSHA 1910.120 Regulation(s) 40-Hr. HAZWOPER and/or an annual refresher training course.

This training shall help OCD environmental Staff to identify the level of personal protection equipment based on environmental work conditions to obtain samples in a safe manner that shall not pose a safety threat to themselves or others while in the act of compliance and enforcement split-sampling, inspection, monitoring, etc. in the field with a UIC Program permitted operator. Environmental staff hired by the OCD shall have environmental technical sample collection experience and also learn or gain experience through various forms of on-the-job training.

The QAO shall attend UIC training regarding QAPPs and/or Quality Management Plans (QMPs). This shall have to be done over time as the QAO has many other job responsibilities other than UIC Quality Assurance.

The OCD QAO shall attend EPA required seminars on the following environmental subject matter:

1. Orientation to Quality Assurance Management.

2. Introduction to Data Quality Objectives.
3. Quality Management Plans (QMPs) and Quality Assurance Project Plans (QAPPs).

All Environmental Bureau staff, including the QAO and Bureau Chief shall have technical degrees in geology, geophysics, hydrology, hydrogeology, and/or engineering. Many of the staff members have worked in the oil and gas industry and therefore have a good understanding of what potential problems may arise at a particular project location.

All training and job qualifications are maintained on file by the Energy, Minerals, and Natural Resources Department- Human Resources Bureau.

A8. <u>DOCUMENTATION AND RECORDS</u>

The importance of documentation and record keeping is of paramount importance for the success of the UIC environmental sampling and monitoring program and shall be considered an integral part of the OCD QAPP. All record keeping shall include:

1. All records shall be itemized with all information included.

2. The reporting format shall document each environmental sampling event and shall be ascertained with ease.

3. The report shall also include the raw data, instrument print-outs, QA/QC checks, and any required instrument calibration checks, data or information.

4. The standard turnaround time shall be 30 days with other options for emergencies, i.e., 24 and 72 hour emergency turnaround available through the OCD contract environmental laboratories.

5. The OCD staff member who collects the sample shall note any difficulties in his/her field book. The field books are kept on file with the Environmental Bureau Chief.

6. All original documents are kept on “OCD Online” electronic filing system maintain by program staff and records experts. For appointment scheduling to view electronic documents at the OCD, OCD is located at:
   1220 South St. Francis Drive in Santa Fe, New Mexico 87505 (Phone: (505) 476-3440).

A9. MODIFICATION/REVISION/DEVIATION

Major versus Minor Modification or Revision of the QAPP shall occur as follows:

1. The QAO shall conduct a full review of the QAPP for modification or revision at least every 5-years for submittal to the EPA.
2. The QAO shall document and report any deviation(s) from the QAPP, if any, on an annual basis during the annual review and reporting to the EPA.
3. The QAO shall identify the root cause of any deviation(s), determine if the deviation(s) is unique or has significant impact on data accuracy, the potential for recurrence, and recommend procedures to the UIC Director to modify the QAPP on an annual basis, as needed.

MEASUREMENT/DATA ACQUISITION:

B1. SAMPLING PROCESS DESIGN

A sampling process by design must be representative, complete and documented to provide scientific, legally defensible, usable environmental data.

The sample design process shall incorporate the following:

1. A general experimental design for the project.
2. The types of samples required.
3. Sample network design, frequency, matrices, measurement parameters, and rationale for the design.
4. Guidelines to be followed – including locations and accuracy of samples.
5. Classifications of measurements.
6. Measurement validation procedures.
7. Measurement of process conditions.

In Appendix C and D are the OCD guidelines to be used in sample collection to ensure that all the points above are covered.

B2. SAMPLING METHODS REQUIREMENTS

All sample methods shall be SW-846 and/or EPA approved methods and outlined in Appendix(s) – C, D, and E. These appendices address the entire range of sample collection through sample analysis at the entire range of sample collection through sample analysis at a NELAC environmental laboratory. The OCD shall use the information in these appendices to ensure that all sample projects are complete, representative, and documented to provide scientific, legally defensible, and usable environmental data. Since federal regulations require all assistance agreement recipients to implement a quality system for environmental data collection and technology programs (EPA Quality Assurance Guidance at http://www.epa.gov/ogd/grants/assurance.htm), documentation of all current practices utilized by OCD staff are included herein.

B3. SAMPLE HANDLING/CUSTODY REQUIREMENTS

The handling and documentation of chain-of-custody during environmental sampling and secure custody transfer of field sample procedures to a National Environmental Laboratory Accreditation Conference (NELAC) environmental analytical laboratory for analysis is outlined in the Appendices – C, D, and E. The use of the information in the appendices shall allow the OCD to take into account maximum allowable holding times before extraction or analysis, and shall provide the needed procedure to ensure that the appropriate provisions are maintained in sample custody and legally defensible in an OCD compliance and enforcement Court case.

B4. ANALYTICAL METHODS REQUIREMENTS

The required NELAC environmental analytical laboratory methods shall be SW-846 and/or EPA approved methods and must be specified in the QA/QC information submitted by the lab, the information specifications may be found in Appendix E. OCD environmental Staff should work with the lab to determine in advance of environmental sampling if there are any corrective action steps to ensure that the environmental analytical laboratory test method is valid based on the complexity of sampling and/or analytes or chemicals interference, etc. issues do not invalidate the data from usability in an OCD compliance and enforcement Court case.

B5. QUALITY CONTROL REQUIREMENTS

All chemical method quality control requirements are addressed in the Appendices – C, D, and E.

B6. INSTRUMENT/EQUIPMENT TESTING, INSPECTION, MAINTENANCE REQUIREMENTS

All environmental laboratory instrument/equipment testing, inspection and maintenance are addressed in the Appendices – C, D, and E.

B7. INSTRUMENT CALIBRATION AND FREQUENCY

All environmental laboratory instrument calibration and frequency of calibration are addressed in the Appendices – C, D, and E.

B8. INSPECTION/ACCEPTANCE REQUIREMENTS FOR SUPPLIES AND CONSUMABLES

All supplies and consumables shall be inspected and accepted for project use by the QAO and Environmental Bureau staff. Supplies shall include all sample containers, custody tapes/labels and sampling gear such as bailers, specific conductivity, and pH meters. Consumables shall consist of items indelible writing ink pens, gloves, hoses, distilled water, isopropyl alcohol, and soap (i.e., tri-sodium phosphate, etc.) for decontamination of sampling equipment in the field.

All of the above items shall be maintained and stored by environmental Staff to ensure proper field sample collection procedures and decontamination are carried during environmental field sample collection in order to prevent cross-contamination of the samples being collected for analytical laboratory analysis.

B9. DATA ACQUISITION REQUIREMENTS (NON-DIRECT MEASUREMENTS)

Environmental Staff shall, when possible before field sampling, check the Office of State Engineer (OSE) and/or Federal databases (i.e., USGS) for available hydrogeologic and water quality data, i.e., specific conductivity, ground water depths, etc. Information regarding site specific data when available shall be obtained from existing OCD and New Mexico Environment Department (NMED) records on file in the Santa Fe offices. This data shall be used only for establishing general trends in water quality and not for detailed project specific analysis.

B10. DATA MANAGEMENT

All environmental data that is collected in the field and obtained through laboratory analysis shall be checked throughout the data report generation process. All data, except data withheld due to “Confidentiality” regulations, shall be kept on “OCD Online” the electronic administrative records on the OCD Website. All original documents are kept on OCD’s electronic filing system “OCD Online” maintained by program staff and records experts. For appointment scheduling to view electronic documents at the OCD, OCD is located at: 1220 South St. Francis Drive in Santa Fe, New Mexico 87505 (Phone: (505) 476-3440).

ASSESSMENT/OVERSIGHT:

C1. ASSESSMENTS AND RESPONSE ACTIONS

The purpose of data assessments and response actions is to ensure that the data collected meets the criteria and goals of the projects intended purpose. The Environmental Bureau along with the QAO shall implement assessments and response actions to ensure the QAO shall implement assessments and response actions to ensure project compliance with QA/QC goals and project specific objectives. The QAO shall report any problems and recommend project specific assessments on the particular sampling project in question. In the event that response actions are nee for non-conforming situations the QAO and the UIC Director shall obtain advice for the Environmental Bureau staff before declaring a determination. All Environmental Bureau staff with the approval of the Environmental Bureau Chief, QAO, and UIC Director shall implement response actions and project data assessments.

C2. REPORTS TO MANAGEMENT

Reports to management (UIC Director, OCD Deputy Director, Environmental Bureau Chief, and QAO) shall occur soon after problems have been identified, corrective action is needed, or upon special request. Each manage who is affected shall be copied with the QAO as the designated recipient of the report.

Each report shall incorporate the following:

1. Project statement of problem and potential violations.

2. Project status.

3. Results of performance and system audits.

4. Results of periodic data quality assessments.

5. Listing of significant quality assurance problems and recommended solutions.

DATA VALIDATION AND USABILITY:

D1. DATA REVIEW, VALIDATION, VERIFICATION

Data shall be reviewed by the Environmental Bureau Staff, QAO, and Environmental Bureau Chief in order to ensure data verification and validation. Data shall be accepted or rejected based on the policies/procedures outlined in Appendix – C, D, and E. Project objectives shall be approved/disapproved based upon data collection procedures and analytical technique utilized and lab QA/QC.

D2. VALIDATION AND VERIFICATION METHODS

The methods of validation and verification are described in Appendix C, D, and E from the time a sample is collected to point at which it is analyzed by the lab.

D3. RECONCILIATION WITH DQO (DATA QUALITY OBJECTIVES)

Upon evaluation of project data it must be reconciled in order to establish compatibility or consistency with data quality objectives. Issues shall be resolved with the QAO if a discrepancy occurs with sample/project data results.

The procedures outlined in Appendix C, D, and E shall serve as the basis for the QAO to assess project precision, accuracy, and completeness. Issues that cannot be resolved by the QAO shall be resolved by a group made up of the Environmental Bureau Staff, the UIC Director, QAO, and Environmental Bureau Chief.

APPENDIX A

DEFINITIONS

Activity - an all-inclusive term describing a specific set of operations or related tasks to be performed, either serially or in parallel (e.g., research and development, field sampling, analytical operations, equipment fabrication), that in total, result in a product or service.

Assessment - the evaluation process used to measure the performance or effectiveness of a system and its elements. In this Standard, assessment is an all-inclusive term used to denote any of the following: audit, performance evaluation, management systems review, peer review, inspection or surveillance.

Audit - a planned and documented investigative evaluation of an item or process to determine the adequacy and effectiveness as well as compliance with established procedures_, instructions, drawings, QAPPs, and other applicable documents.

Characteristic - any property or attribute of a datum, item, process, or service that is distinct, describable, and measurable.

Contractor - any organization or individual that contracts to furnish services or items or perform work.

Computer Program - sequence of instructions suitable for processing by a computer. Processing may include the use of an assembler, a compiler, an interpreter, or a translator to prepare the program for execution. A computer program may be stored on magnetic media, and be referred to as "software", or may be stored permanently on computer chips, and be referred to as "firmware". Computer programs covered by this Standard are those used for design analysis, data acquisition, data reduction, data storage (data bases), operation or control, and data base or document control registers when used as the controlled source of quality information.

Corrective Action - measures taken to rectify conditions adverse to quality, and where necessary, preclude their recurrence.

Customer - any individual or organization for which items or services are furnished or work performed in response to defined requirements and expectations. .

Data Quality Assessment (DQA) - is a process for performing statistical analysis to determine whether the quality of a data set is adequate for its intended use.

Data Quality Objectives (DQOs) - a statement of the precise data, the manner in which such data may be combined, and the acceptable uncertainty in those data in order to resolve an environmental problem or condition. This may also include the criteria or specifications needed to design a study that resolves the question or decision addressed by the DQO process.

Data Quality Objectives (DQO) Process - a Total Quality Management (TQM) tool developed by the U.S. Environmental Protection Agency to facilitate the planning of environmental data collection activities to ensure the usability of the data. The DQO process asks planners to focus their planning efforts by specifying the use of the data (the decision), the decision criteria the data must meet, and the tolerance to accept an incorrect decision based on compromised data. The products of the DQO process are the DQOs, i.e., chemical parameter detection limits at or below the regulatory limit, field samples are properly preserved and cooled in storage containers to minimum temperatures and transport to lab requirements after sampling, chain-of-custody during sample collection and record keeping during sampling, etc.

Data Usability - the process of ensuring or determining whether the quality of the data produced meets the intended use of the data or meets the DQOs of the recipient, i.e., OCD, EPA, etc.

Design Review - a documented evaluation by a team, including Staff other than the original designers, the responsible designers, the customer for the work or product being designed; and, a QA representative to determine if a proposed design will meet the established design criteria and perform as expected when implemented.

Engineered Environmental Systems - an all-inclusive term used to describe pollution control devices and systems, waste treatment processes and storage facilities, and site remediation technologies and their components that may be utilized to remove pollutants or contaminants from the environment. Examples include wet scrubbers (air), soil washing (soil), granulated activated carbon unit (water), and filtration (air, water). Usually, this term will apply to hardware-based systems; however, it will also apply to methods or techniques used for pollutant reduction of the contaminants, such as capping, solidification or vitrification, and biological treatment.

Environmental Conditions - the description of a physical medium (e.g., air, water, soil, sediment) or biological system expressed in terms of its physical, chemical, radiological, or biological characteristics.

Environmental Data - any measurements or information that describes environmental processes or conditions, or the performance of engineered environmental systems.

Environmental Data Operations - work performed to obtain, use, or report information pertaining to environmental processes and conditions.

Environmental Monitoring – is the process of measuring or collecting environmental data.

Environmental Processes – unnatural (manufactured) or natural processes that produce discharges to or impact the ambient environmental quality.

Environmental Programs - an all-inclusive term pertaining to any work or activities involving the environmental, including but not limited to: characterization of environmental processes and conditions; environmental monitoring; environmental research and development; the design, construction and operation of engineered environmental systems; and laboratory operations on environmental samples.

Environmentally Related Measurements - the data collection activity or investigation involving the assessment of chemical, physical or biological factors in the environment, which affect human health or the quality of life.

Environmental Technology - an all-inclusive term used to describe pollution control devices and systems, waste treatment processes and storage facilities, and site remediation technologies and their components that may be utilized to remove pollutants or contaminants from or prevent them from entering the environmental. Examples include wet scrubbers (air), soil washing (soil), granulated activated carbon unit (water), and filtration (air, water). Usually, this term will apply to hardware-based systems; however, it will also apply to methods or techniques used for pollution prevention, pollutant reduction, or containment of contamination to prevent further movement of the contaminants, such as capping, solidification or vitrification, and biological treatment.

Extramural - relating to environmental activities performed for OCD but not by OCD employees, usually under a contract, grant or cooperative agreement associated with QAPPs and QMPs.

Financial Assistance - the process by which funds are provided by one organization (usually government) to another organization for the purpose of performing work or furnishing services or items. Financial assistance mechanisms include grants, cooperative agreements, and government interagency agreements.

Gas Chromatography (GC) - a method used to separate and identify the constituents and concentrations of volatile compounds or substances within a laboratory sample container.

Gas Chromatography/Mass Spectrometry (GC/MS) - a device used for an analytical method that combines the features of gas-liquid chromatography and mass spectrometry to identify and measure concentrations of different organic and inorganic substances within a laboratory sample container.

Gas Compositional Analysis - Dissolved gas composition analytical method(s), i.e., RSK 175 Method, determines the concentrations of the following hydrocarbons: Methane, Ethane, Ethylene, Propane, Propylene, Isobutane, Normal Butane, Isopentane, Normal Pentane, and Hexanes Plus. Also, the following fixed gases: Nitrogen, Oxygen, Argon, Carbon Dioxide, Carbon Monoxide, Hydrogen and Helium within a laboratory sample container.

Gas Isotope Analysis - stable isotope ratios of the following: Carbon, Hydrogen, Nitrogen, Oxygen and Sulfur in a gas media can be determined within a laboratory sample container using mass spectrometry (MS) and/or Cavity Ring-Down Spectroscopy (CRDS).

Geochemical Fingerprinting - technique used to establish chemical and interpretational methods to fully characterize the hydrocarbon composition of a natural gas or hydrocarbon liquid sample within a laboratory sample container. The purpose of this characterization is to establish the unique chemical composition or “fingerprint” of a gas or an oil sample. This fingerprint can be used for environmental investigations to differentiate the sample in question from other gas or liquid hydrocarbon samples to identify the source(s) of gas detected in the environment.

Graded Approach - the process of basing the level of application of managerial controls applied to an item or work according to the intended use of results and the degree of confidence needed in the quality of the results associated with the Data Quality Objectives (DQO) Process.

Hazardous Waste - any waste materials that satisfy the definition of "hazardous waste" as given in 40 CFR Part 261, "Identification and Listing of Hazardous Waste".

Independent Assessment - an assessment performed by a qualified individual, group, or organization that is not part of the organization directly performing and accountable for the work being assessed.

Inspection - examination or measurement of an item or activity to verify conformance to specific requirements.

Intramural - term used to describe environmental activities performed by OCD employees under State funding and/or under Federal contract, grant or cooperative agreement associated with QAPPs and QMPs.

Item - an all-inclusive term used in place of the following: appurtenance, facility, sample assembly, component, equipment, material, module, part, product, structure, subassembly, subsystem, system, unit, documented concepts, or data.

Management - those individuals directly responsible and accountable for planning, implementing, and assessing work.

Management System - a structured non-technical system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for conducting work and producing items and services.

Management System Review (MSR) - the qualitative assessment of a data collection operation and/or organization(s) to establish whether the prevailing quality management structure, policies, practices and procedures are adequate for ensuring that the type and quality of data needed are obtained.

Mass Spectrometry (MS) - is the method used to measure isotopic samples as small as one 1 nano-gram. It consists of an ion generator, analyzer, and several detectors. A sample is ionized by an ionic generator and passed through a magnetic field separating the samples into different groups based on their mass and ionization levels. When each ionized sample reaches the Faraday Cup where it is stored, a current is produced and measured as an electrical signal. A computer can then identify the types and concentration of atoms present in the sample and the number of atoms the sample. The stable isotope ratios of Hydrogen and Carbon in the gas can be determined.

May - denotes permission but not a requirement.

Method - a body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification) systematically presented in the order in which they are to be executed.

Mixed Waste - hazardous waste material, as defined by 40 CFR Part 261 (RCRA) mixed with radioactive constituents.

Must - denotes a requirement that has to be met.

NELAC - On November 6, 2006, a giant step towards achieving a long-term goal of the environmental laboratory and monitoring communities to have a national accreditation program was realized. After years of an evolving program under the auspices of the National Environmental Laboratory Accreditation Conference (NELAC) and the Institute for National Environmental Laboratory Accreditation (INELA), both Boards of Directors took action to form The NELAC Institute (TNI). The purpose of TNI is to foster the generation of environmental data of known and documented quality through an open, inclusive, and transparent process that is responsive to the needs of the community. As reflected in the new name, TNI has combined the heritage of NELAC with the consensus process of INELA into one organization dedicated to the vision that all entities generating environmental data in the United States be accredited to a national standard.

Objective Evidence - any documented statement of fact, other information or record, quantitative or qualitative, pertaining to the quality of an item or activity, based on observations, measurements, or tests which can be verified.

Organization - a company, corporation, firm, enterprise, or institution, or part thereof, whether incorporated or not, public or private, that has its own functions and administration.

Peer Review - a documented critical review of work generally beyond the state of art or characterized by the existence of potential uncertainty. The peer review is conducted by qualified individuals (or organization) those are independent of those who performed the work, but are collectively equivalent in technical expertise (i.e., peers) to those who performed the original work. The peer review is conducted to ensure that activities are technically adequate, competently performed, properly documented, and satisfy established technical and quality requirements. The peer review is an in-depth assessment of the assumptions, calculations, extrapolations, alternate interpretations, methodology, acceptance criteria, and conclusions pertaining to specific work and of the documentation that supports them. Peer reviews provide an evaluation of a subject where quantitative methods of analysis or measures of success are unavailable or undefined, such as in research and development.

Performance Evaluation (PE) - a type of audit in which the quantitative data generated in a measurement system are obtained independently and compared with routinely obtained data to evaluate the proficiency of an analyst or laboratory.

Procedure - a documented set of steps or actions that systematically specifies or describes how an activity is to be performed.

Process - an orderly system of actions that are intended to achieve a desired end or result. Examples of processes include analysis, design, data collection, operation, fabrication, and calculation.

QTRAK - is a Computer Program that contains database information on Quality Assurance Project Plans and Quality Management Plans for Program Managers, Project Officers, and the OQA for planning and assessment of the status of regional Quality Assurance Project Plans and the associated Project Plans.

Qualified Data - any data that have been modified or adjusted as part of statistical or mathematical evaluation, data validation, or data verification operations.

Quality - the sum of features and properties/characteristics or a process, item, or service that bears on its ability to meet the stated needs and expectations of the user.

Quality Assurance (QA) - an integrated system of management activities involving planning, implementation, assessment, reporting and quality improvement to ensure that a process, item, or service is of the type and, quality needed and expected by the customer.

Quality Assurance Forum - the interdivisional organization, with an advisory function for Quality Assurance activities of OCD in general and the Quality Assurance Office specifically. Provides regular feedback to the ESD Director and the customers of the QA Office.

Quality Assurance Management Staff (QAMS) - the U.S. EPA's headquarters staff element that establishes and promulgates Quality Assurance Policy.

Quality Assurance Officer (QAO) - the designated OCD staff member that has the delegated authority for approval of all Quality Assurance Project Plans in OCD.

Quality Assurance Program Description/Plan - see Quality Management Plan.

Quality Assurance Project Plan (QAPP) - a formal document describing in comprehensive detail the necessary environmental field and laboratory procedures that must be implemented to ensure that the environmental sampling and analytical laboratory data results from completed environmental activities and applied QA/QC comply with the stated planning, implementation, and assessment criteria of the QAPP.

Quality Control (QC) - the overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer.

Quality Improvement - a management program for improving the quality of operations. Such management programs generally entail a formal mechanism for encouraging worker recommendations with timely management evaluation and feedback or implementation.

Quality Indicators - measurable attributes of the attainment of the necessary quality for a particular environmental decision. Indicators of quality include: precision, bias, completeness, representativeness, reproducibility, comparability, and statistical confidence.

Quality Management - that aspect of the overall management system of the organization that determines and implements quality policy. Quality management includes strategic planning, allocation of resources, and other systematic activities (e.g., planning, implementation, and assessment) pertaining to the quality system.

Quality Management Plan (QMP) - a formal document that describes the quality system in terms of the organizational structure, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, and assessing all activities conducted.

Quality System - a structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC.

Readiness Review - a systematic, documented review of the readiness for the startup or continued use of a facility, process, or activity. Readiness reviews are typically conducted before proceeding beyond project milestones and prior to initiation of a major phase of work.

Record - a completed document that provides objective evidence of an item or process. Records may include photographs, drawings, magnetic tape, electronic, and other data recording media.
Remediation - the process of reducing the concentration of a contaminant (or contaminants) in air, water, or soil media to a level that poses an acceptable risk to human health.

Self-Assessment - Assessments of work conducting by individuals, groups, or organizations directly responsible for overseeing· and/or performing the work.
Service - the category of economic activity that does not produce manufactured items. In environmental data operations or engineering projects, such activities include design, inspection, laboratory and/or field analysis, repair, and installation.

Significant Condition - any state, status, incident, or situation of an environmental process or condition of an engineered environmental system in which the work being performed will be adversely affected in a manner sufficiently serious to require corrective action to satisfy quality objectives or specifications and safety requirements.

Specification - a document stating requirements and which refers to or includes drawings or other relevant documents. Specifications should indicate the means and the criteria for determining conformance.

Standard Operating Procedure (SOP) - a written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps, and that is officially approved as the method for performing certain routine or repetitive tasks.

Stray Gas – natural hydrocarbon gas that enters water wells as a dissolved component in ground water, or as separate gas bubbles in household water.

Supplier - any individual or organization furnishing items or services or performing work according to a procurement document or financial assistance agreement. This is an all-inclusive term used in place of any of the following: vendor, seller, contractor, subcontractor, fabricator, or consultant.

Surveillance - the act of monitoring or observing a process or activity to verify conformance to specified requirements.

Technical Review - a documented scientific or engineering review by a technically degreed, certified, trained and or qualified reviewer of an environmental report where work was performed and completed at the level of a QAPP to evaluate and assess the validity and findings of the report. The review is accomplished by one or more qualified reviewers, i.e., QAOs, and/or equivalent who are independent of those who performed the work. The review is an in-depth analysis and evaluation of environmental documents, field activities, material, data, or items that require technical verification or validation for applicability, correctness, adequacy, completeness, and assurance that established requirements are satisfied and data meets DQOs.

Technical Systems Audit (TSA) - a thorough, systematic, on-site qualitative audit of facilities, equipment, Staff, training procedures, record keeping, data validation, data management, and reporting aspects of a system.

Total Quality Management (TQM) - the process of applying quality management to all activities of the organization, including technical and administrative operations. See Quality Management and Quality System.

Validation - an activity that demonstrates or confirms that a process, item, data set, or service satisfies the requirements defined by the user.

Verification - the act of authenticating or formally asserting the truth that a process, item, data set, or service is, in fact, that which is claimed.

Work - the process of performing a defined task or activity (e. g., research and development, field sampling, analytical operations, equipment fabrication).

APPENDIX B

STAFF ORGANIZATION CHARTS

PROGRAM ORGANIZATION CHART

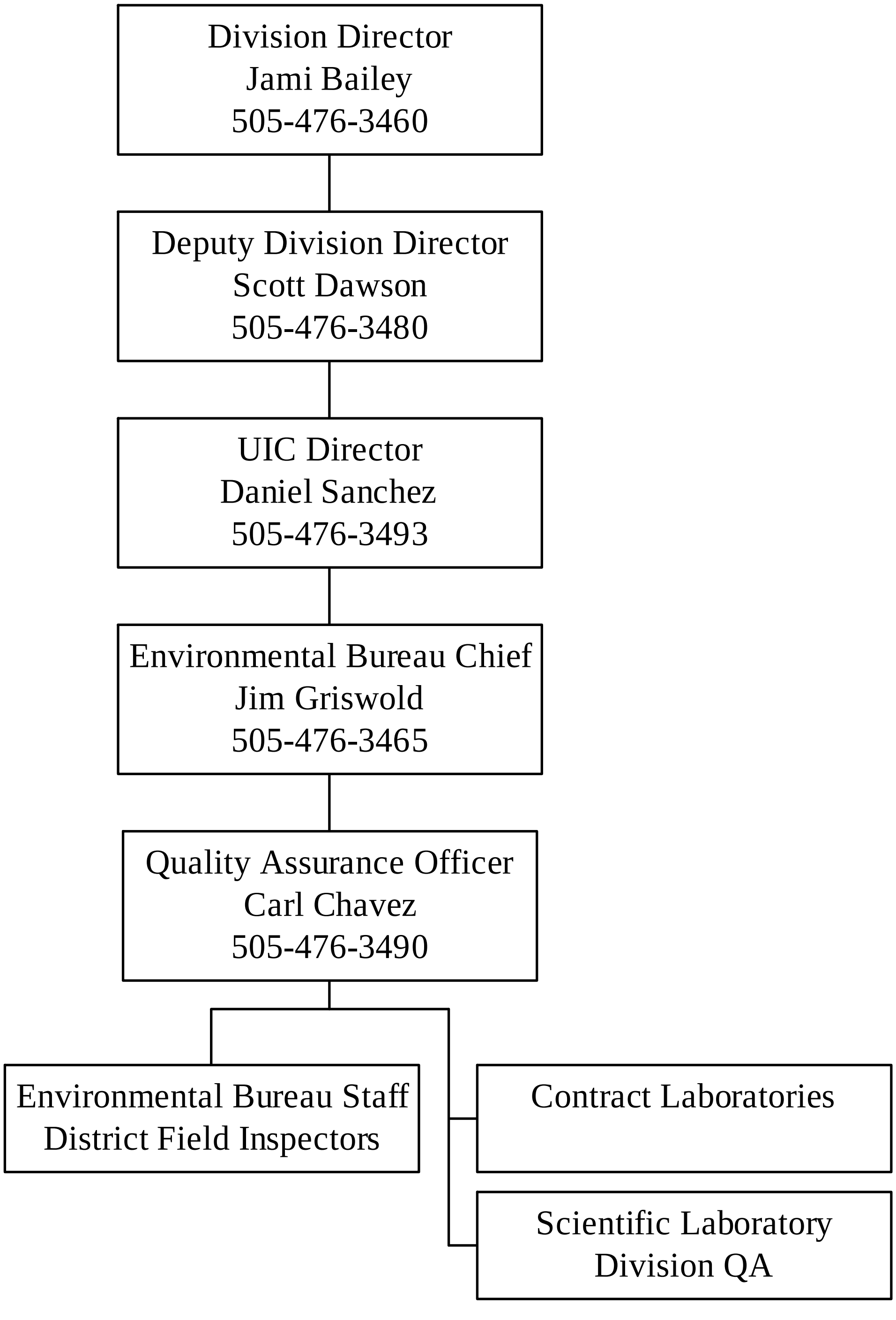
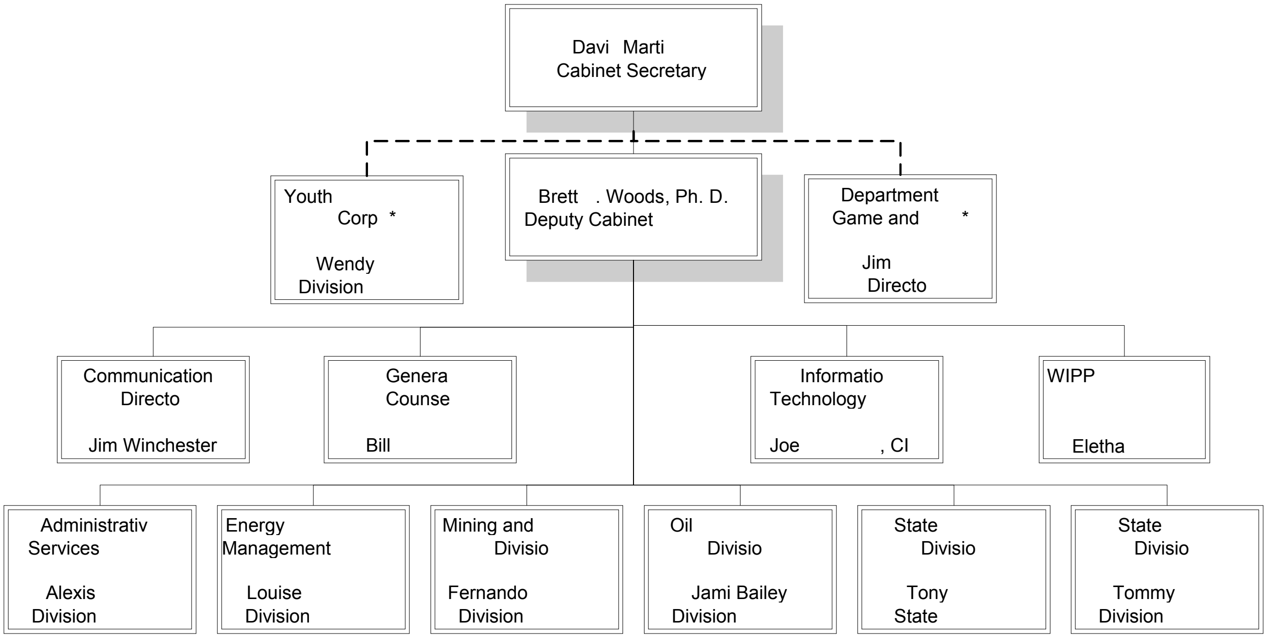


Figure 1

ENERGY, MINERALS & NATURAL RESOURCES

DEPARTMENT ORGANIZATION CHART



* Administratively attached with no direct budget support from .
EMNRD

Figure 2

APPENDIX C

OCD SAMPLE REQUIREMENTS

OCD Field Sample Methods

All water quality test sample methods required in the UIC program must be done in accordance with one of the following methods:

1) Organic and inorganic compounds, water quality measurements: 40 CFR Part 136 "Guidelines Establishing Test Procedures for the Analysis of Pollutants" (as amended), <136.3, Table I. This list references the accepted methods to analyze waters for organic and inorganic contaminants. It also includes some physical tests (temperature, specific gravity, etc.). This document is available from the SQAO.

2) Organic compounds, water quality measurements: "Methods for Organic Chemical Analysis of municipal and Industrial Wastewater", EPA-600/4-82-057, July 1982, available from the Center for Environmental Research Information (CERI) 26 West St. Clair Street, Cincinnati, Ohio 45268, Phone: (513) 684-7562 or FTS 684-7562.
Note: This technical report provides procedures that are as uniform and cost effective as possible (with some minor compromises) for the analysis of some organic pollutants. It also provides references that would be helpful to the analyst.

3) Methods for the analysis of inorganic compounds: "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1979, available from Center for Environmental Research (CERI), 26 West St. Clair Street, Cincinnati, Ohio 45268.
Note: This reference is included in number1 above and provides acceptable analytical methods.

4) Other analyses not covered above should be performed in accordance with the most recent edition of "Standard Methods for the Examination of Water and Wastewaters": American Public Health Association, American Water Works and the Water Pollution Control Federation. Other analyses not covered above should be performed by the best available methods.

5) For UIC Class II well programs, analyses which require a high degree of accuracy must be done as explained above or in accordance with "API Recommended Practice for Analysis of Oil-Field Waters" API RP 45.

6) US EPA Test Methods for Evaluating Solid Waste SW-846 Final Updates.

7) OCD requires that NELAC certified environmental analytical laboratories conduct testing of environmental field samples following methods prescribed above.

8) Since federal regulations require all assistance agreement recipients to implement a quality system for environmental data collection and technology programs (EPA Quality Assurance Guidance at http://www.epa.gov/ogd/grants/assurance.htm), documentation of all current practices utilized by OCD staff are included herein.

Note: Techniques already approved and used for other programs (i.e., RCRA, CERCLA, NPDES, PWSS, etc.) are acceptable to OCD for the same type of sample method(s) for environmental analytical laboratory analysis.

Preservative, Holding Time, and Containers

Please refer to Appendix E QMP/QAPP (under “Appendix E”).

APPENDIX D

OCD SAMPLE PROCEDURES

INTRODUCTION

In order to standardize sampling procedures in the field, this summary of methods for investigation sampling of possible water contaminants has been obtained from the "National Handbook of Recommended Methods for Water-Data Acquisition", a publication of the United States Geological Survey, and from "Sample Collection Procedures", the New Mexico Scientific Laboratory Division.

Sampling is the process of collecting a representative portion of the sample matrix (aqueous/solid) in question; thus a representative sample must typify the rest of the fluid and or soils. Collecting a representative sample and maintaining its integrity is important because the validity of each measurement begins with the sampling procedure.

To get the best analytical results the field and laboratory Staff should work together to plan what to look for and how to look for it. Laboratory analyses can be expensive, and, not closely following proper procedures can cause a sample to misrepresent the conditions it exhibited at the time it was collected.

Field analytical methods for key water quality parameters should be performed directly in the field to provide additional environmental data to supplement the environmental analytical laboratory data results. Properties such as dissolved oxygen (DO), oxidation-reduction potential (ORP), specific conductance, pH, and temperature are all excellent indicators of the environmental quality of ground water, surface water, or effluent that are likely to be altered during environmental sampling, collection, holding time or storage, and transportation to the laboratory. Therefore, acceptable field sampling and analytical methods used to derive environmental water quality data should be allowed to be obtained in the field rather than at the environmental analytical laboratory.

ONSITE MEASUREMENT

Specific Conductivity

The specific conductivity of a water sample is a measure of the waters ability to conduct an electrical current under specific conditions and gives an indication of the concentration of dissolved solids in the sample.

Specific conductivity meters should be equipped with an integral temperature probe, and read directly in micromhos/cm at a specific temperature. The meter should be "red line" calibrated before submerging the probe in the water sample.

Once the environmental water media sample is in a container, its specific conductivity should be measured as soon as possible because the specific conductivity will change with time as solids begin to precipitate out of the sample. The cell should be gently moved in the sample until a steady reading is obtained. A second reading is recommended to ensure accuracy.

To avoid cross contamination, do not use a sample to be chemically analyzed for metering the specific conductivity. Keep the sample to be sent to the lab for analyses separate.
Temperature

The temperature of the sample should be obtained by using the specific conductivity meter. The temperature will be used in determining the specific conductivity by adjusting the meter to the appropriate temperature. The temperature should be recorded to provide additional information to the analytical laboratory.

Solution pH

The pH of a solution is a measure of the effective hydrogen ion concentration and is controlled primarily by the carbonate system of gases and dissolved carbon dioxide, bicarbonates and carbonates. Other dissolved gases, such as hydrogen sulfide and ammonia, can also affect the pH of the system.

The pH of a solution can be measured in the field in one of two ways; by using pH indicator strips or a pH meter. The method of using pH strip paper is faster than the meter method, however the accuracy is reduced. A pH determination by meter is done with a glass hydrogen ion electrode compared against a reference electrode of known potential by means of a pH meter.

The pH meter must be calibrated prior to use. First wash the probe in a pH 7.00 buffer solution or deionized water. Immerse the electrode probe in a pH 7.00 buffer and adjust the temperature control to the temperature of the buffer solution. When the reading stabilizes, adjust the calibration control to set the display to the pH value of the buffer solution. Calibration can be assured by performing the calibration procedure on another buffer solution of a different pH value.

To obtain a pH value for the unknown solution, rinse the electrode probe with the unknown solution to decontaminate the probe from the buffer solution used to perform calibration. Immerse the probe in the sample solution and adjust the temperature of the meter to the temperature of the sample solution. Keep the probe submerged long enough for the pH reading to stabilize. Repeat the procedure to assure accuracy, and recalibrate if necessary.

Headspace Analyses

The use of a photo ionization detector (PID) is used to determine the concentration of organic vapors in a given matrix. This field examination procedure is beneficial in the contaminant investigation of impoundments that have received exploration and production wastes containing volatile organic constituents.

Accepted OCD procedures are as follows:

1. Fill a 0.5 liter or larger jar half full of a sample and seal the top tightly with aluminum foil, or

fill a one quart zip-lock bag half full of a sample and seal the top of the bag leaving the remainder of the bag full of air.

2. Ensure that the sample temperature is between 15 and 25 degrees Celsius (59-77 degrees Fahrenheit).

3. Allow aromatic hydrocarbon vapors to develop within the headspace of the sample jar or bag for 5 to 10 minutes. Sometime during this period, the sample container should be shaken vigorously for l minute or the contents of the bag massaged to break up soil clods.

4. If using a jar, pierce the aluminum seal with the probe of the PID and record the highest (peak) measurement. If using a bag, carefully open one end of the bag and insert the probe of the OVM into the bag and seal the bag around the probe as much as possible to prevent the vapors from escaping. Record the peak measurement. The OVM should be calibrated to ensure a benzene response factor.

SAMPLE COLLECTION

Sample Plans

Sampling of solid and liquid wastes for analytical properties requires that representative samples collected exhibit the average properties of the entire waste body. An appropriate sampling plan must be responsive both to regulatory and scientific objectives. Field and laboratory Staff must work together to plan what to look for and how best to obtain it. Because the burden of responsibility rests with the waste generator, it is advisable that he or she seek competent advice before designing a sampling plan if unsure of the proper procedures for collecting representative samples.

Refer to the EPA SW-846 Volume II: Field Manual (Ch. 9) for an in-depth description of accepted procedures for sampling plan design. Since federal regulations require all assistance agreement recipients to implement a quality system for environmental data collection and technology programs documentation of all current practices OCD Staff are encouraged to follow EPA Quality Assurance Guidance at http://www.epa.gov/ogd/grants/assurance.htm.

Recommended sample containers are plastic containers and glass vials or jars, or other containers as recommended by the laboratory. If the sample container cannot be directly filled, a thoroughly cleansed glass canning jar, or other appropriate decontaminated sampling device may be used for collecting samples from well sites.

Pit Sampling

A location on the opposite side of the pit from the inflow should be chosen and the surface of the pit fluid agitated to break up any deposits on the surface. Care should be taken not to allow surface oil or paraffins to get in the sample. The glass jar is used to dip fluid from the pit and to transfer the fluids to the specified sample container(s).

Separator & Dehydrator Sampling

When sampling effluent directly from separators or dehydrators, safety precautions should be undertaken to prepared for a high pressure discharge and or high temperature discharge. Sample valves/ports are to be opened slowly or cautiously during sampling events.

Water & Air Well Sampling

Groundwater samples should be collected in clean containers supplied by the analytical lab that will conduct the analyses or from a reliable laboratory supply company. Samples for different analyses require specific types of containers. The environmental and/or subcontract laboratory can provide information on the types of containers, etc. The typical sample process for air and water media is as follows:

Water Dissolved Gases

Dissolved light gases (i.e., ethane, methane, propane, ethene, CO_2, CO, O_2, NOX, SO_X, etc.) in water are sampled similarly to BTEX and TPH in water media.

Containers: 3, 40ml VOA, zero head space, no preservative
Hold Time: 14 days at <6˚C
Test Methods: RSK 175 and EPA RM 18

Air Light Gases

Light (dry) gases in well head gas can be sampled using a suma canister or Tedlar bag, or can be measured in the field. Suma canisters come with a vacuum and a valve is released to allow gas to fill the canister. Tedlar bags are filled using a pump or vacuum chamber. Field measurements can be performed directly at the well head using similar procedures as those for air emissions testing.

Containers: Suma canister or liter Tedlar bag
Hold Time: 1-4 weeks at room temperature
Test Methods using suma canister or Tedlar bag: EPA RM 18 or RSK 175
Test Methods - Field: EPA 18, 24A, 25, or 320.

Isotopic Analysis - Air

Sampling is similar to light gases above.

Container: 3, liter Tedlar bags
Hold Time: 1 week at room temperature
Test Method: Dependent on lab performing tests

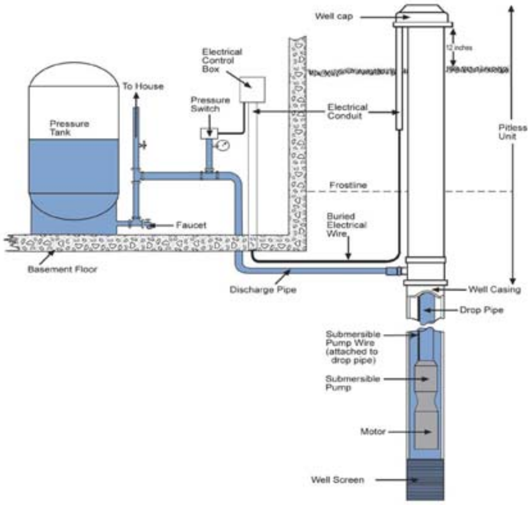
Isotopic Analysis - Water

Sampling is similar to dissolved gases above.

Container: 3, liter bottles with septum cap and bactericide preservative, no head space
Hold Time: 2 weeks at <6˚C
Test Method: Dependent on lab performing tests

The recommended information to accompany all well samples includes: point and method of collection, exact location of well, rate of discharge, duration of pumping prior to sampling, field measurements that apply, date and time of collection, appearance, presence of gas, associated odors, and any other relevant observation, such as the use of the well under sampling conditions. Include the depth of the well, depth to the top of the fluid, diameter of the casing, and the location of effluent disposal areas and the proximity in relation to the well.

Domestic wells should be sampled at the closest point to the wellhead (see figure below), such as the well faucet or the pressure tank. The water should be allowed to run until three casing volumes of water have been discharged before collecting the sample, if possible.



Source: Courtesy of Minnesota Department of Health

Monitor wells must be sampled with clean bailers in order to avoid cross contamination. Bailers should be cleaned prior to each sample point using the following procedure: 1) wash bailer inside and out using an acceptable laboratory cleaning soap; 2) rinse with deionized water; 3) rinse with laboratory reagent alcohol containing only ethanol or methanol; 4) rinse with deionized water. The OCD believes that PVC bailers will provide accurate results for samples containing organics. The use of a clear polycarbonate plastic bailer is preferred where floating product is present in the well. If possible, three casing volumes of water should be bailed or pumped from a monitor well before a sample is collected and/or another sample method, i.e., low-flow sample method, is approved by OCD.

In cases where water wells or ground water is suspected of being impacted by stray gas from oil and gas development activity, i.e., well related shale fracking, nearby gas storage, gas production, etc., OCD may require ground water sample collection of dissolved gas composition and/or isotopic analyses utilizing a select environmental analytical laboratory and/or mobile laboratory methods to investigate the source(s) of gas pollution. The sample must be taken from the well itself where the dissolved gas is representative of the inflow into the well. Water sampled from the tap may have passed through filters, water softeners or heaters that could alter the gas chemistry. Analysis of water and contained gas is generally done by a commercial lab (e.g., Isotech), or in labs at some major research universities. Sample containment and shipment procedures are important with dissolved gas samples. Samplers are advised to contact the lab directly for advice on the analytical method, sampling, containment, shipping, etc.

There are environmental laboratories that specialize in the use of geochemical fingerprinting to differentiate gases from different sources. With the huge increase in onshore oil and gas exploration made feasible by horizontal drilling and fracking of shales, the need for accurate methods of monitoring dissolved gas concentrations in groundwater has greatly increased. Most gases of interest do not truly dissolve in water but instead simply partition themselves between the water phase and the gas. The method required for collecting water samples can vary depending on the gas concentration.

There are at least three methods currently being used for dissolved gas analysis. With the "headspace equilibration" method, a suitable bottle is completely filled with water and submitted to the laboratory. In the lab, some of the water is withdrawn with a syringe and replaced with helium forming a headspace. This method works well if the gas concentration is significantly below the saturation level. But if any gas is present at high enough concentrations to form bubbles, some gas will be lost while sampling and the amount of dissolved gas will be underestimated.

At least 2 different methods have been used for measuring dissolved gases when they exceed saturation at atmospheric pressure. With the "water displacement" method, a suitable container is filled with water and then inverted in a pail of water. A hose connected to the water supply is inserted into the inverted container such that any bubbles in the water will collect in the top of the container. This is a very imprecise method as the rate at which the gas escapes from the water can depend on the water flow rate, water temperature, size of orifice, and a host of other parameters.

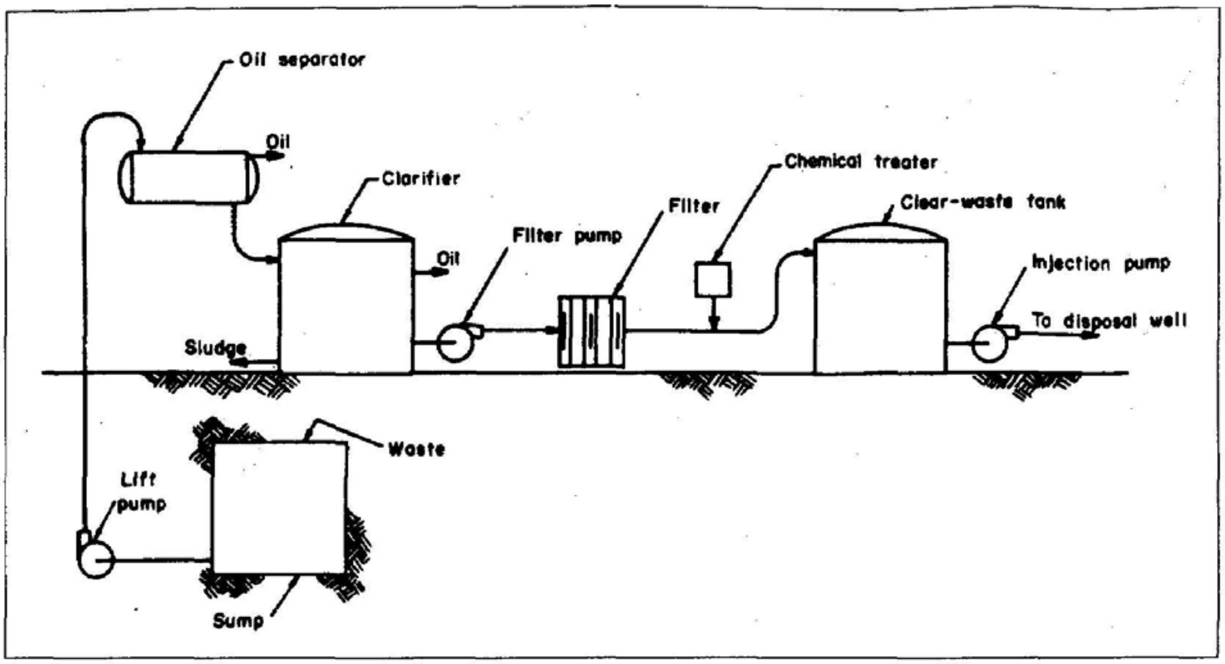
A more precise and universally applicable method may be referred to as the "two phase" method. With this method both the water phase and any gas phase that forms are collected simultaneously. Newly developed sampling containers that are now becoming available, allow collection of samples by any of the above methods, using the same container. A review of gas solubility and a discussion of procedures for collection of water samples under different conditions will be included.

Methane in the shallow groundwater has been identified to occur naturally in aquifers throughout North America. Understanding the source of methane in groundwater can be complex. Furthermore, determining whether groundwater has been impacted from oil and gas development activity rather than other anthropogenic sources requires a holistic approach using multiple data sources. This generally requires multivariate statistical analyses to identify deviations in baseline (or "Pre-Drill") versus post-complaint data sets, which may involve extensive well integrity evaluations. Building upon the existing baseline water quality data and using historical state and federal data sets, regional and localized groundwater trends can be established and geo-referenced. As part of a groundwater contamination investigation, the water source in question can be fingerprinted and compared against a larger data set. Traditional analytical methods, including isotopic analysis and laboratory analytical results, are able to provide "snap-shot" views of the geochemical composition of an aquifer within weeks of initial sample collection. However, with advances in technology, real-time continuous monitoring of the geochemical composition is possible and provides instantaneous results. For example, a mobile gas chromatograph (GC) and mass spectrometer (MS) unit can have the potential for real-time isotopic analysis in a variety of sampling locations (e.g., basements, wells, ponds, fields, rivers, etc.) in a much more cost effective and thorough manner. By using a mobile GC/MS unit as part of an aquifer characterization, the water quality range can be measured and used to provide historical data assurances, quantify relationships between aquifer stage and water quality, and to direct an ongoing investigation. Continuous monitoring with GC/MS units may also allow for a more thorough investigation of a production well's integrity and its potential relationship to alleged stray gas incidents. Mobile GC/MS units can be integrated into existing well integrity investigation practices, including pressure build-up tests and vent rate testing to provide a more comprehensive understanding of well integrity. Additionally, using the portable GC/MS allows for the continuous monitoring of gas composition at both the production well and the reported stray gas location throughout remedial actions to evaluate any potential correlations and the effectiveness of well remedial activity.

Underground Injection Control (UIC) Injection Well Sampling

When sampling waste effluent from a UIC well, safety precautions (personal protection equipment and clothing) should be implemented before and during sampling to prepare for handling corrosive waste water, high pressure discharge and or high temperature discharge. Sample valves/ports are to be opened slowly or cautiously during sampling events. A containment area shall be emplaced to prevent surface discharge from occurring during sampling events.

Typical UIC well waste effluent sample locations based on a well's plumbing system (see figure of typical disposal well facility layout below) are from the waste tank (static purge condition near bottom of tank) and/or after the injection pump (in-line dynamic purge condition under operational conditions) from a properly located and constructed sample collection valve or port.



Source: Courtesy of EPA/625/6-89/025a: "Assessing the Geochemical Fate of Deep-Well-Injected Hazardous Waste" (June 1990)

There is no minimum purge requirement for UIC effluent waste sampling; however, the operator is required to: implement standard EPA environmental sample techniques or methods for proper sample collection; prevent artificial agitation or aeration of an aliquot during sampling; use proper environmental sample containers for constituent(s) sampled; properly preserve samples based on chemical(s) or constituent(s) to be tested; properly store samples under refrigeration during the transport of environmental samples to the environmental laboratory following proper chain-of-custody procedures; ensure proper environmental laboratory test method(s) are conducted within the allowed holding time; and implement the environmental analytical test method(s) in accordance with EPA Quality Assurance/Quality and Control (QA/QC) Methods with adherence to Data Quality Objectives (DQOs).

SAMPLE FILTRATION

When concentrations of dissolved inorganic constituents in water are needed, a one gallon sample must be filtered through a 0.45 mm average pore diameter membrane filter. If the sample has many solids, it may be necessary to use a pre-filter in addition to the 0.45 mm filter.

It is advisable to discard the first 150 to 200 ml of filtration in order to rinse the filter and filtration apparatus of any contaminating substance.

The filtrate, collected in 2 labelled one-liter containers, is divided so that one container is filtered but not acidified; the second container is filtered and immediately acidified with 2 ml concentrated nitric acid. If nitrates or phosphates are to be tested for, a third container should be collected, filtered and preserved by adding 2 ml of H2S04.

PRESERVATION

Deteriorated samples negate the efforts and costs in obtaining good samples. In general, the shorter the holding time after sample collection, the more reliable the analytical results. Samples can be preserved by chilling and/or by adding the appropriate acid (See Appendix C). Samples may then be allowed to stand for a longer period of time before the analysis under proper storage conditions. Select the method of analysis and determine what preservative is recommended for the particular analysis before adding a preservative to any sample. Many environmental laboratories today provide sample containers with preservatives pre-added for convenience.

Samples for metal analysis can be preserved by the addition of nitric acid; samples for organic constituent determinations by chilling; and samples for the determination of Total Organic Carbon (TOC), biodegradable substances such as nitrogen and phosphorous species, nitrates, phosphates, and surfactants by filtering, adding H2S04, and chilling the sample immediately in an ice bath. Organic samples for hydrocarbon analyses are then stored in the dark at a temperature just above freezing until the analyses are conducted. Samples for analysis of certain dissolved inorganic species must not be frozen because it is not always possible to reconstitute the original sample exactly as it was before freezing.

Samples for metals analysis that are preserved with nitric acid may be stored for several months. Chilled or refrigerated samples are also stable if no sediment is present. However, most samples should be analyzed as soon as possible within the holding time specification of each analytical method (See Appendix C).

Under normal conditions the following sample containers (see Appendix C) would be appropriate:

Heavy Metal Analysis- l one-liter plastic container, filtered, and preserved with HNO3.

Major Cations and Anions - 1 one-liter container, filtered, and not preserved.

Purgeable Organics - two 40-ml glass vials with teflon-lined caps, samples not filtered, and not acidified.

Nitrogen Species and Phosphorous Species - 1 one-liter container, filtered, and preserved with H2S04.

Phenols Analysis- l one-liter glass jar, unfiltered, and preserved with HN03 plus CUS04.

Polynuclear Aromatic Hydrocarbons - 2 one liter brown glass containers, unfiltered, and not acidified.

SAMPLE IDENTIFICATION

Sampling points should be identified by a detailed and accurate description of their location. A field book record should be made of every sample collected, and every bottle and container should be identified by attaching an appropriately inscribed label or tag, and writing with waterproof felt pen. This information is also recorded on the Chain-of-Custody form, which must be completed concurrently during field sampling activities and not afterward.

The recommended minimum information recorded in a field book should include: date, geographic location of the site, weather with temperature conditions, persons present, well name and all pertinent information posted on the company sign at the well site, exact location of the sampling site and point of collection (blow-down pit, separator, etc.), date and time of collection, rate of discharge and physically observed properties (if possible), and size and collection of pit sampled. Sample from domestic wells should include the name, address, and phone number of the well owner.

Each sample should be recorded similar to one of the following examples:

1) MW-35 (i.e., sample # MW-35): The sample id, date, time, etc. are recorded on the sample label and chain-of-custody form during sample collection and delivered to the lab afterward.

2) 93 08 06 13:25
year month day time (i.e., sample #9308061325)

Each container should be labeled during sample collection with the following: well name, sample location, date, and time of collection. Containers should be labeled: "F" (filtered) or "NF" (non-filtered), and "NA" (non-acidified) or "A" (acidified) together with the acid name (i.e., HN03 or H2S04). Please refer to Appendices C, D and E for more information.

Please note that the person(s) collecting an environmental sample must record pertinent field information on the sample label of each container and in the chain-of-custody (COC) form simultaneously during environmental field investigations and associated sampling to comply with EPA QA/QC and DQOs. Collecting environmental samples without completing the COC form simultaneously during an environmental sampling event(s) “disqualifies” the environmental analytical data from consideration in a U.S. Court of Law.

CHAIN-OF-CUSTODY

Chain-of-custody procedures (See Appendix C and E) have been developed to track samples from the moment of sample collection through receipt at the laboratory for testing, data processing, and reporting of the results. The major concerns noted in the procedures include sample possession, the need to preserve the identity and integrity of the sample and documentation. Each link in the chain of custody must strengthen the potential evidentiary nature of the resulting data for litigation.

In order to form an exception to the hearsay rule, chain of custody procedures must be in written form and implemented as the normal operating procedure in cases where litigation can be expected. Routine monitoring and sampling do not require strict compliance with chain of custody procedures, but reasonable care should be maintained to insure sample validity.

Chain-of-custody sample seals shall be placed over the caps and shoulders of vials and/or sample containers before shipment to a NELAC Certified environmental analytical laboratory. The sample seals verify that each sample container has not been tampered with after sample collection. Sample seals can only be removed at the receiving lab. In lieu of sample seals over each container, a shipping container tape seal may be wrapped around each sample container before shipment to a lab and the seal, if broken, would compromise the sample integrity of all samples lacking a sample seal shipped within a container. It is recommended that both sample seals and shipping container seals be used when shipping environmental samples to the laboratory.

SHIPMENT OF SAMPLES

Shipping containers should be sturdy and well packed to prevent breakage and excessive temperature changes. All samples should be individually, wrapped and shipping containers filled in addition to ice with insulating material such as styrofoam, popcorn, etc. Shipping containers should be labeled with the laboratory address and a return address. Organic samples shall be chilled with ice.

Note: The shipping of all samples will conform to US Department of Transportation (DOT) and/or U.S. Postal Service (USPS) regulations. The shipping container shall be wrapped with an external tape seal to ensure that the shipping container was not opened and/or individual sample container seals are intact and undisturbed.

APPENDIX E

QUALITY ASSURANCE MANUAL WITH QUALITY MANAGEMENT PLAN

Quality Assurance Manual with Quality Management Plan

Revision 15.0
for TraceAnalysis, Inc.

Issued Date: 08/02/2013
Effective Date: 08/13/2013

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CORPORATE CEO:____
REBECCA LEFTWICH **DATE**

CORPORATE TECHNICAL DIRECTOR:________ Blair Leftwich _ 8-6-13
BLAIR LEFTWICH **DATE**

CORPORATE QUALITY ASSURANCE MANAGER: ______________________________
JAMES TAYLOR **DATE**

Prepared by:
____
James Taylor

TraceAnalysis Controlled Copy No.

Local Laboratory Controlled Copy No.________

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PREFACE

TraceAnalysis, Inc., with laboratories located in El Paso, Lubbock and Midland, Texas, provides a wide variety of chemical services to a broad range of customers. The Quality Assurance Program is designed to assure the customer that a high standard of accuracy, reliability and impartiality are consistently applied to all services rendered by the laboratory.

This Quality Assurance Manual with Quality Assurance Plan (QAM from this point forward) is written with reference to the elements required in *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations,* EPA QA/R-5 October 2000, and DOD Quality Systems Manual, Version 4.2, October 25, 2010, and TNI Standard, 2009. This document contains the required elements of a Quality Assurance Plan.

The Quality Assurance (QA) philosophy of the management at TraceAnalysis, Inc. is one of total commitment to ensuring the technical and legal reliability and validity of all analytical laboratory data. This philosophy encompasses all phases of chemical and physical analyses and extends through the interpretation and final publication of results. The Quality Assurance Department, an independent operations group reporting directly to the company president, consistently monitors these functions. This separation allows the QA Department the flexibility and independence to shape the program in a manner that best fits the needs of the laboratory and clients.

The QA Plan defines the systems of quality control and quality assessment that make up the comprehensive Quality Assurance program at TraceAnalysis, Inc. Quality control consists of specific procedures applied to all phases of analysis from sample receipt through the final reporting of results. The purpose of quality control is to ensure that quality goals are met under routine operating procedures. Quality assurance involves the continuous evaluation of data and monitoring of analytical processes for the purpose of ensuring that the quality control systems are performing effectively.

OBJECTIVES

The purpose of this QAM is:

- To define procedures for the establishment of analytical systems and for the acquisition, documentation, evaluation, reporting, and archival of legally defensible data;
- To provide uniform systems for sample receipt, sample handling, instrument maintenance and calibration, methods control, performance evaluation, data acquisition, evaluation of quality, and reporting of the data;
- To ensure the accuracy and precision of the analytical results;
- To assess the capabilities of analytical methods for meeting users' needs regarding precision, accuracy, sensitivity and specificity;
- To establish and monitor the routine operational performance of our laboratory through appropriate systems checks for ensuring that all aspects of the QA program are operative;
- To run performance audits of blind samples for evaluation of our laboratory;
- To perform corrective action as necessary;

- To ensure that client's rights are protected, including the confidentiality of all information garnered, and the protection of any proprietary rights a client may have.
- To ensure that TraceAnalysis adheres to ISO Guide 17025 for analytes on state certification scopes.
- To ensure that TraceAnalysis adheres to the TNI 2009 standard for all analytes on the NELAC Institute Accreditation Program - Recognized Laboratory Fields of Accreditation for TraceAnalysis.
- And that TraceAnalysis adheres to LELAP rules for all samples to be reported to the state of Louisiana
- And that TraceAnalysis adheres to DOD Quality Systems Manual rules for all samples to be reported to the DOD or their affiliates.

Specific procedures to be used for maintaining chain of custody, sample receipt, storage and disposal of samples, preventive maintenance, chemical analyses, internal quality control, data reporting, QA audits and corrective actions are described in specific sections of this plan or in standard operating procedures (SOP’s) which are referenced when applicable.

POLICY STATEMENT

TraceAnalysis, Inc. is committed to quality and expects from its management and staff a high degree of commitment to providing legally defensible data of known and appropriate quality to its clients. The validity and reliability of the data generated is ensured by the adherence to documented standard operating procedures (SOPs). TraceAnalysis, Inc.’s SOPs are written to comply with the approved analytical methods.

TraceAnalysis, Inc. emphasizes the application of sound quality assurance/quality control principles beginning with the initial planning of the project, throughout all analytical procedures, and ultimately with the preparation of the final report. The principles of the data quality objectives is to develop results that are representative, complete, comparable, precise, and accurate to the samples that are received at TraceAnalysis.

To ensure client satisfaction, TraceAnalysis, Inc., encourages strong interaction with the client at all phases of the project. Proactive interaction with the client helps TraceAnalysis, Inc. to deliver a final product that meets the QAM objectives as well as project-specific data quality objectives. TraceAnalysis, Inc. is committed to providing the resources, facilities, equipment, and Staff to ensure the timely completion of analysis and adherence to applicable QA/QC protocols.

TraceAnalysis staff and management are committed to compliance with the TNI Standard and the DOD Quality Systems Manual that are currently accepted by the accrediting authorities of the accreditations that TraceAnalysis currently holds.

FIELDS OF TESTING COVERED

TraceAnalysis, Inc. provides environmental testing for industry, municipalities, regulatory agencies, and consulting and engineering firms using approved analytical methods. Analytical procedures fall into one of four categories of analysis: chemical analyses, physical analysis, trace metal analysis, and organic analysis.

QAM MANAGEMENT

RESPONSIBILITY

The management of TraceAnalysis, Inc.'s QAM is the responsibility of the Quality Assurance Manager.

QAM REVIEW FREQUENCY

The Quality Assurance Manager reviews the manual at appropriate intervals. At any time during the year, lab Staff may request changes to the manual based on actual lab practice. Requests for revision of the manual must come directly to the Quality Assurance Department and are reviewed for admission into the next quality plan revision. New employees have to read the QAM as part of their training. When the QAM is updated all people who the changes affect will read the changes and sign off on their signature page that they have been made aware of the changes and have read them.

ORGANIZATION AND RESPONSIBILITY

THE LABORATORIES: TRACEANALYSIS, INC. OWNS AND OPERATES THREE LABS IN TEXAS.

The El Paso lab operates in the wet chemistry (and limited organics) area and serves as a drop off location all other analysis to be shipped to the Lubbock laboratory.

The Lubbock lab is a full service environmental lab. The lab operates in the inorganics area including Metals and Wet Chemistry, the organics areas including Volatiles (GC/MS and GC), Semi-volatiles (GC/MS and GC), TOC and Microbiology (E. Coli and Total Coliforms).

The Midland lab analyzes samples for in a BTEX, TPH, GRO, DRO and Wet Chemistry. The Midland lab also serves as a drop off location for all other analyses to be analyzed in the Lubbock laboratory.

The organizational chart for the corporation is located in Appendix A and the laboratory organizational charts are located in Appendix B.

ULTIMATE RESPONSIBILITY

Ultimate responsibility for company policy and decision belongs to Rebecca Leftwich, President/CEO of TraceAnalysis, Inc.

KEY STAFF

Rebecca Leftwich – President/CEO

Blair Leftwich – Senior Vice-President/Corporate Technical Director (Deputy: James Taylor)

James Taylor - Corporate Quality Assurance Manager (Deputy: Blair Leftwich)

Mike Abel – Lubbock Laboratory Manager (Deputy: Blair Leftwich)

Liz Givens – Client Services

Steve Rudeseal – LIMS Director

Brian Pellam – Internal Production Manager

Debbie Adams – Accounts Receivable

James Ratcliff– El Paso Laboratory Manager/Onsite QA Officer (deputies are James Taylor and Blair Leftwich)

Amy Hernandez- Midland Laboratory Manager (deputy is Blair Leftwich)

Allison Kelley – Midland Laboratory Technical Manager/QA Officer (deputies are James Taylor and Blair Leftwich)

ROLES AND RESPONSIBILITIES

President/CEO - The President/CEO is responsible for finances, purchasing, advertising, work environment and human resources for the company. The President/CEO also has the ultimate responsibility for all aspects of the Quality Assurance Plan. The President/CEO is also responsible for the growth and ultimate direction of TraceAnalysis, Inc.

Corporate Technical Director - The Corporate Technical Director directs the laboratory with the responsibility for the technical and financial performance of the company. Other duties include client consultation, final data review, and signature of lab reports, and the yearly management review.

Quality Assurance Manager -The Quality Assurance Manager has the responsibility for ensuring that all activities of the lab are in compliance with quality policies. The Quality Assurance Manager leads the QA team and reports directly to the President/CEO. The Quality Assurance Manager has the authority and the responsibility to implement and approve corrective actions as needed. The Quality Assurance Manager is responsible for monitoring QC sample analysis results and the results obtained for analyses of external performance samples to identify potential problems. The Quality Assurance Manager is responsible for initiating both preventive and corrective action processes as needed to ensure proper operations within the laboratory. The Quality Assurance Manager is also responsible for maintaining accreditation required for laboratory operations. The Quality Assurance Manager has the authority to stop work should there be serious problems with data quality. The Quality Assurance Manager has the authority to authorize resumption of work when a stoppage of work has been issued. The Quality Assurance Manager functions independently from laboratory operations where QA oversight is provided.

Lubbock Laboratory Manager - The Lubbock Laboratory Manager is in charge of the technical portion of the Lubbock lab. The Lubbock Laboratory Manager answers directly to the President/CEO, the Corporate Technical Director and the Quality Assurance Manager.

El Paso Laboratory Manager/QA Officer – The El Paso Laboratory Manager/QA Officer (EP LM/QAO) is in charge of the lab management, the technical management and QA of the El Paso lab. The EP LM/QAO answers directly to the President/CEO, the Corporate Technical Director and the Quality Assurance Manager.

Midland Laboratory Manager – The Midland Laboratory Manager is in charge of the management of the Midland lab. The Midland Lab Manager answers directly to the President/CEO, the Corporate Technical Director and the Quality Assurance Manager.

Midland Laboratory Technical Manager/QA Officer – The Midland Laboratory Technical Manager/QA Officer (Midland LTM/QAO) is in charge of the technical and QA of the Midland Lab. The Midland LTM/QAO answers directly to the President/CEO, the Corporate Technical Director and the Quality Assurance Manager.

Internal Production Manager - The Internal Production Manager assures that the sample input and data output of the lab runs smoothly in Lubbock. The Internal Production Manager duties also include assuring sample hold-times and turnaround times are met and that clients and project managers are notified if there are problems in those two areas.

Supervisory Staff – Organic Section and Inorganic Section supervisors oversee technical operations in their respective areas. Responsibilities include scheduling of sample analysis, chemist training, instrument preventive maintenance, logbook review and raw data review.

Client Services - Client services provide the client interface and the project management staff necessary to ensure a project is completed in the manner required by the client.

Analysts and Technical Staff - Laboratory analysts and technicians are responsible for performing analyses according to standard operating procedures and for evaluating the acceptability of their data based on established quality control criteria. Analysts are also responsible for initiating corrective action when QC criteria are not met and when audits or performance testing studies show corrective action is needed. General and daily type QC failures (such as matrix interference on spike recoveries) can be documented with flagged data by the technician with no formal CAR report being necessary.

Marketing – Marketing, an important part of business development, is responsible for advertising for the labs, printed materials, and representation at appropriate trade shows.

LIMS Director - The LIMS Director is responsible for developing and maintaining the LIMS system including the networking of the laboratory. Computer training is also provided for the operation of the LIMS as well as other programs.

Project Manager – The Project Manager tracks projects from sample receipt through final report generation. This includes communication with the client and with the analyst to ensure the correct analyses are performed, analyses are performed in an appropriate timeframe, and that the integrity of the data is upheld. The Project Manager will also work to resolve any problems that may arise during the project.

Accounts Receivable – Accounts receivable takes care of all billing including any account questions that a client may have about invoicing, pricing and payment.

Additional job qualifications - Additional job qualifications are kept on file in the QA Office.

SPECIFIC COMPANY POLICIES

DOCUMENT CONTROL

All of TraceAnalysis' documents are controlled following SOP 110 Procedure Control.

CAPACITY AND CAPABILITY

Before new work is accepted for TraceAnalysis, Inc., SOP 102 Capacity and Capability shall be followed. This will help to assure quality work in a reasonable time by the laboratory.

CORRECTED REPORTS

In the case where erroneous results are reported to the client or if a report needs to be amended, then the corrected report is sent to the client labeled as a corrected certificate and the corrections are noted on the report. More information on the policy for erroneous results is found in SOP 142 Reports.

COMMERCIAL OR FINANCIAL PRESSURES

Employees of TraceAnalysis, Inc. perform their work so that they are free from any commercial or financial pressures by clients of TraceAnalysis, Inc. or any other external sources. See SOP 137 Data Integrity and Data Review for more Information.

TRACEANALYSIS, INC.'S CONTINGENCY PLAN FOR INSTRUMENT FAILURE AND CLOSURE

TraceAnalysis Contingency Plan for analysis failure is as follows: In the event of instrument failure, every effort will be made to analyze samples within holding times by approved alternate means. If duplication of instrumentation is insufficient to handle the samples of concern, efforts will be made to secure the equivalent or similar analyses from another approved laboratory. (The laboratory shall be accredited under TNI for the tests performed or with a lab that meets the applicable statutory and regulatory requirements for performing the tests and submitting the results of the tests performed. These laboratories shall be clearly identified by inclusion of their own reports into the data package.) The client will be consulted immediately in this eventuality and permission to subcontract these analyses will be obtained (preferably in writing). In the case where the client specifies a subcontractor, TraceAnalysis will not be responsible for the subcontractor’s work. In the event TraceAnalysis’ changes ownership or closes the clients’ data will be handled according to the Contingency Plan letter located in the QA file.

CONFIDENTIALITY

TraceAnalysis, Inc. is responsible for seeing that confidentiality is maintained by its employees concerning all confidential information with which they become acquainted as a result of their contact with any given project. Trace Analysis, Inc. agrees to hold all disclosed confidential or proprietary information or trade secrets in trust and confidence. The information shall be used only for the client's purposes. The information shall not be disclosed to any third party without written consent of the client. See SOP 104 Client Confidentiality for more information.

INTERNAL AUDIT FILING

Each employee and method of TraceAnalysis, Inc. is subject to an internal audit at the determination of the Quality Assurance Department. The results of the internal audits are filed in the Quality Assurance Department. Training resulting from internal audit findings is copied into the employee's training file. It is the endeavor of the Quality Assurance Department to audit a majority of the analytical methods annually. Copies of the internal audits are given to the Laboratory Manager for the Laboratory Manager's review. See SOP 115 for more information.

DEVIATIONS FROM PROCEDURES OR POLICIES

Deviations from TraceAnalysis, Inc. procedures or policies are permitted if the client (if applicable) has been notified as to why a departure is needed for the project. Also, the Laboratory Manager and Quality Assurance Manager needs to be notified before a departure from TraceAnalysis, Inc. procedures or policies are to take place. SOP 109 Departure Procedures should be followed for deviations.

MANUAL INTEGRATIONS

Manual integrations, if necessary, are performed according to SOP 116 Manual Integrations.

AUTHORIZED SIGNATURE LIST

An authorized signature list for analytical certificates is maintained on file in the Quality Assurance Department.

LABORATORY FACILITIES

TraceAnalysis, Inc. of Lubbock operates in Lubbock, Texas. The laboratory occupies approximately 11,000 square feet of which approximately 8,500 square feet are dedicated to laboratory space. Extraction and instrumentation labs are kept separate with individual HVAC units to minimize cross-contamination. Each area is provided with an emergency notification device. The floor plan of TraceAnalysis, Inc. of Lubbock is depicted in Appendix D.

TraceAnalysis, Inc. of El Paso operates in El Paso, Texas. The lab occupies a space, which encompasses approximately 1,400 square feet of combined analytical and administrative areas. The floor plan of TraceAnalysis, Inc. of El Paso is depicted in Appendix E.

TraceAnalysis, Inc. of Midland operates in Midland, Texas. The lab occupies a space, which encompasses approximately 2,500 square feet of combined analytical and administrative areas. The floor plan of TraceAnalysis, Inc. of Midland is depicted in Appendix E.

Combination of the laboratories provides 13,500 square feet for laboratory functions. In each area of the lab is a fire extinguisher. Eye wash stations, safety shower and fire blanket are accessible to all areas where chemicals are used for sample extraction and preparation purposes. Safety storage cabinets are located in areas where flammable chemicals, acids, or corrosives are stored. The individual laboratories are large, clean, and well lighted, and promote a natural flow of sample analysis. The combination of these three laboratories provides full scale analytical support to various industries throughout the Southwestern United States.

REPRESENTATIVENESS, COMPARABILITY AND COMPLETENESS

REPRESENTATIVE

Representative is a qualitative measure that is related to the ability to obtain a sample that best reflects the characteristics of the part of the environment that is to be assessed. The laboratory uses homogenization of the sample, if compatible with the tests to be performed, to ensure the results obtained are representative of the sample as received.

COMPLETENESS

Completeness is a measure of successfully obtaining all information necessary for a valid scientific study. The objective for completeness is: the methodology proposed for chemical characterization of the samples collected will provide data meeting QC acceptance criteria, following standard laboratory data review and validation, for at least 95% of all samples collected. Completeness may also be defined as a comparison of the number of tests successfully completed (with acceptable QC) to the number of tests requested.

CORRECTIVE ACTION REPORTS

Corrective action reports (CAR) are completed in accordance with standardized procedures in order to provide explanation when QC criteria are not met. The analyst describing the situation encountered completes the CAR report. The corrective action required is taken and documented in the appropriate section of the CAR report by the supervisor and analyst. General and daily type QC failures (such as matrix interference on spike recoveries) can be documented with flagged data by the technician with no formal CAR report being necessary. See Corrective Action in Section 21.

COMPARABILITY

The objective of comparability is to produce results that do not differ significantly from those produced by other parties for the same purpose. TraceAnalysis, Inc. participated in blind proficiency studies provided by from privatized WP/WS and Solid Waste programs approved by TNI. Replicate testing using the same or different methods, re-testing of retained samples, and the correlation of results for different characteristics are also utilized as appropriate, and as specified in the standard operating procedures. The analyses of proficiency test items are to follow the same internal quality control schemes established for client samples. TraceAnalysis participates in each program (SOIL, WP, WS, UST) if applicable twice a year.

Precision and Accuracy

Precision and Accuracy are used to establish and maintain analytical systems that produce analytical results supported by QC data within acceptance criteria specified in the proposed analytical procedures. Precision and accuracy guidelines for the organic and inorganic procedures recommended by the USEPA are normally specified in the individual methods. These provide guidance as laboratory specific criteria are developed for each analytical method.

Accuracy

Accuracy is indicated by the measure of the difference between observed and true values.

If enough sample is available, matrix spikes are analyzed at a frequency specified in the SOP for analyses and are spiked with a standard solution to assist in the evaluation of accuracy of the method for a given sample matrix through calculation of percent recovery of the matrix spike. The analytical method shall be followed for the frequency of a spiked sample.

At a frequency specified in the SOP, a laboratory control sample (LCS) is prepared to ensure the analysis system is operating in control. The percent recovery for the LCS is calculated by comparison of the value obtained for the analysis with the true value of the LCS. The analytical method shall be followed for the frequency of a spiked sample.

Surrogate compounds are spiked into samples analyzed by GC and GC/MS methods. The percent recoveries of the surrogates are used as an indicator of the accuracy and extraction efficiency of the analysis

Precision

Precision refers to the reproducibility of results obtained for the analyses of duplicate samples or matrix spiked duplicate samples. If sample amount permits, at least one out of every twenty samples of similar matrix analyzed by each method for organic analysis, and one out of every ten for inorganic analysis (except metals by SW-846 6010C which allows for one out of every twenty), should be run in duplicate or as matrix spike duplicates for determining precision. If not enough sample is available the LCS/LCSD will be used for precision.

For more specific Quality Control procedures see Section 19.

CALCULATIONS

In the following sections, terms will be used for the following these calculations.

SPIKE % RECOVERY

The calculation of percent recovery for spikes is performed in the following manner:

$$\textbf{\% Recovery} = \frac{|\,SSR - USR\,|}{SA} \times 100\%$$

Where:
SSR = Spiked sample result
USR = Unspiked sample result
SA = Spike added

SURROGATE % RECOVERY

The calculation of percent recovery for surrogates is performed in the following manner:

$$\textbf{\% Recovery} = \frac{\text{Result obtained}}{\text{True Value}} \times 100\%$$

PRECISION

The results of the duplicate analyses are computed and the absolute relative percent difference (RPD) is calculated as follows:

$$\textbf{RPD} = \frac{|\,(R1 - R2)\,|}{\frac{(R1 + R2)}{2}} \times 100\%$$

Where:
R1 = First replicate result
R2 = Second replicate result

The RPD must fall within set method acceptance limits for the results to be accepted and subsequent data validated.

STANDARD DEVIATION

The standard deviation is calculated as follows:

$$s = \sqrt{\sum_{i=1}^{n} \frac{(xi - xmean)^2}{(n-1)}}$$

Where:

s = standard deviation
n = total number of values
x_i = each individual value used to calculate mean
xmean = mean of n values

The percent relative standard deviation (%RSD) or coefficient of variance (CV) is calculated by:

standard deviation
%RSD = ------------------------- X 100%
mean

SAMPLE CUSTODY AND HANDLING PROCEDURES

SAMPLE CONTAINERS

TraceAnalysis, Inc. provides its clients with pre-cleaned sample containers necessary to carry out any given project. Sample containers are constructed of polyethylene or glass. TraceAnalysis, Inc. routinely uses new sample containers obtained from qualified suppliers. The laboratory checks the cleanliness of the new sample containers by analysis of DI (de-ionized) water blanks. Sample containers are used only once and disposed of according to federal, state, and local guidelines. In addition, TraceAnalysis, Inc. supplies certified, pre-cleaned containers.

SAMPLE CONTAINER ORDERS

Bottle Order Form

Bottle orders are prepared by Support Services. Bottle orders must be placed as far in advance as possible. The bottle order is received by e-mail or by phone. A request must contain the following information: analyses, matrices, number of samples, name and shipping address, and date required.

Trip Blanks

Trip blanks are prepared by completely filling an acid included 40 mL vial with organic-free reagent water. The last few drops are gently poured into the vial so that surface tension holds the water in a convex meniscus. The vial is then capped. If air space is present, the procedure is repeated. The vial is labeled as a trip blank. Trip Blanks are tested as each lot is made to ensure there is no contamination before they are sent to clients.

Filling Sample Container Orders

The sample container order is filled by a member of the support services group. Bottles, with proper preservatives added, are packed in shipping containers using bubble-wrap to minimize breakage. The containers are typically sent in the ice chest in which they will be returned to the lab. A chain-of-custody form (see Appendix F) is sealed in a plastic bag and sent with each bottle order. Labels and custody seals are also made available. The bottles may be picked up at the laboratory, delivered by TraceAnalysis, Inc. Staff or a third party carrier.

DEFINITION OF HOLDING TIMES AND PRESERVATIVES

Holding times

Holding times are defined as the amount of time that elapses between the collection of the sample from the source in the field and the beginning of the analysis procedure.

Preservatives

Preservatives are defined as techniques used to maintain the target analytes at concentration representative of those in the source sampled until the sample is analyzed in the laboratory.

Published holding time

Published holding time is viewed as valid as long as the associated preservation and container requirements have been met. Appendix E lists appropriate sample containers, preservatives, and maximum holding times for each analysis.

DEFINITION OF TURNAROUND TIME

Turnaround time is defined as the amount of time that elapses between the receipt of the sample at the lab and the receipt of the data by the client, excluding weekends and holidays. Reports are e-mailed upon completion with a hard-copy of the invoice and original chain-of-custody mailed thereafter unless otherwise specified by the client.

CHAIN-OF-CUSTODY

A chain-of-custody record (Appendix F) should be completed with each sampling event to document sample custody from the time of collection through transfer of custody to the laboratory. At a minimum, the chain-of-custody record must contain the following information:

- Analyses required
- Type of sample bottle(s)
- Preservative(s)
- Sample identification(s)
- Signature of collector
- Date and time of collection(s)
- Signature and inclusive date and times of possession for each person taking custody of the samples.
- Air bill #'s if samples are sent by a common carrier.

A chain-of-custody (COC) completed by the client and/or sampler accompanies all samples received by TraceAnalysis, Inc. TraceAnalysis; Inc. provides chain-of-custody forms for all containers supplied to the client. Clients choosing to use chain-of-custody forms other than those provided by TraceAnalysis, Inc. are responsible for ensuring all essential information is included on the form. The original COC is returned to the client with final reports. A copy of the COC and final reports are kept by TraceAnalysis, Inc.

SAMPLE RECEIVING

Sample Receipt and Verification of Documentation

Samples are received in accordance with the procedures set forth in TraceAnalysis, Inc.'s SOP 125 Sample Receiving. Shipping containers are inspected for custody seals and the condition is noted in the bottom right hand corner of the chain-of-custody. The shipping containers (usually ice chests) are then opened and inspected for enclosed documentation. The sample bottle labels are inspected and compared to the chain-of-custody. Any discrepancies are listed on the chain-of-custody and the client is notified by client services Staff to determine the action required. Samples received with no paperwork are held in refrigerated storage until the proper instruction for analysis is received. The client is contacted immediately and the resolution of the problem is documented in the project file.

Verification of Sample Preservation

The temperature inside the shipping container is determined using a hand-held infrared thermometer and is recorded on the chain-of-custody form. In cases where the samples are hand delivered to the laboratory immediately after collection, the temperature is recorded on the COC with a note specifying that samples were received on ice immediately after sampling. Aqueous samples, except Volatile samples and Oil and Grease by 1664 samples, are checked for pH at log-in. Volatile samples have their pH verified and recorded by the analyst after the analysis has taken place; Oil and Grease samples pH are verified by the analyst before analysis.

Notification of Clients

If samples are received in the wrong container, improperly preserved, broken, or with head space in VOA vials, the client is notified to determine corrective action. This is recorded on the chain-of-custody and is noted in the comments section in LIMS.

SAMPLE LOG-IN AND LIMS

Samples are logged into TraceAnalysis, Inc.'s Laboratory Information Management System (LIMS) in accordance with the Sample Receiving SOP. Each project is assigned a work order number which is reported on the chain-of-custody (COC), and each sample receives a unique sample number that is also written on the COC. Upon entry of all required sample identification and analysis information into the LIMS, the information is reviewed and approved by a secondary check person (peer review) for accuracy and completeness. Any errors or omissions are corrected at this time. All instrumentation downloads the data directly into LIMS except for wet chemistry, TPH by IR and PCBs. The technician verifies the data that is downloaded from the instrument to the LIMS. While data is downloading, data summary sheets for BTEX, TPH and metals, and copies of sample results for GC/MS are printed for inclusion with the COC. The wet chemistry, PCBs and TPH by IR all are hand entered. The technician checks the hand entered data for accuracy and completeness. The results (bench cards) from these areas are copied and placed with each COC they represent. When the final data results are printed, the laboratory manager (or authorized signatory) checks the results versus the copy of the bench cards, summary sheets, and copies of sample results placed with the COC for accuracy and completeness. Any errors or omissions are corrected at this time and a new report is printed and checked again for accuracy and completeness.

SAMPLE STORAGE

The samples are stored in designated refrigerators according to the type of analysis to be performed. Samples to be analyzed for volatile organic compounds are stored in separate refrigerators designated for volatile samples (VOA vials only). Samples are stored separate from standards, reagents and other possible contaminating sources. All refrigerators are monitored daily to ensure the temperature is maintained within a range of 2-6°C. Refrigerator temperatures are recorded every working day and a max/min temperature is recorded over weekends and holidays. Deviations from this temperature range are noted in the temperature logbook and corrective action is taken immediately to help ensure the integrity of the samples.

SAMPLE ACCESS

Controlled Access

Operating the laboratory facilities under controlled access ensures integrity of samples. Only employees are allowed into the laboratory areas. Visitors must register upon arrival and are allowed access to the facility only with an escort.

Internal Chain-of-Custody

An internal chain-of-custody for samples is maintained within the laboratory. Analysts must check the samples in and out of cold storage on the provided internal chain-of-custody section of the LIMS.

SAMPLE SUBCONTRACTING DOCUMENTATION

When samples are subcontracted to other laboratories due to TraceAnalysis, Inc.'s inability to perform the required analyses, a separate chain-of-custody record and analysis request is filled out and sent accompanying the samples. A copy is also put into the client file. Subcontracted work is reported on the letterhead of the laboratory which performed the analysis. The client will be notified in writing of the subcontracted work. TraceAnalysis, Inc. will have on file the QAM and any other QA records needed of the subcontracting laboratory that is running analytes on TraceAnalysis' NELAP scope.

SAMPLE DISPOSAL

Samples not totally consumed during analysis and any excess extracts or digests generated during analysis are disposed of in accordance with local, state, and federal regulations. Specific disposal requirements are arranged with the client before receipt of samples. Sample disposal is addressed in SOP 123 Sample Disposal.

ANALYTICAL PROCEDURES

PURPOSE AND APPLICABILITY

This section specifies the sources of analytical methods used by TraceAnalysis, Inc. and defines controls on standard operating procedures SOPs, their content, and approval for use, distribution, and revision. A list of preparation and analytical methods performed at TraceAnalysis, Inc. is included in Section 27.

METHOD REFERENCES

TraceAnalysis, Inc. employs analytical methods from the following recognized sources:

- CWA Methods of Interest approved for use at 40 CFR Part 136. Methods on www.epa.gov website

- SW-846, Test Methods for Evaluating Solid Wastes, November 1986, Update III as well as the Update IV additions that is located on the EPA website.

- Methods of Soil Analysis, American Society of Agronomy, 2nd Edition, 1982.

- Method References - American Society for Testing of Materials.

- Standard Methods for the Examination of Water and Wastewater, on-line Edition except where noted in the SOPs

METHOD DEVIATIONS

Method deviations are permissible to allow for advances in analytical techniques as long as the actual chemistry of the method is not changed. An example of this would be modifying a gas chromatographic method for the use of capillary columns. Other permissible modifications would include sample volume or weight changes as long as the ratios set forth in the methods are retained. A study to show the deviations do not negatively affect the results of the analysis must be completed, documented, and referenced in the laboratory SOP. Adjustments in sample size used must be reported, before analysis, to the Project Manager who will notify the client to make him/her aware that the adjustments may affect the reporting limit of the analysis.

STANDARD OPERATING PROCEDURES

All analytical procedures are performed according to a written standard operating procedure, incorporating specifics regarding TraceAnalysis, Inc.'s quality control procedures, set-up, and operation of current laboratory instrumentation. SOPs address the following if applicable:

- **Test Methods** -lists the reference document from which the SOP was derived;
- **Applicable Matrices**- describes the sample matrices;
- **Detection Limits** – limits regularly obtained by method represented by the SOP;
- **Scope and Application** -lists the property, analyte(s), or class of compounds measured and situations to which the procedure applies;
- **Summary of Test Method**- summarizes the procedure;
- **Definitions** - acronyms, abbreviations, and specialized forms used in the SOP;
- **Interferences** – any interference that may alter the validity of the result;
- **Health and Safety Warnings** - indicating operations that could result in personal injury or loss of life and explaining what will happen if the procedure is not followed or is followed incorrectly; listed here and at the critical steps in the procedure;

- **Equipment and Maintenance**-describes the instruments, glassware, and other equipment applicable to the procedure and maintenance required for the equipment, note also designated locations where found;
- **Troubleshooting**-"what to do if" section which may be incorporated within the procedure
- **Computer Hardware and Software**-describes the computer system and the software used in analysis
- **Reagents and Standards**-describes the reagent and standard concentration, grade, preparation, and use;
- **Sample Preservation and Holding Time** – preservation, holding times and special requirements needed for sample procurement;
- **Quality Control** – What quality control is needed for the procedure;
- **Calibration and Standardization**- calibrating the process or instruments and curve generation;
- **Procedure**-describes the sequence of activities to be performed. This includes calibration or standardization, sample pretreatment, sample analysis, calculations, reporting limits, quality control checks, and special glassware cleaning procedures as appropriate to the method.
- **Data Analysis and Calculations** – how to present and review the results generated and any calculations needed for the procedure.
- **Method Performance**
- **Pollution Prevention** – steps that can be put in place to reduce the amount of waste generated running the procedure;
- **Data Assessment and Criteria for Quality Control Measures** -_forms, logbooks, standard and reagent logs, and locations for data and data storage;
- **Corrective Action**-describes corrective actions taken when nonconformance or out-of-control situations occur during the procedure. This includes invalid calibrations, method blanks, quality control checks, and matrix interference;
- **Contingency for Handling Out of Control or Unacceptable Data** – Steps to take if the data is out of control or unacceptable;
- **Waste Management** – Describes proper handling of the waste generated from running the procedure;
- **References**-to methods that were used in forming the SOP, Standard Methods, EPA, SW-845, etc.;
- **Tables, Diagrams, Flow Charts and Validation Data ;**
- **Cautions** - indicating activities that could result in equipment damage, degradation of sample or possible invalidation of results; listed here and at critical steps in the procedure.

Any additional information on Standard Operating Procedures can be found in the SOP of SOP Writing.

METHOD START-UP QC

Before a method is approved to generate client data, method start-up quality control must be performed by each analyst and retained on file. Method start-up QC is method dependent and includes at a minimum: Initial Demonstration of Capability and Method Detection Limit Studies. If a modification is made to a method, the method start-up QC must be repeated with the modification as an integral part of the method. Method detection limit studies must be conducted at a minimum of once a year.

Initial Demonstration of Capability

Each analyst or technician must demonstrate that he/she can meet the specifications in the method for recovery of analytes spiked into a reference matrix (reagent water or soil). The test consists of spiking the analytes of interest into a set of four portions of reagent water or soil. The spiking standard needs to be prepared from standards different than those used to prepare the curve, or prepared using stock standards that are prepared independently from the curve. These aliquots are then processed through the entire analytical procedure. The mean concentration and the standard deviation of the mean concentration are calculated for each analyte. The values are compared to specifications in each method. If the mean and standard deviation are within limits, the analyst can use the method to analyze client samples. Other means of demonstrating capability may be employed such as analyzing blind or PT samples or by observation of a trained analyst for those tests that do not have spiking standards.

METHOD DETECTION LIMIT STUDIES

The procedure for determining MDLs is published in 40 CFR parts 136, Appendix B. All programs across the EPA cite this reference. The study is based on repetitive analysis of an interference-free sample spiked with a known amount of the target analyte. In general, seven aliquots of the spiked sample are taken through the entire sample preparation and instrument analysis protocol. The standard deviation of the results is determined, and then multiplied by the one-tailed t-statistic at the 99% confidence level for the number of degrees of freedom in the study (one less than the number of repetitions used to calculate the standard deviation). For seven repetitions, this is a multiplier of 3.143. The resulting value is finally compared to the spike level in the sample. If the spike level is within ten times the calculated MDL then the procedure is considered successful. If not, the spike level in the sample is adjusted, and the study is repeated. More information on MDLs can be located in SOP117 MDLs and RLs.

METHOD CONTINUATION QC

A yearly method continuation quality control must be performed by each analyst and retained on file. Method continuation quality control is a method dependent Demonstration of Capability (like the IDC) and must be conducted at a minimum of once a year. The IDC is performed the first year and the Demonstration of Capability is completed every year after the first for each technician and the method they are following.

DEMONSTRATION OF CAPABILITY (ONGOING)

Each analyst or technician must demonstrate that he/she can meet the specifications in the method for recovery of analytes spiked into a reference matrix (reagent water or soil). The test consists of spiking the analytes of interest into a set of four portions of reagent water or soil. Two consecutive sets of LCS/LCSD pairs may be used to meet this requirement. The mean concentration and the standard deviation are calculated for each analyte. The values are compared to LCS recovery ranges for each analyte. If the recovery of each analyte and the mean recovery are within limits, the analyst can use the method to analyze client samples. Other means of demonstrating capability may be employed such as analyzing blind or PT samples or by observation of a trained analyst for those tests that do not have spiking standards.

METHOD SELECTION

TraceAnalysis, Inc. will use EPA approved methodology for the analysis of environmental samples whenever such methods are available. If the client has not specified an approved method, TraceAnalysis, Inc. will select a recognized and validated method for use. For non-standard methods, validation will be as extensive as necessary to meet the needs of the application.

EQUIPMENT

An extensive scope of services, which TraceAnalysis, Inc. provides to its clients, requires significant capital investment. The laboratory furnishes all items of equipment required for the correct performance of tests.

LIST OF EQUIPMENT

A list of all major equipment is included in Appendix G for the Lubbock Laboratory, Appendix H for the El Paso Laboratory and Appendix I for the Midland Laboratory. It is not intended to be a compilation of all equipment in use, but simply a summary of the significant instrumentation dedicated to providing clients with on-time, quality data.

INSTRUMENT PREVENTIVE MAINTENANCE

All instruments and equipment receive routine preventive maintenance, which is recorded in instrument specific maintenance logs. Routine maintenance ensures that the equipment is operating under optimum conditions, reducing the possibility of instrument malfunction. Preventative maintenance procedures including lubrication, source cleaning, detector cleaning, and the frequency of such maintenance are performed according to the procedures recommended in the manufacturer’s instrument user manual. Chromatographic carrier gas purification traps, injector liners, and injector septa are replaced on a regular basis.

MAINTENANCE

Maintenance must be performed when the instrument begins to degrade as evidenced by the degradation of peak resolution, shift in calibration curves, decreased sensitivity, or failure to meet one or another of the quality control criteria. Precision and accuracy data are examined for trends and excursions beyond control limits to determine evidence of instrument malfunction. Maintenance actions are also recorded in logs located by the major pieces of equipment and is kept in the laboratories at all times. The laboratories also maintain adequate supplies of spare parts such as GC columns, syringes, septa, injection port liners, and other consumable parts to minimize potential instrument downtime. In the event of equipment malfunction that cannot be readily resolved by laboratory Staff, service is obtained from the instrument vendor or manufacturer. Major repairs performed by the vender are also recorded. The field service technician's report is retained on file.

OUT OF SERVICE INSTRUMENTS

An item of equipment which has been subjected to overloading, or mishandling, or which gives suspect results, or has been shown by verification, or otherwise to be defective, shall be taken out of service. At the time the instrument is taken out of service it will be clearly identified and wherever possible stored at a specified place until it has been repaired and shown by calibration, verification or test to perform satisfactorily. The laboratory shall examine the effect of this defect on previous tests and notify the customer of any discrepancies in their reports.

REAGENTS, SOLVENTS, GASES, AND OUTSIDE SUPPLIES

REAGENTS

All reagents are prepared using, at minimum, ACS reagent grade chemicals. Preparation information is recorded in the standards/reagents log.

SOLVENTS AND ACIDS

Solvents and acids used are ultra-high purity, typically surpassing those recommended in actual analytical methods. For volatile organics, purge and trap grade methanol is used. For extractable organics, pesticide grade or Optima ™ grade solvents are used. For metals, trace metals grade acids are used.

GASES

Carrier gases (He) used on gas chromatographs are UHP grade except for the GC/MS systems, which use a research grade of carrier gas. Make-up and other gases used on gas chromatographs are selected according to manufacturer's specifications.

OUTSIDE SUPPLIES

If the laboratory procures outside supplies, they will not be used until they are inspected and verified as compliant to standard specifications relevant to tests concerned. See SOP on Purchasing for further information on outside supplies.

REAGENT AND REFERENCE MATERIAL STORAGE

Reagent Storage

All reagents and chemicals are stored in appropriate areas of the laboratory where they are most commonly used. Corrosive and flammable chemicals are stored in approved cabinets. Ionic salts and other dry chemicals are stored on shelves in the area where they are being used.

Reference Material Storage

Standards and reference materials are stored in the areas of the laboratory where they are used by analysts. A standards refrigerator or freezer designated for its use is in each area. Temperature logs are maintained for standards refrigerators and freezers.

GLASSWARE SPECIFICATIONS

GLASSWARE CLEANING

All dirty laboratory glassware is cleaned and processed by the Support Services department. EPA approved cleaning and baking procedures are followed. Details of glassware cleaning are addressed in SOP 501 Glassware Processing.

CLASS A AND NON-CLASS A GLASSWARE

Laboratory volumetric glassware (pipettes and flasks) is Class A, and any non-Class A Glassware is verified before use and documented in the non-Class A Glassware logbook. When applicable for preparing standards, Class A volumetric glassware will be used.

CALIBRATION PROCEDURES

Analytical instruments and equipment used to obtain measurements, or record data to be used for calculations of analytical results, are calibrated at a frequency and in a manner such that accuracy and reproducibility are consistent with the manufacturer's specifications for proper instrument operation, and the calibration is in compliance with the analysis method requirements.

Laboratory measurements are based upon comparisons to results obtained for the analysis of reference standards analyzed by the same method. The results obtained for the analysis of calibration standards are used to prepare calibration curves or calculate calibration factors. The results of the sample analysis are quantified using either internal or external calibration techniques. Typically, calibration is achieved by the analysis of five calibration standards for organics and three calibration standards for inorganics at concentration levels set forth in the referenced method.

CALIBRATION FREQUENCY

Recalibration of instrumentation is performed at specified time intervals, when indicated by the continuous verification procedures, or when required by the contract-required method. Calibration procedures are method specific. Consult the appropriate SOP for details regarding initial and continuous calibration.

SECONDARY REFERENCE

Where applicable, another source standard from an alternate accredited vender is used to check the calibration of the instruments. If a second vender is not available, then another lot from the same vender is acceptable. If another lot is not available then another analyst can make a secondary reference for the first analyst using the same vender and same lot.

CALIBRATION RECORDS

Each analyst maintains calibration files for the methods performed. This file includes date of calibration, calibration plots, calibration raw data and a unique identifier of the calibration. Data is also present showing traceability to standard reference materials.

TRACEABILITY OF CALIBRATION REFERENCE MATERIALS

All instruments are calibrated using standard solutions of known concentrations. Where applicable, the standards are prepared from certified reference materials traceable to NIST or from reference materials whose concentration has been verified against NIST traceable materials. Certificates of Analysis from standards vendors are kept on file by the Purchasing Agent in the QA file. Thermometers and balances are calibrated annually, or sooner as needed, using NIST traceable thermometers and weights. Daily verification of balance calibration is described in the Balance and Thermometer Acceptance Criteria SOP. Balances, NIST weights and thermometers are serviced by certified technicians annually. Balances are calibrated with results recorded in the Balance Log. Refrigerator temperatures are recorded every working day with a max/min temperature range recorded on weekends and holidays. Oven temperatures are recorded during analysis.

STANDARDS PREPARATION RECORDS

Calibration standards are prepared from commercially available traceable stock standard solutions. The identity of the stock solution, intermediate solution, preparation procedure, solvent lot, date, preparer, expiration date, and identity of the calibration standard are recorded in a standards/reagents logbook. The entry is dated and signed by the analyst. The standard ID and initials of prep person and expiration date are recorded on the standard container. More information on standards preparation is included in SOP on Standards.

ACCEPTANCE OF A STANDARD CURVE

The laboratory calibration procedure utilized must meet or exceed the method calibration criteria for analyses performed. In the event that calibration criteria is not attained, a recalibration is attempted. If the calibration fails again, the analysis is halted and corrective action is taken. The calibration procedure in the method is followed for each specific analysis. Calibration records are documented on computer printouts, in the analysis logbook, and/or on bench sheets where applicable.

INITIAL CALIBRATION VERIFICATION

The initial calibration verification (ICV) is performed to determine if the calibration curve that has just been generated is valid. It is a check upon the accuracy of the individual calibration standards used to perform the calibration. The ICV solution is prepared from a different lot number or obtained from a different manufacturer than that of the calibration standards. If the ICV is not from a different lot or source, then a second source needs to be added to check the calibration where applicable.

CONTINUING CALIBRATION VERIFICATION

The continuing calibration verification (CCV) is used to ascertain that the initial calibration is still holding and correct as the instrument is used to process samples. For instruments that incorporate analyte identification into the procedure such as retention time matching from a gas chromatograph or spectral matching from a mass spectrometer, the CCV also serves to determine that the identification criteria are still being met. The source of the CCV could be one of the calibration standards.

FACILITY AND SAFETY REQUIREMENTS

Extraction and instrumentation areas are kept separate with individual HVAC units to minimize cross-contamination. Each area has a fire extinguisher and emergency notification device. Eye wash stations, safety showers, and a fire blanket are accessible to all areas. Ventilation hoods are located in all areas where chemicals are used for sample extraction and preparation purposes. Safety storage cabinets are located in areas where flammable chemicals, acids, or corrosives are stored. Safety meetings are conducted by the Safety Officer and all employees are required to be present for these meetings.

LABORATORY QUALITY CONTROL

PURPOSE AND APPLICABILITY

This procedure provides an overview of the quality control (QC) measures used to assess and control analytical processes at TraceAnalysis, Inc. Specific information on quality control checks for individual laboratory departments is provided in TraceAnalysis, Inc. SOPs for individual analysis methods.

RESPONSIBILITIES

Quality Assurance Department

The Quality Assurance Department shall establish and publish acceptance limits for quality control checks and assist laboratory Staff in updating variable limits annually, at a minimum.

Laboratory Analysts

Laboratory analysts shall compare the results of quality control checks to the published acceptance limits, and shall take appropriate corrective measures whenever acceptance limits are exceeded. Corrective measures shall be documented.

DAILY QUALITY CONTROL

NOTE: The following discussion of the daily quality control program is general in nature. The test specific requirements of the methods, as outlined in TraceAnalysis, Inc. SOPs, supersede these general requirements. In addition, client or project-specific QC requirements may supersede those specified in this QA Plan.

Quality Control Checks

The daily quality control program includes a variety of QC checks inserted in the analysis process by analysts. These checks include instrument tuning or sensitivity checks, continuing calibration or calibration verification standard, and lab control samples. Method blank results are evaluated for the presence/absence of laboratory contaminants. These quality control checks monitor the accuracy of the analytical procedure in the absence of matrix interference. The decision to accept or reject analytical results is based on these quality control results.

Acceptance/Rejection Limits for LCS/LCSD

Acceptance limits for these checks are taken from EPA methods or are established by TraceAnalysis, Inc. from actual QC data. If these checks fail to meet acceptance limits, corrective action may be required before continuation of analysis and/or reporting of the data (Check SOP for specifics). If the out of control data is reported (i.e. not enough sample remains, bias high and no hits on analytes of interest), then the data will be qualified in the final report.

Matrix Spikes

Matrix spikes are analyzed at a frequency specified in the SOP to evaluate matrix effects on analyte recovery. Accuracy is calculated as percent recovery of the matrix spike. Precision is calculated as the relative percent difference (RPD) of duplicates or matrix spike duplicates.

Acceptance/Rejection Limits for MS/MSD

Specified acceptance/rejection procedures are found in the method SOP. If any data outside of acceptance limits are reported, the data will be qualified.

Acceptance Limits

Acceptance limits for the daily QC program are taken from EPA methods or are established by TraceAnalysis, Inc. from actual data as described in this section. Acceptance limits are calculated and summarized annually, at a minimum, and distributed to laboratory operations Staff by the Quality Assurance Manager. Current QC acceptance limits are listed in the Statement of Limits.

Fixed Limits

In general, acceptance limits for GC, GC/MS and metals analyses for tuning, initial and continuing calibration, method blanks, and precision and accuracy of matrix spikes and duplicates or duplicate matrix spikes are based on acceptance limits established in EPA methods.

Variable Limits

Variable limits are based on laboratory-generated data and are updated annually, at a minimum.

Acceptance limits for percent recovery of lab control samples and GC and GC/MS surrogate standards are calculated from actual QC data. The mean (x) and standard deviation (s) are calculated from the most recently generated percent recovery data. A minimum of 20 values is necessary to establish most limits. Outliers are excluded from the calculation of acceptance limits. Control charts are available for these parameters. See SOP 107 for more details on establishing control charts.

Acceptance limits are calculated as follows, where (x) represents the mean individual values and (n) is the number of values.

Parameter	Symbol	Formula
Upper Control	UCL	x + 3s
Upper Warning Limit	UWL	x + 2s
Center Line (mean)	x	(Σχi) ⁄ n
Lower Warning Limit	LWL	x – 2s
Lower Control Limit	LCL	x – 3s

If the data generated are insufficient to calculate acceptance limits and the method does not provide acceptance criteria, the following limits will apply:

- Inorganic Chemistry: 75-125% recovery
- Metals: 75-125% recovery (water); 75-125% recovery (soil) (6010C); LCS 85-115% recovery (200.7)
- Organic chemistry – Volatiles/Semi-Volatiles: 70-130% recovery (8000C)
- Other analyses: 75-125% recovery

Acceptable relative percent difference (RPD) of duplicate analyses is ≤20% for duplicate results greater than 10 times the method detection limit (MDL). When one or both results are ≤10 times the MDL, the RPD acceptance range is ≤67%.

Acceptance limits for spike and surrogate recoveries will be decided based on the following criteria:

1. If the analyte is on the DOD list, then the laboratory recovery limits will be no wider than those established by the DOD. The low end of recovery will be no lower than the DOD limit but no lower than 10 percent (the minimum TRRP limit), and the high end of recovery will be no higher than the DOD limit.

2. The laboratory limits will be no tighter than either end of the instrument limit (CCV limit). The low end will be no higher than the low end of the CCV limit, and the high end of the recovery limit will be no lower than the high end of the CCV limit.

3. All other limits, lower or higher, will be decided by the third standard deviation of laboratory control charts.

Exceptions will include methods with required recovery limits (method specific limits) such as metals, BOD, Oil and Grease, IC, etc. in which the method specific limits will be followed. Any client specific limits will be applied on those projects only.

Acceptance limits will be updated annually at a minimum, when 20 or more new values have been generated unless a method is used so infrequently that would call for use of a smaller population of values. The summary of acceptance limits is revised and distributed to the appropriate lab groups after each update.

REPORTING LIMITS

Reporting limits are generated based on a factor of roughly 1-10 times the calculated MDL depending on the confidence level of the analysis. Reporting limits are available to the client by request.

DATA COLLECTION, REDUCTION, AND REPORTING

This section defines the TraceAnalysis, Inc. procedures for data collection, reduction, entry into the LIMS, validation, and reporting. All data is collected, reduced, entered, validated, and reported in accordance with this procedure unless an alternate scheme is outlined in a project-specific plan.

RESPONSIBILITIES

Analysts

Analysts conduct data collection and reduction in accordance with this procedure.

Peer review

A peer review person is assigned to each analyst for review of data, QA ,and data entry for correctness.

Supervisors

Laboratory Supervisors review data and assist in corrective action procedures.

Quality Assurance Manager

The QA Manager, QA Deputy or other designee reviews 1% of all data packages for technical completeness and accuracy except for DoD clients where 10% review is done.

Laboratory Manager

The laboratory manager (or authorized signatory) has the final review before he/she signs the final reports; then the reports are sent to the clients.

DATA COLLECTION

Sample Preparation and Analysis

Sample preparation and analytical activities are documented in sufficient detail to allow the analysis to be recreated. The information must be recorded in a laboratory notebook or on preprinted worksheets, or retrievable from instrument output. This includes the following at a minimum:

- The analytical activity being performed (i.e. the specific analytical method or preparation method performed)
- The person(s) performing the activity and the date the activity was initiated.
- Instrument parameters, including instrument identification and settings. Instrument settings may be referenced to previous documentation of instrument parameters.
- The analytical sequence must be documented (i.e. the chronological order of analysis). The following data for each sample, standard, and QC check ran in the analytical sequence must be recorded and/or retrievable from an instrument printout (quantitation report, etc.)
- QC sample type identification, if QC sample
- Dilution factor
- Sample aliquot/final volume
- Instrument reading
- Units for all variables are specified, preferably in column headings
- TraceAnalysis, Inc. sample number
- Final result
- Percent recovery and RPD
- The calibration curve from which data are quantified, identified by instrument and date ran, or by reference to a notebook and page number or a filename, if the initial calibration is included in the analytical run.

- Identification of the source of standards used for calibration, calibration verification, and laboratory control samples, and matrix spikes referenced to a standards prep notebook and page number.

- Notes regarding any anomalies (e.g. change in color, formation of precipitate, sample foaming) or difficulties (e.g. instrument malfunction) encountered during analysis.

- Support equipment ID (hot block, oven, balance, etc.) must be documented in the logbook used for analysis.

Data Recording and Error Correction

All handwritten data must be recorded using indelible ink. When an error in any hard copy documentation of data is corrected, the person making the correction draws a single line through the erroneous data so as not to obscure the original entry. He/she then writes his/her initials, the date, and the correct information, if applicable, adjacent to the error. When corrections are for reasons other than transcription errors, the analyst or responsible party needs to document the reason for the correction.

DATA REDUCTION

Qualitative Identification

Qualitative identification of organic compounds is performed according to retention time matching. Second column confirmation by GC is performed upon request or when specified by the requested method.

Quantitation

The equations used to calculate final results are specified in the appropriate laboratory methods and SOPs. In general, the following rules concerning blank correction, reporting limits, significant figures, and rounding rules apply to those calculations.

Blank Correction

Blank correction is not allowed except for analytical procedures or methods that require blank correction.

Significant Figures and Rounding Rules

- All calculation results are rounded to the correct number of digits (usually 3) as the final calculation step. No result is rounded before reaching the final answer, even in a lengthy calculation.

- To round a number, first determine the number of digits to be reported (the reportable figures, usually 3). Determine whether the digit to the immediate right of the right-most reportable figure is greater than, equal to, or less than 5. Ignore any digits further to the right unless the number is 5. If the number is greater than 5, round up (e.g. 1.766 is rounded to 1.77). If the number is less than 5, truncate after the last reportable figure (e.g. 1.764 is rounded to 1.76). If the number is 5 and is followed by other non-zero digits, then we add one to the preceding digit (e.g. 1.7653 and 1.76501 will both round to 1.77). If the digit after the point of round off is a 5 and no other digits follow the 5, then we drop the 5 if the preceding digit is even and add one to the preceding digit if it is odd (e.g. 1.765 is rounded to 1.76 and 1.775 is rounded to 1.78).

Round results at the end of calculations to three digits as follows, with the exceptions noted:

- If the initial concentration of the sample is less than the reporting limit, express the reporting limit as 3 digits (e.g. <1.00 mg/L)

- If the initial concentration of the sample is above the reporting limit, and if expressed in scientific notation its exponent would be equal to that of the reporting limit expressed in scientific notation, report the result to 3 digits. (For example, if the reporting limit is 1.00 mg/L, the initial concentration is 5.148 mg/L and no dilutions were made, report the result as 5.15 mg/L.)

- If the initial concentration is above the reporting limit, and is expressed in scientific notation its exponent would be greater than that of the reporting limit expressed in scientific notation, report the result to 3 digits. (For example, if the reporting limit is 1.00 mg/L, and the initial concentration is 51.480 mg/L and no dilutions were made, report the result as 51.5 mg/L.)

Note: for quality control checks and PT samples, express results, recoveries, and relative percent differences using at least three significant figures whenever possible.

Evaluation

The quality control data for each batch or analytical run are evaluated against acceptance limits. Whenever a quality control result exceeds acceptance limits, corrective action may be required (check the method specific SOP) before turning in data for the batch or analytical run for data review. All data reported with exceeded limits will be qualified.

DATA VALIDATION

Data Review

Following data reduction and before data entry, the raw data associated with the analytical run, instrument output (quantitation reports, chromatograms, spectra), calibration curves, etc. are subjected to secondary review. The review encompasses the correctness, acceptability, and completeness of the following elements of data generation and handling (all elements are not applicable to all tests):

- Instrument tuning
- Initial Calibration
- Continuing calibration/calibration verification
- Calibration Blanks
- Method or preparation blanks
- Surrogate and/or lab control sample recovery
- Qualitative identifications
- Quantitation, including units and reportable figures
- Precision of duplicates
- Recovery of matrix spikes
- Holding Times
- Data qualifiers
- Data Evaluation

When unacceptable calibration or quality control check is generated, the data reviewer ensures that appropriate corrective action was taken before approving the data. Any defects are corrected. Raw data are corrected as necessary. If corrective action cannot be taken, the samples are qualified appropriately.

Upon approval of the data, the reviewer initials the lab notebook, page(s), worksheet(s), or instrument printout, and indicates approval of the data, which allows the data to proceed to data entry and final report generation. Following data review and approval, preliminary results may be provided to the client when necessary. The results must be clearly labeled as being preliminary and subject to change upon completion of laboratory review.

Data Entry

Following data evaluation and review, the sample results and QC data are entered into the LIMS system by the analyst.

Data Reporting

Following data review, data are available for report preparation through the LIMS. The report consists of a lab analysis report and a quality control report. On most reports, the QC information is available on the same page as the lab analysis report. The lab analysis report contains the following information:

- A title, e.g. “Analytical and Quality Control Report”, “Test Report” or “Analytical Report”
- Name and address of laboratory
- An Order Identification Number
- Name and address of client
- Project information
- Matrix identification
- Characterization and condition of the test item
- Date sampled and date of sample receipt
- Date of performance of tests
- Identification of test method used
- Result and units for each analyte for each sample
- Any comments about the sample or results (e.g. matrix effect)
- A signature and title of person accepting responsibility for the content of the report

If requested by the client, results from organics analyses which fall between the method detection limit and the reporting limit may be reported with a flag indicating that the result is an estimate. Additionally, results quantitated over the standard range will also be reported with a flag indicating that the result is an estimate.

Quality Control Reporting

The quality control report contains the following information as applicable to the analyses:

- Supplemental information, including method reference, date, analysis and analyst
- Surrogate standard recoveries
- Method blank results
- Matrix spike and duplicate or matrix spike duplicate results

If any quality control sample result does not meet the applicable acceptance criteria, a footnote or comment shall be included with the result in order to explain the nonconformance and corrective action taken, if appropriate. The quality control report may be further supplemented with initial and continuing calibration data and/or raw data upon request.

Final Report Review

After the LIMS report is printed, it is forwarded, with any supplemental information, including reviewed data sheets, to the Laboratory Manager, who compiles and reviews the report, ensuring that all deliverables are correct. Errors and inconsistencies that are not evident in the initial review may become apparent when each result is evaluated in light of the results obtained for the other parameters: Specifically the following are observed:

- Units and reportable figures
- Interparametric relationships (e.g. TDS/specific conductance, TOC/BOD/COD, dissolved/total, anion/cation balance, where appropriate)
- Reasonableness of results given the available information about the sample Method references
- Any problems with the data must be corrected before the final report is approved

RECORDS RETENTION

All records of raw data, audits, quality control, proficiency test results, and laboratory procedures are maintained in various files and notebooks throughout the lab. At the end of each year they are transferred to storage and kept five years. All records will be kept for five years.

All records of client sample analysis are maintained in client files. These records include copies of the original signed results, a copy of the chain-of-custody, copies of applicable Corrective Action Reports, and all raw data associated with the results. These records are transferred to storage at the end of the year and are retained for five years. All other records are kept for five years.

CONFIDENTIALITY OF DELIVERABLES

The laboratory delivers the reports to the specified contact listed on the chain-of-custody accompanying the samples. Where clients require transmission of test results by telephone, facsimile or other electronic or electromagnetic means, staff will follow documented procedures that ensure that the requirements are met and that confidentiality is preserved. See SOP 104 Client Confidentiality for more information confidentiality of deliverables.

UNCERTAINTY MEASUREMENT

Upon client request, the uncertainty of measure can be provided and is calculated as follows: 2 times the standard deviation from the most recent control chart. This product is applied to the sample result (sample result ± uncertainty).

CORRECTIVE ACTION

INITIATION AND COMPLETION OF CORRECTION ACTION

If, because of an audit or QC sample analysis, a system defect is discovered, corrective action is implemented. The analyst, section supervisor, Quality Assurance Manager, or Laboratory Manager may initiate the action and will participate in the corrective action. If previously reported data are affected by a situation requiring correction, the matter will be acted upon by the Quality Assurance Manager and Laboratory Manager.

The steps that may comprise a closed-loop corrective action system are as follows:

- Define the problem
- Assign responsibilities for problem investigation
- Investigate and determine the cause of the problem
- Check all calculations
- Re-analyze the sample
- Verify the integrity of the spiking solution, laboratory control sample, or calibration standard
- Check instrument and operating conditions to preclude the possibility of malfunctions or operator error
- Determine the corrective action(s) necessary to eliminate the problem
- Assign and accept responsibilities for implementing the corrective action
- Establish the effectiveness of the corrective action and implement the correction
- Verify and document that the corrective action has eliminated the problem, using the automated TraceAnalysis' VersaLIMS Corrective Action Report menu.

Depending on the nature of the problem, the corrective action implemented may be formal or informal. In either case, occurrence of the problem, the corrective action employed, and verification that the problem has been eliminated must be documented.

PERFORMANCE EVALUATIONS AND SYSTEM AUDITS

INTERNAL AUDITS

The records, logbooks, and data files of each laboratory department are audited annually, at a minimum, by the Quality Assurance Department. The data is reviewed for completeness, accuracy, and adherence to standard operating procedures. Random project files are evaluated for compliance to procedures throughout the analytical process. There is review of all logbooks and records to ensure appropriate documentation of analyses are being recorded in the proper manner. For any deficiencies generated during the internal audit, the Laboratory Manager will have the responsibility of responding to the deficiencies within 45 days, if possible, and implementing any necessary corrective actions. If the internal audit uncovers data of doubtful quality, the laboratory will take immediate corrective action and will notify, in writing within thirty days any client whose work has been affected.

EXTERNAL AUDITS

TraceAnalysis, Inc. is audited as required by regulatory agencies to maintain laboratory certifications and approvals. Commercial clients with laboratory audition programs typically conduct on-site audits and perform data audits on a project-specific basis. These audits are conducted by the client or a consulting firm specializing in this service and operating under contract to the client.

PERFORMANCE EVALUATIONS

TraceAnalysis, Inc. participates in semi-annual wastewater and soil Performance Evaluation Studies. TraceAnalysis, Inc. also participates in client-sponsored performance evaluations by analyzing QC samples prepared and submitted by commercial clients in conjunction with their own QA program.

QUALITY ASSURANCE REPORTING

REPORTS TO LABORATORY MANAGER

Through quality reports to the Laboratory Manager, it is ensured that management Staff are informed of situations, which could affect the performance of the laboratory. Reports are provided by the Quality Assurance Manager to the Laboratory Manager. This report addresses the quality assurance activities including details of corrective actions implemented, audit results, and QC summary information.

QA MEETINGS

In addition to the QA reports, meetings are used to communicate to the laboratory’s management staff and technical staff pertinent information related to QA/QC issues.

TRAINING

This section of the QA Plan describes the TraceAnalysis, Inc. program for training in areas where quality is affected. Specific areas where training must be documented include:

- Analytical methods training
- Quality assurance/quality control (QA/QC) training
- Safety Training
- Internal Audit Training

Other types of training also occur but are not at this time required to meet the requirements of the quality assurance program; these include such subjects as computer training, continuing education, and seminars.

ANALYTICAL METHODS TRAINING

All analysts are trained and supervised in performing specific analytical procedures before working unsupervised. The laboratory section supervisors are responsible for training within their work groups. A supervisor or senior analyst typically conducts the training, using method-specific analytical SOPs as training guides.

A training record is used to document the trainee's proficiency in performing the procedure. For some methods, analyst proficiency is also demonstrated through the analysis of standard materials, with documentation retrievable from the lab notebook and raw data.

Each section supervisor will determine the frequency of retraining, based on revisions to the SOPs or the methods themselves.

QA/QC TRAINING

The Quality Assurance Manager conducts training of new hires in general QA/QC principles. The Quality Assurance Manager determines the frequency of retraining, based on deficiencies determined during performance evaluation or systems audits. Additionally, the Quality Assurance Manager may provide project-specific training before the laboratory analyzes samples for a major project or a project with specific QA/QC or analytical requirements.

A training record is used to document each trainee's attendance at a given training session.

SAFETY TRAINING

The laboratory Safety Officer conducts training of new hires in the TraceAnalysis, Inc. safety program and Chemical Hygiene Plan. Annually all employees are given safety training, which includes the following subjects:

- Safety and Chemical Hygiene Plan
- Fire Safety

The Safety Officer also conducts other safety-related training as needs arise. A safety meeting attendance record is used to document each employee's attendance at a given safety meeting

TRAINING RECORDS

Records are maintained documenting each employee's training in analytical methods, QA/QC principles, and safety. Training records shall specify the trainee, trainer, date, and subject of the training session. The results of proficiency testing, where applicable, should be included. Each employee has a training file in which are updated periodically.

NOTE: See SOP 129 Training for more information on training.

CONTINGENCY PLAN

CLOSURE OR SALE OF TRACEANALYSIS

In the event of a closure or sale of TraceAnalysis, Inc., TraceAnalysis, Inc. will have the following contingency plan:

If the laboratory is sold to another laboratory, all client reports, data supporting the report and responsibility for the report will be passed on to the new laboratory owners.

If the laboratory closes, then an off-site storage facility and a moderator will be utilized for the storage of the reports and data supporting the reports. This will continue until the five required years is exhausted. At that point, the moderator will be released of his duties and the data will be disposed of. The clients of concern will be notified as to the moderator's contact information.

QUALITY MANUAL

QAM	Quality Assurance Manual with Quality Management Plan

SYSTEM PROCEDURES

SOP	101	Balance and Thermometer Acceptance Criteria
SOP	102	Capacity and Capability
SOP	103	Chemical Hygiene Plan
SOP	104	Client Confidentiality
SOP	107	Control Chart Procedure
SOP	108	Corrective Action
SOP	109	Departure Procedures
SOP	110	Procedure Control
SOP	111	Employee Policy Manual
SOP	113	Internal Audits
SOP	114	Maintenance
SOP	115	Management Review
SOP	116	Manual Integration
SOP	117	Method Detection Limits and Reporting Limits
SOP	118	Pipettes
SOP	119	Preventative Action
SOP	120	Purchasing
SOP	121	Records Management
SOP	123	Sample Disposal
SOP	124	Sample Handling
SOP	125	Sample Receiving
SOP	126	Shelf Life and Labeling
SOP	127	Software Validation
SOP	128	Standards and Traceability
SOP	129	Training

SOP	130	Writing the SOP
SOP	137	Data Integrity and Data Review
SOP	138	Demonstration of Capability
SOP	139	Proficiency Testing
SOP	140	Data Security and Back-up
SOP	141	LOD/LOQ/LDR/RTW
SOP	142	Reports Procedure

TECHNICAL STANDARD OPERATING PROCEDURES AND METHODS

METALS

SOP	3005	Metals Sample Preparation Procedure (EPA Method 3005 A)
SOP	3010	Metals Sample Preparation Procedure (EPA Method 3010 A)
SOP	3050	Metals Sample Preparation Procedure (EPA Method 3050 B)
SOP	6010	Metals by ICP (6010 C, E 200.7)
SOP	7471	Mercury in Soils (7471 B)
SOP	7470	Mercury in Water (7470 A, E 245.1)

SEMI VOLATILE ORGANICS

SOP	5310 C	TOC in Water (5310 C, 415.1)
SOP	418.1W	TPH in Water (418.1)
SOP	418.1S	TPH in Soil (418.1)
SOP	1005	TPH in Soil/Water by TCEQ Method 1005
SOP	1006	TCEQ Method 1006 Characterization of Nc_6 to Nc_{35} Petroleum Hydrocarbons
SOP	1311	TCLP Toxicity Characteristic Leaching Procedure (1311)
SOP	1312	SPLP Synthetic Precipitation Leaching Procedure (1312)
SOP	3510	Sep. Funnel Extractions in Water (3510 C)
SOP	3550	Ultrasonic Organic Extractions in Soil (3550 C)
SOP	8011	EDB/DBCP/123 TCP in Water
SOP	8015DRO	Diesel Range Organics in Soil/Water (8015 D DRO)
SOP	OA-2	Diesel Range Organics by Gas Chromatography (OA-2)
SOP	8081	Pesticides in Soils/Waters (8081 B, E 608)
SOP	8082	PCB’s in Soils/Waters (8082 A, E 608)
SOP	8270	Semi Volatiles (8270 D, E 625)
SOP	9077	TOX in Soil/Oil (9077)
SOP	AEEA	AEEA

VOLATILE ORGANICS

SOP	8015 D GRO	Gasoline Range Organics by GC in Soil/Water (8015D GRO and OA-1)
SOP	8021	Aromatic Volatiles by GC in Soils/Water (8021 B, E 602)
SOP	8260	Volatiles by GC/MS (8260 C, E 624, 5030, 5035)

WET CHEMISTRY

SOP	120.1	Electrical Conductivity in Water (2510B, 120.1)
SOP	150.1	Aqueous pH (4500-H$^+$ B, 150.1)
SOP	160.4	Fixed and Volatile Solids (2540 E, 160.4)
SOP	300.0	Anions by Ion Chromatograph (300.0, E 9056 A)
SOP	310.1	Alkalinity in Water (2320 B, E 310.1)
SOP	330.4	Chlorine in Water (E 330.4, SM 4500-Cl F)
SOP	345.1	Iodide (345.1)
SOP	350.2 S	Nitrogen, Ammonia in Soil (4500-NH_3 B,C, E 350.2)
SOP	350.2 W	Nitrogen, Ammonia in Water (4500-NH_3 B,C, E 350.2)
SOP	350.2	Ammonia w/KCl (4500-NH_3 B,C, E 350.2)
SOP	410.4	COD in Water (5220 D, 410.4)
SOP	413.1	Oil and Grease (E 413.1)
SOP	1010	Flashpoint: Closed-Cup Method for Ignitability (water)(1010A)
SOP	1110	Corrosivity towards steel and pH Method (1110 A)
SOP	1664	Oil and Grease (1664 B)
SOP	2130	Turbidity (2130 B)
SOP	2216	Determination of Moisture (ASTM D 2216-05)
SOP	2310	Acidity (2310B)
SOP	2540B	Total Solids (2540 B, E 160.3)
SOP	2540C	Total Dissolved Solids in Water (2540 C, E 160.1)
SOP	2540D	Total Suspended Solids (2540 D, E 160.2)
SOP	2540G	Volatile Solids in Semi-solid Samples (E 160.4, SM 2540 G)
SOP	2974	Moisture, Ash and Organic Matter (ASTM D 2974-87)
SOP	3060 A	Hexavalent Chromium in Soil (3060 A, 3500 Cr B)
SOP	3500Cr	Hexavalent Chromium in Water (3500-Cr B)
SOP	Low Level Cr^{+6}	Low Level Hexavalent Chromium in Water (3500-Cr B)
SOP	4500CLS	Soil Chloride, Titrimetric in Soil (4500-Cl^- B)
SOP	4500CLW	Chloride, Titrimetric in Water (4500- Cl^- B)
SOP	4500CNS	Cyanide in Soil (4500-CN^- C, E)
SOP	4500CNW	Cyanide in Water (4500-CN^- C, E)
SOP	4500CN	Weak Acid Dissociable (4500 CN C, E, I)
SOP	4500NO2	Nitrite – Colorimetric in Water (4500- NO_2^- B)
SOP	4500NO3	Nitrate – Cd Reduction (4500- NO_3^- E)
SOP	4500S	Sulfide (4500-S^{2-} C, D)
SOP	4500SO3	Sulfite (4500 SO_3 B)
SOP	5049	Reactivity Screening (ASTM D 5049 D)
SOP	5210	BOD/CBOD (5210 B, 405.1)
SOP	5530	Phenolics in Water (5530D)

SOP	5540	Surfactants, MBAS (5540C)
SOP	9040 C	Liquid Waste (9040 C)
SOP	9045	Non-Aqueous pH (9045C)
SOP	9095	Paint Filter (9095 A)
SOP	ASA 90-3.2	Organic Carbon (ASA 90-3.2)
SOP	City Soils	City Soils
SOP	DEN	Density
SOP	Ferrous Iron	Ferrous Iron (HACH IR-1)
SOP	RCI_IGN	Ignitability (soils) (1010)
SOP	RCI_CN	Reactive Cyanides (SW 846. 7.3.3)
SOP	RCI_S	Reactive Sulfides (SW 846, 7.3.4)
SOP	TKN S	TKN in Soil (4500-N_{org} B, 351.2, 351.3)
SOP	TKN W	TKN in Water (4500-N_{org} B, 351.2, 351.3)
SOP	Crude Protein	Crude Protein (calculated w/351.3 and 4500-N_{org} B)
SOP	TX 128 E	pH of Soil-Construction Method (TEX 128 E)

MICROBIOLOGY PROCEDURES

SOP Colilert 18 and Colisure Total Coliform and E. Coli (P/A and Enumeration) (Colisure, Colilert 18)

EL PASO TECHNICAL STANDARD OPERATING PROCEDURES AND METHODS

SOP	2540C	Total Dissolved Solids (SM 2540C, E 160.1)
SOP	2540D	Total Suspended Solids (SM 2540D, E 160.2)
SOP	EP 300.0	Anions by Ion Chromatograph (300.0)
SOP	310.1	Alkalinity (SM 2320B, E 310.1)
SOP	EP BOD/CBOD	BOD/CBOD (E 405.1, SM 5210B)
SOP	410.4	COD (E 410.4, SM 5220 D)
SOP	1664	Oil and Grease (1664 A)
SOP	120.1	Electrical Conductivity (2510B, E 120.1)
SOP	EP 3500CR	Hexavalent Chromium (3500-Cr B)
SOP	2540 B	Total Solids (2540 B, E160.3)
SOP	EP 4500H	pH (4500-H^+, E 150.1)
SOP	330.4	Chlorine (E330.4, SM 4500 Cl F)

MIDLAND TECHNICAL STANDARD OPERATING PROCEDURES AND METHODS

SOP	Conductivity	Electrical Conductivity in Water (2510B, 120.1)
SOP	L ML 150.1	Aqueous pH (4500-H^+ B, 150.1)
SOP	2540C	Total Dissolved Solids in Water (2540 C, E 160.1)
SOP	2540D	Total Suspended Solids (2540 D, E 160.2)
SOP	2540 G	Fixed and Volatile Solids (2540 E, E 160.4)
SOP	L ML 300.0	Anions by Ion Chromatograph (300.0, E 9056)

SOP	310.1	Alkalinity in Water (310.1, 2320B)
SOP	2216	Determination of Moisture (ASTM D 2216-05)
SOP	MID 4500CL	Titrimetric Chloride (4500- CL^- B)
SOP	MID 9045	Non-Aqueous pH (9045 C)
SOP	8015 D GRO	Gasoline Range Organics by GC in Soil/Water (8015 D)
SOP	8021	Aromatic Volatiles by GC in Soils/Water (8021 B)
SOP	1005	TPH in Soil/Water by TCEQ Method 1005
SOP	8015 D DRO	Diesel Range Organics by GC in Soil/Water (8015 D)

WORK INSTRUCTION PROCEDURES

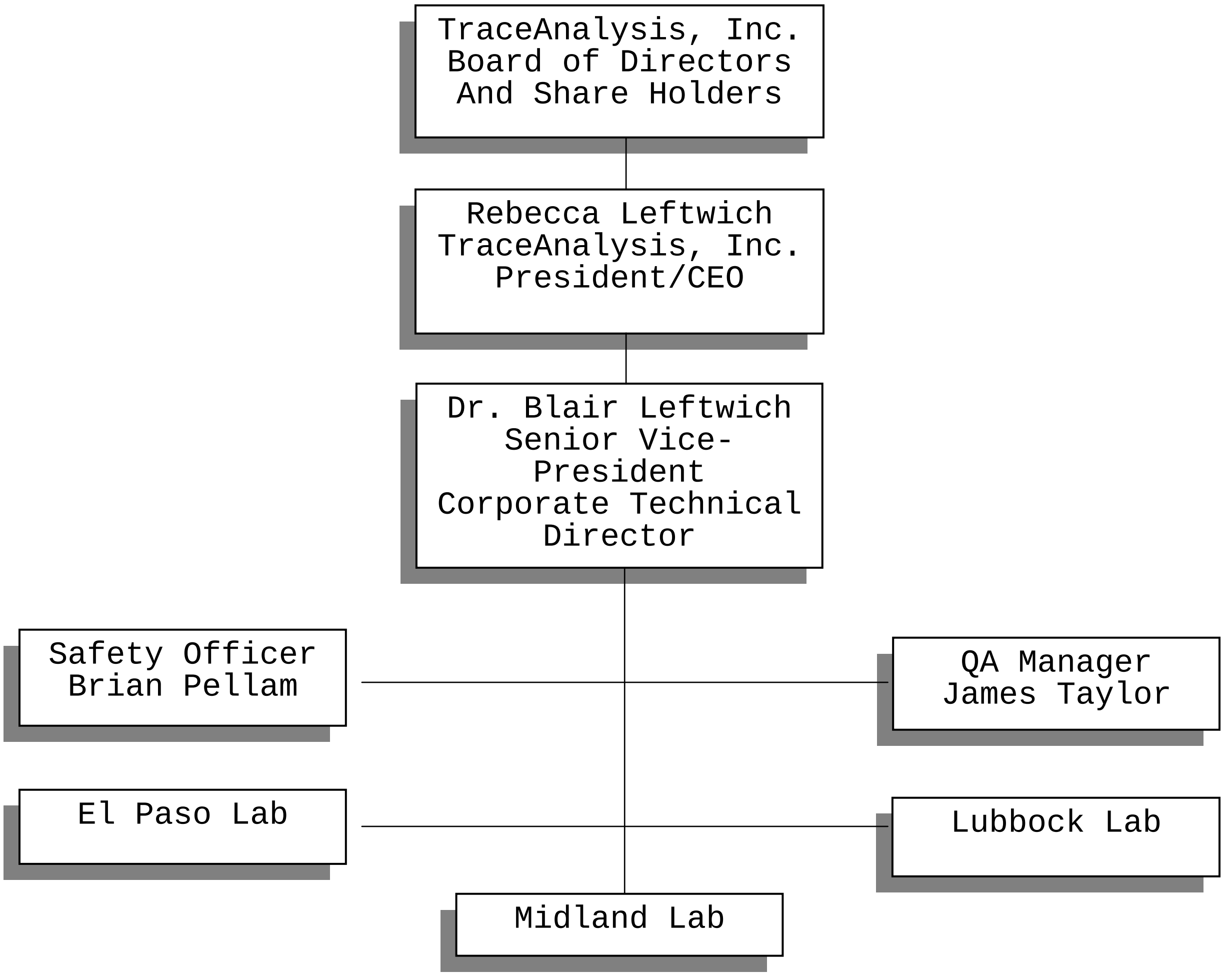
SOP	501	Glassware Processing

MASTER LIST

(Summary of all Quality System Policies, Procedures, and Arrangements) Logbook TA-307Master List of Quality System Documents and Technical SOPs

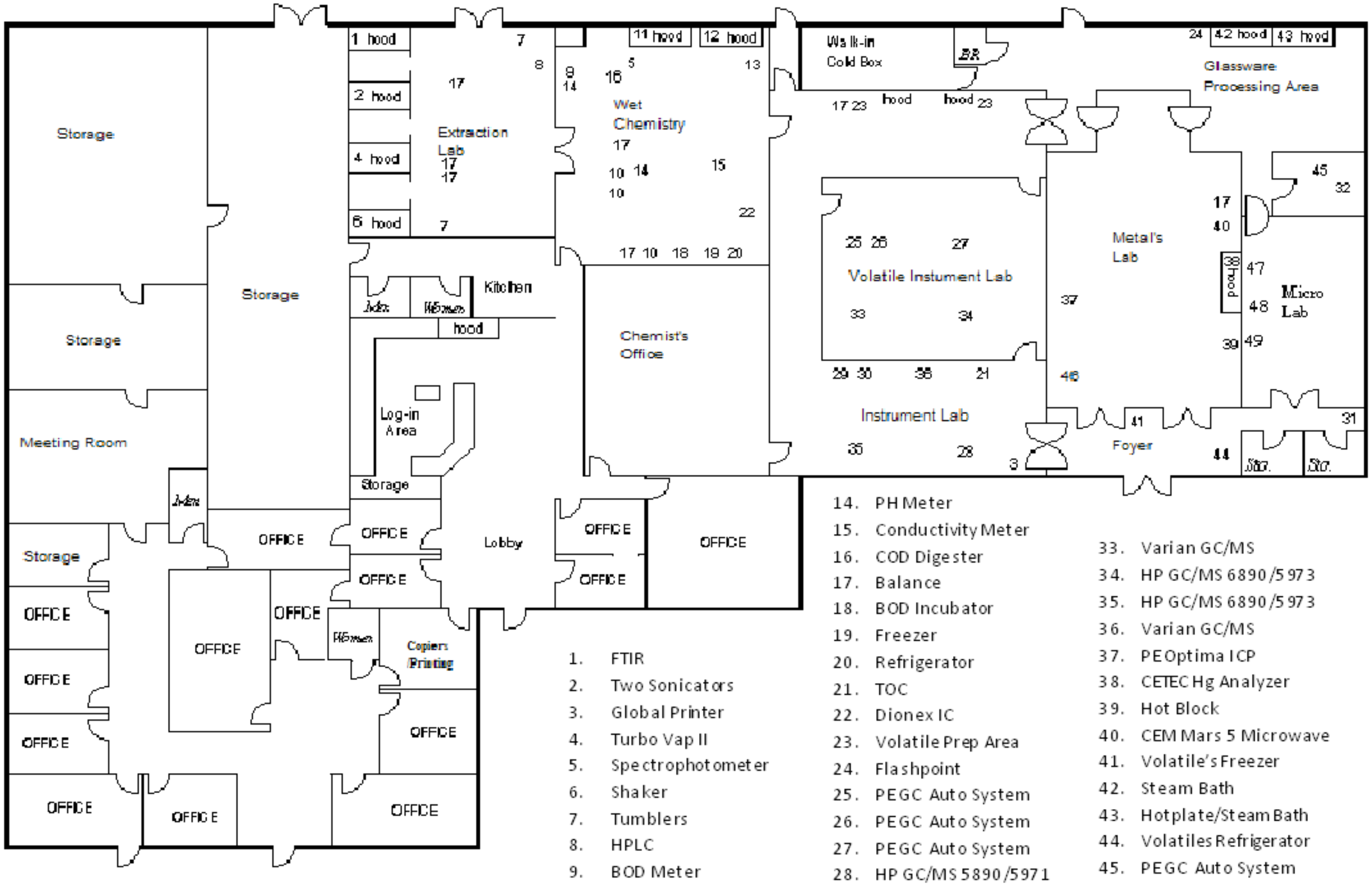
APPENDIX

A. TRACEANALYSIS, INC. ORGANIZATIONAL CHART



B. LABORATORY ORGANIZATIONAL CHART

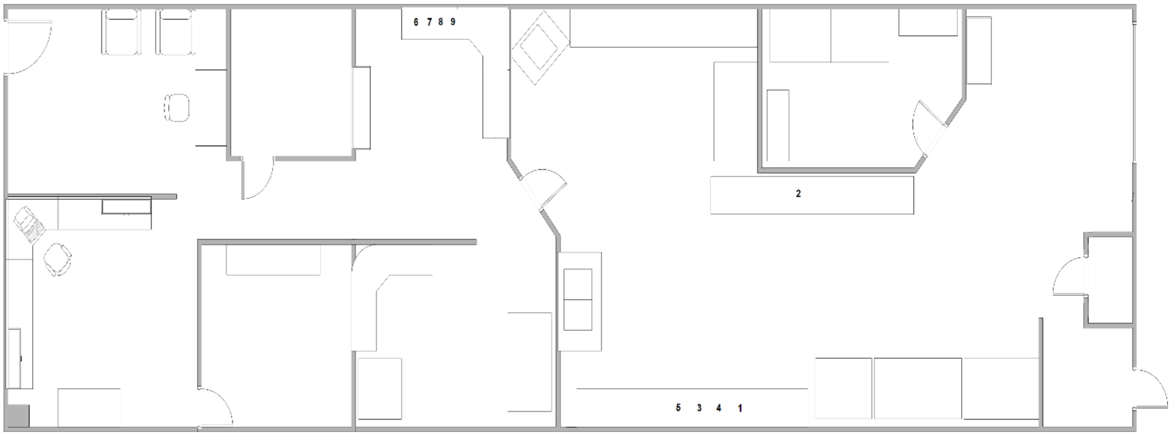
C. LUBBOCK LABORATORY FLOOR PLAN



1. FTIR
2. Two Sonicators
3. Global Printer
4. Turbo Vap II
5. Spectrophotometer
6. Shaker
7. Tumblers
8. HPLC
9. BOD Meter
10. Ovens
11. Distillation Unit
12. TKN Digester
13. Rapid Distiller
14. PH Meter
15. Conductivity Meter
16. COD Digester
17. Balance
18. BOD Incubator
19. Freezer
20. Refrigerator
21. TOC
22. Dionex IC
23. Volatile Prep Area
24. Flashpoint
25. PEGC Auto System
26. PEGC Auto System
27. PEGC Auto System
28. HP GC/MS 5890/5971
29. PEGC Auto System
30. PEGC Auto System
31. TPH Soil Freezer
32. PEGC Auto System
33. Varian GC/MS
34. HP GC/MS 6890/5973
35. HP GC/MS 6890/5973
36. Varian GC/MS
37. PEOptima ICP
38. CETEC Hg Analyzer
39. Hot Block
40. CEM Mars 5 Microwave
41. Volatile's Freezer
42. Steam Bath
43. Hotplate/Steam Bath
44. Volatiles Refrigerator
45. PEGC Auto System
46. Spectros ICP
47. Incubator
48. Fluoroscope
49. Quanti Tray Sealer

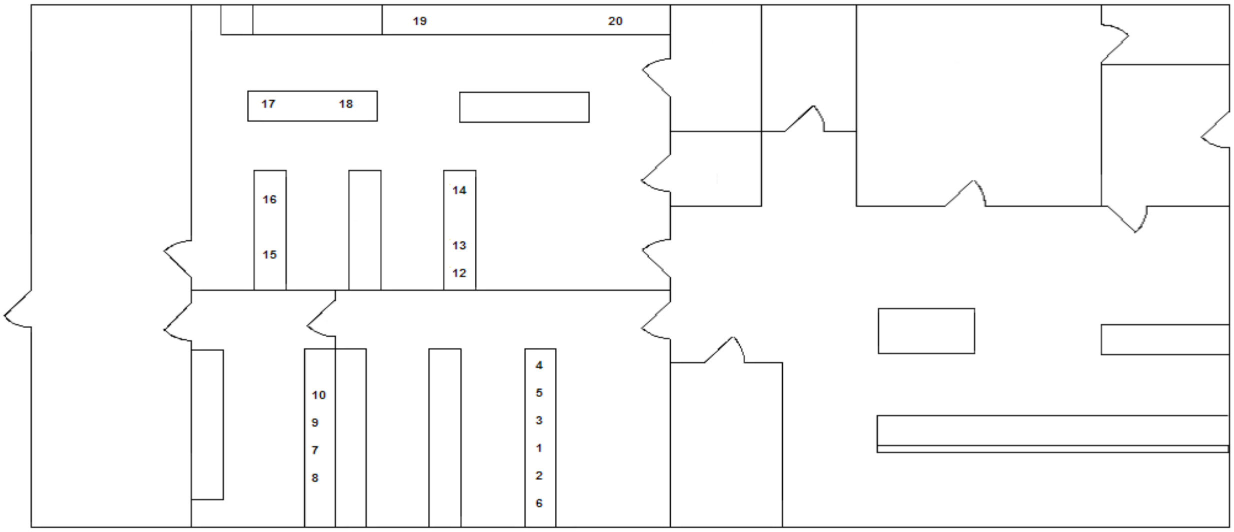
D. EL PASO AND MIDLAND LABORATORY FLOOR PLANS

El Paso Floor Plan



1. Hach DR/2500 Spectrophotometer
2. Accumet AR40 DO Meter
3. Orion pH Meter Model # 720 A
4. Orion Conductivity Meter Model #160
5. Hach COD Reactor Model #45600
6. Dionex DX 120 Ion Chromatograph
7. AS40 Automated Sampler
8. Advanced Chromatography Model CMA-1
9. Autoion Controller Conductivity Detector Model COM-1
10. Dionex Analytical Pump

MIDLAND FLOOR PLAN



1. Perkin Elmer Autosystem GC
2. OI Analytical Sample Concentrator
3. EST Autosampler
4. Perkin Elmer Autosystem GC
5. OI Analytical Sample Concentrator
6. EST Autosampler
7. Perkin Elmer Autosystem GC
8. TDX EZ Flash
9. Perkin Elmer Autosystem GC
10. TDX EZ Flash
11. Perkin Elmer Autosystem XL GC
12. Accumet pH Meter XL
13. Accumet Conductivity Meter
14. Ohaus Explorer Pro Scale
15. Dionex IC
16. Dionex Autosampler
17. I-Chem Tumbler
18. Thelco Precision Oven
19. Accuspin 1 Centrifuge
20. Easypure II Watersystem

E. HOLD TIMES AND PRESERVATIVE CHARTS

TRACEANALYSIS, INC.

SAMPLE CONTAINERS & PRESERVATION REQUIREMENTS

AQUEOUS SAMPLES

PARAMETERS	Containers	Preservative	Maximum Holding Time	Sample Volume
MICROBIOLOGY				
E. coli and Total Coliform	P,G	Cool ≤ 10°C, $Na_2S_2O_3$ [2]	6 Hours (WW)	100 mls
Total Coliform	P,G	Cool ≤ 10°C, $Na_2S_2O_3$ [2]	30 Hours (DW)	100 mls
INORGANICS/PHYSICALS				
Acidity	P,G(B)	Cool ≤ 6 °C	14 days	100 mls
Alkalinity	P,G	Cool ≤ 6 °C	14 days	250 mls
Ammonia	P,G	Cool ≤ 6 °C, H_2SO_4 to pH<2	28 days	500 mls
Biochemical oxygen demand (BOD)	P,G	Cool ≤ 6 °C	48 hours	1000 mls
Boron	P, PTFE, or Quartz	HNO_3 to pH<2	6 months	100 mls
Bromide	P,G	None required	28 days	100 mls
Biochemical oxygen demand, carbonaceous (CBOD)	P,G	Cool ≤ 6 °C	48 hours	1000 mls
Chemical oxygen demand (COD)	P,G	Cool ≤ 6 °C, H_2SO_4 to pH<2	28 days	100 mls
Chloride	P,G	None required	28 days	100 mls
Chlorine, total residual	P,G	None required	Analyze immediately	500 mls
Color	P,G	Cool ≤ 6°C	48 hours	500 mls
Cyanide, total and amenable to chlorination	P,G	Cool ≤ 6 °C, NaOH to pH>12	14 days, 24 hours if sulfide is present	1000 mls
Cyanide, total	P,G	Add NaOH to pH>12, refrigerate in dark. If sample is chlorinated check SM 4500-CN^- for pretreatment	14 days, 24 hours if sulfide is present	1000 mls
Cyanide, amenable to chlorination	P,G	Add 100 mg $Na_2S_2O_3$ per Liter of sample	14 days, 24 hours if sulfide is present	1000 mls
Fluoride	P	None required	28 days	250 mls
Hardness	P,G	HNO_3 to pH<2, H_2SO_4[1] to pH<2	6 months	100 mls
Hydrogen ion (pH)	P,G	None required	Analyze within 15 minutes	50 mls
Iodide	P,G	Cool ≤ 6°C	Analyze immediately	500 mls
Kjeldahl and organic nitrogen	P,G	Cool ≤ 6 °C, H_2SO_4 to pH<2	28 days	500 mls
Nitrate (chlorinated)	P,G	Cool ≤ 6°C	28 days	100 mls
Nitrate	P,G	Cool ≤ 6 °C	48 hours	100 mls
Nitrate-nitrite	P,G	Cool ≤ 6 °C, H_2SO_4 to pH<2	28 days	100 mls
Nitrite	P,G	Cool ≤ 6 °C	48 hours	100 mls
Oil and grease (O&G)	G	Cool ≤ 6 °C, HCl or $H_2SO_4$to pH<2 [4]	28 days	1000 mls
Organic carbon, total (TOC)	P,G	Cool ≤ 6°C, H_2SO_4 to pH<2 [4], store in dark.	28 days	3 X 40 mls
Orthophosphate	P,G	Filter immediately, Cool ≤ 6 °C	48 hours	100 mls
Oxygen, dissolved probe	G bottle and top	None required	Analyze immediately	500 mls
Phenols	G only	Cool ≤ 6 °C, H_2SO_4 to pH<2	28 days	500 mls
Phosphorous, Total (6010C)	P,G	HNO_3 TO ph<2	6 months	100 mls
Residue, Total (TS)	P,G	Cool ≤ 6 °C	7 days	200 mls
Residue, Filterable (TDS)	P,G	Cool ≤ 6 °C	7 days	200 mls
Residue, Nonfilterable (TSS)	P,G	Cool ≤ 6 °C	7 days	200 mls
Residue, Settleable	P,G	Cool ≤ 6 °C	48 hours	200 mls
Residue, Volatile (VS)	P,G	Cool ≤ 6 °C	7 days	200 mls
Resistivity	P,G	Cool ≤ 6 °C	28 days	100 mls
Silica	P, PTFE, or Quartz	Cool ≤ 6 °C	28 days	100 mls
Specific conductivity	P,G	Cool ≤ 6 °C	28 days	100 mls
Sulfate	P,G	Cool ≤ 6 °C	28 days	100 mls

PARAMETERS	Containers	Preservative	Maximum Holding Time	Sample Volume
Sulfide	P,G	Cool ≤ 6 ^{o}C add zinc acetate [3] plus NaOH to	7 days	100 mls
Sulfite	P,G	None required	Analyze immediately	100 mls
Surfactants (MBAS)	P,G	Cool ≤ 6 ^{o}C	48 hours	250 mls
Temperature	P,G	None required	Analyze immediately	1000 mls
Turbidity (EPA 180.1)	P,G	Cool ≤ 6 ^{o}C	48 hours	100 mls
Turbidity (SM 2130B)	P,G	Cool ≤ 6 ^{o}C	Analyze same day; store in dark up to 24 hours.	100 mls
Metals				
Boron	P	HNO_3 TO ph<2	6 Months	250 mls
Chromium VI (hexavalent chromium)	P(A),G(A)	Cool ≤ 6 ^{o}C,	24 hours	250 mls
Mercury	P(A),G(A)	HNO_3 to pH<2	28 days	100 mls
Metals (except Borons and Mercury)	P,G	HNO3 to pH<2 NOTE: For dissolved metals filter immediately then add HNO3 to pH<2	6 Months	250 mls
Organics				
Acrolein and acrylonitrile (624 and 8260C)	G w/TLC	Cool ≤ 6 ^{o}C, 0.008% $Na_2S_2O_3$ [2] HCl to pH < 2	14 days	3 X 40 mls
Alcohol amines	G w/TLS	Cool ≤ 6 ^{o}C	14 Days	2 X 40 mls
Benzidines (8270D)	G w/TLC	Cool ≤ 6 ^{o}C, 0.008% $Na_2S_2O_3$ [2]	7 days to extraction, 40 days after	1000 mls
Chlorinated hydrocarbons	G w/TLC	Cool ≤ 6 ^{o}C, 0.008% $Na_2S_2O_3$ [2]	7 days to extraction, 40 days after	1000 mls
Dioxins and Furans	G w/TLC	Cool ≤ 6 ^{o}C, 0.008% $Na_2S_2O_3$ [2]	30 days to extraction, 45 days after	1000 mls
Fuel Fingerprint	G w/TLS	Cool ≤ 6 ^{o}C	14 Days	3 X 40 mls
Haloethers	G w/TLC	Cool ≤ 6 ^{o}C, 0.008% $Na_2S_2O_3$ [2]	7 days to extraction, 40 days after	1000 mls
Nitroamines	G w/TLC	Cool ≤ 6 ^{o}C, 0.008% $Na_2S_2O_3$ [2] Store in dark. pH < 2	7 days to extraction, 40 days after	1000 mls
Nitroaromatics and cyclic ketones	G w/TLC	Cool ≤ 6 ^{o}C, 0.008% $Na_2S_2O_3$ [2] Store in dark.	7 days to extraction, 40 days after	1000 mls
Organic halides, Total (TOX)	G w/TLC	Cool ≤ 6 ^{o}C, H_2SO_4 to pH<2	28 days	1000 mls
Organochlorine Pesticides	G w/TLC	Cool ≤ 6 ^{o}C	7 days to extraction, 40 days after	1000 mls
Petroleum hydrocarbons, Total (TX1005)	G w/TLS	Preserve with $NaHSO_4$ or HCl to pH <2, Cool ≤ 6^{o}C.	14 days	3 X 40 mls
Petroleum hydrocarbons, Total (TX1006)	G w/TLS	Preserve with $NaHSO_4$ or HCl to pH <2, Cool ≤ 6^{o}C.	14 days	4 X 40 mls
Phenols (8270D)	G w/TLC	Cool ≤ 6 ^{o}C, 0.008% $Na_2S_2O_3$[2]	7 days to extraction, 40 days after	1000 mls
Phalate esters (8270D)	G w/TLC	Cool ≤ 6^{o}C	7 days to extraction, 40 days after	1000 mls
Purgeable Halocarbons (624 and 8260C)	G w/TLS	Cool ≤ 6 ^{o}C, 0.008% $Na_2S_2O_3$[2]	14 days	3 x 40 mls
Purgeable aromatic hydrocarbons (BTEX, 602, 8021B, 625, 8260C)	G w/TLS	HCl to pH < 2	14 days	3 X 40 mls
PCBs (608, 625, 8082A, 8270D)	G w/TLC	Cool ≤ 6^{o}C, 0.008% $Na_2S_2O_3$[2]	1 year to extraction, 1 year after	1000 mls
Polynuclear aromatic hydrocarbons (625, 8270D and 8310)	G w/TLC	Cool ≤ 6^{o}C	7 days to extraction, 40 days after	1000 mls
RCI	P,G	Cool ≤ 6^{o}C	14 Days	500 mls
Semivolatiles (625, 8270D)	G w/TLC		7 days to extraction, 40 days after	1000 mls
TPH DRO	G w/TLS	Cool ≤ 6 ^{o}C, 0.008% $Na_2S_2O_3$ [2] HCl to pH < 2	14 Days	3 X 40 mls
TPH GRO	G w/TLS	Cool ≤ 6 ^{o}C, 0.008% $Na_2S_2O_3$ [2] HCl to pH < 2	14 Days	3 X 40 mls

TRACEANALYSIS, INC.

SAMPLE CONTAINERS & PRESERVATION REQUIREMENTS

NON-AQUEOUS SAMPLES AND TCLP

PARAMETERS	Containers	Preservative	Maximum Holding Time	Sample Volume
INORGANICS				
Inorganic analytes (except hexavalent chromium and mercury)	P(A),G(A)	Cool ≤ 6 °C	6 months	4 oz.
Chromium, hexavalent	P(A),G(A)	Cool ≤ 6 °C	One month to extraction, 24 hours after extraction to analysis	4 oz.
Conductivity	P,G	Cool ≤ 6 °C	28 Days	4 oz.
Metals (except chromium VI and mercury)	P(A),G(A)	Cool ≤ 6 °C	6 months	4 oz.
RCI	G (P is ok for corrosivity and Reactivity)	Cool ≤ 6 °C	ASAP not exceeding 14 days	8 oz.
VOLATILE ORGANICS				
Volatiles	G, PTFE lined cap Method 5035: 40mL vials with septum and stirring bar.	Cool ≤ 6 °C	48 hours or up to 14 days if kept frozen at < -7 °C	4 oz.
SEMIVOLATILE ORGANICS				
Alcohol amines	G w/TLC	Cool ≤ 6 °C	14 Days	4 oz.
Base/Neutral and Acid Semi-Volatile Compounds	G w/TLC	Cool ≤ 6 °C	14 days to extract 40 days after extract to analysis	4 oz.
Chlorinated Pesticides and PCBs	G w/TLC	Cool ≤ 6 °C	14 days to extract 40 days after extract to analysis	4 oz.
Petroleum hydrocarbons, Total (TX1005/1006)	G w/TLC	Cool ≤ 6 °C	14 days	4 oz.
PCB (in Transformer oil)	P,G	Cool ≤ 6 °C	28 Days, recommended	20 mls
TCLP				
Mercury	P(A),G(A)	Preserve with HNO3 to pH<2 after TCLP	28 days to TCLP, 28 days after TCLP to analysis.	4 oz. Solids 500 mL Aqueous
Other Metals	P(A),G(A)	Preserve with HNO3 to pH<2 after TCLP	180 days to TCLP, 180 days after TCLP to analysis.	4 oz. Solids 500 mL Aqueous
Chlorinated pesticides	G w/TLC	Cool ≤ 6 °C	14 days to TCLP, 7 days after TCLP to extraction, 40 days after extraction to analysis	4 oz. Solids 1000 mL Aqueous
Volatiles	G w/TLS	Cool ≤ 6 °C and minimum headspace before and after TCLP	14 days to TCLP 14 days after TCLP to analysis	4 oz. Solids 1000 mL Aqueous
Semi-Volatiles	G w/TLC	Cool ≤ 6 °C	14 days to TCLP, 7 days after TCLP to extraction, 40 days after extraction to analysis	4 oz. Solids 1000 mL Aqueous

NOTES:

[1] H_2SO_4 and HNO_3 for hardness preservatives only listed in 40CFR Ch I (7-1-2010 Edition) Table II. HNO_3 is the only preservative listed in Manual or the Certification of Laboratories Analyzing Drinking Water

[2] Free chlorine if present must be removed by appropriate addition of $Na_2S_2O_3$.

[3] Need to add drops 2N zinc acetate / 100 mL of sample.

[4] HCl or H_2SO_4 can be used in SW846 and 40 CFR methods.

[5] The pH adjustment is not required if acrolein will not be measured. Samples receiving no pH adjustment must be analyzed within 3 days of sampling.

Multiple Analyses from Same Container:

Above list the sample container, volume, and preservation for single tests. Often more than one test can be taken from the same container as long as the preservative is the same. Usually 2-4 test can be taken from the same container.

Example for water: TDS,TSS, pH, conductivity, anions, and cations can all be analyzed from a one liter non-preserved bottle; ammonia and TKN can be analyzed from the same 500ml H2SO4 perserved bottle; and BOD, pH, and TSS can be taken from the same non-perserved liter container. Tests requiring separate containers are Oil and Grease, TPH, volatiles, semi-volatiles, pesticides herbicides, PAHs, PCBs, TOC, total metals and TOX.

Example for soil: BTEX, metals, TPH, and semivolatiles can be taken from the same 4oz bottle. Chloride, TPH, BTEX, and conductivity can be from the same 4oz bottle. TCLP usually takes a separate 4oz bottle. A one quart zip lock plastic bag can be analyzed for nutrients, metals, moisture, pH, and salts.

PLEASE CONTACT THE LABORATORY FOR SAMPLE VOLUMES REGARDING MULTIPLE ANALYSES.

Composites

No more than 10 subsamples should be composited to avoid dilution of high analytes. Water samples should be composited into a common container before thoroughly mixing and pouring into sample containers. All containers should be opened and each containers should be poured 1/4 full, then add another 1/4 to each container and so forth until containers are full. Soil samples should be composited into a bucket, stainless steel bowl, or plastic bag then clods should be reduced and the sample mixed before placing in sample containers. Care should be taken to reduce loss of volatiles when they are of concern.

Splits

A sample is a true split only when the two subsamples come from the same container. Samples should be split in the same manner as composites above with the exception that the duplicate water sample containers can be filled at the same time using the 1/4 full at a time procedure. The order of filling should be reversed for each pass.

Abbreviations:

P: polyethylene
G: Glass
PTFE: Teflon
TLC: Teflon-lined cap
TLS: Teflon-lined septum
P(A) or G(A): rinsed with 1 + 1 HNO_3
G(S): borosilicate glass

Sample Preservation:

Sample preservation should be performed immediately upon sample collection. For composite samples, samples may be preserved by maintaining the sample at ≤6°C until compositing and sample splitting is completed.

Holding Times:

Holding times listed are the times that samples may be held before analysis and still be considered valid under EPA regulations. Holding times are measured from the date of sampling

Measurements:

If the dissolved content is to be measured, samples should be filtered on-site immediately before adding preservatives.

These requirements are based on 40CFR136, Table II; SW-846, fourth edition, and Standard Methods online edition .

F. CHAIN-OF-CUSTODY

LAB Order ID # ____________________ Page_____of_____

TraceAnalysis, Inc.
email: lab@traceanalysis.com

6701 Aberdeen Ave, Ste 9
Lubbock, Texas 79424
Tel (806) 794-1296
Fax (806) 794-1298
1 (800) 378-1296

5002 Basin Street, Suite A1
Midland, Texas 79703
Tel (432) 689-6301
Fax (432) 689-6313

200 East Sunset Rd., Suite E
El Paso, Texas 79922
Tel (915) 585-3443
Fax (915) 585-4944

BioAquatic Testing
2501 Mayes Rd., Ste 100
Carrollton, Texas 75006
Tel (972) 242-7750

Company Name: **Phone #:**
Address: (Street, City, Zip) **Fax #:**
Contact Person: **E-mail:**
Invoice to:
(If different from above)
Project #: **Project Name:**
Project Location (including state): **Sampler Signature:**

LAB # (LAB USE ONLY)	FIELD CODE	# CONTAINERS	Volume/Amount	MATRIX					PRESERVATIVE METHOD							SAMPLING		ANALYSIS REQUEST (Circle or Specify Method No.)																					
				WATER	SOIL	AIR	SLUDGE		HCL	HNO_3	H_2SO_4	NaOH	ICE	NONE		DATE	TIME	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	Moisture Content	Cl, F, SO_4, NO_3-N, NO_2-N, PO_4-P, Alkalinity	Na, Ca, Mg, K, TDS, EC			Turn Around Time if different from standard	Hold

Relinquished by: Company: Date: Time: Received by: Company: Date: Time: INST_______ OBS _______°C COR _______°C

Relinquished by: Company: Date: Time: Received by: Company: Date: Time: INST_______ OBS _______°C COR _______°C

Relinquished by: Company: Date: Time: Received by: Company: Date: Time: INST_______ OBS _______°C COR _______°C

LAB USE ONLY
Intact____Y / N____
Headspace Y / N /NA
Log-in Review_____

REMARKS:
☐ Dry Weight Basis Required
☐ TRRP Report Required
☐ Check If Special Reporting Limits Are Needed

Submittal of samples constitutes agreement to Terms and Conditions

Carrier #____________________

ORIGINAL COPY

G. LUBBOCK LABORATORY EQUIPMENT LIST

	In-service Date	Serial Number
GC's		
Perkin-Elmer Auto System GC-1(FID)(PID)	10/96	610N3020107
Perkin-Elmer Auto System GC-2 (FID)	8/92	610N2081902
Perkin-Elmer Auto System GC-3 (FID)(PID)	10/96	610N0090502
Varian Archon Autosampler-1		15243
Varian Archon Autosampler-2	2/2005	14390
Varian Archon Autosampler-3		12573
OI Eclipse 4660 Concentrator-1	4/2009	E842466008P
OI Eclipse Model 4660 Concentrator-2		E842466005P
OI Eclipse Model 4660 Concentrator-3		C301271
Perkin-Elmer Auto System (ECD x 2)	8/92	610N0040401
Perkin-Elmer Auto System (ECD x 2)	8/92	610N2081903
Perkin-Elmer Auto System (FID)-TPH1	12/2002	610N6053004
ThermoOrion Detection EZ Flash	1/99	000819
Perkin-Elmer Auto System	12/2002	610N1052103
Thermedics Detection EZ Flash	6/2000	981909
Perkin-Elmer Auto System (FID)	10/96	610N0090502
HNU SYSTEMS Photoionizer		101178
HNU Systems Photoionzer	11/00	901330
CSi 300 Series GC	4/2009	984318
Perkin Elmer PID		924034
GC/MS		
Varian 431-GC	4/2009	GC0810B542
Varian 210-MS	4/2009	MS0810W045
EST Analytical Auto sampler		11949-669A
OI Analytical Concentrator-5	9/2008	E842466007P
Hewlett Packard 5973 Mass Selective Detector	2/98	US72010693
HP6890 Series GC System	2/98	US00009866
OI Analytical Concentrator-4		E84266006P
EST Analytical Auto sampler		13062
Hewlett Packard 5971A Mass Selective Detec.	8/1992	3050A01784
HP 5890 Series II GC	8/1992	3033A32538
HP 7673 Injector	8/1992	3120A27994

Autosampler Controller	8/1992	3138A26814
Autosampler Carousal	8/1992	3137A26261
Hewlett Packard 5971A Mass Selective Detec.	8/1995	3222A03727
HP 5890 Series II GC	8/1995	3121A36087
HP 7673 Injector	/1995	3334A36001
Autosampler Controller	8/1995	3113A25761
Autosampler Carousal	8/1995	3123A25305
Hewlett Packard 5973 Mass Selective Detec.	2/1998	US72070693
HP 6890 GC System	2/1998	US00009866
OI Analytical 4660 Sample Concentrator	9/2008	E842466007P
Varian Archon Purge and Trap Autosampler		12573
Varian 431-GC	4/2009	GC0810B542
Varian 210-MS	4/2009	MS0810W045
Varian Archon	4/2009	MS0810W003
Hewlett Packard 5971A Mass Selective Detec.	8/1992	3188A03479
H.P. 5890 GC Series II	8/1992	3203A41107
O.I 4560 Sample Concentrator	8/1992	A220276
Varian Archon	10/2002	13841
FTIR		
Perkin-Elmer Spectrum 1	4/2005	73368
ICP		
PE Optima 8300 ICP	4/2012	078N2022701
Autosampler PE510	4/2012	
Poly Sci Chiller	4/2012	1B1221046
PE Optima 3300DV	9/2002	069N9021203
Autosampler AS90	12/1998	9026
Thermoflex 1400 Chiller	9/2002	110295045
Dayton Air Compressor	9/2002	653020
Mercury Analyzer		
CETAC M 6100	8/2004	120301QT6
ASX400	8/2004	120309ASX-4
Peristalic Pump	8/2004	120306PMP

IC		
Dionex ICS-1100 IC	2/2011	10111192
Dionex AS-DV Auto-sampler	2/2011	10120079
Dionex DS6 Conductivity Detector	2/2011	10111242
Misc.		
Fisher Scientific pH meter 50	8/1992	C0005908
YSI Model 3100 Conductivity Instrument	1/2000	99K0360 AD
YSI Conductivity Probe		061-2460
Hach DR/2500 Spectrophotometer	10/2003	030100004567
International Equip. Company 2K Centrifuge	8/1992	71653831
Emerson Vacuum Pump Motor		0692A
Emerson Vacuum Pump Motor		0692B
Kontes Midi-Vap 3000 CN^- Rapid Distillation	12/2007	2508
VWR Heater		811734
Fisher Scientific Distillation Unit 100	12/2007	520010256
Accumet XL60 pH / DO meter	11/2007	XL94003994
TOC Analyzer		
OI Aurora 1030	11/17/2008	F838730814
OI Auto Sampler 1088	11/17/2008	D839788871
Prep		
Zymark Turbo Vap II Sample Concentrator	9/1996	TV9622N6870
Zymark Turbo Vap II Sample Concentrator		04023
Environmental Express Hot Block		980327-127TS
Tumbler A.O. Smith	8/1992	327P896
Tumbler MOD# 3240-12-BRE	8/1997	1709
Tumbler MOD# 3240-12-BRE	8/1997	1224
Fugikin Pressure Filter		
Environmental Express Pressure Filter		
Seperatory Funnel I Shaker Apparatus		
Ultrasonics Sonic Dismembrator	8/1997	2778B
550 Fisher Sonic Dismembrator	8/1992	F1512
Gast House Vacuum System	8/1992	1192
Thermolyne Maxi Mix II	8/1992	871971249688
Thermolyne Maxi Mix II	8/1997	871971038614
10 Zero Head Space Containers Various		
Kontes Filtration Manifold and Glassware	6/2000	

Fisher Ultrasonic Bath	8/1992	192143
Fisher Scientific Thermix Stirrer Model 120S		70200545
Fisher Scientific Stirrer		707920313398
Fisher Scientific Stirrer		707920796456
Corning Stirrer Model PC-161		
Microlab		
Binder Incubator	6/2011	10-07601
Quanti-Tray Sealer Model 2X	6/2011	11-047-06943
Spectroline UV Lamp CM-10A	6/2011	1784274
Balances		
OHAUS Precision Standard Scale (#5)	9/1998	13931
Scout Pro (#2)	3/2007	7125480364
Scout Pro (#3)	3/2007	7125490025
Mettler AE 200 S (#10)	2/2010	H55735
Scout Pro (#13)	12/2010	7131410725
OHAUS EP 214C (#11)	12/2010	L1661128173514P
Scout Pro (#14)	8/2012	7131410742
OHAUS CS 5000 (#15)	11/2012	NA
Data Systems		
VersaLIMS Version 2.51		
GC-TotalChrom Data System		
PE Optima – Winlab 32 v2.2		
HPLC and IC – Chromeleon v.6.11		
GC/MS - Agilent Chem Station		

H. EL PASO LABORATORY EQUIPMENT LIST

Instrument	In-service Date	Serial Number
YSI 5000 Dissolved Oxygen Meter with Self-Stirring Probe	5/2012	9900036
Cole-Parmer Ultrasonic Cleaner, Model 08891-11	2/2007	QBB120617235D
Thermo Fisher/Dionex ICS-100 Ion Chromatograph	8/2012	12070444
Dionex AS40 Automated Sampler	8/2012	99020042
Dionex Pump (2), Degasser, Injection Valve	8/2012	
DS6 Heated Conductivity Cell	8/2012	12070342
Dionex Chromeleon 7.1.1.1127 Software	8/2012	152443
Fisher Scientific Centrific Centrifuge, Model 228	1/2007	1624061007322
Fisher Scientific Isotemp 500 Series Oven Model: 516G	1/1998	71200584
Fisher Scientific Isotemp Hotplate/Stirrer Model: 1160049SH	2/2006	1619050902804
Hach COD Reactor, Model 45600	3/1998	900702785
Hach DR/2500 Spectrophotometer	1/2004	040300007345
Mettler Toledo SevenMulti S40 pH Meter	5/2010	1231045430
Ohaus Explorer Pro Analytical Balance Model: EP214C	1/2004	I0091122510335P
Orion 720A pH Meter	11/1994	011134
Precision Economy Oven Model: 6522	12/2005	600842
Precision-180 Series Water Bath	7/2005	605041097
YSI 3200 Conductivity Meter	1/2004	03C0458 AC

I. MIDLAND LABORATORY EQUIPMENT LIST

Instrument	In-service Date	Serial Number
Perkin Elmer Autosystem GC	07/2006	610N2081901
OI Analytical Sample Concentrator	07/2006	J503460893
EST Autosampler	07/2006	14442
Perkin Elmer Autosystem GC	07/2006	610N3122203
OI Analytical Sample Concentrator	07/2006	N310460128
EST Autosampler	07/2006	14205
Perkin Elmer Autosystem GC	07/2006	610N2060611
TDX EZ Flash	07/2006	00001150
Perkin Elmer Autosystem GC	07/2006	610N3022608
TDX EZ Flash	07/2006	00001225
Accumet pH Meter XL	07/2006	XL94000720
Accumet Conductivity Meter	07/2006	AB92323501
Ohaus Explorer Pro Scale	07/2006	K1601127201800
I-Chem Tumbler	07/2006	1709
Thelco Precision Oven	07/2006	601922
Accuspin 1 Centrifuge	07/2006	40583047
Easypure II Watersystem	07/2006	1305060786362
Ohaus Scout Pro		7132191176
Ohaus Scout Pro	07/2006	7125020326
Dionex LC20-1		96110016
CD-20 Dionex		96090107
GP40 Dionex		96080212
Dionex AS40		95120074
Mettler AE200 Scale		H31120
Fisher Scientific Oven		1579060676709
HACH DR 2700 Spectrophotometer	8/2012	1448172

J. LIST OF ACRONYMS/ABBREVIATIONS

AA	Atomic Absorption
ACS	American Chemical Society
AES	Atomic emission spectroscopy
ASTM	American Society for Testing Materials
BFB	4-bromofluorobenzene
BNA	Base/neutral acid
BOD	Biological oxygen demand
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CAR	Corrective Action Report
CCB	Continuing calibration blank
CCC	Continuing calibration check
CCV	Continuing calibration verification
CEC	Cation exchange capacity
COC	Chain of Custody
COD	Chemical oxygen demand
CFR	Code of Federal Regulations
CVAA	Cold vapor atomic absorption
DCS	Detectably check sample
DFTPP	Decafluorotriphenylphosphine
DOC	Demonstration of competence/capability (samples)
DOD	Department of Defense
DQO	Data quality objectives
ECD	Electron capture detector
EOX	Extractable organic halogens
EPA	Environmental Protection Agency
FID	Flame ionization detector
FOC	Fractional organic carbon
FTIR	Fourier-transform infrared
GC	Gas chromatograph
GFAA	Graphite furnace atomic absorption
GC/MS	Gas chromatograph/mass spectrometry
HDPE	High density polyethylene
HPLC	High Pressure (or Performance) Liquid Chromatography
IC	Ion Chromatograph
ICP	Inductively coupled plasma
ICP-AES	Inductively coupled plasma/atomic emission spectroscopy
ICV	Initial calibration verification
ID	Identification
IDC	Initial demonstration of competence/capability
IDL	Instrument detection limit
IPC	Instrument performance check
ISE	Ion-selective electrode
ISO	International Organization for Standardization
LCR	Linear Calibration Range
LDR	Linear Dynamic Range
LCS	Laboratory control samples

LCSD	Laboratory control samples duplicate
LELAP	Louisiana Environmental Lab Accreditation Program
LIMS	Laboratory information management system
LOD	Limit of Detection
LOQ	Limit of Quantitation
MDL	Method detection limit
MS	Matrix spike
MSA	Multiple standard addition
MSD	Matrix spike duplicate
ND	Non-detected
NELAC	National Environmental Laboratory Accreditation Conference
NELAP	National Environmental Laboratory Accreditation Program
NIST	National Institute for Standards and Technology (formerly NBS)
NTIS	National Technical Information Service
PAH	Polynuclear aromatic hydrocarbons
PCB	Polychlorinated biphenyl
PDS	Post-digestion spikes
PE	Performance evaluation
PT	Proficiency test
PID	Photoionization detector
PQL	Practical quantitation level
QA	Quality assurance
QAM	Quality Assurance Manager
QAPP	Quality assurance project plan
QC	Quality control
QCS	Quality control sample
%R	Percent recovery
RCRA	Resource Conservation and Recovery Act
RPD	Relative percent difference
RRF	Relative response factors
RRT	Relative retention time
RSD	Relative standard deviation
SAR	Sodium absorption ratio
SOP	Standard operating procedures
SPCC	System performance check compounds
SPE	Solid phase extraction
SPLP	Synthetic precipitation leaching procedure
SVO	Semivolatile organic
SVOC	Semivolatile organic compound
TAT	Turn-around time
TCEQ	Texas Commission on Environmental Quality (previously named TNRCC)
TCL	Target compound list
TCLP	Toxicity characteristic leaching procedure
TDS	Total Dissolved Solids
TICs	Tentatively identified compounds
TNI	The NELAC Institute
TOX	Total organic halides
TPH	Total petroleum hydrocarbons

TRPH	Total recoverable petroleum hydrocarbons
TRRP	Texas Risk Reduction Program
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
UV	Ultraviolet
VOA	Volatile organic analysis
VOC	Volatile organic compound
WP	Water Pollution (PE Sample)

K. REVISIONS PAGE

Rev. #	Rev. Date	Description
11	December 28, 2007	Added additions for organization changes, Midland Laboratory additions and additional NELAC information to several sections and a revisions page.
11.1	February 11, 2008	Section 9 - Key Staff, Appendix L - updated equipment list, Appendix O – updated acronyms, Significant Figures and Rounding Rules updated, Appendix J – updated methods list – updated corrective action report.
11.2	June 02, 2008	Section 10 – Added statement to link to contingency plan to letter in QA File.
12	April 13, 2009	Updated equipment list, SOP #s and method #s.
13	May 15, 2010	Updated SOP list, equipment list, and made changes to uncertainty, QA Manager responsibilities and Staff.
14	June 20, 2011	Updated to the TNI standard, 2009 and DOD Quality Manual.
15	July 31, 2013	Changes made throughout document, removed annual document review page, and fixed pagination problem. Updated equipment list. Updated SOP list.